NE 175th St (5th Ave NE - 15th Ave NE) Roadway Configuration Review

Executive Summary

Based on a comparative review of existing and future traffic analysis, collision data, adopted City policies, and master plans, staff recommends the NE 175th Street corridor from 5th Ave NE to 12th Ave NE be reconfigured from a 4-lane (2 lanes in each direction) to a 3-lane (1 lane each direction plus center turn lane) roadway as part of the NE 175th Street Pavement Preservation Project. A conceptual representation of the 3-lane layout is provided as Attachment A, with the existing 4-lane shown in Attachment B. The 4-lane to 3-lane conversion results in a difference in delay for the eastbound (PM Peak Hour direction) and westbound (AM Peak Hour direction) for both 2018 (existing) and 2030 (projected) traffic as shown in the table below.

	2018 Average Added Travel Time for 3-lane Configuration (seconds)	**2030** Average Added Travel Time for 3-lane Configuration (seconds)
Eastbound (PM Peak)	16	30
Westbound (AM Peak)	22	23

All analyzed scenarios included capacity improvements at 15th Ave NE. The modification includes adding a right turn lane in the eastbound direction at 15th Ave NE, which allows for significant reduction in delay and queuing. Other minor signal modifications would be made at 5th Ave NE and 10th Ave NE in conjunction with a 3-lane layout.

The major benefits associated with making this change to the roadway are as follows:

1) **Pedestrian safety** at crossings for all intersections, but particularly the legal unsignalized crossings at 8th Ave NE and 10th Ave NE, is significantly improved. Pedestrians only have to navigate 3 lanes of traffic, instead of 4, eliminating the pedestrian multi-lane threat scenario. In addition, the 3-lane layout allows for a buffer between active traffic lanes and pedestrians using the sidewalk.

2) **Safer left turns at 10th Ave NE** are provided and can better accommodate future conditions. Currently, drivers on NE 175th Street must yield to two lanes of high speed, high volume traffic, while also yielding to any pedestrians crossing 10th Ave NE. There has been an uptick in collisions at 10th Ave NE, and turn related collisions would be expected to grow as more traffic will be rerouted to this intersection during Sound Transit construction impacts and more generally in the future after light rail station opening, and higher levels of development in the area. Increased collisions may result in the need to consider split phase operation, where the eastbound and westbound movements run separately. This phasing scheme would induce significantly more delay than a 3-lane layout, where dedicated left turn lanes are provided and can be phased more efficiently. Providing left turn pockets as part of the 3-lane layout allows the City to proactively address safety issues related to both increased growth and Sound Transit related construction, while minimizing the potential for delay.

A traffic consultant, Fehr & Peers, was tasked with conducting a peer review of potential roadway layouts in consideration of the repaving project. This peer review resulted in the same recommendation as City staff's, to reconfigure the roadway to 3-lanes, with signal modifications. The consultant's review is provided as Attachment C. Fehr & Peers used slightly more dynamic modeling software and looked at some additional measures of effectiveness. The consultant's corridor travel times were lower than the City's 2018 and 2030 projections, however the queuing results were slightly higher and are likely more representative given the model's more robust capabilities.

Supporting City Codes & Policies

City of Shoreline Complete Street Municipal Code (SMC 12.50)

The city shall, to the maximum extent practicable, plan for, design, construct, operate, and maintain an appropriate and integrated multi-modal transportation system for the safe accommodation of pedestrians, bicyclists, transit users, motorists, and users of all ages and abilities in new construction, retrofit, and reconstruction projects of public streets. The system's design is to be supportive of the community, recognizing that transportation needs vary and must be balanced in a flexible, safe, and cost-effective manner. [Ord. 755 § 1 (Exh. A), 2016]

Transportation Master Plan

Bicycle Plan Element

Goal T VIII: Develop a bicycle system that is connective, safe and encourages bicycling as a viable alternative method of transportation.

Policy T14: Implement the Bicycle System Plan. Develop a program to construct and maintain bicycle facilities that are safe, connect to destinations, access transit and are easily accessible. Use short-term improvements, such as signage and markings, to identify routes when large capital improvements will not be constructed for several years.

14.4. Through the City's Complete Streets policies, accommodate bicycles in future roadway or intersection improvement projects with facilities or technologies that make bicycling safer, faster and more convenient for riders.

Implementation Strategy 14.6. Include bicycle facilities identified on the City's Bicycle System Plan as part of the City's six-year Capital Improvement Plan and Transportation Improvement Program. Develop plans for implementation of short- and long-term improvements to the bicycle system, including integration with the City's annual overlay program.

Pedestrian Plan Element

Goal T IX: Provide a pedestrian system that is safe, connects to destinations, accesses transit and is accessible by all.

Implementation Strategy 18.3. Through the City's Complete Streets policies, continue to accommodate pedestrians in future roadway or intersection improvement projects with facilities or technologies that make walking safer and more convenient for pedestrians.

Policy T19: Design crossings that are appropriately located and provide safety and convenience for pedestrians.

Sustainability & Quality of Life Element

Policy T1: Make safety the first priority of citywide transportation planning and traffic management. Place a higher priority on pedestrian, bicycle and automobile safety over vehicle capacity improvements at intersections.

Federal Guidance

The Federal Highway Administration has deemed 4-lane to 3-lane conversions a proven safety countermeasure. Case studies of 4-lane to 3-lane conversions have consistently shown a crash reduction of 19-47%. In addition, the conversions have produced more community-focused environments that better accommodate the needs of all road users due to more consistent speeds and a friendlier pedestrian and bicycle environment. https://safety.fhwa.dot.gov/provencountermeasures/

Safety

In reviewing collision data since 2010, NE 175th Street between 5th Ave NE and 12th Ave NE (.37 miles) experiences approximately 1.5 injury collisions per year on average, and approximately 10 collisions total per year on average.

In the most recent Annual Traffic Report, the intersection of 10th Ave NE and NE 175th Street was noted as seeing a significant uptick in injury collisions, with 3 over the last three years (2015 through 2017).

AASHTO Highway Safety Manual

Treatment	Crash Modification Factor (reduction in collisions)
Four to three lane conversion	.71

Assumptions

1. Speed Limit: 35 mph
2. 85th percentile speed (measured)
    a. Eastbound: 39 mph
    b. Westbound: 40 mph
3. Base Free Flow Speed (HCM calculated) = 39 mph
4. Study area
    a. PM Peak Analysis: Eastbound, just east of I-5 through 15th Ave NE (.68 miles)
    b. AM Peak Analysis: Westbound, 15th Ave NE just north of NE 175th to just east of I-5.

c. Proposed rechannelization area - 5th Ave NE to 12th Ave NE (.37 miles)

5 Consistency with SMC 20.60.140(A) Traffic Level of Service
   a. LOS D at intersections & V/C ratio of .90 or lower

6 Study Periods
   a. PM Peak – 5:00 PM to 6:00 PM
   b. AM Peak – 8:00 AM to 9:00 AM

7 Modifications at 15th Ave NE (see Figure 1) are assumed for all scenarios as the changes add intersection capacity and reduce delay compared to existing conditions. The modification includes adding a right turn lane in the eastbound direction at 15th Ave NE, which allows for significant reduction in delay and queuing.

Figure 1. 15th Ave NE signal modifications for improved operation

8 Annual growth rate based on the highest segment anticipated within the Transportation Master Plan 2030 forecast = 29%, applied to all movements, representing a very conservative future projection.

9 Directional capacity
   a. 4 lane = 1,600 vehicles per hour per direction
   b. 3 lane = 960 vehicles per hour per direction

10 Average Weekday Daily Traffic (2018)
   a. I-5 to 5th = 16,000
   b. 5th Ave NE to 10th Ave NE = 13,000

Results

2018 Existing Conditions

	5th Ave NE delay (sec)	10th Ave NE delay (sec)	15th Ave NE delay (sec)	Segment travel time (sec)	Total Average Travel Time (min:sec)
Eastbound (PM Peak)	19.6	7.8	59.2	62.3	**2:29**
Westbound (AM Peak)	17.4	7.2	48.8	62.3	**2:16**

2018 – 4 Lane with modifications at 15th Ave NE

The following summarizes travel time performance for the existing 4 lane roadway configuration, with capacity modifications to the intersection of 15th Ave NE and NE 175th Street as shown in Figure 1.

	5th Ave NE delay (sec)	10th Ave NE delay (sec)	15th Ave NE delay (sec)	Segment travel time (sec)	Total Average Travel Time (min:sec)
Eastbound (PM Peak)	19.6	7.8	27.6	62.3	**1:57**
Westbound (AM Peak)	17.4	7.2	47	62.3	**1:54**

The projected average PM peak travel time savings with 15th Ave NE modifications is 32 seconds (average per vehicle during peak hour), and the AM peak travel time savings is 22 seconds (average per vehicle during the peak hour).

2018 – 3 Lane (proposed)

The following table summarizes traffic conditions for the modified 3-lane roadway configuration between 5th Ave NE and 12th Ave NE, including modifications to the signal at 15th Ave NE and NE 175th Street.

	5th Ave NE delay (sec)	10th Ave NE delay (sec)	15th Ave NE delay (sec)	Segment travel time (sec)	Total Average Travel Time (min:sec)
Eastbound (PM Peak)	19.1	9.7	27.6	76.7	**2:13**
Westbound (AM Peak)	21.9	8.4	49.2	76.7	**2:22**

2030 – 4 Lane with modifications at 15th Ave NE

The following table summarizes traffic conditions for the existing 4-lane roadway configuration, assuming modifications to the signal at 15th Ave NE and NE 175th Street as shown in Figure 1 and increased traffic volumes to account for anticipated growth.

	5th Ave NE delay (sec)	10th Ave NE delay (sec)	15th Ave NE delay (sec)	Segment travel time (sec)	Total Average Travel Time (min:sec)
Eastbound (PM Peak)	23.9	8.9	39.5	62.3	**2:14**
Westbound (AM Peak)	20.8	5.6	48.8	62.3	**2:18**

2030 – 3 Lane (proposed)

The following table summarizes traffic conditions for the proposed 3 lane roadway configuration, assuming modifications to the signal at 15th Ave NE and NE 175th Street as shown in Figure 1 below and increased traffic volumes to account for anticipated growth.

	5th Ave NE delay (sec)	10th Ave NE delay (sec)	15th Ave NE delay (sec)	Segment travel time (sec)	Total Average Travel Time (min:sec)
Eastbound (PM Peak)	25.2	12.8	35.2	76.7	**2:34**
Westbound (AM Peak)	26	9.5	49	76.7	**2:27**

4-Lane versus 3-Lane Comparative Summary

2018

A comparison of travel time delay between the *4 Lane + 15th Signal Modifications* option versus the *3 Lane* option (which also includes signal modifications at 15th) is shown in the following table. Approximately **16 - 22 seconds** of additional travel time would be expected on this segment of corridor during the associated peak traffic period in considering existing traffic volumes. Note that 5th Ave NE operates better in the 3-lane scenario for the eastbound direction; this is due to the right lane being restricted to right turns only, which means that the right lane will be unobstructed for right turns on red. Currently, through traffic can use the right lane, blocking following right turners from being able to take a right turn on red. Right turn volumes are relatively high, so the 3-lane scenario provides a benefit for this eastbound right turn movement in this respect.

	5th Delay Difference (seconds)	10th Delay Difference (seconds)	15th Delay Difference (seconds)	Segment Travel Time Difference (seconds)	Avg Added Travel Time for 3 lane Configuration (seconds)
Eastbound (PM Peak)	-.5	1.9	0	14.4	**15.8**
Westbound (AM Peak)	4.5	1.2	2.2	14.4	**22.3**

The table below shows the anticipated additional 95th percentile queue at each intersection for the *3-lane* option (which also includes signal modifications at 15th), in comparison to the *4 Lane + 15th Signal Modifications* option for existing conditions. The distance between signalized intersection approaches and closest unsignalized intersection is 340 feet, with most more than 600 feet apart. The closest driveway is 150 feet from a signalized intersection approach. Highest anticipated queues are not shown to block public intersections, but in some cases would block private driveways which is not uncommon.

	5th Queue Difference (ft/approx. # of cars)	10th Queue Difference (ft/approx. # of cars)	15th Queue Difference (ft/approx. # of cars)
Eastbound (PM Peak)	0	143/5	0
Westbound (AM Peak)	168/6	110/4	0

2030

A comparison of travel time delay between the *4 Lane + 15th Signal Modifications* option versus the *3-Lane* option (which also includes signal modifications at 15th) for increased future traffic volumes is

shown in the following table. Approximately **20 - 23 seconds** of additional travel time would be expected on this segment of the corridor during the associated peak traffic period in considering future traffic volumes, with each movement escalated by nearly 29%.

	5th Delay Difference (seconds)	10th Delay Difference (seconds)	15th Delay Difference (seconds)	Segment Travel Time Difference (seconds)	Avg Added Travel Time for 3 lane Configuration (seconds)
Eastbound (PM Peak)	1.3	3.9	0	14.4	**19.6**
Westbound (AM Peak)	5.2	3.6	0	14.4	**23.2**

The table below shows the anticipated additional 95th percentile queue at each intersection for the *3-lane* option (which also includes signal modifications at 15th), in comparison to the *4 Lane + 15th Signal Modifications* option in considering future traffic volumes, with each movement escalated by nearly 29%. The distance between signalized intersection approaches and closest unsignalized intersection is 340 feet, with most more than 600 feet apart. The closest driveway is 150 feet from a signalized intersection approach. Highest anticipated queues are not shown to block public intersections, but in some cases would block private driveways which is not uncommon.

	5th Queue Difference (ft/approx. # of cars)	10th Queue Difference (ft/approx. # of cars)	15th Queue Difference (ft/approx. # of cars)
Eastbound (PM Peak)	-57/-2	296/10	0
Westbound (AM Peak)	175/9	162/5	0

Concurrency Review

All intersections meet the LOS D standard for the proposed 3-lane configuration, as reported by Synchro and displayed in the table below. All movements were escalated by nearly 29% in conjunction with the most conservative estimate from Shoreline's Transportation Master Plan travel demand model.

2030 – Intersection LOS Performance

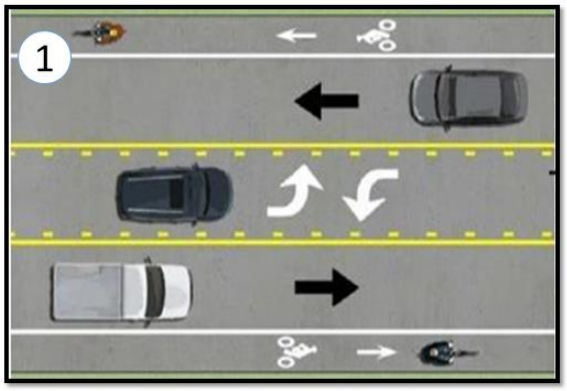
		5th Ave NE	10th Ave NE	15th Ave NE
Eastbound (PM Peak)	Intersection LOS	LOS C	LOS B	LOS D
	Avg Intersection Delay sec/vehicle)	29.6	12.4	43.5
Westbound (AM Peak)	Intersection LOS	LOS C	LOS A	LOS C
	Avg Intersection Delay (sec/vehicle)	24.9	9.3	27.7

2030 - V/C Summary

Assuming a 3 lane capacity of 960 vehicles per hour per direction, the resulting V/C ratios are reported below for a 3 lane future condition.

	5th Ave NE to 10th Ave NE	10th Ave NE to 15th Ave NE
Eastbound (PM Peak)	817 veh/hour/direction = .85	813 veh/hour/direction = .85
Westbound (AM Peak)	662 veh/hour/direction = .69	563 veh/hour/direction = .59

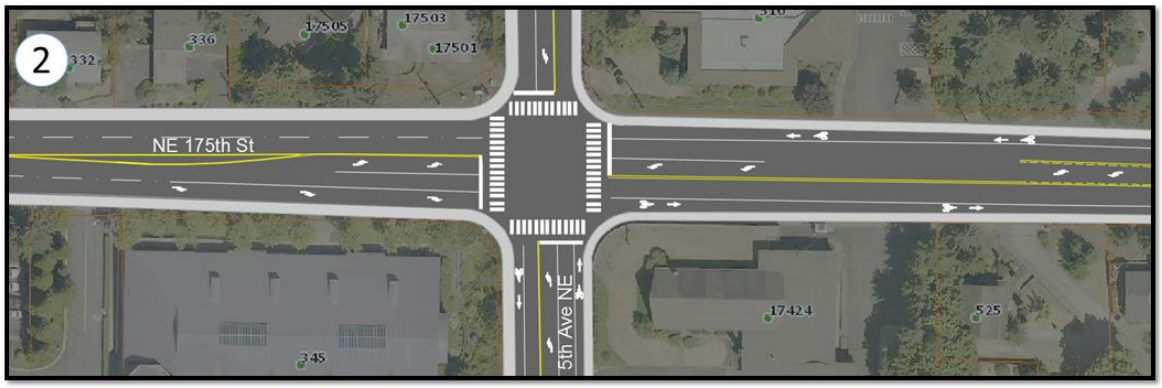
Attachment A - Proposed Conceptual Roadway Layout

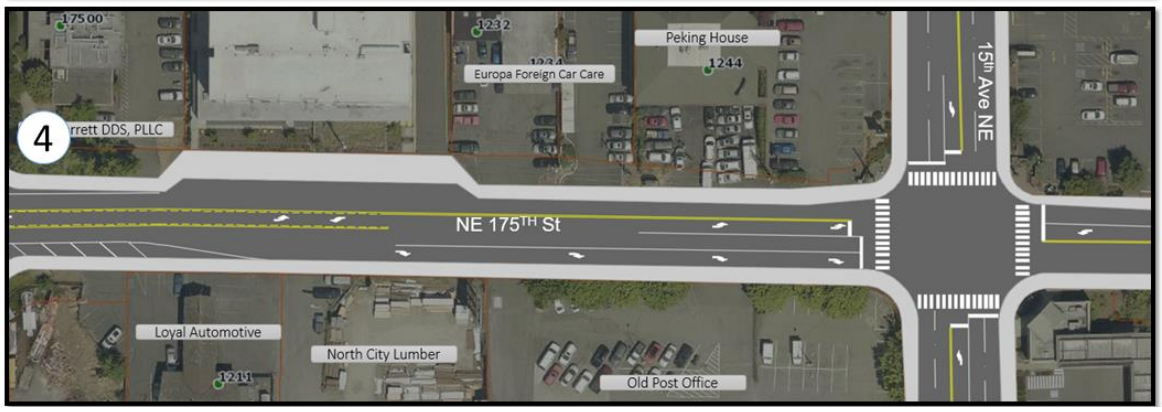


1. Between signalized intersections
2. 5th Ave NE intersection
3. 10th Ave NE intersection
4. 15th Ave NE intersection

N

Not to Scale





Attachment B – Existing Roadway Layout

Attachment C – Consultant Peer Review of Roadway Configuration Alternatives

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MEMORANDUM

Date:	December 14, 2018
To:	Kendra Dedinsky, PE PTOE, City of Shoreline Traffic Engineer
From:	Kara Hall, EIT and Chris Grgich, PE PTOE, Fehr & Peers
Subject:	**175th Overlay Traffic Operations Analysis**

SE17-0567.04

INTRODUCTION

An operational analysis has been completed for the reconfiguration of 175th as part of the NE 175th Street Pavement Preservation. As part of pavement resurfacing, this project will re-stripe NE 175th Street from Interstate 5 (I-5) to 15th Ave NE. SimTraffic was used to complete micro-simulation for two proposed striping plans. Analysis for these plans was completed for the PM Peak hour for the year 2030. The scenarios analyzed, findings, safety, and consistency with the City of Shoreline planning documents are summarized below.

SCENARIOS ANALYZED

The project was analyzed under 2030 conditions using volumes consistent with projected growth in the City's Transportation Master Plan. Three scenarios were analyzed, each scenario is described below.

Existing: This scenario was analyzed to provide a baseline for comparison between alternatives if no improvements were made.

Three-Lane Scenario: This scenario would convert 175th to a three-lane roadway (one travel lane in each direction with a two-way-left-turn lane) with bicycle lanes in each direction.

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www.fehrandpeers.com

Four-Lane Scenario with Modifications at 15th Ave NE: This scenario would restripe the segment between 11th Ave NE and 15th Ave to feature one westbound travel lane, two eastbound travel lanes, and the addition of a right-turn pocket at the 15th Ave NE intersection. The westbound approach to the intersection would be restriped to provide a dedicated left-turn lane and a through lane. These striping improvements would allow for improvements to the signal timing at the intersection.

FINDINGS

Through the use of micro-simulation, Level of Service (LOS), queueing, and travel times along the corridor from 5th Ave NE to 15th Ave NE were compared in order to evaluate the three alternatives.

LOS is a term that describes the operating performance of an intersection or roadway. LOS is measured quantitatively and reported on a scale from A to F, with A representing the best performance and F the worst. The City identifies LOS D as the standard, which is described as having constrained operating conditions with marginal progression, according to the *Highway Capacity Manual (HCM) 6th Edition*. In 2030, based on the micro-simulation completed, all three scenarios would maintain LOS above the City Standard. While the 4-Lane with Modifications Scenario would generally provide the best conditions for vehicles, the Three-Lane scenario would provide the same LOS at two of the three analyzed intersections, with seconds of delay increasing minimally, while adding additional multimodal capacity. Maintaining the existing configuration would lead to the worst operations at NE 15th Ave of all three scenarios and limit the number of vehicles able to access the corridor.

Queueing along the corridor was also analyzed to determine if any scenario would create spill-back to the I-5 Ramp intersections. While the Three-Lane scenario would result in longer queues, specifically in the eastbound direction at the 5th Ave NE intersection, when compared to the 4-Lane Scenario with Modifications or Existing, the queue would not extend to the ramp terminal intersection, and would therefore not impact adjacent intersections.

Travel time in the eastbound and westbound direction was also evaluated between 5th Ave NE and 15th Ave NE under all three scenarios. The scenario with the best travel time was found to be the Four-Lane with Modifications, followed by the Existing Configuration, and Three-Lane Scenario. However, it is important to note the differences were minimal, with only seven seconds between the Three-Lane Scenario and Four-Lane with Modifications scenario in the eastbound direction and 11 seconds in the westbound direction.

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Tables summarizing the operational analysis are attached for reference.

SAFETY

The Federal Highway Administration (FHWA) identifies road diets as a safety measure for both vehicles, pedestrians and bicyclists. Reducing lanes often leads to reduced number of collisions, lower speeds, and fewer lanes for pedestrians to cross.

The three-lane scenario would lead to reduced number of lanes on 175th Street, reduce conflict points for vehicles and likely lead to reduced free-flow travel speeds along the corridor.

For bicyclists the three-lane scenario would allow for a dedicated bicycle lane, while all other scenarios would require bicyclists to share a lane with vehicles or use the sidewalks which is too narrow to meet the requirements for a shared use facility.

Pedestrians under the three-lane scenario would be required to cross fewer lanes when crossing 175th Street when compared to the two other scenarios. Under the three-lane scenario, separation of the pedestrian facilities and travel lanes by the bicycle lane would also enhance the pedestrian experience along with lower speeds as a result of the lane reduction.

CONSISTENCY WITH SHORELINE PLANNING DOCUMENTS

The three scenarios were evaluated for consistency with the following documents and ordinances.

Shoreline Municipal Code: The City's Complete Street Ordinance indicates that to the extent possible, Complete Streets (streets that are designed to enable safe and convenient access and travel for all users) should be integrated into the transportation system.

Bicycle System Plan: Adopted as part of the 2011 Transportation Master Plan, identifies NE 175th Street in the project area as a Bicycle Route with a designated Bike Lane.

Pedestrian Plan: Adopted as part of the 2011 Transportation Master Plan, identifies a goal of providing a pedestrian system that is safe, connects to destinations, accesses transit and is accessible by all.

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City LOS Standard: The City identifies LOS D as the standard, which is described as having constrained operating conditions with marginal progression, according to the *Highway Capacity Manual (HCM) 6th Edition.*

As the Existing Scenario would not provide any additional benefit for bicycle or pedestrian users it does not provide any level of consistency with the documents identified above.

The three-lane scenario would provide bicycle facilities consistent with the Bicycle System Plan and improved conditions for pedestrians as required by the City's Complete Street Ordinance, while still meeting the City's LOS standard vehicle delay, this scenario would be consistent with all ordinances and plans identified above.

SUMMARY

Based on the analysis summarized above, safety considerations, and consistency with Shoreline Planning Documents the Three-Lane Scenario is the recommended improvement.

While metrics related to vehicle operations are degraded slightly, all standards are maintained and do not create spillback to adjacent intersections. Considerations to safety also identify this scenario as having the greatest benefit, in allowing for the inclusion of bicycle lanes throughout the corridor and improving pedestrian access and safety along the corridor.

Attachments:

175th Intersection Operations Summary

Queueing Summary

System-Wide Measures of Effectiveness

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175th Intersection Operations Summary

Intersection	2030					
	Existing		3 Lane		4 Lane with Mods	
	Delay	LOS	Delay	LOS	Delay	LOS
5th/175th	20	C	30	C	22	C
10th/175th	7	A	13	B	9	A
15th/175th	55	D	41	D	37	D

Source: Fehr & Peers, 2018.

175th Intersection Demand Served

Intersection	2030		
	Existing	3 Lane	4 Lane with Mods
	% Demand Served	% Demand Served	% Demand Served
5th/175th	86	89	89
10th/175th	84	89	88
15th/175th	83	94	91

Note: Demand Served is the number of vehicles that are able to access an intersection divided by the number of vehicles that want to access the intersection.
Source: Fehr & Peers, 2018.

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175th Four Lane Queuing Results

Intersection	Movement	2030			
		Existing		4 Lane with Mods	
		Storage	Queue	Storage	Queue
5th/175th	NBL	95	**119**	95	**120**
	NBT[1]	260	**321**	260	**395**
	NBR	-	-	-	-
	SBL	90	78	90	75
	SBT[1]	380	183	380	156
	SBR	-	-	-	-
	EBL	100	**124**	100	**172**
	EBT	1,080	323	1,080	320
	EBR[1]	1,080	335	1,080	359
	WBL	150	106	150	124
	WBT	590	168	590	205
	WBR[1]	590	200	590	227
10th/175th	NBL	-	-	-	-
	NBT[2]	265	92	265	87
	NBR	-	-	-	-
	SBL	-	-	-	-
	SBT[2]	180	139	180	129
	SBR	-	-	-	-
	EBL[3]	580	183	580	238
	EBT[1]	580	181	580	220
	EBR	-	-	-	-
	WBL[3]	580	107	580	124
	WBT[1]	580	124	580	148
	WBR	-	-	-	-
15th/175th	NBL	100	**127**	100	**125**
	NBT	440	244	440	262
	NBR[1]	180	**244**	180	**264**
	SBL	150	**175**	150	**175**
	SBT	555	432	555	390
	SBR[1]	555	434	555	400
	EBL	565	449	565	302
	EBT[4]	565	**640**	565	185
	EBR	-	-	300	129
	WBL[5]	300	237	300	130
	WBT[1]	100	**125**	300	**341**
	WBR	-	-	-	-

Notes:
Bold text indicates queue exceeds storage.
[1] Shared Thru/Right Lane
[2] Shared Left/Thru/Right Lane
[3] Shared Thru/Left Lane
[4] Shared Thru/Right Under Existing Only
[5] Shared Thru/Left Under Existing Only
Source: Fehr & Peers, 2018.

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175th Three Lane Queueing Results

Intersection	Movement	2030	
		Storage	Queue
5th/175th	NBL	95	**120**
	NBT[1]	260	**496**
	NBR	-	-
	SBL	90	**93**
	SBT[1]	380	170
	SBR	-	-
	EBL	200	**246**
	EBT	1,080	667
	EBR	1,080	289
	WBL	200	**225**
	WBT[1]	590	456
	WBR	-	-
10th/175th	NBL	-	-
	NBT[2]	265	96
	NBR	-	-
	SBL	-	-
	SBT[2]	180	144
	SBR	-	-
	EBL	200	200
	EBT[1]	580	319
	EBR	-	-
	WBL	200	37
	WBT[1]	580	304
	WBR	-	-
15th/175th	NBL	100	**125**
	NBT	440	337
	NBR[1]	180	**350**
	SBL	150	**175**
	SBT	555	357
	SBR[1]	555	380
	EBL	300	265
	EBT	565	280
	EBR	400	122
	WBL	300	287
	WBT[1]	300	**377**
	WBR	-	-

Notes:
Bold text indicates queue exceeds storage.
[1] Shared Thru/Right Lane
[2] Shared Left/Thru/Right Lane
[3] Shared Thru/Left Lane
Source: Fehr & Peers, 2018.

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System-Wide Measure of Effectiveness

MOE	2030		
	Existing	3 Lane	4 Lane with Mods
Average Delay Per Vehicle	180	140	140
Vehicle Hours of Delay	270	210	210
Demand Served	98%	99%	99%
Travel Time: EB (Min:Sec)	1:46	1:50	1:43
Travel Time: WB (Min:Sec)	1:23	1:29	1:18

Average Delay Per Vehicle: The total delay in seconds divided by the number of vehicles in the network.
Vehicle Hours of Delay: The total delay experienced in the corridor.
Travel Time: Measured from 5th Ave NE to 15th Ave NE.
Source: Fehr & Peers, 2018.