Council Meeting Date: August 20, 2007 **Agenda Item:** 8(a)

CITY COUNCIL AGENDA ITEM
CITY OF SHORELINE, WASHINGTON

AGENDA TITLE:	15th Ave NE Roadway Configuration Options
DEPARTMENT:	Public Works-Traffic Services
PRESENTED BY:	Mark Relph, Public Works Director Jesus Sanchez, Operations Manager Rich Meredith, City Traffic Engineer

PROBLEM/ISSUE STATEMENT:

On May 14, 2007, Public Works presented a report to the City Council on the current operation of 15th Ave NE between NE 150th St and NE 175th St. This roadway was converted in December, 2003, from a 4-lane roadway, two lanes in each direction, to a 3 lane roadway with one lane in each direction, a center turn lane, and bike lanes.

City Council members asked Public Works to develop more roadway configuration alternatives for review. The intent of this report is to provide a broader view of the alternatives that may exist with some general observations of what the advantages and issues may be for each alternative. A more detailed analysis with modeling would be necessary beyond the scope of this report if a more precise comparison is required in selecting an alternative to pursue.

FINDINGS/CONCLUSIONS

Staff developed and reviewed eight roadway configuration concepts. An analysis of the options is discussed in the body of the report. For a safer pedestrian and vehicle environment, the existing 3-lane with enhancements, option 1A, appears to be the best solution. However, capacity will be limited to a maximum between 25,000 and 30,000 vehicles per day with a corresponding increase in vehicle delay.

To accommodate higher vehicle volumes and a higher potential to reduce travel time in the corridor, option 2 would be better. It is recommended that traffic signals be located every five blocks for controlled pedestrian and vehicle access. This means that traffic signals should be installed at NE 170th St and at NE 150th St. It is also recommended that curbing be installed between intersections to improve safety and traffic progression by reducing turning conflicts.

RECOMMENDATION

Staff recommends Option 1A - existing configuration with enhancements. Staff also recommends not pursuing additional analysis and modeling of other alternatives since the cost is not likely to reveal one single alternative that is substantially more efficient in increasing pedestrian safety or improving traffic flow, The cost of a comparative analysis is extremely high for the return on investment.

Approved By: City Manager ______ City Attorney ______

ACTION/BACKGROUND

Historically, 15th Ave NE consisted of two lanes in each direction between NE 150th St and NE 175th St. The curb to curb width of 15th Ave NE is 44 feet, so there is not enough room for a center turn lane and two lanes in each direction. The character of the land uses along 15th Ave NE is primarily residential. The speed limit is 35 MPH. There were complaints about pedestrian safety along the corridor. The City of Shoreline funded a study to examine the corridor and recommend improvements. In the study titled "Final Pedestrian Safety report, January, 2003, one of the recommendations was to reconfigure 15th Ave NE from four lanes to one lane in each direction with a center turn lane. This change, sometimes referred to as a "road diet" because of the reduction in the number of lanes, has been found to improve overall safety of a roadway. One specific safety benefit is the reduction of the "multiple threat" situation for pedestrians. A "multiple threat" situation occurs when one car stops for a pedestrian, but a vehicle in the adjacent lane doesn't, in part because the visibility of the pedestrian can be obscured by the stopped vehicle.

DISCUSSION

15th Ave NE is currently 44 ft wide between curbs. Without roadway widening, there are a limited number of possible of roadway configurations. Using lane widths of 11-12 ft, and bike lane width of 5 feet, Public Works staff developed the roadway scenario options listed below. A last option requiring roadway widening (acquiring private property) was also included for consideration.

As Council considers all the options provided by staff, it is important to note however, that all the options provided with the exception of Options #4 and #6 are actually four lane configurations, using all four lanes in different design transportation/movement schemes. Option #4 uses three lanes to move "through" traffic as opposed to the existing operation, which only uses two lanes to move "through" traffic. Option #6, actually uses all four lanes for traffic movement north and south bound, but includes a center turn lane, requiring property acquisition. In the final analysis looking at the various configurations, there is no optimal lane configuration. Each has a different set of values and disadvantages, requiring careful modeling and study.

Going back to the original four lane configuration has it advantages and disadvantages, namely pedestrian safety. The multiple threat (pedestrian safety) condition would exist. If council wishes to consider returning to a four lane design, then there are proposed pedestrian enhancements that would be important for council to consider as part of lane reconfiguring.

Finally, if council were to consider any of the aforementioned options provided, staff would need sufficient time to study and model them so to present to council a more detailed impact statement addressing neighborhoods, pedestrian safety, Level of Service (LOS) values, traffic devices, any warrant study and budgetary impacts.

ISSUES

Option #1 and #1A

Option 1 is the existing 3-lane configuration with one lane each direction, center turn lane, and bike lanes. Option #1A (with enhancements) adds:

- traffic islands for safety in the center turn lane to help reduce incidents of vehicles using the center lane to pass.
- Concurrence with Metro Transit to have the buses pull over to the curb and out of the travel lane, thereby keeping the through lane clear. Some delineation of the striping may be necessary.
- Continue to monitor the neighborhood traffic and aggressively seek and fund opportunities to minimize cut-through traffic and speeding through the Neighborhood Traffic Safety Program.

Advantages

This is the existing roadway configuration. Currently carrying approximately 16,500 - 17,500 vehicles per day and 1,400 vehicles in the peak hours. Multiple threat scenario is not present, and pedestrians have an easier time crossing 15th Ave NE compared to a 4-lane roadway. Designated bicycle lanes are striped on 15th Ave NE. The center turn lane and bicycle lanes provide improved safety for turning vehicles

Issues

Greater potential for increased congestion in the corridor compared to four lanes, and the three lane configuration has a lower limit for the ultimate capacity of the corridor compared to other options. Since implementation, the collision rate has been 4.3 crashes per million vehicle miles over the three years. The injury rate during the same period was 2.2 injuries per million vehicle miles.

Option #2

4-lane configuration with two lanes in each direction. (no bike lanes or center turn lane)

Advantages

This is the previous roadway configuration. Carried approximately 17,500 -18,500 vehicles per day and 1,700 vehicles in the peak hours. Ultimately provides more roadway capacity compared to existing operation (options #1 & #1A).

Issues

Multiple threat scenario is present, and pedestrians will have a more difficult time crossing 15th Ave NE compared to a existing roadway. No room for designated bicycle lanes, and reduced safety for turning vehicles. The collision rate was 4.0 crashes per million vehicle miles for three years prior to reconfiguration. The injury rate during the same period was 2.8 injuries per million vehicle miles.

Option #3A and 3B

4-lane configurations with one in one direction, two lanes in the other, and a center turn lane. (no bike lanes)

Advantages
Provides more roadway capacity compared to existing operation (options #1 & #1A). Two lanes in one direction will have more capacity to carry traffic than existing, which will be beneficial during mostly one peak hour. Turn lane provides improved safety for turning vehicles, and provides pedestrians with an easier crossing of 15th Ave NE compared to a 4-lane roadway

Issues
Multiple threat scenario still exists for pedestrians on half of the roadway. No room for designated bicycle lanes. Intersection radius improvements may be needed to accommodate vehicle turns onto the one-lane direction of 15th Ave NE.

Option #4A and 4B
4-lane configurations with one in one direction, two lanes in the other, and bike lanes. (no center turn lane)

Advantages
Two lanes in one direction will have more capacity to carry traffic than existing, which will be beneficial during one peak hour. Provides designated bicycle lanes on 15th Ave NE. Bicycle lanes help improve visibility at intersections and driveway for turning vehicles.

Issues
Provides less roadway capacity compared to existing operation (options #1 & #1A). Multiple threat scenario exists for pedestrians on half of the roadway, and pedestrians will have a more difficult time crossing 15th Ave NE compared to a existing roadway. Roadway improvements may need to be made to accommodate vehicle turns onto one-lane side of 15th Ave NE.

Option #5
4-lane configuration with one lane in each direction and transit/right-turn lanes in each direction. (no bike lanes or center turn lane)

Advantages
Improves transit speed and reliability.

Issues
Multiple threat scenario is present, and pedestrians will have a more difficult time crossing 15th Ave NE compared to a existing roadway. No room for designated bicycle lanes, and reduced safety for turning vehicles. Provides less capacity than existing configuration (options #1 & #1A).

Option #6
5-lane configuration with two lanes in each direction and a center turn lane.

Advantages
Provides more roadway capacity compared to existing operation. Pedestrians can cross half a roadway at a time, making this option easier to cross than the 4-lane option. Improved safety for turning vehicles.

Issues
Multiple threat scenario is present. No room for designated bicycle lanes. This option will require a minimum of 12 feet of right-of- way acquisition; more if bike lanes are added. Acquisition costs could be significant.

FUNDING CONSIDERATIONS

Should the 3-lane configuration remain permanent (options #1), it is recommended that median islands be constructed (option #1A), restriping to better accommodate bus pullouts and continue emphasis on neighborhood traffic safety improvements. The cost to construct two landscaped islands can be in the range of $25,000 to $30,000. In addition, adding a new traffic signal on 15th Ave NE at NE 170th St can enhance pedestrian safety at that crosswalk location.

For all options 2 through 6, required capital costs would include removal of existing markings, restriping, signing, and signal modifications. The cost of this project would be around $70,000. Other costs to consider would be an increased need for traffic signals to facilitate access across 15th Ave NE. A potential location for a traffic signal is at the intersection of NE 170th St. A project to install a traffic signal at this location would need to include improvements on NE 170th St for pedestrian safety and traffic signal equipment. The project is budgeted at 600K. The City of Shoreline has recently been notified of a grant award to help defray costs.

A new traffic signal is already scheduled to be built at 15th Ave NE and NE 150th St this year. The cost of that project is budgeted at $500k.

Options 2 and 5 would need curbing installed on the centerline between intersections to limit left turns and improve safety.

Options 3 and 4 may also require intersection radius improvements to help facilitate turning vehicles. Such improvements may require acquisition of easements or right of way.

Option 6 would require a minimum of 12ft of right of way along 15th Ave NE from NE 150th St to NE 175th St to accommodate widening the roadway for a 5th lane. The costs for property acquisition have not been determined at this time.

The cost to pursue additional analysis and modeling would likely range from $15,000 to $30,000. Staff does not believe this cost would clearly demonstrate one single alternative being better than another. This is perhaps an over simplification, but staff suggests the issue largely falls to what shall be the emphasis of the street section; pedestrian safety and turning movements, or corridor capacity passing through the neighborhood.

CONCLUSION

Staff developed and reviewed eight roadway configuration concepts. For a safer pedestrian and vehicle environment, option #1A, the existing 3-lane with enhancements, appears to be the best solution. However, capacity will be limited to a maximum of about 25,000 to 30,000 vehicles per day and vehicle delay can increase. This upper limit would require modeling to forecast at what point in the future this may become an issue.

To accommodate higher vehicle volumes and reduce travel time in the corridor, option 2 may have greater potential. It is recommended that traffic signals be located every five blocks for controlled pedestrian and vehicle access. This means that traffic signals should be installed at NE 170th St and at NE 150th St. It is also recommended that curbing be installed between intersections to improve safety by reducing turning conflicts.

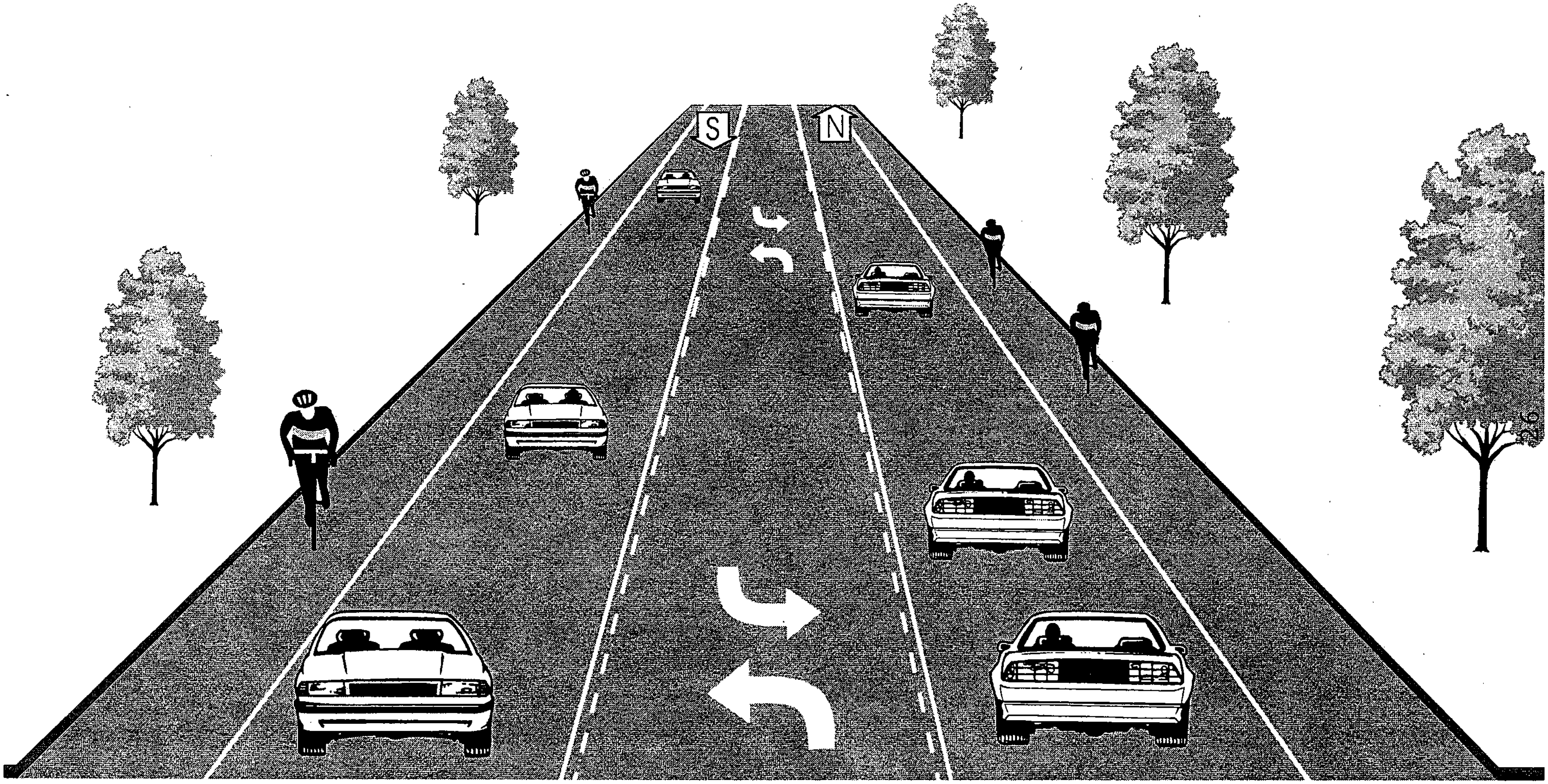
RECOMMENDATION

Staff recommends Option 1A - existing configuration with enhancements. Staff also recommends not pursuing additional analysis and modeling of other alternatives since the cost is not likely to reveal one single alternative that is substantially better than another. Staff would suggest the issue largely focuses on the issue of whether or not the City wants to provide more emphasis on pedestrian safety and turning movements, or roadway capacity passing through the neighborhood.

ATTACHMENTS

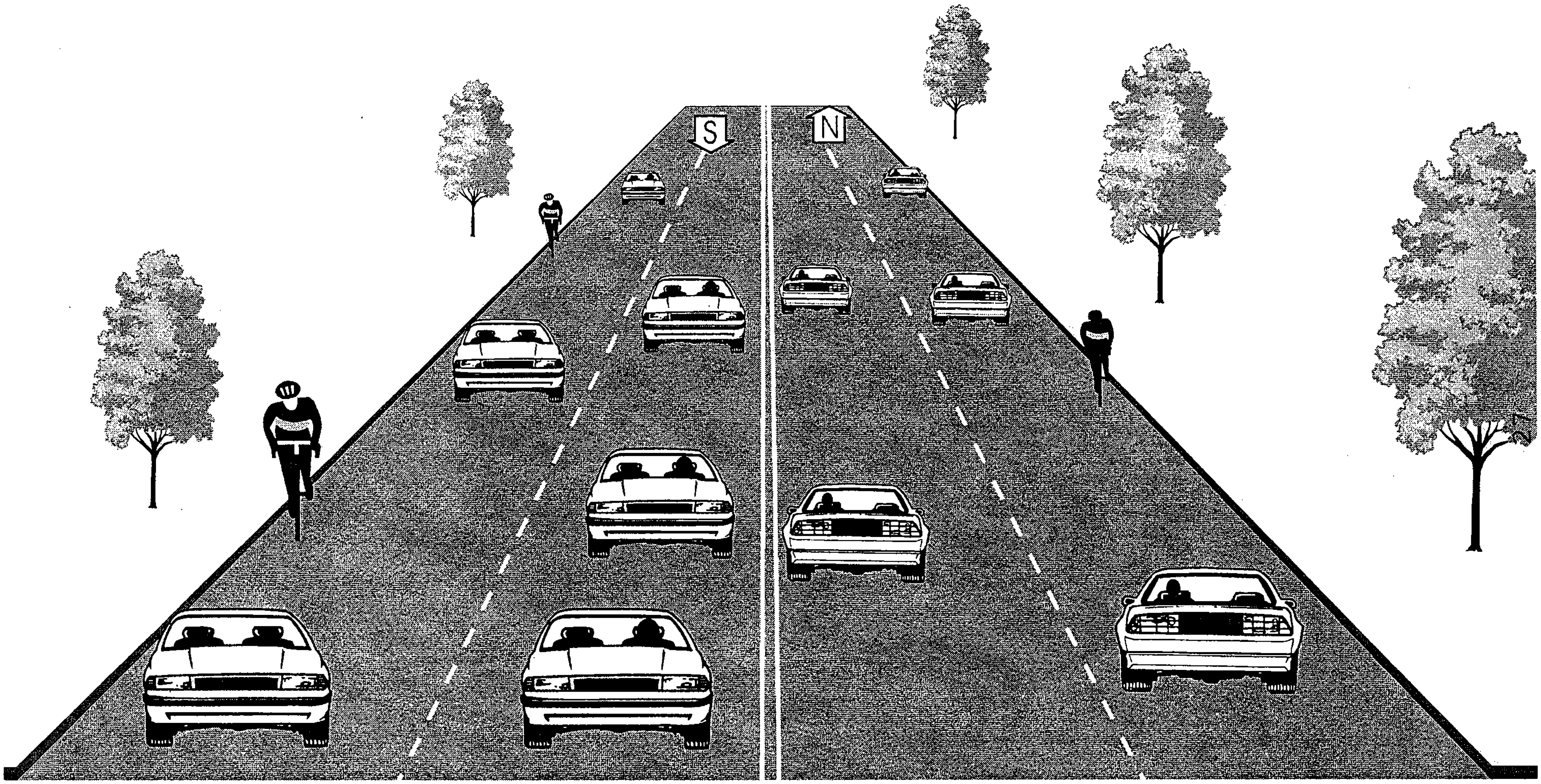
Appendix A - Graphics of Roadway Configurations
Appendix B – Analysis of Options Matrix
Appendix C - Collision Analysis

Appendix A - Roadway Configuration Options



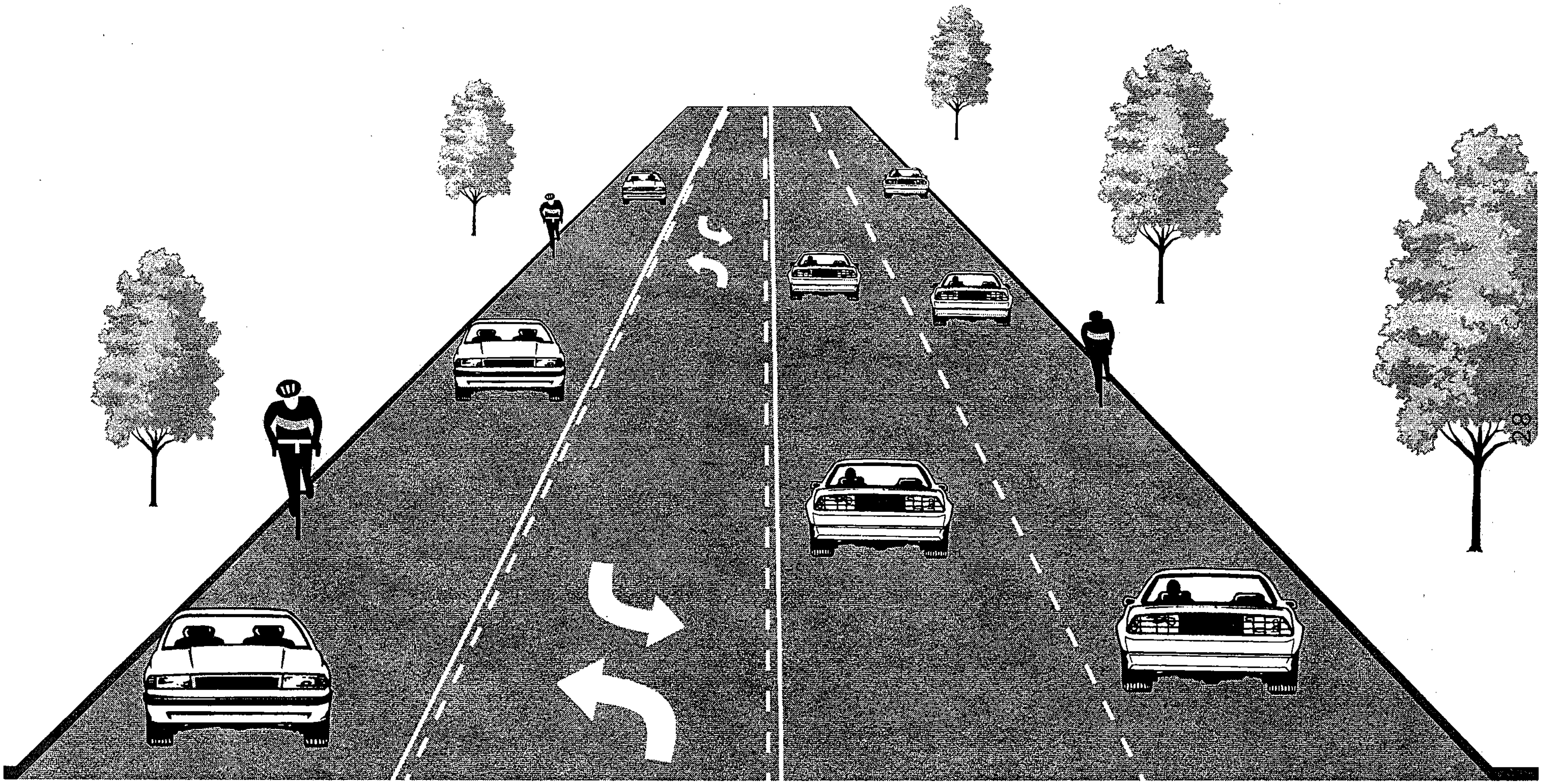
Options #1 and #1A
Existing With Marked Bike Lanes

Appendix A - Roadway Configuration Options



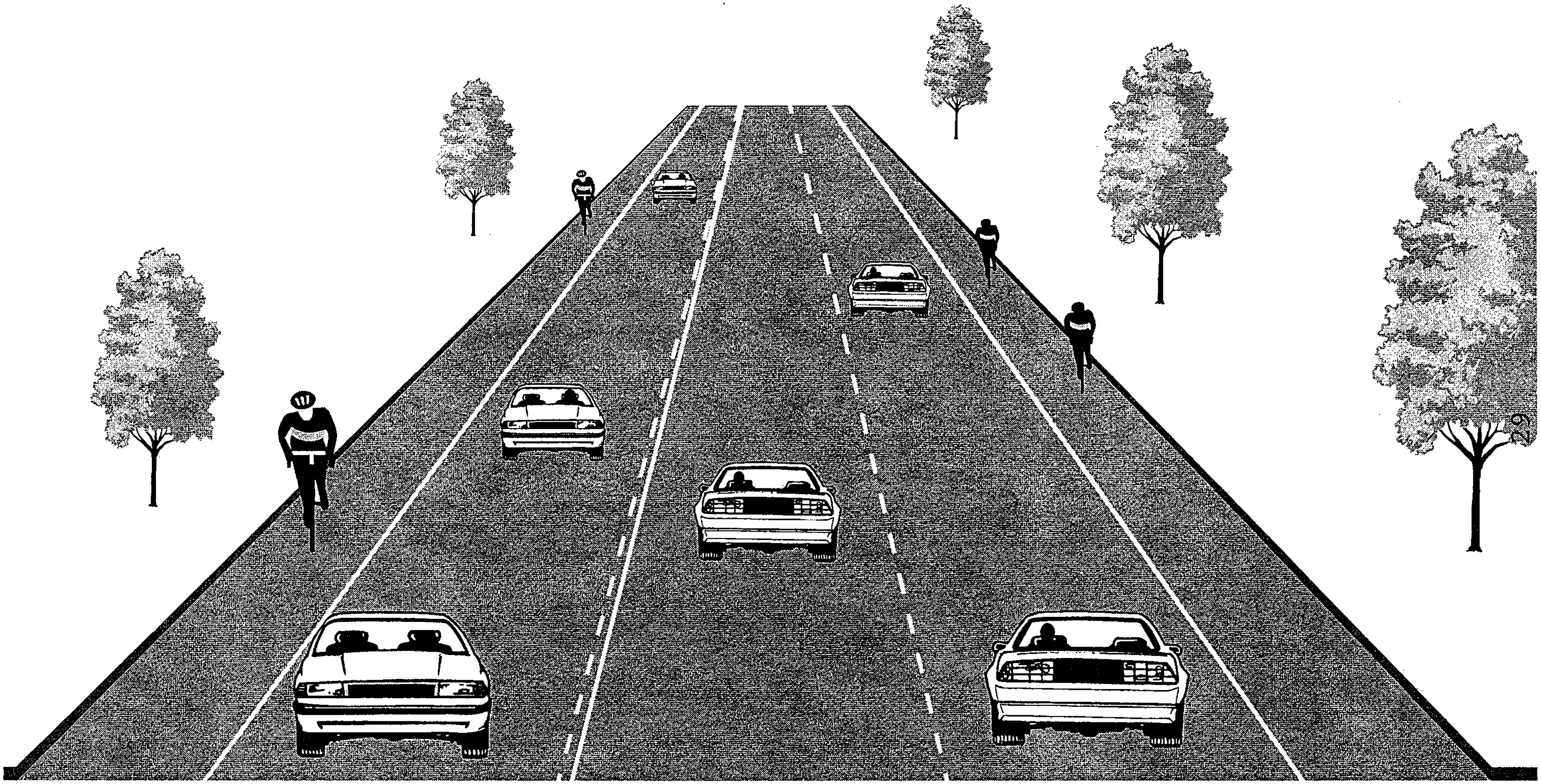
Option #2
Four Lanes Option

Appendix A - Roadway Configuration Options



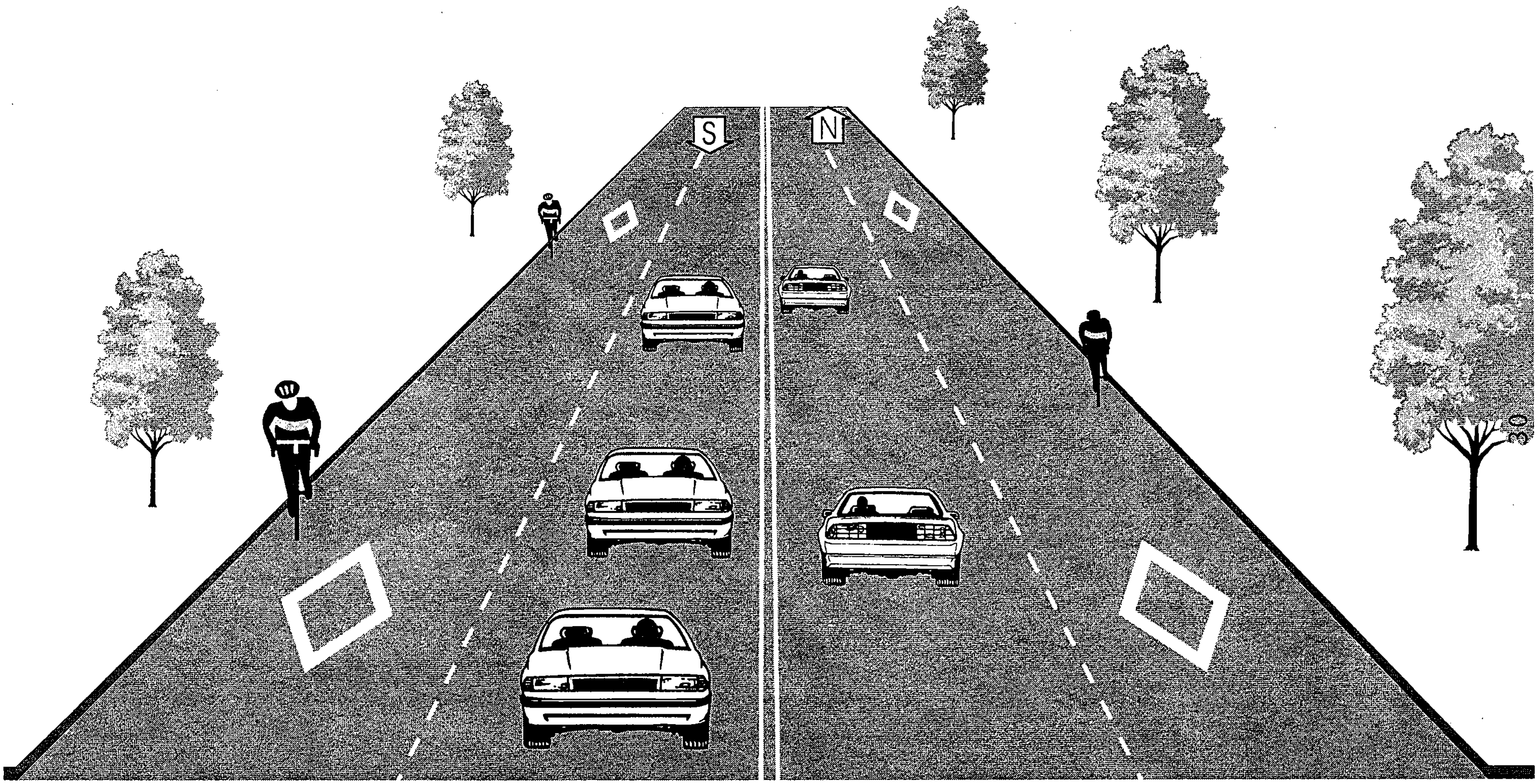
Options #3A and #3B
Three Lanes and a Center Lane

Appendix A - Roadway Configuration Options



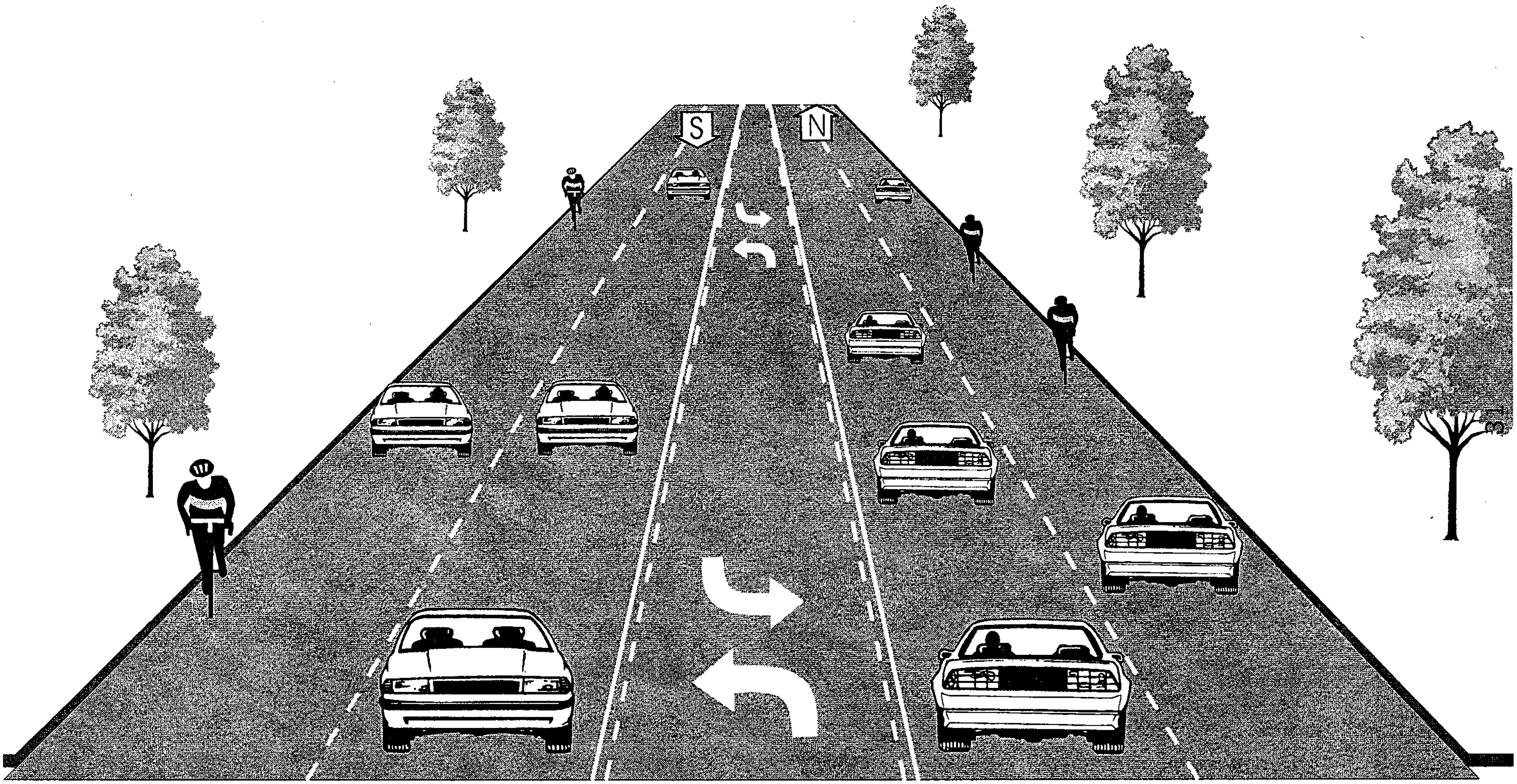
Options #4A and #4B
Three Lanes With Marked Bike Lanes

Appendix A - Roadway Configuration Options



Option #5
Four Lanes with BAT Lanes

Appendix A - Roadway Configuration Options



Option #6
Four lanes and a Center Turn Lane

Appendix B - Analysis of Options

Pedestrians

	Option 1 3-lane-bike	Option 2 4-lanes	Option 3A 1S-2N-turn	Option 3B 2S-1N-turn	Option 4A 1S-2N-bike	Option 4B 2S-1N-bike	Option 5 1S-1N-bat	Option 6 5-lanes
Pedestrian Crossing Difficulty	A center turn lane helps pedestrians in that they only need to cross one lane at a time. The shorter crossing distance requires smaller gaps in traffic to cross, providing more crossing opportunities per hour.	Pedestrians need to cross 4 lanes at once. This means that there are fewer gaps in traffic each hour of sufficient length to cross 15th Ave NE	A center turn lane helps pedestrians in they only need to cross 1 or 2 lanes at once. This means that there are more gaps in traffic each hour of sufficient length to cross 15th Ave NE than in option 1.		Pedestrians need to cross 3 lanes at a time. This means that there are fewer gaps in traffic each hour of sufficient length to cross 15th Ave NE than in option 2.		Pedestrians need to cross 4 lanes at once. This means that there are fewer gaps in traffic each hour of sufficient length to cross 15th Ave NE	A center turn lane helps pedestrians in they only need to cross 2 lanes at once. This means that there are more gaps in traffic each hour of sufficient length to cross 15th Ave NE than in options 1, 3, and 4.
Pedestrian Safety		"multiple threat" crossing scenario issues	"multiple threat" crossing scenario issues		"multiple threat" crossing scenario issues		"multiple threat" crossing scenario issues	"multiple threat" crossing scenario issues

Vehicle Volume

	Option 1 3-lane-bike	Option 2 4-lanes	Option 3A 1S-2N-turn	Option 3B 2S-1N-turn	Option 4A 1S-2N-bike	Option 4B 2S-1N-bike	Option 5 1S-1N-bat	Option 6 5-lanes
Vehicle Capacity - AM (southbound only)	1 lane southbound and center turn lane can handle approximately 1200-1400 vehicles per hour	2 lanes southbound can handle approximately 1800-2000 vehicles per hour	1 lane southbound and center turn lane can handle approximately 1000-1200 vehicles per hour	2 lanes southbound and center turn lane can handle approximately 2300-2400 vehicles per hour	1 lane southbound can handle approximately 900-1100 vehicles per hour	2 lanes southbound can handle approximately 1800-2000 vehicles per hour	2 lanes southbound can handle approximately 1000-1200 vehicles per hour	2 lanes southbound and center turn lane can handle approximately 2300-2400 vehicles per hour
Vehicle Capacity - PM (northbound only)	1 lane northbound and center turn lane can be expected to handle approximately 1200-1400 vehicles per hour	2 lanes northbound can be expected to handle approximately 1800-2000 vehicles per hour	2 lanes northbound and center turn lane can be expected to handle approximately 2300-2400 vehicles per hour	1 lane northbound and center turn lane can be expected to handle approximately 1000-1200 vehicles per hour	2 lanes northbound can be expected to handle approximately 1800-2000 vehicles per hour	1 lane northbound can be expected to handle approximately 900-1100 vehicles per hour	2 lanes northbound can be expected to handle approximately 1000-1200 vehicles per hour	2 lanes northbound and center turn lane can be expected to handle approximately 2300-2400 vehicles per hour
Vehicle Capacity - daily	Can be expected to handle 25,000 to 30,000 vehicles per day	Can be expected to handle 30,000 to 40,000 vehicles per day	Can be expected to handle 25,000 to 35,000 vehicles per day		Can be expected to handle 12,000 to 25,000 vehicles per day		Can be expected to handle 12,000 to 25,000 vehicles per day	Can be expected to handle 40,000+ vehicles per day

Appendix B - Analysis of Options

	Option 1 3-lane-bike	Option 2 4-lanes	Option 3A 1S-2N-turn	Option 3B 2S-1N-turn	Option 4A 1S-2N-bike	Option 4B 2S-1N-bike	Option 5 1S-1N-bat	Option 6 5-lanes
Speed								
Vehicle Speed	Single lane helps limit overall speeds. Turn lane can allow for fewer faster throughput.	Two lanes can allow for fewer faster throughput. Turning vehicles can cause spot slowing.	Single lane helps limit overall speeds. Two lanes can allow for fewer faster throughput. Turn lane can allow for fewer faster throughput.		Single lane helps limit overall speeds. Two lanes can allow for fewer faster throughput. Turning vehicles can cause spot slowing, especially in single lane		Single lane helps limit overall speeds. Left Turning vehicles can cause spot slowing.	Two lanes can allow for fewer faster throughput. Turn lane can allow for fewer faster throughput.
Safety								
Collision Rate	4.3 collisions per million vehicle miles	4.0 collisions per million vehicle-miles	Can expect the collision rate to drop slightly compared to the three lane section should the traffic volumes increase.		Can expect the collision rate to rise slightly compared to the three lane section with the loss of the center turn lane.		Can expect the collision rate to be similar to Option 1 (4 lanes).	Can expect the collision rate to drop compared to the three lane section should the traffic volumes increase.
Injury Rate	2.2 injuries per million vehicle-miles	2.8 injuries per million vehicle-miles	Can expect the injury rate to rise slightly compared to the three lane section due to travel lanes moving closer to the curb, reducing some intersection visibility.		Can expect the injury rate to rise slightly compared to the three lane section due to loss of the center turn lane.		Can expect the injury rate to be similar to Option 1 (4 lanes).	Can expect the injury rate to drop compared to the four lane section should the traffic volumes increase and the center turn lane.
Emergency Vehicle Access	Emergency vehicles can use center turn lane to pass stopped vehicles	Emergency vehicles can use inside lane if vehicles have moved to the curb lane. Otherwise, they can cross centerline and travel in oncoming traffic lanes	Emergency vehicles can use center turn lane to pass stopped vehicles		Emergency vehicles can use inside lane if there are two lanes and vehicles have moved to the curb lane. If there is only one lane, emergency vehicles will need to cross centerline and travel in oncoming traffic lanes		Emergency vehicles can use BAT lane to pass stopped vehicles	Emergency vehicles can use center turn lane to pass stopped vehicles
Left-Turn Safety	Center turn lane provide place to wait for an adequate gap in traffic to safely make a left turn.	Left turning vehicles must wait in a travel lane for an adequate gap in traffic to safely make a left turn.	Center turn lane provide place to wait for an adequate gap in traffic to safely make a left turn.		On the two-lane side, left turning vehicles must wait in a travel lane for an adequate gap in traffic to safely make a left turn. On the one-lane side, left turning traffic traffic will block the travel lane while waiting for an adequate gap in traffic to safely make a left turn.		Left turning vehicles must wait in a travel lane for an adequate gap in traffic to safely make a left turn.	Center turn lane provide place to wait for an adequate gap in traffic to safely make a left turn.
Multi-Modal								
Bicycle Lanes	yes	no	no		yes		no	no
Transit Impacts	yes	no	yes		yes		no	no

	Option 1 3-lane-bike	Option 2 4-lanes	Option 3A 1S-2N-turn	Option 3B 2S-1N-turn	Option 4A 1S-2N-bike	Option 4B 2S-1N-bike	Option 5 1S-1N-bat	Option 6 5-lanes
Neighborhoods								
Neighborhood Impacts	Existing condition	Expect traffic volumes to increase as more vehicles are drawn into area.	Expect traffic volumes to increase as more vehicles are drawn into area.		Expect traffic volumes to remain about the same.		Expect traffic volumes to increase as more vehicles are drawn into area.	Expect traffic volumes to increase as more vehicles are drawn into area.
Funding Considerations								
Cost to Implement	Have identified $25,000 in improvements for traffic islands	Identified 70,000 in restriping costs. Recommend traffic signal at NE 170th St to achieve signal spacing goal. Also recommend installing curbing on centerline to mitigate left-turning vehicle issues between intersections.	Identified 70,000 in restriping costs. Recommend traffic signal at NE 170th St to achieve signal spacing goal. Also recommend corner radius improvements at intersections to facilitate turning vehicles into the one-lane side of the roadway.		Identified 70,000 in restriping costs. Recommend traffic signal at NE 170th St to achieve signal spacing goal. Do not recommend installing curbing on centerline to mitigate left-turning vehicle issues between intersections as this would impact emergency response vehicles.		Identified 70,000 in restriping costs. Recommend traffic signal at NE 170th St to achieve signal spacing goal. Also recommend installing curbing on centerline to mitigate left-turning vehicle issues between intersections.	Costs have not been calculated. Roadway widening and property acquisition costs can be vey high.

Appendix C

15th Ave NE three lane conversion
Collision Comparision

1/1/2001 to 12/31/2006

15th Ave NE btwn NE 150th St to NE 175th St				Collison Types					Contributing Circumstances		Collision Rates	
	TOT COL	# INJ	# FTL	HDO	ANG	RE	SS	PED	RGT TRN	LFT TRN	Crash Rate	Injury Rate
4-lane Configuration 2 north - 2 south lanes 1/2002 to 1/2004	96	68	1	0	17	30	5	3	0	15	4.019	2.847
3-lane Configuration 1 north - 1 south - 1 turn lane 1/2004 to 1/2006	**93**	**47**	**0**	**0**	**16**	**39**	**2**	**4**	**0**	**8**	**4.333**	**2.190**
change	(3)	(21)	(1)	0	(1)	9	(3)	1	0	(7)	0	(1)
% change	-3.1%	-30.9%	-100%	0.0%	-5.9%	30.0%	-60.0%	25.0%	0.0%	-46.7%	7.8%	-23.1%

Definition Of Abbreviations

TOT/COL = Total # of Collisions
#/INJ = Total # of Injured
#/FTL = Total # of Fatalities
HDO = Head-on Collision
ANG = Right Angle
RE = Rear End
SS = SideSwipe
PED = Pedestrian
RGT/TRN = Right Turn
LFT/TRN = Left Turn