APPENDIX B: ALTERNATIVE ACTIONS AND SCREENING REPORT (TASK I REPORT)

TASK I – ALTERNATIVE ACTIONS AND SCREENING

TASK REPORT

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Preamble

This Task Report summarizes and documents the alternatives screening phase of the proposed Goethals Bridge Replacement (GBR) Project's environmental review. The screening concluded with the recommendation to advance four bridge-replacement alternatives for detailed evaluation in the GBR Environmental Impact Statement (EIS). Following completion of the alternatives screening process and preparation of this Task Report, input obtained during the agency coordination and public outreach program results in refinements to the four original build design alternatives assessed during the screening phase. As a result, the design concepts for the four bridge-replacement alternatives presented in this report were subsequently refined and serve as the basis for the alternatives' evaluation in the main body of the Draft EIS (DEIS). The refinements to the project alternatives do not alter the screening process outcome, as the conceptual alignments remain largely the same, with similar impacts to those documented in this report. Therefore, although this report reflects the original alternatives in design concept and nomenclature, the outcome of the alternatives screening remains unchanged, and the refined alternatives will be evaluated in the main body of the DEIS document.

The Goethals Bridge is located approximately 3 miles from the southern boundary of Newark Liberty International Airport. Given this proximity, the Port Authority of New York and New Jersey (Port Authority), the project sponsor, submitted a completed Form 7460 (Notice of Construction or Alteration) to the Federal Aviation Administration (FAA) for review. In response to this form, the FAA, which is a member of the GBR EIS Technical Advisory Committee (TAC), identified a potential concern with the 350-foot high towers originally proposed for the replacement bridge. The Port Authority then conducted its own aeronautical studies and held further discussions with FAA and representatives of the airlines operating at the airport to ascertain a tower height for the replacement bridge that would not pose a hazard to aviation height clearances.

As a result of the Port Authority's aeronautical studies and consultation process with the FAA and airport stakeholders, a maximum tower height of 272 feet above mean sea level (MSL) was then established for the proposed Goethals Bridge replacement to avoid conflict with flight departures from the airport. This decrease of 78 feet from the originally proposed maximum tower height of 350 feet above MSL, in turn, required redesign of the proposed bridge-replacement alternatives' main span towers.

Design studies that were undertaken to address the effects of the tower height decrease on the previously prepared conceptual bridge-replacement designs confirmed that the cable-stayed design is the most efficient bridge type, given the Goethals Bridge site's physical characteristics. However, the 272-feet maximum tower height required refinements to the bridge-replacement alternatives' alignments, principally due to changes in tower design and roadway clearance interferences with the lowered angle of the cable stays. The new design studies, while still conceptual, further determined that a single bridge configuration containing two decks separated by a set of bridge towers would be suitable for the alignments of all four bridge-replacement alternatives, instead of the two separate design concepts that had been advanced during the GBR EIS alternatives screening process (i.e., single replacement bridge south or north of the existing bridge's alignment, and twin replacement bridges within and directly south or north of the existing bridge's alignment). Therefore, the twin replacement-bridge alternatives north and south of the existing Goethals Bridge are no longer under consideration.

The four alternative alignments associated with the refined bridge-replacement configuration are conceptually the same as for the four bridge-replacement alternatives that were recommended for more detailed study at the end of the GBR EIS alternatives screening process. However, since the refined alternatives all include a single, modified design concept instead of the two separate design concepts originally studied in the alternatives screening process, the nomenclature of the four refined alternatives

has been modified from those for the original alternatives studied. Listed below in italics are the names of the four refined alternatives, as used in the main body of the DEIS, while the names of the four original alternatives, as used in this report, are provided in parentheses:

- *New Alignment South Alternative* - a single-span bridge-replacement in an alignment directly south of the existing Goethals Bridge (originally 6-Lane Replacement Bridge – South);
- *New Alignment North Alternative* - a single-span bridge-replacement in an alignment directly north of the existing Goethals Bridge (originally 6-Lane Replacement Bridge – North);
- *Existing Alignment South Alternative* – a single-span bridge-replacement in an alignment within and extending south of the existing Goethals Bridge alignment (originally Twin Replacement Bridges – South); and
- *Existing Alignment North Alternative* - a single-span bridge replacement in an alignment within and extending north of the existing Goethals Bridge alignment (originally Twin Replacement Bridges – North).

Therefore, while the conceptual bridge-replacement design and alignments have necessarily been refined to address the reduction in allowable maximum tower height, they remain consistent with the intent and general locations of the four bridge-replacement alternatives advanced from the screening process for detailed evaluation in the GBR EIS.

Following the design studies to refine the four conceptual bridge-replacement alternatives, the refinements were presented to and discussed with the Study's Technical Advisory Committee (TAC) and Environmental Task Force (ETF) at a meeting scheduled specifically for this purpose. Both the TAC and ETF had been involved in the review of the alternatives screening process, results, conclusions, and recommendations of the original bridge-replacement alternatives. The meeting with the TAC and ETF regarding the refined alternatives included discussion of the underlying airport-related impediments to the previously assumed maximum tower height and associated design concept modifications; comparison of the refined alternatives' alignments to the alignments of the four original bridge-replacement alternatives, via visual displays of overlay mapping of the original and corresponding refined alignments; and the screening results for the four refined alternatives using the same basic criteria and evaluation measures as were previously used in the alternatives screening process that is summarized in this Task Report..

With the input received from the TAC and ETF review of the refined alternatives, the USCG, as lead federal agency for preparation of the GBR EIS, has concluded that the refined alternatives are consistent with the recommendations of the alternatives screening process and appropriate for continued detailed evaluation of the proposed project's potential social, economic and environmental impacts, which is being documented in the main body of the GBR EIS. However, this Task I Report documents the analysis of the original alternatives, based on the earlier design concepts, alignments and nomenclature.

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1.0 Introduction

1.1 Study Overview

The Port Authority of New York and New Jersey (Port Authority) has proposed to construct a new bridge to replace the existing Goethals Bridge crossing the Arthur Kill between Staten Island, New York, and Elizabeth, New Jersey. A United States Coast Guard (USCG) Bridge Permit, pursuant to the General Bridge Act of 1946, is required before construction can begin, since the proposed replacement bridge would cross navigable waters of the United States. The USCG, the Federal lead agency, with cooperation of the Port Authority, as project sponsor, has undertaken preparation of an Environmental Impact Statement (EIS), pursuant to the National Environmental Policy Act (NEPA) of 1969. The EIS examines the potential social, economic, and environmental impacts of reasonable and feasible alternatives for replacement of the Goethals Bridge. The principal elements of the Goethals Bridge Replacement (GBR) EIS process include definition and analysis of alternatives, environmental documentation, and public outreach and interagency coordination.

A series of technical studies have been conducted to identify project alternatives that are reasonable and feasible and, therefore, warrant further consideration through detailed evaluations in the DEIS. The studies comprise the alternatives development and screening evaluation process, which is described in this report.

1.2 Purpose and Need for the Proposed Bridge Replacement

The purpose and need for the proposed replacement of the Goethals Bridge, and the factors against which project alternatives will ultimately be judged, are the existing bridge's:

- *functional and physical obsolescence* due to outdated, substandard design features for current codes and standards;
- need for ongoing maintenance, repair, and rehabilitation at increasing costs due to its age;
- *need for seismic retrofit* of the bridge's substructure and superstructure;
- *deficiency as a reliable transportation link* within the Staten Island Bridges system (which includes the Goethals Bridge, the Outerbridge Crossing, and the Bayonne Bridge) and, more broadly, in the New York/New Jersey region;
- *deteriorating traffic conditions and relatively higher accident levels*;
- *configuration/design and approach limitations* for:
  - maximizing traffic flow improvements from E-ZPass technology;
  - providing dedicated space for potential future transit service and other alternatives to single-occupancy-vehicle commutation across the bridge;
  - providing safe and reliable access for wider trucks currently using the crossing;
- providing safe and secure pedestrian and bicycle access across the bridge.

1.2.1 Project Goals

The project goals, which are derived directly from the project purpose and need, are as follows:

- Address the functional obsolescence of the existing Goethals Bridge;

- Address structural integrity issues associated with the aging bridge;
- Reduce roadway congestion and delays and enhance mobility on the Goethals Bridge;
- Improve the flow of goods to and from Staten Island and New Jersey and in the New York/New Jersey region;
- Correct the inability of the existing bridge to physically accommodate transit services and other single-occupant-vehicle commuting alternatives;
- Restore and enhance pedestrian access and provide for bicycle access;
- Implement measures to improve bridge structural security; and
- Minimize environmental consequences of the improvement.

1.3 Overview of Alternatives Screening Process

The screening process comprised two distinct phases: 1) an initial screening of preliminary alternatives; and 2) a comparative screening of intermediate alternatives that survived the initial screening. The overall alternatives evaluation process is depicted in Figure 1-1. The preliminary alternatives, representing the universe of potentially reasonable and feasible project alternatives, were identified on the basis of the project purpose and need, and related goals, for the proposed replacement of the Goethals Bridge. Potential alternatives that would not satisfy at least one aspect of the identified purpose and need and/or did not appear reasonable and feasible based on evaluations, as described in Appendix A, were not identified as preliminary alternatives for the proposed project.

Each preliminary alternative represented a single transportation mode and was defined at a conceptual level, appropriate to the initial screening. The initial screening had two purposes:

- to test each conceptual single-mode alternative against a limited set of qualitative criteria designed to determine, early in the alternatives evaluation process, whether an alternative has any fundamental flaw(s) that makes it *not* reasonable and feasible, such that any preliminary alternative that is clearly infeasible or unreasonable due to an identifiable fundamental flaw(s) was not advanced to the comparative screening phase; and
- to consider how fully each single-mode preliminary alternative would likely satisfy the full project purpose and need, and related goals.

Based on the findings of the initial screening, preliminary alternatives that did not have any fundamental flaw were advanced to the comparative screening phase, as *intermediate* alternatives. During that second screening phase, certain single-mode alternatives that by themselves would not address all aspects of the purpose and need and related goals were combined to create multi-modal intermediate alternatives that may have the potential to more comprehensively address the project purpose and need and goals.

The intermediate alternatives were more fully defined in terms of alignments, connections to the existing transportation network, system components, operations, ancillary facilities, institutional requirements for implementation and operation, and other characteristics. The intermediate alternatives were screened against a broader set of criteria and associated qualitative and quantitative evaluation measures, which collectively reflect the project purpose and need and related goals. The purpose of the comparative screening was to identify principal advantages and shortcomings of each intermediate alternative, highlight key differences among them, and determine the respective merits of each. The further definition and comparative screening of the intermediate alternatives was focused, rather than encyclopedic, to provide sufficient information for selection of a short list of alternatives that warrant further development and detailed evaluation in the DEIS.

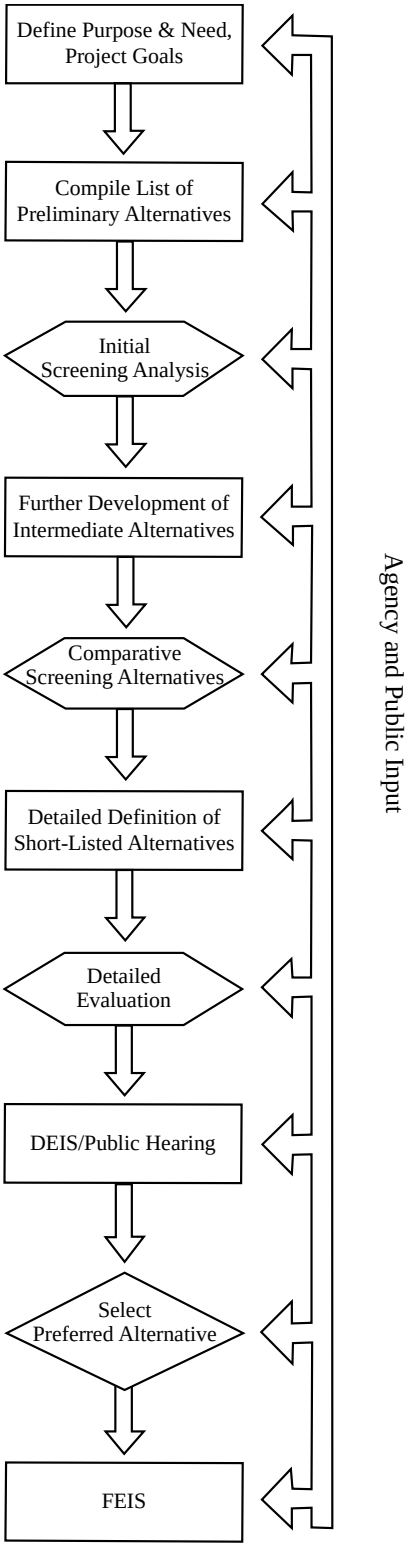

FIGURE 1-1: ALTERNATIVES EVALUATION PROCESS

In order to appropriately and adequately address the different transportation modes represented by multi-modal intermediate alternatives, the comparative screening was defined to evaluate both features that are specific to distinct types of transportation modes (e.g., ridership potential for a new transit service), and features or potential effects that would be common to all types of alternatives (e.g., effect on traffic volume and flow in the Goethals Bridge corridor; potential for adverse environmental impact; etc.).

Consistent with consideration of alternatives in a NEPA EIS, the No-Action alternative, which represents future conditions without the proposed Goethals Bridge Replacement project, was carried through the alternatives screening process.

1.4 Organization of Report

This report summarizes the sequential steps of the alternatives development and screening evaluation process. Section 2.0 describes the alternatives screening evaluation methodology, criteria, and associated evaluation measures; Section 3.0 identifies and describes the No-Action alternative and the preliminary alternatives identified for consideration; Section 4.0 details the results and recommendations of the initial screening conducted of the preliminary alternatives; Section 5.0 identifies and describes the intermediate alternatives surviving the initial screening; Section 6.0 details the results and conclusions of the comparative screening of intermediate alternatives; and Section 7.0 reports the screening process' conclusions and the USCG's determination of which alternatives warrant detailed evaluation in the DEIS.

2.0 Alternatives Screening Methodology

The alternatives screening methodology comprised two tiers of screening evaluation: 1) initial, qualitative screening of preliminary alternatives, and 2) comparative qualitative and quantitative screening of intermediate alternatives that survived the initial screening. Each screening step, including its associated criteria and evaluation measures, is described below.

2.1 Initial Screening Criteria

The purpose of the initial screening was two-fold: 1) to identify any preliminary alternative(s) that had a fundamental flaw or was otherwise deemed to be not reasonable and feasible to consider in light of the proposed project's purpose and need; and 2) to consider how fully each single-mode preliminary alternative would likely satisfy the project purpose and need, and the established goals. As the preliminary alternatives were only conceptually defined, the initial screening was conservative in eliminating alternatives.

The first step consisted of a qualitative screening of each preliminary alternative's fundamental reasonableness and feasibility. The reasonableness or feasibility of transportation options is typically related to primary engineering, design, or operational considerations. The following four criteria were defined to screen each preliminary alternative to determine if it was reasonable for further consideration. These criteria are denoted as IS-1 through IS-4, indicating that they were specifically used for the Initial Screening process.

Criterion IS-1. A preliminary alternative must connect logical termini at existing and/or programmed and committed transportation facilities or services. A preliminary alternative that entails construction of new infrastructure (e.g., a new bridge or tunnel crossing; a new fixed-guideway transit system or branch; bus rapid transit that runs in an exclusive right-of-way or a new, dedicated lane; a new freight rail system or link) must terminate with logical connections to the transportation network within which it is proposed to function. Similarly, an alternative that does not entail construction of new infrastructure but provides a travel option within the broader transportation network (e.g., express bus service) must connect logical termini within the corridor it seeks to serve.

A new bridge or tunnel crossing would need to have logical termini at major roadways at each end of the new crossing, such that it would be physically and functionally integrated with other roadways that could serve the crossing's traffic. A new transit alternative would need to extend to termini that represent valid origins and/or destinations for commute trips (e.g., employment or retail center, park-and-ride lot, dense residential community) or need to be integrated through a connection to the existing regional public transportation network (e.g., an intermodal transfer facility or a point of intersection with an existing/programmed fixed-guideway system). A freight alternative involving rail must be connected in a logical manner to the nation's general railroad network (e.g., an all-rail or carfloat connection to a Class I railroad carrier).

Criterion IS-2. A preliminary alternative must be able to be operationally integrated with the existing and/or programmed and committed transportation network. Given the transportation system density in the vicinity of the Goethals Bridge corridor and in the New York/New Jersey metropolitan area, as a whole, a preliminary alternative must be able to be integrated with and complement existing and programmed and committed transportation systems and services.

A new crossing must be able to be integrated with existing highway interchanges or must not contravene intersection location guidelines for a new interchange, if a new interchange would be required to be

constructed to implement the alternative, because interchange spacing directly affects highway operations. The guidelines for minimum recommended spacing between interchanges are based on operational experience and the need for flexibility and adequate signage (American Association of State Highway & Transportation Officials, *A Policy on Geometric Design of Highways and Streets*, 2001).

A new transit system or service must be able to be integrated within the existing multi-modal transportation system such that the alternative would not require more than two transfers for passengers to complete travel between predominant origin and destination nodes. Transfers en route from origin to destination add time, inconvenience, and uncertainty to a journey by transit, which can discourage use. Commuters in the New York/New Jersey metropolitan area tend to be more flexible than their counterparts elsewhere in the United States and are typically not averse to making transit journeys that entail up to two transfers en route (i.e., a three-segment transit journey). However, a transit journey that requires three en route transfers (i.e., a four-segment transit journey) would be significantly less attractive, particularly to a commuter who has an automobile available and currently commutes via a single-occupant vehicle. Therefore, transit alternatives that would require more than two en route transfers for peak travel between primary residential and employment markets would not satisfy this criterion.

Criterion IS-3. A preliminary alternative must have independent utility. A fundamental consideration in transportation project development is that an alternative evaluated in an EIS is to have independent utility or significance, such that it would be usable and would be a reasonable expenditure even if no additional transportation improvements in the area are made (23 CFR 771.111(f)(2)). The test of "independent utility" seeks to ensure that any alternative considered for evaluation in the EIS encompasses all elements necessary for its implementation. Applying this guidance, a preliminary alternative must be capable of being implemented without need for other transportation investment(s) to make it usable.

Criterion IS-4. A preliminary alternative that requires new infrastructure must be able to conform to current, accepted engineering and safety standards, criteria, and practices. Current standards, criteria, and practices applicable to roadway, bridge, or tunnel options are defined by the American Association of State Highway and Transportation Officials (AASHTO). These standards may be supplemented with criteria defined by the facility's owner, the Port Authority, in conjunction with the New Jersey and New York State Departments of Transportation. Key design criteria applicable to conceptual definition of a new-crossing alternative are listed in Table 2.1.

For new transit or freight movement-related infrastructure, current standards, criteria, and practices are defined by the American Railway Engineering & Maintenance-of-Way Association (AREMA), the Federal Railroad Administration (49CFR 213 – Track Safety Standards), the Federal Transit Administration (TCRP Report 57, "Track Design Handbook for Light Rail Transit"), and the local transit agencies owning and operating a service, as applicable.

The second step in the initial screening process consisted of a qualitative screening of how well each preliminary alternative would meet the purpose and need and the full set of project goals. A rating system (1 = does not meet goal; 3 = uncertain; 5 = meets goal) was used to assign a value for each alternative's performance against each goal, and results were totaled and presented, as illustrated in Table 2.2. Project Goals Screening Matrix. A preliminary alternative that satisfied some but not all project goals was retained for additional screening if it was likely that it could be combined with another alternative to create a multi-modal alternative that would satisfy all of the project goals.

TABLE 2.1:
GEOMETRIC DESIGN CRITERIA

Navigation Channel	500 feet horizontal clearance 135 feet minimum vertical clearance above MHW
Maximum Structure Elevation	350 feet
Minimum Vertical Clearance above Highways and Ramps	16 feet – 6 inches
Minimum Vertical Clearance above Local Streets	14 feet – 6 inches
Minimum Vertical Clearance above Railroads	23 feet
Design Speed	50 MPH
Design Vehicle	WB-67
Travel Lane Width	12 feet
Right Shoulder Width	12 feet
Left Shoulder Width	5 feet
Bicycle/Pedestrian Path Width	10 feet
Minimum Stopping Sight Distance	425 feet
Maximum Profile Grade	4%
Minimum Profile Grade	0.5%
Maximum Super-elevation	6.0%
Travel Lane Cross Slope	1.5% - 2.0%
Maximum Shoulder Cross Slope	4.0%
K for Crest Vertical Curve	84
K for Sag Vertical Curve	96
Minimum Transit Corridor for Single Track LRT	14 feet
Minimum Transit Corridor for Double Track LRT	27 feet

TABLE 2.2:
PROJECT GOALS SCREENING MATRIX

Preliminary Alternatives	**Project Goals**								
	Address bridge's obsolescence	**Address bridge's structural integrity**	**Improve bridge's structural security**	**Enhance mobility**	**Address alternatives to SOVs**	**Improve goods move-ment**	**Restore ped/bike access**	**Minimize envir'l impacts**	**TOTAL RATING**
Alternative 1									
Alternative 2									
Etc.									

Note: 1 = does not meet goal; 3 = uncertain; 5 = satisfies goal.

2.2 Comparative Screening Criteria and Evaluation Measures

Intermediate alternatives, selected on the basis of the initial screening phase described above, were each evaluated independently against a set of defined criteria, in terms of the associated evaluation measures (see Table 2.3). Multimodal intermediate alternatives, initially defined at the conclusion of the initial screening, were refined during the comparative screening process in order to optimize the alternatives' overall performance and potential to satisfy the project purpose and need and goals.

TABLE 2.3: COMPARATIVE SCREENING CRITERIA

Screening Criteria	Performance Measures
CS-1. An alternative should enhance mobility on the Goethals Bridge and its approaches in the future analysis year (2030).	• LOS improvement in the peak hour, peak direction • estimated order-of-magnitude annual number of accidents
CS-2. An alternative should not result in deterioration of traffic conditions at other Staten Island bridges or in the region in the future analysis year (2030).	• LOS in the peak hour, peak direction at the Outerbridge Crossing, Bayonne Bridge, and Verrazano-Narrows Bridge • region-wide VMT in the AM and PM peak periods • total number of region-wide vehicle trips during the AM and PM peak periods • region-wide average travel speed during the AM and PM peak periods
CS-3. An alternative should enhance non-SOV commutation opportunities.	• degree of an alternative's physical accommodation for non-SOV travel (high, medium, low) • peak-period transit ridership, in number of passenger trips • transit travel time compared to vehicular travel time in the AM peak period between primary commuter travel markets
CS-4. An alternative should seek to minimize potential adverse environmental effects.	*Protected habitat/species* • number of species potentially affected • acreage of Federal- or state-designated significant or critical habitat taken or affected • degree of habitat fragmentation (minor, moderate, major) • type of identified waterfowl use area and distance from alternative's alignment • disruption of waterfowl daily movements between use areas (minor, moderate, major) • impact to habitat (minor, moderate, major) *Essential Fish Habitat* • number of species potentially affected • impact to habitat (minor, moderate, major) *Wetland resources* • acreage of wetlands and/or buffer zone taken • type and value of wetlands taken • degree of fragmentation of wetland system (minor, moderate, major)

TABLE 2.3:
COMPARATIVE SCREENING CRITERIA (continued)

Screening Criteria	Performance Measures
CS-4. An alternative should seek to minimize potential adverse environmental effects. *(continued)*	*Cultural resources* • number of designated or eligible historic resources within one-half mile of alternative's alignment • number of historic resources taken • number and/or extent of known archaeological resources or degree of archaeological resource potential within alternative's alignment *Parklands and recreation areas* • number, acreage, and quality of parkland/recreation areas within one-half mile of alternative • acreage of parkland/recreation areas to be taken *Property acquisition or proximity effect* • number and types of properties to be taken • number of residential units displaced by takings • number of businesses displaced by takings • number of residential or institutional uses within 200 feet of an alternative's alignment *Noise-sensitive land uses* • number or concentration of noise-sensitive receptors within 500 feet of new roadway or within 1,500 unobstructed feet of added rail activity on existing or new rail lines
CS-4. An alternative should seek to minimize potential adverse environmental effects. (continued)	*Known hazardous substance sites* • number of sites, by status, within alternative's alignment *Air quality* • change in annual regional emissions of NOx and VOCs (tons) • change in annual particulate ($PM_{2.5}$) emissions (tons)
CS-5. An alternative should be capable of being constructed without extraordinary techniques, with feasible maintenance of existing transportation services during construction, and at reasonable cost comparable to other alternatives with similar benefits.	• degree of construction complexity (low, medium, high) • duration of construction period (months) • feasibility of traffic maintenance and protection (high, medium, low) • order-of-magnitude construction and/or initial capital cost (2005 dollars)

The intermediate alternatives were defined at a sketch-level of detail sufficient for estimating their relative performance against each of the comparative screening criteria, in terms of the associated evaluation measures. This further development of intermediate alternatives addressed alignments, connections to the existing transportation network, system components, operations, ancillary facilities, and other characteristics, some of which are specific to individual transportation modes.

The results of the screening evaluation of each alternative were then compared to determine each alternative's relative ability, compared to other alternatives, to satisfy the criteria. The purpose of this comparative screening was to highlight the key strengths and weaknesses of each alternative, relative to

others, and identify potential consequences, both positive and negative, inherent in selecting one alternative over another. Evaluation matrices were prepared both to display discrete findings of the screening evaluation for each alternative, and to compare their performance relative to each criterion and to each other.

Table 2.3 lists the five comparative screening criteria, which are denoted as CS-1 through CS-5. For each criterion, evaluation measures were identified, including appropriate units in which the results were quantified and reported. For the evaluation measures associated with the first four criteria (i.e., non-construction-related), the alternatives' performance was evaluated relative to the future No-Action condition to determine the likely change, positive or negative, that would occur with implementation of a given alternative, compared to not undertaking the proposed project.

The analyses that were conducted for each criterion are summarized below.

Criterion CS-1. An alternative should enhance mobility on the Goethals Bridge and its approaches in the future analysis year (2030). Primary non-structural factors affecting mobility on the Goethals Bridge crossing include traffic congestion and resultant delays, and occurrence and clearing of accidents. Two evaluation measures were used to evaluate the relative ability of alternatives to enhance mobility at the Goethals Bridge crossing. Alternative-specific projections for these measures were obtained from the multi-modal travel demand forecasting model (Goethals Transportation Model [GTM][1]) developed for use in the transportation studies for the Goethals Bridge Replacement EIS, including this alternatives screening process. The specific evaluation measures related to this criterion are as follow:

- *Improvement in level-of-service (LOS), preferably to LOS D, in the peak hour in the peak direction* - Based on preliminary travel forecasts[2] of as much as 20 to 25 percent traffic growth during peak travel periods by the year 2025, it is projected that, without improvements, traffic service on the Goethals Bridge will deteriorate to LOS F[3] in both the AM and PM peak hours. This would result in unstable traffic flows, queues on the bridge and its approaches, and increased safety problems potentially resulting in more accidents and traffic-delaying incidents. Given these projected conditions, an alternative should improve peak-hour, peak-direction LOS, compared to the future No-Action condition, preferably to LOS D, the design-year LOS to which new highway infrastructure is typically designed.

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1 The GTM was developed from the New York Metropolitan Transportation Council's (NYMTC) regional Best Practice Model (BPM), using NYMTC's and the North Jersey Transportation Planning Authority's (NJTPA) most recent base-year population and employment statistics and population and employment forecasts to the year 2030. Employment forecasts received from NYMTC for Staten Island were refined, via consultation and in coordination with NYMTC, the City of New York Department of City Planning and Economic Development Corporation, for moderate high, uniform growth rates across Staten Island.

2 Preliminary travel forecasts developed by the New York Metropolitan Transportation Council (NYMTC) in 2004, as part of its update to its regional transportation model for sub-regional, corridor-level, and conformity-related travel demand forecasting.

3 LOS, as defined by the Transportation Research Board, ranges from level "A" to level "F," where LOS "A" indicates free-flowing traffic conditions with high travel speeds and LOS "F" describes breakdown conditions with excessive congestion and delays. LOS "C" indicates stable traffic flows and overall good conditions and is generally used as an optimal design objective. LOS "D" represents heavy traffic flow conditions without excessive delays and is considered to be the minimum acceptable operating condition for urban areas. LOS "E" is defined as the theoretical capacity of the roadway, or the maximum stop-and-go flow of vehicles, given existing physical conditions. It is generally considered that LOS E and LOS F are below the threshold of acceptable operating conditions.

- *Estimated order-of-magnitude annual number of accidents* – An alternative should seek to reduce the annual number of accidents, compared to the future No-Action condition. The annual number of accidents that may be anticipated on the Goethals Bridge and its approaches with a given alternative was estimated based on projected annual traffic volumes and VMT, multiplied by accident reduction factors applicable for specific types of accidents, based on Federal guidance adopted by the New Jersey and New York State Departments of Transportation. The factors were applied using professional engineering and transportation planning judgment regarding the likely effects of an alternative's physical and operational attributes, compared to the existing bridge.

Relative to Criterion CS-1, alternatives were considered more desirable if they would improve LOS on the Goethals Bridge and its approaches, and reduce the annual average number of accidents.

Criterion CS-2. An alternative should not result in deterioration of traffic conditions at other crossings or in the region in the future analysis year (2030). While enhancing mobility on the Goethals Bridge, an alternative should not do so at the expense of mobility on the other parts of the Port Authority's Staten Island bridge system (i.e., the Outerbridge Crossing and the Bayonne Bridge) or on the Verrazano-Narrows Bridge. Similarly, an alternative should not exacerbate congestion in the region. Four evaluation measures were used to evaluate alternatives' effects on mobility on other crossings and in the region. Alternative-specific projections for these measures were obtained from GTM forecast modeling. The specific evaluation measures related to this criterion are as described below:

- *LOS in the peak hour, peak direction at the Outerbridge Crossing, Bayonne Bridge, and Verrazano-Narrows Bridge* - As a measure of future mobility across, and reliability of, these three crossings with a given improvement in the Goethals Bridge corridor, the other bridges' future LOS were projected for the peak periods in the peak direction. An alternative should seek to avoid LOS deterioration, particularly seeking to avoid traffic service worsening to below LOS D, which represents heavy traffic flow conditions without excessive delays and is considered to be the minimum acceptable operating condition for urban areas.
- *Region-wide vehicle miles traveled (VMT) in the AM and PM peak periods* – Total region-wide VMT is one measure of an alternative's effect on the regional transportation system's traffic performance. An alternative should seek to maintain or decrease region-wide VMT, compared to the future No-Action condition. Change in regional VMT in the AM and PM peak travel periods were projected to determine the degree to which an alternative would have a positive, negative, or neutral effect on overall regional traffic performance.
- *Total number of region-wide vehicle trips during the AM and PM peak periods* – An alternative should seek to maintain or decrease total peak-period vehicle trips in the region, compared to the future No-Action condition. Change in the total number of region-wide vehicle trips in the AM and PM peak periods were projected as an additional measure of the degree to which an alternative would have a positive, negative, or neutral effect on overall regional traffic performance.
- *Region-wide average travel speed during the AM and PM peak periods* - An alternative should seek to maintain or improve region-wide peak-period average travel speeds, compared to the future No-Action condition. Average travel speed in the region was calculated (VMT ÷ VHT) for the AM and PM peak travel periods, and expressed as average miles per hour, reflecting the degree to which an alternative would have positive, negative, or no effect on this aspect of regional traffic conditions.

Relative to Criterion CS-2, alternatives were considered more desirable if they would not degrade peak-period LOS at the Outerbridge Crossing, Bayonne Bridge, or Verrazano-Narrows Bridge below LOS D;

not result in increase in peak-period regional VMT and vehicle trips; and not result in decrease in region-wide peak-period travel speeds.

Criterion CS-3. An alternative should enhance non-single-occupant-vehicle (SOV) commutation opportunities. Two evaluation measures were used to consider each alternative's relative ability to accommodate or enhance opportunities for non-SOV commutation. These include primary market and operational considerations. GTM modeling was conducted to forecast potential ridership and performance of transit alternatives. The specific evaluation measures related to this criterion are described below:

- *Peak-period transit ridership* – Alternatives that propose new or expanded transit services and/or systems enhance non-SOV commutation opportunities, by definition. This evaluation measure was used to evaluate the degree to which a given transit alternative would attract new transit users and divert users from SOV commutation. Ridership potential was expressed as passengers per AM and PM peak periods. A transit alternative should seek to maximize transit ridership by attracting new riders from SOV commutation, particularly in the Goethals Bridge corridor.
- *AM peak-period transit travel time* – The attractiveness of a transit service is related, in large part, to passengers' travel times from origin to destination, compared to travel time for the same trip by other mode, typically auto. Transit travel time was expressed as total travel time, in minutes, from selected primary origins to primary destinations in the AM peak period, and compared to vehicle travel times for the same trips. A transit alternative should seek to offer peak-period travel times comparable to or faster than peak-period auto travel for the same trip in order to attract passengers in sufficient numbers to become a viable transportation option.

Relative to Criterion CS-3, alternatives were considered more desirable if they would be capable of accommodating more, rather than fewer, non-SOV commutation trips. Transit alternatives with greater ridership potential compared to other transit alternatives, and comparable or shorter travel times relative to auto travel times, were considered more desirable.

Criterion CS-4. An alternative should seek to minimize potential adverse environmental effects. Nine evaluation measures were used to characterize the potential adverse or beneficial effects of an alternative's construction and operation, in terms of key environmental considerations. The specific evaluation measures related to this criterion are as follow:

- *Wetland resources* – Alternatives should seek to avoid permanent taking (i.e., filling) of designated wetlands, pursuant to Presidential Executive Order 11990, which directs all Federal agencies to minimize adverse effects on wetlands, protect wetland resources, and undertake or allow construction in wetland areas only when there are no practical alternatives. If no reasonable alternatives to the use of wetlands are available, effects must be minimized and then mitigated. Wetlands are also protected pursuant to Section 404 of the Federal Water Pollution Control Act of 1972, which provides the U.S. Army Corps of Engineers (USACE) with the responsibility for regulating the placement of fill material in wetlands. Permits would be required from the New Jersey Department of Environmental Protection (NJDEP) and the New York State Department of Environmental Conservation (NYSDEC) for the taking of any state-regulated wetlands, as well as regulated buffer/transition areas. In the case of NYSDEC, impacts to any buffer zone of up to 150 feet upland of a tidal wetland boundary within New York City and 100 feet for a regulated freshwater wetland require a permit. In the case of NJDEP, transition areas of 0, 50 or 150 feet adjacent to freshwater wetlands classified as "ordinary," "intermediate" or "exceptional," respectively, also require permit approval.

The potential effects of alternatives on wetland resources were expressed in terms of acreage of wetlands that would be permanently taken; the type and value of wetlands to be taken; and the degree of fragmentation (minor, moderate, major) of the wetland system affected. Potential takings of wetlands and/or buffer zone were identified and estimated for each alternative through review of U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) Maps and NJDEP and NYSDEC maps of tidal and freshwater wetlands, supplemented by field observations, as necessary.

Acreage potentially taken by an alternative was estimated and determinations were made as to whether the takings would be critical to high-value wetland systems. Generally, an alternative that would affect no wetlands or less area of lower value wetlands within a fragmented wetlands system is considered to be more acceptable than an option that would affect a higher-quality, continuous (unfragmented) wetland system.

- *Protected habitat/species* - Harm to a protected species or to critical habitat (or significant portion thereof) necessary for the survival or propagation of an endangered or threatened species as defined in the Endangered Species Act of 1973 (Public Law 93-205) is an adverse effect. "Endangered" species are those determined to be currently in danger of extinction; "threatened" species include those not currently in such danger, but likely to become so in the foreseeable future. "Rare" species are those listed as either endangered, or threatened, or of special concern on the New York and New Jersey endangered species lists. These lists include Federally listed species that may be found within each state. "Significant habitat" at both the state and Federal levels refers to areas and ecosystems used by a protected species during any life stage or for any critical activity (such as spawning, nesting or feeding).

  Potential adverse effects of an alternative on protected habitat and/or species were evaluated in terms of the number of listed/protected species potentially affected; acreage of Federal- or state-designated significant or critical habitat that would be permanently taken by an alternative; the degree of habitat fragmentation (minor, moderate, major); the type of identified waterfowl use area and distance from an alternative's alignment; disruption of waterfowl daily movements between use areas (minor, moderate, major); and, cumulatively, the impact to Federal/state-designated significant or critical habitat (minor, moderate, major). The presence or absence of threatened or endangered species and associated habitats was determined in consultation with the USFWS and the National Marine Fisheries Service (NMFS) at the Federal level.

  At the state level, this information was obtained through requests for reviews of state Natural Heritage Program databases placed with the NYSDEC, Division of Fish, Wildlife & Marine Resources, New York Natural Heritage Program, and with the NJDEP's Division of Parks and Forestry, Office of Natural Lands Management, Natural Heritage Program. The New York State Department of State, Division of Coastal Resources, also maintains a database and series of maps that identify Significant Coastal Fish and Wildlife Habitats. A review of these data for habitats was conducted to determine if any would be subject to impacts due to an alternative.

- *Essential Fish Habitat* – Essential Fish Habitat (EFH) in the vicinity of an alternative was identified for species actively managed under Federal fishery management plans, as defined under the Magnuson-Stevens Conservation and Management Act, as amended by the Sustainable Fisheries Act of 1966. The number of potentially affected designated species was identified and the degree of potential impact to the habitat was assessed (minor, moderate, major). Potential impacts may result from physical alteration to useable habitat for a species, including loss of benthic and vertical habitat resulting from placement of bridge abutments, loss of wetland and marsh habitat, and/or temporary construction-period increases in local turbidity or loss of habitat due to placement of equipment and cofferdams.

- *Cultural Resources* – Section 106 of the National Historic Preservation Act of 1966 directs all Federal agencies to take into account the effect of an undertaking on any prehistoric or historic district, site, building, structure, or object that is included in or eligible for inclusion in the National Register of Historic Places, prior to issuing an approval for or approving the expenditure of any Federal funds on the undertaking. The taking of a designated or eligible historic resource or disturbance of any area of known or potential archaeological sensitivity is an adverse effect.

  Potential effects of alternatives on cultural resources were expressed in terms of the number of designated or identified eligible historic resources within one-half mile of an alternative's alignment and identification of any that would likely be required to be taken; and the number and geographic extent of known archaeological resources or the degree of archaeological resource potential (high, medium, low) within an alternative's alignment or footprint. Resources were identified through consultation with the New York City Landmarks Preservation Commission (NYCLPC) and the New Jersey and New York State Historic Preservation Offices (SHPO), as well as through review of previous studies, reports, and other documentation.

- *Parklands and recreation areas* – The permanent taking of public parkland or recreation area is considered an adverse effect, as these are typically highly valued community resources. The number, acreage, and types of any parks and recreational areas within an alternative's alignment were identified from available mapping and reports, review of any approved plans for new park resources, and site reconnaissance, as appropriate. Any parkland or recreational resource acreage that would be required to be taken for implementation of an alternative was estimated.

- *Property acquisition* – Adverse effects on occupied properties may be due to actual property takings or to proximity effects related to an alternative. Properties that may need to be acquired or displaced for implementation of an alternative were estimated, by number and type of property (number of occupied residential properties and constituent residential units, commercial properties, and institutional properties). As a measure of potential proximity effects (e.g., shadows, visual obstruction, traffic, noise, etc.), the number of residential and institutional properties within 200 feet of an alternative's alignment was identified. Properties were identified from aerial mapping, review of reports and studies, and field reconnaissance, as appropriate.

- *Noise-sensitive land uses* – New or expanded transportation infrastructure and/or increased vehicular or rail traffic may adversely affect noise-sensitive land uses. Such uses typically include residences, community centers, libraries, schools, hospitals, and houses of worship. Sensitive land uses within 500 feet of the alignment of a roadway-based alternative or within 1,500 unobstructed feet of the alignment of a rail transit alternative were identified through review of aerial mapping, reports and studies, and field reconnaissance, as appropriate.

- *Known hazardous substance sites* – Although there is a general trend toward encouragement of brownfield cleanup, disturbance of known or suspected hazardous waste sites is considered an adverse effect from an EIS perspective, as regulatory requirements for either in situ remediation or removal would pose cost and schedule implications for implementation of an alternative. The number and locations of any known or suspected hazardous waste sites that may be disturbed during construction of an alternative's required infrastructure were identified through review of the US Environmental Protection Agency's (USEPA) CERCLIS Special Report and the National Priorities List of Superfund sites, and applicable NJDEP and NYSDEC databases. Alternatives should seek to avoid disturbance of contaminated sites.

- *Air quality* – Given the current moderate non-attainment status of the region with regard to the 8-hour ozone standard[4], the potential effect of an alternative on regional emissions of ozone

[4] USEPA Region 2, April 15, 2004.

precursors, primarily nitrogen oxides (NOx) and volatile organic compounds (VOC), is a measure of whether conformance with the requirements of the Clean Air Act would likely be achieved by a given alternative. In addition, as the region is also designated as a non-attainment area for PM2.5[5], the potential effect of an alternative on regional particulate emissions was also quantified. Potential regional air quality effects of each alternative were evaluated based on GTM forecasts of VMT and VHT resulting with a given alternative and MOBILE 6 (i.e., USEPA's emission factor algorithm model) estimates of NOx, VOCs, and particulates, and reported as tons of each pollutant.

Related to Criterion C-4, alternatives were considered more desirable if they would result in fewer and less significant adverse environmental effects on protected natural and sensitive manmade resources, and have the potential to improve regional air quality.

Criterion C-5 – An alternative should be capable of being constructed without extraordinary techniques, with feasible maintenance of existing transportation services during construction, and at reasonable cost comparable to other alternatives with similar benefits. Construction- and cost-related evaluation measures have been defined to address practical considerations of each alternative's feasibility and implementation, relative to other alternatives. While this criterion is not directly derived from the project goals, practical construction and cost factors may serve to differentiate between alternatives that otherwise perform similarly against the other comparative screening criteria. Four evaluation measures were defined, as described below:

- *Degree of construction complexity* – The degree of complexity involved in construction of an alternative's new or expanded infrastructure was qualitatively assessed (as low, medium, high), based on preliminary review of any notably difficult alignment or site conditions, non-standard construction techniques that may be required, etc.
- *Duration of construction period* – The length of construction is included in the screening of alternatives because it is assumed that alternatives requiring new infrastructure will likely result in temporary construction-period impacts (e.g., traffic disruption, noise from construction equipment, etc.) and, consequently, alternatives with shorter construction periods would likely be more desirable. The number of months required for construction of an alternative was estimated based on professional estimates of work similar to that required for a given alternative, including construction activities required and degree of construction complexity. The estimates of duration of construction did not include the time required for pre-construction studies and design, receipt of necessary permits and approvals, or awarding of construction contracts.
- *Feasibility of traffic maintenance and protection* – As the existing Goethals Bridge is a critical link in the Staten Island bridges' and region's transportation systems, it is imperative that travel in the corridor, particularly during peak commutation periods, be protected and maintained, to the maximum extent possible. The feasibility of maintaining construction-period traffic flows in the Goethals Bridge corridor was qualitatively assessed (as high, medium, low), based on examination of potential sequencing of construction activity, availability of alternate travel routes and options, etc.
- *Order-of-magnitude construction and/or initial capital cost* – The principal elements of a given alternative's implementation cost may comprise construction of new infrastructure and/or procurement of vehicles (e.g., rolling stock, buses, or ferries for rail, bus, or ferry transit alternatives, respectively). The cost of new infrastructure was based on an approximation of square- or linear-feet of construction required, multiplied by respective standard unit costs for

[5] State of New Jersey DEP, February 13, 2004; State of New York DEC, February 13, 2004.

each major construction component, and expressed in 2005 dollars. Standard cost estimation techniques and factors were used, and a 20 percent contingency was added uniformly to all construction cost estimates to allow for unknown costs. The initial capital cost of any new vehicles, such as may be required for a transit alternative, was based on review of appropriate transportation agencies' costs for similar types of equipment. The order-of-magnitude cost estimates were pertinent to the comparative screening of the intermediate alternatives but do not represent actual expected construction costs, such as would be developed in significantly greater detail for more fully developed projects. Alternatives that would be substantially more costly than others but without similarly substantial, positive performance against the other screening criteria were considered less desirable than those that would more cost-effectively satisfy the project purpose and need.

Related to Criterion C-5, alternatives were considered more desirable if, compared to other alternatives, they would entail comparatively lesser construction complexity, a shorter construction period, lower total cost, and could more feasibly protect and maintain traffic during the construction period.

3.0 Preliminary Alternatives

3.1 No-Action Alternative

The No-Action alternative represents the reasonably foreseeable future conditions that will occur in the Goethals Bridge corridor and study area, if the proposed Goethals Bridge replacement or other alternative to address the proposed project's purpose and need is not implemented. The resulting social, economic, and environmental effects of taking no action constitute the future baseline against which the potential effects of implementing the project (or "build") alternatives are compared. Ultimately, the No-Action alternative and evaluation of its consequences provide decision-makers with a benchmark for comparing the nature and magnitude of potential effects of the various project alternatives.

Definition of the No-Action alternative includes programmed and committed projects that are scheduled to be implemented by the analysis years considered in the GBR EIS (i.e., estimated time of completion (ETC) + 20 years, which is assumed, for purposes of the screening evaluation, to be 2030). Programmed and committed projects are those that: 1) have completed all applicable review and approval processes; 2) have obtained available or committed funding; 3) have been included in the Transportation Improvement Plan (TIP) of either of the two New York/New Jersey area's Metropolitan Planning Organizations (MPO) (i.e., the New York Metropolitan Transportation Council [NYMTC] and the North Jersey Transportation Planning Authority [NJTPA]); and/or 4) are considered to be regionally significant and would normally be included in the modeling of an MPO's transportation network. Plans, initiatives, and projects that have progressed sufficiently to be deemed programmed and committed were identified through investigation and review of current planning and project development activities in the Goethals Bridge corridor and in the broader New York/New Jersey region. Other plans and projects that are in earlier phases of project development and, therefore, are not included in the definition of the future No-Action condition have nonetheless been identified to characterize the planning context within which the proposed Goethals Bridge replacement is being considered. Note that the list of programmed/committed projects and ongoing/planned studies identified below represents the conjecture and assumptions considered in mid-2006 when such screening effort was then conducted. Therefore, the list below does not represent the most current update on such projects or studies. Those more up-to-date statuses are actually presented separately in Appendix C of the main EIS Document.

3.1.1 Goethals Bridge

The No-Action alternative assumes that the Goethals Bridge will not be replaced. However, given continued and increasing repair and maintenance needs and related questions of structural integrity associated with the 78-year-old bridge, the No-Action alternative includes future rehabilitation activities in addition to routine maintenance.

The 2005 major rehabilitation and repair contract (on the order of $65 million) involved interim repairs expected to extend the life of the structure for another 7 to 10 years. After that period, a complete deck slab replacement with seismic retrofit will be required to keep the bridge in service. Various superstructure and substructure maintenance repairs may also be required at that time. The deck replacement would occur over a span of 4.5 to 5.5 years if conducted during daytime hours, with attendant closures of two lanes of traffic on the bridge. If deck replacement were to be conducted at night, construction would take 7 to 8 years and involve nighttime closure of two lanes and possible full closure of the roadway in one direction. Deck slab replacement costs would vary from $125 – $225 million, depending on the selected deck system, construction duration, and maintenance of traffic plan specifics.

Following the deck replacement, the Goethals Bridge's geometric and design deficiencies (10-foot lane-widths; lack of shoulders; approach span grade and alignment), and consequent functional obsolescence, would remain and could not be rectified. The functional obsolescence would likely continue to contribute to reduced traffic capacity and unsatisfactory service levels, cumulatively resulting in diminished traffic performance and traveler safety. Following the deck replacement and other rehabilitation work anticipated to be required in 7 to 10 years, ongoing maintenance and periodic major rehabilitation projects would continue to be needed to keep the Goethals Bridge in service in future decades.

3.1.2 Programmed and Committed Projects

The No-Action alternative encompasses future transportation and land use development projects and any public policies or policy changes that are programmed and committed to be implemented within the analysis timeframe assumed in the screening evaluation (i.e., 2030). As described above in Section 2.0, programmed and committed projects are those that have completed all applicable review and approval processes, and have obtained available or committed funding. In addition, programmed and committed transportation projects are included in the TIPs of the regional MPOs (i.e., NYMTC and NJTPA) and/or are regionally significant.

3.1.2.1 Transportation Projects and Enhancements

Projects that are programmed and committed for implementation and would potentially affect travel in the Goethals Bridge study area were identified through review of NYMTC's and NJTPA's TIPs, as well as project-specific reports and other documentation, and through consultation with project sponsors and public agencies. Locations of the identified programmed and committed projects are shown in Figure 3-1.

The programmed and committed projects are as follows:

- *Staten Island Expressway Median Bus Lane Extension, Staten Island* – In November 2005, the New York State Department of Transportation (NYSDOT) opened east- and westbound exclusive bus lanes in the median of the Staten Island Expressway (SIE) between Slosson Avenue and the Verrazano-Narrows Bridge toll plaza. The bus lanes, which operate between these limits on a 24-hour/7-day basis for both directions of travel, were developed as an interim transitional step in the process of ultimately implementing the recommendations in the SIE Major Investment Study (*Staten Island Expressway Corridor Major Investment Study, Final Report*, NYSDOT, December 2002). (See Transportation Studies Section 3.1.3.1 below regarding current NYSDOT studies on the median lanes.)
- *West Shore Expressway Corridor/Service Road Improvements, Staten Island* – NYSDOT is reconstructing various expressway interchanges to improve arterial network distribution on the West Shore of Staten Island. Service roads from the SIE interchange to Victory Boulevard have been designed, and construction is scheduled for completion by 2010.
- *Staten Island Railroad (SIRR) Reactivation for Freight Rail, Staten Island and New Jersey* – Two agencies are involved in responsibility for this project to provide freight rail service and, ultimately, intermodal capability between New Jersey and the New York Container Terminal (NYCT) at Howland Hook in Staten Island. The Port Authority is working on the New Jersey portion of the SIRR line, while the NYC EDC is concurrently working on the New York portion of the line, including the Arthur Kill Lift Bridge.

  As part of the project, the Port Authority constructed the Northern Rail Connector between the SIRR line and the Chemical Coast Railroad Secondary Line, which is owned and operated by

Consolidated Rail Corporation (a subsidiary of the Norfolk Southern Railway Corporation and CSX Transportation, Inc.). This new rail connector provides a direct link between Staten Island and the national rail network and replaces the connections once provided by car float between St. George and Port Ivory, New York, and Port Newark, New Jersey.

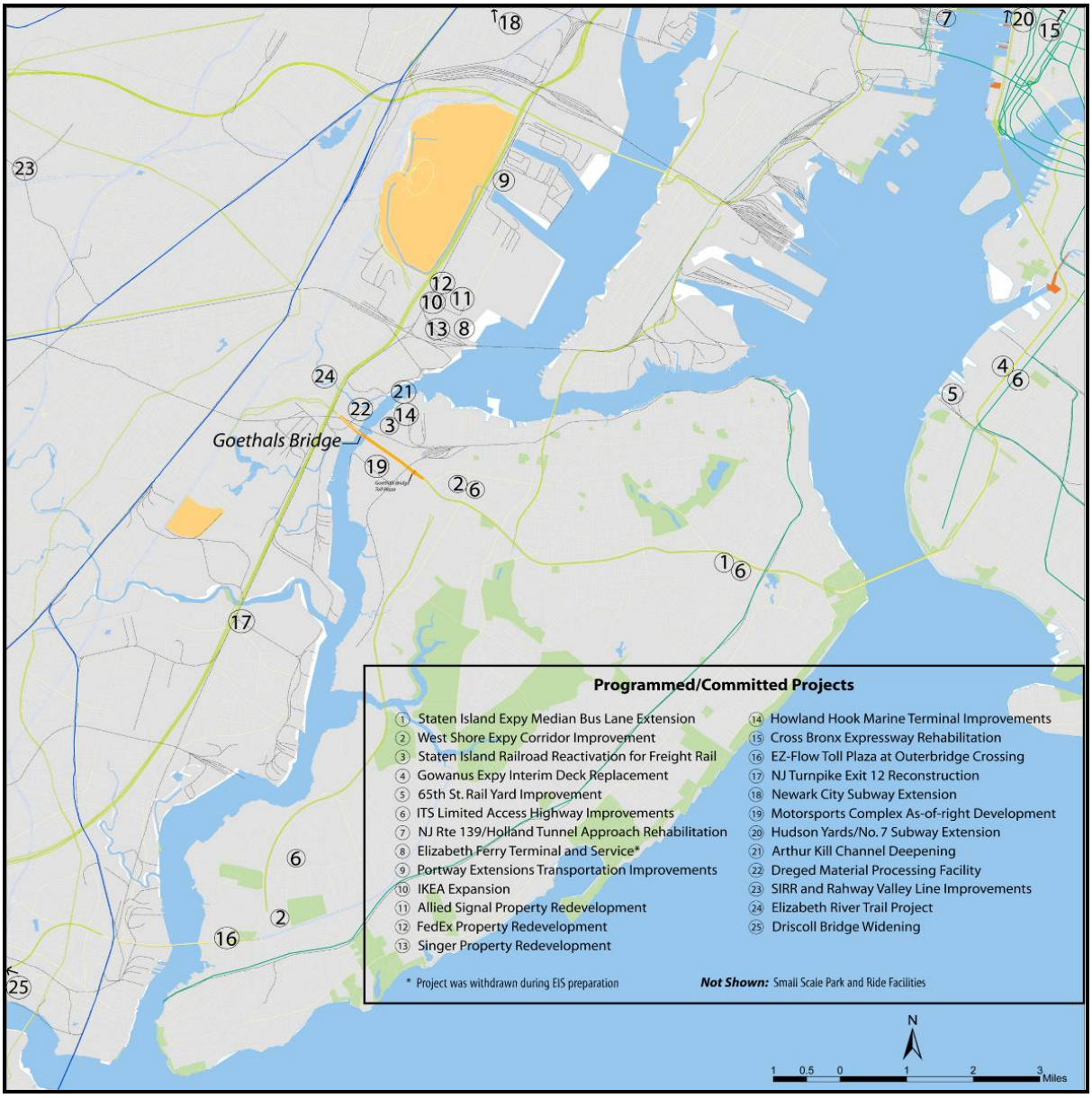

FIGURE 3-1: PROGRAMMED AND COMMITTED PROJECTS IN STUDY AREA

(Subsequent to this programmed and committed SIRR Reactivation project, if warranted by future rail volumes, the Port Authority may evaluate a Southern Rail Connector between the SIRR line and the Chemical Coast Secondary Line; at this time, there is no committed schedule nor allocated funding.)

The NYCEDC, with funding from various sources, began work in 2003 to restore the Arthur Kill Lift Bridge and portions of the SIRR line on the north and west shores of Staten Island. This project includes rail lines serving New York City's Arlington Yard, which was rehabilitated with Port Authority funds, and a new intermodal rail terminal that the Port Authority is building on the site of the former Procter and Gamble site at Port Ivory (which will be operated by NYCT) and the aforementioned rail connector between the Arthur Kill Lift Bridge and the Conrail mainline. The project on Staten Island also includes the Travis Branch, which bisects the Goethals Bridge Study Area and extends south to the Travis neighborhood of Staten Island to serve commercial and manufacturing activities on the west shore of Staten Island, including the NYC Department of Sanitation's transfer station at Fresh Kills for the conveyance of solid waste. With the reactivation of rail freight services along the SIRR completed in Spring 2007 and the growth of businesses servicing the terminal at Howland Hook, it is anticipated that freight movement between New Jersey and Staten Island will grow substantially in the future and promote a higher demand for manufacturing, warehouse, and distribution uses in the regional area.[6]

- *Gowanus Expressway Interim Deck Replacement, Brooklyn* – NYSDOT is bidding a series of four contracts for the replacement of 1.8 million square feet of concrete deck of the Gowanus Expressway. This is an interim measure to curb deterioration while awaiting completion of the Gowanus Expressway DEIS and subsequent action. Deck replacement construction is under way for the viaduct from 92nd Street to the Brooklyn-Queens Expressway Interchange. Construction is expected to be completed in 2011.
- *65th Street Rail Yard Improvement, Brooklyn* –NYCEDC is improving operation of the 65th Street Rail Yard and its associated rail float bridge. Existing on-street rail rights-of-way between Brooklyn waterfront rail yards will also be improved, with construction expected to be completed in 2007. NYCEDC is currently seeking proposals from shipping industry companies to operate two distinct parcels within the 65th Street Rail Yard. The more southern of the two parcels, roughly 18 acres, incorporates 14 rail tracks (a classification yard) that are connected to the two electric gantry float bridges. The northern parcel (15 acres) of the Rail Yard has an intermodal area with water frontage. The outcome of NYCEDC's solicitation for facility operators is not known at this time.
- *Intelligent Transportation Systems (ITS) Limited Access Highway Improvements Program, New York City* – NYSDOT is implementing an ITS network on all limited access highways in the New York metropolitan region, slated to be completed by 2010. A series of closed-circuit cameras, loop detectors, variable message signs, and a regional data center will be in place at completion.
- *NJ Route 139/Holland Tunnel Approach Rehabilitation, Jersey City* – The New Jersey Department of Transportation (NJDOT) will rehabilitate the 12th and 14th Street viaducts, which are part of the Route 139 approaches in Jersey City connecting Routes 1/9 to the Holland Tunnel.

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[6] A Feasibility Study of the North Shore Railroad Right-of-Way, commissioned by the PANYNJ on behalf of the Office of the Staten Island Borough President, was prepared in March 2004 by the URS Corporation. This planning initiative for the 5.1-mile rail line (which is the direct eastern extension of the SIRR between Arlington Yard and St. George Ferry Terminal) was intended to evaluate the feasibility of reintroducing passenger transit services. In July 2006, study funding was contained in a 2006 spending transportation bill cleared by the Senate Appropriations Committee, which approved $3 million for a detailed feasibility study of the plan.

The project, scheduled for completion in December 2008, includes re-decking of the viaducts and structural repairs. The project does not entail provision of additional roadway capacity.

- *Elizabeth Ferry Terminal and Service, Elizabeth* – A new ferry terminal, located just off Exit 13A on the NJ Turnpike, near the Jersey Gardens Mall, was planned to be constructed to serve passengers destined for Lower Manhattan. This project was taken into consideration for the No-Action Alternative, but has since been withdrawn.
- *Portway Extensions Transportation Improvements, New Jersey* – NJDOT is implementing a program of systems, operational, and infrastructure improvements for the primary purpose of accommodating the movement of freight containers to, from, and through port facilities in Newark, Elizabeth, Jersey City, and Bayonne, and the major intermodal rail yard facilities in Newark, South Kearny, Secaucus, and Jersey City. A series of 11 transportation improvements were recommended, of which one has been constructed and two are under construction (completion slated for 2006). Two are in final design or final scope development, while the remaining improvements are still in the feasibility assessment stage.
- *Cross-Bronx Expressway Rehabilitation* – NYSDOT is rehabilitating all of the bridges that cross or support the Cross Bronx Expressway (CBE) as part of a $200 million dollar rehabilitation program. Construction on two of the easternmost bridges (East Tremont Avenue over the CBE, and the CBE over Randall Ave) is under way. Rehabilitation of the deck of the Alexander Hamilton Bridge, to incorporate full shoulders, is currently in the design stage.
- *NJ Turnpike Exit 12 Reconstruction Project* - The NJ Turnpike Authority is performing final engineering to rebuild Exit 12 (Roosevelt Avenue) in Carteret. Designed to relieve truck traffic through the area, the reconstruction plan calls for constructing new flyover ramps linking to Roosevelt Avenue, widening existing bridges, building a new road (with a bridge over the Rahway River) to the Tremley Point industrial area of Union County, increasing the number of toll booths, and demolishing several oil tanks in the area. The project has three distinct phases, with the first encompassing local road improvements; the second focusing on reconstruction of the interchange and toll plaza; and the final phase focusing on construction of the new connector road. The project is expected to be finished by mid-2007. The first phase was completed in December 2005. Construction of the second phase is expected to be completed by 2009. For the proposed connector road to Tremley Point in the third phase, an environmental assessment is anticipated to be needed before final approvals are received and it is programmed and committed.
- *Arthur Kill Channel Deepening Program* – As part of a U.S. Army Corps of Engineers' program to deepen channels in the Port of New York and New Jersey the deepening of the existing 35-foot Arthur Kill navigation channel will provide for a 41-foot MLW channel from its confluence with the Kill Van Kull and Newark Bay Channels to the NYCT at Howland Hook in Staten Island, and a 40-foot MLW from the Terminal to the ConocoPhillips (Tosco) Oil Terminal and former GATX sites in New Jersey and New York, respectively. The Program also plans to deepen the Arthur Kill from its confluence with the Kill Van Kull and Newark Bay Channels to the New York Container Terminal to 50 feet. Also included are selected widenings and realignments of the channel, as well as a 23-acre wetland mitigation program. Deepening work in the Arthur Kill to 41 feet was initiated in July of 2003, with completion scheduled in 2007.
- *Small-Scale Park and Ride Facilities, Staten Island* – NYSDOT has allocated $8 million to continue an ongoing program to develop small-scale park and ride facilities on Staten Island, primarily on the west shore.
- *Staten Island Transportation Initiatives, Staten Island* – In his 2006 State of the City Address, NYC Mayor Bloomberg announced that the City's Transportation and Planning Departments would undertake a 60-day study to identify a package of initiatives designed to address the

Borough's growing traffic congestion. In March 2006, 40 preliminary recommendations for easing traffic congestion on Staten Island – including a short-term action plan of 17 initiatives to be implemented within the next year -- were presented to the Staten Island Transportation Task Force. The initial projects focus on improvements to roadway (traffic flow and safety concerns at specific high-priority locations; freight rail improvements; and passenger transit service enhancements. Completion of a land-use analysis to identify corridors for potential public/private improvements, implementation of a public education/outreach program, and enhanced interagency coordination were also included.

- *Freight Rail Improvements, New Jersey* – Restoration of the Staten Island Railroad from Cranford to Linden, which was expected to be completed in fall 2005 with the exception of grade crossing signals, was delayed due to funding issues. As of end of 2007, it is expected to be completed and operational by July 2008. The Morristown & Erie Railway was hired by Union County to repair the Staten Island Railroad and the Rahway Valley Line, from Cranford northwest to Summit, and to restore freight rail service in the center of the County. Work was suspended in 2006 due to lack of funding. As of end 2007, New Jersey State and Union County officials have noted that restoration of the final link to Summit may be years from completion.
- *Driscoll Bridge Widening over Raritan River, New Jersey* – On April 10, 2006, a new span crossing the Raritan River was opened for south- and northbound traffic on the Garden state Parkway whiled the existing spans undergo a $50–60 million rehabilitation, including re-decking. Upon completion of the program in 2009, the new and rehabilitated structures will provide a total of 15 widened travel lanes. The new bridge will have seven lanes for southbound traffic, while the existing bridge will be reconfigured with eight northbound lanes.

In addition to the above-listed transportation projects that are expected to be implemented in the future, existing *travel demand management (TDM) and transportation system management (TSM) programs* are expected to be enhanced and expanded as integral elements of the transportation system in the Goethals Bridge study area and the NY/NJ region. Therefore, they are considered part of future baseline conditions.

TSM programs are designed to improve the efficiency of the existing transportation system through use of technology and operations management enhancements. Examples of TSM enhancements include *intelligent transportation system (ITS) programs* to deploy sensors and cameras to monitor traffic flow and alert drivers to traffic conditions through variable message signs. Enhancements of current monitoring and variable message sign systems are proposed for future implementation in the respective TIPs prepared by NYMTC and NJTPA.

Another example of TSM includes high-speed *E-ZPass toll collection systems*. Currently, the Port Authority has implemented 25-miles-per-hour (mph) E-ZPass lanes at the Goethals Bridge and George Washington Bridge, thereby increasing the capacity of the toll plazas at those facilities. The Port Authority has implemented 45-mph E-ZPass toll collection at the Outerbridge Crossing and is considering similar implementation at the Goethals Bridge and its other facilities.

TDM programs are designed to reduce vehicular travel demand while maintaining adequate levels of mobility. In their long-range Regional Transportation Plans (RTP), NYMTC and NJTPA indicate support for two broad types of TDM initiatives: employer-based programs and incentives implemented by Transportation Management Associations (TMA). TDM initiatives likely to be expanded in the future, irrespective of the outcome of the proposed Goethals Bridge replacement studies, include the following:

- *Incentives for Telecommuting* – While financial subsidies to encourage telecommuting are not typically provided by TMAs or government agencies, TMAs can play a significant role in

reaching out to and educating businesses about the benefits of telecommuting, e.g., reduced or eliminated commute time and stress for employees, increased productivity, improved morale, lower absenteeism, and office space savings.

- *Corporate Programs for Time-Staggered Work Hours* – Similarly to the incentives for telecommuting, TMAs can play an active role in reaching out and educating businesses about the benefits of time-staggered work hours.

3.1.2.2 Land Use Development Projects

Programmed and committed land use development projects that have the potential to affect travel demand across the Goethals Bridge and in the study area include:

- *Jay Cashman Dredged Material Processing Facility* – Bounded to the north by Clifton Street (just north of the SIRR line), to the east by the Arthur Kill, to the south by the Goethals Bridge, and to the west by South Front Street, this proposed facility will redevelop the former Borne Chemical Site on the property located at 632-650 South Front Street. The developer, Jay Cashman, Inc. submitted an application for a Waterfront Development Permit to the New Jersey Department of Environmental Protection (NJDEP), Office of Dredging and Sediment Technology on June 15, 2006 for the construction and operation of a full-scale upland pug-mill dredged material processing facility and associated infrastructure (truck staging/ weighing area and offices). Construction, estimated at $1.4 million, will also include rehabilitation of an existing dilapidated bulkhead. The developer plans to bring the dredged material from the Arthur Kill and the Kill van Kull to the site using scow barges. Portland cement, obtained from the nearby cement company on South Front Street, and other additives approved by the NJDEP would be added, and the hardened material would be unloaded from the barge and placed in an upland holding area. From there, the material would be loaded onto tandem dump trucks for delivery to the Meadowlands.

  This proposed development conforms to the *South Front Street Redevelopment Plan*, a planning initiative of the City of Elizabeth seeking to redevelop the former Borne Chemical site with specific permitted land uses and building requirements. Approved by the City of Elizabeth on May 5, 2005, the purpose of the plan is to transform the underutilized and obsolete properties into more useful and valuable resources. Permitted land uses in the plan range from light manufacturing, warehouse distribution, office and trucking-oriented businesses to waterfront facilities and marinas. Prohibited uses identified in the plan include many of the uses that currently exist in the vicinity of the redevelopment area, such as residential, retail, petrochemical industrial uses, tank storage, junkyards, and truck terminals. The plan's building requirements include an 80-foot height restriction, a requirement of one off-street parking space for each 7,500 square feet of gross floor building area for buildings other than offices and one off-street space for each 1,000 square feet of office space, and a requirement for each off-street loading space to be at least 20,000 square feet. According to the Elizabeth Planning Department, this Redevelopment Area may be expanded to include properties near the Goethals Bridge. Under the Redevelopment Plan, the City intends to redevelop the entire area as an industrial district to attract businesses that require direct transportation access to the regional and national transportation network.

- *New York Container Terminal (NYCT, operator of Howland Hook Marine Terminal) Improvements, Staten Island* – The Port Authority is working with the NYCT and the City of New York to develop both on-site and associated off-site transportation expansions and improvements for this vital port facility for containerized cargo. With the phasing of potential improvements through 2018, this redevelopment program involves: extension of the existing ship

berth by 500 linear feet to accommodate three ships simultaneously (completed in 2005); reconfiguration of berth and container operations (currently under way); redevelopment of the former Procter and Gamble site into a 38-acre intermodal rail terminal and 48-acre warehousing and container area; and reactivation of the Staten Island Railroad including the Arlington Yard (just east of NYCT) and the rehabilitated Arthur Kill Lift Bridge (completed in 2007).

Hudson Yards/No. 7 Subway Extension EIS, New York – The New York City Department of City Planning (NYCDCP) and the Metropolitan Transportation Authority – New York City Transit (MTA-NYCT) completed a FEIS of rezoning and redevelopment of Manhattan's Far West Side and extension of the No. 7 subway to serve the area. The project includes: adoption of zoning map and text amendments to the New York City Zoning Resolution and related land use actions to permit the development of Hudson Yards as a mixed-use community (roughly 26 million square feet of office space, 13.6 million square feet of residential space, 1 million square feet of hotel space, and 1 million square feet of retail space); the extension of the No. 7 Subway Line with two new stations (10th Avenue at 41st Street and 11th Avenue at 34th Street); expansion of the Jacob Javits Convention Center; a new Multi-Use Facility (this project element is no longer being considered); and new garages for the New York City Department of Sanitation (NYCDOS) and the NYC Police Department's tow pound. The New York City Council has approved the amendments to the zoning resolution and the expansion of the Javits Center. The MTA Board has approved the extension of the subway line. Funding for the subway extension, which has been proposed to be through Tax Increment Financing from development projects that will be enabled by the rezoning, has not yet been finalized. Final preliminary engineering leading to procurement of tunnel engineering contractors is currently under way.

- *Redevelopment of Allied Signal Site, Elizabeth* - A portion of this former manufacturing site is to be redeveloped for a 1 million square foot warehouse to support port-related cargo by 2010; the utilization of the remainder of the site is yet to be determined. The project developer is in the process of obtaining permits from the New Jersey Department of Environmental Protection.
- *Fed-Ex Distribution Center Redevelopment, Elizabeth* – This former manufacturing site is identified for redevelopment for 500,000 square feet of space for use by Federal Express, some time after 2020.
- *Singer Manufacturing Site Redevelopment, Elizabeth* – This former warehouse site is to be redeveloped for 445,000 square feet of office space and 100 residential units by the year 2020.
- *Elizabeth River Trail Project, Elizabeth* – The trail, a greenway project that will run from Broad Street to Mattano Park, will provide for pedestrian and bicycle travel along the banks of the Elizabeth River. The Union County Open Space, Recreation and Historic Preservation Trust Fund approved a $500,000 grant to Groundwork Elizabeth, a non-profit corporation dedicated to fostering sustainable community regeneration, to design and construct the Elizabeth River Trail Project. The project also received an earmark of $400,000 in SAFETEA-LU for design and construction of the trail.

3.1.3 Ongoing/Planned Studies within the Study Area

Numerous studies of potential projects within the study area are ongoing, with decisions, necessary approvals, and funding for their potential implementation not yet obtained. These projects, listed below, are not considered part of the No-Action alternative, as the projects are not programmed and committed and the likelihood of their implementation is uncertain. However, the GBR EIS studies coordinated with these other studies as they progressed to identify any that became programmed and committed during the GBR EIS study timeframe. Any such projects were then incorporated in the No-Action alternative, and factored into the EIS studies.

3.1.3.1 Transportation Studies

- *Cross Harbor Freight Movement EIS, New York* - NYCEDC is proposing a rail freight tunnel between Brooklyn and New Jersey. The proposed tunnel alignment, across New York Harbor, would connect the east side of the Hudson River to the national rail network in New Jersey. This would allow freight destined for Long Island to continue on rail to a location closer to its final destination, rather than being transferred to trucks for transport on the region's highway network (including the Goethals Bridge corridor). The project DEIS was completed. The Cross Harbor Project received a $100 million earmark in SAFETEA-LU funding.
- *Verrazano-Narrows Bridge Study for Toll Plaza Rehabilitation, New York* - A study will be performed to evaluate the condition of the existing toll booths, toll plaza tunnel pavement, utilities and lighting systems, signage and traffic interchange in and around the toll plaza.
- *Verrazano-Narrows Bridge Rehabilitation, New York* - This project is to rehabilitate the Brooklyn on-grade approach to the Verrazano-Narrows Bridge. The anchorages will be rehabilitated and sealed to protect the structure from moisture penetration. In addition, a study will be performed to determine the feasibility of widening the Belt Parkway ramps in order to facilitate reconstruction and allow for two-lane access to and from both the upper and lower levels of the bridge.
- *NYC BRT Study, New York* – MTA-NYCT, the New York City Department of Transportation (NYCDOT), and NYSDOT are studying the possible introduction of Bus Rapid Transit (BRT) in New York City. The study is currently developing concept plans for 15 corridors that have been identified as having BRT potential, including one in Staten Island – extending from the Verrazano-Narrows Bridge, along Hylan Boulevard and Richmond Avenue to the Staten Island Mall. This will be followed by development of detailed BRT implementation plans for the five best corridors. Completion of the study and beginning of the selected projects' implementation is scheduled for 2008. The project sponsors anticipate that at least one BRT corridor will be developed in each borough.
- *Gowanus Expressway DEIS, Brooklyn* - In addition to the interim deck replacement for the Gowanus Expressway, NYSDOT and the Federal Highway Administration (FHWA) are preparing a DEIS to consider longer-term improvement options. The project alternatives being evaluated in the DEIS include: a No-Build/maintenance alternative; a relief viaduct; full viaduct rehabilitation; and one or more tunnel alternatives. Five tunnel alternatives were proposed for evaluation in the DEIS. NYSDOT and the study's Community Stakeholder Group conducted a screening process and selected a single tunnel alternative to be advanced for analysis in the DEIS. Completion of the Record of Decision is scheduled for early to mid-2009.
- *Bronx Arterial Needs Major Investment Study, Bronx* – This study was completed in March 2004, and focused primarily on the Cross Bronx Expressway and the Major Deegan Expressway. The study assessed travel conditions and problems within these corridors, and conceptual plans were developed to implement programs, projects and strategies to help optimize the movement of people and goods. Special consideration was given to the Highbridge Interchange, which provides a connection between the Cross-Bronx and Major Deegan Expressways. At this time, further development of the alternatives has not occurred, nor has full environmental review been undertaken for any of the study's components.
- *Staten Island West Shore Land Use & Transportation Study, Staten Island* – The NYCDCP has initiated a comprehensive assessment of land use issues and transportation needs along the West Shore of Staten Island. The study is reviewing the status of properties in this part of the borough to assess development constraints and potentials in light of significant pressure for new development. In addition, the study is assessing transportation needs associated with

development planning for the area, notably including the need for north-south access connections to roadways and to other transportation transit services. A final report is anticipated to be completed in 2006.

- *Staten Island Transportation Initiatives, Staten Island* – In his 2006 State of the City Address, NYC Mayor Bloomberg announced that the City's Transportation and Planning Departments would undertake a 60-day study to identify a package of initiatives designed to address the Borough's growing traffic congestion. In March 2006, 40 preliminary recommendations for easing traffic congestion on Staten Island—including a short-term action plan of 17 initiatives to be implemented within the next year—were presented to the Staten Island Transportation Task Force. The initial projects focus on improvements to roadway (traffic flow and safety concerns at specific high-priority locations; freight rail improvements; and passenger transit service enhancements. Completion of a land-use analysis to identify corridors for potential public/private improvements, implementation of a public education/outreach program, and enhanced interagency coordination were also included. [Multiple locations, not delineated on Figure 3-1.]
- *South Shore Fast Ferry Landing, Staten Island* – Development of a fast-ferry terminal on a 4.5-acre parcel in Pleasant Plains on the South Shore of Staten Island is under study. The City of New York is in negotiations for $6 million purchase of the waterfront parcel, near the former Camp St. Edward property on which a developer is currently constructing 100 townhouses. If implemented, the proposal for fast ferries to carry Staten Island commuters from Mid-Island and the South Shore to Manhattan is anticipated to be in place by 2008.
- *Canal Street Area Transportation Study, Phase II, New York* – This new corridor study, being managed by NYMTC on behalf of concerned member agencies, includes assessment of projected future conditions in the Canal Street corridor and development and evaluation of strategies to address anticipated worsening of traffic congestion, with implications for its capacity, reliability, and connectivity with the regional transportation network in both New York and New Jersey. The study also may investigate additional transportation system management and regulatory strategies that would affect traffic flow in the corridor, with potential implications for other interstate corridors within the metropolitan area.
- *Staten Island Transit Enhancement Study, New York* -- The Staten Island Economic Development Corporation (SIEDC) commissioned an independent investigation of the feasibility of creating a LRT service to serve the borough's West Shore, proposing a phased plan including extension of the LRT via the Bayonne Bridge to a connection with the Hudson-Bergen Light Rail Transit (HBLRT) system. The initial study was completed in July 2004, and forwarded through NYMTC to the pertinent member agencies for their review and comments, which are pending. In order to build ridership, the first phase would consist of a BRT system running from the Richmond Valley area of Staten Island to the HBLRT station at 22nd Street in Bayonne, at which point, Manhattan-bound riders would transfer to the Port Authority Trans-Hudson (PATH) transit system to complete their journey. The envisioned LRT construction would begin in Phase II and extend from the HBLRT to the former GATX property off Bloomfield Road. Phases II and III would comprise a Minimum Operable Segment (MOS) that could provide effective service to the West Shore. An optional final Phase IV would involve construction of a spur leading to the Staten Island Mall. As ISC has purchased the GATX property, the potential of developing the further phases is unlikely. Portions of this study are presumed to be subsumed in NYCDCP's West Shore Transportation and Land Use Study.
- *Staten Island Expressway Median Lane Study, Staten Island* – NYSDOT is currently evaluating bus and HOV lane alternatives considered in the SIE Major Investment Study (NYSDOT, 2002), as well as other potential bus and HOV alternatives. If feasible, bus lanes or bus/HOV lanes may be extended westward in the next phase of construction from the current terminus at Slosson

Avenue to Victory Boulevard and ultimately to the Goethals Bridge toll plaza. Initial studies are anticipated to be completed by late 2006; if feasibility is established, additional study and design are projected to be completed in 2008.

- *Reconstruction of West Shore Expressway/Staten Island Expressway Interchange* – Reconstruction of this interchange is planned by NYSDOT to support possible future bus/HOV lane expansion and improvements on the SIE and planned improvement in the Goethals Bridge corridor, and to provide better connections to the New York Container Terminal at Howland Hook. Preliminary design is currently scheduled for 2009.
- *NJ Turnpike Widening Study, New Jersey* – Former Acting New Jersey Governor Codey announced a plan to extend the separation of "car-only" and "car-truck" lanes from their current terminus near Exit 8A in Middlesex County, south to Exit 6 in Burlington County. This stretch of the Turnpike is one of the busiest and most congested, with a reported total of 120,000 daily drivers in both directions. Currently, the project is in the proposal stage. The New Jersey Turnpike Authority will undertake planning, environmental review, engineering and design work. Completion of the project is expected to take 7 to 10 years.
- *NJ Turnpike Interchange Study, New Jersey* – The NJTA is examining all interchanges on the New Jersey Turnpike north of Exit 8A in Middlesex County, with the exception of Interchange 13 in Elizabeth (for which studies will be undertaken after the Port Authority of New York and New Jersey's plans for the Goethals Bridge are finalized). The purpose of the study is to examine traffic flows and congestion at each of the intersections, determine which intersections are in greatest need of relief, and develop conceptual designs to improve traffic conditions at the priority interchanges.
- *Newark-Elizabeth Rail Link (NERL) MOS-2 and MOS-3, New Jersey* – In addition to the initial operating segment that is currently under construction, two additional segments have been planned, but have not been programmed and committed. MOS-2 calls for an extension of the system from downtown Newark to Newark Liberty International Airport. MOS-3, redesignated as Union County Light Rail, would further extend LRT service from Newark Liberty International Airport to downtown Elizabeth and Elizabethport, and include a cross-county connection to Cranford. The future of MOS-2 is uncertain, as no work beyond the DEIS has been undertaken. A Supplemental DEIS (SDEIS) has been prepared for MOS-3, as the initial design did not extend into Elizabethport, nor did it include the cross-county connection. A Supplemental Final EIS (SFEIS) for MOS-3 is pending. The future of MOS-3 is uncertain, as it is unknown whether the project can proceed without the development of MOS-2.
- *Palisades Interstate Parkway Connector Ramp, New Jersey* – The Port Authority is studying potential alignments for connecting the Palisades Interstate Parkway to the lower level of the George Washington Bridge. A construction contract for the design is expected to be let in December 2006.

3.1.3.2 Land Use Development Studies

- *Comprehensive Port Improvement Plan, New York and New Jersey* – Preparation of a Comprehensive Port Improvement Plan (CPIP) for the Port of New York and New Jersey (PONYNJ) was initiated by federal, State, and local agencies and the Port Authority to determine how best to plan for handling future growth in ocean-borne cargo volumes in an economically and environmentally sustainable manner. Based on CPIP forecasts of future cargo volumes to the year 2060 and estimates of the port facilities' assessed capacities, CPIP has concluded that capacity shortfalls will not occur for several decades (i.e., not until the 2030s and 2040s, varying by the type of cargo) and, therefore, that major port improvements are not required in the near-term. The CPIP Plan is intended to serve as a framework for planning and implementation of

future port and associated transportation improvements to support cargo volume growth in the PONYNJ.

- *Development of Former GATX and Duke Energy Properties* – The former GATX and Duke Energy properties, which together comprise 675 acres immediately south of the Goethals Bridge, are located south of Old Place Creek and are bounded by the West Shore Expressway to the east, by the Arthur Kill to the west, and Bloomfield Avenue to the south. The portion of the properties near the Goethals Bridge includes undeveloped lands and wetlands and brownfield properties. The site has been the focus of several recent development proposals. In 2005, the International Speedway Corporation (ISC) proposed to construct and operate a speedway for National Association for Stock Car Auto Racing (NASCAR) events. The development was proposed to include a ¾-mile oval track with grandstand seating for up to 80,000 spectators; related parking, buildings and services; a year-round regional retail center; and a ferry landing and helicopter pad. In March 2006, the NYC Department of City Planning issued a Positive Declaration (CEQR No. 05DCP043R) and requested the preparation of a Draft Environmental Impact Statement. However, faced with local opposition and concerns about the project's effects on traffic on Staten Island, ISC dropped its plans for the site's development and sought a purchaser for the property. In 2007, ProLogis, a developer of distribution warehouses, expressed interest but the corporations could not agree on the terms of sale.

  Prior to abandoning its plan for the racetrack, ISC stated that, if the proposed project failed to receive approval, the project site would likely be developed as-of-right, under its existing M2-1 and M3-1 zoning designations, with approximately 270,000 gross square feet (gsf) of retail space and 2.6 million gsf of industrial use. This as-of-right development was assumed for purposes of the travel demand forecasting for the alternatives screening process, since the racetrack proposal was still under study and could not be considered programmed and committed.

- *Fresh Kills Park Master Plan, New York* – A master plan has been developed to remediate and reuse the former Fresh Kills landfill as a natural habitat park on Staten Island. Called Fresh Kills Lifescape, this multi-agency effort comprises three phases of landscape development over the course of the next 30 years. The project also proposes construction of an access road to the park from the West Shore Expressway. With completion of the master plan, the environmental review process was initiated in 2006, with anticipated completion in 2007, at which time design and construction would begin.

- *Staten Island Growth Management, Staten Island* – In January 2006, New York City Mayor Bloomberg announced a series of efforts to counter overdevelopment on Staten Island. The Staten Island Growth Management Task Force will consider zoning proposals made by the NYCDCP to curtail commercial development in specific areas of the Borough; develop new rules for all commercial districts to direct appropriate commercial development; coordinate with the West Shore Land Use and Transportation Planning Study (see Transportation Studies Section 3.1.3.1, above) to create a planning framework for the area.

- *Stapleton Waterfront Development Plan, Staten Island* – Redevelopment of the former 36-acre U.S. Navy Homeport Site in the Stapleton section of Staten Island has been proposed by NYCEDC, in collaboration with NYCDCP. The mixed-use development proposal includes creation of a waterfront esplanade and public open space, 350 residential units, a restaurant banquet facility, sports complex, local retail, farmers market, parking and commercial uses. The proposal also seeks to encourage complementary private mixed-use development, including 288 residential units, parking and rail uses on adjacent parcels located between Front Street and the Staten Island Rapid Transit right-of-way. The proposal, which is currently in planning and environmental review with a DEIS scheduled for spring 2007, would require approvals for street mapping/demapping and rezoning actions to accommodate the mixed-use developments. The

proposed project, which is anticipated to be completed in 2015, has received a $66 million initial investment from NYC to implement the infrastructure improvements associated with the Plan over the next 5 years

- *Howland Hook Marine Terminal Improvements, Staten Island* – New York Container Terminal (NYCT), operator of the Howland Hook Marine Terminal in the northwest corner of Staten Island, has proposed improvements to increase the capacity of the terminal to accommodate forecasted growth of 12 percent/year. A business decision concerning further development of HHMT will be made regarding two principal alternatives: 1) development of the 38-acre Parcel C of the 124-acre former Procter and Gamble site, on the northern waterfront of HHMT into a high-efficiency container terminal, with a new berth measuring 1,200 and 220 feet in length and width, respectively; and 2) efficiency and capacity improvements on-site without or with partial expansion onto Parcel C. With Parcel C development, the necessary environmental review process would be conducted concurrently with design, followed by construction, assuming receipt of approvals. With either alternatives, new access and egress ramps to/from the Goethals Bridge are proposed to handle anticipated growth in truck traffic. The existing berth has been dredged to 45 feet and further deepening of the channels leading to NYCT and berth to 50 feet is scheduled for completion in late 2010.
- *Downtown Brooklyn Redevelopment Projects, Brooklyn* – Various project development initiatives have been undertaken for the redevelopment of Downtown Brooklyn. NYCDCP has proposed a series of zoning and development changes to expand the downtown Brooklyn Central Business District by about 4.5 million square feet of office space and nearly 1 million square feet of retail space. Forest City/Ratner Associates has purchased the NBA Nets franchise and intends to locate them in a proposed new facility over the Atlantic Avenue Rail Yards of the Long Island Rail Road. The redevelopment around the yards would include about 2 million square feet of office space and 300,000 square feet of retail space.
- *Union County, New Jersey, Studies* – Transportation and development initiatives in Union County include current planning initiatives and engineering work geared to improving the accessibility of the Elizabethport district of that city and adjacent Union County communities. Proposals include the NERL extension, mentioned above, for which a Final EIS has still to be completed; the North Avenue Corridor Improvement project; improved access/egress from NJ Turnpike Exit 12 to Tremley Point, mentioned above; and a planning study for a potential parking facility and commuter bus transfer facility adjacent to the Turnpike at North Avenue in Elizabeth.
- *Downtown Newark Redevelopment Projects, New Jersey* – Officials from the City of Newark have unveiled a new downtown redevelopment plan that creates a new Downtown Core Redevelopment District within walking distance of Newark Penn Station. Major new redevelopment elements envisioned for the downtown district include up to 4 million square feet of office space, 500,000 square feet of new retail, a nationally branded hotel, a new Board of Education and City Municipal Building, new parking garages, and an arena to be the home of the New Jersey Devils NHL hockey team. The City created the Newark Downtown Core Redevelopment Corporation, comprised of local area leaders to oversee the redevelopment district and plan. The first stage of the redevelopment plan has been formalized with a letter of intent signed by the Devils to play as the primary tenant of the arena in 2007/2008, and construction of the arena is under way. The City expects to designate a master developer for the Downtown Core Redevelopment District shortly. Sites have been identified for certain elements, but the City has not yet established a timeline for these developments, nor have final design plans been developed.
- *Portfields Initiative* – A project of the Port Authority and the New Jersey Economic Development Authority (EDA), the Portfields Initiative is a study to provide financial support to private

developers, communities and others to identify and transform brownfields and other underutilized sites within the Port of New York and New Jersey (defined as an area with 25-mile radius from the Statue of Liberty) into productive properties for Port-related warehousing and distribution operations. Each site will have a feasible development potential for a minimum of 350,000 square feet of competitive building space for ocean or air freight cargo distribution. Nearly 20 such sites, ranging in size from 16 to 300 acres, have been identified and are under consideration for development in the municipalities of Kearny, Newark, Elizabeth, Linden, Carteret, and Perth Amboy, New Jersey.

3.1.4 Projects Completed during Preparation of GBR DEIS

- *EZ-Flow Toll Plaza at the Outerbridge Crossing* – The Port Authority has installed high-speed E-ZPass lanes at the Outerbridge Crossing to produce an unobtrusive open road through the toll plaza. To prepare the toll plaza for Express E-ZPass, three tollbooths were removed and replaced with overhead gantries that house electronic equipment for reading toll tags and identifying toll violators. Overhead signs have been posted on approach roads leading to the toll plaza. A concrete barrier before and after the toll plaza separates Express E-ZPass customers from slower-moving traffic. Construction was completed in June 2005.
- *Newark City Subway Extension to Newark Broad Street Station, New Jersey* – Formerly a part of the larger Newark-Elizabeth Rail Link (NERL) project, this is the first in a series of three minimum operable segments (MOS) of modern light rail transit (LRT) extensions of the Newark City Subway. The subway extension, between Broad Street Station and Newark Penn Station in downtown Newark, opened on July 17, 2006. LRT stations are located at Center Street (New Jersey Performing Arts Center), Atlantic Street, Washington Park, and at Riverfront Stadium.
- *IKEA Expansion, Elizabeth* – The existing IKEA facility was expanded with an additional 400,000 square feet of retail space and 30,000 square feet of office space, with completion in late 2005.

3.2 Preliminary Build Alternatives

Preliminary "build" alternatives that were identified for consideration in the alternatives screening process are transportation options that would directly address one or more aspects of the proposed project's purpose and need. Transportation options that would not directly address at least some aspect of the project purpose and need were not included as a preliminary alternative (see Appendix A for discussion of alternatives considered but not included, and the rationale for their dismissal). In addition to the primary consideration of addressing the project purpose and need, preliminary alternatives were defined based on:

- knowledge of the transportation system within the Goethals Bridge corridor and the broader New York/New Jersey region;
- data and information regarding existing transportation infrastructure, services, and technology;
- identification of future transportation improvements that are programmed and committed for implementation, as well as those in various stages of project planning and development;
- identification of potential travel needs and markets and/or obvious transportation gaps or deficiencies in the study area;
- review of alternatives presented in previous studies, including *Staten Island Bridges Program (SIBP) DEIS* (1995) and *FEIS* (1997), *Staten Island Expressway Corridor Major Investment*

Study (2002) and *North Shore Railroad Right-of-Way Feasibility Study* (2004), that may be pertinent to addressing the purpose and need, and project goals; and

- agency and public input received during the GBR EIS scoping process in Fall 2004.

Alternatives included in the SIBP EIS and other transportation studies and reports were reviewed to determine whether they have the potential to address some aspect(s) of the proposed Goethals Bridge replacement; those that would do so were refined and updated, as appropriate, to reflect the current transportation system, traffic conditions, and travel markets.

A total of 15 preliminary alternatives, described below, are listed by category in Table 3.1.

In addition to the 15 preliminary alternatives shown in Table 3.1, six alternatives suggested during the agency and public scoping process conducted during Fall 2004 were deemed to be not reasonable for consideration as preliminary alternatives. These suggestions included:

- Tunnel Replacement for Goethals Bridge;
- Wetlands-Avoidance Goethals Bridge Replacement;
- Double-Decked Replacement of Goethals Bridge;
- Two-Way Tolling on Verrazano-Narrows Bridge;
- Expanded Railcar Floating System; and
- New Bridge Coupled with Reuse of Existing Goethals Bridge as Two-Lane Truck-Only Facility.

The rationale for not advancing these suggestions as preliminary alternatives to be studied through the screening process is provided in Appendix A of this report.

TABLE 3.1: PRELIMINARY ALTERNATIVES

New-Crossing Alternatives	
1.	Bridge Alternative 1: Goethals Replacement Bridge South
2.	Bridge Alternative 2: Goethals Replacement Bridge North
3.	Bridge Alternative 3: Goethals Parallel Bridge South
4.	Bridge Alternative 4: Goethals Parallel Bridge North
5.	Bridge Alternative 5: Goethals Twin Replacement Bridges South and in Current Right-of-way
6.	Bridge Alternative 6: Goethals Twin Replacement Bridges North and in Current Right-of-way
Transit Alternatives	
7.	Transit Alternative 1: Bus Rapid Transit Service via New Goethals Bridge with Local Bus Service Enhancements
8.	Transit Alternative 2: Ferry Service between Brooklyn, St. George, and Elizabethport with Local Bus Service Enhancements (with or without New Goethals Bridge)
Travel-Demand-Management Alternatives	
9.	TDM Alternative 1: Temporal Shift (with or without New Goethals Bridge)
10.	TDM Alternative 2: Temporal, Payment, and Mode Shift (with or without New Goethals Bridge)
11.	TDM Alternative 3: Peak-Period Temporal Shift and Transit Support (with or without New Goethals Bridge)
12.	TDM Alternative 4: High-Occupancy Toll (HOT) Lane (with New Goethals Bridge)
Freight-Movement Alternatives	
13.	Freight Alternative 1: Highway Freight-Movement Enhancement (with New Goethals Bridge)
14.	Freight Alternative 2: Rail Freight-Movement Enhancement (with or without New Goethals Bridge)
15.	Freight Alternative 3: Intermodal Freight-Movement Enhancement (with or without New Goethals Bridge)

3.2.1 Preliminary New-Crossing Alternatives

The identification of preliminary new-crossing alternatives focused on the existing Goethals Bridge corridor, spanning the Arthur Kill to connect major roadway systems in Staten Island, New York, and Elizabeth, New Jersey. This geographic focus appropriately reflects the project's purpose and need and the crossing's critical role in the corridor. New-crossing alternatives were also focused on the existing corridor in order to minimize project-related environmental impact, compared to impacts that would be anticipated with introduction of a new crossing and associated highway infrastructure in an entirely new location.

Each preliminary new-crossing alternative comprised one or more new bridges in the Goethals Bridge corridor. (As described in Appendix A, a tunnel crossing in the Goethals Bridge was not deemed reasonable and feasible for consideration.) The preliminary bridge alternatives and their approaches would be located immediately north and south of the existing bridge and connect to New Jersey Turnpike Interchange 13 to the west and to the Staten Island Expressway to the east, consistent with the existing crossing's termini. The preliminary bridge alternatives identified within the Goethals Bridge corridor are as follows:

- Bridge Alternative 1: Goethals Replacement Bridge South, for eastbound and westbound traffic (Figure 3-2);
- Bridge Alternative 2: Goethals Replacement Bridge North, for eastbound and westbound traffic (Figure 3-3);
- Bridge Alternative 3: Goethals Parallel Bridge South for eastbound traffic with the existing structure reconfigured for westbound traffic (Figure 3-4);
- Bridge Alternative 4: Goethals Parallel Bridge North for westbound traffic with the existing structure reconfigured for eastbound traffic (Figure 3-5);
- Bridge Alternative 5: Goethals Twin Replacement Bridges South, one south of the existing right-of-way (ROW) for eastbound traffic and one in the current ROW for westbound traffic (Figure 3-6); and
- Bridge Alternative 6: Goethals Twin Replacement Bridges North, one north of the existing ROW for westbound traffic and one in the current ROW for eastbound traffic (Figure 3-7).

Replacement, parallel, and twin bridge structures would be designed and constructed to meet modern codes and standards. With the replacement bridge and twin bridge alternatives in the Goethals Bridge corridor, the existing span would be demolished and removed. With the twin bridge alternatives, the new bridge south or north of the existing bridge would be constructed first and would temporarily accommodate both directions of traffic until the existing bridge was demolished and the second bridge was constructed. With the parallel bridge alternatives, the existing span would be reconfigured, as noted above, to carry one direction of traffic. Traffic lanes would be upgraded to meet design criteria but the main span and approaches could accommodate only 4-foot-wide and 2-foot-wide right and left shoulders, respectively; the existing structure would require a full deck replacement and seismic upgrade.

Any bridge crossing within the Goethals Bridge corridor must accommodate projected traffic volumes safely and efficiently in order to be responsive to the project purpose and need. The appropriate number of travel lanes is generally determined on the basis of forecasted traffic, considering other transportation improvements in the corridor and region that may affect travel demand volume and, as appropriate, configuration for multimodal access across the bridge. Each preliminary bridge alternative, as presented

below, was defined to include a total of six lanes of traffic,[7] three in each direction, in order to normalize the initial analysis of future traffic effect with a proposed Goethals Bridge replacement:

- a replacement bridge would have six lanes;
- a parallel bridge would have three in combination with three on the reconfigured existing span; and
- twin bridges would each have three lanes serving one direction of travel, thereby totaling six lanes in combination.

Present safety standards and practices dictate the use of a median barrier and shoulders, as well as wider lanes. A new bridge crossing would also include adequate width to provide for bicyclists, pedestrians, and potential transit use. While the preliminary bridge alternatives identified below were defined only conceptually for the initial screening phase, those that were advanced to the comparative screening phase were further developed to a sketch-level of detail, including definition of their connections to logical termini in New York and New Jersey.

The preliminary bridge alternatives are described and depicted conceptually on the following pages.

[7] During the comparative screening phase of the alternatives screening process, the six-lane capacity concept for the preliminary new-crossing alternatives was evaluated against criteria defined to test an alternative's transportation performance. Based on the future traffic projections for the Goethals Bridge and corridor in coming decades, the proposed number of general-purpose travel lanes remained at six; additional measures to improve future transportation service on a new crossing were also investigated.

3.2.1.1 Bridge Alternative 1

Goethals Replacement Bridge South (Figure 3-2) – A new bridge would be designed and constructed south of and roughly parallel to the existing structure, and the existing bridge would be subsequently demolished and removed. The new 6-lane bridge would provide 12-foot-wide lanes, three in each direction, a 12-foot-wide right shoulder, and a 5-foot-wide left shoulder in each direction. In addition to vehicular travel lanes, the overall bridge cross-section would have adequate width to accommodate a sidewalk/bikeway (10-foot-wide) and potential transit service. In addition to reconstruction of the railroad bridge of the Staten Island Railroad's Travis Branch, located west of the existing toll plaza, toll plaza and local roadway improvements associated with the bridge replacement may also be included.

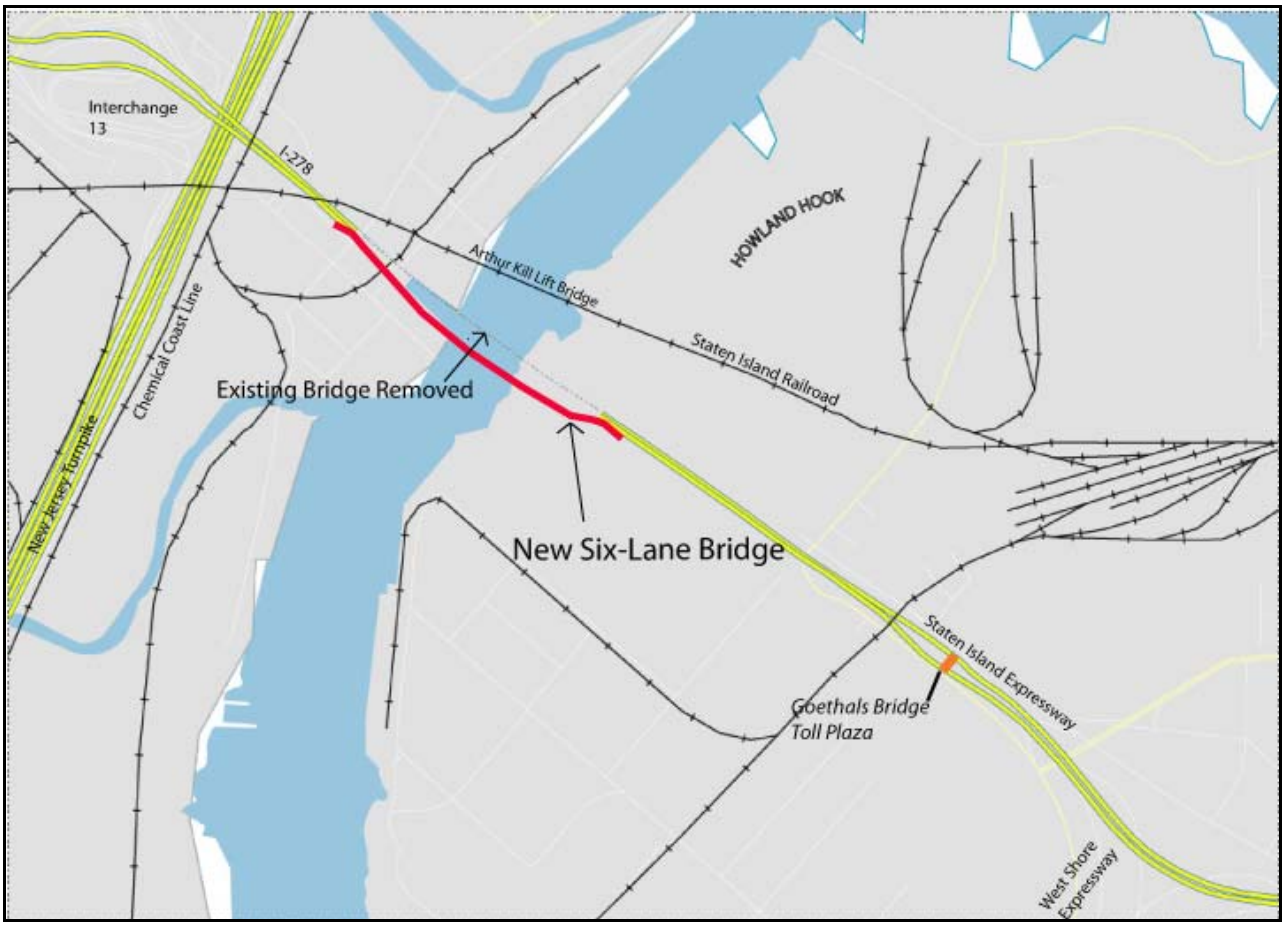


FIGURE 3-2: BRIDGE ALTERNATIVE 1: GOETHALS REPLACEMENT BRIDGE SOUTH

3.2.1.2 Bridge Alternative 2

Goethals Replacement Bridge North (Figure 3-3) – A new bridge would be constructed north of and roughly parallel to the existing bridge, which would be subsequently demolished and removed. As with the south replacement option, the new bridge would provide six 12-foot-wide lanes, three in each direction, and 12- and 5-foot-wide right and left shoulders, respectively. The overall cross-section would have adequate width to accommodate a 10-foot-width sidewalk/bikeway and potential transit use. In addition to reconstruction of the railroad bridge of the Staten Island Railroad's Travis Branch, located west of the existing toll plaza, toll plaza and local roadway improvements associated with the bridge replacement may also be included.

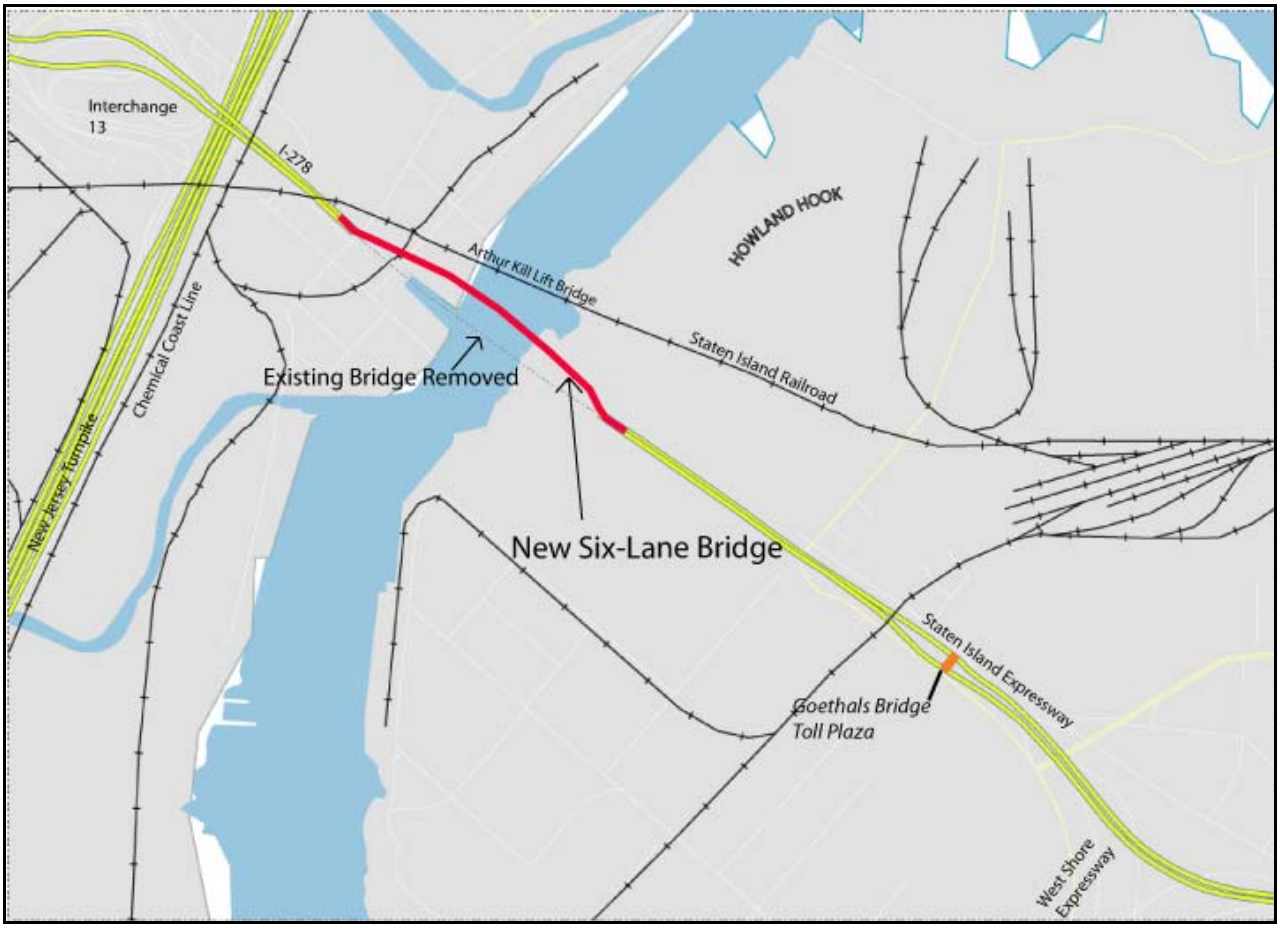


FIGURE 3-3: BRIDGE ALTERNATIVE 2: GOETHALS REPLACEMENT BRIDGE NORTH

3.2.1.3 Bridge Alternative 3

Goethals Parallel Bridge South (Figure 3-4) – A new 3-lane bridge, south of and roughly parallel to the existing Goethals Bridge, would be designed and constructed to carry eastbound traffic. The new structure would provide 12-foot-wide lanes; a 12-foot-wide right shoulder; a 5-foot-wide left shoulder; a 10-foot-wide walkway/bikeway; sufficient additional width to accommodate potential transit use; and associated toll plaza and possible local roadway improvements. The existing Goethals Bridge and its approaches would be reconfigured and partially reconstructed to convert it for three lanes of westbound traffic, in addition to 4- and 2-foot-wide right and left shoulders, respectively, along the main bridge span, and wider shoulders on the approaches. In addition to reconstruction of the railroad bridge of the Staten Island Railroad's Travis Branch, located west of the existing toll plaza, toll plaza and local roadway improvements associated with the bridge replacement may also be included.

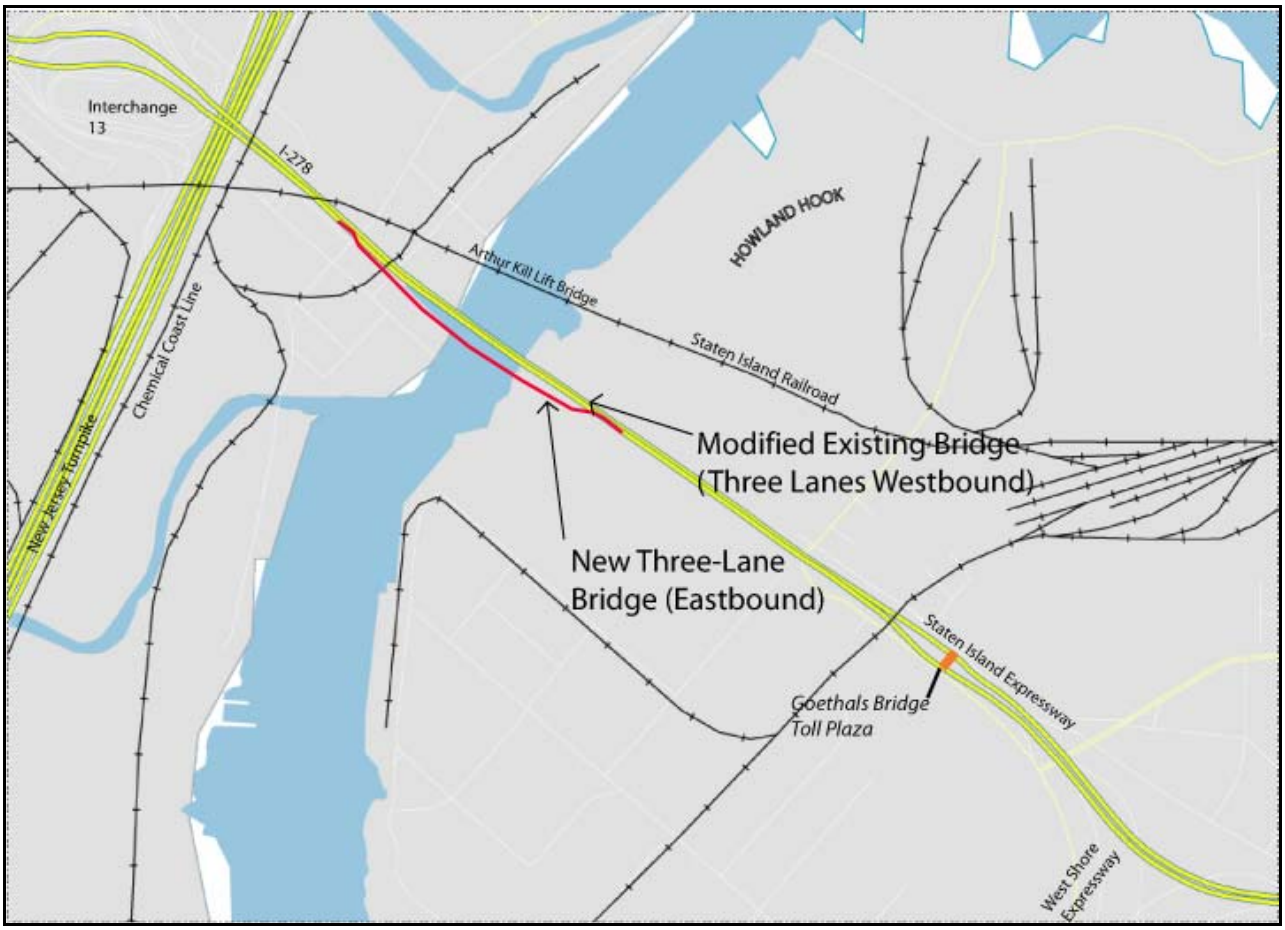


FIGURE 3-4: BRIDGE ALTERNATIVE 3: GOETHALS PARALLEL BRIDGE SOUTH

3.2.1.4 Bridge Alternative 4

Goethals Parallel Bridge North (Figure 3-5) – A new 3-lane bridge, north of and roughly parallel to the existing Goethals Bridge, would be designed and constructed to carry westbound traffic. The new structure would provide 12- and 5-foot-wide right and left shoulders, respectively; a 10-foot-wide walkway/bikeway; sufficient additional width to accommodate potential transit use; and associated toll plaza and possible local roadway improvements. The existing Goethals Bridge and its approaches would be reconfigured and partially reconstructed to convert it for three lanes of eastbound traffic, in addition to 4- and 2-foot-wide right and left shoulders, respectively, along the main bridge span, and wider shoulders along the approaches. In addition to reconstruction of the railroad bridge of the Staten Island Railroad's Travis Branch, located west of the existing toll plaza, toll plaza and local roadway improvements associated with the bridge replacement may also be included.

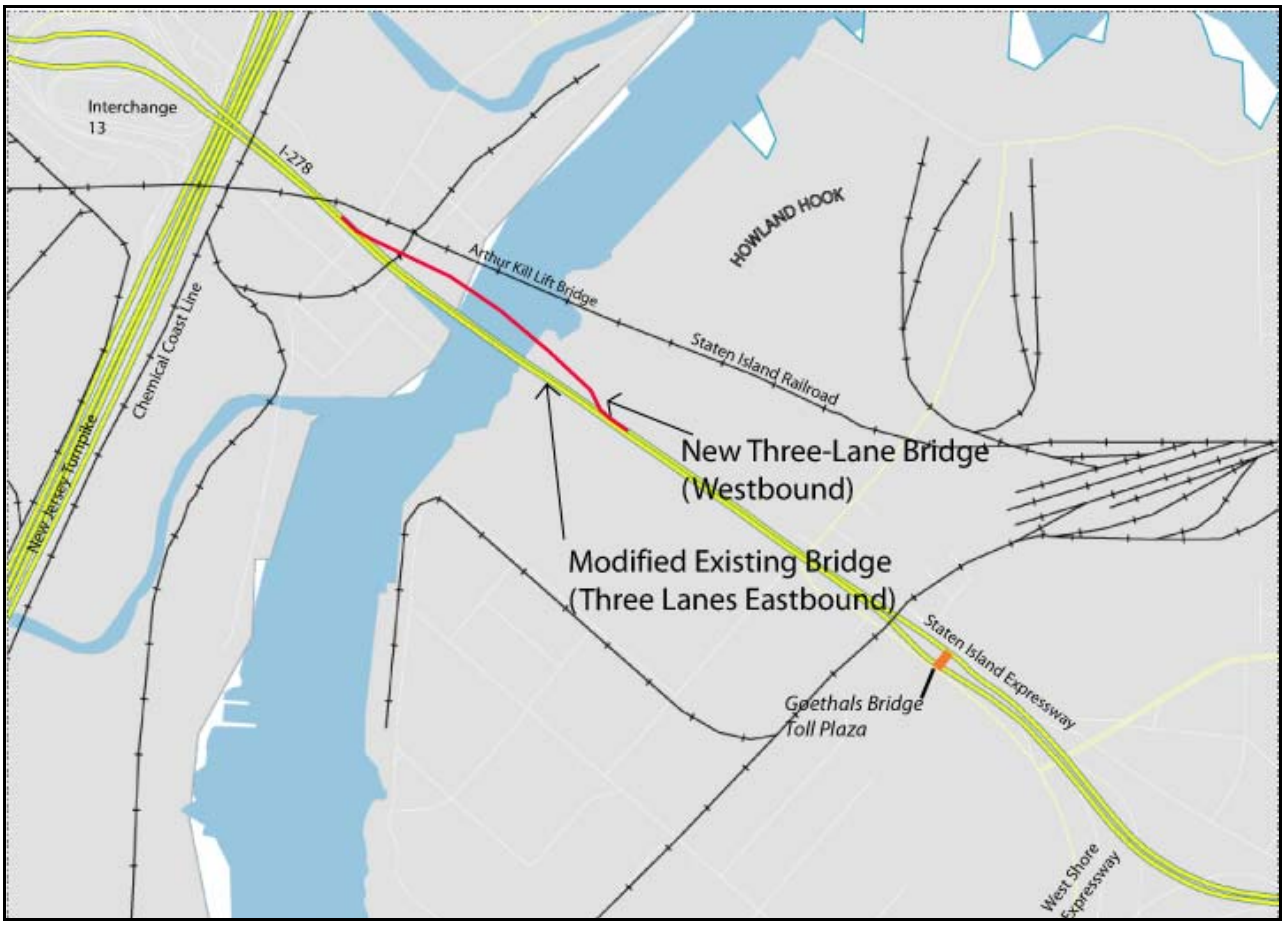


FIGURE 3-5: BRIDGE ALTERNATIVE 4: GOETHALS PARALLEL BRIDGE NORTH

3.2.1.5 Bridge Alternative 5

Goethals Twin Replacement Bridges South and in Current ROW (Figure 3-6) – A new 3-lane bridge, south of and roughly parallel to the existing Goethals Bridge, would be designed and constructed to carry eastbound traffic. A second new 3-lane bridge in the current Goethals Bridge ROW would be designed and constructed to carry westbound traffic. This twin structure would provide 12-foot-wide lanes, 12- and 5-foot-wide right and left shoulders, respectively; a 10-foot-wide walkway/bikeway; sufficient additional width to accommodate potential transit use. In addition to reconstruction of the railroad bridge of the Staten Island Railroad's Travis Branch, located west of the existing toll plaza, toll plaza and local roadway improvements associated with the bridge replacement may also be included.

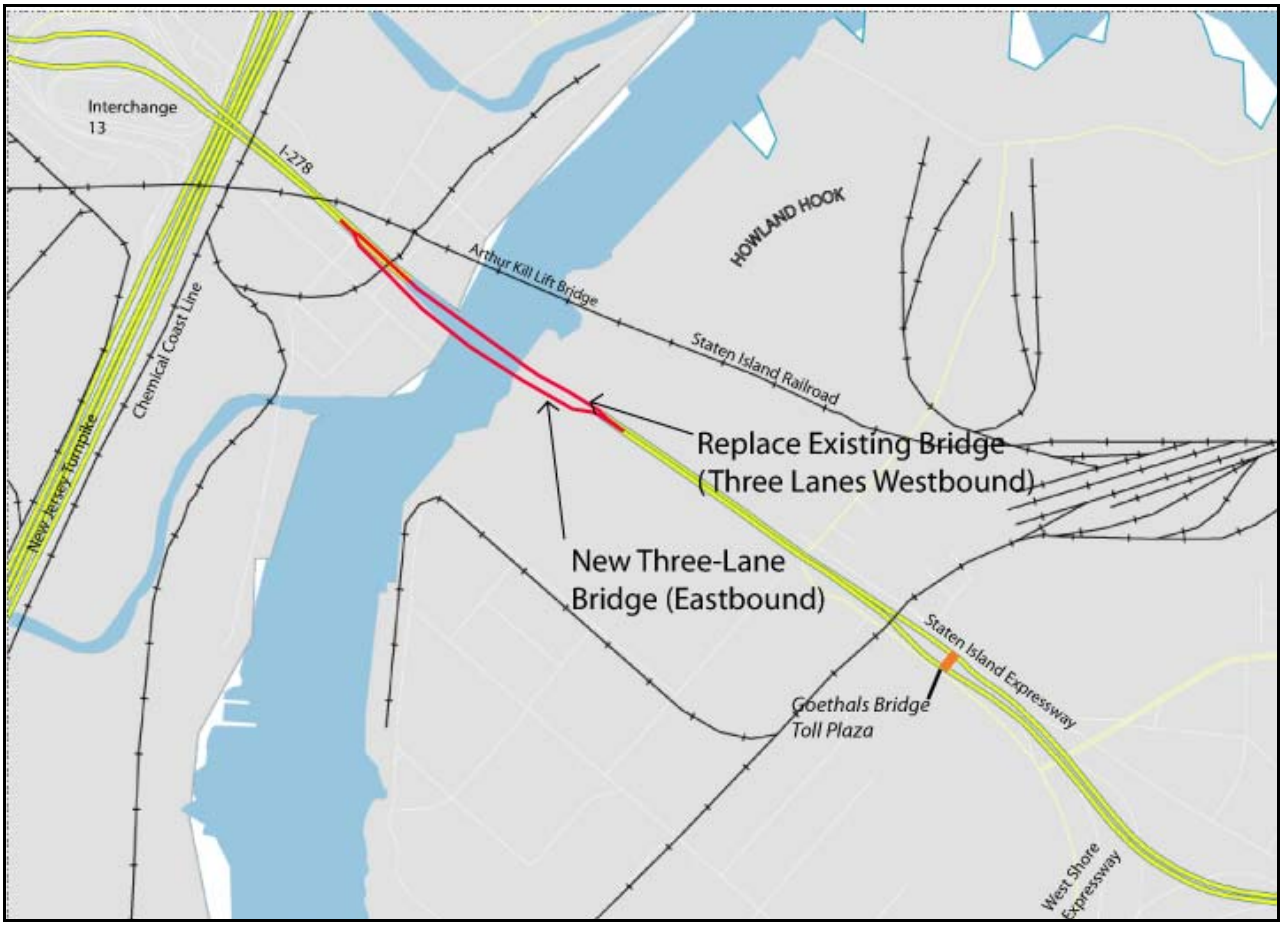


FIGURE 3-6: BRIDGE ALTERNATIVE 5: GOETHALS TWIN REPLACEMENT BRIDGES SOUTH

3.2.1.6 Bridge Alternative 6

Goethals Twin Replacement Bridges North and in Current ROW (Figure 3-7) – A new 3-lane bridge, north of and roughly parallel to the existing Goethals Bridge, would be designed and constructed to carry westbound traffic. A second new 3-lane bridge in the current Goethals Bridge ROW would be designed and constructed to carry eastbound traffic. This twin structure would provide 12-foot-wide lanes, 12- and 5-foot-wide right and left shoulders; a 10-foot-wide walkway/bikeway; sufficient additional width to accommodate potential transit use. In addition to reconstruction of the railroad bridge of the Staten Island Railroad's Travis Branch, located west of the existing toll plaza, toll plaza and local roadway improvements associated with the bridge replacement may also be included.

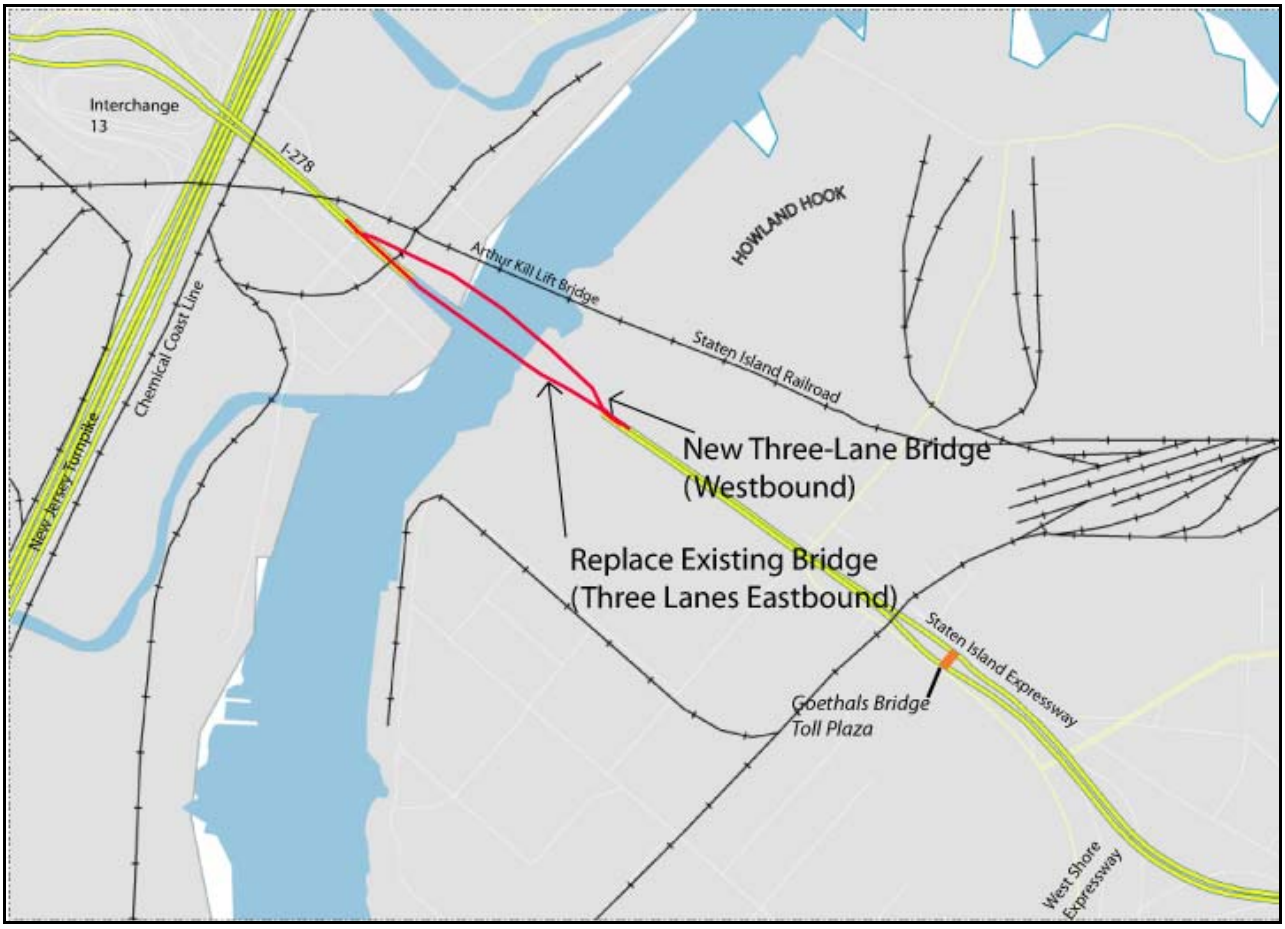


FIGURE 3-7: BRIDGE ALTERNATIVE 6: GOETHALS TWIN REPLACEMENT BRIDGES NORTH

3.2.2 Preliminary Transit Alternatives

3.2.2.1 Introduction

Transit alternatives developed to address the project purpose and need and related project goals should have direct relevance to the current and projected future market crossing the Arthur Kill on the Goethals Bridge span. Preliminary transit alternatives were identified through a process that involved:

- Collection of background information from prior studies, reports and traffic surveys;
- Identification of present, planned, and programmed transit services that define the future framework within which a transit alternative should be considered;
- Review of the above information to identify appropriate market, mode, and alignments for potential transit alternatives; and
- Agency and public comments received during the GBR EIS scoping process in Fall 2004.

Initial efforts to develop preliminary transit alternatives focused on the development, updating, and analysis of transit alternatives drawn from review of the following sources:

- United States Coast Guard (USCG)
  - Staten Island Bridges Program - Modernization and Capacity Enhancement Project Draft Environmental Impact Statement (SIBP DEIS) (1995).
  - Staten Island Bridges Program - Modernization and Capacity Enhancement Project Final Environmental Impact Statement (SIBP FEIS) (1997).
- City of New York Department of City Planning, Transportation Division
  - Staten Island North Shore Greenway-Preliminary Design Investigation (1998).
  - Northwest Staten Island Study – Phase I (1999).
- New Jersey Transit (NJ Transit)
  - Various documents for the Hudson-Bergen and Newark-Elizabeth Light Rail Transit Projects (2000-2003).
  - Various guides, schedules and maps for available public transportation services.
- New York State Department of Transportation (NYSDOT)
  - Staten Island Expressway Corridor Major Investment Study (SIE MIS) Final Report (2002).
- Port Authority of New York and New Jersey
  - Goethals Bridge Modernization – 100% Final Stage I/Phase I Design Submission – Volumes I and II (2003).
  - Goethals Bridge Modernization Program – Final Stage I/Phase II Report, Volumes I and II (2004).
  - Various guides, schedules and maps for PATH service.
- Port Authority of New York and New Jersey for the Office of Staten Island Borough President
  - Feasibility Study of the North Shore Railroad Right-of-Way (2004)
- Metropolitan Transportation Authority of New York (MTA)
  - Various guides, schedules, and maps for available public transportation services.

Although there is currently no common carrier, fixed-route bus, rail, or ferry service operating across the Goethals Bridge providing passenger transportation service directly between Staten Island and New Jersey, Red & Tan (Coach USA) currently operates two routes (122 and 144) across the Bayonne Bridge, connecting Staten Island with downtown Jersey City, and points in between. In addition, several MTA

Staten Island express bus routes operate over the Goethals Bridge to and from Manhattan via the Lincoln Tunnel, although these services do not embark or disembark passengers in New Jersey. There are also publicly subsidized and private van services that currently operate over the Goethals Bridge from Staten Island to New Jersey employment sites, but access to these services is limited to employees or service subscribers that meet various needs-based eligibility requirements.

Various forms, arrangements, and alignments of new bus, rail and ferry services were described in the above source documents. However, there was little or no mention of new interstate transit services over the Goethals Bridge, except in the SIBP DEIS and SIBP FEIS, and in the transit component of the NYSDOT Staten Island Expressway MIS.

3.2.2.2 Potential Transit Markets

One means of measuring the relevance of a new interstate transit link to the travelers who presently cross the Arthur Kill on the Goethals Bridge or would be expected to in the future is to look at the current use of the bridge. The Port Authority conducted a survey of the origins and destinations of eastbound drivers on the Goethals Bridge during peak periods of travel (2002-2003 Vehicular Customer Travel Surveys). Survey results were inflated proportionally by actual traffic volumes in order to reflect actual volumes of peak-period travel between origins and destinations.

In many cases, analysis of county-level origins and destinations did not provide sufficient detail for identifying potential transit markets, especially for the three counties immediately adjacent to the Goethals Bridge (i.e., Union and Essex counties in New Jersey and Richmond County in New York). Therefore, the data for these counties were further parsed using the zip codes of respondents' origins and destinations. Trips reported in the survey with a frequency of less than five days per week were weighed proportionally and added to trips reported as five or more days a week to produce a composite tally of origins and destinations for peak-period journeys across the Goethals Bridge on a typical weekday. The results are provided in Tables 3.2 through 3.7.

According to responses collected from eastbound drivers in the AM peak period:

- More than half of the trips (54 percent) were bound for Staten Island destinations, with Brooklyn as the second greatest concentration of destinations (30 percent) (Table 3.2).
- Only 3 percent of the trips were bound for Manhattan destinations (Table 3.2).
- Of the Staten Island-bound trips, over half (65 percent) were destined for northern areas of the Island (21 percent to Castleton Corners, 17 percent to St. George, 14 percent to Mariners Harbor) (Table 3.3).
- Almost half of the trips (42 percent) originated in Union and Essex counties (27 and 15 percent, respectively) (Table 3.4). Of these, the only notable concentrations of trips were from Newark (6 percent), Elizabeth (5 percent) and Linden (3 percent).

According to responses collected from eastbound drivers in the PM peak period:

- More than half of the trips (66 percent) were bound for Staten Island destinations, with Brooklyn as the second greatest concentration of destinations (23 percent) (Table 3.5).
- Only 1 percent of the trips were bound for Manhattan destinations (Table 3.5).

TABLE 3.2:
GOETHALS BRIDGE EASTBOUND AM PEAK-PERIOD TRIPS BY BOROUGH DESTINATION

Destination	Trips	Percent
New York City	4,533	93%
Staten Island	2,611	54%
Brooklyn	1,467	30%
Queens	297	6%
Manhattan	158	3%
Bronx	0	0%
Other (Outside NYC)	341	7%

TABLE 3.3:
GOETHALS BRIDGE EASTBOUND AM PEAK-PERIOD TRIPS BY STATEN ISLAND DESTINATION

Destination	Trips	Percent
North Shore	1,693	**65%**
St. George	457	**17%**
Port Richmond	131	**5%**
Mariners Harbor	375	**14%**
West New Brighton	179	**7%**
Castleton Corners	551	**21%**
East Shore	457	**17%**
Stapleton	201	**8%**
Rosebank	213	**8%**
New Dorp	43	**2%**
South Island	461	**18%**
Great Kills	81	**3%**
Princes Bay	98	**4%**
Eltingville	265	**10%**
Tottenville	16	1%

TABLE 3.4:
GOETHALS BRIDGE EASTBOUND AM PEAK-PERIOD TRIPS BY NEW JERSEY ORIGIN

Origin	Trips	Percent
Essex County	746	15%
Newark	276	6%
Other Essex County	469	10%
Union County	1,298	27%
Elizabeth	238	5%
Linden	131	3%
Other Union County	928	19%
Hudson County	187	4%
Middlesex County	786	16%
Morris County	200	4%
Bergen County	466	10%
Passaic County	105	2%
Somerset County	33	1%
Monmouth County	304	6%
Mercer County	64	1%
NJ West Other	83	2%
NJ South Other	152	3%
Other (Outside NJ)	451	9%

TABLE 3.5:
GOETHALS BRIDGE EASTBOUND PM PEAK-PERIOD TRIPS BY BOROUGH DESTINATION

Destination	Trips	Percent
New York City	7,809	95%
Staten Island	5,436	66%
Brooklyn	1,895	23%
Queens	398	5%
Manhattan	54	1%
Bronx	25	Less than 1%
Other (Outside NYC)	408	7%

TABLE 3.6:
GOETHALS BRIDGE EASTBOUND PM PEAK-PERIOD TRIPS BY STATEN ISLAND DESTINATION

Destination	Trips	Percent
North Shore	2,562	47%
St. George	274	5%
Port Richmond	317	6%
Mariners Harbor	440	8%
West New Brighton	120	2%
Castleton Corners	1,410	26%
East Shore	1,269	23%
Stapleton	493	9%
Rosebank	285	5%
New Dorp	490	9%
South Island	1,606	30%
Great Kills	335	6%
Princes Bay	286	5%
Eltingville	878	16%
Tottenville	108	2%

TABLE 3.7:
GOETHALS BRIDGE EASTBOUND AM PEAK-PERIOD TRIPS BY NEW JERSEY ORIGIN

Origin	Trips	Percent
Essex County	2,797	34%
Newark	221	3%
Other Essex County	2,576	31%
Union County	1,780	22%
Elizabeth	301	4%
Linden	425	5%
Other Union County	1,053	13%
Hudson County	309	4%
Middlesex County	890	11%
Morris County	619	8%
Bergen County	671	8%
Passaic County	344	4%
Somerset County	109	1%
Monmouth County	12	0%
Mercer County	61	1%
NJ West Other	74	1%
NJ South Other	54	1%
Other (Outside NJ)	498	6%

- Of the Staten Island-bound trips, nearly half (47 percent) were destined for northern areas of the Island (26 percent to Castleton Corners and 21 percent to other North Shore destinations) (Table 3.6). Another 30 percent were bound for southern Staten Island destinations and 23 percent were destined for the East Shore of the Island.
- Over half of the trips (56 percent) originated in Union and Essex counties (22 and 34 percent, respectively) (Table 3.7). Of these, the only notable concentrations of trips were from Newark (3 percent), Elizabeth (4 percent), and Linden (5 percent).

In New York State, Staten Island (54 percent) and Brooklyn (30 percent) were identified as the destinations for 84 percent of the eastbound bridge crossings in the AM peak period. This suggests that these boroughs may be the sites of employment for many New Jersey residents. The reverse seems also as likely, since 89 percent of the eastbound PM peak-period crossings were bound for Staten Island and Brooklyn (66 and 23 percent, respectively). However, the absolute number of commuters making these trips over the Goethals Bridge is relatively low (4,078 AM peak-period trips and 7,332 PM peak-period trips).

Eastbound AM peak-period traffic origins in New Jersey can serve as a proxy for identifying where the presumed commuters to Staten Island and Brooklyn work sites reside. However, the origins are dispersed over a broad area, suggesting no real significant concentration of trip origins for travel across the Goethals Bridge. Essex, Union and Middlesex counties represent a majority of trips (58 percent), but most of the trip origins were scattered throughout each county outside of major urban centers (i.e., Newark, Elizabeth and Linden). In terms of absolute numbers, all AM peak-period trips originating in Essex, Union and Middlesex counties amount to 2,829 trips over the Goethals Bridge, again, a relatively low number.

Eastbound PM peak-period traffic origins can serve the corresponding function of identifying where presumed commuters who reside in Staten Island and Brooklyn work. These trip origins are dispersed over a broad area, similar to the AM peak-period traffic origins. Essex, Union and Middlesex counties represent a majority of trip origins (67 percent), with few trips originating in urban centers. In terms of absolute numbers, all PM peak-period trips originating in Essex, Union and Middlesex counties amount to 5,466 trips over the Goethals Bridge, another relatively low number.

In summary, new transit alternatives that would have the greatest potential relevance for travelers using the Goethals Bridge would be interstate transit links connecting the two following sets of markets:

- In the State of New York:
  - Staten Island North Shore;
  - South Staten Island;
  - Staten Island East Shore; and
  - Brooklyn.
- In the State of New Jersey:
  - Essex and Union counties;
  - Middlesex County.

The question of whether to seek to improve Manhattan-bound transit service was somewhat difficult to answer with the available origin/destination survey data; these data are based on existing driver behavior, which may under-represent the potential Manhattan-bound transit market due to the unattractiveness of making that trip by private automobile. However, the data do indicate that there is limited potential for converting existing Goethals Bridge users to transit for a trip to Manhattan. In addition, there are already a number of transit services linking Staten Island and Manhattan, including the Staten Island Ferry and

various public and private express bus services. In particular, ridership information for the existing MTA express bus services crossing the Goethals Bridge indicates that close to 10,000 daily riders use these routes to travel between Staten Island and midtown Manhattan. However, while transit enhancements across the Goethals Bridge would provide improved service for these existing transit users, this does not necessarily indicate that there is latent demand for improved Manhattan-bound transit service. Based on this analysis, it does not appear that a new transit alternative directed principally towards the Manhattan commuting market would significantly reduce peak vehicular traffic volumes crossing the Goethals Bridge. However, over a longer time frame, the provision of enhanced transit alternatives across the Goethals Bridge may result in changes in land use and demographics that will improve the market for transit service to Manhattan (and other locations). Thus, the potential need for improved transit service to Manhattan in the long-term should not be dismissed, particularly over the lifetime of the proposed new infrastructure investment.

Reflecting all of these considerations regarding current and future travel patterns, the preliminary transit alternatives were principally directed toward the non-Manhattan-bound commuting markets (generally referred to as "reverse commute" and the "intra-suburban" commute markets). This orientation appears consistent with the growth in job markets outside of Manhattan over the past decade, which should have significant implications for public transportation. The bounds of this market were preliminarily defined as between Staten Island and Essex and Union counties in New Jersey and, to a lesser extent, expanded to include Brooklyn and Middlesex County, based on the results of the Port Authority survey of origins and destinations.

Cost-effectively expanding fixed-route transit service in a suburban environment for the non-traditional commuter, however, represents a meaningful challenge. Reverse-peak and intra-suburban work trips represent ever greater volumes of traffic; these are commuter groups that are difficult to attract to transit because the existing radial transit route structure was designed to serve the needs of traditional Central Business District (CBD)-bound commuters. There are three basic factors that make this market particularly challenging:

- Reverse-peak work trips for urban residents require that the suburban workplace be within a reasonable walking distance of a transit route.
- Intra-suburban work trips for suburban residents require that both the residence and the workplace be within a reasonable walking distance of a transit route.
- Due to the dispersed distribution of suburban employment centers, relatively few suburban work trips can be provided with a direct, one-seat ride on transit, as is often provided to the CBD-bound commuter. Coordinated bus connections at designated transfer centers can enhance transit's performance in low density areas, but only to a limited degree.

The ready availability of free parking at most suburban worksites further weakens transit's competitive position for the suburban commuter. The net effect of these factors is reflected in the marginal number of reverse commuters and the minimal number of intra-suburban commuters using public transportation for work trips today. These particular challenges call for the use of more flexible transit services, although the deployment of these services in a cost-effective manner, while providing an appropriate level of transit service, has not always followed easily from this conceptual understanding of the problem.

Modal selection also factors in the effectiveness of new fixed-route transit systems, which can include fixed-guideway, roadway-based, or waterborne transit systems. Determining which transit mode best suits a particular corridor typically requires extensive analysis that would be premature at the initial stage of alternatives development. Therefore, a set of generalized transit warrants were applied to the potential

interstate transit links described above to help identify what mode or modes may be most appropriate for inclusion in a preliminary transit alternative.

The transit warrants are based on the relationship between land use and the relative effectiveness of various transit modes in terms of cost-effectiveness, productivity, and efficiency. The warrants applied in this analysis were originally developed and refined for recent transit studies conducted in Portland, Oregon; the state of Delaware; Northeast Maryland; and Southeastern Pennsylvania, drawing information and guidance from the following sources:

- *Public Transportation and Land Use Policy* by Jeffrey Zupan and Boris Pushkarev (1977);
- *Transit Cooperative Research Program Report 16, Transit and Urban Form* (1996); and
- Transit Cooperative Research Program Report 100, *Transit Capacity and Quality of Service Manual* (2000).

All three references derived their original conclusions regarding land use/transit relationships from a national database of transit operations in which all New York City metropolitan area public transportation carriers were represented, as well as local and regional land use relationships. The research identified and evaluated various factors that influence the "appropriateness" of different transit modal applications. These included development density, distance, coverage, service frequency, passenger comfort, ridership levels, energy use, fuel consumption, capital costs, and operating and maintenance costs. The conclusion was that population density and employment concentration are the most significant determinants for where transit "works." In particular, the density and magnitude of the destination business district reflects the ultimate viability of a specific transit mode, while residential density at the origin end of a trip reflects what would constitute an acceptably viable service frequency.

Generally, researchers found that "higher-order" transit modes (e.g., rail transit) provide an attractive return on their investment for very high volumes of transit passengers—justifying their high financial and energy cost by their ability to transport many travelers very efficiently. At the other end of the spectrum, efficiency is optimized by using "lower-order" modes (e.g., local bus) having a cost-benefit comparison that is relatively more attractive for the lower density settings in which they operate.

A nomograph was produced to represent these relationships (Figure 3-8). The vertical axis of the nomograph is Downtown Employment Center Size in terms of millions of square feet of non-residential floor space. Various fixed-guideway and roadway-based transit modes were evaluated to identify potential GBR transit elements, based on this transit warrant's nomograph.

The nomograph illustrates the following relationships:

- Commuter rail systems are most suited to regions with very large downtowns, which attract large markets of long-distance commuters.
- Heavy rail, in comparison, operates most productively in corridors with very large downtowns and very high residential densities, which together can produce enough all-day ridership to justify the high financial and energy expenditures of the mode, to the point that heavy rail becomes the most appropriate choice in very high density settings.
- Light rail and bus rapid transit (including express bus), meanwhile, function as a slower, lower-cost, and lower-capacity version of heavy rail, and predictably operate most appropriately in areas with medium residential and employment densities.
- Local bus transit can be the best choice for areas with low to medium residential and employment densities, although some suburban residential densities are so low that no fixed route, fixed schedule bus option may be viable.

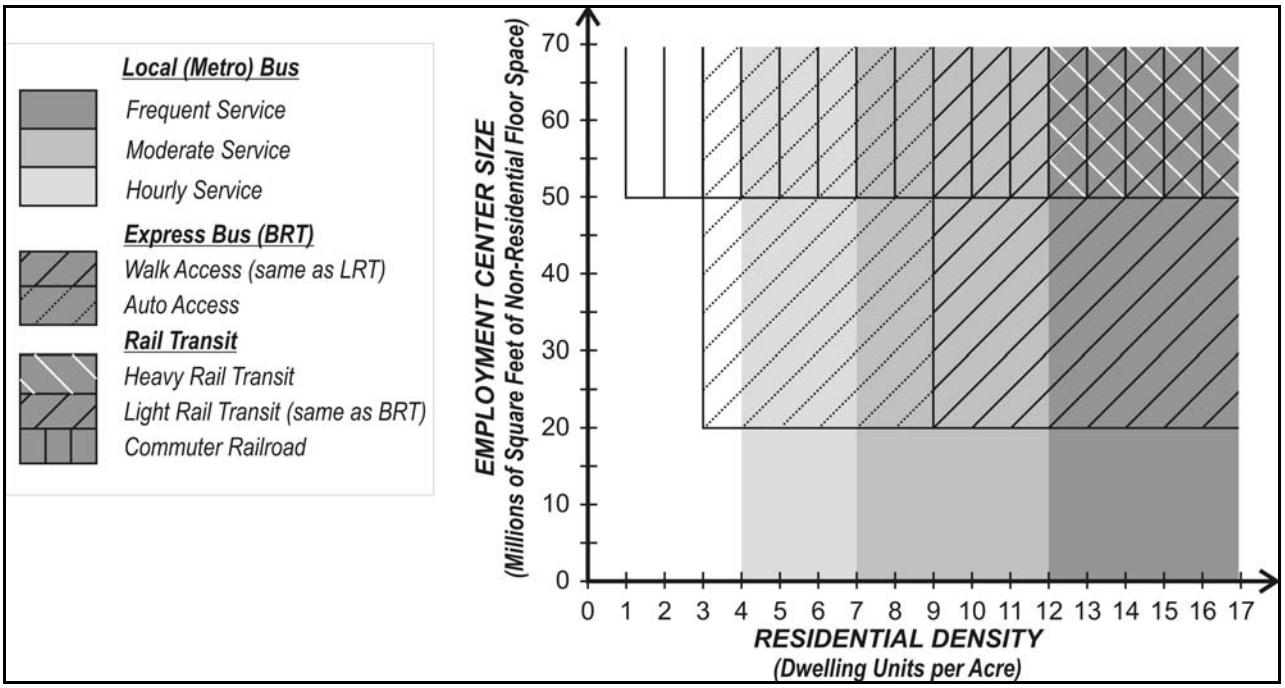


FIGURE 3-8: TRANSIT WARRANTS NOMOGRAPH

The following section further discusses the potential transit modes and their potential applicability for identifying preliminary GBR transit alternatives.

3.2.2.3 Potential Transit Modes

Fixed Guideway Systems

Fixed guideway systems considered in this analysis to define preliminary transit alternatives consist of commuter rail, heavy rail, and light rail transit. More specialized fixed guideway systems (e.g., monorails, automated guideway systems) were not considered since there are no existing, long-distance applications of these technologies within the study area and, therefore, little or no economies of scale to be exploited in their implementation.

Commuter rail operates on railroad rights-of-way, either intermixed with freight and other passenger train traffic or in an exclusive right-of-way. Tracks are not necessarily grade-separated at vehicular and pedestrian crossings, but at-grade highway crossings need some form of protection. Commuter rail service is characterized by longer trip lengths and more distant station spacing in comparison to other urban transit systems. NJ Transit operates commuter rail services in the project study area.

Commuter rail viability depends on having a significant concentration at the destination end of a work trip sufficient to attract commuters from a long distance. This is defined by the nomograph shown in Figure 3-8 as 50 million or more square feet of non-residential floor space (NRFS) accessible to the destination terminal (generally considered as being within 12 minutes walking distance or travel on connecting transit). For example, Manhattan overall has more than 500 million square feet of NRFS. Newark, however, has only about 16.5 million square feet of NRFS in the Downtown and Ironbound areas adjacent to Newark Penn Station, and another 9.7 million in and around Newark International Airport. None of the Newark area employment sites meets the warrants for commuter rail service (although

Newark is clearly already well served by commuter rail as an intermediate destination en route to New York City).

This shortcoming is compounded by the fact that the only commuter rail alignment in the Goethals Bridge corridor is the former Staten Island Railroad alignment linking the North Shore of Staten Island with the NJ Transit Raritan Valley Line in Cranford, New Jersey. This alignment does not run past the Newark area target markets (the connection at Cranford is oriented for traffic to and from the west). A study conducted in 2004, for the Staten Island Office of the Borough President, to investigate restoring rail service along the North Shore alignment considered a commuter rail alternative using a self-propelled diesel railcar, but did not consider service west of the Arlington section of Staten Island.

Based on the foregoing, services involving commuter rail were not recommended for consideration as a preliminary transit alternative for this study.

Heavy rail transit, also referred to as rail rapid transit, is a mode utilizing electrically self-propelled rail vehicles operating singularly or in trains typically up to ten cars in length on a fully controlled right-of-way. Rights-of-way cannot be shared or crossed at-grade by other vehicular traffic or pedestrians. Heavy rail transit is designed to carry high volumes of passengers at high speed with a high degree of efficiency. A high level of performance is achieved, however, at an investment cost greater than for any other mode. This is the reason its warrants are portrayed on the nomograph as requiring both high employment and residential densities, neither of which exist in the study area.

Both the Port Authority's PATH and the MTA-New York City Transit's (MTA-NYCT) Staten Island Railway operate heavy rail transit services in the study area. The Staten Island Rapid Transit (SIRT) service ran along the North Shore alignment as far west as Arlington until 1953. The aforementioned investigations by the Staten Island Borough President considered the opportunities and constraints of a heavy rail system along the North Shore right-of-way but did not draw a conclusion regarding its restoration. On the New Jersey side of the corridor, the Port Authority PATH service terminates at Newark Penn Station, principally providing a link to Manhattan and the Hudson waterfront. While PATH also serves downtown Newark destinations as a secondary, reverse-commute market, Newark itself does not contain enough non-residential floor space to justify heavy rail transit on its own.

Based on the foregoing, services involving heavy rail were not recommended for consideration as a preliminary transit alternative for this study.

Light rail transit (LRT) is a mode utilizing electrically self-propelled rail vehicles operating singularly or in trains on predominately reserved, but not necessarily grade-separated rights-of-way. LRT is unique among rail modes in its capability to operate effectively in a broad range of right-of-way conditions while continuing to offer the advantages generally associated with rail technologies: superior capacity, labor productivity, operating speeds, and ride quality. Street-running in mixed traffic is the least desirable right-of-way condition; fully controlled rights-of-way are more desirable, but also the most capital-intensive type of facility.

Most modern LRT systems in the United States function as a line-haul transit service connecting central business districts (CBDs) with outlying residential areas, as well as providing for circulation within the CBD. LRT can operate in urban corridors without substantial modifications and the initial capital costs are often dramatically less than those for a comparable conventional heavy rail system.

As portrayed in the transit warrants nomograph (Figure 3-8), LRT systems are a more effective option than are commuter rail or heavy rail transit for markets with lower employment densities. The minimum employment density threshold identified for LRT service is around 20 million square feet of NRFS. The

combined employment density of downtown Newark, the Ironbound district, and Newark Liberty International Airport is about 26.2 million square feet of NRFS, although this space is dispersed across several nodes.

NJ Transit has introduced two modern LRT systems to the study area:

- The Hudson-Bergen LRT system currently operates service from 22nd Street in Bayonne to Jersey City and Hoboken, where most passengers transfer to PATH or ferry service to Manhattan. The system will be extended further south to 8th Street in Bayonne, near the New Jersey approach to the Bayonne Bridge.
- The Newark City Subway Extension to Newark Broad Street Station is a 1-mile link connecting Broad Street Station and Newark Penn Station in downtown Newark. While extensions of NERL from downtown Newark to Newark Liberty International Airport and downtown Elizabeth via Elizabethport have been proposed, these remain as proposals and have not been programmed for development.

Although there are two LRT systems in the project study area, the nature of travel demand in the Goethals Bridge corridor and the current status of these projects preclude consideration of expanding either of these existing systems as a preliminary transit alternative for this study. It is worth noting that, based on the transit warrants presented above and the commercial real estate densities in downtown Newark, the proposed NERL alignment from Elizabethport to downtown Newark via Newark International Airport represents a likely candidate alignment for a LRT service crossing the Goethals Bridge.

Given active interest in LRT services in communities on both sides of the Goethals Bridge, provision for future capability to accommodate potential LRT or other transit service as part of a replacement Goethals Bridge is recommended for consideration.

Roadway-Based Systems

Bus rapid transit (BRT) represents an improvement over conventional bus operations by providing exclusive or semi-exclusive rights-of-way for bus operations. Generally speaking, exclusive busways function more like rail rapid transit in that they are constructed with passenger stations and offer a degree of physical separation from other vehicular traffic. At-grade intersections are typically controlled by highway traffic signals. BRT combines the flexibility of conventional buses with the efficiency of an exclusive guideway system. Passenger capacity is higher for BRT than for conventional bus systems because buses may run at higher speeds on exclusive rights-of-way.

In practice, the term BRT encompasses a broad range of strategies for expediting bus transportation systems. At the low end are express buses, which operate non-stop over an extent of their routing, bypassing local stops and making use of limited access highways, where available. At the opposite extreme are the infrastructure-intensive BRT systems where exclusive busways and on-line stations provide a passenger experience equivalent to rail rapid transit. For this reason, the effective range of BRT systems is portrayed in the transit warrant nomograph (Figure 3.7) as roughly equivalent to LRT systems. The ability of buses to circulate on local streets beyond the end of exclusive busways, however, makes BRT systems more effective than LRT in areas of lower residential and/or employment density.

In late 2004, three New York agencies undertook a major initiative to introduce BRT service to the five boroughs. The sponsors announced the goal of introducing at least one BRT corridor in each borough and identified several specific corridors on Staten Island as candidates for further development of BRT schemes. While the study sponsors have indicated that their scope of work does not encompass consideration of BRT route extensions via any Staten Island-New Jersey bridge, a development of one or

more BRT corridors on Staten Island could provide connectivity with a BRT corridor on a replacement Goethals Bridge, as well as potential service and access to passenger facilities and intermodal transfer points.

Based on the foregoing, BRT was recommended for consideration as a preliminary transit alternative for this study, enhanced with additional local transit access support, as described below.

Local bus service enhancements entail operational improvements to local bus service to enhance access to or from rail, BRT, or ferry service with fixed stops or stations that may be located more than a reasonable walking distance from residential or commercial developments. These improvements may entail implementation of new, dedicated feeder services or modifications to existing local transit services, as may be appropriate. Such enhancements are not considered a "stand-alone" transit element, but would be implemented only in conjunction with other line-haul transit elements.

High-occupancy vehicle (HOV) strategies can be an effective opportunity to maximize the people-moving capacity (versus vehicle-moving capacity) of existing or new highway facilities by encouraging carpooling and vanpooling. HOV strategies are often complemented by parallel programs and policies that discourage single-occupant-vehicle (SOV) use.

HOV strategies generally are developed to provide incentives to HOV users (e.g., travel time savings, travel cost reductions) through various forms of preferential treatment. Preferential treatments include exclusive HOV lanes, high-occupancy toll (HOT) lanes, high-speed toll-lane bypasses, ramp queue bypasses and differential tolls. A public agency can further encourage HOV use by sponsoring commuter-matching programs and constructing park-and-ride lots.

However, HOV strategies do not represent a transit alternative per se. They may prove to be a more effective approach to increasing the people-carrying capacity of the Goethals Bridge than traditional transit strategies, given the low-density and disparate nature of trip origins and destinations identified as target markets for transit elements. Furthermore, roadway-based transit elements such as BRT and express buses can share special highway facilities such as HOV lanes and HOT lanes with vanpools and carpools, maximizing the benefits derived from investments in such facilities. HOV strategies are explored further in Section 3.3. as part of the investigation of preliminary travel demand management (TDM) alternatives.

Waterborne Systems

Waterborne systems represent an open right-of-way for passenger transport completely separated from conflicts with highway traffic through use of the waterways of New York Harbor. Two decades ago, the municipally-sponsored Staten Island Ferry was the sole remaining example of public, common-carrier transit regularly using those waterways. By the mid-1980s, a revival of private passenger ferry services focused on Manhattan occurred, which was spurred by renewed public interest and investments in vessels, landside facilities, and services.

The transit warrant nomograph (Figure 3-8) does not address waterborne transit systems. This is because, unlike most fixed guideway and roadway-based transit systems, there is not a clear-cut correlation between the effectiveness of waterborne transit systems and the density of employment and residential development in its service area. Waterborne transit systems are a more specialized mode often implemented in response to a particular local transportation challenge.

Waterborne systems must address issues related to passenger access and egress more than other modes, as relatively few passenger origins or destinations are within reasonable walking distance of the pierhead

(the Lower Manhattan/World Financial Center complex being an obvious exception to that statement). Most waterborne systems require complementary feeder services at one or both ends of their route.

A waterborne system with appropriate supplementary local transit support was recommended for consideration as a preliminary transit alternative for this study.

3.2.2.4 Preliminary Transit Alternatives

Some of the transit elements described above cannot by themselves constitute a fully realized transit alternative. In some cases, two or more transit elements need to be combined to provide a rational link between passenger origins and destinations. For example, a BRT service across the Goethals crossing implemented for the primary purpose of trips between Staten Island and New Jersey would also require some form of an improved feeder bus service to enhance intermodal connectivity and to provide access to a broader range of origins and/or destinations.

Therefore, transit elements were combined to create preliminary transit alternatives having the potential to address the project purpose and need and goals, based on the preceding data and analysis. Two preliminary transit alternatives were identified through the investigations described above:

- Transit Alternative 1: Bus Rapid Transit service via a New Goethals Bridge, with Local Bus Service Enhancements in Staten Island and New Jersey; and
- Transit Alternative 2: Ferry Service between Brooklyn, St. George and Elizabethport, with Local Bus Service Enhancements in Brooklyn and New Jersey (with or without a New Goethals Bridge).

Each of these preliminary transit alternatives is further described below.

Transit Alternative 1: Bus Rapid Transit via New Goethals Bridge

Description: This preliminary alternative would provide BRT service between Staten Island and Union and Essex counties in New Jersey via the Goethals Bridge. Exclusive bus lanes would be provided on a new Goethals Bridge, in the North Shore Railroad right-of-way, on the Staten Island Expressway (portions of which already exist or are under construction), and on the West Shore Expressway (which may be shared as HOV lanes, except along the North Shore). Further extension across the Verrazano Narrows Bridge could link the service to Brooklyn.

Potential Markets: This service would primarily accommodate trips between residential communities and employment sites on Staten Island and in Brooklyn, New York, and in Union, Essex, and Middlesex counties -- notably Newark Liberty International Airport and the cities of Newark and Elizabeth. Secondary linkages would be afforded to Lower Manhattan and locations along the Northeast Corridor via Elizabeth Station.

Service Frequency: BRT/express buses would operate in both directions on frequent headways via the busway network. Buses would circulate through neighborhoods on Staten Island and in Brooklyn, and then enter the busway network to cross into New Jersey, and vice versa. In New Jersey, express buses would mix with other traffic on the New Jersey Turnpike to service Newark Liberty International Airport and downtown Newark.

Facilities & Rolling Stock: This service would be provided by motor coaches of the sort currently operated by NJ Transit and the MTA-NYCT, or potentially by vehicle types consistent with planned introduction of BRT service on Staten Island. Portions of the North Shore Line in Staten Island would

need to be converted to busway, with connecting ramps to existing roadways. New transportation hubs with park-and-ride lots and interchange facilities for local bus services would be provided along the North Shore and West Shore of Staten Island.

Relationship to Existing Services: This preliminary alternative would connect with the Staten Island Ferry, Staten Island Railway, and express and local MTA-NYCT bus services at St. George Terminal; local MTA-NYCT bus services and Staten Island Rapid Transit Operation Authority (SIRTOA) throughout Staten Island; NJ Transit Northeast Corridor Line trains (and, potentially, NERL service) at Elizabeth; and NJ Transit bus services in Union and Somerset counties. MTA-NYCT express bus service that currently operates via the Goethals Bridge would also make use of the BRT facilities.

Relationship to Other Service Elements: This preliminary alternative would be mutually exclusive of the waterborne service alternative. It would rely on local bus service enhancements on Staten Island and in New Jersey to provide access to and from worksites greater than a reasonable walking distance from a BRT station.

Transit Alternative 2: Ferry Service between Brooklyn, St. George, and Elizabethport (with or without a New Goethals Bridge)

Description: This preliminary transit alternative would provide ferry service linking Brooklyn and St. George with a new ferry slip in Elizabethport (as has been previously proposed for the NERL project), via the Kill van Kull and New York Harbor. This alternative could operate with or without a New Goethals Bridge. The location of the Brooklyn terminal has not yet been determined.

Potential Markets: This service would primarily accommodate trips between northern Staten Island and Brooklyn, New York, and (via local bus connections) Union and Essex counties -- notably Newark Liberty International Airport and the cities of Newark and Elizabeth. Secondary linkages would be afforded to locations along the Northeast Corridor via the Elizabeth Station.

Service Frequency: Ferries would operate in both directions on 20-minute headways or more frequently, if warranted by passenger demand.

Facilities & Fleet: This preliminary alternative would require acquisition of high-speed (35 knots), open-water ferries of the sort currently operated in Hoboken-Manhattan ferry service. New ferry terminals with significant park-and-ride lots and bus interchange facilities would be needed at one or both ends of each ferry service.

Relationship to Existing Services: Ferries would connect with local MTA-NYCT bus services in Brooklyn and St. George, as well as the Staten Island Railway.

Relationship to Other Service Elements: This preliminary alternative would be mutually exclusive of the BRT alternative. It would rely on local bus service enhancements on Staten Island and in New Jersey to provide access to and from worksites greater than a reasonable walking distance from a ferry terminal, as discussed below.

Local Bus Service Enhancements

Description: Local bus service enhancements on Staten Island and in Brooklyn in New York, and Essex and Union counties in New Jersey would provide access to and from BRT or ferry services, described above, that are located more than a reasonable walking distance from residential or commercial developments. These improvements may entail implementation of new, dedicated feeder services or

modifications to existing local services. In the BRT alternative, these feeder services may take advantage of the BRT system for portions of their routes, before or after circulating through outlying areas.

Service Frequency: Buses would operate in both directions on headways reflective of the service frequency of the connecting line-haul service or lesser frequency, as warranted by passenger demand.

Potential Markets: This service element would be primarily intended to improve local distribution of work trips by public transportation to and from residential communities and employment sites on Staten Island and in Brooklyn in New York, and Essex and Union counties in New Jersey.

Facilities & Rolling Stock: This service element would be provided by a range of transit coaches of the sort currently operated by MTA-NYCT and NJ Transit.

3.2.3 Preliminary Travel Demand Management (TDM) Alternatives

3.2.3.1 TDM Strategies

Travel demand management (TDM) alternatives embody strategies that change travel behavior (i.e., how, when and where people travel) in order to increase transportation system efficiency and achieve specific objectives such as reduced traffic congestion, road and parking cost savings, increased safety, improved mobility for non-drivers, energy conservation and pollution emission reductions.

Typical TDM strategies include park-and-ride lots, employer-based strategies (e.g., employee trip reduction programs), transportation management associations (TMAs), transportation systems management (TSM), and value pricing, which are described below.

Implementation of TDM initiatives in the Goethals Bridge corridor has the potential to reduce traffic volume on the crossing during peak hours. For example, encouragement of carpooling through regional TMAs, large employers and transportation agencies, plus strategic locating of park-and-ride lots in New Jersey and Staten Island along the roadways approaching the Goethals Bridge may reduce volumes on the bridge. Combining various available TDM measures represents a potentially effective strategy to help manage traffic congestion. TDM measures will be considered for their effectiveness in managing congestion in the No-Action condition and in combination with bridge-replacement alternatives.

3.2.3.2 Transportation Management Associations and Ridesharing

TMAs are non-profit, public/private partnerships that provide an institutional framework for the implementation of TDM programs and services (e.g., rideshare matching and vanpool coordination). There are multiple TMAs that serve Staten Island and the surrounding areas of New Jersey. These include:

- *CommuterLink* – An alternative transportation management organization that provides ridesharing assistance, transit commute itineraries, a guaranteed ride home program, parking management programs and other trip reduction strategies for businesses and commuters in the five boroughs of New York City.
- *Meadowlink* – A TMA that provides a comprehensive package of transportation-related services to businesses and commuters in Bergen County and urban areas of Essex, Passaic, and Union counties in New Jersey. Services include the provision of shuttle services, corporate relocation plans, parking management programs, funding identification and strategies, ridesharing assistance, an emergency ride home program, and other trip reduction strategies for businesses and commuters.

- *Keep Middlesex Moving (KMM)* – KMM provides alternative transportation solutions and options to businesses, municipalities, developers and commuters in Middlesex County, New Jersey. These include shuttle services, ridesharing assistance, an emergency ride home program, assistance with developing circulation plans, pedestrian safety initiatives, the provision of bicycle and transit information, and other trip reduction strategies for businesses and commuters.

Rideshare matching and coordination are key services provided by these organizations that may help reduce vehicular travel demand while maintaining adequate levels of mobility on the Goethals Bridge and connecting roadways. Ridesharing includes both carpooling and vanpooling. Carpooling uses participants' own vehicles and is defined as two or more people driving to work together. Vanpooling usually uses vans that are owned or leased by an organization or group and are made available specifically for commuting. Vanpools consist of a group of 7 to 15 people who meet at a common location, or are picked up at their homes, and drive to work together. Current rideshare services provided by the aforementioned TMAs include:

- *Rideshare Matching* – CommuterLink, Meadowlink, and KMM utilize extensive databases of commuters traveling within New York City, within New Jersey, and between New York City and New Jersey to match commuters who live and work close to each other, and work a similar schedule. Meadowlink and KMM utilize the same statewide rideshare matching database of commuters, which is maintained by the New Jersey Department of Transportation (NJDOT).
- *Vanpool Coordination* – All three organizations also offer vanpool coordination services. CommuterLink and Meadowlink coordinate vanpools by matching interested individuals the same way they match people interested in ridesharing, through an extensive database of commuters. In addition to matching potential vanpool participants via a database, KMM allows existing vanpool groups to recruit new participants by posting advertisements on the organization's website.
- *Empty Seat Subsidy Program* – KMM recently implemented the Empty Seat Subsidy Program, which gives vanpool groups a financial boost when they need it, helping them stay in operation as long as possible. The subsidy is available to vanpools with empty seats amounting to at least 20 percent of the full van capacity. KMM provides a $125 monthly subsidy for up to 3 months, depending on group eligibility and the availability of funding. The 3-month supplement, sent directly to the van leasing company, helps defray the monthly costs of the van while members search for new riders.
- *Guaranteed/Emergency Ride Home* – To ensure that rideshare and vanpool participants are never stranded at work without a way home, CommuterLink, Meadowlink, and KMM have Guaranteed/Emergency Ride Home programs. These programs provide a ride home to participants when unexpected circumstances and emergencies arise, e.g., unexpected overtime, a family emergency, or a vehicle breakdown.

In addition to the rideshare services provided by TMAs, NJ Transit facilitates a *Vanpool Sponsorship Program*. This is an incentive program meant to encourage long-term vanpooling. The program provides van groups with a discount of $150 per month off their van lease. If approved for the Vanpool Sponsorship Program, the vanpool group receives a monthly subsidy for a term of one year, at which time the application is renewed with NJ Transit.

3.2.3.3 Potential TMA-based TDM Measures for Preliminary Alternatives

Given the range of existing services provided by TMAs in the corridors serving the Goethals Bridge, the following enhanced and expanded TDM measures may be considered as part of preliminary TDM alternatives:

- *Carpool Staging Area* – areas to facilitate carpooling and reduce an impediment to carpool formation, namely, identifying and picking up carpool passengers.
- *Rideshare Matching* – expansion of current TMA initiatives to facilitate matches among potential carpool users.
- *Transit Park-and-Ride* – this strategy includes providing parking lots in areas that are convenient to transit services (e.g., a stop along a commuter bus line or near a train station), and can be coupled with carpool staging.
- *Subscription Bus Service* – this para-transit option typically provides long-distance, express bus service from a common meeting area to one major destination (e.g., large employer, office park, or medical facility). Subscription routes usually operate only during the morning and evening peak periods, and have limited, if any, stops.
- *Incentives for Telecommuting* – while financial subsidies to encourage telecommuting are not typically provided by TMAs or government agencies, TMAs can play a significant role in reaching out to and educating businesses about the benefits of telecommuting (e.g., reduced or eliminated commute time and stress for employees, increased productivity, improved morale, lower absenteeism, and office space savings).
- *Corporate Programs for Time-Staggered Work Hours* – similarly to the incentives for telecommuting, TMAs can play an active role in reaching out and educating businesses about the benefits of time-staggered work hours.
- *After-Hours Delivery Initiatives* – incentives or regulatory initiatives to promote after-hours or overnight commercial deliveries in portions of New York City would allow trucking companies more flexibility in off-peak use of the interstate crossings.
- *Extended Port Operations* – extended operating hours or 24-hour service at regional port and intermodal facilities would allow trucking companies more flexibility in off-peak use of the interstate crossings.

3.2.3.4 TSM Programs

TSM programs are designed to improve the efficiency of the existing transportation system through use of technology and operations management enhancements. In the past several years, the Port Authority has undertaken several TSM measures on the Goethals Bridge, as well as their other interstate crossings. Examples include: implementation of variable message signs (VMS); automated toll collection (i.e., the E-ZPass toll collection system discussed below in Section 3.3.4); lane configuration changes to enhance vehicle flow at dedicated E-ZPass lanes; and 25 MPH E-ZPass toll lanes. Other examples of TSM measures implemented in the region include: exclusive bus lanes on the Staten Island Expressway; high-speed (55 MPH) E-ZPass lanes on the New Jersey Turnpike and Garden State Parkway; and the Intelligent Transportation Systems (ITS) improvements program undertaken by NYSDOT to collect real-time traffic data and advise motorists of congestion and route changes through variable message signs on NYSDOT's highway network.

3.2.3.5 Potential TSM Applications for Preliminary Alternatives

Enhanced and expanded TSM strategies could work to reduce congestion as part of preliminary TDM alternatives. Potential TSM strategies include the following:

- *High-Speed E-ZPass* – the Port Authority has already begun implementation of high-speed toll booths on its facilities (currently 25 mph at the Goethals Bridge and George Washington Bridge and 45 mph at Outerbridge Crossing) and has plans for broader implementation of 45-mph speeds

and full-speed toll-lanes, such as those implemented on the New Jersey Turnpike (at Exits 1, 6, and 18), which could further increase the capacity of the toll plazas;

- *Incident Management* – initiatives to manage and improve the response and clearance time of traffic incidents to optimize system performance;
- *Variable Message Signs* – real-time congestion and alternative routing information for travelers;
- *In-Vehicle Systems* – real-time congestion and alternative routing information for commuter and commercial travelers;
- *Reversible Lanes* – reversible lanes to re-allocate under-utilized capacity in the reverse direction during peak period travel;
- *Ramp Terminal Signal Coordination* – signal coordination on exit ramps with demand levels to reduce queuing;
- *Ramp Metering* – access limitations through signals based on congestion levels.
- *Provision for bicycle and pedestrian crossings* – dedicated lanes which facilitate access and promote safety will encourage non-motorized use of the crossings for commuting and recreational trips.
- *Exclusive Bus Lanes* (See preliminary Transit Alternative 1: Bus Rapid Transit.)

3.2.3.6 Value Pricing

Value pricing is the TDM strategy with the greatest potential to modify travel behavior. The rationale behind value pricing is as follows:

- Each individual user of a congested transportation facility imposes a congestion cost on other users;
- When this congestion cost is unpriced, there will tend to be too many users; and
- Value pricing represents a way of allocating a scarce commodity (i.e., capacity on the congested facility) in an efficient manner by differentiating pricing to reflect congestion. That is, by raising the user cost, or toll, in the most congested peak periods, pricing will tend to encourage those with greater flexibility to shift their use to less congested, off-peak periods.

3.2.3.7 Value Pricing Experience in the New York/New Jersey Region

Automated toll collection (e.g., E-ZPass) is a TSM measure that has been used to support value pricing on the Port Authority's bridge and tunnel crossings to improve system efficiency. Experience at the Port Authority's and other agencies' facilities shows that E-ZPass, with its automated collection system based on transponder technology, has resulted in operational efficiencies and congestion mitigation, and has reduced queuing. Following the introduction of E-ZPass, the Port Authority instituted changes to toll lane configurations to allow for higher speeds for E-ZPass transactions. Currently, the Port Authority has opened non-stop toll booths on the Goethals Bridge and the Outerbridge Crossing and has set speed limits at 25 and 45 mph, respectively. In March 2001, the Port Authority instituted an off-peak toll discount for travel at all their bridge and tunnel crossings between New Jersey and New York and a differential in price to encourage use of the E-ZPass system.

The Port Authority's pricing system at the time of this study is summarized below:

- The cash price at all hours is $6.00 for passenger autos, $6.00 per axle for commercial vehicles, $3.00 for buses, and $5.00 for motorcycles.

- The E-ZPass price during peak hours is $5.00 for autos (a price differential of 20 percent from the cash price), $6.00 per axle for commercial vehicles, $2.70 for buses, and $4.00 for motorcycles. Peak hours are weekdays between 6:00-9:00 AM and 4:00-7:00 PM and on weekends between 12:00-8:00 PM.
- The E-ZPass price during off-peak hours for autos is $4.00, the same toll rate that was in place before the March 2001 toll revision. This amounts to a 25 percent differential from the peak-period E-ZPass price or a 50 percent differential from the cash price. Commercial vehicles are $5.00 per axle, a 20 percent differential from the peak-period E-ZPass or cash price.
- Overnight toll rates for trucks are substantially discounted from peak and off-peak daytime rates. The toll price for trucks is $3.50 per axle from 12:00 -6:00 AM Monday through Friday, a differential of 70 percent from the peak E-ZPass or cash price and 40 percent from the E-ZPass off-peak daytime price.
- An HOV discount is available for carpools of three or more persons with E-ZPass, and pre-enrolled E-ZPass accounts for vehicles with non-commercial plates. The toll price is $1.00, a differential of 500 percent from the peak E-ZPass price.
- A commuter discount plan is available for use on the Staten Island Bridges (SIB), including the Goethals Bridge. The plan is available to pre-enrolled E-ZPass users for vehicles with non-commercial plates. The cost is $50.00 for 20 trips ($2.50 per trip) that must be made within 35 days. The SIB plan was initiated in recognition of the relatively limited transportation alternatives available to motorists using the crossings. Utilization rates range from 8 to 10 percent of all travelers and are highest during peak periods.

Value pricing programs are also in place at other regional toll facilities. In 1997, the New York State Thruway Authority instituted value pricing for commercial vehicles at the Tappan Zee Bridge, increasing the toll from the overnight period to the morning peak in 15-minute incremental steps from 6:15-7:00 AM (e.g., Class 5 trucks between 12:00-6:14 AM are $10.00, plus another $2.50 for each 15 minutes until 7:00 AM when the toll reaches $20). There are no value pricing programs for private autos on the Tappan Zee Bridge.

The New Jersey Turnpike Authority also has a value pricing program for auto traffic. The program includes prices raised during the peak periods (7:00-9:00 AM and 4:30-6:00 PM) by an average of 13 percent over off-peak rates, and 24-hour cash tolls higher than off-peak prices and 17 percent higher than peak prices to encourage participation in the E-ZPass program.

A recent evaluation of the Port Authority's value pricing program shows that the program has served to mitigate traffic congestion during the morning peak period with a 2/3 percent shift from the AM peak to the early morning off-peak hour (Muriello and Jiji, 2004). Overall, more traffic in the morning peak period has been arriving at Port Authority crossings during the 5:00-6:00 AM hour, indicating that motorists are traveling earlier on weekday mornings to take advantage of off-peak discounts and avoid traffic congestion. The share of traffic in this 5:00-6:00 AM period grew by 1.3 percent in the months immediately following the March 2001 toll change and by an additional 0.9 percent after the first year of the program, amounting to a 21 percent growth in the number of vehicles during that morning hour. However, a more recent decline in the off-peak share of traffic, as congestion in the peak has declined, indicates that any shifts in travel attributable to the $1.00 price differential are highly correlated to the overall level of congestion in peak hours (Muriello and Jiji, 2004). In addition to temporal shifts from peak to off-peak hours, the program has produced shifts in method of payment from cash to E-ZPass.

An initial review of the traffic data suggests that the small overall shift in volumes during the morning peak period observed for all crossings holds true for individual crossings, including the Goethals Bridge.

At the Goethals Bridge, the proportion of truck traffic (toll classes 2 through 6) using the crossing during the 12:00-6:00 AM overnight toll-discount period in 2003 has increased by 1.79 percent since 2000. The proportion of trips in the 6:00-9:00 AM peak period and midday off-peak hours (9:00 AM-4:00 PM) has declined from 2000 to 2003 (see Table 3.8).

TABLE 3.8: GOETHALS BRIDGE ANNUAL REVENUE EASTBOUND TRUCK TRAFFIC (TOLL CLASSES 2-6)

Time Period	2000 Volume	Percent	2003 Volume	Percent	% Change in Share
Overnight	191,223	17.86%	212,564	19.65%	+10%
AM Peak	219,574	20.51%	217,693	20.13%	-2%
Midday Off-Peak	471,234	44.02%	455,645	42.12%	-4%
PM Peak	100,750	9.41%	100,827	9.32%	-1%
PM Off-Peak	87,760	8.20%	94,951	8.78%	+7%
Total	1,070,541	100.00%	1,081,680	100.00%	

Source: Port Authority Tunnels, Bridges and Terminals Dept., 2004

Value pricing initiatives also appear to have contributed to rising E-ZPass participation rates (TRB, 2004). Auto E-ZPass usage increased by 5 percent in the months immediately following the toll change and continued to climb through 2003 to 69 percent, up from 65.5 percent in January 2001. E-ZPass participation has also increased for commercial vehicles. However, other factors have contributed to higher participation rates, including an expansion of the E-ZPass network and the economic downturn, which has reduced the number of low-frequency discretionary cash-paying trips relative to high-frequency E-ZPass customers. Overall, E-ZPass usage has eased congestion at toll plazas, particularly in the off-peak and shoulder periods when the tollbooths themselves serve as a bottleneck.

Evaluations based strictly on shares in truck traffic by time of day do not take into account other factors that influence trip patterns, such as the business cycle, differential growth of different commercial trip types, and population growth. Recent studies conducted for the Port Authority involving surveys of commercial customers at the crossings (Port Authority TB&T, 1999; 2003) suggest that, while there is a subset of users that has some flexibility in the time of travel, most truck crossings made during the peak hours are constrained from switching to off-peak or shoulder hours by delivery times and other scheduling concerns. Future value pricing programs should not be expected to produce large changes in commercial vehicle trip patterns, as price elasticities for peak-period travel in that segment appear to be low.

The recent studies did not, however, specifically evaluate toll pricing in conjunction with programmed rail freight improvements in the Southern Corridor, such as reactivation of the Staten Island Railroad, and the 65th Street Railyard improvements. Value pricing TDM alternatives developed for analysis in the Goethals Bridge Replacement DEIS will be evaluated in the context of such programmed freight-mode improvements, which will be included in the No-Action alternative, and in conjunction with any rail or intermodal freight-movement alternatives advanced through the alternatives screening process to determine to what extent value pricing policies would encourage truck-to-rail shift in freight transport.

Other examples of value pricing programs in the region have resulted in modest shifts in traffic, according to recent studies (TCRP, 2003). Results include the following:

- The value pricing program for commercial vehicles at the Tappan Zee Bridge has produced only modest shifts in truck traffic. However, surveys taken subsequent to the toll change have indicated that there is low awareness of the pricing program, and that 27 percent of survey respondents would have changed their trip times had they known about the program.
- A survey of auto users at the Tappan Zee Bridge found that 17 percent of the respondents would consider shifting the time of their trip up to 30 minutes later or earlier in response to a peak/off-peak toll differential.
- The New Jersey Turnpike pricing program has produced small changes in traffic patterns with 0.2 to 0.5 percentage changes in shares between peak and shoulder periods.

3.2.3.8 Potential Value Pricing Applications for Preliminary Alternatives

There are four basic applications of roadway value pricing programs outlined in the literature (TCRP, 2003):

- Areawide value pricing programs involve fees charged for entering a central area or traveling on a network of routes serving that area. Methods of collection could include use of electronic transponders, gas price surcharges, or licensing schemes.
- Single facility, route, or corridor applications involve tolling on single transportation facilities such as roads, bridges, or tunnels. The goal is to reduce congestion on key traffic bottlenecks with peak-period surcharges.
- Single or multiple lane programs involve application of fixed or variable charges for the use of specific lanes on a highway facility or crossing. An example would be HOT lanes that allow free use of restricted lanes for HOV users and a fee for use by SOVs. The goal is to promote transit and carpooling, while allowing for optimal use of the dedicated lane and reduction of congestion in the unrestricted lanes.
- Vehicle use pricing programs are designed to promote efficient vehicle use by converting fixed costs to variable usage costs (e.g., pay-by-the-mile insurance and car-sharing programs).

Potential value pricing strategies that were considered for preliminary alternatives are based primarily on the single facility/corridor and single/multiple lane pricing strategies described above, which have the greatest potential for addressing the project goal to reduce traffic congestion and delay. It must be recognized, however, that the Goethals Bridge is part of an area-wide pricing cordon around the New York/New Jersey metropolitan core. As such, the evaluation of potential value pricing initiatives for the proposed project must account for pricing conditions on other Port Authority crossings and crossings and tolled highway facilities operated by other agencies. In addition, Staten Island's dependence on tolled crossings for vehicular trips outside the borough has historically been a significant toll policy issue for both the Port Authority crossings and at the Verrazano-Narrows Bridge.

The basic premise of value pricing is to allocate scarce capacity in an efficient manner. To do this, value pricing alters the price of a specific mode as an absolute cost only, or as a cost relative to that of other modes. The cost of travel by a specific mode always includes non-monetary costs of travel, such as in-vehicle travel time, out-of-vehicle travel time, transfers, and costs associated with perceived service unreliability. Along with out-of-pocket expenses such as tolls, these costs comprise the generalized cost of travel that is the relevant cost facing users of a mode or facility.

In general, pricing schemes are meant to alter traveler behavior in several ways:

- *Foregone Travel* – implementation of a charge per use to transportation systems is intended to reduce the overall number of trips or the miles traveled by encouraging users to forego unnecessary or discretionary trips in peak periods or to combine multiple trips into a single journey.
- *Mode Shift* – In corridors where other modes of transportation are available, pricing schemes can be designed to encourage users to utilize high-occupancy modes (carpools, rail, buses, ferries) or non-motorized modes (walking, biking). To induce mode shift, there must be a price differential between modes, for example between a trip using a SOV (with a toll charge) versus the same trip on other modes.
- *Temporal Shift* – Differentials in toll pricing between peak periods of travel and off-peak periods can encourage users to shift the time of their trip to the less congested period, freeing up capacity for trips that must occur during peak hours. Efficiencies may be substantial here, as discretionary trips will be reallocated and congestion reduced for users who have little or no option to travel at other times. While users who have little or no option to travel at other times may benefit from a decrease in congestion, they will also incur an increase in out-of-pocket travel costs due to higher toll prices, which can raise equity concerns.
- *Spatial Shift* – Differentials in toll pricing between facilities can encourage travelers to choose lower cost or no-charge alternative routes. To be effective, there must be practical alternative routes with capacity for additional travel.

Value pricing programs can be designed to achieve any one or all of the effects outlined above. The effectiveness of the programs depends on several highly related factors: the elasticity of demand for trips on the facility in question; the magnitude of the differentials in generalized cost of travel; and infrastructure/operational changes to support shifts in use (e.g., frequent transit service, carpool matching/staging areas, dedicated lanes and toll plazas, public awareness campaigns).

In cases where demand is highly inelastic, value pricing regimes may need to impose quite high tolls in order to influence behavior in any significant way. The elasticity of demand for a particular mode may be itself influenced by the availability of travel options by alternative modes. With greater alternative travel options, and particularly the closer the relative generalized costs of travel, the easier it will be to influence behavior through pricing. Initial studies in the New York/New Jersey region and elsewhere have shown that toll price elasticities are low, ranging from -0.02 to -0.24.

Existing experience at various facilities suggests that several characteristics could define a more ambitious value pricing program at the Goethals Bridge than the one currently in place:

- *Increased Toll for Peak Periods* – Despite findings of relatively inelastic demand, increasing peak-period tolls may serve to reduce peak-period traffic volumes at the Goethals Bridge.
- *Adjustment of Peak Periods* – Adjusting the peak period during which higher tolls apply could increase the incentive for greater temporal shifting.
- *Stepped Toll Pricing* – Differentiating tolls by time more finely could induce greater temporal shifts due to the heterogeneity of users in terms of trip flexibility, value of time, and the changing temporal profile of congestion at the facility. A generalization of stepped pricing would be variable pricing, where pricing would be determined by prevailing congestion levels, although such “real-time” variable pricing may present difficulty for travelers to plan their trips.
- *Toll Differential by Facility* – Charging a premium price for the most congested facilities during the peak period could induce shifts from higher priced, more congested facilities to lower priced, less congested facilities, which could ultimately lead to changes in VMT.

- *HOT Lane Implementation* – This option (i.e., high occupancy toll lanes, whereby SOVs can pay a toll to use a restricted, HOV lane) would be difficult to implement without complementary capacity expansion in the Goethals Bridge corridor, as it would imply that one-half of the capacity on the Goethals Bridge would be restricted to HOVs and the SOVs willing to pay a premium.
- Elimination of high frequency discounts coupled with development of transit alternatives – Eliminating the SIB commuter discount could enhance the effect of peak pricing.

3.2.3.9 Preliminary TDM Alternatives

The review of existing TMA, TSM, and value pricing program elements suggests that enhancements to the existing programs could serve to reduce traffic congestion and enhance mobility at the Goethals Bridge crossing. Depending on its specific elements, a more robust value pricing strategy with supporting TDM, TMA and/or TSM measures could potentially result in the following:

- *Shift in Trip Demand* – To be effective, value pricing initiatives must include differentials in toll prices large enough to have a measurable effect on trip-making behavior. A 1 percent increase in a toll price usually induces a substantially smaller change in the number of trips (price-elasticity response) than would a larger toll increase. Empirical studies suggest that the overall elasticity response to toll levels for the Port Authority crossings range between -0.2 and -0.3. Data from the most recent toll change in March 2001 (Muriello and Jiji, 2004) indicate that the raising of peak-period tolls by 25 percent was followed by a lowering of the peak-period share of crossings by 1 to 2 percent. This reduction in peak-period share must be considered in the context of the E-ZPass usage rate of 62 to 66 percent, depending on vehicle type.
- *Shift in Travel Time or Mode* – Properly structured TDM programs are intended to influence trip-making behavior through an overall reduction in the number of trips (foregone trips), a shift in the time of travel (temporal shift from peak to off-peak travel) or mode of travel (shift from SOV to carpool, transit, or other HOV modes of travel). A TDM program involving significant toll price differentials or ridesharing services, for example, implemented only at the Goethals Bridge may encourage travelers to use other crossings where prices have not been changed (e.g., Outerbridge Crossing, Bayonne Bridge, and Holland Tunnel), potentially resulting in traffic increases at those facilities.
- *Reduction in VMT and VHT* – Shifts from peak to off-peak travel and from SOV to HOV modes would result in decreased congestion at Port Authority facilities and reductions in overall regional vehicle miles traveled (VMT) and vehicle hours traveled (VHT) as the number of trips are reduced. However, TDM initiatives implemented only at the Goethals Bridge could result in overall increases in VMT and VHT as some traffic may be diverted to other crossings. To avoid diversion of traffic to other Port Authority bridges and tunnels that also experience congestion in peak periods, it is assumed that each of these pricing alternatives would apply to all Port Authority interstate crossings.

In evaluating TDM alternatives, the following issues must be addressed:

- *Equity Concerns* – While users who have little or no option to travel during peak periods may benefit from a decrease in congestion, they would also incur an increase in out-of-pocket travel costs due to higher toll prices, which can raise equity concerns. Staten Island's dependence on tolled crossings for vehicular trips outside the borough has historically been a significant toll policy issue.

- *Compatibility with Regional Initiatives* – The effectiveness of TDM initiatives at the Goethals Bridge depends in part on policies in effect at other Port Authority crossings, as well as at facilities operated by other agencies in the region such as the Verrazano-Narrows Bridge and the New Jersey Turnpike. While consideration of regional tolling initiatives is not directly pertinent to identifying preliminary alternatives for purposes of the proposed Goethals Bridge replacement, the studies for the GBR EIS are being conducted in coordination with the other regional transportation agencies.

With these considerations in mind, four preliminary TDM alternatives were defined. As noted above, toll pricing components are assumed to apply to all Port Authority interstate crossings. These alternatives were designed to reflect a range of toll pricing initiatives compatible with other preliminary alternatives presented here and consistent with previous Port Authority toll changes:

TDM Alternative 1: Temporal Shift (with or without New Goethals Bridge)

This alternative comprises the following elements:

- Peak-period E-ZPass toll increased to $6.00 (20 percent increase over current $5.00 toll);
- Cash toll increased to $7.00 at all times (17 percent increase over current $6.00 toll);
- Off-peak E-ZPass to remain at $4.00;
- Carpool to remain at $1.00;
- Truck tolls increased to $7.00 per axle for cash transactions at all times and for E-ZPass transactions during the peak period (17 percent increase over current $6.00 toll); and
- Off-peak E-ZPass tolls for trucks to remain at $5.00 per axle and $3.50 per axle during overnight weekday hours.

This alternative, which would apply to the No-Action condition and a replacement bridge, focuses primarily on a change in value pricing, with modest ridesharing support. The current toll rate for off-peak travel and carpooling would be retained and an increase would be made to the rate for peak-period travel to encourage shifts from peak to off-peak. The cash price would also be increased to retain the differential between cash and E-ZPass to encourage the use of higher-capacity electronic toll lanes. Toll changes would be comparable to the Port Authority's first implementation of value pricing in March 2001 (i.e., a smaller increase in peak toll rate but expansion of the differential between peak and off-peak pricing overall).

TDM Alternative 2: Temporal, Payment and Mode Shift (with or without New Goethals Bridge)

This alternative comprises the following elements:

- Peak-period E-ZPass toll increased to $7.00 (40 percent increase over current $5.00 toll);
- Cash toll increased to $8.00 at all times (33 percent increase over current $6.00 toll);
- Off-peak E-ZPass to remain at $4.00;
- Carpool to remain at $1.00;
- Inclusion of TMA transit elements;
- Truck tolls increased to $8.00 per axle for cash transactions at all times and E-ZPass transactions during the peak period (33 percent increase over current $6.00 toll); and
- Off-peak E-ZPass tolls for trucks to remain at $5.00 per axle and $3.50 per axle during overnight weekday hours.

This alternative, which would apply to the No-Action condition and a replacement bridge, would retain the current toll rate for off-peak travel and carpool and increase the rate for peak-period travel to encourage shifts from peak to off-peak. The cash price would also be increased to enhance the differential between cash and E-ZPass to encourage the use of higher-capacity electronic toll lanes. To enhance effect on travel patterns, toll price change would be larger than the Port Authority's first implementation of value pricing in March 2001 (i.e., a greater increase in peak and cash toll rate and substantial expansion of the differential between peak and off-peak pricing overall). This alternative would be further supplemented by additional carpool/TMA transit park-and-ride lots to encourage modal diversion. This alternative would also be analyzed in combination with rail and/or intermodal freight-movement alternatives (see Sections 3.3 and 3.4, depending on which preliminary TDM and freight-movement alternatives are advanced to the second phase of screening) to evaluate the potential for toll pricing changes to promote modal shifts for freight transport.

TDM Alternative 3: Peak-Period Temporal Shift and Transit Support (with or without New Goethals Bridge)

This alternative comprises the following elements:

- Tolls during the first and last hour of weekday peak periods (6:00 – 7:00 AM; 8:00 – 9:00 AM; 4:00 – 5:00 PM; 6:00 – 7:00 PM) would be as in TDM Alternative 1 (i.e., E-ZPass toll increased to $6.00 [20 percent increase over current $5.00 toll] and $7.00 per axle for trucks [17 percent increase over current $6.00 toll]);
- Tolls during the middle hour of weekday peak periods (7:00 – 8:00 AM; 5:00 – 6:00 PM) would be as in TDM Alternative 2 (i.e., E-ZPass toll increased to $7.00 [40 percent increase over current $5.00 toll] and $8.00 per axle for trucks [33 percent increase over current $6.00 toll]);
- Tolls during weekend peak would be as in TDM Alternative 1 (i.e., E-ZPass toll increased to $6.00 [20 percent increase over current $5.00 toll] and cash toll increased to $7.00 at all times 17 percent increase over current $6.00 toll] with truck toll set at $7.00 per axle for E-ZPass transactions;
- Cash toll increased to $8.00 for autos and per axle for trucks at all times (33 percent increase over current $6.00 toll);
- Off-peak E-ZPass for autos at $4.00 while trucks would remain at $5.00 per axle and $3.50 per axle during overnight weekday hours;
- Carpool at $1.00;
- Inclusion of transit elements; and
- Rail and intermodal freight-movement alternatives.

This alternative, which would apply to both the No-Action condition and a replacement bridge, would involve stepped-toll pricing to encourage shift in travel from the hour representing the "peak of the peak" to earlier or later time periods. Overall, the hours defining the peak and off-peak periods would remain the same. This alternative allows for application of a higher toll during the most congested period without raising the toll rate for the entire peak period and is designed to distribute trips more evenly within the peak, in addition to encouraging a shift to off-peak travel. This alternative would be consistent with value pricing literature that recommends toll pricing commensurate with congestion. Pricing for carpool commuters would be kept at its current level to encourage HOV use. This alternative could be combined with one or more of the preliminary transit alternatives (see Section 3.2.4) to evaluate the potential for pricing to encourage shifts in commuter travel to transit modes rather than encourage diversions to other

crossings. This alternative could also be analyzed in combination with rail and/or intermodal freight-movement alternatives (see Sections 3.3 and 3.4, depending on which preliminary TDM and/or freight-movement alternatives were advanced to the second phase of screening) to evaluate the potential for toll pricing changes to promote modal shifts for freight transport.

TDM Alternative 4: HOT Lane (with New Goethals Bridge)

This alternative comprises the following elements:

- Tolls would remain at current levels for peak and off-peak travel in general purpose lanes;
- Dedicated HOT lane added with toll rates as in TDM Alternative B (i.e., Peak-period E-ZPass toll increased to $7.00 [40 percent increase over current $5.00 toll]; cash toll increased to $8.00 at all times [33 percent increase over current $6.00 toll]; off-peak E-ZPass at $4.00; and carpool at $1.00).

This alternative would retain the current value pricing structure in the general purpose lanes and would add a dedicated lane to accommodate HOVs at the carpool price and SOVs at a premium price during the peak hour. The HOT lane would function to reduce congestion in the general travel lanes while accommodating buses and carpools at reduced rates, and SOVs willing to pay a premium price for use of the lane. This alternative would be applicable only to new Goethals Bridge crossing alternatives that have capacity for a HOT lane.

3.2.4 Preliminary Freight-Movement Alternatives

The identification of preliminary freight-movement alternatives was based on several factors, including: review of recent analyses of freight operations in the region and the resulting proposals for freight improvements; analysis of freight operations in the study corridor, particularly at the Howland Hook Marine Terminal in Staten Island, located at the base of the Goethals Bridge; and consideration of freight-movement-related comments received during the GBR EIS scoping process. Preliminary freight-movement alternatives that were identified on this basis are divided into potential highway, rail, and intermodal (road and rail) alternatives, as described below.

3.2.4.1 Freight-Movement Considerations in Goethals Bridge Corridor

There are a number of factors that influence the flow of goods and freight through the Goethals Bridge corridor, ranging from the local influence of the Howland Hook Marine Terminal to global trends in the freight industry. This section provides a brief summary of this context, as a basis for understanding the issues in the study area.

3.2.4.2 Howland Hook Marine Terminal

Howland Hook Marine Terminal (HHMT), which is owned by the City of New York, leased to the Port Authority, and operated by New York Container Terminal, Inc., is a 187-acre marine terminal located directly north of the Staten Island approach to the Goethals Bridge. Following varying periods of activity and inactivity, HHMT was returned to operation in 1996, functioning mainly as a container terminal. Traffic at the terminal has grown substantially since then, mirroring a general rise in the volume of goods movement in the Port of New York and New Jersey (PONYNJ), the United States, and globally. In 1996, HHMT handled 34,000 TEUs , while in 2001, the terminal processed 498,399 TEUs (NJDOT, 2003). This growth is expected to continue as additional investments are made in the facility, including lengthened and deepened berths, new gantry cranes, and the addition of an intermodal rail yard and additional warehousing capacity on the adjacent 124-acre Procter & Gamble/Port Ivory site.

Restoration of the Staten Island Railway between Arlington Yard (just east of HHMT) and the Conrail Chemical Coast Secondary in New Jersey via the Arthur Kill Lift Bridge will reconnect HHMT to the national rail network and will further increase the attractiveness of this terminal as an intermodal container port. As a baseline, rail service from HHMT is expected to capture at least 10 percent of the containers arriving at HHMT. Recent estimates show the rail share growing to over 25 percent, particularly in light of the Port Authority's proposed Port Inland Development Network, which has the overall goal of shifting container traffic from trucks to other modes. Although truck trips generated by HHMT are only 2 percent of the total traffic on the Goethals Bridge, the terminal is the single largest generator of truck traffic on the bridge, representing 21 percent of total truck trips. The importance of HHMT-related truck traffic to consideration of preliminary alternatives for the proposed Goethals Bridge replacement is underscored by the estimate that 70 to 80 percent of trucks leaving the terminal are expected to use the Goethals Bridge (Port Authority, 2004).

3.2.4.3 Port of New York and New Jersey

The PONYNJ, comprised of multiple port facility sites throughout New York Harbor, has undergone substantial growth in cargo volume and related traffic over the past decade, a pattern that is expected to continue in the future. A variety of efforts have been undertaken to plan for improvements in all aspects of port operations, including the Comprehensive Port Improvement Plan (CPIP) and the Portway and Portway Extension infrastructure improvements, and the Cross Harbor Freight Movement Project. Ongoing improvements to the PONYNJ include channel deepenings (including the creation of 50-foot channels), berth rehabilitation, rail and truck access improvements, and the installation of larger gantry cranes. All of these investments are aimed at improving the efficiency of port operations, thereby allowing the PONYNJ's business to continue to grow without having to substantially increase its physical area.

3.2.4.4 Port-Related Truck Traffic

While recent and forecast increases in general truck trips and port-related truck trips often loom large when viewed without context, overall and PONYNJ-related truck traffic represents a small component of total regional traffic. In 2000, all truck traffic in the NY/NJ region represented only 0.07 percent of total regional traffic, and PONYNJ-related truck traffic represented 1.8 percent of total truck traffic. Projections indicate that, by 2020, port-related truck traffic as a percent of total traffic and of total truck traffic will increase to just 0.09 percent and 2.4 percent, respectively (CPIP Consortium, 2004). However, on local roadways near port facilities, port-related truck traffic represents a larger share of both total traffic and total truck traffic (e.g., as noted above, HHMT-related truck traffic comprises 21 percent of all truck trips across the Goethals). Therefore, freight-movement alternatives that seek a mode-shift from truck-based to rail-based freight transport to/from HHMT may have greater potential for reducing truck traffic on the Goethals Bridge and in its corridor, thereby, enhancing mobility on the Goethals Bridge while improving the flow of goods to and from Staten Island and New Jersey, and in the overall NY/NJ region.

3.2.4.5 Overall Freight Trends

Global freight trends influence freight operations within the New York/New Jersey region. The increasing use of "Post-Panamax" cargo ships, which are capable of carrying as many as 10,000 TEUs on a single ship, is requiring the dredging of deeper channels and the installation of larger loading cranes. In addition, the fact that these vessels cannot fit through the Panama Canal is changing shipping patterns. One response to this change has been the creation of Land Bridges, where freight that needs to travel between the Atlantic and the Pacific Oceans is off-loaded to rail, shipped transcontinentally, and then loaded onto another ship to complete the journey. This concept evolved into a more popular method termed "Mini Land Bridge" (MLB) that uses transcontinental rail for movement of containers primarily

between ports on the West Coast and intermodal terminals on the East Coast, where they are delivered to local customers.

Operations such as these that currently flow through this region require the use of drayage (short truck trips) to transfer containers from rail terminals to marine terminals and customers. The reactivation of the Staten Island Railway and connection to the national freight network opens up the possibility that a Land Bridge could be operated from HHMT, and/or that MLB trains could be operated to a new intermodal terminal in the Arlington Yard (see *Freight Alternative 3* in Section 3.2.4.6).

The growing congestion on the nation's road and rail networks is also beginning to have a negative impact on freight operations, leading government agencies to consider investments in the freight network.

3.2.4.6 Preliminary Freight-Movement Alternatives

Given the characteristics and trends related to freight movement within the Goethals Bridge corridor and the region as a whole, preliminary Freight-Movement alternatives were defined, as follows.

Freight Alternative 1: Highway Freight-Movement Enhancement on New Goethals Bridge

Some of the baseline highway criteria for preliminary bridge replacement alternatives would result in improvements for freight truck movement due to wider (12-foot-wide) travel lanes that would better accommodate truck traffic across the span and simultaneously decrease the impact of trucks on other vehicles. Freight-movement enhancements to preliminary bridge replacement alternatives may be considered to include the following elements (see Figure 3-9):

- *Improved Howland Hook Access* - This potential improvement, for which various options have been previously investigated (Port Authority, 2004), would entail new ramps and/or local street and intersection improvements at the eastern end of the Goethals Bridge and its approaches, to improve access to the HHMT. In addition to providing trucks with faster, more direct access/egress to/from the terminal, it may reduce truck-related impacts on local streets and intersections adjacent to the terminal. This improvement could include some combination of ramps between the bridge and the terminal, and any ancillary improvements to the local streets and intersections in the terminal's vicinity. A direct connecting ramp to the terminal may also permit use of high-speed electronic toll collection and automated entry clearance to decrease delays for trucks at HHMT.
- *NJ Turnpike Interchange 13 Improvement* - This potential improvement, detailed in the Portway Extensions report (NJDOT, 2003), would entail physical enhancements to NJ Turnpike Interchange 13. In addition to improving the geometry of the interchange, certain enhancements would improve access to the Bayway industrial area in Elizabeth and remove those truck trips from local streets. Another element of this improvement could be so-called "slip ramps," which would provide direct access from the NJ Turnpike to the Goethals Bridge, without needing to travel through the central toll plaza. These types of ramps are available only to vehicles equipped with electronic toll collection tags, with all other users required to use the regular toll plaza. Slip ramps can save time in a variety of ways, including creating a more direct connection, reducing toll plaza delays, and avoiding the low-speed curves often associated with interchange toll plazas.
- *Exclusive Truck or Shared HOV Lanes* - Compared to the other preliminary freight-movement improvements, which would entail improvements to the roadway system at either end of the crossing to improve freight access to the bridge, this improvement would add either a dedicated truck lane or a shared HOV lane on a replacement Goethals Bridge. This would provide trucks with either an exclusive facility and eliminate interaction with passenger vehicles, or a shared

facility that would be HOV/truck-exclusive. A facility of this type could either be provided in both directions, or as a reversible lane that would operate in the peak-flow direction, thereby taking trucks out of the general purpose lanes during the heaviest travel periods.

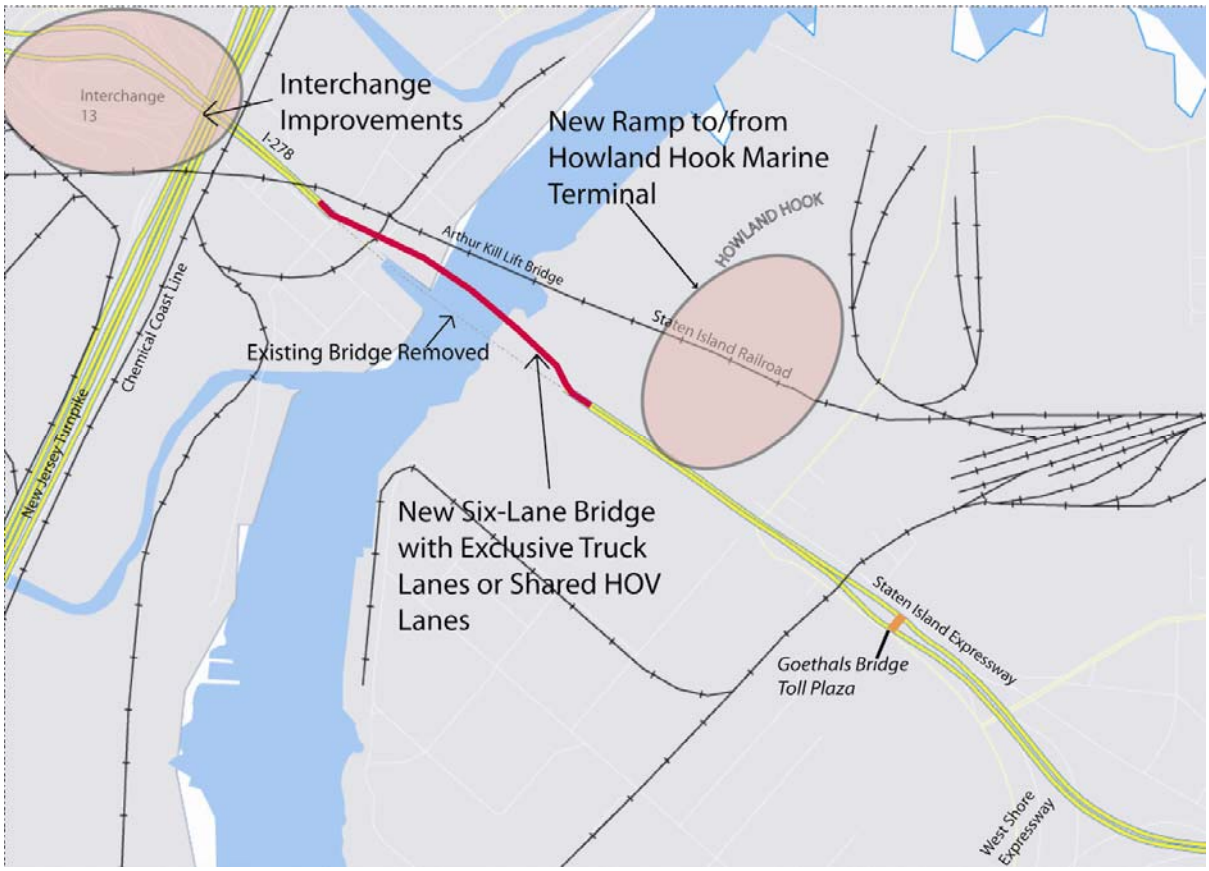


FIGURE 3-9: FREIGHT ALTERNATIVE 1: HIGHWAY FREIGHT-MOVEMENT ENHANCEMENT ON NEW GOETHALS BRIDGE

Freight Alternative 2: Preliminary Rail Freight-Movement Enhancement (with or without New Goethals Bridge)

Potential rail improvements for freight movement include those that may improve access to the HHMT/Arlington Yard area for trains, and better rail access for goods moving to Staten Island. Some of the most important rail freight improvements in the study area have already been implemented or are actively moving forward. These include the restoration of the Arthur Kill Lift Bridge, the construction of a connection from the Staten Island Railway to the Conrail Chemical Coast Secondary, and the reactivation of the Staten Island Railway Arlington Yard and Travis Branch. The following elements constitute a preliminary rail-based alternative for freight-movement (Figure 3-10):

- *Conrail Chemical Coast Secondary (North) Improvement* - The new connection being built from the Staten Island Railway to the Chemical Coast Secondary will connect from the east to the north, providing access to Oak Island Yard in New Jersey and beyond. A recent capacity analysis of this mostly single-track segment of the Chemical Coast Secondary has shown that the area

from Elizabethport Yard (just north of the new Staten Island Railway connection) to Port Newark (on the south side of Oak Island Yard) is currently well over capacity (Port Authority, 2001), a situation which will worsen as more rail traffic is added. This capacity problem is exacerbated by the fact that the main track is sometimes used to assemble trains, due to limited space in the multiple rail yards located in this area. This improvement would entail adding a third track approximately 3,000-feet long to the Chemical Coast Secondary north of the Elizabeth Port Yard, to improve the capacity and flexibility of the line through this busy area. In addition, the current main line between the north end of Port Newark Yard ("PN") and the SIRR northern connection, along with an existing parallel yard track between PN and the Elizabeth Port Yard, will be equipped with a signal system, forming a much more efficient corridor for all trains that operate through this area.

- *Conrail Chemical Coast Secondary (South) and Conrail Port Reading Secondary Improvements* - The Staten Island Railway/Chemical Coast connection that is currently under construction provides a connection from east to north. This potential improvement would provide another leg to this connection going from east to south. This would allow trains going to or coming from HHMT/Arlington Yard to travel south on the Chemical Coast Secondary towards Port Reading. At Port Reading, trains could turn west and use the Port Reading Secondary to access either the Norfolk Southern Lehigh Line or the CSXT Trenton Line, both of which provide connections to the national rail network. In addition to the new connection in Elizabeth, improvements would be made to the Chemical Coast Secondary and the Port Reading Secondary, both of which are mostly single-track, dispatcher-controlled rail lines. These improvements would consist of some combination of track and signal improvements. Because this route already has the clearances necessary for double-stack trains, it would provide an alternate route for trains from HHMT (and other PONYNJ terminals) to access the national rail network without having to travel through the more congested connections to the north. This improvement would also better connect HHMT and Staten Island to the proposed "Short Haul Rail Spine" (NJDOT, 2003), which would improve rail access to central and southern New Jersey.
- *Staten Island Railway (West) Improvements* - This improvement would involve restoring service along the Staten Island Railway west of the Chemical Coast Secondary, providing connections to either the Norfolk Southern Lehigh Line at Staten Island Junction or the NJ Transit Raritan Valley Line (which then provides access to the CSXT Trenton Line) at Cranford Junction, or to both. As with the use of the Chemical Coast Secondary and the Port Reading Secondary, this improvement would provide an alternative connection to the national rail network without traveling to the north.

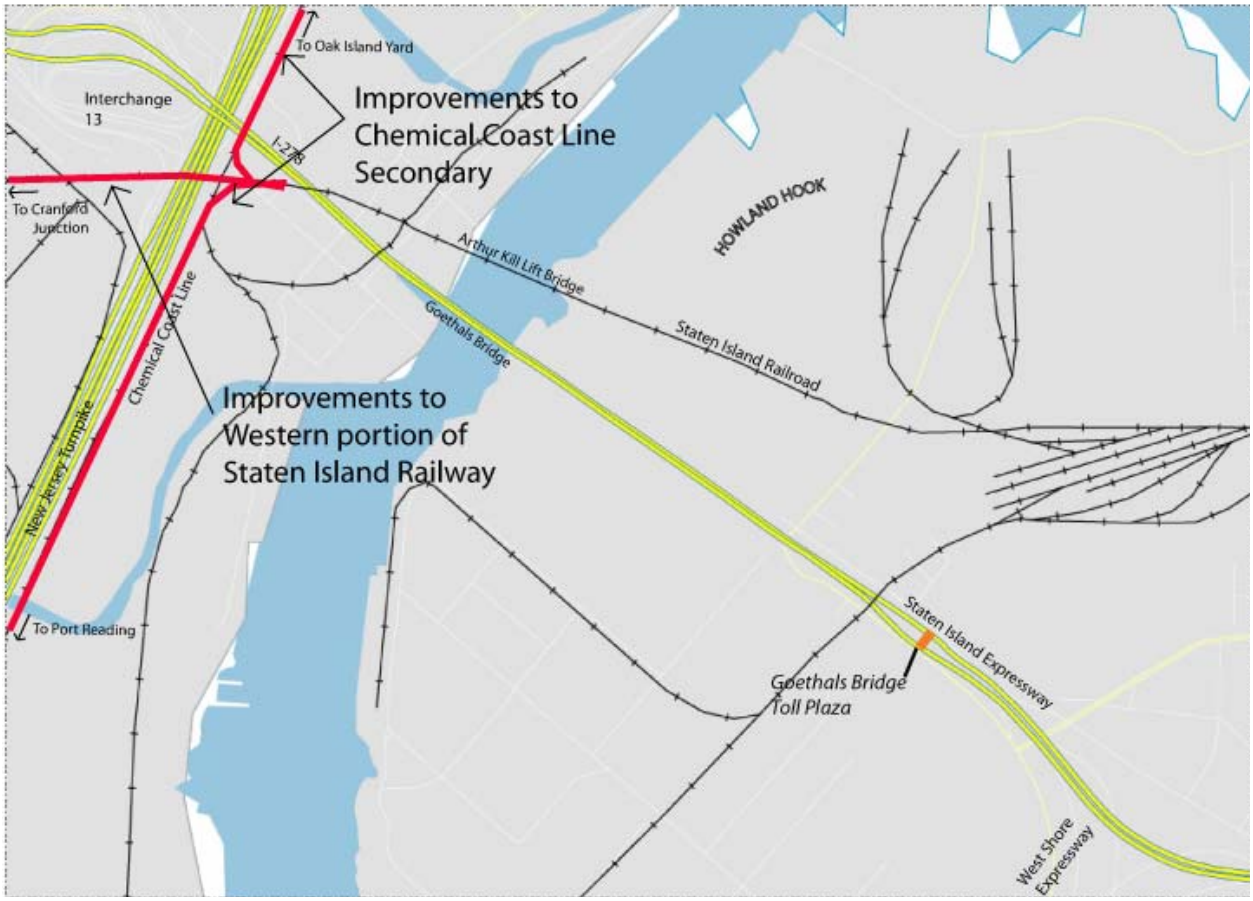


FIGURE 3-10: FREIGHT ALTERNATIVE 2: PRELIMINARY RAIL FREIGHT-MOVEMENT ENHANCEMENT (WITH OR WITHOUT NEW GOETHALS BRIDGE)

Freight Alternative 3: Intermodal Freight-Movement Enhancement (with or without New Goethals Bridge)

An intermodal freight-movement alternative would take advantage of potential synergies with other facilities that are already planned, either as part of this study or other improvements. The primary element of this alternative involves improvements to the Arlington Yard Intermodal Distribution Facility (Figure 3-11). The Port Authority is currently constructing an intermodal freight yard at the Port Ivory site to expedite the transfer of containers from ship to rail. As a separate facility in Arlington Yard, this alternative would involve the construction of an intermodal facility for moving containers (and other cargo) from rail to truck, for distribution on Staten Island. This alternative could reduce the volume of trucks crossing the Goethals Bridge, by providing another option for moving freight onto Staten Island. This facility could also function as a distribution point for freight headed to points on Long Island, which could further reduce the truck traffic on the Goethals Bridge (although not on the downstream crossings and highway).

FIGURE 3-11: FREIGHT ALTERNATIVE 3: INTERMODAL FREIGHT-MOVEMENT ENHANCEMENT (WITH OR WITHOUT NEW GOETHALS BRIDGE)

4.0 Initial Screening Results and Recommendations

Results of the initial screening of preliminary alternatives are provided in Table 4.1, which addresses each preliminary alternative's performance against the four defined measures of reasonableness and feasibility and in Table 4.2, which reports each alternative's potential ability to satisfy the project goals. Based on these matrices, the preliminary alternatives that satisfy all of the reasonableness/feasibility criteria were recommended to be advanced to the comparative screening phase.

The two elements of the initial screening phase—i.e., screening against initial criteria and against project goals—are intended to work in tandem, towards development of intermediate alternatives that are both a) fundamentally feasible and reasonable and b) have the potential to meet the full set of project goals. Based on the results, preliminary alternatives that satisfied all four of the initial screening criteria were advanced to the second screening phase. However, whether they advanced as single-mode intermediate alternatives or were combined with other single-mode alternative(s) to create multi-modal intermediate alternatives was determined, at least in part, by how many and which of the project goals they would likely satisfy.

A rating system (1 = does not meet goals; 3 = uncertain; 5 = meets goal) was used to evaluate preliminary alternatives against the project goals. A preliminary alternative's total score quantifies the degree to which it would satisfy the full set of project goals. A perfect score of 40 (rating of 5 x 8 goals) indicates that a given preliminary alternative has the potential to satisfy all of the project goals independently. While each alternative's score indicates both the alternative's absolute and relative degrees of goal satisfaction—i.e., each alternative's score considered separately, as well as compared to the other alternatives' scores—it is important to focus on which goals a given alternative would or would not satisfy. This focus provided the opportunity to consider pairings or combinations of preliminary alternatives that would be complementary in terms of goal achievement (i.e., two alternatives, each of which satisfies a goal that is not addressed by the other, would be complementary). In this way, multi-modal intermediate alternatives with potential to comprehensively satisfy the full set of project goals were considered.

4.1 Assessment of Preliminary Alternatives Against Reasonableness and Feasibility Criteria

The following identifies the specific findings for preliminary alternatives against the initial criteria (see Table 4.1):

- **Bridge Alternative 1: Goethals Replacement Bridge South**
  - *Logical Termini:* Interchange 13/NJ Turnpike on the west and Staten Island Expressway on the east.
  - *Operational Integration:* Would provide continuation of and critical link within Interstate Highway System, connecting NJ Turnpike and Staten Island Expressway/West Shore Expressway.
  - *Independent Utility:* Would provide critical crossing of Arthur Kill and link between NJ Turnpike and Staten Island Expressway, and is not "connected" to any other action[8].

[8] "Connected" actions means that 1) two actions are closely related and should be discussed together in the same EIS; 2) that one action automatically triggers the other, which may require an EIS; 3) that one action cannot or will not proceed unless other actions are taken previously or simultaneously; or 4) that the actions are interdependent parts of a larger action and depend on the larger action for their justification (40 CFR 1508.25(a)(1)).

TABLE 4.1: FUNDAMENTAL FEASIBILITY AND REASONABLENESS SCREENING MATRIX

Preliminary Alternatives		Initial Screening Criteria			
		Logical Termini?	**Capable of Operational Integration?**	**Independent Utility?**	**Would Conform to Current Standards?**
B1	Replacement Bridge South	✓	✓	✓	✓
B2	Replacement North	✓	✓	✓	✓
B3	Parallel Bridge South	✓	✓	✓	x[1]
B4	Parallel Bridge North	✓	✓	✓	x[1]
B5	Twin Replacement Bridges South & Existing ROW	✓	✓	✓	✓
B6	Twin Replacement Bridges North & Existing ROW	✓	✓	✓	✓
T1	Bus Rapid Transit (requires new bridge)	✓	✓	x[2]	✓
T2	Ferry Services	✓	✓	✓	✓/x[3]
TDM1	Temporal Shift	✓	✓	✓	✓
TDM2	Temporal/ Payment/ Mode Shifts	✓	✓	✓	✓
TDM3	Peak-Period Temporal Shift + Transit Support	✓	✓	✓/x[4]	✓
TDM4	HOT Lane (requires new bridge)	✓	✓	x[2]	✓
FM1	Highway Freight-Movement Enhancement (requires new bridge)	✓	✓	x[2]	✓
FM2	Rail Freight-Movement Enhancement	✓	✓/x[5]	✓	✓
FM3	Intermodal Freight-Movement Enhancement	✓	✓	✓	✓

✓ = yes x = no ✓/x = uncertain

Notes

1. Reconfiguration of existing bridge would retain substandard emergency shoulders, and retrofitting could not fully incorporate recommended measures to protect against security threats.
2. Alternative requires new bridge for implementation.
3. Definition of preliminary ferry services alternative did not specify ferry terminal locations. While it may be assumed that design of the ferry terminals would conform to current standards, it cannot be stated with certainty.
4. Alternative would have independent utility only if transit support comprises the preliminary ferry alternative, as this would not require a new bridge for implementation; the preliminary BRT alternative would require a new bridge; therefore, this alternative's performance against the criterion of independent utility was judged as uncertain in the initial screening phase.
5. While this alternative was assumed to be capable of being integrated with existing freight rail operations, it was uncertain in the initial screening phase.

- *Current Standards*: Design would meet all current American Association of State Highway and Transportation Officials (AASHTO) standards and criteria, potentially supplemented with criteria defined by PANYNJ in conjunction with NJ and NYS Departments of Transportation.

- **Bridge Alternative 2: Goethals Replacement Bridge North –** Same findings as for Bridge Alternative 1.
- **Bridge Alternative 3: Goethals Parallel Bridge South –** Same findings as for Bridge Alternative 1, with one exception:
- *Current Standards*: Design of new bridge would meet all current AASHTO standards and criteria, potentially supplemented with criteria defined by PANYNJ in conjunction with NJ and NYS Departments of Transportation. Reconfiguration of existing bridge would retain insufficient emergency shoulder width.

- **Bridge Alternative 4: Goethals Parallel Bridge North –** Same findings as for Bridge Alternative 1 with one exception:
- *Current Standards*: Design of new bridge would meet all current AASHTO standards and criteria, potentially supplemented with criteria defined by PANYNJ in conjunction with NJ and NYS Departments of Transportation. Reconfiguration of existing bridge would retain insufficient emergency shoulder width.

- **Bridge Alternative 5: Goethals Twin Replacement Bridges South and in Current Right-of-way –** Same findings as for Bridge Alternative 1.
- **Bridge Alternative 6: Goethals Twin Replacement Bridges North and in Current Right-of-way –** Same findings as for Bridge Alternative 1.
- **Transit Alternative 1: Bus Rapid Transit Service via New Goethals Bridge with Local Bus Service Enhancements (requires new bridge)**
- *Logical Termini:* Exclusive bus lane network would extend to the (new) Goethals Bridge, the North Shore Railroad right-of-way, the Staten Island Expressway, and the West Shore Expressway.
- *Operational Integration:* BRT service would connect to existing transit services and facilities at St. George Terminal; throughout Staten Island; in Elizabeth; and in Union and Somerset counties.
- *Independent Utility:* This alternative could not proceed without construction of a new bridge, and therefore does not have independent utility.
- *Current Standards:* Design would meet all current Federal Transit Administration (FTA) standards and criteria.

- **Transit Alternative 2: Ferry Service between Brooklyn, St. George, and Elizabethport with Local Bus Service Enhancements**
- *Logical Termini:* Ferry service would extend from Elizabethport to St. George to Brooklyn, via the Kill van Kull and New York Harbor.
- *Operational Integration:* Ferry service would connect with local bus services beyond the ferry landings in Brooklyn and St. George, and with the Staten Island Railway.
- *Independent Utility:* Would provide transit service and is not "connected" to any other action.
- *Current Standards:* As ferry terminal locations were not yet been identified in the definition of this preliminary alternative, it was assumed that locations selected during further development of this alternative (were it to survive the initial screening) would permit a design that meets current standards. However, conformance to this criterion was judged uncertain at the initial screening phase.

- **TDM Alternative 1: Temporal Shift**
- *Logical Termini:* The congestion pricing would be implemented on all of the PANYNJ's Staten Island Bridge and other river crossings.

- *Operational Integration:* Would be integrated with PANYNJ's toll collection operations and facilities.
- *Independent Utility:* Is not "connected" to any other action, and could be implemented independently.
- *Current Standards:* Would meet PANYNJ tolling policies and use available EZPass technology.

- **TDM Alternative 2: Temporal, Payment, and Mode Shift**
  - *Logical Termini:* The congestion pricing would be implemented on all of the PANYNJ's Staten Island Bridge and other river crossings.
  - *Operational Integration:* Would be integrated with PANYNJ's toll collection operations and facilities.
  - *Independent Utility:* Is not "connected" to any other action, and could be implemented independently.
  - *Current Standards:* Would meet PANYNJ tolling policies and use available EZPass technology.
- **TDM Alternative 3: Peak-Period Temporal Shift and Transit**
  - *Logical Termini:* The congestion pricing would be implemented on all of the PANYNJ's Staten Island Bridge and other river crossings. The transit support component's logical termini would be as defined for either the preliminary BRT or ferry service alternative.
  - *Operational Integration:* Would be integrated with PANYNJ's toll collection operations and facilities. Transit component would be operationally integrated as defined for either the preliminary BRT or ferry service alternative.
  - *Independent Utility:* This alternative has independent utility if the transit component is the preliminary ferry service, but could not proceed without construction of a new bridge if the preliminary BRT alternative is assumed. Therefore, this would be uncertain until the alternative were to be further developed.
  - *Current Standards:* Would meet PANYNJ tolling policies, and use available EZPass technology; design of the transit component would meet FTA standards and criteria.
- **TDM Alternative 4: High-Occupancy Toll (HOT) Lane (requires New Goethals Bridge)**
  - *Logical Termini:* The congestion pricing would be implemented on all of the PANYNJ's Staten Island Bridge and other river crossings. The HOT lane component would be implemented on the (new) Goethals Bridge and, subject to interagency agreement between the PANYNJ and New York State Department of Transportation (NYSDOT) regarding their respective facilities, would be extended to the Staten Island Expressway's exclusive bus lane, parts of which have been constructed.
  - *Operational Integration:* Congestion pricing would be integrated with PANYNJ's toll collection operations and facilities. The HOT lane component would be integrated with the Staten Island Expressway's exclusive bus lane, subject to PANYNJ/NYSDOT negotiations.
  - *Independent Utility:* This alternative could not proceed without construction of a new bridge, and therefore does not have independent utility.
  - *Current Standards:* Would meet PANYNJ tolling policies, and use available EZPass technology; design of the HOT lane component would meet pertinent standards and criteria.
- **Freight Alternative 1: Highway Freight-Movement Enhancement (requires New Goethals Bridge)**
  - *Logical Termini:* Termini of alternative's components would be: a) improved Howland Hook access between Goethals Bridge and the marine terminal; b) improvements to NJ Turnpike Interchange 13 within the interchange and possibly extending to the Bayway industrial area in

Elizabeth, c) slip ramps between the interchange and the Goethals Bridge; and d) exclusive truck or shared HOV lanes on the (new) Goethals Bridge and its approaches.

- *Operational Integration:* Would be integrated with connecting roadway systems (NJ Turnpike, Staten Island Expressway, local roads to/from marine terminal and possibly Bayway industrial area in Elizabeth).
- *Independent Utility:* This alternative could not proceed without construction of a new bridge, and therefore does not have independent utility.
- *Current Standards:* All components would be designed to conform to AASHTO standards and criteria.

- **Freight Alternative 2: Rail Freight-Movement**

- *Logical Termini:* Termini of alternative's components would be: a) Conrail Chemical Coast Secondary (North) improvement between Staten Island Railway to Port Newark; b) Conrail Chemical Coast Secondary (South) and Conrail Port Reading improvements between Staten Island Railway and Port Reading; and c) Staten Island Railway (West) improvements between Chemical Coast Secondary and either Norfolk Southern Lehigh Line at Staten Island Junction or NJ Transit Raritan Valley Line at Cranford Junction, NJ, or both.
- *Operational Integration:* Improvements to rail freight infrastructure and operations would be integrated with existing infrastructure and operations on Chemical Coast Secondary, Staten Island Railway, and, from there, with national rail network.
- *Independent Utility:* Has independent utility as it is not "connected" to any other action.
- *Current Standards:* All improvements would be designed in conformance with Federal Railway Administration (FRA) and AREMA standards and criteria.

- **Freight Alternative 3: Intermodal Freight-Movement Enhancement**

- *Logical Termini:* Intermodal facility would be constructed within Arlington Yard, and be connected to the Staten Island Railway.
- *Operational Integration:* Would be integrated with rail and roadway networks for receipt of containers via rail and transfer of goods to trucks for intra-Staten Island distribution.
- *Independent Utility:* Is not "connected" to any other action, and could be implemented independently.
- *Current Standards:* Design of intermodal yard would conform to current standards and criteria for rail-to-truck intermodal facilities.

4.2 Assessment of Preliminary Alternatives Against Project Goals

The following identifies the specific findings for each preliminary alternative against the project goals (Table 4.2):

- **Bridge Alternative 1: Goethals Replacement Bridge South**

- *Address Functional Obsolescence:* New bridge would be designed to current standards and criteria.
- *Address Structural Integrity:* New bridge would be designed to current standards and significantly extend life span of crossing.

TABLE 4.2:
PROJECT GOALS SCREENING MATRIX

Preliminary Alternatives	Address bridge's functional obsolescence	Address bridge's structural integrity	Improve bridge's structural security	Reduce congestion & delays & enhance mobility on bridge	Address bridge's inability to accommodate alternatives to SOVs	Improve goods flow to/from SI & NJ, & in NY/NJ region	Restore/enhance bike & pedestrian access on bridge	Minimize adverse environmental effects	TOTAL
B1 Replacement Bridge South	5	5	5	5	5	3[1]	5	3	36
B2 Replacement Bridge North	5	5	5	5	5	3[1]	5	3	36
B3 Parallel Bridge South + Reconfigured Existing Bridge	1[2]	1[3]	1[4]	5	5	3[1]	5	3	26
B4 Parallel Bridge North + Reconfigured Existing Bridge	1[2]	1[3]	1[4]	5	5	3[1]	5	3	26
B5 Twin Replacement Bridges South & in Current ROW	5	5	5	5	5	3[1]	5	3	36
B6 Twin Replacement Bridges North & in Current ROW	5	5	5	5	5	3[1]	5	3	36
T1 Bus Rapid Transit (requires new bridge)	1	1	1	3[5]	1	3[5,6]	1	3	14
T2 Ferry Service	1	1	1	3	1	3[6]	1	3	14
TDM1 Temporal Shift	1	1	1	3	1	3[7]	1	5	16
TDM2 Temporal/ Payment/Mode Shifts	1	1	1	3	1	3[7]	1	5	16

TABLE 4.2:
PROJECT GOALS SCREENING MATRIX (CONTINUED)

Preliminary Alternatives	Address bridge's functional obsolescence	Address bridge's structural integrity	Improve bridge's structural security	Reduce congestion & delays & enhance mobility on bridge	Address bridge's inability to accommodate alternatives to SOVs	Improve goods flow to/from SI & NJ, & in NY/NJ region	Restore/enhance bike & pedestrian access on bridge	Minimize adverse environmental effects	TOTAL
TDM3 Peak-Period Temporal Shift + Transit	1	1	1	3	1	3[7]	1	3	14
TDM4 HOT Lane (requires new bridge)	1	1	1	3[5]	1	3[5,6]	1	3	14
FM1 Highway Freight-Movement Enhancement (requires new bridge)	1	1	1	3[5]	1	3[5]	1	3	14
FM2 Rail Freight-Movement Enhancement	1	1	1	3[8]	1	5	1	3	16
FM3 Intermodal Freight-Movement Enhancement	1	1	1	3[8]	1	5	1	3	16

1 = does not meet goal; 3 = uncertain; 5 = satisfies goal

Notes:

1. Positive effect on truck-based goods movement due to standard-width lanes and increased capacity with six lanes in crossing but uncertainty regarding broader effect on goods movement in NY/NJ region.
2. Emergency shoulders on reconfigured existing bridge would be of substantially substandard width (i.e., 4 and 2 feet widths).
3. Reconfiguration of the existing bridge would not address the structure's age, which is past its normal service life, and consequent need for ongoing maintenance, repair and rehabilitation costs.
4. Design of the new parallel bridge would include structural security measures; the existing bridge could be seismically retrofitted, but only certain measures to limit security threats to the existing bridge could be feasibly implemented.
5. As this single-mode alternative could not be accommodated on the existing bridge but requires a new bridge, it cannot independently address this goal; however, it may have a positive effect related to this goal if implemented with a new bridge.
6. Potential positive effect on truck-based goods movement, depending on degree of alternative's ability to attract sufficient SOV travelers on bridge to use alternate travel option and, thereby, reduce vehicular traffic on bridge, enhancing traffic flows.
7. Potential improvement in traffic flows, but only during peak commutation periods, which are not necessarily coincident with peak periods for truck traffic.
8. Performance related to this goal depends on whether improvements in non-highway-based freight movement sufficiently reduce truck traffic to improve general traffic flows.

- *Improve Structural Security:* New bridge would be designed to current seismic code and implement FHWA/AASHTO-recommended approaches for dealing with security threats.
- *Reduce Congestion/Delays & Enhance Mobility*: Capacity enhancement of 6 lanes, compared to existing 4 lanes, is assumed to satisfy goal (forecast modeling will determine degree of mobility improvement).
- *Address inability to accommodate alternatives to SOVs:* Greater bridge width and additional lanes would improve crossing's ability to physically accommodate SOV alternatives.
- *Improve Goods Flow:* Improvements in general-traffic flows and, consequently, in truck-based goods flow, are assumed with standard lane-widths and additional capacity; effect on regional traffic flows and truck-based goods-movement would be uncertain.
- *Restore/Enhance Bike/Pedestrian Access:* Bike/pedestrian accommodation assumed as part of bridge design.
- *Minimize Adverse Environmental Consequences:* While new infrastructure implies some environmental impact, given known environmental sensitivities in and near corridor (e.g., wetlands), degree of environmental impact is uncertain.

- **Bridge Alternative 2: Goethals Replacement Bridge North**

- Same conclusions as for Alternative 1.

- **Bridge Alternative 3: Goethals Parallel Bridge South**

- *Address Functional Obsolescence:* The new bridge would be designed to current standards and criteria. The existing bridge would not be compliant with current standards, due to insufficient shoulder widths.
- *Address Structural Integrity:* The new bridge would inherently be structurally sound. The existing bridge would have to undergo deck replacement in an estimated 7 to 10 years after completion of the current bridge repair contract, followed by other significant repair and rehabilitation costs every 20 to 25 years to extend the structure's life span.
- *Improve Structural Security:* Design of the new bridge would address structural security and seismic design issues. The existing bridge would need to be seismically retrofitted (at same time as deck replacement and other rehabilitation and repair work must be conducted, at an estimated 7 to 10 years after completion of the current bridge repair contract), and feasible blast-resistant measures, such as strengthening/hardening of critical, non-redundant structural members, would need to be undertaken. Other measures to enhance structural security, e.g., creating or increasing standoff distances, would not be feasible for certain critical bridge elements as they are precluded by existing constraints (e.g., location of pier protection within the Arthur Kill's navigation channel would require fendering, which would further impact navigation channel; narrow deck width and no shoulders provide inadequate stand-off distance from critical superstructure structural members to accommodate placement of barriers to minimize blast impact).
- *Reduce Congestion/Delays & Enhance Mobility*: Capacity enhancement of 6 lanes, compared to existing 4 lanes, is assumed to satisfy goal (forecast modeling will determine degree of mobility improvement).
- *Address inability to accommodate alternatives to SOVs:* Additional lanes and new bridge's increased width would improve crossing's ability to physically accommodate SOV alternatives.
- *Improve Goods Flow:* Improvements in general-traffic flows and, consequently, in truck-based goods flow, are assumed with standard lane-widths and additional capacity; effect on regional traffic flows and truck-based goods-movement would be uncertain.
- *Restore/Enhance Bike/Pedestrian Access:* Bike/pedestrian accommodation assumed as part of the new parallel bridge's design.

- *Minimize Adverse Environmental Consequences:* Although reuse of the existing bridge presumably minimizes new adverse impact, the degree of environmental impact potential associated with the new parallel bridge would be uncertain.

- **Bridge Alternative 4: Goethals Parallel Bridge North**
- Same conclusions as for Alternative 3.

- **Bridge Alternative 5: Goethals Twin Replacement Bridges, South and in Current Right-of-way**
- *Address Functional Obsolescence***:** New bridges would be designed to current standards and criteria.
- *Address Structural Integrity***:** New bridges would be designed to current standards and significantly extend life span of crossing.
- *Improve Structural Security:* New bridges would be designed to current seismic code and implement FHWA/AASHTO-recommended approaches for dealing with security threats.
- *Reduce Congestion/Delays & Enhance Mobility:* Capacity enhancement of 6 lanes, compared to existing 4 lanes, is assumed to satisfy goal (forecast modeling will determine degree of mobility improvement).
- *Address inability to accommodate alternatives to SOVs:* Greater total bridge width and additional lanes would improve crossing's ability to physically accommodate SOV alternatives.
- *Improve Goods Flow:* Improvements in general-traffic flows and, consequently, in truck-based goods flow, are assumed with standard lane-widths and additional capacity; effect on regional traffic flows and truck-based goods-movement would be uncertain.
- *Restore/Enhance Bike/Pedestrian Access:* Bike/pedestrian accommodation assumed as part of bridges' design.
- *Minimize Adverse Environmental Consequences:* While one of the replacement bridges would be located in the existing bridge's alignment, the degree to which that would minimize adverse environmental impact (e.g., on wetlands) would be uncertain.

- **Bridge Alternative 6: Goethals Twin Replacement Bridges North and in Current Right-of-way**
- Same conclusions as for Alternative 5.

- **Transit Alternative 1: Bus Rapid Transit (BRT) Service via New Goethals Bridge with Local Bus Service Enhancements (Requires New Bridge)**
- *Address Functional Obsolescence:* Not addressed by independent BRT alternative.
- *Address Structural Integrity:* Not addressed by independent BRT alternative.
- *Improve Structural Security:* Not addressed by independent BRT alternative.
- *Reduce Congestion/Delays & Enhance Mobility:* While introduction of transit as a travel option is assumed to have a positive effect on congestion, delay, and mobility by causing some shift of travelers from SOVs using the bridge, the degree of BRT's attractiveness and resultant likely ridership would be uncertain.
- *Address inability to accommodate alternatives to SOVs:* Not addressed by independent alternative.
- *Improve Goods Flow:* Potential positive effect on truck-based goods movement, depending on degree of alternative's ability to attract sufficient SOV travelers using the (new) bridge to use transit travel option and, thereby, reduce vehicular traffic on bridge, enhancing traffic flows.
- *Restore/Enhance Bike/Pedestrian Access:* Not addressed by independent alternative.

- *Minimize Adverse Environmental Consequences:* Implementation of this BRT alternative would require a new bridge of greater than 4 lanes (and could be implemented with any of the new-crossing alternatives, each of which would impose some degree of adverse environmental impact). The BRT alternative would also require construction of connecting ramps between the North Shore Line in Staten Island, and new transportation hubs with park-and-ride lots and interchange facilities for local bus services along the North Shore and West Shore of Staten Island, which would collectively impose some degree of adverse impact. The degree of environmental impact would be uncertain.

- **Transit Alternative 2: Ferry Service between Brooklyn, St. George, and Elizabethport with Local Bus Service Enhancements**
- *Address Functional Obsolescence:* Not addressed by independent ferry alternative.
- *Address Structural Integrity:* Not addressed by independent ferry alternative.
- *Improve Structural Security:* Not addressed by independent ferry alternative.
- *Reduce Congestion/Delays & Enhance Mobility:* While introduction of transit as a travel option is assumed to have a positive effect on congestion, delay, and mobility by causing some shift of travelers from SOVs using the bridge, the degree of ferry service's attractiveness and resultant likely ridership would be uncertain.
- Address inability to accommodate alternatives to SOVs: Not addressed by alternative.
- *Improve Goods Flow:* Potential positive effect on truck-based goods movement, depending on degree of alternative's ability to attract sufficient SOV travelers using bridge to use transit travel option and, thereby, reduce vehicular traffic on bridge, enhancing traffic flows.
- *Restore/Enhance Bike/Pedestrian Access:* Not addressed by alternative.
- *Minimize Adverse Environmental Consequences:* Implementation of ferry service is assumed to have some adverse environmental impacts, due to need to build/improve ferry landings and make other physical improvements near the harbor, as well as potential impacts of the ferry vehicles' operation as they travel across the water.

- **TDM Alternative 1: Temporal Shift**
- *Address Functional Obsolescence:* Not addressed by alternative.
- *Address Structural Integrity:* Not addressed by alternative.
- *Improve Structural Security:* Not addressed by alternative.
- *Reduce Congestion/Delays & Enhance Mobility:* Changes in toll policies are assumed to have a positive effect on congestion and delay, although their impact on mobility would be uncertain.
- *Address inability to accommodate alternatives to SOVs:* Not addressed by alternative.
- *Improve Goods Flow:* Potential positive effect on truck-based goods movement, depending on degree of alternative's ability to reduce congestion and delays, and thereby improve traffic flows, but only during peak commutation periods, which are not necessarily coincident with peak truck traffic.
- *Restore/Enhance Bike/Pedestrian Access:* Not addressed by alternative.
- *Minimize Adverse Environmental Consequences:* Implementation of toll and TDM initiatives is assumed to have no direct adverse environmental impacts.

- **TDM Alternative 2: Temporal, Payment, and Mode Shift**
- *Address Functional Obsolescence:* Not addressed by alternative.
- *Address Structural Integrity:* Not addressed by alternative.
- *Improve Structural Security:* Not addressed by alternative.

- *Reduce Congestion/Delays & Enhance Mobility:* Changes in toll policies are assumed to have a positive effect on congestion and delay, although their impact on mobility would be uncertain.
- *Address inability to accommodate alternatives to SOVs*: Not addressed by alternative.
- *Improve Goods Flow:* Potential positive effect on truck-based goods movement, depending on degree of alternative's ability to reduce congestion and delays, and thereby improve traffic flows, but only during peak commutation periods, which are not necessarily coincident with peak truck traffic.
- *Restore/Enhance Bike/Pedestrian Access:* Not addressed by alternative.
- *Minimize Adverse Environmental Consequences:* Implementation of toll and TDM initiatives is assumed to have no direct adverse environmental impacts.

- **TDM Alternative 3: Peak-Period Temporal Shift and Transit Support**

- *Address Functional Obsolescence:* Not addressed by alternative.
- *Address Structural Integrity:* Not addressed by alternative.
- *Improve Structural Security:* Not addressed by alternative.
- *Reduce Congestion/Delays & Enhance Mobility:* Changes in toll policies and transit enhancements are assumed to have a positive effect on congestion and delay, although their impact on mobility would be uncertain.
- *Address inability to accommodate alternatives to SOVs:* Not addressed by alternative.
- *Improve Goods Flow:* As this alternative seeks temporal shift just within the peak period (from peak hour to shoulder hours), degree of potential positive effect on truck-based goods movement is likely to be very limited, given the alternative's focus on improving travel within single AM and PM peak hours.
- *Restore/Enhance Bike/Pedestrian Access:* Not addressed by alternative.
- *Minimize Adverse Environmental Consequences:* While implementation of toll and TDM initiatives are assumed to have no direct adverse environmental impacts, construction of the transit support component (whether incorporating the preliminary BRT or ferry service alternative) would impose some degree of environmental impact.

- **TDM Alternative 4: High-Occupancy Toll (HOT) Lane (requires New Goethals Bridge)**

- *Address Functional Obsolescence:* Not addressed by independent alternative.
- *Address Structural Integrity:* Not addressed by independent alternative.
- *Improve Structural Security:* Not addressed by independent alternative.
- *Reduce Congestion/Delays & Enhance Mobility:* HOT lane is assumed to have a positive effect on congestion, delay, and mobility.
- *Address inability to accommodate alternatives to SOVs:* Not addressed by independent TDM alternative.
- *Improve Goods Flow:* Potential positive effect on truck-based goods movement, depending on degree of alternative's ability to attract sufficient HOVs, buses, and premium-toll-paying SOVs on the (new) bridge to the HOT lane and, thereby, reduce vehicular traffic on bridge, enhancing traffic flows.
- *Restore/Enhance Bike/Pedestrian Access:* Not addressed by independent alternative.
- *Minimize Adverse Environmental Consequences:* Implementation of this HOT Lane alternative would require a new bridge of greater than 4 lanes (and could be implemented with any of the new-crossing alternatives, each of which would impose some degree of adverse environmental impact). Incorporating a HOT lane would not increase the degree of adverse environmental impact already imposed by the new bridge.

- **Freight Alternative 1: Highway Freight-Movement Enhancement (requires New Goethals Bridge)**
  - *Address Functional Obsolescence:* Not addressed by independent alternative.
  - *Address Structural Integrity***:** Not addressed by independent alternative.
  - *Improve Structural Security:* Not addressed by independent alternative.
  - *Reduce Congestion/Delays & Enhance Mobility:* Degree to which improvements in truck-based goods flow would also lead to improvements in general traffic flow (e.g., due to removal of freight traffic from general-purpose lanes) would be uncertain.
  - *Address inability to accommodate alternatives to SOVs:* Not addressed by independent alternative.
  - *Improve Goods Flow:* Alternative specifically designed to improve the flow of goods; degree of positive effect would be uncertain.
  - *Restore/Enhance Bike/Pedestrian Access:* Not addressed by independent alternative.
  - *Minimize Adverse Environmental Consequences:* New and enhanced road-based freight-movement facilities associated with this alternative would likely impose some degree of adverse environmental impact, though the type and degree of impact would be uncertain.
- **Freight Alternative 2: Rail Freight-Movement Enhancement**
  - *Address Functional Obsolescence:* Not addressed by independent alternative.
  - *Address Structural Integrity:* Not addressed by independent alternative.
  - *Improve Structural Security:* Not addressed by independent alternative.
  - *Reduce Congestion/Delays & Enhance Mobility:* Would depend on whether improvements in goods flow also lead to improvements in general traffic flow (e.g., due to removal of freight traffic from general traffic lanes), so ranking was not certain at the initial stage of analysis.
  - *Address inability to accommodate alternatives to SOVs:* Not addressed by alternative.
  - *Improve Goods Flow:* Alternative specifically designed to improve the flow of goods; degree of positive effect would be uncertain.
  - *Restore/Enhance Bike/Pedestrian Access:* Not addressed by independent alternative.
  - *Minimize Adverse Environmental Consequences:* New and enhanced railroad facilities associated with this alternative would likely impose some degree of adverse environmental impact, though the type and degree of impact would be uncertain.
- **Freight Alternative 3: Intermodal Freight-Movement Enhancement**
  - *Address Functional Obsolescence:* Not addressed by independent alternative.
  - *Address Structural Integrity:* Not addressed by independent alternative.
  - *Improve Structural Security:* Not addressed by independent alternative.
  - *Reduce Congestion/Delays & Enhance Mobility:* Would depend on whether improvements in goods flow also lead to improvements in general traffic flow (e.g., due to removal of freight traffic from general traffic lanes), so ranking was not certain at the initial stage of analysis.
  - *Address inability to accommodate alternatives to SOVs:* Not addressed by alternative.
  - *Improve Goods Flow:* Alternative specifically designed to improve the flow of goods; degree of positive effect would be uncertain.
  - *Restore/Enhance Bike/Pedestrian Access:* Not addressed by independent alternative.
  - *Minimize Adverse Environmental Consequences:* New and enhanced facilities at Arlington Yard associated with this alternative would likely impose some degree of adverse environmental impact, though the type and degree of impact would be uncertain.

4.3 Finding and Recommendations of Initial Screening

Table 4.1 shows that most of the preliminary alternatives satisfy all four of the initial screening criteria,[9] with the exceptions noted below:

- Four preliminary alternatives,[10] each of which would require a new bridge in the Goethals corridor in order to be implemented, failed the test of independent utility. While these alternatives were not advanced as single-mode alternatives, the two transit options were recommended for combining with other preliminary alternatives that comprise a new bridge(s), if doing so would produce multimodal intermediate alternatives with complementary transportation services that together would satisfy all project goals.
- The two preliminary parallel bridge alternatives (B3. Parallel Bridge South and B4. Parallel Bridge North) failed the test of conforming to current standards, as the reconfigured existing bridge would retain substandard emergency shoulders, and bridge retrofitting could not fully incorporate recommended measures to protect against security threats. These shortcomings could not be nullified by combining these preliminary alternatives with others.
- One preliminary alternative, FM2. Rail Freight-Movement Enhancement, could not be judged in the initial screening regarding its ability to be integrated operationally within the existing and programmed/committed rail network. While it may be capable of being integrated with the region's rail freight operations, integration of the alternative's Staten Island Railway improvements, west of the Chemical Coast Line Secondary, with the Raritan Valley Line's passenger services at Cranford Junction is uncertain.

Table 4.2 shows that there are no preliminary alternatives that could be judged, in the initial screening, to fully satisfy all of the project goals. Some preliminary alternatives simply failed to address certain goals; other preliminary alternatives' abilities to satisfy one or more of the goals were uncertain at the initial stage of screening.

The single and twin replacement bridge alternatives had the highest total scores (36). Their ability to improve goods flow within the NY/NJ region – separate from their assumed ability to improve goods flow between Staten Island and New Jersey – was uncertain, as was their ability to minimize adverse environmental effects.

The parallel bridge alternatives failed to address the existing bridge's functional obsolescence, and structural integrity issues, and could only partially address issues of the existing structure's security. The ability of these two alternatives, like the replacement bridge alternatives, to improve goods movement within the NY/NJ region and to minimize adverse environmental effects was also uncertain at the initial stage of screening.

Compared to the bridge alternatives, the other categories of preliminary alternatives – transit, travel demand management (TDM), and freight-movement – all had significantly lower total scores (14 and 16, of the total possible score of 40). This reflects the inherent inability of these types of single-mode alternatives to respond to the proposed project's principal focus on addressing deficiencies and constraints of the existing bridge. Nonetheless, some of these lower scoring alternatives represented opportunities to

[9] This reflects the approach used to identify the preliminary alternatives, which included consideration of existing and future transportation and land use contexts, review of multiple data and mapped information sources, and application of general engineering and transportation planning principles.

[10] 1) T1. Bus Rapid Transit (BRT); 2) TDM2. Peak-Period Temporal Shift + Transit Support, if the transit were T1. BRT; 3) TDM4. Hot Lane; 4) FM1. Highway Freight-Movement Enhancement.

complement the bridge replacement alternatives and thereby create potential multimodal solutions for the proposed project's underlying purpose and need.

Based on these findings, the following recommendations were made to conclude the initial screening:

- *Advance the four bridge-replacement alternatives.* Each of the four bridge-replacement alternatives (B1, B2, B5, B6) satisfied all four of the initial screening criteria and had a rating of 36 (out of a total possible rating of 40) against the project goals. It was recommended that these alternatives be advanced initially as single-mode intermediate alternatives for modeling[11] of their future transportation performance. As each of the bridge-replacement alternatives was initially defined as having six lanes for general-purpose travel, i.e., the same capacity, one model run will be sufficient to ascertain how well the defined capacity would satisfy the comparative screening criteria related to improving mobility on the Goethals Bridge and its approaches (comparative screening criterion CS-1) without resulting in deterioration of traffic conditions at other Staten Island bridges or in the region (comparative screening criterion CS-2).
- *Consider supplementing bridge-replacement alternatives with transit options.* Depending on the modeling results and findings related to the two transportation-related criteria in the next, comparative phase of the alternatives screening process, consideration was given to combining bridge-replacement alternatives with the transit options defined, in recognition of the interest in enhancing transit services in the study area and the region. Potential ridership was first forecast—assuming an improved Goethals Bridge—to ascertain whether either one or both of the transit options would attract sufficient riders to make the proposed service viable to implement in the near-term. The intent was to seek synergies between the transportation modes to satisfy the transportation-related criteria.
- *Forecast ridership potential of the two transit options as supplements to the bridge-replacement alternatives.* Each of the bridge-replacement alternatives would independently satisfy the goal of addressing the existing bridge's "inability to physically accommodate transit services and other SOV commuting alternatives." Nevertheless, given public interest expressed during the DEIS scoping process related to improved transit services in the Goethals Bridge corridor, it was recommended that modeling be conducted to forecast the BRT and ferry options' potential future ridership to determine whether either one or both appear viable for near-term implementation.
- *Do not advance the two parallel bridge alternatives.* It was recommended that the two parallel bridge alternatives (B3. South and B4. North) not be advanced to the next phase of the screening process because: 1) they would not conform to current design standards, and 2) they would not address goals related to the existing bridge's functional obsolescence and structural integrity, and only certain measures to limit security threats to the existing structure could be feasibly implemented.

[11] Screening-phase modeling was conducted with the base Best Practices Model (BPM), while development of the GTM continued. The GTM was used subsequently to forecast performance of the alternatives that were short-listed via the screening process for detailed evaluation in the DEIS.

5.0 Intermediate Alternatives

On the basis of the preceding steps, four intermediate alternatives were advanced for further development and subsequent comparative screening (see Figures 5-1 through 5-4):

- *6-Lane Bridge Replacement South* – A new bridge would be designed and constructed south of and roughly parallel to the existing structure, and the existing Goethals Bridge would be demolished. The new 6-lane bridge would provide 12-foot-wide lanes, three in each direction, a 12-foot-wide right shoulder, and a 5-foot-wide left shoulder in each direction; and adequate overall bridge width to accommodate a sidewalk/bikeway and any potential future transit service; and associated toll plaza improvements (Figure 5-1).
- *6-Lane Bridge Replacement North* – Similar to the 6-Lane Bridge Replacement South, above, but the new bridge would be designed and constructed north of and roughly parallel to the existing structure (Figure 5-2).
- *Twin Replacement Bridges South* – Two 3-lane replacement bridges would be designed and constructed, one south of and roughly parallel to the existing structure for eastbound traffic, and the second in the right-of-way (ROW) of the existing Goethals Bridge, following demolition of the existing structure, for westbound traffic. Each of the bridges would provide 12-foot-wide lanes and 12- and 5-foot-wide right and left shoulders, respectively. The westbound bridge would also include a 10-foot-wide walkway/bikeway, and the two bridges would together provide sufficient width to accommodate any potential future transit service. Associated toll plaza improvements would also be provided (Figure 5-3).
- *Twin Replacement Bridges North* – Similar to the Twin Replacement Bridges South, above, but with the first 3-lane bridge north of and roughly parallel to the existing structure for westbound traffic, and the second in the ROW of the existing Goethals Bridge for eastbound traffic. The walkway/bikeway would be on the eastbound bridge (Figure 5-4).

Potential transit options identified and screened in the initial screening phase were not advanced for further consideration as independent alternatives. However, BRT and ferry service concepts were further detailed in the comparative screening phase to estimate their potential future ridership and potential ability to enhance mobility in the Goethals Bridge corridor with any of the bridge-replacement alternatives. Details of the BRT and ferry options are provided below.

- *BRT System* (Figure 5-5)
  - 9 routes, each with 15-minute headway;
  - Articulated vehicles with 90-passenger capacity (seated and standing);
  - $4.00 one-way fare for all routes;
  - All BRT stations would have walk, pick-up/drop-off, and transfer access from other transit modes within ¼-mile distance;
  - Available on-street or lot parking; Staten Island Ferry Terminal and NJ Transit train station parking; no parking availability at Newark Airport;
  - Convenient transfer to/from NYC Transit local and express bus routes.

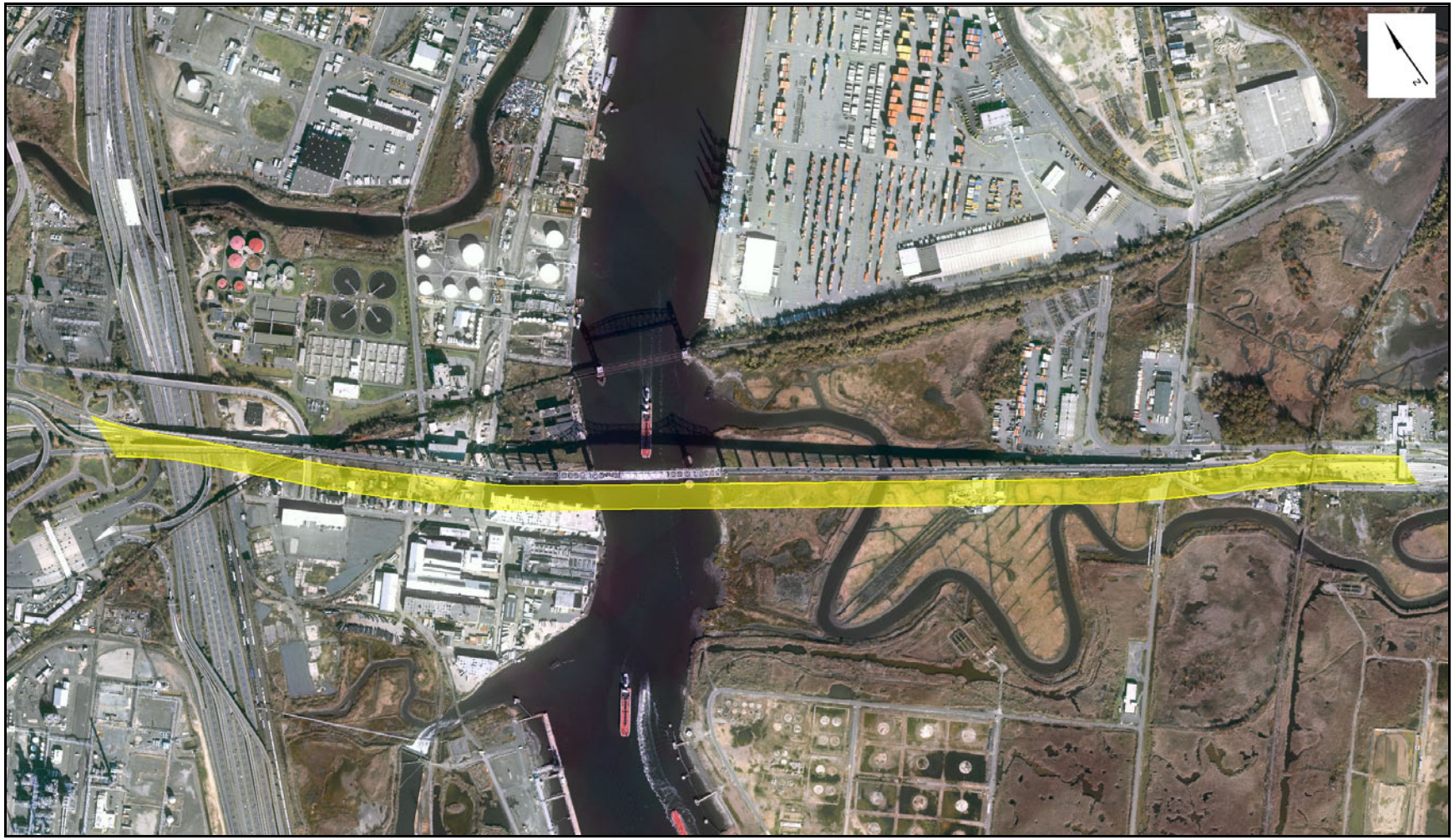


FIGURE 5-1: 6-LANE REPLACEMENT BRIDGE - SOUTH

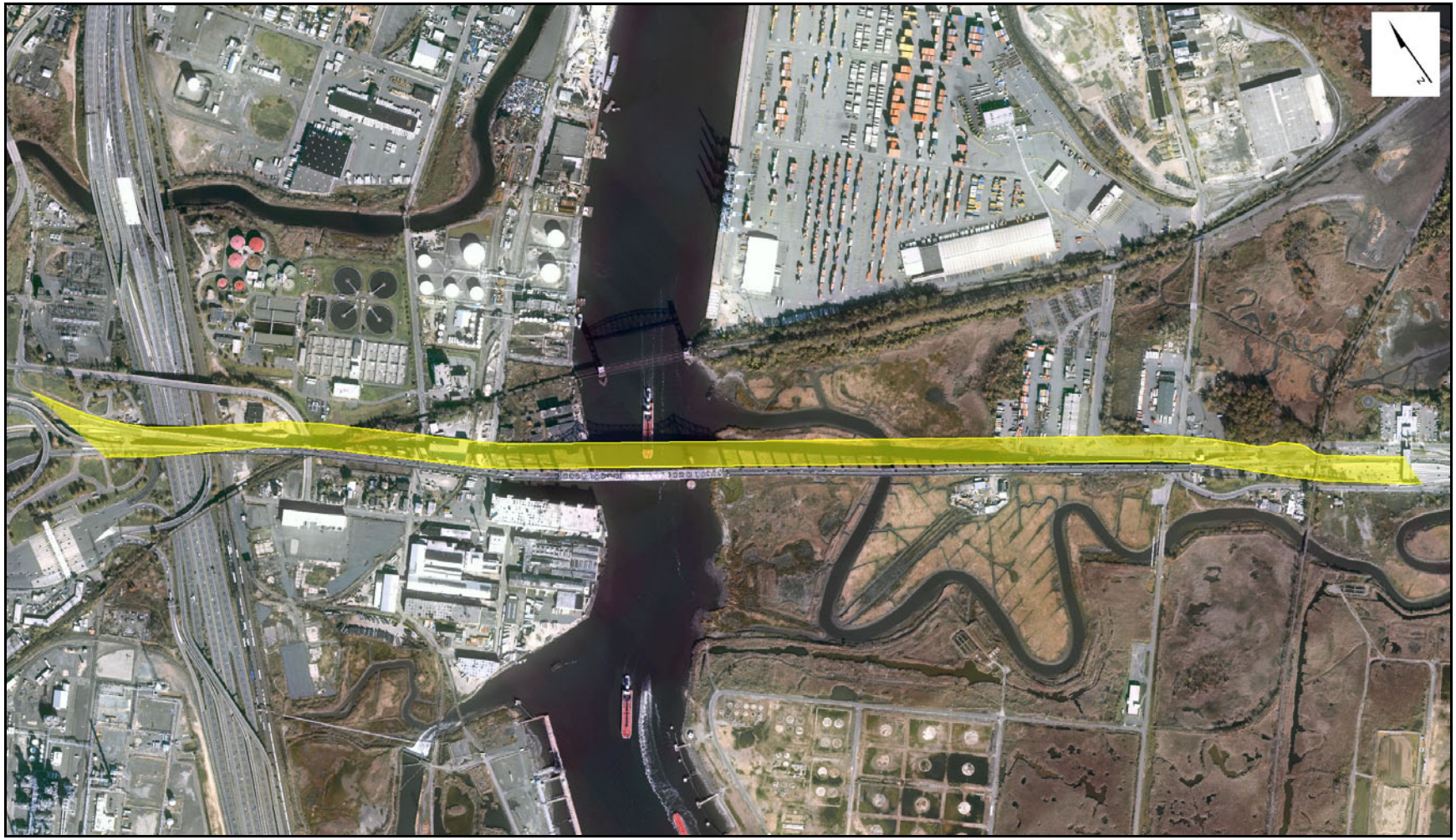


FIGURE 5-2: 6-LANE REPLACEMENT BRIDGE - NORTH

FIGURE 5-3: TWIN 3-LANE REPLACEMENT BRIDGES - SOUTH

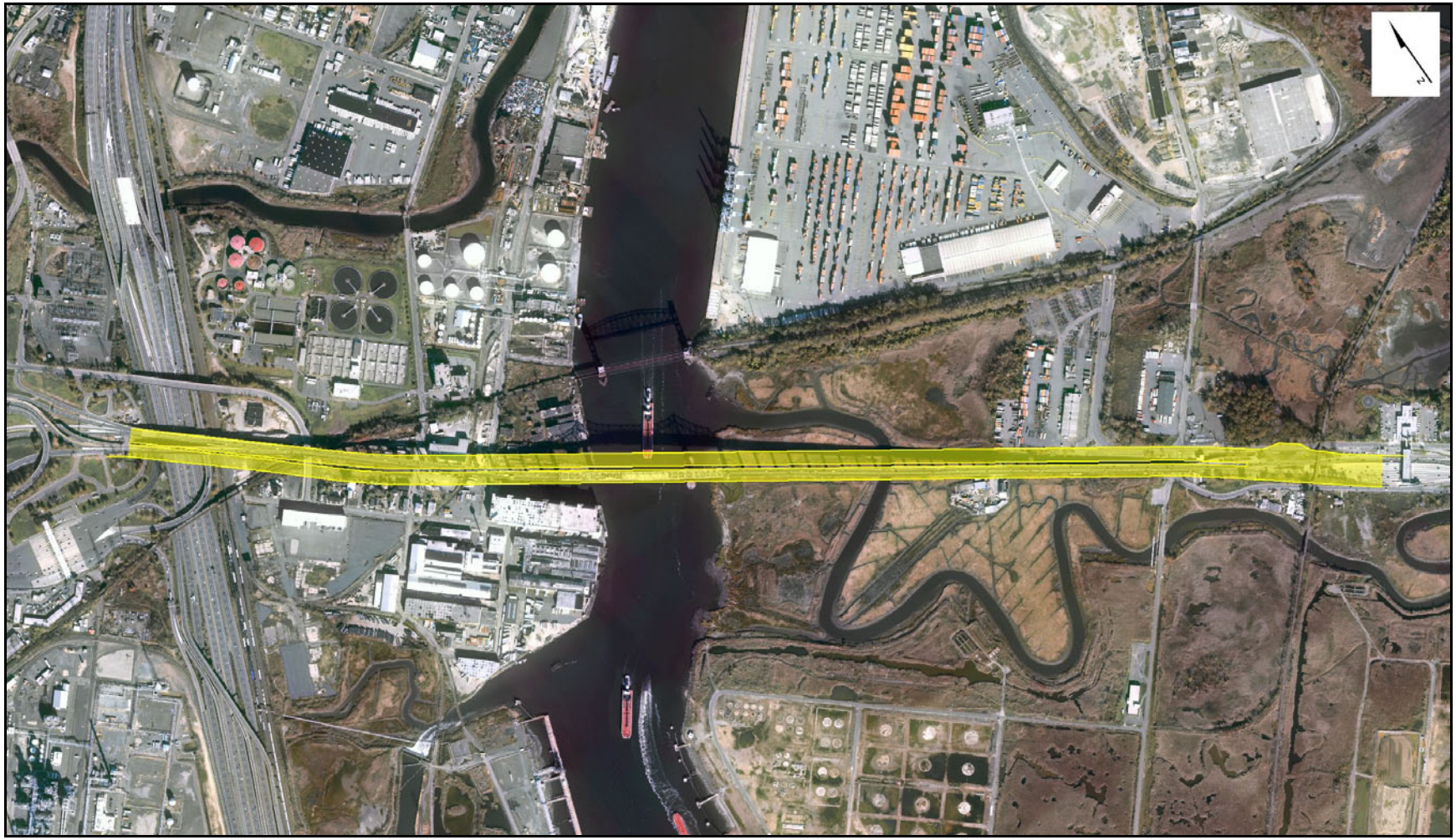


FIGURE 5-4: TWIN 3-LANE REPLACEMENT BRIDGES - NORTH

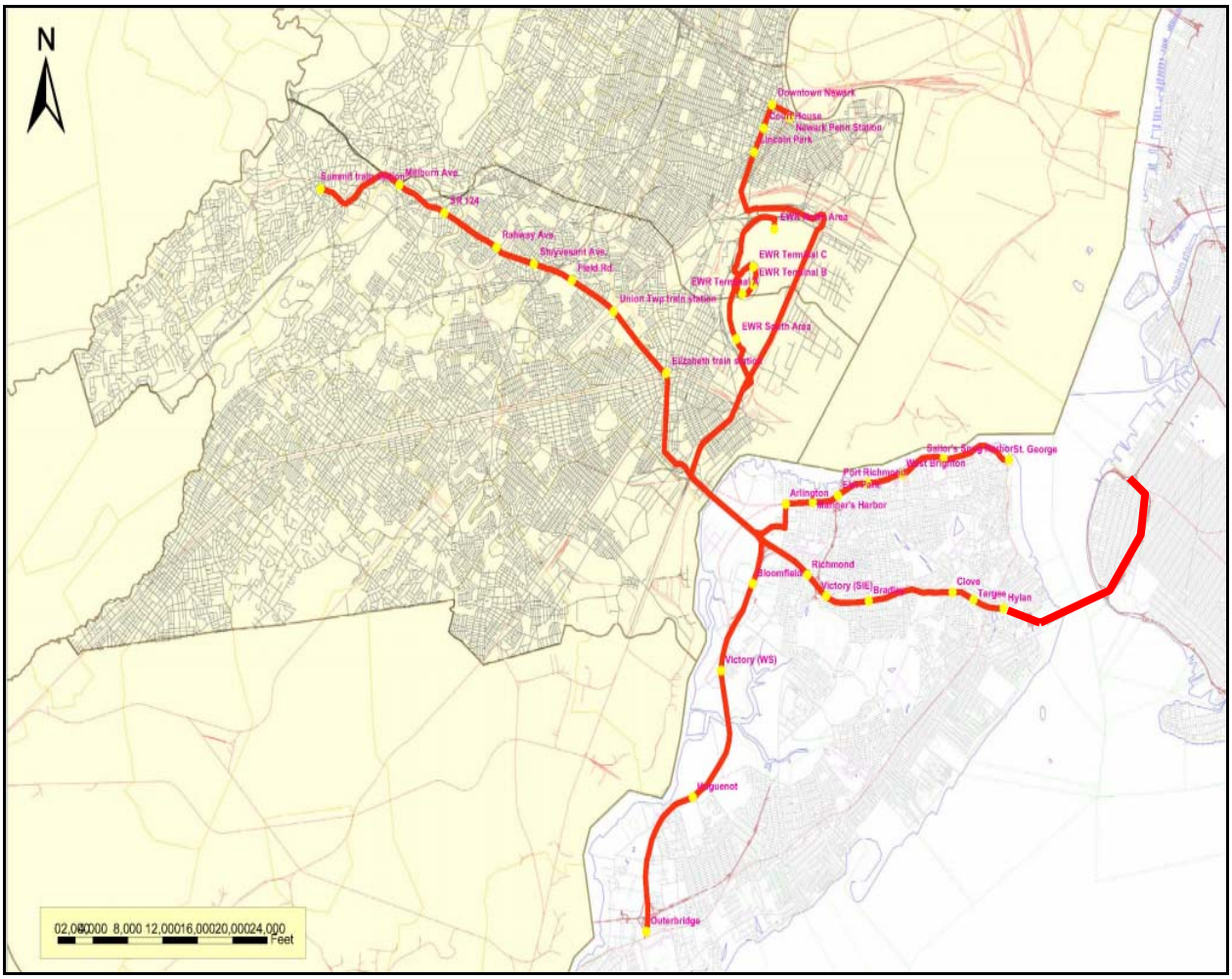


FIGURE 5-5: BRT SYSTEM

- *Ferry System* (Figure 5-6)
  - 3 ferry terminals (new Elizabeth Ferry Terminal; St. George Ferry Terminal; Brooklyn Army Terminal)
  - 30-minute headways and timed transfers at ferry terminals;
  - Ferry terminals served by feeder bus routes;
  - 150-passenger capacity of ferries;
  - $6.00 one-way fare for all routes; free access to feeder bus routes in New Jersey;
  - All ferry landing bus stations would have walk, pick-up/drop-off, and transfer access from other transit modes within ¼-mile distance;
  - New Elizabeth Ferry Terminal (to be constructed independently) east of Jersey Gardens Mall;
  - At Brooklyn Army Terminal landing, walk access to/from N & R subway lines at 59th Street;
  - Available on-street parking; Staten Island Ferry Terminal and NJ Transit train station parking; no parking available at Newark Airport.

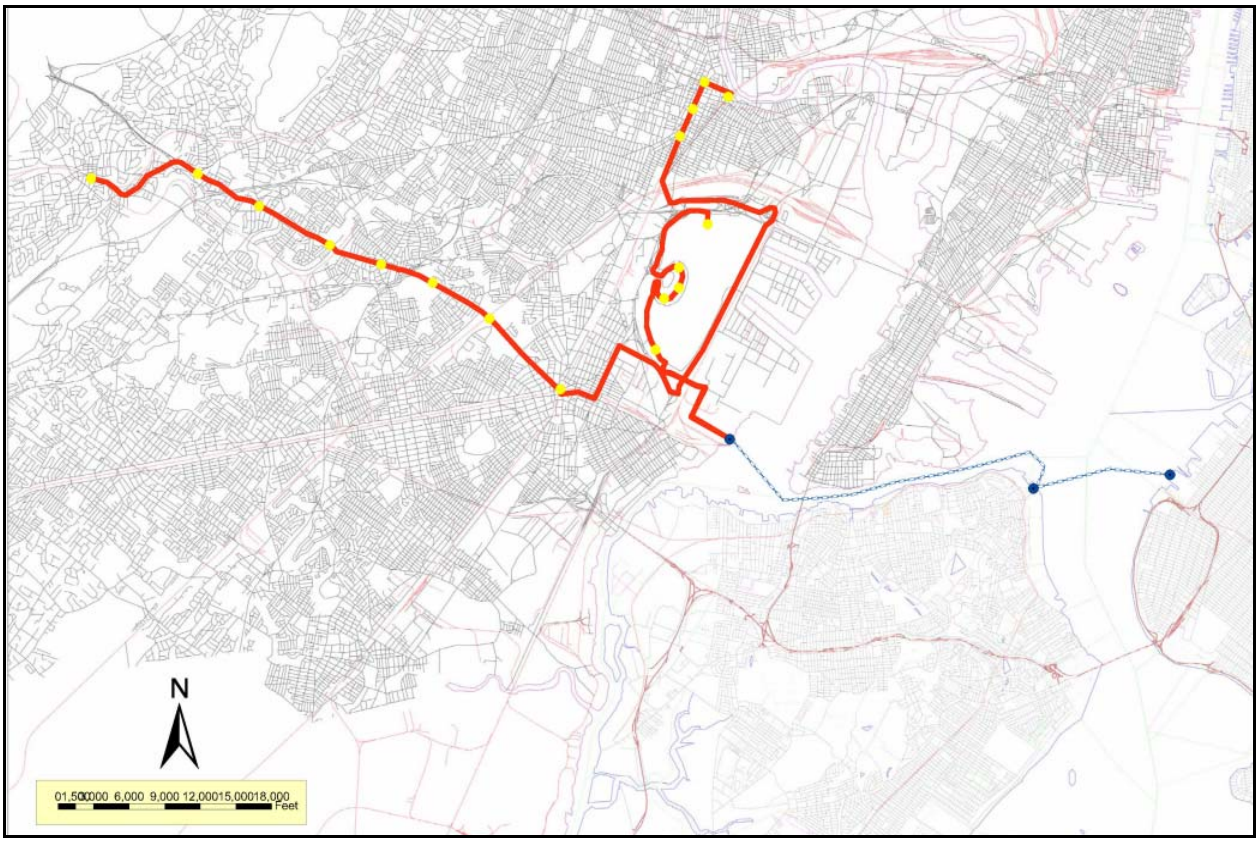


FIGURE 5-6: FERRY SYSTEM

6.0 Comparative Screening Results

The four intermediate alternatives, and the two transit options considered as a potential ancillary element of any of the bridge-replacement alternatives, were comparatively screened against the following criteria (see Table 2.3, pages 8 and 9):

- *CS-1.* An alternative should enhance mobility on the Goethals Bridge and its approaches in the future analysis year (2030).
- *CS-2.* An alternative should not result in deterioration of traffic conditions at other Staten Island bridges or in the region in the future analysis year.
- *CS-3.* An alternative should enhance non-single-occupant-vehicle (SOV) commutation opportunities.
- *CS-4.* An alternative should seek to minimize potential adverse environmental effects.
- *CS-5.* An alternative should be capable of being constructed without extraordinary techniques, with feasible maintenance of existing transportation services during construction, and at reasonable cost compared to other alternatives with similar benefits.

The results of the comparative screening evaluation are provided on the following pages. Each alternative's performance against the comparative screening criteria and their related evaluation measures is portrayed in a series of matrices (see Tables 6.1 through 6.5), exhibiting both quantitative analysis results and qualitative judgments, as appropriate to each evaluation measure.

Assumptions underlying the comparative screening analyses and details of the findings by evaluation measures are provided in notes to the tables and in the accompanying text.

TABLE 6.1:
EVALUATION AGAINST CRITERION CS-1

An alternative should enhance mobility <u>on the Goethals Bridge and its approaches</u> in the future analysis year (2030).

Performance Measures	Alternatives				
	2030 No-Action	6-Lane Bridge or Twin Replacement Bridges		6-Lane Bridge or Twin Replacement Bridges	
		South	North	w/2 Lanes for BRT[4]	+ Ferry Service[5]
1) LOS[1] in Peak Hour, Peak Direction[2]	F	D	D	E	D
2) Estimated Annual No. of Accidents[3]	276	179	179	223	179

Notes:

1. Level of service (LOS), as defined by the Transportation Research Board, denotes traffic conditions and ranges from level "A" to level "F," where LOS A indicates free-flowing traffic conditions with high travel speeds and LOS "F" describes breakdown conditions with excessive congestion and delays. LOS "D" represents heavy traffic flow conditions without excessive delays and is generally considered to be the minimum acceptable operating condition for urban areas. LOS "E" is defined as the theoretical capacity of a roadway, or the maximum stop-and-go flow of vehicles, given existing physical conditions. It is generally considered that LOS "E" and LOS "F" are below the threshold of acceptable operating conditions.
2. The highest volume at the Goethals Bridge is in the PM peak hour and the peak direction is eastbound.
3. Future no-build number of accidents was based on the increased VMT and current accident rates developed by the New York State Department of Transportation (NYSDOT). Numbers of accidents with 6-lane build alternatives are based on reduction factors developed by NYSDOT and assume improved geometry, addition of a third lane in each direction, and full shoulders and improved clearances.
4. Assumes a single 6-lane replacement bridge or twin 3-lane replacement bridges with 2 general-use lanes and 1 BRT-dedicated lane in each direction. The level-of-service (LOS) shown for the 6-Lane Replacement Bridge with BRT was calculated for the 4 general-purpose lanes, i.e., represents performance in the non-BRT lanes to indicate travel conditions for the majority of vehicles on the bridge.
5. Assumes a single 6-lane replacement bridge or twin 3-lane replacement bridges plus ferry service.
6. The number of accidents shown for the 6-Lane Replacement Bridge with BRT represents the forecast of accident incidence in the general-purpose lanes, not in the BRT lanes. The higher number of accidents with BRT in place, compared to the pure 6-Lane Replacement Bridge, may be explained by the somewhat greater degree of congestion in the general-purpose lanes and by the relatively less "safe" design of a BRT lane immediately to the left of the general-purpose lanes and less than full-width shoulders.

TABLE 6.2:
EVALUATION AGAINST CRITERION CS-2

An alternative should not result in deterioration of traffic conditions <u>at other Staten Island bridges or in the region</u> in the future analysis year (2030).

Performance Measures	Alternatives				
	2030 No-Action	6-Lane Bridge or Twin Replacement Bridges		6-Lane Bridge or Twin Replacement Bridges	
		South	North	w/2 Lanes for BRT	+ Ferry Service
1) LOS in Peak Hour, Peak Direction at					
Outerbridge Crossing:	F	F	F	F	F
Bayonne Bridge:	C	C	C	C	C
Verrazano-Narrows Bridge:	F	F	F	F	F
2) Regionwide VMT[1] (millions)					
AM peak period:	18.5	18.3	18.3	18.3	18.3
PM peak period:	22.5	22.3	22.3	22.3	22.3
3) Total No. of Regionwide Vehicle Trips[2] (millions)					
AM peak period:	26.5	27.1	27.1	26.8	26.8
PM peak period:	26.2	27.0	27.0	26.8	26.8
4) Regionwide Average Travel Speed[3]					
AM peak period:	11	11	11	11	11
PM peak period:	10	10	10	11	11

Notes:

1. Vehicle miles of travel (VMT) was calculated from GTM output and shown for the counties nearest the Goethals Bridge and, therefore, most likely to be affected: Kings, Richmond, Hudson, Essex, Union and Middlesex.
2. Total vehicle trips were calculated from GTM output and shown for the counties nearest the Goethals Bridge and, therefore, most likely to be affected: Kings, Richmond, Hudson, Essex, Union and Middlesex.
3. Speeds were calculated from GTM output for the two counties on either side of the Goethals Bridge: Richmond and Union.

TABLE 6.3:
EVALUATION AGAINST CRITERION CS-3

An alternative should enhance non-SOV commutation opportunities.

Performance Measures	Alternatives				
	2030 No-Action	6-Lane Bridge or Twin Replacement Bridges		6-Lane Bridge or Twin Replacement Bridges	
		South	North	w/2 Lanes for BRT	+ Ferry Service
1) AM Peak-period Transit Ridership (no. of passenger trips)[1]	N/A	N/A	N/A	15,360	274
2) Transit Travel time[2] in AM Peak Period betw. Primary Commuter Travel Markets[3] (+/- minutes, compared to vehicular travel time)	N/A	N/A	N/A	-48 to +60	-48 to +93

N/A – Not applicable, as BRT and ferry options are not present in the No-Build and base replacement bridge(s) alternatives.

Notes:

1. The BRT ridership forecasts represent the total passengers that would cross the Goethals Bridge during the 4-hour AM peak period in both westbound and eastbound directions on all of the 9 BRT routes. The route-specific ridership ranges from a low of 220 to a high of 1,683 passengers. This level of ridership translates to about 50 to 52 bus trips per hour or an average of about one bus on a BRT lane each minute, at which level the BRT lanes would appear underutilized in each direction.
2. Transit travel time includes in-vehicle and out-of-vehicle travel times and is represented as total transit travel time compared to vehicular travel time, were the same trip between a specific origin and destination pair to be made by auto.
3. Primary commuter travel markets using the Goethals Bridge in the AM peak period are defined as the top origin-destination county pairs, based on GTM output.
4. The range of transit travel times, compared to vehicular travel times, during the AM peak period between the primary commuter travel markets served by the Goethals Bridge are as follow:

Travel Direction Across Goethals Bridge	Top Origin-Destination County Pairs		Average Transit Travel time (+/- minutes)	
	Origin	Destination	BRT	Ferry
Eastbound	Union	Richmond	+27	+74
	Essex	Richmond	+16	+58
	Union	Kings	-26	-23
	Middlesex	Kings	-48	-48
Westbound	Richmond	Union	+27	+89
	Richmond	Essex	+3	+43
	Richmond	Middlesex	+60	+93
	Kings	Essex	-7	-5

TABLE 6.4:
EVALUATION AGAINST CRITERION CS-4

An alternative should seek to minimize potential adverse environmental effects

Performance Measures	Alternatives								
	2030 No-Action	6-Lane Replacement Bridge				Twin Replacement Bridges			
		South		North		South		North	
Wetland Resources									
1) Wetland and/or Buffer Acreage Affected	**N/A**	**Wetland**	**Buffer[1]**	**Wetland**	**Buffer**	**Wetland**	**Buffer**	**Wetland**	**Buffer**
a) Permanent Taking (piers)									
NJ		0.52 ac	0.00 ac	0.00 ac	0.00 ac	0.69 ac	0.00 ac	0.39 ac	0.00 ac
NY		0.87 ac	0.28 ac	0.59 ac	0.01 ac	0.90 ac	0.18 ac	0.75 ac	0.02 ac
TOTAL		**1.39 ac**	**0.28 ac**	**0.59 ac**	**0.01 ac**	**1.59 ac**	**0.18 ac**	**1.14 ac**	**0.02 ac**
b) Construction-Period Effect[2]		**2.16 ac**		**2.83 ac**		**2.00 ac**		**2.06 ac**	
2) Type & Value of Wetlands Permanently Taken	**N/A**	NJ – **low value**, freshwater emergent (0.29 ac) NJ – **moderate value,** open water in Cory Warehouse boat slip (0.23 ac) NY – **high value,** tidal emergent (0.87 ac)		NJ – N/A NY – **high value**, tidal emergent (0.59 ac)		NJ – **low value**, freshwater emergent (0.29 ac) NJ – **moderate value,** open water in boat slip (0.40 ac) NY – **high value**, tidal emergent (0.90 ac)		NJ – **low value**, freshwater emergent (0.29 ac) NJ – **moderate value,** open water in boat slip (0.10 ac) NY – **high value**, tidal emergent (0.75 ac)	
3) Degree of Wetland Fragmentation	**N/A**	**Minor Impact** – only pier placements w/in wetlands; no solid continuous physical barrier		**Minor Impact** (Same as for 6-Lane Replacement Bridge South)		**Minor Impact** (Same as for 6-Lane Replacement Bridge South)		**Minor Impact** (Same as for 6-Lane Replacement Bridge South)	

Notes:

1. Buffer refers to the "transition areas" adjacent to wetlands regulated by New Jersey Department of Environmental Protection (NJDEP) and "adjacent areas" around wetlands regulated by New York State Department of Environmental Conservation (NYSDEC). NJDEP regulates freshwater and tidal wetlands, and transition areas around freshwater wetlands up to 150 feet. Tidal wetlands and water courses do not contain regulated transition areas. NYSDEC regulates both the wetland areas and a buffer zone of up to 150 feet of adjacent area upland of the wetland boundary within the City of New York.
2. Construction access road impacts were calculated only for New York side. Construction access for New Jersey was assumed to be available from existing upland areas/roadways.

TABLE 6.4:
EVALUATION AGAINST CRITERION CS-4 (CONTINUED)

An alternative should seek to minimize potential adverse environmental effects

Performance Measures	Alternatives				
	2030 No-Action	6-Lane Replacement Bridge		Twin Replacement Bridges	
		South	North	South	North
Protected Habitat/Species					
1) Number of Species Potentially Affected	**N/A**	**2 species:** 1) Peregrine Falcon - NY & NJ State endangered -foraging and nesting habitat present. Nest on existing protective dolphin. 2) Persimmon - NY State threatened. Two locations: (1) 0.3 mi sw of junction of Routes 278 and 440 on nw side of service road and (2) east of the toll booths between Old Place Creek and the road.	**2 species**: 1) Peregrine Falcon 2) Persimmon	**2 species:** 1) Peregrine Falcon 2) Persimmon	**2 species:** 1) Peregrine Falcon 2) Persimmon
2) Acreage of Federal- or State-Designated Significant Habitat Taken or Affected	**N/A**	0	0	0	0
3) Degree of Habitat Fragmentation	**N/A**	**Minor Impact** – only pier placements w/in wetlands; no solid continuous physical barrier	**Minor Impact** (Same)	**Minor Impact** (Same)	**Minor Impact** (Same)

TABLE 6.4:
EVALUATION AGAINST CRITERION CS-4 (CONTINUED)

An alternative should seek to minimize potential adverse environmental effects

Performance Measures	Alternatives				
	2030 No-Action	6-Lane Replacement Bridge		Twin Replacement Bridges	
		South	North	South	North
Protected Habitat/Species (continued)					
4) Type of Identified Waterfowl Use Area and Distance from Alignment[3]	**N/A**	Foraging habitat, including wetlands and shallow open water habitats associated with Old Place Creek for numerous shorebird species, including Pied-Billed Grebe (NY – Threatened [T]; NJ – Endangered [E] for breeding population, Special Concern [SC] for non-breeding pop.); and Black Skimmer (NY – SC; NJ- E for breeding pop. and T for non-breeding pop.) Goethals Pond within 0.25 mi of alignment.	Same as for 6-Lane Replacement Bridge South Same	Same as for 6-Lane Replacement Bridge South Same	Same as for 6-Lane Replacement Bridge South Same
5) Degree of Disruption of Waterfowl Movements Between Use Areas	**N/A**	**Minor Impact –** no additional structural barrier as proposed bridge alignment is located within the same approximate corridor as existing bridge to be demolished.	**Minor Impact** (Same)	**Minor Impact** (Same)	**Minor Impact** (Same)
6) Impact to Habitat	**N/A**	**Minor Impact –** proposed bridge alignment in same approximate corridor as existing bridge.	**Minor Impact** (Same)	**Minor Impact** (Same)	**Minor Impact** (Same)

Note:

3. In addition to Pied-Billed Grebe and Black Skimmer, there is breeding and forage habitat present within the project area for an additional four shore/wading bird species that are protected only in New Jersey: Great Blue Heron (SC), Black-Crowned Night Heron (T), Yellow-Crowned Night Heron (T), and Spotted Sandpiper (SC). However, there would be no direct impact to these species.

TABLE 6.4:
EVALUATION AGAINST CRITERION CS-4 (CONTINUED)

An alternative should seek to minimize potential adverse environmental effects

Performance Measures	Alternatives				
	2030 No-Action	6-Lane Replacement Bridge		Twin Replacement Bridges	
		South	North	South	North
Essential Fish Habitat (EFH)					
1) Number of Species Potentially Affected	**N/A**	EFH for 19 species w/in project area**.** The # of species affected dependent on seasonal timing and duration of construction and demolition.	Same	Same	Same
2) Impact to Habitat					
a) Bridge Construction	**N/A**	**Moderate Impact** of piers placed in Cory Warehouse boat slip. No pier placements in Old Place Creek.	**Minor Impact** (no pier intrusion on Cory Warehouse boat slip nor in Old Place Creek)	**Moderate Impact** (same as 6-Lane Replacement Bridge South)	**Moderate Impact** (Same as 6-Lane Replacement Bridge South)
b) Existing Bridge Demolition	**N/A**	**Minor Impact**	**Minor Impact**	**Minor Impact**	**Minor Impact**
Cultural Resources					
1) No. of Designated or Eligible Historic Resources w/in 0.5 mi[5]	**N/A**	4	4	4	4
2) No. of Historic Resources Taken	**N/A**	1 (Goethals Bridge - eligible for designation)	1 (Goethals Bridge - eligible for designation)	1 (Goethals Bridge - eligible for designation)	1 (Goethals Bridge - eligible for designation)
3) No. and Extent of Known Areas of Potential Archeological Sensitivity within Alignment[6]	**N/A**	1	2	2	2
Parklands and Recreation Areas					
1) Number of Resources and Acreage within 0.5 mi[7]	**N/A**	10 parks total 312.1 ac	Same	Same	Same
2) Acreage Taken[7]	**N/A**	0	0	0	0

Notes:

4. See Table 6.6 on page 110 for a summary of federally managed species with Essential Fish Habitat Designations in the vicinity of the proposed project.
5. See Table 6.7 on page 111 for a summary of historic resources identified within the defined area of study.
6. Four distinct loci were identified and all may be related to a single larger site, identified as the Old Place Creek site. The boundaries of this site have never been defined and may extend over the entire New York side of the project area.
7. See Table 6.8 on page 112 for a summary of potentially affected parklands.

TABLE 6.4:
EVALUATION AGAINST CRITERION CS-4 (CONTINUED)

An alternative should seek to minimize potential adverse environmental effects

Performance Measures	Alternatives				
	2030 No-Action	6-Lane Replacement Bridge		Twin Replacement Bridges	
		South	North	South	North
Property Acquisition or Proximity Effect					
1) Business Impacts[8,9]					
Property Encroachments[10]	**N/A**	5	2	4	5
Property Displacements[11]	**N/A**	4	2	4	2
Billboard Displacements	**N/A**	2	1	1	0
Total	**N/A**	***11***	***5***	***9***	***7***
2) Residential Impacts[9,12]					
Property Displacements	**N/A**	14	0	5	5
Unit Displacements	**N/A**	28	0	11	9
3) Vacant Property Impacts[13]	**N/A**	6	4	10	7
4) Utility Impacts[14]	**N/A**	0	1	0	0
5) Transportation Infrastructure Relocations[15]	**N/A**	1	4	1	2
6) No. of Residential or Institutional Uses w/in 200 ft. of Right-of-Way's Alignment	**N/A**	18	6	18	18

Notes:

8. Business Impact Assumptions (see Table 6.9 on page 113 for details of business property impacts):
   - A business property encroachment was considered to occur if an alternative's alignment right-of-way would encroach on some portion of a business property parcel, regardless of the degree/amount of encroachment.
   - A business property displacement was considered to occur if the business structure or building was within an alternative's right-of-way.
   - Displacement of a commercial billboard, even if there are no buildings on-site, was considered a business impact as it would result in a loss of income, though not of employment.
   - Port Authority properties were not included in assessment of property acquisition or proximity effects as the use of PANYNJ properties was not considered an encroachment or displacement impact for the purpose of constructing a Port Authority facility, with the exception of the Howland Hook Marine Terminal (HHMT) property, which is leased to New York Container Terminal, Inc.
9. Mixed-Use Properties – Impacts to mixed-use business/residential properties, e.g., a building with a ground-floor business with an apartment above, may be counted as both business and residential impacts. However, in instances where the business property would be encroached but the building would not be taken, the residential units were assumed to remain. There are four mixed-use properties that would be impacted by the alternatives' rights-of-way:

Ground-floor Business	No. of Residential Units Above
Wild Things Go-Go Bar	4
Sinners Go-Go Bar	4
Anchor Tavern	7
A&R Place	8

10. Howland Hook Marine Terminal (HHMT) – Alternatives' impacts to the HHMT (and its operator, New York Container Terminal, Inc.) include encroachment on the facility property and its main inbound/outbound truck entrance. Estimates of each alternative's degree of encroachment on HHMT, in acres, are as follows:

6-Lane Replacement Bridge North –	4.10 acres, including the M&R parking lot and building, and facility's main truck entrance
Twin Replacement Bridges North –	2.17 acres, including the M&R parking lot and building, and facility's main truck entrance
6-Lane Replacement Bridge South –	0.0
Twin Replacement Bridges South –	0.15 acres, including the M&R parking lot

11. Proposed Redevelopment of Borne Chemical Site – Per communication with the Elizabeth Development Corporation , the former Borne Chemical site is being redeveloped by a joint venture of the Elizabeth Development Corporation and Jay Cashman, Inc. Site cleanup and remediation will be followed by construction of a warehouse for the processing of Arthur Kill/Kill van Kull dredge spoils will be constructed on the site. As the preliminary concept plan for the site shows development over the entire parcel, any encroachment on the site by an alternative is considered a property displacement. Estimates of the alternatives' physical encroachment on the site, in acres, are as follows:

6-Lane Replacement Bridge North –	2.16 acres
Twin Replacement Bridges North –	1.15 acres
6-Lane Replacement Bridge South –	0.0
Twin Replacement Bridges South –	0.07 acres

12. Residential Impact Assumptions:
    - A residential property displacement was considered to occur if an alternative's right-of-way falls within the property parcel, whether or not the actual residential structure or building would be affected.
    - Residential unit displacements were considered in conjunction with residential property displacements (above) in order to consider the impact on individual residences, e.g., apartments, within a single residential structure that would be displaced for an alternative's right-of-way.
13. Vacant property impact was considered to occur if an undeveloped property was within an alternative's right-of-way.
14. Utility impact was considered to occur if a transportation, communication, or other utility infrastructure or property was within an alternative's right-of-way. The 6-Lane Replacement Bridge North's ROW would cross a high pressure pump station of the Texas Eastern Gas Pipeline, operated by Texas Eastern Transmission Corporation. (While this alternative would also encroach on an undeveloped lot of Brooklyn Union Gas Company, located adjacent to a lot of Texas Eastern Transmission Corporation, this impact considered a vacant property, rather than utility, impact.)
15. Transportation infrastructure (roadway, rail) relocation impacts were considered to occur if any part of an alternative would be physically located within an existing road or rail alignment. An alternative's alignment may require the relocations of transportation infrastructures (i.e., local roadway or railroad), which, in turn, would result in indirect access impacts to properties served by the road or railway. (In the case of Krakow Street on the New Jersey side of the alternatives' alignments, no transportation infrastructure relocation would be necessary since all abutting properties would have already been displaced by the alternative.) The transportation infrastructure affected by the alternatives and the consequent property access effects are identified below. (Potential impacts of relocations of transportation infrastructure were not assessed.)
    - *Northern Rail Connector and Relocated Bayway Avenue* –For the 6-Lane Replacement Bridge North alternatives, some pier locations would conflict with the Relocated Bayway Avenue and/or the Northern Rail Connector, which is under construction as part of Staten Island Railroad reactivation and connection to Chemical Coast Secondary. This, in turn, would affect freight-rail access to HHMT. The alternatives' impacts are as follows:

6-Lane Replacement Bridge North –	Relocation of both the Relocated Bayway Avenue and Northern Rail Connector.
Twin Replacement Bridges North –	No Impact
6-Lane Replacement Bridge South –	No Impact
Twin Replacement Bridges South –	No impact

- *Goethals Road North–Gulf Avenue* – One-way travel along these roads currently provides the only access to several business properties (including HHMT) and the Goethals Garden Homes community, which are located west of Forest Avenue and along either Goethals Road North or Gulf Avenue. Gulf Avenue, which extends beneath the existing Goethals Bridge approach, connects with Goethals Road North. The alternatives' impacts are as follows:

6-Lane Replacement Bridge North –	Relocation of Goethals Road North, realignment of Gulf Avenue
Twin Replacement Bridges North –	Relocation of Goethals Road North, realignment of Gulf Avenue
6-Lane Replacement Bridge South –	Realignment of Gulf Avenue
Twin Replacement Bridges South –	Realignment of Gulf Avenue

TABLE 6.4:
EVALUATION AGAINST CRITERION CS-4 (CONTINUED)

An alternative should seek to minimize potential adverse environmental effects

Performance Measures	Alternatives				
	2030 No-Action	6-Lane Replacement Bridge		Twin Replacement Bridges	
		South	North	South	North
Noise-Sensitive Land Uses					
No. or Concentration of Noise-Sensitive Receptors w/in 500 ft of New Roadway or w/in 1,500 Unobstructed ft. of Additional Rail Activity	**N/A**	1 (Krakow Street residences)	1 (Krakow Street residences)	1 (Krakow Street residences)	1 (Krakow Street residences)
Known Hazardous Substance Sites					
Number of Sites by Status within alignment[16]	**N/A**	1 (RT Baker)[17,18]	0	1 (RT Baker; area of site disruption less than for 6-Lane Replacement Bridge South)	1 (RT Baker; area of site disruption less than for 6-Lane Replacement Bridge South & Twin Replacement Bridges South)
Air Quality					
1) Change in Annual Regional NOx and VOCs (tons)	**N/A**	-0.07 tons NOx -0.04 tons VOC	-0.07 tons NOx -0.04 tons VOC	-0.07 tons NOx -0.04 tons VOC	-0.07 tons NOx -0.04 tons VOC
2) Change in Annual Particulate ($PM_{2.5}$) Emissions (tons)	**N/A**	-0.005 tons	-0.005 tons	-0.005 tons	-0.005 tons

16. Includes only hazardous waste sites that fall within the alternative's alignment. Does not consider sites near but not falling within alignment.
17. The R.T. Baker & Son Machinery Dismantlers site is listed in NYSDEC's *Inactive Hazardous Waste Sites Database* and is located at 250 South Washington Avenue. The site, consisting of approximately three acres of filled-in wetlands, is bound entirely by marshland and tidal creeks, except for an access road to Washington Avenue. The site, including shallow groundwater and down-gradient bedrock wells as well as a wetland area about 190 feet west of the site, has been found to be contaminated with PCBs. Negotiations with the Port Authority were made to investigate and remediate the site as part of its previous Staten Island Bridges Program. Investigations in 1994 revealed low PCB levels in the soils and groundwater. Investigation in 1995-96 identified PCBs in the soil at a depth of 14 to 16 feet; no PCBs were found in the groundwater at that time. Groundwater contaminants from the Baker site have the potential to enter the Arthur Kill by way of shallow groundwater as well as through Old Place Creek. The unsaturated soil at the site contains relatively high concentrations of PCBs and several metals. These contaminants have migrated into the shallow aquifer and onto the wetland surface, but are not believed to have contaminated the deeper bedrock aquifer. Exposures to contaminated groundwater are not expected because Staten Island is served by public drinking water. The site has no public water or sanitary utilities. NYSDEC has classified the site as a *Significant Threat to the Public Health or Environment – Action Required.*
18. The 6-Lane Replacement Bridge South would encroach on the Baker site to a greater extent, extending to about 60 percent of the property, than would the Twin Replacement Bridges South (approximately 30 percent or the property) or Twin Replacement Bridges North (approximately 10 percent).

TABLE 6.5:
EVALUATION AGAINST CRITERION CS-5[1]

An alternative should be capable of being constructed without extraordinary techniques, with feasible maintenance of existing transportation services during construction, and at reasonable cost compared to other alternatives with similar benefits.

Performance Measures	Alternatives				
	2030 No-Action	6-Lane Replacement Bridge		Twin Replacement Bridges	
		South	North	South	North
1) Degree of Construction Complexity (low, medium, high)	N/A	High	High	High	High
2) Duration of Construction Period (months)[2]	N/A	54	60	72	78
3) Complexity of Traffic Maintenance and Protection (low, medium, high)	N/A	Medium	High	Medium	High
4) Order-of-Magnitude Construction and/or Initial Capital Cost (2005 dollars)	N/A	$500,000,000	$561,000,000	$547,000,000	$604,000,000

Note:

1. Assumptions and details of the evaluations related to construction of the alternative are provided on pages 113 through 116.
2. Estimate of duration of construction period includes construction of new bridge(s) and demolition of the existing Goethals Bridge.

TABLE 6.6:
SUMMARY OF FEDERALLY MANAGED SPECIES WITH EFH DESIGNATIONS IN THE PROJECT VICINITY

Species	Eggs	Larvae	Juveniles	Adults	Spawning Adults
Red hake (*Urophycis tenuis*)		M,S	M,S	M,S	
Winter flounder (*Pleuronectes americanus*)	M,S	M,S	M,S	M,S	M,S
Windowpane flounder (*Scopthalmus aquosus*)	M,S	M,S	M,S	M,S	M,S
Atlantic sea herring (*Clupea harengus*)		M,S	M,S	M,S	
Bluefish (*Pomatomus saltatrix*)			M,S	M,S	
Butterfish (*Peprilus triacanthus*)		M,S	M,S	M,S	
Atlantic mackerel (*Scomber scombrus*)			S	S	
Summer flounder (*Paralicthys dentatus*)		M,S	M,S	M,S	
Scup (*Stenotomus chrysops*)	S	S	S	S	
Black sea bass (*Centropristus striata*)			M,S	M,S	
King mackerel (*Scomberomorus cavalla*)	X	X	X	X	
Spanish mackerel (*Scomberomorus maculatus*)	X	X	X	X	
Cobia (*Rachycentron canadum*)	X	X	X	X	
Sandbar shark (*Charcharinus plumbeus*)		X		X	
Sand tiger shark (*Odontaspis taurus*)		X			
Dusky shark (*Charcharinus obscurus*)		X	X		
Winter skate (*Raja ocellata*)			X	X	
Little skate (*Raja erinacea*)			X	X	
Clearnose skate (*Raja eglanteria*)			X	X	

Source: NMFS (1999)

S = Includes the seawater salinity zone (salinity 25.0‰)

M = Includes mixing water/brackish salinity zone (0.5‰ < salinity < 25.0‰)

F = Includes tidal freshwater salinity zone (0.0‰ < salinity < 0.5‰)

X = Designated EFH but no salinity zone specified

Non-designated = Striped bass & "turtle species" as per NOAA and river herring, American shad, Atlantic and shortnose sturgeon as per NJDEP

TABLE 6.7:
HISTORIC RESOURCES

Municipality/Borough	Historic Resource	SHPO ID#	Eligible/Designated	Details/Notes
Staten Island & Elizabeth	Goethals Bridge	2909	Eligible SHPO Opinion: 2/14/1995	a.k.a. Interstate Highway 278 over Arthur Kill. Constructed from 1926 - 1928. Opened June 29, 1928.
Staten Island & Elizabeth	Arthur Kill Lift Bridge	2677	Eligible SHPO Opinion: 06/11/1991	a.k.a. Staten Island Railway Lift Truss Bridge, Central Railroad of New Jersey. Originally built as a swing bridge in 1889 and replaced by a vertical lift bridge in 1959. While the bridge is individually eligible for designation, it is also considered to be part of the SIRR Historic District because it is considered as being a key contributing resource to the district.
Elizabeth & Linden	Staten Island Railroad (SIRR) Historic District (New Jersey Portion)	3482	Eligible SHPO Opinion: 02/27/1995	a.k.a. Baltimore & New York Railroad. Built in 1884 to 1889. Only the portion in New Jersey from the AK Lift Bridge and west to Cranford Junction (New Jersey) has been found eligible for designation. The entire section of the SIRR within the primary and secondary study areas is eligible for designation and therefore considered of historic significance for this screening effort. This portion of the SIRR has recently undergone new construction under a PANYNJ and NYCEDC joint project for its reactivation, including connection to the Chemical Coast Secondary. Consultation with SHPO will be needed to determine how this may have affected the SIRR's eligibility for designation.
Elizabeth	Elizabeth River Bridge Central Railroad of New Jersey	2662	Eligible SHPO Opinion: 04/09/1990	a.k.a. Scherzer-Type Bascule Bridge over the Elizabeth River. Built ca. 1912 and located just east of the New Jersey Turnpike along the Chemical Coast Secondary.

TABLE 6.8:
PARKLANDS AND RECREATION AREAS

Municipality/ Borough	Parkland/Public Recreation Area	Size (Acres)	Use	Location
Staten Island	Joseph Manna Park	0.1	Passive recreation park with a sitting area, mall, and World War II memorial monuments honoring war veterans.	On Forest Avenue between Meeker Avenue and Goethals Road North.
Staten Island	Forest Grove	0.4	Natural land that consist of forest and wetlands.	Bound by Forest Avenue and Elizabeth Grove Road.
Staten Island	Staten Island Industrial Park	226.3	The park consists of both passive recreational areas and large natural areas that surround 1,530,000 square feet of office space. The park includes gardens, ponds, trails, and 130 acres of wetlands.	Adjacent to the Staten Island Expressway, Merrill Avenue, Teleport, and South Avenue.
Staten Island	Father Marcis Park	12.4	An active recreation park that consist of softball and soccer fields and bleachers.	South of the Staten Island Expressway bounded by Fahy Avenue and Lamberts Lane
Staten Island	Graniteville Swamp Park	8.1	Preserved natural land that contains broad expanses of both wetlands and upland forest, in addition to marshes and creeks.	North of Goethals Road North between Meeker Avenue and Morrow Street.
Elizabeth	Drotar Field and Erxleben Center	8.7	Drotar Field is an active recreation park and Erxleben Center is an active recreational facility. Drotar Field includes a lighted baseball field, basketball court, an Olympic-size swimming pool, and playground. The Erxleben Center includes a 500-seat gymnasium, exercise facility, game rooms, services for senior citizens, and shower and locker facilities.	On Richmond Street bounded by Clifton Street to the north and Pulaski Street to the east
Elizabeth	Mattano Park	39.7	An active and passive public recreational space, including a baseball field, tennis and basketball courts, a horseshoe game area, a playground, a picnic area, and a building for the distribution of recreational equipment during the summer months.	North of Clifton Street and bisected by the Elizabeth River
Elizabeth	Williams Field	11.5	Williams Field is an active recreation park. The facility includes a football field, a running track and a baseball field.	At the western edge of the study area behind the Thomas Edison House north of Summer Street between Green Street and Clarkson Avenue
Linden	Milkosky Park and Recreation Center	4.1	Active recreation park and facility. The facility includes a softball field, basketball court, a supervised play area and playground, an ice skating rink, a recreation center.	West of I-278 along Bedle Place
Linden	McGillvray Place Park	0.8	A small active recreation park which serves as a neighborhood play area	On McGillvray Place west of Bedle Place

Source: The Louis Berger Group, Inc., 2005.

TABLE 6.9:
BUSINESS PROPERTY IMPACTS

6-Lane Replacement Bridge South	Twin Replacement Bridges South
Property Encroachments - 5 GATX (NASCAR) Waste Management, Inc. Wild Things Go-Go Bar Anchor Tavern A&R Place	**Property Encroachments - 4** GATX (NASCAR) Waste Management, Inc. Wild Things Go-Go Bar HHMT
Property Displacements - 4 Cory Warehouse (Bay Way Industrial Center) Paley, Lloyd & Donahue R.T. Baker & Sons Sinners Go-Go Bar	**Property Displacements - 4** Cory Warehouse (Bay Way Industrial Center) Paley, Lloyd & Donahue R.T. Baker & Sons Proposed Redevelopment of Borne Chemical Site
Commercial Billboard Displacements – 2	**Commercial Billboard Displacements** - 2
6-Lane Replacement Bridge North	**Twin Replacement Bridges North**
Property Encroachments - 2 HHMT Coca-Cola Warehouse	**Property Encroachments - 5** HHMT Cory Warehouse (Bay Way Industrial Center) Paley, Lloyd & Donahue R.T. Baker & Sons Wild Things Go-Go Bar
Property Displacements - 2 Proposed Redevelopment of Borne Chemical Site Waste Management, Inc.	**Property Displacements - 2** Proposed Redevelopment of Borne Chemical Site Waste Management, Inc.
Commercial Billboard Displacements - 1	**Commercial Billboard Displacements -** 0

The assumptions underlying the Criterion CS-5 evaluations of the intermediate alternatives and construction-related details of the evaluations are provided below for each of the four evaluation measures:

- *Construction Complexity:*
  - It is assumed that the towers or main piers would be set behind the shoreline of the Arthur Kill. This arrangement for all alternatives simplifies construction. Marine traffic interruption would be minimized. Ship collision protection requirement would be minimal or eliminated.
  - The New Jersey side of any replacement bridge would need to cross one elevated railroad track at a large skew angle. The 6-Lane Replacement Bridge North alignment would also need to pass over an additional railroad track, which is generally parallel to the bridge alignment.
  - All of the alternatives would require staged construction at the New Jersey Turnpike crossing.
  - Constrained by existing pier and buildings, the New Jersey side construction would be more difficult than the Staten Island side, particularly for the two northern alternatives. With the 6-Lane Replacement Bridge North and the Twin Replacement Bridges North, the new approach structures would cross the existing alignment, requiring staging of construction and demolition, including some degree of temporary decking. The length of alignment and complexity of construction in the areas of overlap between new bridge and existing bridge is greater for the Twin Replacement Bridges North than for the 6-Lane Replacement North.
  - All of the alternatives involve construction of major bridge structures and would be considered complex construction. However, in comparative terms, the twin replacement alternatives would

be more complex to construct due to construction overlap for the two new structures (see below) to reduce construction duration.

- *Duration of Construction Period:*
  - The majority of either 6-Lane Replacement Bridge (South or North) would be constructed independently from any direct disturbance to the existing bridge. Staged construction is expected only at both ends where the new bridge would tie into the existing roadways.
  - All bridges can be constructed on at least 5 fronts: main spans, Staten Island Approach, New Jersey Approach, over the Staten Island Railroad, and at the New Jersey Turnpike Interchange.
  - Assessment assumes the main span will be a cable-stayed bridge. Construction durations for several cable-stayed bridge projects, including approaches, elsewhere in the U.S. range from 48 to 60 months (St. Francisville Bridge over Mississippi River, in Louisiana; Cooper River Bridge over Cooper River, in Charleston, SC; William Natcher Bridge over Ohio River, in Owensboro, KY; and Leonard P. Zakim Bunker Hill Bridge over Charles River, in Boston, MA).
  - Construction duration for the 6-Lane Replacement Bridges (South and North) is estimated at 54 and 60 months, respectively, including demolition of the existing bridge.
  - Construction duration for the Twin Replacement Bridges (South and North) is estimated at 72 and 78 months, respectively, including demolition of the existing bridge. This assumes start of construction of the second bridge before construction of the first bridge is completed. This screening-level estimate of the degree of feasible construction overlap is based solely on concept-level alignment drawings, but provides sufficient basis to assess comparative construction durations, with the twin bridge replacements taking approximately 18 months (30 percent) longer to construct than the 6-lane replacement bridge alternatives on a comparable alignment.
- *Complexity of Maintenance and Protection of Traffic (MPT):*
  - The most challenging portion of the maintenance and protection of traffic is staging construction to maintain two lanes of traffic in each direction during the peak periods. It appears likely that some overbuild may be required for the northern replacement bridge alternatives to provide safe transitions when shifting traffic lanes.
  - Replacements to the south are less complex for MPT than are replacements to the north, and the further north a new bridge alignment is, the more complex MPT during its construction would be. This is because the travel way for a northern replacement either crosses or is above more existing physical features (railroad tracks, roadways, buildings) that would either have to be retained or be removed and replaced.
  - For the northern replacement bridge alternatives at the ends, it appears that it would be necessary to fill the area between the two structures (whether between the existing and a replacement bridge, or between two new parallel bridges during their overlapping construction) with either temporary or permanent decking, as appropriate, to facilitate traffic crossovers from one bridge to another during construction. This would allow maintaining two lanes of traffic in each direction during the peak periods.
  - Some temporary support of existing approach spans would be necessary for all alternatives.
  - The New Jersey side is inherently more complex than the New York side. This is because the new and rebuilt spans of the New Jersey approach would cross over the most heavily traveled section of the New Jersey Turnpike and approaching roadways. Therefore, maintaining traffic while placing new piers within the New Jersey Turnpike express and local lanes may require some construction-period traffic slow-downs on the New Jersey Turnpike.
  - On the New York side, temporary and new permanent pavement construction would be accommodated on grade first to the north for the single replacement-bridge alternative to the north, or on grade first to the south for the single-replacement bridge to the south.

- *Order-Of-Magnitude Construction Cost:*

– The existing-bridge demolition is a common cost for all alternatives. Therefore, its cost is not factored into this comparative screening analysis.

– A cost estimate was prepared in 1994 for the Staten Island Bridges Program: Modernization and Capacity Enhancement Project Draft Environment Impact Statement/Draft Section 4(f) Statement (SIBP DEIS). The SIBP DEIS estimate is the basis for this cost estimate, inflated to 2005 dollars.

– The inflation adjustment is based on the *Engineering New Record* publication of the *Construction Cost Index History*. The inflation ratio between 2005 and 1994 is computed to be 1.35.

– The 2005 basic unit costs are the SIBP DEIS unit costs increased by 35 percent.
Cable-Stayed Bridge: $380/SF x 1.35 = $513; use $520/SF
Approaches: $184/SF x 1.35 = $248; use $250/SF

– The main-span unit costs are adjusted as follows:

– Use single 6-Lane Replacement Bridge South alternative as a base: $520/SF.

  ♦ 6-Lane Replacement Bridge North alternative is increased by 3% from $520/SF to $535/SF because the total construction period (48 months) would likely be 10 to 20 percent longer than that of the single 6-Lane Replacement Bridge South alternative (42 months). The additional construction time would increase the costs of management, staging area leasing, traffic control, environmental control, inflation adjustment, and risk mark-up.

  ♦ The main-span unit cost of the Twin Replacement Bridge North alternative is increased by 10 percent to $570/SF, due to increased construction time compared to the 6-Lane Replacement Bridge South alternative.

  ♦ The main-span unit cost of the Twin Replacement Bridge South alternative is increased by 8 percent to $560/SF, due to increased construction time compared to the 6-Lane Replacement Bridge South alternative.

– The approach unit costs are adjusted as follows:

  ♦ Use single 6-Lane Replacement Bridge South alternative as a base: $250/SF.

  ♦ 6-Lane Replacement Bridge North alternative is increased by 10% from $250/SF to $275/SF for more difficult construction, and increased another 3% to $285/SF for increased construction time compared to the 6-Lane Replacement Bridge South alternative;

  ♦ Twin Replacement Bridges North alternative is increased by 10% from $250/SF to $275/SF for more difficult construction, related principally to more difficult MPT, and increased another 10% to $300/SF for increased construction time compared to the 6-Lane Replacement Bridge South alternative.

  ♦ Twin Replacement Bridges South alternative is increased by 8% from $250/SF to $270/SF for increased construction time compared to the 6-Lane Replacement Bridge South alternative.

– The bridge lengths are assumed to be as below, based on the conceptual alternatives defined for screening analysis purposes:

  ♦ Main spans 400' +900' +400' = 1,700'

  ♦ New Jersey Approach = 2,600'

  ♦ Staten Island Approach = 3,000'

  ♦ Total Approach Length = 5,600'

- Total Bridge Length = 7,300'

– The bridge widths are as assumed below, based on the conceptual alternatives defined for screening analysis purposes:
  - 6-lane Replacement Bridge Alternatives = 167'
  - Twin Replacement Bridges Alternatives = 92' +81' =173'

– The costs of miscellaneous items are computed based on the 1994 SIBP DEIS cost estimate, and increased by inflation ratio and width ratio of the 2005 and the 1994 designs.

– The costs of highway approach and toll plaza are computed based on the SIBP DEIS cost estimate, increased by inflation only. It is assumed that the toll plaza would not be expanded.

6.1 Review of Comparative Screening Results with Study's Committees and General Public

The results of the comparative screening evaluation[12] of the four bridge-replacement alternatives and the transit options were presented at meetings of the Study's committees: the TAC and ETF on June 1, 2006, and the Stakeholder Committee on June 15th. In addition to the presentation, display boards were available for review and discussion with the study team; the boards displayed the bridge-replacement alternatives' conceptual alignments and cross-section; and locations of potential wetland, archeological, and property impacts related to each alternative. Each of the presentations was followed by discussion in response to attendees' questions and comments; subsequent to the meetings, additional information and clarification was provided to attendees requesting further detail, via written communications. Summaries of the committee meetings are provided in Appendix B of this report.

Public open houses were held to present the comparative screening results and obtain public comment and input on June 27th and 28th in, respectively, Elizabeth, New Jersey, and Staten Island, New York. The purpose of the open houses was to provide members of the general public an opportunity to review the alternatives and screening results, as portrayed on the display boards and presented in a PowerPoint presentation; to engage in dialogue with study team members about project details; and to offer comment and input on the alternatives and their potential effects. The presentation slides are provided in Appendix C of this report. Questions and comments from attendees at the two open houses addressed various issues, including: safety and remaining useful life of the existing bridge; proposed replacement bridge dimensions, configuration, and design; the transit options investigated; alternatives considered in the screening process; rationale for the analysis year of 2030; context of the proposed Goethals Bridge replacement project vis a vis other agencies' activities in the corridor; traffic conditions and potential impacts, notably on local neighborhoods; potential displacement impacts; potential effects on the New York Container Terminal; and extent of the public outreach program for the Study.

[12] In addition to the comparative screening results, details of the GTM development process were presented and discussed at the TAC, ETF, and SC meetings, and the Study schedule of next activities was reviewed.

7.0 Conclusions of Alternatives Screening Process

7.1 Conclusions

Conclusions drawn from the comparative screening phase of the alternatives screening process were the following:

- The transportation benefits to be gained from the four bridge-replacement alternatives -- which would be identical, due to the alternatives' uniform 6-lane capacity and design in accordance with current design criteria – satisfy the defined evaluation measures and transportation improvement thresholds defined in the alternatives screening methodology;
- Bridge-replacement alternatives with two lanes dedicated for BRT (one lane in each direction) would not achieve the desired improvement in LOS in the four general-purpose lanes (two in each direction) and would result in reduced safety with a greater average annual number of accidents than would the 6-lane bridge-replacement configurations without dedicated BRT lanes;
- For bridge-replacement alternatives with dedicated BRT lanes, the forecast AM peak-period ridership of 15,360 passengers crossing the Goethals Bridge would be spread across four hours in both westbound and eastbound directions on nine BRT routes, with few instances of travel time savings. This ridership potential implies approximately 50 to 52 bus trips per hour, or an average of one bus per minute in the BRT lanes, such that the BRT lanes would be underutilized while the general-use lanes would be congested;
- Bridge-replacement alternatives with ancillary ferry service would provide very limited AM peak-period ferry ridership, with 274 passengers spread across four hours, in both peak and reverse-peak directions, on three routes;
- The potential social, economic, and environmental impacts of the four bridge-replacement alternatives are identical or very similar for certain of the evaluation measures (e.g., protected species and habitat, historic resources, parks and recreation areas), such that these do not serve to differentiate among the alternatives' potential beneficial and adverse effects; and
- The principal evaluation measures for which the four alternatives' impacts are different are as presented in Table 7.1; while the impacts differ among alternatives for these measures, none of the alternatives' collective potential adverse effects are markedly greater than the others';
- The estimated construction period for the bridge-replacement alternatives ranges from approximately 4.5 years for the to approximately 6.5 years for the Twin Replacement Bridges North; and
- The spread of estimated construction costs is approximately $100 million, with the 6-Lane Replacement Bridge South at the low end and the Twin Replacement Bridges North the most costly.

TABLE 7.1: ENVIRONMENTAL DIFFERENTIATORS

Performance Measures	Alternatives				
	2030 No-Action	6-Lane Replacement Bridge		Twin Replacement Bridges	
		South	North	South	North
Wetland Acreage Affected	N/A	3.55	3.42	3.59	3.2
Construction Impact to Habitat	N/A	Moderate (piers in Cory Warehouse boat slip. No pier placements in Old Place Creek)	Minor (no pier intrusion on Cory Warehouse boat slip)	Moderate	Moderate
Number and Extent of Known Areas of Potential Archeological Sensitivity within Alignment	N/A	1	2	2	2
Known Hazardous Substance Sites within Alignment	N/A	1 (RT Baker – NYSDEC Inactive Hazardous Waste Site; Significant Threat to the Public Health or Environment – Action Required)	0	1 (RT Baker, area of site disruption less than for 6-Lane Replacement Bridge South)	1 (RT Baker, area of site disruption less than for 6-Lane Replacement Bridge South & Twin Replacement Bridges South)
Business Impacts					
Property Encroachments	N/A	5	2	4	5
Property Displacements	N/A	4	2	4	2
Billboard Displacements	N/A	2	1	1	0
Total	N/A	11	5	9	7
Residential Impacts					
Property Displacements	N/A	14	0	5	5
Unit Displacements	N/A	28	0	11	9
Vacant Property Impacts	N/A	6	4	10	7
Utility Impacts	N/A	0	1	0	0
Transportation Infrastructure Relocations	N/A	1	3	1	1
No. of Residential or Institutional Uses w/in 200 ft. of Right-of-Way's Alignment	N/A	18	6	18	18

7.2 Recommendations

Based on the results of the alternatives screening process, the conclusions itemized in Section 7.1, and consideration of comments and input obtained from the Study's committees and the general public, the following recommendations were made:

- The four bridge-replacement alternatives should all be advanced for further, detailed evaluation in the DEIS;
- The BRT and ferry options do not provide sufficient transportation benefit as ancillary services to the bridge-replacement alternatives to warrant further evaluation for the proposed project;

- In recognition of interest in the Goethals Bridge corridor and, more generally, in the New York/New Jersey region, the design of the proposed replacement bridge should include sufficient width or right-of-way and structural capacity so as to not preclude potential future consideration and accommodation of transit, should future conditions warrant it;
- While forecasts of potential BRT ridership are insufficient to warrant its further investigation with a replacement bridge, study of expanded express bus service as an element of a special-use lane on a replacement bridge(s), potentially also accommodating high-occupancy vehicles and/or congestion pricing, may warrant investigation in the DEIS.

APPENDIX A
Scoping Suggestions Deemed Not Reasonable for Consideration as Preliminary Alternatives

The following suggested alternatives, provided in comments and input received during the DEIS scoping process, were investigated and conceptually defined, per the scoping comments, but deemed to be not suitable for identification as preliminary alternatives. Each of these suggested alternatives was examined to determine: 1) whether it would address any aspect(s) of the proposed project's purpose and need; and 2) whether it is reasonable and feasible. This latter judgment was made based on general transportation planning and engineering principles and practice; knowledge about the existing transportation system in the Goethals Bridge corridor and the broader New York/New Jersey region; and examination of available mapped information and previous studies pertinent to the given suggested option.

The suggested alternatives, each of which was found to be non-responsive to the project purpose and need and/or not reasonable and feasible, are described below. The rationale for not advancing them as preliminary alternatives is provided.

A.1 Tunnel Replacement for Goethals Bridge

As suggested during scoping, a tunnel replacement for the Goethals Bridge was investigated. As with bridge replacement options, the alignment of a replacement tunnel could be north or south of the existing bridge and would be designed to connect to New Jersey Turnpike Interchange 13 to the west and to the Staten Island Expressway to the east. A replacement tunnel would require reconfiguration of New Jersey Turnpike Interchange 13, as the existing structures over the Turnpike would not be suitable for connection with a tunnel crossing since they currently climb to meet the existing Goethals Bridge. The roadway elevations at each end of the tunnel, as well as the adjacent walls, would need to rise above the 1,000-year flood level to ensure protection against flooding. Tunnel length would be approximately 4,500 feet.

The tunnel design could be assumed to use 4 percent grade, which would permit facility termini roughly comparable to existing connections at Interchange 13 and the Staten Island Expressway, and could accommodate both vehicular and truck travel, as well as potential rail (light rail, but not commuter rail) or bus transit.

Like the preliminary bridge alternatives, which have been defined to include a total of six travel lanes with three in each direction, (subject to review and possible modification, based on modeling results of forecasts of future traffic volumes), a replacement tunnel would have six lanes. Unlike the bridge alternatives, however, there could be no provisions for bicyclists and pedestrians, due to considerations of safety and security within the tunnel. Inclusion of potential rail transit in a replacement tunnel would require separate tubes, were the grades for vehicular and transit travel required to be different, or design and construction of a wall to physically separate the two travel modes' operations if the same grade were assumed for both modes.

There are two primary design options for constructing a tunnel: 1) immersed tube; and 2) bored (mined). While both are feasible in this instance, immersed tunneling may be preferred because a bored (mined) tunnel would need to be some 20 feet deeper to get sufficient rock headroom beneath the Arthur Kill and the authorized channel depth of 50 foot MLW (Water Resource Development Act, 2000). Construction on both sides of the Arthur Kill could be cut and cover within a cofferdam to minimize lateral disturbances, although immersed tunnels could be floated in over most of the tunnel length.

An immersed tunnel would be at approximately -80 feet, which would allow for overdredge and protection. Assuming a 4 percent grade, the roadway could reach the surface on the New Jersey Side roughly 600 feet east of the Chemical Coast rail line (approximately where the Staten Island Railroad and Relocated Bayway intersect). From that point, two separate cut and cover tunnels could be constructed to go under the rail line and the Turnpike, with the alignments merging east of the Turnpike in an open cut or tunnel. Interchange reconfiguration would be required to connect to the various interchange ramps.

On the Staten Island side, the immersed tunnel would emerge from rock roughly 300 feet inland from the Arthur Kill and about 600 feet south of the existing bridge, with a portal located roughly 1,500 feet inland and at surface well before Western Avenue (Figure A.1). The tunnel portal and a new roadway to make the connection with the Staten Island Expressway would necessarily be located in the Old Place Creek wetland area to make the transition to the expressway. Alternatively, were the tunnel to be extended an additional approximately 1,100 feet to avoid direct taking of wetland acreage for the tunnel portal and connecting roadway, the portal and at-grade roadbed would be located just west of Western Avenue, from where the necessary connection to the Staten Island Expressway would be made. This alternative alignment would require a longer tunnel section, with extensive construction-period disturbance to Old Place Creek and wetlands, but less permanent wetland taking. A northern alignment for a replacement tunnel would also encroach extensively on extant wetlands between the Goethals Bridge and the Howland Hook Marine Terminal.

In general, tunnels incur substantially higher construction and maintenance costs than do bridge facilities, assuming both would be constructed in the same general alignment and serving the same vehicular traffic.

With both tunnel lengths described above, extensive construction-period wetland impacts and permanent wetland takings on Staten Island would require significant mitigation actions, the extent and details of which would have to be determined through permitting and consultation with federal and state agencies with wetland-protection jurisdiction. Federal wetland regulations direct all federal agencies to seek, first, to avoid wetlands; second, if no reasonable alternatives to the use of wetlands are available, to minimize adverse effects on wetlands; and, third, to mitigate the effects.

As there are reasonable alternatives to a replacement tunnel that would require fewer to no wetland impact in comparison to that required by tunnel construction, a tunnel alternative is deemed not reasonable for further consideration. In addition, safety-related constraints would preclude provision of pedestrian and bicycle access in a replacement tunnel. Finally, capital construction and annual maintenance costs for a replacement tunnel, compared to other options for addressing the purpose and need for replacement of the Goethals Bridge, would be greater while dealing with the same level of traffic. Therefore, this alternative was not deemed suitable for further consideration.

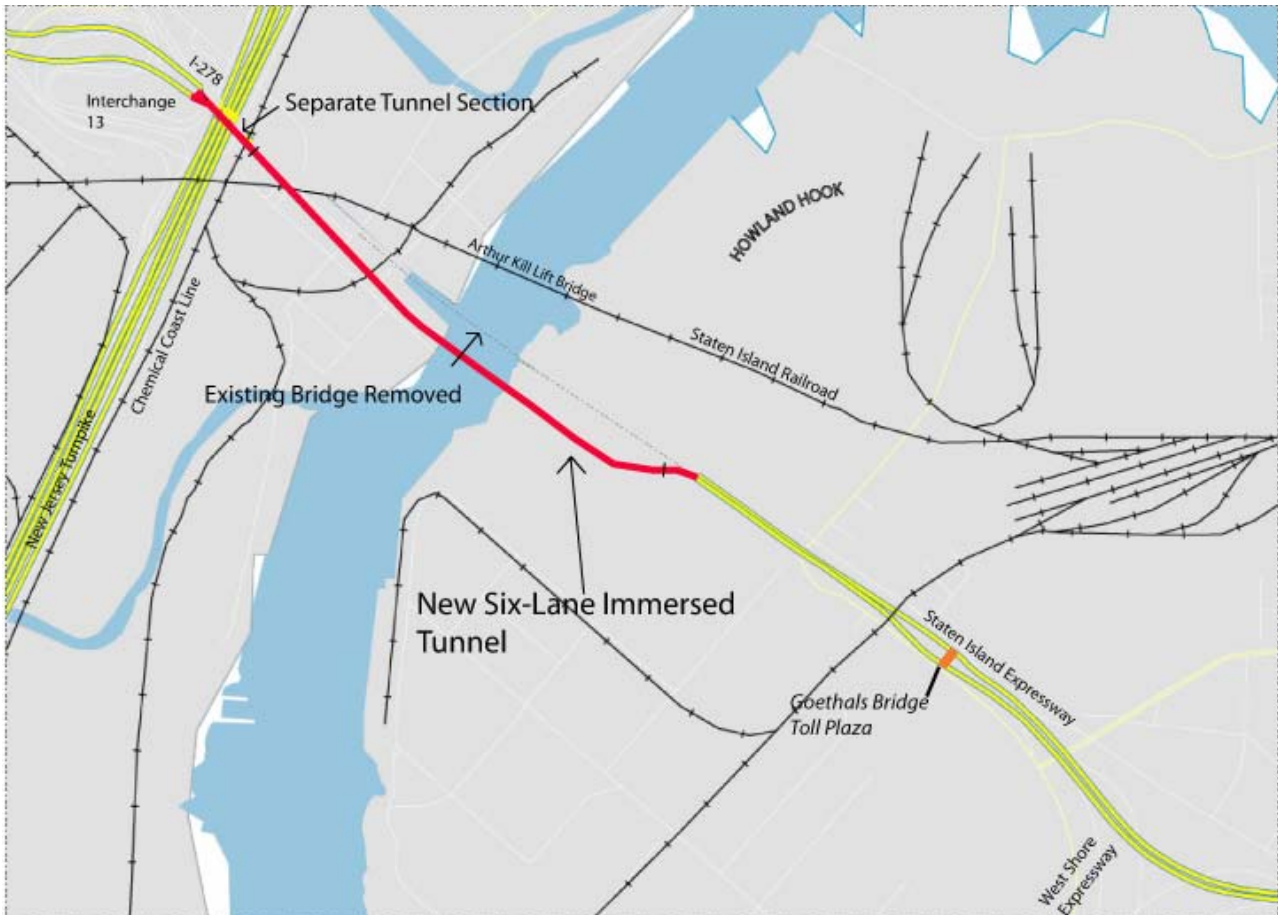


FIGURE A.1 REPLACEMENT TUNNEL

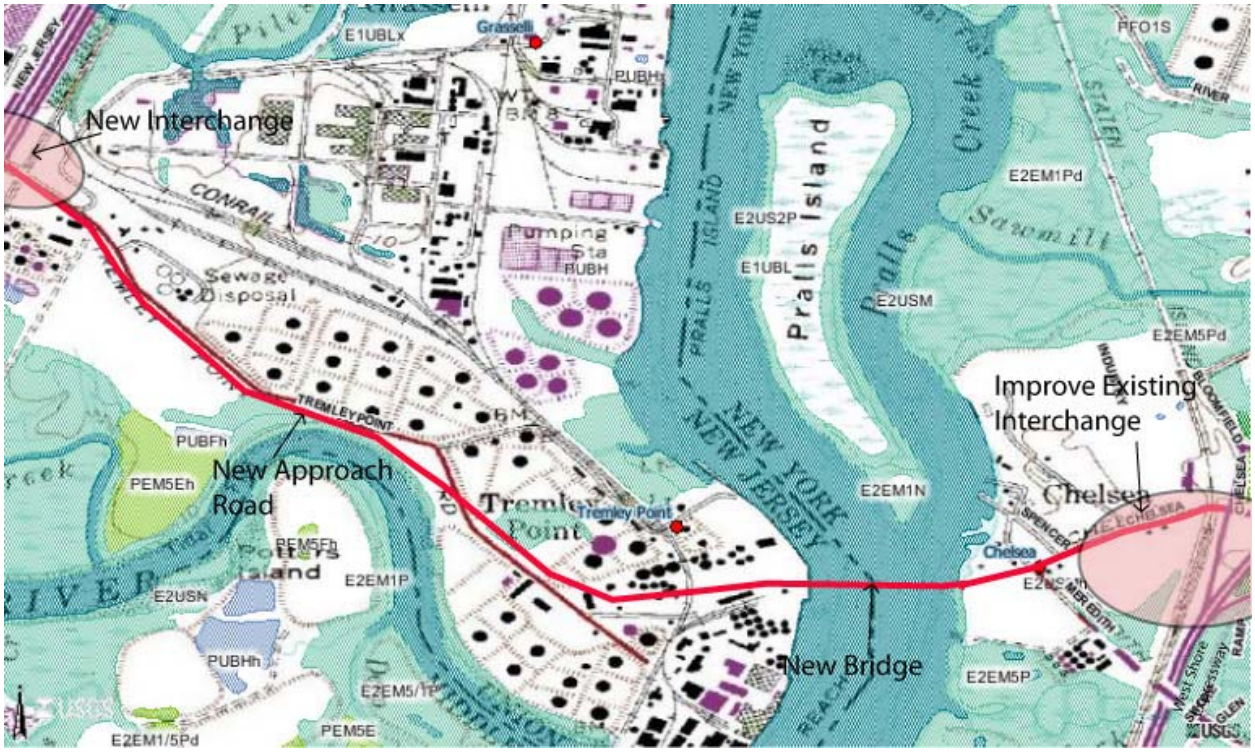
A.2 Wetlands-Avoidance Goethals Replacement Bridge

A replacement-bridge alternative was suggested during the scoping process with the focus of locating the new crossing far enough south of the existing bridge to avoid extant wetlands. This alternative concept was further defined in scoping to also seek to avoid conflict with existing petroleum industry sites (tank farms) in New Jersey across from the sections of Staten Island's West Shore that do not have wetlands, where a new crossing terminus might be located.

The investigation of potential locations to achieve the dual purposes of the suggested alternative entailed review of National Wetlands Inventory (NWI) mapping, United States Geologic Survey (USGS) digital orthophoto quadrangles, New York City Real Property data, and the master plans of Union and Middlesex counties in New Jersey. No suitable alignment was able to be identified that would: 1) avoid both wetlands and petroleum sites; 2) be feasibly connected to the West Shore Expressway and New Jersey Turnpike; and 3) not be located so far south of the Goethals Bridge that it would be within the traffic service area of the Outerbridge Crossing instead.

Subsequent review was performed to identify a corridor that could potentially minimize, if not entirely avoid, wetlands and could be adjacent to, but not have to pass over, petroleum facilities. A corridor was identified for a potential crossing between Chelsea, Staten Island, and Tremley Point in Union County, New Jersey. This new bridge crossing would connect the South Avenue/West Shore Expressway

interchange in the Chelsea area of Staten Island to a relocated or reconstructed interchange with the New Jersey Turnpike via a new roadway through the Tremley Point area of New Jersey (see Figure A.2). While a new crossing in this location would not encroach on wetlands, its alignment would have to snake through a concentration of existing petroleum industry facilities.



Source: USGS, The National Map

FIGURE A.2 WETLANDS-AVOIDANCE GOETHALS BRIDGE REPLACEMENT

The New Jersey Turnpike Authority has a current project focused on improvements at and near Interchange 12 (Roosevelt Avenue) in Carteret. The project has three distinct phases, with the first encompassing local road improvements; the second focusing on reconstruction of the interchange and toll plaza; and the third phase focusing on construction of a new connector road, with a bridge over the Rahway River, to the Tremley Point industrial area. The first phase is currently in construction, while the second phase is in final engineering. However, for the proposed connector road to Tremley Point in the third phase, an environmental assessment is anticipated to be needed before approvals are received and it can be considered programmed and committed for implementation.

The West Shore Expressway interchange would also need to be upgraded to handle traffic using the new crossing, and a new Turnpike interchange would need to be constructed. Additionally, a toll collection facility would need to be constructed either on Staten Island west of the West Shore Expressway interchange or along the bridge approach in New Jersey. Construction of toll facilities and reconstruction of interchanges in New Jersey and Staten Island would require substantial property takings. A potential, albeit circuitous, alternative to reconstructing the Turnpike interchange would be to upgrade and improve the local roadway connection (see Figure A.3); this would entail construction of a new road westward from the new bridge and over the Turnpike to connect to Stiles Road and then to N.J. Routes 1&9; bridge traffic would then use N.J. Routes 1&9 to access I-278 and existing Turnpike Interchange 13.

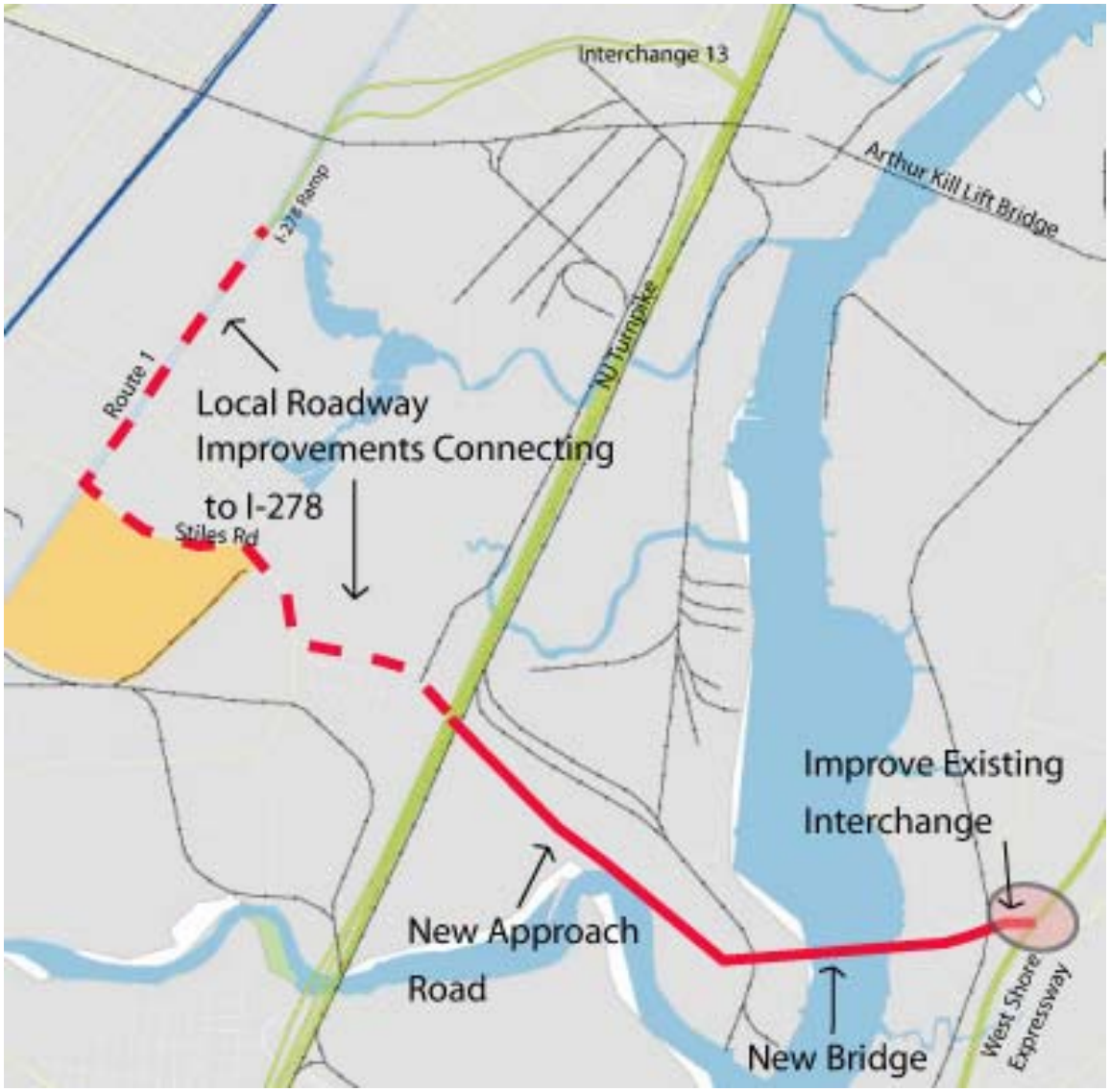


FIGURE A.3 LOCAL ROADWAY CONNECTION TO NJ TURNPIKE FOR WETLANDS-AVOIDANCE GOETHALS BRIDGE REPLACEMENT

While this alignment would succeed in avoiding wetlands, it would not succeed in avoiding conflict with petroleum industry sites. This dual purpose does not appear achievable within the geographic area served by the Goethals Bridge. In addition, the new crossing's connections with the New Jersey Turnpike would either require an entirely new interchange or circuitous routing on existing and new local access roads. As with necessary upgrading of the Staten Island Expressway interchange, either access option on the New Jersey side would require substantial property acquisition. Therefore, this alternative was not deemed suitable for further consideration.

A.3 Double-decked Replacement of Goethals Bridge

As suggested during scoping, a double-decked Goethals Bridge replacement was investigated. The scoping commenter suggested a "double-tiered" bridge, similar to the George Washington Bridge, and

assumed that construction of the new bridge could take place while the existing bridge remained in operation. The commenter also suggested that truck traffic be limited to one level of the bridge. The stated benefit of the suggested alternative was to reduce environmental impacts during construction, reduce shading effects on the Arthur Kill, and reduce costs, as compared to construction of two bridges.

The vertical clearance of the existing Goethals Bridge above the Arthur Kill navigation channel is 135 feet, the minimum required to accommodate navigation on the waterway. Therefore, the second deck of the double-decked replacement structure would have to be positioned above the elevation of the current bridge deck.

Due to Port Authority security considerations and policy changes in the aftermath of the September 11, 2001 terrorist attacks, all truck traffic on Port Authority crossings must travel on the upper level of double-decked structures such as the George Washington Bridge. As the commenter suggested restriction of truck traffic to one level of the replacement bridge (necessarily the upper deck, per Port Authority security-related policy), the double-decked Goethals Bridge replacement would need to provide for bi-directional travel on each level. The resultant double-decked bridge would have a minimum of two lanes per direction per level (a total of 8 travel lanes).

Each approach span to the double-decked main span would need to be "split" to serve both levels of the bridge, requiring more extensive approach structures with wider footprints and greater numbers of approach support piers. On the New Jersey approach, transitioning a two-level structure into New Jersey Turnpike Interchange 13 would be considerably more complex (split traffic operations, difficult horizontal and vertical geometry, less-than-standard clearances) than for a single-level structure. It may require that the upper level of the New Jersey approach extend farther out on the interchange, and would require considerably more approach structure to converge onto the existing roadways. On the Staten Island approach, the split approach would extend approximately 1,500 to 2,000 feet, incurring potentially more extensive wetland impacts than would a common approach structure.

Additionally, approach grades steeper than the existing 4 percent grade would be required to carry truck traffic to the upper level, which is inconsistent with geometric design criteria for maximum profile grade, as defined by the American Association of State Highway and Transportation Officials (AASHTO), the Port Authority as the facility's owner, and the New York and New Jersey Departments of Transportation. Steeper grade and higher deck elevation for the upper deck that would be used exclusively for truck traffic would also complicate provision of more direct truck access between the Goethals Bridge and the Howland Hook Marine Terminal.

This alternative would pose significant design and operational complexities, compared to single-decked bridge replacement alternatives, without achieving the purposes for which the double-decked alternative was suggested. It would: 1) present similar construction impacts as would other single-bridge replacement alternatives for construction of the new span and demolition of the existing Goethals Bridge; 2) may have similar shading effects on the Arthur Kill as would other single-bridge alternatives, depending on the number of travel lanes, provision of bike/walkway, or potential transit component, and the consequent overall bridge width; and, 3) while its cost may compare favorably with two-bridge replacement options, it would not be less costly than other single-bridge replacement alternatives. Therefore, a double-decked replacement bridge is not considered suitable for further consideration.

A.4 Two-way Tolling on Verrazano-Narrows Bridge

A provision in the U.S. Department of Transportation and Related Agencies Appropriations Act of 1986 mandated toll collection on the Verrazano-Narrows Bridge only for "vehicles exiting from such bridge in Staten Island." As a result, the Metropolitan Transportation Authority (MTA)-Triborough Bridge and

Tunnel Authority (TBTA) instituted one-way tolling on the Verrazano-Narrows Bridge in the westbound direction, increasing the one-way toll price to match the level of the previous two-way tolls. This mandate was reaffirmed in a provision of the U.S. Department of Transportation and Related Agencies Appropriations Act of 1993. Resumption of two-way tolling would require amendment to this Act of Congress.

In a 1987 EIS and a 1993 Supplemental EIS that evaluated alternative directions of toll collection, TBTA evaluated the effects of the one-way toll and resumption of two-way tolling policy at the Verrazano-Narrows Bridge. The studies found that elimination of the eastbound toll produced travel time savings in eastbound travel on the Staten Island Expressway during the morning peak. Evaluation of several alternatives for restoring two-way toll collection for trucks to avoid congestion related to diversions found that these two-way tolling alternatives would unacceptably increase the risk and severity of accidents on the Staten Island Expressway approach to the Verrazano-Narrows Bridge. The EIS stated that one-way toll collection compared to two-way collection at any facility, including on the Verrazano-Narrows Bridge, improves traffic flows in the toll-free direction while also improving traffic in the tolled direction; this latter finding is a result of using some of the toll collection booths in the non-tolling direction for the tolled direction, increasing toll collection capacity and, thus, expediting traffic throughput.

The New York Metropolitan Transportation Council (NYMTC), in preparation of its most recent Regional Freight Plan for 2025 (April 2004) considered alteration of the tolling direction for the Verrazano-Narrows Bridge in its Policy Package projects designed to reduce congestion and improve freight flow. However, NYMTC dropped this alternative from its final evaluation of alternatives because it was not supported by the MTA, would be opposed by the Staten Island community, and would require an Act of Congress to achieve.

Based on the results of these previous studies, a two-way tolling strategy at the Verrazano-Narrows Bridge is not considered a likely scenario. Of greater pertinence to this option's dismissal as a preliminary alternative for the current GBR study is that two-way tolling on the Verrazano-Narrows Bridge would fail to address the defined purpose and need for the Goethals Bridge replacement project.

A.5 Expanded Railcar Floating System

A scoping commenter suggested upgrading the remains of what was previously a "harborwide and profitable railcar floating system," positing that it would be a better potential freight solution than the proposed rail freight tunnel across New York Harbor. While the Cross Harbor Freight Movement (CHFM) EIS did not recommend improvements to the railcar float system as the preferred alternative for that project, the suggested alternative was investigated in the context of the purpose and need and project goals for the proposed Goethals Bridge replacement, which differ from those for the CHFM. As with the freight options identified as preliminary alternatives in this Technical Memorandum, an expanded railcar float system would be, at best, complementary to another Goethals Bridge Replacement alternative, rather than a stand-alone alternative.

Within the CHFM EIS, the expanded railcar float system is described as an improvement that would result in the operation of one railcar float every hour in each direction over a period of 16 hours on weekdays and 8 hours on weekends (resulting in 192 total one-way trips every week). Each float would be capable of handling at least 20 freight cars, which is in line with a float "capable of handling four five-platform cars," as stated in the scoping comment. This alternative would also include various improvements to the railcar float loading facilities and the connecting railroad links and yards, to handle the increased float traffic.

While the CHFM EIS did not select the improved railcar float system as the preferred alternative, it is a useful source of information about how the improvement might be expected to perform. The CHFM contains information specifically about how this alternative would affect traffic on the three Staten Island Bridges (including specific information on the Goethals Bridge), on the Verrazano-Narrows Bridge, and on the Staten Island and West Shore Expressways. These projections are summarized in Table A-1 (traffic on the Staten Island bridge system) and Table A-2 (truck traffic on the Goethals Bridge and connecting highways), below.

TABLE A-1: TRAFFIC FLOWS ON THE STATEN ISLAND AND VERRAZANO-NARROWS BRIDGES

Time Period	Current (2000)	No Action (2025)	Expanded Float (2025)	Percentage Change
Commodity Truck Volumes				
6am-10am	1,835	2,734	2,714	-0.7%
3pm-7pm	1,270	1,830	1,819	-0.6%
24-hour	9,620	13,138	13,050	-0.7%
Total Truck Volumes				
6am-10am	8,970	9,480	9,460	-0.2%
3pm-7pm	3,940	4,620	4,630	0.2%
24-hour	31,670	34,560	34,480	-0.2%
Total Traffic Volumes				
6am-10am	121,059	151,080	151,364	0.2%
3pm-7pm	122,182	155,521	155,706	0.1%
24-hour	479,331	604,973	605,265	0.0%

Source: Cross Harbor Freight Movement DEIS, pg. 8-61.

Note: CHFM study's travel demand forecasting used 2000 as the base year.

TABLE A-2: COMMODITY TRUCK FLOWS ON STATEN ISLAND FACILITIES

Time Period	Current (2000)	No Action (2025)	Expanded Float (2025)	Percentage Change
Goethals Bridge				
6am-10am	601	751	725	-3.5%
3pm-7pm	441	532	535	0.6%
24-hour	3,587	3,908	3,837	-1.8%
Staten Island Expressway				
6am-10am	N/A	1,044	998	-4.4%
3pm-7pm	N/A	679	678	-0.1%
24-hour	N/A	5,351	5,237	-2.1%
West Shore Expressway				
6am-10am	161	265	269	1.5%
3pm-7pm	99	176	191	8.5%
24-hour	675	1,171	1,167	-0.3%

Source: Cross Harbor Freight Movement DEIS, pages 8-62 and 8-66.

Note: CHFM study's travel demand forecasting used 2000 as the base year.

The CHFM forecasts indicate that implementation of an expanded car float system would have minimal effect on the volume of traffic, either generally on the Staten Island bridge system or specifically on the Goethals Bridge and the connecting highways. Based on these results, it may be concluded that expansion of the rail float system would not materially improve the flow of goods to and from Staten Island and New Jersey and in the New York/New Jersey region, as it would not result in reduction of truck volumes from the existing roadway system (and by its very design, the railcar float would not directly improve goods movement between Staten Island and New Jersey). Based on these data, it is reasonable to conclude that an expanded railcar float system would not have the desired effect suggested by the commenter. Therefore, this alternative was not deemed suitable for further consideration as a freight-movement alternative for the proposed Goethals Bridge replacement, as it would not address the proposed project's transportation-related purpose and need.

A.6 New Bridge Coupled with Reuse of Existing Goethals Bridge as Two-Lane Truck-Only Facility

As suggested during scoping**,** a replacement bridge coupled with re-use of the existing bridge as a two-lane, two-directional truck-only facility was investigated. The scoping commenter suggested that the existing bridge should be reconfigured to carry one lane of traffic in each direction dedicated solely to truck traffic. The scoping commenter suggested that segregating truck traffic from passenger cars is a safety consideration, both for purposes of security and lessening of fatal accidents.

This suggested option of two-directional traffic on each of the replacement and existing bridges poses both design and operational complexities. The scheme would require significant reconfiguration of approaches, and accommodation for weaving between the east and west auto and east and west truck traffic flows in order to connect to the Staten Island Expressway and New Jersey Turnpike. Each approach span to the two bridges would need to be "split" to serve both bridges, requiring wider approach structures and an increased number of approach support piers, compared to either a single bridge or two single-directional bridges, potentially resulting in greater wetland and other impacts. Particularly on the New Jersey approach, transitioning two separate structures into New Jersey Turnpike Interchange 13 would be considerably more complex (split traffic operations, difficult horizontal and vertical geometry, less-than-standard clearances) than for either one bridge or two single-directional structures.

While the reconfiguration of the existing bridge to two single lanes, one in each direction, would correct the currently obsolete 10-foot lane widths and permit provision of a shoulder for breakdowns, issues with the existing bridge's structural integrity and security would remain.

While the suggested option does not appear appropriate for consideration as a preliminary alternative due to design and operational complexities, relative environmental impact, and inability to address the existing span's structural deficiencies, the scoping commenter's rationale for suggesting the option – to address bridge security and safety concerns related to truck traffic – will be factors considered in the development and evaluation of alternatives for the proposed project.

Appendix B
Summary of Technical Advisory Committee, Environmental Task Force, and Stakeholder Committee Meetings

COMMITTEE MEETING SUMMARY

GOETHALS BRIDGE REPLACEMENT EIS

DATE:	**August 8, 2006**	**TAC MEETING #:**	**2**
TO:	**E. Feemster, G. Kassof (USCG)** **E. Lopez, J. Blackmore, C. Hopson, P. Crist, L. Venech,** **J. Papageorgis, M. Luongo, K. Lucianin, P. Dinh (PANYNJ)**		
FROM:	**M. Fitzpatrick/C. Ryan (HSH), K. Hess/J. Versenyi/JP Magron (Berger/PB JV)**		
SUBJECT:	**TAC Meeting #2 Summary – 6/1/06 from 10:00 am – 12:00 noon at USCG**		
CC:	**Committee members**		

On 6/1/06, the US Coast Guard (USCG) hosted the second meeting of the Technical Advisory Committee (TAC) for the Goethals Bridge Replacement Environmental Impact Statement (GBR EIS). The purpose of the TAC is to provide an opportunity for transportation and environmental resource agencies to discuss traffic/transportation and related air quality and noise issues and areas of potential concern related to the proposed project. This was the second of three scheduled TAC meetings to be held during the preparation of the Draft EIS. The USCG has also established an Environmental Task Force (ETF) and a Stakeholder Committee. The ETF consists of federal, state and local agencies with expertise in all environmental aspects of the project not covered by the TAC. The ETF also met on June 1, 2006 and the same information as described below was presented to the ETF member agencies in attendance.

Gary Kassof of the USCG welcomed the meeting attendees and introduced Chris Ryan of the environmental consultant team who facilitated the meeting. Mr. Ryan reviewed the purpose of the committee and the meeting agenda. He then asked the participants to introduce themselves.

Ken Hess of the consultant team then gave an overview of the EIS status, focusing on the efforts performed since the first TAC meeting was held on March 3, 2005. He also introduced the two technical presentations that followed.

Peter Sucher of the consultant team then made a presentation on the Goethals Transportation Model (GTM) development and refinement. A copy of all meeting presentations is attached to this summary. The floor was then opened to comments and questions, and there were none.

Judy Versenyi of the consultant team then made a presentation on the alternatives screening process and results, including a brief review of alternatives and screening criteria, and the results of the comparative screening. This was followed by a discussion period.

Group Discussion:

A representative from NYMTC asked how accident reduction rates were estimated. The consultant team responded that they examined future geometric improvements and forecast levels. They used a NYSDOT standard of calculating potential accident rates that included criteria such as lane widths, shoulders, geometry, speed limit and lateral distance to the barrier. The NYMTC representative requested more information at the conclusion of the presentation.

A Turnpike Authority representative asked how the capacity of the existing toll plaza was reflected and what its ability is to alleviate congestion and help operations. The consultant team indicated that the study evaluated the existing level of service (LOS) at the barrier and the potential for E-ZPass to impact the LOS. This will be modeled further as part of the DEIS. A representative from the Port Authority added that a new bridge would have barrier-free E-ZPass and video tolling, rather than just the existing staffed lanes.

A NYSDOT representative asked whether there would be a bus or high occupancy vehicle (HOV) lane. The consultant team indicated that should there be a special use lane, it could potentially accommodate both bus and HOV use. NYSDOT expressed interest in obtaining detailed numbers of HOV use projections versus bus rapid transit (BRT). The NJ TRANSIT representative in attendance also requested more detailed information on BRT routes.

A Turnpike Authority representative asked if the 15,360 AM peak-period transit riders mentioned in the presentation comprises all transit riders crossing the bridge, and the consultant team confirmed that was the case.

A City of Elizabeth representative asked what volume of traffic going to Elizabeth was making local trips and what volume was going to the Turnpike. The consultant team stated that for the purposes of the comparative analysis, the trips were not separated, but that local traffic impacts will be examined in the detailed analysis for the DEIS. The same representative also stated that the missing link between I-278 and Route 1/9 northbound is an important concern for the City of Elizabeth and that this link should be evaluated concurrently with the Goethals Bridge Replacement EIS.

A Turnpike Authority representative asked whether the study was considering using a reversible lane for Bus Rapid Transit (BRT) during the predominant direction of travel. The consultant team responded that a special-use lane is being considered, and that the DEIS will look at the potential operations of this lane in detail, however it has been determined that dedicating a lane on a proposed bridge to BRT only does not warrant further consideration in the DEIS.

A NYMTC representative asked about the area of coverage for the VISSIM model and the consultant team responded that it included the Goethals corridor from Route 1&9 to a third of the Staten Island Expressway past the West Shore Expressway Interchange, and that no local level of detail has been conducted at this time. .

A City of Elizabeth representative asked why the analysis stops at Interchange 13 and why there are no detailed plans for local traffic in Elizabeth. The consultant team responded that the modeling activities, using both the GTM and VISSIM, will include the local and freeway network, including Routes 1 and 9. The VISSIM model will model the highway section and determine the need for E-ZPass tolling.

NYSDOT asked when the modeling results will be made available to the TAC, and the study team responded that this would be available in the late fall of 2006.

Chris Ryan then told attendees that it is expected that the TAC will meet again in the fall of 2006 to review the results of the DEIS analysis of alternatives, and reviewed the remaining project schedule.

Gary Kassof then thanked those in attendance, and invited TAC members to join the team in reviewing more detailed information on the boards.

Additional topics raised in discussions at the board area included:

- The City of Elizabeth stated the need for a direct connection between Routes 1 / 9 and I-278.
- The FAA representative discussed their guidelines for the height of newly-constructed bridges. One of the Port Authority representatives indicated the Authority's awareness of these guidelines, and that discussion with FAA regarding this issue has already been occurring.

Attachments:

- List of Meeting Attendees
- Meeting Agenda
- Meeting presentations

COMMITTEE MEETING SUMMARY

GOETHALS BRIDGE REPLACEMENT EIS

DATE:	**August 8, 2006**	**ETF MEETING #:**	**2**
TO:	**E. Feemster, G. Kassof (USCG)** **E. Lopez, J. Blackmore, C. Hopson, P. Crist, L. Venech,** **J. Papageorgis, M. Luongo, K. Lucianin, P. Dinh (PANYNJ)**		
FROM:	**M. Fitzpatrick/C. Ryan (HSH), K. Hess/J. Versenyi/JP Magron (Berger/PB JV)**		
SUBJECT:	**ETF Meeting #2 Summary – 6/1/06 from 1:30 pm – 3:30 pm at USCG**		
CC:	**Committee members**		

On 6/1/06, the US Coast Guard (USCG) hosted the second meeting of the Environmental Task Force (ETF) for the Goethals Bridge Replacement Environmental Impact Statement (GBR EIS). The purpose of the ETF is to provide regulatory and resource agencies an opportunity to discuss environmental issues and areas of potential concern related to the proposed project. This was the second of three scheduled ETF meetings to be held during the preparation of the Draft EIS. The USCG has also established a Technical Advisory Committee (TAC) and a Stakeholder Committee. The TAC consists of federal, state and local agencies with expertise on traffic/transportation and mobile-source air quality and noise issues and analysis. The TAC also met on June 1, 2006 and the same information as described below was presented to the TAC member agencies in attendance.

Gary Kassof of the USCG welcomed the meeting attendees and introduced Chris Ryan of the environmental consultant team who facilitated the meeting. Mr. Ryan reviewed the purpose of the committee and the meeting agenda. He then asked the participants to introduce themselves.

Ken Hess of the consultant team then gave an overview of the EIS status, focusing on the efforts performed since the first ETF meeting held March 3, 2005. He also introduced the two technical presentations that followed.

Peter Sucher of the consultant team then made a presentation on the Goethals Transportation Model (GTM) development and refinement. A copy of all meeting presentations is attached to this summary. The floor was then opened to comments and questions.

First Group Discussion:

A representative from US Fish and Wildlife Service asked where air quality information would be derived from and if there is an air quality component to the model. The consultant team responded that air quality impacts would be calculated from the GTM forecast. For comparative screening, there has only been a preliminary estimate, but a more detailed evaluation will be included in the DEIS.

The NYC Department of Parks and Recreation (NYCDPR) representative asked whether there would be a bike path on the proposed bridge structure. The consultant team responded that a new bridge would include a 10-foot wide pedestrian and bicycle lane.

A City of Elizabeth representative asked where the bicycle and pedestrian lane would terminate in Elizabeth. The consultant team responded that current alignment drawings are at the conceptual level, and that further details, such as the terminus for the bike/ped amenity, would be developed at a later point in time outside of this EIS process.

NYCDPR then asked if dioxin levels will be considered as part of the air quality evaluation. The consultant team responded that there will be an evaluation of CO, ozone precursors, and particulate matter, but not dioxin.

Judy Versenyi of the consultant team then made a presentation on the alternatives screening process and results, including a brief review of alternatives and screening criteria, and the results of the comparative screening. This was followed by a discussion period.

Second Group Discussion:

A representative from NJDEP asked why a new bridge would be designed to achieve a Level of Service (LOS) of D, and whether that is considered adequate. The consultant team responded that the new facility would improve LOS by two levels during the peak travel period, and that while the LOS D applied only to the worst-case scenario at peak travel period, it would be deemed as appropriate for facilities in urban areas.

The NYCDPR representative asked how many acres of wetlands would be impacted by the project and what the provisions for mitigation would be. The consultant team responded that the study is not yet at that stage of determining mitigation. Current estimates of impacts, ranging between 3.2 and 3.6 acres, have been generated for the comparative screening stage of analysis, but a much more detailed evaluation will be conducted in the DEIS.

The NYC Department of Parks and Recreation (NYCDPR) representative then asked about air quality impacts during construction, and the consultant team responded that while this evaluation has not yet been conducted, it will be included in the DEIS.

Representatives from the US Environmental Protection Agency (USEPA) and NYC Department of Environmental Protection (NYCDEP) raised concern over the lane configuration, specifically a six-lane bridge connecting with four lanes of highway on the Staten Island side. The consultant team responded that there are multiple tie-ins to the bridge on both sides of the Arthur Kill, with the Turnpike and local roads in NJ and the Staten Island Expressway and Route 440 in Staten Island.

The US Environmental Protection Agency (USEPA) representative asked about the directional volumes projected for the bridge which appear to be counter-intuitive. The consultant team verified that in the morning peak period there are higher volumes traveling westbound than eastbound. USEPA continued that their agency supports the inclusion of high occupancy vehicle (HOV)/high occupancy toll (HOT) lanes in the bridge design. The consultant team responded that the DEIS phase of study would include an analysis of special use lanes.

A City of Elizabeth representative asked about impacts to wetlands across the different alternatives, and how the cost of mitigation for those impacts would affect the total cost of the project. The consultant team responded that at the current phase of analysis, the wetland acreage affected by the four bridge alternatives differs by only 4/10 of an acre. The current cost estimates only include the cost of construction, and do not yet include any wetland mitigation costs.

The City of Elizabeth continued with a concern about what will be done to mitigate northbound traffic in Elizabeth especially for the missing link between I-278 westbound and Routes 1&9 northbound. The consultant team responded that a detailed local traffic analysis will be done in the DEIS.

A representative from the NJ Historic Preservation Office asked why the preliminary alternative of maintaining the existing bridge and building a parallel twin was not included in the comparative analysis. The consultant team responded that this alternative did not meet the project's purpose and need, which has been vetted and approved through the public and agency scoping process. Even with rehabilitation, the existing bridge could not provide an opportunity for safer crossing, transit enhancements, E-ZPass technology, a bicycle and pedestrian facility, or shoulders.

The NYCDPR representative asked if there was an opportunity for questions to be submitted and resolved outside of today's meeting. The consultant team responded that the project web site (www.goethalseis.com) contains up-to-date project information, and that comments and questions can be submitted to the USCG at any time.

The City of Elizabeth representative asked if there is any significance to the 2030 forecast date when the estimated life of a new bridge would be 100 years. The consultant team responded that the standard practice for EIS analyses is to project out 20 years past the estimated completion time of the project, which in this case is 2010.

The City of Elizabeth asked how the public open houses were being publicized. The consultant team responded that advertisements were being placed in NY and NJ papers, that a meeting announcement flyer was mailed to the project mailing list, flyers have been posted in libraries and community centers, a media advisory will be sent, and the information is posted on the project web site. The City of Elizabeth representative requested copies of the meeting announcement flyer (*in response, those copies were sent subsequent to the meeting*).

Chris Ryan then told attendees that it is expected that the ETF will meet again in the fall of 2006 to review the results of the DEIS analysis of alternatives, and reviewed the remaining project schedule.

Gary Kassof then thanked those in attendance, and invited ETF members to join the team in reviewing more detailed information on the boards.

Additional topics raised in discussions at the board area included:

- The NJ Historic Preservation Office discussed the status of the USCG's Area of Potential Effect (APE) for the project

- The USEPA will meet with the study team during the summer to discuss cumulative impacts. The representative also discussed new regulations that will be forthcoming on air toxics analysis.
- The US Fish and Wildlife Service reviewed the data sources for the study's analysis of fish and aquatic habitats.
- National Marine Fisheries Service discussed a cumulative assessment of wetlands, as well as suggested improvements to documentation of the endangered fish habitat screening that was conducted for the comparative screening.
- The NYCDPR inquired about the level of effort employed to date regarding attempts to minimize wetland impacts of the several alternatives being screened.

Attachments:

- List of Meeting Attendees
- Meeting Agenda
- Meeting presentations

COMMITTEE MEETING SUMMARY

GOETHALS BRIDGE REPLACEMENT EIS

DATE:	**August 8, 2006**	**SC MEETING #:**	**2**
TO:	**E. Feemster, G. Kassof (USCG)** **E. Lopez, J. Blackmore, C. Hopson, P. Crist, L. Venech,** **J. Papageorgis, M. Luongo, K. Lucianin, P. Dinh (PANYNJ)**		
FROM:	**M. Fitzpatrick/C. Ryan (HSH), K. Hess/J. Versenyi/JP Magron (Berger/PB JV)**		
SUBJECT:	**Stakeholder Committee Meeting #2 Summary – 6/15/06 from 2:00 pm – 4:00 pm at the Elizabeth Public Library**		
CC:	**Committee members**		

On 6/15/06, the US Coast Guard (USCG) hosted the second meeting of the Stakeholder Committee (SC) for the Goethals Bridge Replacement Environmental Impact Statement (GBR EIS). The purpose of the SC is to provide a forum for discussion and encourage interaction about EIS-related issues among key stakeholder organizations potentially affected by the proposed Goethals Bridge Replacement Project. This was the second of three scheduled SC meetings to be held during the preparation of the Draft EIS.

Gary Kassof of the USCG welcomed the meeting attendees and reviewed the purpose of the SC. He then asked the participants to introduce themselves and introduced Maura Fitzpatrick of the environmental consultant team who facilitated the meeting.

Ms. Fitzpatrick reviewed the meeting agenda. She then briefed attendees on where the project team was in the process of preparing the DEIS, and the steps that had been taken since the SC last met on March 24, 2005. She notified all of the TAC and ETF meetings held June 1, 2006. She then asked if there were any initial questions, and there were none.

Peter Sucher of the consultant team then made a presentation on the Goethals Transportation Model development and refinement. A copy of all meeting presentations is attached to this summary. The floor was then opened to comments and questions.

First Group Discussion:

A representative from Staten Island Community Board 1 asked whether the consultant team had considered impacts to roadways beyond the Staten Island Expressway when calculating future eastbound traffic volumes. The consultant team responded that the next stage of detailed evaluation in the DEIS will consider impacts on surrounding facilities to determine if they can accommodate the projected traffic volumes, or if mitigation is warranted.

A representative from the Elizabeth Chamber of Commerce asked whether the consultant team had taken into account the increase in gas prices and the potential impacts of that increase on future traffic volumes. The consultant team responded that the model does look at cost as a factor in projecting travel behavior, but that it could not predict the impacts of sudden shifts or unexpected increases in gas prices in the future.

A representative from Meadowlink asked whether a replacement bridge would be accessible to bicycles, and the consultant team responded that any of the considered replacement bridge alternatives would include a dedicated bicycle/pedestrian amenity.

A representative from the Brooklyn Borough President's Office asked how large an area would be examined to determine impacts of future traffic volumes, and specifically how far into the I-278 corridor would be examined. The consultant team responded that the analysis area for traffic impacts includes a portion of Brooklyn and the BQE corridor on the NY side and Routes 1 and 9 and the I-278 Expressway on the NJ side and that the study area will be increased, if warranted. The study area can be increased if warranted.

The Brooklyn Borough President's representative asked about the relationship between the traffic volumes on the Goethals Bridge and the Outerbridge Crossing, as well as between the Goethals and Bayonne Bridges. He added that the Bayonne Bridge is underutilized and that Transportation Demand Management (TDM) techniques such as Variable Message Signs (VMS) could be used to divert traffic away from the Goethals Bridge to other crossings. The consultant team responded that the analysis evaluated all three NY/NJ crossings, as well as the Verrazano Narrows Bridge, examining projected growth in jobs and population to project future traffic flows and proportional volumes among the crossings.

A representative from the Tri-State Transportation Campaign asked whether the model includes increases in freight movement via truck due to the expected modifications to the New York Container Terminal at Howland Hook. The consultant team indicated that the modeling for truck traffic was based on the most up-to-date data, and projections from the Port Authority of NY&NJ relative to NYCT.

A representative from the Staten Island Borough President's office asked whether the direction of traffic volumes was correct for the morning peak travel period, as it seems contrary to what one experiences when traveling on the Bridge. The consultant team responded that the unique thing about the Goethals Bridge is that travel during the peak hours is in reverse of what is expected, i.e., the majority of vehicles are traveling towards NJ in the morning rather than towards NY.

A representative from the Elizabeth Police Department asked whether the traffic projection model took expansion plans at the NY Container Terminal (NYCT) at Howland Hook into consideration, and asked what those expansion plans are. The consultant team responded that the model does take the NYCT into consideration and that this will be studied in greater detail in the DEIS. A representative from the NYCT indicated that the next rail project at the facility, the Dock Mail Yard will start in August of this year and will take 300-400 trucks per week off the road.

The Elizabeth Police Department representative asked about the level of detail of the Goethals Transportation Model (GTM) and why Bayway Circle was not included in the transportation model from the beginning. The consultant team responded that the GTM transportation model was originally adapted from the Best Practice Model (BPM) developed and used by the New York Metropolitan Transportation Council (NYMTC). The BPM is primarily used for determining regional air conformity, and as such, does not include detailed information about local intersections. The GBR EIS study team created the Goethals Transportation Model (GTM) in part to include the necessary details such as the Bayway Circle.

The Elizabeth Police Department representative asked why the study area was limited to 1/8 mile from the existing Goethals Bridge, and the consultant team clarified that a 500-foot distance to either side of the existing bridge is only for identifying environmental conditions and assessing potential impacts to wetlands and other environmental features in proximity to the proposed project. The study area for traffic and transportation impacts includes a much larger geographic area which can be expanded as necessary.

A representative from the City of Linden asked if NJDOT and Federal agencies have been notified about these projections. In addition, it was asked where westbound traffic will go if a six-lane bridge is built. If the missing link between Rte. 278W and Routes 1 & 9N was completed first, then there would be sufficient capacity for westbound traffic coming off a new bridge. The consultant team responded that both NJDOT and key Federal agencies are members of the study's Technical Advisory Committee and have been included in the process from the beginning. The DEIS phase of the study will look in more detail at potential traffic impacts and any necessary steps to mitigate those impacts.

In addition, the Brooklyn Borough President's representative asked whether NYC Economic Development Corporation's plans for upgrading the Staten Island Railroad Lift Bridge had been considered in this evaluation. The representative commented that the Bayonne Bridge is under-utilized, and that the study team needs to consider that when looking at the forecasts for Goethals. The consultant team responded that the evaluation looked at all Staten Island bridges for the purpose of determining impacts of a Goethals Bridge replacement. They added that the study included all programmed and committed projects in the area in its projections of future conditions.

Ken Hess of the consultant team then made a presentation on the alternatives screening process and results, including a brief review of alternatives and screening criteria, and the results of the comparative screening. This was followed by a discussion period.

Second Group Discussion:

A stakeholder asked if the study was considering improvements to the bridge piers or changes to the height of the bridge to accommodate large ships, as the height of the current bridge severely limits the types of ships that can pass underneath it. The consultant team responded that these specific needs would be refined during the design process, but that in advance of that phase, the study team had met with the Harbor Pilots to get their input and were in agreement with the proposed clearance, which is slightly higher than the existing bridge's clearance. It was also stated that the bridge piers are proposed to be moved further away from the navigation channel of the Arthur Kill. Given restrictions on the height of the bridge that have been imposed by the Federal Aviation Administration, there is little additional ability to further increase the amount of clearance above the navigation channel.

A stakeholder asked about the present conditions of the bridge structure, and the areas of the worst deterioration. A representative from the Port Authority of NY&NJ stated that the main issue is the functional obsolescence of the bridge and its structural steel elements. The ongoing bridge's deck rehabilitation work that is being conducted to maintain the roadway conditions can only be considered a "band aid" with an estimated lifetime of 10 years before the next deck rehabilitation project.

A representative from the Elizabeth Chamber of Commerce asked about the construction duration and impacts to traffic for the two alternatives that would construct twin bridges. The consultant team and a representative from the Port Authority explained that the existing bridge would be maintained through construction of the first span of the twin bridge, and then taken down prior to the construction of the second span. During the construction of the second span of the twin bridge, the first span would be temporarily striped for dual two-way traffic so that it would maintain two lanes of traffic in each direction, while taking advantage of the wider shoulders. When the second span of the twin bridge is completed, each span would contain three lanes for traffic in addition to the bicycle/pedestrian amenity and shoulders.

A representative from the Baykeeper asked if the study team has coordinated with the Army Corps of Engineers which is proposing to dredge and deepen the Arthur Kill. The consultant team responded that the study is coordinating with the Army Corps of Engineers. A representative from the Port Authority added that the Army Corps of Engineers has been designated a cooperating agency for this EIS

The Baykeeper representative asked whether the team was advancing an alternative that transferred freight from ship to rail in an effort to take trucks off the road. The consultant team responded that that alternative was considered early in the process, but it did not meet the project's purpose and need which was vetted during the scoping process.

The Meadowlink representative asked whether the team had studied connections for the bicycle/pedestrian amenity proposed for the new bridge alternatives. The consultant team responded that this had not yet been considered at this stage of the study, but that a more detailed evaluation would be conducted at a later point in time. A ten-foot width is currently planned to accommodate the bicycle and pedestrian facility on the new bridge(s).

The Brooklyn Borough President's representative questioned a statement made during the presentation that the number of lanes on the Goethals Bridge drives the volume of traffic going over it, expressing concern that an increase in lanes would increase traffic. He recommended that the team revisit the bus rapid transit (BRT) analysis to determine a way to make it work, and it was suggested that there may have been better destinations that could have been considered. His main concern is that the future traffic increases associated with a 50% increase in number of lanes (from 4 to 6 lanes) for any of the proposed new bridge alternatives would have a negative impact on both the road network of Staten Island and Brooklyn. He cited a statement submitted by the Brooklyn Borough President during the public scoping comment period in November 2004 which stated: "The interaction of the truck and rail modes in connecting west of the Hudson to the east of the Hudson, including the potential effect of the Cross Harbor Freight Movement Project should be thoroughly analyzed." It was also suggested that this study should analyze how the truck cargo can be diverted to rail.

The Staten Island Borough President's representative questioned the population and job growth projections used by the consultant team for Staten Island, and asked how they were derived and if that information could be made available to the SC members. The consultant team responded that these projections were made in coordination with the New York Metropolitan Transportation Council, the New York City Department of City Planning, and the New York City Economic Development Corporation. The study team will share these projections with SC members.

The Elizabeth Chamber of Commerce representative commented that improving traffic from a level of service F to only a level of service D is unacceptable.

The Baykeeper representative asked if the consultant team could distinguish between trucks vs. autos in the projected traffic volumes. The consultant team did not have that breakdown available but indicated that it could be done for the next meeting, and that the truck data could be broken down further to different sizes of trucks.

A representative from the Staten Island Economic Development Corporation asked if the study would reconsider analyzing the BRT option at a later stage of the EIS Process. The consultant team responded that while dedicating a lane strictly to BRT would result in an underutilized BRT lane and unacceptable traffic volumes in the remaining lanes, the consultant team was considering other special use lane options, such as high-occupancy vehicle (HOV) or high-occupancy toll (HOT) lanes, congestion pricing, express toll lanes, and express bus services, in conjunction with the proposed general-use lanes.

The Brooklyn Borough President's representative stated that this project needs to incorporate heavy rail into its transportation model to test how tolling trucks can have an impact of shifting from truck to rail for goods movement.

Maura Fitzpatrick of the consultant team then told attendees that it is expected that the SC will meet again in the late Fall of 2006 to review the results of the DEIS analysis of alternatives, and reviewed the remaining project schedule.

Gary Kassof then thanked those in attendance, and invited SC members to join the team in reviewing more detailed information on the boards.

In addition to the comments captured above, a comment sheet was submitted following the meeting with the following suggestion:

- The Meadowlink representative recommended that the project team engage the bi-state Transportation Management Associations (TMAs) in their goal of enhancing non-single occupancy vehicle (SOV) commuting opportunities.

Attachments:
- Meeting Agenda
- Meeting presentations

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