

Nassau County Back Bays, NY, Coastal Storm Risk Management Feasibility Study

U.S. Army Corps of Engineers, Philadelphia
District – Virtual Meeting

Non-Federal Sponsor: New York State
Department of Environmental Conservation
in Partnership with Nassau County, NY

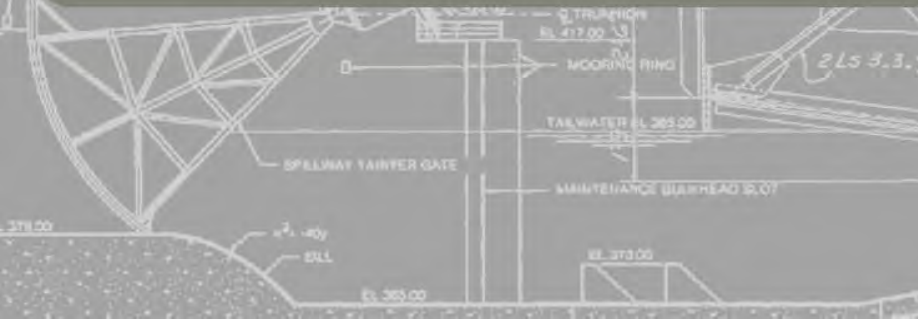
27 January 2021



Nautical Mile, Freeport, NY (2015)



Hurricane Sandy Damage, Oceanside, NY (2012)



AGENDA

- Opening Remarks
- Study Background
- Plan Formulation (Reformulation)
- Tentatively Selected Plan
- Ongoing Additional Analysis
- Path Forward
- Questions & Discussion



US Army Corps
of Engineers[®]



STUDY AUTHORITY

Public Law 71, Chapter 140 (15 June 1955) - *That in view of the severe damage to the coastal and tidal areas of the eastern and southern United States from the occurrence of hurricanes, particularly the hurricanes of August 31, 1954, and September 11, 1954, in the New England, New York, and New Jersey coastal and tidal areas... The Secretary of the Army... is hereby authorized and directed to cause an examination and survey to be made of the eastern and southern seaboard of the United States with respect to hurricanes, with particular reference to areas where severe damages have occurred.*

Public Law 113-2 (Disaster Relief Appropriations Act of 2013) – *North Atlantic Coast Comprehensive Study (NACCS) identified Nassau County Back Bays as one of nine high risk focus areas to manage risk associated with coastal flooding and sea level rise.*

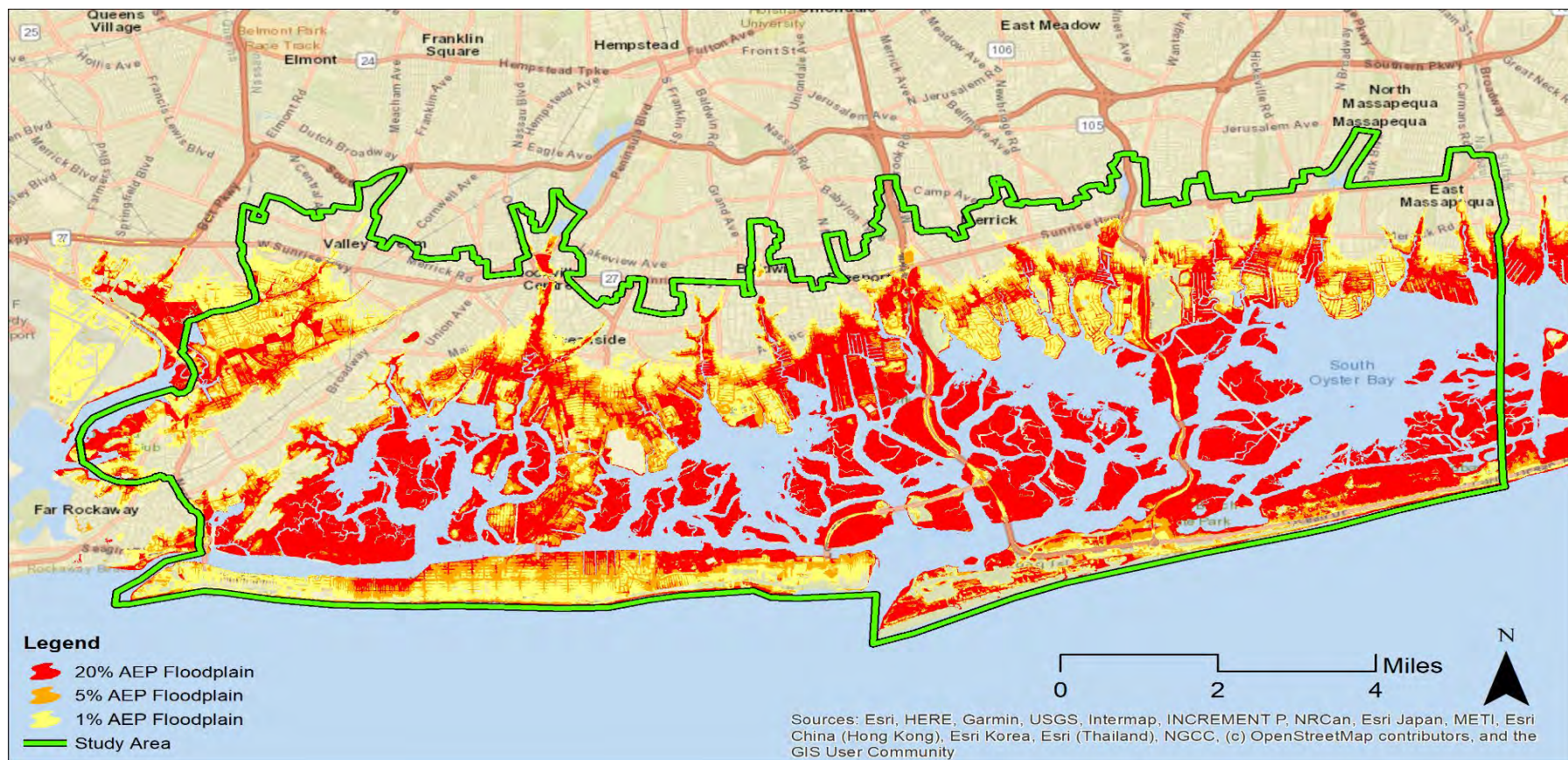


US Army Corps
of Engineers[®]



STUDY PURPOSE & NEED

- PURPOSE** – to determine the feasibility of a project to reduce coastal storm risk in the back bays of Nassau County, New York, while contributing to the resilience of communities, critical infrastructure, and the natural environment.
- NEED** – the study area is low-lying and experiences flooding from coastal storms and astronomically high tides; is considered at high risk to coastal storm flooding with an associated threat to life safety; is susceptible to relative sea level change in the future; includes a degraded back bay ecosystem supporting sensitive species and habitats.



PLAN FORMULATION

Overall Objective:

The objective of the NCBB CSRM Feasibility Study is to develop solutions to manage risk associated with coastal flooding affecting critical infrastructure and highly vulnerable risk areas.

Specific Planning Objectives:

- Manage potential life loss related to coastal flooding in the study area through 2080.
- Manage the risk of coastal storm damage to public infrastructure and important societal resources, as well as highly vulnerable portions of Nassau County through 2080.
- Contribute to the long-term sustainability and resilience of coastal communities in Nassau County through 2080.

Specific Planning Constraints:

- Avoid construction within Coastal Barrier Resources Act (CBRA) System Units
- Avoid impacts to life safety activities for the U.S. Coast Guard
- Avoid impacts to Federal navigation channels
- Avoid impacts to constructed and planned resilience projects
- Avoid impacts to Threatened and Endangered Species
- Minimize or avoid effects on cultural resources and historic structures, sites and features

Specific Planning Considerations:

- Avoid induced coastal flooding in adjacent communities, and flooding from rainfall or overwhelming of existing interior drainage systems
- Avoid degradation to water quality



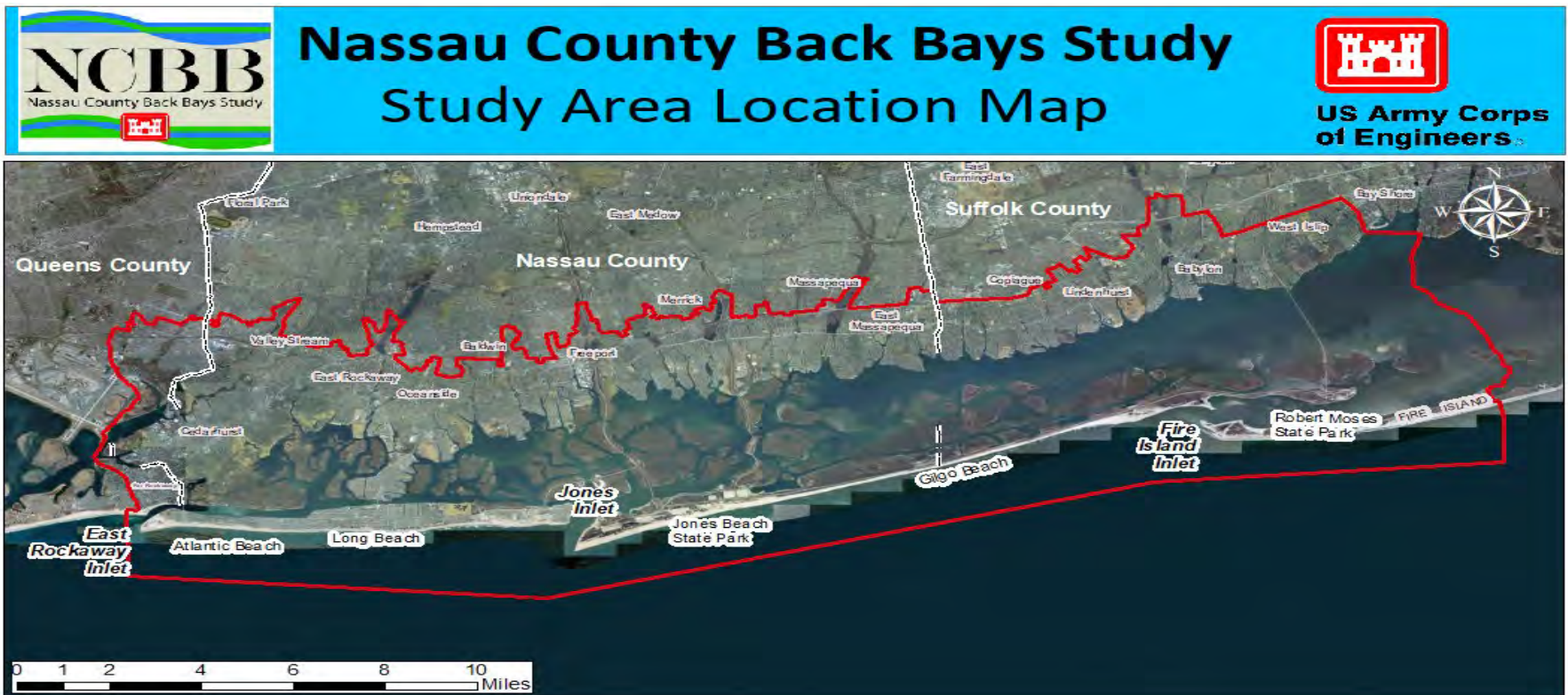
US Army Corps
of Engineers[®]



PLAN FORMULATION

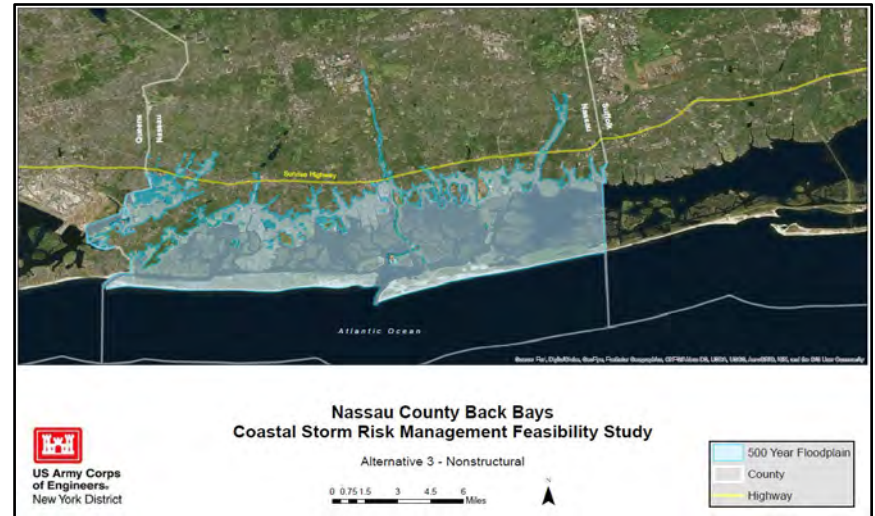
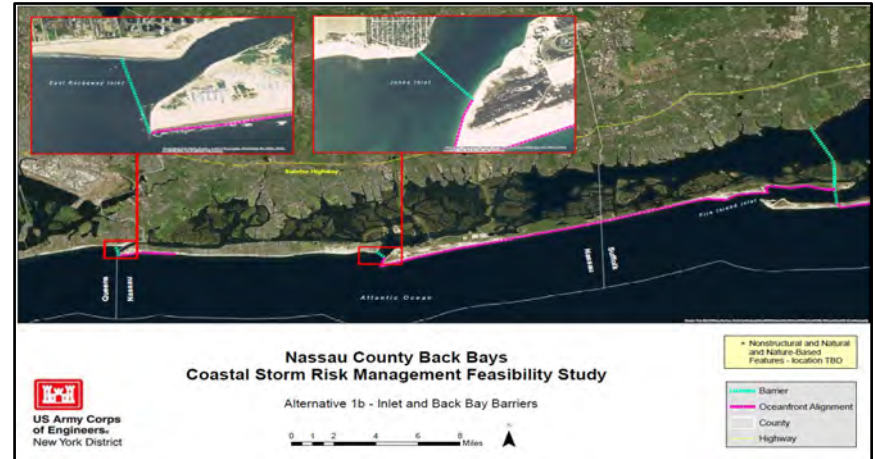
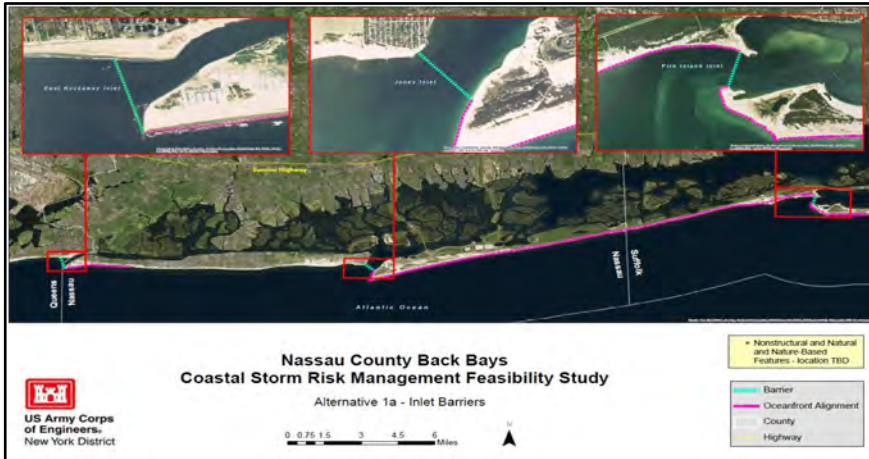
Original Study Area:

- Northern Boundary – Mainland of Long Island @+19 feet NAVD88
 - Established using NACCS water level statistics for the 500-year return period (0.2% AEP) at 13 locations.
- Southern Boundary – Atlantic Ocean offshore of Long Beach, Jones, and Fire Islands.
- East/West Boundary – Extended approximately 30 miles primarily in Nassau County, but also in adjacent portions of Queens and Suffolk Counties



PLAN FORMULATION

Original Array of Alternatives: Alternatives Milestone (AMM)



ALTERNATIVES ANALYSIS

Further Evaluation of Planning Constraints and Considerations:

- Avoid construction within **CBRA System Units**
- Avoid impacts to life safety activities for the U.S. Coast Guard
- Avoid impacts to Federal navigation channels
- Avoid impacts to Threatened and Endangered Species
- Avoid **induced coastal flooding in adjacent communities**, and flooding from rainfall or overwhelming of existing interior drainage systems
- Avoid degradation to water quality

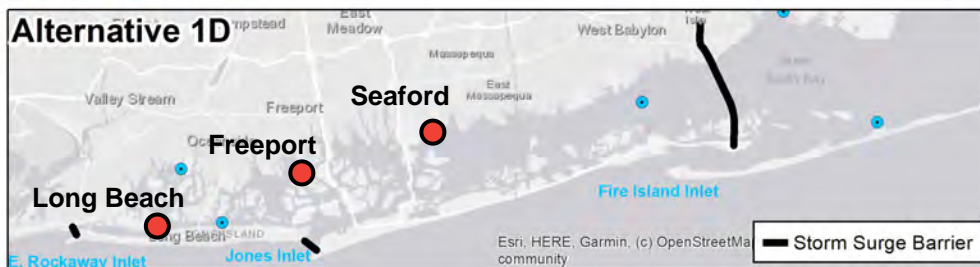
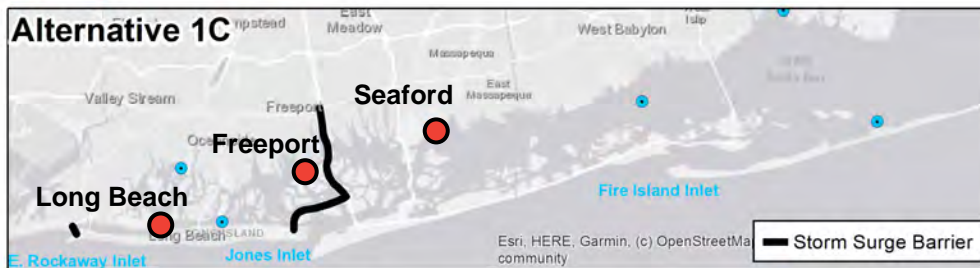
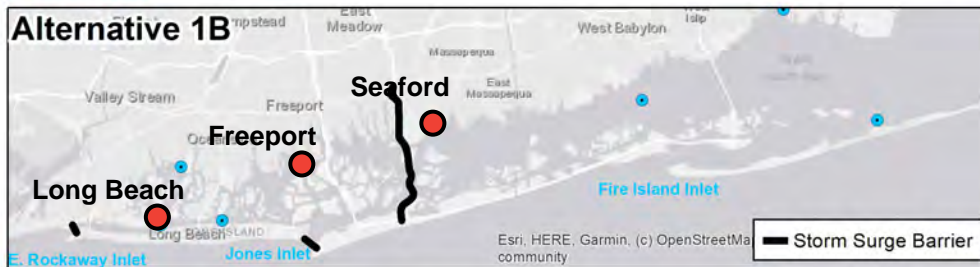
Further Evaluation of **Hydraulic Impact** of Storm Surge Barriers/Interior Bay Closures:



US Army Corps
of Engineers[®]

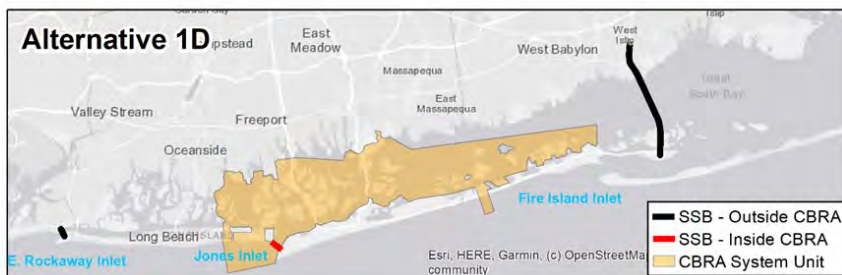
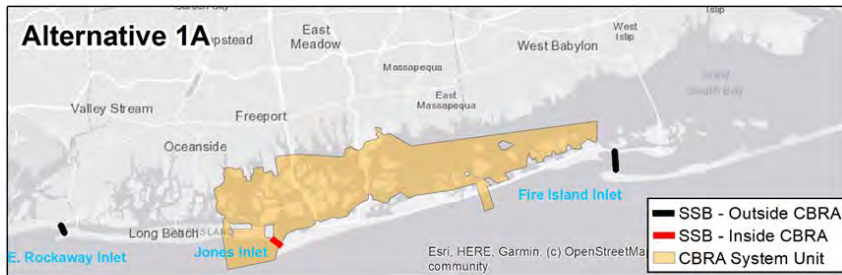


ALTERNATIVES ANALYSIS – STRUCTURAL MEASURES



- Two principal processes are responsible for back bay flooding in the NCBB study area: (1) storm surge propagation through tidal inlets and (2) local wind-driven storm surge along the east-west bay axis.
- Effective storm surge barrier and interior bay closure measures must address both processes.
- **Alternative 1A** - inlet closures alone are only able to reduce the 1% AEP (100-year return period) water elevation by approximately one foot, from 10 feet NAVD88 to 9 feet NAVD88. into the study area limiting the effectiveness of Alternative 1A)
- **Alternatives 1B, 1C, and 1D** combinations of storm surge barriers/interior bay closures successfully reduce water elevations inside the storm surge barrier/interior bay closure system. However, outside the system, specifically east of the bay closures in Great South Bay, the 1% AEP (100-year return period) water elevations increase by 2 to 4 feet over extensive areas (10 to 20 miles).

ALTERNATIVES ANALYSIS – STRUCTURAL MEASURES



- Alternatives 1A through 1D have at least one storm surge barrier and/or interior bay closure located entirely within the footprint of a CBRA System Unit.
- Eliminating storm surge barrier and/or interior bay closures located in a CBRA System Unit will render these alternatives even less effective at reducing storm surge by severely limiting their ability to reduce storm surge from both of the principal processes responsible for NCBB back bay flooding.



US Army Corps
of Engineers®



REFORMULATION

- Reformulation based on additional consideration of the planning constraints associated with the CBRA System Unit and the updated storm surge barrier/interior bay closure modeling results
 - Focus on Critical Infrastructure and vulnerable populations that are at immediate and short-term risk;
 - Non-structural measures and consideration of neighborhood cohesiveness;
 - Natural and Nature-Based Features evaluated as complementary measures.
 - Further consideration of large surge barriers has been eliminated due to:
 - CBRA issues.
 - Potential induced flooding
 - Environmental impacts
 - Life safety impacts related to the three Coast Guard stations in the study area



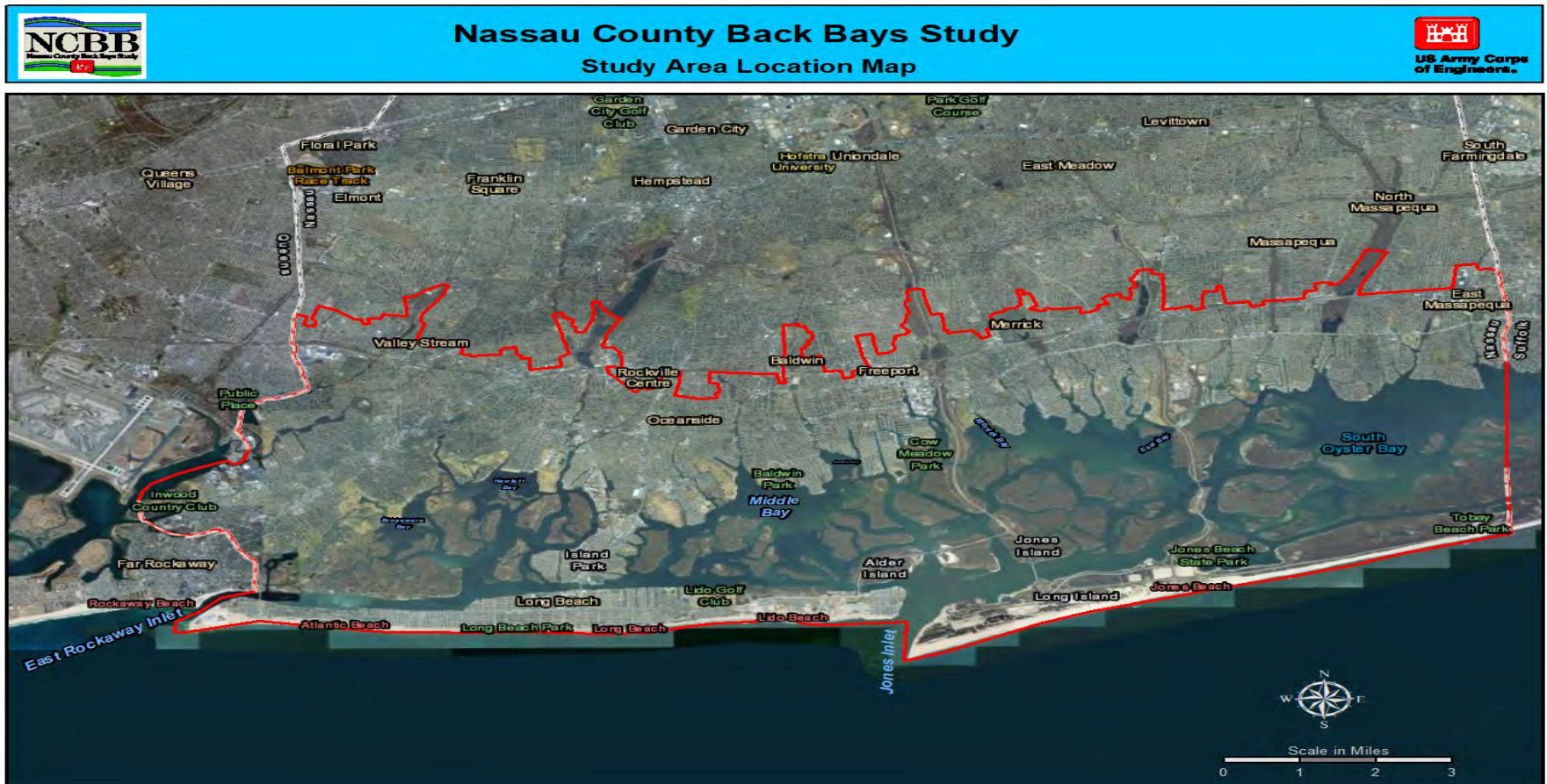
US Army Corps
of Engineers[®]



REFORMULATION

Re-scoped Study Area:

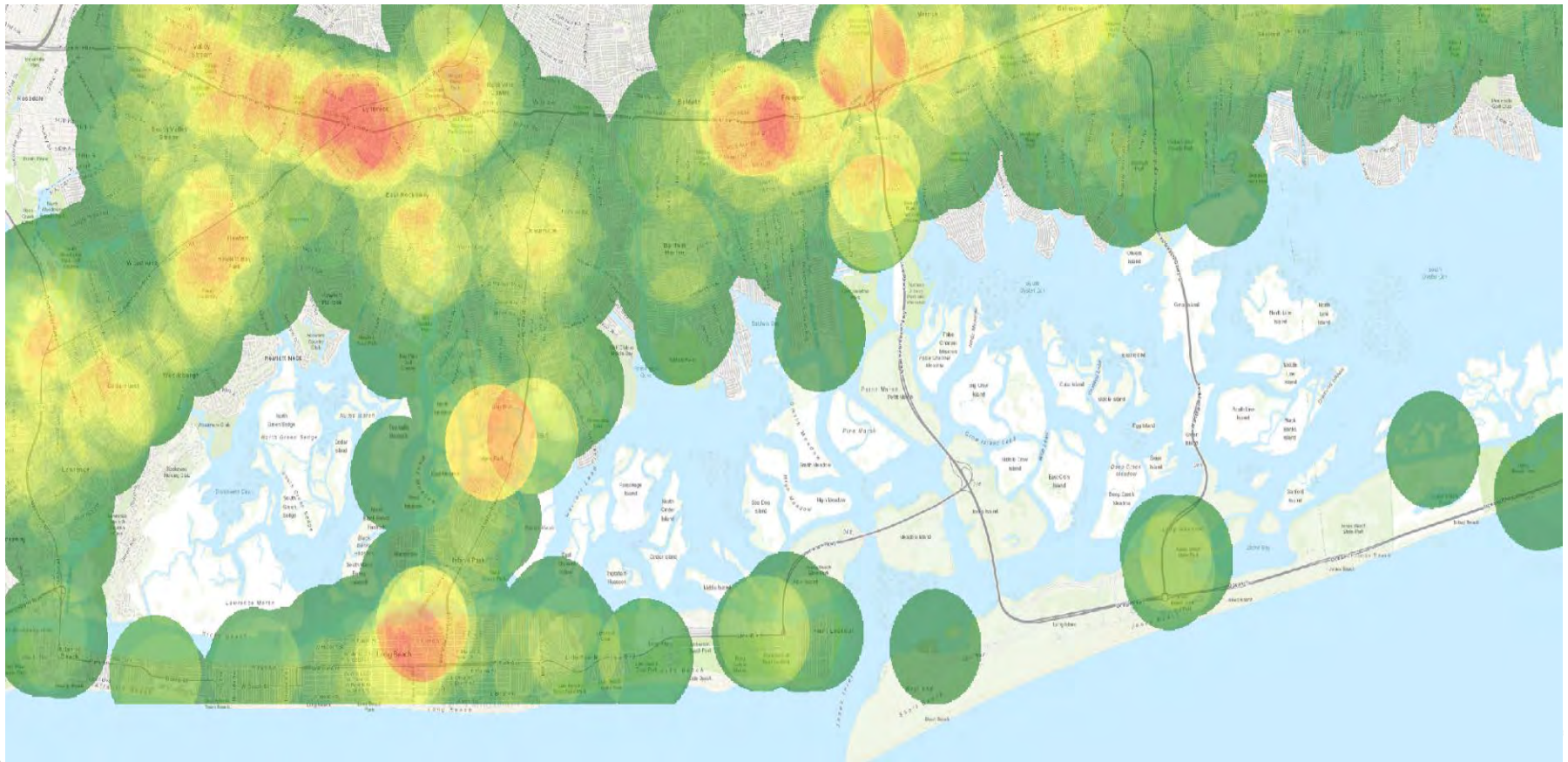
- Northern Boundary/Southern Boundary remain the same
- East/West Boundary – East/West geographical extent of Nassau County
- While the study scope has been revised, the study goal remains to promote resilience and sustainability of the communities in the study area.



REFORMULATION

Identification of Critical Infrastructure: Per the North Atlantic Coast Comprehensive Study (NACCS), critical infrastructure is defined as infrastructure that could be considered essential services, operations, or necessary to ensure civil order.

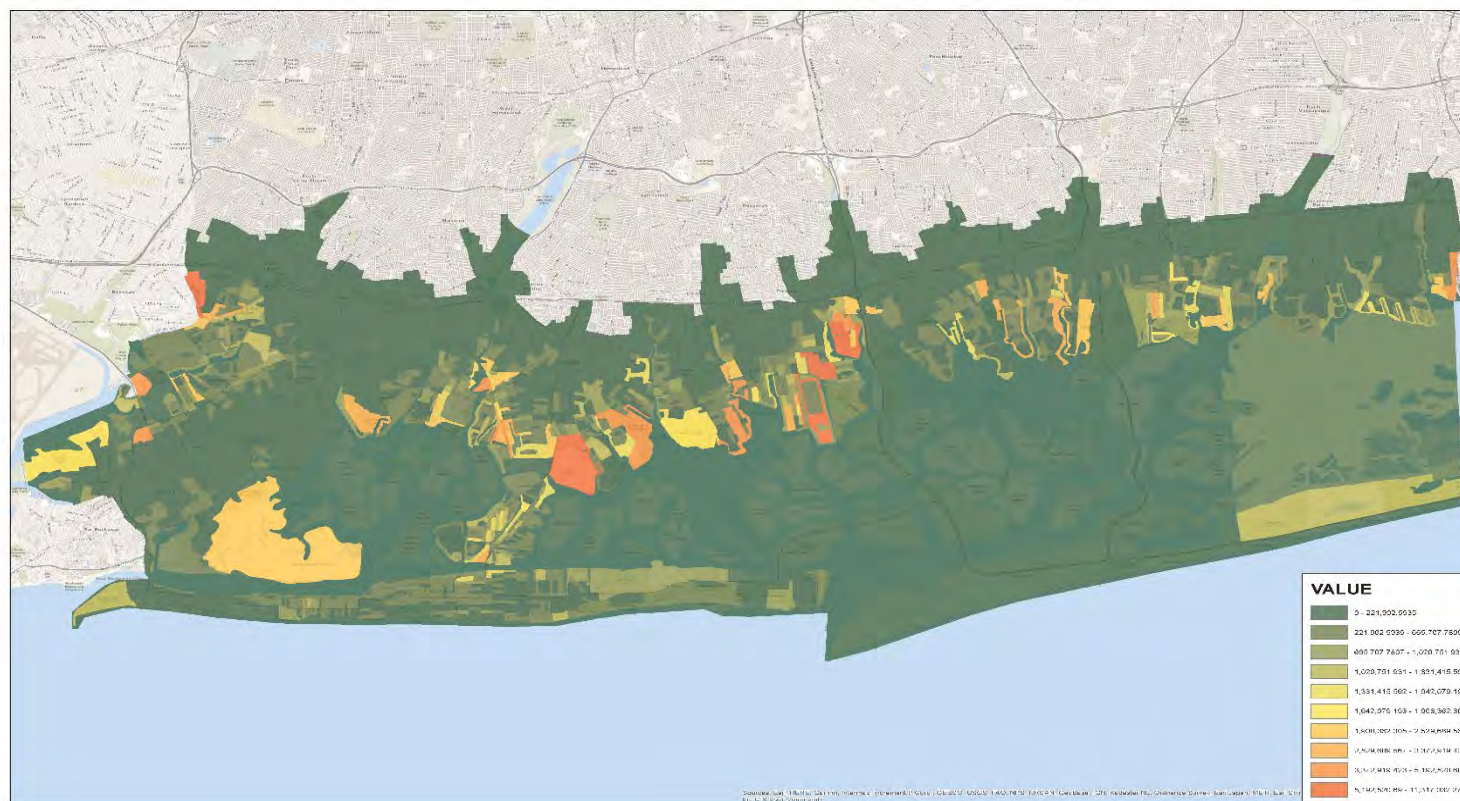
- The NACCS utilized the Department of the Army Field Manual (FM) 3-34.170 to rank infrastructure that supports populations and communities.



REFORMULATION

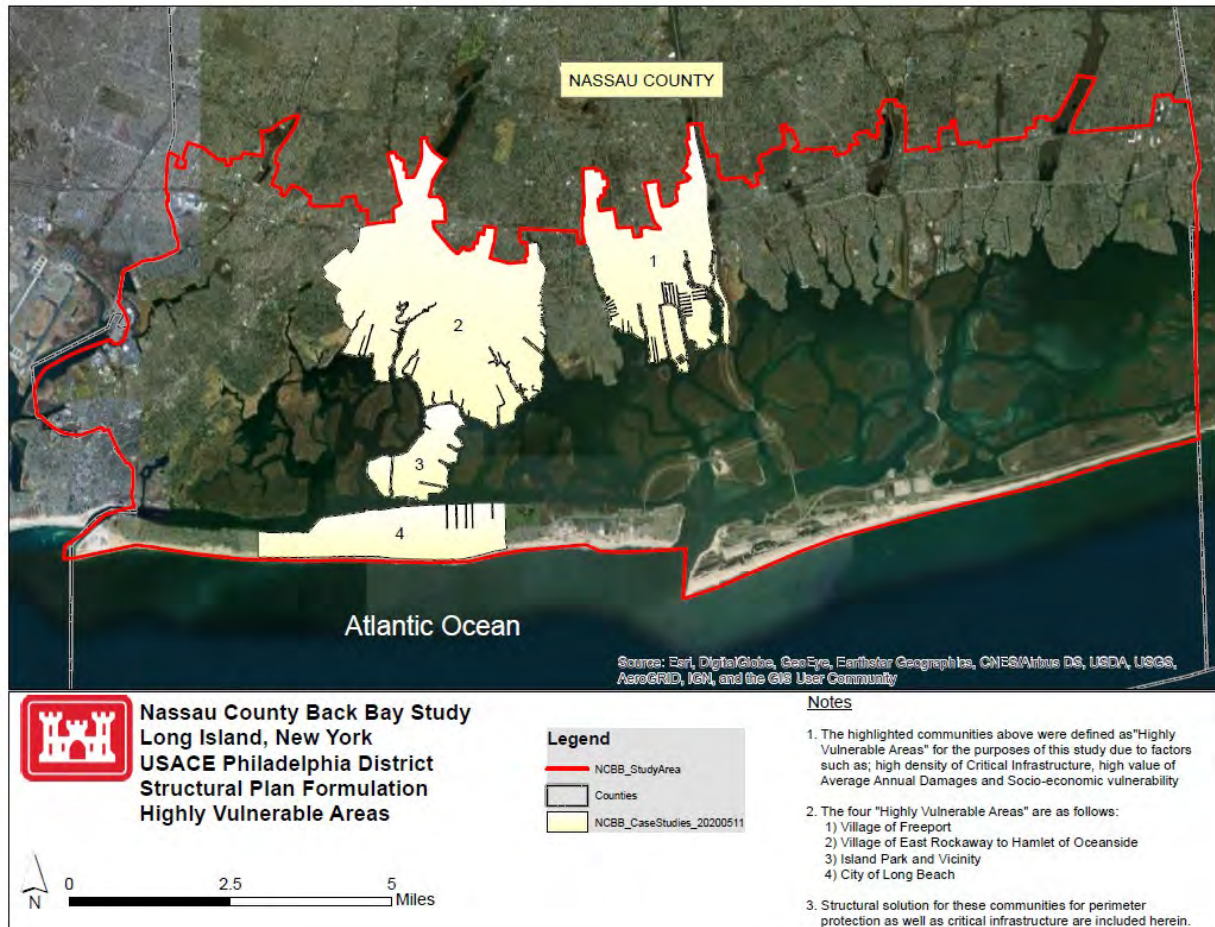
Identification of Highly Vulnerable Areas: Utilized outputs from economic modeling to generate heat map highlighting Average Annual Damage (AAD) distribution in Nassau County.

Nassau County Average Annual Damages (AAD)



REFORMULATION

- Four highly vulnerable areas (encompassing approximately 29% of the land area in Nassau County) were identified with a combination of high Average Annual Damages and critical infrastructure.



FOCUSED ARRAY OF ALTERNATIVES

1. No Action Plan
2. Non-Structural (NS) Countywide Plan
3. Floodwall at City of Long Beach & NS Plan
4. Floodwall at City of Long Beach, East Rockaway & NS Plan
5. Floodwall at City of Long Beach, East Rockaway, Village of Freeport & NS Plan
6. Floodwall at City of Long Beach, East Rockaway, Village of Freeport, Island Park & NS Plan

| Alternative 2: Nonstructural Only | | Alternative 3: Long Beach Floodwall + NS Plan (TSP) | |
|--|-------------|--|-------------|
| Initial Construction | \$8,744,767 | Initial Construction | \$8,854,411 |
| Annual OMRR&R | \$0 | Annual OMRR&R | \$7,771 |
| BCR | 2.3 | BCR | 2.3 |
| AANB | \$391,388 | AANB | \$414,523 |
| Residual Risk | 38.1% | Residual Risk | 34.7% |

| Alternative 4: Long Beach & East Rockaway Floodwalls + NS Plan | |
|---|-------------|
| Initial Construction | \$9,859,044 |
| Annual OMRR&R | \$21,490 |
| BCR | 2.1 |
| AANB | \$416,269 |
| Residual Risk | 29.7% |

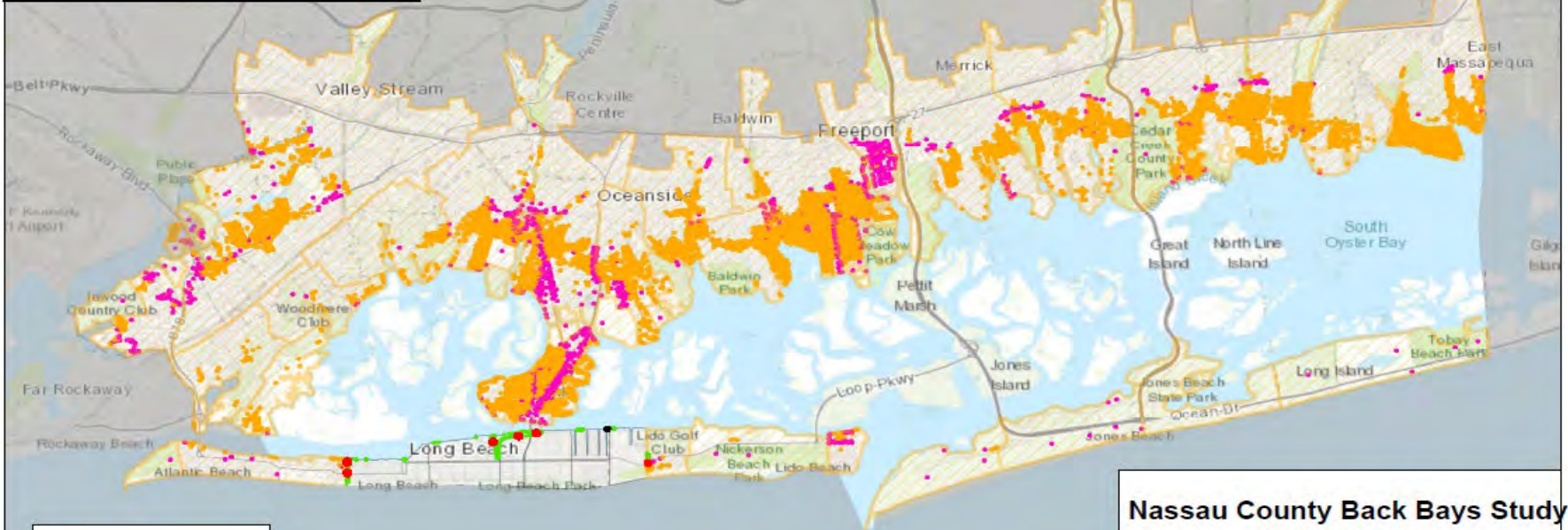
| Alternative 5: Freeport, Long Beach, East Rockaway Floodwalls + NS Plan | |
|--|--------------|
| Initial Construction | \$10,811,674 |
| Annual OMRR&R | \$31,752 |
| BCR | 2.0 |
| AANB | \$406,858 |
| Residual Risk | 26.2% |

| Alternative 6: Freeport, Long Beach, Island Park, East Rockaway Floodwalls + NS Plan | |
|---|--------------|
| Initial Construction | \$12,109,774 |
| Annual OMRR&R | \$42,394 |
| BCR | 1.7 |
| AANB | \$360,589 |
| Residual Risk | 24.9% |



TENTATIVELY SELECTED PLAN

| | |
|---|-------------|
| Alternative 3: Long Beach Floodwall + NS Plan (Costs in Thousands) | |
| Initial Construction | \$8,854,411 |
| Annual OMRR&R | \$7,771 |
| BCR | 2.3 |
| AANB | \$414,523 |
| Residual Risk | 34.7% |



Measures

- Perimeter Wall
- Sluice/Miter Gate
- Road Closure
- Railroad Closure
- Elevate Structure
- Floodproof Structure
- Nonstructural

**Nassau County Back Bays Study
Alternative 3
Long Beach Floodwall & NS Plan**

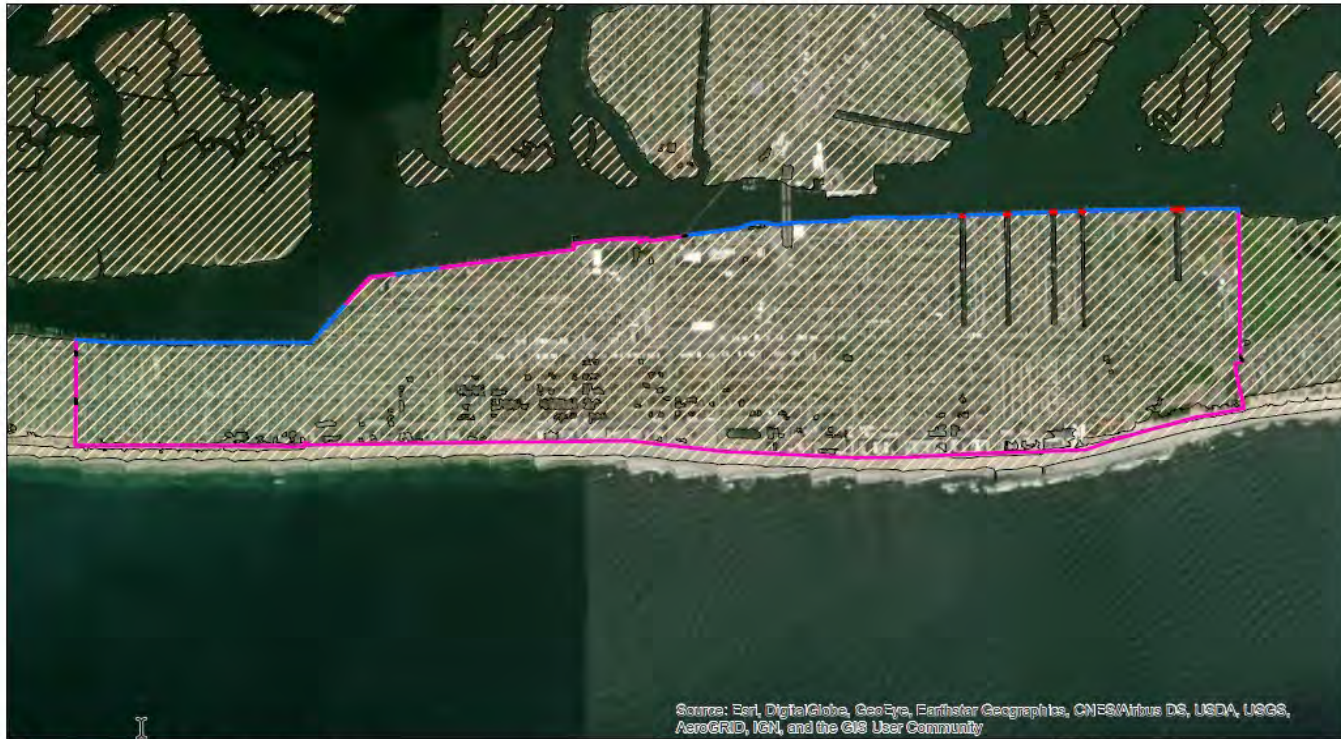
N

Scale in Miles
0 1 2 3

US Army Corps of Engineers

NCBB

TENTATIVELY SELECTED PLAN



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



City of Long Beach
Long Island, NY
Nassau County Back Bay
100 YR PLAN/ 1% AEP

Legend

- MITER-SLUICE GATE - 100 YR
- ROAD-RAIL CLOSURE GATE - 100 YR
- TYPE B WALL - 100 YR
- TYPE C WALL - 100 YR
- NCBB_WL100_Floodplain

Notes

1. 46,400LF of Floodwall Construction to El. +16.0 NAVD88
2. (5) Miter Gates @ El. +16.0 NAVD88
3. (4) Road & (1) Rail Closure Gates @ El. +16.0 NAVD88
4. 100 YR Floodplain Elevation @ +10.3NAVD88



US Army Corps of Engineers®



PINE STREET CANAL – AERIAL VIEW



US Army Corps
of Engineers[®]



PINE STREET CANAL (VIEW FROM WATER) – 1% AEP



Proposed
Miter Gate
(Closed)

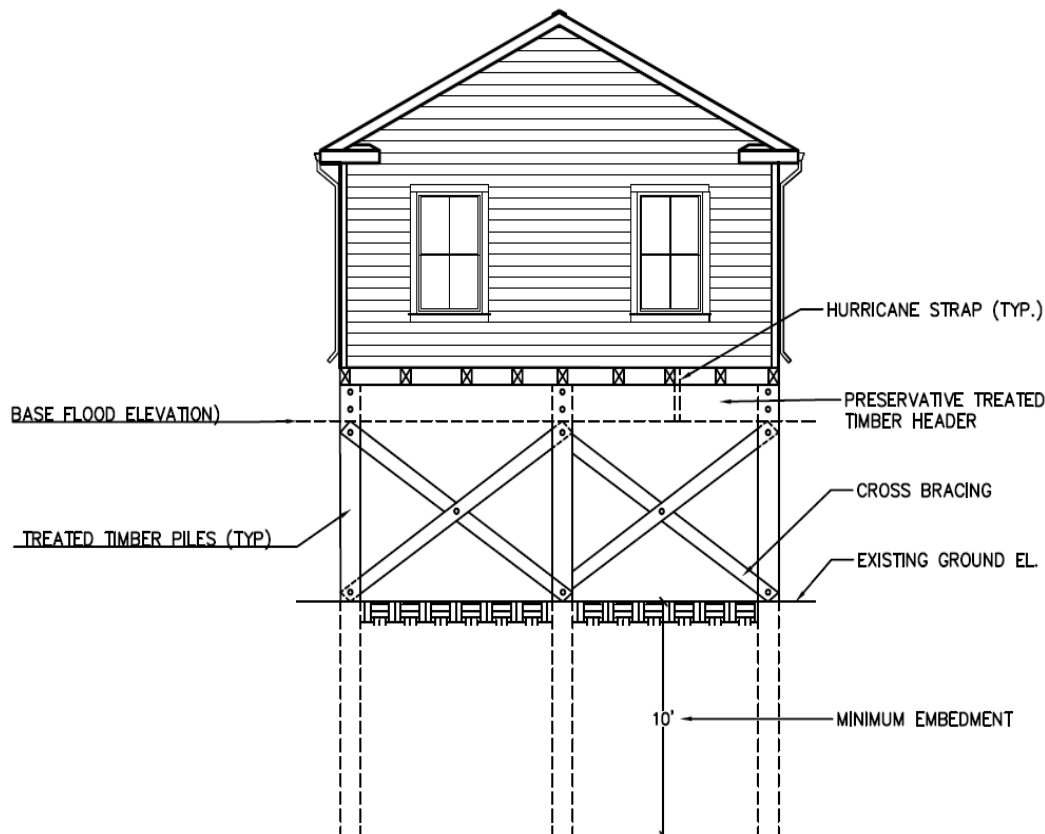
EI. +16.0
NAVD88
Floodwall

PINE STREET CANAL (VIEW FROM LAND) – 1% AEP



TENTATIVELY SELECTED PLAN NON-STRUCTURAL MEASURES

1. **Elevation** of eligible residential structures will consist of elevating structures to the modeled 1% AEP (100-year return period) non-structural design water surface elevation, which includes intermediate sea level change projected to 2080 and all risk and uncertainty.*
2. **Acquisition** or relocation of residential structures that would require elevation over 12 ft above ground level and properties in poor condition. Property owners would receive fair market value for the property acquired and relocation benefits.



**Elevating structures greater than 12 ft above ground level introduces damage risk from winds during tropical events as a new condition. This height generally serves as a differentiator for insurance rates for wind/hail coverage as well and is therefore used as the upper limit for elevating structures.*

**Elevation will not be below the local regulatory requirement.*



US Army Corps
of Engineers[®]



TENTATIVELY SELECTED PLAN NON-STRUCTURAL MEASURES

Dry Floodproofing of non-residential and public structures (Example – Island Park Fire Department)

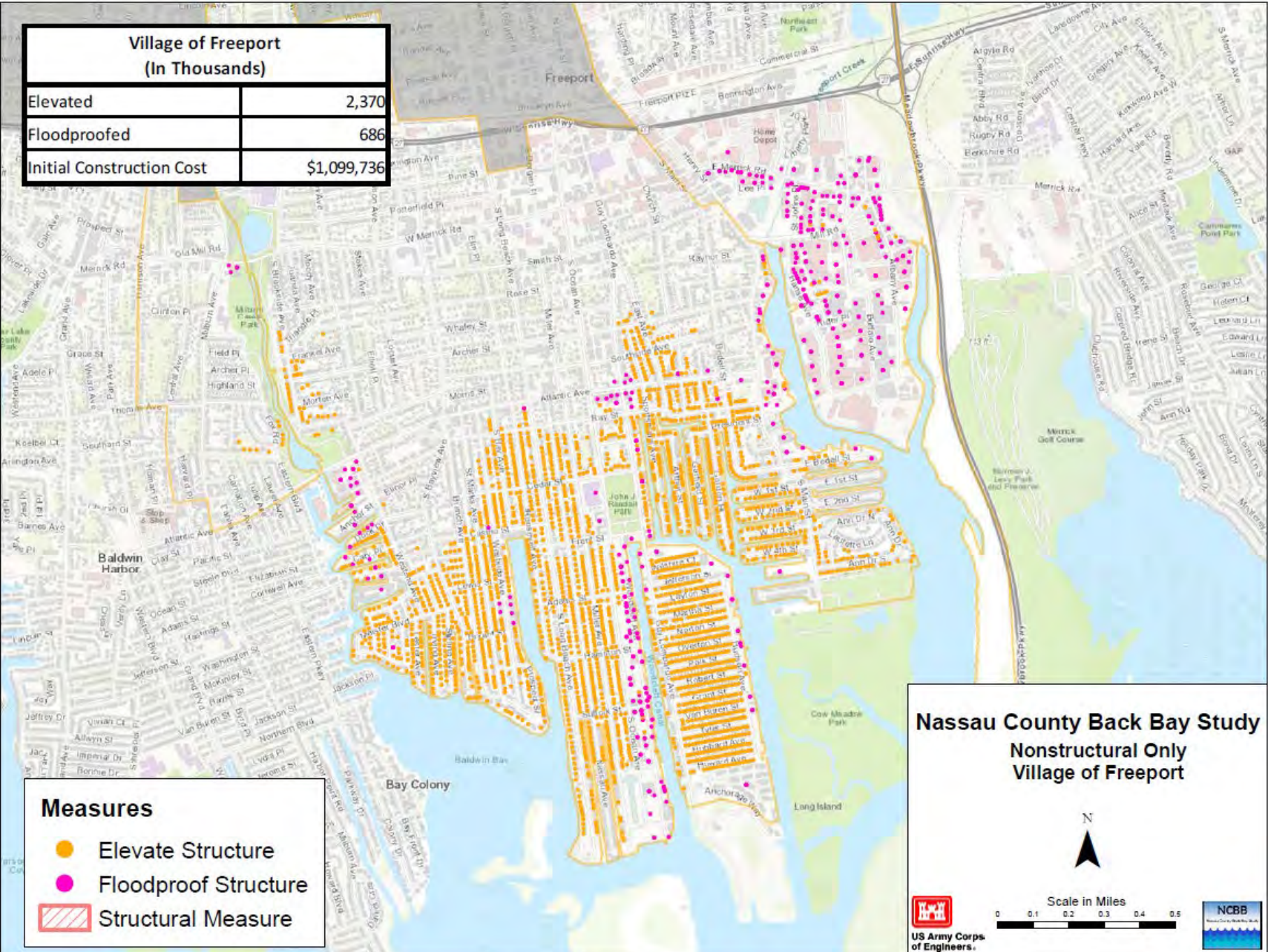


Dry flood proofing is analyzed to provide CSRМ benefits associated with 3 ft. of vertical construction. A structural analysis is required to determine if a higher vertical construction level can be applied and be able to withstand the additional forces from the increase in water height.

| | | | | |
|--|--|---|---|---|
| | <p>Village of Island Park Long Island, NY Nassau County Back Bay Small-Medium Public Facility Non-Structural Plan</p> | <p>Legend</p> <ul style="list-style-type: none"> Stop Logs (Garage Door) Flood Shield (Pedestrian Door) Utility Elevation Pipe Penetration | <p>Notes</p> <ol style="list-style-type: none"> 1. Waterproof Membrane to be applied to entire building perimeter, at a maximum of 3' from ground. 2. (5) Stop Logs to be installed at Garage Entrances. 3. (4) Flood Shields to be installed at Building Entrance Points. 4. (6) Pipe Penetration locations to be sealed & (8) Sq. Ft. of Utilities to be elevated. | <p>Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS,</p> |
|--|--|---|---|---|

Village of Freeport (In Thousands)

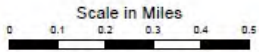
| | |
|---------------------------|-------------|
| Elevated | 2,370 |
| Floodproofed | 686 |
| Initial Construction Cost | \$1,099,736 |



Measures

- Elevate Structure
- Floodproof Structure
- Structural Measure

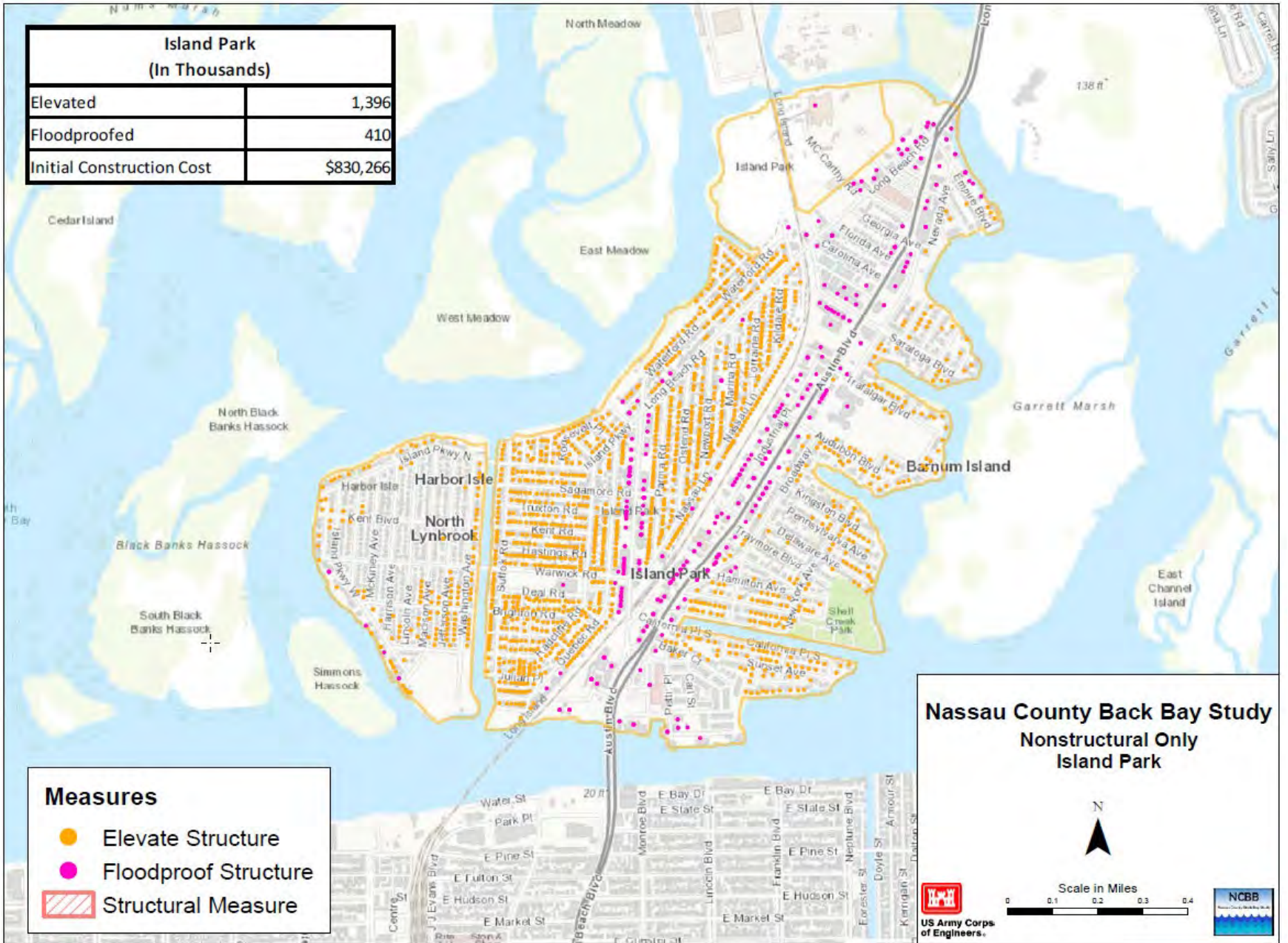
Nassau County Back Bay Study Nonstructural Only Village of Freeport



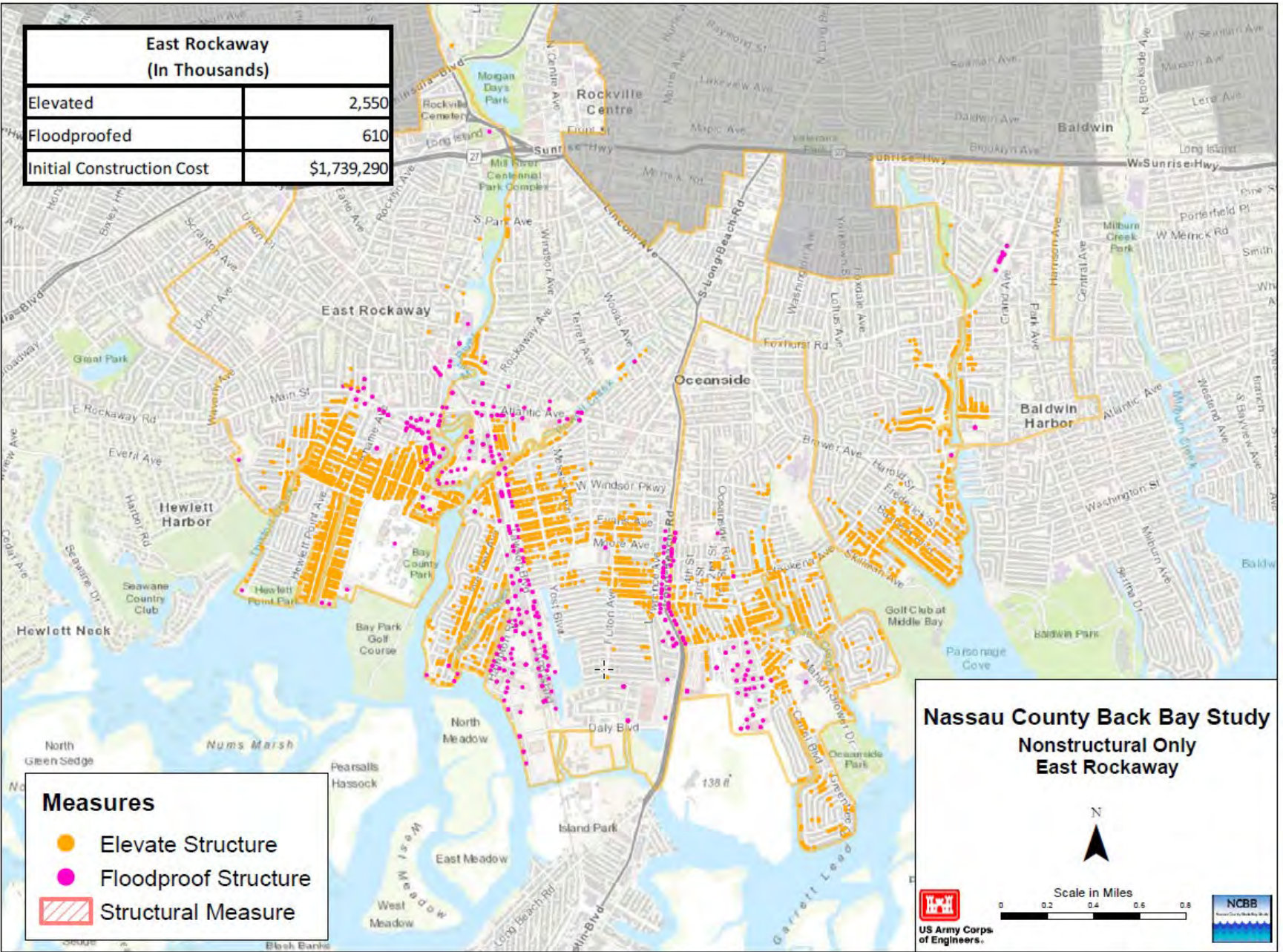
US Army Corps of Engineers



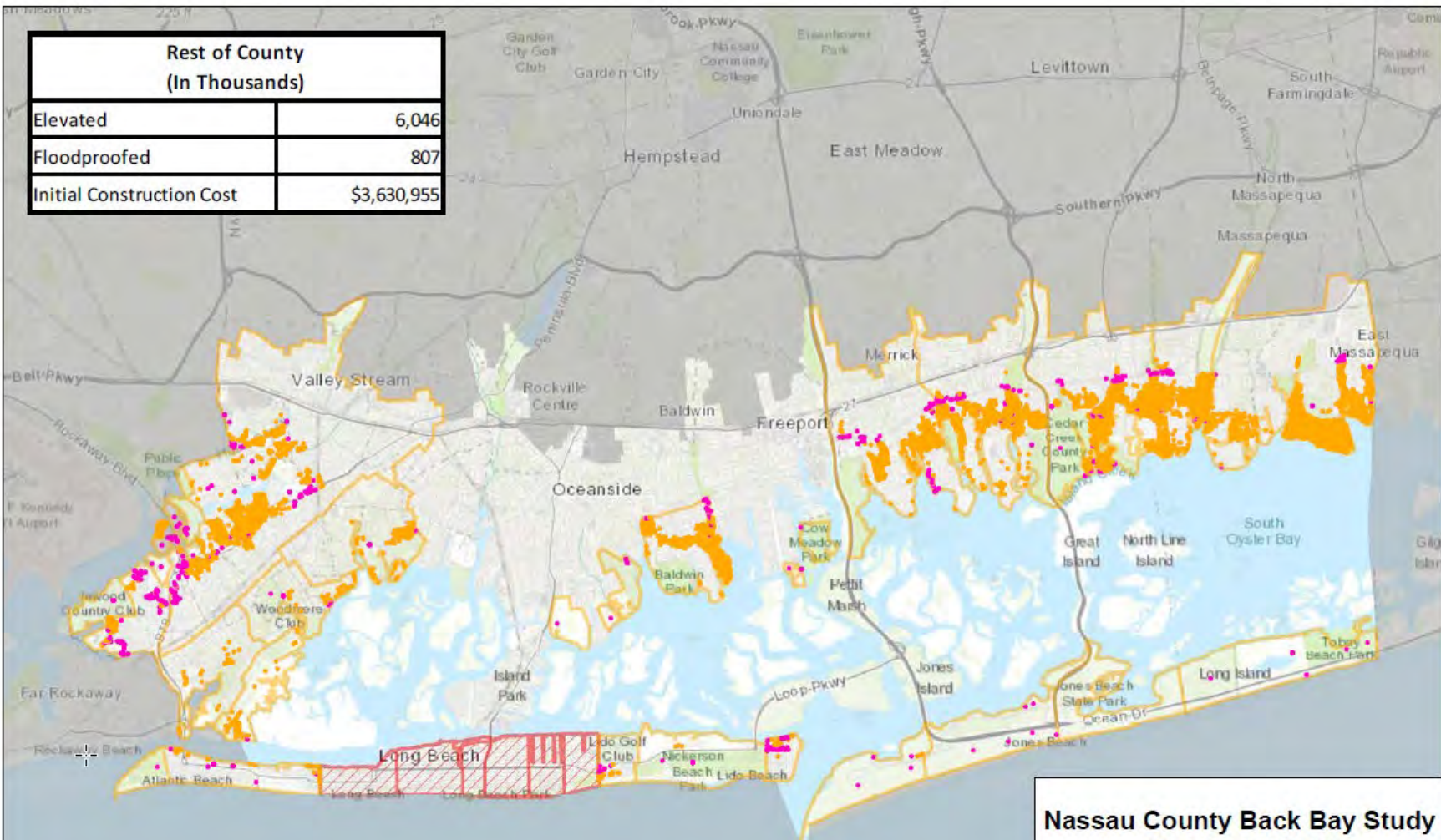
| Island Park (In Thousands) | |
|-------------------------------|-----------|
| Elevated | 1,396 |
| Floodproofed | 410 |
| Initial Construction Cost | \$830,266 |



| East Rockaway (In Thousands) | |
|---------------------------------|-------------|
| Elevated | 2,550 |
| Floodproofed | 610 |
| Initial Construction Cost | \$1,739,290 |



| Rest of County (In Thousands) | |
|----------------------------------|-------------|
| Elevated | 6,046 |
| Floodproofed | 807 |
| Initial Construction Cost | \$3,630,955 |



Measures

- Elevate Structure
- Floodproof Structure
- Structural Measure

**Nassau County Back Bay Study
Nonstructural Only
Rest of County**

N

Scale in Miles
0 1 2 3

ONGOING ADDITIONAL ANALYSIS

1. Complementary structural (localized floodwalls) and non-structural measures to further reduce risk to critical infrastructure.
2. Complementary Natural and Nature-Based Features (NNBF) measures to provide added Coastal Storm Risk Management while potentially improving ecosystem services.



US Army Corps
of Engineers[®]



NCBB STRUCTURAL CRITICAL INFRASTRUCTURE MEASURES

EF Barrett Power Station

Bay Park Reclamation Facility



Planned



Existing



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



**Island Park & Vicinity
Long Island, NY
Nassau County Back Bay
Critical Infrastructure Plan
100 YR PLAN/ 1% AEP**

Legend

- TYPE C WALL - 100YR CI
- SLUICE-MITER GATE - 100YR CI
- ROAD-RAIL CLOSURE GATE - 100YR CI
- NCBB Map Deck - Meeting

Notes

1. 6,950LF of Floodwall Construction to El. +16.0 NAVD88
2. (2) Sluice Gates @ El. +16.0 NAVD88
3. (2) Road Closure Gates @ El. +16.0 NAVD88
4. 100 YR Floodplain Elevation @ +10.3 NAVD88





Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



**City of Long Beach
Long Island, NY
Nassau County Back Bay
Critical Infrastructure Plan
100 YR/ 1% AEP**

Legend

-  TYPE C WALL - 100 YR CI
-  ROAD-RAIL CLOSURE GATE - 100 YR CI
-  NCBB_WL100_Floodplain


Notes

1. 10,280LF of Floodwall Construction to El. +16.0 NAVD88
2. (3) Road & (1) Railroad Closure Gates @ El. +16.0 NAVD88
3. 100 YR Floodplain Elevation @ +10.3 NAVD88
4. Key Facilities Protected As Shown.





Village of Freeport
Long Island, NY
Nassau County Back Bay
Critical Infrastructure Plan
100 YR/ 1% AEP



0 1,000 2,000 Feet

Legend

- TYPE B WALL - 100YR CI
- TYPE C WALL - 100YR CI
- SLUICE-MITER GATE - 100YR CI
- ROAD-RAIL CLOSURE - 100YR CI
- NCBB_WL100_Floodplain

Notes

1. 12,250LF of Floodwall Construction to Elevation @ El. +16.0 NAVD88
2. (2) Road Closure Gates @ El. +16.0 NAVD88
3. 100 YR Floodplain Elevation @ +9.7 NAVD88
4. Key Facilities Protected As Shown



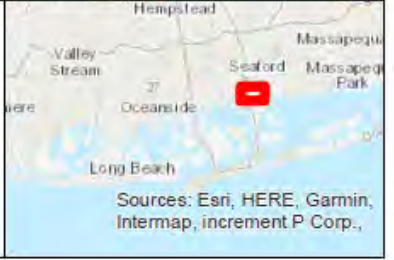
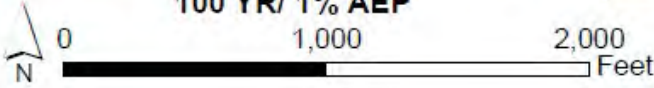
Sources: Esri, HERE, Garmin, Intermap, increment P Corp.,



Wastewater Treatment Plant
Hamlet of Wantagh, NY
Nassau County Back Bay
Critical Infrastructure Plan
100 YR/ 1% AEP

| Legend | |
|--------|-----------------------------------|
| | TYPE C WALL - 100YR PLAN CI |
| | ROAD-RAIL CLOSURE - 100YR PLAN CI |
| | NCBB_WL100_Floodplain |

- Notes**
1. 9,100LF of Floodwall Construction to Elevation @ El. +16.0 NAVD88
 2. (2) Road Closure Gates @ El. +16.0 NAVD88
 3. 100 YR Floodplain Elevation @ +8.6 NAVD88
 4. Key Facilities Protected As Shown




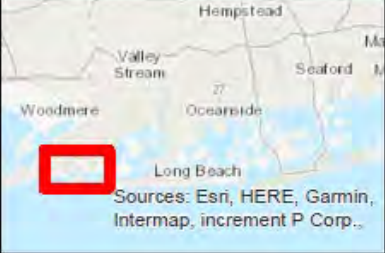
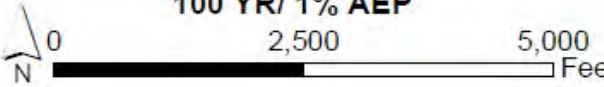





NCBB CRITICAL INFRASTRUCTURE MEASURES

HIGH RISK EVACUATION ROUTES

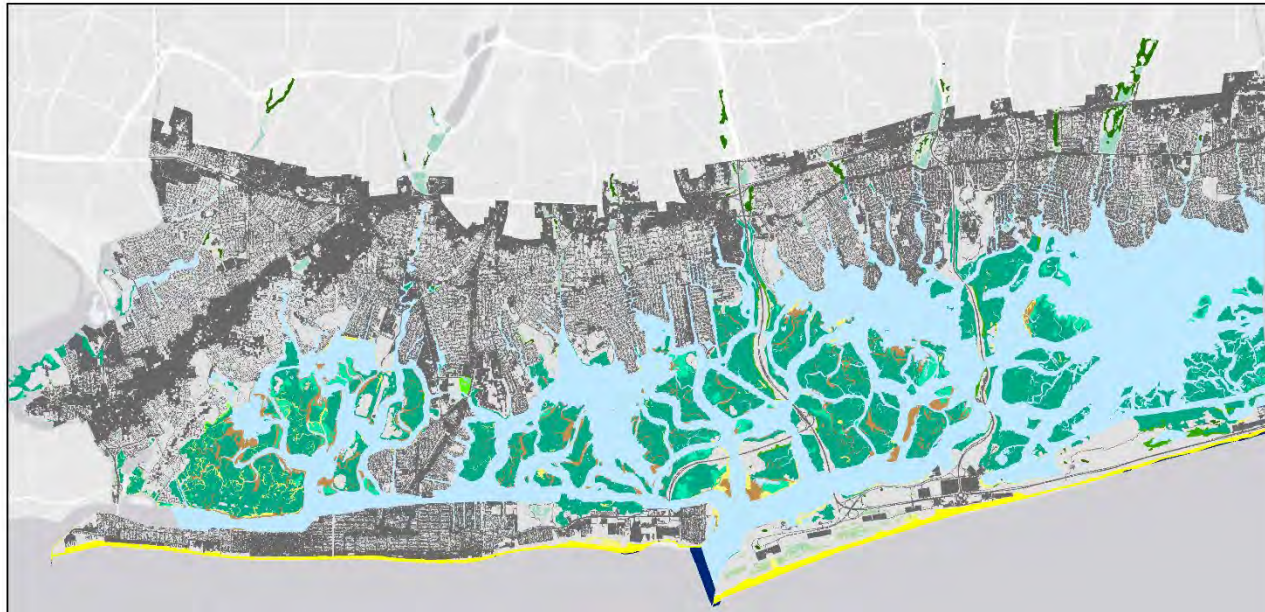
- **Route 1**
 - Section 1
 - Section 2
 - Section 3
 - Section 4
- **Route 2**
 - Section 1
 - Section 2
 - Section 3
- **Route 3**
 - Section 1
 - Section 2
- **Route 4**
 - Section 1





| | | | | | |
|--|--|--|---|--------------|--|
|  | Evacuation Route Protection Far Rockaway, NY Nassau County Back Bay Critical Infrastructure Plan 100 YR/ 1% AEP | | Legend | Notes |  <p>Sources: Esri, HERE, Garmin, Intermap, increment P Corp.,</p> |
| |  |  MITER-SLUICE GATE - 100YR CI PLAN  ROAD-RAIL CLOSURE - 100YR CI PLAN  TYPE C WALL - 100YR CI PLAN  NCBB_StudyArea_02Aug2018  NCBB_WL100_Floodplain | <ol style="list-style-type: none"> 1. 8,200LF of Floodwall Construction to Elevation @ El. +16.0 NAVD88 2. (9) Road Closure Gates & (1) Sluice Gate @ El. +16.0 NAVD88 3. 100 YR Floodplain Elevation @ +8.6 NAVD88 4. Key Route Protected As Shown | | |

NCBB STRUCTURAL NATURAL AND NATURE-BASED FEATURES (NNBF)



Existing Conditions

- Intertidal marsh (~83%)
- High marsh (~17%)
- Freshwater marsh (<1%)

Wetland Loss: 1974 to 2008* (~15% loss)

- Conversion: high marsh to intertidal marsh
- Formation: pannes and ponds within marshes
- Widening: tidal creeks and manmade ditches
- Erosion/retreat: seaward edge
- *Phragmites* encroachments

* New England Interstate Water Pollution Control Commission.
2015. *Long Island Tidal Wetlands Trends Analysis*.



US Army Corps
of Engineers[®]



NCBB STRUCTURAL NATURAL AND NATURE-BASED FEATURES (NNBF)

**Protection/preservation of marsh vegetation
using NNBF could:**

- Slow storm surge
- Dissipate wave energy
- Enhance adaptive capacity of the system
- Provide wildlife and fisheries habitat
(Including for Threatened & Endangered
Species)



US Army Corps
of Engineers[®]



PATH FORWARD

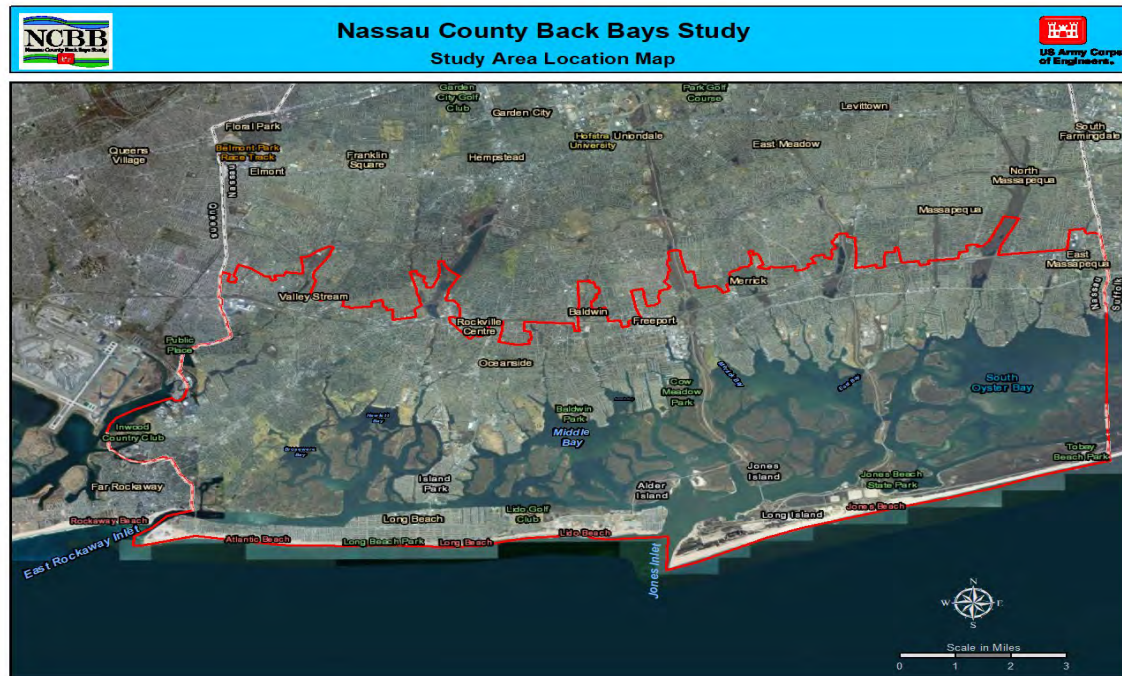
- Additional Outreach
- Tentatively Selected Plan (TSP) Milestone Meeting
- Release of Draft Feasibility Report/Environmental Impact Statement
- 45-Day Public Review/Comment Period



US Army Corps
of Engineers[®]



QUESTIONS/COMMENTS



- Email USACE: PDPA-NAP@USACE.ARMY.MIL
- Email New York State DEC: Ryan.Hodgetts@dec.ny.gov