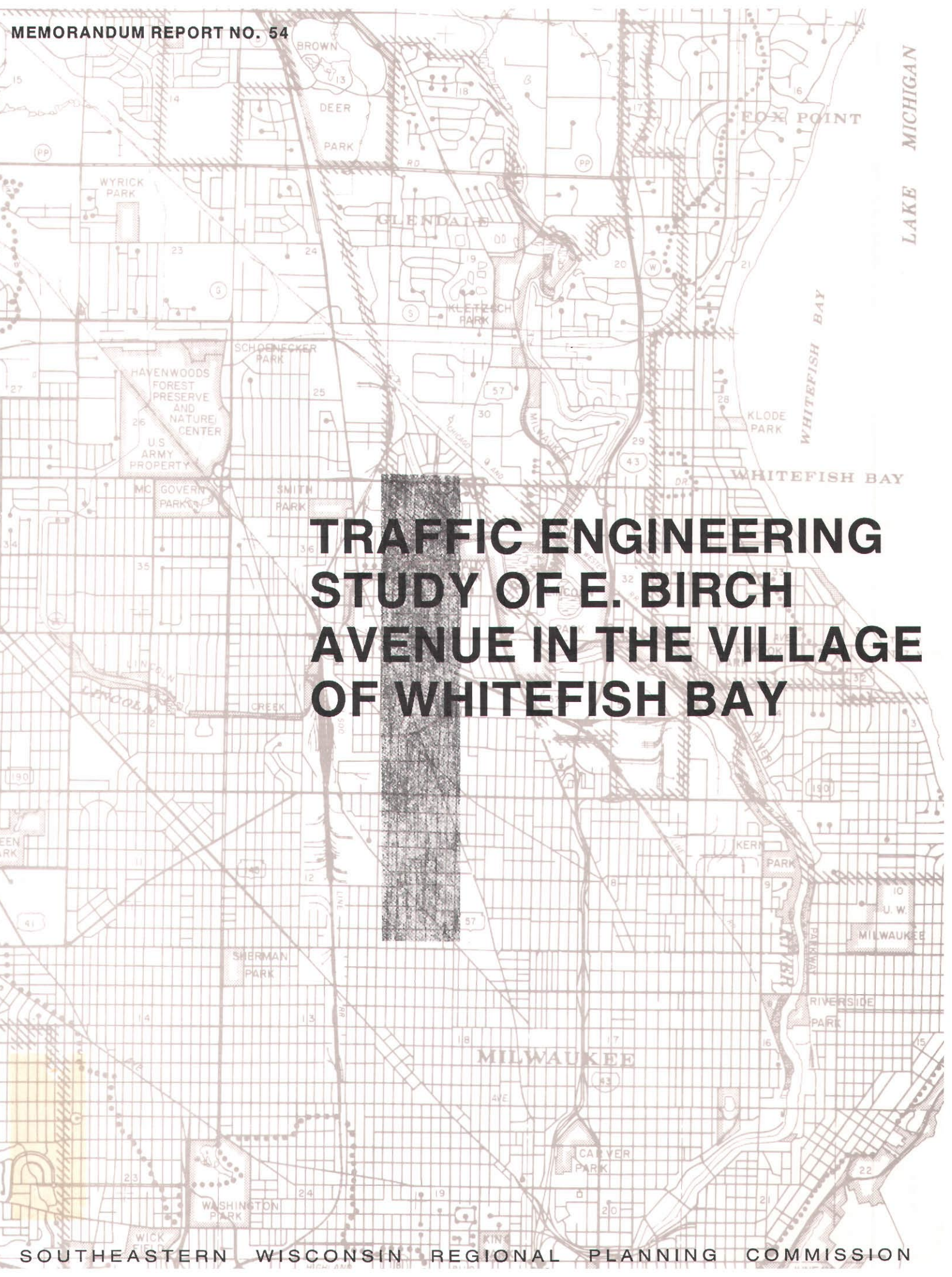




TRAFFIC ENGINEERING STUDY OF E. BIRCH AVENUE IN THE VILLAGE OF WHITEFISH BAY

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Special acknowledgement is due Mr. Robert E. Beglinger, SEWRPC
Principal Engineer, and Mr. Peter C. Daniels, P.E., SEWRPC Senior
Engineer, for their contribution to the conduct of this study and the
preparation of this report.

**MEMORANDUM REPORT
NUMBER 54**

**TRAFFIC ENGINEERING STUDY OF E. BIRCH AVENUE
IN THE VILLAGE OF WHITEFISH BAY**

Prepared by the
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Memorandum Report No. 54

Traffic Engineering Study of E. Birch Avenue in the Village of Whitefish Bay

INTRODUCTION

On October 16, 1989, the Village of Whitefish Bay requested that the Commission staff conduct a traffic engineering study of E. Birch Avenue in the Village of Whitefish Bay. Over the past several years, village residents and elected officials have become increasingly concerned about the perceived volume of through traffic and attendant vehicle speed on E. Birch Avenue between N. Marlborough Drive and N. Lake Drive. This memorandum report presents the findings and recommendations of the requested study. The report describes the traffic problems which currently exist; identifies and evaluates alternative traffic engineering measures which could be used to abate these existing traffic problems; and recommends traffic engineering measures for implementation.

EXISTING CONDITIONS

Functional Classification

Street and highway systems may be classified several ways. Two of the more important classifications are the functional and the jurisdictional classification systems. A functional system provides the basis for organizing, designing, and constructing a street network and includes three classes: 1) arterial streets; 2) collector streets; and 3) land access streets. Arterial streets are those streets and highways primarily intended to serve the movement of through traffic. Some arterial streets, as a secondary function, provide access to abutting property, but access should always be subordinate to their principal function of carrying traffic. Collector and land access streets are sometimes referred to together as local, or nonarterial, streets. Collector streets are those streets or highways which are intended to serve as

connections between the arterial street network and the land access street system. As a secondary function, collector streets may provide access to abutting properties. Land access streets are those streets which primarily provide access to abutting property. This scheme is illustrated conceptually in Figure 1. East Birch Avenue may be functionally classified as a local land access street and, thus, its function should be to provide access to abutting properties.

The jurisdictional classification of a facility identifies the governmental agency responsible for the facility. East Birch Avenue is under the jurisdiction of the Village of Whitefish Bay and, thus, the Village of Whitefish Bay is responsible for the construction, operation, and maintenance of this facility.

Roadway Physical Characteristics

East Birch Avenue extends approximately 3,600 feet within the Village of Whitefish Bay from N. Lydell Avenue to N. Lake Drive. Within the study area between N. Marlborough Drive and N. Lake Drive, E. Birch Avenue traffic is controlled by stop signs at N. Lake Drive and N. Marlborough Drive. This study segment of E. Birch Avenue is approximately 1,370 feet in length and is constructed to an urban cross-section with curb and gutter, and has a pavement width of 22 feet. Parking is permitted on the north side of the street. Sidewalks are provided on the north and south sides of the street. The posted speed limit is currently 25 miles per hour along the entire length.

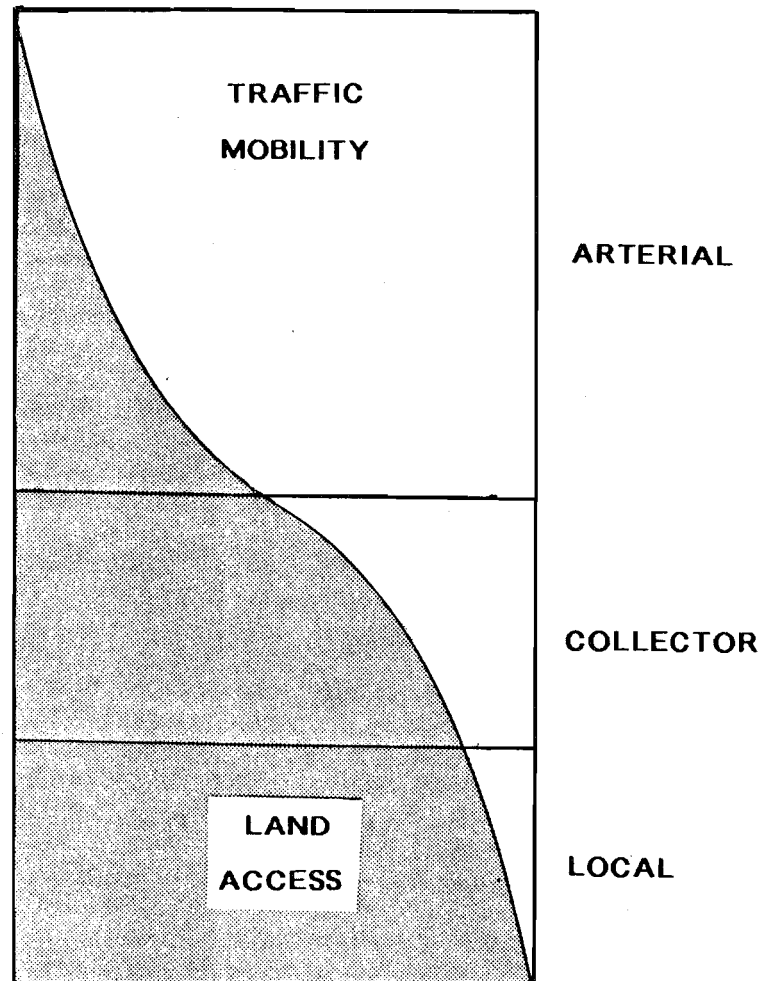
It may be noted that E. Birch Avenue was discontinuous between N. Danbury Road and N. Marlborough Drive until the cessation in the early 1950s of electric street railway service operating on a privately owned right-of-way abutting N. Marlborough Drive on the east. The Village acquired the right-of-way and constructed the missing street segment to enhance the provision of emergency services to residents in the area.

Traffic Volumes

The Commission staff conducted 24-hour machine counts on E. Birch Avenue and other selected streets within and near the study segment of E. Birch Avenue in

Figure 1

RELATIONSHIP OF FUNCTIONALLY CLASSIFIED
SYSTEMS IN TRAFFIC MOBILITY AND LAND ACCESS



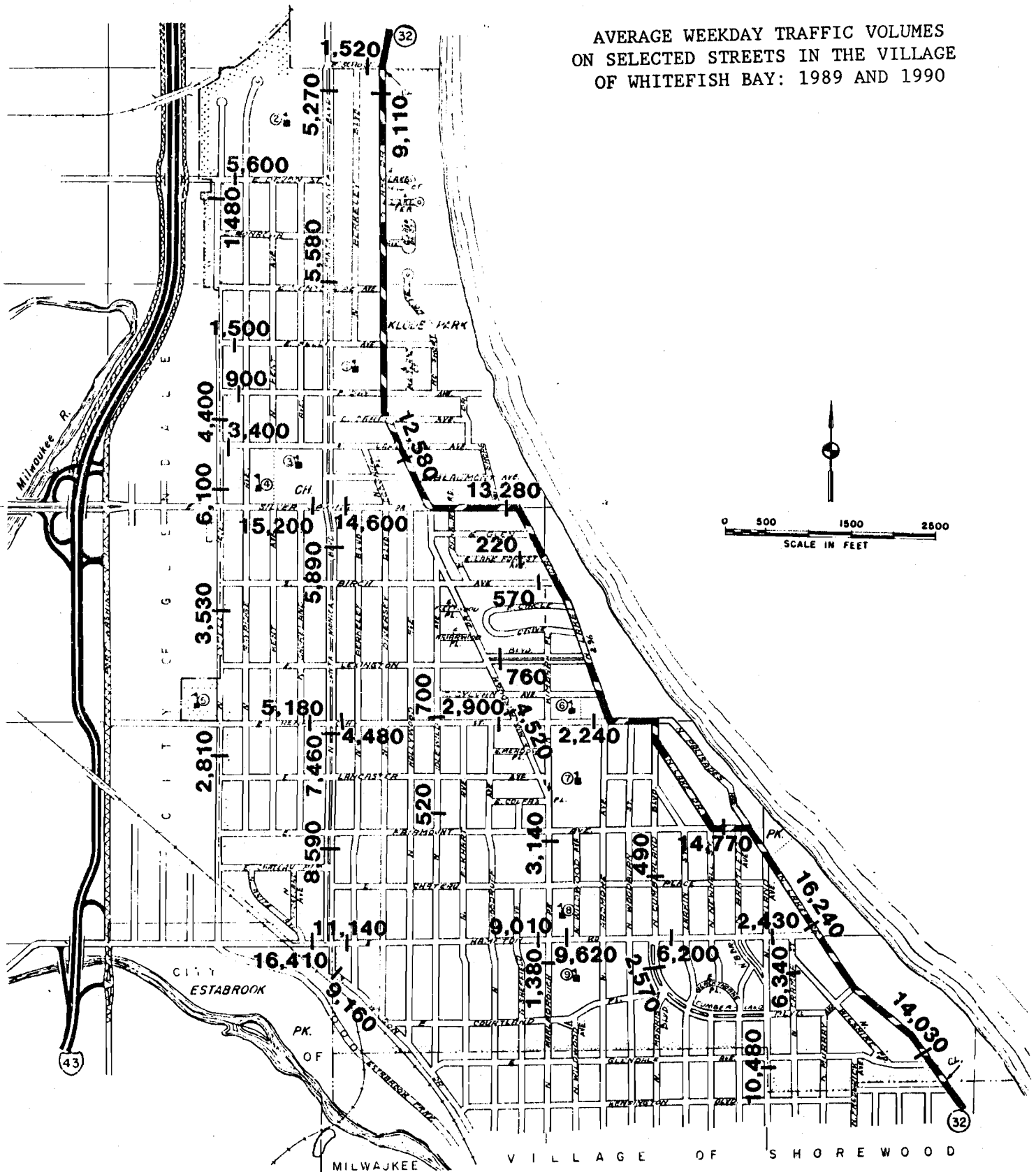
August 1989. In mid-October the Village requested that the Commission staff conduct additional 24-hour machine traffic counts for a duration of at least one week and to conduct a license plate survey. In order to ensure sufficient daylight to conduct the license plate survey, the staff advised that such a survey not be conducted until the spring of 1990; and that the 24-hour machine counts be conducted simultaneously. Accordingly, the license plate survey and machine traffic counting were conducted in April and May 1990. Map 1 and Tables 1 and 2 show the traffic count data. East Birch Avenue currently carries an average weekday traffic volume of about 570 vehicles, and an average daily traffic volume of about 550 vehicles. The machine traffic counts conducted in April and May 1990 were continued for a duration of 10 days in order to measure variation in traffic volumes between days of the week and Saturdays and Sundays. As is typical in the Region, traffic volumes were found to be lower on the weekend than on the average weekday. The traffic volume on Saturday on E. Birch Avenue was 530 vehicles per day, while the Sunday traffic volume was 430 vehicles per day. The traffic volume on Friday was 660 vehicles, the highest volume observed during the 10-day count. Tables 1 and 2 also show that no significant differences were found between the counts conducted in August 1989 and the counts conducted in April and May 1990.

License Plate Survey

On Friday and Saturday, April 27 and 28, 1990, the Commission staff conducted a license plate survey at two locations on E. Birch Avenue--one location just west of N. Lake Drive and the other location just east of N. Marlborough Drive. The survey was conducted to determine what proportion of the total traffic on the study segment of E. Birch Avenue is traffic which neither originates nor ends at a property abutting the study segment of E. Birch Avenue. Data were collected between the hours of 6:00 a.m. and 6:00 p.m. on Friday, and 11:00 a.m. and 3:00 p.m. on Saturday because the village staff indicated that such traffic was perceived to occur principally on E. Birch Avenue during those weekday and Saturday hours. It may also be noted that, on a typical weekday, 80 percent of the total weekday traffic volume occurs between 6:00 a.m. and 6:00 p.m. The data collection consisted of recording license plates on each vehicle by direction at both survey stations. Based on the license plate survey, traffic which neither originates nor ends at a property

Map 1

AVERAGE WEEKDAY TRAFFIC VOLUMES
ON SELECTED STREETS IN THE VILLAGE
OF WHITEFISH BAY: 1989 AND 1990



Source: Wisconsin Department of Transportation and SEWRPC.

Table 1
AVERAGE WEEKDAY TRAFFIC ON SELECTED
STREETS IN THE VILLAGE OF WHITEFISH BAY

Facility	Limits	Wisconsin Department of Transportation		SEWRPC		
		1986	1989	1986	1989	1990
E. Birch Avenue.....	N. Marlborough Drive to N. Lake Drive	500	--	--	550	570
E. Lake Forest Avenue.....	N. Danbury Road to N. Lake Drive	--	--	--	--	220
W. Devon Street.....	N. Lydell Avenue to N. Bay Ridge Avenue	4,950	--	--	5,600	--
N. Lydell Avenue.....	W. Silver Spring Drive to W. Lakeview Avenue	--	--	7,600	6,100	--
	W. Lakeview Avenue to W. Day Avenue	4,280	4,220	3,400	4,400	--
W. Lakeview Avenue.....	N. Lydell Avenue to N. Bay Ridge Avenue	--	--	3,300	3,400	--
W. Day Avenue.....	N. Lydell Avenue to N. Bay Ridge Avenue	--	--	1,200	900	--
W. Belle Avenue.....	N. Lydell Avenue to N. Bay Ridge Avenue	--	--	1,650	1,500	--
E. Silver Spring Drive.....	N. Kent Avenue to N. Shoreland Avenue	13,860	15,200	13,600	--	--
	N. Shore Drive to N. Lake Drive	13,450	13,820	--	--	--
N. Santa Monica Boulevard...	E. Silver Spring Drive to E. Lakeview Avenue ^a	--	3,110	2,650	--	--
	E. Silver Spring Drive to E. Birch Avenue	5,180	5,890	--	--	--
E. Lexington Boulevard.....	N. Marlborough Drive to N. Kimbark Place	770	--	--	700	760

^aCounts shown are for the northbound direction only.

Source: Wisconsin Department of Transportation and SEWRPC.

Table 2

HOURLY TRAFFIC COUNTS ON E. BIRCH AVENUE
BETWEEN N. LAKE DRIVE AND N. MARLBOROUGH DRIVE

Time Time	Average Weekday in August 1989	Average Weekday in April, May 1990	Average Day in April, May 1990
12:00-1:00 a.m.	5	2	3
1:00-2:00	3	1	2
2:00-3:00	1	0	0
3:00-4:00	1	0	0
4:00-5:00	2	4	4
5:00-6:00	2	4	4
6:00-7:00	17	13	11
7:00-8:00	40	49	40
8:00-9:00	31	33	31
9:00-10:00	26	27	27
10:00-11:00	32	29	33
11:00-Noon	38	38	41
Noon-1:00 p.m.	36	36	35
1:00-2:00	36	31	29
2:00-3:00	29	33	34
3:00-4:00	37	45	44
4:00-5:00	43	52	51
5:00-6:00	46	53	48
6:00-7:00	37	38	35
7:00-8:00	35	33	32
8:00-9:00	23	19	19
9:00-10:00	16	16	15
10:00-11:00	8	7	7
11:00-12:00	10	4	5
Total	554	567	550

Source: SEWRPC.

abutting the study segment of E. Birch Avenue was estimated to account for 54 percent of the traffic between 6:00 a.m. and 6:00 p.m. on Friday, April 27, 1990; and 69 percent of the traffic between 11:00 a.m. and 3:00 p.m. on Saturday, April 28, 1990, as shown in Table 3.

There are currently 30 homes on E. Birch Avenue between N. Lake Drive and N. Marlborough Drive. Typically, a single-family detached home may be expected to generate about 10 trips per average weekday to and from the residence.¹ If the traffic on E. Birch Avenue was only to or from abutting residences, it may be expected that approximately 300 vehicle trips per day would be made on this segment of E. Birch Avenue. The estimated current average weekday traffic volume from traffic counts on E. Birch Avenue is 570 vehicles per average weekday, or about 90 percent higher than expected. East Lake Forest Avenue is located parallel to and one block north of E. Birch Avenue. There are currently 26 homes on E. Lake Forest Avenue between its limits of N. Danbury Road and N. Lake Drive. This indicates that approximately 260 trips per day may be expected on this segment of E. Lake Forest Avenue. The average weekday traffic volume--based on actual traffic counts--on this segment was 220 vehicles, somewhat fewer than the expected number of trips. Based on its relationship to the street system, it may be expected that all the traffic on E. Lake Forest Avenue is related to the abutting residential land use. Thus, this analysis confirms the license plate survey finding that about 50 percent of the traffic on the study segment of E. Birch Avenue has neither origins nor destinations at properties abutting the study segment.

The Commission staff obtained garaging address information from the Wisconsin Department of Transportation, Division of Motor Vehicles, for those vehicles which did not have one trip end which either began or ended on the study segment of E. Birch Avenue. These data are shown on Map 2 to assist in determining whether this traffic should be classified as arterial-type traffic or

¹This trip generation rate is based on data contained in Institute of Transportation Engineers, "Trip Generation--An Informational Report," third edition, 1982, and, as well, the Commission's surveys of household travel within southeastern Wisconsin.

Table 3

ESTIMATED TOTAL AND THROUGH TRAFFIC VOLUMES BASED ON THE
LICENSE PLATE SURVEY CONDUCTED ON E. BIRCH AVENUE: APRIL 1990

Friday, April 27, 1990					
Time	Through Vehicles			Total Vehicles	Percentage of Traffic Traveling Through
	Eastbound	Westbound	Total		
6:00 a.m.-7:00 a.m.	10	0	10	16	62.5
7:00 a.m.-8:00 a.m.	25	4	29	45	64.4
8:00 a.m.-9:00 a.m.	13	4	17	31	54.8
9:00 a.m.-10:00 a.m.	21	0	21	41	51.2
10:00 a.m.-11:00 a.m.	16	1	17	31	54.8
11:00 a.m.-12:00 noon	14	13	27	50	54.0
12:00 p.m.-1:00 p.m.	16	9	25	52	48.1
1:00 p.m.-2:00 p.m.	16	1	17	37	45.9
2:00 p.m.-3:00 p.m.	10	1	11	24	45.8
3:00 p.m.-4:00 p.m.	15	10	25	46	54.3
4:00 p.m.-5:00 p.m.	16	12	28	62	45.2
5:00 p.m.-6:00 p.m.	29	18	47	70	67.1
Total	201	73	274	505	54.3
Estimated 24-Hour Volume	260	100	360	660 ^a	54.3

Saturday, April 28, 1990					
Time	Through Vehicles			Total Vehicles	Percentage of Traffic Traveling Through
	Eastbound	Westbound	Total		
11:00 a.m.-12:00 noon	26	12	38	52	73.1
12:00 p.m.-1:00 p.m.	25	7	32	41	78.0
1:00 p.m.-2:00 p.m.	6	3	9	16	56.3
2:00 p.m.-3:00 p.m.	13	9	22	37	59.5
Total	70	31	101	146	69.2
Estimated 24-Hour Volume	260	110	370	530	69.2

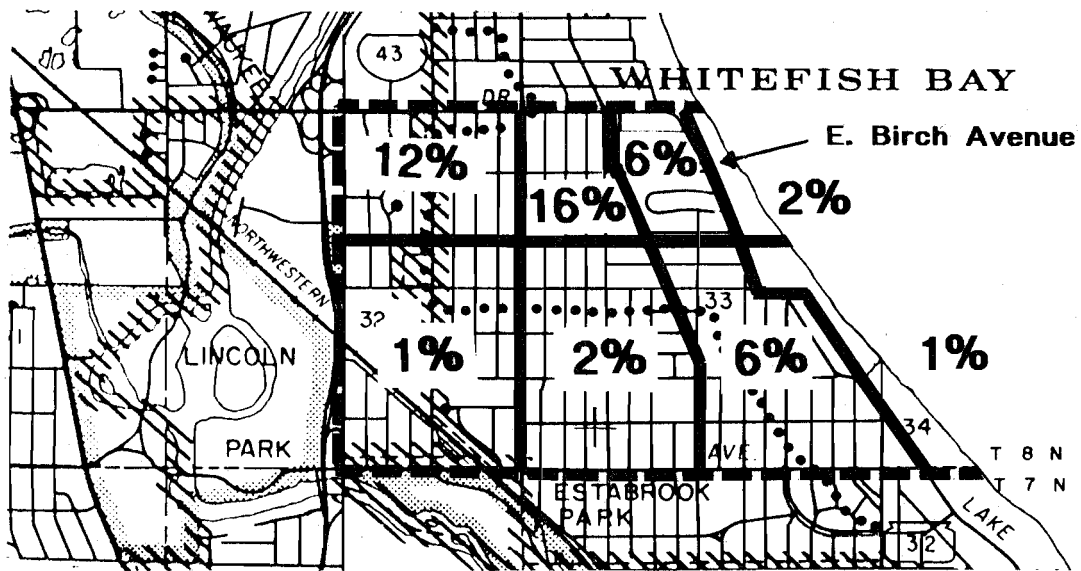
^aFriday traffic volumes are typically higher than average weekday traffic volumes. The average weekday traffic volume on E. Birch Avenue is 570 vehicles, and the estimated through traffic is 310 vehicles.

Source: SEWRPC.

[illegible]

Source: SEWRPC.

Map 2 (continued)

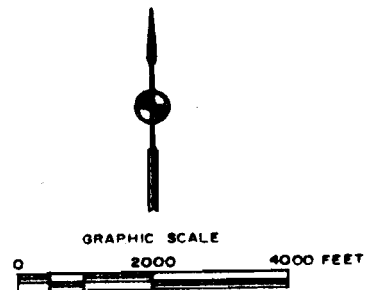


LEGEND

--- INSET BOUNDARY

— SUBAREA BOUNDARY

6% PERCENT OF TRAFFIC
ON STUDY SEGMENT OF
E. BIRCH AVENUE
WHICH NEITHER ORIGINATES
OR ENDS ON THE STUDY
SEGMENT



Source: SEWRPC.

collector-type traffic. Arterial traffic may be typified as intercommunity travel with relatively long trip lengths. These trips should be on the arterial street and highway system. The major difference between arterial-type traffic and collector-type traffic is that the collector traffic has one end of its trip in a neighborhood immediately adjacent to the study segment. Collector-type traffic uses E. Birch Avenue as a bridge between the land access streets in the adjacent neighborhoods and the arterial streets and highways such as N. Marlborough Drive and N. Lake Drive. Approximately 46 percent of the traffic with neither trip end on the study segment of E. Birch Avenue had a garaging address within the municipalities of Whitefish Bay and Glendale, bounded on the south by Hampton Avenue, the west by Lincoln Park, the north by Silver Spring Drive, and the east by Lake Michigan.

Operating Speeds

As shown in Table 4, spot speed studies were conducted by the Village of Whitefish Bay Police Department on the study segment of E. Birch Avenue and, for comparative purposes, on E. Lake Forest Avenue and E. Lexington Boulevard. These studies were conducted on the same days as the license plate survey in April and May 1990 between the hours of 9:00 a.m. and 3:00 p.m. Approximately 47 percent of all vehicles on E. Birch Avenue travel at or below the 25 mile per hour speed limit. In comparison, approximately 40 percent of all vehicles on E. Lexington Boulevard and 58 percent of all vehicles on E. Lake Forest Avenue travel at or below the 25 mile per hour speed limit. This indicates that an additional 11 percent of motorists traveling on E. Lake Forest Avenue, and 7 percent fewer motorists traveling on E. Lexington Boulevard, are complying with the posted speed limit compared to E. Birch Avenue.

The 85th percentile speed--the speed at or below which 85 percent of the traffic is traveling--was measured to be 29.9 miles per hour for E. Birch Avenue traffic. In comparison, the 85th percentile speed was measured to be 27.9 miles per hour for E. Lake Forest Avenue traffic and 31.6 miles per hour for E. Lexington Boulevard traffic. The 85th percentile speed of E. Birch Avenue, E. Lake Forest Avenue, and E. Lexington Boulevard traffic is shown graphically in Figure 2.

Table 4

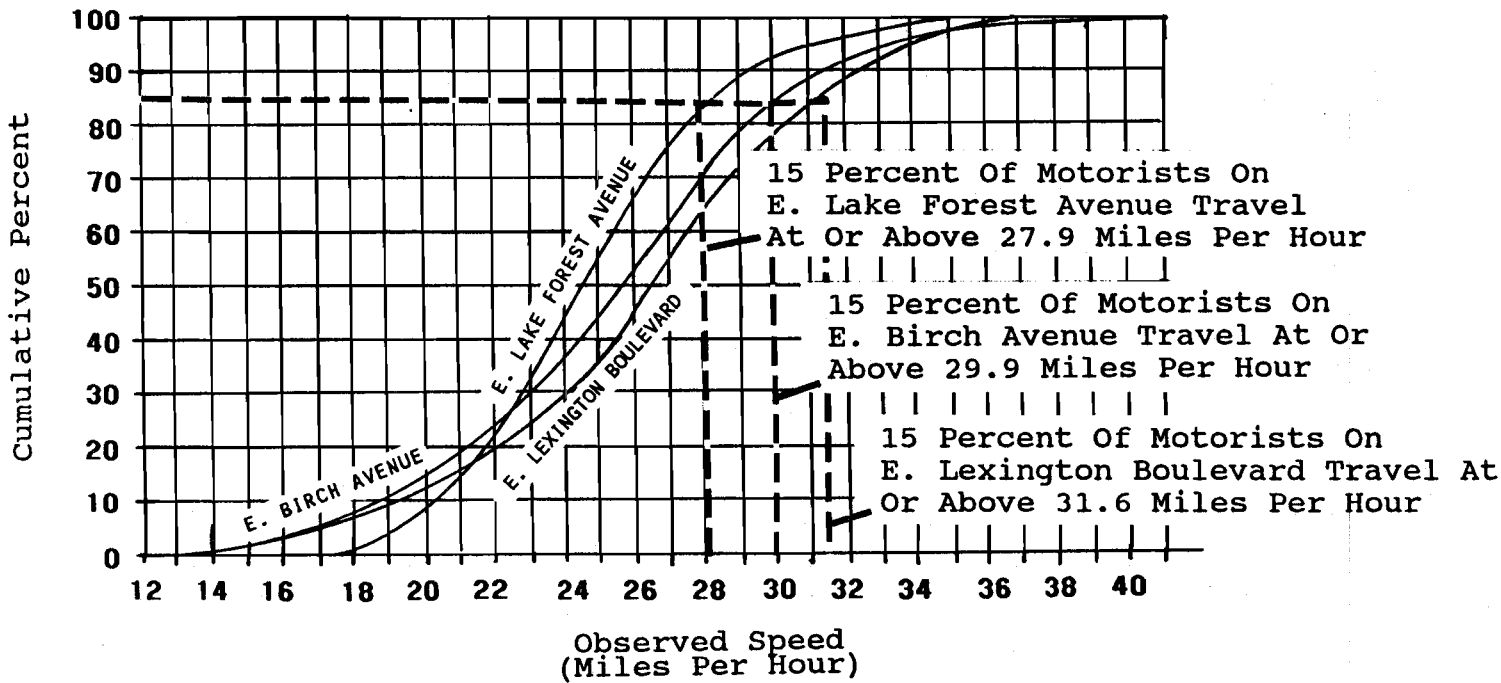
COMPARISON OF OPERATING SPEEDS ON E. BIRCH
AVENUE, E. LAKE FOREST AVENUE, AND E. LEXINGTON
BOULEVARD IN THE OFF-PEAK TRAFFIC HOURS

Speed	E. Birch Avenue	E. Lake Forest Avenue	E. Lexington Boulevard
Average Speed.....	+0.9 mile per hour over the speed limit	+0.4 mile per hour over the speed limit	+2.0 miles per hour over the speed limit
85th Percentile Speed..	+4.9 miles per hour over the speed limit	+2.9 miles per hour over the speed limit	+6.6 miles per hour over the speed limit
10 Mile Per Hour Pace..	21 to 30 miles per hour	20 to 29 miles per hour	23 to 32 miles per hour
Speed Range of the Top 15 Percent of Traffic Traveling at Highest Speeds....	30 to 41 miles per hour	28 to 35 miles per hour	32 to 36 miles per hour

Source: SEWRPC.

Figure 2

CUMULATIVE SPEED DISTRIBUTION CURVES FOR
VEHICLES ON E. BIRCH AVENUE, E. LAKE FOREST AVENUE
AND E. LEXINGTON BOULEVARD IN THE VILLAGE OF
WHITEFISH BAY: 1990



The 10 mile per hour pace--that is, the 10 miles per hour speed range, including the largest number of vehicles--was determined to be 21 to 30 miles per hour, and to include 74 percent of the traffic traveling on E. Birch Avenue. In comparison, the 10 mile per hour pace was determined to be 20 to 29 miles per hour and to include 87 percent of the traffic traveling on E. Lake Forest Avenue; and to be 23 to 32 miles per hour and to include 73 percent of the traffic traveling on E. Lexington Boulevard. Thus, 13 percent more and 1 percent less traffic are within the 10 mile per hour pace on E. Lake Forest Avenue and E. Lexington Boulevard, respectively. The fastest recorded speed on E. Birch Avenue was 41 miles per hour, while the fastest recorded speed on E. Lake Forest Avenue was 35 miles per hour, and the fastest recorded speed on E. Lexington Boulevard was 36 miles per hour.

An additional spot speed study was conducted by the Village of Whitefish Bay Police Department on the study segment of E. Birch Avenue in September 1990 between the hours of 3:30 p.m. and 6:00 p.m. Table 5 compares the operating speeds on E. Birch Avenue in the peak and off-peak traffic hours. Approximately 39 percent of all eastbound vehicles and 27 percent of all westbound vehicles on E. Birch Avenue traveled at or below the 25 mile per hour speed limit during the peak hours. In comparison, 42 and 56 percent of motorists traveling eastbound and westbound, respectively, in the off-peak traffic hours are complying with the posted speed limit. The 85th percentile speed on E. Birch Avenue for both directions was measured to be 31.6 miles per hour in the peak traffic hours compared to 29.9 miles per hour in the off-peak traffic hours. The 10 mile per hour pace in the peak traffic hours was determined to be 21 to 30 miles per hour and to include 67 percent of the traffic traveling east on E. Birch Avenue; and to be 23 to 32 miles per hour and to include 75 percent of the traffic traveling west on E. Birch Avenue. Thus, 6 and 4 percent less traffic traveling eastbound and westbound, respectively, is within the 10 mile per hour pace in the peak traffic hours compared to the off-peak traffic hours. Thus, it may be concluded that the speeds during the peak period compared to the off-peak period are modestly higher.

Table 5

COMPARISON OF OPERATING SPEEDS ON E. BIRCH
AVENUE IN THE PEAK AND OFF-PEAK TRAFFIC HOURS

Speed	Peak Period	Off-Peak Period
Average Speed.....	+2.3 miles per hour over the speed limit	+0.9 mile per hour over the speed limit
85th Percentile Speed..	+6.6 miles per hour over the speed limit	+4.9 miles per hour over the speed limit
10 Mile Per Hour Pace..	23 to 32 miles per hour	21 to 30 miles per hour
Speed Range of the Top 15 Percent of Traffic Traveling at Highest Speeds....	32 to 39 miles per hour	30 to 41 miles per hour

Source: SEWRPC.

Traffic Accidents

The incidence and location of traffic accidents provides another important measure of the efficiency and operating characteristics of a roadway. The Village of Whitefish Bay Police Department reported that only two accidents have occurred on the study segment since 1984, with one occurring in 1986 and one in 1989. The first accident involved a northbound vehicle on N. Lake Drive turning left onto E. Birch Avenue; the left turning vehicle was rear ended by a second northbound vehicle on N. Lake Drive, the driver of which had been distracted by a squirrel crossing her path. The second accident involved a vehicle that was backing out of a driveway onto E. Birch Avenue and collided with a vehicle that was stopped. Neither the roadway physical characteristics nor the operating speeds on E. Birch Avenue appears to have contributed significantly to the two accidents on the study segment.

ANALYSIS AND PROBLEM IDENTIFICATION

This section of the memorandum report analyzes the physical and operational data collected and compares it with accepted traffic engineering standards to identify existing traffic problems.

Roadway Physical Characteristics

East Birch Avenue is constructed to an urban cross-section with curb and gutter, and has a pavement width of 22 feet. According to the Wisconsin Department of Transportation's local road inventory log, the study segment of E. Birch Avenue is one of the narrowest in the Village. This width provides an eight-foot-wide parking lane on the north side of the street and a 14-foot-wide travel lane on the south side of the street and may be considered an absolute minimum cross-section for a land access street. The provision of only one unobstructed traffic lane requires that the opposing conflicting traffic must yield and pause in the parking lane area until sufficient width is again available to pass.

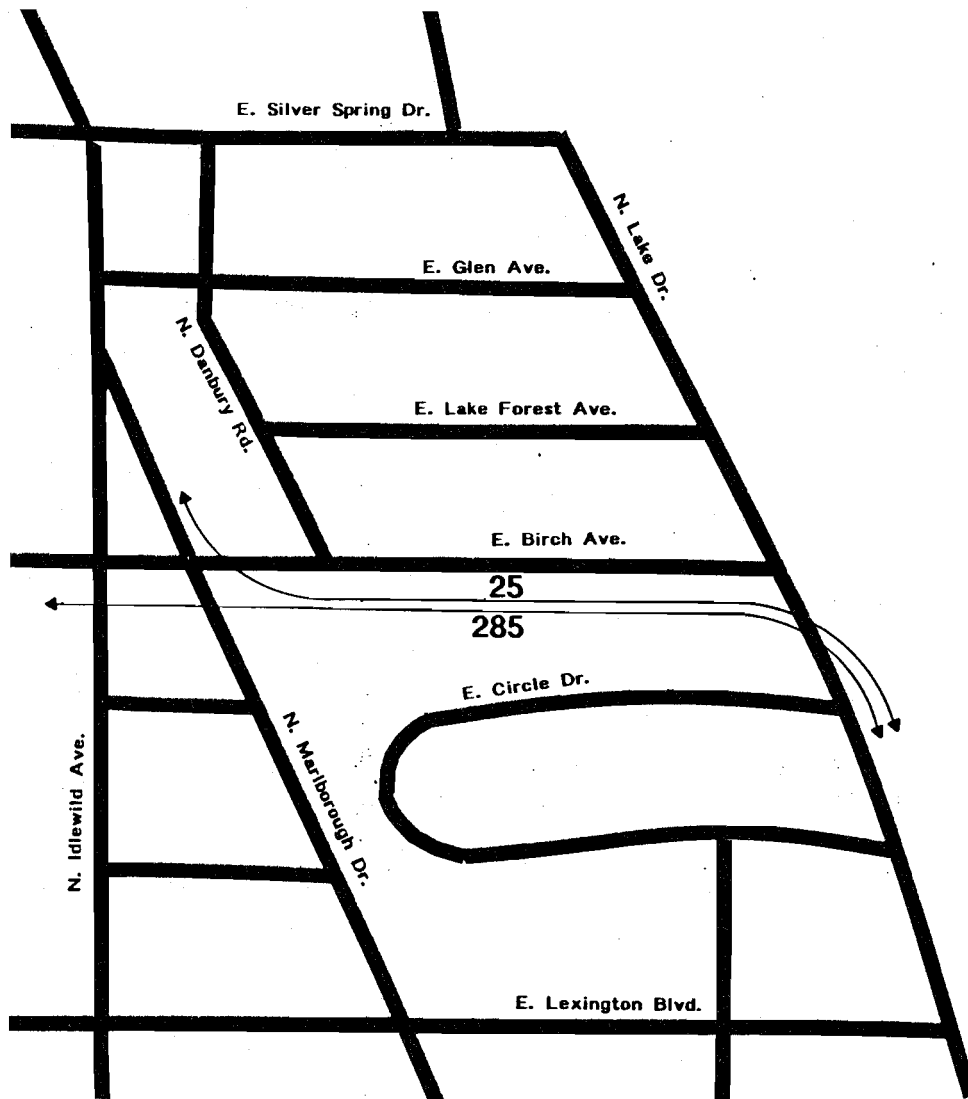
Traffic Volumes and Characteristics

The estimated current average weekday traffic volume of 570 vehicles is substantially less than the volume of traffic--1,500 vehicles per average weekday--typically considered to be the maximum desirable volume of traffic on a local land access street and, as shown on Map 1, is less than many village land access streets. However, as noted in the previous section, the pavement width of 22 feet may be considered an absolute minimum cross-section for a land access street and one of the narrowest in the Village.

The license plate survey established that about 310 vehicles per average weekday, 360 vehicles per average Friday, and about 370 vehicles per average Saturday neither originated nor ended their trips at a property abutting the study segment. Map 3 shows the estimated average weekday traffic by direction which has neither trip end at property abutting the study segment of E. Birch Avenue. It may be noted that only a small percentage of this nonresident traffic--25 of the 310 vehicles per average weekday--is traffic which appears to be using E. Birch Avenue as an alternative to E. Silver Spring Drive between N. Lake Drive and N. Marlborough Drive, and N. Lake Drive between E. Silver Spring Drive and E. Birch Avenue. Most of the nonresident traffic--285 of the 310 vehicles per average weekday--appears to be using E. Birch Avenue to travel to and from residential neighborhoods west of Marlborough Drive; and to travel to and from commercial and other land uses along E. Silver Spring Drive. The garaging address data from the license plate survey indicated that about 85 vehicles, or 28 percent of the nonresident traffic of 310 vehicles per average weekday were garaged in residential neighborhoods immediately west of N. Marlborough Drive in the area bounded by Port Washington Road--CTH W--on the west, E. Silver Spring Drive on the north, N. Marlborough Drive on the east, and E. Lexington Boulevard on the south. For this traffic, E. Birch Avenue functions as a collector street, providing access between a series of north-south land access streets and an arterial--N. Lake Drive--to the east. Thus, the license plate survey clearly indicates that the study segment of E. Birch Avenue functions not only as a land access facility, but also as a collector facility, and for a small amount of traffic as an arterial facility.

Map 3

ESTIMATED AVERAGE WEEKDAY TRAFFIC PATTERNS
FOR TRIPS WITH NEITHER TRIP END AT A PROPERTY
ABUTTING THE STUDY SEGMENT OF E. BIRCH AVENUE



Legend
25 Average weekday
traffic by movement

Not to Scale

Source: SEWRPC.

Operating Speed

Based on the results of the Village of Whitefish Bay Police Department's spot speed study, it appears that there is a modest speeding problem on E. Birch Avenue relative to the posted speed limit on the study segment. A greater percentage of the traffic stream on E. Birch Avenue was found to be exceeding the posted speed limit than on E. Lake Forest Avenue. Yet a smaller percentage of motorists traveling on E. Birch Avenue was found to be exceeding the posted speed limit than on E. Lexington Boulevard. Similarly, the 85th percentile speed on E. Birch Avenue was found to be higher than the 85th percentile speed on E. Lake Forest Avenue, but lower than the 85th percentile speed on E. Lexington Boulevard.

A larger percentage of traffic on E. Birch Avenue and E. Lexington Boulevard was found to be traveling outside the 10 mile per hour pace than on E. Lake Forest Avenue, thereby constituting a greater potential traffic safety problem on E. Birch Avenue and E. Lexington Boulevard than on E. Lake Forest Avenue due to the disparity in travel speeds between them and the general traffic stream.

In addition, the modest speeding problem on E. Birch Avenue was greater in the peak traffic hours than in the off-peak traffic hours. The percentage of motorists in the peak traffic hours complying with the posted speed limit compared to the off-peak traffic hours decreases from 47 to 34 percent.

It may be noted that the travel speeds observed on the study segment are likely typical of the prevailing travel speeds on continuous land access residential streets in the Village. It may further be noted that the average speed and 85th percentile speed on the segment of E. Birch Avenue are only modestly greater than those on E. Lake Forest Avenue, which is a single block in length and carries only local traffic. It may be further noted that the average speed and 85th percentile speed on E. Birch Avenue are below the average and 85th percentile speeds on E. Lexington Boulevard.

Conclusions

Two traffic problems exist on the study segment. The first problem is related to the traffic traveling on the study segment of E. Birch Avenue, which neither originates nor ends at property abutting the study segment. Of the estimated 570 vehicles per average weekday using E. Birch Avenue between N. Lake Drive and N. Marlborough Drive, approximately 310 vehicles per average weekday, or 54 percent, represent such collector and arterial street traffic. Approximately 85 vehicles per average weekday, or 28 percent of the collector and arterial traffic, represent collector traffic to and from the residential areas west of N. Marlborough Drive. Approximately 200 vehicles per average weekday, or 64 percent of the collector and arterial traffic, represent traffic using E. Birch Avenue to travel to commercial and other land uses along E. and W. Silver Spring Drive. This traffic includes both collector and arterial traffic. Approximately 25 vehicles per average weekday, or 8 percent of the arterial and collector traffic, represent arterial traffic which is using E. Birch Avenue and N. Marlborough Drive as an alternative to N. Lake Drive.

The existing total volume of traffic on E. Birch Avenue between N. Lake Drive and N. Marlborough Drive cannot be considered a traffic problem. The existing total average weekday traffic volume approximates 570 vehicles per average weekday, which is well within the desirable range of traffic volume for a land access street. Therefore, even though the pavement width of E. Birch Avenue between N. Lake Drive and N. Marlborough Drive meets only minimum standards for a land access street of this length, the total level of traffic may not be considered a problem as it is well within the desirable range of traffic--up to 1,500 vehicles per average weekday--for a land access street. As shown in Map 1, there are few land access streets in the Village of Whitefish Bay which carry less average weekday traffic than E. Birch Avenue.

A traffic volume problem which may be identified is the arterial traffic which E. Birch Avenue carries, that is, traffic which should be using N. Lake Drive and, as well, E. and W. Silver Spring Drive. Arterial traffic should not be carried on local streets and the minimum width of E. Birch Avenue increases this problem. The amount of arterial traffic carried by E. Birch Avenue is relatively modest, that is, an estimated 130 vehicles per average weekday. The

minimum width of this segment of E. Birch Avenue also makes the carrying of collector traffic on this land access street undesirable; however, the estimated volume of such traffic is relatively modest, that is, an estimated 180 vehicles per average weekday. Most land access streets in the Village may carry as much, or more, collector traffic.

In summary, the total level of average weekday traffic volume may not be identified as a traffic problem. The portion of the traffic volume which consists of arterial traffic, however, should be considered a problem. The portion of traffic volume which is collector traffic may, due to the limited width of the street, be a potential problem.

It may be noted that E. Birch Avenue is not the only land access street in the Village which experiences these problems. For example, E. Lakeview Avenue, E. Belle Avenue, and E. Day Avenue between N. Lydell Avenue and N. Santa Monica Boulevard experience similar problems. The arterial and collector traffic carried by these streets result in average weekday traffic volumes which range from 900 to 3,400 vehicles per average weekday.²

The second problem is a modest vehicular speeding problem on E. Birch Avenue during both peak and off-peak traffic hours. The speeding problem is slightly greater during the peak traffic periods. Based on a comparison of the vehicular speeds on E. Birch Avenue to such speeds on E. Lake Forest Avenue and on E. Lexington Boulevard, it may be concluded that the speeding problem on E. Birch Avenue is not atypical of land access streets in the Village, particularly for such streets that extend several blocks in length. The speeding problem on E. Birch Avenue was somewhat greater than that of E. Lake Forest Avenue, but somewhat less than that of E. Lexington Boulevard.

²See SEWRPC Community Assistance Planning Report No. 153, Traffic Management and Control Plan for the Village of Whitefish Bay.

ALTERNATIVE AND RECOMMENDED TRAFFIC MANAGEMENT AND IMPROVEMENT ACTIONS

As requested by the Village, this section of the memorandum report presents traffic management actions which attempt to abate the perceived and identified traffic problems, and which the Village of Whitefish Bay may consider for implementation.

Traffic Speeding Actions

A traffic management measure considered specifically to alleviate the problem of motorists modestly exceeding the posted speed limit is increased law enforcement on a random basis. Motorists operate at speeds which they consider reasonable and safe under existing roadway conditions. Factors which influence the choice of speed include horizontal and vertical alignment, pavement width and condition, building setback, and driveway spacing. Based upon analysis of the Village of Whitefish Bay Police Department's spot speed study, motorists are modestly violating the posted 25-mile-per-hour speed limit. It may be noted that it is often the fastest vehicles in the traffic stream rather than those traveling at the median or 85th percentile speed that disturbs residents and raises concerns about pedestrian and bicyclist safety. Additional law enforcement has the potential to cause these motorists to reduce their travel speed. The advantage of this alternative is increased motorist compliance with the posted speed limit which may be expected particularly when a law enforcement officer is present. The disadvantages of this alternative include potentially diminished compliance with the speed limit when a police officer is not present and the costs attendant to providing an additional four to five man-hours per week of speed enforcement activity. While not a disadvantage per se, the travel speeds observed on the study segment were very similar to travel speeds on E. Lexington Boulevard and E. Lake Forest Drive. Thus, provision of added enforcement activity on the study segment may result in the Village receiving additional requests for additional enforcement activity. It is recommended that the Village consider increasing its speed limit enforcement activity on a random basis, particularly between the hours of 6:00 a.m. and 6:00 p.m.

Traffic Diversion Actions

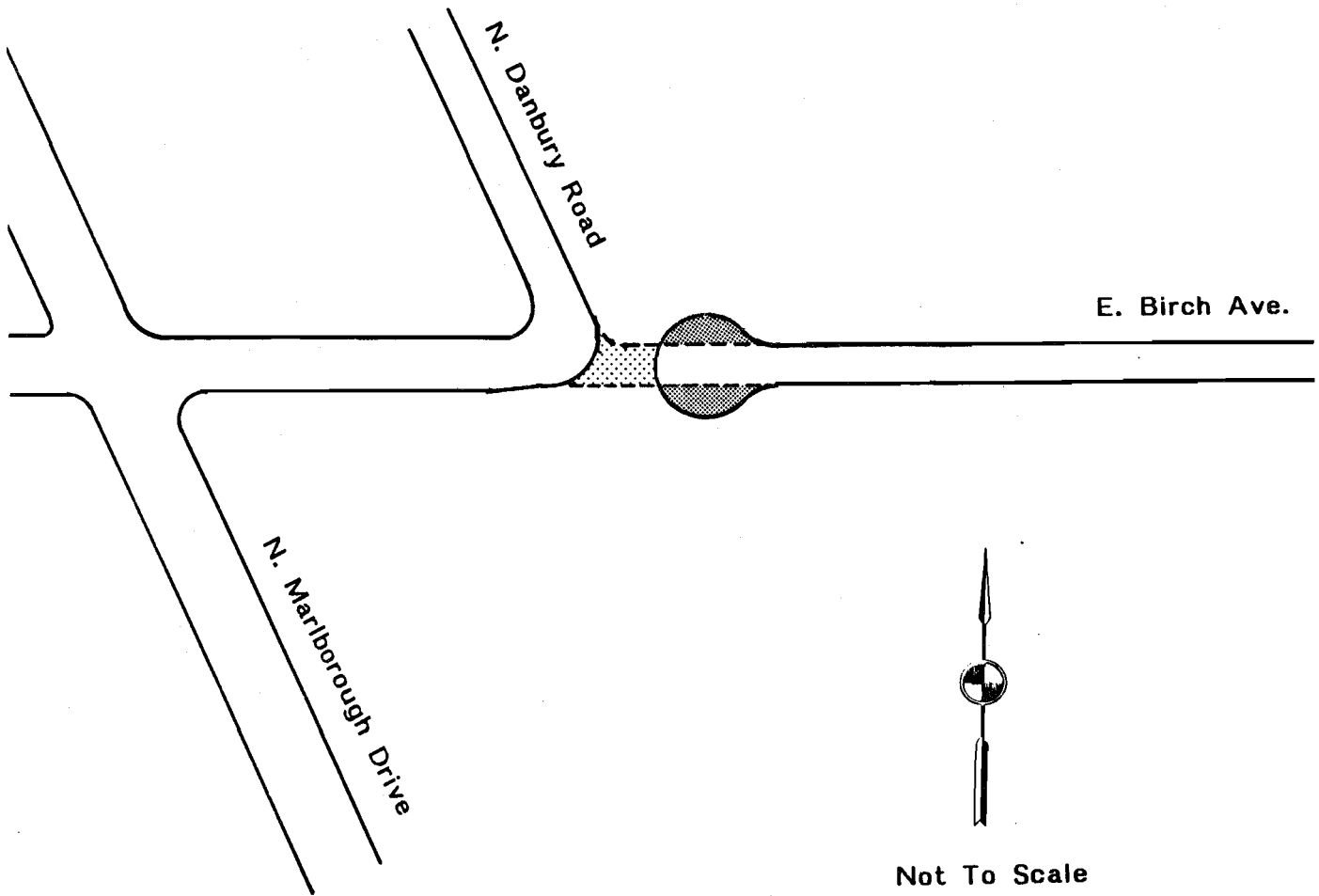
The Commission staff identified and evaluated nine alternative traffic management measures which could be expected to divert the arterial and collector-type traffic from the study segment of E. Birch Avenue. Two of the nine alternative measures considered are passive in nature; that is, are measures which rely on motorist compliance with regulatory signing to achieve the desired action. The other seven alternative traffic management measures considered are physical in nature and would impose the desired action on the motorist.

One of the passive traffic management measures--Alternative 1--is the installation of regulatory signing to prohibit selected turning movements at both ends of the study segment. The other passive measure--Alternative 2--considered is the conversion of E. Birch Avenue to a one-way facility, with the direction of travel westbound between N. Marlborough Drive and N. Danbury Road; and eastbound between N. Danbury Road and N. Lake Drive. The seven physical measures considered include Alternative 3, a street closure of E. Birch Avenue immediately east of N. Danbury Road, as shown in Figure 3; Alternative 4, provision of an isolated median with a channelized opening at the intersection of E. Birch Avenue with N. Marlborough Drive, as shown in Figure 4; Alternative 5, provision of barrier curb diverters at both ends of the E. Birch Avenue study segment, as shown in Figure 5; Alternative 6, provision of a traffic diverter at the intersection of E. Birch Avenue with N. Danbury Road, as shown in Figure 6; Alternative 7, provision of a realignment of E. Birch Avenue at N. Marlborough Drive, as shown in Figure 7; Alternative 8, vacation of E. Birch Avenue between N. Idlewild Avenue and N. Marlborough Drive, as shown in Figure 8; and Alternative 9, provision of a traffic diverter at the intersection of E. Birch Avenue with N. Hollywood Avenue, as shown in Figure 9. An evaluation of each of the nine alternative traffic management measures considered is presented in Table 6.

The evaluation focused on the effectiveness of each alternative to divert the arterial and collector type traffic from the study segment of E. Birch Avenue; the amount of such through and local traffic which would be diverted to other local streets; the potential increase in circuitous travel; the implications for emergency service provision; the land required for the construction of the

Figure 3

ALTERNATIVE 3: POTENTIAL STREET CLOSURE ON
E. BIRCH AVENUE IMMEDIATELY EAST OF N. DANBURY ROAD



LEGEND

-  Pavement To Be Removed
-  New Pavement

Source: SEWRPC.

Figure 4

ALTERNATIVE 4: POTENTIAL ISOLATED
MEDIAN WITH CHANNELIZED OPENING ALTERNATIVE

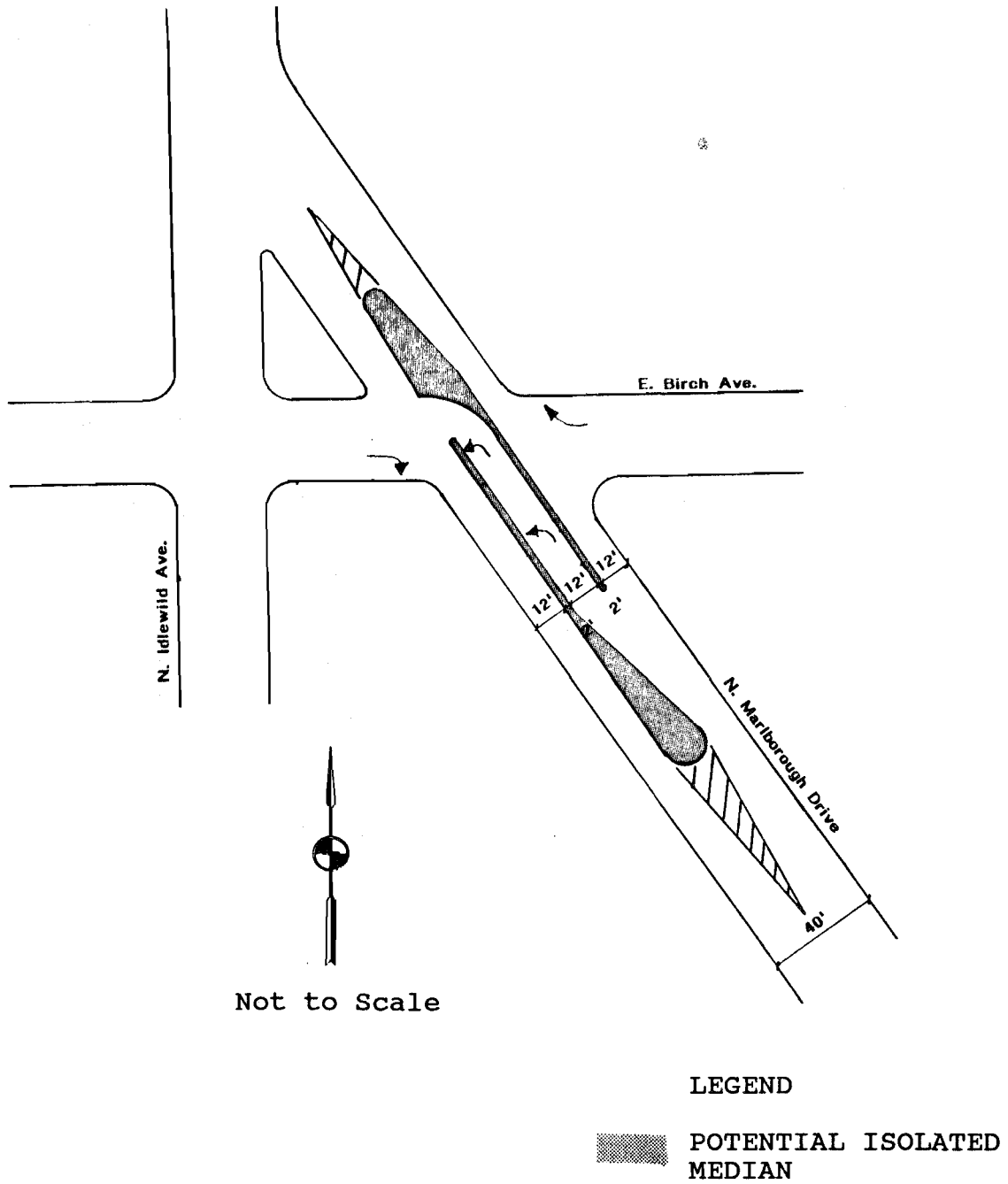
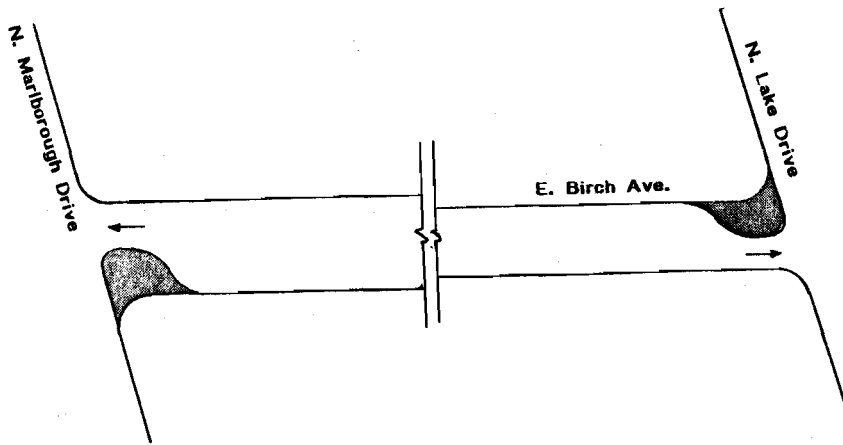


Figure 5

ALTERNATIVE 5: POTENTIAL TRAFFIC DIVERTER AT
N. LAKE DRIVE AND N. MARLBOROUGH DRIVE ALTERNATIVE



Source: SEWRPC.



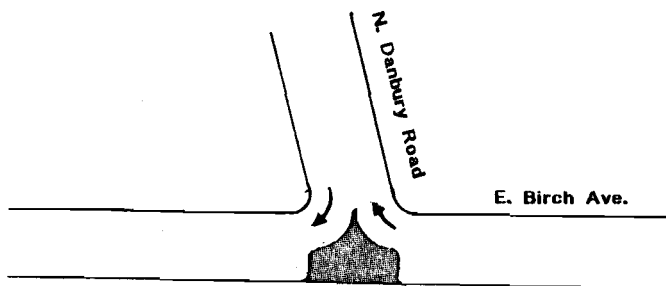
Not to Scale

LEGEND

 POTENTIAL TRAFFIC DIVERTER

Figure 6

ALTERNATIVE 6: POTENTIAL TRAFFIC
DIVERTER AT N. DANBURY ROAD ALTERNATIVE



Not to Scale

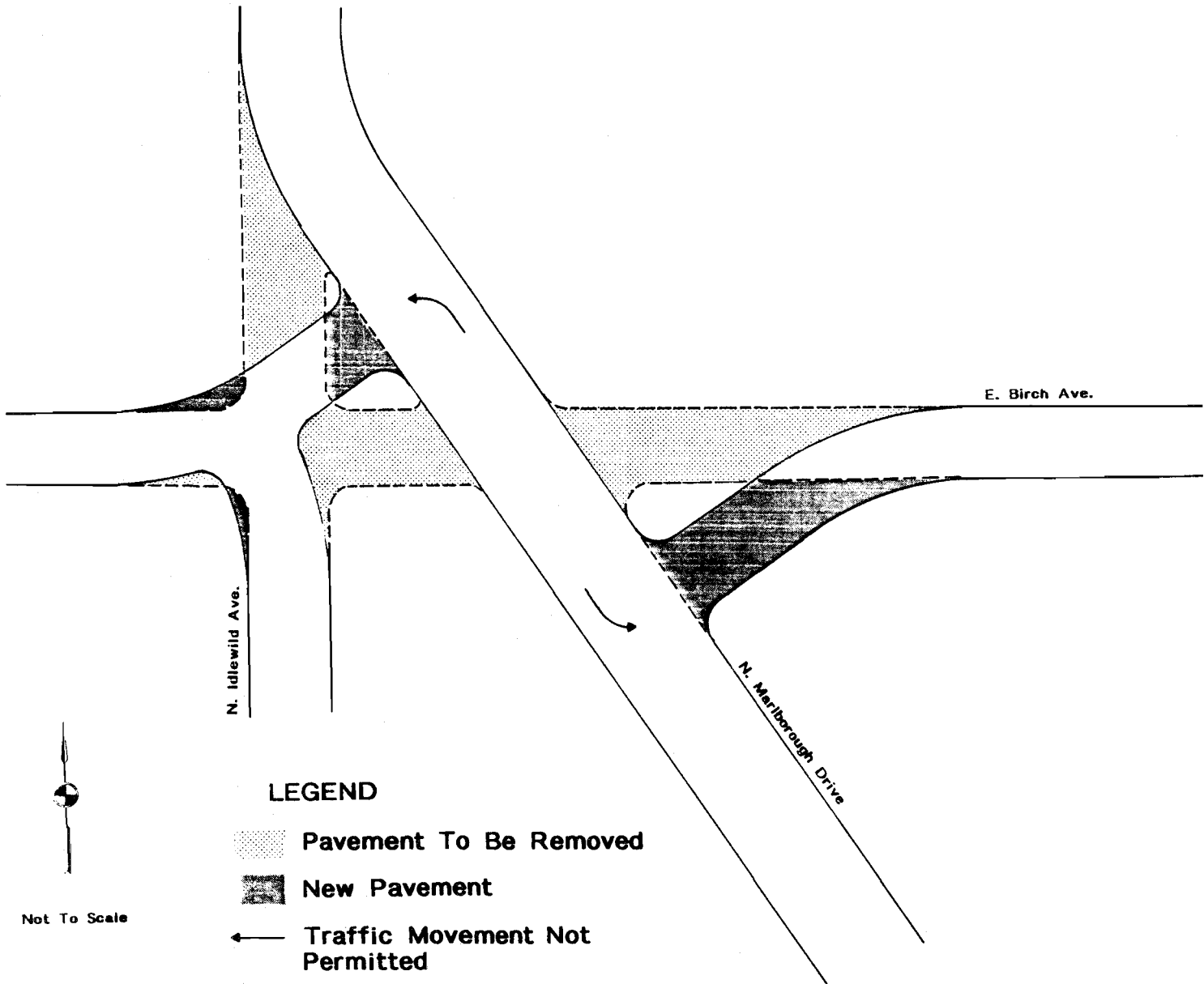
LEGEND

 POTENTIAL TRAFFIC DIVERTER

Source: SEWRPC.

Figure 7

ALTERNATIVE 7: POTENTIAL REALIGNMENT OF
E. BIRCH AVENUE AT N. MARLBOROUGH DRIVE



Source: SEWRPC.

Figure 8

ALTERNATIVE 8: POTENTIAL VACATION OF E. BIRCH AVENUE
BETWEEN N. IDLEWILD AVENUE AND N. MARLBOROUGH DRIVE

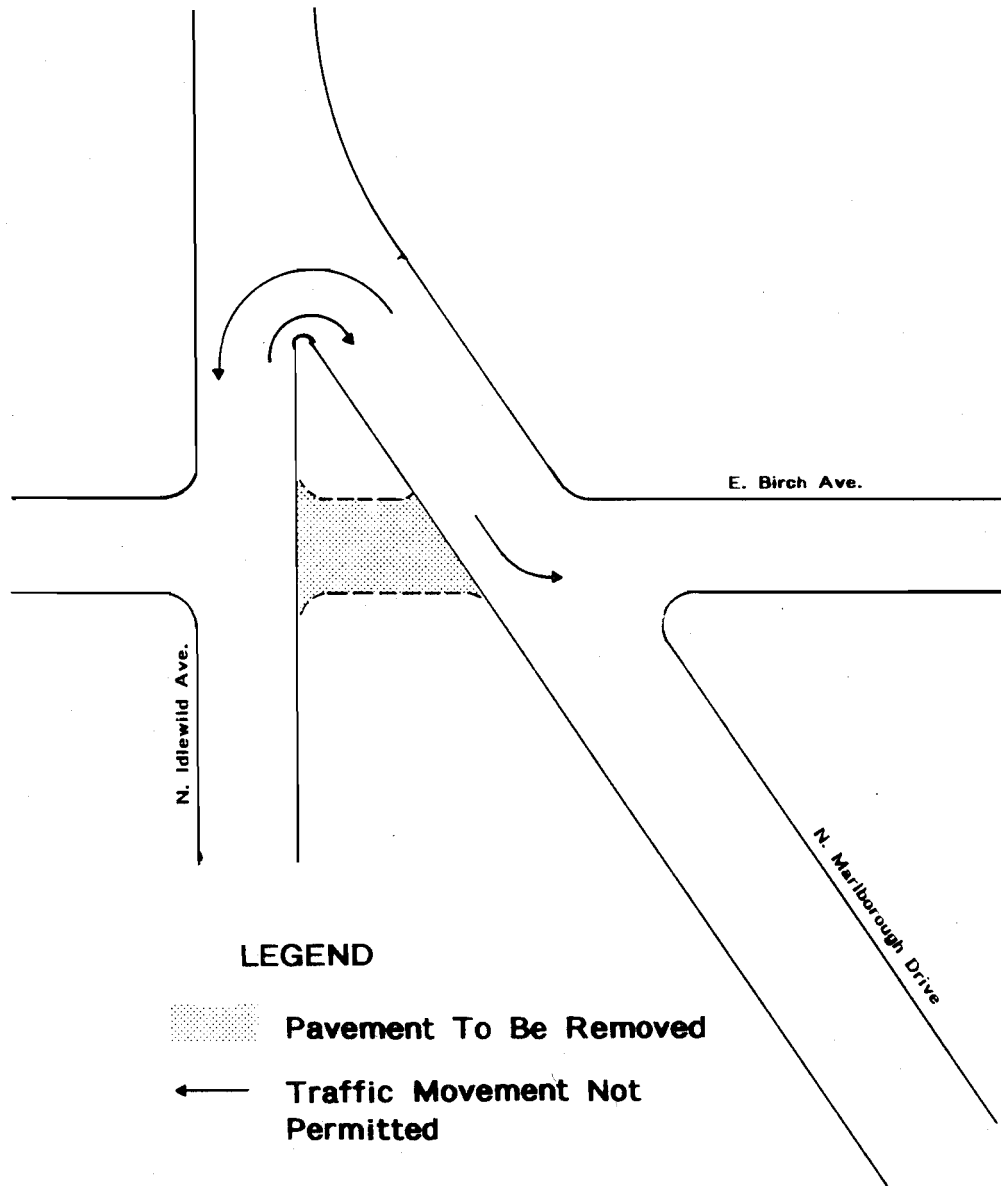
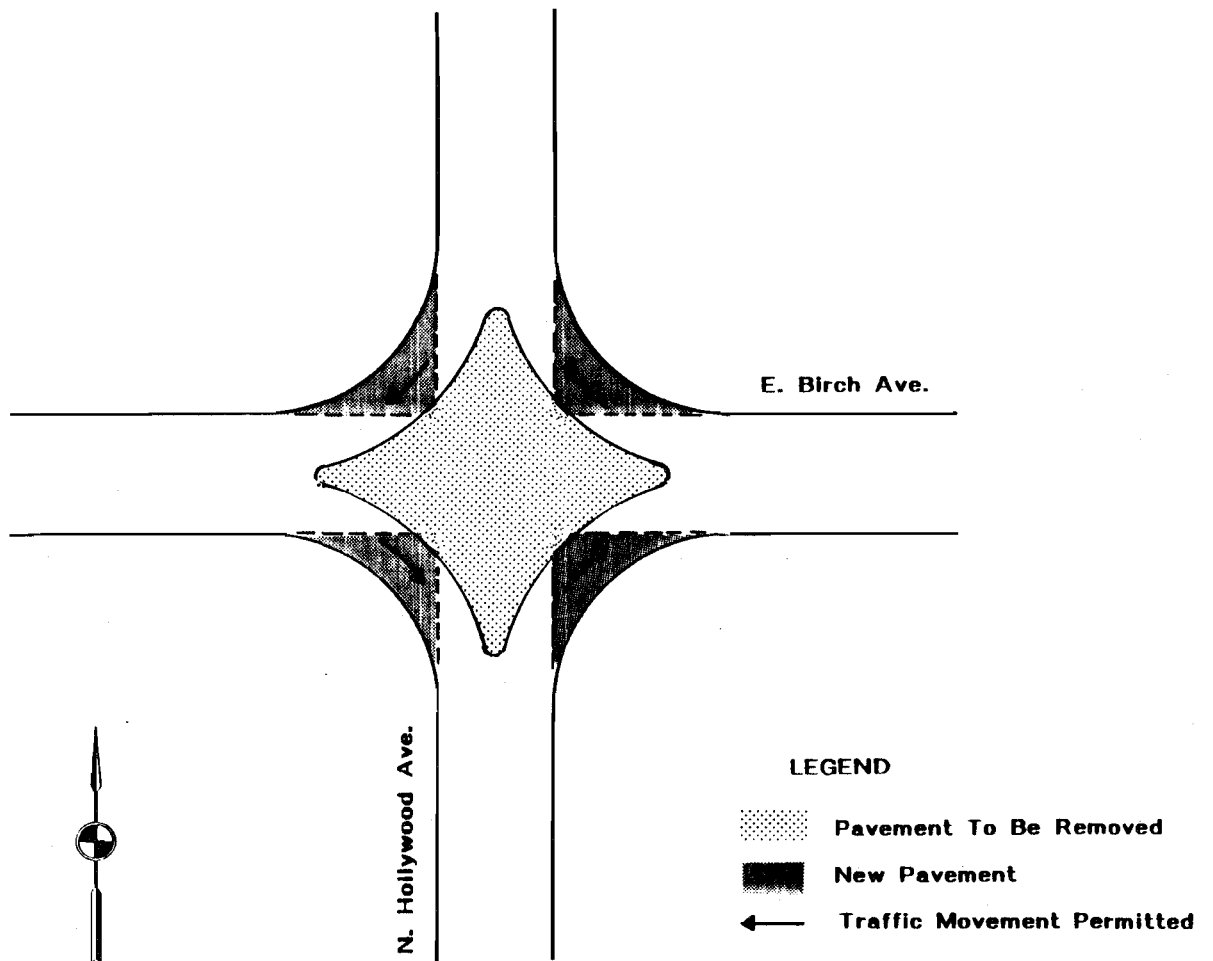


Figure 9

ALTERNATIVE 9: POTENTIAL TRAFFIC
DIVERTER AT N. HOLLYWOOD AVENUE



Not To Scale

Source: SEWRPC.

Table 6

EVALUATION OF TRAFFIC MANAGEMENT ACTIONS TO ABATE THROUGH
TRAFFIC PROBLEMS ON E. BIRCH AVENUE IN THE VILLAGE OF WHITEFISH BAY

Alternative Action	Estimated Cost	Advantages	Disadvantages
1. Prohibit left turns on southbound approach of N. Marlborough Drive and northbound approach to N. Lake Drive at E. Birch Avenue ^a (see Figure A-2 in Appendix A)	\$ 200	An estimated 100 vehicle trips of collector- and arterial-type traffic from northbound N. Lake Drive and southbound N. Marlborough Drive may be expected to be diverted from E. Birch Avenue Emergency vehicles may disregard turn prohibitions and, thus, there will not be an impact on emergency vehicle response time	An estimated 210 collector- and arterial-type trips are not expected to be diverted from E. Birch Avenue Of the 100 collector- and arterial-type trips expected to be diverted, approximately 25 are expected to be diverted to the arterial system and the remaining 75 are expected to be diverted to E. Lexington Boulevard^b Travel for some residents on the study segment of E. Birch Avenue, as well as some residents of N. Danbury Road and E. Lake Forest Avenue, becomes slightly more circuitous. On an average weekday, the change in travel patterns resulting from the left-turn prohibition may be expected to add: - o 25 vehicle trips to E. Glen Avenue - o 65 vehicle trips to E. Lake Forest Avenue - o 25 and 80 vehicle trips to N. Danbury Road between E. Glen Avenue and E. Lake Forest Avenue; and E. Lake Forest Avenue and E. Birch Avenue respectively - o An additional 30 vehicle trips to E. Lexington Boulevard Law enforcement activity is likely to be required to ensure motorist compliance
2. Restrict E. Birch Avenue to one-way westbound between N. Marlborough Drive and N. Danbury Road; and one-way eastbound between N. Danbury Road and N. Lake Drive (see Figure A-3 in Appendix A)	\$ 600	An estimated 310 vehicle trips of collector- and arterial-type traffic may be expected to be diverted from E. Birch Avenue Emergency vehicles may disregard the one-way prohibition and, thus there will not be an impact on emergency vehicle response time	Of the 310 collector- and arterial-type trips expected to be diverted, approximately 55 are expected to be diverted to the arterial system; and the remaining 255 are expected to be diverted to E. Lexington Boulevard^b Travel for all residents on the study segment of E. Birch Avenue, as well as some residents of N. Danbury Road and E. Lake Forest Avenue, becomes slightly more circuitous. On an average weekday, the change in travel patterns resulting from the one-way street pattern may be expected to add:

-continued-

Alternative Action	Estimated Cost	Advantages	Disadvantages
2. Restrict E. Birch Avenue to one-way westbound (continued)			- o 100 vehicle trips to E. Glen Avenue - o 130 vehicle trips to E. Lake Forest Avenue - o 100 and 150 vehicle trips to N. Danbury Road between E. Glen Avenue and E. Lake Forest Avenue, and E. Lake Forest Avenue and E. Birch Avenue, respectively - o An additional 30 vehicle trips to E. Lexington Boulevard Police patrols on E. Birch Avenue may be reduced
3. Construct street closure on E. Birch Avenue immediately east of N. Danbury Road ^c (see Figure 3 and Figure A-4 in Appendix A)	\$10,500	An estimated 310 vehicle trips of collector- and arterial-type traffic may be expected to be diverted from E. Birch Avenue Temporary traffic barricades may be installed, at an estimated cost of \$1,200, and the impact of the closure measured for a trial period. Upon completion of the trial period, a decision could be made with regard to the desirability of a permanent closure	Of the 310 collector- and arterial-type trips expected to be diverted, approximately 55 are expected to be diverted to the arterial system and the remaining 255 are expected to be diverted to E. Lexington Boulevard^b Travel for some residents on the study segment of E. Birch Avenue, as well as some residents of N. Danbury Road, becomes slightly more circuitous. On an average weekday, the change in travel patterns resulting from the street closure may be expected to add: - o 20 vehicle trips to E. Lake Forest Drive - o An additional 20 vehicle trips to E. Lexington Boulevard Provision of emergency services to E. Birch Avenue residents east of N. Danbury Road becomes more circuitous, adding a maximum of 60 seconds to the current response time. In addition, emergency vehicles may not be able to turn around in cul-de-sac, thus necessitating the backing up of the vehicles. Police patrols on E. Birch Avenue may also be reduced Provision of nonemergency municipal services such as trash removal and snow plowing modestly impaired with a cul-de-sac with a minimum radius of 25 feet constructed at the street closure. Would entail extension of street pavement on each side of the existing roadway to the existing sidewalk's outside edge and the removal of two trees

-continued-

Alternative Action	Estimated Cost	Advantages	Disadvantages
4. Construct isolated median with channelized opening at intersection of E. Birch Avenue with N. Marlborough Drive (see Figure 4 and Figure A-5 in Appendix A)	\$15,200	An estimated 300 vehicle trips of collector- and arterial-type traffic may be expected to be diverted from E. Birch Avenue Provision of emergency services from the Village's fire station remains the same as today	An estimated 10 collector- and arterial-type trips are not expected to be diverted from E. Birch Avenue Of the 300 collector- and arterial-type trips expected to be diverted, approximately 45 are expected to be diverted to the arterial system and the remaining 255 are expected to be diverted to E. Lexington Boulevard^b Travel for some residents on the study segment of E. Birch Avenue, as well as some residents of N. Danbury Road and E. Lake Forest Avenue, becomes slightly more circuitous. On an average weekday, the change in travel patterns resulting from the isolated median may be expected to add: - o 85 vehicle trips to E. Glen Avenue - o 30 vehicle trips to E. Lake Forest Avenue - o 85 and 45 vehicle trips to N. Danbury Road between E. Glen Avenue and E. Lake Forest Avenue; and E. Lake Forest Avenue and E. Birch Avenue, respectively - o An additional 45 vehicle trips to E. Lexington Boulevard Existing bus stops at the intersection of E. Birch Avenue with N. Marlborough Drive would have to be relocated and parking would need to be prohibited on both sides of N. Marlborough Drive for 100 feet to the north and 200 feet to the south of E. Birch Avenue
5. Construct traffic diverter on E. Birch Avenue at intersection with N. Lake Drive and with N. Marlborough Drive would permit exit only (see Figure 5 and Figure A-6 in Appendix A)	\$ 3,800	An estimated 310 vehicle trips of collector- and arterial-type traffic may be expected to be diverted from E. Birch Avenue Travel on E. Birch Avenue would be two-way except at the intersections of N. Lake Drive and N. Marlborough Drive, which only permit exiting from the study segment Emergency vehicles may disregard the exit only and, thus, there will not be an impact on emergency vehicle response time	Of the 310 collector- and arterial-type trips expected to be diverted, approximately 55 are expected to be diverted to the arterial system and the remaining 255 are expected to be diverted to E. Lexington Boulevard^b Travel for all residents on the study segment of E. Birch Avenue, as well as some residents of N. Danbury Road and E. Lake Forest Avenue, becomes slightly more circuitous. On an average weekday, the change in travel patterns resulting from the traffic diverter may be expected to add:

-continued-

Alternative Action	Estimated Cost	Advantages	Disadvantages
5. Construct traffic diverter on E. Birch Avenue (continued)		Traffic diverter could replace street surface with attractive landscaped area	- o 100 vehicle trips to E. Glen Avenue - o 130 vehicle trips to E. Lake Forest Avenue - o 100 and 150 vehicle trips to N. Danbury Road between E. Glen Avenue and E. Lake Forest Avenue; and E. Lake Forest Avenue and E. Birch Avenue, respectively - o An additional 30 vehicle trips to E. Lexington Boulevard Police patrols on E. Birch Avenue may be reduced
6. Construct traffic diverter at intersection of E. Birch Avenue with N. Danbury Road (see Figure 6 and Figure A-7 in Appendix A)	\$ 1,500	An estimated 310 vehicle trips of collector- and arterial-type traffic may be expected to be diverted from E. Birch Avenue Traffic diverter could replace street surface with attractive landscaped area Traffic diverter could be perceived as providing the benefits of a curvilinear local street system--that is, low levels of traffic and isolated residential street--within a grid street system	Of the 310 collector- and arterial type trips expected to be diverted, approximately 55 are expected to be diverted to the arterial system and the remaining 255 are expected to be diverted to E. Lexington Boulevard^b Travel for some residents on the study segment of E. Birch Avenue, as well as some residents of N. Danbury Road and E. Lake Forest Avenue, becomes slightly more circuitous. On an average weekday, the change in travel patterns resulting from the traffic diverter may be expected to add: - o 75 vehicle trips to E. Glen Avenue - o 40 vehicle trips to E. Lake Forest Avenue - o 75 and 35 vehicle trips to N. Danbury Road between E. Glen Avenue and E. Lake Forest Avenue; and E. Lake Forest Avenue and E. Birch Avenue, respectively - o An additional 40 vehicle trips to E. Lexington Boulevard Provision of emergency services to E. Birch Avenue residents east of N. Danbury Road becomes more circuitous, adding a maximum of 60 seconds to the current response time Police patrols on E. Birch Avenue may also be reduced

-continued-

Alternative Action	Estimated Cost	Advantages	Disadvantages
7. Reconstruct and realign E. Birch Avenue at its intersection with N. Marlborough Drive to make E. Birch Avenue discontinuous; prohibit southbound left turns from N. Marlborough Drive to E. Birch Avenue; prohibit northbound left turns from N. Marlborough Drive to E. Birch Avenue^a (see Figure 7 and Figure A-8 in Appendix A)	\$25,800	An estimated 300 vehicles of collector- and arterial-type traffic may be expected to be diverted from E. Birch Avenue Emergency vehicles may disregard turn prohibitions and, thus, there will not be an impact on emergency vehicle response time	Of the 300 collector- and arterial-type trips expected to be diverted, approximately 45 are expected to be diverted to the arterial system, and the remaining 255 are expected to be diverted to E. Lexington Boulevard^b Travel for some residents on the study segment of E. Birch Avenue becomes slightly more circuitous. On an average weekday, the change in travel patterns resulting from the realignment may be expected to add: - o 45 vehicle trips to E. Glen Avenue - o 45 vehicle trips to N. Danbury Road between E. Glen Avenue and E. Birch Avenue Travel for some residents in the neighborhood bounded by E. and W. Silver Spring Drive; N. Marlborough Drive; E. and W. Lexington Avenue; and N. Lydell Avenue becomes slightly more circuitous. On an average weekday, the change in travel patterns resulting from this alternative action may be expected to add: - o An additional 170 vehicle trips to E. Lexington Boulevard west of N. Marlborough Drive Law enforcement activity is likely to be required to ensure motorist compliance Would require acquisition of green space owned by the Village of Whitefish Bay and the removal of some trees. This green space could be replaced with vacated street right-of-way
8. Vacate segment of E. Birch Avenue between N. Idlewild Avenue and N. Marlborough Drive; prohibit right turns from northbound N. Idlewild Avenue to N. Marlborough Drive; prohibit left turns from northbound N. Marlborough Drive to N. Idlewild Avenue; prohibit left turns from southbound N. Marlborough Drive to E. Birch Avenue (see Figure 8 and Figure A-9 in Appendix A)	\$ 2,000	An estimated 300 vehicle trips of collector- and arterial-type traffic may be expected to be diverted from E. Birch Avenue	Of the 300 collector- and arterial-type trips expected to be diverted, approximately 45 are expected to be diverted to the arterial system and the remaining 255 are expected to be diverted to E. Lexington Boulevard^b Travel for some residents on the study segment of E. Birch Avenue becomes slightly more circuitous. On an average weekday, the change in travel patterns resulting from the street vacation may be expected to add:

-continued-

Alternative Action	Estimated Cost	Advantages	Disadvantages
8. Vacate segment of E. Birch Avenue (continued)			- o 45 vehicle trips to E. Glen Avenue - o 45 vehicle trips to N. Danbury Road between E. Glen Avenue and E. Birch Avenue Travel for some residents in the neighborhood bounded by E. and W. Silver Spring Drive; N. Marlborough Drive; E. and W. Lexington Avenue and N. Lydell Avenue becomes slightly more circuitous. On an average weekday, the change in travel patterns resulting from this alternative action may be expected to add: - o An additional 490 vehicle trips to E. Lexington Boulevard west of N. Marlborough Drive Law enforcement activity is likely to be required to ensure motorist compliance Provision of emergency services to E. Birch Avenue residents west of N. Marlborough Drive becomes more circuitous, adding a maximum of 30 seconds to the current response time. Police patrols may also be reduced
9. Construct traffic diverter on E. Birch Avenue at intersection with N. Hollywood Avenue (see Figure 9 and Figure A-10 in Appendix A)	\$10,100	An estimated 245 vehicle trips of collector- and arterial-type traffic may be expected to be diverted from E. Birch Avenue Traffic diverter could replace street surface with attractive landscaped area Traffic diverter could be perceived as providing the benefits of a curvilinear local street system--that is, low levels of traffic and isolated residential street--within a grid street system	Of the 245 collector- and arterial-type trips expected to be diverted, approximately 30 are expected to be diverted to the arterial system, and the remaining 215 are expected to be diverted to E. Lexington Boulevard^b Travel for some residents in the neighborhood bounded by E. and W. Silver Spring Drive; N. Marlborough Drive; E. and W. Lexington Avenue and N. Lydell Avenue becomes slightly more circuitous. On an average weekday, the change in travel patterns resulting from this alternative action may be expected to add: o An additional 470 vehicle trips to E. Lexington Boulevard west of N. Marlborough Drive

-continued-

Alternative Action	Estimated Cost	Advantages	Disadvantages
9. Construct traffic diverter on E. Birch Avenue (continued)			Provision of emergency services to E. Birch Avenue residents west of N. Hollywood Road becomes slightly more circuitous, adding a maximum of 30 seconds to the current response time. Police patrols may also be reduced Would require acquisition of green space owned by Village of Whitefish Bay and the removal of some trees

^aAn option of this traffic management alternative was the prohibition of left turns only during the hours of peak traffic flow. An advantage of this option is that it would not alter residents' travel patterns throughout the day, but, rather, only during those periods of peak traffic flow. However, it should be noted that the through traffic problem is not limited to the peak periods.

^bAs shown in Map 2, 28 percent of all the collector- and arterial-type traffic originates in an area south of E. Silver Spring Drive, north of E. Lexington Boulevard, west of N. Marlborough Drive, and east of Port Washington Road, and currently does not use the arterial street system. Given the traffic patterns observed--shown in Figure A-1 in Appendix A, the origin of this traffic, and the substantial excess capacity on E. Lexington Boulevard, it may be expected that motorists would continue to avoid using a congested E. Silver Spring Drive.

^cTwo options of this traffic management alternative were to construct the street closures on E. Birch Avenue east of N. Marlborough Drive or west of N. Lake Drive. However, both options were found to result in more circuitous travel for most local traffic, nonresident delivery traffic, and visitor traffic to E. Birch Avenue, N. Danbury Road, and E. Lake Forest Avenue. Therefore, these options were not recommended.

Source: SEWRPC.

traffic management actions; and construction cost. The estimates of diversion presented in Table 6 are based on: 1) analysis of the garaging address information shown in Map 2; and 2) the travel patterns of the through traffic shown in Map 3.

It should be noted that, of the nine alternatives evaluated, one alternative--Alternative 1, which proposes left-turn prohibition at E. Birch Avenue on N. Lake Drive and N. Marlborough Drive--may only be expected to remove a portion of the through traffic on the study segment of E. Birch Avenue. This alternative may be expected to remove only about 100 of the 310 such through vehicle trips on an average weekday. All the other alternatives--Alternatives 2 through 9--may be expected to remove all or nearly all of the through traffic.

In abating the arterial and collector traffic problem on E. Birch Avenue, each of the alternatives may be expected to generate undesirable impacts. All the alternatives may be expected to result in increases in traffic on other local streets, including E. Lexington Boulevard, N. Danbury Road, E. Lake Forest Avenue, and E. Glen Avenue. With respect to E. Lexington Boulevard, Alternatives 2 through 9 may be expected to result in an increase in traffic of about 300 vehicles per average weekday over the existing 700 vehicles per average weekday. Alternative 1 may be expected to result in an increase of about 100 vehicles per average weekday. The potential increase in traffic on E. Lexington Boulevard is of concern as E. Lexington Boulevard is also a local street. Its potential volume of 1,000 vehicles per average weekday, however, would still be within the desirable range of traffic for a land access street and its pavement width is adequate for such a street. Other potential negative consequences of the alternative actions include construction cost, which is estimated to range from \$200 to \$26,000; additional traffic on N. Danbury Road, E. Glen Avenue, and E. Lake Forest Avenue; impacts on local streets west of N. Marlborough Drive; impacts on the provision of emergency services; and land required for construction of some of the alternative actions. An increase in traffic on N. Danbury Road, E. Glen Avenue, and E. Lake Forest Drive is of concern as these too are land access streets. However, even with the potential traffic increase under each of the alternatives, traffic on these streets

would remain well within the desirable range for land access streets. In summary, the evaluation of alternatives indicated that each alternative resolution of the arterial and collector traffic problem on E. Birch Avenue would entail undesirable impacts.

Alternative 3, which proposes the closing of E. Birch Avenue at N. Danbury Road, may be expected to eliminate all of the E. Birch Avenue arterial and collector traffic. With respect to its undesirable impacts, it may be expected to result in the least additional traffic on N. Danbury Road, E. Glen Avenue, and E. Lake Forest Avenue. Its estimated construction cost of \$10,500 is in the middle of the range of the costs of the other alternatives of \$200 to \$26,000. However, it may be expected to have a negative impact on the provision of emergency services to E. Birch Avenue and other subareas of the Village. Fire equipment routing will be indirect unless some emergency access and egress through the street closure can be established. Police patrols on E. Birch Avenue will be reduced as E. Birch Avenue now receives an atypical heavy level of patrolling as a through street which divides north and south police districts for the Village. Also, the construction of a 50-foot-diameter cul-de-sac will entail extension of street pavement on each side of the existing roadway to the existing sidewalk's outside edge and the removal of some trees.

Other alternatives may also be expected to remove all or nearly all the through traffic. Alternative 2--the one-way street alternative--has a lower cost, fewer restrictions for fire emergency services, and does not have the need to construct additional pavement for a cul-de-sac, but diverts substantially more traffic to E. Lake Forest Avenue and N. Danbury Road. Alternative 4--the construction of a median in N. Marlborough Drive at E. Birch Avenue--has a higher construction cost and may be expected to result in more traffic on segments on N. Danbury Road, although it has fewer restrictions for emergency services and construction can be accomplished within the existing street pavement. Alternatives 5 and 6--the construction of traffic diverters on E. Birch Avenue--have a lower cost and can be constructed within the existing street pavement, but divert more traffic to E. Lake Forest Avenue and N. Dan-

bury Road. Alternatives 7, 8, and 9 also disrupt traffic on E. Birch Avenue and other local streets west of N. Marlborough Drive. Also, Alternative 9 has a higher construction cost and converts existing green space to roadway pavement.

Therefore, it is recommended that the Village in its consideration of the implementation of Alternative 3--the closure of E. Birch Avenue east of N. Danbury Road--or any of the other alternatives which would provide for elimination of the arterial and collector traffic on E. Birch Avenue, recognize that these actions achieve the reduction of traffic on E. Birch Avenue largely by diverting traffic to other local streets in the Village, principally E. Lexington Boulevard. Such diversion and the resultant potential increases in traffic on these other local streets have been identified as a concern by residents of those streets. While the expected levels of traffic on the other streets to which traffic is to be diverted may be anticipated to remain within a desirable range of traffic volume for land access streets, the study segment of E. Birch Avenue did not require diversion of traffic to achieve a desirable range of traffic volume. The diversion of traffic from E. Birch Avenue was examined in an attempt to minimize traffic and, in particular, eliminate arterial and collector traffic due to its minimum pavement width.

If it is considered by village officials to be not feasible or desirable to implement Alternative 3--or other alternatives that would fully remove the arterial and collector traffic--due to their cost, impact on other local streets, and provision of emergency services, the Village may wish to consider implementation of Alternative 1, which would prohibit left turns to E. Birch Avenue from N. Marlborough Drive and N. Lake Drive. This alternative would divert about 100 of the 310 existing through average weekday vehicle trips on E. Birch Avenue, but would, in particular, eliminate the N. Lake Drive/E. Silver Spring Drive arterial traffic. It would result in less traffic diversion to E. Lexington Boulevard and would have limited impact on emergency services. The consideration of implementation of this alternative should recognize, however, that this alternative may be expected to also divert traffic to E. Lake Forest Avenue and N. Danbury Road. This traffic would consist of

E. Birch Avenue residents who can no longer directly access their street from all directions.

Additional Measures Considered But Rejected

The following additional traffic management measures, including those suggested by citizens, were considered but rejected to alleviate the volume of through traffic and excessive vehicle speeds on E. Birch Avenue: 1) designating E. Birch Avenue a one-way street; 2) installing speed control bumps or speed control humps on E. Birch Avenue; 3) installing "Road Closed to Thru Traffic" signs on E. Birch Avenue immediately east of N. Danbury Road and immediately west of its intersection with N. Lake Drive; and 4) the placement of stop signs at midblock locations.

Designating E. Birch Avenue a one-way street was rejected because: 1) it would not prevent motorists from making through trips in one direction; 2) one-way streets should be operated in pairs and conversion of an adjacent parallel street to one-way in the other direction may be expected to attract the through trips in the opposite direction; 3) studies have shown that vehicle speeds tend to be higher on one-way streets; 4) a one-way street would result in more circuitous travel for residents; and 5) one-way streets generally increase trip length and are more confusing to the occasional visitor. For these reasons this traffic management action was rejected.

The installation of speed control bumps on E. Birch Avenue was considered but rejected. Speed control bumps are raised sections in the pavement surface extending transversely across the traveled way approximately four inches high off the pavement surface and normally less than one foot in length. Speed control bumps catch only the wheels on one end of a vehicle at a time. The effect on the ride of the vehicle is, therefore, quite pronounced. Speed control bumps: 1) are not recommended for use in the Manual of Uniform Traffic Control Devices; 2) are reported to interfere with winter snow plowing operations; 3) constitute a hazard to bicyclists and motorcyclists; 4) can buck firemen riding on the back of fire trucks off the truck; and 5) can potentially distract motorists from observing pedestrians/bicyclists. In addition, driver discomfort with respect to traveling over speed bumps actually decreases at

high speeds. Finally, vehicles crossing a speed bump generate noise that may be a problem for residents in the immediate vicinity. Therefore, this traffic management action was rejected.

In contrast to speed control bumps, speed control humps are raised pavement surface undulations extending transversely across the traveled way which can provide effective speed control on a continuous basis without the presence of law enforcement personnel. A standard speed hump is constructed to a height of three inches and 12 feet in width. A series of speed humps approximately 300 feet apart typically results in speeds of 22 to 23 miles per hour over the hump, with motorists accelerating to slightly higher speeds between humps to achieve and maintain an average speed of about 25 miles per hour. The installation of speed humps must be accompanied by the installation of appropriate advisory signing and pavement markings in advance of each hump. The disadvantages of installing speed humps on the study segment include: 1) the installation of speed humps does not address the principal problem identified on the study segment of through traffic; 2) between the speed humps, vehicles may be expected to accelerate to 27-28 miles per hour--speeds similar to the current 85th percentile speed--and thus the benefit realized would be marginal; 3) the potential loss of control by motorists deliberately traveling over the humps at excessive speeds; and 4) an increase in emergency response time, as the preferred crossing speed for fire trucks and ambulances is 15 miles per hour. Therefore, this traffic management action was rejected.

The installation of signs stating "Road Closed to Through Traffic" was rejected because of the difficulty of enforcing this measure; and because such signing has been demonstrated ineffective when implemented elsewhere.

The placing of stop signs midblock to be used as a form of speed control was rejected because: 1) the basic purpose of stop signs is to assign right-of-way at intersections and is not recommended for use as a speed control device in the Manual of Uniform Traffic Control Devices; 2) the installation of unwarranted stop signs can result in an increase in traffic accidents as motorists who do see and obey the sign become mixed with motorists who do not obey or do not see the stop sign; and 3) studies indicate that motorists tend to increase

their speed between stop signs to make up the time lost as a result of the stop. Therefore, this traffic management action was rejected.

SUMMARY

On October 16, 1989, the Village of Whitefish Bay requested that the Commission staff conduct a traffic engineering study of E. Birch Avenue between N. Marlborough Drive and N. Lake Drive in the Village of Whitefish Bay. Over the past several years, village residents and elected officials have become increasingly concerned about the perceived volume of through traffic and attendant vehicle speed on E. Birch Avenue between N. Marlborough Drive and N. Lake Drive. This memorandum report presents the findings and recommendations of the requested study.

The study segment of E. Birch Avenue between N. Lake Drive and N. Marlborough Drive may be functionally classified as a local land access street and, thus, its principal function should be to provide access to abutting properties. East Birch Avenue is constructed to an urban cross-section with curb and gutter and has a pavement width of 22 feet, providing a minimal cross-section for a land access facility.

The Commission conducted 24-hour machine traffic counts on E. Birch Avenue in August 1989 and again in April and May 1990. East Birch Avenue was determined to carry an average weekday traffic volume of about 570 vehicles and an average daily traffic volume of about 550 vehicles. The traffic count on Saturday on E. Birch Avenue was 530 vehicles per day, while the Sunday traffic count was 430 vehicles per day. The traffic volume on Friday was 660 vehicles, the highest volume observed during the 10-day count. The estimated current average weekday traffic volume of 570 vehicles is substantially less than the volume of traffic--1,500 vehicles per average weekday--typically considered to be the maximum desirable volume of traffic on a local land access street, and is less than many village land access streets.

To determine the extent to which the study segment was being used by arterial and collector-type traffic, a license plate survey was conducted by the Com-

mission staff on April 27 and 28, 1990. The license plate survey established that about 310 vehicles per average weekday, 360 vehicles per average Friday, and about 370 vehicles per average Saturday neither originated nor ended their trips at a property abutting the study segment. It may be noted that only a small percentage of this nonresident traffic--25 of the 310 vehicles per average weekday--is traffic which appears to be using E. Birch Avenue as an alternative to E. Silver Spring Drive between N. Lake Drive and N. Marlborough Drive, and N. Lake Drive between E. Silver Spring Drive and E. Birch Avenue. Most of the nonresident traffic--285 of the 310 vehicles per average weekday--appears to be using E. Birch Avenue to travel to and from residential neighborhoods west of Marlborough Drive; and to travel to and from commercial and other land uses along E. Silver Spring Drive. Thus, the license plate survey clearly indicated that the study segment of E. Birch Avenue functions not only as a land access facility, but also as a collector facility, for about 180 vehicles per average weekday, and as an arterial facility for about 130 vehicles per average weekday.

Spot speed studies were conducted on the study segment of E. Birch Avenue by the Village of Whitefish Bay Police Department. Analysis of the studies indicate that approximately 53 percent of E. Birch Avenue traffic in the nonpeak hours, and 66 percent in the peak hours, travel above the speed limit. During the nonpeak hours, 15 percent of E. Birch Avenue traffic travels at speeds of 29.9 miles per hour or greater, and during the peak hours at speeds of 31.6 miles per hour or greater. The travel speeds observed on the study segment are likely typical of the prevailing travel speeds on continuous land access residential streets in the Village and, in fact, are only modestly greater than those on E. Lake Forest Avenue, and modestly less than those on E. Lexington Boulevard.

The incidence and location of traffic accidents on the E. Birch Avenue study segment were also analyzed. The Village of Whitefish Bay Police Department reported that only two accidents have occurred on the study segment since 1984, with one occurring in 1986 and one in 1989. Neither the roadway physical characteristics nor the operating speeds on E. Birch Avenue appears to have contributed significantly to the two accidents on the study segment.

Based on the analyses conducted under the study, it was concluded that two traffic problems exist on the E. Birch Avenue study segment. The first problem is related to the traffic traveling on the study segment of E. Birch Avenue, which neither originates nor ends at property abutting the study segment. Arterial traffic should not be carried on local streets and the minimum width of E. Birch Avenue increases this problem. The amount of arterial traffic carried by E. Birch Avenue is relatively modest, that is, an estimated 130 vehicles per average weekday. The minimum width of this segment of E. Birch Avenue also makes the carrying of collector traffic on this land access street undesirable; however, the estimated volume of such traffic is relatively modest, that is, an estimated 180 vehicles per average weekday. Most land access streets in the Village may carry as much, or more, collector traffic. The existing total volume of traffic on E. Birch Avenue between N. Lake Drive and N. Marlborough Drive cannot be considered a traffic problem. The existing total average weekday traffic volume approximates 570 vehicles per average weekday, which is well within the desirable range of traffic volume for a land access street. Therefore, even though the pavement width of E. Birch Avenue between N. Lake Drive and N. Marlborough Drive meets only minimum standards for a land access street of this length, the total level of traffic may not be considered a problem as it is well within the desirable range of traffic. In summary, the total level of average weekday traffic volume may not be identified as a traffic problem. The portion of the traffic volume which consists of arterial traffic, however, should be considered a problem. The portion of traffic volume which is collector traffic may, due to the limited width of the street, be considered a problem as well.

The second problem is a modest vehicular speeding problem on E. Birch Avenue during both peak and off-peak traffic hours. The speeding problem is slightly greater during the peak traffic periods. Based on a comparison of the vehicular speeds on E. Birch Avenue to such speeds on E. Lake Forest Avenue and on E. Lexington Boulevard, it may be concluded that the speeding problem on E. Birch Avenue is not atypical of land access streets in the Village, particularly for such streets that extend several blocks in length.

As requested by the Village, traffic management actions which attempt to abate the perceived and identified traffic problems were identified and evaluated for consideration by the Village for implementation. To alleviate the problem of motorists modestly exceeding the posted speed limit, it was recommended that the Village consider increased law enforcement on a random basis between the hours of 6:00 a.m. and 6:00 p.m. The advantage of this alternative is increased motorist compliance with the posted speed limit which may be expected particularly when a law enforcement officer is present. The disadvantages of this alternative include the costs attendant to providing an additional four to five man-hours per week of speed enforcement activity.

The Commission staff also identified and evaluated nine alternative traffic management measures which may be expected to divert the arterial and collector-type traffic from the study segment of E. Birch Avenue. The diversion of traffic from E. Birch Avenue was examined in an attempt to minimize traffic and, in particular, to eliminate arterial and collector traffic due to the minimum pavement width of E. Birch Avenue. Two of the nine alternative measures considered are passive in nature; that is, are measures which rely on motorist compliance with regulatory signing to achieve the desired action. The other seven alternative traffic management measures considered are physical in nature and would impose the desired action on the motorist.

The evaluation focused on the effectiveness of each alternative to divert the arterial and collector type traffic from the study segment of E. Birch Avenue; the amount of such through and local traffic which would be diverted to other local streets; the potential increase in circuitous travel; the implications for emergency service provision; the land required for the construction of the traffic management actions; and construction cost.

Of the nine alternatives evaluated, only one alternative--Alternative 1, which proposes left-turn prohibition at E. Birch Avenue on N. Lake Drive and N. Marlborough Drive--may only be expected to remove a portion of the through traffic on the study segment of E. Birch Avenue. This alternative may be expected to remove only about 100 of the 310 such through vehicle trips on an

average weekday. All the other alternatives--Alternatives 2 through 9--may be expected to remove all or nearly all of the the through traffic.

It was recommended that the Village in its consideration of the implementation of the alternatives which would provide for elimination of the arterial and collector traffic on E. Birch Avenue, recognize that these actions achieve the reduction of traffic on E. Birch Avenue largely by diverting traffic to other local streets in the Village, principally E. Lexington Boulevard. Such diversion and the resultant potential increases in traffic on these other local streets--E. Lexington Boulevard, E. Lake Forest Avenue, and N. Danbury Road--have been identified as a concern by residents of those streets. While the expected levels of traffic on the other streets to which traffic is to be diverted may be anticipated to remain within a desirable range of traffic volume for land access streets, the study segment of E. Birch Avenue did not require diversion of traffic to achieve a desirable range of traffic volume. The diversion of traffic from E. Birch Avenue was examined in an attempt to minimize traffic and, in particular, eliminate arterial and collector traffic due to its minimum pavement width.

If it is considered by village officials to be not feasible or desirable to implement Alternative 3--or other alternatives that would fully remove the arterial and collector traffic--due to their cost, impact on other local streets, and provision of emergency services, it was suggested that the Village may consider implementation of Alternative 1, which would prohibit left turns to E. Birch Avenue from N. Marlborough Drive and N. Lake Drive. This alternative would divert about 100 of the 310 existing through average weekday vehicle trips on E. Birch Avenue, but would, in particular, eliminate the N. Lake Drive/E. Silver Spring Drive arterial traffic. It would result in less traffic diversion to E. Lexington Boulevard and would have limited impact on emergency services. The consideration of implementation of this alternative should recognize, however, that this alternative may be expected to also divert traffic to E. Lake Forest Avenue and N. Danbury Road. This traffic would consist of E. Birch Avenue residents who can no longer directly access their street from all directions.

The following additional traffic management measures, including those suggested by citizens, were considered but rejected to alleviate the volume of through traffic and excessive vehicle speeds on E. Birch Avenue: 1) designating E. Birch Avenue a one-way street; 2) installing speed control bumps or speed control humps on E. Birch Avenue; 3) installing "Road Closed to Thru Traffic" signs on E. Birch Avenue immediately east of N. Danbury Road and immediately west of its intersection with N. Lake Drive; and 4) the placement of stop signs at midblock locations.

APPENDICES

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EXISTING TRAFFIC PATTERNS FOR TRAFFIC WHICH
CURRENTLY USES THE STUDY SEGMENT OF E. BIRCH AVENUE



Not To Scale

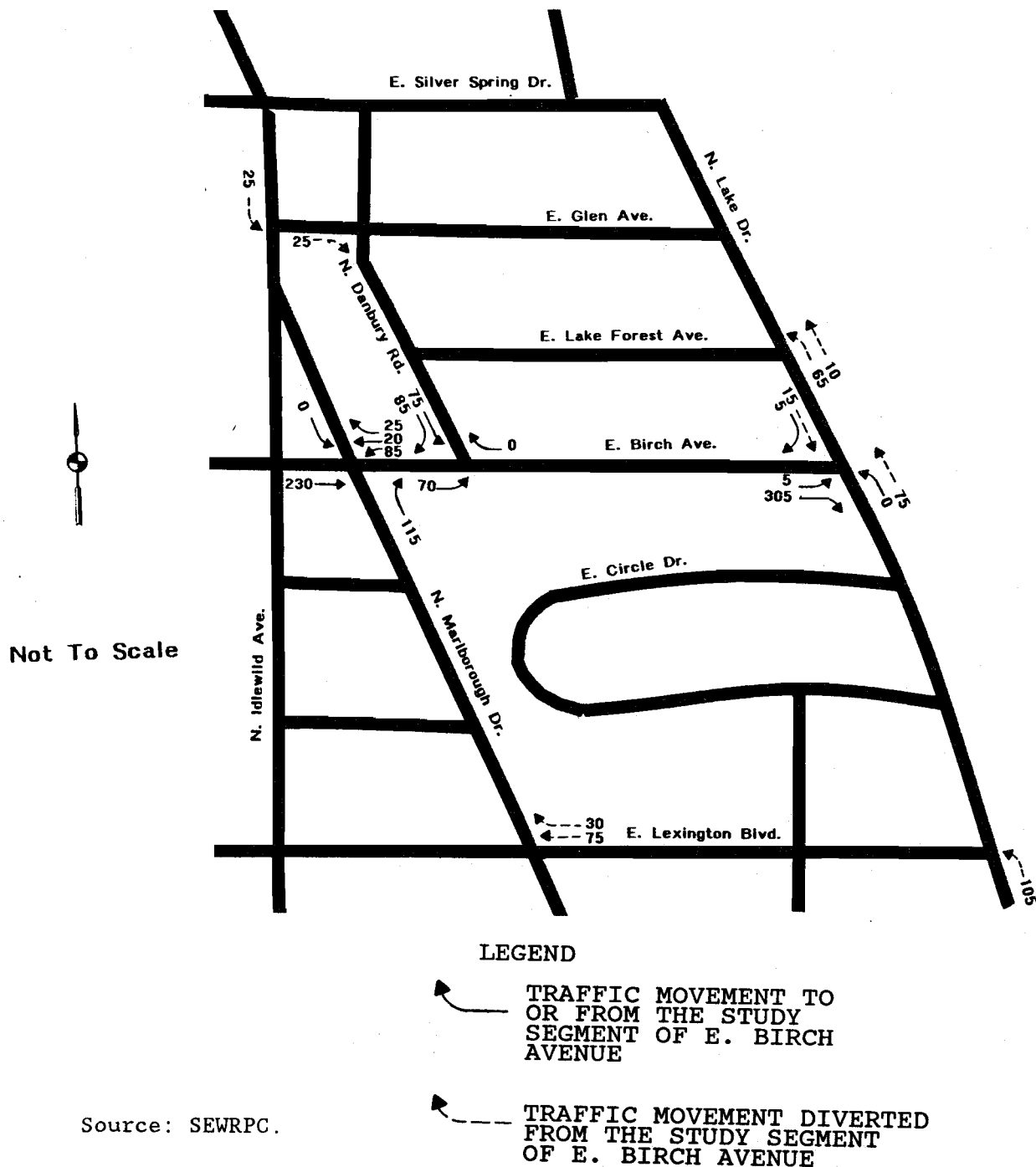
LEGEND

TRAFFIC MOVEMENT TO
OR FROM THE STUDY
SEGMENT OF E. BIRCH
AVENUE

Appendix A (continued)

Figure A-2

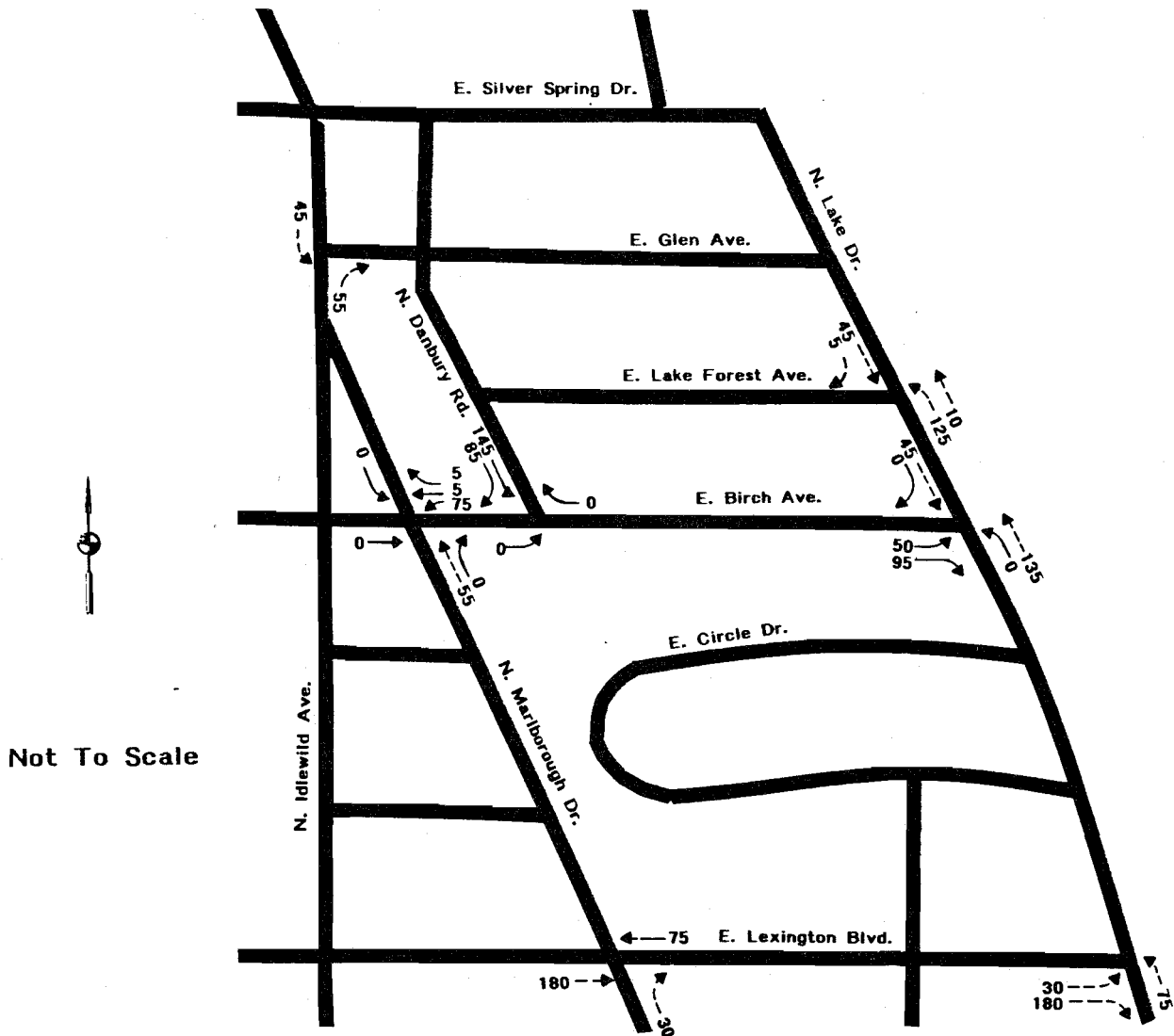
EXPECTED TRAFFIC PATTERNS WITH POTENTIAL LEFT-TURN PROHIBITIONS
ON SOUTHBOUND N. MARLBOROUGH DRIVE APPROACH AND NORTHBOUND
N. LAKE DRIVE APPROACH AT E. BIRCH AVENUE FOR TRAFFIC
WHICH CURRENTLY USES THE STUDY SEGMENT OF E. BIRCH AVENUE



Appendix A (continued)

Figure A-3

EXPECTED TRAFFIC PATTERNS WITH POTENTIAL RESTRICTIONS
ON E. BIRCH AVENUE OF ONE-WAY WESTBOUND BETWEEN
N. MARLBOROUGH DRIVE AND N. DANBURY ROAD; AND ONE-WAY
EASTBOUND BETWEEN N. DANBURY ROAD AND N. LAKE DRIVE FOR
TRAFFIC WHICH CURRENTLY USES THE STUDY SEGMENT OF E. BIRCH AVENUE

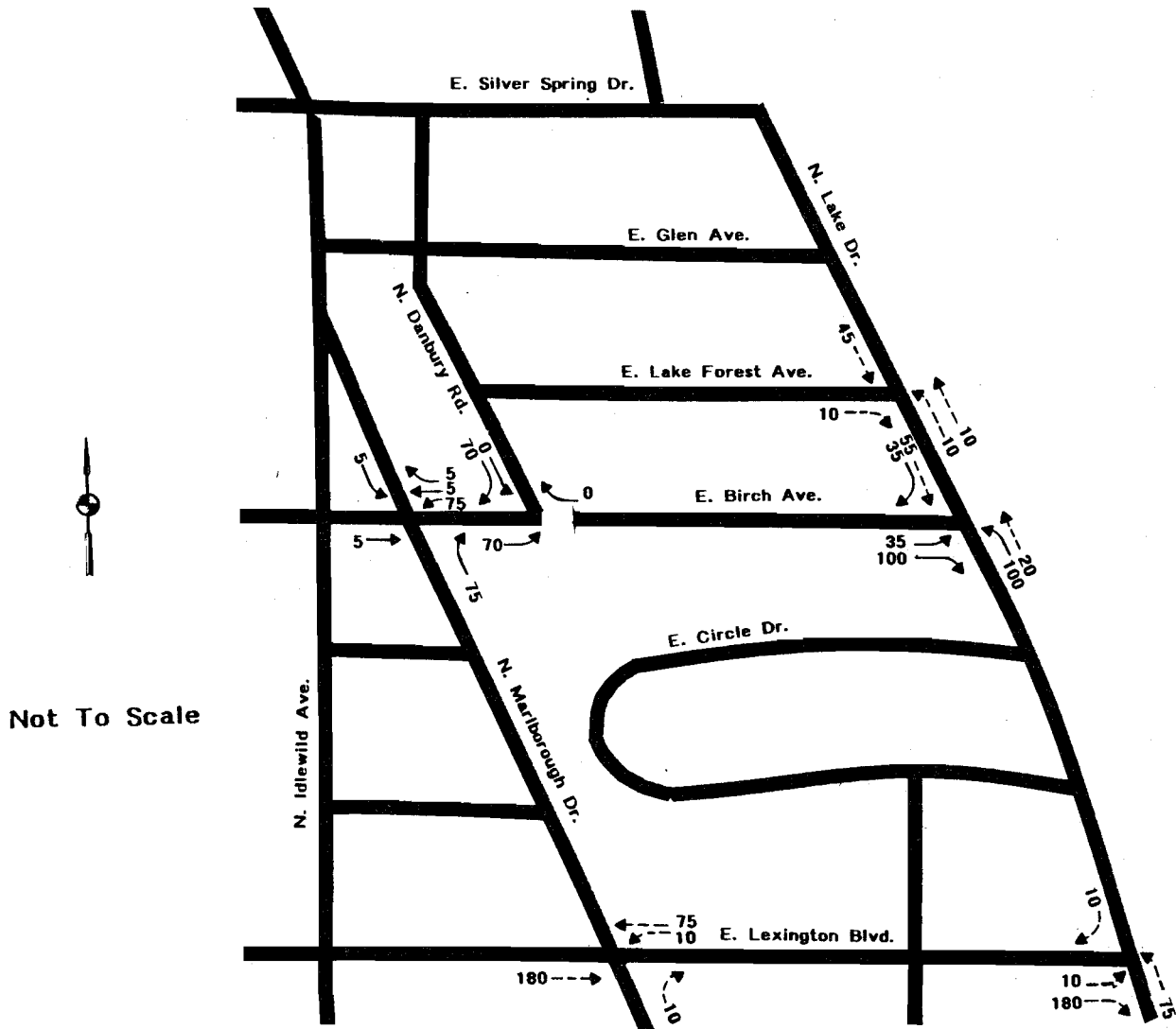


Source: SEWRPC.

Appendix A (continued)

Figure A-4

EXPECTED TRAFFIC PATTERNS WITH POTENTIAL STREET CLOSURE
ON E. BIRCH AVENUE IMMEDIATELY EAST OF N. DANBURY ROAD FOR
TRAFFIC WHICH CURRENTLY USES THE STUDY SEGMENT OF E. BIRCH AVENUE



LEGEND

TRAFFIC MOVEMENT TO
OR FROM THE STUDY
SEGMENT OF E. BIRCH
AVENUE

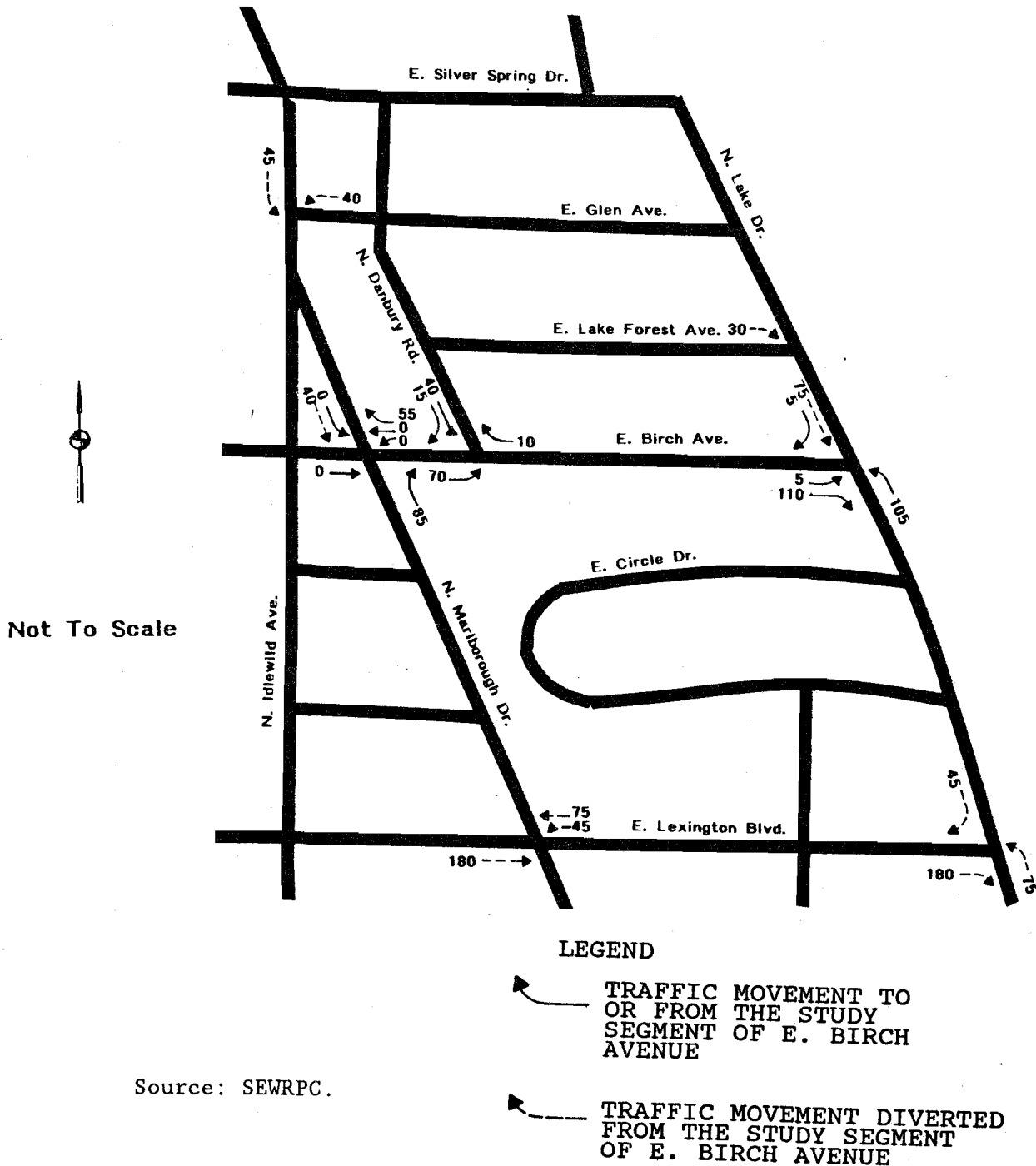
TRAFFIC MOVEMENT DIVERTED
FROM THE STUDY SEGMENT
OF E. BIRCH AVENUE

Source: SEWRPC.

Appendix A (continued)

Figure A-5

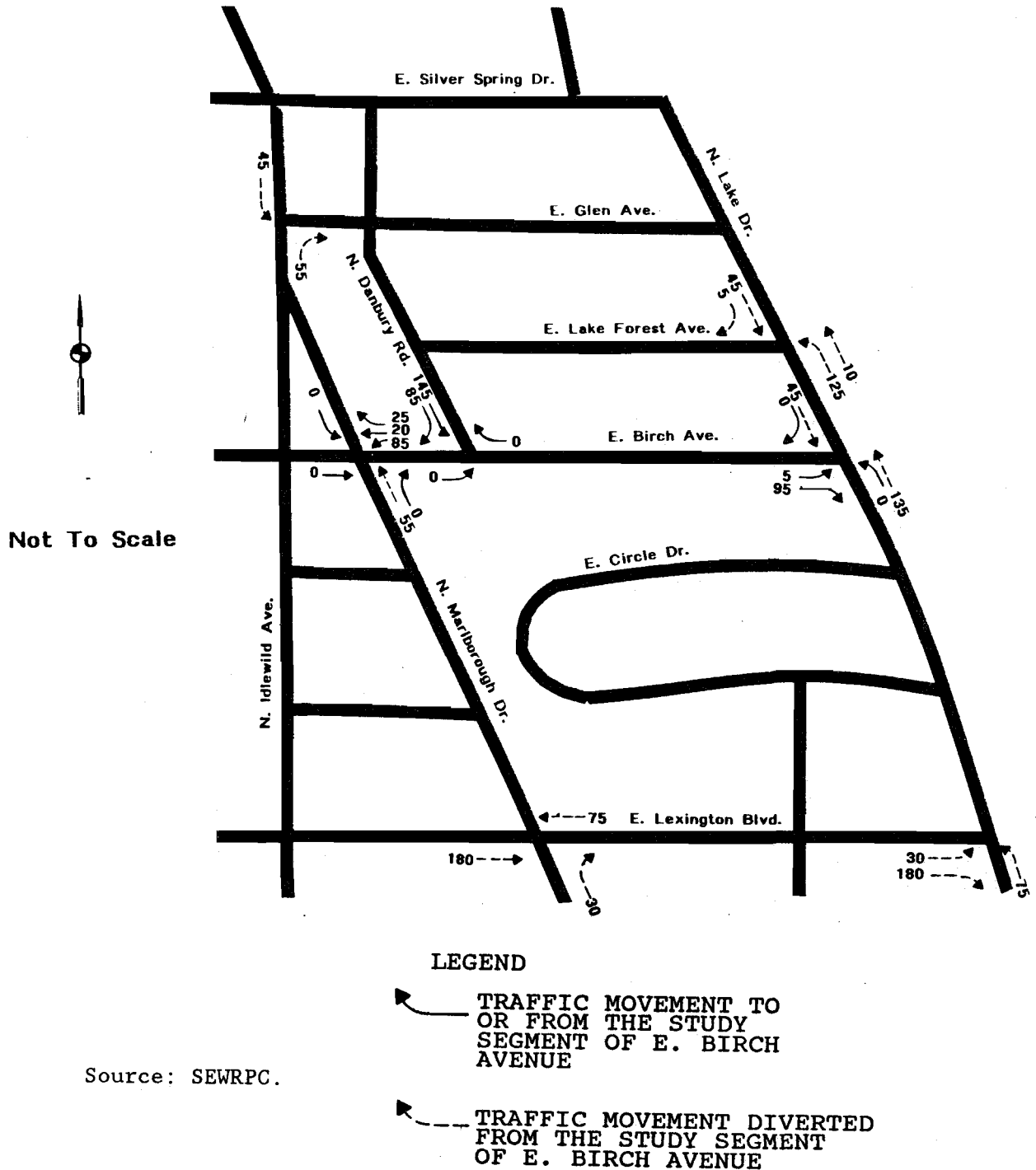
EXPECTED TRAFFIC PATTERNS WITH POTENTIAL ISOLATED MEDIAN
AT INTERSECTION OF E. BIRCH AVENUE AND N. MARLBOROUGH DRIVE FOR
TRAFFIC WHICH CURRENTLY USES THE STUDY SEGMENT OF E. BIRCH AVENUE



Appendix A (continued)

Figure A-6

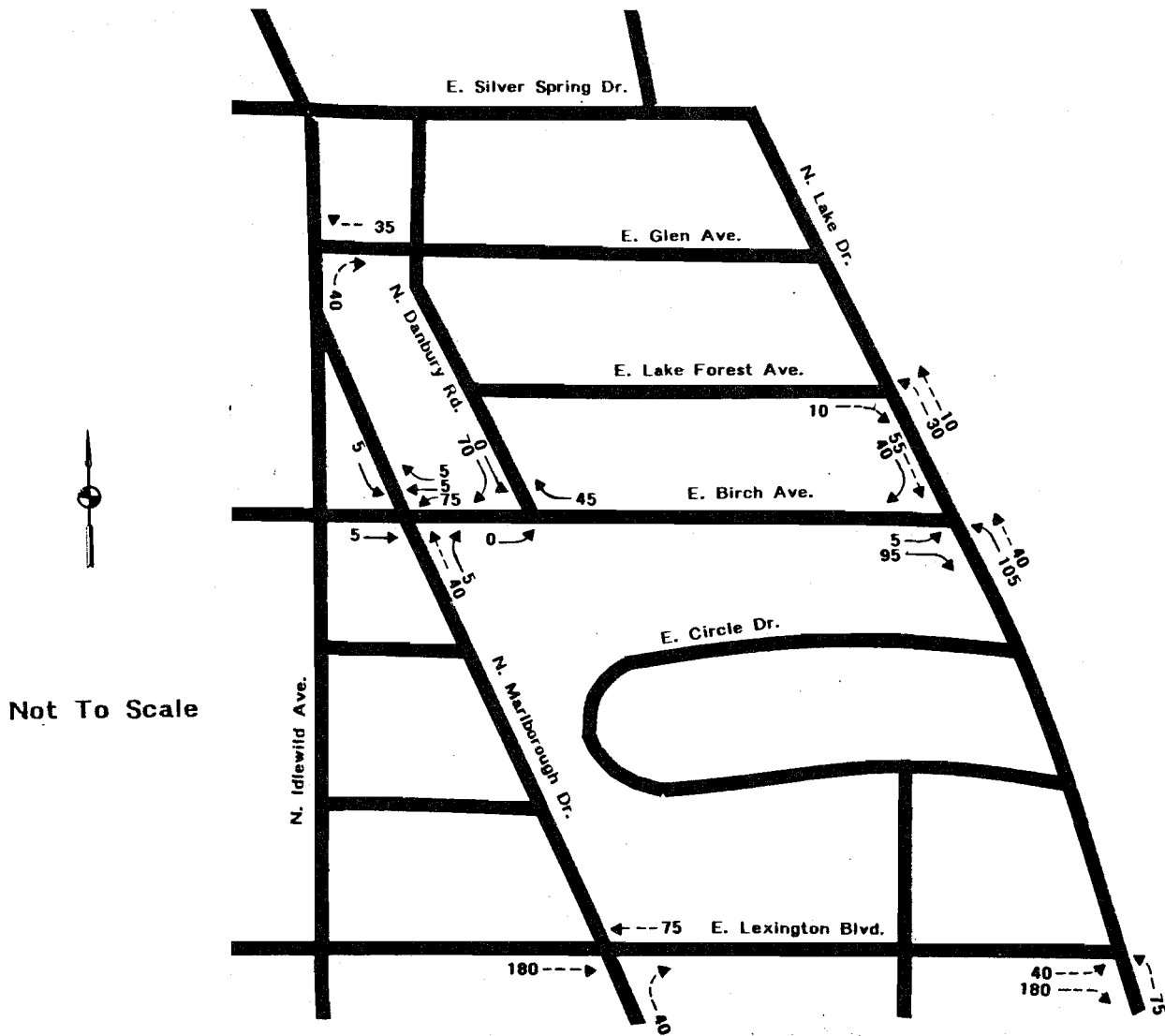
EXPECTED TRAFFIC PATTERN WITH POTENTIAL TRAFFIC DIVERTER
ON E. BIRCH AVENUE AT INTERSECTION WITH N. LAKE DRIVE AND
WITH N. MARLBOROUGH DRIVE WHICH PERMIT EXIT ONLY FOR TRAFFIC
WHICH CURRENTLY USES THE STUDY SEGMENT OF E. BIRCH AVENUE



Appendix A (continued)

Figure A-7

EXPECTED TRAFFIC PATTERN WITH POTENTIAL TRAFFIC DIVERTERS
ON E. BIRCH AVENUE AT INTERSECTION WITH N. DANBURY ROAD FOR
TRAFFIC WHICH CURRENTLY USES THE STUDY SEGMENT OF E. BIRCH AVENUE



LEGEND

—
TRAFFIC MOVEMENT TO
OR FROM THE STUDY
SEGMENT OF E. BIRCH
AVENUE

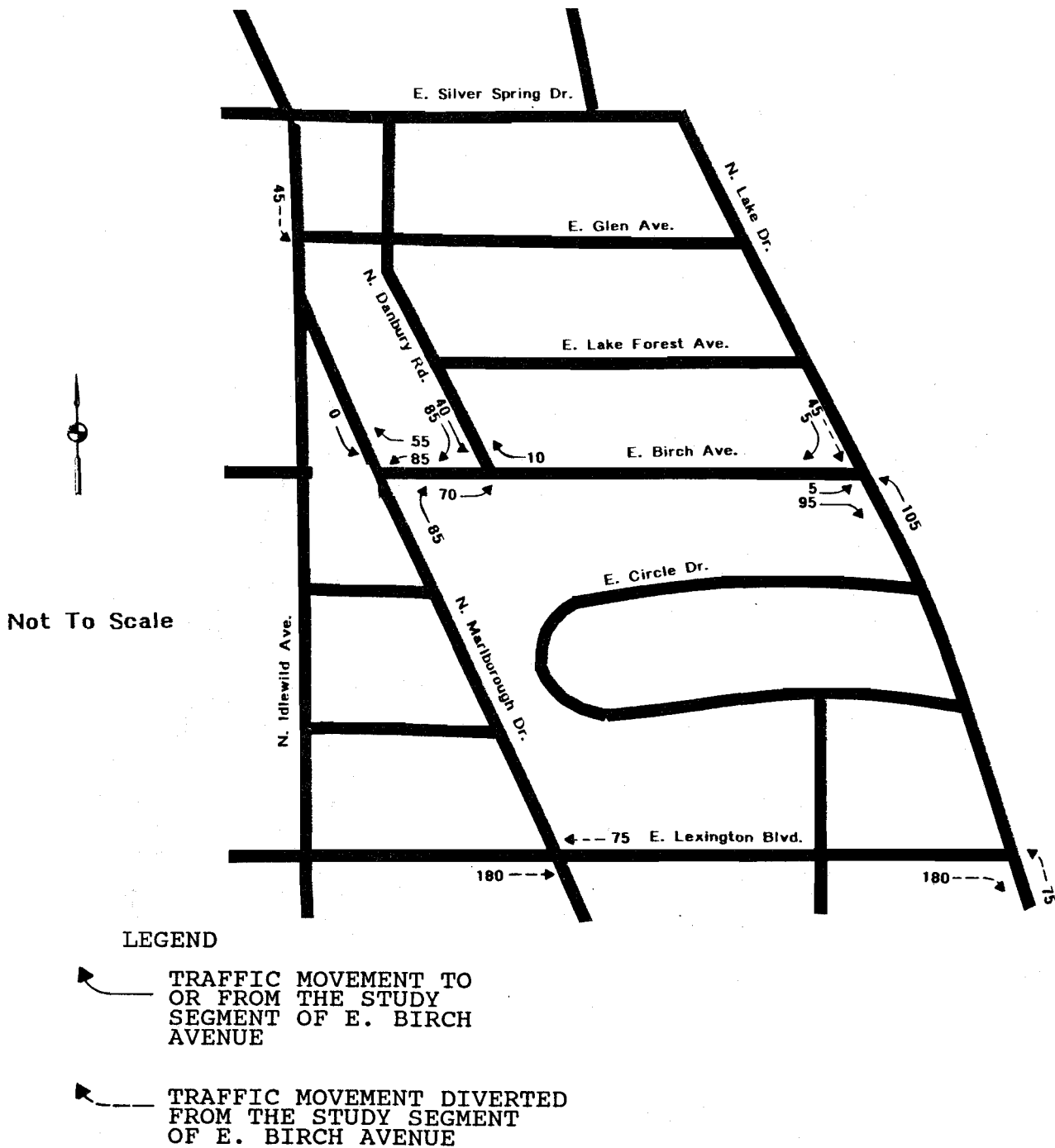
- - -
TRAFFIC MOVEMENT DIVERTED
FROM THE STUDY SEGMENT
OF E. BIRCH AVENUE

Source: SEWRPC.

Appendix A (continued)

Figure A-9

EXPECTED TRAFFIC PATTERN WITH POTENTIAL VACATED SEGMENT
OF E. BIRCH AVENUE AND CORRESPONDING TRAFFIC MOVEMENT
PROHIBITIONS FOR TRAFFIC WHICH CURRENTLY USES E. BIRCH AVENUE ^a



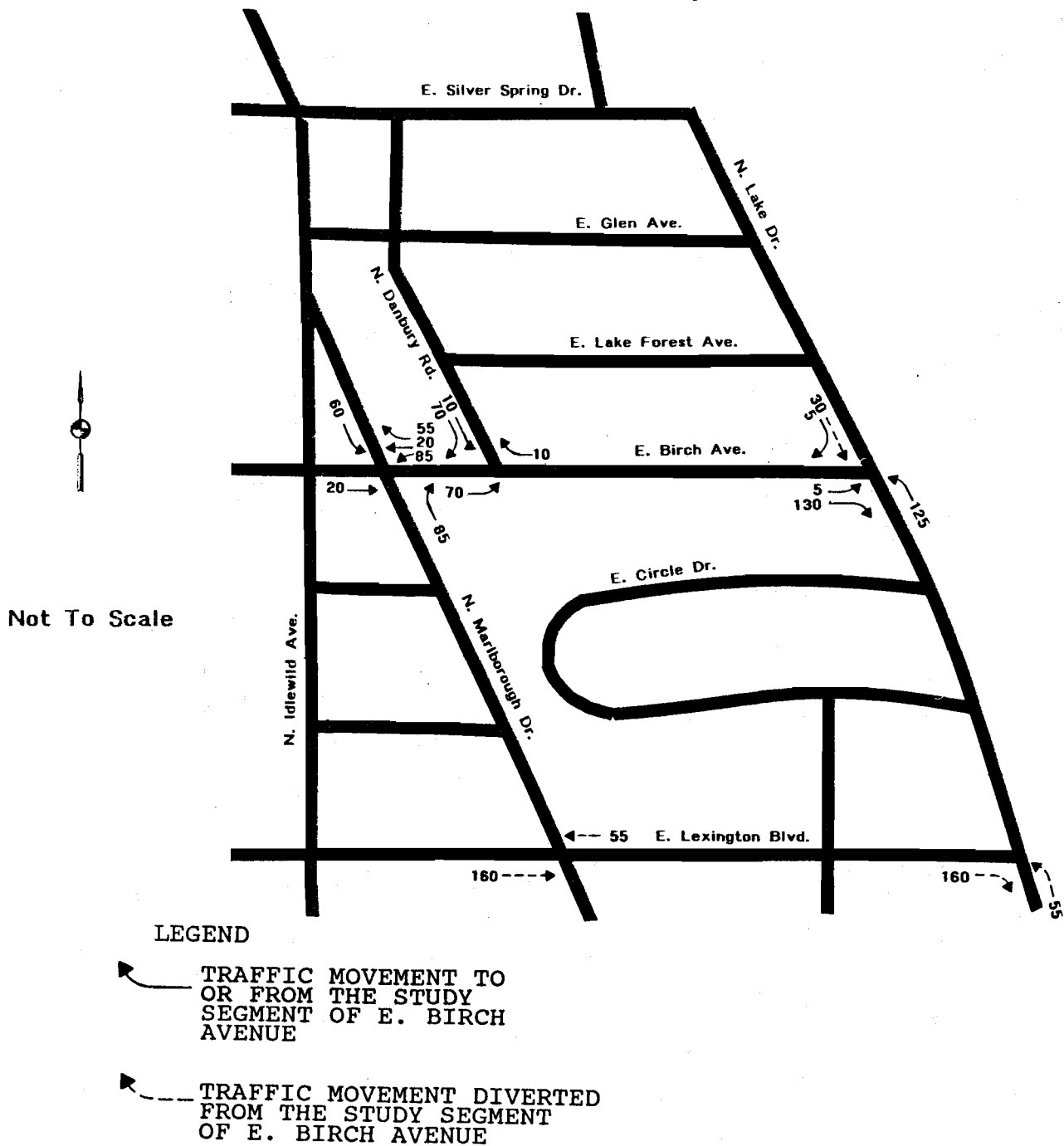
^a This alternative diverts an additional 490 trips to E. Lexington Boulevard west of N. Marlborough Drive.

Source: SEWRPC.

Appendix A (continued)

Figure A-10

EXPECTED TRAFFIC PATTERNS WITH POTENTIAL TRAFFIC DIVERTER
ON E. BIRCH AVENUE AT INTERSECTION WITH N. HOLLYWOOD
AVENUE FOR TRAFFIC WHICH CURRENTLY USES E. BIRCH AVENUE ^a



^a This alternative diverts an additional 470 trips to E. Lexington Boulevard west of N. Marlborough Drive.

Source: SEWRPC.