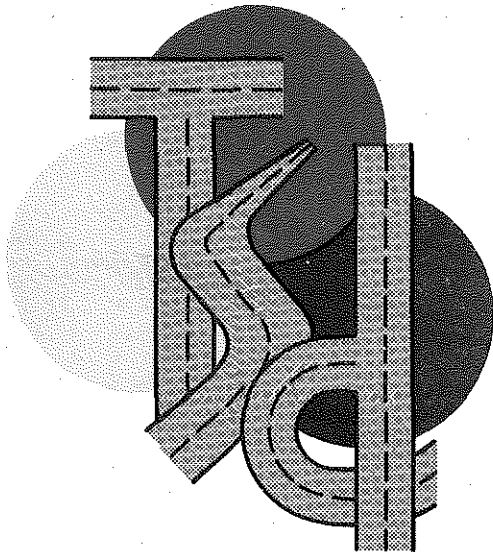


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Report TSD-261-75

A TRAFFIC ACCIDENT ANALYSIS
AND TRAFFIC CONTROL DEVICES INVENTORY
IN WASHTENAW COUNTY



**TRAFFIC and
SAFETY
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Michigan Department
of
State Highways and Transportation

Report TSD-261-75
A TRAFFIC ACCIDENT ANALYSIS
AND TRAFFIC CONTROL DEVICES INVENTORY
IN WASHTENAW COUNTY

JOSEPH L. MESZAROS
TRAFFIC ENGINEERING SERVICES

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PREPARED BY

Traffic Engineering Services
Traffic and Safety Division
Michigan Department of State Highways and Transportation

in cooperation with
The Michigan Office of Highway Safety Planning
and
The U. S. Department of Transportation
Federal Highway Administration

"The opinions, findings and conclusions expressed in this publication are those of the authors and not necessarily those of the State or U. S. Department of Transportation, Federal Highway Administration."

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MICHIGAN DEPARTMENT OF STATE POLICE

Lt. Zane Gray
Sgt. Miller Richter

WASHTENAW COUNTY

Don A. Weir - Chairman
James K. Daniels - Vice Chairman
William R. Lynch - Member
T. J. Vaillencourt - Managing Director
C. M. Hoedeman - Engineer

MICHIGAN DEPARTMENT OF STATE HIGHWAYS AND TRANSPORTATION

G. J. McCarthy	Deputy Director - Highways
D. E. Orne	Engineer of Traffic and Safety
R. J. Kuzma	Supervising Engineer
U. L. Savage	Project Engineer
K. J. O'Berry	Traffic Technician
D. J. McDonald	Traffic Technician
D. V. Wilson	Traffic Technician
D. F. Korman	Traffic Technician

MICHIGAN OFFICE OF HIGHWAY SAFETY PLANNING

Thomas Reel - Director
FHWA Project MCD-73-001C

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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. Highway safety standards were then developed to assure the orderly implementation of the Act.

Purpose

Highway Safety Standard 4.4.13, Traffic Engineering Services, is one of those standards. The purpose of Standard 4.4.13 is

"to assure the full and proper application of modern traffic engineering principles and uniform standards for traffic control to reduce the likelihood and severity of traffic accident."

One of the goals of this standard is identifying specific locations or sections of streets and highways which have a high accident experience or potential as a basis for establishing priorities for eliminating or reducing these hazards. Another objective is an orderly inventory of all traffic control devices, which include those signs, signals, markings and devices placed on, over or adjacent to a street or highway to regulate, warn and guide vehicular and pedestrian traffic.

The State of Michigan carries out a program of this type on the state trunkline system; however, many city and county agencies lack the financial and technical prerequisites necessary to pursue similar programs. To improve the overall evaluation of the accident picture in Michigan, the Michigan Department of State Highways and Transportation requested and received through the Office of Highway Safety Planning in the Department of State Police, a federally funded project entitled "Traffic Engineering Services for Cities and Counties."

The Department's personnel will provide the expertise for each participating city and county. A traffic engineering evaluation of the factors contributing to traffic accidents and recommendations to correct these conditions will be made. The traffic control devices will be upgraded.

Scope

The intent of this program is to improve traffic safety on all Michigan streets and highways by expanding the traffic engineering evaluation of factors causing accidents, and by providing uniform standards for traffic control to reduce the frequency and severity of traffic accidents.

Study Procedures

The study procedures for this project involve a review of high accident locations, and an inventory of traffic control devices. The review of high accident locations includes: basis data collection; identifying and locating high accident locations; an accident analysis of these high accident locations; technical evaluation of accident facts; and consequent remedial recommendations.

The traffic control devices inventory includes: a field review of all County Primary routes noting the placement, condition and adequacy of the traffic control devices; tabulation of the field data; determination of priorities for upgrading of traffic control devices; and cost estimation for the proposed recommendations.

Funding

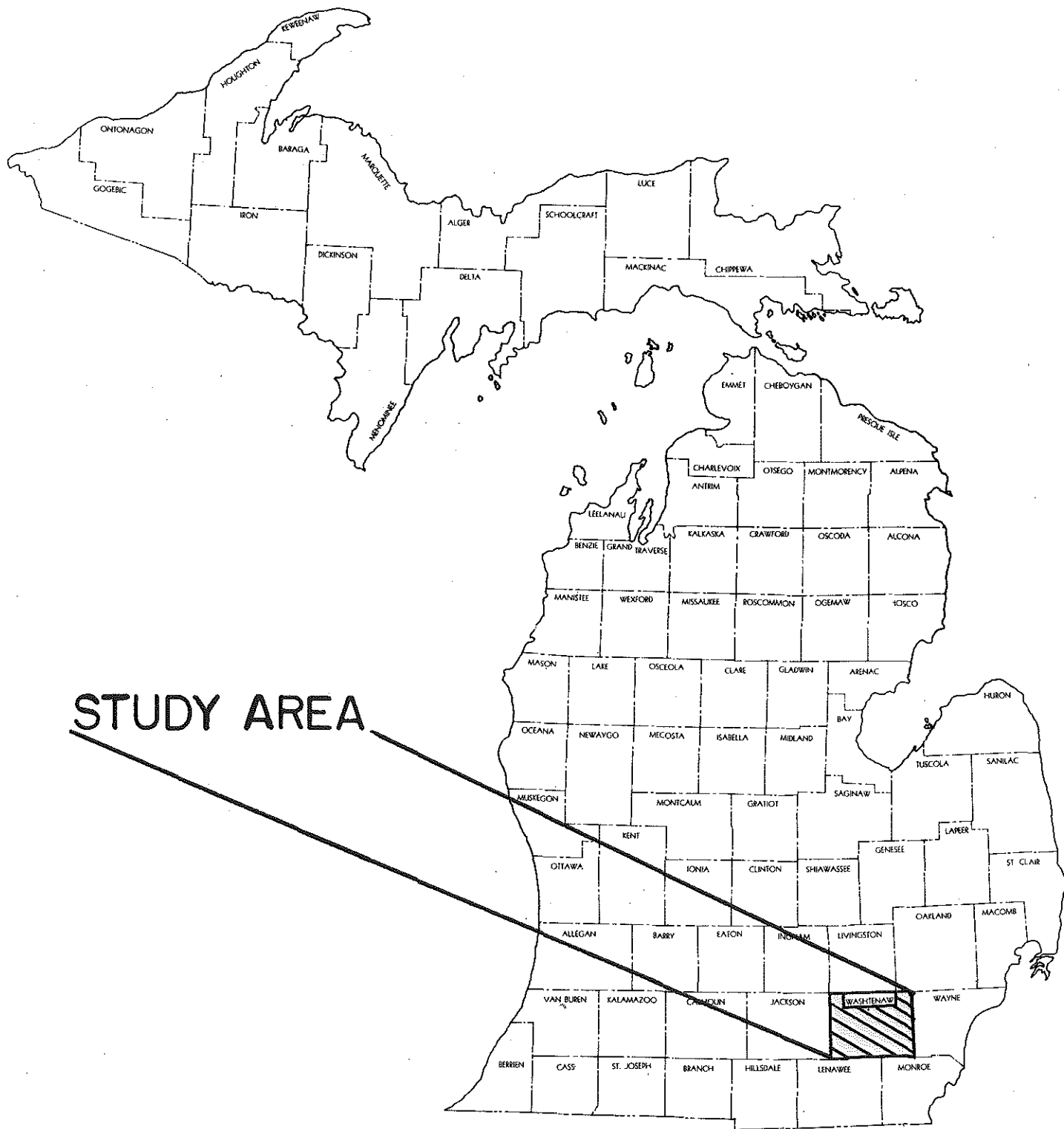
The implementation of the proposed recommendations is the responsibility of Washtenaw County. Financial assistance may be obtained through the Highway Safety Act of 1973 (Appendix I) which was established to provide funding for the implementation of safety improvement projects aimed at the elimination or reduction of traffic accidents. Further information on this Program may be obtained by contacting the Local Government Division of the Michigan Department of State Highways and Transportation.

Study Area

Washtenaw County is located in the southeast corner of the state (Figure 1). It is bordered by Livingston and Oakland Counties on the north, Wayne County on the east, Lenawee and Monroe Counties on the south and Jackson County on the west.

The road system in Washtenaw County, according to the Twenty-Third Annual Progress Report as compiled by the Local Government Division of the Michigan Department of State Highways and Transportation, is made up of 147.98 miles of state trunkline, 500.02 miles of county primary roads and 944.55 miles of county local roads for a total of 1,592.55 miles of roadway.

FIGURE 1



STUDY AREA

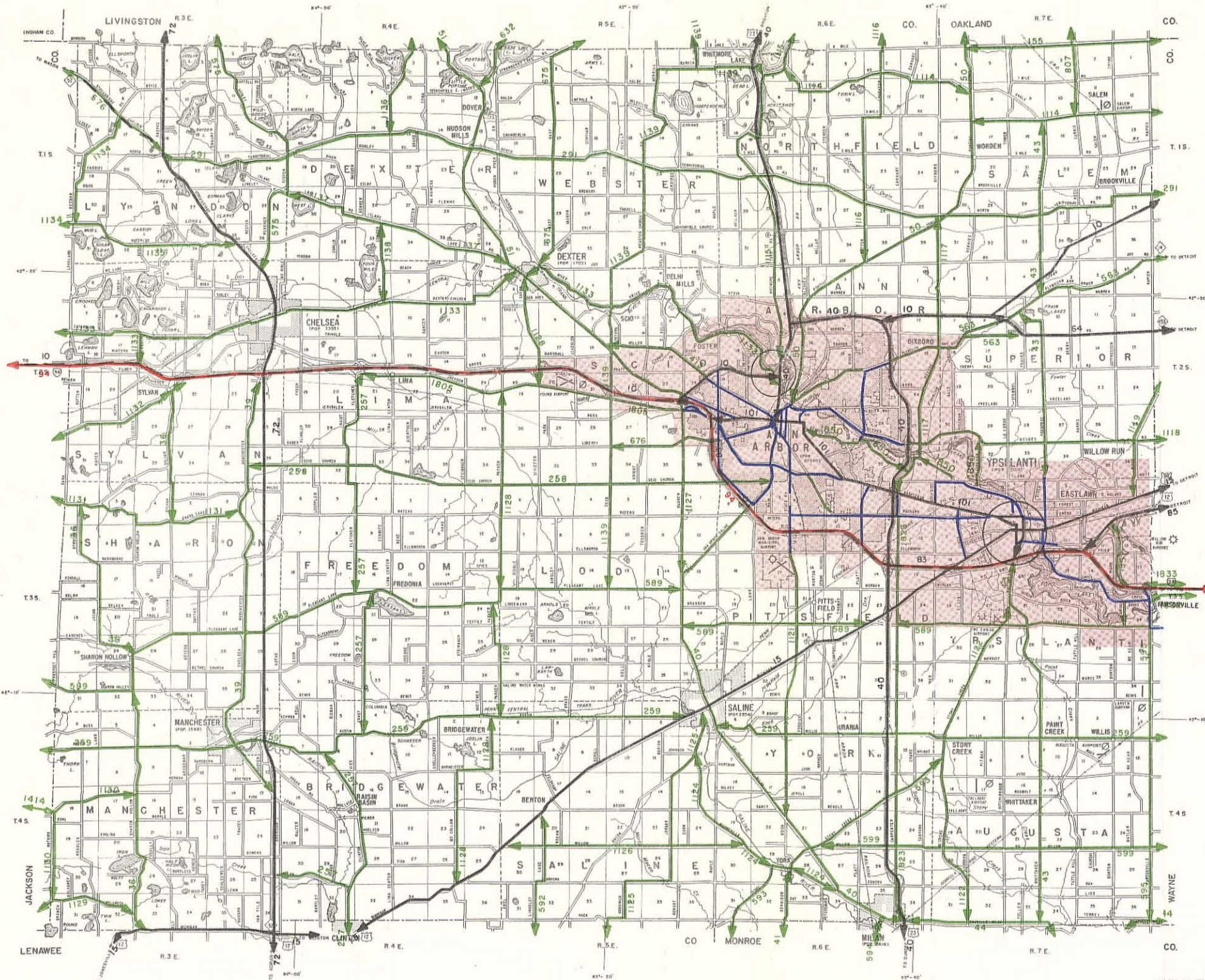


FIGURE 2

COUNTY ROAD SYSTEM



KEY TO COUNTIES



LEGEND

APPROVED FEDERAL AID SYSTEM	PROPOSED REVISIONS
INTERSTATE AND PRIMARY	ADDITION TO _____ SYSTEM
PRIMARY	DELETION FROM _____ SYSTEM
SECONDARY (STATE)	FEDERAL-AID URBAN BOUNDARY
SECONDARY (COUNTY) URBAN	REVISED TO JANUARY 1, 1973

FOR FEDERAL - AID SYSTEM DETAILS
SEE FEDERAL - AID SYSTEM AND
URBAN AREA BOUNDARY MAP.

FEDERAL AID SYSTEMS
WASHTENAW 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" = 2.75 MILES
POLYCONIC PROJECTION

TRINLINES AND CORPORATE LIMITS REVISED JANUARY 1969

TRAFFIC ENGINEERING ANALYSIS

Control Devices Inventory

Collection of Field Data - All county-maintained control devices on the County Primary Road System including the Federal-Aid Secondary routes (Figure 2) were surveyed. All the signs on this system, except guide signs, were inventoried including "Stop" and "Yield" signs on other routes which intersect the inventoried routes.

The control devices were inventoried by driving west to east or south to north depending on the basic direction of the route. When inventoried routes intersected, the "Stop" and "Yield" signs at such intersections were inventoried on their respective routes; however, all signs are shown at each intersection. Traffic Control Orders for speed and parking control zones on the County Primary Road System were checked with the Department of State Police. The inventoried routes were checked to ensure compliance with these Traffic Control Orders, as well as the "Michigan Manual of Uniform Traffic Control Devices".

Conversion of Field Data - Two simple forms (Inventory Sheets and Quantity Sheets) are used in recording the field data. These forms will enable the Washtenaw County Road Commission's personnel to determine the work which must be done per route and county wide.

Inventory Sheets - The inventory sheets are 11" x 16" ozalid reproductions that show existing traffic control devices that are required to provide conformance with the present standards.

Each sign, whether it is an existing sign, a replacement or needed sign, is located on the inventory sheet by establishing its distance in miles from a major crossroad, city limit, village limit, or county line. At locations where alterations in the present signing are necessary, a description of these alterations is indicated on the Inventory sheets. A number which is circled at each location indicates the priority by which the work should be completed. The two priorities are as follows:

- 1) Work which should be completed as soon as possible, for example, installation of a new sign, replacement of an existing sign, or removal or relocation of a sign.
- 2) Work which should be completed when and if the existing signing is replaced with symbol signing.

Quantity Sheets - There are two sets of quantity sheets, one set for the county wide signs and one set for each route. The county wide quantity sheets (located in the beginning of the 11" x 16" book) are divided into signs located on the FAS routes and signs located on the County Primary routes and indicate the total number of signs which are needed under priority one, priority two and those that require no change. The quantity sheets for each route (located at the beginning of each route in the 11" x 16" book) indicate the number of signs which are needed under priority one, priority two and those that require no change. Signals and flashers located at the intersection of two inventoried routes will be found on the quantity sheet pertaining to the east-west route.

Maintenance of Inventory - The Inventory sheets (both ozalid and vellum copies) indicate those signs which should be erected, those which must be removed, those which must be relocated and those which are adequate. All unnecessary notes and priority numbers should be removed (from the vellum copies) as each portion of work is completed. When the work has been completed and the necessary corrections have been made on the Inventory (vellum copies) sheets, the signs remaining will be those which are in place on the road system.

It is recommended that the Washtenaw County Road Commission make the necessary corrections to the inventory as future signs are installed, removed or altered.

Signs

Regulatory - A comprehensive study of traffic control devices on the Washtenaw County Primary Road System has established a need for installation or maintenance of approximately 18 percent of the required regulatory signs. The primary reason for these deficiencies were due to either the lack of reflectivity, poor condition or absence of the following signs: "STOP" (R1-1) signs, Speed Limit (R2-1) signs, "REDUCE SPEED _____ AHEAD" (R2-5b) signs, "DO NOT PASS" (R4-1) signs, "PASS WITH CARE" (R4-2) signs, "NO PARKING AT ANY TIME" (R7-1) signs, "NO STOPPING STANDING PARKING" (R7-2) signs and "CENTER LANE FOR PASSING ONLY" signs.

Warning - The inventory indicates a need for installation of approximately 20 percent of the required warning signs. The most evident deficiencies were due to either lack of reflectivity, poor condition or absence of the following signs: Turn (W1-1) signs, Curve (W1-2) signs, Directional Target Arrows (W1-6) signs, Bi-Directional Target Arrows (W1-7) signs, Cross Road Warning (W2-1) signs, "STOP AHEAD" (W3-1) signs, Slippery When Wet (W8-5 & Plaque) signs, "TRUCK CROSSING" (W11-10) signs, Advisory Speed (W13-1) plates and Type III Object Markers.

The traffic control devices inventory also reveals a need for many Type III Object Marker panels. It is permissible to use reflective liquids in place of Type III Object Markers where the obstruction would not be hidden by weeds growing along the road. For the purpose of estimating costs, it is assumed that Washtenaw County will use the Type III Object Marker panels at all locations.

No-Passing Zone - It was noted that there were approximately 970 no-passing zones designated by signs and/or markings on the County Primary Road System in Washtenaw County. A no-passing zone is defined as a section of roadway having insufficient passing sight distance. A field survey should be completed on all sections of hard-surfaced roads where sight distances are restricted. Such a field survey should result in any necessary corrections being made to the limits of existing no-passing zones and the establishment of new zones where necessary.

After the field survey is completed, no-passing zones should be indicated by solid yellow lines applied along the limits established by the survey. Then "DO NOT PASS" (R4-1) and "PASS WITH CARE" (R4-2) signs may (at the option of the County Road Commission) be placed at the limits of the no-passing zones; however, when either of these signs is used, they shall both be erected. Where additional notice is deemed necessary for a no-passing zone, a pennant-shaped "NO PASSING ZONE" sign (W14-3) shall be located on the left side of the roadway opposite the beginning of the zone.

Pavement Markings at Railroad Crossings - The approach pavement at several of the railroad crossings is not properly marked. The pavement marking in advance of a railroad crossing shall consist of an X, the letters RR, a no-passing marking, and certain transverse lines. They should be placed on all paved approaches to railroad crossings. These markings, if physically feasible, shall be placed at all grade crossings where railroad crossing signals or automatic gates are operating, and at all other crossings when the prevailing speed of highway traffic is 40 mph or greater.

The markings shall also be placed at crossings when engineering studies indicate there is a significant potential conflict between vehicles and trains. At minor crossings or in urban areas, these markings may be omitted if engineering studies indicate that other devices installed provide suitable protection. Such markings shall be white except for the no-passing markings.

Cost Estimate - The cost estimate for the work shown on the Inventory sheets, including materials, labor costs involved

in installing signs, sign supports, or straightening signs or supports, is as follows:

Federal-Aid Secondary			County Primary	
Priority 1	Regulatory	\$36,400.00	Regulatory	\$2,630.00
	Warning	46,450.00	Warning	2,780.00
Priority 2		\$ 0.00		\$ 0.00
Total		\$82,850.00	Total	\$5,410.00

Date of Field Survey - The inventory of all the traffic control devices on the County Primary Road System in Washtenaw County was completed in September 1973.

Accident Analysis

Collection and Analysis of Field Data - The Department of State Police examine their records and transmitted to the Traffic and Safety Division of the Michigan Department of State Highways and Transportation a list of the 20 high accident locations (Figure 3) on the county road system. An automated system of locating accidents on local roads has not yet been established on a statewide basis; therefore, the high accident locations for Washtenaw County were determined by manually extracting and compiling those locations with the highest number of accidents from 1970 county accident reports. Once the problem locations were identified, accident information for the years 1971, 1972, and 1973 was compiled in order to provide the latest data.

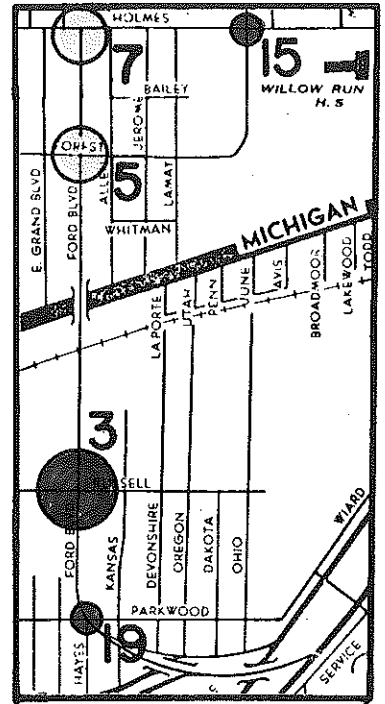
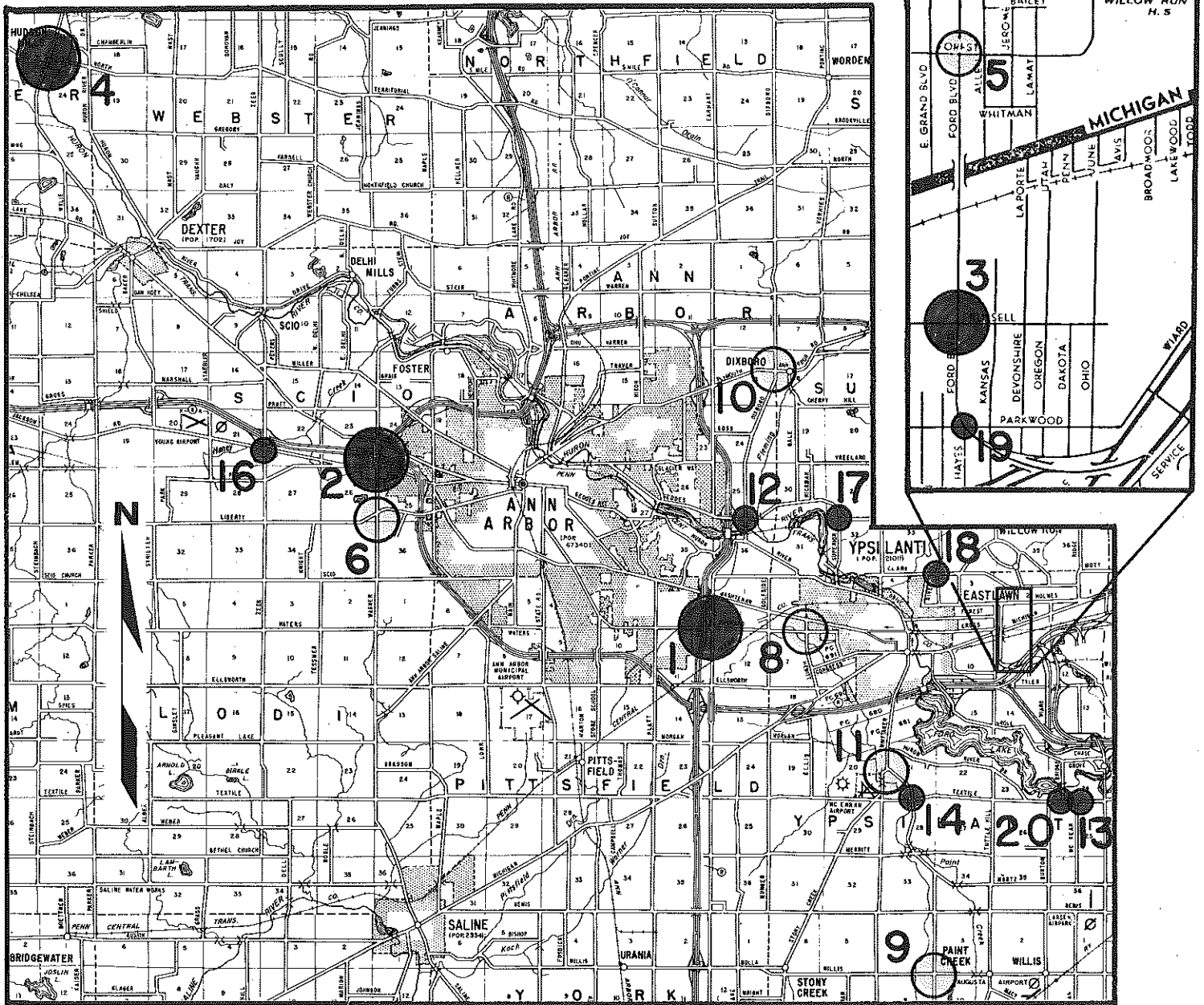
The 20 high accident locations accounted for 568 accidents during the three-year study period. Traffic volumes on the County Primary Road System in Washtenaw County vary from moderate in outlying areas to heavy near the Cities of Ann Arbor and Ypsilanti. It is understandable that the high concentration of accidents will be in this area (Figure 4).

The data collection for which the Department of State Highways and Transportation is responsible, involves the following basic steps: 1) conducting a field investigation of each location; 2) preparing of collision diagrams and physical condition diagrams for each location; 3) obtaining traffic and speed study counts where necessary; 4) preparing a warrant graph and capacity analysis for signalized locations; and 5) conducting skidometer tests at locations where wet and skidding accidents occur.

The analysis portion involves analyzing 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. Individual

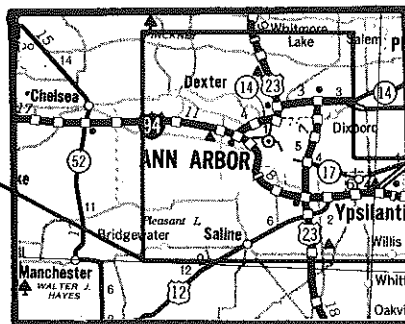
SPOT MAP OF HIGH ACCIDENT LOCATIONS IN WASHTENAW COUNTY (1971 - 1973)

FIGURE 3



LEGEND

- 0 - 20 ACC.
- 21 - 40 ACC.
- 41 - AND UP



KEY TO COUNTIES

accident reports were reviewed in detail and collision diagrams were prepared for each location in order to identify accident patterns and to locate the accident in relation to the geometrics of the intersection. The analysis results in evaluating the total information and prescribing the proper treatment at each location.

County-Wide Recommendations

Signalization - Green Arrows - In Washtenaw County there are a substantial number of leading left turn green arrows which terminate without warning. At the end of the green arrow interval the circular green for the thru movement is displayed. The termination of the green arrow and the beginning of the circular green creates a period of conflict between vehicles making a late left turn and vehicles starting on the circular green. The Michigan Manual of Uniform Traffic Control Devices states "Separate signal faces should be used when exclusive turning movements are controlled by green arrows. A clearance interval shall be provided between the termination of a green arrow indication and the showing of a green indication to any conflicting traffic movement".

The locations that have these leading left turn green arrows should be reevaluated. If the left turn phase is warranted, then a separate signal face should be installed at these locations.

Approach Lanes - Field observation revealed that a few signalized locations in Washtenaw County had only one approach lane. When an intersection is signalized, there often develops a need for additional intersection capacity. If the approaches have a single lane, then turning vehicles may cause extensive delay to other traffic on the same approach. A left turn may be delayed by opposing traffic or pedestrians in the crosswalk. Other traffic will then be held up in the same lane, until the turn can be completed. A right turn can be held up due to pedestrians in the crosswalk.

Since turning movements so readily create delay, there is a need for a minimum of two approach lanes on every approach to every signalized intersection. The second lane will allow by-passing of vehicles stopped or slowing to make turns, and will reduce unnecessary delays even if not actually needed for capacity. The widening of intersectional approaches to separate turning traffic from thru traffic is recommended to help reduce the delays caused by assignment of right-of-way at the intersections controlled by traffic signals. Widening also aids in the overall operation of the intersection, because more vehicles are able to negotiate the intersection per signal cycle. Additional width

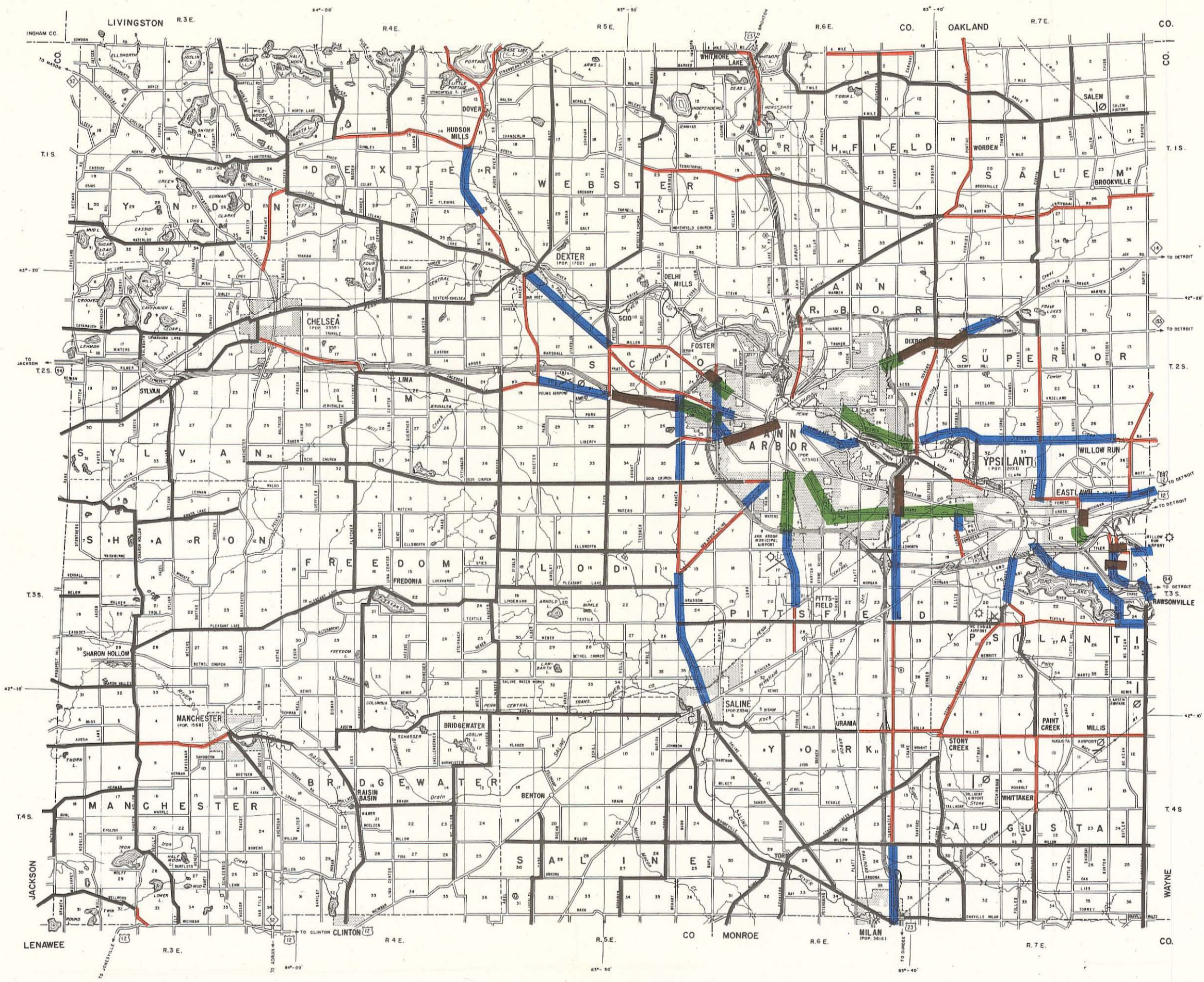
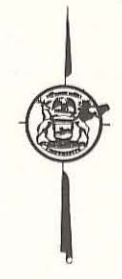


FIGURE 4

WASHTENAW COUNTY A. D. T. MAP



KEY TO COUNTIES

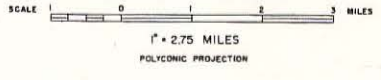


LEGEND

	0 - 2,499
	2500 - 4,499
	5000 - 7,499
	7500 - 9,999
	10000 - OVER

WASHTENAW 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



TOWNLINES AND CORPORATE LIMITS REVISED JANUARY 1949

is also necessary on the leaving side as much as the approach side of the intersection to promote movement throughout the intersection.

4-Way Stops - In Washtenaw County 4-Way Stops are used to control traffic operation at certain high accident locations. The Michigan Manual states that a "4-Way Stop" installation is useful as a safety measure at some locations and should ordinarily be used only where the volume of traffic on the intersecting roads is approximately equal.

Any of the following conditions may warrant a 4-Way Stop sign installation:

1. Where traffic signals are warranted and urgently needed, the 4-Way Stop is an interim measure that can be installed quickly to control traffic while arrangements are being made for the signal installation.
2. An accident problem, as indicated by five or more reported accidents of a type susceptible of correction by a 4-Way Stop installation in a 12-month period. Such accidents include right and left-turn collisions as well as right-angle collisions.
3. Minimum traffic volumes:
 - (a) The total vehicular volume entering the intersection from all approaches must average at least 500 vehicles per hour for any 8 hours of an average day, and
 - (b) The combined vehicular and pedestrian volume from the minor street or highway must average at least 200 units per hour for the same 8 hours, with an average delay to minor street vehicular traffic of at least 30 seconds per vehicle during the maximum hour, but
 - (c) When the 85-percentile approach speed of the major street traffic exceeds 40 miles per hour, the minimum vehicular volume warrant is 70 percent of the above requirement.

We are in agreement with Washtenaw County in converting the operation of three locations: Dexter-Pinckney Road at North Territorial Road; Whittaker Road at Willis Road and Whittaker Road at Textile Road to 4-Way Stops. Washtenaw County should utilize the above warrants when considering future 4-Way Stop operation.

Clear Vision Areas - In order to provide ample sight distance at intersections, the corners of these intersections must not be overgrown with foliage nor have other obstructions. Although buildings or other permanent

obstacles sometime create inadequate visibility, most of the time removable objects such as trees, signs, or parked vehicles prohibit adequate sight distances. It is therefore recommended that Washtenaw County not only establish a program to create clear vision corners at all intersections, but also begin a maintenance program to insure that all corners are kept clear of obstacles.

Skidometer Testing - The Traffic and Safety Division uses two techniques to determine whether a skidometer test is necessary. Both techniques involve the number of wet pavement accidents at a location as a criteria. Method #1 involves subtracting the snow and ice accidents over the study period. If the wet pavement accidents percentage is more than 40 percent of this new total, skidometer tests should be recommended. In Method #2, if the wet accidents are more than 27 percent of the total accidents at a location over the study period, then skidometer tests should be recommended. If either method is satisfied, then skidometer tests should be conducted at the location. Skidometer tests have been requested to be conducted at Location 5, since 55 percent of the accidents occurred on wet pavement. The Testing and Research Division will conduct these test and will forward the results to the Traffic and Safety Division's Traffic Engineering Services Unit to be evaluated. Recommendations will then be presented to the Washtenaw County Road Commission.

Estimated Cost - Since final construction plans are not available in estimating the construction costs, the lump sum of \$7.50 per square foot has been used. The cost for all other recommendations is based on Department unit prices and using Department personnel for the work.

High Accident Locations - After the analysis of the 20 high accident locations was completed, it was apparent that no engineering recommendations would be feasible for seven of these locations. At three other locations traffic control operation (4-Way Stops) was changed during the study period. This report will discuss in detail the remaining ten locations.

The high accident locations for the three year study period (1971-1973) are as follows:

<u>Location</u>	<u>Accidents</u>	<u>Average Accident Rate ACC/MV</u>
1. Carpenter Road and Packard Street	103	5.2
2. Jackson Road and Wagner Road	49	2.4
3. Ford Blvd. and Russell Road	47	5.4

	<u>Location</u>	<u>Accidents</u>	<u>Average Accident Rate ACC/MV</u>
*4.	Dexter-Pinckney Rd. and N. Territorial Road	41	4.4
5.	Ford Blvd. and Forest Avenue	33	2.3
.6.	Wagner Road and Liberty Road	30	3.2
7.	Holmes Rd. and Ford Blvd.	28	2.1
8.	Packard Street and Hewitt Road	26	1.4
*9.	Whittaker Road and Willis Road	23	4.8
**10.	Dixboro Rd. and Plymouth Road	22	1.8
11.	Whittaker Rd. and Stony Creek Rd.	21	3.9
**12.	Dixboro Road and Geddes Road	20	2.7
13.	Textile Road and McKean Road	20	1.1
*14.	Whittaker Road and Textile Road	20	4.6
**15.	Holmes Road and Midway Road	19	1.3
**16.	Jackson Road and Zeeb Road	17	1.4
**17.	Geddes Road and Superior Road	16	2.5
**18.	Clark Road and Prospect Street	12	1.4
**19.	Ford Blvd. and Parkwood St., Hayes Street	11	1.3
20.	Textile Road and Bridge Road	10	0.8

*The Traffic controls changed at these locations.

**These locations will not be discussed.

CARPENTER ROAD AT PACKARD STREET

Operational Analysis:

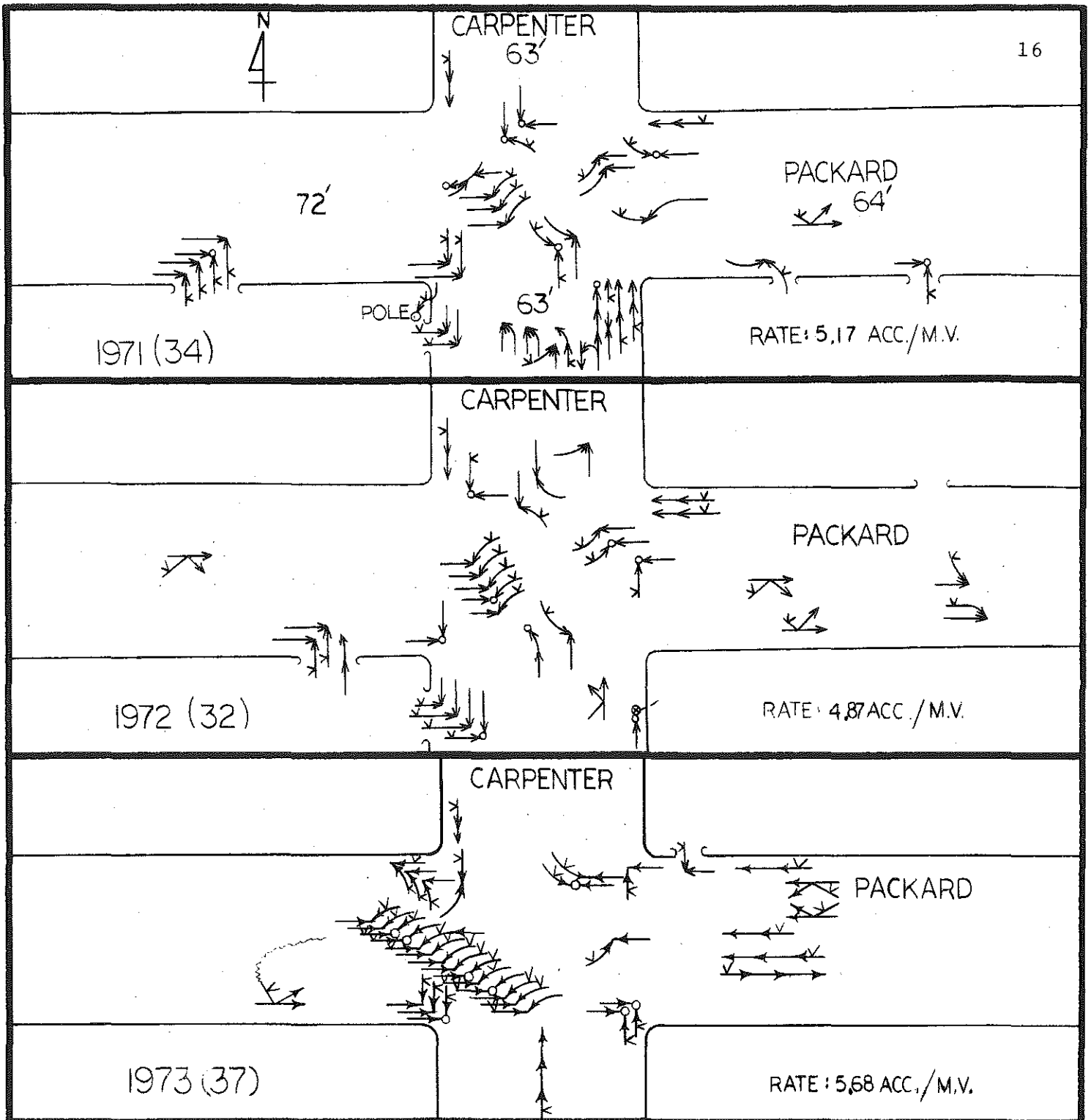
Carpenter Road intersects Packard Street to form a right-angle intersection operating under traffic signal control. The right-of-way assignment is based on a 60 second cycle with 55-45 split favoring Packard Street and yellow clearance intervals of five percent (3.0 seconds). Included in the phasing of this signal is a 12 percent (7.2 seconds) leading green arrow for left turns off Packard Street.

Accidents:

<u>Type</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>Total</u>
Head On Left Turn	8	9	15	32
Right-Angle	10	9	7	26
Turning	7	4	6	17
Rear End	6	5	6	17
Sideswipe	1	4	3	8
Miscellaneous	2	1	0	3
	<hr/>	<hr/>	<hr/>	<hr/>
Total	34	32	37	103

The miscellaneous types included one ran off roadway, one improper backing and one pedestrian accident. The accident rate was 5.2 ACC/MV.

The problem at this intersection involves the non-standard use of a leading left turn arrow which terminates without warning. This non-standard traffic control device creates head on-left turn accident types as indicated by the collision diagram.



LEGEND

**MICHIGAN DEPARTMENT OF STATE HIGHWAYS
TRAFFIC AND SAFETY DIVISION**

Stop & Go Signal Stop Sign **S**
 Flashing Beacon Yield Sign **Y**

Location **CARPENTER AT PACKARD
WASHTENAW CO.**

Figure 5

Fatal Pedestrian
 Injury Tree
 Skidding Out of Control
 Jackknife Driver Intent
 Overturned Deer
 Backing Violator

Period: 1971 THRU 1973 5.2 ACC./M.V.
 Accidents - Total 103 P.D. 79
 Injury 24 () Fatal 0 ()
 C.S. _____ Miles _____ Drawn DFK
 Plan No. LOCATION 1 Date 5-13-74



NORTHBOUND CARPENTER ROAD



SOUTHBOUND CARPENTER ROAD

Figure 6



EASTBOUND PACKARD STREET



WESTBOUND PACKARD STREET

Figure 7

RECOMMENDATIONS

<u>Type</u>	<u>Estimated Costs</u>
1. Change the signal timing to 70 second cycle with a 44-36 split favoring Packard Street and a left turn phase for east and westbound Packard Street of 20 percent (14.0 seconds). The yellow clearance interval should be six percent (4.2 seconds) in each phase.	\$ 70.00
2. Install a signal face for the left turns on east and westbound Packard Street and remove the existing single left turn green arrow. The Manual states that a green indication can't be terminated without going through a yellow and red indication. Re-arrange the signal faces as shown on the condition diagram. (Figure 8)	\$ 664.00
3. Apply pavement markings including centerlines, lane lines and pavement arrows to stress the function of each lane at this intersection.	\$ 997.50
4. Erect overhead Lane-Use Control signs to indicate the purpose of each lane.	\$8,296.70
	<hr/>
TOTAL	\$10,028.20

JACKSON ROAD AT WAGNER ROAD

Operational Analysis:

Jackson Road intersects Wagner Road to form a right-angle intersection operating under signal control. The right-of-way assignment is based on a 70 second cycle with a 60-40 percent split favoring Jackson Road and yellow clearance intervals of five percent (3.5 seconds). Two 10 percent (7.0 seconds) leading green arrows for left turns are included in the phasing of this signal. Jackson Road is a divided highway at this intersection.

Accidents:

<u>Types</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>Total</u>
Right-Angle	7	9	5	21
Turning	3	8	1	12
Rear End	2	1	4	7
Miscellaneous	5	2	2	9
	<hr/>	<hr/>	<hr/>	<hr/>
Total	17	20	12	49

The miscellaneous types included four ran off roadways, four head on-left turns and one accident involving a vehicle going the wrong way on a one-way street. The accident rate was 2.4 ACC/MV.

The operation at this location was changed in 1973 from stop control to signal control. The utilization of two non-standard leading left turn arrows which terminate without warning is in violation of the Michigan Manual of Uniform Traffic Control Devices.



WAGNER
63'

22

61'

JACKSON
52'

24'

1971 (17)

63'

RATE: 2.49 ACC./M.V.

WAGNER

POLE

JACKSON

1972 (20)

RATE: 2.93 ACC./M.V.

WAGNER

JACKSON

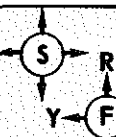
1973 (2)

RATE: 1.76 ACC./M.V.

LEGEND

STATE OF MICHIGAN
DEPARTMENT OF STATE HIGHWAYS
AND TRANSPORTATION

Stop & Go Signal



Stop Sign



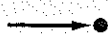
Flashing Beacon



Yield Sign



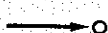
Fatal



Pedestrian



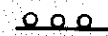
Injury



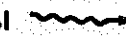
Tree



Skidding



Out of Control



Jackknife



Driver Intent



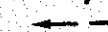
Overtaken



Deer



Backing



Violator



Location JACKSON AT WAGNER
WASHTENAW CO.

Figure 9

Period: 1971 THRU 1973 24 ACC./M.V.

Accidents - Total 49 P.D. 39

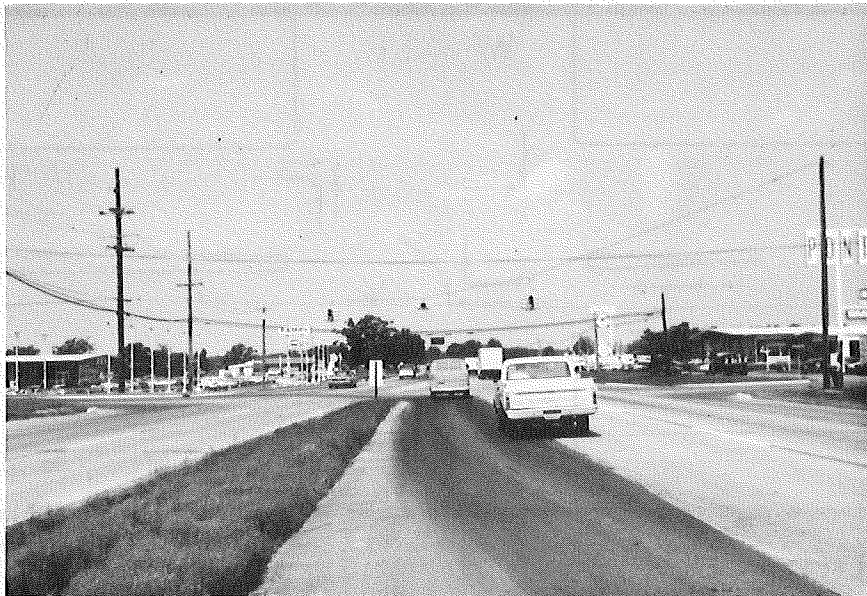
Injury 10 () Fatal 0 ()

C.S. Miles Drawn DFK

Plan No. LOCATION 2 Date 5-14-74



EASTBOUND JACKSON ROAD



WESTBOUND JACKSON ROAD

Figure 10



NORTHBOUND WAGNER ROAD



SOUTHBOUND WAGNER ROAD

**TRANSPORTATION LIBRARY
MICHIGAN DEPT. STATE HIGHWAYS &
TRANSPORTATION LANSING, MICH.**

Figure 11

RECOMMENDATIONS

<u>Type</u>	<u>Estimated Cost</u>
1. Since a capacity analysis does not indicate a need for the left turn phases, it is recommended that the separate phases for left turns be removed.	\$70.00
2. Apply pavement marking including pavement arrows to define the function of each lane.	\$1,085.50
3. Erect overhead Lane-Use Control signs.	\$8,314.60
	<hr/>
Total	\$9,470.10

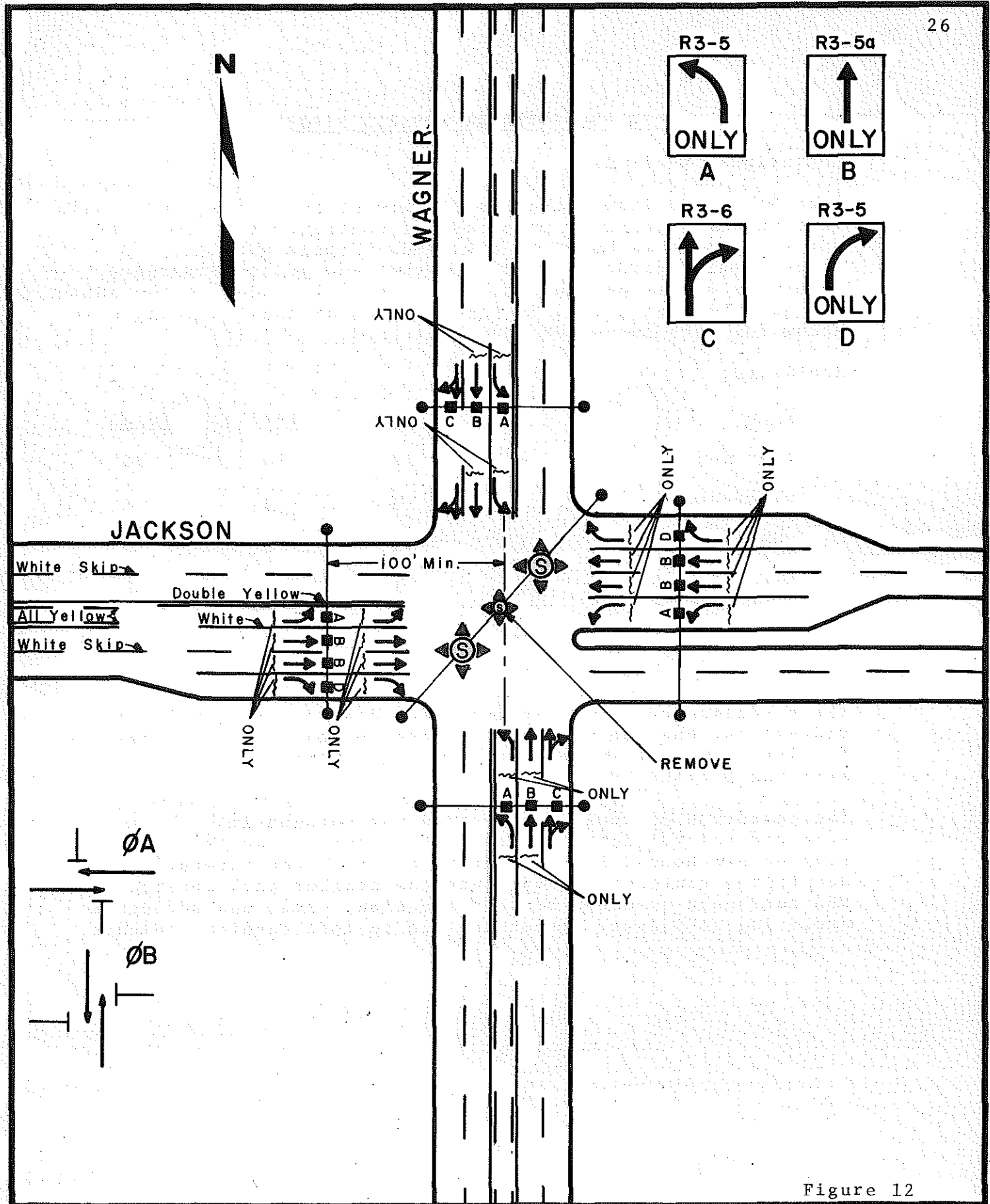


Figure 12

STATE OF MICHIGAN DEPARTMENT OF STATE HIGHWAYS TRAFFIC & SAFETY DIVISION	AUTH. NO.	DRAWN DFK	PROPOSED INTERSECTION APPROACH DIAGRAM
	CONT. SEC.	DATE 11-13-74	
	REF.	SCALE	
	SHEET OF	PLAN	

FORD BOULEVARD AT RUSSELL STREET

Operational Analysis:

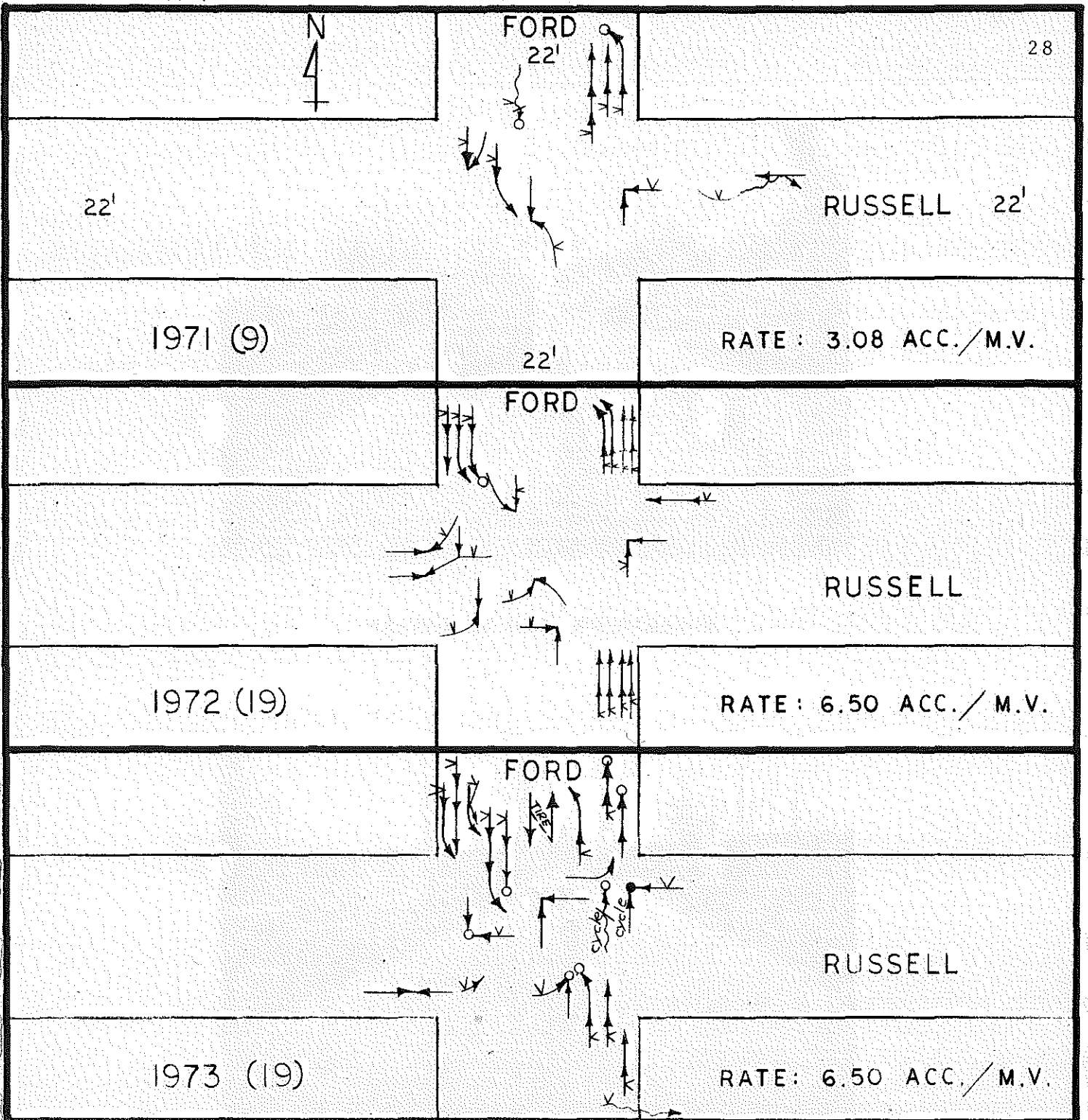
Ford Boulevard intersects Russell Street to form a right-angle intersection operating under signal control. The right-of-way assignment is based on a 60 second cycle with a 67-33 percent split favoring Ford Boulevard and yellow clearance intervals of six percent (3.0 seconds). Included in the phasing at this signal is a 16 percent (9.6 seconds) leading green arrow for left turns off Ford Boulevard.

Accidents:

<u>Type</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>Total</u>
Rear End	4	12	10	26
Right-Angle	1	3	3	7
Turning	1	3	2	6
Miscellaneous	3	1	4	8
Total	9	19	19	47

The miscellaneous types included two head on-left turns, two sideswipes, one ran off roadway, one improper backing, one defective equipment and one motorcycle accident. The accident rate was 5.4 ACC/MV.

The operation of this intersection was changed in 1975 from stop control to signal control. Rear end accidents are occurring on northbound Ford Boulevard north of the intersection due to the vehicles turning into the trailer park located in the northwest quadrant of this location. Rear end accidents occurring at Russell Street are due to left turning vehicles.



LEGEND

**STATE OF MICHIGAN
DEPARTMENT OF STATE HIGHWAYS
AND TRANSPORTATION**

Stop & Go Signal Stop Sign S S S S
 Flashing Beacon Yield Sign Y Y Y Y

Location **FORD AT RUSSELL
WASHTENAW CO.**

Figure 13

Fatal Injury Skidding Jackknife Overturned Backing Pedestrian Tree Out of Control Driver Intent Deer Violator V V V

Period: 1971 THRU 1973 5.4 ACC./M.V.
 Accidents - Total 47 P.D. 36
 Injury 10 () Fatal 1 (1)
 C.S. Miles Drawn DFK
 Plan No. LOCATION 3 Date 5-17-74



NORTHBOUND FORD BOULEVARD



SOUTHBOUND FORD BOULEVARD

Figure 14



EASTBOUND RUSSELL STREET



WESTBOUND RUSSELL STREET

Figure 15

RECOMMENDATIONS

<u>Type</u>	<u>Estimated Cost</u>
1. Construct additional laneage on each leg of this intersection to provide a center lane for left turns for each approach leg.	\$122,460.00
2. By providing a left turn lane on Ford Boulevard a separate turning phase will not be needed. The volume of turning traffic at this intersection indicates that the left turn traffic can be handled by a seven percent (4.2 second) yellow clearance interval.	\$ 70.00
3. Apply pavement marking including pavement arrows to indicate the function of each lane.	\$ 45.80
4. Erect a four way case sign (R3-10) with the legend "Left Turn Lane" for each left turn lane.	\$ 370.00
5. Resurface this intersection so that the joints between lanes will not be visible.	\$ 8,615.00
	<hr/>
Total	\$131,560.80

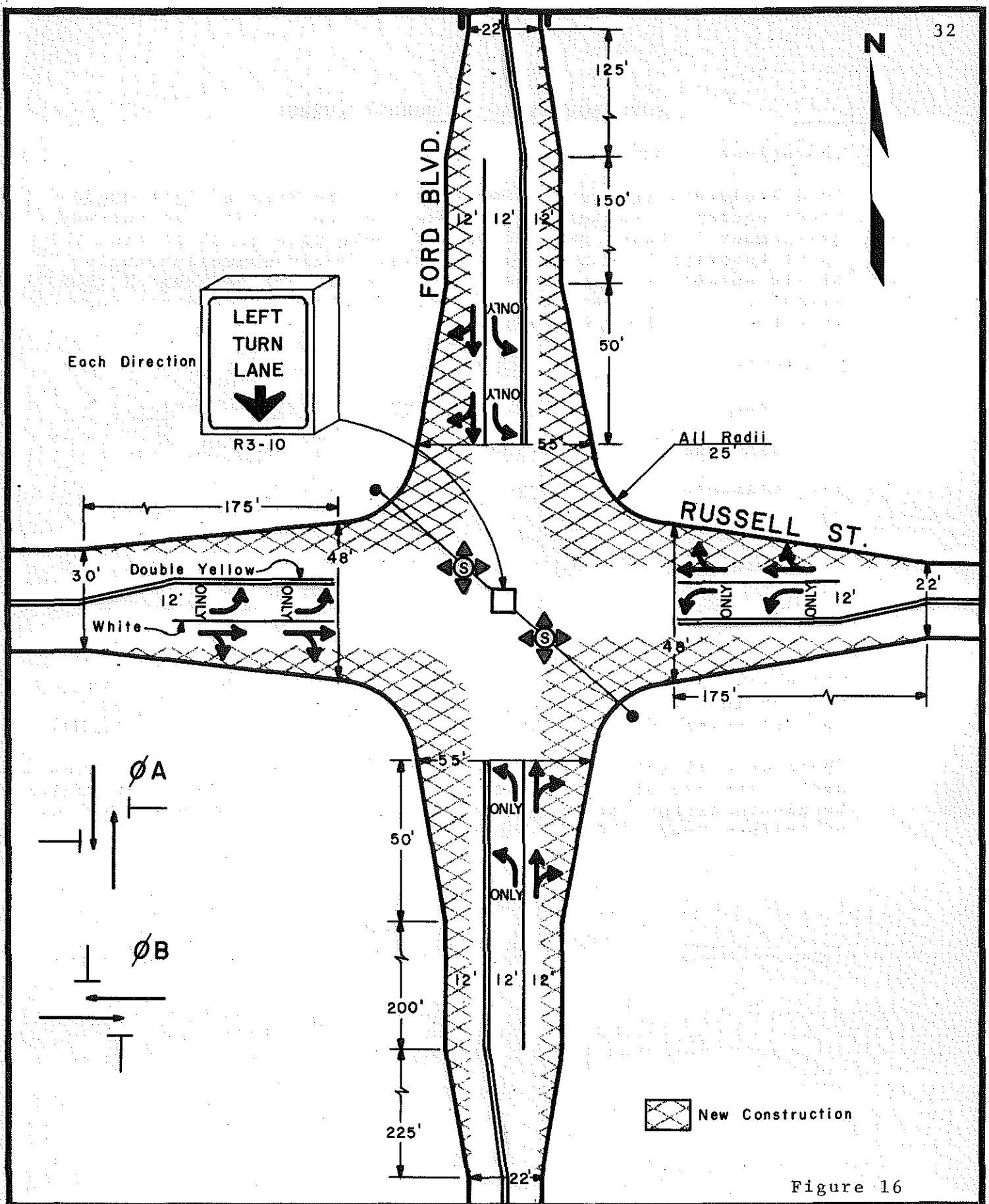


Figure 16

STATE OF MICHIGAN DEPARTMENT OF STATE HIGHWAYS TRAFFIC & SAFETY DIVISION	AUTH. NO.	DRAWN DFK	PROPOSED INTERSECTION APPROACH DIAGRAM
	CONT. SEC.	DATE 3-20-75	
	REF.	SCALE	
	SHEET OF	PLAN	

FORD BOULEVARD AT FOREST AVENUE

Operational Analysis:

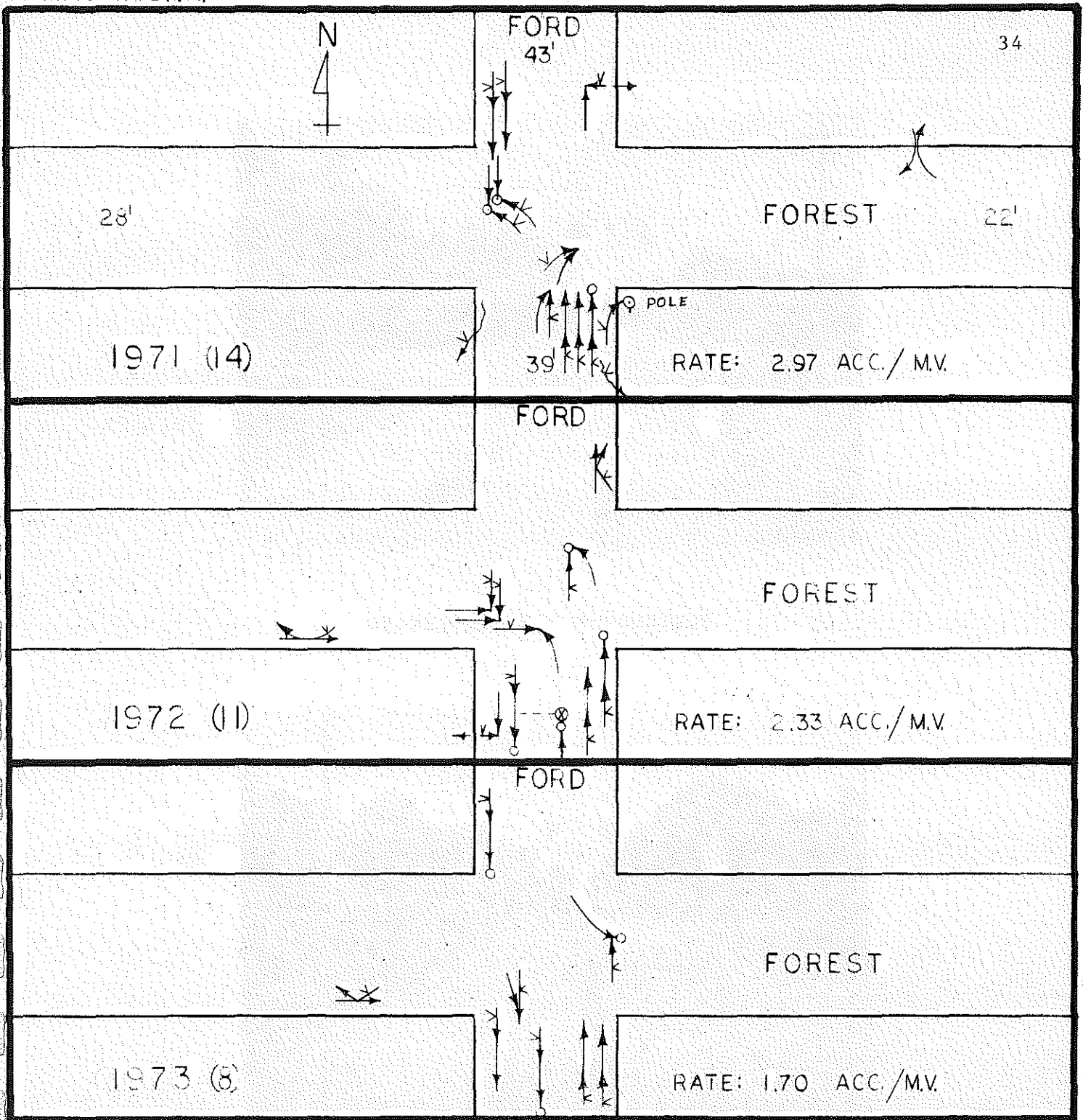
Ford Boulevard intersects Forest Avenue to form a right-angle intersection operating under signal control. The right-of-way assignment is based on a 60 second cycle with 67-33 percent split favoring Ford Boulevard and yellow clearance intervals of six percent (3.0 seconds). Included in the phasing of this signal is a 16 percent (9.6 seconds) leading green arrow for left turns off Ford Boulevard.

Accidents:

<u>Type</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>Total</u>
Rear End	5	3	5	13
Sideswipe	1	2	2	5
Turning	2	2	0	4
Miscellaneous	6	4	1	11
	<hr/>	<hr/>	<hr/>	<hr/>
Total	14	11	8	33

The miscellaneous type include three ran off roadways, three head on left turns, two improper backings, two right-angles and one pedestrian accident. The accident rate was 2.3 ACC/MV.

There were 18 (55 percent) accidents that occurred on wet pavement. The use of two non-standard leading left turn arrows which terminate without warning is in violation of the Michigan Manual of Uniform Traffic Control Devices.



LEGEND

Stop & Go Signal		Stop Sign	
Flashing Beacon		Yield Sign	
Fatal		Pedestrian	
Injury		Tree	
Skidding		Out of Control	
Jackknife		Driver Intent	
Overtaken		Deer	
Backing		Violator	

STATE OF MICHIGAN
DEPARTMENT OF STATE HIGHWAYS
AND TRANSPORTATION

Location FOREST AT FORD
WASHTENAW CO.

Figure 17

Period: 1971 THRU 1973 2.3 ACC./M.V.

Accidents - Total 33 P.D. 23

Injury 10 () Fatal 0 ()

C.S. _____ Miles _____ Drawn DFK

Plan No. LOCATION 5 Date 5-16-74



NORTHBOUND FORD BOULEVARD



SOUTHBOUND FORD BOULEVARD

Figure 18



EASTBOUND FOREST AVENUE



WESTBOUND FOREST AVENUE

Figure 19

RECOMMENDATIONS

<u>Type</u>	<u>Estimated Cost</u>
1. Construct additional laneage on Forest Avenue to permit two approach lanes. The left turn lanes should align opposite each other.	\$44,550.00
2. Since a minimal number (4%) of vehicles turn left from southbound Ford Blvd. and since this left turn can be made at another intersection, it is recommended that this left turn be prohibited. Use an overhead case sign with the legend "NO LEFT TURN" to accomplish this. Also, use two post-mounted "NO LEFT TURN" symbol signs, one on the near right hand corner and one on the far left hand corner.	\$411.76
3. Erect Overhead Lane Use Control signs on southbound Ford Blvd. Also, erect a "RIGHT LANE MUST TURN RIGHT" (R3-7) sign on southbound Ford Blvd. to indicate a turn movement for this lane.	\$ 2,095.70
4. The new signal timing would include a 70 second cycle with a 64-36 percent split favoring Ford Blvd. and six percent (4.2 seconds) yellow clearance interval for each phase. The north and southbound traffic would operate for 50 percent (35.0 seconds), then the southbound traffic would get a red indication, while the delayed left turn and continued thru movement for northbound traffic would operate for the remaining 14 percent (9.8 seconds). Traffic on Forest Avenue would be allowed 36 percent (24.2 seconds) to operate.	\$ 35.00
5. Apply pavement markings including pavement arrows to stress the function of each lane.	\$583.40
6. Skidometer tests have been ordered for all approaches to this intersection because of the substantial amount of wet pavement accidents.	No Cost

Total \$47,675.86

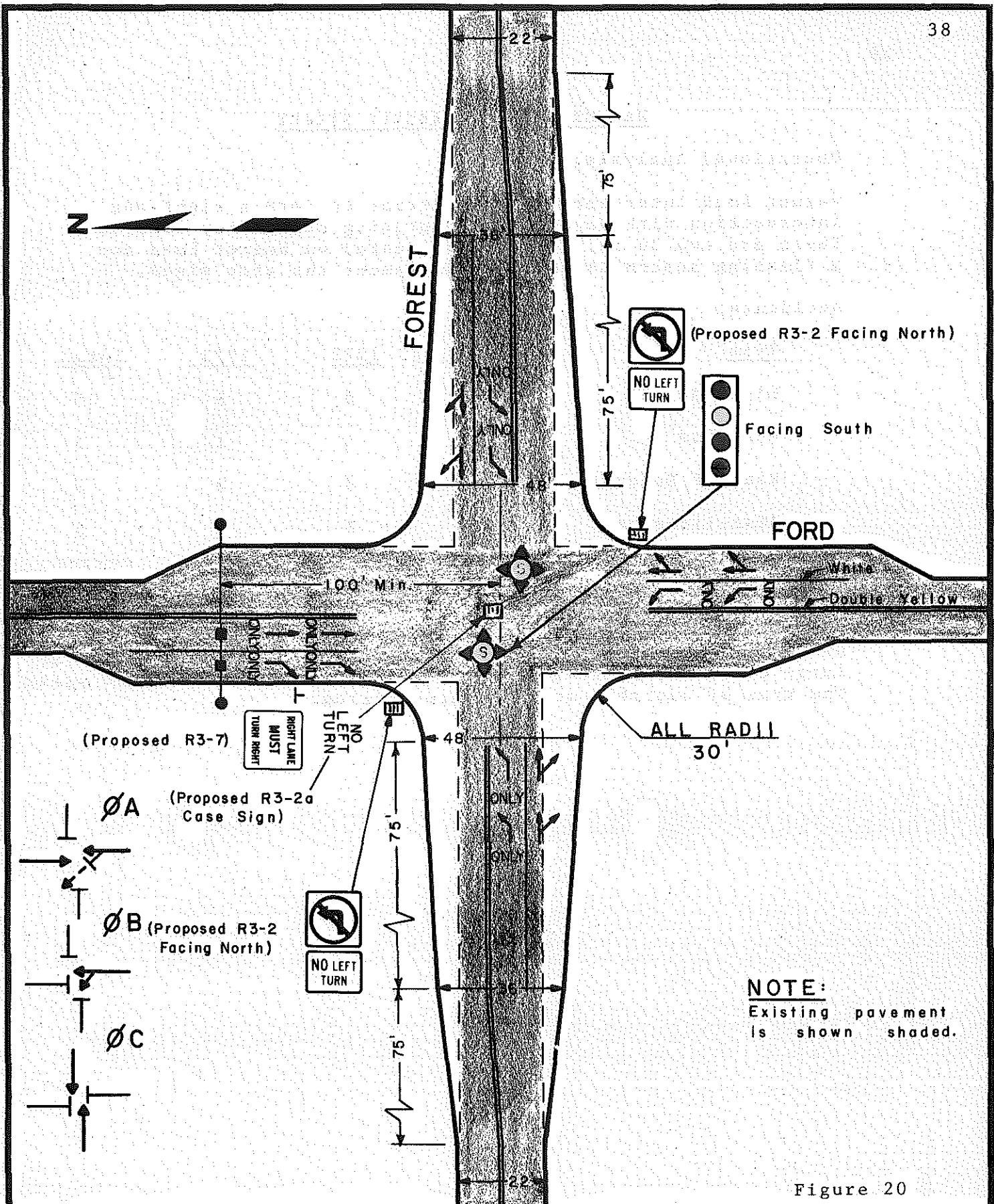


Figure 20

STATE OF MICHIGAN DEPARTMENT OF STATE HIGHWAYS TRAFFIC & SAFETY DIVISION	AUTH. NO.	DRAWN DFK	PROPOSED INTERSECTION APPROACH DIAGRAM
	CONT. SEC.	DATE 7-23-74	
	REF.	SCALE	
	SHEET OF	PLAN	

WAGNER ROAD AT LIBERTY STREET

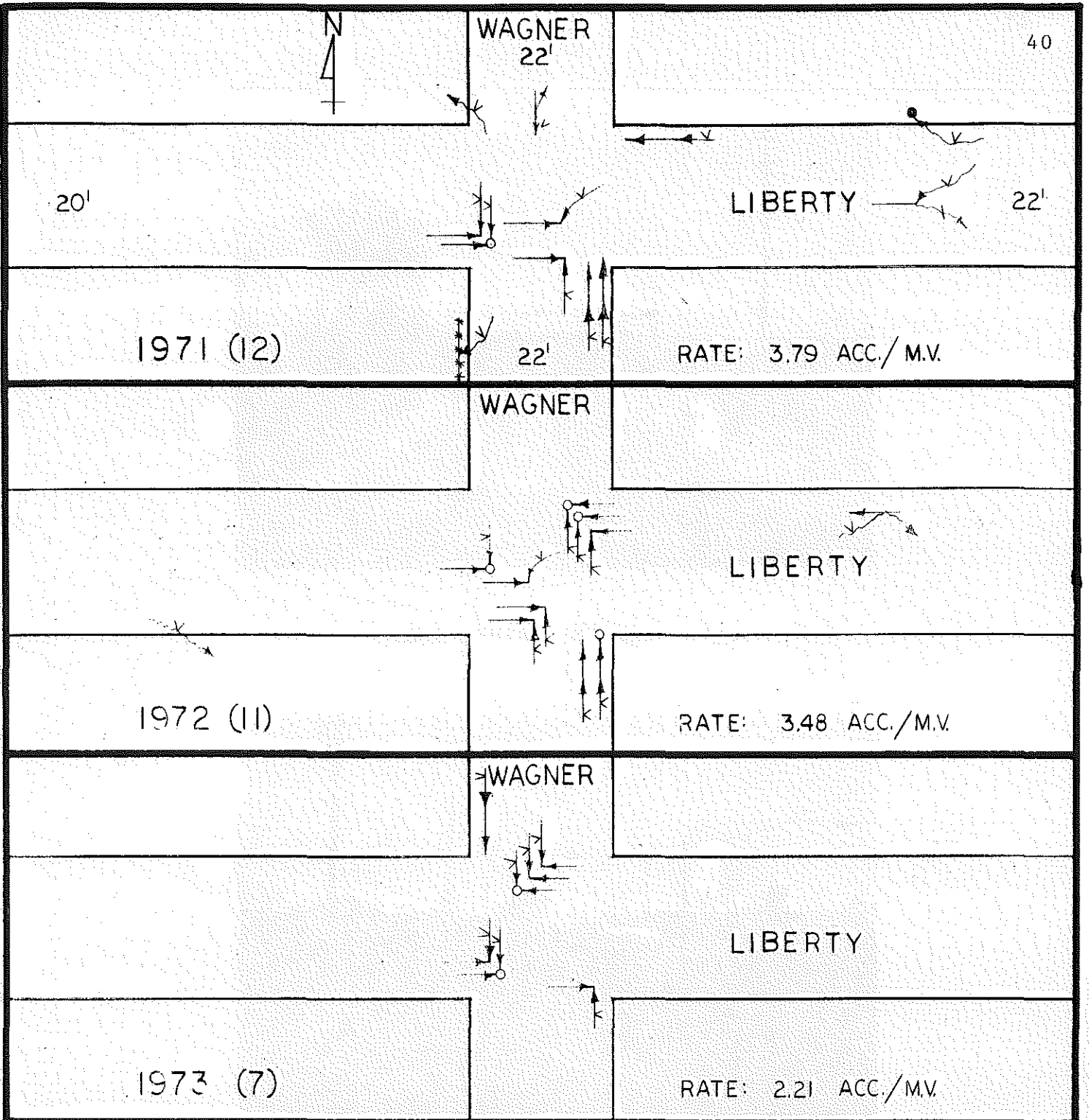
Operational Analysis:

Wagner Road intersects Liberty Street to form a right-angle intersection with Wagner Road operating under stop control. There are two 36 in. stop signs located on Wagner Road and a flashing beacon is used to supplement the stop signs.

Accidents:

<u>Type</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>Total</u>
Right-Angle	3	6	6	15
Rear End	3	1	1	5
Ran Off Roadway	3	2	0	5
Miscellaneous	3	2	0	5
	<hr/>			
Total	12	11	7	30

The miscellaneous types included three sideswipes and two head on-left turn accidents. The accident rate was 3.2 ACC/MV. The large number of right-angle accidents can be reduced by changing the type of controls at this intersection.



LEGEND		STATE OF MICHIGAN DEPARTMENT OF STATE HIGHWAYS AND TRANSPORTATION	
Stop & Go Signal		Stop Sign	
Flashing Beacon		Yield Sign	
Fatal		Pedestrian	
Injury		Tree	
Skidding		Out of Control	
Jackknife		Driver Intent	
Overtaken		Deer	
Backing		Violator	
		Location LIBERTY AT WAGNER WASHTENAW CO.	
		Figure 21	
Period: 1971 THRU 1973		3.2 ACC./M.V.	
Accidents - Total 30		P.D. 22	
Injury 7 ()		Fatal 1 ()	
C.S. _____ Miles _____		Drawn DFK	
Plan No. LOCATION 6		Date 5-17-74	



NORTHBOUND WAGNER ROAD



SOUTHBOUND WAGNER ROAD

Figure 22



EASTBOUND LIBERTY STREET



WESTBOUND LIBERTY STREET

Figure 23

RECOMMENDATIONS

<u>Type</u>	<u>Estimated Cost</u>
1. In an attempt to reduce the right-angle accidents, it is recommended that this location be converted to a 4-Way Stop. A 4-Way Stop will require two 36 in. Stop signs, two 36 in. Stop signs, two 36 in. Stop Ahead signs and four "4-Way" Panels. The flashing beacon will also have to be converted to four red lenses.	\$290.72
2. Install an overhead street lighting system at this location.	\$252.00
3. Remove the Special Sign Background on the Stop Ahead signs at this intersection.	\$48.00
	<hr/>
Total	\$590.72



Remove Bi-directional Special Sign Background from W3-1



Proposed RI-3 4 WAY

Existing RI-1



LIBERTY RD.

Double Yellow

Proposed RI-1

4 WAY Proposed RI-3

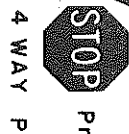


Stop Bar

Proposed W3-1



Proposed W3-1



4 WAY Proposed RI-3

Proposed RI-1



Replace "SLIPPERY WHEN WET" with W8-5



"CAUTION (Existing) TRUCKS TURNING"



WAGNER RD.



Proposed Overhead Lighting System

Existing RI-1

4 WAY Proposed RI-3



Remove Bi-directional Special Sign Background from W3-1

Figure 24

STATE OF MICHIGAN DEPARTMENT OF STATE HIGHWAYS

TRAFFIC & SAFETY DIVISION

AUTH. NO.

CONT. SEC.

REF.

SHEET

OF

PLAN

DRAWN

DFK

DATE

3-19-75

SCALE

PROPOSED INTERSECTION APPROACH DIAGRAM

HOLMES ROAD AT FORD BOULEVARD

Operational Analysis:

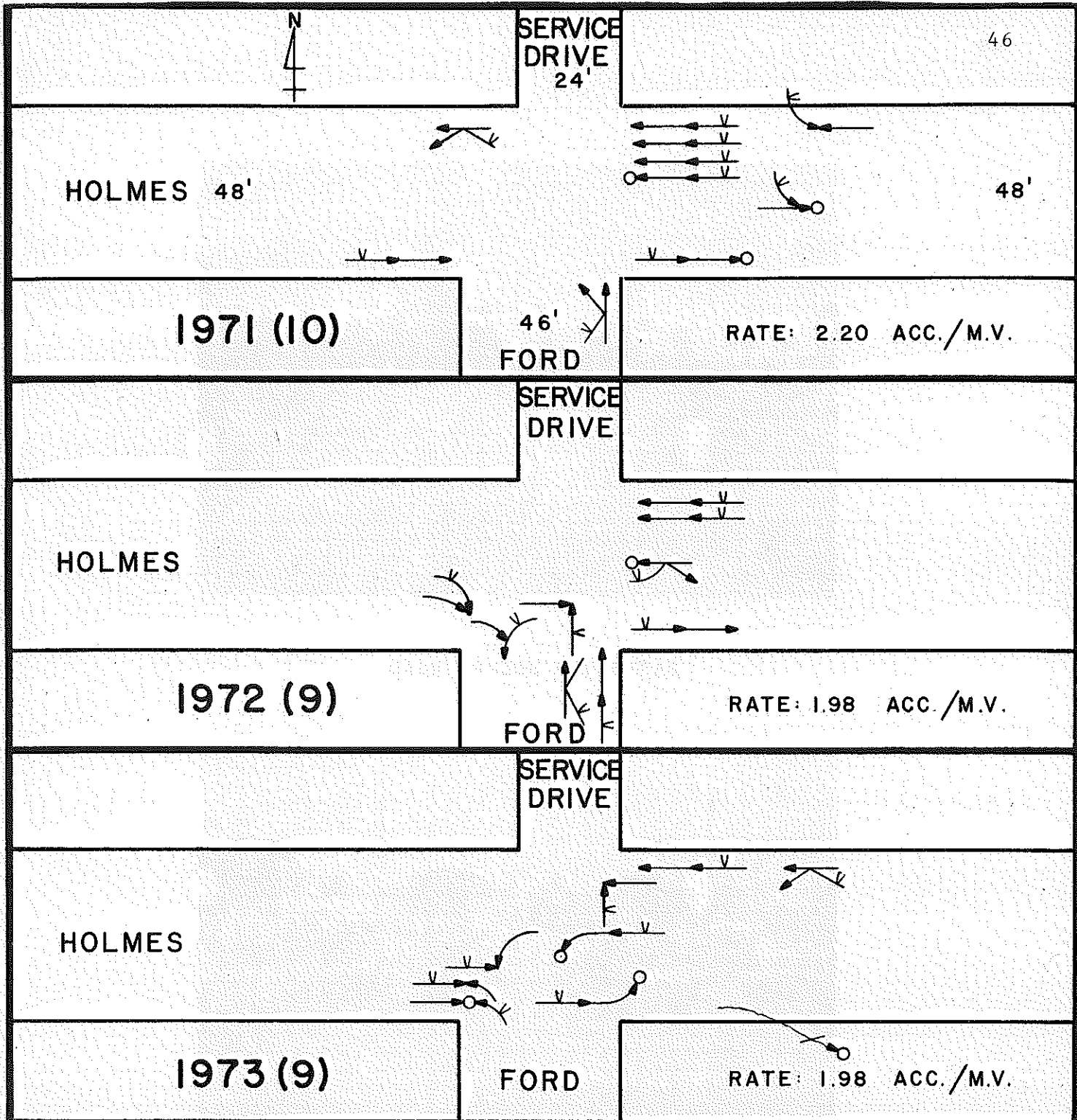
Holmes Road intersects Ford Boulevard to form a "T" intersection operating under traffic signal control. The right-of-way assignment is based on a 70 second cycle with a 64-36 split favoring Holmes Road and clearance intervals of seven percent (4.2 seconds). A leading green arrow for left turns off westbound Holmes Road of 11 percent (7.7 seconds) is included in the phasing of this signal. A shopping center drive, located directly across from Ford Boulevard, has no traffic controls.

Accidents:

<u>Type</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>Total</u>
Rear End	6	4	3	13
Turning	2	2	2	6
Sideswipe	2	2	1	5
Miscellaneous	0	1	3	4
	<hr/>			
Total	10	9	9	28

The miscellaneous types include two right-angles, one head on-left turn and one ran off roadway accident. The accident rate was 2.1 ACC/MV.

The utilization of a left turn green arrow that terminates without a yellow clearance interval is not in accordance with the Michigan Manual and creates an accident potential at this intersection.



LEGEND	
Stop & Go Signal	
Flashing Beacon	
Stop Sign	
Yield Sign	
Fatal	
Injury	
Skidding	
Jackknife	
Overtaken	
Backing	
Pedestrian	
Tree	
Out of Control	
Driver Intent	
Deer	
Violator	

MICHIGAN DEPARTMENT OF STATE HIGHWAYS
TRAFFIC AND SAFETY DIVISION

Location **FORD AT HOLMES**
WASHTENAW CO.

Figure 25

Period: **1971 THRU 1973** 2.1 ACC./M.V.

Accidents - Total 28 P.D. 20

Injury 8 () Fatal 0 ()

C.S. _____ Miles _____ Drawn DFK

Plan No. LOCATION 7 Date 3-21-75



EASTBOUND HOLMES ROAD

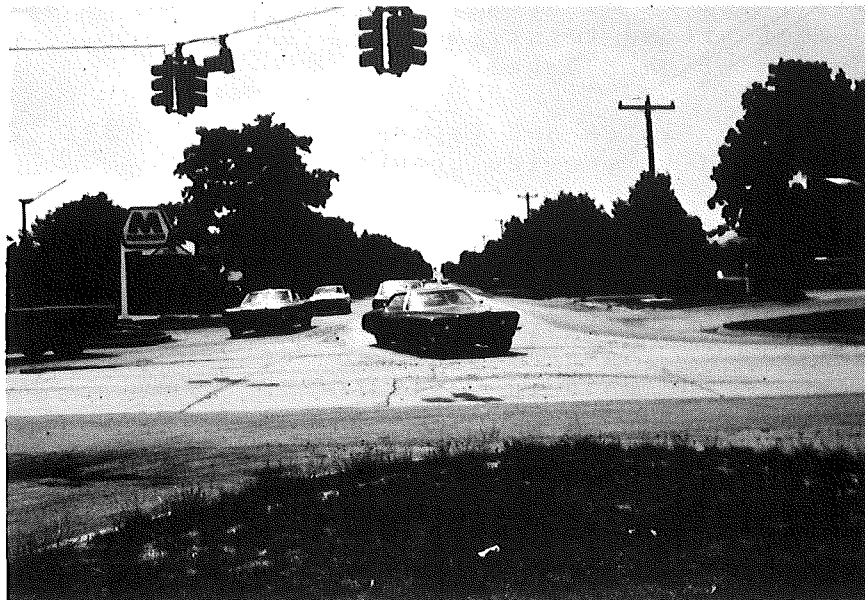


WESTBOUND HOLMES ROAD

Figure 26



NORTHBOUND FORD BOULEVARD



SOUTHBOUND FORD BOULEVARD

Figure 27

RECOMMENDATIONS

<u>Type</u>	<u>Estimated Cost</u>
1. Change the present signal operation to a three phase system. Install a vertical signal arrangement (4 lenses) for westbound Holmes Road and green arrows for the right turn lane on eastbound Holmes Road and northbound Ford Boulevard. The new signal timing would include a 70 second cycle with six percent (4.2 seconds) yellow clearance intervals. The three phases would include one phase for east and westbound Holmes Road traffic (40 percent - 28 seconds), one phase for westbound Holmes Road traffic including the left turn movement on Holmes Road and the right turn from Ford Boulevard (20 percent - 14 seconds), and one phase for northbound Ford Boulevard including the right turn from eastbound Holmes Road (40 percent - 28 seconds).	\$204.00
2. Apply pavement marking including pavement arrows to stress the function of each lane.	\$466.50
3. Extend the flares and tapers on Holmes Road to provide enough laneage for vehicles to maneuver around waiting vehicles.	\$31,500.00
4. Close off the Shopping Center service drive. There are other drive openings available to the east that provide access to the shopping center.	\$6,600.00
5. Erect two R3-7 "RIGHT LANE MUST TURN RIGHT" signs for the eastbound Holmes Road right turn lane.	\$71.80
	<hr/>
Total	\$38,842.30

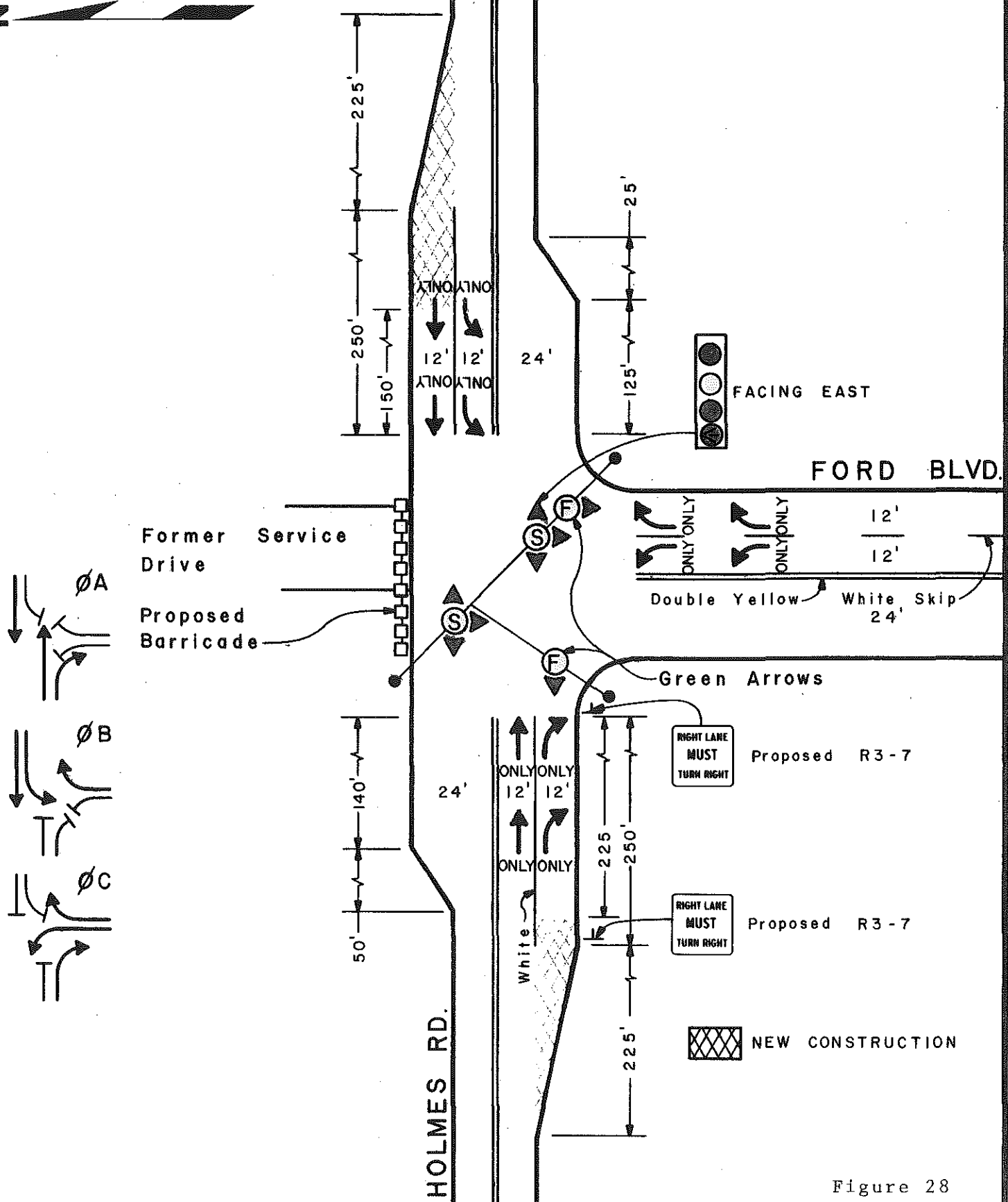
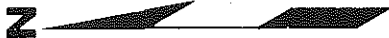


Figure 28

STATE OF MICHIGAN DEPARTMENT OF STATE HIGHWAYS TRAFFIC & SAFETY DIVISION	AUTH. NO.	DRAWN DFK	PROPOSED INTERSECTION APPROACH DIAGRAM
	CONT. SEC.	DATE 11-25-74	
	REF.	SCALE	
	SHEET OF	PLAN	



PACKARD STREET AT HEWITT ROAD

Operational Analysis:

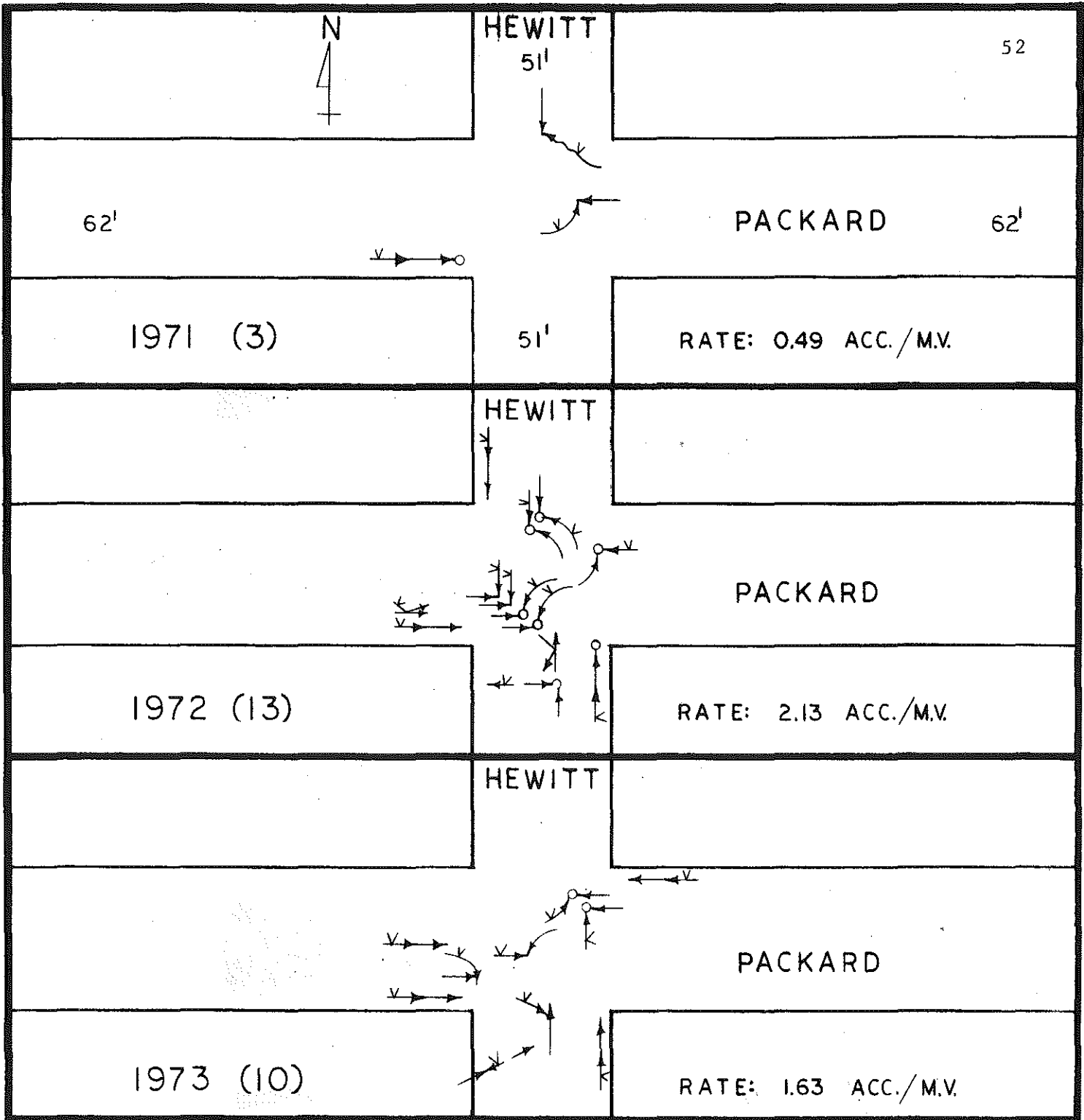
Packard Street intersects Hewitt Road to form a right-angle intersection operating under signal control. The right-of-way assignment is based on a 70 second cycle with a 57-43 percent split favoring Packard Street and yellow clearance intervals of seven percent (4.9 seconds). There is also a ten percent (7.0 second) left turn green arrow for east and westbound Packard Street.

Accident:

<u>Type</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>Total</u>
Head On-Left Turn	1	5	2	8
Rear End	1	3	4	8
Right-Angle	0	2	1	3
Turning	1	0	2	3
Miscellaneous	0	3	1	4
	<hr/>			
Total	3	13	10	26

The miscellaneous types include two sideswipes and two improper backing accidents. The accident rate was 1.4 ACC/MV. The operation of this location was changed in 1972 from stop control to signal control.

The use of a leading left turn arrow which terminates without warning is non-standard according to the Michigan Manual of Uniform Traffic Control Devices.



LEGEND

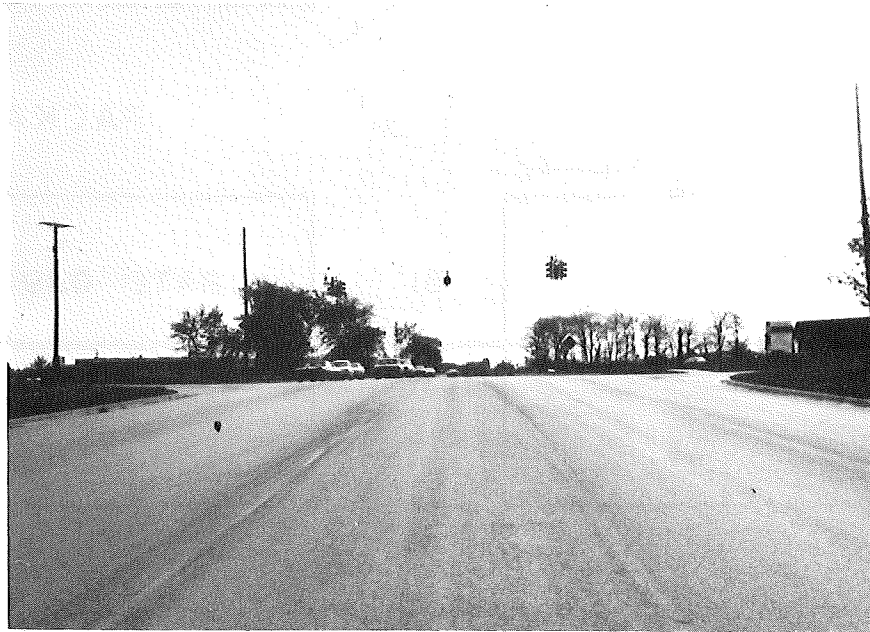
- | | | | |
|------------------|--|----------------|--|
| Stop & Go Signal | | Stop Sign | |
| Flashing Beacon | | Yield Sign | |
| Fatal | | Pedestrian | |
| Injury | | Tree | |
| Skidding | | Out of Control | |
| Jackknife | | Driver Intent | |
| Overtaken | | Deer | |
| Backing | | Violeter | |

**STATE OF MICHIGAN
DEPARTMENT OF STATE HIGHWAYS
AND TRANSPORTATION**

Location **HEWITT AT PACKARD
WASHTENAW CO.**

Figure 29

Period: 1971 THRU 1973 1.4 ACC./M.V.
 Accidents - Total 26 P.D. 16
 Injury 10 () Fatal 0 ()
 C.S. _____ Miles _____ Drawn DFK
 Plan No. LOCATION 8 Date 5-17-74



EASTBOUND PACKARD STREET



WESTBOUND PACKARD STREET

Figure 30



NORTHBOUND HEWITT ROAD



SOUTHBOUND HEWITT ROAD

Figure 31

RECOMMENDATIONS

<u>Type</u>	<u>Estimated Cost</u>
1. A traffic investigation and a capacity analysis indicate that a left turn problem does not exist for traffic on Packard Street. It is recommended that the left turn arrows be removed.	\$70.00
2. Apply pavement markings including pavement arrows to aid in determining the function of each lane.	\$894.80
3. Erect overhead Lane-Use Control signs for all four approaches.	\$8,278.80
	<hr/>
Total	\$9,243.60

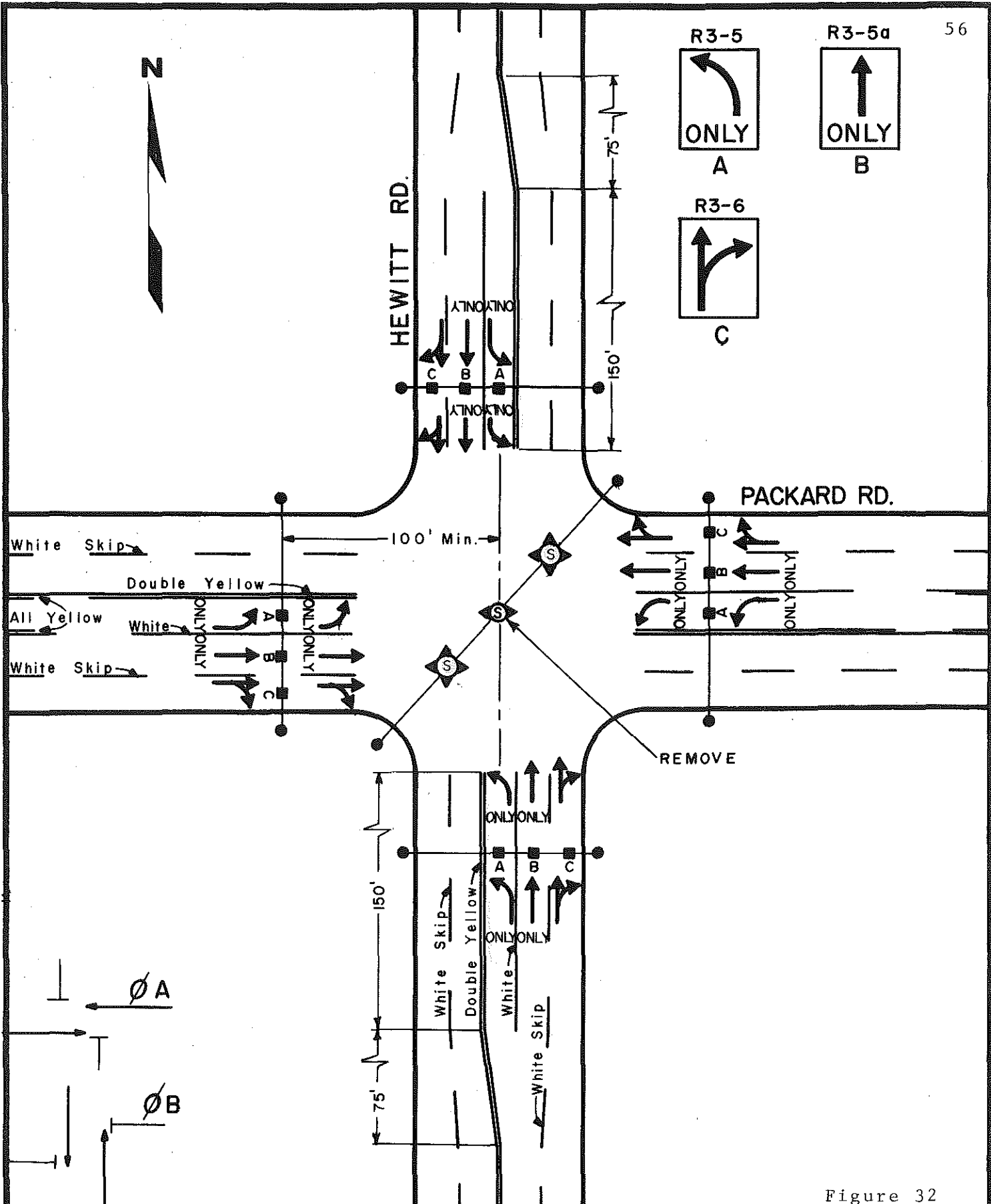


Figure 32

STATE OF MICHIGAN DEPARTMENT OF STATE HIGHWAYS TRAFFIC & SAFETY DIVISION	AUTH. NO.	DRAWN DFK	PROPOSED INTERSECTION APPROACH DIAGRAM
	CONT. SEC.	DATE 9-20-74	
	REF.	SCALE	
	SHEET OF	PLAN	

WHITTAKER ROAD AT STONY CREEK ROAD

Operational Analysis:

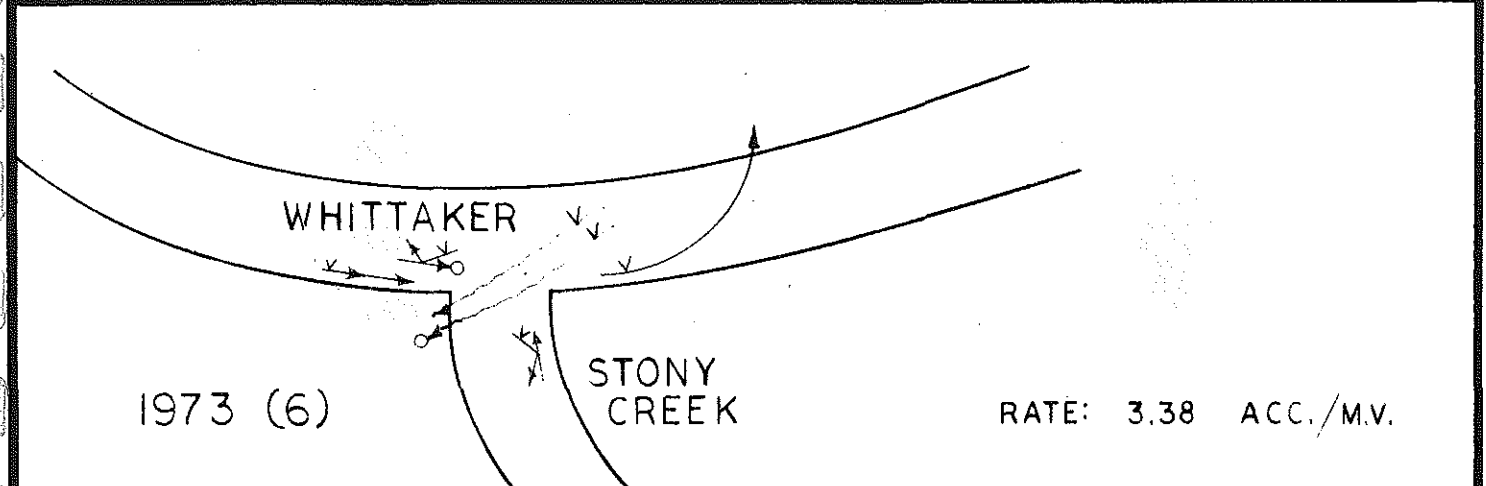
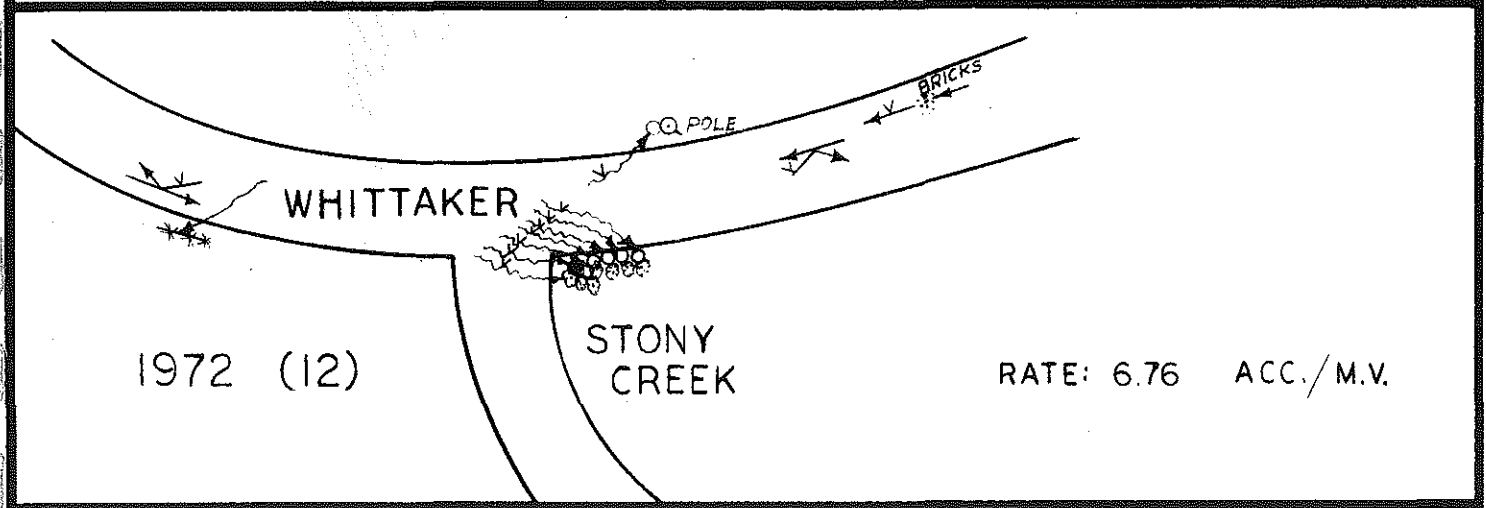
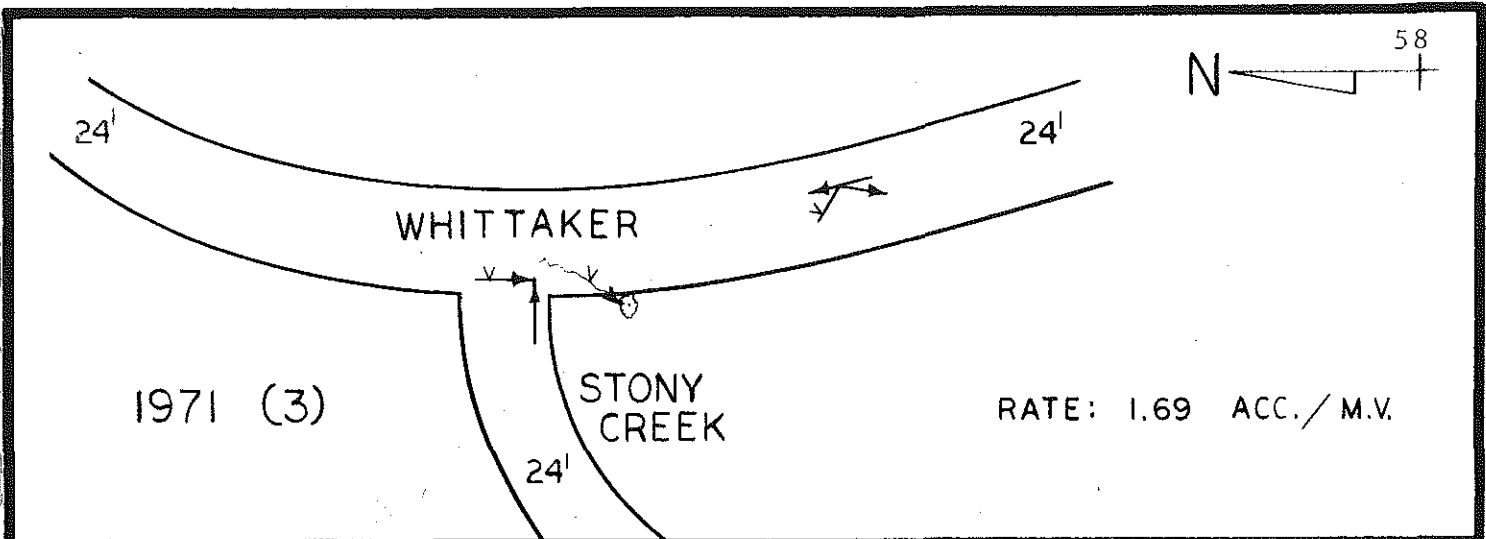
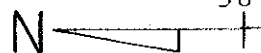
Whittaker Road intersects Stony Creek Road to form a "T" intersection with Stony Creek Road operating under stop control. There is a 36 in. Stop sign and supplemental flashing beacon on Stony Creek Road.

Accidents:

<u>Type</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>Total</u>
Ran Off Roadway	1	9	3	13
Sideswipe	1	2	2	5
Miscellaneous	1	1	1	3
	<hr/>	<hr/>	<hr/>	<hr/>
Total	3	12	6	21

The miscellaneous types included one rear end, one involving debris falling off a vehicle and one right-angle accident. The accident rate was 3.9 ACC/MV.

Thirteen of the accidents occurred at night. Ten of the thirteen ran off roadway accidents occurred at night.



LEGEND

- Stop & Go Signal
- Flashing Beacon
- Fatal
- Injury
- Skidding
- Jackknife
- Overtaken
- Backing
- Pedestrian
- Tree
- Out of Control
- Driver Intent
- Deer
- Violator
- Stop Sign
- Yield Sign

STATE OF MICHIGAN
DEPARTMENT OF STATE HIGHWAYS
AND TRANSPORTATION

Location WHITTAKER AT STONY CREEK
WASHTENAW CO.

Figure 33

Period: 1971 THRU 1973 3.9 ACC./M.V.

Accidents - Total 21 P.D. 12

Injury 8 () Fatal 1 ()

C.S. _____ Miles _____ Drawn DFK

Plan No. LOCATION 11 Date 5-23-74



NORTHBOUND WHITTAKER ROAD



SOUTHBOUND WHITTAKER ROAD

Figure 34



EASTBOUND STONY CREEK ROAD



WESTBOUND STONY CREEK ROAD

Figure 35

RECOMMENDATIONS

<u>Type</u>	<u>Estimated Cost</u>
1. Change the Bi-Directional Target Arrows to Directional Target Arrows (96 x 48) on both north and southbound Wittaker Road.	\$126.64
2. Apply pavement markings - center line, edge line and stop bars - to aid motorists during periods of darkness.	\$120.00
3. Create a safe landing area by removing the trees, bushes, poles, etc., south of Stony Creek Road.	\$500.00
4. Relocate the guide sign which is in target position for southbound Whittaker Road to a position north of the intersection.	\$16.00
5. Erect Road Name signs (D3-2a) on the existing Side Road warning signs on Whittaker Road on both sides of the intersection.	\$41.84
6. Erect delineators at 50 foot intervals along the west side of Whittaker Road for a distance of 500 feet each direction from Stony Creek Road to provide visibility at night.	\$183.00
	<hr/>
Total	\$987.48

Replace W1-1 & W12-1(35mph) w/ W1-2 & W13-1 (35 mph)

Proposed D3-2a(STONY CREEK RD.) on Existing W2-2

Existing DI-2, Relocate from 20' southeast of Stony Creek Rd.

Replace W1-7 w/ W1-6

Existing DI-1

Existing W1-7

Double Yellow Stop Bar

Existing RI-1

Replace W1-7 w/ W1-6

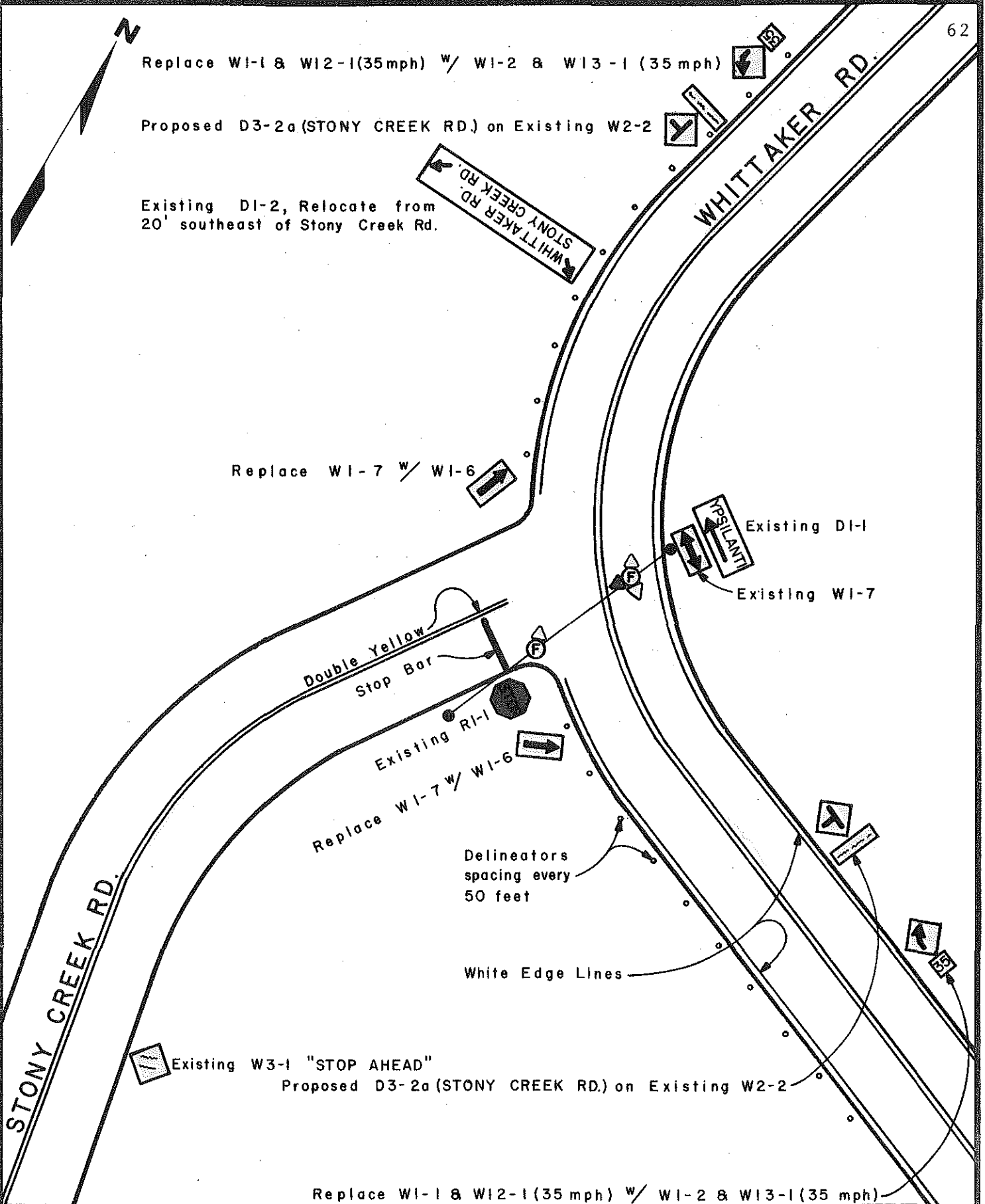
Delineators spacing every 50 feet

White Edge Lines

Existing W3-1 "STOP AHEAD"

Proposed D3-2a(STONY CREEK RD.) on Existing W2-2

Replace W1-1 & W12-1(35 mph) w/ W1-2 & W13-1(35 mph)



STATE OF MICHIGAN DEPARTMENT OF STATE HIGHWAYS TRAFFIC & SAFETY DIVISION	AUTH. NO.	DRAWN DFK
	CONT. SEC.	DATE 11-15-74
	REF.	SCALE
	SHEET OF	PLAN

**PROPOSED INTERSECTION
DIAGRAM**

Figure 36

TEXTILE ROAD AT MCKEAN ROAD

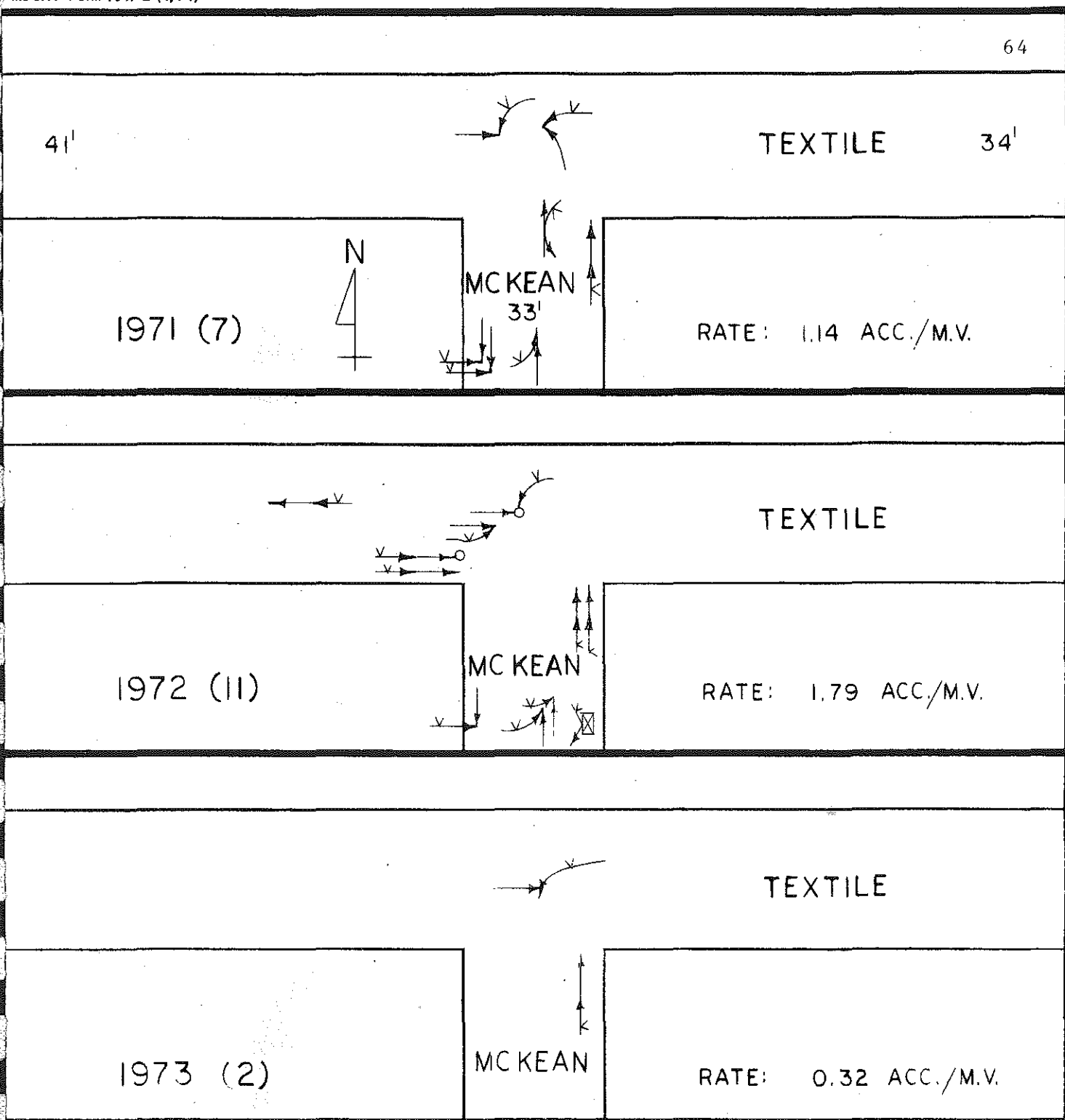
Operational Analysis:

Textile Road intersects McKean Road to form a "T" intersection. Traffic is controlled at this intersection by two traffic signals which operate on flasher (yellow for Textile Road and red for McKean Road) except when there is a shift change at the adjacent Ford Motor Company plant. Included in the phasing of this signal is a 12 percent (7.2 seconds) leading green arrow for left turns off westbound Textile Road. There are two green arrows for right turns off eastbound Textile Road and northbound McKean Road.

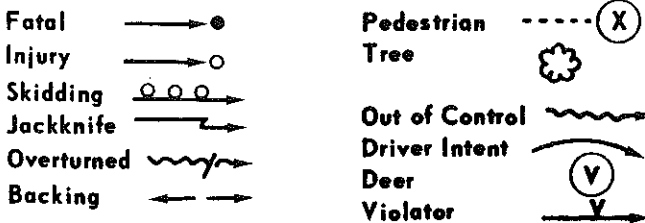
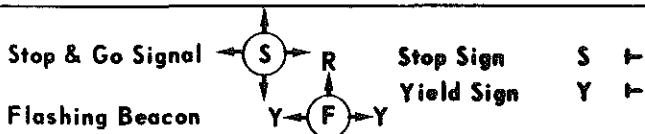
Accidents:

<u>Type</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>Total</u>
Rear End	1	5	1	7
Turning	2	3	0	5
Right-Angle	2	1	0	3
Head On Left Turn	1	1	1	3
Miscellaneous	1	1	0	2
	<hr/>	<hr/>	<hr/>	<hr/>
Total	7	11	2	20

The miscellaneous types included one parked vehicle and one sideswipe accident. The accident rate was 1.1 ACC/MV. The use of a leading left turn arrow which terminates without warning is in violation of the Michigan Manual of Uniform Traffic Control Devices; however, this only occurs during the stop and go operation of the signal.



LEGEND



**STATE OF MICHIGAN
 DEPARTMENT OF STATE HIGHWAYS
 AND TRANSPORTATION**

Location **TEXTILE AT MCKEAN
 WASHTENAW CO.**

Figure 37

Period:	1971 THRU 1973	1.1 ACC./M.V.
Accidents - Total	20	P.D. 18
Injury	2 ()	Fatal 0 ()
C.S.	Miles	Drawn DFK
Plan No.	LOCATION 13	Date 5-23-74



EASTBOUND TEXTILE ROAD

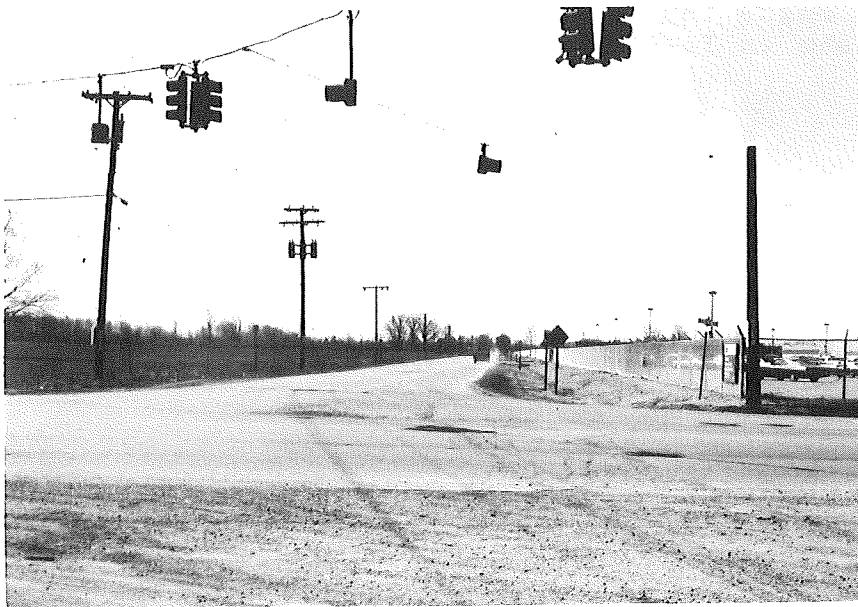


WESTBOUND TEXTILE ROAD

Figure 38



NORTHBOUND MCKEAN ROAD

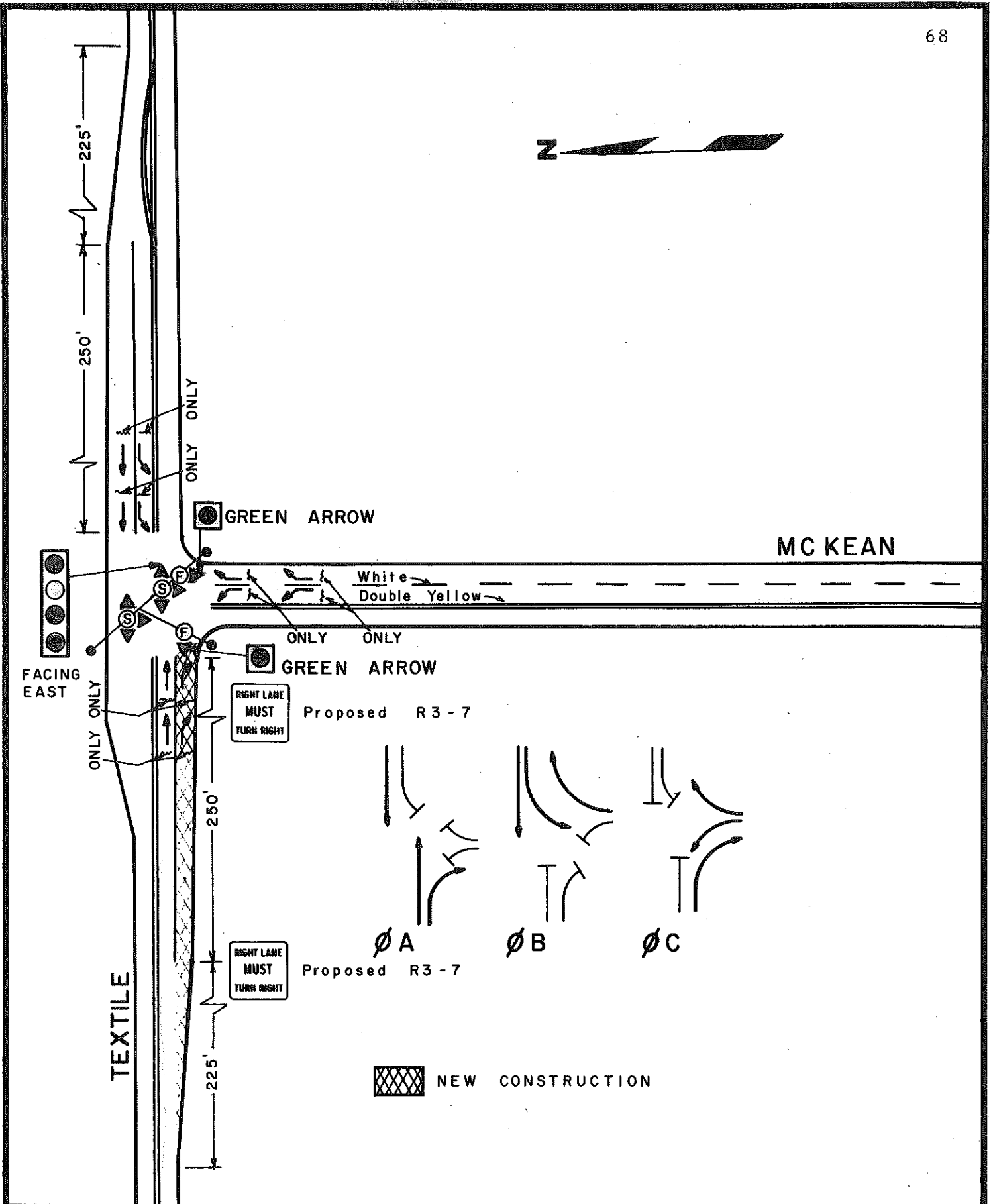


SOUTHBOUND MCKEAN ROAD

Figure 39

RECOMMENDATIONS

<u>Type</u>	<u>Estimated Cost</u>
1. Change the present signal operation to three phases. The new signal timing would include a 70 second cycle with six percent (4.2 seconds) yellow clearance intervals. The three phases include one for east and westbound Textile Road traffic (40 percent - 28.0 seconds), one for westbound Textile Road traffic including the right turn from McKean Road (33 percent - 29.7 seconds) and one for northbound McKean Road traffic including the right turn from McKean Road (33 percent - 29.7 seconds). A vertical signal arrangement (4 lenses) should be installed for westbound Textile Road.	\$280.00
2. Apply pavement markings including pavement arrows to stress the function of each lane.	\$467.50
3. Reconstruct additional laneage to provide two approach lanes per approach.	\$32,625.00
4. Erect two R3-7 "RIGHT LANE MUST TURN RIGHT" signs for the eastbound right turn lane on Textile Road.	\$71.80
	<hr/>
	Total \$33,444.30



STATE OF MICHIGAN
DEPARTMENT OF STATE HIGHWAYS
TRAFFIC & SAFETY DIVISION

AUTH. NO.		DRAWN DFK
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SHEET	OF	PLAN

PROPOSED INTERSECTION
APPROACH DIAGRAM

Figure 40

TEXTILE ROAD AT BRIDGE ROAD

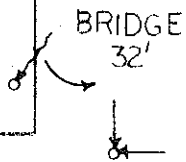
Operational Analysis:

Textile Road intersects Bridge Road to form a four-legged intersection. The south leg is a private drive leading into the Ford Motor Company plant. Traffic is controlled at this intersection by two signal heads which operate on flasher (yellow for Textile Road and red for Bridge Road and the private drive) except when there is a shift change at the adjacent Ford plant. Included in the phasing of this signal is a 12 percent (7.2 seconds) leading left turn arrows for left turns off east and westbound Textile Road.

Accidents:

<u>Type</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>Total</u>
Turning	3	1	0	4
Right-Angle	1	1	1	3
Miscellaneous	1	1	1	3
	5	3	2	10
Total	5	3	2	10

The miscellaneous types included two rear ends and one ran off roadway accident. The accident rate was 0.8 ACC/MV. The use of a leading left turn arrow which terminates without warning is in violation of the Michigan Manual of Uniform Control Devices; however, this only occurs during the stop and go operation of the signal.



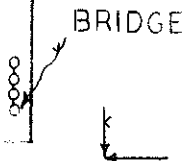
32'

TEXTILE 32'

1971 (5)

20' 20'

1.13 ACC/MV



TEXTILE

1972 (3)

0.68 ACC/MV



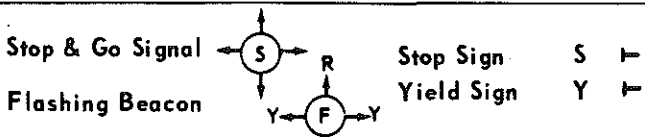
TEXTILE

1973 (2)

0.45 ACC/MV

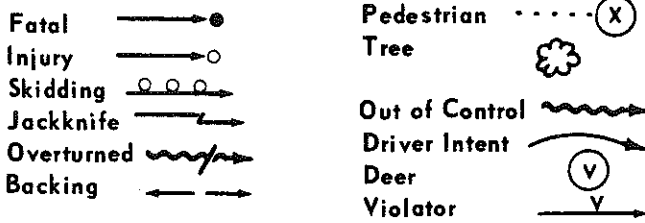
LEGEND

MICHIGAN DEPARTMENT OF STATE HIGHWAYS
 TRAFFIC AND SAFETY DIVISION



Location TEXTILE AT BRIDGE
 WASHTENAW CO.

Figure 41



Period: 1971 THRU 1973 0.8 ACC/MV
 Accidents - Total 10 P.D. 6
 Injury 4 () Fatal ()
 C.S. Miles Drawn JLM
 Plan No. LOCATION 20 Date 5-8-74



EASTBOUND TEXTILE ROAD

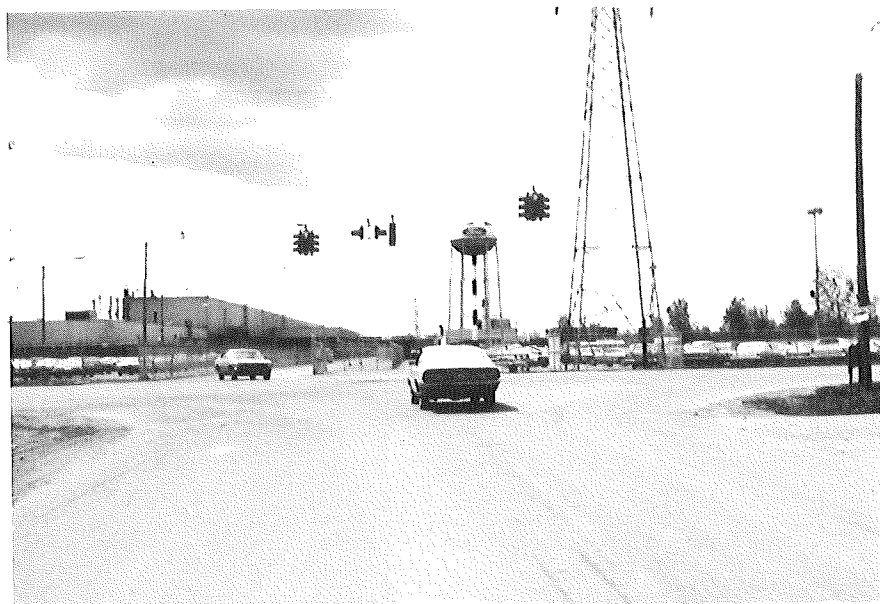


WESTBOUND TEXTILE ROAD

Figure 42



NORTHBOUND BRIDGE ROAD

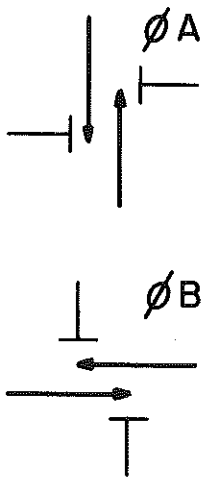
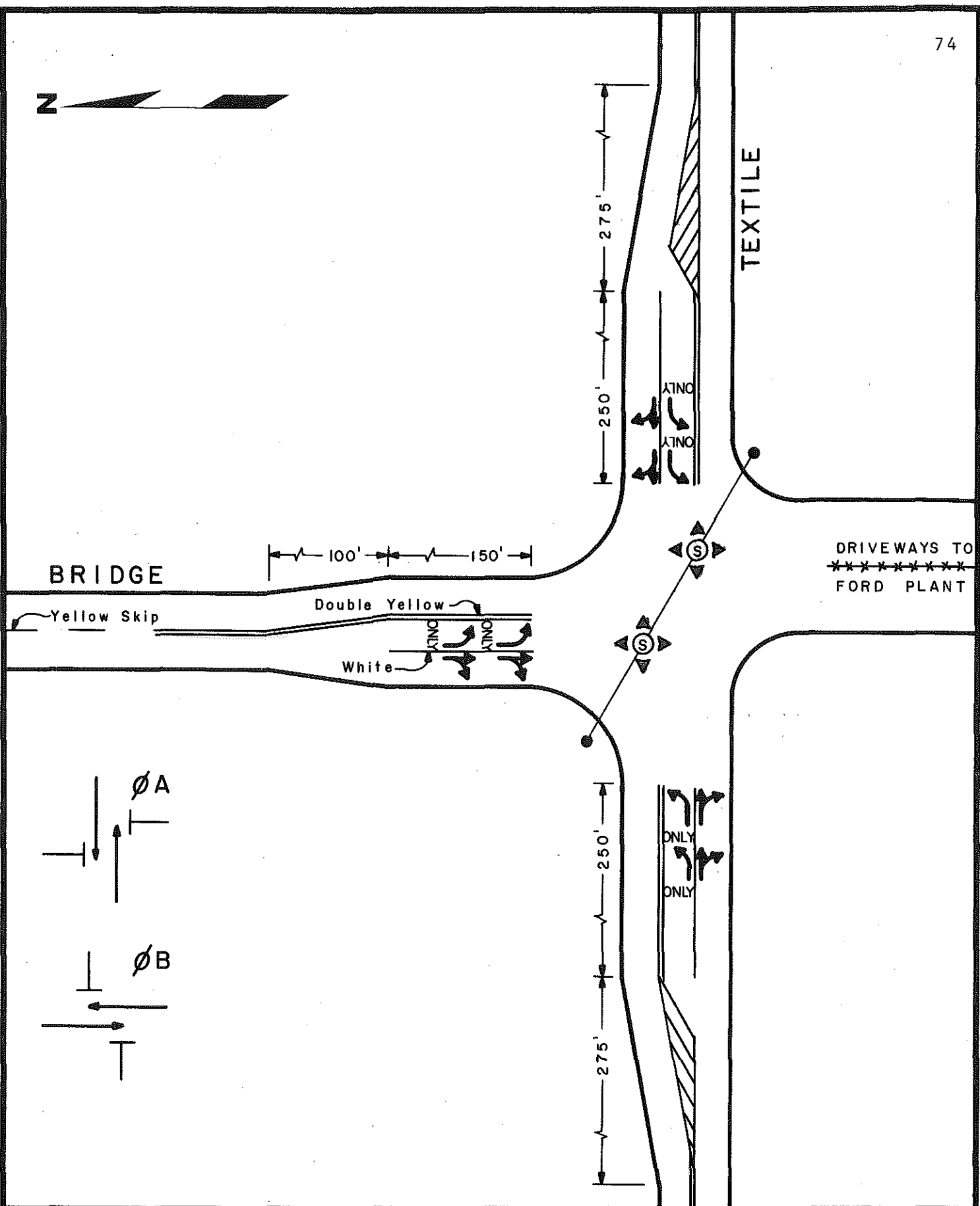


SOUTHBOUND BRIDGE ROAD

Figure 43

RECOMMENDATIONS

<u>Type</u>	<u>Estimated Cost</u>
1. Eliminate the left turn arrows at this intersection due to a small number of left turns. The signal timing should be 60 second cycle with a 50-50 percent split and yellow clearnace interval of seven percent (4.2 seconds).	\$70.00
2. Apply pavement markings including pavement arrows to define the functions of each lane.	\$468.18
	<hr/>
Total	\$538.18



STATE OF MICHIGAN DEPARTMENT OF STATE HIGHWAYS TRAFFIC & SAFETY DIVISION	AUTH. NO.	DRAWN DFK	PROPOSED INTERSECTION APPROACH DIAGRAM Figure 44
	CONT. SEC.	DATE 2-6-75	
	REF.	SCALE	
	SHEET OF	PLAN	



SUMMARY OF RECOMMENDATIONS

The Department of State Police submitted 20 high accident locations for Washtenaw County to the Michigan Department of State Highways and Transportation. After an in-depth study of these locations, we formulated recommendations for 10 of them. The recommendations are as follows:

<u>Location Number</u>	<u>Location Description and Cost Estimate</u>	<u>Recommendations</u>
1	Carpenter Road and Packard Street \$10,028.20	Change the signal timing. Install a signal face for left turns off Packard Street. Apply pavement markings. Erect overhead Lane-Use Control signs.
2	Jackson Road and Wagner Road \$ 9,470.10	Remove the left turn phase. Apply pavement markings. Erect overhead Lane-Use Control signs.
3	Ford Boulevard at Russell Street \$131,560.80	Construct additional laneage to provide two approach lanes. Eliminate left turn green arrows. Erect a four way case sign (R3-10) for each left turn lane. Apply pavement markings. Resurface the intersection.
5	Ford Boulevard at Forest Avenue \$47,675.86	Construct additional laneage on Forest Avenue. Eliminate the left turn from southbound Ford Boulevard. Erect overhead Lane-Use Control signs on Ford Boulevard. Erect a R3-7 sign on southbound Ford Boulevard. Change the signal timing to include a delayed left turn. Apply pavement markings.

<u>Location Number</u>	<u>Location Description and Cost Estimate</u>	<u>Recommendations</u>
6	Wagner Road at Liberty Road \$590.72	Convert the operation of this intersection to a 4-Way Stop. Erect R1-1 and W3-1 signs on east and westbound Liberty Street. Install a overhead lighting system. Remove the special sign background.
7	Holmes Road at Ford Boulevard \$38,842.30	Change the signal timing. Apply pavement markings. Close off shopping center service drive. Construct additional laneage on Holmes Road. Erect two R3-7 signs for eastbound Holmes Road.
8	Packard Street at Hewitt Road \$9,243.60	Remove the left turn phase. Apply pavement markings. Erect overhead Lane-Use Control signs.
11	Whittaker Road at Stony Creek Road \$987.48	Replace W1-7 Arrows with W1-6 Arrows on north and southbound Whittaker Road. Apply pavement markings. Create a safe landing area. Relocate the guide sign. Erect D3-2a for north and southbound Whittaker Road. Erect delineators at 50 foot intervals on the west side of Whittaker Road.
13	Textile Road at McKean Road \$33,444.30	Change the signal timing. Apply pavement markings. Construct additional laneage. Erect two R3-7 signs for eastbound Textile Road. Install a four level signal face for westbound Textile Road.
20	Textile Road at Bridge Road \$538.18	Eliminate the left turn phase for Textile Road. Apply pavement markings.

Furthermore, a few general recommendations were formulated that should be implemented by Washtenaw County.

1. Signalized intersections should have two approach lanes to provide adequate capacity at these intersections.
2. Green arrows shouldn't be terminated without going through a yellow and red indication as per the Manual.
3. A program should be initiated by the county for removing vision obstructions that are located in clear vision areas at intersections through the county.
4. Approximately 18 percent of the required regulatory signs on the Washtenaw County Primary Road System are in need of maintenance or new installation.
5. Approximately 20 percent of the required warning signs are in need of maintenance or new installation.

ESTIMATED COSTS

High Accident Location Recommendations	\$282,381.54
Control Devices Inventory	88,260.00
	<hr/>
TOTAL	\$370,641.54

APPENDIX I

HIGHWAY SAFETY ACT OF 1973

Section	Highway System	Types of Projects	Finance Federal-State
203 Rail-Highway Grade Crossings	Federal-aid (Except Interstate)	Protective Devices; Signs & Markings; Crossing Illumination & Surface Improvements	90-10
205 Pavement Marking Demonstration Program	All Highways (Except Interstate)	Centerline & Edgeline Markings; Establishing & Painting "NO PASSING" zones	100
209 Projects for High Hazard Locations	Federal-aid (Except Interstate)	Intersection widening, Channelization, & sig- nalization; Skid-prone location correction	90-10
210 Program For Elim- ination of Road- side Obstacles	Federal-aid (Except Inter- state)	Guard rail end treat- ments Breakaway signs; Crash cushions; Tree Re- moval; Culvert headwall corrections	90-10
230 Federal-aid Safer Roads Demonstration Program	Non Federal- aid	Pavement Marking, sign- ing, eliminate roadside obstacles, eliminate hazards @ railway crossings	90-10

The projects eligible for consideration for Funding under Section 209 are:

Loc. #1	Carpenter Road at Packard Road
Loc. #2	Jackson Road at Wagner Road
Loc. #3	Ford Blvd. at Russell Road
Loc. #5	Ford Blvd. at Forest Avenue
Loc. #6	Wagner Road at Liberty Road
Loc. #7	Holmes Road at Ford Blvd.
Loc. #8	Packard Road at Hewitt Road
Loc. # 13	Textile Road at McKean Road
Loc. #20	Textile Road at Bridge Road

The project eligible for consideration for funding under Section 210 is:

Loc. #11	Whittaker Road at Stony Creek Road.
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