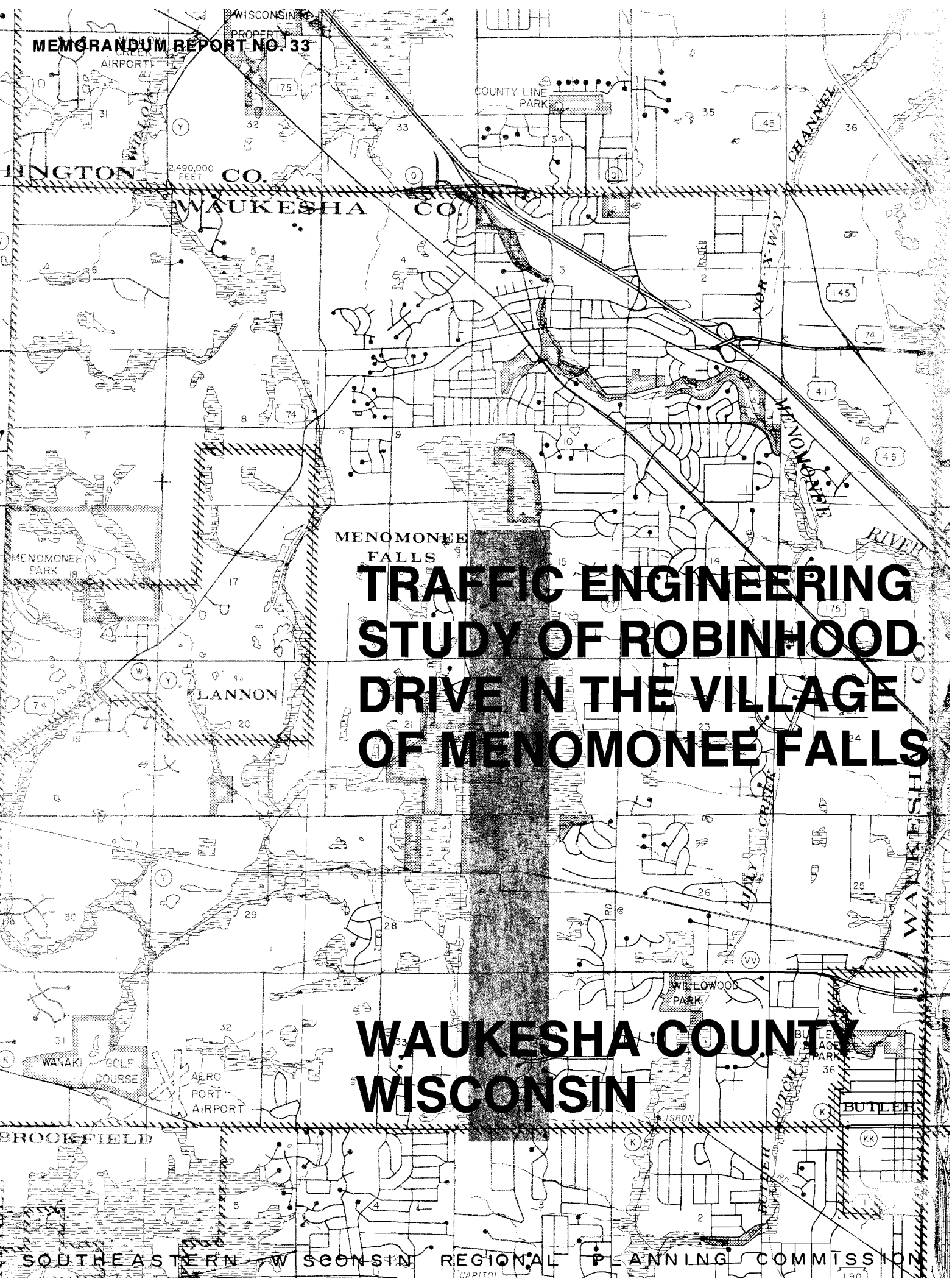
MEMORANDUM REPORT NO. 33




# TRAFFIC ENGINEERING STUDY OF ROBINHOOD DRIVE IN THE VILLAGE OF MENOMONEE FALLS

## WAUKESHA COUNTY WISCONSIN

SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION

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## WAUKESHA COUNTY, WISCONSIN

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# TRAFFIC ENGINEERING STUDY OF ROBINHOOD DRIVE IN THE VILLAGE OF MENOMONEE FALLS

## INTRODUCTION

On March 31, 1989, the Village of Menomonee Falls requested the Commission staff to conduct a traffic engineering study of Robinhood Drive in the Village of Menomonee Falls to address resident complaints of excessive vehicular speed and, of through traffic. This report presents the findings and recommendations of the requested traffic engineering study. The report describes the traffic problems which currently exist and identifies and evaluates traffic engineering actions which may be expected to abate these problems.

## EXISTING CONDITIONS

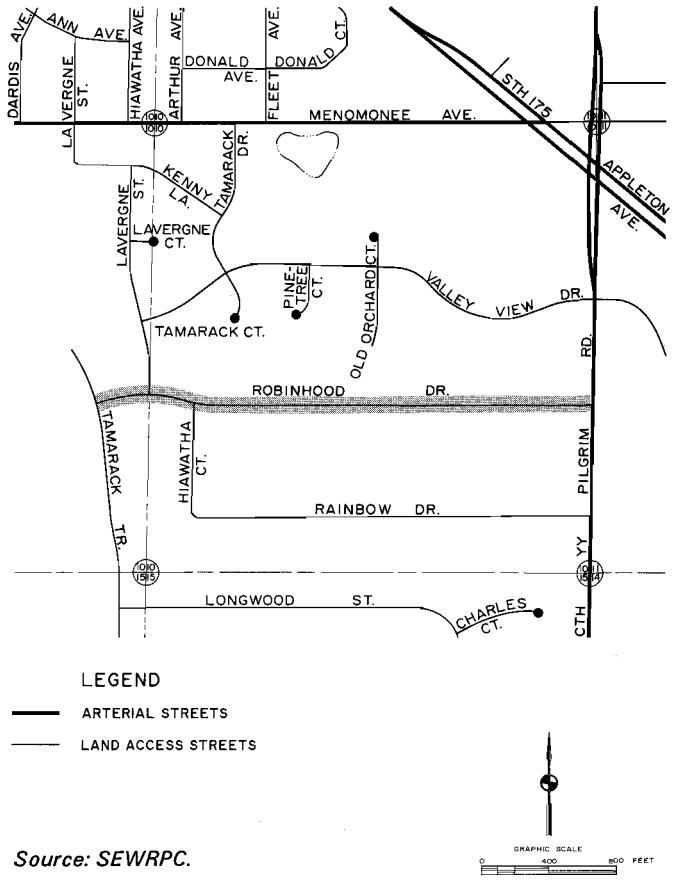
Robinhood Drive is a local land access street which should function primarily to provide access to abutting properties. Robinhood Drive is under the sole jurisdiction of the Village of Menomonee Falls. The Village of Menomonee Falls is, therefore, responsible for its construction, operation, and maintenance.

### Roadway Physical and Operational Characteristics

As shown on Map 1, Robinhood Drive is intersected by Hiawatha Court and Lavergne Street; in addition, Robinhood Drive intersects Pilgrim Road (CTH YY) and Tamarack Trail. The intersection of Robinhood Drive with Tamarack Trail and the intersection of Robinhood Drive with Pilgrim Road are controlled by stop signs on Robinhood Drive. In addition, traffic is controlled by a stop sign on Lavergne Street at the intersection of Robinhood Drive. At the intersection of Hiawatha Court and Robinhood Drive there is no traffic control. The horizontal alignment of Robinhood Drive from Pilgrim Road to Hiawatha Court is on a tangent and direct; and from Hiawatha Court to Tamarack Trail it is a horizontal curve with a 750-foot radius. The vertical alignment is gently rolling, never exceeding a 4 percent gradient. Robinhood Drive is constructed to a rural cross-section, with ditches and narrow to nonexistent shoulders. Between Pilgrim Road and Hiawatha Court it has a pavement width of 22 feet, and between Hiawatha Court and Tamarack Trail it has a pavement width of 36 feet. There are no sidewalks on either side of Robinhood Drive, and the typical abutting residence is set back approximately 80 feet from the edge of the roadway.

**Map 1**

**LOCATION OF ROBINHOOD DRIVE VILLAGE OF MENOMONEE FALLS, WISCONSIN**




*Source: SEWRPC.*

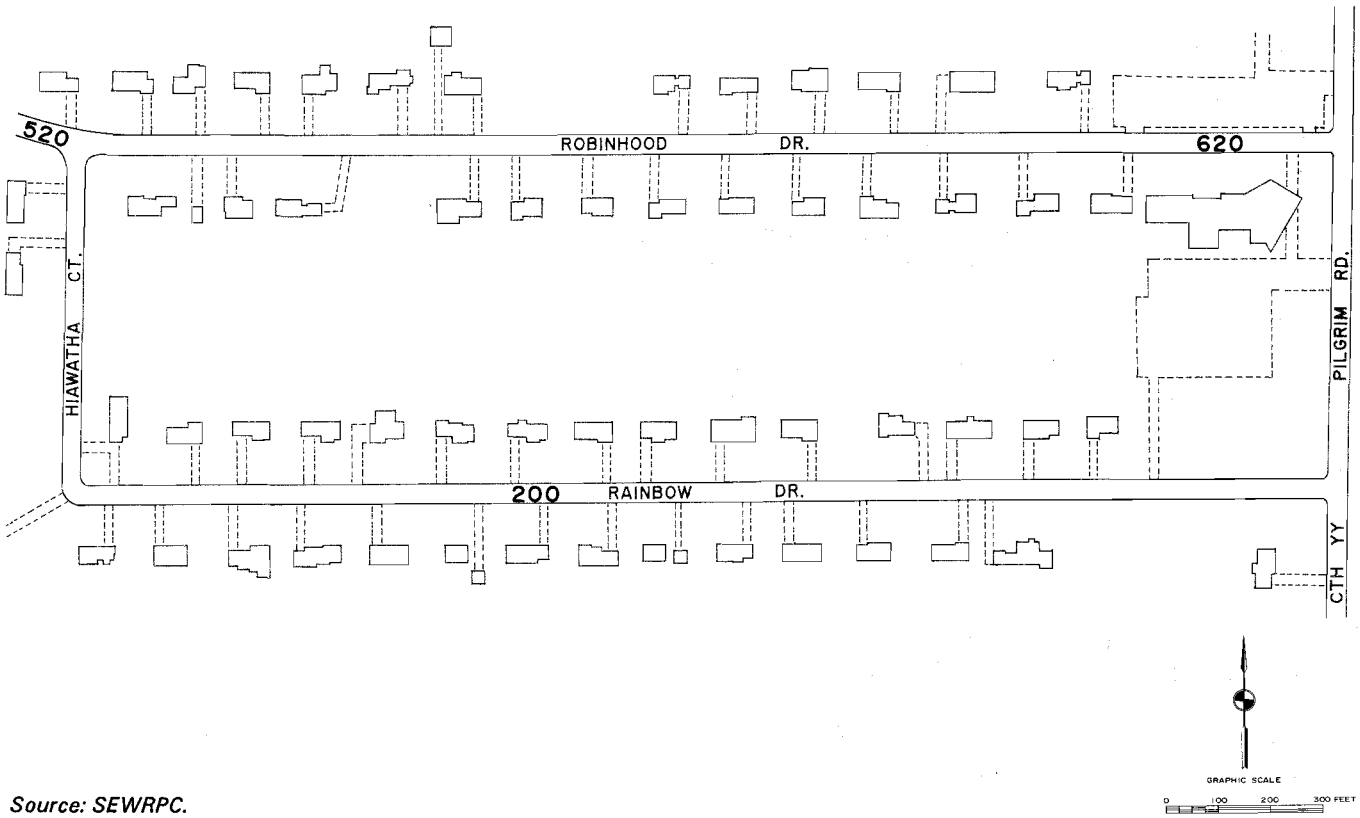
The speed limit on Robinhood Drive is posted at 25 miles per hour along the entire length of the street.

### Traffic Volumes

As shown on Map 2, the estimated traffic volume on Robinhood Drive at Pilgrim Road, based upon traffic counts conducted in April 1989, is 620 vehicles per average weekday. This is well within the recommended desirable upper limit of 1,000 to 1,500 vehicles per average weekday on residential land access streets.

**Map 2**

**AVERAGE WEEKDAY TRAFFIC ON ROBINHOOD DRIVE AND RAINBOW DRIVE: 1989**




*Source: SEWRPC.*

There are 29 residences which have direct access to Robinhood Drive and two residences located on Hiawatha Court, adjacent to Robinhood Drive.

Commission studies indicate that private residences generate approximately 10 vehicle trips per average weekday. Consequently, it may be estimated that the 29 residences with direct access off of Robinhood Drive and the two residences on Hiawatha Court generate 310 vehicle trips per average weekday. Of these estimated 310 vehicle trips generated, it is estimated that 255 vehicle trips travel to and from the east on Robinhood Drive, and the remaining 55 vehicle trips travel to and from the west on Robinhood Drive. The remaining 365 vehicle trips per average weekday which use Robinhood Drive are principally generated by residential and other land uses served by streets intersecting Robinhood Drive, including Tamarack Trail and Lavergne Street.

Average Operating Speeds

Motorists operate at speeds which they consider reasonable, convenient, and safe under existing roadway conditions. Factors influencing the speed of choice include horizontal and vertical alignment, pavement width, and building setback. A spot speed study was conducted by the Commission staff on Robinhood Drive on May 3 and 4, 1989. The average travel speed on Robinhood Drive was 31.6 miles per hour for vehicles traveling eastbound and 30.9 miles per hour for vehicles traveling westbound. The 85th percentile speed, the speed at or below which 85 percent of traffic is traveling, was determined to be 36.3 miles per hour for eastbound Robinhood Drive traffic and 34.7 miles per hour for westbound traffic on Robinhood Drive. The "10 mile per hour pace," that is, the 10 mile per hour increment of speed range including the largest number of vehicles, was found to be 26 to 35 miles per hour for 69 percent of the traffic traveling east on Robinhood Drive and 25 to 34 miles per

hour, for 74 percent of the traffic traveling west on Robinhood Drive. Based on the spot speed study, half of all motorists are traveling at least 5 miles per hour over the speed limit, and 15 percent are traveling at least 10 miles per hour over the speed limit. Given the facts that half of all motorists are going at least 5 miles per hour over the speed limit and that about half of the traffic on Robinhood Drive can be attributed to motorists who live on Robinhood Drive, it is evident that residents of Robinhood Drive contribute significantly to the speeding problem.

## ANALYSIS AND RECOMMENDATIONS

This section of the memorandum presents alternative traffic management actions which were analyzed and those which are recommended to abate the problem of excessive vehicle speeds on Robinhood Drive. These actions may be divided into physical actions and passive actions. Physical actions, or modifications, actually change the street configuration, while passive actions attempt to influence the driver as the result of a reaction to traffic control devices.

### Physical Traffic Management Actions

Physical actions, or modifications, change the physical characteristics of a street. The advantages to this type of control are, first, it is largely self-enforcing and second, by its design, it limits through traffic and high-speed traffic.

A physical traffic management alternative recommended for implementation is the construction of speed-control humps on Robinhood Drive. Speed-control humps, as shown in Figure 1, are raised undulations in the pavement surface extending transversely across the traveled way, and are raised approximately three inches above the pavement surface and 12 feet wide. Speed-control humps spaced approximately 300 feet apart are effective speed-attenuating devices because they cause driver discomfort that increases as vehicle speed increases beyond 25 miles per hour. Speed-control humps conforming to this design can be traversed at 25 miles per hour with little driver discomfort and do not pose a hazard to bicyclists and motorcyclists. Emergency and long-wheelbase vehicles can traverse speed-control humps at almost any speed. However, they are more seriously affected than automobiles in that the drivers experience discomfort at even the lowest speeds.

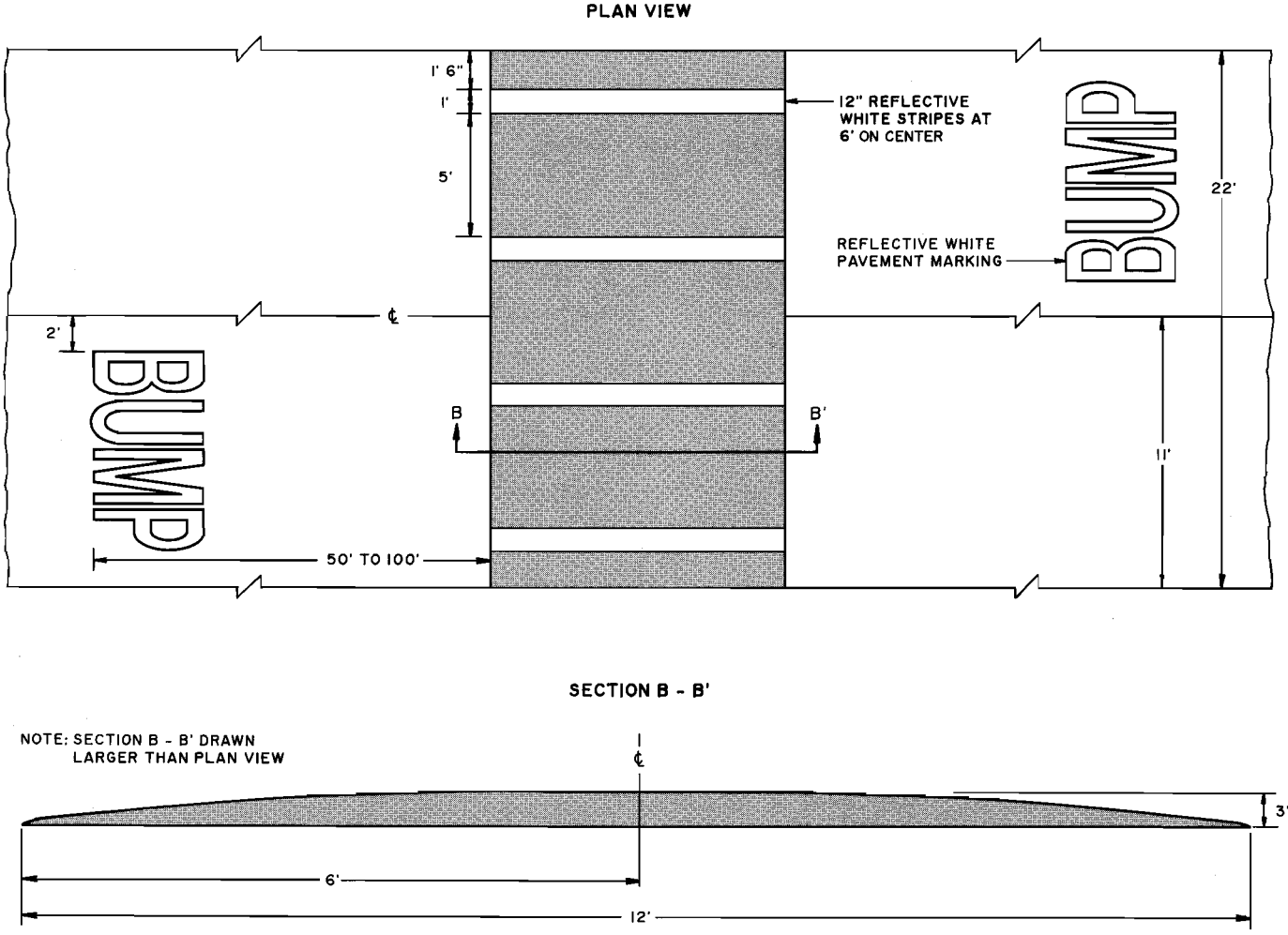
The effectiveness of speed-control humps in reducing vehicle speeds is largely dependent on the distance between the humps, with the ideal spacing being approximately 300 feet. However, speed-control humps should not be located within 200 feet of an intersecting street. Warning signs bearing the message "Speed Humps" should be installed about 125 feet in advance of the speed-control humps. Pavement markings with an eight-foot-high message "Bump" should be installed about 75 feet in advance of each speed-control hump and one-foot-wide longitudinal pavement markings six feet on center should be installed on each speed-control hump. These warning signs and pavement markings must be diligently and regularly maintained. Speed-control humps reduce vehicle speeds without the need for constant and costly police enforcement and without restricting the public from the free use of all public roads. Speed-control humps may be installed and maintained by the Village's Public Works Department and should not pose any snow removal problems. Map 3 shows a potential configuration of speed-control humps on Robinhood Drive.

The potential disadvantages of speed-control humps include a modest 30- to 40-second increase in emergency vehicle response time, assuming a decrease in emergency vehicle speed from 40 to 45 miles per hour to 20 miles per hour. Also, motorists may attempt to leave the roadway to avoid traversing the speed-control hump. Roadway curbs, which would prevent motorists from leaving the roadway to avoid speed-control humps, do not exist on Robinhood Drive. However, because of the lack of shoulders and proximity and depth of the open ditch drainage system on each side of Robinhood Drive, it may be expected that motorists would not leave the roadway to avoid the speed-control humps. Finally, another disadvantage is that additional requests for installation on nearby streets, many of which may not be warranted, may be expected.

Warrants for the installation of speed-control humps, related to the physical and operational characteristics of a street, are presented in Table 1. The study segment of Robinhood Drive meets the warrants for the installation of speed-control humps to reduce and control vehicular speeds. Therefore, it is recommended that this traffic management action be implemented, at an estimated cost of $4,000.

Figure 1

A TYPICAL SPEED-CONTROL HUMP FOR ROBINHOOD DRIVE



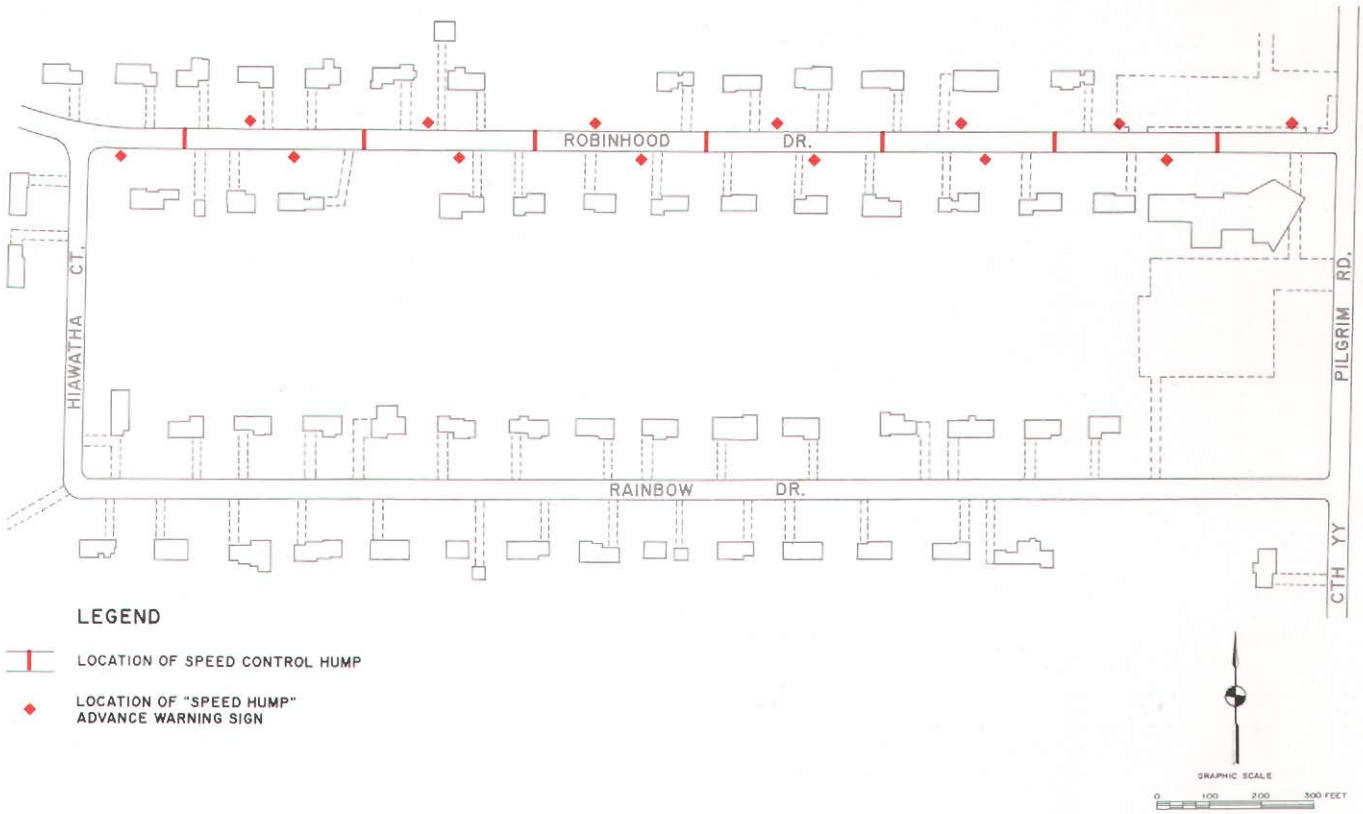

*Source: SEWRPC.*

Another traffic management alternative considered was the closure of Robinhood Drive, as shown in Map 4. This alternative would remove that traffic generated by the residential and other land uses served by Tamarack Trail and Lavergne Street, but traveling on Robinhood Drive and contributing to the speeding problem. A temporary closure could be constructed, at a cost of about $400, and used to observe the effects of a permanent closure on local traffic patterns and on vehicular speed on Robinhood Drive. At the end of a trial period, the desirability of a permanent closure could be determined. A permanent closure would have an estimated cost of $2,700.

The potential disadvantages of closing Robinhood Drive include a modest increase in response time for some emergency vehicles. Emergency vehicles from the Village of Menomonee Falls Fire Station No. 1 would be able to continue to serve the area with negligible change in response times; however, emergency vehicles from Fire Station No. 3 would require an estimated additional 1.1 minutes to travel to the vicinity of Robinhood Drive and Tamarack Trail if Robinhood Drive were closed between Lavergne Street and Hiawatha Court. Another disadvantage is the diversion of some traffic from Robinhood Drive to other streets. Such traffic diversion would be limited to about 365 vehicles per

Map 3

POTENTIAL SPEED-CONTROL HUMP LOCATIONS ON ROBINHOOD DRIVE




*Source: SEWRPC.*

Table 1

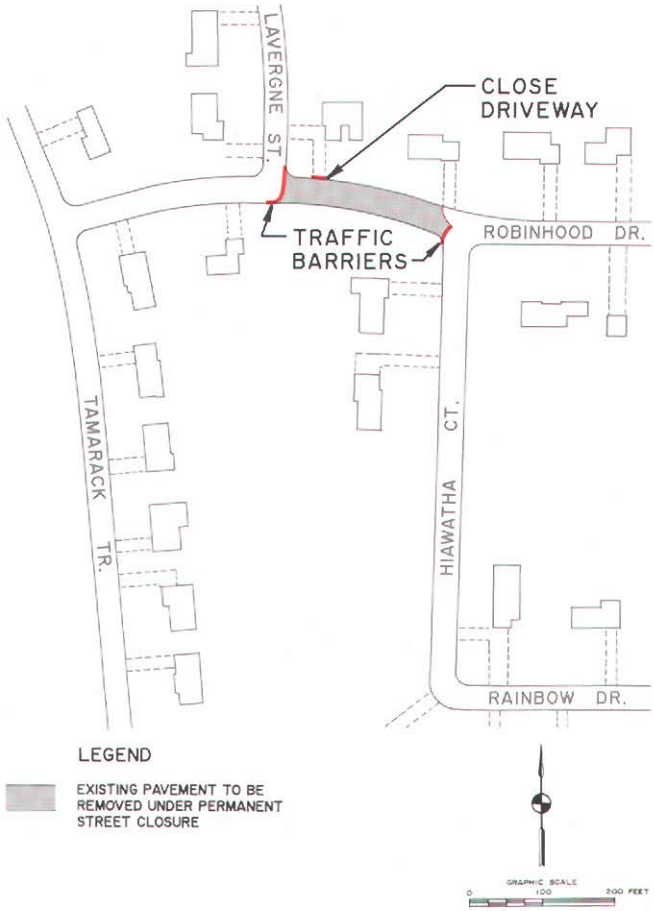
WARRANTS FOR SPEED-CONTROL HUMP INSTALLATION

1. The street must be classified as a residential land access street with two traffic lanes and a maximum pavement width of 40 feet
2. The average weekday traffic volumes on the street must be fewer than 1,500 vehicles
3. The speed limit on the street must be 25 miles per hour, and the 85th percentile speed of traffic on the street must be greater than 35 miles per hour
4. The use of speed-control humps should not divert more than 20 percent of the existing traffic volume from the street, or cause a significant increase in traffic volumes on adjacent streets
5. Gradients of the street's vertical alignment must not exceed 5 percent and horizontal curves must have radii equal to or greater than 400 feet

*Source: SEWRPC.*

Map 4

PROPOSED STREET CLOSURE
OF ROBINHOOD DRIVE BETWEEN
HIAWATHA COURT AND LAVERGNE STREET




*Source: SEWRPC.*

average weekday. These diverted vehicles may be expected to use Menomonee Avenue, Appleton Avenue, and Pilgrim Road. Another disadvantage is that the closure of Robinhood Drive would result in an average increase in travel distance of approximately one-half mile for travel by Robinhood Drive residents to destinations north or northwest of Robinhood Drive. Another disadvantage is that those residents of Robinhood Drive who are contributing to the speeding problem may be expected to do so even if the street were closed between Hiawatha Court and Lavergne Street. It is recommended that the closure of Robinhood Drive not be implemented at this time. However, if the speed-control humps prove to be ineffective, then it is recommended that a trial closure of Robinhood Drive be considered for implementation.

The following physical traffic management actions, including those suggested by citizens, were considered but rejected for the control of vehicle speed on Robinhood Drive: 1) speed-control bumps, 2) the extreme narrowing of Robinhood Drive, and 3) the relocation of the intersection of Robinhood Drive and Pilgrim Road 115 feet to the north.

The installation of speed-control bumps on Robinhood drive was considered but rejected. Speed-control bumps are raised sections in the pavement surface extending transversely across the traveled way raised approximately four inches above the pavement surface and normally less than three feet wide. Speed-control bumps differ from the speed-control humps recommended in this memorandum in that they are higher and shorter, catching only the wheels on one end of a vehicle. Their effects on the ride of the vehicle are, therefore, more pronounced than the effects of speed-control humps. Speed-control bumps are not recommended for use by the Manual of Uniform Traffic Control Devices. Such bumps are reported to interfere with winter snow plowing operations, are a hazard to bicyclists and motorcyclists, and can buck firemen riding on the back of fire trucks off the truck. In addition, driver discomfort from traveling over speed-control bumps actually decreases at high speeds. Finally, vehicles crossing a speed-control bump generate noise that may be a problem for residents in the immediate vicinity.

The extreme narrowing of sections of Robinhood Drive to one lane about 13 feet wide was considered but also rejected. This lane would be used by vehicles in both directions, with occasional full width sections for vehicles in opposing direction to pass one another. This configuration increases the possibility of driver error and head-on collisions, and therefore was rejected.

The relocation of the intersection of Robinhood Drive with Pilgrim Road 115 feet to the north was rejected because it would reduce vehicle speeds only on a short segment of Robinhood Drive. In addition, it would require acquisition of additional right-of-way and the relocation of the Holy Cross Evangelical Lutheran Church park-

ing lot. For these reasons and attendant cost, this traffic management alternative was rejected.

Passive Traffic Management Actions

Passive traffic management controls do not physically alter the roadway and thereby affect the operation of vehicles but, rather, influence the driver as the result of reaction to a traffic control device. This type of control is generally not as effective as physical controls. Passive controls can be easily violated, which can result in an increase in traffic accidents.

The following passive traffic management alternatives, including those suggested by citizens, were considered but rejected for the control of vehicle speeds on Robinhood Drive: 1) installation of a midblock "Stop" sign; 2) the installation of "Slow" signs; 3) reduction of the speed limit; and 4) the installation of an access regulation sign stating "Thru Traffic Prohibited." The installation of a midblock "Stop" sign was rejected because good traffic engineering practice dictates that "Stop" signs be used only to assign right-of-way at intersections with significant volumes or safety problems, and not used for speed control. The installation of unwarranted "Stop" signs can result in an increase in traffic accidents as motorists who do see and obey the "Stop" sign become mixed with motorists who do not obey, or do not see, the "Stop" sign. Moreover, studies indicate that motorists tend to increase their speed between unwarranted "Stop" signs to make up the time lost as a result of the stop. Therefore, this traffic management alternative was rejected.

The installation of "Slow" warning signs was rejected because studies have shown this type of sign to have little effect on vehicle speed. The reduction of the speed limit was also rejected because compliance with the present speed limit is not good and there is no reason to believe that a lower speed limit will be observed, thereby reducing present vehicle speeds. The installation of "Thru Traffic Prohibited" signs was rejected because it is not expected to be effective in reducing the traffic on Robinhood Drive, reducing vehicle speeds, or being easily enforced.

Public Reaction to the Study

The findings and recommendations of the traffic engineering study of Robinhood Drive were presented at a public informational meeting held on September 7, 1989, at the Municipal Building in the Village of Menomonee Falls. The purpose of the hearing was to provide interested citizens an opportunity to ask questions about, and provide comments on, the traffic engineering actions proposed to reduce vehicle speeds on Robinhood Drive. Two Robinhood Drive households spoke in favor of implementing either the staff-recommended speed-control hump alternative or the closure of Robinhood Drive immediately west of Hiawatha Court. Most of the approximately one dozen Robinhood Drive households at the meeting objected to the installation of speed-control humps. Several residents expressed concern over: 1) the safety of vehicle passengers, particularly school bus passengers as the speed-control humps are negotiated; and 2) a negative effect on the appearance of the residential area concerned and resultant decline in property values as a result of the warning signing necessary to alert motorists to the presence of the speed-control humps.

Several residents of adjacent streets also attended the meeting and expressed their concern that anything done to improve the Robinhood Drive problem may shift the speeding and through traffic problems to the street on which they live. They also noted that the alternative proposing closure of Robinhood Drive would result in circuitous travel for Lavergne Drive and Tamarack Trail residents. A number of the Robinhood Drive residents also expressed their objections to the alternative proposing closure of Robinhood Drive, citing the resultant circuitous travel to the northwest and west. In addition, some Robinhood Drive citizens noted that some students in Robinhood Drive households receive school bus service and that the proposed closure would, therefore, have a negative impact on school busing. Further, these residents noted that the school district re-opened kindergarten classes at the Thomas Jefferson Center and anticipates the addition of elementary grades one through five in the fall of 1990. The residents suggested that this militated against closing Robinhood Drive, which needed to be kept open as a route for school buses. Lastly, a number of citizens attending the meeting indicated their perception that the speeding problem was the result of through traffic in their neighborhood, which should, instead, be using the arterial streets, specifically, Menomonee Avenue, Appleton Avenue, and Pilgrim Road.

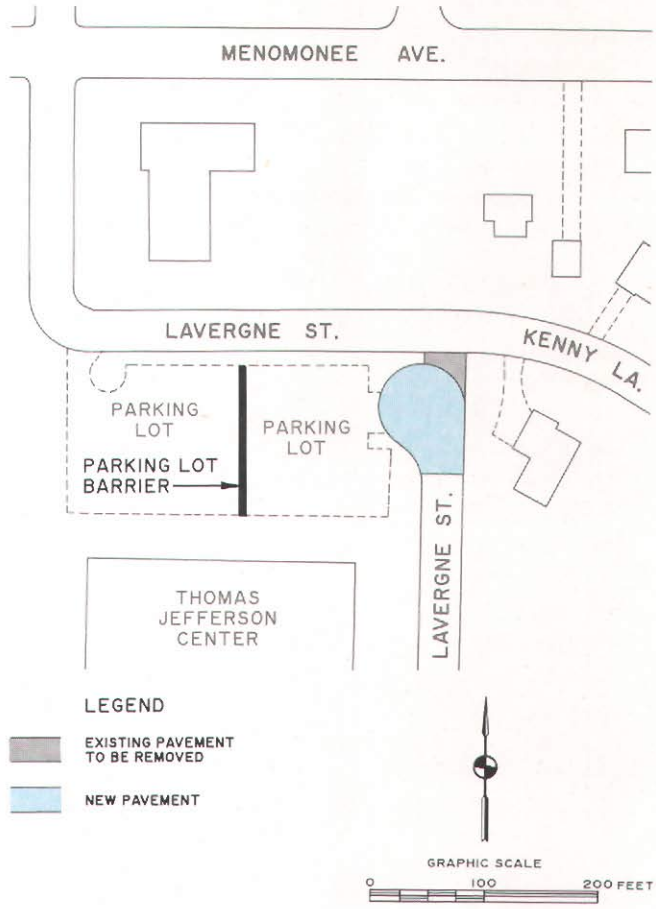
Responding to the citizen comments, the Protection of Persons and Property Committee of the

Village of Menomonee Falls Village Board requested that the Commission staff review and evaluate three additional alternatives; 1) the closure of Lavergne Street immediately south of its intersection with Kenny Lane; 2) limiting the initial number of speed-control humps on Robinhood Drive to three, located approximately midway between the intersections of Lavergne Street with Robinhood Drive and Pilgrim Road with Robinhood Drive; and 3) increased law enforcement on a random basis, not only on Robinhood Drive, but on adjacent streets as well.

The first additional alternative which was proposed by the Village and evaluated by the Commission staff was the closure of Lavergne Street immediately south of Kenny Lane. Like the street closure alternative identified by Commission staff, this alternative may be expected to remove the potential for through traffic to use Robinhood Drive and would have minimal impact on other parallel local streets. A trial closure could be implemented to determine the impact of a closure on Robinhood Drive and other local streets, at an estimated cost of $400. A permanent closure is shown in Map 5 and would have an estimated cost of $10,600, including the construction of a "turn-around" pavement at the end of the cul-de-sac, which Lavergne Street would become, and the barrier curb in the Thomas Jefferson Center parking lot to prevent motorists from accessing Lavergne Street from Kenny Lane via the parking lot. The potential disadvantages of closing Lavergne Street include a modest increase in response time to the area south of the closure for some emergency vehicles, particularly those from Fire Station No. 1. Also, with respect to travel to the north or northwest, residents on Lavergne Street and Tamarack Trail would experience a modest increase in travel time and distance, in addition to those residents on Robinhood Drive and Rainbow Drive similarly inconvenienced by the staff-proposed closure alternative on Robinhood Drive. Another disadvantage of this alternative is that, as with the staff-identified roadway closure, the new closure alternative would not address the problem of residents of Robinhood Drive who may continue to speed. A disadvantage of this alternative, which is not shared by the staff-proposed closure alternative, is that the planned extension of Tamarack Trail from its current terminus to Menomonee Avenue will provide a direct connection to Robinhood Drive and a route for through traffic between Menomonee Avenue and Pilgrim

**Map 5**

**STREET CLOSURE OF LAVERGNE STREET AT KENNY LANE PROPOSED BY CITIZENS**




*Source: SEWRPC.*

Road. Therefore, the Commission staff would recommend that, should the Village select and implement this alternative closure, it be acknowledged that the staff-proposed closure alternative may need to be implemented upon the extension of Tamarack Trail.

The second additional alternative proposed for evaluation was the reduction of the number of speed-control humps recommended for use on Robinhood Drive from seven along the full length of Robinhood Drive to three, located approximately midway between the intersections of Pilgrim Road with Robinhood Drive and Lavergne Street with Robinhood Drive, spaced approximately 300 feet apart. This alternative would provide speed control on a stretch of Robinhood Drive about 800 feet in length in the

immediate vicinity of the speed-control humps, and would reduce the number of speed-control humps and warning signs and markings necessary to alert motorists to the existence and location of the speed-control humps. The disadvantage of using only three speed-control humps located at midblock is that two segments of Robinhood Drive, one on each side of the speed-control humps, nearly 900 feet long would have no speed control. The distance between the speed-control humps and the intersection of Robinhood Drive with Lavergne Street and Robinhood Drive with Pilgrim Road provide an opportunity for motorists to attain the current high vehicle speeds prior to any slowing upon encountering the first speed-control hump. Therefore, the Commission staff recommends that this alternative be rejected.

The third additional alternative to be evaluated by Commission staff was increased law enforcement, totaling about 200 hours per year on Robinhood Drive and adjacent local streets. The advantage of this alternative is the increased motorist compliance with the posted speed limit which may be expected, particularly when a police officer is present. The disadvantages of this alternative include potentially diminished compliance with the speed limit when a police officer is not present. The degree of compliance may be expected to be in direct proportion to the presence of a police officer. Thus, another disadvantage would be the annual cost incurred in achieving compliance. The presence of an officer with a squad car may be expected to cost approximately $30 per hour, with the annual costs of the increased enforcement activity estimated to be $6,000. The Commission staff would recommend that this alternative be implemented if the Village of Menomonee Falls chooses not to implement the installation of the seven speed-control humps or the closures of Lavergne Street or Robinhood Drive.

## SUMMARY

On March 31, 1989, the Village of Menomonee Falls requested that the Commission staff conduct a traffic engineering study of Robinhood Drive in the Village of Menomonee Falls because local residents have become concerned about the excessive speeds of vehicles utilizing Robinhood Drive. This report presents the findings and recommendations of that study.

Traffic volume counts conducted on Robinhood Drive in April 1989 determined that 620 vehicles use Robinhood Drive on an average weekday. It is estimated that 365 vehicle trips of the total 620 vehicle trips on an average weekday on Robinhood Drive are generated by residential and other land uses served by Tamarack Trail and Lavergne Street. The remaining 255 vehicle trips are generated by residences directly abutting Robinhood Drive and the residents adjacent to Robinhood Drive on Hiawatha Court.

A spot speed study was conducted by the Commission on May 3 and 4, 1989, to establish the compliance with the 25 mile per hour posted speed limit. The average travel speed was determined to be 31.6 miles per hour and 30.9 miles per hour for vehicles traveling eastbound and westbound, respectively. The 85th percentile speed, the speed at or below which 85 percent of traffic is traveling, was determined to be 36.3 miles per hour for eastbound Robinhood Drive traffic, and 34.7 miles per hour for westbound traffic. Based on this study, about half of all motorists are traveling at least five miles per hour over the speed limit and 15 percent are traveling at least 10 miles per hour over the speed limit.

To control the speed of vehicles on Robinhood Drive, a number of alternative traffic control measures, categorized into physical and passive actions, were evaluated. Physical actions modify the street or physically affect the vehicle and motorist. Passive actions are those actions that influence the driver as the result of reaction to a traffic control device. Several physical actions were considered and one, the installation of speed-control humps, was recommended to the Village for implementation to control vehicular speeds on the study segment of Robinhood Drive, at an estimated cost of $4,000. The closing of Robinhood Drive between Lavergne Street and Hiawatha Court was recommended for future consideration only if the speed-control humps prove unsatisfactory. The estimated cost of the street closure is $2,700.

Several additional physical traffic management actions were considered but rejected. These included the construction of speed-control bumps, extreme pavement narrowing, and realignment of the Robinhood Drive and Pilgrim Road intersection 115 feet north of its current location. In

addition, several passive actions were considered for implementation but rejected. These included the use of "Stop" signs in midblock, the use of "Slow" signs, lowering the speed limit, and the use of "Thru Traffic Prohibited" signs.

On September 7, 1989, a public informational meeting was held at the Municipal Building in the Village of Menomonee Falls. The meeting provided a forum for citizens to raise questions about, and comment on, the proposed traffic engineering actions recommended for Robinhood Drive. The majority of comments received were opposed to the use of speed-control humps and the closing of Robinhood Drive.

The Village Board's Protection of Persons and Property Committee requested that three additional alternatives which were suggested by citizens at the public informational meeting be evaluated by Commission staff. One alternative suggested was the closure of Lavergne Street immediately south of Kenny Lane. Another alternative suggested was to reduce the number of speed-control humps on Robinhood Drive from seven to three. The final alternative suggested was an increase in law enforcement activity. The Commission staff recommended rejection of the alternative to reduce the number of speed-control humps due to the attendant decrease in effectiveness over the alternative utilizing seven such humps. The Commission staff recommended that, if the Village selected the alternative to close Lavergne Street at Kenny Lane, the Village implement the staff-proposed closure of Robinhood Drive when Tamarack Trail is extended to Menomonee Avenue. Finally, the Commission staff recommended an increase in law enforcement activity if the Village of Menomonee Falls determines that construction of the speed-control humps or, alternatively, a street closure cannot be implemented.