This document is provided for informational purposes only. The Design-Build Proposer shall not rely on this information in the preparation of a project Proposal. Please refer to the project’s Request for Proposal (RFP) for the final project requirements.
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1.0 Introduction

P.I.N.: X731.25
TITLE: Kosciuszko Bridge – Vandervoort Avenue
Entrance Ramp
B.I.N.: 1-07569-B
DATE: November 2011
ORDER: Kings
PS&E: July 2017
COUNTY: Kings
ADV. PRELIM. PLAN: October 2016

### Vandervoort Avenue Entrance Ramp – Vandervoort Avenue to Varick Avenue

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<tr>
<td>SUPERSTRUCTURE</td>
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<td>Concrete Slab on Expanded Polystyrene Fill</td>
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<td>SUBSTRUCTURE</td>
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<td></td>
<td>Concrete closure walls with brick veneer</td>
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<tr>
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### Vandervoort Avenue Entrance Ramp – at Varick Avenue

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## Vandervoort Avenue Entrance Ramp – Varick Avenue To Brooklyn Approach

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<td>SUPERSTRUCTURE:</td>
<td>Concrete Slab</td>
<td>Concrete Slab on Expanded Polystyrene Fill</td>
</tr>
<tr>
<td>SUBSTRUCTURE:</td>
<td>Concrete piers on spread footings, Concrete closure walls with brick veneer</td>
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<td>SKEW:</td>
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This Structure Justification Report (SJR) describes the structural alternatives that were considered for the replacement of the Vandervoort Avenue Entrance Ramp of the Kosciuszko Bridge and identifies the strengths and weaknesses of each option.

The existing structure will be replaced to accommodate the operational and geometric improvements of the Brooklyn-Queens Expressway (BQE) that are scheduled under four contracts of the Kosciuszko Bridge Project. See the November 2011 SJR – BIN 1-07569-9 for further information regarding the Kosciuszko Bridge Project. The Vandervoort Avenue Entrance Ramp is located in Brooklyn between Vandervoort Avenue and the Brooklyn Approach. The ramp is adjacent to the eastbound BQE mainline of the Brooklyn Connector and provides access for local street traffic to the eastbound BQE, which also leads to the Long Island Expressway (LIE). The BQE is identified as an urban principal arterial interstate.

The existing Vandervoort Avenue Entrance Ramp is a 23 span eastbound ramp located between Vandervoort Avenue and the Brooklyn Approach spans east of Varick Avenue and is part of the Brooklyn Connector. The Brooklyn Connector (spans 1 through 78), which was constructed in 1939 and modified in 1971, is a low level viaduct that extends from west of Morgan Avenue to east of Varick Avenue in Brooklyn. For more information on the Brooklyn Connector please refer to the SJR – BIN 1-07569-9. The existing Vandervoort Avenue entrance ramp, with the exception of the local street crossing over Varick Avenue, consists of a reinforced concrete deck slab that is monolithic with reinforced concrete cap beams and that is supported by individual reinforced concrete columns on spread footings. The area below the ramp is enclosed by reinforced concrete walls with brick veneer. The existing span over Varick Avenue is a reinforced concrete rigid frame. The existing ramp is approximately 23 feet wide and carries one lane of eastbound traffic.

In order to find the most suitable structure types, the Vandervoort Avenue Entrance Ramp is evaluated in different segments as described below:

**Vandervoort Avenue to Varick Avenue**

This segment extends from the start of the ramp on the east side of Vandervoort Avenue to the west side of Varick Avenue. This segment is approximately 500 feet long. The embankment, assuming that the structure is built on fill, will vary in width from approximately 53 feet at the entrance to approximately 46 feet at the west side of Varick Avenue. The roadway will be a constant width of approximately 37 feet.

The proposed ramp alignment will contain two 12’-0” wide travel lanes. The left shoulder will be 3’-6” wide and the right shoulder will be 6’-6” wide. There will be a concrete barrier on the south fascia and outside the left shoulder.

The entrance ramp will be constructed concurrently with the eastbound mainline roadway, and will be located to the eastbound side of the existing bridge. The existing eastbound ramp and roadway will then be demolished and the new westbound roadway constructed within its footprint. Once all traffic is transferred to the new structure, the existing westbound structure will be demolished and the new bikeway/walkway will be constructed in its footprint.

An Expanded Polystyrene (EPS) filled structure is the preferred structure type for this segment of the ramp. See Section 2.1 for a discussion on the structural alternatives.
Varick Avenue Crossing (Span 1)

The ramp span over Varick Avenue will be approximately 67 feet long and constructed concurrently with the proposed eastbound mainline roadway. The eastbound roadway and eastbound ramp will be constructed to the eastbound side of the existing structure. The existing eastbound roadway will then be demolished and the new westbound roadway will be constructed within its footprint. Once all traffic is transferred to the new structure, the existing westbound structure will be demolished. Once the existing westbound structure has been demolished, the proposed bikeway/walkway will be constructed.

The span over Varick Avenue will be approximately 37 feet wide and contain two 12'-0" wide travel lanes. The left shoulder will be 3'-6" wide and the right shoulder will be 6'-6" wide. There will be a concrete barrier on both fasciae. There will be a gap between the eastbound mainline and Vandervoort Avenue Entrance ramp that varies in width from approximately 9'-0" to 7'-6".

Precast Concrete NEXT Beams are the preferred structure type for this span due to their aesthetics and the low construction and maintenance costs. See Section 2.2 for a discussion on the structural alternatives.

Varick Avenue to Brooklyn Approach

This segment is approximately 120 feet long and will be enclosed by reinforced concrete walls on both the north and south side. The structure will be constructed concurrently with the span over Varick Avenue. The roadway will be approximately 37 feet wide and contain two 12'-0" wide travel lanes. The left shoulder will be 3'-6" wide and the right shoulder will be 6'-6" wide. There will be a concrete barrier on both fasciae. The Vandervoort Avenue Entrance ramp will be constructed adjacent to and abutting the eastbound mainline.

EPS fill is the preferred structure type for this segment of the ramp. See Section 2.3 for a discussion on the structural alternatives.

2.0 Superstructure Considerations

In coordination with the NYSDOT, the bridge types described below were developed by a team of bridge engineers and bridge architects with the overall goal of providing an attractive, economical structure that is an appropriate solution for each segment described above.

2.1 Ramp Segment 1 (Brooklyn Connector Segment 3): East side of Vandervoort Avenue to the west side of Varick Avenue.

The alternatives considered for the replacement of this portion of the Vandervoort Avenue Entrance Ramp, which are the same as those considered for the replacement of the Brooklyn Connector, are as follows:

- Expanded Polystyrene (EPS) Fill
- Retained Earth

These two options eliminate the need for structure and therefore will have minimal maintenance requirements and have lower construction costs. Also, since this structure would be enclosed
by precast concrete closure walls under any option, these non-structure alternatives would have identical aesthetics as structure alternatives. Therefore, structure alternatives, such as steel and concrete girders were eliminated from consideration for this segment of the ramp. For a more detailed discussion of the structure alternatives see the SJR – BIN 1-07569-9.

Alternative 1: Expanded Polystyrene (EPS) Fill

Alternative 1 consists of composite pavement slab supported on a layer of earth fill, a reinforced concrete slab, and below, the EPS. The earth fill would be a minimum of 4 feet thick to prevent differential icing in accordance with NYSDOT requirements and as recommended in NCHRP Web Document 65, Geofoam Applications in the Design and Construction of Highway Embankments. The EPS fill would consist of large blocks that would be glued together using an adhesive and that would be founded on a gravel leveling course. All surfaces of the EPS would be protected with a petroleum-compatible polymer geomembrane. The pavement slab would also serve to anchor the precast concrete side walls that would enclose the fill.

This would match the preferred alternative for the mainline in this segment of the Brooklyn Connector. The EPS is furnished in blocks that will provide a self standing alternative to M.S.E.S. walls or other retained earth alternatives. In addition, since this segment of the connector would be enclosed regardless of the alternative chosen, the EPS alternative will provide identical aesthetics to the structural alternatives. The proposed ramp would be constructed concurrently with and abutting the eastbound mainline. There would be a cast-in-place solid concrete pier located on the west side of Varick Avenue. The solid pier would be supported on cast-in-place concrete piles.

The ramp abutting the adjacent eastbound mainline would be constructed as part of the fill area in order to avoid an open alley between structures that could be difficult to maintain.

The use of EPS as the fill material would provide advantages over an earth fill alternative. Benefits of utilizing an EPS embankment include: (1) significant reduction in truck traffic that would be required to place earth fill, (2) ease and speed of construction, (3) possible elimination of the need for preloading and surcharging, and (4) little to no lateral load on the side walls or abutments. This would allow the end pier at Varick Avenue to be designed primarily as a solid concrete pier, and not an abutment, thereby minimizing the numbers of piles required.

When compared to a retained earth alternative, the use of EPS would minimize the number of truck loads to the highly congested area, one of the stated objectives of the EIS. Standard EPS blocks are 8’ x 4’ x 3’ and are relatively massless. The EPS blocks can be brought to the site by tractor trailer (flatbed or closed box) and quickly offloaded and placed. When compared to an earth fill alternative, it is estimated that approximately 80% fewer trucks trips would be required.

The EPS alternative has an initial construction cost that is somewhat higher but comparable to a retained earth alternative. The advantage of minimizing truck traffic and the shorter construction duration when compared to a retained earth alternative outweigh the slightly higher initial construction cost. In addition, since this segment of the connector will be enclosed regardless of alternative chosen, the EPS alternative will provide identical aesthetics to the more expensive structural alternatives.
Alternative 2: Retained Earth

Alternative 2 is similar to Alternative 1 except an earth fill, utilizing Mechanically Stabilized Earth (M.S.E.S.) walls, would be provided instead of EPS fill.

A modular (T-Wall) system was also investigated, and although it would be constructible for the Vandervoort Avenue Entrance Ramp, the necessity of installing the proposed bikeway/walkway on the north side of the mainline in a separate stage would prohibit the use of the system on the westbound side. The vertical height would require a larger stem length for the modular system than what could be installed within the limited horizontal width of the bikeway/walkway construction stage. Also, the visual appearance of a T-Wall system would not be consistent with the remaining portions of the enclosure walls.

Although the initial construction cost of an M.S.E.S. wall alternative is slightly lower than that of an EPS alternative, there is one primary disadvantage when compared to the EPS alternative. The primary disadvantage of this option would be in the logistics of having to transport the earth fill to the job site, as the number of trucks would be significantly higher than for the EPS alternative. Secondary issues could include: anticipated longer construction duration, due to the need to place and compact the fill, the possibility for settlement that could impact any local utilities and the possible difficulty in obtaining sufficient suitable fill.

2.2 Ramp Segment 2 (Brooklyn Connector Segment 4): Varick Avenue Crossing

For this local street crossing the following structure alternatives were considered:

- NEXT Beams
- Northeast Bulb Tees
- Steel Girders
- Adjacent Box Beams

Alternative 1: NEXT Beams (Preferred Alternative)

The simple span over Varick Avenue could be accomplished with the use of prestressed NEXT Beams, which resemble a double tee beam with wider stems to provide a deck form for a cast-in-place concrete deck, thereby saving substantial time during construction. The beams would be 32 inches deep and would be constructed utilizing concrete with a minimum strength of 10 ksi, in accordance with Section 9.6 of the NYSDOT Bridge Manual.

The deck slab would be composite concrete with a monolithic wearing surface. Stainless steel reinforcement would be utilized in the deck slab. The use of stainless steel reinforcement in the concrete deck allows for a thinner slab when compared to an epoxy coated reinforced deck. This reduced deck thickness leads to a lighter superstructure and minimizes foundation size and pile quantity. The reduced deck thickness also leads to a more efficient girder design, as the dead load would be reduced.

Cast in place solid reinforced concrete piers would be utilized on the east and west sides of Varick Avenue. The solid piers would be shared by the mainline structure, forming continuous walls along their respective length. The foundations would be supported on cast-in-place
concrete piles due to their efficiency at carrying high loads (both axial and lateral loads) at this site.

The NEXT beam configuration would provide for the same benefits as double tee beams and would be more stable and resistant to lateral buckling when compared to Bulb Tee girders. The cast-in-place concrete deck would provide for the live load distribution among adjacent beam stems and no intermediate diaphragms would be required. Cast-in-place end diaphragms would be used to support the un-stiffened slab edge for live loads.

NEXT beams, similar to other prestressed concrete girders, would be fabricated off site and delivered via truck to the bridge site. Erection could be accomplished with conventional equipment, although this may require short term lane closures. Long term maintenance costs for concrete superstructures are typically less than steel superstructures. The NEXT Beam alternative would offer a competitive initial construction cost and a lower maintenance cost when compared with a steel alternative.

For the reasons mentioned above, Alternative 1 is recommended as the preferred alternative.

Alternative 2: Concrete Girders

Alternative 2 consists of a precast concrete multiple girder system, utilizing Northeast Bulb-Tee girders made composite with the monolithic concrete deck. The deck would be composite reinforced concrete with stainless steel reinforcing. The girders would be approximately 48 inches deep.

Four girders evenly spaced at approximately 9'-8” would be used. Erection could be accomplished with conventional equipment not requiring the use of field splices. Intermediate diaphragms could be cast in place or prefabricated offsite adding flexibility to the contractor’s means and methods.

Long term maintenance costs for concrete superstructures are typically less than steel superstructures as steel components are more susceptible to corrosion requiring steel repairs and repainting multiple times throughout the service life, although this could be mitigated by the use of unpainted weathering steel wherever possible. However, the need for deck formwork with the multi-girder alternative makes Alternative 2 less desirable than Alternative 1. For this reason, Alternative 2 is not the preferred alternative.

Alternative 3: Steel Girders

Alternative 3 consists of a rolled steel multi-girder system. All steel girders would be made composite with the monolithic concrete deck and be approximately 40 inches deep. The deck would be reinforced with stainless steel reinforcing. The girders would use weathering steel that would be unpainted except for the exterior of the fascia girders and the girder ends at the roadway expansion joints.

Similar to Alternative 2, the girders would be on a straight alignment with equal spacing. However, the use of rolled steel sections would require a five girder layout with spacing of approximately 7'-6”. The use of rolled steel sections would provide for a decrease in material costs and fabrication time over welded steel plate girders.
A multi-girder system is a redundant framing system. The steel girders could easily be adjusted using variable pedestal heights as well as varying haunch depths to accommodate the roadway cross slopes and profile. Small flange widths would allow for efficient slab design by minimizing haunches and slab thicknesses. In addition, the span length and girder spacing would allow for the efficient use of rolled sections that provide for a decrease in material costs over built-up steel sections. The construction costs and future maintenance costs would be higher for the steel alternative than the concrete alternatives. Therefore, steel girders were eliminated from consideration.

Alternative 4: Adjacent Box Beams

Alternative 4 would be similar to the multi-girder alternatives but adjacent prestressed concrete box girders made composite with a monolithic concrete deck would be utilized instead of steel girders, NEXT Beams or Bulb-Tees. This could be accomplished with the use of nine BI48-27 concrete box units. The span length would be identical to the other three alternatives.

The common advantages of using adjacent box beams are for the elimination of deck formwork, maintaining a shallow superstructure, and the ability to use a thinner deck slab. The advantage of a shallower superstructure would not provide any benefit in this location as there are no clearance issues. The elimination of deck formwork provides an advantage in erection time when compared to the steel girder and Bulb-Tee alternatives. However, no deck formwork is required for the preferred NEXT Beam alternative. In addition, the entrance ramp would be constructed concurrently with the adjacent mainline structure, and adjacent box beam units could not be utilized on the mainline. Furthermore, since long piles are anticipated, the heavier superstructure of the adjacent box beam alternative would be a disadvantage as more, or larger, piles would be required. For these reasons, Alternative 4 was eliminated from consideration.

2.3 Ramp Segment 3 (Brooklyn Connector Segment 5): Area between Varick Avenue and the Brooklyn Approach

The alternatives considered for the replacement of this portion of the Vandervoort Avenue Entrance Ramp, which are the same as those considered for the replacement of the Brooklyn Connector, are as follows:

- Expanded Polystyrene (EPS) Fill
- Retained Earth

These two options eliminate the need for structure and therefore will have minimal maintenance requirements and have lower construction costs. Also, since this structure would be enclosed by precast concrete closure walls under any option, these non-structure alternatives would have identical aesthetics as structure alternatives. Therefore, structure alternatives, such as steel and concrete girders were eliminated from consideration for this segment of the ramp. For a more detailed discussion of the structure alternatives see the SJR – BIN 1-07569-9.

Alternative 1: Expanded Polystyrene (EPS) Fill

For the segment between Varick Avenue and the Brooklyn Approach the preferred alternative would consist of a composite pavement slab supported on EPS fill, details of which are described above in Section 2.1. Similar to the area between Vandervoort Avenue and Varick
Avenue, the EPS fill will be a self standing alternative to M.S.E.S. walls or other retained earth alternatives. In addition, since this segment of the connector would be enclosed regardless of the alternative chosen, the EPS fill alternative would provide identical aesthetics to the structural alternatives. The EPS fill would be enclosed by solid concrete piers at Varick Avenue and the Brooklyn Approach, and by precast concrete wall panels along the south. This segment would be constructed adjacent to and abutting the eastbound mainline.

The benefits of EPS fill when compared to other retained earth alternatives have been described in Section 2.1. One additional advantage in this area is that the EPS blocks can be quickly offloaded and put in place without the need for secondary heavy equipment.

For the above reasons, Alternative 1 is the Preferred Alternative.

Alternative 2: Retained Earth

Alternative 2 is similar to Alternative 1 except an earth fill, utilizing M.S.E.S. walls, would be provided instead of EPS fill. Although the initial construction cost of an M.S.E.S. wall alternative is slightly lower than that of an EPS fill alternative, there are disadvantages when compared to the EPS fill alternative.

In addition to the reasons stated above in Section 2.1, the logistics of transporting the fill material to the site are a disadvantage when compared to the utilization of EPS fill. The area is highly congested with limited available space. The use of EPS-blocks would reduce the number of trucks to deliver material when compared to the use of earth fill, which is a stated objective of the project EIS.

For the above reason, EPS fill was the preferred alternative to retained earth.

3.0 Innovative/Unusual Structure

As per Section 20.2.2 of the NYSDOT Bridge Manual, the Eastbound Entrance Ramp is not considered an unusual structure. However, the Kosciuszko Bridge Project as a whole is considered a complex project due to the geometric constraints of the replacement structure being located within the tight transportation corridor and the intricate construction staging and contract breakdown required to maintain traffic on this critical interstate highway.

4.0 Geotechnical Considerations

A geotechnical subsurface investigation was performed between September and November 2009. The full results of this investigation can be found in the Preliminary Geotechnical Report included in Appendix B. The investigation included sixteen (16) 4-inch diameter boreholes.

Based on the results of the subsurface investigation the soil/rock stratigraphy above bedrock at the project site can be generally described in the following 5 sections:

- Stratum 1: Fill;
- Stratum 2: Organic Deposits
- Stratum 3: Silty Sand
- Stratum 4: Silty Clay
- Stratum 5: Decomposed Rock.

Strata 1 and 2 are not considered as suitable foundation bearing strata. Strata 3, 4 and 5 are considered adequate foundation bearing strata.

Stratum 3 exists at a depth of approximately 10 to 15 feet from the ground surface. As a result, deep spread foundations are anticipated to achieve adequate soil bearing capacity.

The use of pile foundations can also be considered.

Results based on the preliminary driven steel pipe pile analysis (for vertical load only) using the obtained boring data are as follows:

- Allowable Pile Capacity:
  - 16-in OD: 135 tons
  - 20-in OD: 200 tons
  - 24-in OD: 270 tons

- Pile Length Required:
  - 70 feet

5.0 Substructure Considerations

5.1 Piles (Preferred Option)

For the cast in place solid concrete piers that would be utilized at Varick Avenue and the shared pier of the Brooklyn Approach, cast-in-place concrete piles are the preferred choice for foundation support, subject to the approval of the NYSDOT GEB. The use of piles would minimize the potential for differential settlement of strip foundations that would be constructed in stages, as required under this project. The use of piles would also minimize excavation depth, thereby minimizing excavation support requirements and reducing the quantity of contaminated material that would require disposal. Installation of the cast-in-place concrete piles would not displace any soil or groundwater, minimizing impacts to contaminated materials.

5.2 Spread Footings

A suitable bearing layer exists at a depth at approximately 10 to 15 feet from the ground surface.

Therefore, spread footings can be considered in these areas. However, the use of spread footings would require deeper excavation than pile supported foundations in order to reach the suitable bearing layer.

The soil in the project area has also been found to include numerous contaminants, as described in Section 11.0 of this report. The deeper excavation of the spread footing option would lead to further exposure to the contaminated materials as well as a higher quantity of contaminated disposal. For these reasons it is recommended that all foundations of the Vandervoort Avenue Entrance Ramp be pile supported.
Since the east end pier of the ramp is also shared by the Brooklyn Approach, spread footings are not an option for this pier due to the high loads of the Approach Structure alternatives and the reasons noted in section 5.1 above.

6.0 Construction Considerations

6.1 Construction Cost

The proposed Vandervoort Avenue Entrance Ramp is part of the new Brooklyn Connector and will be constructed with the Connector, therefore, the construction cost estimates for this ramp are included with the estimates for the complete Brooklyn Connector. These costs are presented in SJR – BIN 1-07569-9. These cost comparisons also show that the Retained Earth and EPS fill are significantly less expensive to construct than other structure alternatives.

6.2 Life Cycle/Maintenance Requirements

The NYSDOT will continue to be responsible for the maintenance of the Kosciuszko Bridge. All bridge types will require periodic inspection and maintenance, including cleaning and washing, pavement re-striping, joint repair/replacement and wearing surface or roadway deck replacement.

The EPS and Retained Earth alternatives will require minimal inspection and maintenance of the precast enclosure walls. All other bridge types would require bearing replacement at 20 to 30 year intervals. Painting of the structural steel elements could be minimized through the use of weathering steel, ASTM A 709 Gr. 50W, which could be unpainted except at roadway expansion joints and at fascia beams if they are exposed. It is expected that any painted steel elements would require recoating every 12 to 15 years.

6.3 Constructability

NEXT Beams, Steel I-girders and Bulb-Tees would be lifted into place from ground level using a single crane, or a crane at each end. This would result in temporary night closures and local detours for Varick Avenue traffic as girders are lifted into place.

For the EPS fill alternative it is important that the site is prepared properly before installation of the blocks. The soil should not be frozen and there should be no debris or large pieces of vegetation protruding through the subgrade. Ideally there will be no standing water present although experience has shown that some standing water can be accommodated.

It is imperative that the blocks not be exposed to petroleum products or damaged before, during or after installation. If the blocks are to be stockpiled until placement, a secure area should be designated for this purpose. Shotcrete is typically used to protect the blocks during construction staging.

In general, the paving system can be constructed in the normal manner with only a few cautions related to the presence of EPS blocks. Vehicles and construction equipment such as earthmoving equipment must not directly traffic on the EPS. One construction procedure that can be used to minimize damage to the EPS blocks is to use relatively lightweight equipment to push approximately 12 inches minimum of soil or aggregate onto the EPS blocks before compacting the material. Typically placement of the first lift of unbound material is accomplished
by pushing the material ahead using a relatively small bulldozer or front-end loader. Placement of additional unbound and bound layers of the pavement system can then be placed in the normal manner although trafficking of the surface by trucks or heavy equipment of all types should be minimized or avoided altogether until the pavement is completed. If necessary, temporary mats could be provided to distribute vehicle loads.

6.4 **Construction Material Delivery**

The majority of construction materials for the entrance ramp may be delivered to the site utilizing Newtown Creek for waterway delivery, or the Interstate Highway system and primary arterials in the vicinity for delivery by truck. The size of each structure member will be considered during final design to ensure that deliverability problems will be mitigated. Field splices may be utilized to control delivery problems. There are numerous low clearance bridges in the area but the preliminary evaluation indicates that truck delivery is feasible for the Vandervoort Avenue Entrance Ramp.

6.5 **Construction Duration**

Based on additional studies conducted as part of the initial stage of Final Design, the overall construction duration is expected to be completed under 4 construction contracts anticipated for the Kosciuszko Bridge Project. The Kosciuszko Bridge Project has estimated minimum overall construction duration of approximately 6 years to completion. The overall construction duration would be similar for any of the structure types considered.

7.0 **Architectural Considerations**

The Brooklyn Connector and ramps, although not as bold as the signature main span and approaches, should still be noteworthy additions to the Kosciusko Bridge Project, as well as efficient and functional modes of connection to the bridge.

The Vandervoort Avenue Entrance Ramp, with the exception of the Varick Avenue crossing, will be enclosed on the south side by precast concrete enclosure walls, on the north side by the adjacent mainline structure, and the east end and Varick Avenue crossing by solid concrete piers. The precast panels will have a vertical architectural pattern. Enclosing the structure will provide a simple façade and keep the area beneath the bridge free from debris.

Architectural features will be included in the design of the structure to address the aesthetic concerns of the community.

8.0 **Work Zone Traffic Control**

The Vandervoort Avenue Entrance Ramp will be constructed in its entirety concurrently with the eastbound mainline structure. Traffic will be maintained on the existing entrance ramp until the proposed ramp is completed. Traffic will then be shifted to the new ramp and the existing eastbound roadway will be demolished and the westbound roadway and exit ramp will be constructed in its footprint.

See Appendix D for the construction staging of the overall project.
9.0 Utilities

The Brooklyn Connector and Vandervoort Avenue Entrance Ramp will be designed to allow construction in an elaborate network of subsurface and overhead utilities. Please see Section 4.8 of the SJR BIN 1-07569-9 for more information regarding utilities affected in this area of the Kosciuszko Bridge project.

10.0 Asbestos

The inspection of the existing bridge structure identified several locations of suspect asbestos containing materials along the length of the Brooklyn Connector and in the materials found inside the structure's storage areas. The suspect materials include bond breaker, ebony boards, arc shields, floor tiles, window caulk, debris, waterproofing membrane, and pipe wrap and insulation on utilities to be relocated.

See the Asbestos Assessment and Design Report for further information. The report provides the results from the field investigation including asbestos materials identified, location, type and quantity found. Appropriate handling and disposal procedures will be specified in the construction documents.

11.0 Contaminated/Hazardous Waste

Several environmental investigations completed for the project identified soil and groundwater across much of the project site with volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), metals, and polychlorinated biphenyls (PCBs), likely as a result of the historic industrial nature of the area. Construction of the foundations will require excavation and dewatering in areas of known contamination. The Meeker Avenue Chlorinated Solvent Plume and the Greenpoint Underground Oil Spill are sources of contamination along the Brooklyn Connector. Please see Section 4.10 of the SJR BIN 1-07569-9 for more information regarding contaminated/hazardous waste in the vicinity of the Brooklyn Connector.
12.0 Conclusion and Recommendation

Based on the parameters discussed relating to the technical criteria, construction methodology, initial construction costs, and future maintenance costs of each option, the preferred alternative for the Vandervoort Avenue Entrance Ramp is apparent.

For the segments between Vandervoort Avenue and Varick Avenue and Varick Avenue and the Brooklyn Approach the EPS alternative provides the identical aesthetic appearance of any structural alternative, a comparable initial construction cost to retained earth with considerably fewer delivery trucks needed during construction, and the lowest long term maintenance costs. For these reasons the EPS system is the preferred alternative.

For the Varick Avenue crossing the precast NEXT Beam alternative provides the appropriate aesthetic appearance, material durability, low initial cost, and the lowest long term maintenance cost described in this report. Because of these reasons the precast NEXT Beam system is the preferred alternative.

Signature/Title

Date: