Access Management Research and Awareness Program
Phase IV Final Report

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Iowa Department of Transportation

ACCESS MANAGEMENT RESEARCH AND AWARENESS PROGRAM PHASE IV FINAL REPORT

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INTRODUCTION

Access management involves balancing the dual roles that roadways must play—through travel and access to property and economic activity. When these roles are not in proper balance, the result is a roadway system that functions sub-optimally. Arterial routes that have a too high driveway density and provide overly extensive access to property have high crash rates and begin to suffer in terms of traffic operations. Such routes become congested, delays increase, and mean travel speeds decline.

OVERVIEW OF PREVIOUS PROJECT PHASES

The Iowa access management research and awareness project has had four distinct phases. Phase I involved a detailed review of the extensive national access management literature so lessons learned elsewhere could be applied in Iowa. This phase resulted in a printed literature review. In addition, during this phase large cities and counties in Iowa were surveyed in terms of their awareness and practice of access management. This survey demonstrated a need for additional education about the subject.

In Phase II original case study research was conducted in Iowa. These case studies were analyzed to determine the impacts of access management treatments on traffic safety, traffic operations, and the vitality of businesses along access-managed corridors. Refer to *Access Management Awareness Program Phase II Summary Report* (December 1997) and *Access Management: Coralville, Iowa, Case Study* (July 1998) for additional information. Several access management projects in Iowa implemented during the 1990s demonstrated a significant and positive impact on both traffic safety and traffic operations. For example, past access management projects in Iowa were found to reduce crash rates an average of 40 percent.

Phase III of the project concentrated on outreach and education about access management. An Iowa access management conference was held in May 1998 and attracted several hundred people from Iowa as well as several nearby states, including Kansas, Minnesota, Missouri, and Nebraska. Printed materials and a video were also prepared in order to educate technical and non-technical audiences about access management. Presentations on access management principles, benefits, and impacts were made to a large number of interested audiences.

PHASE IV WORK PRODUCTS

Phase IV of the Iowa access management project extended the work conducted during Phases II and III. The main work products for Phase IV were as follows:

- Three additional before and after case studies, illustrating the impacts of various access management treatments on traffic safety, traffic operations, and business vitality.
- An access management handbook aimed primarily at local governments in Iowa.

- A modular access management toolkit with brief descriptions of various access management treatments and considerations. This toolkit is more technical than the handbook and is intended to serve as an educational resource for engineers and planners who need to develop access management projects in their jurisdiction.
- An extensive outreach plan aimed at getting the results of Phases I through IV of the project out to diverse audiences in Iowa and elsewhere. Presentations were made in Iowa to groups including the Iowa Chapter of the American Planning Association (APA), the Iowa Downtown Conference, the Iowa Chapter of the American Public Works Association (APWA), the Iowa Association of Regional Councils (IARC), the Iowa Traffic Safety and Control Association (ITSCA), the Iowa Department of Transportation's Field Services staff, and the Iowa County Engineers Association. Outside Iowa, presentations were made at the AASHTO Mississippi Valley conference, the National Access Management Conference, the TRB Transportation and Law Workshop, the National Value Engineering Conference, and the Midwest Transportation Planning Conference. Iowa's research results on access management have gotten a lot of national attention, particularly the business vitality research.

The handbook, toolkit, and previous materials produced by the Project are available though the Center for Transportation Research and Education (CTRE). Past research reports—up to and including Phase IV—are or soon will be available on the World Wide Web at: http://www.ctre.iastate.edu/Research/access/.

A short videotape overview of access management, aimed at a non-professional audience, was co-produced by CTRE and the Iowa Department of Transportation, and is also available in limited quantities from CTRE.

SUMMARY OF PAST CASE STUDY RESULTS FROM PHASES II AND III

A total of seven full case studies and a number of partial, "sidebar" case studies were produced during Phase II. In addition, a study of improvements along US 6 in Coralville was produced during Phase III. These case studies have indicated that:

- Access management is a powerful tool for improving highway safety. All but one of the eight Phase II and III case studies (US 71 in Spencer) led to an absolute reduction in highway crashes. All eight resulted in reductions in crash rates per million vehicle-miles of travel; the range of crash rate reductions was from 10 to 70 percent, with 40 percent being a typical reduction post-project. The most significant reductions in crashes occurred in terms of property damage only crashes, rear-end collisions, and broadside/left-turn collisions.

- Access management projects also generated significant operational and traffic flow benefits. Access management projects in Iowa are typically initiated on routes with moderate levels of traffic by national standards. However, on the case study routes they resulted in significant increases in the ability of roads to carry

traffic at levels of service to motorists that indicate little or no congestion or delay at peak travel periods.

- The most compelling results (besides safety benefits) from the Phase II and III case studies came in terms of impacts on businesses and business customers along the routes. Perceived impacts of access management on adjacent commercial businesses and landowners are often major impediments to projects moving forward. The case studies showed that in fact access management projects are rather benign in terms of business impacts. Access managed corridors generally had lower rates of business turnover than other parts of their communities. They had more rapid growth in retail sales once projects were completed. Far more business owners, when surveyed, indicated that their sales had been stable or increased following project completion than reported sales losses.

PHASE IV CASE STUDIES

The three new case studies for Phase IV were selected by the Iowa Access Management Task Force to fill out the portfolio of projects developed during Phases II and III. Additional geographic coverage and project type coverage resulted. The three new case studies were from the city of Bettendorf (one project) and the Des Moines area (two projects) and involved three types of access management treatments: a two-way left-turn lane project, a full-raised median project, and a project that installed raised medians and left-turn lanes only at major intersections over a long period of time.

The three new case studies are presented below.

Bettendorf Case Study

(Continuous two-way left-turn lane)
US Highway 67/ State Street
From 26th Street to S. Bellingham Street

Background

The Community The community of Bettendorf is located on the Iowa-Illinois border just east of Davenport. While Bettendorf has a population of about 30,000 people, the total urbanized area, known as the Quad Cities, is well over 120,000 people. The metropolitan area includes the communities of Davenport and Bettendorf, Iowa, and Moline and Rock Island, Illinois. In the past five years, the Quad Cities area has had considerable growth in population, retail trade, and manufacturing and industrial development, therefore expanding the need for highway transportation.

The Transportation Environment The corridor of State Street (US 67) facilitates commuters from both Iowa and Illinois travelling between Interstate Highways 80 and 74. The extensive population growth and development of manufacturing and other commercial businesses in the Quad Cities over the last couple of years has increased the utilization of this highly traveled commuter route. In addition, two large casinos are located just west of the corridor area. As a result, traffic volumes along US Highway 67 can be very heavy at times, especially during the morning and evening commutes.

The Study Area The area of focus for this case study is a section of US Highway 67 in Bettendorf. The study area extends from 26th Street on the west side of the city limits to South Bellingham Street on the east. This section of US Highway 67 was a four-lane undivided roadway in the early 1990s. The study corridor is approximately 1.3 miles in length with a posted speed limit of 35 miles per hour. Within this study area traffic volumes are moderately high, with an estimated 21,600 vehicles a day traveling this corridor on average today. This number can be assumed to be higher in future years due to the opening of new river-based casinos in the area.

The Before Environment Over the last several years, the US Highway 67 corridor has become a heavily traveled commuter route. A varied mix of land uses can be found along this corridor, including heavy commercial and industrial plants with a small amount of light residential. The types of commercial activity that traditionally have been present on State Street include convenience stores, gasoline service stations, restaurants, taverns, and other automobile oriented shops. Mixed among these commercial developments are other land uses, such as light industrial plants including a concrete plant and several residential areas including trailer homes and small single family residential homes.

Even with the large amount of commercial activity in this study area, access management had not been implemented until the 1996 project. Prior to the 1990's, access was not

controlled sufficiently and turning traffic began to disrupt traffic flow. As of 1995, there were over 41 driveway access points on the south side of the State Street case study corridor and 39 points on the north side—a total of over 60 driveway access points per mile. These access points complicated the flow of traffic by creating numerous conflict points and had potential to cause crashes, congestion and traffic delays. Early in the 1990's, the traffic volume for State Street was approximately 20,000 annual average daily traffic (AADT). This was already one of the most highly traveled corridors in the city of Bettendorf.

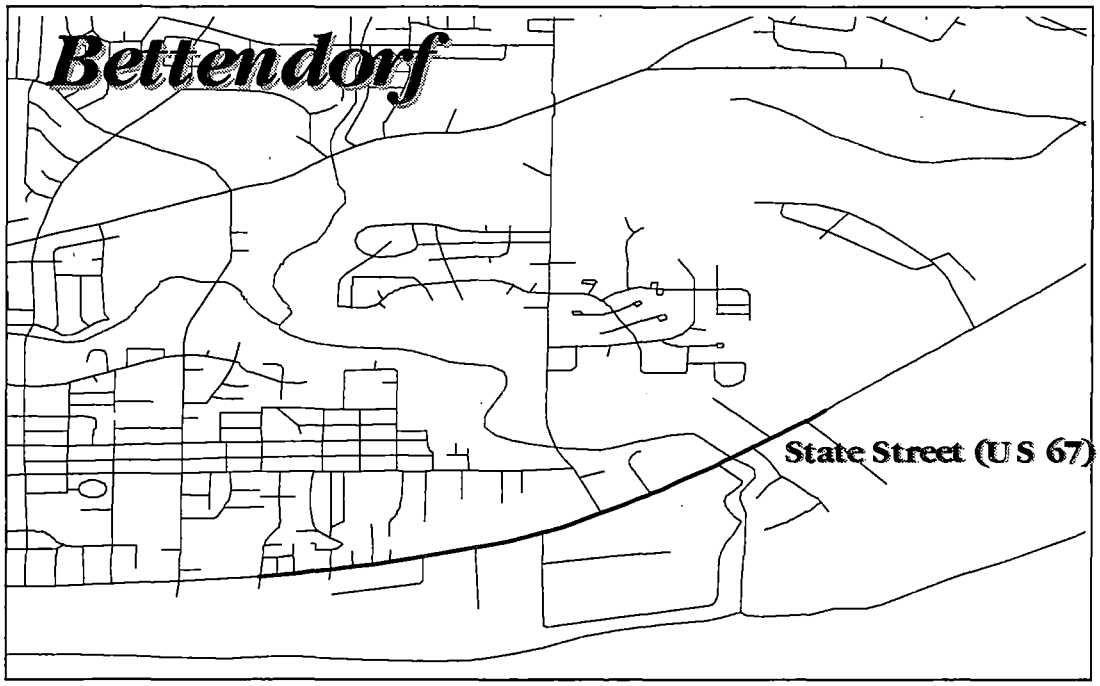


Figure 1: Map of case study site in Bettendorf, Iowa

Analysis

As a result of the high number and density of access points along US Highway 67, this study area began to see many typical access-related problems in the early 1990s. The combination of unmanaged access and growing traffic volumes led to safety and congestion problems within the study area. Because of concerns about what was happening to the corridor, the City of Bettendorf and Iowa Department of Transportation (Iowa DOT) began to take steps to correct the access-related problems.

Safety Concerns As was seen with previous Iowa access management case studies, poor access control can result in significant safety problems. In this study area, there has been an increase in traffic volume since 1990 and with the poor access management, there was also an increase in the number of crashes in the corridor. In this area alone, between 1990–1995, there was an average of 62 crashes every year—more than one per week.

There was a steady increase of crashes per year since 1990 (with 52 crashes), peaking at 71 crashes in 1995. This represents a 37 percent increase in crashes over five years.

Operational Problems In addition to the increasing number of crashes every year, there were also beginnings of operational and traffic flow problems. This corridor had become a highly utilized commuter route, and the amount of traffic volume was growing considerably every year. The traffic volume is projected to continually increase because of the amount of development happening overall in the Quad Cities metropolitan area. Because this route had become a commuter route, problems with congestion and a lower level of traffic service tended to occur mainly at peak hours. However, the opening of several gambling casinos nearby was expected to lead to a situation in which off-peak congestion also occurred.

Improvement Process As a result of the number of crashes and the steadily increasing traffic volume, plans to improve this corridor were undertaken in 1996. These plans involved adding a continuous two-way left-turn lane in the middle of the roadway to help remove left-turning traffic from through traffic. With funding from the Iowa Department of Transportation's Traffic Safety Improvement Program (TSIP), the construction of the two-way left-turn lane began in 1996.

Results

A continuous two-way left-turn lane was added from 26th Street all the way to South Bellingham Street in the neighboring city of Riverdale. This fifth lane was added all the way through the study area and was developed so that any left-turning automobiles on either side of traffic could use the lane. This lane is only to be used for traffic turning left into a driveway or other accessway. There were also some other minor improvements made to the roadway during the construction of the center turn lane. Today, US Highway 67/State Street is a wider, safer, and better functioning corridor for drivers to use (see Figure 2).

Figure 2: State Street (US Highway 67) after the addition of a continuous two-way left-turn lane

Crash Reduction After the completion of the 1996 improvement project on State Street (US Highway 67), the study area has seen considerable progress in reducing the number of crashes. The peak of crashes occurred in 1994–1995—right before the project began. The amount of decrease in the number of total crashes from before the project to after the project, 1996–1997, is approximately 50 percent.

As in other access management projects, the largest decrease in crashes was in access related types of crashes such as broadside left-turn, broadside right-angle, and rear end collisions. The largest category of crash reductions was in broadside left-turn crashes. There was a 91 percent reduction in those crashes; 22 crashes occurred from 1994–1995 and only five crashes after the project was in full effect. This has been the most significant accomplishment of this project. The number of rear-end crashes also decreased substantially from 59 crashes in 1994–1995 to 31 crashes in 1996–1997--a decrease of almost 50 percent (see Table 1).

Table 1: US Highway 67 (State Street) crash statistics

Year	Broadside/ Left Turn	Broadside/ Right Angle	Rear End	Other Crashes	Total
1990	5	6	24	17	52
1991	6	4	15	30	55
1992	8	2	21	26	57
1993	14	3	25	26	68
1994	9	5	30	26	70
1995	13	4	29	25	71
1996	3	7	22	17	49
1997	2	3	9	7	21
1990–95	55	24	144	150	373
1994–95	22	9	59	52	141
1996–97	5	10	31	24	70

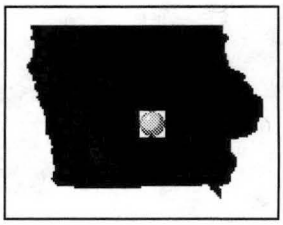
The crash rate (expressed in crashes per million vehicle-miles traveled (VMT)) on State Street was cut by more than half from 1994 to 1995 (before project completion) through 1996–1997 (after project completion); it was 7.5 per million VMT in the earlier time period and 3.4 after. This result is entirely consistent with the findings from other Phase II and III Iowa case studies where two-way left-turns were employed.

Improved Operations The ability of the roadway to handle increased traffic flow has also been increased since the implementation of the project. With the addition of the center lane, the flow of traffic is improved and this can be attributed to the access improvements that have removed most left-turning vehicles from the four lanes of through traffic. This adjustment of lane assignments has eliminated some conflict points, as well as increased the amount of volume the corridor can handle effectively at peak periods. Previously congestion along this route tended to occur at peak times (e.g. manufacturing shift changes) but has been lessened.

Although the traffic volume handled by the route increased by about eight percent after project completion, the approximate traffic level of service provided at peak hours increased from a "C" to a "B."

Conclusion

This project is an excellent example of how access management can improve operational efficiency and decrease the amount of potential problems that can occur on America's roadway today. By eliminating conflict points on this study area, the project has helped decrease the amount of crashes that occurred and also improved the flow of traffic. This access management project was successful in attaining its goal of decreasing crash rates and improving the overall efficiency of the roadway.



West Des Moines/Des Moines Case Study

(Improved with full raised medians and turning bays)
Iowa 28 / 63rd Street / 1st Street
From Railroad Avenue to Grand Avenue

Background

The Community West Des Moines, one of the largest suburbs of Des Moines, is also one of the fastest growing areas in the state of Iowa. Geographically located just west of Des Moines, it houses many commuters to downtown or other parts of the metropolitan area. The study corridor area is located on the border between the cities of West Des Moines and the core city of Des Moines; combined, these two cities have a population of nearly 235,000 people. The Des Moines metropolitan area is the largest in the state in terms of population and area. However, the core city is not growing either in population or employment.

The Transportation Environment Iowa Highway 28, also known as 63rd/1st Street on the border of Des Moines and West Des Moines helps motorists commute both north and south and also serves as the home for a limited amount of commercial development. Many commuters from the southwest part of the metropolitan area utilize this road to either access Grand Avenue or Interstate 235 for transport to the downtown area. Grand Avenue serves as a major arterial, moving a majority of commuters between West Des Moines and the downtown business district of Des Moines. Railroad Avenue intersects Iowa 28 about nine-tenths of a mile south of the Grand Avenue intersection and is utilized mainly as a local corridor by the people of West Des Moines, but because of the continual growth of West Des Moines' population, this avenue could become a major corridor in the future. Railroad Avenue runs parallel to the Valley Junction Railroad; most traffic utilizing this roadway accesses recreational facilities, commercial businesses along the corridor, and the historic Valley Junction shopping district.

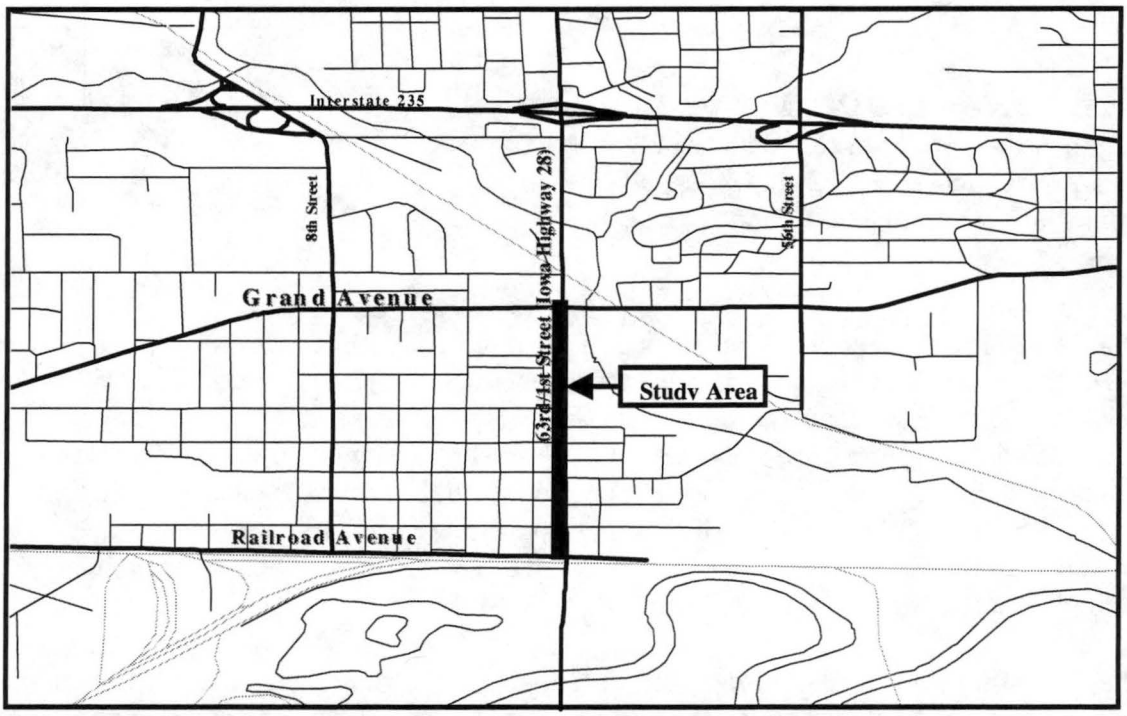


Figure 3: Map of case study site in West Des Moines/Des Moines, Iowa

The Study Area The focus area for this case study is a section of Iowa Highway 28, locally referred to as either 1st Street or 63rd Street, depending on which side of the street one is on. (The street numbering systems in Des Moines and West Des Moines are not coordinated and the Des Moines street numbering system ends at 63rd Street). Iowa 28 runs in a north-south direction between Interstate 235 to the north and Iowa Highway 5 to the south. This section, between Grand Avenue on the north and Railroad Avenue on the south, lies along the border between Des Moines and West Des Moines. Grand Avenue intersects with Iowa 28 one mile south of Interstate Highway 235. This part of Iowa Highway 28 was formerly a four-lane undivided roadway and was improved by implementing full raised medians and left-turn bays in 1991. This study corridor is approximately 0.9 miles in length with a posted speed limit of 35 miles per hour. The traffic volume was approximately 18,500 AADT in 1997 and was approximately 18,700 AADT in 1992, indicating a small decrease in traffic over time. This is somewhat surprising given the growth of the area; however nearby areas were flooded out during 1993 and some adjacent and nearby properties were purchased and razed as a result of the highway project and flood cleanup efforts.

The Previous Corridor Environment In recent history, many metropolitan areas have expanded much more quickly in land area than in population, a phenomenon commonly known as urban sprawl. The Des Moines metropolitan area has followed this national trend with the recent explosion of population and land development in suburban Des Moines, especially in West Des Moines. With this high rate of growth in population in the last decade and potential growth to the south and southwest, Iowa Highway 28 has the potential to become a high volume corridor. This area was a low-density residential area

but its land uses are now predominantly commercial with a small amount of residential land uses scattered between Walnut Street and Vine Street. The commercial land uses in this area include a wide variety of offices, restaurants, service businesses, and convenience stores. Some of this variety includes a bakery, an auto parts store, a furniture store, a hardware store, a video store, an engineering firm, a financial broker service, and several gasoline service stations.

Access along this section of roadway was not well managed before the project in 1991. There were many driveways lining each side of the road, especially near the residential area, where driveways were practically unlimited and packed closely together. Without any type of control around the medians, traffic was continually darting across oncoming traffic to get to their desired destinations. This created numerous conflict points and safety problems.

Traffic volumes around this section of roadway have remained relatively constant over the last seven years, between approximately 18,700 vehicles per day in 1992 and 18,500 vehicles per day in 1997. The busiest portion of roadway in the study area is the intersection of 63rd Street and Grand Avenue, where two routes that many people use to commute to and from work cross. Traffic volumes on routes around the study corridor are higher than those immediately inside the study area. For example, north of the intersection of Grand Avenue, 63rd Street has 23,700 annual average daily traffic (AADT) and south of the intersection with Railroad Avenue, 63rd Street has an AADT of about 22,200.

Analysis

During the 1980s and early 1990s Iowa Highway 28 began to have many traffic problems related to a lack of access management. With the high number of access points along this commuter route, traffic problems were increasing daily and could be anticipated to increase in the future as West Des Moines continued to develop.

Crash History and Safety Concerns Because of the lack of access control and the high potential growth rate of daily traffic in this study area, traffic safety became a major concern leading up to the project. The highest rate of crashes that were related to the uncontrolled access were rear end collisions and right-angle broadside collisions. These two types of collisions accounted for over 50 percent of all crashes in the area in the early 1990s. The majority of rear end collisions involved left turning vehicles waiting in the inside lanes to turn into driveways for both commercial and residential properties.

In 1990 there were 15 rear end crashes alone, causing an immediate concern for traffic safety. There were 41 total crashes in this study area in 1990—nearly on per week—and the majority of these crashes could be linked to the lack of controlled access.

Operational Problems Both sides of the corridor were beginning to become commercialized, leading to an increase in the amount of traffic that is turning across traffic and slowing down the flow of traffic. These types of movements are the biggest safety concerns for drivers. The volume of traffic on Iowa 28 is highest during rush hour

due to the use of this route for commuting. Most operational problems that were developing were associated with high volumes of traffic during peak commuting hours.

Results

In 1991, an extensive improvement project occurred that reconstructed Iowa Highway 28 between Grand Avenue and Railroad Avenue. This project took the four-lane undivided roadway and improved it with full raised medians and turning bays. In addition to this construction, there were also minor improvements in terms of driveway consolidation and some widening of business driveways to complement the access control that was implemented.

The implementation of a median in the middle of an undivided highway caused right of way to be taken on both the east and west sides of the study area. Some homes and commercial properties were purchased in order to accomplish the project. Median openings with left turning bays were left at high traffic intersections and roadways: Grand Avenue, Walnut Street, Locust Street, Vine Street, Winona Avenue, and Walnut Street. In addition to these openings with the left turning bays, there were four more median openings distributed along this 0.9-mile long case study area. These accessible turning areas are concentrated mainly around commercial areas, but the new raised median has put control on the amount of turning traffic (see Figure 4).

Figure 2: Iowa Highway 28 (63rd Street/1st Street) today

Crash Reduction Since the completion of this project in 1991, Iowa Highway 28 is a very different roadway in terms of safety. Before this project was completed there was little control of turning traffic along this commercialized corridor and this was becoming hazardous to drivers. As may be seen in Table 2 below, this project has considerably

increased the safety of this roadway. In almost every crash classification there is a considerable reduction, but especially in rear end collisions and total amount of crashes. The amount of traffic on the route has remained relatively stable in the last 10 years; however the amount of total crashes has been reduced by approximately 51 percent.

Table 2: Iowa Highway 28 crash statistics

Year	Broadside/ Left Turn	Broadside/ Right Angle	Rear End	Other crashes	Total
1990	1	6	15	19	41
1991	0	5	10	10	25
1992	0	3	17	11	31
1993	0	2	8	13	23
1994	2	1	8	9	20
1995	0	7	4	6	17
1996	6	2	4	11	23
1997	1	0	4	15	20

The crash rate along Iowa Highway 28 has improved dramatically. Prior to project completion, it was about 6.7 crashes per million vehicle-miles traveled. After project completion, the crash rate declined by about 51 percent, to 3.3 crashes per million vehicle-miles traveled. The 51 percent figure is consistent with experience from other projects studied in Iowa during Phases II and III of the Iowa access management research and awareness project. This current crash rate is indicative of a very safe roadway.

Improved Operations In addition to the vast improvement of crash reduction, the flow of traffic and decrease in congestion have increased the level of service this corridor provides since the implementation of this project. With the implementation of a median and left-turning bays, this has improved the flow of traffic and has improved the congestion problems included with stopped left-turning traffic. The turning bays provided for turning traffic have removed most left-turning vehicles from the four lanes of through traffic resulting in less stop and go traffic. As a result, fewer points cause problems, and this corridor can handle more traffic without increasing safety problems.

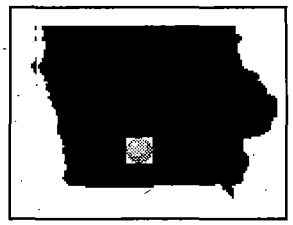
The traffic level of service on this stretch of roadway has improved from a "B" or "C" to a virtually free-flowing "A." This roadway will clearly be able to handle the new traffic growth that can be expected on the south sides of Des Moines and West Des Moines as the new southern beltway around Des Moines is completed and land development occurs to the south of Des Moines.

Conclusion

This roadway, considered fairly safe before any access management improvements, shows how even minor improvements can increase safety. Although the improvements were considered controversial by some area business owners, they have increased the overall safety of the corridor. The improvements have also increased the corridor's ability

to carry higher traffic volumes without increasing safety hazards or hurting traffic flow. This may be important soon since a new development is under construction south of this study area.

Des Moines Case Study



(Channelized with raised medians and improved intersections)
US Highway 5 (Army Post Road)
From SE 14th Street to SW 14th Street
And SW 9th from Army Post Road to Bell Avenue

Background

The Community Des Moines is the capital of Iowa, and also its largest city. Des Moines is located about 30 miles south of the geographic center of the state at the intersection of Interstate 35 and Interstate 80. This city of almost 200,000 people is located about 200 miles northeast of Kansas City, Missouri, and about 125 miles east of Omaha, Nebraska. In past few decades, Des Moines has become a business center for major insurance companies from all over the world and home to many other corporations and manufacturers.

The Transportation Environment Its size and strategic location makes Des Moines the most important transportation and commercial hub in the state. One of the higher volume arterials is Army Post Road, also known as Iowa Highway 5. This highway begins just six miles west of the SW 9th Street intersection as an exit and entrance to Interstate 35. Iowa 5 runs east through the southern section of Des Moines, then heads south and east to Knoxville, Iowa, and then continues directly south into Missouri. Iowa Highway 5 is in the process of being bypassed by a major project that encircles Des Moines on the east and south. SW 9th Street, a north and south corridor, is also another high-volume arterial that connects the downtown area to the south central part of Des Moines.

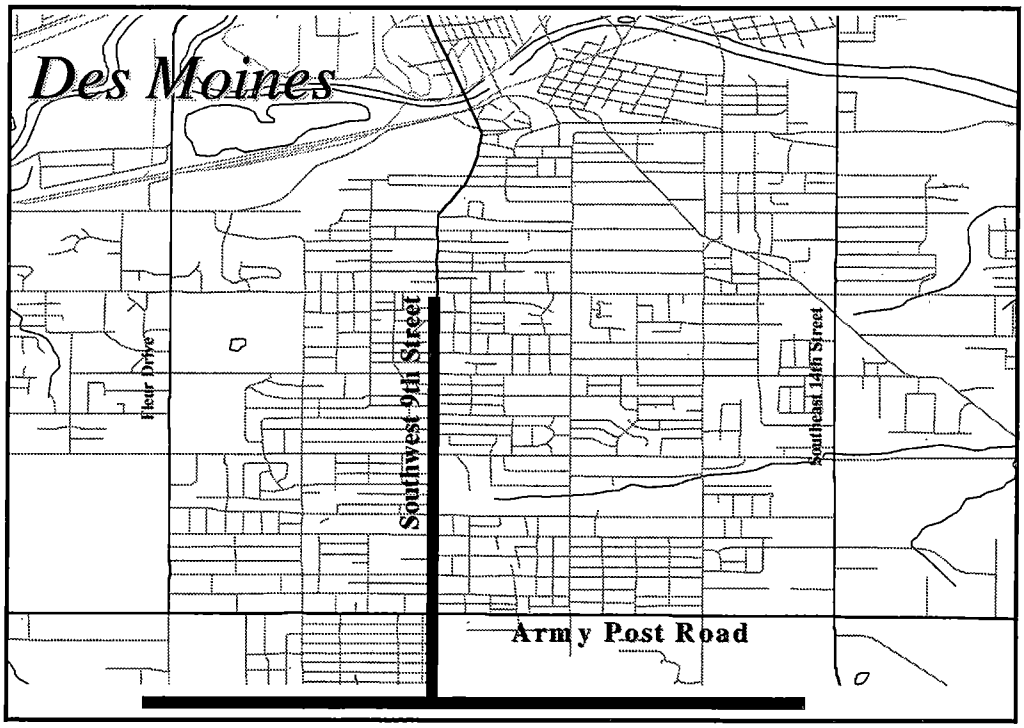


Figure 5: Map of case study site in Des Moines, Iowa

The Study Area The case study focus area is a section of Army Post Road between SE 14th Street and SW 14th Street. This study also includes SW 9th Street between Bell Avenue and Army Post Road going north to south. Both Army Post Road and SW 9th Street are heavily traveled roadways. Army Post Road serves as a major arterial access way for the south central part of Des Moines that serves the Des Moines International Airport, Interstate 35, the southeastern parts of the city, and Polk County.

This study section of Army Post Road is approximately four miles long, with a posted speed limit of 35 miles per hour. Several intersections near SW 14th Street were channelized with raised medians in 1989 and the intersection of South Union was improved in October 1997. Within this section of the study area, traffic volumes are high by Iowa standards with an estimated 23,800 vehicles a day on average in 1997. The highest volume area is between SE 2nd Street and SW 9th Street.

The study area of SW 9th Street is approximately 2.5 miles long with posted speed limits of 30 and 35 miles per hour. The main focus area includes the intersections at Bell Avenue, McKinley Avenue, Watrous Avenue, and Park Avenue. These intersection improvements included implementation of new medians and turning bays on these dates: Park Avenue was improved in 1983, Bell and McKinley Avenues were improved in 1984, and Watrous Avenue was done in 1985. This part of the focus area does not have as much traffic volume as the Army Post section, but has been estimated at 17,500 daily traffic (see Figure 6).

Figure 6: Typical section of SW 9th Street

Previous Corridor Environment Army Post Road has traditionally been a commercial corridor with the majority of land use in small commercial districts and businesses, although there are some larger commercial businesses, and shopping centers have developed around SE 14th Street. In the recent past there have been some new commercial developments along Army Post Road that enhanced the aesthetics and conditions of the area. The types of commercial activity which have traditionally been located along this corridor include restaurants, motels, taverns, convenience stores, a retail shopping mall, service stations, and churches. It is an area of what might be described as "mom and pop" businesses. Although the land use is mainly commercial, there are also some light industrial and residential uses. Some of the residential areas that border this corridor include a mobile home park, apartment complexes, and some single-family residential homes. The traffic volumes utilizing Army Post Road are currently about 23,600 vehicles per day.

The arterial of SW 9th Street is similar in land use to that of Army Post Road with the majority of land uses being commercial. Some of these include restaurants, doctor's offices, local insurance companies, churches, convenience stores, and other varieties of commercial businesses and services "Mom and pop" businesses dominate the area. Traffic volumes for this roadway average about 17,500 vehicles per day. There are some small residential areas within this corridor including single family residential houses and apartment complexes and public schools. This surrounding region is predominantly a home for many people that work in the local vicinity or in the downtown Des Moines area.

Controlling access along this study area became a concern early in the 1980s, primarily because the crash numbers on crash rates in the study area were considerably higher than

average. The areas on SW 9th Street were improved in 1983 through 1985 and similar improvements along Army Post Road followed later.

Analysis

The access management project that was implemented in this area is one of the earliest completed that have been researched in Iowa. Army Post Road is one of the main corridors in the south side of Des Moines and provides indirect access to the Des Moines International Airport, which is located at the intersection of Army Post Road and Fleur Drive. SW 9th Street, a highly traveled corridor on the south side of the metropolitan area, can be considered a commuter route for the people of this area, yet it is not utilized solely for this purpose. Access management became a concern in this area in the 1980s when the city began to improve some of the intersections and implemented channelized medians to try and control access uniformly. Raised median projects have been implemented incrementally since 1983 in hopes of solving the access management problems that have caused safety concerns in the area.

Accident History and Safety Concerns Because there was initially little control over access along Army Post Road and SW 9th Streets and traffic volumes were high, safety and traffic flow became concerns of the community in the southern part of Des Moines. Rear end collisions became a common occurrence in this focus area, along with the many other operational problems. Crashes happened almost daily along the study corridor. Unfortunately, comparable crash statistics do not exist from the 1980s. However, over the last eight years, crash numbers have remained remarkably constant in the study area, with over 300 in an average year. A large proportion of these has involved rear end collisions and turning traffic, as shown in Table 3.

Table 3: Crash statistics for Army Post Road and SW 9th Street

Year	Broadside/ Left Turn	Broadside/ Right Angle	Rear End	Other Crashes	Total
1990	61	46	93	128	328
1991	59	32	74	139	304
1992	66	34	103	115	318
1993	85	30	118	151	384
1994	68	50	113	134	365
1995	81	47	93	144	365
1996	67	33	72	127	299
1997	51	46	107	130	334
Total	**538**	**318**	**773**	**1068**	**2697**

This study focused on the entire system of roads (Army Post Road and SW 9th Street) in this area and found little change in the overall number and rate of crashes. However, focusing on just the areas with the highest level of access management (areas adjacent to the raised medians at the intersections) is also useful. The median improvements were mainly made at the intersections of major through streets such as Fleur Drive, South Union, Bell Avenue, McKinley Avenue, Watrous Avenue, and Park Avenue. As can be

seen in Table 4 below, the crash experience in these locations is much more positive overall. The average number of crashes per year from 1991 through 1997 at these locations averaged about 1.6 less than the average between 1984 and 1990. Still, the reduction amounted to only about four percent. Further, some of the median locations (e.g. Fleur and Watrous) appear to have been much more successful than others (e.g. McKinley and SW 9th/Army Post. At other intersections (South Union, Park, and Bell), the crash numbers have varied less over time.

Table 4: Crash statistics at major intersections with access management (raised median) improvements

Year	Fleur Dr	S. Union	Bell Ave	McKin-ley Ave	Watrous Ave	Park Ave	SW 9th/ Army Post	Total
1984	4	3	5	8	8	3	5	36
1985	4	5	7	7	5	5	4	37
1986	9	4	7	4	3	5	4	36
1987	5	6	7	6	8	9	8	49
1988	2	8	5	6	2	5	6	34
1989	6	9	4	5	6	6	7	43
1990	6	8	7	5	3	6	7	42
1991	3	4	7	5	2	5	9	36
1992	2	5	6	8	2	7	9	39
1993	1	3	7	3	3	9	9	35
1994	2	6	4	5	3	3	7	30
1995	4	6	4	11	1	3	9	38
1996	3	6	5	9	5	10	8	46
1997	3	4	3	8	1	4	8	31
Total	54	77	78	90	52	80	100	532
Mean	**3.9**	**5.5**	**5.6**	**6.4**	**3.7**	**5.7**	**7.1**	**38.0**
1980–1990	5.1	6.1	6.0	5.9	5.0	5.6	5.9	39.6
1991–1997	2.6	4.9	5.1	7.0	2.4	5.9	8.4	36.4
Diff-erence	1.3	0.6	0.4	-0.6	1.3	-0.1	-1.3	1.6

Operational Problems This study area is classified as a commercialized area, attracting many drivers and some pedestrians to this area. With the area also being a four-lane corridor, this route also attracts many commuters particularly those going toward and into downtown Des Moines. The flow of traffic along these corridors can be slow and sometimes stop and go because of traffic turning into and out of numerous unconsolidated driveways along this study area. Also, Army Post Road can become

congested due to a high number of passengers departing or arriving at the airport at its peak times.

Results

In an attempt to improve safety and traffic flow along Iowa Highway 5 and Southwest 9th Street in the southern part of the Des Moines metropolitan area, a series of similar road improvement projects have been implemented over a relatively long period of time. The majority of the improvements involved improving intersections with channelized medians. These projects were completed in phases, which occurred in 1983, 1984, 1985, 1989, and 1997. The roadways are still essentially four-lane undivided commercial corridors, but they are now divided near major public street intersections to help solve access problems at and near major corners and to channelize left-turning traffic. These projects did not include many other access control improvements. Few driveways were consolidated at the times of the projects and newly developed businesses or residential areas have caused an increase in the number and density of driveways along the corridor. The reason that improvements have been limited along Army Post Road is that much of the through traffic (on Iowa Highway 5) should be diverted as a result of the southern loop bypass of Des Moines. It is largely in place or under construction now and should be completed by the early part of the next decade.

With the implementation of these improved intersections, there has been an increase in safety around the major intersections, at least in terms of the rate of crashes per million vehicle-miles of travel. But there has not been a change in the raw number of crashes. Even though these medians were projected to improve the overall service of the roadway, without any consolidation of driveways there is still a safety problem with respect to traffic entering and exiting the driveways. The crash rate along the case study corridor, although reduced from about 6.7 crashes per million VMT, is still a relatively high 5.6 crashes per million VMT.

The traffic level of service along this case study corridor has not changed appreciably either as a result of this project. It was approximately at a level of service "C" before the medians were placed and still operates at that level. Daily traffic volumes have increased in the last couple of years and are projected to continue to increase because of the amount of new development in the southern part of the Des Moines metropolitan area. Any further increase in the amount of traffic that will be utilizing these roadways may be expected to reduce the level of service to a point that further improvements and access controls will be warranted. (A level of service "D" is usually considered the minimum acceptable level for urban areas in Iowa by both the DOT and metropolitan planning organizations.)

Conclusion

Since the implementation of these projects, there has not been much difference in the raw number of accidents (see Table 3). The number of crashes in each classification of the accident statistics has remained stable after some initial declines; for instance, rear end collisions declined for a time and then rebounded. However, since there has been a steady

increase in the amount of daily traffic in the study corridor over time, the crash rate along these streets has, in fact, declined by about 10 percent. A modest level of access management has returned a modest safety gain in this case. This case study is an example where more could have been done to manage access and where more will have to be done in the future given expected increases in traffic in the area.

BUSINESS VITALITY IMPACTS ANALYSIS

Local opposition from businesses is often the key barrier to implementing access management projects. This is because business owners and land owners perceive that changes in direct access to their property—such as through consolidating driveways or installing raised medians—will lead to declines in patronage and sales. This section of the report provides an analysis of the impact of the access management projects on the case study corridors' business climates using results from interviews with businesses and motorists and some secondary data such as business directories and sales tax records.

General Community Business Climates

Bettendorf is one of the Iowa-Illinois Quad Cities, a metropolitan area straddling the Mississippi River. The city of Bettendorf has a population of about 31,000 persons and is growing at a moderate rate—about one to two percent per year. It is a high-income community by Iowa standards. Over the past 25 years, Bettendorf has seen a large increase in the number of its retail firms; however it is losing retail market share to surrounding communities such as Davenport that contain regional shopping malls and large-scale strip mall development. Bettendorf is a strong competitor in services but weak in the general merchandise sector.

Des Moines is the largest city in the largest metropolitan area in Iowa and has a population of about 193,000. It is basically an older core city ringed by suburbs and is not growing. The median income is moderate. Des Moines has been a steady retail market for a long time. Des Moines is strongest in the services, home furnishings, and wholesale sectors and weak in the areas of eating and drinking establishments and general merchandise. These sectors appear to have been subject to extensive competition from suburban businesses at and near regional shopping malls.

West Des Moines is a rapidly growing suburb of Des Moines with about 40,000 residents. It is a high-income community. West Des Moines has seen a 400 percent increase in retail firms over the past 25 years and has steadily increased its share in the regional market. Sales continue to grow rapidly. It is strong in virtually every retailing sector, particularly in general merchandise, apparel, and specialty stores. West Des Moines is approaching Des Moines in terms of its retail trade pull factor—the ratio of business it pulls in from beyond its borders (see Table 4). This means that it is becoming as important as the core city as a regional trade center.

Table 5: Case study community business performance

Case Study Community	Five Year Retail Sales Growth (percent)	Five Year Change in Retail Firms (percent)	1996 Retail Trade Pull Factor
Bettendorf	+24.9	+11.1	1.04
Des Moines	+24.2	-3.2	2.39
West Des Moines	+53.2	+21.7	1.97

Sales Tax Trends

As with most previous case studies in Iowa, a comparison of sales tax receipt trends along the managed corridor versus the case study community as a whole indicates that the managed corridors fared very well in terms of growth in commercial activity. The Bettendorf, Des Moines, and West Des Moines corridors all exceeded their host communities in terms of retail trade activity by at least 20 percent. The performances of the Des Moines (Army Post Road/SW 9th Street) and West Des Moines (63rd Street) corridors were especially strong. The West Des Moines corridor (63rd Street) exhibited a pattern of percentage growth very similar to previously studied suburban corridors such as Ankeny, Clive, and Coralville. As was noted in the Phase II research report, most corridors in Iowa that have been studied show retail trade growth performance as good or better than their surrounding communities. The only notable exception found in the Iowa case studies was the City of Clive, another suburb of Des Moines. This is attributable to the explosive retail growth of newly developing areas of the city.

As Figure 4 indicates, most access-managed corridors studied in Iowa outperformed their surrounding community during the 1990s. These data from the Iowa Department of Revenue and Finance indicate that even when the corridor underperformed its surrounding community (e.g. in Ames, Clive, and Fairfield), the growth in sales tax revenues in the access-managed corridors was impressive. For the three case studies included in this report, the index of sales tax growth was always at least 20 percent above that for the surrounding communities. This indicates that the three access management projects did not negatively impact the overall business climate in any of the three corridors.

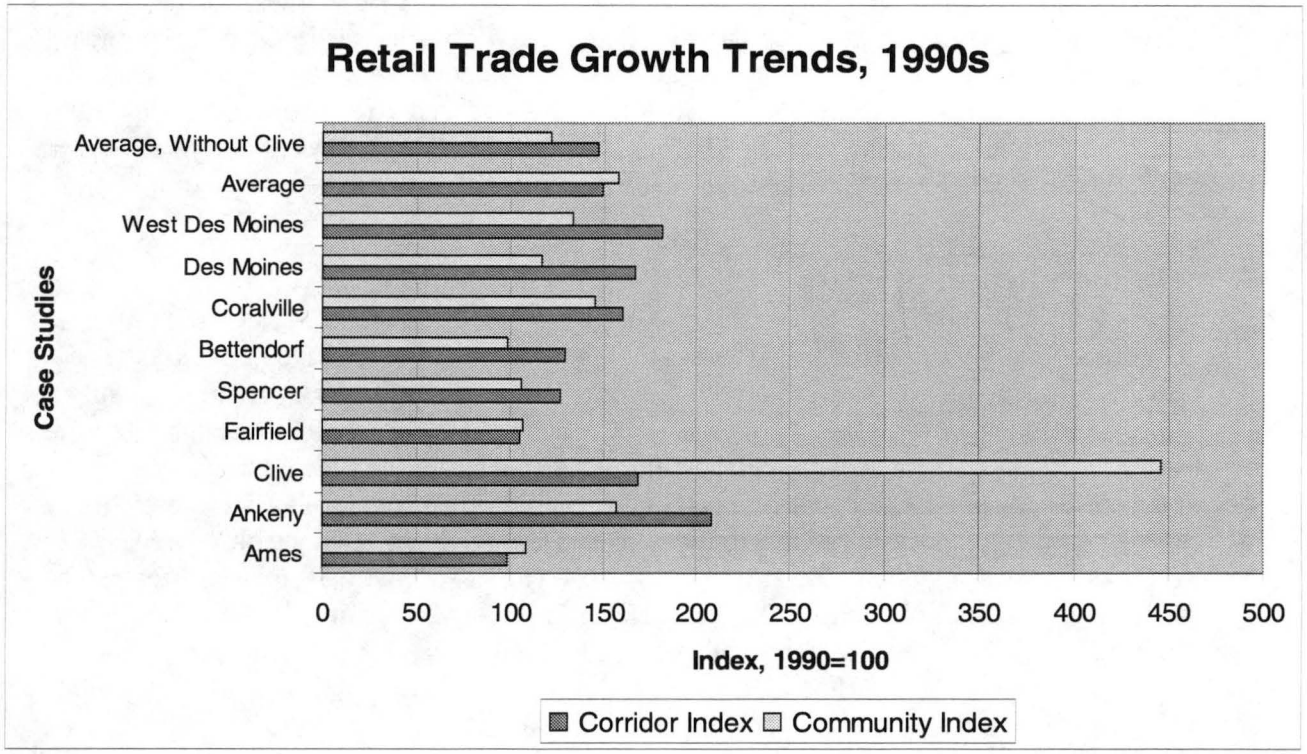


Figure 4: Retail sales tax growth trends for all Iowa case studies

Business Turnover Analysis

Typically, about 10 percent of all businesses in Iowa that require sales tax permits turn over; they change owners, move from the state, are bought out, or go out of business. Case studies completed during Phases II and III of the Iowa access management research and awareness project indicated that corridors where projects were put in place did about as well as or better than their surrounding communities in terms of business turnover. The three new case studies show a larger degree of variation.

In the Bettendorf corridor, the business turnover rate has been remarkably low. Only five businesses turned over between 1995 and 1999—a rate of about one percent per year. (The access management project was completed in 1996.) There was a net gain of five businesses along this corridor from 1995 through 1999.

The Army Post Road/SW 9th Street corridor had a very different experience. Army Post Road had a high rate of business turnover, but also a net gain of 17 new businesses from 1990 through 1999. SW 9th Street saw a high rate of turnover and a net loss of 18 businesses from 1990 through 1999. There was essentially no net gain of businesses along the entire "T"-shaped corridor, although the Army Post Road portion did relatively well. Both the businesses that left and the businesses that moved in were, with a few exceptions, small businesses.

Along 63rd Street on the boundary of Des Moines and West Des Moines, business development has been stable to positive. There were 42 businesses in the corridor prior to project completion and 46 after, a net gain of seven percent. Twelve of the original businesses have closed or moved, but they were by replaced 16 new ones. The "churn rate" of businesses exiting this corridor has been less than three percent per year—several percentage points lower than the Iowa statewide average.

Opinion Research

As in Phases II and III, the University of Northern Iowa Department of Marketing conducted extensive personal interviews along the three new case study corridors. The results of these interviews were—with one interesting exception—similar to the results for the previous case studies. As before, very few business owners and managers reported sales declines once the access management projects were put in place. Only three businesses out of 63 surveyed (five percent) reported post-project sales declines. These were a convenience store on US Highway 67 in Bettendorf and two gasoline service stations opposite medians along Army Post Road (Iowa Highway 5) in Des Moines. No businesses along the 1st Street/63rd Street (Iowa Highway 28) project in West Des Moines reported a decline. The five percent figure is identical to the five percent decline figure that was found in Phases II and III.

What is different in these three case studies from the previous ones is a larger "uncertain" response rate and a smaller "increase" response rate. In particular, the "uncertain" rates are very high for the Bettendorf and Des Moines cases. The Bettendorf project was very new at the time of the interviews, while the Des Moines project was very old (see Table 6).

Table 6: Post-Project Sales Based on Survey Responses

Post-Project Sales	Bettendorf (24 businesses) (percent)	West Des Moines (9 businesses) (percent)	Des Moines (30 businesses) (percent)	All Three Cases (63 businesses) (percent)
Increased	17	0	10	11
Same	41	89	37	46
Decreased	4	0	7	5
Uncertain	38	11	47	38

Business reports or customer complaints about access to their businesses were somewhat higher for these three case studies than for the originals. Twenty-two of the 63 businesses (35 percent) reported complaints. For the original case studies, this figure was 19 percent.

The Bettendorf (two-way left-turn lane) project enjoyed the highest support among business owners (at 92 percent) and a low level of customer complaints. The Des Moines Army Post Road and SW 9th Street project (medians at intersections) had a similarly low level of customer complaints about access, but somewhat lower support (60 percent) from business owners. The owners of auto-oriented businesses adjacent to the raised

medians were the least supportive of the project, as would be expected. The West Des Moines (full raised median) project generated the most customer complaints about access (half of the businesses reported complaints from customers), but also enjoyed a 78 percent support rate from the business owners.

As before, about half of the businesses reporting complaints were the auto-oriented businesses, including gasoline filling stations, convenience stores, and fast-food restaurants. These businesses report complaints at a higher than proportional rate to their numbers.

As in Phases II and III, the University of Northern Iowa also surveyed business patrons (who are also motorists) as a part of the business vitality study. The Bettendorf and West Des Moines projects were supported by a strong majority of motorists surveyed and awareness of these projects was nearly 100 percent for both. However, the percentage of motorists aware of the median improvements along Army Post Road and SW 9th Streets in Des Moines was much lower (63 percent). Motorists gave this project much lower ratings than were given to the other two projects in terms of improved traffic safety, better traffic flow, convenience, and perceived safety. In fact, only about eight percent of the motorists surveyed along the Army Post Road project indicated they supported the improvements given their experiences driving along the project (see Table 7).

Table 7: Overall support expressed for projects by case study

Community	Project Type	Motorists (percent)	Business Owners (percent)
Ames	TWLTL	96	91
Ankeny	Median	100	100
Clive	Median	92	70
Fairfield	Driveway	100	88
Spencer	TWLTL	100	100
Bettendorf	TWLTL	100	92
Coralville	TWLTL	95	96
Des Moines	MAI	8	60
West Des Moines	Median	93	78
Nine Case Average		87	86

KEY CONCLUSIONS OF PHASE IV CASE STUDIES

Two of the case studies selected for Phase IV exhibited similar results to those studied during Phases II through III of the access management research and awareness project. These two projects were the raised median project along Iowa Highway 28 (63rd Street) in Des Moines/West Des Moines and the two-way left-turn lane project along US Highway 67 in Bettendorf. As seen with previous case studies, these two projects had

positive impacts on traffic safety and operations and do not appear to have adversely impacted the vitality of businesses along the managed corridor.

The remaining Phase IV case study—Iowa Highway 5 (a "T"-shaped set of corridors including Army Post Road and SW 9th Street) in the southern part of Des Moines—had a different result. Although the business vitality results of the project were similar to those found for previous case studies (e.g. there appears to have been no dramatic negative commercial impact), the impact of this project on traffic safety and operations was relatively modest (see Table 8). It was also the only project among all the cases studied during Phases II through IV that was not overwhelmingly supported by motorists in an opinion survey.

Table 8: Summary of case study results from Phase IV

Case Study Location	Case Study Length (Miles)	Time Period	Traffic (AADT)	Average Annual Crashes	Travel (Million VMT)	Crash Rate (Million VMT)
Bettendorf (State Street)	1.3	Before Project	20,000	71	9.49	7.48
Bettendorf (State Street)	1.3	After Project	21,500	35	10.20	3.43
Percentage Change			+7.5%	-50.7%	+7.5%	-54.1%
West Des Moines (1st Street, 63rd Street)	0.9	Before Project	18,700	41	6.14	6.68
West Des Moines (1st Street, 63rd Street)	0.9	After Project	18,500	20	6.08	3.29
Percentage Change			-1.0%	-51.2%	-1.0%	-50.7%
Des Moines (Army Post Road and SW 9th Street)	6.5	Before Project	21,250*	317	50.4	6.29
Des Moines (Army Post Road and SW 9th Street)	6.5	After Project	23,800*	317	56.5	5.61
Percentage Change			+12.0%	No Change	+12.0%	-10.8%

**Based on average traffic for the two routes*

There may be two reasons for this. First, parts of the project were completed several years ago. This may be the reason that motorists did not express a favorable opinion.

Projects that are recent create a much stronger impression. Second, compared to most of the access management case studies, this project did not involve very extensive changes to the roadway and it was done incrementally. No through lanes or continuous turning lanes were added. Few driveways were consolidated. The project only added turning lanes and medians at major intersections. All of these facts suggest that once the Des Moines loop bypass is in place and new traffic patterns are established it may be time to consider a more extensive access management project in the Army Post Road/SW 9th corridor. Such a project would redevelop this corridor in a manner consistent with other major arterials in the area, such as Fleur Drive and SE 14th Street.

A 3D graphic analysis of crashes along the Army Post/SW 9th case study corridor using the GIS-ALAS (Geographic Information System/Accident Location and Analysis System) system also indicates that there may still be access management problems along the Army Post Road portion. The 1996 crash records for Army Post indicate that although most crashes occurred at major intersections, a large number also occurred at driveways along the route (see Figure 8).

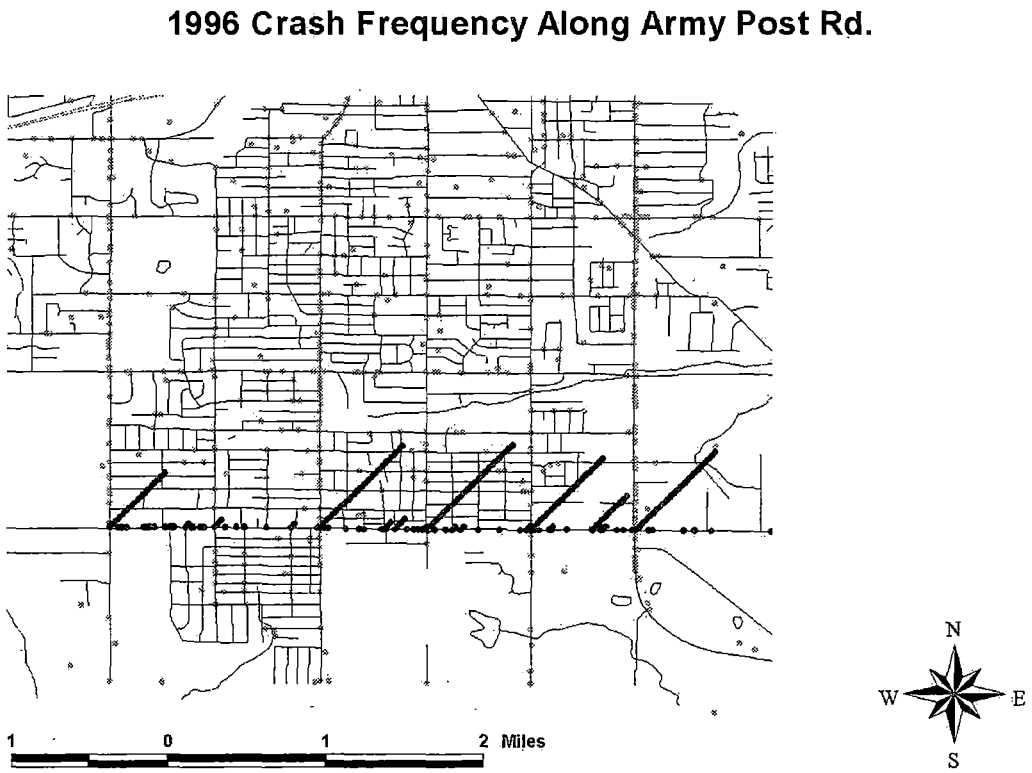


Figure 8: Army Post Road crash plot

By contrast, crashes along SW 9th Street in 1996 were very much concentrated at major intersections between public roads. This suggests that the access management project along that portion of the case study have been more successful in achieving their goals (see Figure 9).

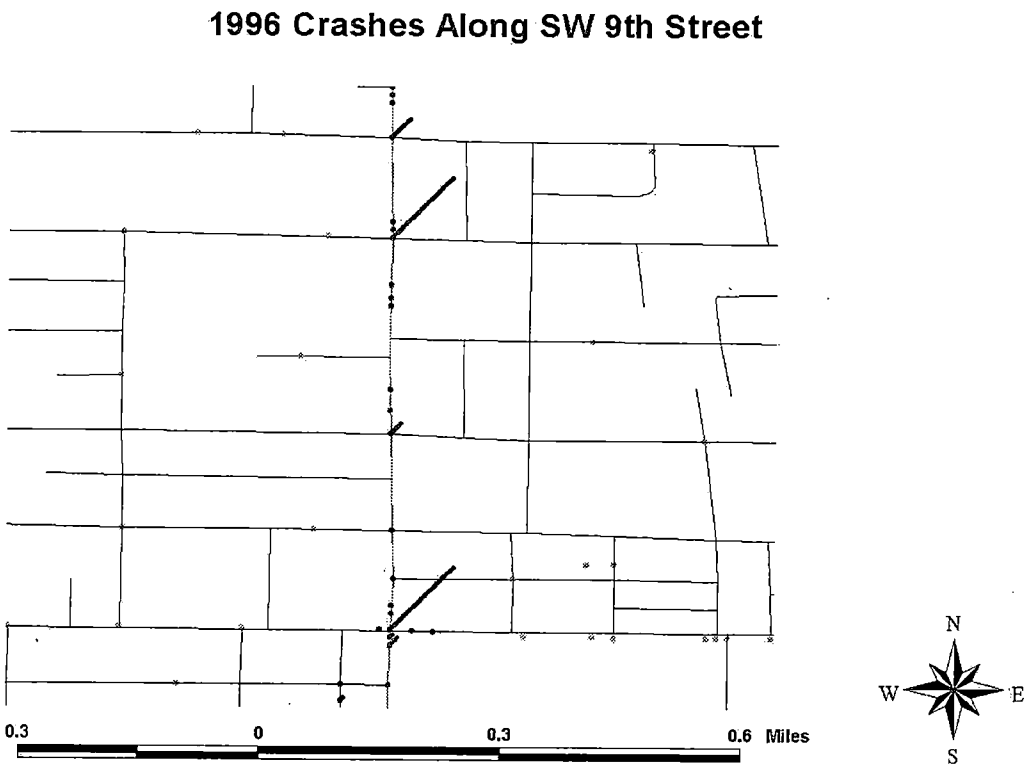


Figure 9: SW 9th Street crash plot

The 63rd Street project shows a pattern similar to the pattern on SW 9th, e.g. that mid-block crashes are relatively rare. In fact, there were few crashes at all on 63rd Street to the south of Grand Avenue. Crashes that did happen were almost entirely at public road intersections (see Figure 10).

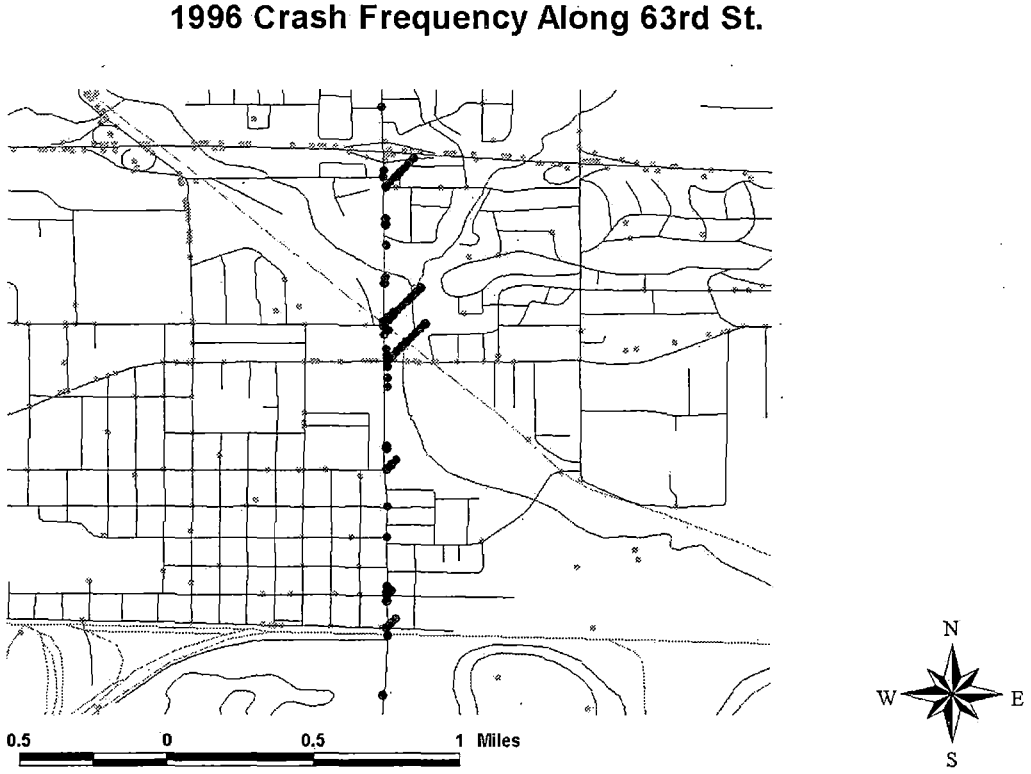


Figure 10: 1st Street/ 63rd Street crash plot

Conclusions

The results of the cases studied during Phases II through IV of the Iowa access management research and awareness project, taken as a whole, strongly indicate that access management is an important concept for improving the surface transportation system in Iowa. Access management can dramatically improve the safety of roadways and significantly reduce crash rates, personal injury crashes, and property damage crashes. Access-managed roads function better than they did before management treatments were applied. Motorists are overwhelmingly supportive of these projects. Access-managed roads often are able to carry higher traffic volumes at a higher level of traffic service. This means that congestion is reduced, as are delays. Taxpayers' investments in roadways and roadway capacity are preserved and even enhanced through access management. Finally, access managed corridors are good places to do business. Business success is not, for the most part, diminished when access is managed well.