TRAFFIC ASSESSMENT
TOWN OF CHEVY CHASE
CHEVY CHASE, MARYLAND

Prepared For:

Town of Chevy Chase

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CONTENTS

PAGE

EXHIBITS

APPENDICES

A DATA FROM PRIOR STUDIES

B COMPILATION OF SITE SPECIFIC STUDIES

EXECUTIVE SUMMARY

In response to continuing comments and concerns about a variety of traffic related issues within the community, the Town of Chevy Chase retained Street Traffic Studies, Ltd. (STS LTD) in May 2001 to review and evaluate current conditions. The general objective of this work was to develop a series of recommendations, the overall effect of which would be to produce better compliance with existing traffic regulations and a safer, more pedestrian friendly community.

The study began with a review of an earlier study prepared in 1979 by Barton-Aschman Associates. The principal result of this study was to produce a plan that blocked "cut-thru" traffic by installing "diverters" that forced use of alternate routes by anyone who wanted to use town streets as a short-cut between Wisconsin and Connecticut Avenues, the north/south state arterial highways that bracket the town. This earlier study was completed prior to the town assuming control of Leland Street from the state, closing Willow Lane, diverting traffic around the Elm Street Park and establishing many of the peak period entry controls that now exist. Other useful information garnered from this study was a snapshot of traffic flows on several streets in the town that could be compared with current conditions.

The next significant study that the town commissioned was one in which volunteers recorded the license plate numbers of vehicles entering and leaving the town at its borders between 4:30 and 5:30 p.m. in 1993. The consultant for this work (Dr. Everett Carter) then took the raw data, matched the numbers and provided a report establishing the number of vehicles crossing the town from one border to the other. The study was repeated about seven years later and suggested that the amount of cut-thru traffic had increased. However, since the time period studied was different (5:30 to 6:30 p.m.), ending after the expiration of the entry restrictions, the study results were inconclusive.

In the early stages of the current study it was suggested that it would be useful to hold a town meeting that would allow the residents to express their concerns in a public forum. The town meeting was scheduled for early July 2001 and produced a number of useful comments about traffic conditions in the town. The thrust of these comments was that excessive speed and ignoring posted regulations

were more critical issues than cut-thru traffic. In the words of some residents, the volume of traffic was something that could be tolerated provided means were found to produce more uniform adherence to speed limits and greater respect for the regulations already in place. If these goals could be achieved, then it was opined that the opportunity to save time by using town streets to bypass congested external arterial streets would be reduced.

With the above information as background, STS LTD set up a program of data collection that was carried out during October and November 2001. Both manual turning movement intersection counts and automatic traffic recorder counts at mid-block locations were conducted. The latter also included recording the speed of traffic at the mid-block locations. These data then provided a basis to develop recommendations in accordance with standard guidelines published by the Institute of Transportation Engineers and local adaptations of these guidelines by nearby jurisdictions, namely Montgomery and Howard counties.

Unlike many of the traffic studies prepared in the region, this is not a typical "traffic impact study". Such studies are directed at identifying the magnitude of trips generated by a specific use and then developing recommendations to mitigate the impact. In this case the thrust of the study is to develop measure that will assure adequate access, circulation, and adherence to established traffic controls within the town boundaries.

Based on this overall goal, the principal scope of services that were undertaken are as follows:

- Field inspections of the area to collect physical information on existing traffic controls, geometric configurations, and other roadway characteristics.

- Weekday peak period turning movement counts at numerous intersections. The hours covered by these counts were 7:00 to 9:00 a.m. and 4:00 to 7:00 p.m. so as to include at least one hour of data after the entry restrictions expired.

- Automatic Traffic Recorder counts over four weekdays and Saturday along two "screen

lines" to provide an overview of volume and speed of traffic in the town.

- Meetings with the Town Council, the Town Traffic Committee and residents to review the status of current programs, facilities, and to identify areas of concern.

The results of these efforts have culminated in the development of a "traffic calming" plan that is expected to limit traffic on town streets to current levels thus reducing the impact of future development in the commercial areas that border the town to the west. In addition, the plan seeks to increase adherence to existing traffic controls and regulations and to propose modifications where appropriate.

As the reader reviews the proposals it is important to recognize the fact that the streets in the town are already relatively narrow limiting the use of many of the traffic calming measures that one may see in other jurisdictions. Many measures developed to calm traffic are aimed at actual, or psychological, reductions in street width to slow the speed of traffic. In the Town of Chevy Chase, streets are already narrow and are made more narrow by the on-street parking that is permitted. Therefore, the thrust of the plan is to use traffic circles, raised intersections and speed humps to achieve a more uniform traffic speed among residents and to discourage non-residents from finding shortcuts via town streets. Further, the collective experience of the traffic engineering profession is that "gimmicky" signs and devices loose their effectiveness once the novelty has expired in the public mind. Additionally, residents believe the signs *do not apply* to them, thus exacerbating the conditions which are being addressed. Lastly, from the perspective of non-residents, they neither recognize nor understand such devices. The result can be either non-compliance with the intent of the device, or worse, an erroneous response that causes an unintended consequence.

The report that follows outlines in greater detail the data collection that was undertaken and its relationship to historical information, the various traffic calming measures that were considered and the measures that were selected for the plan that is presented herein.

DATA COLLECTION RESULTS & COMPARISONS

Traffic studies and the associated programs of data collection have a long history in the Town of Chevy Chase. The first such study of which the current consultant is aware was done in 1979 by the firm of Barton-Aschman Associates. Later in this section there will be comparisons made between conditions that were observed at that time with those that were observed in the past two years. In 1993 and again in 2000, Dr. Everett Carter supervised the collection of license plate data that was used to evaluate the amount of traffic using town streets that had neither an origin nor a destination within the town (the "cut-thru" traffic issue). Also in 2000, town officials decided that there was a need to secure traffic count data through an outside contractor at two locations on Leland Street (the 4200 and 4400 blocks) and on Aspen Street (4100 block) where residents had raised concerns about the amount of traffic using these streets. In addition to volume data the contractor also provided information on the speed pattern for vehicles passing these three locations. The information derived from the Carter study and the volume counts led to the decision to undertake a more comprehensive analysis which, in turn, led to the study proposals set forth in this report.

After the initial discussions with town officials and the town meeting in July, a program of data collection was set up to provide insight into the issues that were being raised by the residents of the town. Two basic types of data collection were agreed upon and programmed to be undertaken in October and November 2001. The first type was designed to provide an understanding of the patterns of trips through key intersections in the town. The second was to provide an overview of the usage of various streets on a daily basis and to determine the speed patterns on selected streets.

Manual Turning Movement Counts

Intersection traffic patterns are determined by conducting manual turning movement counts. The intent of such counts is to determine the direction of movement of each vehicle that enters an intersection during the hours of observation. These counts were conducted during the hours of higher traffic flow, specifically between the hours of 7:00 to 9:00 a.m and 4:00 to 7:00 p.m. at eighteen (18) locations throughout the town. The locations selected and the results derived from

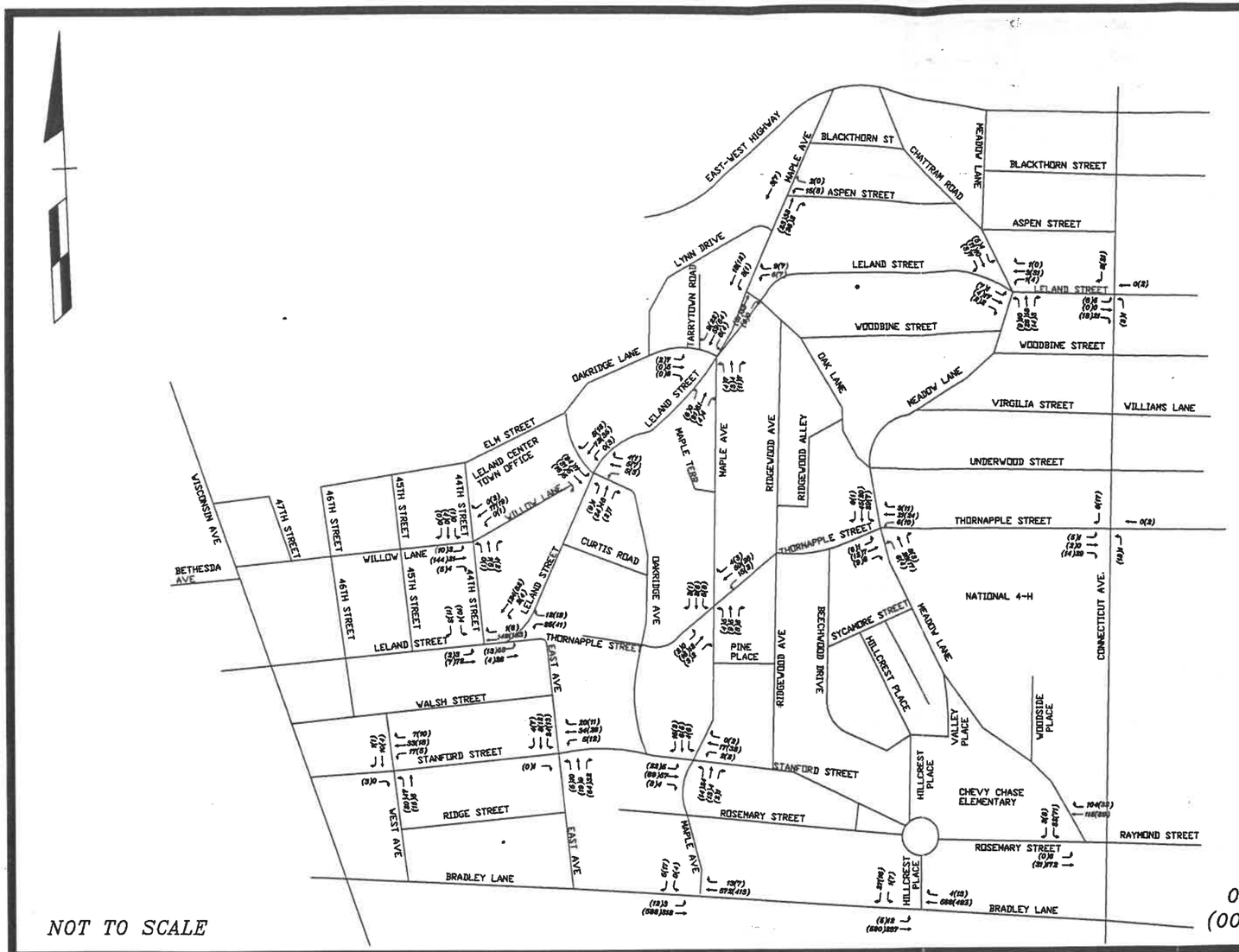
these counts are shown in Exhibit 1. None of these locations were found to have sufficient flow to qualify as a "congested" intersection.

Other observations that were drawn from a review of the intersection counts include a) traffic through the Leland Center parking lot is as high as any principal street within the town limits, b) entry restrictions are being violated at the intersections along Bradley Boulevard, and c) there are additional entry violations around Rosemary Circle.

Automatic Traffic Recorder Counts

The automatic traffic recorder (ATR) counts are intended to provide an overall understanding of the usage of the various streets in the town. To provide a systematic basis for this assessment two imaginary lines were drawn across the town. These lines, referred to as "screen lines" were drawn so as to provide insight into the north/south flow of traffic crossing an east/west screen line and the east/west flows crossing a north/south screen line. But conducting ATR counts for five day periods from Tuesday through Saturday it was possible to determine the use of each of the streets crossed by the screen line and the relative use of each street compared to the others crossed by the same line. The results derived from this study are shown in Exhibit 2.

In addition to the volume of traffic on each street crossed by the screen line, the speed of vehicles at the screen line was also determined. This data provides an overview of how travel speeds vary throughout the town and identified areas where speeds are higher relative to other areas of the town. This compilation of speed data throughout the town also demonstrates that the "85th percentile" speed of traffic in general ranges between 25 and 30 mph. This is the speed at or below which 85% of all the vehicles observed were traveling. It is also the speed at which traffic engineers try to establish speed limits so that enforcement can concentrate on the 15% that are traveling too fast for conditions. The 85th percentile speed at each count site is also shown in Exhibit 2.



NOT TO SCALE

00-MORNING PEAK HOUR
(00)-EVENING PEAK HOUR

STREET TRAFFIC STUDIES, LTD.

Exhibit 1

Existing Peak Hour Traffic Volumes

TOWN OF CHEVY CHASE - TRAFFIC DATA

Screenline Crossings

Note: Traffic data were collected using Automatic Traffic Recorders (ATRs) along an East/West and a North/South line running through the Town. The following tabulation shows the average number of daily vehicle trips on each of the streets along each of the two screenlines.

North/South Screenline

Streets	85th Percentile Speed - All Traffic	Direction of Flow	Average Daily Weekday Traffic	Percent of Total Crossings	Saturday Traffic	Percent of Total Crossings
Maple Avenue (7600 Block)	25 MPH	Eastbound	740	30%	645	44%
		Westbound	321	14%	226	12%
		Total	1061	22%	871	25%
Leland Street (4100 Block)	26 MPH	Eastbound	406	16%	110	7%
		Westbound	470	21%	420	22%
		Total	876	19%	530	15%
Woodbine Street (4100 Block)	26 MPH	Eastbound	155	6%	102	7%
		Westbound	112	5%	86	4%
		Total	267	6%	188	5%
Oak Lane (7400 Block)	30 MPH	Eastbound	235	9%	165	11%
		Westbound	366	16%	325	17%
		Total	601	13%	490	14%
Thornapple Street (4100 Block)	32 MPH	Eastbound	460	18%	218	15%
		Westbound	312	14%	284	15%
		Total	772	16%	502	15%
Stanford Street (4100 Block)	31 MPH	Eastbound	334	13%	129	9%
		Westbound	487	22%	453	23%
		Total	821	17%	582	17%
Rosemary Street (4100 Block)	32 MPH	Eastbound	173	7%	112	8%
		Westbound	154	7%	157	8%
		Total	327	7%	269	8%
All Streets Combined		Eastbound	2503	100%	1481	100%
		Westbound	2221	100%	1951	100%
		Total	4723	100%	3432	100%

East/West Screenline

Streets	85th Percentile Speed - All Traffic	Direction of Flow	Average Daily Weekday Traffic	Percent of Total Crossings	Saturday Traffic	Percent of Total Crossings
Elm Street (4300 Block)	28 MPH	Southbound	276	13%	256	12%
		Northbound	One-way		Southbound	
		Total	276	6%	256	6%
Willow Lane (4300 Block)	28 MPH	Southbound	309	15%	301	14%
		Northbound	406	18%	321	17%
		Total	715	16%	622	16%
Leland Street (4300 Block)	25 MPH	Southbound	883	41%	917	44%
		Northbound	981	43%	896	48%
		Total	1864	42%	1813	46%
Oakridge Avenue (7100 Block)	29 MPH	Southbound	232	11%	223	11%
		Northbound	184	8%	79	4%
		Total	416	9%	302	8%
Maple Avenue (7300 Block)	29 MPH	Southbound	141	7%	102	5%
		Northbound	224	10%	142	8%
		Total	365	8%	244	6%
Ridgewood Ave. (7400 Block)	27 MPH	Southbound	74	3%	73	3%
		Northbound	117	5%	132	7%
		Total	191	4%	205	5%
Meadow Lane (7200 Block)	26 MPH	Southbound	214	10%	234	11%
		Northbound	348	15%	302	16%
		Total	562	13%	536	13%
All Streets Combined		Southbound	2129	100%	2106	100%
		Northbound	2259	100%	1872	100%
		Total	4388	100%	3978	100%

Source: Automatic Traffic Recorder (ATR) counts by Vehicle Volume Recording Company, Gaithersburg, Maryland

Comparisons With Prior Studies

The 1979 Barton-Aschman study collected ATR volume data at three locations, two on Leland Street and one on Rosemary Street. The two locations on Leland Street were also the sites at which data were collected in 2000 and 2001. The comparison of conditions then with those now, shown in Exhibits 3, 4 and 5 indicate that the transfer of control of Leland Street from the state to the town and the entry controls imposed by the town have produced a significant reduction in total traffic using this street.

A new count on the link of Rosemary Street studied in 1979 was not included in the current study. However, data collected by the town in 1998 are plotted for a comparison in Exhibit 5.

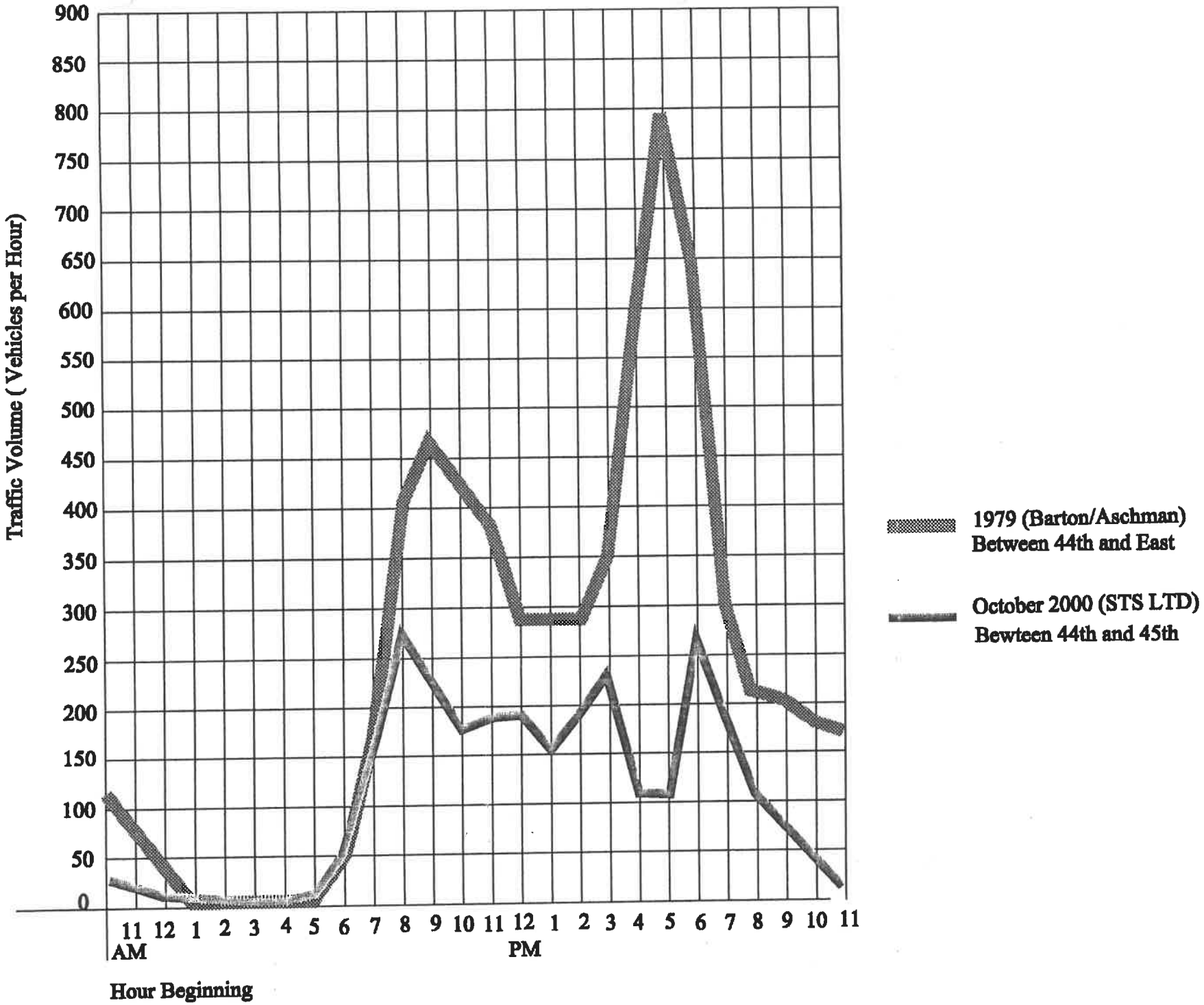
Other comparative data between the studies by Dr. Carter and the 1979 report are included in Appendix A.

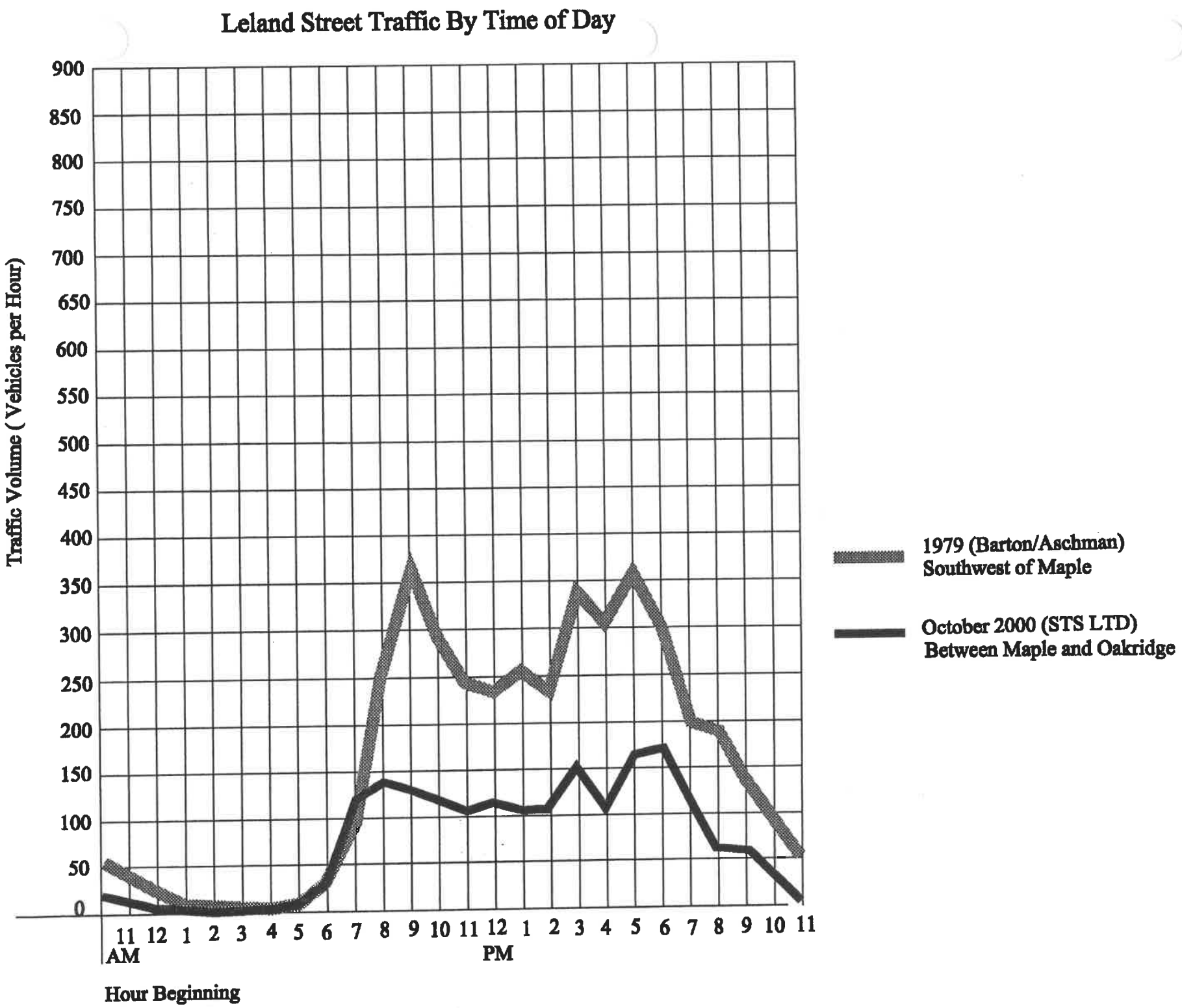
Existing Traffic Controls

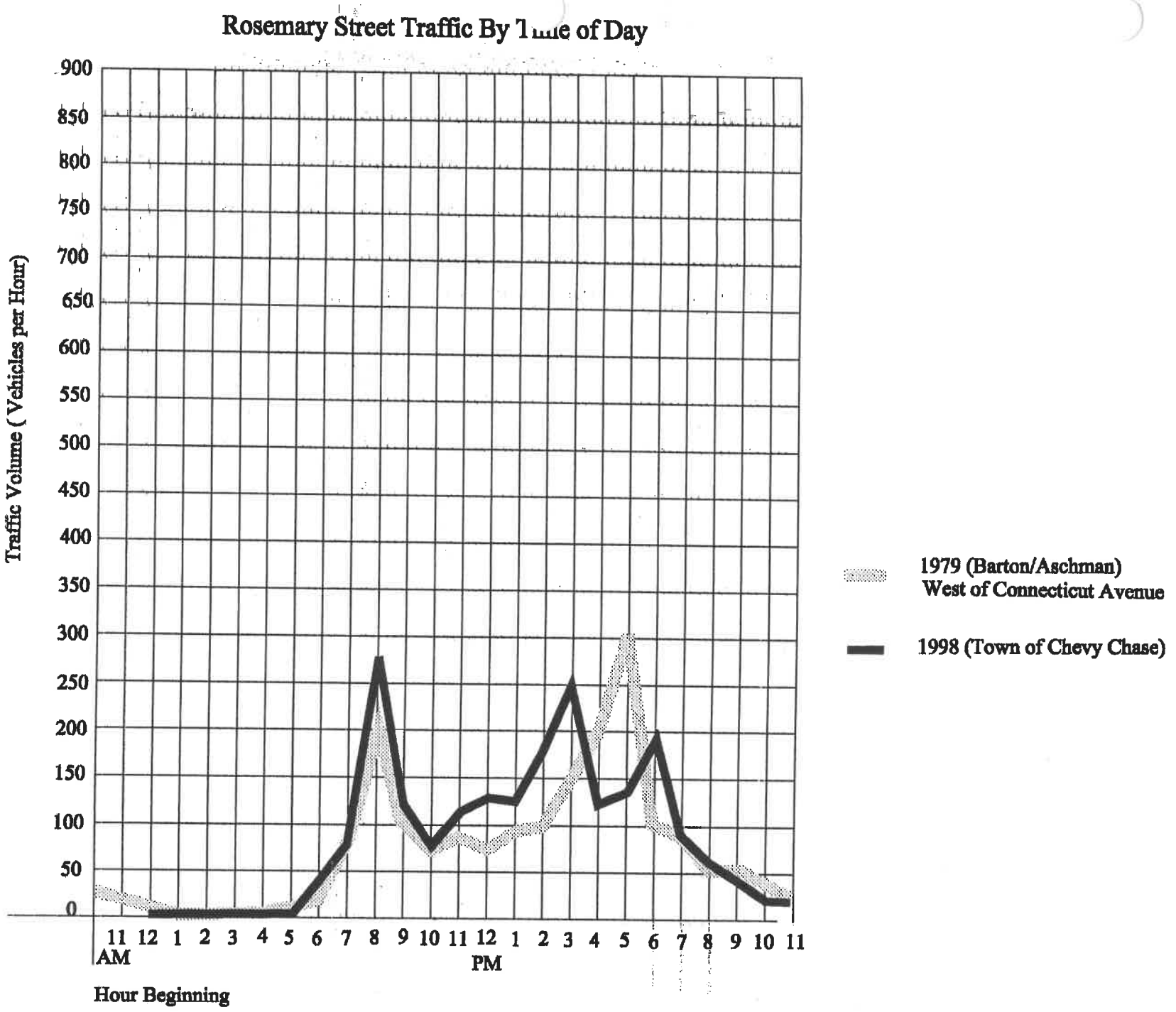
In addition to the measurements of traffic flow described above, a survey was made of existing traffic controls. The survey was based on both field observations and records provided by the town. A series of illustrations follow showing the different types of current traffic control measures.

STOP Sign Controlled Intersections - Exhibit 6 shows the locations that are currently controlled with STOP signs. A general observation is that this type of control has been overused. One consequence of excessive use of a traffic control measure such as STOP signs is that the level of observance by drivers decreases and the difficulty of enforcement increases. Once other measures proposed in this study have been implemented, it would be appropriate to review the current controls to determine if modifications should be made.

Leland Street Traffic By Time of Day




Leland Street Traffic By Time of Day
Traffic Volume (Vehicles per Hour)
900
850
800
750
700
650
600
550
500
450
400
350
300
250
200
150
100
50
0
11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11
AM
PM
Hour Beginning
1979 (Barton/Aschman)
Southwest of Maple
October 2000 (STS LTD)
Between Maple and Oakridge


Rosemary Street Traffic By Time of Day
Traffic Volume (Vehicles per Hour)
900
850
800
750
700
650
600
550
500
450
400
350
300
250
200
150
100
50
0
11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11
AM
PM
Hour Beginning
1979 (Barton/Aschman)
West of Connecticut Avenue
1998 (Town of Chevy Chase)

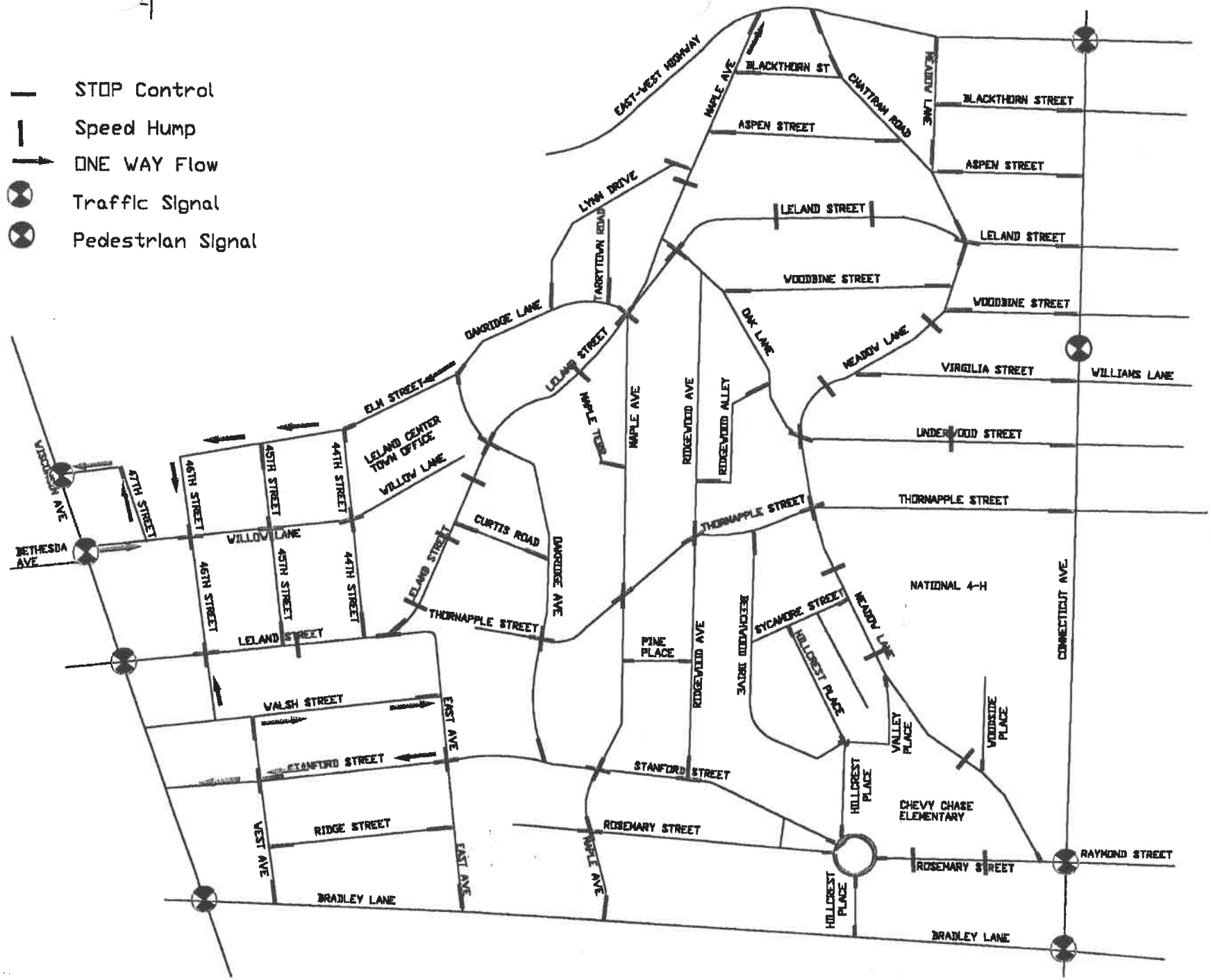
Speed Control Humps - Exhibit 6 shows the location of Speed Humps that have been installed to regulate traffic flow. During the course of the study many of the existing humps were increased in height from a range of 3 to 3 ½ inches to 4 inches. This height has the effect of reducing speeds at the spot location of the higher hump. However, experience with speed humps in Montgomery County and elsewhere suggests that a "table-top" design placed at intervals along a street produces a more uniform traffic flow with a narrower speed range. When the speed range is compressed there is less likelihood of excessive speed by a few motorists and less of a need to try to enforce an unrealistically low limit.

Peak Period Entry Controls - Exhibit 7 shows the locations that are posted with controls to restrict entry during the peak periods of traffic flow. These controls apply to residents and non-residents alike. The intent of the controls is to deter non-residents from entering the town and using town streets to bypass the congested state arterial streets on the town borders. The comparisons of traffic volume data described above illustrate that the controls have been effective. However, one consequence of the controls is that residents living along the bordering state arterial roads are unable to enter the town to visit or conduct business during the restricted hours. However, as shown in Exhibit 1, traffic is entering Maple Avenue during the peak hours in violation of the entry restrictions.

Other Qualitative Observations

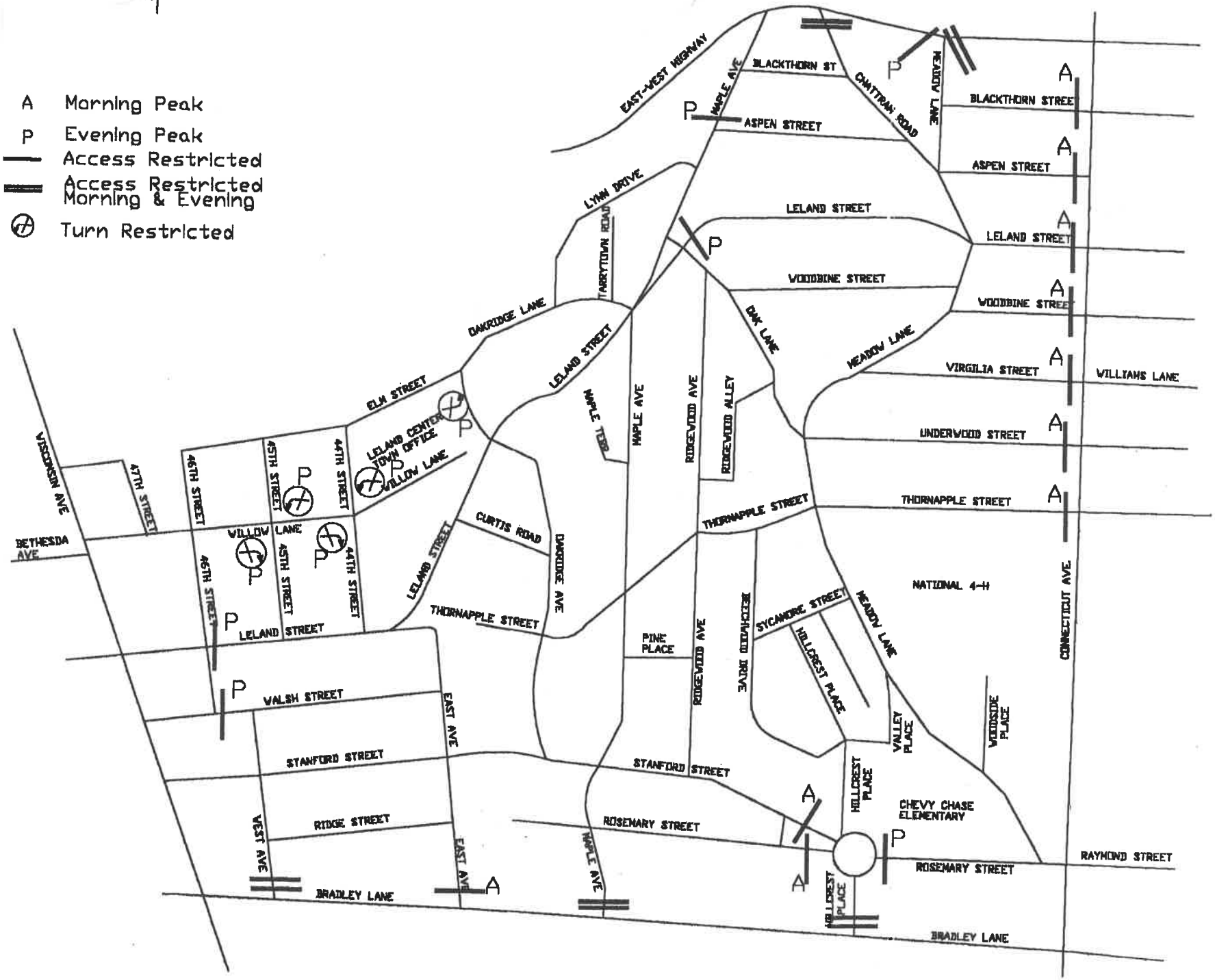
The consultant team has spent many hours circulating through the town and has at sometime in the past nine months traveled on almost every street. Some of the conditions that have been observed are discussed briefly below.

Town Hall Parking Lot - The regulations that have been adopted to restrict entry into the town during peak traffic periods have produced what can best be described as an unintended consequence relative to the Town Hall parking lot. The entry controls limit access to the town from the west to Willow Lane. However, as a part of a prior program to regulate traffic, Willow Lane was dead-ended at Leland Street. Thus, trips that enter the town on Willow Lane use the Town Hall parking lot as a street producing conflicts among a variety of users of this parking lot and traffic cutting through



EXISTING INTERNAL TRAFFIC CONTROLS (FULL TIME)

4



EXISTING PEAK PERIOD TRAFFIC CONTROLS

the lot. From the consultants perspective this is an undesirable condition that needs to be corrected.

Street Parking - The street is the only parking resource for many residents. However, many of the streets are too narrow to maintain both two-way traffic and parking on both sides. For the more lightly traveled streets this is not a serious issue, provided visibility is not restricted by hill crests and horizontal curvature along the street. On the other hand, some of the streets where this condition exists are more heavily traveled because of peculiarities in the street network and the hilly terrain. On these streets there is the potential for head-on conflicts which could result in accidents.

TRAFFIC CALMING

Traffic Calming is the combination of physical measures which reduce the adverse impacts of vehicles traversing a neighborhood, and effect driver behavior to improve the overall experience for pedestrians and residents. They are often structured around the three "E's" - Education, Enforcement and Engineering. Typically, these begin with a citizen request for a traffic safety campaign, followed by a Speed Watch program, and lastly installation of engineering measures to enforce restrictions. We have focused on engineering measures, because when properly designed, experience in other areas in Montgomery County has demonstrated that they reduce speeds and cut-thru traffic.

Following is a brief description of traffic calming goals and objectives, and methods to achieve reductions in speed and volumes within subdivisions throughout the United States.

Goals

The goals of traffic calming are to:

- Increase the quality of life for residents and guests
- Create safer environments
- Reduce vehicular impacts; e.g., pollution, and sprawl
- Promote pedestrians and bicycle use

Objectives

The objectives are as follows:

- Reduce vehicular speeds and accidents
- Reduce the need for police enforcement
- Enhance the street environment through street scaping
- Reduce cut-thru traffic

Typical Measures/Options

The typical measures used in traffic calming include the following:

Speed Humps - A raised area of pavement placed perpendicular to the direction of travel to slow traffic and enhance awareness of pedestrians. Speed Humps can be fixed (permanent) or movable, movable humps are costly versus permanent humps. Each are used to compress the range of speeds; i.e., reduce the number of vehicles traveling greater than the normal speed of traffic.

Chokers - Obstructions and/or curb modifications placed to reduce the available pavement width on a roadway in order to reduce the rate of travel (speed)

Chicanes - Obstructions and/or curb modifications placed to reduce the available pavement width on a roadway in order to reduce the rate of travel (speed)

Traffic Circles - Used to slow or divert traffic within a neighborhood. Increases safety for pedestrians and reduces occurrence of speeding. Reduces delay and inconvenience as compared to STOP signs

Raised Intersections - Flat raised area covering an entire intersection, often with brick or other textured material

Diagonal diverters - Barriers placed in a diagonal fashion across an intersection to block traffic

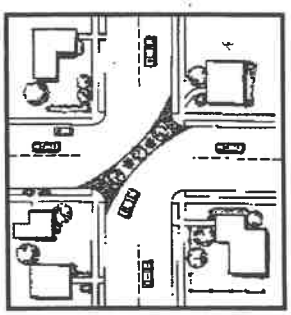
Median barrier - Raised islands in the centerline of a street to block access to a cross street, thereby closing access to the main roadway

Full closure - Barriers placed perpendicular to the direction of travel to completely block traffic along a street. Sometimes called cul-de-sacs or dead-ends.

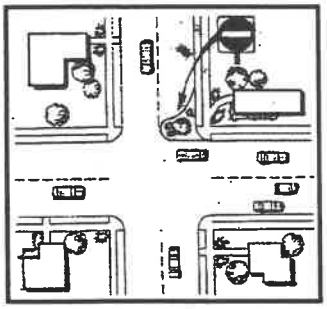
Exhibits 8 and 8A presents a graphical illustration of the various devices described above.

The desire for area wide traffic calming is clear from responses of town residents. The need for a clear plan focused on the entire Town will be required to reduce the occurrence of speeding, increased volumes and cut-thru traffic. Following is a more detailed discussion of the measures chosen to "calm" traffic within the town limits.

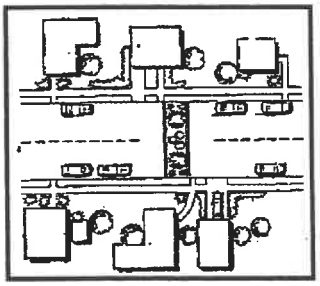
Diagonal diverters are barriers placed diagonally across an intersection, blocking through movement; they are sometimes called full diverters or diagonal road closures



Half closures are barriers that block travel in one direction for a short distance on otherwise two-way streets; they are sometimes called partial closures, entrance barriers, or one-way closures (when two half-closures are placed across from one another at an intersection, the result is a semi-diverter)



Full-street closures are barriers placed across a street to completely close the street to through-traffic, usually leaving only sidewalks open; they are sometimes called cul-de-sacs or dead-ends



Median barriers are raised islands in the centerline of a street and continuing through an intersection that block the left turn movement from all intersection approaches and the through movement at the cross street

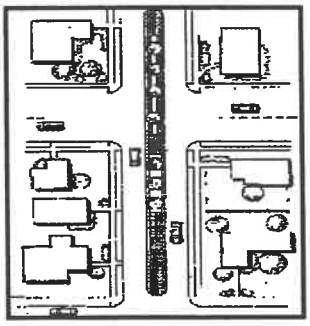
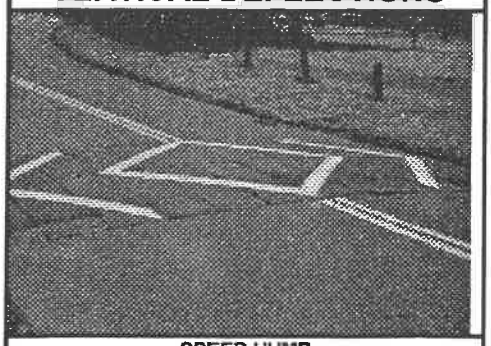
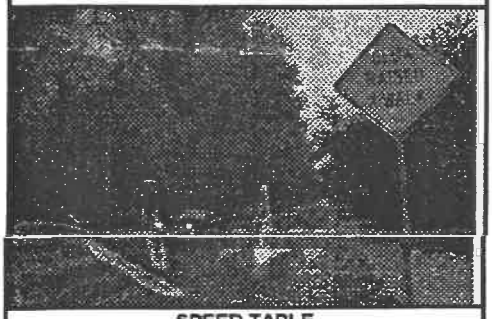


Exhibit 8
Typical Calming Measures

VERTICAL DEFLECTIONS



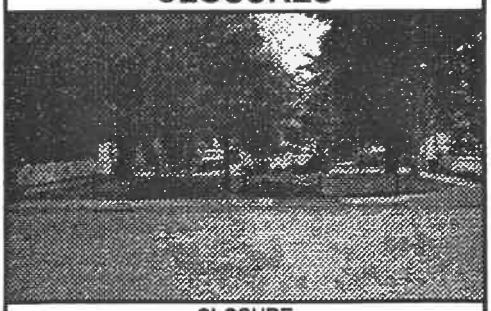
SPEED HUMP



SPEED TABLE

RAISED INTERSECTION

CLOSURES



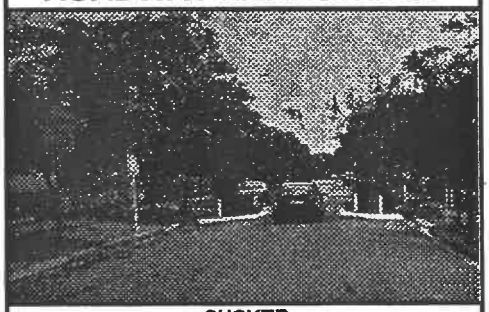
CLOSURE

HORIZONTAL SHIFTS

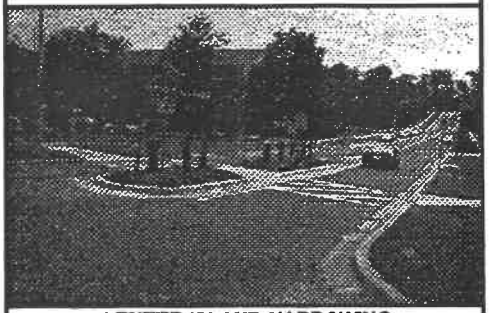
NEIGHBORHOOD TRAFFIC CIRCLE

CHICANE

ROADWAY NARROWINGS



CHOKER



CENTER ISLAND NARROWING

Exhibit 8A
Typical Calming Measures

STS
STREET TRAFFIC STUDIES, LTD.

MEASURES CHOSEN FOR CHEVY CHASE

It is important to recognize that the relatively narrow streets in the town limits the use of many of the traffic calming measures that one may see in other jurisdictions. Many measures developed to calm traffic are aimed at actual, or psychological, reductions in street width to slow the speed of traffic. In the Town of Chevy Chase streets are already narrow and are made more narrow by the street parking that is permitted. Therefore, the thrust of the plan is to use traffic circles, raised intersections and speed humps to achieve a more uniform traffic speed among residents and to discourage non-residents from finding shortcuts via town streets. Further, the collective experience of the traffic engineering profession is that "gimmicky" signs and devices loose their effectiveness once the novelty has expired in the public mind. Also, from the perspective of non-residents, they neither recognize nor understand such devices. The result can be either non-compliance with the intent of the device, or worse, an erroneous response that causes an unintended consequence. Following is a discussion of the experience of local jurisdictions with the measures chosen.

Speed Humps

Speed humps have been established as an effective tool in the realm of traffic calming. They are typically used on Local streets of not more than 40 feet in width. Horizontal and vertical curvature must be such that adequate Stopping Sight Distance is provided. Typically, posted speed limits are 30 mph or less, and the routes on which they are located are *not* primary emergency response or bus routes. Below is information which discusses impacts to emergency and rescue equipment, as well as current use practices.

Impact to Fire and Rescue Vehicle Response

Speed Humps were analyzed to determine the impact of humps on Emergency Fire & Rescue equipment within Montgomery County. The analysis was conducted by staff of the Montgomery County Departments of Fire and Rescue Services and Public Works and Transportation. The results of the tests confirmed that both the "Watts" style of Speed Hump, the design currently used in the

Town of Chevy Chase, and Traffic Circles cause delays to fire/rescue vehicles en route to incidents.

During the test travel time runs, drivers were attempting to maintain a constant speed of 25 miles per hour (mph). The average delay per hump was found to range from 2.8 to 7.3 seconds, dependent on the type of vehicle. Overall, the test vehicles averaged 20 mph over the test route, about one half of the desired cruise speed of 35 - 40 mph. The desirable cruising speed is directly related to the service area. The typical service area is 2 linear miles or 16 square miles. The impact of speed humps reduces the service area to 1.3 miles or 6.8 square miles.

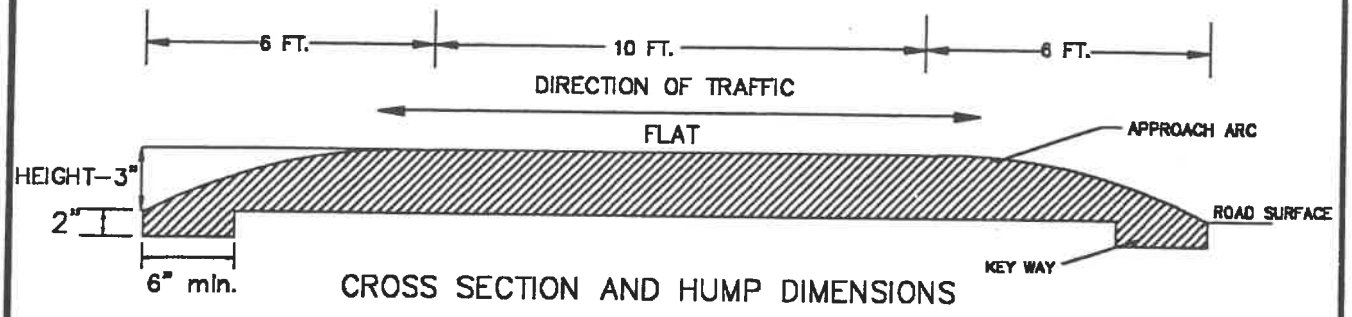
The results of the tests, in concert with results obtained in Portland, Washington and Austin, Texas confirm that speed humps and traffic circles cause delays for fire/rescue apparatus. These delays may adversely impact the outcome of certain life-threatening incidents. Thus, installation of these devices requires a willingness to accept the probability of slower response times.

It is important to note that the "Flat Top" speed hump design is believed to have a somewhat lesser impact on fire/rescue response times than do the parabolic shaped Watts style hump.

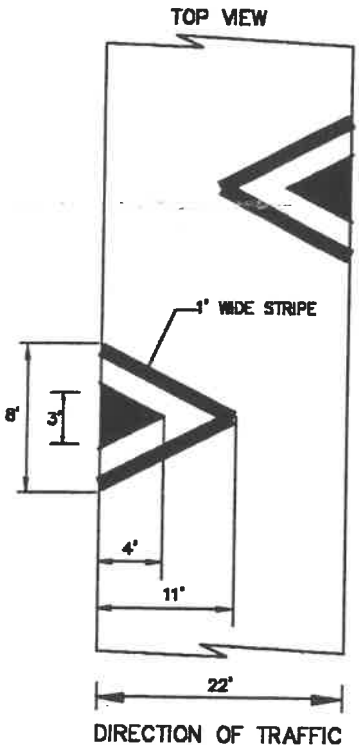
Standards/Size

The Montgomery County Department of Public Works and Transportation (MCDPWT) has recently approved a new standard for Speed Humps, the 22 foot Flat Top hump. A schematic illustration of this hump is shown in Exhibit 9.

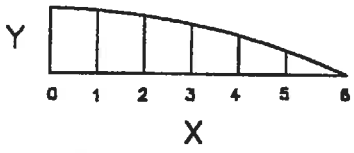
Considerable time and effort was expended to derive the current standard. Speed Humps have been used within the County for approximately 5 years. Since their inception, there have been numerous debates regarding their design, and in particular, their height. It was determined via tests by the Department of Fire and Rescue Services, and complaints from County residents that a 4" height was not desirable. Studies by the Institute of Transportation Engineers (ITE) have resulted in a height standard between 3 and 3.5". The current standard has been proven to be more effective in maintaining speeds between humps as opposed to shorter, higher humps which tend to promote



CROSS SECTION AND HUMP DIMENSIONS

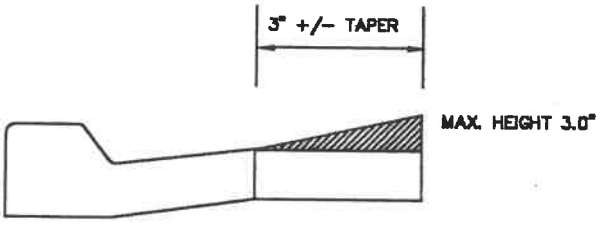


NOTE: MARKINGS TO ALIGN WITH CENTER OF TRAVEL LANE

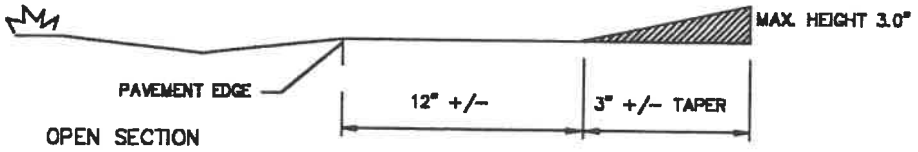


APPROACH ARC DETAIL

X(ft.)	Y(ft.)	Y(inches)
0	0.25	3.0
1	0.24	2.9
2	0.22	2.6
3	0.19	2.3
4	0.14	1.7
5	0.10	0.9
6	0.00	0.0



CLOSED SECTION



OPEN SECTION

GENERAL NOTES

1. THIS STANDARD MAY BE USED ONLY WITH THE PRIOR APPROVAL OF DPWT OR DPS.
2. SIGNING AND MARKING TO BE IN ACCORDANCE WITH APPLICABLE DPWT STANDARD.
3. MODIFY MARKINGS AS NECESSARY FOR ONE WAY STREETS.

APPROVED _____ DATE	REVISED	MONTGOMERY COUNTY DEPT. OF PUBLIC WORKS & TRANSPORTATION
DIRECTOR, DEPT. OF P.W.&T.		SPEED HUMP FLAT TOP PROFILE
CHIEF, DIV. OF ENG. SERVICES		STANDARD NO.

acceleration and deceleration between humps. The desired effect is a uniform speed along a road section. Experience has shown that the longer humps, used in a series, do a better job of encouraging more motorists to travel at a uniform speed.

Signing and Marking

The current trend for marking Speed Humps is to install white chevrons on the hump via paint or retro reflective tape (see Exhibit 9). The chevron is placed with the narrowest part in the direction of travel. The use of the chevron alerts a motorist of a raised object in the travel path and differentiates a hump from a raised crosswalk. In addition to markings, signing should also be placed in advance of and adjacent to a hump. Typical signing is illustrated in Exhibit 10.

Effectiveness

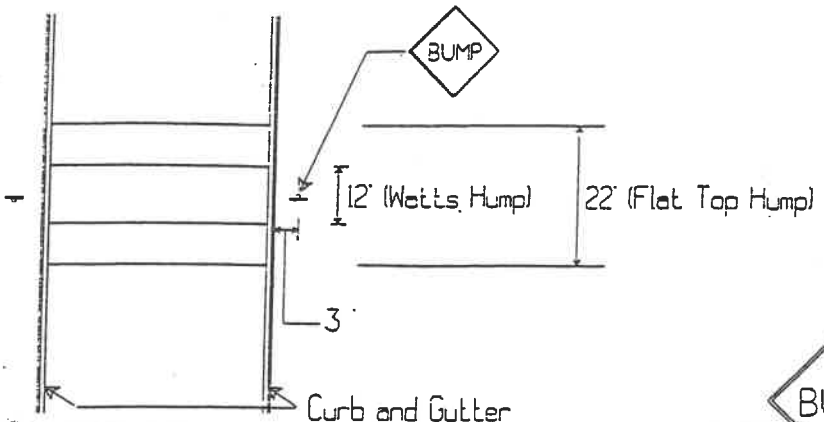
The most effective use of speed humps to "calm" traffic and reduce speeds is placement. That is, speed humps placed in a series have the effect of slowing travel speeds, because there is less opportunity to increase speed between humps.

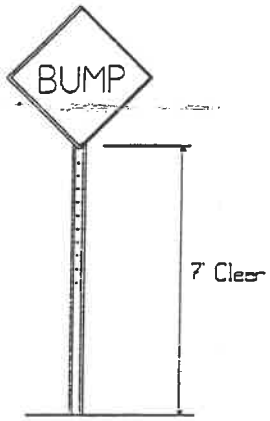
Spacing and Warrants

Spacing criteria vary from 150 feet to 800 feet throughout the Country. The local jurisdictions of Howard and Montgomery County have established spacing in the 400 - 600 feet range. This spacing provides for reduced speeds and effective calming of cut-thru traffic.

To determine the feasibility of installing a hump, STS LTD reviewed the Town of Chevy Chase Speed Hump Specifications and the Institute of Transportation Engineers (ITE) publication *Traffic Calming: State of the Practice*. Additionally, STS LTD also reviewed Montgomery County Guidelines for installation of humps. In general, all three documents specify a spacing criteria of 200 - 600 feet apart, but not within 200 feet of a traffic control devise; e.g., a STOP sign.

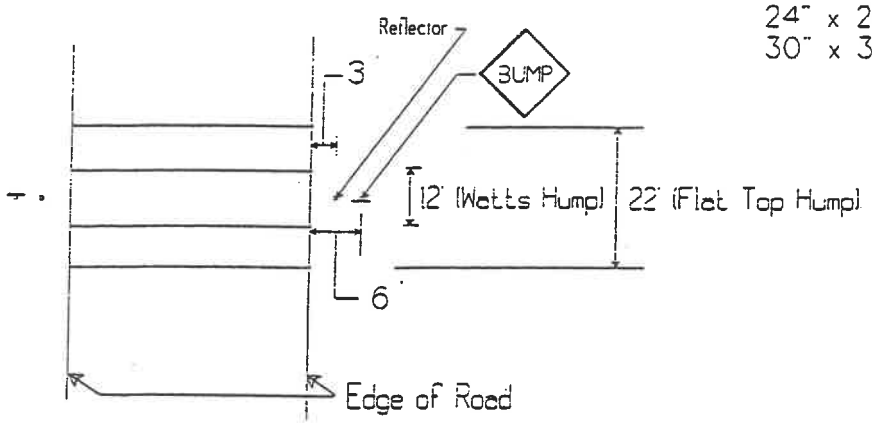
CLOSED SECTION





24" x 24" - 11' u-post
30" x 30" - 12' u-post

OPEN SECTION



NOTES:

* Bump Sign to be installed within limits of bump.

NUMBER	REVISION	DATE	APP'D

DATE 01/25/96

DES. BY EG

DRAWN BY EG

SCALE NONE

DIVISION OF TRAFFIC AND PARKING SERVICES
DEPARTMENT OF TRANSPORTATION
MONTGOMERY COUNTY, MARYLAND

BUMP SIGN INSTALLATION (TYPICAL)

APPROVED [signature] 1-25-96
CHIEF, TRAFFIC OPERATIONS SECTION

DRWG NO ____ of ____ SHEETS

In addition, Montgomery County policy indicates that Speed Humps are warranted for the following conditions

Criteria	Warrant
Minimum Volume	100 vph
Minimum 85th Percentile Speed Secondary Road Primary Road	 32 mph (+7 above posted) 34 or 39 mph (+9 above posted)
Minimum length of section	1000 feet
Resident Concurrence	80% on treated Street 50% on affected side streets

Traffic Circles

Traffic Circles are raised islands placed in an intersection, around which traffic circulates. Motorists entering the circle are required to yield the right-of-way to traffic already in the circle. They force drivers to slow, but may not require a full STOP. Traffic circles are different from round-abouts in that they do not increase capacity, and are most common on local/residential streets.

Traffic circles have been used to reduce speeds within residential neighborhoods. They are not as controversial as speed humps, and are one of the more common measures used by local jurisdictions throughout the country as a calming tool.

Impact to Fire and Rescue Vehicle Response

Emergency response vehicles typically slow to about 13 mph with an associated delay of 5 to 8 seconds. However, emergency vehicles can maneuver around circles at these slower speeds.

Signing and Marking

Signing for traffic circles include Yield signs on the approaches, and may include Chevrons within the circle itself. Markings may include painted diverter islands on the approach to aid in the reduction of approach speed.

Standards/Size

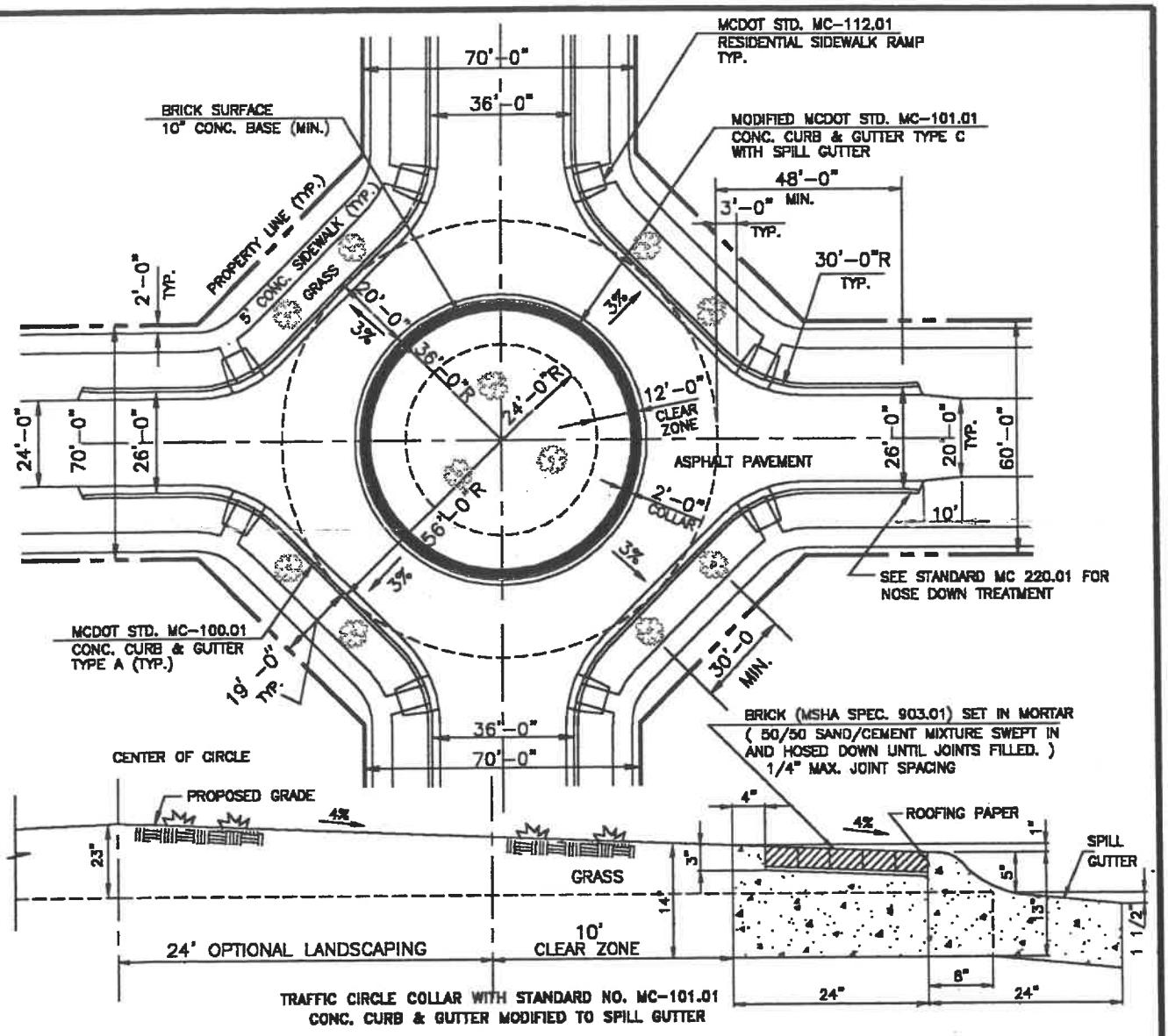
The Montgomery County Department of Public Works and Transportation (MCDPWT) has an approved standard for Traffic Circles. The County standard is designed to be used on residential streets. A schematic of the approved circle is shown in Exhibit 11. The standard includes a circular island approximately 36 feet in diameter and a 20 foot roadway. Due to the narrowness of streets within the town, a modification of this standard may be required. Within Montgomery County, the retrofit design has been used successfully either in concert with speed humps or in lieu of humps.

Warrants

There are no current warrants for circles, however, they have been used to provide a slowing effect on vehicles and control right-of-way at an intersection. All approaching vehicles must yield to traffic already in the circle, and vehicles are required to travel to the right (except emergency equipment or large trucks such as a moving van).

Raised Intersections

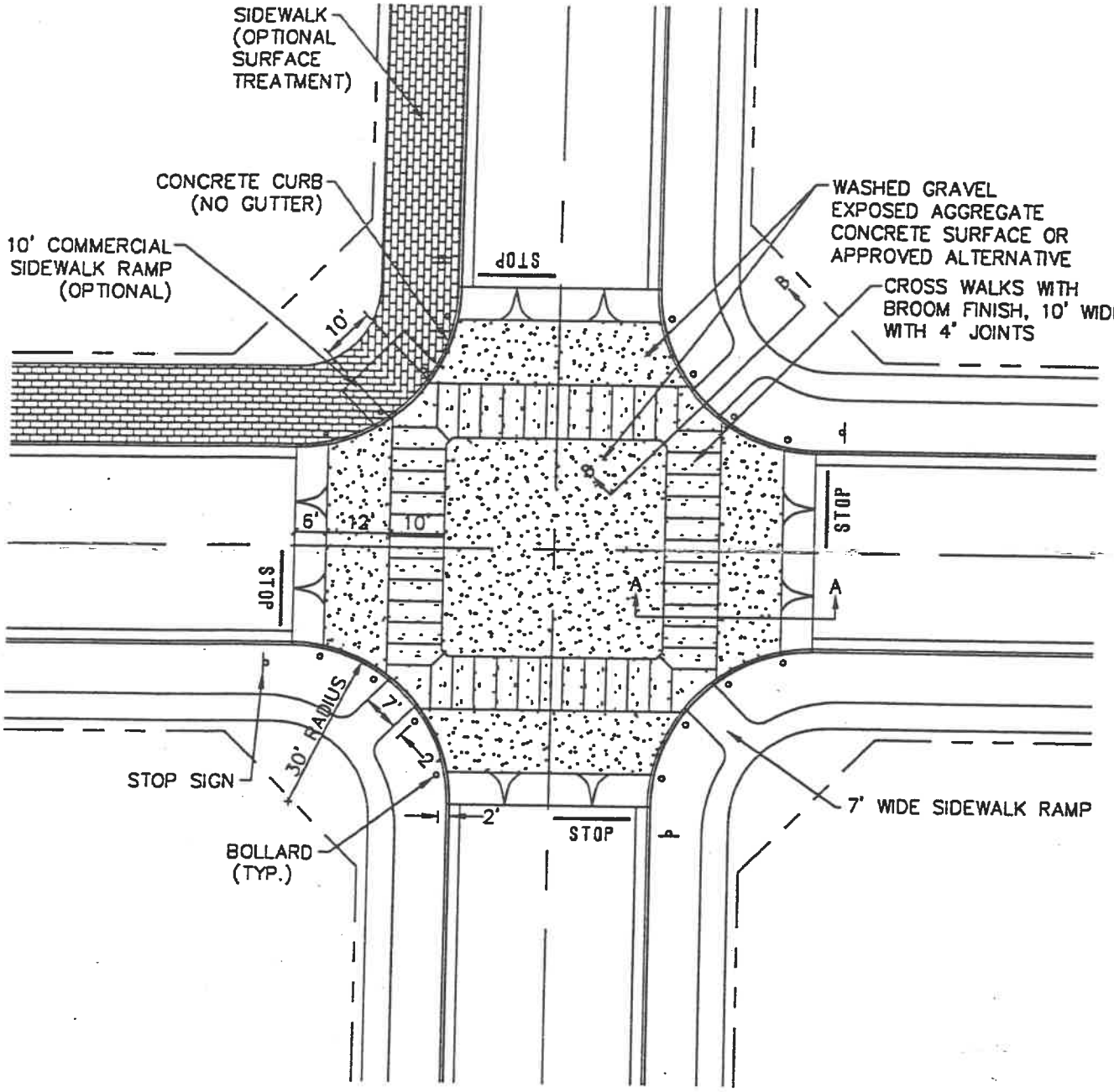
Raised intersections have also been established as an effective tool in the realm of traffic calming. They are typically used at the intersection of local streets to increase the awareness of pedestrians and bring about greater enforcement of STOP control Additional benefits are reduction in through travel speeds and minimal impact on access. They are similar to flat top speed humps, but are spread over an entire intersection. A schematic example is shown in Exhibit 12.



GENERAL NOTES

1. THIS STANDARD MAY BE USED ONLY WITH THE PRIOR APPROVAL OF DPW&T / DPS.
2. THIS STANDARD IS APPLICABLE TO INTERSECTIONS OF SECONDARY AND PRIMARY ROADS WITH OTHER SECONDARY OR PRIMARY ROADS. TERMINATE CURB & GUTTER PER STD. MC-220.01
3. THE NEAREST POINT OF ANY DRIVEWAY APRON EXTENSIONS SHALL BE LOCATED AT LEAST 25' BEYOND THE HANDICAP RAMPS AWAY FROM THE CIRCLE.
4. USE A 1% MINIMUM GUTTER GRADE EXCEPT AROUND THE ISLAND. ROADWAY GRADES MUST NOT EXCEED 4%
5. TRAFFIC CIRCLE LANDSCAPING PER DPWT APPROVED LANDSCAPE LIST
6. SIDEWALKS SHALL BE PROVIDED IN ACCORDANCE WITH THE APPLICABLE ROAD STANDARDS AND STANDARD MC-112.01 FOR RESIDENTIAL SIDEWALK RAMPS. THE SIDEWALK SHALL EXTEND ALONG THE INTERSECTION TRUNCATION, A MINIMUM OF TWO FEET FROM THE PROPERTY LINE.
7. RESIDENTIAL TRAFFIC CIRCLES AT T-INTERSECTIONS AND MID-BLOCK LOCATIONS SHALL USE THIS STANDARD (MODIFIED AS REQUIRED). FOR THESE USES, THE CIRCLE MUST REMAIN CENTERED IN THE TRAVELWAYS.
8. ALIGN COLLAR EXPANSION JOINTS WITH CURB EXPANSION JOINTS.

APPROVED _____ DATE DIRECTOR, DEPT. OF P.W.&T. CHIEF, DIV. OF ENG. SERVICES	REVISED	MONTGOMERY COUNTY DEPT. OF PUBLIC WORKS & TRANSPORTATION RESIDENTIAL TRAFFIC CIRCLE STANDARD NO. MC-



GENERAL NOTES

1. THIS STANDARD MAY BE USED ONLY WITH PRIOR APPROVAL OF MCDPWT OR MCDPS.
2. THIS STANDARD IS APPLICABLE TO THE INTERSECTION OF TWO PRIMARY (MC 212.01) OR TWO COMMERCIAL/INDUSTRIAL ROADS (MC 214.02, MC 214.03).
3. PROVIDE POSITIVE DRAINAGE AWAY FROM SIDEWALK RAMPS.

PROVED _____		MONTGOMERY COUNTY DEPT. OF PUBLIC WORKS & TRANSPORTATION
DIRECTOR, DPWT.		RAISED INTERSECTION
CHIEF, DIV. OF ENG. SERVICES		STANDARD NO.

Impact to Fire and Rescue Vehicle Response

Emergency response vehicles typically slow to cross a raised intersection, however, there is little impact to response times given that raised intersections are typically installed at STOP controlled intersections.

Signing and Marking

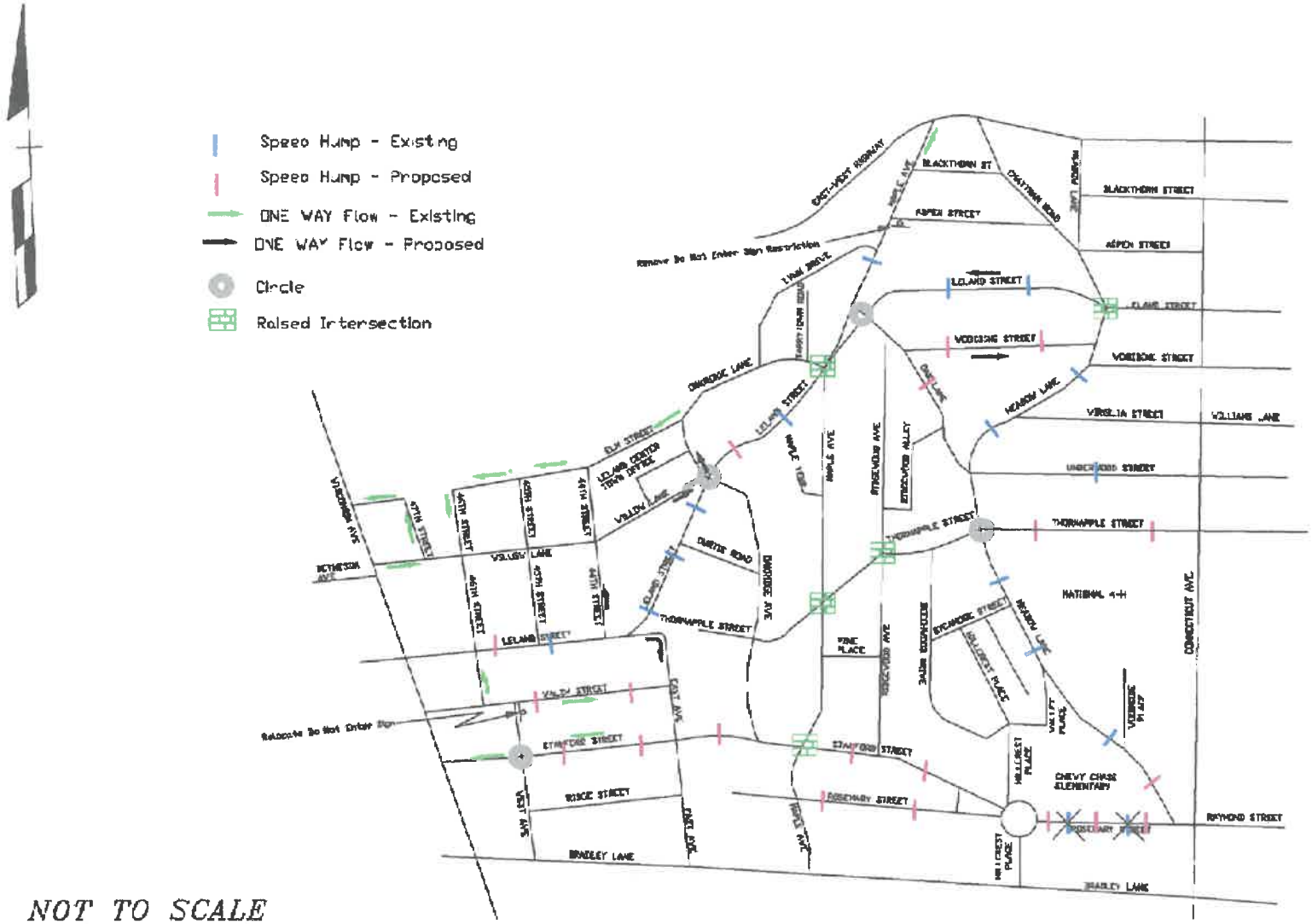
Signing for a raised intersection is similar to that of a crosswalk. That is, crosswalks are painted on each leg of the intersection to bring greater awareness of the presence of pedestrians. Other design elements are exposed aggregate, concrete and brick pavers. An example of an asphalt raised intersection design can be seen at Bel Pre Road and Arctic Avenue in the Rockville area of the County.

Size

The size of a raised intersection is dependent upon the size of the intersection where it will be located. The reader is referred to Exhibit 12 for design details.

Overall Circulation/Traffic Control Plan

Based on the calming measures discussed above, STS LTD prepared a "traffic control and calming" plan as shown in Exhibit 13. Following is a summary of the recommendations with a brief description and basis for each location.



STS TRAFFIC STUDIES, LTD.

Exhibit 13
Traffic Control and Circulation Plan

Location	Area of Concern	Calming Measure	Basis for Improvement	Cost
Maple Avenue at Aspen Street	Cut-Thru traffic onto Aspen Street	Remove Entry Restriction during PM Peak	To eliminate cut-thru traffic along Aspen Street and Meadow Lane. Maple Avenue is already ONE-WAY away; therefore no impact	$150.00
Leland Street/Maple Avenue at Oak Lane	Speeding, Vehicular Volume and Adherence to Traffic Control	Traffic Circle	A traffic circle will require traffic to yield on the approach to the circle and reduce speed as they approach the circle. Eliminates the STOP control, but provides a reduction of speed	$15,000.00
Leland Street at Oakridge Avenue	Speeding, Vehicular Volume and Adherence to Traffic Control	Traffic Circle	A traffic circle will require traffic to yield on the approach to the circle and reduce speed as they approach the circle. Eliminates the STOP control, but provides a reduction of speed	$15,000.00
Oakridge Lane	Access to and from Leland Center	ONE-WAY designation (northbound) between Leland Street and Leland Center Entrance	Will reduce cut-thru traffic through the Leland Center parking lot and eliminate one of the legs at the intersection of Leland Street/Oakridge Avenue	$150.00

Location	Area of Concern	Calming Measure	Basis for Improvement	Cost
Willow Lane	Cut-Thru traffic in Leland Center parking lot	Open roadway to Leland Street (ONE -WAY between access drive and Leland Street)	Will reduce/eliminate cut-thru traffic in parking lot. Traffic will enter Leland Street at a traffic circle, keeping speed lower	?
44th Street	Traffic entering Leland Street as cut-thru	ONE-WAY designation (northbound) between Leland Street and Willow Lane	Will reduce traffic entering Leland Street and reduce east-west movements through Town by outsiders. Also eliminates a sight distance problem under current conditions	$150.00
Leland Street (4600 block)	Speeding, Vehicular Volume and Adherence to Traffic Control	Speed Hump	Will reduce vehicular speeds and work in tandem with existing hump circa 4500 block	$1500.00
East Avenue	Narrowness of street, blind curve, accidents	ONE-WAY designation (southbound) beginning at Leland Street	One-way flow will eliminate conflicts with opposing vehicles.	$150.00

Location	Area of Concern	Calming Measure	Basis for Improvement	Cost
Walsh Street	Entry restriction	Relocation of Do Not Enter sign	Allows access for two lots within Town and allows for clockwise circulation around block at all times.(Therefore, no longer an enforcement issue)	$150.00
Walsh Street	Speeding, Vehicular Volume	Speed Humps	Will reduce vehicular speeds and encourage a uniform speed through Town	$3000.00
Stanford Street at West Avenue	Speeding, Vehicular Volume and Adherence to Traffic Control	Traffic Circle	A traffic circle will require traffic to yield on the approach to the circle and reduce speed as they approach. Eliminates the STOP control, but provides a reduction of speed	$15,000.00
Stanford Street between East and West Avenues	Speeding, Vehicular Volume and Adherence to Traffic Control	Speed Humps	Will reduce vehicular speeds and encourage a uniform speed	$3000.00

Location	Area of Concern	Calming Measure	Basis for Improvement	Cost
Stanford Street between East Avenue and Oakridge Avenue	Speeding, Vehicular Volume and Adherence to Traffic Control	Speed Hump	Will reduce vehicular speeds and encourage a uniform speed. Will help with vehicular conflicts created by speeding within section	$1500.00
Stanford Street at Maple Avenue	Vehicular Volume and Adherence to Traffic Control	Raised Intersection	Will require traffic to reduce speed on the approach to the intersection and provides self enforcement of the existing traffic control. Improves pedestrian safety	$45,000.00
Stanford Street between Maple Avenue and Hillcrest Place	Speeding, Vehicular Volume and Adherence to Traffic Control	Speed Humps	Will reduce vehicular speeds and encourage a uniform speed through Town, and work in conjunction with additional humps to the west	$3000.00
Rosemary Street between Maple Avenue and Hillcrest Place	Speeding, Vehicular Volume and Adherence to Traffic Control	Speed Humps	Will reduce vehicular speeds and encourage a uniform speed through Town	$3000.00

Location	**Area of Concern**	**Calming Measure**	**Basis for Improvement**	**Cost**
Rosemary Street between Hillcrest Place and Meadow Lane	Speeding, Vehicular Volume and Adherence to Traffic Control	Speed Humps (remove existing and replace with Flat Top)	Will reduce vehicular speeds and encourage a uniform speed through Town	$6500.00
Meadow Lane between Rosemary Street and Woodside Place	Speeding, Vehicular Volume	Speed Hump	Will reduce vehicular speeds, cut-thru and encourage a uniform speed	$1500.00
Thornapple Street	Speeding, Vehicular Volume and Adherence to Traffic Control	Speed Humps	Will reduce vehicular speeds and encourage a uniform speed through Town	$3000.00
Thornapple Street at Ridgewood Avenue	Vehicular Volume and Adherence to Traffic Control	Raised Intersection	Will require traffic to reduce speed on the approach to the intersection and provides self enforcement of the existing traffic control. Improves pedestrian safety	$45,000.00

Location	Area of Concern	Calming Measure	Basis for Improvement	Cost
Thornapple Street at Maple Avenue	Vehicular Volume and Adherence to Traffic Control	Raised Intersection	Will require traffic to reduce speed on the approach to the intersection and provides self enforcement of the existing traffic control. Improves pedestrian safety	$45,000.00
Thornapple Street at Meadow Lane	Vehicular Volume and Adherence to Traffic Control	Traffic Circle	A traffic circle will require traffic to yield on the approach to the circle and reduce speed as they approach. Eliminates the STOP control, but provides a reduction of speed	$15,000.00
Thornapple Street between Meadow Lane and Connecticut Avenue	Speeding, Vehicular Volume and Adherence to Traffic Control	Speed Humps	Will reduce vehicular speeds and encourage a uniform speed through Town, and work in conjunction with additional humps to the west	$3000.00
Leland Street at Meadow Lane/Chatham Road	Vehicular Volume and Adherence to Traffic Control	Raised Intersection	Will require traffic to reduce speed on the approach to the intersection and provides self enforcement of the existing traffic control. Improves pedestrian safety	$45,000.00

Location	Area of Concern	Calming Measure	Basis for Improvement	Cost
Leland Street at Oakridge Lane/Maple Avenue	Vehicular Volume and Adherence to Traffic Control	Raised Intersection	Will require traffic to reduce speed on the approach to the intersection and provides self enforcement of the existing traffic control. Improves pedestrian safety	$45,000.00
Leland Street between Oakridge Avenue and Maple Avenue	Speeding, Vehicular Volume	Speed Hump	Will reduce vehicular speeds, cut-thru and encourage a uniform speed	$1500.00
Leland Street between Oak Lane and Meadow Lane	Speeding, Vehicular Volume	ONE-WAY designation	Will reduce cut-thru traffic through Town and reduce conflicts with opposing vehicles	$150.00
Woodbine Street Oak Lane and Meadow Lane	Speeding, Vehicular Volume and Adherence to Traffic Control	Speed Humps	Will reduce vehicular speeds and encourage a uniform speed through Town, and work in conjunction with additional humps to the west	$3000.00
Woodbine Street Oak Lane and Meadow Lane	Speeding, Vehicular Volume	ONE-WAY designation	Will reduce cut-thru traffic through Town and reduce conflicts with opposing vehicles	$150.00
Totals				$318,050.00

Site Specific/Mini-Studies

A series of small studies were conducted for individual locations within the Town limits. A copy of the various reports/memorandum are included herein as Appendix B.

Survey/Questionnaire

The Town forwarded a survey to the Town residents to elicit responses to several issues regarding traffic within the Town limits. The survey included questions about speed and volume, as well as, adherence to existing traffic control. A copy of the survey is shown on the following page. Approximately, 1000 surveys were distributed to residents. Residents were asked a series of 12 questions relating to their concerns regarding speed and volume of traffic. A total of 403 responses were returned for a response rate of 39%. The results of the survey indicated that speeding is a concern, particularly on Leland and Stanford Streets. Also, adherence to existing traffic controls is a concern; e.g., STOP signs and Do Not Enter restrictions. Lastly, cut-thru traffic was identified as a concern by a majority of residents. Conversely, 54% of the responses indicated that the volume of traffic through the Town was not a major concern.

Dear Resident,

What traffic issues concern you? Many residents have expressed a concern about the increase and speed of traffic in town. Therefore, the Town traffic committee has decided to survey all our residents. We ask that you take a moment to answer the questions below. With your response, we can accurately assess the level and nature of concern in the Town and identify the most effective and acceptable solutions.

1. Is speeding on Town streets: o A problem o Not a problem

2. Is speeding on my street: o A problem o Not a problem

3. The name of my street is _____.

4. I consider any speed over _____ miles per hour to be excessive speed.

5. I am most concerned with speeding during the following hours:

   o weekday mornings o weekday mid-day o weekday evenings o weekends

6. Is ignoring STOP signs: o A problem o Not a problem

7. A car needs to come to a complete stop at a STOP sign:

   o Yes o No

8. Violating Do Not Enter signs during restricted hours is:

   o A problem o Not a problem

9. Is use of Town streets by non-resident, cut-through traffic:

   o A problem o Not a problem

10. Is the volume of traffic on Town streets:

    o A problem o Not a problem

11. Have the controls established by the Town to calm traffic created a hardship for you when trying to enter the Town?

    o Yes o No

12. My most serious traffic concern is _____

    _____.

Thank you for your time and attention to this issue. Please fold, tape and mail to the address printed on the back. We appreciate your interest and assistance.

IMPLEMENTATION PLAN

Following is a priority listing for implementation of the Town Circulation Plan. It should be noted that any item can be implemented at a different time frame, however, it is our opinion that the opening of Willow Lane is high priority with regard to public safety and access to Leland Center. The phasing of traffic controls focuses on speed reductions in the Stanford Street corridor, followed by reductions in cut-through traffic along Leland Street. The installation of humps along Rosemary Street will provide an opportunity to test the use of Flat Top Humps versus the Watts style currently in use within the Town limits.

1) *Rosemary Street* - Remove existing Watts humps (2) and replace with Flat Top humps (3)
   Rosemary can be used as test for the effectiveness of Flat Top Hump
   Third Hump will provide greater inducement for uniform speed and help deter additional traffic
   Add weekly enforcement of restrictions
   Reviewed options; i.e., barricades (movable and retractable)

2) *Willow Lane* - Open to traffic
   Will eliminate/reduce traffic through the Leland Center parking center
   Designed as ONE-WAY towards circle between Leland Center DW and Oakridge Avenue

3) *Stanford Street/Rosemary Street* - Implement Speed Humps between Maple Avenue and Hillcrest Place
   Creates uniform speed along primary Town street
   Helps with problem between Maple and Ridgewood

4a) *Stanford Street* - Traffic Circle at West Avenue
   Requires traffic to slow on approaches to West Avenue, and provides physical enforcement of traffic control

4b) East Avenue - Implement ONE-WAY designation east of Leland Street

Eliminates accident potential and vehicle conflicts

4c) Stanford Street - Implement Speed Humps between West Avenue and Oakridge Avenue

Creates uniform speed along primary Town street

Helps with problem between Maple and Ridgewood

5) Leland Street - Maple Avenue to Aspen Street

Install raised intersection Maple Avenue and traffic circle at Maple Avenue/Oak Lane

6) Thornapple Street - Implement Speed Humps between Meadow Lane and Connecticut Avenue

Creates uniform speed along primary Town street

7) Thornapple Street - Implement Traffic Circle at Meadow Lane

Requires traffic to slow on approaches, and provides physical enforcement of traffic control

8) Thornapple Street - Implement Raised Intersection Traffic at Maple Avenue and Ridgewood Avenue

Requires traffic to slow on approaches, and provides physical enforcement of traffic control

Creates uniform speed along primary Town street

9) Leland Street/Woodbine Street - Implement Speed Humps and ONE-WAY pair

Will reduce cut-thru traffic through Town and reduce conflicts with opposing vehicles

Town of Chevy Chase
Block Numbers