



DEPARTMENT OF ENVIRONMENTAL SERVICES

North Harrison Street
(Lee Highway to Little Falls Road)
Comparative Analysis

Prepared for:

**Arlington County Department of Environmental Services
Transportation Engineering and Operations Bureau
2100 Clarendon Boulevard, Suite 900
Arlington, VA 22201**

Prepared by:
B. Obikoya

February 2007

I. Executive Summary

This analysis will compare traffic patterns and other traffic related issues along the North Harrison Street Corridor from Lee Highway to Little Falls Road in North Arlington County. The time period used for the analysis is prior to Summer 2006 and after August 2006. Included in the analysis are:

- Speed Data,
- Traffic volumes, and
- Accident Data.

The following safety improvements have been implemented along this corridor during the years 2005-2006:

1. Bicycle lane installations along the corridor with a share bicycle/travel lane near the Lee-Harrison Shopping Center
2. Delineated parking lanes on both sides of North Harrison Street along the corridor from 26th Street North to Little Falls Road
3. New solar powered pedestrian flasher with push button, crosswalk and curb ramp at the Lee-Harrison Shopping Center
4. Painted crosswalk at 26th Street North
5. Speed Indicator installations on North Harrison Street near 27th Street North and near Little Falls Road
6. Painted mid-block crosswalk at the Chestnut Hills Park entrance, and
7. Curb ramp and pedestrian crossing signs installed at the Chestnut Hills Park entrance.

Average Daily Traffic (ADT) volumes and speeds were collected and documented on Wednesday, April 2, 2000 and Tuesday, September 19, 2006. Although these two collections may adequately reflect the traffic trends before and after the safety improvements, Arlington County Division of Transportation (DOT) staff acknowledges that a six-year time difference in data collection may seemingly diminish the relevancy of the comparisons. However, based upon our knowledge of the area we feel that the comparisons do have some merit.

Based on the findings of the comparative analysis, the number of speeding vehicles relative to the total number of vehicles has been reduced in the northbound direction along the corridor. However, the number of speeding vehicles relative to the total number of vehicles has increased in the southbound direction since April 2000. DOT recommends the installation of a speed indicator in the southbound direction near the Chestnut Hills Park. Also, additional police enforcement must be implemented to assist in reducing driver speeding patterns in both directions especially the southbound direction.

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installation of a roadway median. The most viable and cost-effective option was Option 2. Option 2 involved pavement markings for bike lanes, parking lanes and shared bicycle/vehicle symbols, as well as crosswalks, curb ramps, a speed indicator and pedestrian flashers. Since funding was limited and additional funds had not been allocated for roadway improvements along the corridor for the design options presented at the meeting, the community agreed to implement Option 2. DOT staff has worked closely with the Yorktown Civic Association to perform the improvements and has completed the work identified in Option 2 within the FY 2006 operations budget.

The design options presented to the community were preceded by the “Arterial Transportation Management Study” (ATM)¹ prepared by the Arlington County Department of Environmental Services in August 2004. Overall goals of ATM and the design alternatives were to use the Arterial Management toolbox to involve a consensus-building process with citizens in the planning and design process, and enhance the safety and efficiency of travel by all modes (especially pedestrians, bicyclists, and transit users). In the ATM Study, North Harrison Street was reviewed and a five percent (5%) concept level design was presented. The limits of the study for North Harrison Street were from Lee Highway to 26th Street North. The conceptual plans presented in the ATM study were reflected in the design options presented to the Yorktown Civic Association.

The following improvements along North Harrison Street should improve traffic conditions along the corridor; some of these listed improvements were also recommended in a letter from the community dated January 19, 2004:

1. Bicycle lanes along the corridor with a share bicycle/travel lane near the Lee-Harrison Shopping Center
2. Delineated parking lanes on both sides of North Harrison Street along the corridor from 26th Street North to Little Falls Road
3. New solar powered pedestrian flasher with push button, crosswalk and curb ramp at the Lee-Harrison Shopping Center
4. Painted crosswalk at 26th Street North
5. Northbound speed indicator on North Harrison Street near 27th Street North and near Little Falls Road
6. Painted mid-block crosswalk at the Chestnut Hills Park entrance
7. Curb ramp and pedestrian crossing signs at the Chestnut Hills Park entrance
8. 25 MPH speed limit signs north of the Lee-Harrison Shopping Center for northbound traffic, and
9. New, pedestal pole traffic signal with pedestrian enhancements at the intersection of North Harrison Street and Yorktown Boulevard.
10. Intersection redesign at Lee Highway and North Harrison Street including new mast arm poles and the installation of left-turn lanes in the eastbound and westbound directions is underway.

11. North Harrison Street and 27th Street North intersection redesign is in progress. There are currently four (4) options proposed. See Appendix for alternative schematic plans of the intersection. The options are:
- a. Option 1 – Four-way Stop
 - b. Option 2 – Median
 - c. Option 3 – Turn Lane
 - d. Option 4 – Roundabout

IV. Speed Data

Table 1 - *North Harrison Street South of Little Falls Road - Northbound* illustrates that the number of vehicles traveling northbound along the roadway from year 2000 to 2006 has increased by a 4.8% annual growth rate. The increase in vehicles is probably due to the increase in activity at the Lee-Harrison Shopping Center in recent years.

Table 1 - North Harrison Street South of Little Falls Road - Northbound

Speed Statistics	Before[1]		After[2]		Difference
Number of Vehicles	2488		3296		808
Number Speeding	2233	89.8%	3016	86.6%	-3.2%
Vehicles over 30 mph	1179	47.4%	1769	42.4%	-5.0%
Vehicles over 35 mph	218	8.8%	350	7.1%	-1.6%
85 th Percentile(mph)	33.0			34.0	1.0
Mean Speed (mph)	29.8		30.3		0.5

[1] Before Traffic Data taken on April 5, 2000. See Speed Histogram in Appendix.

[2] After Traffic Data taken on September 19, 2006. See Speed Histogram in Appendix.

This roadway segment experienced the highest increase at 110 vehicles in the AM peak hour in the northbound direction; see the related graph in Figure 2 - *Northbound Before & After Volumes*. The percentage of the number of vehicles speeding relative to the total number of vehicles traveling the corridor has decreased in the northbound direction. These two variables are inversely proportional on a roadway. When vehicular and pedestrian activity experience a significant increase along a roadway, the vehicular speeds typically decrease provided that all other variables remain the same due to a decrease in a driver's level of comfort. Other measures that may have decreased the vehicular speed include the installation of the pedestrian crosswalk, curb ramps and pedestrian flashers. The highest number of vehicles traveling northbound before and after the roadway improvements in any given period occurred between 4:00 – 5:00 PM.

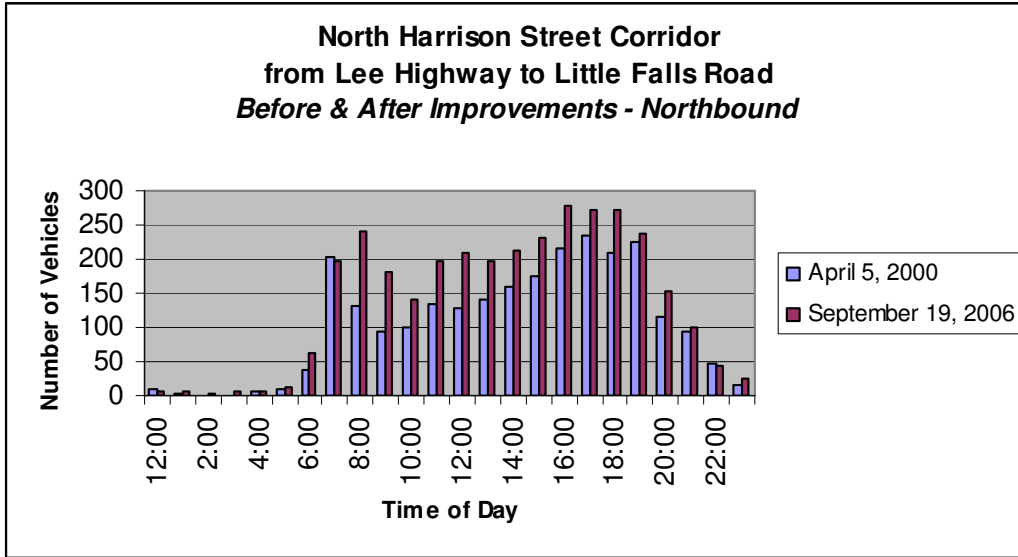


Figure 2 - Northbound Before & After Volumes

Table 2 - North Harrison Street South of Little Falls Road – Southbound

Speed Statistics	Before[1]		After[2]		Difference
	Count	Percentage	Count	Percentage	
Number of Vehicles	2919		3351		432
Number Speeding	1772	60.7%	2738	81.7%	21.0%
Vehicles over 30 mph	241	8.3%	1052	31.4%	23.1%
Vehicles over 35 mph	17	0.6%	124	3.7%	3.1%
85 th Percentile (mph)	28			31.8	3.8
Mean Speed (mph)	25.7		28.3		2.6

[1] Before Traffic Data taken on April 5, 2000. See Speed Histogram in Appendix.

[2] After Traffic Data taken on September 19, 2006. See Speed Histogram in Appendix.

The number of vehicles traveling along the roadway from 2000 to 2006 has increased by 2.3% annually. In Table 2 - *North Harrison Street South of Little Falls Road – Southbound*, the percentage of speeding vehicles and vehicles traveling over 30 and 35 mph has increased by 21%, 23% and 3%, respectively. As illustrated in Figure 3 - *Southbound Before & After Volumes*, the highest number of vehicles traveling southbound before and after the roadway improvements in any given period occurred around 8:00 AM. See the Speed Data in the Appendix for a more in-depth look at the data collected.

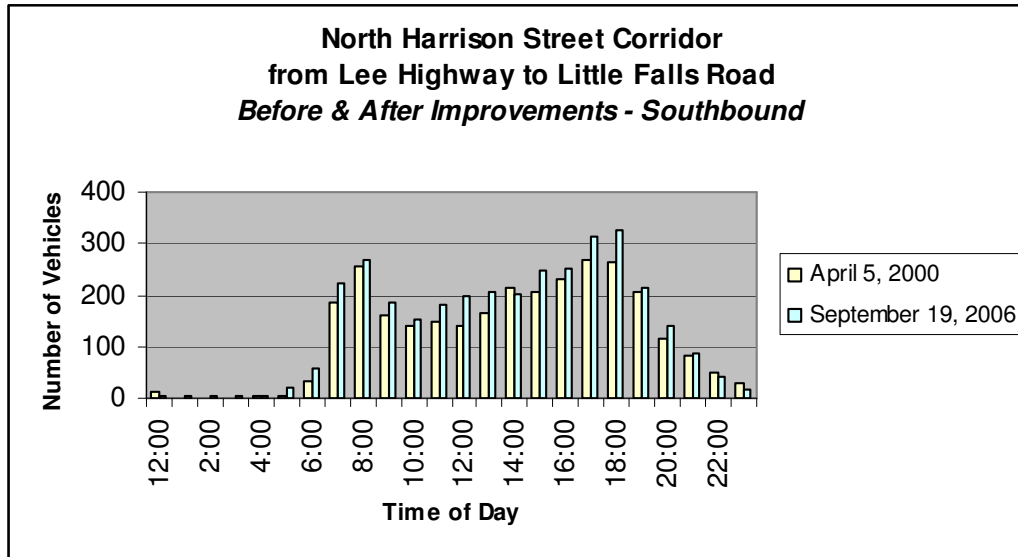


Figure 3 - Southbound Before & After Volumes

The roadway level of service (LOS), the manner in which the roadway handles traffic, in the northbound direction is affected by the traffic volumes and the roadway geometry. If the geometry appears to comfortably accommodate higher vehicular speeds, then a driver's perception will adjust to fit a seemingly appropriate higher speed. The LOS of the roadway, therefore, relates to the speed and comfort level that drivers experience as they utilize the roadway. Therefore, on Harrison Street, bike lanes were installed throughout the corridor to not only allow cyclist the opportunity to travel in a dedicated lane but to also change driver perception with reduced lane widths of 10 – 10.5 feet. These improvements could both increase and decrease speeds based on the drivers' perceptions.

The increased speeds in the southbound direction imply that drivers are comfortable at these speeds and suggest that the speed limit should be increased to a more reasonable speed limit, i.e. 30 miles per hour. This is NOT an option that DOT will consider at this time. However, the installation of a speed indicator near the Chestnut Hills Park, should further help alert drivers of their speeds and assist in slowing down the speeds in this area. If a speed indicator is to be installed, then the affected residents must agree on the exact placement of the indicator. Previously due to strong opposition of physical traffic devices near some residents' properties, the proper placement of the speed indicator and other flashers were not agreed upon by the participants.

As demonstrated along North Harrison Street, sometimes safety improvements make the street appear safer and higher speeds occur as a result. In this case, police enforcement must also play a critical role in keeping speeds within acceptable limits. Three (3) separate police enforcement operations were conducted along North Harrison Street in the past eight (8) months. According to the most recent detail conducted by the Police Department, eight (8) citations were issued over an 8-hour period, which translates into about one citation per each hour of police enforcement efforts. Six (6) citations were issued for speeding and two (2) were issued for other non-speeding offenses.

V. Accident Data

Fourteen (14) accidents occurred north of Lee Highway and south of Little Falls Road on North Harrison Street between 2002 and 2006. About 2.8 accidents occurred per year in this area. Of those accidents, half involved angle accidents at the intersections. The other accidents involved vehicles backing into other vehicles and fixed-object collisions. Accident rates (per million vehicles traveled) were calculated for the intersection based on guidelines from the ITE Manual of Transportation Engineering Studies, copyrighted in 1994. Based on the 2006 ADT counts and the highest number of accidents at an intersection, the corridor's highest accident rate is .49 accidents per million vehicles traveled. This rate falls below the threshold of 1.0 accident per million vehicles traveled to be considered as a high accident location. Overall, the accident rates seem to remain moderately low and constant in this area before and after the roadway improvements.

North Harrison Street Corridor Accidents by Year						
	Lee Hwy	26th St	27th St	27th Rd	Little Falls Rd	TOTAL
TOTAL	36	6	4	1	3	50
2002	7			1	2	10
2003	7	3	1			11
2004	10	1				11
2005	5	2	2			9
2006	7		1		1	9

North Harrison Street Corridor Accidents by Year						
	Lee Hwy	26th St	27th St	27th Rd	Little Falls Rd	TOTAL
TOTAL	36	6	4	1	3	50
Rear End	12	1	1			14
Angle	10	3			2	15
Right/Left Angle	8	2				10
Sideswipe	3					3
Fixed Object	1		1	1		3
Head On	1					1
Backed Into			2			2
Other/Non Collision	1				1	2

VI. Conclusion

While the number of accidents have remained low and the number of vehicles have increased in the North Harrison Street Corridor, possibly due to the addition of the Lee-Harrison Shopping Center addition, the analysis shows the relative number of vehicles speeding over 30 miles per hour (mph) in the southbound direction has been reduced by 5%. In the northbound direction, however, the relative number of vehicles traveling over 30 mph in the northbound direction has increased by 21%. DOT believes that this increase is due to roadway improvements, which

created a perceived increase in safety for the driver. This perception often times makes the drivers more comfortable on the roadway and thus increases speeding. These roadway improvements included adding bike lanes, crosswalks and pedestrian flashers at the crosswalks, a speed indicator and curb ramps. Other improvements were offered to the community, which DOT believes may reduce speeding. Some residents rejected these improvements. For instance, another speed indicator was proposed but not implemented due to strong opposition from affected residents over proper placement. It was clear that affected residents did not want the devices placed near their house for perceived quality of life reasons. It is DOT's recommendation, however, to install the southbound speed indicator and a pedestrian flasher near the Chestnut Hills Park to alert the drivers of their vehicular speeds and of pedestrians crossing the street.

Police enforcement is another key factor that may help to change driver speeding patterns. DOT is working with the Police Department to enforce the speed limit and to make drivers aware of their speeding patterns. Previous police detail operations have resulted in approximately one (1) citation per each hour of police enforcement efforts.

VII. Appendix

A. Speed Histogram

MetroCount Traffic Executive Speed Histogram

Speed Statistics

Site: [454] N. HARRISON STREET SOUTH OF LITTLE FALLS ROAD- HR28BN-SP-REG
Survey Duration: 09:00 Wed 05 Apr 2000 to 09:00 Thu 06 Apr 2000
Direction: North (bound)
Total vehicles in profile= 2488
Posted speed limit = 25 mph
Number speeding = 2233 (89.75%)
Vehicles over 30 mph = 1179 (47.39%)
Vehicles over 35 mph = 218 (8.76%)
Mean speed = 29.79 mph
85% speed = 33 mph
12 mph pace = 24 to 36
Number in 12 mph pace = 2178 (87.54%)
Variance = 16.47
Standard deviation = 4.06 mph

MetroCount Traffic Executive Speed Histogram

Speed Statistics

Site: [454] N. HARRISON STREET SOUTH OF LITTLE FALLS ROAD- HR28BN-SP-REG
Survey Duration: 09:00 Wed 05 Apr 2000 to 09:00 Thurs 06 Apr 2000
Direction: South (bound)
Total vehicles in profile= 2919
Posted speed limit = 25 mph
Number speeding = 1772 (60.71%)
Vehicles over 30 mph = 241 (13.60%)
Vehicles over 35 mph = 17 (0.98%)
Mean speed = 25.74 mph
85% speed = 28 mph
12 mph pace = 20 to 32
Number in 12 mph pace = 2739 (93.83%)
Variance = 10.84
Standard deviation = 3.29 mph

Arlington County Speed Histogram

Speed Statistics

N. HARRISON STREET SOUTH OF LITTLE FALLS ROAD TUESDAY SEPTEMBER 19, 2006

Vehicles = 6647

Posted speed limit = 25 mph, Exceeding = 5754 (86.57%)

Vehicles over 30mph = 2821 (42.44%),

Vehicles over 35mph = 474 (7.13%).

Mean = 29.3 mph

85% Speed = 33.1 mph

10 mph Pace = 24 - 34

Number in Pace = 5374 (80.85%)

Variance = 16.63

Standard Deviation = 4.08 mph

NORTHBOUND SOUTHBOUND

Speed Statistics

N. HARRISON STREET SOUTH OF LITTLE FALLS ROAD TUESDAY SEPTEMBER 19, 2006 NORTHBOUND DIRECTION

Vehicles = 3296

Posted speed limit = 25 mph, Exceeding = 3016 (91.50%)

Vehicles over 30mph = 1769 (53.67%),

Vehicles over 35mph = 350 (10.62%).

Mean = 30.3 mph

85% Speed = 34.0 mph

10 mph Pace = 25 - 35

Number in Pace = 2681 (81.34%)

Variance = 16.48

Standard Deviation = 4.06 mph

Speed Statistics

N. HARRISON STREET SOUTH OF LITTLE FALLS ROAD TUESDAY SEPTEMBER 19, 2006 SOUTHBOUND DIRECTION

Vehicles = 3351

Posted speed limit = 25 mph, Exceeding = 2738 (81.71%)

Vehicles over 30mph = 1052 (31.39%),

Vehicles over 35mph = 124 (3.70%).

Mean = 28.3 mph

85% Speed = 31.8 mph

10 mph Pace = 23 - 33

Number in Pace = 2806 (83.80%)

Variance = 14.77

Standard Deviation = 3.84 mph

B. Accident Data

Accidents for North Harrison Street at 26th Street North

Year	Acc_no	Inj_acc	Fatal_acc	Ped_acc
2003	3	1	0	0
2004	1	0	0	0
2005	2	0	0	0
Total	6	1	0	0

Day_of_wk	Acc_no
Wed	2
Thu	2
Sat	1
Fri	1
Total	6

Data from: 05/07/2003
through: 07/30/2005

Accidents for North Harrison Street at 26th Street North Cont'd

Accident_type	Acc_no
Angle	3
Left angle	1
Rear end	1
Right angle	1
Total	6

Accident_type	YR2003	YR2004	YR2005	Acc_no
Angle	2	1	0	3
Left angle	0	0	1	1
Rear end	1	0	0	1
Right angle	0	0	1	1
Total	3	1	2	6

Contrib_factor	Acc_no
UNIT 1	0
Did not have right-of-way	4
Following too close	2
	0
	0
UNIT 2	0
No improper action	6
Total	12

Accidents for North Harrison Street at 27th Street North

Year	Acc_no	Inj_acc	Fatal_acc	Ped_acc
2003	1	0	0	0
2005	2	0	0	0
2006	1	0	0	0
Total	4	0	0	0

Day_of_wk Acc_no

Thu	2
Tue	1
Fri	1
Total	4

Data from 09/12/03
 through: 02/07/06

Accidents for North Harrison Street at 27th Street North Cont'd

Accident_type	Acc_no
Backed into	2
Fixed object - in road	1
Rear end	1
Total	4

Accident_type	YR2003	YR2005	YR2006	Acc_no
Backed into	0	2	0	2
Fixed object - in road	1	0	0	1
Rear end	0	0	1	1
Total	1	2	1	4

Contrib_factor	Acc_no
UNIT 1	0
Improper backing	2
Driver distraction	1
Other	1
	0
	0
UNIT 2	0
No improper action	3
	1
Total	8

Accidents for North Harrison Street at 27th Road North

Year	Acc_no	Inj_acc	Fatal_acc	Ped_acc
2002	1	0	0	0
Total	1	0	0	0

Day_of_wk Acc_no

Mon	1
Total	1

Data from: 10/28/2002
 through: 10/28/2002

Accidents for North Harrison Street at 27th Road North Cont'd

Accident_type	Acc_no
Fixed object - off road	1
Total	1

Accident_type	YR2002	Acc_no
Fixed object - off road	1	1
Total	1	1

Contrib_factor	Acc_no
UNIT 1	0
Other	1
	0
	0
UNIT 2	0
	1
Total	2

Accidents for North Harrison Street at Little Falls Road

Year	Acc_no	Inj_acc	Fatal_acc	Ped_acc
2002	2	0	0	0
2006	1	0	0	0
Total	3	0	0	0

Day_of_wk	Acc_no
Thu	2
Fri	1
Total	3

Data from: 01/07/2002
 through: 02/17/2006

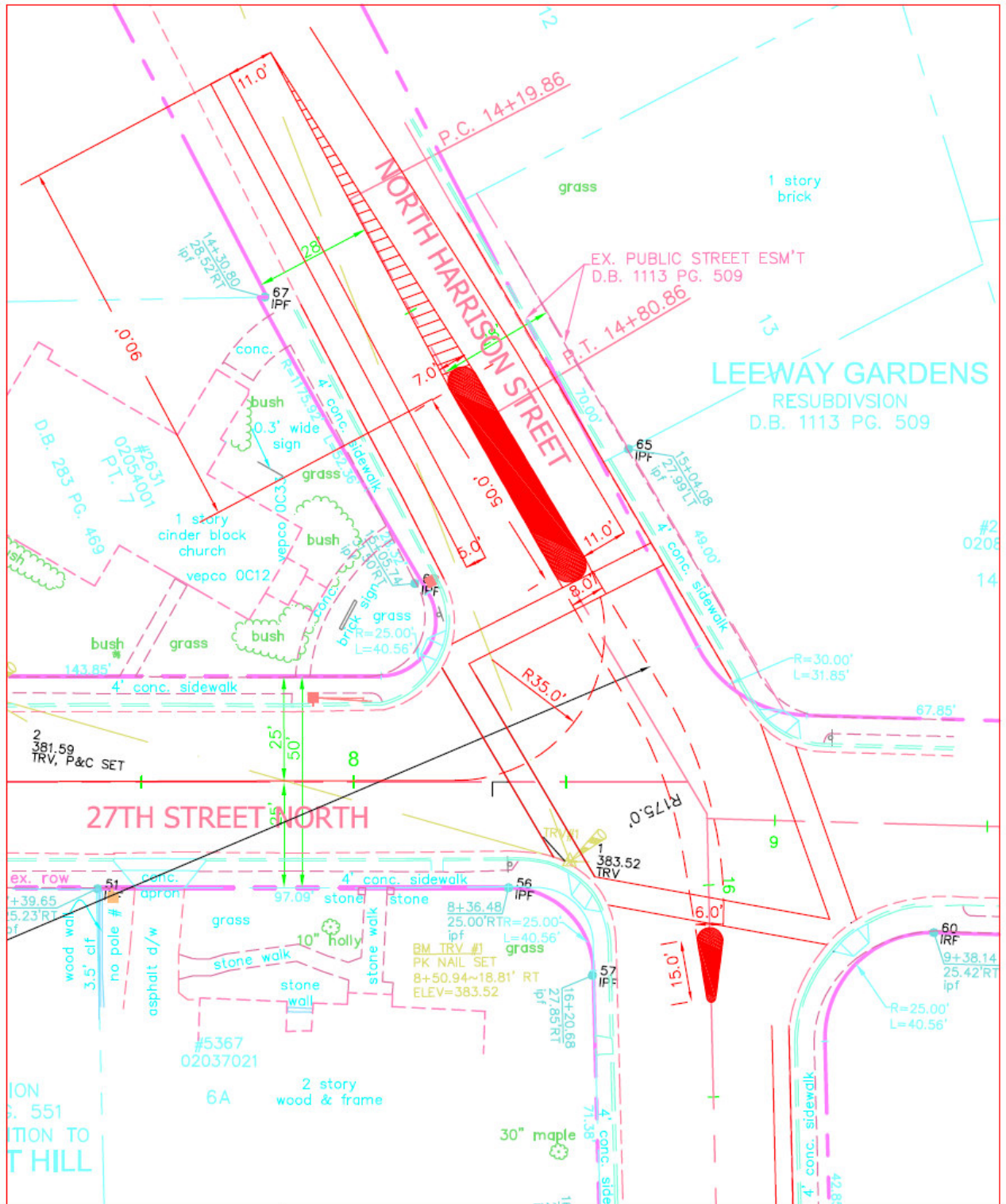
Accidents for North Harrison Street at Little Falls Road Cont'd

Accident_type	Acc_no
Angle	2
Other	1
Total	3

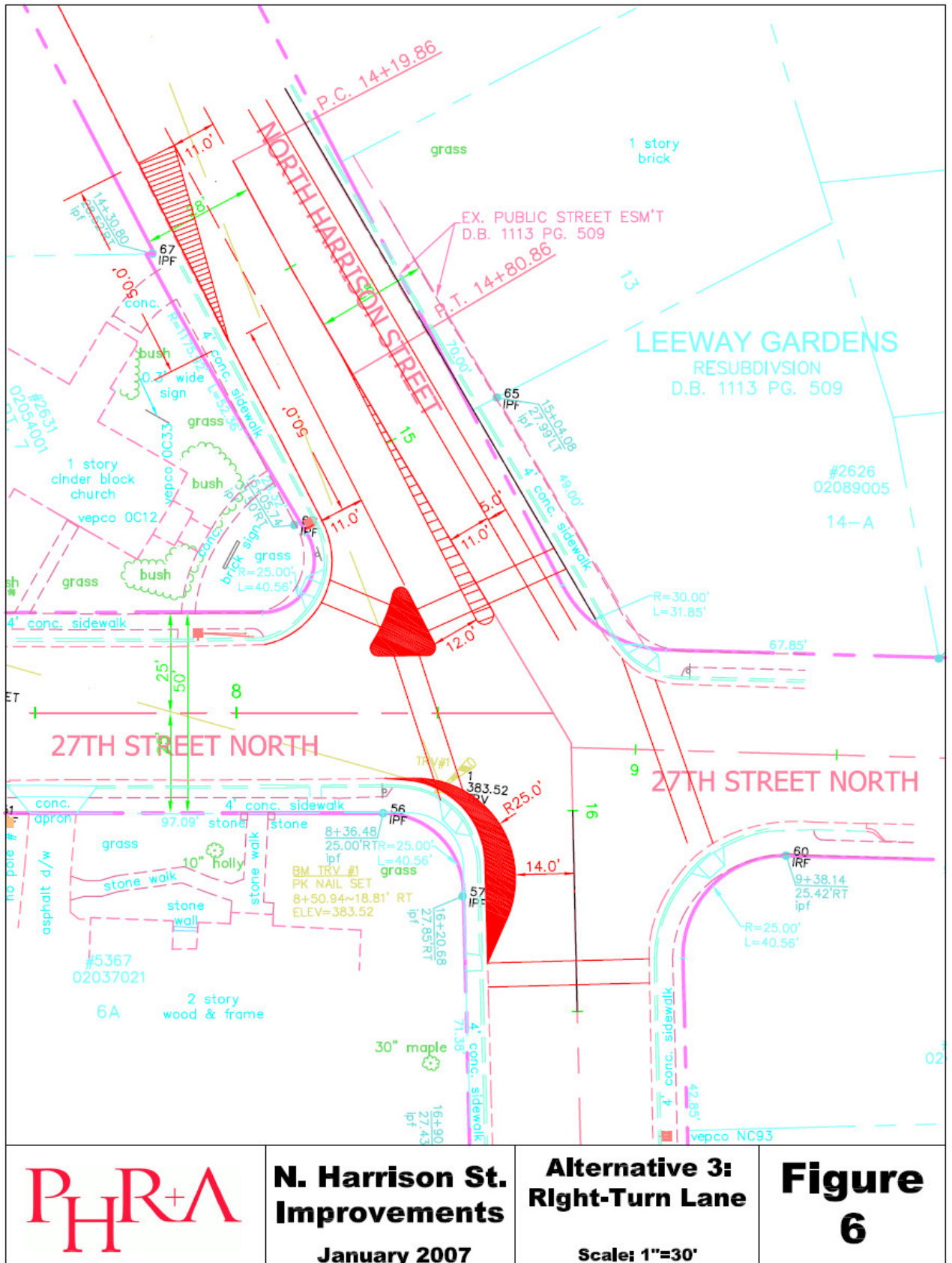
Accident_type	YR2002	YR2006	Acc_no
Angle	2	0	2
Other	0	1	1
Total	2	1	3

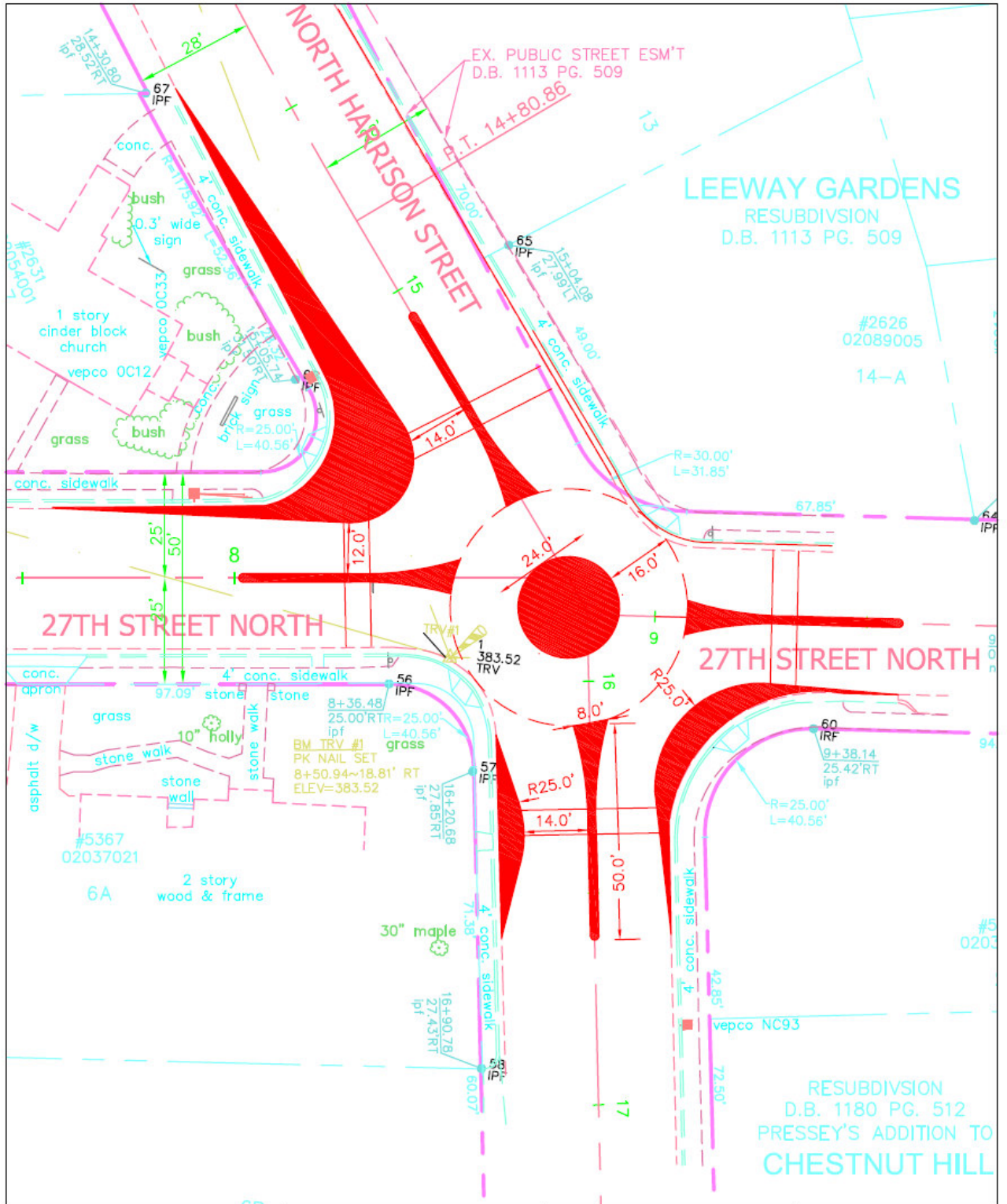
Contrib_factor	Acc_no
UNIT 1	0
Disregarded stop or yield sign	1
Other	1
Did not have right-of-way	1
	0
	0
UNIT 2	0
No improper action	3
Total	6

C. North Harrison Street at 27th Street Schematic Plans



	<p>N. Harrison St. Improvements January 2007</p>	<p>Alternative 2: Median Scale: 1"=30'</p>	<p>Figure 5</p>
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	<p>N. Harrison St. Improvements January 2007</p>	<p>Alternative 4: Roundabout Scale: 1"=30'</p>	<p>Figure 7</p>
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D. Letter from Community

Attention: Terry Bellamy
Traffic Engineering Division
Arlington County Department of Public Works
2100 Clarendon Boulevard Suite 717
Arlington, Virginia 22201

Date: January 19, 2004

Re: Automobile Accidents at North Harrison and 27th Road and the Need for a Uniform County Policy

Dear Mr. Bellamy,

The purpose of this letter is to address the traffic control measures taken in response to two very dangerous car accidents last year at the intersection of Harrison and 27th Road.

I know I speak for many in the neighborhood when I say that *it is urgently necessary to slow traffic down* on Harrison Street between Lee Highway and Little Falls Road by every reasonable means, without seriously impeding traffic flow.

After three months, it seems the traffic control measures implemented by the County for Harrison Street have not accomplished this goal. In fact, it appears that traffic is moving faster than ever before, because the improved striping and signage have made it easier for drivers to see the road as they enter the intersection of Harrison and 27th Street from either side. Thus, they now approach this intersection with less fear than before, and feel free to move faster as a result. So the measures applied by the County seem to have worked too well, as far as vehicular speed is concerned.

Whereas a more clearly marked roadway may theoretically lower the risk of accidents, the question is whether the higher speeds which seem to result from increased driver confidence are in fact offsetting the benefit of better markings. After three months, this is the conclusion I have drawn after personally observing traffic an average of three times per day; because more cars are moving faster than before, the risk of a spin-out at high or even moderate speed is at least as great as before the application of traffic facilitation measures, *because the basic design of the intersection has not been changed in the meantime.*

Thus it might have been an error in judgment on the County's part to improve traffic flow through an inherently defective intersection such as at Harrison and 27th, even if it intends to make conditions safer, without improving the design of the intersection itself.

Therefore, I strongly recommend the County implement select traffic calming measures to counterbalance this improved flow (see diagrams on pages 3 and 4), and signal the County's intent to more vigorously enforce traffic laws on Harrison Street:

1. Electronic speed indicators ("your speed is.."), one positioned above the 25 mph sign in front of the church at 27th and Harrison (see page 4), and another due west of Chestnut Hills Park;

2. An alternating yellow flasher positioned above the arrow west of the intersection (page 4), visible to oncoming cars from the crest of 26th and Harrison, to warn of the impending curve and to slow down generally;
3. Four-way pedestrian striping at 26th and Harrison (the same as at 27th and Harrison) with additional signage to warn drivers of pedestrians and that they are entering a residential neighborhood (see page 3);
4. A 25 mph speed limit sign just prior to Harrison and 26th (page 3; there is a 25 mph sign in front of the Lee-Harrison shopping center but it is too far from the intersection to serve as an immediate warning to oncoming drivers).


Combined with a greater police presence, i.e. more active ticket-writing, the long-term goal is for Harrison Street to acquire a reputation for law enforcement while nonetheless maintaining sufficient traffic flow in both directions.

These measures will signal the County's intent to discourage speeding and reckless driving by every reasonable means at its disposal. After this, it might be fair to say the County has done all it can to lessen the risk of more accidents such as the ones at Harrison and 27th Road, short of redesigning the entire intersection.

And whereas it may be unfair to expect that fear of law enforcement alone will eliminate speeding and other types of reckless driving on Harrison Street, it is equally unfair to assume it will not prove an effective traffic-calming tool in combination with other measures, particularly since a more vigorous law enforcement program has yet to be applied.

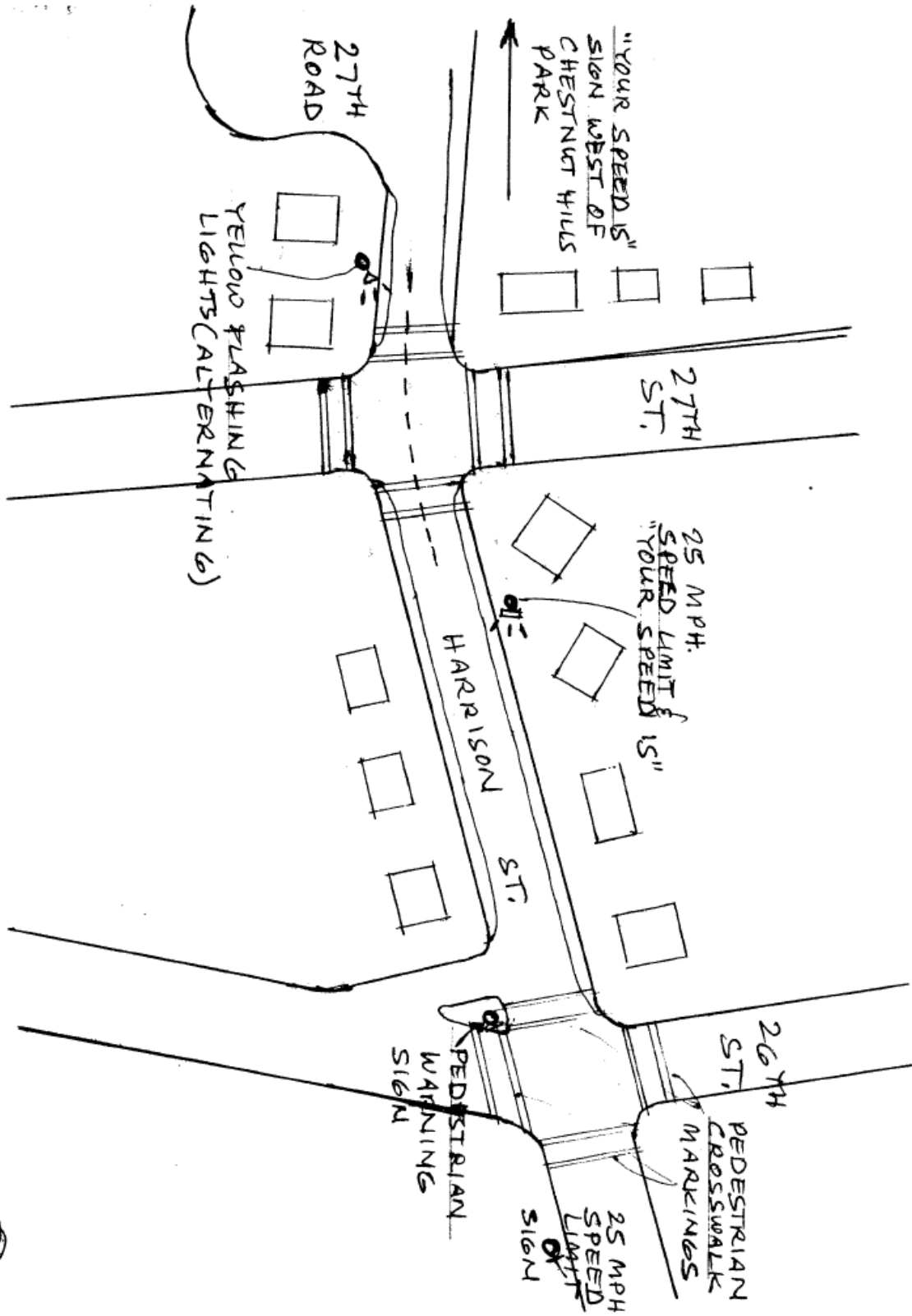
What is happening on Harrison Street may also suggest that **traffic calming and traffic facilitation should be implemented in equal measure, in combination with one another, as a matter of County policy**; in this regard, Harrison Street may yet prove an unfortunate example of what happens when one is applied without the other, and illustrate the need for a more balanced and comprehensive policy toward all residential streets.

Yours Very Truly (and I look forward to your reply),

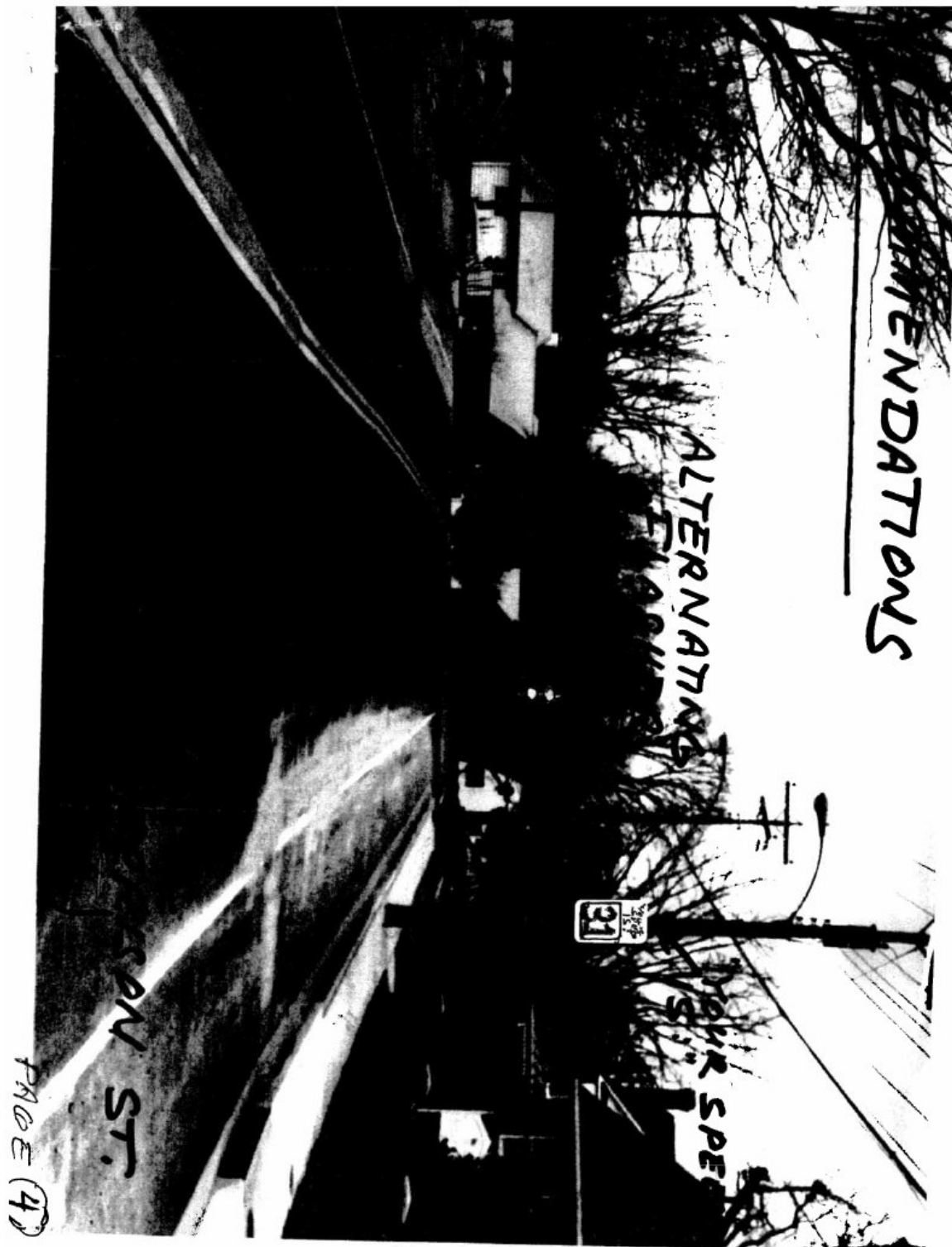


Frank Morgan
Designer and Consultant
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cc Joe Durkee
County Manager's Office (attn: Michelle Ferguson)
Richard Best, Transportation Commission Coordinator
Stephen Powers, P.E.
Bob Littell
Mark Hennessey



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¹ "Arterial Transportation Management Study" (ATM). Kimley-Horn Associates, Inc. for the Arlington County Department of Environmental Services. August 2004.