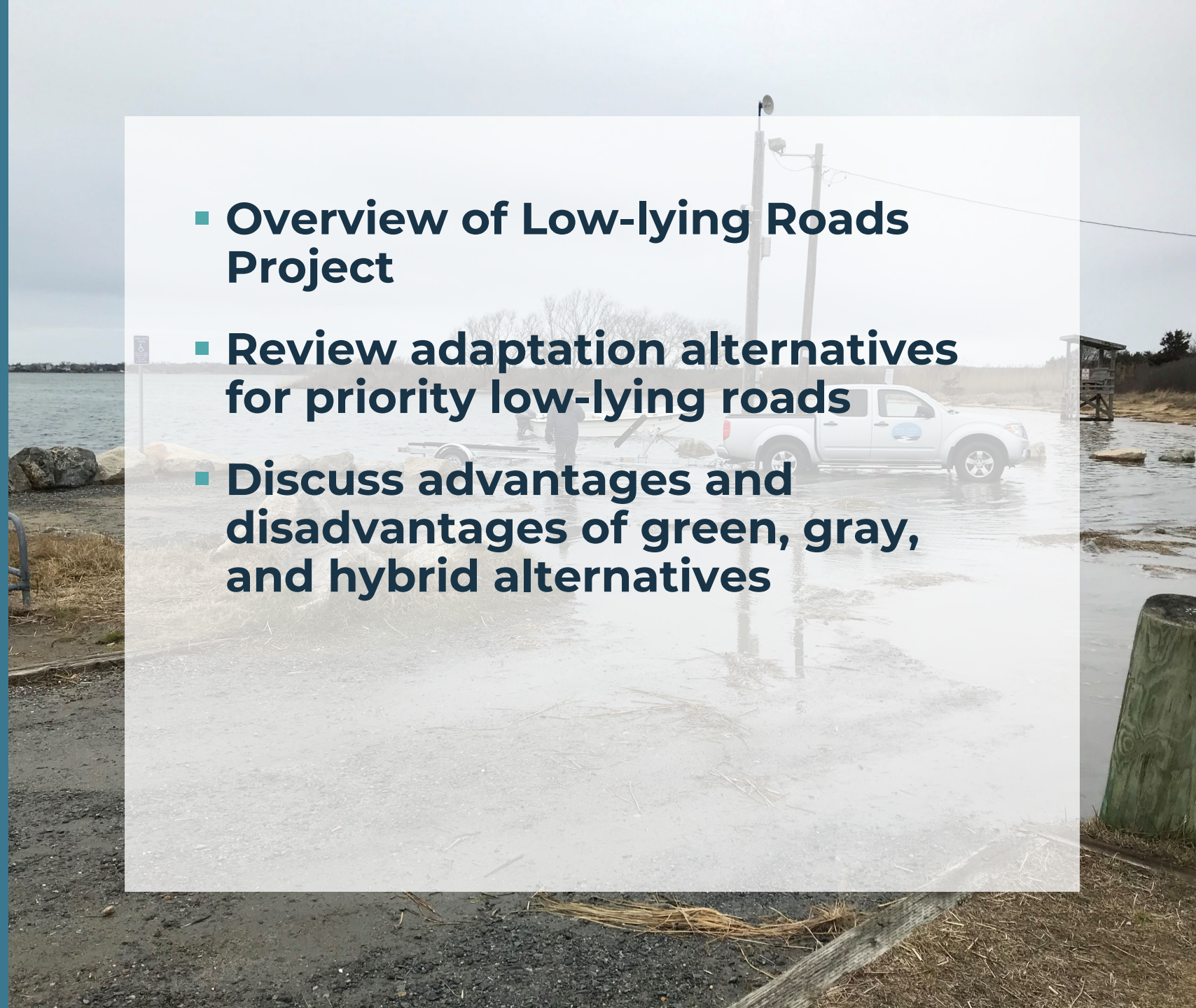
Low-lying Roads: Truro

Project funded by the Municipal Vulnerability Preparedness Program

Purpose and Objectives of Public Meeting



- **Overview of Low-lying Roads Project**
- **Review adaptation alternatives for priority low-lying roads**
- **Discuss advantages and disadvantages of green, gray, and hybrid alternatives**

Agenda

- Project Overview
- Town staff comments
- Presentation of conceptual design alternatives
  - Shore Rd
  - Stotts Crossing
- Questions, comments, and discussion
- Next Steps

Low Lying Roads

10
TOWNS

Barnstable
Bourne
Brewster
Dennis
Eastham
Orleans
Sandwich
Truro
Wellfleet
Yarmouth

- Flooding vulnerability assessment of low-lying roads and transportation infrastructure
- Support municipal road segment prioritization
- Identify range of potential design solutions, costs

Work performed by Cape Cod Commission and Woods Hole Group

PROJECT TIMELINE

Vulnerability Assessment

Prioritize Roadway Segments

1st Workshop: Vulnerable & At-Risk Roads

Roadway site visits

Roadway analysis & solutions ID

2nd Workshop: Present alternatives

September 2021

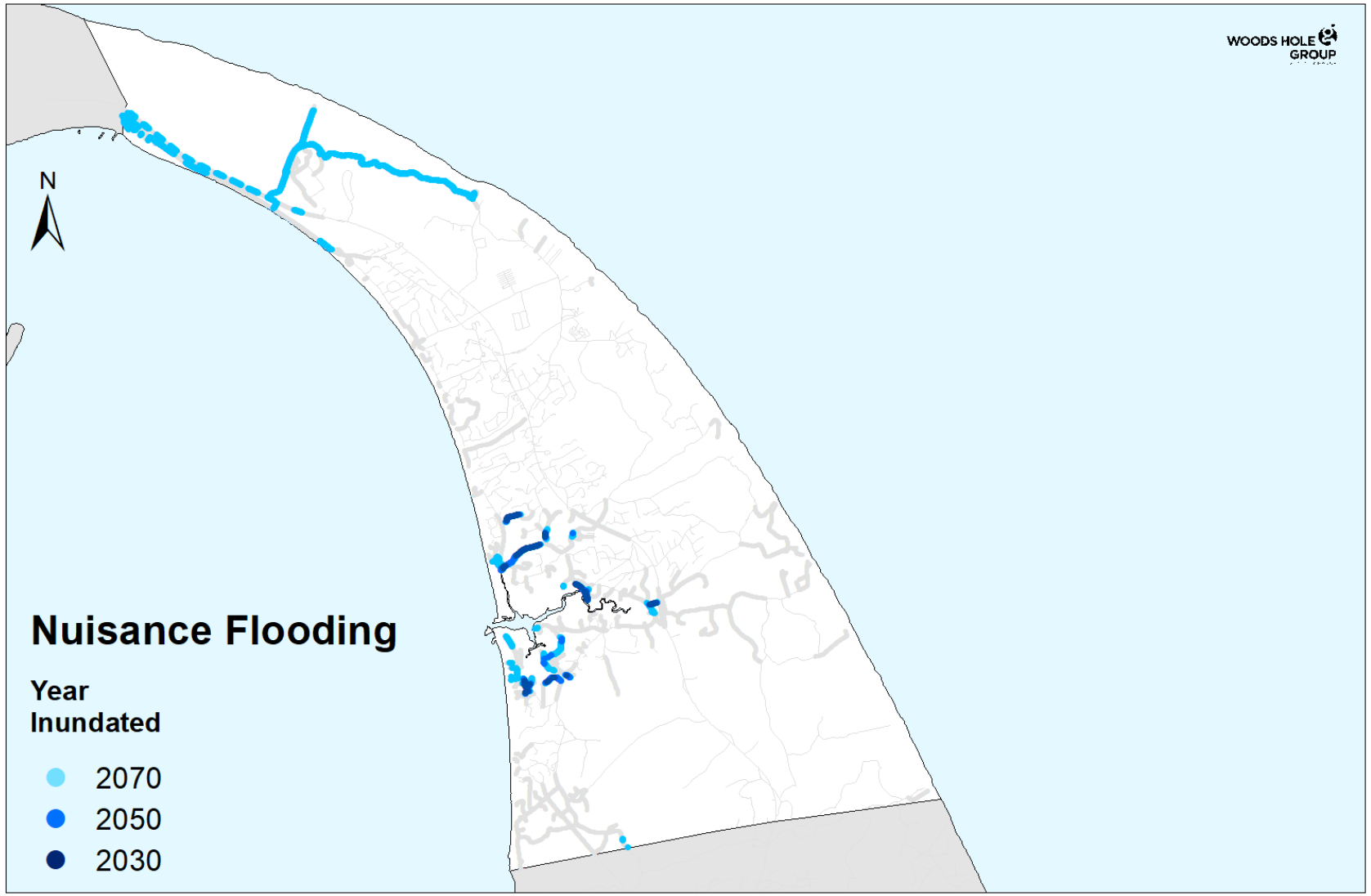
Summer 2022

April 2023

Additional Context & Information

- **Detailed information on webpages:** https://www.capecodcommission.org/our-work/low-lying-roads-project/
- **Other Truro road projects – town comments?**
- **Clarifying questions**
- **Format for meeting**

Low Lying Roads Nuisance Flooding (Truro)



Road Miles 2030

0.9/44.2

Road Miles 2050

1.5/44.2

Road Miles 2070

8.8/44.2

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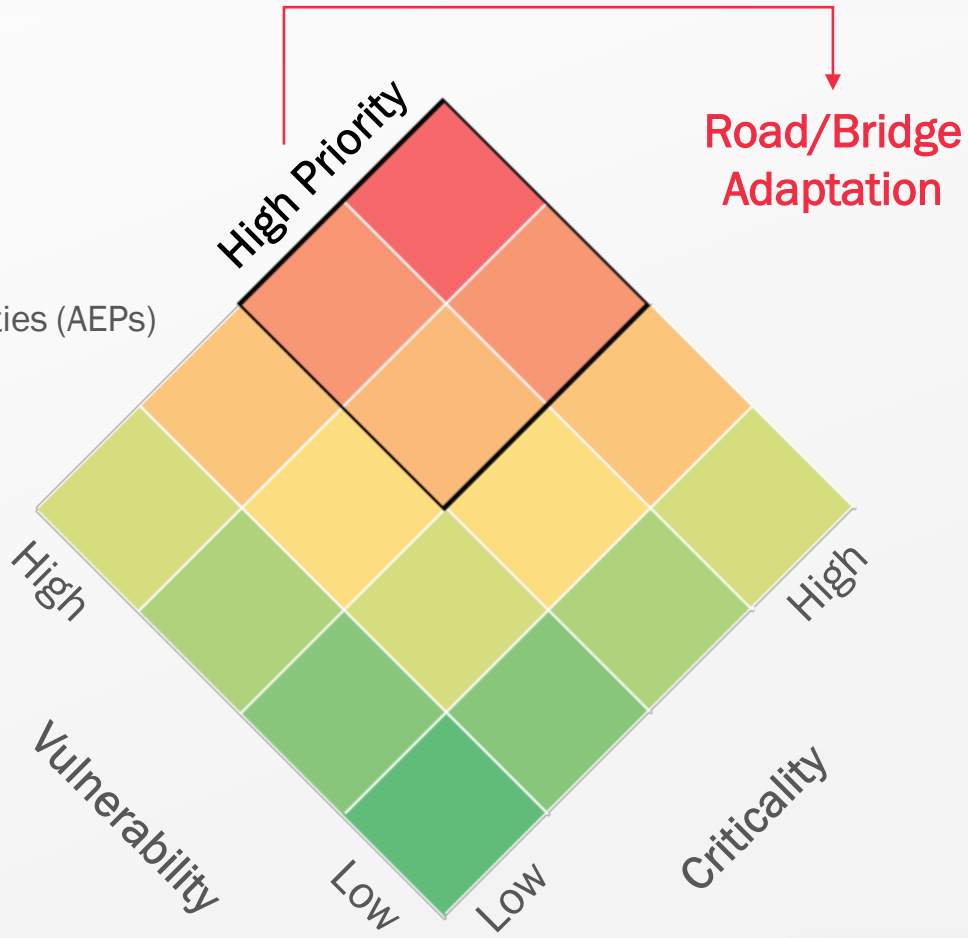
A CLS COMPANY

Cape Cod Low Lying Roads Risk Assessment Approach

1. Extract roadway/bridge critical elevations (CEs)
   - From LiDAR at 20m interval along surface
2. Compile 2030/2050/2070 MC-FRM water surface elevations (WSEs)
   - 0.1%, 0.2%, 0.5%, 1%, 2%, 5%, 10%, 20%, 100% Annual Exceedance Probabilities (AEPs)
3. Compare CEs to WSEs to determine vulnerability
   - Highest probability WSE exceeding CE
4. Score road segment criticality
   - Usage/Network Function
   - Economy
   - Vulnerable Populations
   - Community and Emergency Services
5. Probability * Criticality = Risk
6. Prioritize high-risk road segments for community consideration



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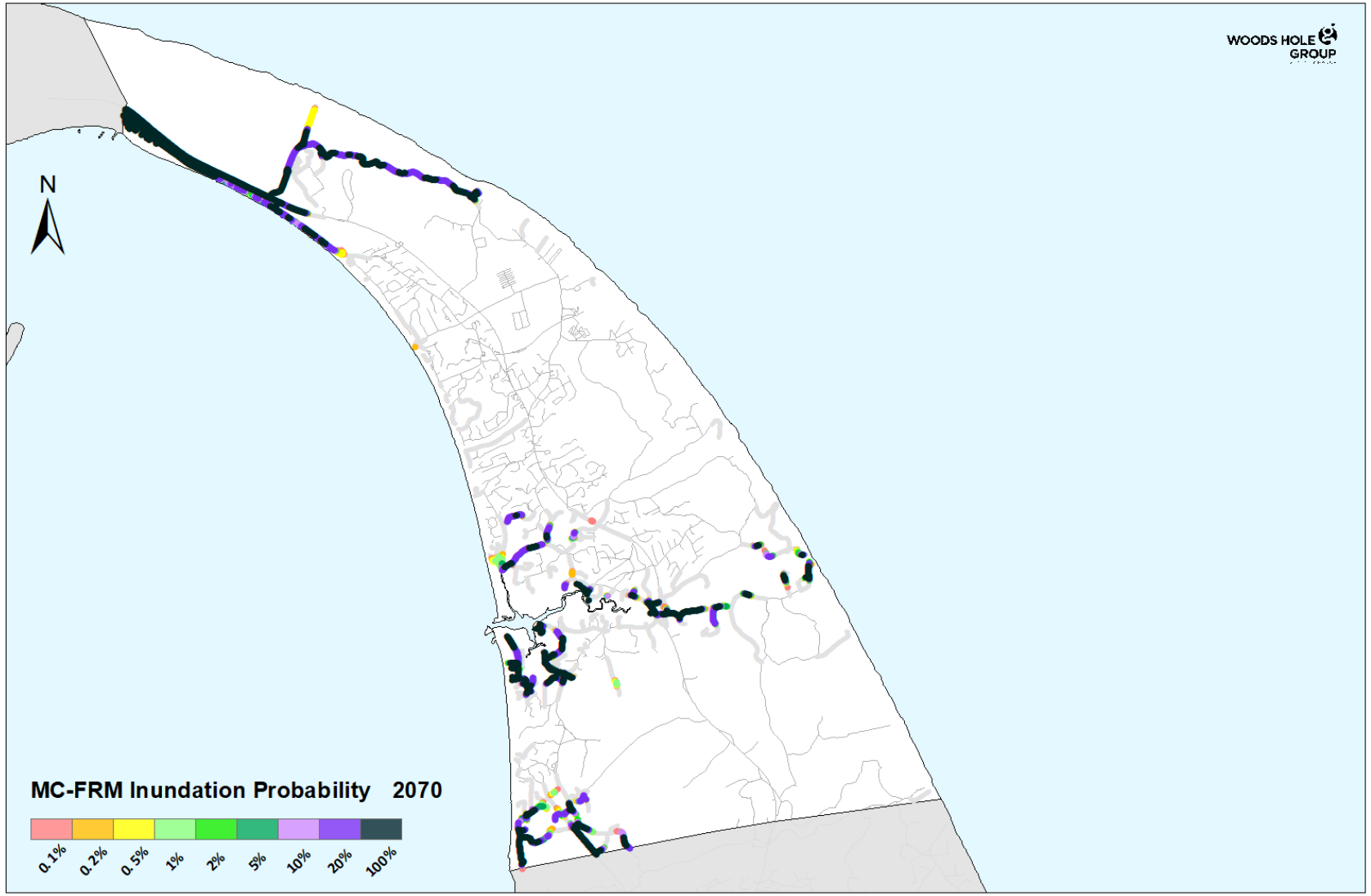
Low Lying Roads 2070 Inundation Probability (Truro)



	%	Road miles
	0.1	19.1
	0.2	18.8
	0.5	18.4
	1	17.7
	2	17.1
	5	16.6
	10	16.0
	20	15.3
	100	10.9

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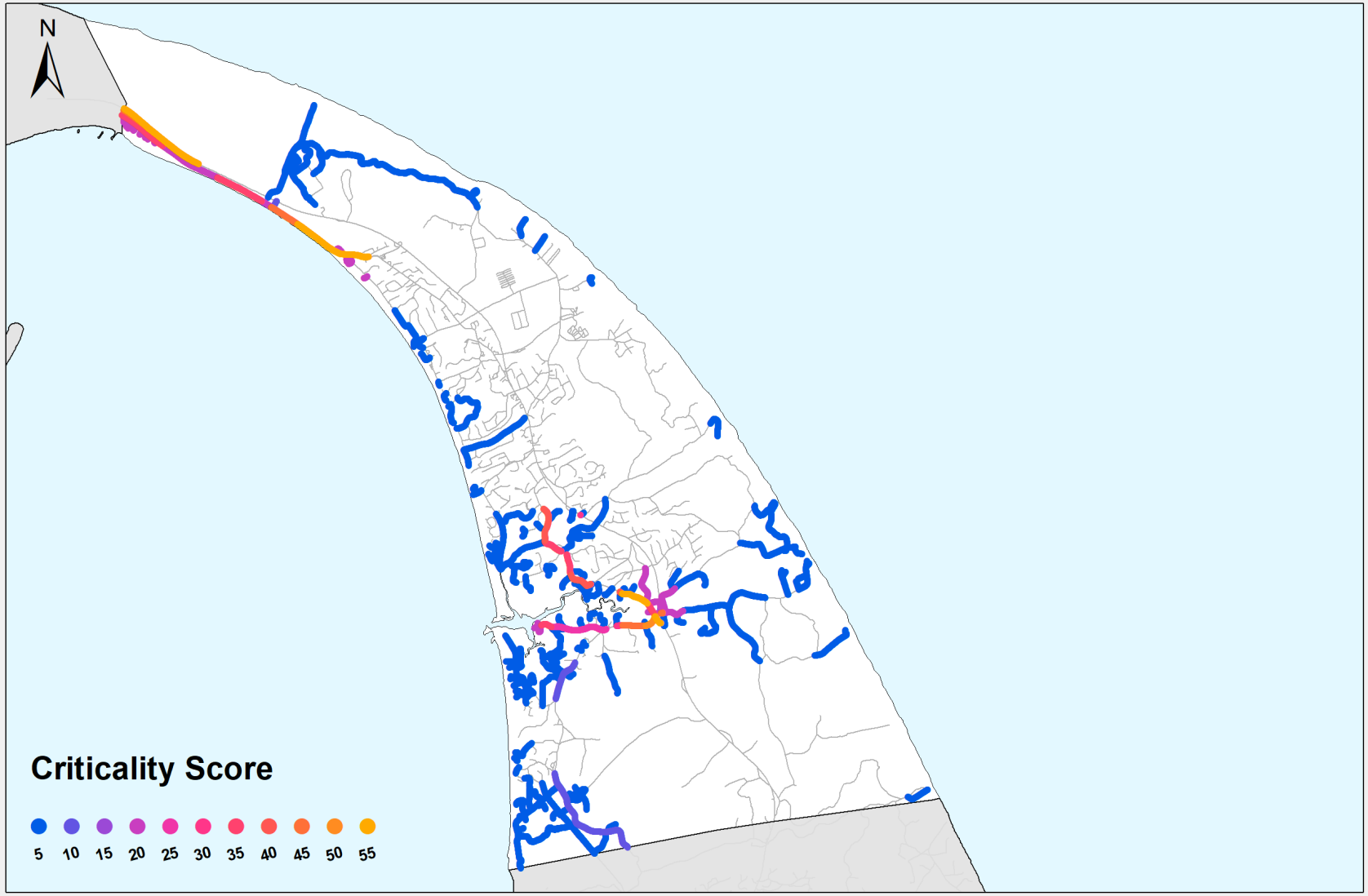
Low Lying Roads Criticality Scoring (Truro)



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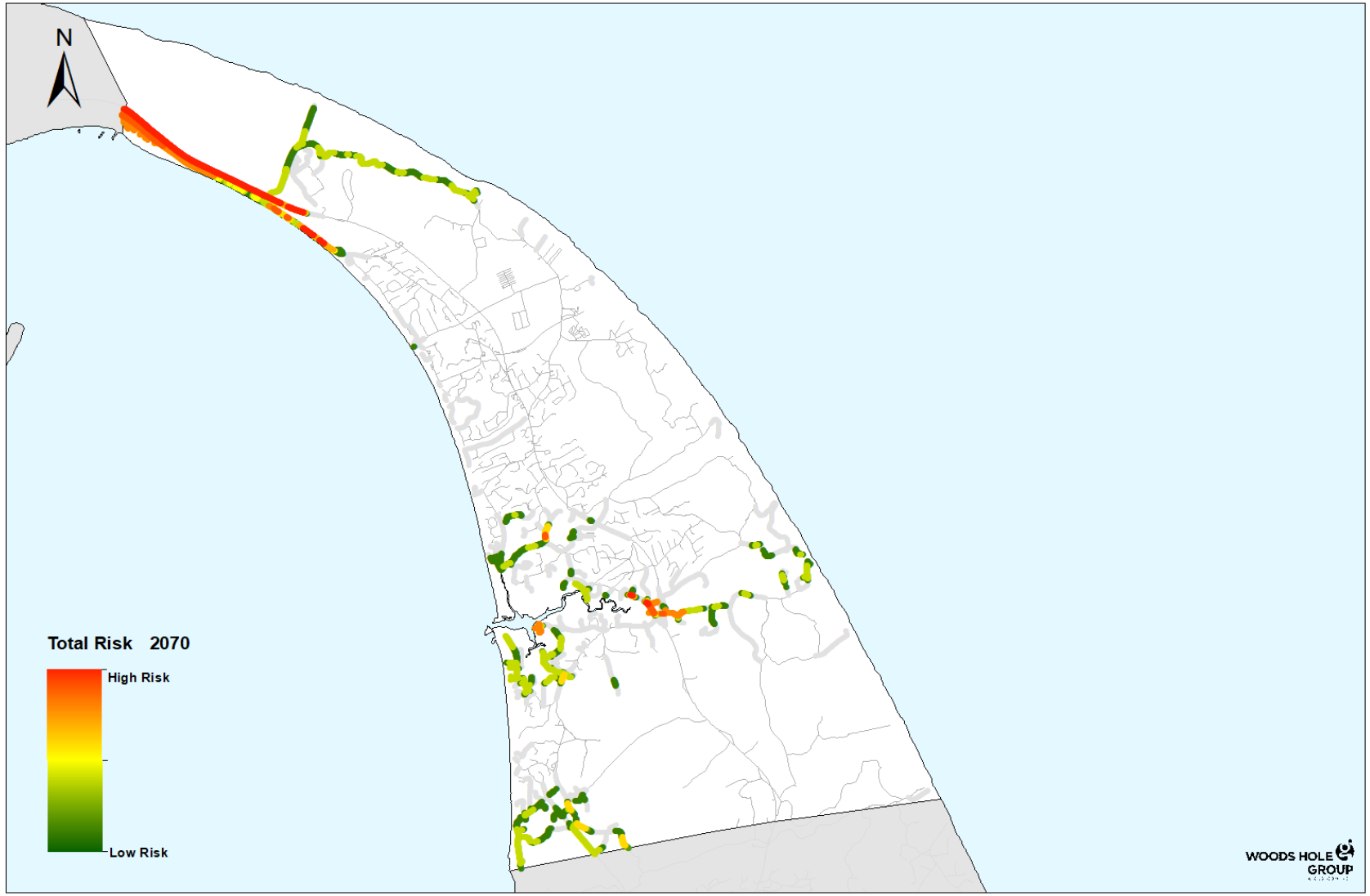
Low Lying Roads 2070 Risk Results (Truro)



High Risk Road Segments

Shore Rd (Rte 6A)*

Shore Rd & Commercial Rd (Rte 6A)*

South Pamet Rd

Old County Rd

Old Pamet Rd & Truro Center Rd

Route 6 at East Harbor*

Castle Rd @ Grays Ln

Shore Rd & Stotts Crossing (Rte 6A)*

Castle Rd @ Little Pamet River

Corn Hill Rd

Fisher Rd

Shore Rd (Rte 6A)*

Holden St

Old County Rd

South Pamet Rd

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Summary of High Priority Road Segments (Truro)

	Name	Length (ft)	Description	Segment Storm Probability (%)			Nuisance Length (ft)		
				2030	2050	2070	2030	2050	2070
A	Shore Rd (Rte 6A)*	2020	Route 6A adjacent to Top Mast Resort	0-100	0.2-100	10-100			740
☑ B	Shore Rd & Commercial Rd (Rte 6A)*	5660	Route 6A leading to Provincetown line	0.1-100	5-100	20-100			3760
C	South Pamet Rd	2500	Large segment east of Route 6 bridge	0-100	0.5-100	10-100			
D	Old County Rd	460	Near Paradise Hollow	0.1-100	2-100	20-100			80
E	Old Pamet Rd & Truro Center Rd †	900	Culverted road over Pamet River	0.1-100	2-100	20-100	340	400	1060
F	Route 6**	12260	Route 6 at East Harbor	0-10	1-20	20-100			5700
G	Castle Rd	240	Intersection with Grays Lane	0-1	2-10	20-100			
☑ H	Shore Rd & Stotts Crossing (Rte 6A)* †	2540	Intersection of Shore Road and Stotts Crossing	0-5	0.2-20	5-100			320
I	Castle Rd	140	Culverted road over Little Pamet River	0-0.5	5	100	80	140	140
J	Corn Hill Rd	2400	Access to Corn Hill Beach	0-1	2-5	10-100	1520	2200	2360
K	Fisher Rd	640	Access to neighborhood	0.5-100	10-00	20-100	440	540	620
L	Shore Rd (Route 6A)*	3460	Additional vulnerable segments of Route 6A	0-2	0-10	1-100			
M	Holden St ††	1020	Access to Head of the Meadow Beach	0-0.2	1-10	20-100			620
N	Old County Rd	600	Culverted road and access to neighborhood	0.1-10	2-100	20-100			
O	South Pamet Rd	860	Access to Ballston Beach	0-100	1-100	10-100			

* = Town and MassDOT roadway
** = MassDOT roadway

† = Town and private roadway
†† = Private roadway

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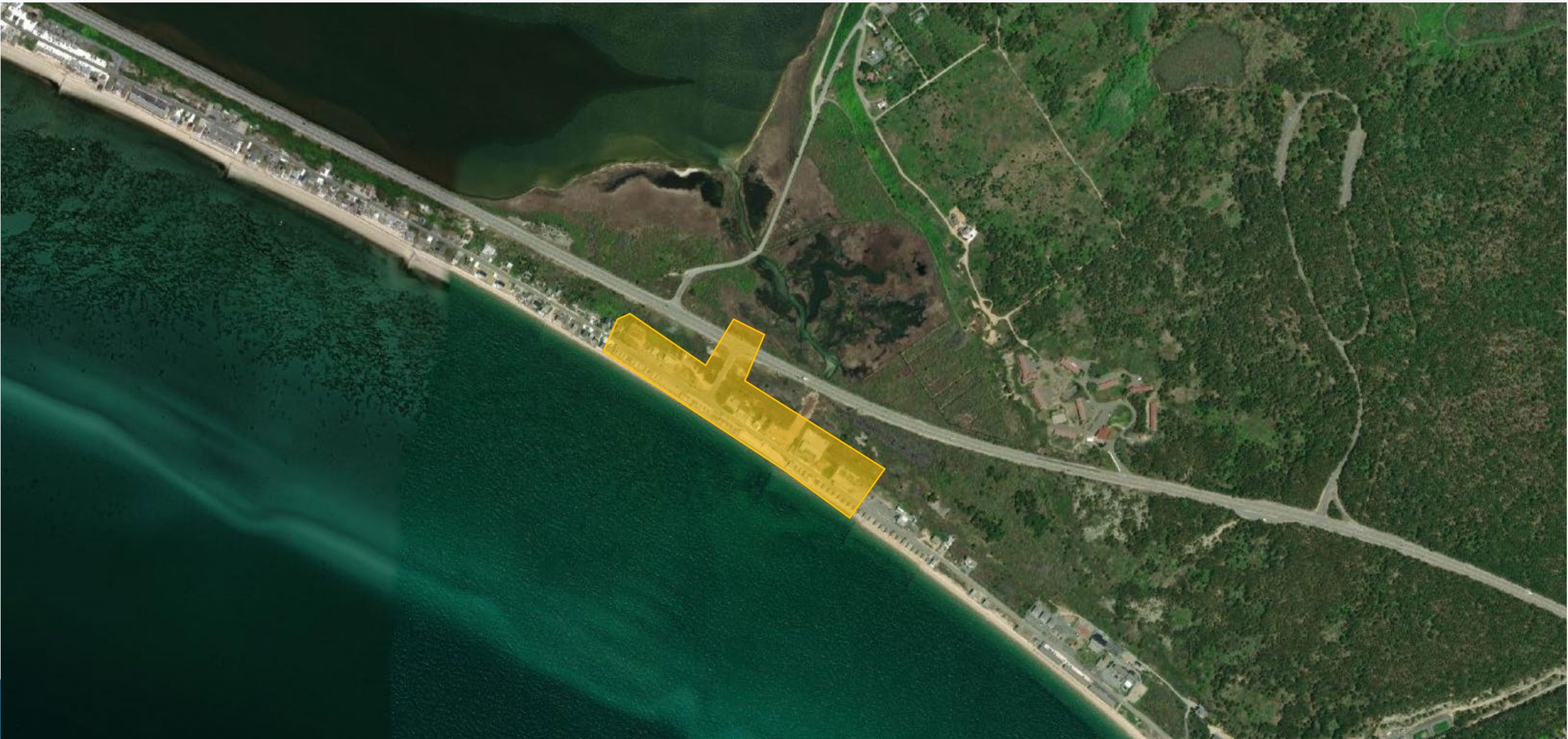
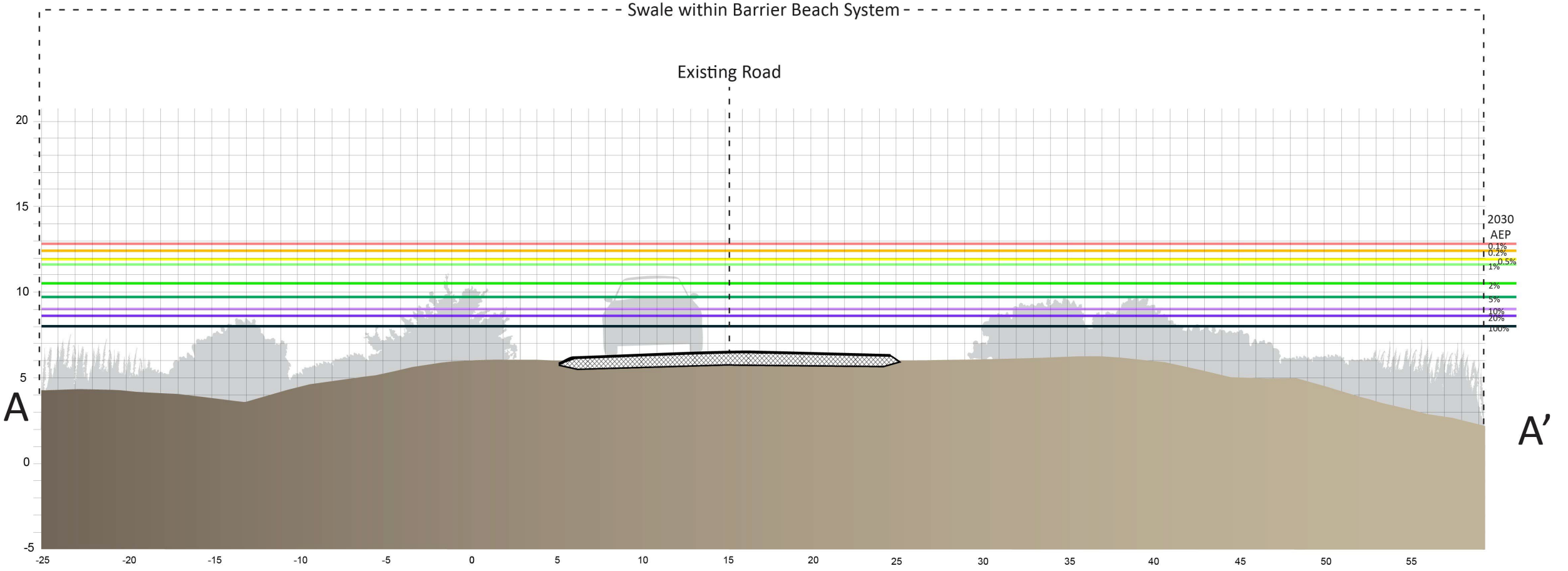
Shore Road at Stotts Crossing



Shore Road at Stotts Crossing



EXISTING CONDITIONS

Stotts Crossing, Truro

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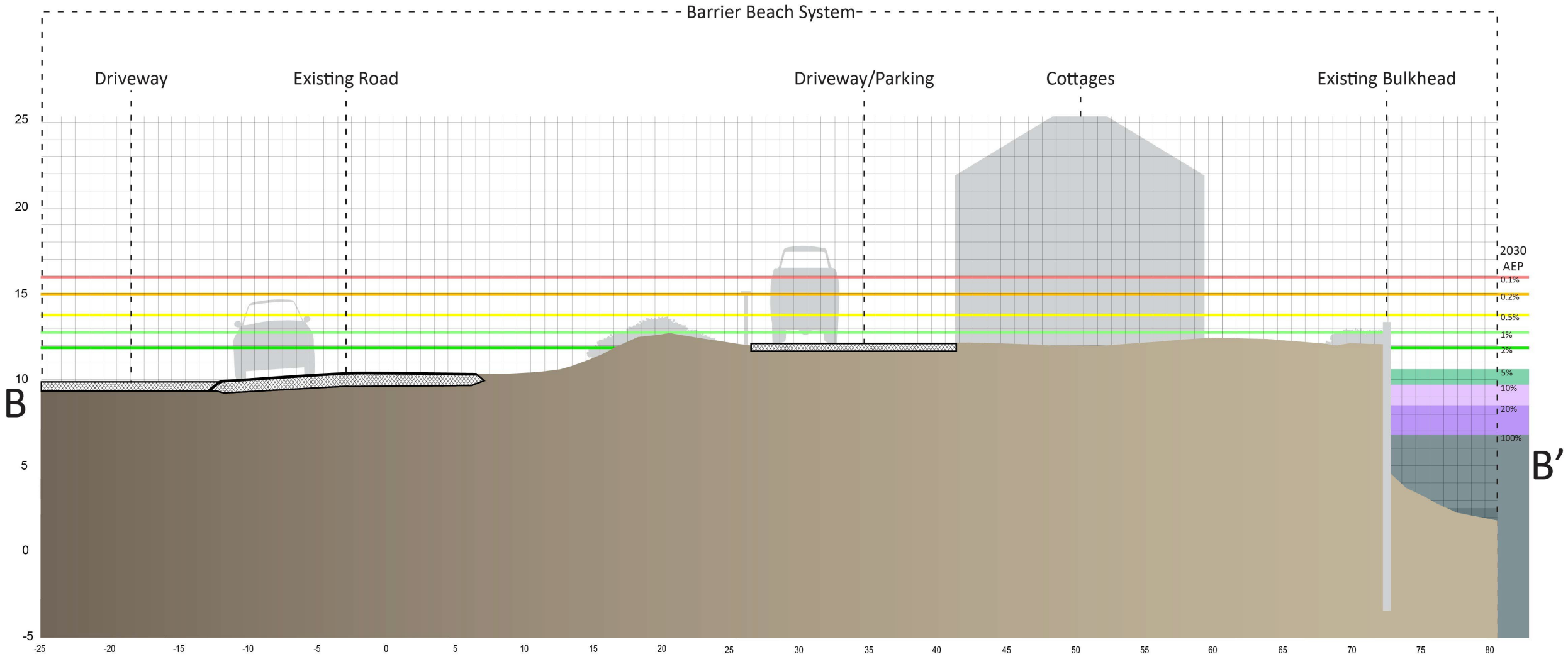
Shore Road at Stotts Crossing



EXISTING CONDITIONS

Shore Road, Truro

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Note: Project overlap with wetland areas, rights of way and property lines is approximate and needs confirmation with a site survey

Shore Road at Stotts Crossing
TRURO

ALTERNATIVE 1: GRAY

1994 linear feet of town-owned road are raised Shore Road is raised from a lowest point of 8.5 feet to a lowest point of 12.0 feet. Stotts Crossing slopes from Shore Road at 12.0 feet to Route 6 at 9.5 feet, raising its lowest point from 5.9 to 9.5 feet. The road segments are protected from primary flood pathways from Cape Cod Bay to 12.0 feet and from potential flanking flood pathways from East Harbor to 9.5 feet.

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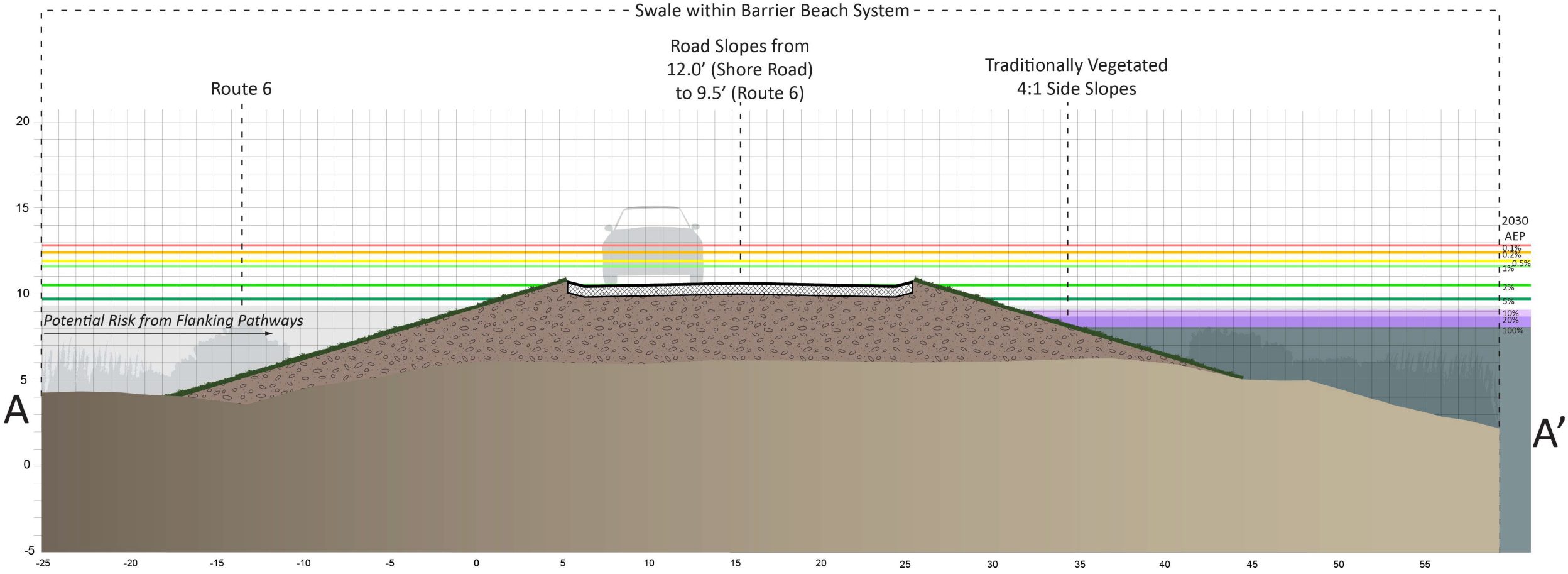
Shore Road at Stotts Crossing



ALTERNATIVE 1: GRAY

Stotts Crossing, Truro

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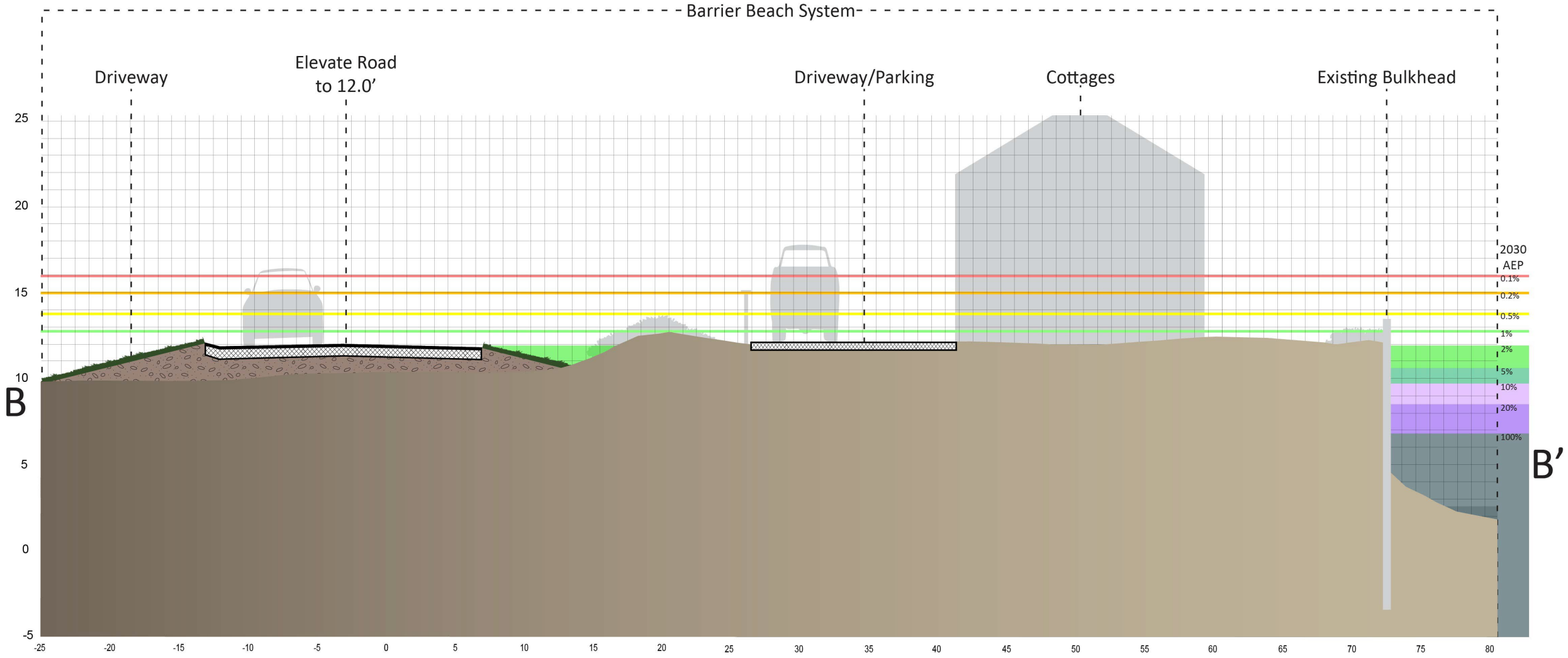
Shore Road at Stotts Crossing



ALTERNATIVE 1: GRAY

Shore Road, Truro

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Note: Project overlap with wetland areas, rights of way and property lines is approximate and needs confirmation with a site survey

Shore Road at Stotts Crossing
TRURO

ALTERNATIVE 2: HYBRID

Approximately 2000 linear feet of private bulkhead are retrofitted or extended to provide protection to 13.5 feet. The bulkhead ties in to the existing dune at the town beach and existing higher bulkhead and dune on either end. This approach does not address possible flanking pathways from East Harbor.

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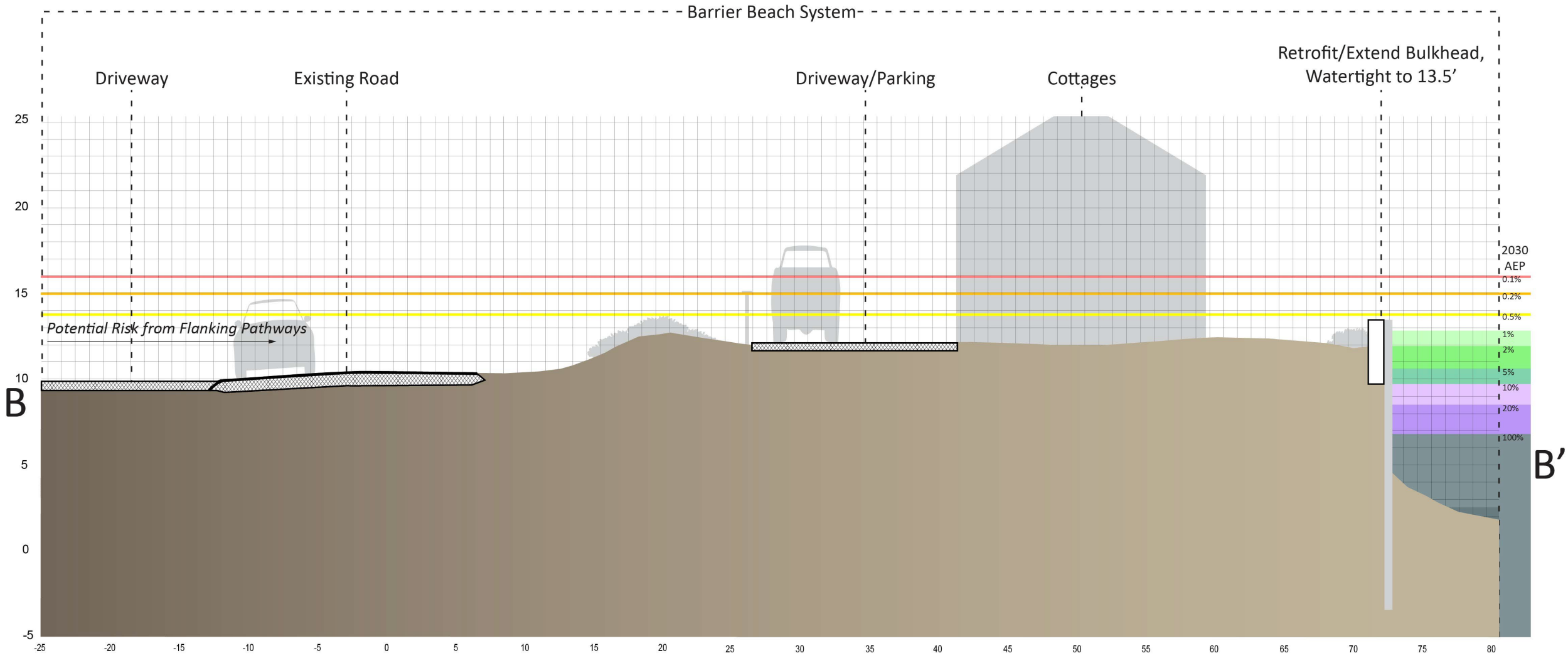
Shore Road at Stotts Crossing



ALTERNATIVE 2: HYBRID

Shore Road, Truro

WOODS HOLE GROUP
A CLS COMPANY

Note: Project overlap with wetland areas, rights of way and property lines is approximate and needs confirmation with a site survey

Shore Road at Stotts Crossing
TRURO

ALTERNATIVE 3: GREEN

Approximately 2400 linear feet of dunes and dune enhancements to 15 feet are constructed along Shore Road. Three parcels' worth of cottages are bought out. There is a possiblity to extend this approach to the east to prevent flanking from Cape Cod Bay. This approach does not address possible flanking pathways from East Harbor.

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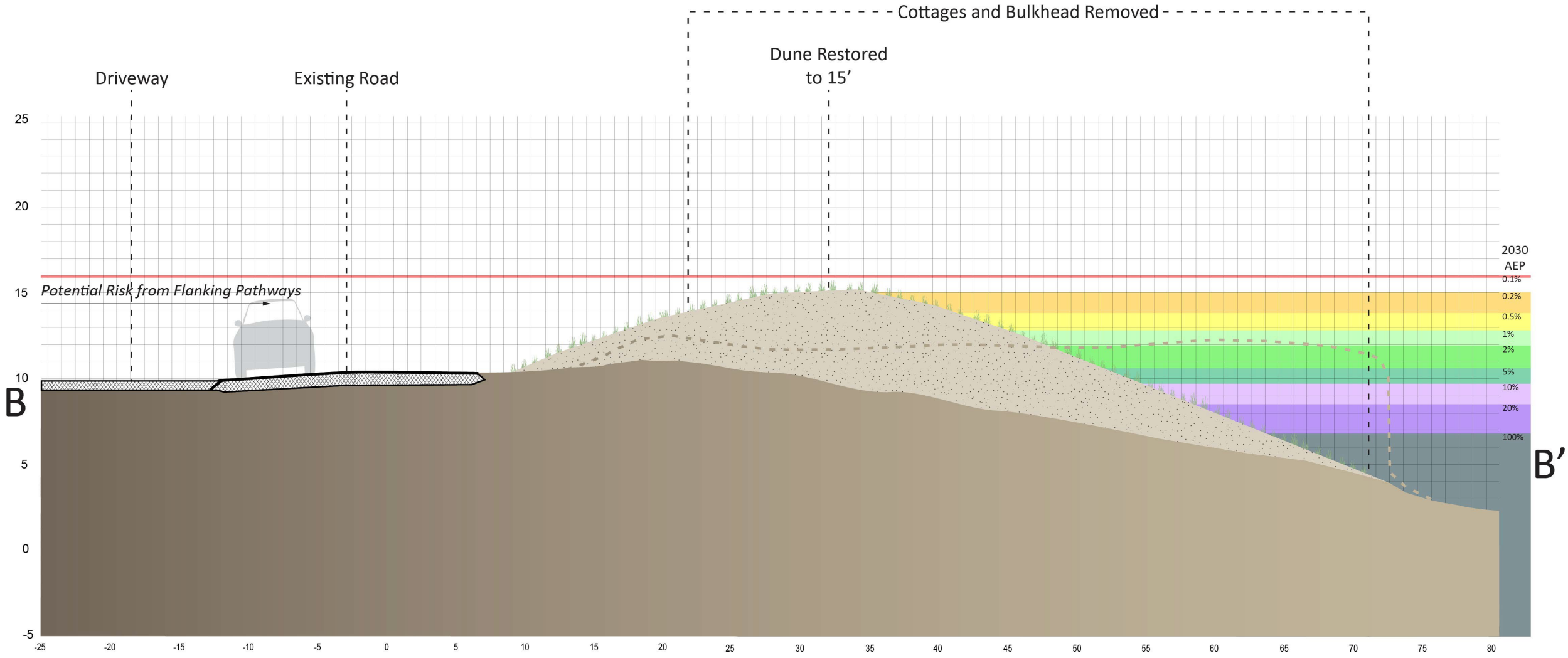
Shore Road at Stotts Crossing



ALTERNATIVE 3: GREEN

Shore Road, Truro

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SHORE ROAD at STOTTS CROSSING, TRURO

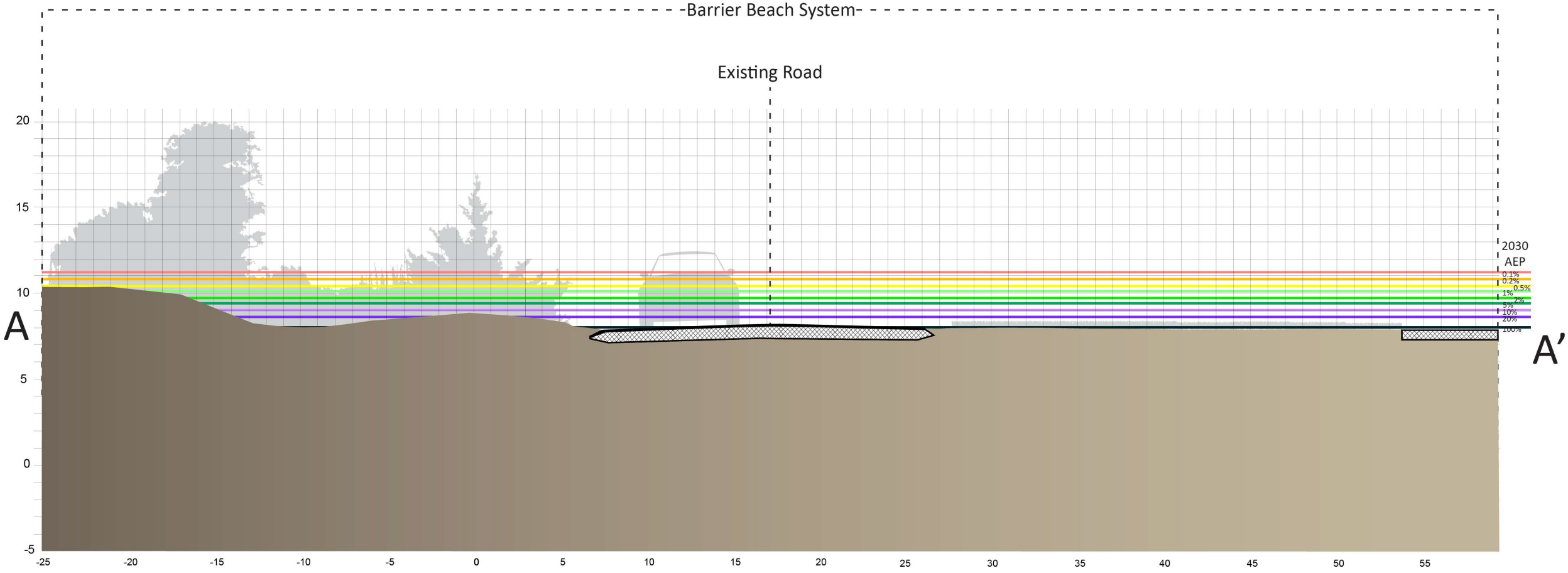
Summary of alternatives

	Description	Critical Elevation	Annual Exceedance Probability			Vulnerable to Tidal Flooding	Impacts to Resource Area(s)	Impacts to Private Property	Estimated Cost*
			2030	2050	2070				
EXISTING	A segment of 20 foot wide road with a culvert crossing.	5.9 feet	100%	100%	100%	2070	N/A	N/A	N/A
ALTERNATIVE 1: GRAY	1994 linear feet of town-owned road are raised to 12.0 feet using traditionally vegetated 4:1 side slopes. Stotts Crossing slopes from Shore Road at 12.0 feet to Route 6 at 9.5 feet, raising its lowest point from 5.9 to 9.5 feet.	12.0 feet	0.5%	2%	20%	N/A	Minimal	Minimal	$831,000
ALTERNATIVE 2: HYBRID	Approximately 2000 linear feet of private bulkhead are retrofitted or extended to provide protection to 13.5 feet. This approach does not address possible flanking pathways from East Harbor.	13.5 feet	0%	0.2%	2%	2070	Minimal	Yes	$899,000 (excluding easments)
ALTERNATIVE 3: GREEN	1994 linear feet of town-owned road are raised Shore Road is raised from a lowest point of 8.5 feet to a lowest point of 12.0 feet. Stotts Crossing slopes from Shore Road at 12.0 feet to Route 6 at 9.5 feet, raising its lowest point from 5.9 to 9.5 feet. The road segments are protected from primary flood pathways from Cape Cod Bay to 12.0 feet and from potential flanking flood pathways from East Harbor to 9.5 feet.	15.0	0%	0%	0.2%	2070	Possible Positive	Yes	$1,496,000 (excluding acquisitions)

*2023 installed material cost +40% escalation (through 2029) and 15% contingency. Excludes design, permitting, mobilization, stormwater and wastewater infrastructure, and site controls. Costs based on experienced contractor opinion and MassDOT costing data.

Shore Road at Provincetown Line

Shore Road at Provincetown Line



EXISTING CONDITIONS

Shore Road at Provincetown Line, Truro

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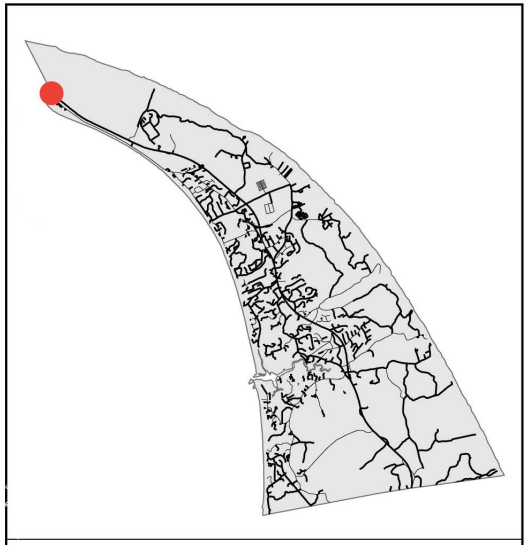

Shore Road at Provincetown Line
TRURO

ALTERNATIVE 1: GRAY

2378 linear feet of town-owned road are raised from a lowest point of 7.6 feet to a lowest point of 10.5 feet using traditionally vegetated 4:1 side slopes. This alternative extends into Provincetown, and collaboration would be necessary.

Note: Project overlap with wetland areas, rights of way and property lines is approximate and needs confirmation with a site survey

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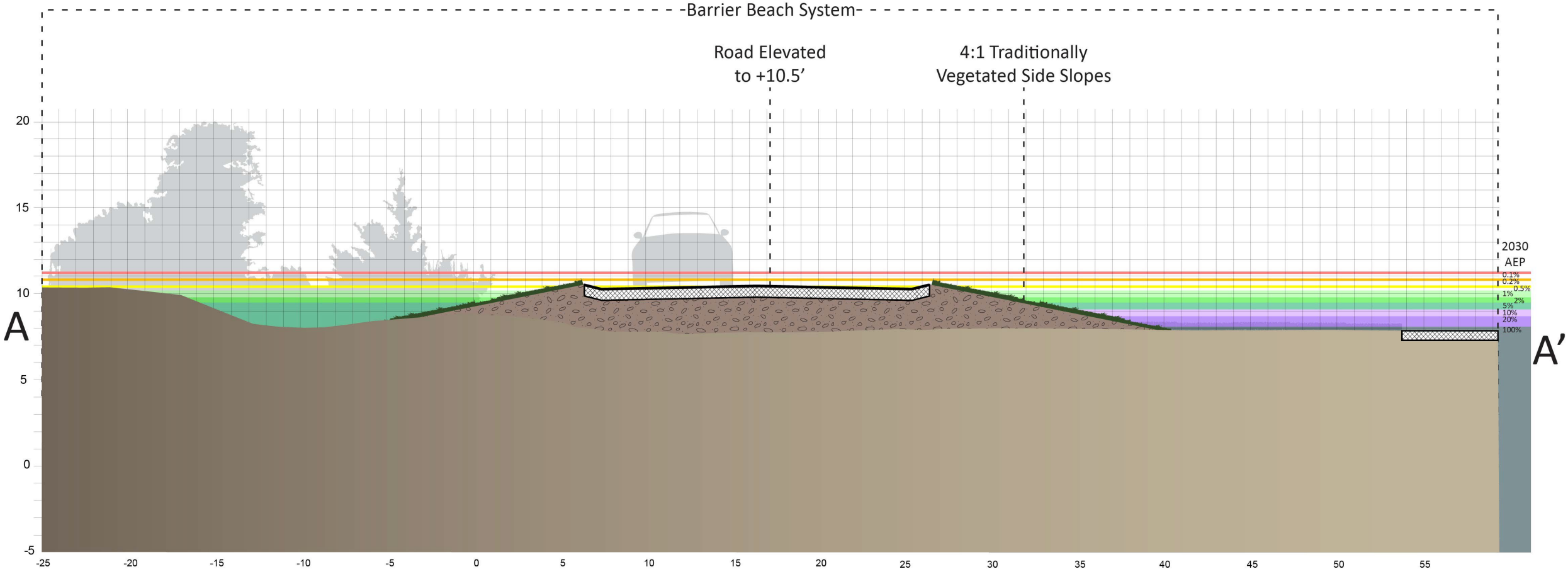
Shore Road at Provincetown Line



ALTERNATIVE 1: GRAY

Shore Road at Provincetown Line, Truro

WOODS HOLE GROUP
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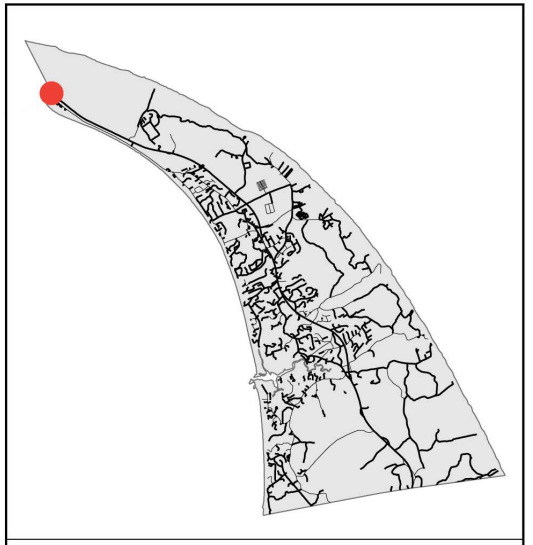
Note: Project overlap with wetland areas, rights of way and property lines is approximate and needs confirmation with a site survey



Shore Road at Provincetown Line
TRURO

ALTERNATIVE 2: GREEN

A wide dune to 11.0 feet is restored on Parcels 2-5-0, 2-13-0, and 1-6-0. Other breaches in the dune are patched. This alternative could be phased and possibly extended eastward in the future. Dune walkovers or mobimats can be used to preserve beach access. This approach may need to consider potential flanking from East Harbor.

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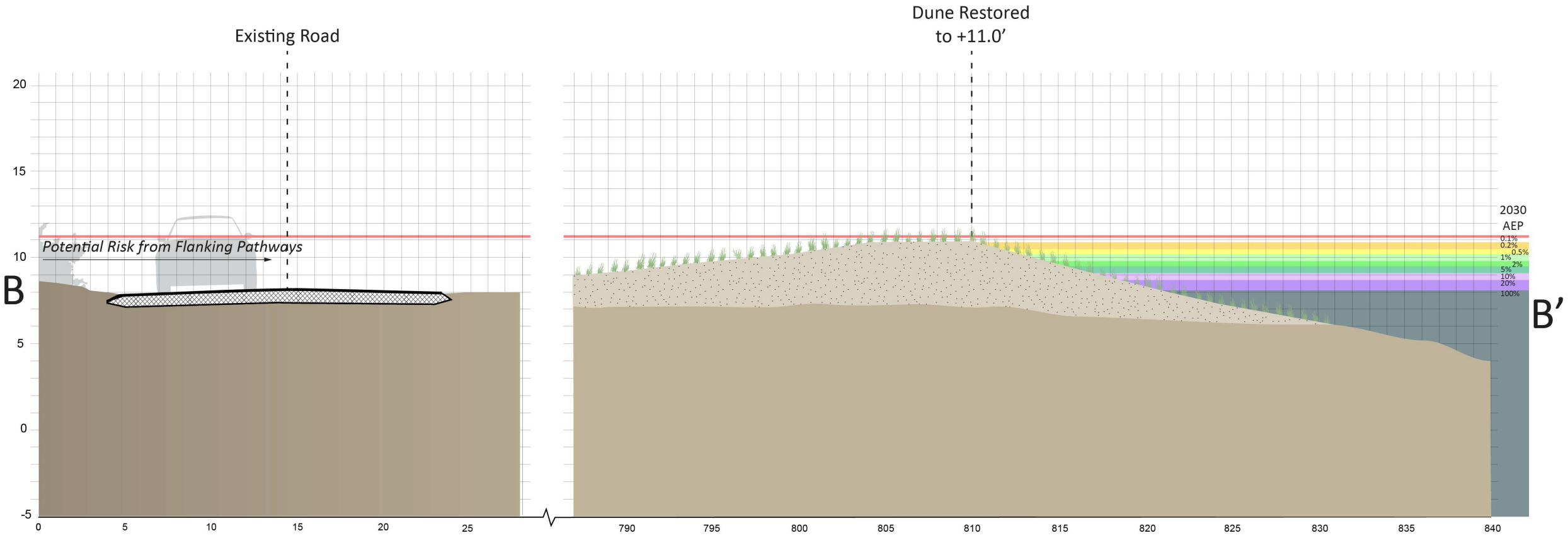
Shore Road at Provincetown Line



ALTERNATIVE 2: GREEN

Shore Road at Provincetown Line, Truro

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SHORE ROAD at PROVINCETOWN LINE

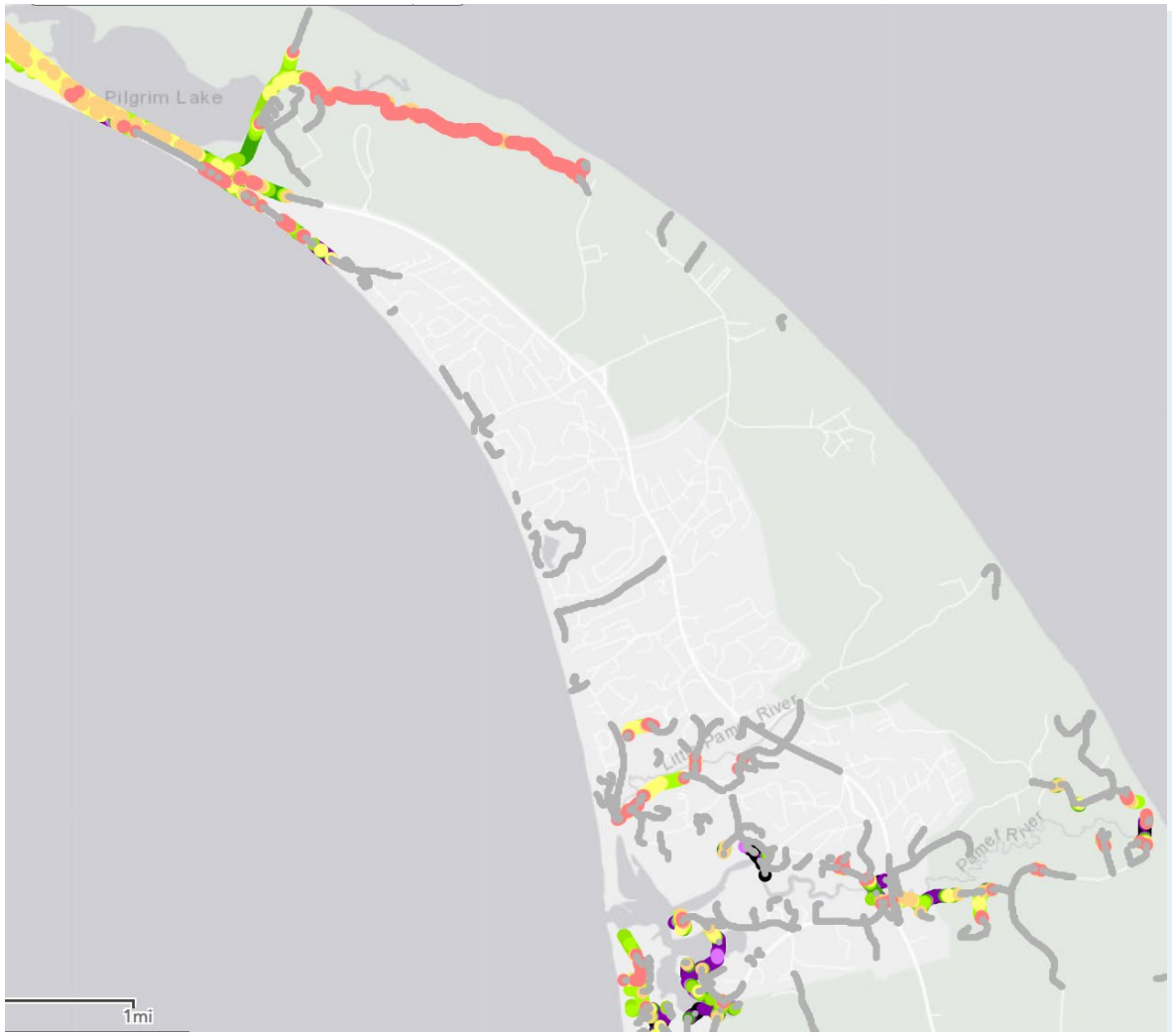
Summary of alternatives

	Description	Critical Elevation	Annual Exceedance Probability			Vulnerable to Tidal Flooding	Impacts to Resource Area(s)	Impacts to Private Property	Estimated Cost*
			2030	2050	2070				
EXISTING	A road intersection with a culvert crossing and adjacent wetland.	7.6 feet	100%	100%	100%	2070	N/A	N/A	N/A
ALTERNATIVE 1: GRAY	2378 linear feet of town-owned road are raised from a lowest point of 7.6 feet to a lowest point of 10.5 feet using traditionally vegetated 4:1 side slopes. This alternative extends into Provincetown, and collaboration would be necessary.	10.5 feet	0.5%	10%	100%	N/A	Minimal	Minimal	$1,046,000
ALTERNATIVE 2: GREEN	A wide dune to 11.0 feet is restored on Parcels 2-5-0, 2-13-0, and 1-6-0. Other breaches in the dune are patched. This alternative could be phased and possibly extended eastward in the future. Dune walkovers or mobimats can be used to preserve beach access. This approach may need to consider potential flanking from East Harbor.	11.0 feet	0.1%	5%	100%	N/A	Yes	Yes	$3,228,000 (excluding easements)

*2023 installed material cost +40% escalation (through 2029) and 15% contingency. Excludes design, permitting, mobilization, stormwater and wastewater infrastructure, and site controls. Costs based on experienced contractor opinion and MassDOT costing data.

LOW LYING ROADS

Discussion



- **Shore Road**
- **Stotts Crossing**

NEXT STEPS

- Comments! Use form on project webpages
  https://www.capecodcommission.org/our-work/low-lying-roads-project/
- Town staff to determine which projects, designs
  - Review of community input
  - Engineering, permitting
- Identify funding

FUNDING OPPORTUNITIES

Federal Bipartisan Infrastructure Law (BIL)

Federal Highway Administration

- PROTECT – Competitive Resilience Improvement and Planning grants
- Culvert Aquatic Organism Passage Program - competitive grants for the replacement, removal, and repair of culverts or weirs that meaningfully improve or restore fish passage for anadromous fish

[NEW] PROTECT Grants (discretionary)

Purpose	Planning, resilience improvements, community resilience and evacuation routes, and at-risk coastal infrastructure
Funding	$1.4 B (FY 22-26) in Contract Authority from the HTF
Eligible entities	• State (or political subdivision of a State) • MPO • Local government • Special purpose district or public authority with a transportation function • Indian Tribe • Federal land management agency (applying jointly with State(s)) • *Different eligibilities apply for at-risk coastal infrastructure grants*
Eligible projects	• Highway, transit, intercity passenger rail, and port facilities • Resilience planning activities, including resilience improvement plans, evacuation planning and preparation, and capacity-building • Construction activities (oriented toward resilience) • Construction of (or improvement to) evacuation routes
Other key provisions	• Higher Federal share if the eligible entity develops a resilience improvement plan (or is in a State or area served by MPO that does) and the State or MPO incorporates it into its long-range transportation plan • May only use up to 40% of the grant for construction of new capacity

FUNDING OPPORTUNITIES

Nature Based Solutions, Ecological Restoration, Culverts

- FEMA Building Resilient Infrastructure and Communities (BRIC)
- National Coastal Resiliency Fund (NCRF) through National Fish and Wildlife Fund
- Natural Resources Conservation Service (NRCS) through the Cape Cod Conservation District
- Municipal Vulnerability Preparedness Program (MVP)
- Division of Ecological Restoration (DER) Culvert Replacement Municipal Assistance Grant Program