
5 Level 2 Screening Results – Highway Scenarios

Two scenarios (H3 and BRT1) were developed to improve traffic safety and operations on I-287 in Rockland County. Both scenarios include a replacement bridge (with either 8 or 10 lanes). They would also include the reconstruction of the full I-287 roadway cross section and improvements to interchanges, bridges, and overpasses, as necessary, between Suffern and the river crossing. The reconstructed roadway would conform to current design standards, thereby eliminating existing non-standard features. No highway improvements (beyond those programmed as part of the April 1998 I-287 Record of Decision and the March 2000 revised Record of Decision) were considered in Westchester County.¹ A review of the general provisions of the two highway improvement scenarios is as follows:

- **Scenario H3** – A fourth general-purpose lane would be provided in each direction from Interchange 11 (Nyack) to Interchange 15 (Suffern), a distance of approximately 12 miles, to provide a balanced lane configuration (providing a continuous eight-lane roadway) between the I-87/I-287 merge at Interchange 15 in Suffern and Interchange 8 in Westchester. The scenario would include a replacement eight-lane bridge and toll plaza configured for open-tolling E-ZPass on the Westchester side. Scenario H3 would also include a westbound climbing lane from the west end of the Tappan Zee Bridge to the Garden State Parkway (Interchange 14A) to improve safety and highway operations.
- **Scenario BRT1** – A bus rapid transit/high occupancy toll (BRT/HOT) lane would be provided in each direction from west of Interchange 14B (Airmont Road) to the Tappan Zee Bridge toll plaza, a distance of about 15 miles. The BRT/HOT lanes would be incorporated into a widened and reconstructed roadway and occupy the inside left lane in each direction. The existing general-purpose lane configuration would be maintained. The scenario would include a replacement bridge with eight general-purpose lanes and two BRT/HOT lanes, resulting in a ten-lane bridge. The bridge cross section would match the approach roadway cross section.

The screening analysis of the highway scenarios in Rockland County and on the bridge considered two basic issues: (1) given the need for highway improvements, should that need be met by adding general-purpose lanes only or by introducing a transit mode in the form of BRT/HOT lanes; and (2) given the long uphill grades on I-287 in Rockland County and the high percentage of truck traffic, should westbound and/or eastbound climbing lanes be considered to improve traffic safety and operations?

5.1 General-Purpose Lanes (H3) vs BRT/HOT Lanes (BRT1)

The Level 2 screening criteria used to evaluate general-purpose lanes vs. BRT/HOT lanes included: corridor mobility, transportation system integration, traffic safety and operations, environmental factors, cost and cost-effectiveness. The roadway network in the corridor and the existing I-87/I-287 lane configuration are shown in Figure 5-1.

¹ Final Environmental Impact Statement for P.I.N. 8729.30, I-287/Cross Westchester Expressway, New York State Thruway, Route 303 to Route 120 Westchester and Rockland Counties, New York.

5.1.1 Corridor Mobility

Mobility refers to the movement of people and goods – not just the volume of people or goods moved, but the ease with which transportation needs are satisfied. As such, congestion levels, travel times, alternative modes not in fixed traffic, and reserve capacity are the key measures of mobility explored as part of the Level 2 screening evaluation.

The BPM modeling results lead to a number of findings and conclusions regarding these two highway improvement options. Scenario H3 would provide additional general-purpose capacity between Interchanges 15 (Suffern) and 11 (Nyack). This added capacity would induce trips in Rockland and Westchester Counties. Compared to the No Build, daily VMT would increase 4.4 percent (or about 390,000 VMT) in Rockland County and 0.3 percent (or about 75,000 VMT) in Westchester County. However, the added lanes would primarily benefit only intra-Rockland trips.

BRT1 would provide both transit-related and highway-related benefits. Buses, HOVs, and some SOVs would move from the general-purpose lanes into the BRT/HOT lanes, thereby freeing up capacity in Rockland. In addition, a capacity increase would be realized from the ten-lane bridge. The added capacity would also induce additional trips, but fewer trips as compared to H3. Compared to No Build conditions, daily VMT would increase 2.5 percent (or about 222,000 VMT) in Rockland County and 0.2 percent (or about 52,000 VMT) in Westchester County.

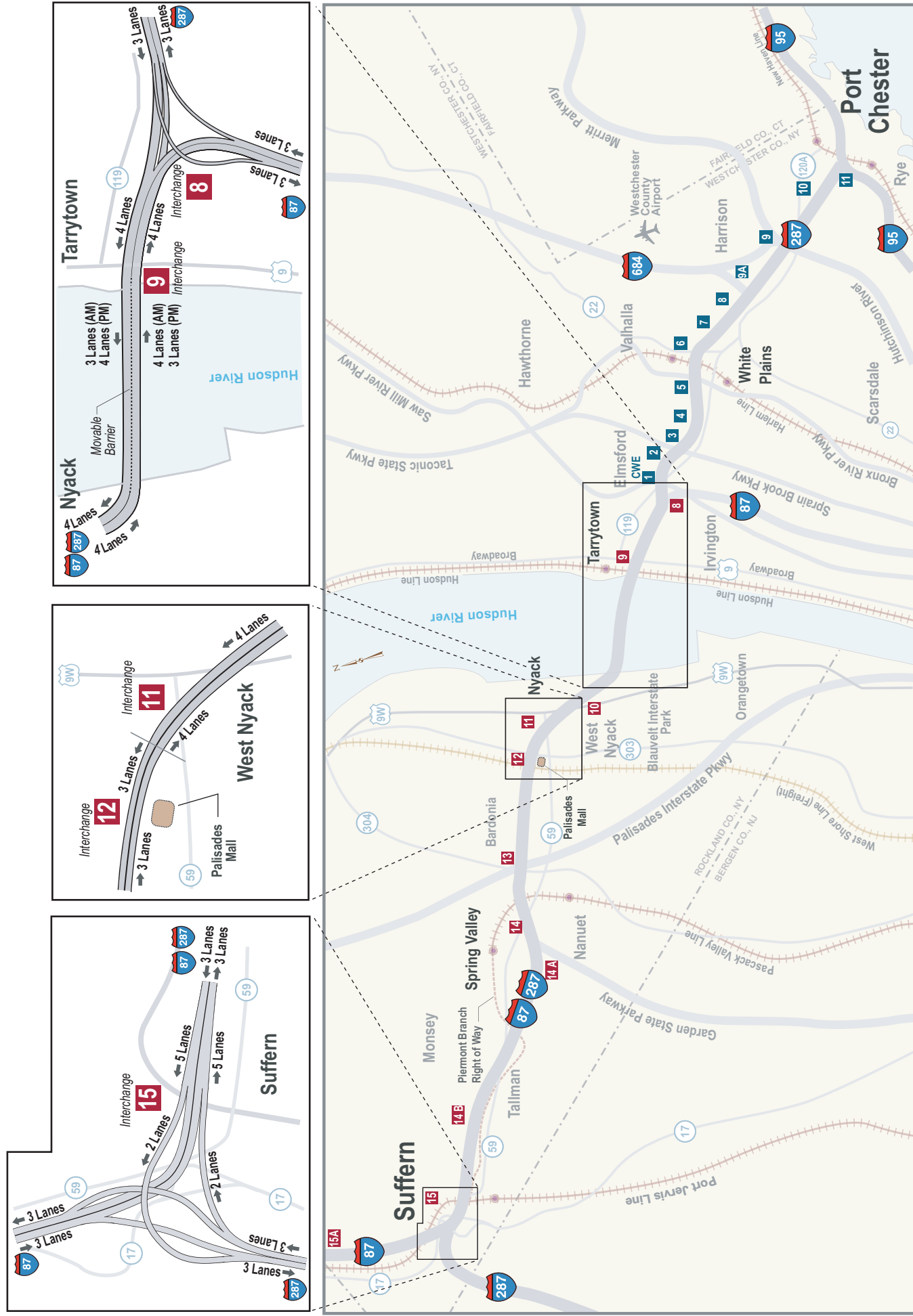
Compared to the No Build Scenario, both H3 and BRT1 would increase vehicle throughput at the Tappan Zee Bridge by about 10 percent in the peak direction of travel during the AM peak hour. In Suffern, H3 would increase throughput by about 25 percent, whereas BRT1 would increase throughput by only 8 percent in the peak direction of travel during the AM peak hour. Neither scenario would increase throughput in Westchester east of Interchange 8 to a significant degree.

Table 5-1 depicts the effect of the roadway improvements on peak direction main line levels of service (LOS) for the peak direction of travel in the AM and PM peak hours.

5.1.1.1 Roadway Congestion in Rockland County

During the AM peak period in the eastbound direction in Rockland County and at the river crossing, BRT1 would perform better than H3. Compared to the 2025 No Build Scenario, H3 would reduce the percentage of lane miles of congestion in Rockland from 58 percent to 25 percent in the AM peak for the peak direction of travel. In this same time period, BRT1 would reduce the percentage of lane miles of congestion from 58 to 10 percent.

BRT1's advantage is largely due to the addition of the BRT/HOT lane and the ten-lane bridge. Under H3, eastbound queues would extend longer from an eight-lane bridge because the only capacity increases east of Interchange 11 would result from provision of full shoulders and standard width lanes on the replacement bridge, which would not be sufficient to handle the extra induced traffic from the additional general purpose lane.



Existing Highway Configuration
Figure 5-1

Table 5-1
Estimated Main Line Impacts – Year 2025
Vehicle Volumes/LOS

Expressway Segment	Eastbound AM Peak Hour			Westbound PM Peak Hour		
	No Build (H1) ¹	Eight Lanes with Climbing Lane (H3)	HOT Lanes (BRT1) HOT Lane GP Lanes	No Build (H1) ¹	Eight Lanes with Climbing Lane (H3)	HOT Lanes (BRT1) HOT Lane GP Lanes
Rockland						
Int 15 (Rte 17) — Int 14A (GSP)	4800 D	6000 C	400 A	7200 F	8100 E	1100 B 6200 E
Int 14A (GSP) — Int 14 (Rte 59)	5000 D	6600 D	600 B	6700 F	8500 E	1100 B 6700 F
Int 14 (Rte 59) — Int 13 (PIP)	4400 F ²	6000 C	1100 ¹ B	6300 E	9200 D	1100 B 6900 F
Int 13 (PIP) — Int 12 (Rte. 303)	5000 F ²	6700 D	1100 B	7300 F	10000 E	1100 B 7900 F
Int 12 (Rte 303) — Int 11 (Rte 9W, Nyack)	5400 F ²	7100 D	1100 B	7100 F	9400 D	1100 B 7700 F
Int 11 (Rte 9W, Nyack) — Int 10 (Rte 9W, S. Nyack) Note: There are 4 GP lanes in each direction between Int 11 and TZB	7200 F ²	8600 F	1100 B	7100 D	9100 D	1100 B 7700 E
Int 10 (Rte 9W) – TZB	8800 F	9900 F	1100 B	8100 F	9900 F	1100 B 8800 F
Westchester						
TZB – Int 8	7800 E	8800 F	N/A	6300 F ²	7400 F ²	N/A 7500 E
Exit 2 (Rte 9A) — Exit 3 (Sprain Brook)	5200 E	5700 E	N/A	5800 F	6000 F	N/A 6000 F
Exit 4 (Rte. 100A) – Exit 5 (Rte. 100)	6800 D	7000 D	N/A	6300 F	6500 F	N/A 6500 F
Exit 7 (CWP) — Exit 8W (Rt. 127)	6800 F	7000 F	N/A	6000 F	5700 E	N/A 5700 E
Exit 9 (HRP) — Exit 10 (Rt. 120)	4500 D	4500 D	N/A	4200 D	4300 D	N/A 4300 D
<p>(1) 2025 No Build was estimated based on 1996 counts, the year to which BPM is calibrated. Recent 2004 counts indicate that in the western portion of the Rockland corridor, the eastbound AM peak congestion may be underestimated and the westbound PM peak overestimated. Traffic counts will be obtained in 2005 for the analyses in the DEIS.</p> <p>(2) LOS F is caused by queues extending from the bridge, not by volume on segment itself.</p>						

In the PM peak in the westbound direction, H3 would improve conditions more than BRT1. H3 would extend the existing four-lane section west to Interchange 15 (Suffern) and include a climbing lane, which together would provide additional capacity for the westbound PM peak period. The added lanes would improve traffic flow up the steady climb from the Palisades Mall to Spring Valley and Monsey, where a number of roadway segments have 3 percent grades. As a result, compared to the 2025 No Build Scenario, H3 would reduce the percentage of lane miles of congestion in Rockland from 90 to 67 percent in the PM peak hours for the peak direction of travel. During this same time period, BRT1 would reduce the percentage of lanes miles of congestion from 90 percent to 80 percent.

In BRT1, although vehicles in the BRT/HOT lane would experience free-flow travel conditions, the projected increase in traffic volumes (particularly trucks) in the design year would exceed the capacity of the three general-purpose lanes. The increased volumes versus available capacity would create extended queues on the 3 percent grades between West Nyack and Monsey. In addition, the bottleneck caused by the transition from four lanes to three lanes just west of Interchange 11 would remain, resulting in additional congestion on the 3 percent climb west of the bridge.

The added capacity under both H3 and BRT1 would channel traffic back onto I-87/I-287 in Rockland County, lessening delay on parallel arterials. The improved flow on the highway would draw in traffic from competing east-west arterials, mainly Route 59, which would benefit from speed improvements along most stretches. Speeds on north-south feeder routes to I-87/I-287, however, would decline slightly (up to 5 mph) as more vehicles opt for the faster travel on the mainline.

5.1.1.2 Roadway Congestion in Westchester County

During the AM peak period in the eastbound direction in Westchester County between the bridge and Interchange 8, significant deterioration in LOS would occur under both scenarios as compared to the 2025 No Build Scenario due to the additional volume attracted by the new bridge. East of Interchange 8, levels of service would be the same as in the No Build condition.

In the westbound direction in Westchester County during the PM peak period, BRT1 would alleviate projected LOS F conditions between Interchange 8 and the bridge. This is because the 10-lane bridge would provide capacity for an additional 1,100 vehicles in the BRT/HOT lane compared to the capacity of an eight-lane bridge and thus would eliminate most of the queuing on the approach to the bridge.

5.1.1.3 Travel Time

Table 5-2 contains travel times for selected origin and destination pairs. H3 would provide small travel time savings for trips in Rockland County and across the corridor. BRT1 would offer significant time savings for the BRT/HOT lane users and small savings for general-purpose lane users as a result of the additional capacity east of Interchange 11 and the five total eastbound lanes on the replacement bridge.

The Manhattan-bound trips would be largely unaffected by the H3 highway improvements to the general-purpose lanes, since the fastest route would be via the George Washington Bridge (GWB) or the Lincoln Tunnel. The uncongested BRT/HOT lanes, however, would offer a faster route via the Tappan Zee Bridge and I-87 southbound to Manhattan. This is especially relevant for Orange/Rockland residents headed to the Bronx or to northern Manhattan.

Table 5-2

Travel Time via Auto for Selected Trips
Weekday AM Peak Hour

Trip	Travel Time in Minutes			
	Existing	2025		
		No Build	Eight-Lane Highway/Climbing Lane	BRT/HOT Lanes
Suffern to White Plains	37 ^a	80	76	47 HOT lane ^b 74 GP lane ^b
Stamford to White Plains	29	48	48	48 GP lane
Spring Valley to Manhattan	82 ^c	120 ^c	120 ^c	90 HOT lane ^e 117 GP lane ^e
Suffern to Manhattan	88 ^d	128 ^d	128 ^d	98 HOT lane ^e 125 GP lane ^e

Notes:

This table represents a sample (for selected O-D pairs) of the travel times used in the BPM model to estimate travel demand forecasts.

Travel times are considerably longer on holidays and Sundays in the summer. A trip taken on a summer Sunday afternoon between Suffern and White Plains, for example, takes on average 58 minutes, based on data collected in June 2004 by the NYSTA.

Assumptions:

- Based on speed data obtained in June 2004 from NYSTA. All other travel times obtained from BPM runs.
- HOT lanes would be priced to maintain speed up to 55 mph.
- Using Palisades Interstate Parkway to the GWB.
- Using I-287, Route 17, and the Lincoln Tunnel.
- Using Tappan Zee Bridge and I-87 Southbound.

5.1.1.4 Alternative Modes Not in Mixed Traffic

In BRT1, buses would enjoy uncongested conditions in Rockland and over the bridge; however, they would operate in mixed traffic in Westchester. H3 operates only in mixed traffic and is therefore subject to roadway congestion.

5.1.1.5 Reserve Capacity

H3 would not offer significant reserve capacity or provide for growth beyond year 2025. BRT1 does provide some reserve capacity in the HOT lanes and exclusive bus lanes.

5.1.2 Transportation System Integration

Both scenarios would integrate directly into the existing transportation corridor. H3 would provide lane balance and continuity from Interchange 15 (Suffern) to Interchange 8 (Greenburgh). Under BRT1, the existing unbalanced lane condition would remain where eight general-purpose lanes transition to six lanes at Interchange 11 (Nyack).

5.1.3 Traffic Safety and Operations

Both scenarios would reconstruct the entire roadway in Rockland to current design standards, and eliminate safety concerns related to non-standard features. At Interchange 11 (Nyack), a significant safety improvement would be realized under H3 with the elimination of the bottleneck where the westbound Thruway transitions from four lanes to three lanes just west of the interchange.

Without the proposed improvements, heavy truck traffic, which approaches 9 percent of the daily traffic stream across the Tappan Zee Bridge, would create additional congestion and potential safety hazards westbound from the Tappan Zee Bridge to Interchange 14A (Garden State Parkway) due to the effects of the 3 percent grades. Based on the American Association of State Highway and Transportation Officials (AASHTO) criteria, analysis of the critical lengths of grade and service levels indicates that the climbing lane is warranted for the Thruway segments with 3 percent gradients (see Subchapter 5.2).

BRT1 would neither eliminate the westbound bottleneck at Interchange 11 nor address the congestion and potential safety hazards related to the 3 percent grades; however, the BRT/HOT lanes would provide an uncongested lane for buses, HOVs, toll-paying SOVs, and emergency vehicles.

5.1.4 Environmental Factors

Scenarios H3 and BRT1 were evaluated with respect to the established environmental criteria for the study. Regarding right-of-way issues, widening for both scenarios would be accommodated within the existing right-of-way between Interchange 15 (Suffern) and Interchange 12 (Palisades Mall), with partial takings of property at reconstructed interchanges and lengthened bridges over the Thruway. Both scenarios could impact property atop the tall rock slopes east of Route 303 (Mountainview Park on the north side) depending on the method used to widen the roadway through this area.

East of Interchange 11 (South Nyack), in addition to widening the highway for 12-foot shoulders for both scenarios, BRT1 would require 20 more feet of pavement than would H3. In this area, BRT1 requires

widening for the two 12-foot BRT/HOT lanes and two 4-foot buffer strips for a total of 32 feet, while H3 would require widening to accommodate the 12-foot climbing lane. Widening for either the BRT/HOT lanes or the climbing lane between Interchanges 11 and 10 would likely require shifting the entire roadway south onto NYSDOT property (Route 9W right-of-way) to avoid property displacements and impacts to adjacent local arterials (Cooper Drive) located on the north side of I-287.

Other environmental factors evaluated included:

- **Air quality** – The increased VMT under both scenarios would require further study in the DEIS to determine the effect on regional pollutant levels.
- **Parklands** – Both scenarios would have potential partial takings at Mountainview Park in West Nyack and Elizabeth Park in South Nyack.
- **Visual** – Both scenarios would remove the vegetative buffer along the sides of the roadway.
- **Ecology** – Both scenarios would impact 2 to 3 acres of wetlands.

5.1.5 Cost and Cost-Effectiveness

H3 and BRT1 would have comparable costs for the roadway reconstruction in Rockland County. BRT1 would be slightly more expensive because it has a wider roadway cross section and includes the extra costs for ITS and E-ZPass installations along the HOT lanes. The river crossing costs would be higher for BRT1 to accommodate the additional lanes.

- **H3 = \$4.2 billion** – \$1.11 billion (which includes \$60 million for climbing lane) for roadway improvements in Rockland County and \$3.12 billion for the replacement bridge.
- **BRT1 = \$4.8 billion** – \$1.15 billion for roadway improvements in Rockland County and \$3.71 billion for the replacement bridge.

Cost-effectiveness has been evaluated for this analysis by comparing the net cost of the improvements per person (assuming 1.2 persons per vehicle in the general-purpose lanes and 2.2 persons per vehicle for BRT/HOT lane users) for the two alternatives for year 2025. Net cost is the annualized construction cost plus the operation and maintenance cost less the toll revenues and the value of travel time saved, using the \$8.50/hour FTA recommended value (all trip times including those on arterials were included in the calculation). Applying this methodology to the question of the relative effectiveness of eight general-purpose lanes or two BRT/HOT lanes in Rockland County and on the bridge indicates that both alternatives would be cost-effective, operating with tolls equivalent to the George Washington Bridge. A premium toll of \$7 was also assumed for SOVs using the BRT/HOT lanes from Suffern to Tarrytown during the peak hour.

Net surplus per person was calculated to be:

- Eight general-purpose lanes: +\$1.95
- BRT/HOT lanes: +\$2.28

5.2 Climbing Lane

A climbing lane is generally defined as an auxiliary lane, not as a general-purpose lane. Its purpose is not to provide additional capacity, but to improve the operational and safety characteristics of the highway by segregating slow moving vehicles from free flowing traffic in the general-purpose lanes. Slow-moving trucks typically impede the faster moving vehicles behind them, thereby causing those vehicles to cross into an adjacent lane in order to pass. This reduces the effective capacity of the general-purpose lane and may create a potentially unsafe operating condition: these vehicles must now shift into the adjacent lane where traffic is moving at higher speeds. There are environmental implications related to this slowdown of traffic – lower speeds result in higher levels of air pollutant emissions.

The effect of heavy trucks on traffic flow is expressed in terms of “passenger car equivalents” (PCEs), which equate a typical loaded heavy truck to an equivalent number of passenger cars. The critical factors considered are the percentage of trucks in the traffic flow and the grades of the highway. On level ground, the PCE value is usually 1.5; however, when trucks are climbing on long, steep grades, the PCE increases to as much as 3.0 on 3 percent grades one-mile long, and negatively affects the highway operational characteristics of capacity and safety.

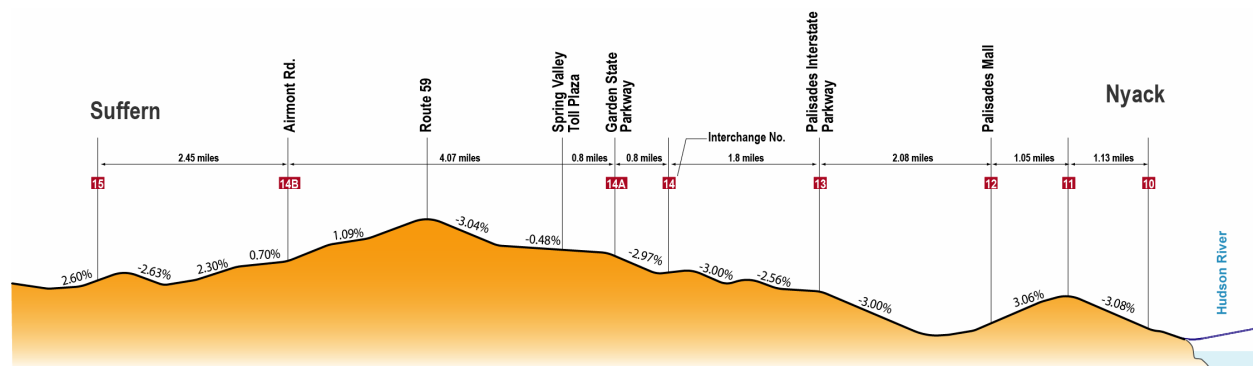
In the Rockland corridor, consideration of the westbound climbing lane was based on the combination of the I-287 profile grades and the high traffic volumes in relation to capacity (including up to 12 percent trucks daily through the Spring Valley toll barrier). The analysis to justify the addition of a climbing lane is based on criteria given in *A Policy on Geometric Design of Highways and Streets* (AASHTO 2004) and in the NYSDOT Highway Design Manual. As per these references, a climbing lane on a multilane highway is justified when both of the following conditions are met:

- A typical heavy truck (three-axle, 200 pounds per horsepower [lb/hp]) would have a speed reduction of at least 10 miles per hour (mph) along the length of a particular grade on the highway, as determined by Exhibit 3-59 in Section 3 of the AASHTO publication.
- The LOS for the particular highway segment is E or F.

5.2.1 Reduction in Travel Speed

In evaluating the first criterion, a general description of the existing I-287 profile is helpful. The hills of the Hudson River valley tend to run north-south, whereas the I-287 Corridor alignment generally runs east-west. A highway alignment across these hills and valleys must include long sections of uphill grades that have a negative impact on traffic flow. The existing roadway between Suffern and the Tappan Zee Bridge has profile grades that reflect this rolling terrain, with 7 miles of its 13.6-mile length on grades steeper than 2 percent, of which more than 4 miles are at 3 percent (see Rockland profile on Figure 5-2).

On these uphill segments, trucks lose speed as they ascend the grade until they reach what is referred to as their “crawl speed,” which is the maximum sustained speed that can be maintained on an extended upgrade of a given percent. For a typical heavy truck on a long 3 percent grade the crawl speed typically is considerably less than the average vehicle speed for the segment. This speed differential creates gaps in the traffic flow, which leads to operational deficiencies by creating congestion behind the trucks, thus reducing the LOS. However, more significant than the drop in the operational service level is the unsafe condition created by slow-moving vehicles traveling at sharply different speeds than the rest of the traffic. Studies cited in AASHTO have shown that regardless of the average speed on the highway, the more a vehicle deviates from the average speed, the greater are its chances of becoming involved in a crash.



Rockland County Profile

Figure 5-2

To evaluate whether a particular highway segment warrants consideration for a climbing lane, the segment length and grade are compared to the critical length of grade, which is defined as the maximum length of a designated upgrade on which a loaded truck can operate without unreasonable reduction in speed. AASHTO recommends that for a typical heavy truck a 10 mph reduction in speed be used to determine the critical length of grade for a specific segment. Table 5-3 shows those westbound segments on I-287 for which a climbing lane has been evaluated.

Table 5-3

I-287 Westbound Climbing Lane Determinants

Proposed Climbing Lane Segment	Segment Characteristics				Westbound PM Peak Hour - Vehicle Volumes/LOS			
	Length (ft)	Grade (%)	Critical Length of Grade(1) (ft)	Truck Speed on Grade vs. Free Flow Speed (mph)	2025 – H1	2025 – H3	2025 – BRT1/ HOT LANES	
					No Build *	GP Lanes+Climbing	HOT Lane	GP Lanes
Tappan Zee Bridge to Interchange 11 (Broadway to Mountain View Avenue)	5,000	3	1,750	42 / 65	7100 (4L)	9100 (4 L+CL)	1100	7700 (4L)
					F**	D	B	F**
Interchange 12 to 13 (Palisades Center Mall to Palisades Interstate Pkwy)	6,200	3	1,750	43 / 60	7300 (3L)	10000 (4L+CL)	1100	7900 (3L)
					F	E	B	F
Interchange 13 to 14 (Middletown Road. to Interchange 14)	1,800	3	1,750	51 / 65	6300 (3L)	9200 (4L+CL)	1100	6900 (3L)
					E	D	B	F
Interchange 14 to 14A (Pascack Road to Garden State Pkwy)	2,700	3	1,750	50 / 65	6700 (3L)	8500 (4 L+CL)	1100	6700 (3L)
					F	D	B	F
Interchange 14A to 14B (Saddle River Road to Route 59)	3,450	3	1,750	47 / 65	7200 (3L)	8100 (4L)	1100	6200 (3L)
					F	E	B	E

(1) Based on an entering speed of 70 mph as determined from Exhibit 3-59 in *A Policy on Geometric Design of Highways and Streets* (AASHTO 2004). When the entering speed is less than or more than 70 mph, the speed reduction will occur over a shorter or longer length of grade respectively, but for the permissible speed reduction (10 mph), the critical length (1,750 feet) would not change.

Notes:

* The No Build condition assumes that the existing Tappan Zee Bridge would remain in its current 4/3 lane configuration without shoulders, and continue to be a capacity constraint with limited throughput capacity.

** The LOS F for this segment is based on the combined effects of the 1-mile-long 3 percent grade and the lane drop west of Interchange 11 that results in reduced speeds on the ascending grade and congestion that backs up traffic on the segment and across the bridge.

5.2.2 Level of Service

The second determinant used to justify the climbing lane is the measure of traffic volume in relation to capacity referred to as LOS. Simply put, a climbing lane would be warranted when traffic volumes on the segment in question result in an LOS of E or F.

Traffic analyses performed in the AA process have demonstrated that existing capacity throughout the I-287 Corridor during both the AM and PM weekday peak periods is limited, causing congestion and long travel times. Current speed data in the corridor obtained in June 2004 from NYSTA indicates that westbound congestion during the evening peak period results in speeds below 30 mph between the Tappan Zee Bridge and Interchange 11 (Nyack-Route 9W). In this four-lane segment, the impacts of the mile-long 3 percent grade with up to 7 percent truck traffic, and most significantly, the lane drop from four lanes to three lanes just west of Interchange 11, combine to reduce travel speeds to the equivalent of LOS F and cause backups across the Tappan Zee Bridge and into Westchester County.

The forecasts of future peak period traffic conditions in the corridor (see Chapter 4) were projected to increase at an overall rate of 30 percent from 1996 to the year 2025 for the No Build condition. Based on these projected traffic volumes for the 2025 No Build condition, failure conditions (LOS F) would occur on a typical weekday in the PM peak period throughout most of the corridor in both Westchester and Rockland Counties.

In consideration of the projected poor service conditions, a climbing lane along a critical length of grade would be justified. Table 5-3 includes the projected traffic volumes and LOS for the westbound segments where climbing lanes are proposed.

The data presented in Table 5-3 demonstrate that the length of each of the proposed climbing lane segments creates speed differentials between a typical heavy truck and the average vehicle speed that exceed 10 mph, which satisfies the first determinant for justification of the proposed climbing lanes. The table also reflects the poor LOS (E and F) for these same segments, based on the projected traffic volumes for the No Build and BRT1 Scenarios, which do not include the climbing lane. The analysis for Scenario H3 reflects the improved LOS when the climbing lane is included in each of the segments.

5.2.3 Additional Considerations Related to Climbing Lanes

Although there are profile segments in between the 3 percent grades westbound that are flatter or even downhill, it is proposed to provide an auxiliary lane between the uphill segments to effect lane balance and continuity along the highway. This continuity is necessary because dropping the climbing lane in roadway segments with high traffic volumes would create operational problems and unsafe conditions when slower moving trucks are forced to merge back into the general-purpose lanes.

In the DEIS, consideration will be given to extend the climbing lane from its proposed terminus at Interchange 14A (Garden State Parkway) further west a distance of approximately 1 mile to the Spring Valley truck toll barrier. Although the additional length is not on a steep grade, and therefore would not meet the climbing lane criteria, extending the climbing lane as an “exclusive truck lane” to the toll barrier would be a logical terminus, since all trucks must exit the travel lanes and enter the toll barrier. The extension would also eliminate the need to drop a lane before the toll barrier. Additional consideration will be given to continue the climbing lane west of the toll barrier and up the 4,000-foot-long 3 percent grade to Route 59 (Old Nyack Turnpike) in Monsey. These options would be studied further in the DEIS using updated traffic counts and new traffic volume forecasts for the evaluation.

In the eastbound direction most of the corridor profile is downgrade except for the three-lane segment between Interchange 12 and Interchange 11, which is on a 3 percent upgrade and approximately one-mile long. Although the 1996 traffic volumes indicate a LOS C for this segment, field observations and average weekday speed data received from the NYSTA for a period in June 2004 (see Chapter 4) indicate a significant slow down in average speed to below 40 mph on the upgrade, then an increase to over 60 mph east of Interchange 11 on the downgrade to the bridge. This LOS deterioration is caused by vehicles entering at Interchange 12 and slow moving trucks in the traffic stream that must climb the long 3 percent upgrade to Interchange 11.

Traffic projections for the future 2025 No Build condition indicate a LOS F for this segment, primarily due to the estimated queue resulting from the constraints caused by the geometrics of the existing bridge; however, the June 2004 volumes, when projected to 2025 would indicate a level of service as poor as E based on traffic volumes alone. The AASHTO climbing lane warrants used in the westbound analysis, when applied to this segment, would justify consideration of a climbing lane to improve operating conditions.

When climbing lane segments include interchange ramps, the lengths of acceleration and deceleration lanes would be extended as necessary to provide safe weaving lengths for vehicles entering and exiting the highway.

Ample signing would be posted on the highway directing trucks to use the climbing lane, except to pass. Other signs would advise trucks to keep to the right lanes of the highway. Strict enforcement of these requirements by state police would help assure compliance.

5.3 Conclusions

5.3.1 BRT/HOT Lanes vs GP Lanes

The Level 2 screening process resulted in the recommendation to eliminate from consideration expansion of the highway to eight general-purpose lanes in Rockland County (H3). The introduction of BRT/HOT lanes (BRT1) would be preferred over general-purpose lanes because they would offer significant benefits to the corridor not provided by general-purpose lanes. BRT/HOT lanes would better enhance corridor mobility by improving trip time reliability and by providing travel time savings and trip options in a congested corridor. The BRT/HOT lanes would also:

- Improve and enhance the existing bus service by providing an uncongested through lane for shorter travel times, and new convenient park and ride locations.
- Reduce demand on general-purpose lanes by moving buses, high-occupancy vehicles, and some SOVs into the BRT/HOT lanes.
- Generate revenue to offset operating costs.
- Provide an uncongested lane for emergency vehicles.
- Provide potential to relieve weekend traffic congestion by using BRT/HOT lanes as express lanes in each direction between Suffern and the Tappan Zee Bridge.

The analyses also determined that BRT/HOT lanes would not be as effective as general-purpose lanes in raising levels of service in the westbound direction in the three-lane segments west of Interchange 11 (Nyack). As a result, additional improvements in the form of auxiliary (climbing) lanes, as discussed below, were considered with the BRT/HOT lanes to better meet the goals and objectives of the study.

5.3.2 Consideration of Climbing Lanes

Projected traffic forecasts of increased volumes combined with heavy truck traffic, which currently is 12 percent of the daily westbound traffic stream at the Spring Valley toll barrier, would create significant congestion westbound from the Tappan Zee Bridge to the Garden State Parkway (Interchange 14A) due, in part, to the long roadway segments with 3 percent uphill grades

The analysis based on the AASHTO and NYSDOT criteria demonstrates that a climbing lane would be warranted in order to mitigate operations and safety issues for those segments with long 3 percent gradients. Therefore, a westbound climbing lane is proposed from the Tappan Zee Bridge to the Garden State Parkway or possibly further west to the Spring Valley toll barrier, and an eastbound climbing lane is proposed between Interchange 12 and Interchange 11.

These climbing lane concepts will be included in the DEIS, where they will be submitted to further traffic analyses based on updated traffic counts and forecasts.

5.3.3 Development of a DEIS Highway Alternative

The proposed alternative would add BRT/HOT lanes in both directions in a reconstructed I-87/I-287 highway corridor in Rockland County, and on a replacement Tappan Zee Bridge. The existing six-lane to eight-lane roadway configuration would be maintained with modifications and additions on specific highway segments to address problems forecasted in the year 2025, as follows:

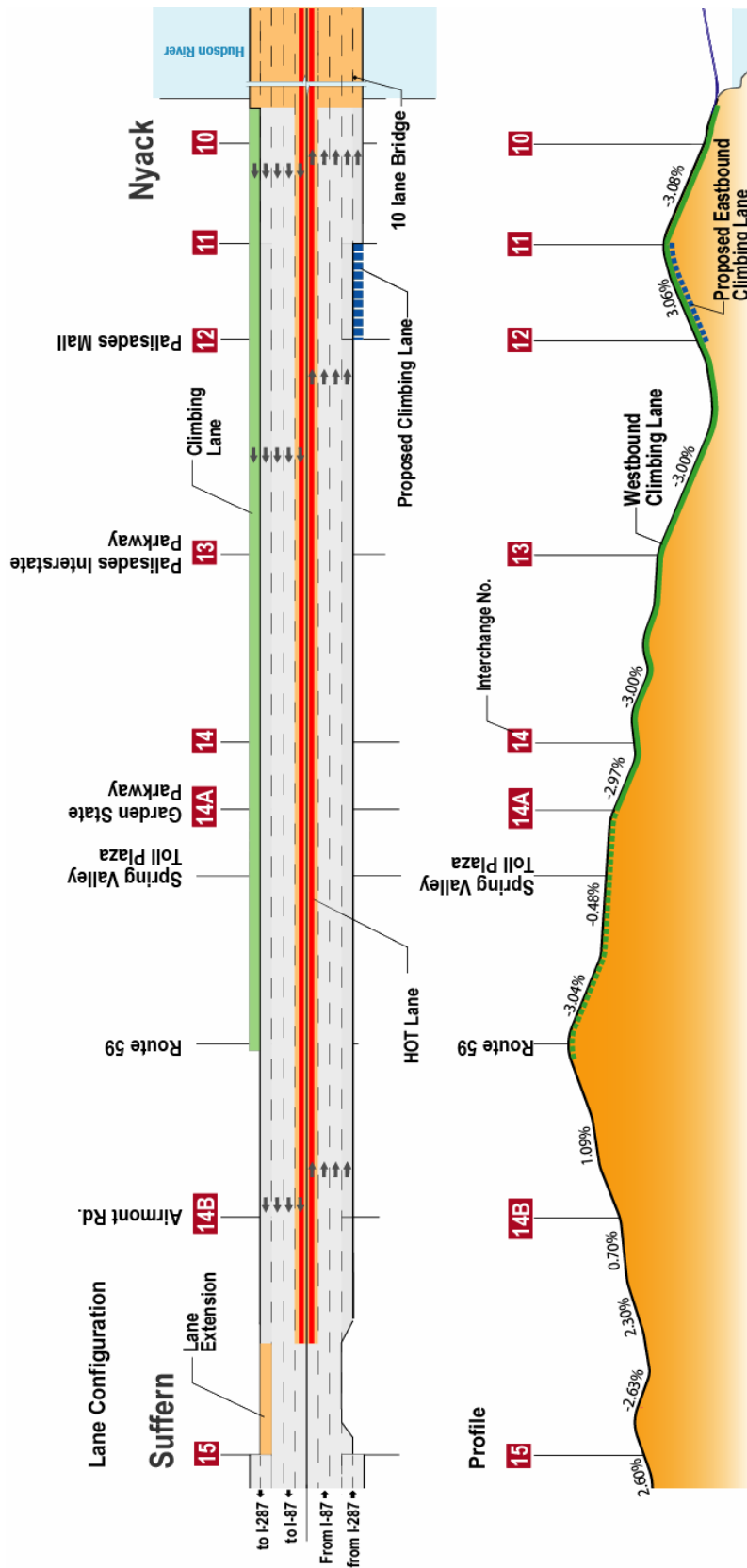
- The existing westbound outside general purpose lane, beginning at the western end of the new bridge to Interchange 11, would be converted to an auxiliary climbing lane for slow moving vehicles. The auxiliary climbing lane would be continued to just west of the Route 59 (Nyack Turnpike) overpass in Monsey, which is the profile high point in Rockland County for a total length of approximately 10 miles.
- An eastbound auxiliary climbing lane on the 3 percent ascending grade from Interchange 12 to Interchange 11 (approximately 1 mile).

Figure 5-3 contains a schematic plan and profile of the highway alternative. Figure 5-4 depicts typical cross sections at three locations in Rockland County.

In addition to the right-of-way impacts identified for BRT1, additional right-of-way impacts would be expected to occur where the proposed climbing and auxiliary lanes are constructed between Interchanges 11 (Nyack) and 12 (Palisades Mall). Between Interchanges 12 (Palisades Mall) and Interchange 15 (Suffern), where the right-of-way is typically 250 feet, an approximate 40-foot buffer would be preserved on each side of the roadway in its present configuration.

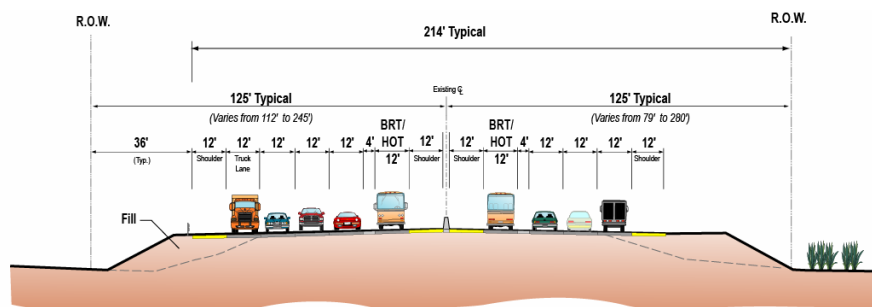
If a dedicated right-of-way were required for a fixed rail alignment in conjunction with this highway alternative, most of the typical 250-foot wide right-of-way would be used for the improvements and a buffer of less than 20 feet would remain on each side, indicating a greater potential for construction impacts.

The cost for the added improvements to the BRT1 scenario would be approximately \$90 million, which would increase the roadway cost for the proposed DEIS Highway Alternative to \$1.24 billion and the total cost, including the replacement bridge, to \$4.95 billion.

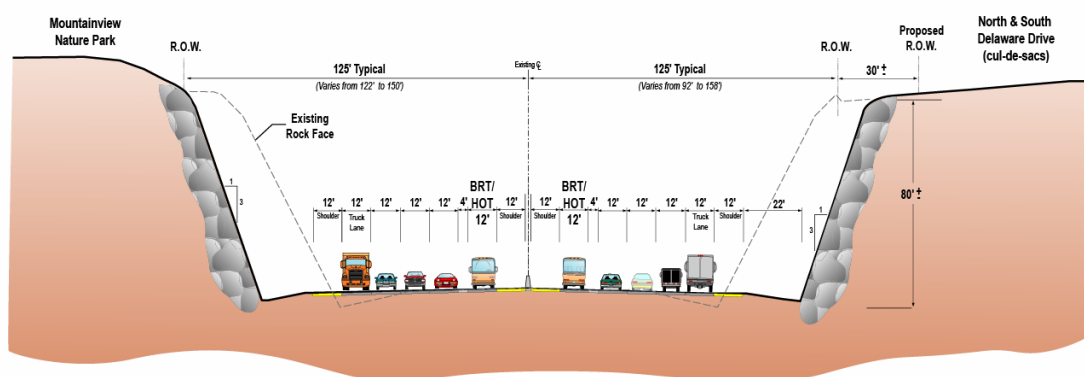


Proposed Highway Improvements in Rockland County

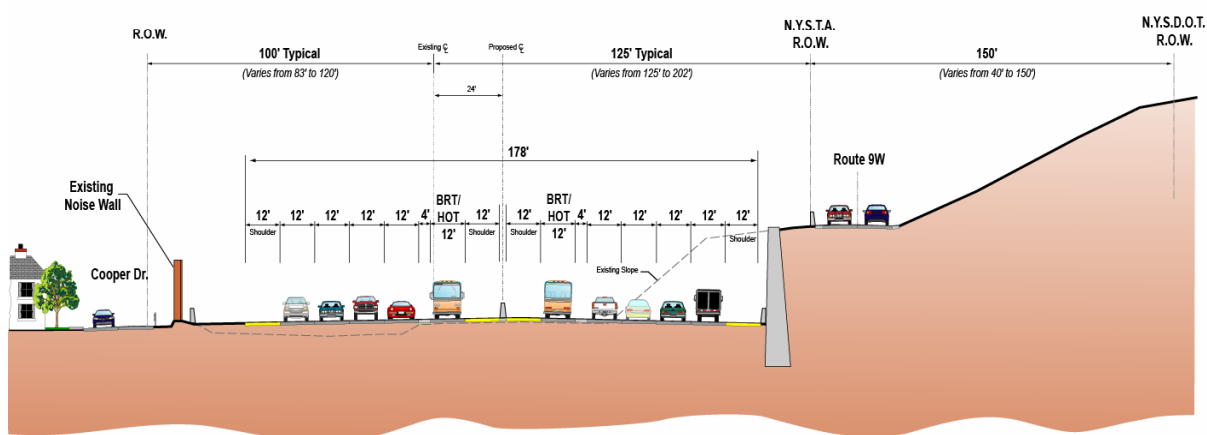
Figure 5-3



*East of Interchange 14B to Interchange 12
Route 59 Monsey to Palisades Mall
(Looking East)*



Section at Exposed Rock Slopes between Interchanges 12 and Interchange 11



*Interchange 11 to TZB
Nyack to TZB
(Looking East)*

Proposed Highway Improvements in Rockland County – Cross Sections

Figure 5-4