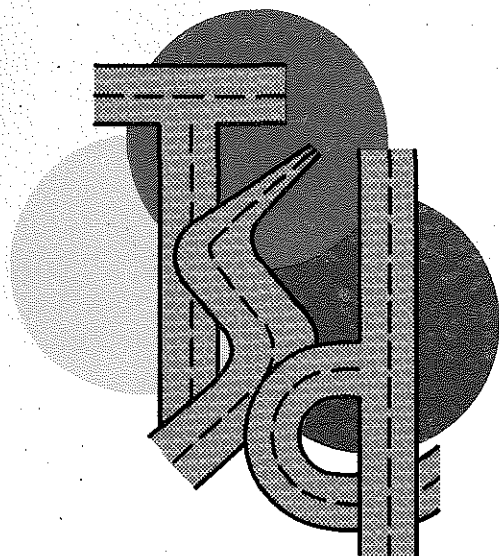


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A TRAFFIC ACCIDENT ANALYSIS
OF HIGH ACCIDENT LOCATIONS
IN LAPEER COUNTY

Report TSD-SS-134-70



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A TRAFFIC ACCIDENT ANALYSIS
OF HIGH ACCIDENT LOCATIONS
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by

ROBERT G. LARIVIERE

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Safety & Surveillance Section
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Bureau of Operations
Michigan Department of State Highways

in cooperation with
National Highway Safety Bureau
Department of Transportation

"The opinions, findings and conclusions expressed in this publication are those of the authors and not necessarily those of the National Highway Safety Bureau."

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Lapeer County Sheriff Department

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NHSB PROJECT #IS-69-3-001

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INTRODUCTION

The Highway Safety Act of 1966 was enacted by the Congress of the United States in order to promote highway safety programs. Subsequently, various highway safety standards were developed to assure the orderly implementation of the Act.

Highway Safety Standard 4.4.9, Identification and Surveillance of Accident Locations, is one of those standards. The purpose of Standard 4.4.9 is to identify specific locations or sections of streets and highways which have high or potentially high accident experience as a basis for establishing priorities for improvement, selective enforcement or other operational practices that will eliminate or reduce the hazards at the location so identified.

The State of Michigan carries out a program of this type on the state trunkline system; however, many of the State's city and county agencies lack the financial and technical prerequisites necessary to pursue similar programs with similarly defined objectives. To insure that this additional Highway Safety Standard is met and to improve the overall evaluation of the accident picture in Michigan, the Michigan Department of State Highways requested and received through the Office of Highway Safety Planning in the Executive Office of the Governor

a federally funded project entitled, "Traffic Accident Analysis for Cities and Counties". The intent of this new project is to provide a special traffic engineering field service for cities and counties. In cooperation with participating cities and counties, the proposed service under the direction of Department personnel will make a traffic engineering evaluation of the factors causing traffic accidents and will recommend corrections to those conditions which may be contributing to accidents.

SCOPE

The intent of this program is to improve traffic safety on all Michigan streets and roads by expanding the traffic engineering evaluation of factors causing accidents. This should be accomplished by conducting traffic accident analysis of locations which experience high accident frequencies, and summarizing recommendations for corrective action.

STUDY PROCEDURES

The study procedures for the subject project involve several distinct phases. They may be described as follows: basic data collection, identifying and locating high accident locations, an accident analysis of these high accident locations, technical evaluation of previously compiled facts and consequent remedial recommendations.

Since a portion of the data collection phase involves accident records and reports, and since the Michigan Department of State Police is responsible for keeping all accident records in Michigan, the task of identifying and locating high accident locations in Lapeer County (and providing an inventory of those locations) was designated as State Police responsibility. Because of the lack of a modern or automatic system of locating accidents on the county road system, the high accident locations for Lapeer County were determined by manually extracting and compiling those locations with the highest number of accidents from the 1968 county accident reports. From this list the 19 highest accident locations were selected. Once the problem locations were identified, additional accident information for the years 1966, 1967 and 1969 was compiled in order to expand the accident base at each location. Upon completion of this portion of the data collection, the Department of State Police documented and transmitted to the Traffic and Safety Division of the Department of State Highways a list, along with the accident reports, of the high accident locations for Lapeer County.

The second portion of the data collection phase, which is the responsibility of the Department of State Highways, involves data collection utilizing the following basic steps: 1) preparation of collision diagrams, and if necessary, physical condition diagrams for each

selected location, 2) obtaining traffic counts where necessary.

The accident analysis phase involves the analysis of the summarized facts and field data from the viewpoint of a highway traffic engineer with special attention focused on the effect which the highway environment may have had on the accident. Thus, at each high accident location, individual accident reports were reviewed in detail and the accident factors were tabulated and grouped in various tables. Collision diagrams were prepared for each location in order to identify accident patterns and to locate the accident in relation to the intersection or approaches to the intersection.

The traffic engineering analysis phase involves evaluating the summarized facts and field data and prescribing the proper remedial treatment.

STUDY AREA

Lapeer County is located in southeastern Michigan and is bordered by Genesee County on the west, Tuscola County on the north, St. Clair County on the east and Oakland County on the south (see Figure 1, following page). Lapeer County has a land area of 657 sq. miles and a water area of 3 sq. miles. Its 1965 population per sq. mile was 67.9. Lapeer is the county's largest city and is the center of an important agricultural and milk producing area. Lapeer County is second in

the State of Michigan in value of dairy products sold per farm. Lapeer County's location on the emerging secondary trade linkage between Flint and Port Huron will be important to the county's future development. Its regional highways and major thoroughfares, airports and railroad facilities place the county in the direct path of industrial and consumer markets.

Lapeer County's population will continue to develop at a deliberate pace as can be seen by the population projection in Figure 2. By 1990 the population growth will be steady but substantial and will come about as pleasant residential development. Development patterns are strongest on the west leading to and from Flint. By 1990 the southern and western townships of Lapeer County will be the most densely developed. Large residential developments will appear for the workers who continue, in the majority, to work outside the county.

Overall, Lapeer County economically may be characterized by a rural and agricultural way of life. Agriculture and related activity is big business in Lapeer County. Seventy-six point five percent of all its land was delegated to farm use in 1954. During the next 10 years, this figure decreased to 69.4%. By 1990 various types of development will be experienced in the county on land presently classified as agricultural. The impact of future develop-

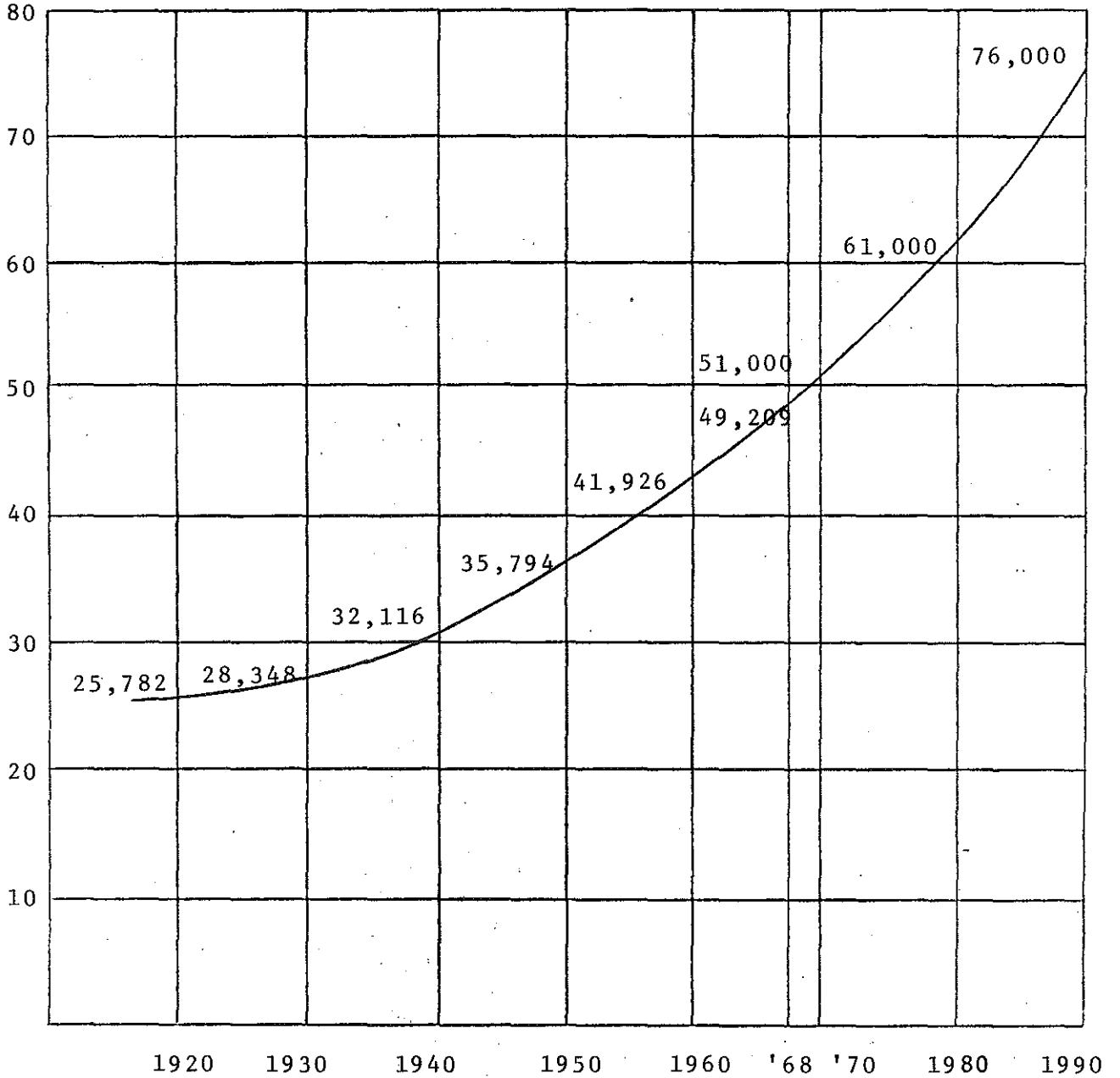
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Figure 2

POPULATION PROJECTION

Lapeer County: 1950 to 1990

Population, Thousands



Sources: U.S. Decennial Censuses, 1920-1960; Parkins, Rogers & Associates, Inc., projections.

ment will be reflected in decreases in the agricultural land use categories. Lapeer County farms are becoming fewer and growing larger which reflects the national trend.

Urbanization in Lapeer County is increasing. However, industrial incentives are still important to the economic future of Lapeer County if urbanization is to continue expanding. Lapeer County's labor force represents a rather stable and substantial 32% of the population. As the county grows, the percent of its labor force tends to rise as its population tends to rise. The economic activity for Lapeer County is shown in Table 1. The projection for 1990 indicates that manufacturing will make tremendous gains in the next 20 years. The county's industrial development will appear in the form of light manufacturing plants or in the form of major automotive related production facilities. The Detroit area will definitely have a great influence on Lapeer County's development by expanding growth corridors northerly.

According to the Eighteenth Annual Progress Report as compiled by the Local Government Division of the Michigan Department of State Highways, Lapeer County has 1,362.89 miles of highways. This figure does not include city and incorporated village streets and roads. It does include, however, 91.16 miles of state trunkline, 330.70 miles of county primary roads and 941.03 miles of local roads. Only




TABLE 1
 ECONOMIC ACTIVITY
 LAPEER COUNTY, 1950, 1960 and 1990*

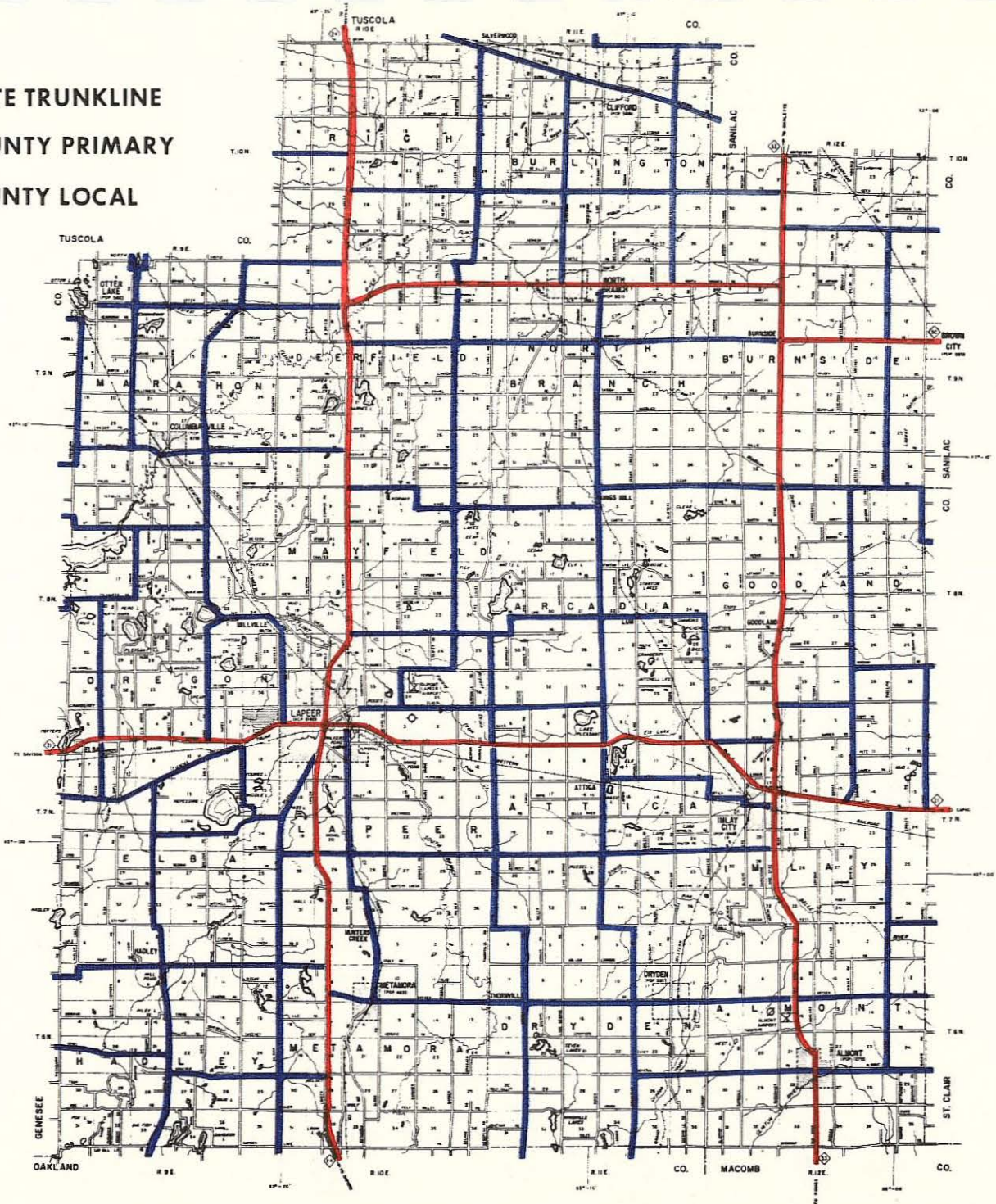
	1950	1960	Projected 1990
Population, Actual or Projected	35,794	41,926	76,000
Employed Labor Force			
Persons	11,315	13,308	28,000
% of Population	31.6	31.7	36.9
Agriculture			
Employment	3,310	2,045	1,120
Employment per 1,000 Population	92.3	48.8	14.7
% of Employed Labor Force	29.2	15.3	4.0
Manufacturing			
Employment	3,045	4,125	9,800
Employment per 1,000 Population	84.9	98.8	129.0
% of Employed Labor Force	26.9	31.0	35.0
Wholesale and Retail Trade			
Employment	1,570	2,120	4,250
Employment per 1,000 Population	43.9	50.7	56.0
% of Employed Labor Force	13.9	15.9	19.0
Partial Selected Services			
Employment	301	344	912
Employment per 1,000 Population	8.4	8.2	12.0
% of Employed Labor Force	2.7	2.6	3.3

*U.S. Bureau of the Census, County and City Data Book, 1956, A Statistical Abstract Supplement, (Washington: U.S. Government Printing Office, 1956). Selected Services figures have been adjusted; U.S. Bureau of the Census, County and City Data Book, 1962, A Statistical Abstract Supplement, (Washington: U.S. Government Printing Office, 1962); Projections made by Parkins, Rogers & Associates, Inc.

about 1/4 of the miles of county roads are hard surfaced while the remaining mileage is either gravel or unimproved dirt road (see Figure 3 following page).

Lapeer County's vehicle registrations have increased 22.5% over the past three years while the total number of accidents in the county has increased only 7.8%.

-  STATE TRUNKLINE
-  COUNTY PRIMARY
-  COUNTY LOCAL



KEY TO COUNTIES



Figure 3

LAPER COUNTY

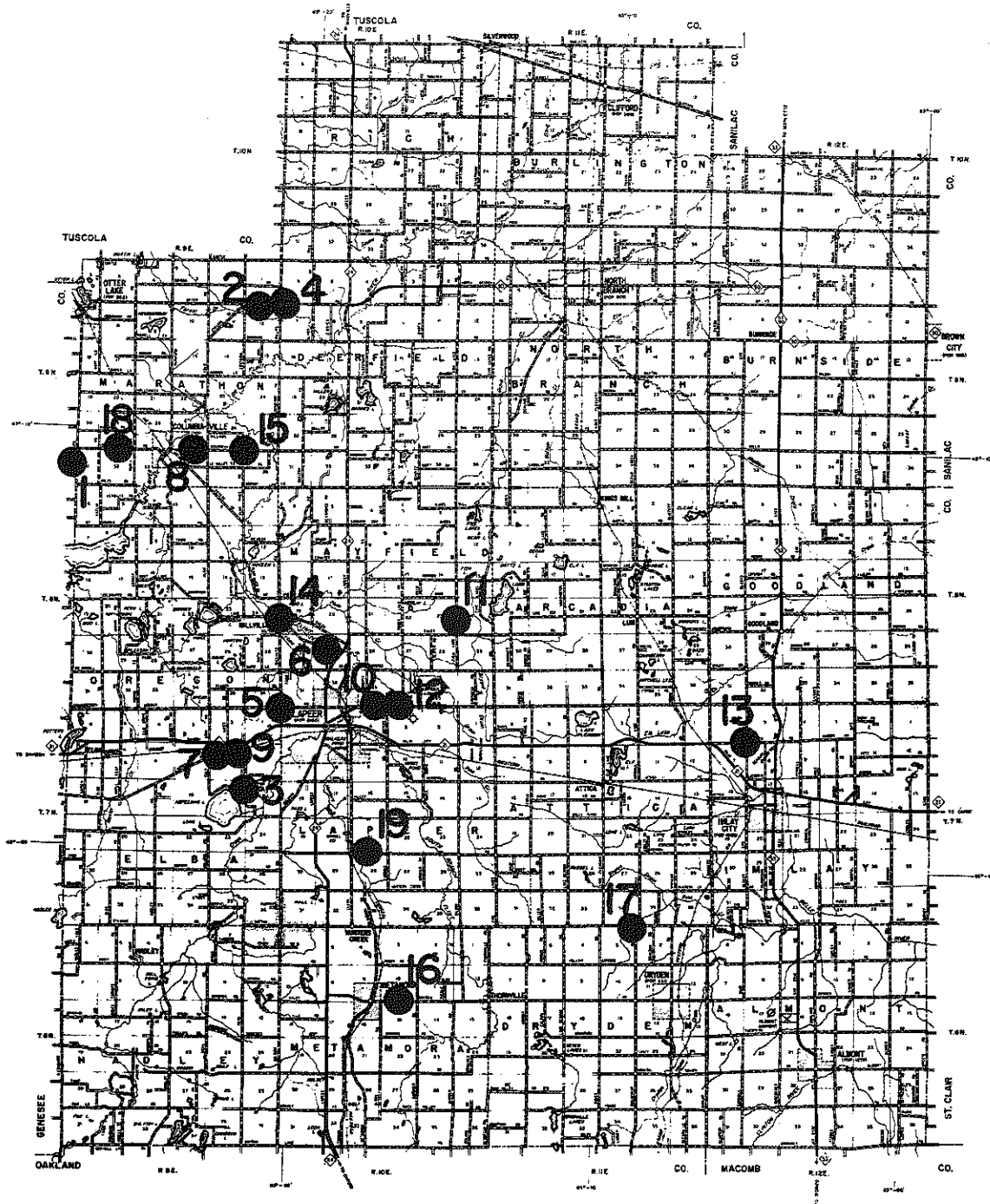
MICHIGAN
 STATE HIGHWAY COMMISSION
 DEPARTMENT OF STATE HIGHWAYS
 DATA OBTAINED FROM
 HIGHWAY PLANNING SURVEY
 CONDUCTED IN COOPERATION WITH
 U.S. DEPARTMENT OF TRANSPORTATION
 FEDERAL HIGHWAY ADMINISTRATION
 BUREAU OF PUBLIC ROADS



TRAFFIC ENGINEERING ANALYSIS

The accident data for Lapeer County shows 19 high accident locations (see spot map following page). After analyzing the data, it was apparent that no recommendations would be feasible for seven of these locations. Consequently, this report will discuss in detail only the remaining 12 locations. The collision diagrams and pictures for each of these will be found on the page following the discussion. The collision diagrams and pictures for the remaining seven locations are found in Appendix I.

SPOT MAP
FOR
HIGH ACCIDENT
LOCATIONS



- LEGEND**
- ROADS**
- UNIMPROVED ROAD
 - DISTRICT AND BRANCHED ROAD
 - SOIL SURFACED ROAD
 - GRAVEL OR SIMILAR ROAD
 - BITUMINOUS SURFACED ROAD
 - PAVED ROAD
 - DIVIDED HIGHWAY
 - DIVIDED HIGHWAY WITH FRONTAGE ROAD
- ROAD SYSTEM DESIGNATION**
- INTERSTATE HIGHWAY
 - UNITED STATES HIGHWAY
 - STATE HIGHWAY
- AIRPORTS**
- MILITARY AIRPORT (WITH FIELD LIGHTS AND AIR TOWER)
 - MILITARY AIRPORT (NO FIELD LIGHTS OR AIR TOWER)
 - CIVILIAN AIRPORT (COMMERCIAL OR MUNICIPAL)
 - UNIMPROVED AIRPORT (COMMERCIAL OR MUNICIPAL)
 - LANDING AREA OR STRIP
 - UNIMPROVED PRIVATE AIRFIELD
- RAILROADS**
- RAILROAD (ANY NUMBER TRACKS)
 - RAILROAD (ANY NUMBER TRACKS) USED BY SINGLE OPERATING COMPANY
 - RAILROAD (ANY NUMBER TRACKS) USED BY MORE THAN ONE OPERATING COMPANY OR STATE OR FEDERAL RIGHTS OF ONE TRAIL TRUCKING RIGHTS
 - RAILROAD STATION
 - RAILROAD CROSSING ROAD
 - RAILROAD BRIDGE ROAD
 - RAILROAD TUNNEL
- HIGHWAY SERVICES**
- GENERAL OVERPASS
 - GENERAL UNDERPASS
 - ARCH
 - TRESTLE OR GIRDERS
 - HIGHWAY BRIDGE
 - INTERCHANGE
 - INTERCHANGE SHOWING RAMP
- DRAINAGE**
- NARROW STREAM
 - WIDE STREAM (OVER 200 FT)
- NAVIGATION**
- FREE FERRY
 - TOLL FERRY
- DAMS**
- DAM WITH ROAD
 - DAM WITHOUT ROAD
- BOUNDARIES**
- NATIONAL BOUNDARY
 - COUNTY BOUNDARY
 - CITY BOUNDARY
 - CITY BOUNDARY (U.S. LINE)
 - SECTION LINE
- CITY AND VILLAGE**
- CITY CAPITAL
 - COUNTY SEAT
 - UNINCORPORATED COMMUNITIES
 - UNINCORPORATED CITY OR VILLAGE

GENERAL HIGHWAY MAP
LAPEER COUNTY

MICHIGAN
STATE HIGHWAY COMMISSION
DEPARTMENT OF STATE HIGHWAYS
DATA OBTAINED FROM
HIGHWAY PLANNING SURVEY
CONDUCTED IN COOPERATION WITH
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
BUREAU OF PUBLIC ROADS

SCALE 1" = 2 1/2 MILES
PUBLISHED 1957

Figure 4

1. Washburn Road at Dodge Road, Marathon Township

After studying this "T" intersection, a definite pattern became apparent. Out of the 20 accidents in the four-year period from 1966 to 1969, 19 of them happened at night. All 20 of these accidents occurred with the vehicles running off the end of Dodge Road. There were 13 accidents caused by excessive speed with six of these accidents occurring on wet pavement. This pattern suggests that the drivers are unable to realize in time that Dodge Road is a stop street, and that it also ends at Washburn Road.

The present traffic controls on Dodge Road consist of a stop ahead warning sign (W3-1-36, Appendix II, p. 100), a "T" intersection sign (W2-4-30, Appendix II, p. 99) and a stop sign (R1-1-30, Appendix II, p. 92). There is a bi-directional target arrow at the end of Dodge Road (W1-7-48, Appendix II, p. 98), plus stop signs for Washburn Road north and south.

Recommendation:

It seems from the data that the drivers need a more pronounced warning that they are approaching an intersection. We recommend use of lattice background (see Section C, p. 141, Warning Signs - Michigan Manual of Uniform Traffic Control Devices - Appendix II, p. 103) which would give greater emphasis to the stop ahead

sign. We further recommend lattice background be placed behind the bi-directional target arrow or the target arrow could be increased in size to a 96 in. x 48 in. arrow (see Section C, p. 89 of the Manual - Appendix II, p. 98).

Since seven out of the 20 accidents involved personal injury and 13 out of the 20 involved property damage, we recommend that a safe landing area be created at the end of Dodge Road. Presently the area behind the target arrow consists of an open ditch approximately two feet below the pavement. If this area were filled and break-away supports for the target arrow used, personal injury and property damage would be reduced considerably.

We further recommend that skidometer tests be made at this intersection since a sizeable number of the accidents occurred on wet pavement. This service is available from the Testing and Research Division of the Michigan Department of State Highways. Prior arrangement should be made with Mr. L. T. Oehler, Engineer in the Research Laboratory Section of the Testing and Research Division, who will schedule the test.

While discussing the accident locations with Mr. H. F. Bennett, Lapeer County Engineer, he advised us that this location is not totally under Lapeer County's jurisdiction but that Lapeer County handles the maintenance

on Washburn Road while Genesee County, under County Engineer Charles E. Wiles, has control of the signing on both Dodge Road and Washburn Road, as well as the maintenance on Dodge Road. Thus, a copy of this report will also be sent to Mr. Charles E. Wiles, and we suggest that the two county engineers discuss the recommendations.

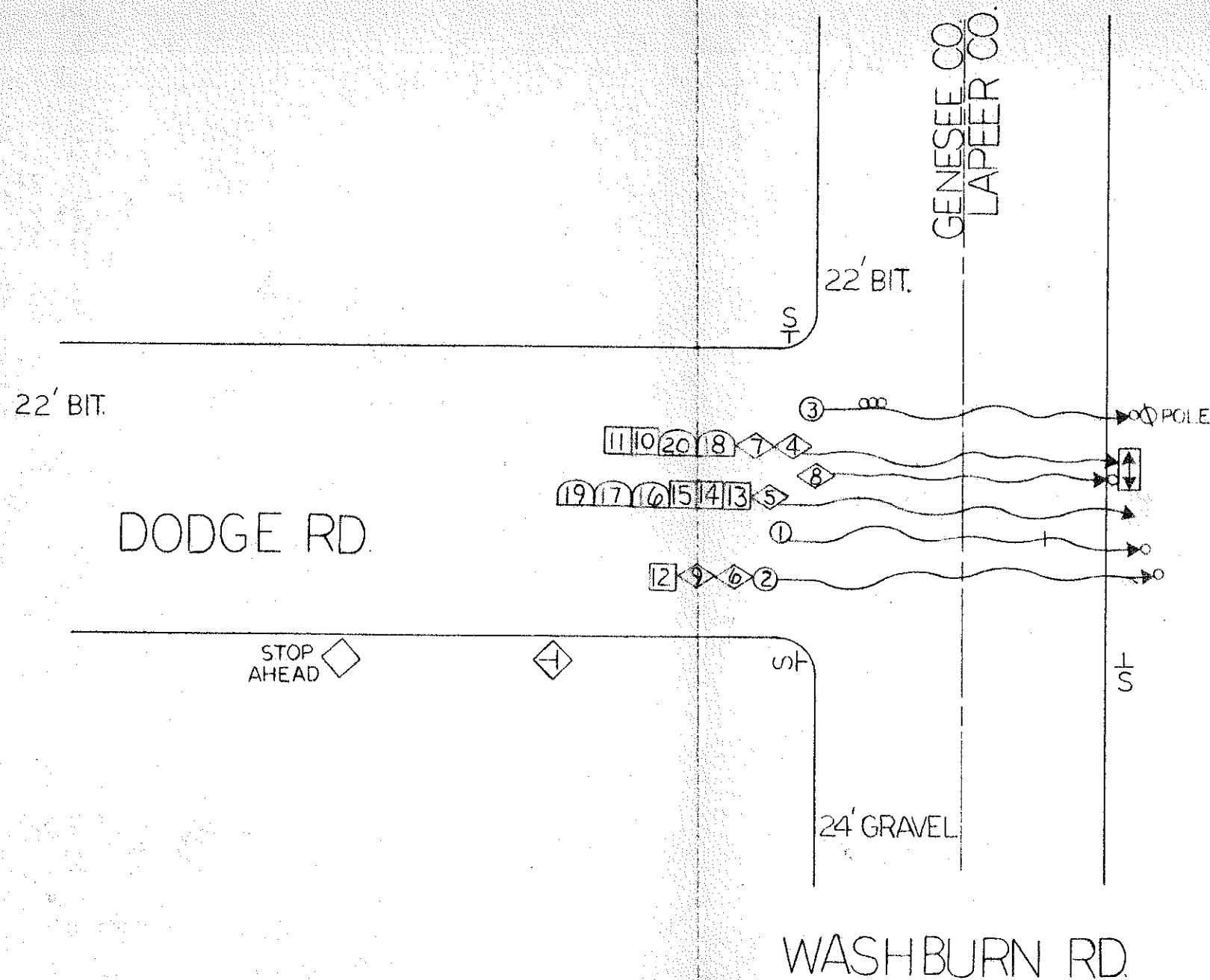


FIGURE 5

REMARKS	LEGEND	ACCIDENT STUDY COLLISION DIAGRAM	MICHIGAN DEPARTMENT OF STATE HIGHWAYS TRAFFIC AND SAFETY DIVISION
<p>○ 1966</p> <p>◇ 1967</p> <p>□ 1968</p> <p>◐ 1969</p>	<p>Stop & Go Signal Stop Sign S</p> <p>Flashing Beacon Yield Sign Y</p> <p>Fatal Pedestrian </p> <p>Injury Tree </p> <p>Skidding Out of Control </p> <p>Jackknife Driver Intent </p> <p>Overtaken Deer </p> <p>Backing Violator </p>	<p>Period: <u>1966 THRU 1969</u></p> <p>Accidents - Total <u>20</u></p> <p>P.D. <u>13</u> ADT _____</p> <p>Injury <u>7 (7)</u> Rate _____ /100 mvm</p> <p>Fatal <u>0 ()</u> Rate _____ / mv</p>	<p>Location WASHBURN RD. at DODGE RD.</p> <p>MARATHON TWP.</p> <p>LAPEER CO.</p> <p>C.S. _____ Miles _____</p> <p>Drawn <u>DVW</u> Date <u>1-22-70</u></p> <p>Plan No. _____ #1</p>



EASTBOUND
DODGE ROAD

NORTHBOUND
WASHBURN ROAD

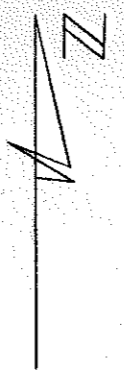


SOUTHBOUND
WASHBURN ROAD

2. Otter Lake Road, (F.A.S. 715), 0.3 to 0.5 miles west of Willits Road, Marathon Township

This location was the scene of 12 accidents during the study period. All 12 were on wet or icy roadway and were of the ran-off roadway type. Seven of the accidents were reportedly caused by high speeds. The accident experience at this location indicates the road surface became very slippery when wet. The problem associated with this portion of Otter Lake Road has probably been solved by new construction which consists of a two lane, 24 ft width bituminous surface on a new base, with five foot gravel shoulders. This construction was finished in November of 1969, and we suggest that the 1970 accident records be checked to determine its effect on the accident picture.

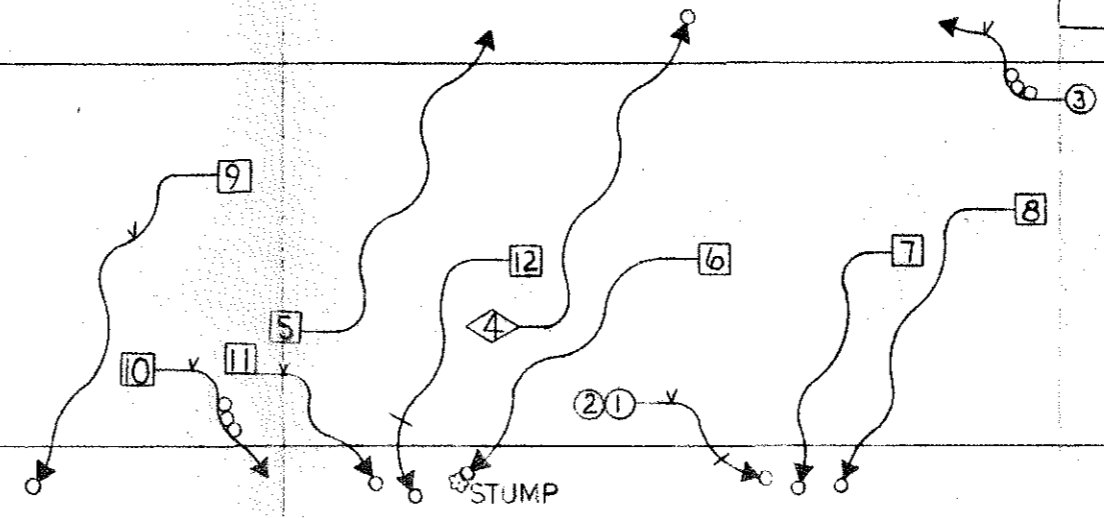
no Rec,



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24' BIT.

OTTER LAKE RD.



NOTE: FIELD INVESTIGATION TAKEN
AFTER RECONSTRUCTION.

FOSTORIA RD.

WILLITS RD.

FIGURE 6

REMARKS	LEGEND	ACCIDENT STUDY COLLISION DIAGRAM	MICHIGAN DEPARTMENT OF STATE HIGHWAYS TRAFFIC AND SAFETY DIVISION
<p>○ 1966</p> <p>◇ 1967</p> <p>□ 1968</p> <p>◐ 1969</p>	<p>Stop & Go Signal Stop Sign S</p> <p>Flashing Beacon Yield Sign Y</p> <p>Fatal Pedestrian (X)</p> <p>Injury Tree (X)</p> <p>Skidding Out of Control (X)</p> <p>Jackknife Driver Intent (V)</p> <p>Overturned Deer (V)</p> <p>Backing Violator (V)</p>	<p>Period: <u>1966 THRU 1969</u></p> <p>Accidents - Total <u>12</u></p> <p>P.D. <u>3</u> ADT _____</p> <p>Injury <u>9 (13)</u> Rate _____ /100 mvm</p> <p>Fatal <u>0 ()</u> Rate _____ / mv.</p>	<p>Location OTTER LAKE RD. 0.3 TO 0.5 MI. WEST OF WILLITS RD. MARATHON TWP. LAPEER CO.</p> <p>C.S. _____ Miles _____ Drawn <u>DVW</u> Date <u>1-23-70</u> Plan No. _____ # <u>2</u></p>



EASTBOUND
OTTER LAKE ROAD



WESTBOUND
OTTER LAKE ROAD

3. Lake Nepessing Road, (F.A.S. 1567), at Hunt Road, Elba Township

There were 12 accidents at this "T" intersection over the four-year study period. Six of these were of the ran-off roadway type, but only three of these occurred at the end of Hunt Road. Out of the 12 accidents, eight resulted in personal injury.

The traffic controls on Hunt Road consist of a stop ahead sign (W3-1-24, Appendix II, p.100), a stop sign (R1-1-24, Appendix II, p. 92) and a bi-directional target arrow (W1-7-48, Appendix II, p. 98) at the end of Hunt Road. Hunt Road approaching the intersection has a vertical alignment with a minus gradient which would make it difficult to stop when the roadway is slippery. The stop ahead warning sign, however, is located on that portion of the vertical alignment with a plus gradient which should give the operator time to begin slowing down before beginning his descent toward the intersection.

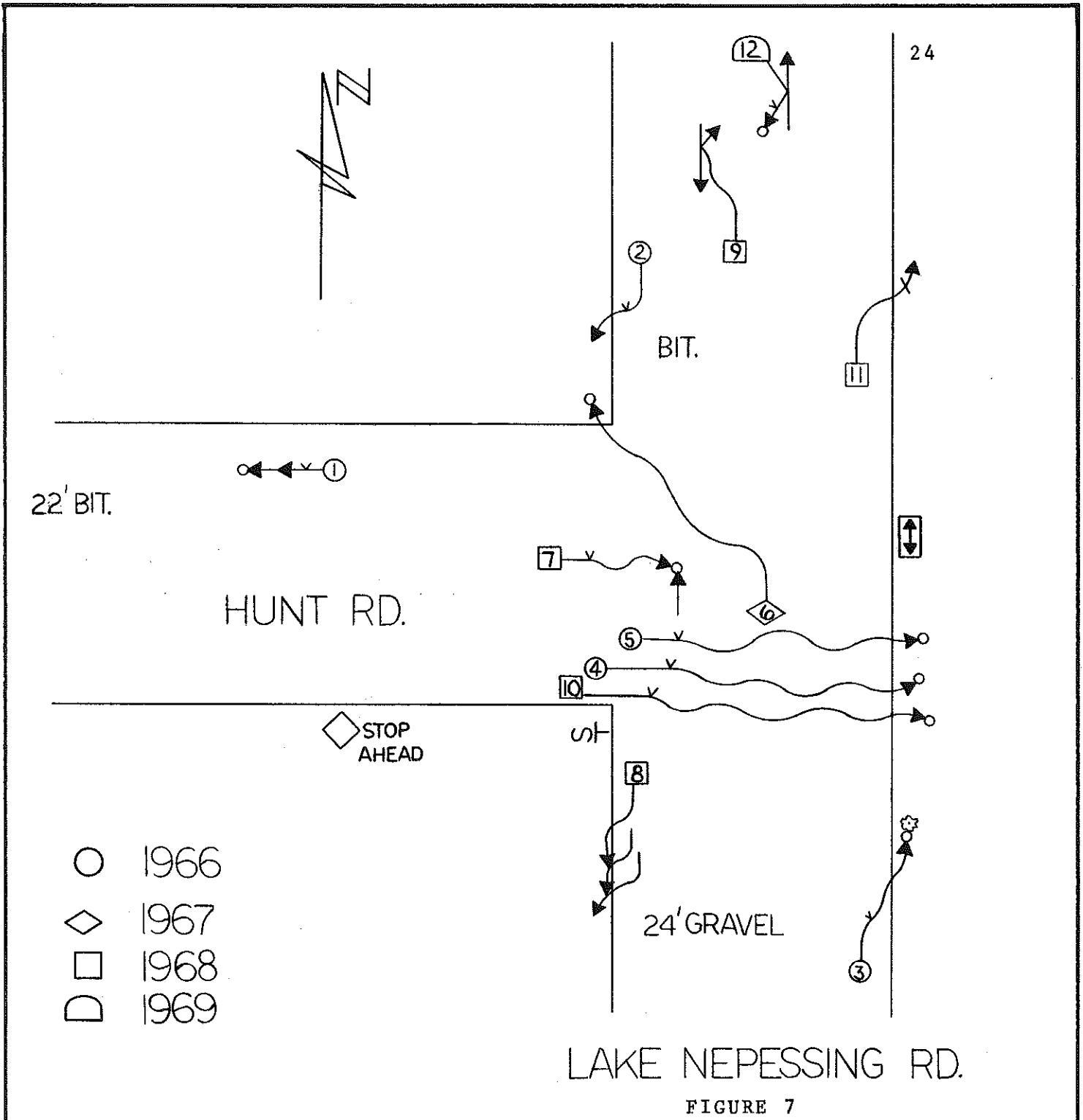
Recommendation:

We recommend lattice background (see Section C, p. 141, Warning Signs - Appendix II, p.103) be placed behind the bi-directional target arrow at the end of Hunt Road or the target arrow could be increased in size to a 96 in. x 48 in. arrow (see Section C, p. 89 of the Manual - Appendix II, p.98). Either of these

improvements would make the target arrow more effective at night which is the time when the three ran-off roadway accidents occurred. Since all three of these accidents resulted in personal injury, we recommend that a safe landing area be provided in the area behind the target arrow. Removal of the trees at the end of Hunt Road should be included in creating the safe landing area.

Also the stop ahead warning sign on Hunt Road should be increased in size to a W-1-30 (see Appendix II, p.100) so that the sign will conform to the minimum size in the Michigan Manual of Uniform Traffic Control Devices.

In our discussion with Mr. Bennett, he pointed out that Lake Nepessing Road will be in line for reconstruction after the completion this Fall of M-21 from the Lapeer County line to M-24.

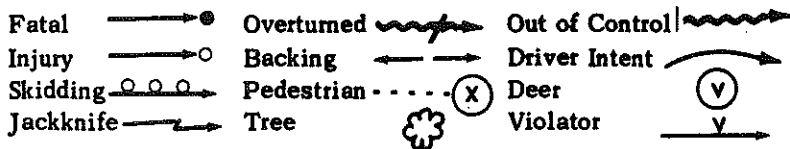
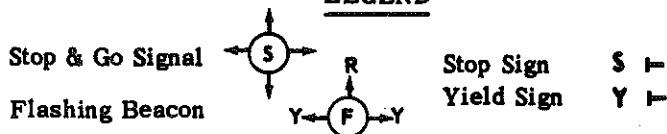


LAKE NEPESSING RD.

FIGURE 7

MICHIGAN DEPARTMENT OF STATE HIGHWAYS
Traffic Division

LEGEND



ACCIDENT STUDY
COLLISION DIAGRAM

Period: 1966 THRU 1969
 ELBA TWP. Description LAPEER CO.
 LAKE NEPESSING RD. at HUNT RD.
 Accidents - Total 12
 P.D. 4 Injury 8 (11.)
 Fatal 0 ()
 Acc. Rate/mv _____
 Acc. Rate/mvm _____
 C.S. _____ Miles _____
 Drawn DVW Date 1-23-70 Rev. _____
 Plan No. _____ # 3



EASTBOUND
HUNT ROAD



EASTBOUND
HUNT ROAD



SOUTHBOUND
LAKE NEPESSING ROAD



NORTHBOUND
LAKE NEPESSING ROAD

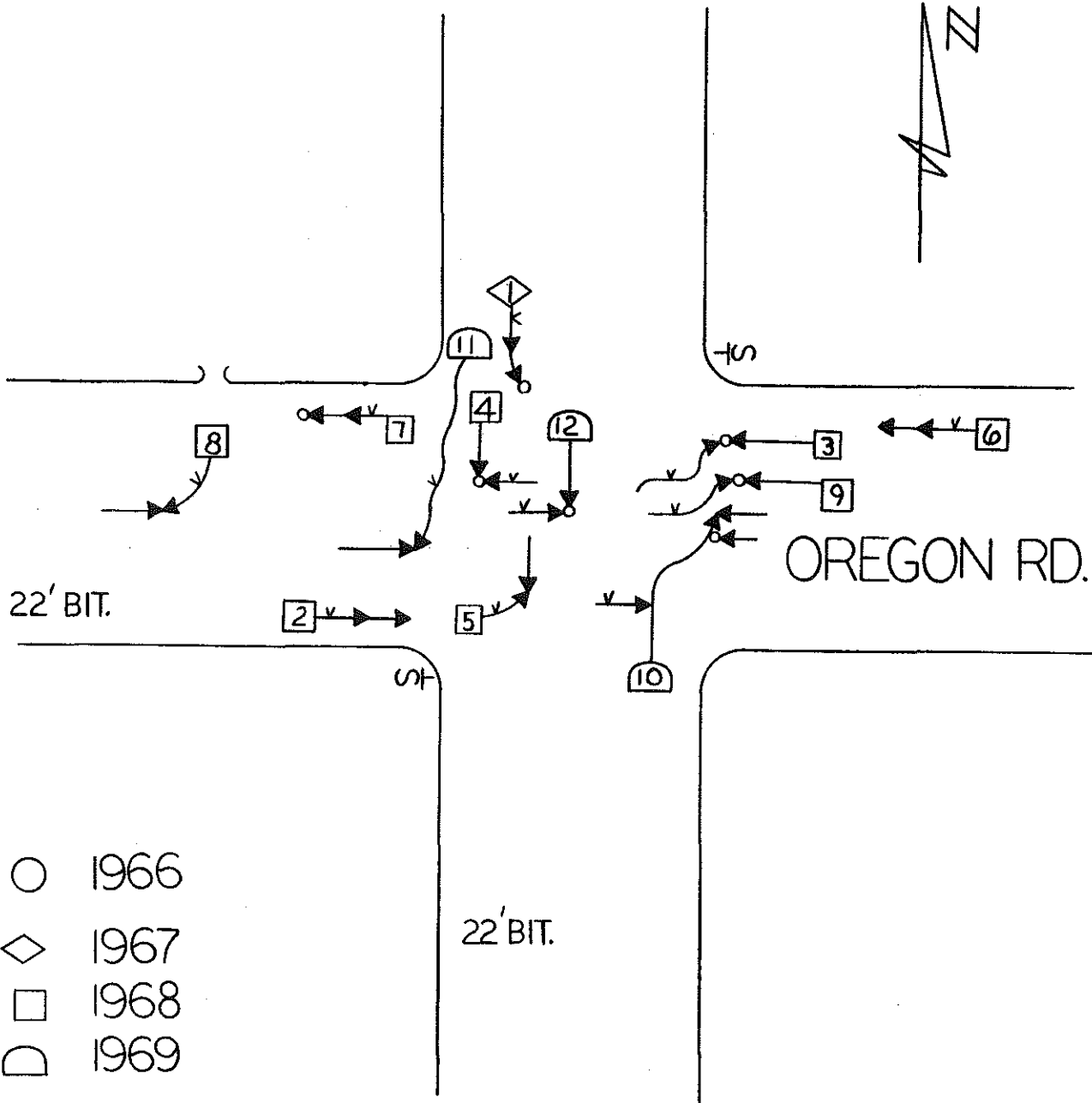
4. Millville Road, (F.A.S. 834), at Oregon Road, Oregon and Mayfield Townships

There were 12 accidents at this intersection during the four-year study period. Eight of these accidents occurred on dry pavement and nine occurred during the day. There were four right angle accidents, three of them involving either failure to yield the right of way or failure to stop at Millville Road.

Recommendation:

Even though the stop signs on Oregon Road are both visible, three vehicles still drove through the intersection and claimed in the accident reports that they did not see the stop signs. The traffic on both Millville and Oregon is quite heavy due to a high school located in the southeast quadrant. Thus, even though there were only three accidents of this type, we recommend that stop ahead warning signs (see Section C, p. 94 of the Manual, Appendix II, p. 100) be placed on Oregon Road both east and west of Millville Road.

MILLVILLE RD.

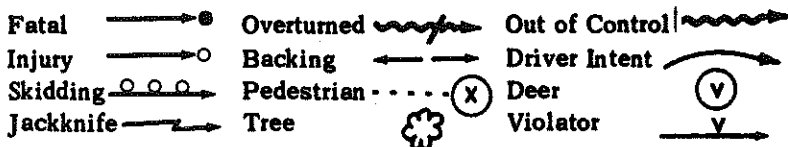
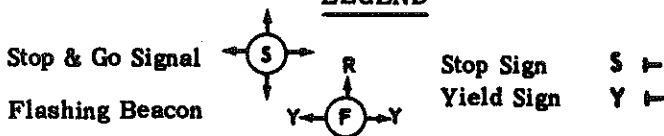


- 1966
- ◇ 1967
- 1968
- ◐ 1969

FIGURE 8

MICHIGAN DEPARTMENT OF STATE HIGHWAYS
Traffic Division

LEGEND



ACCIDENT STUDY COLLISION DIAGRAM

Period: 1966 TO 1969
OREGON & MAYFIELD TWP. Description LAPEER CO.
 MILLVILLE RD. at OREGON RD.
 Accidents - Total 12
 P.D. 5 Injury 7 (19)
 Fatal 0 ()
 Acc. Rate/mv _____
 Acc. Rate/mvm _____
 C.S. _____ Miles _____
 Drawn DVW Date 1-26-70 Rev. _____
 Plan No. _____ # 4



EASTBOUND
OREGON ROAD

SOUTHBOUND
MILLVILLE ROAD



WESTBOUND
OREGON ROAD

5. Mayfield Road at Angle Road, Mayfield Township

Mayfield Road at Angle Road is a "Y" shaped intersection. Angle Road merges with Mayfield Road on a curve. The through movement is from the west to the south and the south to the west. Mayfield Road north of Angle Road is gravel and traffic is required to stop for Angle Road. The curve is marked on both Angle Road and Mayfield Road by curve signs (W1-2-30, Appendix II, p. 96) with 25 mile per hour advisory speed panels.

The accident data for the intersection shows that 11 out of the 12 accidents during the study period were run-off roadway type. Nine of these involved speeds too high for the curve or too high for conditions.

Driving this curve at 25 miles per hour gives the driver an uncomfortable feeling. However, after using the Devil Level at this location, it was evident that the 25 mile per hour advisory speed panel is adequate for the curve. The Devil Level readings were as follows: (see Section C, pp. 132-133 of the Manual, Appendix II, p.101).

Speed	Readings	
	North to West	East to South
30	18°	18°
25	10°	12°
20	8°	10°

The uncomfortable feeling could be accounted for by the fact that the high part of the curve from Mayfield to

Angle Road is flat instead of superelevated.

Recommendations:

Due to the fact that the accidents were of the run-off roadway type and seven of them were at night, we feel that a target arrow should be placed in target position for the north to west traffic movement (see Section C, p. 88 of the Manual - Appendix II, p. 97) and that a 48 in. x 24 in. bi-directional target arrow (see Section C, p. 89 of the Manual - Appendix II, p. 98) should be placed at the end of Angle Road. We recommend lattice background (see Section C, p. 141 of the Manual - Appendix II, p. 103) accompany both target arrows.

A secondary problem at this location is the existence of a curve at an intersection with another road. The ultimate solution to the reduction of accidents is the reconstruction of the curve. We expect, however, that this type of work would have to be scheduled in advance for future construction. When reconstruction at this location is feasible, we recommend that the curve and the intersection be separated to eliminate the present situation where two potential problem spots (a curve and an intersection) exist at one location.

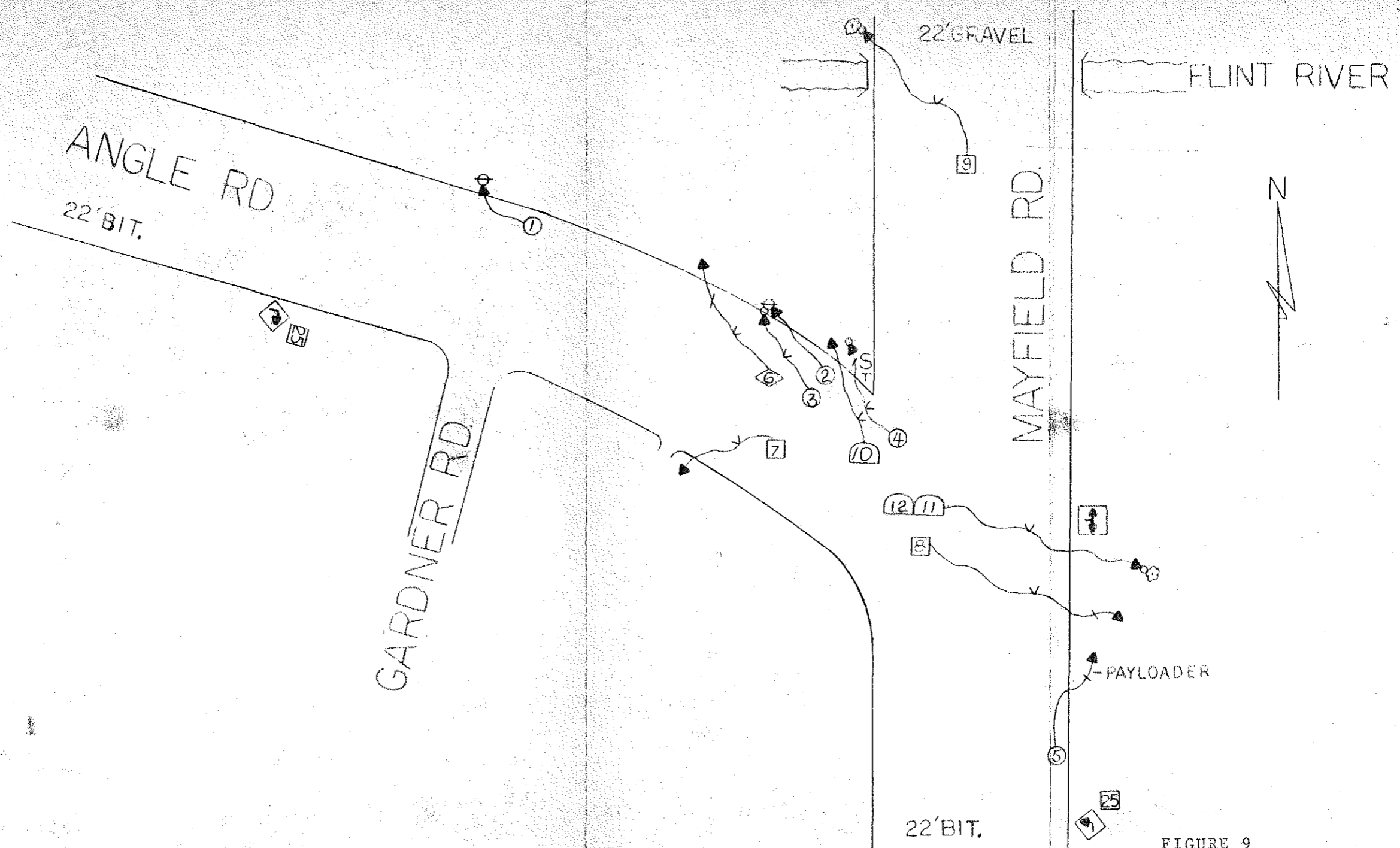


FIGURE 9

REMARKS	LEGEND		ACCIDENT STUDY COLLISION DIAGRAM		MICHIGAN DEPARTMENT OF STATE HIGHWAYS TRAFFIC AND SAFETY DIVISION	
	<p>○ 1966</p> <p>◇ 1967</p> <p>□ 1968</p> <p>◐ 1969</p>	<p>Stop & Go Signal </p> <p>Flashing Beacon </p> <p>Stop Sign </p> <p>Yield Sign </p> <p>Pedestrian </p> <p>Tree </p> <p>Out of Control </p> <p>Driver Intent </p> <p>Deer </p> <p>Violator </p>	<p>Period: <u>1966 THRU 1969</u></p> <p>Accidents - Total <u>12</u></p> <p>P.D. <u>7</u></p> <p>Injury <u>5 (7)</u></p> <p>Fatal <u>0 ()</u></p>	<p>ADT _____</p> <p>Rate _____ /100 mv</p> <p>Rate _____ / mv</p>	<p>Location <u>MAYFIELD RD AT ANGLE RD.</u> <u>MAYFIELD TWP.</u> <u>LAPEER CO.</u></p> <p>C.S. _____ Miles _____</p> <p>Drawn <u>D.V.W.</u> Date <u>1-26-70</u></p> <p>Plan No. _____ # <u>5</u></p>	



EASTBOUND
ANGLE ROAD



NORTHBOUND
MAYFIELD ROAD



SOUTHBOUND
MAYFIELD ROAD

6. Otter Lake Road, (F.A.S. 715), at Willits Road,
Marathon and Deerfield Townships

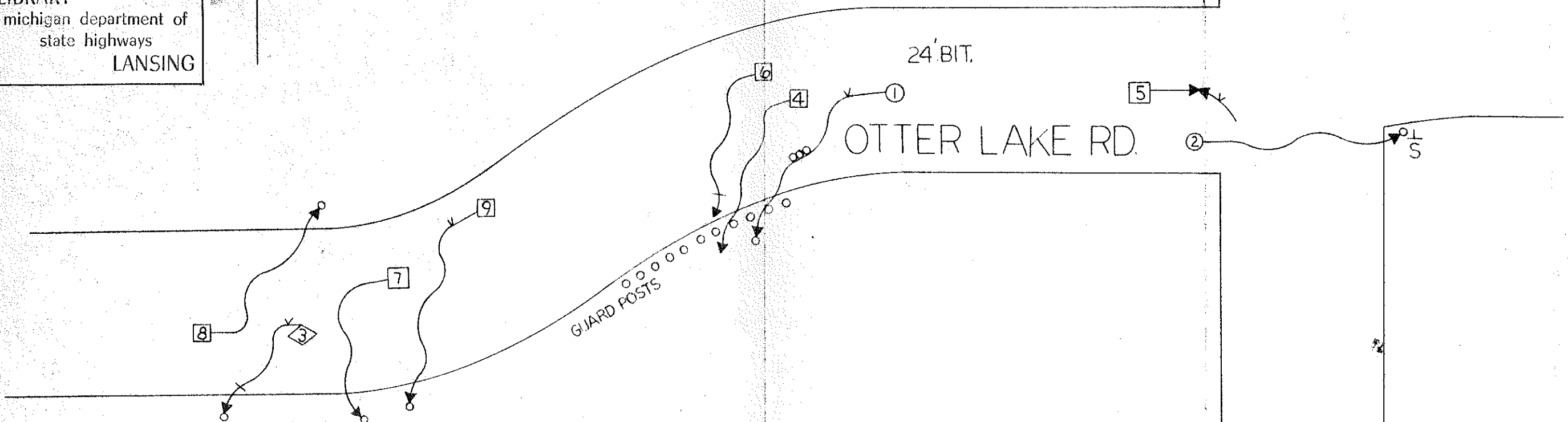
Eight of the nine accidents occurring at this location during the study period were ran-off roadway type. The alignment of Otter Lake Road consisted of a sharp, horizontal s-curve which apparently accounted for the ran-off roadway accidents. New construction, which was completed in November, 1969, relocated the curve to the south. The alignment now will accommodate a speed of 65 miles per hour without any noticeable discomfort to the driver. The new construction should eliminate the ran-off roadway type of accident at this location.

No Rec.

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state highways
LANSING







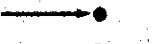

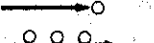

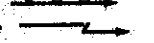



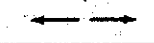



20' GRAVEL



NOTE: FIELD INVESTIGATION TAKEN
AFTER RECONSTRUCTION

WILLITS RD.

FIGURE 10

REMARKS	LEGEND	ACCIDENT STUDY COLLISION DIAGRAM	MICHIGAN DEPARTMENT OF STATE HIGHWAYS TRAFFIC AND SAFETY DIVISION
<p>○ 1966</p> <p>◇ 1967</p> <p>□ 1968</p> <p>◡</p>	<p>Stop & Go Signal  Stop Sign </p> <p>Flashing Beacon  Yield Sign </p> <p>Fatal  Pedestrian </p> <p>Injury  Tree </p> <p>Skidding  Out of Control </p> <p>Jackknife  Driver Intent </p> <p>Overtaken  Deer </p> <p>Backing  Violator </p>	<p>Period: <u>1966 THRU 1969</u></p> <p>Accidents - Total <u>9</u></p> <p>P.D. <u>3</u> ADT _____</p> <p>Injury <u>6 (11)</u> Rate _____ /100 mvm</p> <p>Fatal <u>0 ()</u> Rate _____ / mv</p>	<p>Location OTTER LAKE RD. at WILLITS RD.</p> <p>MARATHON & DEERFIELD TWP.</p> <p>LAPEER CO.</p> <p>C.S. _____ Miles _____</p> <p>Drawn <u>DVW</u> Date <u>1-23-70</u></p> <p>Plan No. _____ # <u>6</u></p>



EASTBOUND
OTTER LAKE ROAD



EASTBOUND
OTTER LAKE ROAD



WESTBOUND
OTTER LAKE ROAD

FIGURE 10a

7. Genesee Road, (F.A.S. 547), 0.3 to 0.5 miles east of Golf Road (see Appendix I, p. 73)

<u>Total</u>	<u>P.D.</u>	<u>Inj.</u>	<u>Fat.</u>
6	2	4	0

8. Columbiaville Road, (F.A.S. 87), 0.4 to 0.5 miles west of Klam Road, (see Appendix I, p. 76)

<u>Total</u>	<u>P.D.</u>	<u>Inj.</u>	<u>Fat.</u>
6	2	4	0

9. Genesee Road, (F.A.S. 547), 0.25 to 0.4 miles west of Lake Nepessing Road, Oregon Township

This curve was the scene of nine accidents during the four-year study period. Seven of these accidents involved running off the roadway and five occurred on snowy or icy pavement. Two of the motorists reported losing control of their vehicles when their tires dropped off the pavement onto the shoulders.

The present signing consists of curve warning signs (W1-2-30, Appendix II, p. 96) for both directions on Genesee Road. The warning sign for eastbound traffic has an accompanying 35 mile per hour speed panel.

Recommendation:

We recommend that 40 mile per hour speed panels

accompany the curve signs for eastbound and westbound Genesee Road traffic. The following Devil Level readings were recorded for the curve: (see Section C, pp. 132-133 of the Manual - Appendix II, p. 101)

Speed	Readings	
	East to North	South to West
40	8°	8°
35	6°	6°
30	4°	4°

Furthermore, due to the large number of ran-off roadway accidents, we feel that target arrows should be placed in target position for both directions of traffic (see Section C, p. 88 of the Manual, Appendix II, p. 97).

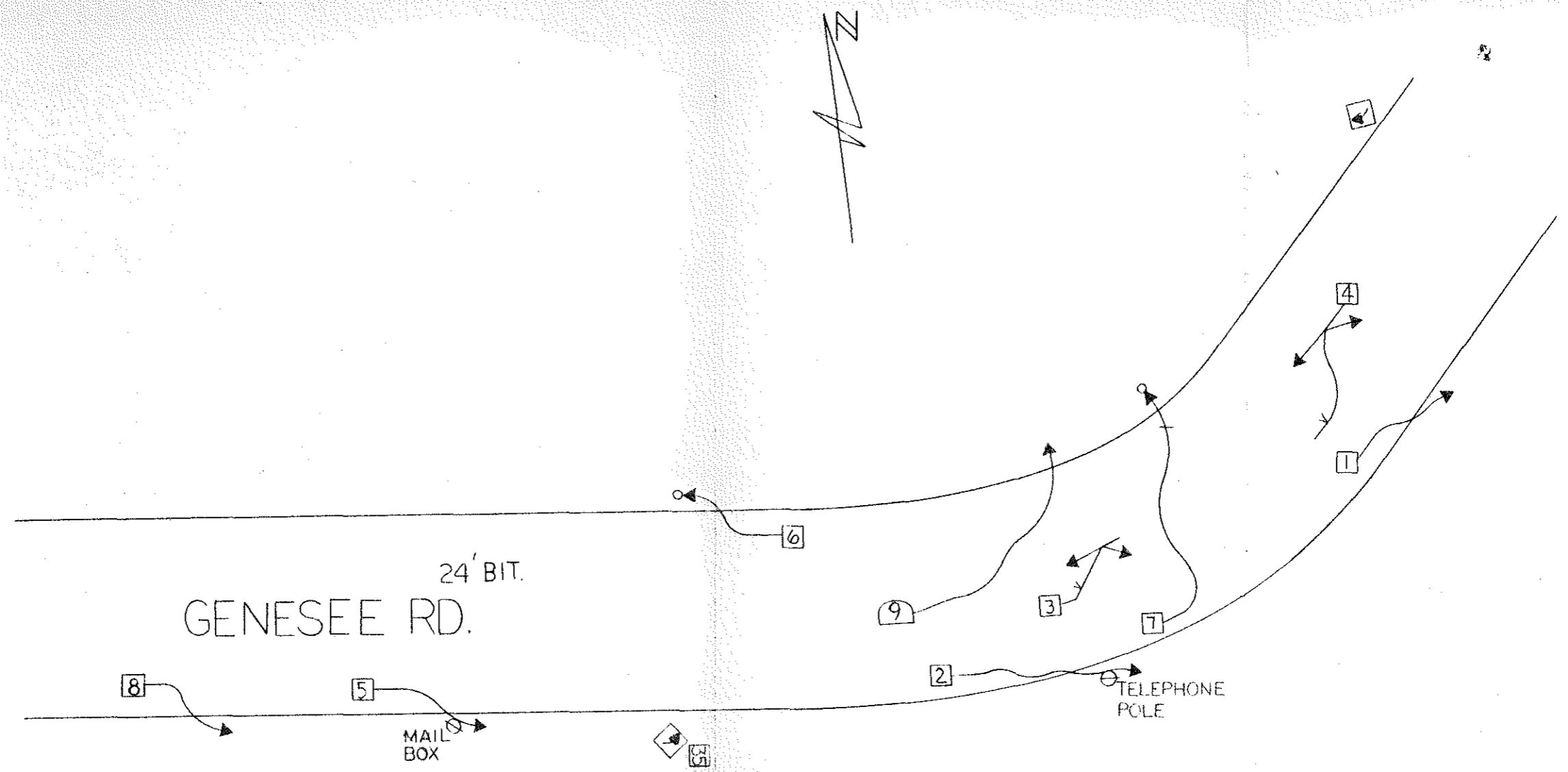


FIGURE 11

REMARKS	LEGEND	ACCIDENT STUDY COLLISION DIAGRAM	MICHIGAN DEPARTMENT OF STATE HIGHWAYS TRAFFIC AND SAFETY DIVISION
<p>○ 1966</p> <p>◇ 1967</p> <p>□ 1968</p> <p>◐ 1969</p>	<p>Stop & Go Signal Stop Sign S T</p> <p>Flashing Beacon Yield Sign Y T</p> <p>Fatal Pedestrian (X)</p> <p>Injury Tree </p> <p>Skidding Out of Control </p> <p>Jackknife Driver Intent </p> <p>Overtaken Deer </p> <p>Backing Violator </p>	<p>Period: 1966 THRU 1969</p> <p>Accidents - Total 9</p> <p>P.D. 7</p> <p>Injury 2 (3)</p> <p>Fatal 0 ()</p> <p>ADT _____</p> <p>Rate _____ /100 mvm</p> <p>Rate _____ / mv</p>	<p>Location GENESEE RD. 0.25 TO 0.4 MI. WEST OF LAKE NEPESSING RD.</p> <p>OREGON TWP. LAPEER CO.</p> <p>C.S. _____ Miles _____</p> <p>Drawn DVW Date 2-2-70</p> <p>Plan No. #9</p>



EASTBOUND
GENESEE ROAD



EASTBOUND
GENESEE ROAD



WESTBOUND
GENESEE ROAD

10. Bowers Road, (F.A.S. 1569), 0.1 to 0.25 miles east of Farnsworth (see Appendix I, p. 78)

<u>Total</u>	<u>P.D.</u>	<u>Inj.</u>	<u>Fat.</u>
6	5	1	0

11. Bowers Road, (F.A.S. 1569), 0.3 to 0.5 miles west of Roods Lake Road (see Appendix I, p.80)

<u>Total</u>	<u>P.D.</u>	<u>Inj.</u>	<u>Fat.</u>
6	2	4	0

12. Fish Lake Road, (F.A.S. 816), 0.25 to 0.3 miles north of Daley Road, Mayfield Township

This location experienced five accidents from 1966 to 1969. Four of the five accidents involved vehicles running off the roadway and resulted in personal injury to the occupants.

The roadway is in fair condition except for 100 feet of uneven pavement 1/2 mile north of Daley Road. The unevenness contributes materially to the ran-off roadway accidents. The deep ditches on each side of this stretch of roadway contribute to the accident severity when a vehicles leaves the roadway.

Recommendations:

We recommend that the 100 feet of uneven pavement be repaired.

DALEY RD.

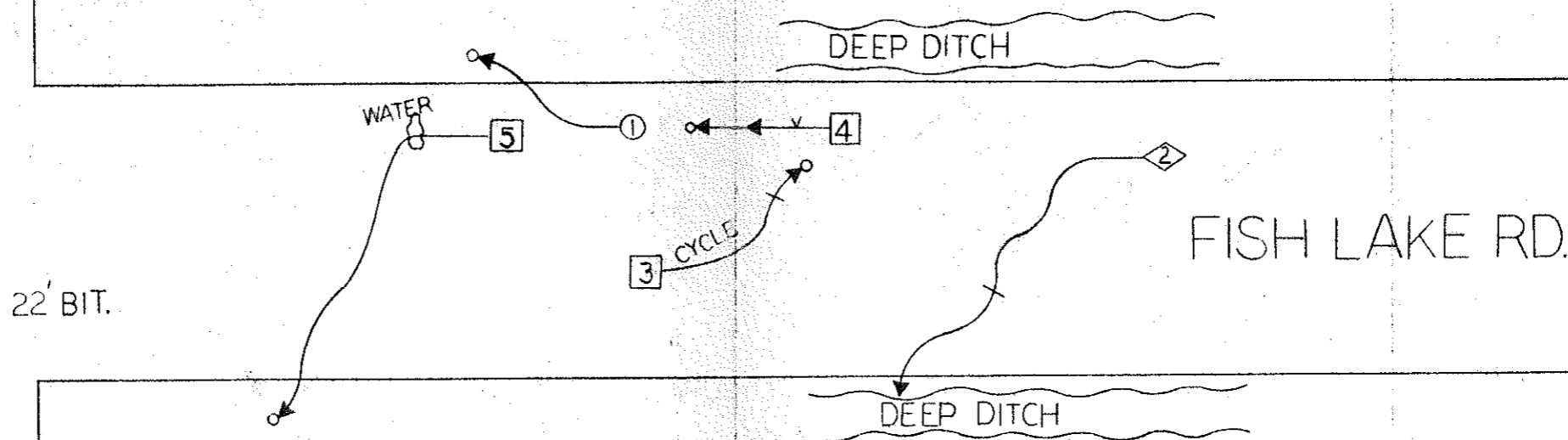
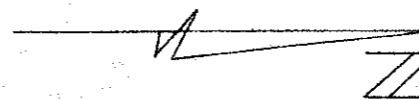


FIGURE 12

REMARKS	LEGEND	ACCIDENT STUDY COLLISION DIAGRAM	MICHIGAN DEPARTMENT OF STATE HIGHWAYS TRAFFIC AND SAFETY DIVISION
<p>○ 1966</p> <p>◇ 1967</p> <p>□ 1968</p> <p>◡ 1969</p>	<p>Stop & Go Signal Stop Sign S</p> <p>Flashing Beacon Yield Sign Y</p> <p>Fatal Pedestrian </p> <p>Injury Tree </p> <p>Skidding Out of Control </p> <p>Jackknife Driver Intent </p> <p>Overtaken Deer </p> <p>Backing Violator </p>	<p>Period: <u>1966 THRU 1969</u></p> <p>Accidents - Total <u>5</u></p> <p>P.D. <u>1</u> ADT _____</p> <p>Injury <u>4 (5)</u> Rate _____ /100 mv</p> <p>Fatal <u>0 ()</u> Rate _____ / mv</p>	<p>Location FISH LAKE RD. 0.25 TO 0.3 MI. NORTH OF DALEY RD. MAYFIELD TWP LAPEER CO.</p> <p>C.S. _____ Miles _____ Drawn <u>DVW</u> Date <u>2-3-70</u> Plan No. _____ #12</p>



NORTHBOUND
FISH LAKE ROAD



SOUTHBOUND
FISH LAKE ROAD

FIGURE 12a

13. Weyer Road, (F.A.S. 1416), at Blacks Corners Road, (see Appendix II, p. 83)

<u>Total</u>	<u>P.D.</u>	<u>Inj.</u>	<u>Fat.</u>
5	2	3	0

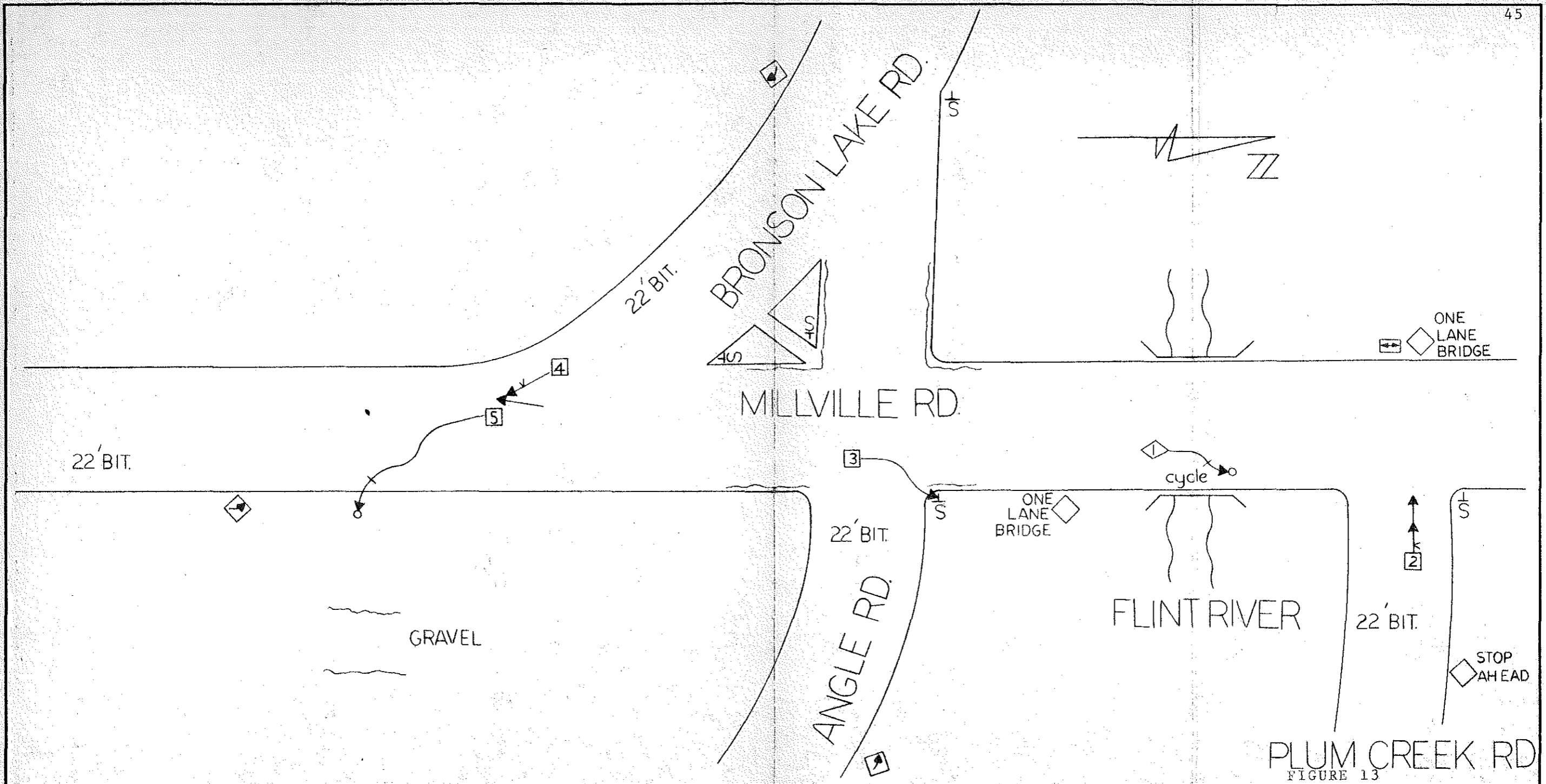
14. Millville Road, (F.A.S. 834), at Angle Road and Plum Creek Road, and Bronson Lake Road, Mayfield and Oregon Townships

This location had five accidents during the four-year study period. Two accidents occurred on the Bronson Lake Road curve which runs into Millville Road. This curve has curve warning signs (W1-2-30, Appendix II, p. 96) without advisory speed panels.

















Recommendations:

We recommend that 30 mile per hour advisory speed panels accompany the curve warning signs that appear on Bronson Lake Road and Millville Road (see Section C, p. 132 of the Manual - Appendix II, p.101). The Devil Level readings for this curve were as follows:

<u>Speed</u>	<u>Readings</u>	
	<u>North to West</u>	<u>East to South</u>
40	16°	18°
35	12°	14°
30	10°	10°



PLUM CREEK RD
FIGURE 13

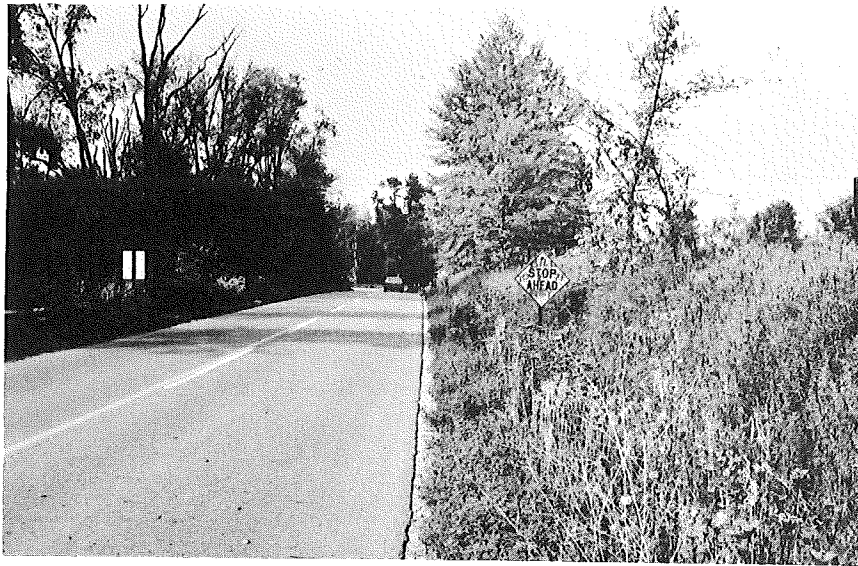
REMARKS	LEGEND	ACCIDENT STUDY COLLISION DIAGRAM	MICHIGAN DEPARTMENT OF STATE HIGHWAYS TRAFFIC AND SAFETY DIVISION
<p>○ 1966</p> <p>◇ 1967</p> <p>□ 1968</p> <p>◐ 1969</p>	<p>Stop & Go Signal  Stop Sign  S T</p> <p>Flashing Beacon  Yield Sign  Y T</p> <p>Fatal  Pedestrian  (X)</p> <p>Injury  Tree </p> <p>Skidding  Out of Control </p> <p>Jackknife  Driver Intent </p> <p>Overtaken  Deer </p> <p>Backing  Violator </p>	<p>Period: <u>1966 THRU 1969</u></p> <p>Accidents - Total <u>5</u></p> <p>P.D. <u>3</u> ADT _____</p> <p>Injury <u>2 (2)</u> Rate _____ /100 mvm</p> <p>Fatal <u>0 ()</u> Rate _____ / mv</p>	<p>Location MILLVILLE RD. at PLUM CREEK, ANGLE, & BRONSON LAKE RD. MAYFIELD & OREGON TWP. LAPEER CO.</p> <p>C.S. _____ Miles _____</p> <p>Drawn <u>DVW</u> Date <u>2-5-70</u></p> <p>Plan No. <u>#14</u></p>



EASTBOUND
BRONSON LAKE ROAD



SOUTHBOUND
BRONSON LAKE ROAD



WESTBOUND
PLUM CREEK ROAD

WESTBOUND
PLUM CREEK ROAD



SOUTHBOUND
MILLVILLE ROAD



WESTBOUND
ANGLE ROAD

WESTBOUND
ANGLE ROAD



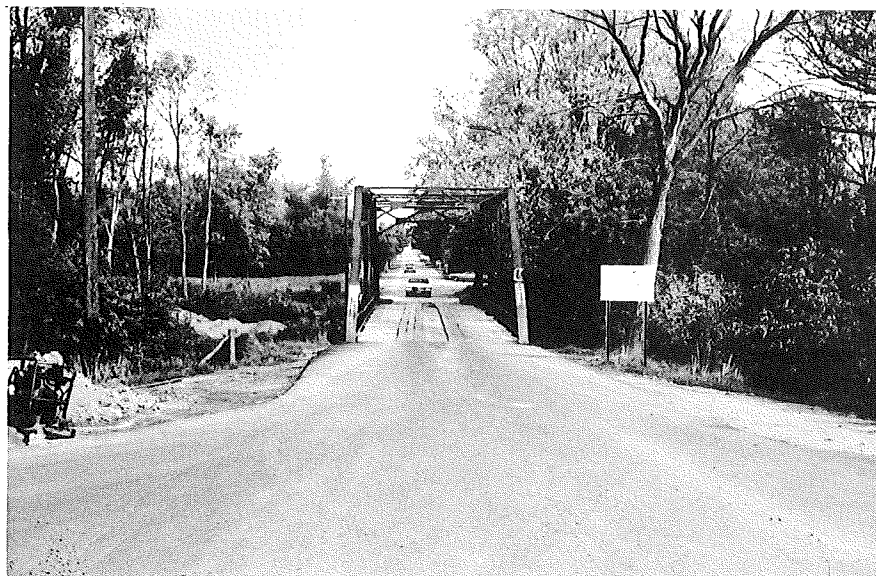
WESTBOUND
ANGLE ROAD





NORTHBOUND
MILLVILLE ROAD

NORTHBOUND
MILLVILLE ROAD



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state highways
LANSING

NORTHBOUND
MILLVILLE ROAD

15. Sutton Road at Rochester Road, (F.A.S. 128), Attica and Dryden Townships

This location experienced five ran-off roadway accidents during the four-year study period. Three of these accidents were caused by excessive speed, one by a defective tire and the fifth because the operator was reported to be asleep. The road edge on the inside of the curve from Sutton Road to Rochester Road is rough and broken up. The remaining road surface is in fair condition.

The existing signing consists of curve warning signs (W1-2-30, Appendix II, p. 96) on Sutton Road and Rochester Road and a stop sign (R1-1-24, Appendix II, p. 92) on westbound Sutton Road giving Rochester Road traffic the right of way. There is also a stop sign (R1-1-24, Appendix II, p. 92) located in the traffic island for southbound traffic on Rochester Road.

Recommendations:

Because motorists tend to allow their vehicles to drift to the inside of a curve, we recommend that the road edge of the inside of the curve from Sutton Road to Rochester Road should be repaired to improve the ability of the operators to control their vehicles. The Devil Level readings indicate a 30 mile per hour advisory speed panel (see Section C, p. 132 of the Manual -

Appendix II, p.101) should accompany the curve warning signs. The Devil Level readings were as follows:

Speed	Readings	
	North to West	East to South
35	13°	9°
30	10°	10°
25	7°	4°

Also, a bi-directional target arrow (see Section C, p. 89 of the Manual, Appendix II, p. 98) should be placed at the end of Rochester Road for the traffic which continues straight and then turns east.

There is a conflict which exists between eastbound traffic on Sutton Road which continues through and northbound traffic on Rochester Road which follows the curve to westbound Sutton Road. Thus, we recommend that a yield sign (see Section C, p. 15 of the Manual, Appendix II, p. 93) be placed in the traffic island for the latter movement.

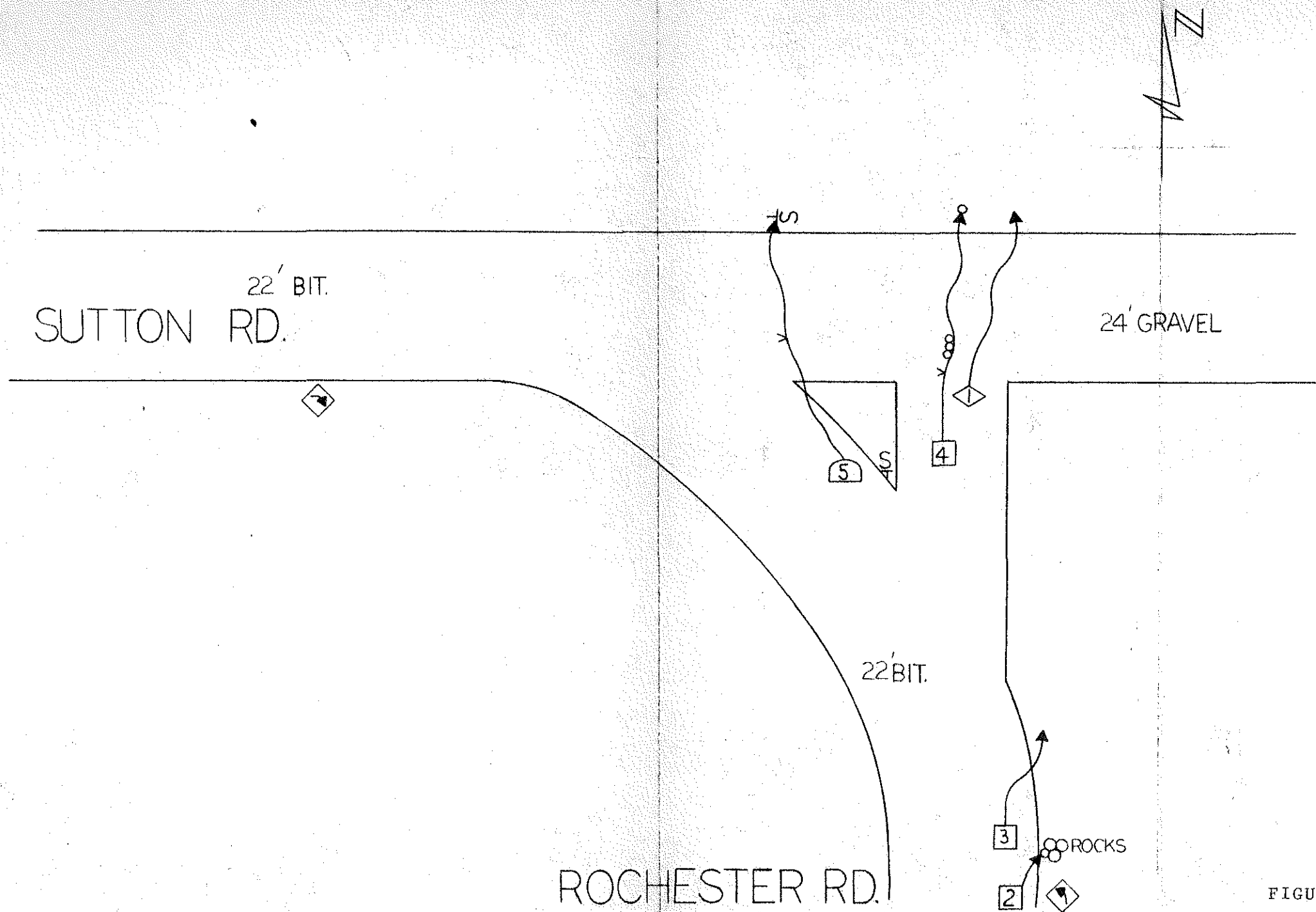
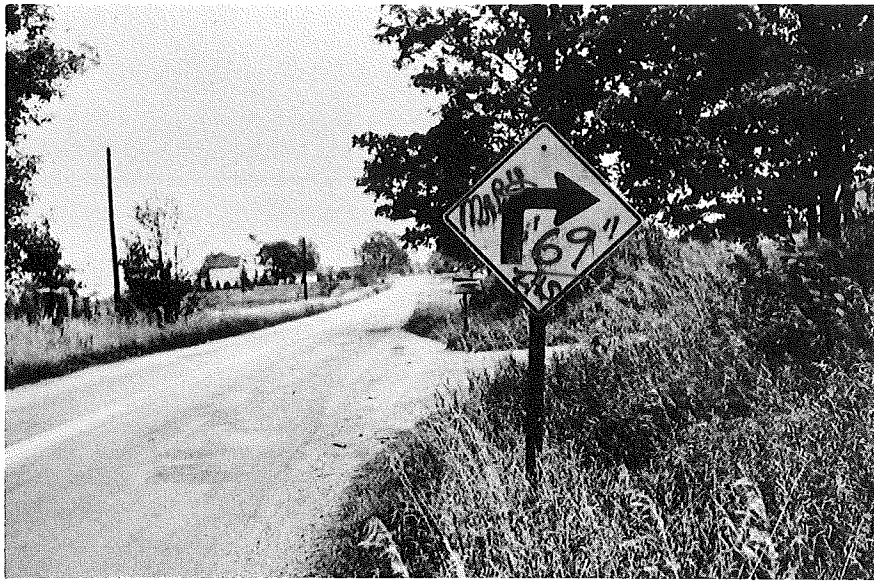


FIGURE 14

REMARKS	LEGEND		ACCIDENT STUDY COLLISION DIAGRAM		MICHIGAN DEPARTMENT OF STATE HIGHWAYS TRAFFIC AND SAFETY DIVISION	
	○ 1966 ◇ 1967 □ 1968 ▽ 1969	Stop & Go Signal S Flashing Beacon F Stop Sign S Yield Sign Y Fatal ● Injury ○ Skidding ○○○ Jackknife Overturned Backing Pedestrian X Tree Out of Control Driver Intent Deer Violator V	Period: <u>1966 THRU 1969</u> Accidents - Total <u>5</u> P.D. <u>3</u> Injury <u>2 (3)</u> Fatal <u>0 ()</u>	ADT _____ Rate _____ /100 mv Rate _____ / mv	Location SUTTON RD. at ROCHESTER RD. ATTICA & DRYDEN TWP. LAPEER CO. C.S. _____ Miles _____ Drawn <u>DVW</u> Date <u>2-5-70</u> Plan No. <u>#15</u>	



EASTBOUND
SUTTON ROAD

NORTHBOUND
ROCHESTER ROAD



NORTHBOUND
ROCHESTER ROAD



SOUTHBOUND
ROCHESTER ROAD



WESTBOUND
SUTTON ROAD

16. Columbiaville Road, (F.A.S. 87), 0.1 to 0.25 miles west of North Lake Road, Marathon Township

Four of the five accidents at this location during the study period occurred during passing manuevers. The horizontal alignment, as shown in the photographs, is such that vision for passing is not obstructed. However, the 22 ft roadway has uneven patches approximately three feet from each edge of metal, thus reducing the surface for comfortable driving to about 16 ft. A vehicle which is passing another vehicle, would be forced to drive over this uneven pavement edge, thereby causing loss of control.

Recommendations:

Until complete resurfacing in this area is feasible, we recommend repairing the roadway edges so that they are relatively smooth. This would help in reducing the accidents due to passing since it would provide a full roadway surface on which the motorist can keep control of his vehicle.

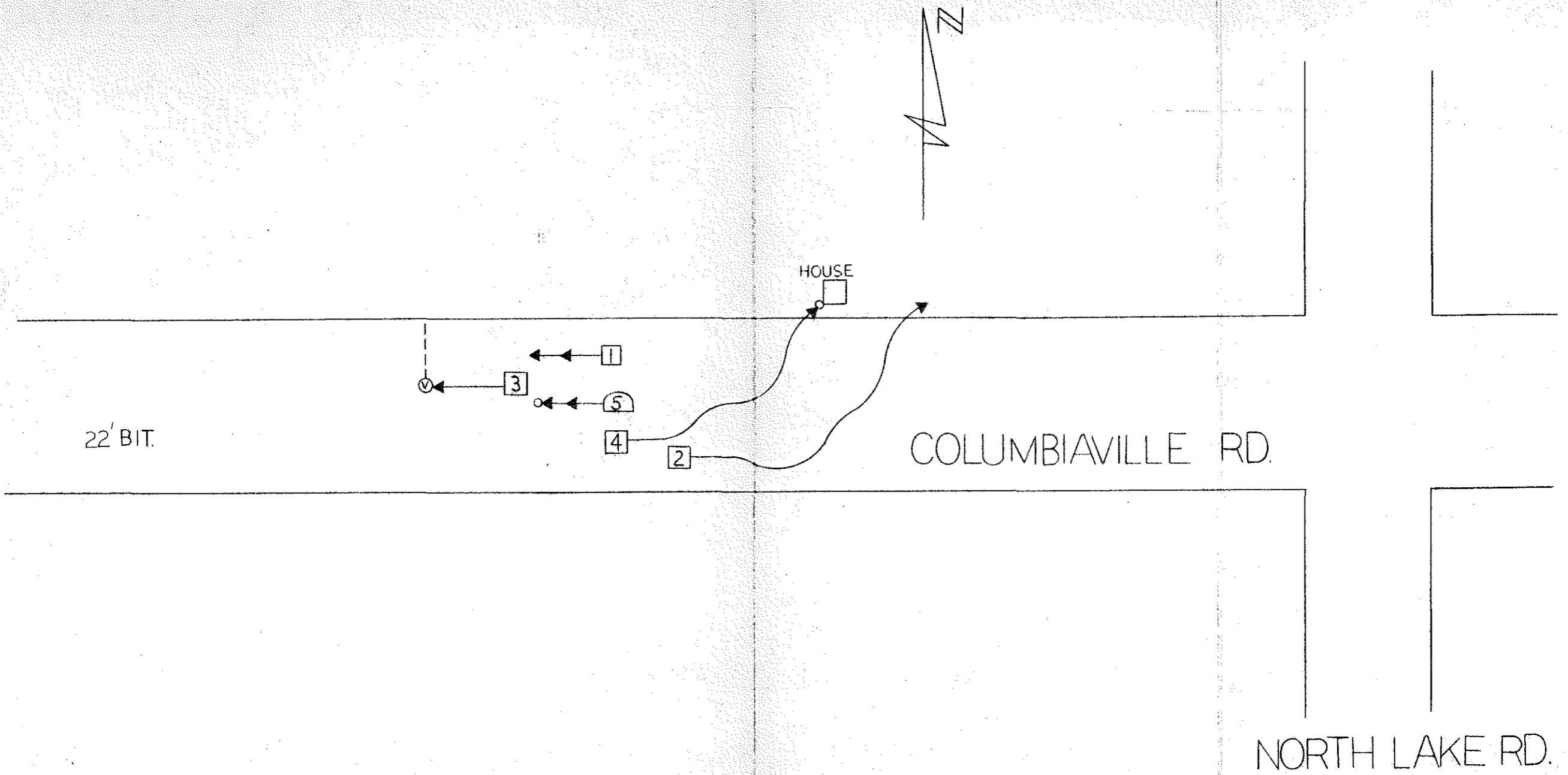


FIGURE 15

REMARKS	LEGEND	ACCIDENT STUDY COLLISION DIAGRAM	MICHIGAN DEPARTMENT OF STATE HIGHWAYS TRAFFIC AND SAFETY DIVISION
<p>○ 1966</p> <p>◇ 1967</p> <p>□ 1968</p> <p>◡ 1969</p>	<p>Stop & Go Signal Stop Sign S</p> <p>Flashing Beacon Yield Sign Y</p> <p>Fatal Pedestrian </p> <p>Injury Tree </p> <p>Skidding Out of Control </p> <p>Jackknife Driver Intent </p> <p>Overtaken Deer </p> <p>Backing Violator </p>	<p>Period: <u>1966 THRU 1969</u></p> <p>Accidents - Total <u>5</u></p> <p>P.D. <u>3</u> ADT _____</p> <p>Injury <u>2 (3)</u> Rate _____ /100 mvm</p> <p>Fatal <u>0 ()</u> Rate _____ / mvm</p>	<p>Location COLUMBIAVILLE RD. 0.1 TO 0.25 MI. WEST OF NORTH LAKE RD. MARATHON TWP LAPEER CO.</p> <p>C.S. _____ Miles _____</p> <p>Drawn <u>DVW</u> Date <u>2-9-70</u></p> <p>Plan No. _____ # <u>16</u></p>



EASTBOUND
COLUMBIAVILLE ROAD



WESTBOUND
COLUMBIAVILLE ROAD

17. Columbiaville Road, (F.A.S. 87), 0.6 to 0.8 miles west of LeValley Road, (see Appendix I, p. 86)

<u>Total</u>	<u>P.D.</u>	<u>Inj.</u>	<u>Fat.</u>
3	1	1	0

18. Dryden Road, (F.A.S. 79), 0.5 to 0.6 miles west of Gardner Road, Metamora Township

All of the accidents at this location occurred in 1968 and all were head-on left turn accidents occurring at the entrance to the Metamora sanitary land fill. Because of the geometrics of the road, it was difficult for vehicles entering or exiting the land fill area to see approaching traffic. Thus, the driveway was moved in May, 1969, closer to the crest of the hill. Another move is scheduled this summer to locate the driveway in a clear vision area.

No Rec.

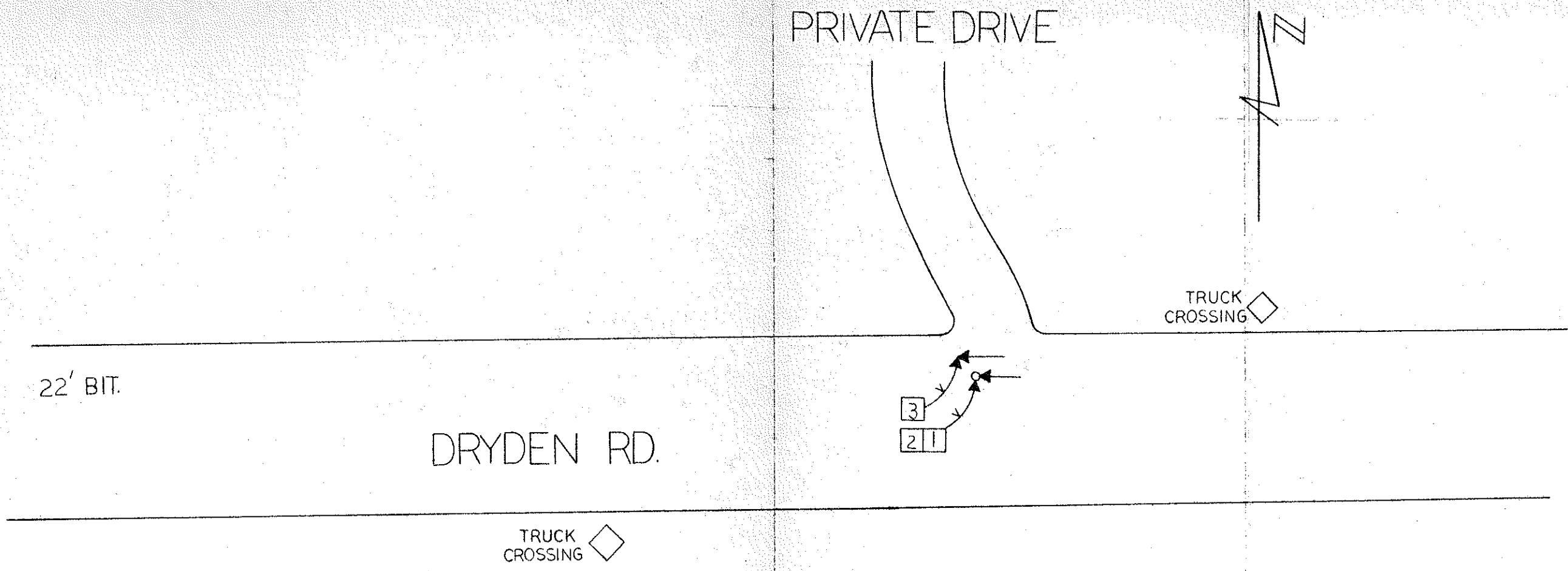


FIGURE 16

REMARKS	LEGEND	ACCIDENT STUDY COLLISION DIAGRAM		MICHIGAN DEPARTMENT OF STATE HIGHWAYS TRAFFIC AND SAFETY DIVISION
<ul style="list-style-type: none"> ○ 1966 ◇ 1967 □ 1968 ◐ 1969 	<p>Stop & Go Signal Stop Sign Yield Sign </p> <p>Flashing Beacon Tree </p> <p>Fatal Pedestrian </p> <p>Injury Out of Control </p> <p>Skidding Driver Intent </p> <p>Jackknife Deer </p> <p>Overtaken Violator </p> <p>Backing </p>	<p>Period: <u>1966 THRU 1969</u></p> <p>Accidents - Total <u>3</u></p> <p>P.D. <u>1</u></p> <p>Injury <u>2 (4)</u></p> <p>Fatal <u>0 ()</u></p>	<p>ADT _____</p> <p>Rate _____ /100 mvm</p> <p>Rate _____ / mv</p>	<p>Location DRYDEN RD. 0.5 TO 0.6 MI. WEST OF GARDNER RD. METAMORA TWP. LAPEER CO.</p> <p>C.S. _____ Miles _____</p> <p>Drawn <u>DVW</u> Date <u>2-5-70</u></p> <p>Plan No. _____ #18</p>



EASTBOUND
DRYDEN ROAD



EASTBOUND
DRYDEN ROAD



WESTBOUND
DRYDEN ROAD



WESTBOUND
DRYDEN ROAD

19. Newark Road, (F.A.S. 554), 0.5 to 0.25 miles east of Clark Road, (see Appendix I, p. 88)

<u>Total</u>	<u>P.D.</u>	<u>Inj.</u>	<u>Fat.</u>
4	4	0	0

SUMMARY

There was a total of 2,734 reported traffic accidents on Lapeer County roads during the study period 1966 through 1969 for an average of 683 accidents per year. The 19 high accident locations accounted for 146 of the total reported accidents in the County during the four-year study period. This figure is only 5.2% of the reported accidents. It would appear from these figures that the greatest portion of Lapeer County's reported accidents have not occurred at any specific locations but are scattered throughout the entire County. Even so, the County as a whole doesn't experience an alarming accident criticality.

Table 2, found on the following page, contains some interesting data on the reported traffic accidents in Lapeer County and the vehicle registration. (Information on traffic accident breakdown and vehicle registrations for 1969 in Lapeer County has not yet been received.) Reported traffic accidents in Lapeer County decreased each year from 1966 through 1969 for a total decrease over the four years of 8.4%. This decrease is also reflected in the 19 high accident locations as there were only 16 accidents in 1969 compared to 130 accidents for the three previous years. This decrease in reported accidents is a good sign when one considers the fact that

TABLE 2

REPORTED TRAFFIC ACCIDENTS IN LAPEER COUNTY

Year	Property Damage	Injury	Fatal	Total	County Road	State Route	Inter- State	Persons	
								Injured	Killed
1966	749	559	28	1,336	722	614	0	986	38
1967	790	470	19	1,279	682	557	0	803	23
1968	883	529	28	1,440	669	639	0	903	30

COMPARISON OF ACCIDENT FREQUENCY

Lapeer County Total Accidents
 Roads State of Mich.

1966	722	302,880
1967	682	299,004
1968	669	305,495
1969	661	331,223

PERCENTAGE OF CHANGE FOR THE ABOVE TOTALS

1966-67	-5.54	-1.28
1967-68	-1.91%	2.17
1968-69	-1.20	8.42

VEHICLE REGISTRATIONS IN LAPEER COUNTY

Year	Pass.	Comm.	Farm Vehicle	Trailer	Trailer Coach	Motor Cycles	Muni- cipal	Total Plates
1966	-	-	-	-	-	-	-	25,796
1967	17,446	3,748	606	3,105	447	751	13	26,116
1968	17,979	4,220	594	3,369	511	793	19	27,485

vehicle registrations increased every year.

To further document the various facts present at the 19 high accident locations, the following tables were prepared to tabulate and chart specific data.

3. Monthly and Daily Accident Occurrence
4. Annual Accident Summary
5. Daily and Hourly Accident Occurrence
6. Age of Drivers Involved in Accidents
7. Residence of Drivers Involved in Accidents
8. Weather Conditions at Scene of Accidents
9. Pavement Conditions at Scene of Accidents

Table 3 shows that the peak accident month was November and the peak accident day was Saturday. September, October and November together comprise 32% of the total accidents while almost 40% of the accidents occurred on Friday or Saturday.

The information summarized in Table 4 shows that of the 146 accidents at the 19 high accident locations 72 resulted in personal injury while 73 resulted in property damage. There was one fatal over the four-year period.

Table 5 shows the peak accident hour as 5:00 p.m. to 6:00 p.m. with 12 - 1 a.m. a close second. Tables 6 and 7 contain the age and residence of the drivers involved

in the accidents while Tables 8 and 9 show the weather conditions and pavement conditions at the scene of the accidents. These tables could be used by agencies interested in highway safety from the standpoint of driver education and law enforcement.

ACCIDENT ANALYSIS

Table 3

MONTHLY AND DAILY ACCIDENT OCCURRENCE
NINETEEN HIGH ACCIDENT LOCATIONS IN LAPEER COUNTY

Period Studied: 1966 through 1969

* * * * *

Month	Day of the Week							Monthly Total	% of Total
	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Sun.		
January	3	1			2	6	3	15	10.275
February	1	1	3	3	5	1		14	9.589
March		1	4		1	3	3	12	8.219
April			1	2	1	1	1	6	4.110
May	4	1	2	1	2		2	12	8.219
June			1		1	4	2	8	5.479
July	1	2		1	1	4	2	11	7.534
August	1	3	2		1		1	8	5.479
September	1	3	1		2	6	2	15	10.274
October		3	1	2	3	3	4	16	10.959
November	1	3	3	3	2	3	2	17	11.644
December	2	2	1	2	3	2		12	8.219
Day Total	14	20	19	14	24	33	22	146	100%
% of Total	9.589	13.699	13.014	9.589	16.438	22.603	15.068	100%	

Peak Accident Day: Saturday

Peak Accident Months: November

October

September

January

ACCIDENT ANALYSIS

Table 4

ANNUAL ACCIDENT SUMMARY

NINETEEN HIGH ACCIDENT LOCATIONS IN LAPEER COUNTYPeriod Studied: 1966 through 1969

* * * * *

Accident Type	Day	Night	Total
Fatal Accident		1	1
Personal Injury Acc.	39	33	72
Property Damage Acc.	23	50	73
Total	62	84	146

* * * * *

Month	Fatal		Injury		Prop. Damage		Sub. Total		Total
	Day	Night	Day	Night	Day	Night	Day	Night	
January			3		3	9	6	9	15
February			3	3	5	3	8	6	14
March			4	1	1	6	5	7	12
April			1	2		3	1	5	6
May			6	2	2	2	8	4	12
June			2	2	2	2	4	4	8
July			4	2	2	3	6	5	11
August			5	1		2	5	3	8
September			4	3	2	6	6	9	15
October			6	4	3	3	9	7	16
November			1	9	1	6	2	15	17
December		1		4	2	5	2	10	12
S. Total		1	39	33	23	50	62	84	146
Total	1		72		73		146		146

ACCIDENT ANALYSIS

Table 5

DAILY AND HOURLY ACCIDENT OCCURRENCE

NINETEEN HIGH ACCIDENT LOCATIONS IN LAPEER COUNTY

Period Studied: 1966 through 1969

Hour	Day of the Week							Hour Total	% of Total
	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Sun.		
12 - 1AM		1	2	2		3	2	10	6.848
1 - 2AM			1	1		1	2	5	3.424
2 - 3AM	1		1		1	3	3	9	6.164
3 - 4AM				2	2	1		5	3.424
4 - 5AM									
5 - 6AM		1	2	1	1	1		6	4.110
6 - 7AM				2		2		4	2.740
7 - 8AM	1	2	1	1		2		7	4.795
8 - 9AM			1	1			1	3	2.055
9 - 10AM		1	1			1	1	4	2.740
10 - 11AM	2				2	1		5	3.424
11 - 12AM	3	2				2		7	4.795
12 - 1PM			2	1				3	2.055
1 - 2PM		2		1		2	2	7	4.795
2 - 3PM	1	2	1	1		1		6	4.110
3 - 4PM		3	1		1	3	1	9	6.164
4 - 5PM		1		1	2	1	2	7	4.795
5 - 6PM	2	2	1		3	2	2	12	8.218
6 - 7PM		1			1		1	3	2.055
7 - 8PM			1		2	2	1	6	4.110
8 - 9PM	1		1		2	2		6	4.110
9 - 10PM			2		2	2	1	7	4.795
10 - 11PM	3	1	1	1	2		1	9	6.164
11 - 12PM		1			3	1	1	6	4.110
Not Stated									
Day Total	14	20	19	15	24	33	21	146	
% of Total	9.589	13.698	13.014	10.274	16.438	22.603	14.384		100%

Peak Accident Hour: 5 - 6PM

Peak Accident Day: saturday

TABLE 6

AGE OF DRIVERS INVOLVED IN ACCIDENTS

NINETEEN HIGH ACCIDENT LOCATIONS IN LAPEER COUNTY

Period Studied: 1966 through 1969

* * * * *

Age Group	Number of Drivers Involved in				% of Total
	Fatal	Injury	Prop. Damage	Total	
Under 16			2	2	1.075
16-19		15	19	34	18.280
20-24		15	17	32	17.204
25-34		29	26	55	29.570
35-44		11	12	23	12.366
45-54	1	15	10	26	13.978
55-64		5	2	7	3.763
65-74		2	1	3	1.613
75 & Over		3	1	4	2.151
Not Stated					
Total	1	95	90	186	100%

* * * * *

Table 7

RESIDENCE OF DRIVERS INVOLVED IN ACCIDENTS

Residence	Number of Drivers Involved in				% of Total
	Fatal	Injury	Prop. Damage	Total	
Local	1	60	67	128	68.817
Michigan		33	22	55	29.570
Out of State		2	1	3	1.613
Not Stated					
Total	1	95	90	186	100%

TABLE 8

WEATHER CONDITIONS AT SCENE OF ACCIDENTS
 NINETEEN HIGH ACCIDENT LOCATIONS IN LAPEER COUNTY

Period Studied: 1966 through 1969

* * * * *

Weather	Severity of Accident				% of Total
	Fatal	Injury	Prop. Damage	Total	
Clear or Cloudy	1	46	50	97	66.439
Rain		18	7	25	17.123
Fog		3	6	9	6.164
Snow or Sleet		4	10	14	9.589
Not Stated		1		1	0.685
Total	1	72	73	146	100%

* * * * *

TABLE 9

PAVEMENT CONDITIONS AT SCENE OF ACCIDENTS

Pavement	Severity of Accident				% of Total
	Fatal	Injury	Prop. Damage	Total	
Dry	1	35	36	72	49.315
Wet		25	19	44	30.137
Snowy/Icy		12	16	28	19.178
Icy			1	1	0.685
Not Stated			1	1	0.685
Total	1	72	73	146	100%

APPENDIX I

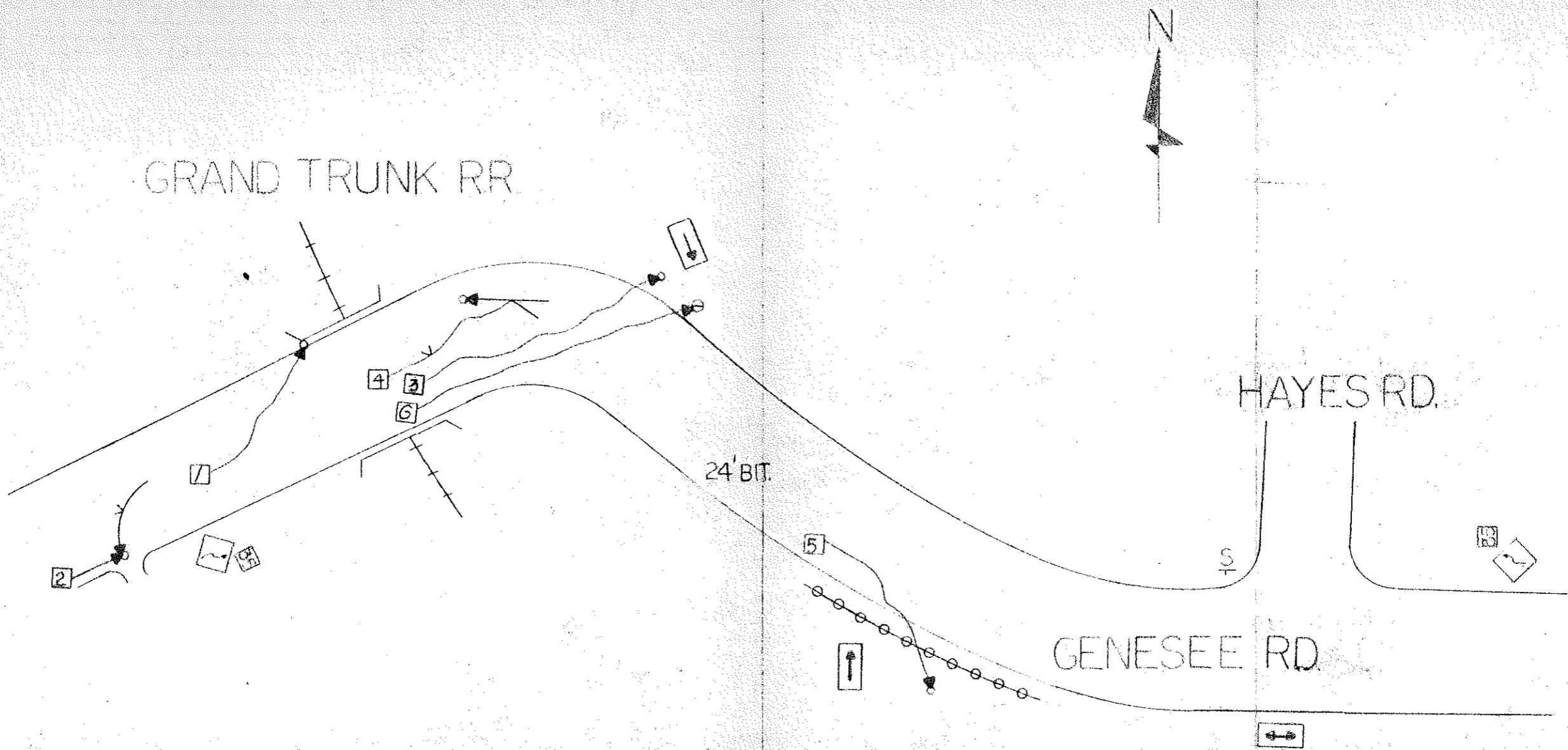




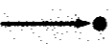



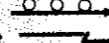









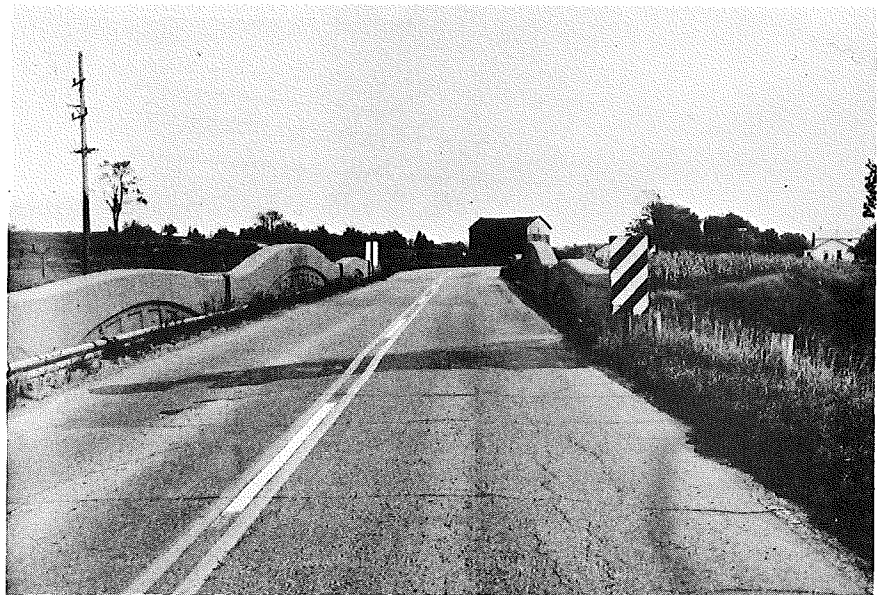
FIGURE 17

REMARKS	LEGEND	ACCIDENT STUDY COLLISION DIAGRAM	MICHIGAN DEPARTMENT OF STATE HIGHWAYS TRAFFIC AND SAFETY DIVISION
<p>○ 1966</p> <p>◇ 1967</p> <p>□ 1968</p> <p>◐ 1969</p>	<p>Stop & Go Signal  Stop Sign </p> <p>Flashing Beacon  Yield Sign </p> <p>Fatal  Pedestrian </p> <p>Injury  Tree </p> <p>Skidding  Out of Control </p> <p>Jackknife  Driver Intent </p> <p>Overtaken  Deer </p> <p>Backing  Violator </p>	<p>Period: <u>1966 THRU 1969</u></p> <p>Accidents - Total <u>9</u></p> <p>P.D. <u>7</u> ADT _____</p> <p>Injury <u>2 (3)</u> Rate _____ /100 mvm</p> <p>Fatal <u>0 ()</u> Rate _____ / mv</p>	<p>Location <u>GENESEE RD 0.3 MI TO 0.5 MI EAST OF GOLF RD.</u></p> <p><u>OREGON TWP</u></p> <p><u>LAREER CO.</u></p> <p>C.S. _____ Miles _____</p> <p>Drawn <u>D.V.W.</u> Date <u>10-12-70</u></p> <p>Plan No. <u>#7</u></p>



EASTBOUND
GENESEE ROAD

EASTBOUND
GENESEE ROAD



EASTBOUND
GENESEE ROAD

FIGURE 17A



WESTBOUND
GENESEE ROAD

WESTBOUND
GENESEE ROAD



WESTBOUND
GENESEE ROAD

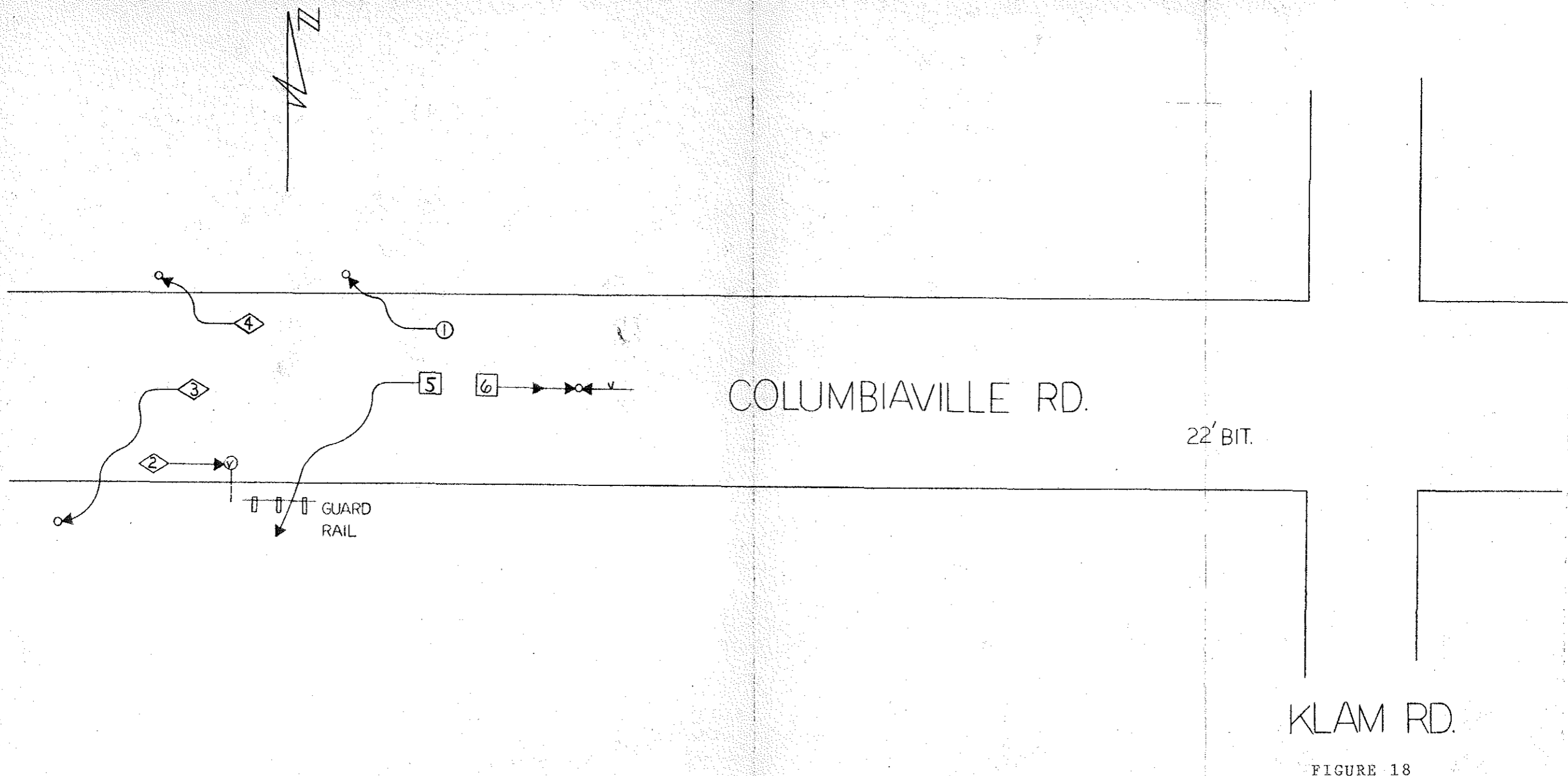


FIGURE 18

REMARKS	LEGEND	ACCIDENT STUDY COLLISION DIAGRAM	MICHIGAN DEPARTMENT OF STATE HIGHWAYS TRAFFIC AND SAFETY DIVISION
<p>○ 1966</p> <p>◇ 1967</p> <p>□ 1968</p> <p>◐ 1969</p>	<p>Stop & Go Signal Stop Sign </p> <p>Flashing Beacon Yield Sign </p> <p>Fatal Pedestrian </p> <p>Injury Tree </p> <p>Skidding Out of Control </p> <p>Jackknife Driver Intent </p> <p>Overtaken Deer </p> <p>Backing Violator </p>	<p>Period: <u>1966 THRU 1969</u></p> <p>Accidents - Total <u>6</u></p> <p>P.D. <u>2</u> ADT _____</p> <p>Injury <u>4 (8)</u> Rate _____ /100 mvm</p> <p>Fatal <u>0 ()</u> Rate _____ / mv</p>	<p>Location COLUMBIAVILLE RD. 0.4 TO 0.5 MI. WEST OF KLAM RD. MARATHON TWP. LAPEER CO.</p> <p>C.S. _____ Miles _____</p> <p>Drawn <u>DVW</u> Date <u>1-27-70</u></p> <p>Plan No. <u># 8</u></p>



EASTBOUND
COLUMBIAVILLE ROAD



WESTBOUND
COLUMBIAVILLE ROAD

FARNSWORTH RD.

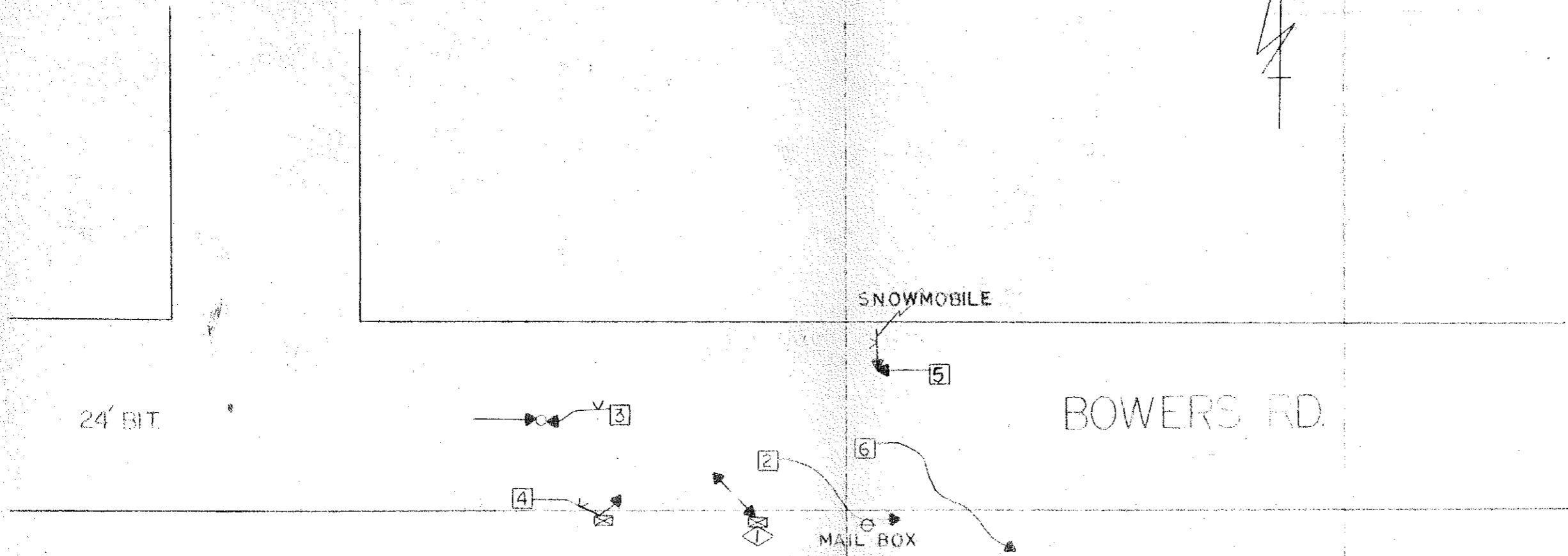
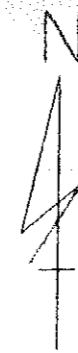


FIGURE 19

REMARKS ○ 1966 ◇ 1967 □ 1968 ◡ 1969	LEGEND		ACCIDENT STUDY COLLISION DIAGRAM		MICHIGAN DEPARTMENT OF STATE HIGHWAYS TRAFFIC AND SAFETY DIVISION	
	Stop & Go Signal Flashing Beacon	Stop Sign Yield Sign	Fatal Injury Skidding Jackknife Overturned Backing	Pedestrian Tree Out of Control Driver Intent Deer Violator	Period: <u>1966 THRU 1969</u> Accidents - Total <u>6</u> P.D. <u>5</u> Injury <u>1 (3)</u> Fatal <u>0 ()</u>	ADT _____ Rate _____ /100 mvm. Rate _____ / mv.



EASTBOUND
BOWERS ROAD



WESTBOUND
BOWERS ROAD

LINCOLNSHIRE DR

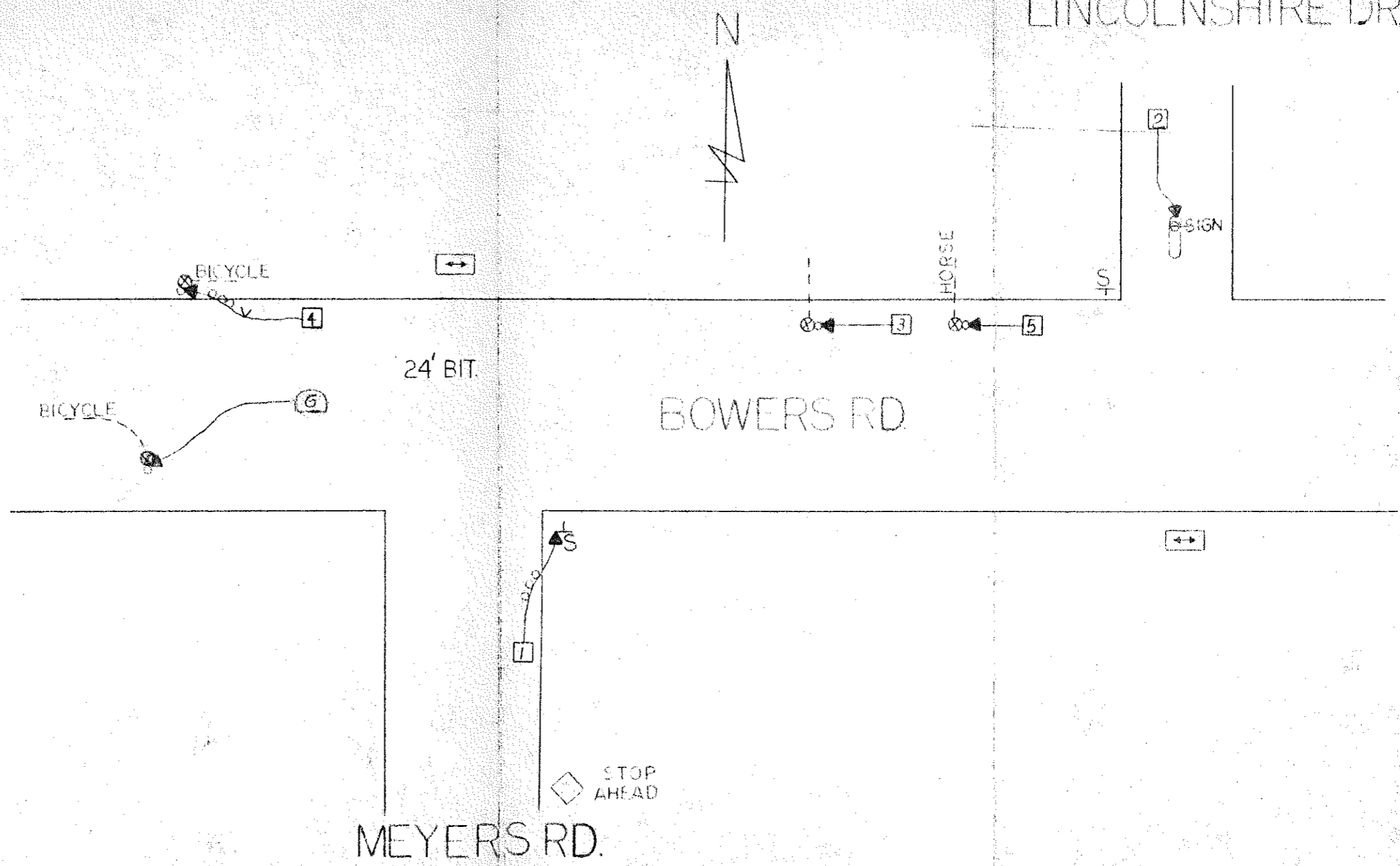


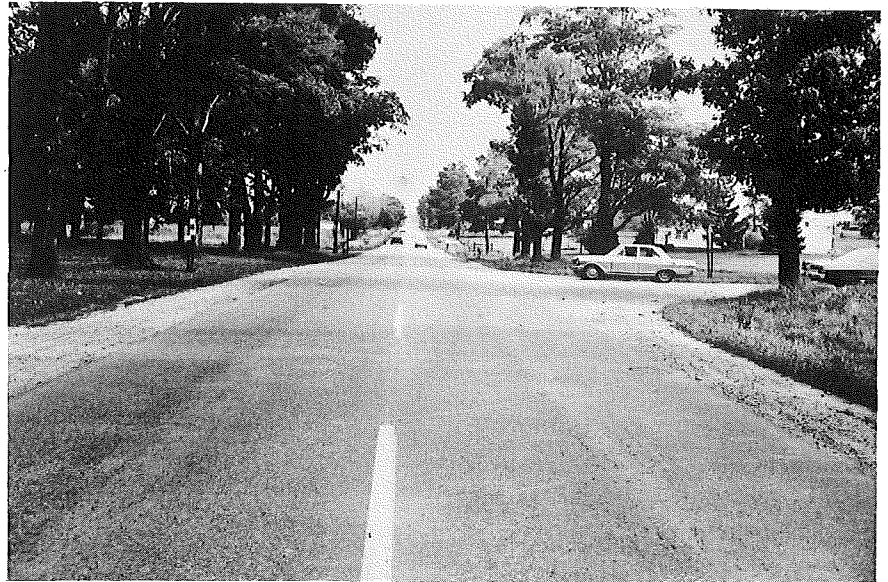
FIGURE 20

REMARKS	LEGEND	ACCIDENT STUDY COLLISION DIAGRAM		MICHIGAN DEPARTMENT OF STATE HIGHWAYS TRAFFIC AND SAFETY DIVISION	
<p>○ 1966 ◇ 1967 □ 1968 ◡ 1969</p>	<p>Stop & Go Signal Stop Sign Flashing Beacon Yield Sign </p> <p>Fatal Pedestrian Injury Tree Skidding Out of Control Jackknife Driver Intent Overturned Deer Backing Violator </p>	<p>Period: <u>1966 THRU 1969</u> Accidents - Total <u>6</u> P.D. <u>2</u> Injury <u>4 (4)</u> Fatal <u>0 ()</u></p>	<p>ADT _____ Rate _____ /100 mvm Rate _____ / mv</p>	<p>Location <u>BOWERS RD. 0.3 TO 0.5 MI. WEST OF ROODS LAKE RD. LAPEER + MAYFIELD TWP. LAPEER CO.</u> C.S. _____ Miles _____ Drawn <u>DVW</u> Date <u>10-14-70</u> Plan No. _____ # <u>11</u></p>	

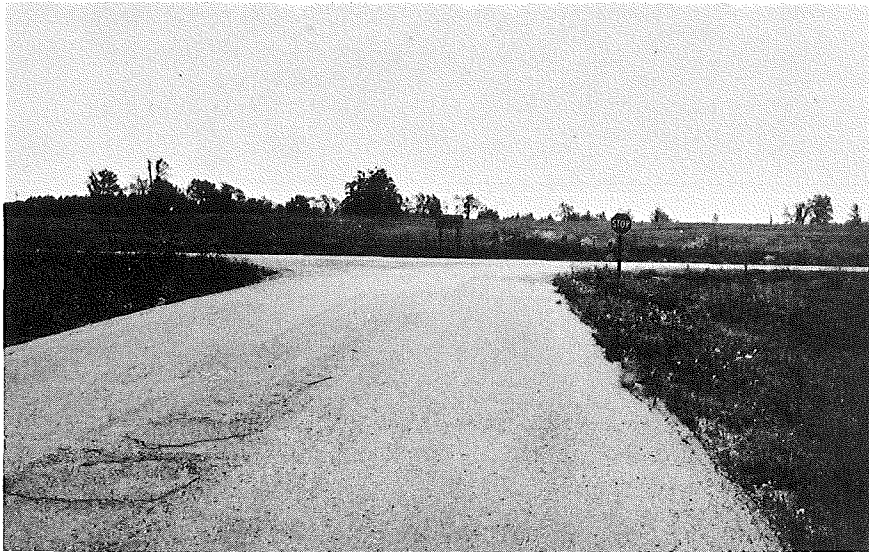


NORTHBOUND
MEYERS ROAD

EASTBOUND
BOWERS ROAD



WESTBOUND
BOWERS ROAD



SOUTHBOUND
LINCOLNSHIRE DRIVE

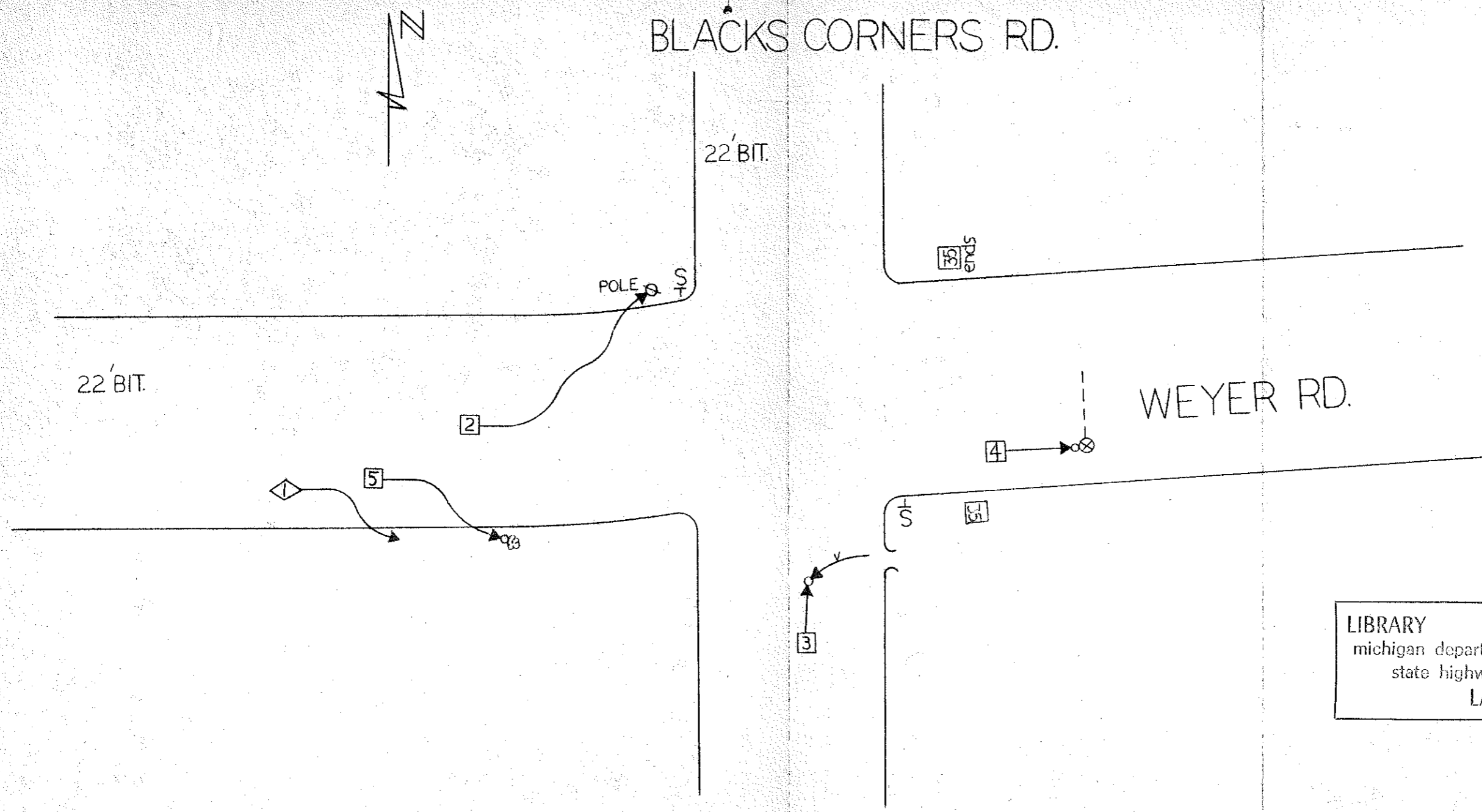


EASTBOUND
BOWERS ROAD













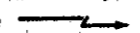





WESTBOUND
BOWERS ROAD

BLACKS CORNERS RD.



LIBRARY
michigan department of
state highways
LANSING

FIGURE 21

REMARKS	LEGEND	ACCIDENT STUDY COLLISION DIAGRAM	MICHIGAN DEPARTMENT OF STATE HIGHWAYS TRAFFIC AND SAFETY DIVISION
<p>○ 1966</p> <p>◇ 1967</p> <p>□ 1968</p> <p>◡ 1969</p>	<p>Stop & Go Signal  Stop Sign </p> <p>Flashing Beacon  Yield Sign </p> <p>Fatal  Pedestrian </p> <p>Injury  Tree </p> <p>Skidding  Out of Control </p> <p>Jackknife  Driver Intent </p> <p>Overtaken  Deer </p> <p>Backing  Violator </p>	<p>Period: <u>1966 THRU</u></p> <p>Accidents - Total <u>5</u></p> <p>P.D. <u>2</u> ADT _____</p> <p>Injury <u>3 (4)</u> Rate _____ /100 mvm</p> <p>Fatal <u>0 ()</u> Rate _____ / mv</p>	<p>Location <u>WEYER RD. at BLACKS CORNERS RD.</u></p> <p><u>IMLAY TWP.</u></p> <p><u>LAPEER CO.</u></p> <p>C.S. _____ Miles _____</p> <p>Drawn <u>DVW</u> Date <u>2-4-70</u></p> <p>Plan No. _____ # <u>13</u></p>



SOUTHBOUND
BLACKS CORNERS ROAD



WESTBOUND
WEYER ROAD

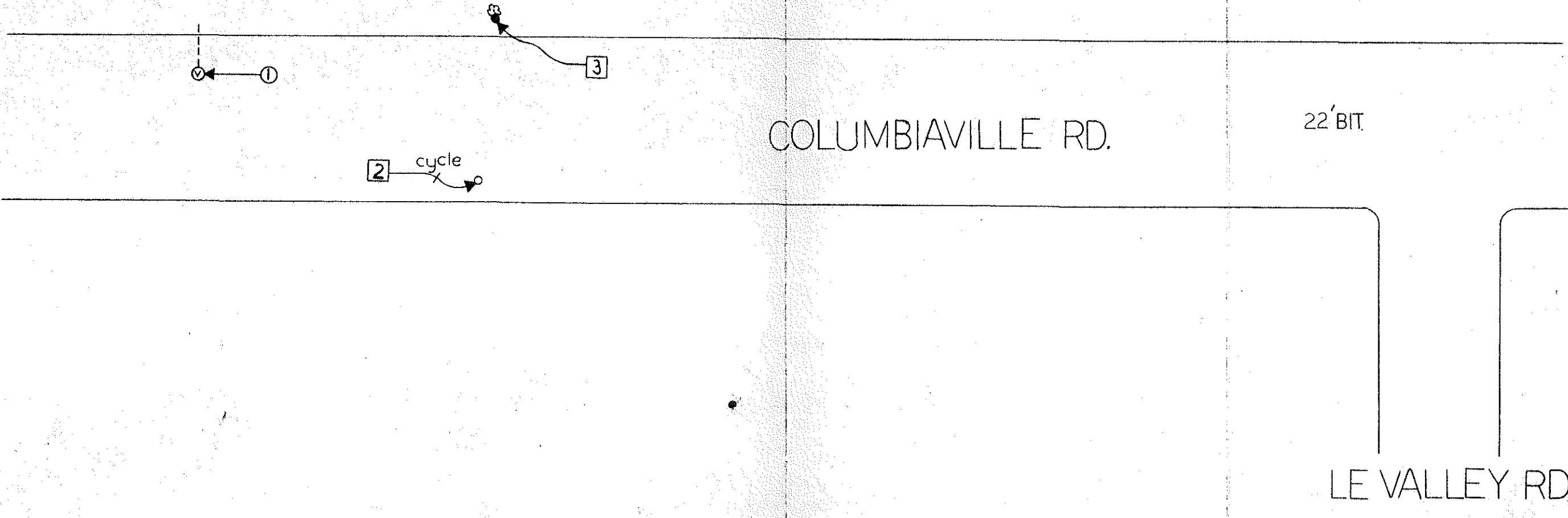


NORTHBOUND
BLACKS CORNERS ROAD



















EASTBOUND
WEYER ROAD

LIBRARY
michigan department of
state highways
LANSING



LE VALLEY RD.

FIGURE 22

REMARKS	LEGEND	ACCIDENT STUDY COLLISION DIAGRAM		MICHIGAN DEPARTMENT OF STATE HIGHWAYS TRAFFIC AND SAFETY DIVISION	
<p>○ 1966</p> <p>◇ 1967</p> <p>□ 1968</p> <p>◡ 1969</p>	<p>Stop & Go Signal  Stop Sign </p> <p>Flashing Beacon  Yield Sign </p> <p>Fatal  Pedestrian </p> <p>Injury  Tree </p> <p>Skidding  Out of Control </p> <p>Jackknife  Driver Intent </p> <p>Overtaken  Deer </p> <p>Backing  Violator </p>	<p>Period: <u>1966 THRU 1969</u></p> <p>Accidents - Total <u>3</u></p> <p>P.D. <u>1</u></p> <p>Injury <u>1 (2)</u></p> <p>Fatal <u>1 (1)</u></p>	<p>ADT _____</p> <p>Rate _____ /100 mvm</p> <p>Rate _____ / mv</p>	<p>Location COLUMBIAVILLE RD. 0.6 TO 0.8 MI. WEST OF LE VALLEY RD.</p> <p>MARATHON TWP. LAPEER CO.</p> <p>C.S. _____ Miles _____</p> <p>Drawn <u>DVW</u> Date <u>2-5-70</u></p> <p>Plan No. _____ # <u>17</u></p>	



EASTBOUND
COLUMBIAVILLE ROAD



WESTBOUND
COLUMBIAVILLE ROAD

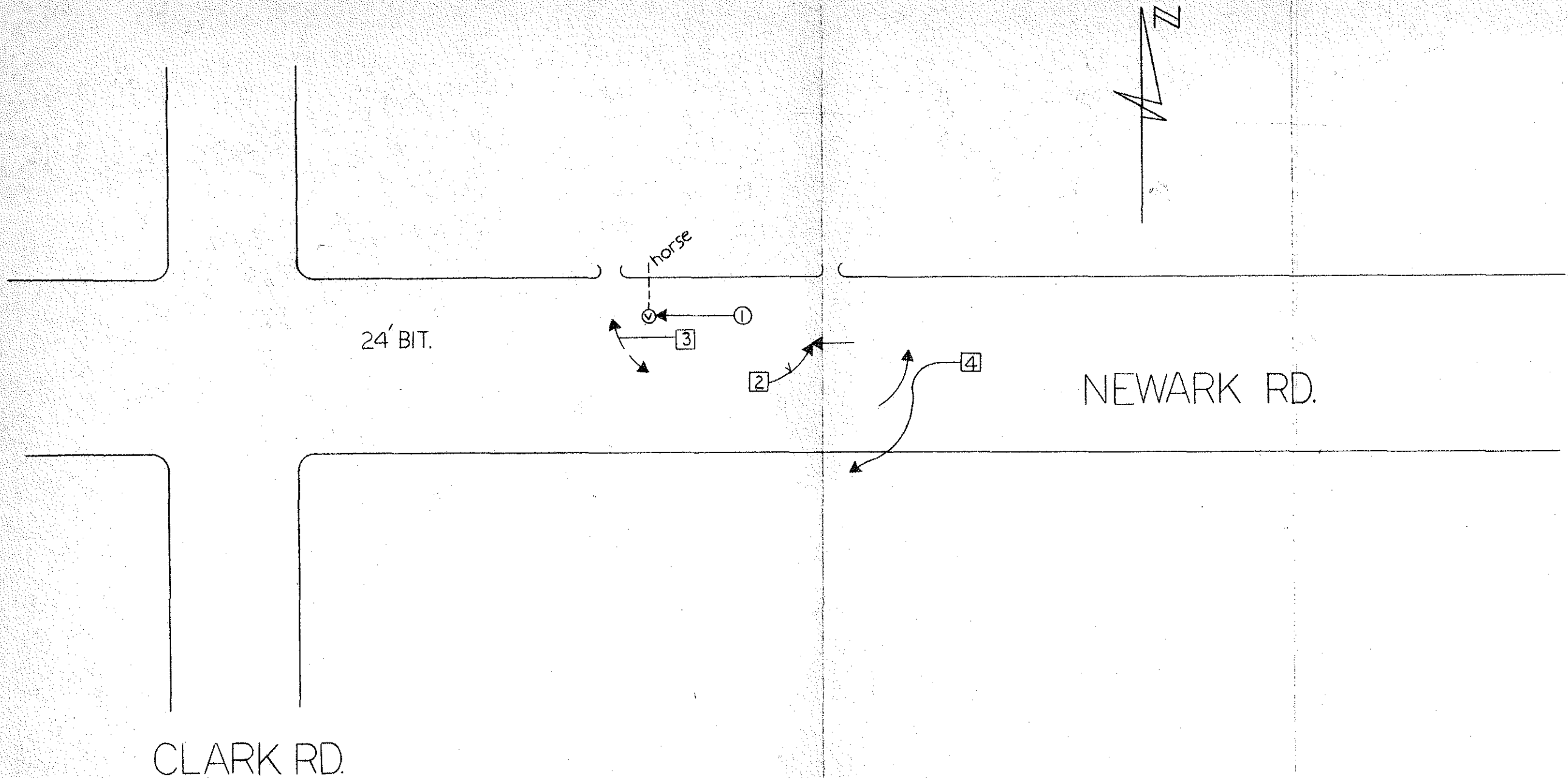


FIGURE 23

REMARKS	LEGEND	ACCIDENT STUDY COLLISION DIAGRAM		MICHIGAN DEPARTMENT OF STATE HIGHWAYS TRAFFIC AND SAFETY DIVISION
<p>○ 1966</p> <p>◇ 1967</p> <p>□ 1968</p> <p>◡ 1969</p>	<p>Stop & Go Signal Stop Sign S</p> <p>Flashing Beacon Yield Sign Y</p> <p>Fatal Pedestrian (X)</p> <p>Injury Tree (X)</p> <p>Skidding Out of Control (X)</p> <p>Jackknife Driver Intent (X)</p> <p>Overtaken Deer (V)</p> <p>Backing Violator (V)</p>	<p>Period: <u>1966 THRU 1969</u></p> <p>Accidents - Total <u>4</u></p> <p>P.D. <u>4</u></p> <p>Injury <u>0</u> ()</p> <p>Fatal <u>0</u> ()</p>	<p>ADT _____</p> <p>Rate _____ /100 mv.</p> <p>Rate _____ / mv.</p>	<p>Location NEWARK RD. 0.5 TO 0.25 MI. EAST OF CLARK RD. LAPEER TWP. LAPEER CO.</p> <p>C.S. _____ Miles _____</p> <p>Drawn <u>DVW</u> Date <u>2-9-70</u></p> <p>Plan No. _____ # <u>19</u></p>



EASTBOUND
NEWARK ROAD



WESTBOUND
NEWARK ROAD

APPENDIX II

Section B. Regulatory Signs

Regulatory Signs shall be used to inform highway users of traffic laws or regulations that apply at given places or on given highways. They are essential to indicate the applicability of legal requirements that would not otherwise be apparent. Great care must be exercised to see that they are erected wherever needed to fulfill this purpose, but unnecessary mandates should be avoided.

Included among regulatory signs are some, like those marking the end of a restricted zone, that are related to operational controls though not in themselves imposing any obligations or prohibitions.

Regulatory signs shall be erected at those locations where the regulations apply and shall be mounted so as to be easily visible and legible to the motorist whose actions they are to govern. Signs that have been erected but are no longer applicable shall be removed. Regulatory signs cannot be expected to command respect and obedience unless the regulations thereon set forth are adequately enforced.

Regulatory signs are classified in the following groups:

- | | |
|-------------------|-------------|
| (1) Right-of-Way | (R1 Series) |
| a. "STOP" Sign | |
| b. "YIELD" Sign | |
| (2) Speed | (R2 Series) |
| (3) Movement | (R3 Series) |
| a. Turning | |
| b. Alignment | |
| c. One Way | |
| d. Exclusion | |
| (4) Parking | (R4 Series) |
| (5) Pedestrian | (R5 Series) |
| (6) Miscellaneous | (R6 Series) |

With few exceptions, hereinafter detailed in the specifications for individual signs, regulatory signs are rectangular in shape with the larger dimension vertical and have black legends on white backgrounds. The principal exceptions referred to are the "STOP" sign, the Yield sign, the One Way arrow, and the Parking signs.

STOP SIGN



ReflectORIZED

R1-1-24	24" x 24"	(8" letters)
R1-1-30	30" x 30"	(12" letters)
R1-1-36	36" x 36"	(12" letters)

All "STOP" signs shall be reflectORIZED or internally illuminated so that the shape, color, and legend will be comparable to that in day time conditions and will not produce detrimental glare to traffic.

The "STOP" sign may be supplemented by two alternating red flashing beacons in the face or by one red flashing beacon directly above the sign. Such beacon(s) shall be operated continuously.

Place at the point where it is desired to have traffic stop, or as near thereto as possible at the following locations:

1. On streets or highways intersecting a through street or highway.
2. Railroad crossing where a stop is required by order of the appropriate public authority.
3. Opposite all Stop lines applied on the pavement, except at intersections controlled by a traffic control signal.
4. At intersections where a flashing red beacon exists.

There shall be no "STOP" signs on approaches to an intersection where such approaches are controlled by a traffic control signal.

An overhead internally illuminated "STOP" sign may be used in lieu of roadside "STOP" signs.

Secondary messages shall not be used on the face of a "STOP" sign. At a four-way stop intersection, each "STOP" sign may

be supplemented by a separate panel reading "4-WAY". Where this panel is used in conjunction with an R1-1-24, it shall be 24" x 9" with 5-inch legend. Where used with an R1-1-30 or R1-1-36, it shall be 30" x 12" with a 7-inch legend. Each panel shall have a black legend and border with a white reflectorized background. No additional sign shall be displayed with a "STOP" sign except one of the following: R3-1, R3-2, R3-3, R3-5, R3-6, or R3-23.

A hand held "STOP" sign may be used by Traffic Regulators as provided in Part II, Section E. Drivers facing the hand held "STOP" sign shall come to a complete stop and remain standing until an indication is given to proceed.

For placement see figures 1-3 and 1-4 and for special interim application see page 409.

YIELD SIGN



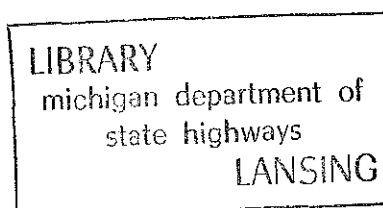
Reflectorized

R1-2-36 36" Equilateral Triangle (8", 3" and 2½" letters)

All Yield signs shall be reflectorized or internally illuminated so that the shape, color, and legend will be comparable to that in day time condition and will not produce detrimental glare to traffic.

Place at the point where it is desired to have traffic yield or as near thereto as possible at the following locations:

1. At the approach to an intersection where it is necessary to assign right-of-way to the major road, but where a stop is not necessary at all times.
2. At any location where a special problem exists and where an engineering study indicates the problem to be susceptible to correction by use of the Yield sign.



Section C. Warning Signs

Introduction

Warning signs shall be used for the purpose of warning traffic of existing or potentially hazardous conditions either on or adjacent to the roadway. Warning signs require caution on the part of the motorist and may call for reduction of speed or other maneuver in the interest of his own safety and that of other motorists and pedestrians. Adequate warnings are of great assistance to the vehicle operator and are valuable in safeguarding and expediting traffic. However, the use of warning signs should be kept to a minimum. Too frequent use of them or their unnecessary use to warn of conditions which are apparent tends to bring disrespect for all signs.

The conditions warranting warning signs are classified in the following groups according to the type of conditions to which they are applied:

- | | |
|---------------------------------------|---------------|
| 1. Changes in Horizontal Alignments | (W1 Series) |
| 2. Intersections | (W2 Series) |
| 3. Advance Warning of Control Devices | (W3 Series) |
| 4. Converging Traffic Lanes | (W4 Series) |
| 5. Narrow Roadways | (W5 Series) |
| 6. Changes in Highway Design | (W6 Series) |
| 7. Grades | (W7 Series) |
| 8. Roadway Surface Conditions | (W8 Series) |
| 9. Schools and Pedestrians | (W9 Series) |
| 10. Railroad Crossings | (W10 Series) |
| 11. Entrances and Crossings | (W11 Series) |
| 12. Miscellaneous | (W12 Series) |
| 13. Construction and Maintenance | (W13 Series)* |

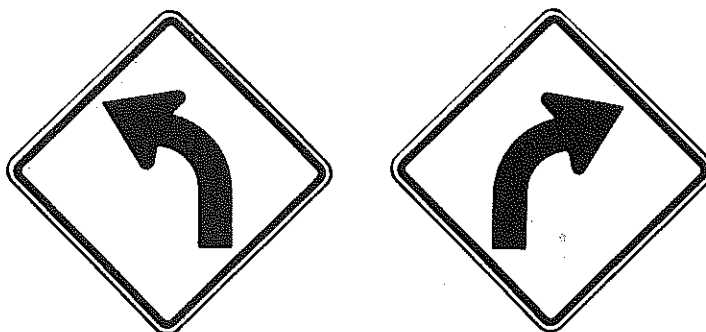
Warning signs with certain exceptions shall be diamond-shaped (square with one diagonal vertical) and shall have a "Highway Yellow" background with black legend. These exceptions are

*Special warning signs for highway construction and maintenance projects are to be found in Part II of this Manual.

the Railroad Crossing signs, the Target Arrow signs, the Advisory Speed panel, the Exit Speed sign, the Obstruction panel, and the Lattice Background. Other exceptions to the diamond shape are provided for in the case of temporary signs for highway construction and maintenance.

The use of warning signs should be limited to those standard signs set forth in this section. However, after the Engineer has exhausted all possibilities, it may be found that no standard sign fits the situation and warning signs, other than those specified, may be required. Such signs shall conform with the general specifications for size (30" minimum), shape, and color of warning signs. All warning signs having significance during hours of darkness shall be reflectorized or illuminated.

CURVE SIGN



Reflectorized

W1-2-30 30" x 30"

W1-2-36 36" x 36"

W1-2-48 48" x 48"

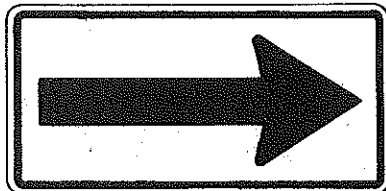
The Curve sign shall be used to denote changes in the horizontal alignment of all roads (except minor roads and streets where in the judgment of the engineer the use of this sign is unnecessary) where a ball bank indicator or Devil Level registers 10° or more at speeds between 30 and 60 miles per hour, and at such other locations where the change in alignment of the roadway is not apparent to the driver. Additional protection may be provided by use of the Curve Speed panel (W12-1).

The Curve sign shall be located in advance of the point of curvature at the approximate distance indicated below:

85th Percentile Speed			
35 & Below	36-45	45-55	56 & Over
250'	400'	550'	750'

Curves that are less than 400 feet apart shall be designated by the W1-4 sign.

For placement see figures 1-11 and 1-35.

TARGET ARROW SIGN

Reflectorized

W1-6-48 48" x 24"

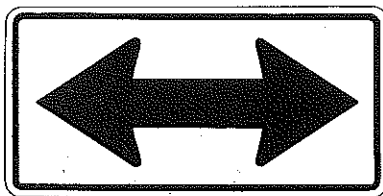
W1-6-96 96" x 48"

This sign may be used as a supplement to a Turn or Curve sign for potentially hazardous turns or curves. To increase its target value and to obscure misleading topography, the sign may be mounted on a Lattice Background (W12-10).

Where further emphasis of the required movement is desired, the W1-6-96 may be used in lieu of the unit consisting of the W1-6-48 and the W12-10.

This sign shall not be used to mark the ends of medians, centerpiers, etc., where there is no change in the direction of travel for all traffic. Further, it shall not be used as a route directional confirmatory marker or in any location where an intersecting street or highway of equal or nearly equal importance presents a choice of movement.

When used, the Target Arrow sign shall be erected in target position and, if possible, mounted high enough to be visible for at least 500 feet. It shall be placed at five feet minimum bottom height and two feet from the edge of the shoulder or curb face.

BI-DIRECTIONAL TARGET ARROW SIGN

Reflectorized

W1-7-48 48" x 24"

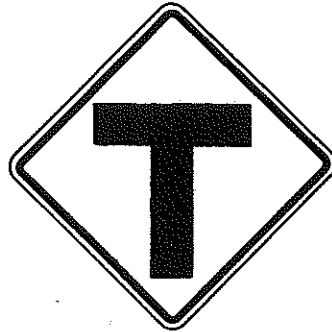
W1-7-96 96" x 48"

The Bi-Directional Target Arrow sign may be used at "T" or "Y" intersections to inform the driver of the abrupt changes in highway alignment.

This sign shall not be used to mark the ends of medians, center-piers, etc., where there is no change in the direction of travel for all traffic. For low speed minor streets a diamond hazard marker may be used in lieu of the W 1-7.

When used, this sign shall be erected in target position and, if possible, it should be mounted high enough to be visible for at least 500 feet. It shall be placed at five feet minimum bottom height and two feet from the edge of the shoulder or curb face.

Where further emphasis of the required movements is desired, the W1-7-96 may be used in lieu of the W1-7-48.

"T" SYMBOL SIGN

Reflectorized

W2-4-30 30" x 30"

W2-4-36 36" x 36"

This sign may be used to warn traffic approaching a "T" intersection on the road that forms the stem of the "T", i.e., where traffic must make a turn either to the right or to the left. This sign should not generally be used on an approach where traffic is required to stop before entering the intersection, nor at a "T" intersection that is channelized by traffic islands, nor where junction signs or advance turn arrows are present.

The relative importance of the intersecting roads may be shown by different widths of line. It may also be desirable to place a Bi-Directional Target Arrow sign (W1-7) at the head of the "T" in target position.

Where used, the "T" symbol sign shall be located in advance of the intersection at the approximate distance indicated below:

85th Percentile Speed			
35 & Below	36-45	46-55	56 & Over
250'	400'	550'	750'

For placement see figure 1-11.

STOP AHEAD SIGN



Reflectorized

W3-1-30 30" x 30" (6" letters)

W3-1-36 36" x 36" (8" letters)

The "STOP AHEAD" sign shall be erected in advance of an intersection where traffic is required to stop and the "STOP" sign is not visible to motorists for a sufficient distance or where emphasis is needed because of poor observance of the stop. The "STOP AHEAD" sign may also be used in advance of a red flashing beacon.

Where required, the W3-1-30 shall be used in advance of a 24-inch "STOP" sign and the W3-1-36 in advance of a 30 or 36-inch "STOP" sign.

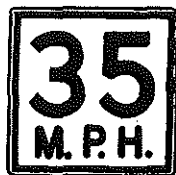
Except where used on State trunkline highways at junctions with other State trunkline highways, it shall be located in advance of the required stop at the approximate distance indicated below:

85th Percentile Speed			
35 & Below	36-45	46-55	56 & Over
250'	400'	550'	750'

For location on State trunkline highways see figures 1-17 and 1-26.

For placement see figure 1-11.

CURVE SPEED PANEL



Reflectorized

W12-1-21 21" x 21" (10" and 3" letters)

W12-1-24 24" x 24" (12" and 3" letters)

The Curve Speed panel may be used as a supplement to the W1-1 through W1-5 signs only and shall display a speed legend in increments of five miles per hour. Since this legend is advisory, no Traffic Control Order is required. The W12-1-21 shall only be used with the appropriate 30 or 36 inch W1 sign and the W12-1-24 with the appropriate 48 inch W1 sign.

To determine the accurate negotiable speed on a turn or curve by the use of a ball bank indicator or Devil Level, several runs should be made in the same direction to obtain the most accurate reading possible. Readings obtained from several trial runs in the same direction shall determine the curve speed for that respective direction. Since the comfortable turn or curve speed on a specific turn or curve may vary, depending on direction of travel, the same procedure shall be used to obtain the curve speed for the opposite direction.

The following table indicates the speed to be used on the Curve Speed panel.

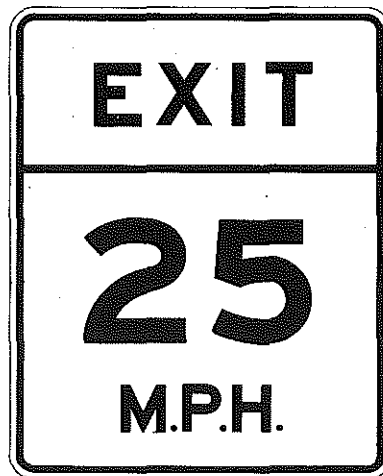
Indicator Reading	Speedometer Reading	Appropriate Panel Legend
10°	60, 59, or 58	60
10°	57, 56, 55, 54, or 53	55
10°	52, 51, 50, 49, or 48	50
10°	47, 46, 45, 44, or 43	45
10°	42, 41, 40, 39, or 38	40
10°	37, 36, 35, 34, or 33	35
12°	32, 31, 30, 29, or 28	30
12°	27, 26, 25, 24, or 23	25

Indicator Reading	Speedometer Reading	Appropriate Panel Legend
14°	22, 21, 20, 19, or 18	20
14°	17, 16, 15, 14, or 13	15
14°	12, 11, or 10	10

The speed legend displayed may equal but never exceed that of the posted speed limit in a Speed Control Zone.

For placement see figure 1-11.

EXIT (RAMP) — MILES PER HOUR SIGN



Reflectorized

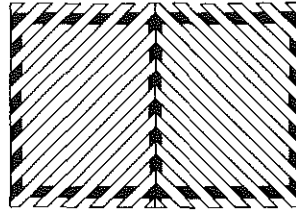
W12-2-48 48" x 60" (8", 16", and 6" letters)

This advisory sign shall be used only at ramps or exists at interchanges where it is necessary to indicate a lower speed. Where deemed appropriate, the word "RAMP" may be used in lieu of "EXIT".

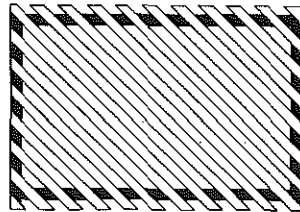
If a safe speed indication is required for a second curve on an off-ramp well beyond the gore, a curve sign with a curve speed panel should be used.

For placement see figure 1-35.

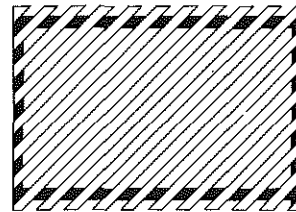
LATTICE BACKGROUND



Bi-directional



Right Directional



Left Directional

Reflectorized

W12-10

The Lattice Background shall only be used in conjunction with a warning or guide sign as outlined herein where greater emphasis is desired.

Where used for advance warning signs, (such as the Curve, Turn, or "STOP AHEAD" signs) an installation may be placed on the right, or both sides, of the roadway (a left directional on the right side and right directional on the left).

Where used in target position (such as for the Large Arrow sign or route marker with route marker arrow) a single installation (left or right directional) with the diagonals pointing down in the direction traffic is required to turn shall be installed. For cases where traffic may proceed in two directions, (where the Large Double Arrow sign or a bi-directional route marker arrow is required) the bi-directional shall be used.

Where used, the Lattice Background shall be placed in such a position that the sign mounted thereon is at the bottom height prescribed under the sign description. The entire unit shall be

placed six feet to the right (left) of the pavement edge where used for advance signs and at a minimum of two feet beyond the usable shoulder or curb face when used for signs in target position.

For location see figure 1-17.

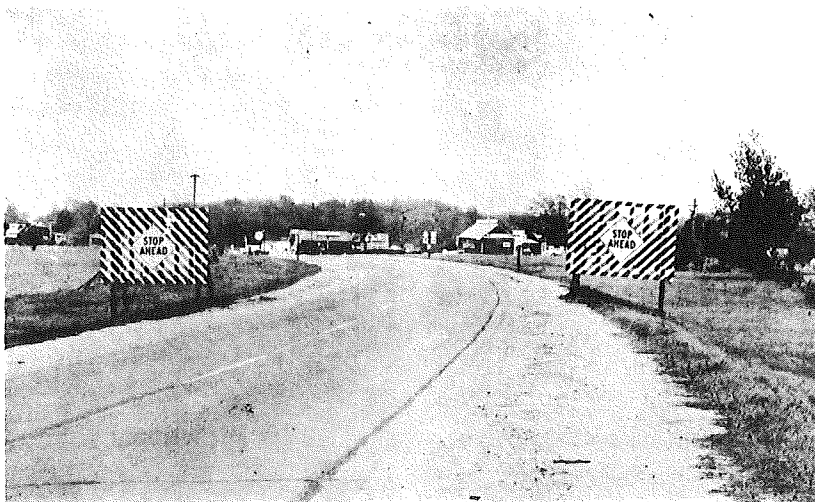


Figure 1-10. The lattice background is one method of providing greater emphasis of warning signs.

PRISON AREA SIGN



Reflectorized

W12-11-30 30" x 30" (5" letters)

The "PRISON AREA" sign may only be used along non-free-ways at maximum security prisons to discourage motorists from