NEW YORK STATE
DEPARTMENT OF TRANSPORTATION

D015621, PIN X730.56

BROOKLYN-QUEENS EXPRESSWAY (BQE)/I-278 EIS
DOWNTOWN BROOKLYN
KINGS COUNTY, NEW YORK

DRAFT
ALTERNATIVES EVALUATION
TECHNICAL MEMORANDUM

January 2011
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1.0 INTRODUCTION

The New York State Department of Transportation (NYSDOT) and the Federal Highway Administration (FHWA) as joint lead agencies, in partnership with the New York City Department of Transportation (NYCDOT), are preparing an Environmental Impact Statement (EIS) in conformance with the National Environmental Policy Act of 1969 (NEPA), the State Environmental Quality Review Act (SEQRA), the transportation planning provisions of Section 6002 of the Safe, Accountable, Flexible, Efficient Transportation Equity Act – A Legacy for Users (SAFETEA-LU), and the NYSDOT project development process for the rehabilitation, reconstruction or replacement of approximately 1.5 miles of the Brooklyn-Queens Expressway (BQE)/Interstate 278 (I-278) in Kings County, New York (the Project). The limits of the Project extend between Sands Street on the east and Atlantic Avenue on the west, including the entire Atlantic Avenue interchange. NYCDOT is the owner of this segment of the BQE. As part of the environmental review and planning process, a number of alternatives have been proposed through a public process. This memorandum documents the results of an evaluation of those alternatives to identify the alternatives that should be further evaluated in the EIS. Included in this document is:

- A description of the methodology used to identify and screen alternatives;
- A description of the proposed alternatives;
- An evaluation of proposed alternatives; and
- Identification of alternatives for further evaluation in the environmental review process.
2.0 METHODOLOGY USED TO IDENTIFY & SCREEN ALTERNATIVES

Alternatives for the rehabilitation, reconstruction or replacement of the BQE between approximately Atlantic Avenue (on the west) and Sands Street (on the east) were identified based on the results of a scoping process in which a Stakeholder Advisory Committee (SAC), a Technical Advisory Committee (TAC) and the general public were provided opportunity to comment on the purpose and need for the Project, and alternatives to address the purpose and need through the following process:

- Identification and documentation of the purpose and need for the Project (see Section 2.1 “Purpose & Need”);
- Identification and documentation of goals and objectives in support of the purpose and need for the Project (see Section 2.2 “Goals & Objectives”);
- Development of a list of alternatives with the potential to meet the purpose and need and related goals and objectives of the Project;
- Review of the purpose and need, goals and objectives and preliminary list of alternatives during the public scoping process (see Appendix A: Final Project Scoping Document);
- Completion and documentation of a July 2010 “Alignment/Mode Workshop” with the SAC and TAC (see Appendix B: Tier 1 Alignment/Mode Workshop Summary, Wednesday, July 28, 2010); and
- Identification of a “long list” of alternatives resulting from the public scoping process and the July 2010 Alignment/Mode workshop.

A total of twelve modal and alignment alternatives resulted from the project scoping process and Alignment/Mode Workshop. These included rehabilitation of the existing facility within its existing alignment, reconstruction of the existing facility within new alignments, and implementation of a number of transportation systems management (TSM) and travel demand management (TDM) options as either stand-alone measures, or measures that could be used with one or more of the roadway rehabilitation, reconstruction or replacement options. These options are documented in Chapter 3.0 “Description of Alternatives” of this memorandum.
2.1 PURPOSE & NEED

Based on a series of studies and field observations of the segment of the BQE within the project limits, the Project is required to address the following needs:

- Observed structural deterioration of a series of bridge structures within established project limits;
- Nonstandard features within the project limits, including narrow (10.5 feet) lanes, lack of shoulders, short merge/weave distances near on- and off-ramps, nonstandard horizontal curvature, limited safe stopping sight distance, and nonstandard vertical clearances;
- Safety and operation concerns, including high accident locations (HALs) within the project limits; and
- Opportunities to apply Integrated Corridor Management (ICM) strategies to reduce the level of congestion within the project limits.

Based on these needs, the purpose of the Project has been established as:

- Addressing deteriorating structural conditions and to bring the roadway into a state of good repair in conformance with seismic design criteria;
- Addressing those nonstandard features that contribute to HALs and levels of congestion on the roadway within project limits;
- Eliminating the diversion of large trucks onto local streets by addressing deficient nonstandard vertical clearances within the project limits;
- Addressing deficient and/or discontinuous connections between the roadway and key local arterials and the Brooklyn and Manhattan Bridges; and
- Evaluating the potential to reduce congestion through the implementation of coordinated managed use lane strategies and application of alternate modes within the project limits.

To the extent practicable, the Project will also seek opportunities to improve access to Brooklyn Bridge Park (BBP) and address other transportation and development initiatives in its vicinity.
2.2 GOALS & OBJECTIVES

Based on the identified purpose and need, goals and related objectives were identified for the Project. These included goals and objectives listed in subsections 2.2.1 through 2.2.6 concerning the structural condition of the roadway within the project limits, safety and operational conditions within the project limits, and the quality of life, land uses, and parkland within the affected corridor:

2.2.1 Goal: Improve the structural condition of bridges, pavements and other highway elements within the Project Corridor

Objective:

- Complete needed structural improvements to bring I-278/BQE within the project limits to—at a minimum—a state of good repair.

2.2.2 Goal: Improve Safety and Reduce Congestion

Objectives:

- Conform to NYSDOT and the FHWA design standards that would improve safety;
- Incorporate operational improvements to address HALs identified within project limits;
- Improve connections to the East River bridges and the local street network as feasible to better serve the community;
- Improve pedestrian and bicyclist safety at intersections of BQE ramps with the local street network, including intersections along Old Fulton Street and Atlantic Avenue, which are important approaches to the Brooklyn Bridge Park; and
- Apply Integrated Corridor Management (ICM) and Managed Use Lane (MUL) strategies to reduce congestion.

2.2.3 Goal: Improve quality of life along the Project Corridor

Objectives:

- Reduce noise, vibration, and traffic congestion/Improve local and sub-regional air quality;
- Conform to NYSDOT and FHWA design standards that would reduce or eliminate diversion of traffic to local streets due to nonstandard geometrics; and
Mitigate construction related impacts to the local community to include unnecessary diversion of traffic to local streets.

2.2.4 Goal: Protect existing land uses along the Project Corridor

Objectives:

- Minimize the need to take any property outside of the existing rights-of-way of the BQE either permanently or on a temporary basis; and
- Minimize temporary construction-related effects on residential properties, businesses, and community facilities along the Project Corridor.

2.2.5 Goal: Protect and enhance open space and cultural resources

Objectives:

- Avoid/minimize adverse effects on public parkland and significant cultural resources;
- Minimize the need to use property outside of the existing right-of-way of the BQE either on a permanent or temporary basis; and
- Improve connections between major community resources such as parks, and adjacent neighborhoods.

2.2.6 Goal: Promote energy conservation

Objectives:

- Minimize long-term energy requirements.

2.3 METHODOLOGY USED TO SCREEN ALTERNATIVES

The screening of alternatives was based in the following four considerations:

- The ability of each alternative to meet the purpose and need and related goals and objectives of the Project (See Section 2.3.1: Ability to Meet Project Goals & Objectives);
- The degree to which alternatives would divert from the established project limits (See Section 2.3.2 “Extent of Diversion from Established Project Limits”);
• The potential for alternative to result in disproportionately high and adverse effects on minority and low income populations compared to effects on other populations (see Section 2.3.3 “Potential Effects on Environmental Justice Populations”); and

• The likelihood that an alternative could be funded within the timeframe needed to address the purpose and need of the Project without affecting the funding of critical elements of the overall regional surface transportation program (see Section 2.3.4 “Fundability of Proposed Alternatives and Effect on Regional Transportation Program”).

2.3.1 Ability to Meet Project Goals & Objectives

The evaluation of the extent to which each alternative meet the goals and objectives of Project was estimated on the basis of evaluation criteria and related measures of effectiveness. The initial step in this evaluation was to develop a draft list of evaluation criteria and measures of effectiveness for review by the SAC. The draft Level I Screening Criteria document was provided to the SAC in December 2009. Based on comments received from the SAC, a final Level I Screening Criteria document was provided to the SAC in May 2010 (See Appendix C “Final Level I Screening Criteria”). These measures were used to identify the degree to which the competing alternatives could achieve the purpose and need and related goals and objectives of the Project. A rating system was then used to assess the relative performance of the alternatives against each measure of effectiveness. Ratings were assigned to each alternative based on the following rating system:

- The alternative is projected to meet the given measure to a meaningful degree.
- The alternative is projected to meet the given measure, but to a lesser degree.
- The alternative would not meet the given measure, or would do so only to a very limited extent.

This screening allowed the project team to identify those alternatives that would not meet the Project purpose and need, and supporting objectives consistent with the level of detail appropriate for a Tier I EIS. While the criteria used in this screening were based on a conceptual level of engineering design, the results of the evaluations were measurable and replicable, leaving little to the subjectivity of the evaluator.

Provided below are descriptions of the screening criteria and related performance measures used to evaluate the degree to which the alternatives have the potential to meet the goals and objectives of the Project.
CRITERION 1: Major Engineering, Operational and Structural Considerations

— Measure 1-1: This criterion considers whether an alternative could be accomplished from an engineering perspective.

Pass: Alternative can be constructed and maintained to achieve stated objectives from an engineering perspective.

Fail: Alternative cannot reasonably be constructed and maintained to achieve stated objectives, from an engineering perspective.

— Measure 1-2: Provide 24/7, continuous operation of the highway during construction of the alternative — This criterion considers whether an alternative would meet federal and State requirements for maintaining the expressway as a means of travel. Barriers to free flow of people and goods on the Interstate system are prohibited by federal regulation. Therefore, the FHWA has an obligation to maintain the BQE/I-278 as a 24-hour, “barrier-free” interstate, and could not accept any alternative that would create a long-term barrier to travel. Failure to meet this need is considered a “fatal flaw” and will eliminate an alternative from further consideration.

Pass: No barrier to maintaining traffic through the corridor would be created.

Fail: Barrier to maintaining traffic through the corridor would be created.

— Measure 1-3: Improve deteriorating structural conditions in this segment of the BQE — The BQE within the project limits includes over 20 bridges. The NYSDOT bridge condition rating system is applied in this criterion to identify alternatives that do not address the deteriorating structural conditions of existing bridges to be considered in "good condition." In New York State, bridge inspectors are required to evaluate, assign a condition score, and document the condition of up to 47 structural elements, including rating 25 components of each span of a bridge, in addition to general components common to all bridges. The NYSDOT condition rating scale ranges from 1 to 7, with 7 being in new condition and a rating of 5 or greater considered as good condition. The alternative would result in a NYSDOT bridge condition, or equivalent, rating of:

Pass: 5 or greater

Fail: under 5

CRITERION 2: Improve traffic operations and safety in the project corridor by addressing nonstandard geometrics identified within this segment of the highway.

This criterion considers the ability of an alternative to address nonstandard geometrics, which would result in the improvement of operational conditions and traffic safety, and reduce congestion in this segment of the BQE over the long term.

— Measure 2-1: Improve nonstandard vertical clearances to reduce diversion of traffic to local roadways. Relative to existing conditions, under the proposed alternative:
None of the four nonstandard clearances would be standardized.

- Up to three nonstandard clearances would be standardized.
- All four nonstandard clearances would be standardized.

**Measure 2-2:** Improve operational conditions and traffic safety by widening nonstandard traffic lane widths. Relative to existing conditions, the proposed alternative would:

- Provide no standard lane widths.
- Provide standard lane widths for only a portion of the roadway.
- Provide standard lane widths.

**Measure 2-3:** Improve operational conditions and traffic safety by widening nonstandard shoulder widths. Relative to existing conditions, the proposed alternative would:

- Not incorporate any standard shoulder widths.
- Partially incorporate standard shoulder widths.
- Fully incorporated standard shoulder widths.

**Measure 2-4:** Improve operational conditions and traffic safety by incorporating standard highway horizontal stopping sight distances on the highway “mainline” which includes the principal lanes of the highway (separate from access ramps). Relative to existing conditions, under the proposed alternative:

- None of the 12 nonstandard horizontal stopping sight distance lengths would be standardized.
- Six or more nonstandard horizontal stopping sight distance lengths would be standardized.
- All 12 nonstandard horizontal stopping sight distance lengths would be standardized.

**Measure 2-5:** Improve operational conditions and traffic safety by incorporating standard highway horizontal curvature on the highway mainline. Relative to existing conditions, under the proposed alternative:

- None of the 4 (per bound) nonstandard horizontal curvature radii lengths would be standardized.
- Two or more (per bound) nonstandard horizontal radii curvature lengths (per bound) would be standardized.
- All 4 nonstandard horizontal radii curvature lengths would be standardized.
— **Measure 2-6**: Improve operational conditions and traffic safety by incorporating standard highway design elements on access ramps. Relative to existing conditions, under the proposed alternative:

- Less than half of the nonstandard horizontal curvature and sight stopping distance ramp lengths would be improved.

- More than half of the nonstandard horizontal curvature and sight stopping distance ramp lengths would be improved.

- More than half of the nonstandard horizontal curvature and sight stopping distance ramp lengths would be standardized.

— **Measure 2-7**: Improve operational conditions and traffic safety where exit ramps meet local streets so vehicular, bicycle and pedestrian movement and safety is optimized, and conflicts are eliminated. Relative to existing conditions, under the proposed alternative:

- Safety conditions would be improved at less than half of such intersections.

- Safety conditions would be improved at more than half of such intersections.

- Safety conditions would be improved at all such intersections.

**CRITERION 3: Reduce diversion of traffic from the highway onto local streets, both during construction and long term.**

This criterion considers the likelihood that an alternative would result in the short-term (construction-related) or long-term (operation-related) diversion of traffic from the BQE to local streets. Quantitative measures would be applied to the extent to which traffic estimates and assessments are available at the Level I screening stage.

— **Measure 3-1**: Minimize temporary (construction-period) diversion of traffic from the highway to local street system. Relative to existing conditions, the proposed alternative would:

- Not maintain six lanes of traffic (i.e., three lanes in each direction) in weekday daytime during the construction period.

- Maintain six lanes of traffic (i.e., three lanes in each direction) in weekday daytime through staging and shifting of lanes.

- Maintain six lanes of traffic during weekdays and weeknights.

— **Measure 3-2**: Minimize diversion of traffic from the highway to local street system for vehicles connecting to the East River bridges. Relative to existing conditions, the proposed alternative would:

- Restrict the potential to incorporate improved connections between the BQE and the Brooklyn and Manhattan Bridges.
Not restrict the potential to incorporate improved connections between the BQE and the Brooklyn and Manhattan Bridges.

Enhance the potential to incorporate improved connections between the BQE and the Brooklyn and Manhattan Bridges.

**CRITERION 4: Environmental Effects – Avoid adverse impacts on local residents and businesses, adjacent properties, parks, and historic resources.**

This criterion considers the likelihood that an alternative would result in short-term (construction-related) or long-term (operation-related) adverse effects on adjacent communities, require property acquisition, or entail extensive new construction.

— **Measure 4-1:** Avoid acquisition of residential property. Relative to existing conditions, the proposed alternative would:

  ○ Require acquisition of more than 10 residential properties, or 50 dwelling units.

  □ Require acquisition of 5 to 10 residential properties, or 25 to 50 dwelling units.

  ● Require acquisition of less than 5 residential properties, or 25 dwelling units.

— **Measure 4-2:** Avoid acquisition of commercial and industrial business. Relative to existing conditions, the proposed alternative would:

  ○ Require acquisition of more than 10 businesses.

  □ Require acquisition of 5 to 10 businesses.

  ● Require acquisition of less than 5 businesses.

— **Measure 4-3:** Avoid temporary (construction-period) impacts to commercial and industrial businesses. Relative to existing conditions, the proposed alternative would:

  ○ Disrupt more than 50 businesses.

  □ Disrupt 25 to 50 businesses.

  ● Disrupt less than 25 businesses.

— **Measure 4-4:** Avoid impact on public parks and significant historic resources. Per Section 4(f) of the Department of Transportation Act of 1966, the use of Section 4(f) resources—including public parks and significant historic sites—for transportation purposes is allowed only if there are no reasonable and prudent alternatives to such use. Relative to existing conditions, the proposed alternative would:

  ○ Result in adverse effects to public park property or significant historic resources.

  □ Not result in adverse effects to public park property or significant historic resources.
● Enhance public parks and significant historic resources.

— Measure 4-5: Avoid adverse impacts on noise-sensitive receptors. Relative to existing conditions, the proposed alternative would:
  ○ Exceed FHWA Noise abatement Criteria (NAC) at sensitive receptors during the operational phase.
  □ Increase noise levels, but not exceed NAC during the operational phase.
  ● Reduce noise levels during the operational phase and minimize construction-related adverse noise impacts.

— Measure 4-6: Avoid adverse impacts on vibration-sensitive receptors, including residential and historic structures. Relative to existing conditions, the proposed alternative would:
  ○ Increase ground-borne vibrations levels at sensitive receptors during the operational phase.
  □ Contribute to similar vibration conditions during the operational phase.
  ● Reduce ground-borne vibration levels during the operational phase and minimize construction-related adverse vibration impacts.

— Measure 4-7: Incorporate sustainable design and development elements. Relative to existing conditions, the proposed alternative would:
  ○ Increase GHG emissions due to energy use during the operational phase.
  □ Contribute to similar amounts GHG emissions due to energy use during the operational phase.
  ● Reduce GHG emissions due to energy use during the operational phase and minimize construction-related GHG emissions.

— Measure 4-8: Avoid environmental impacts related to the duration of the construction period — The construction phase of the project would last:
  ○ 5 years or more.
  □ Between 3 and 5 years.
  ● 3 years or less.
2.3.2 Extent of Diversion from Established Project Limits

FHWA regulations (23 CFR 771.111(f)) specify that the following principles should be used to define the limits of a highway project:

1. Project limits should connect logical termini and be of sufficient length to address environmental matters on a broad scope;

2. Project limits should have independent utility or independent significance, i.e., be usable and be a reasonable expenditure even if no additional transportation improvements are made in the area; and

3. Project limits should not restrict consideration of alternatives for other reasonably foreseeable transportation improvements.

As identified in the Initial Project Proposal (IPP) for the Project, the geographic limits of the Project are Sands Street on the east and Atlantic Avenue on the west. These project limits were included in the draft Scoping Document for Project made available for public review on June 2009, and subsequently finalized in the final Scoping Document for the Project in May 2010.

The “logical termini” or the geographic limits for the Project were developed on the basis of several considerations. The eastern limit of the Project was principally dictated by the western limit of the reconstruction and rehabilitation of the Park Avenue and Nassau/Concord Viaducts portion of the BQE between Sands Street and Flushing Avenue completed in 2009.\(^1\) The western limit of the Project was defined by the Atlantic Avenue Interchange, immediately east of Hamilton Avenue, where the BQE enters a depressed “trench” section. The trench section is structurally distinct from aboveground bridge structures that comprise the segment of the BQE between Sands Street and Atlantic Avenue.

Developing the Project within these limits would have independent utility and be a reasonable expenditure even if no additional transportation improvements are made in the area. Other reasonable foreseeable improvements to the transportation system—including improved access to the Brooklyn and Manhattan Bridges and modifications to the trench section—would not be restricted or dictated by the development of the Project within these project limits. In addition, while the Project is focused on the rehabilitation, reconstruction and/or replacement of the

\(^1\) NYSDOT Project I.D. No. X73057
structures within these project limits, the establishment of these limits would not restrict safety and operational improvements to related structures outside of the project limits.

Alternatives that substantially divert from the identified project limits were not considered to be reasonable alternatives and were eliminated from further consideration by NYSDOT.

### 2.3.3 Potential Effect on Environmental Justice Populations

*Executive Order 12898 “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* ² mandates that an evaluation be conducted of whether an action proposed by a federal agency would result in disproportionately high and adverse human health or environmental effects on minority populations and low-income populations as compared to potential effects on other populations.

The intent of *Executive Order 12898* is to ensure that each federal agency “make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations.” The Council on Environmental Quality (CEQ), which has oversight of the federal government’s compliance with *Executive Order 12898* and NEPA, ³ has developed guidance ⁴ to assist federal agencies with their NEPA procedures so that environmental justice concerns are effectively identified and addressed. Federal agencies are permitted to supplement this guidance with more specific procedures tailored to their particular programs or activities. Consequently, the United States Department of Transportation (USDOT) has adopted its own guidance addressing Environmental Justice. ⁵

As depicted in Figure 2-1 “Census Tracts with Environmental Justice Populations in the Project Area,” there are 16 census tracts with a significant proportion of minority and low-income

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² Signed by President William J, Clinton on February 11, 1994.
³ Certain oversight functions in the Executive Order are delegated to the Deputy Assistant to the President for Environmental Policy. Following the merger of the White House Office on Environmental Policy with CEQ, the Chair of CEQ assumed those functions. The Environmental Protection Agency (EPA) has lead responsibility for implementation of the Executive Order as Chair of the Interagency Working Group (IWG) on Environmental Justice.
⁴ Environmental Justice Guidance under the National Environmental Policy Act; CEQ; December 10, 1997.
⁵ USDOT Order on Environmental Justice; Federal Register: April 15, 1997 (Volume 62, Number 72).
Figure 2-1: Census Tracts with Environmental Justice Populations in the Project Area
populations in the vicinity of the proposed alternatives. As a consequence, there is the potential that one or more of the proposed alternatives would result in disproportionately high and adverse human health or environmental effects on these populations. An assessment was completed of whether the identified alternatives would result in one or more of these adverse effects, including potential disproportionately high and adverse effects during construction and operation of each alternative. Alternatives that would likely result in such disproportionately high and adverse effects on Environmental Justice populations were not considered to be reasonable and were eliminated from further consideration.

2.3.4 Fundability of Proposed Alternatives and Potential Effect on Funding Regional Transportation Program

FHWA and NYSDOT guidance dictates that only “feasible” alternatives be considered for implementation. As defined in the FHWA guidance,\(^6\) feasibility includes the ability of alternatives to be financed and managed during both construction and operation. Guidance in the NYSDOT Project Development Manual,\(^7\) indicates that feasible alternatives need to include one or more courses of action or designs that can be funded within the timeframe needed to address observed deterioration of the structure within the project limits.

NYSDOT Region 11 is responsible for the operation, maintenance, and capital construction of transportation projects within New York City, exclusive of those under the jurisdiction of the Port Authority of New York & New Jersey (PANYNJ), New York City Department of Transportation (NYCDOT), and the Metropolitan Transportation Authority (MTA). As such, it is responsible for approximately 5,300 highway lane miles of roadway and 828 state bridges. Given the extensive list of improvements needed to maintain the regional transportation system in a state of good repair and the limited resources realistically available to fund these improvements, it is critical that an alternative be selected that would not encumber a disproportionate share of the federal, State and local resources projected to be available to fund these projects in the timeframe required to meet the need for the Project. In addition to the projects needed to maintain the regional transportation system under the ownership of the NYSDOT, there is also a long list of projects identified by NYCDOT to maintain and enhance the transportation system under its

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\(^7\) NYSDOT Project Development Manual, Chapter 3—Project Scoping Procedure; December 2004
ownership, including the segment of the BQE within the project limits. Consequently, an assessment was completed of whether:

- The construction, operation and maintenance of an alternative could be financed and managed;

- An alternative could be completed within the time period required to meet the purpose and need of the Project given the limited resources to fund and implement the alternatives; and

- The level of funding required for an alternative would have the potential to adversely affect the ability of NYSDOT and NYCDOT to fund other critical transportation needs within New York City.

This was accomplished by:

- Identifying the costs of “fiscally-constrained” roadway projects within New York City—i.e., projects for which funding has been identified—for the 2010-2035 time period, as documented in the New York Metropolitan Transportation Council (NYMTC) 2010 – 2035 Regional Transportation Plan (RTP), “A Shared Vision for a Shared Future” (NYMTC, September 2009). The first five years of the RTP fiscally-constrained plan includes projects and programs for which sources of funding have been identified from a combination of federal, state, and local partners (see Section 2.3.4.1: Cost of Fiscally Constrained Roadway Projects in the 2010-2035 Regional Transportation Plan);

- Identifying the potential sources and level of funding potentially available to fund the competing alternatives based on the resources identified in RTP (See Section 2.3.4.2: Available Revenue Streams to Fund RTP Projects and Proposed Alternatives);

- Evaluating the degree of certainty that projected funding levels will actually be in place in light of the delay in enactment of a new federal surface transportation statute to replace SAFETEA-LU;

- Estimating the costs to construct, operate and maintain each alternative (see Section 3.0 “Description of Alternatives”);

- Comparing the costs to construct, operate and maintain each alternative against the potential level of funding for the overall roadway program;

- Assessing the potential of whether construction, operation and maintenance of each alternative could be funded within the timeframe needed to meet the purpose and need and related objectives of the proposed project; and

- Assessing the potential effect of funding each alternative on the ability to fund other critical initiatives in the region.
Alternatives that would require extraordinary capital and/or maintenance and operation costs, have little potential to be funded within the timeframe anticipated meet the purpose and need of the Project, and would adversely affect the ability to meet other pressing transportation needs in the City, were eliminated from further consideration in the environmental review process. The NYCDOT has indicated that necessary state-of-good-repair activities within project limits must be commenced by 2020.

2.3.4.1 Costs of Fiscally Constrained Roadway Projects in the 2010-2035 Regional Transportation Plan

$338.41 million has been identified as the estimated cost of the Downtown Brooklyn BQE Project in the list of fiscally-constrained projects in the 2010 – 2035 RTP. Citywide, the 2010–2035 RTP included a list of fiscally-constrained projects sponsored by NYSDOT and NYCDOT totaling approximately $9.843 billion (see Table 2-1 “Anticipated Project Funding Levels: 2010—2035”). Not included in this list are such projects of regional importance as the East Side Access, Second Avenue Subway, and Lower Manhattan rebuilding projects.

Projects included in the RTP must be “fiscally-constrained” and only include projects that already have funding commitments from a combination of federal, State and local partners. These projects appear in the NYMTC Transportation Improvement Program (“TIP”) which defines funding for specific investments and actions over a five-year horizon. The RTP also includes a “vision” element that identifies additional projects, proposals, and studies that are priorities for the Region but do not yet have an identified funding source. The fiscally-constrained and vision elements of the RTP include, in addition to a list of capital projects, a broad range of safety projects, preservation projects, maintenance activities, operational activities, and other initiatives identified by NYMTC member agencies.

Overall, for the entire 10-county (New York, Kings, Bronx, Richmond, Queens, Rockland, Putnam, Westchester, Nassau, and Suffolk) NYMTC region, it is projected that a total of $137.1 billion of highway and bridge projects will need to be funded during the 2010 – 2035 period, of which approximately $44.8 billion (approximately 30%) is needed to support operation and maintenance of the existing system, and approximately $92.3 billion (approximately 70%) is needed to fund state-of-good-repair/normal replacement projects.
2.3.4.2 Available Revenue Streams to Fund RTP Projects and Proposed Alternatives

Funding of transportation projects in New York State is provided through a number of federal and State sources. SAFETEA-LU is the principal source of federal funding for surface transportation projects. Technically expired on September 30, 2009, it was extended in March 2010 until the end of the 2010 calendar year, and recently extended until March 4, 2011. SAFETEA-LU had previously received four short-term extensions prior to the nine month extension ending December 31, 2010. Included in the extension were sufficient funds to maintain the solvency of the Highway Trust Fund. Funds from SAFETEA-LU provide the federal share for the construction, operation and maintenance of the nation’s surface transportation program, including both roadways and transit.

New York State does not have a single transportation trust fund. Instead it has varied sources of transportation funds including the Transportation Infrastructure Renewal Fund, Mass Transportation Operating Assistance Fund, Dedicated Highway and Bridge Trust Fund, Dedicated Mass Transportation Trust Fund, and the Transportation Safety Account.

Funding for the New York State highway system over the six-year authorization period of SAFETEA-LU totaled $10.07 billion, or approximately $1.75 billion per year for the six-year period. The NYMTC RTP assumes revenues from four new federal transportation acts until 2035 at a growth rate of 20% for each six-year authorization period, and that 60% of the funding for highway projects would come from New York State resources supported by statewide taxes and fees. These are assumed projections based on previous experience. Actual funding levels may differ from these levels, including the potential for the funding of dedicated “earmarked” projects.
Table 2-1: Anticipated Project Funding Levels: 2010—2035

<table>
<thead>
<tr>
<th>Project Area</th>
<th>Estimated Cost (Millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>New York City</td>
<td>$ 9,843.37</td>
</tr>
<tr>
<td>Lower Hudson Valley(^9)</td>
<td>$ 1,760.02</td>
</tr>
<tr>
<td>Long Island(^10)</td>
<td>$ 1,893.04</td>
</tr>
<tr>
<td>10-County Region</td>
<td>$15,548.36</td>
</tr>
</tbody>
</table>

Estimated costs to construct, operate and maintain each alternative are noted in Table 3-1 “Long List of Alternatives.” The estimated cost of the alternatives under consideration range between $201 million for the Rehabilitation within Current Alignment (R-1) Alternative, and $13.4 billion for the “Outboard Tunnel between Sunset Park and Exit 33” (W-3) Alternative. Estimates for the R-1 and Context Sensitive (CS-1) alternatives were completed using standard NYSDOT capital cost estimation techniques based on the conceptual level of engineering design currently available for the listed projects. Estimates for tunnel alternatives were based on costs for a comparable project.\(^{11}\) Estimates include a contingency factor of 20%. Actual costs would likely be greater than these estimates since they are based on 2010 dollars since the anticipated construction initiation date for the identified alternative is 2020. Operation and maintenance costs include the cost of needed roadway lighting and—in the case of tunnel alternatives—ventilation.

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\(^8\) Source: NYMTC Regional Transportation Plan 2010—2035; September 2009.

\(^9\) Counties: Westchester, Rockland, and Putnam

\(^10\) Counties: Nassau and Suffolk

\(^11\) Estimates for tunnel alternatives were based on costs for the State Route 99/Alaskan Way Viaduct Replacement Project in the City of Seattle, WA. Project sponsor: Washington State Department of Transportation (http://www.wsdot.wa.gov/Projects/Viaduct).
3.0 DESCRIPTION OF PROPOSED ALTERNATIVES

As described in Chapter 2 “Methodology Used to Identify and Screen Alternatives,” alternatives were identified based on the results of the Project scoping process, in which the SAC, TAC and the public were provided opportunity to comment on the range of alternatives to be considered, and the results of a July 2010 Alignment/Mode Workshop. A total of 12 alternatives resulted from the project scoping process and the Alignment/Mode Workshop, including a broad range of modal and alignment options (see Table 3-1 “Long List of Alternatives” and Figure 3-1 “Surface Roadway and Tunnel Alignments”). These included surface roadway alignments, tunnel alignments, and development of a broad range of transit, TSM, and TDM options as either stand-alone measures or as measures that could be used with one or more of the roadway rehabilitation or reconstruction options.

3.1 SURFACE ROADWAY ALIGNMENTS

3.1.1 REHABILITATION WITHIN CURRENT ALIGNMENT (R-1)

This alternative would maintain the existing BQE mainline and ramp alignments, lane configurations, lane widths, shoulder widths and all other roadway geometry features. There would be no mainline improvements. The existing pavement would be rehabilitated and/or fully reconstructed as would all bridges within the project limits. All guiderail and drainage system components would be replaced and updated as would pavement markings and lighting.

3.1.2 CONTEXT SENSITIVE CORRIDOR (CS-1)

This alternative would closely follow the existing BQE alignment within established project limits. Any deviations from the existing alignment would avoid structures adjacent to the corridor. Under this alternative, the existing nonstandard and non-conforming features would be minimized or eliminated to the extent possible without resulting in structural effects on buildings, or the Brooklyn and Manhattan Bridge. The pavement, drainage system, guiderail, pavement markings, signage and lighting would be replaced and upgraded. The proposed widening of the roadway would require modification of the triple-cantilever structure to a stacked framed structure that would extend to the sidewalk on the western side of Furman Street.
Table 3-1: Long List of Alternatives

<table>
<thead>
<tr>
<th>Alternatives</th>
<th>R-1</th>
<th>CS-1</th>
<th>S-1</th>
<th>S-2</th>
<th>T-1</th>
<th>T-2</th>
<th>T-3</th>
<th>Transit-TSM/TDM</th>
<th>W-1</th>
<th>W-2</th>
<th>W-3</th>
<th>W-4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Alternative Name</strong></td>
<td>Rehab w/ Current Alignment</td>
<td>Context Sensitive Corridor</td>
<td>Standard Alignment - North</td>
<td>Standard Alignment - South</td>
<td>Under Downtown Brooklyn Tunnel</td>
<td>Existing BQE Corridor Tunnel</td>
<td>Outboard Tunnel</td>
<td>(see detailed Transit-TSM/TDM table)</td>
<td>T-1 modification/extension</td>
<td>Straight-line tunnel between Exits 24 and 30</td>
<td>Outboard tunnel connecting Sunset Park and Exit 33</td>
<td>4th Avenue/outboard tunnel between Exits 24 and 30</td>
</tr>
<tr>
<td><strong>Alternative Mode</strong></td>
<td>Vehicular</td>
<td>Vehicular</td>
<td>Vehicular</td>
<td>Vehicular</td>
<td>Vehicular</td>
<td>Vehicular</td>
<td>Vehicular</td>
<td>Vehicular</td>
<td>Vehicular</td>
<td>Vehicular</td>
<td>Vehicular</td>
<td>Vehicular</td>
</tr>
<tr>
<td><strong>Alternative Alignment</strong></td>
<td>Same as existing alignment.</td>
<td>Would closely follow the existing alignment to avoid built structures</td>
<td>Would follow the existing alignment along the triple-cantilever. North of Orange &amp; Nassau Sts., the alignment would shift north of the existing alignment to meet NYSDOT/AASHTO standards</td>
<td>Would follow the existing alignment along the triple-cantilever. North of Orange &amp; Nassau Sts., the alignment would shift south of the existing alignment to meet NYSDOT/AASHTO standards</td>
<td>Tunnel with horizontal alignment following Hicks/ Henry Street to Tillary Street. The existing BQE infrastructure would be maintained as a collector-distributor roadway.</td>
<td>Tunnel alignment approximately north of the existing alignment with a subaqueous segment between Atlantic Avenue and Doughty Street</td>
<td>N/A</td>
<td>Tunnel with horizontal alignment approximately following Willow Street to Tillary Street</td>
<td>Horizontal alignment would run approximately in a straight line tunnel between BQE Exits 24 and 30 - avoiding neighborhoods approximately west of 4th- Lafayette-Washington Avenues</td>
<td>Outboard tunnel connecting Greenpoint (BQE Exit 33) to the north and Sunset Park to the South (65th Street)</td>
<td>Tunnel with horizontal alignment following 4th Ave., and curve east north of Flatbush Ave. to meet the BQE at Exit 30 (Park Avenue)</td>
<td></td>
</tr>
<tr>
<td>Alternatives</td>
<td>R-1</td>
<td>CS-1</td>
<td>S-1</td>
<td>S-2</td>
<td>T-1</td>
<td>T-2</td>
<td>T-3</td>
<td>Transit-TSM/TDM</td>
<td>W-1</td>
<td>W-2</td>
<td>W-3</td>
<td>W-4</td>
</tr>
<tr>
<td>-------------</td>
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<td>----------------</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td>Total Length (miles)</td>
<td>1.7</td>
<td>1.7</td>
<td>1.8</td>
<td>1.8</td>
<td>1.3</td>
<td>1.7</td>
<td>2.3</td>
<td>N/A</td>
<td>2.3</td>
<td>2.5</td>
<td>8.5</td>
<td>3.5</td>
</tr>
<tr>
<td>Mainline Improvements:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Travel Lanes (each direction)</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>N/A</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>(Additional -ly, existing BQE lanes would be maintained as a collector-distributor roadway)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Width of Travel Lanes (feet)</td>
<td>No change</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>N/A</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Shoulder Width (feet)</td>
<td>No change</td>
<td>Right: 10 Left: 4 (where possible)</td>
<td>Right: 10 Left: 4</td>
<td>Right: 12 Left: 2</td>
<td>Right: 12 Left: 2</td>
<td>Right: 12 Left: 2</td>
<td>N/A</td>
<td>Right: 8 Left: 2</td>
<td>Right: 8 Left: 2</td>
<td>Right: 8 Left: 2</td>
<td>Right: 8 Left: 2</td>
<td>Right: 8 Left: 2</td>
</tr>
<tr>
<td>Other mainline improvements</td>
<td>None</td>
<td>Improved Horizontal Curve, Standard Horizontal Curve and Clearance, Improved Stopping</td>
<td>Standard Horizontal Curve and Clearance, Standard Vertical Clearance</td>
<td>Standard Vertical Clearance, Standard Horizontal Curve</td>
<td>Standard Vertical Clearance, Improved Horizontal Stopping</td>
<td>Standard Vertical Clearance, Improved Horizontal Stopping Sight Distance, Improved Horizontal Clearence</td>
<td>N/A</td>
<td>Standard Horizontal Curve and Vertical Clearance, Improved Horizontal Stopping</td>
<td>Standard Horizontal Curve and Vertical Clearance</td>
<td>Standard Horizontal Curve and Vertical Clearance</td>
<td>Standard Horizontal Curve and Vertical Clearance</td>
<td>Standard Horizontal Curve and Vertical Clearance</td>
</tr>
</tbody>
</table>
## Alternatives

<table>
<thead>
<tr>
<th>Alternatives</th>
<th>R-1</th>
<th>CS-1</th>
<th>S-1</th>
<th>S-2</th>
<th>T-1</th>
<th>T-2</th>
<th>T-3</th>
<th>Transit-TSM/TDM</th>
<th>W-1</th>
<th>W-2</th>
<th>W-3</th>
<th>W-4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ramp Improvements</td>
<td>None</td>
<td>Minor changes to ramp configurations and geometry to improve safety and operations</td>
<td>Improvements possible due to relocation of ramps</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Anticipated Construction Period (years)</td>
<td>2</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>N/A</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Construction Cost ($ millions)</td>
<td>201</td>
<td>721</td>
<td>2,000</td>
<td>2,150</td>
<td>1,910</td>
<td>3,040</td>
<td>3,770</td>
<td>N/A</td>
<td>3,760</td>
<td>4,140</td>
<td>13,400</td>
<td>5,700</td>
</tr>
<tr>
<td>Annual Operational and Maintenance Costs ($ millions)</td>
<td>To come</td>
<td>To come</td>
<td>To come</td>
<td>To come</td>
<td>8</td>
<td>10</td>
<td>12</td>
<td>N/A</td>
<td>8</td>
<td>10</td>
<td>25</td>
<td>To come</td>
</tr>
<tr>
<td>Construction cost as % of anticipated funding for 2010—2035 RTP Fiscally Constrained Projects in New York City</td>
<td>2%</td>
<td>7%</td>
<td>20%</td>
<td>22%</td>
<td>19%</td>
<td>31%</td>
<td>38%</td>
<td>N/A</td>
<td>38%</td>
<td>43%</td>
<td>136%</td>
<td>58%</td>
</tr>
</tbody>
</table>
Figure 3-1: Surface Roadway & Tunnel Alignments
This alternative would include minor changes to ramp configurations and geometry to improve safety and operations. All existing connections between local streets and the BQE would be maintained. The length and limits of the CS-1 alignment along with a summary of mainline improvements, ramp improvements, construction period, and estimated costs are noted in Table 3-1 “Long List of Alternatives.” Features include:

- Maintenance of existing connections of the BQE and the local street network.
- Minor changes to ramp configurations and geometry to improve safety and operations.
- Improved mainline traffic safety and operations due to substantially standardized features.

3.1.3 STANDARD ALIGNMENT – NORTH (S-1)

This alternative would incorporate roadway features conforming to AASHTO design criteria for a 65 miles per hour (mph) design speed. The alignment would be within established project limits, but would deviate to the north of the existing BQE alignment into the DUMBO neighborhood. The length and limits of the S-1 alignment along with a summary of mainline improvements, ramp improvements, construction period, and estimated costs are noted in Table 3-1 “Long List of Alternatives.” Features include:

- Maintenance of existing connections between the BQE and the local street network.
- Relocation of access ramps at Atlantic Avenue, Old Fulton Street, and Brooklyn Bridge.
- Relocation of the Columbia Heights overpass.
- Removal of approximately 800 residential and commercial units.
- Improved traffic safety and mainline operations due to fully standardized features.

3.1.4 STANDARD ALIGNMENT – SOUTH (S-2)

This alternative would incorporate roadway features conforming to AASHTO design standards for a 65 mph design speed. The alignment would deviate to the south of the existing BQE alignment, into the Brooklyn Heights neighborhood. The length and limits of the S-2 alignment along with a summary of mainline improvements, ramp improvements, construction period, and estimated costs are noted in Table 3-1 “Long List of Alternatives.” Features include:

- Maintenance of connections between the BQE and the local street network.
- Relocation of access ramps at Atlantic Avenue, Old Fulton Street, and Brooklyn Bridge.
- Relocation of the Columbia Heights overpass.
- Removal of approximately 750 residential and commercial units.
- Improved traffic safety and mainline operations due to fully standardized features.

3.2 TUNNEL ALIGNMENTS

3.2.1 UNDER DOWNTOWN BROOKLYN TUNNEL (T-1)

This alternative would include the construction of 1.7-mile long twin tunnels—with two travel lanes in each direction—under Downtown Brooklyn. The tunnel entrances or “portals” would be located along the existing BQE alignment approximately at Kane Street on the west and North Portland Avenue on the east. T-1 includes all features of the R-1 Alternative and re-stripping of the existing BQE alignment as a two-lane collector-distributor roadway. The collector-distributor roadway would allow the existing local street connections to be maintained and would also standardize many of the existing nonstandard features of the BQE due to the possible reduction in required design speed that would accompany the downgrade in classification of the BQE from Interstate to a collector-distributor roadway. The length and limits of the T-1 alignment along with a summary of mainline improvements, construction period, and estimated costs are noted in Table 3-1 “Long List of Alternatives.” Features include:

- Maintenance of existing connections between the BQE collector-distributor road and the local street network.
- Potential acquisition of easements and private property at tunnel portals, vent buildings, and locations above the tunnels.
- Increase in traffic capacity due to maintenance of the existing BQE segment as a collector-distributor roadway that would supplement the BQE mainline capacity.
- Improved mainline traffic safety and operations due to standardized features.

3.2.2 EXISTING BQE CORRIDOR TUNNEL (T-2)

This alternative would include three travel lanes that would follow and replace the existing above-ground segment of the BQE. Connections to the East River Bridges and the local streets that the existing roadway provides would be eliminated. Portal locations would be similar to those for the T-1 alternative. The length and limits of the T-2 alignment along with a summary
of mainline improvements, construction period, and estimated costs are noted in Table 3-1 “Long List of Alternatives.” Features include:

- Potential acquisition of easements and private property at tunnel portals, vent buildings, and at locations above the tunnels.
- Improved mainline traffic safety and operations due to standardized features.
- Highway geometry that is non-compliant with design speed to a similar extent as the existing BQE alignment.

3.2.3 OUTBOARD TUNNEL (T-3)

This alignment would include twin tunnels with three travel lanes in each direction. A major portion of the T-3 alignment would be underneath the East River, which would not allow for connections to the local streets or East River Bridges. The length and limits of the T-2 alignment along with a summary of mainline improvements, construction period, and estimated costs are noted in Table 3-1 “Long List of Alternatives.” Features include:

- Potential acquisition of easements and private property at tunnel portals, vent buildings, and at locations above the tunnels.
- Improved mainline traffic safety and operations due to standardized features.

3.2.4 T-1 MODIFICATION/EXTENSION (W-1)

The W-1 alignment is a modification of the T-1 alignment that would extend its limits to Exit 30/Grand Avenue on the east and Kane Street on the west, where the portals would be located. Conceptually, this alternative could include improved access to Brooklyn Bridge Park through the modification or demolition of existing BQE structures. The length and limits of the W-1 alignment along with a summary of mainline improvements, construction period, and estimated costs are noted in Table 3-1 “Comparison of Alternatives.” Features include:

- Potential acquisition of easements and private property at tunnel portals, vent buildings, and at locations above the tunnels.
- Improved mainline traffic safety and operations due to standardized features.
3.2.5  STRAIGHT-LINE TUNNEL BETWEEN BQE EXITS 24 AND 30 (W-2)

This alignment would consist of a geometrically straight tunnel connecting BQE exits at Grand Avenue on the east and Hamilton Avenue on the west, with three travel lanes in each direction. Other features of this alternative are similar those of the T-2 alternative. The length and limits of the W-2 alignment along with a summary of mainline improvements, construction period, and estimated costs are noted in Table 3-1 “Long List of Alternatives.” Features include:

- Potential acquisition of easements and private property at tunnel portals, vent buildings, and at locations above the tunnels.
- Improved mainline traffic safety and operations due to standardized features.

3.2.6  OUTBOARD TUNNEL CONNECTING SUNSET PARK AND BQE EXIT 33 (W-3)

The W-3 alternative includes the same cross-section and similar geometry to the T-3 alternative, and would conform to AASHTO design criteria for a 65 mph design speed. This alternative would include an approximately 8.5-mile long, primarily subaqueous, tunnel alignment directly connecting BQE Exit 33 (near Williamsburg) and 65th Street (in Sunset Park). The length and limits of the W-3 alignment along with a summary of mainline improvements, construction period, and estimated costs are noted in Table 3-1 “Long List of Alternatives.” Features include:

- Potential acquisition of easements and private property at tunnel portals, vent buildings, and at locations above the tunnels.
- Improved mainline traffic safety and operations due to standardized features.

3.2.7  FOURTH AVENUE/OUTBOARD TUNNEL BETWEEN BQE EXITS 24 AND 30 (W-4)

This alternative would include an approximately 2.7-mile long tunnel alignment along Fourth Avenue and connects Gowanus Exit 22 (50th St.) and BQE Exit 30 (Grand Ave). All other features of this alternative are similar to those for the T-2 alternative. The length and limits of the W-4 alignment along with a summary of mainline improvements, construction period, and estimated costs are noted in Table 3-1 “Long List of Alternatives.” Features include:

- Potential acquisition of easements and private property at tunnel portals, vent buildings, and at locations above the tunnels.
• Improved mainline traffic safety and operations due to standardized features.

### 3.3 TRANSIT, TRANSPORTATION SYSTEMS MANAGEMENT, AND TRAVEL DEMAND MANAGEMENT ALTERNATIVES

Transit measures include new ferry and bus service as well as enhancements to existing bus service. Development of “fixed guideway” options such as light rail transit, heavy rail transit and extension of the existing subway system were not considered to be viable given the limited right-of-way available on the BQE within the project limits, the limited length between proposed project termini thereby limiting the potential ridership of such service, and the lack of potential direct connections between these options and existing transit service within and adjacent to the corridor.

TSM measures seek to optimize transportation system performance for commuter and non-commuter trips and for recurring and non-recurring events through implementation of relatively low cost enhancements to the existing system, while TDM measures seek to reduce demand on the roadway network through a range of roadway pricing and ridesharing measures, and programs that provide incentives to use the regional transit system. (See Technical Memorandum “Transit, Travel Demand Management & Transportation System Management Alternatives” for a detailed description of Transit, TDM, and TSM alternatives)

Transit, TSM and TDM measures could be used alone or in combination to increase the performance of the transportation network, improve traffic flow and the movement of goods, and enhance system accessibility and safety. In many cases, responsibility for the implementation of these measures would rest with other entities than the NYSDOT, including the Metropolitan Transportation Authority (MTA), the Port Authority of New York and New Jersey (PANYNJ), and the NYCDOT. The measures could also be implemented either as permanent enhancements to the regional transportation system, or as temporary measures to maintain and protect traffic during the construction of a selected alternative. Identified transit, TSM and TDM options are described in Table 3-2 “Transit, TSM and TDM Alternatives.”
<table>
<thead>
<tr>
<th>Description</th>
<th>Implementing Agency</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Transit Alternatives</strong></td>
<td></td>
</tr>
<tr>
<td>Express Bus/Bus Rapid Transit (BRT) Service</td>
<td>Development of express buses and/or BRT along corridors that feed into the BQE from more distant suburban locations</td>
</tr>
<tr>
<td>Ferry Service</td>
<td>Waterborne transportation alternatives, such as additional passenger ferry service from Brooklyn/Queens to Manhattan</td>
</tr>
<tr>
<td>Transit Incentive Program</td>
<td>Provide for variable fares based on the distance traveled.</td>
</tr>
<tr>
<td><strong>TSM Alternatives</strong></td>
<td></td>
</tr>
<tr>
<td>Harden Shoulders</td>
<td>Harden Right Shoulder</td>
</tr>
<tr>
<td>Overhead Lane Control, Speed/Q Warning Signs</td>
<td>Helps manage traffic by posting speed limits on a roadway or over each lane on an advisory or regulatory basis in real time.</td>
</tr>
<tr>
<td>Traffic Diversion</td>
<td>Divert traffic to Williamsburg Bridge</td>
</tr>
<tr>
<td>Traffic Surveillance, Incident Detection and Response System</td>
<td>Provide real time information on roadway conditions to motorists, responsible agencies, and affected organizations</td>
</tr>
<tr>
<td><strong>Freight Management:</strong></td>
<td></td>
</tr>
<tr>
<td>Shift commercial traffic to the Belt Parkway</td>
<td>Reduce commercial vehicle restrictions on the Belt Parkway to divert JFK International Airport bound traffic from the BQE to Belt Parkway</td>
</tr>
<tr>
<td>Electronic tolling of trucks heading east into Brooklyn or Verrazano-Narrows Bridges</td>
<td>Trucks could be tolled to head east into Brooklyn, while Staten Island residents would continue to travel into Brooklyn for free</td>
</tr>
<tr>
<td>Restrict truck use of the BQE to local deliveries only</td>
<td>NYSDOT would need to pass a resolution restricting use of the BQE to local deliveries only and NYPD would be responsible for enforcement. Truck traffic between Manhattan and Long Island/New England/upstate New York would use the Queens-Midtown Tunnel.</td>
</tr>
<tr>
<td>Institute electronic tolling for trucks on the Manhattan Bridge</td>
<td>Implement westbound tolls on the Manhattan Bridge.</td>
</tr>
<tr>
<td><strong>TDM Alternatives</strong></td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>Implementing Agency</td>
</tr>
<tr>
<td>----------------------------------------------------------------------------</td>
<td>--------------------------------------------</td>
</tr>
<tr>
<td>Enhanced Ride Matching Program</td>
<td>NYSDOT, MetroPool</td>
</tr>
<tr>
<td>Outreach/promotional campaign tied to a corridor-based ride matching system with rewards</td>
<td></td>
</tr>
<tr>
<td>Outreach and engagement with individual commuters and area employers</td>
<td>NYSDOT, MetroPool</td>
</tr>
<tr>
<td>Media campaign</td>
<td>NYSDOT, MetroPool</td>
</tr>
<tr>
<td>Enhanced ridesharing</td>
<td>NYSDOT, MetroPool</td>
</tr>
<tr>
<td>Encourage carpooling and vanpooling</td>
<td></td>
</tr>
<tr>
<td>Real time travel information</td>
<td>NYSDOT, MetroPool</td>
</tr>
<tr>
<td>Provide real time travel information, including time savings due to transit or ridesharing</td>
<td></td>
</tr>
<tr>
<td>Pricing Strategies/User Fees</td>
<td>MTA Bridges &amp; Tunnels</td>
</tr>
<tr>
<td>Pricing/occupancy strategy on the Brooklyn-Battery Tunnel</td>
<td></td>
</tr>
<tr>
<td>Pricing/occupancy strategy on the East River Bridges</td>
<td>NYCDOT</td>
</tr>
<tr>
<td>Two-way tolling on the Verrazano-Narrows Bridge</td>
<td>MTA Bridges &amp; Tunnels, US Congress</td>
</tr>
</tbody>
</table>
4.0 EVALUATION OF ALTERNATIVES

Alternatives described in Chapter 3 “Description of Alternatives” were evaluated based on the following four factors:

- Ability to meet Project goals and objectives
- Extent of diversion from established project limits
- Potential effects on Environmental Justice Populations
- Fundability of proposed alternatives and potential effect on funding the Regional Transportation Program

Provided are assessments of the identified alternatives concerning each of these factors. A summary evaluation of the degree to which the competing alternatives would meet the goals and objectives of the Proposed Project based on the criteria and measures of effectiveness identified in Chapter 2 of this memorandum is provided in Table 4-1 “Evaluation of Alternatives against Project Goals & Objectives.” A summary of the extent of diversion of the identified alternatives from the established project limits of Sands Street to the east and Atlantic Avenue to the west is provided in Table 4-2 “Limits of Proposed Roadway Alignments.”

As summarized in Table 4-2 and depicted in Figure 3-1, the S-1, S-2, R-1, and CS-1 alignments would be entirely within the established project limits of Sands Street on the east and Atlantic Avenue on the west. Tunnel alternatives T-1, T-2, and T-3 would be substantially within the established project limits, and tunnel alternatives W-1, W-2, W-3, and W-4 would substantially diverge from the established project limits of Sands Street on the east and Atlantic Avenue on the west.
**Table 4-1: Evaluation of Alternatives against Project Goals & Objectives**

<table>
<thead>
<tr>
<th>Evaluation Criteria</th>
<th>Alternatives</th>
<th>Transit - TSM/TDM</th>
<th>W-1</th>
<th>W-2</th>
<th>W-3</th>
<th>W-4</th>
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<tr>
<td></td>
<td>R-1</td>
<td>CS-1</td>
<td>S-1</td>
<td>S-2</td>
<td>T-1</td>
<td>T-2</td>
</tr>
<tr>
<td><strong>Screening Criterion 1</strong></td>
<td></td>
<td></td>
<td></td>
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<td>Measure 1-3</td>
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### Evaluation Criteria

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<thead>
<tr>
<th>Screening Criterion 3</th>
<th>Reduce construction-period/long term diversion to local streets</th>
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<tbody>
<tr>
<td>Measure 3-1</td>
<td>Maintain six lanes of traffic during construction</td>
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<td>Measure 3-2</td>
<td>Minimize diversion of vehicles connecting to the East River bridges</td>
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<tr>
<th>Screening Criterion 4</th>
<th>Avoid adverse environmental effects</th>
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<tbody>
<tr>
<td>Measure 4-1</td>
<td>Avoid acquisition of residential property</td>
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<tr>
<td>Measure 4-2</td>
<td>Avoid acquisition of businesses</td>
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<tr>
<td>Measure 4-3</td>
<td>Avoid construction-period impacts to businesses</td>
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<td>Measure 4-4</td>
<td>Avoid impacts on public parks and significant historic resources</td>
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<tr>
<td>Measure 4-5</td>
<td>Avoid impacts on noise-sensitive receptors</td>
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<td>Measure 4-6</td>
<td>Avoid impacts on vibration-sensitive receptors</td>
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<td>Measure 4-7</td>
<td>Incorporate sustainable/energy-efficient design elements</td>
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<tr>
<th>Alternatives</th>
<th>R-1</th>
<th>CS-1</th>
<th>S-1</th>
<th>S-2</th>
<th>T-1</th>
<th>T-2</th>
<th>T-3</th>
<th>Transit - TSM/ TDM</th>
<th>W-1</th>
<th>W-2</th>
<th>W-3</th>
<th>W-4</th>
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<tr>
<td>Measure 3-1</td>
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<tr>
<td>Evaluation Criteria</td>
<td>R-1</td>
<td>CS-1</td>
<td>S-1</td>
<td>S-2</td>
<td>T-1</td>
<td>T-2</td>
<td>T-3</td>
<td>Transit - TSM/ TDM</td>
<td>W-1</td>
<td>W-2</td>
<td>W-3</td>
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<tr>
<td>Minimize construction period duration</td>
<td>●</td>
<td>◘</td>
<td>◘</td>
<td>◘</td>
<td>○</td>
<td>○</td>
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<tr>
<td>Anticipated Construction Period</td>
<td>2</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>N/A</td>
<td>5</td>
<td>5</td>
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<tr>
<td>Estimated Construction Cost ($ million)</td>
<td>201</td>
<td>721</td>
<td>2,000</td>
<td>2,150</td>
<td>1,910</td>
<td>3,040</td>
<td>3,770</td>
<td>N/A</td>
<td>3,760</td>
<td>4,140</td>
<td>13,400</td>
<td>5,700</td>
</tr>
<tr>
<td>Construction cost as % of anticipated funding for 2010—2035 RTP Fiscally Constrained Projects in New York City</td>
<td>2%</td>
<td>7%</td>
<td>20%</td>
<td>22%</td>
<td>19%</td>
<td>31%</td>
<td>38%</td>
<td>N/A</td>
<td>38%</td>
<td>43%</td>
<td>136%</td>
<td>58%</td>
</tr>
</tbody>
</table>

**Notes:**
N/A – Not Applicable

*Legend (see description of measures under the Level I Screening Criteria in Section 1.4):*
- ● The alternative is projected to meet the given measure to a meaningful degree.
- ◘ The alternative is projected to meet the given measure, but to a lesser degree.
- ○ The alternative would not meet the given measure, or would do so only to a very limited extent.*
### Table 4-2: Limits of Proposed Roadway Alignments

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Limits</th>
<th>Within Defined Project Limits?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>East</strong></td>
<td><strong>West</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Surface Roadway Alignments</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standard Alignment-North (S-1)</td>
<td>Sands St.</td>
<td>Atlantic Ave.</td>
</tr>
<tr>
<td>Eliminated</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standard Alignment-South (S-2)</td>
<td>Sands St.</td>
<td>Atlantic Ave.</td>
</tr>
<tr>
<td>Eliminated</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rehabilitation within Current Alignment (R-1)</td>
<td>Sands St.</td>
<td>Atlantic Ave.</td>
</tr>
<tr>
<td>Context Sensitive Corridor (CS-1)</td>
<td>Sands St.</td>
<td>Atlantic Ave.</td>
</tr>
<tr>
<td><strong>Tunnel Alignments</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Under Downtown Brooklyn Tunnel (T-1)</td>
<td>North Portland Ave.</td>
<td>Kane St.</td>
</tr>
<tr>
<td>Existing BQE Alignment Tunnel (T-2)</td>
<td>North Portland Ave.</td>
<td>Kane St.</td>
</tr>
<tr>
<td>Outboard Tunnel (T-3)</td>
<td>North Portland Ave.</td>
<td>Kane St.</td>
</tr>
<tr>
<td>Extended Under Downtown Brooklyn (W-1)</td>
<td>Grand Ave.</td>
<td>Kane St.</td>
</tr>
<tr>
<td>Straight Line Tunnel between Exits 24 &amp; 30 (W-2)</td>
<td>Grand Ave.</td>
<td>Hamilton Ave.</td>
</tr>
<tr>
<td>Outboard Tunnel connecting Sunset Park (65th St.) &amp; Exit 33 (W-3)</td>
<td>McGuiness Blvd.</td>
<td>65th St.</td>
</tr>
<tr>
<td>Fourth Avenue/Outboard Tunnel (W-4)</td>
<td>Grand Ave. (BQE Exit 30)</td>
<td>50th St.</td>
</tr>
</tbody>
</table>

As summarized in Table 3-2 “Long List of Alternatives”, the estimated capital cost of the identified alternatives range between approximately between $201 million for Alternative R-1 and approximately $13.4 billion for Alternative W-3. These construction costs represent 2% and 136%, respectively, of the anticipated funding level of approximately $9.843 billion for the fiscally constrained projects in New York City identified in the 2010-2035 RTP developed by NYMTC. The estimated construction costs of the proposed tunnel range between approximately $1.9 billion and $13.4 billion, equivalent to approximately 19% and 136%, respectively, of the anticipated 2010-2035 funding level for fiscally constrained projects in the RTP. Annual operations and maintenance costs for the proposed alternatives range between approximately (TO COME) for the R-1 alternative and approximately $25 million for the W-3 alternative.
**R-1: REHABILITATION WITHIN CURRENT ALIGNMENT**

*Project Limits*

This alternative would be entirely within the established project limits of Sands Street on the east and Atlantic Avenue on the west.

*Performance against Goals and Objectives*

The alternative would pass all “Major Engineering, Operational and Structural Considerations” measures under Criterion 1. However, rehabilitation of the BQE within the current alignment would not provide the opportunity for the roadway and ramp widening needed to improve traffic safety and operations. This alternative would not accomplish any of the measures under Criterion 2 “Improve traffic operations and safety by addressing nonstandard geometrics.” Regarding Criterion 3, during the construction period, the six travel lanes within this segment of the BQE would be maintained only during weekday daytime hours, which could result in diversion of traffic to local streets on weeknights or weekends. Since there would be no changes in horizontal alignment relative to the existing BQE alignment, R-1 would not result in any taking of park land, residential properties, businesses, or community facilities, and would not result in any long term adverse environmental effect, and, as a consequence, performs well against Criterion 4 “Avoid adverse environmental impacts.” Since this alternative meets the Pass/Fail measures under Criterion 1, and would not result in the permanent acquisition of property or result in significant adverse environmental impacts under Criterion 4, this alternative will pass the screening concerning performance against Goals and Objectives.

*Potential Effects on Environmental Justice Populations*

This alternative would closely follow the existing BQE alignment would not involve major construction activities, or displacement of residents or businesses. Therefore, this alternative is unlikely to result in adverse effects on environmental and socioeconomic conditions in adjacent neighborhoods, including local income or high minority communities identified in Figure 2-1 “Census Tracts with Environmental Justice Populations in the Project Area.”

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12 Screening Criterion 3: Reduce diversion of traffic from the highway onto local streets, both during construction and long term.
Fundability

- Estimated Construction Cost: $201 million
- Estimated Operation and Maintenance Cost: To come (annual)
- Construction cost as percentage of anticipated funding for 2010—2035 RTP Fiscally Constrained Projects in New York City: 2%

The Rehabilitation within Current Alignment alternative would be the least costly of the alternatives under consideration. The estimated capital cost of approximately $201 million would represent approximately 2% of the anticipated total funding level for the fiscally constrained projects within the 10-county New York City metropolitan region served by NYMTC (see Section 2.3.4.2 “Available Revenue Streams to Fund RTP Projects and Proposed Alternatives”). Estimated costs to operate and maintain this alternative would not exceed that for similar roadways within the region. Relative to competing alternatives, funding is likely to be available for the construction, operation and maintenance of this alternative within the time period needed to address the structural deterioration of the existing structure. It is not anticipated that this would have a significant adverse effect on the ability to fund the overall transportation program for the New York Region during the 2010-2035 planning period.

Summary Evaluation

Based on the results of the evaluation against established goals and objectives, the low potential for disproportionately high and significant adverse effects on minority and low income populations, its relatively low capital cost compared to other competing alternatives, and its lack of adverse effect on the ability to fund other needed transportation improvements in the region, the R-1 alternative will be advanced for evaluation in the Tier I EIS.

CS-1: Context Sensitive Corridor

Project Limits

This alignment would be entirely within the established project limits.

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13 See Table 5-1 "Anticipated Project Funding Levels: 2010—2035"
Performance against Goals and Objectives

The alternative would pass all major engineering, operational and structural considerations under Criterion 1. Since this alternative would allow for the roadway and ramp widening at certain locations, the alternative overall performs moderately well to meet measures involving roadway geometrics under Criterion 2 “Improve traffic operations and safety by addressing nonstandard geometrics.” Regarding Criterion 3, during the construction period, the six traffic lanes within this segment of the BQE would be maintained only during weekday daytime hours, which could result in diversion of traffic to local streets on weeknights or weekends. Under Criterion 4 “Avoid adverse environmental effects,” this alternative would be unlikely to result in adverse environmental effects and would require minimal acquisition, if any, of private property. The widening of certain portions of the roadway and ramps would require some acquisition of public parkland. This alternative satisfies the goals and objectives screening since it meets the Pass/Fail measures under Criterion 1, is less likely to result in adverse environmental impacts, would require minimal—if any—acquisition of private property, and would require limited use existing public parkland.

Potential Effects on Environmental Justice Populations

This alternative would closely follow the existing BQE alignment, would not involve the displacement of residents or businesses, and is unlikely to result in adverse environmental effects on adjacent communities—including low income and high minority populations—based on the results of the screening evaluation. Any limited use of existing parkland would not disproportionately effect low-income and minority populations residing in the project area. Therefore, Alternative CS-1 is unlikely to result in disproportionately high and adverse effects on minority and low income populations.

Fundability

- Estimated Construction Cost: 721 million
- Estimated Operation and Maintenance Cost: To come (annual)
- Construction cost as percentage of total anticipated funding for 2010—2035 RTP Fiscally Constrained Projects in New York City: 7%
The estimated capital cost of the Context Sensitive Corridor alternative of $721 million would represent approximately 7.3% of the anticipated funding for fiscally constrained projects within the 10-county New York City metropolitan region served by NYMTC (see Section 2.3.4.2 “Available Revenue Streams to Fund RTP Projects and Proposed Alternatives”). Estimated costs to operate and maintain this alternative would not exceed that for similar roadways within the region. Relative to competing alternatives, funding is likely to be available for the construction, operation and maintenance of this alternative within the time period needed to address the structural deterioration of the existing structure. It is not anticipated that this would have a significant adverse effect on the ability to fund the overall transportation program for the New York Region during the 2010-2035 planning period. However, this level of funding would most likely represent the outer limit of spending that would not adversely affect the ability to fund other critical projects included in the fiscally constrained project list in the 2010-2035 RTP.

**Summary Evaluation**

Based on the results of the evaluation against established goals and objectives, the low potential for disproportionately high and significant adverse effects on minority and low income populations, its relatively low capital cost compared to other competing alternatives, and its lack of adverse effect on the ability to fund other needed transportation improvements in the region, the CS-1 alternative will be advanced for evaluation in the Tier I EIS.

**S-1/S-2: STANDARD ALIGNMENTS – SOUTH/NORTH**

**Project Limits**

This alternative would be entirely within the established project limits of Sands Street on the east and Atlantic Avenue on the west.

**Evaluation against Goals and Objectives**

This alignment would meet all NYSDOT and AASHTO design criteria. To accommodate these roadway design standards—including standardized lane/shoulder widths, horizontal curvature, and ramp lengths—any standard alignment would need to deviate from the existing BQE alignment. Alternatives S-1 and S-2 represent two such alignments with the minimal possible deviation from the existing BQE alignment. These two alternatives would pass all major engineering, operational and structural considerations under Criterion 1, and would meet the
measures under Criterion 2 “Improve traffic operations and safety by addressing nonstandard geometrics” to a meaningful degree. During the construction period, the six traffic lanes within this segment of the BQE would be maintained only during weekday daytime hours, as noted under Criterion 3, which could result in diversion of traffic to local streets on weeknights or weekends. However, these alignments would not meet the requirements under Criterion 4 “Avoid adverse environmental effects” since their implementation would require the acquisition of greater than approximately 750 residential or commercial units. As indicated at the June 23, 2010 SAC meeting, this degree of acquisition of private property was deemed sufficient to withdraw these two alternatives from further consideration.

**Potential Effects on Environmental Justice Populations**

Alternatives S1 and S2 would require the acquisition of greater than approximately 750 residential or commercial units, and displacement of lands uses that proposed standard alignments would encroach onto. Since several such properties are located within areas with low minority and high poverty communities, there is a likelihood that Alternatives S1 and S2 would result in significant adverse effects on Environmental Justice populations.

**Fundability**

- Estimated Construction Cost: $2 billion (S-1), $2.12 billion (S-2)
- Estimated Operation and Maintenance Cost: To come (annual)
- Construction cost as percentage of total anticipated funding for 2010—2035 RTP Fiscally Constrained Projects in New York City: 14 20% (S-1), 22% (S-2)

Construction costs for the standard alignments are estimated to be approximately $2 billion for Alternative S-1 and approximately $2.15 billion for Alternative S-2, which would represent 20% and 22%, respectively, of the anticipated funding level for the fiscally constrained projects within the 10-county New York City metropolitan region served by NYMTC (see Section 2.3.4.2 “Available Revenue Streams to Fund RTP Projects and Proposed Alternatives”). Relative to competing alternatives, funding is not likely to be available for the construction, operation and maintenance of the standard alignment alternatives within the time period needed to address the structural deterioration of the existing structure. It is also anticipated that this funding these

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14 See Table 5-1 “Anticipated Project Funding Levels: 2010—2035”
Alternatives would have a significant adverse effect on the ability to fund the overall transportation program for the New York Region during the 2010-2035 planning period since the cost of the alternative would represent 20% or more of the entire funding level for the fiscally constrained projects included in the RTP.

Summary Evaluation

Based on the evaluation against goals and objectives, the S-1 and S-2 alternatives will be withdrawn from further evaluation under the environmental review process. Specifically, these alignments would not meet the requirements under Criterion 4 “Avoid adverse environmental effects” since their implementation would involve considerable acquisition of private property. As noted earlier, in agreement with the SAC on June 23, 2010, this level of acquisition of private property was deemed sufficient to withdraw these two alternatives from further consideration.

T-1: UNDER DOWNTOWN BROOKLYN TUNNEL

Project Limits

The limits of the T-1 alternative (North Portland Avenue to the east and Kane Street to the west) would be substantially within the established project limits of Sands Street to the east and Atlantic Avenue to the west.

Evaluation against Goals and Objectives

The alternative would pass all major engineering, operational and structural considerations under Criterion 1. Since subterranean construction activities would be relatively less constrained by existing structures and resources, this alternative would meet all but two measures under Criterion 2 “Improve traffic operations and safety by addressing nonstandard geometrics” to a meaningful degree. Existing ramp lengths and intersections of ramps with local streets would not be improved. This alternative would meaningfully meet Criterion 3 since the six traffic lanes within this segment of the BQE would be maintained throughout weekdays and weeknights during the construction period, and the existing segment of the BQE—including the triple cantilever structure—would be maintained as a collector-distributor roadway to provide connection with local streets as under existing conditions, and prevent deterioration of level of service on local streets. However, this alternative would not meet the requirements under
Criterion 4 “Avoid adverse environmental effects” since its implementation would likely require acquisition of 10 or more residential or commercial properties to construct portals and one or more ventilation structures.

_Potential Effects on Environmental Justice Populations_

Tunnel portals for the above alternative are proposed to be located in the vicinity of Kane Street and North Portland Avenue. These areas include minority or low-income populations which would likely experience disproportionately high and adverse impacts related to the construction and operation of tunnel portals, including right-of-ways takings and adverse noise-related environmental effects compared to anticipated impacts on other populations along the project alignment.

_Fundability15_

- Estimated Construction Cost: $1.9 billion
- Estimated Operation and Maintenance Cost: $8 million (annual)
- Construction cost as percentage of anticipated funding for 2010—2035 RTP Fiscally Constrained Projects in New York City16 19%

Construction costs for the T-1 alternative are estimated to be approximately $1.9 billion, which would represent 19% of the anticipated funding level for the fiscally constrained projects within the 10-county New York City metropolitan region served by NYMTC (see Section 2.3.4.2 “Available Revenue Streams to Fund RTP Projects and Proposed Alternatives”). Relative to competing alternatives, funding is not likely to be available for the construction, operation and maintenance of this alternative within the time period needed to address the structural deterioration of the existing structure. It is also anticipated that this funding this alternative would have a significant adverse effect on the ability to fund the overall transportation program for the New York Region during the 2010-2035 planning period since the cost of the alternative would represent nearly 20% of the entire funding level for the fiscally constrained projects included in the RTP. Estimated costs to operate and maintain of this alternative would be substantially higher than the costs to operate and maintain non-tunnel alternatives due to tunnel ventilation and lighting costs.

15 _Supra_ note 10
16 See Table 2-1 “Anticipated Project Funding Levels: 2010—2035"
Summary Evaluation

Based on performance against established goals and objectives, environmental justice, and funding considerations, the T-1 alternative will be withdrawn from further evaluation under the environmental review process. This alignment would not meet the requirements under Screening Criterion 4 “Avoid adverse environmental effects” since its implementation would involve acquisition of a considerable amount of private property. Construction and operation of tunnel infrastructure at the portals is likely to result in disproportionately high and adverse impacts on low income and high minority communities. The estimated costs of constructing, operating and maintaining this alternative would be substantially greater than other competing alternatives. Funding of this alternative would have a significant potential to adversely affect the ability to fund other critical projects included in the fiscally constrained projects included in the RTP. Funding for the T-1 alternative is, therefore, unlikely to be available within the time period needed to address the structural deficiencies of the existing structure.

T-2: Existing BQE Corridor Tunnel

Project Limits

The limits of the T-2 alignment are North Portland Avenue to the east and Kane Street to the west, and would extend beyond the established project limits of Sands Street to the east and Atlantic Avenue to the west.

Evaluation against Goals and Objectives

The T-2 alternative would pass all major engineering, operational and structural considerations under Criterion 1. Since the geometry of this tunnel alternative would be constrained by the right-of-way of the existing BQE, this alternative would meaningfully meet only three of the seven measures under Criterion 2 “Improve traffic operations and safety by addressing nonstandard geometrics,” and would meet two additional measures to a lesser degree. This alternative would meaningfully meet Criterion 3 since the six traffic lanes within this segment of the BQE would be maintained throughout weekdays and weeknights during the construction period. However, this alternative would not meet the requirements under Criterion 4 “Avoid adverse environmental effects” since its implementation would involve acquisition of 10 or more residential or commercial properties to construct portals and one or more ventilation structures.
Potentially Effects on Environmental Justice Populations

Tunnel portals for the T-2 alternative would be located in the vicinity of Kane Street and North Portland Avenue. These areas include minority or low-income populations, which are likely to experience disproportionately adverse impacts related to the construction and operation of tunnel portals, including right-of-ways takings and adverse noise-related environmental effects, compared to other populations along the proposed alignment.

Fundability

- Estimated Construction Cost: $3 billion
- Estimated Operation and Maintenance Cost: $10 million (annual)
- Construction cost as percentage of anticipated funding for 2010—2035 RTP Fiscally Constrained Projects in New York City: 31%

Construction costs for the T-2 alternative are estimated to be approximately $3 billion, which would represent approximately 31% of the anticipated funding level for the fiscally constrained projects within the 10-county New York City metropolitan region served by NYMTC (see Section 2.3.4.2 “Available Revenue Streams to Fund RTP Projects and Proposed Alternatives”). Relative to competing alternatives, funding is not likely to be available for the construction, operation and maintenance of this alternative within the time period needed to address the structural deterioration of the existing structure. It is also anticipated that this would have a significant adverse effect on the ability to fund the overall transportation program for the New York Region during the 2010-2035 planning period, since the cost of the alternative would represent over 30% of the entire funding level for the fiscally constrained projects included in the RTP. Estimated costs to operate and maintain of this alternative would substantially higher than the costs to operate and maintain non tunnel alternatives due to the cost of ventilating and lighting the alternative.

Summary Evaluation

Based on performance against goals and objectives, environmental justice, and funding considerations, this alternative will be withdrawn from further evaluation under the

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17 Supra note 10
18 See Table 5-1 "Anticipated Project Funding Levels: 2010—2035"
environmental review process. This alignment would not meet the requirements under Screening Criterion 4 “Avoid adverse environmental effects” since its implementation would involve considerable acquisition of private property. Construction and operation of tunnel infrastructure at the portals is likely to result in disproportionately high and adverse impacts on low income and high minority communities. The estimated costs of constructing, operating and maintaining this alternative would be substantially greater than other competing alternatives. Funding of this alternative would have a significant potential to adversely affect the ability to fund other critical projects included in the fiscally constrained projects included in the RTP. Funding for this alternative is, therefore, unlikely to be available within the time period needed to address the structural deficiencies of the existing structure.

**T-3: OUTBOARD TUNNEL**

*Project Limits*

The limits of the T-3 alternative (North Portland Avenue to the east and Kane Street to the west) would be substantially within the established project limits of Sands Street to the east and Atlantic Avenue to the west.

*Evaluation against Goals and Objectives*

The T-3 alternative would pass all major engineering, operational and structural considerations under Criterion 1. Since underground/subaqueous construction would be relatively less constrained by existing structures and resources, this alternative would meet all but two measures under Criterion 2 “Improve traffic operations and safety by addressing nonstandard geometrics” to a meaningful degree. This alternative would meaningfully meet Criterion 3 since the six traffic lanes within this segment of the BQE would be maintained throughout weekdays and weeknights during the construction period. However, this alternative would not meet the requirements under Criterion 4 “Avoid adverse environmental effects” since its implementation would involve acquisition of 10 or more residential or commercial properties to construct portals and one or more ventilation structures.

*Potential Effects on Environmental Justice Populations*
Tunnel portals for the T-3 alternative would be located in the vicinity of Kane Street and North Portland Avenue. These areas include minority or low-income populations, which are likely to experience disproportionately adverse impacts related to the construction and operation of tunnel portals, including right-of-ways takings and adverse noise-related environmental effects compared to other populations along the proposed alignment.

**Fundability**¹⁹

- Estimated Construction Cost: $3.77 billion
- Estimated Annual Operation and Maintenance Cost: $12 million (annual)
- Construction cost as percentage of total anticipated funding for 2010—2035 RTP Fiscally Constrained Projects in New York City: ²⁰ 38%

Construction costs for the T-3 alternative are estimated to be approximately $3.8 billion, which would represent approximately 38% of the anticipated funding level for the fiscally constrained projects within the 10-county New York City metropolitan region served by NYMTC (see Section 2.3.4.2 “Available Revenue Streams to Fund RTP Projects and Proposed Alternatives”). Relative to competing alternatives, funding is not likely to be available for the construction, operation and maintenance of this alternative within the time period needed to address the structural deterioration of the existing structure. It is also anticipated that this would have a significant adverse effect on the ability to fund the overall transportation program for the New York Region during the 2010-2035 planning period, since the cost of the alternative would represent nearly 40% of the entire funding level for the fiscally constrained projects included in the RTP. Estimated costs to operate and maintain of this alternative would substantially higher than the costs to operate and maintain non tunnel alternatives due to the cost of ventilating and lighting the alternative.

**Summary Evaluation**

Based on screening, environmental justice, and funding considerations, this alternative will be withdrawn from further evaluation under the environmental review process. This alignment would not meet the requirements under Screening Criterion 4 “Avoid adverse environmental effects” since its implementation would involve considerable acquisition of private property.

¹⁹ *Supra* note 10
²⁰ See Table 5-1 “Anticipated Project Funding Levels: 2010—2035”
Construction and operation of tunnel infrastructure at the portals is likely to result in disproportionately high and adverse impacts on low income and high minority communities. The estimated costs of constructing, operating and maintaining this alternative would be substantially greater than other competing alternatives. Funding of this alternative would have a significant potential to adversely affect the ability to fund other critical projects included in the fiscally constrained projects included in the RTP. Funding for this alternative is, therefore, unlikely to be available within the time period needed to address the structural deficiencies of the existing structure.

**W-1: T-1 Extension**

**Project Limits**

The limits of the W-1 alternative (North Portland Avenue to the east and Kane Street to the west) would be substantially outside the established project limits of Sands Street to the east and Atlantic Avenue to the west.

**Evaluation against Goals and Objectives**

The W-1 alternative would pass all major engineering, operational and structural considerations under Criterion 1. Since underground construction would be relatively less constrained by existing structures and resources, this alternative would meet all but two measures under Criterion 2 “Improve traffic operations and safety by addressing nonstandard geometrics” to a meaningful degree. This alternative would meaningfully meet Criterion 3 since the six traffic lanes within this segment of the BQE would be maintained throughout weekdays and weeknights during the construction period. However, this alternative would not meet the requirements under Criterion 4 “Avoid adverse environmental effects” since its implementation would involve acquisition of 10 or more residential or commercial properties to construct portals and one or more ventilation structures.

**Potential Effects on Environmental Justice Populations**

Tunnel portals for the W-1 alternative would be located in the vicinity of Kane Street and Grand Avenue. These areas include minority or low-income populations which are likely to experience disproportionately adverse impacts related to the construction and operation of tunnel portals,
including right-of-ways takings and adverse noise-related environmental effects compared to effects on other populations along the project alignment.

**Fundability**

- Estimated Construction Cost: $3.8 billion
- Estimated Operation and Maintenance Cost: $8 million (annual)
- Percentage of total anticipated funding for 2010—2035 RTP Fiscally Constrained Projects in New York City: 38%

Construction costs for the W-1 alternative are estimated to be approximately $3.8 billion, which would represent approximately 38% of the anticipated funding level for the fiscally constrained projects within the 10-county New York City metropolitan region served by NYMTC (see Section 2.3.4.2 “Available Revenue Streams to Fund RTP Projects and Proposed Alternatives”). Relative to competing alternatives, funding is not likely to be available for the construction, operation and maintenance of this alternative within the time period needed to address the structural deterioration of the existing structure. It is also anticipated that this would have a significant adverse effect on the ability to fund the overall transportation program for the New York Region during the 2010-2035 planning period, since the cost of the alternative would represent nearly 40% of the entire funding level for the fiscally constrained projects included in the RTP. Estimated costs to operate and maintain of this alternative would substantially higher than the costs to operate and maintain non tunnel alternatives due to the cost of ventilating and lighting the alternative.

**Summary Evaluation**

Based on project limits, screening, environmental justice, and funding considerations, this alternative will be withdrawn from further evaluation under the environmental review process. This alignment would not meet the requirements under Screening Criterion 4 “Avoid adverse environmental effects” since its implementation would involve considerable acquisition of private property. Construction and operation of tunnel infrastructure at the portals is likely to result in disproportionately high and adverse impacts on low income and high minority communities. The estimated costs of constructing, operating and maintaining this alternative would be

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21 Supra note 10
22 See Table 5-1 “Anticipated Project Funding Levels: 2010—2035”
substantially greater than other competing alternatives. Funding of this alternative would have a significant potential to adversely affect the ability to fund other critical projects included in the fiscally constrained projects included in the RTP. Funding for this alternative is, therefore, unlikely to be available within the time period needed to address the structural deficiencies of the existing structure.

**W-2: STRAIGHT-LINE TUNNEL BETWEEN BQE EXITS 24 AND 30**

*Project Limits*

The limits of the W-2 alternative would outside the established project limits of Sands Street to the east and Atlantic Avenue to the west.

*Evaluation against Goals and Objectives*

The W-2 alternative would pass all major engineering, operational and structural considerations under Criterion 1. Since underground construction would be relatively less constrained by existing structures and resources, this alternative would meet all but two measures under Criterion 2 “Improve traffic operations and safety by addressing nonstandard geometrics” to a meaningful degree. Existing ramp lengths and intersections of ramps with local streets would not be improved. This alternative would meaningfully meet Criterion 3 since the six traffic lanes within this segment of the BQE would be maintained throughout weekdays and weeknights during the construction period. However, this alternative would not meet the requirements under Criterion 4 “Avoid adverse environmental effects” since its implementation would involve considerable property acquisition to construct portals and one or more ventilation structures.

*Potential Effects on Environmental Justice Populations*

Tunnel portals for the W-2 alternative would be located in the vicinity of North Portland Avenue. These areas include minority or low-income populations which are likely to experience disproportionately adverse impacts related to the construction and operation of tunnel portals, including right-of-ways takings and adverse noise-related environmental effects compared to effects on other populations along the project alignment. Additionally the proposed alignment would pass under or in the vicinity of Census Tracts 39, 129, and 127. These areas include minority or low-income populations and may experience disproportionately adverse impacts.
related to the construction and operation of ventilation structures, including right-of-ways takings and adverse noise-related environmental effects compared to effects on other populations along the project alignment.

**Fundability**

- Estimated Construction Cost: $4.14 billion
- Estimated Operation and Maintenance Cost: 10 million (annual)
- Percentage of total anticipated funding for 2010—2035 RTP Fiscally Constrained Projects in New York City: 43%

Construction costs for the W-2 alternative are estimated to be approximately $4 billion, which would represent approximately 43% of the anticipated funding level for the fiscally constrained projects within the 10-county New York City metropolitan region served by NYMTC (see Section 2.3.4.2 “Available Revenue Streams to Fund RTP Projects and Proposed Alternatives”). Relative to competing alternatives, funding is not likely to be available for the construction, operation and maintenance of this alternative within the time period needed to address the structural deterioration of the existing structure. It is also anticipated that this would have a significant adverse effect on the ability to fund the overall transportation program for the New York Region during the 2010-2035 planning period, since the cost of the alternative would represent over 40% of the entire funding level for the fiscally constrained projects included in the RTP. Estimated costs to operate and maintain of this alternative would substantially higher than the costs to operate and maintain non-tunnel alternatives due to the cost of ventilating and lighting the alternative.

**Summary Evaluation**

The W-2 alternative would extend significantly beyond the established project limits and would undermine the value of public investment in recently completed and ongoing transportation improvements for the BQE/I-278 east and west of the project limits—including the recently completed Park Avenue Viaduct, and structural improvements that are ongoing or under development for the Gowanus Expressway. This alignment would not meet the requirements under Screening Criterion 4 “Avoid adverse environmental effects” since its implementation

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23 *Supra* note 10

24 See Table 5-1 “Anticipated Project Funding Levels: 2010—2035”
would involve considerable acquisition of private property. Construction and operation of tunnel infrastructure at the portals is likely to result in disproportionately high and adverse impacts on low income and high minority communities. The estimated costs of constructing, operating and maintaining this alternative would be substantially greater than other competing alternatives. Funding of this alternative would have a significant potential to adversely affect the ability to fund other critical projects included in the fiscally constrained projects included in the RTP. Funding for this alternative is, therefore, unlikely to be available within the time period needed to address the structural deficiencies of the existing structure.

Based on project limits, performance against goals and objectives, environmental justice, logical termini, and funding considerations, this alternative will be withdrawn from further evaluation under the environmental review process.

**W-3: Outboard tunnel connecting Sunset Park and BQE Exit 33**

*Project Limits*

The W-3 alternative includes an approximately 8.5-mile long, primarily subaqueous, tunnel alignment directly connecting BQE Exit 33 (near Williamsburg) and 65th Street (in Sunset Park). The limits of this alternative are outside the established project limits.

*Evaluation against Goals and Objectives*

The W-3 alternative would pass all major engineering, operational and structural considerations under Criterion 1. Since subterranean construction activities would be relatively less constrained by existing structures and resources, this alternative would meet all but two measures under Criterion 2 “Improve traffic operations and safety by addressing nonstandard geometrics” to a meaningful degree. This alternative would meaningfully meet Criterion 3 since the six traffic lanes within this segment of the BQE would be maintained throughout weekdays and weeknights during the construction period. However, this alternative would not meet the requirements under Criterion 4 “Avoid adverse environmental effects” since its implementation would involve considerable property acquisition to construct portals and one or more ventilation structures.

*Potential Effects on Environmental Justice Populations*
Tunnel portals for the W-3 alternative would be located in the vicinity of Exit 33 of the BQE and in the Sunset Park neighborhoods in the vicinity of 65th Street. These areas include minority or low-income populations\textsuperscript{25} which are likely to experience disproportionately adverse impacts related to the construction and operation of tunnel portals, including right-of-ways takings and adverse noise-related environmental effects compared to effects on other populations along the project alignment.

**Fundability**

- Estimated Construction Cost: $13 billion
- Estimated Annual Operation and Maintenance Cost: $25 million (annual)
- Construction cost as percentage of total anticipated funding for 2010—2035 RTP Fiscally Constrained Projects in New York City: \textsuperscript{26} 136%

Construction costs for the W-3 alternative are estimated to be approximately $13 billion, which represents approximately 136% of the anticipated funding level for the fiscally constrained projects within the 10-county New York City metropolitan region served by NYMTC (see Section 2.3.4.2 “Available Revenue Streams to Fund RTP Projects and Proposed Alternatives”). Relative to competing alternatives, funding is not likely to be available for the construction, operation and maintenance of this alternative within the time period needed to address the structural deterioration of the existing structure. It is also anticipated that this would have a significant adverse effect on the ability to fund the overall transportation program for the New York Region during the 2010-2035 planning period, since the cost of the alternative would represent over 40% of the entire funding level for the fiscally constrained projects included in the RTP. Estimated costs to operate and maintain this alternative would substantially higher than the costs to operate and maintain non-tunnel alternatives due to the cost of ventilating and lighting the alternative.

**Summary Evaluation**


\textsuperscript{26} See Table 5-1 “Anticipated Project Funding Levels: 2010—2035"
The W-3 alternative extends significantly beyond the logical termini established for the Project and would undermine the value of public investment in recently completed and ongoing transportation improvements for the BQE/I-278 east and west of the project limits—including the recently completed Park Avenue Viaduct, and structural improvements that are ongoing or under development for the Gowanus Expressway. This alignment would not meet the requirements under Screening Criterion 4 “Avoid adverse environmental effects” since its implementation would involve considerable acquisition of private property. Construction and operation of tunnel infrastructure at the portals is likely to result in disproportionately high and adverse impacts on low income and high minority communities. The estimated costs of constructing, operating and maintaining this alternative would be substantially greater than other competing alternatives. Funding of this alternative would have a significant potential to adversely affect the ability to fund other critical projects included in the fiscally constrained projects included in the RTP. Funding for this alternative is, therefore, unlikely to be available within the time period needed to address the structural deficiencies of the existing structure.

Based on project limits, performance against goals and objectives, environmental justice, and logical termini, and funding considerations, the W-3 alternative will be withdrawn from further evaluation under the environmental review process.

**W-4: FOURTH AVENUE/OUTBOARD TUNNEL**

*Project Limits*

The W-4 alternative primarily includes an approximately 3.5-mile long tunnel alignment connecting 50th Street and Exit 30 (Grand Avenue). The extents of this alternative are outside the established project limits.

*Evaluation against Goals and Objectives*

The W-4 alternative would pass all major engineering, operational and structural considerations under Criterion 1. Since subterranean construction activities would be relatively less constrained by existing structures and resources, this alternative would meet all but two measures under Criterion 2 “Improve traffic operations and safety by addressing nonstandard geometrics” to a meaningful degree. Existing ramp lengths and intersections of ramps with local streets would not be improved. This alternative would meaningfully meet Criterion 3 since the
six traffic lanes within this segment of the BQE would be maintained throughout weekdays and
weeknights during the construction period. However, this alternative would not meet the
requirements under Criterion 4 “Avoid adverse environmental effects” since its implementation
would involve considerable property acquisition to construct portals and one or more ventilation
structures.

Potential Effects on Environmental Justice Populations

The western tunnel portal for the W-4 alternative is proposed to be located in the vicinity of
North Portland Avenue. These areas include minority or low-income populations which are
likely to experience disproportionately adverse impacts related to the construction and operation
of tunnel portals, including right-of-ways takings and adverse noise-related environmental
effects compared to effects on other populations along the project alignment. Additionally the
proposed alignment would pass under or in the vicinity of Census Tracts 39, 129, and 127.
These areas include minority or low-income populations and may experience disproportionately
adverse impacts related to the construction and operation of ventilation structures, including
right-of-ways takings and adverse noise-related environmental effects compared to other
populations along the project alignment.

Fundability

- Estimated Construction Cost: $5.7 billion
- Estimated Annual Operation and Maintenance Cost: To come
- Percentage of total anticipated funding for 2010—2035 RTP Fiscally Constrained
  Projects in New York City: 28

Construction costs for the W-4 alternative are estimated to be approximately $5.7 billion, which
would represent approximately 58% of the anticipated funding level for the fiscally constrained
projects within the 10-county New York City metropolitan region served by NYMTC (see Section
2.3.4.2 “Available Revenue Streams to Fund RTP Projects and Proposed Alternatives”).
Relative to competing alternatives, funding is not likely to be available for the construction,
operation and maintenance of this alternative within the time period needed to address the
structural deterioration of the existing structure. It is also anticipated that this would have a

27 Supra note 10
28 See Table 5-1 "Anticipated Project Funding Levels: 2010—2035"
significant adverse effect on the ability to fund the overall transportation program for the New York Region during the 2010-2035 planning period, since the cost to construct the alternative would represent 58% of the entire funding level for the fiscally constrained projects included in the RTP. Estimated costs to operate and maintain of this alternative would substantially higher than the costs to operate and maintain non-tunnel alternatives due to the cost of ventilating and lighting the alternative.

**Summary Evaluation**

The W-4 alternative extends significantly beyond the logical termini established for the Project and would undermine the value of public investment in recently completed and ongoing transportation improvements for the BQE/I-278 east and west of the project limits— including the recently completed Park Avenue Viaduct, and structural improvements that are ongoing or under development for the Gowanus Expressway. This alignment would not meet the requirements under Screening Criterion 4 “Avoid adverse environmental effects” since its implementation would involve considerable acquisition of private property. Construction and operation of tunnel infrastructure at the portals is likely to result in disproportionately high and adverse impacts on low income and high minority communities. The estimated costs of constructing, operating and maintaining this alternative would be substantially greater than other competing alternatives. Funding of this alternative would have a significant potential to adversely affect the ability to fund other critical projects included in the fiscally constrained projects included in the RTP. Funding for this alternative is, therefore, unlikely to be available within the time period needed to address the structural deficiencies of the existing structure.

Based on performance against goals and objectives, environmental justice, and project limit considerations, the W-4 alternative will be withdrawn from further evaluation under the environmental review process.

**TRANSIT, TSM, AND TDM**

**Project Limits**

Project limits would vary depending on specific Transit, TSM, and TDM alternatives.

**Evaluation against Goals and Objectives**
Alternatives under this classification would not address the deteriorating structural conditions of existing bridges to be considered in "good condition." Therefore, these alternatives alone would fail Measure 1-3 “Achieve NYSDOT bridge condition rating of 5” under Criterion 1 “Major Engineering, Operational and Structural Considerations”. These alternatives can however be considered in tandem with other alternatives that pass the Level I screening.

**Potential Effects on Environmental Justice Populations**

Any adverse environmental effects from these alternatives are unlikely to have a disproportionate effect low-income and minority populations residing in the project area.

**Fundability**

Cost estimates would vary depending on specific Transit, TSM, and TDM alternatives.

**Summary Evaluation**

Since these alternatives would not pass the screening evaluation, they will be withdrawn from further evaluation under the environmental review process. However, Transit, TDM and TSM improvements may be implemented to supplement other roadway alternatives. A detailed discussion on Project-specific Transit, TDM and TSM alternatives can be found in the “Transit, Travel Demand Management & Transportation System Management Alternatives” technical memorandum.
5.0 IDENTIFICATION OF ALTERNATIVES FOR FURTHER EVALUATION IN THE ENVIRONMENTAL REVIEW PROCESS

Alternatives that would warrant further evaluation in the environmental review process under NEPA and SEQRA were identified based on the results of the evaluation presented in Chapter 4 “Evaluation of Alternatives” of this memorandum (see Table 5-1 “Summary Evaluation of Alternatives/Identification of Alternatives for Further Evaluation”). These include 1) Rehabilitation of the BQE within the current alignment; and 2) Context Sensitive Corridor. A description of these alternatives is provided in Chapter 3 “Description of Alternatives” of this memorandum.
### Table 5-1: Summary Evaluation of Alternatives/ Identification of Alternatives for Further Evaluation

<table>
<thead>
<tr>
<th>Alternatives</th>
<th>R-1</th>
<th>CS-1</th>
<th>S-1</th>
<th>S-2</th>
<th>T-1</th>
<th>T-2</th>
<th>T-3</th>
<th>Transit-TSM/TDM</th>
<th>W-1</th>
<th>W-2</th>
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<td>Alternative Name</td>
<td>Rehab w/ Current Alignment</td>
<td>Context Sensitive Corridor</td>
<td>Standard Alignment - North</td>
<td>Standard Alignment - South</td>
<td>Under Downtown Brooklyn Tunnel</td>
<td>Existing BQE Corridor Tunnel</td>
<td>Outboard Tunnel</td>
<td>(see detailed Transit-TSM/TDM table)</td>
<td>T-1 modification/extension</td>
<td>Straight-line tunnel between Exits 24 and 30</td>
<td>Outboard tunnel connecting Sunset Park and Exit 33</td>
<td>4th Avenue/outboard tunnel between Exits 24 and 30</td>
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</table>

<sup>29</sup> ● The alternative is projected to meet the given measure to a meaningful degree / ○ The alternative would not meet the given measure, or would do so only to a very limited extent