

**TRAFFIC ENGINEERING  
STUDY OF ANN RITA DRIVE,  
COVENTRY DRIVE, AND  
MACAULAY DRIVE IN  
THE CANTERBURY HILL  
SUBDIVISION**

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Special acknowledgement is due Robert E. Beglinger, SEWRPC Principal Engineer, for his contribution to this report.

**MEMORANDUM REPORT  
NUMBER 86**

**TRAFFIC ENGINEERING STUDY OF ANN RITA DRIVE, COVENTRY DRIVE,  
AND MACAULAY DRIVE IN THE CANTERBURY HILL SUBDIVISION**

**CITY OF BROOKFIELD, WAUKESHA COUNTY, WISCONSIN**

Prepared by the

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SEWRPC Memorandum Report No. 86

TRAFFIC ENGINEERING STUDY OF ANN RITA DRIVE,  
COVENTRY DRIVE, AND MACAULAY DRIVE IN THE CANTERBURY HILL SUBDIVISION,  
CITY OF BROOKFIELD, WAUKESHA COUNTY, WISCONSIN

INTRODUCTION

On October 1, 1990, the City of Brookfield requested the Commission staff to conduct a traffic engineering study of the streets in the Canterbury Hill Subdivision, a subdivision located in the Southeast one-quarter of U. S. Public Land Survey Section 18, Township 7 North, Range 20 East. The study was requested to address resident complaints and concerns about through traffic and attendant vehicle speed and safety problems on Ann Rita Drive between Talbots Lane and Coventry Drive; Coventry Drive between Ann Rita Drive and Macaulay Drive; and Macaulay Drive between Ann Rita Drive and North Avenue. This report presents the findings and recommendations of the requested study. The report describes the current traffic problems; identifies and evaluates alternative traffic engineering actions which may serve to abate these problems; and recommends traffic engineering measures for implementation.

PREVIOUS STUDIES

In July, 1990, the City of Brookfield engineering staff collected average weekday traffic count data on the study segment of Ann Rita Drive and on four streets located throughout the City and considered by the City engineering staff to be similar in function to Ann Rita Drive. These four count locations were Imperial Drive just north of Revere; Midland Place at Buena Vista Drive; Fiebrantz 200 feet north of Keefe Avenue, and Bradee at Shore Line Drive. The traffic count on Ann Rita Drive was approximately 1,580 vehicles per average weekday; the counts at the other four locations ranged between 1,320 and 2,130 vehicles per average weekday. The City engineering staff determined that the traffic count on Ann Rita Drive was within the range of traffic volume which should be expected on a residential collector street such as Ann Rita Drive and recommended that no changes be made.

The City of Brookfield Police Department conducted vehicular speed enforcement activities on the study segment of Ann Rita Drive, Coventry Drive, and Macaulay Drive on several days in June and July of 1990. Because only six citations and 12 warnings were issued during this period, the Police Department concluded that an excessive vehicular speeding problem did not exist on the study segments. The Police Department reported, however, that a problem did exist with motorists violating the stop signs located at the intersection of Ann Rita Drive and Macaulay Drive. The Police Department further reported that of the total of 45 citations and warnings issued for speeding and failure to obey the stop signs, six were issued to residents of the Canterbury Hill Subdivision.

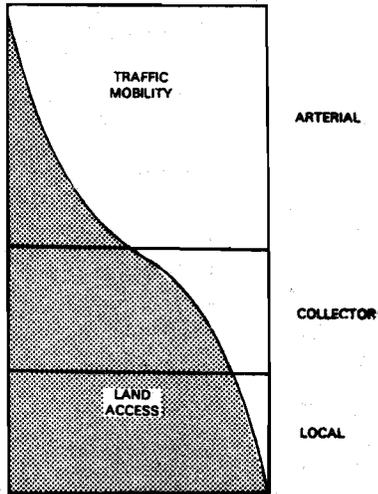
#### EXISTING CONDITIONS

Street and highway systems may be classified in several ways. Two of the more important classification systems are the functional and jurisdictional classification systems. The functional system provides the basis for organizing, planning, 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 generally also 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. It may be noted that, based on the layout of the study segments of Ann Rita Drive, Coventry Drive, and Macaulay Drive in relation to the other streets in the Canterbury Hill and adjacent subdivisions, it appears that the study segments have been intended to function as collector streets.

The jurisdictional classification of a facility identifies the governmental agency responsible for the facility. The facilities comprising the Canterbury Hill subdivision street system are under the jurisdiction of the City of

Figure 1

**RELATIONSHIP OF FUNCTIONAL HIGHWAY CLASSIFICATION SYSTEMS TO TRAFFIC MOBILITY AND LAND ACCESS**



Source: SEWRPC

Brookfield and, thus, the City of Brookfield is responsible for construction, operation, and maintenance of these facilities.

One other type of street system is important in this case, namely, the system of emergency response routes. This system is comprised of those streets used to access subareas of a community when responding to emergency situations. The study segments of Ann Rita Drive, Coventry Drive, and Macaulay Drive are the preferred emergency response route to the residential areas north of North Avenue and east of Springdale Road from the City fire station located at 2000 N. Calhoun Road.

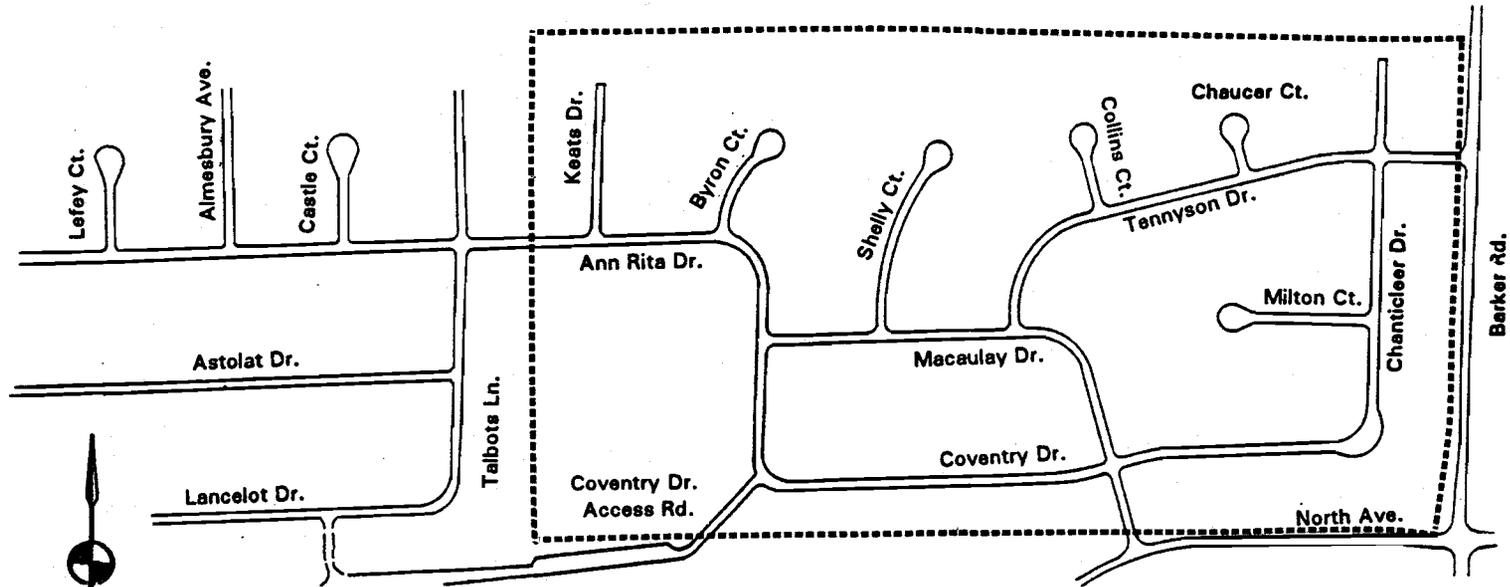
ROADWAY PHYSICAL CHARACTERISTICS

As shown in Figure 2, the study segments of Ann Rita Drive, Coventry Drive and Macaulay Drive, are located--except for the westernmost 185 feet of Ann Rita Drive--within the Canterbury Hill subdivision. It may be noted that the study segments comprise one of the only two routes to the Barker Road and North Avenue intersection from the subdivisions located adjacent to the study segments. The other route uses Springdale Road and North Avenue. As shown in Figure 3, the study segment of Ann Rita Drive is intersected by Keats Drive, Byron Court, Macaulay Drive, and the Coventry Access Road. Traffic at the intersections of Ann Rita Drive and Macaulay Drive, Macaulay Drive and Tennyson Drive, and Macaulay Drive and Coventry Drive, is stop sign controlled on all approaches. The study segment of Macaulay Drive is intersected by Ann Rita Drive, Shelley Court, Tennyson Drive and Coventry Drive; and the study segment of Coventry Drive is intersected by the Coventry Access Road to a neighborhood park and elementary school and Macaulay Drive.



Figure 3

LOCATION MAP OF ANN RITA  
DRIVE, COVENTRY DRIVE, AND  
MACAULAY DRIVE IN THE CANTERBURY  
HILL SUBDIVISION IN THE CITY OF BROOKFIELD



NOT TO SCALE

LEGEND

----- Limits of Canterbury  
Hills Subdivision

Source: SEWRPC.

Ann Rita Drive from Talbots Lane to its intersection with the Coventry Drive Access Road is constructed to an urban cross-section with rolled curb and gutter and a pavement width of 22 feet. Both Coventry Drive and Macaulay Drive are also constructed to an urban cross-section with rolled curb and gutter and a pavement width of 22 feet. There are no sidewalks on either side of any street within the Canterbury Hill subdivision, and the typical abutting residence is set back approximately 70 feet from the edge of the roadway.

The horizontal alignment of Ann Rita Drive from Talbots Lane to Byron Court, and from Macaulay Drive to the Coventry Access Road is straight and direct. At Byron Court the horizontal alignment of Ann Rita Drive abruptly changes about 90 degrees from an east-west orientation to a north-south orientation. This change in alignment is accomplished by means of a horizontal curve with a centerline radius of about 140 feet. The horizontal alignment of Coventry Drive from Macaulay Drive to the Coventry Access Road is straight and direct. At the Coventry Access Road the horizontal alignment abruptly changes by about 90 degrees from its north-south orientation to an east-west orientation. This alignment change is accomplished by means of a horizontal curve with a centerline radius of about 90 feet.<sup>1</sup> The horizontal alignment of Macaulay Drive between Ann Rita Drive and Coventry Drive is comprised of two tangent sections, one with an east-west orientation and one with a northwest-southeast orientation connected by a horizontal curve with a centerline radius of about 160 feet.

The posted speed limits on Ann Rita Drive, Macaulay Drive, and Coventry Drive are all 25 miles per hour.

#### TRAFFIC VOLUMES

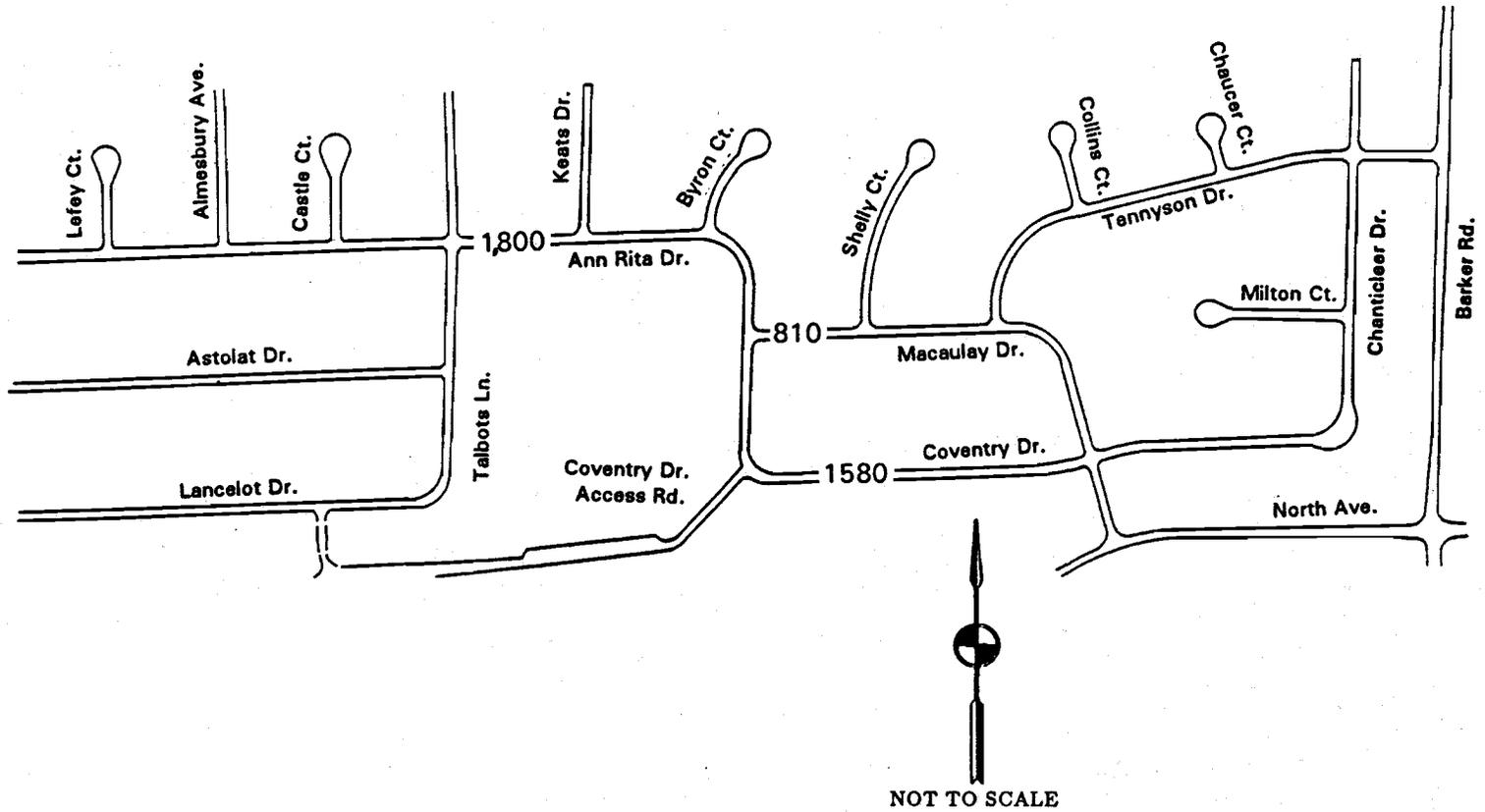
The Commission staff conducted 24-hour machine traffic counts on Ann Rita Drive, Macaulay Drive and Coventry Drive during the third week of May, 1991. Set forth in Figure 4 are the average weekday traffic count data for these locations.

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<sup>1</sup>It may be noted that the centerline radius of this curve was reduced by the Department of Public Works in an apparent effort to reduce vehicular speeds.

Figure 4

24-HOUR AVERAGE WEEKDAY  
TRAFFIC ON THE STUDY STREET  
SEGMENTS WITHIN THE CANTERBURY HILL  
SUBDIVISION IN THE CITY OF BROOKFIELD: MAY 1991



Source: SEWRPC.

On Wednesday, May 22, 1991, the Commission staff conducted a license plate survey utilizing the three stations shown on Figure 5. The survey was conducted to determine the proportion of the total traffic on the street segments concerned that had neither origin nor destination at a property within the Canterbury Hill subdivision. Data were collected between 12:00 Noon and 6:00 p.m. and consisted of recording the license plate of each vehicle by direction at each survey station. It may be noted that, based on the average weekday traffic count data collected on the study segments, about 40 percent of the total average weekday traffic volume occurs between 12:00 Noon and 6:00 p.m. The license plates observed on vehicles entering the subdivision at each location were compared to the license plates observed exiting the subdivision at the other two locations.

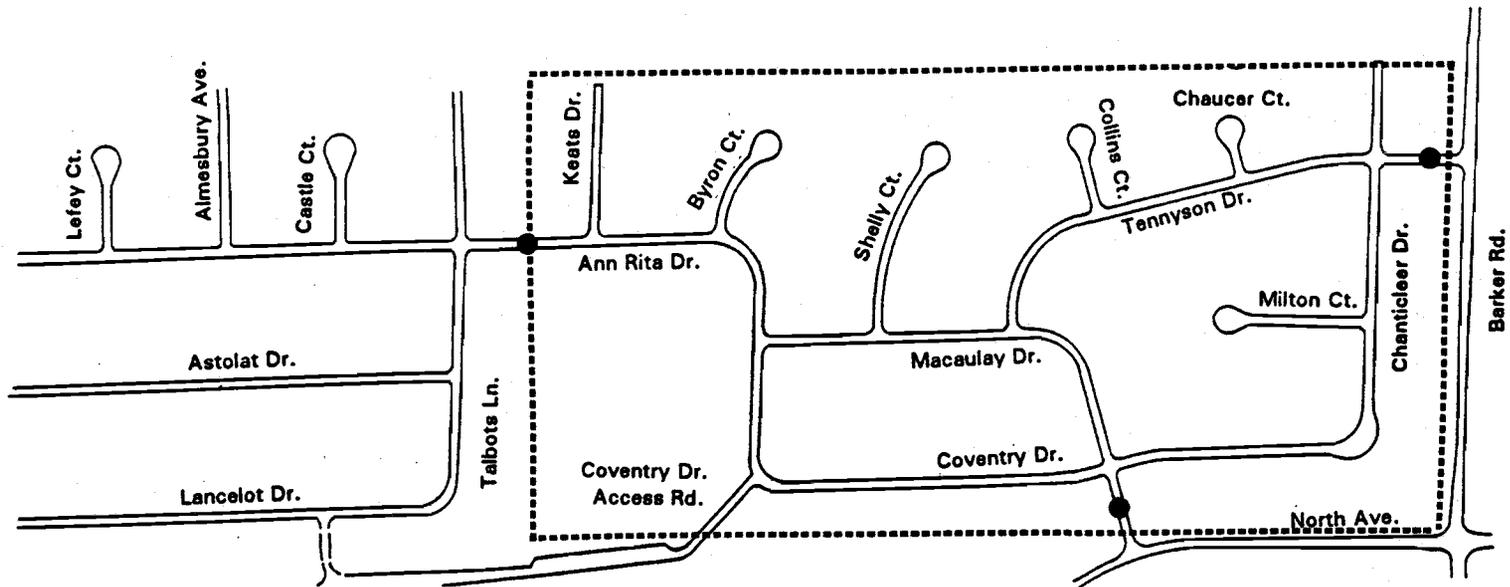
As set forth in Table 1, through traffic, that is traffic with both trip ends located outside the Canterbury Hill Subdivision, accounts for about 28 percent of the total average weekday traffic on Tennyson Drive just west of Barker Road; about 54 percent of the total average weekday traffic on Macaulay Drive north of North Avenue; and about 68 percent of the total average weekday traffic on Ann Rita Drive east of Talbots Lane. Figure 6 presents the patterns of the trip movements within the Canterbury Hill Subdivision in graphic summary form.

The Commission staff obtained garaging address information from the Wisconsin Department of Transportation for those vehicles which did not have one trip end with either origin or destination within the Canterbury Hill subdivision. This information--as shown in Table 2--indicates that the traffic which has neither an origin or destination in the Canterbury Hill Subdivision, is actually "collector" traffic which has one end of its trip in a subdivision located immediately adjacent to Canterbury Hill. Such "collector" traffic is found on Ann Rita Drive, Coventry Drive, and, to a lesser extent, Macaulay Drive, which act as connectors between the land access streets in the adjacent subdivisions and two arterial streets and highways: North Avenue and Springdale Road.

Approximately 74 percent of the traffic with neither trip end within the Canterbury Hill Subdivision had a garaging address in subdivisions immediately adjacent to the study segment. This traffic is collector-type traffic using the study segments to reach adjacent arterial streets. The remaining 26 percent of

Figure 5

LOCATION OF LICENSE PLATE SURVEY STATIONS IN THE CANTERBURY HILL SUBDIVISION IN THE CITY OF BROOKFIELD: MAY 22, 1991



LEGEND

- License Plate Survey Station
- Limits of the Canterbury Hills Subdivision



NOT TO SCALE

Source: SEWRPC.

TABLE 1

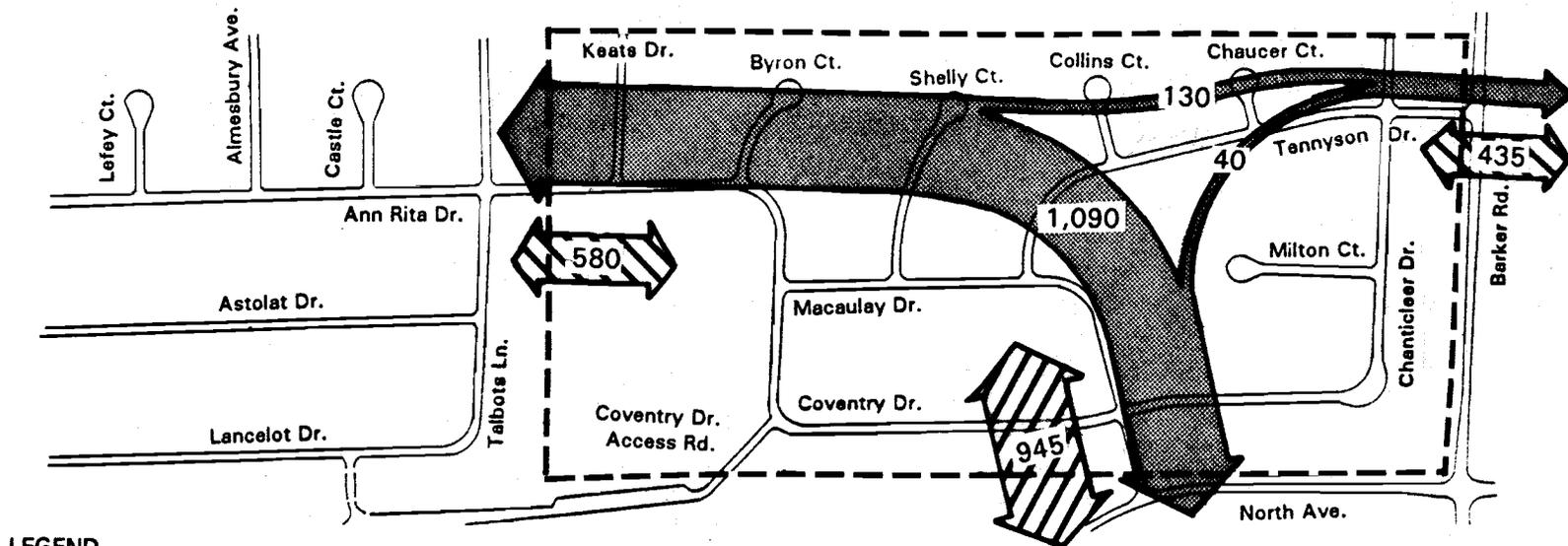
ESTIMATED 24-HOUR TRAFFIC BASED  
ON THE LICENSE PLATE SURVEY CONDUCTED IN THE  
CANTERBURY HILL SUBDIVISION IN THE CITY OF BROOKFIELD: MAY 1991

Location	Estimated 24-Hour Survey--Day Traffic		Percentage of Collector Traffic
	Total Traffic	Collector Traffic	
Ann Rita Drive	1,800	1,220	67.8
Macaulay Drive	2,075	1,130	54.5
Tennyson Drive	605	170	28.1

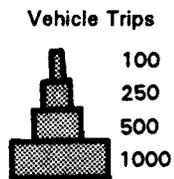
Source: SEWRPC

Figure 6

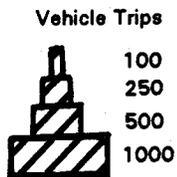
ESTIMATED AVERAGE WEEKDAY TRAFFIC PATTERNS FOR THE CANTERBURY HILL SUBDIVISION IN THE CITY OF BROOKFIELD: MAY 1991



LEGEND



Average weekday traffic patterns for trips with neither an origin nor destination at a property within the Canterbury Hills subdivision



Average weekday traffic patterns for trips with either an origin or destination at a property within the Canterbury Hills subdivision



Limits of Canterbury Hills Subdivision



NOT TO SCALE

Source: SEWRPC.

TABLE 2

GARAGING LOCATION OF VEHICLES  
OBSERVED USING THE STUDY SEGMENTS WITH  
NEITHER AN ORIGIN NOR DESTINATION AT A PROPERTY WITHIN  
THE CANTERBURY HILL SUBDIVISION IN THE CITY OF BROOKFIELD: 1991

Location	Percentage
Camelot Forest, Camelot Meadows, Gaywood Subdivisions	73.9
City of Brookfield	12.8
Milwaukee County	6.7
Town of Pewaukee, Village of Pewaukee, Village of Menomonee Falls	4.5
City of Waukesha	2.1

the traffic with neither trip end within the Canterbury Hill Subdivision had a garaging address elsewhere in the City of Brookfield or another community in Milwaukee or Waukesha County. This traffic also was likely to be collector-type traffic, including visitors and service vehicles traveling to the neighborhoods adjacent to the Canterbury Hill Subdivision. It may also include leased vehicles used by residents of adjacent subdivisions.

It may be noted that the preliminary plat of the western portion of the Chadwick Greens Subdivision provides for a roadway connecting Norman Drive in the Chadwick Greens Subdivision with Cambridge Circle to the west in the Camelot Meadows Subdivision. The alignment currently under consideration is shown on Figure 2. The City has acquired a parcel of land in Camelot Meadows to facilitate this roadway connection. The connection would cross wetlands and therefore require Wisconsin Department of Natural Resources approval. Once constructed, this roadway connection would provide an alternative to the study segments for residents of Gaywood and Camelot Meadows Subdivisions. Although the potential for diversion of collector traffic from the study segments may be expected to be relatively modest--about 50 vehicles per average weekday, or about 5 percent of the connector traffic volume on the study segments--construction of the proposed roadway would serve to reduce the problem of collector traffic on the Ann Rita Drive, Coventry Drive and Macauley Drive study segments.

#### Operating Speeds

The Commission staff conducted four spot speed studies on the street segments concerned. One study was conducted on Coventry Drive on May 23, 1991, during the evening peak traffic hour. The remaining three studies were conducted on Ann Rita Drive near Keats Drive; two on May 28, 1991; one during the off-peak hours of traffic between 9:00 a.m. to 3:00 p.m.; and the other during the evening peak traffic hour. Because the findings of the latter speed study were contrary to the perceptions of the residents of the Canterbury Hill Subdivision that vehicle speeds increase during the evening peak traffic hour, a second spot speed study was conducted on December 10, 1991, during the evening peak traffic hour.

On Coventry Drive, the average travel speed during the evening peak hour was determined to be 30.3 miles per hour. The 85th percentile speed--the speed at

or below which 85 percent of the traffic was traveling--was determined to be 33.7 miles per hour. The cumulative speed distribution curve for Coventry Drive traffic is shown in Figure 7. The "10 mile per hour pace," that is, the 10-mile per hour range of speed, containing the largest number of vehicles, was found to be 24 to 33 miles per hour, with 81 percent of the vehicles traveling within this range of speed.

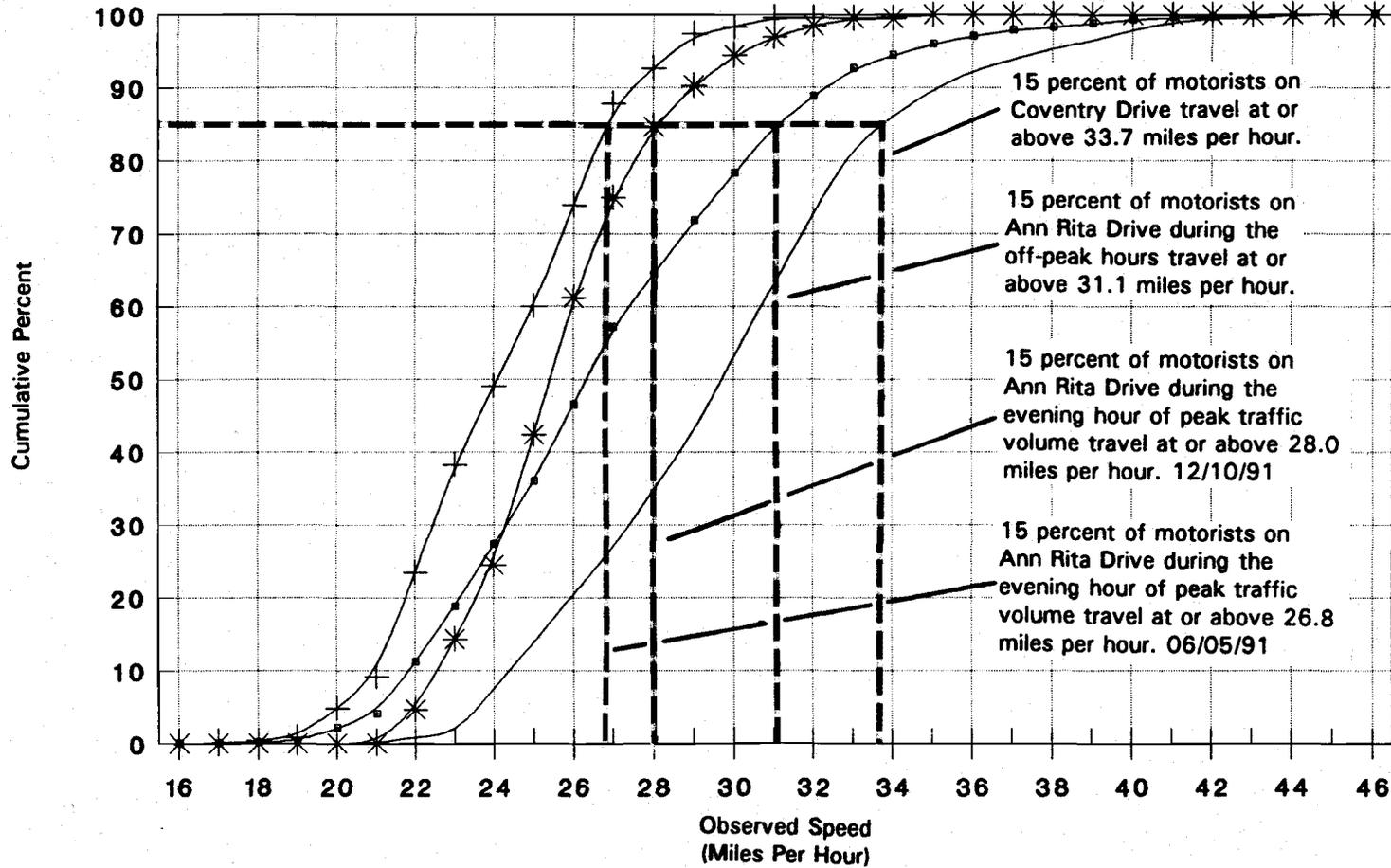
On Ann Rita Drive, the average travel speed during the non-peak hours of traffic was determined to be 27.4 miles per hour. The 85th percentile speed was determined to be 31.1 miles per hour. The cumulative speed distribution curve for non-peak hour traffic on Ann Rita Drive is shown in Figure 7. The 10-mile per hour pace range of speed was determined to be 22 to 31 miles per hour with 81 percent of the vehicle traffic traveling within this range of speed.

On Ann Rita Drive during the evening peak traffic hour, the average travel speed was determined to be 24.7 miles per hour. The cumulative speed distribution curve for evening peak hour traffic is shown in Figure 7. The 85th percentile speed was determined to be 26.8 miles per hour. The 10-mile per hour pace was determined to be 20 to 29 miles per hour with 96 percent of the traffic traveling within this range of speed.

Comparison of the peak hour and non-peak hour average travel speeds--24.7 and 27.4 miles per hour, respectively--on Ann Rita Drive indicates that the average vehicle traveled slightly slower during the evening peak hour. Comparison of the evening peak hour and non-peak hour 85th percentile speeds--26.8 and 31.1 miles per hour, respectively--indicates a significant decrease in the 85th percentile speed during the evening peak hour. Because it is the perception of the residents of Canterbury Hill that vehicle speeds increase during the evening peak traffic hour, a second spot speed study was conducted on Ann Rita Drive on December 10, 1991. The average travel speed during the evening peak traffic hour on Ann Rita Drive was determined to be 26.1 miles per hour, and the 85th percentile speed was determined to be 28.0 miles per hour. The cumulative speed distribution curve for the traffic during the second evening peak hour is also shown in Figure 7. The 10-mile per hour pace was determined to be 22 to 31 miles per hour with 97 percent of the traffic traveling within this range of speed.

Figure 7

CUMULATIVE SPEED DISTRIBUTION  
 CURVES FOR VEHICLES ON ANN RITA DRIVE  
 AND COVENTRY DRIVE IN THE CANTERBURY HILL  
 SUBDIVISION IN THE CITY OF BROOKFIELD: 1991



LEGEND

- |   |   |     |  |     |   |     |   |
|---|---|-----|--|-----|---|-----|---|
| — | Coventry Drive<br>Evening Hour of<br>Peak Traffic<br>05/23/91 | —■— | Ann Rita Drive<br>Off-Peak Hours<br>Of Traffic<br>05/28/91 | —+— | Ann Rita Drive<br>Evening Hour of<br>Peak Traffic<br>05/28/91 | —*— | Ann Rita Drive<br>Evening Hour of<br>Peak Traffic<br>12/10/91 |
|---|---|-----|--|-----|---|-----|---|

Source: SEWRPC.

The data obtained from this second spot speed study are slightly higher than the results obtained from the initial peak hour speed study. The average travel speed increased 1.4 miles per hour from 24.7 miles per hour to 26.1 miles per hour. The 85th percentile speed increased 1.2 miles per hour from 26.8 miles per hour to 28.0 miles per hour. The 10-mile per hour pace range remained approximately the same as observed during the previous peak hour study. The data obtained by the second evening peak hour spot speed study on Ann Rita Drive confirms the data obtained by the initial peak hour speed study, and indicates that non-peak hour vehicular speeds tend to be higher than the evening peak hour traffic speeds although the difference is modest.

#### Traffic Accidents

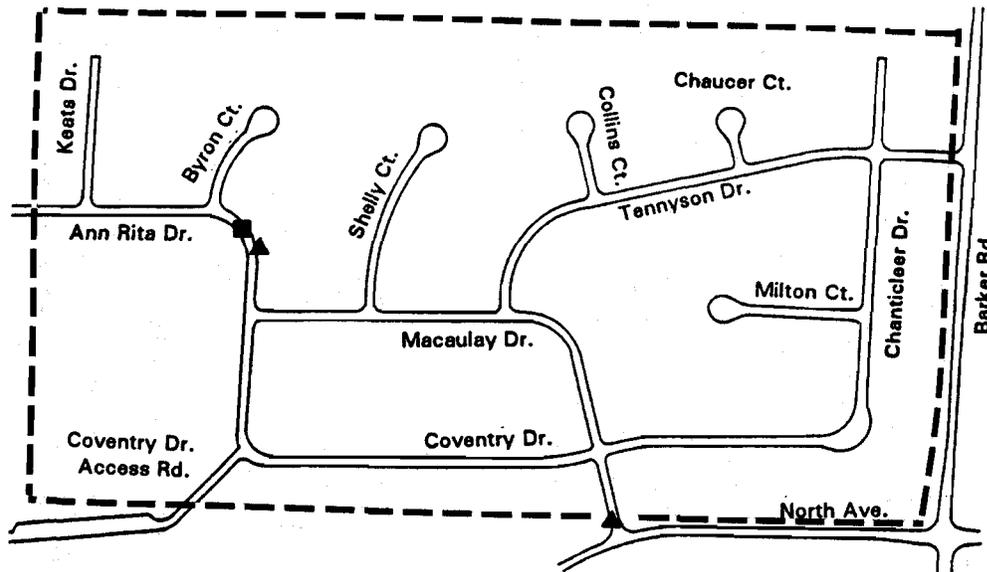
The incidence and location of traffic accidents provides another important measure of the efficiency and operating characteristics of a roadway. A three year history of vehicular accident data was collected for the study segments. The location of each accident is set forth in Figure 8. A total of three accidents occurred during the three-year period, with no accidents occurring from December 1988 through November 1989; one accident occurring from December 1989 through November 1990; and two accidents occurring from December 1990 through November 1991. None of the accidents resulted in injuries or fatalities, and there were no accidents involving pedestrians or bicyclists.

#### Travel Time

Motorists may generally be expected to follow the route through a street network which results in the minimum travel time. For travel to and from the east, for nearly all residents of the Camelot Forest, Camelot Meadows and Gaywood subdivisions, the minimum travel time path is over the study street segments. The other alternative route--local streets within those subdivisions to Springdale Road and then Springdale Road to North Avenue--is both more time consuming and more circuitous than the study street segments. Shown on Figure 9 is the area in those subdivisions located adjacent to Canterbury Hill Subdivision for which travel to and from the intersection of Barker Road and North Avenue is most direct via the study segments of Ann Rita Drive, Coventry Drive, and Macaulay Drive rather than the alternative route of Springdale Road and North Avenue.

Figure 8

TRAFFIC ACCIDENT LOCATIONS ON THE STUDY  
SEGMENTS WITHIN THE CANTERBURY HILL SUBDIVISION  
IN THE CITY OF BROOKFIELD: JANUARY 1989-NOVEMBER 1991



Legend

- (none) 1989
- 1990
- ▲ 1991
- - - Limits of Canterbury Hills Subdivision

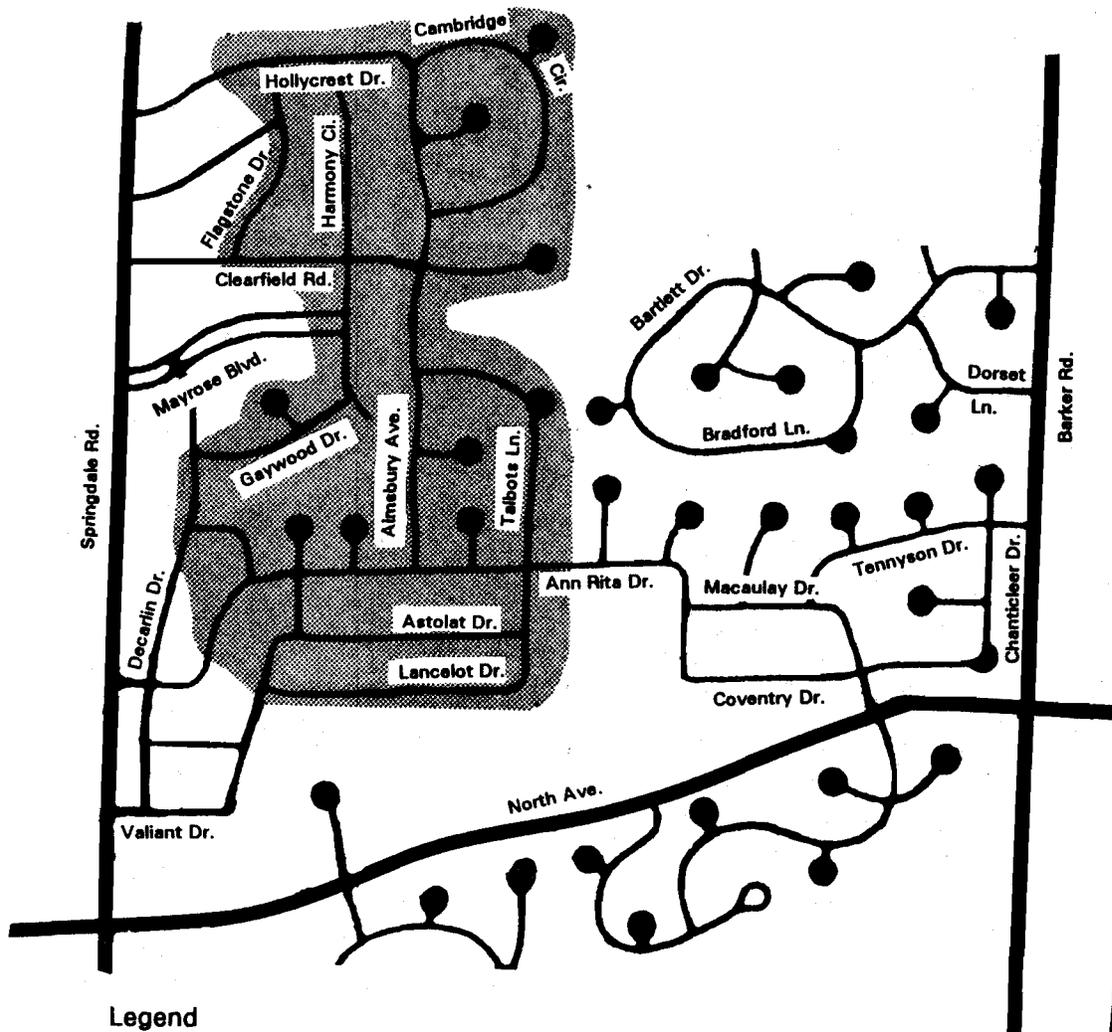


NOT TO SCALE

Source: SEWRPC.

Figure 9

AREAS OF ADJACENT SUBDIVISIONS FROM WHICH THE TRAVEL TIME TO AND FROM THE INTERSECTION OF NORTH AVENUE AND BARKER ROAD IS SHORTER USING ANN RITA DRIVE, COVENTRY DRIVE, AND MACAULAY DRIVE THAN USING THE ARTERIAL STREET SYSTEM



Legend



Traffic traveling to and from the east and either originating or ending within this area may be expected to use the route of Ann Rita Drive, Coventry Drive, and Macaulay Drive as this route results in the minimum travel time.



NOT TO SCALE

## 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

The physical roadway characteristics of Ann Rita Drive, Coventry Drive, and Macaulay Drive were compared to the land access and collector street design guidelines set forth in Table 3. The study segments generally meet the physical design standards for land access streets, the only exception being the length of the centerline radius of the horizontal curve connecting Ann Rita Drive and Coventry Drive. This length is about ten feet shorter than the minimum length recommended. None of the study segments, however, meet the recommended physical design standards for collector streets despite functioning as collector streets.

### Traffic Volumes and Characteristics

The observed average weekday traffic counts on the study segments ranged from about 810 vehicles to about 1,800 vehicles per average weekday. These counts are well within the level of traffic volume typically considered the maximum acceptable for a land access street of about 2,500 vehicles per average weekday. However, the current average weekday traffic volume on Ann Rita Drive and Coventry Drive--1,800 and 1,580 vehicles per average weekday, respectively--exceed the threshold of traffic--1,500 vehicles per average weekday--typically considered to be the maximum desirable traffic volume on a land access street. As land access streets carry traffic volumes which exceed about 1,500 vehicles per average weekday, abutting residents typically begin to perceive the level of traffic to be a nuisance.

The results of the license plate survey indicate that on an average weekday a substantial proportion of study street segment traffic--from about 54 to 68 percent--is comprised of "collector street type" traffic with trip origins and destinations within the adjoining subdivisions of Camelot Forest, Camelot

TABLE 3  
LAND ACCESS AND COLLECTOR STREET DESIGN STANDARDS

Design Element	Recommended Standards <sup>a</sup>	
	Land Access Street	Collector Street
Centerline Curve Radius	Minimum 100'	Minimum 300'
Pavement Width	Minimum 18' Maximum 36'	Minimum 36' Maximum 48'
Type of Curb	None or Roll-Type	Vertical Face
Sidewalk Width	None	4 to 6 ft.

<sup>a</sup>See SEWRPC Planning Guide No. 1, Land Development Guide, November, 1963.

Source: SEWRPC

Meadows, and Gaywood. Such traffic is, of course, "through" traffic with respect to the Canterbury Hill Subdivision. For this traffic, Ann Rita Drive, Coventry Drive, and Macaulay Drive provide connections between the land access streets within the adjacent subdivisions and the arterial streets of North Avenue and Barker Road. Thus, it may be concluded that the study segments carry collector-type traffic and that the study segments are serving traffic for which they were not physically designed to carry. This is the result of a basic design flaw in the subdivision layout.

The threshold of volume typically considered acceptable and the threshold of volume typically considered desirable on collector streets is 4,000 and 2,500 vehicles per average weekday, respectively. The average weekday traffic counts observed on the study segments are well within these ranges.

#### Accidents

The three-year traffic accident history was analyzed and the only pattern identified was that two of the three accidents occurred on Ann Rita Drive at the sharp horizontal curve at Byron Court. Both accidents occurred during inclement weather and during nighttime. Because only three accidents occurred in three years and because inclement weather conditions may have been a possible contributing factor, it may be concluded that a traffic safety problem does not exist on the study segments.

#### Operating Speed

During the evening peak traffic hour, the 85th percentile speed on Ann Rita Drive was determined to be 28.0 miles per hour, and 97 percent of all vehicles were found to be traveling in the 10 mile per hour pace speed range. During the off-peak hours of traffic, the 85 percentile speed increased to 31.1 miles per hour, and the percentage of vehicles traveling within the 10 mile per hour pace speed range decreased to 81 percent.

On Coventry Drive, the 85th percentile speed was determined to be 33.7 miles per hour, and 81 percent of all vehicles were found to be traveling within the 10 mile per hour pace speed range. The 85th percentile speeds exceed the posted speed limit on Ann Rita Drive and Coventry Drive by 6.1 and 8.7 miles per hour

during non-peak hours. While these data do not indicate an excessive vehicular speeding problem, it may be concluded that the posted speed limit of 25 miles per hour is generally disregarded, and that a modest speeding problem does exist. This problem is somewhat moderated by the large percentage of motorists traveling within the 10 mile per hour pace range of speeds.

#### Inappropriate Traffic Control

Three study segment intersections are stop sign controlled on all approaches--Ann Rita Drive at Macaulay Drive; Tennyson Drive at Macaulay Drive; and Coventry Drive at Macaulay Drive. The implementation of multi-way stop signs should only occur if the traffic volume or traffic accident warrants set forth in the Federal Highway Administration's Manual on Uniform Traffic Control Devices<sup>2</sup> are met. Neither the existing traffic volumes nor the incidence of traffic accidents warrant the use of multi-way stop signs at these three intersections. The installation of unwarranted traffic control devices tends to result in noncompliance with, and encourage disrespect for, other traffic control devices. Thus, it may be concluded that the use of multi-way stop sign control at these intersections is inappropriate. It may also be concluded that the stop signs have not eliminated vehicle speeding problems on the study segments based on the spot speed study results. Further, the stop signs have not diverted collector traffic from the study segments based upon the results of the license plate survey.

#### Conclusions

Three traffic problems were identified on the study segments of Ann Rita Drive, Coventry Drive, and Macauley Drive. The first problem identified is that the study segments function as collector streets but were not designed and constructed to meet collector street design standards. The second problem identified on the study segments is a modest vehicular speeding problem. The third problem identified on the study segments was inappropriate traffic control

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<sup>2</sup>U.S. Department of Transportation, Federal Highway Administration, "Warrants for the Installation of Traffic Signals and Stop and Yield Signs," Manual on Uniform Traffic Control Devices, 1989.

at the intersections of Ann Rita at Macauley Drive; Tennyson Drive at Macauley Drive; and Coventry Drive at Macauley Drive.

It may be noted that although the study segments function as collectors, the traffic volumes on the study segments are well within the desirable range of average weekday traffic volumes for collector facilities. Further, the average weekday traffic volumes on the study segments only modestly exceeds the desirable range and is well within the range of volume generally considered acceptable for land access facilities.

#### ALTERNATIVE AND RECOMMENDED TRAFFIC MANAGEMENT ACTIONS

This section documents the evaluation of the traffic management actions and other improvement actions considered to abate the traffic problems identified on the study segments of Ann Rita Drive, Macauley Drive, and Coventry Drive.

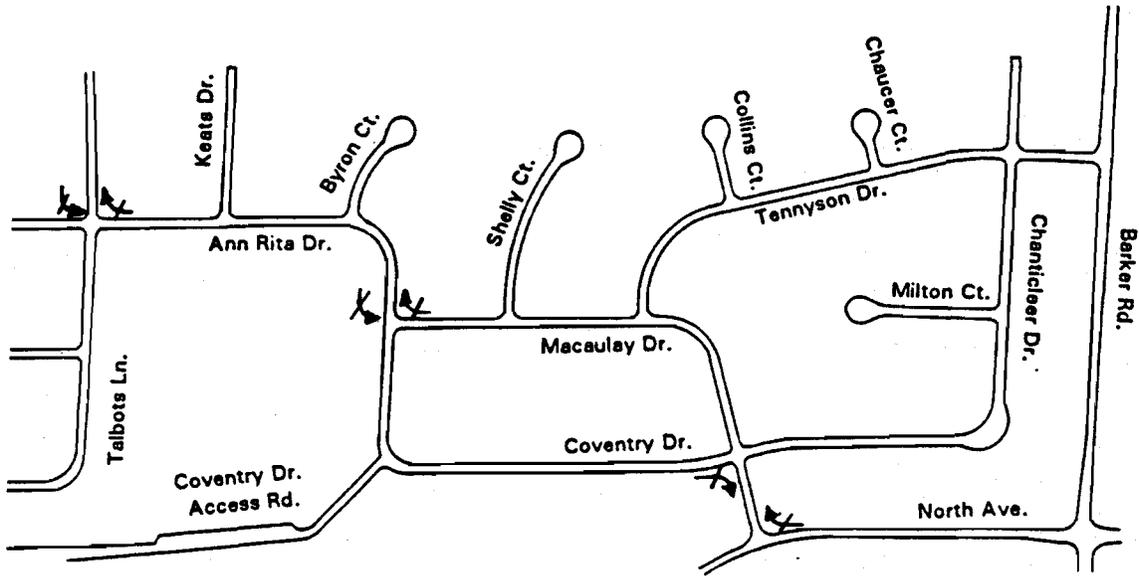
##### Traffic Diversion Actions

The Commission staff identified and evaluated nine alternative traffic management measures which could be expected to divert the collector-type traffic from the study segments of Ann Rita Drive, Coventry Drive, and Macauley Drive. 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 certain intersections along the study segments as shown in Figure 10. The other passive measure--Alternative 2--considered is the conversion of Ann Rita Drive to a one-way facility, between Talbots Lane and Macauley Drive. The seven physical measures considered include Alternative 3, a street closure of Ann Rita Drive between Talbots Lane and Keats Drive, as shown in Figure 11. Alternative 4, provision of constricting traffic diverter at the intersection of Ann Rita Drive with Talbots Lane, as shown in Figure 12; Alternative 5, provision of a diagonal traffic diverter at the intersection of Ann Rita Drive and Talbots Lane, as shown

Figure 10

**ALTERNATIVE 1: PROPOSED TURN PROHIBITIONS AT  
SELECTED INTERSECTION APPROACHES ALONG THE STUDY SEGMENTS**



**LEGEND**

**PROPOSED TURNING MOVEMENT PROHIBITIONS**

 RIGHT TURN

 LEFT TURN

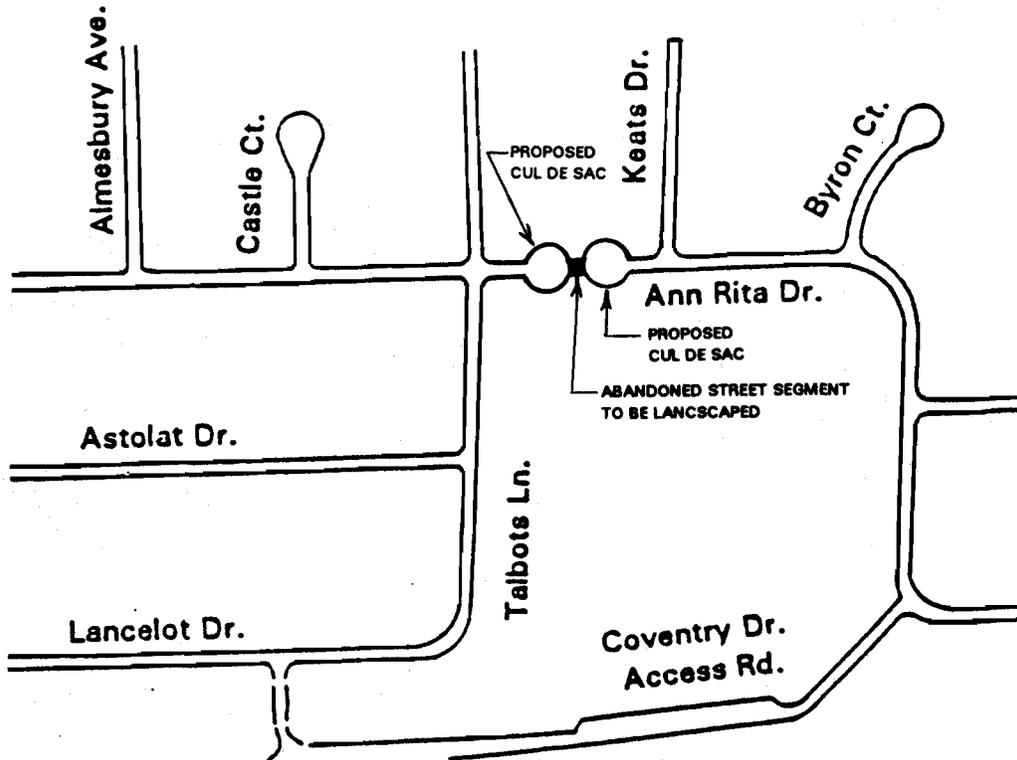


Not to Scale

Source: SEWRPC

Figure 11

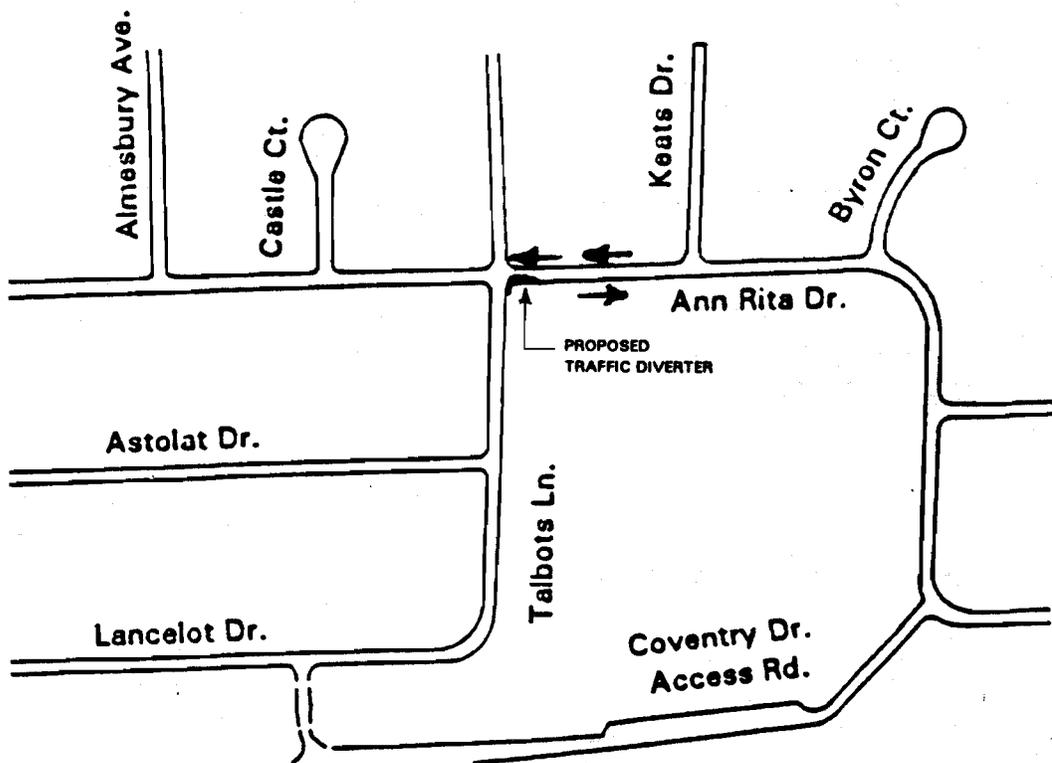
ALTERNATIVE 3: THE CLOSURE OF ANN RITA DRIVE  
BETWEEN TALBOTS LANE AND KEATS DRIVE



Not to Scale

Figure 12

ALTERNATIVE 4: THE CONSTRUCTION OF A TRAFFIC DIVERTER AT THE INTERSECTION OF TALBOTS LANE AND ANN RITA DRIVE TO PROHIBIT INGRESS FROM, BUT ALLOW EGRESS TO THE WEST



LEGEND

← PERMITTED TRAFFIC MOVEMENT



Not to Scale

Source: SEWRPC

in Figure 13, with a right turn prohibition from Talbots Lane to Astolat Drive and a left turn prohibition from Astolat Drive to Talbots Lane; Alternative 6, street closures of Macaulay Drive between North Avenue and Coventry Drive and between Shelley Court and Ann Rita Drive, as shown in Figure 14; Alternative 7, provision of a diagonal diverter at the intersection of Coventry Drive and Macaulay Drive and a street closure of Macaulay Drive between Ann Rita Drive and Shelley Court as shown in Figure 15; Alternative 8, the extension of Lynette Lane from Lancelot Drive to North Avenue as shown in Figure 16; and Alternative 9, reconstruction of the study segments to current collector street design standards. An evaluation of each of the nine alternative traffic management measures considered is presented in Table 4.

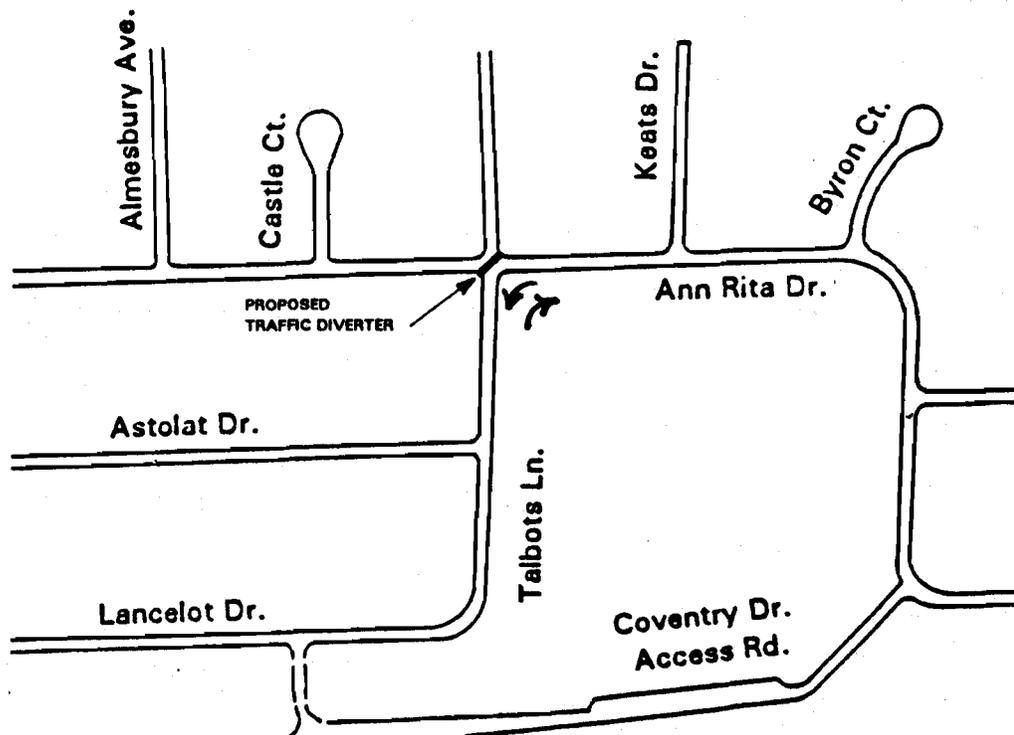
The evaluation focused on the effectiveness of each alternative to divert the collector-type traffic from the study segments of Ann Rita Drive, Coventry Drive, and Macaulay Drive; the amount of traffic which would be diverted to other local streets; the potential increase in circuitous travel; and the implications for emergency service provisions; and construction cost. The estimates of diversion presented in Table 4 are based on: 1) analysis of the garaging address information; and 2) the travel patterns of the collector traffic shown in Figure 6.

It should be noted that, of the nine alternatives evaluated, only one alternative--Alternative 3, which proposes the closure of Ann Rita Drive between Talbots Lane and Keats Drive--may be expected to fully remove collector traffic from the study segments. All of the other alternatives except Alternative 9 may be expected to remove only a portion of the collector traffic. Alternative 9 is not expected to divert any of the collector traffic.

In abating the collector traffic problem on Ann Rita Drive, Coventry Drive, and Macaulay Drive, each of the alternatives may be expected to generate undesirable impacts. All of the alternatives may be expected to result in increases in traffic on other local streets, including Valiant Drive and Guinevere Drive; Galahad Lane and Camelot Drive; Mayrose Boulevard; Clearfield Road and Holly Crest Drive. The potential increase in traffic on these facilities is of concern as each of these facilities is also a land access street. The potential volume of average weekday traffic--including both existing and diverted traffic--on most

Figure 13

**ALTERNATIVE 5: THE CONSTRUCTION OF A DIAGONAL TRAFFIC DIVERTER AT THE INTERSECTION OF TALBOTS LANE AND ANN RITA DRIVE**



**LEGEND**

← PERMITTED TRAFFIC MOVEMENT

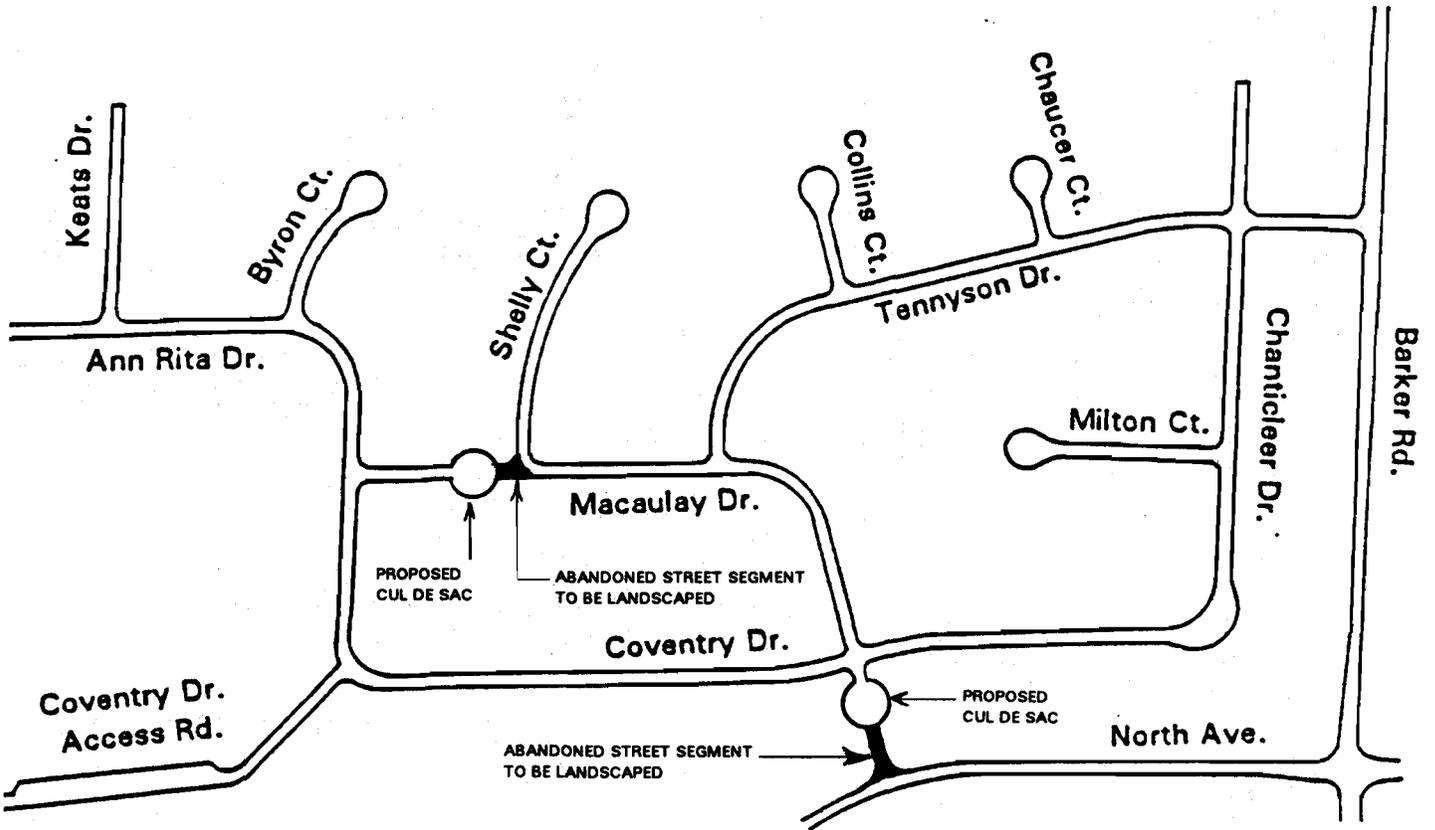


Not to Scale

Source: SEWRPC

Figure 14

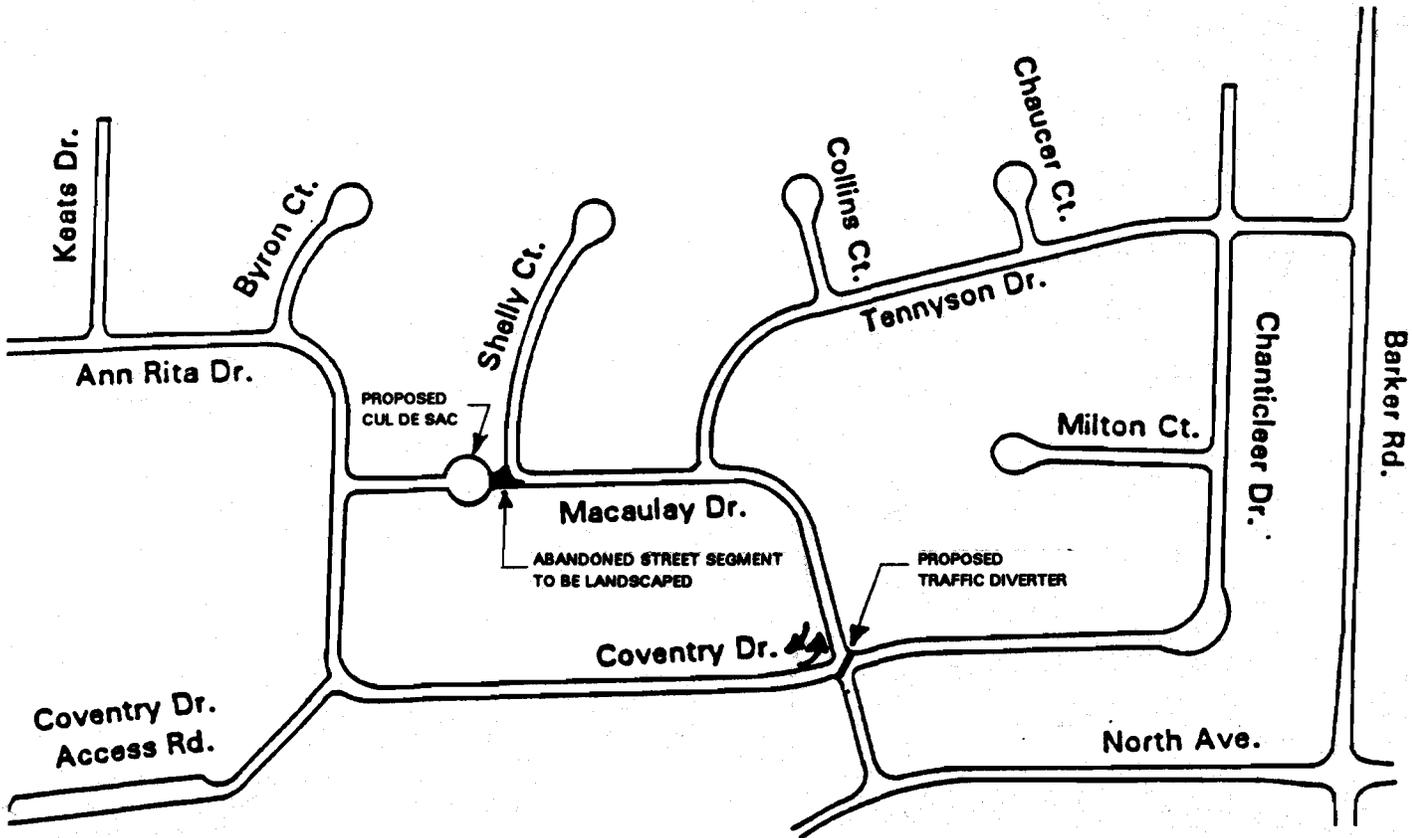
ALTERNATIVE 6: THE CLOSURE OF MACAULAY DRIVE BETWEEN  
NORTH AVENUE AND COVENTRY DRIVE AND  
BETWEEN ANN RITA DRIVE AND SHELLY COURT



Not to Scale

Figure 15

**ALTERNATIVE 7: THE CLOSURE OF MACAULAY DRIVE BETWEEN ANN RITA DRIVE AND SHELLEY COURT AND THE CONSTRUCTION OF A DIAGONAL TRAFFIC DIVERTER AT THE INTERSECTION OF COVENTRY DRIVE AND MACAULAY DRIVE**



**LEGEND**

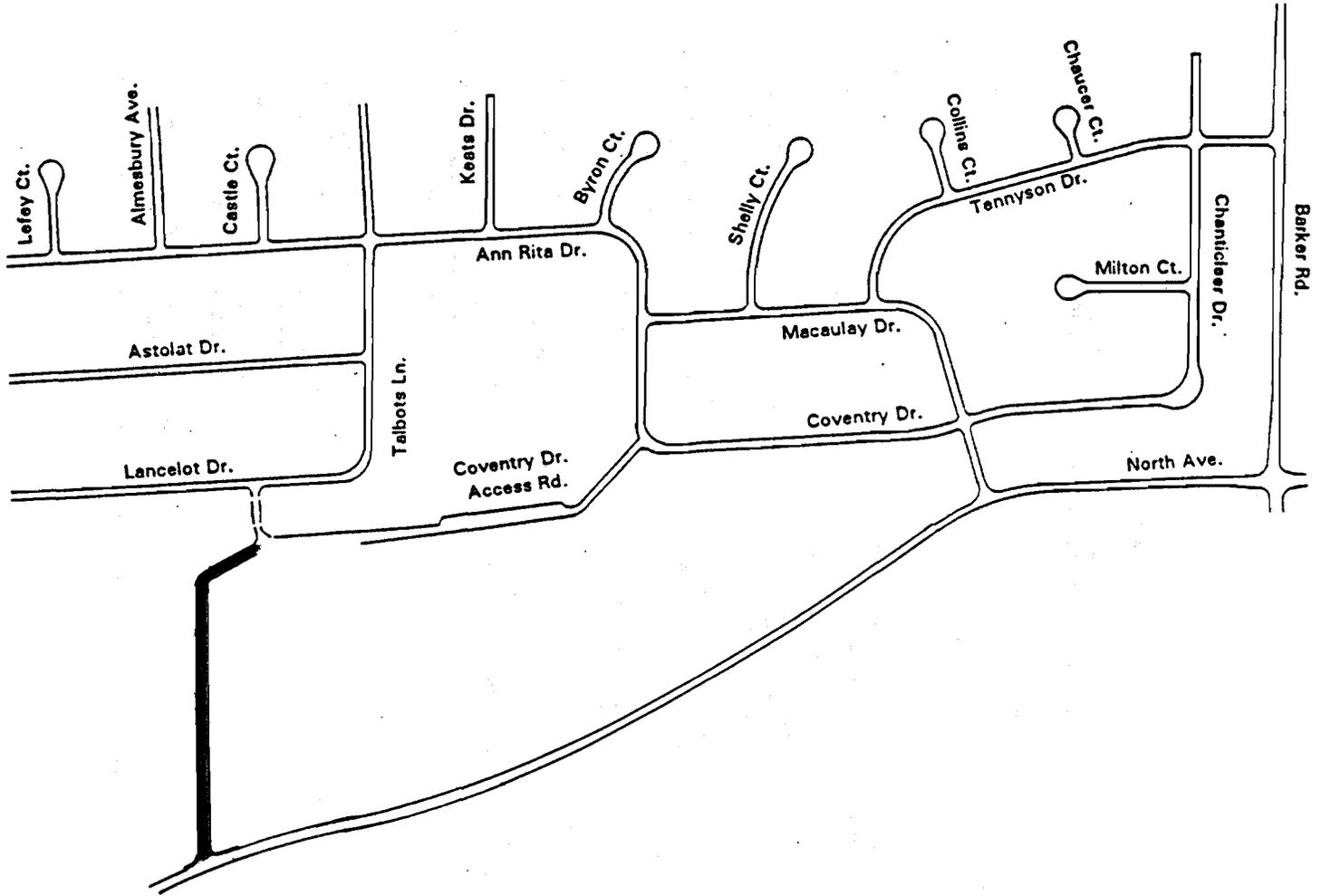
← **PERMITTED TRAFFIC MOVEMENT**



**Not to Scale**

Figure 16

**ALTERNATIVE 8: THE CONSTRUCTION OF A NEW FACILITY  
EXTENDING LYNETTE DRIVE SOUTHERLY TO NORTH AVENUE**



**LEGEND**

 **NEW ROADWAY**



**Not to Scale**

TABLE 4

EVALUATION OF TRAFFIC MANAGEMENT ACTIONS TO ABATE THROUGH TRAFFIC PROBLEMS ON ANN RITA DRIVE, COVENTRY DRIVE, AND MACAULAY DRIVE

ALTERNATIVE ACTIONS	ESTIMATED COST	ADVANTAGES	DISADVANTAGES	ESTIMATED AVERAGE WEEKDAY TRAFFIC DIVERSION
<p>1. The prohibition of right turns from North Avenue to Macaulay drive; from Coventry Drive to Macaulay Drive; from Ann Rita Drive to Talbots Lane; from Talbots Lane to Ann Rita Drive; and from Macaulay Drive to Ann Rita Drive; and the prohibition of left turns from Ann Rita Drive to Talbots Lane and from Talbots Lane to Ann Rita Drive; from Ann Rita Drive to Macaulay Drive. (See Figure 10)</p>	<p>\$ 800</p>	<p>Travel through the Canterbury Hill subdivision becomes more circuitous, adding approximately 0.3 miles and 45 seconds to the minimum travel time path between Ann Rita Drive at Talbots Lane and North Avenue at Barker Road.</p> <p>For residents of Talbots Lane, Astolat Drive and Lancelot Drive, as much as an additional 0.6 miles and one minute and 45 seconds may be added to the minimum travel path through the Canterbury Hill subdivision.</p> <p>The additional travel time may be expected to divert an estimated 250 vehicles, all collector traffic from the study segments.</p> <p>Emergency vehicles may disregard the turn prohibitions in emergency situations and thus there is no impact on the provision of emergency services to the area.</p> <p>This alternative may be implemented on a temporary basis and the impacts assessed after a trial period to determine the desirability of implementing on a permanent basis.</p>	<p>Compliance with the turn prohibitions relies on voluntary motorist compliance.</p> <p>The turn prohibitions may require directed law enforcement activity to ensure compliance.</p> <p>The turn prohibitions may be "defeated" by entering the first available driveway downstream of a prohibited turn; backtracking through the intersection and executing a legal turn. That is, an eastbound motorist on Coventry Drive could "defeat" the proposed right turn prohibition on this approach to the Coventry Drive and Macaulay Drive intersection by driving through the intersection to the first driveway, reversing directions back to the intersection and then turning left onto Macaulay Drive.</p> <p>Travel for some Canterbury Hill subdivision residents becomes more circuitous as well, adding both time and distance to the travel path to North Avenue at Barker Road.</p> <p>The remaining collector and additional local traffic may be expected to be routed over Coventry Drive, Chanticleer Drive, and Tennyson Drive between Macaulay Drive and Barker Road in addition to the study segments. These facilities have been physically designed as land access streets.</p> <p>Collector traffic diverted from the study segments would be expected to use the following land access streets to access Springdale Road: Valiant Drive, Guinevere Drive, Camelot Drive, Galahad Lane, Mayrose Boulevard, Clearfield Road, and Holly Crest Drive. Certain of these facilities may be to function as collectors serving as a bridge between the arterial streets and adjacent subdivisions, in particular: Camelot Drive, Galahad Lane, Clearfield Road, and Holly Crest Drive.</p> <p>An increase in fuel consumption and air pollutant emissions may be expected due to increased travel time and distance.</p>	<p>Valiant Drive-Guinevere Drive: About 100 vehicles.</p> <p>Camelot Drive, Galahad Drive, Mayrose Boulevard, Clearfield Road, and Holly Crest Drive: Fewer than 25 vehicles on each of these facilities.</p>

TABLE 4 (Continued)

ALTERNATIVE ACTIONS	ESTIMATED COST	ADVANTAGES	DISADVANTAGES	ESTIMATED AVERAGE WEEKDAY TRAFFIC DIVERSION
<p>2. The conversion of Ann Rita Drive to one way operation between Talbots Lane and Keats Drive.</p>	<p>\$ 500</p>	<p>Restricting travel to one direction only may be expected to divert approximately 600 vehicles, all collector traffic from the study segments.</p> <p>Emergency vehicles may disregard the restriction on travel direction in emergency situations and thus there is no impact on the provision of emergency services to the area.</p> <p>This alternative may be implemented on a temporary basis and the impacts assessed after a trial period to determine the desirability of implementing on a permanent basis.</p>	<p>This action, which changes neither the roadway cross-section nor the horizontal alignment of the study segments, would not be expected to resolve the conflict between continuing to function as a collector, and not meeting current physical design standards for that function.</p> <p>This action would not be expected to address the modest vehicular speeding problem identified on the study segments and may tend to encourage a modest increase in travel speeds as motorists attempt to overcome the added travel time and distance.</p> <p>There is no suitable parallel alternative facility over which to route travel in the opposite direction although some motorists may use Coventry Access Road to avoid this situation.</p> <p>Access to or from the Canterbury Hill subdivision for residents of Ann Rita Drive between Talbots Lane and Keats Drive is restricted. Regardless of the destination of any trip, these residents would be required to drive through the Camelot Forest subdivision on either the exit leg or return leg of that trip to reach their residence.</p> <p>Access to or from the west for other Canterbury Hill subdivision residents may be restricted as well due to a lack a parallel facility over which to route travel in the opposite direction. Although such access would be via the arterial street system to either Macauley Drive at North Avenue, or Tennyson Drive at Barker Road it may nonetheless be more more circuitous in terms of travel time and distance.</p> <p>Collector traffic diverted from the study segments would be expected to use the following land access streets to access Springdale Road: Valiant Drive, Guinevere Drive, Camelot Drive, Galahad Lane, Mayrose Boulevard, Clearfield Road, and Holly Crest Drive. Certain of these facilities may be to function as collectors serving as a bridge between the arterial streets and adjacent subdivisions, in particular: Camelot Drive, Galahad Lane, Clearfield Road, and Holly Crest Drive.</p> <p>An increase in fuel consumption and air pollutant emissions may be expected due to increased travel time and distance.</p>	<p>Valiant Drive-Guinevere Drive: About 110 vehicles                      Camelot Drive-Galahad Drive: About 240 vehicles                      Clearfield Road: About 130 vehicles                      Holly Crest Drive: About 40 vehicles                      Mayrose Boulevard: Fewer than 25 vehicles</p>

TABLE 4 (Continued)

ALTERNATIVE ACTIONS	ESTIMATED COST	ADVANTAGES	DISADVANTAGES	ESTIMATED AVERAGE WEEKDAY TRAFFIC DIVERSION
<p>3. The closure of Ann Rita Drive between Talbots Lane and Keats Drive. (See Figure 11)</p>	<p>\$ 15700</p>	<p>Travel would no longer be possible between the Canterbury Hill subdivision and adjacent subdivisions to the west and thus all of the collector traffic currently using the study segments would be diverted.</p> <p>This alternative may be implemented on a temporary basis and the impacts assessed after a trial period to determine the desirability of implementing on a permanent basis.</p>	<p>This action, which changes neither the roadway cross-section nor the horizontal alignment of the study segments, would not be expected to resolve the conflict between continuing to function as a collector, and not meeting current physical design standards for that function.</p> <p>This action would not be expected to address the modest vehicular speeding problem identified on the study segments.</p> <p>Access to or from the west for Canterbury Hill subdivision residents would be restricted. Although such access would be via the arterial street system to either Macaulay Drive at North Avenue, or Tennyson Drive at Barker Road it may nonetheless be more circuitous in terms of travel time and distance.</p> <p>The provision of emergency services to residents of Camelot Forest, Camelot Meadows, and Gaywood subdivisions would require up to 1.5 additional minutes as the existing route used to access these subdivisions would be severed.</p> <p>Collector traffic diverted from the study segments would be expected to use the following land access streets to access Springdale Road: Valiant Drive, Guinevere Drive, Camelot Drive, Galahad Lane, Mayrose Boulevard, Clearfield Road, and Holly Crest Drive. Certain of these facilities may be to function as collectors serving as a bridge between the arterial streets and adjacent subdivisions, in particular: Camelot Drive, Galahad Lane, Clearfield Road, and Holly Crest Drive.</p> <p>An increase in fuel consumption and air pollutant emissions may be expected due to increased travel time and distance.</p> <p>This action would not be expected to address the modest vehicular speeding problem identified on the study segments.</p> <p>The street closure is best accomplished by the construction of a cul de sac with a 30 foot radius which move the extreme edge of the pavement about 19 feet closer to existing homes.</p>	<p>Valiant Drive-Guinevere Drive: About 220 vehicles Camelot Drive-Galahad Drive: About 480 vehicles Clearfield Road: About 260 vehicles Holly Crest Drive: About 80 vehicles Mayrose Boulevard: About 40 vehicles</p>
<p>4. The construction of a pavement choker on the east leg of the intersection of Talbots Lane and Ann Rita Drive to prohibit ingress from,</p>	<p>\$ 3500</p>	<p>Travel between the arterials abutting Canterbury Hill subdivision on the south and east and adjacent subdivisions to the west via the study segments is restricted to the west-</p>	<p>Access to or from the west for Canterbury Hill subdivision residents would be via the arterial system to either Macaulay Drive at North Avenue, or Tennyson Drive at Barker Road and</p>	<p>Valiant Drive-Guinevere Drive: About 110 vehicles Camelot Drive: About 240 vehicles</p>

TABLE 4 (Continued)

ALTERNATIVE ACTIONS	ESTIMATED COST	ADVANTAGES	DISADVANTAGES	ESTIMATED AVERAGE WEEKDAY TRAFFIC DIVERSION
<p>but allow egress to the west. (See Figure 12)</p>		<p>bound direction only. As with one-way operation, restricting travel to one direction only may be expected to divert approximately 600 vehicles, all collector traffic from the study segments.</p> <p>Because travel on Ann Rita Drive between Talbots Lane and Keats Drive remains two-way, access for residents of this segment of Ann Rita Drive is better than it is under one-way operation.</p> <p>Emergency vehicles may disregard the restriction on travel direction in emergency situations and thus there is no impact on the provision of emergency services to the area.</p> <p>This alternative may be implemented on a temporary basis and the impacts assessed after a trial period to determine the desirability of implementing on a permanent basis.</p>	<p>would be more circuitous in terms of both travel time and distance.</p> <p>Collector traffic diverted from the study segments would be expected to use the following land access streets to access Springdale Road: Valiant Drive, Guinevere Drive, Camelot Drive, Galahad Lane, Mayrose Boulevard, Clearfield Road, and Holly Crest Drive. Certain of these facilities may be to function as collectors serving as a bridge between the arterial streets and adjacent subdivisions, in particular: Camelot Drive, Galahad Lane, Clearfield Road, and Holly Crest Drive.</p> <p>An increase in fuel consumption and air pollutant emissions may be expected due to increased travel time and distance.</p> <p>This action, which changes neither the roadway cross-section nor the horizontal alignment of the study segments, would not be expected to resolve the conflict between continuing to function as a collector, and not meeting current physical design standards for that function.</p> <p>This action would not be expected to address the modest vehicular speeding problem identified on the study segments.</p>	<p>Clearfield Road: About 130 vehicles</p> <p>Holly Crest Drive: About 40 vehicles</p> <p>Mayrose Boulevard: Fewer than 25 vehicles</p>
<p>5. The construction of a diagonal traffic diverter at the intersection of Talbots Lane and Ann Rita Drive. (See Figure 13)</p>	<p>\$ 7500</p>	<p>Travel through the Canterbury Hill subdivision becomes more circuitous for residents located north of Ann Rita and west of Talbots Lane in adjacent subdivisions. Between 0.35 and 0.5 miles and between 50 and 70 seconds would be added to the minimum travel time path to arrive at the Ann Rita Drive intersection with Talbots Lane for those residents depending upon their location.</p> <p>The additional travel time may be expected to divert an estimated 130 vehicles, all collector traffic from the study segments.</p> <p>This alternative may be implemented on a temporary basis and the impacts assessed after a trial period to determine the desirability of implementing on a permanent basis.</p>	<p>Travel to or from the northwest for Canterbury Hill subdivision residents, although modestly more circuitous in terms of travel time and distance, would not be expected to be diverted to the arterial system where it properly belongs.</p> <p>The provision of emergency services to residents of Camelot Forest, Camelot Meadows, and Gaywood subdivisions would require up to an additional 70 seconds.</p> <p>Collector traffic diverted from the study segments would be expected to use the following land access streets to access Springdale Road: Valiant Drive, Guinevere Drive, Camelot Drive, Galahad Lane, Mayrose Boulevard, Clearfield Road, and Holly Crest Drive. Certain of these facilities may be to function as collectors serving as a bridge between the arterial streets and adjacent subdivisions, in particular: Camelot Drive, Galahad Lane, Clearfield Road, and Holly Crest Drive.</p> <p>An increase in fuel consumption and air pollutant emissions</p>	<p>Clearfield Road: About 30 vehicles</p> <p>Camelot Drive, Mayrose Boulevard, Valiant Drive, Galahad Lane, Guinevere Drive, and Holly Crest Drive: Fewer than 25 vehicles on each of these facilities.</p>

TABLE 4 (Continued)

ALTERNATIVE ACTIONS	ESTIMATED COST	ADVANTAGES	DISADVANTAGES	ESTIMATED AVERAGE WEEKDAY TRAFFIC DIVERSION
<p>6. The closure of Macaulay Drive between North Avenue and Coventry Drive and between Ann Rita Drive and Shelly Court. (See Figure 14)</p>	<p>\$ 15700</p>	<p>Travel through the Canterbury Hill subdivision becomes more circuitous, adding approximately 0.3 miles and 45 seconds to the minimum travel time path between Ann Rita Drive at Talbots Lane and North Avenue at Barker Road.</p> <p>The additional travel time may be expected to divert an estimated 170 vehicles, all collector traffic from the study segments.</p> <p>This alternative may be implemented on a temporary basis and the impacts assessed after a trial period to determine the desirability of implementing on a permanent basis.</p>	<p>may be expected due to increased travel time and distance.</p> <p>This action, which changes neither the roadway cross-section nor the horizontal alignment of the study segments, would not be expected to resolve the conflict between continuing to function as a collector, and not meeting current physical design standards for that function.</p> <p>This action would not be expected to address the modest vehicular speeding problem identified on the study segments.</p> <p>Travel for some Canterbury Hill subdivision residents becomes more circuitous as well, adding both time and distance to travel path to North Avenue at Barker Road.</p> <p>The remaining collector and additional local traffic may be expected to be routed over Coventry Drive, Chanticleer Drive, and Tennyson Drive between Macaulay Drive and Barker Road in addition to the study segments. These facilities have been physically designed as land access streets.</p> <p>Collector traffic diverted from the study segments would be expected to use the following land access streets to access Springdale Road: Valiant Drive, Guinevere Drive, Camelot Drive, Galahad Lane, Mayrose Boulevard, Clearfield Road, and Holly Crest Drive. Certain of these facilities may be to function as collectors serving as a bridge between the arterial streets and adjacent subdivisions, in particular: Camelot Drive, Galahad Lane, Clearfield Road, and Holly Crest Drive.</p> <p>An increase in fuel consumption and air pollutant emissions may be expected due to increased travel time and distance.</p> <p>This action, which changes neither the roadway cross-section nor the horizontal alignment of the study segments, would not be expected to resolve the conflict between continuing to function as a collector, and not meeting current physical design standards for that function.</p> <p>This action would not be expected to address the modest vehicular speeding problem identified on the study segments and may tend to encourage a modest increase in travel speeds as motorists attempt to overcome the added travel</p>	<p>Camelot Drive, Mayrose Boulevard, Galahad Lane, Valiant Drive, Holly Crest Drive, Guinevere Drive, and Clearfield Road: Fewer than 25 vehicles on each of these facilities.</p>

TABLE 4 (Continued)

ALTERNATIVE ACTIONS	ESTIMATED COST	ADVANTAGES	DISADVANTAGES	ESTIMATED AVERAGE WEEKDAY TRAFFIC DIVERSION
<p>7. The closure of Macaulay Drive between Ann Rita Drive and Shelly Court and the construction of a diagonal diverter at the intersection of Coventry Drive and Macaulay Drive. (See Figure 15)</p>	<p>\$ 15400</p>	<p>Travel through the Canterbury Hill subdivision becomes more circuitous, adding approximately 0.35 miles and 50 seconds to the minimum travel time path between Ann Rita Drive at Talbots Lane and North Avenue at Barker Road.</p> <p>The additional travel time may be expected to divert an estimated 180 vehicles, all collector traffic from the study segments.</p> <p>This alternative may be implemented on a temporary basis and the impacts assessed after a trial period to determine the desirability of implementing on a permanent basis.</p>	<p>time and distance.</p> <p>The length of the cul de sac created by closing Macaulay Drive between Ann Rita Drive and Shelly Court -- approximately 900 feet from the intersection of Macaulay Drive to the northern-most end of Shelly Court -- exceeds current design standards for the length of a cul de sac of 750 feet.</p> <p>The provision of emergency services to residents of Camelot Forest, Camelot Meadows, and Gaywood subdivisions may require up to an additional 45 seconds. The provision of emergency services to some residents of Canterbury Hills subdivision would be similarly impacted.</p> <p>The street closure is best accomplished by the construction of a cul de sac with a 30 foot radius which move the extreme edge of the pavement about 19 feet closer to existing homes.</p> <p>Travel for some Canterbury Hill subdivision residents becomes more circuitous as well, adding both time and distance to travel path to North Avenue at Barker Road.</p> <p>The remaining collector and additional local traffic may be expected to be routed over Macaulay Drive and Tennyson Drive between Coventry Drive and Barker Road in addition to the study segments. Macaulay Road and Tennyson Drive have been physically designed as land access streets.</p> <p>Collector traffic diverted from the study segments would be expected to use the following land access streets to access Springdale Road: Valiant Drive, Guinevere Drive, Camelot Drive, Galahad Lane, Mayrose Boulevard, Clearfield Road, and Holly Crest Drive. Certain of these facilities may be to function as collectors serving as a bridge between the arterial streets and adjacent subdivisions, in particular: Camelot Drive, Galahad Lane, Clearfield Road, and Holly Crest Drive.</p> <p>An increase in fuel consumption and air pollutant emissions may be expected due to increased travel time and distance.</p> <p>This action, which changes neither the roadway cross-section nor the horizontal alignment of the study segments, would not be expected to resolve the conflict between continuing to</p>	<p>Valiant Drive-Guinevere Drive: About 30 vehicles Camelot Drive, Mayrose Boulevard, Clearfield Road, Galahad Lane, and Holly Crest Drive: Fewer than 25 vehicles on each of these facilities.</p>

TABLE 4 (Continued)

ALTERNATIVE ACTIONS	ESTIMATED COST	ADVANTAGES	DISADVANTAGES	ESTIMATED AVERAGE WEEKDAY TRAFFIC DIVERSION
<p>8. The construction of a new facility extending Lynette Drive southerly to North Avenue.<sup>a</sup> (See Figure 16)</p>	<p>\$ 240000</p>	<p>This roadway extension would provide an alternative route to the arterial system.</p> <p>An estimated 70 vehicles would be diverted from the study segments, all collector type traffic.</p> <p>The provision of emergency services to the area may be enhanced.</p>	<p>function as a collector, and not meeting current physical design standards for that function.</p> <p>This action would not be expected to address the modest vehicular speeding problem identified on the study segments and may tend to encourage a modest increase in travel speeds as motorists attempt to overcome the added travel time and distance.</p> <p>The length of the cul de sac created by closing Macaulay Drive between Ann Rita Drive and Shelly Court -- approximately 900 feet from the intersection of Macaulay Drive to the northern-most end of Shelly Court -- exceeds current design standards for the length of a cul de sac of 750 feet.</p> <p>The provision of emergency services to residents of Camelot Forest, Camelot Meadows, and Gaywood subdivisions would require up to an additional 50 seconds. The provision of emergency services to some residents of Canterbury Hill subdivision would be similarly impacted.</p> <p>The street closure is best accomplished by the construction of a cul de sac with a 30 foot radius which move the extreme edge of the pavement about 19 feet closer to existing homes.</p> <p>Because Lynette Drive does not directly intersect Ann Rita Drive it may be considered unlikely that motorists would divert from Ann Rita Drive unless some additional action is implemented on Ann Rita Drive to increase the travel time on that facility. Thus the area of influence of this alternative may be expected to be largely limited to the area bounded by Ann Rita Drive on the north, Talbots Lane on the east, Guinevere Drive on the west, and Lancelot Drive on the south.</p> <p>Lynette Drive would be expected to function as a collector street and, thus, collector traffic would be traveling on a facility adjacent to Hillside Elementary School.</p> <p>This action, which changes neither the roadway cross-section nor the horizontal alignment of the study segments, would not be expected to resolve the conflict between continuing to function as a collector, and not meeting current physical design standards for that function.</p>	<p>Lynette Drive extension: 40 vehicles</p>

TABLE 4 (Continued)

ALTERNATIVE ACTIONS	ESTIMATED COST	ADVANTAGES	DISADVANTAGES	ESTIMATED AVERAGE WEEKDAY TRAFFIC DIVERSION
<p>9. Reconstruction of the study segments to meet current design standards for collector facilities.</p>	<p>\$ 1920000</p>	<p>The study segments would be adequately designed and constructed to accommodate collector traffic.</p>	<p>This action would not be expected to address the modest vehicular speeding problem identified on the study segments.</p> <p>The acquisition of a strip of right of way 80 feet wide and approximately 750 feet in length would be required.</p> <p>The distance between the segment of Ann Rita Drive which is parallel to Coventry Drive and Coventry Drive is 700 feet, or approximately 60 feet less than the distance required to accommodate even the minimum length of radius for a 35 mile per hour design speed horizontal curve.</p> <p>At least two existing residences abutting the study segments would be displaced, and the edge of pavement of the new roadway would be located about 35 feet closer to four other residences, and about six feet closer to all other residences abutting the study segments.</p> <p>Reconstruction of the study segments may result in increased travel speeds on the study segments.</p>	<p>No diversion would be expected.</p>

<sup>a</sup> Consideration of the construction of a new facility extending Lynette Drive westerly to Hammock Hill Drive was requested by an Ann Rita Drive resident. Such a facility would be expected to have a similar cost and to have similar advantages and disadvantages as the southerly extension of Lynette Drive to North Avenue. However, because the westerly extension would be less direct than the southerly extension -- adding about 0.2 miles of indirection and about 30 seconds of travel -- the number of motorists diverting from the study segments may be expected to be reduced. Further, that collector traffic which is diverted would utilize Hammock Hill Drive, currently a cul de sac whose physical design and relationship within the adjacent street pattern clearly indicate that it is a land access street.

of these facilities may be expected to remain within the desirable range of traffic for a land access street. The potential average weekday traffic volumes on Ann Rita Drive west of Talbots Lane and on Camelot Drive, however, may exceed the level of traffic generally considered desirable on a land access street.

Other potential negative consequences of the alternative actions include construction cost, which is estimated to range from \$500 to \$1,920,000; impacts on the provision of emergency services; and land required for construction of some of the alternative actions. In summary, the evaluation of alternatives indicated that each alternative resolution of the collector traffic problems on the Ann Rita Drive, Coventry Drive and Macaulay Drive study segments would entail undesirable impacts.

Alternative 8--the extension of Lynette Drive--and Alternative 9--the reconstruction of Ann Rita Drive, Coventry Drive and Macaulay Drive--would each require a major capital expenditure--an estimated \$240,000 and \$1,920,000, respectively, and would necessitate the acquisition of existing residences. Neither of these alternatives may be expected to divert substantial through traffic volumes from the study segments, nor would they be expected to abate either of the remaining two traffic problems identified on the study segment. Because of the high cost of implementation and because neither alternative may be expected to be fully effective in abating the problems identified in the study segments, it is recommended that these two alternatives be eliminated from further consideration. It is further recommended that Alternative 2 be eliminated from further consideration despite its relative effectiveness in removing collector traffic--about 600 vehicles of the total 1,220 vehicles per average weekday--and its low cost--\$500--because of a lack of parallel facility over which to route traffic in the opposite direction.

Of the remaining alternatives, Alternative 3--which proposes the closing of Ann Rita Drive between Talbots Lane and Keats Drive--may be expected to be the most effective in terms of removing collector traffic from the study segments, eliminating all such traffic. This alternative may also be expected to impose the most severe undesirable impacts, including the diversion of about 1,200 vehicles per average weekday to the local streets in the Camelot Forest, Camelot

Meadows, and Gaywood subdivisions. It may be expected to have a negative impact on the provision of emergency services to the Camelot Forest, Camelot Meadows, and Gaywood subdivisions. Fire equipment and paramedic routing would be indirect via North Avenue to Springdale Road and then into the subdivisions. Travel to and from the west for Canterbury Hill residents--an estimated 585 vehicles per average weekday--would also become more circuitous. Its estimated construction cost of \$15,700 is at the highest of the range of the costs for the seven remaining alternatives of \$500 to \$15,700.

No other alternative may be expected to remove more than 600 vehicles per average weekday. Alternative 1--the prohibition of turning movements on selected intersection approaches--has a lower cost--an estimated \$800--does not restrict the provision of fire emergency services, and does not have the need to construct additional pavement for a cul-de-sac. Alternative 1 may be expected to divert about 250 vehicles from the study segments on an average weekday to land access streets in the Camelot Forest, Camelot Meadows and Gaywood subdivision. Alternative 4--the construction of a pavement choker at the intersection--has a modest construction cost--\$3,500--and may be expected to divert about 600 vehicles per average weekday to land access streets in adjacent subdivisions. It would have a nominal impact on emergency services and construction can be accomplished within the existing street pavement. Alternative 5--the construction of a traffic diverter at the intersection of Talbots Lane and Ann Rita Drive--has a moderate construction cost of \$7,500, but may be expected to only divert about 130 vehicles per average weekday from the study segments. This alternative would have a moderate negative impact on the provision of emergency services to adjacent subdivisions imposing additional travel time and more circuitous travel.

Alternative 6--the closure of Macaulay Drive between North Avenue and Coventry Drive and between Ann Rita Drive and Shelley Court--has a high cost--an estimated \$15,700--and may be expected to divert only about 170 vehicles per average weekday from the study segments. This alternative modestly increases the time to provide emergency services not only to subdivisions to the west but to some residents of Canterbury Hill also. The construction of a 50-foot diameter cul-de-sac will entail 13 added feet of street pavement on each side of the existing

roadway. Alternative 7--the closure of Macaulay Drive between Ann Rita Drive and Shelley Court and the construction of a diagonal traffic diverter at the intersection of Coventry Drive and Macaulay Drive has a high cost--an estimated \$15,400--and may be expected to divert only about 180 vehicles per average weekday from the study segments. This alternative modestly increases the time to provide emergency services not only to subdivisions to the west but to some residents of Canterbury Hill also. The construction of a 50-foot diameter cul-de-sac will entail 13 added feet of street pavement on each side of the existing roadway.

The diversion of traffic from the study segments should be examined in an attempt to minimize traffic and, in particular, eliminate or reduce collector traffic due to pavement widths and the characteristics of the horizontal curves of the study segments. In its consideration of any of the remaining alternatives which would provide for elimination of or a reduction in the volume of the collector traffic on Ann Rita Drive, Coventry Drive, and Macaulay Drive, the City should recognize that these actions achieve the reduction of traffic on the study segments largely by diverting traffic to other local streets in adjacent subdivisions. Such diversion and the resultant potential increases in traffic on these other local streets may be expected to be of concern to and resisted by residents of those streets. The impact on the provision of emergency services may be expected to be of concern, not only to affected City residents but to City personnel responsible for these services. 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--with the possible exception of Ann Rita Drive and Camelot Drive--the study segments did not require diversion of traffic to achieve an acceptable range of traffic volume.

Although Alternative 3--the closure of Ann Rita Drive between Talbots Lane and Keats Drive--is the most effective alternative in terms of eliminating through traffic, it may not be the most feasible or desirable alternative due to its cost; diversion of collector traffic to other local streets; imposition of circuitous travel; and its negative impact on the provision of emergency services. Importantly, this alternative does not abate the problem of collector-

type traffic using facilities designed as land access streets. Rather such traffic would be diverted to other land access facilities in the area bounded by Springdale Road; North Avenue; Barker Road; and the C. P. Rail System trackage.

Of the alternatives examined, Alternative 4, which is very similar to Alternative 3 except that travel would only be prohibited in one direction, may be the most feasible to implement. As with Alternative 3, traffic would be diverted to other local streets although, because travel would be permitted in one direction, the diversion is anticipated to be about half of the diversion under Alternative 3. Circuitous travel would result from the diversion. Confusion on the part of motorists may also result as travel is permitted in one direction but not the other. Under Alternative 4, the impact on the provision of emergency services is significantly reduced. As with Alternative 3, Alternative 4 does not eliminate the underlying problem but merely shifts it to other local streets in the area.

All of the other alternatives examined are anticipated to have minimal impacts and thus are not recommended for further consideration. Because of the problems identified with the implementation of Alternative 3, it may be concluded that only two alternatives merit further consideration: Alternative 4 and the "do nothing" alternative. Because none of the alternatives evaluated abate the underlying problem, the "do nothing" alternative may be concluded to be most appropriate for this situation. If the City does wish to implement one of the alternatives; the Commission staff would recommend implementation of Alternative 4 on a trial basis, and that its effectiveness be evaluated during a trial period and a decision then made as to whether or not to implement this alternative on a permanent basis.

#### 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 spot speed

studies conducted by the Commission staff, motorists are moderately 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. In addition, the provision of added enforcement activity on the study segments may result in the City receiving additional requests for additional enforcement activity. It is recommended that the City 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.

#### Inappropriate Traffic Control

To alleviate the problem identified as inappropriate traffic control at the intersections of Ann Rita Drive and Macaulay Drive; Coventry Drive and Macaulay Drive; and, Tennyson Drive at Macauley Drive; it is recommended that the stop signs on selected approaches to these intersections be removed. The advantages of the removal of unwarranted stop signs include conformance with the Manual on Uniform Traffic Control Devices and a resultant increased respect for and compliance with traffic control devices which are warranted. Travel speeds between stop signs may be somewhat reduced as motorists no longer increase speeds to make up for time lost as a result of the stop. Noise generated as vehicles decelerate and accelerate at the stop signs may be eliminated. Fuel consumption and air pollutant emissions may be reduced as some stops are eliminated. There are no disadvantages to implementing this traffic engineering action unless the installation of multi-way stop sign control at these intersections was in response to a traffic safety problem. In this event, traffic safety may be expected to be degraded. Therefore, it is recommended that the stop signs on the following intersection approaches be removed: 1) the Ann Rita Drive approaches to its intersection with Macaulay Drive; and 2) the Macaulay Drive approaches to

its intersections with Coventry Drive and Tennyson Drive unless the stop signs on these approaches were installed in response to a prior traffic safety problem. The cost of implementing this recommended action is \$300.

Additional Measures Considered But Rejected

The following traffic management measures were considered, but rejected, to alleviate the volume of through traffic and/or to alleviate the modest vehicular speeding problem on the study segments: 1) installing speed control bumps or speed control humps on Coventry Drive and Ann Rita Drive; and 2) installing "Road Closed to Thru Traffic" signs on Macaulay Drive just north of North Avenue, on Ann Rita Drive just east of its intersection with Talbots Lane, and on Tennyson Drive just west of Barker Road.

The installation of speed control bumps on Ann Rita Drive and Coventry Drive 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 on Uniform Traffic Control Devices; 2) are reported to interfere with winter snow plowing operations; 3) constitute a safety hazard to bicyclists and motorcyclists; and 4) can potentially distract motorists from observing pedestrians/bicyclists. In addition, driver discomfort actually decreases as the speed of the vehicle crossing the bump increases. 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 segments include: 1) the installation of speed humps does not address the principal problem identified on the study segments of through traffic; 2) between the speed humps, vehicles may be expected to accelerate to 27 to 28 miles per hour; 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 Thru Traffic" was rejected because of the difficulty of enforcing this measure; and because such signing has been demonstrated ineffective when implemented elsewhere.

#### SUMMARY

On October 1, 1990, the City of Brookfield requested that the Commission staff conduct a traffic engineering study of segments of Ann Rita Drive, Coventry Drive and Macaulay Drive in the Canterbury Hill subdivision. This study was to address resident concerns of through traffic and attendant vehicular speed and safety problems on the study segments. This memorandum report presents the findings and recommendations of the requested study.

The study segments of Ann Rita Drive, Coventry Drive and Macaulay Drive may be functionally classified as local land access streets and, thus, should have the principal function to provide access to abutting properties. These facilities are constructed to an urban cross-section with curb and gutter, and have a pavement width of 26 feet, providing a cross-section for a land access facility. In addition, the horizontal alignment of these facilities contains three curves whose centerline radii are shorter than the minimum radius recommended for a collector facility. The Commission staff conducted 24-hour machine traffic counts on the study segments in May of 1991. Average weekday traffic counts

ranged from 810 vehicles on Macaulay Drive just east of Ann Rita Drive, to 1,800 vehicles on Ann Rita Drive just east of Talbots Lane. The current average weekday traffic count of 1,800 vehicles is greater 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, but is less than the volume of traffic--2,500 per average weekday--typically considered to be the maximum acceptable volume on a local land access street.

To determine the extent to which the study segments are being used by collector-type traffic, a license plate survey was conducted in May of 1990. The license plate survey established that about 1,200 vehicles per average weekday neither originated nor ended their trips at a property abutting the study segments. Thus, the license plate survey clearly indicated that the study segments function not only as land access facilities, but also as collector facilities. Spot speed studies were conducted on Ann Rita Drive and on Coventry Drive. Analyses of the studies indicated that during the evening peak hour, 85 percent of the motorists on Coventry Drive travel at or below 33.7 miles per hour. During the evening peak hour on Ann Rita Drive, 85 percent of the motorists travel at or below 28.0 miles per hour. During the non-peak hours, 85 percent of the motorists on Ann Rita Drive travel at or below 31.1 miles per hour. The travel speeds observed on the study segments are likely typical of the prevailing travel speeds on continuous land access residential streets in the City.

The incidence and location of traffic accidents on the study segments were also analyzed. The City of Brookfield Police Department reported only three accidents having occurred on the study segments over a three-year period from November 1988 to November 1991. None of the accidents resulted in injuries or fatalities.

Based on the analyses conducted under the study, it was concluded that three traffic problems exist on the study segments. The first problem is related to the traffic traveling on the study segments which neither originates nor ends at property abutting the study segments. The existing total volume of traffic on the study segments cannot be considered a traffic problem. The existing total average weekday traffic volume approximates 1,800 vehicles per average weekday, which is well within the acceptable range of traffic volume for a land access

street. Therefore, even though the pavement width and horizontal alignment of the study segments only meet standards for a land access street, the total level of traffic may not be considered a problem as it is well within the acceptable range of traffic. The portion of the total traffic volume, however, which is collector traffic may, due to the limited width of the street, be considered a problem. The second problem is a moderate vehicular speeding problem on the study segments during both peak and off-peak traffic hours. The speeding problem is relatively constant throughout the day; that is, the speeds at which 85 percent of motorists travel at or below is relatively consistent during the peak and off-peak travel hours. The third problem identified was inappropriate traffic control at three study segment intersections, namely Ann Rita Drive at Macaulay Drive; Tennyson Drive at Macaulay Drive; and Coventry Drive at Macaulay Drive. These intersections currently are stop sign controlled on all approaches. This control is not warranted by either the traffic volumes, nor the incidence of traffic accidents at these intersections.

As requested by the City, a number of traffic management actions, which attempt to identify traffic problems or identified and evaluated for consideration by the City for implementation. To alleviate the problem of motorists moderately 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 posted speed limit which may be particularly expected 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.

To alleviate the problem of inappropriate traffic control, the Commission staff recommended that the stop signs on the following intersection approaches be removed: 1) the Ann Rita Drive approaches to its intersection with Macaulay Drive, and 2) the Macaulay Drive approaches to its intersections with Coventry Drive and Tennyson Drive. This recommendation was made contingent upon the fact that the initial installation of stop signs on these approaches was not in response to a traffic safety problem at these intersections. The advantages of the removal of unwarranted stop signs include conformance with the Manual on

Uniform Traffic Control Devices, and a resultant increased respect for and compliance with those traffic control devices which are warranted. There are no disadvantages to implementing this traffic engineering action unless the installation of a multi-way stop sign control at these intersections was in response to a traffic safety problem.

The Commission staff identified and evaluated nine alternative traffic management measures which may be expected to divert the collector traffic from the study segments. The evaluation of the alternatives focused on the effectiveness of each alternative to eliminate from or reduce and collector-type traffic on the study segments; the potential impacts on other land access streets in the area; the potential increase in circuitous travel; the implications for the provision of emergency service; and the estimated construction cost for implementation.

Two alternatives of the nine considered were found to be most effective in abating the use of Ann Rita Drive by through traffic. Alternative 3--the closure of Ann Rita Drive between Talbotts Lane and Keats Drive--may be considered the most effective alternative in terms of eliminating collector traffic. Implementation of this alternative may be not feasible nor desirable to due to its cost, diversion of collector traffic to other land access streets, the imposition of circuitous travel, and its negative impact on the provision of emergency services. Alternative 4 is similar to Alternative 3 except that access to the study segments would be prohibited from the west only. Thus, about one half of the collector traffic diverted under Alternative 3 would be diverted under Alternative 4. Circuitous travel would result from the diversion and some confusion may result as travel is permitted in one direction but not the other. The negative impact on emergency services is reduced under Alternative 4. None of the alternatives considered eliminates the underlying problem but merely shifts it in varying degrees to other land access streets in the area. All of the remaining alternatives considered were found to have only minimal impacts in terms of diverting collector traffic from the study segments.

Because of the substantial negative impacts attendant to the implementation of Alternative 3, it may be concluded that only two alternatives merit further consideration: Alternative 4 and the "do nothing" alternative. Because none of

the alternatives evaluated eliminate the underlying problem, the "do nothing" alternative seems to be most appropriate for this situation. If the City does wish to implement one of the alternatives, the Commission staff would recommend implementation of Alternative 4 on a trial basis; its effectiveness be evaluated after the trial period, and a decision then made as to the desirability of permanently implementing this alternative.

The following additional traffic management measures were considered but rejected to relieve the volume of through traffic and excessive vehicle speeds on the study segments: 1) the installation of speed control bumps or speed control humps on study segments; and 2) the installation of "Road Closed to Thru Traffic" on the study segments.

10/6/93

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