



Town of North Beach Compound Flood Action Plan

TOWN MEETING

APRIL 20, 2023



The Jewel of the Chesapeake Bay
North Beach, Maryland

Introduction to BayLand

- Environmental Engineering Firm
- Specializing in Projects at the Land-Water Interface
 - Stream & Ecological Restoration
 - Stormwater Management & Sustainable Site Development
 - Marine, Dredging & Shoreline
- Project Team
 - Megan Barniea, PE – Senior Project Manager
 - Anna Johnson, PE, CC-P – Coastal Engineer
 - Sepehr Baharlou, PE – QA/QC



Agenda

- October 2022 Meeting Summary
- Vulnerability Assessment
- Assessment Area Prioritization
- Flood Mitigation Strategies
 - Coastal Flooding
 - Stormwater Flooding
 - Management Strategies for Flood Mitigation
 - Alternatives Analysis
- Implementation Plan
- Funding Opportunities

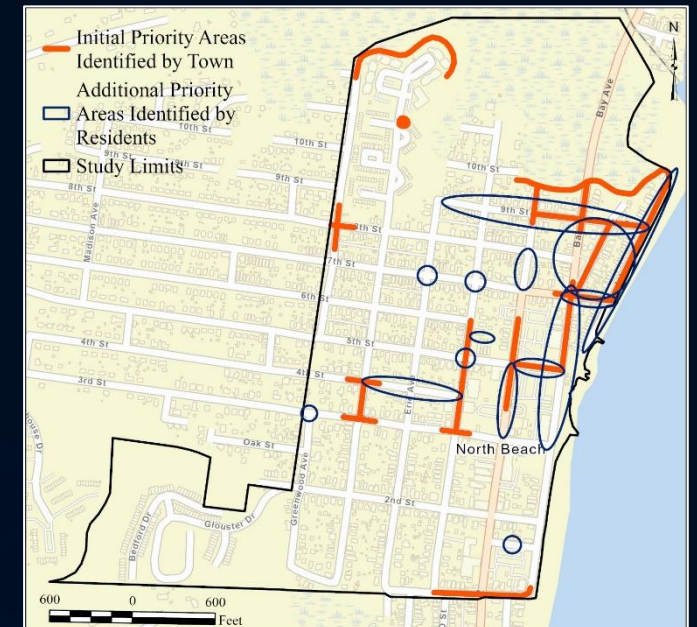
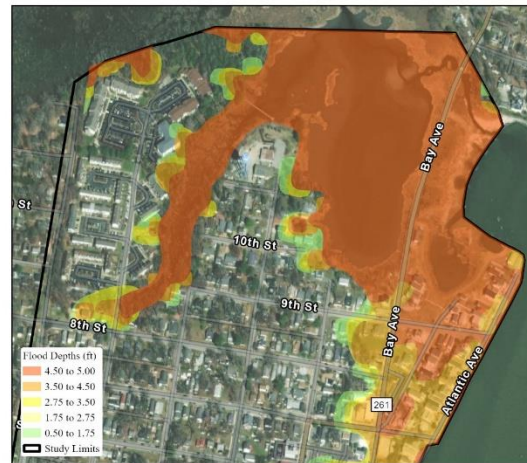
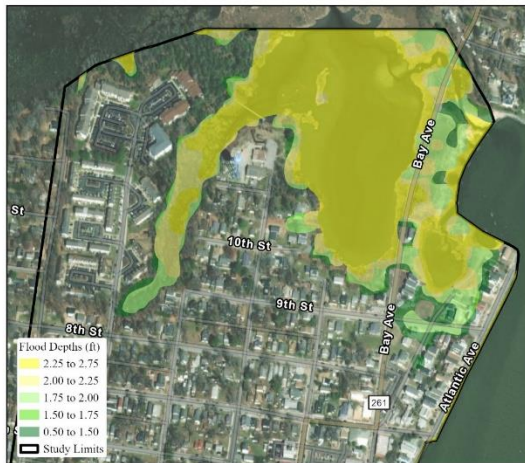
October 2022 Meeting Summary

- Field Investigations
- Existing Conditions
- Flooding Analysis
 - Coastal Flooding Analysis
 - Stormwater Flooding Analysis
- Initial Priority Areas



2050 - MHW

2050 + 1% Annual Chance Exceedance Stillwater Level

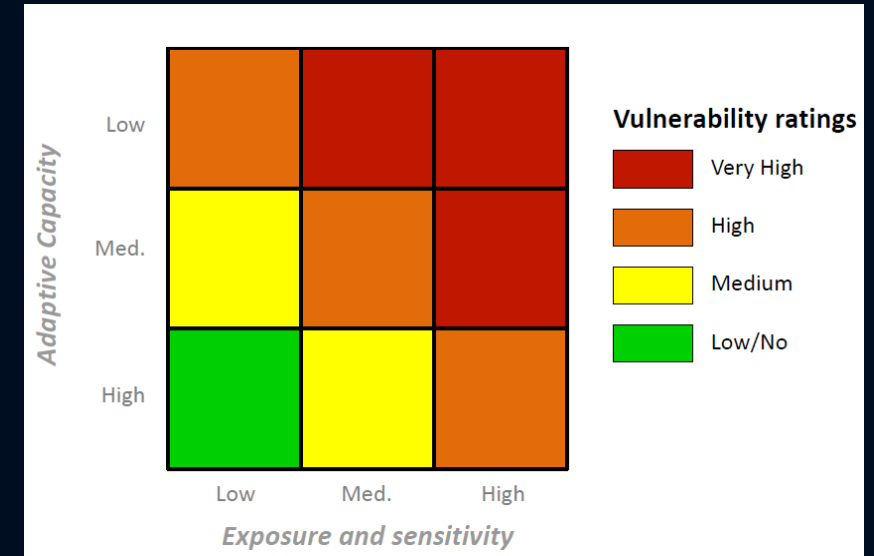


Vulnerability Assessment

- Components of Vulnerability

- *Exposure* – how exposed is each high priority area to a hazard such as flooding?
- *Sensitivity* – is the high priority area sensitive to the consequences of a hazard such as flooding?
- *Adaptive Capacity* – can the high priority area be easily adapted to the conditions exposed by a hazard such as flooding?

- Metrics for each component established to determine vulnerability of the high priority areas

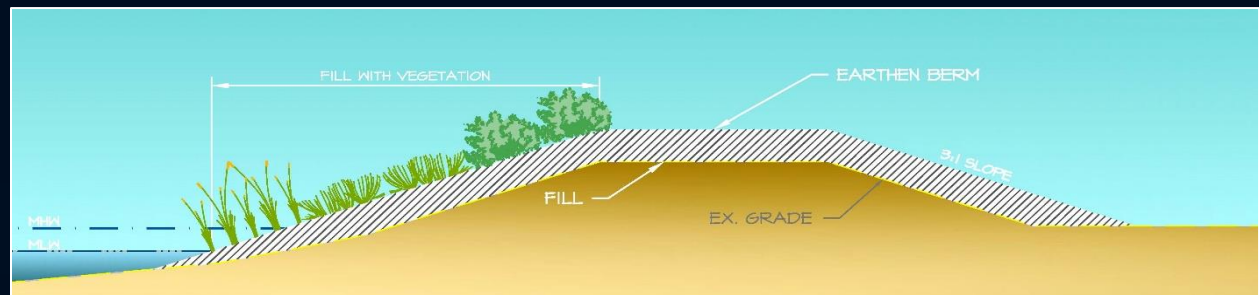
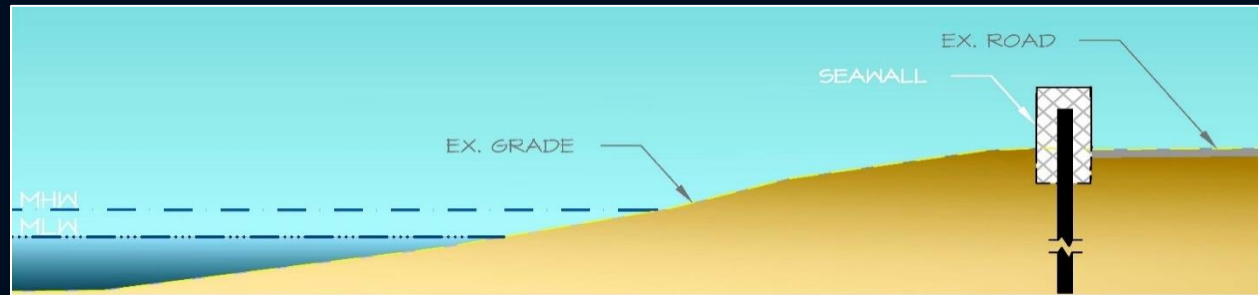
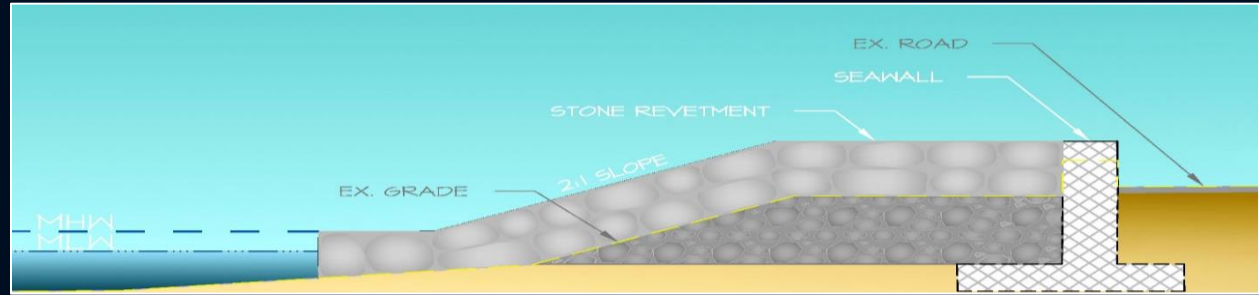


Assessment Area Prioritization

Prioritization of High Priority Areas	
Priority	Assessment Area Description
1	7th Street between Bay, Annapolis, and Atlantic Avenue
2	5th Street between Chesapeake Avenue and Bay Avenue
3	Atlantic Avenue
4	9th Street between Chesapeake Avenue and Atlantic Avenue
5	Bay Avenue between 5 th and 7 th
6	Annapolis Avenue between 7th Street and 9th Street
7	Chesapeake Avenue between 4th Street and 6th Street
8	Dayton Avenue between 3rd Street and 6th Street
9	1st Street between Chesapeake Avenue and Bay Avenue
10	Frederick Avenue between 3rd Street and 4th Street
11	Greenwood Avenue and 8th Street
12	Burnt Oaks North Apartments
13	Other Areas Identified by Community Input

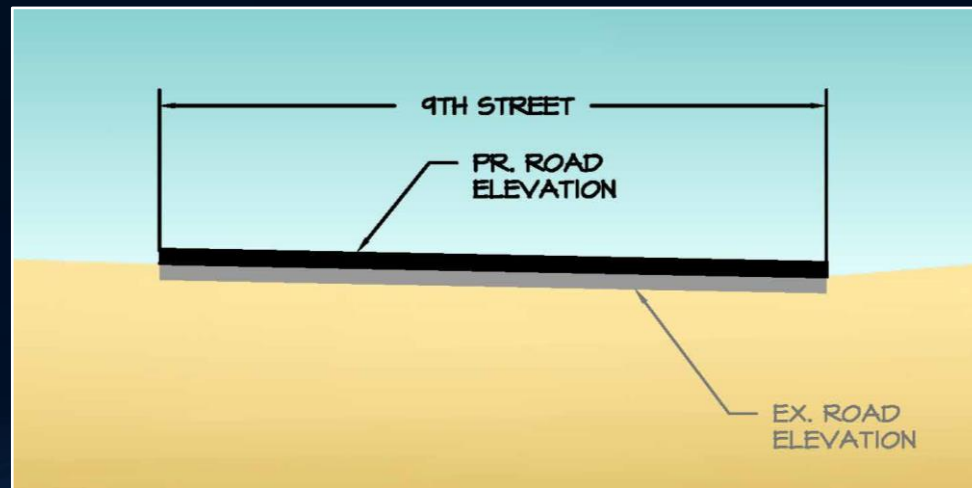
Coastal Flooding Mitigation Strategies

- Seawall and Revetment
- Seawall
- Earthen Berm
- Stop Log



Stormwater Flooding Mitigation Strategies

- Storm Drain Infrastructure Improvements
- Tide Gate Valve
- Elevating Roadways
- Underground Storage Vaults
- Pumping Station
- Green Infrastructure



Risk Management Strategies for Flood Risk Mitigation

- Revise existing and/or develop new ordinances
 - Similar to Maryland Coast Smart Council for regulation of construction and reconstruction within flood prone areas
- Update development code and/or permit application requirements to include flooding assessment potential due to climate change
- Participation in FEMA's Community Rating System (CRS)
 - Voluntary program to implement flood management practices that exceed the minimum requirements of the National Flood Insurance Program (NFIP)
 - Lowers insurance premiums for properties
- Create staff position through grant funds to implement projects and oversee operation, maintenance, etc.
- Establish educational program for the public
 - Minor improvements can adversely impact neighbors
 - Emphasize and encourage property owners to implement flood reduction measures
 - Connect vulnerable landowners with grant opportunities for implementing small-scale measures
- Expand land acquisition program

Alternatives Analysis

- Performed for each priority area
- Types of Risk Management
 - Tolerate – also referred to as Risk Acceptance where the risk is either ignored or accepted.
 - Terminate – also referred to as Risk Avoidance where the risk is avoided altogether.
 - Transfer – Risk Transfer occurs when a separate entity is given the responsibility for managing the risk, such as the purchase of insurance.
 - Treat – also referred to as Risk Mitigation or Risk Reduction. This option will aim at lessening the risk or the impacts should the risk be realized.
- Evaluate how each mitigation strategy managed risk for the priority area



Alternatives Analysis – Decision Matrix (Example)

- 7th Street between Bay and Atlantic Avenue
 - Tolerate: What would flood conditions be in 2050?
 - Stormwater flooding for 18hours+
 - Storm Surge flooding of multiple feet
 - Road perpetually flooded from backwatering
 - Road unpassable multiple times a month
 - Terminate
 - Seawall to +11 feet
 - Earthen Berm to +7 feet
 - Increase stormwater pipes 3x and add pump station
 - Transfer – N/A
 - Treat
 - Seawall to +6.5 feet
 - Earthen Berm to +6 feet
 - Install storage vault and pump station

Decision Matrix for 7th Street						
Options	Feasibility	Effectiveness	Socio-economic Impacts	Environmental Impacts	Cost	Total
RMS 1 – Tolerate Risk	5	0	0	2	5	12
RMS 2 – Terminate Risk	2	5	2	1	1	11
RMS 3 – Transfer Risk	-	-	-	-	-	-
RMS 4 – Treat Risk	4	3	4	2	2	15

Implementation Plan

IMPLEMENTATION PLAN		
Project	Description	Cost
<i>Immediate Implementation</i>		
1	Seawall and Revetment at Atlantic Avenue	\$7,910,400
2	Construct Earthen Dike at Marsh NW of Bay Avenue	\$912,060
3	Stormwater System Upgrades at Atlantic Avenue	\$49,632
4	Stormwater System Upgrades at 9 th Street	\$313,296
5	Stormwater System Upgrades at 7 th Street	\$635,880
6	Stormwater System Upgrades at 5 th Street	\$255,000
7	Installation of Seawall and Revetment along Boardwalk	\$1,916,400
Total Implementation Cost		\$11,992,668
<i>Mid-Term Implementation</i>		
8	Heighten Earthen Dike at end of Annapolis Avenue	\$418,800
9	Installation of Seawall within Beach Area	\$4,845,000
10	Stormwater System Upgrades at Annapolis Avenue	\$49,920
11	Stormwater System Upgrades at Bay Avenue	\$71,400
12	Stormwater System Upgrades at Chesapeake Avenue	\$171,000
13	Stormwater System Upgrades at Dayton Avenue	\$462,600
14	Stormwater System Upgrades at Frederick Avenue	\$540,720
15	Stormwater System Upgrades at Greenwood Avenue	\$103,200
Total Implementation Cost		\$6,662,640
<i>Long-Term Implementation</i>		
16	Revetment Enhancement along Boardwalk	\$2,958,240
17	Stormwater System Upgrades at 1 st Street	\$85,320
Total Implementation Cost		\$3,043,560

Funding Opportunities

- Federal and State Grants
 - Federal Emergency Management Agency (FEMA)
 - Hazard Mitigation Grant Program (HMGP)
 - Flood Mitigation Assistance (FMA)
 - Building Resilient Infrastructure and Communities (BRIC)
 - Cost-share through MDE Comprehensive Flood Management Grant Program (CFMGP)
 - Housing and Urban Development (HUD)
 - National Oceanic and Atmospheric Administration (NOAA)
 - Natural Resource Conservation Service (NRCS)
- Loans and Bonds

Question and Answer Session

