September 10, 2010

TO: Frances Higgins, Manager, Section 5 Village of Chevy Chase

FROM: Joseph Cutro, P.E., Traffic Engineering Consultant

SUBJECT: Speed Hump and Turn Restriction Plans

As requested by the Village Council, I have prepared plans for the deployment of speed humps on Section 5 streets, and also for regulatory signing that would restrict traffic flow onto community streets from northbound Connecticut Avenue. The Council has identified these two measures as having the most potential for mitigating traffic speeds and volumes on Village streets, in addition to having a reasonable probability for public acceptance.

The plans that follow are intended primarily to highlight the minimum extent of coverage for the measures to be sustainable. For speed humps in particular, the plan also identifies optimal (or even just acceptable) locations for each device. As such, these plans should not be regarded as a formal proposal of any kind, but rather as "contingency" arrangements. They are not intended to either justify or discourage implementation one way or the other. Either or both plans would be implemented only if and when approved by the Council, presumably on the basis of extensive public input.

It should be stressed that each of the plans is independent of the other. The speed hump plan does not require the deployment of turn restrictions as a prerequisite, nor do the turn restrictions need the speed humps to be sustainable. Of greater importance is the idea that for both speed humps and turn restrictions, a "critical mass" of devices is needed to establish overall effectiveness and equitability for the community at large.

For each plan, options and recommendations for implementation procedures are also discussed.

Speed Humps – The Plan

The plan is composed of two groups of prospective speed hump locations. The first is a "core" group of 12 speed humps intended to protect four through streets connecting Connecticut Avenue and Brookville Road. These streets are, from south to north, Thornapple Street, Underwood Street, Williams Lane, and Woodbine Street. Three humps at roughly uniform spacings would be placed on each street. Spacings between humps and clearances to STOP signs, driveways, and side street intersections would conform to the recognized national standard for speed hump design, *Guidelines for the Design and Application of Speed Humps*, published by the Institute of Transportation Engineers (ITE). Not coincidentally, this pattern of three humps per street mimics that

found on parallel streets (Taylor, Shepherd, Raymond) in Section 3 where humps are already deployed.

To attain an effective and equitable result for the community as a whole, **all 12 humps must be deployed at one time**. In other words, all 12 should be installed, or none.

If the "core" group of humps is approved and installed, the Village can also consider humps at a group of secondary locations, including Glendale Road, Thornapple Street east of Brookville Road (within Section 5 limits), and Leland Street (within Section 5 limits). Requests for a hump at any of these locations can be evaluated independently, with the pre-requisite that no such requests should be entertained unless the 12-hump "core" has been installed. If the Village is going to enter the speed hump business at all, it should not be for a single hump on an isolated street.

For individual humps in both groups, optimal locations have been identified in Table 1. The optimal locations, based primarily on roadway geometry and location of existing features (driveways, STOP signs, etc.) are intended to provide maximum speed reduction in both directions of travel. The prospective hump locations conform to all ITE requirements. In August, 2010, the center ridge line of each prospective hump was marked on the pavement in temporary (lasts about 2 months) white chalk.

The plan allows some flexibility for locations other than the geometrically optimal. Some street segments have as many three zones of varying length in which a speed hump could be placed. A hump located anywhere within the defined "windows" (see Table 2) would continue to meet ITE requirements. There should, however, be few reasons other than political considerations to move humps away from their stated optimal locations.

Speed Humps – Procedural Considerations

The process leading up to the installation of speed humps normally involves three kinds of assessments:

- Physical plan development, including checks of applicability and local conditions
- Justification based on traffic flow characteristics
- Public concurrence

The most important aspect of plan development is to provide a design and layout that meets or exceeds the requirements of the national ITE guidelines. Compliance with these guidelines not only maximizes the effectiveness of the project(s), but more importantly, minimizes the Village's exposure to liability. This document serves to complete the plan development aspect of the process, with the exception of possible "tweaks" in hump locations. To that end, the Village-wide plan, as outlined in Table 1, is intended to fully comply with the ITE guidelines.

The measurement of traffic speeds and volumes is a highly desirable aspect of a speed hump program. Many jurisdictions, Montgomery County included, test traffic flow measurements against stated criteria to prioritize competing projects, justify installation of speed humps in the first place, or both. The fact is, however, that not everybody uses such testing. The Town of Chevy Chase, for example, has installed 28 humps on its streets without reference to speed and volume criteria. [The Town eventually developed such criteria in 2008]. Should Section 5 adopt speed and volume criteria to justify speed hump installations?

Section 5 does have pertinent data available, having frequently measured speeds and volumes on its streets over the years. The most recent measurements were taken in 2007. Since statistical speed profiles for individual streets tend to remain stable over many years, the 2007 profiles should be valid today and for at least several years to come. The four "core" streets defined in the speed hump plan show nearly identical speed profiles – all have a median speed of about 18 mph, and an 85th percentile speed of about 24 mph. Coincidentally, this measured profile is almost precisely equal to the "design" speed profile of the standard 12-foot speed hump. What that means is that if speed humps are deployed, no change in the measured speed profile should be expected. Nevertheless, humps should reduce the number of egregious speeding incidents (35 mph or higher), although the current number of those incidents is no greater than 10 per day on any street.

For speed humps, volume is generally a less important measure than vehicle speed. The use of volume in speed hump justification has more to do with cost-effectiveness. On a street with lower volume, a speed hump "buys" fewer occurrences of speed reduction, and at some point, that number becomes too low to justify a capital expenditure. Volume criteria can vary greatly among jurisdictions, with Montgomery County requiring 1000 vehicles per day to qualify for a speed hump, while Rockville only requires 500.

A professional traffic engineer would invariably be inclined to recommend the adoption of reasonable speed and volume criteria, but as a practicality, Section 5 is essentially free to make its own choice. Here are some further thoughts to consider in the matter:

- If speed humps are further pursued and no (or weak) speed or volume criteria are adopted, the Village could be criticized for wasting resources on a largely ineffective undertaking.
- A lack of speed and volume criteria for speed humps should pose no legal liability implications for the Village.
- No street in the Village has the required speed profile to qualify for speed humps under the rules of the Montgomery County Department of Transportation.
- Only one street in the Village (Leland Street) has the necessary volume to meet MCDOT requirements.
- (On the other hand) Section 5 streets are not subject to MCDOT requirements unless approved by the Village Council.
- Whether or not the Council adopts speed and volume criteria, no further collection of speed and volume data should be needed on Village streets until at least 2012.

Public concurrence is by its nature more a matter of politics and municipal management than it is of engineering. Nevertheless, experiences gained from area speed hump programs provide important insights into application and consensus processes

If it is determined that speed and volume criteria will not be used to justify speed humps, then the Village should initiate public concurrence survey/poll for the "core" group of humps without specific application or petition. For this "core" group, I would recommend polling **all** households within the town, using the ¼ of households outside the "core" to represent the interests of the greater driving public. To indicate public approval from this mix, a relatively low supermajority should be adopted, something on the order of 60%. Montgomery County requires 80% approval from households having direct frontage on the streets in question, and 50% from other households within the "traffic-shed" of the hump project.

For the core croup of humps, no approval or consent from adjacent jurisdictions is needed, although advisory input from outside Section 5 should be invited and welcome.

For each of the three optional locations, a speed hump project can be initiated with an informal application/petition from local residents. Final concurrence would be via survey form sent to households having frontage on the affected street, and to any within a reasonable "traffic-shed". For approval, a supermajority of 60% or 70% should be used. Again, speed humps should not be considered for any of the optional locations if and until the "core" group is approved and installed.

For a hump on Thornapple east of Brookville Road, approval should be sought from the Village of Martin's Additions, and the consensus area should include selected households from within that municipality.

For a hump on Leland Street, Montgomery County should be invited to weigh in with an opinion, particularly with regard to bus operations (Ride-On Route #1) and emergency services delivery. [While bus operations professionals cannot be expected to be enthused about speed humps, there do exist many examples around the County of speed humps on bus routes.] As an additional courtesy, all households on Leland as far west as Glendale could be included in the consensus area.

My proposed location for a hump on Leland Street would allow insertion of a second hump closer to Glendale Road, outside the Village limit. A hump on that segment of Leland would be subject to all Montgomery County requirements, but a local petition for two humps (one inside Section 5, one outside) should not be out of the question.

On Glendale Road, a few homes south of Leland Street but outside the Village limits should be included in the consensus area. No deeper County involvement, however, should be needed. I would recommend, however, that all households on Alden Lane be included within the consensus area.

Turn Restrictions – The Plan

Turn restrictions directed at northbound Connecticut Avenue traffic could serve to reduce non-local ("cut-through") traffic on Section 5's east-west through streets during selected hours of the day. Reductions in cut-through traffic would have to be weighed against impositions upon local residents, who would now have to alter their travel paths to approach their street from Brookville Road or elsewhere. [State law does not allow exceptions to posted traffic regulations for local residents.] The benefits would also have to be weighed against the additional traffic burden that would inevitably be shifted to some other street or streets. Protective turn restrictions of this kind should not be installed in isolation, because both local and cut-through traffic would simply be diverted to parallel streets equally unsuited to handle additional traffic.

The plan herein would entail evening peak period turn restrictions along northbound Connecticut Avenue at 7 consecutive intersections, one of which is already posted. The proposed restriction is:

No Right Turn [symbol], 4:30-6:00 PM, MON-FRI

The plan would create a continuous "cordon" along the east side of Connecticut Avenue to protect residential streets from cut-through traffic in both Section 3 and Section 5. This would mimic the cordon established by the Town of Chevy Chase on the west side of Connecticut Avenue, in which southbound right turns are prohibited in the morning peak period at a series of seven intersections, starting south of East-West Highway. For an east side cordon, the cross streets that would logically define the limits of the cordon would be Raymond Street on the south, where the proposed turn restriction is already posted, and Woodbine Street on the north. The next street north of Woodbine, Leland Street, would remain unrestricted. Leland Street is an established bus route, and with a somewhat wider cross-section than parallel streets in the area, is generally more suitable for handling through traffic. The cordon would thereby include the following streets:

- Raymond Street (Section 3) – already posted
- Shepherd Street (Section 3)
- Taylor Street (Section 3)
- Thornapple Street (Section 5)
- Underwood Street (Section 5)
- Williams Lane (Section 5)
- Woodbine Street (Section 5)

The restricted hours selected for the cordon are those of its "germ", the existing northbound turn restriction at Raymond Street. There may be good reason (further traffic studies?) to alter the restricted hours somewhat, but in any event, the restrictions at all seven intersections should be identical.

It may be possible to limit the cordon to the four Section 5 cross-streets only, particularly if origin-destination studies show that traffic would not divert to Shepherd and Taylor.

That's not a safe assumption at this time, however, and it would be better to plan on the basis of including all seven listed streets.

It should be obvious that if a cordon is approved, either as proposed here or for the four Section 5 streets only, Leland Street will bear the primary burden for handling local traffic circulation. But care needs to be taken not to regard Leland Street as some sort of "bottomless pit" for traffic. Classified as a secondary residential street in the BCC Master Plan, Leland remains entitled to some level of protection despite its greater importance relative to nearby parallel streets.

Turn Restrictions – Procedural Considerations

Unlike for speed humps, design and layout are not major issues. The appropriate signing would need to be posted so that it is clearly visible to northbound Connecticut Avenue traffic, and near enough to each intersection so that the signing obviously relates to the intersection. Tree and utility pole obstructions, as well as interference with other signs, would have to be avoided. Any problems in these matters, however, should be resolvable after-the-fact – if and when the sign cordon is actually approved.

Before proceeding to the public concurrence phase, further traffic studies are strongly advised. Especially critical would be an origin-destination survey that would "follow" (by reading license plates) northbound Connecticut Avenue traffic currently entering the four Section 5 cross-streets. Such a study would reveal how much cut-through traffic actually exists on these streets during the hours in question, how many residents living on those streets would be inconvenienced by having to alter their travel paths, and how much traffic would be diverted to Leland and perhaps other unprotected cross-streets.

An important input into these studies will be defining which traffic is local and which is not. It should be clear that any vehicle that starts on Connecticut Avenue and ends up north or east of the Brookville/Leland intersection is non-local. (That traffic belongs on eastbound Leland Street or East-West Highway.) What isn't clear is how traffic that ends up on Thornapple or Woodbine east of Brookville Road, or even at a local Brookville Road address, should be regarded.

How much traffic, cut-through or otherwise, is too much for a residential street? The answer can certainly be subjective, but some objective guidance is provided by Montgomery County's Executive Regulation #17-94AM. This regulation, issued in 1994, lists minimum volume criteria for access restrictions (including turn restrictions) on public streets. For residential streets with characteristics like those of Thornapple, Underwood, Williams, and Woodbine, the minimum volume of traffic needed to qualify for a volume restriction is 100 vehicles per hour (two directions) within the period under consideration. Of that volume, non-local traffic must exceed 50 percent, as determined using a license plate survey as described earlier. By comparison, the highest known hourly volume recorded on any of the streets in question is 77, counted on Woodbine Street during a *morning* (8-9 AM) peak hour in February, 2001. That should suggest that from Montgomery County's point-of-view, none of these streets have a traffic volume

problem. Section 5, however, is subject to that regulation only if it wants to be. In any event, the Council should not take further action on a turn restriction plan without the benefit of a new license plate survey that reveals more about non-local use of Section 5 streets.

If, after review of the accumulated traffic data, it is determined that a turn restriction plan should go forward, the Village can initiate a public *advisory* poll without a specific application or petition. As for speed humps, I would recommend polling **all** households within the Village, using the ¼ of households not fronting the four affected cross-streets to represent the interests of the greater driving public. If Section 3 streets are included in the plan, then a consensus area within that municipality will need to be included in the polling. Unlike speed humps, however, the poll should not be the final step in the public concurrence process. As Montgomery County requires for these kinds of access restrictions, a public hearing (joint with Section 3?) should be convened, following which final decision on the turn restriction plan would be made by the respective Section 5 and Section 3 Councils.

Regarding interaction with other jurisdictions, it should be obvious that cooperation between Section 5 and Section 3 would be absolutely essential in this matter. As described above, Section 5 could conceivably "go it alone", but that could very well be regarded as an unfriendly gesture. Other potentially affected jurisdictions should be consulted, most notably Martin's Additions, and Montgomery County, which is responsible for much of Leland Street and parallel streets further north.

Finally, approval for turn restrictions intended to regulate traffic on Connecticut Avenue (MD 185) is required from the Maryland State Highway Administration. Such approval, however, should be a mere formality if it is clear that the plan is supported by the affected jurisdiction(s). On the other hand, the SHA would probably want to be deeply involved in the location and installation of the approved signs, and may in fact insist that the SHA itself install the signing to its own satisfaction.

Table 1

Section 5 Village of Chevy Chase **Speed Hump Location Plan** 8/30/2010

Street Name	Segment Limits	Segment Length	No. of humps	Optimal hump location within segment	Address	Remarks
Thornapple Street	Connecticut to Dalkeith	401	1	22' west of center	3806(S)/3807(N)	
Thornapple Street	Dalkeith to Thornapple Pl	484	1	0' from (at) center	3708(S)/3707-09(N)	
Thornapple Street	Thornapple Ct to Brookville Rd	461	1	9' east of center	3608(S)/3609(N)	
Underwood Street	Connecticut to Dalkeith	398	1	20' west of center	3806(S)/3807(N)	
Underwood Street	Dalkeith to Thornapple Pl	436	1	18' west of center	3708(S)/3709(N)	
Underwood Street	Thornapple Pl to Brookville Rd	412	1	23' east of center	3606(S)/3605(N)	
Williams Lane	Connecticut to Brookville Rd	1306	3	248' east of Conn. Ave	3814(S)/3815(N)	
				0' from (at) center	3800(S)/3801(N)	replaces STOP signs
				269' west of Brookville	3708(S)/3707(N)	
Woodbine Street	Connecticut to Glendale	750	2	200' east of Conn. Ave.	3820(S)/3815-17(N)	secondary location nearly optimal
				207' west of Glendale	3806(S)/3807(N)	
Woodbine Street	Glendale to Brookville Rd	464	1	1' west of center	3704-06(S)/3705-07(N)	

optional locations:

Glendale Road	Woodbine to Leland	476	1	42' north of center	7605(E)/7508(W)	just north of Alden Lane
Thornappple Street	Brookville Rd to Chestnut	494	1	9' west of center	3510(S)/3515(N)	very close to VMA boundary
Leland Street	Connecticut to Glendale	741	1	247' east of Conn. Ave.	3810(S)/3815(N)	2nd hump outside Section 5

hump spacing requirements:
min 150' from STOP sign/stop bar
min 20' from flowline of side street, and not within curb return area
min 200' between humps
minimum 5' driveway clearance
additional 5' to driveways if window size allows

Table 2

Section 5 Village of Chevy Chase **Speed Humps - allowable location variations** 8/30/2010

Street Name	Segment Limits	Window 1 Length	Window 1 center of window	Window 2 Length	Window 2 center of window	Window 3 Length	Window 3 center of window
Thornapple St	Connecticut to Dalkeith	22	22' west of center	31	35' east of center	n/a	
Thornapple St	Dalkeith to Thornapple Pl	77	23' east of center	33	58' west of center	n/a	
Thornapple St	Thornapple Ct to Brookville Rd	22	9' east of center	27	41' west of center	35	53' east of center
Underwood St	Connecticut to Dalkeith	46	27' west of center	29	34' east of center	n/a	
Underwood St	Dalkeith to Thornapple Pl	23	18' west of center	27	55' west of center	34	27' east of center
Underwood St	Thornapple Pl to Brookville Rd	30	23' east of center	28	25' west of center	n/a	
Williams Lane	Connecticut to Brookville Rd	47	241' east of Conn. Ave	n/a		n/a	
		47	near center	n/a		n/a	
		46	262' west of Brookville	22	315' west of Brookville	n/a	
Woodbine St	Connecticut to Glendale	24	200' east of Conn. Ave	22	239' east of Conn. Ave	n/a	
		35	205' west of Glendale	n/a		n/a	
Woodbine St	Glendale to Brookville Rd	64	17' west of center	n/a		n/a	
optional locations:							
Glendale Road	Woodbine to Leland	36	44' north of center	n/a		n/a	
Thornappple St	Brookville Rd to Chestnut	102	44' west of center	25	35' west of center	n/a	
Leland Street	Connecticut to Glendale	22	50' east of Leland Ct	n/a		n/a	