

Monmouth County Three Bridges
Green Avenue over Debbie's Creek (Bridge W-7)
Fisk Avenue Culvert over Glimmer Glass (Structure W-8)
Monmouth County Bridge W-9 carrying Brielle Road over the
Glimmer Glass (Structure #13000W9)(Glimmer Glass Bridge)

Borough of Manasquan and Borough of Brielle
Monmouth County, New Jersey

DRAFT
ENVIRONMENTAL ASSESSMENT AND
PROGRAMMATIC SECTION 4(f) EVALUATION

US Department of Transportation
Federal Highway Administration
New Jersey Department of Transportation and
County of Monmouth

Submitted Pursuant to 42 U.S.C. 4332 (2) (c),
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October 2026

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APPENDICES

Appendix A – *Technical Environmental Report*. September 2026.

Appendix B – *Alternatives Analysis Report, Monmouth County Three Bridges, Bridge W-7, Structure W-8 & Bridge W-9*. November 30, 2021 (Revised September 16, 2022). Prepared by Mott MacDonald.

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1.0 EXECUTIVE SUMMARY

Monmouth County has identified three structures on connecting roadways that need replacement due to their current condition: Green Avenue Bridge over Debbie's Creek (Bridge W-7); Fisk Avenue Culvert over Glimmer Glass (Structure W-8); and Monmouth County Bridge W-9 carrying Brielle Road over the Glimmer Glass (Structure #13000W9) (Glimmer Glass Bridge). The structures are located at the border between the Boroughs of Brielle and Manasquan. The waterways crossed by the structures are part of the Manasquan River estuary. The project location is shown in Figure 1.

Action is required to enable continued use of these crossings and their associated approach roadways in a safe, efficient, and cost-effective manner. A detailed alternatives analysis (refer to Appendix B) was conducted under the direction of Monmouth County and the New Jersey Department of Transportation (NJDOT) for each of the three crossings (Mott MacDonald, 2022). Based on the analysis, the County proposes to replace all three structures to meet current safety, structural, and geometric standards and enable their continued use as a coastal evacuation route. The County proposes that Green Avenue Bridge over Debbie's Creek (Bridge W-7) be replaced with a new wider bridge, Fisk Avenue Culvert over Glimmer Glass (Structure W-8) be replaced with a new reinforced concrete pipe culvert, and Monmouth County Bridge W-9 carrying Brielle Road over The Glimmer Glass (Structure #13000W9) (Glimmer Glass Bridge) be replaced with a new, wider structure that both mechanically functions like and resembles the existing historic structure. This project is in the Scoping Phase and following a project delivery process that will advance directly to the Final Design Phase upon completion of the Scoping Phase.

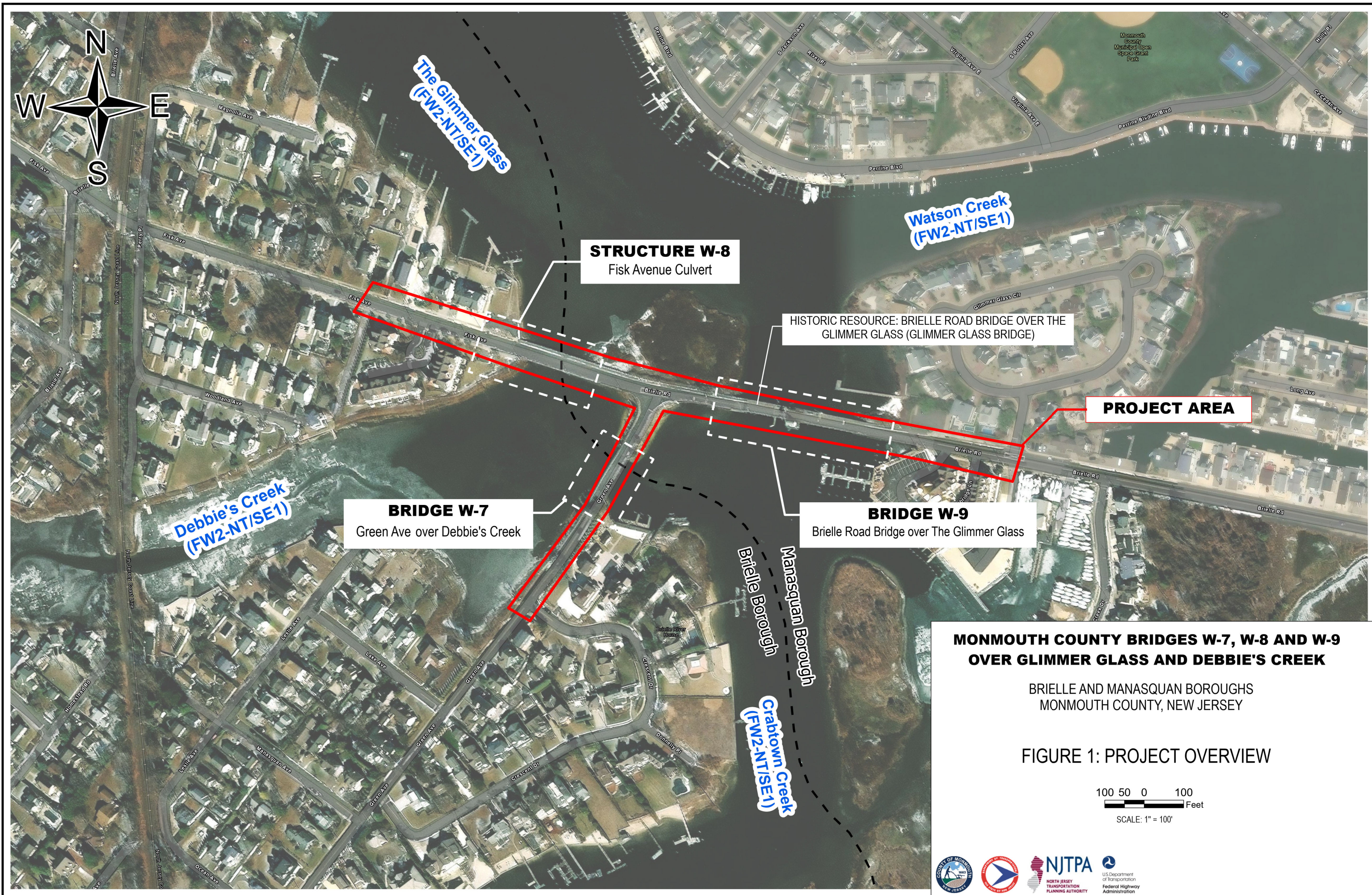
The purpose of an Environmental Assessment (EA) is to determine whether a federal action has the potential to cause significant environmental impacts. This EA has been prepared for the Federal Highway Administration (FHWA), the lead Federal Agency, in consultation with New Jersey Department of Transportation (NJDOT), New Jersey Transportation Planning Authority (NJTPA) (Project sponsor), and Monmouth County (Project Applicant) in compliance with the National Environmental Policy Act (NEPA). For this project, the NEPA procedures adopted by the Federal Highway Administration (FHWA) have been followed in accordance with the project type and Federal funding source. As such, the EA includes a discussion of the project's purpose and need; considered alternatives; environmental impacts of the proposed action; and agencies, organizations, and persons consulted.

Based on the findings discussed herein, the FHWA may take one of the following actions:

- Issue a Finding of No Significant Impact (FONSI). A FONSI is a document that is issued if an agency determines that the proposed action will not have significant environmental impacts. A FONSI would present the reasons why the agency has concluded that no significant environmental impacts are projected to occur upon implementation of the action.
- Order the preparation of an Environmental Impact Statement (EIS) if the EA determines that the environmental impacts of the proposed Federal action will be significant.

Cooperating Agencies are defined by 40 CFR 1508.5 as any Federal agency, other than a lead agency, that has jurisdiction by law or special expertise regarding any environmental impact involved in a proposed project or project alternative. The federal agencies that accepted Cooperating Agency status include:

- National Oceanic and Atmospheric Administration (NOAA)
- United States Army Corps of Engineers (USACE)
- United States Coast Guard (USCG)



STRUCTURE W-8
Fisk Avenue Culvert

HISTORIC RESOURCE: BRIELLE ROAD BRIDGE OVER THE GLIMMER GLASS (GLIMMER GLASS BRIDGE)

PROJECT AREA

BRIDGE W-7
Green Ave over Debbie's Creek

BRIDGE W-9
Brielle Road Bridge over The Glimmer Glass

**MONMOUTH COUNTY BRIDGES W-7, W-8 AND W-9
OVER GLIMMER GLASS AND DEBBIE'S CREEK**

BRIELLE AND MANASQUAN BOROUGH
MONMOUTH COUNTY, NEW JERSEY

FIGURE 1: PROJECT OVERVIEW

100 50 0 100
Feet
SCALE: 1" = 100'

2.0 EXISTING FACILITIES

The Green Avenue Bridge over Debbie’s Creek (Bridge W-7), the Fisk Avenue Culvert over Glimmer Glass (Structure W-8), and Monmouth County Bridge W-9 carrying Brielle Road over the Glimmer Glass (Structure #13000W9)) (Glimmer Glass Bridge) serve as the primary link for commercial, recreational, and emergency response vehicles, as well as bicyclists and pedestrians, between the Boroughs of Manasquan and Brielle. The conditions of each structure have deteriorated such that emergency repair action and closure of the bridges to truck traffic have been necessary. For ease of reference, the three structures are identified as Bridge W-7, Structure W-8, and Bridge W-9 throughout the remainder of this document.

The replacement of all three structures is being investigated as a single project due to the close proximity of the structures and their overlapping approach geometries. Improvements would likely include the entire area along Brielle Road/Fisk Avenue stretching from approximately 200 feet west of Structure W-8 to 200 feet east of Bridge W-9, as well as Green Avenue from the intersection with Brielle Road south to the intersection with Crescent Drive. The evaluation of the existing facilities and scoping have been conducted by engineers and other specialists from Mott MacDonald in close coordination with Monmouth County Engineering and NJDOT. The *Alternatives Analysis Report* is included in Appendix B of this EA. Information from that report is utilized in this section.

Structure W-8 and Bridge W-9 are part of a designated and signed coastal evacuation route established by the Manasquan Office of Emergency Management. However, their usage as such is restricted by current load restrictions on Bridge W-9. The three roadways in the project area form a “T” intersection, with Fisk Avenue and Brielle Road comprising the flange of the “T” (east/west direction) and Green Avenue being the stem (north/south direction). Fisk Avenue and Brielle Road are functionally classified by the NJDOT as urban major collector roadways. Green Avenue is functionally classified as an urban local roadway. All three roads have a posted speed limit of 25 mph.

Manasquan Borough has a full-time resident population of approximately 5,880 (2023). Seasonal residents and daily beach visitors swell these numbers dramatically during the summer season. Populations and documented beach visitor numbers are listed in Table 1 below.

Table 1. Approximate Population and Seasonal Visitors in Manasquan, NJ

Full-time population (approximate)	5,880
Seasonal population (approximate)	5,924
Daily beach wristbands sold for 2025 season	66,517
Season beach badges sold for 2025 season	19,329

Source: Manasquan Borough Beach Department 2025 Beach Report
(https://www.manasquan-nj.gov/sites/g/files/vyhlif831/f/uploads/4761_001.pdf)

A sizable percentage of this population is concentrated in the low lying southeastern beachfront area confined by the Atlantic Ocean to the east, Manasquan Inlet to the south, and Watson Creek to the west. This area contains close to a thousand residential structures and many small businesses, a mile of ocean front beaches, and over 1,000 feet of inlet bulkhead. It also includes the 55-acre Fisherman’s Cove Conservation Area, a part of the Monmouth County Park System. In addition, several hundred boats are berthed upstream of Bridge W-9 in the Glimmer Glass. The entire sector is inundated within the 100-year storm limits, and tidal flooding is common, sometimes necessitating evacuation. Brielle Road/Fisk Avenue is one of only three vehicular access/egress routes for the peninsula and has therefore been designated as a Coastal Evacuation Route by the Manasquan Office of Emergency Management.

Brielle Borough has a full-time resident population of approximately 4,900 within its area of 1.8 square miles (2023). The Borough does not maintain statistics on seasonal population, but reports that Brielle experiences a very low change in seasonal population numbers. The borough has no ocean frontage but has almost 4 miles of frontage on the Manasquan River, Debbie's Creek, and the Glimmer Glass. Very little vacant undeveloped land remains within the community. Primarily a residential community, the main industry is tied to the waterfront. Brielle's marinas host more than 200 commercial and charter fishing boats. The waterfront areas are subject to flooding from the 100-year storm as well as tidal flooding. For the Glimmer Glass and Debbie's Creek waterfront areas, Fisk Avenue serves as a connector to Route 71, which is designated as an emergency evacuation route by the NJ State Police.

Conditions and Substandard Features Background and Definitions

The condition of the existing bridges and culvert described herein is based on the most recent available National Bridge Inspection Standards (NBIS) bridge survey re-evaluation reports (see Appendix D), which include Cycle 19 (May 2023) for Bridge W-7; Cycle 2 (November 2022) for Structure W-8; and Cycle 20 (June 2023) for Bridge W-9 and supplemented by other available data including field observations. These bridge survey reports and associated inspections are conducted on a biennial basis, in accordance with Federal Highway Administration (FHWA) policies. The procedure includes the assignment of a numerical condition evaluation for various elements on a scale of 0 to 9, with each value defined as follows:

- 9 Excellent Condition
- 8 Very Good Condition – No problems noted.
- 7 Good Condition – Some minor problems noted.
- 6 Satisfactory Condition – Structural elements show some minor deterioration.
- 5 Fair Condition – All primary structural elements are sound but may have minor section loss, cracking, spalling or scour.
- 4 Poor Condition – Advanced section loss, deterioration, spalling or scour.
- 3 Serious Condition – Loss of section, deterioration, spalling or scour have seriously affected primary structural components. Local failures are possible. Fatigue cracks in steel or shear cracks in concrete may be present.
- 2 Critical Condition – Advanced deterioration of primary structural elements. Fatigue cracks in steel or shear cracks in concrete may be present or scour may have removed substructure support. Unless closely monitored, it may be necessary to close.
- 1 Imminent Failure Condition – Major deterioration or section loss present in critical structural components or obvious vertical or horizontal movement affecting structure stability. Bridge is closed to traffic but corrective action may put it back into light service.
- 0 Failed Condition – Out of service. Beyond corrective action.

The load carrying capacity, or rating, of the structure, is also calculated and is factored into the overall evaluation. When utilizing either the Load Factor Rating (LFR) or the Allowable Stress Rating (ASR) methodologies, highway structures are rated at two load carrying capacity levels; the upper load level or Operating Rating and the lower load level or Inventory Rating. Operating and Inventory Ratings are defined as follows: Operating Rating – the maximum permissible load level to which the structure may be subjected due to truck loads and Inventory Rating – the load level which can safely utilize the structure for an indefinite period of time.

Rating calculations are performed based on the as-inspected condition or assigned based on engineering judgement for several legal load types. In New Jersey, if the Operating Ratings are calculated or judged to be lower than the legal weights for truck types 3, 3S2, or 3-3 (refer to Table 2), the bridge must be posted to restrict usage.

Table 2. NJ Legal/Design Loads

Vehicle Type	Number of Axles	Legal Weight (tons)
Type H15 (Design)	2	15
Type HS20 (Design)	3	36
Type 3 (Legal)	3	25
Type 3S2 (Legal)	5	40
Type 3-3 (Legal)	6	40

Source: NJDOT Highway Bridge Load Rating Manual

The bridge survey re-evaluation reports also include a summary of geometric and other key data pertaining to the structure and its approaches. All of this information is coded and summarized in Structural Inventory and Appraisal (SI&A) sheets and used to determine whether or not the structure is structurally deficient or functionally obsolete. An overall Sufficiency Rating (SR) on a scale of 0 to 100 is also calculated and reported, with a score of 100 indicating a fully sufficient bridge. This rating is based on several factors including essentiality for public use, serviceability and functional obsolescence, and structural adequacy and safety.

Based on this and other available information, the roadway and structures at the project site were reviewed for substandard features. The latest versions of the following documents were used as a basis for determining substandard features:

- American Association of State Highway and Transportation Officials (AASHTO) LRFD Bridge Design Specifications
- NJDOT Design Manual for Bridges and Structures
- NJDOT Roadway Design Manual
- AASHTO A Policy on Geometric Design of Highways and Streets
- AASHTO Guide for the Development of Bicycle Facilities
- ADA Standards for Accessible Design
- Manual on Uniform Traffic Control Devices

The substandard features and controlling substandard design elements (CSDE's) for each structure have been identified and are summarized in the following discussions.

2.1 Green Avenue Bridge over Debbie's Creek (Bridge W-7)

2.1.1 Existing Conditions

Bridge W-7 was constructed in 1944 and spans between the Boroughs of Brielle and Manasquan. It is a fixed, seven span timber bridge supported on eight timber pile bents with asphalt paving over the timber deck panels. The two end timber bents abut timber bulkheads. The bridge crosses over the tidally influenced Debbie's Creek and forms the Green Avenue approach to the T-intersection with Fisk Avenue and Brielle Road. The bridge is 120' long with a 26.2' out-to-out width. The deck carries a 21.7' wide roadway plus a 2.9' wide sidewalk on the east side, which is further reduced by a guide rail separating the walkway from traffic. Clearances for vehicular traffic are unlimited vertically and 21'-8" horizontally. Clearances for marine navigation are approximately 20' horizontal and 6' vertical as measured above Mean High Water (MHW). The approach roadway width varies from around 22' in the vicinity of the bridge to around 32' south of the bridge near the intersection of Green Avenue and Crescent Drive. The bridge is not eligible for listing on the State or National Registers of Historic Places.

There is an uncased 10" diameter sewer force main attached along the east fascia, which would most likely break and result in severe environmental consequences should the bridge be compromised. There is also a meter cabinet mounted on the same fascia near the south end of the bridge.

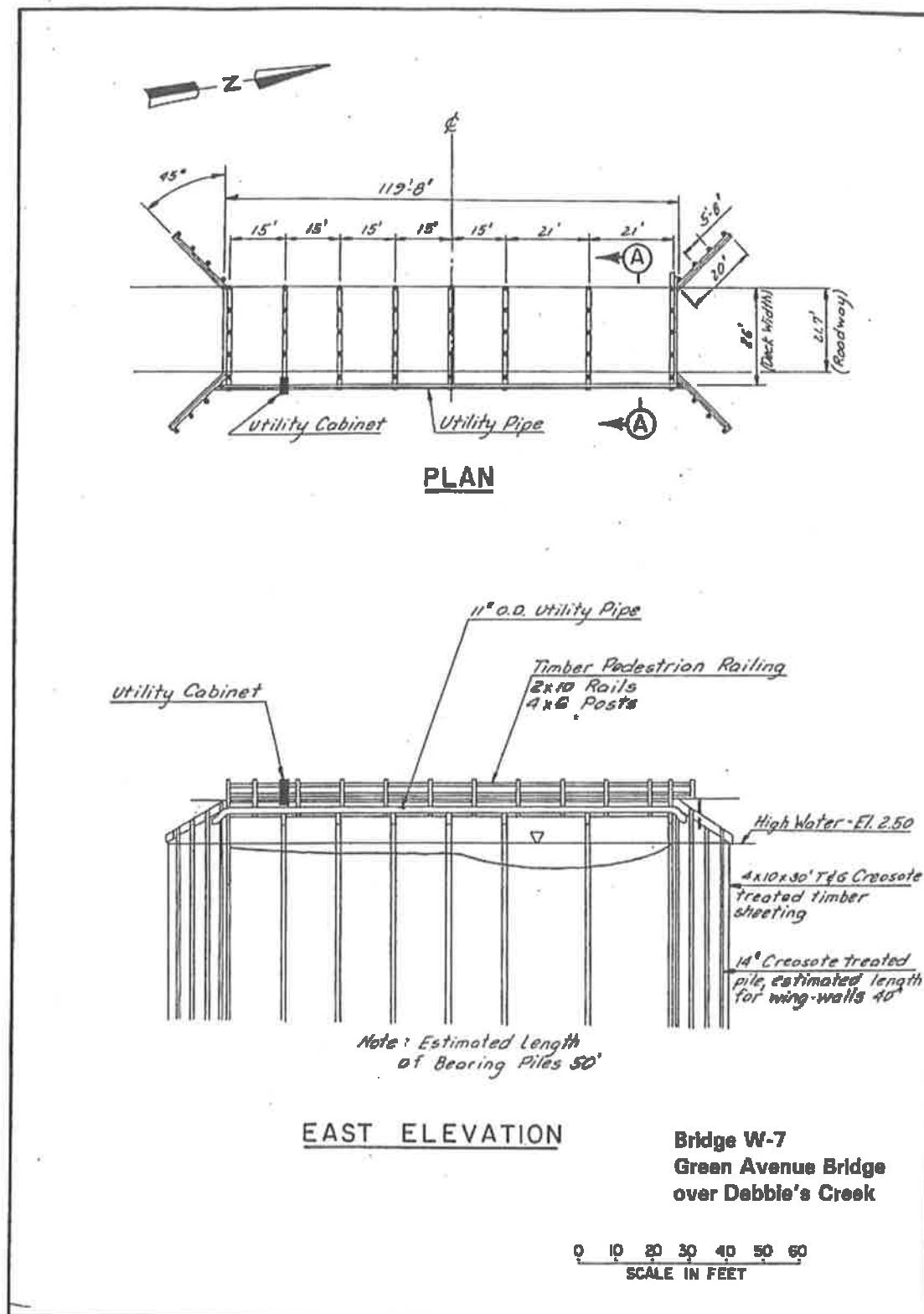
According to the May 2023 Cycle 19 Bridge Re-Evaluation Survey Report, Bridge W-7 is in overall poor condition (4) due to the low Inventory ratings and the condition of the substructure. The deck is in satisfactory condition (rated as 6), the superstructure is in satisfactory condition (6), and the substructure is in poor condition (4). The bridge is functionally obsolete due to insufficient curb-to-curb width for the number of lanes and the traffic volume. The bridge is also structurally deficient due to the poor condition of the substructure and the low load ratings.

The substructure is in poor condition, with the abutment breastwalls, wing walls, piles, headers, and pile caps all exhibiting moderate to advanced decay with up to 50% section loss, heart rot, and checks/splits on various members. The bridge is posted for 3 tons gross weight.

The overall evaluation of the bridge is poor (4) based on the overall condition, the low-capacity ratings, and being structurally deficient and functionally obsolete. The bridge has an overall Sufficiency Rating (SR) of 31.5 out of 100.

Figure 2 shows elevation and approach views of the bridge. Additional photographs of Bridge W-7 are included in the *Technical Environmental Report* (TER) prepared September 2026, provided as Appendix A.

Figure 2a. Bridge W-7 Existing Sketches (1 of 2)



4x6 Timber Post

2x10 Timber Rails

2x6 Continuous Board

11" O.D. Pipe

10" Steel Channel

Timber Blocking

Timber Scab

6x16 Stringers
Spacing Varies
(19'-20' C-C)

26.0'

21.7'

2x9'

6'

Steel Guide Rail Element

6x6 Timber Post

6x6 Timber Wheel Guards

2" Blocking

2" Asphalt Surfacing

4x8 Timber Deck (Transverse)

2x9'

Varies
6' or 4'

Timber Posts
6x6 & 4x6

6x6

3" Blocking

2x6 Continuous Board

1x6 Nailer (Typ.)

12x12 Cap

4x10 Timber Bracing

6.0' (Typ)

Timber Piles

SCALE IN FEET

0

5

10

SECTION A-A

Bridge W-7
Green Avenue
over Debbie's Creek

**Bridge W-7
Green Avenue
over Debbie's Creek**

2.1.2 Substandard Features

Structural Capacity – The posted weight limit of the bridge is 3 tons due to the poor condition and the construction of the superstructure and substructure. Ideally, there should be no posted weight limit, allowing the maximum legal load in NJ of 40 tons.

Bridge Roadway Width – The existing bridge roadway width is 21.7' and is substandard per AASHTO and NJDOT. Per NBIS, the minimum roadway width required to not be assessed as functionally obsolete is 32' for projected volumes.

Bridge Rail – The existing railing is a non-standard installation consisting of wood and steel members that are not crashworthy based on current NJDOT and AASHTO standards (substandard geometrically and structurally).

Approach Roadway Width – The current approach roadway width is 22' minimum and varies with no delineated shoulders. Per AASHTO, the minimum width for curbed local urban roadways with a delineated, bicycle-compatible shoulder and guard rail is 32' curb-to-curb.

Sidewalk – The existing bridge includes a walkway, which is less than 3' wide and is separated from traffic by guide rail. There is no sidewalk on the approaches to the bridge. A 4' minimum clear sidewalk is required to satisfy the Americans with Disabilities Act (ADA) accessibility guidelines, with greater widths required at certain intervals and specific locations for passing and maneuvering (NJDOT standard bridge sidewalk width is 6').

2.1.3 Pavement/Overlay Condition

As noted in the Cycle 19 Bridge Re-Evaluation Survey Report, there are wide transverse reflective cracks throughout the asphalt wearing surface. The deck joints and approaches have also been recently paved over due to settlement and other condition issues.

2.2 Fisk Avenue Culvert over Glimmer Glass (Structure W-8)

2.2.1 Existing Conditions

Structure W-8 was constructed in 1946 and is located in Brielle, just west of the municipal boundary with Manasquan. It is an 80" by 80" flat bottom reinforced concrete pipe culvert through a steel sheet pile supported, earth-filled causeway. The culvert connects the Glimmer Glass to Debbie's Creek. This structure is submerged and partially silted in on the upstream side. The steel sheeting continues in each direction along Brielle Road/Fisk Avenue, containing the embankment and forming a causeway. The pipe culvert is 48' long and supported on 12" diameter, 30' long timber piles spaced at 6'. The individual steel sheet piles retaining the causeway embankment are of standard design and are interlocked. The sheets are 35' long with an approximately 5' exposure. Every fourth sheet pile is 45' long. There are 1-½" tie rods linking the north and south sides. The causeway has a current curb-to-curb width of 34.8' accommodating two lanes of traffic and has an approximately 6' wide sidewalk on the north side. This structure is not eligible for listing on the New Jersey or National Registers of Historic Places.

There are no known utilities located over Structure W-8. However, there is a utility pole in the channel immediately adjacent to the southerly causeway bulkhead line with lighting and overhead lines.

Figure 3 shows elevation and approach views of the structure. Additional photographs of the culvert are included in the TER (Appendix A).

Structure W-8 is in overall poor condition (sufficiency rating of 63.6), exhibiting advanced deterioration of the culvert barrel (flat bottom reinforced concrete pipe) and the headwall over the culvert. The steel sheet piling at each end supporting the approach roadways (forming the causeway) is also in poor condition.

In addition to the above, Structure W-8 is partially blocked by silts and sediments due to years of tidal action and deposition. The pavement over the culvert exhibits wide, full-width transverse cracks. The causeway sheeting exhibits heavy corrosion and exfoliation. The steel cap of the northwest bulkhead shows 100% corrosion loss in some areas. The culvert barrel has extensive medium and wide cracking with areas of heavy rust staining. There are also large spalls with exposed and rusted reinforcing bars. Spalls, broken and missing concrete can be seen at the culvert ends. The northeast end of the culvert pipe is broken and missing at the waterline, with exposed, rusted reinforcement that is corroded throughout the bottom of the culvert pipe.

Photographs illustrating the condition of this structure are included in the TER (Appendix A).

2.2.2 Substandard Features

Structure W-8 is in overall poor condition. If assessed consistently with the coding guidelines from the FHWA, the culvert would be considered structurally deficient due to its poor condition.

2.2.3 Pavement/Overlay Condition

The roadway pavement at the structure is in generally fair condition. There have been several repair patches made at this location.

Bridge W-8	
Fisk Avenue	Culvert

Figure 3b. Structure W-8 Existing Sketches (2 of 3)

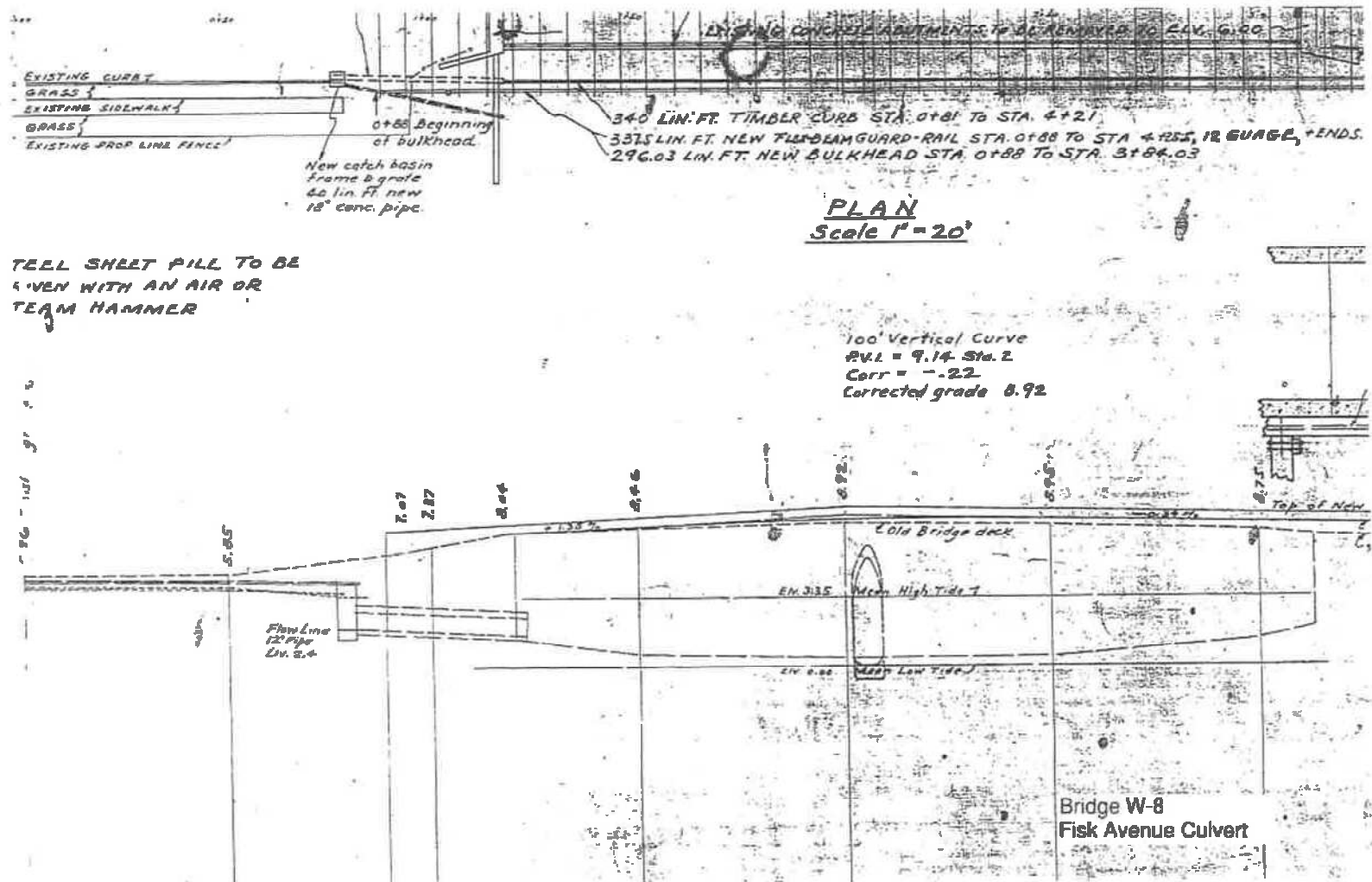
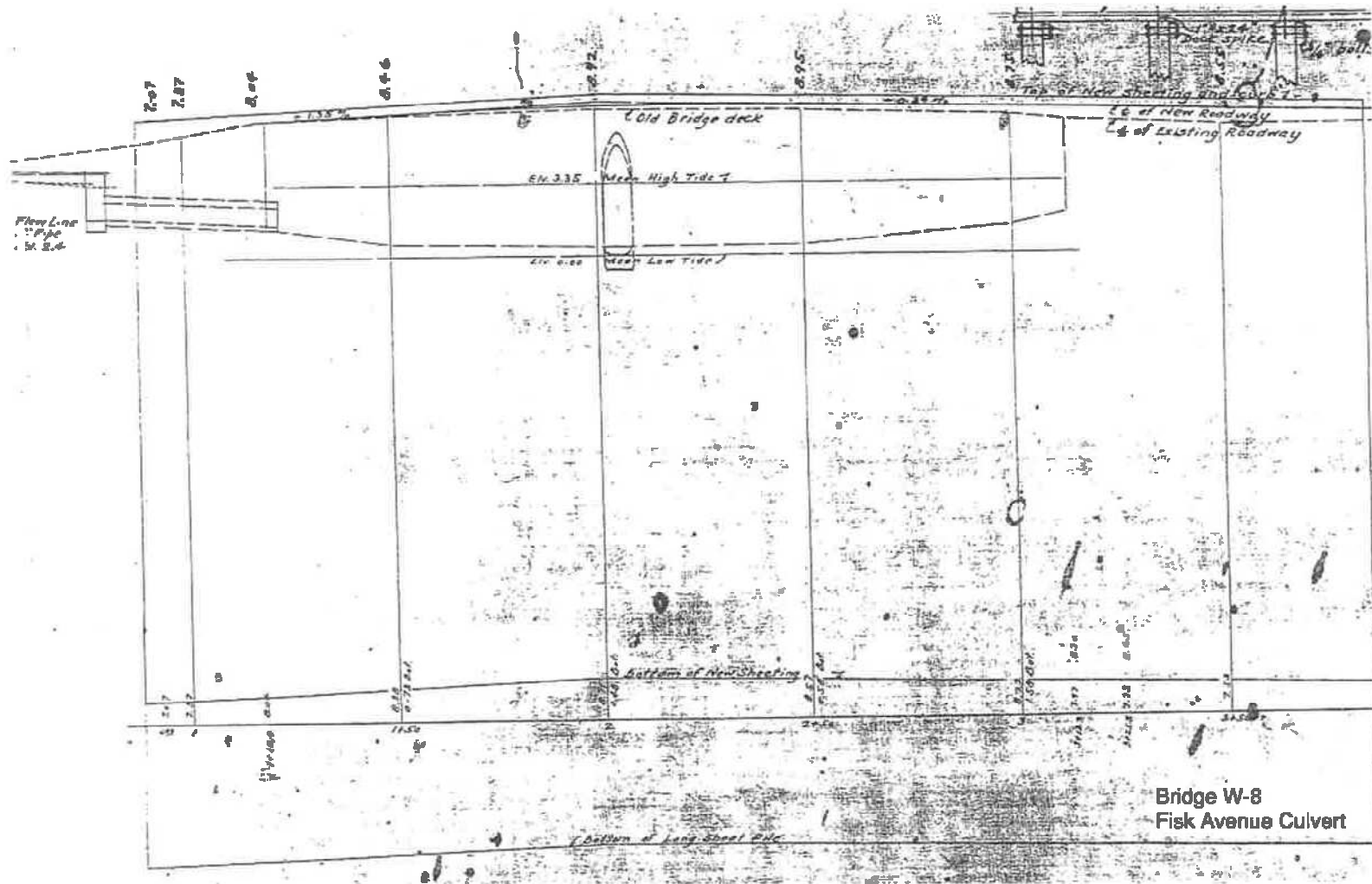


Figure 3c. Structure W-8 Existing Sketches (3 of 3)



2.3 Monmouth County Bridge W-9 carrying Brielle Road over the Glimmer Glass (Structure #13000W-9) (Glimmer Glass Bridge)

2.3.1 Existing Conditions

Original construction drawings are not available for Bridge W-9. However, historic maps indicate that a fixed span (non-movable) timber trestle bridge was first constructed at this site in the late 1800s. In order to allow marine navigation upstream of Brielle Road, a single-leaf, cable lift bascule span with rolling counterweights was inserted into the Brielle Road trestle bridge in 1938. This structure had been fabricated several years earlier for another location in Ocean County, was never used and then subsequently acquired in 1925 by Monmouth County and kept in storage. The 1938 bridge structure was approximately 590' long. Around 1950, the bridge underwent a major reconstruction that resulted in a reduction in bridge length to its current length of 279', an increase in the approach span widths, and an approximately 5' rise in the roadway profile at the channel. The length reduction was accomplished by extending the approach bulkheads and thereby eliminating 20 approach timber trestles. Since then, several repairs have been made including major rehabilitations in 1971 and 1995, as well as emergency repairs in 2014-2015 and 2017-2018. The bridge was listed on the New Jersey Register of Historic Places on February 28, 2008 and the National Register of Historic Places on April 25, 2008. The bridge is technologically and historically significant as the only example of its type in New Jersey and exemplifies the need for movable bridge technology in the late 19th and 20th centuries for transportation of vehicles over navigable waterways. Refer to Section 4.11 and the TER (Appendix A) for additional information.

The current two-lane bridge carries Brielle Road over the Glimmer Glass, a navigable tidal inlet of the Manasquan River. It is composed of sixteen approximately 15' long laminated timber deck spans supported on braced timber pile bents and a 34' cable lift, single leaf, bascule movable span with rolling counterweights on curved counterweight tracks. Minimum horizontal clearances for vehicular traffic are 20' at the bascule span (19.3' at the bascule span tower) and 23' at the approach spans, while the minimum vertical clearance is 14' at the bascule span tower and unlimited elsewhere. There is also an approximately 6' wide sidewalk on the northern side of the road with localized variances, including a reduction in width down to 3'-9" near the bascule span where safety fence has been placed around the counterweight track. Clearances for marine navigation are as follows: 31' horizontal between the timber fenders protecting the bents supporting the bascule span and 7' vertical as measured above Mean High Water (MHW). The vertical clearance with the bascule span fully open is unlimited. However, the toe of the bascule span does not completely clear the fender system and may therefore partially encroach on the "unlimited" clearance within the navigable channel.

The single-leaf movable span within the bridge is a deck girder type bascule with floor beam and stringer framing, supporting an open steel grid deck (stringers and grid deck replaced in 1995). Single cables attached to each corner of the toe end of the movable leaf rise to pass over grooved operating drums (sheaves) atop the braced timber tower columns, then deflect downward towards the braced curved counterweight tracks on the spans adjacent to the movable leaf. The opposite end of the cable is attached to a connecting yoke that joins the shafts of the rolling counterweights positioned in series on the curved track. The two top metal counterweights have a solid center guide while the last one has disk guides. The track has built up wood end stops. The tower columns are braced with wood struts on the outboard sides, a timber and steel truss between tower columns, and steel bar stays on the downstream side. An electric motor mounted atop a supplemental column added in the 1950 construction engages the drive shaft to turn the operating sheaves, which causes the span to open and the counterweights to start moving down the track. The motor reverses the action to close the bridge. The operator's house has been upgraded over the years, but the house's construction and function originate circa 1950.

Electrical service is mounted along the south fascia and a submarine cable cabinet is located on the bridge. There are also overhead roadway lights attached to the movable span, traffic signals at both approaches, and navigation lights attached to both fenders. There is roadway lighting along both approaches as well as mounted to the bridge. Many of these features have been added, replaced, or supplemented after the 1950 original construction.

Figure 4 shows elevation and approach views of this bridge. Additional photographs of Bridge W-9 are included in the TER (Appendix A).

According to the June 2023 Cycle 20 Bridge Re-Evaluation Survey Report, Bridge W-9 is in overall critical (2) condition due to low load capacity ratings as a result of advanced deterioration of primary bridge components. The deck is in satisfactory condition (6), the superstructure is in poor condition (4), and the substructure is in fair condition (5). The bridge is functionally obsolete due to insufficient curb-to-curb width given the number of lanes and traffic volume. The bridge is also structurally deficient due to the condition of the superstructure and the low-capacity ratings.

Due to the increased deterioration of the structure over the last 30 years, the overall condition of Bridge W-9 has been downgraded from “poor” (4) in June 1984 to “serious” (3) in June 1990 and was first assessed to be in “critical” (2) condition in 2013. Most of the bridge’s timber elements were installed circa 1950, and the downgrades are consistent with these elements reaching the limits of their respective service lives, as exacerbated by the harsh marine environment. As of the June 2023 Bridge Re-Evaluation Report, Bridge W-9 has a Sufficiency Rating of 9.1 out of 100.

In April 2011, Childs Engineering Corporation of Bellingham, Massachusetts performed an independent cursory one-day review of the condition of the bridge including the above water and accessible structural members. This was associated with their review of a February 2009 Work-in-Progress version of the Alternatives Analysis (AA) Report. Their observations, described in their 2011 and 2012 Letter Reports along with their review of the 2009 Work-in-Progress AA Report, were generally consistent with the subsequent Cycle 15 July 2013 Bridge Re-Evaluation Report.

In August 2014, Bridge W-9 suffered a catastrophic failure of the east approach spans due to an overweight vehicle traversing the bridge. The damage to the bridge deck resulted in a complete bridge closure lasting approximately 7 months. During this time, emergency interim repairs were made not only to address the new damage, but to temporarily alleviate some of the highest priority needs identified in the most recent bridge evaluation reports at that time. As per the post-construction plans completed in March 2015, the following key work was done:

- 35 deteriorated piles were jacketed and encapsulated with epoxy grout and some of the associated bracing was repaired and/or replaced as necessary.
- 13 new timber piles along with the associated wales and ties were installed at the abutment and bulkhead embankments to supplement the existing failed components.
- Supplemental piles were added at Bents 8 and 9, and bolted timber cap beam reinforcements were added to restore some capacity of the heavily deteriorated steel cap beam cap at Bent 6.
- Timber sheeting and waler repairs were made to the fender system.
- Supplemental pilings were installed at both causeway embankments, including drag piles for waler tie-back anchors.
- The nail laminated timber superstructure and overlay were fully replaced on all approach spans.

While the condition of the approach spans superstructures and some of the substructure components were improved during the emergency project, only a marginal improvement in the overall condition of Bridge W-9 was noted in the 2015 Bridge Survey Re-evaluation Report. Most of the repairs were

completed with the intent of quickly reopening the bridge to traffic and delaying the ongoing effects of deterioration. They did not address all of the underlying issues, particularly at the bascule span (structural capacity) and the substructure (condition of timber piles and caps). Many of the repairs, including pile jacketing, were considered short term (slowing the rate of further deterioration and not restoring structural capacity) and were not equivalent to replacement. Bridge W-9 remains structurally deficient due to its low load ratings as controlled by the bascule span and functionally obsolete due to its geometry and various substandard features.

Another independent cursory inspection of Bridge W-9 was conducted in June 2017 by McLaren Engineering Group. The report noted severe deterioration of the substructure piles requiring priority attention. The full report is included in Appendix R of the *Alternatives Analysis Report* in Appendix B. The worsening substructure condition required a second emergency closure and repair, as additional pile deterioration needing immediate attention was discovered during routine maintenance in November 2017. These repairs consisted of jacketing the remainder of the timber piles, installing some new supplemental piles, and minor repairs throughout.

The bridge is currently posted for 3 tons. The live load ratings are controlled by the deck girders in the bascule span. The Operating Ratings are 6, 8, and 12 Tons for type H-15, 3, and 3S2 trucks respectively (only 40%, 32%, and 30% of the full vehicle loads). This bridge is also posted for a substandard vertical clearance of 14' (further limited to 10' by recently installed overhead clearance bars on the approaches). These capacity and height restrictions, combined with the narrow width between tower columns, all effectively close the bridge to all trucks, buses, and large emergency vehicles.

Mechanical/Electrical Systems

The mechanical/electrical operating system for the moveable span is outdated. Most of its current machinery components do not meet current AASHTO and Occupational Safety and Health Administration (OSHA) standards and requirements. Type II NJDOT Mechanical and Electrical Inspections were performed in October 2015 and were included within the 16th Cycle Bridge Re-Evaluation Survey Report. Type III-S inspections were performed in 2019 and included with the 18th Cycle reports. These inspection reports indicate that the bridge's mechanical systems are in overall poor but still functioning condition. Calculations from a previous inspection in 2009 show that the trunnion shafts, operating drum shafts and wire ropes are all overstressed by current AASHTO standards. The operating system of this bridge has no redundancy. As a result, if any single component fails, control of the span and counterweights movement would be lost, potentially causing a sudden and irrecoverable failure resulting in serious property damage and/or injuries to users. Numerous additional mechanical and electrical deficiencies were noted in the recent reports, which affect the operational reliability of the movable span.

Limited repairs were conducted to the mechanical components as part of the 2017-2018 emergency repairs. The repairs were intended to protect the mechanical system from further deterioration and maintain them in functioning condition for the immediate future.

As part of the electrical inspection, items such as lighting, traffic signals, warning devices, and gates/barrier were evaluated and interlock tests performed. These tests check that sufficient controls are in place to prevent unwanted actions (such as turning the signals green before the bridge is seated). The report indicated serious safety concerns regarding the interlocks and signal control system. Potentially dangerous out of sequence signal/gate operations were identified as a possibility. Modern bridges have controls in place to prevent these unwanted operations. Some of these interlock issues have since been corrected, but the 2019 report still reported interlock test failures and provided numerous minor recommendations. The 2019 report also highlighted that the distances between the warning and barrier gates do not conform to current Manual on Uniform Traffic Control Devices (MUTCD) requirements.

The time required to physically open (approximately 4.5 minutes) and close (approximately 3 minutes) the bascule span is considered excessive, in comparison to newer bascule bridges of comparable size and type with modern operating, control, and safety systems. According to a previous 2009 Mechanical Re-Evaluation Report, the opening time should be less than 1 minute for a bascule bridge of this size. The quoted times do not include the time required for the various preceding and succeeding steps to the physical opening. The entire span opening procedure takes significantly longer, as the roadway gates must first be lowered, the vehicle barrier swung into place on the west approach, and the manual span locks disengaged. Further to this, the speed of operation (opening/closing) has been slowed over time to reduce the stresses on the mechanical system.

Based on the data from the 2009 Mechanical Report, Bridge W-9 is opened an average of less than 10 times per month during the winter months. In contrast, during the peak summer months, it is typically opened over 500 times per month, with a high of over 800 times per month.

Bridge W-9 is operated around-the-clock in accordance with United States Coast Guard regulations for this crossing as published in the Code of Federal Regulations (CFR). From Memorial Day to Labor Day, during peak marine travel times (7:00am to 8:00pm), the bridge is opened by signal on the hour and half hour. From January 1st to April 1st, from 4:30pm to 8:00am, the bridge is only opened upon four hours advance notice. At all other times, the bridge is opened on-demand (opened for approaching marine traffic).

2.3.2 Substandard Features

Bridge Roadway Width – The existing curb-to-curb width varies from as little as 19.3' at the bascule span tower columns, 20' in the adjacent spans, and 23' along the approach spans, and is substandard throughout. The controlling width is located at the tower columns at the east end of the bascule span. Per NBIS, the minimum width required for the bridge to not be considered functionally obsolete is 32' for projected traffic volumes.

Structural Capacity – The posted weight limit of Bridge W-9 is 3 tons due to the condition and construction of the bascule span girders. Ideally, the maximum legal vehicular load in NJ of 40 tons (indicative of multi-axle trucks) should be able to be accommodated. Condition aside, the bridge was not originally designed to handle current vehicular loads. The bridge may also be at or near the end of its fatigue life. The main load carrying components have been subjected to loads greater than the original design loads and greater than current fatigue design loads. This has subjected certain members to repetitive loading with high stress ranges, weakening materials and their connections over time.

Approach Roadway Width – The current approach roadway width is 23' on the west approach back to the intersection with Green Avenue and varies from 23' to approximately 42' on the east approach near Glimmer Glass Circle. Per AASHTO and NJDOT, the desired roadway width for an urban collector roadway is 40' (two 12' lanes and two 8' shoulders), while the minimum required width for a bicycle compatible urban collector roadway is 32'. The horizontal clearance is currently wider on the approach roadway than the bridge, and both approaches neck down at the bridge.

Vertical Clearance – The existing vertical clearance is 14' and is substandard per NBIS and NJDOT standards. It is controlled by the timber truss between the two tower columns. The minimum vertical clearance for an urban collector roadway is 14'-6". A recent installation of overhead clearance bars on the approaches by Monmouth County has further limited the clearance to 10'. These were installed to further deter large vehicles from attempting to cross the structure.

Mechanical/Electrical Operation – The existing operating machinery is unreliable and overstressed and does not meet design codes. Numerous deficiencies were noted in the most recent inspection reports. All mechanical and electrical equipment should meet AASHTO and the National Electrical Code (NEC).

Bridge Rail – The existing guide rail is substandard (both geometrically and structurally) per NJDOT and AASHTO, resulting in insufficient deflection strength and end protection. It is also not adequate to protect the timber tower columns or vehicles from damage during a collision and is not properly stiffened in the transition zones where the more flexible approach railing meets the stiffer bridge railing.

2.3.3 Pavement/Overlay Condition

During the emergency closure in 2014-2015, the overlay and curbs were replaced as part of replacing the timber deck panel approach spans. Wide cracks were noted in the pavement throughout the roadway during the most recent inspection in 2023.

The moveable span of Bridge W-9 has an open grid deck which has reduced skid resistance and there is a potential fixed object roadside hazard created by the proximity of the timber tower columns to the edge of roadway. For photographs showing the existing deck, see the TER (Appendix A).

Figure 4a. Bridge W-9 Existing Sketches (1 of 6)

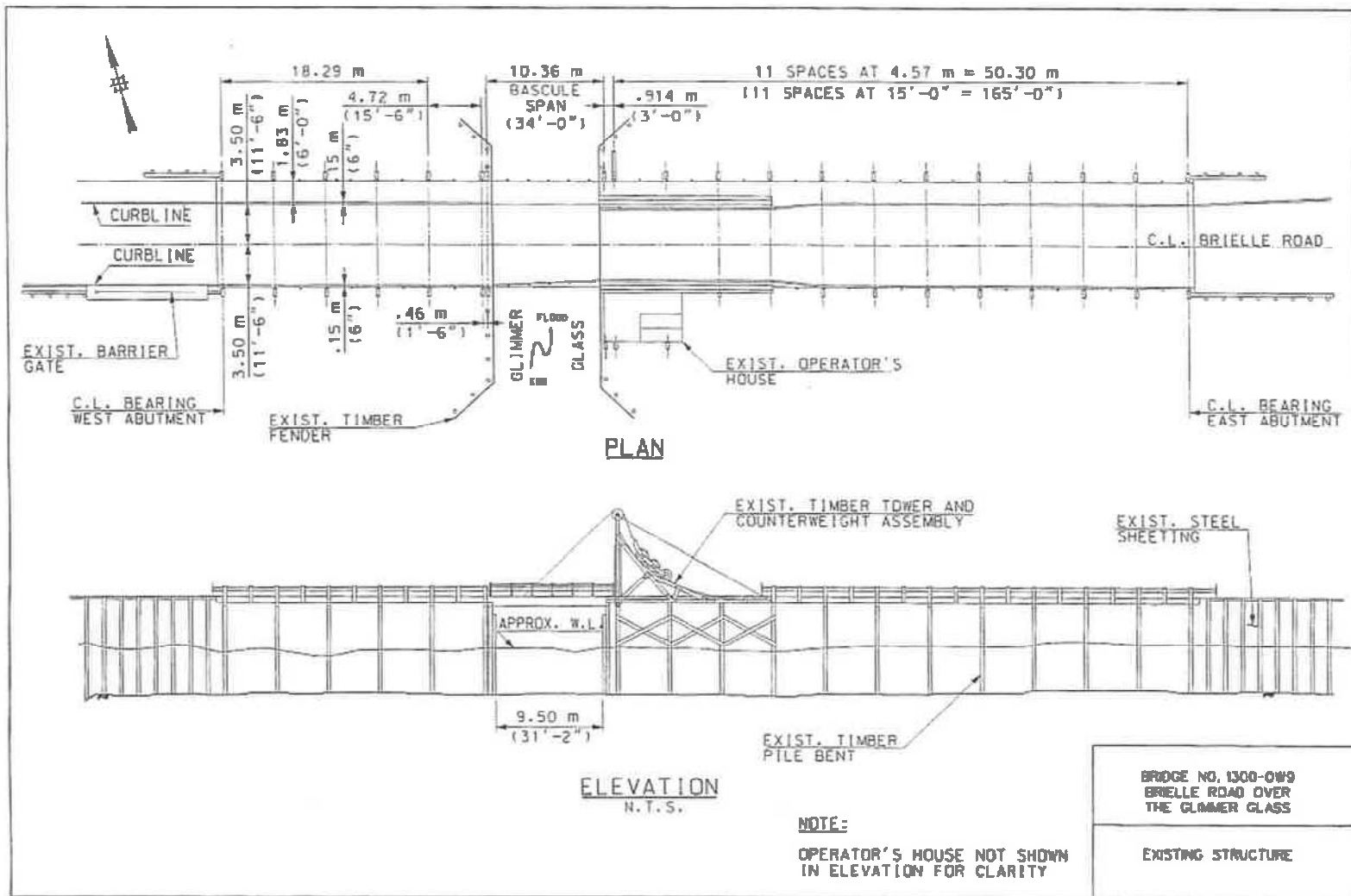
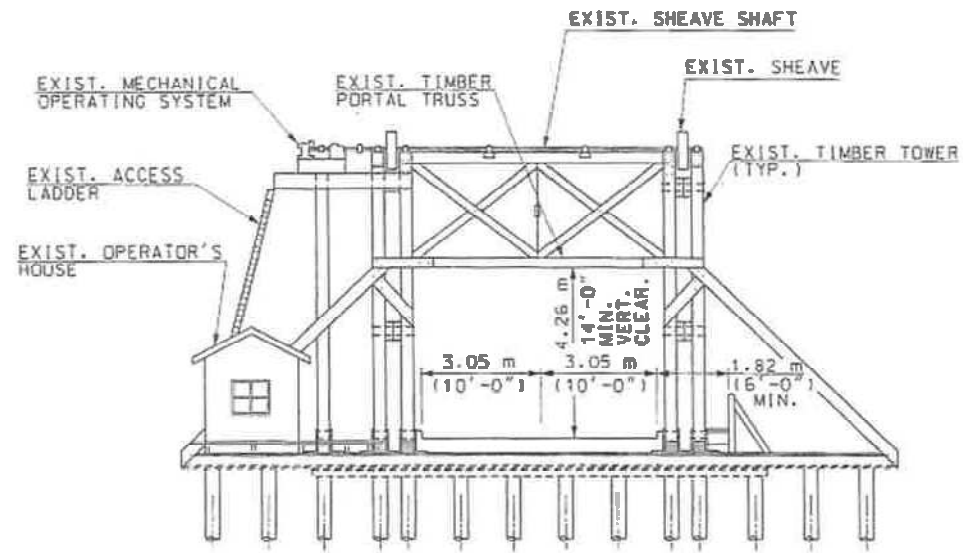


Figure 4b. Bridge W-9 Existing Sketches (2 of 6)



BRIDGE CROSS SECTION AT TOWERS
N.T.S.

BRIDGE NO. 1300-OW9
BRELLE ROAD OVER
THE GLIMMER GLASS

EXISTING STRUCTURE

Figure 4c. Bridge W-9 Existing Sketches (3 of 6)

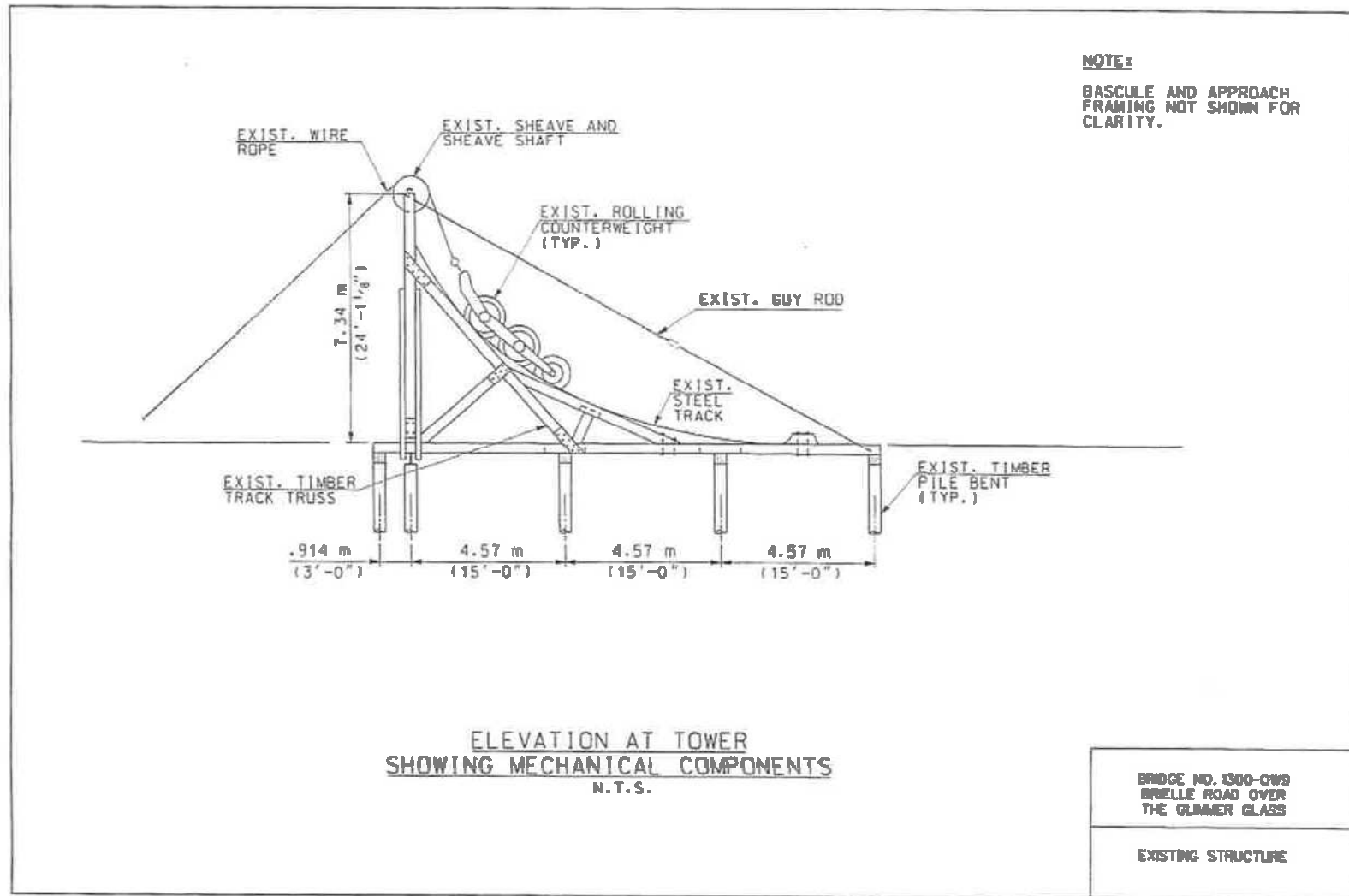
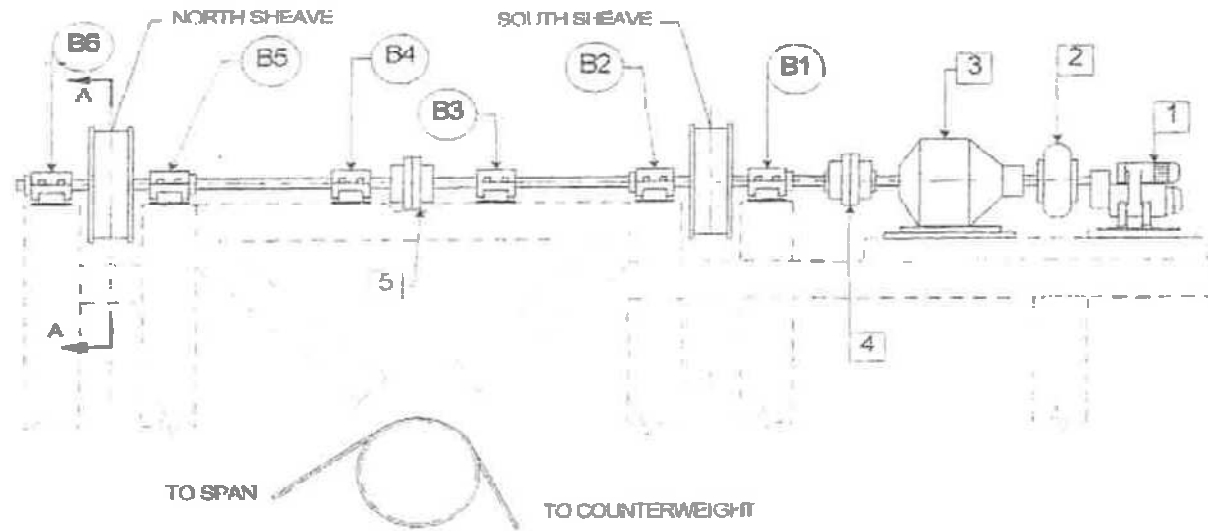


Figure 4d. Bridge W-9 Existing Sketches (4 of 6)



SECTION A - A

1. REEVES 1 HP VARIATION BUILT DRIVEN GEARMOTOR
2. DODGE PARA-FLEX PX70 RUBBER INSERT COUPLING
3. SIMITOMO CYCLO DRIVE REDUCTOR - (841:1)
4. FAIRBANK 1040G DOUBLE ENGAGEMENT GEAR COUPLING
5. FAIRBANK 1040G DOUBLE ENGAGEMENT GEAR COUPLING

OPERATING MACHINERY LAYOUT

(N.T.S)

BRIDGE NO. 1300-0W9
BRIELLE ROAD OVER
THE GLIMMER GLASS

EXISTING STRUCTURE

Figure 4e. Bridge W-9 Existing Sketches (5 of 6)

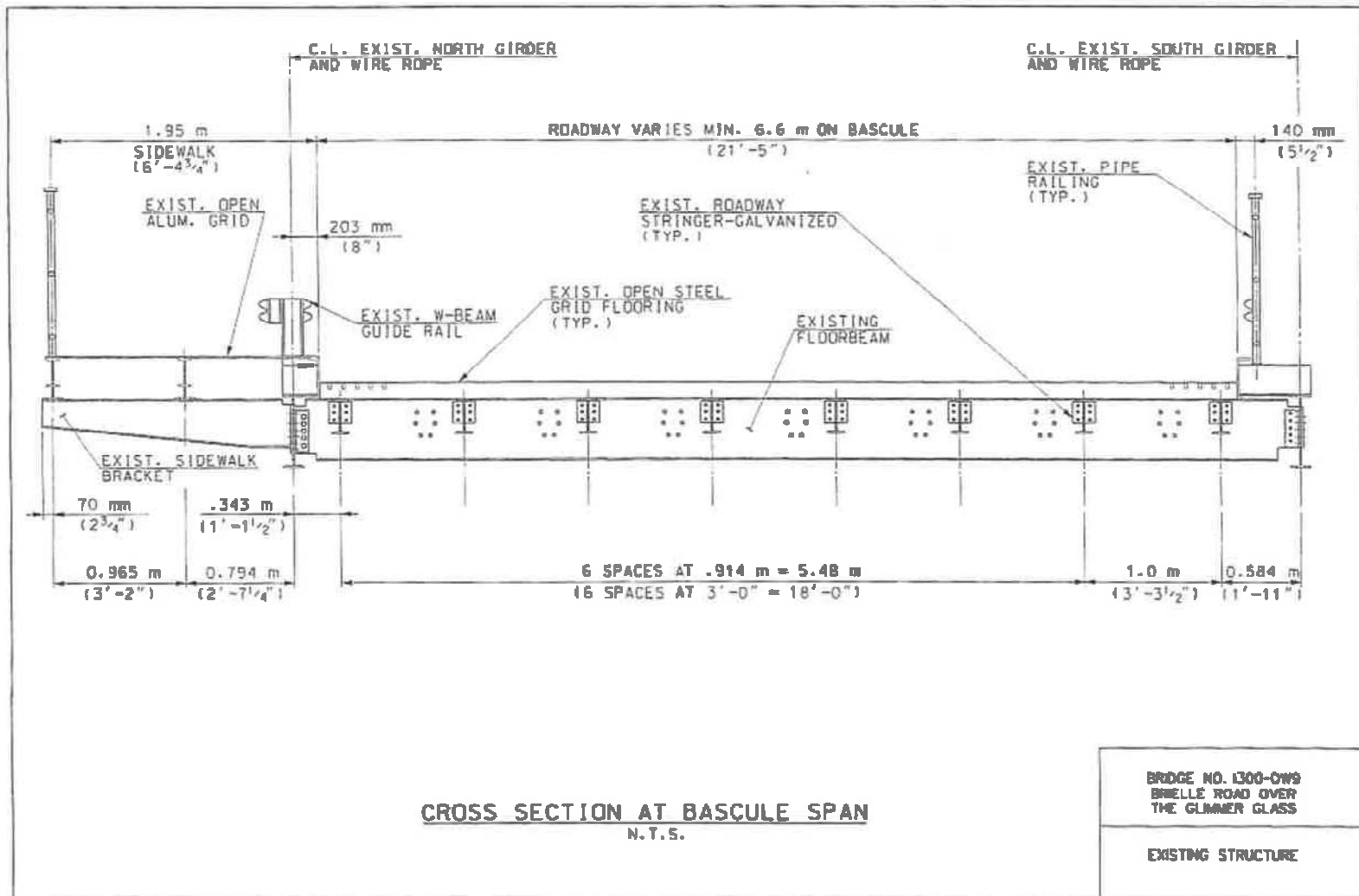
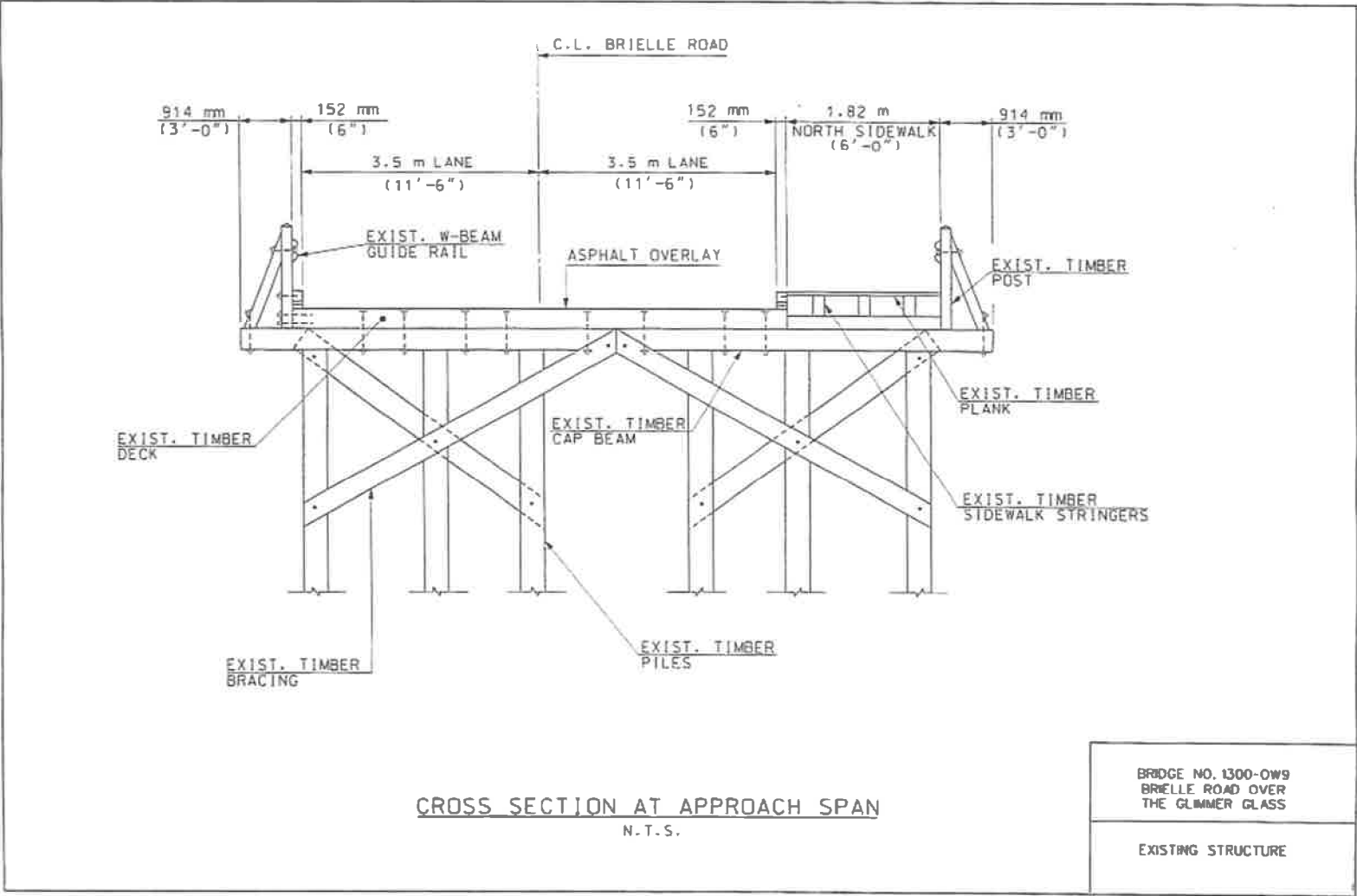


Figure 4f. Bridge W-9 Existing Sketches (6 of 6)



2.4 Existing Traffic Conditions

Existing traffic conditions within the project limits were reviewed by Mott MacDonald (Mott MacDonald, 2022) to determine existing operational characteristics, including vehicular Level of Service (LOS), existing crash data, existing bicycle and pedestrian data, and roadway safety characteristics. Vehicular operations along Brielle Road/Fisk Avenue are controlled by Bridge W-9 opening and closing and the bridge's load posting, which prohibits all vehicles with a gross weight over 3 tons (almost all truck traffic) from crossing and necessitates alternate routing to the beachfront. Vehicular operations along Green Avenue are stop-controlled at the T-intersection of Green Avenue and Brielle Road/Fisk Avenue. Existing bicycle and pedestrian traffic is impacted by narrow travel way lane widths and non-contiguous sidewalk within the project limits, including a single sidewalk on the north side of Brielle Road/Fisk Avenue.

2.4.1 Existing Vehicular Circulation

Traffic circulation adjacent to the project limits and available alternate routes to the Manasquan beach were reviewed. Refer to Figure 1 in Section 1 for a location map. The municipal boundary is formed by the waterways passing under Bridge W-7 and Structure W-8. Brielle Road/Fisk Avenue is the southernmost roadway of one of only three local roadways that provide access to the Manasquan beachfront destination area and Fisherman's Cove Conservation Area. The other two local roadways that provide access to the beachfront include Main Street to the immediate north of Brielle Road and Ocean Avenue further to the north, adjacent to Stockton Lake. Frisk Avenue, Main Street, and Green Avenue all traverse the NJ Transit North Jersey Coast Line via at-grade rail crossings, and along with Stockton Lake Boulevard, are the only four roadways that provide access across the rail line within the area.

Brielle Road/Fisk Avenue provides access from the western and southern residential areas of Brielle to the beachfront. The roadway begins at an unsignalized intersection with Route 71 to the west, traverses the NJ Transit North Jersey Coast Line via an at-grade rail crossing, and terminates at the beachfront. It provides connections to the beachfront from Route 71 and Route 35 to the south. The roadway is carried over the Glimmer Glass via a single leaf rolling counterweight bascule bridge that opens for marine traffic at scheduled times during peak hours and on-demand during non-peak hours, which impacts vehicular capacity and travel time. The roadway is posted as a coastal evacuation route.

Main Street provides access from much of Manasquan Borough to the beachfront, along with eastern portions of Wall Township, and is the main east-west thoroughfare through Manasquan. The roadway is to the north of the project area and begins at a signalized intersection with Sea Girt Avenue, which connects to Route 35, intersects Route 71 via a signalized intersection, and terminates at the beachfront. Similar to Brielle Road/Fisk Avenue, Main Street traverses the NJ Transit North Jersey Coast Line via an at-grade rail crossing. It provides connections to the beach front from Route 71 and Route 35 to the west. The roadway is carried over Watson Creek via a low-level fixed bridge that allows for passage of small marine vessels. The roadway is also posted as a coastal evacuation route.

Ocean Avenue is a local roadway that provides local access from the Stockton Lake side of Manasquan to the beachfront north of the project area. The roadway begins at an unsignalized intersection with Potter Avenue, also a local roadway, which does not provide direct connection to a state highway. Unlike Brielle Road/Fisk Avenue, Ocean Avenue does not traverse the NJ Transit North Jersey Coast Line as its terminus at Potter Avenue is east of the railroad tracks. The roadway is carried over Watson Creek via a low-level fixed bridge that allows for passage of only small marine vessels. The roadway is posted as a coastal evacuation route.

2.4.2 Existing Traffic Data Collection

Traffic counts, including ATR and turning movement counts (TMC) were conducted in June, July, and November 2015 to reflect current conditions and determine seasonal variations in traffic volumes along the roadway.

Based on review of the ATR and TMC data, the peak seasonal volumes occurred during the July count period. The following existing Average Daily Traffic (ADT) volumes were determined from the ATR count data. June 2015, July 2015, and November 2015 ATR count data and Turning Movement Count data can be found in Appendix C.

Table 3. Existing Weekend Two-Way ADT Traffic Volumes

Roadway	Two Way ADT June 2015	Two Way ADT July 2015	Two Way ADT November 2015
Fisk Avenue	2,579 vehicles	2,812 vehicles	1,532 vehicles
Brielle Road	4,333 vehicles	4,806 vehicles	2,690 vehicles
Green Avenue	3,431 vehicles	3,915 vehicles	2,192 vehicles

The count data for each month collected was further reviewed to determine peak hour volumes. For the June and November count periods, existing peak hour traffic volumes were determined from the count data for both the Bridge W-9 crossing and the stop-controlled intersection of Fisk Avenue, Brielle Road, and Green Avenue. For the June count period, the peak hour occurred on Saturday, June 13, 2015 between 11:00 A.M. and 12:00 P.M. For the November count period, the peak hour occurred on Friday, October 30, 2015 between 5:00 P.M. and 6:00 P.M. The highest peak hour volumes were obtained from the July 2015 count data. The highest peak hour volume crossing Bridge W-9 occurred on Sunday, July 19, 2015 between 4:00 P.M. and 5:00 P.M. The peak hour at the intersection of Fisk Avenue, Brielle Road and Green Avenue also occurred on Sunday, July 19, 2015 between 4:00 P.M. and 5:00 P.M.

Table 4. Existing Peak Hour Traffic Volumes

Roadway	Peak Hour Volumes June 2015	Peak Hour Volumes July 2015	Peak Hour Volumes November 2015
Fisk Avenue	249 vph	258 vph	143 vph
Brielle Road	427 vph	493 vph	287 vph
Green Avenue	300 vph	358 vph	216 vph

The total entering and exiting volumes were balanced. The peak hour balanced flows were converted to estimated turning movements for the peak hour through the use of proportional distribution using the average volumes based on the intersection turning movement count. A diesel truck traffic study was performed in October 2025 as part of the air study. Since the results are less than the 2015 peak data, no further analysis is required.

Bicycle and pedestrian volumes were also obtained as part of the TMC program. A 12-hour pedestrian and bicycle count was performed on Saturday, July 25, 2015, between the hours of 8:00 A.M. and 8:00 P.M., along Brielle Road at the Bridge W-9 crossing. The bicycle and pedestrian data was considerably heavy for a 12-hour period, with a total of 770 bicyclists and 272 pedestrians crossing the bridge – an overall average of 64 bicyclists and 23 pedestrians per hour. Weather on the day of data collection was overcast and cool,

which typically results in less pedestrian activity. Therefore, bicycle and pedestrian volumes can be expected to be higher on days with milder weather. The data was also analyzed to determine the peak hour of bicycle and pedestrian traffic. Volumes corresponding to the vehicular peak hour of bridge crossing (4:00-5:00 P.M.) were reviewed, showing that 70 bicyclists and 16 pedestrians crossed the bridge during this time. However, the actual peak hour of bicycle and pedestrian traffic was found to be 9:45 A.M. to 10:45 A.M. Over this hour, 74 bicyclists and 31 pedestrians crossed the bridge. Existing bicycle and pedestrian volumes for the July 2015 count period can be found in Appendix C.

The County provided updated traffic data in October 2025 (Appendix C). However, these counts are taken off-season and are well below the counts used for analysis in the AA Report (based on peak July summer season counts). As this data does not accurately reflect peak conditions, the original data controls.

2.4.3 Level of Service Analysis

To determine operational Levels of Service (LOS) at the Brielle Road/Green Avenue intersection and the Bridge W-9 crossing, delays were calculated. Using Highway Capacity Software (HCS+), an unsignalized LOS analysis was performed for the intersection, and a signalized LOS analysis was performed for the bridge crossing. Analysis of the July 2015 baseline peak hourly volumes indicates that the intersection operates at LOS “A” with a total delay of 7.9 seconds per vehicle for all approaches except the Green Avenue approach, which operates at LOS “B” with a total delay of 13.9 seconds per vehicle. Therefore, operating conditions at the intersection proper are within acceptable limits. Capacity, however, within the study area is controlled by the bridge openings.

Presently, Bridge W-9 takes slightly over five minutes for the bascule span to open and close and remains open for variable lengths of time depending on marine traffic. By regulation, during peak boating season (Memorial Day to Labor Day) the bridge opens twice an hour. Assuming that the bascule span remains in the open position for four minutes on average, 18 minutes out of every hour is lost due to the bridge opening.

During the Sunday July 2015 peak hour of 4:00 P.M. to 5:00 P.M., delays crossing Bridge W-9 total 66.2 seconds per vehicle for the eastbound approach and 80.0 seconds per vehicle for the westbound approach. This includes time waiting while the bridge is open as well as for queues to clear. The bridge opening affects roadway capacity much the same way as a signalized intersection with an extensive background cycle. Roadway operating conditions over the bridge therefore are at LOS “E” with an average delay at 75.8 seconds per vehicle. A copy of the existing traffic capacity analysis for the July 2015 seasonal peak is provided in Appendix C.

Table 5. Existing Level of Service – July 2015 Peak Seasonal Period

Roadway	Existing LOS July 2015	Existing Delay July 2015
Brielle Road/Fisk Avenue Intersection Approaches	LOS A	7.9 sec
Green Avenue Intersection Approach	LOS B	13.9 sec
Bridge W-9 (Brielle Road/Fisk Ave)	LOS E	75.8 sec

2.4.4 Accident History

Crash data for the years 2014 – 2019 was obtained from the NJDOT Crash History database. In addition, both the Brielle Borough and Manasquan Borough Police Departments were contacted to confirm the accident history and provide any additional crashes. Based on a review of this crash data, there were 8 crashes reported within the project area in this timeframe. Three of the accidents during this period either

involved pedestrians or cyclists, one of which was a head-on collision resulting from avoidance of a cyclist. Three accidents involved hitting fixed objects, while the last two were right angle crashes. In addition, several accidents were noted on Brielle Road approaching Bridge W-9 in 2015 and 2016 (west of project limits). They included side swipes, as well as collisions with cyclists and parked cars, which could also be indicative of the narrow roadway widths.

Aside from the reported accidents, both bridge tenders and the owner of the adjacent marina have reported dozens of instances of broken vehicle mirrors and side swipes resulting from two opposing vehicles crossing the narrow bascule span at the same time. Formal reports are typically not filed for these as the low speeds generally keep the damage to less than \$500 (legal limit for filing report). However, there was at least one such case reported in 2010.

2.4.5 Safety

Based on recent site observations, all three roadways – Brielle Road, Fisk Avenue, and Green Avenue – are posted for 25mph throughout the project limits. Roadway geometrics at Bridge W-7 and Bridge W-9 are substandard due to bridge roadway widths being narrower than required by AASHTO and NJDOT and narrower than the approach roadways. This results in the bridges being assessed as functionally obsolete when assessed in accordance with NBIS. The following Road Safety Audit items were reviewed and resulted in safety concerns about vehicle and pedestrian traffic:

Existing Roadway Widths – Existing roadway widths within the project limits were reviewed. The roadway widths vary along Brielle Road/Fisk Avenue, specifically at Bridge W-9 and on the approaches to the Green Avenue intersection. The current approach roadway width is around 23' on the west approach to Bridge W-9, which continues back to the intersection with Green Avenue. The roadway width along Fisk Avenue west of the Green Avenue intersection is approximately 34', which meets the desired minimum per AASHTO for bicycle compatibility. The existing roadway width on the east approach varies from 23' at Bridge W-9 before eventually widening out to 42' at the intersection of Brielle Road and Glimmer Glass Circle. The horizontal clearance is currently wider on the approach roadway than the bridge and both approaches narrow at the bridge. The narrow roadway width contributes to a reduction in traffic capacity at the bridge along with vehicles in opposing directions occasionally “clipping” side view mirrors. The narrow roadway width also contributes to reduced bicycle and pedestrian operation and safety through a reduced level of comfort between bicyclists and adjacent vehicular traffic and walking pedestrians.

The existing roadway widths along Green Avenue vary from approximately 22' minimum from the intersection with Brielle Road south across Bridge W-7, before widening to around 32' further south of the bridge near the intersection of Green Avenue and Crescent Drive.

Existing Shoulder Widths – No delineated shoulders exist on the Brielle Road approaches to Bridge W-9. The lack of shoulders does not provide bicycle compatibility or a level of comfort for pedestrians walking along the existing sidewalk on the north side of Brielle Road. The lack of existing shoulders along the already narrow travel way increases potential for opposite direction vehicle crashes, including sideswipes and impacts with the adjacent bridge tower columns.

Formal striped shoulders are not present along Fisk Avenue. However, there is sufficient roadway width to provide at least a 5' shoulder on each side of the roadway leading up to the Green Avenue intersection. There are no delineated shoulders provided along Green Avenue, which when combined with the insufficient narrow roadway width, does not facilitate bicycle compatibility, pedestrian circulation, or driver comfort.

Existing Pedestrian Circulation – There is an existing timber/asphalt sidewalk with a variable width of approximately 6' to 8' along the north side of Brielle Road/Fisk Avenue within the project limits that connects to an existing sidewalk network at each end of the project limits.

There is no sidewalk present along the south side of Brielle Road/Fisk Avenue. There are also no existing sidewalks along Green Avenue within or immediately outside of the project limits. In addition, crosswalks are not provided for a safe pedestrian circulation and access route anywhere within the project limits. The lack of contiguous sidewalks and crosswalks does not provide for safe pedestrian accessibility from the adjacent residential neighborhoods to the Manasquan beachfront or for general recreational use. The lack of contiguous sidewalk forces pedestrians to use the roadway travel lanes which are considered narrow for vehicular traffic, let alone shared use traffic.

Existing Street Lighting – There is currently street lighting along Brielle Road/Fisk Avenue mounted on the existing utility poles. The existing lighting alternates sides of the roadway and is comprised of “cobra-head” cutoff luminaires on 8' aluminum lighting arms. The type of existing fixture (i.e. high-pressure sodium, LED, etc.) is unknown. Street lighting does not exist along Green Avenue. The adequacy of the existing street lighting for lighting level distributions will be further reviewed during later project stages.

Existing Bridge W-9 Dynamic Warning System – An existing dynamic warning system is provided for Bridge W-9 as a positive warning system to prevent vehicles from crossing the bridge when it is open. The system is located on both approaches to the existing bridge and is comprised of overhead mast arm traffic signals, clamp mounted traffic signals, warning gongs, and moveable warning and barrier gates with warning lights, with the gate types differing on each approach.

The gate on the eastbound approach is a horizontal rolling swing gate. Warning lights and reflectors are incorporated on the gate. It extends across the existing sidewalk, thus providing provisions for pedestrian warning and safety along with vehicular warning and safety. The gate on the westbound approach is a vertical arm type gate and also includes warning lights and reflective markings. The gate also extends across the existing sidewalk, thus providing provisions for pedestrian warning and safety. The configuration of warning and barrier gates does not conform to current MUTCD requirements.

Existing Railings – The adequacy of the existing bridge rails along Bridge W-7 and Bridge W-9 was reviewed. The existing combination of timber/steel railings do not meet current AASHTO/NJDOT standards and are not considered crashworthy. The guide rail at Bridge W-9 is also not adequate to protect the timber tower columns and traffic from a vehicular collision and is not properly stiffened in the transition zones. There is insufficient clear zone from the bridge tower columns to the adjacent travel lanes.

Green Avenue Intersection Sight Distance – Intersection sight distance (ISD) for passenger vehicles was reviewed on the Green Avenue approach to the Brielle Road/Fisk Avenue intersection. An ISD of 335' is required for a passenger vehicle at 30mph design speed (25mph operating speed), per Chapter 6 of the NJDOT Roadway Design Manual. Sufficient ISD in both directions along Brielle Road/Fisk Avenue is available for passenger vehicles along the Green Avenue approach. Minor vegetation clearing would be recommended to maximize the visible area at the Green Avenue stop bar. Stopping sight distance along the Brielle Road/Fisk Avenue approaches to the intersection was also reviewed. A stopping sight distance of 200' approaching the intersection is required for a passenger vehicle at a 30mph design speed. Per the reviewed data, the stopping distance is sufficient. For ISD calculations and additional information refer to Appendix C.

Emergency Vehicle Access – Emergency vehicles over 3 tons, including fire trucks and ambulances, are not currently permitted across Bridge W-7 and Bridge W-9. The Brielle Fire Department is located at 509

Longstreet Avenue and serves as the primary water rescue agency and the primary mutual aid agency for fire suppression for all of Manasquan. The Brielle First Aid Squad is located at 710 Old Bridge Road and serves as the primary mutual aid agency for first aid calls in Manasquan. Both agencies must currently utilize East Main Street to access the Manasquan peninsula/waterfront. Not only is this crossing further mileage-wise than Bridge W-9, but it requires emergency vehicles to clear a busy signalized intersection between Route 71 and Main Street, as well as an NJ Transit railroad crossing directly adjacent to the Manasquan train station. Extended gate closures at this rail crossing occur while the train is stopped at the Station for embarking/disembarking passengers.

It is difficult to precisely quantify emergency response times as they depend on several factors. Besides the increased travel distance, there are other challenges – using busier roads, traversing intersections, dealing with the railroad, etc. (see Appendix C for letter from Manasquan) – that result in the current routes adding several minutes of time, with implications to life safety and property protection.

3.0 PROJECT PURPOSE AND NEED

The project purpose, needs, objectives and goals have been developed by Monmouth County with input from County residents and the New Jersey Department of Transportation.

3.1 Project Purpose

The purpose of the project is to provide a safe and efficient crossing for all modes of travel within the project limits by addressing the geometric, structural, operational, and maintenance deficiencies of Bridge W-7, Structure W-8, and Bridge W-9.

3.2 Project Needs

3.2.1 Bridge Needs

The three noted structures and their associated roadways provide critical transportation connections for this coastal area accommodating vehicular traffic, bicyclists, pedestrians, and marine traffic. They also function as part of a critical evacuation route in the event of coastal flooding or other emergencies. All three structures are structurally deficient, and Bridge W-7 and Bridge W-9 are also functionally obsolete as defined by FHWA, making them candidates for replacement and eligible for Federal funding.

The NJDOT identifies several key controlling design elements that should be adhered to on certain types of projects. Exceptions to these criteria are only approved on a case-by-case basis and must be documented and supported by strong data. This design exception process typically occurs during final design. There are several controlling substandard design elements (CSDE's) in the project area pertaining to the structures. They include the following:

Structural Capacity (Bridge W-7, Structure W-8, and Bridge W-9) – In NJ, all bridges are load rated for select predefined legal truck types. Posting is required if the bridge cannot support the full legal weight of any of these vehicles. Furthermore, per NJDOT standards, all new or reconstructed bridges carrying vehicular traffic must be designed to support full HL-93 loading.

Bridge Width (Bridge W-7 and Bridge W-9) – As per the FHWA and NJDOT Recording and Coding Guides, the minimum bridge roadway width measured from curb-to-curb (or face-to-face of railing) necessary for the bridge to not be classified as functionally obsolete is 32' when the average daily traffic (ADT) exceeds 5,000 vehicles. AASHTO also provides guidelines for minimum widths considering factors such as shared use. Per AASHTO and NJDOT, the bridge width should also be at least as wide as the approach roadway width.

Vertical Clearance (Bridge W-9) – Per the NJDOT Design Manual for Bridges and Structures, the minimum vertical clearance for local and collector roads is 14'-6" with an additional 6" tolerance desired to account for future resurfacing. State law requires that all roadways with a vertical clearance lower than 14'-6" be posted.

The following is a summary of the specific bridge needs for each structure:

Bridge W-7 – Structurally deficient due to the poor physical condition of the substructure and its low load carrying capacity. The bridge is currently posted for a maximum gross load of 3 tons. Bridge W-7 is also functionally obsolete due to inadequate bridge deck geometry. Its current curb-to-curb width of 21.7' is insufficient (too narrow) in consideration of the existing and projected traffic volumes (ADT) on the bridge.

Structure W-8 – Structurally deficient due to poor physical condition, exhibiting advanced deterioration of the culvert barrel with spalls, cracking, and broken and missing concrete. The headwalls at each end of the culvert and the adjacent steel sheet piling walls supporting the causeway embankment also exhibit advanced corrosion and section loss. The culvert is not load posted.

Bridge W-9 – Structurally deficient due to the serious physical condition of the structure and its low load carrying capacity. The bridge is currently posted for a maximum gross load of 3 tons (regardless of number of axles), effectively excluding all trucks, buses, larger service vehicles, and most emergency vehicles, such as fire trucks and larger ambulances and EMS vehicles. This restriction prevents Bridge W-9 from being utilized as a coastal evacuation route. Moreover, the bridge is functionally obsolete due to inadequate bridge deck geometry. Its current minimum bridge roadway width of 19.3' at the tower columns near the bascule span is insufficient (too narrow) in consideration of the existing and projected traffic volumes (ADT) on the bridge. The existing posted vertical clearance of 14'-0" is also substandard and further restricts the structure's usage.

3.2.2 Roadway Needs

Fisk Avenue and Brielle Road are functionally classified by the NJDOT as urban major collector roadways. Green Avenue is classified as an urban local roadway. The average daily traffic (ADT) volumes, as measured in July 2015 for Green Avenue, Fisk Avenue, and Brielle Road were 3,915, 2,812, and 4,806 vehicles respectively. Due to the various load restrictions, these numbers represent almost exclusively passenger vehicles. During the summer tourism season, pedestrians and bicyclists also make up a large proportion of the roadway users, many of which use these routes to access the beachfront areas just to the east. On one weekend in July of 2015, a total of 770 bicyclists and 272 pedestrians were counted in a 12-hour period. Projected ADT volumes for the year 2040 were calculated to be 5,681, 4,082, and 6,973 for Green Avenue, Fisk Avenue, and Brielle Road respectively. Refer to Appendix C for the traffic projection analysis. A diesel truck traffic study was performed in October 2025 as part of the air study. Since the results are less than the 2015 peak data, no further analysis is required. The existing roadway widths vary along the length of each roadway with sidewalks present in certain locations. There are numerous roadway controlling substandard design elements (CSDE's) in the project area. They include the following:

Lane Width (Green Avenue and Brielle Road) – Existing lane widths vary along Green Avenue and Brielle Road. They narrow to less than 11' wide on the approaches to Bridge W-7 and are around 11.5' wide on the approaches to Bridge W-9. The desired width is 12' and minimum width is 11' (per NJDOT Roadway Design Manual and AASHTO A Policy on Geometric Design of Highways and Streets).

Shoulder Width (Green Avenue, Fisk Avenue, and Brielle Road) – Shoulders are not delineated on Green Avenue or Brielle Road/Fisk Avenue west of Bridge W-9 (within project limits) and only partially delineated on Brielle Road east of Bridge W-9. They vary in width and, in some locations along Green Avenue and Brielle Road, do not exist. The minimum width for a bicycle compatible delineated shoulder with no parking adjacent to a curbed roadway is 5' (AASHTO Guide for Development of Bicycle Facilities).

Cross Slope (Green Avenue, Fisk Avenue, and Brielle Road) – Due to settlement and pavement repairs over the years, the existing cross slope on each of the roadways is variable and has likely dropped below minimum requirements in certain locations. The minimum roadway pavement cross slope is 1.5% (per NJDOT Roadway Design Manual and A Policy on Geometric Design of Highways and Streets).

3.2.3 System Linkage

The bridge crossings are critical components of local transportation system linkage, and maintaining them as active, safe, and in a state of good repair for all users is important to the surrounding communities. Public frustrations regarding recent long-term emergency closures of Bridge W-9 in 2014-2015 and 2017-2018 have highlighted the importance of the following facets of system interconnectivity:

Roadway Network – Green Avenue, Fisk Avenue, and Brielle Road form a "T" intersection in the project area. The structures on these roadways are key components in the roadway network, providing routine and emergency access over Debbie's Creek and the Glimmer Glass between the beachfront area of

Manasquan and Brielle Borough. Access to the beach area in Manasquan is of significant local economic importance, particularly during the summer season. The roadways connect these boroughs and serve as primary access for residential, recreational, and commercial vehicles, emergency and service vehicles, and bicycles and pedestrians. However, the current load postings for Bridge W-7 and Bridge W-9 preclude their use by many vehicles, including most emergency vehicles, buses, and trucks.

Emergency Response – The roadways connect these boroughs and are the most direct access route for emergency vehicles serving the beachfront. The Brielle Fire Company serves as the main surface water rescue team for Manasquan’s beachfront. The most direct route from Brielle to the waterfront is over Debbie’s Creek and the Glimmer Glass. However, the current load postings for Bridge W-7 and Bridge W-9 preclude their use by most emergency vehicles, forcing the emergency teams to use the Main Street Bridge and causing a delay in response time to the inlet.

Coastal Evacuation – Bridge W-9 also provides the only access/egress for about 150 housing units located just east of the bridge in Manasquan during times of flooding on Brielle Road from east of Deep Creek Drive and extending to 4th Avenue. This is a chronic problem resulting from storms and during astronomically high tides. Furthermore, Brielle Road and Fisk Avenue are designated and signed as part of the Coastal Evacuation Route from the beachfront area to the mainland, functioning as one of only three access/egress points to and from the Manasquan beachfront area.

Marine – There are a substantial number of marinas and docks located upstream (north) of the project site along the Glimmer Glass and Watson Creek. The drawbridge span of Bridge W-9 provides the only means of access to the Manasquan River/Atlantic Ocean for taller marine vessels and is regularly utilized for this purpose. Reliable operation of the movable bridge is critical to provide for these marine needs and is also vital to minimizing delays associated with bridge openings to the various bridge users.

3.2.4 Pedestrian/Bicycle Compatibility and ADA Compatibility

As stated in section 3.2.2, pedestrian and bicyclist usage of the aforementioned roadways is particularly high, especially during the summer months. Existing roadway and sidewalk widths vary throughout the project area. There is a single existing sidewalk on the northbound side of Bridge W-7 that does not extend beyond the limit of the bridge, and a single sidewalk on the westbound sides of Brielle Road/Fisk Avenue that extends across both structures and along approaches to these structures. Due to the variability of sidewalks, the levels of compatibility with the Americans with Disabilities Act (ADA) and guidelines established by the American Association of State Highway and Transportation Officials (AASHTO) also vary. The current sidewalk and roadway geometry is substandard in many locations and generally is insufficient to safely accommodate bicycle/pedestrian users per current AASHTO guidance. Conditions and compatibility are summarized below.

Bridge W-7 Existing Conditions – The deck carries a 21.7' wide roadway, plus a 2.9' wide sidewalk on the east side. There is no sidewalk on the approaches to the bridge. Substandard Features: The existing bridge includes a walkway less than 3' wide. A 4' minimum clear sidewalk is required to satisfy the ADA Public Rights-Of-Way Accessibility Guidelines.

Structure W-8 Existing Conditions – The causeway has an approximately 6' wide sidewalk on the north side.

Bridge W-9 Existing Conditions – There is an approximately 6' wide sidewalk on the northern side that reduces to 3'-9" near the bascule span. Substandard Features: A 4' minimum clear sidewalk is required to satisfy the ADA Public Rights-Of-Way Accessibility Guidelines.

T-intersection – Vehicular operations along Green Avenue are stop-controlled at the T-intersection of Green Avenue and Brielle Road/Fisk Avenue. Existing bicycle and pedestrian traffic is impacted by narrow travel way lane widths and non-contiguous sidewalk within project limits.

Sidewalks and Crosswalks – An existing timber/asphalt sidewalk with a variable width of approximately 6' to 8' runs along the north side of Brielle Road/Fisk Avenue within the project limits and connects to an existing sidewalk network at each end of the project limits. There is no sidewalk present along the south side of Brielle Road/Fisk Avenue. There are also no existing sidewalks along Green Avenue within or immediately outside of the project limits. In addition, crosswalks are not provided for a safe pedestrian circulation and access route anywhere within the project limits. The lack of contiguous sidewalks and crosswalks does not provide for safe pedestrian accessibility from the adjacent residential neighborhoods to the Manasquan beachfront or for general recreational use. The lack of contiguous sidewalk forces pedestrians to use the roadway travel lanes, which are considered narrow for vehicular traffic, let alone shared use traffic.

Existing Roadway Widths – Roadway widths vary along Brielle Road/Fisk Avenue, specifically at Bridge W-9 and on the approaches to the Green Avenue intersection. The current approach roadway width is around 23' on the west approach to Bridge W-9, which continues back to the intersection with Green Avenue. The horizontal clearance is currently wider on the approach roadway than on Bridge W-9, and both approaches narrow at the bridge. The narrow roadway width contributes to a reduction in traffic capacity at the bridge along with vehicles traveling in opposing directions occasionally “clipping” side view mirrors. The narrow roadway width also contributes to reduced bicycle and pedestrian operation and safety through a reduced level of comfort between bicyclists and adjacent vehicular traffic and pedestrians.

Existing Shoulders – No delineated shoulders exist on the Brielle Road approaches to Bridge W-9. The lack of shoulders does not provide bicycle compatibility or a level of comfort for pedestrians walking along the existing sidewalk on the north side of Brielle Road. Formal striped shoulders are not present along Fisk Avenue, although there is sufficient roadway width to provide at least a 5' shoulder on each side of the roadway up to the Green Avenue intersection. There are no delineated shoulders provided along Green Avenue, which when combined with the insufficient narrow roadway width, does not facilitate bicycle compatibility, pedestrian circulation, or driver comfort.

3.3 Goals and Objectives

The project goals and objectives were developed from input received from Monmouth County, local elected officials, business owners, residents, and other stakeholders. While the project may not be able to satisfy all goals and objectives listed herein, the recommended alternatives address as many as practical. The goals and objectives are identified as follows:

1. Provide ADA compliant pedestrian facilities and crossings with connectivity – There are no sidewalks on either of the approaches to Bridge W-7. The sidewalk width is also too narrow in the vicinity of the bascule span on Bridge W-9. Other features such as curb ramps and crosswalks are nonexistent within the project area.
2. Reduce safety risks for all users – The existing bridge railings are substandard geometrically and structurally. The roadside safety features, including guide rails, guide rail attachments, and end treatments do not meet current AASHTO and NJDOT requirements. In addition, the electrical and mechanical systems on Bridge W-9 have insufficient safety controls.
3. Reduce the frequency of major bridge maintenance activities, as these disrupt traffic flow.
4. Avoid, minimize, or mitigate adverse effects on the National and State Register of Historic Places listed Bridge W-9 – Employ context sensitive solutions in the roadway and bridge design approach.
5. Avoid or minimize social, economic, and environmental impacts.
6. Maintain the existing scenic/aesthetic landscape context.
7. Maintain traffic operations/volume and marine vessel passage with minimum disruption and delay during construction.

4.0 EXISTING CONDITIONS, PROPOSED IMPACTS, AND MITIGATION

This section describes the existing environmental conditions in and around the three structures. The *Technical Environmental Report* (TER) describes the natural, historic, and manmade resources that were identified as present within the project study area and potentially impacted by the proposed action. The TER also identifies certain resources or special protected areas (e.g., Marine Protected Areas, Wild and Scenic Rivers) that are not present or anticipated to be impacted by the proposed actions and are excluded from further discussion within this EA. Impacts to the environment that are proposed by the preliminary preferred alternative (PPA) for each structure are detailed herein, as are measures proposed to mitigate for those impacts. Plans for each of the preferred alternatives and anticipated limits of aquatic resources to be disturbed by the implementation of the preferred alternative for each structure are included in the TER in Appendix A.

4.1 Topography, Geology, Soils and Groundwater

4.1.1 Existing Environmental Conditions

The project location is shown on the Point Pleasant, NJ USGS Topographic Quadrangle (Figure 5). This mapping shows that the project area is relatively flat, with little to no change in elevation, and is only nominally above sea level.

The project area lies within the Outer Coastal Plain physiographic province, which is underlain by the Kirkwood Formation. The Kirkwood Formation is characterized by unconsolidated sand, silt, and clay of Cenozoic age and marine and continental origin. A layer of sand, clay, and gravel sediments of Quaternary age, deposited by glacial outwash, overlies the Kirkwood Formation. These Quaternary deposits are generally surficial. According to existing geologic resources, including the Acid Substrata Potential Map of New Jersey, the Kirkwood Formation is an area of known acid producing soils.

The highly permeable beds of coarse material form aquifers that differ in areal extent and thickness. Slightly permeable interbeds of silt and clay form confining beds, which restrict the vertical flow of water. There are five principal Coastal Plain aquifers, and the project site is in the area overlying the Kirkwood-Cohansey aquifer system (Appendix A).

More than 75 percent of the freshwater supply in the New Jersey Coastal Plain is from ground water. In the Coastal Plain, high-capacity production wells used for public supply commonly yield 500 to 1,000 gallons per minute (gal/min), and many exceed 1,000 gal/min. Water quality is satisfactory except for local excessive iron concentrations [as much as 460 milligrams per liter (mg/L)] in several aquifers, and for local contamination from saltwater intrusion and waste disposal. In the unconfined Kirkwood-Cohansey aquifer system, water is brackish or salty in some coastal areas.

The US Department of Agriculture (USDA) Natural Resources Conservation Service Web Soil Survey (updated October 2025) shows the following soil map units within the project area: Appoquinimink-Transquaking-Mispillion complex (AptAv); Udorthents (UdaB); and minor components, including Hammonton. The Web Soil Survey Mapping is shown in Figure 6.

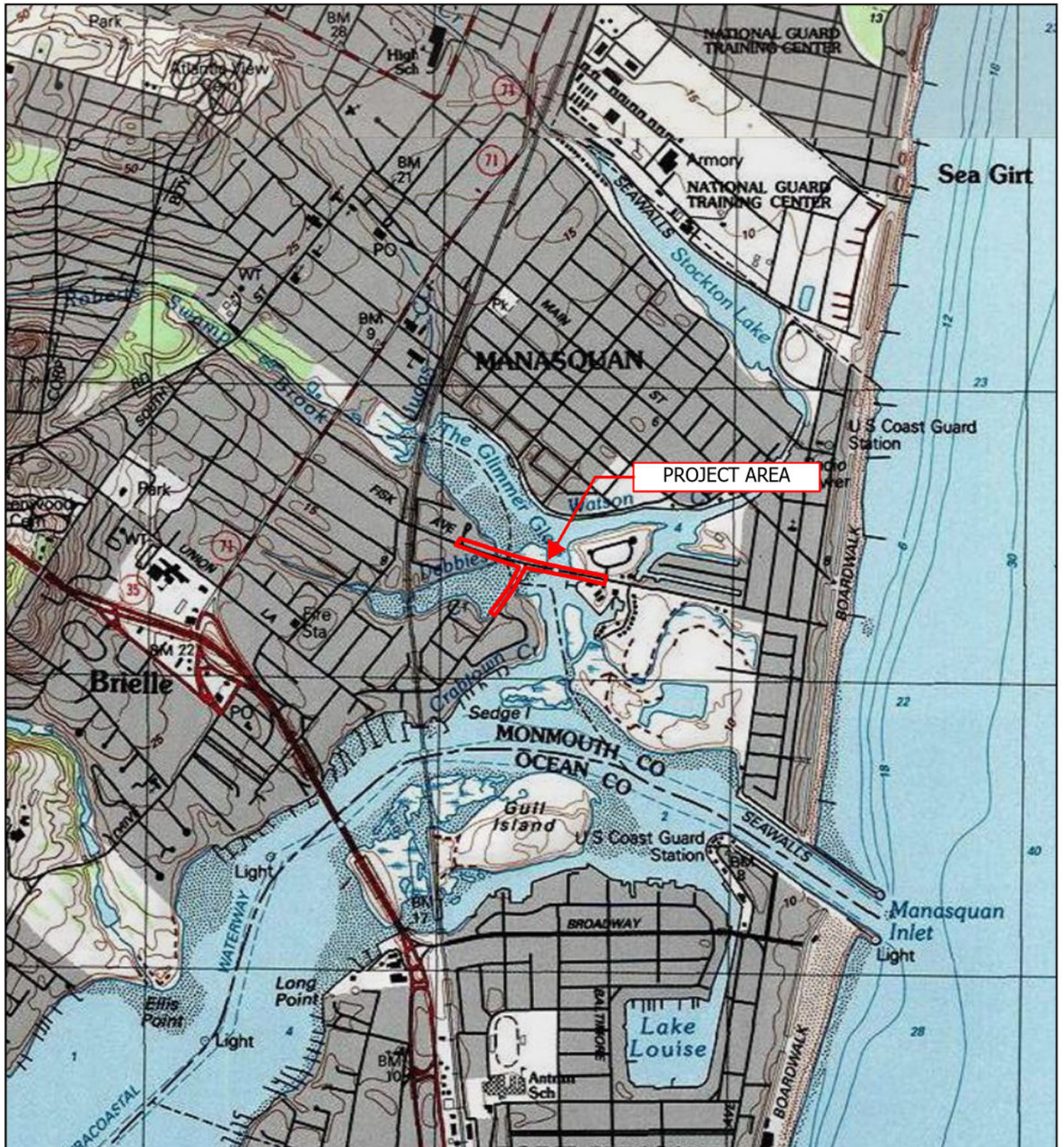


FIGURE 5. SITE LOCATION MAP
Monmouth County Three Bridges (W-7, W-8, W-9)
 Brielle and Manasquan Boroughs, Monmouth County, New Jersey



0 1,000 2,000 Feet
 1" = 2,000'

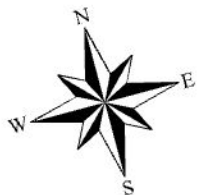
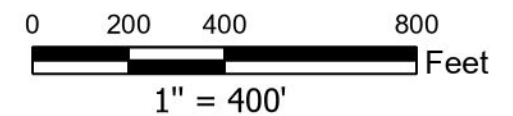


Figure 6. Soils Map

Monmouth County Three Bridges (W-7, W-8, W-9)
 Brielle and Manasquan Boroughs, Monmouth County, New Jersey



The Appoquinimink-Transquaking-Mispillion complex comprises land that is almost flat (0 to 1 percent slopes) and very frequently flooded. The composition of this map unit is as follows:

- 40% Appoquinimink, very frequently flooded and similar soils – Appoquinimink is commonly found in tidal marshes and at the toes of slopes. Its parent material is loamy fluviomarine deposits over herbaceous organic material. A typical profile is silt loam over mucky peat. It is very poorly drained and in hydrologic soil group B/D. It is rated as a hydric soil.
- 30% Transquaking, very frequently flooded and similar soils – Transquaking is also commonly found in tidal marshes, at the toes of slopes, and in dips. Its parent material is herbaceous organic material over loam. A typical profile includes mucky peat over muck atop silty clay. Transquaking is very poorly drained and in hydrologic soil group B/D. It is rated as a hydric soil.
- 25% Misfillion, very frequently flooded and similar soils – Misfillion is commonly found in tidal marshes. Its parent material is herbaceous organic material over loamy marine deposits and/or loamy fluviomarine deposits. A typical profile is mucky peat atop muck over silt loam. It is very poorly drained and in hydrologic soil group C/D. It is rated as hydric.
- 5% minor components including Hammonton – Hammonton is typically found in depressions and flats. It is moist loamy upland and is not rated as hydric.

Udorthents consists of level to gently sloping (0 to 8 percent slopes), well drained to somewhat poorly drained soils that are not commonly flooded. They formed in stratified or graded, sandy or loamy fill or disturbed original soil material. All these soils have been altered (fill or excavated) and therefore vary from place to place. However, a typical soil profile is a 12-inch loam A-horizon over a C horizon of loamy sand. Udorthents are not rated as hydric. None of the soil map units or their components are classified as prime farmland.

4.1.2 Impacts Anticipated under the PPA

Mild dust production and sedimentation is expected to occur as a result of the construction activities. These impacts will be temporary. Direct and indirect impacts to aquatic resources from accelerated erosion and sedimentation will be through the application of Best Management Practices (BMPs), including installation floating turbidity barriers, silt fencing, and construction fencing to limit disturbance.

The project proposes minor impacts within areas that are not considered actively disturbed. However, since the majority of the project area is highly disturbed, and replacement of existing structures will occur within the same general footprint, no permanent or significant adverse impacts to geology or soils are anticipated. Much of the area is overlain by historic fill, which is known to potentially contain contaminants such as polycyclic aromatic hydrocarbons (PAHs) and heavy metals, which will be addressed during final design as part of establishing material handling and offsite disposal requirements. Soil handling will be governed by the NJDEP Linear Construction Technical Guidance document and the NJDOT Standard Specifications.

4.1.3 Impact Avoidance and Mitigation

A Soil Erosion and Sediment Control Plan will be prepared and approved in accordance with the Natural Resource Conservation Service “Standards for Soil Erosion and Sediment Control in New Jersey” pursuant to the Soil Erosion and Sediment Control Act of 1975 (N.J.S.A. 4:24-12). Soil erosion control measures will be implemented as approved to mitigate soil erosion impacts.

In addition, soil borings may be required by NJDEP prior to construction to determine whether acid producing soils will be exposed during construction. If these soils do exist, a mitigation plan will be developed during final design to minimize the potential for adverse impacts to the environment. Should

acid producing soils be encountered during construction; the following procedures will be implemented:

- Exposure of acid producing soils to air and/or water will be minimized;
- Soils that have been disturbed will be quickly stabilized so as to prevent acid producing soils from washing into any nearby water;
- Any acid that is generated or exposed will be properly neutralized;
- The disturbed area will be treated to ensure that post-exposure oxidation rates do not exceed pre-exposure oxidation rates;
- Acid producing soils will be disposed of properly and shall not be mixed into or spread over non-acid producing soils;
- Any acid producing soils remaining after construction will be covered with lime and a layer of non-acid producing soil sufficient to facilitate the growth of vegetation; and
- Appropriate regulatory agencies will be contacted as necessary.

4.2 Water Quality

4.2.1 Existing Environmental Conditions

Bridge W-7 crosses the tidally influenced Debbie's Creek, while Structure W-8 and Bridge W-9 cross the tidally influenced Glimmer Glass, as shown in Figure 7. Both waterways are tributaries of the Manasquan River. The NJDEP Surface Water Quality Standards (N.J.A.C. 7:9B) classify both waterways as Freshwater Non-Trout (FW2-NT) and Saline Estuarine 1 (SE1). Designated uses in FW2-NT and SE1 waters include the following:

- Maintenance, migration and propagation of the natural and established biota;
- Primary contact recreation;
- Industrial and agricultural water supply;
- Public potable water supply after conventional filtration treatment (a series of processes including filtration, flocculation, coagulation, and sedimentation, resulting in substantial particulate removal but no consistent removal of chemical constituents) and disinfection;
- Shellfish harvesting in accordance with N.J.A.C. 7:12; and
- Any other reasonable uses.

Stormwater currently flows off the impervious roadways via overland sheet flow. In some locations, stormwater flows into existing storm inlets and culverts. In other, uncurbed locations, stormwater flows onto adjacent areas. There are no existing stormwater management facilities associated with the project structures.

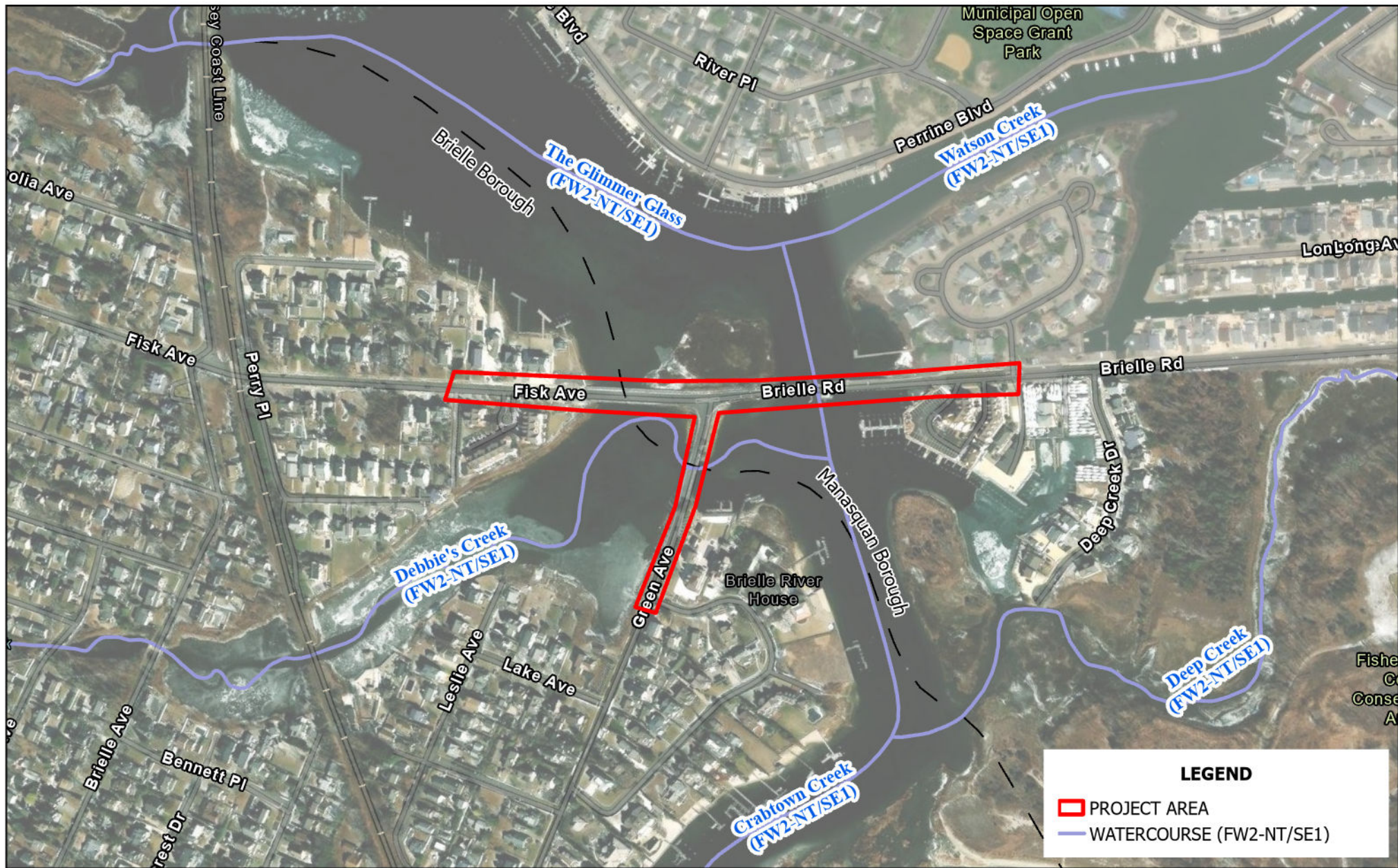


Figure 7. Surface Water Map

Monmouth County Three Bridges (W-7, W-8, W-9)
 Brielle and Manasquan Boroughs, Monmouth County, New Jersey

0 200 400 800
 Feet
 1" = 400'

4.2.2 Impacts Anticipated under the PPA

Potential temporary impacts to water quality during construction could result from soil erosion and subsequent increased sediment loading into project area receiving waters where earthwork is proposed along existing roadways. Disturbance of the benthos will occur where replacement of pilings and bulkheads will occur. These impacts are considered temporary in nature since they will: 1) occur from the replacement of existing structures and not from construction of new structures; and 2) occur only during active construction.

Some additional stormwater runoff will be created by the new impervious surfaces that will discharge via overland sheet flow into storm inlets, culverts, and other stormwater management collection systems along the approach roadways, into vegetated strips along approaches, and directly into the waterways (through the open deck of Bridge W-9). The amount of additional stormwater generated by the project will be nominal, as there is no increase in number of lanes proposed. It is anticipated that roadway pollutant levels will remain the same, considering traffic patterns are not to be altered as a result of the project. If the project meets the definition of a “major development”, in that it disturbs greater than one (1) acre of land and/or creates greater than one-quarter acre of regulated impervious surface and/or regulated motor vehicle surface, the project will be required to comply with the NJDEP Stormwater Management (SWM; N.J.A.C. 7:8) regulations. Per N.J.A.C. 7:8-1.6 of the recently amended (January 20, 2026) SWM regulations (N.J.A.C. 7:8), the project is subject to the March 2, 2021 SWM regulations, which were effective at the time of PPA approval (see *Alternatives Analysis Report* prepared by Mott MacDonald and dated September 16, 2022, in Appendix B), as long as the project scope, as defined in the PPA, is not revised in such a way as to not be considered de minimis impact on water resources.

During the construction phase, temporary impacts to water quality are anticipated due to grading and construction of waterfront bridge and road structures. It is reasonable to assume that mild sedimentation will occur during construction, particularly if heavy precipitation is encountered during the construction period. Settling of airborne dust and sediments related to excavation, together with pollutants produced by diesel trucks and excavation equipment, is expected to have minor and temporary impacts on water quality. Construction impacts will be minimized through the proper phasing of construction activities to ensure that pollutant control measures are among the first activities undertaken. Soil erosion and sediment control measures will be employed during and throughout construction and will include silt and construction fencing, straw bale dikes, filter fabric around inlets, proper maintenance of inlet structures, and temporary bulk heading or cofferdams. These measures will be used around each area along the waterway as needed. All construction debris, including any empty storage containers, will be removed from the site on a regular basis and transported to an acceptable disposal site. Sanitary facilities will be provided and properly maintained for use by all construction workers, when required.

4.2.3 Impact Avoidance and Mitigation

BMPs will be employed to minimize impacts to water quality from soil erosion and water runoff during construction in accordance with the Natural Resource Conservation Service “Standards for Soil Erosion and Sediment Control in New Jersey” pursuant to the Soil Erosion and Sediment Control Act of 1975 (N.J.S.A. 4:24-12) and in accordance with the NJDEP Stormwater Management regulations (N.J.A.C. 7:8) (if the project is a “major development”) and the Coastal Zone Management (CZM) Rules (N.J.A.C. 7:7).

4.3 Floodplains and Tidelands

4.3.1 Existing Environmental Conditions

4.3.1.1 Floodplains

Floodplains are established by the Federal Emergency Management Agency (FEMA) using geographic data that includes, but is not limited to, the following: soils, topography, regional land features, and proximity to water. The FEMA database was utilized to identify potential flood hazard zones at and adjacent to the site. The currently approved effective 2009 National Flood Insurance Program, Flood Insurance Rate Map (FIRM) indicates that the entire project area is located within a special flood hazard area (Zone AE) with a base flood elevation (100-year storm event) ranging from 7 to 9 feet. This elevation range increases to 9 to 11 feet in the latest preliminary FIRM released in January 2014, which is based on more recent data, and which shall govern, per the New Jersey Flood Hazard Area Control Act Rules (FHACARs; N.J.A.C. 7:13), until superseded by a new effective FIRM. Since no NJDEP flood studies exist, the base flood elevation from the preliminary FIRM shall be utilized to determine the regulatory New Jersey Flood Hazard Area Design Flood (NJFHADF) (or climate-adjusted flood elevation). Under the anticipated amendments to the FHACARs, to incorporate the NJPACT REAL rule amendments, the tidal NJFHADF elevation will increase by 4 feet to elevation 13 to 15 feet. Vegetation disturbance within 50 feet from the top of bank (riparian zone) could result in a NJDEP Flood Hazard Area compliance review as part of the permit process. Floodplain mapping is included as Figure 8.

4.3.1.2 Tidelands

The NJDEP Tidelands Data Viewer and the NJ-GeoWeb GIS tidelands layer (Tidelands map number T462-2172) were used to identify tidelands claim areas at the project site. The mapping indicates that the majority of the project site is situated within New Jersey claimed tidelands. The appropriate Tidelands grant, lease, or license will be determined as detailed design is advanced.

4.3.2 Impacts Anticipated under the PPA

Because the project will occur within mapped flood hazard areas, it will be subject to compliance review under the FHACARs (N.J.A.C. 7:13), which govern development and construction activities within a floodplain and related regulated areas (e.g., riparian zone). Compliance review under CAFRA and/or the Waterfront Development permit process will also be required.

The proposed work is located within a tidal flood hazard area, governed by tidal flooding from the Atlantic Ocean. Since all watercourses within the project limits are tidal, there will be no restrictions on fill volume or discharge quantity for the proposed scope of work. Impacts to the tidal flood hazard area are expected to be negligible, and no additional flooding is anticipated from the proposed project.

4.3.2.1 Roadways

The approaches to all three structures will be raised nominally to improve flooding conditions and accommodate the proposed structure depths. However, based upon the current design, it is anticipated that the roadways will remain in the floodplain. Adjustments will be made within the bulkhead limits.

4.3.2.2 Structures

The top of deck elevations for all three structures will be raised nominally above their current elevations to improve flooding conditions and accommodate the proposed structure depths. However, based on the current design, it is anticipated that they will remain in the floodplain.

FIGURE 8. FEMA FIRM MAP

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The community map repository should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations (BFEs)** and/or **Floodway Data** have been determined, users are encouraged to consult the **Flood Profiles and Floodway Data** and/or **Summary of Stillwater Elevations** tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only to landward of 10 North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations tables in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations tables should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by flood control structures. Refer to Section 2.4 Flood Protection Measures of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The projection used in the preparation of this map was State Plane New Jersey FIPS 2000. The horizontal datum was NAD83, GRS 80 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey at <http://www.ngs.noaa.gov> or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, NNGS12
National Geodetic Survey
SSM0-3, #6202
1215 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242, or visit its website at <http://www.ngs.noaa.gov>.

Base map information shown on this FIRM was provided in digital format by the New Jersey Office of Information Technology (NJ-OIT), Office of Geographic Information Systems (OGIS). This information was derived from digital orthophotos produced at a scale of 1:24,000 (1"=200') with a 1-foot pixel resolution from photography dated 2012.

This map reflects more detailed and up-to-date **stream channel configurations** and **floodplain delineations** than those shown on the previous FIRM for this jurisdiction. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study Report (which contain authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map. Also, the need to floodplain relationships for unreviewed streams may differ from what is shown on previous maps.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities later containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

The **AF Zone** category has been divided by a **Limit of Moderate Wave Action (LMWA)**. The LMWA represents the approximate landward limit of the 1.5-foot breaking wave. The effects of wave hazards between the VE Zone and the LMWA (or between the shoreline and the LMWA for areas where VE Zones are not identified) will be similar to, but less severe than those in the VE Zone.

Contact the **FEMA Map Information Exchange** at 1-877-336-2267 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The FEMA Map Information Exchange may also be reached by Fax at 1-800-368-6620 and their website at <http://www.mic.fema.gov>.

If you have questions about this map or questions concerning the National Flood Insurance Program in general, please call 1-877-FEMA-MAP (1-877-336-2267) or visit the FEMA website at <http://www.fema.gov/businessinfo>.

IF OPENWAY IN THIS AREA IS TOO NARROW TO SHOW TO SCALE, REFER TO FLOODWAY DATA TABLE

BOUNDARIES OF THE FLOODWAYS WERE COMPUTED AT CROSS SECTIONS AND INTERPOLATED BETWEEN CROSS SECTIONS. THE FLOODWAYS WERE BASED ON HYDRAULIC CONSIDERATIONS WITH REGARD TO REQUIREMENTS OF THE NATIONAL FLOOD INSURANCE PROGRAM. FLOODWAY WIDTHS AND OTHER PERTINENT FLOODWAY DATA ARE PROVIDED IN THE FLOOD INSURANCE STUDY REPORT FOR THIS JURISDICTION.

CERTAIN AREAS NOT IN SPECIAL FLOOD HAZARD AREAS MAY BE PROTECTED BY FLOOD CONTROL STRUCTURES. REFER TO SECTION 2.4 FLOOD PROTECTION MEASURES OF THE FLOOD INSURANCE STUDY REPORT FOR INFORMATION ON FLOOD CONTROL STRUCTURES FOR THIS JURISDICTION.

THE PROJECTION USED IN THE PREPARATION OF THIS MAP WAS STATE PLANE NEW JERSEY FIPS 2000. THE HORIZONTAL DATUM WAS NAD83, GRS 80 SPHEROID. DIFFERENCES IN DATUM, SPHEROID, PROJECTION OR UTM ZONES USED IN THE PRODUCTION OF FIRMS FOR ADJACENT JURISDICTIONS MAY RESULT IN SLIGHT POSITIONAL DIFFERENCES IN MAP FEATURES ACROSS JURISDICTION BOUNDARIES. THESE DIFFERENCES DO NOT AFFECT THE ACCURACY OF THIS FIRM.

FLOOD ELEVATIONS ON THIS MAP ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988. THESE FLOOD ELEVATIONS MUST BE COMPARED TO STRUCTURE AND GROUND ELEVATIONS REFERENCED TO THE SAME VERTICAL DATUM. FOR INFORMATION REGARDING CONVERSION BETWEEN THE NATIONAL GEODETIC VERTICAL DATUM OF 1929 AND THE NORTH AMERICAN VERTICAL DATUM OF 1988, VISIT THE NATIONAL GEODETIC SURVEY AT [HTTP://WWW.NGS.NOAA.GOV](http://WWW.NGS.NOAA.GOV) OR CONTACT THE NATIONAL GEODETIC SURVEY AT THE FOLLOWING ADDRESS:

NGS INFORMATION SERVICES
NOAA, NNGS12
NATIONAL GEODETIC SURVEY
SSM0-3, #6202
1215 EAST-WEST HIGHWAY
SILVER SPRING, MARYLAND 20910-3282
(301) 713-3242

TO OBTAIN CURRENT ELEVATION, DESCRIPTION, AND/OR LOCATION INFORMATION FOR BENCH MARKS SHOWN ON THIS MAP, PLEASE CONTACT THE INFORMATION SERVICES BRANCH OF THE NATIONAL GEODETIC SURVEY AT (301) 713-3242, OR VISIT ITS WEBSITE AT [HTTP://WWW.NGS.NOAA.GOV](http://WWW.NGS.NOAA.GOV).

BASE MAP INFORMATION SHOWN ON THIS FIRM WAS PROVIDED IN DIGITAL FORMAT BY THE NEW JERSEY OFFICE OF INFORMATION TECHNOLOGY (NJ-OIT), OFFICE OF GEOGRAPHIC INFORMATION SYSTEMS (OGIS). THIS INFORMATION WAS DERIVED FROM DIGITAL ORTHOPHOTOS PRODUCED AT A SCALE OF 1:24,000 (1"=200') WITH A 1-FOOT PIXEL RESOLUTION FROM PHOTOGRAPHY DATED 2012.

THIS MAP REFLECTS MORE DETAILED AND UP-TO-DATE STREAM CHANNEL CONFIGURATIONS AND FLOODPLAIN DELINEATIONS THAN THOSE SHOWN ON THE PREVIOUS FIRM FOR THIS JURISDICTION. AS A RESULT, THE FLOOD PROFILES AND FLOODWAY DATA TABLES IN THE FLOOD INSURANCE STUDY REPORT (WHICH CONTAIN AUTHENTIC HYDRAULIC DATA) MAY REFLECT STREAM CHANNEL DISTANCES THAT DIFFER FROM WHAT IS SHOWN ON THIS MAP. ALSO, THE NEED TO FLOODPLAIN RELATIONSHIPS FOR UNREVIEWED STREAMS MAY DIFFER FROM WHAT IS SHOWN ON PREVIOUS MAPS.

CORPORATE LIMITS SHOWN ON THIS MAP ARE BASED ON THE BEST DATA AVAILABLE AT THE TIME OF PUBLICATION. BECAUSE CHANGES DUE TO ANNEXATIONS OR DE-ANNEXATIONS MAY HAVE OCCURRED AFTER THIS MAP WAS PUBLISHED, MAP USERS SHOULD CONTACT APPROPRIATE COMMUNITY OFFICIALS TO VERIFY CURRENT CORPORATE LIMIT LOCATIONS.

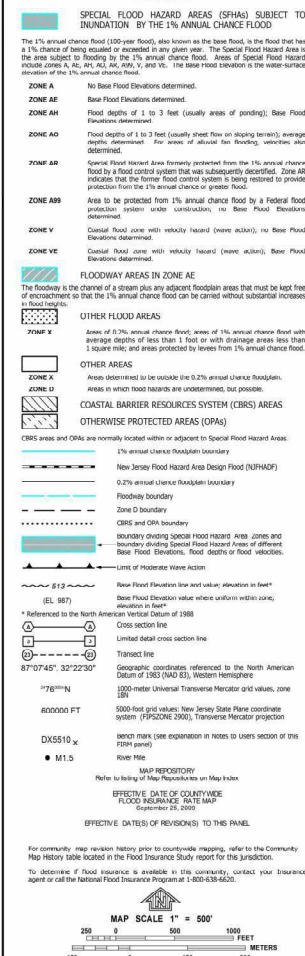
PLEASE REFER TO THE SEPARATELY PRINTED MAP INDEX FOR AN OVERVIEW MAP OF THE COUNTY SHOWING THE LAYOUT OF MAP PANELS; COMMUNITY MAP REPOSITORY ADDRESSES; AND A LISTING OF COMMUNITIES LATER CONTAINING NATIONAL FLOOD INSURANCE PROGRAM DATES FOR EACH COMMUNITY AS WELL AS A LISTING OF THE PANELS ON WHICH EACH COMMUNITY IS LOCATED.

THE AF ZONE CATEGORY HAS BEEN DIVIDED BY A LIMIT OF MODERATE WAVE ACTION (LMWA). THE LMWA REPRESENTS THE APPROXIMATE LANDWARD LIMIT OF THE 1.5-FOOT BREAKING WAVE. THE EFFECTS OF WAVE HAZARDS BETWEEN THE VE ZONE AND THE LMWA (OR BETWEEN THE SHORELINE AND THE LMWA FOR AREAS WHERE VE ZONES ARE NOT IDENTIFIED) WILL BE SIMILAR TO, BUT LESS SEVERE THAN THOSE IN THE VE ZONE.

CONTACT THE FEMA MAP INFORMATION EXCHANGE AT 1-877-336-2267 FOR INFORMATION ON AVAILABLE PRODUCTS ASSOCIATED WITH THIS FIRM. AVAILABLE PRODUCTS MAY INCLUDE PREVIOUSLY ISSUED LETTERS OF MAP CHANGE, A FLOOD INSURANCE STUDY REPORT, AND/OR DIGITAL VERSIONS OF THIS MAP. THE FEMA MAP INFORMATION EXCHANGE MAY ALSO BE REACHED BY FAX AT 1-800-368-6620 AND THEIR WEBSITE AT [HTTP://WWW.MIC.FEMA.GOV](http://WWW.MIC.FEMA.GOV).

IF YOU HAVE QUESTIONS ABOUT THIS MAP OR QUESTIONS CONCERNING THE NATIONAL FLOOD INSURANCE PROGRAM IN GENERAL, PLEASE CALL 1-877-FEMA-MAP (1-877-336-2267) OR VISIT THE FEMA WEBSITE AT [HTTP://WWW.FEMA.GOV/BUSINESSINFO](http://WWW.FEMA.GOV/BUSINESSINFO).

LEGEND



NFIP PANEL 0456G

FIRM
FLOOD INSURANCE RATE MAP
MONMOUTH COUNTY,
NEW JERSEY
(ALL JURISDICTIONS)

PANEL 456 OF 457
(SEE MAP INDEX FOR FIRM LAYOUT)

COMMUNITY	NUMBER	PANEL	SUFFIX
BRIDGE TOWNSHIP OF	0001	0001	00
BRIDGE TOWNSHIP OF	0002	0002	00
SEA GIRT BOROUGH OF	0003	0003	00
SEA GIRT BOROUGH OF	0004	0004	00
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PRELIMINARY
JANUARY 31, 2014

Notice to User: The Map Number shown below should be used when placing map orders. The Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER
34025C0456G

MAP REVISED

Federal Emergency Management Agency

4.3.3 Impact Avoidance and Mitigation

To minimize temporary impacts to floodplains from construction activities, the project will employ mitigation measures based on BMPs established in accordance with the Natural Resource Conservation Service “Standards for Soil Erosion and Sediment Control in New Jersey” pursuant to the Soil Erosion and Sediment Control Act of 1975 (N.J.S.A. 4:24-12) and in accordance with the NJDEP Stormwater Management regulations (N.J.A.C. 7:8) (if the project is a “major development”). These will include proper phasing of construction activities to ensure that pollutant control measures are among the first activities undertaken. An approved soil erosion and sediment control plan will be implemented during construction and will include measures such as perimeter silt fence, temporary and final stabilization measures, turbidity curtains, filter fabric around inlets, and proper maintenance of inlet structures. All construction debris, including any empty storage containers, will be removed from the site on a regular basis and transported to an acceptable disposal site. Excess soils, bedding materials, and other unused project materials will be immediately removed upon construction. All disturbed areas will be restored as appropriate and returned to clean conditions as part of project completion. Additionally, Monmouth County will ensure compliance with any mitigation requirements for floodplain impacts that are incorporated by project permits (see Section 6.0).

4.4 Terrestrial Habitat, Vegetation, and Wildlife

4.4.1 Existing Environmental Conditions

4.4.1.1 Terrestrial Habitat

Terrestrial, upland habitat throughout the project study area is predominantly characterized by developed lands associated with the existing transportation infrastructure and adjacent residential land uses, including roadway shoulders, maintained rights-of-way, impervious surfaces, landscaped residential properties, and other previously disturbed or filled areas. Due to the highly developed nature of the surrounding landscape and the long-standing presence of transportation infrastructure, terrestrial habitats within the project area are generally fragmented and possess few natural characteristics. Ultimately, undisturbed vegetated terrestrial habitats are confined to shoreline transition zones, adjacent to open waters in the project area.

4.4.1.2 Terrestrial Vegetation

Terrestrial vegetation within the project area is limited in extent and is largely associated with disturbed shoreline environments and maintained developed lands. The disturbed communities are comprised of maintained herbaceous lawns, ornamental landscaping, and scattered pockets of planted or naturally established trees, shrubs, or herbaceous plants. The fringe communities, established on the filled water’s edge adjacent to the three structure crossings are characterized by a mixture of upland and hydrophytic vegetation occurring within disturbed shoreline settings. These semi-natural areas consist of tidally influenced emergent wetlands (described in Section 4.5.1.1) and fringe, transitional upland communities established on previously disturbed and maintained lands. Documented vegetation in the transitional upland area consists primarily of eastern red cedar (*Juniperus virginiana*), switchgrass (*Panicum virgatum*), and maintained lawn grass. No forested areas exist within or in the vicinity of the project location.

4.4.1.3 Terrestrial Wildlife

The project study area includes terrestrial, transitional wetland, and open water habitats, which supports a variety of resident and migratory terrestrial wildlife species that utilize the area year-round or seasonally. Additionally, many species depend and rely upon both the terrestrial and adjoining aquatic environment throughout various phases of their life cycle. Birds known to occur within the project area

include bufflehead (*Bucephala albeola*), Canada goose (*Branta canadensis*), brant (*Branta bernicla*), various passerines, ducks, swans, gulls, and herons. Other terrestrial wildlife expected to inhabit the area include small mammals such as rodents (mice, rats, squirrels), eastern cottontail rabbit (*Sylvilagus floridanus*), muskrat (*Ondatra zibethica*) and moles, as well as reptiles such as snapping turtle (*Chelydra serpentina*) and northern diamondback terrapin (*Malaclemys terrapin terrapin*). Additionally, some special concern (Rank 2) avian species, identified through both the NJDEP NJ Landscape Project and Natural Heritage Program (NHP) letter, dated September 21, 2025 (Appendix A), nest colonially which can make them susceptible to severe weather events and disease, meriting special concern despite potential local abundance. The Rank 2 species documented by NJDEP utilizing area within the project limits for foraging habitat include: bald eagle (*Haliaeetus leucocephalus*), common tern (*Sterna hirundo*), glossy ibis (*Plegadis falcinellus*), little blue heron (*Egretta caerulea*), snowy egret (*Egretta thula*), and tricolored heron (*Egretta tricolor*).

4.4.2 Impacts Anticipated under the PPA

The majority of activities proposed by the project will occur within the existing footprint of the bridges, culvert, and approach roadways discussed herein. As such, it is anticipated that impacts to terrestrial habitat, vegetation and wildlife will primarily be temporary in nature, resulting from construction activities. Noise and ground disturbance during daytime hours will temporarily disrupt the foraging of wildlife that typically uses the vegetated strips along approach roadways. Some vegetation will be disturbed by equipment or removed as required to facilitate the proposed work. Loss of terrestrial habitat may result from the minor widening of the approach roadways and structures; however, such loss is anticipated to occur in low-quality habitat areas subject to historic disturbance.

4.4.3 Impact Avoidance and Mitigation

Impact avoidance and mitigation measures for the vegetation and wildlife resources described above will include BMPs such as strategic construction staging, employment of appropriate soil erosion and sediment control measures (e.g., silt fencing), the implementation of a spill prevention, control, and countermeasure plan for construction, and observance of applicable time-of-year restrictions for vulnerable wildlife.

Additionally, in accordance with EO 13112 *Invasive Species* and other pertinent statutes, the approved SESC plan will include measures to prevent and control the introduction or spread of nuisance and non-native invasive species in both the terrestrial and aquatic environments. Specific measures will include cleaning equipment prior to mobilization both to and from the project site, inspecting fill materials, verifying seed mixes are certified free of noxious weeds, performing restoration and planting following the cessation of disturbance in accordance with applicable rules and regulations, and by performing post-construction monitoring and implementing adaptive management techniques to reduce the risk of establishment and spread of invasive species. Any conditions established in the environmental permits issued for the project will be complied with to avoid and/or mitigate impacts to the maximum extent possible, and further regulatory coordination will be pursued as needed.

4.5 Aquatic Vegetation and Wildlife

4.5.1 Existing Environmental Conditions

4.5.1.1 Wetlands

A review of the Coastal Wetlands Maps, available through NJDEP's NJ-GeoWeb, determined that portions of the study area are adjacent to wetlands historically mapped pursuant to the Wetlands Act of 1970. The adopted map sheets establish the regulatory landward extent of Coastal Wetlands and depict mapped

wetlands extending to the shorelines and along the existing three project structures where Bridge W-7, Structure W-8, and Bridge W-9 make landfall to the south, west, and east, respectively. A large, mapped wetland is located at the intersection of all three structures. Based on historic characterization, the mapped coastal wetlands were dominated by saltmarsh cordgrass (*Sporobolus alterniflorus*), as shown on the aquatic habitat mapping included as Figure 9.

A wetland and open water delineation for the project area was previously performed in the earliest phase of project development in 1995, and field verification of the delineation was performed in August 2011, which resulted in the identification of one additional emergent wetland habitat on the northwest bank of Structure W-8, dominated by saltmarsh cordgrass. In total, five tidally influenced wetlands were identified and delineated within the project study area. Field verification of previously mapped wetland limits and delineation of additional wetlands, if identified, and other aquatic resources will be performed during the subsequent final design phase.

4.5.1.2 Open Waters

The three project structures are located at the confluence of The Glimmer Glass, Debbie's Creek, and Watson Creek, whose convergence forms a tidal embayment within the Manasquan River estuarine system. Open-water habitat within the tidal embayment is characterized by sheltered, shallow-water conditions, salinity gradients typical of estuarine environments, and predominantly unconsolidated soft-bottom substrates. Downstream of the project area, surface waters are conveyed to a single watercourse, Crabtown Creek, before discharging to the Manasquan River. Crabtown Creek and the estuarine waters in the project area are tidally influenced, and direct hydrologic connectivity to the Atlantic Ocean is maintained through the Manasquan Inlet. Tidal fluctuations support navigability within the project area by local maritime vessel traffic, and The Glimmer Glass contains a maintained navigation channel that passes beneath the bascule span of Bridge W-9.

4.5.1.3 Intertidal and Subtidal Shallows

NJDEP identifies intertidal and subtidal shallows that extend from a depth of 4 feet below the mean low water line to the spring high water line. These zones contain mud flats, which are defined in 40 CFR 230.42 as unvegetated or sparsely vegetated areas dominated by organic and fine-grained sediments, with vegetation limited to algal mats. Mud flats are typically inundated at high tide and exposed during low tide. Tidal mud flats are recognized as particularly valuable habitat for migratory shorebirds, as well as for aquatic marine invertebrates such as blue crabs (*Callinectes sapidus*) and horseshoe crabs (*Limulus polyphemus*). Based on aquatic resource modeling and land use mapping developed by NJDEP and the known presence of low marsh wetland, it is anticipated that intertidal and subtidal shallows, including areas that may be designated as mud flats, are present along the entirety of Structure W-8, where Bridges W-7 and W-9 make landfall along their respective shores, and around the central wetland island at the convergence of all three structures. They may also occur along the mapped wetland area to the northeast of Bridge W-9. Detailed topographic and bathymetric surveys will be completed during the final design phase to delineate this zone, including identification and delineation of mud flats.

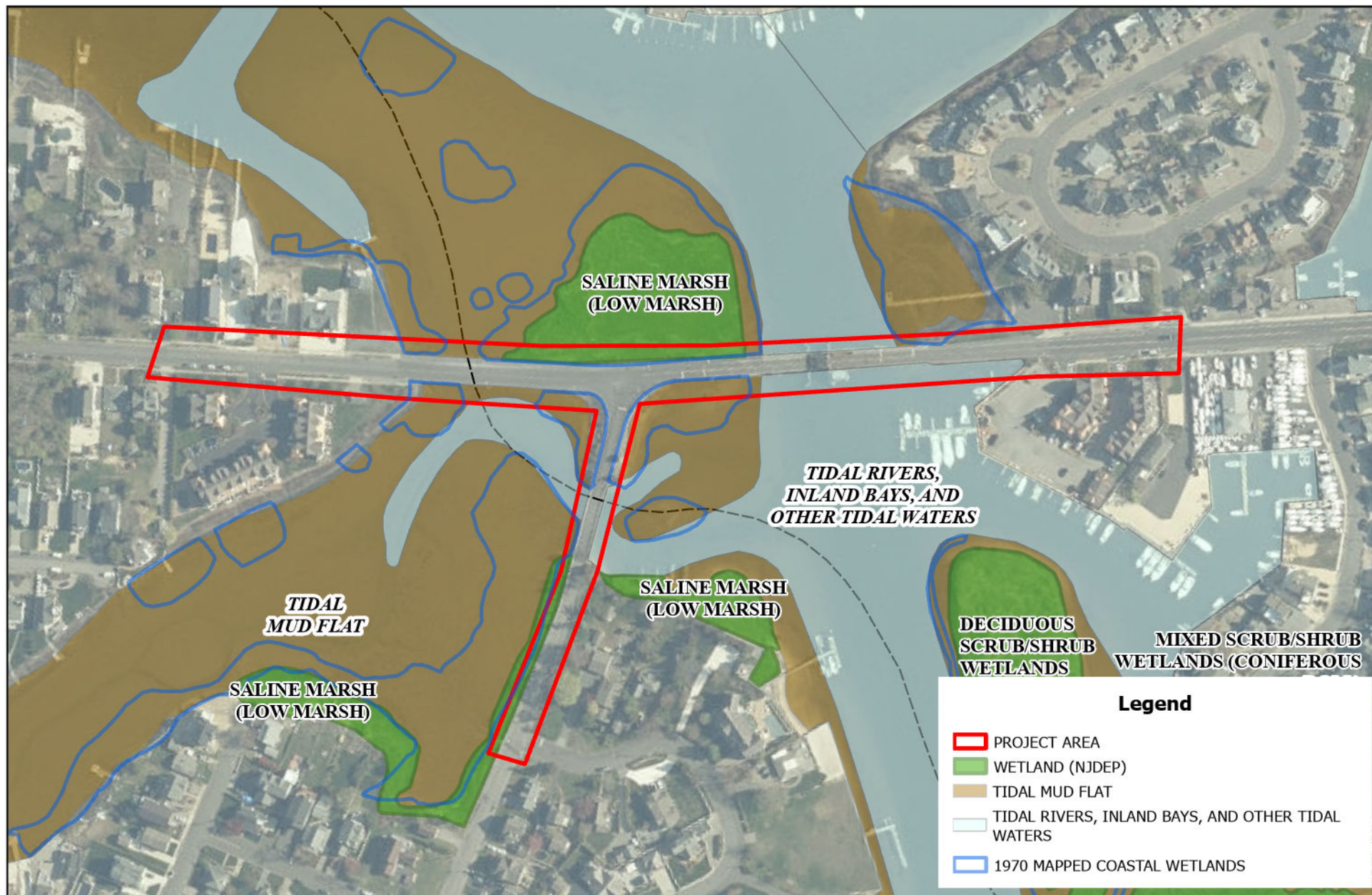
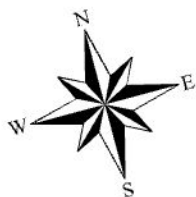


Figure 9. Aquatic Habitat Map

Monmouth County Three Bridges (W-7, W-8, W-9)

Brielle and Manasquan Boroughs, Monmouth County, New Jersey



4.5.1.4 Submerged Aquatic Vegetation

Submerged aquatic vegetation (SAV) beds serve as a key estuarine habitat, as well as a sensitive indicator of overall estuarine health. As vegetated shallows, they are classified as a special aquatic site under 40 CFR 230.43 and are regulated as a Special Area under NJDEP's Coastal Zone Management (CZM) Rules. Additionally, SAV is identified by NOAA as a Habitat Area of Particular Concern (HAPC) within and in vicinity to the project action area for juvenile Summer Flounder due to its critical role as a nursery habitat.

Based upon a review of SAV Mapping, developed and maintained by NJDEP and dated 1979 and 1984, no SAV beds were historically known to occur within or in proximity to the project area. One species, *Ulva lactuca* (Sea Lettuce), a macroalgae, is denoted on the 1979 map downstream of the project and within the Manasquan River, approximately 0.25-miles upstream of its confluence with the Glimmer Glass. The nearest mapped occurrence of a rooted vascular SAV species, *Zostera marina* (eelgrass), is approximately 1-mile upstream of the Glimmer Glass-Manasquan River confluence based on the available 1984 NJDEP SAV map. Historic mapping is included in the TER (Appendix A) and shown in Figure 10.

4.5.1.5 Essential Fish Habitat

Essential Fish Habitat (EFH) is identified for species managed under Fishery Management Plans in accordance with the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act [MSA]) and applies to each life stage of approximately 1,000 managed species. Consultation with NOAA's National Marine Fisheries Service (NMFS), in accordance with both the MSA and the Fish and Wildlife Coordination Act (FWCA) was initiated through the identification of potential EFH present within or in proximity to the project area. A review of NOAA's EFH Mapper tool for this project identified Essential Fish Habitat within the proposed project area for twenty-four (24) species of fish during some or all points of their lifecycle. The NOAA EFH Mapper identifies SAV as a Habitat Area of Particular Concern (HAPC) for summer flounder. As noted in Section 4.5.1.4, there is no known SAV within or in proximity to the project limits. The identified species and associated lifecycle stage(s) – adult, juvenile, larvae, and/or eggs – are presented below.

Table 6. EFH Mapper Results

Common Name	Scientific Name	Lifecycle Stage
Atlantic butterfish	<i>Peprilus triacanthus</i>	Adult
Atlantic cod	<i>Gadus morhua</i>	Larvae
Atlantic herring	<i>Clupea harengus harengus</i>	Adult, Juvenile
Atlantic mackerel	<i>Scomber scombrus</i>	Eggs
Black sea bass	<i>Centropristis striata</i>	Adult, Juvenile
Bluefin tuna	<i>Thunnus thynnus</i>	Adult, Juvenile
Bluefish	<i>Pomatomus saltatrix</i>	Adult, Juvenile
Clearnose skate	<i>Raja eglanteria</i>	Adult, Juvenile
Little skate	<i>Leucoraja erinacea</i>	Adult, Juvenile
Longfin inshore squid	<i>Loligo pealeii</i>	Adult, Juvenile, Eggs
Monkfish	<i>Lophius americanus</i>	Eggs/Larvae
Ocean pout	<i>Zoarces americanus</i>	Adult, Eggs
Pollock	<i>Pollachius virens</i>	Larvae
Red hake	<i>Urophycis chuss</i>	Adult, Eggs/Larvae/Juvenile

Common Name	Scientific Name	Lifecycle Stage
Sandbar shark	<i>Carcharhinus plumbeus</i>	Juvenile
Scup	<i>Stenotomus chrysops</i>	Juvenile
Silver hake	<i>Merluccius bilinearis</i>	Adult, Eggs/Larvae
Skipjack tuna	<i>Katsuwonus pelamis</i>	Adult
Spiny dogfish	<i>Squalus acanthias</i>	Adult Female, Adult Male, Sub-adult Female
Summer flounder	<i>Paralichthys dentatus</i>	Adult, Juvenile, Larvae
Windowpane flounder	<i>Scophthalmus aquosus</i>	Adult, Juvenile, Larvae, Eggs
Winter flounder	<i>Pseudopleuronectes americanus</i>	Eggs, Juvenile, Larvae/Adult
Winter skate	<i>Leucoraja ocellata</i>	Adult, Juvenile
Yellowtail flounder	<i>Limanda ferruginea</i>	Adult, Juvenile, Larvae

4.5.1.6 Shellfish Beds

Shellfish resources and habitats (shellfish beds) are managed pursuant to a combination of federal and state rules and regulations. NJDEP manages shellfish habitat primarily through its Bureau of Marine Habitat and Shellfisheries and Bureau of Marine Water Monitoring. These entities are responsible for classifying shellfish-growing waters and managing the licensing to harvest, possess, transport, lease, or commercially sell shellfish. Shellfisheries, as habitat, are managed as Special Areas in accordance with the CZM Rules by NJDEP. Federally, both NOAA NMFS and USACE provide oversight and recommendations to minimize, avoid, or mitigate for impacts to or disturbance of shellfish under authorities such as the MSA, the FWCA, and Section 404 of the Clean Water Act.

NJDEP shellfish distribution maps from 1963 and 1984 were reviewed to determine and characterize if historic shellfish populations were known to occur within and around the project area. Based upon the 1963 map, soft clams (*Mya arenaria*) were historically present to the north of Structure W-8. The 1984 mapping identifies hard clams (*Mercenaria mercenaria*) present in low-density throughout the project area and surrounding estuarine habitat (see Figure 10). Currently, shellfish harvesting within the project area and surrounding waters is prohibited due to the exceedance of total coliform. To date, no field investigations have been conducted to verify the continued presence or extent of shellfish beds. Coordination during the subsequent final design phase will be performed with regulatory agencies to determine if and where shellfish surveys are required.

4.5.1.7 General Aquatic Wildlife

In addition to the species discussed under applicable regulatory programs described above, the abundance and diversity of aquatic species found in the project area is limited to those tolerant of fluctuations in salinity and tides. The estuarine habitats surrounding the project area likely support a diverse assemblage of common aquatic fauna, including American eel (*Anguilla rostrata*), channel catfish (*Ictalurus punctatus*), striped bass (*Morone saxatilis*), Atlantic menhaden (*Brevoortia tyrannus*), bay anchovy (*Anchoa mitchilii*), and other estuarine forage fishes. Common invertebrates include blue crab (*Callinectes sapidus*), white-fingered mud crab (*Rhithropanopeus harrisi*), grass shrimp (*Palaemon vulgaris*), and a variety of polychaetes, mollusks, amphipods, and other benthic macroinvertebrate species characteristic of brackish tidal habitats. These species, even if common, may be managed as NOAA Trust Resources and effects are considered via consultation pursuant to the MSA and the FWCA.

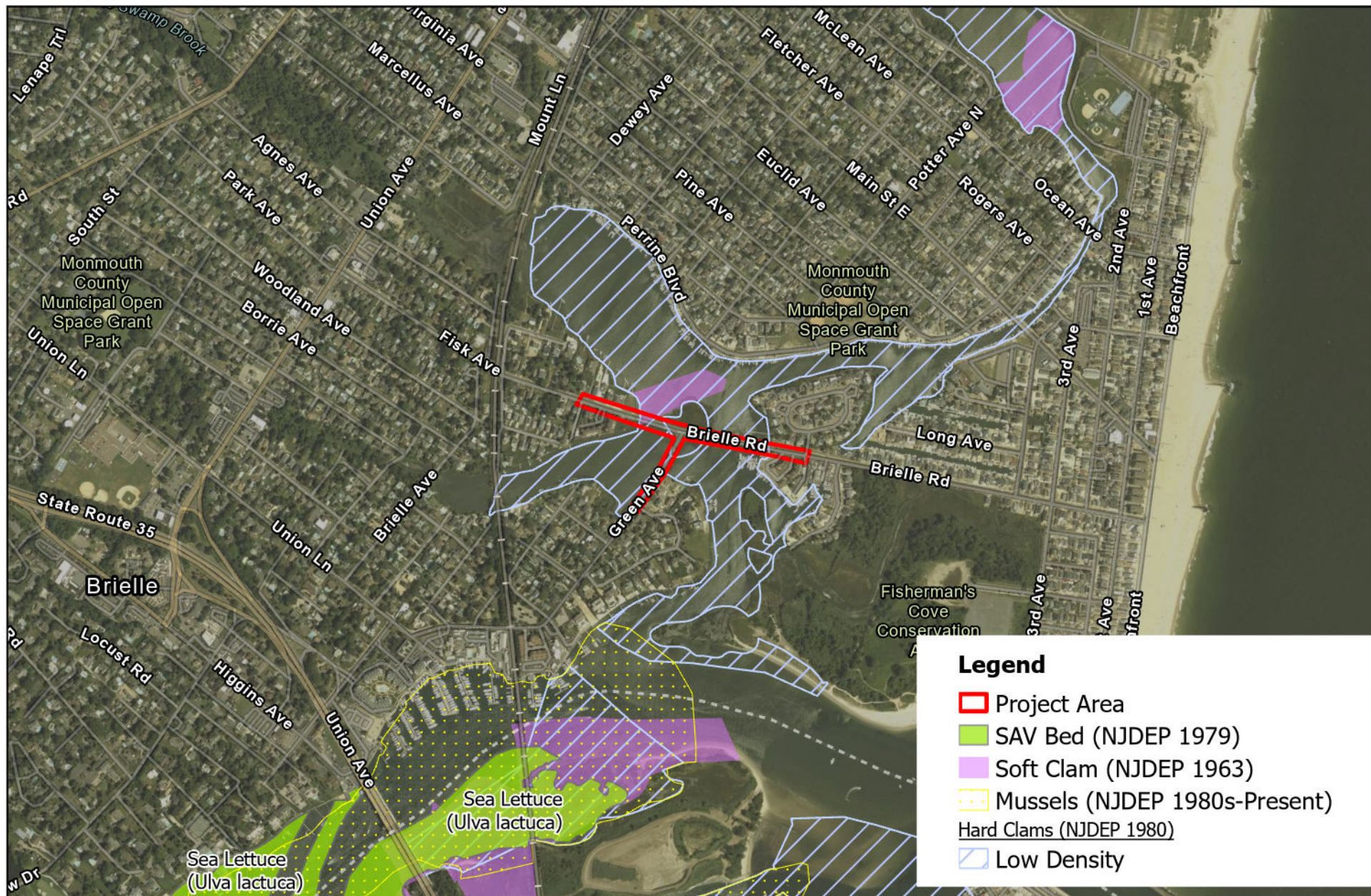


Figure 10. NJDEP Historic SAV and Shellfish
Monmouth County Three Bridges (W-7, W-8, W-9)
 Brielle and Manasquan Boroughs, Monmouth County, New Jersey

0 500 1,000 2,000
 Feet
 1" = 1,000'

4.5.2 Impacts Anticipated under the PPA

Disturbance to aquatic resources is anticipated from the proposed activities required to meet the project's purpose and need. Based on the location of the project structures and surrounding aquatic resources, avoidance of impacts is not feasible. Table 7 below identifies activities that are anticipated to potentially disturb or permanently impact aquatic resources, and the following sections describe impacts specific to the aquatic habitats, vegetation, and wildlife identified in Section 4.5.1 above.

Table 7. Summary of Proposed Disturbance Activities

Proposed Activity	Anticipated Disturbance
Earth/sediment disturbance and fill	Earth-disturbing activities will include excavation, grading, filling, and other ground-disturbance associated with demolition, construction access, substructure installation, and other proposed improvements. To mitigate for potential effects from such activities, perimeter erosion controls (e.g., turbidity barriers) will be installed in and along aquatic habitats, where necessary. Such activities may result in direct and indirect, temporary and permanent impacts to terrestrial and aquatic habitats through vegetation removal, soil disturbance, filling, and increased turbidity.
Demolition of existing structure(s)	The demolition and removal of the existing structures will include the dismantling and removal of existing bridge structures, culverts, bulkheads, and associated roadway infrastructure using a combination of land- and water-based access. Demolition activities are anticipated to be performed via mechanical methods and will include temporary direct and indirect impacts associated with earth/sediment disturbance, underwater noise, vessel traffic, and localized habitat disturbance.
Cofferdam installation	Where in-water work requires isolation or to be performed "in the dry", steel Z piles, anticipated to be installed via vibratory hammer, will be used to construct a cofferdam. Temporary suspension of sediments is anticipated during installation and areas behind the cofferdam will temporarily be isolated and unavailable for use by local aquatic species. At no time is a significant portion of the channel width proposed to be isolated behind a cofferdam.
Installation of Piers/Piles	Pile and pier installation would involve the placement of foundation piles and associated substructure elements using marine and/or land-based equipment. Steel piles installed using impact pile driving are anticipated to support the proposed Structures W-7 and W-9. Installation of the piles/piers will result in temporary impacts to open-water and nearshore habitats through installation of cofferdams, sediment disturbance, elevated underwater noise and vibration, and temporary increases in vessel activity for construction.
Replacement of bulkhead	Bulkhead replacement would involve removal of the existing bulkhead and installation of a new bulkhead along Structure W-8. Associated activities would result in temporary impacts to nearshore and aquatic habitats from sediment disturbance, increased turbidity, and construction noise and permanent disturbance due to placement of the bulkhead.
Barge Activity	Barge operations will support in-water construction activities by transporting equipment, materials, and personnel and by providing stable work platforms for demolition, pile installation, and other marine construction activities. Barge use would result in temporary disturbances to aquatic habitats through vessel traffic, underwater noise, shading effects, and the potential for localized sediment disturbance during anchoring, spudding, or positioning activities.

4.5.2.1 Wetlands and Open Waters

The project will result in temporary and permanent impacts to wetlands and open waters within the limits of disturbance (LOD). Temporary impacts will result from construction access, including temporary impacts for staging of a construction-support barge, and temporary disturbance required for demolition of the existing structures and excavation and placement of the proposed structures and their associated appurtenances. Permanent disturbance will result from placement of the structural abutments and piers, filling along the roadway to accommodate the improved roadway geometrics, and replacement of the bulkhead along Structure W-8. Permanent shading impacts may also result from the proposed widening of Bridge W-7 and Bridge W-9. The proposed disturbance totals are conservatively estimated based on available information and summarized in Table 8 below.

Table 8. Anticipated Impacts to Regulated Areas Under PPAs

Structure ID	Proposed Work	Projected Impacts (Approximate)		
		Temporary Wetlands Disturbance	Permanent Wetlands Disturbance	In-water Disturbance
Green Avenue Bridge over Debbie's Creek (Bridge W-7)	- Widen and reconstruct approach roadways - Construct new concrete/steel substructures - Construct new wider concrete superstructure	1,700 SF	1,250 SF	1,975 SF
Fisk Avenue Culvert over Glimmer Glass (Structure W-8)	- Replacement of existing culvert - Replace steel bulkhead full length - Reconstruct pavement over new culvert	325 SF	50 SF	2,325 SF
Brielle Road over the Glimmer Glass (Glimmer Glass Bridge) (Bridge W-9)	- Widen and reconstruct approach roadways - Demolish existing superstructure & substructure - Construct new concrete/steel substructures - Construct new wider concrete superstructure - Construct new steel rolling counterweight span	2,750 SF	2,750 SF	17,975 SF
Totals:		4,775 SF (0.11 acre)	4,050 SF (0.09 acre)	22,275 SF (0.51 acre)

As referenced above, impacts to wetlands and open waters at the project site will require authorization from both USACE and the NJDEP. Applications for the appropriate permits will be prepared during the final design phase of the project.

4.5.2.2 Intertidal and Subtidal Shallows

In-water disturbance areas associated with the project are expected to include both temporary and permanent disturbance to mud flats. Based on available data, disturbance totals for these areas were estimated to the extent feasible for each structure and include the following: areas adjacent to delineated tidal wetlands for Bridge W-7 (375 + 550 SF) and Bridge W-9 (1,075 + 3,050 SF) [temporary] and the entire proposed in-water disturbance for Structure W-8 (1,050 + 1,275 SF) [permanent]. In total, impacts to mudflat areas were estimated to include 5,050 SF of temporary disturbance and 2,235 SF of permanent disturbance.

4.5.2.3 Submerged Aquatic Vegetation

Historic data indicates the absence of SAV beds at or in vicinity to the project location; therefore, no direct or indirect impacts to SAV are anticipated by the proposed action. However, the 1979 and 1984 SAV mapping was as comprehensive as the technology allowed at that time, and recent surveys within other estuaries have depicted dramatic changes in SAV bed sizes, locations, and species compositions. Therefore, given ongoing dynamic changes to SAV communities and the historic nature of available information, an SAV survey will be performed to verify the absence of SAV beds in the final design phase within the project's potential area of effect.

4.5.2.4 Essential Fish Habitat

To determine if significant adverse effects may result from the project, proposed project activities were evaluated against the *January 2024 FHWA Programmatic EFH Consultation and General Concurrence for Select Transportation Actions in the NMFS Greater Atlantic Region* (Programmatic). Project activities will include actions that result in both temporary and permanent disturbance, outlined in Table 8, and that will impact areas classified as supporting or being Essential Fish Habitat (EFH). Impacts are expected to occur over a three-year construction period (anticipated from 2029 to 2031). Specific activities may include direct (e.g., filling, grading, installation of structures) and indirect (e.g., underwater noise, turbidity, shading) stressors to EFH. Proposed permanent impacts are unavoidable due to the existing alignment of the three structures and the need to improve roadway geometries, which will necessitate widening and therefore result in both loss of special aquatic sites, as a result of filling, and also additional shading impacts from the widened Bridge W-7 (1750 sf) and Bridge W-9 (3250 sf) to open water or other adjacent habitats.

Appendix A of the Programmatic contains conditions that must be satisfied in order to be eligible for programmatic consultation. Condition 1 of Appendix A denotes that proposed activities must result in the disturbance of less than 1000 square feet of tidal special aquatic sites. As noted above in Sections 4.5.2.1 and 4.5.2.2., disturbance to greater than 1000 square feet of tidal special aquatic sites (e.g., mudflats, wetlands) are anticipated. Therefore, since anticipated disturbance exceeds that threshold, project-specific EFH consultation with NMFS is necessary to satisfy consultation requirements under the MSA and the FWCA. Project-specific EFH consultation was initiated with NOAA NMFS Habitat in July 2026 and concurrence that substantial adverse effects will not occur as a result of proposed activities was received on August 20, 2026 from NMFS Habitat and Ecosystem Services Division (HESD), based on proposed avoidance, minimization, and mitigation measures, as described in Section 4.5.3.4 below. Consultation materials and NMFS HESD's concurrence letter are included in the TER (Appendix A to this narrative).

4.5.2.5 Shellfish Beds

The installation of new piers and abutments will temporarily disturb the benthic zone of the project area, resulting in temporary impacts to shellfish populations based on the extent of those communities. Following construction completion, shellfish communities will not be subject to further disturbances associated with project work, such as potential water quality or temperature shifts, and are anticipated to recover without permanent, long-term effects.

Although historic shellfish beds are mapped for the project area, shellfish harvesting is currently classified as prohibited due to elevated coliform bacteria levels. As such, shellfish harvesting activities will not be impacted by the proposed project, and the mapped areas are not anticipated to be classified or regulated as shellfish beds by NJDEP.

Ultimately, neither construction activities nor long-term activities resulting from project improvements are expected to adversely affect shellfish beds or their use. Shellfish surveys and development of specific conservation and/or compensatory measures will be completed as part of future project phases, as required.

4.5.3 Impact Avoidance and Mitigation

4.5.3.1 Wetlands and Open Waters

Field verification of previously mapped wetland limits and delineation of wetlands and other aquatic resources will be performed during the subsequent final design phase. Wetlands, where present, will be distinguished between those regulated under the Coastal Management Zone Rules (N.J.A.C. 7:7) and those located landward of the mapped coastal wetland limit and regulated pursuant to the Freshwater Wetland Protection Act Rules (N.J.A.C. 7:7A). Direct impacts to wetlands, including wetland buffers or transition areas and open waters, will be minimized to the extent practicable, and disturbance during construction activities will not exceed the permitted quantities. Temporary staging areas will be incorporated on the finalized design plans and approved prior to construction. Additionally, all authorized soil erosion and sediment control measures will be installed as appropriate prior to disturbance and will be routinely inspected and maintained until permanent stabilization has been achieved. A combination of measures, including floating turbidity barriers and heavy-duty silt fencing, is proposed to minimize potential indirect impacts from erosion and sedimentation. Areas of temporary wetland or transition area impact will be restored, with all re-grading and replanting work completed in accordance with the approved project plans. No invasive or nuisance vegetation will be proposed for restoration. Post-construction monitoring and adaptive management techniques will be employed to reduce the risk of establishment and proliferation by such species, as described in Section 4.4.3.

Based on field survey results and final disturbance totals, mitigation may be required to satisfy permit conditions or other regulatory criteria. The project may require habitat creation or enhancement to compensate for functional value loss from proposed permanent disturbances. The mitigation ratio is determined on a case-by-case basis, depending upon the mitigation approach. Mitigation planning may include acquisition of compensatory credits within the same watershed management area (WMA 12), or a minimum 2:1 creation to loss ratio for coastal wetlands and minimum 1:1 creation to loss ratio for freshwater wetlands, if identified. Pending availability, it is anticipated that mitigation credits and/or off-site mitigation will be the primary mechanisms for addressing impacts. Any compensatory mitigation stipulated by the USACE will comply with the regulations included in 40 CFR 230 Subpart J – Compensatory Mitigation for Losses of Aquatic Resources.

4.5.3.2 Intertidal and Subtidal Shallows

To accurately identify and delineate the intertidal and subtidal shallow zones, including mud flats, that may be directly or indirectly impacted by the proposed project, detailed bathymetric and topographic surveys will be completed in the final design phase. Design considerations will be taken to avoid impacts, where practicable, and minimize disturbance to these special aquatic sites, where impacts are unavoidable. Should disturbance result in the loss of habitat within this zone, compensatory mitigation, in the form of either credits, from an approved mitigation bank within the same watershed, or the creation of compensatory habitat at a minimum 1:1 creation to loss ratio will be performed.

4.5.3.3 Submerged Aquatic Vegetation

As noted in Sections 4.5.1.4 and 4.5.2.3, SAV beds are not known to be present within the project's action area, and a SAV survey will be performed during the final design phase to verify the absence of SAV. Detailed information from the survey will be provided to NOAA, USACE, and NJDEP to satisfy necessary

consultation and permitting requirements. Should SAV be identified within or in proximity to the project area, disturbance to SAV beds will be avoided or limited to the extent practicable. If temporary disturbance is unavoidable within SAV beds, the areas will be restored to pre-construction condition and replanted with the appropriate native species. If permanent impacts are necessary, in-kind restoration of SAV habitat will be done in as close proximity as possible to the project site. Any mitigation planning will include monitoring and adaptive management planning to ensure long-term success and be coordinated with and approved by applicable regulatory agencies before implementation.

4.5.3.4 Essential Fish Habitat

Proposed actions related to the Bridge and Culvert Replacement Project, were compared against other conservation recommendations included in the Programmatic, including the Minimum Conservation Measures in Section 6.0 and conservation recommendations (CRs) in Appendix B. To avoid and minimize the potential for other significant adverse impacts, the project will implement and comply with all Minimum Conservation Measures and, to the extent practicable, will incorporate the conservation recommendations applicable to the five stressor categories associated with the proposed project type, as presented in Appendix B of the Programmatic.

Specifically, the project will employ applicable time-of-year restrictions, outlined in Appendix C of the Programmatic, for in-water work, which is expected to extend from January 1 to June 30 for protected species (Winter Flounder + diadromous fish). Fish passage/migration habitat is not expected to be impacted, and installation of measures that could substantially block the waterway available to fish will not be installed during the period of September 1 to November 30. In-water work that may cause sedimentation will be performed outside of time-of-year restrictions or otherwise be performed with appropriate controls (e.g., turbidity curtains) or cofferdams. To mitigate for disturbance, temporarily impacted areas will be restored to pre-construction conditions and compensatory mitigation will be provided for unavoidable permanent loss of resources due to fill and/or shading, as described above for the applicable special aquatic sites supporting or considered to be EFH.

As noted in Section 4.5.2.4, concurrence from NOAA NMFS HESD was received that substantial adverse effects are not anticipated from the proposed project activities. Five EFH conservation recommendations were recommended for adoption by the project, including implementing the time-of-year restrictions for in-water work, as noted above; developing compensatory mitigation plans to offset permanent impacts and obtaining USACE and NMFS approval; and avoiding creosote, coal tar epoxy, or other hydrocarbon-based coating on in-water or overwater structures. Conservation recommendations will be incorporated into the final design, and consultation with NMFS HESD will be re-initiated during the final design phase following completion of the future resource delineations and evaluations.

4.5.3.5 Shellfish Beds

Waters that are classified as prohibited, such as those within and surrounding the project area, are not regulated under the shellfish habitat rule by NJDEP. However, shellfish beds are considered NOAA Trust Resources and impacts to shellfish beds are also regulated by USACE. Therefore, impacts to these areas may require compensatory mitigation in the form of a salvage and relocation plan or payment to the NJDEP dedicated account for shellfish habitat mitigation. Measures to avoid and minimize in-water impacts, as described in Section 4.5.3.1, will also apply to potential shellfish beds located within the project area. Ultimately, the need for future surveys and compensatory mitigation will be determined during the final design phase via coordination with NOAA NMFS, USACE, and NJDEP.

4.6 Threatened and Endangered Species

Documented or potential threatened or endangered species within the project area were identified by reviewing NJDEP Landscape Project v3.4 mapping, submitting an NJDEP Natural Heritage Data project screening request, initiating the project review process through the USFWS Information for Planning and Consultation (IPaC) tool, and reviewing NOAA's Endangered Species Act (ESA) Section 7 Mapper for the Greater Atlantic Region. Both state-listed and federal-listed threatened or endangered species were identified through the respective screening methods, and the TER (Appendix A) includes a comprehensive description of species identified and effects determinations made by both USFWS and NOAA as part of the Section 7 ESA, FWCA, and Marine Mammal Protection Act (MMPA) consultations. A summary for both state-listed and federal-listed threatened or endangered species is included in individual sections below.

4.6.1 Existing Environmental Conditions

4.6.1.1 State Listed Species

To identify potential state-listed threatened or endangered species within or in vicinity to the project area, both a review of NJDEP Landscape Project v3.4 mapping and a NJDEP Natural Heritage Program (NHP) data request were completed. Table 9 includes the species and potential lifecycle stage(s) supported by habitat that occurs within or in vicinity to the project, as identified by Landscape Project mapping and the September 21, 2025 NHP data request response.

Table 9. NHP Consult Results for Project Site and/or Immediate Vicinity¹

Common Name	Scientific Name	Feature Type	State Status ²	Federal Status ²
Black skimmer	<i>Rynchops niger</i>	Foraging	E	NL
Black-crowned night-heron	<i>Nycticorax nycticorax</i>	Foraging	T	NL
Least tern	<i>Sternula antillarum</i>	Foraging	E	NL
Yellow-crowned night-heron	<i>Nyctanassa violacea</i>	Foraging; Nesting colony	T	NL
Roland's seablite	<i>Suaeda rolandii</i>	Vascular plant	E	NL

¹Immediate vicinity extends up to ¼ mile from the project site

²E = endangered; T = threatened; NL = not listed

4.6.1.2 Federally Listed Species

U.S. Fish and Wildlife Service (USFWS)

An Official Species List was obtained using the USFWS IPaC tool on August 21, 2025 to identify federal-listed threatened or endangered species under the jurisdiction of USFWS that may potentially be affected by the project. The Official Species List generated for this project by the New Jersey Ecological Services Field Office identified the four (4) species in the table below.

Table 10. USFWS IPaC Results

Common Name	Scientific Name	Federal Status ¹	State Status ¹
Monarch butterfly	<i>Danaus Plexippus</i>	PT	NL
Northern long-eared bat	<i>Myotis septentrionalis</i>	E	E
Piping plover	<i>Charadrius melodus</i>	T	T
Swamp pink	<i>Helonias bullata</i>	T	E

¹E = endangered; T = threatened; PT = proposed threatened; NL = not listed

No additional Federally listed or proposed threatened or endangered wildlife under USFWS jurisdiction are reported for the project area. However, twenty-six (26) migratory bird species, including bald eagle, were identified on the IPaC Species list as protected under the Migratory Birds Treaty Act of 1918 (MBTA). The protection of Bald Eagle is also regulated under the Bald and Golden Eagle Protection Act of 1940 (BGEPA).

NOAA Marine Fisheries Service (NMFS)

The NOAA Greater Atlantic Region Field Office (GARFO) ESA Section 7 Mapper was reviewed for potential listed threatened and endangered species that may be present within approximately 0.5-mile of the project area. The following listed species under NOAA jurisdiction were identified for the area.

Table 11. NOAA GARFO Section 7 Mapper Results

Common Name	Scientific Name	Federal Status ¹	Lifecycle Stage
Atlantic sturgeon	<i>Acipenser oxyrinchus oxyrinchus</i>	T/E	Adult, Subadult – Migrating/Foraging
Green sea turtle	<i>Chelonia myda</i>	T	Adult, Juvenile – Migrating/Foraging
Kemp’s ridley sea turtle	<i>Lepidochelys kempii</i>	E	Adult, Juvenile – Migrating/Foraging
Leatherback sea turtle	<i>Dermochelys coriacea</i>	E	Adult, Juvenile – Migrating/Foraging
Loggerhead sea turtle	<i>Caretta caretta</i>	T	Adult/Juvenile – Migrating/Foraging
North Atlantic right whale	<i>Eubalaena glacialis</i>	E	Adults/Juveniles - Migrating
Fin whale	<i>Balaenoptera physalus</i>	E	Adults/Juveniles – Migrating, Overwintering, Foraging, Calving

¹E = endangered; T = threatened

No critical habitat was identified within the project’s anticipated effect area. While whale species are located within 0.5-miles of the proposed project, impacts to these species are considered unlikely due to the project’s location within the shallow estuary at the project location. No potential stressors were identified that may extend into habitat suited for the Section 7 whale species identified on the ESA mapper.

4.6.2 Impacts Anticipated under the PPA

4.6.2.1 State Listed Species

Substantial adverse impacts to state listed species are considered unlikely. The listed avian species identified for the project site and/or its immediate vicinity are primarily reported as using the area for foraging. The only species identified as potentially nesting in the immediate vicinity of the project site (within ¼ mile) is the yellow-crowned night-heron. According to New Jersey Fish & Wildlife, yellow-crowned night-heron typically nests on barrier islands, dredge spoil islands, and bay islands that contain forested wetlands or scrub/shrub thickets. Colonies may occur in dense shrubby thickets, forests with an open understory, or suburban parks and yards that offer suitable habitat structure and cover. Based on the predominant habitat types that characterize the project area – open water, saline low marsh, and mudflat – nesting of yellow-crowned night-heron is not expected to occur within the project area.

The NHP consult response letter cites an observation of Roland's seablite from 2013 in the immediate vicinity of the project site. The Rare Plant Profile prepared by NHP for Roland's seablite describes the plant as a halophyte that grows at elevations of 1-10 meters above sea level. It is mainly found in salt marsh habitat but also occurs on tidal flats along rivers or creeks. Roland's Seablite has been known to establish within suitable habitat in highly developed areas, adjacent to roads and landfills, and on dredge spoils (Program, 2024).

Habitat assessments and/or targeted surveys for state listed species will be performed during later project phases, as determined through further coordination with NJDEP. At this time, significant adverse impacts are not anticipated. Conservation and/or compensatory measures, such as protective demarcation or fencing of surveyed habitat, will be implemented as applicable.

4.6.2.2 Federally Listed Species

U.S. Fish and Wildlife Service (USFWS)

Following receipt of the Official Species List, USFWS was contacted for further consultation pursuant to Section 7 of the ESA. Through their final consult response dated December 1, 2025 (Appendix A), USFWS determined that the proposed project may affect, but is not likely to adversely affect, federally listed species under their jurisdiction, and verified that no further consult is warranted. A summary of the effects determination for each species is included below, additional details and discussion are included in the TER (Appendix A).

Northern Long-Eared Bat (NLEB)

USFWS concurred that Structure W-8 is unlikely to be suitable for bat roosting and that both Bridge W-7 and W-9 are potentially suitable for roosting; however, the overall likelihood of northern long-eared bats roosting is discountable, given the lack of forest cover in the surrounding area and the low frequency of NLEB on bridges in New Jersey.

Swamp Pink

USFWS concurred that the project is not likely to adversely affect swamp pink as the nearest suitable habitat is likely >0.25-mile upstream of the project.

Piping Plover

A No Effect determination was made for Piping Plover by NJDOT. Based on the absence of preferred shoreline and beach habitat in the project area, along with suitable alternate foraging habitat nearby, the project is anticipated to have no adverse effect on piping plover.

Monarch Butterfly

According to the USFWS December 1, 2025 letter, monarch butterfly may occur within the project area. This project is not likely to jeopardize the continued existence of the monarch butterfly; therefore, ESA Section 7(a)(4) conference is not required. An assessment of potential project effects to this species and consultation with USFWS may be required if a final rule to list the monarch butterfly is published prior to project completion.

Migratory Birds

Potential stressors from project activities that have the potential to impact migratory birds, protected under the MBTA, include vegetation removal, ground disturbance, structures, lighting, and noise.

Bald Eagle

Bald eagle, protected under the BGEPA of 1940 and MBTA of 1918, was also identified by the USFWS IPaC screening as potentially occurring in the project area. No known nests are located within or in proximity to the project study area and suitable foraging habitat will remain available in the vicinity;

therefore, the project is expected to have no effect on this species. Should new information become available, or a nest be observed or documented in the vicinity of the project, implementation of recommended measures to reduce disturbance in accordance with the *National Bald Eagle Management Guidelines* and initiation of consultation for potential effects to eagles with USFWS may be required.

NOAA Marine Fisheries Service (NMFS)

Project activities were evaluated for consistency with the *FHWA GARFO 2018 NLAA Program* criteria. As a Bridge and Culvert Replacement project, proposed activities are anticipated to result in potential effects through all five stressor categories within the NLAA Program document (underwater noise, impingement/entrainment and entanglement, water quality/turbidity, habitat alteration, and vessel traffic). Specific project activities that may result in these stressors include the following: earth/sediment disturbance and filling, demolition of existing structures, installation of cofferdams, installation of piers, piles, and other structural components, replacement of the bulkhead associated with Structure W-8, and barge operations required to support the replacement of Bridge W-9. These activities are described in Table 7 above.

The project activities and associated resulting stressors were evaluated utilizing conservative assumptions against the NLAA Program project design criteria (PDC), and conformance or potential nonconformance was documented on the ESA Section 7 Verification Form (updated January 2025). Overall, based on proposed activities, significant adverse impacts to the identified listed ESA species are not anticipated. Consultation with the NMFS GARFO Protected Resources Division to satisfy requirements under Section 7 of the ESA and the MMPA was initiated on July 24, 2026, and concluded on July 31, 2026, with NMFS concurring that the proposed action is not likely to adversely affect listed species per the justifications included within the Verification Form. The signed Verification Form and consultation materials are provided in the TER (Appendix A).

4.6.3 Impact Avoidance and Mitigation

4.6.3.1 State Listed Species

As noted, disturbance by proposed activities will be limited to the extent practicable and permanent disturbance will be limited to previously disturbed areas abutting the existing structures. Coordination will be performed with NJDEP as part of the final design phase to determine if additional investigations, including habitat-assessments or species-level surveys, are required to further evaluate the project's potential to impact state-listed species potentially present within or in vicinity to the project. Identified conservation or compensatory measures, such as protective demarcation or fencing, will be implemented as necessary.

4.6.3.2 Federal Listed Species

U.S. Fish and Wildlife Service (USFWS)

In accordance with the USFWS December 1, 2025, letter, and as a precaution to avoid unintended take of Northern Long-eared bat, a pre-construction bridge survey to determine if either bridge is occupied or used by bats will be conducted. Should evidence of bat occupancy be observed or suspected, NJDOT will contact USFWS for further guidance and reinitiate consultation, if necessary.

Additionally, during the final design, consideration will be given to the stressors that may impact avian wildlife protected under the MBTA. Should disturbance to suitable breeding habitat be necessary, minimization and conservation measures, including pre-construction surveys to locate breeding birds or timing restrictions to avoid disturbance to breeding habitat within the project's action area will be implemented.

NOAA Marine Fisheries Service (NMFS)

Best Management Practices, outlined in *NOAA Fisheries/FHWA Best Management Practices Manual for Transportation Activities in the Greater Atlantic Region*, will be included within final design plans, details, and construction specifications. As noted in the Verification Form and NMFS consultation materials, all applicable General PDCs are proposed to be implemented, and all applicable PDCs for impingement/entrainment and entanglement, water quality/turbidity, habitat alteration, and vessel traffic are also proposed to be implemented. In-water activities, outside of de-watered areas within cofferdams, will be restricted to the period outside of March 1 to June 30. Moreover, any in-water work that occurs between September 1 to November 30 is anticipated to be restricted to activities that will not significantly impede the waterway opening (defined as >50% of waterbody with suitable habitat for identified ESA species). Improvements to Bridge W-7 and Bridge W-9 will be staged to occur at different times during construction, such that access to upstream habitat beyond the project structures remains available. To reduce the potential for injurious noise levels during pile driving, soft-start procedures will be implemented, and pile-driving activities will be limited to a maximum of eight hours per day to reduce the likelihood of adverse noise exposure and provide extended daily recovery and movement opportunities for aquatic species.

4.7 Air Quality

4.7.1 Existing Environmental Conditions

The Clean Air Act (CAA) sets forth the framework and goals for improving air quality to protect public health and the environment. It requires the USEPA to establish National Ambient Air Quality Standards (NAAQS) for the following “criteria” pollutants: ozone (O₃), carbon monoxide (CO), nitrogen dioxide (NO₂), sulfur dioxide (SO₂), particulate matter with an aerodynamic diameter smaller than or equal to 10 micrometers (PM₁₀), particulate matter with an aerodynamic diameter smaller than or equal to 2.5 micrometers (PM_{2.5}), and lead (Pb). NAAQS are divided into two (2) types of criterion: primary standards to protect the public health with an adequate margin of safety and secondary standards to protect the public welfare from any known or anticipated adverse effect of a pollutant (e.g. soiling, vegetation damage, material corrosion). Units of measure for the standards are parts per million (ppm) by volume, parts per billion (ppb) by volume or micrograms per cubic meter of air (µg/m³). The current primary and secondary NAAQS are shown in Table 12.

Table 12. National Ambient Air Quality Standards

POLLUTANT	AVERAGING PERIOD	NATIONAL PRIMARY	NATIONAL SECONDARY
Carbon Monoxide	1 hour	35 ppm	-
	8 hour	9 ppm	-
Ozone	8 hour	0.070 ppm	0.070 ppm
Nitrogen Dioxide	Annual	53 ppb	53 ppb
	1 hour	100 ppb	-
Lead	Rolling 3 month Average	0.15 µg/m ³	0.15 µg/m ³
Sulfur Dioxide	Annual	-	10 ppm
	1 hour	75 ppb	-
Inhalable Particulates (PM ₁₀)	24 hour	150 µg/m ³	150 µg/m ³
Fine Particulates (PM _{2.5})	24 hour	35 µg/m ³	35 µg/m ³
	Annual	12 µg/m ³	15 µg/m ³

Source: USEPA, 2025; <https://www.epa.gov/criteria-air-pollutants/naaqs-table>

Section 107 of the 1970 Clean Air Act Amendment (CAAA) requires USEPA and individual States to identify areas not meeting the NAAQS. Areas with measured air quality concentrations lower than a given NAAQS are designated “attainment” for that standard. Areas that exceed the NAAQS are designated “nonattainment”. An area can be attainment for one pollutant and nonattainment for others. Areas that previously did not meet one of the NAAQS but have since attained the standards are subject to the State Implementation Plan (SIP) for air quality “maintenance”. Such areas are commonly referred to as “maintenance areas”. The project is located within Monmouth County, which is designated as attainment for CO, NO₂, Pb, SO₂, and PM₁₀, nonattainment for O₃ and maintenance for PM_{2.5}.

NJDEP monitors each criteria pollutant is monitored on a continuous basis throughout New Jersey. Currently, NJDEP maintains twenty-nine (29) air quality monitoring stations, located across fifteen (15) counties. Each monitoring station documents one or more criteria pollutants, and not all pollutants are documented within each county. Certain monitoring stations also document levels of acid deposition, black carbon, measured benzene, toluene, ethyl benzene, xylenes, mercury, meteorological parameters, total reactive oxides of nitrogen, air toxics, and/or visibility. Air quality monitoring aims to provide an early warning system for pollutant concentrations, assess air quality for public health and welfare standards, and track trends or changes in pollutant levels.

Naturally occurring O₃ in the upper atmosphere protects the population from harmful ultraviolet rays. Ground-level O₃ is formed when nitrogen oxides (NO_x) and volatile organic compounds (VOC) react in the presence of sunlight and heat. Since O₃ is a secondary pollutant and as such, the highest concentrations are found some hours downwind of the sources, precursors (NO_x and VOCs) are tracked very carefully. Ground-level O₃ can cause serious adverse health effects by damaging cells that line our airways. Therefore, O₃ can aggravate respiratory disease and cause the public to be more susceptible to respiratory infections. The incomplete combustion of fossil fuel, power plants and other sources of combustion emit the primary source of NO_x. In recent years, documented O₃ levels in New Jersey have been decreasing (NJDEP Bureau of Air Monitoring, 2023 New Jersey Air Quality Report, page 4-10). Effective December 28, 2015, the USEPA created a more stringent ambient O₃ standard. The project is located within the *New York – N. New Jersey – Long Island, NY-NJ-CT Eight-Hour (2008) Severe 15 Non-Attainment* area.

A design value is calculated by USEPA based on actual air quality monitoring data over the most recent three-year period (2022-2024). The O₃ design value, calculated from fourth highest 8-hour annual concentrations, and respective standard is presented below. The 8-hour O₃ design value at a Monmouth County monitoring station in West Long Branch Borough is 0.067 ppm and, therefore, meets the NAAQS.

Table 13. Ozone Design Value, Monmouth County (2022-2024)

YEAR	8-HOUR ¹ (ppm)
Design Value ²	0.067
Standard	0.070

¹ – 4th highest daily maximum 8-hour average concentration.

² – Design value computed for latest design value period (2022-2024) using Federal Reference Method.

Source: USEPA, 2025; <https://www.epa.gov/air-trends/air-quality-design-values>

Particulate matter includes very small liquid and solid particles suspended within the lower atmosphere. Particulate matter irritates the membranes of the respiratory system and may significantly affect sensitive groups including the elderly, individuals with cardiopulmonary disease such as asthma, and children. USEPA is concerned with inhalable particulate matter that is not easily filtered by the nose and throat and can reach deep in the lungs causing lung disease, emphysema, and/or lung cancer. PM_{2.5} is created from chemical reactions in the atmosphere and through fuel combustion by sources such as motor vehicles and

power generation. The NAAQS was revised in 2024 to provide a more stringent annual PM_{2.5} standard. In 2013, USEPA redesignated Monmouth County along with twelve other New Jersey counties to PM_{2.5} attainment. Monmouth County is therefore in PM_{2.5} maintenance and is held to a maintenance plan.

A design value is calculated by USEPA based on actual monitoring data over the most recent three-year period (2022-2024). NJDEP does not monitor PM_{2.5} levels in Monmouth County. The closest and most representative PM_{2.5} monitoring station to the project study area is located in Ocean County (Toms River Township). PM_{2.5} design values based on 98th percentile 24-hour concentration and annual mean concentrations and their respective standards are presented below. The 24-hour and annual mean design values at the nearest representative monitoring station are 18 µg/m³ and 6.9 µg/m³, respectively. Both PM_{2.5} design values meet NAAQS at this representative monitoring location.

Table 14. PM_{2.5} Design Values, Ocean County (2022-2024)

YEAR	24-HOUR CONCENTRATION ¹ (µg/m ³)	ANNUAL MEAN CONCENTRATION (µg/m ³)
Design Value ²	18	6.9
Standard	35	9.0

¹ – 98th percentile concentration

² – Design value computed for latest design value period (2022-2024) using Federal Reference Method.

Source: USPEA, 2025; <https://www.epa.gov/air-trends/air-quality-design-values>

4.7.2 Impacts Anticipated under PPA

The project is located within Monmouth County which is in PM_{2.5} maintenance and therefore local air quality impact of the project must be addressed. Based on 40 CFR 93.123(b)(1), roadway projects that result in a significant increase in the number of diesel vehicles require a quantitative PM_{2.5} analysis following procedures outlined in USEPA's *Transportation Conformity Guidance for Quantitative Hot-spot Analyses in PM_{2.5} and PM₁₀ Nonattainment and Maintenance Areas* (EPA-420-B-15-084).

In the early 1990's, Bridge W-9 was posted to prohibit trucks weighing ≥ 3 tons from crossing the bridge. Therefore, trucks weighing ≥ 3 tons were forced to access the Manasquan peninsula by utilizing either the Main Street (Bridge W-10) or Ocean Avenue (Bridge W-11). Traffic classification counts were performed in October 2025 for Bridge W-9 and Bridges W-10 and W-11 (See Appendix C). Due to the weight restriction posted for Bridge W-9 and supported by the traffic counts, heavy diesel vehicles consisted of approximately 0% of average daily traffic (ADT) of 3151 along Brielle Road. Based on October 2025 traffic data provided for Main Street (Bridge W-10), truck traffic was documented at approximately 3% of the ADT (3855 vehicles), or approximately 99 trucks per day. Additionally, October 2025 traffic data provided for the Ocean Avenue (Bridge W-11), truck traffic was documented at approximately 2% of the ADT (1205), or approximately 24 trucks per day. The majority of truck (and vehicular) traffic accessing Manasquan currently use the Main Street Bridge and will likely continue to do so. Conservatively, it has been assumed that half of the trucks traveling along Main Street and Ocean Avenue (approximately 62) may divert onto Brielle Road after implementation of the project and weight restrictions are lifted. Therefore, heavy-duty diesel truck traffic along Brielle Road may increase the project-related truck traffic an additional 2% (from 0% to 2%). Based on the diesel truck traffic estimation performed, the project is not anticipated to significantly increase diesel vehicles, and as a result, PM_{2.5} concentrations are not expected to cause or contribute to a significant adverse PM_{2.5} impact.

4.7.3 Transportation Conformity

The Transportation Conformity Regulation (TCR), 40 CFR 93 Subpart A, provide criteria and procedures for determining conformity to the State Implementation Plan (SIP) related to transportation plans, programs, and projects funded or approved under Title 23 USC or the Federal Transit Act. Since the project is located in an area classified nonattainment and maintenance for O₃ and PM_{2.5}, respectively, TCR requirements apply.

The project is located within the jurisdiction of the North Jersey Transportation Planning Authority (NJTPA). The NJTPA performs regional emissions analyses for non-exempt projects (i.e., shown to be a regionally significant contributor of emissions) to demonstrate regional emissions that would result from the area's transportation system are within the limits outlined in the SIP. SIP conformity means that the transportation activities listed within the Statewide Transportation Improvement Program (STIP) will not cause new violations of the NAAQS, worsen existing violations, or delay timely attainment of the NAAQS. A project is said to conform if that project is included within an approved STIP. The project is included in the FY 2026 STIP (N59306/950607) which was approved on July 1, 2025. The project listing within the FY 2026 STIP is included in the TER (Appendix A). In addition to being from the most recently conforming STIP, the review of project-level PM_{2.5} demonstrates that the project conforms to the SIP and the transportation-related requirements of the CAA.

4.8 Noise

4.8.1 Existing Environmental Conditions

The Federal Highway Administration (FHWA) highway traffic noise regulation is United States Code of Federal Regulations Part 772 (23 CFR 772), *Procedures for Abatement of Highway Traffic Noise and Construction Noise*, amended, effective July 13, 2011. Within this regulation, three project types are defined: Type I, Type II and Type III. Type I projects are those which require a detailed noise analysis and consideration of abatement measures if impacts are predicted. Type II projects are those for which abatement is considered along existing highways, however, development and implementation of such projects are not mandatory requirements of Federal law or regulation, and the state of New Jersey no longer funds the Type II program. Type III projects are those that do not fulfill the requirements of a Type I or Type II project and do not require a noise analysis under 23 CFR 772.

The project is located within an area primarily comprised of residential and commercial land uses. No other noise-sensitive land use was identified (e.g. schools, places of worship, parks, etc.) within 500 feet of project improvements. Existing sources of noise generally result from vehicular traffic on Brielle Road/Fisk Avenue and Green Avenue.

4.8.2 Impacts Anticipated under PPA

As detailed within the *Alternatives Analysis Report*, dated September 16, 2022 (Appendix B), the purpose of the proposed project is to provide safe and efficient crossing for all modes of travel within project limits by addressing geometric, structural and operational maintenance deficiencies of Bridge W-7, Structure W-8, and Bridge W-9. The proposed alignment of the Preliminary Preferred Alternative (PPA) for each bridge was reviewed, relative to the Type I criteria listed in 23 CFR 772.5. None of the proposed improvements would involve construction of a highway on a new location, addition of through or auxiliary lanes, relocation of interchange lanes or ramps, pavement restriping to add through or auxiliary lanes, or addition/alteration of a weigh station, rest stop, ride-share lot or toll plazas. As such, the horizontal and vertical alignment changes were reviewed to determine whether any significant alterations are proposed. Distances between the traffic noise source and nearest sensitive receptor under the Existing and PPA

alignments for each structure were identified and compared to determine whether any improvement would ‘halve’ the distance between traffic noise source and sensitive receptor, as required to be considered a Type I project. Elevation changes were also reviewed to determine if any improvement would remove shielding and expose line-of-sight between the traffic noise source and sensitive receptors.

Green Avenue Bridge over Debbie’s Creek (Bridge W-7)

The PPA for Bridge W-7 proposes to replace the existing bridge in its entirety in-kind. The new bridge would be 17 feet wider, and the top roadway surface would be raised by as much as ± 1.6 feet. The closest sensitive receptors to improvements on Bridge W-7 are residences located along Green Avenue, north of Crescent Place. The closest source-receptor distance (between the edge of pavement and property line) under the existing condition was identified to be 18 feet, and the distance in the same location with proposed improvements would be 16 feet, resulting in a source-receptor distance decrease of 11 percent; therefore, proposed improvements would not ‘halve’ the distance between traffic source and receptor. Further, minor elevation changes to the top roadway surface would not expose any new line-of-sight between the bridge and sensitive receptors.

Fisk Avenue Culvert over Glimmer Glass (Structure W-8)

Replacement of the existing Structure W-8 proposes replacement of the culvert with an equivalent size reinforced pipe and provides for new headwalls and steel sheeting at each end. Improvements would not require any change in roadway width or profile. The roadway would be restriped for 12’ lanes and 5’ minimum bicycle compatible shoulders in each direction. The closest sensitive receptors to restriping of Structure W-8 are residences located along Fisk Avenue. There are no changes to the traffic source-receptor distance (between the edge of pavement and property line). Therefore, proposed improvements would not ‘halve’ the distance between source and receptor nor expose any new line-of-sight between the bridge and sensitive receptors.

Monmouth County Bridge W-9 carrying Brielle Road over the Glimmer Glass (Structure #13000W9) (Glimmer Glass Bridge)

The PPA for Bridge W-9 proposes to replace the existing bridge with a new wider bridge on the same alignment as the existing bridge. The new bridge would be widened to provide two (2) 12-foot travel lanes with 5-foot shoulders. The closest sensitive receptor to improvements on the structure is a public fishing pier, north of the bridge. Within this area, details regarding objects outside the bridge limit were not available in CAD format. Therefore, the distance measurement from the existing edge of pavement to the fishing pier was obtained using Nearmap™. The closest source-receptor distance (between the edge of pavement and fishing pier) under the Existing condition was identified to be 74 feet, and the distance in the same location with proposed improvements would be 69 feet, resulting in a source-receptor distance decrease of 7 percent. Therefore, proposed improvements would not ‘halve’ the distance between traffic source and receptor. Minor elevation changes to the top roadway surface would also not expose any new line-of-sight between the bridge and sensitive receptors.

In the early 1990’s, Bridge W-9 was posted to prohibit trucks weighing ≥ 3 tons from crossing the bridge. Therefore, trucks weighing ≥ 3 tons were forced to access the Manasquan peninsula by utilizing either Main Street (Bridge W-10) or Ocean Avenue (Bridge W-11). Traffic classification counts were performed in October 2025 for Bridge W-9 and Bridges W-10 and W-11 (See Appendix C). Due to the weight restriction posted for Bridge W-9 and supported by the traffic counts, trucks weighing < 3 tons consisted of approximately 0% of average daily traffic (ADT) of 3151 along Brielle Road. Based on October 2025 traffic data provided for Main Street (Bridge W-10), truck traffic was documented at approximately 3% of the ADT (3855 vehicles), or approximately 99 trucks per day. Additionally, October 2025 traffic data

provided for the Ocean Avenue (Bridge W-11), truck traffic was documented at approximately 2% of the ADT (1205), or approximately 24 trucks per day.

The proposed moveable span bridge configuration along Brielle Road will have scheduled and on-demand openings, which would likely deter some commercial truck use. In addition, Bridge W-10 and Bridge W-11 entry points are closer to the highway network for commercial trucks traveling to the area. Therefore, the majority of truck (and vehicular) traffic accessing Manasquan currently use the Main Street Bridge and will likely continue to do so with project implementation. Conservatively, it has been assumed that half of the trucks currently traveling along Main Street and Ocean Avenue (approximately 62) may divert onto Brielle Road after implementation of the project and weight restrictions are lifted. With the addition of approximately 62 trucks, traffic volumes along Brielle Road may increase by 2%. A 100% increase in traffic volumes would equate to a perceivable change in noise levels to the average healthy human ear. Since truck traffic may increase total traffic volumes by less than 100%, lifting the weight restrictions with project implementation is not likely to result in a perceivable increase in noise levels at sensitive receptors.

Since the project would not result in the construction of a highway on a new location, addition of through or auxiliary lanes, relocation of interchange lanes or ramps, pavement restriping to add through or auxiliary lanes, or addition/alteration of weigh station, rest stop, ride-share lot or toll plazas and would also not substantially change horizontal or vertical alignments, none of the Type I criteria listed in 23 CFR 772.5 are met. As such, the project would be considered Type III, and no traffic noise analysis is required. In addition, the project is also not anticipated to cause a perceivable change in noise levels by lifting the existing Bridge W-9 weight restriction.

4.9 Hazardous Materials

A Hazardous Waste Screening was performed for the proposed project location. The screening consisted of a review of environmental databases, aerial photographs, topographical maps, fire insurance maps, city-directory data, and an on-site inspection. The inspection was conducted to verify environmental databases and assess current site conditions. Reviewed environmental information is presented in the TER (Appendix A).

4.9.1 Potential Areas of Concern

The following information regarding the project site was obtained:

- Evidence of Historic Fill was identified:
 - Historic Fill is known to contain contaminants such as Polycyclic Aromatic Hydrocarbons (PAHs) and metals including cadmium, lead, and arsenic
 - Historic Fill may be required to be reported to the NJDEP and addressed in accordance with site remedial requirements
- Two (2) electrical transformers were identified on site:
 - One transformer was located at the western end of Brielle Road and the other transformer was located near a drain at the eastern end. Staining was not observed at the pole base or adjacent soils.
- A PVC stick-up pipe was observed at the eastern end of Brielle Road. It was located on the northern grassy area, near a small metal pipe entering the bridge.
- Several long cracks were identified in the road. Unmaintained vehicles may have leaked motor oil, coolant, and gasoline/diesel fuel onto the road, which could potentially affect underlying soil conditions.
- Marine pilings were observed at the site:

- Pilings are typically treated with chemicals such as Wood Tar Creosote (WTC), Chromated Copper Arsenate (CCA), and Pentachlorophenol (PCP)
- Contaminants of concern include PAHs, Phenols, Arsenic, Chromium, Copper, Dioxin, and Furans
- Pilings with a blue appearance suggest CCA treatment, particularly at Bridge Monmouth County Bridge W-9 carrying Brielle Road over the Glimmer Glass (Structure #13000W9) (Glimmer Glass Bridge)
- Black residue and sealant/tar were observed on several pilings
- Treated wood must be disposed of off-site in accordance with State requirements
- Potential impacts to the waterway were identified:
 - Contaminants present in soil may enter surface water through runoff
 - The transformer near the drain may have impacted surface water
 - Chemicals used to treat pilings may have leached into the waterway and settled into sediment
- Evidence of wetlands was observed in the immediate vicinity of the site
- Several catch basins were identified throughout the site; stains were not identified adjacent to them

4.9.2 Recommended Action

Due to potential impacts to proposed site improvements, soil and sediment/surface water samples should be collected to determine if site contamination is present. Historic Fill is known to contain contaminants such as PAHs and metals and should be addressed during Preliminary Design for handling and off-site disposal requirements.

4.10 Land Use

The project area is immediately surrounded by residential areas in the Boroughs of Brielle and Manasquan. The bridges/structures are part of serene vistas from any direction. The project study area for this section encompasses the neighborhoods around each waterway crossing. In addition, areas surrounding possible detour routes were evaluated to identify the presence of any land use concerns.

The project study area is primarily residential with small pockets zoned for business, conservation, or parking. Businesses can be found primarily at the intersection of Main Street and NJ State Highway 71 and on 1st Avenue in Manasquan. Public recreation areas include Fisherman's Cove Conservation Area and the Atlantic Ocean beachfront, which are also areas set aside for conservation. The project area sits within year-round residential communities that experience a large influx of visitors and part-time residents during the summer months. Brielle Borough's Manasquan River waterfront is also a popular destination for visitors. Glimmer Glass and Debbie's Creek are popular destinations for boaters and fishermen throughout the warmer months. Manasquan has a downtown area with many small businesses. The area between the three bridges and the Atlantic beachfront is heavily accessed by visitors due to the location of local bars and restaurants along 1st Avenue. Bridge W-7, Structure W-8, and Bridge W-9 provide a vital link between the mainland and this part of the Manasquan beachfront. Access to the beachfront is of significant local economic importance.

Zoning Maps for the Boroughs of Brielle and Manasquan are included in the TER (Appendix A). Bridge W-9 is entirely within Manasquan's conservation zone. Bridge W-7 and Structure W-8 are also in the conservation zone where they fall within Manasquan boundaries and in residential zones within Brielle boundaries. The project study area within Brielle Borough is zoned entirely as residential, with the

exception of a commercial zone where State Highway 35 meets the Manasquan River. In Manasquan Borough, the study area is primarily residential, with the following exceptions: Fisherman's Cove Conservation Area is zoned as Public Recreation; Deep Creek Cove Full Service Marina is zoned as Marine Business; Glimmer Glass Island and a few parcels around the Glimmer Glass are zoned for Conservation; and Business and Retail zones occur at the intersection of Main Street and NJ State Highway 71.

4.10.1 Study Area

The project area is surrounded by residential areas in the Boroughs of Brielle and Manasquan. The bridges/structures are part of serene vistas from any direction. The project study area for this section was designated to include the neighborhoods immediately surrounding the project area and is delineated by the following boundaries:

- Manasquan River and NJ State Highway 35 in the south;
- Main Street to the north;
- NJ State Highway 71 in the west; and
- 1st Avenue in the east.

4.10.2 Surrounding Land Use

4.10.2.1 Residential and Business Development

The area surrounding the proposed project is almost entirely residential. Development is primarily detached, single-family homes and town homes. Residential development continues as one travels away from the bridges in any direction. See photographs in the TER (Appendix A).

Deep Creek Cove Full-Service Marina is the only commercial property located within the project study area. It is located on the south side of Brielle Road, just east of Bridge W-9. No other business activities operate in the immediate vicinity of the project site. However, the bridges and culvert provide a link between the mainland and the Manasquan beachfront. Access to the beachfront is significant to the local economy, especially to owners and operators of rental properties, restaurants, bars, and shops.

Commercial/Business zones occur at various locations along Main Street in Manasquan and along NJ State Highways 35 and 71 (Brielle and Manasquan) at the outskirts of the project study area. A possible construction detour route would direct traffic along Main Street and State Highways 35 and 71. No construction activities are proposed in these areas.

4.10.2.2 Community Facilities

No community facilities occur at the project site. The Brielle Police Department is headquartered at the intersection of State Routes 35 and 71. Manasquan's Police Department is located at the intersection of State Route 71 and Main Street. The closest hospital is the Hackensack Meridian Health Ocean University Medical Center in Brick, NJ. The closest fire house is located at 33 Abe Voorhees Road in Manasquan. There is also a Point Pleasant Beach fire house on Laurel Avenue south of Manasquan River. Fisherman's Cove Conservation Area is located just east of the project site, within the study area and three blocks before the Atlantic beachfront. Fisherman's Cove is part of the Monmouth County Park System. Community facilities and open space are mapped in Figure 11.

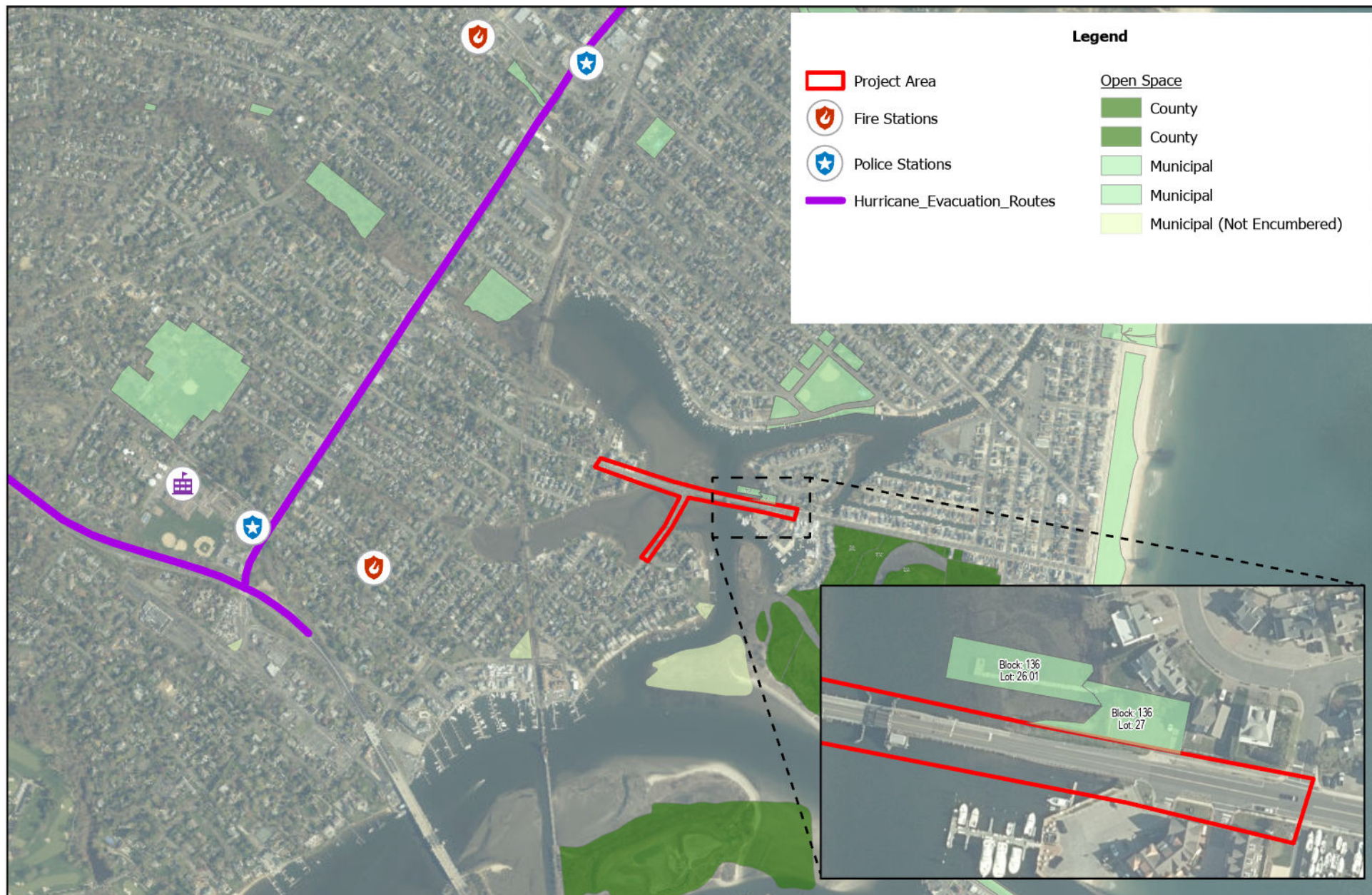


Figure 11. Community Facilities and Evacuation Route
Monmouth County Three Bridges (W-7, W-8, W-9)
 Brielle and Manasquan Boroughs, Monmouth County, New Jersey

0 750 1,500 3,000 Feet
 1" = 1,500'

There are undeveloped properties nearby that are zoned for conservation. The project has the potential to encroach onto one of the parcels zoned for conservation: Glimmer Glass Island, located at the junction of the three roads. The zoning map for Manasquan Borough is included in the TER (Appendix A).

The Recreation and Open Space Inventory (ROSI) database lists for the Boroughs of Brielle and Manasquan were reviewed for Green Acres encumbered parcels adjacent to the bridges or within the project study area. In addition to the parcels that are part of Fisherman's Cove Conservation Area, two parcels located near Bridge W-9 were identified on the Manasquan ROSI database list: Block 136, Lot 26.01 and Block 136, Lot 27. These lots house the Brielle Road Fishing Pier and associated parking adjacent to the bridge. The fishing pier is part of the Borough of Manasquan parks system. No Green Acres encumbered parcels located adjacent to the project site or within the project area were identified on the Brielle ROSI database. The ROSI database lists are included in the TER (Appendix A). The fishing pier is identified as public open space (local) in Figure 11.

The acquisition, maintenance, and/or improvement of Green Acres parcels may be funded through the Land and Water Conservation Fund (LWCF). The LWCF is a federally funded conservation and recreation program established in 1964 to acquire, protect, and enhance public parks, open spaces, and recreation resources. Properties receiving LWCF assistance are protected under Section 6(f)(3) of the LWCF Act and must remain dedicated to public outdoor recreation, unless a federally approved conversion and replacement process is completed through the U.S. National Park Service.

Although Green Acres parcels may receive funding from the LWCF, the LWCF project map maintained by the Land and Water Conservation Fund Coalition does not identify LWCF-funded projects at or around the project area. Based on the Tidelands License and Declaration of Encumbrance for the above-referenced parcels, included within the TER (Appendix A), the properties were historically owned by the State of New Jersey and conveyed to Manasquan Borough in 2003. The Declaration of Encumbrance was made by Manasquan Borough in 2008, with Exhibit 1 denoting that both parcels are encumbered under the Green Acres program. However, the parcels are also denoted as "unfunded," indicating that no Green Acres funding was used to acquire or develop either property.

4.10.3 Impacts to Surrounding Land Use

The proposed project will not adversely affect the use of the surrounding land. Establishing standard-width roadway shoulders and ADA compliant sidewalks will enhance the use of the existing environment by providing pathways for pedestrians and bicyclists.

Impacts regarding this topic are exclusively from property acquisitions for widening of the approach roadway that will accommodate a wider structure to replace Bridge W-7. For Bridge W-7, construction of the preliminary preferred alternative would require acquisition of approximately 5,300 square feet of property along the east side of Green Avenue for permanent Right-of-Way (ROW). While significant, this acquisition would not affect residents' use of or access to their property. It also would not affect any open space parcels.

4.11 Cultural Resources

4.11.1 Tribal Consultation

FHWA conducted Tribal Consultation with the Delaware Tribe of Indians, the Shawnee Tribe of Oklahoma, and the Delaware Nation in correspondence dated July 9, 2025. A response was received from the Delaware Nation requesting to be a consulting party and for the Delaware Nation's Inadvertent Discovery Policy and Consultation Protocols to be incorporated into the project documents. Continuing Section 106 consultation will occur as the project develops.

4.11.2 Section 106 of the National Historic Preservation Act

The three structures proposed for replacement, the Green Avenue Bridge over Debbie's Creek (Bridge W-7), the Fisk Avenue Culvert over Glimmer Glass (Structure W-8), and Monmouth County Bridge W-9 carrying Brielle Road over the Glimmer Glass (Structure #13000W9), were evaluated in several cultural resource surveys and through consultation with the SHPO. The Green Avenue Bridge over Debbie's Creek (Bridge W-7) and the Fisk Avenue Culvert over Glimmer Glass (Structure W-8) were determined to not be eligible for listing on the National Register of Historic Places.

Monmouth County Bridge W-9 carrying Brielle Road over the Glimmer Glass (Structure #13000W9) (Glimmer Glass Bridge) was previously identified within the project Area of Potential Effect (APE) for historic architecture. Bridge W-9 was first identified as a potentially eligible resource in the Monmouth County Historic Sites Inventory in 1990 (Hunton and McCabe 1984/1990). In 1994 it was evaluated as an eligible resource in NJDOT's New Jersey Historic Bridge Survey (A.G. Lichtenstein & Associates 1994), an evaluation that was concurred with by SHPO in 1995 (Dorothy P. Guzzo, SHPO Administrator, to Andras Fekete, NJDOT Bureau of Environmental Analysis Manager, June 30, 1995).

It was again noted as an eligible resource in the original cultural resource survey completed for the Monmouth County Three Bridges Project in 2004 (Cultural Resource Consulting Group 2004). The bridge received a formal State Historic Preservation Officer Opinion of Eligibility later that same year (Dorothy P. Guzzo, Deputy SHPO, to Anthony B. Sabidussi, NJDOT Bureau of Environmental Program Resources Manager, July 15, 2004; see Appendix A). A National Register of Historic Places Nomination Form was completed for the bridge in 2007 (Hickey 2006/2007).

Monmouth County Bridge W-9 (Glimmer Glass Bridge) was listed on the New Jersey Register of Historic Places on February 28th, 2008, and it was listed on the National Register of Historic Places on April 25th, 2008. According to the National Register nomination, the bridge meets National Register Criterion C for its technological significance "as a bascule-type movable bridge which is a representative example of little-used technology first developed in the 1890s...as the only example of its type in New Jersey and exemplifies advances in movable bridge technology in the late 19th and early 20th centuries for the transportation of vehicles over navigable waterways" (Hickey 2010: 8-1). Documentation pertaining to the nomination of Bridge W-9 and inclusion into the National and New Jersey Register of Historic Places is provided in the most recent version of the cultural resource survey provided in the TER (Appendix A).

The NJDOT and SHPO determined that an updated cultural resource survey was necessary to update the earlier work due to the time elapsed since its completion. An updated Phase IA Archaeological Survey and an Intensive-level Historic Architectural Survey was completed in 2018 (updated 2024) by NV5. The Phase IA archaeological survey recommended that no archaeological resources are present within the project APE for archaeology. The Intensive-level Historic Architectural Survey identified Monmouth County Bridge W-9 carrying Brielle Road over the Glimmer Glass (Structure #13000W9) (Glimmer Glass Bridge). The report concluded that the planned replacement of Bridge W-9 will constitute an adverse effect to historic properties. The adverse effects will be mitigated through the development of a Memorandum of Agreement (MOA) including the following stipulations: completion of Historic American Engineering Record (HAER) Level II Documentation, High Definition Laser 3D Scanning, an interpretive website, an interpretive display, and to determine the feasibility of the salvage of bridge components. Execution of the MOA is pending. The most recent version of the cultural resource survey is provided in the TER (Appendix A).

4.11.3 New Jersey Register of Historic Places Act

As the Monmouth County Bridge W-9 (Glimmer Glass Bridge) is listed on the New Jersey Register of Historic Places and owned by Monmouth County, the replacement project requires prior authorization from the New Jersey Department of Environmental Protection. An Application for Project Authorization was submitted to the Historic Site Council for the proposed replacement of the structure. In accordance with the New Jersey Register of Historic Places Act (N.J.A.C. 7:4), the New Jersey Department of Transportation and Monmouth County (“the County”) appeared before the New Jersey Historic Sites Council at a public meeting on December 19, 2024. The recommendation made by the Council in a letter dated January 21, 2025 (HPO-A2025-198 PROD) was to adopt a resolution numbered 2024-446, authorizing the replacement of Bridge W-9 in accordance with the following mitigating conditions:

1. Prior to the removal, demolition, or alteration of any components of the Glimmer Glass Bridge, the NJDOT and the County, using the services of an Architectural Historian who meets the *Secretary of the Interior’s Professional Qualifications Standards* [48 FR 44738-9] in Architectural History, shall document the existing conditions of the structure to Level II standards of the Historic American Engineering Record (HAER) for submission to the Library of Congress in accordance with the National Park Service (NPS) – HAER guidance. The Schedule of Documentation to guide recordation of the bridge shall be developed by the NPS Interior Region 1 HABS/HAER/HALS program.

Documentation shall include the existing conditions of the bridge, its operating mechanism, and its setting. Recordation will also include a written historical report in accordance with Level II HAER standards. Documentation shall be prepared using archival materials and processes to comply with the HAER collection’s permanence standards. In addition to large format photographs and negatives, documentation shall include high-resolution digital photos that meet the NPS National Register Digital Photograph Submission Standards.

Draft copies of the documentation shall be submitted to the HPO and the NPS Interior Region 1 HABS/HAER/HALS program for review and comment within one (1) year of project authorization. Final copies shall be submitted to the HPO and the NPS Interior Region 1 HABS/HAER/HALS program for approval and final transmittal to the Library of Congress within three (3) months of receipts of comments from the HPO and NPS. A digital copy of the report shall also be provided to the HPO and duplicate copies, with original photographs, shall be provided to the appropriate repositories as identified in consultation with the Historic Preservation Office.

2. The NJDOT and the County shall employ High-Definition Laser (3D) Scanning to document the Glimmer Glass Bridge prior to the removal, demolition or alteration of any components of the bridge. The data shall be used as follows:
 - a. A minimum of two elevation drawings shall be produced from the scanning to be incorporated into the HAER documentation. These drawings will be submitted to HPO and National Park Service (NPS) Interior Region 1 HABS/HAER/HALS program for review. Final drawings will be submitted on HAER drawing sheets as part of the HAER documentation required in Condition #1.
 - b. A 3D rendering of the Glimmer Glass Bridge shall be produced for use on a webpage about the structure, as required in Condition #3.
3. The NJDOT and the County, using the services of a person meeting the Secretary of the Interior’s Professional Qualifications Standards [48 FR 44738-9] in History and/or Architectural History, shall create a webpage that interprets the engineering significance of the Glimmer Glass Bridge. The webpage shall reflect the information contained in the National Register of Historic Places nomination for the structure and shall incorporate historic images, photographs produced as part of the HAER

documentation, the 3D rendering produced from the High-Definition Laser Scanning, and video of the structure in operation. The webpage shall be hosted by Monmouth County or another organization to be identified through consultation.

The content and text of the website shall be submitted to HPO for review and approval prior to web publication and within 18 months of the project authorization. The NJDOT and the County shall ensure that the website is published within three (3) months of the HPO's approval of the draft, and a link shall be provided to the HPO. The website shall be maintained a minimum of five years from project authorization. The County shall consult with the HPO prior to removal of the web page in order to select a suitable archival option for the information contained therein.

4. The NJDOT and the County, using the services of a person meeting the Secretary of the Interior's Professional Qualifications Standards [48 FR 44738-9] in History and/or Architectural History, shall create an interpretive display detailing the history and significance of the Glimmer Glass Bridge, to be displayed on the fishing pier adjacent to the bridge or another publicly accessible area to be determined through consultation. The display shall include at least one (1) interpretive sign and salvaged material from the bridge, if feasible. The content of the signage shall include a colorful panel mounted on a pedestal or kiosk, and the content shall incorporate historic photographs and images created as part of the HAER documentation, as well as text on the historic significance of the bridge.

The location, content, size, and text of the display shall be submitted to the HPO for review and approval prior to fabrication and within 18 months of project authorization. The display shall be installed, and verification of installation shall be provided to the HPO, within three (3) months of the project completion.

5. The NJDOT and the County are strongly encouraged to pursue the salvage and display of components of the bridge for interpretive and educational purposes. The goal will be to determine the feasibility of retaining specific bridge components for meaningful interpretation and education regarding the Glimmer Glass Bridge. Any plans for salvage and display of bridge components should be determined in consultation with the HPO and interested parties and documented on project plans.

Both the letter and resolution are presented in the TER (Appendix A).

5.0 ALTERNATIVES CONSIDERED

5.1 Introduction

An in-depth alternatives analysis for the project has been conducted by Mott MacDonald on behalf of Monmouth County (Appendix B). The purpose of the analysis was to compare and assess various alternatives developed against the project's stated purpose and needs, while striving to also meet the stated goals and objectives. As part of the process, a no-build alternative and several build alternatives were evaluated for each of the three structures and included rehabilitating or replacing the existing structures and approaches. The advantages of each alternative were discussed and lifecycle cost estimates were developed. Based on these analyses and comparisons, a preliminary preferred alternative (PPA) was identified for advancement for each structure.

For use and consideration in developing the build alternatives, traffic volumes were projected to the design year of 2040 based on existing traffic data. Future traffic volumes and traffic analysis are appended to the *Alternatives Analysis Report* attached here in Appendix B.

Alternatives were assessed against criteria that included the project purpose, project needs, project goals and objectives, construction costs and duration, advantages and disadvantages, ROW and environmental impacts, and required permits. Alternatives and sub alternatives were developed and the PPA for each structure selected involved an extensive public outreach program.

5.2 Alternatives for Green Avenue Bridge over Debbie's Creek (Bridge W-7)

Four main alternatives with several variations were considered for Bridge W-7. These are summarized below. For further detail and a matrix presenting all alternatives and variations considered for Bridge W-7, please see Appendix B.

5.2.1 Alternative 1: No-Build

The no-build alternative does not allow for any improvement of the bridge other than routine maintenance. Following this alternative the needs and goals defined in the Project Purpose, Needs and Goals would not be achieved. These include improving the structural capacity, improving roadway geometries, providing better pedestrian and bicycle compatibility and connectivity, providing ADA compliant facilities and crossings, improving safety features, and reducing the frequency of bridge maintenance.

With the no-build alternative, the bridge would eventually need to be closed to traffic due to deterioration of critical components, such as the substructure piles. The remaining service life of this bridge is estimated to be less than 10 years (Mott MacDonald, 2022). As such, this alternative would postpone replacement of the bridge rather than avoid it.

Additionally, though there are no initial construction costs associated with this alternative, the bridge's advanced age and the deterioration of its structural components dictate an acceleration of maintenance costs in the near future. Prior to reaching the end of the service life of the structure, the bridge loading will likely be further reduced, with the bridge eventually being closed to traffic. Replacing substructure piles would entail a major rehabilitation effort and be beyond the scope of maintenance activities. The cost of a full rehabilitation or replacement of the bridge would be postponed rather than avoided.

5.2.2 Alternative 2: Rehabilitation

The second alternative considered for Bridge W-7 consists of rehabilitating and strengthening the existing bridge to accommodate two lanes of current design live load, thereby increasing the structural capacity to support full legal loading. With this alternative, there is also an opportunity to provide improvements to the

vehicular railings and provisions for a widened 6-foot sidewalk along the east side. However, the roadway geometrics would be approximately maintained (22' curb-to-curb), resulting in a bridge that would remain functionally obsolete and not have the minimum required roadway width of 32' curb-to-curb.

With this alternative, there would be no significant change in the character of the bridge, whether viewed from above or in profile. The existing opening for navigation would be maintained (approximately 15' wide by 10'-6" high). The proposed redesign of Bridge W-7 would have a similar appearance to the fixed spans of Bridge W-9 and its approaches, in order to provide similar aesthetics and economies of scale during construction.

Environmental impacts from this alternative would be small as the bridge profile and footprint would be nearly the same. Some temporary impacts are expected during construction, such as increased noise and localized vegetation and wetland impacts along the approach roadways. Permanent wetland impacts of approximately 400 square feet (SF) are expected. Additionally, some permanent ROW acquisitions (1,850 SF) and temporary construction easements (4,850 SF) would be required along Green Avenue and at the intersection of Green Avenue and Brielle Road.

This alternative only meets some of the project needs. It would improve the bridge structural capacity, maintain system linkage, and provide for better pedestrian compatibility with wider sidewalks. However, it would not address the substandard geometric features such as the narrow bridge and approach roadway widths, keeping the bridge in the functionally obsolete category and maintaining existing safety risks for bicyclists and motorists.

In terms of the project goals and objectives, some pedestrian facilities would be provided, but with limited approach work. Maintenance requirements would decrease in the short term, but would still be higher than that for a new bridge. It is anticipated that jacketing or posting of piles would be required within the first 10-15 years and complete replacement of the bridge would be required in only 20-30 years.

The initial construction cost for this alternative is estimated at approximately \$2.4 million. The present value cost assuming a 100-year return period is estimated to be around \$6.3 million.

5.2.3 Alternative 3: Replacement with a Wider Bridge - PPA

Alternative 3 consists of two variations that both propose the replacement of the existing bridge in its entirety, but differ in the sidewalks offered. In Variation 1, a 6' sidewalk on the east side of the roadway is proposed. In Variation 2, 6' sidewalks on both the east and west sides of the roadway are proposed. Alternative 3, Variation 1 (Alternative 3-1) is the preliminary preferred alternative for Bridge W-7. As part of the design of the new bridge, existing roadway geometrics would be improved as required to meet current standards. This includes increasing the bridge width, providing a consistent approach roadway width, and smoothing out the roadway profile on the approaches and across the bridge. Alternative 3 drawings are included as Figures 12, 13, and 14.

The new bridge superstructure would likely consist of prestressed concrete voided slab beams with a cast-in-place concrete deck slab. The substructure would consist of either prestressed concrete piles or equivalent diameter concrete filled steel pipe piles with reinforced concrete abutments and bents.

The overall bridge width in Alternative 3-1 would be approximately 43'-3", consisting of a 34' roadway (12' lanes and 5' bicycle compatible shoulders in each direction), a 6' wide sidewalk along the east side, and metal bridge railing along each fascia. Compared to the existing structure, the new bridge would be 17' wider than the existing bridge, and the top roadway surface would be raised by as much as 1.6'±. The bridge length of 120' would remain the same and the roadway alignment would maintain the west curb line at nearly its present location. In order to accommodate these geometric improvements, approximately 5,300 SF of

permanent ROW acquisition would be required along the east side of Green Avenue. While significant, this acquisition would not affect residents' use of or access to their property.

Environmental impacts would be moderate with Alternative 3-1. Approximately 1,500 SF of wetlands would be permanently impacted in order to widen the roadway and install new substructures. Bridge geometry and construction sequences would be developed to minimize these effects.

In the second variation of this alternative, Alternative 3-2, the overall bridge width would be 6' wider than Alternative 3-1 because of the additional sidewalk along the west side. The additional width would require significant increases in permanent ROW impacts (to 8,800 SF) and temporary construction easements (to 7,300 SF). The area of environmental impact from Alternative 3-2 would also be more significant than that expected from Alternative 3-1. To accommodate two sidewalks, the area of permanent wetland disturbance would rise to 4,800 SF. The existing 10'-6" high clearance for marine navigation would be maintained, but the channel width would likely increase due to differences in pier bent locations.

It is desirable to plan the appearance and design details of Bridge W-7 to be compatible with the alternative selected for Bridge W-9, given their proximity and relationship. Doing so could partially mitigate impacts to the visual character/landscape. Architectural and aesthetic details to consider include the primary substructure and superstructure construction materials, parapet and railing treatments, faux pile cross bracing, and roadway surface treatments.

Both variations of Alternative 3 meet all of the project needs. It would improve safety by correcting the substandard bridge and approach roadway widths, increase the bridge's structural capacity, improve system linkage, and provide for better pedestrian and bicyclist compatibility.

Regarding the project goals and objectives, the following is true of both Variations of Alternative 3: pedestrian facilities and crossings would be provided; and maintenance requirements would be the lowest with the lowest long-term costs as compared to the other alternatives (with the exception of Alternative 4). However, construction duration, cost, and impacts would be larger compared to the rehabilitation alternative (Alternative 2). Options such as the use of precast components could be investigated during final design to decrease construction time.

The initial construction costs for Alternative 3-1 are estimated at approximately \$4.9 million. The present value costs assuming a 100-year return period are estimated to be around \$6.2 million. For Alternative 3-2, initial construction costs are estimated at approximately \$5.2 million, and lifecycle costs are estimated at \$6.6 million. This alternative is anticipated to have a service life of at least 75 years.

5.2.4 Alternative 4: Replacement with Monmouth County Bridge W-9 carrying Brielle Road over the Glimmer Glass (Structure #13000W9) (Glimmer Glass Bridge)

Alternative 4 consists of the relocation of the movable portion of Monmouth County Bridge W-9 to the location of Green Avenue Bridge over Debbie's Creek (Bridge W-7). The intention of this alternative is to partially preserve this historic bridge near its original location. Three variations were considered as part of this alternative, with varying levels of rehabilitation and movable span operability: rehabilitation resulting in a wider bridge with a movable span; rehabilitation resulting in a wider bridge with a fixed span; and rehabilitation with reuse of the superstructure, maintaining the roadway width of Bridge W-7's location, with a movable span for educational/commemorative use only.

The first two variations meet the project purpose and all of the project needs. However, both variations have significantly higher costs than Alternative 3. The third variation would not meet the purpose and needs of the project.

The initial construction costs for Alternative 4 are estimated at approximately \$11.6 million, \$8.3 million, and \$10.6 million for variations 1 to 3. The respective present value costs assuming a 100-year return period are estimated to be around \$17.6 million, \$12.6 million, and \$15.9 million.

For further detail and comparison of alternatives, please refer to the *Alternatives Analysis Report* in Appendix B.

5.2.5 Detour

Full closure of Bridge W-7 associated with Alternatives 2, 3, and 4 will require establishment of a signed detour route. One possible detour would be via Green Avenue, Union Lane, Brielle Avenue, and Fisk Avenue. This route is 1.2 miles long and adds approximately 4 minutes to the travel time. A slightly longer alternative would route traffic via Green Avenue, Union Lane, Union Avenue (Route 71), and Fisk Avenue. This brings the total detour length to 1.6 miles and 5 minutes of travel time. The second option will require a Highway Occupancy Permit from the New Jersey Department of Transportation due to the use of a state highway (Route 71). Both routes require going through two NJ Transit at-grade railroad crossings. The latter route also includes a signalized intersection. Each of these has the potential to cause additional delays.

The drawing shows a plan view of Green Avenue from station 52+00.00 to 56+46.25. Key features include:

- Proposed Construction:** New wider concrete superstructure and new concrete/steel substructures.
- Easements:** Prop. Temporary Construction Easement (1,500 SF), Prop. Temporary Construction Easement (845 SF), Prop. Temporary Construction Easement (780 SF), Prop. ROW (1,645 SF), Prop. ROW (3,660 SF).
- Wetlands:** Permanent Wetlands Disturbance Area = 195 SF, Permanent Wetlands Disturbance Area = 45 SF, Permanent Wetlands Disturbance = 50 SF, Permanent Wetlands Disturbance Area = 810 SF, Permanent Wetlands Disturbance Area = 250 SF.
- Curbs and Sidewalks:** Prop. Conc. Vertical Curb (TYP.), Prop. Conc. Sidewalk (TYP.).
- Rails:** Prop. Guide Rail (TYP.), Proposed Guide Rail, Prop. Guide Rail to Bridge End Attachment (TYP.).
- Bridges:** BRIDGE W-7, BRIDGE W-8, BRIDGE W-9.
- Municipal Boundary:** BOROUGH OF BRIELLE, BOROUGH OF MANASQUAN.
- Other Features:** Debbie's Creek, Water Line, Lot 1, SDWLK, EASEMENT, LIMIT OF GRADING (TYP.), MATCH LINE STA. 56+46.25 SEE DWG C-2.

PROPOSED WORK

- CONSTRUCT NEW WIDER CONCRETE SUPERSTRUCTURE
- CONSTRUCT NEW CONCRETE/STEEL SUBSTRUCTURES
- WIDEN AND RECONSTRUCT APPROACH ROADWAYS

HOR. SCALE IN FEET

0 20 40 100

DATE	REVISIONS	BY	CHK
3/2026			

MOTT MACDONALD

CERTIFICATE OF AUTHORIZATION
NO. 24GAZB018600
111 WOOD AVENUE SOUTH
ISELIN, NJ 08830-4112

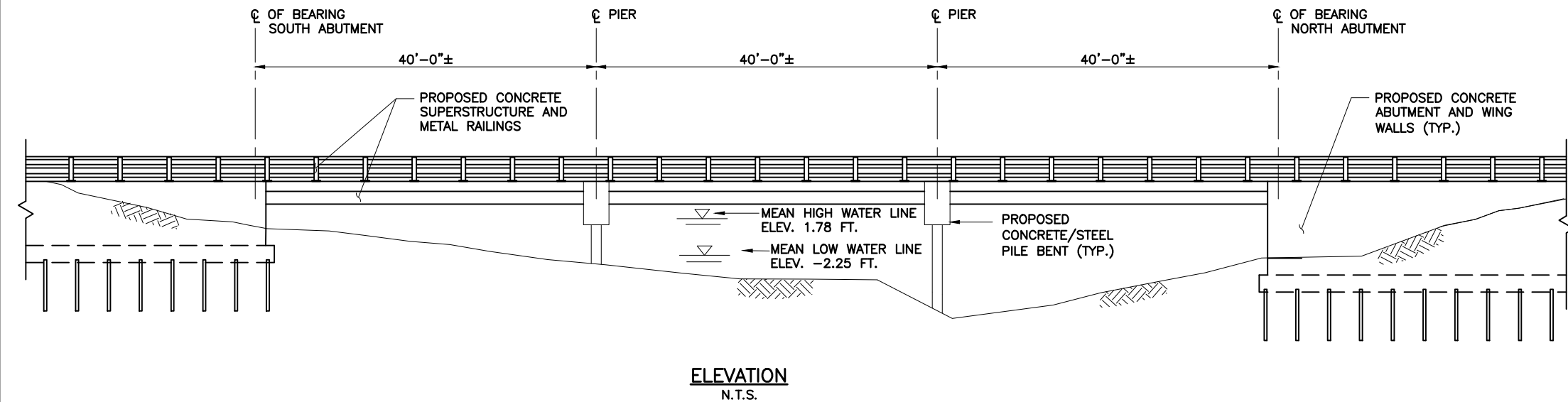
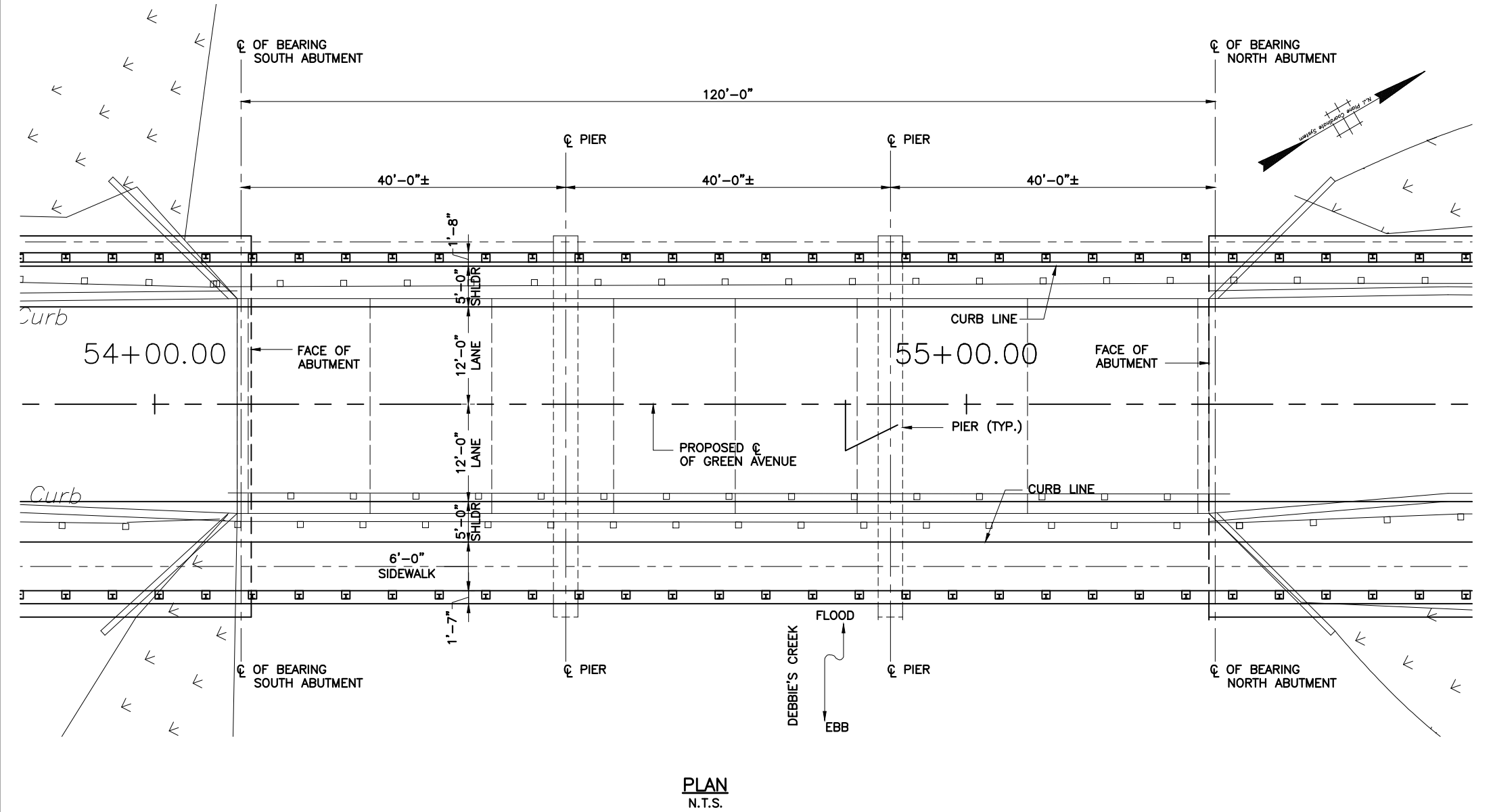
BRIDGES W-7, W-8 AND W-9
BOROUGH OF MANASQUAN AND BRIELLE
MONMOUTH COUNTY, NEW JERSEY

CONSTRUCTION PLAN
3 OF 3

DWG. NO. C-3

DESIGNED
CHECKED
APPROVED

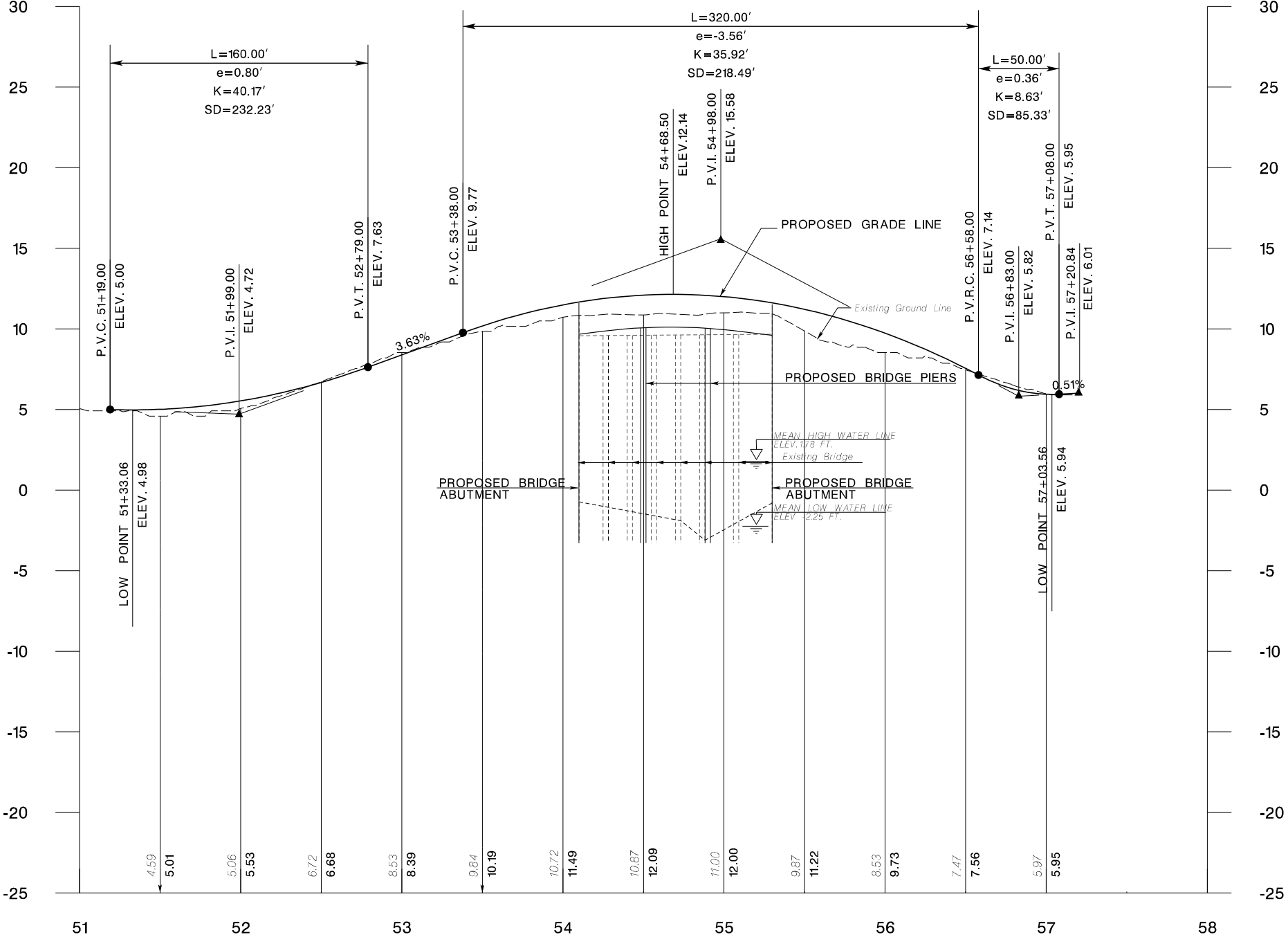
FIGURE 13: BRIDGE W-7 PRELIMINARY PREFERRED ALTERNATIVE BRIDGE PLAN & ELEVATION



FILE NAME: W-7 Bridge Drawings.dwg
DATE: 6/29/2026
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DATE		REVISIONS		BY	CHK.
M M MOTT MACDONALD CERTIFICATE OF AUTHORIZATION NO. 24GA28016600 111 WOOD AVENUE SOUTH ISELIN, NJ 08830-4112		BRIDGES W-7, W-8 AND W-9 BOROUGH OF MANASQUAN AND BRIELLE MONMOUTH COUNTY, NEW JERSEY			
		GENERAL PLAN AND ELEVATION BRIDGE W-7 1 OF 2			
		DWG. NO. B-1	DATE 3/2026 SCALE	DESIGNED DRAWN	CHECKED APPROVED

FIGURE 14: BRIDGE W-7 PRELIMINARY PREFERRED ALTERNATIVE BRIDGE PROFILE



GREEN AVENUE PROFILE

DATE	REVISIONS	BY	CHK.
M M MOTT MACDONALD CERTIFICATE OF AUTHORIZATION NO. 24CA28016600 111 WOOD AVENUE SOUTH ISELIN, NJ 08830-4112			
BRIDGES W-7, W-8 AND W-9 BOROUGH OF MANASQUAN AND BRIELLE MONMOUTH COUNTY, NEW JERSEY			
PROFILE GREEN AVENUE			
DWG. NO.	DATE	DESIGNED	CHECKED
P-2	3/2026		
SCALE	DRAWN	APPROVED	

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USER: \$USERNAME\$

5.3 Alternatives for Fisk Avenue Culvert over Debbie's Creek (Structure W-8)

Four alternatives were considered for Structure W-8, as summarized below. For further detail and a matrix presenting all alternatives considered for Structure W-8, see Appendix B.

5.3.1 Alternative 1: No-Build

The no-build alternative consists only of routine maintenance. It does not meet the project needs, nor does it address the immediate maintenance needs of the crossing. Deterioration of the pipe and sheeting at the headwall area will eventually cause the roadway fill to erode at those locations. Maintenance repairs are specialized and would be difficult to perform within a tidal zone. Due to the advanced age of this structure, the frequency and cost of maintenance will continue to increase in the future. As the culvert continues to deteriorate there is the potential for continued settlement leading up to a partial collapse. Ultimately, the structure will become too deteriorated to repair, requiring a complete road closure. It is estimated that the remaining service life of this structure is less than 10 years.

5.3.2 Alternative 2: Rehabilitation

This alternative consists of the rehabilitation of the existing pipe culvert. The deterioration in the reinforced concrete culvert would be repaired and the structure strengthened as required. Exposed reinforcement would be cleaned and repaired/coated. Deteriorated concrete would be chipped back to sound concrete and patched with repair concrete. Another viable alternative for rehabilitation would be the use of a pipe liner. Either way, this alternative does not address the long-term structural integrity of the culvert and would only provide a limited increase in service life as compared to that provided by a new structure. While rehabilitation would satisfy short-term maintenance requirements of the structure, there would still be a need for continued costly repairs, becoming increasingly frequent over time.

The construction cost for this alternative is estimated at approximately \$410K. Given the relatively low construction and long-term costs for Structure W-8, no lifecycle costs were developed. However, this alternative is anticipated to have a service life of 15-20 years, after which a subsequent rehabilitation or replacement would be required.

5.3.3 Alternative 3: Elimination of the Culvert

This alternative consists of removing the existing culvert, filling in the area, and driving new steel sheeting at both ends. Consideration could be given to replacing the sheet piles along the full length of the causeway. Removal of the culvert would eliminate the need for repairs and the potential for collapse and would meet project needs. This alternative would not require any change in the roadway width or profile, which is currently 34.8' curb to curb with an approximately 6' wide sidewalk. The roadway would be restriped for 12' lanes and 5' minimum bicycle compatible shoulders in each direction. The width of the roadway is controlled by the tied sheet piling walls retaining the causeway fill. Elimination would meet some of the goals and objectives, such as substantially reducing future maintenance costs and activities.

However, removal of the culvert would likely have a significant environmental impact by removing the existing hydraulic connection between the Glimmer Glass and Debbie's Creek. A hydraulic study would have to be performed to determine if adverse impacts on tidal flow, wetlands, and wildlife habitats on either side of Fisk Avenue would occur. Based on experience, adverse impacts are probable and maintaining the existing hydraulic connection is preferred.

The existing hydraulic opening is likely already reduced due to deterioration, settlement, silt build-up, etc. Removal of the culvert would only further increase any impacts and will likely be deemed unacceptable.

The construction cost for this alternative is estimated at approximately \$670K. Replacement of the complete sheet pile bulkhead would add another \$300-350K to the total cost. Given the relatively low construction and long-term costs for Structure W-8, no lifecycle costs were developed. However, this alternative would have no associated long-term costs as the culvert would be eliminated.

5.3.4 Alternative 4: Replacement of Culvert - PPA

This alternative replaces the culvert with an equivalent size reinforced concrete pipe and provides for new headwalls and steel sheeting at each end. The new culvert would be sized to provide similar hydraulic characteristics to the existing one using a hydraulically equivalent circular or horizontally elliptical reinforced concrete pipe. Replacing the existing flat bottom pipe with a pipe of identical cross section would require special fabrication, which is costly and not practical. This alternative would not require any change in the roadway width or profile, which is currently 34.8' curb to curb with an approximately 6' wide sidewalk. The roadway would be restriped for 12' lanes and 5' minimum bicycle compatible shoulders in each direction. The width of the roadway is controlled by the tied sheet piling walls retaining the causeway fill. The existing, highly deteriorated sheet piling at the headwall and immediately adjacent to the culvert ends would be replaced. Consideration could be given to replacing the sheet piles along the full length of the causeway.

This alternative satisfies the project needs by improving the short and long term structural integrity of the structure and accommodating pedestrians and bicyclists, while maintaining the existing hydraulic connection between the Glimmer Glass and Debbie's Creek. It also meets most of the project goals and objectives including sidewalk connectivity, improved safety through upgraded railings and sidewalks, and reduced future maintenance costs and impacts.

However, the construction costs, duration, and impacts are largest for this option. The use of precast components and staged construction may be explored as necessary to limit disruptions.

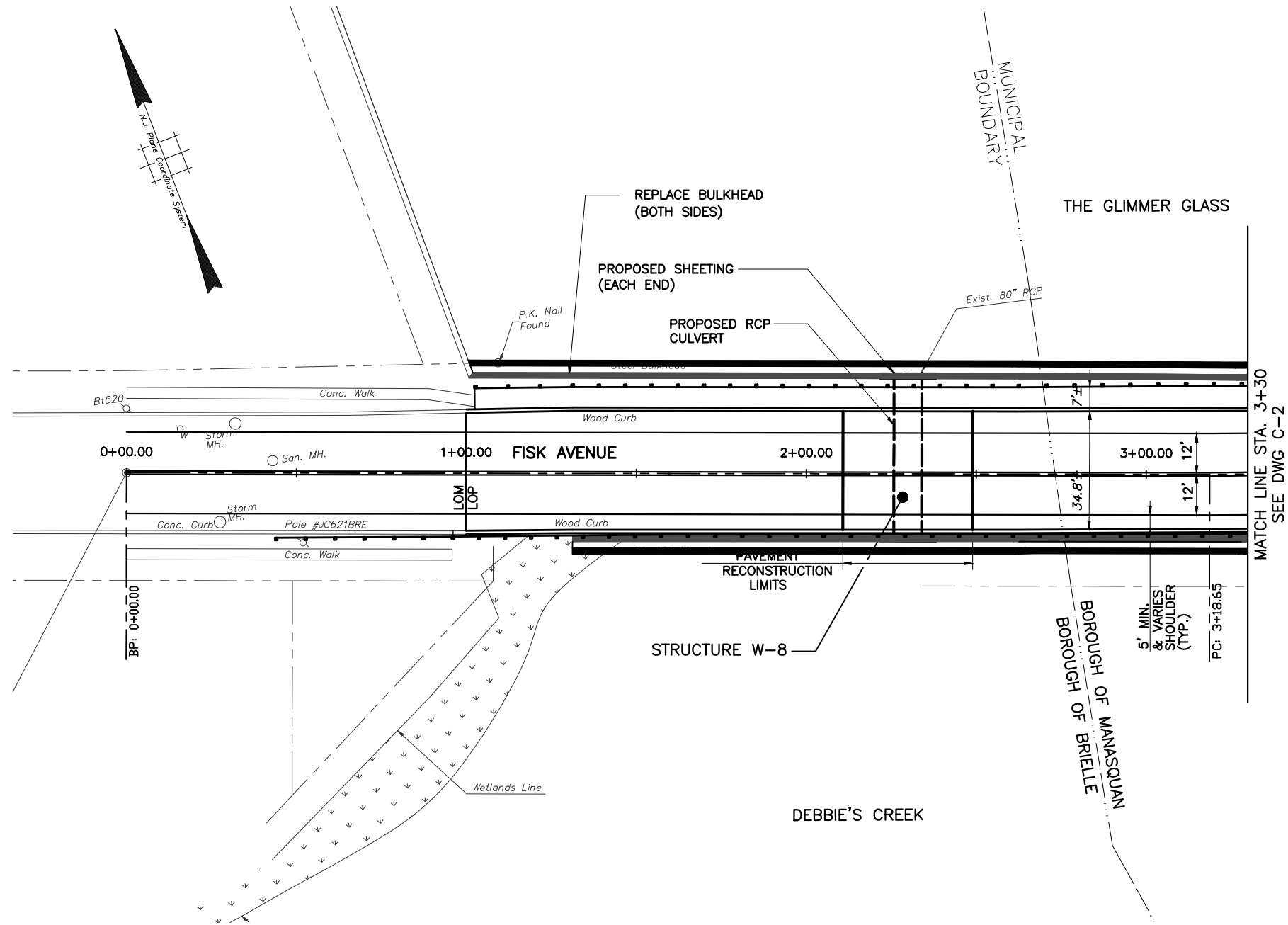
The construction cost for this alternative is estimated at approximately \$940K. Replacement of the complete sheet pile bulkhead would add another \$300-350K to the total cost. See Figures 15 and 16 for the Alternative 4 plans. Given the relatively low construction and long-term costs for Structure W-8, no lifecycle costs were developed. However, this alternative is anticipated to have a service life of at least 75 years.

For further detail and comparison of alternatives, please refer to the *Alternatives Analysis Report* in Appendix B.

5.3.5 Detour

Full closures of Structure W-8 associated with Alternatives 3 and 4 will require establishment of a signed detour route. One possible detour would be via Fisk Avenue, Union Avenue (Route 71), East Main Street, 4th Avenue, and Brielle Road. This route is 2.5 miles long and adds approximately 5-10 minutes to the travel time. Note that a Highway Occupancy Permit will be required from the New Jersey Department of Transportation due to the use of a state highway (Route 71). This route requires going through 2 NJ Transit at-grade railroad crossings and one signalized intersection. Each of these has the potential to cause additional delays.

FIGURE 15: STRUCTURE W-8 PRELIMINARY PREFERRED ALTERNATIVE PLAN



PROPOSED WORK

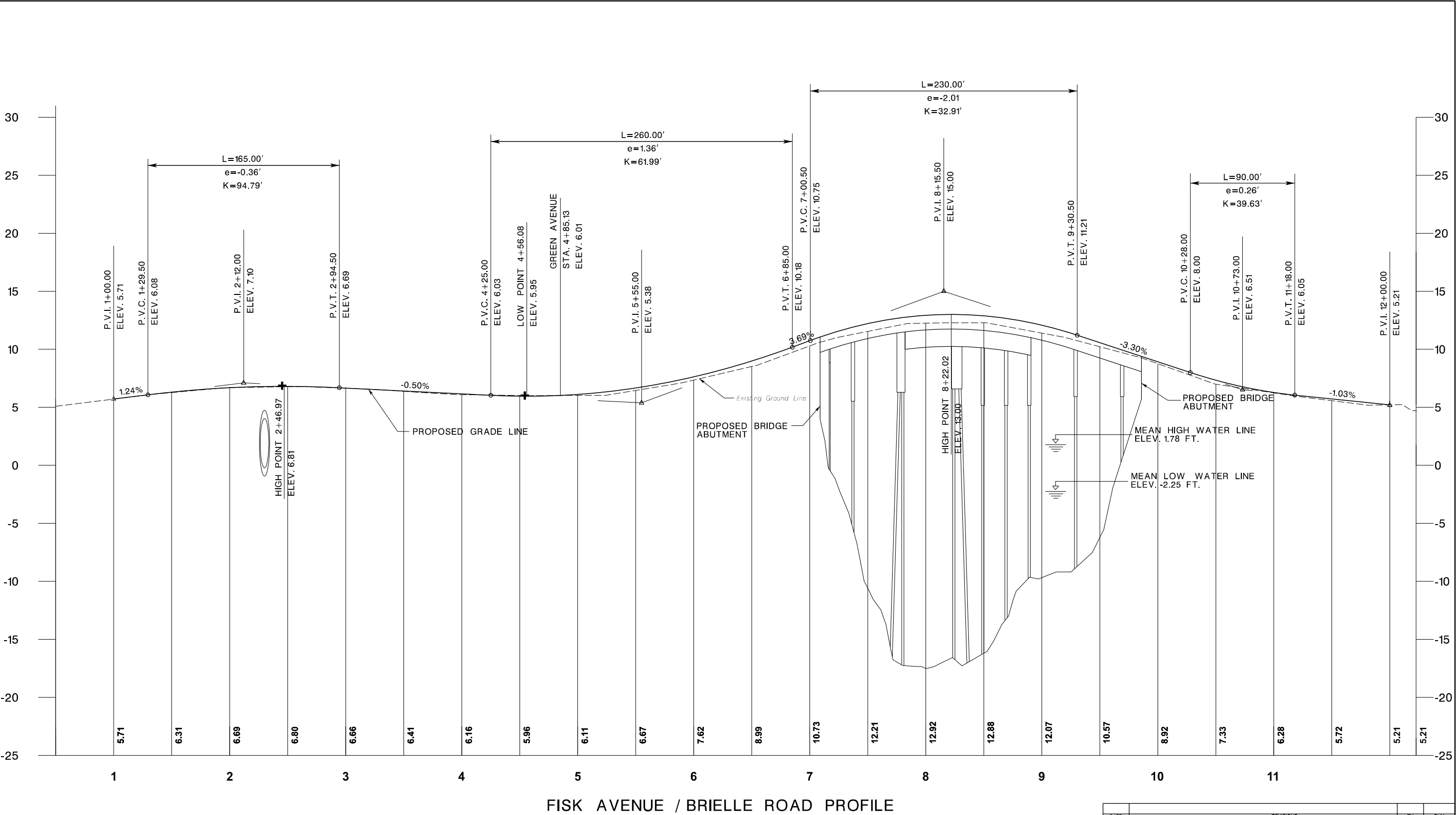
- REMOVE EXISTING CULVERT
- CONSTRUCT NEW CONCRETE CULVERT
- REPLACE STEEL BULKHEAD FULL LENGTH (BOTH SIDES)
- RECONSTRUCT PAVEMENT OVER NEW CULVERT



FILE NAME:WB Construction Plan.dwg
DATE: 4/28/2026
TIME: 10:03 AM
USER: Fernando Santos

DATE		REVISIONS		BY	CHK.
MOTT MACDONALD CERTIFICATE OF AUTHORIZATION NO. 24GA28016600 111 WOOD AVENUE SOUTH ISELIN, NJ 08830-4112		BRIDGES W-7, W-8 AND W-9 BOROUGH OF MANASQUAN AND BRIELLE MONMOUTH COUNTY, NEW JERSEY			
		CONSTRUCTION PLAN 1 OF 3			
		DWG. NO. C-1	DATE 3/2026 SCALE 1"=40'	DESIGNED DRAWN	CHECKED APPROVED

FIGURE 16: STRUCTURE W-8 & BRIDGE W-9 PRELIMINARY PREFERRED ALTERNATIVE PROFILE



FISK AVENUE / BRIELLE ROAD PROFILE

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DATE		REVISIONS		BY	CHK.
M M MOTT MACDONALD CERTIFICATE OF AUTHORIZATION NO. 24CA28016600 111 WOOD AVENUE SOUTH ISELIN, NJ 08830-4112		BRIDGES W-7, W-8 AND W-9 BOROUGH OF MANASQUAN AND BRIELLE MONMOUTH COUNTY, NEW JERSEY			
		PROFILE FISK AVENUE / BRIELLE ROAD			
		DWG. NO. P-1	DATE 3/2026 SCALE	DESIGNED DRAWN	CHECKED APPROVED

5.4 Alternatives for Monmouth County Bridge W-9 carrying Brielle Road over the Glimmer Glass (Structure #13000W9) (Glimmer Glass Bridge)

Monmouth County Bridge W-9 (Glimmer Glass Bridge) is a historic bridge listed on the State and Federal Registers of Historic Places. Several alternatives were developed to investigate the possibility of conserving this resource while meeting the needs of the project and protecting the safety of the community. The following list presents all of the design alternatives explored for Bridge W-9.

- Alternative 1 – No-Build
- Alternative 2 – Rehabilitation
 - Alternative 2A-1 – Restoration
 - Alternative 2A-2 – Rehabilitation without Widening
 - Alternative 2B – Modified Rehabilitation
 - Alternative 2C – Rehabilitation of Movable Span and Replacement of the Approach Spans
- Alternative 3 – Retain Existing Bridge and Build New Bridge
 - Alternative 3A – Retain Existing Bridge (Close to Vehicular Traffic) and Build New Bridge on a Parallel Alignment – High Level Fixed Span Bridge
 - Alternative 3B – Retain Existing Bridge (Close to Vehicular Traffic) and Build New Bridge on a Parallel Alignment – Movable Bridge
 - Alternative 3C – Retain Existing Bridge (Convert to One-Way Traffic) and Build New Bridge on a Parallel Alignment – Movable Bridge
 - Alternative 3D – Rehabilitate Existing Bridge and Build New Pedestrian Bridge on a Parallel Alignment – Movable Bridge
- Alternative 4 – Build New Bridge on Current Alignment
 - Alternative 4A – Build New Bridge on Current Alignment – High Level Fixed Span Bridge
 - Alternative 4B – Build New Bridge on Current Alignment – Movable Bridge, Vertical Lift
 - Alternative 4C – Build New Bridge on Current Alignment – Movable Bridge, Trunnion Bascule
 - Alternative 4D – Build New Bridge on Current Alignment – Movable Bridge, Rolling Counterweight

Four main alternative concepts with several sub-alternatives and variations were considered for Bridge W-9. These are summarized below. For further detail and a matrix presenting details regarding all alternatives, sub-alternatives, and variations considered for this bridge, see Appendix B.

5.4.1 Alternative 1: No-Build

This alternative does not allow for any improvements to the bridge other than routine maintenance and repair. The structurally deficient bridge would remain in place, and the condition of the structure would continue to deteriorate, eventually resulting in permanent closure due to structural and safety concerns. Even with regular maintenance, mechanical components will wear with an increasing likelihood of failure.

As the bridge deteriorates, it will also pose a hazard to marine navigation. This alternative clearly does not address the project's defined purpose or needs, and it achieves few of the project's goals. While it avoids impacts to the historic resource in the short term, eventually the resource will be lost, and the vital crossing will be out of service.

5.4.2 Alternative 2: Rehabilitation

This alternative has several variations that consist of the rehabilitation of the existing bascule and approach spans with varying degrees of modification to the existing structure and approaches.

Several variations were considered for this group of alternatives: Restoration; Rehabilitation without Widening; Modified Rehabilitation; and Rehabilitation of Movable Span with Replacement of the Approach Spans. The County desired options for maintaining the historic bridge while meeting project purpose and needs, especially regarding public safety.

The first two variations of Alternative 2 (2A-1 Restoration and 2A-2 Rehabilitation without Widening) were designed with the intention of meeting the Secretary of the Interior's (SOI) Standards for the Treatment of Historical Properties from the Code of Federal Regulations. The regulation sets forth standards for preservation, rehabilitation, restoration, and reconstruction used by various agencies and commissions to guide their review processes and are codified as part of Title 36, Chapter I of the CFR. In general, they require that the structure be returned to its original appearance during its most significant time period (defined as 1938-1950 for Bridge W-9). Per 36 CFR Part 68, the new work should be "compatible with the historic materials, features, size, scale and proportions, and massing to protect the integrity of the property".

An independent review of the rehabilitation option for Bridge W-9, as presented in a 2009 Work-in-Progress version of the *Alternatives Analysis Report* (Mott MacDonald, 2022), was conducted in 2012 by Childs Engineering Corporation of Bellingham, Massachusetts. The Childs 2012 report goes into further detail regarding SOI considerations for this alternative. The report notes:

"Under the SOI Standards for restoration and rehabilitation, the physical record of its time, place and use will not be changed for which The Glimmer Glass Bridge was constructed. Which in-short states any and all distinctive materials, features, finishes and construction techniques or craftsmanship should be returned as it appeared in at a particular and most significant time period with a few key exceptions:

- 1) Known substandard safety issues
- 2) Known and proven hazardous treatments or chemicals."

Restoration of the existing bridge (Alternative 2A-1) would consist of the repair or replacement of deteriorated portions of the bridge with like materials to match their original appearance and condition. While not a true historic restoration in the sense that recent safety and operational improvements would be maintained, every effort would be made to use like materials of similar scale and proportions. While the Restoration variation would address some of the project goals and objectives, such as minimizing environmental impacts and adverse effects on the historic bridge, it does not meet the project purpose and only partially addresses the project needs. The restored bridge would remain classified as "functionally obsolete" and "structurally deficient."

The Rehabilitation without Widening Variation of this alternative (Alternative 2A-2) is similar to Restoration, except that many components would be replaced with more durable materials designed/treated to mimic the existing components. While there are some advantages to this variation, there would still be no significant geometric changes made. As such, most of the substandard design elements would remain, and the project purpose and needs would not be met.

The Modified Rehabilitation variation (Alternative 2B) consists of rehabilitating the bridge with some widening to address the substandard geometry. Minimum 11' lanes and 5' bicycle compatible shoulders would be provided across the bridge. Modified Rehabilitation meets the project purpose and all of the

project needs. It also meets some of the project goals and objectives. However, the salvage of select components of the existing superstructure results in higher long-term costs than the various replacement alternatives, while likely still being assessed as adversely affecting the historic bridge.

Finally, the Rehabilitation of Movable Span and Replacement of the Approach Spans variation (Alternative 2-C) would attempt to salvage the key historical components of the bridge, namely the single leaf, cable operated bascule span and rolling counterweight. The adjacent spans would also be rehabilitated. The approach spans, however, would be replaced with a wider structure with stronger and more durable material capable of supporting full design/legal live loading. Substructures would also be completely replaced. This variation does not meet the project purpose and only partially meets the project needs. The rehabilitated bascule span would still not support full legal loads. The bridge would still be classified as functionally obsolete due to the substandard deck geometry as controlled by the bascule and adjacent spans. Because the timber trestle approach spans are part of the historic bridge, this variation is not fully compliant with SOI standards.

5.4.3 Alternative 3: Retain Existing Bridge and Build New Bridge

This group of alternatives consists of variations of retaining the existing bridge and adding a new bridge on a parallel alignment. Each variation results in two permanent bridges where one currently stands. The following variations were considered:

- Alternative 3A – Retain Existing Bridge (Close to Vehicular Traffic) and Build New Bridge on a Parallel Alignment – High Level Fixed Span Bridge
- Alternative 3B – Retain Existing Bridge (Close to Vehicular Traffic) and Build New Bridge on a Parallel Alignment – Movable Bridge
- Alternative 3C – Retain Existing Bridge (Convert to One-Way Traffic) and Build New Bridge on a Parallel Alignment – Movable Bridge
- Alternative 3D – Rehabilitate Existing Bridge and Build New Pedestrian Bridge on a Parallel Alignment – Movable Bridge

The key advantage to this group of alternatives is that the historic bridge is fully maintained. Alternative 3C also meets project purpose and needs. However, all of the variations incur very high initial costs and excessive environmental and property (ROW acquisition) impacts. Estimated costs for each of these alternatives was in excess of \$25 million. Because of these excessive costs and impacts, detailed costs were not prepared.

5.4.4 Alternative 4: Build New Bridge on Current Alignment – PPA (4D)

This group of alternatives proposes complete replacement of Bridge W-9 on the current alignment. Variations come from varying designs of the new bridge and include the following: High Level Fixed Span Bridge; Movable Bridge, Vertical Lift; Movable Bridge, Trunnion Bascule; and Movable Bridge, Rolling Counterweight.

Replacing the existing bridge with a high-level fixed span bridge would minimize maintenance and operation costs and would improve bicycle and pedestrian compatibility. However, this variation would have significant property impacts from acquisitions, with possible loss of access to additional properties. The estimated costs for this alternative are in excess of \$25 million.

The remaining variations consist of replacing the existing bridge with one of three types of movable bridge. Improved bicycle and pedestrian compatibility and standard structural capacity and geometry are key advantages. All three of these alternatives would have moderate environmental impacts, with

approximately 1,950 square feet of permanent wetland disturbance. The historic bridge would be eliminated in each case as well.

A movable bridge with vertical lift would meet project purpose, needs, goals and objectives, but would be visually out of context in the project area. It is also the least cost effective as the remaining two variations.

A movable bridge with trunnion bascule would also meet project purpose, needs, goals and objectives. It would have identical environmental impacts to the other variations, but would not be as cost effective as Alternative 4D, the Preliminary Preferred Alternative.

Alternative 4D, the PPA, consists of replacement of the existing bridge on the current alignment with a movable bridge with rolling counterweight. The new bridge would be wider than the existing bridge. The existing bridge would be relocated or demolished to allow for the new bascule span bridge. The replacement bridge would have a similar appearance and mechanical operation as the existing structure. It would be a movable cable operated, rolling counterweight, single leaf bascule bridge on the same alignment, maintaining the existing transportation system linkage and aesthetic appeal of the original bridge. The movable span would consist of steel beams with a studded open grid deck and operate in a comparable manner as the existing bridge, replicating the historically eligible feature of the movable span. The new tower trusses would be taller and wider than those on the existing structure, but would be proportioned to maintain a similar profile in elevation. The proposed navigational clearances would be maintained, subject to USCG approval. The new bridge would be wider to provide improved horizontal geometrics. In addition, an ADA compliant sidewalk would be provided on the north side of the bridge.

See Figure 16 (above) and Figures 17 and 18 (below) for the Alternative 4D plans. For further detail and comparison of alternatives, please refer to the *Alternatives Analysis Report* in Appendix B.

5.4.5 Historic Bridge Relocation

Bridge W-9 is a unique movable bridge listed on the National and New Jersey Registers of Historic Places. Selection of Alternative 4D as the PPA would require demolition of this structure, resulting in the loss of this cultural resource. In recognition of this adverse effect, Monmouth County investigated the relocation of Bridge W-9. Provisions in the Surface Transportation and Uniform Relocation Assistance Act of 1987 (STURAA) make select funds available for this purpose. The relocation of the bridge to another site could provide the best opportunity for an adaptive re-use in the form of a transportation structure. Removing the bridge from the existing site and erecting it at another site is an acceptable method of preservation.

At a new site, Bridge W-9 could continue to function as a bridge, although not necessarily as a movable bascule bridge. There is also precedent to allow the bridge to serve as a historic monument, but not necessarily as a transportation structure. One example is the Knapps Narrow Bridge in Maryland, which now serves as the entrance to the Maritime Museum in St. Michaels, MD.

Potential relocation sites within Monmouth County were evaluated, and a public outreach program was implemented by the County. A marketing plan was developed and the County reached out to over 800 potential interested parties. Very few responses were received, and none expressed an interest in accepting the bridge.

Specifically, the Monmouth County Park System (MC Parks), initially considered one of the top candidates for accepting the relocation of the structure, responded unfavorably to the Engineering Department's request to relocate Bridge W-9 to a County park area in a letter dated February 28, 2007. In the letter, MC Parks acknowledges the structure's unique design and historic significance. However, they maintain that accommodating a structure of such size and complexity would have a negative effect on the character of the County park area. Similarly, the Engineering Department sent a request to the New Jersey Department

of Environmental Protection Division of Parks and Forestry (NJDEP DPF) to relocate Bridge W-9 to the Pine Creek Railroad, a historic site maintained by the New Jersey Museum of Transportation in Allaire Village, Allaire State Park. The NJDEP DPF also responded unfavorably to the County's request in a letter dated April 21, 2008.

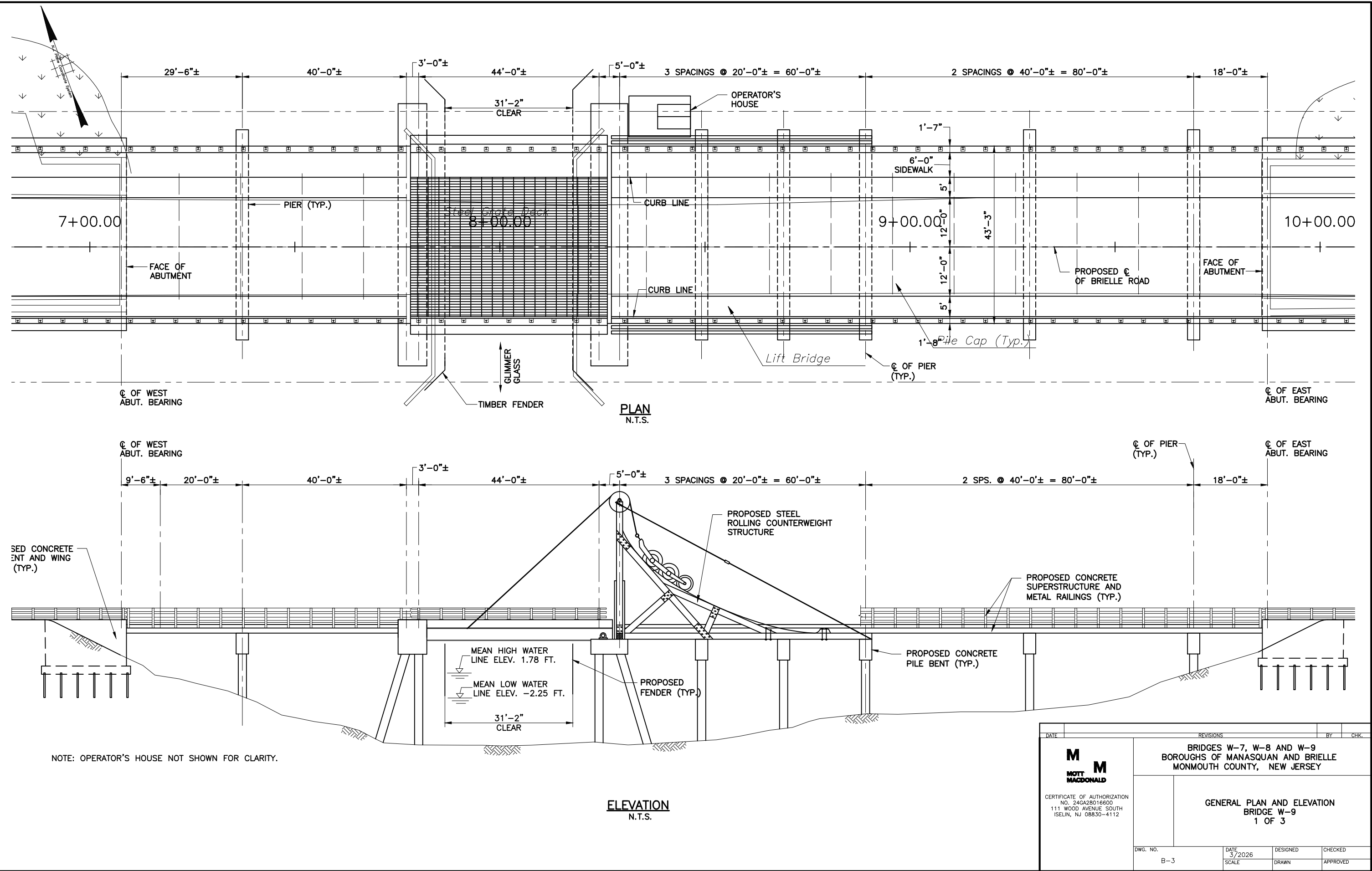
Relocation of Bridge W-9 to the current location of Bridge W-7 was also investigated and evaluated as an alternative. Refer to section 5.2.4 of this report.

5.4.6 Detour

The full closure of Bridge W-9, associated with most of the alternatives, would require establishment of a signed detour route. One possible detour would be via Fisk Avenue, Union Avenue (Route 71), East Main Street, 4th Avenue, and Brielle Road. This route is 2.5 miles long and adds approximately 5-10 minutes to the travel time. Note that a Highway Occupancy Permit will be required from the New Jersey Department of Transportation due to the use of a state highway (Route 71). This route requires going through 2 NJ Transit at-grade railroad crossings and one signalized intersection. Each of these has the potential to cause additional delays.

[illegible]

FIGURE 18: BRIDGE W-9 PRELIMINARY PREFERRED ALTERNATIVE BRIDGE PLAN & PROFILE



6.0 REQUIRED PERMITS AND APPROVALS

The following local, State, and Federal permits/approvals will likely be required for the proposed work:

Freehold Soil Conservation District

Soil Erosion and Sediment Control Plan (N.J.S.A. 4:24-39 et seq)

Projects that disturb a total land area of 5,000 square feet or more are required to submit a plan for Certification of Soil Erosion and Sediment Control (SESC) for review, approval, and inspection.

NJ Department of Environmental Protection

Coastal Zone Management Rules (N.J.A.C. 7:7)

Based on the project location and proposed disturbance to coastal resources, compliance with and authorization pursuant to the Coastal Zone Management Rules at N.J.A.C. 7:7 will be required. A CAFRA Individual Permit (N.J.A.C. 7:7-2.2), Waterfront Development Permit (N.J.A.C. 7:7-2.4), and Coastal Wetland Permit (N.J.A.C. 7:7-2.3) are anticipated to authorize proposed activities. Authorization by NJDEP under the Coastal Zone Management Rules will be required to demonstrate consistency with the Coastal Zone Management Act, which is required by USACE as part of their regulatory approval, as described below.

NJDEP Bureau of Tidelands Conveyance(s) (N.J.S.A. 12:3)

Dependent on final determination of the Bureau of Tidelands of the need for a Tidelands lease or license, Tidelands Conveyances may be required. NJDEP's Bureau of Tidelands is currently reviewing applicable Tidelands mapping and internal files to make that determination.

NJDEP Flood Hazard Area Individual Permit (N.J.A.C. 7:13)

The project area waterways are defined as regulated waterways under N.J.A.C. 7:13-2.2, the project area land is defined as regulated areas under N.J.A.C. 7:13-2.3 and the project is defined as a regulated activity under N.J.A.C. 7:13-2.4(a). Review of the flood hazard regulations indicates that the project is located in a flood hazard area, floodway with a likely 50-foot riparian zone, and may require a flood hazard area individual permit under N.J.A.C. 7:13-10.1.

NJDEP Stormwater Management Compliance (N.J.A.C. 7:8)

If the project meets the definition of a "major development," in that it disturbs greater than one (1) acre of land and/or creates greater than one-quarter acre of regulated impervious surface and/or regulated motor vehicle surface, the project will be required to comply with the NJDEP Stormwater Management (SWM; N.J.A.C. 7:8) regulations. Per N.J.A.C. 7:8-1.6 of the recently amended (January 20, 2026) SWM regulations, the project is subject to the March 2, 2021 SWM regulations, which were effective at the time of PPA approval (see *Alternatives Analysis Report* prepared by Mott MacDonald and dated September 16, 2022), as long as the project scope, as defined in the PPA, is not revised in such a way as to not be considered de minimis impact on water resources.

NJDEP Coastal Wetlands Permit (N.J.A.C. 7:7-2.3) & 401 Water Quality Certification (33 U.S.C. § 33 1341)

Given that the project will impact NJDEP regulated coastal wetlands, an NJDEP Coastal Wetlands Permit is anticipated to be required, which will also include a 401 Water Quality (WQ) Certification. Said 401 WQ Certification is required for the requisite US Army Corps of Engineer's permits to be issued.

NJDEP Freshwater Wetlands Permit (N.J.A.C. 7:7A)

Any impacts to those wetlands which have been determined to occur outside of the mapped upper wetlands boundary will be regulated under the Freshwater Wetlands Protection Act Rules. Authorization for those impacts will be sought from the NJDEP via a Freshwater Wetlands Permit. This authorization would be in addition to permits from the USACE.

NJ Historic Sites Council

NJ State Register of Historic Places Act (N.J.S.A. 13:1B-15.128 et seq)

The Monmouth County Bridge W-9 carrying Brielle Road over the Glimmer Glass (Structure #13000W9) (Glimmer Glass Bridge is a New Jersey Register-listed historic resource; therefore, the proposed replacement is subject to review and approval under the New Jersey Register of Historic Places Act. An Application for Project Authorization was submitted and the project received authorization, contingent upon implementation of mitigation measures developed to resolve adverse effects.

Federal Emergency Management Agency

FEMA No-Rise Certification or Conditional Letter of Map Revision 44 CFR 60.3 (d)(3)

Per the recently amended (January 20, 2026) FHACARs, a no-rise certification or Conditional Letter of Map Revision would be required from FEMA if the project is located within a FEMA delineated floodway, or flood hazard area where the work would, when combined with all other existing and anticipated development within the flood hazard area, result in a cumulative increase of greater than 0.20 feet in the 100-year flood elevation depicted on FEMA mapping. Neither a no-rise certification nor a Conditional Letter of Map Revision is expected to be required from FEMA, as the FEMA FIRM shows the project to be located only within a FEMA delineated flood hazard area (not FEMA-delineated floodway) and since, to comply with the FHACARs, proposed improvements cannot result in an increase in floodplain elevations.

Federal Highway Administration

National Environmental Policy Act (NEPA) Compliance (40 CFR 1508.9)

This NEPA Environmental Assessment (EA) is required in order to comply with the US National Environmental Policy Act by providing a detailed inventory, analysis and determination of existing environmental resources within the project limits and the proposed impacts, both positive and adverse, associated with the selected alternative.

Section 4(f) Programmatic Historic Bridge Evaluation (Section 4(f) of the Department of Transportation Act of 1966, 49 U.S.C. 303, and Section 18(a) of the Federal-Aid Highway Act of 1968 23 U.S.C. 138)

Required as part of the 1966 US Transportation Act, this law requires that any publicly owned parks, recreational property, wildlife and waterfowl refuge, or any public or private historical sites, structure or district a “use” will occur, is subject to a detailed environmental inventory, analysis and determination of existing environmental resources within the project limits and the proposed impacts, both positive and adverse, associated with the selected alternative. Impacts to Section 4(f) properties are authorized only if there are no other alternatives that would avoid or minimize the use of said property and that all measures to minimize the impacts from the selected alternatives have been incorporated into the design. Section 4(f) is being addressed due to Section 106 applicability.

Section 106 of the National Historic Preservation Act Compliance (54 U.S.C. 306108)

Compliance with Section 106 of the NHPA requires federal agencies to identify historic properties listed in or eligible for listing in the National Register of Historic Places (NRHP), assess the effects of the

undertaking on those properties, consult with appropriate parties, and resolve any adverse effects prior to a federal decision. Monmouth County Bridge W-9 carrying Brielle Road over the Glimmer Glass (Structure #13000W9) (Glimmer Glass Bridge) is listed on the NRHP, therefore, its replacement constitutes an adverse effect under Section 106. The Section 106 review process is ongoing and expected to be resolved through the execution of an MOA.

US Army Corps of Engineers (Philadelphia District)

Section 404 of the Clean Water Act (33 CFR Part 330) and Section 10 of the Rivers & Harbors Act (33 CFR Part 322)

The USACE has regulatory authority under Section 404 of the Clean Water Act for discharges of dredged or fill material into waters of the United States, including wetlands, and under Section 10 of the Rivers and Harbors Act for work in, over, under, or affecting navigable waters of the United States. Based on project activities, authorization from the USACE will be required under one or both authorities.

US Coast Guard

U.S. Coast Guard Bridge Permit (Section 9 of the Rivers and Harbors Act of 1899 [33 U.S.C. § 401], General Bridge Act of 1946 [33 U.S.C. § 525], and 33 CFR Part 115)

A U.S. Coast Guard bridge permit is required to replace an existing bridge over a navigable waterway of the United States. The permit is required to obtain Coast Guard approval of the bridge location, plans, and navigational clearances pursuant to applicable federal bridge permitting authorities and regulations. A preliminary navigation clearance determination (PNCD) was obtained through coordination with the Coast Guard.

7.0 PUBLIC COMMENTS AND COORDINATION

The County of Monmouth, the NJDOT, and the NJTPA are committed to developing transportation improvements that best balance transportation needs, the environment, community concerns, and cost. To achieve these goals, the project team has provided multiple opportunities for the community to learn and comment about the project.

Project Website

www.monmouthcountythreebridges.com

A project website was created to make information about the proposed project easily available to the general public, local officials, business owners, and other interested parties. The website is used to address many of the comments made through a Frequently Asked Questions section. Public Information Centers have been announced on the website. A virtual update/narrated video was made available on the project website in October 2024, and the website provided opportunity for input. Additional updates to the project website were made in November 2025 regarding the federal Section 106 process and in April 2026. The April 2026 update included a link to a County of Monmouth presentation, describing options for a publicly accessible, educational interpretive display of the Glimmer Glass Bridge.

Public Involvement Action Plan

A Public Involvement Action Plan (PIAP) was developed for the project and is presented in Appendix T of the *Alternatives Analysis Report* found in Appendix B, as well as independently in Appendix E of this EA. The PIAP will be updated throughout the duration of the project.

Public Involvement Meetings (Note: Meeting Summaries and Notes Available on Project Website: www.monmouthcountythreebridges.com)

Project Stakeholder Meeting #1 (Conducted by Monmouth County, Mott MacDonald and NV5) April 21, 2016

Manasquan Borough Hall

Meeting included project update and re-evaluation of several alternatives as well as stakeholder input on Project Purpose and Need.

Public Information Center (PIC) #1 (Conducted by Monmouth County, Mott MacDonald and NV5) May 24, 2016

Manasquan Borough Hall and Curtis House in Brielle Borough

A PIC was held to inform residents, officials, and the business community of the proposed Monmouth County Three Bridges Project: Green Avenue Bridge over Debbie's Creek (Bridge W-7), Fisk Avenue Culvert over Glimmer Glass (Structure W-8), and Monmouth County Bridge W-9 carrying Brielle Road over the Glimmer Glass (Structure #13000W9) (Glimmer Glass Bridge) in Brielle and Manasquan Boroughs. The PIC included two identical sessions (afternoon/evening) to accommodate differing schedules. Attendees were given an opportunity to review exhibits of the existing bridge, culvert, and road conditions, ask questions, and provide feedback to project team members. The community was encouraged to actively participate by providing input on the project's purpose and needs at the meeting, by mail or email. Comments were accepted through Thursday, June 23, 2016. Property owners with rental units were advised that tenants were welcome and encouraged to participate in this process. Notifications of the PIC were distributed through mail, email, locally posted flyers, local newspapers, and the project website.

Local Officials Meeting (Conducted by Monmouth County and Mott MacDonald)

November 10, 2016

Manasquan Borough Hall

This meeting was held in keeping with the public outreach process for the Monmouth County Three Bridges Project. This meeting was held to brief local officials of the potential alternatives considered for the project, which would be presented during PIC 2 (held December 15, 2016).

PIC #2 (Conducted by Monmouth County, Mott MacDonald and NV5)

November 29, 2016 (Curtis House in Brielle Borough) and December 15, 2016 (Manasquan Borough Hall)

A second PIC was held to continue informing residents, officials, and the business community about the Monmouth County Three Bridges Project. This PIC also consisted of two identical sessions (afternoon/evening). Attendees were given an opportunity to review exhibits of existing conditions and proposed alternatives, ask questions, and provide feedback to project team members. A brief presentation was conducted. Input was encouraged at the meeting, by mail or email. Comments were accepted through January 24, 2017. Notifications of the PIC were distributed through mail, email, locally posted flyers, local newspapers, and the project website.

Local Officials Briefing (Conducted by Monmouth County, Mott MacDonald and NV5)

January 16, 2018

Brielle Borough Hall

This meeting was held in keeping with the public outreach process for the Monmouth County Three Bridges Project. It was held to brief local officials on the project status in advance of the presentation of the Preliminary Preferred Alternatives at an upcoming PIC.

PIC #3 (Conducted by Monmouth County, Mott MacDonald and NV5)

February 15, 2018

Manasquan Borough Hall and Curtis House in Brielle Borough

A third PIC consisting of two identical sessions (afternoon/evening) was held to present the Preliminary Preferred Alternatives for each structure to the general public, local officials, and the business community. Attendees were given an opportunity to review exhibits of the recommended Preliminary Preferred Alternative for each structure, ask questions, and provide feedback. A brief presentation was conducted. Community members were encouraged to provide comments at the meeting, by mail or email. Comments were accepted until March 19, 2018. Notifications of the PIC were provided through mail, email, locally posted flyers, local newspapers, and the project website. Post-comment period stakeholder input was received through December 2020 and shared with the project team.

Committee to Save The Glimmer Glass Bridge Petition

2017 to 2020

It is noted that this stakeholder group submitted petition signatures from January 2017 to December 2020 and had claimed to receive 3,142 signatures. The petition stated desire to rehabilitate Bridge W-9 in its entirety.

Manasquan Beach Improvement Association (MBIA)

Throughout outreach process, this stakeholder group has expressed support for the improvements.

Project Update (Status update provided on project website)

October 2024

A project update, including a narrated PowerPoint presentation, was included on the Project's website to update the public, adjacent property owners, stakeholders, and community groups of the status and upcoming New Jersey Historic Sites Council Meeting.

New Jersey Historic Sites Council Meeting (Conducted by New Jersey Historic Sites Council)

December 19, 2024

Online via Microsoft Teams

In accordance with the New Jersey Register of Historic Places Act (N.J.A.C. 7:4), the NJDOT and Monmouth County appeared before the New Jersey Historic Sites Council. Stakeholders were able to provide or submit comments.

Project Update (Status update provided on project website)

November 2025

A project update was included on the Project's website with details regarding the recommendation for conditional approval from the New Jersey Historic Sites Council to the New Jersey Department of Environmental Protection Commissioner. The update included information regarding Monmouth County's acceptance of required mitigation measures and details of how measures will be implemented.

Project Update (Status update provided on project website)

April 2026

A project update was posted to the Project's website to share the presentation which was presented to the Borough of Manasquan by the County of Monmouth. The presentation included conceptual exhibits for the Interpretative Display and salvaging of existing Bridge W-9 components.

Marketing Plan for Monmouth County Bridge W-9 carrying Brielle Road over the Glimmer Glass (Structure #13000W9) (Glimmer Glass Bridge)

A marketing plan was developed, and the County reached out to over 800 potentially interested parties. Very few responses were received, and none expressed an interest in accepting the bridge. The marketing plan can be found in Appendix P of the *Alternatives Analysis Report* (Appendix B).

8.0 SECTION 4(F) EVALUATION

8.1 Proposed Action and Purpose and Need

The Monmouth County Three Bridges Project consists of the Green Avenue Bridge over Debbie's Creek (Bridge W-7), the Fisk Avenue Culvert over Glimmer Glass (Structure W-8), and Monmouth County Bridge W-9 carrying Brielle Road over the Glimmer Glass (Structure #13000W9) ("Glimmer Glass Bridge") in Monmouth County, NJ. The three roadways in the project area form a "T" intersection, with Fisk Avenue and Brielle Road comprising the flange of the "T" (east/west direction) and Green Avenue being the stem (north/south direction) and serve as the primary link for commercial, recreational, emergency response vehicles, as well as bicyclists and pedestrians, between the Boroughs of Manasquan and Brielle.

All three project structures are in poor condition, and both bridges have identified structural deficiencies, substandard features and have been deemed functionally obsolete due to insufficient curb-to-curb widths for the number of lanes and traffic volume. Due to these issues, the structures are posted for 3 tons gross weight, limiting use by large vehicles, including emergency response vehicles, and impeding use of the structures for their intended emergency purpose as a coastal evacuation route. The project is needed to establish full legal load capacities, address the structural deficiencies and substandard features, and improve accommodation for both vehicular and pedestrian traffic.

Monmouth County and the NJDOT have evaluated actions to address deficiencies associated with each structure. The replacement of all three structures is being proposed as a single project due to the proximity of the structures and their overlapping approach geometries. Replacement structures on the same alignment will incorporate wider roadways and improved roadway geometrics to accommodate both pedestrian and vehicular traffic, including both sidewalks and bicycle-compatible shoulders. Structures will be designed for full legal loads and improvements to approach roadways will better facilitate traffic operations and safety of the roadway and bridges, supporting long-term operational efficiency and improved mobility for both roadway users and maritime traffic.

The PPA for Bridge W-7 proposes replacement of the existing seven span timber bridge with a wider bridge that provides a 34 feet roadway and 6 feet sidewalk on the east side. The bridge would remain similar in length to the existing structure (approximately 120 feet).

The PPA for Structure W-8 proposes replacement of the existing reinforced concrete culvert with an equivalent size culvert with new headwalls and steel sheeting at each end. The roadway width would remain unchanged with re-striping performed to accommodate both vehicle and pedestrian traffic.

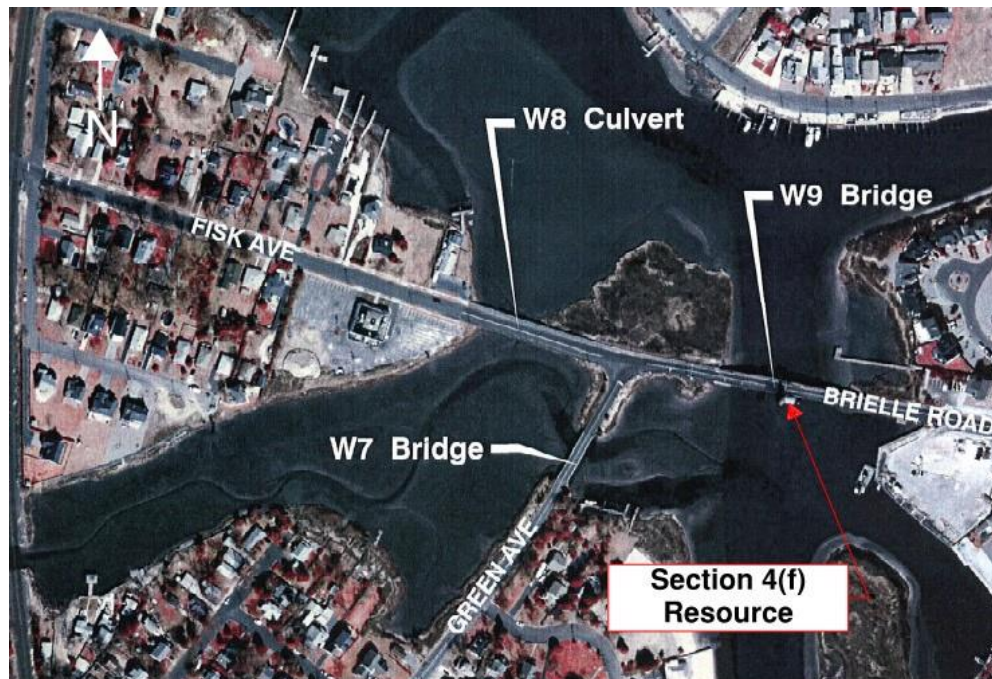
The PPA for Bridge W-9 proposes replacement of the existing structure with a wider bridge that maintains the general aesthetic and operational characteristics of the existing bridge. The wider structure is proposed to accommodate 12' travel lanes, an ADA compliant sidewalk, and bicycle compliant shoulders. The bridge would remain a movable bridge with a single-leaf bascule operated by a rolling counterweight. The structure would be designed and receive aesthetic treatments to mimic the existing structure to the extent practicable.

8.2 Description of Section 4(f) Properties

Section 4(f) properties are defined as any publicly owned or funded parkland, recreation area, or wildlife and waterfowl refuge of national, state, or local significance; any land from a historic site of national, state, or local significance and eligible for or listed on the National Register of Historic Places; and include other considerations for areas that do not cleanly fit into the above two categories but meet the same general criteria of being publicly funded and have a similar purpose (e.g., Wild and Scenic Rivers, school playgrounds). Monmouth County Bridge W-9 (Glimmer Glass Bridge), which is listed on the National

Register of Historic Places, is within the project area and meets the definition of a Section 4(f) resource.

Bridge W-9 was originally identified as a potentially eligible resource in the Monmouth County Historic Sites Inventory in 1990. In 1994, the structure was evaluated as an eligible resource in NJDOT's New Jersey Historic Bridge Survey. Following this, the project site, including all three structures, was evaluated by Cultural Resources Consulting Group between 1996 and 2004 for historic resources, including archaeological sites, which may be considered eligible for listing on the National Register of Historic Places and New Jersey Register of Historic Places. Observations, findings, and conclusions for the evaluation are included in the "Phase I and II Cultural Resources Investigation, Bridge W-7, Culvert W-8, and Bridge W-9, Manasquan and Brielle Boroughs, Monmouth County, New Jersey" (January 30, 2004), which is on file at the New Jersey Historic Preservation Office in Trenton, New Jersey. Bridge W-7 and Structure W-8 are not listed on, and have not been determined eligible for listing on, the National Register of Historic Places or New Jersey Register of Historic Places. Bridge W-9, colloquially called the Glimmer Glass Bridge, was again determined to be eligible for the National Register of Historic Places in 2004 and was officially listed on both the National and State Register in 2008. Therefore, the structure qualifies as a Section 4(f) resource in accordance with 49 U.S.C. § 303 and 23 U.S.C. § 138.



No significant prehistoric or historic archaeological sites were discovered during field surveys performed for this project. The analyses were reviewed with the State Historic Preservation Office (NJ SHPO), and SHPO concurred with these findings by letter dated July 15, 2004. A copy of the SHPO letter is provided in the TER (Appendix A). The figure above identifies Section 4(f) resources located within the project area.

Monmouth County Bridge W-9 carrying Brielle Road over the Glimmer Glass (Structure #13000W9) (Glimmer Glass Bridge)

Bridge W-9 is a single-leaf, cable lift bascule bridge with rolling counterweights and 16 timber trestle approach spans. Originally designed in 1922 as a temporary bridge to carry Route 4 (now NJ Route 88) over the Point Pleasant Canal, Bridge W-9 was inserted into the existing fixed timber trestle bridge at

Brielle Road and dedicated on August 13, 1938. Though numerous modifications have been made over time, including replacement of all the approach spans, the main bascule span of the bridge still retains its significance and integrity, as it still operates as originally constructed and retains the basic technologies first introduced in the 1890s. Photographs of the bridge are included in the TER (Appendix A).

Bridge W-9 received a SHPO Opinion of National Register eligibility on July 15, 2004. It was listed in the New Jersey Register of Historic Places on February 28, 2008, and was listed in the National Register on April 25, 2008. According to the National Register nomination, Bridge W-9 meets National Register Criterion C for its technological significance “as a bascule-type movable bridge which is a representative example of little-used technology first developed in the 1890s...as the only example of its type in New Jersey and exemplifies advances in movable bridge technology in the late 19th and early 20th centuries for the transportation of vehicles over navigable waterways” (Hickey 2010: 8-1). Bridge W-9 is not listed as a National Historic Landmark.

8.3 Impacts to Section 4(f) Properties

The proposed project involves the demolition and replacement of Bridge W-9. The replacement bridge would be a new movable bridge with similar appearance and mechanical operation as the existing structure. The bridge is individually eligible for listing on the National Register of Historic Places, and therefore, its demolition and replacement constitute a Section 4(f) use under the rules.

New Jersey Register of Historic Places Act (N.J.A.C. 7:4)

The proposed replacement of Bridge W-9 requires prior authorization under the New Jersey Register of Historic Places Act. NJ SHPO determined that the project would result in an encroachment on the bridge (HPO-I2024-255 PROD). The project was subsequently reviewed by the Historic Sites Council (HSC) at a public meeting held on December 19, 2024. The NJDOT and Monmouth County received conditional approval from the NJDEP in a letter dated January 21, 2025 (HPO-A2025-198-PROD). The conditions of approval require mitigation measures, including Level II Historic American Engineering Record (HAER) documentation, high-definition laser 3D scanning, development of an interpretive website, installation of an interpretive display, and salvage of select bridge components. These mitigation measures are currently underway.

Section 106 of the National Historic Preservation Act (36 CFR Part 800)

Pursuant to Section 106 of the National Historic Preservation Act, the NJDOT determined that the proposed replacement of Bridge W-9 would have an adverse effect on historic properties. NJ SHPO concurred with this determination in a letter dated July 15, 2004 (HPO-G2004-127). To resolve the adverse effects, an MOA has been drafted, which includes the following mitigation measures: Level II Historic American Engineering Record (HAER) documentation, high-definition laser 3D scanning, development of an interpretive website, installation of an interpretive display, and salvage of select bridge components. Implementation of these mitigation measures is currently underway.

8.4 Programmatic Section 4(f) Applicability

There are five (5) applicability criteria that must be met for use of a Nationwide Programmatic Section 4(f) Evaluation for Historic Bridges. These are listed below, along with how the proposed action applies:

1. **Criterion:** The bridge is to be replaced or rehabilitated with Federal funds.
Applicability: Monmouth County is utilizing federal funds to replace the historic bridge via NJDOT.
2. **Criterion:** The project will require the use of a historic bridge structure which is on or eligible for listing on the National Register of Historic Places.

Applicability: Monmouth County Bridge W-9 carrying Brielle Road over the Glimmer Glass (Structure #13000W9) (Glimmer Glass Bridge) is listed on the National Register of Historic Places under the name “Brielle Road Bridge over the Glimmer Glass” and is colloquially referred to as “Glimmer Glass Bridge.”

3. **Criterion:** The bridge is not a National Historic Landmark.

Applicability: Bridge W-9 is not listed as a National Historic Landmark.

4. **Criterion:** The FHWA Division Administrator determines that the facts of the project match those set forth in the sections of this document labeled Alternatives, Findings and Mitigation.

Applicability: The FHWA Division Administrator will review this Section 4(f) Evaluation, and it is anticipated that the FHWA will determine that the facts of the project match those set forth in sections of the document labeled Alternatives, Findings and Mitigation.

5. **Criterion:** Agreement among the FHWA, the State Historic Preservation Office, and the Advisory Council on Historic Preservation has been reached through procedures pursuant to Section 106 of the NHPA.

Applicability: FHWA has consulted with NJ SHPO and the Advisory Council on Historic Preservation to resolve adverse effects of the proposed project. A draft MOA has been developed and circulated for review and comment. The draft MOA is required to be published with the EA and will be finalized in the Final EA.

8.5 Alternatives Considered/Alternatives Impact Matrix

Twelve (12) alternatives/sub-alternatives were investigated for addressing deficiencies on the bridge and at the site while trying to meet the project’s purpose and need and are listed below. The detailed evaluation of each alternative is included in the *Alternative Analysis Report* (Mott MacDonald, 2022) included in Appendix B. The information and analyses included therein were used as the basis of the alternatives analysis conducted as part of this Programmatic 4(f) evaluation. While certain project details have been refined, including cost estimates and preliminary disturbance totals, since completion of the 2022 analysis, these changes are not considered to be substantial or to alter the findings of the alternative evaluation or determination that no feasible and prudent alternative exists.

- Alternative 1: No-Build (Do Nothing)
- Alternative 2A: Rehabilitation of Existing Bridge
- Alternative 2B: Modified Rehabilitation of Existing Bridge
- Alternative 2C: Rehabilitation of Moveable Span and Replacement of the Approach Spans
- Alternative 3A: Retain Existing Bridge (close to vehicular traffic) and build new bridge on a parallel alignment- High Level Fixed Bridge.
- Alternative 3B: Retain Existing Bridge (close to vehicular traffic) and Build New Bridge on a Parallel Alignment- Moveable Bridge
- Alternative 3C: Retain Existing Bridge (Convert to One-Way Traffic) and Build New Bridge on a Parallel Alignment- Moveable Bridge
- Alternative 3D: Rehabilitate Existing Bridge and Build New Pedestrian/Bicyclist Bridge on a Parallel Alignment-Moveable Bridge
- Alternative 4A: Build New Bridge on Current Alignment- High Level Fixed Bridge
- Alternative 4B: Build New Bridge on Current Alignment- Moveable Bridge-Vertical Lift
- Alternative 4C: Build New Bridge on Current Alignment-Moveable Bridge, Trunion Bascule
- Alternative 4D: Build New Bridge on Current Alignment- Moveable Bridge, Rolling Counterweight (Preliminary Preferred Alternative)

8.6 Alternatives Analysis

Avoidance Alternatives

Alternatives that avoided use of the Section 4(f) resource were evaluated and include Alternatives 1, 2A, 3A, 3B, 3C, and 3D. These alternatives were evaluated to determine if they met the feasible and prudent avoidance alternative definition in 23 CFR 774.17.

Alternative 1 (No Build Alternative)

The No-Build alternative would avoid “use” of the Section 4(f) resource. Under this scenario, no significant improvements to the structure would be made, other than long-term, routine maintenance to extend the useful life of the bridge. Routine maintenance would maintain the contributing historic characteristics of the structure, avoiding Section 4(f) use, as defined in 23 CFR § 774.17. There would be no improvement in the overall condition of the bridge, the substandard roadway configuration, or overall safety of the bridge by selecting this alternative.

As a historic resource, future preservation options would narrow. Deterioration of the features of historic importance would continue, even with periodic maintenance, due to serious structural deficiencies. This alternative was not selected, as the combination of several undesirable elements (structural deficiency, substandard geometry, safety inadequacy, hindrance to navigation) would remain, presenting an unsafe and undesirable condition. Ultimately, Alternative 1 (no-build) does not meet the project purpose and is not recommended. Under this alternative, the bridge would continue to deteriorate with increasing maintenance costs until such time that full closure is required for public safety. Recent emergency closures in 2014-2015 and 2018, as well as the severe load restriction, are indicative of the consequences of this approach. Consequently, the No-Build alternative was determined to not be feasible or prudent under 23 CFR 774.17 due to unacceptable safety and operational problems and was rejected from further consideration.

Alternative 2A

Alternative 2A would include rehabilitation of the existing bascule and approach spans with the intention of meeting the SOI Standards for Treatment. Two variations of rehabilitation, one in-kind and the second employing more durable materials designed or treated to mimic existing components, were evaluated. Replacement in-kind would require use of like-materials at the same proportions, and even with higher strength steel, would limit the capacity of the girders to less than 40 tons for full legal loads and would not improve the identified substandard design elements. Replacement with more durable materials would increase the structural capacity; however, it would still not address the substandard design elements. As safety and operation issues would persist under both variations, this alternative is determined to be not feasible or prudent under 23 CFR 774.17.

Alternative 3A

Alternative 3A would rehabilitate the existing bridge and convert it to pedestrian-only traffic, while constructing a new parallel bridge to support vehicle traffic. The new bridge would be a high-level fixed span bridge tall enough to permit marine traffic to pass beneath and would meet the project purpose and need. To accommodate the necessary marine clearances, the tie-in points would need to extend 1,000 feet in each direction. This would result in significant impacts to over 30 properties, including full parcel acquisition and the potential for eliminating property access points. The parallel alignment would require significant environmental impacts, including approximately 19,200 square feet of direct wetland disturbance. Parallel service roads would also be required, resulting in further parcel acquisition and environmental impacts. Consequently, based on failure to fulfill the purpose and need, severe disruption

to the local community and impacts to environmental resources, this alternative is determined to be not prudent under 23 CFR 774.17.

Alternative 3B

Alternative 3B would construct a new parallel movable bridge, while rehabilitating and retaining the existing bridge for pedestrian-only traffic. The new bridge would carry a wider roadway and require tie-in points that extend beyond the existing bridge limits. This would result in significant environmental impacts, including approximately 19,200 square feet of direct wetland disturbance and the acquisition of five additional parcels. Furthermore, because this alternative requires both the rehabilitation of the existing structure and the complete construction of a new bridge, the initial construction cost is estimated to exceed \$25.0 million. Due to these severe environmental impacts, property acquisitions, and a construction cost of an extraordinary magnitude compared to the PPA, Alternative 3B is determined to be not prudent under 23 CFR 774.17.

Alternative 3C

Alternative 3C would rehabilitate and convert the existing bridge to accommodate one-way traffic in the eastbound direction, while constructing a new parallel movable bridge to support westbound traffic. This would result in significant environmental impacts, including approximately 12,000 square feet of direct wetland disturbance for construction of the parallel bridge, and the acquisition of five additional parcels. Additionally, rehabilitation would result in similar challenges to Alternative 2A, in that the structural capacity and vertical clearance would not be fully addressed. Therefore, the project purpose and only some of the project need would be met. Furthermore, as this alternative would both construct a new bridge and rehabilitate the existing bridge to support vehicle traffic, the initial construction cost is estimated to exceed \$25.0 million. Consequently, due to the severe environmental impacts, property acquisitions, and a construction cost of extraordinary magnitude compared to the PPA, Alternative 3C is determined to be not prudent under 23 CFR 774.17.

Alternative 3D

Alternative 3D would rehabilitate the existing bridge and construct a new parallel movable bridge for pedestrian-only traffic. Similar to statements made under Alternatives 2A, while rehabilitation of the structure would avoid the use of the Section 4(f) resource, it fails to meet the project purpose and need, as the improvements would not permit the bridge to carry full legal loading and would include no substantial improvements to the geometry. Furthermore, the construction of a parallel bridge would result in significant environmental impacts, including approximately 6,000 square feet of direct wetland disturbance. Additionally, as this alternative would both construct a new bridge and rehabilitate the existing bridge to support vehicle traffic, the initial construction cost is estimated to exceed \$25.0 million. Due to the severe environmental impacts and a construction cost of an extraordinary magnitude compared to the PPA, Alternative 3B is determined to be not feasible or prudent under 23 CFR 774.17.

Programmatic Build Alternatives Comparison

Alternative 2B (Rehabilitation, Full Load)

Alternative 2B consists of rehabilitating the bridge by replacing the bascule span superstructure and timber approach spans with wider structures to address the substandard geometry. The initial cost (\$17.4 million) is comparable to that of the PPA (\$17.3 million). However, salvage and reuse of select components would require additional maintenance costs, resulting in a lifecycle cost of \$35.9 million, which is \$2.5 million more expensive than the PPA. The replacement or modification of key historic components (the bascule span and counterweight assembly) would not comply with the SOI Standards for Treatment and

therefore would remain a use of the Section 4(f) resource, reducing Alternative 2B's capacity to minimize harm under 23 CFR 774.3(d).

Alternative 2C (Rehabilitation, Low-Load)

Alternative 2C would rehabilitate and retain the bascule and adjacent spans while replacing the timber approach spans with a wider structure with more durable materials. Materials used in the approach spans would be designed or treated to mimic the existing bridge character to mitigate adverse impacts to the extent practicable. The initial construction cost is \$16.7 million, \$0.6 million less than the PPA; however, total lifecycle costs are \$35.4 million. This is \$2.0 million more than the PPA due to increased maintenance costs associated with maintaining some of the historic components. By maintaining the historic components, the bridge would remain posted due to low-load capacity of the rehabilitated bascule, remain classified as functionally obsolete, and provide a service life of only 20-30 years. Therefore, Alternative 2C would not fully meet the project purpose and need.

Alternative 4A (High-Level Fixed)

Alternative 4A would replace Glimmer Glass Bridge with a high-level fixed span requiring a 50-to-60-foot vertical maritime clearance. To achieve this, the roadway profile must rise steeply, extending the project limits 1,000 feet in both directions. This would result in at least 30 residential and commercial parcel acquisitions, severe community disruption, and potential elimination of local street connectivity to Green Avenue. Further, the construction cost is estimated at over \$25.0 million. Because of these extraordinary community impacts and a construction cost of extraordinary magnitude compared to the preferred alternative, Alternative 4A is determined to have a reduced capacity to minimize harm under 23 CFR 774.3(d).

Alternative 4B (Vertical Lift)

Alternative 4B would replace Glimmer Glass Bridge with a vertical lift span bridge on the same alignment. The new bridge would incorporate wider roadway widths and improved horizontal geometrics to better support vehicle and pedestrian traffic. This alternative would utilize a similar mechanism as the existing bridge to lift the span vertically for vessel traffic (e.g., counterweights) but would still require a 50-to-60-foot vertical clearance. While Alternative 4B has environmental impacts similar to the PPA (approximately 1,950 square feet of wetland disturbance and no right-of-way acquisitions), its initial construction cost is estimated at \$22.1 million (with a total lifecycle cost of \$40.6 million). This is \$4 million more expensive than the PPA. Additionally, the vertical lift towers introduce a modern structural aesthetic that is visually incompatible with the Glimmer Glass environment and fails to replicate the historic cable-operated bascule operating system, reducing its capacity to minimize harm under 23 CFR 774.3(d).

Alternative 4C (Trunnion Bascule)

Alternative 4C would replace Glimmer Glass Bridge with a trunnion bascule bridge on the same alignment. This alternative meets the project purpose and need, but has an estimated initial cost of \$18.6 million (with a total lifecycle cost of \$35.5 million), which is \$1.3 million more expensive than the PPA. While it utilizes a single-leaf bascule, its internal trunnion counterweight design differs from the Glimmer Glass Bridge's iconic overhead cable-operated rolling counterweight system. By failing to replicate Glimmer Glass's unique 19th-century mechanical operations, Alternative 4C provides less historical mitigation value and has a reduced capacity to minimize harm when compared to the PPA under 23 CFR 774.3(d).

Alternative 4D (PPA – Rolling Counterweight)

Alternative 4D would replace Glimmer Glass Bridge with a new, wider movable bridge on the same alignment. The bridge would have a similar appearance and mechanical operation as the existing bridge, including a movable cable-operated rolling counterweight, single-leaf bascule. The new tower trusses

would be taller and wider than those on the existing structure with larger/heavier counterweights, likely constructed of steel, and would remain similar in profile and receive a surface treatment to mimic existing aesthetics. Architectural treatments could be utilized on other components to maintain a similar timber trestle appearance. The bascule would not impede maritime traffic when open. Overall, while adverse impacts to the Section 4(f) resource cannot be avoided by this alternative, this alternative fulfills the project purpose and need and maintains similar characteristics to the historic aesthetics and mechanical functions the existing bridge.

Alternative 4D represents the Preliminary Preferred Alternative (PPA). While it results in an adverse effect through physical bridge replacement, it incorporates all possible planning to minimize harm to the historic resource while fulfilling the project purpose and need, as it is designed to replicate the exact historic, cable-operated rolling counterweight bascule system. Furthermore, at an estimated initial construction cost of \$17.3 million, and total lifecycle cost of \$33.4 million, it is the overall most cost-effective build option, requiring no right-of-way acquisitions and matching the minimal environmental footprint of the other build alternatives. A detailed comparative matrix of the build options is provided in Section 8.6.1.

See Table 15 below for a comparison on how Alternative 4D (PPA) compares to the other build alternatives with respect to key engineering and environmental criteria as part of the Programmatic Section 4(f) Evaluation and Figure 19 for the Alternatives Matrix from the *Alternatives Analysis Report* included in Appendix B.

Table 15. Programmatic Build Alternatives & Minimization Comparison Matrix

Evaluation Criteria	Alt 2B (Rehabilitation, Full Legal Load)	Alt 2C (Rehabilitation, Low-Load)	Alt 4A (High-Level Fixed)	Alt 4B (Vertical Lift)	Alt 4C (Trunnion Bascule)	Alt 4D (PPA) (Rolling CW)	Minimization Selection & Rationale
Ability to Mitigate Adverse Historic Effects	Replacement or modification with larger components may impact visual compatibility.	Would rehabilitate and retain key historic components (bascule and adjacent span) while replaced approach spans would be treated to mimic existing historic character.	Eliminates context-sensitive bascule and rolling counterweight system to construct fixed span bridge.	Tower structures are visually incompatible; cannot replicate bascule system.	Replicates bascule, but counterweights are internal and non-cable operated.	Replicates historic cable-operated bascule with rolling counterweight.	Alternative 2C: Least severe impact because it maintains key historic components of bridge.
Relative Severity of Remaining Historic Harm	Moderate impact: replacement or modification of bascule and/or counterweight assembly.	Minimal impact: retains historic components and architectural treatments preserve historic character.	High impact: permanently alters visual and functional integrity.	High impact: permanently alters visual and functional integrity.	Moderate impact: alters mechanical counterweight configuration.	Minimal impact: preserves context-sensitive mechanical design and historic character.	Alternative 2C and 4D: Least severe impact by preserving context-sensitive design features and character.
Relative Significance of Historic Property	Glimmer Glass (W-9) is individually NRHP-eligible and highly significant.	Same (W-9).	Same (W-9).	Same (W-9).	Same (W-9).	Same (W-9).	Equal: All six build options use the same historic property.
Views of Officials with Jurisdiction (NJHPO)	NJHPO & local historic groups do not favor replacement or modification of key historic components.	NJHPO & local historic groups support preservation of key historic aspects.	NJHPO & local historic groups oppose elimination of context-sensitive mechanical design.	NJHPO & local historic groups do not favor the visual tower intrusion.	NJHPO prefers replication of rolling counterweight.	NJHPO & NJ Historic Sites Council fully support Alternative 4D design.	Alternative 4D: Aligns with the consensus of NJHPO and consulting parties.
Meeting Project Purpose & Need	Yes: However, reuse of components raises maintenance costs and limits structure lifespan.	No: Low-load capacity and substandard deck geometry to remain; bridge still functionally obsolete.	No: Achieves all safety goals but risks severe community and connectivity impacts.	Yes: Achieves full load capacity, wider lanes, and pedestrian safety.	Yes: Achieves all safety and operational goals.	Yes: Achieves all safety and operational goals.	Comparable: Four build options satisfy the purpose and need. Alternatives 2C and 4A do not.
Impacts to Non-Section 4(f) Resources	Moderate: Impacts ~1,950 SF of wetlands; no ROW acquisitions required.	Moderate: Impacts ~1,950 SF of wetlands; no ROW acquisitions required.	High: ROW acquisitions (>30 parcels) with possible loss of access to additional properties	Moderate: Impacts ~1,950 SF of wetlands; no ROW acquisitions required.	Moderate: Impacts ~1,950 SF of wetlands; no ROW acquisitions required.	Moderate: Impacts ~1,950 SF of wetlands; no ROW acquisitions required.	Comparable: Five build options with identical footprints; 4A requires greater ROW acquisition.
Construction & Lifecycle Costs	Initial: \$17.4M Lifecycle: \$35.9M (+2.5M over PPA).	Initial: \$16.7M Lifecycle: \$35.4M (+2.0M over PPA).	Initial: >\$25.0M	Initial: \$22.1M Lifecycle: \$40.6M (+7.2M over PPA).	Initial: \$18.6M Lifecycle: \$35.5M (+2.1M over PPA).	Initial: \$17.3M Lifecycle: \$33.4M (Baseline PPA).	Alternative 4D: Represents the most cost-effective build alternative.

Figure 19. Bridge W-9 (Brielle Road over The Glimmer Glass) Alternatives Matrix

Alternative - Variation Number	Description	Meets Project Purpose?	Achieves Project Needs?				Achieves Project Goals and Objectives										Key Advantages	Key Disadvantages
			Bridge Needs	Roadway Needs	System Linkage	Pedestrian and Bicyclist Compatibility	Sidewalk Connectivity	Safety Improvements	Long-Term Maintenance	Cultural Resources Impacts	Environmental Impacts	Permits Required ¹	ROW Impacts	Estimated Costs ²	Estimated Construction Duration	Traffic Impacts and Detours		
1	No Build	No	Structural Capacity: No Bridge Roadway Width: No Vertical Clearance: No	No	No	No	No	Not Improved	Very High	No	None at first, but additional noise and vehicle emissions on local roads after bridge closure	None	No ROW acquisitions required	Yearly Maintenance Cost: ³ \$135K (10-15 years)	Not Applicable	None at first, but bridge may eventually be closed and require permanent detour.	• No impacts on historic resource • No construction impacts	• Does not address any project needs • Potential for rising maintenance costs and eventual closure
2A-1	Restoration	No	Structural Capacity: Partial ⁴ Bridge Roadway Width: No Vertical Clearance: No	No	Partial ⁵	No	Partial ⁶	Partial: New bridge railings and guide rails and bascule span safety features.	High	Yes	Minimal: no wetlands would be impacted	USACE (NWP 3 & 15), USCG (Bridge Permit), NJDEP (CAFRA, WFD, Coastal Wetlands, GP 23, & Tidelands), Soil Erosion and Sediment Control Plan	No ROW acquisitions required	Initial: \$12.6M (20-30 years) Life Cycle: \$38.2M	18-20 months	Moderate: Full closure required, but shorter duration than full replacement options.	• Limited impacts on historic resource • Construction impacts are minimized • Nominal safety improvements	• Live load capacity and bridge geometry still substandard • High cost relative to life cycle gains with continued high maintenance • No improvements to bicycle/pedestrian compatibility
2A-2	Rehabilitation without Widening	No	Structural Capacity: Yes Bridge Roadway Width: No Vertical Clearance: No	No	Partial ⁵	No	Partial ⁶	Partial: New bridge railings and guide rails and bascule span safety features.	High	Yes	Minimal: no wetlands would be impacted	USACE (NWP 3 & 15), USCG (Bridge Permit), NJDEP (CAFRA, WFD, Coastal Wetlands, GP 23, & Tidelands), Soil Erosion and Sediment Control Plan	No ROW acquisitions required	Initial: \$14.3M (40-50 years) Life Cycle: \$32.2M	18-20 months	Moderate: Full closure required, but shorter duration than full replacement options.	• Historic resource partially maintained • Structural capacity improved • Nominal safety improvements	• Bridge geometry still substandard • High cost relative to life cycle gains • No improvements to bicycle/pedestrian compatibility
2B	Modified Rehabilitation	Yes	Structural Capacity: Yes Bridge Roadway Width: Yes Vertical Clearance: Yes	Yes	Yes	Yes	Yes	Partial: New bridge railings and guide rails and bascule span safety features.	High	Yes	Moderate: around 1950 SF ± of wetlands would be impacted	USACE (NWP 6, 14, & 15), USCG (Bridge Permit), NJDEP (CAFRA, WFD, Coastal Wetlands, GP 23, & Tidelands), Soil Erosion and Sediment Control Plan	No ROW acquisitions required	Initial: \$17.4M (40-50 years) Life Cycle: \$35.9M	18-20 months	High: Full closure required of similar duration to full replacement options.	• Limited components of historic resource reused as compared to replacement options • Structural capacity and geometry improved	• High cost relative to life cycle gains

¹ Legend: United States Army Corp of Engineers (USACE), Nationwide Permit (NWP), General Permit (GP), Individual Permit (IP) New Jersey Department of Environmental Protection (NJDEP), Coastal Area Facility Review Act (CAFRA), Waterfront Development (WFD), Right of Way (ROW), Square Feet (SF)

² Life cycle costs assume a common 100-year period. All future costs are converted to present value dollars. Life cycle costs include initial costs as well as anticipated major replacement/maintenance costs and operating costs within the noted 100-year period.

³ Yearly maintenance costs are averaged and fluctuate by year. They do not include normal operating costs.

⁴ Nominal improvements are possible, but full legal capacity would not be provided.

⁵ Bridge would remain operational in this alternative, but at current level of service and would not adequately service all users.

⁶ No improvements to sidewalk width, but sidewalk ramps and pedestrian crossings would be provided.

Bridge W-9 (Brielle Road over The Glimmer Glass) Alternatives Matrix (Continued)

Alternative - Variation Number	Description	Meets Project Purpose?	Achieves Project Needs?				Achieves Project Goals and Objectives										Key Advantages	Key Disadvantages
			Bridge Needs	Roadway Needs	System Linkage	Pedestrian and Bicyclist Compatibility	Sidewalk Connectivity	Safety Improvements	Long-Term Maintenance	Cultural Resources Impacts	Environmental Impacts	Permits Required ¹	ROW Impacts	Estimated Costs ²	Estimated Construction Duration	Traffic Impacts and Detours		
2C	Rehabilitation of Movable Span and Replacement of the Approach Spans	No	Structural Capacity: Partial ⁷ Bridge Roadway Width: Partial Vertical Clearance: No	No	Partial ⁸	No	Partial ⁹	Partial: New bridge railings and guide rails and bascule span safety features.	Moderate	Yes	Moderate: around 1950 SF ± of wetlands would be impacted	USACE (NWP 6, 14, & 15), USCG (Bridge Permit), NJDEP (CAFRA, WFD, Coastal Wetlands, GP 23, & Tidelands), Soil Erosion and Sediment Control Plan	No ROW acquisitions required	Initial: \$16.7M (20-30 years) Life Cycle: \$35.4M	18-20 months	High: Full closure required for extended period	- Limited impacts on key aspects of historic resource - Approach roadway geometry improved - Reduces long term maintenance	- Live load capacity and bridge geometry still substandard due to bascule span - Minimal improvements to bicycle/pedestrian compatibility
3A	Retain Existing Bridge (Close to Vehicular Traffic) and Build New Bridge on a Parallel Alignment - High Level Fixed Span Bridge	No	Structural Capacity: Yes Bridge Roadway Width: Yes Vertical Clearance: Yes	Yes	No	Yes	No	Substantial: New bridge railings and guide rails and bascule span safety features, improved geometry	Moderate	Yes	Significant environmental impacts from new road/bridge on new alignment, including impacts to wetlands and green acres land.	USACE (IP), USCG (Bridge Permit), NJDEP (CAFRA, WFD, Coastal Wetlands, GP 23, & Tidelands), Soil Erosion and Sediment Control Plan	Significant additional ROW (>30 parcels) with possible loss of access to additional properties & Riparian Grant / License	>\$25M Detailed costs not prepared for this alternative.	28-30 months	Moderate: Parallel construction would minimize required closures	- Historic resource fully maintained (changed use) - New bridge with standard structural capacity and geometry - Eliminates bridge opening delays - Improved bicycle and pedestrian compatibility	- Very high initial cost - Excessive environmental and property/ROW impacts - Creates access issues for several properties - Requires future maintenance of 2 bridges
3B	Retain Existing Bridge (Close to Vehicular Traffic) and Build New Bridge on a Parallel Alignment - Movable Bridge	Yes	Structural Capacity: Yes Bridge Roadway Width: Yes Vertical Clearance: Yes	Yes	Yes	Yes	Yes	Substantial: New bridge railings and guide rails and bascule span safety features, improved geometry	High	Yes	Significant environmental impacts from new road/bridge on new alignment, including impacts to wetlands and green acres land.	USACE (IP), USCG (Bridge Permit), NJDEP (CAFRA, WFD, Coastal Wetlands, GP 23, & Tidelands), Soil Erosion and Sediment Control Plan	Significant additional ROW (≈5 parcels) & Riparian Grant / License	>\$25M Detailed costs not prepared for this alternative.	22-24 months	Low: Parallel construction would minimize required closures	- Historic resource fully maintained (changed use) - New bridge with standard structural capacity and geometry - Improved bicycle and pedestrian compatibility	- Very high initial cost - Excessive environmental and property/ROW impacts - Requires future maintenance of 2 movable bridges

¹ Legend: United States Army Corp of Engineers (USACE), Nationwide Permit (NWP), General Permit (GP), Individual Permit (IP) New Jersey Department of Environmental Protection (NJDEP), Coastal Area Facility Review Act (CAFRA), Waterfront Development (WFD), Right of Way (ROW), Square Feet (SF)

² Life cycle costs assume a common 100-year period. All future costs are converted to present value dollars. Life cycle costs include initial costs as well as anticipated major replacement/maintenance costs and operating costs within the noted 100-year period.

⁷ Capacity of bridge would be limited by movable span, where full legal capacity would not be provided.

⁸ Bridge would remain operational in this alternative, but at current level of service and would not adequately service all users.

⁹ Improvements to sidewalk width limited to approach spans, but sidewalk ramps and pedestrian crossings would be provided.

Bridge W-9 (Brielle Road over The Glimmer Glass) Alternatives Matrix (Continued)

Alternative - Variation Number	Description	Meets Project Purpose?	Achieves Project Needs?				Achieves Project Goals and Objectives										Key Advantages	Key Disadvantages
			Bridge Needs	Roadway Needs	System Linkage	Pedestrian and Bicyclist Compatibility	Sidewalk Connectivity	Safety Improvements	Long-Term Maintenance	Cultural Resources Impacts	Environmental Impacts	Permits Required ¹	ROW Impacts	Estimated Costs ²	Estimated Construction Duration	Traffic Impacts and Detours		
3C	Retain Existing Bridge (Convert to One-Way Traffic) and Build New Bridge on a Parallel Alignment – Movable Bridge	No	Structural Capacity: Partial ¹⁰ Bridge Roadway Width: Yes Vertical Clearance: Partial ¹¹	Yes	Partial ¹²	Yes	Yes	Substantial: New bridge railings and guide rails and bascule span safety features, improved geometry	High	Yes	Significant environmental impacts from new road/bridge on new alignment, including impacts to wetlands and green acres land.	USACE (IP), USCG (Bridge Permit), NJDEP (CAFRA, WFD, Coastal Wetlands, GP 23, & Tidelands), Soil Erosion and Sediment Control Plan	Significant additional ROW (≈5 parcels) & Riparian Grant / License	>\$25M Detailed costs not prepared for this alternative	22-24 months	Moderate: Parallel construction would minimize required closures	• Historic resource fully maintained (maintained use) • New bridge with standard structural capacity and geometry • Improved bicycle and pedestrian compatibility	• Very high initial cost • Excessive environmental and property/ROW impacts • Vertical clearance and structural capacity not improved on existing bridge • Requires future maintenance of 2 movable bridges
3D	Rehabilitate Existing Bridge and Build New Pedestrian/ Bicyclist Bridge on a Parallel Alignment – Movable Bridge	No	Structural Capacity: Partial ¹³ Bridge Roadway Width: No Vertical Clearance: No	No	Yes	Yes	Yes	Partial: New bridge railings and guide rails, but limited changes to geometry	High	Yes	Significant environmental impacts from new road/bridge on new alignment, including impacts to wetlands and green acres land.	USACE (IP), USCG (Bridge Permit), NJDEP (CAFRA, WFD, Coastal Wetlands, GP 23, & Tidelands), Soil Erosion and Sediment Control Plan	Significant additional ROW (≈5 parcels) & Riparian Grant / License	>\$25M Detailed costs not prepared for this alternative	16-18 months	High: Similar to Alternative 2B	• Historic resource fully maintained (maintained use) • Pedestrians and bicyclists accommodated in new separate bridge	• High initial cost • High environmental and property/ROW impacts • Substandard geometry and structural capacity of existing bridge is not fully addressed • Requires future maintenance of 2 movable bridges
4A	Build New Bridge on Current Alignment - High Level Fixed Span Bridge	No	Structural Capacity: Yes Bridge Roadway Width: Yes Vertical Clearance: Yes	Yes	No	Yes	Yes	Substantial: New bridge railings and guide rails and bascule span safety features, improved geometry	Low	Yes	Moderate	USACE (IP), USCG (Bridge Permit), NJDEP (CAFRA, WFD, Coastal Wetlands, GP 23, & Tidelands), Soil Erosion and Sediment Control Plan	Significant additional ROW (>30 parcels) with possible loss of access to additional properties	>\$25M (75+ years) Detailed costs not prepared for this alternative	22-24 months	Very High: Full closure required for extended period	• New bridge with standard structural capacity and geometry • Minimized maintenance and operation costs • Improved bicycle and pedestrian compatibility	• Significant effects to historic resource • Creates access issues for several properties • Moderate environmental impacts
4B	Build New Bridge on Current Alignment - Movable Bridge, Vertical Lift	Yes	Structural Capacity: Yes Bridge Roadway Width: Yes Vertical Clearance: Yes	Yes	Yes	Yes	Yes	Substantial: New bridge railings and guide rails and bascule span safety features, improved geometry	Moderate	Yes	Moderate: Around 1950 SF ± of wetlands would be impacted	USACE (NWP 6, 14, & 15), USCG (Bridge Permit), NJDEP (CAFRA, WFD, Coastal Wetlands, GP 23, & Tidelands), Soil Erosion and Sediment Control Plan	No ROW acquisitions required	Initial: \$22.1M (75+ years) Life Cycle: \$40.6M	18-20 months	High: Full closure required for extended period	• New bridge with standard structural capacity and geometry • Improved bicycle and pedestrian compatibility	• Significant effects to historic resource • Not as cost effective as Alternative 4D • Structure would be visually out of context • Moderate environmental impacts

¹ Legend: United States Army Corp of Engineers (USACE), Nationwide Permit (NWP), General Permit (GP), Individual Permit (IP) New Jersey Department of Environmental Protection (NJDEP), Coastal Area Facility Review Act (CAFRA), Waterfront Development (WFD), Right of Way (ROW), Square Feet (SF)

² Life cycle costs assume a common 100-year period. All future costs are converted to present value dollars. Life cycle costs include initial costs as well as anticipated major replacement/maintenance costs and operating costs within the noted 100-year period.

¹⁰ Full legal capacity would be provided on new parallel bridge, but not on existing bridge.

¹¹ Adequate clearance would be provided on new parallel bridge, but not on existing bridge.

¹² Existing bridge would remain operational in this alternative, but at current level of service and would not adequately service all users.

¹³ Nominal improvements to the existing bridge are possible, but full legal capacity would not be provided.

Bridge W-9 (Brielle Road over The Glimmer Glass) Alternatives Matrix (Continued)

Alternative - Variation Number	Description	Meets Project Purpose?	Achieves Project Needs?				Achieves Project Goals and Objectives										Key Advantages	Key Disadvantages
			Bridge Needs	Roadway Needs	System Linkage	Pedestrian and Bicyclist Compatibility	Sidewalk Connectivity	Safety Improvements	Long-Term Maintenance	Cultural Resources Impacts	Environmental Impacts	Permits Required ¹	ROW Impacts	Estimated Costs ²	Estimated Construction Duration	Traffic Impacts and Detours		
4C	Build New Bridge on Current Alignment - Movable Bridge, Trunnion Bascule	Yes	Structural Capacity: Yes Bridge Roadway Width: Yes Vertical Clearance: Yes	Yes	Yes	Yes	Yes	Substantial: New bridge railings and guide rails and bascule span safety features, improved geometry	Moderate	Yes	Moderate: Around 1950 SF ± of wetlands would be impacted	USACE (NWP 6, 14, & 15), USCG (Bridge Permit), NJDEP (CAFRA, WFD, Coastal Wetlands, GP 23, & Tidelands), Soil Erosion and Sediment Control Plan	No ROW acquisitions required	Initial: \$18.6M (75+ years) Life Cycle: \$35.5M	18-20 months	High: Full closure required for extended period	• New bridge with standard structural capacity and geometry • Improved bicycle and pedestrian compatibility	• Significant effects to historic resource • Not as cost effective as Alternative 4D • Moderate environmental impacts
4D	Build New Bridge on Current Alignment - Movable Bridge, Rolling Counterweight	Yes	Structural Capacity: Yes Bridge Roadway Width: Yes Vertical Clearance: Yes	Yes	Yes	Yes	Yes	Substantial: New bridge railings and guide rails and bascule span safety features, improved geometry	Moderate	Yes	Moderate: Around 1950 SF ± of wetlands would be impacted	USACE (NWP 6, 14, & 15), USCG (Bridge Permit), NJDEP (CAFRA, WFD, Coastal Wetlands, GP 23, & Tidelands), Soil Erosion and Sediment Control Plan	No ROW acquisitions required	Initial: \$17.3M (75+ years) Life Cycle: \$33.4M	16-18 months	High: Full closure required for extended period	• New bridge with standard structural capacity and geometry • Improved bicycle and pedestrian compatibility • Existing bridge aesthetics and general method of mechanical operation replicated	• Significant effects to historic resource • Operation not as efficient as Alternatives 4B and 4C • Moderate environmental impacts

¹ Legend: United States Army Corp of Engineers (USACE), Nationwide Permit (NWP), General Permit (GP), Individual Permit (IP) New Jersey Department of Environmental Protection (NJDEP), Coastal Area Facility Review Act (CAFRA), Waterfront Development (WFD), Right of Way (ROW), Square Feet (SF)

² Life cycle costs assume a common 100-year period. All future costs are converted to present value dollars. Life cycle costs include initial costs as well as anticipated major replacement/maintenance costs and operating costs within the noted 100-year period.

8.7 Measures to Minimize Harm/Mitigative Actions

8.7.1 Context Sensitive Design

Contextual design approaches for the new bridge should be considered and implemented that will provide an overall appearance and feeling that exhibits the same character and style as the old historic bridge. The overall goal should be the construction of a new modern bridge meeting all of the needs and goals of the project that is compatible with the character of the affected Section 4(f) resource (Monmouth County Bridge W-9 carrying Brielle Road over the Glimmer Glass (Structure #13000W9) (Glimmer Glass Bridge)) in terms of size, scale, design, materials and appearance.

8.7.2 Offer for Reuse

Monmouth County has previously, and currently still does, offer the existing Bridge W-9 for removal, transport, and reuse by interested parties and will continue to do so until both a final FONSI is issued for the EA and a formal finding on the Section 4(f) Statement is made by FHWA. The County will also provide a finite amount of funding towards purchase of the existing bridge.

8.7.3 HAER Documentation

Historic American Engineering Record (HAER) of Monmouth County Bridge W-9 carrying Brielle Road over the Glimmer Glass (Structure #13000W9) (Glimmer Glass Bridge) is currently being prepared. This report will include photographic and written documentation of the existing structure as well as reviewing and cataloging the photographs and related historical documentation (i.e., As-Builts) in the Monmouth County Files for future reference.

8.7.4 Interpretive Display/Signage/Website

Using the research and documentation conducted for recordation, an interpretive display can be installed at or in proximity to the Brielle Road Bridge. The location, format, and content of the signage will be determined through consultation among the NJDOT, NJ SHPO, Monmouth County, Manasquan Borough, and Brielle Borough.

A project website was created to make information about the proposed project easily available to the general public, local officials, business owners, and other interested parties. The website is used to address many of the comments made through a Frequently Asked Questions (FAQ) section. Public Information Centers have been announced on the website. A virtual update was performed in late 2024 on the project website.

An interpretative website will be prepared reflecting the information gathered as part of the HAER and the renderings generated from the laser scanning.

8.7.5 3D Scanning

A High-Definition 3D laser scan of the existing structure has been conducted and is being finalized for inclusion on a website and development of drawings.

8.7.6 Architectural Salvage

Monmouth County has retained the services of a Cultural Resource Consultant and has developed alternatives for salvage of bridge materials and interpretive display. Consultation is ongoing.

9.0 REFERENCES

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