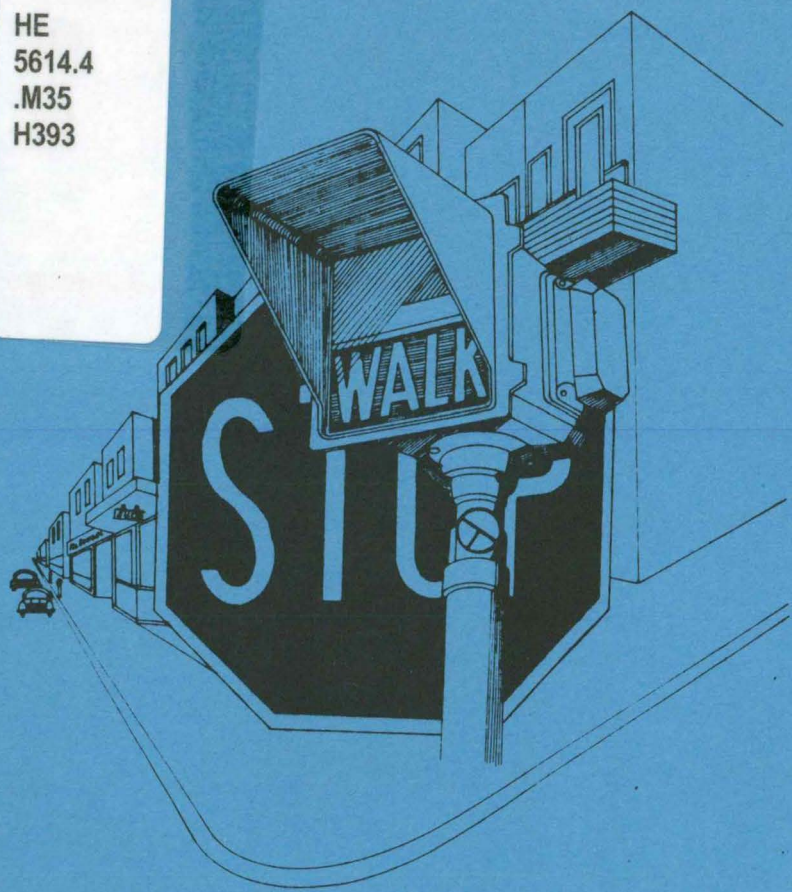


a study of TRAFFIC SAFETY

for the city of Marshalltown, Iowa

ngson, Durham & Richardson

HENNINGSON, DURHAM & RICHARDSON
ARCHITECTURE · ENGINEERING · PLANNING · SYSTEMS · ECOSCIENCES

8404 Indian Hills Drive
Omaha, Nebraska 68114

Mr. Wayne L. Hartwig, P.E., City Engineer
City of Marshalltown
Post Office Box 757
Marshalltown, Iowa 50158

Re: Marshalltown Traffic Safety Study
HDR Project No. R321-07-02.

Dear Mr. Hartwig:

In accordance with our contractural agreement for engineering services, Henningson, Durham & Richardson is pleased to submit our final report on the Marshalltown Traffic Safety Study.

This report contains a written and graphical accounting of information collected in our study. The recommendations are based upon a careful study of accident history and traffic control devices currently utilized by the City. We believe that the implementation of this report will benefit traffic safety in Marshalltown.

We wish to thank you, the City staff, involved local organizations, the Iowa Department of Transportation, and the Federal Highway Administration for their assistance and cooperation during the course of this study. We sincerely hope that this report will be a useful guide towards the betterment of traffic safety in the City of Marshalltown.

Respectfully,

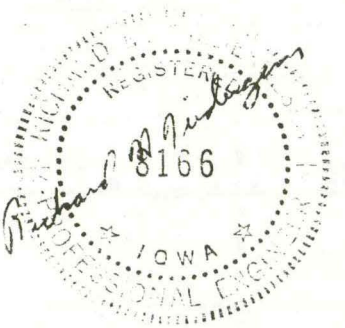
HENNINGSON, DURHAM & RICHARDSON

Robert A Rohling

Robert A. Rohling, P.E.
Vice President

Richard M Niedergeses

Richard M. Niedergeses, P.E.
Transportation Engineer



MARSHALLTOWN, IOWA

TRAFFIC SAFETY STUDY

Prepared by

HENNINGSON, DURHAM & RICHARDSON

OMAHA, NEBRASKA

This report was prepared through a grant provided by the United States Department of Transportation, Federal Highway Administration pursuant to the provision of Section 402 of Title 23 U. S. Code.

ACKNOWLEDGEMENTS

Mayor	Mr. Howard Stegmann	
Council	Mr. Edward Peterson	Mr. James Deninger
	Mr. Jack Nicholson	Mr. Gerald McKimmey
	Mr. Toby Godfrey	Mrs. Jean Cooper
	Mrs. Rosemary Johnson	Mr. Richard Hamblin
		Mr. James Olson
City Engineer	Mr. Wayne L. Hartwig	
Police Chief	Mr. Wayne Beasley	

AND THE MANY ORGANIZATIONS, AGENCIES, BUSINESSES AND OTHER GROUPS WHO CONTRIBUTED THEIR TIME AND THOUGHTS IN SUPPLYING INPUT TOWARD THE COMPLETION OF THIS REPORT.

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Chapter 1
INTRODUCTION

The contents of this report document the study efforts undertaken by Henningson, Durham & Richardson for a traffic engineering safety study of the City of Marshalltown, Iowa. The study places particular emphasis upon high accident locations, signs and signals, the downtown business district, school pedestrian areas, and railroad crossings and underpasses.

The content of the report is structured in such a manner as to provide the City with clear guidelines and directions on the improvements which should be made to improve traffic safety and traffic flow within the City. With this in mind, the reader will find that the first chapters in the report primarily address the city street system at large, wherein the discussion covers the functional classification of streets, city-wide traffic flow, city traffic generators, city-wide high accident locations, city-wide intersection controls and other items relating to the general street system. The later chapters in the report begin to address specific areas such as the downtown, school areas, railroad crossings and special spot location improvements.

The closing chapter addresses an implementation program for the City with emphasis placed upon funding and financing of improvements as well as their scheduling and priorities. At the end of the report is an appendix which contains appropriate supporting information relevant to the study.

STUDY OBJECTIVES

In recognition of the high incidence of traffic accidents and the growing traffic demands on its streets, the City of Marshalltown applied for and received a grant for a Traffic Safety Study. This Study was funded by the Iowa Department of Transportation (IDOT), Division of Highways and the Federal Highway Administration under the Highway Safety Program Standard 13, issued in accordance with the Highway Safety Act of 1966, as revised.

The primary objective of this study was to develop measures for the improvement of traffic safety on the city streets. This was accomplished by the application of accepted traffic engineering practices, principles, and standards to the physical elements of the existing street system and the operational elements of the traffic control devices which regulate traffic on that street system.

STUDY AREA

The study area consisted of the streets and roadways within the corporate limits of the City of Marshalltown, Iowa. However, the Consultant did include in the analysis those intersections in proximity to the corporate limits which in the Consultant's opinion had a relationship to traffic flow and safety within the City.

SCOPE OF STUDY

The basic study approach involved a 3-phase process consisting of the following steps:

1. Survey of existing traffic conditions, traffic control devices, and accident history.

2. Evaluation of existing system and controls to identify deficiencies and develop solutions.

3. Formulation of suggested improvements and guidelines for implementation.

Toward fulfilling these three phases, the scope of work for the study utilized the following tasks in the study's analysis and evaluation.

1. Review and analyze traffic flow patterns as related to access, circulation, safety and efficiency in the movement of vehicles and pedestrians in the City, with particular emphasis upon the Downtown, school locations and adjacent areas, hospital areas, and special traffic generators and recommend improvements where deficiencies are identified.

2. Review and analyze locations with vehicle-pedestrian conflicts and develop recommended improvements for increased pedestrian safety.

3. Study the street system to determine where traffic control changes can contribute to improved safety and operation.

4. Review railroad crossings for sight distance, crossing controls and crossing conditions.

5. Analyze high accident locations and formulate measures to reduce accident potential at intersections with seven or more accidents per year.

6. Review of existing traffic control devices, including the proper usage, adequacy, conformance, and placement of regulatory and warning signs, traffic signals and beacons and pavement markings. For deficient or non-conforming traffic control usages, develop changes or additions to upgrade traffic controls to standards.

7. Toward the implementing of recommended changes and improvements, prepare a general implementation plan, including cost estimates, time schedules, priorities, and funding sources.

COMMUNITY INVOLVEMENT

During the conduct of the study, the Consultant actively solicited opinions and thoughts of City officials, businessmen, school officials, City department representatives, and other interested parties. Their thoughts and opinions were evaluated and served as a useful input for completing this report.

The working relationships established with the local individuals served as a valuable source of information for the study. These contacts also served as a valuable instrument in establishing a two-way avenue of communication that enabled individuals on the local level to be better informed of the progress of the study while, at the same time, assisting the Consultant in better addressing the traffic problems of the community.

SUMMARY OF FINDINGS

The contents of this report present a comprehensive inventory and analysis of traffic safety in Marshalltown. Based on these investigations, a program of improvement recommendations is presented. In some instances, alternatives have been developed for consideration. This report will serve as a resource document for City Government, the City Engineering Department, and others in making decisions regarding future street improvements.

The principal recommendations contained in this report are presented in the following priority listing. These items are presented in order of greatest safety benefit as assessed by the Consultant.

1. School Safety. Provisions for pedestrian safety and particularly school safety were found to be the most deficient areas of Marshalltown's traffic safety picture. The lack of sidewalks and the use of non-conforming traffic signal installations and non-conforming roll-out STOP signs are the primary causes of these dificiencies. Recommendations addressing these and other school safety related problems are made in Chapters 5 and 6.

2. Highway 14 Bypass. The construction of a Highway 14 Bypass and new viaduct have been discussed for a number of years. Studies of the existing viaduct indicated that it is operating well above its safe capacity from a traffic volume standpoint and that serious efforts toward its replacement or expansion are warranted. Chapter 4 and Pages 7-10 and A-30 should be consulted for discussions of this problem.

3. High Accident Locations. Twenty-three intersections in Marshalltown were found to have seven or more accidents per year. These locations were studied and specific recommendations toward the reduction of accidents were made in Chapter 4.

4. Railroad Crossings. Of the 33 railroad crossings in Marshalltown, only one was found to be in complete conformance with the MUTCD. Recommendations for the improvement of crossings are found on Pages 3-17.

5. Signal Recommendations. General recommendations toward the improvement of existing signals to meet current MUTCD standards are mode on Pages 3-5. Specific recommendations to reduce accident frequencies are made in Chapter 4.

6. Flow Continuity. Recommendations directed at the improvement of traffic flow and circulation, and intended to improve travel efficiency by reducing unnecessary stops are made on Pages 3-10.

7. Downtown Street System. The current Downtown street system was found to be both confusing and inefficient. Several alternative street configurations were considered and of these, two were found to be functional. These systems are presented on Pages 2-12.

2

Chapter 2
STREET SYSTEMS

TRAFFIC GENERATORS AND LAND USE

The City of Marshalltown, like many eastern Iowa communities, has developed into an industrial center with a sound agricultural foundation. This development is dependent upon a strong system of rail and highway transportation. Marshalltown is particularly dependent on the Chicago & Northwestern Railroad which transects the City.

Industrial areas, as seen in Figure 2-1, have developed adjacent to rail facilities and are located along an east-west corridor in the center of town and in a major tract along the east side of the City.

Major commercial traffic generators comprise the downtown area which is located in the north central portion of the City and to the north of the Chicago & Northwestern rail line. Other commercial areas consist of two shopping centers and miscellaneous commercial businesses distributed along Highway 14, to the south.

Education facilities are evenly distributed about the area. Major traffic generators are the Community College, south of the City and the High School on 2nd Avenue and Olive.

Other major traffic generators consist of two hospitals, the Iowa State Soldiers Home and the Central Iowa Fairgrounds.

As may be seen in Figure 2-1, the traffic generators are distributed across the entire city area. This serves to distribute the generated traffic fairly evenly over a large number of arterial and collector streets. The grid pattern assists in the distribution and collection of the generated traffic volumes. However, the limited number of major rail crossings (three in number) creates a great deal of congestion and poor circulation on a city-wide basis.

FUNCTIONAL CLASSIFICATION

The functional classification of streets as designated by the City of Marshalltown, is presented in Figure 2-2. The major streets in this system are shown as U. S. 30, Highway 330, and Highway 14, and are classified as either Freeway Extensions or Arterial Extensions.

Main Street and a portion of Valley View Road are the only streets classified as Trunk Extensions. This constitutes an inconsistency in that Main Street is part of a one-way pair from 9th Street to 7th Avenue. The complementary one-way street for Main is State, which is classified only as a Municipal Arterial. It is recommended that State Street be re-classified as a Trunk Extension.

East Olive and North Center are classified as Trunk Collector Extensions.

The Municipal Arterial and Collectors Grid is extensive and provides satisfactory coverage to the community.

TRAFFIC FLOW AND CIRCULATION

Traffic volume data was compiled from traffic counts performed by the Iowa Department of Transportation. Supplementary counts were performed by the Engineering Department of the City of Marshalltown. A composite of these counts is presented in Figure 2-3.

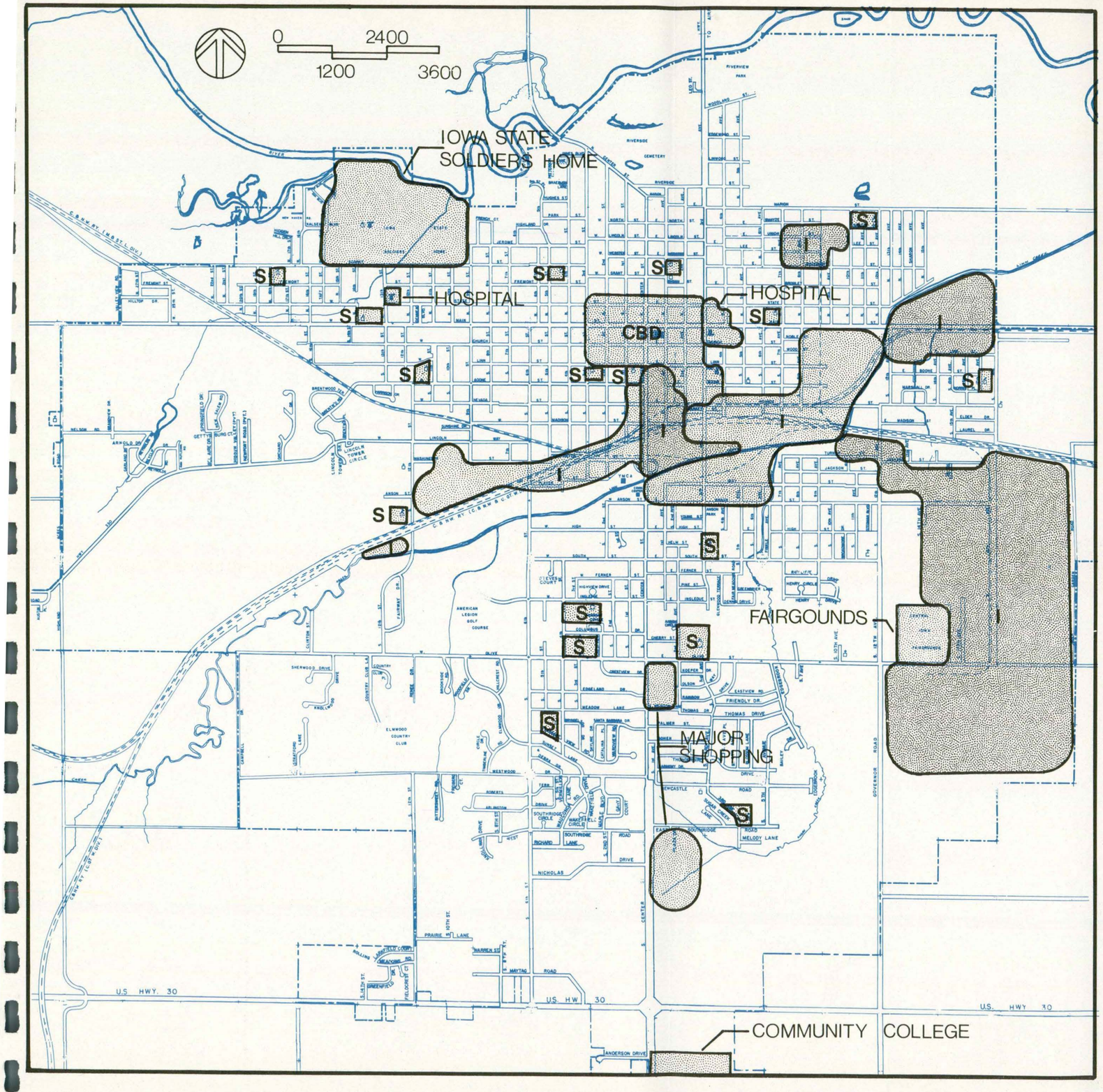
Analysis of these volumes shows an overall distribution of traffic having reasonable volumes with respect to street capacity. Level of service is good with stable flows and only minor delays.

Three areas have capacity problems of concern. The worst of these is along South Center from South Street to Linn. The primary problem within this segment is the two-lane railroad viaduct which is located between two major intersections. Here, traffic volumes exceed 21,000 vehicles per day (VPD) on Center Street and at the intersection of Anson and Center. Boone and Center handle 26,450 and 22,490 vehicles per day, respectively. These volumes are typical for a Four Lane roadway operating at capacity. As a two-lane road, the present overpass is carrying much more traffic than was originally intended.

A second area having capacity problems is the railroad overpass on 3rd Avenue. This structure exhibits a narrow two-lane configuration and is posted for a maximum 10 ton load. Traffic on this structure is approximately 12,000 VPD.

A corridor study is currently being conducted by the Iowa Department of Transportation (I. D. O. T.) to develop alternatives for a new structure. The Consultant recommends that the City continue to press for the replacement of one of these structures with a new four-lane facility.

The third area of concentrated traffic flows is along South Center Street, from Anson to U. S. 30. For the majority of this distance, Center is a



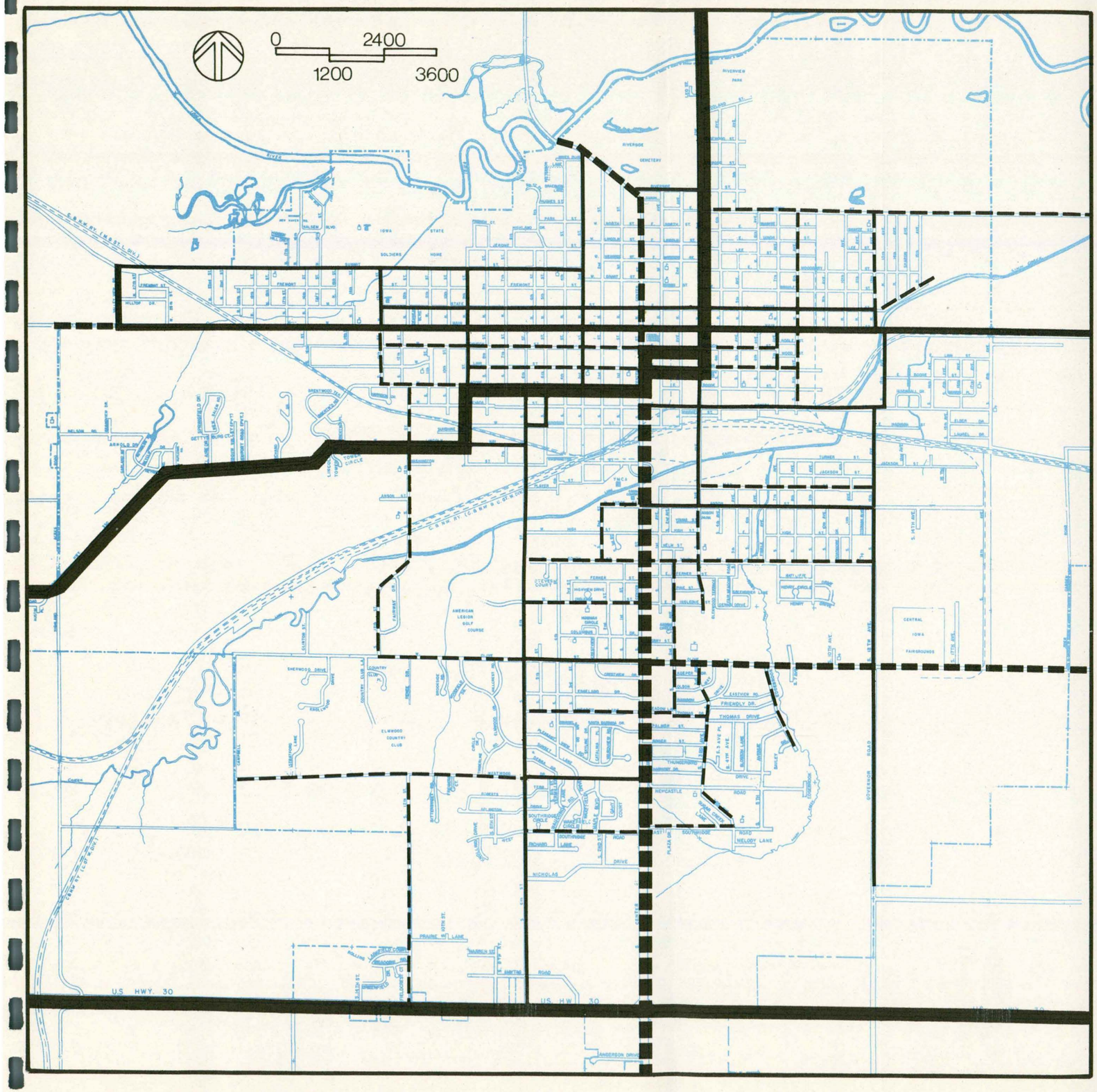
Traffic Generators And Land Use

figure 2-1

legend

Industrial	I	
Heavy Industrial	I	
Educational	S	

MARSHALLTOWN, IOWA



Functional Classification

figure 2-2

legend

- Freeway Extension
- Arterial Extension
- Trunk Extension
- Trunk Collector Extension
- Municipal Arterial
- Municipal Collector

MARSHALLTOWN, IOWA

Traffic Volumes

figure 2-3

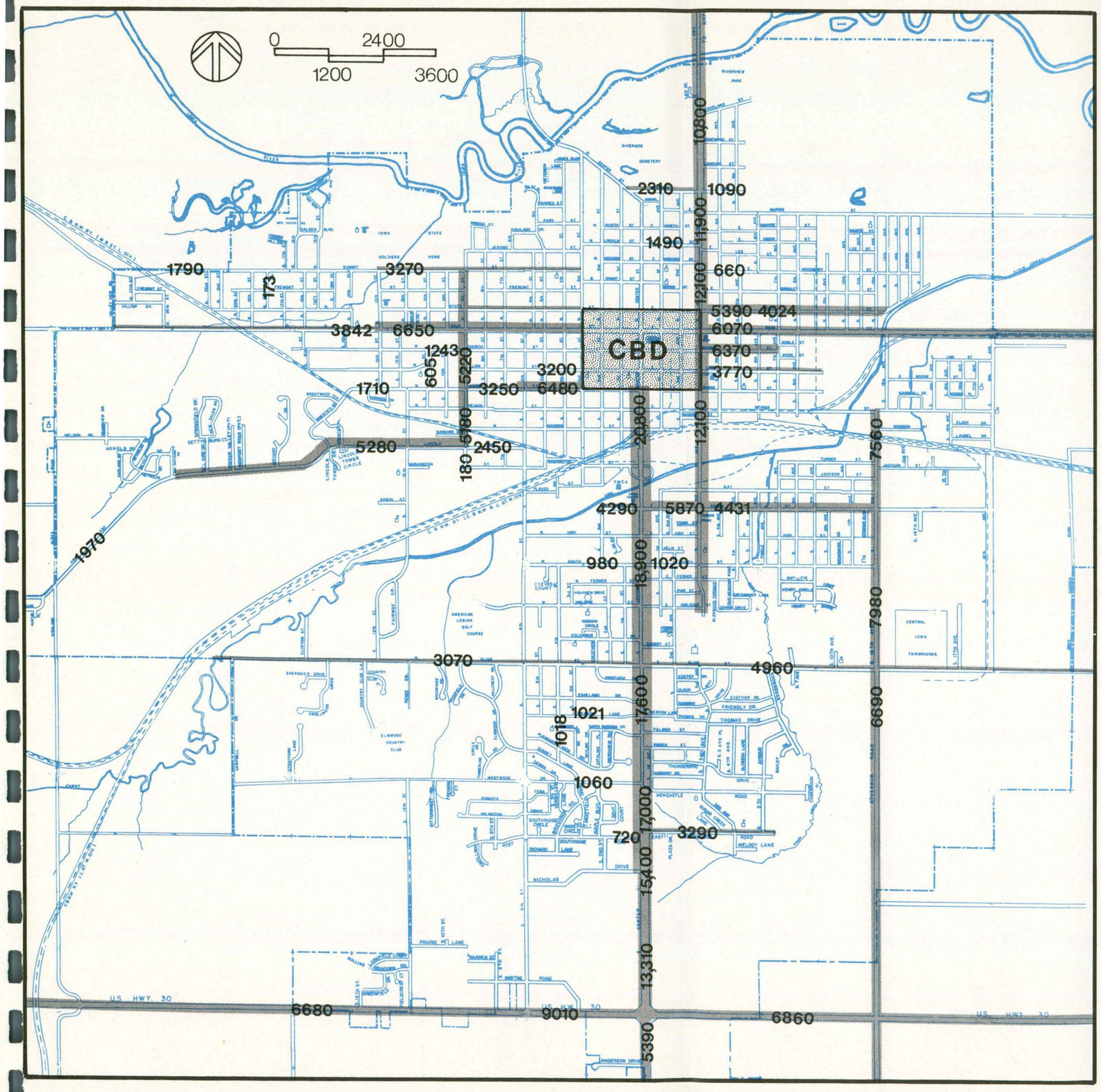
legend

15 000 +

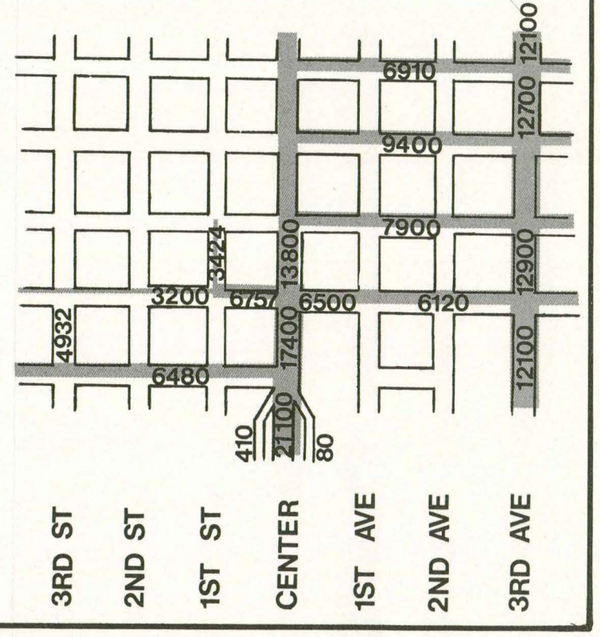
10,000 - 15,000

5000 - 10,000

2500 - 5000



CBD



MARSHALLTOWN, IOWA

four-lane divided section and is functioning within its capacity. Minor congestion is occasionally found at major intersections and often found in the northbound lanes of Center as it approaches Anson. A method of reducing congestion on Center is available and is presented in Figure 3-3 (Proposed Flow Continuity). The re-signing of several intersections on 6th Street and on 3rd Avenue will encourage a distribution of north-south trips and will reduce congestion on Center. These changes will be further discussed in Chapter 3.

To evaluate traffic flow and to pinpoint critical delay problems, a travel-time study was conducted on South Center, North 3rd Avenue (Highway 14) and the one-way pairs Linn/Church and Main/State. This study reinforced the capacity evaluation stated above. The primary area of delay was found to be the section of South Center between Linn and South Street with the major delays on the northbound pass. Total delay ranged from 2 to 4 minutes depending on signal delays. The major delay was found to be on the northbound approach of Anson and Center.

In the east-west direction on Main and State Streets, no delays were encountered and in most cases running speeds equaled the speed limit.

Signal progression was found to be satisfactory wherever checked.

In reviewing the traffic flow patterns, the Consultant has made the following general observations and conclusions:

1. Major street capacity is well matched to current traffic volumes.

2. Three problem areas exist. In order they are:

   a. South Center from Linn to South Street.
   b. 3rd Avenue from Boone to Anson Street.
   c. South Center from South to Southridge Street.

3. It is recommended that the City continue the study for a Highway 14 bypass.

4. The City should make efforts to relieve pressure on South Center and 3rd Avenue by developing South 6th Street, South 12th Street, and South 12th Avenue as more efficient traffic carriers.

5. East State Street could be improved as a traffic carrier by the total removal of parking or by confining parking to the north side only. Increased maintenance of vegetation is required in this area to improve sight distances at intersections.

DOWNTOWN AREA

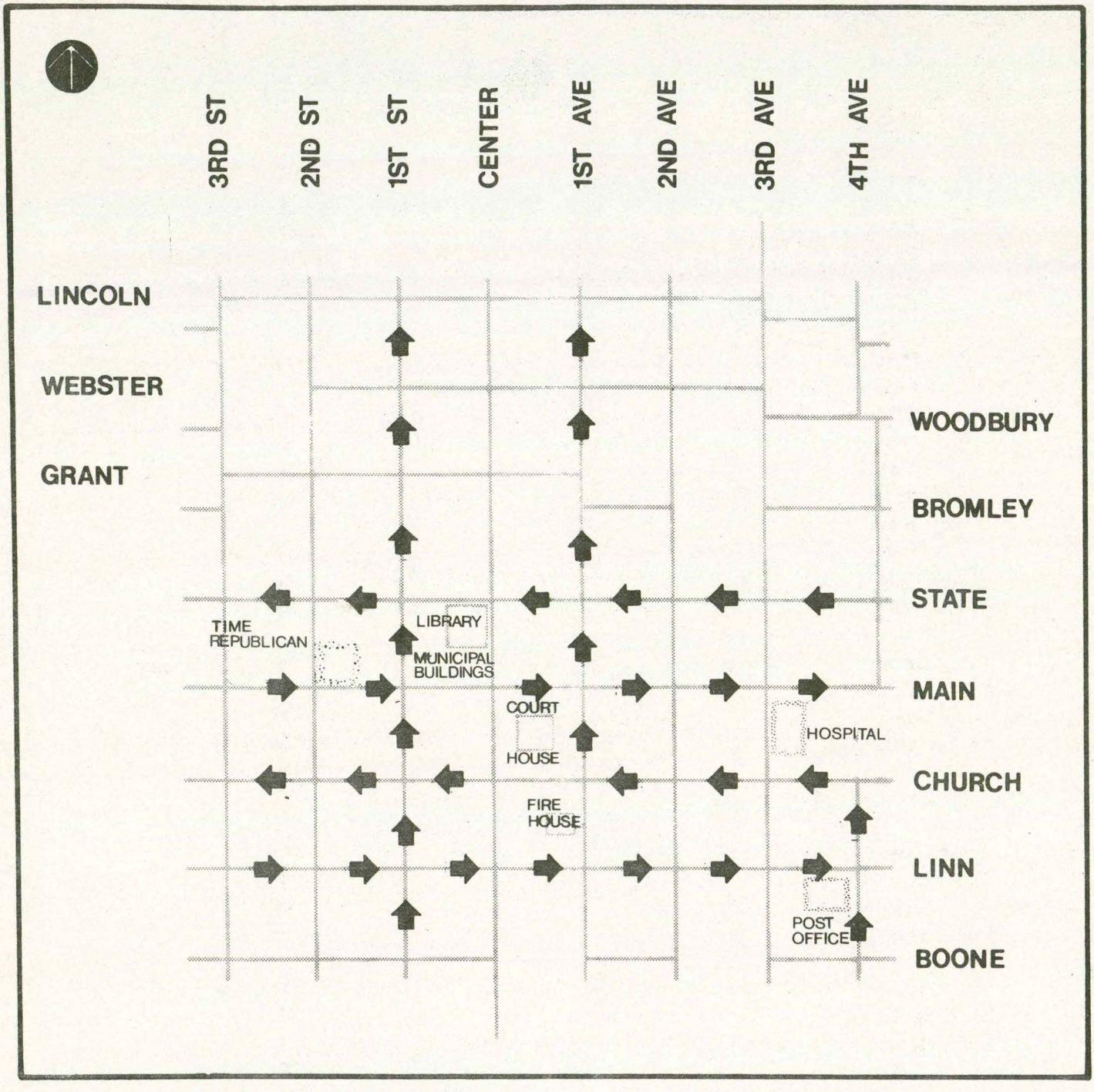
The existing downtown street system, as shown in Figure 2-4, was analyzed with respect to flow patterns as related to circulation, safety and efficiency in vehicle and pedestrian movement. This system was found to be inefficient, requiring much adverse travel and unnecessary circulation. The layout is confusing to non-local drivers and therefore constitutes a safety hazard.

Two alternate street systems were found to be viable alternates. Figure 2-5, (Alternate 1), shows a system having all north-south streets two-way. This configuration provides the best circulation on a local level and is easily understood. Implementation of this system would require modification of 8 signal installations. The efficiency of these intersections with respect to traffic carrying capacity would be slightly reduced and some increase in congestion would be expected. However, a reduction in adverse travel and system generated circulation would compensate for any delay. A review of traffic volumes indicates that the capacity of a two-way system on the north-south streets would be adequate.

The second alternate, shown in Figure 2-6, provides for two one-way pairs on each side of Center. This configuration provides better area access at the cost of local access. It also allows more efficient use of signal progression. This configuration requires the modification of 10 signal installations and would provide an increase in intersection capacity. An increase in adverse travel would also be expected.

Of the two proposed systems the Consultant recommends the two-way system, Alternate 1, as being the least disruptive modification. Since street capacity is not presently a factor in the downtown area, an increase in accessibility would be desirable.

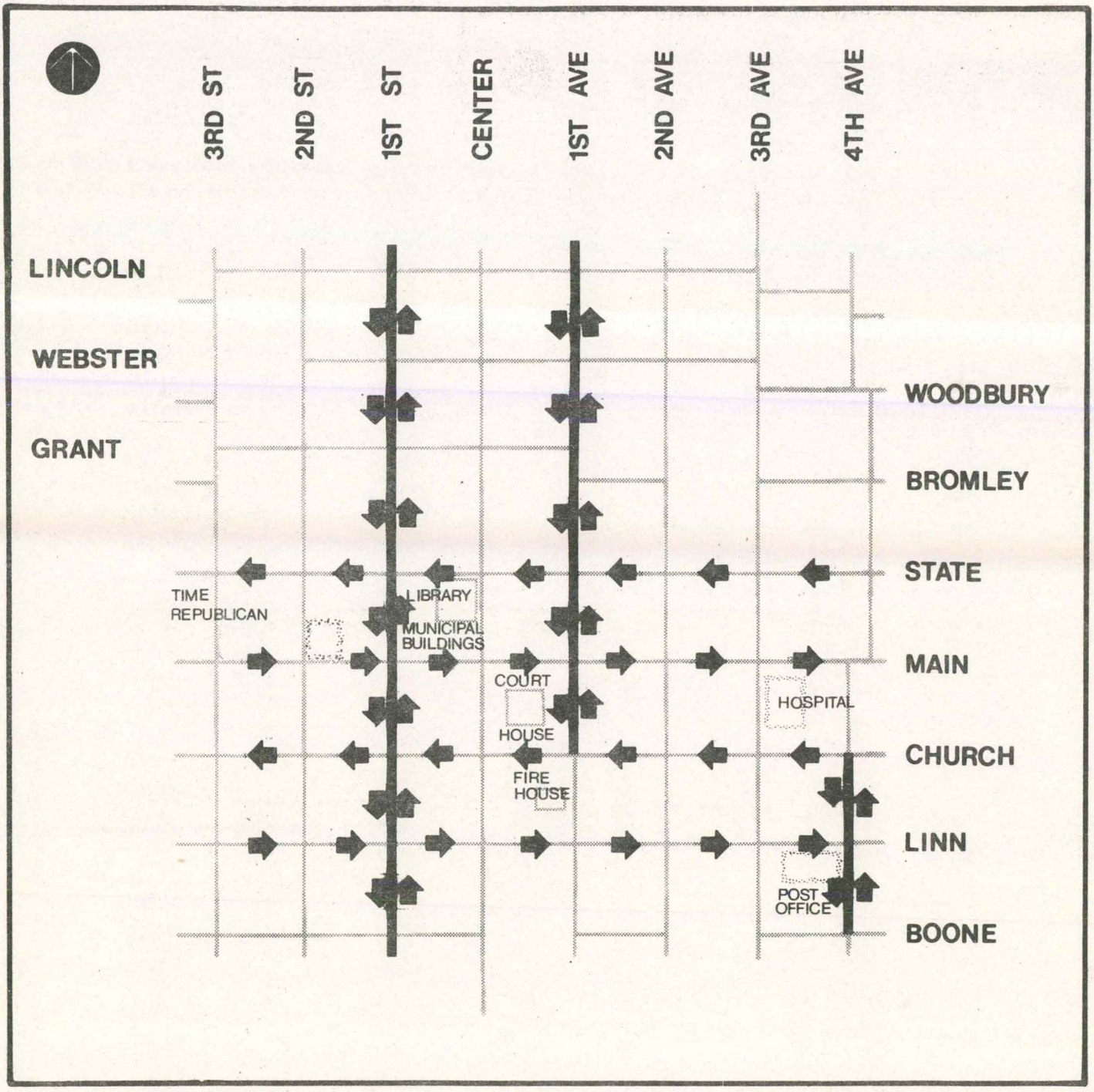
This system would be the least disruptive because fewer streets would be effected and would require the modification of the fewest signal installations. Circulation patterns would remain similar to existing, except in areas of the changes where a substantial improvement would be observed.



Existing Downtown Street System

figure 2-4

MARSHALLTOWN, IOWA

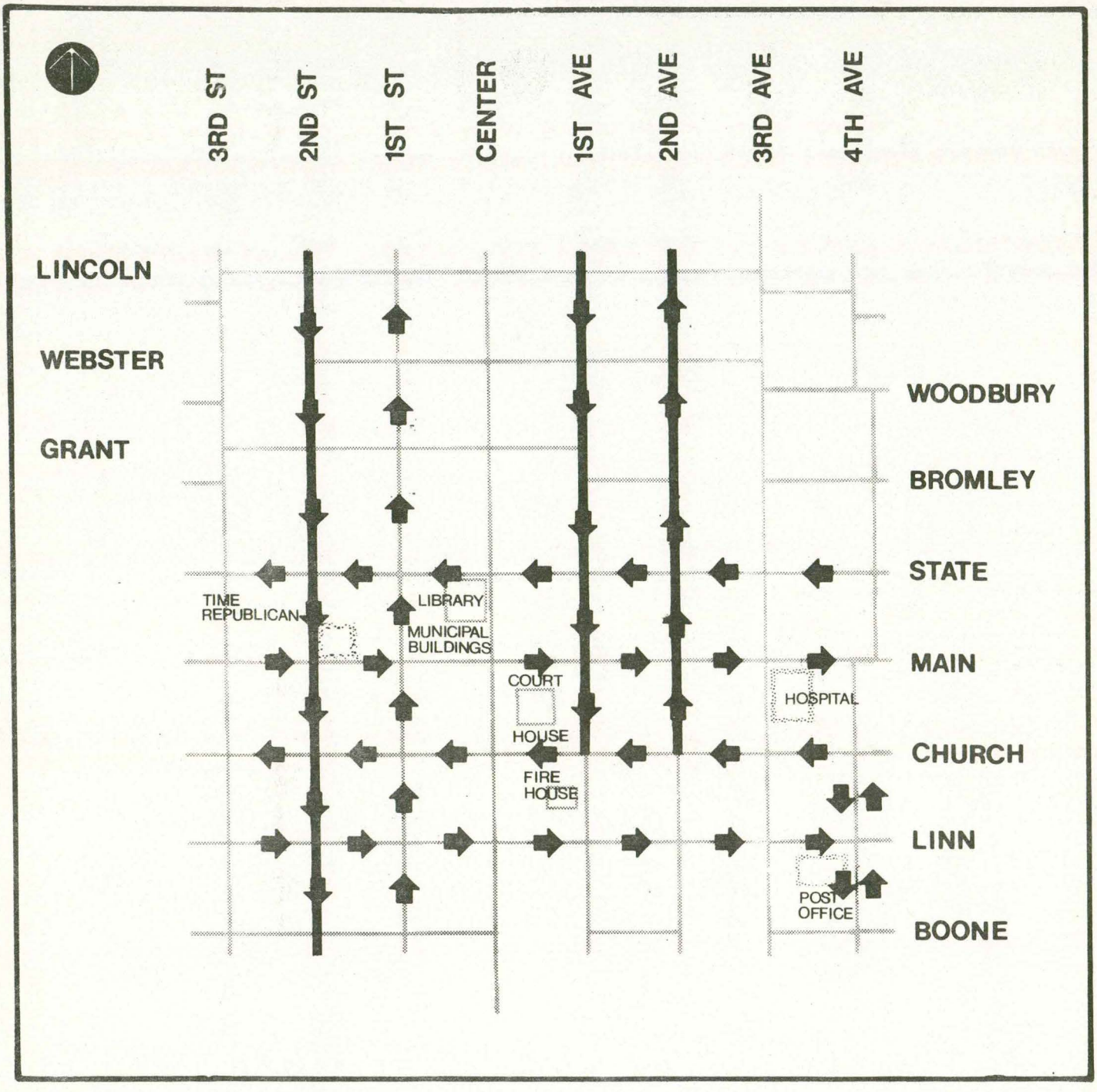


Alternate 1
Street System

Proposed System Changes ——

figure 2-5

MARSHALLTOWN, IOWA



Alternate 2 Street System

Proposed System Changes ——

figure 2-6

MARSHALLTOWN, IOWA

PARKING

Excellent parking facilities were observed by the Consultant in almost all portions of Marshalltown. The downtown area has parallel parking on both sides of the street as shown in Figure 2-7. A number of off-street lots are utilized for parking as the result of an on-going program of lot acquisition.

In many instances, parking occurs too close to designated crosswalks, which may hinder both motorist and pedestrian visibility. The Consultant therefore recommends the establishment of no-parking zones within a minimum of twenty feet from the crosswalk at all locations.

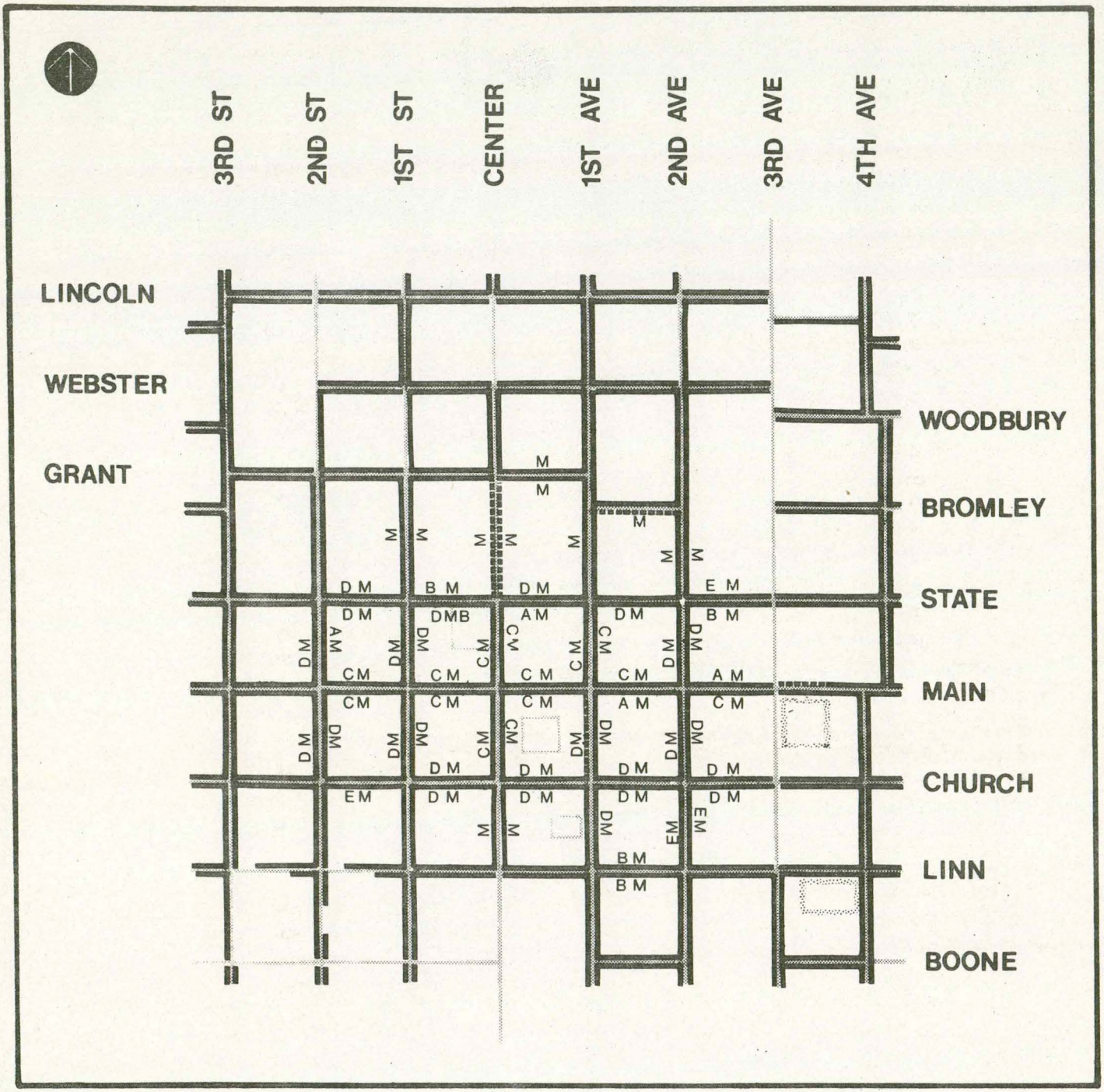
Meter enforcement in downtown Marshalltown appears to be excellent. However, it is the opinion of the Consultant that the fines are too small to be effective. An increase in fines to $2.00 per violation is recommended, or $1.00 if paid the day of the offense.

Loading zones are necessary on each side of each block in the downtown area. Illegal parking in these zones should be minimized by strict enforcement. It is also essential to prohibit the double parking of delivery trucks. These restrictions are necessary to provide a smoother flow of traffic.

Alternate-side parking has been instituted on most city streets, and appears to be effective. However, consideration should be given to the systematic replacement of the restricted parking signs, as they are deteriorating.

Angle parking currently exists on 1st Avenue (Church to Main), Center Street (Grant to State), Byron Street (1st Avenue to 2nd Avenue), and Main Street (3rd Avenue to 4th Avenue). This form of parking limits visibility and should be replaced by parallel parking facilities. The use of angle parking tends to contribute to many parking-related accidents and is to be avoided where possible.

Specific recommendations with respect to parking are made in Chapters 4 and 5.



On-Street Parking

Time Limit
- A 12 min
- B 30 min
- C 1 hr
- D 2 hrs
- E 4 hrs
- F Alternating Sides

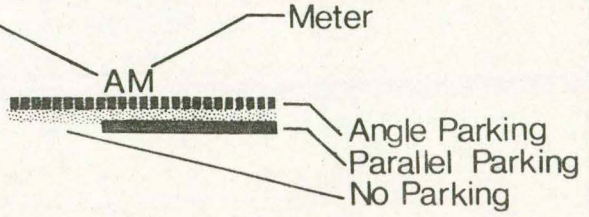


figure 2-7

MARSHALLTOWN, IOWA

3

Chapter 3
TRAFFIC CONTROLS

TRAFFIC SIGNALS

The City of Marshalltown utilizes thirty-six traffic signals, in addition to two school signals and eight school beacons. All signal locations were inspected to determine their suitability to handle existing traffic demands. Installations were examined for physical condition, conformance to the MUTCD, placement and usage, and general suitability of the installation for the need.

The signals currently in use in Marshalltown appear to be in excellent condition. Signals are mounted on pedestals with the exception of the signals on South Center and North 3rd Avenue which are suspended by mast arm.

Most of the signalized intersections also have pedestrian indications, although in many cases the DONT WALK indication is not accompanied by a WALK indication. None of the pedestrian indications have flashing capacity as required by the MUTCD.

The Consultant recommends that the City upgrade the signal installations which do not meet MUTCD standards. Each signal face shall have at least three lenses, but not more than five. The lenses shall be red, yellow, or green in color, and shall give a circular or single arrow type of indication. Pedestrian signals shall include both WALK and DONT WALK indications, and must have a flashing clearance interval as specified in the MUTCD.

Specific recommendations for signals requiring modifications are contained in Table 3-1. Additional modifications to signals are presented in Chapters 4 and 5 as they relate to high accident locations or school crossings.

INTERSECTION SIGNING

The most predominant form of intersection control in Marshalltown involves the usage of STOP and some YIELD signs. Other intersection controls involve signs for turn restrictions, one-way traffic flow, lane controls and related types of miscellaneous signing. The discussion below on the city-wide usage of intersection control signing will concentrate on the use of STOP and YIELD signs. The other intersection control signs will be discussed on an individual location basis in later chapters of this report.

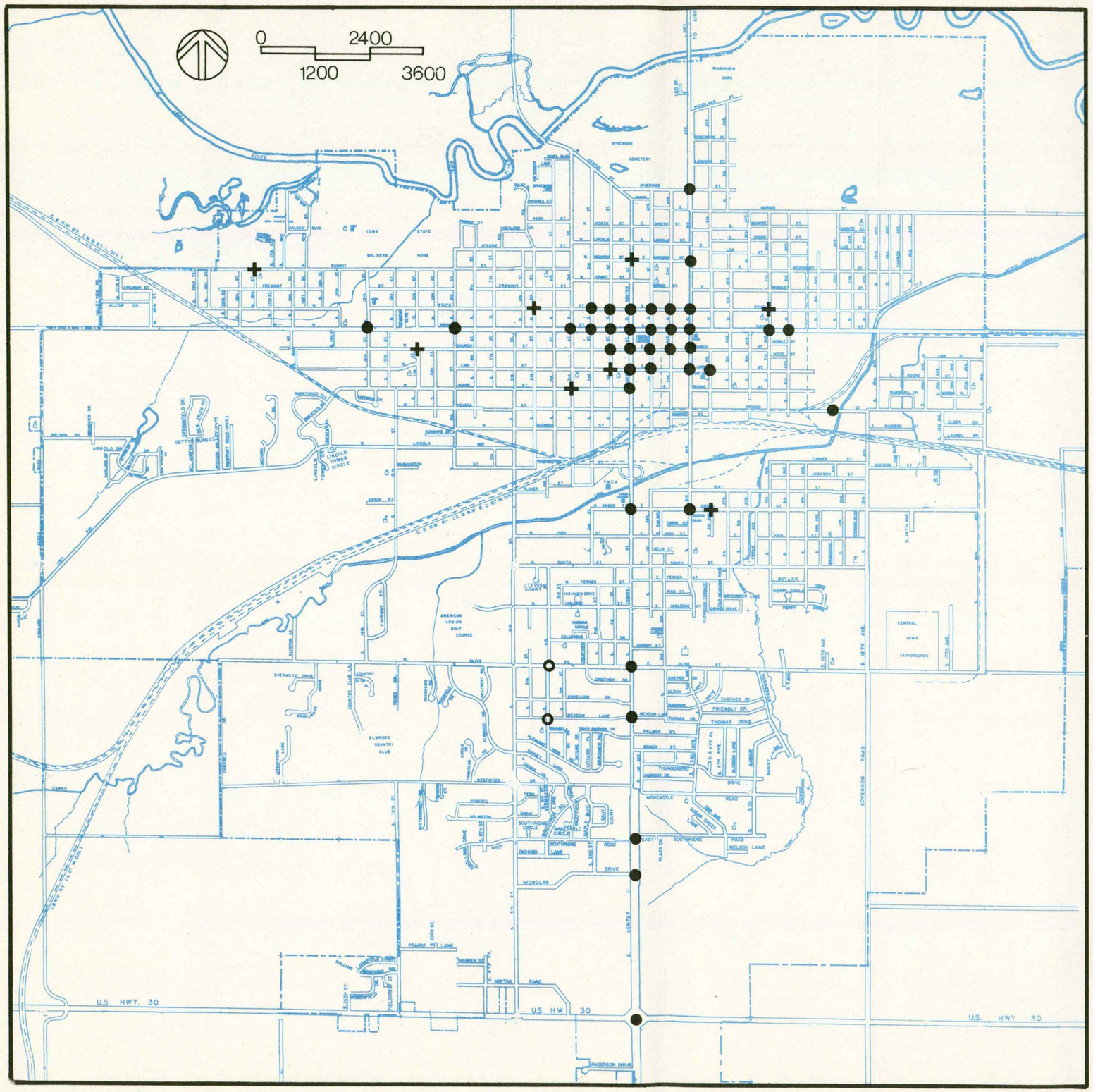
The following overall guidelines and principles were considered in the evaluation of signing in this report and should be adopted by the City in a signing policy.

The three basic objectives of intersection control are:

1. Provision of adequate intersection capacity.
2. Reduction and prevention of accidents.
3. Designation and protection of major streets.

In reviewing the intersection signing currently in use, a number of accepted guidelines and principles were considered towards the development of a logical scheme of intersection signing consistent with the above objectives. The considerations are as follows:

1. Sight distance.
2. Street classification (arterial, collector, local).
3. Speed limits.
4. Intersection geometry (right-angle, skewed).
5. Relative traffic volumes.
6. Turning demands.
7. Use of YIELD to control only minor street.
8. Use of YIELD to control only one street.
9. No mixing of YIELD and STOP signs at an intersection.
10. Conformance to MUTCD.
11. Accident experience.



Traffic Signals And Beacons

figure 3-1

legend

Signal Installation	●
Non Conforming School Signal	o
Non Conforming School Beacon	+

MARSHALLTOWN, IOWA

TABLE 3-1

SIGNAL RECOMMENDATIONS

Location			Modifications
Center	@	State	1. Replace arrows with green ball - 3 locations. 2. Add flashing DONT WALK phase. 3. Cost = $215.
	@	Main	1. Replace arrows with green ball - 4 locations. 2. Add flashing DONT WALK phase. 3. Cost = $220.
	@	Church	1. Replace arrows with green ball - 3 locations. 2. Add flashing DONT WALK phase. 3. Cost = $215.
	@	Linn	1. Replace arrows with green ball - 2 locations. 2. Add flashing DONT WALK phase. 3. Cost = $210.
	@	Boone	1. Replace arrows with green ball - 2 locations. 2. Cost = $10.
	@	Olive	1. Add flashing DONT WALK phase. 2. Omit lagging green, or add yellow arrow to right turn. 3. Cost = $200.
	@	Meadow Lane	1. Omit right turn arrows.
	@	Southridge	1. Omit right turn arrows.
	@	Nicholas	1. Omit right turn arrows.

TABLE 3-1 CONTINUED

Location			Modifications
Main	@	13th Street	1. Add pedestrian indications - 8 locations. 2. Cost = $3,000.
	@	9th Street	1. Add pedestrian indications - 4 locations 2. Cost = $2,000. (optional)
	@	3rd Street	1. Add 6 WALK indications. 2. Add flashing DONT WALK phase. 3. Replace arrows with green ball - 3 locations. 4. Cost = $1,415.
	@	2nd Street	1. Add 6 WALK indications. 2. Add flashing DONT WALK phase. 3. Replace arrows with green ball - 4 locations. 4. Cost = $1,420.
	@	1st Street	1. Add flashing DONT WALK phase. 2. Replace arrows with green ball - 4 locations. 3. Cost = $220.
	@	1st Avenue	1. Add flashing DONT WALK phase. 2. Replace arrows with green ball - 4 locations 3. Cost = $220.
	@	2nd Avenue	1. Add flashing DONT WALK phase. 2. Replace arrows with green ball - 4 locations. 3. Cost = $220.
	@	3rd Avenue	1. Add flashing DONT WALK phase. 2. Replace arrows with green ball - 2 locations. 3. Cost = $210.
	@	7th Avenue	1. Add pedestrian indications - 8 locations. 2. Cost = $3,000.

TABLE 3-1 CONTINUED

Location			Modifications
State	@	2nd Street	1. Add WALK heads - 6 locations. 2. Replace arrows with green ball - 4 locations. 3. Add flashing DONT WALK phase. 4. Cost = $1,220.
	@	1st Street	1. Replace arrows with green ball - 4 locations. 2. Add flashing DONT WALK phase. 3. Add 4 WALK indications. 4. Cost = $820.
	@	1st Avenue	1. Replace arrows with green ball - 4 locations 2. Add flashing DONT WALK phase. 3. Cost = $220.
	@	2nd Avenue	1. Replace arrows with green ball - 3 locations. 2. Add flashing DONT WALK phase. 3. Cost = $1,115.
	@	3rd Avenue	1. Replace arrows with green ball - 3 locations. 2. Add 6 WALK indicators. 3. Add flashing DONT WALK phase. 4. Cost = $1,115.
Church	@	1st Street	1. Replace arrows with green ball - 4 locations. 2. Add flashing DONT WALK phase. 3. Add 4 WALK indicators. 4. Cost = $820.
	@	1st Avenue	1. Replace arrows with green ball - 2 locations. 2. Add flashing DONT WALK phase. 3. Cost = $210.

TABLE 3-1 CONTINUED

Location			Modifications
Church (continued)			
	@	2nd Avenue	1. Replace arrows with green ball - 2 locations. 2. Add flashing DONT WALK phase. 3. Add 3 WALK indicators. 4. Cost = $660.
	@	3rd Avenue	1. Replace arrows with green ball - 1 location. 2. Add flashing DONT WALK phase. 3. Cost = $205.
Linn	@	1st Avenue	1. Replace arrows with green ball - 2 locations. 2. Add flashing DONT WALK phase. 3. Cost = $210.
	@	3rd Avenue	1. Replace arrows with green ball - 1 location. 2. Add flashing DONT WALK phase. 3. Cost = $210.
	@	4th Avenue	1. Replace arrows with green ball - 4 locations. 2. Add 4 WALK indicators. 3. Add flashing DONT WALK phase. 4. Cost = $820.
3rd Avenue	@	Anson	1. Add pedestrian indications (optional) 2. Cost = $3,000.
Nevada	@	10th Avenue	1. Remove signal. 2. Cost = $500.

The cost of signal improvements as outlined in Table 3-1 is $ 23,900.

Overall, inspections by the Consultant show that the physical placement and mounting height of the STOP and YIELD signs are satisfactory. Several locations did reveal that mounting heights were less than the recommended standards in the Manual On Uniform Traffic Control Devices (MTCD). The Consultant recommends that the City take positive measures as part of an annual maintenance program to restore any signs at sub-standard mounting heights to the properly acceptable mounting heights. Guidelines on the sign placement may be found in Figure 5-3, and in the MUTCD.

The City presently has several intersections where all of the legs are controlled with STOP signs. With the exception of a few locations all of these multi-stop locations do not contain the supplemental 3-way or 4-way plates. The Consultant recommends that these supplemental plates be installed at all existing as well as future multi-stop intersections. The usage of these plates clearly advises the motorist that drivers on the other legs must stop at the intersection. In addition, the usage of these plates provides a differentiation between intersections with mulit-stop control vs. stop controls on only some of the intersection legs.

A common problem observed with intersection control signing throughout the City was the obstruction of the signs by tree limbs. In several locations, it appeared that this factor had a bearing on the accident frequency as discussed in Chapter 4. It would be a advisable for the City to establish a program for inspecting and trimming lower tree limbs throughout the City on major arterial streets each spring.

The Consultant also observed many locations where curb-parked vehicles blocked the visibility of STOP or YIELD signs at intersections. In general, the accepted standard is to prohibit parking for 30 feet in advance of an intersection control sign, in residential areas, and 20 feet in business areas. Parking should also be restricted within 20 feet of the sidewalk on the exit leg of an intersection. It is therefore suggested that the City take corrective measures through the installation of NO PARKING signs as required

to prevent visual obstruction of intersection controls by parked vehicles. Parking is further discussed in the final section of Chapter 2.

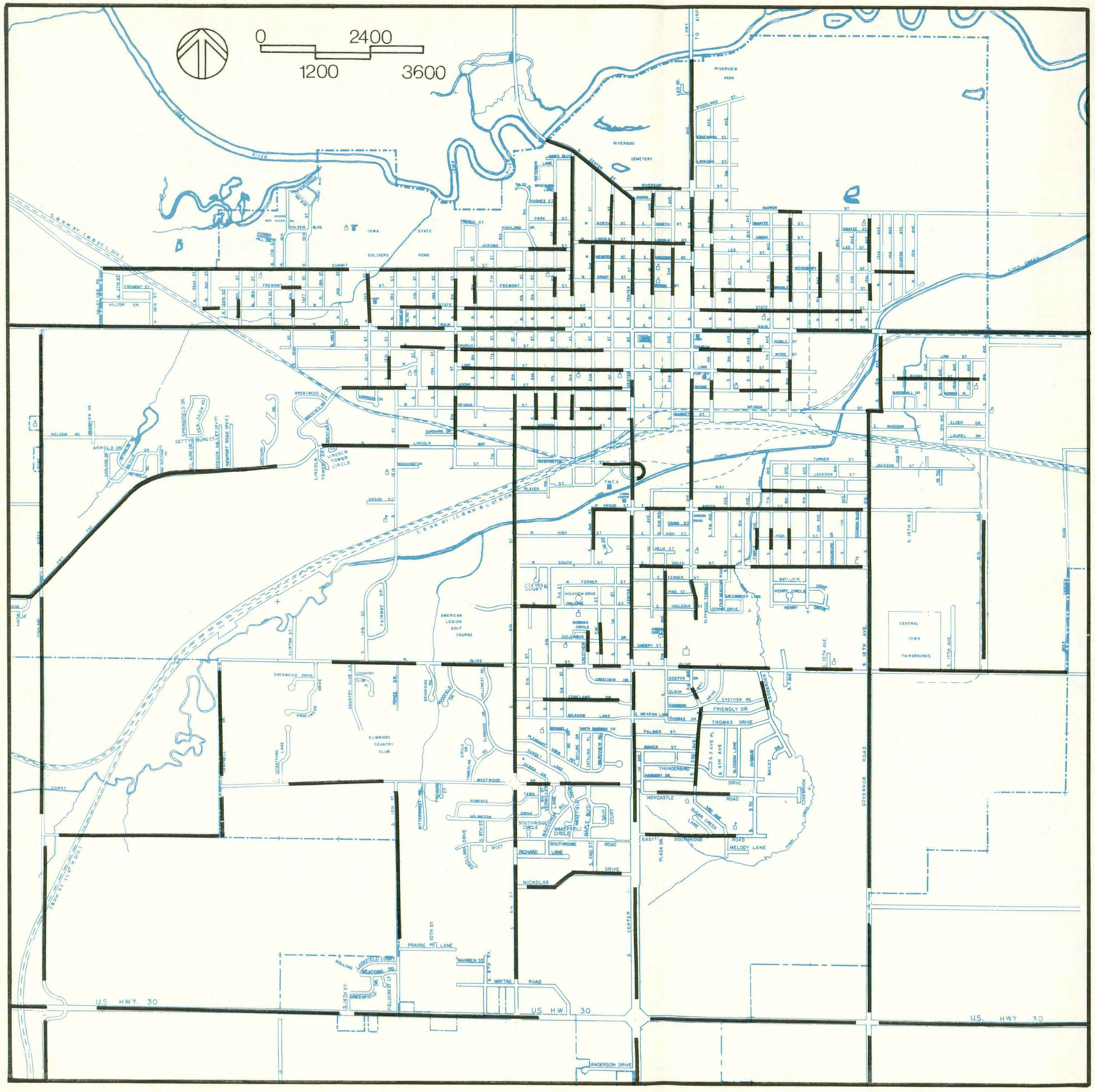
Recommended STOP and YIELD Sign Changes. Based upon evaluation of the intersection controls in Marshalltown, the Consultant delineated those street segments having continuous right-of-way for vehicular traffic. The results of this evaluation are shown in Figure 3-2, which illustrates the existing traffic flow continuity on the present street system.

A comparison was then made between the traffic flow continuity in Figure 3-2 with the functional street classification shown previously in Figure 2-2. This comparison provides an indication of how the street system plan (Functional Street Classification in Figure 2-2) compares directly with what has been implemented on the streets themselves with the intersection traffic control devices (Existing Traffic Flow Continuity shown in Figure 3-2).

In comparing these two figures, the street classification and existing traffic flow continuity are basically consistent for the principal and major arterials in Marshalltown. Flow continuity is maintained for the most part along Highway 330, Boone (west of Center), Summit, Center, Main, South 6th, and South 12th Streets.

However, flow continuity for some of the designated arterial and collector streets does not conform to the functional street classification shown in Figure 2-2. Figure 3-3 illustrates the flow continuity proposed by the Consultant in accordance with the functional classification. This figure also locates STOP sign modifications which would alter the existing flow continuity.

One obvious inconsistency between the signing and the designated street classification occurs along West Lincoln Way, an extension of Highway 330. STOP signs should be placed at several locations to regulate the

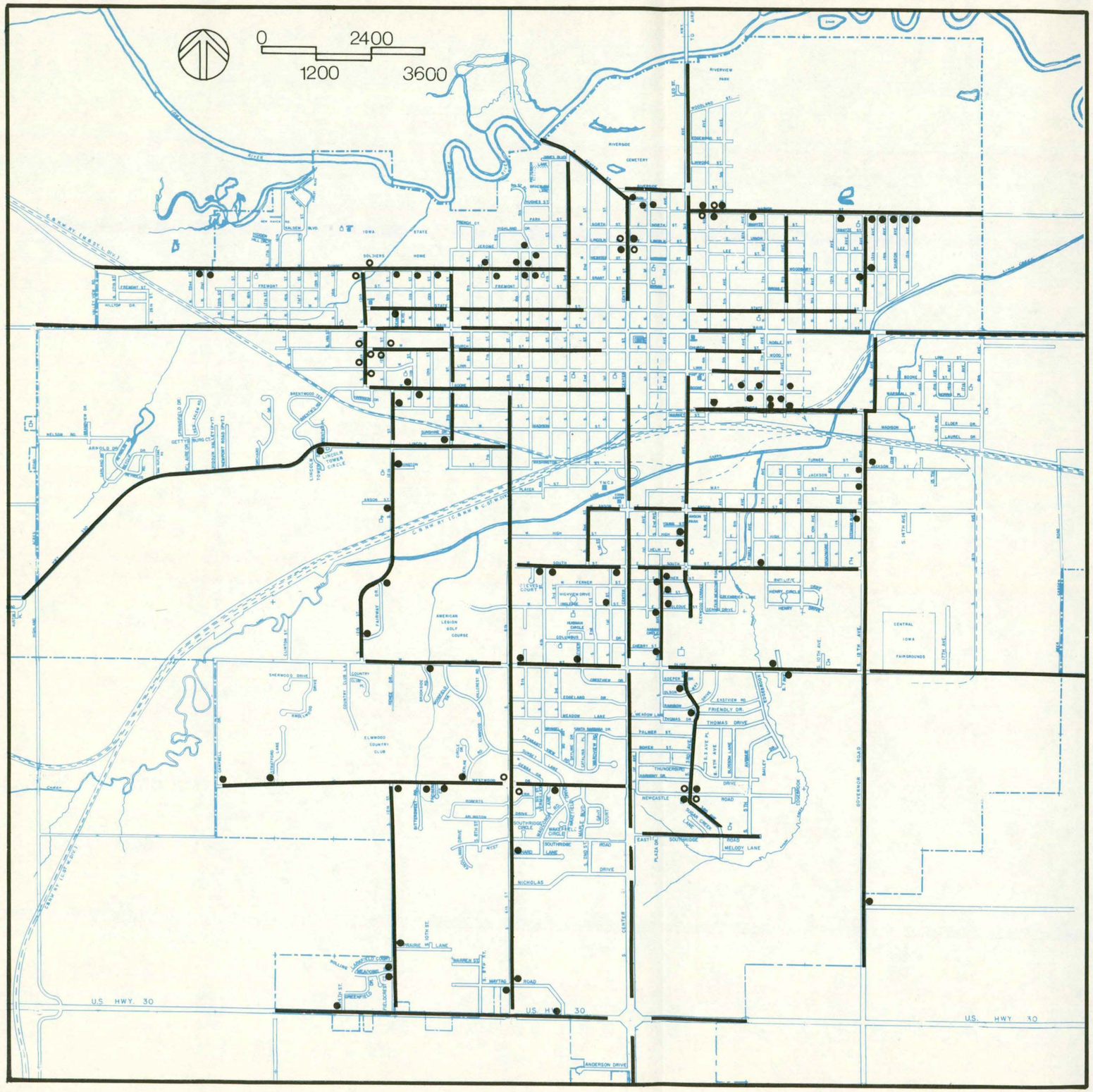


Flow Continuity
figure 3-2

legend

Street with continuous right of way

MARSHALLTOWN, IOWA



Proposed Flow Continuity

figure 3-3

legend

Remove Stop ○

Install Stop ●

MARSHALLTOWN, IOWA

north-south streets intersecting West Lincoln Way and provide east-west flow continuity.

Center Street is an arterial extension and carries extremely heavy traffic volumes. Signing changes are recommended in Figure 3-3, to provide flow continuity along 6th Street, furnishing an additional north-south arterial with continuous right-of-way.

The intersection of 7th Street and Summit does not satisfy the minimum requirement for study as a high accident location (7 accidents per year). However, the accidents which occur indicate a failure to yield right-of-way together with a sight distance problem related to grade. Accident patterns on other portions of Summit suggest that all YIELD signs in this area should be replaced with STOP signs. Flow continuity would then be established along Summit Street.

In general, YIELD signs have been found to be ineffective, and the use of STOP signs is preferable. The Consultant recommends the replacement of YIELD signs with STOP signs for intersection control.

When making any changes in the intersection control signing, the Consultant strongly urges that --

a. The changes be made on a systematic basis rather than a random or spot basis.

b. The improvements be done in small groups; i.e., along an entire street or by a neighborhood or specific section of the City.

c. The assistance of the local newspaper and radio station should be sought to provide public notice of the sign control changes.

d. Bright red flags (plastic or cloth) should be affixed to the top of all newly installed traffic control signs for a period of 30 days following their installation.

PAVEMENT MARKINGS

Pavement markings were inspected with respect to proper usage, maintenance and need for additional markings. Generally, usage is proper and correct and no non-conforming practices were observed. For the duration of this study, pavement markings were well maintained.

Existing pavement markings, together with additional required markings, are shown in Chapters 4 and 5 for high accident locations and school and pedestrian crosswalks.

SPEED LIMITS

In general, most of the roadways in Marshalltown are properly signed for speed limits at the present time. A speed limit of 25 MPH is in effect for all residential and school areas. A maximum speed of 45 MPH is established on roads leading in to the City.

It was noted that in several locations improper sign size and mounting height could prohibit the enforcement of speed laws. These signs should be replaced as noted in the sign survey conducted by the City Engineer.

Further information on school speed limits may be found in Chapter 5.

HOSPITALS

Both of Marshalltown's hospital sites were reviewed for off-site traffic and circulation problems. Although the main facility is located on the fringe of the CBD (Central Business District), only minor problems related to high traffic flows were observed. Generally circulation and access were good.

A problem was noted with respect to on-site circulation and parking supply. Recommendations toward the improvement of these problems were made to the Hospital Administration.

RAILROAD CROSSINGS

General Description

Marshalltown is the site of a major switchyard of the Chicago and Northwestern Railroad. Thirty-five crossings are found within this highly-industrialized city, three of which are grade separated. Five spur lines are also present. Figure 3-4 indicates the locations of the railroad crossings in Marshalltown. Table 3-2 contains an inventory of railroad crossings.

Railroad Grade Crossing Control Standards

The pertinent guidelines in the MUTCD regarding railroad crossing controls are as follows:

1. A crossbuck shall be in place on the right-hand side of each approach to all crossings, usually the railroad's responsibility.

2. Railroad Advance Warning signs shall be used in advance of all crossings (100 feet minimum and 250 feet desirable), except where:
   a. Conditions do not permit effective display,
   b. Crossings are fully protected in CBD areas, or
   c. Crossings are located on infrequently used sidings or spurs which are guarded by crews when in use.

3. Railroad crossing pavement markings shall be placed at all crossings with flashing signals, automatic gates, or where vehicular speeds are greater than 40 MPH.

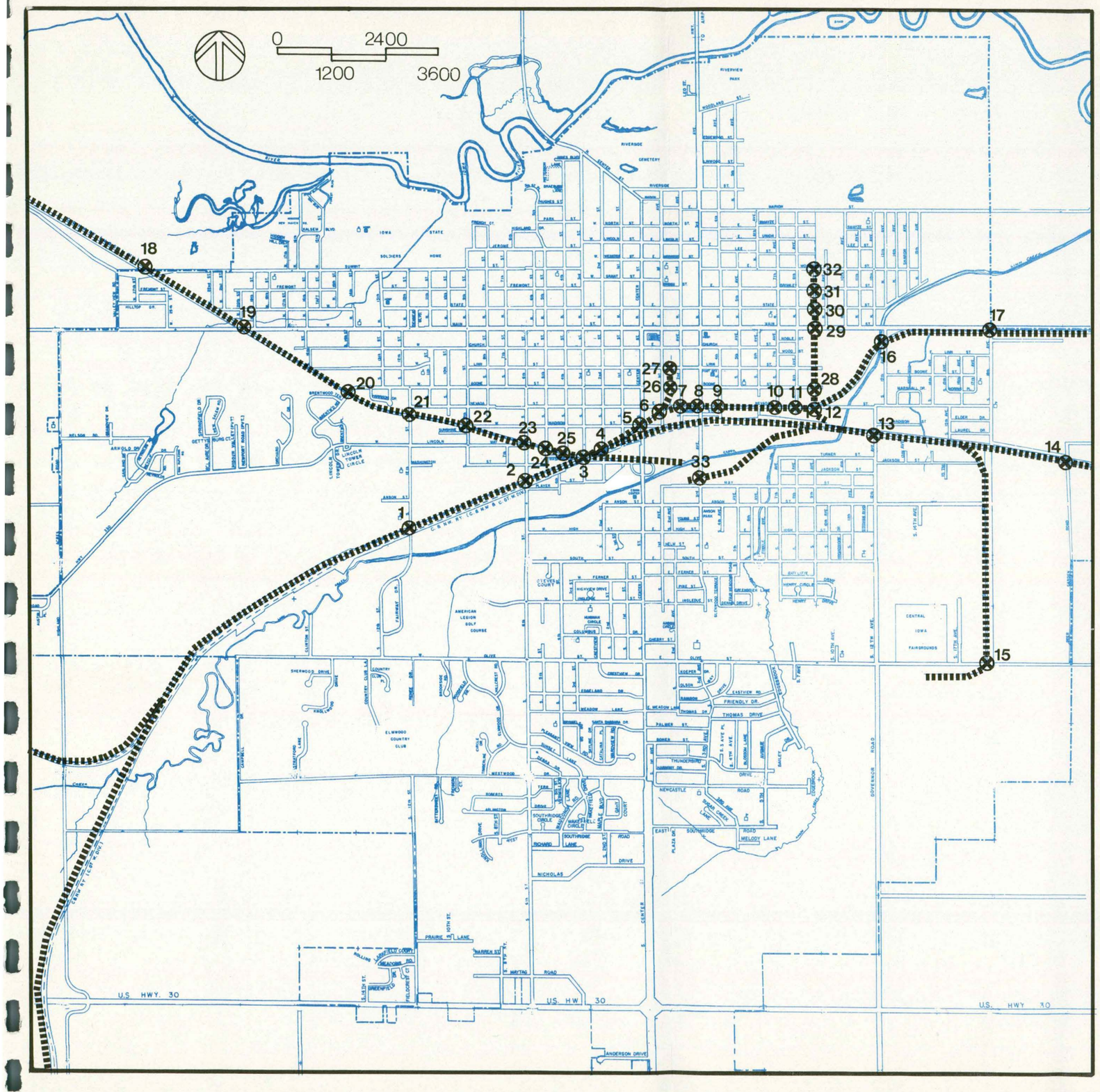
4. The use of STOP signs at crossings has been interpreted to be permissible, provided they are applied discriminantly on the basis of speeds, volumes, and hazards, and that such application be for "an interim use period during which plans for lights, gates, or other controls are being prepared".

In addition, the railroad should be responsible for cutting vegetation to provide proper sight distance, and for maintaining the crossing to assure a smooth driving surface. While few crossings are maintained in optimal condition, unduly rough crossings are intolerable because they can cause loss of control, discomfort, and other undesirable situations.

TABLE 3 - 2

RAILROAD CROSSING INVENTORY

		Controls				Conditions		
No.	Location	X-Buck	Flashing Lights	Gates	Advance Signs	Number of Tracks	Crossing Condition	Sight Distance
1	12th Street	2	4	0	0	3	good	v. good
2	6th Street	2	4	2	0	3	fair	v. good
3	3rd Street	2	4	2	0	4	poor	v. good
4	2nd Street	2	0	0	0	10	poor	v. good
5	Center Street	3	8	0	0	3	v. good	fair
6	1st Avenue	2	4	0	0	4	fair	v. good
7	2nd Avenue	2	4	0	0	2	good	v. good
8	3rd Avenue	3	6	0	0	2	v. good	v. good
9	4th Avenue	1	0	0	0	1	good	v. good
10	7th Avenue	1N	0	0	0	2	good	v. good
11	8th Avenue	1N	0	0	0	2	v. good	v. good
12	Nevada Street	0	0	0	0	1	good	v. good
13	12th Avenue	2	wig wag	0	0	5	fair	v. good
14	Beer Garden Rd.	2	0	0	2	1	poor	good
15	Olive Street	2	0	0	2	1	v. good	v. good
16	12th Avenue	2	4	0	0	1	good	v. good
17	18th Avenue	1	0	0	0	1	fair	poor
18	Summit Street	Grade Separation			-	-	---	---
19	Main Street	2	4	0	0	1	poor	good
20	Brentwood Rd.	2	4	0	0	1	v. good	poor
21	12th Street	2	4	0	0	1	v. good	poor
22	9th Street	2	4	0	0	1	poor	poor
23	6th Street	2	4	0	0	1	good	v. good
24	5th Street	2	0	0	0	1	good	fair
25	4th Street	1	0	0	0	2	poor	good
26	Boone Street	0	0	0	0	2	good	good
27	Linn Street	2	0	0	0	1	good	fair
28	Boone Street	1	0	0	0	2	good	good
29	Main Street	2	0	0	0	1	poor	v. good
30	State Street	1	0	0	0	2	fair	good
31	Bromley St.	2	0	0	0	3	fair	poor
32	Woodbury St.	1E	0	0	0	2	fair	v. good
33	3rd Avenue	0	0	0	1	1	v. good	v. good



Railroad Crossings
figure 3-4

legend

Railroad Crossing & Number — 1

MARSHALLTOWN, IOWA

GENERAL RECOMMENDATIONS

Although the crossings do not exhibit a high frequency of accidents, the Consultant recommends the improvements specified below to reduce any potentials for accidents, and to improve the overall safety of the rail crossings in the City. Because most crossings are occupied by trains for only a small portion of the day, motorists acquire the habit of assuming that a train will not cross their path. The general public does not appreciate the consequences of a misjudgment at a crossing.

For these reasons, the installation and maintenance of crossing protection commensurate with the hazard and need of each location is imperative.

A summary of recommended grade crossing improvements is presented in Table 3-3. Most actions involve additional signing when appropriate. Very few of the crossings are currently protected by Advance Warning signs, and at some locations only one crossbuck is present.

Proper signing, as specified by the MUTCD, should be implemented as soon as possible at each crossing. Old signs should be replaced before excessive wear occurs.

TABLE 3 - 3

RAILROAD CROSSING MODIFICATIONS

No.	Location	Recommendation	Basis *	Cost
1	12th Street	Advance Warning Signs	1, 2	$ 70
2	6th Street	Advance Warning Signs	1, 2	70
		Replace So. Crossbuck	3	75
		Upgrade Crossing	3	--
3	3rd Street	Advance Warning Signs	1, 2	70
		Upgrade Crossing	3	--
4	2nd Street	Advance Warning Signs	1, 2	70
5	Center Street	Advance Warning Signs	1, 2	70
6	1st Avenue	Advance Warning Signs	1, 2	70
7	2nd Avenue	Advance Warning Signs	1, 2	70
8	3rd Avenue	Advance Warning Signs	1, 2	70
9	4th Avenue	Advance Warning Signs	1, 2	70
		Install One Crossbuck	1	75
10	7th Avenue	One Advance Warning Sign	1, 2	35
		Install 2 New Crossbucks	1	150
11	8th Avenue	One Advance Warning Sign	1, 2	35
		Install So. Crossbuck	1	75
		New Post for Crossbuck	1	75
12	Nevada Street	Install Crossbucks	1	150
13	12th Avenue	Advance Warning Signs	1, 2	70
		Replace Wig Wags with Standard Lights	1	--
14	Beer Garden Rd.	Advance Warning Signs	1, 2	70
		Replace 2 Crossbucks	3	150
		Trim Brush (So.)	3	--

TABLE 3 - 3 (Continued)

No.	Location	Recommendation	Basis *	Cost
15	Olive Street	Raise Warning Signs	1, 2	$ --
16	12th Avenue	Advance Warning Signs	1, 2	70
17	18th Avenue	Replace One Crossbuck	3	75
		Install One Crossbuck	1	75
		Advance Warning Signs	1, 2	70
18	Summit Street			
19	Main Street	Advance Warning Signs	1, 2	70
		Upgrade Crossing	3	--
20	Brentwood Road	Advance Warning Signs	1, 2	70
		Trim Trees (So.)	3	--
21	12th Street	Advance Warning Signs	1, 2	70
		Trim Shrubs	3	--
22	9th Street	Advance Warning Signs	1, 2	70
23	6th Street	Advance Warning Signs	1, 2	70
24	5th Street	Advance Warning Signs	1, 2	70
25	4th Street	Advance Warning Signs	1, 2	70
		Install One Crossbuck	1	75
26	Boone Street	Install Crossbucks	1	150
27	Linn Street			
28	Boone Street	Advance Warning Signs	1, 2	70
		Install One Crossbuck	1	75
29	Main Street	Advance Warning Signs	1, 2	70
		Upgrade Crossing	3	--

TABLE 3 - 3 (Continued)

No.	Location	Recommendation	Basis *	Cost
30	State Street	Advance Warning Signs	1, 2	$ 70
		Install One Crossbuck	1	75
		Upgrade Crossing	3	--
31	Bromley Street	Advance Warning Signs	1, 2	70
32	Woodbury Street	Advance Warning Signs	1, 2	70
		Install West Crossbuck	1	75
33	3rd Avenue	One Advance Warning Sign	1, 2	35
		Install Crossbucks	1	150

SUMMARY OF COSTS	City of Marshalltown	$ 1,855
	Railroads (Crossbucks)	1,500
		$ 3,355

* Basis :
1. To conform to established control standards.
2. To improve safety of operation.
3. To perform required or routine maintenance.

4

Chapter 4
ACCIDENT ANALYSIS

ACCIDENT HISTORY

The City Engineer currently maintains a set of accident records which are filed by location, and traffic accident records for 1975 and 1976 were furnished to the Consultant. It is recommended that this file be continued and periodically reviewed as an excellent source of traffic engineering information.

The City Police Department presently utilizes a color-coded accident pin map which shows the location and type (property damage, personal injury, and fatal) of traffic accidents. At the end of each year, these maps should be color-photographed and kept on file for future reference.

A review of the available accident records revealed several intersections which were defined high accident locations. This was defined to be a location where seven or more accidents occurred in the period of a year, or additionally a location where a readily identifiable pattern of accidents could be discerned.

Twenty-three intersections in Marshalltown were found to have an accident history significant enough to warrant review and discussion.

Table 4-1 provides a monthly tabulation of each type of intersection-related accident from September, 1974, to November, 1976. This table also lists the percentage of total accidents attributed to each accident type.

In comparison to nationwide figures, the statistics for Marshalltown vary in certain instances. Rear-end collisions are substantially higher than the national average. Right-angle collisions match national figures, while the proportion of side swipes exceeds the nationwide average. The percentage of turning accidents is well below nationwide figures.

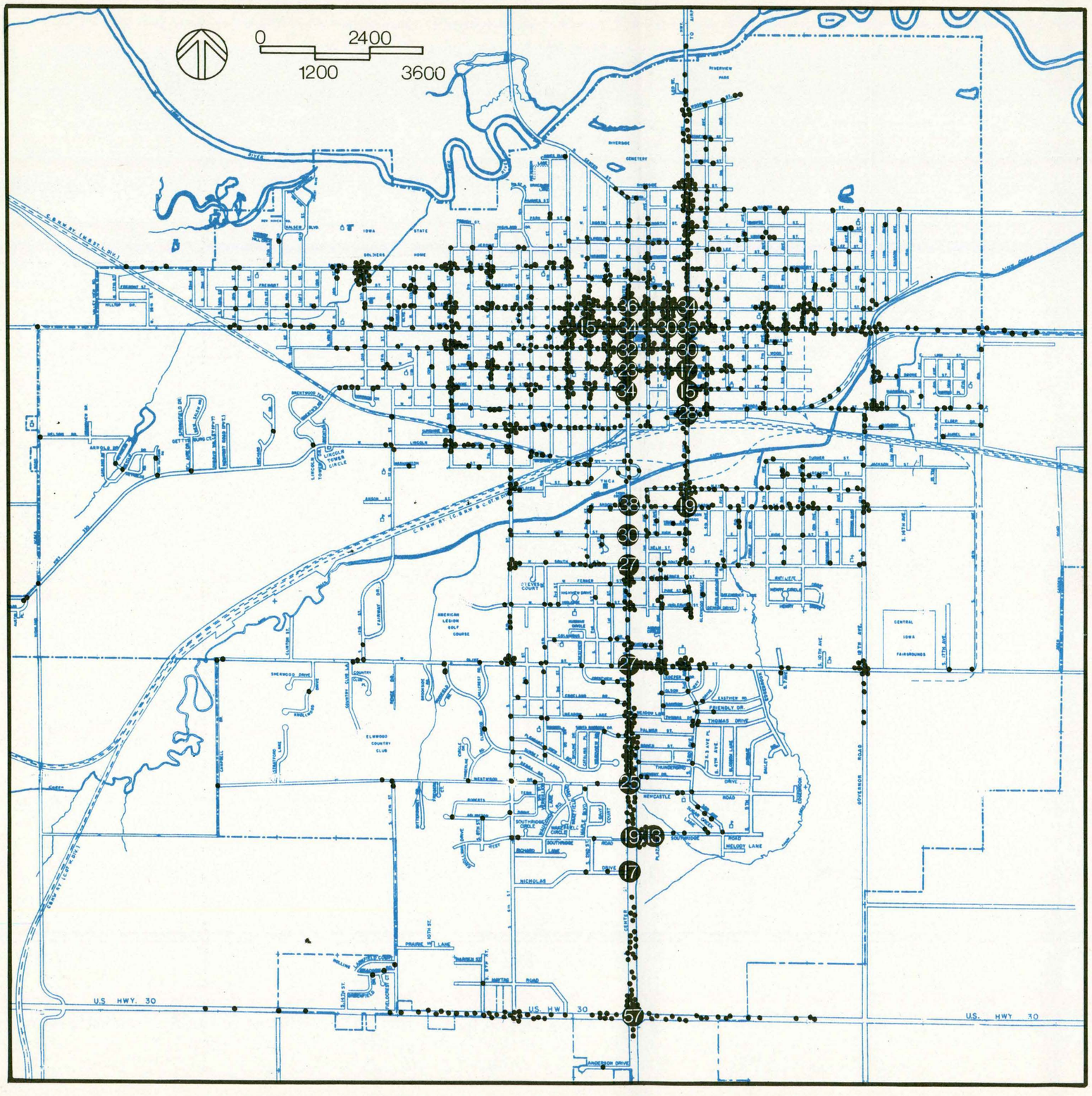
The occurrence of accidents appears to be fairly evenly distributed between the daylight hours (8:00 A.M. to 4:00 P.M.) and the evening hours (4:00 P.M. to midnight). The majority of all accidents occurred during good weather.

Figure 4-1 shows the location of accidents occurring during the period of study. High accident locations as defined for this study are shown by circles containing the number of accidents occurring during the study period. Analysis of this figure indicates that State Highway 14 accounts

TABLE 4 - 1

INTERSECTION - RELATED ACCIDENTS

Month	Right Angle	Rear End	Side Swipe	Head On	Ped.	Fixed Object	Right Turn	Left Turn	Other	Total
(1974)										
Sept.	22	13	8	0	2	0	0	0	0	45
Oct.	31	14	7	2	2	1	2	4	0	63
Nov.	22	19	7	0	1	3	1	2	0	55
Dec.	25	17	7	0	0	4	0	0	0	53
(1975)										
Jan.	25	20	7	0	0	5	0	4	0	61
Febr.	26	25	8	1	1	9	1	2	0	73
Mar.	44	17	7	0	1	1	0	3	0	73
Apr.	24	17	1	0	0	0	1	2	1	46
May	24	16	6	0	1	8	0	2	0	57
June	23	14	4	0	0	1	0	4	0	46
July	22	10	9	0	0	5	1	3	0	50
Aug.	20	15	4	0	0	5	0	2	2	48
Sept.	14	15	6	2	2	2	0	3	0	44
Oct.	15	6	5	0	0	1	0	6	0	33
Nov.	16	17	6	0	0	3	1	3	0	46
Dec.	9	19	8	0	1	4	1	4	0	46
(1976)										
Jan.	18	13	5	0	0	3	1	1	0	41
Febr.	5	6	4	0	0	0	2	3	0	20
Mar.	12	17	7	0	0	5	1	3	0	45
Apr.	16	11	4	0	0	4	0	1	0	36
May	23	11	0	1	0	4	2	3	0	44
June	12	7	3	0	0	2	2	3	0	29
July	20	6	8	1	1	2	1	4	1	44
Aug.	12	13	6	0	1	4	0	2	1	39
Sept.	12	11	3	0	1	4	0	3	0	34
Oct.	12	10	2	0	0	0	1	4	0	29
Nov.	17	8	3	0	0	0	4	4	0	36
Sub. T.	521	367	145	7	14	80	22	75	5	1236
%	42.2	29.7	11.7	.6	1.1	6.5	1.8	6.1	.4	100.0



Accident Distribution

figure 4-1

legend

One Accident •

Ten Accidents ⑩

MARSHALLTOWN, IOWA

for 15 of the 23 hazardous locations. Thirteen of these are also closely related to the Central Business District (CBD). When comparing Figures 3-1 and 4-1, a third common factor is apparent. Seventeen of the 23 locations are signalized.

The city-wide accident picture is good. High Accident Locations are confined to major high volume routes in a fairly small area (the CBD and South Center). In other areas, accidents are fairly uniformly dispersed with a slight concentration in the Northwest part of the City.

GENERAL RECOMMENDATIONS

The Consultant believes that the general accident picture can be improved by the implementation of general policies that would eliminate the underlying causes of accidents.

1. The high traffic volume on South Center Street is a major contributing cause of accidents in this area. It is recommended that the City encourage the use of alternate routes such as 12th Street, 6th Street, 3rd Avenue and 12th Avenue. Establishing signing as recommended in Chapter 3, and giving these streets preferential treatment in future maintenance and street improvement projects, would be helpful. Zoning policies which discourage scattered development along South Center Street are suggested.

2. In the Northwest section of town and along State and Main Streets East of the CBD, a systematic review of intersections is recommended. This review should consist of specific action in eliminating sight distance problems caused by trees and vegetation within the street right-of-way. The implementation of signing changes presented in Chapter 3 is also strongly recommended for its accident reduction potential.

3. Improvements to High Accident Locations as described below should be implemented as specified. Additionally, an attempt to solve the overall accident causes should be undertaken. Recommendations which are made in the text and not shown on the corresponding Figure are made to address these general accident causes.

HIGH ACCIDENT LOCATIONS

Table 4 - 2 lists each high accident location according to rank. Each of these intersections will be reviewed in detail on the following pages. Accident diagrams for the study period (January 1, 1975, to December 31, 1976) can be found in the Appendix.

TABLE 4 - 2

HIGH ACCIDENT LOCATION RANKING AND INDEX

Rank	Location	Total Accidents 1975 & 1976	Personal Injury Accidents	Page
1	So. Center - U.S. Hwy. 30	57	15	4-8
2	So. Center - Anson	38	3	4-11
3	No. Center - State	36	5	4-14
4	So. Center - Boone	34	7	4-16
5	So. 3rd Ave. - Main	34	4	4-18
6	No. 3rd Ave. - State	34	3	4-20
7	So. Center - Main	34	2	4-22
8	So. Center - Church	32	2	4-24
9	So. Center - High	30	6	4-26
10	So. 2nd Ave. - Main	30	5	4-28
11	So. 3rd Ave. - Church	30	4	4-30
12	So. 3rd Ave. - Nevada	28	1	4-33
13	So. Center - South	27	8	4-36
14	So. Center - Olive	27	8	4-38
15	So. Center - Westwood	25	4	4-40
16	So. Center - Linn	23	4	4-42
17	So. 3rd Ave. - Anson	19	4	4-44
18	So. Center - Southridge	19	2	4-46
19	So. Center - Nicholas	17	6	4-48
20	So. 3rd Ave. - Linn	17	3	4-50
21	So. 2nd St. - Main	15	1	4-52
22	So. 3rd Ave. - Boone	15	1	4-54
23	Plaza Dr. - Southridge	13	1	4-56

SOUTH CENTER AND U.S. HIGHWAY 30

Figure 4-2 is a diagram of this high accident location. Center Street is a two-way arterial extension carrying four lanes of traffic. Highway 30 is a two-way, two-lane roadway which flares to accommodate four lanes at the intersection. No parking is allowed near the intersection.

Mast-arm-mounted traffic signals (12" lenses) regulate traffic at this location. No pedestrian indications or crosswalks are present. Lane lines are the only form of pavement marking utilized near the intersection.

On the approaches to this intersection, the primary accident patterns are of the rear-end variety. Within the intersection itself, the accidents are almost exclusively of the left-turn variety. The left-turn accidents primarily involved vehicles entering the intersection from the South and the North. A few left-turn accidents also occurred between vehicles using the East and West approaches.

The following modifications are recommended as being capable of immediate implementation.

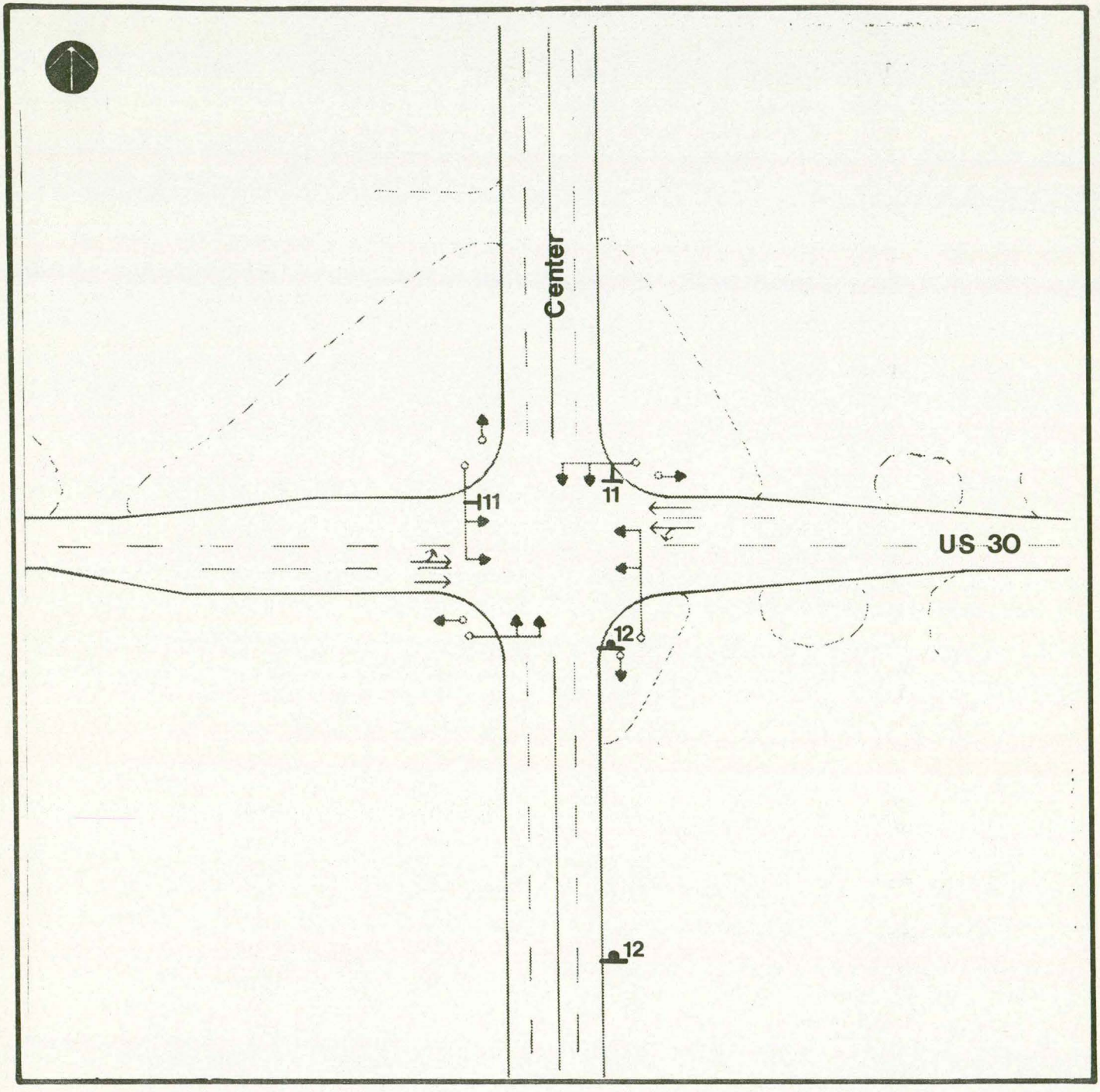
1. A YELLOW ARROW indication should be added to the four-section signal faces to provide a clearance interval following the termination of the GREEN ARROW indication. If the YELLOW ARROW is not provided, the clearance interval should at least be built into the signal controller.

2. As shown in Figure 4-2, special regulatory signs should be installed to inform motorists on the South and East approaches that this is a special signal, and that they should wait for their green indication before proceeding.

3. Almost 25% of the accidents at this location resulted in personal injuries. To reduce the severity of accidents, speed studies should be conducted, and reasonable speed zones should be established. Enforcement is a necessary follow-up to the speed zoning.

After the implementation of the modifications listed above, the accident experience at this location should be monitored. If left-turn accidents persist, it is recommended that all approaches be modified to accommodate an exclusive left-turn lane. On Center Street, each approach should have two through lanes and a left-turn lane. On U.S. 30, each approach would require only one through lane and a left-turn lane. The traffic signal installation would also require modifications to provide leading green phases for the left turns.

Total Cost = $600.



So. Center & US Hwy 30

1 STOP	2 YIELD	3 NO LEFT TURN	4 KEEP RIGHT	5 SPEED LIMIT 25	6 NO PARKING HERE TO CORNER
7 NO PARKING ANY TIME	8 NO PARKING (MISC)	9 DO NOT ENTER	10 ONE WAY	11 DELAYED SIGNAL WAIT FOR YOUR GREEN	12 WATCH FOR TURNING VEHICLES
13	14	15	16	17	18

figure 4-2

MARSHALLTOWN, IOWA

SOUTH CENTER AND ANSON

This high accident location is illustrated in Figure 4-3. Center Street is functionally classified as an arterial extension, while Anson is designated as a municipal arterial. The north leg of the intersection features three through lanes, two of which are southbound. The south leg also utilizes one northbound and two southbound through lanes. Both approaches include an exclusive left-turn lane. Anson Street is a two-way facility, and the East and West approaches both feature an exclusive left-turn lane and two through lanes.

Mast-arm signals provide the traffic control at this intersection. No pedestrian indications or crosswalks are present. Lane lines are utilized on all four approaches.

Thirty-eight accidents were reported at this intersection during the study period, twenty-four of which were rear-end collisions. The remaining mishaps were equally distributed with respect to type and location. Three personal injury accidents occurred at this intersection.

In addition to the 38 accidents recorded in the immediate vicinity of this intersection, several accidents (approximately 22) at the Center Street - High Street and Center Street - South Street intersections can be attributed to vehicle queues resulting from deficiencies of the Center-Anson intersection. The single through lane on the south approach of the subject intersection is not capable of handling the northbound traffic demand. The single through lane was instituted to solve a merging problem that existed between this intersection and a two-lane viaduct north of the intersection. In the opinion of the Consultant, the viaduct is the source of the traffic problem for the entire five-block section of Center Street south of the viaduct. Furthermore, the constriction of traffic flow should be limited to the viaduct rather than spreading the problem (including accident potential) over a five-block area. The foregoing is the basis upon which the following recommendations are founded:

1. Center Street should operate as a four-lane undivided street as shown in Figure 4-3.

    a. A RIGHT LANE ENDS sign (W4-1) and a PAVEMENT WIDTH TRANSITION sign (W4-2) should be installed on the east side of the north leg.

    b. The LANE USE CONTROL signs (R3-5) should be removed from the signal mast-arms.

c. The LANE USE CONTROL signs mounted overhead on the north and south approaches should be removed.

d. The left-turn signal for southbound motorists should be hooded or removed.

e. The pavement markings should be modified as shown in the Figure.

2. The amber intervals for the traffic signals should be set at 4 seconds.

3. Utilizing turning-movement counts provided by the Iowa Department of Transportation, the Consultant evaluated the critical lane movements and computed the required signal timing. If Center Street is converted to a four-lane undivided street:

a. The intersection is capable of operation without congestion.

b. A two-phase signal operation would be adequate to handle existing traffic demands.

c. A cycle length of 60 seconds, with 4-second amber intervals, would be appropriate.

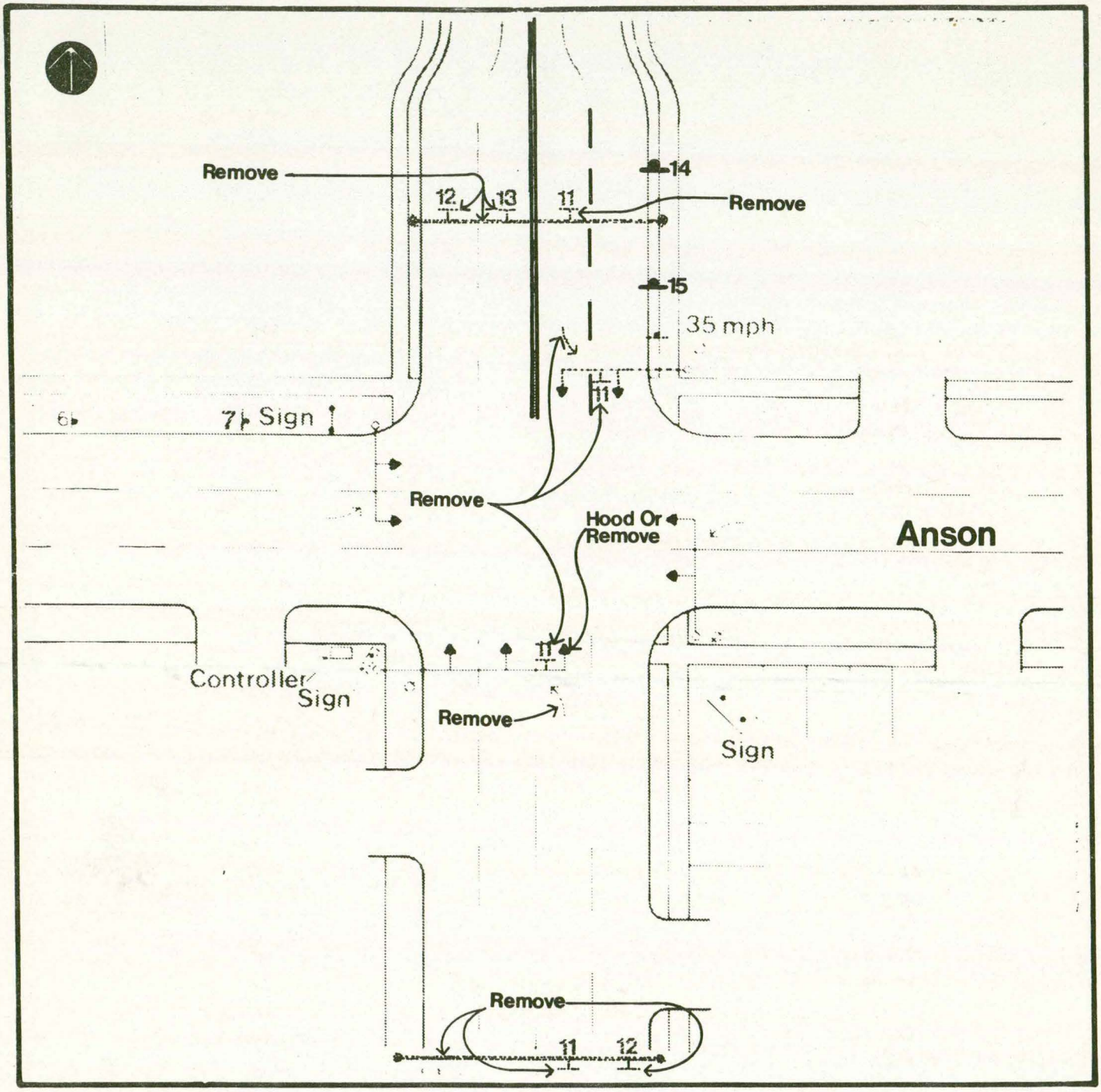
d. The green time should be proportioned so that Center Street receives 33 seconds (55%) and Anson Street receives 19 seconds (32%).

4. Speed checks should be conducted on Center Street to determine the need for enforcement.

The recommendations listed above will improve traffic flow and safety at the intersections of Center Street with Anson, High and South Streets. However, the two-lane bridge will continue to cause traffic problems. The ultimate solutions to the traffic problems, then, are to widen the viaduct to four lanes or to reroute State Highway 14 over the 3rd Avenue bridge.

An alternative intersection configuration is presented on Page A-30 of this report.

Total Cost = $300.



1 STOP	2 YIELD	3 NO LEFT TURN	4 KEEP RIGHT	5 SPEED LIMIT 25	6 NO PARKING HERE TO CORNER
7 NO PARKING ANY TIME	8 NO PARKING MISC	9 DO NOT ENTER	10 ONE WAY	11 ONLY	12
13 ONLY	14	15 RIGHT LANE ENDS	16	17	18

So. Center & Anson

figure 4-3

MARSHALLTOWN, IOWA

NORTH CENTER AND STATE

This high-accident intersection is located in the downtown area and is shown in Figure 4-4. Center Street is a two-way, two-lane trunk collector extension. On the north approach, 45 degree angle parking is furnished on both sides. The south leg provides parallel parking on each side, and also features an exclusive left-turn lane. State Street is a three-lane, one-way, westbound municipal arterial. Parallel parking is permitted along the south side.

Pedestal-mounted traffic signals (8" lenses) furnish the traffic control for this intersection. Pedestrian indications and crosswalks are provided on all four approaches. ONE WAY signs are utilized to indicate the one-way operation of State Street. A STOP line is present on the south approach.

Of the thirty-six accidents which occurred during the study period, 66% involved right-angle, sideswipe, or rear-end collisions. 22% of the mishaps were parking-related. Five personal injury accidents took place, including one pedestrian accident.

Figure 4-4 shows several recommended improvements for this location. The changes are further discussed below:

1. To improve signal visibility, mast arms should be installed on the northeast and northwest corners of the intersection. The existing signals on the other two corners could be retained with the addition of 12" red indications. A complete mast arm installation would be preferable.

2. The existing DONT WALK signals should be modified to allow a flashing operation. The double green arrow lenses should be replaced with circular green indications. The vehicle clearance intervals should be set at 4 seconds.

3. Pavement marking modifications are depicted in Figure 4-4.

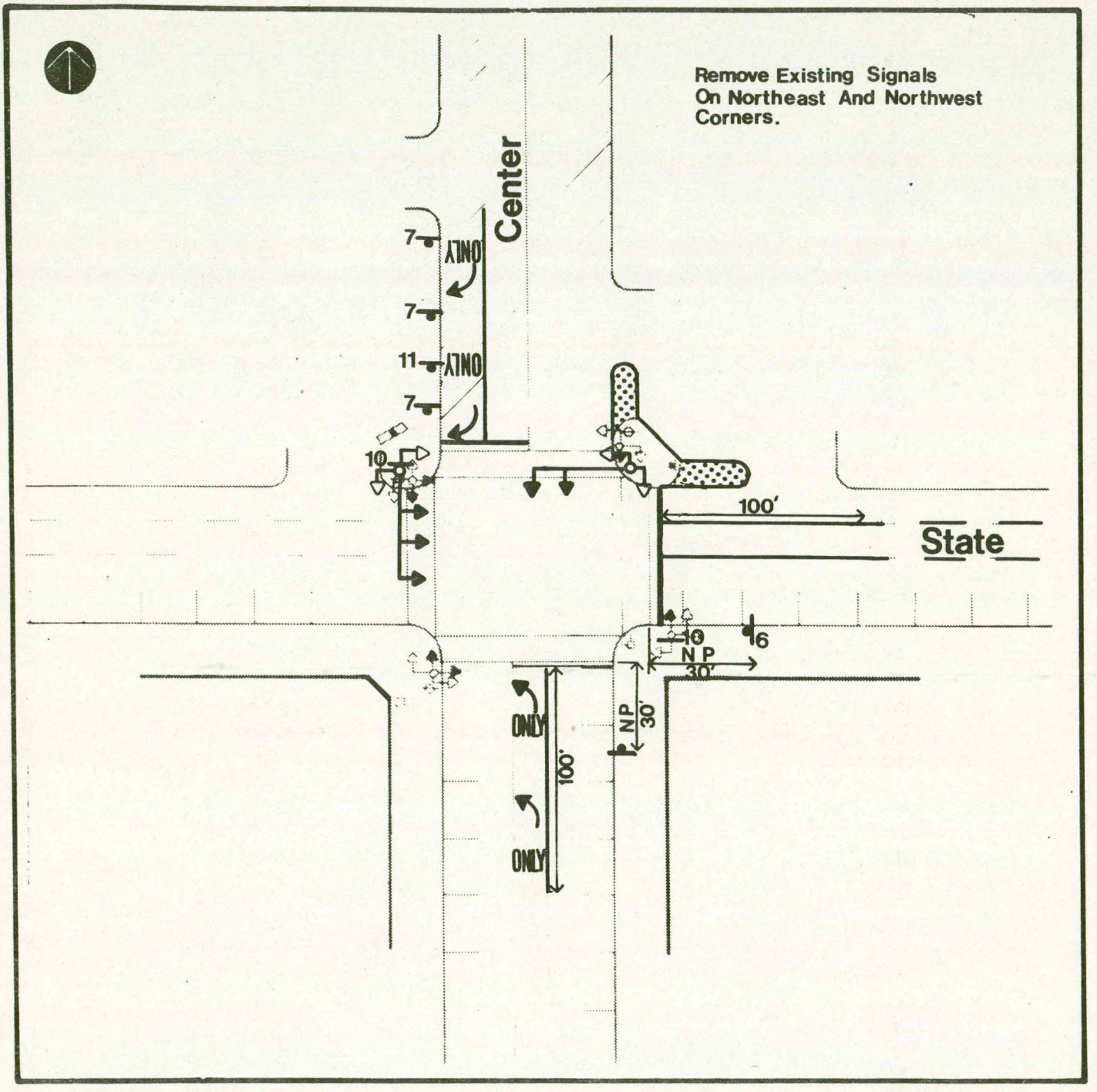
4. The widths of the driveways on the northeast quadrant of the intersection should be reduced to minimize vehicle conflicts near the intersection.

5. Parking restrictions should be implemented as shown in Figure 4-4.

6. ONE WAY signs (R6-1) should be installed on the near right-hand corners of the intersection so as to face traffic crossing State Street.

7. Parking on the north leg should be converted to parallel parking.

Cost = $25,830.
Mast Arms = $12,500.
Total Cost = $38,330.



No. Center & State

1 STOP	2 YIELD	3 NO LEFT TURN	4 KEEP RIGHT	5 SPEED LIMIT 25	6 NO PARKING HERE TO CORNER
7 NO PARKING ANY TIME	8 NO PARKING (MISC)	9 DO NOT ENTER	10 ONE WAY	11 RIGHT LANE MUST TURN RIGHT	12
13	14	15	16	17	18

figure 4-4

MARSHALLTOWN, IOWA

SOUTH CENTER AND BOONE

This high-accident intersection is located on the southern fringe of the downtown area. The north approach is a two-way freeway extension carrying four lanes of through traffic. An exclusive left-turn lane is provided for southbound motorists. The south approach is formed by a two-way viaduct with two through lanes and an exclusive left-turn lane. Single-lane frontage roads emerge at the intersection on both sides of the viaduct. The road to the east of the bridge is one-way northbound, while the west frontage road is one-way southbound. The east leg of the intersection is a two-way, two-lane entrance to a large private parking lot. A left-turn lane is also present. The west approach is a two-way freeway extension carrying two lanes of through traffic. A left-turn lane is protected by a divisional island.

Pedestal-mounted traffic signals (8" lenses) provide the traffic control at this intersection, along with lane-use control signs suspended overhead. Pavement markings in the form of lane lines are also utilized.

Thirty-four accidents occurred at this location during the study period. Rear-end collisions were prevalent, accounting for twenty-six of the total. A variety of accident types were involved in the remainder. Seven personal injury accidents were reported at this intersection.

Figure 4-5 shows some of the recommended changes at this intersection. All of the changes are discussed below.

1. The operation of the north approach should be as shown in the Figure; that is, each of the three traffic lanes should be assigned an exclusive function. Overhead lane-use control signs should be installed to facilitate proper lane selection by the motorists.

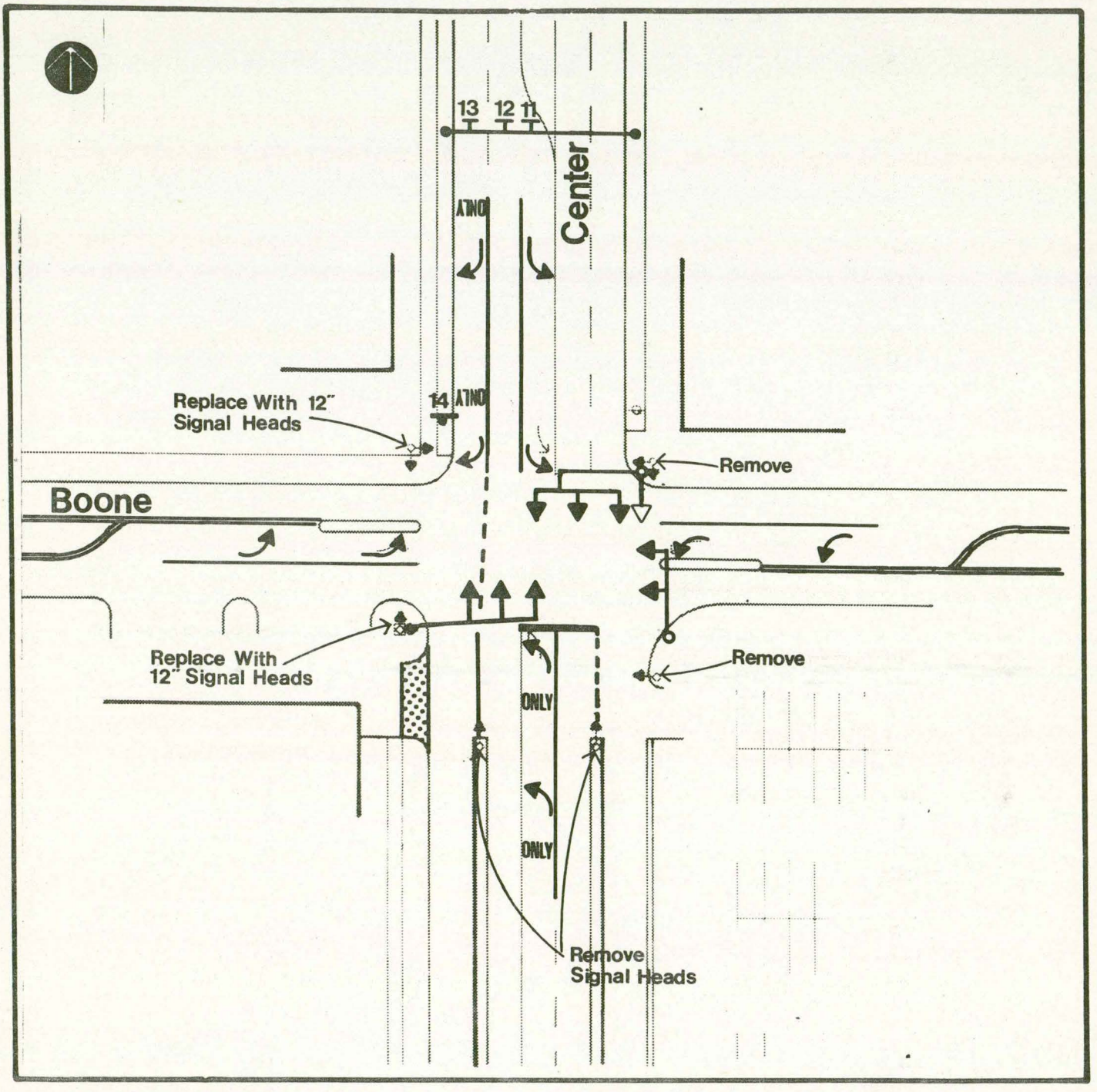
2. No operational changes are recommended for the other three legs. Pavement markings should be installed as shown in Figure 4-5. Crosswalks are not suggested, since pedestrians should not be encouraged to cross at this intersection.

3. The double green arrow indications in the existing signal heads should be replaced with circular green indications. The signal cycle has been provided with proper clearance intervals.

4. The driveway on the southwest corner of the intersection should be closed as shown in the Figure.

5. To improve the visibility of the traffic signals, it is recommended that the existing 8" signals be replaced with 12" signals. The new 12" signals should be mounted on mast arms at those locations shown in Figure 4-5.

Total Cost = $ 33,820.



So. Center & Boone

figure 4 -5

1	STOP	2	YIELD	3	NO LEFT TURN	4	KEEP RIGHT	5	SPEED LIMIT 25	6	NO PARKING WITHIN 10 FEET
7	NO PARKING ANY TIME	8	NO PARKING (MISC)	9	DO NOT ENTER	10	ONE WAY	11	ONLY	12	ONLY
13	ONLY	14	RIGHT LANE MUST TURN RIGHT	15		16		17		18	

MARSHALLTOWN, IOWA

SOUTH 3RD AVENUE AND MAIN

This downtown high-accident location is illustrated in Figure 4-6. Main Street is functionally classified as a trunk extension and is a three-lane, one-way eastbound facility. Parallel parking is provided along Main Street with the exception of the north side of the east leg. At this location, ninety degree angle parking is furnished. Third Avenue is designated as a free-way extension. No parking is allowed along this thoroughfare.

Traffic control at this intersection is provided by pedestal-mounted signal installations (8" lenses) including WALK and DONT WALK pedestrian indications on all four approaches. ONE WAY signs are utilized to indicate the one-way operation of Main Street. Pavement markings at this intersection consist of crosswalks and lane lines.

During the accident analysis period, thirty-four accidents took place at this intersection. Most common in occurrence were right-angle collisions (thirteen) and sideswipe (nine). Six rear-end collisions also occurred. Five personal injury accidents were reported at this location.

Figure 4-6 shows several of the modifications recommended for this location. These recommendations and others are discussed below.

1. Pavement markings should be applied as shown in the Figure. These markings will increase the motorists' awareness of pedestrians and better define lane assignments, thereby reducing the potential for improper turning maneuvers.

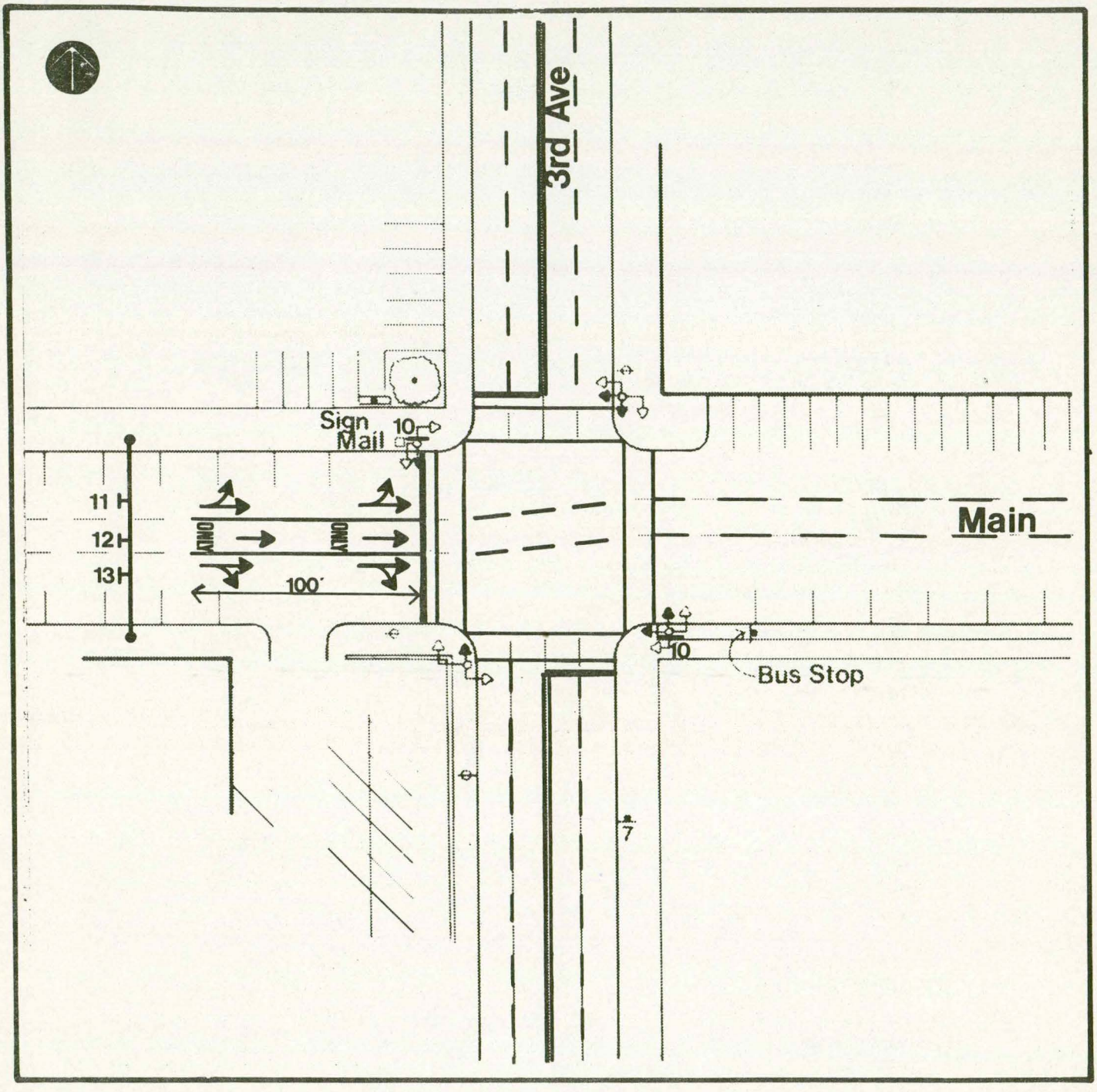
2. ONE WAY signs should be installed as shown in the Figure to bring the signing into conformance with the MUTCD.

3. Immediate improvements can be made to the signal installation. The amber interval should be increased to 4 seconds. The DONT WALK signals should be modified to enable a flashing capability. The double green arrow indications should be replaced by green ball indications.

4. To improve the visibility of the signal faces, the existing pedestal-mounted signals should be replaced by 12" indications, mounted on mast arms. The improved visibility of the signals should reduce the large number of right-angle accidents currently being recorded at this location.

5. LANE-USE CONTROL signs should be mounted overhead on Main Street as shown in Figure 4-6.

Total Cost = $670.



So. 3rd Ave & Main

1 STOP	2 YIELD	3 NO LEFT TURN	4 KEEP RIGHT	5 SPEED LIMIT 25	6 NO PARKING HERE TO CORNER
7 NO PARKING ANY TIME	8 NO PARKING MISC	9 DO NOT ENTER	10 ONE WAY	11	12 ONLY
13	14	15	16	17	18

figure 4-6

MARSHALLTOWN, IOWA

NORTH 3RD AVENUE AND STATE

Figure 4-7 is a diagram of this high-accident location. 3rd Avenue, functionally classified as a freeway extension, is a two-way, four-lane facility. State Street is a three-lane, one-way westbound arterial. Metered parallel parking is provided on the west leg of the intersection.

Pedestal-mounted traffic signals (8" lenses) regulate traffic at this location. DONT WALK pedestrian signals are installed on all four approaches; however, only two WALK indications are present. ONE WAY signs are properly utilized to indicate one-way travel on State Street. Pavement markings, in the form of lane lines and crosswalks, are also present.

This location was the site of thirty-three accidents during the study period. 76% of the mishaps were evenly divided among left-turn, side-swipe, right-angle, and rear-end collisions. Three personal injury accidents were reported.

The recommended modifications for this location are listed below:

1. The existing traffic signals are timed for 3-second amber intervals. These intervals should be increased to 4 seconds.

2. Pedestrian (WALK) signals should be installed to bring the signal installation into conformance with the requirements of the MUTCD. Six WALK signals are needed.

3. The DONT WALK signals should be modified to allow a flashing operation.

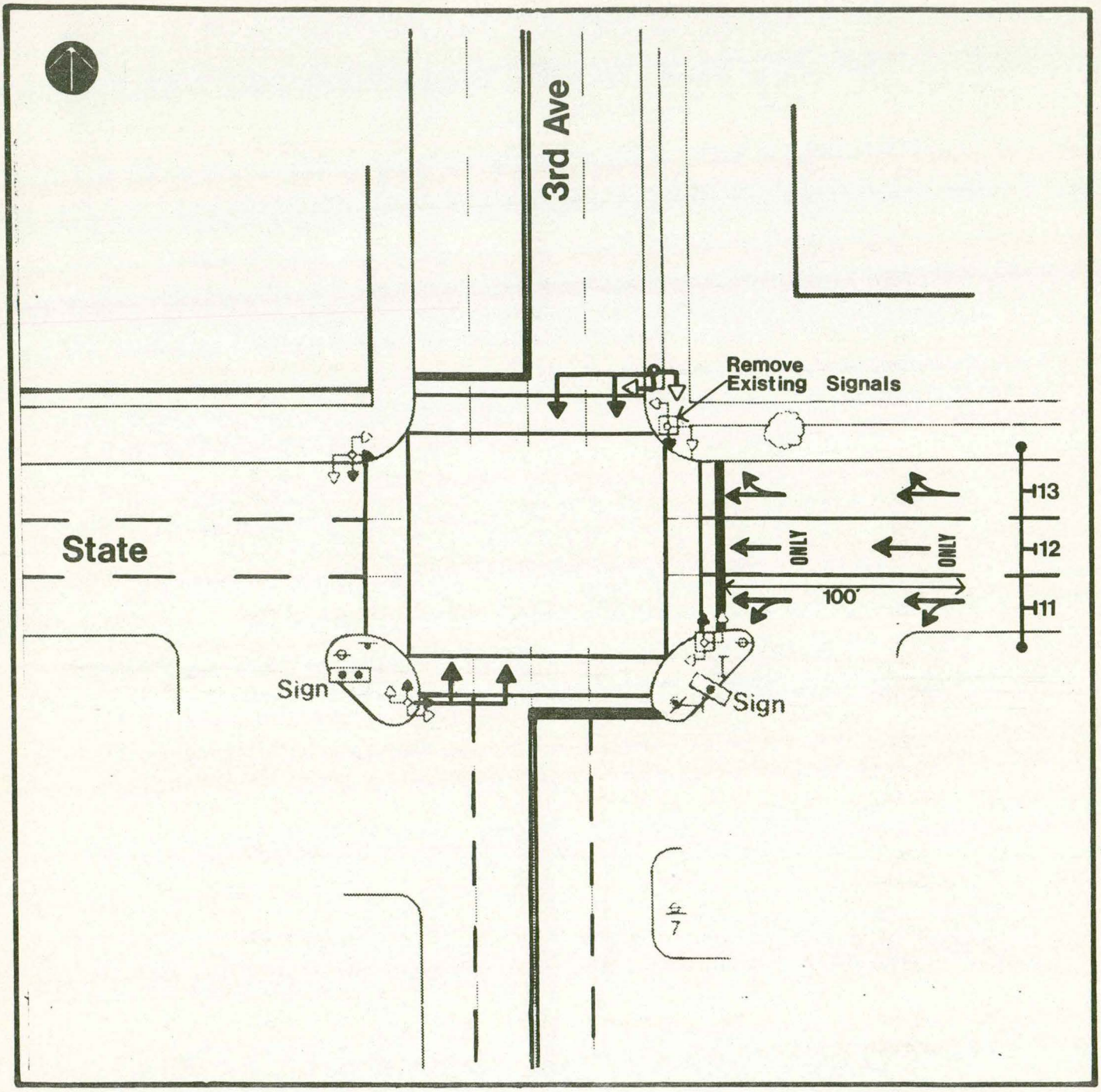
4. The three double-arrow indications should be replaced with green ball lenses.

5. Figure 4-7 shows a suggested pavement marking layout for this intersection.

6. LANE-USE CONTROL signs should be mounted overhead on State Street as shown in Figure 4-7.

7. Mast arm signals with 12" indications are recommended.

Total Cost = $13,990.



No. 3rd Ave & State

1 STOP	2 YIELD	3 NO LEFT TURN	4 KEEP RIGHT	5 SPEED LIMIT 25	6 NO PARKING HERE TO CORNER
7 NO PARKING ANY TIME	8 NO PARKING (MISC)	9 DO NOT ENTER	10 ONE WAY	11	12 ONLY
13	14	15	16	17	18

figure 4-7

MARSHALLTOWN, IOWA

SOUTH CENTER AND MAIN

This location is the downtown intersection of a trunk collector extension and a trunk extension. Main Street is a three-lane, one-way east-bound facility. Parallel parking is provided on both sides. The north approach to the intersection consists of a two-way, two-lane street in addition to an exclusive left-turn lane. The south approach is a two-way, four-lane street which also provides an exclusive left-turn lane. Parallel parking is permitted along both sides of Center Street.

The traffic control at this intersection is provided by pedestal-mounted traffic signals (8" lenses). WALK and DONT WALK indications, as well as crosswalks, are present on every approach. ONE-WAY signs are present to indicate the one-way operation of Main Street.

Thirty-four accidents were reported at this intersection during the study period. Of this total, 26% were rear-end collisions, 24% were right-angle mishaps, 18% were sideswipes, and 15% were parking-related collisions. Two personal injury accidents occurred during the analysis period.

The following safety improvements are recommended for this intersection:

1. The visibility of the existing traffic signals is substandard. Mast arms should be installed as shown in Figure 4-8. The existing signals on the northwest corner of the intersection could be retained.

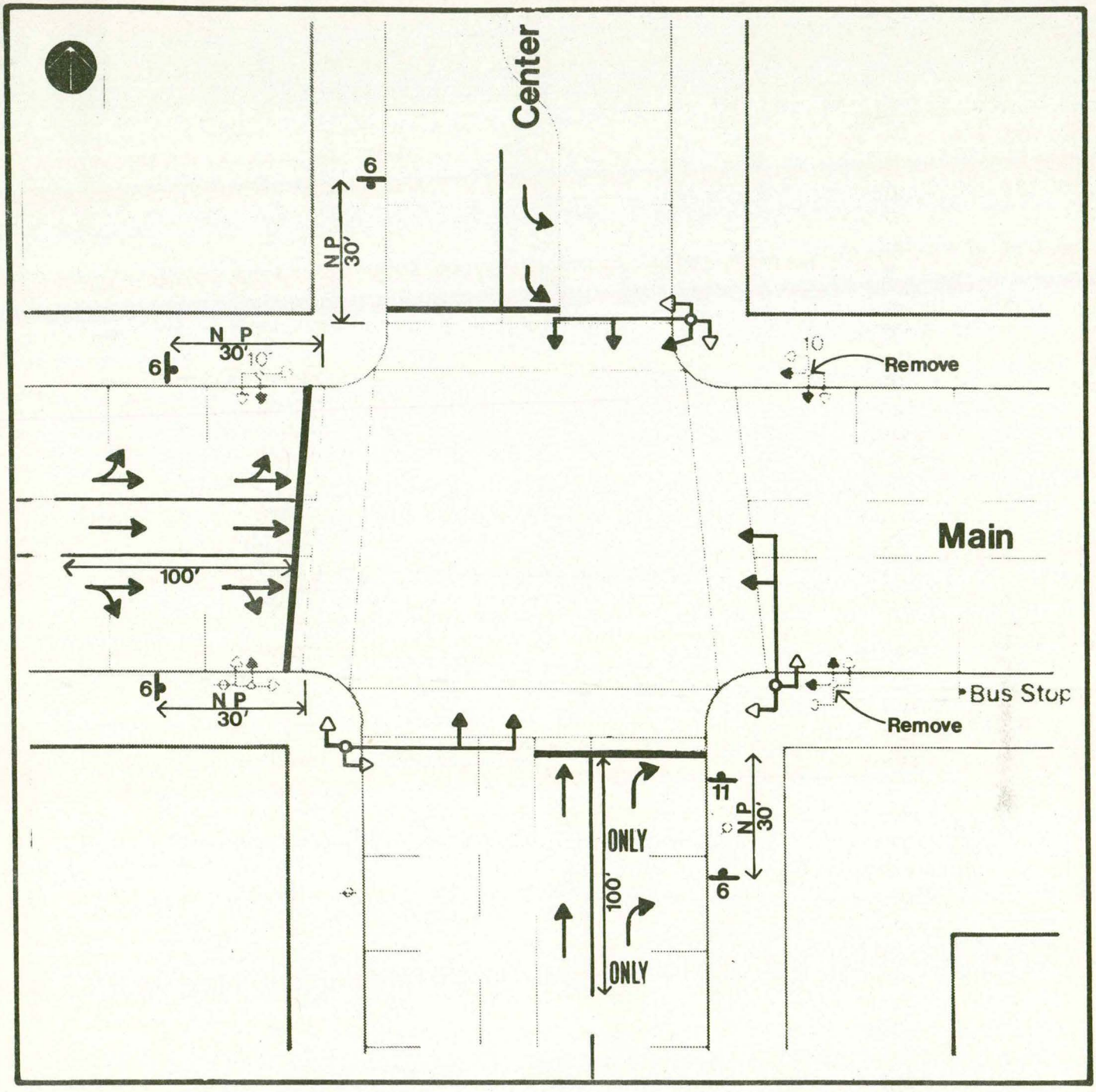
2. Prior to the installation of new signals, a few modifications should be made to the existing signals. All amber intervals should be 4 seconds. The double green arrow indications should be replaced with circular green indications. The DONT WALK signals should be capable of flashing.

3. Pavement marking changes are shown in Figure 4-8.

4. Parking restrictions should be instituted as shown in the Figure.

5. A RIGHT LANE MUST TURN RIGHT sign (R3-7) should be installed on the south approach.

Total Cost = $21,720.



So. Center & Main

1 STOP	2 YIELD	3 NO LEFT TURN	4 KEEP RIGHT	5 SPEED 25	6
7 NO PARKING ANY TIME	8 NO PARKING (MISC.)	9 DO NOT ENTER	10 ONE WAY	11 RIGHT LANE MUST Turn RIGHT	12
13	14	15	16	17	18

figure 4-8

MARSHALLTOWN, IOWA

SOUTH CENTER AND CHURCH

The present conditions at this high-accident location are shown in Figure 4-9. The north approach is a two-way, four-lane, trunk collector extension. The south leg is a two-way freeway extension carrying four lanes of through traffic. An exclusive left-turn lane is also provided. Church Street is a one-way westbound thoroughfare. The east approach carries four lanes of traffic, with parallel parking provided on the north side. The west leg of the intersection consists of three lanes of traffic, in addition to parallel parking facilities on the south side.

Pedestal-mounted traffic signals (8" lenses) provide the traffic control at this intersection. Pedestrian indications and crosswalks are utilized on every approach. ONE WAY signs are installed to indicate the one-way operation of Church Street.

This intersection was the location of thirty-two accidents during the study period. Right-angle, sideswipe, and rear-end collisions accounted for 84% of this total. Three personal injury accidents were reported.

The recommended modifications for this location are listed below:

1. Pavement marking changes are shown in Figure 4-9. The STOP line on the south approach must be located to facilitate turning maneuvers from the east to the south.

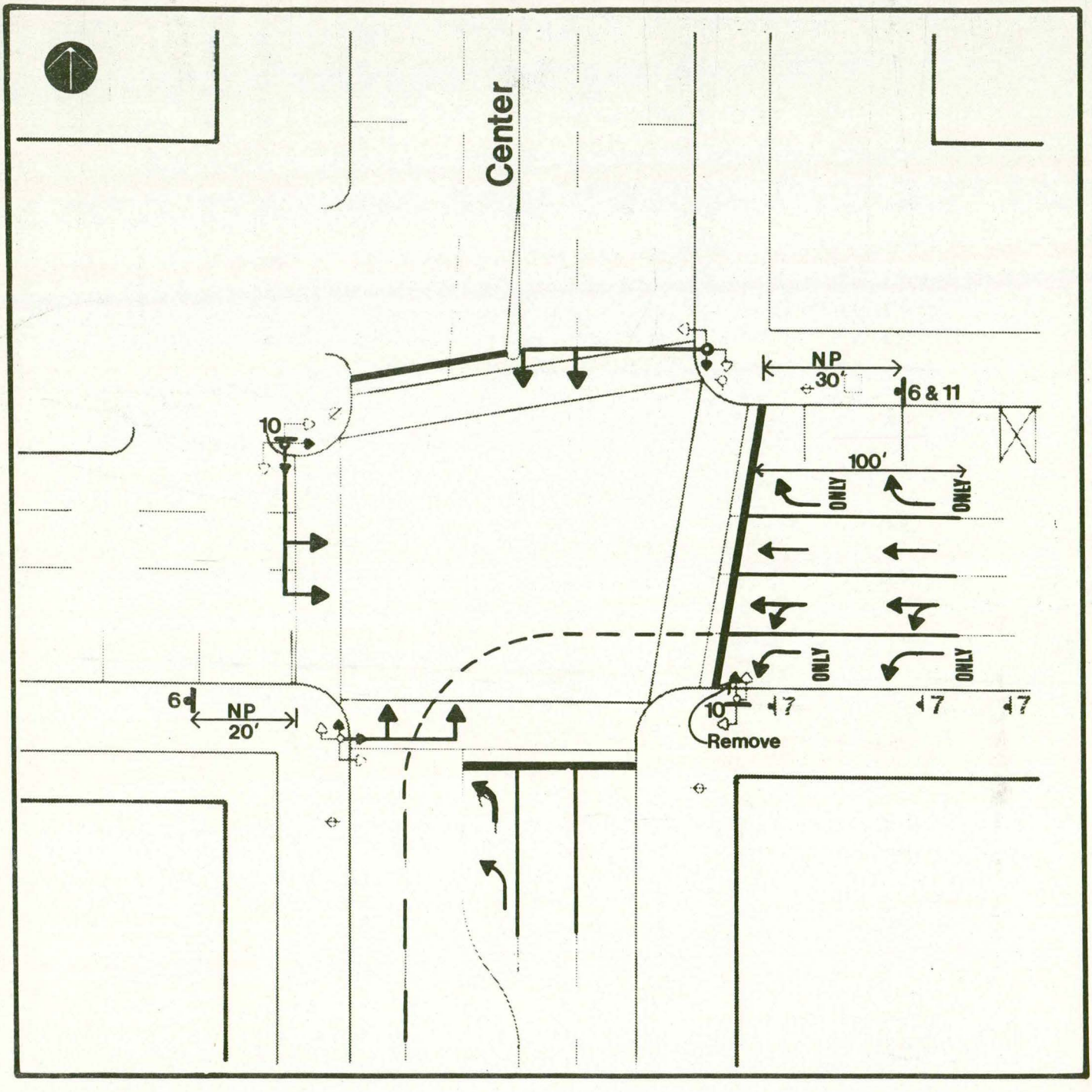
2. ONE-WAY signs are provided on the far-left and far-right corners for Center Street traffic. ONE-WAY signs should be added on the near-right corners (See Figure 4-9).

3. On Church Street, parking should be restricted where it is presently allowed near the intersection.

4. The traffic signals should be timed to provide 4-second amber intervals. The DONT WALK signals should be modified to allow them to flash. The double green arrow indications should be replaced with circular green lenses.

5. Mast-arm-mounted signals should be installed as shown in Figure 4-9. Many of the existing signals, including pedestrian signals, could be retained for use in the mast-arm installation.

Total Cost = $27,740.



So. Center & Church

1 STOP	2 YIELD	3 NO LEFT TURN	4 KEEP RIGHT	5 SPEED LIMIT 25	6 NO PARKING HERE TO CORNER
7 NO PARKING ANY TIME	8 NO PARKING (MISC)	9 DO NOT ENTER	10 ONE WAY	11 NO RIGHT TURN ON RED	12
13	14	15	16	17	18

figure 4-9

MARSHALLTOWN, IOWA

SOUTH CENTER AND HIGH

The present conditions at this high-accident location are shown in Figure 4-10. Center Street functions as a two-way, four-lane arterial extension. High Street has no functional classification and is a two-way, two-lane road.

Traffic control is provided by STOP signs on High Street. Pavement markings in the form of lane lines are utilized on all four approaches.

This intersection was the site of thirty accidents during the study period, half of which were rear-end collisions. Five other accidents occurred involving a fixed object on the northeast corner. Six personal injury accidents occurred at this location.

Nearly every rear-end accident, and two sideswipe accidents, can be attributed to the vehicular queues and lane-change maneuvers dictated by the Center Street-Anson Street intersection. One rear-end accident involved five different vehicles and produced two personal injuries.

Motorists attempting to enter Center Street from either of the High Street approaches experience extreme sight-distance restrictions. The motorists view of oncoming vehicles is blocked by a combination of the following factors: high ground, utility poles, trees and shrubs on the corners; and an adverse vertical alignment of the south Center Street approach. These conditions all contribute to the occurrence of the right-angle and a few of the rear-end accidents.

The recommended improvements for this location are listed below:

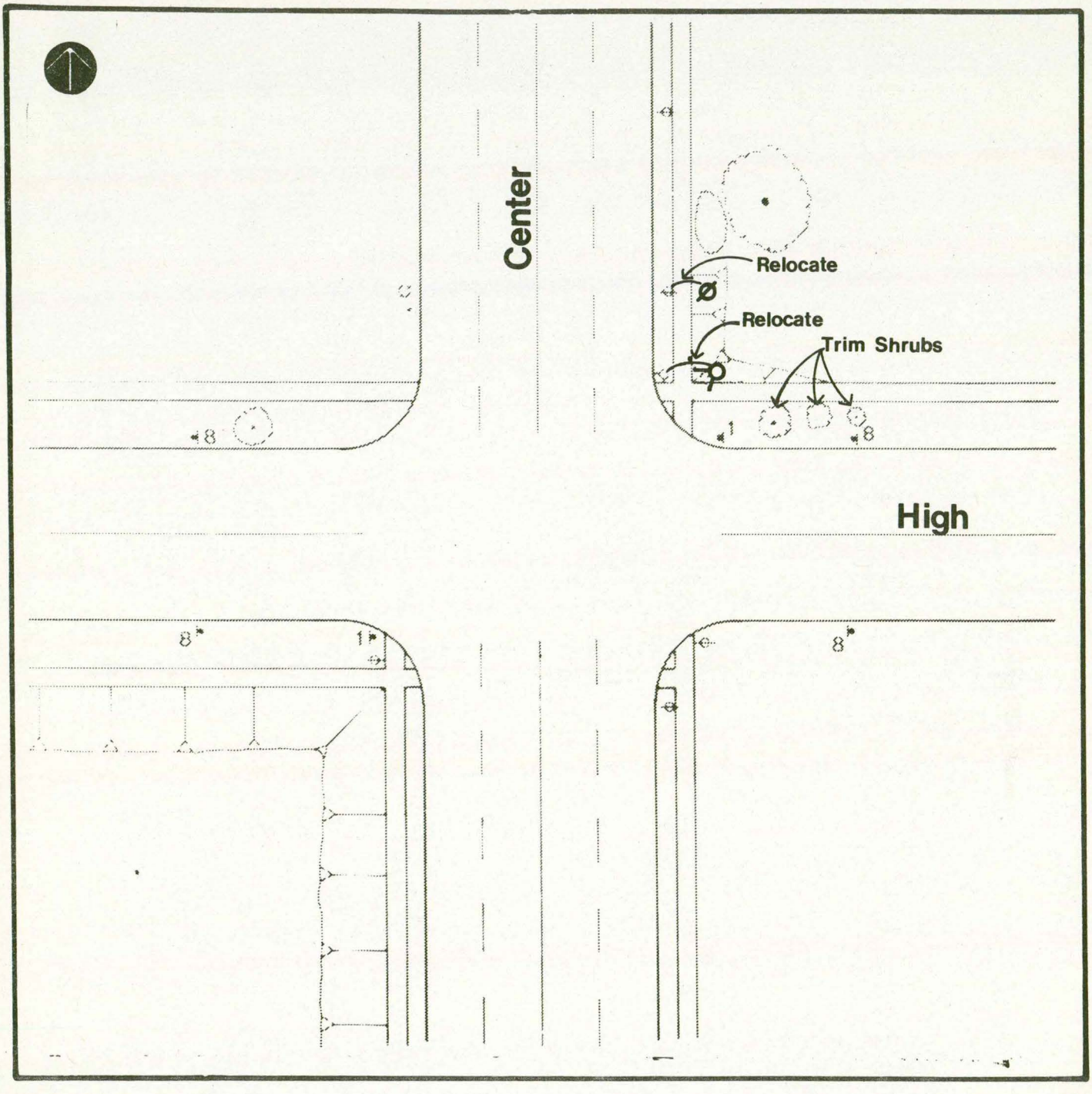
1. The potential for accidents at this location would be greatly reduced if the congestion problems at the Center Street-Anson Street intersection were improved.

2. On the northeast corner of the intersection, the fire hydrant and the overhead sign support should be relocated to reduce their potential for being impacted by out-of-control vehicles.

3. On the east approach, the trees and shrubs should be trimmed to improve the visibility of the STOP sign.

4. The City should monitor the accident experience at this location. If right-angle accidents persist, the initial effort should be to eliminate the sight-distance restrictions mentioned earlier. An alternate solution would be to require traffic on High Street to turn right only. This regulation could be accomplished by means of signs (R3-5) and pavement marking words and symbols.

Total Cost = $800.



So. Center & High

1 STOP	2 YIELD	3 NO LEFT TURN	4 KEEP RIGHT	5 SPEED LIMIT 25	6 NO PARKING HERE TO CORNER
7 NO PARKING ANY TIME	8 NO PARKING (MISC.)	9 DO NOT ENTER	10 ONE WAY	11	12
13	14	15	16	17	18

figure 4-10

MARSHALLTOWN, IOWA

SOUTH 2ND AVENUE AND MAIN

Figure 4-11 illustrates the present conditions at this high-accident location. Main Street, a three-lane, one-way eastbound street, is functionally classified as a trunk extension. Second Avenue is a two-lane street carrying south-north traffic. Each facility provides parallel parking on both sides.

A signal installation regulates traffic flow at this location. The signal heads (8" lenses) are banded to street light poles. WALK and DONT WALK pedestrian indications are present on all four approaches, although flashing capacity does not exist. Pavement markings, including crosswalks and lane lines, are utilized. ONE-WAY signs are installed and properly located to indicate the one-way operation of Main Street.

Thirty-one accidents occurred at this location during the study period. Sideswipe, right-angle, and rear-end collisions accounted for 65% of this total. Six mishaps involving legally parked vehicles occurred. Five personal injury accidents took place, one of which was a pedestrian accident.

Recommended improvements for this location are discussed below. Several improvements are also shown in Figure 4-11.

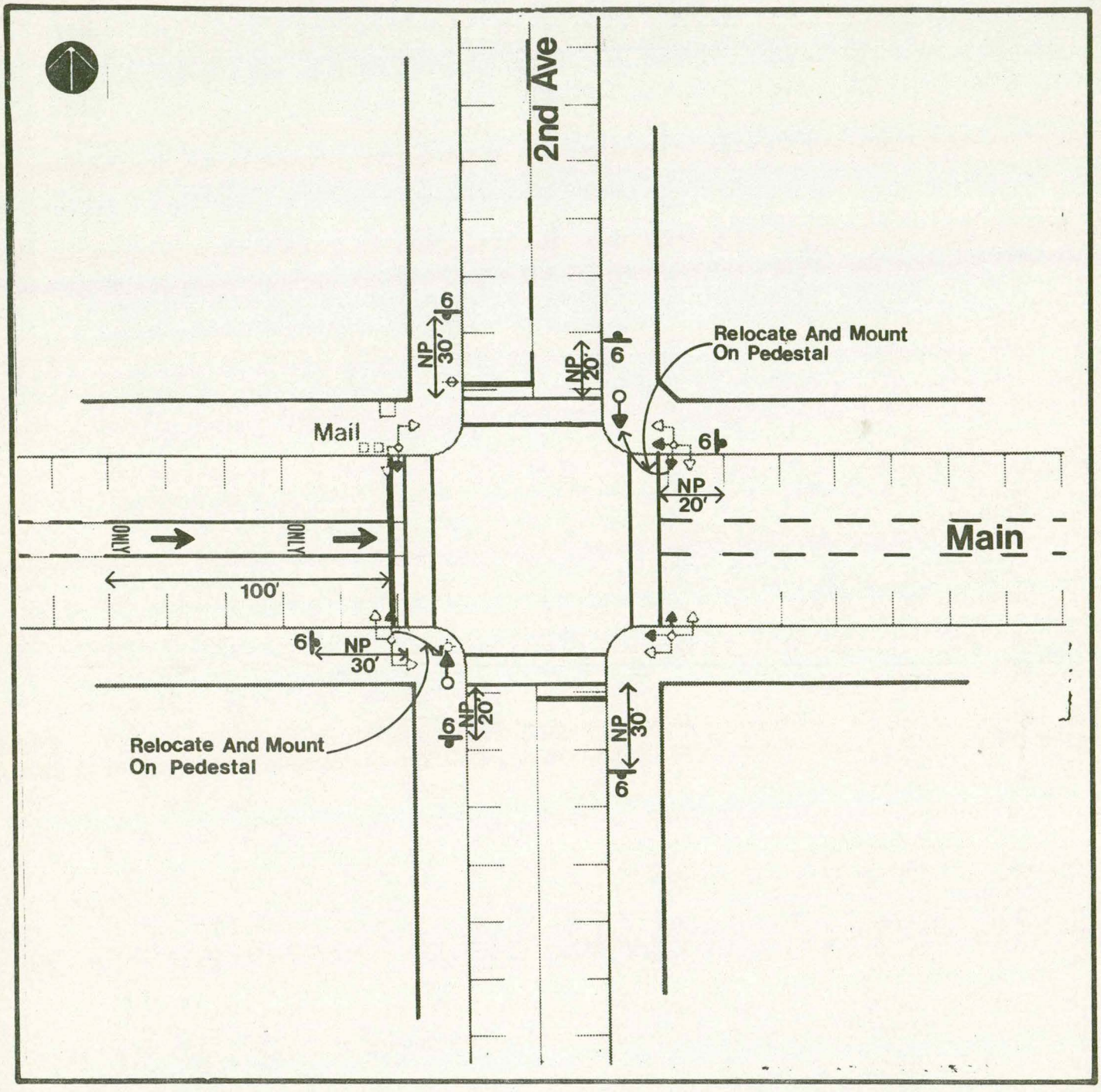
1. Figure 4-11 shows a suggested pavement marking scheme for this intersection.

2. Where parking is allowed near to the intersection, it should be prohibited by means of signing. Curb markings, supplemental to standard signs, may be used.

3. To improve the signal visibility for motorists on 2nd Avenue, the existing signals should be relocated as shown in Figure 4-11. In addition, the 3-second amber intervals should be increased to 4 seconds. A flashing capability should be added to the pedestrian (DONT WALK) signals. The lenses containing double green arrow indications should be replaced with circular green indications.

4. The installation of mast arm signals with 12" indications is recommended.

Cost = $ 6,600.
Mast Arms = $25,000.
Total Cost = $31,600.



So. 2nd Ave & Main

1 STOP	2	3 NO LEFT TURN	4 KEEP RIGHT	5 SPEED LIMIT 25	6 NO PARKING HERE TO CORNER
7 NO PARKING ANY TIME	8 NO PARKING (MISC)	9	10 ONE WAY	11	12
13	14	15	16	17	18

figure 4-11

MARSHALLTOWN, IOWA

SOUTH 3RD AVENUE AND CHURCH

This location is the intersection of two freeway extensions on the eastern fringe of the central business district. Third Avenue is a two-way, four-lane thoroughfare. No parking is permitted on either side of the street. Church Street is a one-way facility carrying three lanes of westbound traffic. Parking is allowed on the west leg of the intersection. The east approach is functionally classified as a municipal collector.

Traffic control at this intersection is provided by pedestal-mounted traffic signals (8" lenses). Pedestrian indicators have been installed on all four approaches. ONE-WAY signs are properly located to indicate the one-way operation of Church Street. Pavement markings, including lane lines and crosswalks, are also utilized.

Of the thirty accidents reported at this location during the study period, 40% were right-angle collisions and 33% were sideswipes. Four personal injury accidents occurred.

The following modifications are recommended to improve vehicular and pedestrian safety at this location.

1. Pavement markings should be applied as shown in Figure 4-12. The markings should be maintained to a high degree of visibility.

2. The driveway on the northwest corner of the intersection should be closed as shown in Figure 4-12.

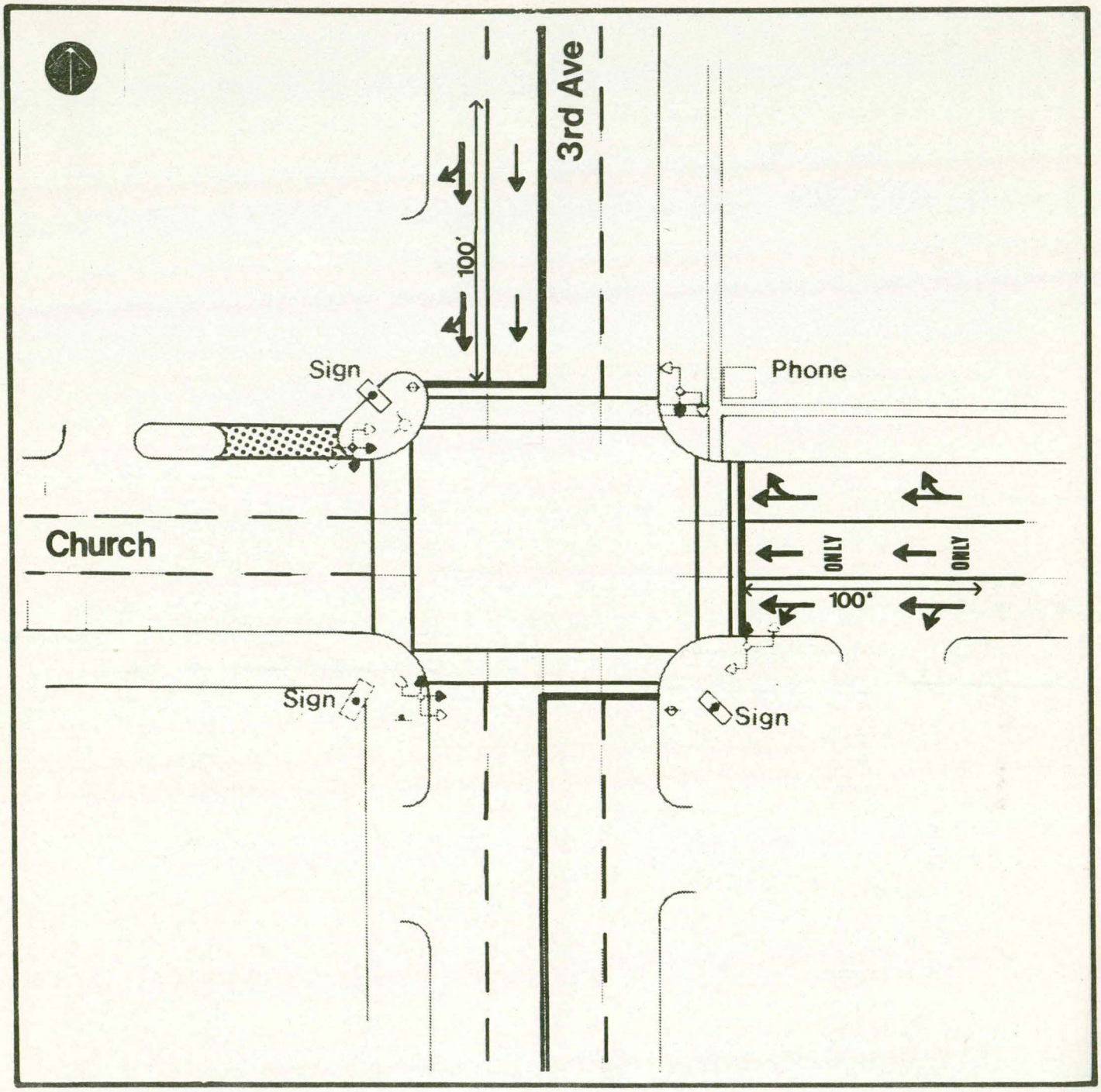
3. The existing 3-second amber interval set in the signal controller should be increased to 4 seconds.

4. The double green arrow indication in the signal face on the southwest corner of the intersection should be replaced with a green ball.

5. The DONT WALK signals should be modified so that they are capable of a flashing operation.

6. The large number of right-angle accidents at this location tends to indicate that signal visibility is not adequate. Field observations revealed that the wide streets and heavy traffic volumes combine to reduce the visibility of the pedestal-mounted signals. It is recommended that the existing signals be replaced with signals mounted over the roadway on mast arms.

Cost = $ 940.
Mast Arms = $25,000.
Total Cost = $25,940.



So. 3rd Ave & Church

1 STOP	2 YIELD	3 NO LEFT TURN	4 KEEP RIGHT	5 SPEED LIMIT 25	6 NO PARKING HERE TO CORNER
7 NO PARKING ANY TIME	8 NO PARKING (MISC.)	9 DO NOT ENTER	10 ONE WAY	11	12
13	14	15	16	17	18

figure 4 - 12

MARSHALLTOWN, IOWA

SOUTH 3RD AVENUE AND NEVADA

Figure 4-13 is a diagram of this high-accident location. Both streets involved are functionally classified as municipal arterials. Nevada Street carries east-west traffic and is a two-lane, two-way facility. No on-street parking is furnished. Two railroad tracks are situated to the north of Nevada Street and run parallel to the roadway. The north approach to the intersection consists of two lanes of two-way traffic. Parallel parking is provided along both sides of 3rd Avenue on this approach. The south approach is formed by a two-lane, two-way viaduct. Single-lane frontage roads emerge at the intersection on both sides of the bridge. The road to the east of the viaduct is one-way northbound, while the west frontage road is one-way southbound. No parking is allowed on the south approach.

STOP signs are the principal means of traffic control at this location. STOP signs are installed on the southeast and southwest corners of the intersection to regulate traffic on Nevada Street. Another STOP sign on the southeast corner serves to halt traffic on the northbound frontage road. Crossbucks are situated on each side of 3rd Avenue immediately north of the railroad tracks. An additional crossbuck is located between the base of the viaduct and the northbound frontage road. Flashing-light signals are attached to each crossbuck installation. Pavement markings in the form of lane lines are utilized.

This location was the site of twenty-eight accidents during the study period. Three predominant accident patterns were established. Rear-end, sideswipe and right-angle collisions accounted for 86% of the total. One personal injury accident occurred.

The following recommendations are made to improve traffic safety at this location:

1. The frontage road on the east side of the bridge should be closed. Figure 4 - 13, shows the installation of curbing to accomplish this end.

2. The black-on-yellow NO PASSING ON VIADUCT sign should be replaced with a DO NOT PASS sign (R4-1). In addition, the dashed yellow centerline should be replaced by a double yellow line.

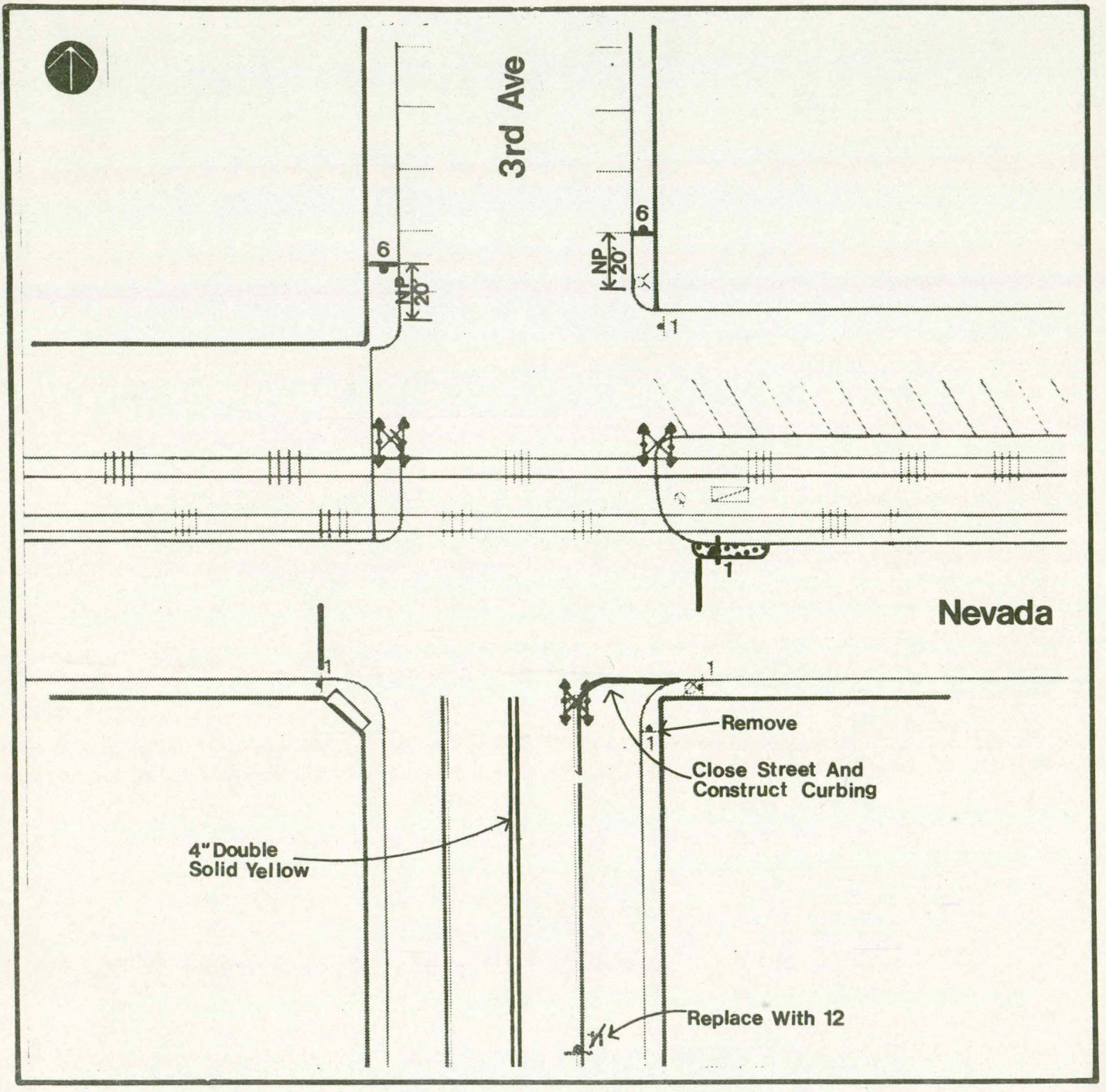
3. Parking prohibitions, as shown in Figure 4-13, should be instituted to improve sight distance conditions near the parking lot and alley entrances.

4. A STOP sign should be installed on the north side of the east leg of Nevada Street. A small curbed island should be constructed to allow a sign placement compatible with the lateral clearance requirements of the railroad. The island should be painted yellow.

5. The proximity of the buildings to the streets causes sight distance restrictions that cannot be improved through minor traffic engineering modifications. However, the situation could be improved by the alternate assignment of right-of-way to conflicting movements. Therefore, it is suggested that the City monitor the traffic volumes at this location to identify the future need for signalization.

The improvements listed above are low-cost modifications capable of immediate implementation. A long-range solution to the problems at this location is the reconstruction of the intersection, including the existing bridge. The redesign should also eliminate both the frontage roads adjacent to the bridge.

Total Cost = $270.



So. 3rd Ave & Nevada

1 STOP	2 YIELD	3 NO LEFT TURN	4 KEEP RIGHT	5 SPEED LIMIT 25	6 NO PARKING HERE TO CORNER
7 NO PARKING ANY TIME	8 NO PARKING (MISC)	9 DO NOT ENTER	10 ONE WAY	11 NO PASSING ON VIADUCT	12 DO NOT PASS
13	14	15	16	17	18

figure 4-13

MARSHALLTOWN, IOWA

SOUTH CENTER AND SOUTH

Figure 4-14 illustrates the existing conditions at this high-accident location. Center Street is functionally classified as an arterial extension and is a two-way, four-lane facility. South Street is a two-way municipal collector which carries two lanes of traffic. No parking is allowed on the east approach. Alternate-side parking is provided on the west approach.

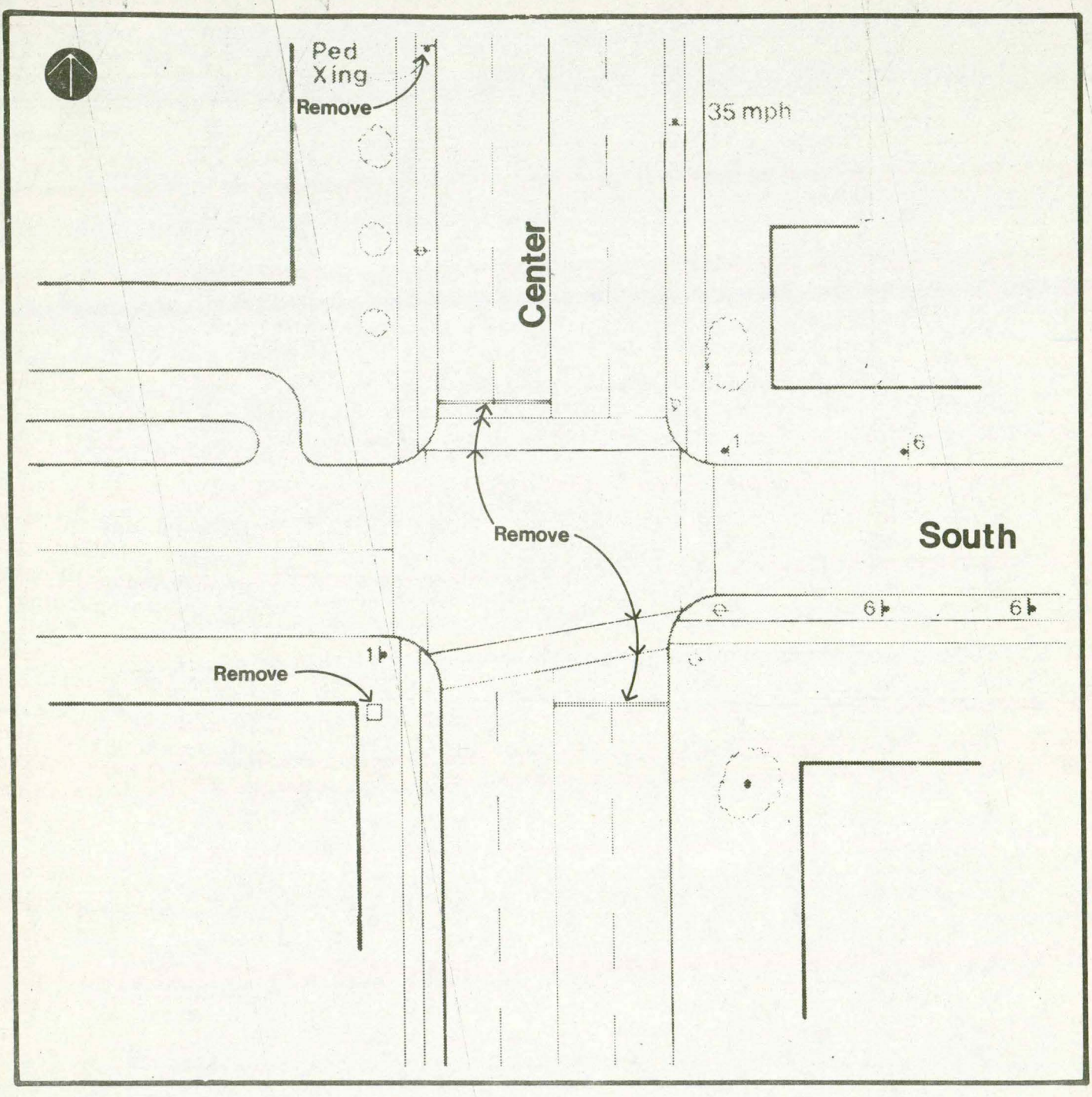
STOP signs have been installed on South Street to indicate vehicular right-of-way on Center Street. Crosswalks are present on all four approaches to the intersection, and stop lines are utilized on the north and south legs. Lane lines are maintained on the north, south, and west approaches.

During the analysis period, twenty-seven accidents occurred at this location. Rear-end and right-angle collisions accounted for 74% of the total. Left-turn accidents were responsible for 15% of the mishaps. Eight personal injury accidents were reported at this intersection. The rear-end accidents involving northbound vehicles are related to the Center Street-Anson Street intersection, which causes vehicular queues from Anson to South Street. The right-angle accidents have resulted primarily from the heavy, high-speed traffic on Center Street. This traffic reduces the availability of safe gaps for traffic entering Center from South Street.

The following recommendations are made concerning modifications that should be made at this location:

1. The crosswalks and stop lines on Center Street should be rubbed out or allowed to weather. The crosswalks on South Street should be retained.
2. The PEDESTRIAN CROSSING signs on the north and south approaches should be removed.
3. Vegetation in the vicinity of this intersection should either be removed or pruned to provide adequate sight distances along Center Street. Considering the vehicular speeds on Center Street, motorists entering Center Street from South Street should be provided with clear sight distances (north and south) of at least 200 feet.
4. The City should periodically count, or request the Iowa Department of Transportation to periodically count, vehicular volumes at this location to investigate the need for traffic signal control. An analysis of the average daily traffic (ADT) volumes for these two streets revealed that no warrants for traffic signal installation are met at this time. The volumes on Center Street are sufficiently high to warrant signals, but the South Street traffic is too light. Warrant 6, Accident Experience, is the warrant most likely to be met in the future.
5. As previously mentioned, several accidents at this location are related to the vehicle queues caused by the intersection of Center and Anson. By improving the traffic conditions at Center and Anson, the accident experience at the subject intersection should also be improved.

Total Cost = $40.



So. Center & South

1 STOP	2	3 NO LEFT TURN	4 KEEP RIGHT	5 SPEED LIMIT 25	6 NO PARKING HERE TO CORNER
7 NO PARKING ANY TIME	8 NO PARKING (MISC.)	9 ROAD CENTER	10 ONE WAY	11	12
13	14	15	16	17	18

figure 4-14

MARSHALLTOWN, IOWA

SOUTH CENTER AND OLIVE

The existing conditions for this intersection are shown in Figure 4-15. Center Street is functionally classified as a two-way arterial extension which carries four lanes of through traffic. Protected left-turn bays are furnished for both northbound and southbound traffic. Olive Street is also a two-way, four-lane facility. Divisional islands separate left turn lanes from through traffic for eastbound and westbound motorists. The west leg of the intersection is designated as a municipal arterial, whereas the east approach is a trunk collector extension.

Traffic control at this intersection is provided by mast-arm traffic signals (12" lenses). WALK and DONT WALK pedestrian indications have been installed, although no crosswalks exist at this location. Lane striping is utilized on all four approaches.

During the accident analysis period, twenty-seven accidents occurred at this intersection. Two main accident types prevailed. Thirteen rear-end collisions took place, six of which included personal injuries. Eight right-angle accidents also occurred, which included two personal injuries.

A list of recommended improvements follows:

1. The amber interval for the left-turn signals should be increased from 2 seconds to 3 seconds. All other amber intervals should be 4 seconds. If right-angle and rear-end accidents persist, the amber intervals should not be increased further; rather, an all-red interval should be implemented.

2. The visibility of the signals, including the pedestrian signals, is excellent. However, the DONT WALK signals should be provided with a flashing capability.

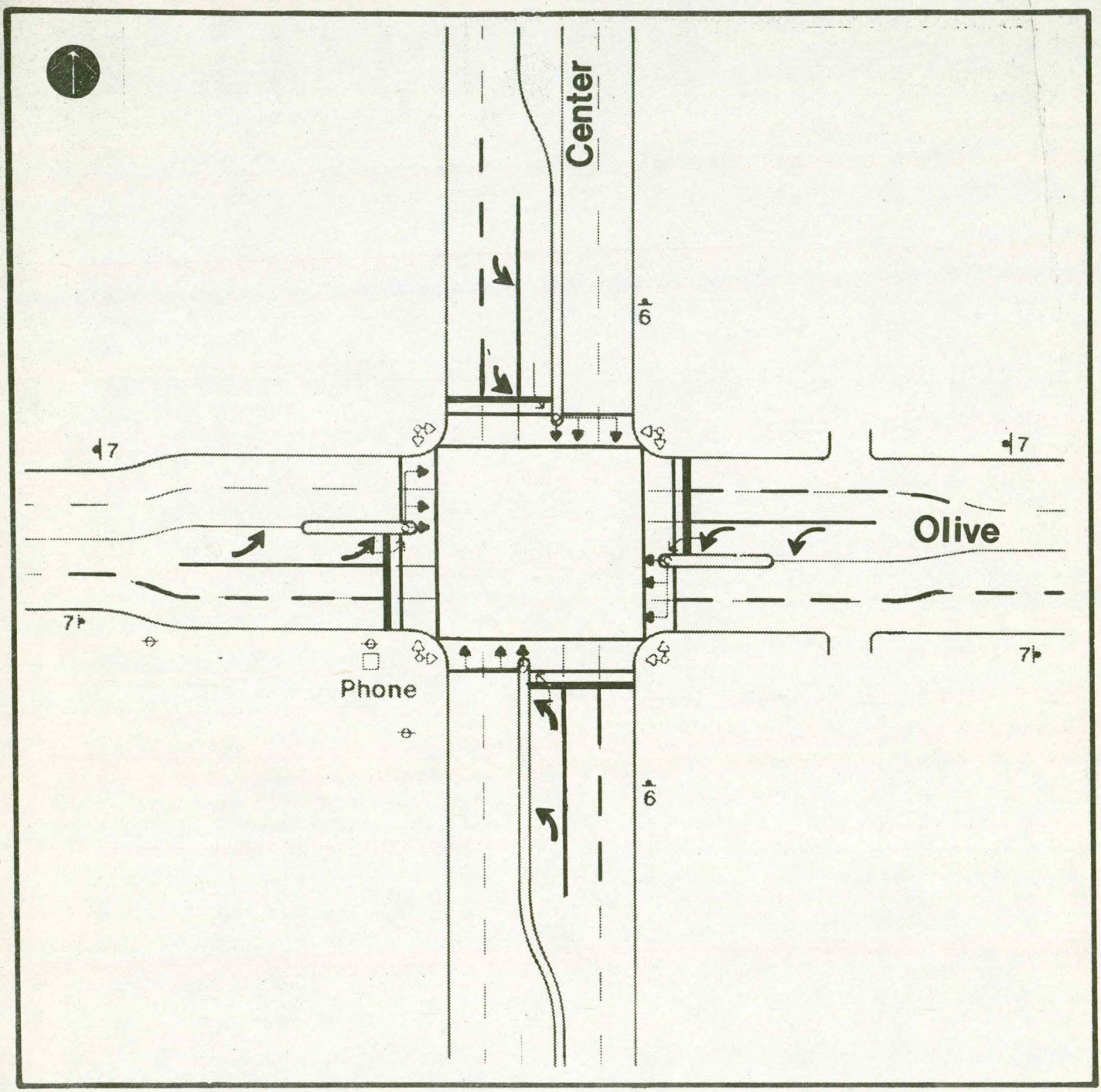
3. Since pedestrian signals are in place at this intersection, crosswalks should be marked on the pavement and maintained. These crosswalks and other markings are shown in Figure 4-15.

4. To encourage the use of the crosswalks, and to discourage jaywalking, sidewalks should be constructed on the approaches to the intersection.

5. One out of three accidents involved a personal injury. This usually indicates that high vehicular speeds are a contributing factor. Speed checks should be made to ascertain the need for speed enforcement.

Total Cost = $485.

Sidewalk construction is assumed as a special assessment to adjacent property.



So. Center & Olive

1 STOP	2 YIELD	3 NO LEFT TURN	4 KEEP RIGHT	5 SPEED LIMIT 25	6 NO PARKING HERE TO CORNER
7 NO PARKING ANY TIME	8 NO PARKING MISC.	9 DO NOT ENTER	10 ONE WAY	11	12
13	14	15	16	17	18

figure 4-15

MARSHALLTOWN, IOWA

SOUTH CENTER AND WESTWOOD

This high-accident location is a "T" intersection situated in south-central Marshalltown. Center is functionally classified as an arterial extension and is a two-way, four-lane facility. Westwood is a two-way, two-lane municipal arterial which provides an exclusive left-turn lane at the intersection. Westwood intersects Center from the west.

A single STOP sign on Westwood and lane striping on both streets are the only traffic control devices utilized at this intersection.

This location was the site of twenty-five accidents during the study period, fourteen of which were rear-end collisions. Sideswipes accounted for five other accidents. Four personal injury accidents were reported at this intersection.

The rear-end accidents have occurred as northbound motorists were struck from behind when they decelerated to turn west onto Westwood or into the McDonald's parking lot. The sideswipe collisions occurred as motorists changed lanes either to avoid turning vehicles or to maneuver into a position to make a left turn themselves. Although excessive speeds and the downgrade on the south approach contribute to the accident potential of this location, it can be concluded that left-turning vehicles are the root of the accident problem.

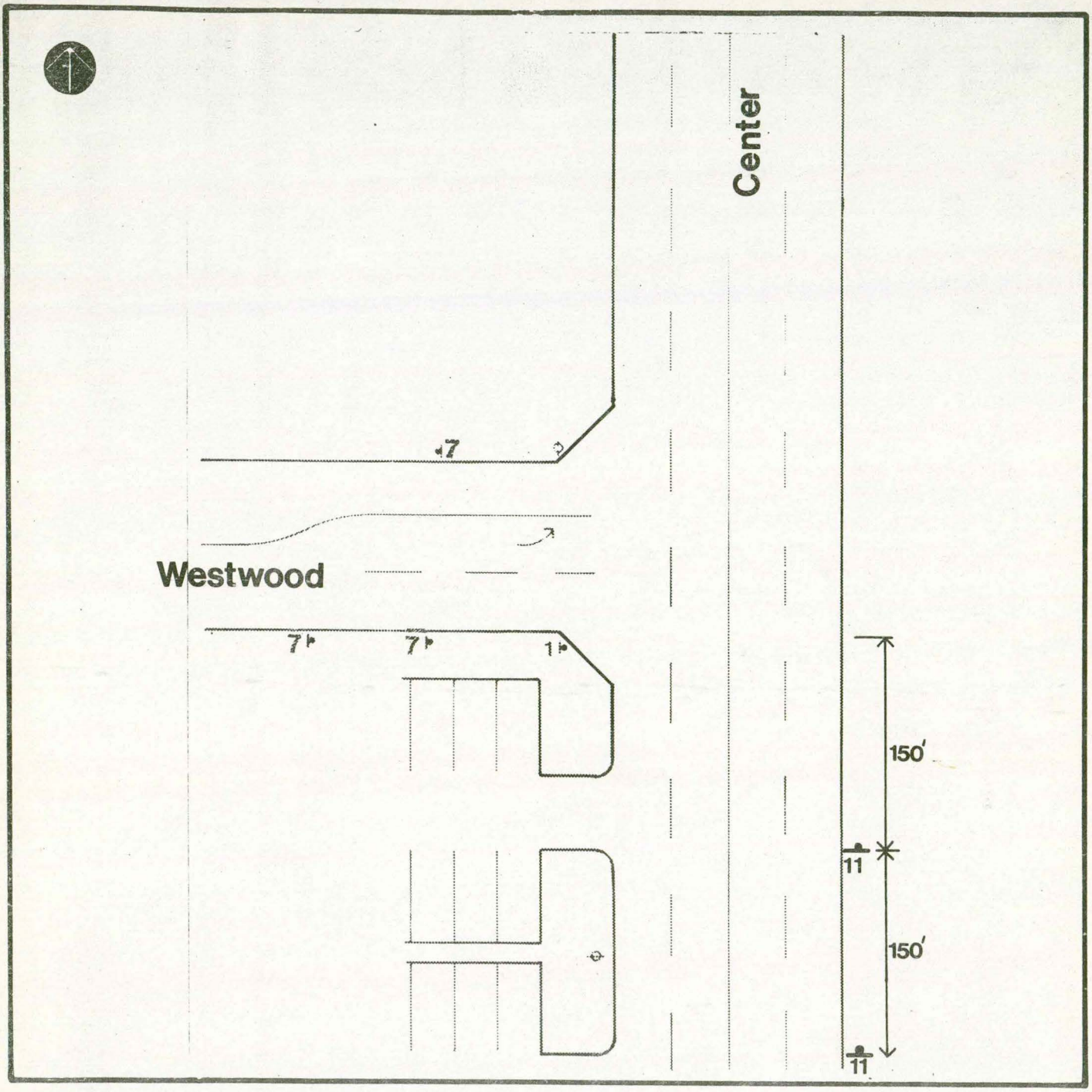
Considering the foregoing, the Consultant compiled the following recommendations and conclusions:

1. Black-on-yellow warning signs with the message WATCH FOR TURNING VEHICLES should be installed. These special warning signs should be diamond shaped, 24 inches square. Two signs should be installed, facing northbound vehicles. The signs should be located about 150 feet and 300 feet south of the intersection.

2. A long-range modification would be the provision of a left-turn bay for drivers turning from the south to the west. Such a modification could be accomplished by widening Center Street on the east side to accommodate a five-lane section (two southbound lanes, two northbound lanes, and the left-turn lane). In the event that this section of Center Street is reconstructed, the Consultant highly recommends that this provision is incorporated into the design and construction.

3. The City may consider the possibility of prohibiting left turns at this intersection. The Consultant does not recommend this prohibition since alternate routes for making this maneuver are not readily available. The planned construction of a frontage road on the southwest quadrant of this location will eliminate many of the above mentioned accidents. The Consultant recommends implementation of recommendation # 1 as a short term improvement and the consideration of recommendation #2 for future development.

Total Cost = $100.



So. Center & Westwood

1 STOP	2 YIELD	3 NO LEFT TURN	4 KEEP RIGHT	5 SPEED LIMIT 25	6 NO PARKING HERE TO CORNER
7 NO PARKING ANY TIME	8 NO PARKING (MISC)	9 PEDESTRIAN CROSSING	10 ONE WAY	11 WATCH FOR TURNING VEHICLES	12
13	14	15	16	17	18

figure 4 -16

MARSHALLTOWN, IOWA

SOUTH CENTER AND LINN

Figure 4-17 shows the existing conditions for this high-accident location. Center Street is a two-way freeway extension carrying four lanes of through traffic. Exclusive left-turn lanes are provided for both northbound and southbound motorists. Linn Street is a three-lane, one-way eastbound facility. The east leg of the intersection is a freeway extension, while the west approach is a municipal collector. Parallel parking is allowed on the north, east, and west legs of the intersection.

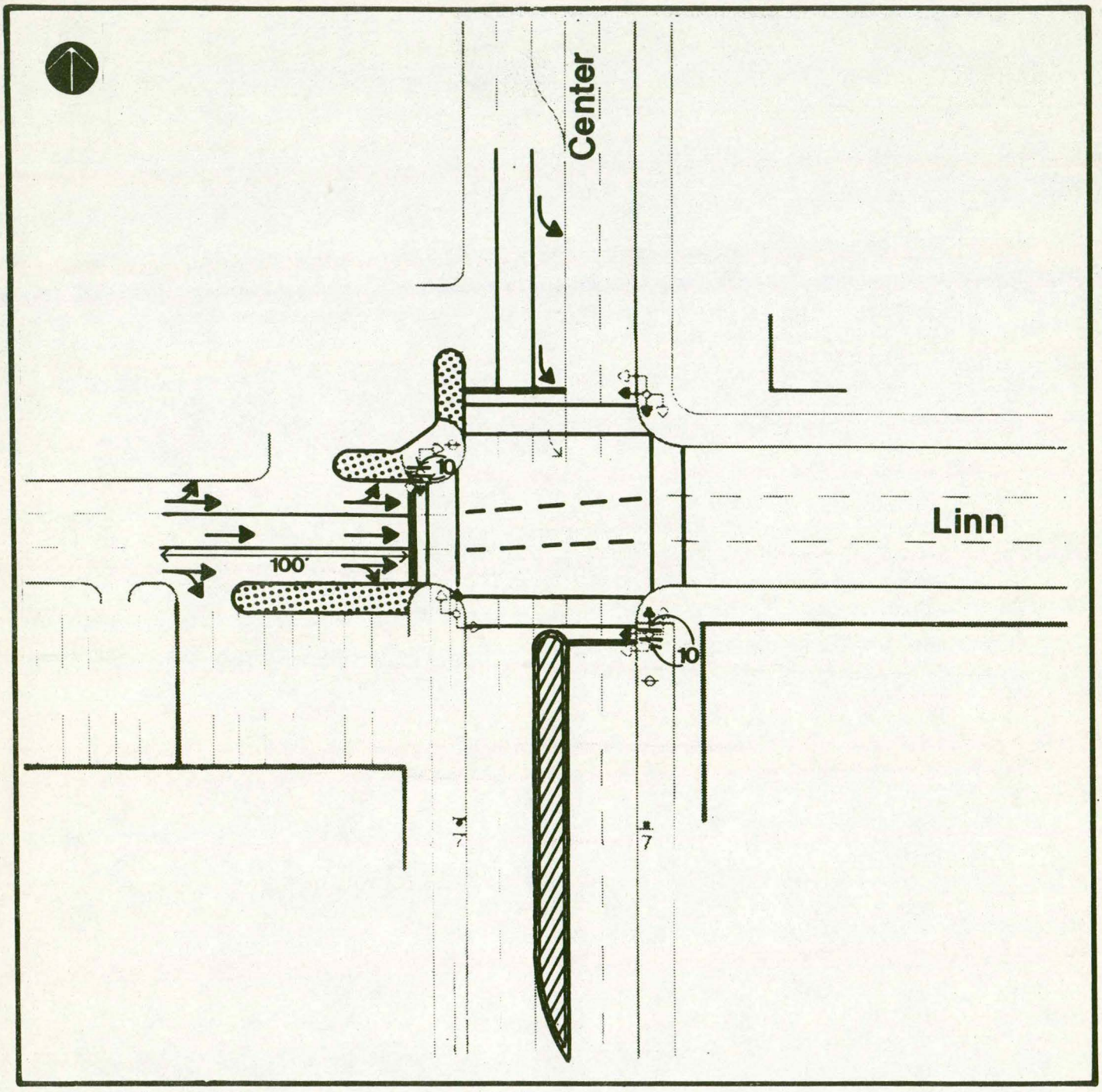
Traffic control at this intersection is provided by pedestal-mounted traffic signals (8" lenses). WALK and DONT WALK pedestrian indications are installed on every approach. Pavement markings at this location consist of lane lines and lane-use control symbols.

During the accident analysis period, twenty-three accidents were reported at this location. Twelve rear-end collisions occurred, while six right-angle accidents also took place. Four personal injury accidents occurred at this intersection. On the south leg of this intersection, the rear-end accidents involving southbound motorists were caused by the conditions at the Center Street-Boone Street intersection and are not attributable to any deficiency of the subject location.

The following recommendations are made concerning modifications that should be made at this location to improve traffic safety:

1. The wide entrance to the parking lot on the southwest corner of the intersection should be modified as shown in Figure 4-17.
2. The driveways to the service station on the northwest corner of the intersection should be narrowed to a width of about 25 feet to minimize their effect on the operation of the intersection.
3. Pavement markings should be applied as shown in Figure 4-17.
4. ONE WAY signs should be installed on the near-right and far-left corners of the intersection to face traffic entering or crossing Linn Street.
5. The traffic signals should be timed to provide 4-second clearance intervals. The double green arrow indications should be replaced by circular green indications. The DONT WALK signals should be provided with a flashing capability.
6. Motorists utilizing the left lane on the west approach can see conflicting indications given by the traffic signals on the southeast corner of the intersection. These signal indications should be properly adjusted or shielded so that approaching drivers can see only the indication controlling their movement.
7. The accident records do not reveal that lane-change accidents are prevalent on the north and west approaches. Therefore, overhead lane-use control signs are not recommended. The suggested pavement markings should be sufficient to reduce the potential for sideswipe accidents. 12" red signal heads and ultimately, mast arms are recommended.

Total Cost = $2,340.



So. Center & Linn

1 STOP	2	3 NO LEFT TURN	4 KEEP RIGHT	5 SPEED LIMIT 25	6 NO PARKING HERE TO CORNER
7 NO PARKING ANY TIME	8 NO PARKING	9 DO NOT ENTER	10 ONE WAY	11	12
13	14	15	16	17	18

figure 4-17

MARSHALLTOWN, IOWA

SOUTH 3RD AVENUE AND ANSON

This location is the intersection of two municipal arterials, both of which are two-lane, two-way facilities. Parallel parking is provided along the west side of 3rd Avenue.

Pedestal-mounted traffic signals (8" lenses) provide the traffic control at this location. No pedestrian indicators have been installed. At the time of the field inspection, no pavement markings were present, although this may have been the result of weathering.

During the accident analysis period, nineteen accidents took place at this intersection. Of this total, 53% were rear-end collisions, with a variety of accident types accounting for the remainder. Four personal injury accidents occurred, including one pedestrian accident.

The following recommendations are made concerning this intersection:

1. The amber interval should be increased from 3 seconds to 4 seconds.

2. On the northeast and northwest corners of the intersection, the existing islands should be enlarged as shown in Figure 4-18.

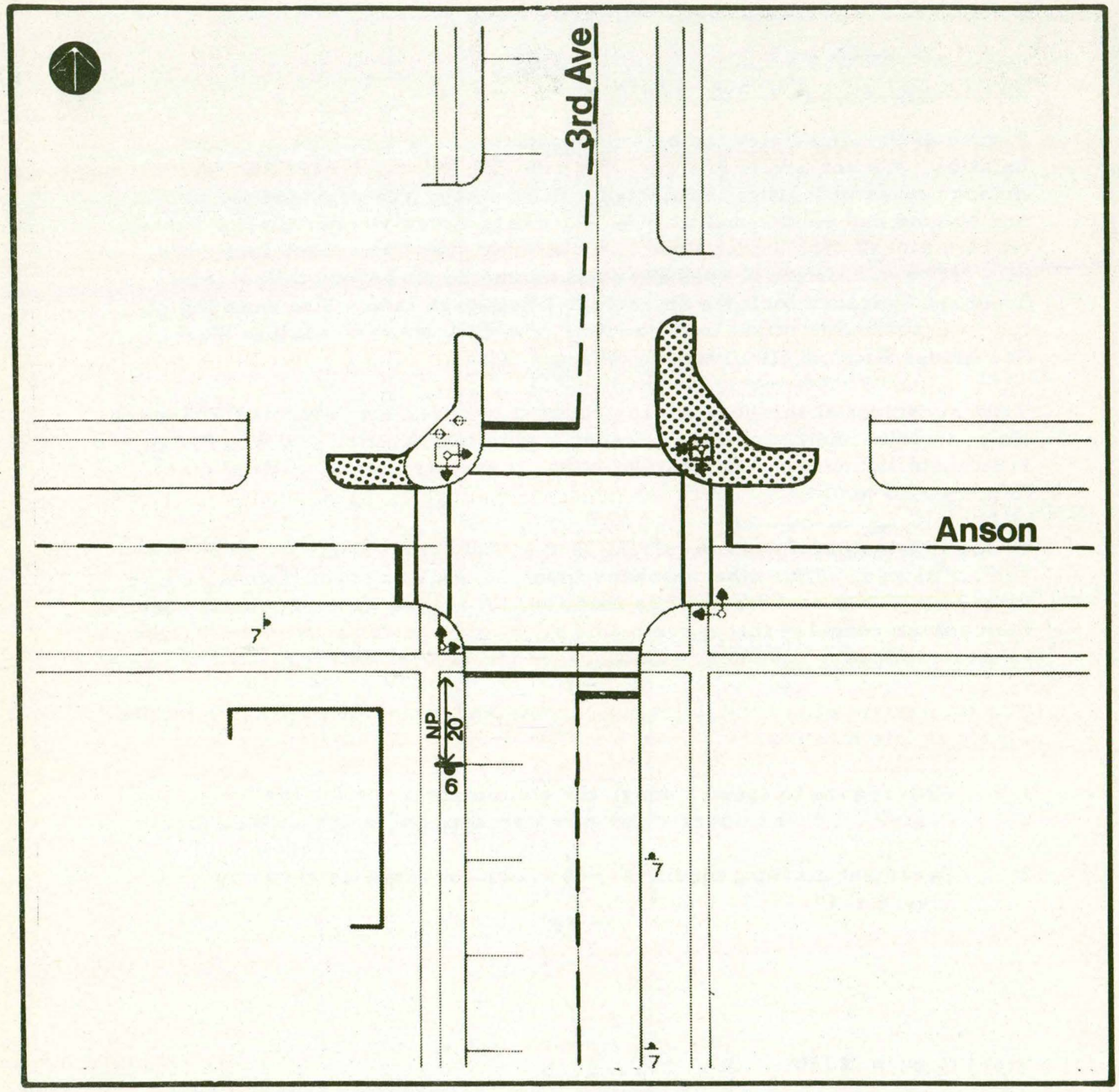
3. Suggested pavement markings for this intersection are depicted in Figure 4-18. These markings should be maintained to a high degree of visibility.

4. Parking should be restricted on the west side of the south approach.

5. Speed zoning has been instituted in the vicinity of this intersection. In an effort to reduce the severity of accidents, the existing speed limits should be strictly enforced.

6. This signalized intersection is somewhat isolated from other signal installations, therefore, it is unexpected. SIGNAL AHEAD signs (W3-3) should be installed on all approaches to warn motorists that they are approaching traffic signals. The signs should be placed about 250 feet in advance of the intersection. 12" signal heads are also recommended.

Total Cost = $3,710.



So. 3rd Ave & Anson

1 STOP	2	3 NO LEFT TURN	4 KEEP RIGHT	5 SPEED LIMIT 25	6 NO PARKING HERE TO CORNER
7 NO PARKING ANY TIME	8 NO PARKING (MISC)	9 DO NOT ENTER	10 ONE WAY	11	12
13	14	15	16	17	18

figure 4-18

MARSHALLTOWN, IOWA

SOUTHRIDGE AND PLAZA DRIVE

This high-accident location is a "T" intersection situated in the extreme southern part of the City. East Southridge Road is functionally classified as a municipal collector, while Plaza Drive carries no functional designation. Southridge is a two-lane, two-way street. Plaza Drive is a two-lane, two-way entrance to a shopping center.

Only two forms of traffic control devices are utilized at this location. Pavement markings, in the form of centerlines, are provided on both streets. Traffic control is provided by a single STOP sign installed on the Plaza Drive approach.

In terms of numbers of accidents, this intersection is the lowest-ranking high-accident location in the City. During the accident analysis period, a total of thirteen accidents were recorded at this intersection. The two main accident patterns were of the right-angle type (6 accidents) and the side-swipe type (4 accidents). One of the right-angle accidents resulted in a personal injury. Four accidents occurred under conditions of slippery pavement.

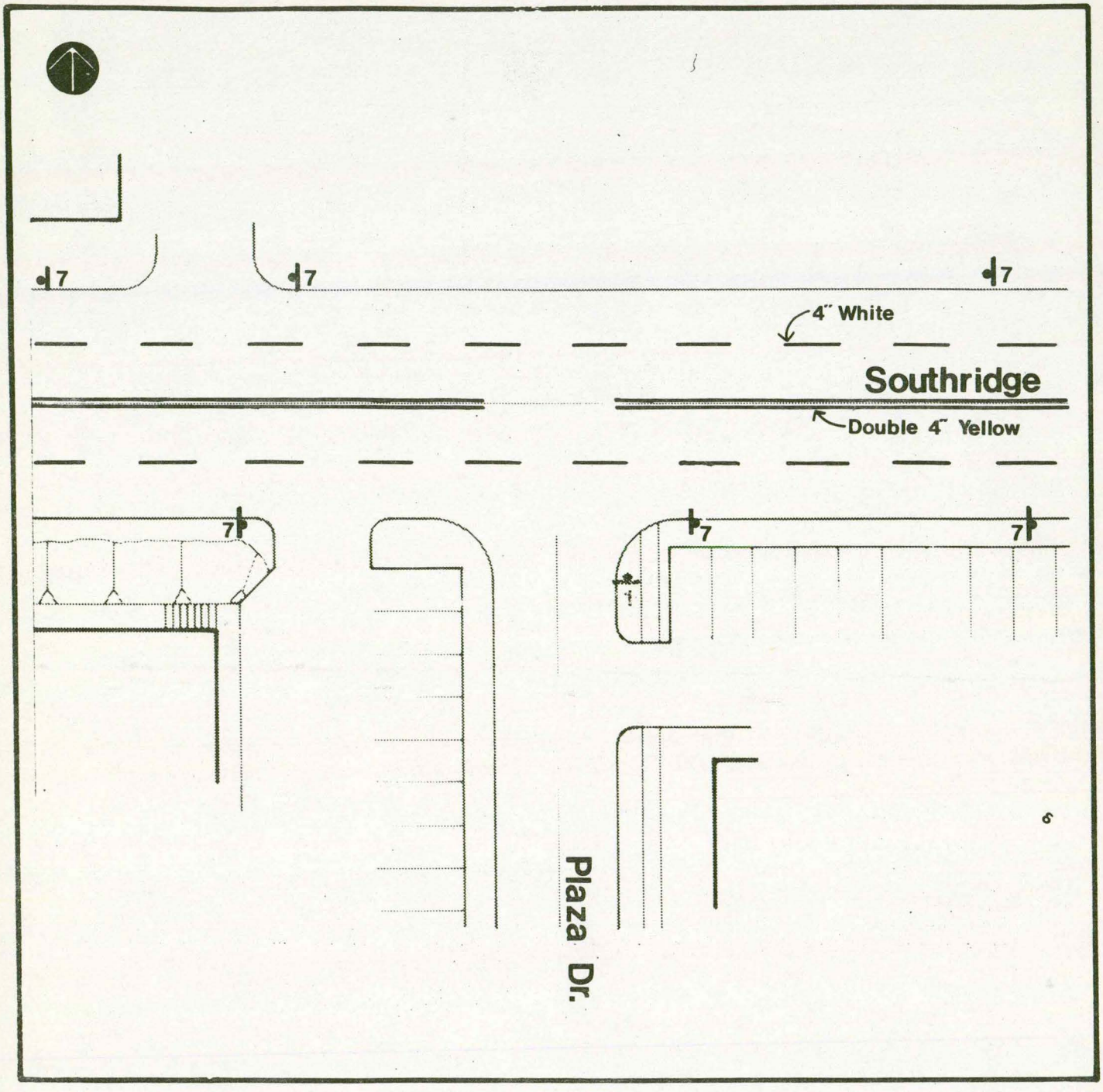
Figure 4-24 shows the existing conditions as well as the recommended improvements for this location. The recommendations are further discussed below:

1. Southridge Road slopes steeply from west to east in the vicinity of this intersection. Timely salting and sanding operations should be employed to minimize slippery pavement conditions, which make vehicle braking operations hazardous.

2. Speed checks are recommended to determine if enforcement is required along this section of Southridge.

3. Southridge Road should be marked as a four-lane undivided street. In conjunction with this new pavement marking scheme, NO PARKING restrictions should be posted as shown in Figure 4-24.

Total Cost = $250.



Southridge & Plaza Dr.

1 STOP	2	3 NO LEFT TURN	4 KEEP RIGHT	5 SPEED LIMIT 25	6 NO PARKING HERE TO CORNER
7 NO PARKING ANY TIME	8 NO PARKING MISC.	9 DO NOT ENTER	10 ONE WAY	11	12
13	14	15	16	17	18

figure 4-24

MARSHALLTOWN, IOWA

5

Chapter 5
PEDESTRIAN SAFETY

DOWNTOWN AREA

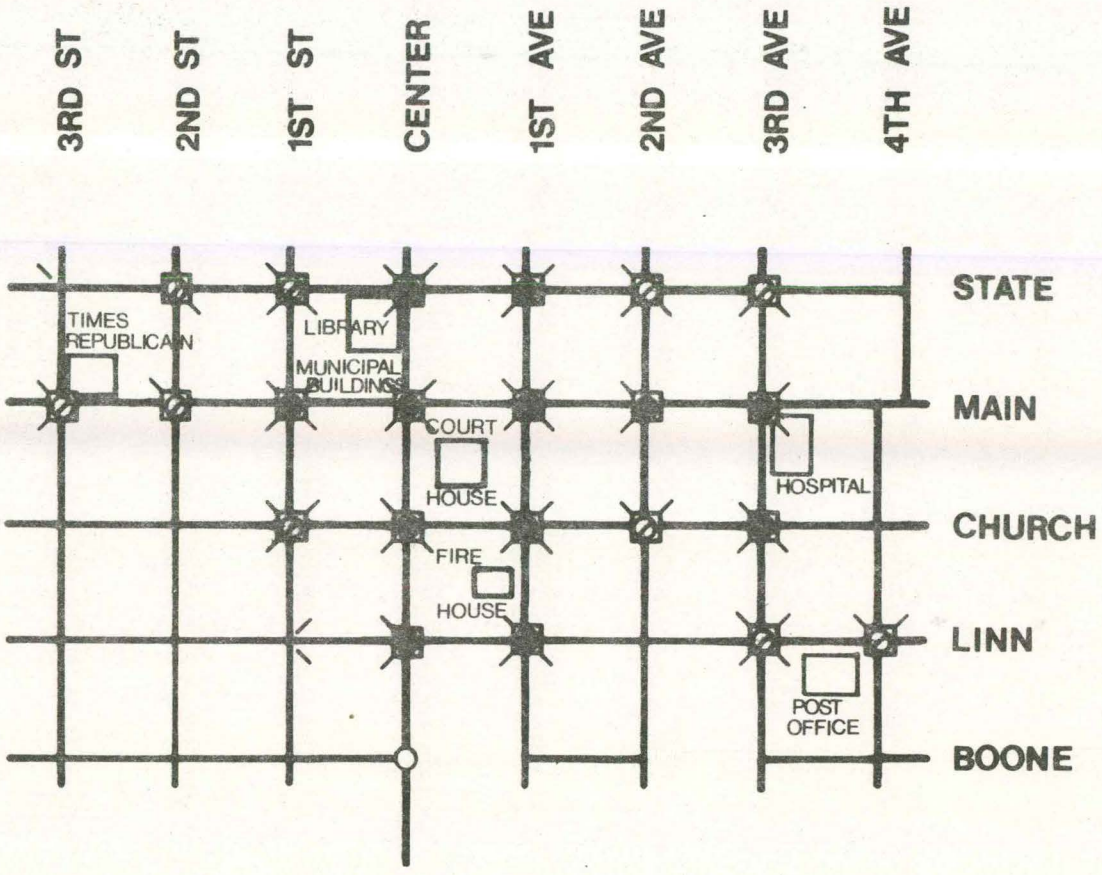
Field observations within the downtown area have revealed that conditions are generally satisfactory with respect to pedestrian safety. The signalization appears to be adequate. Sidewalk ramps for the handicapped have been installed in many locations. However, about forty more installations are required. The existing ramp design should be modified to incorporate a lip at the curb line. The lip assists blind persons using a cane in identifying the beginning or end of a crosswalk. The Appendix to this report contains drawings showing the typical design for sidewalk ramps.

Parking occurs too close to crosswalks at intersections and should be restricted within twenty feet of crosswalks. This recommendation is further discussed in Chapter 2.

St. Mary's and Glick Elementary schools are located in or near the downtown area, and special consideration should be given to these schools in relation to pedestrian safety. Both school localities are discussed in detail in the SCHOOL SAFETY section of Chapter 5.

Figure 5-1 defines and locates the pedestrian safety features present in downtown Marshalltown. In addition to the lack of sidewalk ramps at some corners, crosswalks are not present at some intersections. Pedestrian indications do not accompany all signal installations, and in many cases are incomplete installations, having only one "DONT WALK" indication. The Consultant recommends the downtown crossing modifications specified in Table 5-1. The costs of these proposals are tabulated in Table 5-2.

The pedestrian indications currently utilized in Marshalltown are not equipped with flashing capacity. The MUTCD states: "A pedestrian clearance interval shall always be provided where pedestrian signal indications are used. It shall consist of a flashing DONT WALK indication. The duration should be sufficient to allow a pedestrian crossing in the crosswalk to leave the curb and travel to the center of the farthest traveled lane before opposing vehicles receive a green indication." The cost of adding flashing capacity to each signalized location is given in Table 5-2.



Note: No pedestrian indicators have flashing Don't Walk capacity.

Downtown Crossings

Signal With Pedestrian Indicators ●
Signal With Partial Pedestrian Indicators ⊘
Signals Only ○
Crosswalks □
Handicap Ramps ⌑

figure 5-1

MARSHALLTOWN, IOWA

TABLE 5 - 1

DOWNTOWN CROSSING MODIFICATIONS

Location	Pedestrian Indicators	Crosswalks	Handicap Ramps
3rd St. and State	- -	N, S, E, W	NE, SE, SW
2nd St. and State	2W, 8DW	- -	NE, NW, SW
1st St. and State	4W, 8DW	- -	NE
Center and State	- -	- -	SE
1st Ave. and State	- -	- -	SE
2nd Ave. and State	2W, 8DW	- -	NE
3rd Ave. and State	2W, 8DW	- -	NE, NW
3rd St. and Main	2W, 8DW	- -	NE, NW
2nd St. and Main	2W, 8DW	- -	NE, SE, SW
1st St. and Main	- -	- -	- - -
Center and Main	- -	- -	- - -
1st Ave. and Main	- -	- -	- - -
2nd Ave. and Main	- -	- -	NE, SE
3rd Ave. and Main	- -	- -	NW, SW
1st St. and Church	4W, 8DW	- -	SE
Center and Church	- -	- -	NE
1st Ave. and Church	- -	- -	- - -
2nd Ave. and Church	5W, 8DW	- -	SW, SE
3rd Ave. and Church	- -	- -	NE

BLE 5 - 1 (Continued)

cation	Pedestrian Indicators	Crosswalks	Handicap Ramps
l St. and Linn	- -	- -	NE, NW, SE, SW
l St. and Linn	- -	N, S [4]	NE, NW, SE, SW
St. and Linn	- -	- -	NW, SW
nter and Linn	- -	- -	NE, SE
Ave. and Linn	- -	- -	NE
l Ave. and Linn	- -	N, S, E, W	NE, NW, SE, SW
d Ave. and Linn	2W, 8DW	- -	- - - -
ı Ave. and Linn	4W, 8DW	- -	SE, SW
d St. and Boone	- - -	- -	- - - -
d St. and Boone	- -	N, S [4]	- - - -
t St. and Boone	- -	N, S [4]	NE, NW, SE, SW

1. W = Walk ; DW = Don't Walk
2. N = North ; S = South ; E = East ; W = West
3. NE = Northeast ; NW = Northwest ; SE = Southeast ; SW = Southwest
4. Discussed in SCHOOL SAFETY section

TABLE 5 - 2

COST OF DOWNTOWN CROSSING MODIFICATIONS

Item	Unit	Size	Cost per Unit	Cost per Item	Number of Items	Total Cost
Crosswalks	L. F.	100 ft./Walk	$ .10	$ 10.	8	$ 160/Yr.*
Pedestrian Indicators	Tandem	9" Face	--	300.	55	16,500.
Flashing Capacity	One Per Intersection	- -	--	200.	22	4,400.
Handicap Ramps	Sq. Ft.	40 Sq. Ft.	2.50	100.	49	4,900.
No Parking Signs	- -	12" x 18"	--	$ 25.	192	$ 4,800.

* Crosswalks should be repainted twice a year.

SCHOOL SAFETY

The safety of pedestrians, particularly school children, is an important concern in every community. The interest is usually greatest during the first few weeks of school, although it is of continuing concern throughout the year. The concern is certainly justified because of the number of children involved, and because of their lack of maturity and judgement to act sensibly at all times and to evaluate speeds and distances accurately. Because of the importance of school child safety, many special traffic engineering tools have been developed and should be utilized in a uniform and comprehensive manner to achieve the desired level of safety.

Schools

Within the City of Marshalltown, the school facilities are comprised of thirteen elementary schools, three junior high schools, one senior high school and one special education center. These school locations are shown in Figure 2-1.

Of the thirteen elementary schools, two are active parochial schools. St. Henry's consists of kindergarten through third grade, while St. Mary's furnishes grades four through six. A bus service shuttles the students between the two schools.

The enrollment levels for public schools are summarized in Table 5-3. Approximately 3,260 students attend the elementary levels.

TABLE 5 - 3

ELEMENTARY SCHOOL ENROLLMENT

Elementary Schools	1975-1976 Enrollment	Page
Anson	428	5-20
Fisher	472	5-28
Franklin	286	5-30
Glick	326	5-32
Hansen	187	5-34
Hoglan	360	5-36
Norris	36	5-38
Palmer	265	5-40
Rogers	311	5-42
Williams	205	5-44
Woodbury	381	5-46

ELEMENTS OF A SCHOOL SAFETY PROGRAM

The philosophy of a school safety program is fairly straightforward and simple: to provide a safe path to and from school for children. Necessary elements of such a program include:

- -- school route planning.
- -- appropriate signing, markings, signal controls, and crossing guards.
- -- adequate site layout (to reduce vehicle-pedestrian conflicts).
- -- education of children, parents and motorists.
- -- review of operational and safety experience.
- -- updating plan at regular intervals.

Long-range considerations which apply, especially in the implementation of more costly control devices, are the stability of school attendance boundaries, and the potential for school relocation, expansion, or closing.

Each of these elements is amplified in the following discussion.

School Route Plan

This simply involves the designation of suggested routes between a school and the residential areas within its attendance boundary for grade school age children. A coordinated plan of crosswalk controls can guide children to avoid hazardous crossings or intersections, provide effective and efficient usage of protective measures, and further promote safety by treating similar situations in a similar fashion. Guiding factors in the placement of each route are:

- -- Aggregate children on their way to school to consolidate principal crossings and to enhance the visibility by grouping the children.

- -- Minimize the number of crossings on major streets.

- -- Provide routes that are as direct as possible given other more important constraints.

-- Maximize use of existing traffic and crossing controls, if suitable.

-- Maximize use of existing available sidewalks.

-- Provide adequate sight distances.

-- Avoid midblock crossings other than those adjacent to schools.

Traffic Controls

These include pavement markings, crosswalks, related signing, speed limits, intersection controls, beacons, traffic signals, and crossing guards. The proper use and general warrants for each are described below:

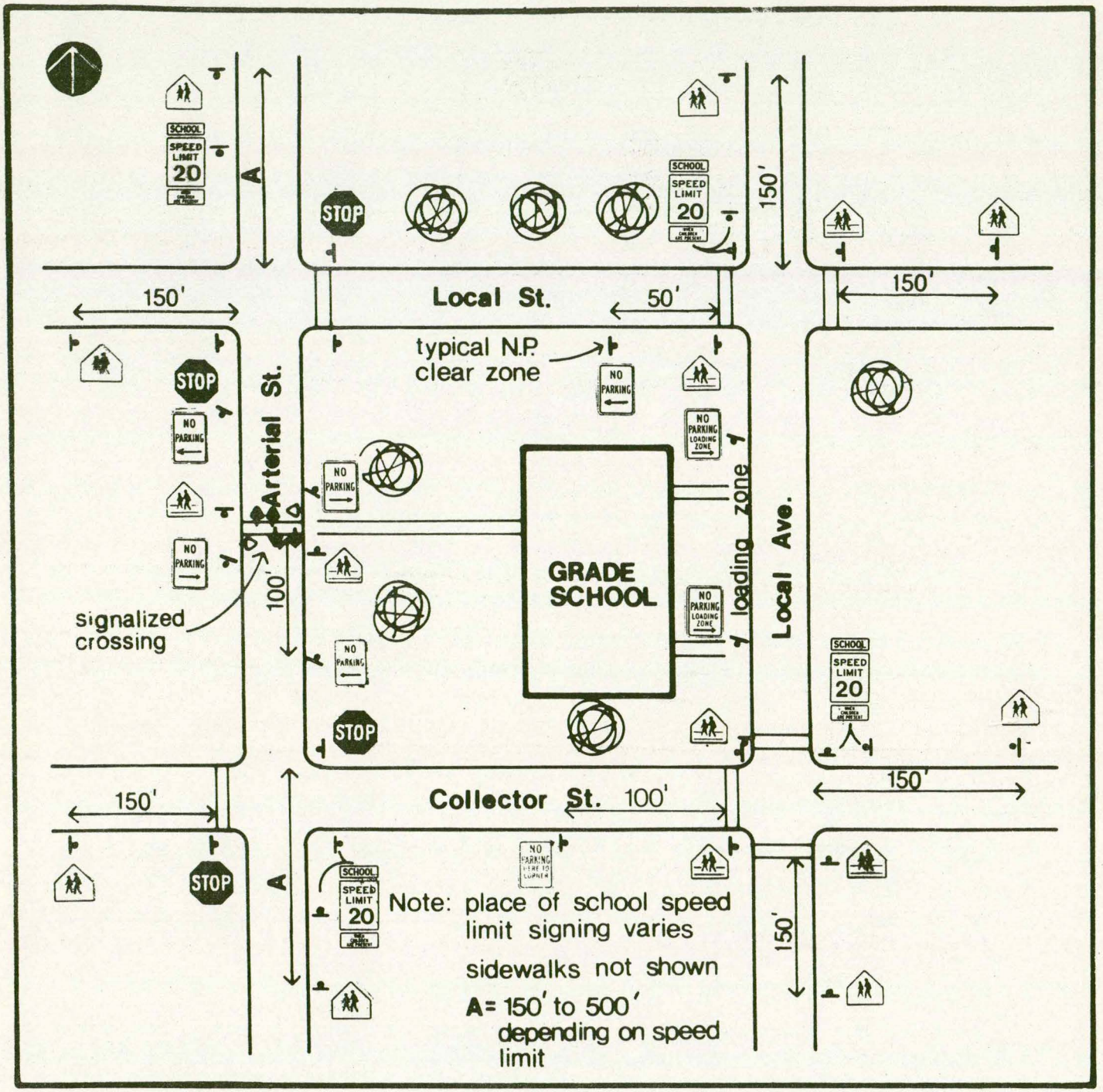
Pavement markings used for school safety in Marshalltown consist of painted crosswalks and stop lines. The MUTCD specifies that crosswalks shall be marked by two white lines at least 6 inches in width and at least 6 feet apart (alternate markings are available). Stop bars are not specifically required by the MUTCD, but are used in conjunction with most marked crosswalks in Marshalltown.

Signing serves to alert motorists to the proximity of a school or crossing and to regulations on speed limit and right-of-way. Typical school zone signing patterns are shown in Figure 5-2.

a. SCHOOL ADVANCE sign (S1-1) is intended for use in advance of school grounds and school crossings. A general guide for placement is a distance in advance of the school zone equal to six times the posted speed limit.

b. SCHOOL CROSSING sign (S2-1) is intended for use at established crosswalks except at crossings controlled by a STOP sign. It shall be preceded by a SCHOOL ADVANCE sign. Placement is at, or as near as possible to, the crosswalk.

c. SCHOOL SPEED LIMIT sign assembly (R2-1 with S4-3 and S4-2) is often used to define a reduced speed zone near school grounds. This sign can be used with flashing yellow beacons, or as a changeable message sign with beacons, to emphasize the school speed zone on streets with higher traffic volumes or a higher base speed limit. At the end of the zone, the standard speed limit



School Area Traffic Controls

figure 5-2

MARSHALLTOWN, IOWA

should be posted. The use of beacons mainly relates to major streets.

d. STOP signs (R1-1) should be installed primarily on the basis of traffic volumes and assignment of right-of-way. Accident experience, sight distance, and inadequate gaps in traffic for children are potential influencing factors.

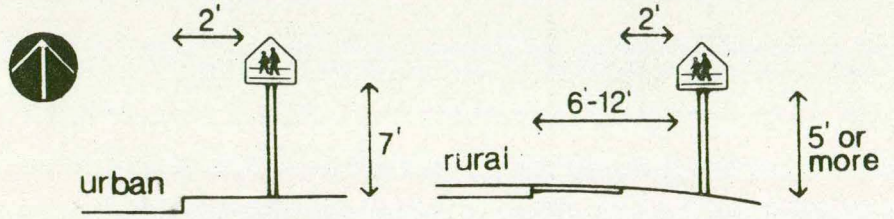
e. NO PARKING signs (R7-series) are usually necessary to provide proper sight distance at crossings, and similar signs can be used to identify school area loading zones.

Beacons may be used in conjunction with various school area signing to draw special attention. Standard permissible uses are yellow beacons used with SCHOOL CROSSING signs or SCHOOL SPEED LIMIT signs, flashing to coincide with the hours of pedestrian activity. According to the MUTCD, flashing red beacons are not to be used on an intermittent basis at intersections or mid-block school crosswalks. This implies that their present use at crosswalks with various warning signs is not conforming. The intent is that at all locations where a motorist is required to come to a complete stop at some times and not at other times, the control should be provided only by signal-type controls. In summary, yellow beacons can be used with warning or regulatory signs on an intermittent basis, if necessary, and red beacons can be used only at intersections where a STOP sign is already posted.

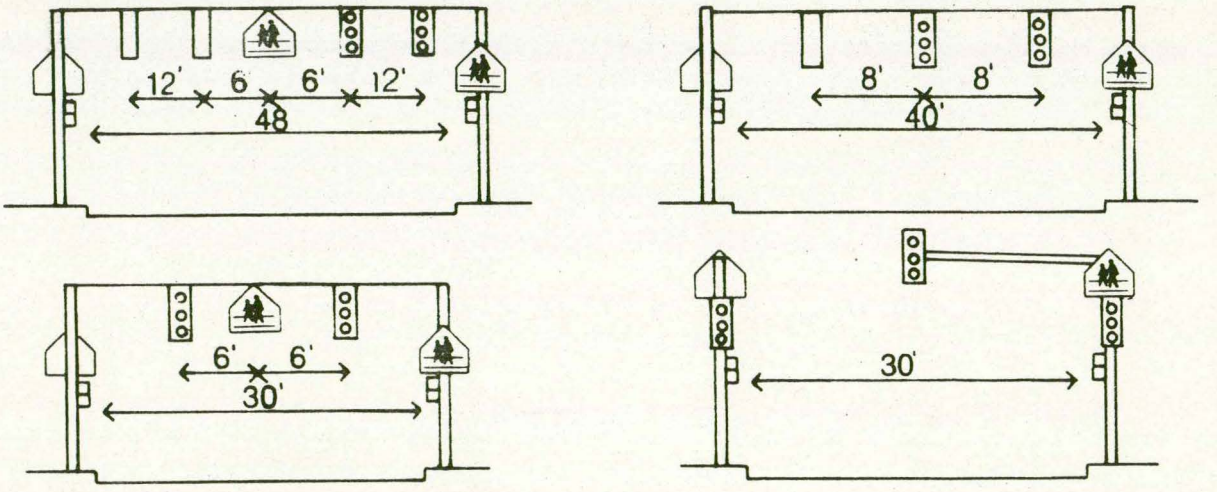
Pedestrian-actuated traffic signals are warranted by the MUTCD when there is less than one adequate gap per minute in traffic for children to cross during the period of crossing activity. Considering walking speed and street width, Table 5-4 depicts the approximate threshold volumes for meeting the signal warrant.

Table 5-4 provides a general guide and should be supplemented by additional field data including pedestrian volumes, vehicle speeds, sight distances and other engineering factors.

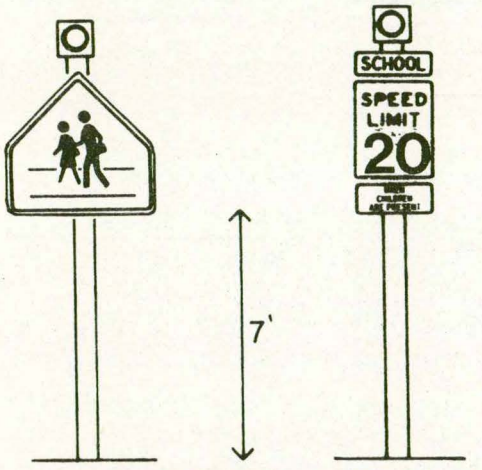
Signalized intersection control can help complete the safe route concept by providing a specified gap in heavy traffic. Such crossings at signals should be marked with crosswalks, warning signs, and pedestrian indications. Care should be taken in signal timing to assure that adequate time is available during a phase for children to completely cross the street. Typical school signal configurations are shown in Figure 5-3.



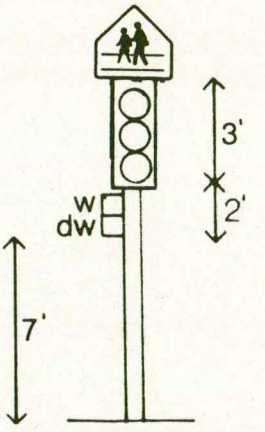
Sign Placement



Typical Signalized Crosswalks



Amber Beacon with School Signing



Signal with School Signing

School Traffic Control Placement

figure 5-3

MARSHALLTOWN, IOWA

TABLE 5 - 4

VOLUME WARRANTS FOR SIGNALIZED CROSSWALKS

Width	Time	Maximum Hourly Volume Allowing 1 Safe Gap per Minute	Approximate Daily Volume Required
18	8	910	10900
22	9	740	8900
24	10	675	8100
28	11	570	6800
30	12	520	6200
36	13	465	5600
40	14	435	5200
44	16	405	4700
48	17	375	4500
55	19	335	4000
65	22	285	3400

School Speed Limits

At the present time, special speed limits are not used in the school zones in and around the various school facilities. The posted speed limit at each of the schools is 25 miles per hour.

The Consultant concurs with the utilization of the existing 25 mile per hour speed limit. Several nationwide studies have shown that lower speed limits of 15 or 20 miles per hour do not significantly improve safety within school zones. Only enforcement of speed limits can effect total compliance.

Adult Crossing Guards are usually assigned to assist children using a marked crosswalk where special hazards exist that can be best gauged by an adult. Such hazards could include long crossings and heavy vehicular or truck traffic. Considerable judgment in the use of crossing guards is necessary because of the expense incurred. One general set of warrants in use specifies the use of adult guards:

- -- at major crosswalks on State and Federal routes.
- -- at crosswalks where the volume of vehicles and children is 1600 or greater during periods of crossing activity.
- -- at crosswalks where a signal is warranted as an interim control, or as a permanent control if special conditions indicate that the guard could provide better protection.

In the control of traffic, adult guards should pick opportune times to create a safe gap. When traffic has stopped, then he permits children to cross. Guard training and supervision should be coordinated through the Police Department.

School crossing patrols are an alternative supplement to traffic control measures. Such patrols are used as part of the school safety program by the parochial schools and are being conducted in a proper manner. The MUTCD should be consulted for special guidelines for the conduct of these patrols.

Pedestrian overpasses are the ultimate solution to eliminating vehicle-pedestrian conflicts at critical locations. However, the high cost of these structures (about $ 100,000 for a four-lane overpass) often precludes their use.

Attendance Areas

Optimally, elementary schools should be located away from major streets. Attendance boundaries likewise should follow along principal streets, railroads, or natural features. Attention to these general guidelines on the location of schools and attendance areas can promote school safety by minimizing major conflict points. Junior and senior high schools, on the other hand, require accessibility and therefore are best located on or near major or minor arterials.

Overall, the delineation of attendance areas should keep in mind school safety as a criteria for identifying school attendance boundaries. School boundaries should be located in such a manner as to prevent or discourage students from crossing hazardous areas on their routes to and from school.

Education of children, parents and motorists is vital as each needs to clearly understand their responsibilities toward safety. Public information releases can inform motorists of new traffic controls and their meaning, while parents and educators can share the task of explaining the system to students.

Considerable effort is presently being made, through the cooperation of the Police Department and the school administration, to educate and promote safe walking and bicycling habits to grade students. This activity is commendable, and its importance cannot be understated.

Monitoring the program is periodically necessary to review its performance and assure that traffic controls and safe routes are in tune with changing needs.

General School Safety Recommendations

The following general recommendations relating to the school safety are made in the interest of improving school safety efforts in Marshalltown:

1. The first and most effective contribution to pedestrian safety in Marshalltown would be the implementation of an active sidewalk construction program as outlined later in this chapter.

2. Flashing red beacon assemblies are used at nine locations to regulate traffic at school crossings. These units consist of a rectangular sign bearing the legend "STOP WHEN FLASHING", above which is mounted a flashing red beacon against a yellow background.

   In all instances, the beacons are timed to correspond to the hours of school crossing activity.

These beacons are non-conforming essentially because they require motorists to stop at some times and not at others. This is a function which is properly accomplished only by the standard Red-Yellow-Green signal operation. Reasons why this use of flashing red beacons is considered hazardous are:

a. At many of the installations if a bulb is burnt out, there is no back-up instruction to the motorist, and more importantly,

b. The intermittent nature of the devices can cause false security that a car will stop in the instances of an inattentive motorist, one unfamiliar with the area, or a motorist who usually passes through the area when the beacon is not operating.

For these reasons, alternative control devices are proposed at all locations where the preceding flashing red beacon devices are in use.

3. In the future, new signing, crosswalks, and signal installations pertaining to school safety should be installed in accordance with guidelines of the MUTCD outlined in this report. Typical placement is shown in Figures 5-2 and 5-3.

4. School officials, with the cooperation of the local P. T. A. and the Public Works Department should undertake to identify safe-routes-to-school for all children within each attendance area, following the guidelines in this chapter. Maps of the attendance area showing prescribed routes should be prepared and distributed to children and parents. Both parents and teachers should allot time to explain and review the maps. Children should be instructed as to why they should follow their own route daily. Student loading zones should be illustrated, and parents strongly encouraged to use them.

Suggested major routes to each school are shown in Figure 5-20 in this chapter. From this skeleton a complete network should be developed.

For such a plan to be successful, however, it is the Consultant's opinion that school officials, parents, and students must take an active part in developing a sound plan and provide better assurances that it will be followed by the students.

5. Once established, the safe route program should be periodically monitored and reviewed for each school area. For those in developing areas this should probably be an annual operation. New developments, shift in traffic, large traffic generators can all necessitate important revisions or changes.

6. While not presently utilized by the public schools, a School Safety Patrol program would be a worthwhile supplement to school safety efforts. The presence of properly trained students would enhance crossing protection. This program should have backing from parents and the community before it is undertaken. Implementation should be in accordance with guidelines of the MUTCD.

7. The following miscellaneous recommendations and suggestions are made in regard to various traffic control elements:

   a. The City may wish to experiment with vinyl-type crosswalk markings at well-trafficked locations.

   b. For a more attractive and less troublesome Speed Limit Sign Assembly, integral one-piece assemblies are available for new and future uses. Alternatively, 24 inch wide Speed Limit signs, rather than the 18 inch wide signs, could be used with the 24 inch wide supplemental S4-2 and S4-3 plates.

   c. Close attention should be paid to proper mounting heights of all signs, especially along streets where parked cars are common. Municipalities have been held liable in some recent cases for improper display or use of accepted traffic controls.

8. The implementation of recommended traffic safety actions presented in the following pages and figures should be pursued as promptly as possible. Where delays are incurred, acceptable interim solutions should be developed as required.

Specific Improvements at Individual Schools

Information regarding perceived conditions at all public schools in Marshalltown was obtained from school officials during a meeting of principals. This meeting revealed that each school has its own problems and needs. This data was supplemented by fieldwork by the Consultant to inventory site conditions, location of signing, crosswalks and related controls, and operational problems.

Recommended actions were formulated on the basis of guidelines contained in the MUTCD, with the objective that improvements or changes be practical, and realistic solutions to identified problems. Recommendations are also as consistent as possible with existing school safety practices in the City.

Typical recommendations included the following:

- -- relocation, replacement, or removal of existing signs
- -- new signing where necessary
- -- designation of student loading zones
- -- no parking clearances in advance of crosswalks
- -- replacement or modification of non-conforming flashing red beacon installations.

A variety of other recommendations are made at each school where special problems exist. Specific problems and recommended engineering treatments are described school-by-school in the following pages. Figures 5-4 through 5-19 graphically depict existing conditions and the Consultant's recommendations.

Cost estimates provided reflect the cost of labor and materials to perform recommended actions, and are approximate values only. Bulk purchase of signing and use of City crews during slack periods would reduce costs somewhat.

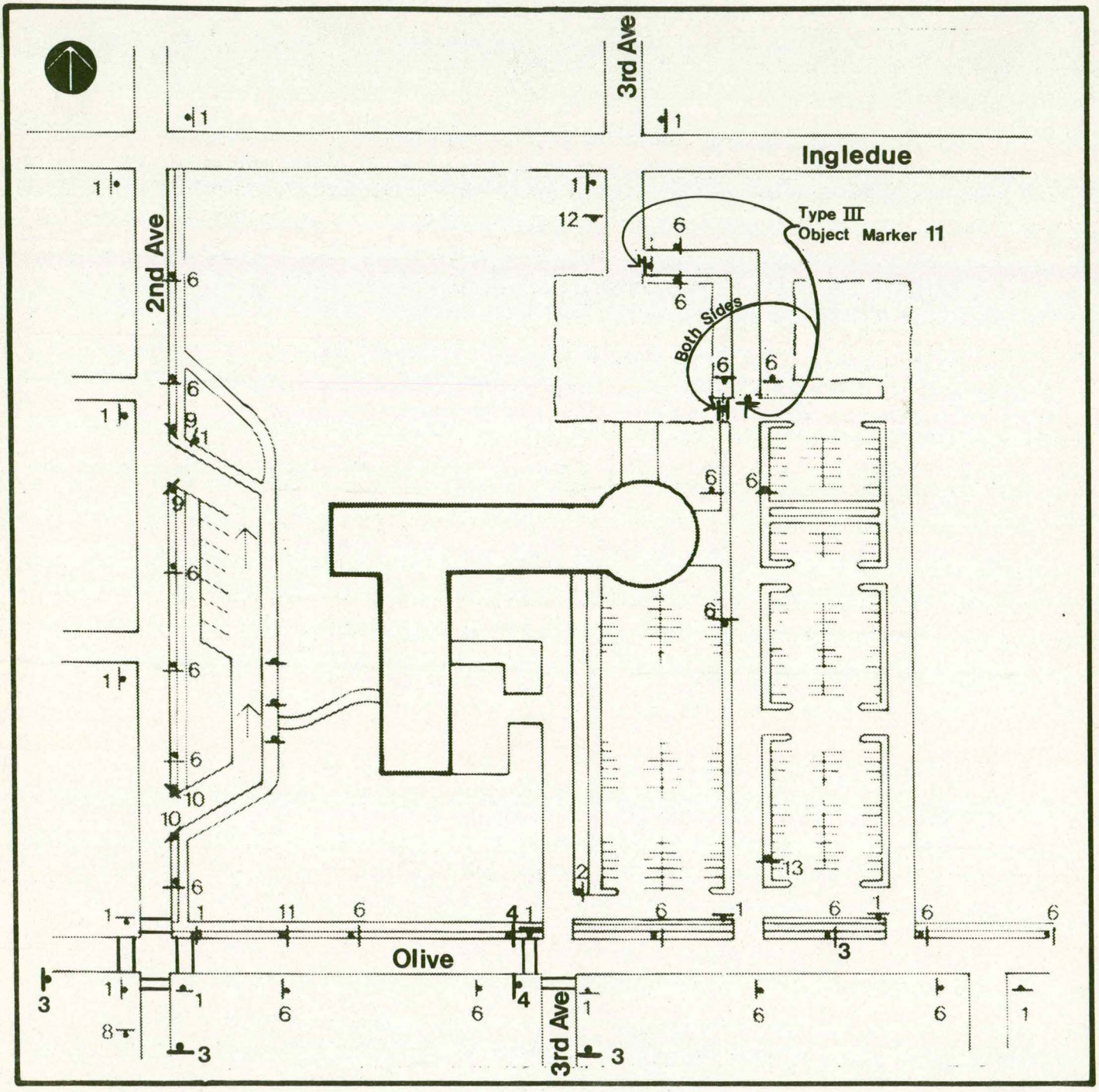
MARSHALLTOWN SENIOR HIGH

Figure 5-4 illustrates the existing conditions along with recommendations for this school facility. These suggestions are as follows:

a. Crosswalks should be added at the locations designated in Figure 5-4.

b. Presently the school is utilizing gates to prohibit 3rd Avenue from serving as a thoroughfare through school grounds. These gates have proven hazardous due to poor visibility at night. The Consultant recommends the installation of Type III object markers at each gate site. The reflectorized markers will serve to alert motorists of the obstructions.

The estimated cost of the improvements shown in Figure 5-4 is $ 255.



Marshalltown Senior High

figure 5-4

1 STOP	2	3	4	5 NO PARKING HERE TO CORNER	6 NO PARKING ANY TIME
7 SCHOOL SPEED 20	8 NO PARKING MISC	9 DO NOT ENTER	10 ONE WAY	11	12
13	14	15	16	17	18

MARSHALLTOWN, IOWA

ANSON JUNIOR HIGH AND ANSON ELEMENTARY

Figure 5-5 shows the present setting for these schools as well as the recommended improvements. These recommendations are specified below:

a. Unnecessary crosswalks should be removed at the locations designated in Figure 5-5.

b. Crosswalks should be added at the signalized intersection of Anson and 3rd Avenue.

c. In conjunction with existing and new crosswalks, the installation of ADVANCE SCHOOL CROSSING (S1-1) and SCHOOL CROSSING (S2-1) signs will be required as shown in Figure 5-5.

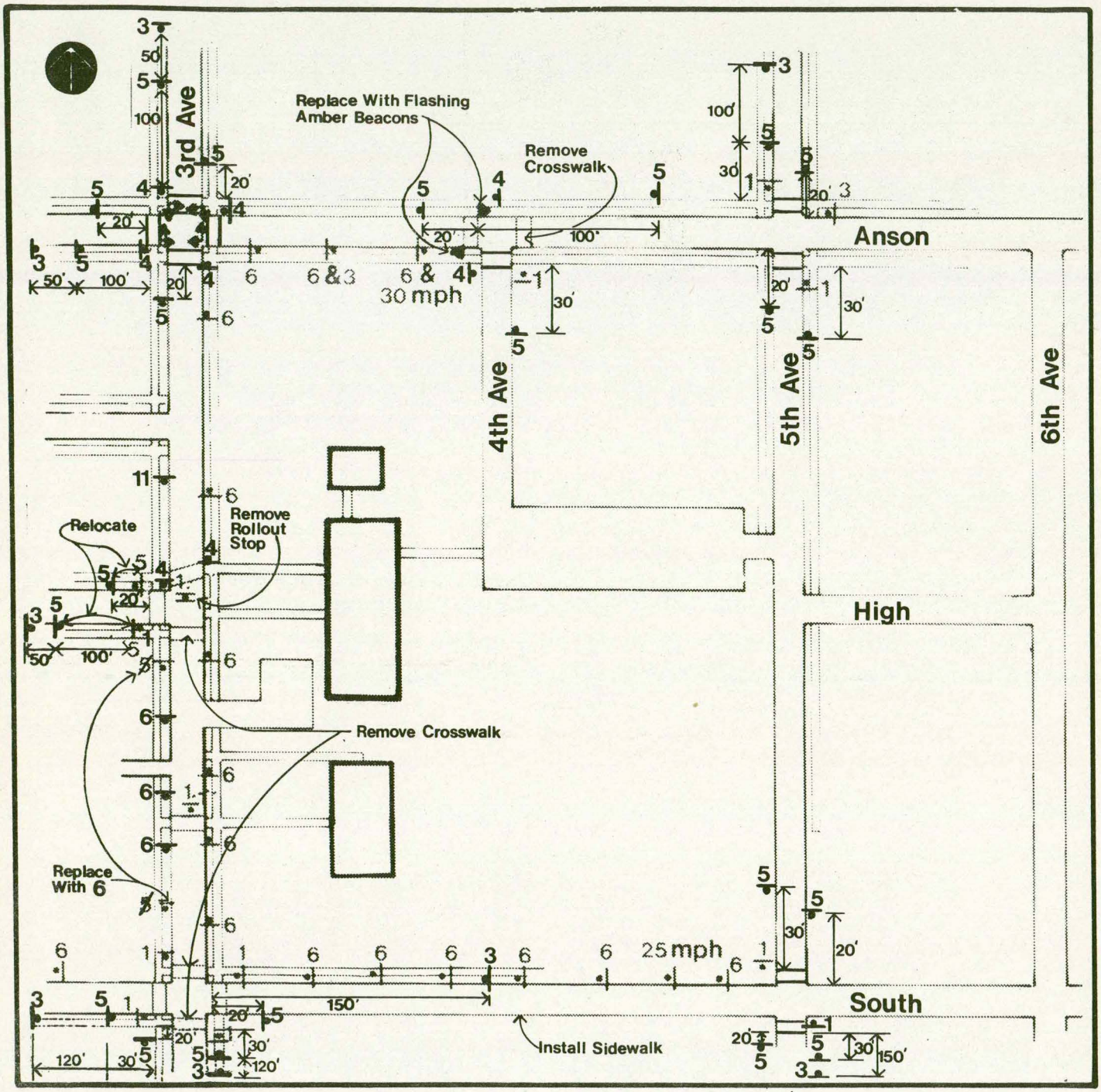
d. A no-parking zone should be established on both sides of 3rd Avenue in front of the schools. This will minimize congestion and increase visibility of crosswalks.

e. A sidewalk should be installed along both sides of South Street, which is a suggested safe route to school.

f. The school beacon presently in operation at the intersection of Anson and 4th Avenue is non-conforming and should be immediately replaced with a flashing amber beacon.

g. The use of roll-out STOP signs should be discontinued.

The estimated cost of the improvements shown in Figure 5-5, is $1,945. This value assumes that the sidewalk installation would be paid through an assessment to the adjacent property owners.



Anson Junior High & Anson Elementary

1	STOP	2		3		4		5	NO PARKING HERE TO CORNER	6	NO PARKING ANY TIME
7	SCHOOL SPEED LIMIT 20	8	NO PARKING (MISC.)	9	DO NOT ENTER	10	ONE WAY	11	NO PARKING	12	
13		14		15		16		17		18	

figure 5-5

MARSHALLTOWN, IOWA

LENIHAN JUNIOR HIGH AND ST. HENRY'S

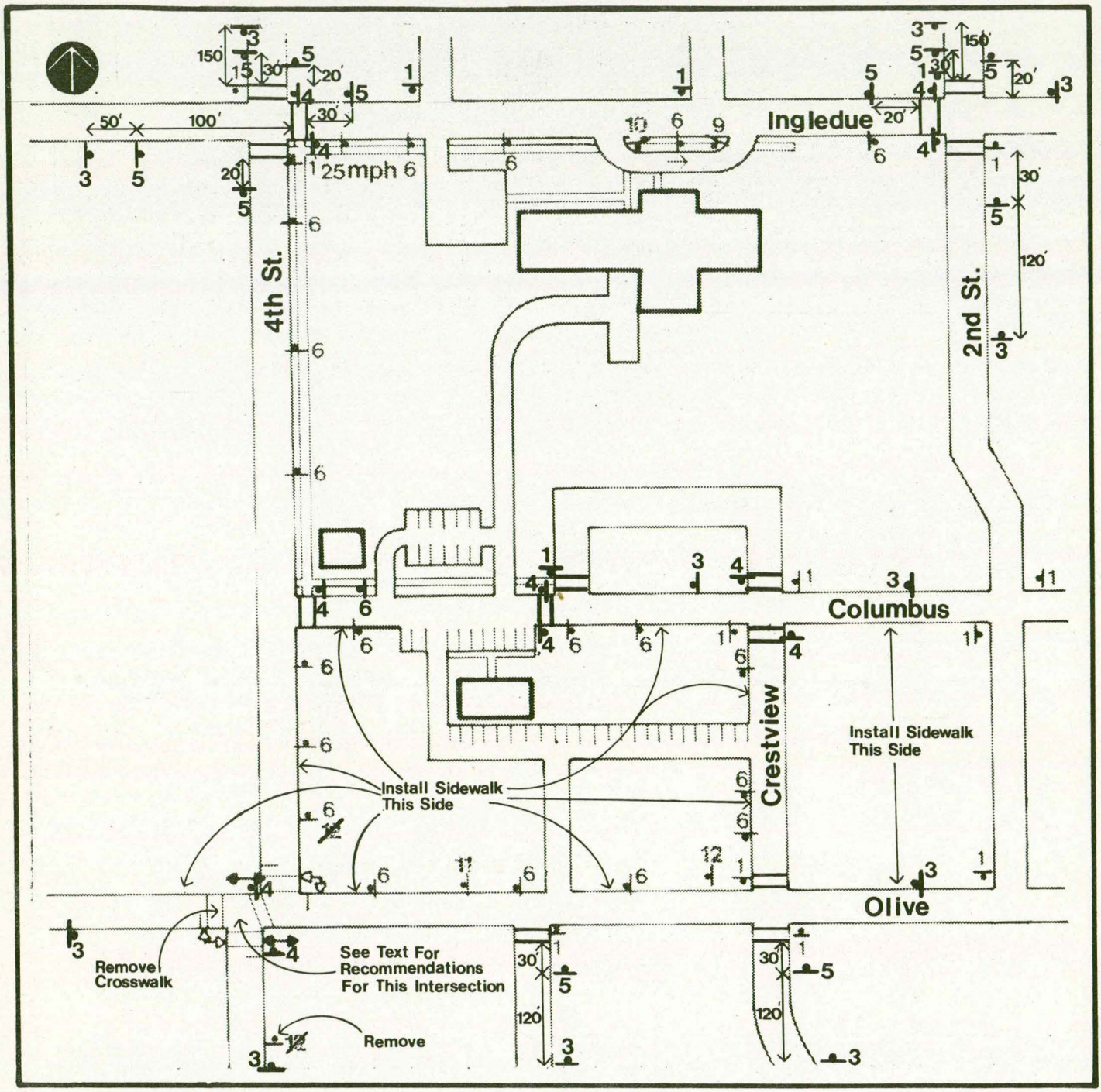
Figure 5-6 illustrates the current setting along with suggested improvements for this school locality. These suggestions are as follows:

a. The current signal installation at the intersection of 4th and Olive does not conform to the MUTCD. In compliance with these standards, the flashing red signals on 4th Street must be replaced with a full signal installation containing red, amber, and green faces. All four approaches must have WALK - DONT WALK indicators. Vehicle detection devices could be installed in the north and south approaches. However, recorded traffic volumes for this intersection were found to be insufficient to warrant signalization. If the present installation is not upgraded it should be replaced with STOP signs on 4th Street to indicate vehicular right-of-way along Olive Street.

b. All crosswalk changes indicated in Figure 5-6 should be implemented to define the safe route to school recommended by the Consultant. Proper signing should accompany each crosswalk addition as shown.

c. Additional sidewalks are needed in the immediate vicinity of the school.

If the traffic control signals at the intersection of 4th and Olive, are upgraded, the cost of the improvements shown in Figure 5-6, would total $22,150. If the present signals are removed and STOP signs installed as previously suggested, the cost of improvements would amount to $17,850. Both estimates include the cost of installing sidewalks on the school property adjacent to St. Henry's Elementary. The remaining sidewalk installations would be paid through an assessment to the adjoining property owners.



Lenihan Junior High & St. Henry's Elementary

figure 5-6

1 STOP	2 YIELD	3	4	5 NO PARKING HERE TO CORNER	6 NO PARKING ANY TIME
7 SCHOOL SPEED LIMIT 20	8 NO PARKING (MISC)	9 DO NOT ENTER	10 ONE WAY	11 SIGNAL AHEAD	12 SLOW SCHOOL
13 SCHOOL SLOW CROSSING	14	15	16	17	18

MARSHALLTOWN, IOWA

MILLER JUNIOR HIGH

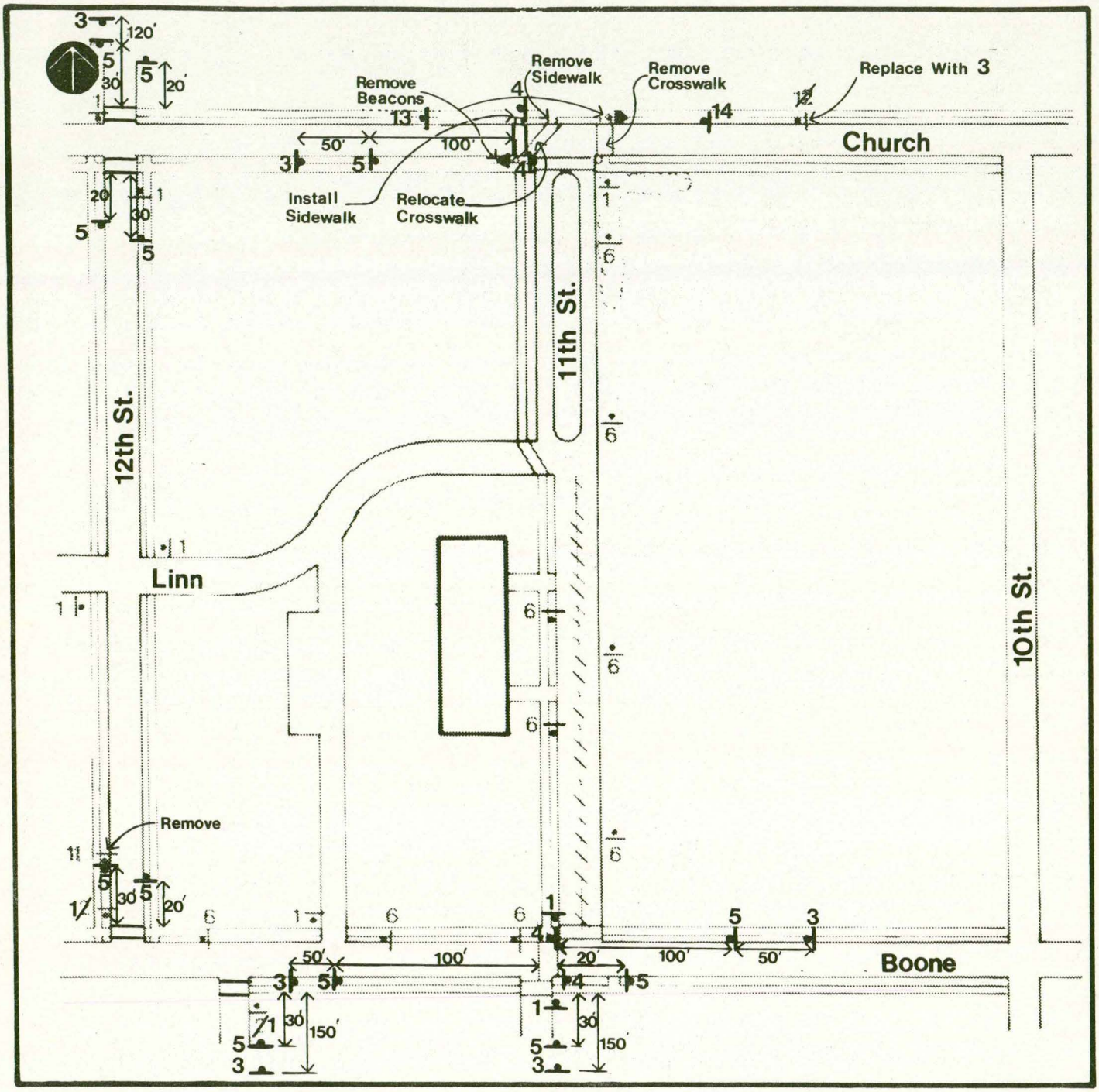
Figure 5-7 shows the existing conditions as well as the recommended improvements for this school facility. These recommendations are listed below.

a. At the intersection of 11th and Church Streets, the west crosswalk and adjacent sidewalk segment should be relocated.

b. Crosswalks should be added or removed as designated in Figure 5-7. All signing changes should be implemented as shown.

c. The flashing beacons at 11th and Church are non-conforming, and should be removed.

The estimated cost of the improvements shown in Figure 5-7 is $1,470.



Miller Junior High

1 STOP	2	3	4	5 NO PARKING HERE TO CORNER	6 NO PARKING ANY TIME
7 SCHOOL SPEED LIMIT 20	8 NO PARKING	9 DO NOT ENTER	10 ONE WAY	11 SLOW	12 SCHOOL STOP AHEAD
13 NO PARKING	14 NO PARKING	15	16	17	18

figure 5-7

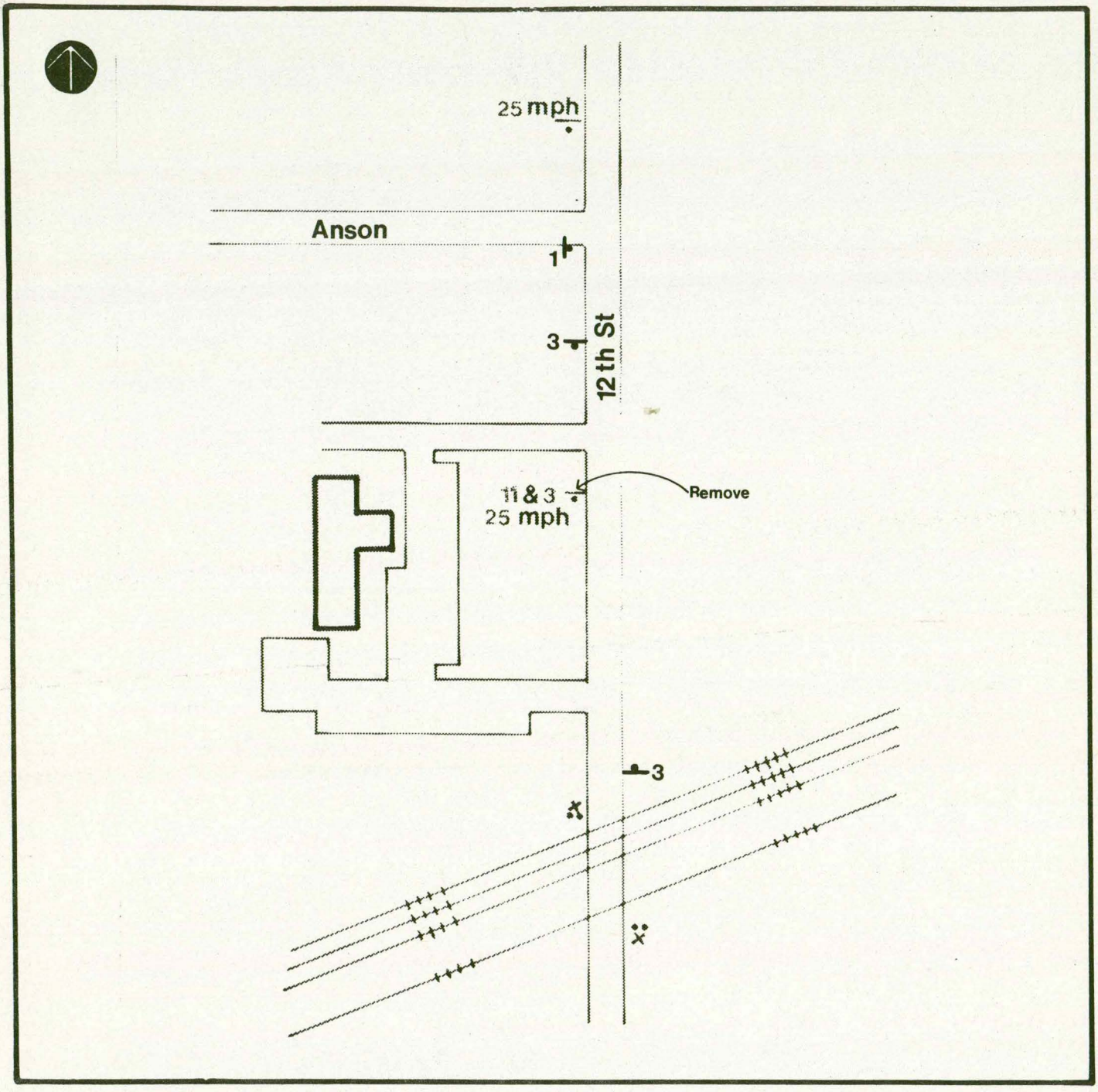
MARSHALLTOWN, IOWA

PLEASANT HILL DEVELOPMENT CENTER

Figure 5-8 shows the present setting and recommendations for this school as follows:

a. No crosswalks are needed for this locality since students are brought in by bus. However, SCHOOL ADVANCE (S1-1) signs should be placed on both sides of 6th Street, to alert motorists.

The estimated cost of the improvements shown in Figure 5-8 is $150.



Pleasant Hill Development Center

1 STOP	2 YIELD	3	4	5 NO PARKING HERE TO CORNER	6 NO PARKING ANY TIME
7 SCHOOL SPEED LIMIT 20	8 NO PARKING (MISC)	9 DO NOT ENTER	10 ONE WAY	11 SLOW CHILDREN AT PLAY	12
13	14	15	16	17	18

figure 5-8

MARSHALLTOWN, IOWA

FISHER ELEMENTARY

Figure 5-9 illustrates the current situation as well as suggested recommendations for this school. These recommendations are specified below:

a. The current signal installation at the intersection of 4th Avenue and Meadow does not conform to the MUTCD. In compliance with these standards, amber and green faces must be added to the signals on the north and south approaches. WALK - DONT WALK indications should be included on the east and west approaches. However, recorded traffic volumes for this intersection were found to be insufficient to warrant signalization. If the present installation is not upgraded, it should be removed, with STOP signs placed on 4th Avenue to indicate vehicular right-of-way along Meadow.

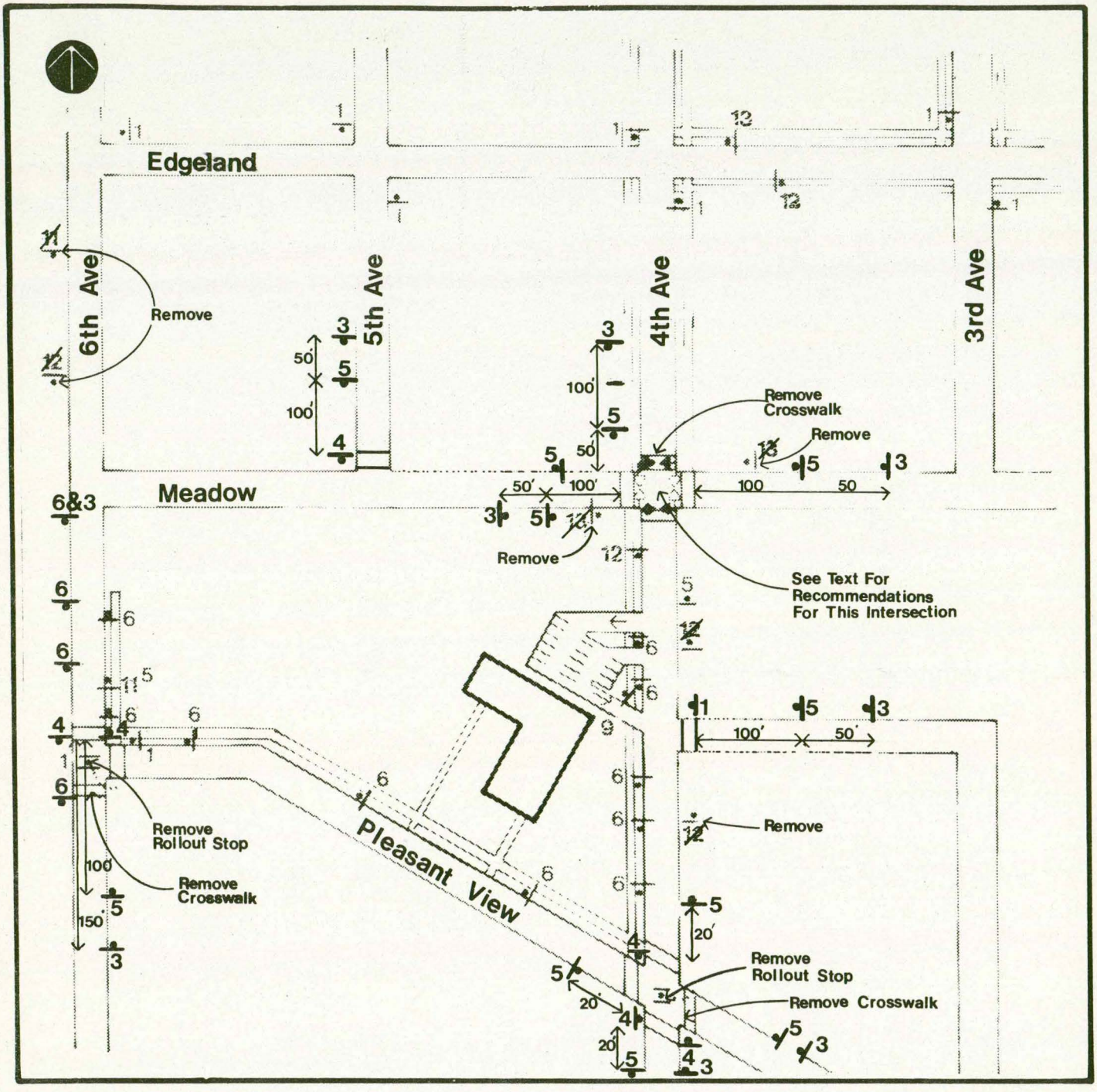
b. All unnecessary crosswalks and signs should be removed as designated in Figure 5-9.

c. No-parking zones should be established near crosswalks to increase visibility.

d. SCHOOL CROSSING (S2-1) and SCHOOL ADVANCE (S1-1) signs are to be installed as indicated in Figure 5-9.

e. At the intersection of 6th Avenue and Pleasant View, the school is using a portable STOP sign. The usage of this sign should be discontinued.

If the City chooses to upgrade the traffic control signals at the intersection of 4th Avenue and Meadow, the cost of the improvements shown in Figure 5-9 would total $ 1,025. If removal of the existing signals is selected, along with the installation of STOP signs, the cost of improvements would amount to $1,385.



Fisher Elementary

1 STOP	2 YIELD	3	4	5 NO PARKING HERE TO CORNER	6 NO PARKING ANY TIME
7 SCHOOL SPEED LIMIT 20	8 NO PARKING (MISC.)	9 DO NOT ENTER	10 ONE WAY	11 SCHOOL SLOW CROSSING	12 SLOW SCHOOL
13 SCHOOL CROSSING	14	15	16	17	18

figure 5-9

MARSHALLTOWN, IOWA

FRANKLIN ELEMENTARY

Figure 5-10 shows the present setting for this school as well as recommendations for improvement. These suggestions are as follows:

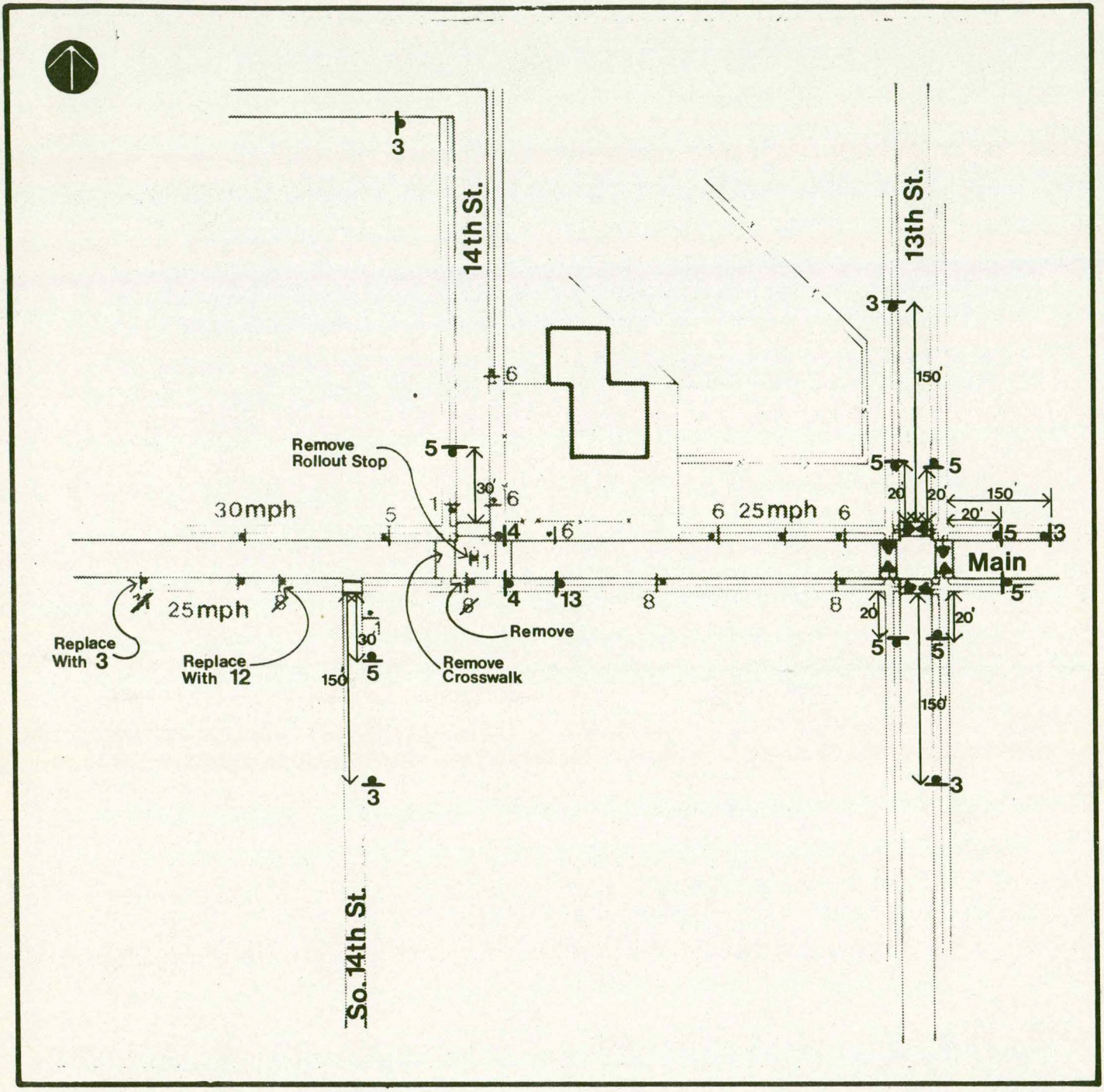
a. At the intersection of North 14th Street and Main Street, the west crosswalk is unnecessary and should be removed.

b. A new crosswalk should be added on South 14th Street at the Main Street intersection. This will serve to identify the suggested safe route to school.

c. Proper signing procedures should be followed near each crosswalk, as shown in Figure 5-10.

d. A portable STOP sign is being used at the intersection of North 14th Street and Main Street. The usage of this sign should be discontinued.

The estimated cost of the improvements shown in Figure 5-10 is $765.



Franklin Elementary

1 STOP	2 YIELD	3	4	5 NO PARKING HERE TO CORNER	6 NO PARKING ANY TIME
7 SPEED 20	8 NO PARKING (MISC)	9 DO NOT ENTER	10 ONE WAY	11 SCHOOL	12 NO PARKING
13 NO PARKING	14	15	16	17	18

figure 5-10

MARSHALLTOWN, IOWA

GLICK ELEMENTARY

Figure 5-11 shows the existing conditions and the recommended improvements for this facility. These recommendations are listed below:

a. At the intersection of Linn and 3rd Street, the west crosswalk is unnecessary and should be removed.

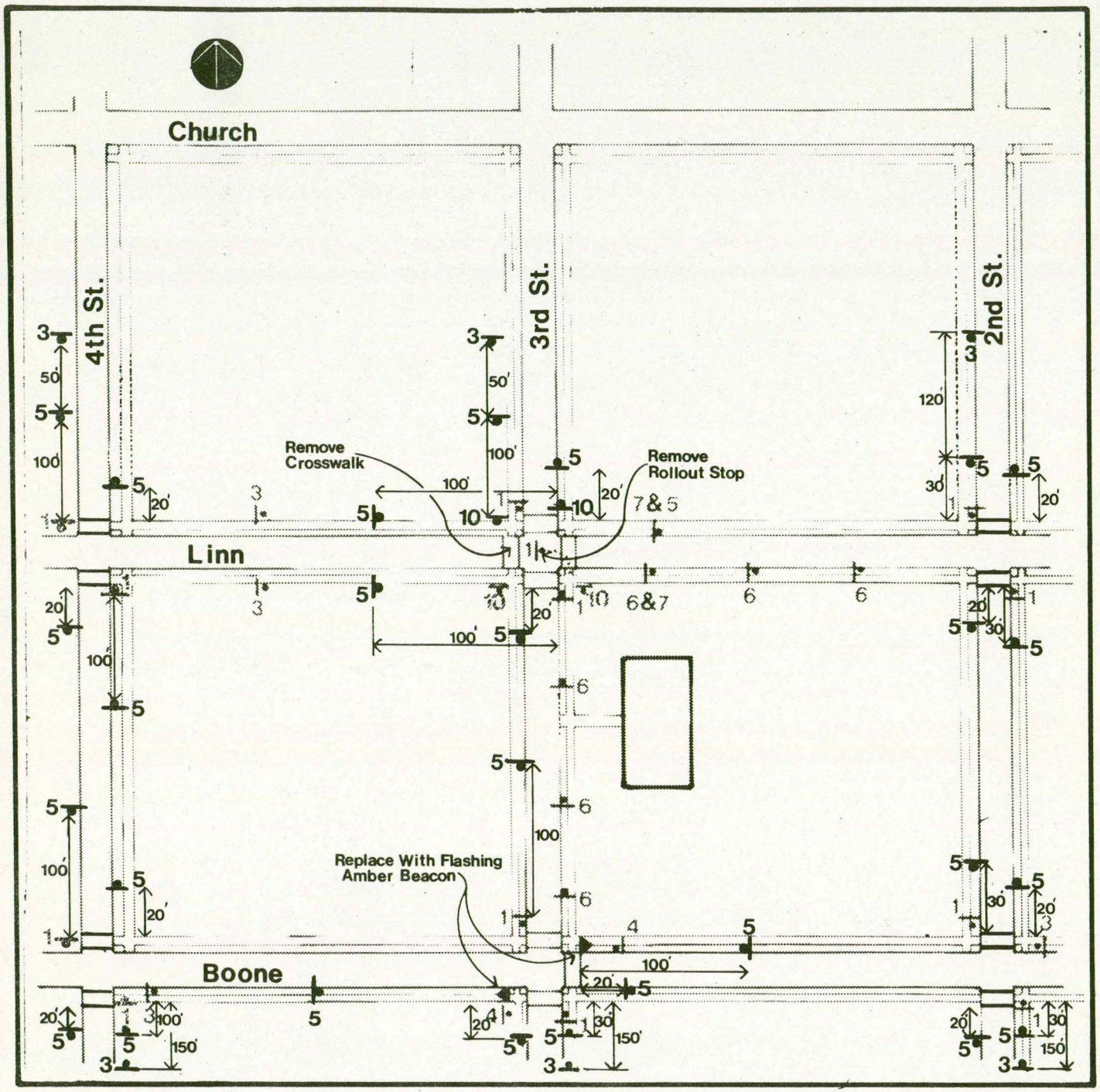
b. Crosswalks are to be added along Boone and Linn Streets as designated in Figure 5-11. Both streets are recommended as safe routes to school.

c. All crosswalks are to be signed as shown in Figure 5-11.

d. The school beacon presently in operation at the intersection of Boone and 3rd Streets is non-conforming and should be replaced with a flashing amber beacon.

e. At the intersection of Linn and 3rd Streets, the school is using a portable STOP sign in conjunction with the crosswalks. The usage of this portable STOP sign should be discontinued.

The estimated cost of the improvements shown in Figure 5-11 is $1,900.



Glick Elementary

1 STOP	2	3	4	5 NO PARKING HERE TO CORNER	6 NO PARKING ANY TIME
7 SCHOOL SPEED 20	8 NO PARKING MISC	9 DO NOT ENTER	10 ONE WAY	11	12
13	14	15	16	17	18

figure 5-11

MARSHALLTOWN, IOWA

HANSEN ELEMENTARY

Figure 5-12 illustrates the present situation along with suggested improvements for this school. These improvements are specified below:

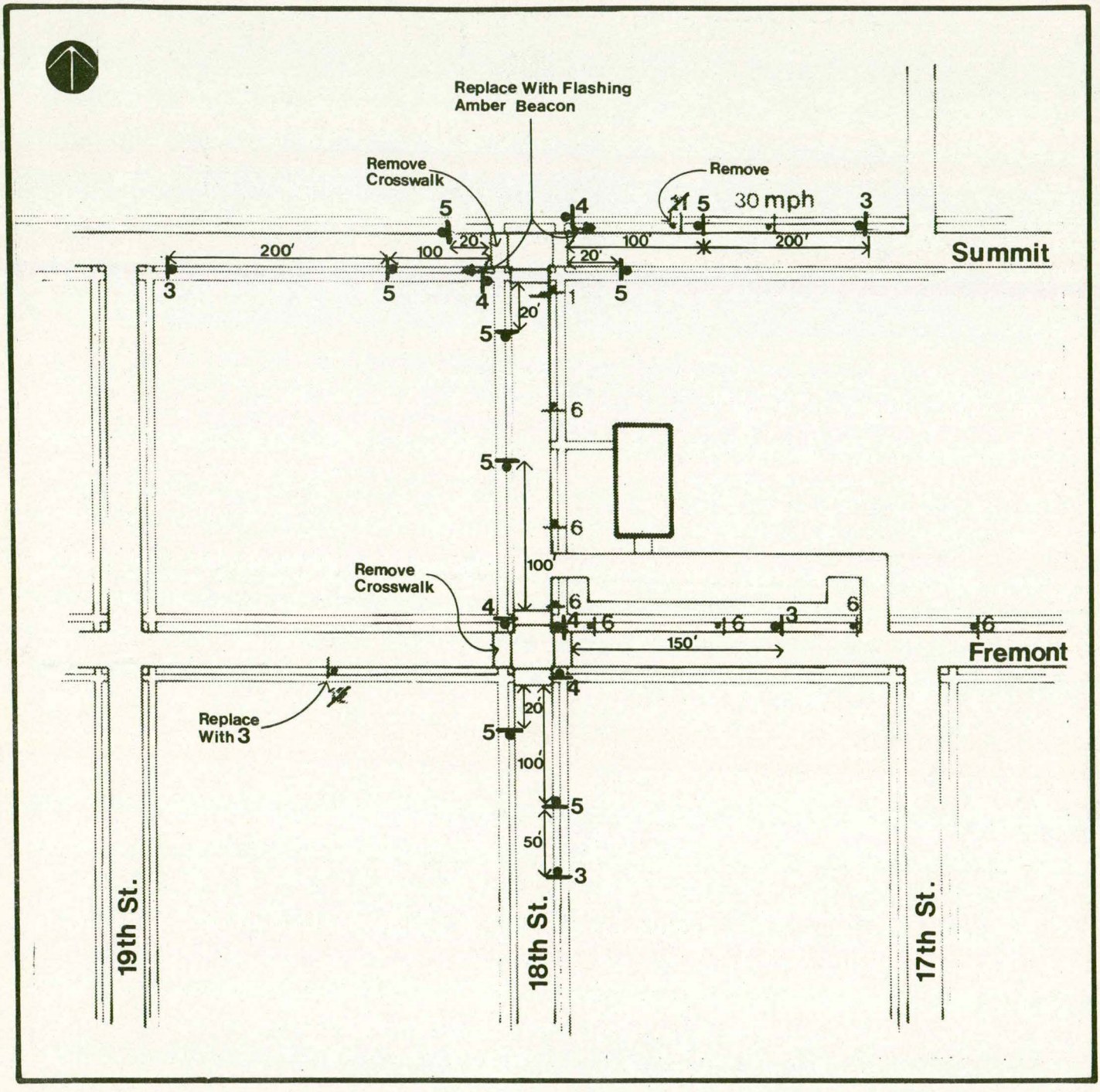
a. The crosswalks designated for removal are unnecessary and should be allowed to weather away.

b. No-parking areas near crosswalks should be established to improve visibility. Proper signing indicating school crossings is required as shown in Figure 5-12.

c. The school beacon presently in operation at the intersection of Summit and 18th Street should be replaced with a flashing amber beacon. Summit is an arterial and must be regulated in accordance with the MUTCD to provide a safe route to school.

d. The City is encouraged to remove or replace the non-conforming signs indicated in Figure 5-12.

The estimated cost of the improvements shown in Figure 5-12 is $1,040.



Hansen Elementary

1 STOP	2	3	4	5 NO PARKING	6 NO PARKING ANY TIME
7 SCHOOL SPEED 20	8 NO PARKING MICE	9 DO NOT ENTER	10 ONE WAY	11 SLOW	12 SCHOOL
13	14	15	16	17	18

figure 5 - 12

MARSHALLTOWN, IOWA

HOGLAN ELEMENTARY

Figure 5-13 shows the current setting for this school as well as the recommended improvements. These recommendations are as follows:

a. It is recommended that a new crosswalk be added on 3rd Avenue at the school drive exit, due to its proximity to the school.

b. All crosswalks should be properly signed as designated in Figure 5-13.

c. Two crosswalks should be added at the intersection of Southridge and 3rd Avenue, along with another crossing Sugar Creek Lane.

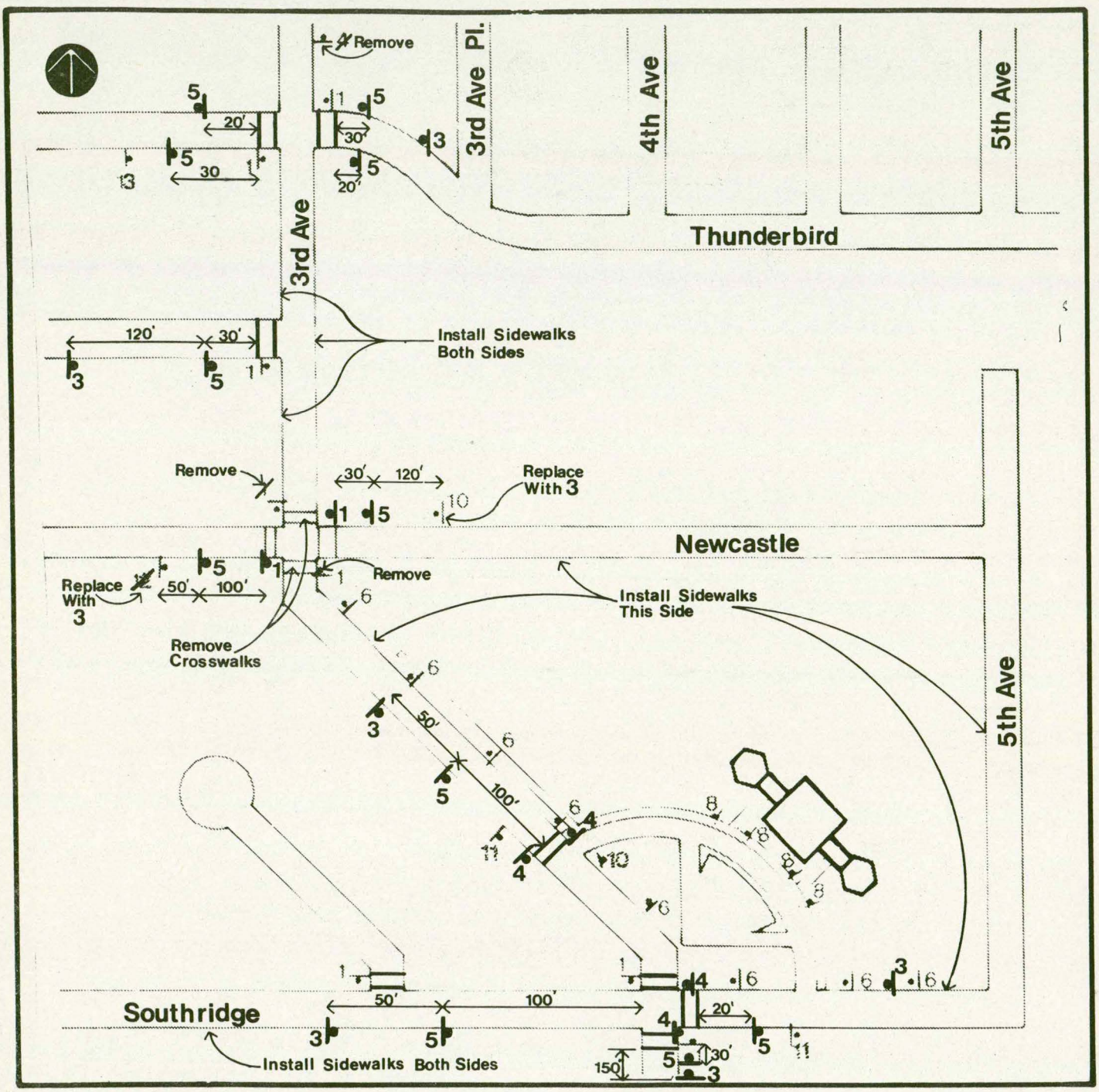
d. Crosswalks should be added along 3rd Avenue as shown in Figure 5-13. This will serve to establish 3rd Avenue as a safe route to school.

e. In conjunction with the removal of two crosswalks at the intersection of Newcastle and 3rd Avenue, the STOP signs on 3rd Avenue at this location should also be removed.

f. The installation of sidewalks on both sides of 3rd Avenue is necessary.

g. Sidewalks are recommended for Newcastle, Southridge, and 5th Avenue at the locations shown in Figure 5-13.

The estimated cost of the improvements shown in Figure 5-13 is $985. This value assumes that the sidewalks would be paid through an assessement to the adjacent property owners.



Hoglan Elementary

figure 5-13

1 STOP	2	3	4	5 NO PARKING HERE TO CORNER	6 NO PARKING ANY TIME
7 SCHOOL SPEED 20	8 NO PARKING (MISC)	9 DO NOT ENTER	10 ONE WAY	11	12 SCHOOL SLOW AHEAD
13 PED XING	14	15	16	17	18

MARSHALLTOWN, IOWA

NORRIS ELEMENTARY

Figure 5-14 shows the existing conditions as well as the suggested improvements for this school facility. These suggestions are as follows:

a. The crosswalk located on 17th Avenue at the Boone Street intersection should be removed.

b. SCHOOL CROSSING signs should be placed at each crosswalk.

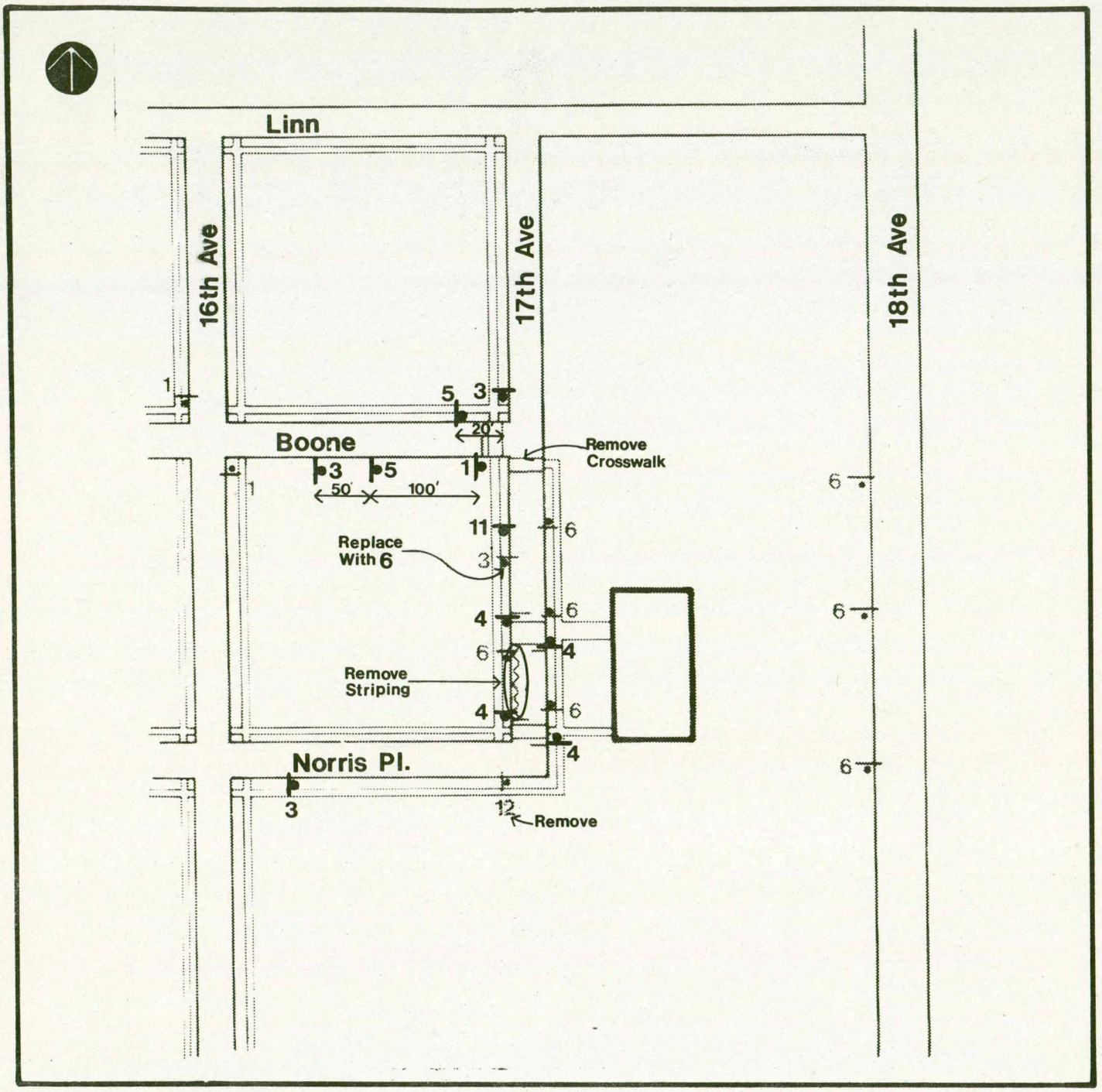
c. ADVANCE SCHOOL CROSSING signs should be placed on Boone and Norris Streets at the locations shown in Figure 5-14.

d. The ADVANCE SCHOOL CROSSING sign on the west side of 17th Avenue should be relocated just north of Boone Street on 17th Avenue to provide an early warning to motorists.

e. No-parking zones should be established near crosswalks to increase visibility.

f. The pavement striping in front of the school is unnecessary and should be removed.

The estimated cost of the improvements shown in Figure 5-14 is $500.



Norris Elementary

1 STOP	2	3	4	5 NO PARKING HERE TO CORNER	6 NO PARKING ANY TIME
7 SCHOOL SPEED LIMIT 20 WHEN FLASHING	8 NO PARKING (MISC.)	9 DO NOT ENTER	10 ONE WAY	11 NO PARKING	12 SLOW SCHOOL
13	14	15	16	17	18

figure 5 -14

MARSHALLTOWN, IOWA

PALMER ELEMENTARY

Figure 5-15 illustrates the present setting along with recommended improvements for this school locality. These improvements are specified below:

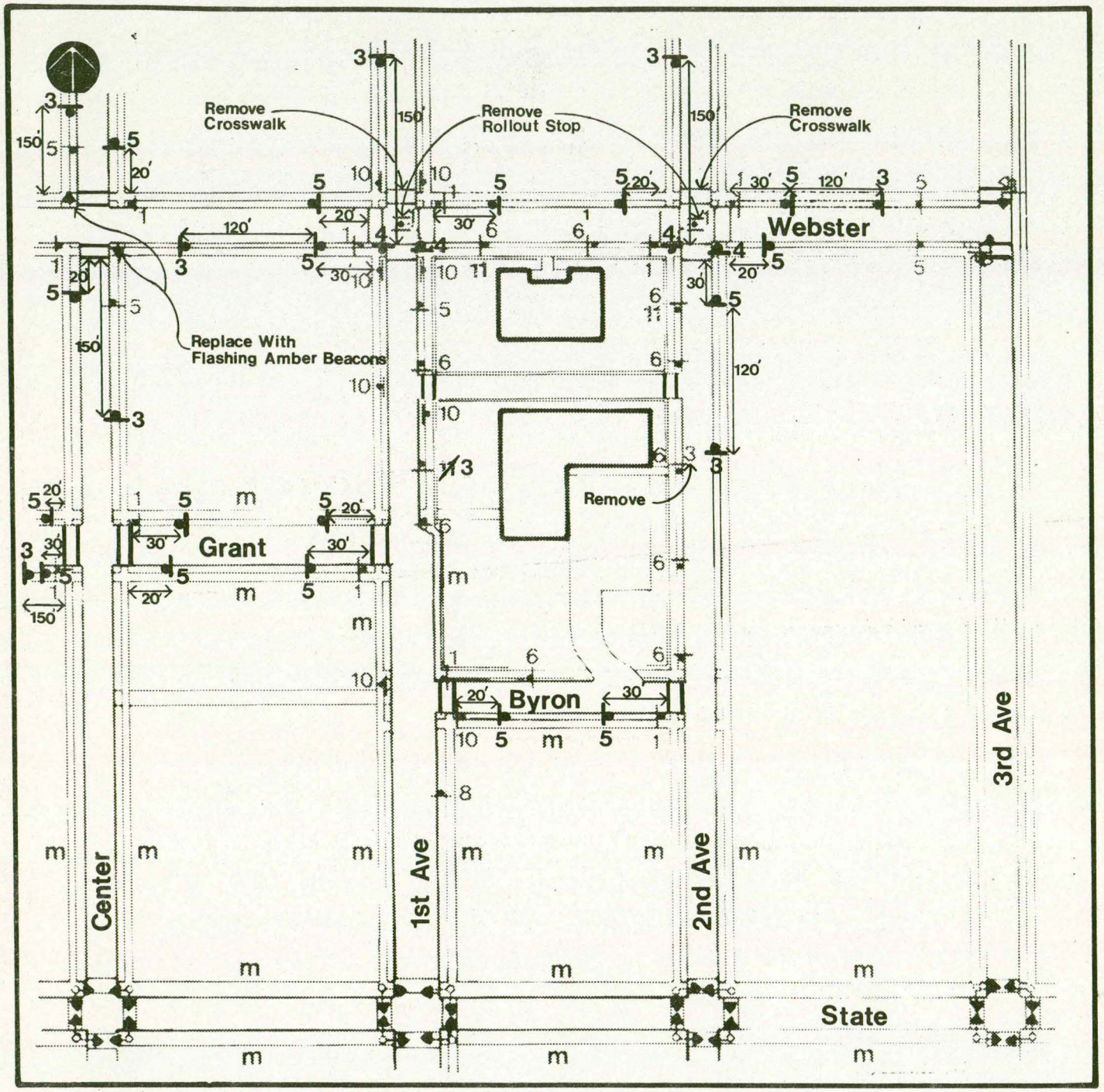
a. Crosswalks should be added or removed where designated in Figure 5-15, in order to provide the recommended safe route to school.

b. Proper signing procedures should be followed at every crosswalk to alert motorists and increase visibility at intersections.

c. Portable STOP signs are currently utilized on Webster Street at the 1st and 2nd Avenue intersections. The usage of these signs should be discontinued.

d. The school beacon presently in operation at the intersection of Center and Webster should be replaced with a flashing amber beacon.

The estimated cost of the improvements shown in Figure 5-15 is $1,570.



Palmer Elementary

1 STOP	2 YIELD	3	4	5 NO PARKING HERE TO CORNER	6 NO PARKING ANY TIME
7 SCHOOL SPEED LIMIT 20	8 NO PARKING (MISC)	9 DO NOT ENTER	10 ONE WAY	11 SLOW SCHOOL	12
13	14	15	16	17	18

figure 5-15

MARSHALLTOWN, IOWA

ROGERS ELEMENTARY

Figure 5-16 presents the current situation as well as suggested improvements for this school. These recommendations are listed below:

a. Crosswalks should be added along State Street as shown in Figure 5-16.

b. At the intersection of 5th Street and State Street, the west crosswalk is unnecessary and should be removed.

c. No-parking zones should be established near crosswalks to improve visibility.

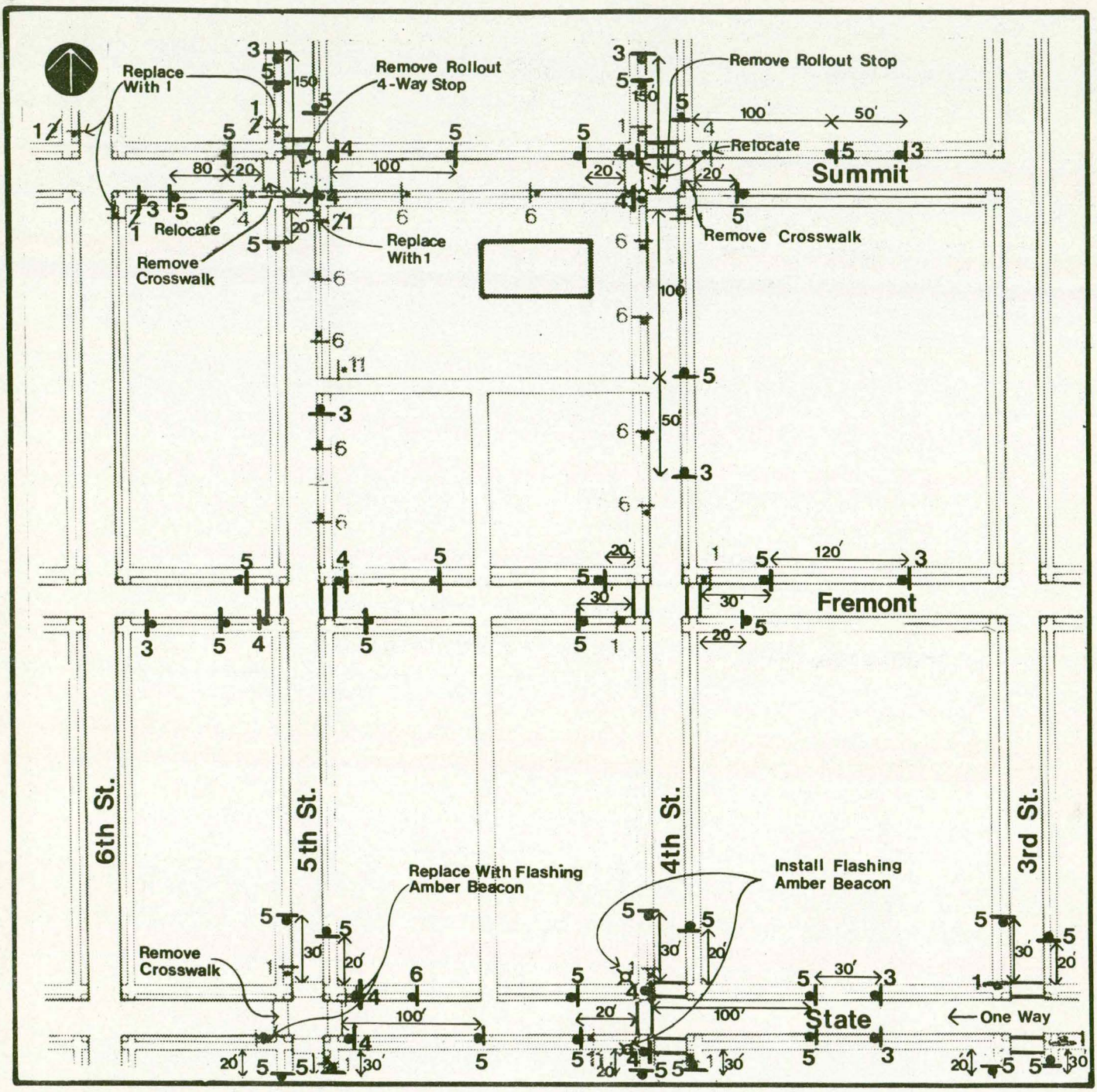
d. The school beacon currently operating at the intersection of 5th and State Streets is non-conforming and should be replaced with a flashing amber beacon.

e. Flashing amber school beacons should be installed on State Street at the 4th Street intersection. State Street is a municipal arterial which requires this additional warning at the pedestrian crossing.

f. Presently, the school is using portable STOP signs on Summit at the 4th and 5th Street intersections. The usage of these signs should be discontinued.

g. To establish vehicular right-of-way, STOP signs should be installed on 4th Street and 5th Street at their Summit Street intersections.

The estimated cost of the improvements shown in Figure 5-16 is $3,995.



Rogers Elementary

1 STOP	2	3	4	5 NO PARKING HERE TO CORNER	6 NO PARKING ANY TIME
7 SCHOOL SPEED 20	8 NO PARKING (MISC.)	9 DO NOT ENTER	10 ONE WAY	11 SLOW	12 NO PARKING
13	14	15	16	17	18

figure 5-16

MARSHALLTOWN, IOWA

WILLIAMS ELEMENTARY

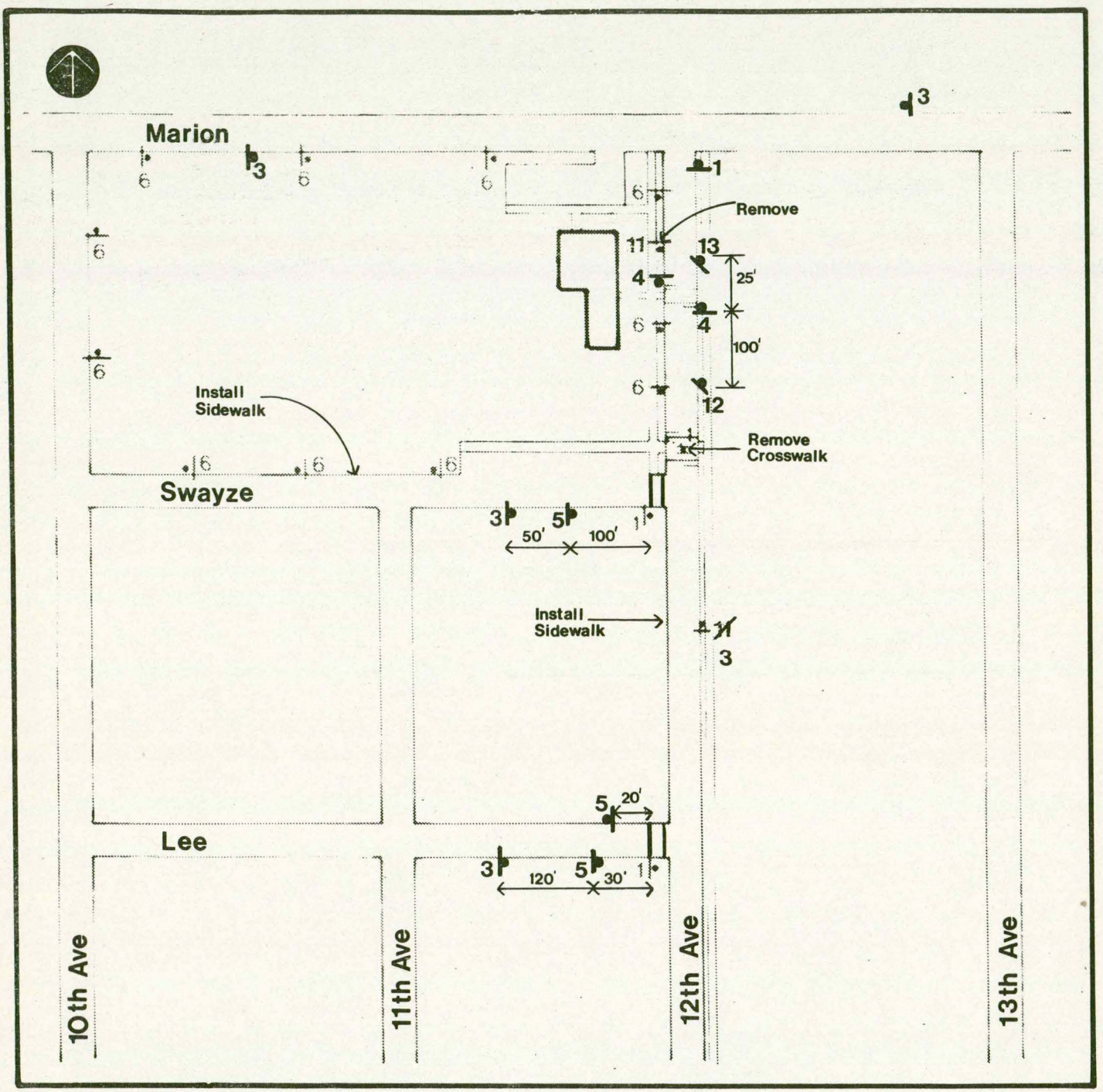
Figure 5-17 illustrates the present situation along with recommended improvements for this school as follows:

a. Signing improvements should be implemented at the crosswalk immediately in front of the school, as shown in Figure 5-17.

b. The City should add crosswalks with proper signing on Lee and Swayze Streets to identify the safe route to school along 12th Avenue.

c. Sidewalks are necessary along 12th Avenue and Swayze Street as shown in Figure 5-17.

The estimated cost of the improvements shown in Figure 5-17 is $3,270. This value includes the installation of a sidewalk on school property bordered by Swayze Street.



Williams Elementary

1 STOP	2 YIELD	3	4	5 NO PARKING HERE TO CORNER	6 NO PARKING ANY TIME
7 SCHOOL SPEED LIMIT 20	8 NO PARKING (MISC)	9 DO NOT ENTER	10 ONE WAY	11 SCHOOL SLOW CROSSING	12 NO PARKING
13 NO PARKING	14	15	16	17	18

figure 5-17

MARSHALLTOWN, IOWA

WOODBURY ELEMENTARY

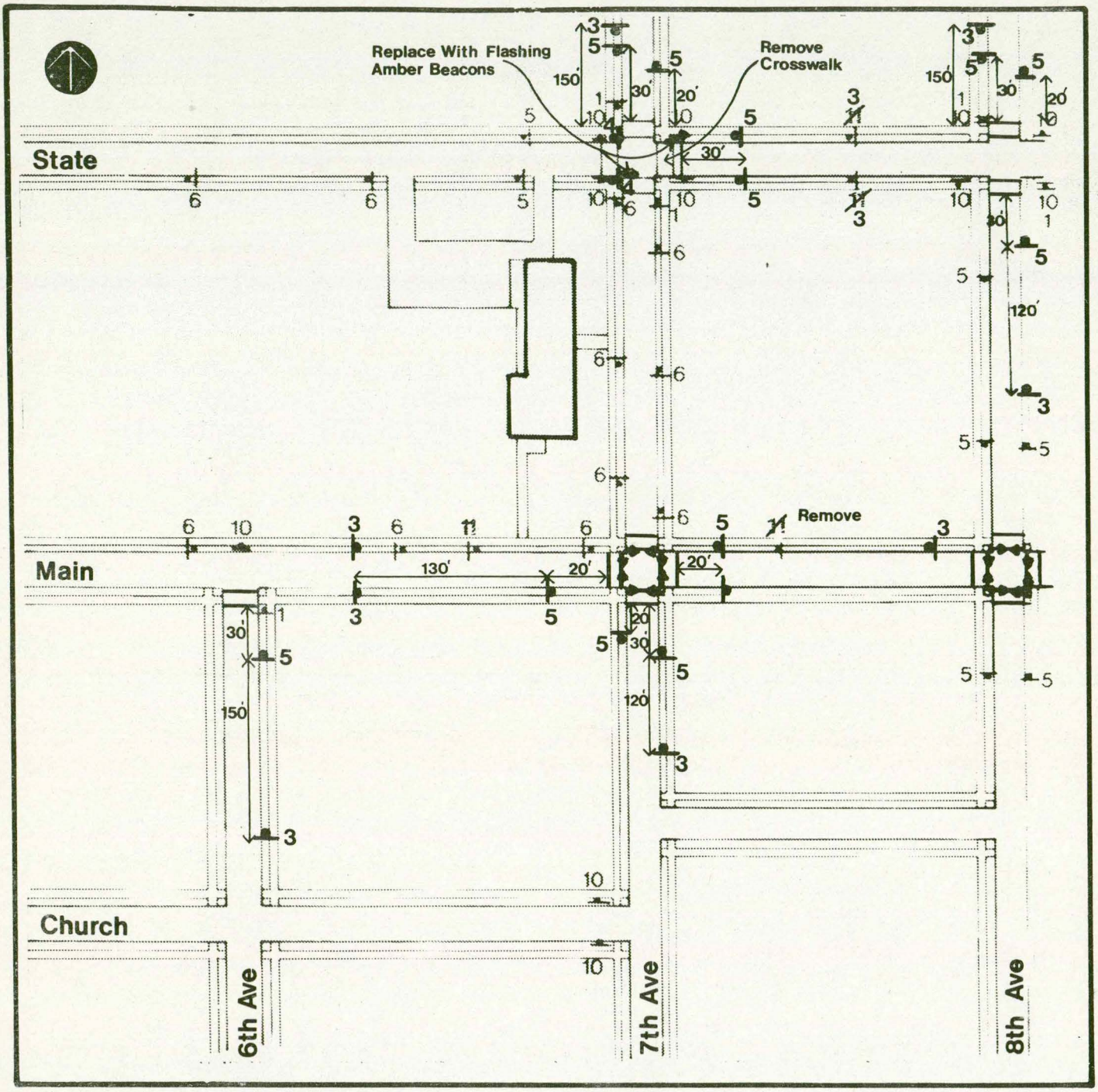
Figure 5-18 shows the current setting for this school facility as well as suggested improvements. These suggestions are specified below:

a. The crosswalk located on the east side of the intersection of 7th Avenue and State Street is unnecessary and should be removed.

b. Crosswalks should be added and signing improvements implemented where shown on Figure 5-18.

c. The school beacon on State Street at 7th Avenue is nonconforming to the MUTCD and should be replaced with flashing amber beacons.

The estimated cost of the improvements shown in Figure 5-18 is $1,200.



Woodbury Elementary

1 STOP	2	3	4	5 NO PARKING HERE TO CORNER	6 NO PARKING ANY TIME
7 SCHOOL SPEED LIMIT 20	8 NO PARKING (MISC)	9 DO NOT ENTER	10 ONE WAY	11 SCHOOL STOP AHEAD	12
13	14	15	16	17	18

figure 5-18

MARSHALLTOWN, IOWA

ST. MARY'S ELEMENTARY

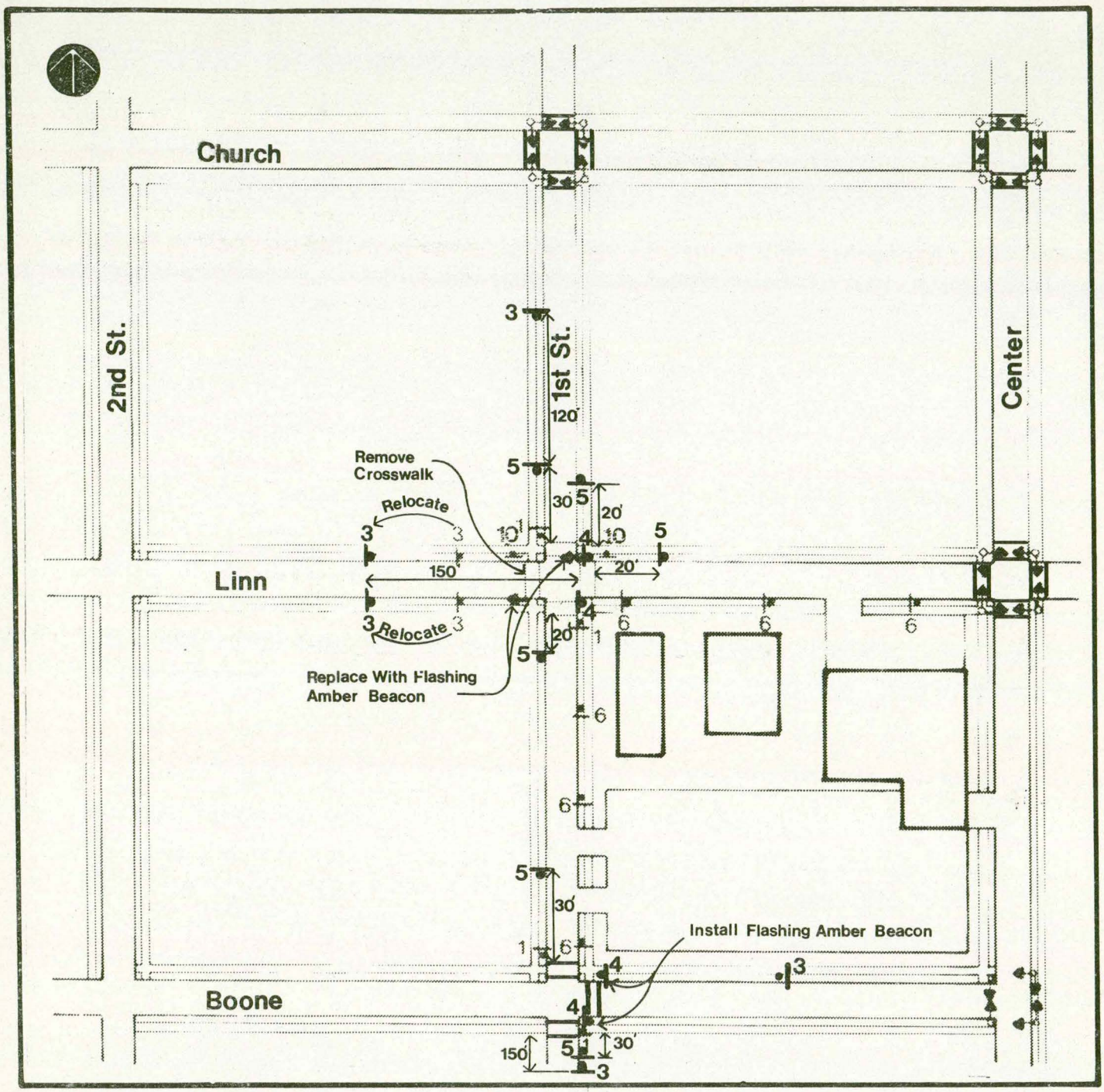
Figure 5-19 shows the existing setting as well as recommended improvements for this school. These recommendations are as follows:

a. Crosswalks should be removed or added as indicated in Figure 5-19.

b. In conjunction with existing and new crosswalks, the installation of SCHOOL ADVANCE (S1-1) and SCHOOL CROSSING (S2-1) signs should be required. No-parking zones will be established in these areas to increase visibility.

c. The school beacon presently in operation at the intersection of 1st and Linn Streets is nonconforming and should be replaced with a flashing amber beacon.

The estimated cost of the improvements shown in Figure 5-19 is $2,050.



St. Mary's Elementary

figure 5-19

1 STOP	2 YIELD	3	4	5 NO PARKING HERE TO CORNER	6 NO PARKING ANY TIME
7 SCHOOL SPEED LIMIT 20	8 NO PARKING MISC.	9 DO NOT ENTER	10 ONE WAY	11	12
13	14	15	16	17	18

MARSHALLTOWN, IOWA

SAFE ROUTE TO SCHOOL

Presently, students are given informal instructions within their classrooms as to the proper means of crossing streets. Emphasis is also given by the teachers and the school administration for students to use the school crossing signals at the various locations in the City when attending school. Additional instruction is provided for a student by incorporating instruction on safety into the course work actually being taught in the classroom. It is hoped that the direct and indirect coverage of safety will be applied by the students as they attend school.

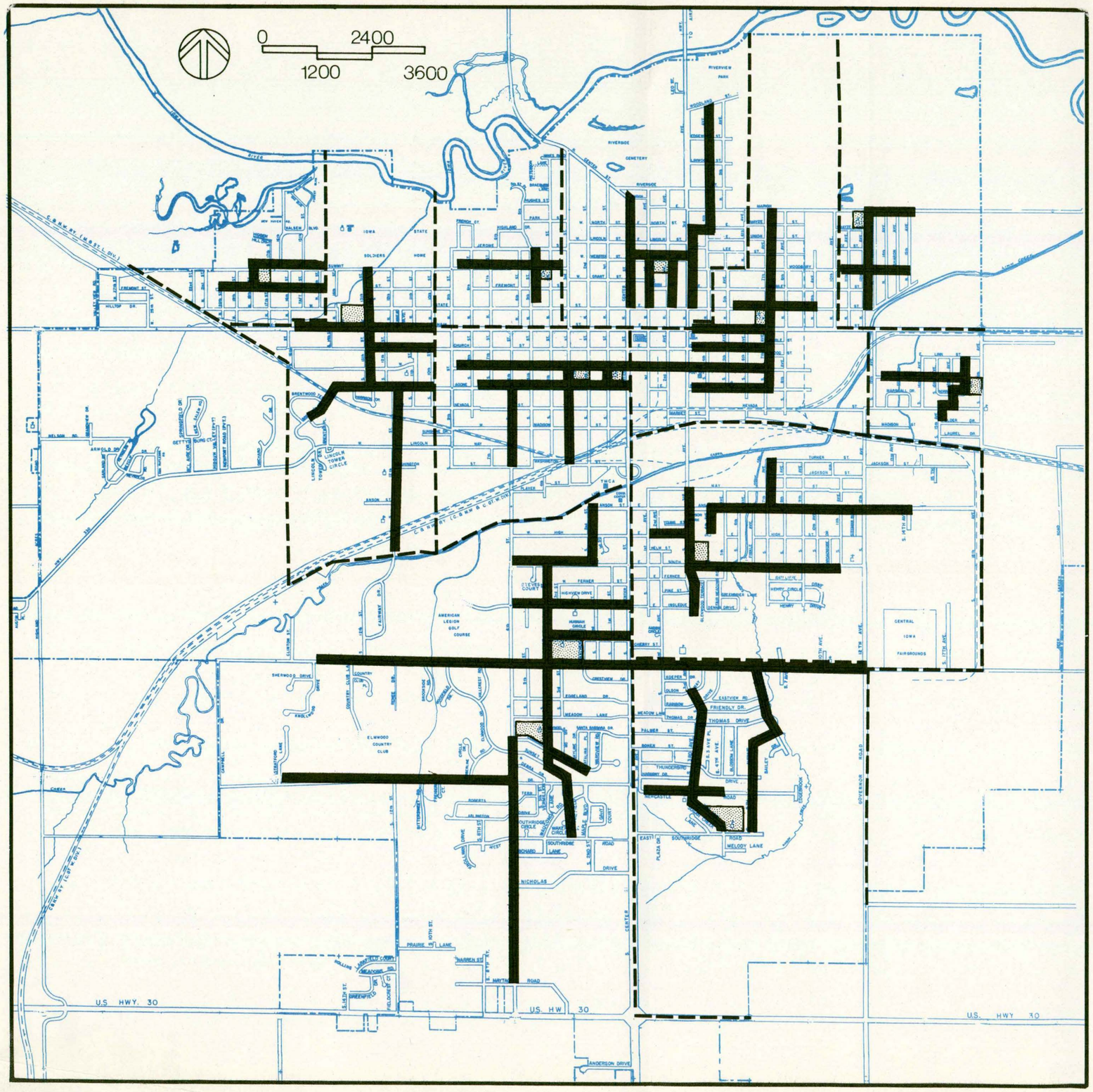
The Consultant did not find that efforts had been made by any schools, particularly the elementary schools, in identifying a safe route to school plan.

In an effort to provide the local schools with guidelines on a safe route to school program, the Consultant has compiled the following discussions. This discussion centers around the elementary schools and the junior high school in Marshalltown.

Figure 5-20 shows the suggested major school routes leading to each of the school sites from the various quandrants within the school attendance district. These major school routes will serve as a guide for the students walking to the school facilities.

It is suggested that the principal and parent groups at each school further refine the suggested measure of routes to school shown in Figure 5-20. Such refinement would include the development of a map handout showing the major safe routes to school. Such a handout would then be used as part of the regular continuing education program to train the students to follow the safest routes to school.

An additional use of the safe route to school plan would be the identification of areas which require new sidewalks or replacement of existing sidewalks. The school route plan will also serve to identify those areas where additional traffic control planning or devices are required to further promote school pedestrian safety. Additional discussions are contained elsewhere in this chapter regarding sidewalks and the traffic control devices required to enhance the major safe routes to schools identified in Figure 5-20.



Safe Route To School

figure 5-20

legend

Schools

Public School Attendance Boundaries

Pedestrian Collector Routes

MARSHALLTOWN, IOWA

A major point which the Consultant wishes to make is that the Consultant can only identify the major criteria or guidelines centering around a safe route to school plan. For such a plan to be successful, school officials, parents, and students must take an active part in developing the best safe route to school plan for their school. Such participation will promote the development of a sound school plan and provide better assurances that it will be followed by the students.

In closing, the following special comment is interesting in regards to school safety. It points out that engineering alone will not totally handle school safety. The best safety protection is a safe route to school and a thorough education of our children so they, as individuals, can make the proper decisions on their own safety.

SCHOOL CROSSINGS: A COMMENT

(The following article by Jan Bierman was submitted as a Letter to the Editor and appeared in the Des Moines Register and Tribune, October, 1974.)

There is no such thing as a "safe route", where the combination of motor vehicles and children occurs. Some day, by some fantastic stroke of luck, people are going to realize this and work toward educating children and drivers in this direction. A child must learn to cross the street independently -- with a healthy respect for vehicles -- without dependency upon Adult Crossing Guards or "Safety Bugs", which are available only at school times. A driver must learn to SEE what is around him and to watch especially for children whose traffic judgment is still developing.

Parents need to spend time teaching traffic values in the home, and demonstrating these values in a positive way on the streets as they come into contact with traffic. Licensing requirements and education of drivers need to be more thorough, with emphasis on children at ALL times, not just near schools or on school routes.

Individual priorities need to be reassigned, so if any mother feels her child is in danger at a crossing, she will be with that child showing him what he needs to watch for -- for the other times and other crossings he may need to make when she is not there. A Crossing Guard has no more control over traffic than a parent has and provides the type of assistance that fosters acceptance of protection in place of independent learning.

It is unrealistic to interpret "safe route" in a literal sense. It was not intended to be understood in that way, and was a poor choice of words by trusting-type officials who felt most people were of reasonable intelligence.

Separation of children and traffic is the only sure way to avoid tragedies. The next best way is to equip our kids on a round-the-clock basis through education of both children and drivers, along with acceptance of responsibility by those who really have the most to gain.

We can educate and accomplish some long term benefits. Or we can assign more Crossing Guards during school times and leave kids to their own resources after 3:45 each school day; and ALL DAY each day throughout week-ends and summer vacations -- which is what we're doing now to "protect our children".

It is not enough. And we need to decide if safety at school times is all we really care about.

SIDEWALKS

Adequate sidewalks are essential in providing pedestrian safety and are particularly important in establishing safe school routes. The suggested safe routes to school as shown in Figure 5-20 indicate where sidewalks are necessary.

Field observations have indicated that north of the Chicago and Northwestern Railroad tracks, sufficient sidewalk facilities do exist at most locations. However, south of these tracks there are few if any areas with adequate sidewalks.

Pedestrian safety is virtually non-existent if children must walk in the street to attend school. A lack of sidewalks serves to nullify the safety efforts on the part of school officials and traffic officers.

Overall, the Consultant recommends that the City begin a program of sidewalk construction. The ultimate goal of this effort should be sidewalks on both sides of all residential streets.

Such a program could be expedited by employing three phases. Phase I should provide sidewalks on both sides of streets within a four-block radius of all schools, and on both sides of all major streets (arterials and collectors, as defined in Figure 2-2). Phase II should strive to provide sidewalks on one side of all minor streets. Phase III would complete the program with sidewalks on both sides of all minor streets.

By utilizing special assessments and spreading payment over a ten-year period, the cost of sidewalks to the average property owner should not exceed $ 50 per year.

Sidewalk ramps for the handicapped should be provided at intersections on all new installations. Ramps should be constructed at all downtown intersections not so equipped and in all areas with high concentrations of senior citizens. The APPENDIX illustrates a typical sidewalk ramp design for the handicapped.

6

Chapter 6
TRAFFIC REGULATIONS & SAFETY PROGRAMS

A number of recommendations which do not fall in the realm of physical improvements can be made regarding administration and enforcement. Some items included in this chapter have been discussed in previous chapters.

TRAFFIC CODE AND ORDINANCES

Sidewalks

The lack of adequate sidewalks in some portions of the City is considered the greatest threat to pedestrian safety in Marshalltown. Discussions of safe routes to school or school crossing protection devices are meaningless if the children are required to walk in the streets. In the past, the City has been fortunate in having a low pedestrian accident record. However, it is only a matter of time before traffic volumes increase, intersection visibility deteriorates with the growth of trees and vegetation and Marshalltown's safe record is ended.

A sidewalk construction program is strongly recommended. Special emphasis should be given to school areas, safe route to school paths and major traffic carrying streets. The final goal should provide for sidewalks on both sides of all streets.

Laws requiring the construction of sidewalks with all new construction should not be waived.

Sidewalk ramps for the handicapped should be required on all new sidewalk construction both commercial and residential.

Four-Way Stops

The installation of four-way stops should be undertaken with care. Installations should be made in accordance with the Warrants outlined in the MUTCD and only in conjunction with a detailed engineering study.

Multi-way stop identifier plates (MUTCD R1-3) should be utilized at all multi-way stops.

Sight Distance

In the course of this study, numerous locations having marginal sight distance because of low vegetation and trees growing in the parking were observed. These locations were most frequently found in the northwest section of the City with occasional problems in the northeast quarter. Although specific problems were identified in Chapter 4, it is apparent that a periodic inspection and clean-up is required.

On a yearly basis, preferably in late spring, the Public Works Department should make an inspection of the entire city. Locations with sight distance problems and locations where traffic control equipment is obscured by vegetation should be identified and corrective measures taken.

Enforcement

Analysis of the 23 high-accident locations of this study indicated that excessive speeds may be a factor at a number of locations. (No speed studies were performed as a part of this study.) As noted in Chapter 4, speed studies should be performed and the proper speed established by engineering analysis. When posted, these speeds should be strictly enforced.

The only effective means of reducing vehicular speeds is through strict enforcement.

PARKING POLICY

In general, parking enforcement was found to be very good. However, the current fine ($1.00 or $.50 if paid the same day) is believed to be low. The Consultant recommends that the overtime parking fine be increased to $2.00 or $1.00 if paid the same day.

Double parking, particularly with respect to delivery trucks, was observed to be a substantial problem in Marshalltown. Loading zones should be established on each block face. These zones shall be strictly patrolled to allow only the loading and unloading of trucks. Double parking should then be eliminated through strict enforcement.

TRAFFIC MONITORING

The State Department of Transportation currently makes a series of traffic counts on major streets and highways (primarily Highway 14) on a biennial basis. These counts should be obtained by the City and then supplemented with machine counts at other locations.

Supplemental counts should be taken at all signalized intersections and the intersection of major collector and arterial streets (see Figure 3-1).

Results of these counts should be studied and the following actions taken:

1. Traffic control devices should be modified to favor the greater traffic demand. This includes signal timing (cycle length, directional split, phasing and progression) as well as the placement of STOP signs and speed limits.

2. Signals should be periodically checked to see if they meet MUTCD minimum volume warrants. Unwarranted signals are very expensive when traffic delay and maintenance and upkeep are considered, and should be removed.

7

Chapter 7
RECOMMENDATIONS & IMPLEMENTATIONS

The preceding chapters of this report have dealt with the analysis of existing traffic conditions, accident experience, and operation; and with the formulation of modifications and improvements to correct deficient, inadequate, or nonconforming conditions. In this final chapter of the report, the discussion is directed toward potential sources of funding the recommended improvements and a priority schedule for implementation.

SOURCES OF FUNDING

Monies for traffic control improvements such as those contained in this report can be obtained from several sources. Funds are available on a reimbursement basis, 70% Federal funds and 30% matching Local funds, for street construction projects, traffic control devices, and other improvements on city streets which are on the Federal-Aid Urban System (FAUS). As described in this chapter, much of the arterial and collector street mileage in the City is on this system (see Figure 7-1). Consequently, many improvements on these streets could qualify for FAUS Funds.

The Iowa Department of Transportation has allocated $420,000 to the City of Marshalltown for use on streets classified as Federal-Aid Urban routes. The City has expended $240,000 of this total, leaving a balance of $180,000 in the City's FAUS account. These monies constitute the 70% Federal share which the City must match on a 30% basis. For example, if the City wishes to use all of the $180,000, then the City must match the Federal share with $77,143. The resultant total dollar amount (Federal plus Local monies) available for projects on the Federal-Aid Urban System equals $257,143.

Furthermore, the City, if it so desires, may borrow money against future allocations of Urban System monies. That is, if the City decides that more than $180,000 of Federal funds are needed immediately, then up to $265,000 of future Federal allocations can be obtained now.

Therefore, by supplying the City's 30% match to this advancement on Urban Systems monies, the City could have an additional $378,571 available to institute traffic safety improvements.

A new Safer Off-System Roads Program has been established by combining the previously authorized Off-System Roads and Safer Roads Demonstration Programs. Funding is authorized to improve the safety and capacity of existing toll-free roads not on the Federal-Aid highway system. Where feasible, the projects funded under this new program are to be low-cost improvements which provide significant safety benefits.

This new Safer Off-System Roads Program has just recently been funded on a national basis and provides for a 70% Federal and 30% Local match. At the time of this writing, the Iowa Department of Transportation had not allocated the funds to Local jurisdictions. Preliminary indications suggest that Marshalltown's allotment will be small, since only $ 3 million were made available on a statewide basis.

A third source of safety funds is available to the City of Marshalltown through the Iowa Department of Transportation's Urban-State Traffic Engineering Program (U-STEP). The objective of U-STEP is to make available a formalized procedure and a continuing funding source through which to assist the cooperating cities with traffic engineering improvements on the Primary Road extensions. The State and the City would each contribute 50% of the cost of any improvement under this program.

The U-STEP Program will be administered by the Highway Division with principal involvement of the Urban Systems Office. As improvements are identified, the District Transportation Planner will be advised and, in cooperation with the District Engineer and the City, will determine if a project is possible. Safety projects on U. S. 30 and State Highways 14 and 330 in Marshalltown could possibly qualify for funding under this program.

Local monies come from various sources including the road use tax, property taxes, special assessments, and other related sources. Summaries of the receipts and expenditures for both the street and the parking programs are shown respectively in Tables 7-1 and 7-2. From these tables, it is evident that at the close of fiscal year 1976, the City had balances of $493,138 in the street account and $260,260 in the parking account. These balances are somewhat committed in the street and parking budgets for the 1977 fiscal year. However, Marshalltown has the revenue available to restructure its street and parking receipts in order to produce the local matching monies needed to apply for State and Federal funds.

TABLE 7-1
STREET FINANCE REPORT

Municipality 5350 Marshalltown
County 64 Marshall
Official Census Figure 26,506

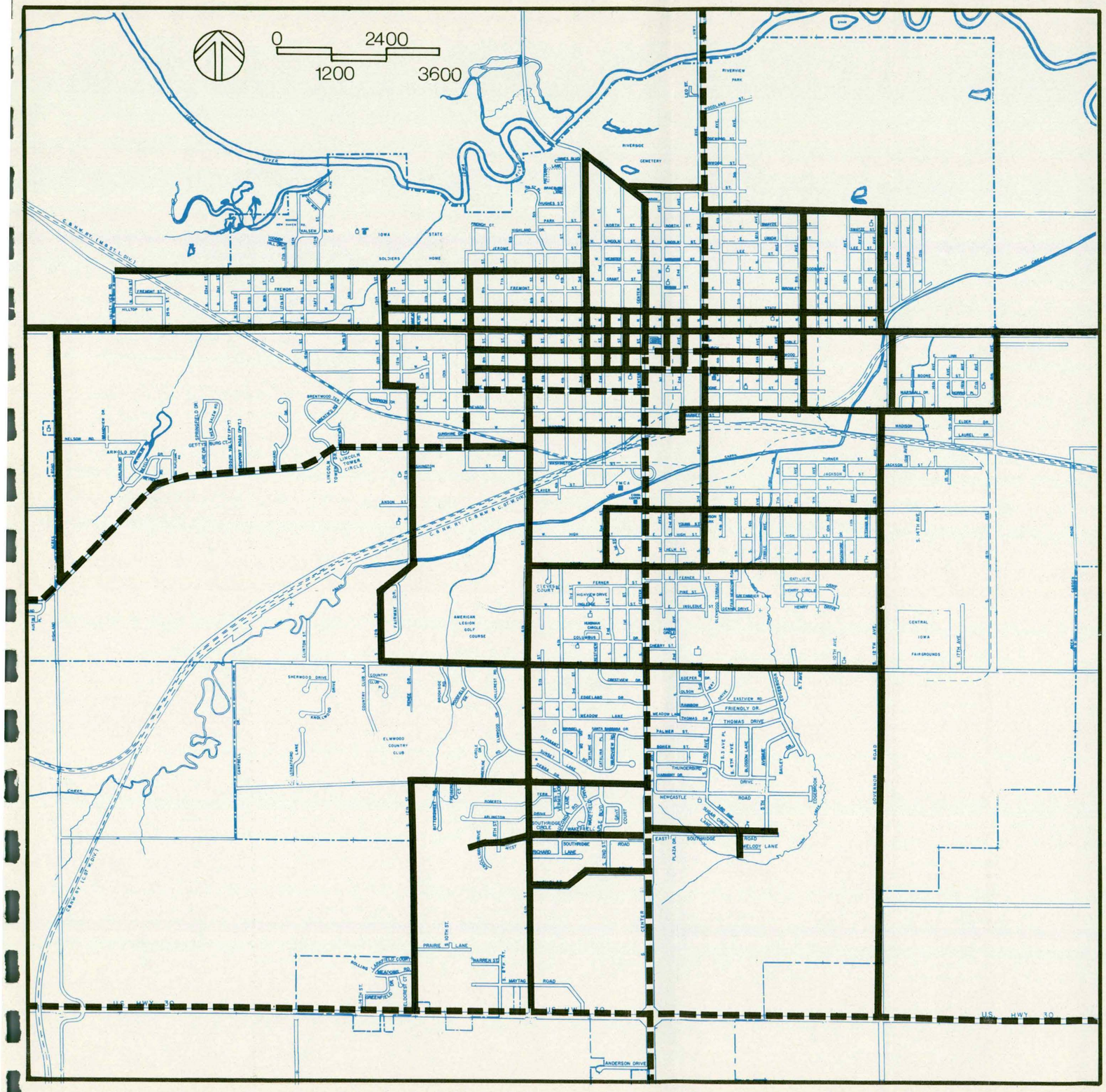
		ROAD USE TAX FUND	STREET ACCOUNT	FROM OTHER ACCOUNTS**	TOTALS
A.	1. Ending Balance Last Financial Report	336,048	143,851	44,009	520,908
	2. Adjustment (Explain on RUT-2B)				
	3. Actual Book Balance, July 1, 1975	336,048	143,851	41,009	520,908
ACTUAL RECEIPTS					
B.	1. Road Use Tax	490,026			490,026
	2. Property Taxes		354,851	355,025	709,876
	3. Special Assessments				
	4. Misc. (Itemize on Next Page)		51,979		51,979
C.	Total Receipts (Lines B1-B6)	490,026	406,830	355,025	1,251,881
D.	TOTAL FUNDS AVAILABLE (Line A+ Line C)	826,074	550,681	396,034	1,772,789
ACTUAL EXPENDITURES					
E.	Maintenance				
	1. Roadway Maintenance	145,335	211,503		356,838
	2. Snow and Ice Removal		41,435		41,435
	3. Storm Sewers				
	4. Traffic Services		10,050		10,050
	5. Street Cleaning		68,011		68,011
F.	Construction or Reconstruction				
	1. Engineering	48,997	96,379	61,781	207,157
	2. Right of Way Purchased	23			23
	3. Roadway Construction	107,097		69,460	176,557
	4. Storm Sewers				
	5. Traffic Services		10,050		10,050
	6. Sidewalks	882			882
G.	Administration		59,628	2,370	61,998
H.	Street Lighting			94,464	94,464
I.	Trees				
J.	Equipment Purchased	30,602	53,625		84,227
K.	Misc. (Itemize on Next Page)				
L.	Bonds and Interest Paid				
	1. Paid on Bonds Retired			104,000	104,000
	2. Interest Paid on Bonds			63,959	63,959
M.	Non-Street Purposes				
N.	Total Expenditures (Lines E thru M)	332,936	550,681	396,034	1,279,651
O.	BALANCE, June 30, 1976	493,138			493,138
P.	TOTAL FUNDS ACCOUNT FORWARD (Line N + Line O)	826,074	550,681	396,034	1,772,789

*Road Use Tax Expenditures for these six items must be divided to Arterial and local street on Form 2-B. (**) Debt Service, General, Sanitation, Public Safety, Utility, etc. Include the balances for accounts which are used entirely for streets. Read your New Instructions.

TABLE 7-2
PARKING FINANCE REPORT

Municipality Marshalltown

A.	ACTUAL BALANCE July 1, 1975	204,176
	ACTUAL RECEIPTS	
B.	Parking and Meter Receipts	
	1. Street Meter Revenue	55,153
	2. Lot or Garage Meter Revenue	57,414
	3. Other Lot or Garage Revenue	
	4. Property Taxes	
	5. Miscellaneous (Itemize below) Interstate on Sinking Fund	13,901
	Total (lines B1-B5) Sales of Parking Lot	26,000
C.	Proceeds of Parking Bonds Sold	
D.	Total Receipts (lines B1-B5 and line C)	152,468
E.	TOTAL PARKING FUNDS AVAILABLE (lines A and D)	356,644
	ACTUAL EXPENDITURES	
F.	For On and Off Street Parking	
	1. Acquisition and Installation of Meters	
	2. Maintenance and Repair of Meters	6,713
	3. Acquisition and Improvement of Parking	10,715
	4. Maintenance and Operation for Parking	8,491
	5. Policing and Enforcement	33,635
	Total (lines F1-F5)	
G.	Parking Bonds and Interest Paid	
	1. Paid on Bonds Retired	20,000
	2. Interest Paid	16,830
H.	Street Work Paid from Parking	
	(Amount claimed under misc. receipts on Form RUT-2B)	
I.	Total Expenditures (lines F1-F5, G1-G2, and line H)	96,384
J.	ACTUAL BALANCE June 30, 1976	260,260
K.	TOTAL PARKING FUNDS ACCOUNTED FOR (lines I and J)	356,644



Federal Aid System

figure 7-1

legend

Primary ----

Urban ——

MARSHALLTOWN, IOWA

IMPLEMENTATION OF IMPROVEMENTS

The Consultant has summarized all of the project improvements contained in this report into three classifications - immediate action projects, short-term projects, and long-term projects. These projects along with their assigned priority are shown respectively in Tables 7-3 through 7-5.

As shown in Table 7-3, the immediate action projects involve routine signing modifications or maintenance items. Because of the low amount of the costs to make these improvements, the Consultant believes that the immediate action projects can be handled locally as part of the regular street budget.

On a time basis, the Consultant believes that the immediate action projects should be completed as soon as possible within the next 3 to 6 months following the acceptance of this report.

The short-term projects shown in Table 7-4 relate to special improvements for schools, high-accident locations, downtown modifications, and city-wide signing improvements. These improvements should be scheduled for implementation over the next 1 to 5 years.

The total estimated cost of the short-term projects is $299,480.

The City may, at its own discretion, follow the Consultant's advice on the priority listing or the City may combine several of the projects into larger projects. It may be advisable when applying for the FAUS funds to place all projects into one large project. The same is true for applications for the Safer Roads moneys.

With regard to the school improvements, the Consultant has broken the estimated cost into the amounts which are eligible only under the FAUS program and under the Safer Roads Program. The breakdown of the school improvement cost by these two Federal Aid programs are shown in Table 7-6.

Table 7-5 lists the long-term projects recommended for Marshalltown. Primary emphasis should be placed upon a Highway 14 bypass study, as the present Center Street viaduct is responsible for several high-accident locations. Here, again, the City could apply for FAUS Funds.

Also included as a long-term project is the ultimate installation of mast-arm signals at two locations within the City.

Although these projects are identified as being long-term, the Consultant suggests that the City take the necessary steps to initiate the Highway 14 Bypass study as soon as possible. This project was separated out into Table 7-5 because of the magnitude of the financing necessary to complete it. The immediacy of implementation will depend upon the time frame within which the City wishes to complete the work and the amount of local matching funds which the City can set aside within its budget.

Overall, the guidelines contained in this section provide the City with sufficient flexibility to approach its traffic engineering improvements on an individual or collective basis. Successful completion of the improvements in this document will enable the City to reduce accidents now occurring, prevent future accidents from occurring, and improve the overall safety and traffic flow within the City of Marshalltown.

TABLE 7-3

IMMEDIATE ACTION PROJECTS

Priority	Recommendation	Page	Estimated Cost	Funding Type	Federal	City
1	Multi-Way Stop Plates (ten locations)	6-1		Local		$400
2	Downtown Crosswalks	5-5	Maintenance Item	Local		
3	Trimming of Shrubbery	6-2	Maintenance Item	Local		

TABLE 7-4

SHORT-TERM PROJECTS

Priority	Recommendation	Page	Estimated Cost	Funding Type	Federal	City
1	School Crossings	Chap. 5	$40,335	FAUS Local	$21,091	$9,039 10,205
2	High Accident Locations	Chap. 4	211,900	FAUS	148,330	63,570
3	Railroad Crossing Modifications	3-24	1,885	Local FAUS	742	825 318
4	Signal Recommendations	3-8	23,900	FAUS	16,730	7,170
5	STOP Sign Installations	3-10	4,500	Local FAUS	2,415	1,050 1,035
6	NO PARKING Signs (Downtown)	5-5	4,800	FAUS	3,360	1,440
7	Alternate 1 Street	2-12	4,760	FAUS	3,332	1,428
8	Handicap Ramps	5-5	4,900	FAUS	3,430	1,470
9	Parallel Parking Stalls	2-16	2,500	FAUS Local	1,400	600 500
	TOTAL		$299,480		200,830	$98,650

TABLE 7-5

LONG-TERM PROJECTS

Priority	Recommendation	Page	Estimated Cost	Funding Type	Federal	City
1	Highway 14 Bypass	7-10				
2	Installation of Mast Arms	4-18	$25,000	FAUS	$17,500	$7,500
3	Sidewalk Construction	6-1	Maintenance Item	Local		
4	Highway 14 Signal Interconnection					

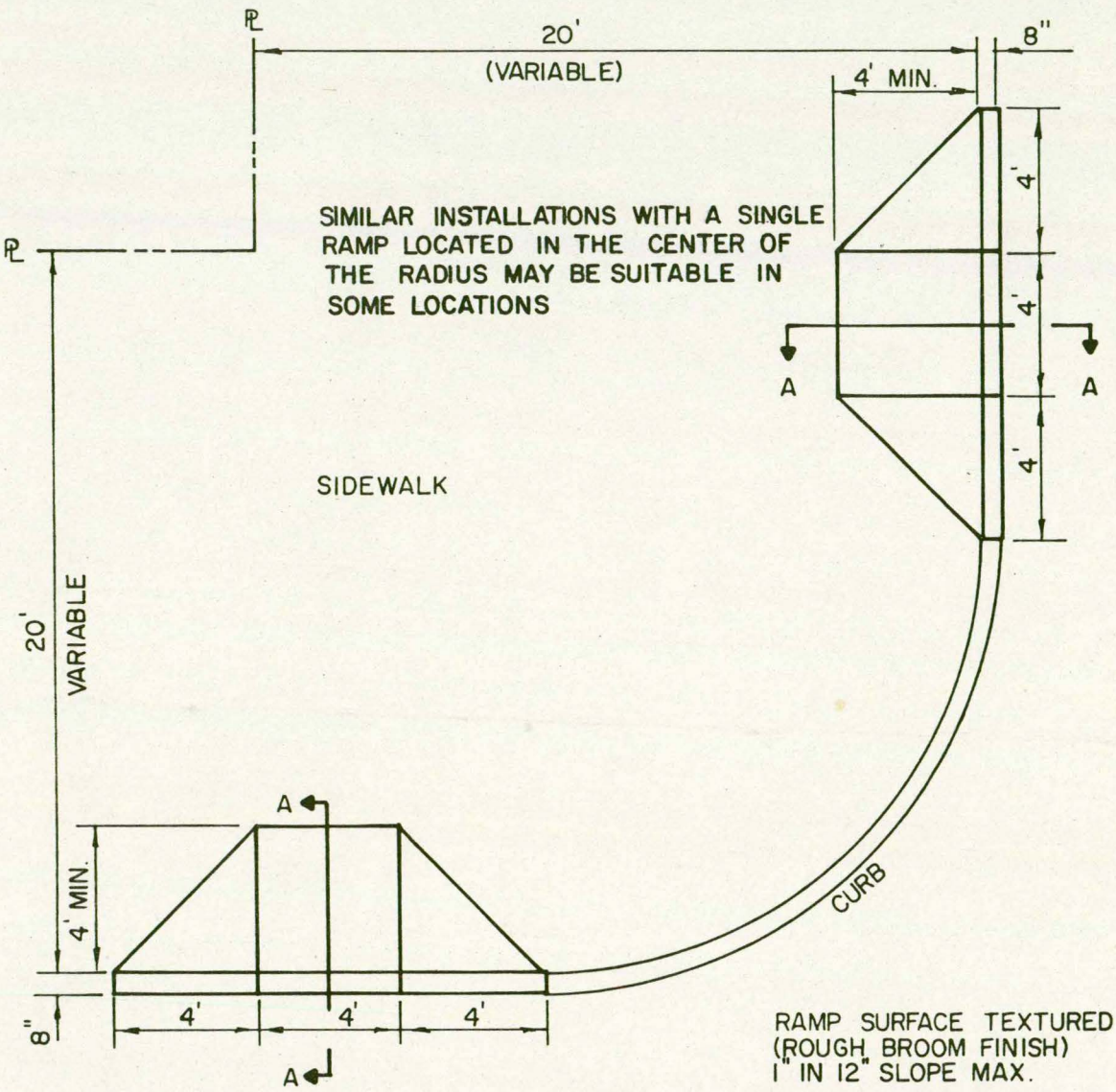
TABLE 7-6

SCHOOL IMPROVEMENT COSTS BY FEDERAL FUNDING

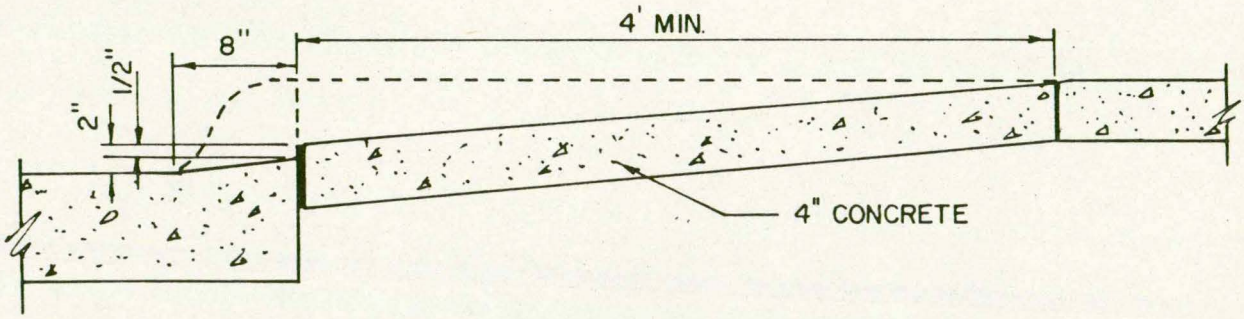
School	Cost Estimate On-System	Off-System
Marshalltown Senior High	170	85
Anson	1,460	485
Lenihan	16,485	1,365
Miller	0	1,470
Pleasant Hill	150	0
Fisher	510	875
Franklin	595	170
Glick	1,140	760
Hansen	625	415
Hoglan	340	680
Norris	0	500
Palmer	0	1,570
Rogers		1,160
Williams	3,015	225
Woodbury	995	205
St. Mary's	+ 1,810	240
TOTALS	$30,130	$10,205

APPENDIX

APPENDIX



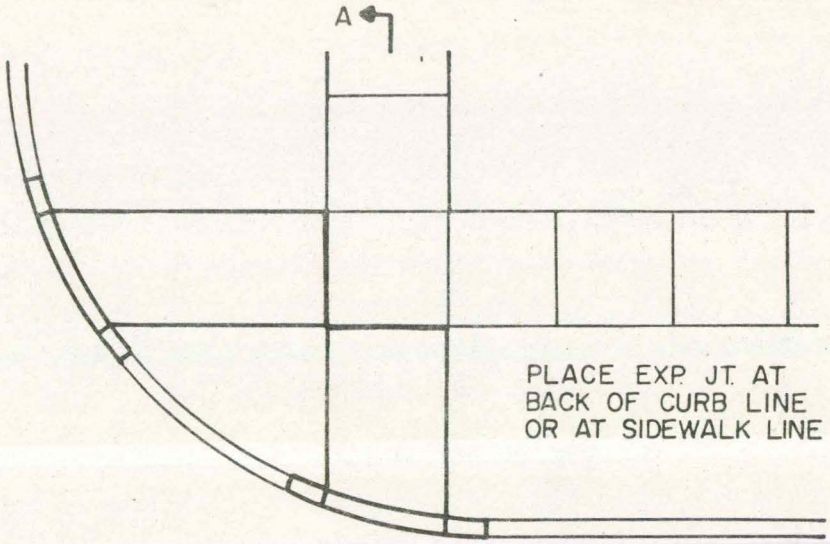
PLAN



SECTION A-A

Business District Sidewalk Ramp

NOT TO SCALE

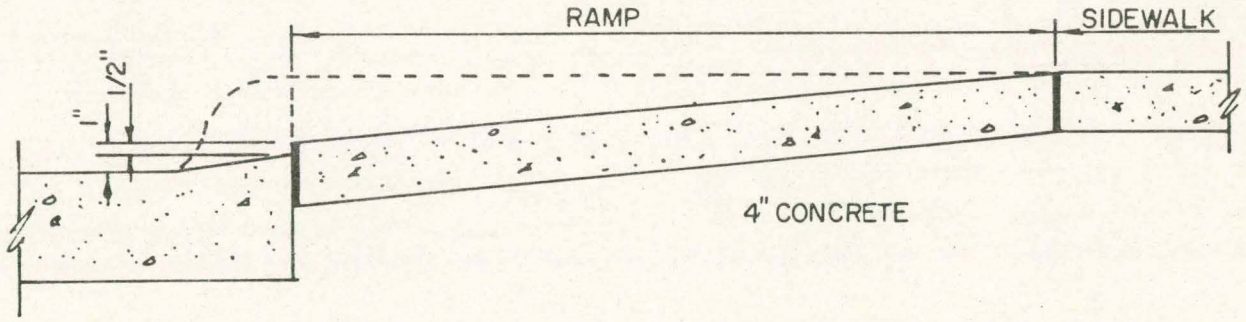


RAMP SURFACE TEXTURED
(ROUGH BROOM FINISH)
1" IN 12" SLOPE MAX.

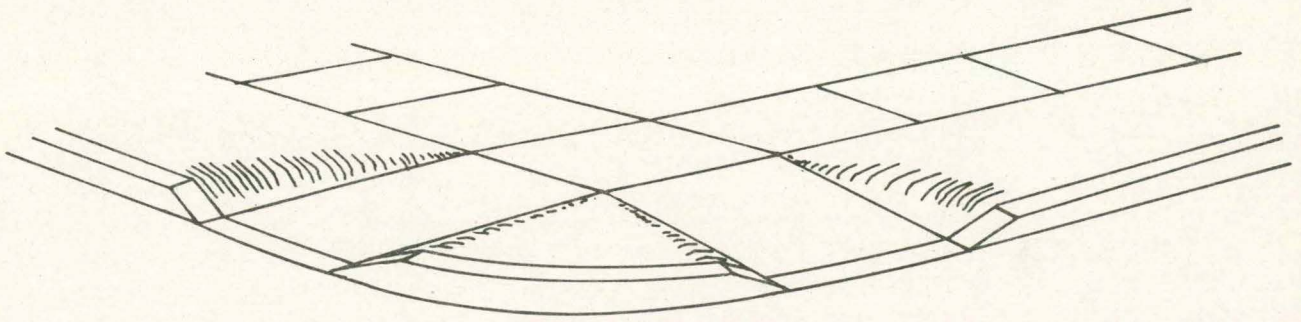
A

PLAN

SIMILAR INSTALLATION WITH A SINGLE RAMP LOCATED IN THE CENTER OF THE RADIUS MAY BE SUITABLE IN SOME LOCATIONS.



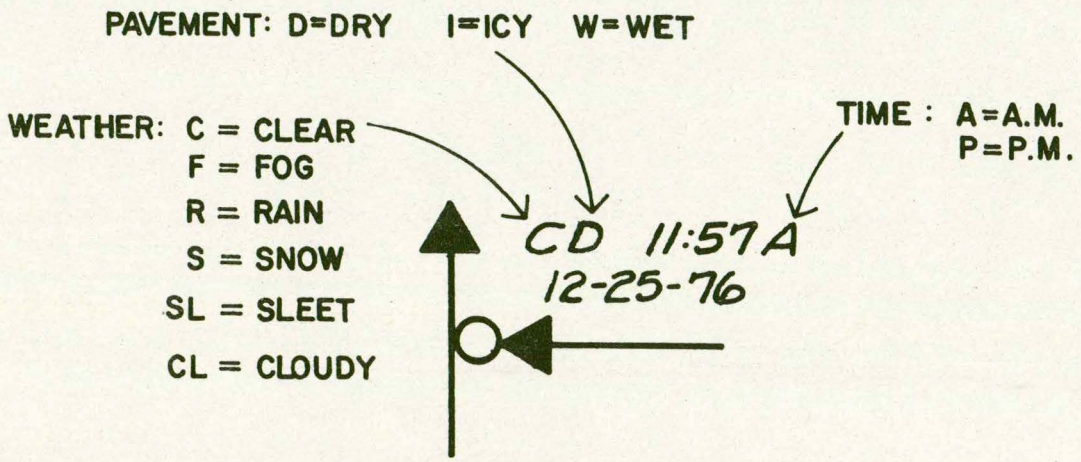
SECTION A-A



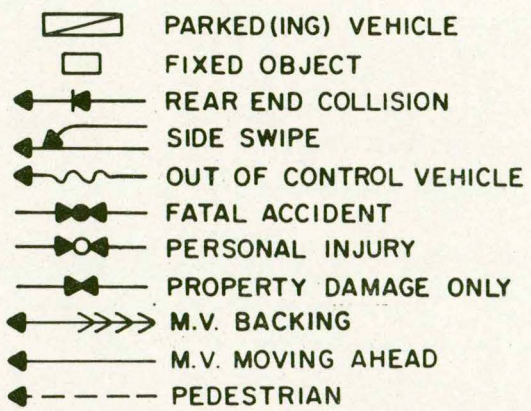
Residential Sidewalk Ramp

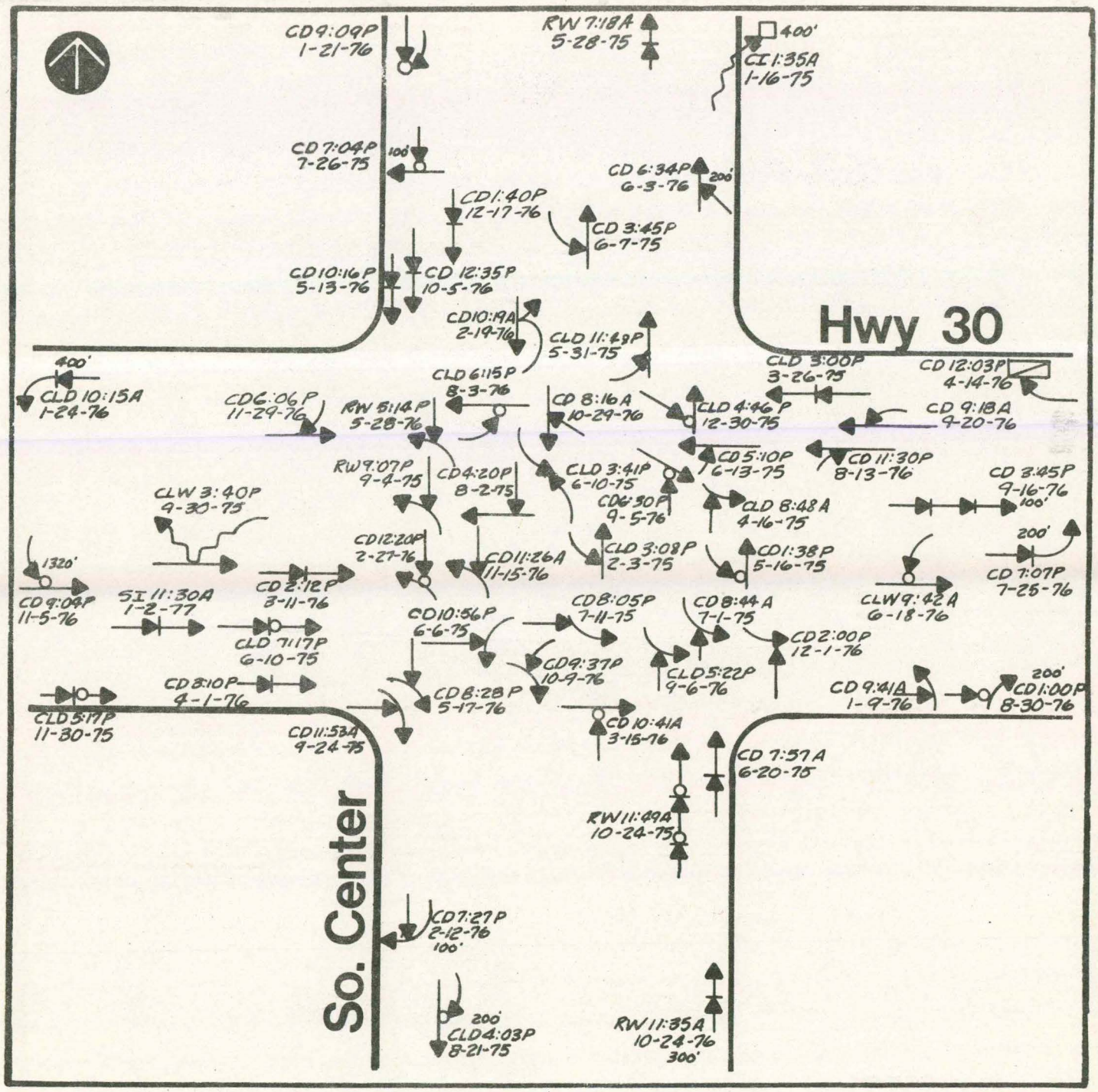
NOT TO SCALE

Accident Key



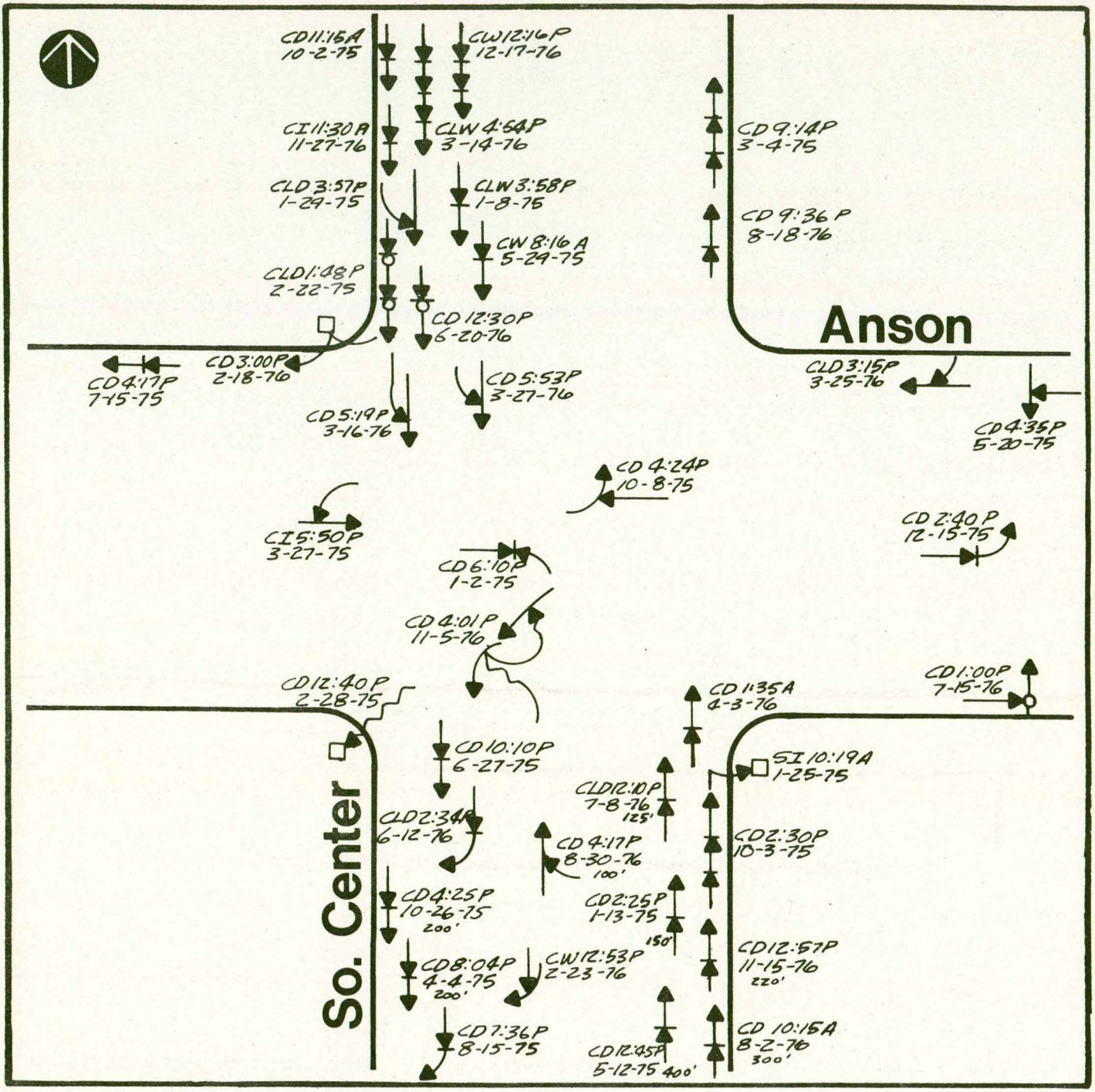
LEGEND





Accident Collision Diagram

MARSHALLTOWN, IOWA



Accident Collision Diagram

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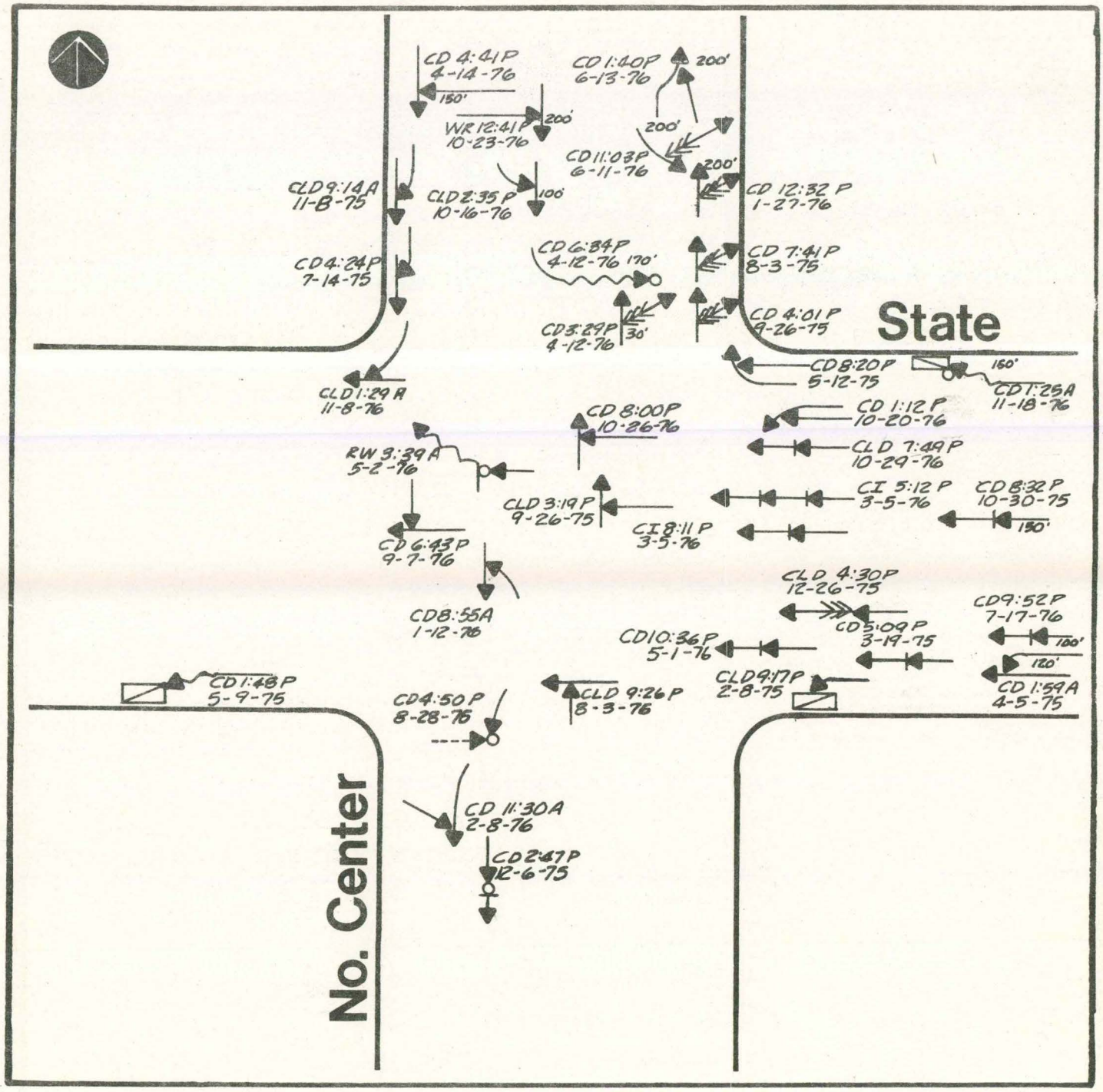

Accident Collision Diagram

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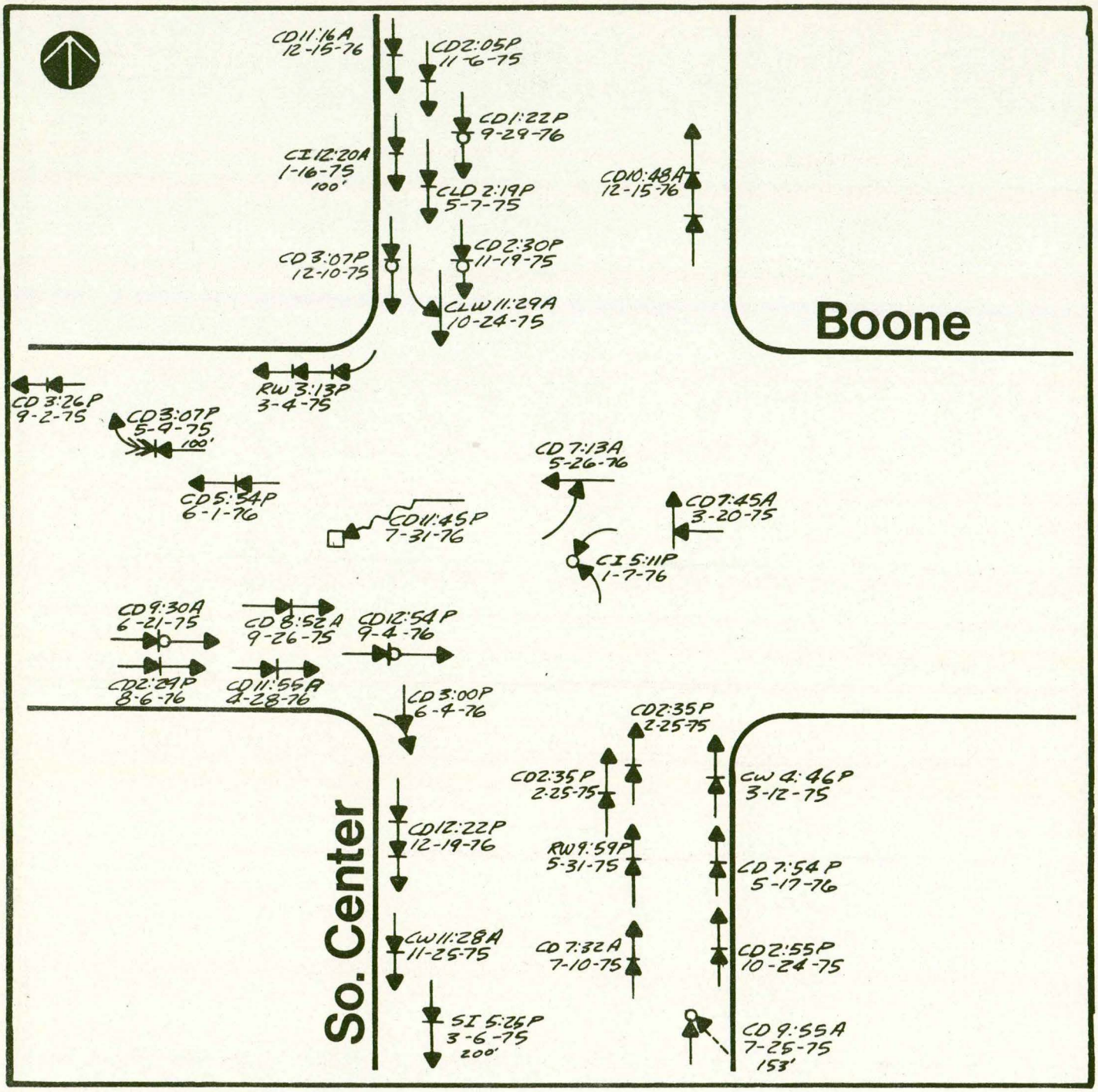

Accident Collision Diagram

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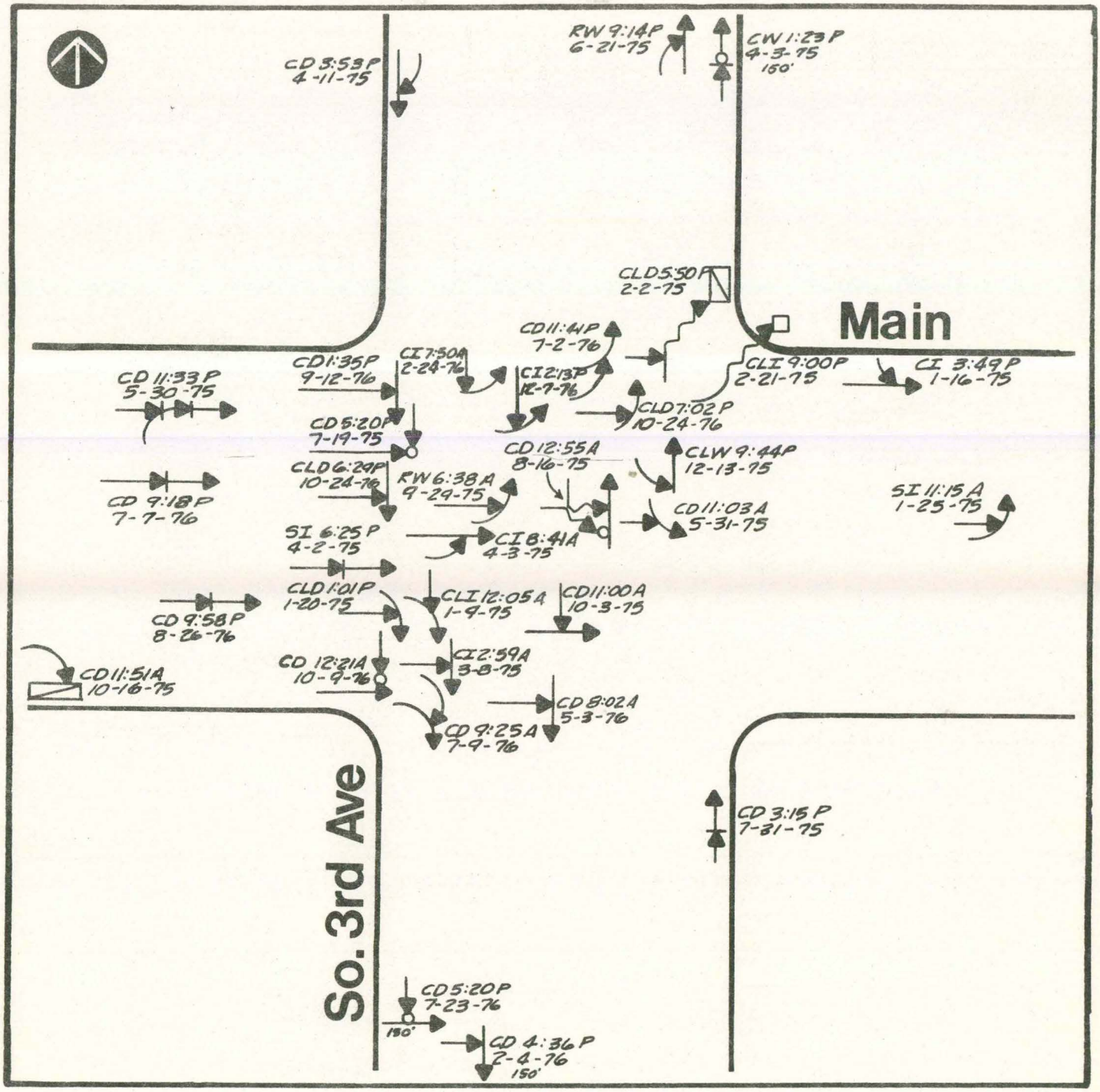

Accident Collision Diagram

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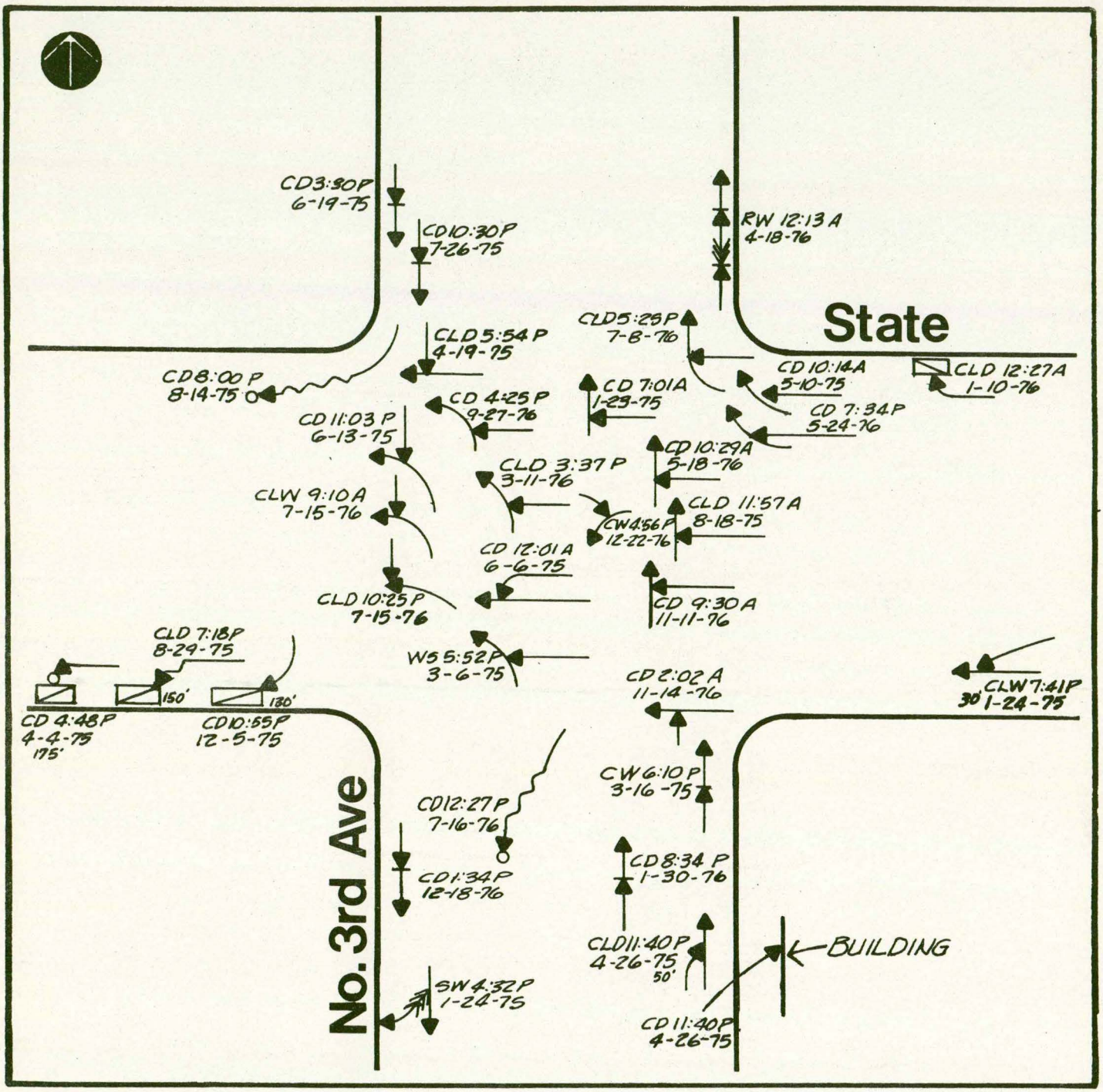

Accident Collision Diagram

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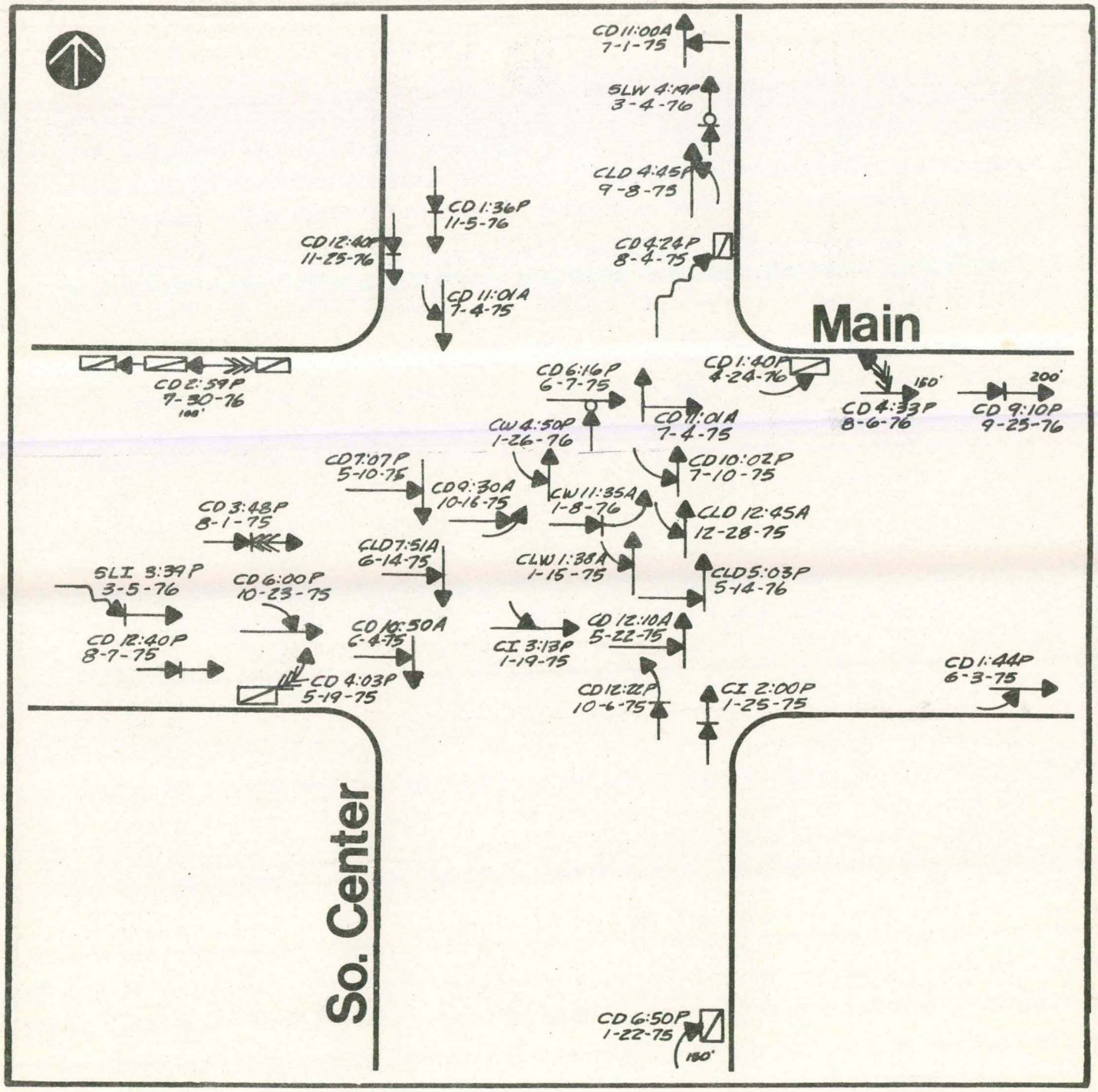

Accident Collision Diagram

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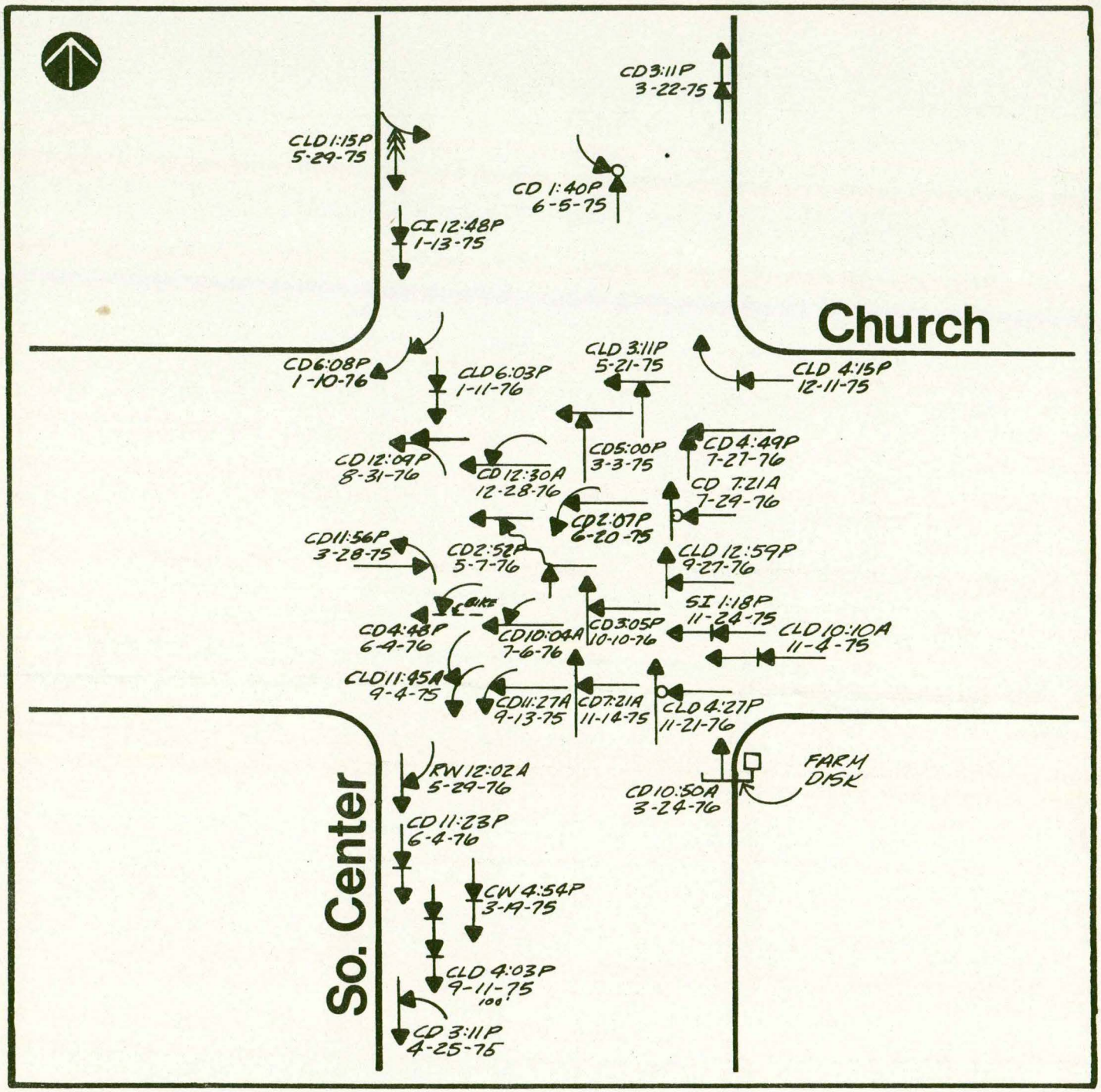

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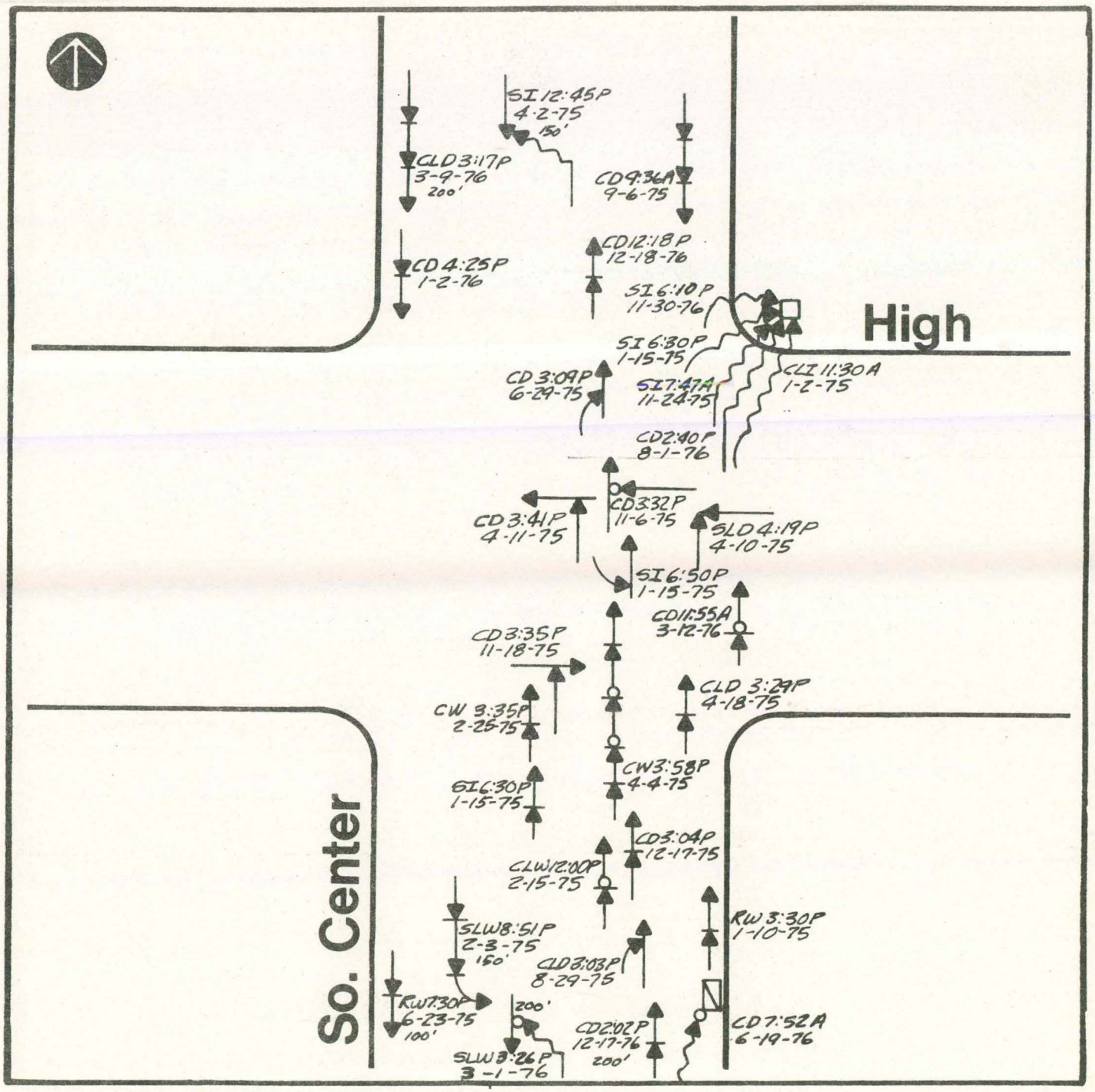

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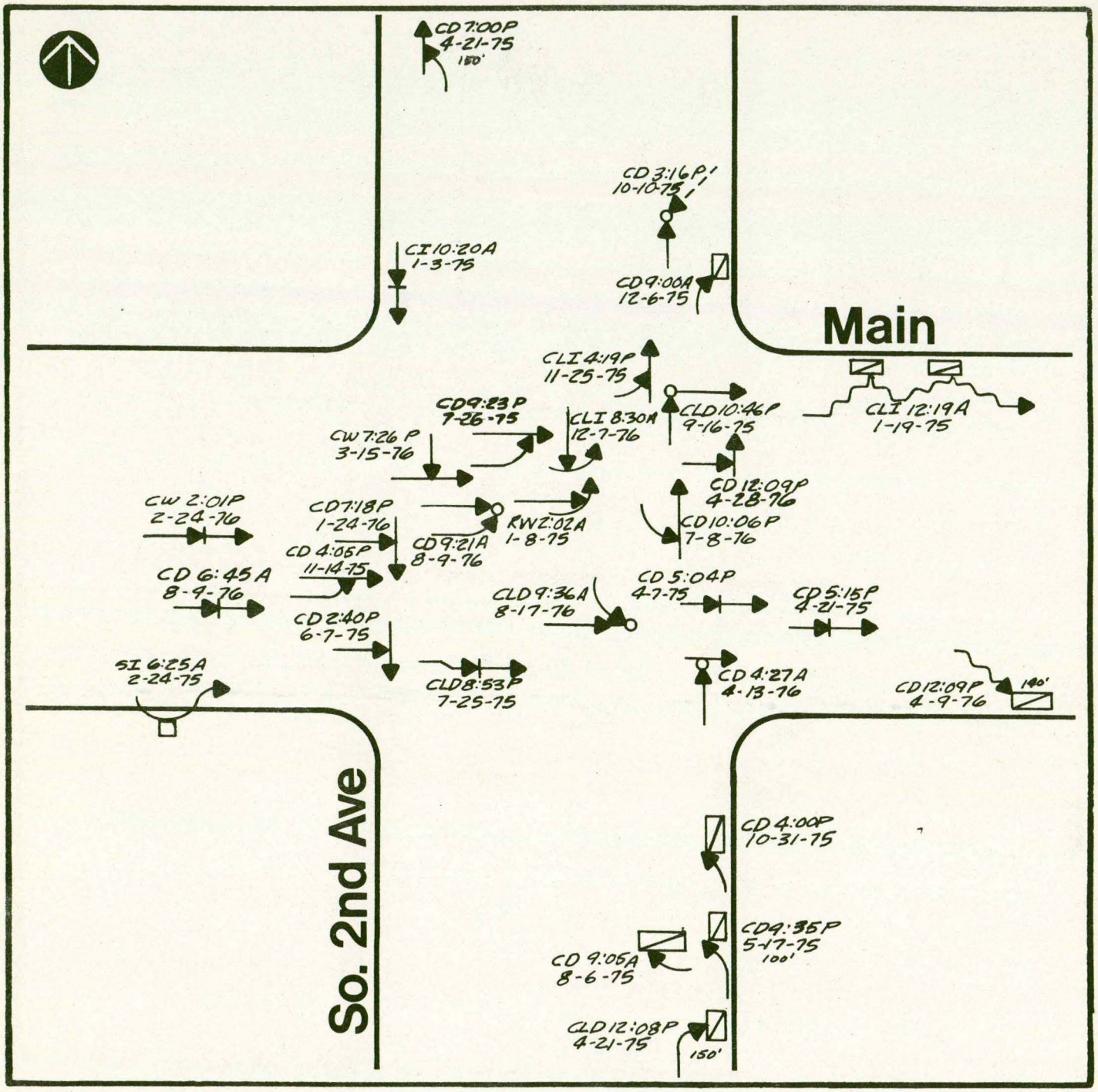

Accident Collision Diagram

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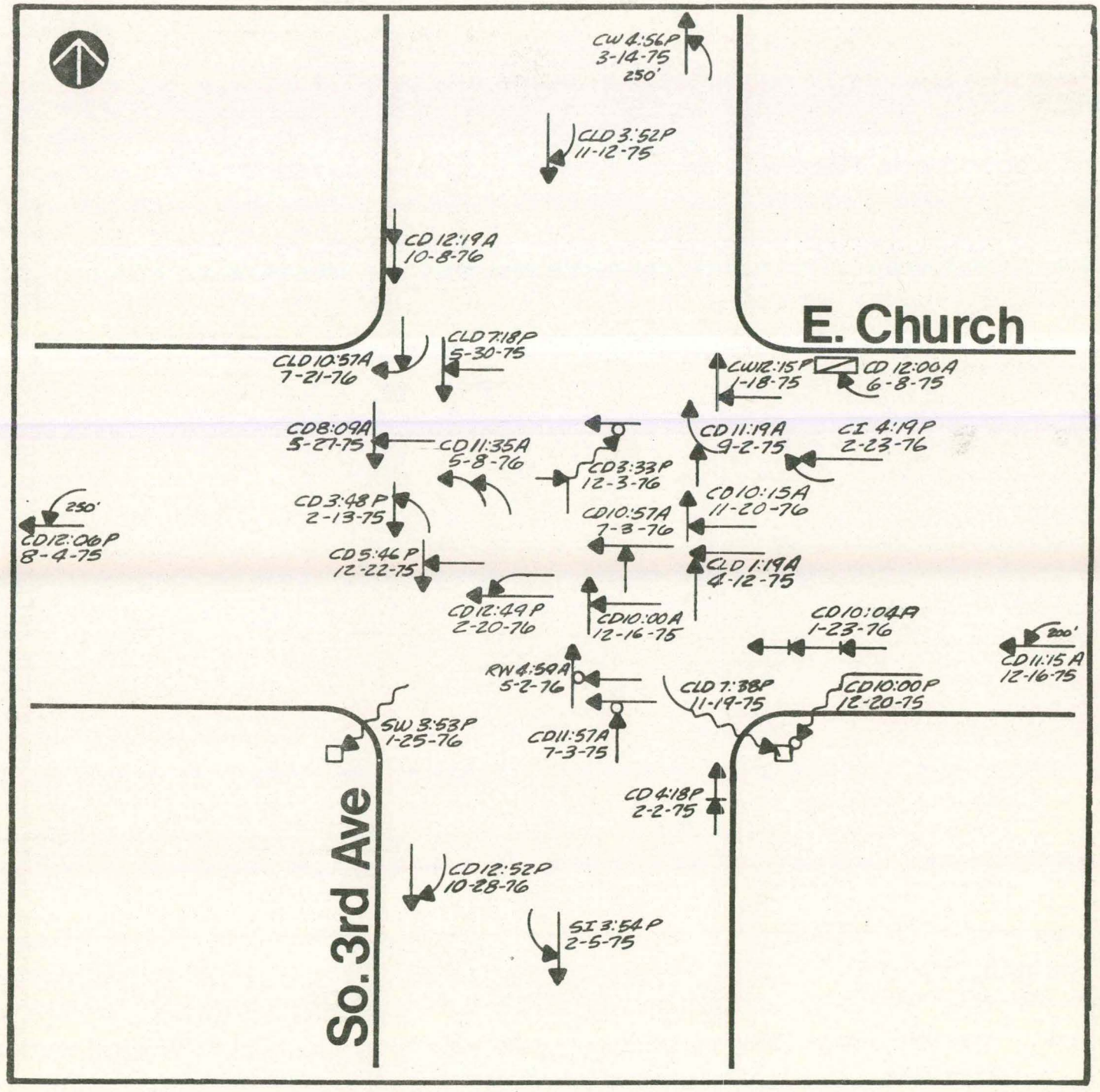

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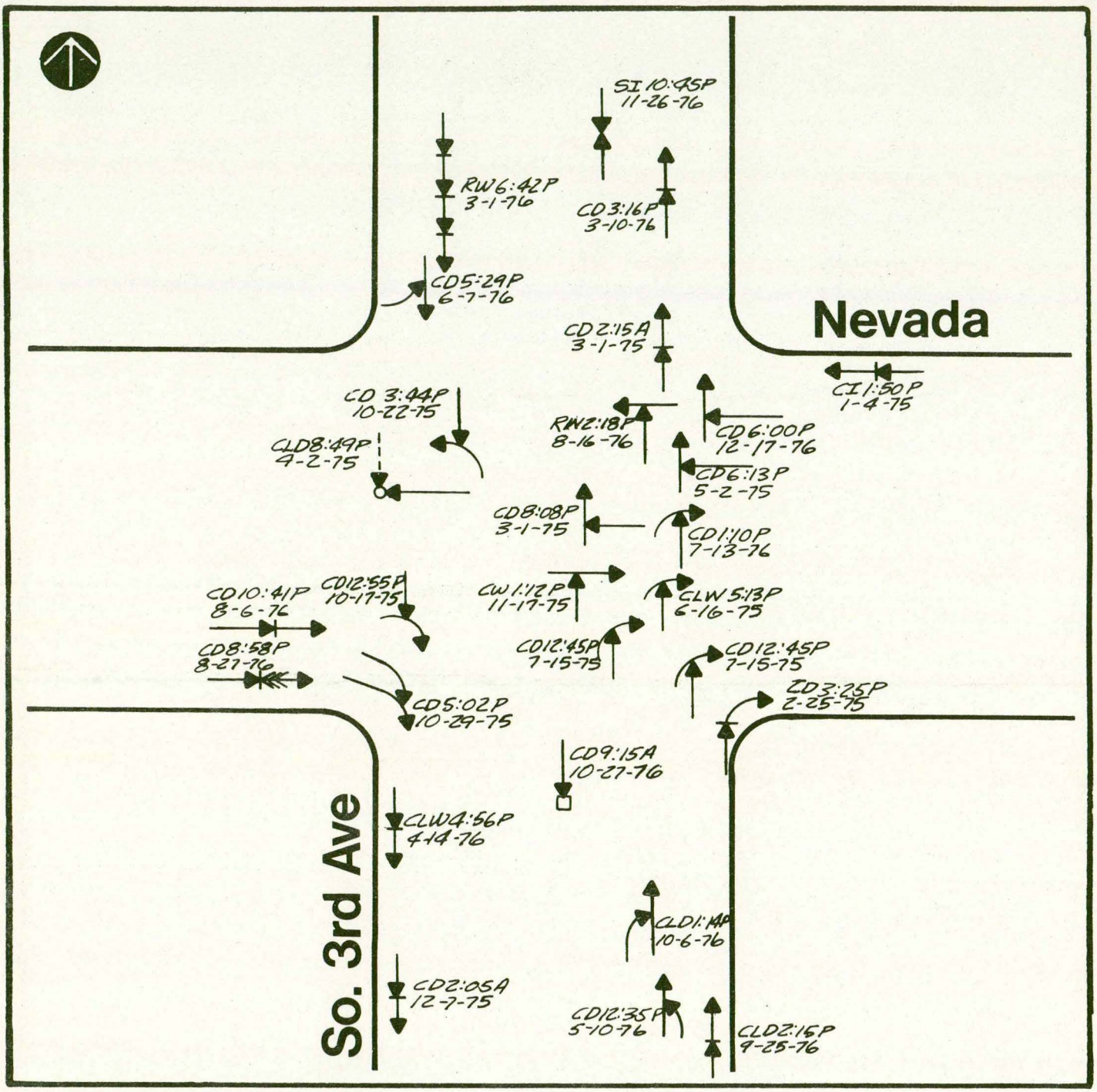

Accident Collision Diagram

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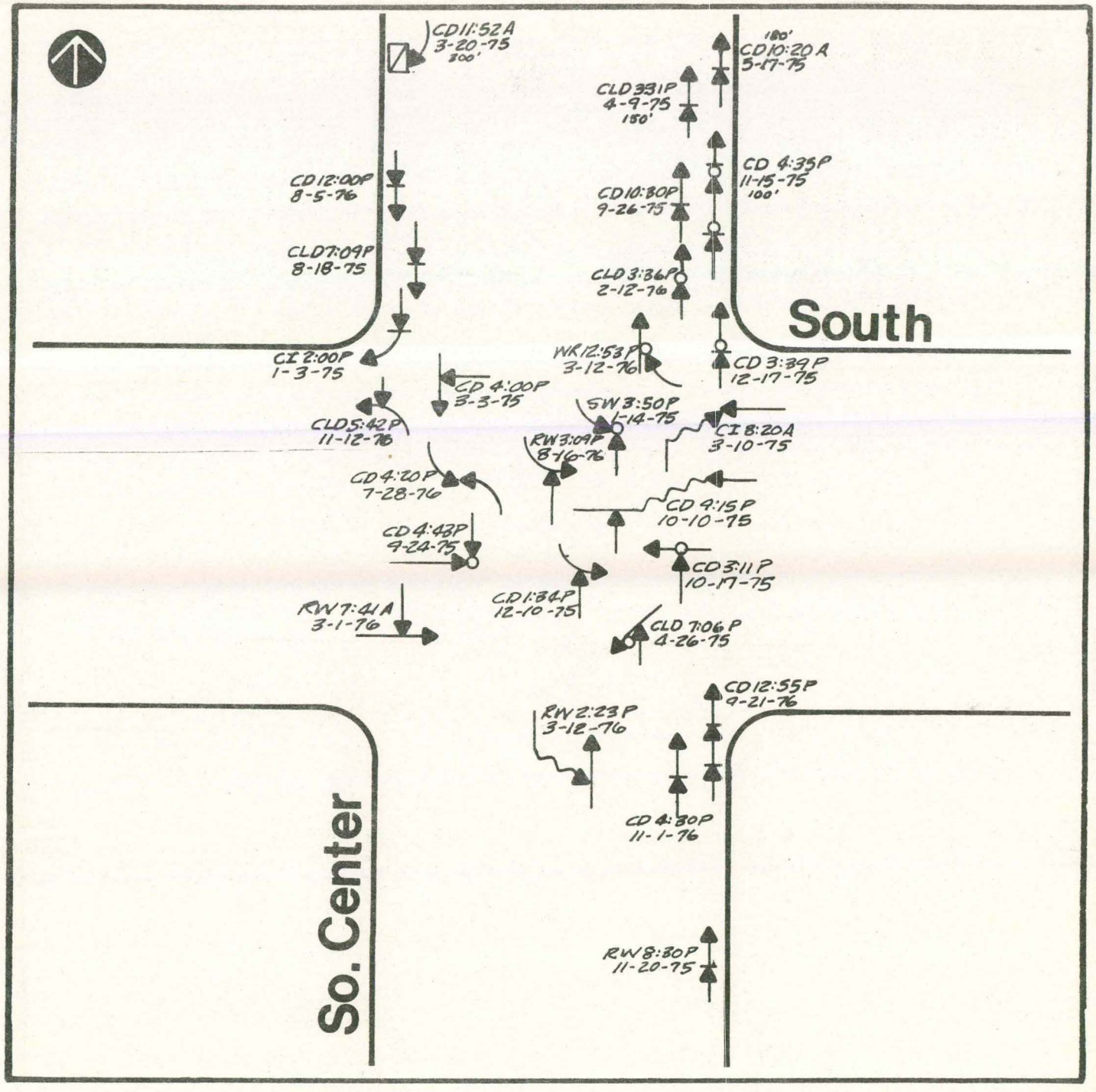

Accident Collision Diagram

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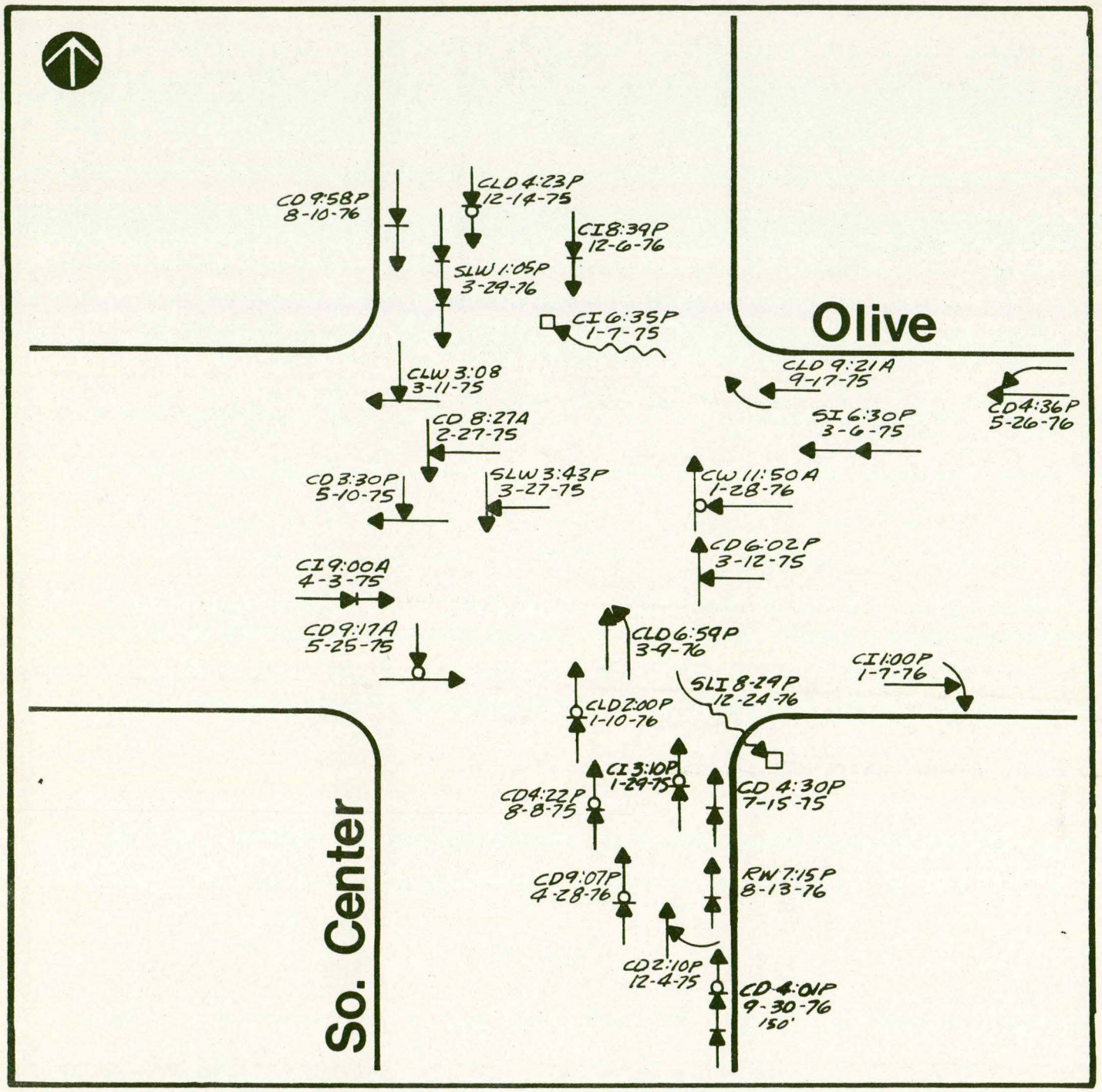

Accident Collision Diagram

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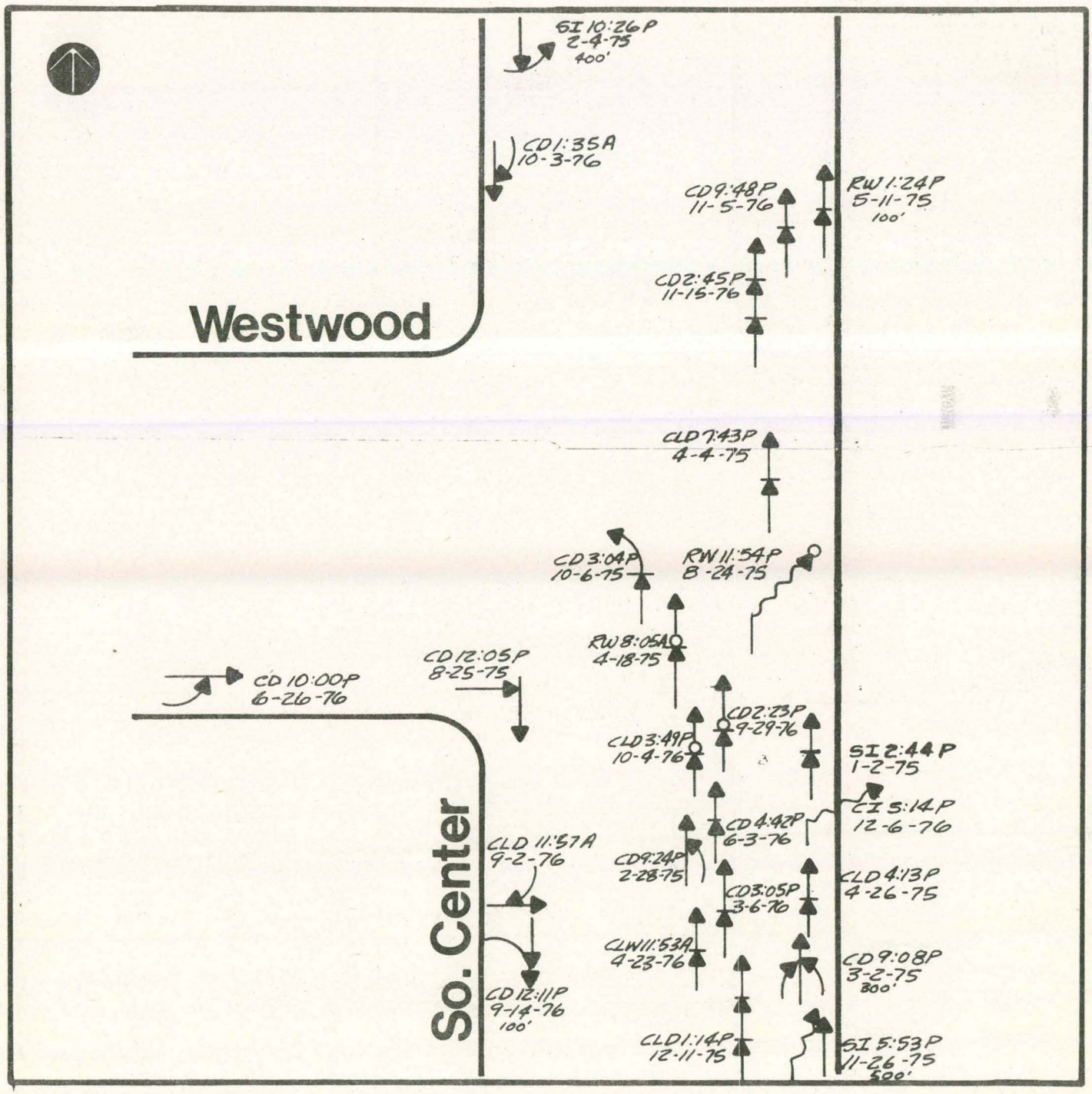

Accident Collision Diagram

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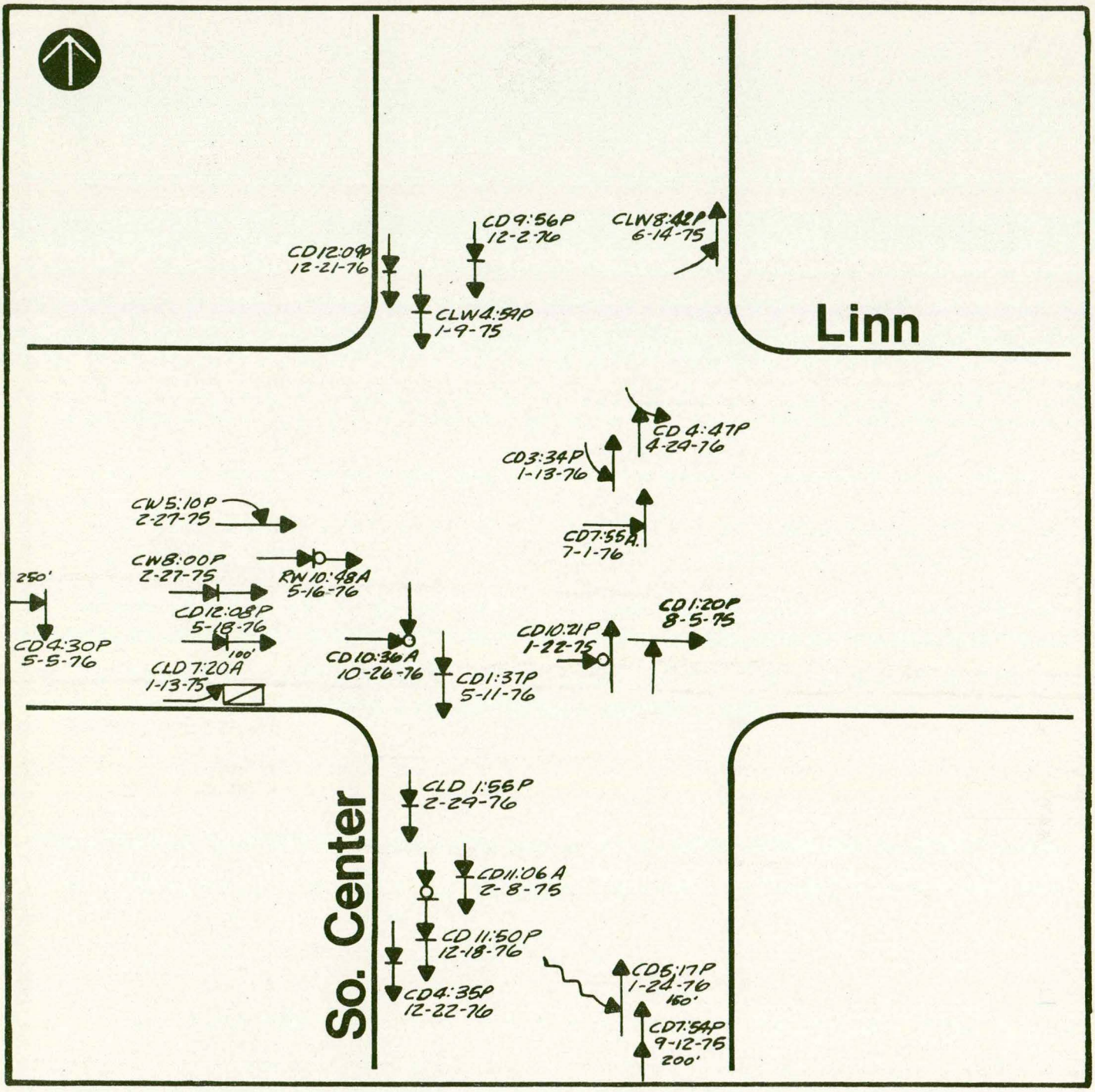

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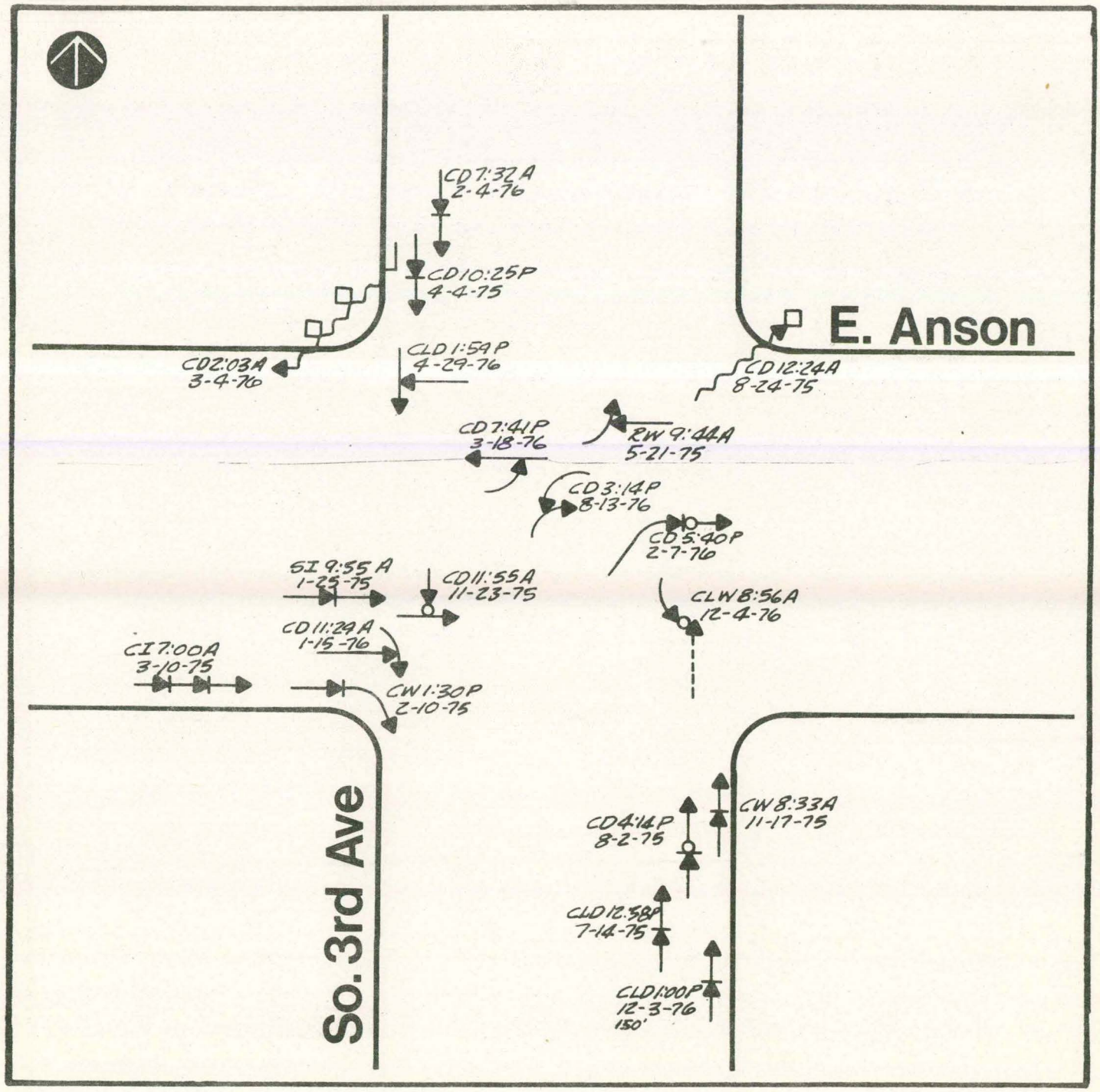

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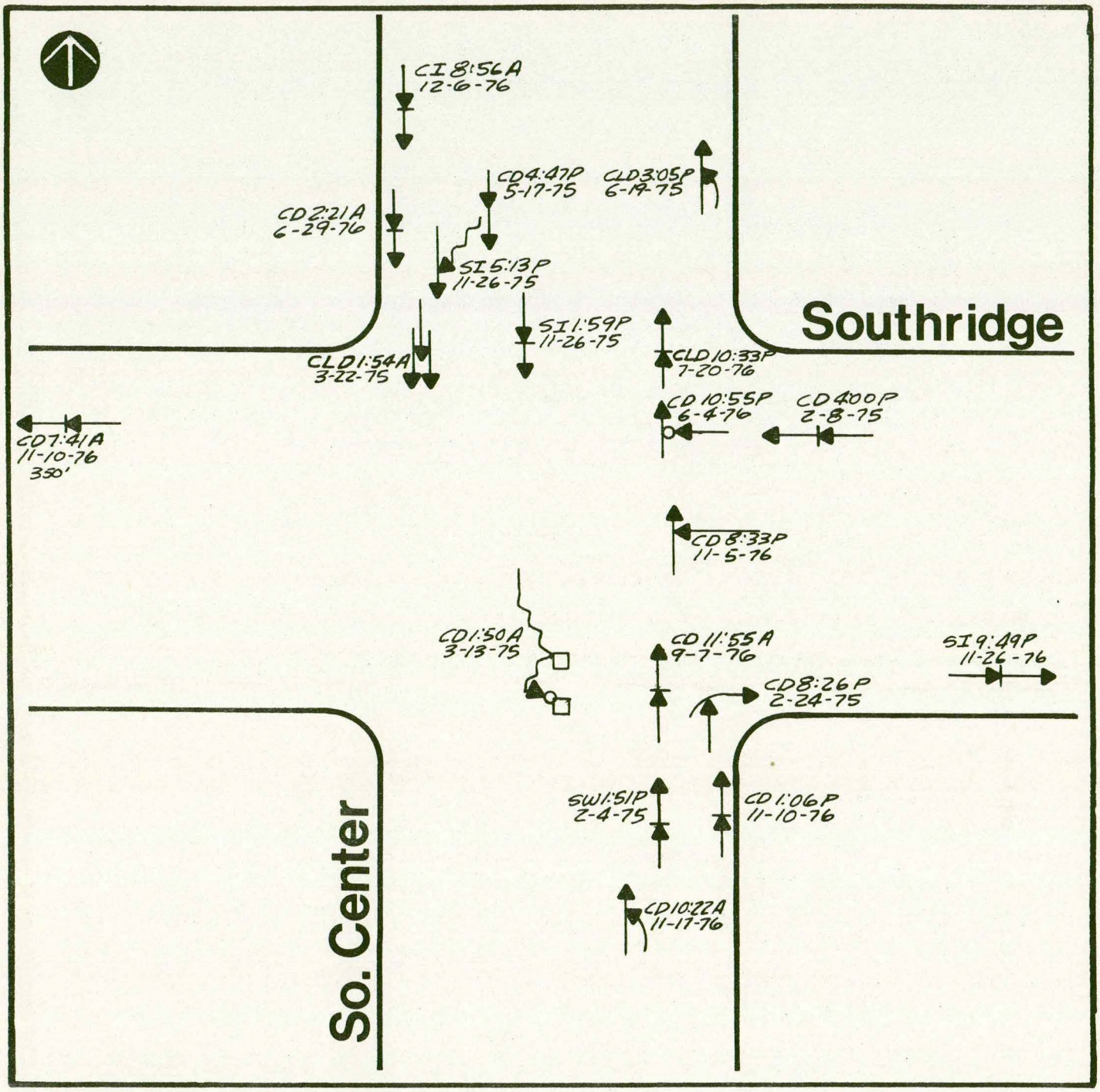

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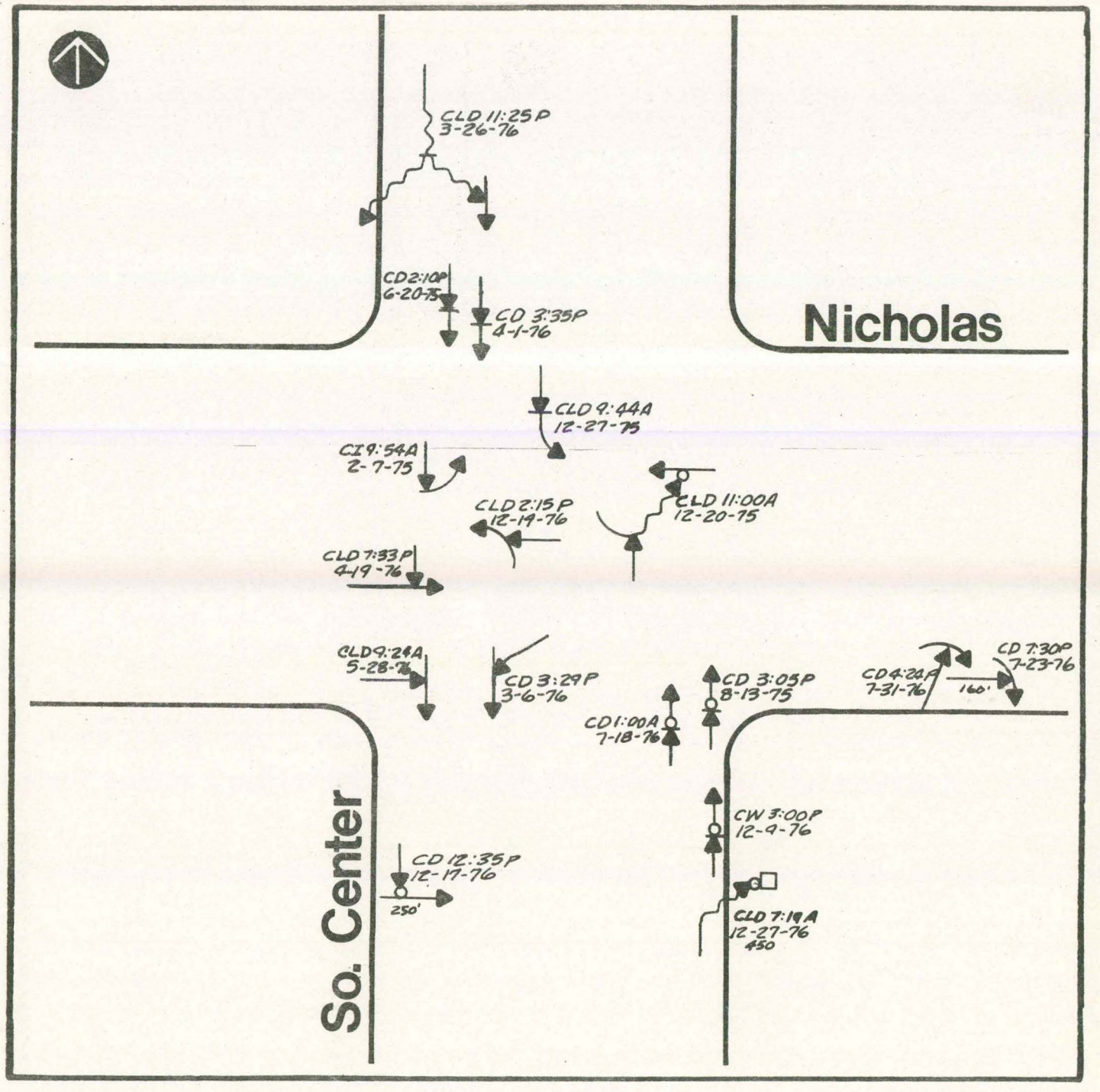

Accident Collision Diagram

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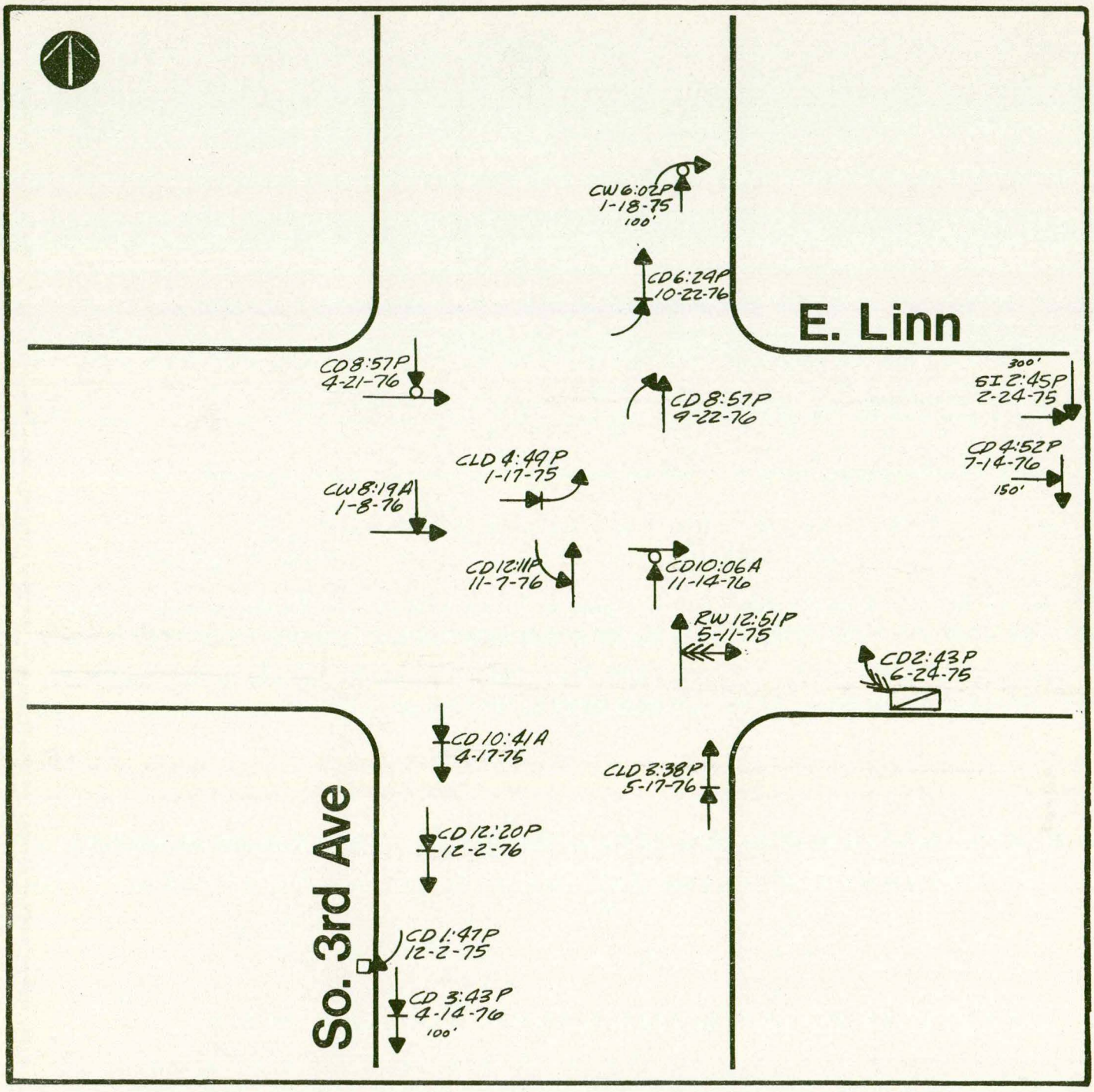

Accident Collision Diagram

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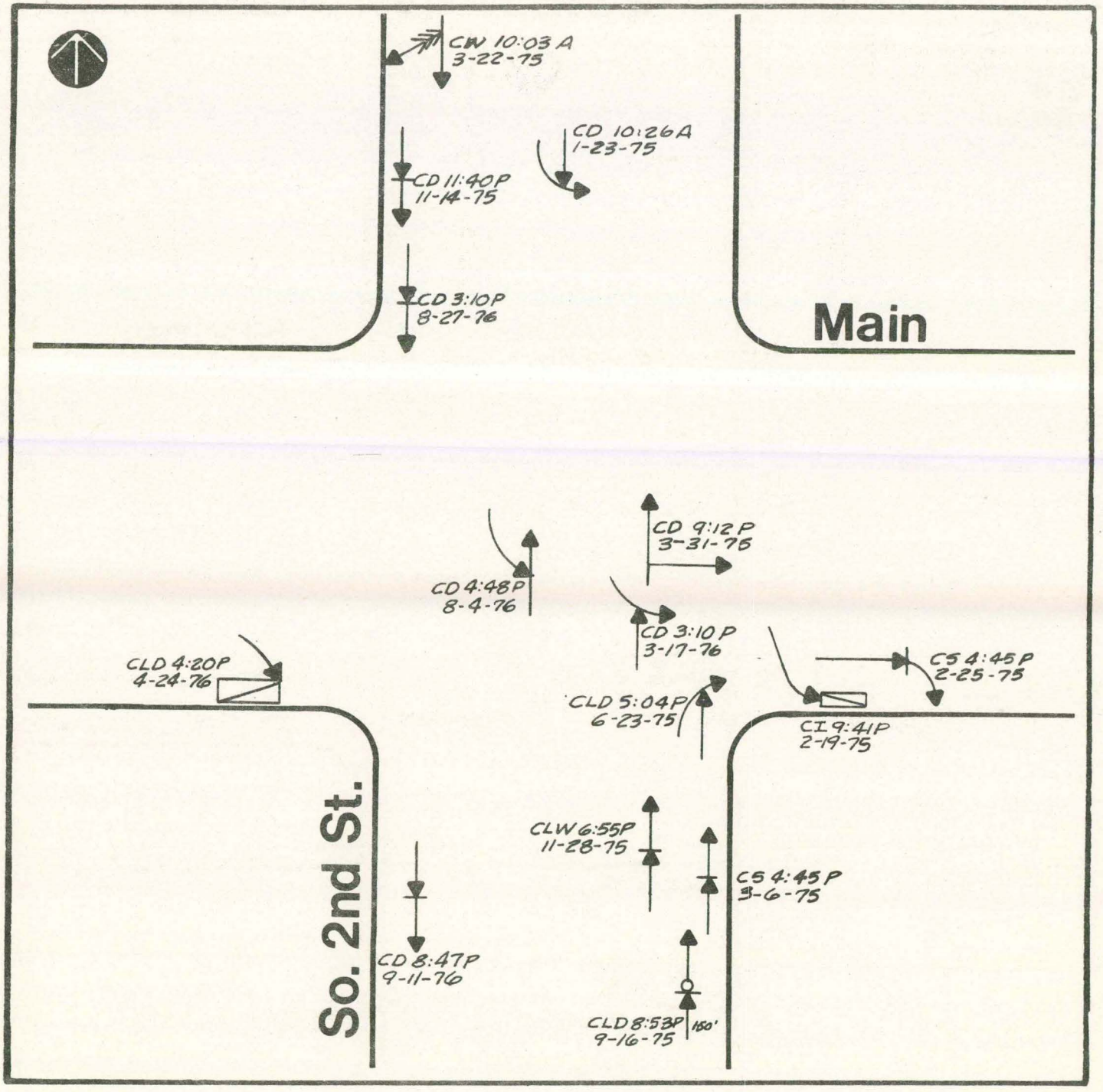

Accident Collision Diagram

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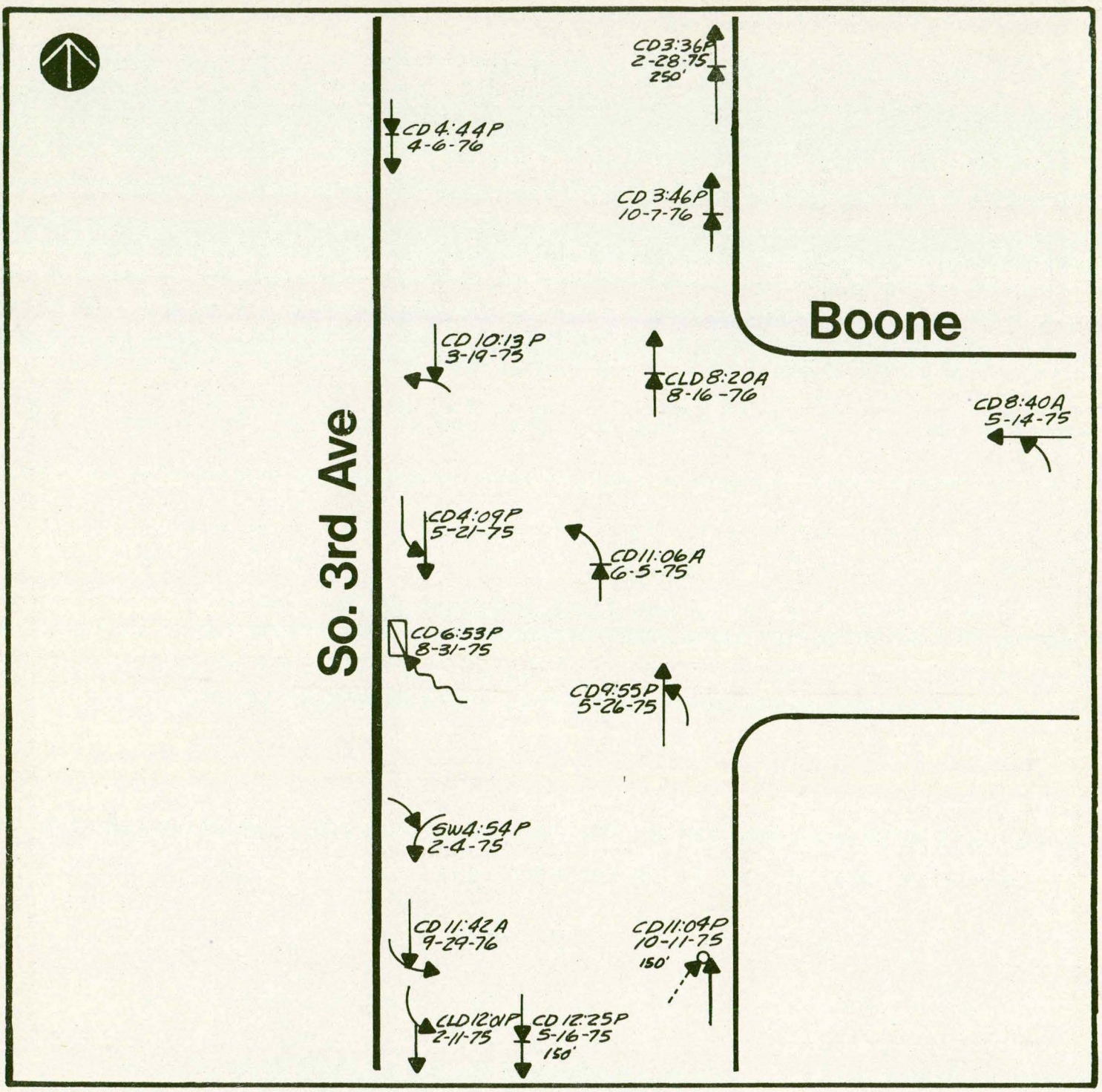

Accident Collision Diagram

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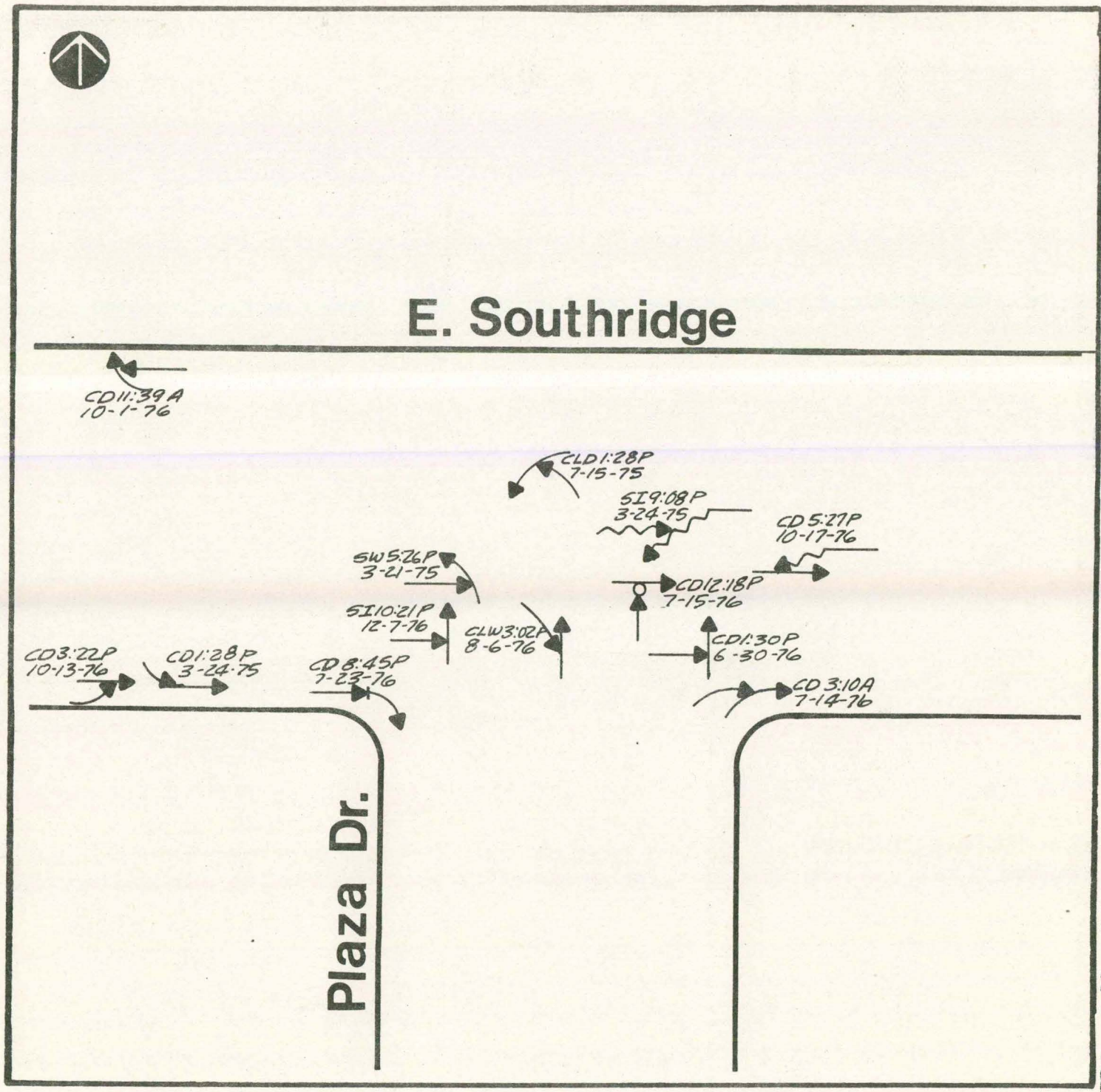
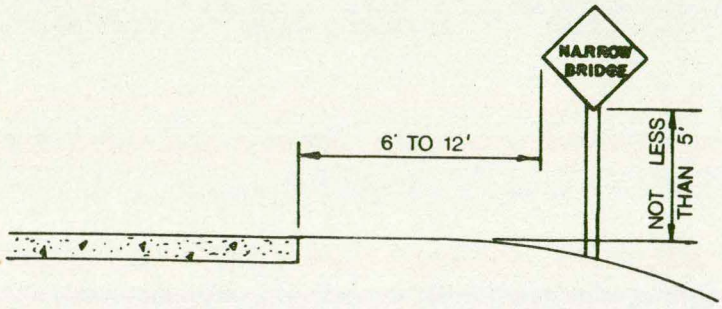
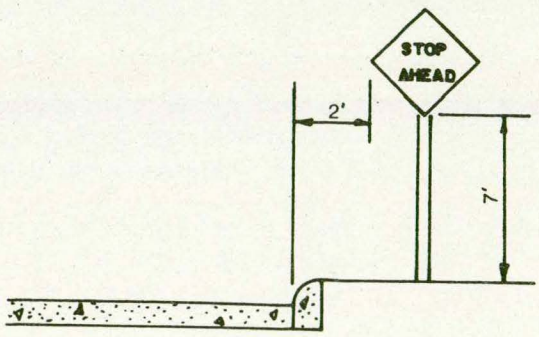


Accident Collision Diagram

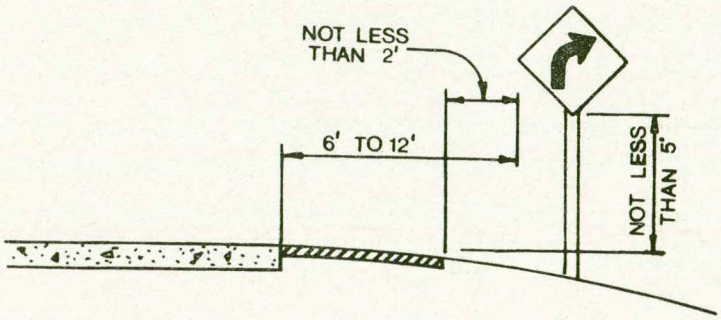
MARSHALLTOWN, IOWA



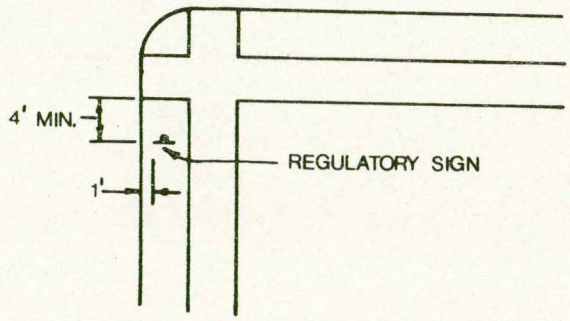
rural section



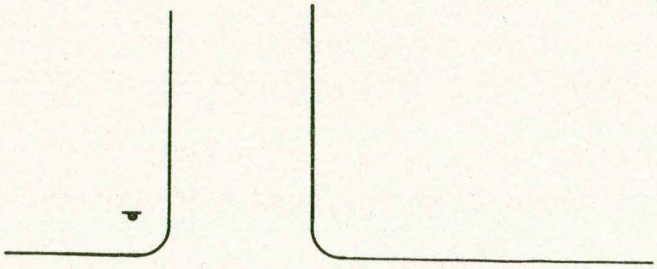
urban section

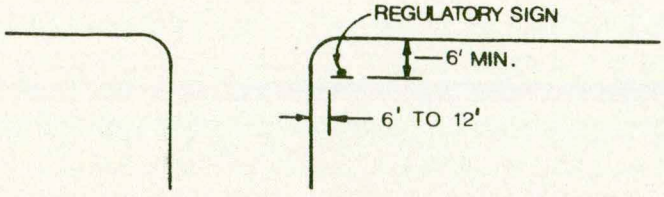


rural section



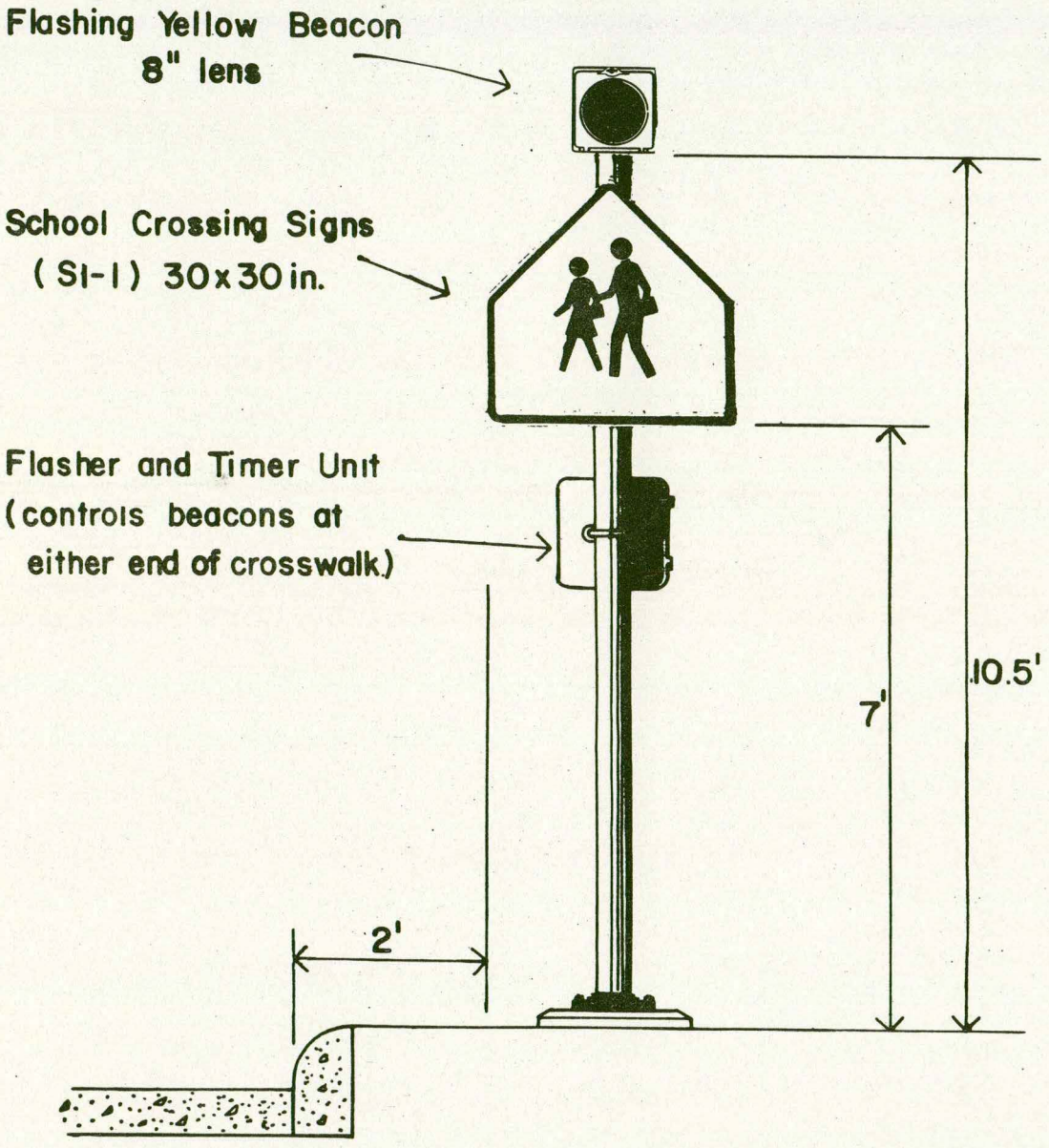
urban intersection





rural intersection

Sign Placement



School Crossing Sign with Beacon

South Center and Anson Alternative

The magnitude of the problem at Center and Anson dictated a more detailed investigation of alternatives than at other locations. In this investigation many types of improvements were considered including, special signalization, the prohibition of turns, the construction of auxiliary lanes, and the creation of reversible lanes. Alternatives requiring reconstruction or a major expenditure were rejected in consideration of the proposed Highway 14 Bypass. The Consultant strongly recommends that the Bypass be actively promoted as the only means to eliminate the real problem caused by the high traffic volumes.

The improvements presented in Chapter 5 are recommended as a least cost, first attempt toward the reduction of accidents and are not intended to improve traffic service.

A second alternative is presented below which is intended to reduce accidents and provide an improvement in traffic service. These improvements are not without cost, however, and will require a reduction in access due to the prohibition of turns from the south approach. This movement is extremely light comprising less than .9 of one percent of the total daily traffic. These turns can be accommodated via left turns at South Street and High Street or by a right turn at High Street and two left turns at 1st Avenue and Anson.

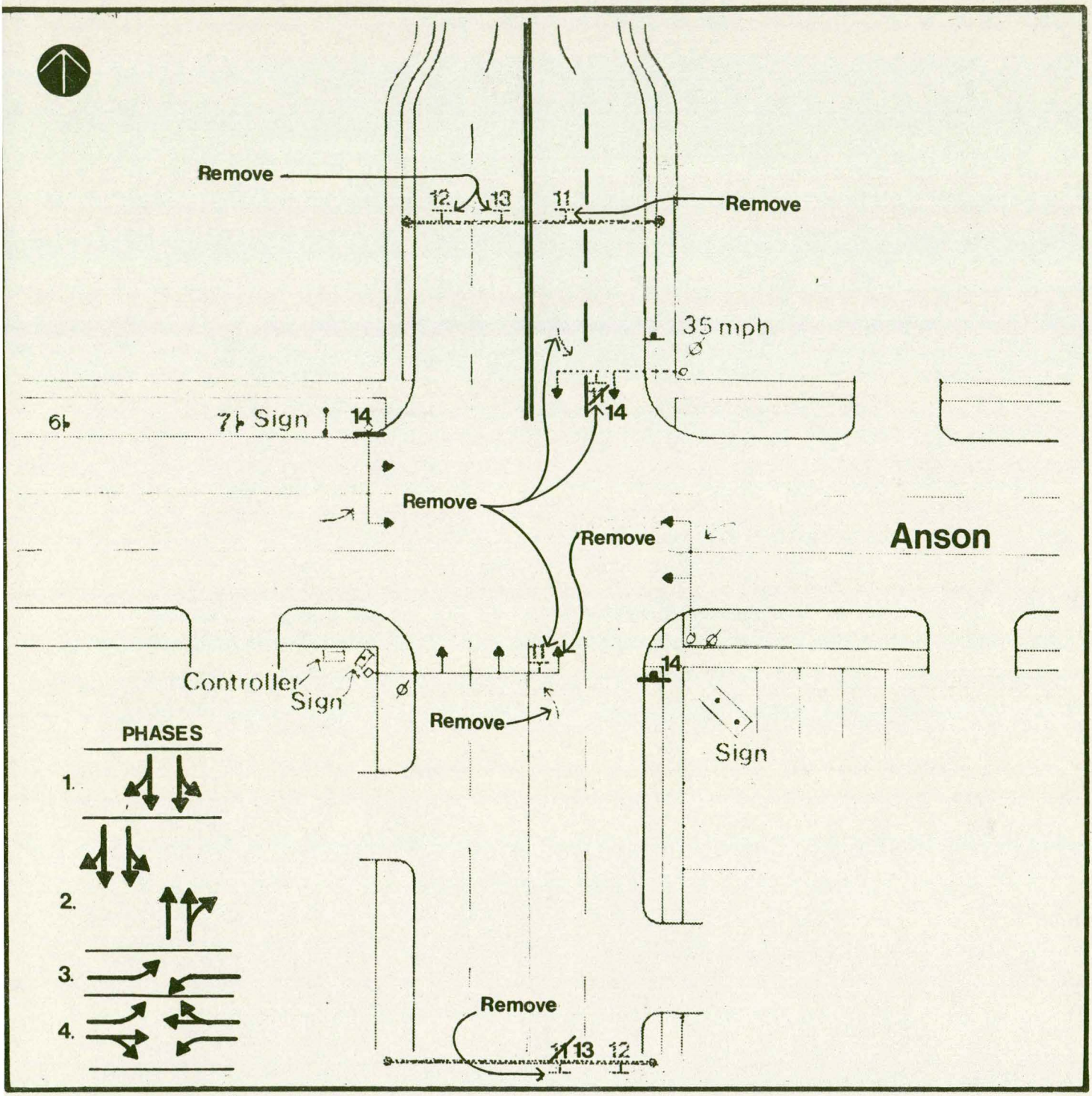
1. The Center Street viaduct should be striped as a three-lane facility with lane width of 12.5', 11.0' and 12.5'. The center and east lane should be designated as northbound.

2. Left turn should be prohibited from the south approach and the center lane should be designated through only.

3. Lane striping and signal modifications should be made as shown on Page A-31.

4. Signal timing for this alternative should be 4-phase with a maximum background cycle length of 90 seconds.

Phase I	Southbound - All movements	11%
Phase II	North and southbound - All movements	52%
Phase III	East-west - Left turns	16%
Phase IV	East-west - All movements	21%



So. Center & Anson

1 STOP	2	3 NO LEFT TURN	4 KEEP RIGHT	5 SPEED LIMIT 25	6 NO PARKING HERE TO CORNER
7 NO PARKING ANY TIME	8 NO PARKING (MISC)	9 DO NOT ENTER	10 ONE WAY	11 ONLY	12
13 ONLY	14 NO RIGHT TURN	15	16	17	18

MARSHALLTOWN, IOWA

References

1. Traffic Engineering Handbook, Institute of Traffic Engineers, Washington, D.C., 1965.

2. Manual on Uniform Traffic Control Devices, Department of Transportation, Federal Highway Administration, 1971.

3. Official Rulings on Requests (For Interpretations, Changes, and Experimentations), Department of Transportation, Federal Highway Administration, November, 1971 through June, 1974.

4. Parking Principles, Transportation Research Board, Special Report 125, Washington, D.C., 1971.

5. Zoning, Parking, and Traffic, Eno Foundation for Transportation, Saugatuck, Connecticut, 1972.

6. Highway Capacity Manual - 1965, Transportation Research Board, Special Report 87, Washington, D.C., 1965.

7. Traffic Control Devices Handbook - An Operating Guide, Department of Transportation, Federal Highway Administration, 1975.