



# Staten Island Feasibility Study

- Phase 1 (Fort Wadsworth to Oakwood Beach)
- Sandy Impacts
- Alternatives assessed
- Proposed Plan Optimization & Details
- Sponsor responsibilities
- Next Steps; Schedule



# Coastal Storm Risk Management

- Disaster Relief Appropriations Act of 2013; Public Law 113-2; provides construction authority and Federal funding
- PL 113-2 objectives: demonstrate project is economically justified, technically feasible, environmentally acceptable
- Evaluate feasibility of Federal participation in implementing solutions to problems and opportunities associated with storm damage and erosion control in study area



# Non-Federal Project Partners

- Project Sponsor is New York State  
Department of Environmental Conservation (NYSDEC)
- NYSDEC in cooperation with the City of New York:
  - NYC Mayor's Office, NYCDEP, NYCDPR, NYCDOT
- NPS properties (Miller Field + Great Kills)
- 100% Federal cost to complete feasibility study
- Construction to be cost-shared in accordance with Project Partnership Agreement, once executed
  - 65% Federal
  - 35% non-Federal



# Study Area Phase 1 + Phase 2

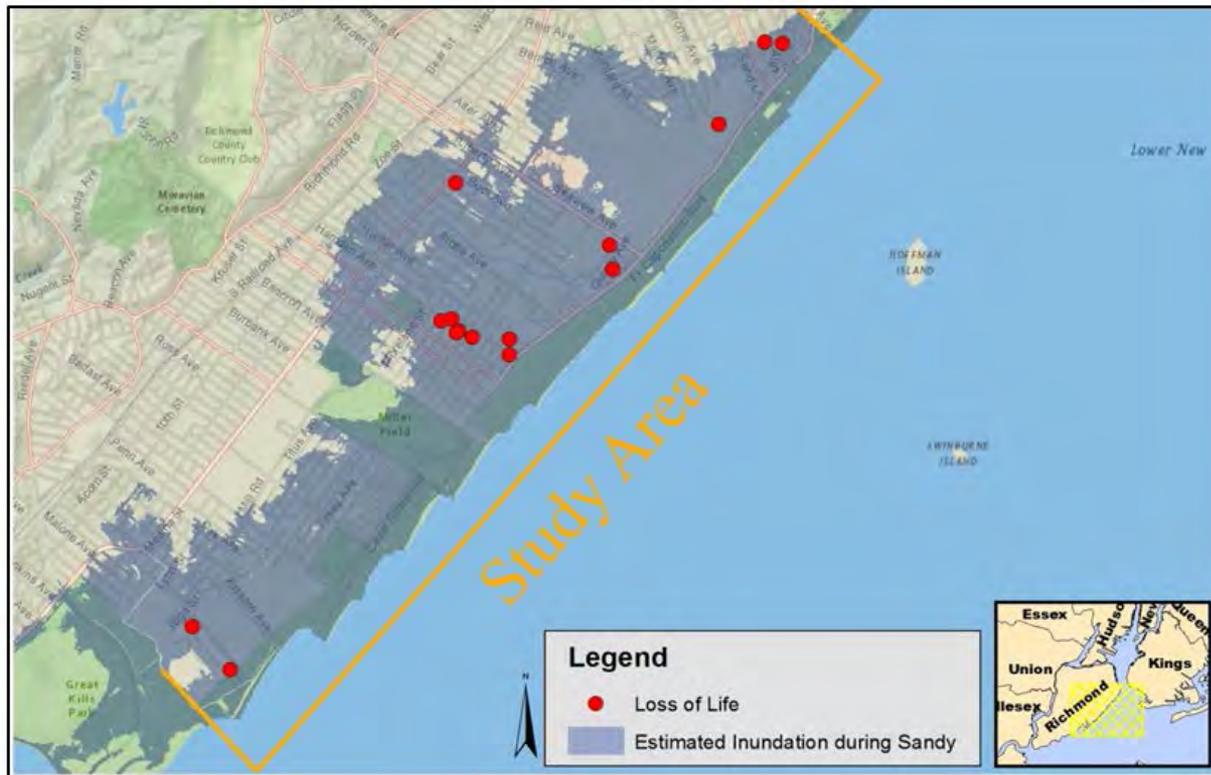
**Phase 1 = Fort Wadsworth to Oakwood Beach**

Phase 2 = Great Kills to Tottenville (separate action)



# Hurricane Sandy

- Hurricane Sandy generated record storm surges
- Several deaths in area, with thousands of buildings damaged or destroyed



# Hurricane Sandy



# Hurricane Sandy

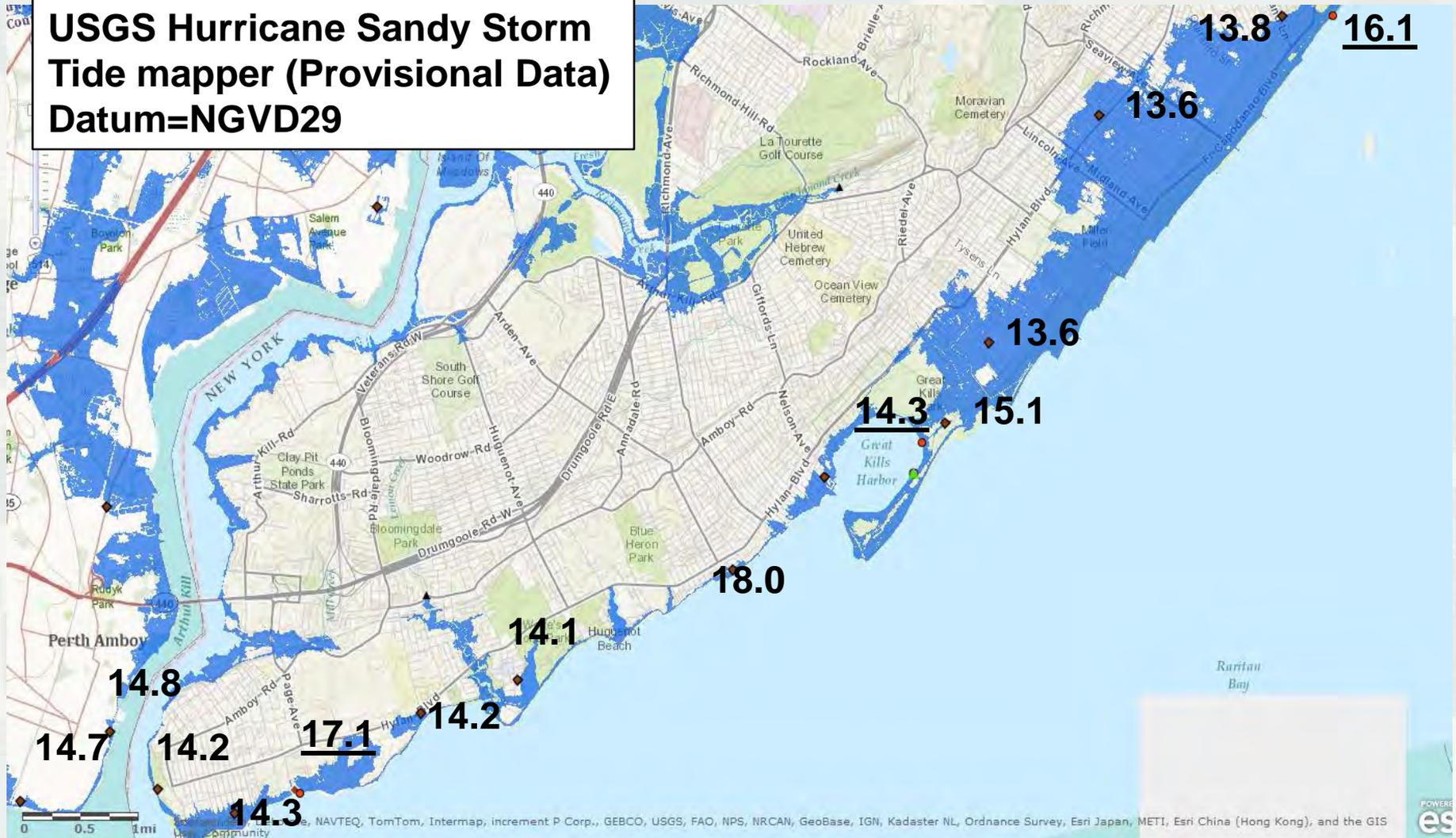


# Hurricane Sandy



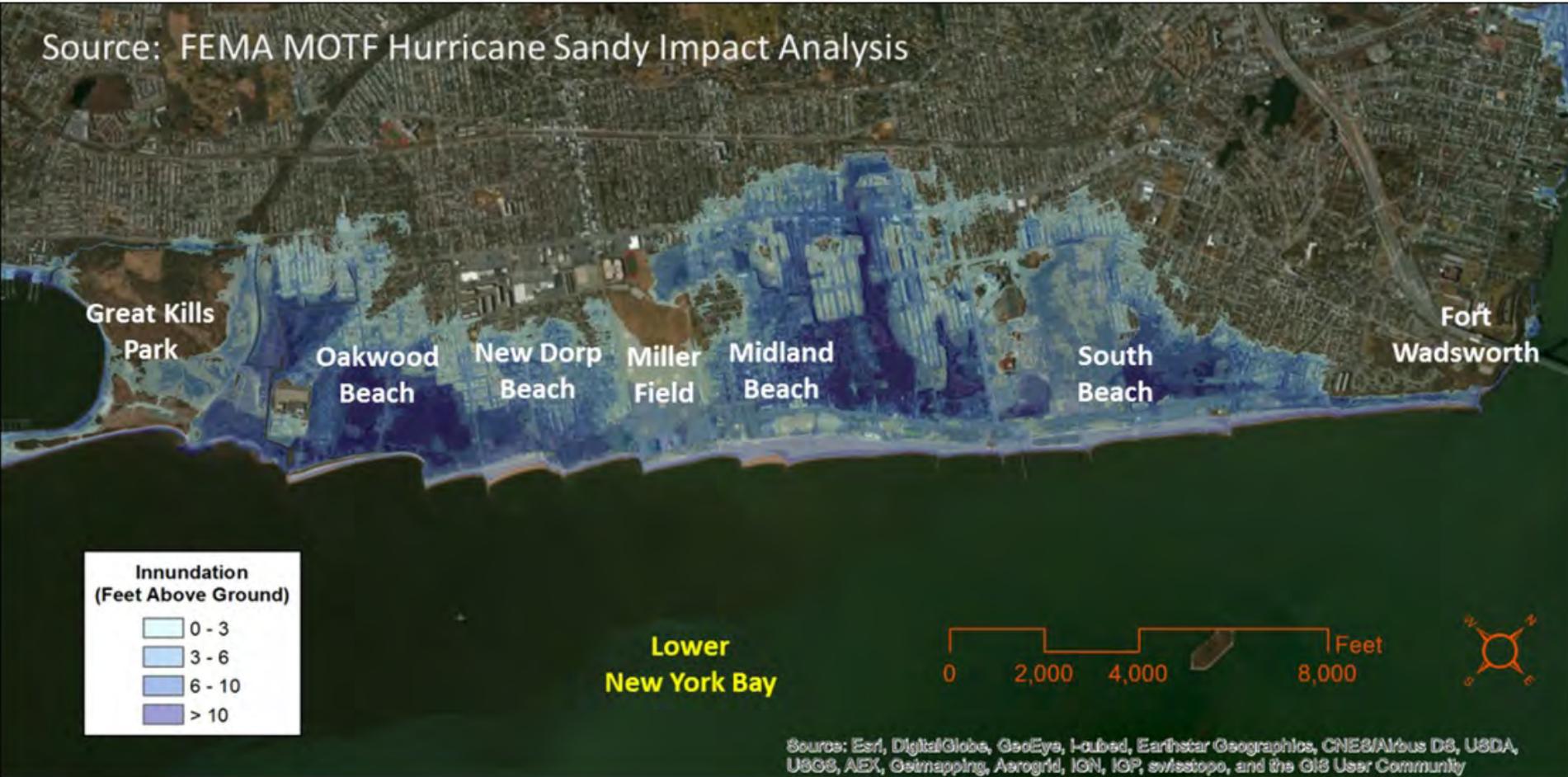
# Hurricane Sandy Impacts

**USGS Hurricane Sandy Storm  
Tide mapper (Provisional Data)  
Datum=NGVD29**



# Hurricane Sandy Inundation

Source: FEMA MOTF Hurricane Sandy Impact Analysis



# Without-project Future Conditions

## Without-project future conditions

- Continued flooding during severe future storm events
- Continued wave impacts to unprotected shoreline
- Continued development and fill of low-lying storage areas
- Without-project damages estimated over \$34 million annually based on 50-year period of analysis (coastal inundation and interior flood damages)

## Sea Level Change

- Storm tide inundation expected to increase over time, resulting in increase of 0.7 ft over 50-year period of analysis



# Preliminary Alternatives

Alternatives designed to provide same level of coastal storm risk management; Analyzed to determine highest net benefits

- No Action
- Non-Structural – floodproofing, buyouts
- Alternative #1 - beach fill, seawall, floodwall, levee
- Alternatives #2 & #3 – variations of Father Capodanno road raising, buried seawall/armored levee, floodwall, levee
- Alternative #4 – buried seawall/armored levee, floodwall, levee



# Comparison of Preliminary Alternatives

## No Action or Non-structural

- Excessive costs

## Alternative #1

- High beach fill quantity required (over 3.2 million CY)
- May disrupt present balance and stability of existing beach front
- Difficult to maintain design shoreline; substantial future nourishments; may not maintain design dimensions when exposed to multiple design storm events

## Alternatives #2/3

- Raising Father Capodanno has significant impacts

## Alternative #4 – PROPOSED PLAN (buried seawall/armored levee)

- **Lowest estimated cost and greatest net benefits**
- **Withstand multiple storms**



# Optimization of the Proposed Plan

- **Alternative #4 buried seawall/armored levee is proposed plan**
- Various stillwater design levels analyzed for optimization
- **+15.6 ft. stillwater design provides maximum net benefits**

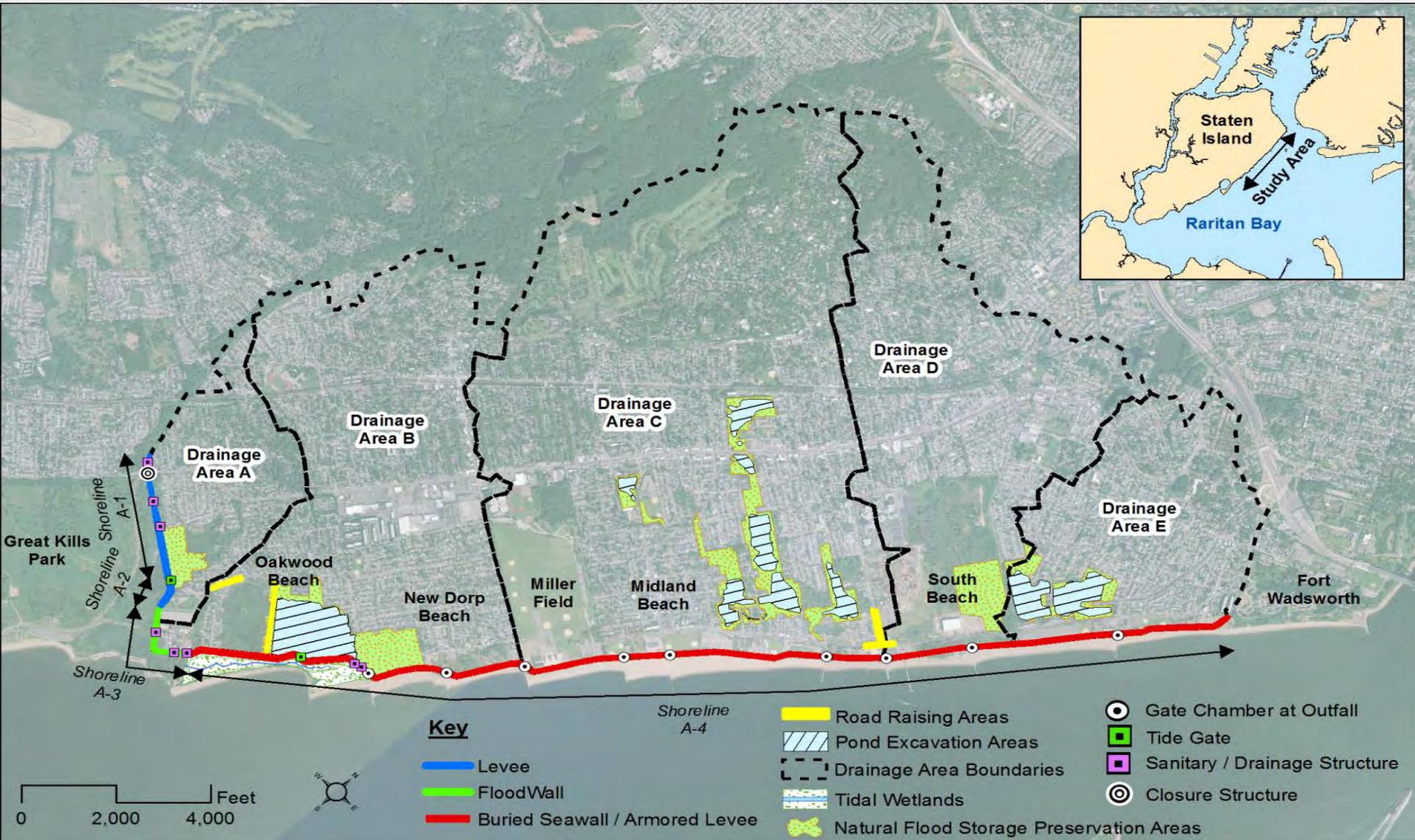
**Table 23 – Economic Comparison of Stillwater Designs**

Scenario	13.3 ft. NGVD 1929 Stillwater Design	14.3 ft. NGVD 1929 Stillwater Design	15.6 ft. NGVD 1929 Stillwater Design	16.6 ft. NGVD 1929 Stillwater Design
Annual Benefits	\$22,098,000	\$24,972,000	\$27,732,000	\$29,252,000
Annual Costs	\$17,690,400	\$19,005,400	\$21,551,400	\$23,603,400
Net Benefits	\$4,407,600	\$5,966,600	\$6,180,600	\$5,648,600
BCR	1.2	1.3	1.3	1.2
<b>Selected as NED Plan</b>			✓	

Rounded to the nearest thousand, 3.375% Discount Rate



# Proposed Plan Layout



# Oakwood Beach Area

Hylan Blvd (near Buffalo St)  
to  
Oakwood Beach Treatment Plant



# Road Closure gate @ Hylan Blvd + Levee + Tide Gate + Acquisition/Preservation of open space



# Levee (Hylan Blvd to Oakwood Treatment Plant)

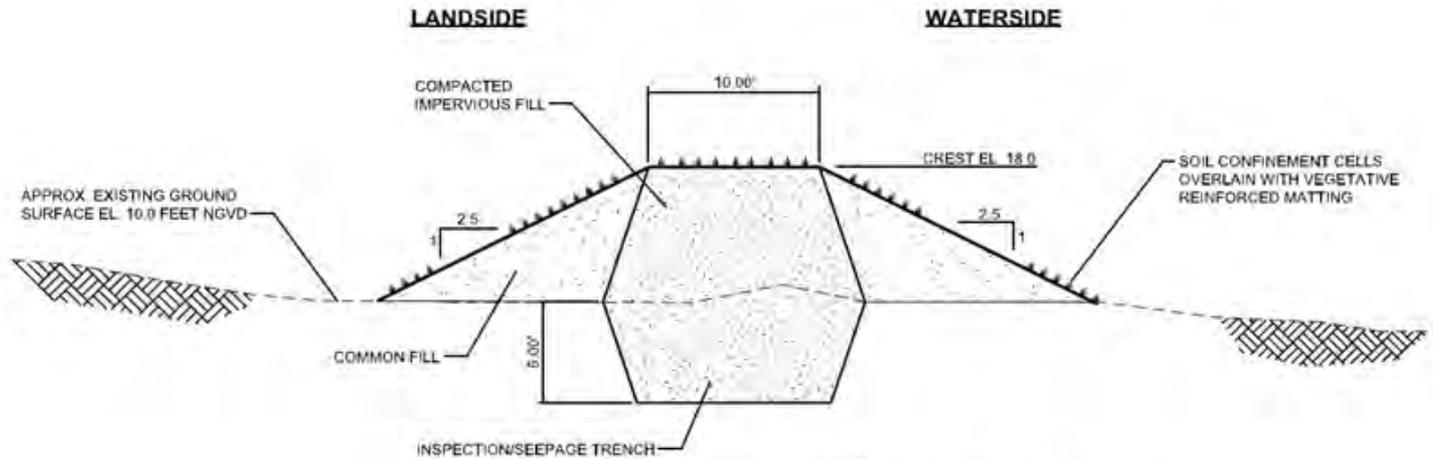


Figure 27 - Levee Typical Section (Reach A-1)

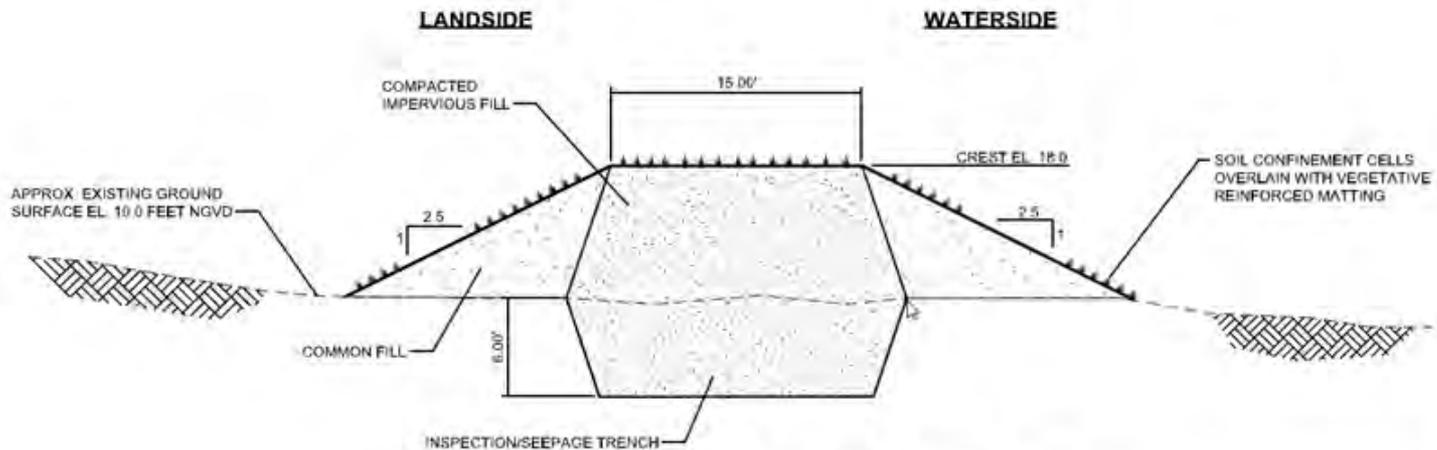


Figure 28 - Levee Typical Section (Reach A-2)



# Tide Gate (Oakwood Creek)

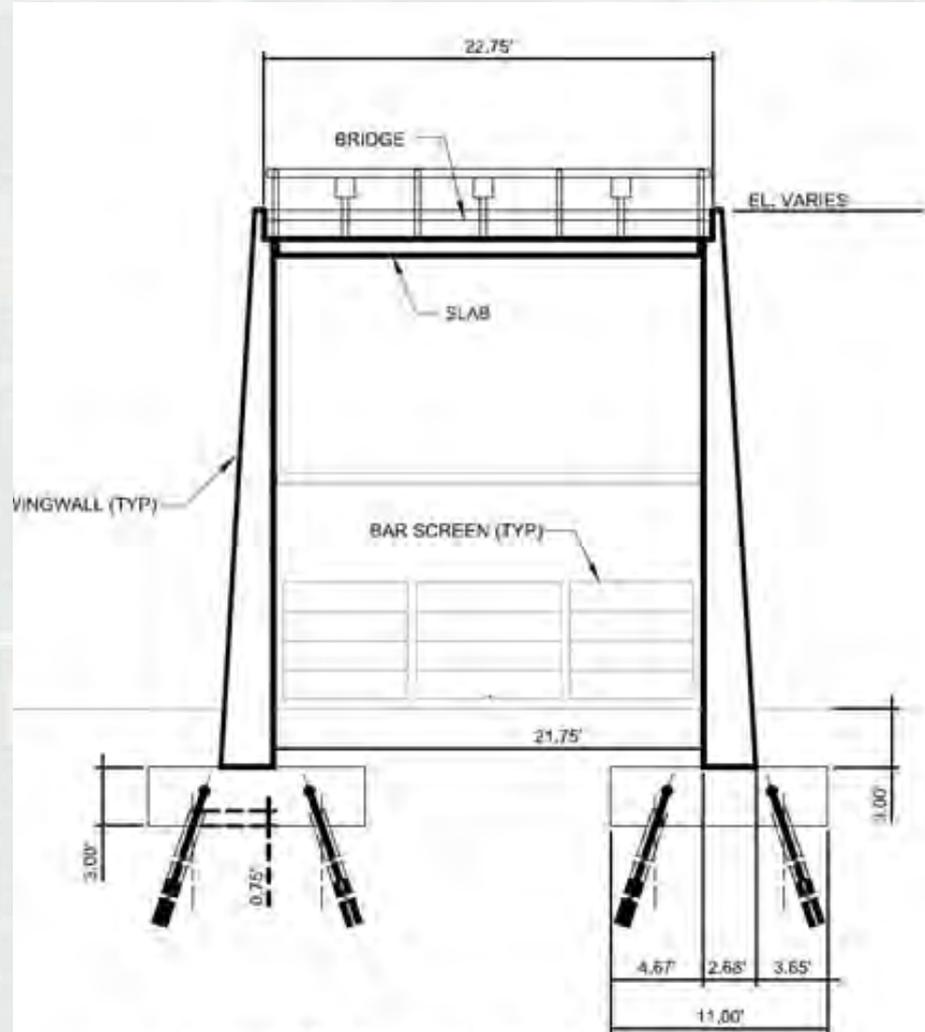


Figure 36 - Typical Section Tide Gate



# Acquisition/Preservation of open space



# Oakwood Beach & New Dorp Beach Areas

Oakwood Beach Treatment Plant  
thru  
Miller Field



Floodwall + Buried Seawall + Outfall chambers + Tidal Wetlands  
 + Tide Gate + Remove Oakwood Tide Gate + Road Raisings  
 + Acquisition/Preservation/Excavation of open space



# Floodwall around Oakwood Treatment Plant

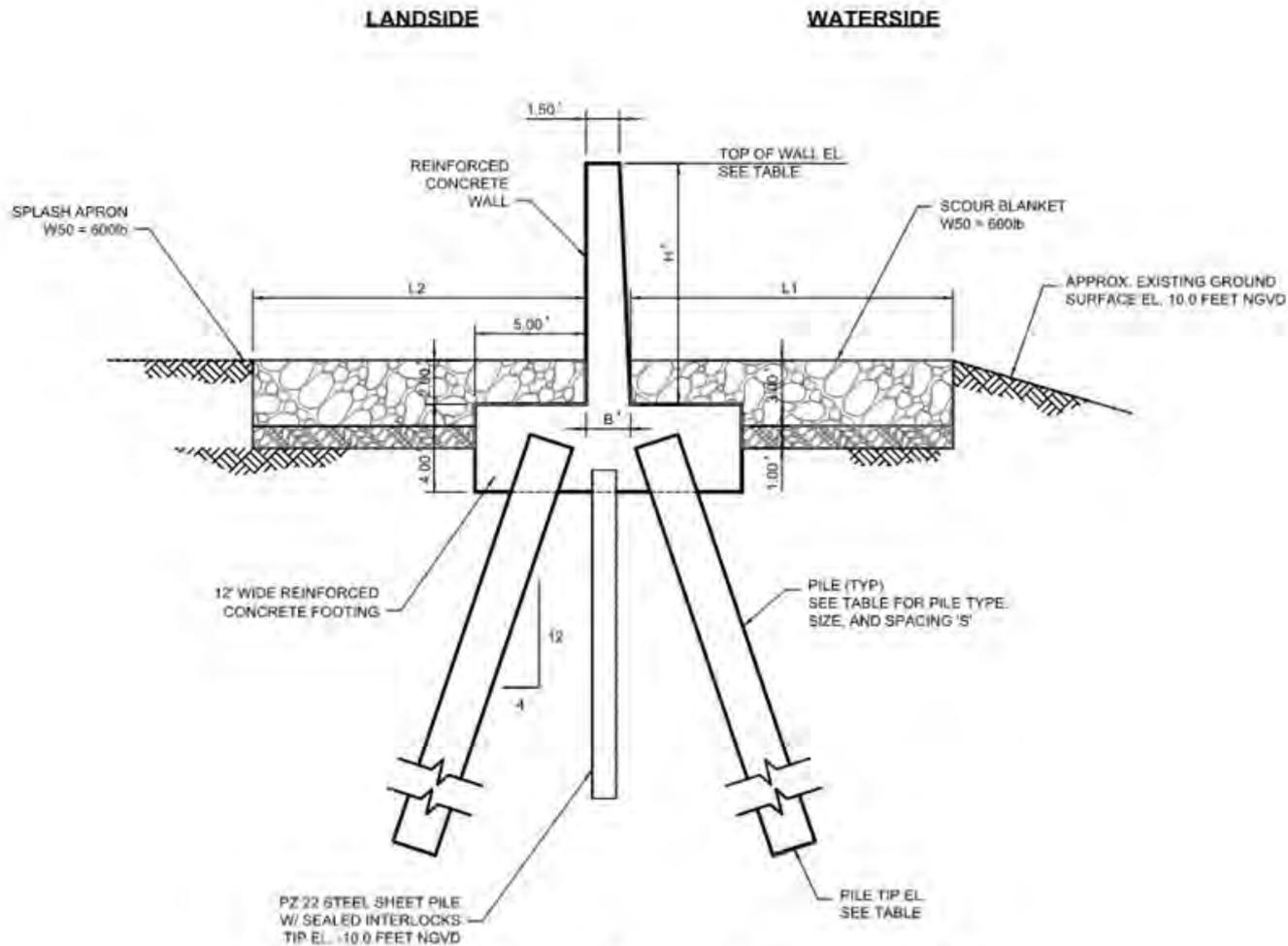
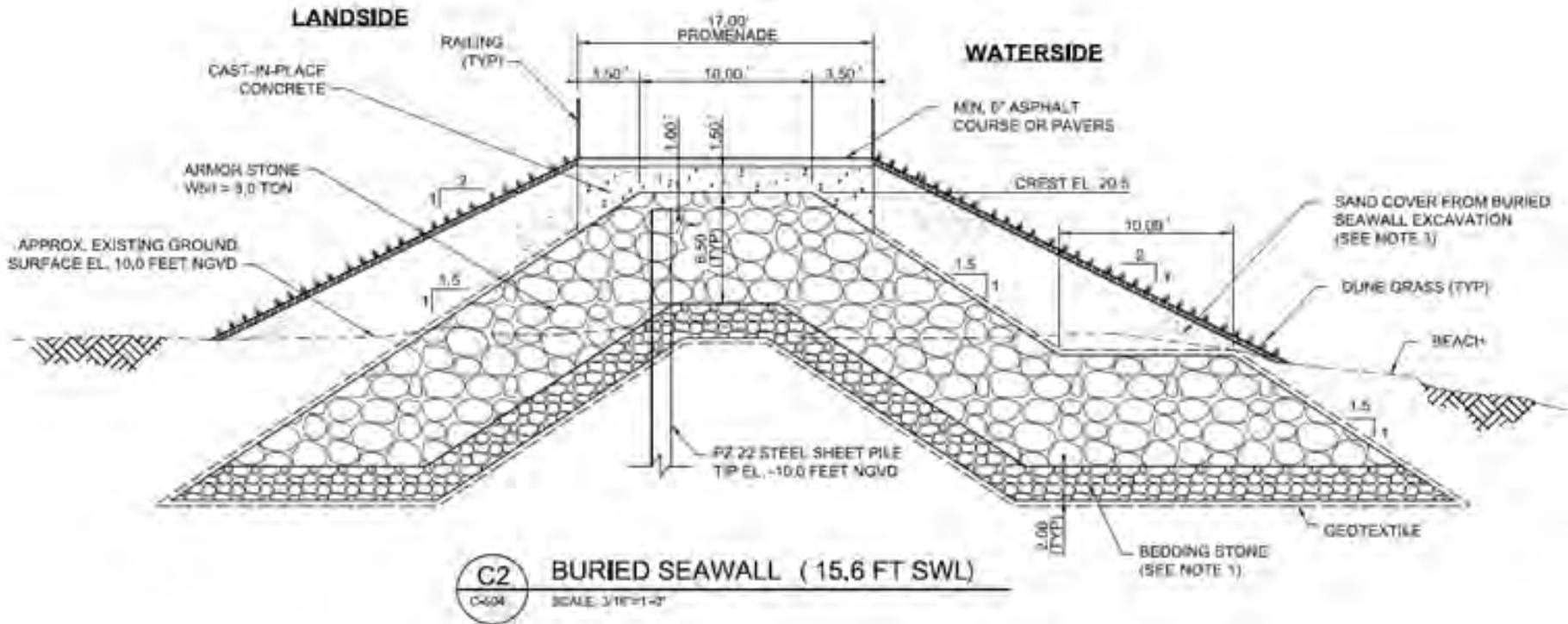


Figure 29 – Floodwall Typical Section (Reach A-3)



# Buried Seawall (Oakwood Beach thru Miller Field)



**Figure 31 – Buried Seawall Typical Section (Reach A-4)**





# Tidal Wetlands fronting Buried Seawall in Oakwood Beach area

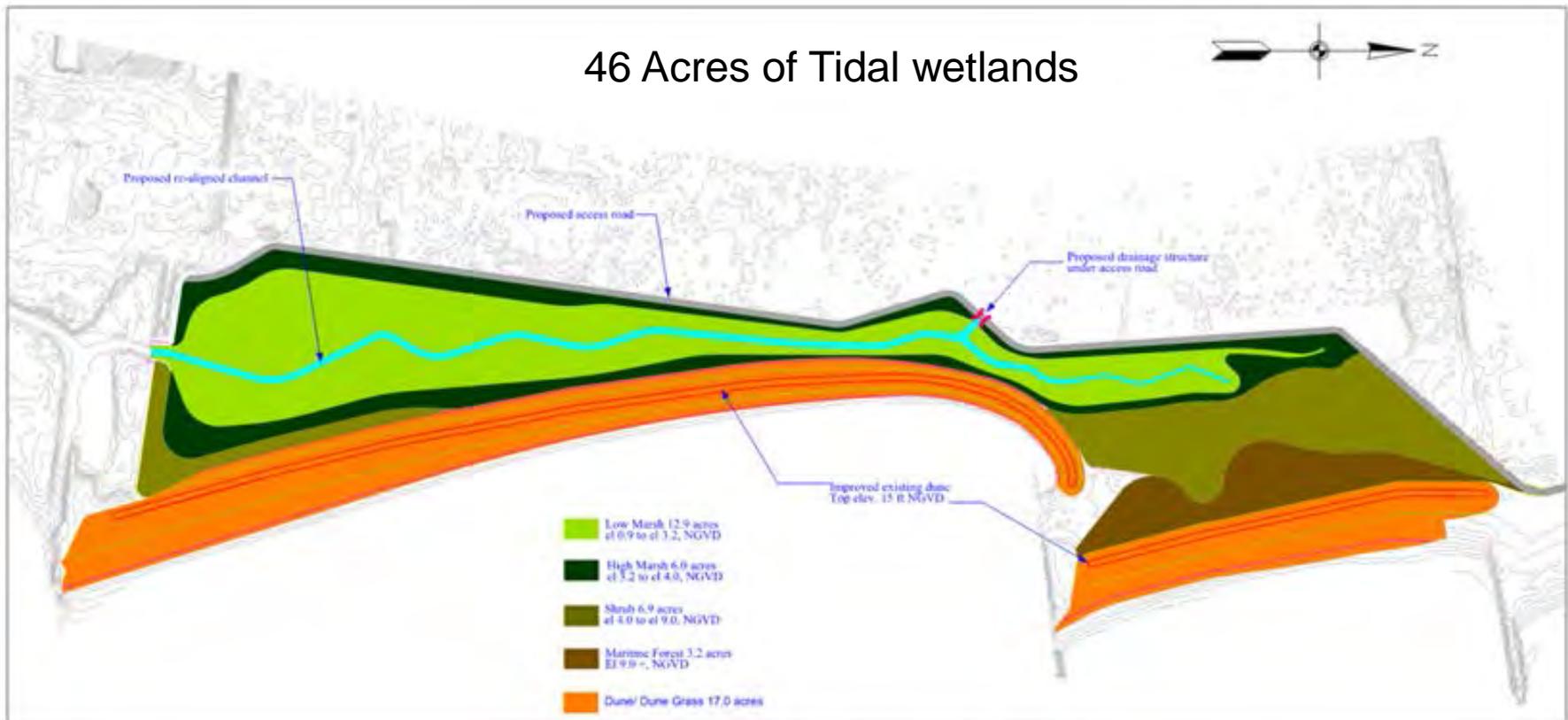


Figure 30 – Tidal Wetlands

# Tide Gate (Oakwood Creek)

+ Removal of existing Oakwood Beach tide gate/levee

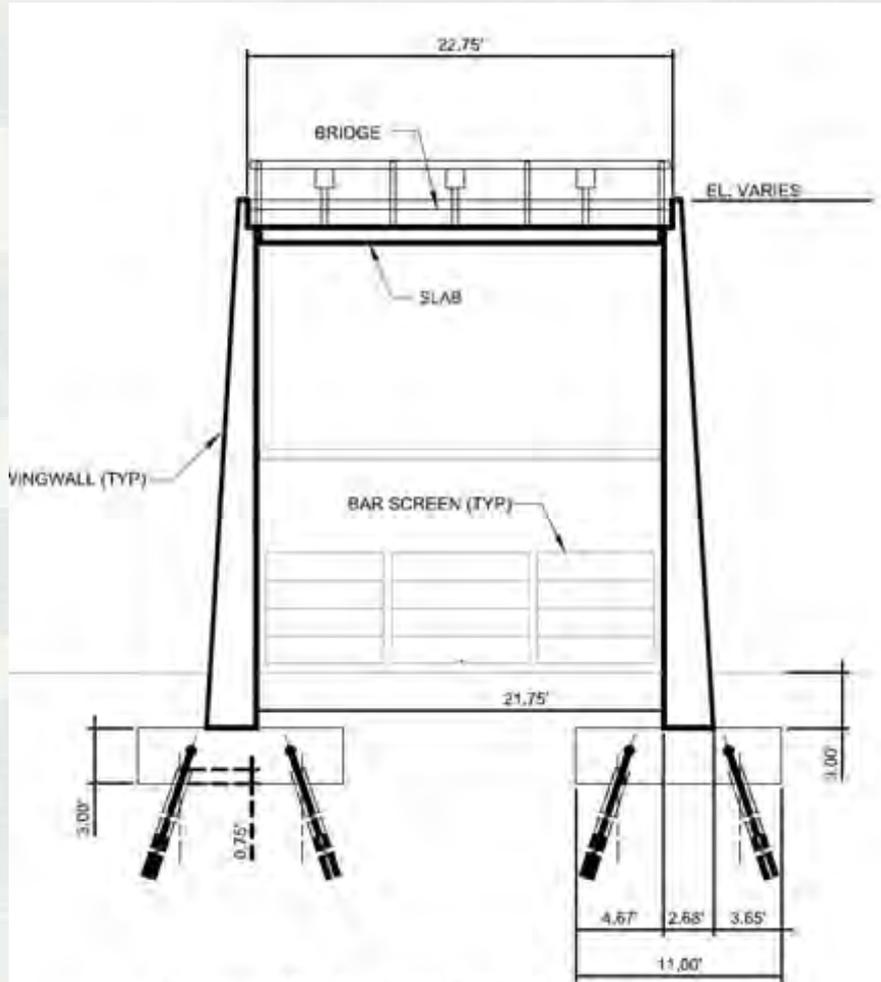
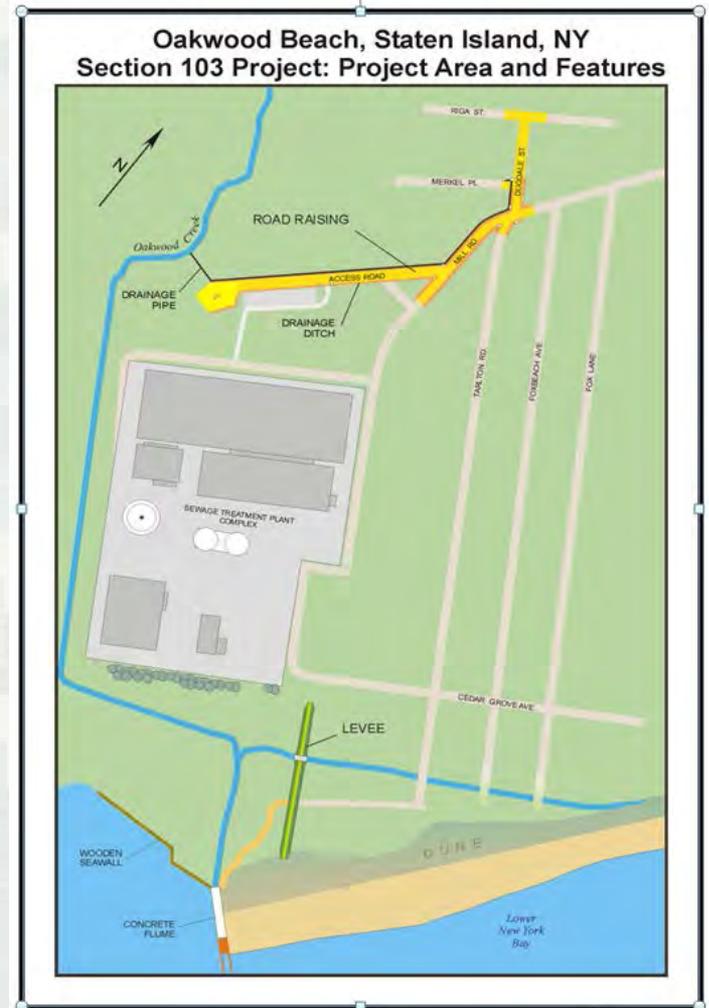


Figure 36 - Typical Section Tide Gate



# Road Raisings

## ➤ Mill Road

- Average raise height of + 1 ft.

## ➤ Kissam Ave

- Average raise height of + 3 ft.



# Acquisition/Preservation/Excavation of open space



# Midland Beach & South Beach Areas

Midland Beach (promenade area)  
to  
Seaview Avenue



Buried Seawall (replaces existing promenade)  
 + Outfall chambers + Road Raisings  
 + Acquisition/Preservation/Excavation of open space







US Army Corps  
of Engineers  
New York District



# Project Renderings



**Existing Promenade  
Midland Beach Area looking North**



**Buried Seawall with new Boardwalk  
Midland Beach Area looking North**

# Gate Chambers for existing outfalls

Greely Ave, Midland Ave, Naughton Ave and Seaview Ave  
Sewer Outfalls

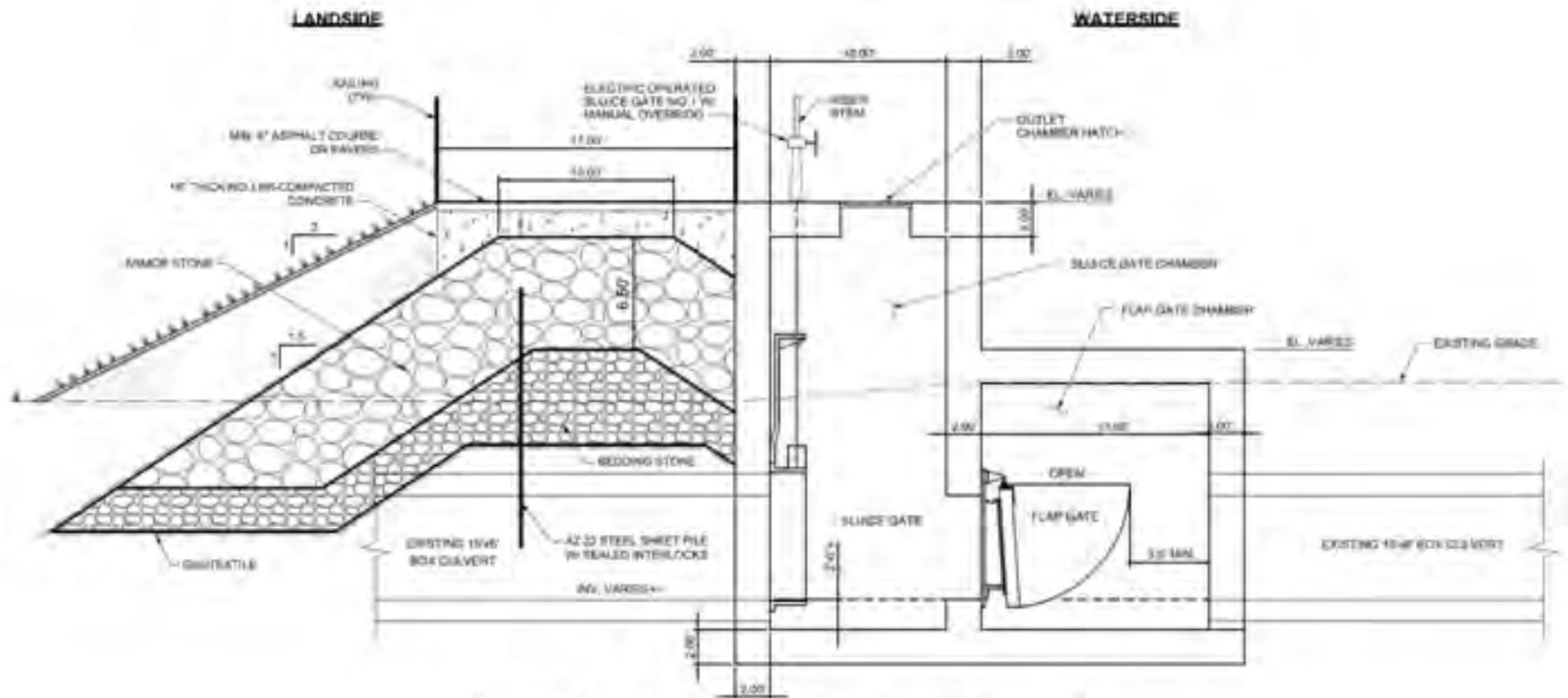


Figure 35 - Typical Section Gate Chamber

# Road Raising

- Seaview Ave
  - Average raise height of + 1 ft.
  
- Father Capodanno Blvd
  - Average raise height of + 1 ft.



# Acquisition/Preservation/Excavation of open space



# South Beach & Fort Wadsworth Areas

Seaview Avenue (boardwalk area)  
to  
Fort Wadsworth



# Buried Seawall (replaces existing boardwalk) + Outfall chamber + Preservation of open space



Buried Seawall (replaces existing boardwalk)  
+ Outfall chambers  
+ Acquisition/Preservation/Excavation of open space



# Buried Seawall (replaces existing boardwalk)

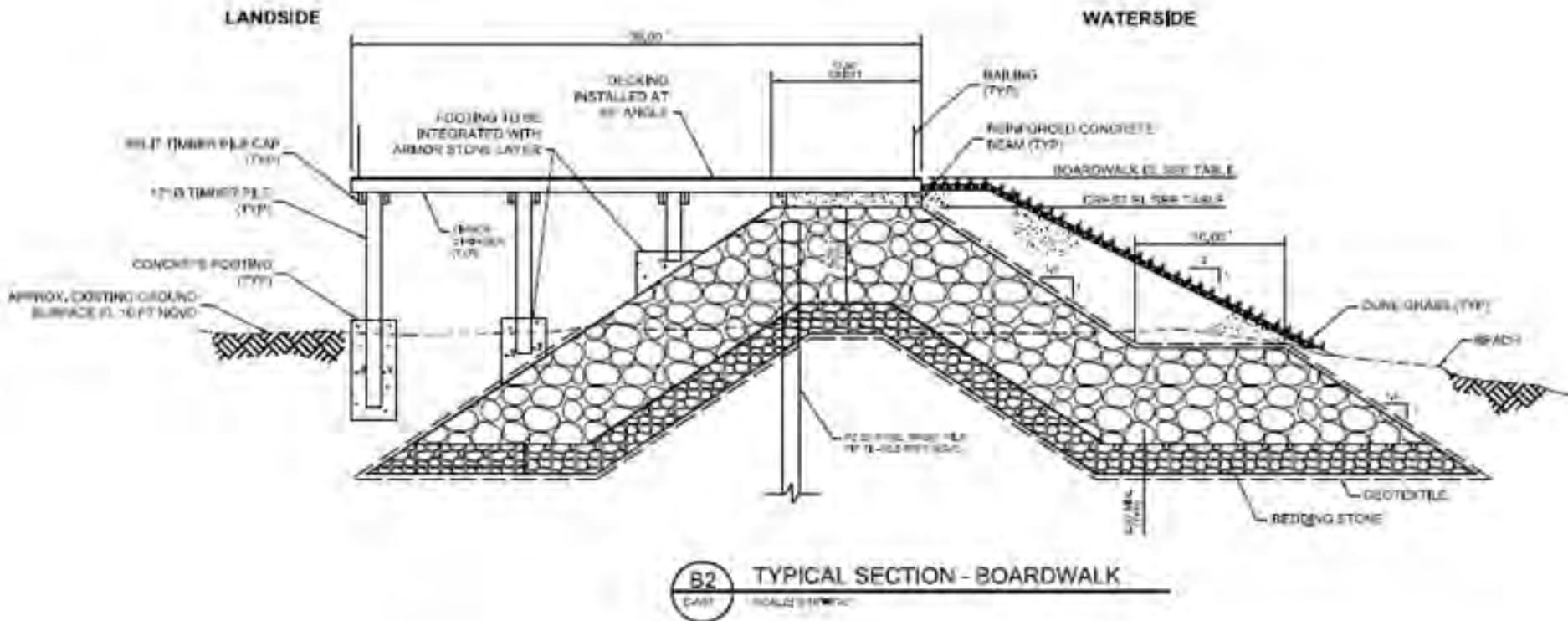


Figure 32 – Boardwalk Typical Section (Reach A-4)



US Army Corps  
of Engineers  
New York District



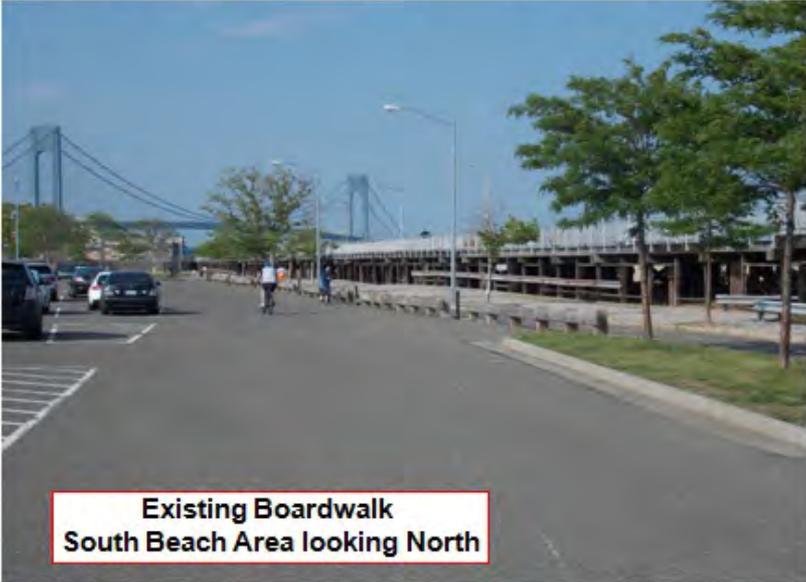
# Project Renderings



**Existing Boardwalk  
South Beach Area looking South**



**Buried Seawall with New Boardwalk  
South Beach Area looking South**



**Existing Boardwalk  
South Beach Area looking North**



**Buried Seawall with New Boardwalk  
South Beach Area looking North**

# Gate Chambers for existing outfalls

Quintard Street, Sand Lane, Quincy Ave  
Sewer Outfalls

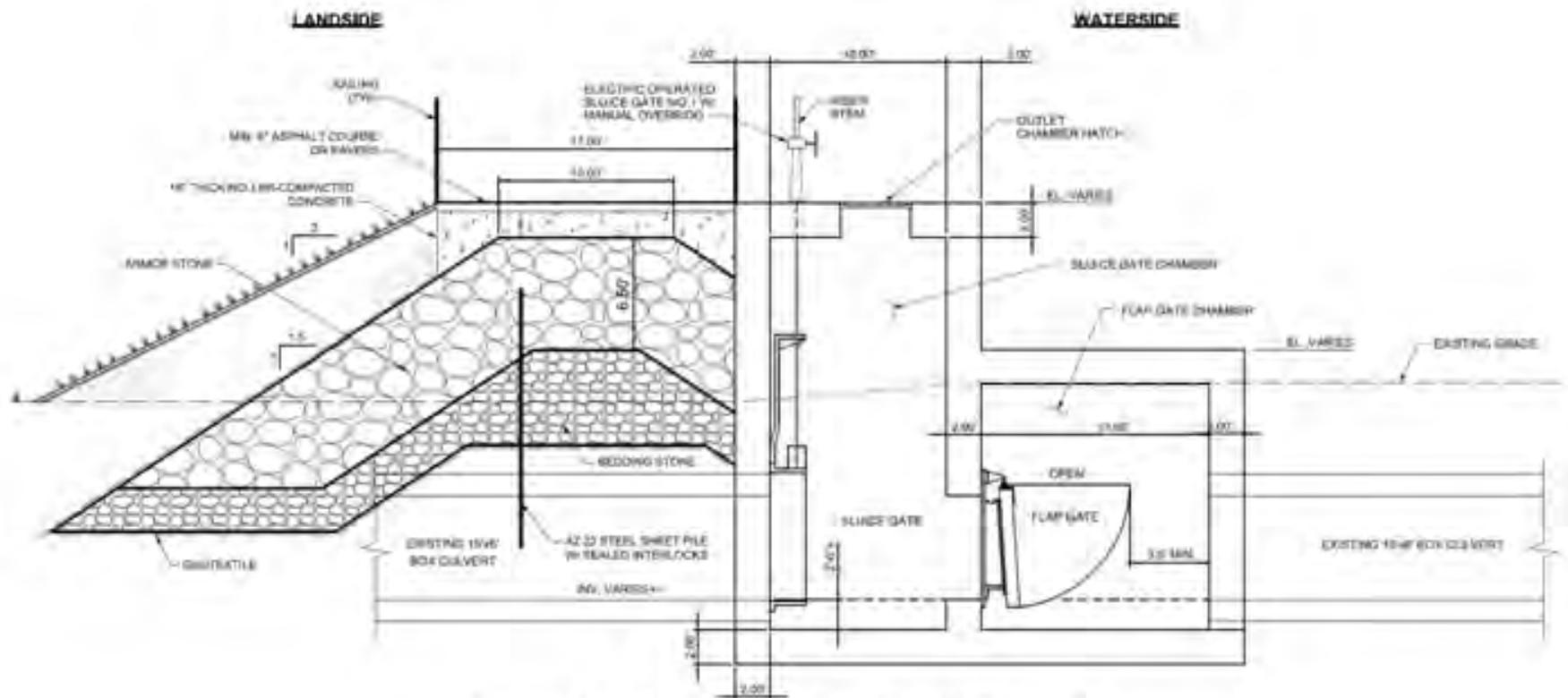


Figure 35 - Typical Section Gate Chamber

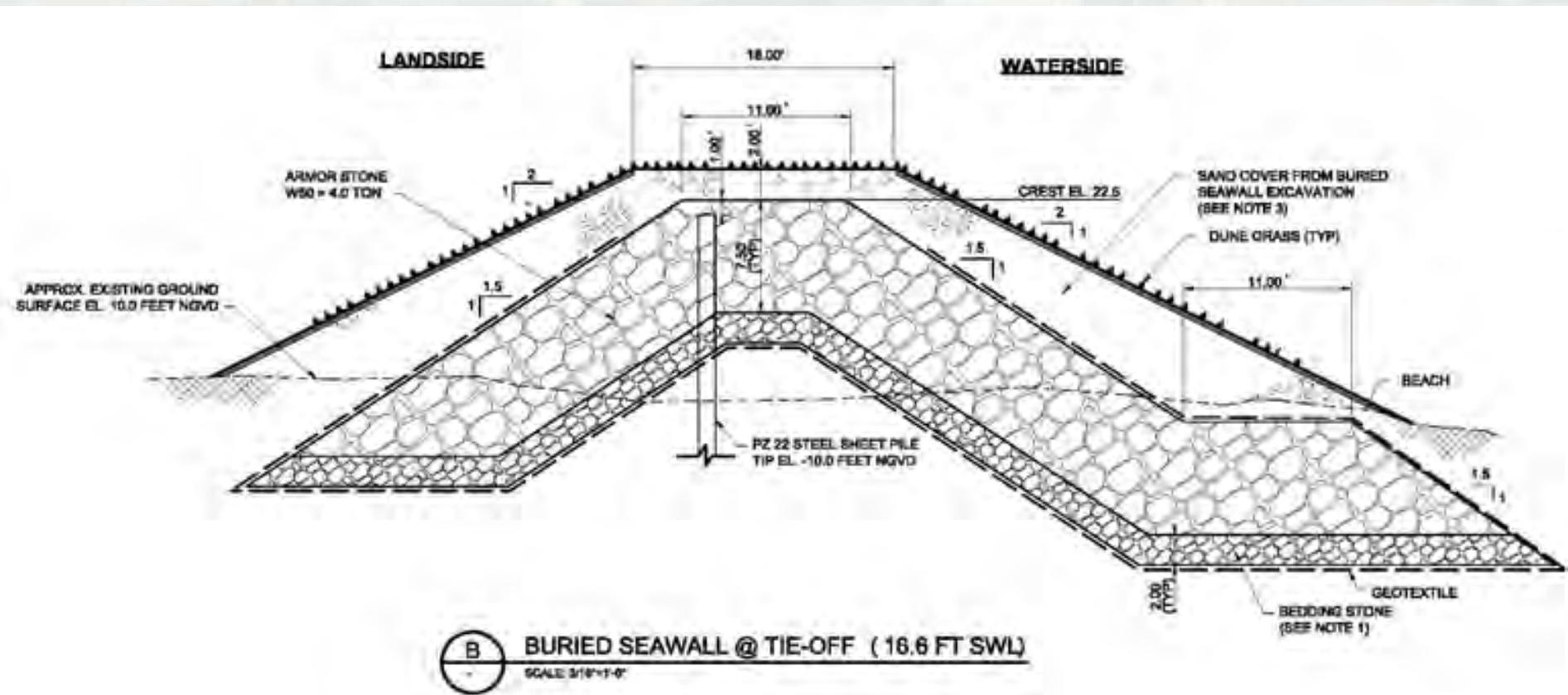
# Preservation of open space



# Acquisition/Preservation/Excavation of open space



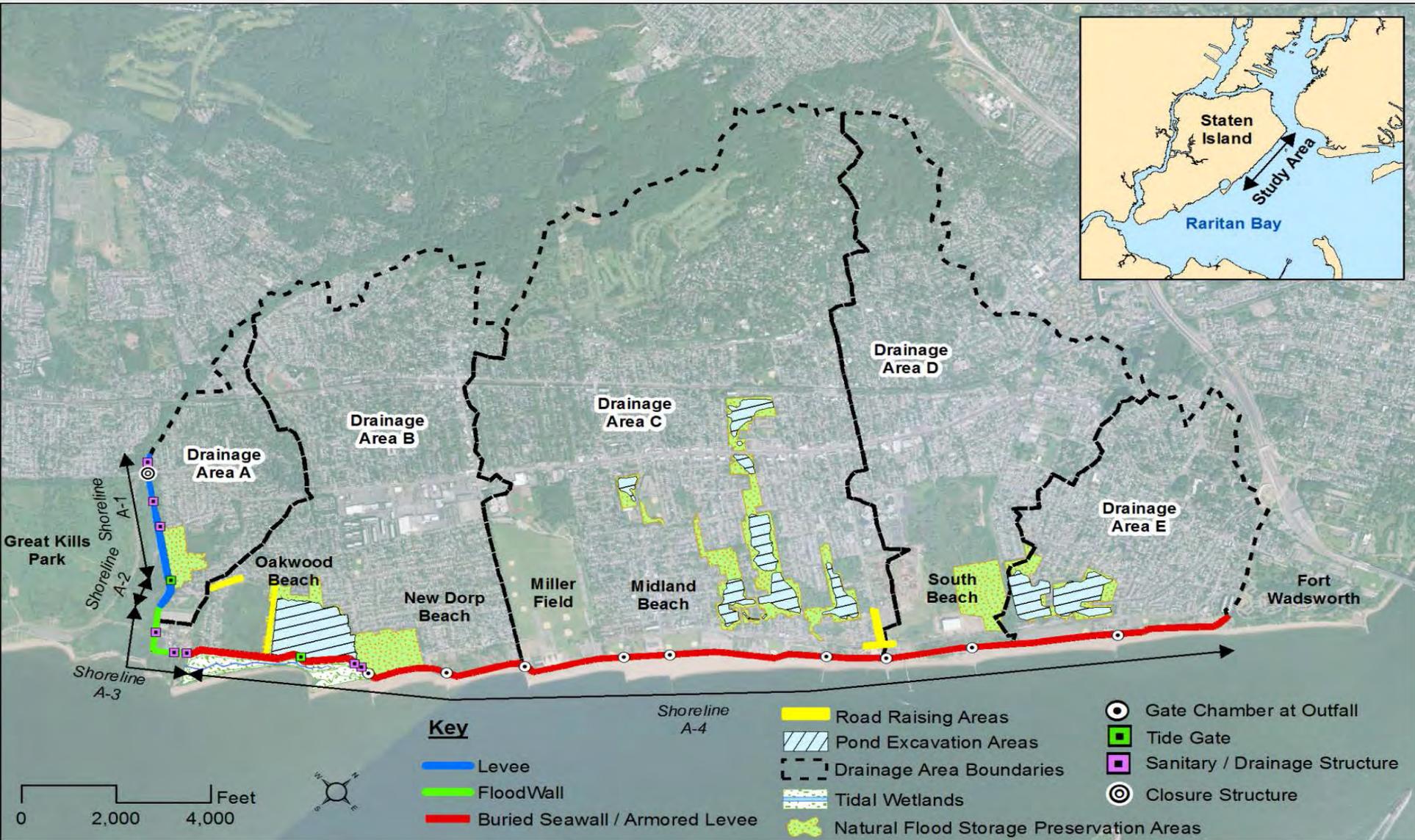
# Buried Seawall ties off near Fort Wadsworth



**Figure 33 – Buried Seawall Section (Reach A-4)**



# Proposed Plan Layout



# Sea level change and future adaptability

## Sea level change over 50 year period

- Historic - 0.7 ft increase
- Intermediate - projected 1.1 ft increase
- High - projected 2.5 ft increase

## Project adaptable in future for increased sea level change

- Add concrete parapet wall atop crest of buried seawall
- Add future cast in place concrete floodwall addition
- Add impervious backfill to increase levee



# Future Adaptability of Proposed Plan

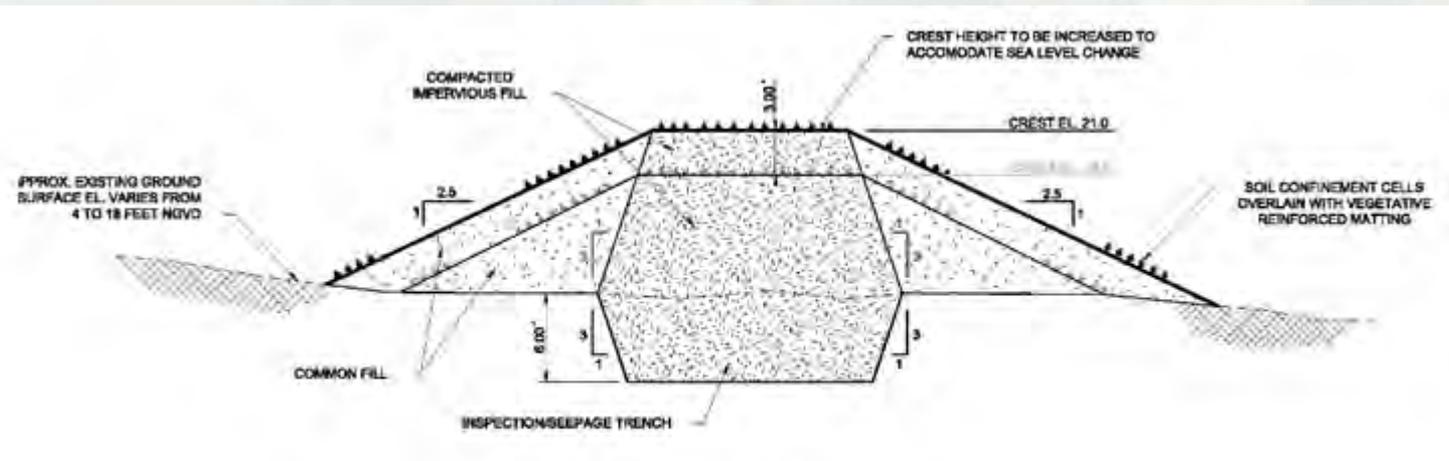


Figure 46 - Raising of Earthen Levee

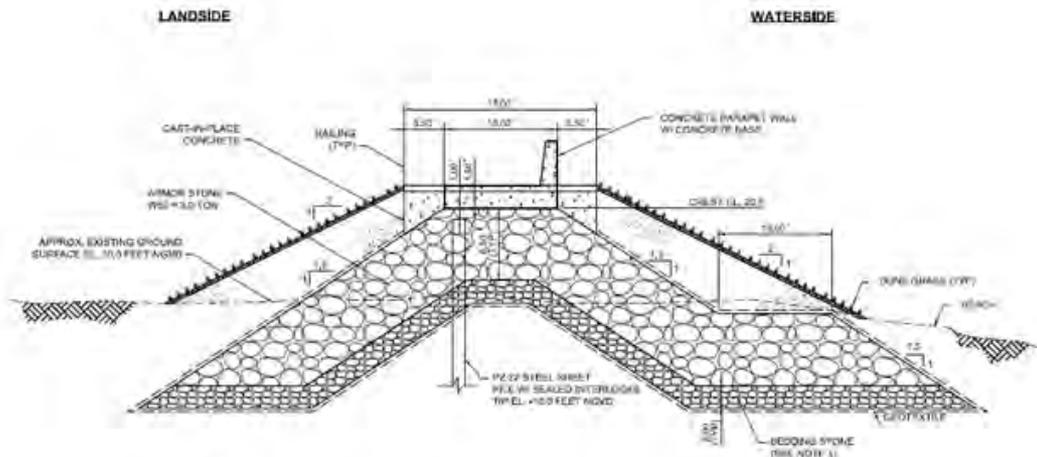


Figure 44 - Concrete Parapet Wall atop Buried Seawall

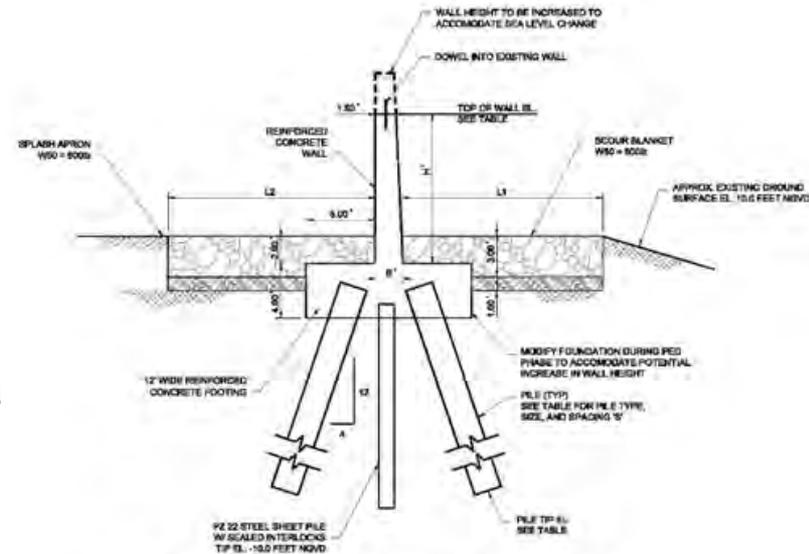


Figure 45 - Raising of Concrete Floodwall

# Proposed Plan

## Project Costs/Benefits and Cost-sharing

**Table 36- Cost Apportionment**

<b>Federal Project Cost (65%)</b>	<b>\$376,302,000</b>
<b>Non-Federal Project Cost (35%)</b>	<b>\$202,624,000</b>
<b>LERR</b>	<b>\$91,261,000</b>
<i>LER</i>	\$43,854,000
<i>Relocations</i>	
Road Raising	\$5,328,000
Boardwalk	\$42,079,000
<b>Cash Balance</b>	<b>\$111,363,000</b>
<b>TOTAL</b>	<b>\$578,926,000</b>

**Table 32 - Feasibility Assessment**

<b>Annual Benefits</b>	<b>\$27,732,000</b>
<b>Annual Costs</b>	<b>\$24,011,000</b>
<b>Net Benefits</b>	<b>\$3,721,000</b>
<b>BCR</b>	<b>1.2</b>
<b>Economically Feasible</b>	<b>Yes</b>



# Real Estate Requirements

Various Standard Estate easements are required to be obtained by the Sponsor

- Flowage Easements – excavation of ponding areas (112 acres)
- Restrictive Easements – land restricted from future development (144 acres)
- Flood Protection Levee Easements – land for construction, operation and maintenance of project (88 acres)
- Temporary Work Area Easements – land for construction staging (63 acres)
- Pipeline and Road Easements – O&M of underground drainage, access road to sewer manholes (1.2 acres)



# Operation & Maintenance Sponsor Requirements

## O&M Requirements (100% non-Federal responsibility)

- Estimated annual cost of \$555,000
- Annual inspections, surveys and report conditions of project features (closure gate, gate chambers, tide gates, ramps, ponds, sand coverage, etc)
- Replacement of sand coverage and dune grass replanting
- Levee mowing + ponds/easement area mowing/maintenance
- Operation/testing of closure gate, tide gates, gate chambers
- Interior drainage replacements (gates, valves, etc) at end of useful project life; estimated 25<sup>th</sup> year



# Proposed Plan Comparison to Hurricane Sandy

- Hurricane Sandy generated record storm surges in area
- Water levels in study area, excluding wave fluctuations, peaked at approximately 13.6 ft NGVD during Sandy
- Proposed plan designed to manage and reduce risk of storm damage due to waves, erosion, flooding for coastal storms with total stillwater elevation (tide plus storm surge) of 15.6 ft NGVD
- 2 feet higher than peak water levels experienced during Sandy



# Proposed Plan comparison to Sandy

- 15.6 NGVD stillwater design height provides project crest elevations ranging between 18 and 20.5 feet NGVD
- Design storm estimated annual chance of exceedance of 0.3 % (~300 year event) under current sea level conditions
- In contrast, existing area is approximately 10 ft. NGVD, with lower spots sporadically thru area (0.1%; 10 year event)



# Residual Flooding With Project in place

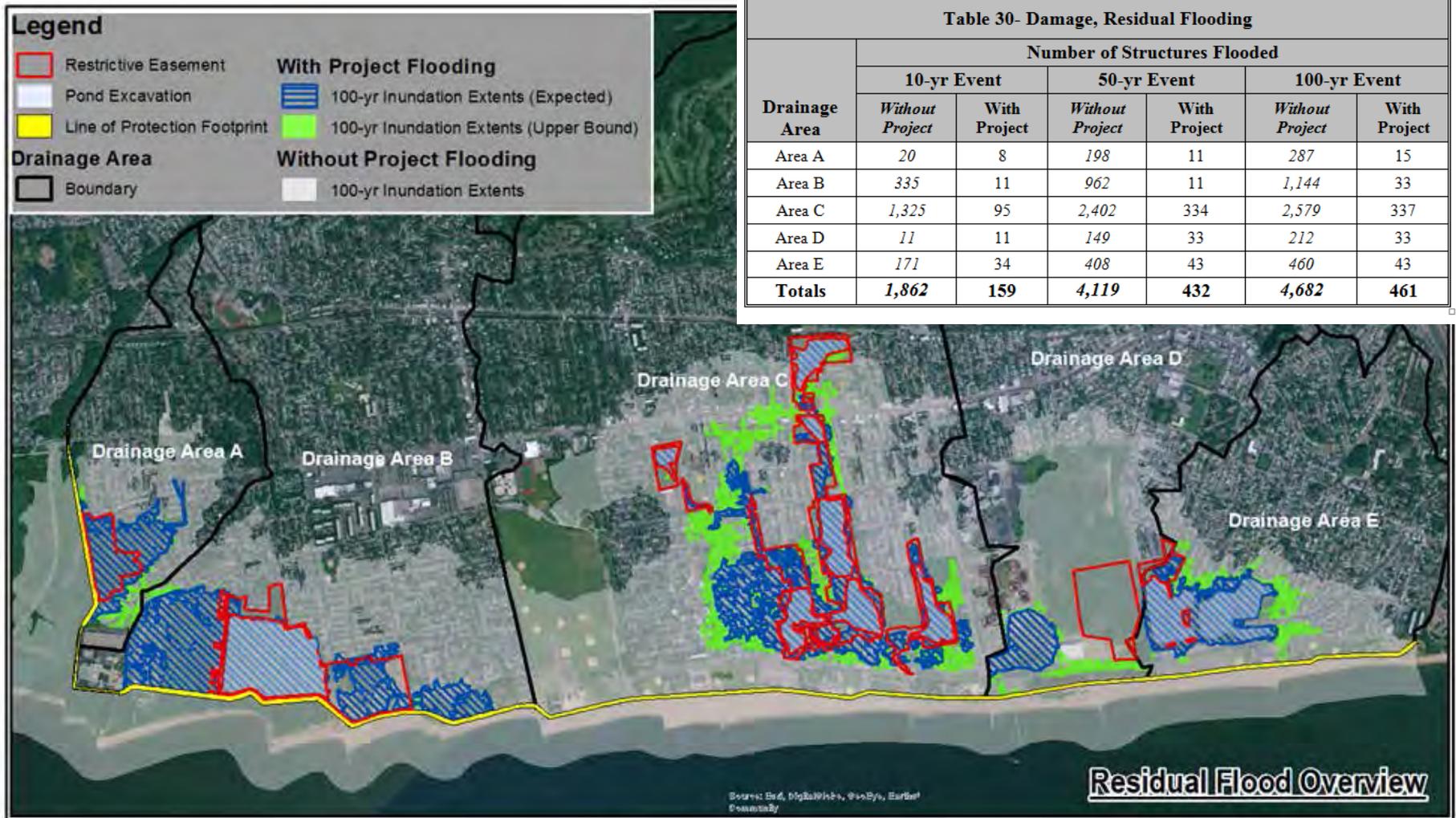


Figure 42 – Residual Flood Overview

# Residual Flooding With Project in place

- Estimated to reduce damages by \$27 million annually
- Will not eliminate all flooding
  - Lower level storm events will continue to cause low level flooding from interior run-off even with project in place
  - Low lying areas will experience ponding of water
- In rare occurrence stillwater exceeds 15.6 ft NGVD (approximately 0.3% annual chance or ~300 year storm) ocean surge could breach and/or overtop line of protection inundating area
- Residents must continue to follow NYC evacuation protocols



# Project Schedule --- REVISED Feb 2016

Final Draft Report/DEIS Released for public review Released for IEPR (external peer) review Released for Corps HQ review	Jun 2015
DEIS public information meetings	Aug 2015
Public Review period closes	9 Sep 2015
<b>Final Report/Final EIS submitted to Corps HQ</b>	<b>Spring 2016</b>
<b>Chief of Engineers submission to ASA</b>	<b>Fall 2016</b>
<b>ASA approval to execute PPA construction agreement</b>	<b>Late 2016</b>
Start Plans/Specs for construction contracts	Early 2017
Construction Agreement execution with NYS	Spring 2017
Real Estate acquisitions completed	Fall 2018
Advertise/Award construction contracts	Late 2018
Construction completion	thru 2022





**US Army Corps  
of Engineers**  
New York District



**Department of  
Environmental  
Conservation**

**US Army Corps of Engineers  
New York State Department of Environmental Conservation  
City of New York**

# **PUBLIC INFORMATION MEETING**

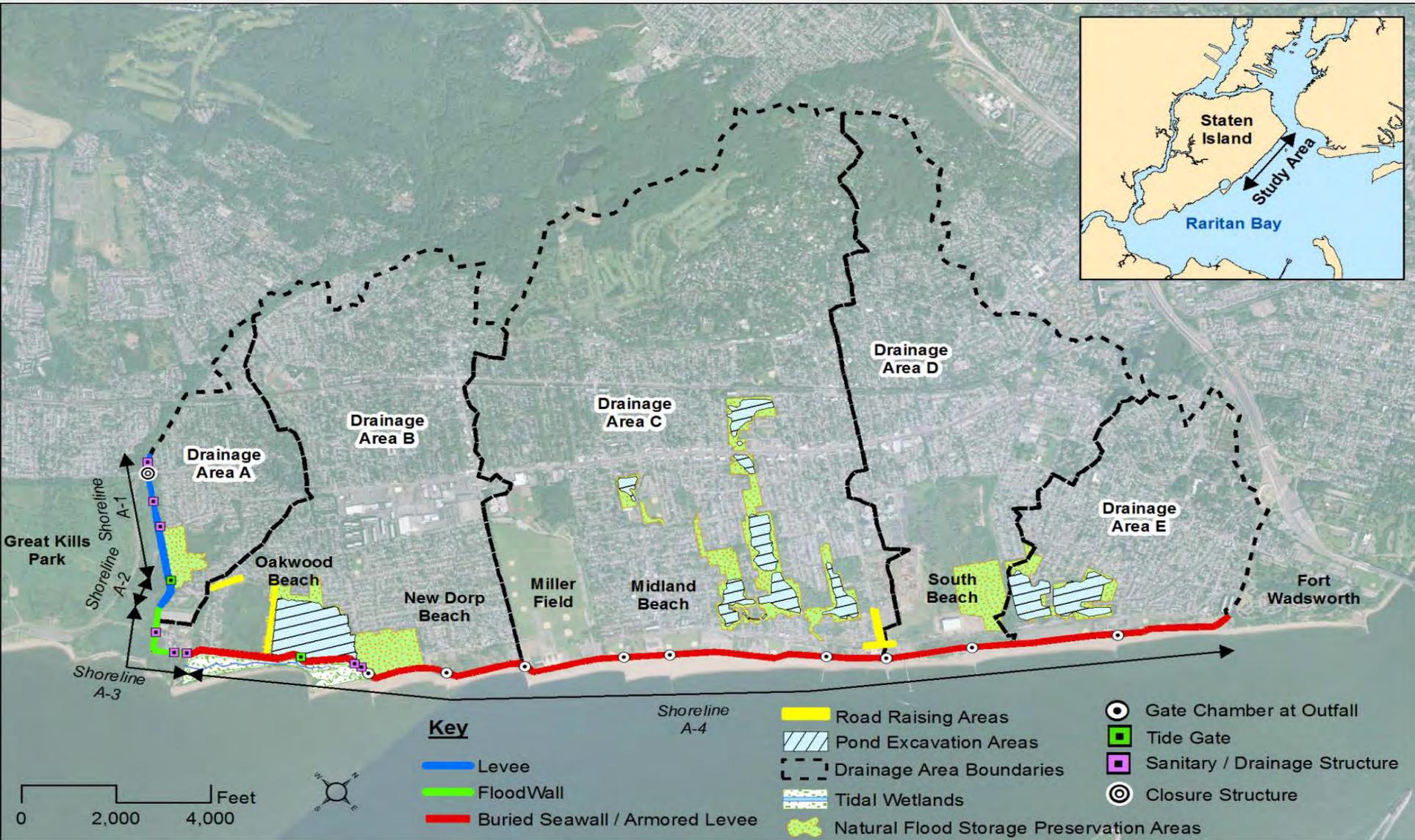
**The Draft Environmental Impact Statement is open for public comment through September 9, 2015.**

**Please address your comments to:**

**US Army Corps of Engineers – New York District  
Attn: Ms. Catherine Alcoba  
26 Federal Plaza, Room 2151  
New York, NY 10278  
catherine.j.alcoba@usace.army.mil**

**Public comment cards are available at this Information Meeting**

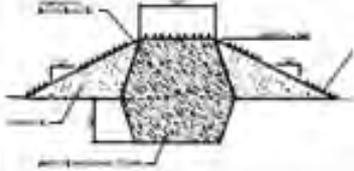
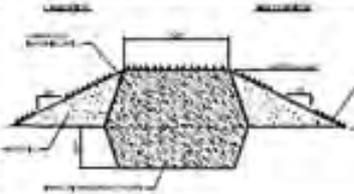
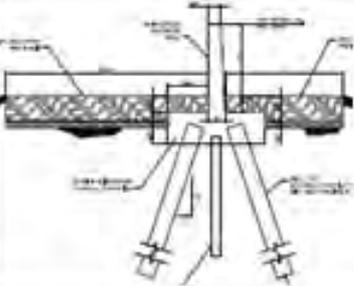
# Proposed Plan Layout



# Line of Protection (Hylan Blvd to Oakwood Treatment Plant)

**Table ES 2 - NED Plan Storm Risk Management Measures**

**Line of Protection**

Reach	Type	Length	Crest Elevation	Depth	Slope	Materials	Typical Section View	Features
A-1	Levee	2,800 lf.	18 ft. NGVD 1929 or 16.9 ft. NAVD 1988	10 ft. wide at crest	2.5:1.0 (H:V)	compacted impervious fill		The compact impervious fill will extend at least 6 feet below the existing grade to prevent seepage, a closure structure will be constructed along Hylan Boulevard.
A-2	Levee	600 lf.	18 ft. NGVD 1929 or 16.9 ft. NAVD 1988	15 ft. wide at crest	2.5:1.0 (H:V)	compacted impervious fill		The compact impervious fill will extend at least 6 feet below the existing grade to prevent seepage.
A-3	Floodwall	1,800 lf.	20.5 ft. NGVD 1929 or 19.4 ft. NAVD 1988	1.5 ft. wide at crest	vertical	reinforced concrete T- Wall on piles		A vertical steel sheet pile wall will be included below the wall to prevent seepage.



# Line of Protection (Oakwood Beach to Fort Wadsworth)

**Table ES 2 - NED Plan Storm Risk Management Measures**

A-4	Buried Seawall / Armored Levee tidal wetland	9,300 lf.	20.5 ft. NGVD 1929 or 19.4 ft. NAVD 1988	10 ft. wide at crest	1.5:1.0 (H:V)	3-ton armor stone		<p>A vertical steel sheet pile wall will be incorporated to prevent seepage. A 17 ft. wide promenade will be constructed on top of the crest of the buried seawall/armored levee. Tidal wetland will help attenuate wave energy and reduce erosion. It also provides biological habitat value.</p>
A-4	Buried Seawall / Armored Levee	13,400 lf.	20.5 ft. NGVD 1929 or 19.4 ft. NAVD 1988	10 ft. wide at crest	1.5:1.0 (H:V)	3-ton armor stone		<p>A vertical steel sheet pile wall will be incorporated to prevent seepage. A 38 ft wide pile supported boardwalk will be constructed on top of the crest of the buried seawall/armored levee.</p>



# Interior Drainage (Oakwood Beach to Fort Wadsworth)

Interior Drainage					
Interior Drainage Area	Natural Storage	Excavated Pond	Tide Gate	Outlets	Road Raising
Area A	17.19 acres	X	22.75 ft. by 18 ft. NGVD 1929 (or 16.9 ft. NAVD 1988) by 16 ft. (LxHxD) with 3 @ 5 ft. by 5 ft. sluice gates, wingwalls, and pre-engineered bridge	2 new sluice gate structures (2 ft. by 2ft.) & 2 intermediate pipe outlets with flap gates	X
Area B	86.41 acres	1 Pond (46 acres) with 94,200 c.y. of excavation to 2.75 ft and NGVD 1929 (1.3ft. NAVD 1988)	22.75 ft. by 20.5 ft. NGVD 1929 (or 19.4 ft. NAVD 1988) by 16 ft. (LxHxD) with 3 @ 5 ft. by 5 ft. sluice gates, wingwalls, and pre-engineered bridge	New gate chambers at Ebbits St., New Dorp Ln., Tysens Ln. outfalls	1,730lf. by 30 ft. of Kissam Ave. to 7.1 ft. NGVD 1929 (6 ft. NAVD 1988). An average raising height of 3 ft.  630lf. by 60 ft. of Mill Rd. to 7.1 ft. NGVD 1929 (6 ft. NAVD 88). An average raising height of 1 ft.
Area C	120.44 acres	7 Ponds (100.51 acres), 377,200 c.y. of excavation to an invert of 2 ft. NGVD 1929 (0.9 ft. NAVD 1988)	X	New gate chambers at Greely Ave., Midland Ave., Naughton Ave., Seaview Ave. outfalls	820lf. by 90 ft. of Seaview Ave to 10 ft. NGVD 1929 (8.9 ft. NAVD 1988). An average raising height of 1 ft.  300lf. by 60 ft. of Father Capodanno Blvd. to 10 ft. NGVD 1929 (8.9 ft. NAVD 1988). An average raising height of 1 ft.
Area D	30.76 acres	X	X	New gate chamber at Quintard Street outfall	X
Area E	46.7 acres	2 Ponds (34 acres), 222,720 c.y. of excavation to an invert of 2 ft. NGVD 1929 (0.9 ft. NAVD 1988)	X	New gate chambers at Sand Lane, Quincy Ave. outfall	X

