

BRIELLE ROAD FLOOD MITIGATION PROJECT

BOROUGH OF MANASQUAN
MONMOUTH COUNTY, NEW JERSEY



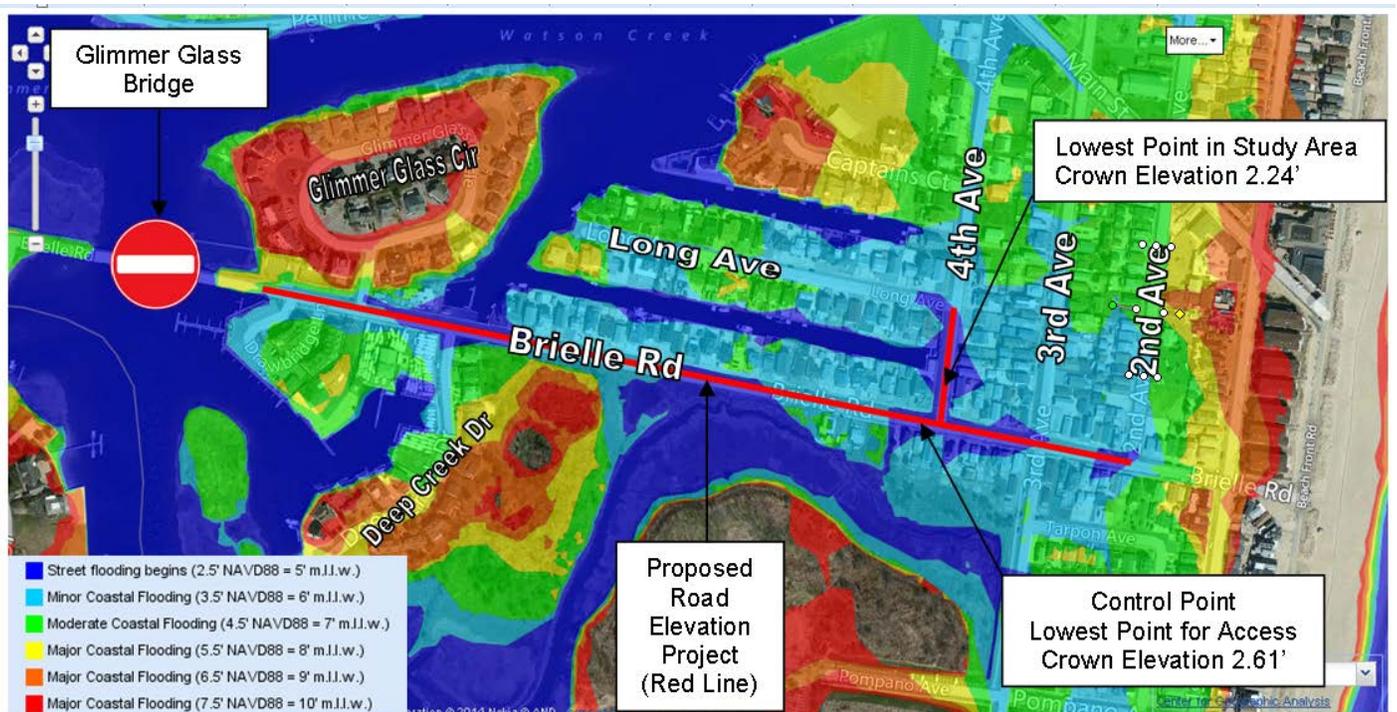
Prepared by:



Manasquan Office of Emergency Management
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Summary:

The following report has been compiled as part of an analysis of the impacts the extended closure of the Glimmer Glass Bridge (Monmouth County Bridge W-9 – Designated Coastal Evacuation Route) will have on access for residents and emergency responders in affected areas. This report also includes an analysis of the potential impacts of the proposed Brielle Road Flood Mitigation Project has on the same area. Specific information, including detailed engineering cost estimates and a traffic study data in the area, will be provided separately.



Aerial view of study area with color-coded elevations (dark blue being lowest)

Problem Statement:

Due to local geography and proximity to the ocean, Manasquan is particularly susceptible to coastal flooding. The lowest area in the Borough is contained within the study area and is located just north of the intersection of Brielle Road and 4th Avenue. The crown of the roadway in this area is actually below monthly spring high tide levels, and was submerged during 292 high tide cycles over the last year.

Tidal flooding in this area is frequent and pervasive. Many vehicles are damaged or destroyed annually as a result of being parked in, or attempting to drive through, floodwaters in this area. With the loss of the bridge and designated coastal evacuation route for access/egress, areas west of 4th Avenue become stranded, and, when tides are of sufficient height, emergency responders are delayed responding to these areas and require the use of surplus military trucks for access. This presents a serious public safety concern as residents are not afforded timely emergency response due to roadway flooding several times per month, and cannot safely access their homes without traversing flood waters at least 1 out of every 3 high tide cycles.

Impacts of Closure of Glimmer Glass Bridge on Vehicle Access:

During times of high astronomical and/or storm tides, the forced closure of the Glimmer Glass Bridge (Monmouth County Bridge W-9) creates an island-effect in areas along Brielle Road west of 4th Avenue, including all of Glimmerglass Circle and Deep Creek Drive, resulting in the loss of access and egress for both residents and emergency vehicles that lack water-fording capabilities. There are approximately 150 residential units and four marinas in the affected area.

The crown elevation (highest point of cross section in roadway, typically in the center) of Brielle Road varies, however, the lowest point of the access/egress route for the area affected by the closure of the Glimmer Glass Bridge occurs on Brielle Road, just west of the intersection of 4th Avenue (2.61' NAVD88 according to Monmouth County Survey Data). This low spot effectively traps residents west of this intersection once flood waters render this area impassable. Since this is the lowest point, this study uses this location as the controlling elevation for traffic passage.

According to the National Weather Service, "Six inches of water will reach the bottom of most passenger cars causing loss of control and possible stalling". Additionally, as can be seen in the photo below, a vehicle traversing six inches of water creates a wave effect in front of the vehicle that causes water to be forced into higher portions of the engine compartment. As such, this study utilizes six-inches above the minimum road crown to estimate durations of road closures for vehicles. The water may be up to an additional 6-inches higher (12" total) within traffic lanes, depending on location of vehicle in relation to the centerline of the roadway when attempting passage.

Utilizing data obtained by the USGS tide gauge at the Glimmer Glass Bridge, in the 12 months spanning 08/29/13 to 08/24/14, flood waters completely covered Brielle Road (control elevation 2.61 NAVD88) 170 times, and flood levels forced the complete closure of the road (control elevation plus 6-inches = 3.11 NAVD88) a total of 63 instances.



Brielle Rd looking west with flood levels approx.. 6" above control elevation (3.1' NAVD88)

Proposed Road Elevation Project:

The proposed roadway elevation project spans a ½ mile section of Brielle Road and proposes raising the centerline of the roadway to a minimum elevation of 3.6' NAVD88. The project spans the intersection of Brielle Road & 2nd Avenue and runs approximately ½ mile west to the eastern terminus of the Glimmer Glass Bridge. The project will also include the intersections of Deep Creek Drive, Glimmer Glass Circle, 2nd, 3rd and 4th Avenues and will tie into a controlling elevation of 3.6' throughout.

The minimum controlling height was chosen as the maximum feasible without potentially triggering impacts to adjoining properties, hydraulic drainage conflicts, right of entry requirements, as well as exponential increases in project costs. The proposed project will tie into existing gutters and does not modify the existing drainage system and as such no impacts to local hydraulics or hydrology are anticipated.

A minimum controlling height of 3.6' will bring the road crown centerline above the threshold of minor coastal flooding and would reduce road closures time from 3318 minutes annually to 204 minutes annually, or by approximately 94%.

Furthermore, this proposed project will also reduce damages to vehicles during periods when portions the road are flooded with salt-water, but still passable by over 98% (542 hours annually to 9 hours annually). This data is based on actual water level observations from the USGS tide gauge located on the Glimmer Glass Bridge for the past calendar year spanning 08/29/13 to 08/24/14.

**Flood Conditions based upon observed tide heights at
USGS tide station located at Glimmer Glass Bridge
(08/29/13 to 08/24/14)**

<u>Annual Occurrences</u>	<u>Current</u>	<u>Post-Project</u>	<u>Reduction</u>
Brielle Road Submerged (instances)	170	16	90%
Brielle Road Submerged (hours)	196	12	94%
Brielle Road Impassable (instances)	63	2	97%
Brielle Road Impassable (hours)	55	3	94%

Traffic Study:

A detailed traffic study was conducted by Monmouth County Engineering on July 14, 2007, July 9, 2011 and July 14, 2012 and yielded an average of 402 one-way vehicle trips/hour on Brielle Road at the Glimmer Glass Bridge. Additional traffic information is available upon request.



Photo of Brielle Road looking east from Glimmer Glass Bridge during flood conditions

Summary:

The extended closure of the Glimmer Glass Bridge due to structural damage presents a serious problem for both residential traffic and emergency responders. The proposed elevation of Brielle Road to a minimum controlling crown height of 3.6' NAVD88 will provide an easily-implemented, cost-effective and efficient solution to the problem of chronic roadway flooding and access issues for both residents and emergency vehicles.

An analysis of the past year's flood conditions on Brielle Road demonstrates that the proposed elevation project will reduce the loss of access for residents and emergency vehicles by at least 94% (3318 minutes annually to 204 minutes annually).

Not only is this project vital during the 10-month closure for temporary repair of the Glimmer Glass Bridge, but it will also be crucial during the at least 2-year long closure for replacement of the bridge anticipated to take place on or around 2016.

Furthermore, this project will also provide numerous benefits during periods when the bridge is open to vehicular traffic as it will keep the roadway open for passage during routine flood conditions, reduce flood damage to vehicles that are forced to traverse the area and will provide much greater access for emergency vehicles and increased evacuation windows during major storm events such as Hurricane Sandy and the Nor'easter of 1992.

Note: *Data utilized for this study has been provided by Steven's Institute of Technology and has undergone post-retrieval quality control. Supplemental calculations are attached as part of this application.*