

RESILIENT RING'S ISLAND

ANALYSIS AND PRELIMINARY DESIGN

WINTER 2020



What Does Climate Change Look Like in Salisbury?



The region is planning for 40" of sea level rise by 2070



Increased flooding will lead to increased erosion



Precipitation may increase in the winter and spring



Winter ice and snowstorms are expected to increase



The risk of drought will increase in the summer and fall



The average temperature could increase by 10°F by 2100

RESILIENT RING'S ISLAND

DESIGN STRATEGY

FALL 2019

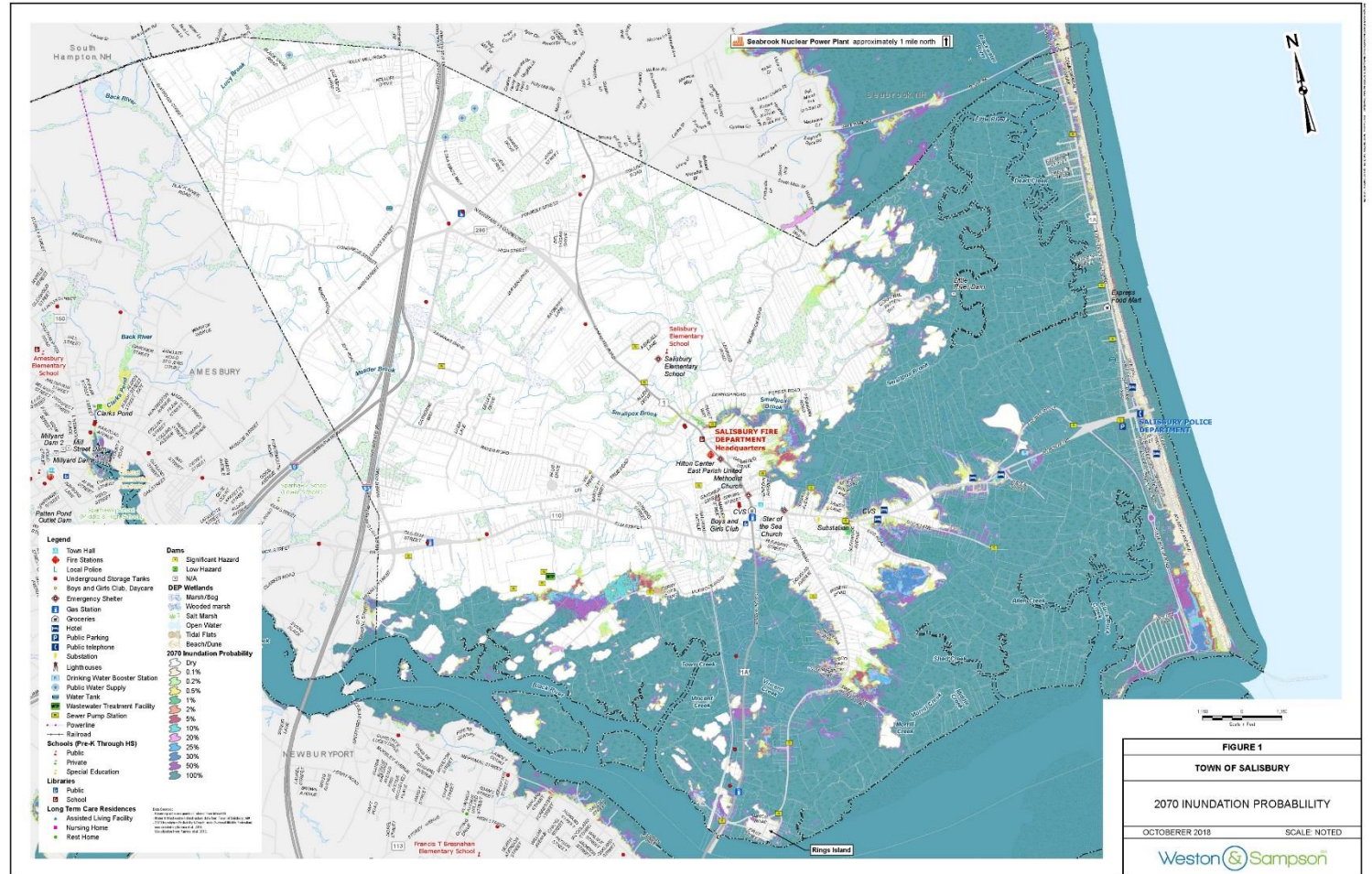
Project Proposal

Flooding occurs along the southwest evacuation route about 8-10 times per year

Northern evacuation route also floods during King Tides and significant storms

Flood conditions are expected to worsen under climate change

4-10 feet of sea level rise is expected by 2100



A map of inundation probability in Salisbury by 2070

RESILIENT RING'S ISLAND

DESIGN STRATEGY

FALL 2019

Municipal Vulnerability Preparedness (MVP) Program

- Program under the MA Executive Office of Energy & Environmental Affairs
- Implementing the MVP Summary of Findings Report
- \$157,500 grant funding to improve the resilience of the Ring's Island neighborhood

Overall Project Goal

The Resilient Ring's Island Project aims to decrease the impact of floods in the area and improve the coastal neighborhood's public safety by raising the access roads and increasing the tidal flushing through culvert replacements at 1st Street, March Road and Ferry Road.

RESILIENT RING'S ISLAND

SURVEY RESULTS

- Public survey to collect feedback related to the proposed Resilient Ring's Island Project
- Accessible on SurveyMonkey from September 2019 to January 2020
- A link was shared on the Salisbury Parks and Recreation Commission's Facebook page
- Hardcopies of the survey were distributed at a public meeting on September 30, 2019. The public meeting was advertised on the Salisbury Parks and Recreation Commission's Facebook page.



19

Online responses



4

Hardcopy responses



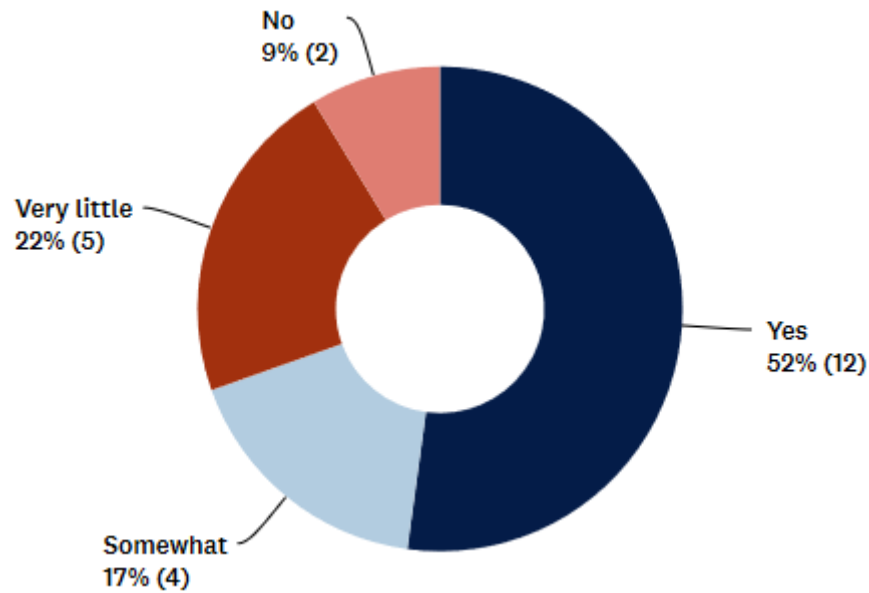
23

Total survey responses

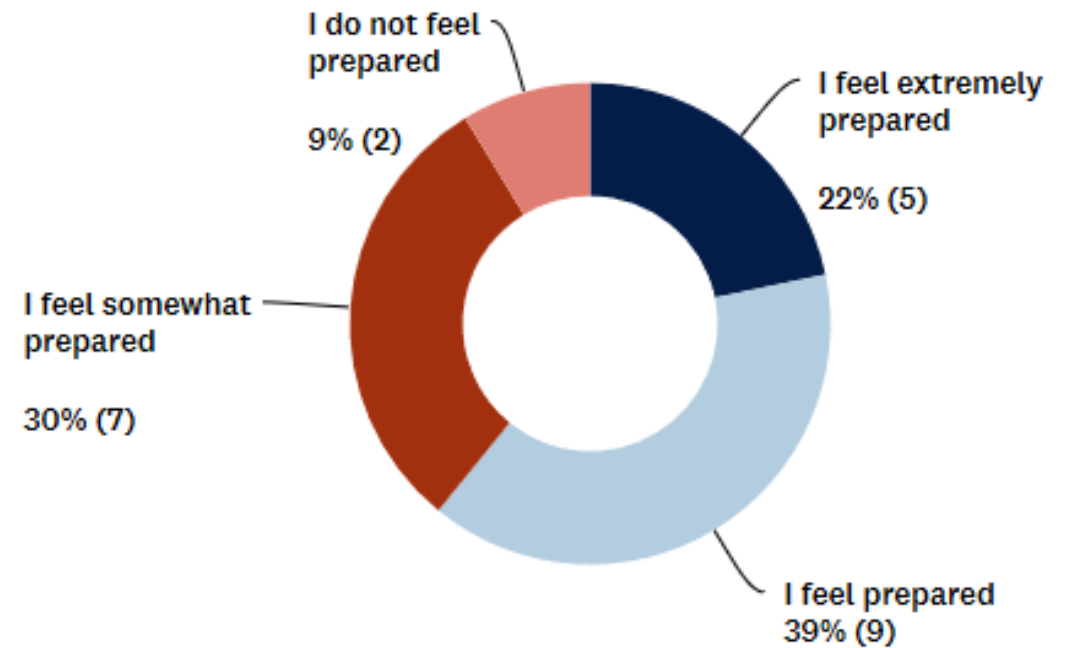
RESILIENT RING'S ISLAND

SURVEY RESULTS

Have you considered how climate change will impact Salisbury?



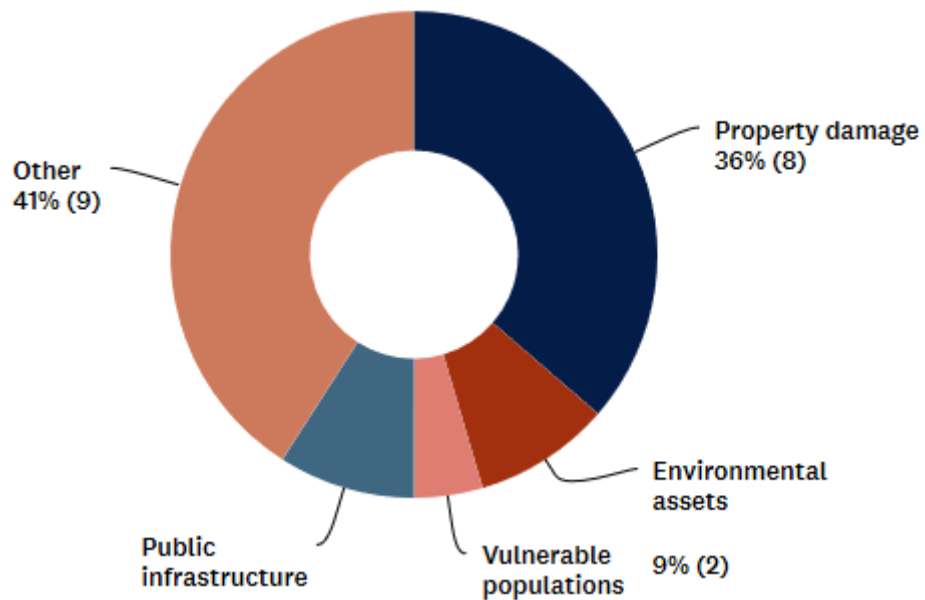
How prepared do you feel for emergencies caused by natural hazards?



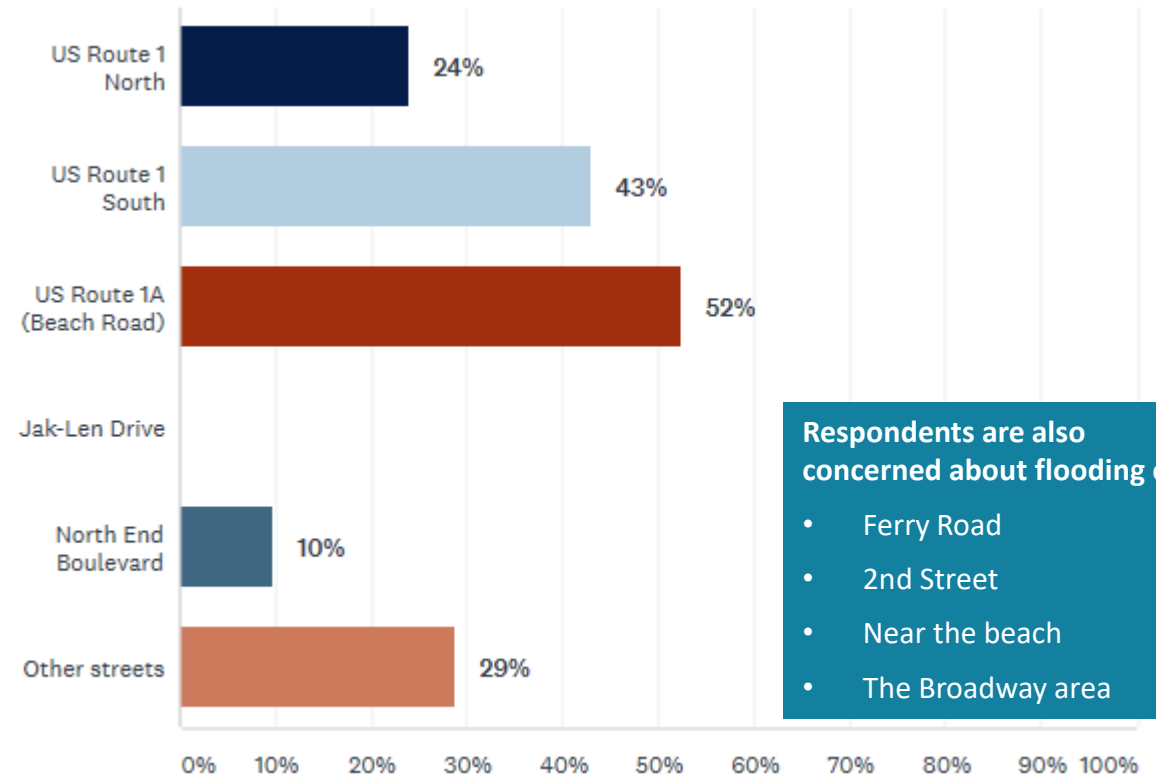
RESILIENT RING'S ISLAND

SURVEY RESULTS

What is your biggest concern regarding climate change?



Have you been impacted by flooding on the following roads?



Respondents are also concerned about flooding on:

- Ferry Road
- 2nd Street
- Near the beach
- The Broadway area

RESILIENT RING'S ISLAND

SURVEY RESULTS

Summary of short-answer responses

- **9 suggestions** that funds be directed toward work in other areas (including the beach)
 - **7 concerns** related to the validity of climate change and whether flooding at Ring's Island is serious enough to constitute a design intervention
 - **7 requests** for receiving additional information on preparing for hazards; including via email, mail, and a flyer
 - **5 concerns** related to the potential impact of tide gates or related interventions on the neighborhood's natural beauty
 - **4 concerns** related to the high speed of cars traveling in this area and the public safety impact for pedestrians if sidewalks are added.
 - **2 comments** that the proposed design will not decrease flooding and may worsen flooding
 - Respondents identified the following priorities for **future climate adaptation work** in Salisbury:
 - The Beach
 - The Broadway area
 - Triton Middle School and High School
 - Burying power lines and developing microgrids
 - Upgrading the water system
 - Fixing storm drains on 2nd street
- Addressing flooding at the beach was **the most frequent response***

RESILIENT RING'S ISLAND

SURVEY RESULTS

Key Findings

Respondents are concerned about...

1/2

Approx. half of respondents have considered local climate change impacts

1/3

Approx. one-third are concerned about climate hazards causing property damage



The aesthetic impact of the proposed design



The validity of climate change and flood risks in this area



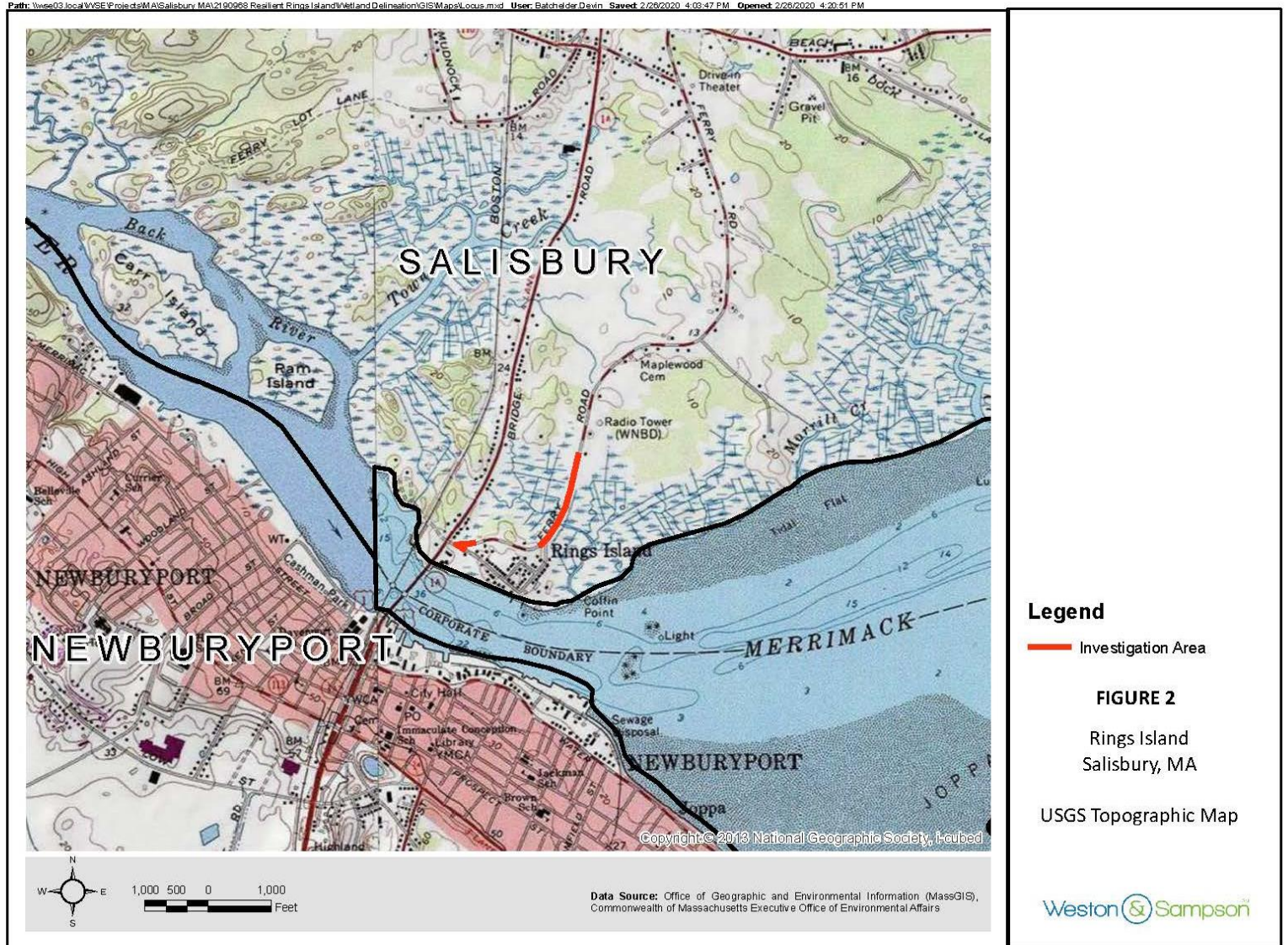
The potential success of the proposed intervention

SURVEY AND ANALYSIS

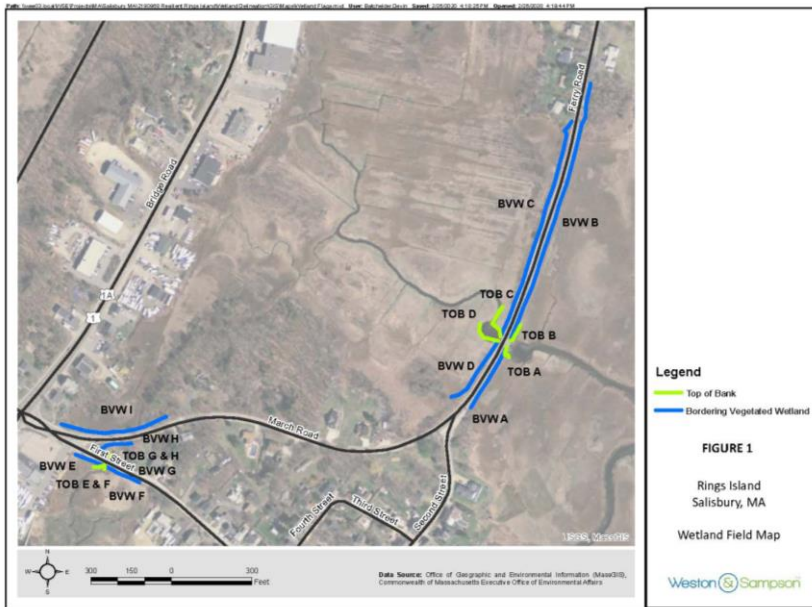
Site Investigation

On January 17, 2020 the presence of wetland resources was investigated in the vicinity of Ring Island in Salisbury.

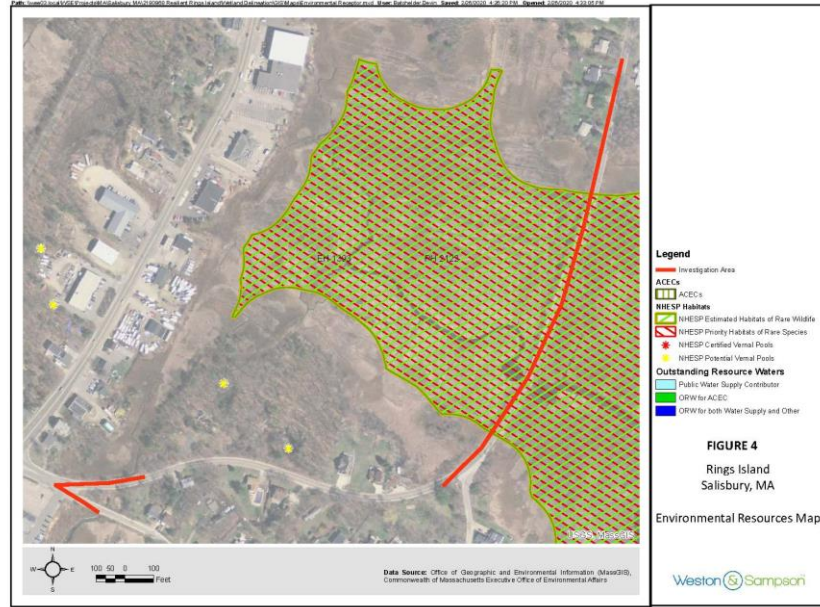
Both bordering vegetated wetlands and intermittent stream bank were identified and flagged at the site.



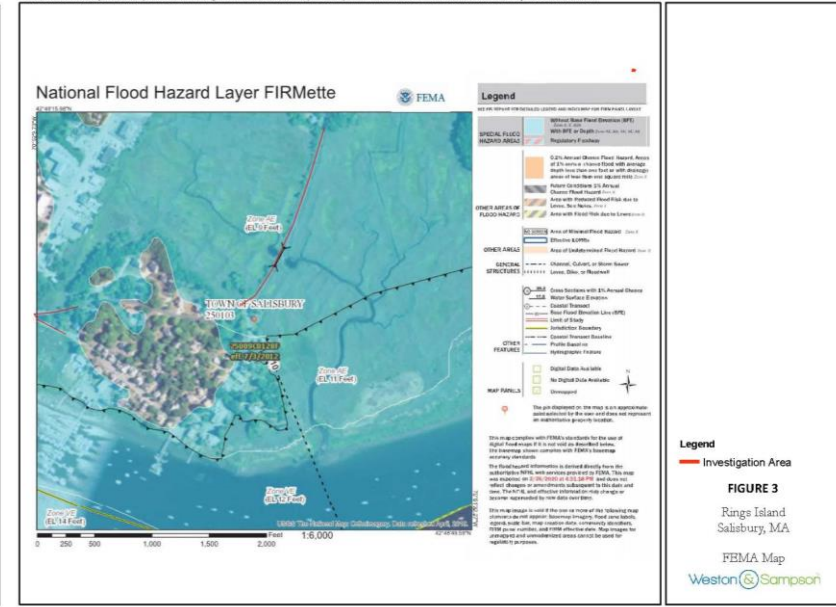
SURVEY AND ANALYSIS



A total of nine BVW series were delineated at the site, and the banks of two perennial streams were flagged.



The following mapping indicates that there is 100-year flood zone, NHESP Priority Habitats of Rare Species and NHESP Estimated Habitats of Rare Wildlife.



Additional environmental mapping was conducted using MassGIS data layers and FEMA FIRM mapping.

RESILIENT RING'S ISLAND

WINTER 2020

PRELIMINARY DESIGN

Redesign Options for Ferry Road and March Road and 1st Street

Option 1: Raised Berm (Earthen Fill)

Option 2: Sheet Pile

Option 3: Elevated Road

New Designed Flood Elevation = 9.5 NAVD88

This is calculated using an astronomical high tide with 2.3 feet of sea level rise (2070 conditions). Woods Hole Group

Additionally, these redesigns incorporate retrofits of the existing, undersized culverts.





Newburyport

Rings Island

Merrimack River



Box Culvert

8'x8'

200 ft

1500 ft

Ferry Road

Existing Pump
Station

March Road

1st Street

500 ft

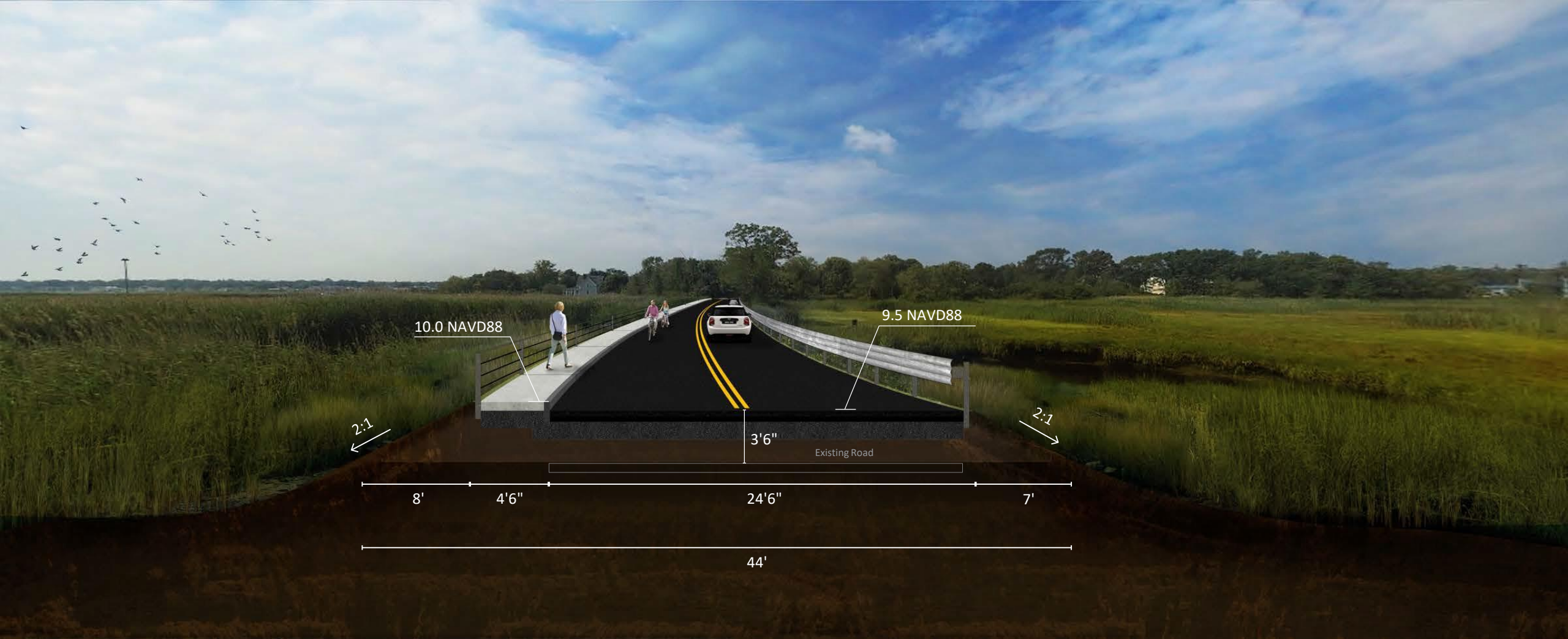
Culvert 2.5ft

US Route 1



Ferry Road towards Rings Island
Option 1 - Raised Berm





Ferry Road towards Rings Island
Option 1 - Raised Berm

Total Volume of Fill
199,750 cubic feet

240,550 cubic feet
with removal of existing road

Pros:

- Easiest to construct
- Simpler relocation of exiting utilities if needed

Cons:

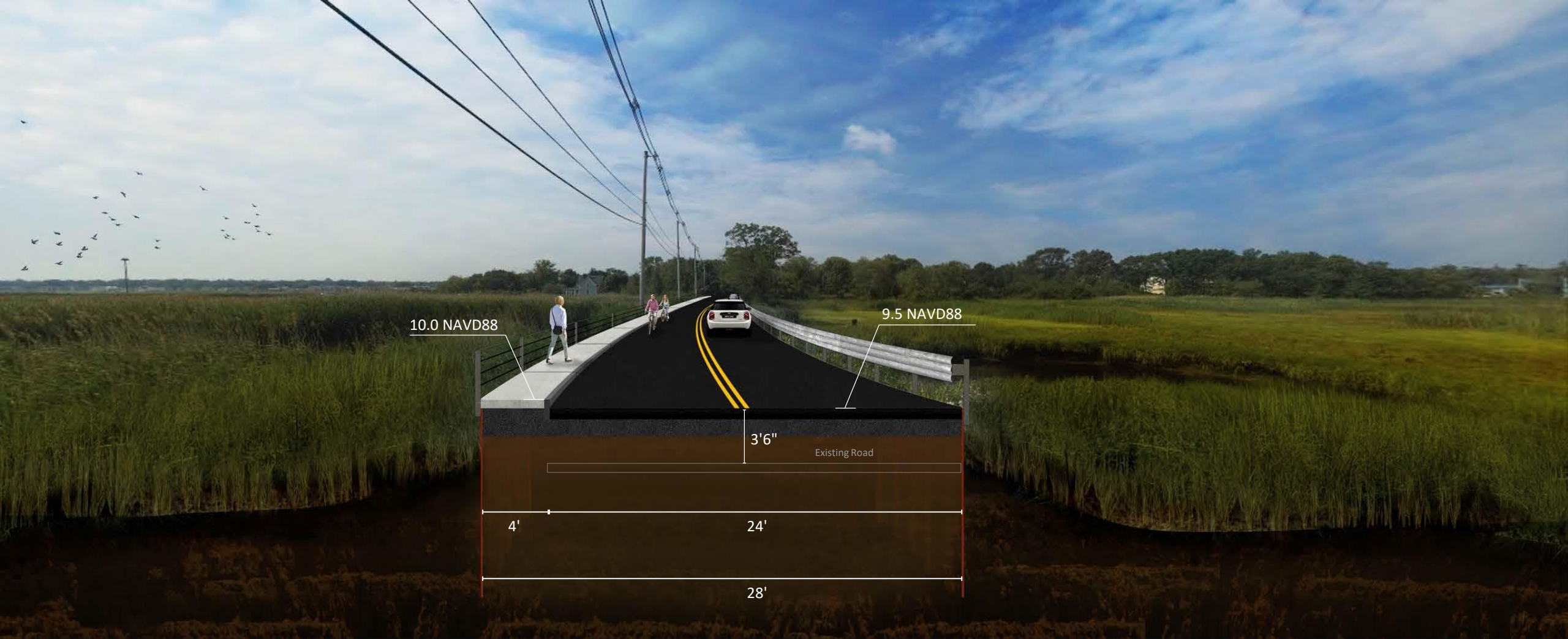
- Wide footprint extends into wetland and would require additional permitting
- Slope offset requires relocation of telephone poles
- Little impact on wetland restoration

Without the Addition of Sidewalk:
Total Volume of Fill

163,200 cubic feet

Area of Wetland Resources Fill
25,500 sq.ft.





Ferry Road towards Rings Island
Option 2 - Sheet Pile

Total Volume of Fill
146,200 cubic feet

Area of Wetland Resources Fill
6,800 sq.ft.

Pros:

- Requires smaller footprint than earthen fill
- Simpler relocation of exiting utilities if needed

Cons:

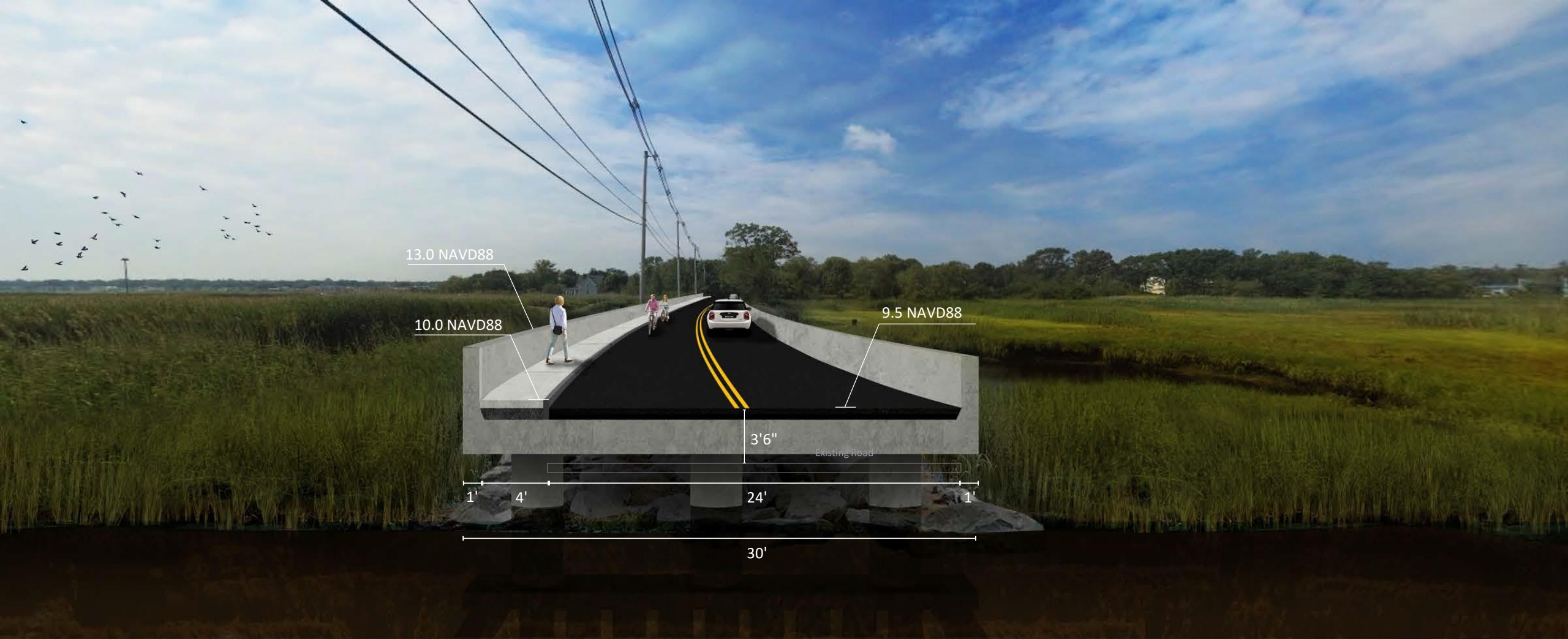
- May negatively impact tidal scouring and intensity along adjacent waterlines due to harder edge
- Negative impact to restoration of wetland
- Requires moving existing buried telephone conduit

Without the Addition of Sidewalk:

Total Volume of Fill
122,400 cubic feet

Area of Wetland Resources Fill
0 sq.ft.





Ferry Road towards Rings Island
Option 3 - Elevated Road

Total Volume of Fill

0 cubic feet

Area of Wetland Resources Fill
10,200 sq.ft. *

Pros:

- Highest potential to improve wetland water flow and ecosystem
- Eliminates need for future culvert enlargements
- Concrete walls can protect from overtopping beyond 2070 SLR and storm surge projections

Cons:

- Costly
- Additional subsurface work for construction of foundations
- Requires moving existing buried telephone conduit and force main

Without the Addition of Sidewalk:

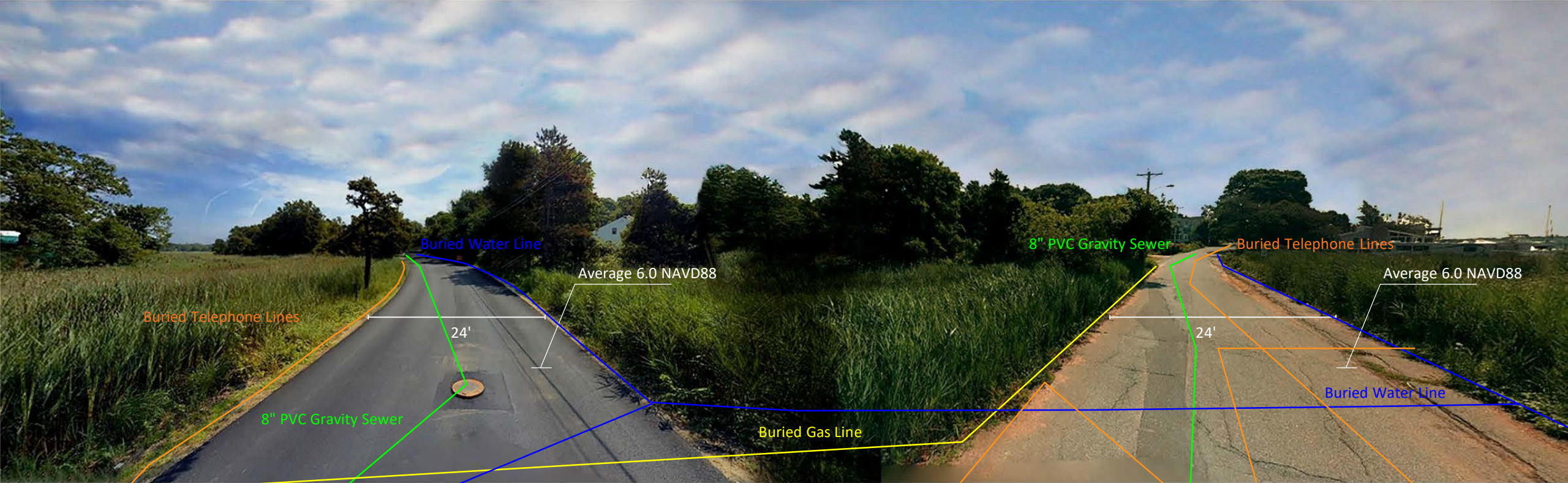
Total Volume of Fill

0 cubic feet

Area of Wetland Resources Fill
3,400 sq.ft.*

*May be closer to 0 sq.ft. because spanning structure will allow light





March Road towards Rings Island
Existing Condition





March Road and 1st St
towards Rings Island
Option 1 - Raised Berm

Total Volume of Fill
100,875 cubic feet

Area of Wetland Resources Fill
38,950 sq.ft.

Pros:

- Easiest to construct
- Simpler relocation of exiting utilities if needed

Cons:

- Wide footprint extends into wetland and would require additional permitting
- Slope offset requires relocation of telephone poles
- Little impact on wetland restoration

Without the Addition of Sidewalk:
Total Volume of Fill

91,200 cubic feet

Area of Wetland Resources Fill
14,250 sq.ft.





March Road and 1st St
towards Rings Island
Option 2 - Sheet Pile

Total Volume of Fill
74,700 cubic feet

Area of Wetland Resources Fill
3,800 sq.ft.

Pros:

- Requires smaller footprint than earthen fill
- Simpler relocation of exiting utilities if needed

Cons:

- May negatively impact tidal scouring and intensity along adjacent waterlines due to harder edge
- Negative impact to restoration of wetland
- Requires moving existing buried telephone conduit

Without the Addition of Sidewalk:

Total Volume of Fill
68,400 cubic feet

Area of Wetland Resources Fill
0 sq.ft.





March Road towards Rings Island Option 3 - Elevated Road

Total Volume of Fill

0 cubic feet

Area of Wetland Resources Fill
5,700 sq.ft. *

Pros:

- Highest potential to improve wetland water flow and ecosystem
- Eliminates need for future culvert enlargements
- Concrete walls can protect from overtopping beyond 2070 SLR and storm surge projections

Cons:

- Costly
- Additional subsurface work for construction of foundations
- Requires moving existing buried telephone conduit and force main

Without the Addition of Sidewalk:

Total Volume of Fill

0 cubic feet

Area of Wetland Resources Fill
1,900 sq.ft.*

*May be closer to 0 sq.ft. because spanning structure will allow light





March Road towards Rings Island
with 1st St Realigned
Option 2 - Sheet Pile

Total Volume of Fill
43,000 cubic feet

Area of Wetland Resources Fill
2,000 sq.ft.

Pros:

- Requires smaller footprint than earthen fill
- Simpler relocation of exiting utilities if needed

Cons:

- May negatively impact tidal scouring and intensity along adjacent waterlines due to harder edge
- Negative impact to restoration of wetland
- Requires moving existing buried telephone conduit

Without the Addition of Sidewalk:

Total Volume of Fill
36,000 cubic feet

Area of Wetland Resources Fill
0 sq.ft.



RESILIENT RING'S ISLAND

ENVIRONMENTAL PERMITTING

WINTER 2020

Option 1 Raised Berm Road for Ferry Street, 2nd St, March Road, and 1st St Combined



Possible Permits:

MA Wetlands Protection Act Notice of Intent (NOI)
MassDEP 401 Water Quality Certification (WQC)
MassDEP Chapter 91 Submission
MEPA Environmental Notification Form (ENF) OR Environmental Impact Report (EIR)
US Army Corp of Engineers (ACOE) Individual Permit (IP)
Massachusetts Coastal Zone Management (CZM) Federal Consistency Review
Massachusetts Division of Marine Fisheries (DMF) Review
Massachusetts Endangered Species Act (MESA) Project Review

Possible Costs:

\$44,000 - \$69,000 (\$34,000 - \$54,000 without sidewalks)

Possible Permit Schedule:

Up to 18 Months (Up to 12 months without sidewalks)

Evaluation Criteria	Option 1	Option 1 Without Sidewalks
Resource Area Impacts	1	2
Possible Permits	1	3
Possible Costs	1	3
Possible Permit Schedule	1	3
Total Rating Score	4	11

A lower score indicates a less preferred alternative.

RESILIENT RING'S ISLAND

ENVIRONMENTAL PERMITTING

WINTER 2020

Option 2 Sheet Pile Road for Ferry Street, 2nd St, March Road, and 1st St Combined



Possible Permits:

MA Wetlands Protection Act Notice of Intent (NOI)
MassDEP 401 Water Quality Certification (WQC)
MassDEP Chapter 91 Submission
MEPA Environmental Notification Form (ENF)
ACOE Individual Permit (IP) or Pre-Construction Notification (PCN)
Massachusetts Coastal Zone Management (CZM) Federal Consistency Review
Massachusetts Division of Marine Fisheries (DMF) Review
Massachusetts Endangered Species Act (MESA) Project Review

Possible Costs:

\$34,000 - \$54,000 (\$20,000 - \$32,000 without sidewalks)

Possible Permit Schedule:

Up to 12 Months (Up to 9 months without sidewalks)

Evaluation Criteria	Option 2	Option 2 Without Sidewalks
Resource Area Impacts	4	6
Possible Permits	3	6
Possible Costs	3	6
Possible Permit Schedule	3	3
Total Rating Score	13	21

A lower score indicates a less preferred alternative.

RESILIENT RING'S ISLAND

ENVIRONMENTAL PERMITTING

WINTER 2020

Option 3 Elevated Road for Ferry Street, 2nd St, March Road, and 1st St Combined



Possible Permits:

MA Wetlands Protection Act Notice of Intent (NOI)
MassDEP 401 Water Quality Certification (WQC)
MassDEP Chapter 91 Submission
MEPA Environmental Notification Form (ENF)
Army Corp of Engineers (ACOE) Individual Permit (IP)
Massachusetts Coastal Zone Management (CZM) Federal Consistency Review
Massachusetts Division of Marine Fisheries (DMF) Review
Massachusetts Endangered Species Act (MESA) Project Review

Possible Costs:

\$34,000 - \$54,000 (\$34,000 - \$54,000 without sidewalks)

Possible Permit Schedule:

Up to 12 Months (Up to 12 months without sidewalks)

Evaluation Criteria	Option 3	Option 3 Without Sidewalks
Resource Area Impacts	3	5
Possible Permits	3	3
Possible Costs	3	3
Possible Permit Schedule	3	3
Total Rating Score	12	14

A lower score indicates a less preferred alternative.

RESILIENT RING'S ISLAND

ENVIRONMENTAL PERMITTING

WINTER 2020

Evaluation reviews each design option for:

- Amount of impact to resource areas
- Required environmental permits associated with those impacts
- Permitting timelines
- Permitting costs

	Combined Ferry Street, 2nd Street, March Road and 1st Street Impacts					
	With Sidewalk			Without Sidewalk		
	Option 1 (Raised Berm)	Option 2 (Sheet Pile)	Option 3 (Elevated Road)	Option 1 (Raised Berm)	Option 2 (Sheet Pile)	Option 3 (Elevated Road)
Resource Area Impacts						
Salt Marsh (sf)	72,950	10,600	15,900	39,750	0	5,300
Bank (lf)	80	16	24	60	0	8
Riverfront Area (sf)	34,400	22,400	24,000	30,400	18,400	20,000
LSCSF (sf)	44,000	8,800	13,200	33,000	0	4,400
NHESP (sf)	39,600	25,200	27,000	35,100	20,700	22,500
Rating Index ¹	1	4	3	2	6	5
Possible Permits	NOI	NOI	NOI	NOI	NOI	NOI
	401 WQC	401 WQC	401 WQC	401 WQC		401 WQC
	Ch 91	Ch 91	Ch 91	Ch 91	Ch 91	Ch 91
	ENF and EIR	ENF	ENF	ENF		ENF
	ACOE IP	ACOE IP	ACOE IP	ACOE IP	ACOE PCN	ACOE IP
Rating Index ¹	1	3	3	3	6	3
Possible Costs²	\$44,000 - \$69,000	\$34,000 - \$54,000	\$34,000 - \$54,000	\$34,000 - \$54,000	\$20,000 - \$32,000	\$34,000 - \$54,000
Rating Index ¹	1	3	3	3	6	3
Possible Permit Schedule (in weeks)	up to 18 months	up to 12 months	up to 12 months	up to 12 months	up to 9 months	up to 12 months
Rating Index ¹	1	3	3	3	3	3
Total Rating Score¹	4	13	12	11	21	14

1. A lower score indicates a less preferred alternative.
2. Costs do not include additional monitoring or studies that may be required to gain permit approval.



Newburyport

Rings Island

Merrimack River



Box Culvert

8'x8'

200 ft

1500 ft

Ferry Road

Existing Pump
Station

March Road

1st Street

Culvert 2.5ft

500 ft

US Route 1

RESILIENT RING'S ISLAND

Questions

Brief Survey: <https://www.surveymonkey.com/r/PYNTRCP>

