TAPPAN ZEE BRIDGE/I-287
ENVIRONMENTAL REVIEW

New York State Thruway Authority
MTA Metro-North Railroad

Level 1 Screening Process

Tappan Zee Bridge/I-287
Environmental Review

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Alternatives Definition and Screening

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Thruway Authority

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Appendices

1 INTRODUCTION

The New York State Thruway Authority (NYSTA) and Metro-North Railroad, a subsidiary of the Metropolitan Transportation Authority (collectively, MTA MNR) are undertaking a comprehensive study of regional transportation needs and mobility within the Tappan Zee Bridge/I-287 Corridor (the Corridor). The Federal Highway Administration (FHWA) and the Federal Transit Administration (FTA) are joint lead agencies under the National Environmental Policy Act (NEPA), with NYSTA and MTA MNR as Study sponsors. The environmental review process to be completed will also satisfy the New York State Environmental Quality Review Act (SEQRA), which follows the same basic process as NEPA.

To be consistent with NEPA and SEQRA, the Tappan Zee Bridge/I-287 Corridor Environmental Impact Statement (EIS) will consider reasonable alternatives and conduct a thorough review of potential environmental impacts of the proposed alternatives. For this Study, as is typically done for major transportation proposals, alternatives are being identified and evaluated through an Alternatives Analysis (AA) process. The intent of the AA process is to advance the most promising alternatives for detailed evaluation in the EIS, and screen out early those alternatives that have serious flaws or clearly fail to meet the Study's objectives.

This report presents the results of Level 1 screening, which is the first step in a two-part AA screening process for the Corridor. During the Level 1 screening process, more than 150 alternative elements to address existing and projected transportation conditions in the Corridor were examined. The alternative elements, which are discussed further in Section 4 of this document, include:

- Travel Demand Management/Travel System Management (TDM/TSM) measures such as congestion pricing, ramp metering, and car and vanpool priority lanes;
- Improvements to the existing transit systems, such as new or enhanced bus and rail service;
- Corridor-wide improvements related to different modes of travel such as commuter rail, light rail, bus rapid transit, and additional highway lanes; and
- River crossing improvements such as Bridge replacement, rehabilitation, preservation, and bored and immersed tube tunnels.

Each of the elements was developed to a concept level sufficient to allow screening based on very general criteria that were derived from the goals and objectives established for the Study. At this level of analysis the alternatives are not sufficiently detailed to undertake the kinds of impact studies that are done to support preparation of an EIS. Instead, the screening process was designed to eliminate those alternatives that clearly would not meet the Study's goals. Thus, unlike an EIS analysis, the AA effort is not focused on disclosing the impacts of alternatives, but rather on justifying the reasons for eliminating alternatives.

As a result of the Level 1 screening process, a number of alternative elements were eliminated, while the remaining ones were used to build scenarios for the Level 2 screening process. In fact, the majority of the 150 alternative elements are recommended to be carried forward into the next level of detailing and analysis. In a number of instances, alternatives that appeared promising but that could have serious implementation issues have been carried forward, since not enough is known at this time to firmly conclude that they really are unworkable.

To facilitate the next level of analysis, 15 Corridor-wide scenarios were formed by combining, in a logical fashion, the alternative elements that survived the first level of screening. The 15 scenarios present a full range of comprehensive solutions in which corridor-wide improvements are combined with river crossing options and then augmented by improvements to the existing transit system and TDM/TSM measures. The 15 scenarios will be evaluated in greater detail in the Level 2 screening process. Level 2 screening will result in the refinement of the scenario concepts, potentially recombining alternative elements to optimize performance and develop a short list of alternatives for detailed evaluation in the EIS. This will allow the EIS to focus on the detailed impacts of only the most promising alternatives.

An AA Report (expected in the Spring of 2004) will document the process that leads to the selection of alternatives to be fully evaluated in the EIS. It will serve as a detailed record that all reasonable alternatives for the Corridor were examined and presented to the public during the environmental review process.

The report that follows begins with an overview of the Corridor conditions and presents the goals and objectives established for the Study. A summary of the screening criteria that was used to evaluate the alternative elements is presented next, followed by the results of the Level 1 screening process.

2 THE CORRIDOR

The Corridor extends from the I-287/I-87 interchange in Suffern to the I-287/I-95 interchange in Port Chester, for approximately 30 miles through Rockland and Westchester counties (Figures 1 and 2). The Corridor includes the 3.1 mile-long Tappan Zee Bridge crossing the Hudson River, and encompasses a critical section of the New York State Thruway, and the entire Cross Westchester Expressway. It provides a critical link in the national system of interstate and defense highways, as well as links to a number of key north-south and east-west regional and interstate routes, including I-87 north to Albany, I-287 south to New Jersey, I-87 south to New York City, I-684 north to Connecticut, and both I-95 north to New England and south to New York City and New Jersey.

The Tappan Zee Bridge opened to traffic in 1955 and carried an average of 18,000 vehicles daily during its first year of operation. Today, approximately 135,000 vehicles cross the Bridge on an average weekday, with volumes as high as 170,000 vehicles on some peak days. During the past 20 years, traffic volumes have grown significantly in the Corridor, by over 50 percent on the Cross Westchester Expressway and by more than 70 percent on the Tappan Zee Bridge.

Passenger rail facilities in the Corridor are oriented north-south and do not cross the Hudson River. Except for Amtrak, the commuter lines east of the river are the responsibility of Metro-North Railroad, and carry more than 250,000 customer trips each weekday and some 72 million trips per year. These lines (the New Haven, Harlem, and Hudson) terminate at Grand Central Terminal in Manhattan. Amtrak also runs trains that provide intercity and commuter service from New York Penn Station north along the east side of the River, to Albany and beyond. The Port Jervis and Pascack Valley lines, which are also commuter lines, are west of the River. These lines are operated by NJ TRANSIT, under contract to Metro-North and terminate at Hoboken, New Jersey. Access to Manhattan from the lines west of the River is presently limited to Port Authority Trans Hudson (PATH) train service from Hoboken, but will soon be augmented by service to Penn Station in Midtown Manhattan via the Northeast Corridor, once the Secaucus Transfer Station in New Jersey opens for full service in early 2004.

There are numerous east-west and north-south bus services provided throughout the Corridor. Long distance bus service is available between upstate New York and New York City, and many local and regional bus services are provided by a combination of local government and commercial providers. In addition, passenger ferry service is provided between Haverstraw and Ossining.

The Corridor includes significant portions of both Westchester and Rockland counties, including the communities of Rye, Harrison, White Plains, Greenburgh, Elmsford, Tarrytown, Nyack, Nanuet, Spring Valley, and Suffern. Development patterns in the Corridor are predominantly suburban, with intermixing commercial areas, business centers, and residential neighborhoods.

The Corridor passes through pockets of more dense urban development predominantly in the White Plains area. In addition to Westchester and Rockland counties, the Corridor provides the primary access between those portions of the New York City metropolitan area east of the Hudson River and the northern suburbs west of the Hudson, primarily Orange County. The Corridor also serves as a major route for traffic traveling between New England and areas to the south and west.


Stewart Airport
Suffern
Spring Valley
Nanuet
Nyack
Port Jervis Line
Pascack Valley Line
West Shore Line
Hudson Line
Harlem Line
New Haven Line
Port Chester
Hoboken Terminal
Penn Station
Grand Central Terminal
Tappan Zee Bridge/I-287 Corridor
With Current Passenger Rail Lines

Figure 1

Figure 2a

Figure 2b

3 STUDY GOALS AND OBJECTIVES

The purpose of the Study is to address the mobility needs in the Tappan Zee Bridge/I-287 Corridor and to address the structural needs of the Tappan Zee Bridge and other existing Thruway infrastructure in the Corridor. The goals and objectives developed for this study were based on the transportation problems and mobility deficiencies identified in the Corridor. Goals are broad statements that reflect expectations of travelers in relation to the problems identified in the Corridor. Physical, operational, environmental and safety objectives are identified for each goal to guide the development of potential transportation solutions. The Purpose and Need for the Study and the Goals and Objectives were presented in the *Scoping Information Packet* (December 2002) and subject to public and agency review at the scoping meetings held to initiate the NEPA process. The six primary goals, with associated objectives, to guide the development and evaluation of the alternatives in the AA process are presented here:

Goal 1: Improve the mobility and accessibility of people, goods and services for the travel markets served by the Tappan Zee Bridge/I-287 Corridor.

- Reduce traffic congestion levels.
- Improve travel times for local trips.
- Improve travel times for regional trips.
- Provide modal travel alternative(s) not subject to roadway congestion.
- Increase the share of travel demand accommodated by transit and ridesharing.
- Provide a non-motorized means of travel, such as bicycle and pedestrian, across the Hudson River.

Goal 2: Maximize the flexibility and adaptability of new transportation infrastructure to accommodate changing long-term travel demand.

- Maximize ability to accommodate increases in travel demand.
- Minimize constraints to serving future travel patterns and markets.

Goal 3: Maintain and preserve vital elements of the transportation infrastructure.

- Assure that the Corridor's transportation infrastructure meets applicable standards for structural design and integrity.
- Assure that the Corridor's infrastructure meets applicable seismic design standards.

Goal 4: Improve the safety and security of the transportation system.

- Reduce motor vehicle accident severity and rates.
- Improve roadway geometrics to applicable standards.

- Improve the likelihood that the river crossing would survive a severe natural or manmade event.

Goal 5: Avoid, minimize, and/or mitigate any significant adverse environmental impacts caused by Corridor improvements.

- Comply with state and federal standards and/or procedures such as those for air quality, noise, surface and ground water quality, stormwater management, ecosystems, environmental justice, energy consumption, hazardous materials, and river navigation.
- Minimize community disruption, displacements, and relocations; as well as adverse impacts to public parks, historic resources, and visual resources and aesthetics resulting from mobility improvements in the Corridor.

Goal 6: Develop feasible, cost-effective solutions that can be implemented within a reasonable time horizon.

- Include improvements that to the extent practical can be implemented quickly to address existing problems, as well as long-term improvements.
- Foster capital and operating cost effectiveness.
- Minimize disruptions to the regional transportation system.
- Maximize use of the region's existing and committed transportation infrastructure.

4 LEVEL 1 ALTERNATIVE ELEMENTS

The development of alternatives for the Corridor began with a broad examination of potential solutions to the transportation needs identified. Alternatives contained in prior studies completed for I-287, as well as those suggested by other agencies, various interest groups, elected officials and the public were considered during Level 1 screening. The "long list" of alternative elements was reviewed and modified through a series of public and agency outreach initiatives including the scoping meetings. It has been organized into four broad categories: TDM/TSM measures, new/improved transit services, Corridor-wide improvements, and river crossings

4.1 TDM/TSM MEASURES

TDM/TSM measures are lower cost management strategies designed to impact travel demand, choice of travel mode, or time of travel, as well as actions to improve the overall efficiency of the existing transportation system. Forty individual TDM/TSM measures were identified, covering the following broad actions:

- Enhance existing MetroPool Employer Trip (ETR) Programs
- Expand existing Easy Street Vanpool Program

- Implement Corridor-wide Parking Pricing and Management
- Introduce Carpool and Transit Priority
- Utilize Tolls and Pricing
- Distribute Real-Time User Information
- Improve the Integration of Rail and Bus Service
- Implement Dynamic Traffic Management Systems
- Implement Commercial Vehicle Programs
- Implement Incident Management Programs

These alternatives included both incentives ("carrots") and disincentives ("sticks") to induce drivers in single-occupant vehicles (SOV) to take transit or join vanpools and carpools. In addition, measures that aim to optimize system operations, capacity and safety were included in this category.

4.2 TRANSIT SERVICE IMPROVEMENTS

The transit service improvements identified for the Corridor include:

- **Bus Transit Service -** increase frequency of express bus routes using or connecting to the Tappan Zee Crossing, expand coverage and frequency of bus routes on facilities parallel to I-287, and expand shuttle services to high traffic generators in the Corridor.
- **Rail Transit Service -** increase frequency of peak and off-peak trains on the Hudson, Harlem and New Haven lines, improve capacity of lines with additional tracks or sidings on Harlem, Pascack Valley, and Port Jervis lines.
- **Ferry Service -** increase frequencies on existing ferry routes and introduce new routes across the Hudson River and from Rockland/Orange counties to Manhattan.
- **Park-and-Ride Improvements -** expand parking supply at existing lots and develop new park-and-ride lots to support transit service alternatives outlined above.

4.3 CORRIDOR-WIDE IMPROVEMENTS

Corridor-wide alternative elements include major capital investments to I-287 in Rockland and Westchester counties and the introduction of new east-west bus and rail transit facilities and services as follows:

- **Roadway Improvements -** add general-purpose lanes and/or auxiliary lanes to selected segments of I-287 in Rockland County, enhance programmed improvements in Westchester County, and improve interchanges/transition areas. The programmed improvements in Westchester County, identified in the revised Record of Decision for I-287/Cross Westchester Expressway, NYS Thruway from Route 303 to Route 120, Westchester and Rockland Counties, FHWA-NY-EIS-95-01F (July 1998), include additional lanes on I-287 east of the Tappan Zee Bridge, but only auxiliary lanes east of Thruway Interchange 8.

- **Bus Rapid Transit (BRT) Facility -** introduce new barrier- or buffer-separated BRT lanes on I-287 in Rockland County and/or similar facilities along portions of I-287 in Westchester County and on parallel arterials (e.g., NY 59 in Rockland County and NY 119 and NY 120 in Westchester County). Provide BRT service for the full length of the Corridor between Suffern and Port Chester, and direct service to the major activity centers and transfers to the existing, north-south commuter rail network.
- **New Commuter Rail Lines -** introduce new commuter rail lines connecting existing north-south rail lines, including service between the Port Jervis and Hudson lines, Port Jervis and Harlem lines, and/or Port Jervis and New Haven lines.
- **Light Rail Transit (LRT)/Automated Guideway Transit (AGT) lines -** introduce new LRT/AGT service connecting to the existing north-south commuter rail lines, and providing service to the major activity centers.
- **Cross-Westchester Multi-Modal Tunnel -** construct new tunnels under Westchester from the Hudson River to I-95, carrying vehicular traffic and bus or rail transit lines.

4.4 RIVER CROSSINGS

River crossing alternatives cover a broad range of actions categorized as follows:

- **Retain the Tappan Zee Bridge -** preserve, rehabilitate without widening, and rehabilitate with widening, with additional general-purpose lanes, priority lanes[1], and/or LRT/AGT.
- **Replace the Tappan Zee Bridge -** construct replacement bridge, replacement tunnel, replacement bridge and tunnel in series, or the combination of a new bridge and a transit tunnel, all generally parallel to and immediately north or south of the existing Tappan Zee Bridge. These replacement crossings could include general-purpose lanes only, or a combination of general-purpose lanes and busway lanes, general-purpose lanes and a variety of transit modes. Replacement tunnels could be bored tunnels or immersed tube tunnels.
- **Supplement the Tappan Zee Crossing with an Additional Crossing -** add a transit tunnel next to the existing Bridge, or a bridge or tunnel crossing, well to the north or to the south of the existing Bridge, to carry either additional highway lanes or commuter rail.

5 SUMMARY OF LEVEL 1 SCREENING CRITERIA

In order to evaluate the effectiveness of the alternative elements and their ability to meet the goals and objectives identified for the Corridor, screening criteria or performance measures were

[1] Priority lanes could be high occupancy vehicle lanes (HOVs) for car pools and buses, exclusive bus lanes, or High Occupancy Toll (HOT) lanes. HOT lanes are limited-access (normally barrier-separated) lanes that allow buses and carpools free access while single occupancy vehicles can gain access by paying a toll. The tolls are varied throughout the day to maintain traffic flow in the lane, even during rush hours.

developed. The Level 1 screening criteria used to evaluate the long list of alternative elements are presented in Appendix A. At this level of analysis, the alternative elements were developed only to a conceptual definition and most measures are qualitative. The intent of this initial screening was to highlight the key differences in performance among the alternative elements within each category (i.e., TDM/TSM measures, transit service improvements, Corridor-wide improvements, and river crossings) based on social, environmental, economic, and transportation factors. Because some of the initial criteria posted were not relevant for specific alternatives or because the criteria did not enable the project team to distinguish between the alternatives at this level of evaluation, performance relative to these criteria was not addressed.

Since detailed design, cost, ridership, and impact information were not available at this stage, many of the Level 1 criteria involve the use of surrogate measures or qualitative, professional judgments. Separate screening procedures were developed for the different improvement categories, whenever the criteria used to evaluate alternatives in one category were not relevant to those in other categories. Criteria for the river crossing alternatives, for example, included an assessment of structural integrity, ability to withstand seismic events, and vulnerability to natural or manmade incidents, which is not relevant for use in evaluating the alternatives in other categories.

For the Corridor-wide alternatives, preliminary travel demand estimates were used including forecast travel times, travel speeds, use of transit and highway modes, and vehicle miles traveled[1]. "Reserve Capacity" or the estimated person-moving capacity of the transportation Corridor beyond the time horizon of this study was calculated on the basis of the four-hour peak period for the Corridor-wide alternatives for the year 2020. In addition to using the quantified information, assumptions on transportation performance were made based on judgment and interpolation, guided by the results of the model runs and an understanding of future Corridor travel conditions.

The Corridor-wide and river crossing improvements were evaluated based on their potential to interconnect components of existing and proposed highway and transit systems within the Corridor, as applicable. Environmental screening focused on direct impacts to the natural and manmade environment. A number of Section 4(f) resources are found in the study area. Section 4(f) of the US Department of Transportation Act of 1966 applies to parklands and historic sites. Study alternatives involving direct impacts to, or changes in the aesthetic setting and character of, historic properties, districts and parkland would be required to meet Section 4(f) requirements for impact avoidance and mitigation.

Level 1 screening is the first of a two-part screening process that will ultimately lead to the selection of a short list of alternatives for detailed analysis in the EIS (Figure 3). At this level of analysis the alternative elements are not sufficiently detailed to undertake the kinds of impact studies that are done to support preparation of an EIS. Instead, the screening process was designed to eliminate those alternatives that clearly would not meet the Study's goals or those that would have impacts so severe that mitigation would not be possible. Thus, unlike an EIS

[1] Preliminary travel demand forecasts were developed using the Best Practices Model (BPM), which is a regional model developed by the New York Metropolitan Transportation Council (NYMTC).

analysis, the AA effort is not focused on disclosing the impacts of alternatives, but rather on justifying the reasons for eliminating alternatives.

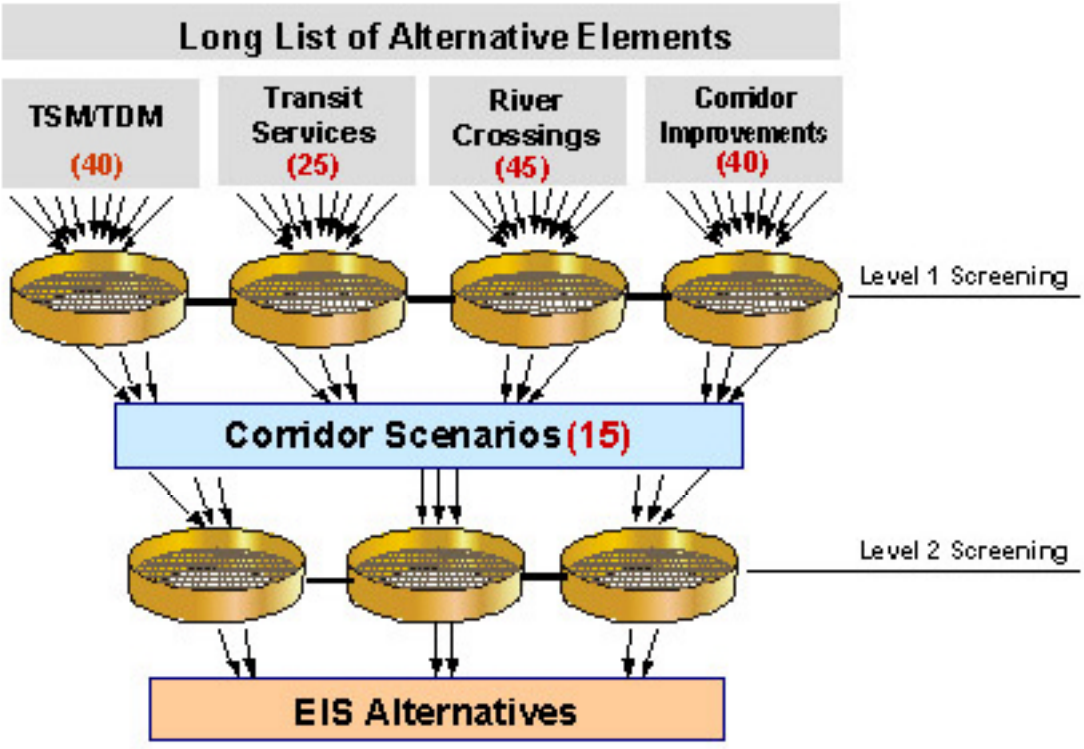

Figure 3 Alternative Analysis Process

6 SUMMARY OF LEVEL 1 SCREENING RESULTS

The screening process narrowed down the long list of alternative elements by eliminating those that would not meet the Study's goals and objectives, i.e., they would:

- Result in significant impacts that could not likely be mitigated; or
- Offer little or no benefit compared to a No Build condition; or
- Perform poorly in meeting the Study's goals and objectives with no apparent benefit compared to other alternative elements.

The disposition of each alternative element is presented in Table B-1 (Appendix B), which indicates those that were eliminated from further consideration and those that are retained, in original or modified form, for further detailing and analysis in the Level 2 screening process.

The rationale for this screening is summarized in the next section, followed by a description of the Level 2 scenarios.

6.1 RATIONALE FOR LEVEL 1 SCREENING RESULTS

6.1.1 TDM/TSM Measures

Many of the TDM/TSM measures in the long list were determined to be potentially effective ways to improve travel conditions in the Corridor. The following are the measures that are not recommended to proceed to Level 2 screening, and the rationale for eliminating these measures:

- Mandating participation in the presently voluntary MetroPool ETR Program would require a significant coordination effort with employers throughout the Corridor, new state legislation, and a cumbersome and potentially costly monitoring program to ensure and enforce compliance. The limited expected transportation benefit from a mandatory MetroPool Program, together with the added difficulties and expense of enforcing compliance, make this an ineffective way to address mobility in the Corridor.
- Currently, most suburban employee parking is provided by the employer at no cost to the employee. While managing the supply and demand of employee parking has the potential to change travel behavior in the Corridor, such policies could unfairly penalize non-Corridor users and would be difficult to implement -- requiring new legislation and the cooperation and coordination of multiple jurisdictions and/or private partners.
- The measures that would limit use of a presently general-purpose lane (either on the Tappan Zee Bridge or I-287) to buses or other HOVs would have an overall detrimental impact on traffic operations and would be inconsistent with the Study goal of increasing mobility in the Corridor. A reduction in general-purpose lane capacity would result in deteriorated levels of service under existing conditions, with significant impacts expected in future years. The number of vehicles that would be removed from the general-purpose lanes by adding an HOV lane would not compensate for the reduction in highway capacity. Travel times would increase for the majority of commuters traveling in the Corridor, and more bottlenecks throughout the Corridor and longer delays at the toll plaza would occur. The conversion of the reversible lane on the bridge alone, for example, would increase travel time for the general-purpose lane users by more than three minutes.

  Today, the Bridge can process only about 1700 vehicles per hour per lane due to the lack of shoulders, lane width, and number of truck trips crossing the Hudson. The capacity of the Bridge today, therefore, is 6800 vehicles per hour in the peak direction of travel and 5100 in the reverse peak direction. Recent traffic data collected at the toll plaza indicates that peak hour traffic routinely exceeds 6900 vehicles per hour, with vehicle queues extending up to 10 miles from the toll plaza. Traffic volumes on the Bridge are expected to continue to grow at a rate of more than one percent per year. As a result, peak hour traffic is expected to exceed 9000 vehicles per hour by 2020 in the peak direction of travel. Traffic traveling in the reverse peak direction is expected to grow at a faster rate than the peak direction.

- The introduction of Corridor-wide distance based tolls would result in traffic diversion to parallel arterials as drivers try to avoid/minimize their toll charges. These traffic diversions would simply displace congestion problems in the Corridor without improving overall mobility.

6.1.2 Transit Service Improvements

Bus, park-and-ride, and Hudson Line commuter rail service improvements have been retained for further analysis in Level 2 screening. Several transit service improvements performed poorly with little or no apparent benefit compared to those retained for further analysis. These were:

- Service improvements on the New Haven and Harlem lines - such improvements, while potentially worthwhile, would not measurably improve transportation performance in the Corridor and rated poorly due to their very limited benefit as stand alone options. These service improvements are also considered below in conjunction with Corridor-wide improvements.
- Ferry service expansions and new routes - while several of these alternatives may be pursued by others in the future where it makes economic sense, ferries would not offer a significant transportation performance benefit in relation to Corridor traffic. This conclusion is reached based on the very limited opportunities for development of needed shoreline support facilities (access roads, parking and docking facilities); the impacts that these facilities and operations would have on river communities; and the limited markets and capacity. As a result, a major new ferry component will not be carried forward into Level 2 analysis.

A number of transit service improvements are already committed and scheduled to be completed and will be carried forward in the No Build scenario. These include MNR and NJT projects on the Port Jervis and Pascack Valley lines. Concurrent with the opening of the Secaucus Transfer during weekdays, MNR will be increasing train service on the Port Jervis and Pascack Valley lines. To support this increased service, new coaches and locomotives will be purchased, train storage yards and parking at stations on both lines will be expanded, and signal system improvements and new passing sidings will be constructed on the Main/Bergen and Pascack Valley lines to increase capacity.

6.1.3 Corridor Improvements

A full array of multi-modal solutions will be carried forward into the Level 2 screening process including scenarios that involve highway alone, highway and bus rapid transit (including a dedicated busway across Rockland and Westchester counties), highway and commuter rail, and highway and commuter rail with a light rail or bus rapid transit component. Alternative elements that were eliminated as a result of Level 1 screening are described below.

Bus Rapid Transit

Construction of a continuous bus rapid transit facility on parallel arterials in the Corridor (NY 59 in Rockland County and NY 119 and NY 120 in Westchester County) was considered and eliminated because it performed poorly in meeting the Study's goals and objectives with no apparent benefit compared to the bus rapid transit scenarios that are retained for further analysis. These arterials do not have adequate right-of-way width to add a continuous exclusive lane

without substantial property acquisition. While converting existing traffic and/or parking lanes to a bus lane (with right turns and driveway access permitted for general traffic) would somewhat improve travel time and dependability of transit service in the Corridor, it would not provide the more efficient high-speed and direct, corridor-length service of the bus rapid transit alternatives that passed Level 1 screening. Buses using these arterials would be subject to frequent stops at traffic lights. In addition, this alternative would increase congestion for general traffic on the arterials and connecting local streets, with negative impacts to mobility in the Corridor.

Commuter Rail

Several commuter rail alternatives were eliminated from further consideration since they would not perform as well as those retained for analysis in Level 2 screening or had potentially serious impacts that would be difficult to mitigate. Eliminated alternatives include the following:

Harlem Line Connection. Connecting the Port Jervis Line to the Harlem Line was eliminated because it would perform less effectively than connecting to the Hudson Line for a number of reasons. The Harlem Line currently operates at capacity during peak hours and would require construction of significant additional trackage to accommodate increased service levels, whereas sufficient capacity exists on the Hudson Line. Travel time from/to Manhattan via the Harlem Line would be significantly longer, approximately 10 minutes, as compared to the Hudson Line due to its more indirect route, slower speeds, and heavier density of traffic. In addition, direct impacts to Section 4(f) parkland associated with the Bronx River Parkway Reservation for the direct connection of the rail lines would be required. Residential property takings north of White Plains would potentially be required.

Reinstitute Putnam Line Service. The commuter rail alternative that would re-institute commuter rail on the Putnam Line would not perform as well as those that make better use of the existing rail infrastructure, such as connecting the Port Jervis and Hudson lines, which have considerably fewer environmental impacts and property acquisition requirements. Use of the Putnam Line for commuter rail operations would duplicate existing north-south commuter rail services and re-establish rail in a location currently unaccustomed to such activity. Most of the Putnam Line between the Bronx and Putnam counties has been converted into a trailway for recreational use.

Restoration of West Shore Line Passenger Service

The possibility of implementing commuter rail service on the West Shore Line from the study area south along the west side of the Hudson River through New Jersey was raised at several public meetings. CSX currently operates freight over the West Shore Line and has jurisdiction over operations and maintenance of the line. NJ TRANSIT is examining implementing West Shore passenger service to serve Rockland County between West Nyack and Hoboken in an EIS, which is currently being prepared. An extension to West Haverstraw is also being considered. This Alternatives Analysis process will, therefore, not separately consider this same West Shore line commuter rail alternative. However, the progress of the NJ TRANSIT studies will be monitored and findings of analyses performed by the project teams will be shared to facilitate effective decision-making.

Cross Westchester Tunnels

In keeping with comments received at the January 14, 2003 Scoping meeting, consideration of a tunnel that would relocate all or portions of I-287 underground between the Hudson River and its terminus at I-95 in Rye was examined in Level 1 screening. In addition, a Cross Westchester Subway between Suffern and Rye for rail transit service was considered. These tunnel alternatives would generally not meet the goals and objectives of the Study.

I-287 is an integral part of the interstate highway system, an east-west roadway that connects important north-south highways and major arterials that radiate from the core of the New York metropolitan area. These include the New York State Thruway (I-87), the Saw Mill River Parkway, the Sprain Brook Parkway, Interstate 684/Hutchinson River Parkway, and the New England Thruway (I-95), Route 9, Route 9A, Route 100A, Route 100, Route 22, Westchester Parkway/Westchester Avenue, and Route 120. In essence, I-287 weaves the regional highway network together. If relocated into a tunnel, this segment of I-287 would still have to perform this essential function of interconnecting the regional network of roadways.

Three conceptual tunnel profiles were considered and are discussed below: (1) a shallow tunnel that rises to the surface to meet the existing roadway network at critical interchanges; (2) a shallow tunnel with new underground interchanges; and (3) a deep tunnel with equally deep underground interchanges:

- A shallow cut-and-cover tunnel with above ground interchanges would require major utility relocations and an extended and highly disruptive construction period. A number of interchanges are so closely spaced along this segment of I-287 that a tunnel could not be constructed between them and rise to meet the ramps at the surface. Hence, a shallow tunnel in these locations would require the permanent closure of certain interchanges. This alternative would not meet the Study's primary goal and objective of improving mobility within the Corridor.

- A shallow cut-and-cover tunnel with underground interchanges would permit a continuous tunnel with connections to the north-south highways and arterials; however, it would require substantial dismantling and reconstruction of interchanges. Ramps that rise from crossing roads to meet I-287 would have to be replaced with ramps that drop onto I-287, and ramps that drop onto I-287 would have to be significantly lengthened to reach the underground roadway. Because most interchange ramps are intricately linked to one another both from a functional and spatial standpoint, this would result in extensive reconstruction at most of the 12 interchanges. Where interchanges are very closely spaced, the longer ramps would likely conflict, necessitating compromises in design or the elimination of conflicting movements. The connections to I-287 would occur at new underground interchanges. The roadway box would have to be widened to accommodate the ramps and acceleration/deceleration lanes. The widening would require a corresponding expansion of the areas of open excavation during construction that would extend beyond the footprint of the current interchanges.

- A deep tunnel, while avoiding the need to open a large trench for the full length of the Corridor, would have many of the same problems identified above. Large open cut

sections and new right-of-way would be required for reconstructed interchanges. Each ramp would constitute a separate tunnel that would have to be built from the surface, largely in open cuts, down to the underground interchange.

Connectivity of an underground subway system with existing and proposed at-grade transit services would also be difficult. Given the preliminary ridership estimates for the Cross Westchester transit line, a tunnel would not be cost-effective and did not perform as well as the primarily at-grade (with aerial or tunnel sections where topography would dictate) commuter rail and LRT/AGT alignments that were retained for analysis in Level 2 screening.

6.1.4 River Crossings

The concepts of preservation, rehabilitation without widening, rehabilitation with widening, replacement bridge, replacement bored tunnel, combination of a new bridge and a transit tunnel, and a rehabilitated bridge and new transit tunnel are all being advanced into Level 2. Preserving the existing bridge without widening will be retained for further analysis as part of the No Build scenario, and used as an environmental baseline for comparison to the other scenarios. Rehabilitating the Bridge without widening was retained for incorporation into a TDM/TSM scenario. These preservation and rehabilitation bridge alternatives have fewer environmental issues but perform less well with respect to traffic operations and safety, structural integrity, and vulnerability than the replacement bridge and tunnel alternatives. Alternative elements that were eliminated from further consideration are reviewed below.

Alternatives with Six General-Purpose Lanes

The alternatives with only six general-purpose lanes on the Bridge would not meet the Study's goal of improving mobility in the Corridor, as they would be expected to cause unacceptable levels of congestion and increase travel time for the vast majority of commuters and weekend travelers in the Corridor, creating more bottlenecks and worsening delay at the toll plaza. As previously discussed, lane capacity on the existing Bridge is only about 1700 vehicles per hour due to lateral clearance, percentage of trucks and other factors. Thus, the effective capacity of three lanes is only 5100 vehicles per hour. Volumes on the Bridge today routinely exceed that capacity in the peak direction of travel during peak periods during both weekdays and on the weekends. Weekend travelers, in particular, experience significant delays in the southbound direction on Sunday afternoons as a result of 10 to 15 mile queues at the toll plaza. Thus, those alternatives that would convert the existing reversible ("zipper lane") to HOV or HOT lane use were eliminated from further study.

Rehabilitation with Widening

A rehabilitated and widened bridge was retained as an option to accommodate an LRT/AGT system only. A rehabilitated and widened bridge with commuter rail would present a number of serious problems when compared to a replacement bridge due to the need to meet commuter rail loading and operational requirements. The weight of commuter rail cars and locomotives and their vibration effects differ from that of vehicular traffic. As a result, rail loading requirements and current standards would require the modification of almost all components in all segments of the existing crossing. The deck of the Bridge is divided into 197 separate spans that are

connected by joints. Poor interaction between the joints and the tracks would be detrimental to the stability of tracks as well as the quality of the train ride. Conversely, the frequent train movements would be detrimental to the joints. Together, the relatively steep grade of the Bridge and the frequency of joints would limit the train's speed and degrade its effectiveness to undesirable levels. Maintenance requirements, metal fatigue and safety would also be of concern.

A widened bridge to accommodate general-purpose or bus lanes was eliminated from consideration primarily because of traffic safety reasons. The desirable arrangement for eight lanes would place three lanes on each side of a fixed median barrier at the center of the roadway, and one additional lane on new steel members connected to the existing structure, on the outside of the existing truss (i.e., the long span steel structure that supports the roadway over the navigational channel). The consequent separation of traffic at the main spans would result in unsafe conditions, because it would require additional driver decisions at unexpected locations.

Immersed Tube Tunnels

Bored tunnels fared much better than immersed tube tunnels based on engineering and environmental considerations. Minimal cost and performance differences were identified between the two types of tunneling. However, construction of the immersed tube tunnel in the Hudson River would entail a major dredging effort that would generate significant sediment disturbance and re-suspension over an extended construction interval. The re-suspended sediment plume would directly impact water quality and influence the passage of important commercial and threatened fish species. Dredging would physically disturb a large area and result in a significant loss of bottom habitat. Recovery or the re-colonization of benthic organisms that inhabit the River bottom would occur only over a long time period. Benthic organisms are important to the energy flow of the ecosystem and serve as a food source for fish and waterfowl. As a result of these considerations, immersed tube tunneling was eliminated from consideration.

Supplemental River Crossings

A number of northern and southern supplemental crossings that would be constructed outside the Corridor were examined. These alignments would require the development of new travel corridors and would not make good use of the existing transportation infrastructure. A number of significant environmental and community issues were identified for these remote crossings:

- A remote supplemental northern crossing, approximately three miles north of the Bridge, would require a new two-mile corridor in Rockland County diverging from I-287 near Interchange 12 and extending to the west shoreline in Upper Nyack. A crossing in this location was chosen for its ability to connect to Route 117 in Westchester County, the nearest east-west roadway located outside of the Corridor to the north. A tunnel would be required under Nyack to avoid the impacts and displacements associated with a new highway through the center of Nyack. On the east shoreline, the river crossing would require a new ½ mile long roadway corridor from the River to a direct connection with Route 117 at its interchange with Route 9. The supplemental corridor would continue on an upgraded Route 117 for nearly four miles to a proposed new interchange with Route

9A (Saw Mill River Road) and the Taconic State Parkway. This remote crossing would pass directly through the Rockefeller State Park Preserve, with direct impacts to this Section 4(f) resource.

- A remote southern crossing would appear to be more effective from a regional travel perspective since a considerable share of vehicles crossing the Bridge are destined for southern Westchester, New York City and points south. One southern crossing that was considered would be in the vicinity of Sneden Landing, about four miles south of the existing Bridge. This location was chosen to avoid the hilly topography of the Palisades that would be encountered further to the south. In Rockland County, the Palisades Interstate Parkway, a four-lane parkway that connects to I-287 at Interchange 13, would be used to link I-287 with the river crossing for a length of about six miles. From the Westchester shore a four- or six-lane, east-west roadway corridor would be required through Dobbs Ferry to meet the New York State Thruway near Interchange 7. Significant environmental and community impacts associated with this alternative include direct impacts to Section 4(f) parkland (part of the Palisades Interstate Parkway) and Hudson River ecosystem impacts because of the proximity of the alignment to the Piermont Marsh, a New York State Significant Coastal Habitat.

- Other southern crossing locations were examined, however, each had significant direct impacts that eliminated them from further consideration.

Serial bridge/tunnel

The concept of a serial bridge – a crossing partly on a bridge and partly in a tunnel -- was explored. The connection between the tunnel and bridge segments would occur in the River, requiring an "island" or peninsula extensions from the shore to be constructed to accommodate the section where the highway transitions from a tunnel to a bridge. This island would be quite large, approximately 3100 feet long by 500 feet wide. The adverse ecological impacts of filling in a portion of the Hudson River, in addition to the effects of immersed tube tunneling (which would also be required) rendered this concept unacceptable for environmental reasons.

Channel Relocation

Relocating the navigational channel was considered as a way to improve the commuter rail connection to the Hudson Line from a new bridge. Shifting the navigational channel westward would allow for a more gradual descent at the River's eastern shoreline. However, based on a review of historic maps, the channel in this reach has naturally sought the easterly shoreline and has not markedly changed its configuration in over 100 years. Since 1902, the earliest year for which the available maps use the current system of depicting river conditions, water depths in the Hudson River appear to be comparable to those shown on the current navigation chart. As a result, shifting the channel westward would potentially create a sediment trap since the River is likely to rework any new channel alignment to restore the stable historic condition. Should this occur, the maintenance free situation that now exists within this reach of the River would be replaced with one where routine dredging operations would be needed. In addition, the Piermont peninsula located to the south of the Bridge on the western shore would prohibit the development

of a straight navigation channel, which would not meet Coast Guard requirements. As a result, the concept of relocating the navigational channel was eliminated from further consideration.

6.2 LEVEL 2 SCENARIOS

Fifteen scenarios, developed from the most promising alternative elements that passed Level 1 screening, are presented in Table C-1 in Appendix C. The scenarios were formed by logically matching the Corridor-wide improvements with river crossings, and then adding transit service improvements to complement the match. (Figure 4). The scenarios included in Appendix C also reflect the results of the public review process and include a number of scenarios that evolved to their present form as a result of public comment and review. No Build and TDM/TSM scenarios were defined as stand alone scenarios to be used as baselines for comparison to the other higher-cost options.

It is important to note that no single scenario presented here represents the "optimal" transportation solution for the Corridor. Rather, the alternatives are defined in such a way as to present sufficient information for each of the technical disciplines to begin Level 2 screening to gain an understanding of the implications of a full range of Corridor solutions. Conceptual designs for each of the 15 scenarios will be developed during the Level 2 screening process, which will be more rigorous and quantitative than Level 1 screening. During Level 2 screening, the alternative elements that now comprise the scenarios will be modified and mixed and matched to form a "short list" of alternatives to be advanced for detailed evaluation in the EIS. The scenarios will be refined based on the results of the Level 2 screening process and the short list of alternatives will be developed to reflect:

- Refinements made to the alternative elements and scenarios during the screening process;
- Additions or deletions of alternative elements/scenarios in response to technical results and public review; and
- Different modal and physical alignment combinations to "optimize" each scenario.

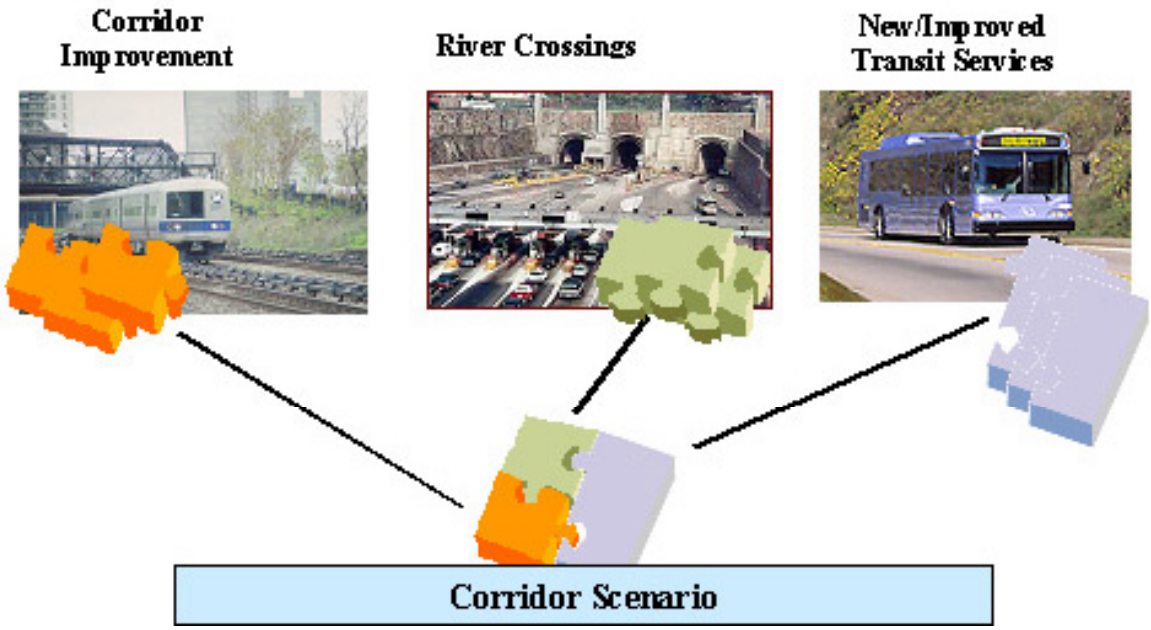

Figure 4 Development of Level 2 Scenarios

7 PUBLIC INVOLVEMENT

A sequential approach with three distinct public review points was established to develop the alternatives in the AA process. Stakeholder committee meetings and public workshops were scheduled to correspond with the:

1) Development of the long list of alternatives and Level 1 screening criteria;

2) Results of the Level 1 screening process and definition of Level 2 scenarios; and

3) Results of the Level 2 screening process and recommended short-list of alternatives.

Public scoping meetings for the AA/EIS were held in January 2003 in accordance with environmental regulations to provide opportunities for the public and agencies to review and comment on the Study's purpose and need, goals and objectives, long list of alternative elements, and methodologies that will be used to assess environmental impacts of the proposed action. In addition, a series of workshops were held in Westchester, Rockland and Orange counties in April 2003 to review the long list of alternatives and Level 1 screening criteria. These workshops were well advertised and open to the public. The screening criteria and long list of alternatives were posted on the Study web site[1].

A second series of workshops were held in Westchester and Rockland counties in July 2003 to review the results of the Level 1 screening process and obtain feedback on the definition of the 15 scenarios that will be examined in the Level 2 screening process. These meetings were well

[1] www.tzbsite.com

attended and a number of suggestions regarding the 15 scenarios and the Level 2 screening criteria were made and incorporated into the study, as indicated below. The final set of meetings for the AA process will include a review of the results of the more quantitative analyses performed for the Level 2 scenarios. The final set of workshops is scheduled for early 2004.

7.1 SUGGESTIONS RELATED TO THE DRAFT LEVEL 2 SCENARIOS

A number of suggestions called for the need to include a dedicated busway across Rockland and Westchester counties as a means of providing flexible, fast and reliable service. As a result of these comments, BRT2 was redefined to include an exclusive busway in Westchester County (in addition to Rockland County) utilizing the I-287 right-of-way and Route 119 for access to Tarrytown and White Plains. Another suggestion resulted in the modification of BRT1 -- which had included a two-lane bus rapid transit facility and a fourth general-purpose lane in each direction in Rockland County -- to include only the two-lane bus rapid transit (buffer-separated) in Rockland County with the same number of general-purpose lanes that exist today. The scenario that will be advanced (without the roadway improvements in Rockland County) will provide meaningful comparison to BRT2, which includes a bus rapid transit (barrier-separated) and four general-purpose lanes in each direction in Rockland County.

Scenario M4 was modified to reflect alternative concepts developed by the Rockland County Executive's office. Scenario M4 includes a rehabilitated bridge for light rail, which would extend between Suffern and Port Chester. A linear parkway with a bicycle/pedestrian promenade would be provided on the rehabilitated bridge along with an emergency vehicle lane/evacuation route and possibly roadway capacity for limited local traffic. A tunnel crossing would be constructed for thru traffic on I-287/I-87 and commuter rail between the Port Jervis and Hudson lines, providing for a one-seat ride to Grand Central Terminal.

General comments were made about the number of scenarios that included roadway expansion in Rockland County and the number that contained rail connections to the Hudson Line for service to Manhattan rather than east-west rail service. As a result, roadway improvements in Rockland County were eliminated in a number of the scenarios and circumferential (i.e., east-west) rail service was added and replaced the Hudson Line connection in CRT3. Scenario M5 was redefined to include a light rail alignment extending the full length of the Corridor, rather than just between the Palisades Mall and White Plains, as was originally proposed.

Other stakeholders emphasized the importance of providing connections and/or transfers to the north-south rail lines under the scenarios with a rail or transit component. Additional modifications included:

- Scenario CRT1 will include a rail connection from the West Shore Line near West Nyack in addition to connections to the Port Jervis, Hudson and New Haven lines and the transfer facility at the Harlem Line that were previously proposed; and

- Under Scenario CRT3, the feasibility of a commuter rail transfer station to the Tarrytown Station on MNR's Hudson Line will be explored in addition to connections to the Port

Jervis and New Haven lines, and the transfer facility at the Harlem Line that were previously proposed.

Draft and revised matrices that describe the 15 scenarios are provided in Appendix D to highlight the changes made to the Level 2 scenarios as a result of the outreach process.

Suggestions that were not incorporated into the Level 2 scenarios include the following:

- *Supplemental northern tunnel approximately three miles north of the existing Bridge and connecting to Route 117*. For the same reasons that the supplemental northern bridge crossing was eliminated from further consideration, the tunnel crossing in this location is not desirable. Route 117 and its connecting roadways would require significant expansion to accommodate the traffic volumes associated with a supplemental river crossing. The area on both sides of Route 117 is designated parkland, part of the Rockefeller State Park Preserve. This alternative could not be constructed without direct impacts to Section 4(f) resources.

- *Bridge rehabilitation with roadway improvements*. The analyses performed for two of the scenarios identified in Table C-1, Rehabilitate Bridge with TDM/TSM (Scenario H2) and Replace Bridge and Roadway Improvements (Scenario H3), will provide the screening information for this suggestion. Depending on the results of the Level 2 screening, Bridge rehabilitation with roadway improvements could be advanced as one of the short list of alternatives in the EIS.

- *Operating two reversible lanes in the peak direction as a means of accommodating peak direction traffic without major capital expenditure*. This option would result in five lanes in the peak direction and only two lanes in the off-peak direction. Today, the number of vehicles traveling in the reverse peak direction on the Bridge routinely exceeds the effective capacity of two general-purpose lanes. Historic traffic reveals that the peak period is extending and traffic volumes in the reverse peak direction (e.g. westbound in the morning) are approaching that of peak travel. By 2020, reverse peak traffic volumes on the Bridge are expected to routinely exceed the effective capacity of three general-purpose lanes.

- *Conversion of the reversible lane to a HOT lane on the existing Bridge*. A HOT lane would permit HOVs and others who would pay a premium toll to travel in a designated lane. This alternative would reduce the capacity of the Bridge to five lanes, due to width requirements for a safe and operationally effective HOT lane. Similar to the other alternative elements that would reduce capacity for general-purpose traffic, this option would not meet the Study's goals and objectives.

7.2 SUGGESTIONS RELATED TO THE LEVEL 2 SCREENING CRITERIA

In addition to receiving input on the definition of the Level 2 scenarios, feedback on the screening criteria proposed for use in the Level 2 screening process was obtained as a result of the stakeholder committee meetings and public workshops. Environmental criteria related to

assessing the effects on historic resources will now include evaluating the potential for indirect or contextual effects, in addition to direct effects, for each of the 15 scenarios. For example, visual elements that would change under each scenario will be considered, based on conceptual designs prepared for their alignments. The extent of these changes will be rated for each scenario and an assessment of the potential for significant adverse impacts (i.e., direct and indirect) under Section 106 of the National Historic Preservation Act and Section 4(f) of the US Department of Transportation Act will be made.

One stakeholder stressed the importance of considering weekend traffic conditions in the screening process due to the severe congestion currently experienced by weekend travelers. Transportation performance measures related to roadway congestion and reserve capacity were expanded to include use of weekend peak period traffic data in addition to weekday peak period data.

The process of ranking the Level 2 scenarios was also addressed. It was suggested that weighted values be applied to each screening criteria to enable the calculation of a single number to represent each of the 15 scenarios. While this method would provide for a readily apparent hierarchy among the 15 scenarios, the resultant ranking would inevitably contain bias and mask a number of issues important to effective decision-making. The process of applying weighted values would be highly subjective and, as a result, this method of ranking the scenarios will be not be performed.

The criteria used to evaluate the Level 2 scenarios are presented in Appendix A.

8 SUMMARY

The first part of the two-part screening process was successful in eliminating those alternative elements that would not meet the goals and objectives established for the Corridor. Of the 150 alternative elements in the long list of alternatives, most are represented in the 15 scenarios that will be carried forward into the Level 2 screening process. Scenarios that involve highway alone, highway and bus rapid transit, highway and commuter rail, and highway and commuter rail with a light rail or bus rapid transit component are combined with the river crossing concepts of preservation, rehabilitation without widening, rehabilitation with widening, replacement bridge, replacement bored tunnel, combination of a new bridge and a transit tunnel, and a rehabilitated bridge and new transit tunnel.

The AA process was designed to involve the public in evaluating alternatives prior to the selection of a preferred alternative and its detailed design. It expands the traditional role of agencies and public interests - from passive reviewers to active contributors in the performance of the study and the decision making process. This process has been highly effective in soliciting meaningful input and bringing awareness to issues that will be addressed early in the project development phase. The AA process will lead to a decision on the design concept and scope for major investments and policies to be incorporated into the regional transportation plan. The objective of the Level 2 screening process will be to advance those alternatives that have the best potential of achieving the study goals and objectives so that they may be subject to detailed analysis in accordance with NEPA and other relevant environmental rules and regulations.

APPENDICES

APPENDIX A

A-1 LEVEL 1 SCREENING CRITERIA

Tables 1, 2a. 2b, 3a, and 3b summarize the criteria used for Level 1 screening. The criteria used for screening the Transportation Demand Management/Transportation Systems Management (TDM/TSM) and Transit Service Improvements are shown in Table 1, Tables 2a and 2b contain the criteria for the Corridor-wide alternative elements, and Tables 3a and 3b the criteria for the River Crossings. Separate screening procedures were used for the various improvement categories, since many of the impact criteria are unique to a given category. As an example Structural Integrity and Seismic Standards relate primarily to the River Crossing alternatives.

For Level 1 screening, detailed design, cost, ridership and impact information were not be available. Thus, many of the Level 1 criteria were surrogate measures or qualitative, professional judgments. The information was presented in several ways, depending on the measurement method as follows:

- Some assessments provided numerical results. For example, travel time was summarized by the number of minutes for typical trips.
- Some assessments resulted in a "pass/fail". For example, the river crossing alternatives either do or do not include a pedestrian/bicycle facility.
- Many assessments resulted in a "level of impact/effectiveness" rating. For example, level of parklands and 4(f) resource impacts were presented using a simple, qualitative statement as to the judged degree of potential impacts.

Since the purpose of the Level 1 screening is to provide a basis to delete or modify ineffective or high impact alternatives, the number of criteria used during this high-level evaluation was not exhaustive. The letter codes for "type" of rating in the tables refer to the following:

- **Q** = Qualitative rating based on judgment (for example, the severity of construction impacts);
- **Q(M)** = Qualitative rating informed by surrogate or approximate measure (for example, rating air quality impacts based on a change in regional vehicle miles of travel);
- **M** = Direct Measurement (for example, auto speed on selected roadway links which is a direct output of the traffic model).

The accompanying tables also indicate the relationship of each of the screening criteria to the previously discussed goals and objectives.

Table 1 – TDM/TSM and Improvements to Existing Transit Services
Level 1 Screening Criteria

Criteria	Measurement Method	Type	Units/Rating System	Related Goal(s)
1.Traffic Operations	Potential to reduce congestion and/or incrementally increase vehicular capacity	Q	Poor/Neutral/ Fair/Good	1
2. Transit Ridership	Potential to increase transit ridership	Q	Poor/Neutral/ Fair/Good	1
3.Auto Occupancy	Potential to increase ridesharing	Q	Poor/Neutral/ Fair/Good	1
4. Peak Period Vehicle Trip Reduction	Potential to reduce peak period vehicle trips	Q	Poor/Neutral/ Fair/Good	1
5. Socio-economic Impacts	Potential for disproportionate impacts to low income and/or minority populations	Q	Yes/No	5
6. Air Quality Impacts	Potential change in air quality as a result of changes in travel conditions	Q	Deterioration/ Neutral/ Improvement	5
7. Other Significant Adverse Impacts	Significant adverse impacts to other environmental resources, as appropriate given the characteristic of the improvement	Q	Nature and Degree of Impact	5
8. Implementation Issues	Judgment based on legislative needs, jurisdictional issues, and public controversy with action	Q	Poor/Neutral/ Fair/Good	6
9. Cost Effectiveness	Rating on anticipated benefits in relation to costs	Q	Poor/Neutral/ Fair/Good	6

Table 2a – Corridor-Wide Improvements
Level 1 Transportation Performance Screening Criteria

Criteria	Measurement Methods	Type	Units/Rating System	Related Goal(s)
10. Travel Time	Highway: AM peak period/peak direction travel times for selected pairs of origin and destinations	M	Average travel time in minutes	1
	Transit: AM peak period/peak direction travel times for selected pairs of origins and destinations	M	Average travel time in minutes	1
11. AM Peak Period Peak Direction Mode Split	Reduction in SOV crossing Hudson River screenline	M	Number of vehicles	1
	Increase in transit share for selected travel markets	M	Percentage	1
12. Transit Ridership	Increase in transit ridership crossing the Hudson River	M	Number of passengers	1
	Increase in regional transit ridership	M	Number of passengers	1
13. AM Peak Period Reserve Capacity	Year 2020 reserve peak period/peak direction highway person-capacity at selected screenlines	M	People/hour	1, 2
	Year 2020 reserve peak period/peak direction transit person-capacity at selected screenlines	M	People/hour	1, 2
14. Transportation System Integration	Ease of integration with existing roadway network	Q	Poor/ Fair/Good	2, 6
	Ease of integration with existing transit infrastructure	Q	Poor/ Fair/Good	2, 6
15. Freight	Potential to accommodate rail freight	Q	Low/Medium/ High	1, 2, 6
16. Alternative Mode(s) Not in Mixed Traffic	Inclusion of alternative mode(s) operating on roadway/guideway not subject to highway congestion	Q	Yes/No	1, 2, 6

Table 2b – Corridor-Wide Improvements
Level 1 Environmental Screening Criteria

Criteria	Measurement Methods	Type	Units/Rating System	Related Goal(s)
17. Potential for Existing Land Use Impacts	Potential consistency with existing land use	Q	Low/Medium/ High	5
18. Potential for Future Land Use Impacts	Potential consistency with adopted land use plans and policies	Q	Low/Medium/ High/Variable	5
19. Potential Change in Air Quality	Year 2020 potential change in air quality	Q	Slight Deterioration/ None/ Slight Improvement	5
20. Acquisitions, Displacements and Relocations	Potential extent of acquisitions, displacements and relocations	Q	Low/Medium/ High	5
21. Historic and Archaeological Resources	Potential to impact resources listed on or eligible for listing on the National or State Register of Historic Places	Q	Low/Medium/ High	5
22. Parklands and Section 4(f)/6(f)	Potential to impact parklands and 4(f)/6(f) resources	Q	Low/Medium/ High	5
23. Potential Impacts on Upland Ecosystems and Water Resources	Potential impacts to ecosystems and water resources	Q	Low/Medium/ High/Severe	5
24. Construction Impacts	Construction impact severity	Q	Low/Medium/ High	5, 6
	Construction impact duration	Q	Short/Medium/ Long	5, 6

Table 3a – River Crossings
Level 1 Transportation Performance Screening Criteria

Criteria	Measurement Methods	Type	Units/Rating System	Related Goal(s)
25. Travel Time	AM peak period/peak direction travel time change by mode	M	Average travel time in minutes	1
26. Traffic Operations and Safety	Potential changes in traffic operations and overall traffic safety based on roadway configuration and geometrics	Q	Negative/ Neutral/Low/ Medium/ High	1, 4
27. AM Peak Period Reserve Capacity	Year 2020 reserve peak period/peak direction highway person-capacity	M	People/hour	1, 2
	Year 2020 reserve peak period/peak direction transit person-capacity	M	People/hour	1, 2
28. Transportation System Integration	Ease of integration with existing roadway network	Q	Poor/ Fair/Good	2, 6
	Ease of integration with existing transit infrastructure	Q	Poor/ Fair/Good	2, 6
29. Freight	Potential to accommodate rail freight	Q	Low/Medium/High	1, 2, 6
30. Structural Integrity	Structural sufficiency rating, based on degree to which river crossing is brought into compliance with current structural standards	Q	Poor/Fair/Good	3
31. Seismic Standards	Seismic sufficiency rating, based on degree to which river crossing is brought into compliance with current seismic standards	Q	Poor/Fair/Good	3
32. Vulnerability	Assessment based on type and characteristics of structure(s)	Q	Poor/Fair/Good	4
33. Alternative Mode(s) Not in Mixed Traffic	Inclusion of alternative mode(s) operating on roadway/guideway not subject to highway congestion	Q	Yes/No	1, 2, 6
34. Non-Vehicular Travel	Inclusion of pedestrian and bicycle facilities	Q	Yes/No	1, 2

Table 3b – River Crossings
Level 1 Environmental Screening Criteria

Criteria	Measurement Methods	Type	Units/Rating System	Related Goal(s)
35. Potential for Existing Land Use Impacts	Potential consistency with existing land use	Q	Low/Medium/ High	5
36. Potential for Future Land Use Impacts	Potential consistency with adopted land use plans and policies	Q	Low/Medium/ High/Variable	5
37. Potential Change in Air Quality	Year 2020 potential change in air quality	Q	Slight Deterioration/ None/ Slight Improvement	5
38. Acquisitions, Displacements and Relocations	Potential extent of acquisitions, displacements and relocations	Q	Low/Medium/ High	5
39. Historic and Archaeological Resources	Potential to impact resources listed on or eligible for listing on the National or State Register of Historic Places	Q	Low/Medium/ High	5
40. Parklands and Section 4(f)/6(f)	Potential to impact parklands and 4(f)/6(f) resources	Q	Low/Medium/ High	5
41. Potential Impacts on Hudson River Ecosystems and Water Resources	Potential impacts to ecosystems and water resources	Q	Low/Medium/ High/Severe	5
42. Construction Impacts	Construction impact severity	Q	Low/Medium/ High	5, 6
	Construction impact duration	Q	Short/Medium/Long	5, 6

A-2 LEVEL 2 SCREENING CRITERIA

UNDER REVISION

APPENDIX B

Table B-1
Long List of Alternative Elements – Screening Results

1. TDM/TSM Measures

No.	Title	Description	Level 2 Status	Rationale for Screening/Related Criteria[1]
TDM-1: Enhance Existing MetroPool Employee Trip Reduction (ETR) Programs				
TDM-1.1	Develop an I-287 Corridor Education and Promotion Program	Enhance educational efforts	✓	Include in a TDM/TSM scenario and test with other scenarios, as appropriate.
TDM-1.2	Increase funding for outreach to Corridor employers	Encourage employers to adopt MetroPool programs	✓	Include in a TDM/TSM scenario and test with other scenarios, as appropriate.
TDM-1.3	Introduce a car-sharing program	Provide rental cars for commuters who only need a car occasionally, on hourly or daily basis	✓	Include in a TDM/TSM scenario and test with other scenarios, as appropriate.
TDM-1.4	Employers provide showers and lockers for those walking/cycling to work	Provide facilities to encourage workers to walk/cycle to work	✓	Include in a TDM/TSM scenario and test with other scenarios, as appropriate.
TDM-1.5	Toll-free programs for off-peak users from participating employers	Encourage the use of flex-time in exchange for reduced or no tolls on the TZ Bridge	X	Based on prior similar initiatives in the region and elsewhere, measure would be ineffective due to low level of employer participation and lack of public acceptance. Congestion pricing is a more effective and comprehensive approach to the same end./1,8
TDM-1.6	TDM-1.6.1: Employee Parking Management: Charge employees for parking	Combine incentives for alternative modes with disincentives, such as parking fees	X	Based on prior similar initiatives in the region and elsewhere, measures would be ineffective due to low levels of employer participation and lack of public acceptance./1,8
	TDM 1.6.2: Employee Parking Management: Cash in lieu of Parking	Provide cash rewards for switching from driving to alternate modes of travel		
	TDM 1.6.3: Employee Parking Management: Restrain parking supply	Encourage alternate travel modes by restricting availability of free parking		
TDM-1.7	Mandate Participation in Metro Pool ETR Program	Require employers to encourage alternate travel modes	X	Based on prior similar initiatives in the region and elsewhere, measure would be ineffective due to low level of employer participation and lack of public acceptance./1,8

[1] Primary criteria number (as indicated on tables 1, 2a, 2b, 3a and 3b in Appendix A) for which the alternative element was rated poorly.

No.	Title	Description	Level 2 Status	Rationale for Screening/Related Criteria[1]
TDM-2: Expand Easy Street Vanpool Program				
TDM-2.1	Increase funding for Easy Street Program	Expedite implementation and expansion of vanpool program	✓	Include in a TDM/TSM scenario and test with other scenarios, as appropriate.
TDM-2.2	Reduce vanpool user costs to encourage greater participation	Provide subsidies, free parking and reduced or no tolls for vanpool users	✓	Include in a TDM/TSM scenario and test with other scenarios, as appropriate.
TDM-3: Corridor-wide Parking Pricing and Management				
TDM-3.1	Establish Parking Authority	Mandate parking policies, eliminate local restrictions and develop enhancement programs	X	Requires new legislation and presents many implementation and enforcement problems with low public acceptance./8
TDM-4: Carpool and Transit Priority				
TDM-4.1	TDM-4.1.1: Restrict existing TZ Bridge reversible lane to HOV: HOV2+ only	Permit only vehicles with 2 or more occupants to use the existing reversible lane	X	Reduction in capacity for general use traffic would result in unacceptable levels of congestion during peak hours./1,2
	TDM-4.1.2: Restrict existing TZ Bridge reversible lane to HOV: HOV3+ only	Permit only vehicles with 3 or more occupants to use the existing reversible lane		
	TDM-4.1.3: Restrict existing TZ Bridge reversible lane to HOV: Transit/vanpools only	Permit only transit vehicles and vanpools to use the existing reversible lane		
	TDM-4.1.4: Restrict existing TZ Bridge reversible lane to HOV: HOV3+ and premium toll for other vehicles	Permit only vehicles with 3 or more occupants to use the existing reversible lane at the current toll; other vehicles will have to pay a premium toll to use reversible lane		

No.	Title	Description	Level 2 Status	Rationale for Screening/Related Criteria[1]
TDM-4.2	TDM-4.2.1: Create new priority lanes on widened crossing: HOV2+ only	Permit only vehicles with 2 or more occupants to use the new priority lanes	X	HOV lane limited to the bridge would be ineffective due to short distance and need to merge with general traffic at shoreline./1 Include priority toll lane with bus rapid transit scenarios.
	TDM-4.2.2: Create new priority lanes on widened crossing: HOV3+ only	Permit only vehicles with 3 or more occupants to use the new priority lanes		
	TDM-4.2.3: Create new priority lanes on widened crossing: Transit/vanpools only	Permit only transit vehicles and vanpools to use the new priority lanes		
	TDM-4.2.4: Create new priority lanes on widened crossing: HOV3+ and premium toll for other vehicles	Permit only vehicles with 3 or more occupants to use the new priority lanes at the current toll; other vehicles will have to pay a premium toll to use priority lanes		
TDM-4.3	Priority lanes for buses/vanpools/carpools at the toll plaza	Use special E-ZPass lanes for HOV only	✓	Include in a TDM/TSM scenario and test with other scenarios, as appropriate.
TDM-4.4	TDM-4.4.1: Priority lanes on feeder arterials at approaches to I-287	Priority lanes on north-south feeder routes for HOV only	✓	Combine with TSM-3.1/3.2 and TDM – 4.4.3 to create one "ramp metering" option. Include in TDM/TSM scenario and test with others, in particular the bus rapid transit scenarios.
	TDM-4.4.2: Priority lanes on parallel arterials	Priority lanes on arterials parallel to I-287 for HOV only	X	Reduction in capacity for general use traffic would result in unacceptable levels of congestion during peak hours./1
	TDM-4.4.3: Priority lanes on entrance ramps	Priority lanes on entrance ramps for HOV only	✓	Combine with TSM-3.1/3.2 and TDM – 4.4.1 to create one "ramp metering" option. Include in a TDM/TSM scenario and test with other scenarios, as appropriate.
TDM-5: Tolls and Pricing				
TDM-5.1	TDM-5.1.1: Congestion Pricing - Increase TZ Bridge car tolls during peak periods	Increase peak period tolls to encourage off-peak travel	✓	Include in a TDM/TSM scenario and test with other scenarios, as appropriate.
	TDM-5.1.2: Congestion Pricing - Introduce Corridor-wide, distance-based tolls	Introduce variable tolls to influence travel choices and control congestion	X	Based on a qualitative assessment, deteriorated levels of service would result from traffic diversions to parallel arterials as some vehicles try to avert tolls./1
	TDM-5.1.3: Congestion Pricing - Eliminate commuter discount on the TZ Bridge	Eliminate discount for individual car use except during off-peak period; maintain discount for HOV	✓	Include in a TDM/TSM scenario and test with other scenarios, as appropriate.

TSM-1: Real-Time Distribution of User Information				
TSM-1.1	Improve and expand use of electronic signs	Increase number of signs, their sophistication and their ability to divert traffic	✓	Include in a TDM/TSM scenario and test with other scenarios, as appropriate.
TSM-1.2	Improve and expand the use of highway advisory radio	Provide additional signing and broadcast points to improve ability of drivers to seek alternate routes	✓	Include in a TDM/TSM scenario and test with other scenarios, as appropriate.
TSM-1.3	Improve and expand the use of the Internet	Increase access to TZ website at park-and-rides and Intermodal Centers	✓	Include in a TDM/TSM scenario and test with other scenarios, as appropriate.
TSM-1.4	Expand TRANSMIT speed readers	Improve speed data gathering to identify incidents and enhance emergency response	✓	Include in a TDM/TSM scenario and test with other scenarios, as appropriate.
TSM-1.5	Employ TRIPS Technology	Electronically notify road users of traffic status	✓	Include in a TDM/TSM scenario and test with other scenarios, as appropriate.
TSM-2: Improve the Integration of Train and Bus Service				
TSM-2.1	Notify bus drivers of train delays	Buses can be held to meet delayed trains	✓	Include in a TDM/TSM scenario and test with other scenarios, as appropriate.
TSM-2.2	Post real-time arrival information at train stations	Commuters are prepared for train arrivals, facilitating boarding	✓	Include in a TDM/TSM scenario and test with other scenarios, as appropriate.
TSM-2.3	Provide real-time information for bus riders	Passengers can be informed of bus arrivals times through the use of Global Positioning Systems	✓	Include in a TDM/TSM scenario and test with other scenarios, as appropriate.
TSM-3: Dynamic Traffic Management System				
TSM-3.1	Ramp access controls	Ramp metering controls entering traffic based on mainline congestion	✓	Combine with TDM 4.4.1 and TDM 4.4.3 to create one "ramp metering" option. Include in a TDM/TSM scenario and test with other scenarios, as appropriate.
TSM-3.2	Ramp terminal real-time signal coordination	Highway traffic exiting /entering local streets can be controlled by adjusting signal cycles to avoid bottlenecks		
TSM-4: Commercial Vehicle Programs				
TSM-4.1	Congestion pricing for commercial vehicles	Congestion pricing for trucks to encourage use of alternative routes	✓	Include in a TDM/TSM scenario and test with other scenarios, as appropriate.
TSM-5: Incident Management				
TSM-5.1	Implement comprehensive Incident Management Program for the I-287/CWE corridor	Monitor, evaluate and decrease response/congestion clearance times for optimum performance and safety	✓	Include in a TDM/TSM scenario and test with other scenarios, as appropriate.

2. Transit Service Improvements (TS)

No.	Title	Description	Level 2 Status	Rationale for Screening
Bus Transit Service (B)				
TS-B1	Expand Tappan Zee Bus Corridor Routes	Provide increased service, including connecting routes and better coordination with train schedules	✓	Include in Level 2 scenarios, as appropriate.
TS-B2	Expand Other Bus Routes	Expand bus service locations and frequency on parallel roads and north-south arterials		
TS-B3	Expand/Create Additional Shuttle Service	Expand shuttle service to land uses with higher densities of population or jobs, or higher levels of activities: office parks, hotel complexes, recreational centers		
Rail Transit Service (R)				
TS-R1	Improve rail service on Hudson Line	Increase peak period express service	✓	Include in Level 2 scenarios, as appropriate.
TS-R2	TS-R2.1: Improve rail service on Harlem Line - Increase Service without a Third Track	Increase mid-day service	X	As stand alone options, would not be effective in reducing peak period congestion levels in the Corridor. Use of Harlem Line is considered below in Corridor-wide improvements./1
	TS-R2.2: Improve rail service on Harlem Line - Increase service with a Third Track	A third track is required to provide the capacity needed to increase peak period express service		
TS-R3	Improve rail service on New Haven Line	Increase peak period express service	X	No measurable improvement of Corridor congestion levels would be expected./1
TS-R4	TS-R4.1: Improve rail service on the Pascack Valley Line once Secaucus Transfer Opens - Improve frequencies and add midday/return service.	Improved service on single track line	+	These improvements are programmed by Metro-North and NJ TRANSIT and will be included in the No Build scenario.
	TS-R4.2: Expand rail infrastructure capacity with additional tracks – Expand capacity of the Pascack Valley Line between Spring Valley and Secaucus.	Construct passing sidings		

No.	Title	Description	Level 2 Status	Rationale for Screening
TS-R5	TS-R5.1: Improve rail service on the Port Jervis Line once Secaucus Transfer Opens - Increase frequencies and midday/return service.	Improved service on single track line	+	These improvements are programmed by Metro-North and NJ TRANSIT and will be included in the No Build scenario.
	TS-R5.2 Expand rail infrastructure capacity with additional tracks. - Expand capacity of the Port Jervis Line between Sloatsburg and Salisbury Mills.	Double-track the line or construct passing sidings.	+	Double tracking the Port Jervis line and/or constructing passing sidings will be studied by MNR and NYSDOT as part of the EIS for the Stewart Airport Extension, scheduled to begin early 2004.
Ferry Service (F)				
TS-F1	Expand Ferry Service between Haverstraw and Ossining	Increase ferry service to connect with more Hudson Line trains to Grand Central Terminal	+	Would not meet the travel needs in the Corridor, given the limited market potential of ferry service. Service expansions programmed by others will be included in the No Build scenario.
TS-F2	Implement New Ferry Route between Nyack and Tarrytown	Provide ferry service to meet Hudson Line trains in both directions	X	Would not meet the travel needs in the Corridor, given the limited market potential of ferry service. Traffic and community impacts would occur at the Nyack and Tarrytown terminals./1,7
TS-F3	TS-F3.1 Implement New High Speed Ferry Route Between Orange/Rockland/Westchester Counties and Manhattan	Provide high speed ferry service directly from Nyack, Haverstraw and Newburgh to Yonkers and existing west side terminals in Manhattan	+	Haverstraw- Yonkers ferry service is being proposed by Rockland County and City of Yonkers. Programmed improvements will be included in the No Build scenario.
	TS-F3.2 Implement New Hovercraft Ferry Service Between Orange/Rockland/Westchester Counties and Manhattan	Provide hovercraft ferry service directly from Nyack, Haverstraw and Newburgh to Yonkers and existing west side terminals in Manhattan	X	Would not meet the travel needs in the Corridor, given the limited market potential of ferry service./1

Parking Improvements to Support Existing/Expanded Transit Services (P)				
TS-P1 to P14	Implement current short-term plans for Parking Improvements	Park-and-ride improvements to be implemented in the next five years	✓	Include in Level 2 scenarios, as appropriate.
S-P15 to P25	Additional Parking Improvements to Support New/Expanded Transit Services	Longer-term park-and-ride improvements, including new and expanded facilities	✓	Include in Level 2 scenarios, as appropriate.
S-P26	Implement EZ Pass at Park & Ride Facilities	Provide EZ Pass as a method of paying at Park & Ride Facilities.	✓	Include in Level 2 scenarios, as appropriate.

Pedestrian/Bicycle Pathways (PED)				
TS-PED1	Provide access to river crossing alternatives that include new pedestrian/cyclist pathway	Connections to existing pathway networks on either shore of the Hudson River	✓	Include in Level 2 scenarios, as appropriate.

3. Corridor-Wide Improvements (CI)

No.	Title	Description	Level 2 Status	Rationale for Screening
Roadway Improvements (R)				
CI-R1	CI-R1.1: Improve Mainline - Add a fourth GP lane in each direction from Interchange 15 in Suffern to Interchange 11, Route 9W in Nyack	Provide lane continuity for the entire length of I-87 in the Corridor	✓	Include in Level 2 scenarios.
	CI-R1.2: Improve Mainline - Add a fourth GP lane in each direction from Interchange 14A, Garden State Parkway to Interchange 11, Route 9W in Nyack	Provide additional lane capacity to accommodate the four interchanges west of Interchange 11	✓	Consider in Level 2 analyses. Detailed traffic operations analysis will provide insight into the optimum extent of the fourth lane in Rockland County.
	CI-R1.3: Improve Mainline - Add a fourth GP lane in each direction from Interchange 13, Palisades Parkway to Interchange 11, Route 9W in Nyack	Provide additional lane capacity to accommodate the two interchanges west of Interchange 11		
	CI-R1.4: Improve Mainline - Add a westbound auxiliary climbing lane from the TZ Bridge to Interchange 14A, Garden State Parkway	Provide an auxiliary climbing lane to alleviate bottlenecks and unsafe conditions on steep westbound upgrades		
	CI-R1.5: Improve Mainline - Enhance Programmed Roadway Improvements in Westchester County between the TZ Bridge Toll Plaza and Interchange 10, Route 120, CWE	Enhancements to programmed improvements by NYSDOT	✓	Consider in Level 2 analyses. Detailed traffic operations analysis will determine the scope of the needed improvements.
	CI-R1.6: Improve Mainline - Improvements to CWE between Interchange 10 (Route 120) and Interchange 11 (I-95)	Potential improvements to be identified/developed based on traffic simulation modeling		
CI-R2	Improve Various Interchanges and Transition areas	Potential improvements to be identified/developed based on traffic simulation modeling	✓	Consider in Level 2 analyses. Detailed traffic operations analysis will determine the scope of the needed improvements.

No.	Title	Description	Level 2 Status	Rationale for Screening
Bus Rapid Transit (BR)				
CI-BR1	CI-BR1.1: New BRT transitway on I-287 with service between Suffern and Port Chester – Access controlled and barrier-separated busway	Dedicated busway for most of the length of the I-287 Corridor	✓	Include in Level 2 scenarios.
	CI-BR1.2: New BRT transitway on I-287 with service between Suffern and Port Chester - Buffer-separated transit only lanes in Rockland County	Left-lane bus lanes constructed for BRT operation, entering/exiting the roadway in mixed traffic in Rockland. Buses run in mixed traffic in Westchester	✓	Include in Level 2 scenarios.
CI-BR2	Bus Rapid Transit on Parallel Arterials through conversion of existing traffic or parking lanes	Existing traffic or parking lanes converted to "basically exclusive" bus lanes coupled with priority at traffic signals and other ITS measures	X	Would not perform as well as bus rapid transit scenarios on I-287 mainline (less travel time savings and lower service dependability)./10,14
New Commuter Rail Lines (CR)				
CI-CR1	New Commuter Rail Line from Port Jervis Line to Hudson Line within I-287 corridor	New rail line mostly within I-287 right-of-way, including new stations and intermodal facilities.	✓	Include in Level 2 scenarios.
CI-CR2	New Commuter Rail Line from Port Jervis Line to Hudson Line within I-287 Corridor between Suffern and West Nyack in Rockland County then via Remote Southern River Crossing. (Includes double-tracking of West Shore Line)	Departs from I-287 Corridor at Interchange 12 to West Shore Line, then along Palisades Interstate Parkway to a remote tunnel river crossing and connection to Hudson Line.	X	Would not perform as well as those commuter rail alternatives retained for further consideration. Would not make good use of existing rail infrastructure, would require new property acquisition/displacements and direct impacts to Section 4(f) resources./14, 20, 22
CI-CR3	New Commuter Rail line from Port Jervis Line to Harlem Line, within I-287 corridor, including 3rd tracking of Harlem Line	New rail line mostly within I-287 right-of-way, including new stations and Intermodal facilities. Design speed varies from 50 to 100 mph. Harlem Line would require third track south of White Plains to provide additional capacity	X	Would not perform as well as those commuter rail alternatives retained for further consideration. Travel time to Manhattan would be longer and direct impacts to Section 4(f) property would be required./10, 22 Include transfer to Harlem Line Service (instead of direct connection) in Level 2 scenarios (see CI-CR4, below).

CI-CR4	New Commuter Rail line from Port Jervis Line to New Haven Line, within I-287 corridor	New rail line mostly within I-287 right-of-way, including new stations and intermodal facilities. Design speed varies from 50 to 100 mph. Underground Transfer station in White Plains to the Harlem Line along a new tunnel alignment below the existing White Plains station	✓	Include in Level 2 scenarios.
CI-CR5	Institute commuter service on West Shore Line between Newburgh in Orange County and Hoboken in New Jersey	Expand West Shore Line to provide commuter rail service along entire line	+	The implementation of commuter rail service on the West Shore Line is currently being studied by NJT (between W. Nyack and Hoboken) and Rockland County/NYSDOT (between W. Haverstraw and W. Nyack).
CI-CR6	CI-CR6.1: Commuter and Freight Rail Service from the Port Jervis Line to the Hudson Line	Add shared freight service with new commuter rail line (C-CR1).	+	The feasibility of a shared commuter rail/freight facility is being studied further.
	CI-CR6.2: Rail Freight Connections from the West Shore Line to the Hudson Line within I-287 Corridor	Provide freight access from the West Shore Line across the Hudson River on a new River Crossing facility connecting to the Hudson Line.		
CI-CR7	Reinstate the Putnam Commuter Rail Line	Acquire rail right-of-way and provide commuter service to points south. Connect proposed corridor commuter rail lines to the reinstated Putnam Line.	X	Would not perform as well as those commuter rail options retained for further analysis. Would require direct acquisition of a number of properties, including Section 4(f) resources and would not make good use of existing rail infrastructure./20, 22
CI-CR8	Rockland-Westchester Commuter Rail Subway	Construct subway tunnel in Rockland under Route 59 and in Westchester under Route 119. Provide underground stations within local business districts.	X	Would not perform as well as those commuter rail options retained for further analysis. Would be significantly less cost-effective and would not provide good transit system integration. Significant environmental impacts would be expected. /14, 24
CI-CR9	New Tarrytown Transfer Facility	New Intermodal Center at the River Crossing in Tarrytown to enable transfers between transit modes in the I-287 corridor and the Hudson Line.	✓	Include in Level 2 scenarios for LRT/AGT and BRT.

New LRT/AGT or Monorail Lines (LR)				
CI-LR1	New LRT/AGT connecting Tarrytown to White Plains	LRT alignment within I-287 corridor or along Route 119 and Hamilton Ave., with grade separations at major road crossings. (AGT/Monorail would be fully grade separated.) Intermodal facilities would be developed at major stations.	✓	Consider in Level 2 analyses. Ridership and other screening data provided for a full length LRT/AGT alignment will be used to determine the optimum length for the system.
CI-LR2	New LRT/AGT connecting West Nyack to White Plains	Extends C-LR1 alignment across the Hudson river, along the I-287 Corridor to Interchange 11 where it could shift to Route 59 or continue along I-287 to the Palisades Mall.	✓	Consider in Level 2 analyses. Ridership and other screening data provided for a full length LRT/AGT alignment will be used to determine the optimum length for the system.
CI-LR3	New LRT/AGT connecting Nanuet to White Plains	Extends C-LR2 alignment west along I-287 Corridor or along Route 59 to the Pascack Valley Line.	✓	Consider in Level 2 analyses. Ridership and other screening data provided for a full length LRT/AGT alignment will be used to determine the optimum length for the system.
CI-LR4	New LRT/AGT connecting Suffern to White Plains	Extends C-LR3 alignment west to Suffern along the Piermont Branch right-of-way or along I-287 Corridor	✓	Consider in Level 2 analyses. Ridership and other screening data provided for a full length LRT/AGT alignment will be used to determine the optimum length for the system.
CI-LR5	New LRT/AGT connecting Suffern to Port Chester/Rye	Extends C-LR4 alignment east along Route 119, I-287 right-of-way to Port Chester or Rye.	✓	Include in Level 2 scenario.
New Cross Westchester Tunnel (Multi-modal) (CWT)				
CI-CWT 1	Intermittent Shallow Tunnel Sections between the Hudson River and I-95 with above ground interchanges and Commuter Rail	Highway alignment along I-287 with intermittent tunnel sections that eliminate interchanges. Above ground alignment provided to maintain major interchanges. Commuter rail in tunnel throughout.	X	Would not perform as well as those above-ground alternatives that are retained for further analysis -- would be less cost-effective, create more traffic impacts related to eliminated interchanges, and require greater right-of-way acquisition and associated environmental and construction impacts./14, 20, 24
CI-CWT 2	Shallow Tunnel from Hudson River to I-95 with below ground interchanges and Commuter Rail	Highway alignment and Commuter rail along I-287 in shallow tunnel throughout.		
CI-CWT 3	Deep Tunnel from Hudson River to I-95 with below ground interchanges and Commuter Rail	Highway alignment and Commuter rail along I-287, in bored tunnel throughout.		

4. RIVER CROSSINGS (RX)

No.	Title	Description	Level 2 Status	Rationale for Screening
Retain the Existing Tappan Zee Bridge				
Preservation Alternatives (P) Continue maintenance program to extend service life 50 years. Seismic deficiencies, traffic capacity limitations, operational deficiencies not addressed. No Build Alternative.				
RX-P1	Preserve TZB with 4/3 Operation	Retains current reversible lane operation	✓	Include in Level 2 screening as part of No Build scenario.
RX-P2	Preserve TZB with 6 GP lanes and a reversible priority lane	Reversible lane is restricted to bus only, or bus and HOV use	X	Reduction in capacity for general use traffic would result in unacceptable levels of congestion and increased travel times during peak hours./25, 26
Rehabilitation Alternatives without Widening (R) Upgrades TZB to meet current structural and safety codes, including seismic criteria, extending service life for 50 years.				
RX-R1	Rehabilitate with 4/3 operation	Similar to RX-P1. Pedestrian/bicycle use not accommodated, highway geometrics limited by existing structure	✓	Include in Level 2 scenarios.
RX-R2	Rehabilitate with 6 GP lanes and a Reversible Priority Lane	Similar to RX-P2. Pedestrian/bicycle use not accommodated, highway geometrics limited by existing structure	X	Reduction in capacity for general use traffic would result in unacceptable levels of congestion and increased travel times during peak hours./25, 26
Rehabilitation Alternatives with Widening (RW) Upgrades TZB to meet current structural and safety codes, including seismic criteria, extending service life for 50 years.				
RX-RW1	Widen to 8 GP lanes	Widening at truss results in split roadway	X	Would not be cost-effective since cost would be similar to a new bridge, traffic operations would worsen and safety concerns would arise./26
RX-RW2	RX-RW2.1: Widen to 6 GP lanes plus 2 priority lanes	Pedestrian/bicycle path accommodated	X	Reduction in capacity for general use traffic would result in unacceptable levels of congestion and increased travel times during peak hours./25, 28
	RX-RW2.2: Widen to 8 GP lanes plus 2 priority lanes	Widening at truss results in split roadway	X	The split roadway would result in unsafe conditions related to the separation of traffic at the main spans and the additional driver decisions at unexpected locations./26
RX-RW3	RX-RW3.1: Widen to 6 GP lanes plus Commuter Rail	Pedestrian/bicycle path accommodated	X	Reduction in capacity for general use traffic would result in unacceptable levels of congestion and increased travel times during peak hours./25, 28
	RX-RW3.2: Widen to 8 GP lanes plus Commuter Rail	Widening at truss results in split roadway	X	Would not be cost-effective given difficult design challenges related to meeting commuter rail load and operational requirements on a rehabilitated bridge./30
RX-RW4	RX-RW4.1: Widen to 6 GP lanes plus LRT/AGT or Monorail	Pedestrian/bicycle path accommodated	X	Reduction in capacity for general use traffic would result in unacceptable levels of congestion and increased travel times during peak hours./25, 28
	RX-RW4.2: Widen to 8 GP lanes plus LRT/AGT or Monorail	Widening at truss results in split roadway	✓	Include in Level 2 scenarios in modified form -- rehabilitated bridge with LRT/AGT and 4/3-lane operation.

No.	Title	Description	Level 2 Status	Rationale for Screening
Replace the Existing Tappan Zee Bridge Replaces the bridge with a new bridge, or tunnel, or combinations of bridge and tunnel.				
Replacement Bridge (B) Replacement Bridges have potential alignments parallel to and immediately south of the existing Tappan Zee Bridge. Bridges could include a pedestrian/bicycle pathway; tunnels and serial bridge/tunnels would not.				
RX-B1	Replacement Bridge with 8 GP lanes	New 8 lane bridge	✓	Include in Level 2 scenarios.
RX-B2	Replacement Bridge with 8 GP lanes and 2 lane Busway	New 8 lane bridge with 2 lane Busway (equivalent to 10 lanes)	✓	Include in Level 2 scenarios.
RX-B3	RX-B3.1: Replacement Bridge with 8 GP lanes and Commuter Rail	Can include rail freight with additional grade restrictions	✓	Include in Level 2 scenarios.
	RX-B3.2: Replacement Bridge with 6 GP lanes, 2 Busway lanes and Commuter Rail	Can include rail freight with additional grade restrictions	X	Reduction in capacity for general use traffic would result in unacceptable levels of congestion and increased travel times during peak hours./25, 28
RX-B4	Replacement Bridge with 8 GP lanes and LRT/AGT or Monorail	New 8 lane bridge with 2 light rail tracks, following highway profile	✓	Include in Level 2 scenarios.
RX-B5	Replacement Bridge with 8 GP lanes, Commuter Rail and LRT/AGT or Monorail	Can include rail freight with additional grade restrictions	✓	Include in Level 2 scenarios.
Replacement Bored Tunnel (BT) Each Bored Tunnel replacement alternative has potential alignments in three generalized locations: parallel to, immediately north of, and immediately south of the existing Tappan Zee Bridge				
RX-BT1	Replacement Bored Tunnel with 8 GP lanes	New 8 lane tunnel	✓	Include in Level 2 scenarios. Evaluate full replacement bored tunnel with 8 GP lanes, commuter rail and 2-lane busway and refine concept based on screening results.
RX-BT2	Replacement Bored Tunnel with 8 GP lanes and 2 lane Busway	New 8 lane tunnel with 2 lane Busway (equivalent to 10 lanes)		
RX-BT3	Replacement Bored Tunnel with 8 GP lanes and Commuter Rail	Can include rail freight with additional grade restrictions		
RX-BT8	Replacement Bored Tunnel with 8 GP lanes, Commuter Rail and 2-lane Busway	New 8-lane tunnel with 2-lane Busway, (equivalent to 10 lanes) and Commuter Rail.		
RX-BT4	Replacement Bored Tunnel with 8 GP lanes and LRT/AGT	New 8 lane tunnel with 2 light rail tracks	X	Would not allow for effective transit system integration since intermodal tunnel connections in Nyack andTarrytown would be required and successful LRT/AGT systems rely heavily on good accessibility to stations./28

Replacement Immersed Tunnel (IT) **Each Immersed Tunnel replacement alternative has potential alignments in three generalized locations: parallel to, immediately north of, and immediately south of the existing Tappan Zee Bridge**				
RX-IT1	Replacement Immersed Tunnel with 8 GP lanes	New 8 lane tunnel	X	Would adversely impact Hudson River ecology with negligible difference in cost and transportation performance as compared to the bored tunnel option./41
RX-IT2	Replacement Immersed Tunnel with 8 GP lanes and 2 lane Busway	New 8 lane tunnel with 2 lane Busway (equivalent to 10 lanes)		
RX-IT3	Replacement Immersed Tunnel with 8 GP lanes and Commuter Rail	Can include rail freight with additional grade restrictions		
RX-IT4	Replacement Immersed Tunnel with 8 GP lanes and LRT/AGT or Monorail	New 8 lane tunnel with 2 light rail tracks		
RX-IT8	Replacement Immersed Tunnel with 8 GP lanes, Commuter Rail and 2 lane Busway	New 8-lane tunnel with 2-lane Busway, and Commuter Rail.		
Replacement Serial Bridge and Tunnel (B/T) **Each Serial replacement alternative has potential alignments in two generalized locations: immediately north of, and immediately south of the existing Tappan Zee Bridge**				
RX-B/T1	Replacement Serial Bridge / Tunnel with 8 GP lanes	New 8 lane bridge/tunnel	X	Would not provide significant transportation benefits over the bridge and bored tunnel options retained for further analysis and would adversely impact Hudson River ecology./41
RX-B/T2	Replacement Serial Bridge / Tunnel with 8 GP lanes and Busway	New 8 lane bridge/tunnel with 2 lane Busway (equivalent to 10 lanes)		
RX-B/T3	Replacement Serial Bridge / Tunnel with 8 GP lanes and Commuter Rail	Can include rail freight with additional grade restrictions.		
RX-B/T4	Replacement Serial Bridge / Tunnel with 8 GP lanes and LRT/AGT or Monorail	New 8 lane bridge/tunnel with 2 light rail tracks		
RX-B/T8	Replacement Serial Bridge / Tunnel with 8 GP lanes, Commuter Rail and Busway	New 8 lane bridge/tunnel with Commuter and 2 lane Busway		

Replacement Bridge and Transit Tunnel (B+BT or B+IT) **Each Replacement Bridge and Transit Tunnel alternative has potential alignments in three generalized locations: parallel to, immediately north of, and immediately south of the existing Tappan Zee Bridge**				
RX-B+BT 2	Replacement Bridge with 8 GP Lanes and Bored Tunnel with 2 lane Busway	New bridge with total of 8 lanes and bored tunnel with 2 lane Busway	X	Would not allow for effective transit system integration since interchanges (markets) on east and west shore would be missed (including a Tarrytown Transfer Station)./28
RX-B+BT 3	Replacement Bridge with 8 GP Lanes and Bored Tunnel with Commuter Rail line	Can include rail freight with additional grade restrictions.	✓	Include in Level 2 scenarios.
RX-B+BT 4	Replacement Bridge with 8 GP Lanes and Bored Tunnel with LRT/AGT	New bridge with total of 8 lanes and bored tunnel with 2 light rail tracks	X	Would not allow for effective transit system integration since intermodal tunnel connections in Nyack and Tarrytown would be required./28
RX-B+BT 5	Replacement Bridge with 8 GP Lanes and LRT/AGT or Monorail and Bored Tunnel with Commuter Rail	Can include rail freight with additional grade restrictions	✓	Include in Level 2 scenarios.

RX-B+IT 2	Replacement Bridge with 8 GP Lanes and Immersed Tunnel with 2 lane Busway	New bridge with total of 8 lanes and immersed tunnel with 2 lane Busway	X	Would not provide significant transportation benefits over the replacement bridge and bored tunnel and would adversely impact Hudson River ecology./41
RX-B+IT 3	Replacement Bridge with 8 GP Lanes and Immersed Tunnel with Commuter Rail line	Can include rail freight with additional grade restrictions.		
RX-B+IT 4	Replacement Bridge with 8 GP Lanes and Immersed Tunnel LRT /AGT or Monorail	New bridge with total of 8 lanes and immersed tunnel with 2 light rail tracks		
RX-B+IT 5	Replacement Bridge with 8 GP Lanes and LRT/AGT or Monorail and Immersed Tunnel with Commuter Rail	Build a new bridge with total of 8 lanes and 2 light rail tracks and tunnel with commuter rail		
Supplement the Tappan Zee Crossing with Additional Crossing (SB, ST or SB/T) Any supplemental crossing can be combined with any of the alternatives that retain the existing Tappan Zee Bridge. New bridges could accommodate a pedestrian/cyclist pathway; new tunnels and serial bridge/tunnels would not.				
RX-SB1	RX-SB1.1: Supplemental Bridge with 4 or 6 GP lanes - Remote North Location	New highway bridge at remote location north of Nyack	X	Would require significant new roadway corridors to connect river crossing to existing highways, acquisitions, displacements, relocations and impacts to Section 4(f) resources./28, 38, 40
	RX-SB1.2: Supplemental Bridge with 4 or 6 lanes - Remote South 1 Location	New highway bridge at remote location south of Piermont		
	RX-SB1.3: Supplemental Bridge with 4 or 6 lanes - Remote South 2 Location	New highway bridge at remote location near New Jersey border		
RX-ST1	Supplemental Bored Tunnel with 4 or 6 GP lanes – Remote South Location	New bored highway tunnel at a remote location south of Piermont	X	Would require significant new roadway corridors, acquisitions, displacements, relocations and impacts to Section 4(f) resources./28, 38, 40
RX-SB6	Supplemental Bridge with Commuter Rail only – Remote South Location	New Commuter Rail bridge at a remote location south of Piermont	X	Would require significant new rail corridor, acquisitions, displacements, relocations and impacts to Section 4(f) resources./28, 38, 40
RX-ST6	RX-ST6.1: Supplemental Bored Tunnel with Commuter Rail only - in existing Tappan Zee Corridor	New bored tunnel with Commuter Rail located immediately north of, parallel to, or immediately south of the existing Tappan Zee Bridge	✓	Include in Level 2 scenarios.
	RX-ST6.2: Supplemental Bored Tunnel with Commuter Rail only – Remote South Location	New bored tunnel with Commuter Rail at a remote location south of Piermont	X	Would require significant new rail corridor, acquisitions, displacements, relocations and impacts to Section 4(f) resources./38, 40
RX-SB/T6	Supplemental Serial Bridge and Immersed Tunnel with Commuter Rail only – in existing Tappan Zee Corridor	New Commuter Rail bridge/tunnel located immediately north of, parallel to, or immediately south of the existing Tappan Zee Bridge	X	Would not provide significant transportation benefits over the bridge and bored tunnel options retained for further analysis and would adversely impact Hudson River ecology./41

RX-ST7	Supplemental Immersed Tunnel with LRT/AGT only - in existing Tappan Zee Corridor	New LRT/AGT immersed tunnel located immediately north of, parallel to, or immediately south of the existing Tappan Zee Bridge	X	Would not provide significant transportation benefits over aboveground options retained for further analysis and would adversely impact Hudson River ecology./41

Hybrid River Crossings (HB) **A combination of a new replacement bridge with the partial use of the existing Tappan Zee Bridge**				
RX-HB1	Hybrid Replacement Bridge with Commuter Rail connecting to the Putnam Line	New highway bridge that crosses the existing alignment, and a new rail crossing that passes under Blauvelt Park in a tunnel, over the western part of the river on a separate bridge, to join the new highway bridge to pass over the channel. (Consideration will be given to incorporating segments of the existing trestle). Commuter rail tunnel would continue in Westchester and connect to the Putnam Line.	X	Would not provide significant transportation benefits over other bridge and tunnel options retained for further analysis and would require a significant number of property acquisitions, displacements, relocations and impacts to Section 4(f) resources./38, 40

Legend:

✓ - Retained for further evaluation

X - Eliminated from further consideration

\+ - Under study by others

APPENDIX C

Table C-1 Level 2 Scenarios
A - Highway Only Alternatives

LEVEL 2 ALTERNATIVE		CORRIDOR IMPROVEMENTS		RIVER CROSSING	TDM/ TSM*	TRANSIT SERVICE IMPROVEMENTS
		GENERAL TRAFFIC	TRANSIT			
H1	**No Build**	• Programmed CWE Improvements	• Programmed Improvements Only	• Preserve TZB with current 4/3 lane operation	None	• Programmed Improvements Only
H2	**Rehabilitate TZB with TDM/TSM Actions Only**	• Programmed CWE Improvements	• Programmed Improvements Only	• Rehabilitate TZB with current 4/3 lane operation	Yes**	• Programmed Improvements • Expand bus routes & service • Improve Hudson Line rail service • Park & Ride improvements
H3	**Replacement Bridge and Roadway Improvements**	• Programmed CWE Improvements • Full 8-GP lane section from West Nyack to Suffern • Westbound auxiliary climbing lane from River Crossing to Interchange 14 • Various interchange improvements as determined by detailed traffic studies	• Programmed Improvements Only	• Replacement Bridge with 8-GP Lanes • Pedestrian & Bicycle facility across river with Improvements to tie into facilities east and west of the river	Yes	• Programmed Improvements • Expand bus routes & service • Improve Hudson Line rail service • Park & Ride improvements

* TDM/TSM Measures

- Enhance Existing Metro Pool Programs
- Car Sharing Program
- Increase Funding for Easy Street Vanpool Program
- HOV Priority Lanes at Toll Plaza
- Enhance Real Time Driver Information
- Enhance Real Time Transit Information
- Comprehensive Incident Management Program
- Ramp Metering with HOV Priority Access
- Comprehensive Signal Coordination
- Congestion Pricing
- Enhance Internet and Employ TRIPS Technology
- Enhance Real Time Information for Bus Riders

** Also includes Ramp Metering

B - Highway + Bus Rapid Transit Alternatives

LEVEL 2 ALTERNATIVE		CORRIDOR IMPROVEMENTS		RIVER CROSSING	TDM / TSM	TRANSIT SERVICE IMPROVEMENTS
		GENERAL TRAFFIC	TRANSIT			
BRT1	**Replacement Bridge with Buffer-Separated BRT/ HOT Lanes**	• Programmed CWE Improvements	• Programmed Improvements modified to reflect new transit facilities • 2-Buffer-separated BRT Priority/HOT lanes on I-287 across Rockland (buses enter and exit through mixed traffic) • Bus/commuter rail transfer facility in Tarrytown • BRT in mixed traffic and intermittent lanes across Westchester	• Replacement Bridge with 8-GP Lanes and 2-Buffer Separated Busway/Priority HOT Lanes • Pedestrian & Bicycle facility across river with improvements to tie into facilities east and west of the river	Yes	• Programmed Improvements modified to reflect new transit facilities • BRT service between Suffern and Rye/Port Chester extending to Stamford • Restructure Rockland bus network to feed BRT system • Improve Hudson Line rail service • Park & Ride improvements
BRT2	**Replacement Bridge and Barrier-Separated BRT and Roadway Improvements**	• Programmed CWE Improvements • Full 8-GP lane section from West Nyack to Suffern[1] • Westbound auxiliary climbing lane from River Crossing to Interchange 14 • Various interchange improvements as determined by detailed traffic studies	• Programmed Improvements modified to reflect new transit facilities • 2-Barrier-separated BRT lanes on I-287 across Rockland (exclusive busway interchanges at major access points) • Bus/commuter rail transfer facility in Tarrytown • BRT in busway on I-287 and Route 119 in Westchester (exclusive busway interchanges at major access points)	• Replacement Bridge with 8-GP Lanes and 2-Barrier Separated Bus Lanes • Pedestrian & Bicycle facility across river with improvements to tie into facilities east and west of the river	Yes	• Programmed Improvements modified to reflect new transit facilities • BRT service between Suffern and Rye/Port Chester extending to Stamford • Restructure Rockland bus network to feed BRT system • Improve Hudson Line rail service • Park & Ride improvements

[1] Extension to Suffern of the existing 8-lane section between the Tappan Zee Bridge and Exit 11 (West Nyack).

C - Highway + Light Rail Transit (AGT/Monorail) Alternatives

LEVEL 2 ALTERNATIVE		CORRIDOR IMPROVEMENTS		RIVER CROSSING	TDM / TSM	TRANSIT SERVICE IMPROVEMENTS
		GENERAL TRAFFIC	TRANSIT			
LRT1	**Replacement Bridge and Full Corridor Light Rail Transit**	• Programmed CWE Improvements	• Programmed Improvements modified to reflect new transit facilities • LRT Line from Suffern to Rye LRT/commuter rail Transfer Facilities in Suffern to Port Jervis Line, Spring Valley to Pascack Valley Line, Tarrytown to Hudson line, White Plains to Harlem Line, and Rye to New Haven Line.	• Replacement Bridge with 8-GP Lanes and Light Rail Transit • Pedestrian & Bicycle facility across river with improvements to tie into facilities east and west of the river	Yes	• Programmed Improvements modified to reflect new transit facilities • LRT service between Suffern and Rye • Restructure bus network to feed LRT • Park & Ride improvements • Improve Hudson Line rail service

D - Highway + Commuter Rail Alternatives

LEVEL 2 ALTERNATIVE		CORRIDOR IMPROVEMENTS		RIVER CROSSING	TDM / TSM	TRANSIT SERVICE IMPROVEMENTS
		GENERAL TRAFFIC	TRANSIT			
CRT1	**Replacement Bridge with Full Corridor Commuter Rail**	• Programmed CWE Improvements •	• Programmed Improvements modified to reflect new transit facilities • Commuter Rail Line from the Port Jervis Line to the New Haven Line • Commuter Rail Line from the Port Jervis Line with connection to Hudson Line near Tarrytown • Commuter Rail connection from the West Shore Line to the Cross Hudson Line near West Nyack • Commuter Rail Transfer Facility or bus shuttle to Hudson Line in Tarrytown • Commuter Rail Transfer Facility to Harlem Line in White Plains	• Replacement Bridge with 8-GP Lanes and Commuter Rail • Commuter rail junction allowing line to split on east side of river both southbound and eastbound • Pedestrian & Bicycle facility across river with improvements to tie into facilities east and west of the river	Yes	• Programmed Improvements modified to reflect new transit facilities • Commuter rail service between Suffern and Rye/Port Chester • Commuter rail service between Port Jervis and GCT via Hudson Line connection • Commuter rail service between Newburgh and GCT via Hudson Line connection • Restructure bus network to feed commuter rail • Park & Ride improvements
CRT2	**Rehabilitate TZB and add Supplemental Tunnel with Hudson Line Commuter Rail Connection**	• Programmed CWE Improvements	• Programmed Improvements modified to reflect new transit facilities • Commuter Rail Line from the Port Jervis Line to the Hudson Line	• Rehabilitate TZB; maintain current 4/3 lane operation • New Bored Tunnel for commuter rail connection to the Hudson Line	Yes	• Programmed Improvements modified to reflect new transit facilities • Commuter rail service between Port Jervis and GCT via Hudson Line connection • Restructure bus network to feed commuter rail • Park & Ride improvements

CRT3	**Replacement Bridge with Circum-ferential Commuter Rail**	• Programmed CWE Improvements • Full 8-GP lane section from West Nyack to Suffern • Westbound auxiliary climbing lane from River Crossing to Interchange 14 • Various interchange improvements as determined by detailed traffic studies	• Programmed Improvements modified to reflect new transit facilities • Commuter Rail Line from the Port Jervis Line to the New Haven Line • Commuter Rail Transfer Facility or shuttle bus to Hudson Line in Tarrytown • Commuter Rail Transfer Facility to Harlem Line in White Plains	• Replacement Bridge with 8-GP Lanes and Commuter Rail • Commuter rail line drops into a tunnel on east side of river to connect to the Hudson Line south of the new bridge. • Pedestrian & Bicycle facility across river with improvements to tie into facilities east and west of the river	Yes	• Programmed Improvements modified to reflect new transit facilities • Commuter rail service between Port Jervis and GCT via Hudson Line connection • Restructure bus network to feed commuter rail • Park & Ride improvements

E - Highway + Multi-Modal Transit Alternatives (2 Transit Modes)

LEVEL 2 ALTERNATIVE		CORRIDOR IMPROVEMENTS		RIVER CROSSING	TDM / TSM	TRANSIT SERVICE IMPROVEMENTS
		GENERAL TRAFFIC	TRANSIT			
M1	**Replacement Bridge with Commuter Rail Connection To Hudson Line, and Buffer-Separated BRT/HOT Lanes**	• Programmed CWE Improvements	• Programmed Improvements modified to reflect new transit facilities • Commuter Rail Line from Port Jervis Line connecting to the Hudson Line south of Tarrytown • 2-Buffer separated BRT/HOT lanes on I-287 from Palisades Mall area, across the river to Tarrytown. • BRT in mixed traffic and intermittent lanes across Westchester	• Replacement Bridge with 8-GP Lanes, Commuter Rail and 2-Lane Buffer Separated Busway/HOT Facility • Commuter rail connection to Hudson Line southbound • Pedestrian and Bicycle facility across river with improvements to tie into facilities east and west of the river	Yes	• Programmed Improvements modified to reflect new transit facilities • Commuter rail service between Suffern and GCT via Hudson Line connection • BRT service between Suffern and Rye/Port Chester and extending on to Stamford • Restructure bus network to feed BRT system • Improve Hudson Line rail service • Park & Ride improvements
M2	**Replacement Bridge with Buffer-Separated BRT/HOT Lanes and LRT**	• Programmed CWE Improvements •	• Programmed Improvements modified to reflect new transit facilities • Light Rail Line from Palisades Mall to White Plains • 2-Bufffer Separated BRT Priority/HOT lanes on I-287 from Suffern to River Crossing • BRT in mixed traffic and intermittent lanes across Westchester	• Replacement Bridge with 8-GP Lanes, LRT, & 2-Lane Buffer Separated Busway/HOT Facility • Pedestrian & Bicycle facility across river with improvements to tie into facilities east and west of the river	Yes	• Programmed Improvements modified to reflect new transit facilities • Light Rail service between Palisades Mall and White Plains • Expand bus routes & service to feed BRT system and light rail line • BRT service from Suffern to Port Chester/Rye • Park & Ride improvements

M3	**Bored Tunnel for Highway and Commuter Rail with Hudson Line Commuter Rail Connection, Buffer Separated Bus Lanes and Roadway Improvements**	• Programmed CWE Improvements • Full 8-GP lane section from West Nyack to Suffern • Various interchange improvements as determined by detailed traffic studies	• Programmed Improvements modified to reflect new transit facilities • Commuter Rail Line from the Port Jervis Line to the Hudson Line • 2-Buffer Separated BRT HOT lanes on I-287 from Palisades Mall to River Crossing • BRT in mixed traffic and intermittent lanes across Westchester	• Replace the TZB with Multiple Bored Tunnels with 8-GP Lanes, Commuter Rail, and Busway/HOT Lane	Yes	• Programmed Improvements modified to reflect new transit facilities • Commuter rail service between Port Jervis and GCT via Hudson Line connection • Expand bus routes & service to feed commuter rail and BRT lines • BRT service from Suffern to Port Chester/Rye • Park & Ride improvements

LEVEL 2 ALTERNATIVE		CORRIDOR IMPROVEMENTS		RIVER CROSSING	TDM / TSM	TRANSIT SERVICE IMPROVEMENTS
		GENERAL TRAFFIC	TRANSIT			
M4	**Rehabilitate TZB for Light Rail Transit and Parkway, add Tunnel for I-287 through traffic with Hudson Line Commuter Rail Connection, and Roadway Improvements**	• Programmed CWE Improvements • Full 8-GP lane section from West Nyack to Suffern • Various interchange improvements as determined by detailed traffic studies	• Programmed Improvements modified to reflect new transit facilities • Commuter Rail Line from the Port Jervis Line to the Hudson Line • LRT Line from Suffern to Port Chester/Rye	• Rehabilitate TZB for LRT and Parkway, Parkway includes a Pedestrian/Bicycle Promenade, Emergency Vehicle and Evacuation Route, and Limited Local Traffic. • New Bored Tunnel with 8-GP lanes and commuter rail connection to Hudson Line	Yes	• Programmed Improvements modified to reflect new transit facilities • Commuter rail service between Port Jervis and GCT via Hudson Line connection • LRT service from Suffern to Port Chester • Expand bus routes & service to feed commuter rail and LRT lines • Park & Ride improvements
M5	**Replacement Bridge with Hudson Line Commuter Rail Connection, Light Rail and Roadway Improvements**	• Programmed CWE Improvements • Full 8-GP lane section from West Nyack to Suffern • Westbound auxiliary climbing lane from River Crossing to Interchange 14 • Various interchange improvements as determined by detailed traffic studies	• Programmed Improvements modified to reflect new transit facilities • Commuter Rail Line from the Port Jervis Line to the Hudson Line • LRT Line from Suffern to Port Chester/Rye	• Replacement Bridge with 8-GP Lanes, Commuter Rail and Light Rail Transit • Pedestrian & Bicycle facility across river with Improvements to tie into facilities east and west of the river	Yes	• Programmed Improvements modified to reflect new transit facilities • Commuter rail service between Port Jervis and GCT via Hudson Line connection • Expand bus routes and service to feed commuter rail and LRT lines • LRT service from Suffern to Port Chester/Rye • Park & Ride improvements

M6	**Rehabilitate and widen Bridge with Light Rail Transit, and Supplemental Tunnel for Hudson Line Commuter Rail Connection**	• Programmed CWE Improvements •	• Programmed improvements modified to reflect new transit facilities • Commuter Rail Line from the Port Jervis Line to the Hudson Line • LRT Line from Palisades Mall to White Plains	• Rehabilitate Bridge maintaining current 4/3 operation and widen for LRT • New Bored Tunnel for commuter rail connection to the Hudson Line •	Yes	• Programmed Improvements modified to reflect new transit facilities • Commuter rail service between Port Jervis and GCT via Hudson Line connection • Expand bus routes & service to feed commuter rail and LRT lines • LRT service from Palisades Mall to White Plains • Park & Ride improvements

APPENDIX D