

Flooding Vulnerability at Babcock Creek/Watering Race Branch

Mays Landing, Township of Hamilton, Atlantic County

A review and analysis of the FEMA May 30, 2014 Flood Insurance Study for Atlantic County in the area of Babcock Creek in Mays Landing



FEMA

Preliminary: May 30, 2014

FLOOD INSURANCE STUDY NUMBER
34001CV000A
Version Number 2.1.1.1

http://floodmaps.fema.gov/prelim/PrelimData/New%20Jersey/Atlantic%20County/prelim_issue_date-2014-05-30/FIS%20Reports/34001CV001A.pdf



**The Great Egg Harbor
Watershed Association &
River Council**

Fred Akers - Administrator
P.O. Box 395
Newtonville, NJ 08346
856-697-6114
fred_akers@gehwa.org

January 4, 2016



**The Great Egg Harbor
Watershed Association &
River Council**

Fred Akers - Administrator
P.O. Box 109
Newtonville, NJ 08346
856-697-6114
Fred_akers@gehwa.org

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Vice President
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January 4, 2016

RE: FEMA Flood Insurance Study 34001CV000A, May 30, 2014

Dear Township of Hamilton, FEMA, Atlantic County Planning, and other interested parties:

The purpose of this report is to identify possible problems with the existence and severity of flood hazards according to FEMA in the tidal reaches of Babcock Creek, a federally designated tributary of the Great Egg Harbor National Scenic and Recreational River.

This report identifies inaccuracies in FEMA's Riverine Hydraulic Analyses, the presence of significant flow obstructions, flood mapping that assumes non-coincidental flooding conditions, the lack of floodway computations for Babcock Creek, the lack of consideration for floodwaters having hazardous velocities, and other concerns for flooding in this area.

Hopefully this report will be useful to the Township of Hamilton to prevent flood damage and to protect the public health, safety and general welfare of the Township.

Respectfully,

Fred Akers

CC:

Phil Sartorio, Flood Plain Manager, Township of Hamilton

Federal Emergency Management Agency (FEMA)

John Peterson, Atlantic County Department of Regional Planning and Development

Frank LoBiondo, Congressman, 2nd District

www.gehwa.org – The Official Website of the Great Egg Harbor Watershed Assoc.

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1.0 Inaccuracies in FEMA's Riverine Hydraulic Analyses for Babcock Creek

1.1 Watering Race Branch flows into Babcock Creek upstream from Great Egg Harbor River Reach 1

According to the referenced May 30, 2014 Flood Insurance Study (FIS) report, FEMA calculates that Babcock Creek is the only tributary that contributes flooding at its confluence with the Great Egg Harbor River in Mays Landing, and that the drainage area of Babcock Creek is only 18 square miles. This information below can be found in Table 5 on page 15 of the FEMA FIS study.

A summary of the drainage area-peak discharge relationships for all the streams studied by detailed methods is shown in Table 5, "Summary of Discharges."

TABLE 5 – SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs)			
		10-PERCENT ANNUAL CHANCE	2-PERCENT ANNUAL CHANCE	1-PERCENT ANNUAL CHANCE	0.2-PERCENT ANNUAL CHANCE
BABCOCK CREEK Confluence with Great Egg Harbor River Reach 1	18	3,600	7,000	9,600	11,800

The following NJDEP GIS data layers show Babcock Creek flowing into Watering Race Branch which then flows into the Great Egg Harbor River, and calculates that the cumulative drainage area of the Babcock Creek subwatershed is 20.12 square miles, and the cumulate drainage area of the Watering Race Branch subwatershed is 10.98 square miles, for a total drainage are of 31.1 square miles converging at the confluence with Great Egg Harbor River Reach 1, not 18 square miles.

NJDEP Stream Network (New Jersey Coastal Basin) flowline020403NJCoastalBasin-5/1/2008

<http://www.state.nj.us/dep/gis/hydro02/flowline020403.zip>

14 Digit Hydrologic Unit Code Delineations for New Jersey (Version 20110225)

<http://www.state.nj.us/dep/gis/digidownload/zips/statewide/dephuc14.zip>

Map 1 on page 4 illustrates the NJDEP delineation of Water Race Branch as the blue line stream that flows into Great Egg Harbor River Reach 1.

1.2 The combined drainage area that flows into Great Egg Harbor River Reach 1 is 31.1 sq. miles.

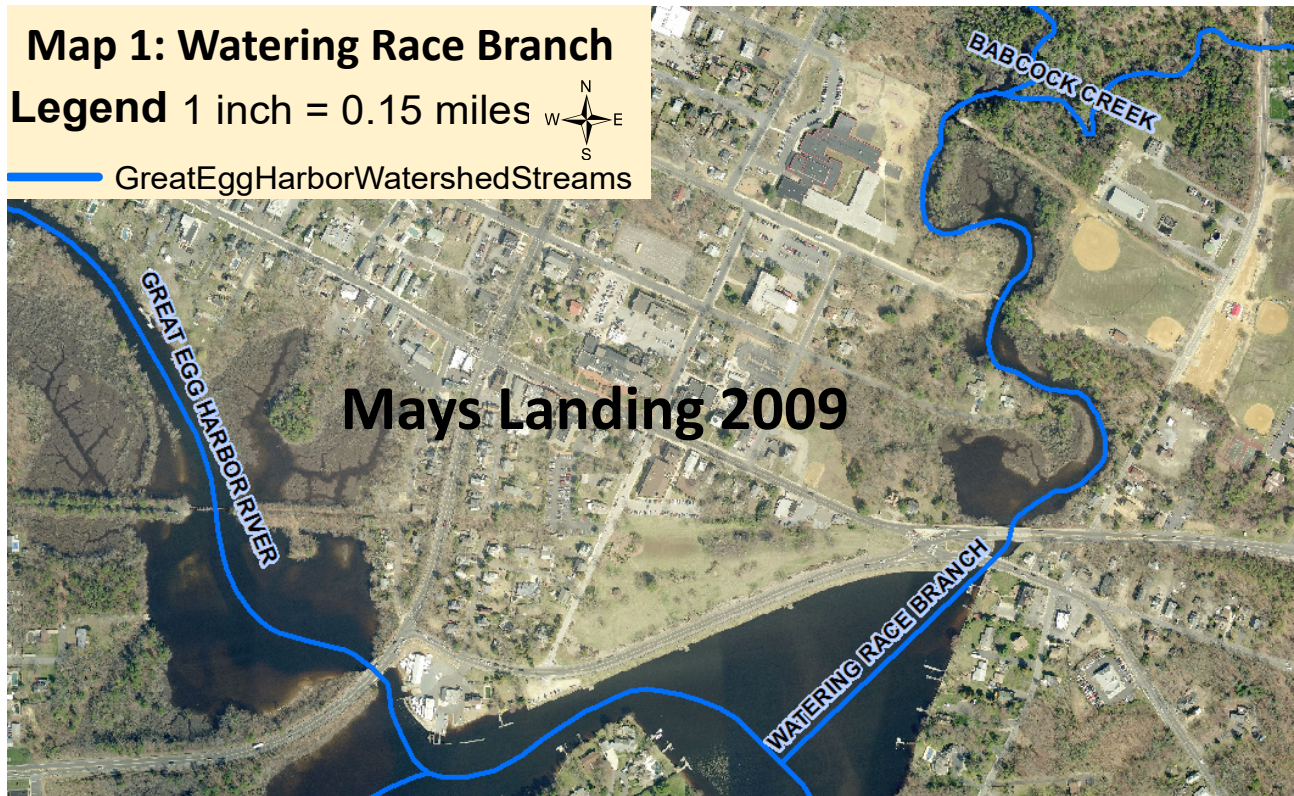
The most current NJDEP data layer for subwatersheds at the Hydrologic Unit Code 14 digit level (HUC14) shows that the Watering Race Branch subwatershed drains 10.98 sq. miles into the Babcock Creek subwatershed, which separately drains 20.12 sq. miles, and a combined area of 31.1 sq. miles then drains into Great Egg Harbor River Reach 1 at only one point of confluence. This new data indicates that the 5/30/14 FEMA Flood Insurance Study only captured 58% of the total drainage area that exists, and that the real existence and severity of flood hazards is significantly greater than FEMA has calculated. Map 2 on page 4 illustrates the extent of the actual drainage area.

Map 1: Watering Race Branch

Legend 1 inch = 0.15 miles



GreatEggHarborWatershedStreams

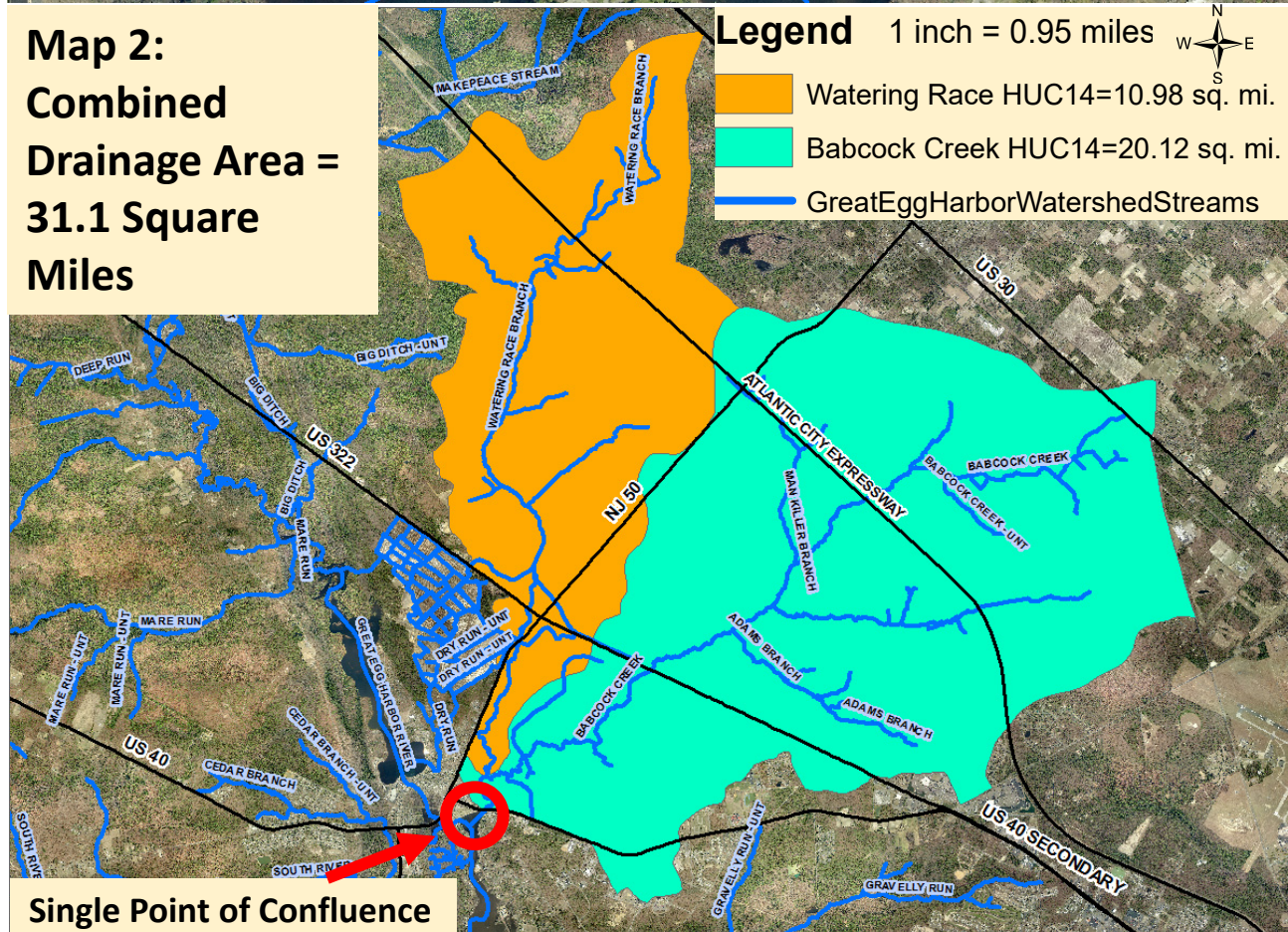


Map 2:
Combined
Drainage Area =
31.1 Square
Miles

Legend 1 inch = 0.95 miles



Watering Race HUC14=10.98 sq. mi.
Babcock Creek HUC14=20.12 sq. mi.
GreatEggHarborWatershedStreams



2.0 Presence of Significant flow obstructions at the confluence are not included in the existence and severity of flood hazards calculations in this area.

According to 3.2 Riverine Hydraulic Analyses on page 19 of the referenced May 30, 2014 Flood Insurance Study report, FEMA does not include potential flow obstructions in their flood mapping as follows:

“The hydraulic analyses for this FIS were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.”

In Mays Landing, the 31.1 combined drainage area of both Watering Race Branch and Babcock Creek must flow through a very narrow channel underneath two bridges. This narrow single point of confluence for this large drainage area is shown on Map 2 on page 5.

On August 20 & 21, 1997, a 13+ inch rain storm washed out a bridge at the intersection of State Route 40 and County Route 559 in Mays Landing. The bridges became major flow obstructions during that storm, and FEMA declared a Major Disaster Declaration for this storm September 23, 1997 (DR-1189).

Both the State Route 40 bridge and the County Route 559 bridge are located well below the head of tide. This means that the degree of obstruction of both bridges varies with tidal fluctuations, and both bridges are substantially restricted at high tide.

On the full moon high tide in Mays Landing at 12:00 pm (noon) on Christmas Day 12/25/15, both bridges were measured and photographed to document the extent of flow restriction at high tide. The following unrestricted flow areas were measured (see P1 & P2 on page 6):

Route 40 bridge free flow opening: 31 inches x 72 feet = 186 square feet unobstructed area.
Route 559 bridge free flow opening: 24 inches x 48 feet = 96 square feet unobstructed area.

These bridges are hydraulic structures that are being operated properly where one failed in the past. As a preexisting condition, these public infrastructure obstructions should be identified by FEMA as possible problems with the existence and severity of flood hazards, and their potential failure should be reflected in the severity of flood hazards calculations.

3.0 FEMA flood mapping in Mays Landing should assume coincidental flooding conditions for tidal areas that are affected by both riverine and coastal flooding.

3.1 Riverine Flood Hazard Areas

The Township of Hamilton riverine flooding risk model has not been updated for 40 years. It is
(continued on page 7)



P1: 12/25/15, 12:19 pm, upstream view of State Route 40 bridge in Mays Landing with 186 square feet of unobstructed area.



P2: 12/25/15, 12:04 pm, upstream view of County Route 559 bridge in Mays Landing with 96 square feet of unobstructed area.

important to note that the hydrologic and hydraulic analyses from the FIS report were prepared by the USACE, Philadelphia District, for the FIA, under Inter-Agency Agreement Nos. IAA-H-15-72, IAA-H-19-74, and IAA-H-16-75, Project Order Numbers 13, 18, and 22, respectively, which was over 40 years ago (page 3).

Table 4 on page 8 of the May 30, 2014 FEMA Flood Insurance Study report illustrates this point as follows:

<u>TABLE 4 – MODEL DATES FOR RIVERINE FLOODING SOURCES</u>		
<u>STREAM NAME</u>	<u>COMMUNITY</u>	<u>MOST RECENT MODEL DATE</u>
Babcock Creek	Township of Hamilton	September 1976
Great Egg Harbor River Reach 1	Township of Hamilton	April 1980

While FEMA ArcView GIS layers (shapefiles) of Riverine Flood Prone Areas are difficult to obtain today, in 2007 the Great Egg Harbor River Council purchased the FEMA Q3 Flood Data derived from the Flood Insurance Rate Maps (FIRMs) for all 4 counties in the Great Egg Harbor Watershed published by FEMA in 1996.

Map 3 on page 8 illustrates the significant extent of riverine floodprone areas for the Watering Race Branch and Babcock Creek subwatersheds back in 1996. The black dots on Map 3 represent the heads of tide in 1986, which illustrates the extent that tidal waters and riverine waters coincide. Map 4 on page 8 illustrates the riverine floodprone areas at the confluence in Mays Landing.

3.2 Coastal (tidal) Flood Hazard Areas

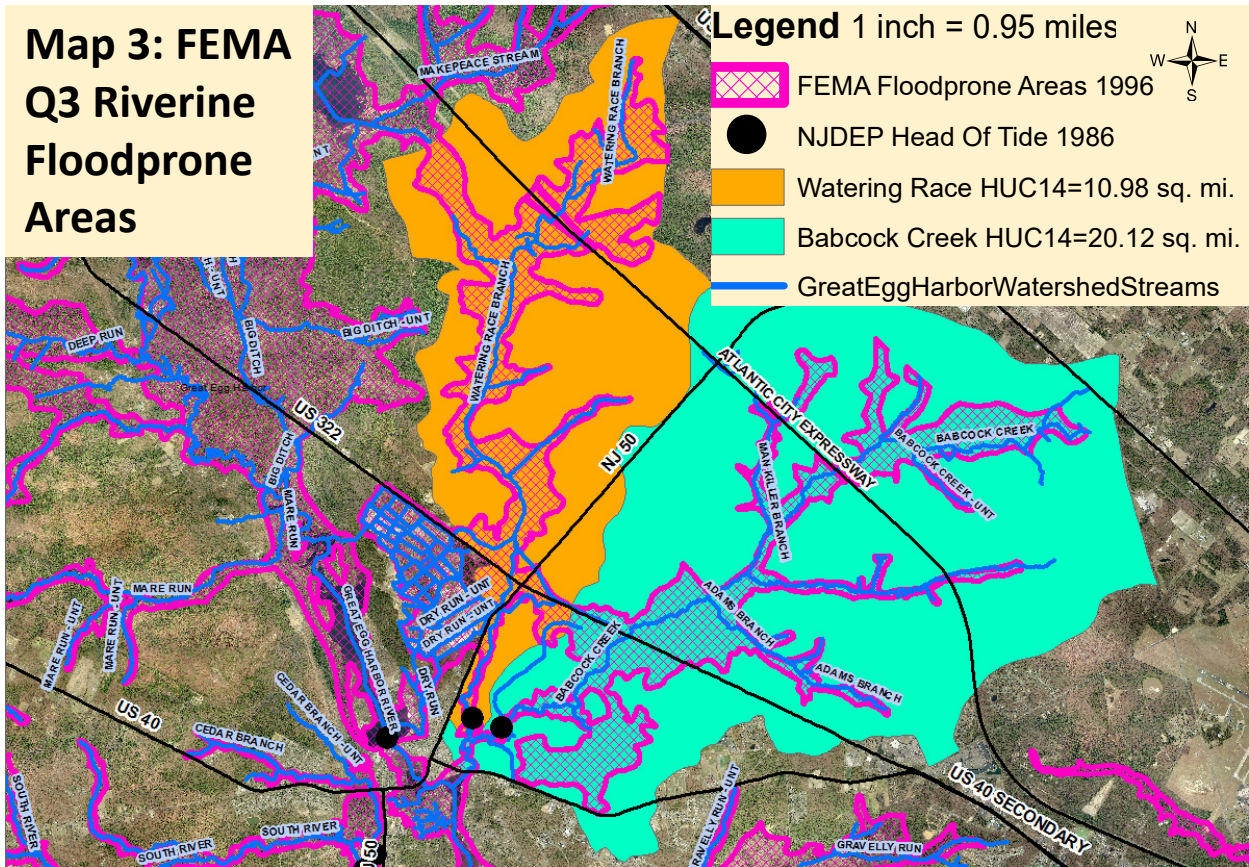
Following the coastal/tidal flooding caused by Hurricane Sandy on October 24, 2012, FEMA updated their coastal/tidal Advisory Flood Zones on December 15, 2012 to reflect the current flood hazard. They created revised Advisory Base Flood Elevations (ABFEs) to reflect the regulatory 1% annual chance of a tidal flooding event and the moderate 0.2% annual chance flood level.

The Township of Hamilton is inland away from wave velocities and is therefore not in the FEMA V Zone, but its tidal waters are in the A Zone which is the next most volatile of the Special Flood Hazard Areas which are subject to rising waters and are usually near a lake, river, stream or other body of water. FEMA has also mapped X zones in Hamilton that are minimal-risk areas where flood insurance is not mandatory.

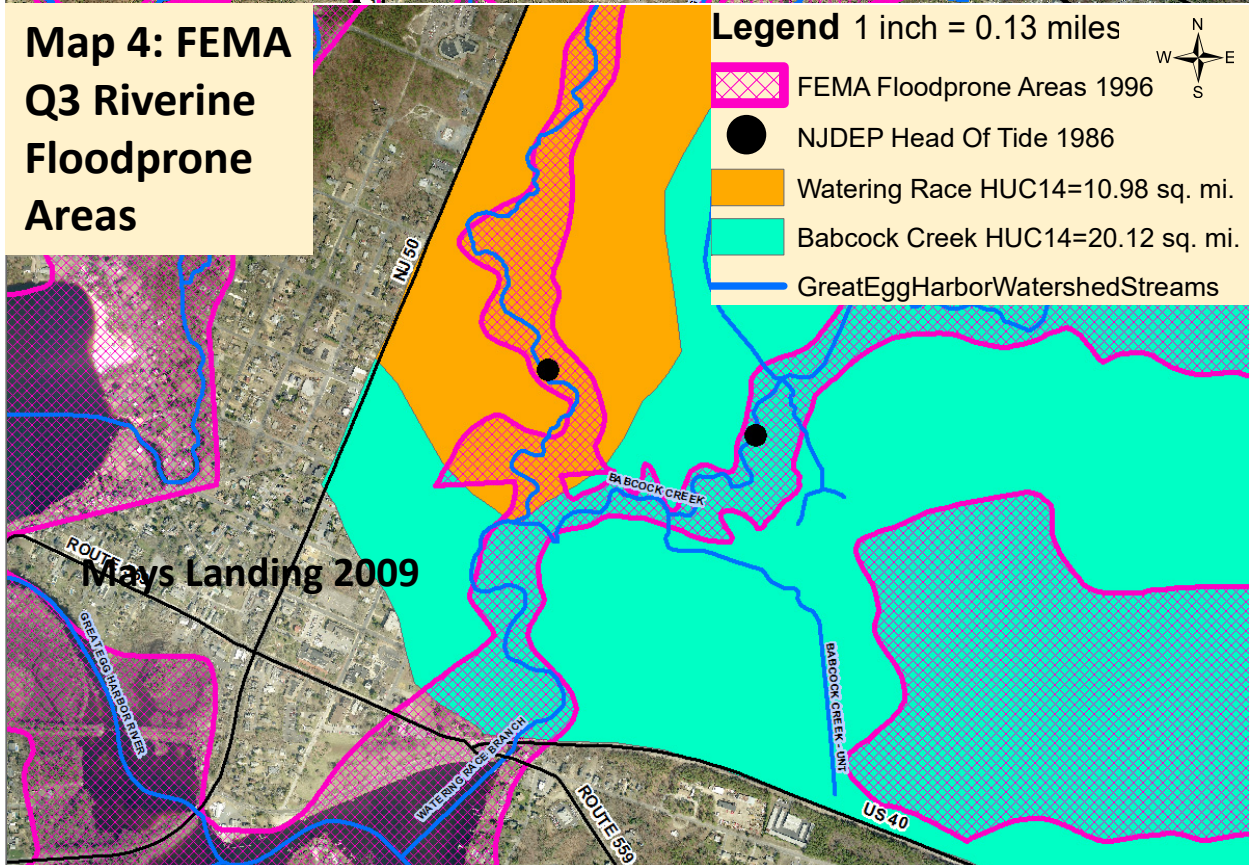
Map 5 on page 9 illustrates the geospatial layer depicting the revised Advisory Flood Hazard Zone A in Mays Landing. **It is significant to note that the 1986 Head of Tide is substantially moved upstream, and that the increased base flood elevation will further obstruct the Route 40 and Route 559 bridge flow openings at high tide.**

(continued on page 10)

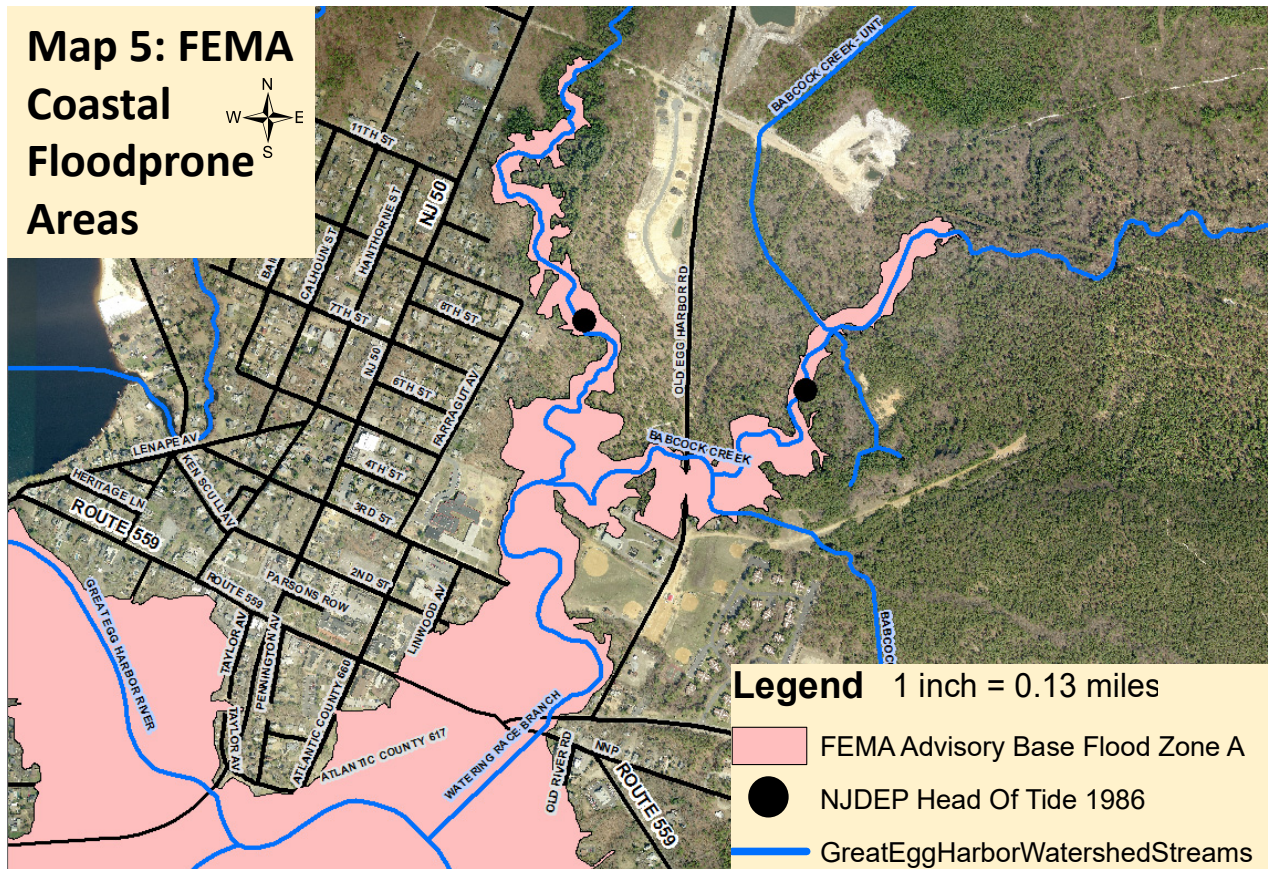
Map 3: FEMA Q3 Riverine Floodprone Areas



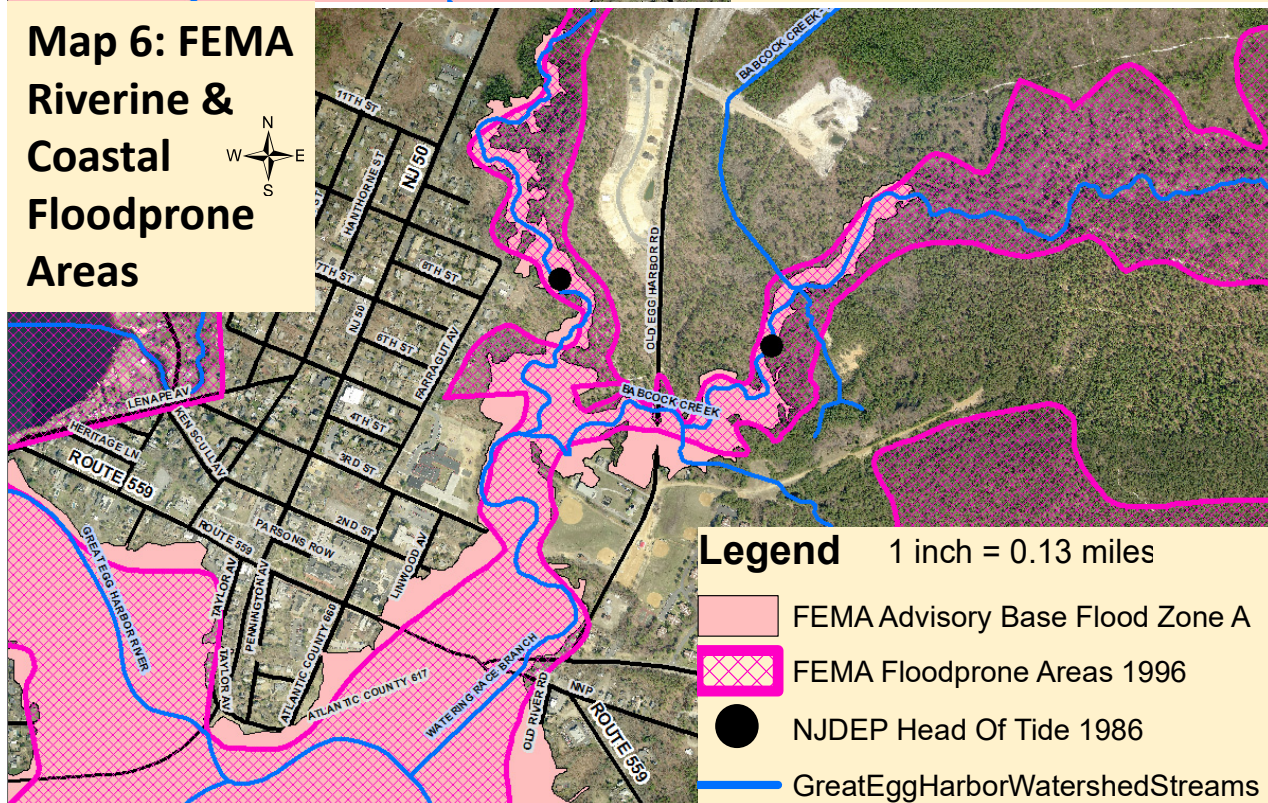
Map 4: FEMA Q3 Riverine Floodprone Areas



Map 5: FEMA Coastal Floodprone Areas



Map 6: FEMA Riverine & Coastal Floodprone Areas



3.3 Coincidental Flood Hazard Areas

According to 3.2 Riverine Hydraulic Analyses on page 19 of the referenced May 30, 2014 Flood Insurance Study report, FEMA does not include coincidental flooding conditions for their existence and severity of flood hazard calculations. For example, starting water-surface elevations for Babcock Creek were obtained from something called the backwater analysis for the Great Egg Harbor River, and the starting water-surface elevations for the Great Egg Harbor River Tributary were based on critical depth **assuming non-coincidental flooding conditions.**

Map 6 on page 9 overlays the riverine flood hazard area onto the coastal/tidal flood hazard area. In the upstream reaches, the riverine flood hazard area exceeds the coastal/tidal flood hazard area, and in the downstream reaches, the coastal/tidal flood hazard area exceeds the riverine flood hazard area.

But what happens to the existence and severity of both flood hazard areas when there is a coincidental flooding event? For example, what if a coastal hurricane pushes a significant storm surge up into Mays Landing at high tide, and simultaneously drops 5 inches of rain in the Watering Race Branch, Babcock Creek and Great Egg Harbor watershed drainage areas upstream from Mays Landing?

The potential for the cumulative impacts of coincidental flooding conditions in this area makes Mays Landing especially vulnerable to high flood hazards.

4.0 No Floodway or hazardous velocities were computed for Babcock Creek.

According to the FEMA FIS at 4.2 Floodways on page 32: “Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the NFIP, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 1-percent-annual-chance floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the 1- percent-annual-chance flood can be carried without substantial increases in flood heights. Minimum federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this FIS are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies. However, the State of New Jersey has established criteria limiting the increase in flood heights to 0.2 foot. Thus, floodways having no more than a 0.2-foot surcharge have been delineated for this study.”

Given the heightened flooding vulnerability of the tidal reaches of Babcock Creek/Watering Race Branch, floodway computations should be established and followed to protect the public welfare.

5.0 Township of Hamilton Code, Chapter 173: Flood Damage Prevention

<http://www.ecode360.com/10225992>

The Township of Hamilton as an excellent flood damage prevention tool in its Chapter 173, which was updated to FEMA's latest Advisory Base Flooding Elevation (ABFE), Advisory Flood Hazard Area (AFHA), and Advisory Flood Map on April 15, 2013.

According to § 173-2. Findings on page 1:

"The flood hazard areas of the Township of Hamilton are subject to periodic inundation which results in loss of life and property, health and safety hazards, disruption of commerce and governmental services, extraordinary public expenditures for flood protection and relief and impairment of the tax base, all of which adversely affect the public health, safety and general welfare. These flood losses are caused by the cumulative effect of obstruction in areas of special flood hazard which increase flood heights and velocities and, when inadequately anchored, damage uses in other areas. Uses that are inadequately floodproofed, elevated or otherwise protected from flood damage also contribute to the flood loss."

And according to § 173-3. Purpose on pages 1 and 2:

"It is the purpose of this chapter to promote the public health, safety and general welfare and to minimize public and private losses due to flood conditions in specific areas by provisions designed:

- A. To protect human life and health.
- B. To minimize expenditures of public money for costly flood-control projects.
- C. To minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public.
- D. To minimize prolonged business interruptions.
- E. To minimize damages to public facilities and utilities, such as water and gas mains; electric, telephone and sewer lines; and streets and bridges located in areas of special flood hazard.
- F. To help maintain a stable tax base by providing for the sound use and development of areas of special flood hazard so as to minimize future flood blight areas.
- G. To ensure that potential buyers are notified that property is in an area of special flood hazard.
- H. To ensure that those who occupy the areas of special flood hazard assume responsibility for their actions."

One consideration that does not appear in Chapter 173 is a process and commitment for evacuation notices and evacuation promises. Unlike at the shore where the storm threats are more prominent, the risk of flood hazards for people living in flood hazard areas in the Township of Hamilton are less broad and much more specific in terms of needing to evacuate.

For example, the residents on 2nd Street in Mays Landing have been seriously flooded in the past, and there should be a mechanism for them to be noticed to evacuate, and a commitment on their part to leave if and when serious flooding occurs. See P2 and P3 on page 12.

Given that there are many unknown factors that could contribute to flood heights greater than the height calculated for a selected size flood and floodway conditions, such as wave action, bridge openings, the hydrological effect of urbanization of the watershed, and sea level rise, Chapter 173 incorporates a one-foot freeboard above FEMA flood hazard levels which significantly lowers flood insurance rates for the Township of Hamilton.

However, freeboard to minimize property damage does little to minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public or to protect human life and health for people living in flood hazard areas.

While this report points to possible deficiencies in FEMA's mapping and policies, strict compliance to Chapter 173 is extremely important to promote the public health, safety and general welfare of the citizens of the Township of Hamilton given the existing FEMA information.



P3: 12/25/15, 1:31 pm, Flooding Vulnerability at 2nd St. Mays Landing, NJ



P4: 12/25/15, 12:19 pm, Flooding Vulnerability at 2nd St. Mays Landing, NJ