QueensWay

Existing Structural Conditions Report

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I. Description of the Rail Line

The north segment of the LIRR Rockaway Beach Branch (RBB) starts from just south of its divergence from the LIRR main line in Rego Park, and continues south through Forest Hills to Union Turnpike. Within this segment, the RBB passes over four intersections with existing bridges (at Fleet Street, Yellowstone Boulevard, Metropolitan Avenue, Union Turnpike), and one intersection over the active LIRR Montauk line where there is currently no bridge. Between the bridges, the RBB is elevated on earthen embankments whose elevations are approximately 20'-25' above adjacent properties and street grades. Since the mid-20th century when rail service along the RBB declined, residential properties were continuously built directly along the east and west right-of-way (ROW) lines from Fleet St. to Metropolitan Ave. At the south end of this segment, between the LIRR Montauk line and Union Turnpike, the rail line is paved over and generally serves as an empty lot for the shopping center directly east of it.

The central segment runs from Union Turnpike and continues south mostly through Forest Park, and then enters the neighborhood of Woodhaven, where it ends at Jamaica Avenue. Within this segment, the RBB is mostly depressed below adjacent properties and street levels in a ravine section within Forest Park. It passes underneath existing bridges carrying the Jackie Robinson Parkway, Myrtle Avenue, and Forest Park Drive. At the north end of this segment, between Union Turnpike and Forest Park, the rail line is again paved over and serves as a parking lot for the Forest View Crescent residential complex directly east of it. Near the south end of Forest Park, the rail line starts to elevate onto earthen embankments so that by the time it exits the park at the bridge over Park Lane South, it is approximately 20' above the crossing street. From this bridge, the RBB continues on an earthen embankment until it reaches the bridge intersection at Jamaica Ave. Residential properties are also continuously built along the east and west ROW's from Park Lane South to Jamaica Ave.
The south segment runs from Jamaica Ave. and continues south through Woodhaven and Ozone Park to Rockaway Boulevard. Within this segment, the RBB passes over two intersections with existing bridges (at 91st Street and Atlantic Avenue), and beginning at 97th Avenue, an 111-span bridge viaduct runs south to Rockaway Blvd. Between Jamaica Ave. and Atlantic Ave., the RBB is elevated on earthen embankments whose elevations are approximately 20’ above adjacent properties and street grades. The residential properties along this stretch appear to have been erected since the early half of the 20th century, based on NYC records (NYC Oasis). South of Atlantic Ave., the properties adjacent to the rail line are more commercial-oriented. Between Atlantic Ave. and 97th Ave., the triangular-shaped tract of land currently occupied by school bus parking is the former spur connection of the east-west underground LIRR Atlantic. Ave. subway line.
II. Existing Structures along the Rail Line

A. Bridges

There are nine existing bridge structures along the RBB. Eight of the nine bridges are one-to-five span steel structures, while the viaduct structure in the south segment is a continuous 111-span steel structure. All have reinforced concrete decks supported by a steel multi-girder or girder-floorbeam framing systems. All were designed and built to carry railroad traffic, and are thus very robust structures that will easily carry the expected loads of a proposed greenway. All were built in the early part of the 20th century (from 1908 through 1924), making these structures at least over 90 years old. All have substructural reinforced concrete abutments and wingwalls that support the bridges and the embankments adjacent to the bridges. At the LIRR Montauk line, there is no bridge since the former wooden bridge collapsed long ago. A new bridge will be proposed at this location as part of this project.

The following is a description of each bridge, its structural configuration, dimensions, along with general photos.

1. Bridge over Fleet Street, BIN 7705660

This is a one-span, steel thru-girder with floorbeam framing system, with a 66’ span; 26’ wide.
2. Bridge over Yellowstone Boulevard, BIN 7705670

This is a five-span, steel multi-girder framing system, skewed, with 40’, 83’, 45’, 39’, 18’ spans; 26’ wide.

3. Bridge over Metropolitan Avenue, BIN 7705680

This is a three-span, steel thru-girder with floorbeam framing system, skewed, with 23’, 65’, 23’ spans; 20’ wide.
4. Bridges over Union Turnpike, two separate bridges, BiN 7705421 and 7705422

For 7705421, west bridge: a one-span, steel thru-girder with floorbeam framing system, skewed, with a 65’ span; 15’ wide. For 7705422, east bridge: a one-span, steel thru-girder with floorbeam framing system, skewed, with a 58’ span; 30’ wide.
5. **Bridge over Park Lane South, BIN 7705440**

This is a one-span, steel thru-girder with floorbeam framing system, skewed, with a 64’ span; 40.5’ wide.
6. Bridge over Jamaica Avenue, BIN 7705450
This is a one-span, steel thru-girder with floorbeam framing system, skewed, with a 70’ span; 26’ wide

7. Bridge over 91 Avenue, BIN 7705600
This is a one-span, steel thru-girder, with floorbeam framing system, with a 54’ span; 28’ wide.
8. **Bridge over Atlantic Avenue, BIN 7705610**

This is a four-span, steel thru-girder with floorbeam framing system, with 30’, 63’, 63’, 30’ spans; 52.5’ wide
9. Elevated Viaduct Structure from Rockaway Boulevard to 97th Ave.

This is a 111-span, steel thru-girder with floorbeam and multi-girder framing systems, typically 60’ wide. Span lengths vary as follows:

- Spans 1-4 are skewed, with 21’, 74’, 23’, 10’ lengths – over Rockaway Blvd.
- Spans 5-16 are 25’ long
- Spans 17-21 are skewed, with 24’, 20’, 47’, 20’, 18’ lengths – over Liberty Ave.
- Spans 22-51 are 25’ long
- Spans 52-55 are 19’, 43’, 19’, 21’ long – over 103 Ave.
- Spans 56-82 are 25’ long
- Spans 83-85 are 19’, 41’, 19’ long – over 101 Ave.
- Spans 86-108 are 25’ long
- Span 109-111 are 16’, 33’, 15’ long – over 97 Ave.

Rockaway Blvd. - General view of bridge

Rockaway Blvd. - General view of underside of deck at 74’ long span

Rockaway Blvd. - General view at top of deck
Liberty Ave. - General view of bridge

Liberty Ave. - General view of underside of deck of 47’ long span

Liberty Ave. - General view at top of deck

103 Ave. - General view of bridge

103 Ave. - General view of underside of deck of 41’ long span
103 Ave. - General view at top of deck

101 Ave. - General view of bridge
101 Ave. - General view of underside of deck

101 Ave. - General view at top of deck
B. Earthen Embankments

The earthen embankments along the RBB generally rise up to 20’-25’ high, with sides typically at 1 vertical-to-1.25 horizontal slope. Along the north segment between the north end and Metropolitan Ave., both sides slope down to neighboring backyards of residential properties. The horizontal width of the ROW in this area is quite wide and over 100’. Between Metropolitan Ave. and the LIRR Montauk line, both sides slope down to the neighboring lots of Home Depot and the Metropolitan Educational Campus. At the car wash on Metropolitan Ave., a low retaining wall cuts the slope along the west ROW. The horizontal width of the ROW in this area narrows somewhat to less than 100’.

Embankments resume again at the south end of Forest Park at Park Lane South and continue until Atlantic Ave. The horizontal width of the ROW in this central-southern segment is also narrower and less than 100’. Due to this narrower ROW, the slopes are slightly steeper, and are closer to a 1-to-1 ratio. Both sides generally slope down to neighboring streets and the backyards of residential properties.
Embankment – Typical view along north segment of RBB; backyard adjacent to ROW embankment slope (Selfridge St. & Olcott St.)

Embankment – Held by retaining wall along west ROW embankment slope (Car wash on Metropolitan Ave.)

Embankment – Typical view along north segment of RBB; embankment slope adjacent to Metropolitan Expedition Learning Schools campus

Embankment – Typical view along north segment of RBB; embankment slope adjacent to Home Depot lot

Embankment – Typical view along center segment of RBB; side slope along ROW embankment (90th Ave. betw. Jamaica & Atlantic Ave.)
C. Retaining Walls

There are only a few retaining walls that are assumed to be included as part of this project. The low-height masonry-block wall along the Metropolitan Ave. car wash was already mentioned above. At Union Tpke., there are two separate bridges with 15’ high concrete retaining walls between them, at both ends of the bridge (see Union Tpke. Bridge photos). Between Atlantic Ave. and 97th Ave. along the east ROW, there is a varying height concrete retaining wall (8’-to-12’ high) supporting the east-side slope of the RBB. This wall is approximately 875’ long, running along 100th Street.

At the south end of the RBB at Rockaway Blvd. bridge, the south abutment of the bridge and its adjacent concrete wingwalls also support the elevated rail line. This location is the end of this project, where the active NYCT elevated subway line merges with the RBB line. We assume the limits of this project ends with the wingwalls of the bridge’s south abutment; these wingwalls extend 15’ beyond the south abutment, after which retaining walls (assumed not to be part of this project) continue southward.

D. Station Structures

Along the entire length of the RBB, there are two remnants of former train stations with platforms. One is located at Atlantic Ave., formerly known as the Woodhaven Station, and the second is located between 101st Ave. and 103rd Ave., formerly known as the Ozone Park Station. This latter station was fairly long since the Ozone Park station was an important connection point when the rail lines were active.

The former station at Atlantic Ave. consists of two concrete platforms which, away from the five-span bridge, are supported by concrete piers founded into the earthen embankment below. These platforms still have their railings and lighting poles. The length of the platforms extend north and
south to 93rd Ave and 94th Ave., respectively, and is approximately 600’ long. Below on both the north and south ends of the bridge, the former street-level entrances and staircases connecting to the platforms above are currently fenced off, with the connection of the stairways to the platforms is blocked off with masonry block walls.

The former Ozone Park station located between 101 Ave. and 103 Ave. also has two flanking concrete platforms, and openings for stairways at the ends of each platform, though no stairways exist anymore. The unique feature along this stretch of structure is the artistic arch treatment along the side fascia of the platforms. These arches span from pier-to-pier of the steel viaduct structure, and are steel members encased in gunite.
E. Railroad Utility Structures

Along the length of the RBB, there still remain a number of utility structures. Operational structures such as signal trestles, posts, and electrical towers appear throughout the RBB. Some towers were observed to have fallen, but most are still standing.
III. Inspection Findings

A. Bridges

A general visual inspection was conducted at all bridge structures, with limited hands-on inspection at isolated locations as determined by the inspection team. Inspection was conducted to record typical and relevant conditions that should be considered for repair for the development of a rehabilitation program. Prior to inspection, the original contract bridge drawings were obtained and reviewed by the inspection team (see Appendix A for original drawings); these drawings were used for field inspection notes and forms, and new sketches were developed during the inspection as required (see Appendix B for field inspection notes).

The bridges' current conditions are generally all in fair-to-good condition, and we observed no structures that appear to need major structural rehabilitation work, such as a superstructure, substructure, or major structural component replacement. There are concerns relating to the elevated viaduct structure running from 97th Ave to Rockaway Blvd., and more discussion on this structure is made below. Most of our findings and recommended repairs will be to address potential cosmetic or safety hazard defects due to continued further deterioration, and not structural defects.

**Fleet St., Union Tpke., Park Lane South, Jamaica Ave., and 91st Ave.**

The structural condition of the bridges at Fleet St., Union Tpke., Park Lane South, Jamaica Ave., and 91st Ave. were all observed to be good. All exposed steel have lost their protective paint coatings, and exhibit light surface rusting and locations of isolated heavier corrosion that have no adverse structural implications. The underside of their concrete decks sounded solid when struck with a hammer, and generally is in good condition. This confirms our assessment that the decks at these bridges can be retained for future use.

**Deck.** Along the underdeck, at the interface edges between exposed steel girders and floorbeams with the concrete deck, the edge of concrete is typically broken and spalled. This is a result of past corrosion of steel at the interface and its rust expansion on neighboring thin portions of concrete, resulting in concrete breaking off. This can be seen in Photos 1 and 2. Similarly, there are numerous isolated locations where the steel bar reinforcement inside the deck and beam encasement is exposed; again, this is a result of past corrosion of the steel bars, which expand and force the thin cover of concrete over the bars to pop out, resulting in concrete spalls. This is shown in Photos 3 and 4. These defects are minor in significance; however, they cause small pieces of concrete debris to detach and possibly fall onto traffic below, representing potential safety hazards. As there was no observed signs of active or prolonged water infiltration at these defects, this corrosion is not believed to be caused by water leakage from above the deck, and instead it is due to exposure to moisture from below the deck. Our assessment is that the decks at these bridges can be maintained for future use.

![Photo 1](image-url) - Typical concrete spalling along edge interface between steel and concrete (photo from Fleet St.)
Due to these conditions, we recommend that the underside of the concrete decks be thoroughly sounded and cleaned to remove any delaminated concrete pieces at these bridges. We also recommend that all exposed steel be sandblasted and painted, including exposed steel reinforcement.

At Park Lane South and the 91st Ave. bridge, there are some light efflorescence formations along the edges of the bottom flanges of the thru-girders with minor active leakage, as evidenced by the formation of icicles noted during the inspection. These are symptoms of water infiltration into the deck from above. See Photo 5. These conditions, however, are isolated and not considered sufficiently significant and prevalent to warrant a corrective repair, which would require removal of the ballast, brick/concrete protection layers, and waterproofing layers above the deck to properly perform the repair.
Yellowstone Blvd., Metropolitan Ave., and Atlantic Ave.

The condition of the bridges at Yellowstone Blvd., Metropolitan Ave., and Atlantic Ave. were observed to be worse than the bridges at Fleet St., Union Tpke., Park Lane South, Jamaica Ave., and 91st Ave. Though the conditions of their steel framing appeared to be generally good, the underside of the deck exhibited spalling with exposed reinforcement bars as a common condition throughout the spans at Yellowstone Blvd. and Metropolitan Ave., with about 30% and 20% of the underside of deck area possessing this defect, respectively. The underside of decks did generally sound solid when struck with a hammer, and were observed to be in fair condition. Due to this, and no observed significant active leakage, our assessment is that the decks at these bridges can be retained for future use.

Deck. At Yellowstone Blvd., the underside of deck outside of the fascia girders exhibited more delaminated, hollow-sounding, and spalled concrete with exposed rebars. These appears to be the result of water exposure from the fascia, and the delaminated, hollow-sounding, and spalled concrete will need to be repaired. See Photos 6 and 7.

The underside of deck between fascia girders at Yellowstone Blvd., the entire underside of deck at Metropolitan Ave., and the underside of deck and platforms at Atlantic Ave. exhibit numerous areas where the steel bar reinforcement inside the deck is exposed; this is a result of past corrosion of the steel bars in combination with thin concrete cover over the bars or joint leakage, which results in concrete spalling off. This is shown in Photos 8-10.
Similar to what was observed at Fleet St., Union Tpke., Park Lane South, Jamaica Ave., and 91st Ave., the interface edges between exposed steel with the concrete deck along the underside of the concrete decks exhibited concrete edges that are broken and spalled.

Due to the above-described conditions, we recommend that the underside of the concrete decks be thoroughly sounded and cleaned to remove any delaminated concrete pieces at these bridges. We also recommend that all exposed steel be sandblasted and painted, including exposed steel reinforcement.
**Steel Substructure.** The base of steel columns at Yellowstone Blvd. exhibit corrosion and deterioration at their interface with concrete base encasements, which are broken due to the expansion of the column steel’s rust. See Photos 11 and 12. The corrosion results in loss of structural section and capacity for the steel column, though it is not at a level that causes structural concern. These defects should, however, be addressed so that further corrosion and loss of section is prevented. *Thus for Yellowstone Blvd., we recommend that all the column base concrete encasements be replaced, and the columns with significant section loss be reinforced.* The steel substructure at Metropolitan Ave. and Atlantic Ave. were generally observed to be in good condition.

![Photo 11 – Yellowstone Blvd. bridge, base of steel column is corroded, with base concrete encasement broken.](image)

![Photo 12 – Yellowstone Blvd. bridge, base of steel column corrosion.](image)

The eight bridges described above all have substructure consisting of concrete abutments and wingwalls, and three bridges (at Yellowstone, Metropolitan, and Atlantic) have steel pier columns/bents. These substructure elements were generally observed to be in good condition, with very minor defects, such as temperature/shrinkage cracking of the concrete substructure. The exposed steel piers have failed paint and light surface rusting, but are otherwise in good condition. *Sandblast cleaning and painting of the steel substructure elements is recommended.*

![Photo 13 – Concrete pylon above Atlantic Ave. bridge’s south abutment, east wingwall, with cracks and efflorescence.](image)
Elevated Viaduct Bridge from 97th Ave to Rockaway Blvd.

This steel bridge structure with concrete deck is 111 spans long and is mostly encased in concrete and/or gunite throughout its length. Our inspection revealed that while the underside of the structure was observed to be generally in good condition, the concrete edges of the bridge along the fascia were generally deteriorated, and exhibits prevalent cracking, signs of water leakage, efflorescence, and spalling throughout.

Deck Fascia. This fascia concrete is in poor condition for approximately 30% of the viaduct’s fascia length, with the remainder of the fascia length in better, but only fair condition. If left alone without repair or addressing, this fascia will continue to weather and deteriorate, and the concrete will continue to spall off. See Photos 14 thru 21.

Photo 14 - Typical deteriorated fascia concrete along viaduct structure with cracking and efflorescence.

Photo 15 - Typical spalling with exposed rebars along underside of fascia at viaduct structure.

Photo 16 - Typical heavy deterioration and spalling along fascia concrete at transverse joint locations along viaduct structure.

Photo 17 - Typical deterioration and broken fascia fascia concrete at transverse joint locations, viewed from above viaduct structure.
Due to the advanced deterioration of the fascia along 30% of the viaduct’s fascia’s length, we would recommend replacing and reconstructing this length of fascia, with the remaining 70% to receive rehabilitation through cleaning and sealing to protect the concrete surface and mitigate against future water exposure.

Deck Underside. Access to the underside of the bridge was generally restricted only to the spans crossing the streets (at 97 Ave., 101 Ave., 103 Ave., Liberty Ave., and Rockaway Blvd.), since most of the properties underneath the bridge are occupied by commercial entities and are closed off. We were able to look into several establishments to try to determine the condition of structure, and typically observed that the beam framing system is concrete encased throughout, and generally in very good condition.
The underside of deck at bridges crossing over 97 Ave., 101 Ave., 103 Ave., Liberty Ave., and Rockaway Blvd. are all similar to each other in that they typically consist of three-span structures with only the longer middle span comprised of thru-girders with transverse floorbeam framing. Their underside of deck conditions are also similar to the conditions observed at Yellowstone Blvd, Metropolitan Ave., and Atlantic Ave. in that while their steel framing appeared to be generally good, the underside of the deck exhibits spalling with exposed reinforcement bars as a common condition throughout the spans. Also, similar to what was observed at all other bridges, the interface edges between exposed steel with the concrete deck exhibited concrete edges that are broken and spalled. See Photos 22 to 26.

The underside of decks did generally sound solid when struck with a hammer, and were observed to be in fair condition. Due to this, and no observed significant active leakage, our assessment is that the decks at these bridges (at 97 Ave., 101 Ave., 103 Ave., Liberty Ave., and Rockaway Blvd.) can be retained for future use. We recommend that the underside of the concrete decks be thoroughly sounded and cleaned to remove any delaminated concrete pieces at these bridges. We also recommend that all exposed steel be sandblasted and painted, including exposed steel reinforcement.

Photo 22 – Spalling with exposed rebar in spans at 97 Ave.

Photo 23 – Spalling of concrete edges along exposed steel at 101 Ave.

Photo 24 – Spalling of beam encasement concrete due to thin cover over encasement rebar at 103 Ave.
Gunite on Steel Fascias and Substructural Steel. Along the entire length of the 111 spans of the viaduct, any exposed steel was covered in a 1.5” layer of gunite, or shotcrete, which is a mortar material. This gunite dates back to the structure’s original construction, and is found on the following structural components along the elevated viaduct:

- Fascia beams over the longer middle spans at the 97 Ave., 101 Ave., 103 Ave., Liberty Ave., and Rockaway Blvd. bridges
- Pier cap beams and columns for all piers in the 111-span viaduct
- All superstructure components supporting the platforms between 101 Ave. and 103 Ave., including the arched fascia beams

At the fascia beams over the longer middle spans at the 97 Ave., 101 Ave., 103 Ave., Liberty Ave., and Rockaway Blvd. bridges, the gunite is typically in fair condition, and still bonded to the steel girder it is covering. The worst condition was observed at Liberty Ave., where large pieces of the gunite were observed to be delaminated, and was easily removed by the inspection team. This gunite can easily fall onto the vehicular traffic below. See Photo 27.
The pier columns and capbeams at the 97 Ave., 101 Ave., 103 Ave., Liberty Ave., and Rockaway Blvd. bridge crossings were all observed to be in poor condition, with many locations of broken, spalled, and missing gunite. At these locations, the mesh and underlying steel structure is exposed. See Photos 28 to 30 for typical conditions.

In the spans between these street crossings, the general condition of the gunite on the pier substructure was observed to be much better. It should be noted again that we were only able to enter a few locations since most of the properties under the viaduct were closed off.

Between 101 Ave. and 103 Ave., the former station platform slabs are supported on pier cap beams and longitudinal arched beams along the fascia of the platforms. These supporting members are also encased in gunite, and in poor condition. See Photos 31 and 32.
The gunite in all the locations described above will continue to deteriorate and delaminate over time, resulting in future falling debris hazards for passing traffic below. We recommend that this gunite be removed in all these locations, which is a significant quantity of work. This will expose the steel that the gunite currently covers, which will need to be sandblasted and painted.

Platforms Slabs between 101 Ave. and 103 Ave. In contrast to the former station platform slabs at Atlantic Avenue, which were inspected to be in good condition, the platforms slabs between 101 Ave. and 103 Ave. are in very poor condition. Along the entire RBB, these members are the only ones whose structural condition is suspect and cannot be relied on. The slabs exhibit prevalent cracking and efflorescence throughout its underside, many locations where holes have developed, revealing the slab reinforcement. We recommend that these slabs cannot be retained and should be removed. See Photos 32 to 34.

Expansion Joints. There are 22 transverse expansion joints located within the 111-span viaduct structure, typically located at every fifth pier. While walking along the top of the viaduct, we observed several locations where the sliding steel plate expansion joint had been uncovered and exposed, with surrounding ballast and fill excavated, and appear to have been sealed with roofing tar and sealer. This suggests that someone in the recent past performed this work to prevent leakage of water through the joint and into the structure below. Since there was no uniformity in the work done at several joints, we believe that the occupants of each property below the joint took liberty to perform this work. At the one location below the deck where we were able to access...
an expansion joint, we did observe water leakage through the joint. Thus, we recommend that rehabilitation all expansion joints along the viaduct be performed to mitigate against water leakage into the structure below. See Photos 35 to 36.

**Railings.** Railings along the fascia are missing along the entire length of the viaduct. Previous railing posts’ anchors can be seen in the existing concrete; thus, the railings have been removed. See Photo 17. *We recommend that these railings be replaced.* (Replacement and/or installation of railings are also required at Atlantic Ave. and Yellowstone Blvd.).

**Miscellaneous Conditions.** At Pier 81, we observed the steel pier cap beam to be inappropriately cut for \(\frac{3}{4}\) of its depth. See Photo 37. It appears that this was done to create vertical clearance underneath the structure for the occupants below. Since there is no live load on the structure, there is sufficient capacity to support existing dead loads, as there is no observed structural distress. *However, we recommend that this cap beam must be repaired.* With limited access to the underside of the structure due to closed commercial properties, we observed no other similar conditions, and assume no other locations such as this exist along the viaduct.

**Photo 35** – View along top of expansion joint; note ballast has been excavated from joint.

**Photo 36** – View along top of expansion joint; note ballast has been excavated from joint.

**Photo 37** – Pier 81 cap beam is inappropriately cut. Note deck expansion joint above this cap beam.
B. Earthen Embankments

The earthen embankments exist along the following stretches of the RBB:
- Along the north segment, between the north end and the LIRR Montauk line
- From the south end of Forest Park at Park Lane South to 97 Ave.

In general, the structure, slope, and stability of the earthen embankments along the RBB were observed to be satisfactory, and no significant conditions that require correction being noted. Any rehabilitation program will need to consider effects of any proposed landscaping, walls, drainage, runoff, and erosion, especially if significant clearing of existing trees, plants, and root systems are planned.

C. Retaining Walls

There retaining walls that are assumed to be included as part of this project are:
- The low-height masonry-block wall along the Metropolitan Ave. car wash
- At Union Tpke., the concrete retaining walls between the two bridges and the wingwalls flanking each bridge
- Between Atlantic Ave. and 97th Ave. along the east ROW, the varying height concrete retaining wall supporting the east side slope of the RBB. This wall is approximately 875’ long, running along 100th Street.

The low-height masonry-block wall at the Metropolitan Ave. car wash and the walls at the Union Tpke. bridges are in good condition, and do not exhibit any significant conditions worth noting.

At the varying height concrete retaining wall between Atlantic Ave. and 97th Ave. along the east ROW, the wall is in fair condition and exhibits some defects that indicate future problems may develop. This wall varies from 8’ to 12’ high along its length, and supports significant surcharge loading from the sloped embankment of the RBB behind it, especially at the north end near Atlantic Ave., where additional fill and debris were previously deposited onto the railway, and reaches several feet above the elevation of the adjacent platform slabs. See Photo 38. This retaining wall shows horizontal cracking along for approximately 50% of its 875’ length, and a couple of locations where water is seeping through the cracks, causing localized spalling in the wall. See Photos 39 to 41. No weepholes were observed along the length of the wall, suggesting that hydrostatic pressure behind the wall will cause additional loading onto the wall. The wall was generally observed to be vertically plumb. We recommend that continue monitoring of the wall be done, and future rehabilitation of this wall may need to be considered.
At the south end of the project limits, at the Rockaway Blvd. bridge, the south abutment of the bridge and its adjacent concrete wingwalls and retaining walls also support the elevated rail line. We assume the limits of this project ends with the wingwalls that are adjacent to the bridge’s south abutment; these wingwalls extend 15’ beyond the south abutment, after which retaining walls continue south. The abutment wingwalls are in fair condition; however, the retaining walls continuing south are in poor condition, especially along the east side on 100 St., where prevalent horizontal cracking with efflorescence exists throughout its 20’ height. See Photo 42.
D. Station Structures

Station structures consist of the two remnants of former train stations with platforms. One is located at Atlantic Ave., formerly known as the Woodhaven Station, and the second is located between 101st Ave. and 103rd Ave., formerly known as the Ozone Park Station.

The former station at Atlantic Ave. consists of two concrete platforms which, away from the five-span bridge, are supported by concrete piers founded into the earthen embankment below. The length of the platforms extend north and south to 93rd Ave and 94th Ave., respectively, and is approximately 600' long. Below on both the north and south ends of the bridge, the former street-level entrances and staircases connecting to the platforms above are currently fenced off, with the connection of the stairways to the platforms blocked off with concrete block walls. The platform slabs and supporting structure throughout this station were observed to be in fair condition, and can be retained. The platform reinforced concrete slab structure exhibits numerous locations of spalled concrete with exposed rebars, as does the substructural piers. See Photos 39, 43, and 44.

We recommend that this project determine if these platforms and their substructural components will be retained and used in the future. If so, then their rehabilitation should be included, which would consist of general concrete spall repair.

The conditions of the platforms along the former Ozone Park station (between 101st Ave. and 103rd Ave.) were discussed previously under the inspection findings for the Elevated Viaduct Bridge. These platforms are in very poor condition and should be removed.

E. Railroad Utility Structures

The many steel utility structures along the length of the RBB were observed to be in good condition. They are all unpainted and exhibit surface rust. It is not likely that these structures will need any rehabilitation work, since they have no structural function.
IV. Recommendations

Throughout the preceding Inspection Findings section, we described the findings and observed defects, and generally provided recommendations for proposed work in *italics* under each subsection. The following is a summary of the recommendations.

A. Bridges

**Fleet St., Union Tpke., Park Lane South, Jamaica Ave., and 91st Ave.**

*Deck.* We recommend that the underside of the concrete decks be thoroughly sounded and cleaned to remove any delaminated concrete pieces at these bridges. We also recommend that all exposed steel be sandblasted and painted, including exposed steel reinforcement.

**Yellowstone Blvd., Metropolitan Ave., and Atlantic Ave.**

*Deck.* We recommend that the underside of the concrete decks be thoroughly sounded and cleaned to remove any delaminated concrete pieces at these bridges. We also recommend that all exposed steel be sandblasted and painted, including exposed steel reinforcement.

*Steel Substructure.* At Yellowstone Blvd., we recommend that all the column base concrete encasements be replaced, and the columns with section loss be reinforced. For all three bridges, and blast cleaning and painting of the steel substructure elements is recommended.

**Elevated Viaduct Bridge from 97th Ave to Rockaway Blvd.**

*Deck Fascia.* Due to the advanced deterioration of the fascia along 30% of the viaduct’s fascia’s length, we would recommend replacing and reconstructing this length of fascia, with the remaining 70% to receive rehabilitation through cleaning and sealing to protect the concrete surface and mitigate against future water exposure.

*Deck Underside at bridges crossing over 97 Ave., 101 Ave., 103 Ave., Liberty Ave., and Rockaway Blvd.* We recommend that the underside of the concrete decks be thoroughly sounded and cleaned to remove any delaminated concrete pieces at these bridges. We also recommend that all exposed steel be sandblasted and painted, including exposed steel reinforcement.

*Gunite on Steel Fascias and Substructural Steel.* We recommend that gunite be removed along all locations that it exists. This will expose the steel that it currently covers, which will need to be sandblasted and painted.

*Platforms Slabs between 101 Ave. and 103 Ave.* We recommend that the platforms slabs be removed.

*Expansion Joints.* We recommend that rehabilitation all expansion joints along the viaduct be performed to mitigate against water leakage into the structure below.

*Railings.* We recommend that the railings be replaced. (Railings are also required at Atlantic Ave. and Yellowstone Blvd.).

*Miscellaneous Conditions.* We recommend that the cut cap beam at Pier 81 be repaired.
B. **Earthen Embankments**

We have no recommendations for work along the earthen embankments.

C. **Retaining Walls**

At the varying height concrete retaining wall between Atlantic Ave. and 97th Ave. along the east ROW, we recommend that continue monitoring of the wall be done.

D. **Station Structures**

For the former station at Atlantic Ave., we recommend that this project determine if these platforms and their substructural components will be retained and used in the future. If so, then their rehabilitation should be included.

For the former Ozone Park station (between 101st Ave. and 103rd Ave.), the platforms are in very poor condition and should be removed.

E. **Railroad Utility Structures**

We have no recommendations for work for the railroad utility structures.

It is recognized that funding for this project may be limited, and the project team may be forced to proposed only a limited number of recommendations for work to limit costs. Thus, the following two categories are presented to help the project team prioritize the recommended work, and identify those items of work that MUST be done, vs. work that we consider SHOULD be done, as evaluated from a structural and safety point of view.

1. **Defects that MUST be repaired, rehabilitated, or removed.**
   a. These can be structural defects that reduce the critical section of a structural member which, if allowed to continue deteriorating, will reduce its capacity to carry loads. Examples:
      i. Base of column section loss at Yellowstone Blvd, and replacement of column base concrete covers
   b. These can be non-structural defects of members that are so deteriorated that we cannot leave them alone. These defects, if allowed to continue deteriorating, may result in falling debris and safety hazards. Examples:
      i. Concrete deck/fascia along the elevated viaduct spans
      ii. Side platforms slabs between 101 Ave. and 103 Ave.
      iii. Gunite along the fascia arches below platforms between 101 Ave. and 103 Ave.
      iv. Deteriorated gunite on fascia girders and substructure at 97 Ave, 101 Ave, 103 Ave, Liberty Ave, Rockaway Blvd bridges
      v. Severely deteriorate concrete substructure

2. **Defects that SHOULD be repaired, rehabilitated, or removed.**
   a. These can be non-structural deterioration or deficiencies that are located in prominent visible locations that everyone would agree should be addressed. Examples:
      i. Blast cleaning of existing steel bridge structure, and repainting
      ii. Concrete abutment and wingwall spalling, scaling, cracking, efflorescence
      iii. Railings
Appendix A

Original Drawings/Sketches of Bridge Structures
Original Drawings/Sketches

for

Fleet Street Bridge
Original Drawings/Sketches
for
Yellowstone Boulevard Bridge
Original Drawings/Sketches
for
Union Turnpike Bridges
UNION TURNPIKE (WEST BRIDGE)
BIN - 7705421

TO ROCKAWAY

BEARING (TYP)

G14

42"

21"

15"

65'

L = VERTICAL STIFFENER
FLOORBEAM TO FLOORBEAM c/c = 21"
GIRDER TO GIRDER c/c = 15"
# FLOOR BEAM

TO L.I. CITY

FRAMING PLAN
(CNT5)
UNION TURNPIKE (EAST BRIDGE)
BIN: 7705422

TO ROCKAWAY

42"

TO L.I. CITY

BEARING (TYP)

G1

G2

G3

L = VERTICAL STIFFENER  C/C = 42"

FLOOR BEAM  C/C = 21"

GIRDER TO GIRDING  C/C = 15'

FRAMING PLAN
(NTS)
Elev - Looking East
Bridge 1
Original Drawings/Sketches
for
Park Lane South Bridge
PARK LANE SO.
BIN - 7705440

TO ROCKAWAY

TO L.I. CITY

52'

G1

G2

G3

G4

L = VERTICAL STIFFENER C/C = 52"

FRAMING PLAN
(NTS)

SECTION - A-A

DATE: 12/13/13
NOTES:

1. TOTAL 50' LX 1' DX 2'-8" W SURFACE SPALL, CRACK WITH
   EFFLORESCENCE NOTED AT ALONG THE GIRDER.

2. FEW SURFACE SPALL ( < 5% DECK AREA) NOTED
   BETWEEN THE FB'S.

3. FH (13'H) X 1/2" W CR. NOTED AT END ABUT UNDER
   LEFT FASCIA GIRDER.

ELEV. LOOKING EAST

* BRIDGE POSTED VERTICAL CLEARANCE FOR 12'-8"
NOTE: AT END ABUT. UNDER LEFT SIDE FASCIA GIRDER
FH (18') x 1/8" WIDE CRACK

AT BEGIN ABUT.
Original Drawings/Sketches
for
Jamaica Avenue Bridge
Original Drawings/Sketches
for
91 Avenue Bridge
Original Drawings/Sketches
for
Atlantic Avenue Bridge
Original Drawings/Sketches
for
Elevated Viaduct Bridge Spans
Appendix B

Inspection Field Notes
Inspection Field Notes
for
Fleet Street Bridge
Inspection Field Notes

for

Yellowstone Boulevard Bridge
Due to water leakage
Gusset H: 307.5L
at connection
L 80% SL 50% SL

Rivet spacing to be so arranged that
an additional track may be added
in future at each side of bridge

All laterals 14.375

Active water leakage
Due to spall &
Exposed rebar

Stringer Schedule

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Grade Top of Concrete 97.3%

Ele Bridge seat 357.34

Expansion Joint

Clearance Line

Elevation

BEG.
ABOUT

Pier 1

Yellowstone Ave.

D.O. NORTH

General Plain

Ele Top of Rail 364.90

Ele Top of Concrete 363.10 at L

Ele 3.32' 361.79

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+ **TOTAL**: 90 SF
Inspection Field Notes
for
Metropolitan Avenue Bridge
Inspection Field Notes
for
Union Turnpike Bridges
UNION TURNPIKE (WEST BRIDGE)
BIN - 7705421

TO ROCKAWAY

BEARING (TYP)

BEGIN ABOUT

42"

21"

15"

65'

L = VERTICAL STIFFENER
FLOORBEAM TO FLOORBEAM c/c = 21"
GIRDER TO GIRDER c/c = 15"
¢ FLOOR BEAM 

TO L.I. CITY

FRAMING PLAN (NTS)
UNION TURNPIKE (EAST BRIDGE)
BIN: 7705422

TO ROCKAWAY

BEARING (TYP)

TO L.I. CITY

G1

G2

G3

L = VERTICAL STIFFENER C/C = 42"

FLOOR BEAM C/C = 21"

GIRDER TO GIRDER C/C = 15'

FRAMING PLAN

(NTS)
Note: No. & Spacing to transverse beams are shown incorrectly. (More beams spaced closer together.)

1. 50% underside area of each bridge have surface spall, no exposed rebars, all spall mostly along the FB's.
SECTION THRU BRIDGE 2

Floor Beam 19" x 400"
ELEV. LOOKING EAST

BRIDGE-2
Inspection Field Notes
for
Park Lane South Bridge
NOTES:

1. Total 50'L x 1'D x 2'-4" W surface spall, crack with efflorescence noted at along the girders.
2. Few surface spall (< 5\% deck area) noted between the FB's.
3. FH (13'1H) at ½" W cr. noted at end abut under left fascia girder.

ELEV. LOOKING EAST

* Bridge posted vertical clearance for 12'-8"
Inspection Field Notes
for
Jamaica Avenue Bridge
EDGE SPALL
2' L x 3' H

CORNER SPALL + H. S. AREA
4' L x 6' H

JAMAICA AVE

BEGIN ABUT.

1 - 6' (FH) x 2' - 3' W OR ON BLOCK PAVERS WALL, 10' FROM CORNER

2 - 13" FROM CORNER OR CRAWL (2'1" W BLOCK WALL 3' 1"W X 7' 1/2" H CRAWL 5' 1/2" WINGWALL

Front Elev. Of West Abutment
Scale 1/10

Front Elev. Of East Abutment
Scale 1/10
Inspection Field Notes
for
91 Avenue Bridge
END ABUTMENT

FLOOR FRAME 14'6" X 41"
(1/10 cts. unless noted)

PLATE x 41" x 9"

NOTE: 5 to 7 ft. of GNL. AREA w/Surface SMALL (1/2"
AND SCALING (NO EXPOSED REDAR)

GRAFFITI ON RIS GIRDER (FASCIA)
SECTION THRU BRIDGE — LOOKING NORTH
ELEVATION - LOOKING EAST
SPAN 1

N.W. ORIENTATION

C/C FB's = 23 1/2"
FB (bf) = 10' W

Grade = 0.21%

S' 10' C/O

BEGIN ABUT.

END ABUTMENT

Level BLK. E1. 55.31

ni 55.07 GC

EX. 156.00

Slope of H.P. Protection Slope

Top of H.P. Protection Slope

Fixed

End Note

Scale 1" = 10'

East Abut
PLAN OF WEST ABUTMENT

-looking to Rockaway
-looking to L.I. City

Symmetrical about 63rd Ave.

BEGIN ABUTMENT
END

15 SF Honeycomb on E.A.

Bim re at BA (Painted over)

Top of Roll: EL 58.817 (East Abut) EL 58.739 (West Abut)

Top of Backwall: EL 55.437

Bridge Seat: EL 54.082

Scarcity

Face Bar: 1 x 12 ac Bathrooms

Existing Sidewalk 2

North W/W for EA

South W/W for BA

5' x 2' H x 1' D Surface Spall

L5' x 1'H x 1' D Surface Spall
Inspection Field Notes

for

Atlantic Avenue Bridge
NOTE: Underside Deck under track (BEAK GIRDERS) generally in good condition. Few surface spalls noted (≤5% of deck).
NOTE:
1. AT PIER - 2 ALL COLUMNS, CHANNELS HAVE 25% THICKNESS LOSS FOR 2" H. (JUST ABOVE ENGAGEMENT)
2. PIER 1 & 3 ARE OK.

SECTION AT BENTS
LOOKING NORTH
Scale 1/10"
Inspection Field Notes

for

Elevated Viaduct – 97 Avenue Bridge
97TH AVE.

LEFT ELEVATION - (NTS)

SPAN-111 (15')  SPAN-110 (33')  SPAN-109 (16')

CONC. PARAPET

CONC. BEAM

SIDEWALK

13'-10"

STEEL ENCASED COLUMN (TYP.)

CONC. PARAPET

CONC. BEAM

SIDEWALK
97TH AVE.

**Diagram:**
- **MAP CRACKING** w/efflorescence
- **SPOAL ½ LOOSE PATCH AREA**
- **TEMP. SHORING (STEEL COLL. SUPPORT X TYP.)**
- **EDGE SPALL**
- **ACTIVE WATER LEAKAGE**

**END ABUTMENT (NTS)**

**E - EFFLORESCENCE AREA.**
LEGEND:  
- SMALL W/EXIT REBARS  
- EFFLO  
- X-Y-Z-Y-X MISSING, BOTTOM ENCASEMENT  
- CRACK  
- CRACK W/EFFLO  

TO ROCKAWAY  

\[ \begin{align*} 
\text{SPAN - 109} & : 16' \text{ at P-109} \\
\text{SPAN - 110} & : 33' \text{ at P-110} \\
\text{SPAN - 111} & : 15' \text{ active water leakage} \\
\end{align*} \]

12-18's, B.F.: 12" x 3\frac{1}{8}"  

6'-7" to 7'-6" beam with 6" spa & 8" x 8" rebars up to 2' D  

SLAB  

BUILT-UP GIRDER (TYP.)  
B.F. = 14" W  

COLUMN: 18" x 15" W/ENCASEMENT  
= 15" x 15" W/O  

END AQUITMENT  

WEIDLINGER ASSOCIATES INC  
CONCRETE ENGINEERS  

07TH AVE  

TO L.I. CITY  

\[ \begin{align*} 
\text{ACTIVE WATER LEAKAGE} \\
\text{END AQUITMENT} \\
\end{align*} \]
Inspection Field Notes

for

Elevated Viaduct – 101 Avenue Bridge
101ST AVE.

ARCH PLATFORM
END ON BOTH SIDE

OLD BILL BOARD
ON BOTH FASCIA
COVERING GIRDER

FULL HEIGHT X 1.5' W SPALL
ON LEFT FASCIA

PARAPET

STEEL GIRDER 5'

CONC. PARAPET

BEAM

WALL

SIDEWALK

SPAN-85 (19')

SPAN-84 (41')

SPAN-83 (19')

LEFT ELEVATION (NTS)
Inspection Field Notes
for
Elevated Viaduct – 103 Avenue Bridge
**ARCH PLATFORM**

Start on both side

**RIGHTSIDE PARAPET**

Push out by 4" x 10' L

---

**SPAN 54 (19')**

**SPAN 53 (43')**

**SPAN 52 (19')**

---

**NOTE:** Span 49-51 are parking lot and generally in OK condition.

**LEFT ELEVATION (NTS)**
NOTE:

1. About 10-15% delaminated conc. area noted in all three spans.

2. Spall on vertical face of fb's (0.2 to 0.3" x 3/4") about 50 on each span.

---

COLUMN: 18" x 18"

LEGEND:

- CR. W/efflo.
- Spall w/efflo. rebar
- Spall w/ezp. rebar
- Exp rebar (4'')

FRAMING PLAN

(NTS)
Inspection Field Notes
for
Elevated Viaduct – Liberty Avenue Bridge
LIBERTY AVE.

12/18/13

SPAN 18 5/20: BOTTOM STEEL 14"x11/2", 27" H CONCRETE

SPAN 19: GIRDER: 5'x12' W (6"x6" ANGLE)

FD'S: b'= 12" W C/C = 31"
SLAB WIDTH: 31"

1STF

CORE SAMPLE 1STF (TY)

SPAN 2 WALL AND SPALLING

ABOUT 10% OF UNDERSIDE DECK

1SF

SPAN 2 WALL AND SPALLING

W/EXP. REBAR, SURFACE

1SF

7 1SF

JOINT

1X1' HOLE

1STF EA.

SCUPPER

CORNER SPALL 2"X1W

SPAN 18 20'

SPAN 19 47'

SPAN 20 20'

N TO LT. CITY
LIBERTY AVE

SPAN: 20 (20')
SPAN: 19 (47')
SPAN: 18 (20')

18 16 14 12 10 8 6 4 2

LEFT ELEVATION
(NTS)

CONC. GIRDERS
CONC. PARAPET
Inspection Field Notes

for

Elevated Viaduct – Rockaway Boulevard Bridge
Note:
1. Span 2 - Underside deck with about 25' 20' 30' SF scalal with exp. repair (1 1/2") add.
2. Bill board on right fascia.
3. Span 3, at P 2 - Right parapet 5' x 3' to 4' push out.

[Diagram with various spans, measurements, and annotations]