UTAH INTERSECTION SAFETY
Recurrent Crash Sites: Identification, Issues and Factors

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ABSTRACT

A study of collisions occurring at intersections along state routes in Utah was conducted. The number of crashes, the crash severity score and, for selected locations, the crash rate were determined and "ranked" for intersections within the Utah Department of Transportation's Region 1, Region 2, Region 3, Region 4's three districts, and the entire state. Study periods of ten years (1994-2003) and three years (2001-2003) were used. The Crash Data Delivery System (CDDS) was used to identify intersections, determine crash frequencies and severities, and find other collision-related statistics. The intersection of Bangerter Highway and 5400 South in Taylorsville experienced the largest number of crashes between 1994 and 2003 (949) and between 2001 and 2003 (296). The intersection of 700 East and 3300 South in South Salt Lake had the state's highest crash severity score between 1994 and 2003 (9,524.8); the score assigns 1,000 points to a fatal crash, 100 points to an incapacitating injury crash, and so forth. This intersection also witnessed the largest number of fatal crashes between 1994 and 2003 (5). The intersection of 31st and Wall Avenue in Ogden had the highest severity score between 2001 and 2003 (3,394.5). The intersection of Main Street and 800 East in Hyrum had the highest crash rate among intersections between two state routes, at 4.54 per million entering vehicles, based on 2001-2003 data. University Avenue and 900 North in Provo experienced the greatest number of crashes among non-signalized intersections between 1994 and 2003 (623), while Riverdale Road and Pacific Avenue in Riverdale had the highest number between 2001 and 2003 (156). The intersection of U.S. 89 and an unnamed road in Sanpete County, at milepoint 216.54, had the highest severity scores among non-signalized intersections for both the ten- and three-year study periods. Detailed examinations of individual crash sites were not performed in this study, although the report contains some general recommendations. For example, signalization *may* be a mitigating strategy at certain non-signalized intersections. Red light cameras, pedestrian facilities, bicycling facilities, and the removal of on-street parking are among the numerous interventions that could be considered for reducing and "calming" crashes. Additional analysis should investigate collision types by crash severity at a variety of intersections, crash rates at intersections between state and non-state routes, and variable functional influence areas. The research team considered the CDDS to be a useful tool, and encourage its continued development, including the customization of certain database search procedures.

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EXECUTIVE SUMMARY

This report summarizes the findings of a study of intersection collisions along state routes in Utah. The Utah Department of Transportation's (UDOT) Crash Data Delivery System was used to identify intersections, crash frequencies and severities at the intersections, and other collision-related information. Intersections were "ranked" according to their respective number of crashes and crash severity score, the latter of which is explained in Section 2. Study periods of ten years (1994-2003) and three years (2001-2003) were used in the development of the rankings. Crash rates were ranked and computed for selected intersections, including those between two state routes, and some additional ones discussed in Section 6. Intersections experiencing recurring fatal crashes - at least two fatal crashes in the ten-year period *and* at least one fatal crash in the more recent three-year period - were also identified. Separate rankings were developed for Utah (i.e., the entire state), UDOT Region 1, Region 2, Region 3, and the Region 4 districts of Cedar City, Price and Richfield. Also, statewide rankings (only) were developed for non-signalized intersections.

Statewide intersections lists are found in Section 2, while regional and district lists are found in Section 3. Non-signalized intersections are discussed in Section 4. The following intersections were "ranked at the top" of their respective lists (4CC = Region 4, Cedar City District; 4P = Region 4, Price District, and 4R = Region 4, Richfield District):

- Statewide, total crashes, 1994-2003: Bangerter Highway + 5400 South, Taylorsville (949)
- Statewide, total crashes, 2001-2003: Bangerter Highway + 5400 South, Taylorsville (296)
- Statewide, crash severity score, 1994-2003: 700 East + 3300 South, South Salt Lake (9,524.8)
- Statewide, crash severity score, 2001-2003: 31st Street + Wall Avenue, Ogden (3,394.5)
- Region 1, total crashes, 1994-2003: 5600 South + 1900 West, Roy (614)
- Region 1, total crashes, 2001-2003: Main Street + Hillfield Road, Layton (227)
- Region 1, crash severity score, 1994-2003: 12th Street + Washington Boulevard, Ogden (7,680.6)
- Region 1, crash severity score, 2001-2003: 31st Street + Wall Avenue, Ogden (3,394.5)
- Region 2, total crashes, 1994-2003: Bangerter Highway + 5400 South, Taylorsville (949)
- Region 2, total crashes, 2001-2003: Bangerter Highway + 5400 South, Taylorsville (296)
- Region 2, crash severity score, 1994-2003: 700 East + 3300 South, South Salt Lake (9,524.8)
- Region 2, crash severity score, 2001-2003: State Street + 4500 South, Murray (2,118.6)
- Region 3, total crashes, 1994-2003: 800 North + State Street, Orem (729)
- Region 3, total crashes, 2001-2003: University Avenue + 900 North, Provo (146)
- Region 3, crash severity score, 1994-2003: 800 North + State Street, Orem (5,599.8)
- Region 3, crash severity score, 2001-2003: University Avenue + 200 North, Provo (2,273.9)
- Region 4CC, total crashes, 1994-2003: St. George Boulevard + 1000 East, St. George (398)
- Region 4CC, total crashes, 2001-2003: St. George Boulevard + 1000 East, St. George (129)
- Region 4CC, crash severity score, 1994-2003: Bluff Street + 700 South, St. George (2,310.3)

- Region 4CC, crash severity score, 2001-2003: Bluff Street + 900 South, St. George (1,223.9)
- Region 4P, total crashes, 1994-2003: 100 North + 100 East, Price (78)
- Region 4P, total crashes, 2001-2003: Carbon Avenue + 100 North, Price (29)
- Region 4P, crash severity score, 1994-2003: SR 10 + SR 29, Emery County (2,001.6)
- Region 4P, crash severity score, 2001-2003: US 6 + US 191, Carbon County (1,101.5)
- Region 4R, total crashes, 1994-2003: North Main Street + 100 North, Richfield (114)
- Region 4R, total crashes, 2001-2003: Main Street + Center Street, Richfield (37)
- Region 4R, crash severity score, 1994-2003: US 89 + "Road right," Sanpete County (1,330.7)
- Region 4R, crash severity score, 2001-2003: US 89 + "Road right," Sanpete County (1,110.1)
- Statewide, non-signalized, total crashes, 1994-2003: University Avenue + 900 North, Provo (623)
- Statewide, non-signalized, total crashes, 2001-2003: Riverdale Road + Pacific Avenue, Riverdale (156)
- Statewide, non-signalized, crash severity score, 1994-2003: Main Street + King Street, Layton (4,109.7)
- Statewide, non-signalized, crash severity score, 2001-2003: 2400 South + 8000 West, Magna (2,102.6)
- Statewide, crash rate, 1994-2003: Main Street + 800 East, Hyrum (4.54 crashes/MEV)

The crash statistics are discussed in greater detail in the body of the document. On the statewide lists, the ranked intersections were concentrated in Regions 1, 2 and 3. Only two intersections from Region 4 appear on any of the six statewide lists. As indicated in Table 2, about 82 percent of the state's highway travel in 2003 was in Regions 1, 2 and 3. The development of separate lists for the Region 4 districts was useful, therefore, in identifying recurring intersection crash sites in those areas, and toward understanding the magnitudes of any intersection crash problems (relative to those in Regions 1-3). The appearance of an intersection on both the 10-year and 3-year list for a given study area suggested that the location had not been improved, improvements did not have the desired impacts, or growth in traffic had offset any improvements. The research team speculated that these "repeat appearance" intersections needed special attention. For non-signalized intersections with recurrent or severe crashes, a proposed mitigation was signalization. The research team cautioned, though, that other factors needed to be considered at each location as part of a traffic signal warrant study.

Intersections that appeared on all four statewide lists, all four statewide non-signalized lists, all four of the lists for any of the regions or districts, or had two or more fatal crashes between 1994 and 2003, one or more fatal crashes between 2001 and 2003 *and* were on two statewide lists were selected for further study. A total of 35 intersections met these criteria. The spatial dispersion of the 35 intersections was good, with six in Region 1, 14 in Region 2, six in Region 3, and nine in Region 4. Crash types (i.e., vehicle-vehicle, vehicle-pedestrian, vehicle-bicycle, etc.), crash severities (no injury, possible injury, bruises and abrasions, broken bones and bleeding wounds, fatal), vehicular involvement by intersection approach, crash rates (per million entering vehicles), collision types (i.e., head-on, rear-end, right-angle, etc.), and radius of influence were investigated for each intersection. The associated crash statistics were obtained from the CDDS for the 1994-2003 study period. None of the intersections were examined in detail, but a few general observations were made, with suggestions for further study. For example, a disproportionately large number of bicycle-motor vehicle collisions occurred at 800 North and State Street in Orem; similarly, a comparatively large number of pedestrian-vehicle collisions were observed at 700 East and 3300 South in South Salt Lake. Mitigating strategies for these and other intersections would need to consider the prevalent crash types. Collectively, about 94 percent of the crashes at the 35 study intersections involved two or more motor vehicles; the other 6 percent were single-vehicle incidents.

Perhaps the most useful next analytical step would be to tabulate crash statistics by collision type. For example, a tabulation of collision type by crash severity would isolate fatal and incapacitating injury crashes by type. It is likely that right-angle, head-on, and pedestrian-vehicle collisions would be among the most severe. It would also be useful to compute crash rates for a larger number of intersections than in this study. The Iowa DOT, for example, was using a composite score to prioritize its intersections for further analysis or mitigation. The composite represented a combination of rankings based on the number of crashes, crash "losses" (analogous to the crash severity score), and crash rates. Such composite scores could be computed for Utah's intersections. Finally, it would also be useful to consider the functional areas of influence of intersections in greater detail. The research team applied a 500-ft radius of influence to all intersections. An examination of the 35 study intersections, however, showed that a 100-ft radius was applicable to about 25 intersections, and only two of the intersections appeared to have a 500-ft radius of influence. Field investigations would be useful for confirming the locations of conflict points relative to intersection stop lines.

The research team considered the CDDS to be a useful tool in this study. Although the compilations were quite time consuming, it was estimated that a similar study *without* the CDDS would have accomplished about one-third as many summaries. The CDDS was particularly valuable for its most fundamental elements: intersection names and milepoints, intersection controls, crash totals, and crash severities. A few state routes were not in the CDDS intersection tools, and the research team had to "match" the milepoints of crashes with "estimated" intersection milepoints. These exercises, which typically involved scaling distances off of street maps, were quite inefficient without the CDDS. The research team's opinion is that the CDDS is a worthwhile investment and it should continue to be developed. Customization of some of the crash and intersection data search procedures, as discussed in Section 7, may be useful in further research.

1. Research Overview

1.1 Research Goals and Objectives

The goal of this research is to ultimately improve the safety of traffic operations at highway intersections in Utah. To achieve this goal, a number of objectives need to be met. This report represents the fulfillment of several, but not all, of these objectives. In effect, to improve the safety of traffic operations at intersections, the following objectives must be met:

1. Identify intersections at which crashes recur. Consider that some crashes are more severe than others, as well as crash frequencies, in making these identifications.
2. Using one or more measures of performance; "rank" intersections according to their crash statistics.
3. Select a subset of intersections that meet one or more performance criteria for further study.
4. For the selected intersections, determine the factors that may have contributed to incident occurrence.
5. Review and incorporate, as applicable, intersection safety information from the literature, the state of the practice in Utah, and the state of the practice elsewhere.
6. Diagnose intersection safety problems using Federal Highway Administration checklists and information from the literature.
7. Based on the results of the diagnoses, suggest pertinent countermeasures. Consider the effectiveness of the countermeasures as discussed in the literature.
8. Summarize the findings and recommend a draft statewide intersection safety plan.
9. Review, modify, and finalize the statewide intersection safety plan.
10. Implement the statewide intersection safety plan.
11. Monitor the effectiveness of the plan; modify and "tweak" it as needed.

This report emphasizes the first four objectives and partially fulfills the fifth and sixth objectives. Further study, subsequent to this research, is suggested to completely fulfill the fifth and sixth objectives, then to continue toward satisfying the seventh through ninth objectives. The tenth objective would require action beyond that of a research study, while the eleventh objective would constitute a post-implementation examination.

1.2 Research Scope, Approach and Limitations

This study considered all at-grade, roadway intersections with numbered state highways in Utah. Intersections between two highways not on the state route system were not considered. Intersections between a state route and a road that is not a state route *were* considered, as well as intersections between two state routes. As of 2003, Utah had 42,720 mi of road, of which 5,853 mi (13.7 percent) were on the state highway system (*Highway Statistics 2003*). There were 947 mi of Interstate and other freeways, all of which were under the state's jurisdiction. Hence, there were 4,906 mi of state routes having *at-grade* intersections; there were 41,773 mi of roads with intersections in the state, of which 11.7 percent were state routes. About 15,677 million vehicle-miles were traveled (VMT) on state routes in 2003, representing 43 percent of the total 36,390 million vehicle-miles traveled on all roads. There were 6,795 million VMT on state routes other than freeways in 2003, representing 24.7 percent of the state's 27,508 million VMT on non-freeway roads. Thus, if there is a direct, linear relationship between VMT and crashes, then one would expect 25 percent of all crashes in Utah to occur along state routes.

1.3 Crash Data Delivery System

Intersections were identified using the Intersection and SR (State Route) Intersection tools in the Utah Department of Transportation's (UDOT's) Crash Data Delivery System (CDDS). The CDDS is a web-delivered application capable of providing customized queries of the UDOT motor vehicle crash database. The capabilities of the CDDS, not all of which were used in this study, include information for decision-making on safety programs, safety-related performance measurement programs, and geographical information system (GIS) mapping for analysis. The CDDS was developed by a contractor, for UDOT, over a multiyear period starting in 2001. A second, enhanced version of the CDDS was available in a limited capacity toward the end of the contract for this study; the research team used several of the enhanced features. For example, a new "Points of Interest" tool allowed the team to efficiently double check on intersection locations and traffic control types. Upon selecting a route and range of milepoints, or a region or district, and the years of analysis, the tool delivered a list of all motor vehicle crashes occurring at intersections along the given route within the range of milepoints, or within the selected region or district. The scope of the list could be further limited by establishing a minimum number of crashes, or by varying the functional area of influence. Further information about the procedures that the research team used to extract information from the CDDS is provided in Section 8 of this report. The tools, along with the CDDS, were developed in separate efforts prior to the start of this study. Modifications and improvements to the tools continued, however, throughout the duration of this contract (at times, in fact, the tools were unavailable). The intersection tools were continuing to be advanced as of the preparation of this report. Subsequent research on intersection safety in Utah should benefit from these improved CDDS tools.

The research team found the CDDS to be quite useful, and essential to the type of study being conducted. For example, SR 186 was one of a handful of highways that were *not* in the CDDS intersection tools; crash data from this highway *was*, however, available from the CDDS' "Advanced Search" tool. To identify intersection-related crashes along SR 186, the research team used *Traffic on Utah Highways 2003* to pinpoint major intersections and milepoints. Then, to identify "lesser" intersections, the team used a street map, scale, and measuring device. This tedious approach was used for SR 186, US 189 and US 191. While these activities were time-consuming, they revealed the efficiency of the CDDS in identifying intersection locations along numerous other major highways. The research team estimated that, without the CDDS, the study would have required triple the amount of time; or, the team would have accomplished about one-third the amount of work. Further, the research team was able to maintain a level of consistency and accuracy in its database searches. It was easy, for example, to transfer responsibilities between members of the research team, as well as to check each other's work. The CDDS querying capabilities enabled, for example, the rapid identification of intersections at which fatal or incapacitating injury crashes occurred by region or district. Although the research team made only limited use of the *enhanced* CDDS - because of the short amount of time - it was evident that the new tools and parameters (such as crash rates and an large number of intersection types) would be of even greater use to future highway safety analysis than the original CDDS. Further discussion of the research team's use of the CDDS is found in Section 8.

1.4 Definition of an Intersection

An intersection is a crossing or meeting of two or more roads, at grade. An intersection may be controlled by a traffic signal, stop signs or yield signs, or it may be uncontrolled. Where two or more roads meet or cross, the intersection may be "controlled" by a traffic circle or rotary. All types of controlled and uncontrolled intersections were considered in this research; the only limitation, as mentioned earlier, was that at least one road was a state route.

The influence area of an intersection extends beyond the boundaries of the *physical* area of an intersection. Stover (1996) found that all intersections have downstream and upstream functional areas. Upstream of an intersection, motorists perceive and react to downstream events, such as an upcoming stop sign or a changing traffic signal. Motorists also decelerate and maneuver into turn lanes and storage queues. Downstream of an intersection, drivers accelerate, make left and right turns, encounter left- and right-turning vehicles from the cross-street, and prepare for deceleration at locations that are farther downstream. The functional areas of the downstream activities are not as well-defined as the areas corresponding to the upstream activities. The lengths of the functional areas vary according to the prevailing speed of travel or speed limit. Any collisions that occur during the upstream or downstream activities are incorporated into the functional area of the intersection. Table 1.1 summarizes the pertinent values.

Table 1.1 Intersection Functional Areas (Distances) (*from Stover 1996*)

	Upstream				Downstream		
	Desirable		Limiting				
Speed	Braking	PIEV + Braking	Braking	PIEV + Braking	SSD	Right Turn Conflict	Left Turn Task
20	--	--	--	--	145	--	90
25	--	--	--	--	205	--	90
30	225	315	170	215	275	100	90
35	295	370	220	270	350	150	90
40	375	490	275	335	435	200	90
45	465	595	340	405	530	300	90
50	565	710	410	485	640	--	90
55	675	835	485	565	750	--	90
60	785	960	565	605	870	--	90

NOTES: *Speed is in mph. Distances are in ft. PIEV = perception-identification-emotion-volition time. The "desirable" PIEV is 2.0 sec, while the limiting PIEV is 1.0 sec. Braking rates are assumed to be 3.5 ft/sec^2 under desirable conditions and 4.5 ft/sec^2 under limiting conditions. SSD = stopping sight distance.*

Application of the values in Table 1 is not straightforward. The strictest interpretation of the values would result in a set of two or more influence distances for each intersection, varying according to the motorist's direction and the speed limit on the given street. Such a detailed approach would be appropriate for the examination of specific intersections. For a general statewide analysis, however, it is most convenient to use an average value that can reasonably be applied to all intersections. An influence distance of 500 ft (actually, 0.09 mi or 475 ft) was selected for this study. This distance corresponds, roughly, to approach speeds of 40 mph. The 500-ft distance overestimates the influence area for intersections with approach speed limits less than 40 mph, and underestimates that for intersections with approach speeds greater than 40 mph. In cases of closely-spaced intersections, it can be difficult to isolate the critical intersection. For the purposes of this study, when intersections were closely spaced, the critical intersection was considered to be the busiest one (i.e., the greater number of entering vehicles) or, in some cases, the one with the greatest number of collisions.

1.5 Identification of Hazardous Intersections

There are several ways to identify hazardous intersections. Kononov (2002) noted that crash frequency and severity are commonly used to measure safety performance. Persaud et al. (2001), for example, used all, all injury, incapacitating injury, and fatal crashes to evaluate the effectiveness of roundabout conversions. A crash *prediction* model will typically use crash frequency as the dependent variable (Belanger, 1994; Bonneson, 2002). Numerous "refined" measures of intersection safety performance have

been used, including the deviation from an average or expected number of crashes (Kononov, 2002; Kononov and Allen, 2003), accident or crash rates (Abo-Qudais and Al-Mughrabi, 2004; Elvik, 2004), conflict rates (Salman and Al-Maita, 1995; Sayed and Zein, 1999), and the number of "primary" and "secondary" conflicts (Katamine, 2000). The research team, with concurrence from the project's technical advisory committee (TAC), opted for three measures of intersection safety performance: the total number of crashes, the crash severity score (described in Section 2), and the crash rate. For the purposes of this research, the crash rate is defined as the ratio of the total number of crashes occurring during a given study period to the total number of vehicles entering the intersection during that period.

1.6 Intersection Crash Contributing Factors

Hauer et al. (2002) listed the following potential contributing factors for various collision types:

- Bicyclist not on shoulder or bike lane; no bicycling facilities (*bicycle-vehicle crashes*)
- Conflicting decisions between drivers moving in the same direction once a traffic signal changes to amber (*rear-end crashes*)
- Conflicts with right turn on red vehicles (*left-turn crashes, pedestrian-vehicle crashes*)
- Conflicts with crossing pedestrians or bicyclists (*left-turn crashes, right-turn crashes*)
- Delayed or slow driver perception and reaction; inattentiveness (*all crashes*)
- Impairment (*all crashes*)
- Lack of conspicuity (*pedestrian-vehicle crashes, bicycle-vehicle crashes*)
- Misjudgment of the speed of oncoming vehicles (*left-turn crashes*)
- Pedestrian crossing outside of designated crossing area (*pedestrian-vehicle crashes*)
- Poor sight distance (*all crashes*)
- Poor visibility (*all crashes*)
- Red light violations; noncompliance with signal (*right-angle collisions, pedestrian-vehicle crashes, bicycle-vehicle crashes*)
- Sudden lane changes (*side-swipe incidents*)
- Speed differences between vehicles moving in the same direction (*rear-end crashes*)
- Speeding (*single vehicle incidents*)
- Swerving to avoid a vehicle, other highway user, animal, or object (*single vehicle incidents*)

The preceding factors may be considered as fundamental to the resultant crash. However, it may take some sleuthing and crash reconstruction expertise to identify the *true* contributing factor in a given crash. Hauer et al. (2002) indicated some secondary contributing factors that may lead to or *induce* the primary factor, thereby resulting in a crash. The secondary factors include:

- Actuated traffic signal that changes too frequently.
- Adjacent land uses contributing (school, senior center, commercial district, park, bar, etc.)
- Bus stop adjacent a pedestrian crossing that is heavily used.
- Bus stop, near-side or far-side, too close to the intersection; no bus bay.
- Bus stop not adjacent a pedestrian crossing.
- Conflicts between left-turning and right-turn-on-red vehicles.
- Conflicts between U-turning and right-turn-on-red vehicles.
- Construction or highway maintenance lane closures or restrictions.
- Cross-sectional design issues (lane widths, shoulder widths, pavement edge drops, cross slopes).
- Crossing pedestrians, possibly jaywalking.
- Dedicated turning lane with no or inadequate upstream warning to highway users.
- Driveways located too close to an intersection.

- Heavy pedestrian crossing volumes.
- High operating speeds on one or more intersection approaches.
- Inadequate traffic signal clearance time interval.
- Intersection located at the base of a downgrade from one or more approaches.
- Intersection located downstream of a horizontal curve along one or more approaches.
- Intersection located downstream of a vertical curve along one or more approaches.
- Isolated traffic signal on a high-speed road; lack of long-distance, advanced detection.
- Lane, stop or crosswalk markings or symbols not visible.
- Lane terminates at or immediately downstream of an intersection.
- Limited turning radii at an intersection.
- Malfunctioning traffic signal(s).
- No bicycling facilities (bike lane, designated bike route, shoulder).
- No pedestrian facilities (pedestrian signals, pushbuttons, grade-separated crossing, median).
- Parallel or angle parking located close to an intersection.
- Pavement surface hazards.
- Permitted left turn phasing with limited opportunities to complete left turns.
- Permitted right turns with limited opportunities for turning; inadequate storage.
- Poor lane delineation or channeling.
- Poor nighttime visibility.
- Poor pavement surface friction.
- Poor sight distance for right turning drivers.
- Poor or reduced traffic signal visibility.
- Right turn lane with no or an inadequate downstream acceleration lane.
- Right turn lane with no or an inadequate upstream deceleration lane.
- Speed limit changes near an intersection.
- Stop line not positioned properly.
- Turning lane (left or right) with an inadequate storage length.
- Uncoordinated, closely-spaced traffic signals, resulting in frequent starts and stops.
- Unfamiliar drivers; inconspicuous street name or highway route signs.
- Unusual intersection layout.
- Wide intersection with long pedestrian crossing distances; inadequate ped signal time.
- Winter roadway surface issues.

Once the primary and/or secondary contributing factors are identified, mitigating strategies can be selected. Identification of the factors would, in general, need to be made on a case-by-case basis; that is, at the site-specific level. An investigation at the statewide, regional or district level, as in this study, can make only general observations regarding intersection improvements. Importantly, a statewide, regional, or district study such as this *can* indicate general needs, reveal the extent of safety problems, and provide guidance for planning, budgeting, and prioritization.

2. Utah Intersection Safety Overview

2.1 General Discussion

As discussed in Section 1, the CDDS provided motor vehicle crash data; 10-year (1994-2003) and three-year (2001-2003) study periods were used. National crash statistics reveal the seriousness of intersection safety concerns. In 2003, for example, there were an estimated 6,328,000 motor vehicle crashes in the United States. A total of 2,567,000 crashes (40.6 percent) were at intersections or were "intersection-related." Of the 2,567,000 intersection crashes, 64.8 percent resulted in property damage only, 34.8 percent resulted in injuries, and 0.4 percent were fatal (*Traffic Safety Facts 2003*). Similar summary statistics for Utah were not available, but a total of 53,370 motor vehicle crashes occurred statewide in 2002 (the latest year for which cumulative data were available). If 40 percent of the crashes occurred at or near intersections, then there were about 21,500 such incidents. Of that year's 276 fatal crashes, an estimated 85 occurred at or near intersections. From 1993 to 2002 (10-year period), a total of 555,176 crashes occurred in the state; an estimated 225,400 of these occurred at or near intersections. From 2000 to 2002 (3-year period), a total of 159,225 crashes occurred; about 64,600 of these occurred at or near intersections. Although these statistics are inexact, they suggest the magnitude of the intersection safety problem in Utah.

Intersection crash statistics were tabulated for the two aforementioned study periods for the seven geographical areas summarized in Table 2.1. Year 2003 vehicle-miles of travel (VMT) levels were roughly proportional to year 2003 populations in the UDOT regions, with additional variation related to economic, tourism and other activities. Intersection safety problems are expected to be related to travel amounts. For example, UDOT Region 2, with 25.8 million DVMT in 2003 (39.3 percent of the state's DVMT) *should* feature the greatest intersection safety concerns of all UDOT regions. Figure 2.1 shows the locations of the UDOT regions and districts.

Table 2.1 Utah Geographical Regions

Geographical Area	Area (sq mi)	Population (2003 est)	2003 Daily VMT
Utah (entire state)	84,170	2,351,467	65,607,782
UDOT Region 1	9,408	611,129	15,334.605
UDOT Region 2	9,554	1,005,232	25,823,374
UDOT Region 3	14,984	466,391	12,352,190
UDOT Region 4, Cedar City District	14,906	158,433	6,219,860
UDOT Region 4, Price District	19,434	53,075	3,302,734
UDOT Region 4, Richfield District	15,884	57,207	2,575,059

2.2 Statewide Intersection Crash Statistics

The research team ranked intersections according to two measures of safety performance: the total number of crashes occurring during a given study period, and the total crash severity score for a given study period. A third measure, crash rate, was used to examine intersections between two state routes *only*. The crash severity score was determined based on the medical outcome of each crash, as stated in the corresponding police accident report (PAR) and as recorded in the CDDS. The scores were based on the cost associated with each outcome, as estimated in a 1994 technical advisory (FHWA 1994). In that advisory, the following figures were proposed as a combination of the costs of property damage: medical intervention, lost earnings, lost household production, emergency services, travel delay, vocational rehabilitation, workplace losses, administrative procedures, legal matters, pain, and lost quality of life.

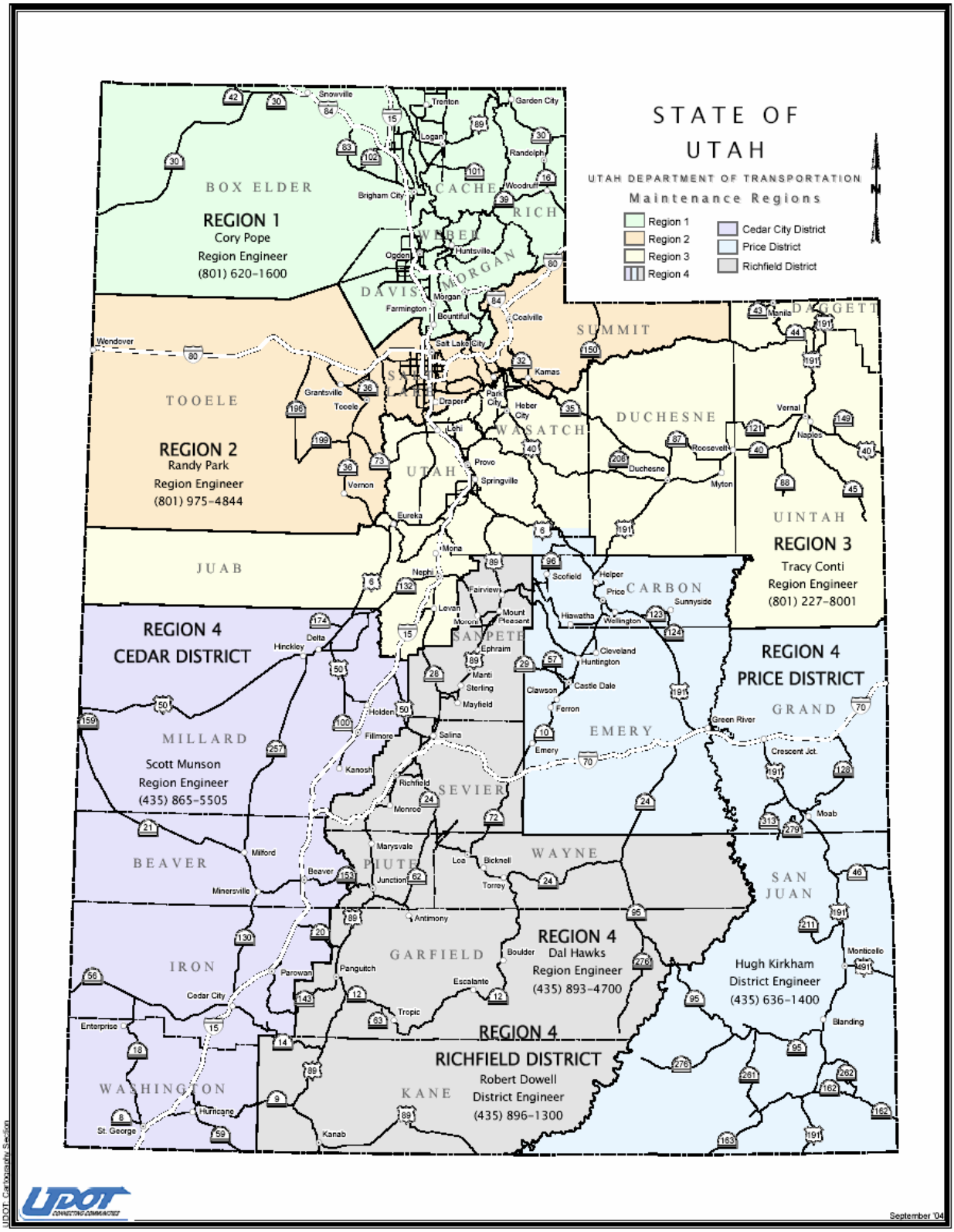


Figure 2.1. Utah Department of Transportation Regions and Districts

The injury categories were based on the K-B-B-C scale. The analogous CDDS categories are provided in parentheses, along with the average cost associated with each:

- Fatality (fatality): $2,600,000
- Incapacitating (broken bones or bleeding wounds): $180,000
- Evident (bruises and abrasions): $36,000
- Possible (possible injury): $19,000
- Property damage only (no injury): $2,000

These costs were rounded to the nearest "tens" unit to simplify the scores. The following scores were produced. As indicated, one fatal crash is ten times as costly as a crash resulting in broken bones or bleeding wounds:

- No injury: 0.1
- Possible injury: 1
- Bruises and abrasions: 10
- Broken bones or bleeding wounds: 100
- Fatality: 1,000

Fifty-deep statewide rankings were produced for each of the following:

- 1994-2003 crashes, based on the total number of crashes (Table 2.2)
- 2001-2003 crashes, based on the total number of crashes (Table 2.3)
- 1994-2003 crashes, based on the total crash severity score (Table 2.4)
- 2001-2003 crashes, based on the total crash severity score (Table 2.5)

The intersections ranked based on the total number of crashes experienced are listed in Tables 2.2 (1994-2003) and 2.3 (2001-2003). The intersection having the most crashes during both the 10-year and three-year study periods was Bangerter Highway (SR 154) at 5400 South (SR 173) in Taylorsville. This intersection had 949 collisions between 1994 and 2003, and 296 between 2001 and 2003, or an average of about 95 per year. For both study periods, the three intersections having the most crash activity were all in Taylorsville. On the 10-year list, 17 of the intersections are in Region 1, 29 are in Region 2, 4 are in Region 3, and none are in Region 4. On the 3-year list, 20 of the intersections are in Region 1, 27 are in Region 2, 2 are in Region 3, and 1 is in Region 4 (Cedar City District). Of the 50 intersections on each list, 43 are traffic signal-controlled. A total of 27,421 collisions occurred at the 50 intersections listed in Table 2.2 between 1994 and 2003, representing approximately 12 percent of all intersection crashes in Utah. A total of 7,132 collisions occurred at the 50 intersections listed in Table 2.3 between 2001 and 2003, or about 11 percent of all intersection crashes. A total of 33 intersections appear on both the 10-year and 3-year study period lists. One supposition of these intersections' recurrence is that no safety improvements were made to these locations between 1994 and 2003.

Intersections ranked based on crash severity scores are listed in Tables 2.4 (1994-2003) and 2.5 (2001-2003). The highest-scoring intersection on the 10-year list is 700 East (SR 71) and 3300 South (SR 171) in South Salt Lake, with 9,524.8 points. This intersection experienced five fatal crashes during the study period, the highest of all intersections in the state, and one of only two intersections to see more than three fatal crashes. The highest-scoring intersection on the 3-year list is 31st Street (SR 79) and Wall Avenue (SR 204) in Ogden, with 3,394.5 points. This intersection was one of just three in Utah to witness more than one fatal crash between 2001 and 2003. On the 10-year list, 16 of the intersections are in Region 1, 30 are in Region 2, and four are in Region 3. On the three-year list, 18 of the intersections are in Region 1, 19 are in Region 2, and 13 are in Region 3. The apparent jump in the number of intersections in Region

3 from 1994-2003 to 2001-2003 may be indicative of growth in Utah County. A total of 15 intersections "made" both the 10-year and 3-year lists. It is likely that there were no safety improvements at these locations during the study period. Four of the intersections on the 10-year list are not signal-controlled, while 13 of those on the 3-year list are not signalized. These intersections *may* be candidates for traffic signals, although several other factors would need to be considered as part of a signal warrant study. Non-signalized intersections are discussed in greater detail in Section 4.

Looking at all four intersection lists (Tables 2.2-2.5), all of the Region 1 locations are in Cache, Davis, or Weber County. All of the Region 2 locations are in Salt Lake County, and all of the Region 3 intersections are in Utah County. Only one intersection in Region 4 appeared on any of the lists, and it is located in St. George (St. George Boulevard and 1000 East). The statistics suggest that *recurrent* crash sites are predominantly an urban problem, as all of the intersections on the four top 50 lists are located within Utah's five urbanized areas (as designated by the U.S. Census). The following six intersections appear on *all four* statewide top 50 lists:

- Redwood Road + 5400 South (SR 68 + SR 173 – Taylorsville)
- 700 East + 3300 South (SR 71 + SR 171 – South Salt Lake)
- 12th Street + Washington Boulevard (SR 39 + US 89 – Ogden)
- 3500 South + 3600 West (SR 171 + 350600 – West Valley City)
- 3500 South + 5600 West (SR 171 + SR 172 – West Valley City)
- 5600 South + 1900 West (SR 97 + SR 126 – Roy)

Five of the intersections are in Region 2 (Salt Lake County) and two are in Region 1 (Weber County). These intersections are examined in greater detail in Section 5 of this report.

2.3 Fatal Crashes

There were 2,918 fatal crashes in Utah between 1994 and 2003, and 783 between 2001 and 2003. Not all of the crashes occurred at intersections. Some took place on freeways, while others were not intersection-related. Still others occurred off of the State Route system. The research team did not tabulate all of the intersections experiencing a fatal crash during the study period, but the following statistics were observed.

Between 1994 and 2003:

- One intersection (700 East and 3300 South in South Salt Lake) witnessed five fatal crashes.
- One intersection (8400 West and 2400 South in Magna) experienced four fatal crashes.
- Nine intersections witnessed three fatal crashes.
- Numerous intersections (probably over 100) experienced two fatal crashes.

Between 2001 and 2003:

- Three intersections (21st Street and Pennsylvania Avenue in Ogden, University Avenue and 200 North in Provo, and 2400 South and 8000 West in Magna) had two fatal crashes.
- Numerous intersections witnessed one fatal crash.

If statewide "top 50" lists of intersections experiencing fatal crashes were prepared for the 10- and 3-year study periods, then all intersections with two or more fatal crashes between 1994 and 2003, and all intersections having at least one fatal crash between 2001 and 2003 would be included (well over 50 on each list!). A total of *32 intersections* would appear on *both* lists. These are shown in Table 2.6. One perspective on these intersections is that fatal crashes *recur* at these locations. This hypothesis cannot be

proven statistically because the number of fatal crashes at any single location is very small. Nonetheless, this subset of 32 intersections may warrant further investigation. The following eleven intersections appear in Table 2.6 and on both the 10- and 3-year statewide lists (Tables 2.4 and 2.5 or Tables 4.2 and 4.3 for non-signalized intersections. These are discussed in Section 4):

- Hinckley Drive and Pennsylvania Avenue (SR 79 at milepoint 1.11 – Ogden)
- Main Street and Airport Drive (2500 North) (US 91 + 050370 – North Logan)
- State Street and Wood Avenue (1580 South) (US 89 at milepoint 323.58 – Salt Lake City)
- University Avenue and 3700 North (US 189 + 490740 – Provo)
- 700 East and 3300 South (SR 71 + SR 171 – South Salt Lake)
- 1900 West and 4400 South (SR 126 + 570090 – Roy)
- 2400 South and 8000 West (SR 111 at milepoint 7.71 – Magna CDP)
- 3500 South and Stanton Street (4640 West) (SR 171 at milepoint 4.73 – West Valley City)
- 3500 South and 4200 West (SR 171 at milepoint 5.28 – West Valley City)
- 5400 South and 4460 West (SR 173 at milepoint 4.07 – West Valley City)
- 5400 South and 5030 West (SR 173 at milepoint 3.35 – West Valley City)

As noted earlier, 700 East and 3300 South also appears on all four statewide lists (Tables 2.2-2.5), while University Avenue and 3700 North also appears on all four lists for Region 3 (Tables 3.8-3.11). All of the intersections listed above are discussed in greater detail in Section 5.

2.4 Intersection Crash Rates

The research team used the updated version of the CDDS to find high crash rates among intersections between Utah's state routes. The crash rates represented an added feature in the new version of the CDDS that was not available in the version used by the research team for the bulk of the study. Crash rates for "full" intersections (i.e., all approaches) were tabulated in the CDDS for state route intersections only (i.e., intersections between two state routes). Crash rates for intersections between state and non-state routes considered the traffic volume (and crashes) on the state route only. Intersections with crash rates greater than or equal to two per million entering vehicles, based on year 2001-2003 crashes and volumes, are listed in Table 2.7. The research team was unable to access crash rate data from Region 4, Cedar City District (*specifically: SR 9 and SR 14*).

The highest crash rate was 4.54 per million entering vehicles, at the intersection of state routes 101 and 165 (Main Street and 800 East) in Hyrum. This is a comparatively low-volume intersection, but the 30 crashes that occurred there between 2001 and 2003 were associated with a high crash rate. Thirteen of the 29 intersections are in Region 1, 13 are in Region 2, and 3 are in Region 3. Seven intersections had a crash rate of 3 or more per million entering vehicles, while one, mentioned above, had a crash rate greater than 4. To evaluate these intersections, it would be appropriate to compare the actual crash rate with the *expected* crash rate. It is interesting to note that the geographical distribution of the intersections in Table 2.7 (and Table 2.6) is less heavily "influenced" by Region 2 than the distributions in Tables 2.2-2.5. One interpretation is that fatal crashes and high crash rates are dependent on factors other than the high traffic volumes that one would expect in Region 2. Some additional considerations on these other factors are offered in Section 5.

Table 2.2 50 Utah Intersections with a Large Number of Crashes: 1994-2003

Rank	Score	Routes[3]	Location	City	Reg	Total	Fatal
1	5,013.0	154 + 173	Bangerter Hwy + 5400 South	Taylorsville	2	949	1
2	4,937.9	68 + 173	Redwood Rd + 5400 South	Taylorsville	2	914	0
3	6,060.4	68 + 266	Redwood Rd + 4700 South	Taylorsville	2	835	1
4	6,559.5	68 + 350640	Redwood Rd + 4100 South	Taylorsville-WVC	2	750	0
5	5,599.8	52 + 89	800 North + State St	Orem	3	729	1
6	5,991.6	266 + 350620	4700 South + 2200 West	Taylorsville	2	696	1
7	9,524.8	71 + 171	700 East + 3300 South	South Salt Lake	2	667	5[4]
8	*5,773.9*	266: 0.19	4700 South + I-215 NB off-ramp	Taylorsville	2	*625*	1
9	*3,153.8*	189: 2.79	*University Av + 900 North*	Provo	3	*623*	0
10	5,110.8	154 + 171	Bangerter Hwy + 3500 South	West Valley City	2	618	1
11	3,923.3	97 + 126	5600 South + 1900 West	Roy	1	614	0
12	4,588.9	126 + 232	Main St + Hillfield Rd	Layton	1	610	1
13	3,846.7	171 + 350600	3500 South + 3600 West	West Valley City	2	568	1
14	1,686.5	266 + 350440	4500 South + 300 West	Murray	2	566	0
15	3,680.8	71 + 152	900 East + Van Winkle Expwy	Murray	2	565	1[4]
16	4,840.8	171 + 172	3500 South + 5600 West	West Valley City	2	564	1
17	*2,953.4*	171: 5.92	*3500 South + 3690 West*	West Valley City	2	563	0
18	4,300.4	71 + 350380	900 East + Ft. Union Bl	Midvale	2	560	1
19	7,680.6	39 + 89	12th St + Washington Bl	Ogden	1	558	3
=20	3,903.2	68 + 89	500 South + 500 West	Bountiful	1	548	1
	4,120.1	68 + 350320	Redwood Rd + 6200 South	Taylorsville	2	548	1
22	*3,024.2*	68: 51.21	Redwood Rd + 5600 South	Taylorsville	2	*542*	1
23	*3,210.0*	171: 10.54	*3300 South + Sue St (30 West)*	South Salt Lake	2	*537*	1
24	*3,120.6*	89: 322.44	State St + I-80 WB ramps	Salt Lake City	2	*534*	1
25	3,760.3	173 + 350050	5400 South + 2700 West	Taylorsville	2	532	0
26	3,449.2	89 + 171	State St + 3300 South	South Salt Lake	2	526	1
27	5,336.8	89 + 350640	State St + 3900 South	South Salt Lake	2	520	1
28	2,792.2	26 + 570150	Riverdale Rd + 300 West	Riverdale	1	517	0
29	4,830.4	108 + 126	Antelope Dr + Main St	Layton	1	514[4]	2
30	*4,001.8*	89: 322.49	*State St + Burton Av*	South Salt Lake	2	*499*	2
31	3,644.8	89 + 91	Main St + 400 North	Logan	1	493	1
32	5,417.6	68 + 171	Redwood Rd + 3500 South	West Valley City	2	491	2
33	*1,637.1*	232: 0.17	Hillfield Rd + I-15 NB ramps	Layton	1	*486*	0
34	2,713.9	71 + 266	700 East + 4500 South	Murray	2	483	0
35	3,697.2	89 + 266	State St + 4500 South	Murray	2	477[4]	1
36	3,521.3	91 + 239	Main St + 1400 North	Logan	1	473	1
=37	2,099.7	103 + 126	650 North + Main St	Clearfield	1	472	0
	1,743.7	91: 27.12	*Main St + Federal Av*	Logan	1	*472*	0
39	*2,569.6*	26: 2.67	*Riverdale Rd + Pacific Av*	Riverdale	1	*460*	0
40	2,730.5	89 + 209	State St + 9000 South	Sandy	2	447	0
41	4,025.8	39 + 204	12th St + Wall Av	Ogden	1	442	2
42	3,163.0	48 + 68	7800 South + Redwood Rd	West Jordan	2	439	1
43	3,223.3	71 + 209	700 East + 9000 South	Sandy	2	437	0
44	1,742.8	203 + 284	Harrison Bl + 37th St	Ogden	1	434	0
45	2,389.4	89 + 265	State St + 1300 South	Orem	3	431[4]	0
46	1,629.1	30 + 91	200 North + Main St	Logan	1	428	0
47	*3,103.6*	171: 10.83	*3300 South + Edison St*	South Salt Lake	2	*427*	1
48	*1,113.3*	232: 0.07	Hillfield Rd + I-15 SB ramps	Layton	1	*423*	0
49	*2,087.9*	203: 2.23	Harrison Bl + 4275 South	Ogden	1	*422*	0
50	4,127.7	89 + 114	500 West + Center St	Provo	3	408[4]	2

Table 2.3 50 Utah Intersections with a Large Number of Crashes: 2001-2003

Rank	Score[2]	Routes[3]	Location	City	Reg	Total	Fatal
1	1,156.5	154 + 173	Bangerter Hwy + 5400 South	Taylorsville	2	296	0
2	1,268.7	68 + 266	Redwood Rd + 4700 South	Taylorsville	2	258	0
3	1,309.8	68 + 173	Redwood Rd + 5400 South	Taylorsville	2	237	0
4	1,075.7	126 + 232	Main St + Hillfield Rd	Layton	1	227	0
5	996.4	266 + 350620	4700 South + 2200 West	Taylorsville	2	181	0
6	830.0	68 + 350640	Redwood Rd + 4100 South	Taylorsville-WVC	2	175	0
7	792.3	68 + 89	500 South + 500 West	Bountiful	1	174	0
8	1,982.0	39 + 89	12th St + Washington Bl	Ogden	1	173	1
9	867.7	26 + 3315	Riverdale Rd + 1500 West	Riverdale	1	172	0
10	1,314.8	97 + 126	5600 South + 1900 West	Roy	1	170	0
11	1,851.8	48 + 68	7800 South + Redwood Rd	West Jordan	2	167	1
12	620.7	68 + 350320	Redwood Rd + 6200 South	Taylorsville	2	161	0
13	352.5	48 + 68	7000 South + Redwood Rd	West Jordan	2	159	0
14	*669.0*	26: 2.67	*Riverdale Rd + Pacific Av*	Riverdale	1	156	0
15	1,415.9	171 + 172	3500 South + 5600 West	West Valley City	2	155	0
16	*1,032.5*	189: 2.79	*University Av + 900 North*	Provo	3	146	0
=17	954.9	108 + 126	Antelope Dr + Main St	Layton	1	144	0
	873.0	171: 5.92	*3500 South + 3690 West*	West Valley City	2	144	0
19	*1,030.4*	126: 1.49	*Main St + King St (750 North)*	Layton	1	*143*	0
20	356.2	203 + 284	Harrison Bl + 3850 South (WSU)	Ogden	1	142	0
=21	531.0	103 + 126	650 North + Main St	Clearfield	1	141	0
	951.0	71 + 209	700 East + 9000 South	Sandy	2	141	0
=23	1,231.6	154 + 171	Bangerter Hwy + 3500 South	West Valley City	2	139	0
	2,015.5	171 + 350600	3500 South + 3600 West	West Valley City	2	139	1
=25	99.2	34 + 530160	St. George Bl + 1000 East	St. George	4CC	137	0
	1,843.4	71 + 171	700 East + 3300 South	South Salt Lake	2	137	1
=27	958.6	173 + 350050	5400 South + 2700 West	Taylorsville	2	135	0
	307.8	203 + 570270	Harrison Bl + Country Hills Dr	Ogden	1	135	0
29	551.4	89 + 209	State St + 9000 South	Sandy	2	132	0
30	544.8	171 + 181	3300 South + 1300 East	Millcreek CDP	2	129	0
=31	1,739.0	89 + 91	Main St + 400 North	Logan	1	128	1
	536.6	173: 4.62	5400 South + 4015 West	Taylorsville	2	128	0
=33	464.5	30 + 91	200 North + Main St	Logan	1	127	0
	401.5	91 + 239	Main St + 1400 North	Logan	1	127	0
=35	1,701.9	89 + 171	State St + 3300 South	South Salt Lake	2	126	1
	600.3	91: 27.12	*Main St + Federal Av*	Logan	1	126	0
=37	582.1	68 + 151	Redwood Rd + 10400 South	South Jordan	2	124	0
	91.6	68 + 209	Redwood Rd + 9000 South	West Jordan	2	124	0
	1,262.5	68: 51.21	Redwood Rd + 5600 South	Taylorsville	2	124	1
	402.1	89 + 173	State St + 5300 South	Murray	2	124	0
41	2,118.6	89 + 266	State St + 4500 South	Murray	2	117	1
42	589.4	26 + 60	Riverdale Rd + 1050 West	Riverdale	1	116	0
=43	515.4	91 + 238	Main St + 300 South	Logan	1	114	0
	491.9	26: 1.10	*Riverdale Rd + 1150 West*	Riverdale	1	114	0
=45	493.5	39 + 204	12th St + Wall Av	Ogden	1	111	0
	498.0	89 + 350420	State St + 6400 South	Murray	2	111	0
	316.2	91 + 050220	Main St + 100 South	Logan	1	111	0
=48	712.0	89 + 265	State St + 1300 South	Orem	3	109	0
	698.5	171 + 195	3300 South + 2300 East	E. Millcreek CDP	2	109	0
50	*81.9*	48: 12.31	*7200 South + 210 West*	Midvale	2	108	0

Table 2.4 50 Utah Intersections with High Crash Severity Scores: 1994-2003

Rank	Score[2]	Routes[3]	Milepoint		Location	City	Region	Crashes	
			1	2				Total	Fatal
1	9,524.8	71 + 171	18.28	11.64	700 East + 3300 South	South Salt Lake	2	667	5[4]
2	7,680.6	39 + 89	6.40	355.88	12th St + Washington Bl	Ogden	1	558	3
3	7,194.9	79 + 204	1.06	1.06	31st St + Wall Av	Ogden	1	336	3
4	6,559.5	68 + 350640	53.47	8.01	Redwood Rd + 4100 South	Taylorsville – West Valley City	2	750	1
5	6,208.5	79: 1.11	1.11	NA	Hinckley Dr + Pennsylvania Av	Ogden	1	147	3
6	6,187.7	111 + 201	10.59	7.20	8400 West + 2400 South	Magna CDP	2	110	4
7	6,060.4	68 + 266	52.47	0.77	Redwood Rd + 4700 South	Taylorsville	2	835	1
8	5,991.6	266 + 350620	0.27	1.00	4700 South + 2200 West	Taylorsville	2	696	1
9	*5,773.9*	266: 0.19	0.19	NA	4700 South + I-215 NB off-ramp	Taylorsville	2	*625*	1
10	5,599.8	52 + 89	1.75	297.69	800 North + State St	Orem	3	729	1
11	5,417.6	68 + 171	54.47	8.04	Redwood Rd + 3500 South	West Valley City	2	491	2
12	5,336.8	89 + 350640	320.26	10.72	State St + 3900 South	South Salt Lake	2	520	1
13	5,191.9	189 + 490740	5.36	3.37	University Av + 3700 North	Provo	3	286	2
14	5,110.8	154 + 171	18.97	5.84	Bangerter Hwy + 3500 South	Taylorsville	2	618	1
15	5,013.0	154 + 173	15.95	4.92	Bangerter Hwy + 5400 South	Taylorsville	2	909	1
16	5,002.1	89 + 186	325.33	5.70	State St + 400 South	Salt Lake City	2	278[4]	1
17	4,937.9	68 + 173	51.47	7.15	Redwood Rd + 5400 South	Taylorsville	2	914	0
18	4,840.8	171 + 172	3.53	4.01	3500 South + 5600 West	West Valley City	2	564	1
19	4,830.4	108 + 126	0.62	3.21	Antelope Dr + Main St	Layton	1	514[4]	2
20	4,818.5	152 + 350410	1.44	2.12	Van Winkle Expwy + 5600 South	Murray	2	197	2
21	4,737.5	126 + 570090	10.15	0.00	1900 West + 4400 South	Roy	1	161	3
22	4,678.6	126 + 193	4.45	0.00	State St + 700 South	Clearfield	1	229	3
23	4,588.9	126 + 232	1.58	0.00	Main St + Hillfield Rd	Layton	1	610	1
24	4,550.8	104 + 570330	0.99	0.00	21st St + 1100 West	West Haven	1	121	3
25	*4,434.5*	68: 53.30	53.30	NA	Redwood Rd + 4200 South-Mantle Av	Taylorsville	2	*380*	1
26	*4,414.0*	209: 7.33	7.33	NA	9000 South + I-15 SB ramps	Sandy	2	*346*	3
27	4,353.1	71 + 350520	15.80	0.00	Van Winkle Expwy + 4800 South	Murray	2	458	2
28	4,329.3	89 + 106	337.31	9.41	US 89 + Shepard Ln	Farmington	1	201	2
29	4,300.4	71 + 350380	12.70	1.30	900 East + Ft. Union Bl	Midvale	2	560	1
30	4,247.0	190 + 210	1.83	0.00	Ft. Union Bl + Wasatch Bl	Cottonwood Heights	2	215	2
31	4,246.1	68 + 186	59.63	2.23	Redwood Rd + North Temple	Salt Lake City	2	197	2
32	4,127.7	89 + 114	291.90	0.00	500 West + Center St	Provo	3	408[4]	2
33	4,120.1	68 + 350320 + 350610	50.46	4.51 + 0.00	Redwood Rd + 6200 South	Taylorsville	2	548	1

Rank	Score[2]	Routes[3]	Milepoint		Location	City	Region	Crashes	
			1	2				Total	Fatal
34	*4,109.7*	126: 1.49	1.49	NA	*Main St + King St (750 North)*	Layton	1	*354*	1
35	4,098.6	91 + 050370	30.13	8.80	Main St + 2500 North	North Logan	1	180	2
36	4,025.8	39 + 204	6.00	3.56	12th St + Wall Av	Ogden	1	442	1[4]
37	*4,020.1*	26: 1.05	1.05	NA	Riverdale Rd + I-84 WB ramps	Riverdale	1	*403*	1
38	4,012.0	189 + 265 + 490970	3.48	4.32 + 0.00	University Av + University Pkwy + 1650 North	Provo	3	322	1
39	*4,001.8*	89: 322.49	322.49	NA	*State St + Burton Av (2360 South)*	South Salt Lake	2	*499*	2
40	*3,969.9*	71: 19.90	19.90	NA	*700 East + Wilmington Av (2185 South)*	Salt Lake City	2	*135*	2
41	3,923.3	97 + 126	5.10	8.66	5600 South + 1900 West	Roy	1	614	0
42	3,903.2	68 + 89	69.42	335.12	500 South + 500 West	Bountiful	1	548	1
43	3,896.1	71 + 351040	19.16	1.49	700 East + 2700 South	Salt Lake City	2	144	2
44	3,866.3	91 + 101	19.48	1.20	US 89 + East Main St	Wellsville	1	107	3
45	*3,861.9*	71: 19.82	19.82	NA	*700 East + Simpson Av (2235 South)*	Salt Lake City	2	*117*	2
46	3,846.7	171 + 350600	6.04	3.00	3500 South + 3600 West	West Valley City	2	568	1
47	3,835.7	111 + 350640	8.10	0.00	8400 West + 4100 South	West Valley City	2	35	3
48	3,833.9	171 + 350290	6.54	7.51	3500 South + 3200 West	West Valley City	2	341	1
49	3,782.6	89 + 269	325.04	0.90	State St + 600 South	Salt Lake City	2	143	2
50	3,760.3	173 + 350050	6.15	11.24	5400 South + 2700 West	Taylorsville	2	532	0

Table 2.5 50 Utah Intersections with High Crash Severity Scores: 2001-2003

Rank	Score[2]	Routes[3]	Milepoint		Location	City	Region	Crashes	
			1	2				Total	Fatal
1	3,394.5	79 + 204	1.06	1.06	31st St + Wall Av	Ogden	1	87	2
2	*2,970.6*	79: 1.11	1.11	NA	Hinckley Dr + Pennsylvania Av	Ogden	1	*42*	2
3	2,273.9	189: 2.16	2.16	NA	University Av + 200 North	Provo	3	50	2
4	2,118.6	89 + 266	319.38	3.53	State St + 4500 South	Murray	2	117	1
5	*2,102.6*	201: 7.71	7.71	NA	*2400 South + 8000 West*	Magna CDP	2	*11*	2
6	2,015.5	171 + 350600	6.04	3.00	3500 South + 3600 West	West Valley City	2	139	1
7	1,982.0	39 + 89	6.44	355.88	12th St + Washington Bl	Ogden	1	173	1
8	1,861.9	75 + 89 + 491250	2.04	286.88	SR 75 + Main St + 1400 North	Springville	3	61	1
9	1,860.0	193 + 232	2.17	2.26	700 South + Hillfield Rd	Layton	1	87	1
10	1,851.8	48 + 68	10.11	48.46	7800 South + Redwood Rd	West Jordan	2	167	1
11	1,843.4	71 + 171	18.28	11.64	700 East + 3300 South	South Salt Lake	2	137	1
12	1,839.9	189 + 490740	5.36	3.37	University Av + 3700 North	Provo	3	75	1
13	1,739.0	89 + 91	373.85	27.46	Main St + 400 North	Logan	1	128	1
14	1,701.9	89 + 171	321.14	10.75	State St + 3300 South	South Salt Lake	2	126	1
15	*1,646.9*	89: 354.25	354.25	NA	Washington Bl + 25th St	Ogden	1	*71*	1
16	1,613.2	89 + 351350	325.64	0.60	State St + 200 South	Salt Lake City	2	49	1
17	*1,604.9*	171: 10.54	10.54	NA	*3300 South + Sue St (50 West)*	South Salt Lake	2	83	1
18	1,598.3	89 + 106	335.79	0.44	500 West + 400 North	Bountiful	1	89	1
19	1,583.5	126 + 570090	10.15	0.00	1900 West + 4400 South	Roy	1	49	1
20	*1,547.6*	89: 288.70	288.70	NA	*State St + King St-2000 South*	Provo	3	*50*	1
21	1,532.4	52 + 89	1.75	297.69	800 North + State St	Orem	3	96	1
22	*1,528.3*	173: 4.07	4.07	NA	*5400 South + 4460 West*	Kearns CDP	2	*37*	1
23	*1,527.8*	171: 10.83	10.83	NA	*3300 South + Edison St (145 East)*	South Salt Lake	2	*95*	1
24	1,502.8	89 + 490655	297.16	1.86	State St + 400 North	Orem	3	61	1
25	1,474.3	89 + 2907	301.27	?	State St + 300 East-700 South	Pleasant Grove	3	55	1
26	1,471.5	181 + 351180	5.74	10.97	1300 East + 1300 South	Salt Lake City	2	27	1
27	1,448.9	91 + 050370	30.13	8.80	Main St + 2500 North	North Logan	1	53	1
28	1,436.8	89 + 570680	358.67	5.84	US 89 + Independence Bl	Harrisville	1	31	1
29	*1,424.3*	89: 298.46	298.46	NA	*State St + 1360 North*	Orem	3	*32*	1
30	1,415.9	171 + 172	3.53	4.01	3500 South + 5600 West	West Valley City	2	155	0
31	1,415.1	209 + 350390	6.83	0.00	9000 South + 700 West-Riverside Dr	Sandy	2	84	1
32	1,390.0	89 + 351020	323.47	3.65	State St + 1700 South	Salt Lake City	2	31	1
33	*1,381.8*	108: 0.92	0.92	NA	Antelope Dr + 1000 East	Clearfield-Layton	1	*57*	1
34	*1,370.6*	89: 294.62	294.62	NA	*State St + 1500 South*	Orem	3	*35*	1

Rank	Score[2]	Routes[3]	Milepoint		Location	City	Region	Crashes	
			1	2				Total	Fatal
35	*1,367.3*	189: 2.07	2.07	NA	*University Av + 100 North*	Provo	3	56	1
36	*1,362.7*	71: 7.40	7.40	NA	*700 East + 11250 South*	Sandy	2	*37*	1
37	1,355.0	89 + 570560	354.97	0.00	Washington Bl + 20th St	Ogden	1	41	1
	1,349.7	89 + 3400	354.11	?	Washington Bl + 26th St	Ogden	1	51	1
38	*1,343.2*	173: 3.35	3.35	NA	*5400 South + 5030 West*	Kearns CDP	2	*22*	1
39	*1,340.6*	203: 0.99	0.99	NA	Harrison Bl + Shadow Valley Dr (5225 South)	Ogden-South Ogden	1	*41*	1
40	*1,326.3*	266: 2.18	2.18	NA	4700 South + 815 West	Taylorsville	2	*24*	1
41	1,325.2	89 + 110360	343.49	4.05	*US 89 + Oak Ln-2030 North*	Layton	1	22	1
42	*1,317.8*	126: 4.78	4.78	NA	*State St + 450 South*	Clearfield	1	*20*	1
43	*1,315.4*	89: 304.41	304.41	NA	*State St + 400 East*	American Fork	3	*32*	1
44	1,314.8	97 + 126	5.10	8.66	5600 South + 1900 West	Roy	1	170	0
45	*1,314.5*	6: 173.90	173.90	NA	*US 6 + View Area*	Utah County	3	*14*	1
46	1,311.4	89 + 114	299.54	10.73	State St + Geneva Rd + Main St	Pleasant Grove	3	37	1
47	1,309.8	68 + 173	51.47	7.15	Redwood Rd + 5400 South	Taylorsville	2	237	0
48	1,307.2	37 + 126	0.00	7.15	1800 North + Main St	Sunset	1	49	1
49	1,298.0	190 + 210	1.83	0.00	Ft. Union Bl + Wasatch Bl	Cottonwood Heights	2	56	1
50	1,268.7	68 + 266	52.47	0.77	Redwood Rd + 4700 South	Taylorsville	2	258	0
51	*1,263.3*	71: 5.83	5.83	NA	*12300 South + 600 East*	Draper	2	*51*	1

NOTES:

1 CDDS = Crash Data Delivery System. Data for intersections between two state highways were obtained from the "SR Intersections" tool. Data for intersections between a state highway and a federal-aid road were obtained from the "Intersections" tool. Crash totals by severity were obtained using the "Advanced Search" tool.

2 Each score was computed by assigning the following "weights" by crash severity: 1,000 – fatal; 100 – broken bones & bleeding wounds; 10 – bruises & abrasions; 1 – possible injury; 0.1 – no injury. The weights are based, approximately, on the societal cost of each crash outcome.

3 Two- and three-digit routes are state highways. Six-digit routes are federal-aid roads.

4 The number disagrees with that provided by the "SR Intersections" tool. The value shown was obtained from the "Advanced Search" tool. In most cases, the values obtained from the two tools were the same.

OTHER NOTES:

Italicized locations are not signalized. Italicized scores correspond to locations at which crash data were available only for the state route (and not for the cross-street). NA = not applicable or not available. WVC = West Valley City.

Table 2.6 32 Utah Intersections with ≥ 2 Fatal Crashes 1994-2003 *and* ≥ 1 Fatal Crash 2001-2003

Fatal	Score	Score				
94-03	**94-03**	**01-03**	**Routes**[3]	**Location**	**City or County**	**Reg**
2	*2,000.2*	*1,000.1*	31: 35.89	*SR 31 + "Road right"*	Emery County	4P
2	3,184.3	1,307.2	37 + 126	1800 North + Main St	Sunset	1
2	2,002.5	1,000.1	40 + 1558	*US 40 + 45000 West*	Fruitland	3
2	*2,002.2*	*1,001.2*	68: 65.33	*Redwood Rd + 600 North*	Salt Lake City	2
2	*3,754.4*	*1,080.9*	71: 4.93	12300 South + I-15 SB ramps	Draper	2
5[4]	9,524.8	1,843.4	71 + 171	700 East + 3300 South	South Salt Lake	2
2	3,622.6	1,240.5	74 + 92	Alpine Hwy + 11000 North	Highland	3
3	*6,208.5*	*2,970.6*	79: 1.11	Hinckley Dr + Pennsylvania Av	Ogden	1
2	*2,657.5*	*1,274.7*	89: 323.58	*State St + Wood Av (1580 South)*	Salt Lake City	2
2	3,747.5	1,598.3	89 + 106	500 West + 400 North	Bountiful	1
2	*3,411.4*	*1,646.9*	89: 354.25	Washington St + 25th St	Ogden	1
2	*2,555.1*	*1,138.9*	89: 355.77	*Washington St + 13th St*	Ogden	1
2	*2,925.4*	*1,220.4*	89: 359.86	US 89 + 750 West	Harrisville	1
2	*2,440.5*	*1,113.3*	91: 19.66	*US 91 + 400 North*	Wellsville	1
2	4,098.6	1,448.9	91 + 050370	Main St + Airport Dr (2500 North)	North Logan	1
2	2,131.3	1,001.1	91 + 1274	*US 91 + 11600 North*	Cache County	1
2	*2,954.4*	*1,381.8*	108: 0.92	Antelope Dr + 1000 East	Clearfield-Layton	1
2	*3,016.2*	*1,222.0*	108: 11.21	Midland Dr + 4000 South "Y"	West Haven	1
2	2,010.3	1,000.0	121 + 2734	*9000 North + 4500 East (SR 121)*	Uintah County	3
2	*2,363.5*	*1,317.8*	126: 4.78	*State St + 450 South*	Clearfield	1
2	*2,370.9*	*1,114.3*	126: 6.64	*Main St + Arsenal Rd (1300 North)*	Sunset	1
3	4,737.5	1,583.5	126 + 570090	1900 West + 4400 South	Roy	1
3	*3,377.7*	*1,211.6*	171: 4.73	*3500 South + Stanton St*	West Valley City	2
2	*2,853.3*	*1,232.9*	171: 5.28	*3500 South + 4200 West*	West Valley City	2
2	*2,603.9*	*1,343.2*	173: 3.35	*5400 South + 5030 West*	Kearns CDP	2
2	*3,595.7*	*1,528.3*	173: 4.07	*5400 South + 4460 West*	Kearns CDP	2
2	3,106.0	1,471.5	181 + 351180	1300 East + 1300 South	Salt Lake City	2
2	*2,384.9*	*1,127.5*	186: 7.25	500 South + 1100 East	Salt Lake City	2
2	*3,094.7*	*2,273.9*	189: 2.16	University Av + 200 North	Provo	3
2	5,191.9	1,839.9	189 + 490740	University Av + 3700 North	Provo	3
2	*3,176.3*	*2,102.6*	201: 7.71	*2400 South + 8000 West*	Magna CDP	2
2	*2,219.9*	*1,114.4*	204: 4.39	*Wall Av + 4th St*	Ogden	1
3	*4,414.0*	*1,133.2*	209: 7.33	9000 South + I-15 SB ramps	Sandy	2
2	*2,361.9*	*1,112.6*	268: 0.14	600 North + I-15 interchange	Salt Lake City	2

NOTES: *A **bold** number in the "Fatal" column means that the intersection had two fatal crashes between 2001 and 2003. All other intersections experienced one fatal crash between 2001 and 2003. Italicized locations are not signalized. Italicized scores indicate that crash data were not available for the cross-street. The intersections are not ranked.*

Table 2.7 29 Utah State Route Intersections with Crash Rates ≥ 2: 2001-2003 Data

Rank	Rate	Crashes	Routes[3]	Location	City or County	Reg
1	4.54	30	101 + 165	Main St + 800 East	Hyrum	1
2	3.88	143	30 + 91	200 North + Main St	Logan	1
3	3.79	174	68 + 89	500 South + 500 West	Bountiful	1
4	3.44	30	126 + 134	2000 West + 2700 North	Farr West	1
5	3.43	227	126 + 232	Main St + Hillfield Rd	Layton	1
6	3.27	141	71 + 209	700 East + 9000 South	Sandy	2
7	3.01	296	154 + 173	Bangerter Hwy + 5400 South	Taylorsville	2
8	2.99	118	104 + 126	21st St + 1900 West	West Haven	1
9	2.96	160	171 + 172	3500 South + 5600 West	West Valley City	2
10	2.92	129	171 + 181	3300 South + 1300 East	Millcreek CDP	2
11	2.90	4	92 + 144	*Alpine Loop Rd + N. American Fork Canyon Rd*	Utah County	3
12	2.800	174	39 + 89	12th St + Washington Bl	Ogden	1
13	2.796	170	97 + 126	5600 South + 1900 West	Roy	1
14	2.73	258	68 + 266	Redwood Rd + 4700 South	Taylorsville	2
15	2.70	167	48+ 68	7800 South + Redwood Rd	West Jordan	2
16	2.64	128	89 + 91	400 North + Main St	Logan	1
17	2.60	109	171 + 195	3300 South + 2300 East	East Millcreek CDP	2
18	2.56	142	203 + 284	Harrison Bl + 37th St	Ogden	1
19	2.52	124	68 + 151	Redwood Rd + 10400 South	South Jordan	2
20	2.41	110	91 + 238	Main St + 300 South	Logan	1
21	2.40	100	68 + 71	Redwood Rd + 12600 South	Riverton	2
22	2.40	237	68 + 173	Redwood Rd + 5400 South	Taylorsville	2
23	2.40	61	147 + 156	State Rd + Main St	Spanish Fork	3
24	2.37	127	91 + 239	Main St + 1400 North	Logan	1
25	2.35	144	108 + 126	Antelope Dr + Main St	Layton	1
26	2.30	19	40 + 191	Main St + Vernal Av	Vernal	3
27	2.21	17	140 + 287	*14600 South + ?*	Bluffdale	2
28	2.12	159	48 + 68	7000 South + Redwood Rd	West Jordan	2
29	2.01	124	68 + 209	Redwood Rd + 9000 South	West Jordan	2

***NOTE**: Crash rate = total number of crashes per million entering vehicles (2001-2003). The total number of entering vehicles at each intersection is actually the year 2003 entering vehicles multiplied by 3. Italicized intersections are not signalized.*

3. Intersection Crash Statistics by UDOT Region

The statewide crash statistics discussed in Section 2 reveal that the highest-ranked intersections, based on the total crashes and crash severity score criteria, are located almost entirely within the urbanized areas in UDOT Regions 1, 2 and 3. To expand the geographical scope of the examination, the research team also developed ranked lists for each UDOT Region and, for Region 4, each of the three districts. Twenty five-deep rankings were produced for each of the following:

- Region 1: 1994-2003 crashes, based on the total number of crashes (Table 3.1)
- Region 1: 2001-2003 crashes, based on the total number of crashes (Table 3.2)
- Region 1: 1994-2003 crashes, based on the total crash severity score (Table 3.3)
- Region 1: 2001-2003 crashes, based on the total crash severity score (Table 3.4)
- Region 2: 1994-2003 crashes, based on the total number of crashes (Table 3.5)
- Region 2: 2001-2003 crashes, based on the total number of crashes (Table 3.6)
- Region 2: 1994-2003 crashes, based on the total crash severity score (Table 3.7)
- Region 2: 2001-2003 crashes, based on the total crash severity score (Table 3.8)
- Region 3: 1994-2003 crashes, based on the total number of crashes (Table 3.9)
- Region 3: 2001-2003 crashes, based on the total number of crashes (Table 3.10)
- Region 3: 1994-2003 crashes, based on the total crash severity score (Table 3.11)
- Region 3: 2001-2003 crashes, based on the total crash severity score (Table 3.12)
- Region 4, Cedar City District: 1994-2003 crashes, based on the total number of crashes (Table 3.13)
- Region 4, Cedar City District: 2001-2003 crashes, based on the total number of crashes (Table 3.14)
- Region 4, Cedar City District: 1994-2003 crashes, based on the total crash severity score (Table 3.15)
- Region 4, Cedar City District: 2001-2003 crashes, based on the total crash severity score (Table 3.16)
- Region 4, Price District: 1994-2003 crashes, based on the total number of crashes (Table 3.17)
- Region 4, Price District: 2001-2003 crashes, based on the total number of crashes (Table 3.18)
- Region 4, Price District: 1994-2003 crashes, based on the total crash severity score (Table 3.19)
- Region 4, Price District: 2001-2003 crashes, based on the total crash severity score (Table 3.20)
- Region 4, Richfield District: 1994-2003 crashes, based on the total number of crashes (Table 3.21)
- Region 4, Richfield District: 2001-2003 crashes, based on the total number of crashes (Table 3.22)
- Region 4, Richfield District: 1994-2003 crashes, based on the total crash severity score (Table 3.23)
- Region 4, Richfield District: 2001-2003 crashes, based on the total crash severity score (Table 3.24)

3.1 Region 1

The intersections ranked based on the total number of crashes experienced are listed in Tables 3.1 (1994-2003) and 3.2 (2001-2003). The intersection having the most crashes during the 10-year study period is 5600 West (SR 97) at 1900 West (SR 126) in Roy, with 614, for an average of about 61 per year. The intersection having the most crashes during the three-year study period is Main Street (SR 126) at Hillfield Road (SR 232) in Layton, with 227. All of the intersections on the Region 1 lists are in Cache, Davis or Weber County. A total of 15 different cities are represented, with Layton, Logan, Ogden, Riverdale and Roy appearing the most frequently. One intersection – US 89 at Shepard Lane in Farmington – has been grade separated within the past two years. This intersection would not be expected to appear on any of these lists again, although the intersections between the US 89 *ramps* and Shepard Lane could see motor vehicle incidents. (It would be interesting to investigate the net effect of grade separation on traffic incidents at this location). All but four of the intersections on both lists are traffic signal-controlled. A total of 22 intersections appear on both the 10-year and 3-year study period lists. One implication of these intersections' recurrence is that, apparently, no safety improvements were made to these locations between 1994 and 2003. Another interpretation is that growth in travel offset any improvements.

Intersections ranked based on crash severity scores are listed in Tables 3.3 (1994-2003) and 3.4 (2001-2003). The highest-scoring intersection on the 10-year list is 12th Street (SR 39) and Washington Boulevard (US 89) in Ogden, with 7,689.5 points. This intersection experienced three fatal crashes during the study period, one of seven such locations in Region 1. The highest-scoring intersection on the 3-year list is 31st Street (SR 79) and Wall Avenue (SR 204) in Ogden, with 3,394.5 points. As noted earlier, this intersection had the *state's* highest score for the 3-year study period. A total of 11 intersections "made" both the 10-year and 3-year lists. It is likely that there were no safety improvements at these locations during the study period. Three of the intersections on the 10-year list are not signalized, while five of those on the 3-year list are not signalized. These intersections *may* be candidates for traffic signals, although several other factors would need to be considered as part of a signal warrant study. Non-signalized intersections are discussed in greater detail in Section 4. The following three intersections appear on *all four* Region 1 top 25 lists:

- Main Street + 400 North (US 89 + US 91 – Logan)
- 12th St + Washington Boulevard (SR 39 + US 89 – Ogden)
- 5600 South + 1900 West (SR 97 + SR 126 – Roy)

Two of these intersections – SR 39 + US 89 and SR 97 + SR 126 – are also on all four *statewide* lists, as noted in Section 2. These intersections, along with US 89 at US 91 in Logan, are examined in greater detail in Section 6 of this report.

The research team observed that SR 39 was missing from the CDDS intersection tools. Collisions occurring along SR 39 were tabulated using the CDDS' advanced search tool; then, intersection locations were estimated using the milepoints provided in the database, orienting milepoints, and maps. Collisions occurring at intersections between SR 39 *and other state highways* were included in the CDDS intersection tools.

3.2 Region 2

The intersections ranked based on the total number of crashes experienced are listed in Tables 3.5 (1994-2003) and 3.6 (2001-2003). The intersection having the most crashes during the 10-year and 3-year study period is the same as that atop the statewide lists: Bangerter Highway (SR 154) at 5400 South (SR 173) in Taylorsville. All of the intersections on both lists are located in Salt Lake County, with 11 different cities represented. All of the intersections are traffic signal-controlled. A total of 15 intersections appear on both the 10-year and 3-year study period lists. One implication of these intersections' recurrence is that, apparently, no safety improvements were made to these locations between 1994 and 2003. Another interpretation is that growth in travel offset any improvements.

Intersections ranked based on crash severity scores are listed in Tables 3.7 (1994-2003) and 3.8 (2001-2003). An additional two communities are represented on these lists as well as one intersection in Tooele County (Main Street and 1000 North in Tooele). The highest-scoring intersection on the 10-year list is the same as the highest on the statewide list: 700 East (SR 71) and 3300 South (SR 171) in South Salt Lake, with 9,524.8 points. The highest-scoring intersection on the 3-year list is State Street (US 89) and 4500 South (SR 266) in Murray, with 2,118.6 points. Four intersections on the 10-year list experienced three or more fatal crashes; one intersection on the 3-year list, 2400 South (SR 201) and 8000 West in Magna, saw two fatal crashes. A total of nine intersections "made" both the 10-year and 3-year lists. It is likely that there were no safety improvements at these locations during the study period. Three of the intersections on the 10-year list were not signalized, while nine on the 3-year list were not signalized. These intersections *may* be candidates for traffic signals, but several other factors would need to be considered as part of a signal warrant study. The growth in the number of non-signalized intersections from the 10- to the 3-year list may be indicative of a "maturation" of operations at these intersections. Non-signalized intersections are discussed in greater detail in Section 4. The following five intersections appear on *all four* Region 2 top 25 lists:

- Bangerter Highway + 3500 South (SR 154 + SR 171 – West Valley City)
- Redwood Road + 4700 South (SR 68 + SR 266 – Taylorsville)
- 700 East + 3300 South (SR 71 + SR 171 – South Salt Lake)
- 3500 South + 3600 West (SR 171 + 350600 – West Valley City)
- 3500 South + 5600 West (SR 171 + SR 172 – West Valley City)

Three of the intersections – SR 71 + SR 171, SR 171 + 350600, and SR 171 + SR 172 – are also on all four *statewide* lists, as noted in Section 2. These intersections, along with SR 154 + SR 171 in West Valley City and SR 68 + SR 266 in Taylorsville, are examined in greater detail in Section 6 of this report.

The research team observed that SR 186 was missing from the CDDS' intersection tools. Collisions occurring along SR 186 were tabulated using the CDDS' advanced search tool; then, intersection locations were estimated using the milepoints provided in the database, orienting milepoints, and maps. Collisions occurring at intersections between SR 186 *and other state highways* were included in the CDDS' intersection tools.

3.3 Region 3

The intersections ranked based on the total number of crashes experienced are listed in Tables 3.9 (1994-2003) and 3.10 (2001-2003). The intersection having the most crashes during the 10-year period is 800 North (SR 52) and State Street (US 89) in Orem, with 729 crashes (average of about 73 per year). The intersection with the most crashes between 2001 and 2003 is University Avenue (SR 189) and 900 North in Provo. All of the intersections on both lists are located in Utah County, with seven different cities represented. Six of the intersections on the 10-year list and four on the 3-year list are not signalized. A total of 15 intersections appear on both the 10-year and 3-year study period lists. One implication of these intersections' recurrence is that, apparently, no safety improvements were made to these locations between 1994 and 2003. Another interpretation is that growth in travel offset any improvements.

Intersections ranked based on crash severity scores are listed in Tables 3.11 (1994-2003) and 3.12 (2001-2003). An additional four cities in Utah County are represented on these lists. Also, one intersection in Wasatch County (SR 32 and SR 40, just north of Heber City), one in Duchesne County (US 40 at State Street and 500 South in Roosevelt), and one in Uintah County (US 40 and 500 South in Vernal) are included on either the 3-year or 10-year list. The highest-scoring intersection on the 10-year list is 800 North (SR 52) and State Street (US 89) in Orem, with 5,599.8 points. The highest-scoring intersection on the 3-year list is SR 75 at Main Street (US 89) and 1400 North in Springville, with 1,862.0 points. Twelve intersections on the 10-year list witnessed two fatal crashes; nearly all of the intersections on the 3-year list had one fatal crash. A total of nine intersections "made" both the 10-year and 3-year lists. It is likely that there were no safety improvements at these locations during the study period. Six intersections on the 10-year list and 12 on the 3-year list were not signalized. The surprisingly large number of non-signalized intersections on the 3-year list may be associated with a propensity for high-speed crashes that result in severe injuries or fatalities. These intersections *may* be candidates for traffic signals, although several other factors would need to be considered as part of a signal warrant study. Non-signalized intersections are discussed in greater detail in Section 4. The following five intersections appear on *all four* Region 3 top 25 lists:

- Center Street + 900 West (SR 114 at milepoint 0.36 – Provo)
- University Avenue + 900 North (SR 189 at milepoint 2.79 – Provo)
- University Avenue + 3700 North (SR 189 + 490740 – Provo)
- University Avenue + University Parkway + 1650 North (SR 189 + SR 265 + 490970 – Provo)
- 800 North + State Street (SR 52 + US 89 – Orem)

These intersections are examined in greater detail in Section 6 of this report. The research team observed that SR 189 was missing from the CDDS' intersection tools. Collisions occurring along SR 189 were tabulated using the CDDS' advanced search tool; then, intersection locations were estimated using the milepoints provided in the database, orienting milepoints, and maps. Several key intersections that are found on the "top 25" lists were identified in this manner.

3.4 Region 4 – Cedar City District

The intersections ranked based on the total number of crashes experienced are listed in Tables 3.13 (1994-2003) and 3.14 (2001-2003). The intersection having the most crashes during the 10-year and 3-year periods is St. George Boulevard (SR 34) and 1000 East in St. George, with 398 crashes (average of about 40 per year) between 1994 and 2003, and 129 (average of 43 per year) between 2001 and 2003. The intersections on both lists are concentrated in two cities in Washington County, St. George and Washington, and Cedar City in Iron County. Nine of the intersections on the 10-year list and 11 on the 3-year list are non-signalized. A total of 20 intersections appear on both the 10-year and 3-year study period lists. One implication of these intersections' recurrence is that, apparently, no safety improvements were made to these locations between 1994 and 2003. Another interpretation is that growth in travel offset any improvements.

Intersections ranked based on crash severity scores are listed in Tables 3.15 (1994-2003) and 3.16 (2001-2003). An additional six cities, along with a location in unincorporated Washington County, are represented on these lists. The highest-scoring intersection on the 10-year list is Bluff Street (SR 18) and 700 South in St. George, with 2,310.3 points. The highest-scoring intersection on the 3-year list is Bluff Street (SR 18) and 900 South in St. George, with 1,223.9 points. One intersection – South Toquer Boulevard and Pioneer Road in Toquerville – experienced two fatal crashes during the 10-year study period. Many other intersections on the 10-year list had one fatal crash. A total of 10 intersections witnessed one fatal crash during the 3-year study period – these 10 constitute to the top ten highest rankers on the list. A total of 15 intersections "made" both the 10-year and 3-year lists. It is likely that there were no safety improvements at these locations during the study period. A total of 13 intersections on the 10-year list and 14 on the 3-year list were not signalized. These intersections *may* be candidates for traffic signals, although several other factors would need to be considered as part of a signal warrant study. Non-signalized intersections are discussed in greater detail in Section 4. The following five intersections appear on *all four* Region 4: Cedar City District top 25 lists:

- Bluff Street + Hilton Drive + Main Street (SR 18 + 530140 – St. George)
- Bluff Street + St. George Boulevard (SR 18 + SR 34 + 530110 – St. George)
- St. George Boulevard + 400 East (SR 34 + 3180 – St. George)
- St. George Boulevard + I-15 southbound ramps (SR 34 at milepoint 1.90 – St. George)
- 3050 East + West Telegraph Street (SR 212 + 530070 + 3204 – Washington)

These intersections are examined in greater detail in Section 6 of this report.

3.5 Region 4 – Price District

The intersections ranked based on the total number of crashes experienced are listed in Tables 3.17 (1994-2003) and 3.18 (2001-2003). The intersection having the most crashes during the 10-year period is 100 North (SR 55) and 100 East in Price, with 78 crashes (average of about 8 per year). The intersection with the most crashes between 2001 and 2003 is Carbon Avenue (SR 10 south, 070200 north) and 100 North (SR 55) in Price, with 29 crashes (about 10 per year). The intersections on both lists are distributed between Carbon, Emery, Grand and San Juan Counties, with five different cities represented. Most of the intersections are traffic signal-controlled. A total of 15 intersections appear on both the 10-year and 3-year study period lists. One implication of these intersections' recurrence is that, apparently, no safety improvements were made to these locations between 1994 and 2003. Another interpretation is that growth in travel offset any improvements.

Intersections ranked based on crash severity scores are listed in Tables 3.19 (1994-2003) and 3.20 (2001-2003). The locations are spread about five cities, along with several unincorporated sites in Carbon, Emery, Grand and San Juan Counties. The highest-scoring intersection on the 10-year list is SR 10 and SR 29 in Emery County, with 2,001.6 points. The highest-scoring intersection on the 3-year list is US 6 and US 191 in Carbon County, with 1,101.5 points. Three intersections on the 10-year list witnessed two fatal crashes; five of the intersections on the 3-year list had one fatal crash. A total of seven intersections "made" both the 10-year and 3-year lists. It is likely that there were no safety improvements at these locations during the study period. Nineteen intersections on the 10-year list and 20 on the 3-year list were not signalized. That is, on both lists, nearly all of the intersections were not signalized. This is strikingly different from the lists based on total number of crashes, in which most of the intersections were signalized. These results suggest that intersections experiencing a large number of crash are, in general, signalized, while intersections that experience severe crashes (not necessarily a large number of these) *can* be associated with non-signalization. It would be interesting to confirm this general observation through a more detailed analysis. Non-signalized intersections are discussed in greater detail in Section 4. The following two intersections appear on *all four* Region 4: Price District top 25 lists:

- Carbon Avenue + 100 North (SR 10 + SR 55 + 070200 – Price)
- Main Street + 100 North (US 191 at milepoint 126.56 – Moab)

These intersections are examined in greater detail in Section 6 of this report. The research team observed that US 191 was missing from the CDDS intersection tools. Collisions occurring along US 191 were tabulated using the CDDS' advanced search tool; then, intersection locations were estimated using the milepoints provided in the database, orienting milepoints, and maps. Several key intersections on the "top 25" lists were identified in this manner.

3.6 Region 4 – Richfield District

The intersections ranked based on the total number of crashes experienced are listed in Tables 3.21 (1994-2003) and 3.22 (2001-2003). The intersection having the most crashes during the 10-year period is North Main Street (SR 120) and 100 North in Richfield, with 114 crashes (average of about 11 per year). The intersection with the most crashes between 2001 and 2003 is Main Street (SR 120) and Center Street in Richfield, with 37 (average of about 12 per year). The intersections on both lists are concentrated in the cities of Richfield, Kanab and Ephraim, with additional locations dispersed among cities and unincorporated areas in Garfield, Kane, Sanpete and Sevier Counties. Most of the intersections are not traffic signal-controlled, reflecting the predominantly rural character of the district. A total of 16 intersections appear on both the 10-year and 3-year study period lists. One implication of these intersections' recurrence is that, apparently, no safety improvements were made to these locations between 1994 and 2003. Another interpretation is that growth in travel offset any improvements.

Intersections ranked based on crash severity scores are listed in Tables 3.23 (1994-2003) and 3.24 (2001-2003). Eleven cities are represented on these lists, along with several locations in unincorporated areas of the aforementioned counties. The highest-scoring intersection on the 10- and 3-year list is US 89 at an unnamed road ("Road right") at milepoint 216.54, with 1,330.7 and 1,110.1 points, respectively. Sixteen intersections on the 10-year list witnessed one fatal crash; three on the 3-year list had one fatal crash. A total of eight intersections "made" both the 10-year and 3-year lists. It is likely that there were no safety improvements at these locations during the study period. Nearly all of the intersections on both lists were not signalized. Non-signalized intersections are discussed in greater detail in Section 4. The following two intersections appear on *all four* Region 4, Richfield District top 25 lists:

- North Main Street + 300 North (SR 118 + SR 120 – Richfield)
- 300 South + 100 East (SR 11 + US 89 – Kanab)

These intersections are examined in greater detail in Section 6 of this report.

3.7 Discussion

One finding is that the intersections ranked by total number of crashes tend to be signalized. This is reasonable since the warrants for a traffic signal are based, in part, on traffic volumes. At any given intersection, there is clearly a correlation between the number of crashes that occurs and the number of entering vehicles. The intersections ranked by severity score are heavily dependent on fatal crashes. That is, an intersection with a small number of crashes can rank very high, provided that the crashes were severe. This fatal crash "dependence" leads to a wider geographic dispersal of intersections on the severity scores lists than on the total crashes lists. As part of the dispersal, there is a greater tendency for the intersections on the severity scores lists to be non-signalized.

Table 3.1 UDOT Region 1 – 25 Intersections with a Large Number of Crashes: 1994-2003

Rank	Score	Routes	Location	City	Crashes	
					Total	**Fatal**
1	3,923.3	97 + 126	5600 South + 1900 West	Roy	614	0
2	4,588.9	126 + 232	Main St + Hillfield Rd	Layton	610	1
3	7,680.6	39 + 89	12th St + Washington Bl	Ogden	558	3
4	3,903.2	68 + 89	500 South + 500 West	Bountiful	548	1
5	2,792.2	26 + 570150	Riverdale Rd + 300 West	Riverdale	517	0
6	4,830.4	108 + 126	Antelope Dr + Main St	Layton	506	2
7	3,644.8	89 + 91	Main St + 400 North	Logan	493	1
8	*1,637.1*	232: 0.17	Hillfield Rd + I-15 NB ramps	Layton	*486*	0
9	3,521.3	91 + 239	Main St + 1400 North		473	1
=10	2,099.7	103 + 126	650 North + Main St	Clearfield	472	0
	1,743.7	91: 27.12	*Main St + Federal Av*	Logan	*472*	0
12	*2,569.6*	26: 2.67	*Riverdale Rd + Pacific Av*	Riverdale	*460*	0
13	4,025.8	39 + 204	12th St + Wall Av	Ogden	442	2
14	1,742.8	203 + 284	Harrison Bl + 37th St	Ogden	434	0
15	1,629.1	30 + 91	200 North + Main St	Logan	428	0
16	*1,113.3*	232: 0.07	Hillfield Rd + I-15 SB ramps	Layton	*423*	0
17	*2,087.9*	203: 2.23	*Harrison Bl + 4275 South*	Ogden	*422*	0
18	*2,995.4*	26: 0.67	Riverdale Rd + 1500 West	Riverdale	*407*	0
19	*4,020.1*	26: 1.05	Riverdale Rd + I-84 WB ramps	Riverdale	*403*	1
20	3,090.7	26 + 60	Riverdale Rd + 1050 West	Riverdale	388	0
21	*4,109.7*	126: 1.49	*Main St + 750 North (King St)*	Layton	*354*	1
22	1,631.9	91 + 050305	Main St + 1000 North	Logan	353	0
23	*1,112.9*	126: 8.90	1900 West + 5400 South	Roy	*347*	0
24	2,115.3	91 + 050155	Main St + 100 South	Logan	345	1
25	1,591.9	232 + 110350	Hillfield Rd + Gordon Av	Layton	344	0

Table 3.2 UDOT Region 1 – 25 Intersections with a Large Number of Crashes: 2001-2003

Rank	Score	Routes	Location	City	Crashes	
					Total	**Fatal**
1	1,075.7	126 + 232	Main St + Hillfield Rd	Layton	227	0
2	792.3	68 + 89	500 South + 500 West	Bountiful	174	0
3	1,982.0	39 + 89	12th St + Washington Bl	Ogden	173	1
4	*867.7*	26: 0.67	Riverdale Rd + 1500 West	Riverdale	*172*	0
5	1,314.8	97 + 126	5600 South + 1900 West	Roy	170	0
6	*669.0*	26: 2.67	*Riverdale Rd + Pacific Av*	Riverdale	*156*	0
7	954.9	108 + 126	Antelope Dr + Main St	Layton	144	0
8	*1,030.4*	126: 1.49	*Main St + King St (750 North)*	Layton	*143*	0
9	356.2	203 + 284	Harrison Bl + 37th St	Ogden	142	0
10	531.0	103 + 126	650 North + Main St	Clearfield	141	0
11	*487.9*	232: 0.17	Hillfield Rd + I-15 NB ramps	Layton	*136*	0
12	*576.9*	203: 2.23	*Harrison Bl + 4275 South*	Ogden	*135*	0
13	1,739.0	89 + 91	Main St + 400 North	Logan	128	1
=14	401.5	91 + 239	Main St + 1400 North	Logan	127	0
	464.5	30 + 91	200 North + Main St	Logan	127	0
16	708.1	232 + 110350	Hillfield Rd + Gordon Av	Layton	126	0
17	*600.3*	91: 27.12	*Main St + Federal Av*	Logan	*126*	0
18	*262.3*	232: 0.07	Hillfield Rd + I-15 SB ramps	Layton	*121*	0
19	589.4	26 + 60	Riverdale Rd + 1050 West	Riverdale	116	0
20	*586.3*	26: 1.05	Riverdale Rd + I-84 WB ramps	Riverdale	*115*	0
21	*491.9*	26: 1.10	*Riverdale Rd + 1150 West*	Riverdale	*114*	0
22	515.3	91 + 238	Main St + 300 South	Logan	113	0
23	493.5	39 + 204	12th St + Wall Av	Ogden	111	0
24	204.6	91 + 050155	Main St + 100 South	Logan	102	0
25	*304.4*	91 + 1220	Main St + 700 North	Logan	*101*	0
26	*1,014.8*	89: 356.85	*Washington Bl + 3rd St*	Ogden	*95*	0

Table 3.3 UDOT Region 1 – 25 Intersections with High Crash Severity Scores: 1994-2003

Rank	Score[2]	Routes[3]	Milepoint 1	Milepoint 2	Location	City	Crashes Total	Crashes Fatal
1	7,680.6	39 + 89	6.40	355.88	12th St + Washington Bl	Ogden	558	3
2	7,194.9	79 + 204	1.06	1.06	31st St + Wall Av	Ogden	336	3
3	*6,208.5*	79: 1.11	1.11	NA	Hinckley Dr + Pennsylvania Av	Ogden	*147*	3
4	4,830.4	108 + 126	0.62	3.21	Antelope Dr + Main St	Layton	514[4]	2
5	4,737.5	126 + 570090	10.15	0.00	1900 West + 4400 South	Roy	161	3
6	4,678.6	126 + 193	4.45	0.00	State St + 700 South	Clearfield	229	3
7	4,588.9	126 + 232	1.58	0.00	Main St + Hillfield Rd	Layton	610	1
8	4,550.8	104 + 570330	0.99	0.00	21st St + 1100 West	West Haven	121	3
9	4,329.3	89 + 106	337.31	9.41	US 89 + Shepard Ln	Farmington	201	2
10	*4,109.7*	126: 1.49	1.49	NA	*Main St + King St (750 North)*	Layton	*354*	1
11	4,098.6	91 + 050370	30.13	8.80	Main St + 2500 North	North Logan	180	2
12	4,025.8	39 + 204	6.00	3.56	12th St + Wall Av	Ogden	442	1[4]
13	*4,020.1*	26: 1.05	1.05	NA	Riverdale Rd + I-84 WB ramps	Riverdale	*403*	1
14	3,923.3	97 + 126	5.10	8.66	5600 South + 1900 West	Roy	614	0
15	3,903.2	68 + 89	69.42	335.12	500 South + 500 West	Bountiful	548	1
16	3,866.3	91 + 101	19.48	1.20	US 91 + East Main St	Wellsville	107	3
17	3,747.5	89 + 106	335.79	0.44	500 West + 400 North	Bountiful	215	2
18	3,644.8	89 + 91	373.85	27.46	Main St + 400 North	Logan	493	1
19	3,521.3	91 + 239	28.74	0.00	Main St + 1400 North	Logan	473	1
20	*3,416.4*	91: 24.66	24.66	NA	*US 91 + 1700 South*	Logan	*90*	2
21	*3,411.4*	89: 354.25	354.25	NA	Washington Bl + 25th St	Ogden	*209*	2
22	*3,291.7*	126: 2.00	2.00	NA	*Main St + 1120 North*	Layton	*67*	2
23	3,184.3	37 + 126	0.00	7.15	1800 North + Main St	Sunset	145	2
24	3,090.7	26 + 60	1.35	0.00	Riverdale Rd + 1050 West	Riverdale	388	0
25	*3,016.2*	108: 11.21	11.21	NA	Midland Dr + 4000 South "Y"	West Haven	*75*	2
26	*2,995.4*	26: 0.67	0.67	NA	Riverdale Rd + 1500 West	Riverdale	*407*	0

Table 3.4 UDOT Region 1 – 25 Intersections with High Crash Severity Scores: 2001-2003

Rank	Score[2]	Routes[3]	Milepoint		Location	City	Crashes	
			1	2			Total	Fatal
1	3,394.5	79 + 204	1.06	1.06	31st St + Wall Av	Ogden	87	2
2	*2,970.6*	79: 1.11	1.11	NA	Hinckley Dr + Pennsylvania Av	Ogden	*42*	2
3	1,982.0	39 + 89	6.44	355.88	12th St + Washington Bl	Ogden	173	1
4	1,860.0	193 + 232	2.17	2.26	700 South + Hillfield Rd	Layton	87	1
5	1,739.0	89 + 91	373.85	27.46	Main St + 400 North	Logan	128	1
6	*1,646.9*	89: 354.25	354.25	NA	Washington Bl + 25th St	Ogden	*71*	1
7	*1,605.3*	89: 343.49	343.49	NA	*US 89 + Country Oaks Dr*	Layton	*24*	1
8	1,598.3	89 + 106	335.79	0.44	500 West + 400 North	Bountiful	89	1
9	1,583.5	126 + 570090	10.15	0.00	1900 West + 4400 South	Roy	49	1
10	1,448.9	91 + 050370	30.13	8.80	Main St + Airport Dr (2500 North)	North Logan	53	1
11	1,436.8	89 + 570680	358.67	5.84	US 89 + Independence Bl + Harrisville Rd	Harrisville	31	1
12	*1,381.8*	108: 0.92	0.92	NA	Antelope Dr + 1000 East	Clearfield-Layton	*57*	1
13	1,355.0	89 + 570560	354.97	0.00	Washington Bl + 20th St	Ogden	41	1
14	1,349.7	89 + 3400	354.11	?	Washington Bl + 26th St	Ogden	51	1
15	*1,340.6*	203: 0.99	0.99	NA	Harrison Bl + Shadow Valley Dr (5225 South)	Ogden-South Ogden	*41*	1
16	*1,317.8*	126: 4.78	4.78	NA	*State St + 450 South*	Clearfield	*20*	1
17	1,314.8	97 + 126	5.10	8.66	5600 South + 1900 West	Roy	170	0
18	1,307.2	37 + 126	0.00	7.15	1800 North + Main St	Sunset	49	1
19	1,246.5	26 + 570295	3.27	6.53	*Riverdale Rd + Lincoln Av + Chimes Circle*	South Ogden	27	1
20	*1,241.0*	89: 356.06	356.06	NA	*Washington Bl + 10th St*	Ogden	*26*	1
21	*1,238.8*	273: 2.88	2.88	NA	200 North + I-15 NB ramps	Kaysville	*31*	1
22	*1,230.1*	126: 5.46	5.46	NA	*Main St + 100 North*	Clearfield	*25*	1
23	*1,222.0*	108: 11.21	11.21	NA	Midland Dr + 4000 South "Y"	West Haven	*16*	1
24	*1,220.4*	89: 359.86	359.86	NA	US 89 + 750 West	Harrisville	*9*	1
25	1,159.2	239 + 1232	0.26	?	1400 North + 200 East	Logan	63	1
26	*1,138.9*	89: 355.77	355.77	NA	*Washington Bl + 13th St*	Ogden	*49*	1
27	*1,129.5*	126: 3.72	3.72	NA	State St + 1000 East	Clearfield	*27*	1

Table 3.5 UDOT Region 2 – 25 Intersections with a Large Number of Crashes: 1994-2003

Rank	Score	Routes	Location	City	*Crashes*	
					Total	**Fatal**
1	5,013.0	154 + 173	Bangerter Hwy + 5400 South	Taylorsville	949	1
2	4,937.9	68 + 173	Redwood Rd + 5400 South	Taylorsville	914	0
3	6,060.4	68 + 266	Redwood Rd + 4700 South	Taylorsville	835	1
4	6,559.5	68 + 350640	Redwood Rd + 4100 South	Taylorsville-West Valley City	750	0
5	5,991.6	266 + 350620	4700 South + 2200 West	Taylorsville	696	1
6	9,524.8	71 + 171	700 East + 3300 South	South Salt Lake	667	5[4]
7	*5,773.9*	266: 0.19	4700 South + I-215 NB off-ramp	Taylorsville	*625*	1
8	5,110.8	154 + 171	Bangerter Hwy + 3500 South	West Valley Ctiy	618	1
9	3,846.7	171 + 350600	3500 South + 3600 West	West Valley City	568	1
10	1,686.5	266 + 350440	4500 South + 300 West	Murray	566	0
11	3,680.8	71 + 152	900 East + Van Winkle Expwy	Murray	565	2
12	*2,953.4*	171: 5.92	*3500 South + 3690 West*	West Valley City	*563*	0
13	4,300.4	71 + 350380	900 East + Ft. Union Bl	Midvale	560	1
14	4,120.1	68 + 350610 + 350320	Redwood Rd + 6200 South	Taylorsville	548	1
15	4,840.8	171 + 172	3500 South + 5600 West	West Valley City	546	1
16	*3,024.2*	68: 51.21	Redwood Rd + 5600 South	Taylorsville	*542*	1
17	*3,210.0*	171: 10.54	*3300 South + Sue St (30 West)*	South Salt Lake	*537*	1
18	*3,120.6*	89: 322.44	State St + I-80 WB ramps	Salt Lake City	*534*	1
19	3,760.3	173 + 350050	5400 South + 2700 West	Taylorsville	532	0
20	3,449.2	89 + 171	State St + 3300 South	South Salt Lake	526	1
21	*4,001.8*	89: 322.49	*State St + Burton Av (2360 South)*	South Salt Lake	*499*	2
22	5,417.6	68 + 171	Redwood Rd + 3500 South	West Valley City	491	2
23	2,713.9	71 + 266	700 East + 4500 South	Murray	483	0
24	3,697.2	89 + 266	State St + 4500 South	Murray	465	1
25	4,353.1	71 + 350520	Van Winkle Expwy + 4800 South	Murray	458	2
26	2,730.5	89 + 209	State St + 9000 South	Sandy	447	0
27	*3,754.4*	71: 4.93	12300 South + I-15 Frontage Rd	Draper	*446*	2

Table 3.6 UDOT Region 2 – 25 Intersections with a Large Number of Crashes: 2001-2003

Rank	Score	Routes	Location	City	Crashes	
					Total	Fatal
1	1,156.5	154 + 173	Bangerter Hwy + 5400 South	Taylorsville	296	0
2	1,268.7	68 + 266	Redwood Rd + 4700 South	Taylorsville	258	0
3	1,309.8	68 + 173	Redwood Rd + 5400 South	Taylorsville	257	0
4	*690.1*	209: 7.58	9000 South + Monroe St (150 West)	Sandy	*205*	0
5	*1,087.8*	266: 0.19	4700 South + I-215 NB off-ramp	Taylorsville	*186*	0
6	1,100.4	266 + 350620	4700 South + 2200 West	Taylorsville	181	0
7	877.0	68 + 350640	Redwood Rd + 4100 South	Taylorsville-West Valley City	175	0
8	1,851.8	48 + 68	7800 South + Redwood Rd	West Jordan	167	1
9	655.2	68 + 350320 + 350610	Redwood Rd + 6200 South	Taylorsville	161	0
10	1,415.9	171 + 172	3500 South + 5600 West	West Valley City	160	0
11	352.5	48 + 68	7000 South + Redwood Rd	West Jordan	159	0
12	*873.0*	171: 5.92	*3500 South + 3690 West*	West Valley City	*144*	0
13	951.0	71 + 209	700 East + 9000 South	Sandy	141	0
14	2,015.5	171 + 350600	3500 South + 3600 West	West Valley City	139	1
15	1,231.6	154 + 171	Bangerter Hwy + 3500 South	Taylorsville	139	0
16	1,843.4	71 + 171	700 East + 3300 South	South Salt Lake	137	1
17	984.6	173 + 350050	5400 South + 2700 West	Taylorsville	135	0
18	551.4	89 + 209	State St + 9000 South	Sandy	132	0
19	544.8	171 + 181	3300 South + 1300 East	Millcreek CDP	129	0
20	*536.6*	173: 4.62	5400 South + 4000 West	Taylorsville	*128*	0
21	1,701.9	89 + 171	State St + 3300 South	South Salt Lake	126	1
=22	*1,262.5*	68: 51.21	Redwood Rd + 5600 South	Taylorsville	*124*	0
	582.1	68 + 151	Redwood Rd + 10400 South	South Jordan	124	0
	91.6	68 + 209	Redwood Rd + 9000 South	West Jordan	124	0
	402.1	89 + 173	State St + 5300 South	Murray	124	0
26	2,118.6	89 + 266	State St + 4500 South	Murray	117	1

Table 3.7 UDOT Region 2 – 25 Intersections with High Crash Severity Scores: 1994-2003

Rank	Score[2]	Routes[3]	Milepoint		Location	City	Crashes	
			1	2			Total	Fatal
1	9,524.8	71 + 171	18.28	11.64	700 East + 3300 South	South Salt Lake	667	5[4]
2	6,559.5	68 + 350640	53.47	8.01	Redwood Rd + 4100 South	Taylorsville – West Valley City	750	1
3	6,187.7	111 + 201	10.59	7.20	8400 West + 2400 South	Magna CDP	110	4
4	6,060.4	68 + 266	52.47	0.77	Redwood Rd + 4700 South	Taylorsville	835	1
5	5,991.6	266 + 350620	0.27	1.00	4700 South + 2200 West	Taylorsville	696	1
6	*5,773.9*	266: 0.19	0.19	NA	4700 South + I-215 NB off-ramp	Taylorsville	*625*	1
7	5,417.6	68 + 171	54.47	8.04	Redwood Rd + 3500 South	West Valley City	491	2
8	5,336.8	89 + 350640	320.26	10.72	State St + 3900 South	South Salt Lake	520	1
9	5,110.8	154 + 171	18.97	5.84	Bangerter Hwy + 3500 South	Taylorsville	618	1
10	5,013.0	154 + 173	15.95	4.92	Bangerter Hwy + 5400 South	Taylorsville	909	1
11	5,002.1	89 + 186	325.33	5.70	State St + 400 South	Salt Lake City	278[4]	1
12	4,937.9	68 + 173	51.47	7.15	Redwood Rd + 5400 South	Taylorsville	914	0
13	4,840.8	171 + 172	3.53	4.01	3500 South + 5600 West	West Valley City	564	1
14	4,818.5	152 + 350410	1.44	2.12	Van Winkle Expwy + 5600 South	Murray	197	2
15	*4,434.5*	68: 53.30	53.30	NA	Redwood Rd + 4200 South-Mantle Av	Taylorsville	*380*	1
16	4,414.0	209: 7.33	7.33	NA	9000 South + I-15 SB ramps	Sandy	346	3
17	4,353.1	71 + 350520	15.80	0.00	Van Winkle Expwy + 4800 South	Murray	458	2
18	4,300.4	71 + 350380	12.70	1.30	900 East + Ft. Union Bl	Midvale	560	1
19	4,247.0	190 + 210	1.83	0.00	Ft. Union Bl + Wasatch Bl	Cottonwood Heights	215	2
20	4,246.1	68 + 186	59.63	2.23	Redwood Rd + North Temple	Salt Lake City	197	2
21	4,120.1	68 + 350320 + 350610	50.46	4.51 + 0.00	Redwood Rd + 6200 South	Taylorsville	548	1
22	*4,001.8*	89: 322.49	322.49	NA	*State St + Burton Av (2360 South)*	South Salt Lake	*499*	2
23	*3,969.9*	71: 19.90	19.90	NA	*700 East + Wilmington Av (2185 South)*	Salt Lake City	135	2
24	3,896.1	71 + 351040	19.16	1.49	700 East + 2700 South	Salt Lake City	144	2
25	*3,861.9*	71: 19.82	19.82	NA	*700 East + Simpson Av (2235 South)*	Salt Lake City	*117*	2
26	3,846.7	171 + 350600	6.04	3.00	3500 South + 3600 West	West Valley City	568	1

Table 3.8 UDOT Region 2 – 25 Intersections with High Crash Severity Scores: 2001-2003

Rank	Score[2]	Routes[3]	Milepoint 1	Milepoint 2	Location	City	Crashes Total	Crashes Fatal
1	2,118.6	89 + 266	319.38	3.53	State St + 4500 South	Murray	117	1
2	*2,102.6*	201: 7.71	7.71	NA	*2400 South + 8000 West*	Magna CDP	*11*	2
3	2,015.5	171 + 350600	6.04	3.00	3500 South + 3600 West	West Valley City	139	1
4	1,851.8	48 + 68	10.11	48.46	7800 South + Redwood Rd	West Jordan	167	1
5	1,843.4	71 + 171	18.28	11.64	700 East + 3300 South	South Salt Lake	137	1
6	1,701.9	89 + 171	321.14	10.75	State St + 3300 South	South Salt Lake	126	1
7	1,613.2	89 + 351350	325.64	0.60	State St + 200 South	Salt Lake City	49	1
8	*1,604.9*	171: 10.54	10.54	NA	*3300 South + Sue St (30 West)*	South Salt Lake	*83*	1
9	*1,528.3*	173: 4.07	4.07	NA	*5400 South + 4460 West*	Kearns CDP	*37*	1
10	*1,527.8*	171: 10.83	10.83	NA	*3300 South + Edison St (145 East)*	South Salt Lake	*95*	1
11	1,471.5	181 + 351180	5.74	10.97	1300 East + 1300 South	Salt Lake City	27	1
12	1,415.9	171 + 172	3.53	4.01	3500 South + 5600 West	West Valley City	155	0
13	1,415.1	209 + 350390	6.83	0.00	9000 South + 700 West-Riverside Dr	Sandy	84	1
14	1,390.0	89 + 351020	323.47	3.65	State St + 1700 South	Salt Lake City	31	1
15	*1,362.7*	71: 7.40	7.40	NA	*700 East + Dusty Creek Av (11250 South)*	Sandy	*37*	1
16	*1,326.3*	266: 2.18	2.18	NA	4700 South + 815 West	Taylorsville	*24*	1
17	*1,318.9*	36: 55.92	55.92	NA	*Main St + 1000 North*	Tooele	*31*	1
18	1,309.8	68 + 173	51.47	7.15	Redwood Rd + 5400 South	Taylorsville	237	0
19	1,298.0	190 + 210	1.83	0.00	Ft. Union Bl + Wasatch Bl	Cottonwood Heights	56	1
20	*1,274.7*	89: 323.58	323.58	NA	*State St + Wood Av (1580 South)*	Salt Lake City	*30*	1
21	1,268.7	68 + 266	52.47	0.77	Redwood Rd + 4700 South	Taylorsville	258	0
22	*1,263.3*	71: 5.83	5.83	NA	*12300 South + 600 East*	Draper	*51*	1
23	*1,262.5*	68: 51.21	51.21	NA	Redwood Rd + 5600 South	Taylorsville	*124*	1
24	1,254.3	171 + 350440	10.15	1.03	3300 South + 300 West	South Salt Lake	69	1
25	*1,232.9*	171: 5.28	5.28	NA	*3500 South + 4200 West*	West Valley City	*35*	1
26	1,231.6	154 + 171	18.97	5.84	Bangerter Hwy + 3500 South	West Valley City	139	0
27	*1,211.6*	171: 4.73	4.73	NA	*3500 South + Stanton St (4640 West)*	West Valley City	*11*	1

Table 3.9 UDOT Region 3 – 25 Intersections with a Large Number of Crashes: 1994-2003

Rank	Score	Routes	Location	City	Crashes	
					Total	**Fatal**
1	5,599.8	52 + 89	800 North + State St	Orem	729	1
2	*3,153.8*	189: 2.79	*University Av + 900 North*	Provo	*623*	0
3	2,389.4	89 + 265	State St + 1300 South	Orem	431[4]	0
4	4,127.7	89 + 114	500 West + Center St.	Provo	406	2
5	*3,080.0*	114: 0.36	Center St + 900 West	Provo	*380*	1
6	2,923.1	89 + 189	State St + University Av	Provo	359[4]	0
7	1,974.4	89 + 490680	State St.+ Center St	Orem	331	0
8	4,012.0	189 + 265 + 490970	University Av + University Pkwy + 1650 North	Provo	322	1
9	2,002.0	89 + 490740	State St + 800 South	Orem	319	0
10	2,873.1	189 + 490990	University Av + 700 North	Provo	300	1
=11	5,191.9	189 + 490740	University Av + 3700 North	Provo	286	2
	1,610.9	89 + 180	State St + 500 East	American Fork	286	0
13	3,299.9	89 + 490655	State St + 400 North	Orem	285	1
14	1,332.0	89 + 490780	State St + 1200 South	Orem	279	0
15	*1,763.7*	52: 1.92	*800 North + 100 West*	Orem	*276*	0
16	3,734.1	189 + 491110	University Av + 2230 North	Provo	270	0
17	*2,741.2*	73: 40.18	*Main St + 200 East*	Lehi	*268*	1
18	*1,779.6*	189: 1.79	*University Av + 200 South*	Provo	*264*	0
19	*3,094.7*	189: 2.16	University Av + 200 North	Provo	*257*	2
20	*1,979.6*	189: 2.23	*University Av + 300 North*	Provo	*248*	1
21	2,084.5	89 + 490710	State St + 1200 North	Orem	245	0
22	*1,173.5*	89: 296.09	State St + 400 South	Orem	*242*	0
23	1,438.0	89 + 490635	State St + 1600 North	Orem	241	0
24	*1,196.7*	89: 292.77	500 West + 940 North	Provo	*240*	0
25	*1,812.1*	189: 2.35	*University Av + 400 North*	Provo	*238*	0
26	*2,354.0*	89: 293.31	State St + Riverside Av (550 West)	Provo	*230*	0
27	3,302.5	75 + 89 + 491250	SR 75 + Main St + 1400 North	Springville	220	1

Table 3.10 UDOT Region 3 – 25 Intersections with a Large Number of Crashes: 2001-2003

Rank	Score	Routes	Location	City	Crashes	
					Total	Fatal
1	*1,032.5*	189: 2.79	*University Av + 900 North*	Provo	*146*	0
2	712.0	89 + 265	State St + 1300 South	Orem	109	0
3	1,050.5	189 + 265 + 490970	University Av + University Pkwy + 1650 North	Provo	101	0
4	1,532.4	52 + 89	800 North + State St	Orem	96	1
5	1,311.4	89 + 114	500 West + Center St	Provo	95	0
6	*1,339.4*	114: 0.36	Center St + 900 West	Provo	*83*	1
7	*741.5*	189: 2.53	*University Av + 600 North*	Provo	*80*	0
=8	1,839.9	189 + 490740	University Av + 3700 North	Provo	75	1
	809.4	89 + 189	State St + University Av	Provo	75	0
=10	488.0	89 + 490740	State St + 800 South	Orem	74	0
	286.4	189: 3.34	*University Av + Paul Ream Av (1450 North)*	Provo	*74*	0
12	*380.7*	52: 1.98	*800 North + 50 West*	Orem	*72*	0
13	386.8	89 + 490780	State St + 1200 South	Orem	70	0
14	500.8	89 + 490620	State St + 1600 North	Orem	67	0
15	472.8	89 + 490680	State St + Center St	Orem	66	0
16	*707.6*	89: 293.76	State St + 1850 North + 950 West	Provo	*65*	0
17	*182.6*	180: 0.04	500 East + I-15 NB ramps	American Fork	*64*	0
18	*69.3*	74: 0.22	100 East + 150 North	American Fork	*63*	0
=19	1,862.0	75 + 89 + 491250	SR 75 + Main St + 1400 North	Springville	62	1
	359.9	89 + 180	State St + 500 East	American Fork	62	0
	420.2	189: 1.79	*University Av + 200 South*	Provo	*62*	0
22	277.0	147 + 156	4th North + Main St	Spanish Fork	61	0
=23	599.9	89 + 3038	500 West + 200 North	Provo	59	0
	284.0	89: 296.09	State St + 400 South	Orem	*59*	0
	380.3	89: 292.77	500 West + 940 North	Provo	*59*	0
26	400.9	89 + 490930	State St + 1720 North	Provo	58	0
27	*1,367.3*	189: 2.07	*University Av + 100 North*	Provo	*56*	1
28	1,474.3	89 + 2907	State St + 300 East + 700 South	Pleasant Grove	*55*	1

Table 3.11 UDOT Region 3 – 25 Intersections with High Crash Severity Scores: 1994-2003

Rank	Score[2]	Routes[3]	Milepoint		Location	City	Crashes	
			1	2			Total	Fatal
1	5,599.8	52 + 89	1.75	297.69	800 North + State St	Orem	729	1
2	5,191.9	189 + 490740	5.36	3.37	University Av + 3700 North	Provo	286	2
3	4,127.7	89 + 114	291.90	0.00	500 West + Center St	Provo	408[4]	2
4	4,012.0	189 + 265 + 490970	3.48	4.32 + 0.00	University Av + University Pkwy + 1650 North	Provo	322	1
5	*3,749.3*	89: 302.38	302.38	NA	State St + Center St	Pleasant Grove	*116*	2
6	3,734.1	189 + 491110	4.00	0.45	University Av + 2230 North	Provo	270	0
7	*3,684.5*	189: 1.24	1.24	NA	*University Av + 780 South*	Provo	*197*	2
8	3,622.6	74 + 92	3.89	5.68	Alpine Hwy + 11000 North	Highland	127	2
9	3,612.9	189 + 490680	6.39	4.05	University Av + 4800 North	Provo	192	1
10	3,302.5	75 + 89 + 491250	2.04	286.88 + 0.00	SR 75 + Main St + 1400 North	Springville	211	1
11	3,299.9	89 + 490655	297.16	1.86	State St + 400 North	Orem	284	1
12	*3,153.8*	189: 2.79	2.79	NA	*University Av + 900 North*	Provo	*623*	0
13	3,126.6	68 + 73	32.83	36.45	Redwood Rd + 8570 North	Lehi-Saratoga Springs	72	2
14	*3,094.7*	189: 2.16	2.16	NA	University Av + 200 North	Provo	*257*	2
15	*3,080.0*	114: 0.36	0.36	NA	Center St + 900 West	Provo	*380*	1
16	2,923.1	89 + 189	291.17	1.70	300 South + University Av	Provo	359[4]	0
17	2,873.1	189 + 490990	2.61	0.18	University Av + 700 North	Provo	300	1
18	*2,832.7*	89: 300.02	300.02	NA	*500 West + 200 North*	Provo	*58*	2
19	*2,775.6*	6: 162.73	162.73	NA	US 6 + Center St	Spanish Fork	*54*	2
20	*2,741.2*	73: 40.18	40.18	NA	*Main St + 200 East*	Lehi	*268*	1
21	2,665.8	32 + 40	0.00	13.30	SR 32 + US 40	Wasatch County	36[4]	2
22	*2,411.7*	89: 288.70	288.70	NA	*State St + King Ln-2000 South*	Provo	*96*	1
23	2,389.4	89 + 265	294.90	2.27	State St + 1300 South	Orem	431[4]	0
24	2,355.2	6 + 89	165.82	281.20	*US 6 + US 89*	Utah County	35[4]	2
25	*2,354.0*	89: 293.31	293.31	NA	State St + Riverside Av (550 West)	Provo	*230*	0
26	2,334.8	114 + 241	8.50	0.00	Geneva Rd + 600 South-1600 North	Lindon-Orem	128	1

Table 3.12 UDOT Region 3 – 25 Intersections with High Crash Severity Scores: 2001-2003

Rank	Score[2]	Routes[3]	Milepoint		Location	City	Crashes	
			1	2			Total	Fatal
1	*2,273.9*	189: 2.16	2.16	NA	University Av + 200 North	Provo	50	2
2	1,862.0	75 + 89 + 491250	2.04	286.88 + 0.00	SR 75 + Main St + 1400 North	Springville	62	1
3	1,839.9	189 + 490740	5.36	3.37	University Av + 3700 North	Provo	75	1
4	*1,547.6*	89: 288.70	288.70	NA	*State St + King Ln-2000 South*	Provo	*50*	1
5	1,532.4	52 + 89	1.75	297.69	800 North + State St	Orem	96	1
6	1,502.8	89 + 490655	297.16	1.86	State St + 400 North	Orem	61	1
7	1,474.3	89 + 2907	301.27	?	State St + 300 East + 700 South	Pleasant Grove	55	1
8	*1,424.3*	89: 298.46	298.46	NA	*State St + 1360 North*	Orem	*32*	1
9	*1,370.6*	89: 294.62	294.62	NA	*State St + 1500 South*	Orem	*35*	1
10	*1,367.3*	189: 2.07	2.07	NA	*University Av + 100 North*	Provo	*56*	1
11	*1,339.4*	114: 0.36	0.36	NA	Center St + 900 West	Provo	*83*	1
12	*1,315.4*	89: 304.41	304.41	NA	*State St + 400 East*	American Fork	*32*	1
13	*1,314.5*	6: 173.90	173.90	NA	*US 6 + View Area*	Utah County	*14*	1
14	1,311.4	89 + 114	299.54	10.73	State St + Geneva Rd + Main St	Pleasant Grove	37	1
15	*1,262.1*	189: 2.23	2.23	NA	*University Av + 300 North*	Provo	*48*	1
16	1,240.5	74 + 92	3.89	5.68	Alpine Hwy + 11000 North	Highland	30	1
17	*1,233.2*	40: 143.24	143.24	NA	*US 40 + 500 South*	Vernal	*20*	1
18	*1,229.1*	89: 290.62	290.62	NA	*300 South + 600 East*	Provo	*24*	1
19	*1,224.4*	89: 309.65	309.65	NA	State St + I-15 SB ramp + Frontage Rd	Lehi	*13*	1
20	1,214.3	40 + 1546	114.18	?	*US 40 + State St + 500 South*	Roosevelt	11	1
21	*1,210.2*	198: 6.17	6.17	NA	*SR 198 + 900 East*	Payson	*6*	1
22	*1,206.9*	114: 0.27	0.27	NA	*Center St + 800 West*	Provo	*63*	1
23	*1,205.4*	6: 164.02	164.02	NA	*US 6 + 2550 East*	Spanish Fork	*12*	1
24	*1,113.5*	114: 0.18	0.18	NA	*Center St + 700 West*	Provo	*20*	1
25	1,050.5	189 + 265 + 490970	3.48	4.32 + 0.00	University Av + University Pkwy + 1650 North	Provo	101	0
26	*1,032.5*	189: 2.79	2.79	NA	*University Av + 900 North*	Provo	*146*	0

Table 3.13 UDOT Region 4, Cedar City District – 25 Intersections with a Large Number of Crashes: 1994-2003

Rank	Score	Routes	Location	City	Crashes	
					Total	Fatal
1	787.7	34 + 3191	*St. George Bl + 1000 East*	St. George	398	0
2	2,131.1	18 + 34 + 530110	Bluff St + St. George Bl	St. George	377	0
3	*789.6*	34: 1.62	*St. George Bl + 900 East*	St. George	*264*	0
4	1,159.7	56 + 130 + 1764	Main St + 200 North	Cedar City	248	0
5	1,594.8	14 + 130 + 289	Main St + Center St	Cedar City	234	0
6	*369.6*	34: 0.10	*St. George Bl + 400 West*	St. George	*231*	0
7	*712.0*	18: 2.60	Bluff St + 500 North	St. George	*226*	0
8	*579.5*	18: 2.35	Bluff St + 300 North	St. George	*215*	0
9	*862.7*	34: 1.51	*St. George Bl + 800 East*	St. George	*212*	0
10	789.4	34 + 3160	St. George Bl + 700 East	St. George	199	0
11	*1,072.4*	18: 2.23	*Bluff St + 200 North*	St. George	*185*	0
12	*982.9*	130: 2.31	*Main St + 65 North*	Cedar City	*172*	0
=13	*742.8*	18: 2.78	*Bluff St + Ridgeview Dr*	St. George	*165*	0
	365.7	34: 2.05	St. George Bl + I-15 NB ramps	St. George	*165*	0
15	1,583.2	34 + 3180	St. George Bl + 400 East	St. George	163	1
16	1,459.7	212 + 530070 + 3204	3050 East + West Telegraph St	Washington	161	0
17	*967.2*	130: 2.39	*Main St + Hoover Av*	Cedar City	*159*	0
18	NA	8 + 18	Sunset Bl + Bluff St	St. George	158	0
=19	1,626.6	18 + 530140	Bluff St + Hilton Dr + Main St	St. George	156	0
	926.4	18: 2.48	*Bluff St + 400 North*	St. George	*156*	0
21	NA	8 + 3166	Sunset Bl + Dixie Downs Dr	St. George	153	0
22	853.6	34 + 3178	St. George Bl + 200 East	St. George	141	0
23	*1,358.8*	34: 1.90	St. George Bl + I-15 SB ramps	St. George	*133*	1
24	1,537.8	34 + 530140	St. George Bl + Main St	St. George	132	1
25	2,310.3	18 + 3172	Bluff St + 700 South	St. George	126	1

Table 3.14 UDOT Region 4, Cedar City District – 25 Intersections with a Large Number of Crashes: 2001-2003

					Crashes	
Rank	**Score**	**Routes**	**Location**	**City**	**Total**	**Fatal**
1	86.7	34 + 3191	*St. George Bl + 1000 East*	St. George	129	0
2	*264.1*	18: 2.60	Bluff St + 500 North	St. George	*112*	0
3	511.6	18 + 34 + 530110	Bluff St + St. George Bl	St. George	85	0
4	*541.6*	18: 2.48	*Bluff St + 400 North*	St. George	*70*	0
5	*383.6*	18: 2.38	Bluff St + 300 North	St. George	*69*	0
6	*264.2*	18: 2.73	*Bluff St + 600 North*	St. George	*68*	0
=7	NA	8 + 18	Sunset Bl + Bluff St	St. George	67	0
	395.5	212 + 530070 + 3204	3050 East + West Telegraph St	Washington	67	0
9	*374.7*	130: 2.39	*Main St + Hoover Av*	Cedar City	*66*	0
=10	*143.3*	34: 0.10	*St. George Bl + 400 West*	St. George	*65*	0
	65.0	34: 1.62	*St. George Bl + 900 East*	St. George	*65*	0
=12	380.3	14 + 130 + 289	Main St + Center St	Cedar City	59	0
	459.5	18 + 530140	Bluff St + Hilton Dr + Main St	St. George	59	0
	166.1	34: 2.05	St. George Bl + I-15 NB ramps	St. George	*59*	0
15	*NA*	8: 0.10	Sunset Bl + Valley View Dr	St. George	*57*	0
16	*140.5*	34: 1.51	*St. George Bl + 800 East*	St. George	*55*	0
17	1,153.8	34 + 3180	St. George Bl + 400 East	St. George	54	1
18	146.6	34 + 3160	St. George Bl + 700 East	St. George	53	0
19	*1,027.4*	34: 1.90	St. George Bl + I-15 SB ramps	St. George	*50*	1
20	*145.8*	34: 0.22	St. George Bl + 300 West	St. George	*45*	0
21	*42.2*	18: 2.23	*Bluff St + 200 North*	St. George	*44*	0
22	NA	8 + 3166	Sunset Bl + Dixie Downs Dr	St. George	42	0
=23	28.4	18 + 3148	*Bluff St + Diagonal St*	St. George	41	0
	131.9	130: 2.14	*Main St + College Av (70 South)*	Cedar City	*41*	0
	121.1	130: 2.31	*Main St + 65 North*	Cedar City	*41*	0
	39.2	130 + 1758 + 1766	Main St + 600 South + Paradise Canyon Rd	Cedar City	41	0

Table 3.15 UDOT Region 4, Cedar City District – 25 Intersections with High Crash Severity Scores: 1994-2003

Rank	Score[2]	Routes[3]	Milepoint		Location	City	Crashes	
			1	2			Total	Fatal
1	2,310.3	18 + 3172	1.06	?	Bluff St + 700 South	St. George	126	1
2	2,131.1	18 + 34 + 3176	2.10	0.00 + ?	Bluff St + St. George Bl	St. George	377	0
3	*2,011.1*	17: 2.39	2.39	NA	*South Toquer Bl + Pioneer Rd*	Toquerville	*5*	2
4	1,766.5	9 + 17	12.41	0.00	*State St + 500 North*	La Verkin	43	1
5	1,748.9	9 + 530055	1.10	5.50	State St + 6300 West-Telegraph St	Washington County	74	0
6	*1,662.2*	18: 0.80	0.80	NA	*Bluff St + 900 South*	St. George	*71*	1
7	1,626.6	18 + 530140	0.39	26.49	Bluff St + Hilton Dr + Main St	St. George	156	0
8	1,594.8	14 + 130 + 289	0.00	2.22 + 0.00	Main St + Center St	Cedar City	234	0
9	1,583.2	34 + 3180	1.04	?	St. George Bl + 400 East	St. George	163	1
10	1,537.8	34 + 530140	0.57	?	St. George Bl + Main St	St. George	132	1
11	1,521.6	18 + 3190	3.85	?	Bluff St + Snow Canyon Pkwy	St. George	24	1
12	1,459.7	212 + 530070 + 3204	0.20	0.00 + ?	3050 East + West Telegraph St	Washington	161	0
13	*1,392.3*	9: 9.06	9.06	NA	West State St + 700 West	Hurricane	*72*	1
14	*1,358.8*	34: 1.90	1.90	NA	St. George Bl + I-15 SB ramps	St. George	*133*	1
15	*1,355.9*	130: 0.21	0.21	NA	*Main St + Royal Pointe Dr*	Cedar City	*32*	1
16	*1,219.8*	130: 2.71	2.71	NA	*Main St + unnamed rd "right"*	Cedar City	*57*	1
17	*1,211.6*	6: 88.28	88.28	NA	*West Main St + 400 West*	Delta	*11*	1
18	*1,210.6*	17: 1.64	1.64	NA	*South Toquer Bl + Treasure View Ln*	Toquerville	*10*	1
19	*1,201.4*	56: 55.88	55.88	NA	*SR 56 + 5300 West + Antelope Rd*	Cedar City	*8*	1
20	*1,159.7*	56 + 130 + 1764	61.35	2.47 + ?	Main St + 200 North	Cedar City	248	0
21	*1,155.8*	34: 0.33	0.33	NA	*St. George Bl + 200 West*	St. George	*38*	1
22	*1,125.1*	9: 7.47	7.47	NA	*West State St + 2260 West*	Hurricane	*10*	1
23	*1,124.8*	130: 4.88	4.88	NA	*Main St + D.L. Sergeant Dr*	Cedar City	*25*	1
24	*1,100.3*	17: 0.41	0.41	NA	*North State St + 740 North*	La Verkin	*5*	1
25	*1,072.4*	18: 2.23	2.23	NA	*Bluff St + 200 North*	St. George	*185*	0

Table 3.16 UDOT Region 4, Cedar City District – 25 Intersections with High Crash Severity Scores: 2001-2003

Rank	Score[2]	Routes[3]	Milepoint		Location	City	Crashes	
			1	2			Total	Fatal
1	*1,223.9*	18: 0.80	0.80	NA	*Bluff St + 900 South*	St. George	*26*	1
2	*1,153.8*	34 + 3180	1.04	?	St. George Bl + 400 East	St. George	*54*	1
3	*1,111.2*	18 + 3190	3.85	?	Bluff St + Snow Canyon Pkwy	St. George	*15*	1
4	*1,101.1*	6: 88.28	88.28	NA	*West Main St + 400 West*	Delta	*4*	1
5	*1,027.4*	9: 9.06	9.06	NA	West State St + 700 West	Hurricane	*22*	1
6	*1,027.4*	34: 1.90	1.90	NA	St. George Bl + I-15 SB ramps	St. George	*50*	1
7	*1,011.0*	130: 4.88	4.88	NA	*Main St + D.L. Sergeant Dr*	Cedar City	*3*	1
8	*1,002.0*	9: 7.47	7.47	NA	*West State St + 2260 West*	Hurricane	*3*	1
9	*1,001.3*	99: 2.34	2.34	NA	*Main St + 100 South*	Fillmore	*5*	1
10	*1,000.2*	17: 1.64	1.64	NA	*South Toquer Bl + Treasure View Ln*	Toquerville	*3*	1
11	880.3	9 + 530055	1.10	5.50	State St + 6300 West-Telegraph St	Washington County	37	0
12	*541.6*	18: 2.48	2.48	NA	*Bluff St + 400 North*	St. George	*70*	0
13	*511.6*	18 + 34 + 3176	2.10	0.00 + ?	Bluff St + St. George Bl	St. George	*85*	0
14	459.5	18 + 530140	0.39	26.49	Bluff St + Hilton Dr + Main St	St. George	59	0
15	412.3	56 + 210240	58.64	0.00	*SR 56 + Lund Hwy*	Cedar City	10	0
16	*395.5*	212 + 530070 + 3204	0.20	0.00 + ?	3050 East + West Telegraph St	Washington	*67*	0
17	*385.5*	56 + 130 + 1764	61.35	2.47 + ?	Main St + 200 North	Cedar City	*66*	0
18	*306.8*	34: 1.27	1.27	NA	*St. George Bl + 600 East*	St. George	*27*	0
19	*270.9*	18 + 3172	1.06	?	Bluff St + 700 South	St. George	*36*	0
20	*264.2*	18: 2.73	2.73	NA	*Bluff St + 600 North*	St. George	*68*	0
21	*258.8*	9: 8.55	8.55	NA	*West State St + 1150 West*	Hurricane	*23*	0
22	*221.3*	212: 0.41	0.41	NA	West Telegraph St + 700 West	Washington	*26*	0
23	*212.6*	56: 59.50	59.50	NA	*SR 56 + Beacon Dr*	Cedar City	*11*	0
24	*212.1*	130: 1.74	1.74	NA	*Main St + 400 South*	Cedar City	*15*	0
25	*210.9*	14: 0.08	0.08	NA	*East Center St + 100 East*	Cedar City	*12*	0

Table 3.17 UDOT Region 4, Price – 25 Intersections with a Large Number of Crashes: 1994-2003

Rank	Score	Routes	Location	City	Crashes	
					Total	Fatal
1	*1,446.0*	55: 1.04	*100 North + 100 East*	Price	*78*	1
2	*590.0*	191: 126.22	Main St + 200 South	Moab	*77*	0
3	1,464.4	10 + 55 + 070200	Carbon Av + 100 North	Price	75	1
4	*506.6*	191: 126.34	Main St + 100 South	Moab	*71*	0
5	*267.4*	191: 126.44	Main St + Center St	Moab	*64*	0
6	378.9	55 + 1344	100 North + 300 East	Price	63	0
7	*571.4*	191: 126.56	Main St + 100 North	Moab	*62*	0
8	276.8	55 + 1342	Main St + 300 East	Price	59	0
9	*263.0*	10: 68.25	*Carbon Av + 500 South*	Price	*56*	0
10	*463.7*	191: 126.12	Main St + 300 South	Moab	*56*	0
11	*172.8*	10: 68.38	*Carbon Av + 400 South*	Price	*54*	0
12	269.6	55 + 1332	100 North + 600 West + West Main St	Price	50	0
13	*429.8*	55: 1.14	*Main St + 200 East*	Price	*50*	0
14	*362.0*	55: 1.74	Main St + 700 East	Price	*47*	0
15	440.1	191 + 491	Main St + Center St	Monticello	45	0
16	*458.8*	191: 126.66	Main St + 200 North	Moab	*43*	0
17	*428.8*	191: 72.69	Main St + 100 North	Monticello	*40*	0
18	1,336.3	6 + 139	*US 6 + Spring Glen Rd + County Club Rd*	Carbon County	34	1
19	*117.5*	55: 0.84	*100 North + 300 West*	Price	*33*	0
20	*138.9*	55 + 1334	*Main St + 400 East*	Price	*32*	1
21	*155.2*	191: 72.40	Main St + 200 South	Monticello	*31*	0
22	*216.9*	6: 227.97	*100 North + US 6 westbound ramps*	Price	*27*	0
23	*137.5*	10: 37.88	*Main St + Center St*	Castle Dale	*25*	0
24	*25.0*	191: 52.05	Main St + Center St	Blanding	*25*	0
=25	*1,226.8*	10: 68.11	*Carbon Av + 600 South*	Price	*24*	1
	35.7	55 + 1338	*Main St + 600 East*	Price	24	0

Table 3.18 UDOT Region 4, Price – 25 Intersections with a Large Number of Crashes: 2001-2003

Rank	Score	Route	Location	City	Crashes	
					Total	Fatal
1	126.0	10 + 55 + 070200	Carbon Av + 100 North	Price	29	0
=2	130.2	55 + 1344	100 North + 300 East	Price	24	0
	35.7	191: 126.34	Main St + 100 South	Moab	*24*	0
4	*27.3*	191: 126.22	Main St + 200 South	Moab	*21*	0
=5	*4.6*	55: 1.04	*100 North + 100 East*	Price	*19*	0
	206.2	55: 1.74	Main St + 700 East	Price	*19*	0
7	15.3	55 + 1342	Main St + 300 East	Price	18	0
8	123.1	55 + 1332	100 North + 600 West + West Main St	Price	16	0
9	*3.2*	191: 126.44	Main St + Center St	Moab	*14*	0
=10	*22.8*	55 + 1334	*Main St + 400 East*	Price	*12*	0
	22.8	191: 126.12	Main St + 300 South	Moab	*12*	0
=12	*11.9*	10: 68.78	Carbon Av + 100 South	Price	*11*	0
	102.8	191: 126.56	Main St + 100 North	Moab	*11*	0
=14	*2.8*	55: 0.84	*100 North + 300 West*	Price	*10*	0
	102.7	55: 1.14	*Main St + 200 East*	Price	*10*	0
=16	13.5	6 + 139	*US 6 + Spring Glen Rd + County Club Rd*	Price	9	0
	102.6	10 + 1306	*SR 10 + Ridge Rd*	Carbon County	9	0
	111.6	55: 2.11	*SR 55 + "Road left"*	Price	*9*	0
=19	*33.2*	55: 1.54	*Main St + 500 East*	Price	*8*	0
	1,101.5	6 + 191	*US 6 + US 191*	Carbon County	8	1
	0.8	191: 73.06	Main St + 500 North	Monticello	*8*	0
=22	0.7	10 + 31	*SR 10 + SR 31*	Emery County	7	0
	2.5	6: 227.97	*100 North + US 6 westbound ramps*	Price	*7*	0
	2.5	10: 66.07	*SR 10 + 2750 South*	Price	*7*	0
	0.7	10: 68.65	*Carbon Av + 200 South*	Price	*7*	0
	11.5	10: 68.88	Carbon Av + Main St	Price	*7*	0
	14.2	55 + 1338	*Main St + 600 East*	Price	7	0
	101.5	55: 2.28	*East Main St + 300 South*	Price	*7*	0

Table 3.19 UDOT Region 4, Price District – 25 Intersections with High Crash Severity Scores: 1994-2003

Rank	Score[2]	Routes[3]	Milepoint 1	Milepoint 2	Location	City	Crashes Total	Crashes Fatal
1	2,001.6	10 + 29	41.27	21.73	*SR 10 + SR 29*	Emery County	9	2
2	*2,000.2*	31: 35.89	35.89	NA	*SR 31 + "Road right"*	Emery County	*4*	2
3	*2,000.0*	163: 19.80	19.80	NA	*SR 163 + "Road right"*	San Juan County	*2*	2
4	1,464.4	10 + 55 + 070200	68.96	0.94 + 0.00	Carbon Av + 100 North	Price	75	1
5	*1,446.0*	55: 1.04	1.04	NA	*100 North + 100 East*	Price	*78*	1
6	1,336.3	6 + 139	223.87	0.00	*US 6 + Spring Glen Rd + County Club Rd*	Carbon County	34	1
7	*1,226.8*	10: 68.11	68.11	NA	*Carbon Av + 600 South*	Price	*28*	1
8	*1,200.1*	191: 152.70	152.70	NA	*US 191 + Thompson Rd*	Grand County	*4*	1
9	1,120.9	6 + 191	217.99	157.93	*US 6 + US 191*	Carbon County	12	1
10	*1,100.3*	10: 39.18	39.18	NA	*East Main St + 300 East*	Castle Dale	*5*	1
= 11	*1,001.1*	10: 43.91	43.91	NA	*SR 10 + "Road crossing"*	Emery County	*3*	1
	1,001.1	163 + 2456	29.01	?	*SR 163 + Valley of the Gods Rd*	San Juan County	3	1
13	*1,001.0*	96: 13.81	13.81	NA	*SR 96 + Madsen Bay Rec Area Rd*	Carbon County	*2*	1
= 14	*1,000.1*	19: 1.74	1.74	NA	*East Main St + Solomon St (100 East)*	Green River	*2*	1
	1,000.1	491 + 2434	14.72	?	*SR 491 + "Road crossing"*	Grand County	2	1
	1,000.1	191: 142.30	142.30	NA	*US 191 + Klondike Bluffs Rd*	Grand County	*2*	1
= 17	*1,000.0*	10: 12.43	12.43	NA	*West Main St + 200 West*	Emery	*1*	1
	1,000.0	191: 53.40	53.40	NA	*US 191 + County Rd 2191*	San Juan County	*1*	1
	1,000.0	191: 105.10	105.10	NA	*US 191 + Brown's Hole Rd*	San Juan County	*1*	1
	1,000.0	491: 8.93	8.93	NA	*US 491 + East Boulder Rd-311 Rd*	San Juan County	*1*	1
21	*590.0*	191: 126.22	126.22	NA	Main St + 200 South	Moab	*77*	0
22	*571.4*	191: 126.56	126.56	NA	Main St + 100 North	Moab	*62*	0
23	*506.6*	191: 126.34	126.34	NA	Main St + 100 South	Moab	*71*	0
24	*463.7*	191: 126.12	126.12	NA	Main St + 300 South	Moab	*56*	0
25	*458.8*	191: 126.66	126.66	NA	Main St + 200 North	Moab	*43*	0

Table 3.20 UDOT Region 4, Price District – 25 Intersections with High Crash Severity Scores: 2001-2003

Rank	Score[2]	Routes[3]	Milepoint 1	Milepoint 2	Location	City	Crashes Total	Crashes Fatal
1	1,101.5	6 + 191	217.99	157.93	*US 6 + US 191*	Carbon County	9	1
2	1,001.3	10 + 29	41.27	21.66	*SR 10 + SR 29*	Emery County	5	1
3	*1,000.1*	31: 35.89	35.89	NA	*SR 31 + "Road right"*	Emery County	*2*	1
=4	*1,000.0*	191: 105.10	105.10	NA	*US 191 + Brown's Hole Rd*	San Juan County	1	1
	1,000.0	491: 8.93	8.93	NA	*US 491 + East Boulder Rd-311 Rd*	San Juan County	1	1
6	*206.2*	55: 1.74	1.74	NA	Main St + 700 East	Price	*19*	0
7	130.2	55 + 1344	1.24	?	Main St + 300 East	Price	24	0
8	*130.1*	6: 209.09	209.09	NA	*US 6 + Emma Park Rd*	Carbon County	*5*	0
9	126.0	10 + 55 + 070200	68.96	0.94 + 0.00	Carbon Av + 100 North	Price	27	0
10	123.1	55 + 1332	0.31	?	100 North + 600 West + West Main St	Price	16	0
11	111.3	55 + 1324	2.08	?	East Main St + Airport Rd (100 South)	Price	6	0
12	103.0	163 + 191	41.45	21.24	*SR 163 + US 191*	San Juan County	4	0
13	*102.8*	191: 126.56	126.56	NA	Main St + 100 North	Moab	*11*	0
14	102.6	10 + 1306	64.33	?	*SR 10 + Ridge Rd*	Carbon County	9	0
15	*101.5*	55: 2.28	2.28	NA	*East Main St + 300 South*	Price	*7*	0
=16	*101.2*	6: 219.72	219.72	NA	*US 6 + 1000 North*	Helper	*4*	0
	101.2	6: 235.88	235.88	NA	*Main St + Louise Wilson Ln (950 East)*	Wellington	*4*	0
	101.2	19: 1.45	1.45	NA	*Main St + Broadway (150 West)*	Green River	*4*	0
=19	*101.1*	6: 230.87	230.87	NA	*US 6 + East Main St eastbound on-ramp*	Price	*3*	0
	101.1	10 + 122	61.00	8.79	*SR 10 + SR 122*	Carbon County	3	0
=21	*101.0*	10: 12.73	12.73	NA	*East Main St + 100 East*	Emery	*2*	0
	101.0	10: 12.83	12.83	NA	*East Main St + 200 East*	Emery	*2*	0
23	*100.3*	191: 110.24	110.24	NA	*US 191 + Hole N'The Rock Museum*	San Juan County	*4*	0
=24	*100.2*	10: 39.18	39.18	NA	*East Main St + 300 East*	Castle Dale	*3*	0
	100.2	10: 67.93	67.93	NA	*Carbon Av + US 6 eastbound ramps*	Price	*3*	0
	100.2	10: 68.00	68.00	NA	Carbon Av + US 6 westbound ramps	Price	*3*	0
	100.2	19: 1.52	1.52	NA	*Main St + Cherry St (100 West)*	Green River	*3*	0

Table 3.21 UDOT Region 4, Richfield – 25 Intersections with a Large Number of Crashes: 1994-2003

					Crashes	
Rank	**Score**	**Route**	**Location**	**City**	**Total**	**Fatal**
1	*646.8*	120: 2.41	*North Main St + 100 North*	Richfield	*114*	0
2	*706.7*	120: 2.32	Main St + Center St	Richfield	*110*	0
=3	*388.4*	120: 2.22	*South Main St + 100 South*	Richfield	*68*	0
	613.4	118 + 120	North Main St + 300 North	Richfield	68	0
=5	*359.7*	120: 2.12	*South Main St + 200 South*	Richfield	*60*	0
	375.0	120: 2.51	*North Main St + 200 North*	Richfield	*60*	0
7	180.4	120 + 2552	*South Main St + 500 South*	Richfield	58	0
8	*267.2*	120: 2.03	*South Main St + 300 South*	Richfield	*53*	0
9	688.0	11 + 89	300 South + 100 East	Kanab	49	0
10	*288.8*	120: 1.74	*South Main St + 600 South*	Richfield	*44*	0
11	162.5	50 + 89	Main St + State St	Salina	41	0
12	138.4	89 + 116	*Center St + Main St*	Mt. Pleasant	34	0
13	157.2	89 + 290	Main St + College Av (100 North)	Ephraim	33	0
=14	16.8	118 + 120		Sevier County	31	0
	414.5	89 + 132	*US 89 + SR 132 (Pigeon Hollow Jct)*	Sanpete County	31	0
16	*324.9*	89: 64.06	*100 East + 200 South*	Kanab	*27*	0
=17	*43.7*	89: 63.79	*300 South + 275 East*	Kanab	*23*	0
	107.6	89: 193.76	*State St + 1st North*	Salina	*23*	0
=19	124.5	24 + 50	*SR 24 + US 50*	Sevier County	22	0
	36.4	50: 58.92	*Main St + 200 West*	Salina	*22*	0
	52.6	89: 64.40	*West Center St + Main St*	Kanab	*22*	0
	255.1	120: 2.80	*North Main St + 500 North*	Richfield	*22*	0
=23	1,121.5	117 + 132	*SR 117 + SR 132*	Sanpete County	20	2
	133.4	89 + 290	*Main St + Center St*	Ephraim	20	0
	24.5	89 + 117	*US 89 + SR 117*	Sanpete County	20	0
	232.4	89: 64.29	*100 East + Center St*	Kanab	*20*	0
	63.2	89: 229.16	*Main St + 100 South*	Ephraim	*20*	0

Table 3.22 UDOT Region 4, Richfield – 25 Intersections with a Large Number of Crashes: 2001-2003

Rank	Score	Route	Location	City	Crashes	
					Total	Fatal
1	*65.8*	120: 2.32	Main St + Center St	Richfield	*37*	0
2	142.8	118 + 120	North Main St + 300 North	Richfield	22	0
3	*126.1*	120: 2.22	*South Main St + 100 South*	Richfield	*19*	0
=4	24.2	120 + 2552	*South Main St + 500 South*	Richfield	17	0
	225.8	120: 2.03	*South Main St + 300 South*	Richfield	*17*	0
6	2.0	89 + 132	*US 89 + SR 132 (Pigeon Hollow Jct)*	Sanpete County	14	0
7	102.9	89 + 290	Main St + College Av (100 North)	Ephraim	12	0
=8	11.9	118 + 2552	*300 North + 100 East*	Richfield	11	0
	13.7	120: 1.74	*South Main St + 600 South*	Richfield	*11*	0
	113.6	120: 2.51	*North Main St + 200 North*	Richfield	*11*	0
=11	*41.5*	89: 64.40	*West Center St + Main St*	Kanab	*10*	0
	111.7	11 + 89	300 South + 100 East	Kanab	10	0
=13	111.6	50 + 89	Main St + State St	Salina	9	0
	2.3	118 + 120	*SR 118 + SR 120*	Sevier County	9	0
	110.7	89: 228.91	*Main St + 300 South*	Ephraim	*9*	0
16	*2.6*	290: 0.52	*College Av (100 North) + 4th East*	Ephraim	*8*	0
=17	*11.5*	50: 58.92	*Main St + 200 West*	Salina	*7*	0
	20.5	89: 207.58	*South Main St + 100 South*	Centerfield	*7*	0
	2.5	89: 222.65	*US 89 + Templer Wy (500 North)*	Sanpete County	*7*	0
	2.5	120: 1.41	*SR 120 + "road right"*	Sevier County	*7*	0
=21	210.3	12 + 89	*SR 12 + US 89 (Bryce Canyon Jct)*	Garfield County	6	0
	110.4	89 + 290	*Main St + Center St*	Ephraim	6	0
	11.4	89 + 117	*US 89 + SR 117*	Sanpete County	6	0
	1.5	89 + 116	*Center St + Main St*	Mt. Pleasant	6	0
	111.2	14 + 89	*SR 14 + US 89 (Long Valley Jct)*	Kane County	6	0

Table 3.23 UDOT Region 4, Richfield District – 25 Intersections with High Crash Severity Scores: 1994-2003

Rank	Score[2]	Routes[3]	Milepoint		Location	City	Crashes	
			1	2			Total	Fatal
1	*1,330.7*	89: 216.54	216.54	NA	*US 89 + "Road right"*	Sanpete County	*14*	1
2	*1,323.5*	89: 207.03	207.03	NA	*South Main St + 500 South*	Centerfield	*14*	1
3	1,201.8	118 + 258	10.07	2.12	*SR 118 + SR 258*	Sevier County	12	1
4	1,121.5	117 + 132	4.91	63.37	*SR 117 + SR 132*	Sanpete County	13	1
5	*1,100.0*	89: 20.82	20.82	NA	*US 89 + Paria Canyon Rd*	Kane County	*2*	1
6	*1,021.2*	89: 260.94	260.94	NA	*US 89 + South Indianola Rd*	Sanpete County	*5*	1
= 7	*1,011.2*	89 + 2524 + 2528	191.04	? + ?	*US 89 + Old Sevier Jct*	Sevier County	*5*	1
	1,011.2	290: 0.88	0.88	NA	*200 North + 200 East*	Ephraim	*5*	1
9	*1,011.1*	89: 129.80	129.80	NA	*US 89 + "Road right"*	Garfield County	*4*	1
10	*1,010.1*	11: 0.94	0.94	NA	*SR 11 + "Road left"*	Kane County	*3*	1
11	1,001.0	24 + 25	39.21	0.00	*SR 24 + SR 25 (Fish Lake Jct)*	Piute County	2	1
12	*1,000.3*	24: 69.22	69.22	NA	*East Main St + 300 East*	Torrey	*4*	1
= 13	*1,000.0*	12: 18.53	18.53	NA	*SR 12 + "Road left"*	Garfield County	*1*	1
	1,000.0	12: 69.51	69.51	NA	*SR 12 + Scenic view area entry*	Garfield County	*1*	1
	1,000.0	14: 35.69	35.69	NA	*SR 14 + "Road right"*	Kane County	*1*	1
	1,000.0	89 + 256	194.77	0.00	*US 89 + SR 256*	Sevier County	*1*	1
17	*706.7*	120: 2.32	2.32	NA	Main St + Center St	Richfield	*110*	0
18	*688.1*	120: 2.70	2.70	NA	*North Main St + 400 North*	Richfield	*41*	0
19	688.0	11 + 89	2.96	63.95	300 South + 100 East	Kanab	49	0
20	*646.8*	120: 2.41	2.41	NA	*North Main St + 100 North*	Richfield	*114*	0
21	613.4	118 + 120	14.75	2.61	North Main St + 300 North	Richfield	68	0
22	451.5	14 + 89	40.48	103.70	*SR 14 + US 89 (Long Valley Jct)*	Kane County	15	0
23	420.8	12 + 89	0.00	124.31	*SR 12 + US 89 (Bryce Canyon Jct)*	Garfield County	14	0
24	414.5	89 + 132	235.53	63.13	*US 89 + SR 132 (Pigeon Hollow Jct)*	Sanpete County	42	0
25	*400.3*	258: 1.41	1.41	NA	*SR 258 + Old Highway 89*	Sevier County	*7*	0

Table 3.24 UDOT Region 4, Richfield District – 25 Intersections with High Crash Severity Scores: 2001-2003

Rank	Score[2]	Routes[3]	Milepoint 1	Milepoint 2	Location	City	Crashes Total	Crashes Fatal
1	*1,110.1*	89: 216.54	216.54	NA	*US 89 + "Road right"*	Sanpete County	*4*	1
2	1,010.0	89 + 2524 + 2528	191.04	? + ?	*US 89 + Old Sevier Jct*	Sevier County	2	1
3	1,000.3	118 + 258	10.07	2.12	*SR 118 + SR 258*	Sevier County	4	1
4	*225.8*	120: 2.03	2.03	NA	South Main St + 300 South	Richfield	*17*	0
5	210.3	12 + 89	0.00	124.31	*SR 12 + US 89 (Bryce Canyon Jct)*	Garfield County	6	0
6	*200.3*	132: 55.59	55.59	NA	*East Main St + 100 East*	Moroni	*5*	0
7	*200.2*	14: 24.09	24.09	NA	*SR 14 + Navajo Lake View Point*	Kane County	*4*	0
8	*200.1*	258: 1.32	1.32	NA	*SR 258 + "Y connect" (Old Hwy 89)*	Sevier County	*3*	0
9	*200.0*	89: 250.10	250.10	NA	*South State St + 200 South*	Fairview	*2*	0
10	142.8	118 + 120	14.75	2.61	North Main St + 300 North	Richfield	15	0
11	*126.1*	120: 2.22	2.22	NA	*South Main St + 100 South*	Richfield	*19*	0
12	*113.6*	120: 2.51	2.51	NA	*North Main St + 200 North*	Richfield	*11*	0
13	*113.1*	89: 207.03	207.03	NA	*South Main St + 500 South*	Centerfield	*6*	0
14	111.7	11 + 89	2.96	63.95	300 South + 100 East	Kanab	10	0
15	111.6	50 + 89	59.10	193.66	Main St + State St	Salina	41	0
16	*111.2*	89: 64.18	64.18	NA	*100 East + 100 South*	Kanab	*5*	0
17	111.2	14 + 89	40.48	103.70	*SR 14 + US 89 (Long Valley Jct)*	Kane County	5	0
18	*110.7*	89: 228.91	228.91	NA	*Main St + 300 South*	Ephraim	*9*	0
19	110.4	89 + 290	229.28	0.00	*Main St + Center St*	Ephraim	6	0
= 20	*110.1*	89: 200.78	200.78	NA	*US 89 + Center St*	Axtell	*3*	0
	110.1	89: 216.28	216.28	NA	*North Main St + 200 North*	Sterling	*3*	0
22	*110.0*	12: 54.79	54.79	NA	*SR 12 + Main Canyon Rd*	Garfield County	*2*	0
23	102.9	89 + 290	229.41	1.16	Main St + College Av (100 North)	Ephraim	12	0
24	*102.1*	89: 229.66	229.66	NA	*North Main St + 300 North*	Ephraim	*4*	0
= 25	*101.1*	89: 0.42	0.42	NA	*US 89 + "Road to Lone Rock"*	Kane County	*3*	0
	101.1	89: 244.41	244.41	NA	*South State St + 100 South*	Mount Pleasant	*3*	0

NOTES *(Tables 9-32): Italicized intersections are not signalized. Italicized crash numbers and scores indicate that crash data were not available for the crossing (minor) street. NA = not applicable or not available.*

4. Non-Signalized Intersections

Separate ranked lists were developed for non-signalized intersections, in part because signalization might be a mitigating strategy. Also, certain intersection safety problems are exclusive to signalization, such as dilemma zones and red light violations. Further, non-signalized locations might be associated with non-stop, high-speed traffic on the uncontrolled approaches, behavioral issues related to stop and yield signs, and choices and differences in gap acceptance. The intersections are listed in Tables 4.1-4.4 for 10- and 3-year study periods, based on the total number of crashes and the crash severity score. The research team did not distinguish between different *types* of non-signalized intersection, such as three-legged or four-legged, two-way stop, four-way stop, yield sign, and so forth.

An examination of Tables 4.1-4.4 reveals that all of the intersections are located along heavily-used roads in Regions 1, 2, 3 or 4 (Cedar City District). In many cases, the cross-street is a collector or local facility, and the major street has the right-of-way. Also, in many cases, the intersection is located near a signalized intersection. In fact, in some of these cases, the crash activity may be associated with "spillover" from the signalized intersection (although the research team excluded from consideration non-signalized intersections that were clearly within the functional area of influence of a nearby signalized intersection; in general, the spacing between these intersections was less than 500 ft). Because of the adjacency of one or more signalized intersections in many of these cases, signalization may not be a feasible strategy. Other approaches, such as turning restrictions, traffic calming devices, and speed limit modifications may need to be considered. The research team did not perform a close investigation of these intersections; site-specific studies would be recommended. The traffic signal warrants in the *MUTCD* would need to be evaluated. It is likely that a majority of the intersections listed in Tables 4.1-4.4 would satisfy the crash criteria in the 6th warrant ("accident experience").

As suggested above, the intersections listed in the four tables are dominated by two-way stop-controlled junctions between a major road and a minor cross-street. It would be of interest to compile separate rankings for other types of non-signalized intersections, including four-way stops, yield sign-controlled locations, T-intersections, and rotaries. Also, Weerasuriya and Pietrzyk (1998) found that the intersection configuration (e.g., number of lanes by approach) was a factor in predicting conflicts. Further, Kaysi and Alam (2000) found that factors such as driver learning, impatience, aggression, and complex gap acceptance were key explanatory variables in predicting the "quality of traffic service" at an unsignalized intersection. Regarding the latter factor, the authors noted that the "mode" of the traffic stream (i.e., the vehicle arrival stream) influenced the gap acceptance behavior of drivers. The behavior became increasingly complex as the conflicting traffic stream became more voluminous with reduced "platooning." A deeper investigation of the intersections listed in Tables 4.1-4.4 was beyond the scope of this study, but the need for examinations in the field is clear.

A total of 21 intersections appear on both the 10-year and 3-year lists based on total number of crashes. The high number of "repeat" intersections suggests that there were few or no improvements at these locations during the study periods. The large number also suggests that signal control *may* be a mitigating strategy, based on the hypothesis that the crashes occurring at these intersections *are related to* the lack of signalization. A total of eight intersections appear on both the 10-year and 3-year lists based on crash severity scores. These intersections may also be candidates for signal control. Between four and 15 intersections in each of Tables 4.1-4.4 also appear in the statewide "top 50" lists (Tables 2.2-2.5). These intersections' appearances on the statewide lists might be a further criterion for mitigation, including signalization. The following two intersections appear in *all four* tables (Tables 4.1-4.4):

- 3300 South and Sue Street (30 West) (SR 171 at milepoint 10.54 – South Salt Lake).
- 3300 South and Edison Street (145 East) (SR 171 at milepoint 10.83 – South Salt Lake).

These intersections are explored in greater deal in Section 6.

Table 4.1 25 Non-Signalized Intersections with a Large Number of Crashes: 1994-2003

Rank	Score	Route	Location	City	Reg	Total	Fatal
1	*3,153.8*	189: 2.79	*University Av + 900 North*	Provo	3	*623*	0
2	*2,953.4*	171: 5.92	*3500 South + 3690 West*	West Valley City	2	*563*	0
3	*3,210.0*	171: 10.54	*3300 South + Sue St (30 West)*	South Salt Lake	2	*537*	1
4	*4,001.8*	89: 322.49	*State St + Burton Av (2360 South)*	South Salt Lake	2	*499*	2
5	*1,743.7*	91: 27.12	*Main St + Federal Av*	Logan	1	*472*	0
6	*2,569.6*	26: 2.67	*Riverdale Rd + Pacific Av*	Riverdale	1	*460*	0
7	*3,103.6*	171: 10.83	*3300 South + Edison St (145 East)*	South Salt Lake	2	*427*	1
8	*2,087.9*	203: 2.23	*Harrison Bl + 4275 South*	Ogden	1	*422*	0
9	*787.7*	34 + 3191	*St. George Bl + 1000 East*	St. George	4CC	*398*	0
10	*2,578.3*	71: 12.64	*900 East + North Union Bl (7145 South)*	Midvale	2	*394*	0
11	*2,303.3*	26: 1.10	*Riverdale Rd + 1150 West*	Riverdale	1	*380*	0
12	*2,513.4*	171: 6.98	*3500 South + Hillsdale Dr (2760 West)*	West Valley City	2	*357*	0
=13	*4,109.7*	126: 1.49	*Main St + King St (750 North)*	Layton	1	*354*	1
	1,927.2	209 + 350305	*9000 South + Frontage Rd (255 West)*	Sandy	2	*354*	1
15	*1,275.2*	89: 315.08	*State St + 7660 South*	Midvale	2	*350*	0
16	*1,422.6*	68: 52.58	*Redwood Rd + Bowling Av (4620 South)*	Taylorsville	2	*348*	0
17	*1,082.7*	91: 27.32	*Main St + 300 North*	Logan	1	*342*	0
18	*1,123.1*	68: 51.12	*Redwood Rd + "Road right"*	Taylorsville	2	*314*	0
=19	*972.1*	68: 50.69	*Redwood Rd + 6020 South*	Taylorsville	2	*289*	0
	2,044.9	266: 2.72	*4500 South + Century Dr (430 West)*	Murray	2	*289*	0
21	*630.8*	48: 12.31	*7200 South + 210 West*	Midvale	2	*287*	0
22	*1,763.7*	52: 1.92	*800 North + 100 West*	Orem	3	*276*	0
23	*2,741.2*	73: 40.18	*Main St + 200 East*	Lehi	3	*268*	1
24	*1,039.0*	126: 8.81	*1900 West + 5450 South*	Roy	1	*265*	0
=25	*789.6*	34: 1.62	*St. George Bl + 900 East*	St. George	4CC	*264*	0
	1,779.6	189: 1.79	*University Av + 200 South*	Provo	3	*264*	0
27	*1,112.3*	171: 11.80	*3300 South + 800 East*	Millcreek CDP	2	*251*	0
28	*1,979.6*	189: 2.23	*University Av + 300 North*	Provo	3	*248*	1
29	*962.1*	68: 47.26	*Redwood Rd + 8760 South*	West Jordan	2	*243*	0

Table 4.2 25 Non-Signalized Intersections with a Large Number of Crashes: 2001-2003

Rank	Score	Route	Location	City	Reg	Total	Fatal
1	*669.0*	26: 2.67	*Riverdale Rd + Pacific Av (400 West)*	Riverdale	1	*156*	0
2	*1,032.5*	189: 2.79	*University Av + 900 North*	Provo	3	*146*	0
3	*873.0*	171: 5.92	*3500 South + 3690 West*	West Valley City	2	*144*	0
4	*1,030.4*	126: 1.49	*Main St + King St (750 North)*	Layton	1	*143*	0
5	*576.9*	203: 2.23	*Harrison Bl + 4275 South*	Ogden	1	*135*	0
6	86.7	34 + 3191	*St. George Bl + 1000 East*	St. George	4CC	129	0
7	*81.9*	48: 12.31	*7200 South + 210 West*	Midvale	2	*108*	0
=8	*491.9*	26: 1.10	*Riverdale Rd + 1150 West*	Riverdale	1	*104*	0
	283.2	68: 50.69	*Redwood Rd + 6020 South*	Taylorsville	2	*104*	0
10	*406.0*	68: 51.12	*Redwood Rd + "Road right"*	Taylorsville	2	*100*	0
=11	*1,527.8*	171: 10.83	*3300 South + Edison St (145 East)*	South Salt Lake	2	*95*	1
	952.7	171: 6.98	*3500 South + Hillsdale Dr (2760 West)*	West Valley City	2	*95*	0
	1,014.8	89: 356.85	*Washington Bl + 3rd St*	Ogden	1	*95*	0
14	*440.5*	68: 52.58	*Redwood Rd + Bowling Av (4620 South)*	Taylorsville	2	*94*	0
15	*885.9*	71: 12.64	*900 East + North Union Bl (7145 South)*	Midvale	2	*93*	0
16	*371.9*	91: 27.32	*Main St + 300 North*	Logan	1	*92*	0
17	*491.1*	266: 2.72	*4500 South + Century Dr (430 West)*	Murray	2	*87*	0
18	*289.4*	89: 315.08	*State St + 7660 South*	Midvale	2	*86*	0
=19	*273.9*	71: 2.63	*12600 South + 1500 West*	Riverton	2	*84*	0
	269.4	89: 322.49	*State St + Burton Av (2360 South)*	South Salt Lake	2	*84*	0
=21	*1,604.9*	171: 10.54	*3300 South + Sue St (30 West)*	South Salt Lake	2	*83*	1
	92.9	71: 2.47	*12600 South + 1630 West*	Riverton	2	*83*	0
	364.8	89: 313.08	*State St + 9270 South*	Sandy	2	*83*	0
24	*282.7*	126: 8.81	*1900 West + 5450 South*	Roy	1	*82*	0
=25	151.1	209 + 350305	*9000 South + Frontage Rd (255 West)*	Sandy	2	80	0
	741.5	189: 2.53	*University Av + 600 North*	Provo	3	*80*	0

Table 4.3 25 Non-Signalized Intersections with High Crash Severity Scores: 1994-2003

Rank	Score[2]	Routes[3]	Milepoint		Location	City	Region	Crashes	
			1	2				Total	Fatal
1	*4,109.7*	126: 1.49	1.49	NA	*Main St + King St (750 North)*	Layton	1	*354*	1
2	*4,001.8*	89: 322.49	322.49	NA	*State St + Burton Av (2360 South)*	South Salt Lake	2	*499*	2
3	*3,969.9*	71: 19.90	19.90	NA	*700 East + Wilmington Av (2185 South)*	Salt Lake City	2	*135*	2
4	*3,861.9*	71: 19.82	19.82	NA	*700 East + Simpson Av (2235 South)*	Salt Lake City	2	*117*	2
5	*3,684.5*	189: 1.24	1.24	NA	*University Av + 780 South*	Provo	3	*197*	2
6	*3,595.7*	173: 4.07	4.07	NA	*5400 South + 4460 West*	Kearns CDP	2	*119*	2
7	*3,416.4*	91: 24.66	24.66	NA	*US 91 + 1700 South*	Logan	1	*90*	2
8	*3,377.7*	171: 4.73	4.73	NA	*3500 South + Stanton St (4640 West)*	West Valley City	2	*45*	3
9	*3,345.5*	68: 54.60	54.60	NA	*Redwood Rd + 3390 South*	West Valley City	2	*164*	2
10	*3,291.7*	126: 2.00	2.00	NA	*Main St + 1120 North*	Layton	1	*67*	2
11	*3,210.0*	171: 10.54	10.54	NA	*3300 South + Sue St (30 West)*	South Salt Lake	2	*537*	1
12	*3,176.3*	201: 7.71	7.71	NA	*2400 South + 8000 West*	Magna CDP	2	*65*	2
13	*3,153.8*	189: 2.79	2.79	NA	*University Av + 900 North*	Provo	3	*623*	0
14	*3,103.6*	171: 10.83	10.83	NA	*3300 South + Edison St (145 East)*	South Salt Lake	2	*427*	1
15	*2,953.4*	171: 5.92	5.92	NA	*3500 South + 3690 West*	West Valley City	2	*563*	0
16	*2,853.3*	171: 5.28	5.28	NA	*3500 South + 4200 West*	West Valley City	2	*165*	2
17	*2,832.7*	89: 300.02	300.02	NA	*500 West + 200 North*	Provo	3	*58*	2
18	*2,741.2*	73: 40.18	40.18	NA	*Main St + 200 East*	Lehi	3	*268*	1
19	*2,708.7*	89: 292.27	292.27	NA	*500 West + 400 North*	Provo	3	*168*	1
20	*2,677.2*	68: 53.96	53.96	NA	*Redwood Rd + 3800 South*	West Valley City	2	*150*	1
21	*2,657.5*	89: 323.58	323.58	NA	*State St + Wood Av (1580 South)*	Salt Lake City	2	*88*	2
22	*2,603.9*	173: 3.35`	3.35	NA	*5400 South + 5030 West*	Kearns CDP	2	*56*	2
23	*2,581.5*	114: 0.27	0.27	NA	*Center St + 800 West*	Provo	3	*156*	1
24	*2,578.3*	71: 12.64	12.64	NA	*900 East + North Union Bl (7145 South)*	Midvale	2	*394*	0
25	*2,569.6*	26: 2.67	2.67	NA	*Riverdale Rd + Pacific Av (400 West)*	Riverdale	1	*460*	0
26	*2,555.1*	89: 355.77	355.77	NA	*Washington Bl + 13th St*	Ogden	1	*108*	2
27	*2,513.4*	171: 6.98	6.98	NA	*3500 South + Hillsdale Dr (2760 West)*	West Valley City	2	*357*	0
28	*2,440.5*	91: 19.66	19.66	NA	*US 91 + 400 North*	Wellsville	1	*42*	2
29	*2,411.7*	89: 288.70	288.70	NA	*State St + King Ln-2000 South*	Provo	3	*96*	1
30	*2,370.9*	126: 6.64	6.64	NA	*Main St + Arsenal Rd (1300 North)*	Sunset	1	*39*	2
31	*2,363.5*	126: 4.78	4.78	NA	*State St + 450 South*	Clearfield	1	*64*	2
32	2,355.2	6 + 89	165.82	281.20	*US 6 + US 89*	Utah County	3	35	2

Table 4.4 25 Non-Signalized Intersections with High Crash Severity Scores: 2001-2003

Rank	Score[2]	Routes[3]	Milepoint 1	Milepoint 2	Location	City	Region	Crashes Total	Crashes Fatal
1	*2,102.6*	201: 7.71	7.71	NA	*2400 South + 8000 West*	Magna CDP	2	*11*	2
2	*1,605.3*	89: 343.49	343.49	NA	*US 89 + Country Oaks Dr*	Layton	1	*24*	1
3	*1,604.9*	171: 10.54	10.54	NA	*3300 South + Sue St (30 West)*	South Salt Lake	2	*83*	1
4	*1,547.6*	89: 288.70	288.70	NA	*State St + King Ln-2000 South*	Provo	3	*50*	1
5	*1,528.3*	173: 4.07	4.07	NA	*5400 South + 4460 West*	Kearns CDP	2	*37*	1
6	*1,527.8*	171: 10.83	10.83	NA	*3300 South + Edison St (145 East)*	South Salt Lake	2	*95*	1
7	*1,424.3*	89: 298.46	298.46	NA	*State St + 1360 North*	Orem	3	*32*	1
8	*1,370.6*	89: 294.62	294.62	NA	*State St + 1500 South*	Orem	3	*35*	1
9	*1,367.3*	189: 2.07	2.07	NA	*University Av + 100 North*	Provo	3	*56*	1
10	*1,362.7*	71: 7.40	7.40	NA	*700 East + Dusty Creek Av (11250 South)*	Sandy	2	*37*	1
11	*1,343.2*	173: 3.35	3.35	NA	*5400 South + 5030 West*	Kearns CDP	2	*22*	1
12	*1,318.9*	36: 55.92	55.92	NA	*Main St + 1000 North*	Tooele	2	*31*	1
13	*1,317.8*	126: 4.78	4.78	NA	*State St + 450 South*	Clearfield	1	*20*	1
14	*1,315.4*	89: 304.41	304.41	NA	*State St + 400 East*	American Fork	3	*32*	1
15	*1,274.7*	89: 323.58	323.58	NA	*State St + Wood Av (1580 South)*	Salt Lake City	2	*30*	1
16	*1,263.3*	71: 5.83	5.83	NA	*12300 South + 600 East*	Draper	2	*51*	1
17	*1,246.5*	26 + 570295	3.27	6.53	*Riverdale Rd + Lincoln Av + Chimes Cir*	South Ogden	1	*27*	1
18	*1,241.0*	89: 356.06	356.06	NA	*Washington Bl + 10th St*	Ogden	1	*26*	1
19	*1,233.2*	40: 143.19	143.24	NA	*US 40 + 500 South*	Vernal	3	*20*	1
20	*1,232.9*	171: 5.28	5.28	NA	*3500 South + 4200 West*	West Valley City	2	*35*	1
21	*1,224.4*	89: 309.65	309.65	NA	*State St + Frontage Rd + I-15 SB ramp*	Lehi	3	*13*	1
22	*1,223.9*	18: 0.80	0.80	NA	*Bluff St + 900 South*	St. George	4CC	*26*	1
23	*1,214.3*	40: 114.18	114.18	NA	*US 40 + State St + 500 South*	Roosevelt	3	*11*	1
24	*1,211.6*	171: 4.73	4.73	NA	*3500 South + Stanton St (4640 West)*	West Valley City	2	*11*	1
25	*1,210.2*	198: 6.17	6.17	NA	*SR 198 + 900 East*	Payson	3	*6*	1
26	*1,206.9*	114: 0.27	0.27	NA	*Center St + 800 West*	Provo	3	*63*	1
27	*1,205.4*	6: 164.02	164.02	NA	*US 6 + 2550 East*	Spanish Fork	3	*12*	1
28	*1,201.1*	68: 62.10	62.10	NA	*Redwood Rd + Earnshaw Ln (1780 North)*	Salt Lake City	2	*5*	1
29	*1,146.3*	248: 0.59	0.59	NA	*Kearns Bl + Sidewinder Dr*	Park City	2	*33*	1

NOTES *(Tables 33-36): Italicized intersections are not signalized. Italicized crash numbers and scores indicate that crash data were not available for the crossing (minor) street. NA = not applicable or not available.*

5. Discussion of Intersection Safety Issues

Although the scope of this research study did not include the development of mitigating strategies for *specific* intersections in Utah, a review of mitigations was considered to be useful to the understanding of *general* intersection safety needs. Khisty and Lall (2003) stated "the objective of intersection design is to reduce the severity of potential conflicts between vehicles (including pedestrians) while providing maximum convenience and ease of movement to vehicles." The safety of intersection operations, therefore, is a primary objective. The authors suggested that intersection design must consider four features, the first three of which are important to intersection safety:

1. Human factors, including driver behavior and cognition,
2. Traffic considerations, including approach capacities, turning movements and conflicts, and vehicle sizes (as well as pedestrians and bicycles),
3. Physical characteristics, including lane geometry, abutting features, and sight distances, and
4. Economic factors, such as the costs and benefits of energy savings.

There are a number of approaches to minimizing the potential for conflicts among highway users at intersections, including traffic control devices, user information and guidance, geometric and cross-sectional design, land use and access management, circulation planning, illumination, collision avoidance systems, sight distance protection, and enforcement. Traffic control devices include stop signs, signals, yield signs, other regulatory signs, flashers, and roundabouts, along with special provisions for pedestrians and bicycles, such as countdown timers and pushbuttons. A byproduct of traffic control is the need for compliance, which can be enhanced by human or automated enforcement. Yet another byproduct, with traffic signals, is the creation of dilemma zones in which drivers can neither stop nor pass through an intersection before the signal becomes red. These zones can be eliminated through changes in the timing of yellow or all-red intervals, reducing speed limits, and advanced driver warnings (Fricker and Whitford, 2004). Geometric and cross-sectional design considers the physical components of an intersection and its approaches, including lane widths, turning lanes, turning bays, channeling, shoulder widths, medians and median widths, stop lines, and other elements. A roundabout, in fact, "straddles the line" between a traffic control device and a geometric design component. Land use and access management involves the location of abutting properties and fixtures relative to intersection traffic flow and sight lines. Access management also concerns the location of driveways relative to intersections, along with the turning movements allowed. Circulation planning can be used to manage the traffic flows within a district or along a corridor. The strategies might include peak period or permanent one-way street conversions, reversible lanes, and others. Illumination concerns the nighttime lighting of intersections. User information and guidance includes warning, informational, directional, and changeable message signs. While these strategies might be considered to be passive, collision avoidance systems can play an active role in preventing conflicts. The systems include autonomous vehicle, autonomous infrastructure, and combined or cooperative technologies designed to reduce driver error and improve driver performance and prevent collisions. In general terms, a collision avoidance system includes a set of sensors, processors, and warnings that alert drivers and other highway users to impending violations and other dangers. A national Intelligent Vehicle Initiative was established in 2003 to promote the development of in-vehicle technologies (Funderburg, 2004). Regarding roadway strategies, Ferlis (2002) discussed roadside information and roadside-to-vehicle communication devices that might be used in combination with intelligent vehicles. Finally, sight distance protection ensures that sight lines remain clear of obstructions; the fundamentals of sight distance provisions might be addressed as part of the intersection design, and in the planning of abutting land uses and fixtures. If none of the preceding strategies work, then grade separation may be the only solution.

The selection of an intersection safety enhancement has traditionally been based on engineering judgment. Certain strategies might be implemented on a widespread basis in some jurisdictions according to a formula or program. For example, the traffic signal warrants in the *Manual on Uniform Traffic Control Devices* are used by numerous jurisdictions to indicate the need for a signal. Recent research has produced sets of intersection safety diagnostics (Hauer et al., 2002) that guide the engineer toward best practices. A set of "Hauer" diagnostics exists for each of several collision types, including rear-end incidents, left-turn crashes, right-turn collisions, right-angle crashes, side-swipe collisions, loss-of-control events, pedestrian crashes, and bicycle collisions. The diagnostic approach for an "ailing" intersection involves responding to a series of questions related to a certain collision type. The "diagnosis" is to select one or a set of countermeasures as a treatment. Although the Hauer procedure is comprehensive and structured, engineering judgment still enters into the selection of countermeasures. With ongoing research in intersection safety, it should be possible to ascertain the effectiveness of various countermeasures in reducing the frequency and severity of certain collision types. Figure 5.1 below summarizes the countermeasures that Hauer et al. offer for consideration (*plus a few additional ones*).

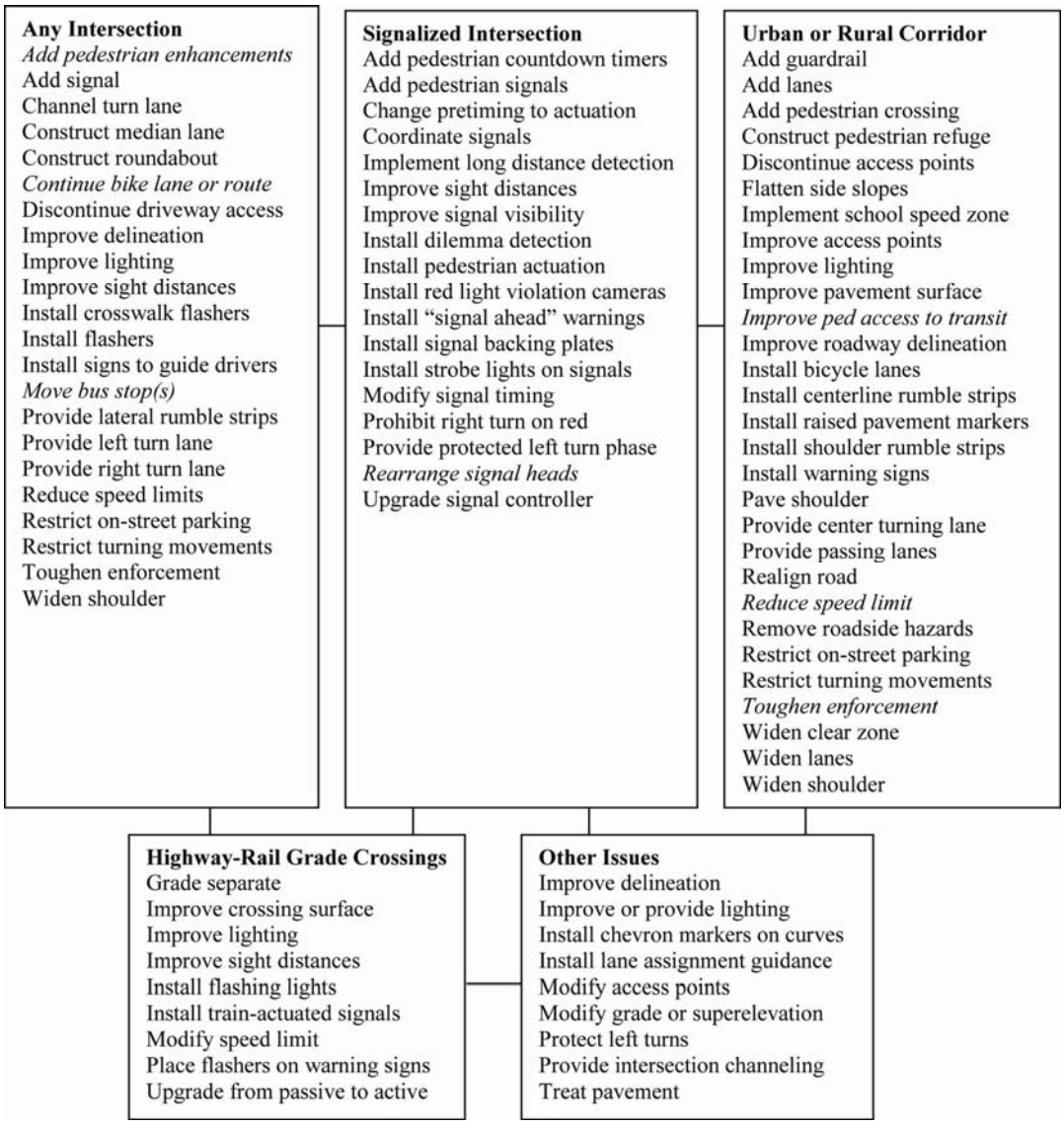


Figure 5.1 Intersection Safety Countermeasures (from Hauer et al., 2002)

6. Study Intersections

Based on the data summarized in Tables 2.2-4.4 and the discussions in Sections 4 and 5, 35 intersections were chosen for further analysis. Each of the 35 intersections appeared on several statewide, regional or district lists, such that each had both a large number of crashes *and* a high crash severity score. Also, as discussed in the text supporting Table 2.6, some of the intersections had a relatively large number of *fatal* crashes. The 35 intersections are listed in Table 6.1. Six are located in Region 1, 14 are in Region 2, six are in Region 3, and nine are in Region 4, with five in the Cedar City District, two in the Price District, and two in the Richfield District. Five of the intersections are in West Valley City, and four are in Provo. Six of the intersections are along US 89, eight are along SR 171, three are along SR 173, and three are along US 189. A total of 27 of the intersections are signalized; the other eight are not signalized, with the major street having the right-of-way (a stop sign faces cross-street traffic; i.e., two-way stop control).

6.1 Crash Types

The types of crashes that occurred at the 35 study intersections between 1994 and 2003 are summarized in Table 38. As expected, most of the crashes involved two or more motor vehicles (the research team did not distinguish between 2-, 3-, and 4-or-more vehicle crashes). In fact, of the 11,615 crashes that occurred, 10,910 (94 percent) involved motor vehicles only. The remaining 6 percent of the crashes involved a single vehicle and a pedestrian (23 percent of all single-vehicle crashes), bicyclist (28 percent), fixed object (13 percent), running off the road (18 percent), rollover (2 percent), animal (2 percent), or some other hazard. An intersection at which any of the crash types deviated from these averages may be problematic for that type. For example, at 800 North and State Street in Orem, bicyclist-vehicle crashes represented 61 percent of all single-vehicle incidents, well above the 35-intersection average of 28 percent. This intersection might have a heavier volume of bicyclists than the others; alternatively, there may be a need for improvements in the accommodations for bicycles at this location. For another example, at 5600 South and 1900 West in Roy, pedestrian-vehicle crashes represented 52 percent of all single-vehicle incidents, well above the average of 23 percent. There may be a need for improvements in the pedestrian facilities at this intersection. Also, at 5400 South and 5030 West in Kearns, single-vehicle crashes were 23 percent of all incidents, much higher than the average of 6 percent. It may be useful to closely examine this intersection for factors related to driver guidance, fixed objects, non-motorized highway users, and so forth.

6.2 Crash Severities

The crash severities at the 35 study intersections are listed in Table 6.3. Each of the intersections was selected for further study because of a large number of crashes and/or a large number of severe or fatal crashes. It is interesting to note that, at ten of the intersections, more than 10 percent of the crashes resulted in either an incapacitating injury or a fatality. These tended to be the (comparatively) “low-crash” intersections (i.e., none had more than 210 crashes between 1994 and 2003). The crash severities at one example of these intersections, 2400 South and 8000 South in Magna, are shown in Figure 6.1. At nearly all of the intersections – particularly the “high-crash” intersections – more than half of the collisions resulted in no injury. The crash severities at one example of these, Redwood Road and 5400 South in Taylorsville, are shown in Figure 6.2. At three of the intersections – Hinckley Drive and Pennsylvania Avenue in Ogden, State Street and Wood Avenue in Salt Lake City, and 3500 South and 4200 West in West Valley City – more than half of the collisions resulted in *at least* a “possible” injury. It is likely that there are high travel speeds on the major street at these intersections. A speed-reducing mitigation, such as a lower speed limit or traffic calming measure, may be needed. A turning restriction or prohibition

from the minor street may also be a strategy. The research team did not look at crash severities by collision type – this would be a subject for further study – but it is likely that many of the minor crashes were rear-end incidents.

Figure 6.1. Crash Severities: 2400 South + 8000 West

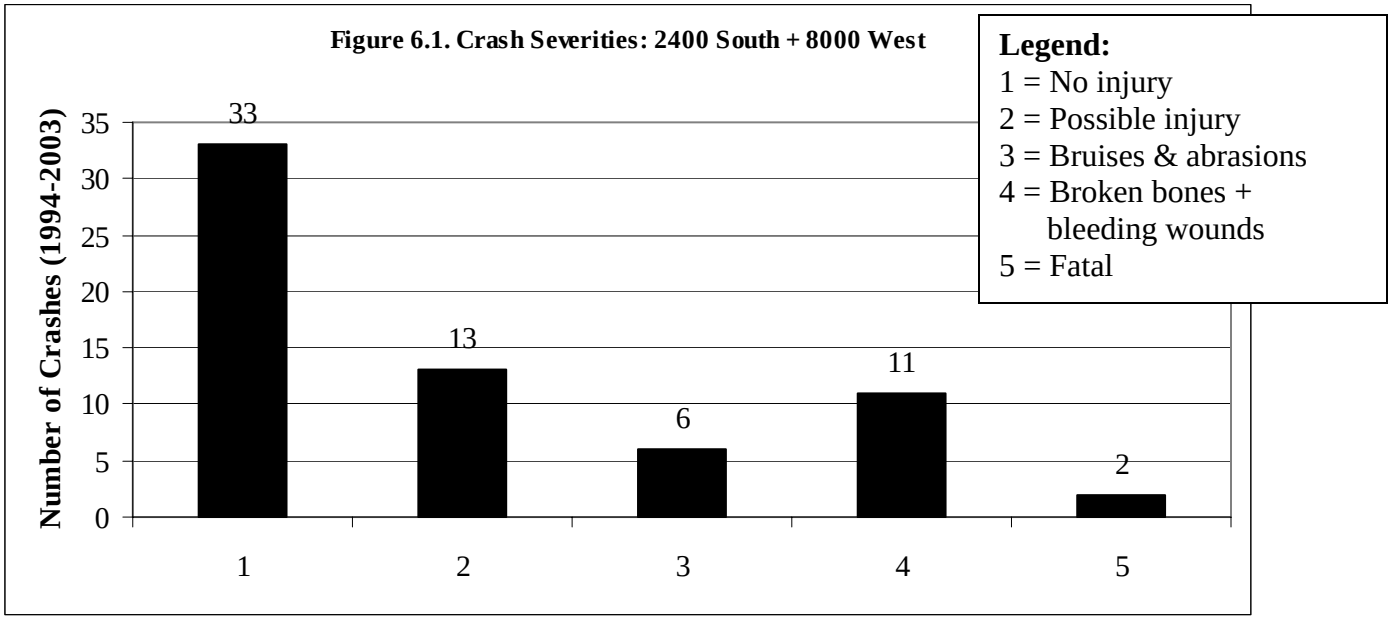
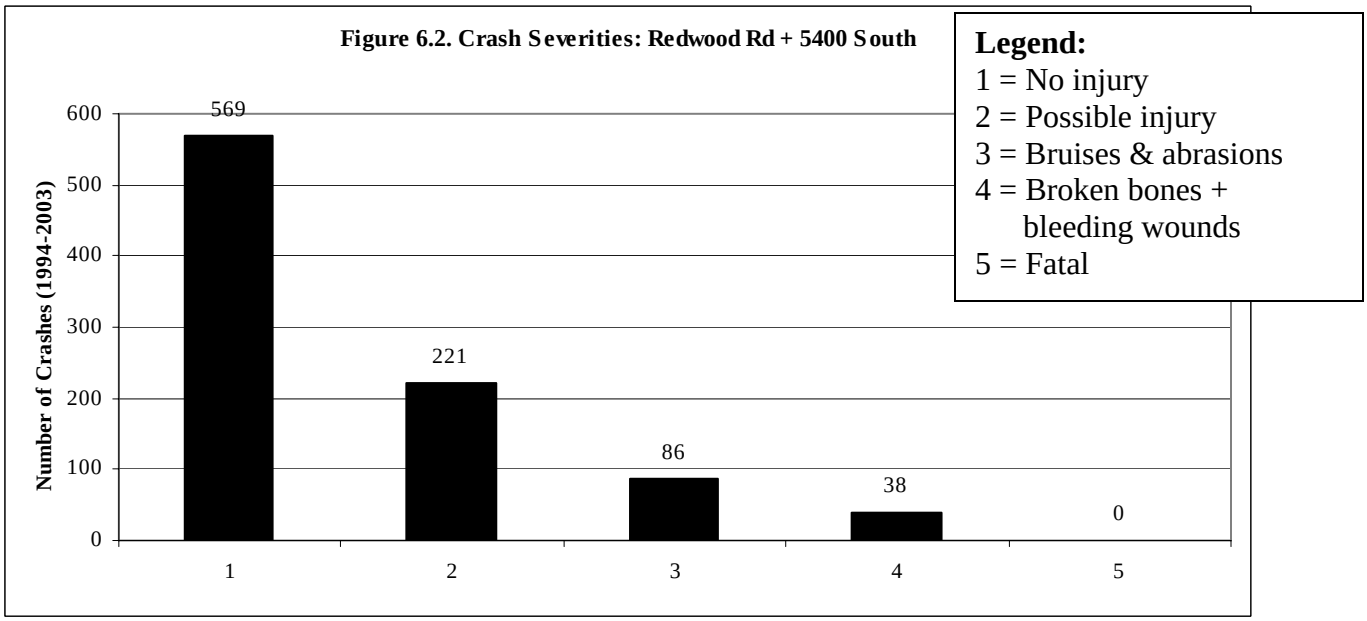


Figure 6.2. Crash Severities: Redwood Rd + 5400 South



6.3 Direction of Travel

Table 6.4 summarizes the vehicles involved in crashes at the study intersection by direction of travel. In general, "Leg 1" is the northbound approach, Leg 2 is southbound, Leg 3 is eastbound, and Leg 4 is westbound. These data indicate the approach(es) along which crashes are concentrated at the given intersection. In many cases, the leg with the heaviest approach volume will have the most vehicular involvement. For example, at the intersection of SR 75, Main Street and 1400 North in Springville, 119 (44 percent) of the 270 vehicles involved in crashes were approaching from the south (i.e., northbound) on US 89 (Main Street). It is not readily clear why the number of vehicles involved in crashes on the northbound approach was 2.6 times that of the southbound approach. At Carbon Avenue and 100 North in Price, just over 90 percent of the vehicles involved in crashes were traveling along 100 North. About 60 percent of the vehicles entering this intersection were using 100 North, so it is not clear why a disproportionate number of these vehicles were involved in collisions. Also, as mentioned earlier, the research team did not examine multiple-vehicle crashes at any of the intersections. These would be subjects for further study.

6.4 Crash Rates

Crash rates at the 35 study intersections, based on 2001-2003 traffic volumes and crashes, are summarized in Table 6.5. The rates can be compared to those listed in Table 2.7, which features all intersections between state routes having a crash rate of two or more per million entering vehicles (MEV). Fourteen of the intersections in Table 6.5 had a crash rate of two or more per MEV; six of these intersections are between state routes, which also appear in Table 2.7. Traffic volumes were not available for one or two of the approaches to some of the intersections; the crash rates listed for these may be *greater* than actual. It would be useful to obtain traffic volumes on the cross-streets at these locations to verify the crash rates. There appears to be a correlation between crash rates and crash totals, although the relationship is unclear. Intersections with very large numbers of crashes appear to also have high crash rates; further study is needed to identify the relationship. Some intersections with few crashes, however, have high crash rates, as shown in Table 2.7.

To prioritize intersections for mitigation, it may be useful to develop a composite ranking based on crash occurrences, crash frequencies, and crash rates. The Iowa DOT, for example, was identifying high-crash locations according to the following procedure (Souleyrette et al., 2001):

1. Rank crash sites according to the total number of crashes in a five-year study period.
2. Rank crash sites according to the crash rate, based on five years of data.
3. Rank crash sites according to the crash "loss" (similar to this report's severity score).
4. For each site, add the three rankings; the cumulative "score" is used to compile a final ranking.

Note that the cumulative scores developed in step 4 do not "weight" any of the rankings; that is, a ranking based on a crash frequency is equivalent to that based on a crash rate or loss. As indicated earlier, the research team did not compile crash rates for intersections between state and non-state routes, except for those listed in Table 6.5. It would be useful to compute these rates, then apply the Iowa DOT method (or a suitable modification) to Utah's intersections. A reasonable study period would need to be selected – the Iowa DOT used five years, while this report used ten and three years. Hauer (1997) argued for using "as much crash data as possible," primarily because crashes are relatively infrequent events. He claimed that the effects of infrastructure changes (e.g., new roads, improvements, new traffic controls, etc.) should be reflected in the crash data. To effectively use this approach, the analyst would need to be aware of the types and dates of all important changes.

6.5 Collision Types

The collision types at the 35 study intersections, based on the numerical codes described in Table 6.6, are listed in Table 6.7. A total of 11,615 crashes occurred at these intersections between 1994 and 2003; 4,259 (37 percent) involved a left-turning vehicle, and 4,410 (38 percent) were rear-end incidents. A total of 825 incidents (7 percent) were side-swipe collisions, and 770 (7 percent) were right-angle incidents. Just over 1 percent of the crashes (165) involved a pedestrian, and just under 2 percent (196) involved a bicycle. Intersections at which the collision types did not "conform" to this distribution may present special strategic needs. For example, the greatest number of backing incidents (17) occurred at Redwood Road and 5400 South in Taylorsville. This intersection also had the most left-turn involvements (365) during the study period. The intersection of 800 North and State Street in Orem had the most bicycle-vehicle collisions (22), and the largest number of right-turn involvements (41). The greatest number of pedestrian-vehicle collisions (17) occurred at 700 East and 3300 South in South Salt Lake, and the largest number of right-angle crashes (67) occurred at 3300 South and 30 West, also in South Salt Lake. Both of these types of collisions tend to be severe, so further investigation would be worthwhile. The Institute of Transportation Engineers (ITE, 2004) reported, in fact, that 60 percent of all fatal intersection crashes are right-angle collisions. The highest number of single-vehicle incidents – excluding pedestrian-vehicle and bicycle-vehicle collisions – occurred at Bangerter Highway and 3500 South in West Valley City (17). This type of crash may be associated with high travel speeds and driver behavioral issues. ITE (2004) reported that about one-third of all fatal intersection crashes involved just one vehicle (and a pedestrian, bicycle, fixed object, or other single-vehicle factor). Center Street and 900 West in Provo had the largest number of side-swipe collisions with 86. Two intersections – 5400 South and 4460 West in Kearns, and 5600 South and 1900 West in Roy – experienced three head-on collisions. The greatest number of any type of crash at any of the study intersections was the 474 rear-end collisions that occurred at University Avenue and 900 North in Provo.

Intersection safety countermeasures, extracted from Hauer et al. (2002), are discussed in Sections 2 and 5, and are displayed in Figure 2.1. Countermeasures for backing and head-on collisions are *not* discussed in Hauer et al.; these were the two "least popular" types of collisions at the study intersections. Backing incidents tend to occur off-street, in parking lots and residential driveways, and are rare on roads and streets. It is likely that backing maneuvers are associated with on-street parking; on-site studies of intersections having recurrent backing crashes would be needed to properly identify the critical issues. Head-on collisions generally involve wrong-way travel (i.e., a median or centerline crossover) by one vehicle. Most head-on collisions occur away from intersections; 22 of the 35 study intersections, in fact, did not experience any head-on collisions. The development of mitigating strategies for head-on collisions has concentrated on non-junction crashes. The two intersections that had three head-on collisions indicate a potentially recurring problem, however, further study is suggested. A possible mitigation would be raised medians on the intersection approaches.

6.6 Functional Radius of Influence

The numbers of crashes by distance from the intersection, in 100 ft increments, are summarized in Table 6.8. As discussed in Section 1, this study used a 500-ft radius for all intersections, based on the findings in Stover (1996). A review of the statistics in Table 6.7 indicates, however, that the radius should probably be varied. For example, a 100-ft radius captured more than half of the crashes at 16 of the study intersections. The crash activity at one intersection that exhibited this pattern, 2400 South and 8000 West in Magna, is shown in Figure 6.3. At an additional nine intersections, the 100-ft radius captured more crashes than any other 100-ft increment. A 200-ft radius captured a large number of crashes in the 100- to 200-ft band at three of the intersections, including Hinckley Drive and Pennsylvania Avenue in Ogden (Figure 6.4). Similarly, a 300-ft radius captured a large number of crashes in the 200- to 300-ft "doughnut" at one intersection (5400 South and 4460 West in Kearns); while, using the same method, a 400-ft radius applied to 3500 South and 4200 West in West Valley City. A 500-ft radius appeared to

apply to only four of the intersections; at these locations, the 400- to 500-ft band was very active. Further study is needed of these radii before a conclusion can be drawn. For example, it may be useful to examine 50- or 25-ft increments. The presence of adjacent intersections may also be a factor. At University Avenue and 900 North in Provo, for example, intersections with 880 North, 940 North, and 960 North are nearby. The intersection with 960 North is, in fact, signalized, and there may be occasional spillover that affects the 900 North intersection. A heavy volume of non-motorized Brigham Young University traffic (i.e., not crossing at the intersections) may also be a factor.

One impact of overstating an intersection's functional area may be to overestimate the number of crashes occurring at that intersection. In some cases, crashes that should be attributed to an upstream or downstream intersection may be "falsely" attributed. Given that driveways proximate to an intersection can be an additional contributing factor, the challenges of pinpointing the functional area are evident. The most direct technique would be to examine an intersection in the field, taking special note of the locations of conflict points. Another technique would be to closely examine accident reports, along with accident reconstruction studies, to determine the pre-crash events and driver intentions. In a general analysis such as in this study, the best approach may be to identify functional areas by varying the radius of influence at each intersection. This would be a time-consuming exercise that may be most efficiently applied to a county or city, rather than an entire district, region, or state.

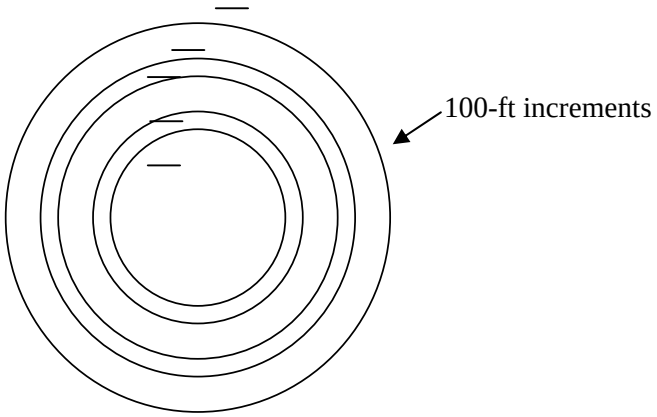


Figure 6.3. Crashes by Radius of Influence: 2400 South + 8000 West, Magna, 1994-2003

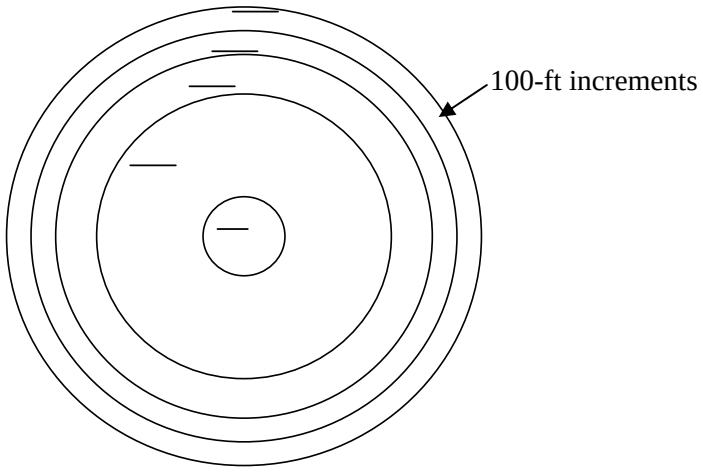


Figure 6.4. Crashes by Radius of Influence: Hinckley Drive + Pennsylvania Avenue, Ogden, 1994-2003

Table 6.1 Intersections Selected for Additional Study: 1994-2003 Crash Statistics

					Crashes		
Region	**City**	**Routes**	**Streets**	**Control**	**Total**	**Fatal**	**Score**
1	Logan	89 + 91	Main St + 400 North	Signal	493	1	3,644.8
	North Logan	91 + 050370	Main St + Airport Dr (2500 North)	Signal	180	2	4,098.6
	Ogden	39 + 89	12th St + Washington Bl	Signal	558	3	7,680.6
		79: MP 1.11	Hinckley Dr + Pennsylvania Av	Signal	*147*	3	6,208.5
	Roy	97 + 126	5600 South + 1900 West	Signal	614	0	3,923.3
		126 + 570090	1900 West + 4400 South	Signal	161	3	4,737.5
2	Kearns CDP	173: MP 3.35	*5400 South + 5030 West*	Stop sign	*56*	2	*2,603.9*
		173: MP 4.07	*5400 South + 4460 West*	Stop sign	*119*	2	*3,595.7*
	Magna CDP	201: MP 7.71	*2400 South + 8000 West*	Stop sign	*65*	2	*3,176.3*
	Salt Lake City	89: MP 323.58	*State St + Wood Av (1580 South)*	Stop sign	*88*	2	*2,657.5*
	South Salt Lake	71 + 171	700 East + 3300 South	Signal	667	5	9,524.8
		171: MP 10.54	*3300 South + Sue St (30 West)*	Stop sign	*537*	1	*3,210.0*
		171: MP 10.83	*3300 South + Edison St (145 East)*	Stop sign	*427*	1	*3,103.6*
	Taylorsville	68 + 266	Redwood Rd + 4700 South	Signal	835	1	6,060.4
		68 + 173	Redwood Rd + 5400 South	Signal	914	0	4,937.9
	West Valley City	154 + 171	Bangerter Hwy + 3500 South	Signal	618	1	5,110.8
		171 + 350600	3500 South + 3600 West	Signal	568	1	3,846.7
		171: MP 4.73	*3500 South + Stanton St (4640 West)*	Stop sign	*45*	3	*3,377.7*
		171: MP 5.28	*3500 South + 4200 West*	Stop sign	*165*	2	*2,853.3*
		171 + 172	3500 South + 5600 West	Signal	564	1	4,840.8
3	Orem	52 + 89	800 North + State St	Signal	729	1	5,599.8
	Provo	114: MP 0.36	Center St + 900 West	Signal	*380*	1	*3,080.0*
		189 + 265 + 490970	University Av + University Pkwy + 1650 North	Signal	322	1	4,012.0
		189: MP 2.79	University Av + 900 North	Signal	*623*	0	*3,153.8*
		189 + 490740	University Av + 3700 North	Signal	286	2	5,191.9
	Springville	75 + 89 + 491250	SR 75 + Main St + 1400 North	Signal	211	1	3,302.5
4CC	St. George	18 + 530140	Bluff St + Hilton Dr + Main St	Signal	156	0	1,626.6
		18 + 34 + 530110	Bluff St + St. George Bl	Signal	377	0	2,131.1
		34: MP 1.90	St. George Bl + I-15 southbound ramps	Signal	*133*	1	*1,358.8*
		34 + 3180	St. George Bl + 400 East	Signal	163	1	1,583.2
	Washington	212 + 530070 + 3204	3050 East + West Telegraph St	Signal	161	0	1,459.7
4P	Moab	191: MP 126.56	Main St + 100 North	Signal	*62*	0	*571.4*
	Price	10 + 55 + 070200	Carbon Av + 100 North	Signal	75	1	1,464.4
4R	Kanab	11 + 89	300 South + 100 East	Signal	49	0	688.0
	Richfield	118 + 120	North Main St + 300 North	Signal	68	0	613.4

Table 6.2 Crash Types at Study Intersections: 1994-2003 CDDS Statistics

		Crash Type							
City	**Streets**	**MV-MV**	**MV-Ped**	**MV-Bike**	**Fixed Object**	**Ran Off Road**	**Rollover**	**MV-Animal**	**Total**
Kanab	100 East + 300 South	41	3	0	0	2	0	0	49
Kearns CDP	5400 South + 4460 West	101	4	4	4	4	1	0	119
	5400 South + 5030 West	43	1	1	4	6	0	1	56
Logan	Main St + 400 North	460	7	12	1	4	1	3	493
Magna CDP	2400 South + 8000 West	52	0	0	3	2	0	3	65
Moab	Main St + 100 North	54	2	4	1	1	0	0	62
North Logan	Main St + Airport Dr (2500 North)	174	0	0	1	3	0	1	180
Ogden	Hinckley Dr + Pennsylvania Av	131	1	0	5	1	1	0	147
	12th St + Washington Bl	515	9	19	2	8	0	0	558
Orem	800 North + State St	693	5	22	4	1	0	0	729
Price	Carbon Av + 100 North	74	0	1	0	0	0	0	75
Provo	Center St + 900 West	355	7	8	2	3	0	0	380
	University Av + University Pkwy + 1650 North	303	6	5	0	7	0	0	322
	University Av + 900 North	596	8	8	1	5	1	2	623
	University Av + 3700 North	271	2	6	2	2	0	1	286
Richfield	North Main St + 300 North	59	2	5	0	1	0	1	68
Roy	1900 West + 4400 South	142	10	5	3	3	0	0	161
	5600 South + 1900 West	591	12	5	4	2	0	0	614
Salt Lake City	State St + Wood Av (1580 South)	72	5	5	3	2	0	0	88
South Salt Lake	700 East + 3300 South	616	17	8	7	11	1	0	667
	3300 South + Edison St (145 East)	393	11	11	6	4	1	0	427
	3300 South + Sue St (30 West)	502	10	10	9	3	1	0	537
Springville	SR 75 + Main St + 1400 North	188	2	1	2	7	1	4	210
St. George	Bluff St + Hilton Dr + Main St	149	1	1	4	1	0	0	156
	Bluff St + St. George Bl	372	1	0	0	2	0	0	377
	St. George Bl + I-15 southbound ramps	128	1	0	2	0	0	0	133
	St. George Bl + 400 East	152	2	2	0	2	1	0	163
Taylorsville	Redwood Rd + 4700 South	788	9	18	3	6	1	0	835
	Redwood Rd + 5400 South	891	5	3	5	4	1	0	914
Washington	3050 East + West Telegraph St	156	1	2	2	0	0	0	161
West Valley City	Bangerter Hwy + 3500 South	581	5	11	2	12	0	0	618
	3500 South + 3600 West	551	5	2	2	4	0	0	568
	3500 South + 4200 West	146	4	7	2	4	0	0	165
	3500 South + Stanton St (4640 West)	36	0	3	1	3	0	1	45

City	Streets	MV-MV	MV-Ped	MV-Bike	Fixed Object	Ran Off Road	Rollover	MV-Animal	Total
	3500 South + 5600 West	534	7	7	4	4	1	0	564

***NOTE**: The numbers of crashes by type do not necessarily add to the total number of crashes because additional categories are not shown (e.g., MV-train).*

Table 6.3 Crash Severities at Study Intersections: 1994-2003 CDDS Statistics

City	Streets	No Injury	Possible Injury	Bruises & Abrasions	Broken Bones-Bloody Wounds	Fatal	Total
Kanab	100 East + 300 South	30	5	8	6	0	49
Kearns CDP	5400 South + 4460 West	57	30	16	14	2	119
	5400 South + 5030 West	29	11	9	5	2	56
Logan	Main St + 400 North	338	91	42	21	1	493
Magna CDP	2400 South + 8000 West	33	13	6	11	2	65
Moab	Main St + 100 North	44	7	6	5	0	62
North Logan	Main St + Airport Dr (2500 North)	106	38	15	19	2	180
Ogden	Hinckley Dr + Pennsylvania Av	55	33	27	29	3	147
	12th St + Washington Bl	316	139	61	39	3	558
Orem	800 North + State St	468	163	59	38	1	729
Price	Carbon Av + 100 North	56	9	5	4	1	75
Provo	Center St + 900 West	230	87	47	15	1	380
	University Av + University Pkwy + 1650 North	170	75	52	24	1	322
	University Av + 900 North	398	154	46	25	0	623
	University Av + 3700 North	149	67	41	27	2	286
Richfield	North Main St + 300 North	44	9	10	5	0	68
Roy	1900 West + 4400 South	85	39	19	15	3	161
	5600 South + 1900 West	383	145	54	32	0	614
Salt Lake City	State St + Wood Av (1580 South)	35	24	23	4	2	88
South Salt Lake	700 East + 3300 South	408	154	63	37	5	667
	3300 South + Edison St (145 East)	276	96	38	16	1	427
	3300 South + Sue St (30 West)	360	114	46	16	1	537
Springville	SR 75 + Main St + 1400 North	124	50	14	21	1	210
St. George	Bluff St + Hilton Dr + Main St	96	27	19	14	0	156
	Bluff St + St. George Bl	261	65	34	17	0	377
	St. George Bl + I-15 southbound ramps	98	29	2	3	1	133
	St. George Bl + 400 East	112	32	14	4	1	163
Taylorsville	Redwood Rd + 4700 South	504	210	80	40	1	835
	Redwood Rd + 5400 South	569	221	86	38	0	914
Washington	3050 East + West Telegraph St	97	30	22	12	0	161
West Valley City	Bangerter Hwy + 3500 South	358	165	61	33	1	618
	3500 South + 3600 West	287	188	73	19	1	568
	3500 South + 4200 West	73	56	29	5	2	165
	3500 South + Stanton St (4640 West)	27	5	7	3	3	45
	3500 South + 5600 West	308	160	65	30	1	564

Table 6.4 Vehicle Involvement in Crashes by Direction of Travel at Study Intersections: 1994-2003 CDDS Statistics

City	Streets	Routes	Leg 1	Leg 2	Leg 3	Leg 4
Kanab	100 East + 300 South	11 + 89	9	14	28	21
Kearns CDP	5400 South + 4460 West	173: 4.07	na	na	83	36
	5400 South + 5030 West	173: 3.35	na	na	33	33
Logan	Main St + 400 North	89 + 91	276	267	62	22
Magna CDP	2400 South + 8000 West	201: 7.71	na	na	30	35
Moab	Main St + 100 North	191: 126.56	na	na	na	na
North Logan	Main St + Airport Dr (2500 North)	91 + 050370	117	49	na	na
Ogden	Hinckley Dr + Pennsylvania Av	79: 1.11	na	na	6	141
	12th St + Washington Bl	39 + 89	186	105	200	124
Orem	800 North + State St	52 + 89	341	101	266	121
Price	Carbon Av + 100 North	10 + 55 + 070200	1	7	43	34
Provo	Center St + 900 West	114: 0.36	na	na	276	104
	University Av + University Pkwy + 1650 North	189 + 265 + 490970	137	231	na	25
	University Av + 900 North	189: 2.79	na	na	na	na
	University Av + 3700 North	189 + 490740	na	na	na	na
Richfield	North Main St + 300 North	118 + 120	11	8	37	41
Roy	1900 West + 4400 South	126 + 570090	111	70	na	na
	5600 South + 1900 West	97 + 126	133	172	210	278
Salt Lake City	State St + Wood Av (1580 South)	89: 323.58	39	49	na	na
South Salt Lake	700 East + 3300 South	71 + 171	127	165	267	160
	3300 South + Edison St (145 East)	171: 10.83	na	na	262	179
	3300 South + Sue St (30 West)	171: 10.54	na	na	274	276
Springville	SR 75 + Main St + 1400 North	75 + 89 + 491250	38	68	119	45
St. George	Bluff St + Hilton Dr + Main St	18 + 530140	127	107	na	na
	Bluff St + St. George Bl	18 + 34 + 530110	187	159	146	18
	St. George Bl + I-15 southbound ramps	34: 1.90	na	na	24	109
	St. George Bl + 400 East	34 + 3180	na	na	51	180
Taylorsville	Redwood Rd + 4700 South	68 + 266	400	164	274	158
	Redwood Rd + 5400 South	68 + 173	449	171	216	264
Washington	3050 East + West Telegraph St	212 + 530070 + 3204	na	98	na	58

City	Streets	Routes	Leg 1	Leg 2	Leg 3	Leg 4
West Valley City	Bangerter Hwy + 3500 South	154 + 171	102	121	236	199
	3500 South + 3600 West	171 + 350600	na	na	78	432
	3500 South + 4200 West	171: 5.28	na	na	115	71
	3500 South + Stanton St (4460 West)	171: 4.73	na	na	18	35
	3500 South + 5600 West	171 + 172	112	215	102	144

***NOTES**: The values in the Leg 1, Leg 2, Leg 3, and Leg 4 columns are the numbers of vehicles involved in crashes on those legs of the intersection. Many crashes involved more than one vehicle. na = not available; intersections along US 189 and US 191 were not in the CDDS intersection tool.*

Table 6.5 Crash Rates at Study Intersections: 2001-2003 CDDS Statistics

			2001-2003 Entering Vehicles (Millions)					
City	**Streets**	**Routes**	**Leg 1**	**Leg 2**	**Leg 3**	**Leg 4**	**Crashes**	**Rate**
Kanab	100 East + 300 South	11 + 89	3.202	3.851	NA	2.854	10	1.01
Kearns CDP	5400 South + 4460 West	173: 4.07	--	NA	16.224	16.224	37	*1.14*
	5400 South + 5030 West	173: 3.35	--	NA	16.224	16.224	22	*0.68*
Logan	Main St + 400 North	89 + 91	21.574	16.963	NA	15.569	128	*2.37*
Magna CDP	2400 South + 8000 West	201: 7.71	NA	--	11.896	11.896	11	*0.46*
Moab	Main St + 100 North	191: 126.56	8.963	8.963	NA	NA	11	*0.61*
North Logan	Main St + Airport Dr (2500 North)	91 + 050370	15.265	15.945	5.081	NA	53	*1.46*
Ogden	Hinckley Dr + Pennsylvania Av	79: 1.11	NA	NA	7.985	8.666	42	*2.52*
	12th St + Washington Bl	39 + 89	16.837	17.766	15.998	13.400	173	2.70
Orem	800 North + State St	52 + 89	27.052	26.240	14.389	18.712	96	1.11
Price	Carbon Av + 100 North	10 + 55 + 070200	5.548	3.834	5.918	7.147	29	1.29
Provo	Center St + 900 West	114: 0.36	NA	NA	18.776	18.776	83	*2.21*
	University Av + University Pkwy + 1650 North	189 + 265 + 490970	20.496	20.446	23.027	11.351	101	1.34
		189: 2.79	24.467	24.467	--	NA	146	*2.98*
	University Av + 900 North	189 + 490740	20.012	18.109	6.008	5.544	75	1.51
	University Av + 3700 North							
Richfield	North Main St + 300 North	118 + 120	7.467	3.425	NA	3.661	22	*1.51*
Roy	1900 West + 4400 South	126 + 570090	13.492	12.985	NA	4.767	49	*1.57*
	5600 South + 1900 West	97 + 126	14.270	20.447	9.342	16.527	170	2.81
Salt Lake City	State St + Wood Av (1580 South)	89: 323.58	15.190	15.190	NA	NA	30	*0.99*
South Salt Lake	700 East + 3300 South	71 + 171	23.907	23.582	16.384	13.297	137	1.78
	3300 South + Edison St (145 East)	171: 10.83	NA	--	19.244	19.244	95	*2.47*
	3300 South + Sue St (30 West)	171: 10.54	NA	--	18.960	18.960	83	*2.19*
Springville	SR 75 + Main St + 1400 North	75 + 89 + 491250	14.633	10.675	6.608	2.747	61	1.76
St. George	Bluff St + Hilton Dr + Main St	18 + 530140	13.939	13.939	NA	NA	59	*2.12*
	Bluff St + St. George Bl	18 + 34 + 530110	21.447	23.660	NA	11.510	85	*1.50*
	St. George Bl + I-15 southbound ramps	34: 1.90	--	*14.620*	19.753	19.753	50	0.92
	St. George Bl + 400 East	34 + 3180	NA	NA	18.862	18.862	54	*1.43*
Taylorsville	Redwood Rd + 4700 South	68 + 266	33.502	24.988	21.782	13.169	258	2.76
	Redwood Rd + 5400 South	68 + 173	33.502	33.502	22.039	15.519	237	2.27
Washington	3050 East + West Telegraph St	212 + 530070 + 3204	6.534	9.012	NA	9.012	67	*2.73*
West Valley City	Bangerter Hwy + 3500 South	154 + 171	27.425	27.345	18.838	21.773	139	1.46
	3500 South + 3600 West	171 + 350600	7.571	4.598	21.773	21.400	139	2.51
	3500 South + 4200 West	171: 5.28	NA	--	14.355	14.355	35	*1.22*
	3500 South + Stanton St (4640 West)	171: 4.73	---	NA	14.355	14.355	11	*0.38*

City	Streets	Routes	Leg 1	Leg 2	Leg 3	Leg 4	Crashes	Rate
	3500 South + 5600 West	171 + 172	12.343	13.361	11.324	13.064	155	3.09

NA = Traffic volume data not available. The volumes shown are 3-year (2001-2003) cumulative totals in millions of vehicles. An *italicized* crash rate indicates that traffic volume data were not available for all legs of the intersection. The rates here might not agree with those in Table 8.

Table 6.6 Collision Type Consolidation

No.	Consolidated Collision Type	CDDS Collision Types
1	Backing	Backing
2	Bicycle	*In accident type category*
3	Head-on	Opposite directions, both vehicles straight, head on
4	Left-turn involvement	Opposite directions, one vehicle straight, one vehicle turning left Same direction, both vehicles turning left One vehicle straight, one coming from left, turning left One vehicle straight, one coming from right, turning left Opposite direction, both vehicles turning left Approach at an angle, both vehicles turning left One vehicle straight, one vehicle making U-turn Opposite direction, one turning left, one turning right
5	Loss of control (single vehicle)	Single vehicle
6	Pedestrian	*In accident type category*
7	Rear-end	Same direction, both vehicles straight, rear end Same direction, one vehicle straight, one turning right, rear end Same direction, one vehicle straight, one turning left, rear end
8	Right-angle	Opposite directions, both straight, side swipe Both vehicles straight, approach at an angle Approach at an angle, one turning left, one turning right
9	Right-turn involvement	One vehicle straight, one coming from right, turning right Same direction, both vehicles turning right One vehicle straight, one coming from left, turning right
10	Side-swipe	Same direction, both straight, side swipe Same direction, one vehicle straight, one turning right Same direction, one vehicle straight, one turning left Same direction, one vehicle turning right, one vehicle turning left

***NOTE**: Collisions are recorded in the CDDS according to 24 different types. The 24 types can be condensed into 10 for further analysis, as shown above.*

Table 6.7 Crashes by Collision Type at Study Intersections: 1994-2003 CDDS Statistics

City	Streets	1	2	3	4	5	6	7	8	9	10	Total
Kanab	100 East + 300 South	1	0	0	18	2	3	9	5	0	7	49
Kearns CDP	*5400 South + 4460 West*	1	4	3	35	8	4	26	21	5	11	119
	5400 South + 5030 West	3	1	1	13	9	1	13	3	2	9	56
Logan	Main St + 400 North	8	12	0	146	12	7	215	34	20	33	493
Magna CDP	*2400 South + 8000 West*	0	0	0	21	12	0	7	18	1	6	65
Moab	Main St + 100 North	1	4	0	16	1	2	13	7	2	10	62
North Logan	Main St + Airport Dr (2500 North)	4	0	0	78	4	0	65	14	7	7	180
Ogden	Hinckley Dr + Pennsylvania Av	1	0	0	107	13	1	11	6	2	3	147
	12th St + Washington Bl	2	19	1	293	14	9	126	43	16	38	558
Orem	800 North + State St	7	22	1	299	2	5	258	22	41	66	729
Price	Carbon Av + 100 North	0	1	0	14	1	0	37	14	4	4	75
Provo	Center St + 900 West	1	8	1	144	3	7	79	35	10	86	380
	University Av + University Pkwy + 1650 North	2	5	2	127	8	6	112	42	8	9	322
	University Av + 900 North	0	8	0	47	9	8	474	29	4	15	623
	University Av + 3700 North	1	6	1	124	6	2	107	20	5	14	286
Richfield	North Main St + 300 North	0	5	0	24	2	2	13	14	3	2	68
Roy	1900 West + 4400 South	2	5	0	73	2	10	35	20	5	11	161
	5600 South + 1900 West	3	5	3	305	4	12	172	27	30	50	614
Salt Lake City	*State St + Wood Av (1580 South)*	1	5	0	23	5	5	34	1	1	12	88
South Salt Lake	700 East + 3300 South	12	8	0	186	16	17	284	40	22	70	667
	3300 South + Edison St (145 East)	7	11	1	128	10	11	181	36	13	28	427
	3300 South + Sue St (30 West)	4	10	0	208	12	10	195	67	9	27	537
Springville	SR 75 + Main St + 1400 North	1	1	1	75	15	2	94	10	2	9	210
St. George	Bluff St + Hilton Dr + Main St	4	1	1	65	5	1	39	22	7	11	156
	Bluff St + St. George Bl	2	0	0	170	3	1	147	33	6	15	377
	St. George Bl + I-15 southbound ramps	0	0	0	44	1	1	83	2	1	1	133
	St. George Bl + 400 East	0	2	0	16	4	2	106	6	5	6	163
Taylorsville	Redwood Rd + 4700 South	5	18	1	316	11	9	334	36	24	75	835
	Redwood Rd + 5400 South	14	3	0	365	11	5	392	29	28	63	914
Washington	3050 East + West Telegraph St	2	2	0	78	2	1	37	16	10	11	161
West Valley City	Bangerter Hwy + 3500 South	4	11	0	172	17	5	218	30	23	29	618
	3500 South + 3600 West	4	2	0	185	7	5	289	24	16	34	568
	3500 South + 4200 West	3	7	0	53	8	4	71	2	4	12	165

City	Streets	1	2	3	4	5	6	7	8	9	10	Total
	3500 South + Stanton St (4460 West)	0	3	1	18	6	0	11	3	1	4	45
	3500 South + 5600 West	3	7	0	273	13	7	123	39	39	37	564

The collision types are described in Table 6.6

Table 6.8 Crashes by Radius of Influence at Study Intersections: 1994-2003 CDDS Statistics

City	Streets	Routes	100 ft	200 ft	300 ft	400 ft	500 ft
Kanab	100 East + 300 South	11 + 89	**21**	30	32	41	49
Kearns CDP	5400 South + 4460 West	173: 4.07	17	36	**97**	107	119
	5400 South + 5030 West	173: 3.35	13	25	32	40	**56**
Logan	Main St + 400 North	89 + 91	**205**	271	344	434	493
Magna CDP	2400 South + 8000 West	201: 7.71	**58**	59	62	63	65
Moab	Main St + 100 North	191: 126.56	**32**	44	51	54	62
North Logan	Main St + Airport Dr (2500 North)	91 + 050370	**114**	134	164	172	180
Ogden	Hinckley Dr + Pennsylvania Av	79: 1.11	46	**136**	141	144	147
	12th St + Washington Bl	39 + 89	**244**	363	458	513	558
Orem	800 North + State St	52 + 89	**411**	521	599	677	729
Price	Carbon Av + 100 North	10 + 55 + 070200	**32**	44	47	57	75
Provo	Center St + 900 West	114: 0.36	**159**	216	263	314	380
	University Av + University Pkwy + 1650 North	189 + 265 + 490970	**195**	257	277	292	322
	University Av + 900 North	189: 2.79	68	144	193	395	**623**
	University Av + 3700 North	189 + 490740	67	**224**	255	269	286
Richfield	North Main St + 300 North	118 + 120	**46**	53	55	58	68
Roy	1900 West + 4400 South	126 + 570090	**123**	136	148	154	161
	5600 South + 1900 West	97 + 126	**318**	421	478	561	614
Salt Lake City	State St + Wood Av (1580 South)	89: 323.58	12	**41**	61	80	88
South Salt Lake	700 East + 3300 South	71 + 171	**421**	511	577	626	667
	3300 South + Edison St (145 East)	171: 10.83	38	76	116	270	**427**
	3300 South + Sue St (30 West)	171: 10.54	27	68	144	326	**537**
Springville	SR 75 + Main St + 1400 North	75 + 89 + 491250	**144**	160	189	202	210
St. George	Bluff St + Hilton Dr + Main St	18 + 530140	**103**	126	132	138	156
	Bluff St + St. George Bl	18 + 34 + 530110	**189**	251	284	309	377
	St. George Bl + I-15 southbound ramps	34: 1.90	**65**	82	100	121	133
	St. George Bl + 400 East	34 + 3180	**93**	123	137	157	163
Taylorsville	Redwood Rd + 4700 South	68 + 266	**502**	631	679	760	835
	Redwood Rd + 5400 South	68 + 173	**527**	667	745	872	914
Washington	3050 East + West Telegraph St	212 + 530070 + 3204	**118**	141	144	148	161

City	Streets	Routes	100 ft	200 ft	300 ft	400 ft	500 ft
West Valley City	Bangerter Hwy + 3500 South	154 + 171	**234**	341	414	511	618
	3500 South + 3600 West	171 + 350600	**190**	313	429	497	568
	3500 South + 4200 West	171: 5.28	35	60	96	**140**	165
	3500 South + Stanton St (4460 West)	171: 4.73	**21**	28	36	41	45
	3500 South + 5600 West	171 + 172	**234**	351	439	511	564

NOTE: *A* ***bold*** *number of crashes indicates the outer range of what appears to be the most "active" radius for the given intersection.*

7. Usage of the Crash Data Delivery System

The research team used crash data from the UDOT Crash Data Delivery System, both the 2004 and 2005 versions, for this study. Both versions of the databases were accessed via the Internet, using the URLs in the references section of this report. While accessing the CDDS was straightforward, compiling the information for and creating the tables in this report was often challenging. The methods used to generate the tables are described below. Except where noted, the research team used the 2004 CDDS.

7.1 Ranking Intersections by Total Number of Crashes

The following procedure was used to develop the statewide and regional lists. The 2004 CDDS was used to do these rankings:

1. Select the "Intersections" tool (see Figure 7.1).
2. Enter the starting and ending years of the study period.
3. Select a region or, for Region 4, a district.
4. Set the radius to 500 ft.
5. To limit the search time, enter a minimum number of accidents – the tool will find all intersections having a number of crashes *greater than or equal to* (not greater than) this number.
6. Hit "Search" and wait for the results.
7. Copy the resultant table and paste it into a spreadsheet, such as Excel (save the spreadsheet).
8. In Excel, sort the table on the number of crashes, producing a ranked list. Refer to this as Table A.
9. Reduce the size of Table A by deleting all crashes occurring on Interstate freeways *and* on federal-aid roads (i.e., those not occurring on state routes).

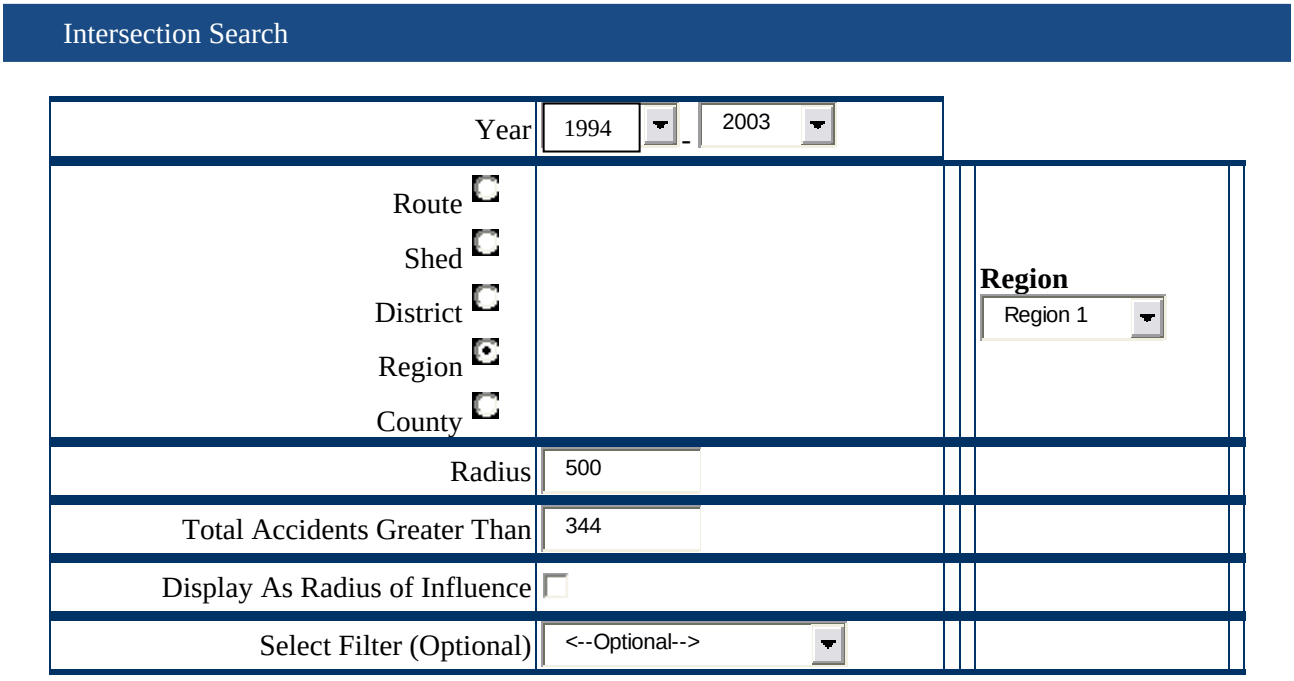


Figure 7.1 Intersection Search Example: Region 1 Crashes, 1994-2003

Three types of intersections appear in Table A from step #8:

- Intersections between state routes and other state routes.
- Intersections between state routes and federal-aid routes.
- Intersections between state routes and other roads (non-state; non-federal-aid).

Crashes can occur on all approaches to an intersection. Therefore, the full complement of crash activity at any given intersection takes into account the crashes occurring on *both* intersecting roads. The CDDS includes information on all motor vehicle crashes occurring on all state and federal-aid routes, but not "other" roads. The next steps in the analysis, therefore, are to tabulate the crashes on the intersecting state and federal-aid routes, then add these values to the crashes that occurred on the state routes. One approach is as follows:

10. In Table A, distinguish among the three intersection types listed above. This may involve adding a column for "intersecting route," then entering a state route number, federal-aid route code, or a blank cell for an "other" road. The names and route numbers of the intersecting roads are found in the "Point Description" column of Table A.
11. For intersections between two state routes, return to the CDDS home page and select the "SR Intersections" tool.
12. Repeat steps #2-6. Using information from Table A, enter a minimum number of accidents that will be conducive to producing a list of intersections with a large number of crashes.
13. Hit "Search" and wait for the results.
14. Copy the resultant table and paste it into a *different* Excel spreadsheet (save the spreadsheet).
15. In Excel, sort the table on the number of crashes, producing a ranked list. Refer to this as Table B. The analyst now has crash totals for intersections between two state routes.
16. To get crash totals for intersections between state and federal-aid routes, return to the CDDS home page and select the "Advanced Search" tool.
17. Based on the data in Table A, select federal-aid routes at intersections at which the number of crashes is fairly large. Use the data in Table B to restrict the selections.
18. In Advanced Search, select the following search fields: Route_Num and Milepoint.
19. Hit "Build Search," producing a new view with a new set of criteria.
20. Enter the starting and ending years of the study period.
21. Scroll down and select a federal-aid route, based on the results of step #17.
22. Enter the starting and ending milepoints – each value should be the milepoint of an intersection $\pm$ 0.09 mi (for a 500-ft radius of influence).
23. Hit "Search" and wait for the results. Once the resultant table appears, scroll down to see the total number of crashes. Record the value, or, add it to the number of crashes for the intersecting state route, and enter the sum, along with the intersection information, into Table B.
24. Return to the "Select Criteria" view and select another federal-aid route.
25. Enter the milepoints, as in step #22, and execute step #23.
26. Repeat steps #22 and 23 until all of the federal-aid routes chosen in step #17 have been covered.
27. Table B should now contain crash totals for state route-state route and state route-federal aid route intersections.
28. Finally, copy the crash totals from the state route-other road intersections listed in Table A into Table B.
29. Sort Table B on the crash totals, producing a ranked list.

To develop a statewide list, combine the three regional and three district tables, then do an overall sort. Regarding step #5, the user may want to enter different values until the list reaches its desired length. In Figure 6.3, the inputs shown produce a preliminary list of the 25 intersections having the most crashes in Region 1.

7.2 Ranking Intersections by Crash Severity Scores

There are, potentially, several ways to develop ranked lists of intersections based on crash severity scores. None of the CDDS intersection tools compute severity scores directly, so the analyst must develop an approach. The challenge is to find intersections that have numerous severe crashes. In Regions 1, 2 and 3, and the Cedar City District of Region 4, there were plenty of intersections that had fatal and/or multiple incapacitating injury crashes during the 10- and 3-year study periods. In the Price and Richfield districts, the number of intersections having severe crashes was limited, so it was necessary to also consider bruises-abrasions crashes. The following procedure – not necessarily the only possible approach – was used to develop the severity scores lists. The 2004 CDDS was used:

1. Select the "Advanced Search" tool (see Figure 7.2).
2. Select the following search fields: Region/District and Severity.
3. Hit "Build Search," producing a new view with a new set of criteria.
4. Enter the starting and ending years of the study period.
5. Select a region or district.
6. Select a severity – for the first iteration, select "Fatal."
7. Hit "Search" and wait for the results.
8. Copy the resultant table and paste it into a spreadsheet, such as Excel.
9. Remove all crashes occurring along Interstate and Federal-aid routes (i.e., crashes not occurring on state routes).
10. In Excel, add a column to the spreadsheet and insert a "5" into each row – these values indicate that the crashes are fatal. Alternatively, each row can be highlighted with a distinguishing color.
11. Save the spreadsheet – refer to this as Table C – and return to "Advanced Search."
12. Reselect the search fields Region/District and Severity.
13. Hit "Build Search."
14. Enter the starting and ending years.
15. Select the same region or district.
16. Select a severity – for the second iteration, select "Broken Bones or Bleeding Wounds."
17. Hit "Search" and wait for the results.
18. Copy the resultant table and paste it into Table C.
19. As in #9, distinguish each of these crashes with either a "4" or a different color.
20. Sort Table C by route number and milepoint.

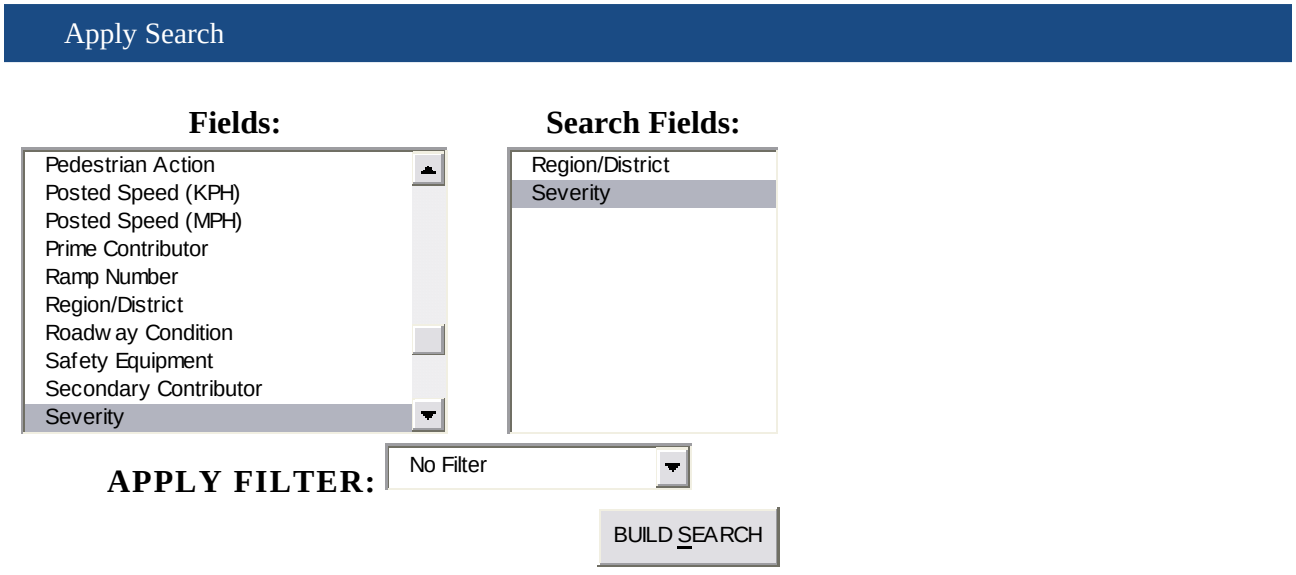


Figure 7.2. Advanced Search Example: Crash Severity by Region or District

As mentioned above, for the Price and Richfield districts, a third iteration on "Bruises and Abrasions" may be necessary. The analyst now has a spreadsheet that includes the fatal, incapacitating injury, and possibly bruises and abrasions crashes that occurred in the given region or district during the study period. The next step is to identify those crashes that occurred within the functional area of an intersection. To reduce the number of locations being considered, it may be useful to examine the routes and milepoints for clusters of crashes. The analyst may define a "cluster" as one or more fatal, or five or more incapacitating injury crashes, for example. For a 500-ft radius of influence, crashes occurring within 0.18 mi of each other *may* be associated with the same intersection. Single or few crashes at isolated locations may not need to be considered. The analyst should maintain an approximate count of the number of clusters. Once the number exceeds some minimum value, such as 50 or 100, then isolated crashes can be removed from the spreadsheet. Then, to identify intersections:

21. Modify Table C to highlight clusters of fatal and broken bones-bleeding wounds crashes, as discussed above.
22. Take special note of the routes along which the crash clusters occurred.
23. Return to the "Intersections" tool.
24. Enter the starting and ending years.
25. Select a route based on information from the modified spreadsheet.
26. Leave the starting (0) and ending (1000) milepoints as is to ensure that the entire route is searched.
27. Set the radius to 500 ft.
28. Set the "Total accidents greater than" criterion equal to zero to ensure that all crashes along the given route are included.
29. Hit "Search" and wait for the results.
30. The resultant table provides a list of all of the intersections along the state route. Compare the milepoints in this table with those in the modified spreadsheet. Eliminate crash clusters that are not within 0.09 mi of an intersection. It would be useful to enter the milepoints and name(s) of the selected cross-streets into Table C.

The purpose of the final set of steps is to determine the severity scores for the selected intersections. Following step #29, the analyst should have a spreadsheet with fatal and incapacitating injury crashes clustered around intersections along state routes.

31. Return to the "Advanced Search" tool (see Figure 7.3).
32. Select the following search fields: Route_Num (route number), Milepoint, and Severity.
33. Hit "Build Search," and produce a new view with a new set of criteria.
34. Enter the starting and ending years of the study period.
35. Select a route.
36. Enter the starting and ending milepoints – each value should be the milepoint of an intersection $\pm$ 0.09 mi (for a 500-ft radius of influence).
37. Select a severity – start with "No Injury."
38. Hit "Search" and wait for the results.
39. Once the resultant table appears, scroll down to see the total number of crashes of the selected severity for the given intersection. Record the value for future application.
40. Return to the "Select Criteria" view and select another severity – for the second iteration, choose "Possible Injury."
41. Hit "Search" and wait for the results.
42. Repeat step #38, record the value, then repeat steps #36-40 for the other three crash severities.

As in section 7.1, it is necessary to find the crash severity scores on the *intersecting cross-streets*. As before, identify the intersecting state route or federal-aid route and milepoint – this information should be available from step #30. For intersections with "other roads," there is no further work to do, and the results obtained in step #41 are final. In "Advanced Search," repeat steps #34-40 for the intersecting state routes and federal-aid routes.

Once the preceding procedure has been completed, the analyst should have the total number of crashes, for each of five severities, for the study intersection, *and* its cross-street. The analyst can now compute the severity score for the intersection. Steps #31-42, along with the procedure in the paragraph following step #42, must be repeated for every intersection in the spreadsheet. Once this work is done, the analyst can perform a sort on the severity scores.

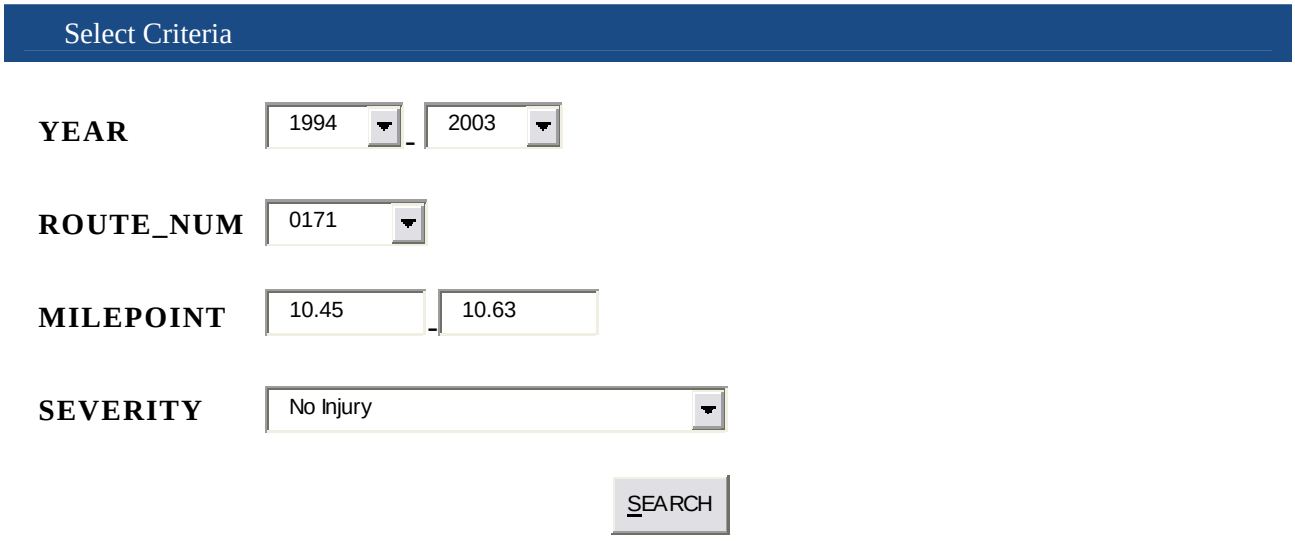


Figure 7.3. Advanced Search Select Criteria Example: SR 171 at milepoint 10.54

7.3 Locating Intersections with Fatal Crashes

To find intersections having one or more fatal crashes during a given study period, the research team used the "Advanced Search" tool, as in steps #1-9 from section 7.2. Then, to eliminate fatal crashes not occurring at intersections, apply steps #23-30 from section 7.2. The analyst should now have a spreadsheet (Table D) that contains intersections at which fatal crashes occurred. By grouping the routes and milepoints, the analyst should begin to observe intersections at which multiple fatal crashes occurred. To complete the tabulation, it is necessary to identify fatal crashes on the intersecting cross-streets. The procedure described in the paragraph following step #42 in section 7.2 can be applied, except that the analyst is searching for fatal crashes only. Note that all of this information may have been compiled during the procedures described in section 7.2. There may be no need to repeat these steps, but the analyst may be interested in intersections in addition to those summarized in section 7.2.

7.4 Crash Rates

Crash rates for state route-state route intersections can be tabulated using the 2005 version of the CDDS:

1. On the home page, select "Accidents" within the "Applications" menu.
2. Click "Intersection" in the upper menu.
3. Enter the starting and ending years of the study period.
4. Select a region or, for Region 4, a district.
5. Set the radius to 500 ft.
6. Set the "Total accidents greater than" to 2 – this will ensure that crash rates at intersections experiencing no more than one crash during the study period are excluded.
7. Leave the other inputs as is, click "Search," and wait for the results.
8. Column 8 of the resultant table features the crash rate at each state route-state route intersection in the study region.
9. Copy the table and paste into a spreadsheet. Refer to this as Table E.
10. In the spreadsheet, sort the tabulation on the crash rate. The sort produces a ranked list.

The analyst should be aware that the CDDS crash rate is the total number of crashes at the study intersection during the study period divided by the total entering traffic volume *during the most recent year*, multiplied by one million. The CDDS crash rate, therefore, is accurate *only if* the study period is one year in length. To properly adjust the rate, one approach is to divide the CDDS crash rate by the length of the study period in years, as follows:

$$\text{Adjusted CDDS crash rate} = \frac{\text{CDDS crash rate}}{\text{Length of study period (years)}}$$

7.5 Non-Signalized Intersections

The research team used the 2005 version of the CDDS to compile crash statistics at non-signalized intersections. The 2005 CDDS featured a "Point of Interests" tool, not available in the 2004 CDDS that made the identification of the traffic control type at each intersection straightforward. To rank non-signalized intersections according to the number of crashes and crash severity scores, the procedures described in Sections 7.1 and 7.2 should be applied. An additional component of the analysis, though, is the traffic control type at each intersection. This can be determined as follows:

1. On the home page, select "Points of Interest Admin" within the Applications menu.
2. Select a route number.
3. Enter the starting and ending milepoints. If the entire route is being examined, then the default entries of 0 and 1000 can be left as is. If the analyst wants to restrict the search range to, say, the portion of a route within a given region or district, then the appropriate milepoints can be entered.
4. Click "Search" and wait for the results.

The resultant list includes the milepoint of and traffic control at each intersection along the route. Note that it is not possible to distinguish between two-way and four-way stop signs. The analyst can "eliminate" signalized intersections by comparing these lists with those developed using the procedures in sections 7.1 and 7.2. Alternatively, the analyst could copy and paste each resultant list into a spreadsheet. If the analyst adds the crash information at each intersection, then the spreadsheet can be sorted by traffic control type. The shortcoming of the latter approach is that very large databases will be generated (i.e., crash and traffic control data at each intersection along each study route).

7.6 Collision Statistics

As discussed in Section 6, the research team compiled collision-related statistics for a group of 35 study intersections. The statistics compiled included:

- Crash types
- Crash severities
- Direction of travel
- Crash rates
- Collision types
- Functional radius of influence

The retrieval of crash severities is described in section 7.2, while crash rates are described in section 7.4. Crash types and collision types were obtained in a similar manner as crash severities. Upon accessing "Advanced Search" the analyst selects "Accident Type 1" to get information on crash types, and "Collision Type" for collision types. The research team used "Accident Type 1" *only*, but search fields exist for "Accident Type 2" and "Accident Type 3." The latter types pertain to multiple-vehicle incidents in which more than one crash type was applicable. The research team did not conduct a thorough examination of these additional crash types at the study intersections, but further study is recommended.

The number of crashes by direction of travel at each intersection is a standard output of the CDDS. That is, following each search, the display window summarizes the number of crashes by direction – for state route-state route intersections, all four approaches (legs) are summarized; for state route-federal aid route intersections, only the two legs on the state routes are summarized. The research team observed that the 2004 CDDS summarizes the *number of vehicles involved* in crashes on each leg. Contrarily, the 2005 CDDS summarizes the *number of crashes* on each leg. The analyst may find each of these summaries to be useful. To confirm crash totals, however, the 2005 CDDS summary is easier to apply than that of the 2004 CDDS. The research team also observed that the leg assignments at each intersection are straightforward in *most* applications. At intersections where routes change directions – SR 11 and US 89 in Kanab, for example – the analyst must be careful in assigning legs to routes.

As mentioned previously, the analyst can easily adjust the functional radius of influence on the "Advanced Search" search criteria page, the "Intersections" tool page, or the "SR Intersections" tool page. The CDDS will apply the same radius to all intersections meeting the search criteria. If the analyst wishes to vary the radius, then he or she must run multiple searches on different values. This is a time-consuming exercise, but may be critical to understanding the sphere of influence of an intersection.

8. References

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