

An aerial photograph of the Cape Cod Canal. The canal is a wide, dark blue waterway that curves through a lush green landscape. A bridge with several tall, thin support pillars spans the canal. The surrounding area is densely forested with green trees. In the background, the ocean is visible under a clear sky.

Cape Cod Canal Transportation Study, Working Group Meeting.

Bourne, Plymouth, Sandwich, Wareham.

April 2, 2015

Agenda.

- Welcome and Introductions.
- Study Process & Framework.
- Study Framework: Goals and Objectives.
- Existing Conditions.
 - Natural and Cultural Resources,
 - Protected Environmental Areas,
 - Infrastructure,
 - Demographic Information,
 - Transportation (Traffic, Transit, Bikes, Pedestrians).
- Schedule/Next Steps.

Welcome and Introductions.

- MassDOT:
 - Ethan Britland – Project Manager,
 - Diane Madden – MassDOT Environmental,
- US Army Corps of Engineers.
- Study Team:
 - Ed Hollingshead, AICP - Team Project Manager (FST),
 - Michael Paiewonsky, AICP – Environmental Planner (FST),
 - Heather Ostertog, PE – Transportation Engineer (FST),
 - Ken Buckland, AICP – Public Involvement (Cecil Group).

Study Process & Framework.

- Step 1: Goals and Objectives, Evaluation Criteria, and Public Involvement Plan.
- **Step 2: Existing Conditions.**
- Step 3: Future Conditions, Alternatives Development, and Issues Evaluation.
- Step 4: Alternatives Analysis.
- Step 5: Recommendations.

Study Framework: Goals.

- To create/improve multimodal mobility in the Cape Cod Canal area.
- To establish an alternative or replacement crossing of the Cape Cod Canal to address the diminishing quality and reliability of year-round connectivity over the Cape Cod Canal, due to the aging Sagamore and Bourne Bridges.

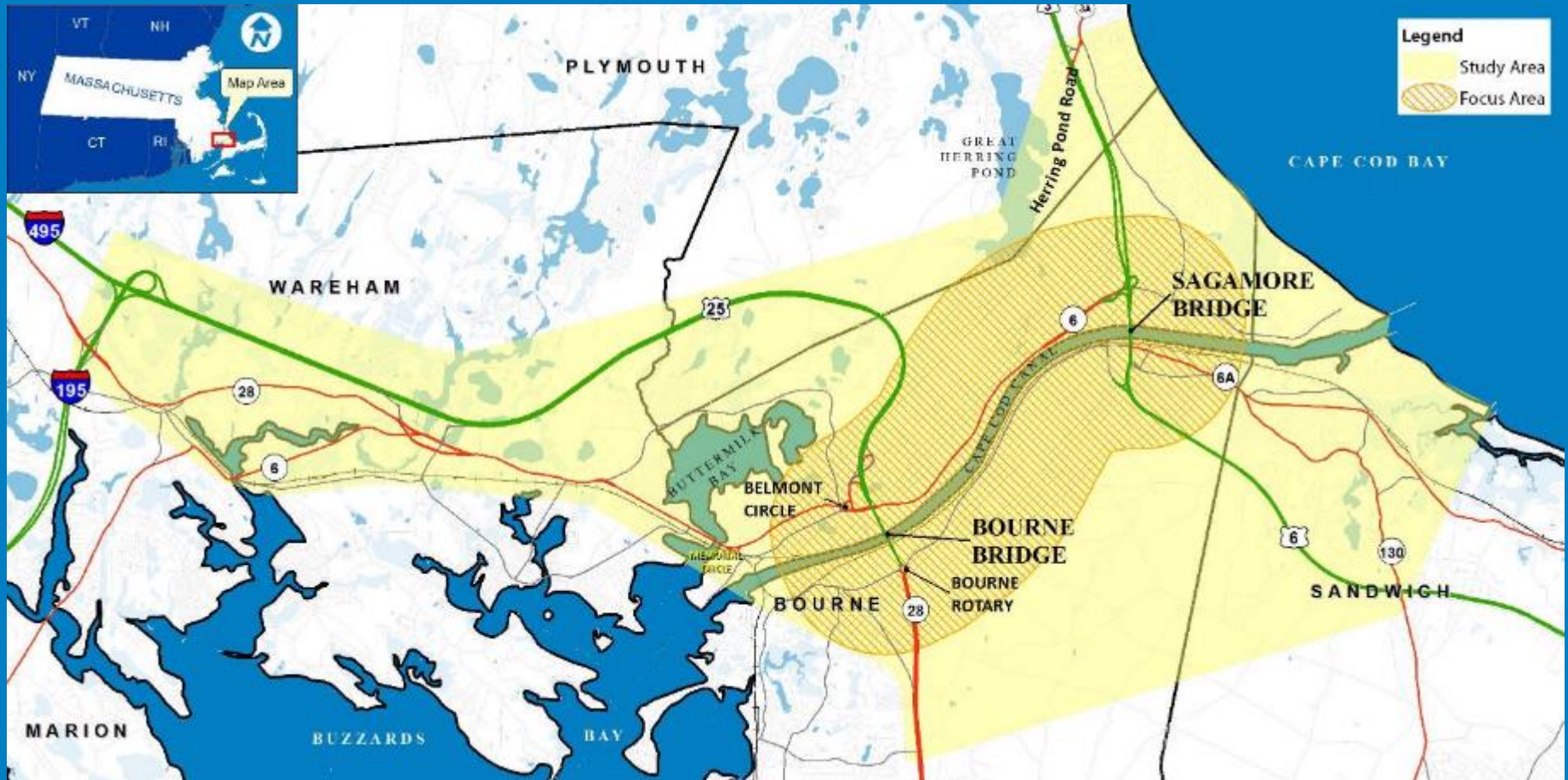
Study Framework: Objectives.

- Create reliable multimodal connectivity and mobility levels such that the quality of life on Cape Cod is not diminished by unreliable connectivity across the Cape Cod Canal.
- Create a reliable multimodal connection across the Cape Cod Canal to maintain/enhance public safety in the event of the need for an emergency evacuation of portions of Cape Cod and to accommodate first responders accessing Cape Cod.
- Ensure that cross canal connectivity does not become a barrier to reliable intra-community connectivity for the Towns of Bourne and Sandwich.

Existing Conditions.

- Natural and Cultural Resources.
- Protected Environmental Areas.
- Infrastructure.
- Demographic Information.
- Transportation (traffic, transit, bikes, and pedestrians).

Study Area.



Study Process & Framework.

- Step 1: Goals and Objectives, Evaluation Criteria, and Public Involvement Plan.
- **Step 2: Existing Conditions.**
- Step 3: Future Conditions, Alternatives Development, and Issues Evaluation.
- Step 4: Alternatives Analysis.
- Step 5: Recommendations.

Federal and State Environmental Laws.

- 42 USC § 4321, National Environmental Policy Act;
- 42 USC § 303, Section 4(f) of the DOT Act;
- 36 CFR § 800, National Historic Preservation Act (NHPA);
- 16 USC § 470, Archaeological Resources Protection Act;
- 42 USC § 7401-7671q, Clean Air Act;
- 33 USC § 1251 - 1376, Section 404 and 401 of the Clean Water Act;
- 42 USC § 13102, 16 USC 1531, Endangered Species Act of 1973;
- 42 USC § 9601 Comprehensive Environmental Response, Compensation, and Liability Act;
- 42 USC § 6901 Resource Conservation and Recovery Act (RCRA); and
- 40 CFR § 700-799, Toxic Substances Control Act (TSCA) of 1970.

Federal and State Environmental Laws, continued.

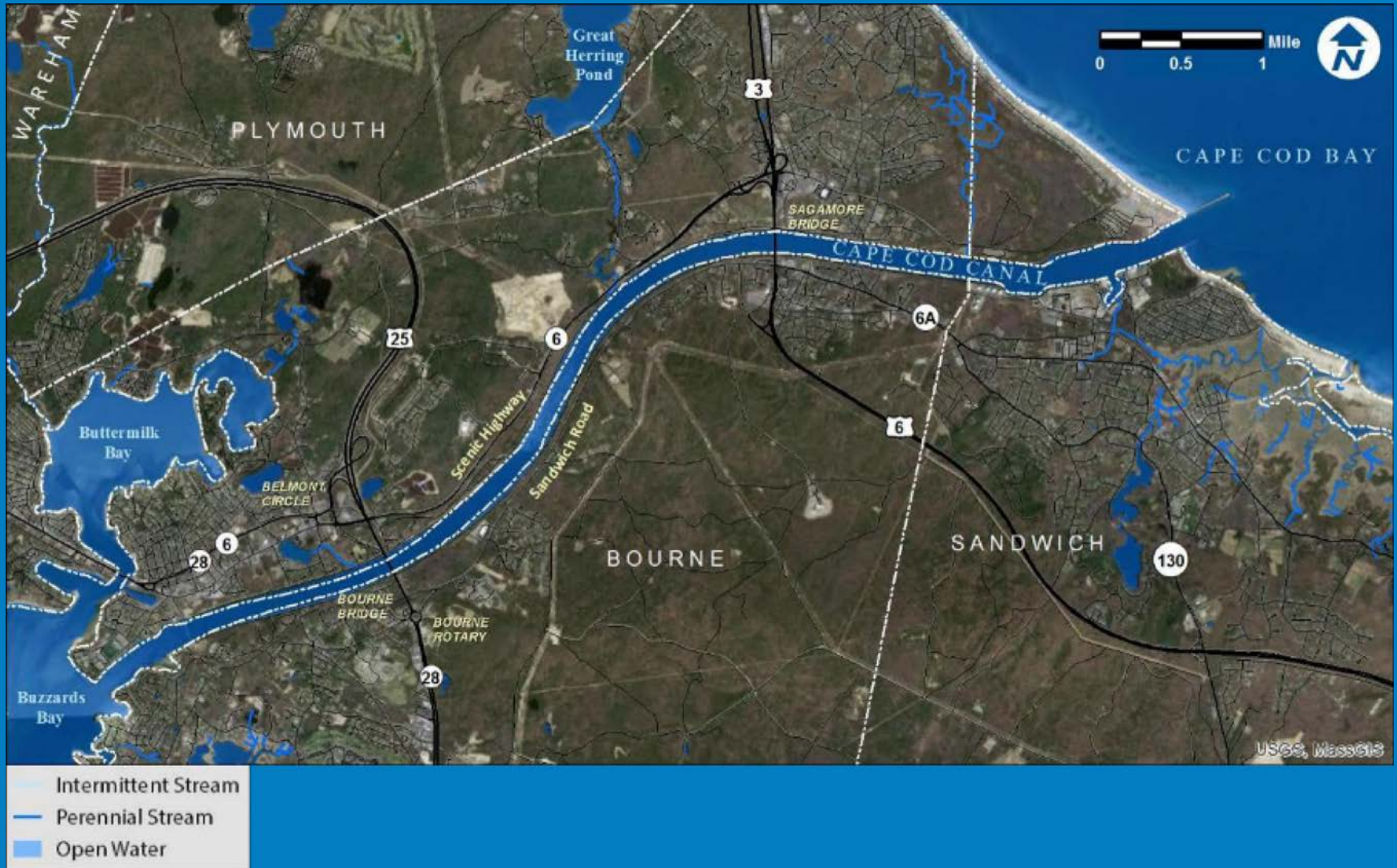
- Executive Order (EO) 11990 (Protection of Wetlands);
- EO 11988 (Floodplain Management);
- EO 12898 (Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations);
- EO 13175 (Consultation and Coordination with Indian Tribal Governments); and
- Massachusetts Environmental Policy Act (M.G.L. Chapter 30, Sections 61 through 62H).

Federal and State Environmental Laws, continued.

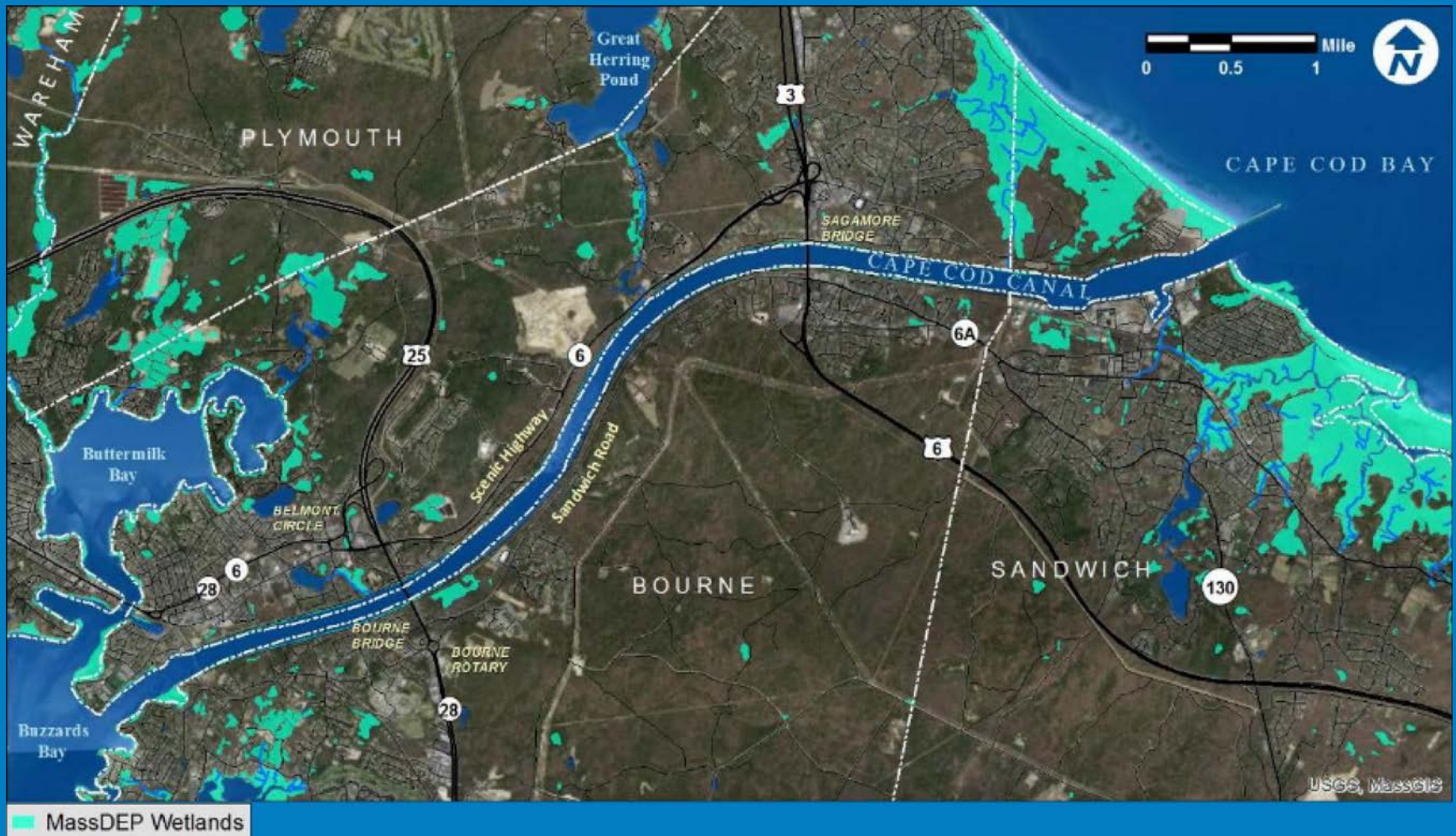
- Massachusetts Wetlands Protection Act (M.G.L. Chapter 131, Section 40);
- Surface Water Quality Standards (314 CMR 4.00 et seq.);
- Massachusetts Executive Order 149, Floodplains;
- Massachusetts Executive Order 438, State Environmental Sustainability Program; and
- Article 97 of the Articles of Amendments to the Constitution of the Commonwealth of Massachusetts

Natural and Cultural Resources

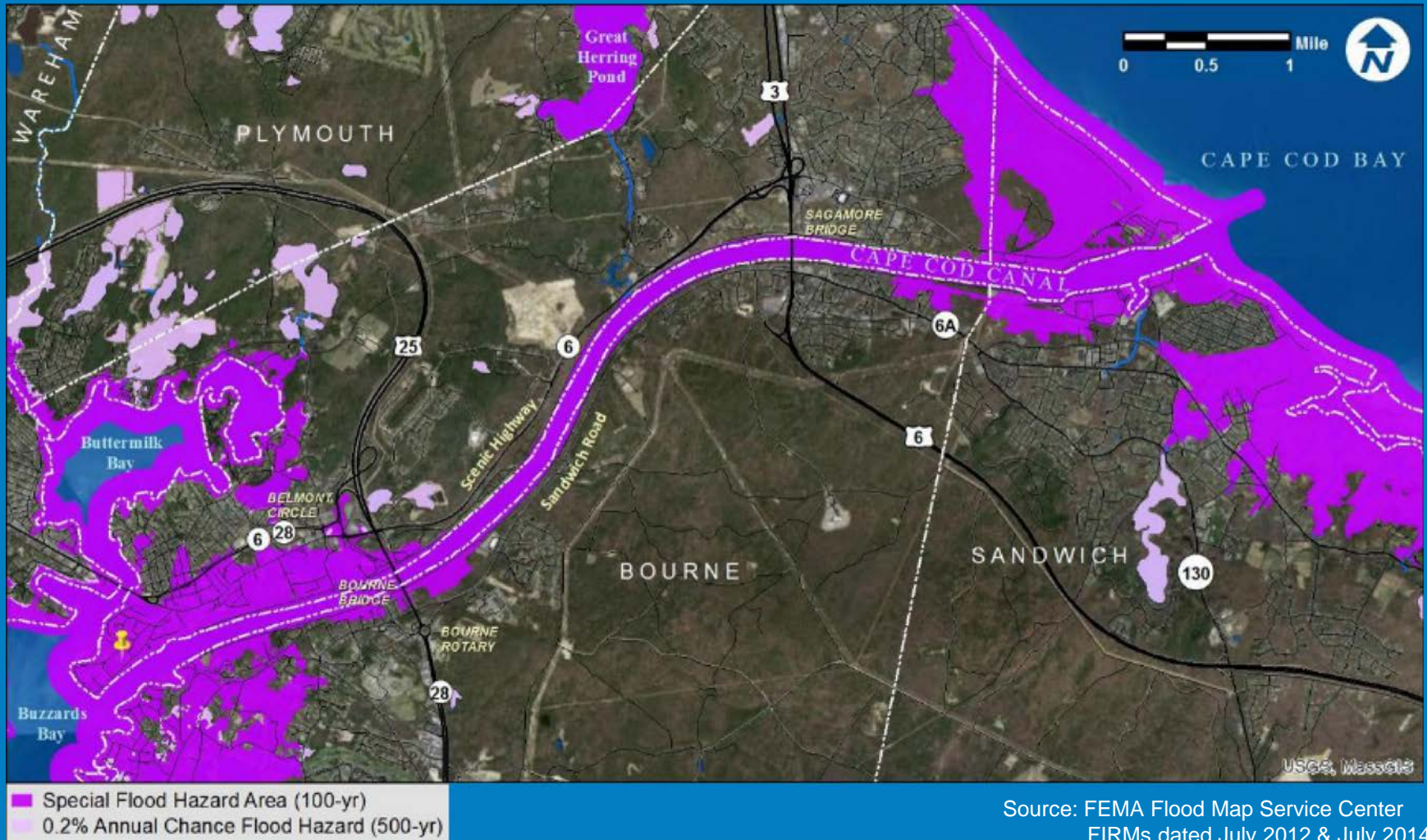
Waterways.



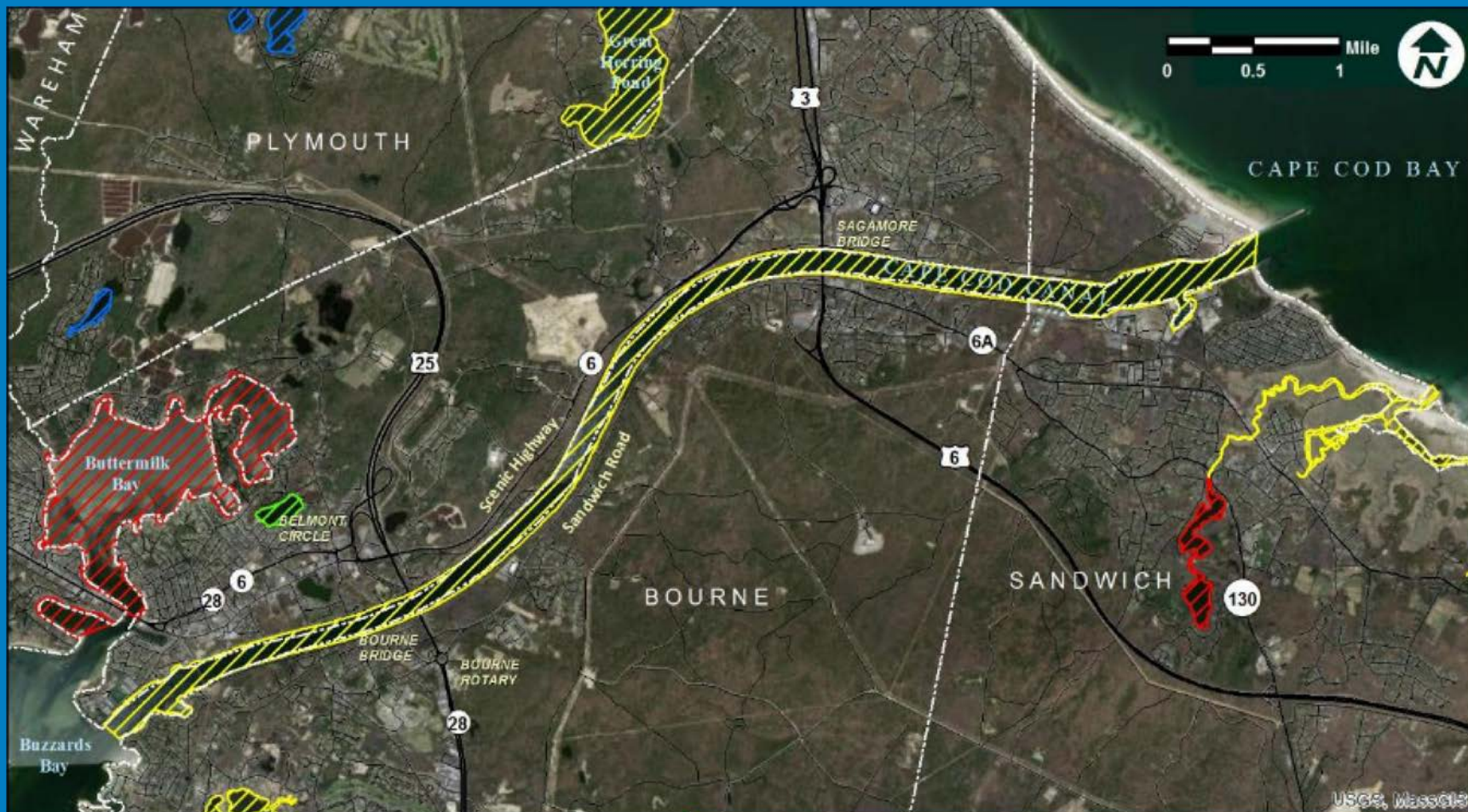
Wetlands.



FEMA Flood Hazard Areas.



Impaired Waters.

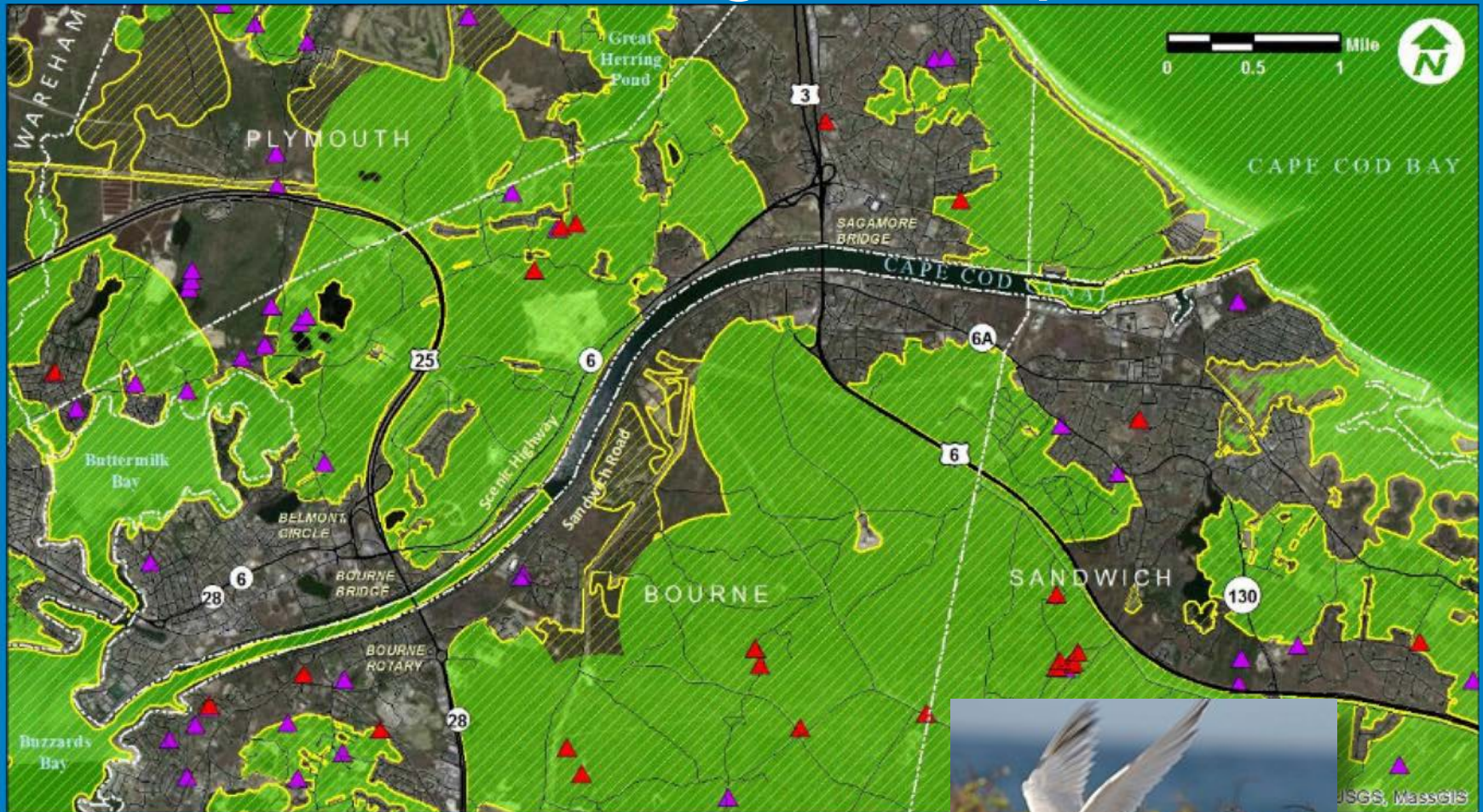


- 2 - Attaining some uses; other uses not assessed
- 3 - No uses assessed
- 4A - Impaired - TMDL is completed
- 5 - Impaired - TMDL required

Fisheries.



Rare & Endangered Species.

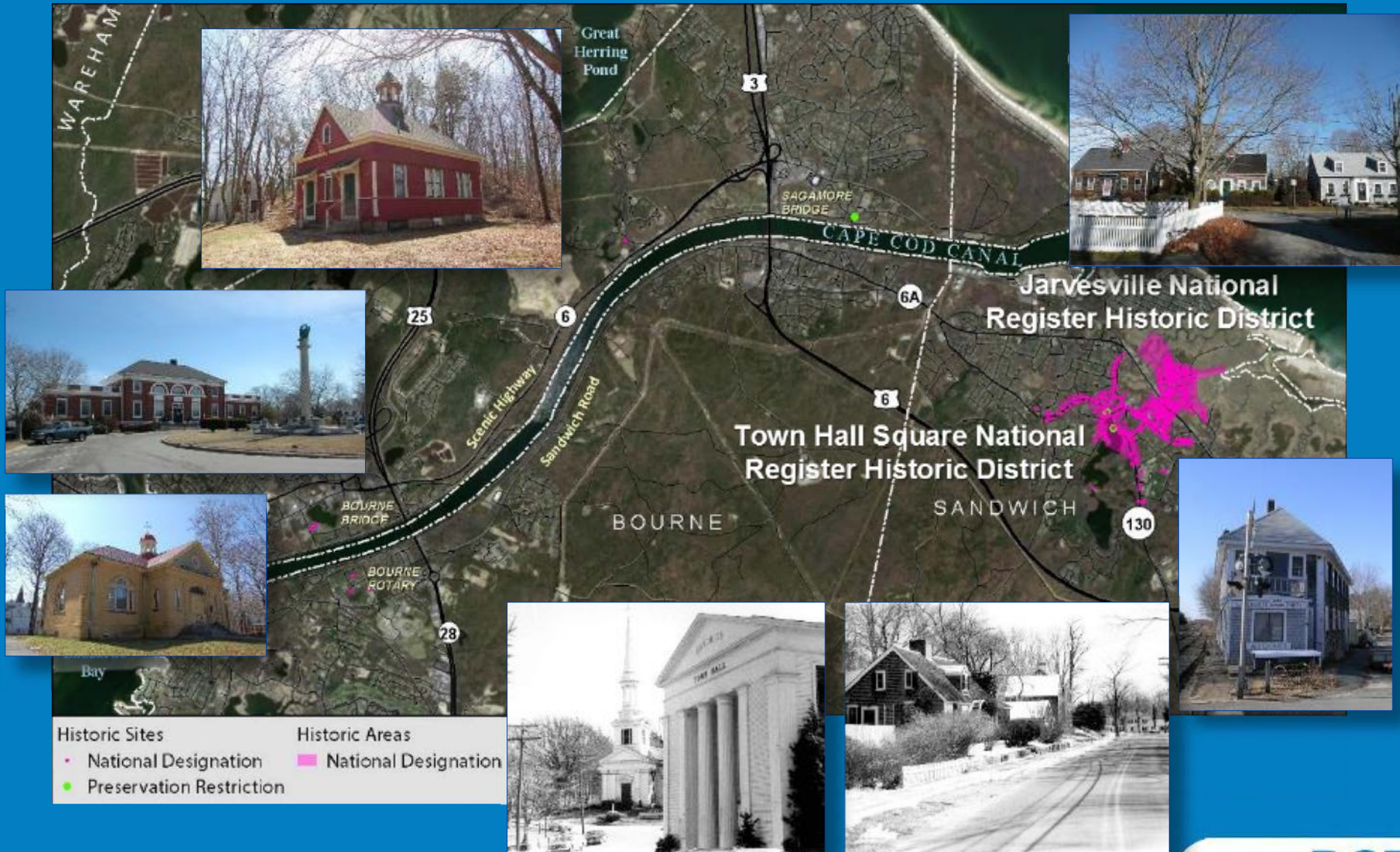


- ▲ NHESP Certified Vernal Pools
- ▲ NHESP Potential Vernal Pools: NOT equivalent to Certified Vernal Pools
- NHESP Priority Habitats of Rare Species
- NHESP Estimated Habitats of Rare Wildlife



USGS, MassGIS

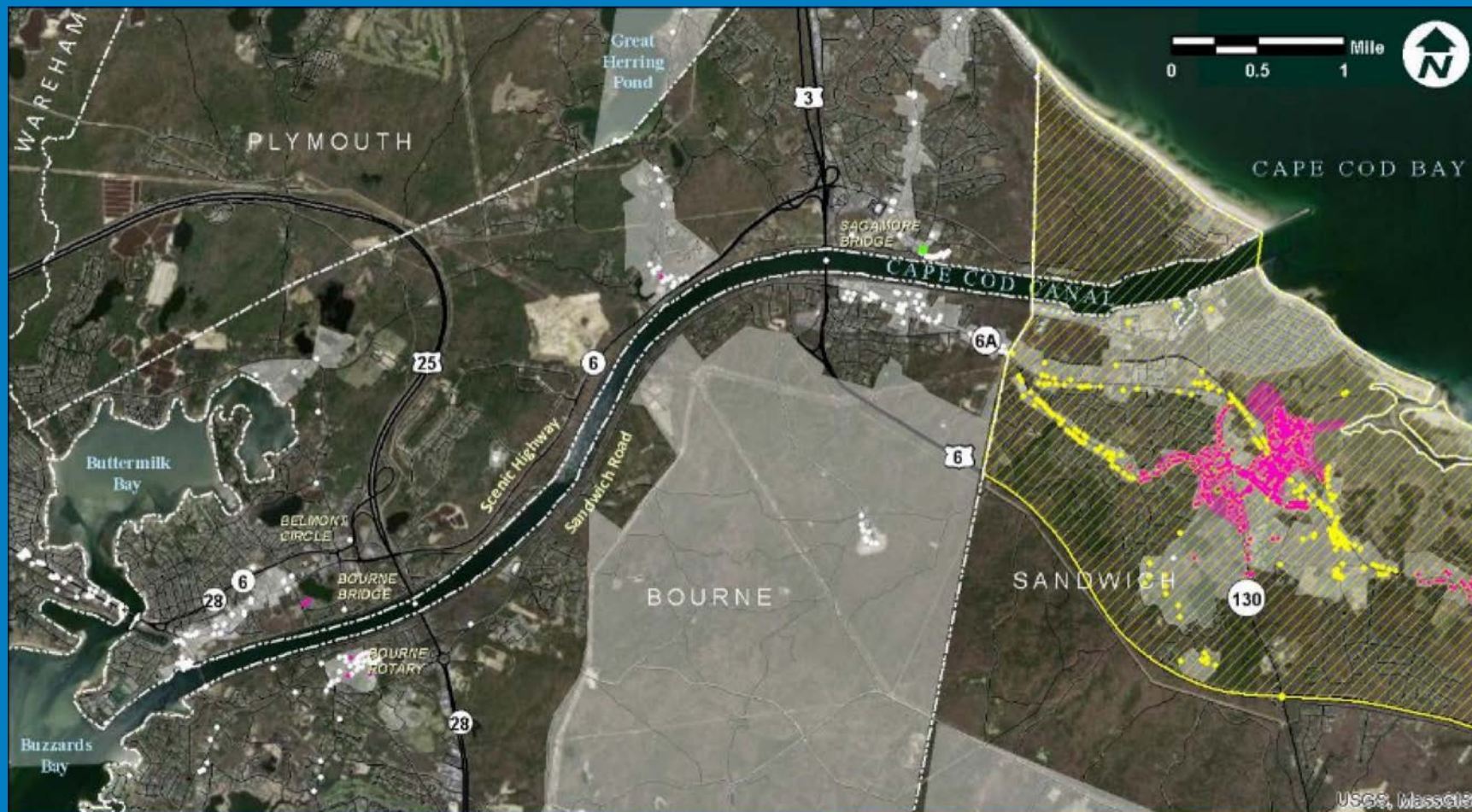
Historic Resources.



Historic Resources.



Historic Resources.



Historic Sites

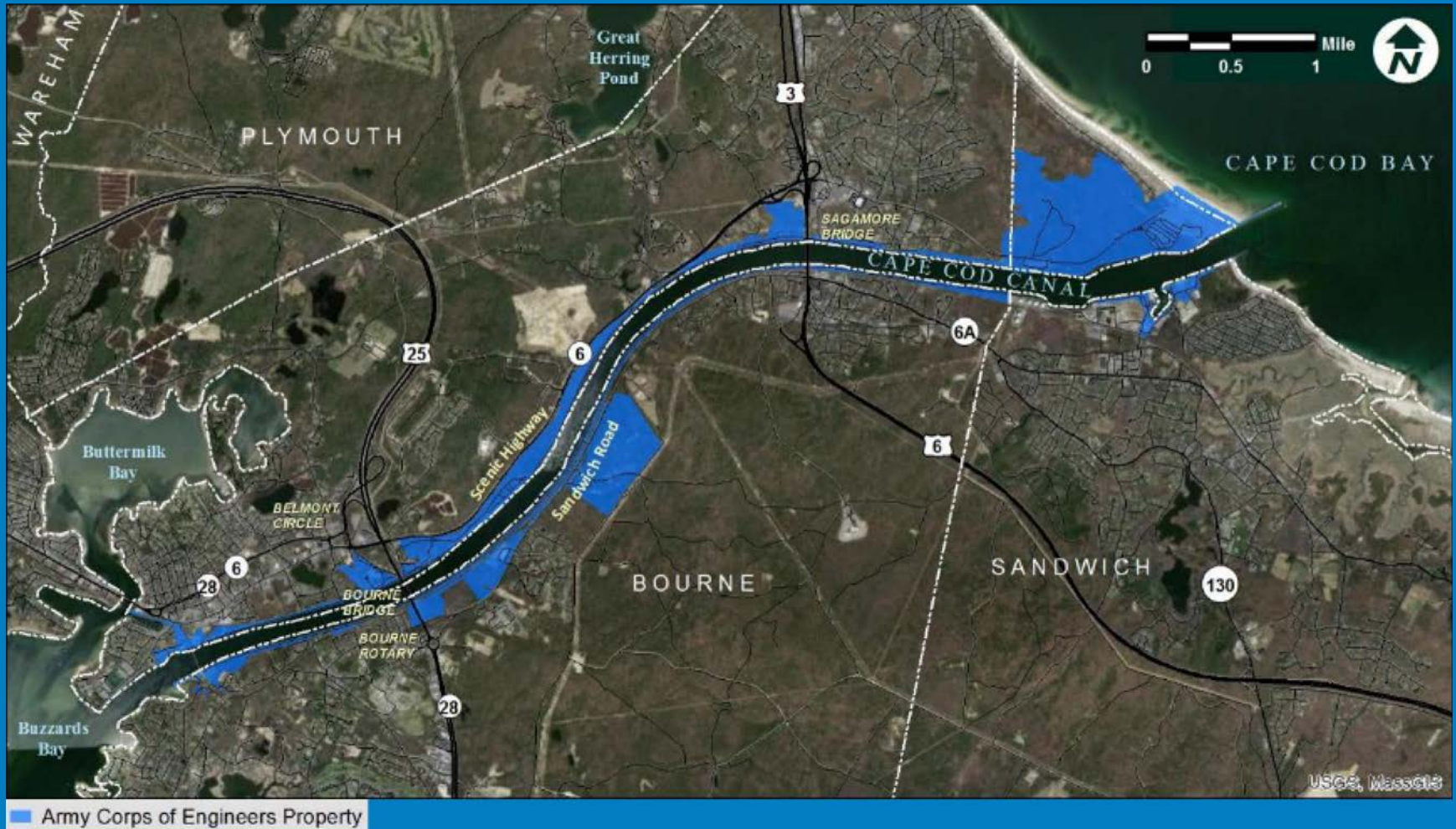
- National Designation
- Local Designation
- Preservation Restriction
- MHC Inventory Point (No Designation)

Historic Areas

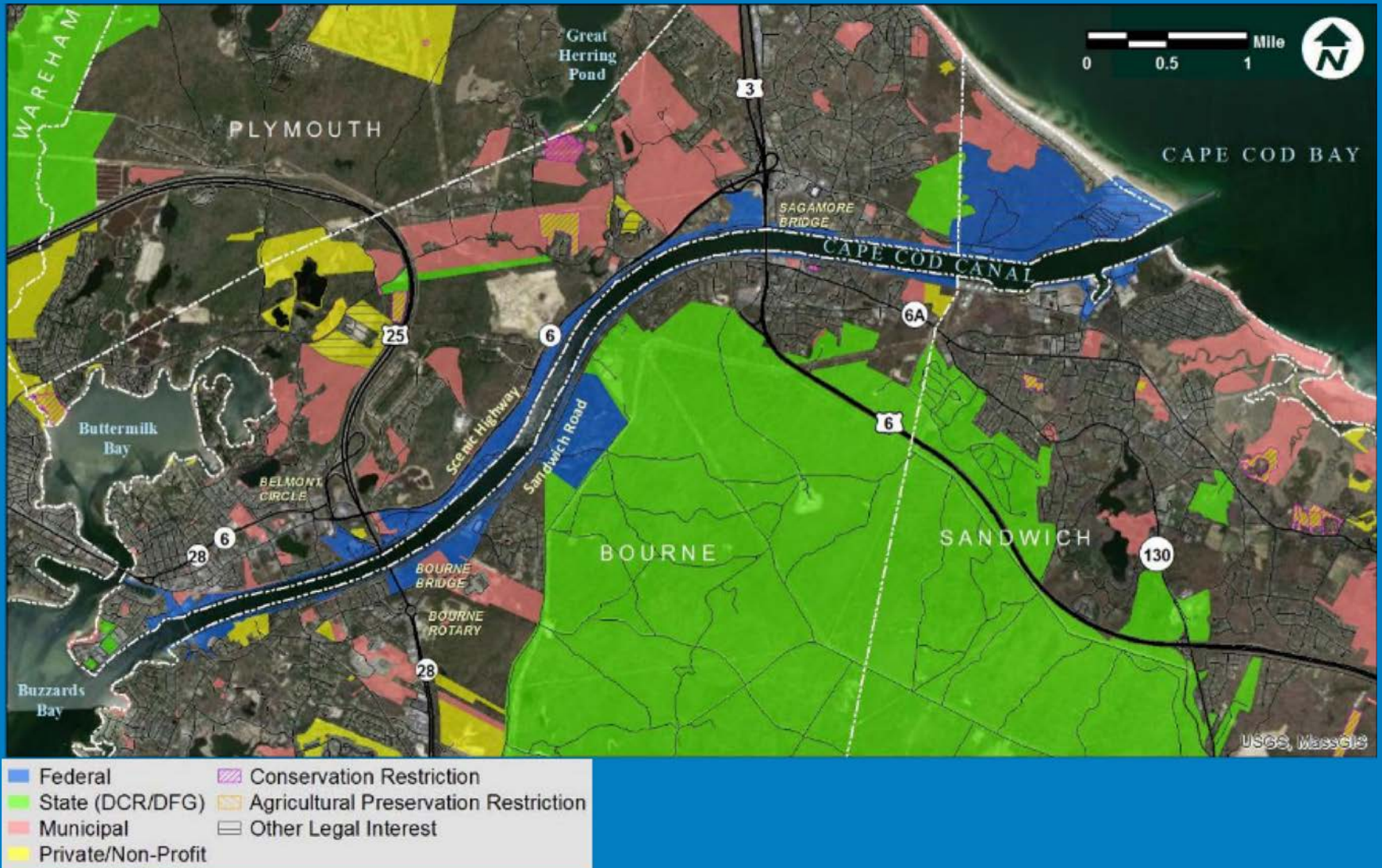
- National Designation
- Local Designation
- MHC Inventoried Area (No Designation)

Protected Environmental Areas

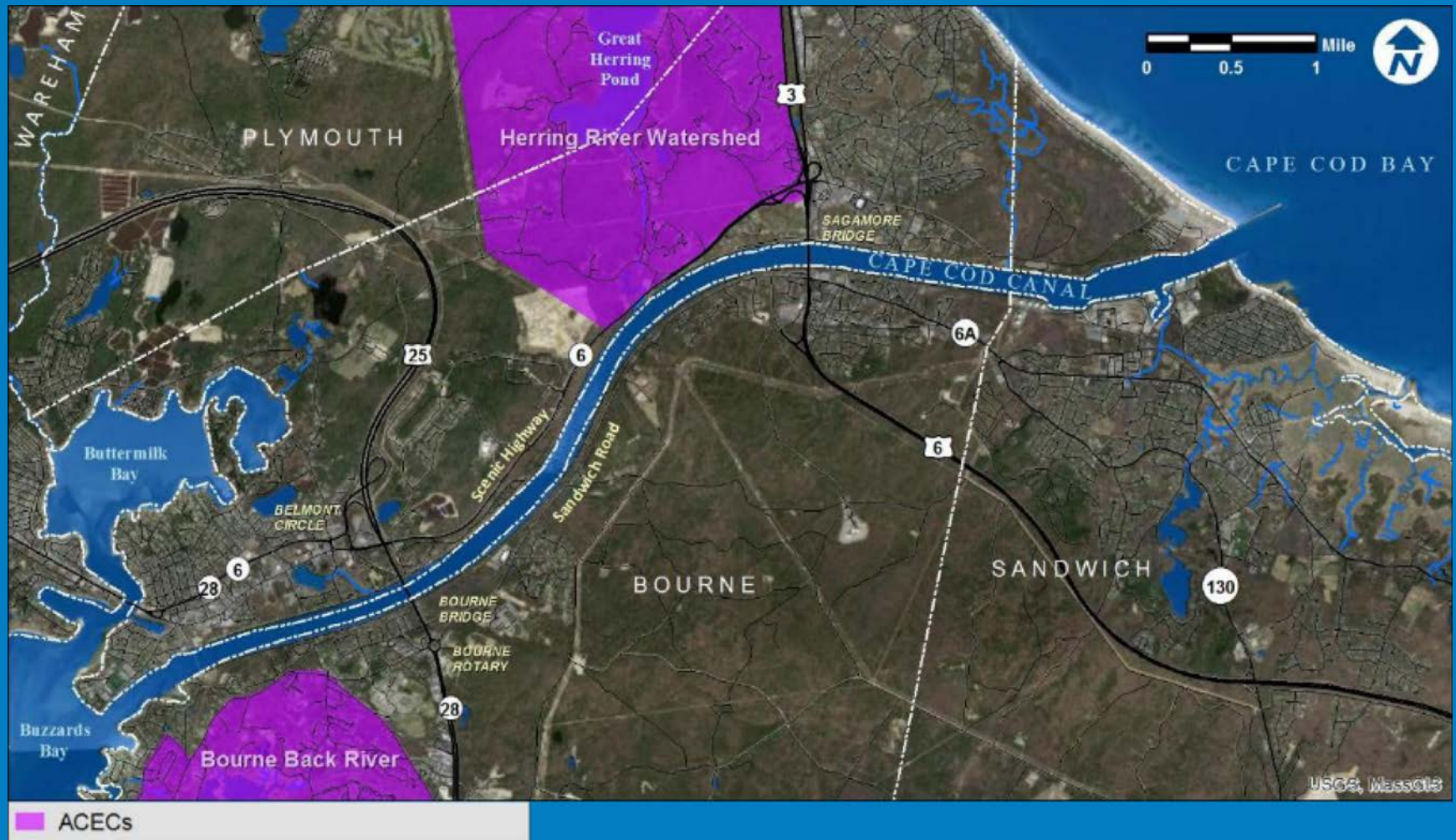
Army Corps Property.



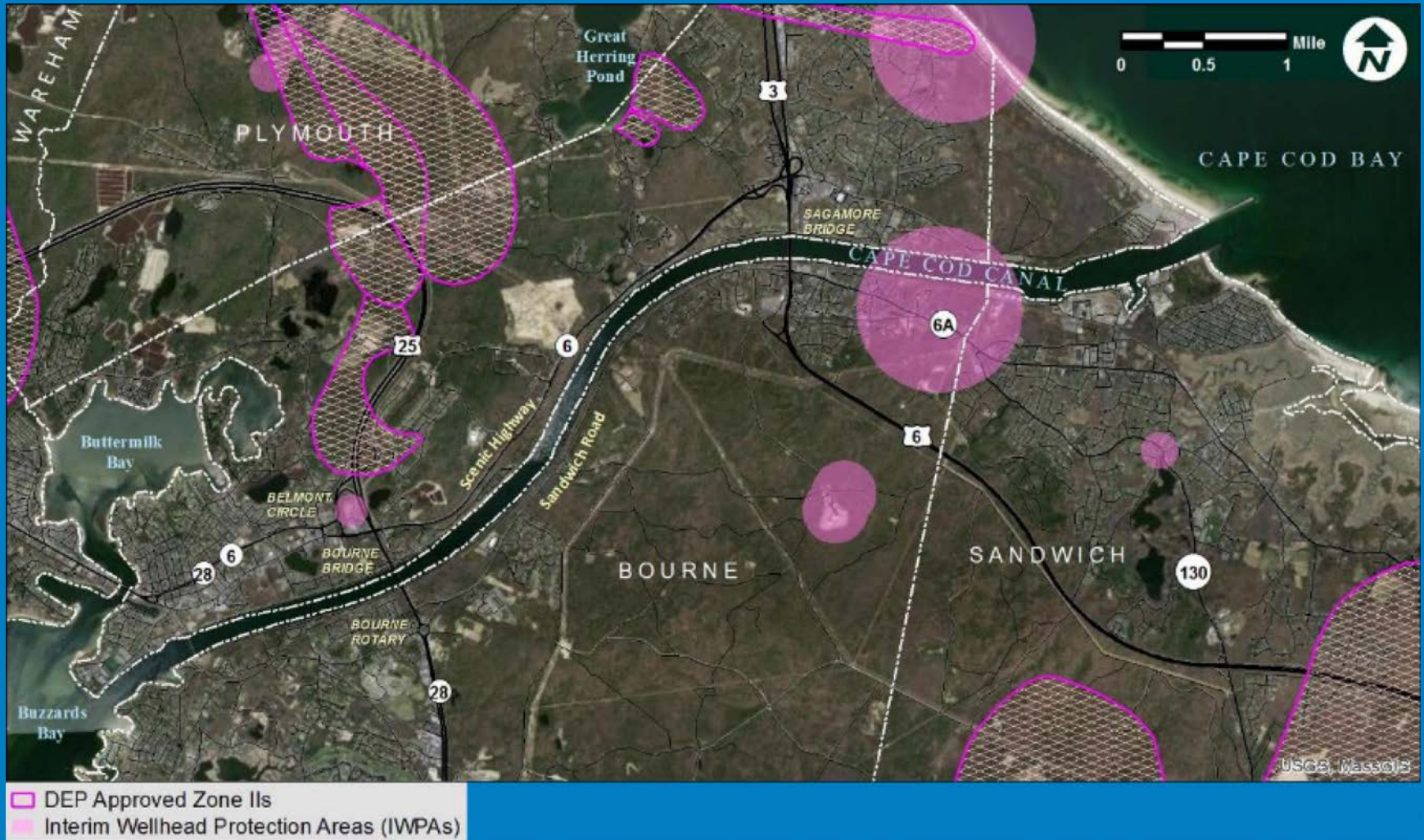
Open Space.



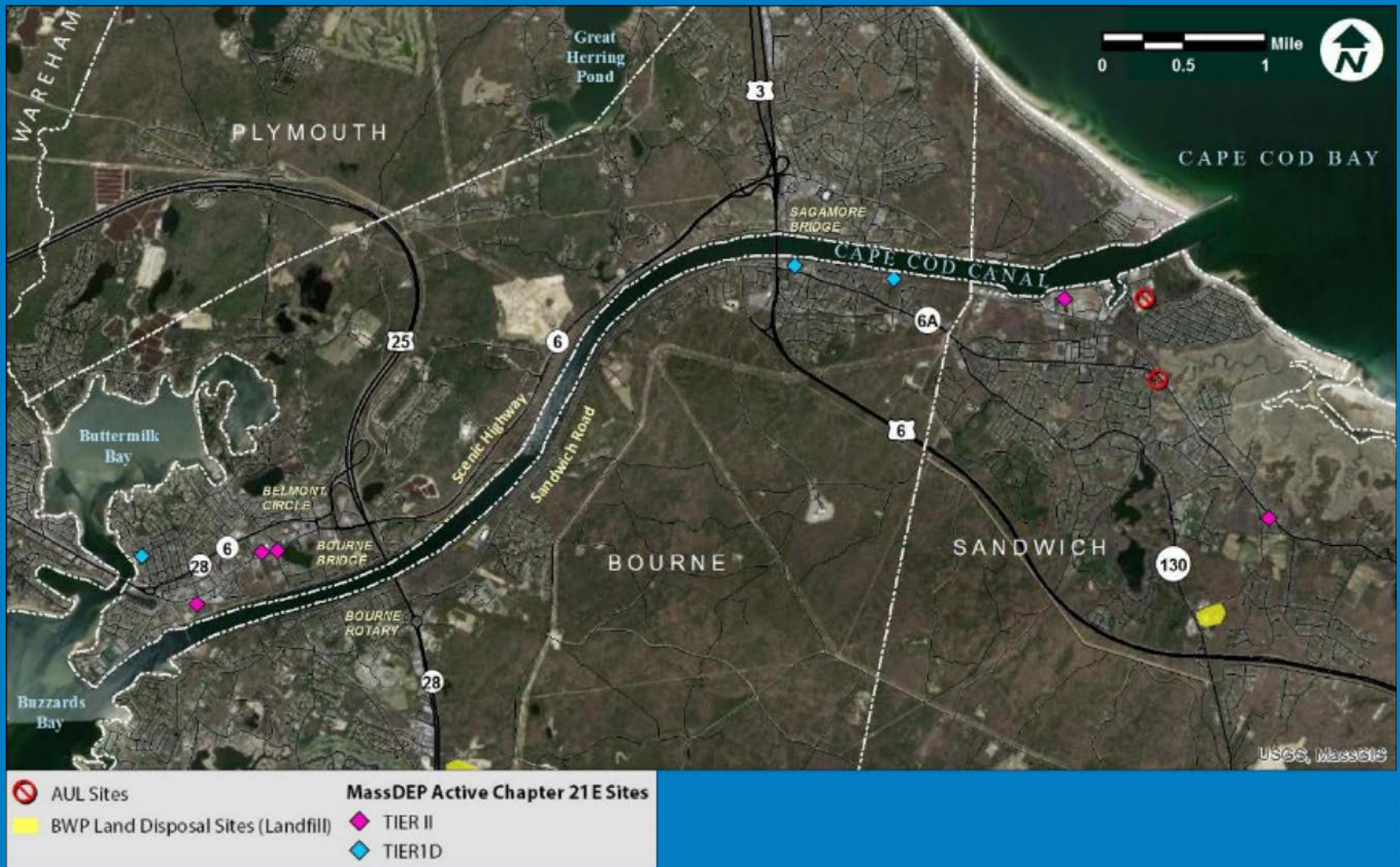
Areas of Critical Environmental Concern.



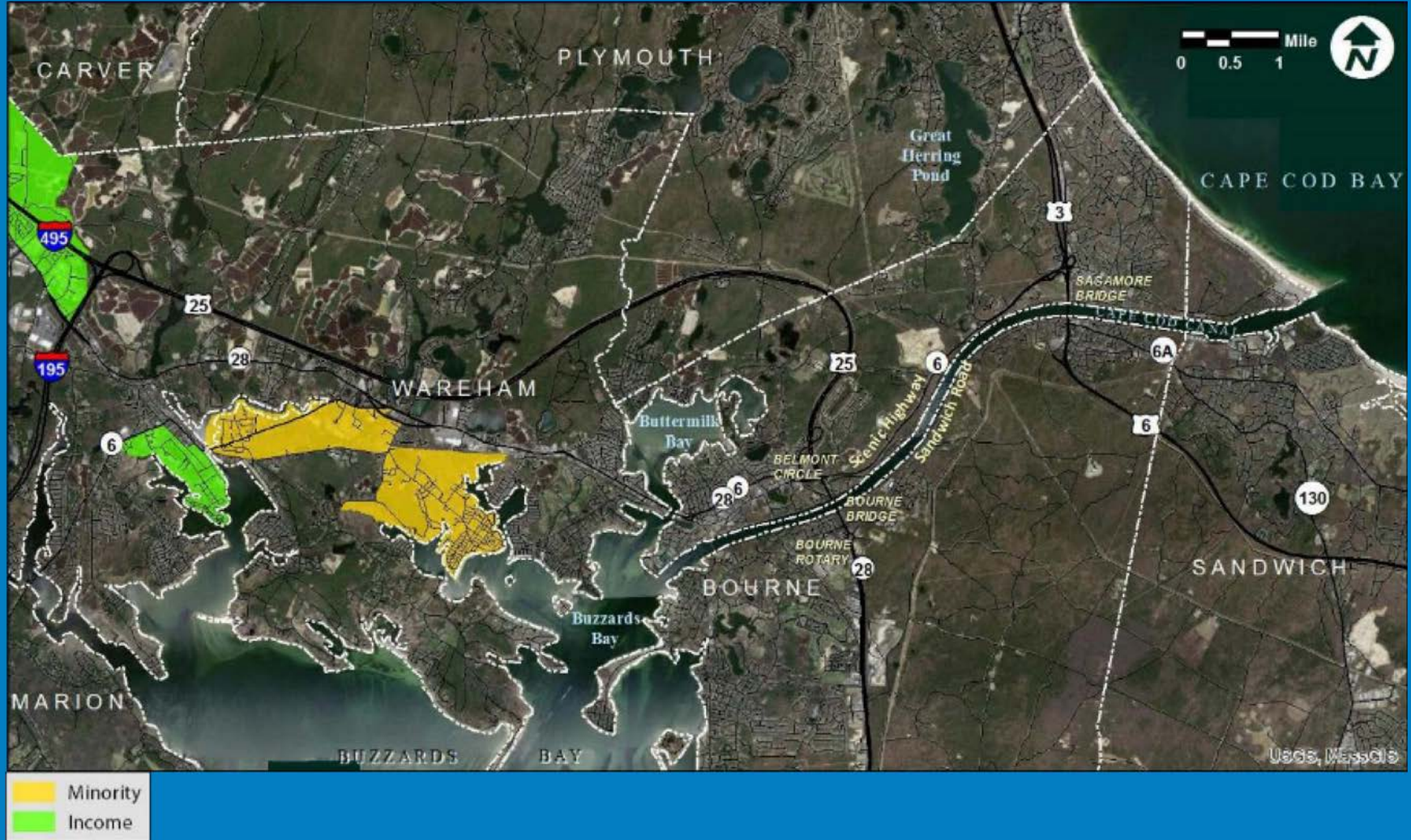
Wellhead Protection Areas.



Hazardous Materials.



Environmental Justice Populations.



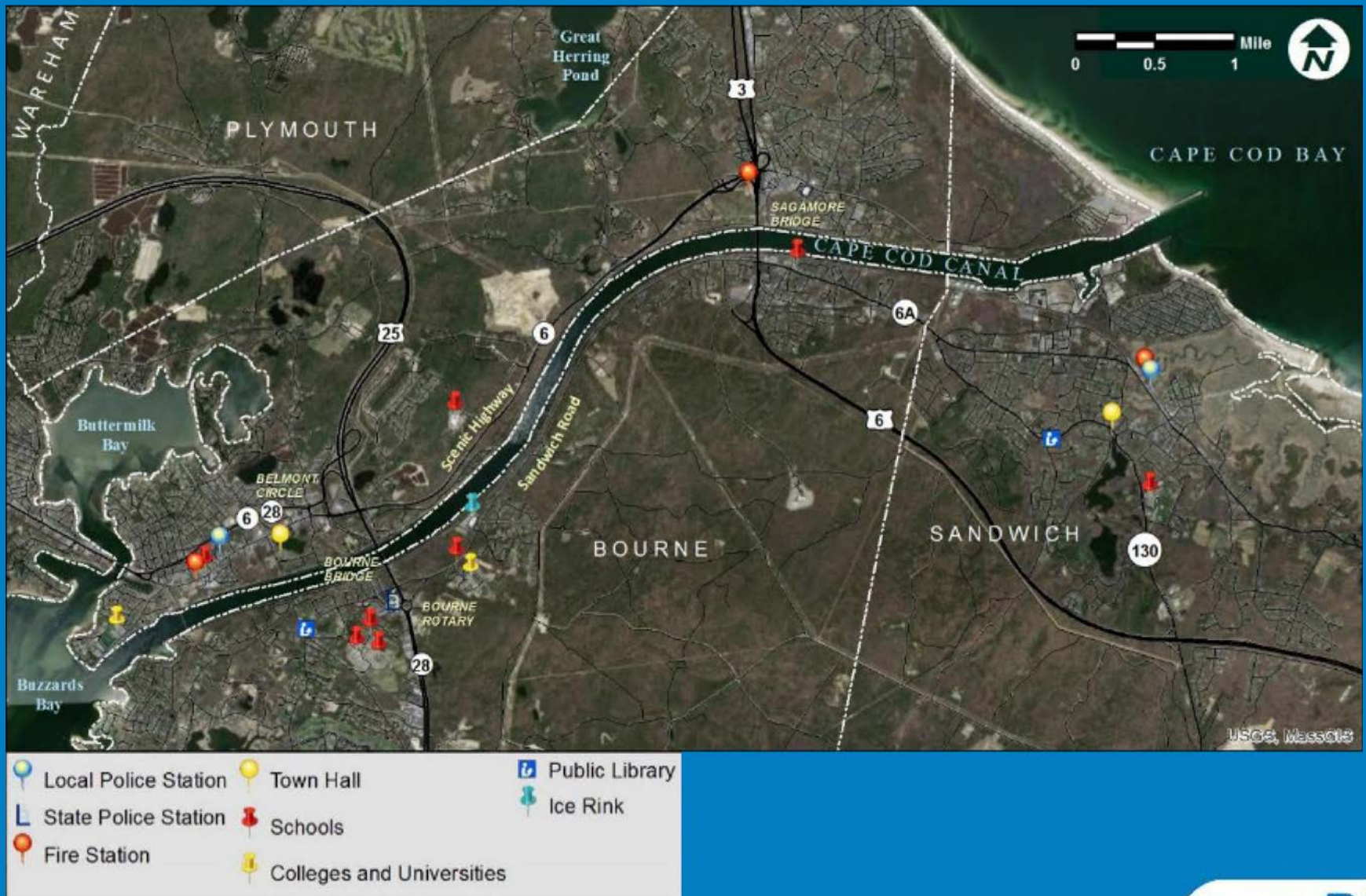
An aerial photograph of a wide river flowing through a lush, green forested landscape. A bridge with multiple spans crosses the river in the middle ground. The river curves to the right in the foreground. The background shows a mix of dense trees and some open fields under a clear sky.

Questions?

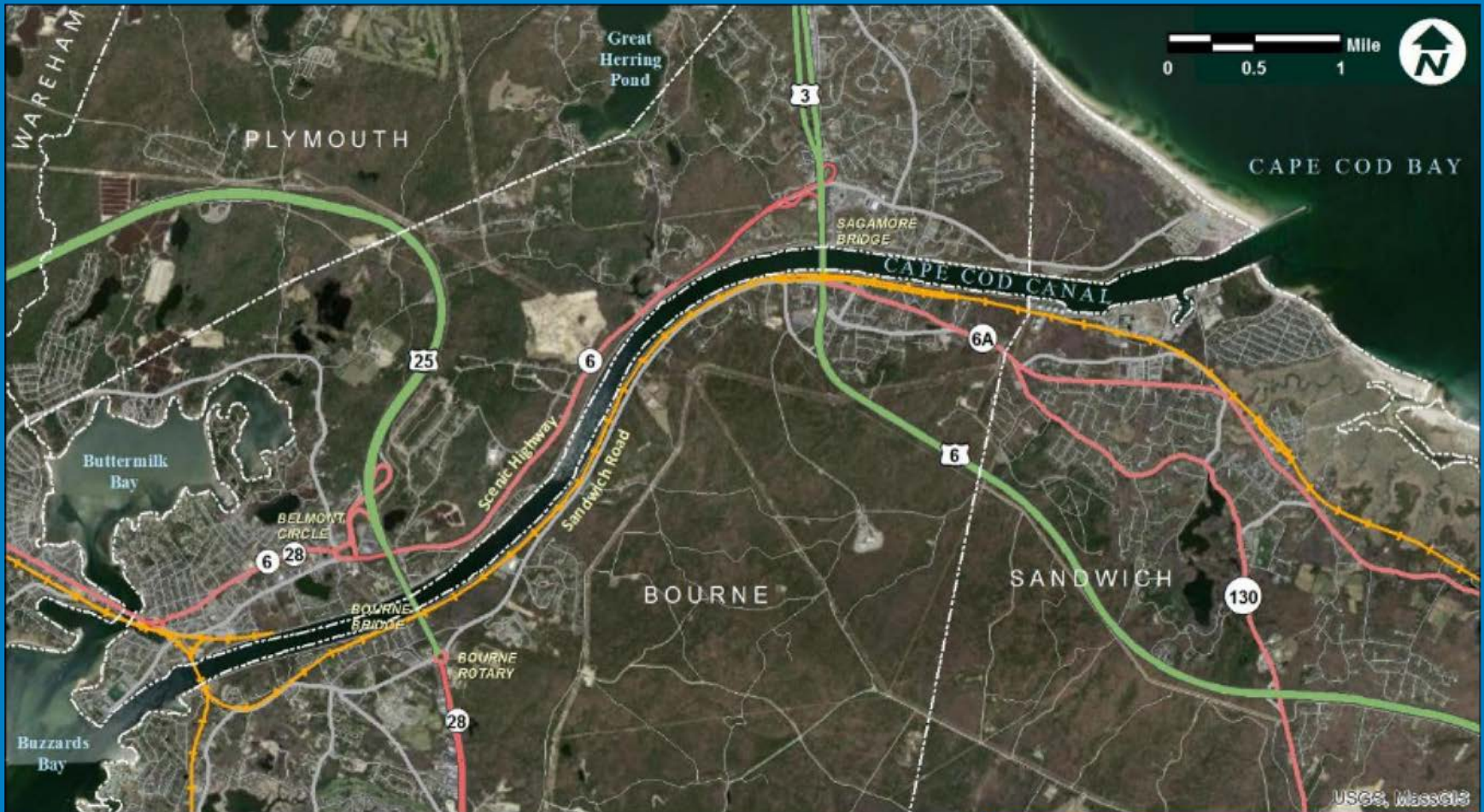
Comments and feedback can be emailed to
Ethan Britland - ethan.britland@state.ma.us

Infrastructure

Public Facilities.



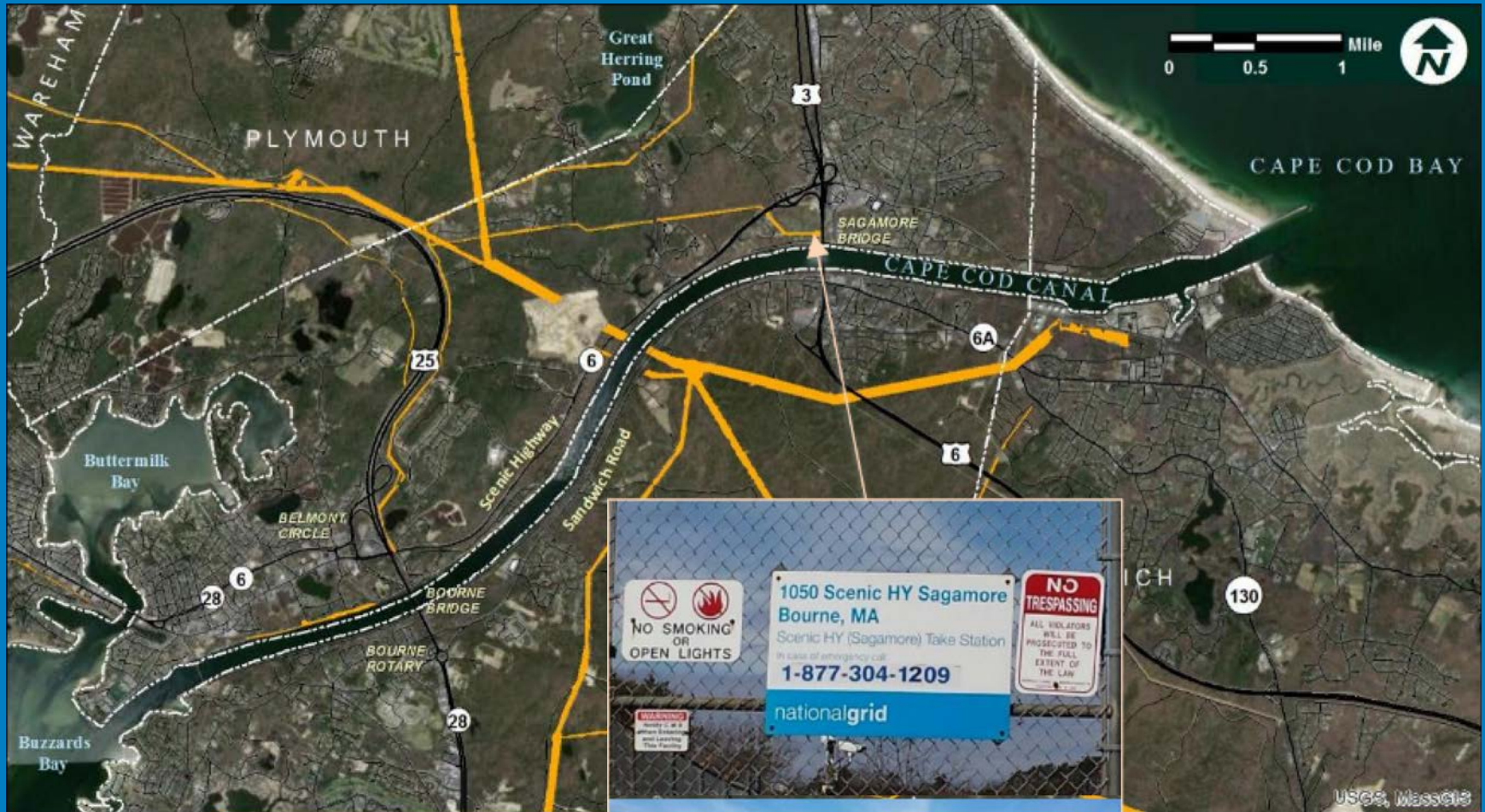
Railroad Lines.



MassDOT Roads

— Limited Access Highway	— Major Road, Collector	— Railroad Line (DOT-owned)
— Multi-lane Hwy, not limited access	— Minor Road, Arterial	
— Other Numbered Highway	— Ramp	

Utilities.

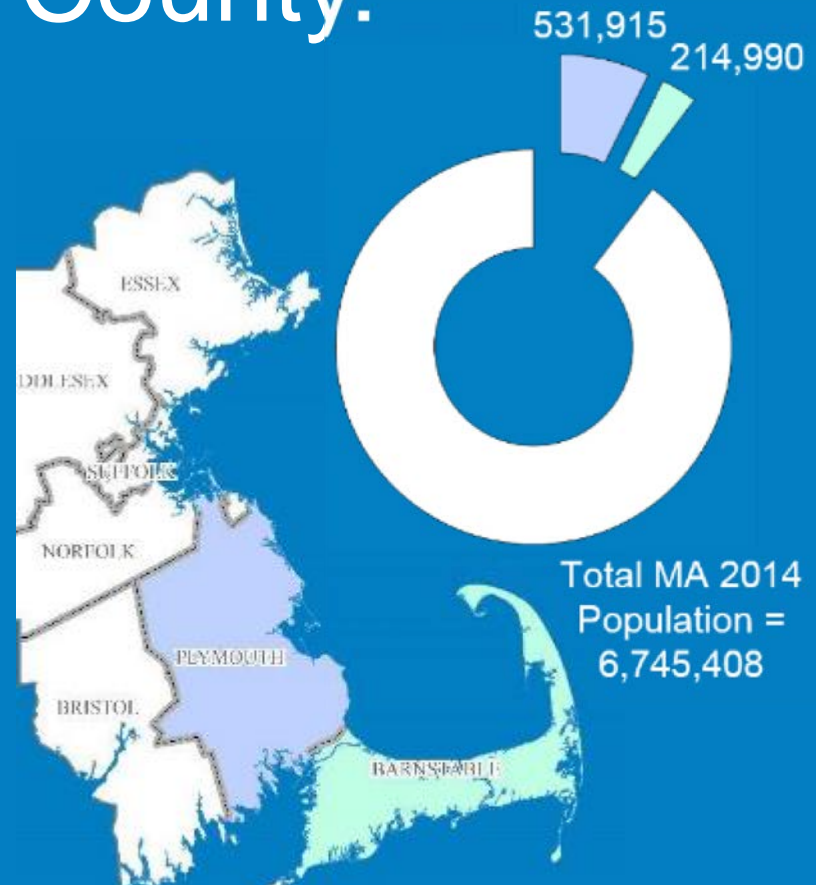
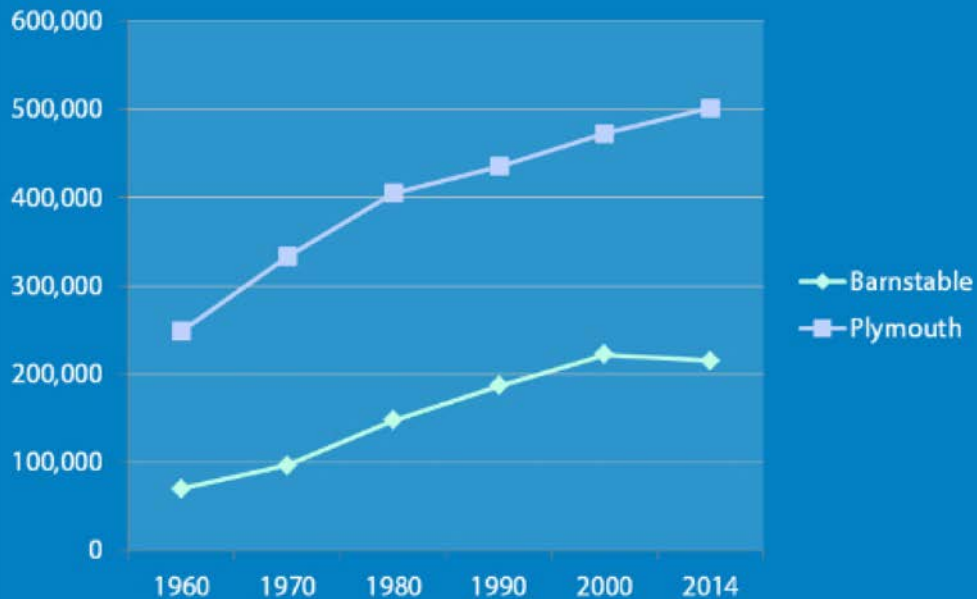
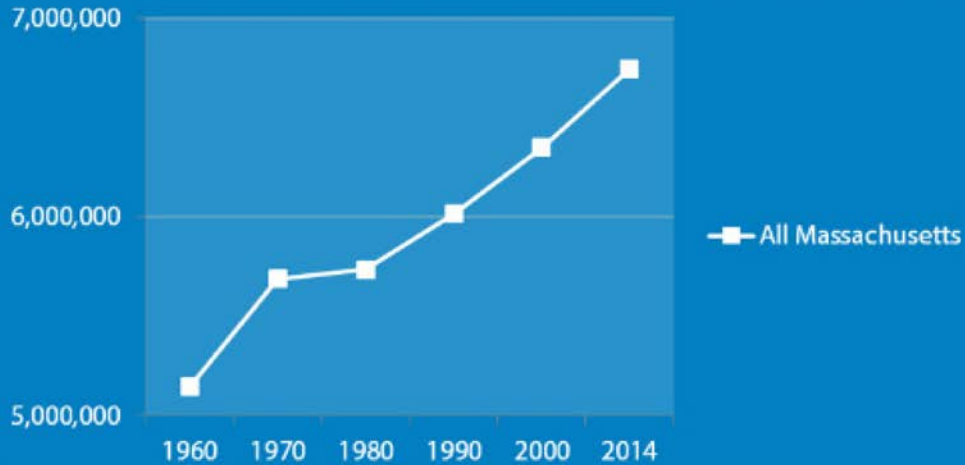


National Grid
Take Station

Demographic Information

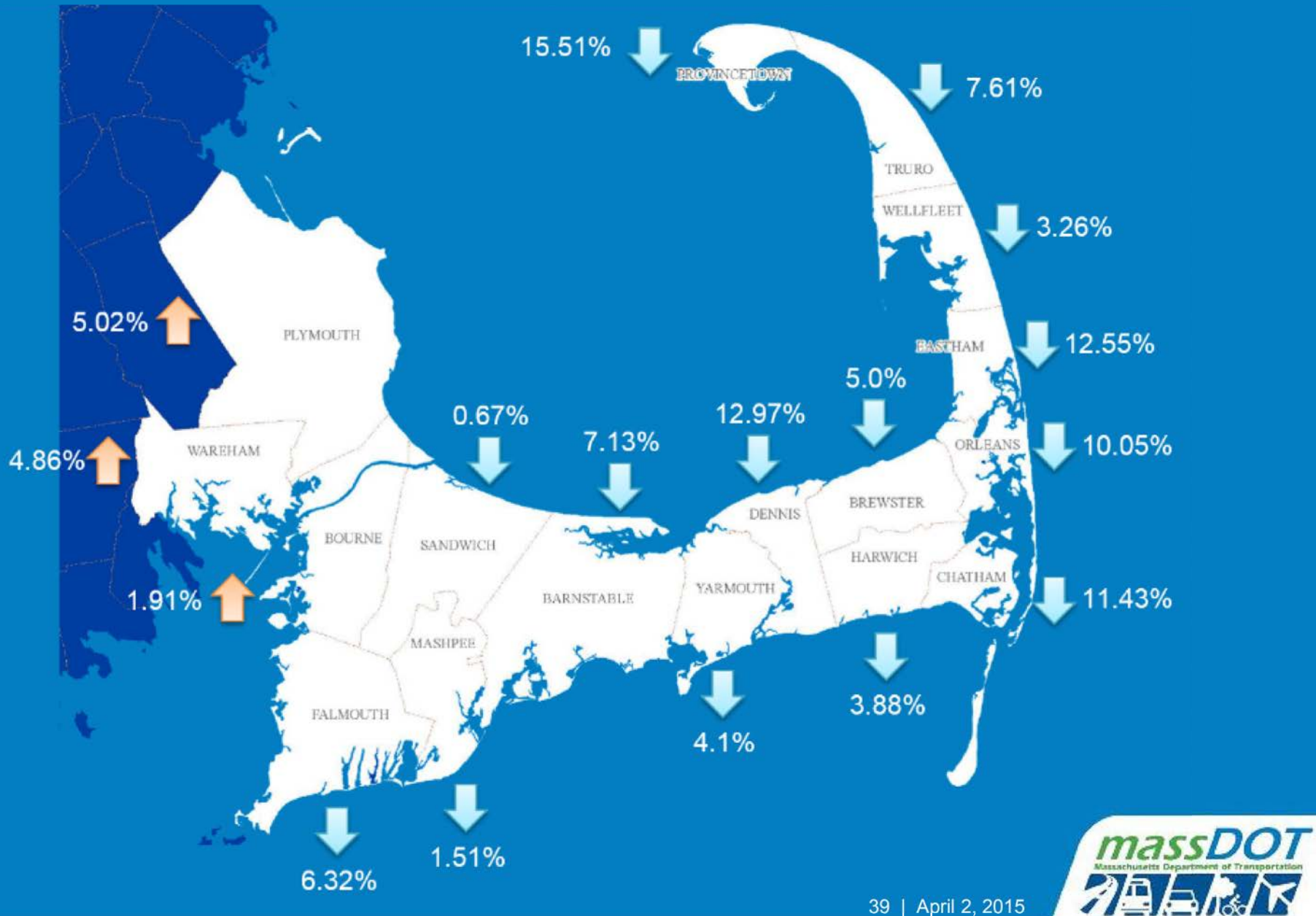
Population – County.

Historic Population Growth



Population Change 2005 to 2013		
Barnstable County	Plymouth County	Statewide
-5.36%	4.42%	4.39%

Population Change 2005 to 2013.



Focus on Barnstable County.

Barnstable County Population	
2005	226,514
2013	214,990
% change -5.36	

Statewide Population	
2005	6,398,743
2013	6,692,824
% change 4.39	

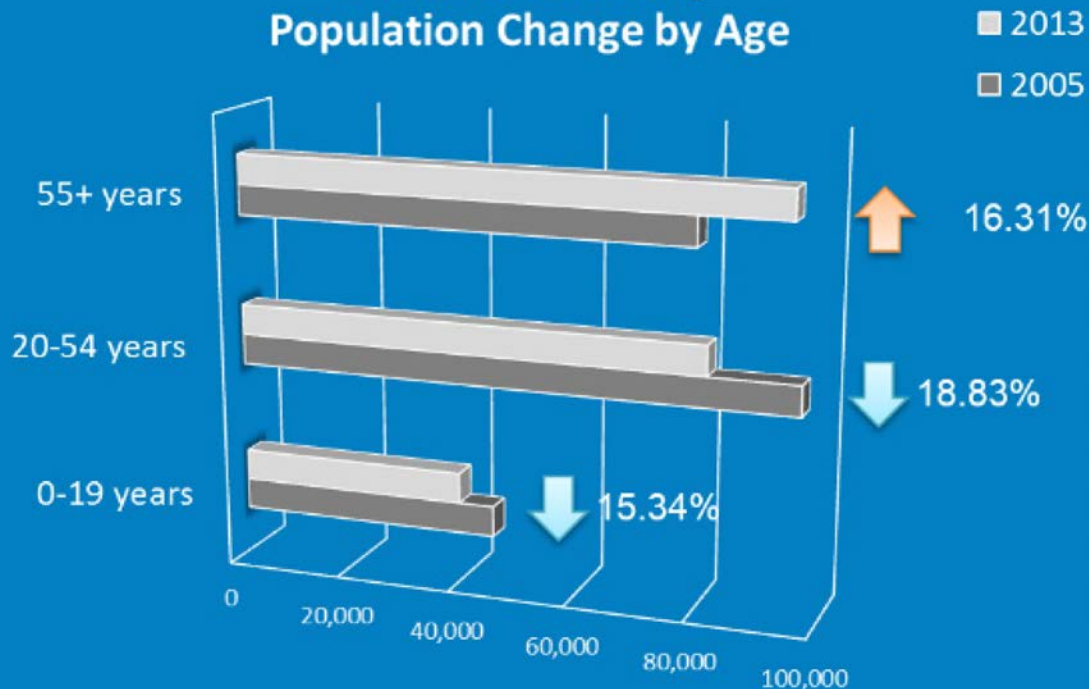
Retirees (65+)	
2005	50,929
2013	58,320
% of population 27.1	

Retirees (65+)	
2005	796,788
2013	990,097
% of population 14.8	

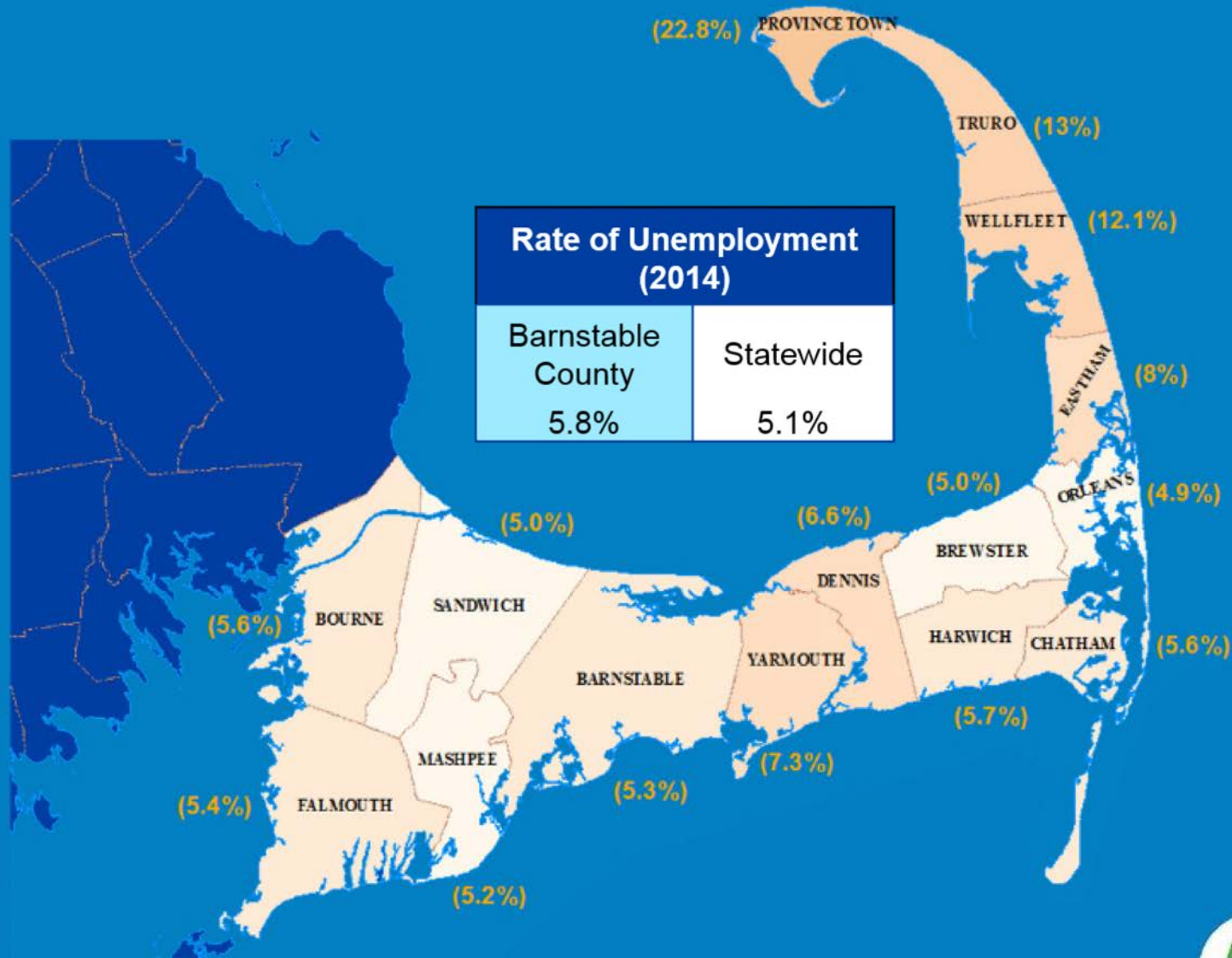
School-Age Children (5-18)	
2005	35,635
2013	30,626
% of population 16.2	

School-Age Children (5-18)	
2005	1,055,601
2013	1,029,030
% of population 20.8	

**Barnstable County
Population Change by Age**



Unemployment.

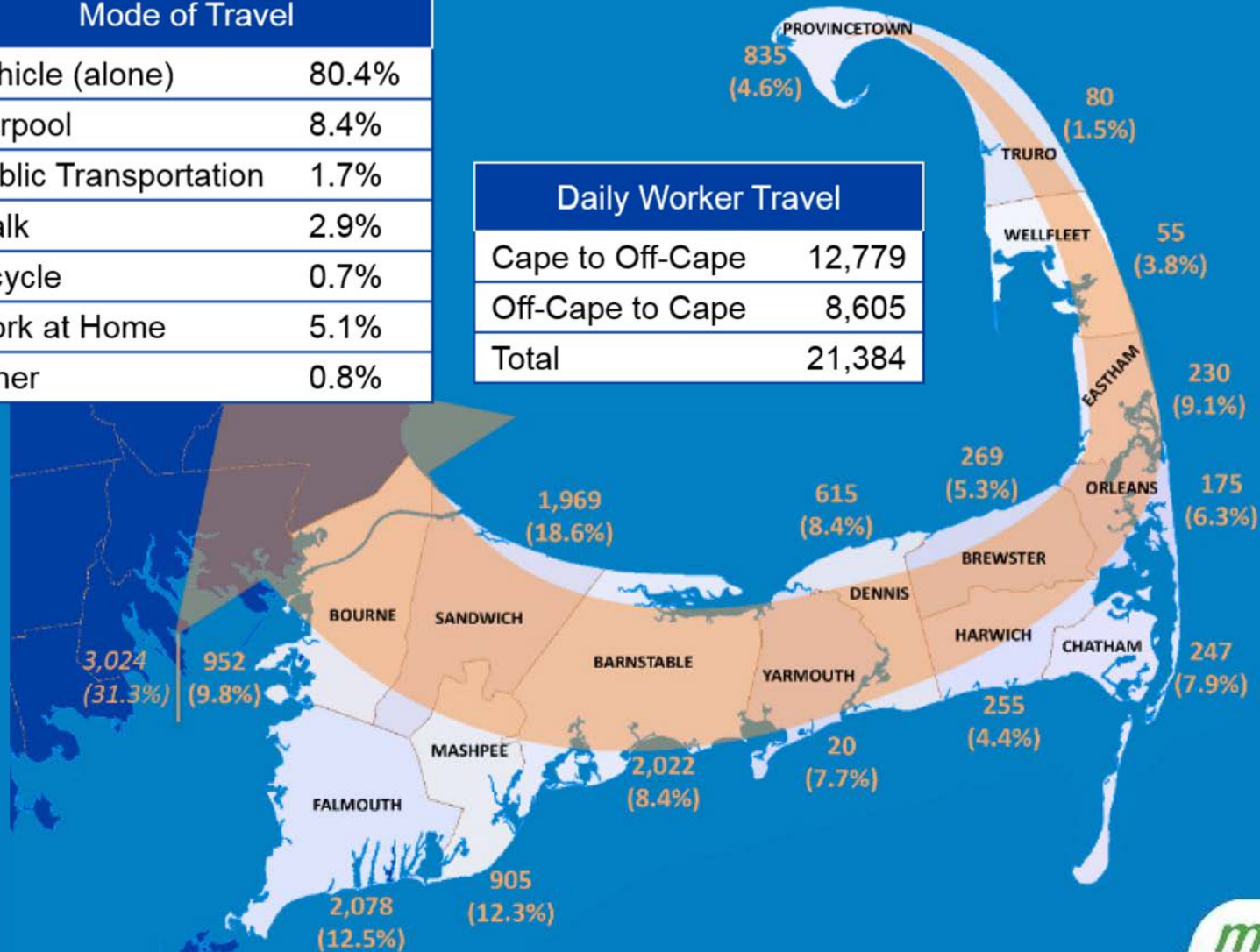


Journey to Work:

Percent of labor force who travel off-cape for work

Mode of Travel	
Vehicle (alone)	80.4%
Carpool	8.4%
Public Transportation	1.7%
Walk	2.9%
Bicycle	0.7%
Work at Home	5.1%
Other	0.8%

Daily Worker Travel	
Cape to Off-Cape	12,779
Off-Cape to Cape	8,605
Total	21,384



An aerial photograph of a wide river flowing through a lush, green forested landscape. A bridge with multiple spans crosses the river in the middle ground. The river curves to the right in the foreground. The background shows a mix of dense trees and some open fields under a clear sky.

Questions?

Comments and feedback can be emailed to
Ethan Britland - ethan.britland@state.ma.us

Transportation.

- Traffic operations.
- Crashes.
- Multi-Modal (transit, bicycles and pedestrians).

Analysis of Traffic Operations.

Traffic Analysis Requirements:

- Identification of analysis locations.
- Traffic volume data.

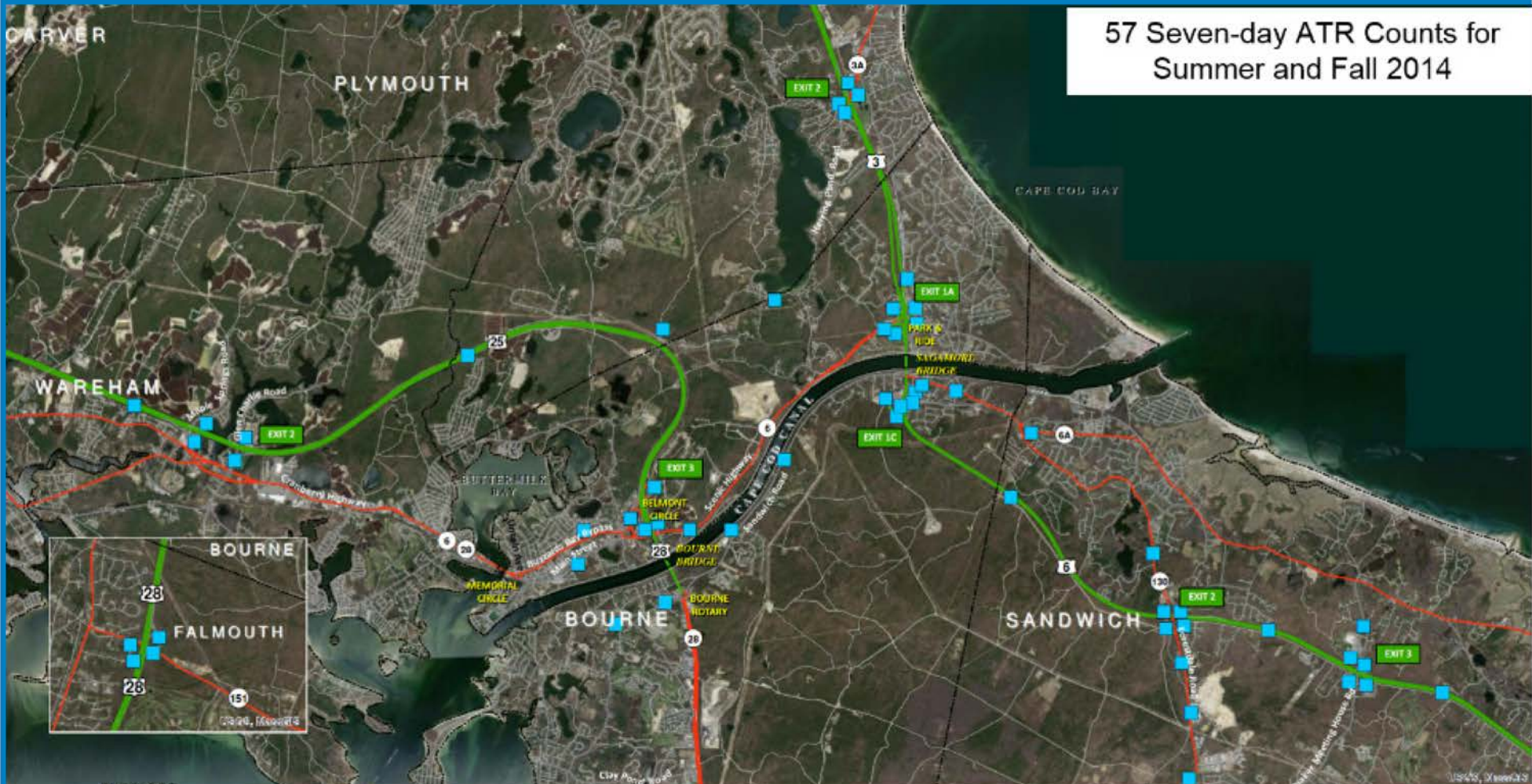
Where should we collect data?

Travel Corridors.



ATR Locations.

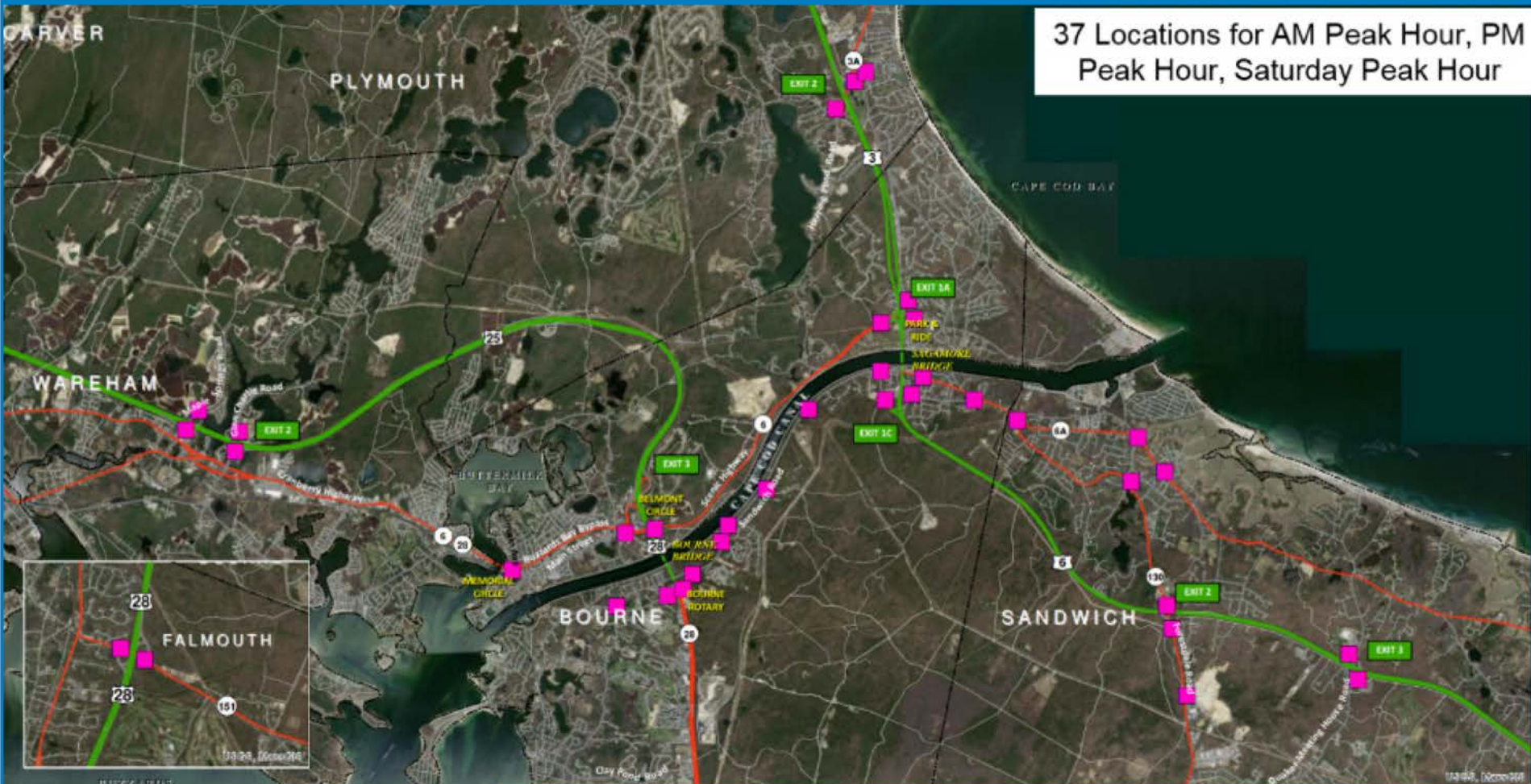
57 Seven-day ATR Counts for
Summer and Fall 2014



Legend

- Town Boundary
- Map Enlargement Areas
- ATR Locations

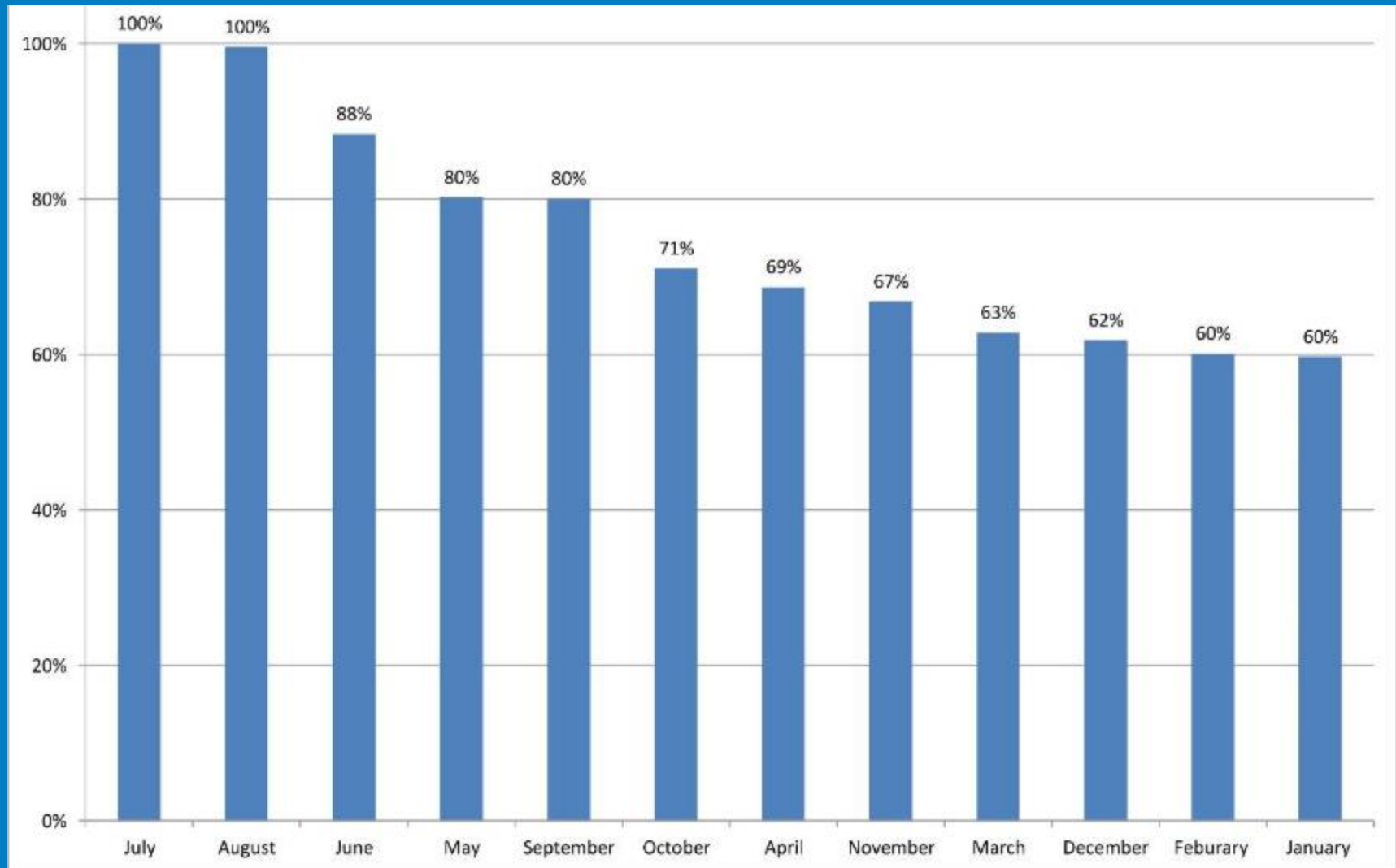
TMC Locations.



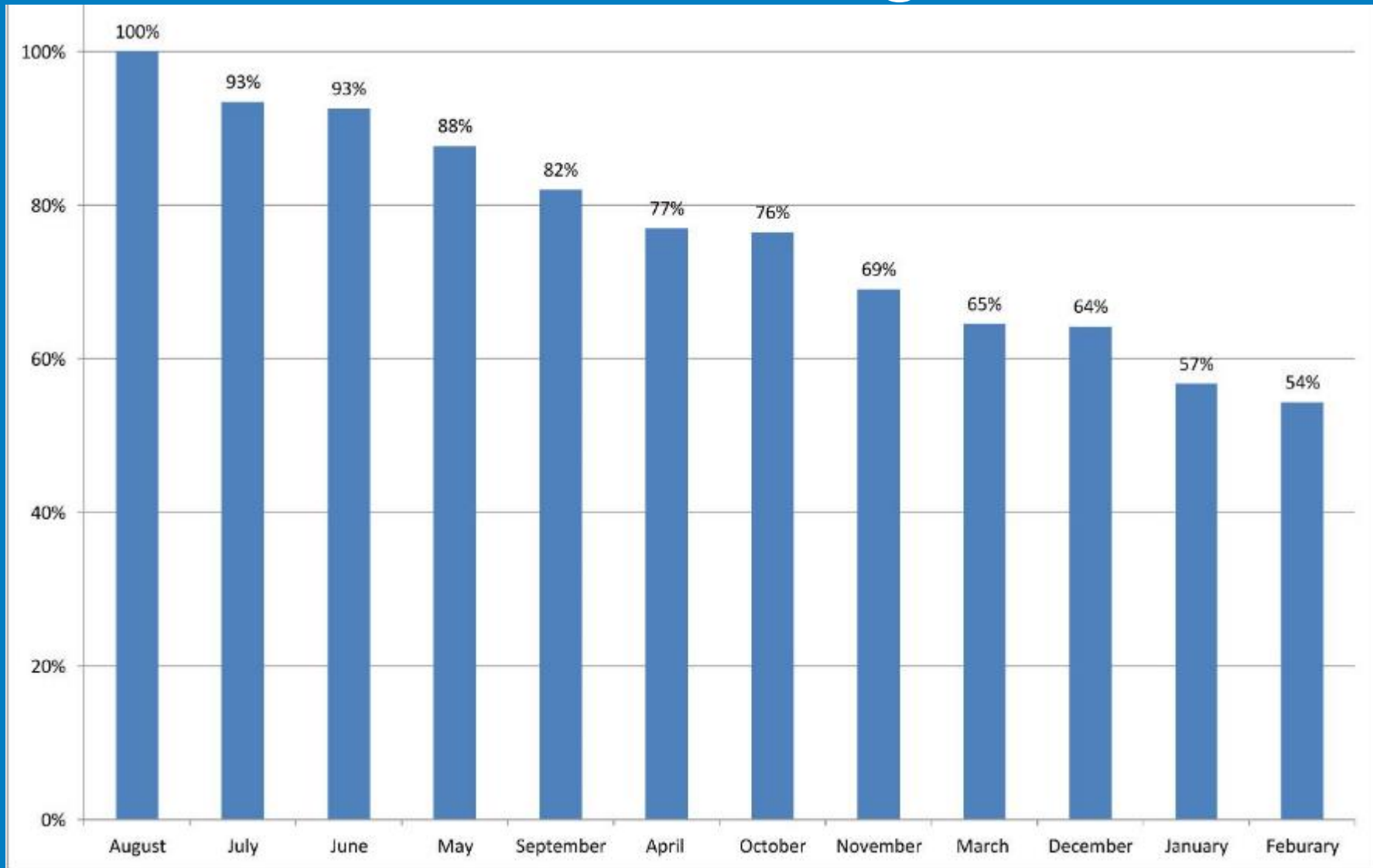
When should we collect traffic data?

Cape Cod has two traffic
seasons:
Summer and Non-summer

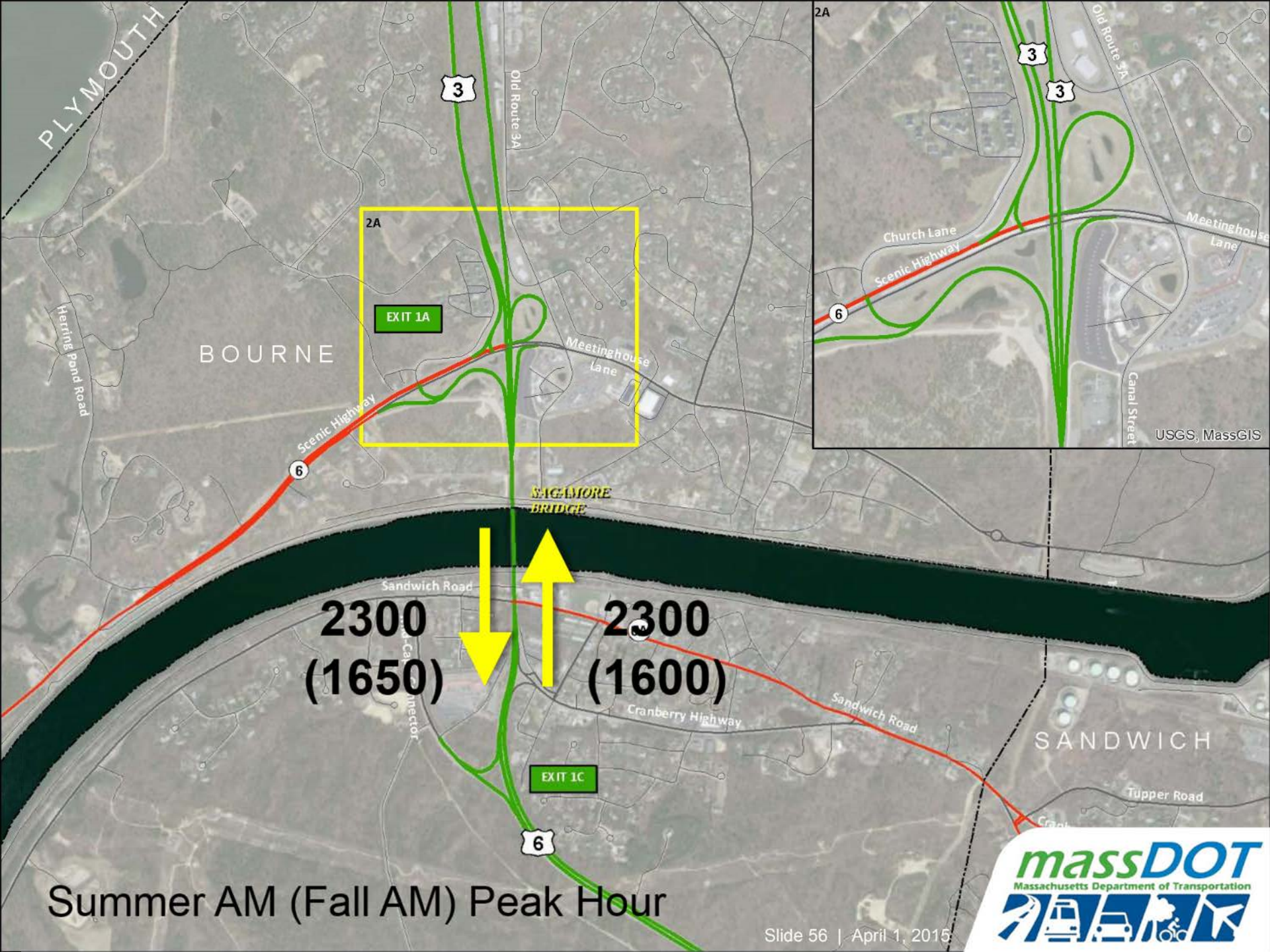
Sagamore Bridge.



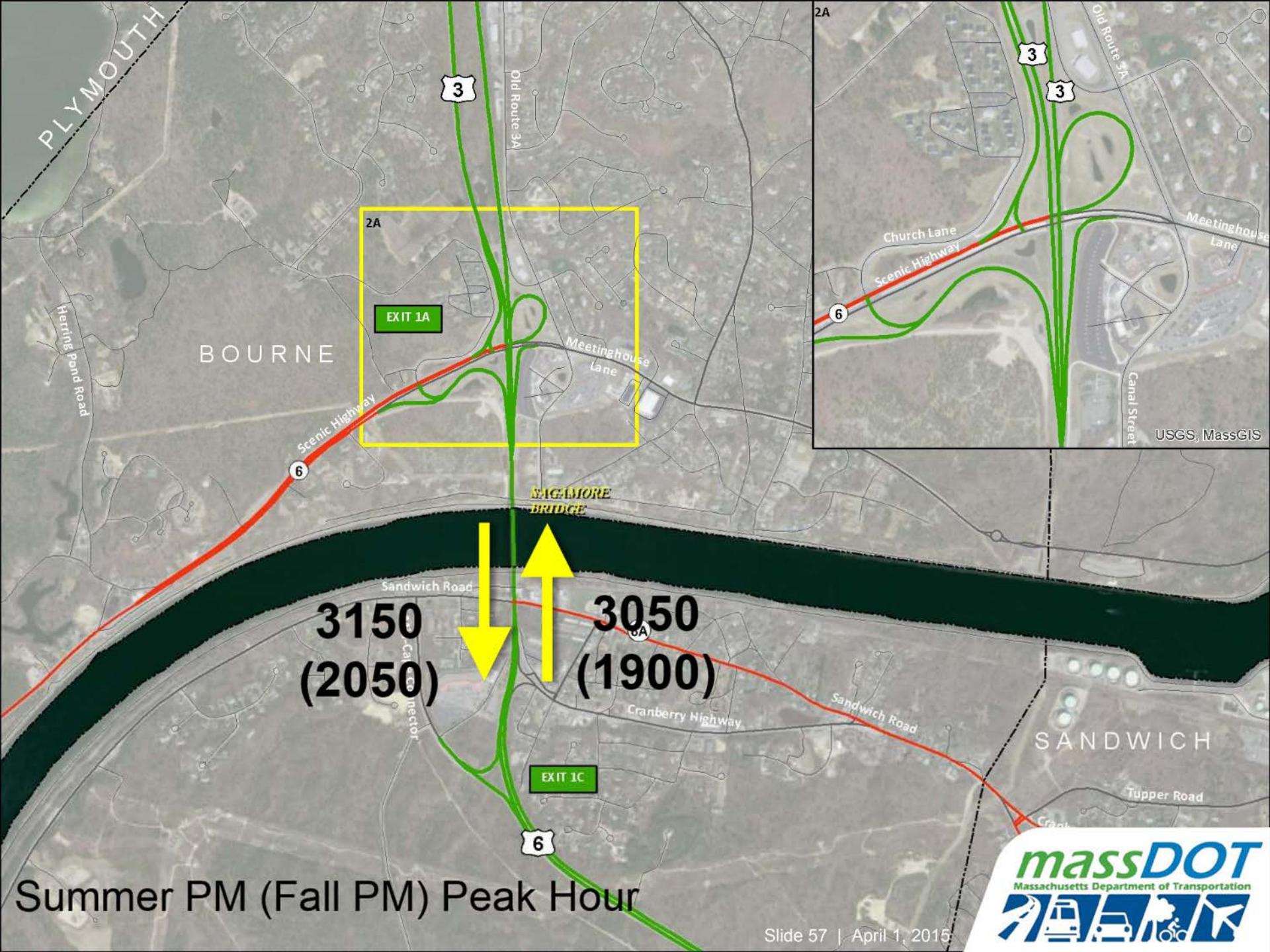
Bourne Bridge.



How different are summer and non-summer traffic volumes?



Summer AM (Fall AM) Peak Hour



Summer and Non-Summer Traffic Volumes.

Scenic Highway	
Summer	38664
Non-Summer	22908
Change (%)	51%

Route 3	
Summer	51613
Non-Summer	38848
Change (%)	28%

Route 25	
Summer	67734
Non-Summer	42648
Change (%)	45%

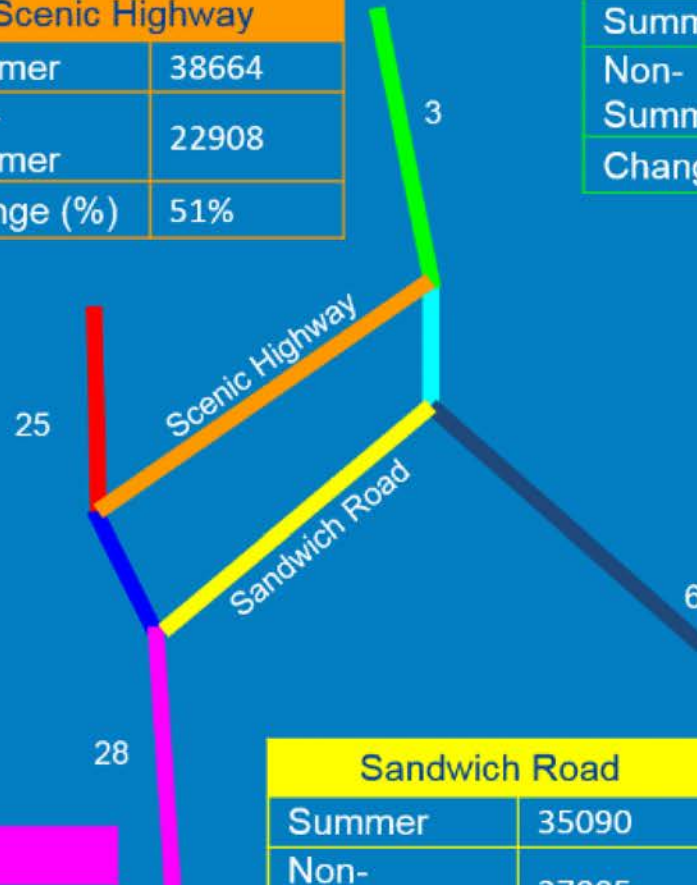
Sagamore Bridge	
Summer	73371
Non-Summer	49837
Change (%)	38%

Bourne Bridge	
Summer	62655
Non-Summer	44794
Change (%)	33%

Route 6	
Summer	78709
Non-Summer	41114
Change (%)	63%

Route 28	
Summer	52145
Non-Summer	30000
Change (%)	54%

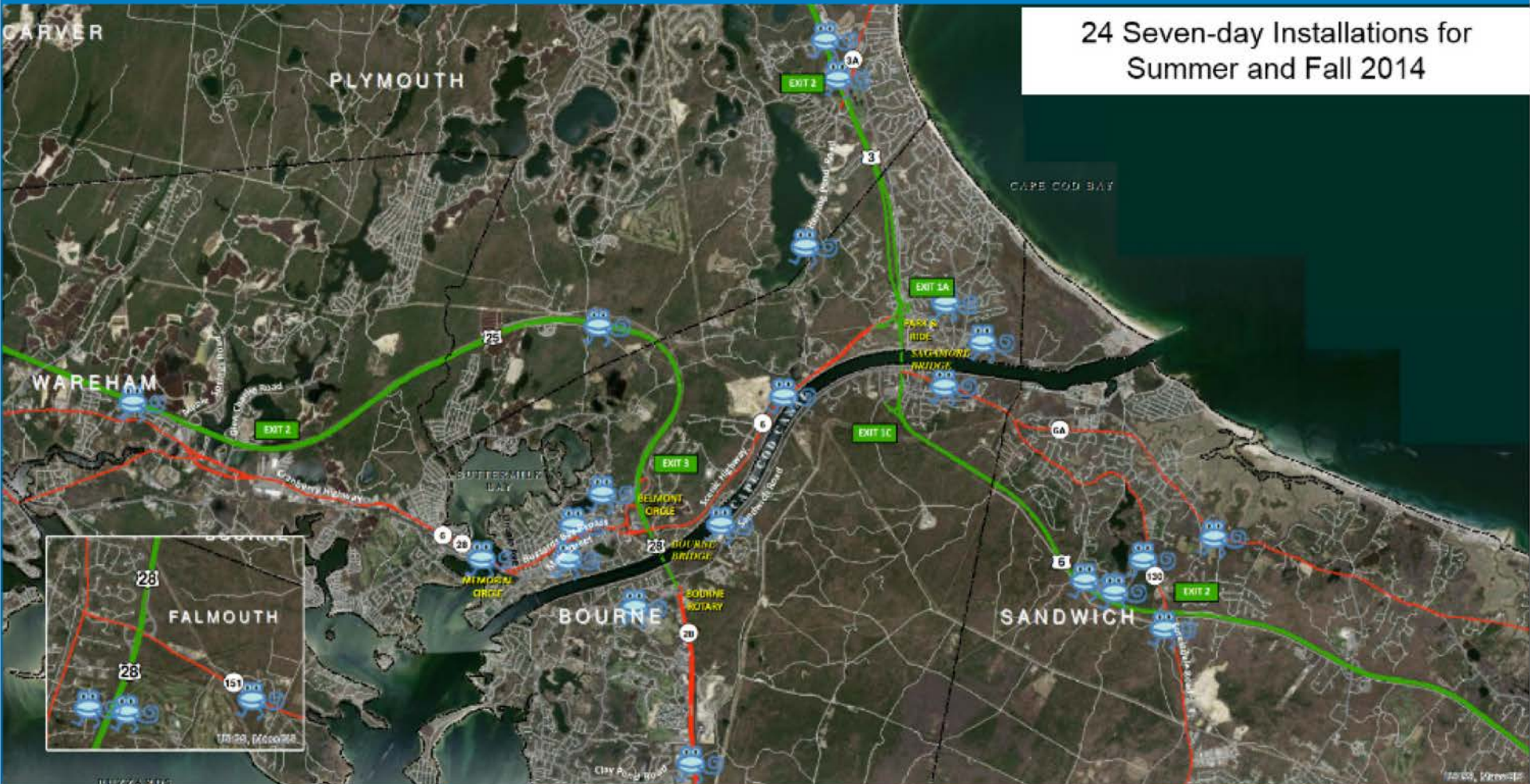
Sandwich Road	
Summer	35090
Non-Summer	27005
Change (%)	26%



Where are drivers going and how do they get there?

BlueTOAD Locations.

24 Seven-day Installations for
Summer and Fall 2014



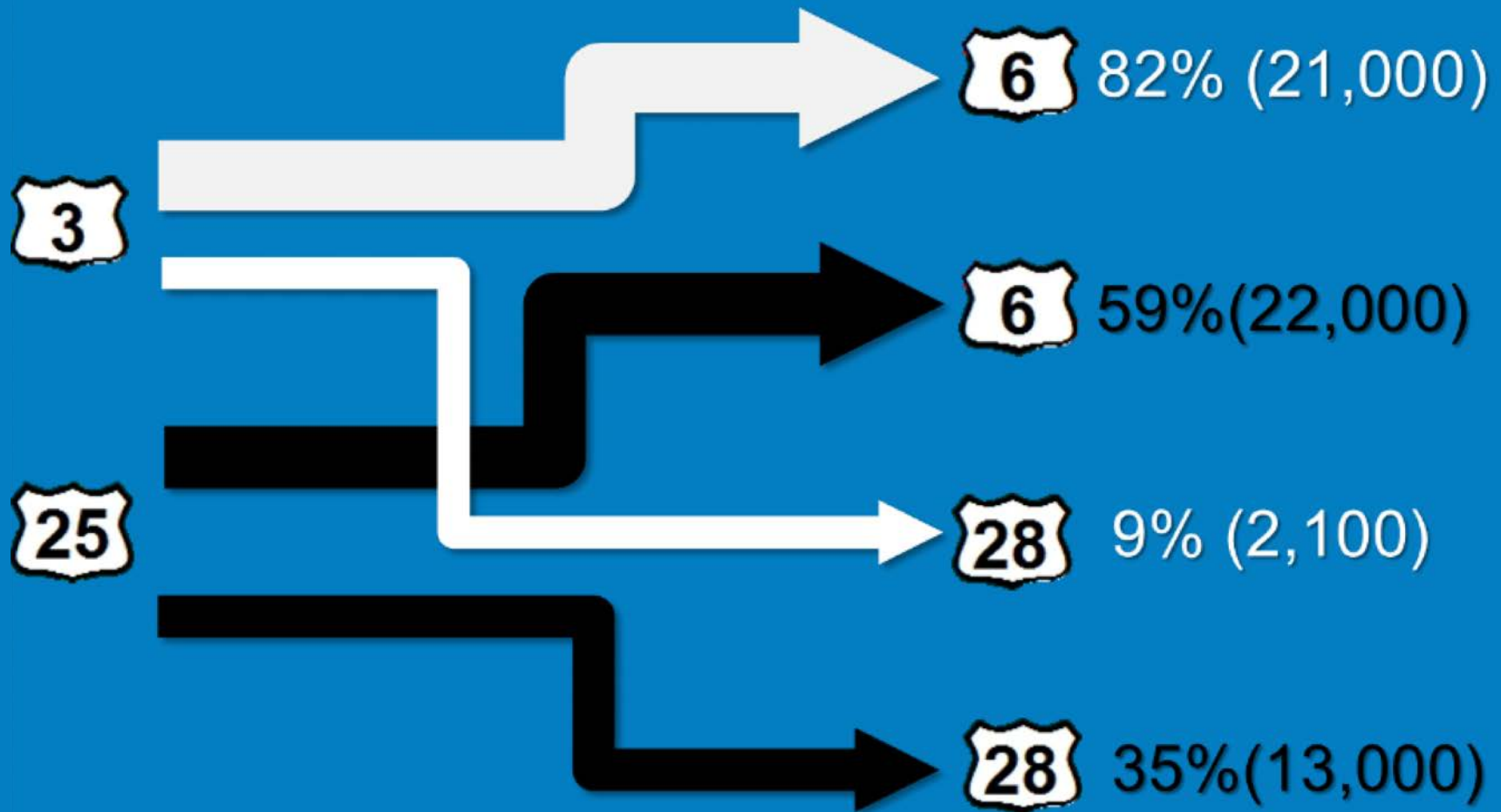
Legend

- Town Boundary
- Map Enlargement Areas
- BlueTOAD Data Collection Locations

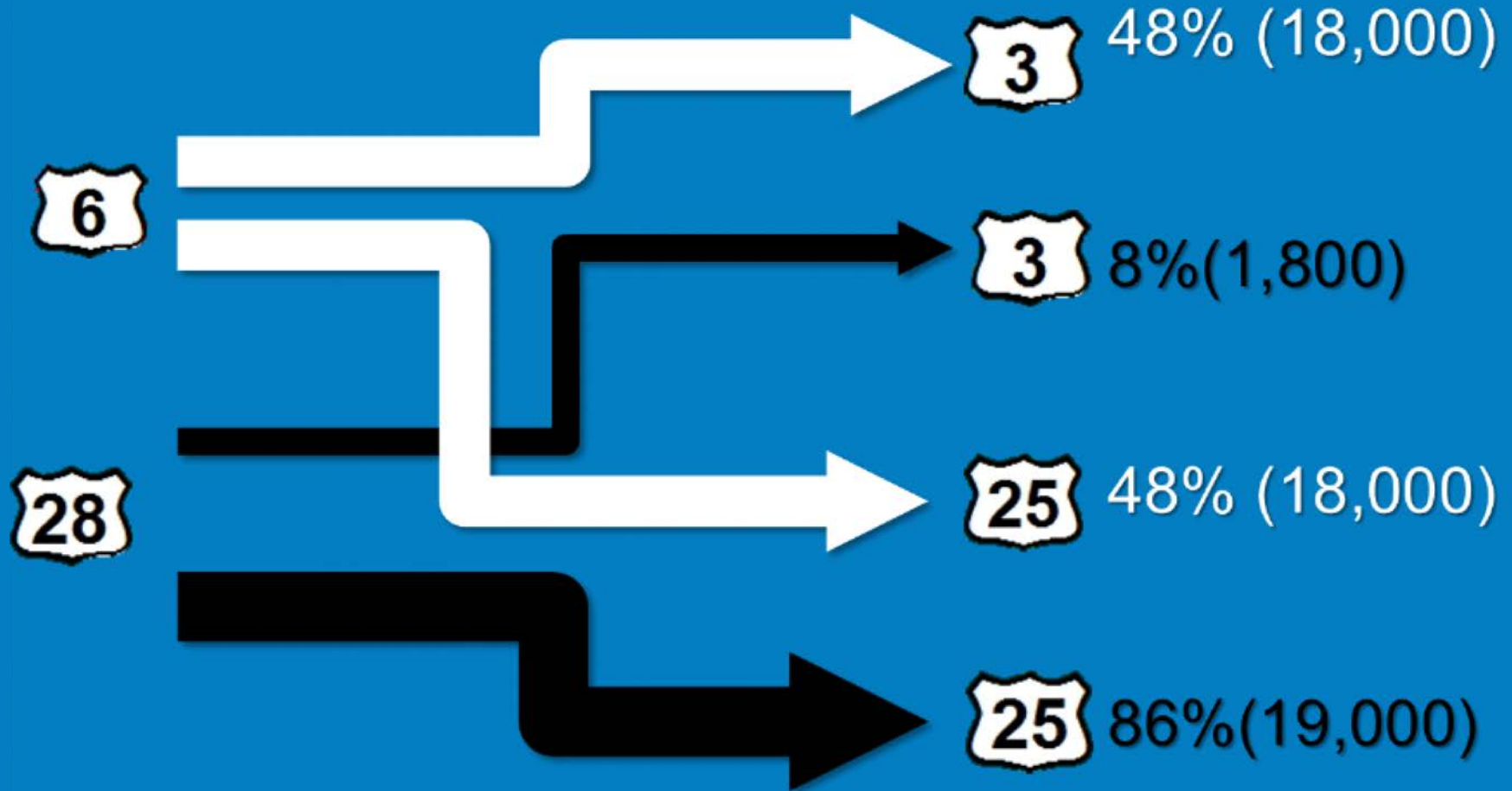
BlueTOADS.



Summer Saturday Cape-Bound Routing.



Summer Sunday Off-Cape Routing.



Level of Service

Level of Service.

- Expression or ranking of traffic operations
Report card LOS A – LOS F.
- Always based on peak hour traffic volumes.
- Peak hour is hour with highest traffic volumes.
- Never based on daily traffic volumes.

Types of Analysis.

- Intersection of Local streets:
 - Conflicting turning movements at unsignalized and signalized location.
- Operations within Rotaries:
 - Conflicting turning movements.
- Travel lanes on limited access roads:
 - Density of traffic inhibits freedom to maneuver.

Existing Traffic Operations.

- Summer and non-summer weekday AM and PM peak hour intersection analysis requires a total of 148 analysis cases.
- Summer and non-summer Saturday peak hour intersection analysis requires 74 analysis cases.
- Summer and non-summer peak hour merge, diverge, and weave analysis requires 60 analysis cases.

282 Level of Service findings
are a lot of data to digest

Where are the problem locations?

TMC Locations.

37 Locations for AM Peak Hour, PM Peak Hour, Saturday Peak Hour

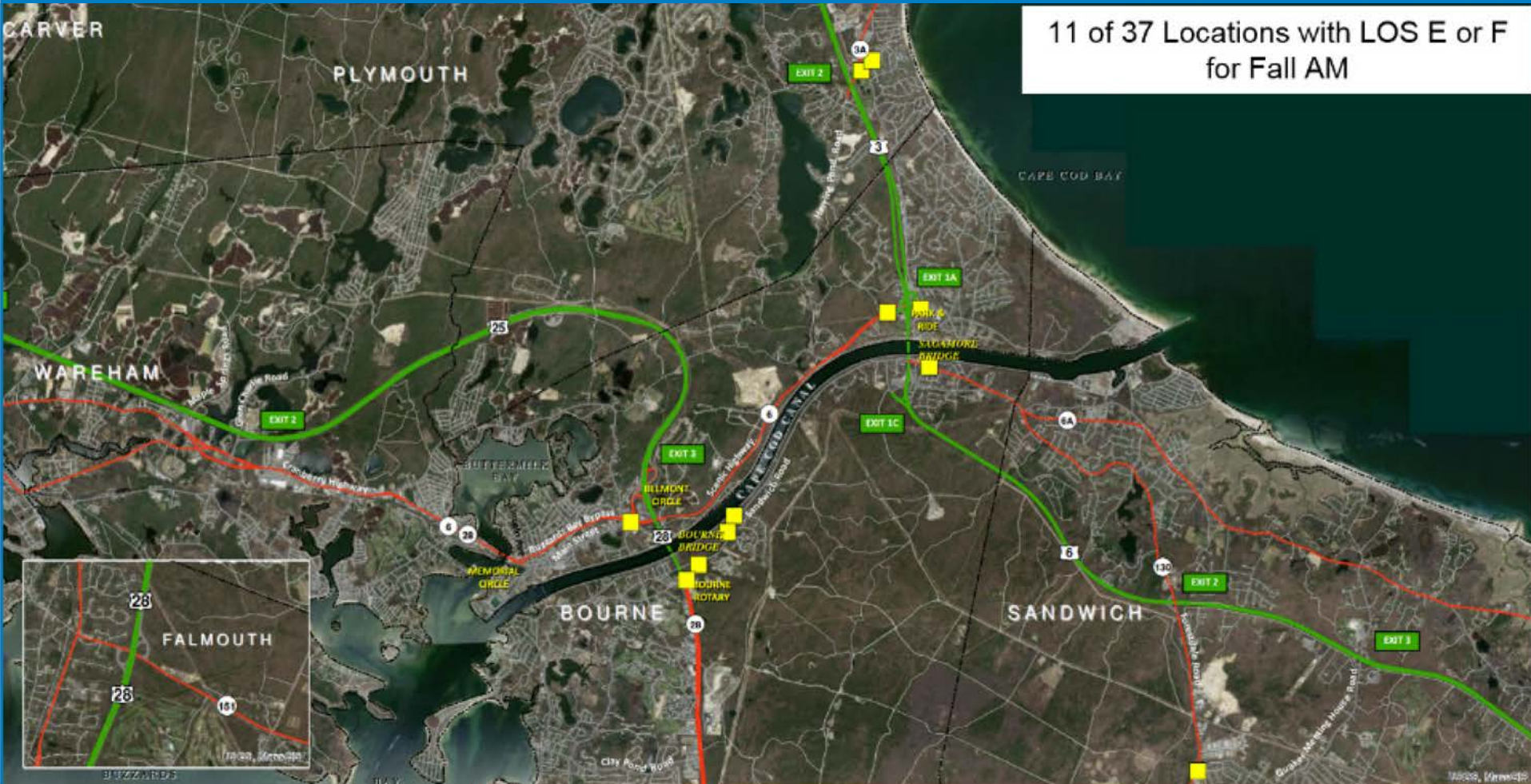


- Legend**
- Town Boundary
 - Map Enlargement Areas
 - Turning Movement Count Locations

Intersections with LOS E or F: Summer AM.



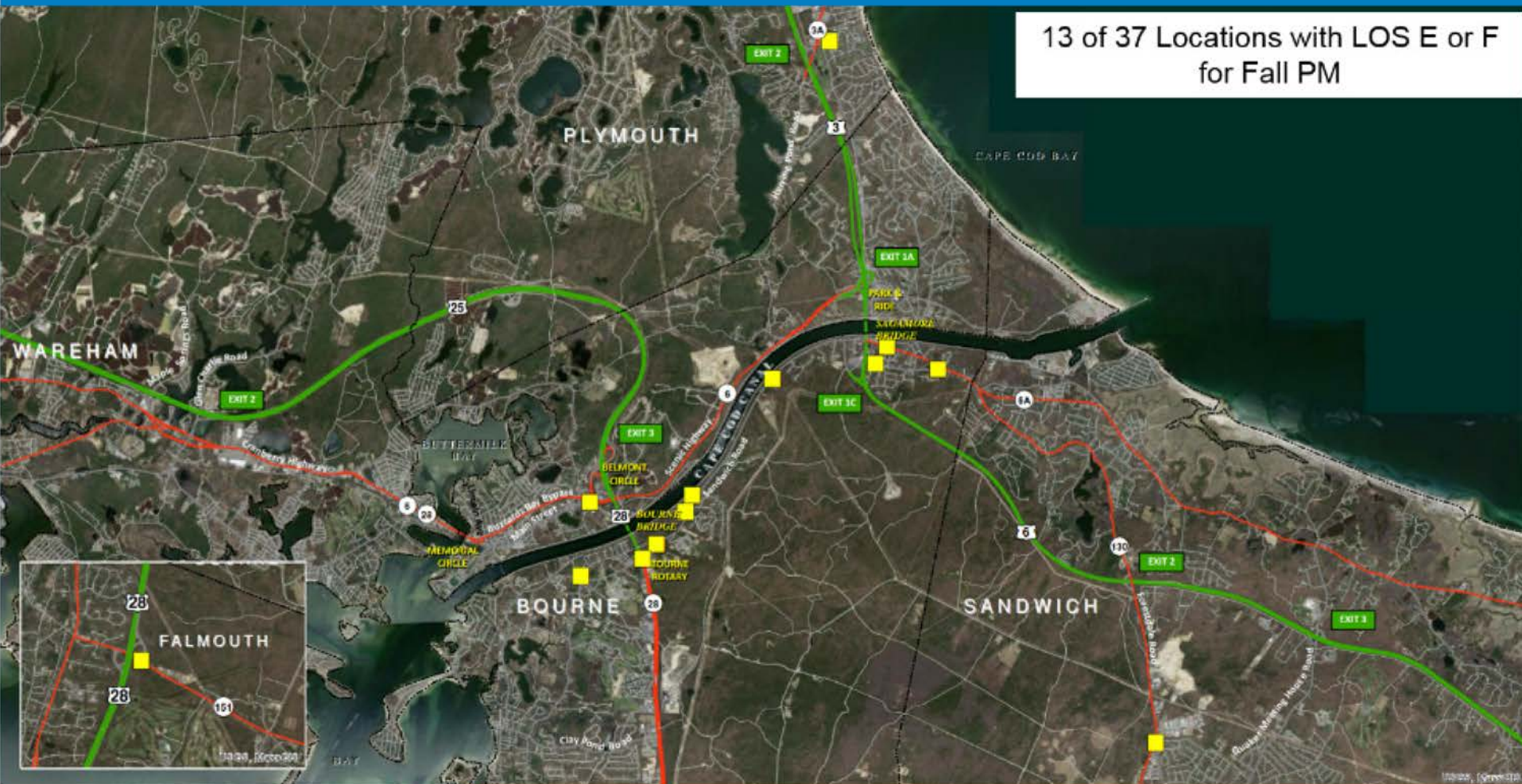
Intersections with LOS E or F: Fall AM.



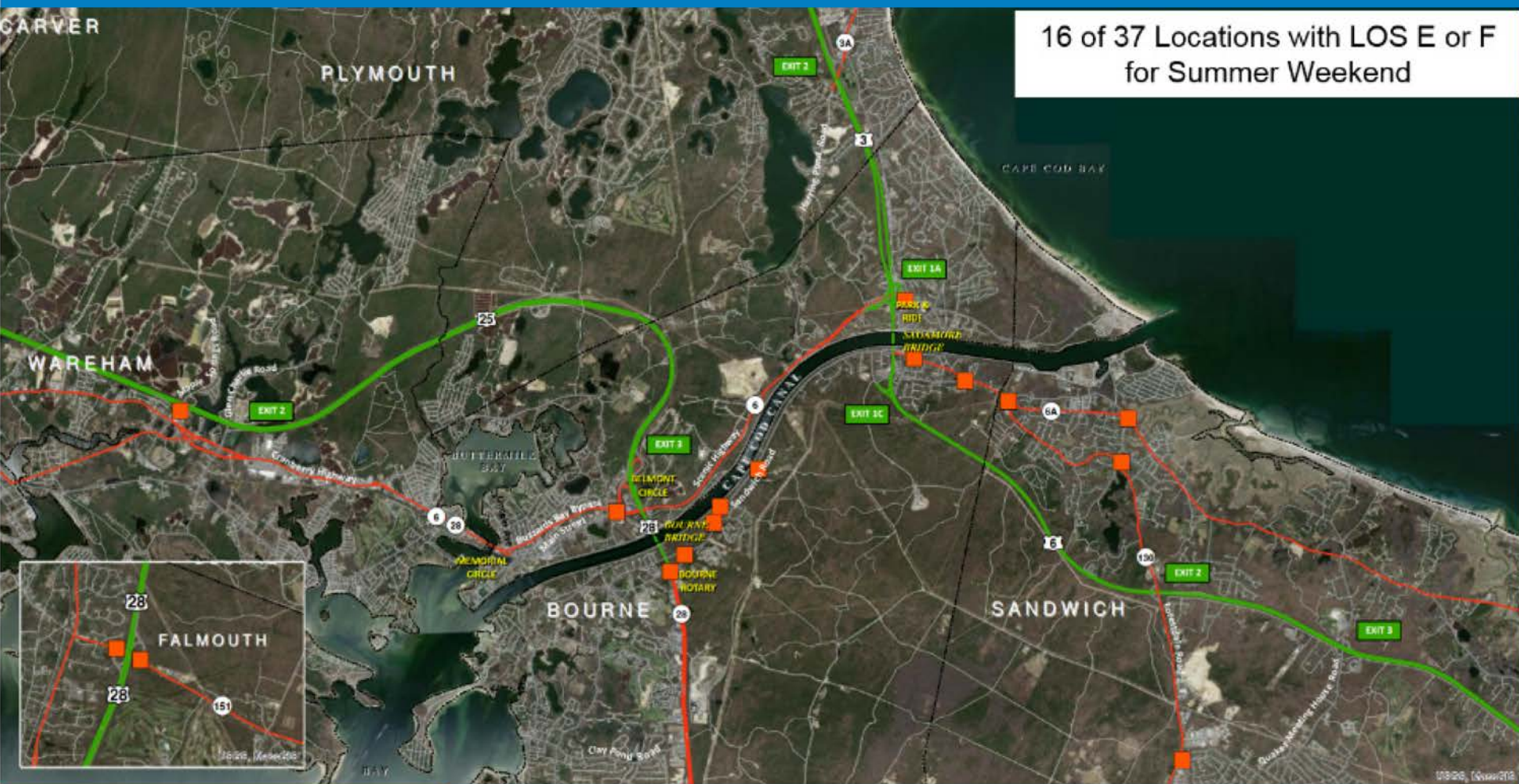
Intersections with LOS E or F: Summer PM.



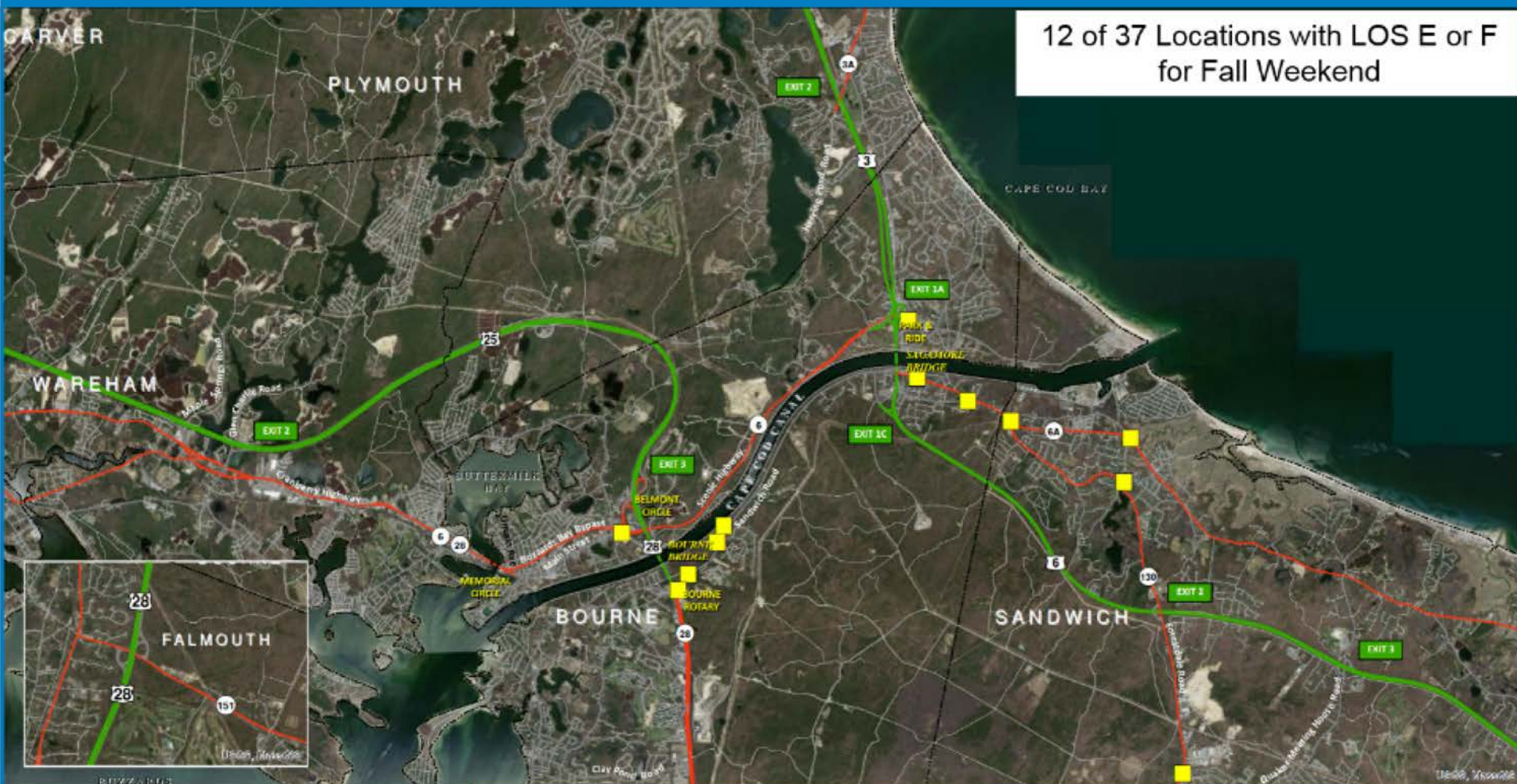
Intersections with LOS E or F: Fall PM.



Intersections with LOS E or F: Summer Weekend.



Intersections with LOS E or F: Fall Weekend.

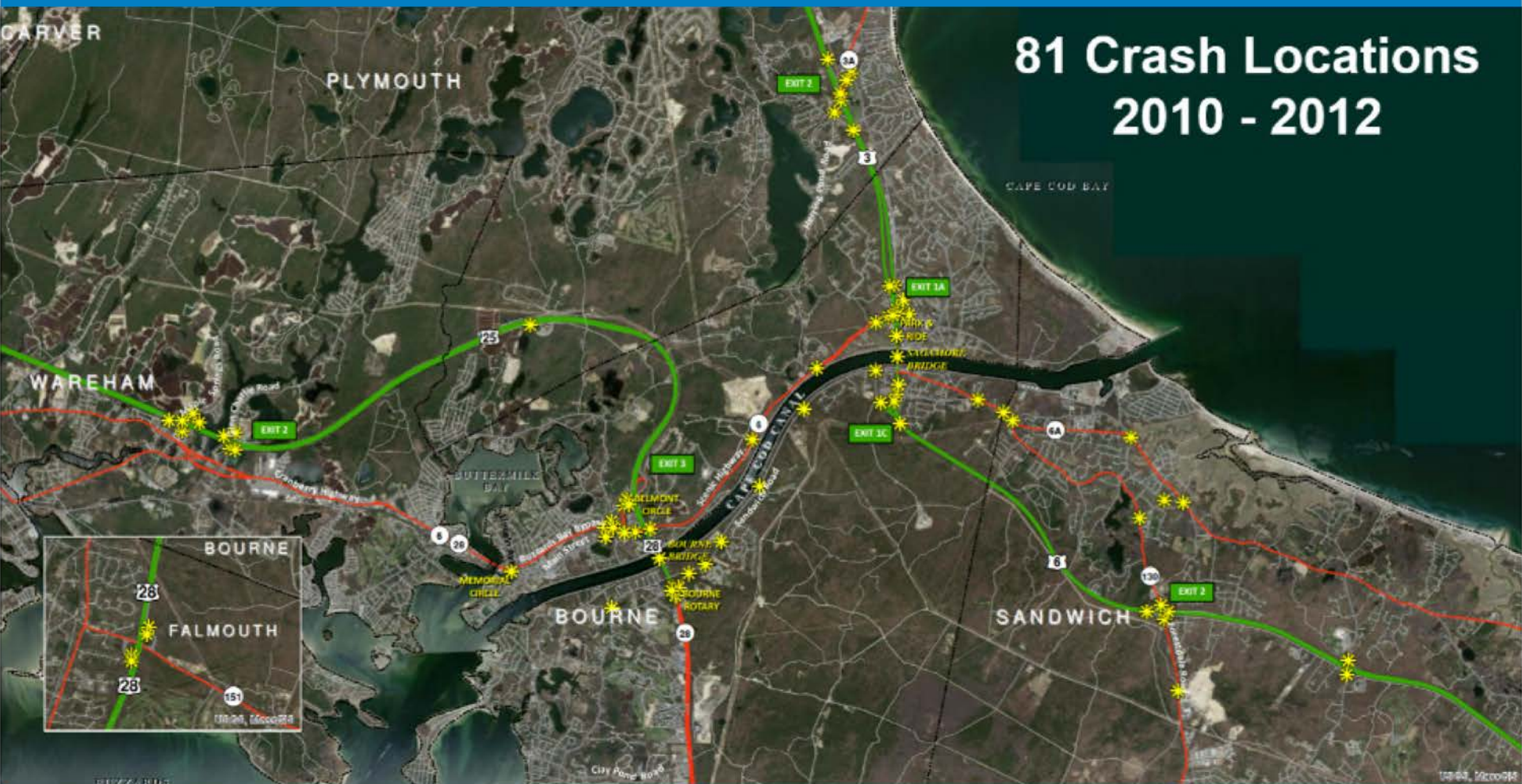


Two Rotaries – VISSIM Simulations

LOS E & F Summary Table.

	Summer AM	Fall AM	Summer PM	Fall PM	Summer Weekend	Fall Weekend
S I G N A L I Z E D						
Main St at Tupper Rd					E	E
Scenic Hwy at Church Ln		F				
Meetinghouse Ln, State Rd, and Canal Rd	E	E	F		F	F
U N S I G N A L I Z E D						
Sandwich Rd at Bourne Rotary Connector	F	F	F	F	F	F
Sandwich Rd at High School Dr		F	F	F	F	F
Sandwich rd at Harbor Lights Rd	F	E	F	F	F	F
Sandwich Rd at Jarvis Dr				F		
Sandwich Rd at Adams St	F	F	F	F	F	F
Rte 151 at Rte 28 NB off Ramp			F	E	E	
Rte 151 at Rte 28 SB Off-ramp	E		F		F	
Sandwich Rd, Cranberry Hwy, and Regency Dr	E		F	E	F	F
Old Kings Hwy at Main St					E	E
Rte 6A at Main St	F				F	F
Maple Springs Rd at Rte 25 EB					F	
Rte 130 at Cotuit Rd	F		F	F	F	F
Herring Pond Rd at State Rd		E	F	F		
Belmont Circle	F	F	F	F	F	F
Bourne Rotary	F	F	F	F	F	F

Crash Analysis Locations.



HSIP Crash Locations.

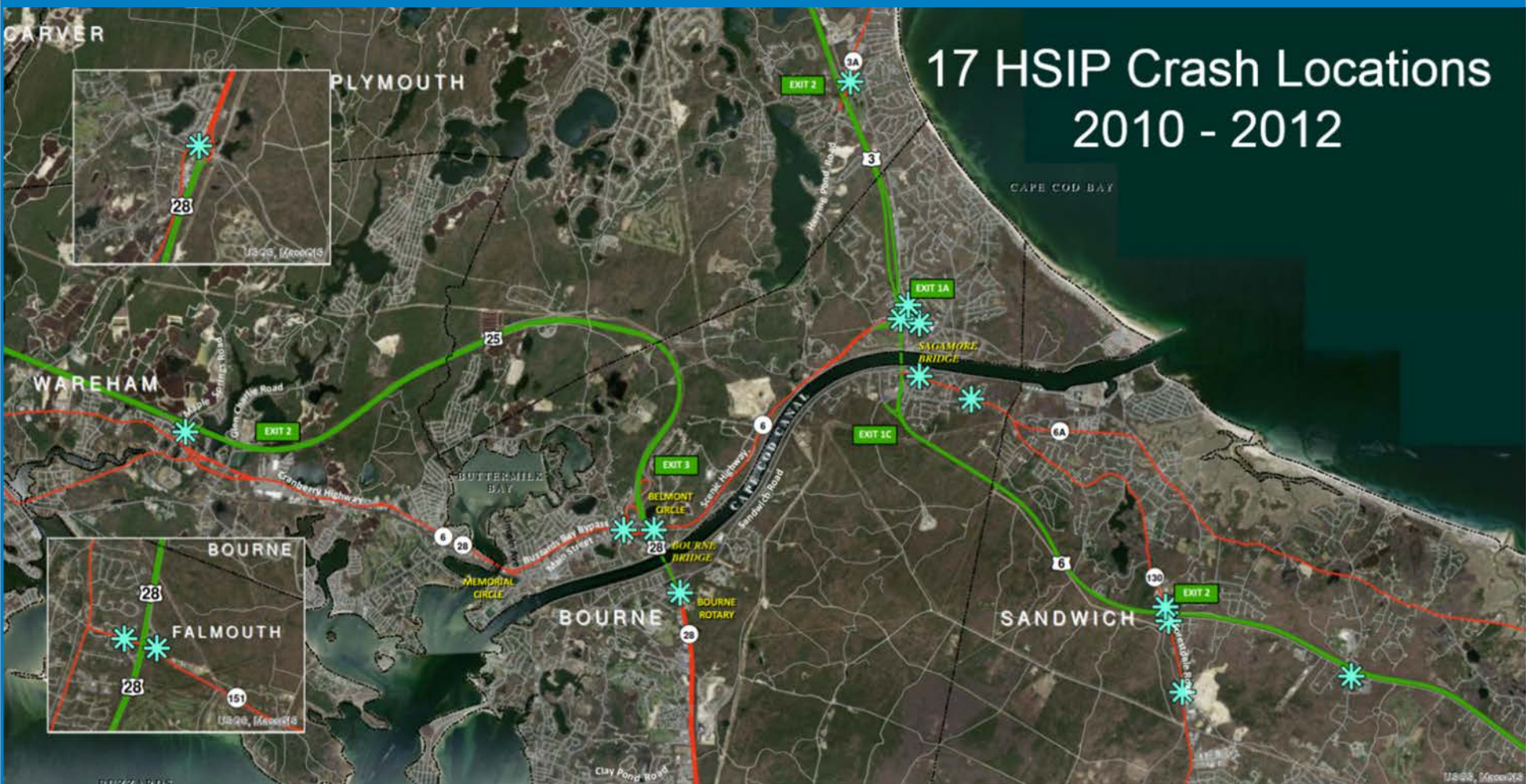
Highway Safety Improvement Program.

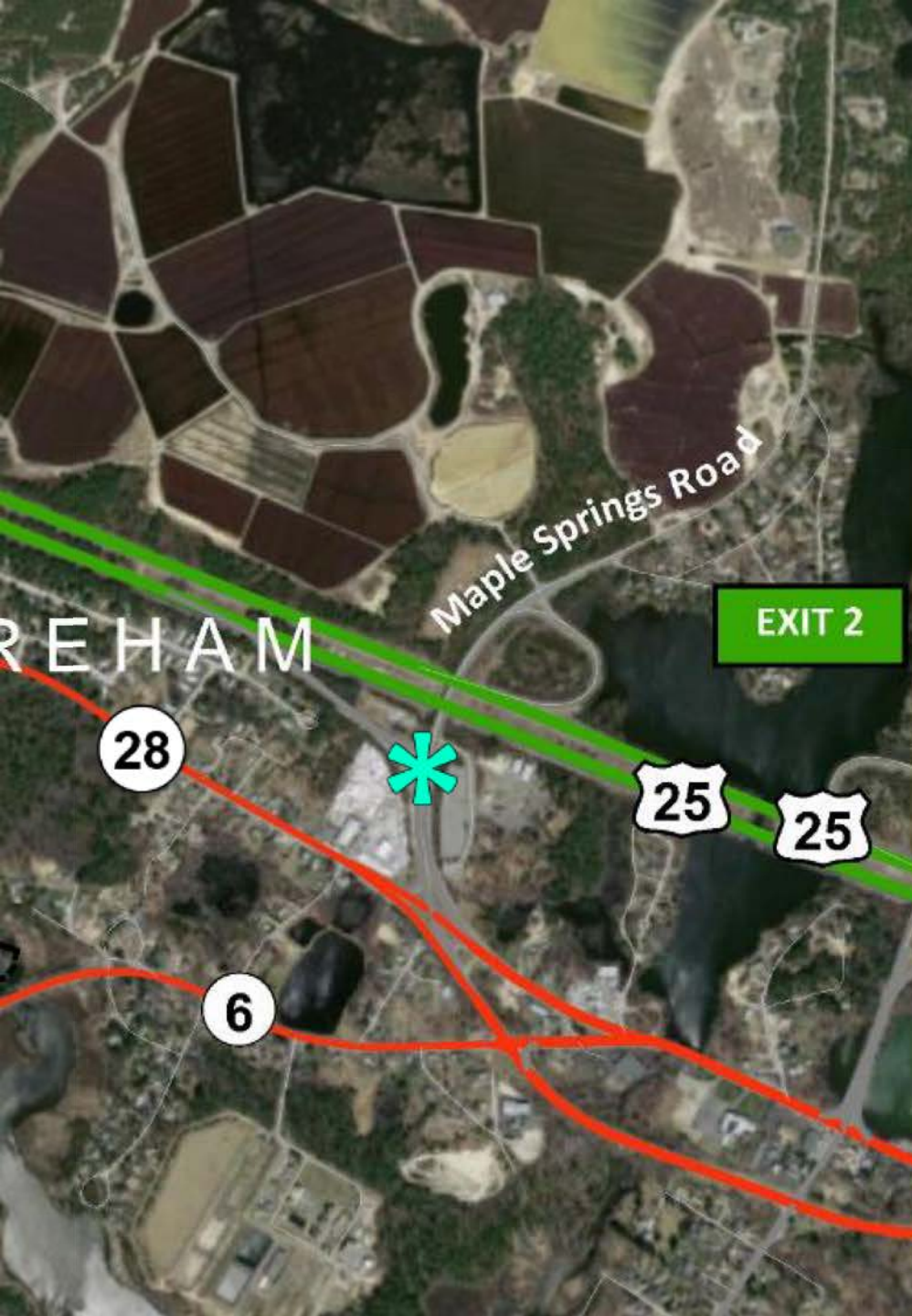
Weighted Rank.

EPDO – Equivalent Property Damage Only
(10, 5, 1).

Located crashes (crash reports) within 200 feet of each are clustered.

HSIP Crash Analysis Locations.

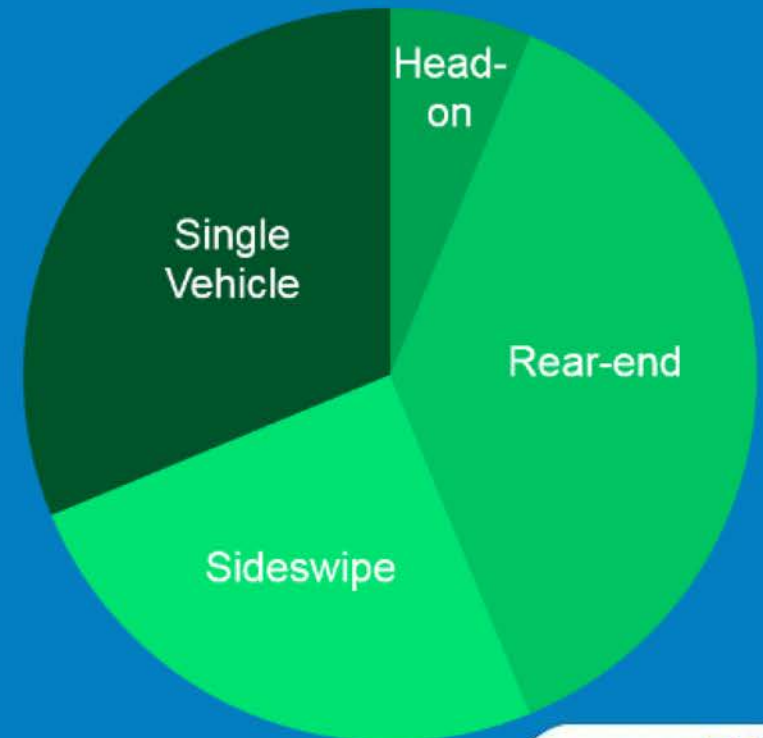




Off-Ramp Route 25 Eastbound to Maple Springs Road.

HSIP High Crash Location

Total Crashes	16 crashes
Yearly Average	5.3 crashes
% During Summer	31%
% Off-Season	69%

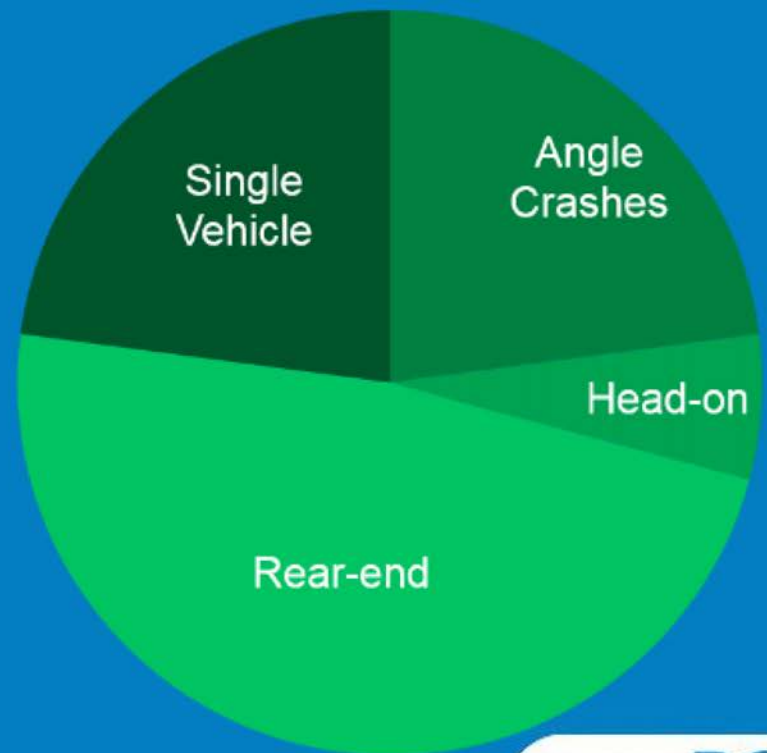


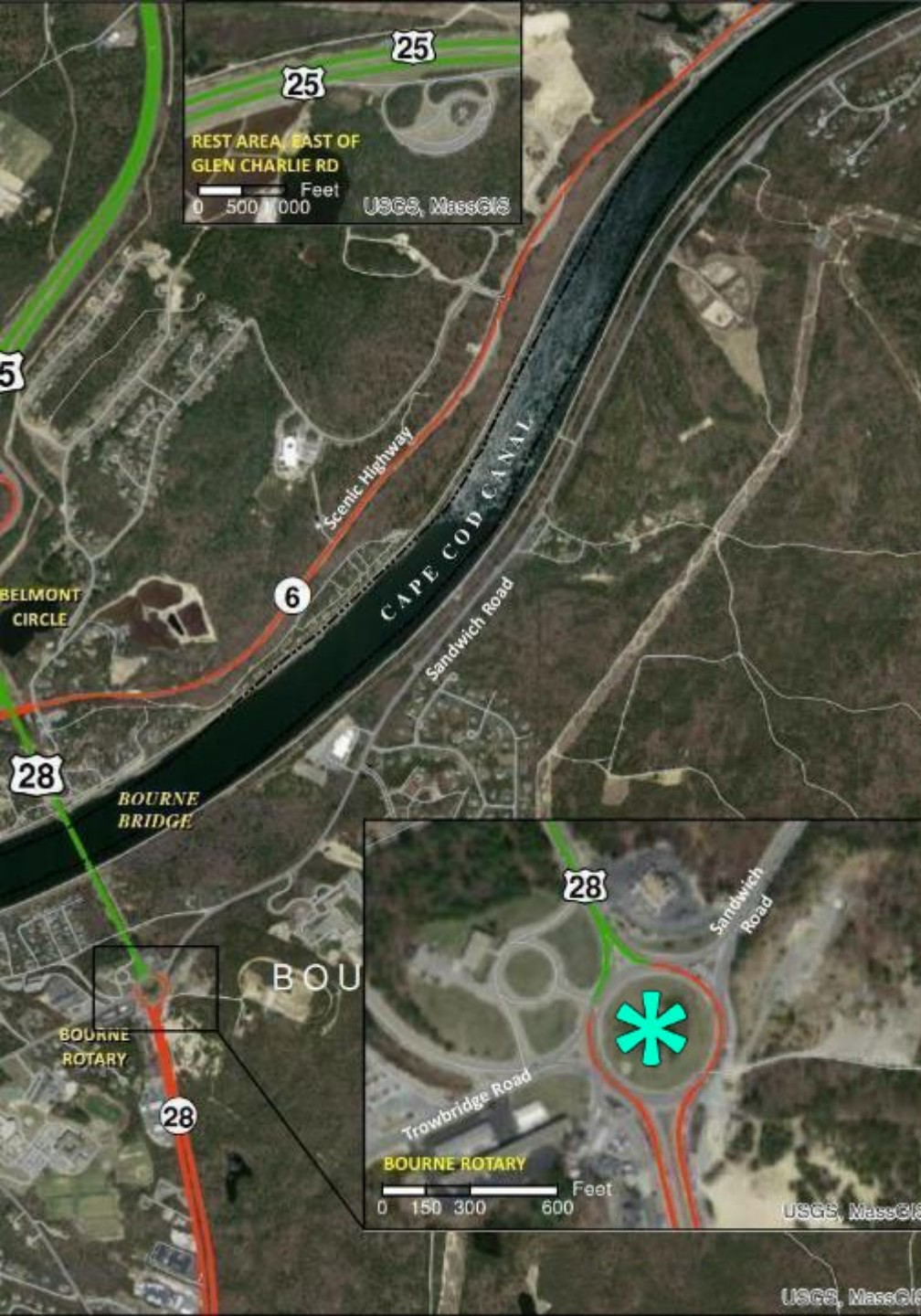


Routes 151 and 28 Interchange.

HSIP High Crash Location

Total Crashes	49 crashes
Yearly Average	16.3 crashes
% During Summer	39%
% Off-Season	61%

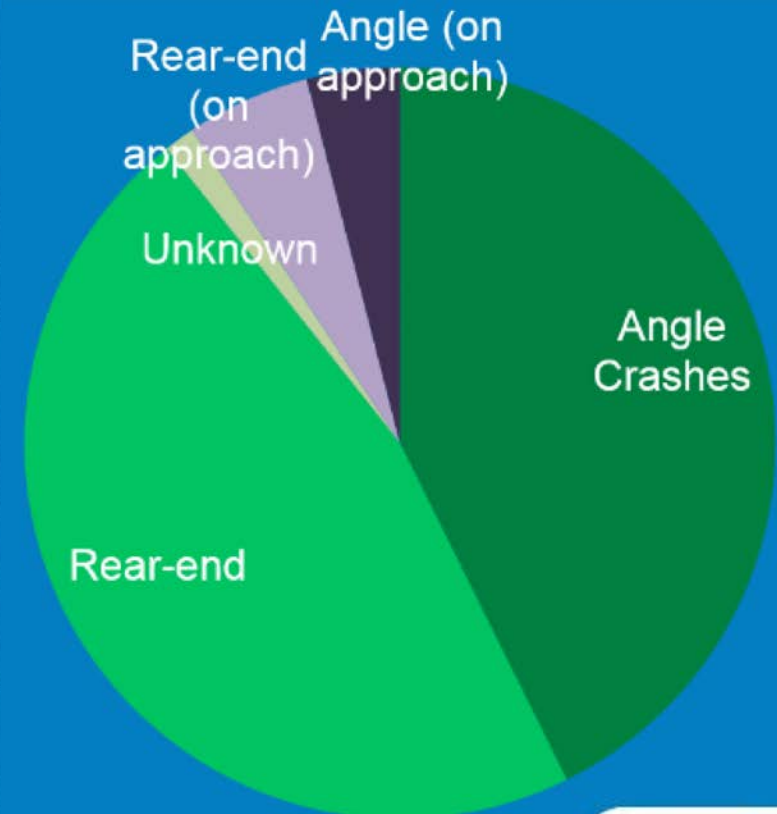




Bourne Rotary.

HSIP High Crash Location

Total Crashes	75 crashes
Yearly Average	25 crashes
% During Summer	33%
% Off-Season	67%



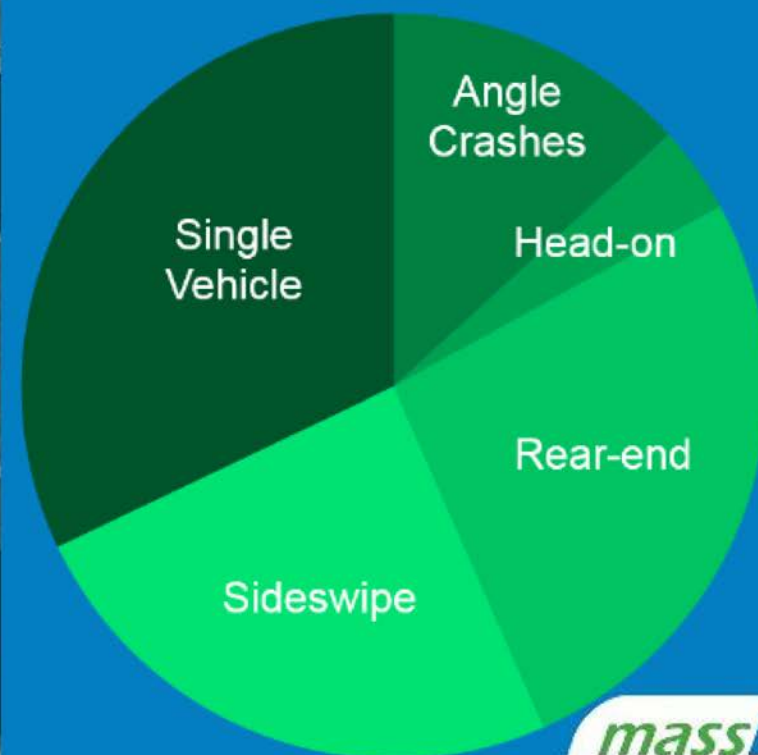


Belmont Circle.

HSIP High Crash Location

Total Crashes	53 crashes
Yearly Average	17.7 crashes
% During Summer	28%
% Off-Season	72%

Pedestrian Fatality

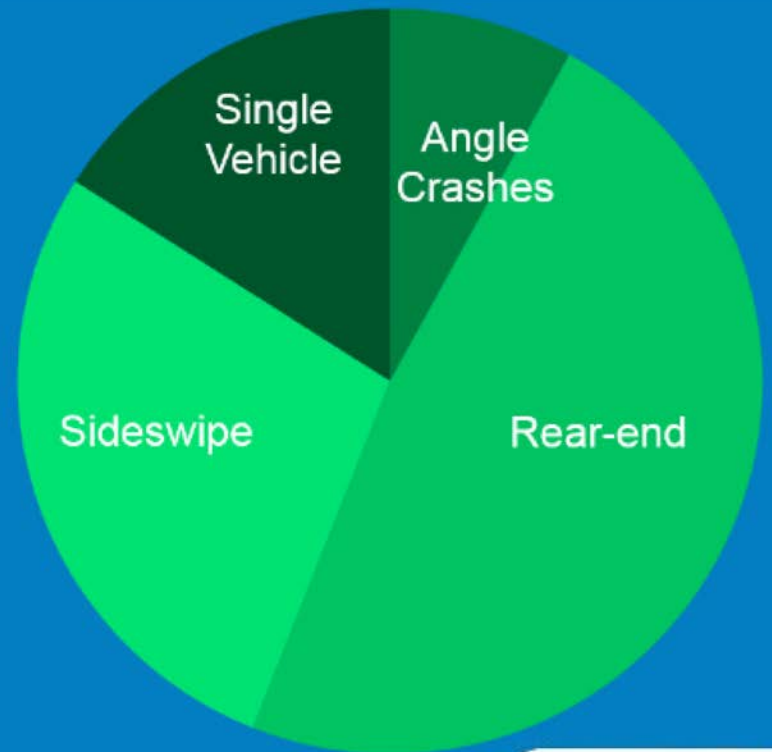


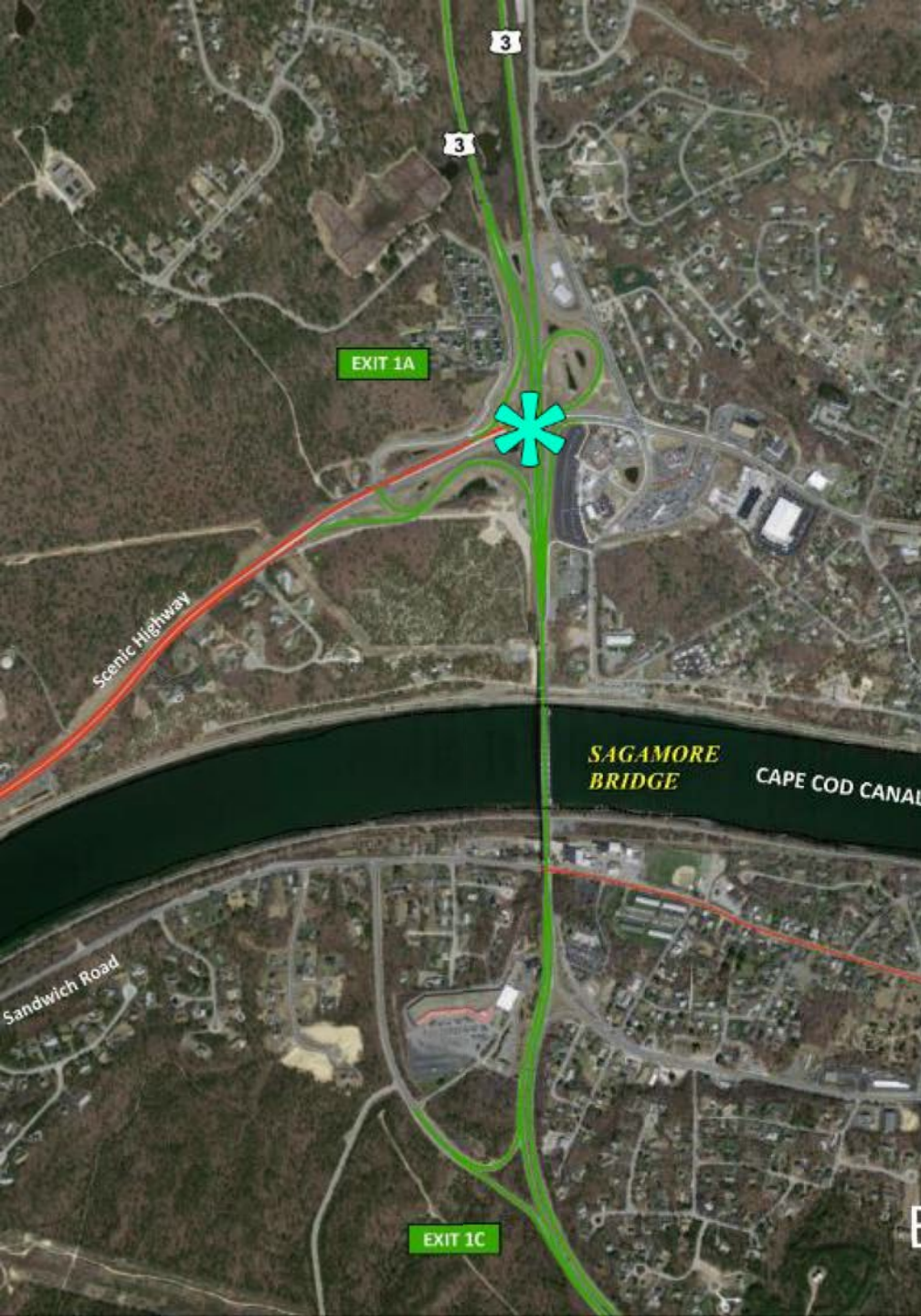


Scenic Hwy and Nightingale Pond Road / Andy Olivia Drive

HSIP High Crash Location

Total Crashes	25 crashes
Yearly Average	8.3 crashes
% During Summer	16%
% Off-Season	84%

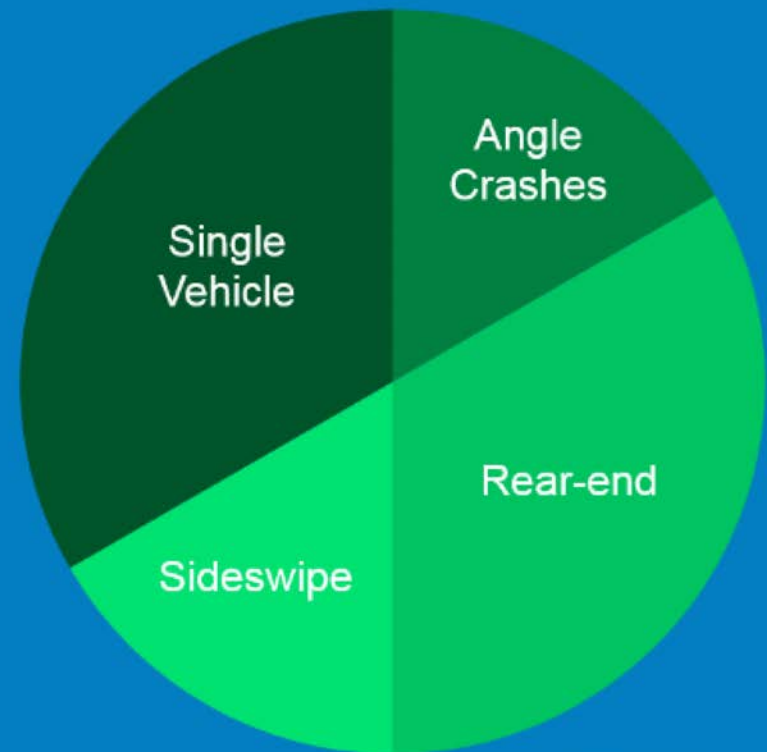


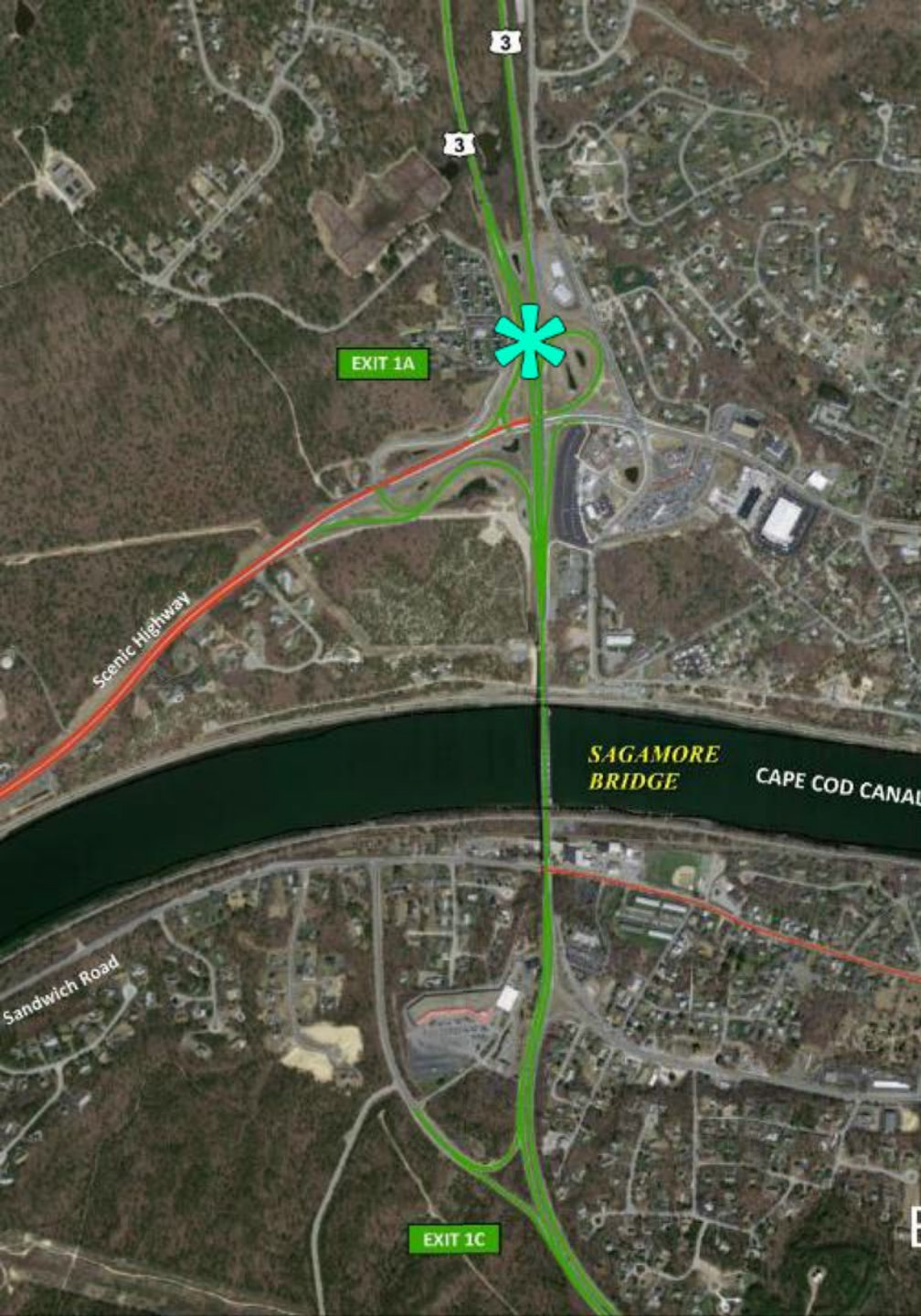


Scenic Highway Under Route 3.

HSIP High Crash Location

Total Crashes	12 crashes
Yearly Average	4 crashes
% During Summer	17%
% Off-Season	83%

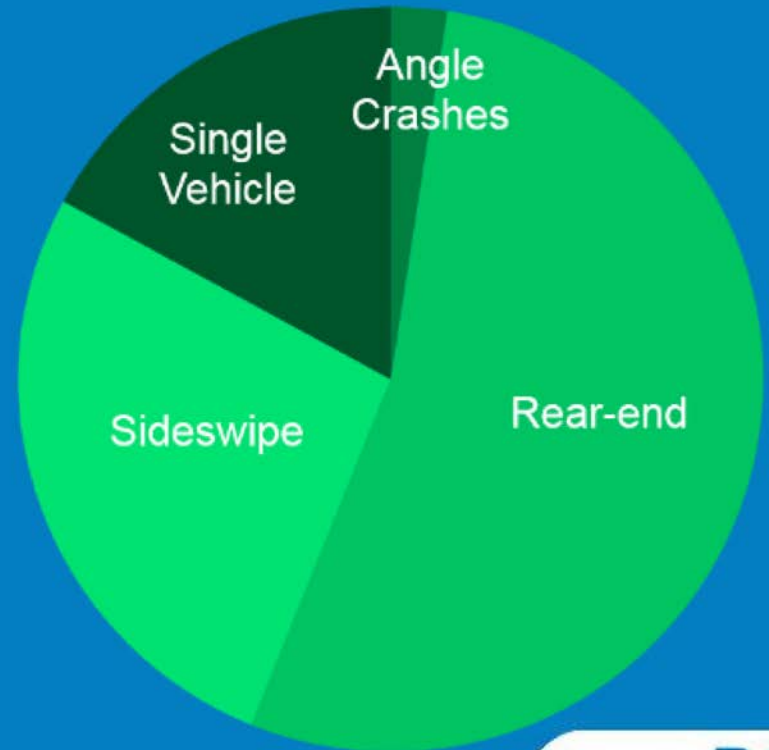




Off-Ramp Route 3 Northbound at Exit 1A to Scenic Highway Westbound

HSIP High Crash Location

Total Crashes	41 crashes
Yearly Average	13.7 crashes
% During Summer	24%
% Off-Season	76%

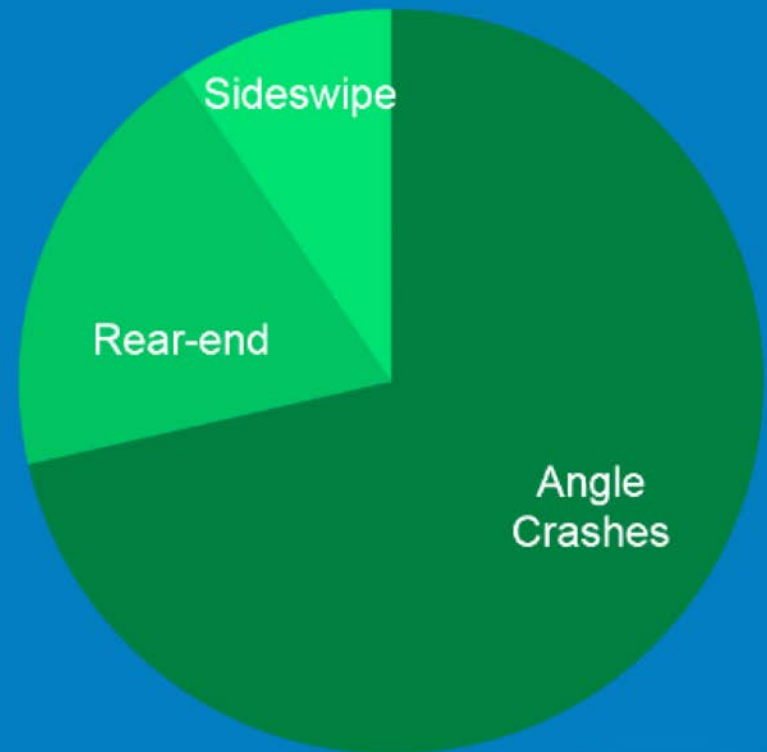


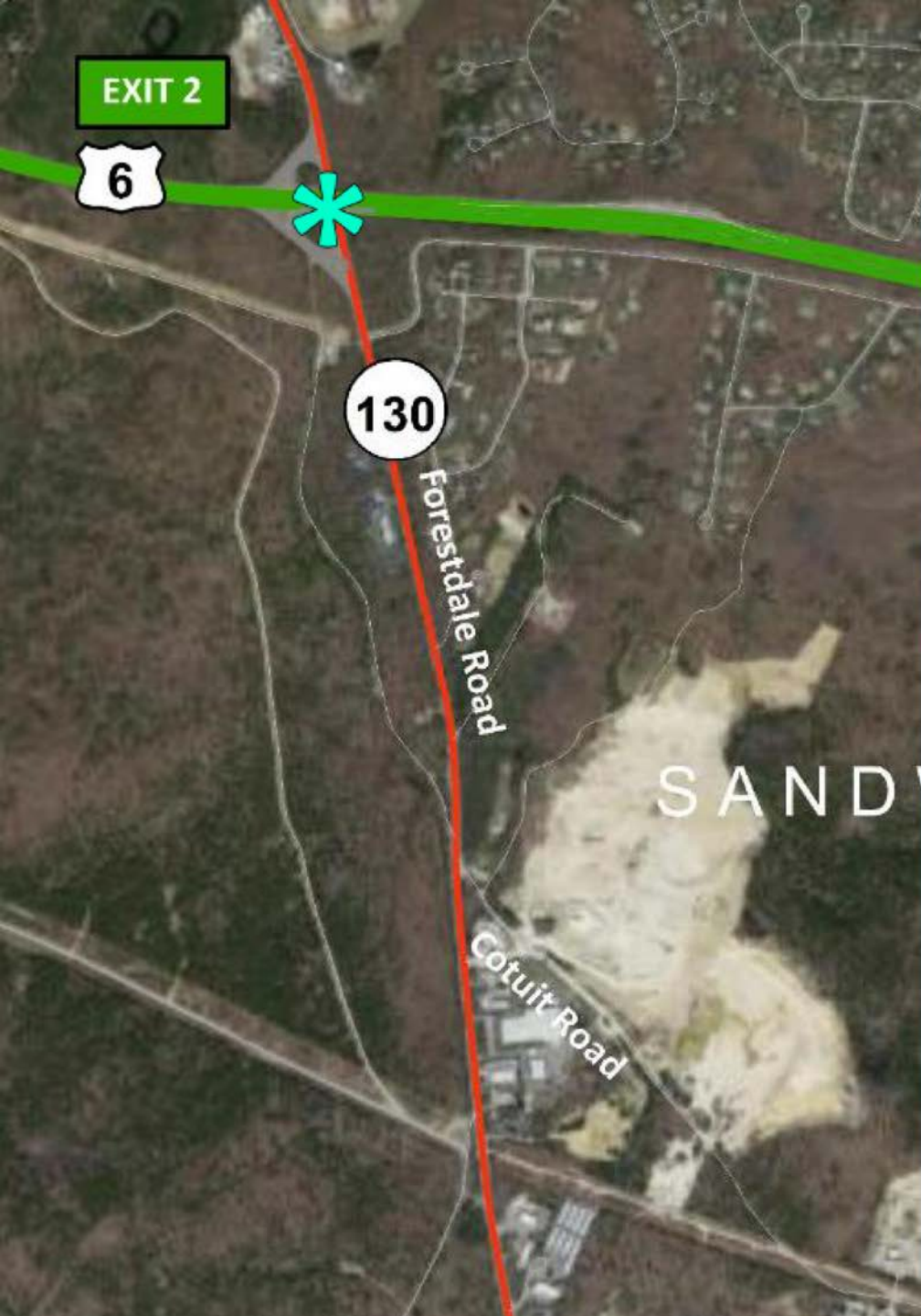


Adams Street and Sandwich Road

HSIP High Crash Location

Total Crashes	21 crashes
Yearly Average	7 crashes
% During Summer	48%
% Off-Season	52%

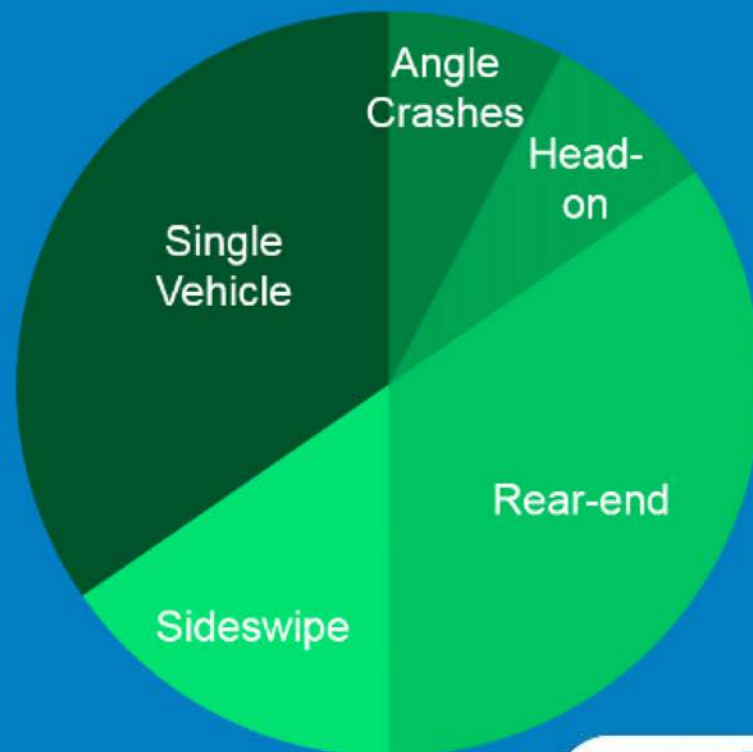


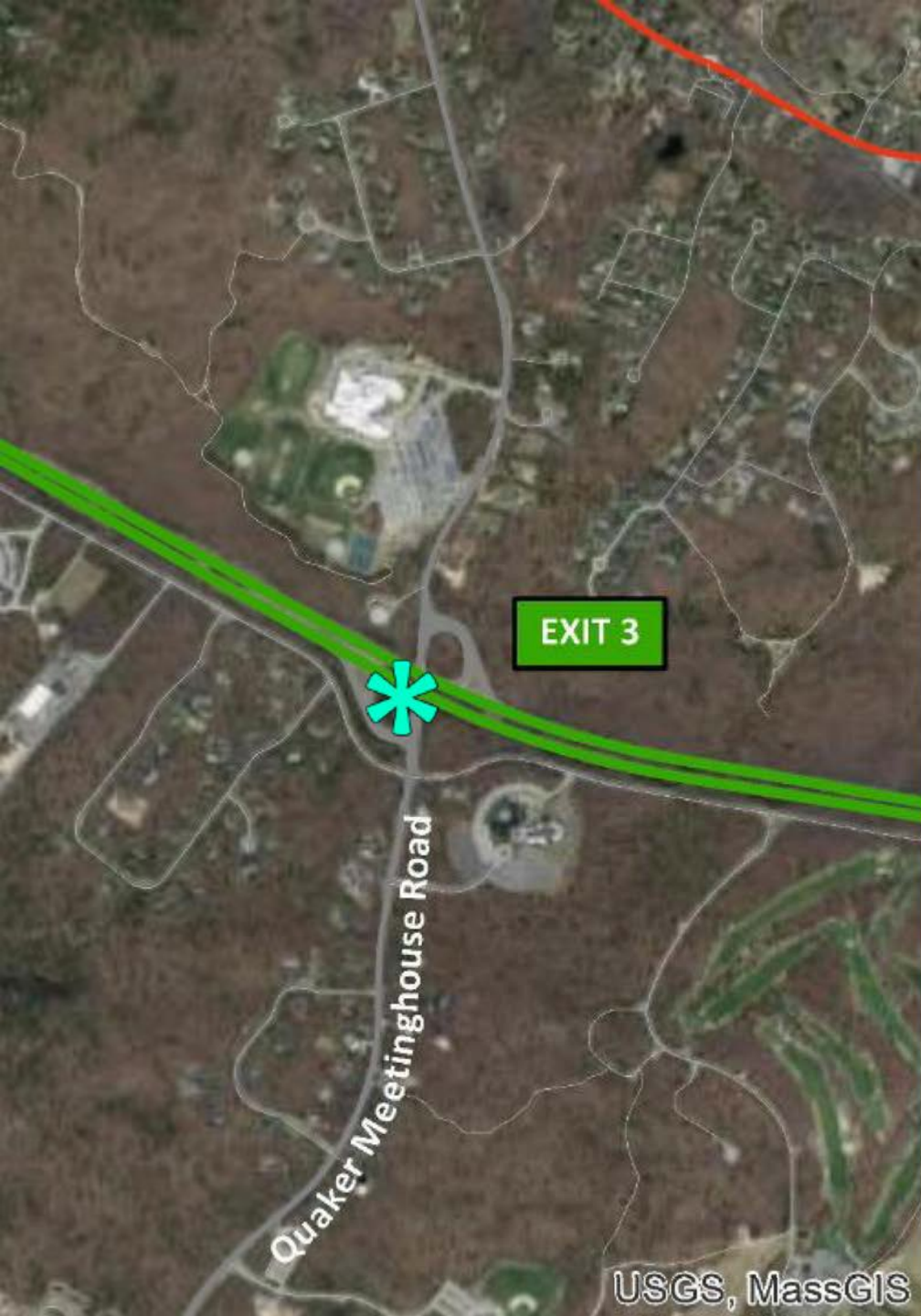


Off-ramp Route 6 Westbound & Eastbound at Exit 2 / Route 130

HSIP High Crash Location

Total Crashes	26 crashes
Yearly Average	8.7 crashes
% During Summer	23%
% Off-Season	77%

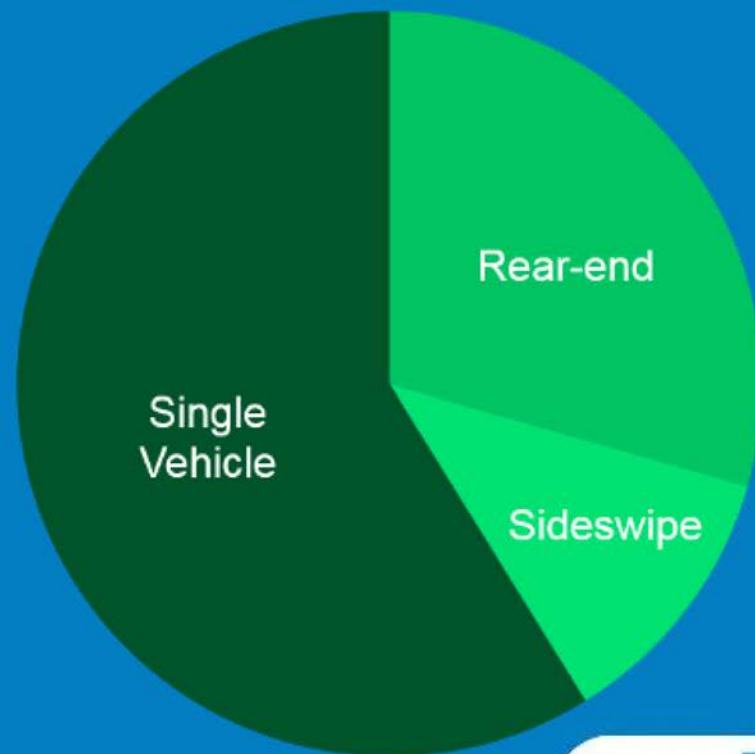




Off-ramp Route 6 EB at Exit 3 / Quaker Meeting House Rd

HSIP High Crash Location

Total Crashes	17 crashes
Yearly Average	5.7 crashes
% During Summer	29%
% Off-Season	71%

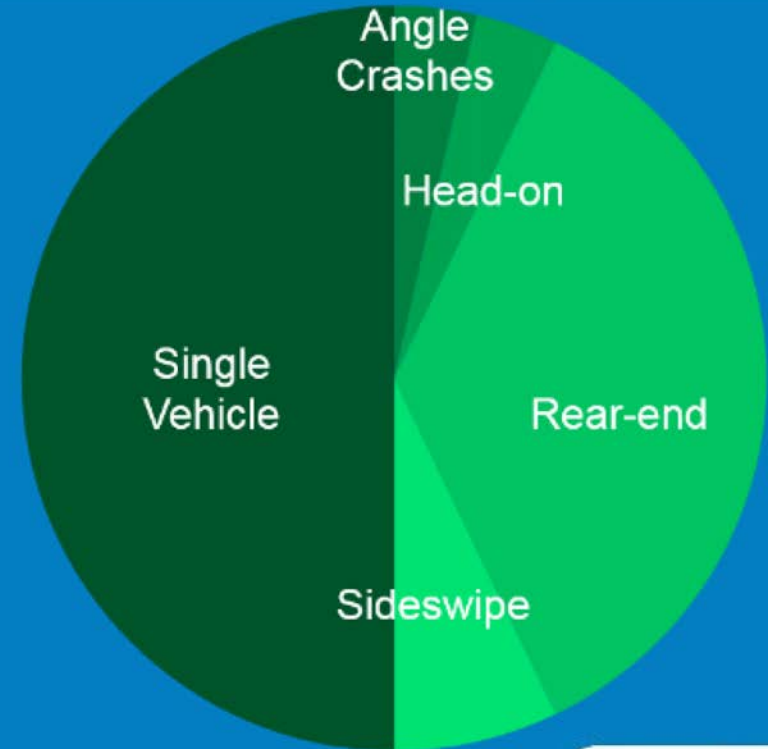


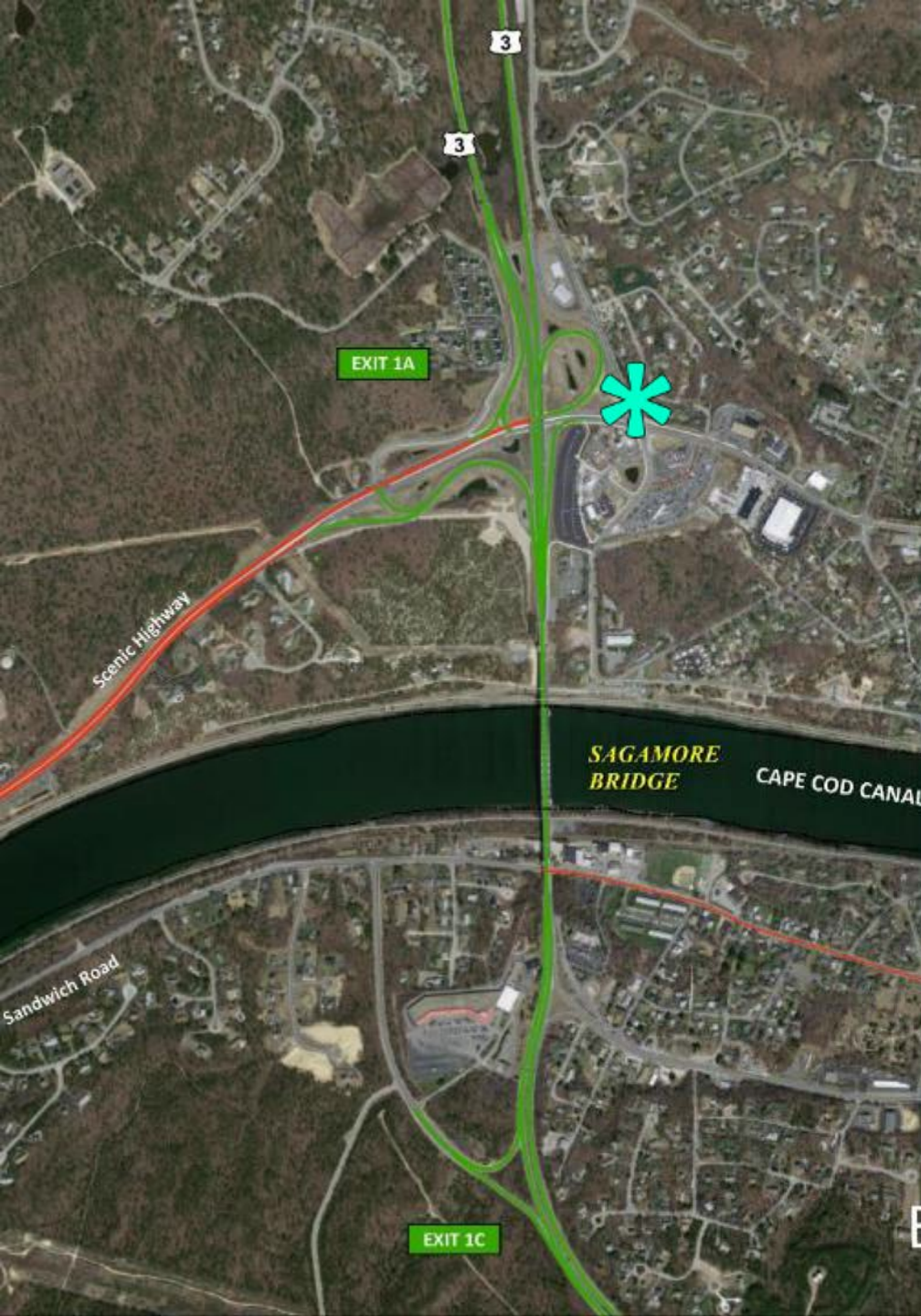


Route 3 Southbound at Exit 2 / Herring Pond Road

HSIP High Crash Location

Total Crashes	28 crashes
Yearly Average	9.3 crashes
% During Summer	32%
% Off-Season	68%

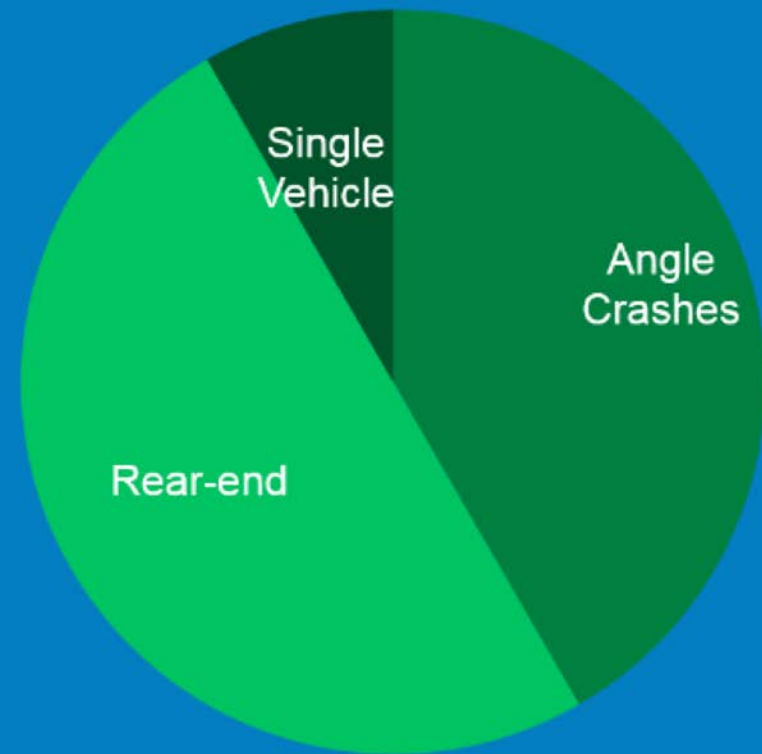




State Road and Scenic Highway

HSIP High Crash Location

Total Crashes	12 crashes
Yearly Average	4 crashes
% During Summer	8%
% Off-Season	92%



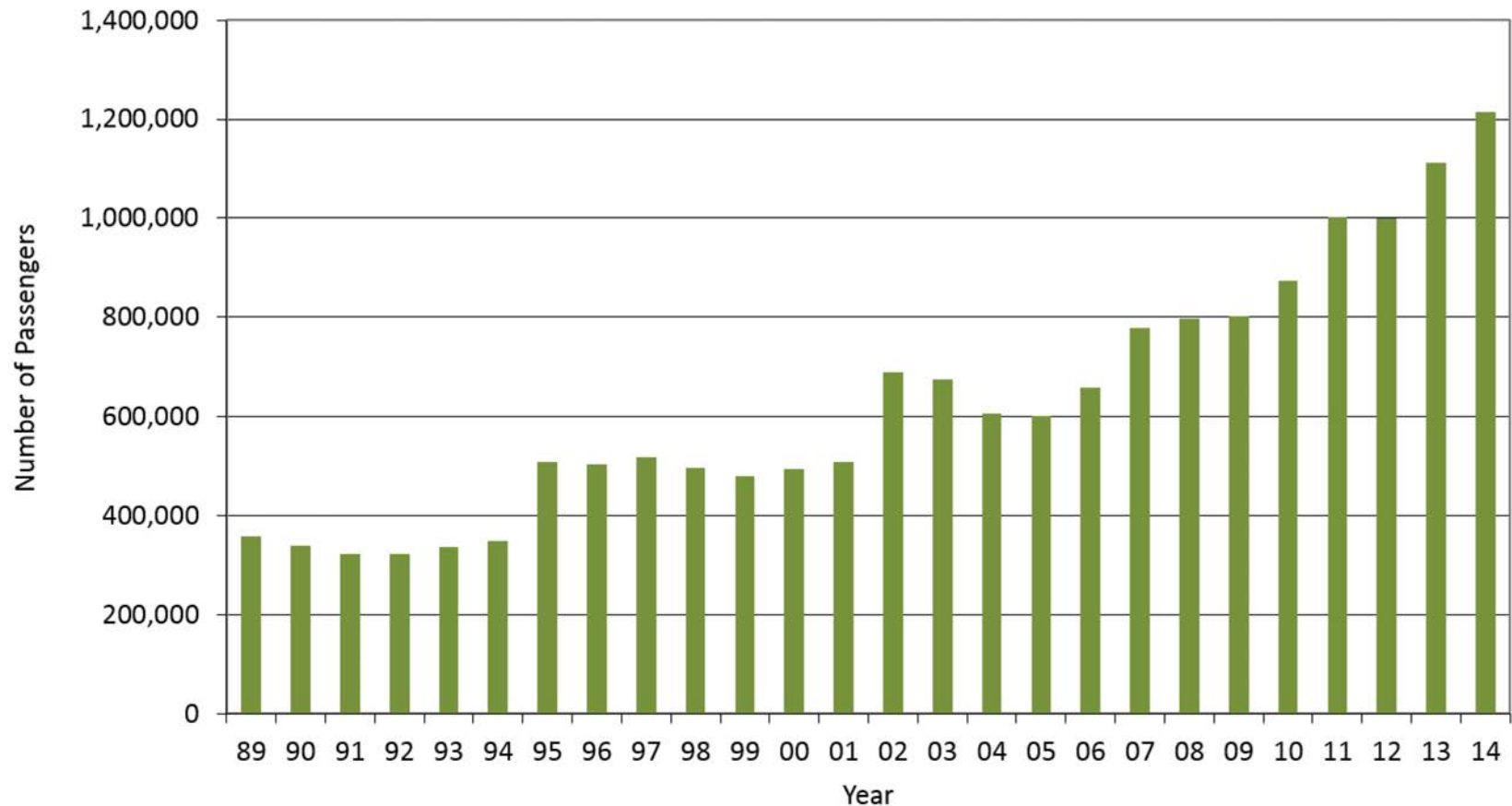
LOS E & F Summary Table HSIP

	Summer AM	Fall AM	Summer PM	Fall PM	Summer Weekend	Fall Weekend	HSIP
S I G N A L I Z E D							
Main St at Tupper Rd					E	E	
Scenic Hwy at Church Ln		F					
Meetinghouse Ln, State Rd, and Canal Rd	E	E	F		F	F	Y
U N S I G N A L I Z E D							
Sandwich Rd at Bourne Rotary Connector	F	F	F	F	F	F	
Sandwich Rd at High School Dr		F	F	F	F	F	
Sandwich rd at Harbor Lights Rd	F	E	F	F	F	F	
Sandwich Rd at Jarvis Dr				F			
Sandwich Rd at Adams St	F	F	F	F	F	F	Y
Rte 151 at Rte 28 NB off Ramp			F	E	E		Y
Rte 151 at Rte 28 SB Off-ramp	E		F		F		Y
Sandwich Rd, Cranberry Hwy, and Regency Dr	E		F	E	F	F	
Old Kings Hwy at Main St					E	E	
Rte 6A at Main St	F				F	F	
Maple Springs Rd at Rte 25 EB					F		Y
Rte 130 at Cotuit Rd	F		F	F	F	F	Y
Herring Pond Rd at State Rd		E	F	F			Y
Belmont Circle	F	F	F	F	F	F	Y
Bourne Rotary	F	F	F	F	F	F	Y

Cape-wide and study area transit service

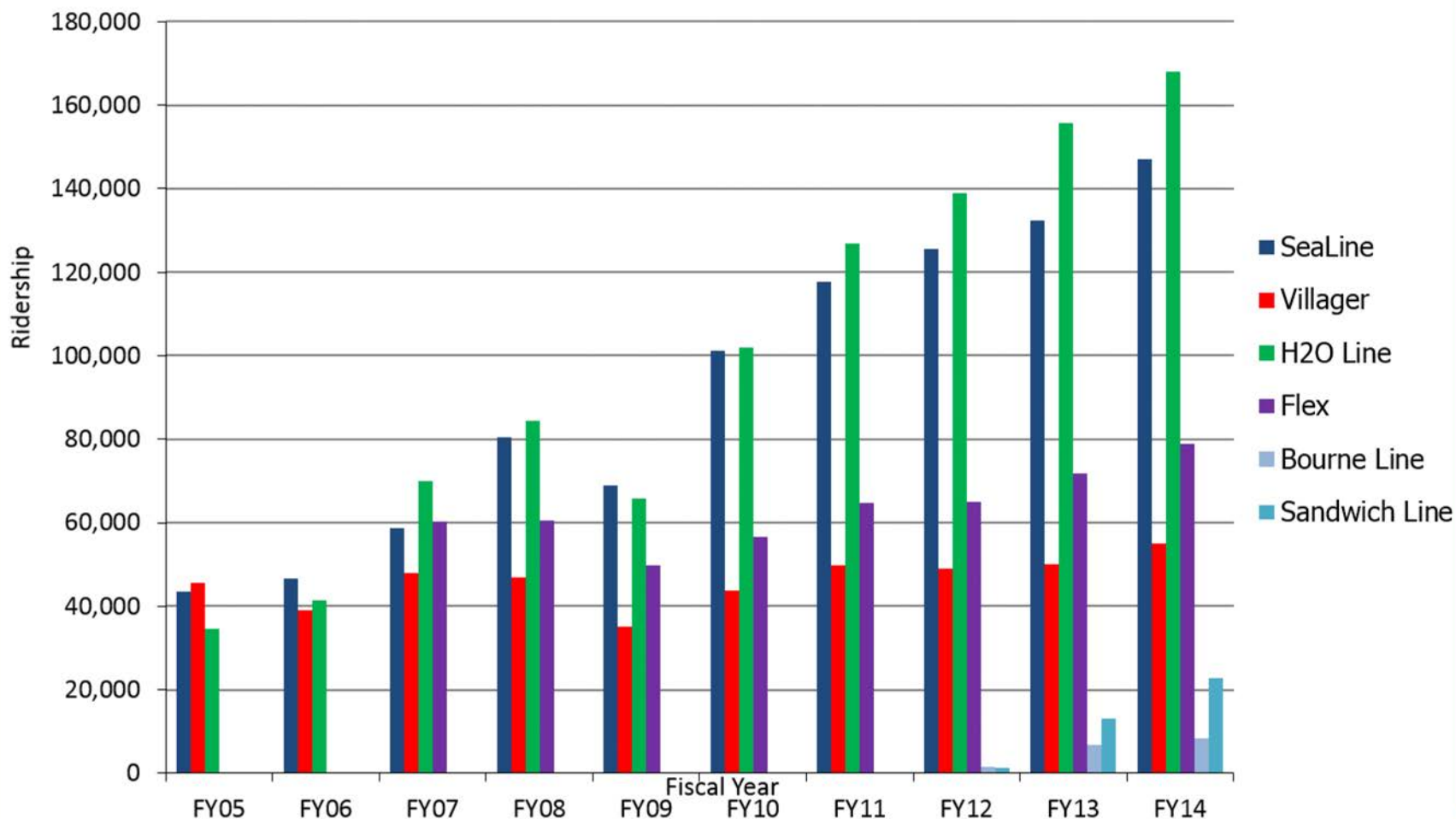
Total Annual CCRTA Ridership.

Total Annual CCRTA Ridership



Annual Fixed-Route Ridership.

Annual Fixed Route Ridership



The Bourne Run.

Bourne Run Map



Bourne Run Fares		
CCRTA Fares	Adults and Youth	People 60 and older People with disabilities**
One-way ride	\$2	\$1
PASSES		
Day Pass	\$6	\$3
31-Day Pass (Unlimited Rides)	\$60	\$30

- Exact fare only. Drivers will not make change.
- Children age five and younger, with an adult, ride free.
- ** Also, persons holding Medicare cards. Transit Access Passes for disabled persons available from the RTA 508-775-8504 Ext. 200.

CCRTA buses have bike racks. Space is limited.


Pets: service animals are welcome, but pets are not allowed unless in a secure carrier.

CCRTA buses are accessible to people who use wheelchairs and others with limited mobility.



— The Sandwich Line
— Sea Line

CCRTA Fares	Adults and Youth	People 60 and older People with disabilities*
One-way ride	\$2	\$1
PASSES		
Day Pass	\$6	\$3
31-Day Pass (Unlimited Rides)	\$60	\$30

-  CCRTA buses are accessible to people who use wheelchairs and others with limited mobility.

Bus and Train Alternatives to Reach Cape Cod

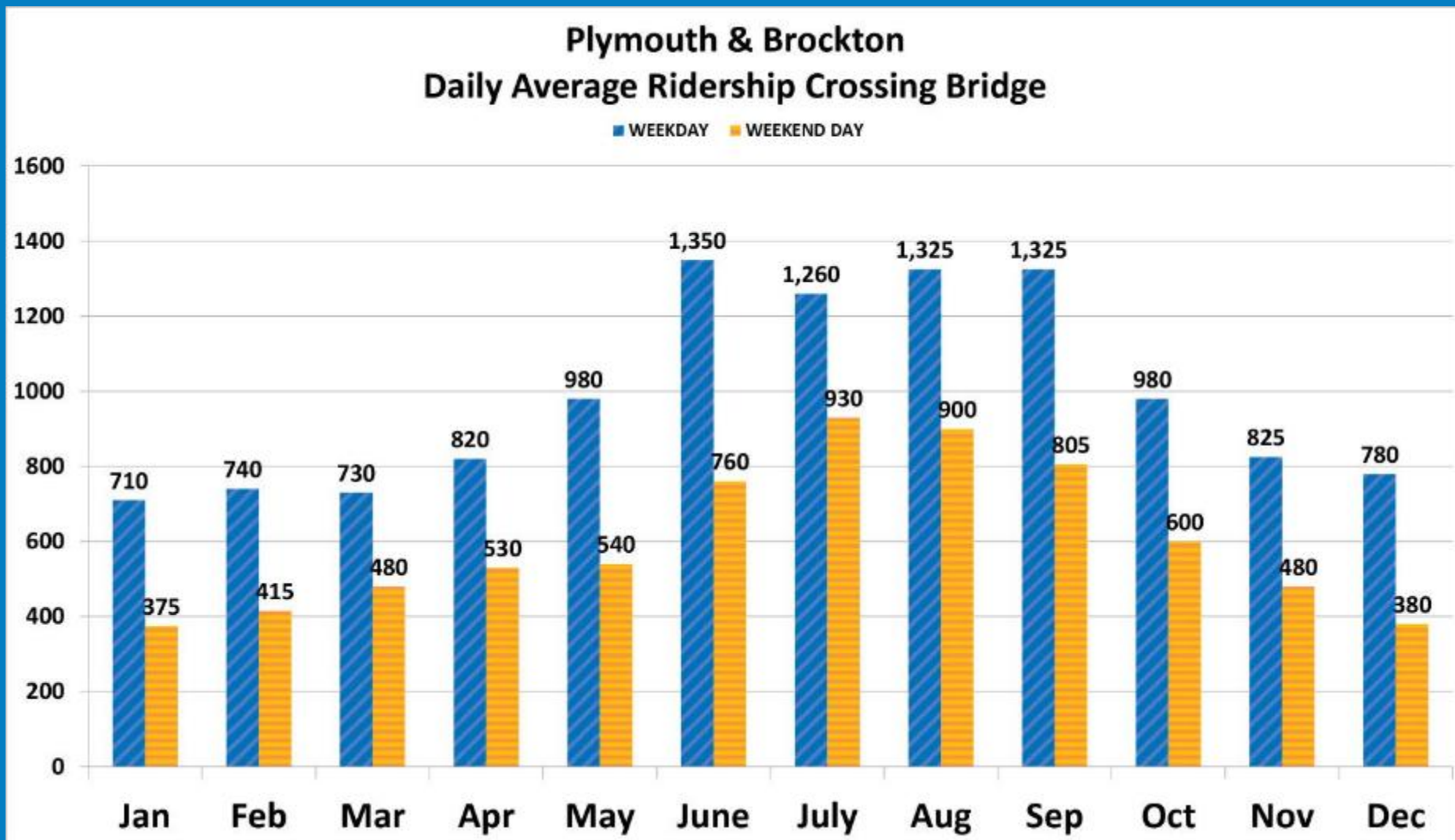
Service Providers.

- MBTA – Cape Cod Flyer,
- Plymouth and Brockton, and
- Peter Pan.

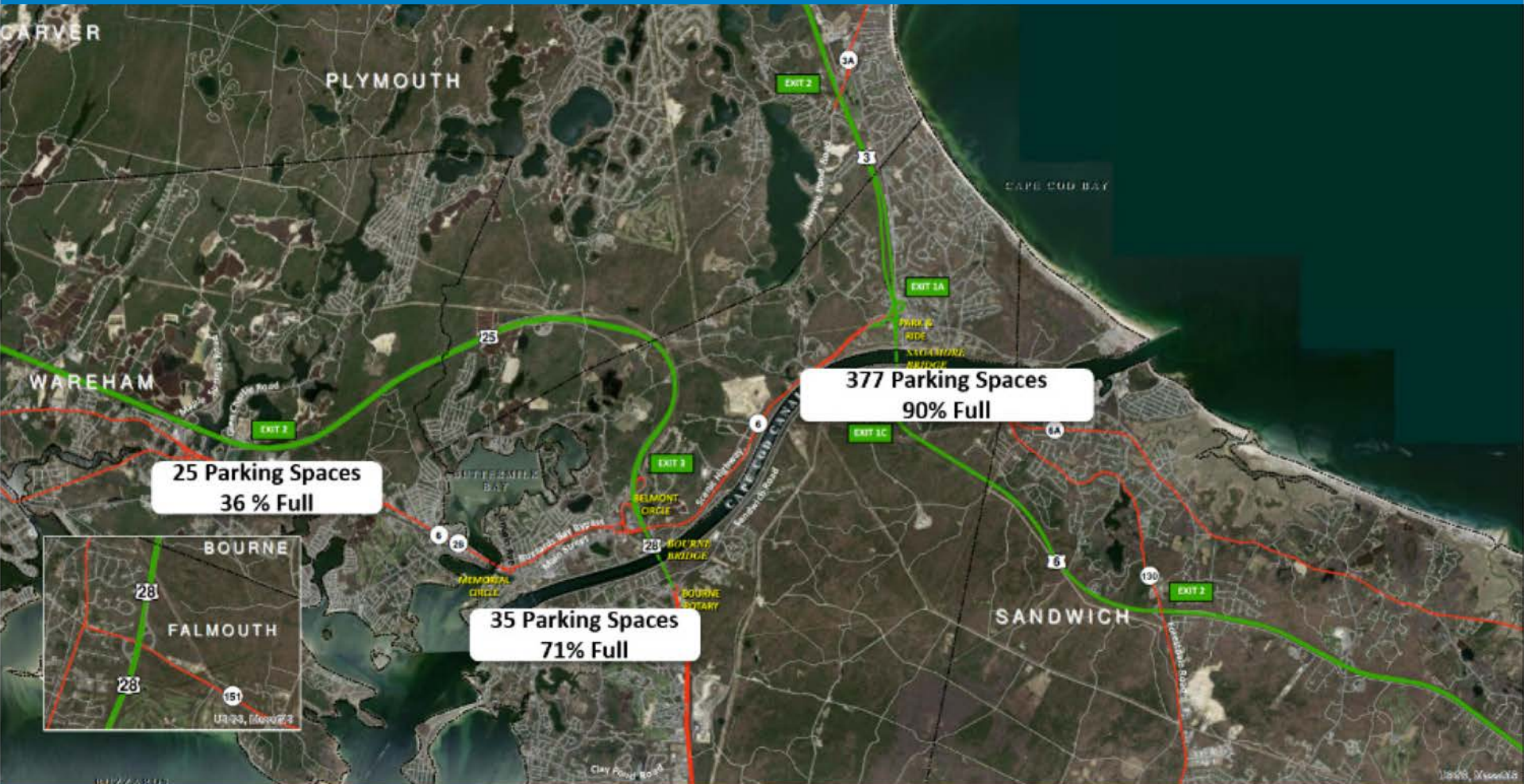
Cape Flyer

- Ridership: May – Columbus Day 2013 – 15,000.
- Ridership: May – September 2014 – 12,625.

Daily Average Ridership Crossing Bridge.

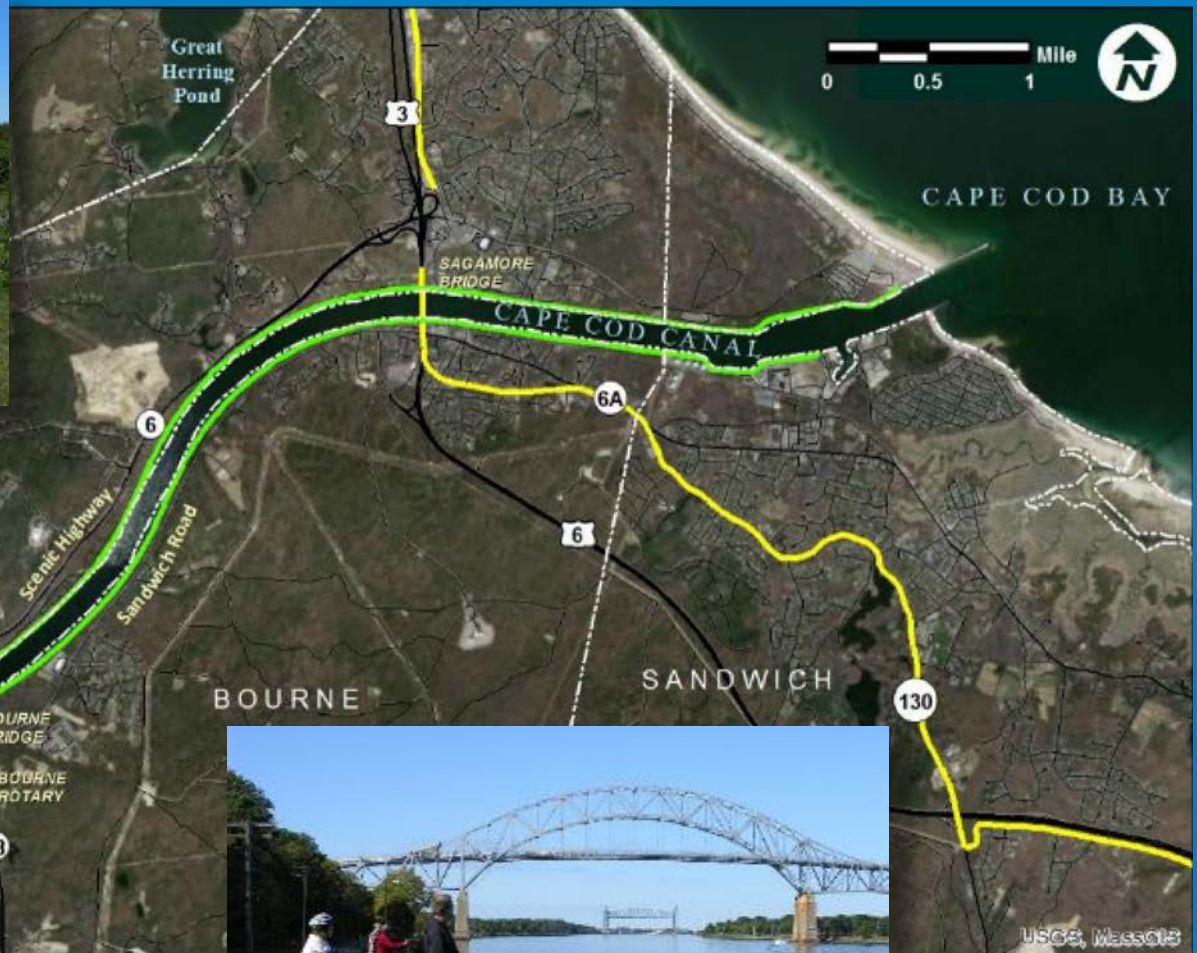


Park and Ride Lots.



Bicycles and Pedestrians

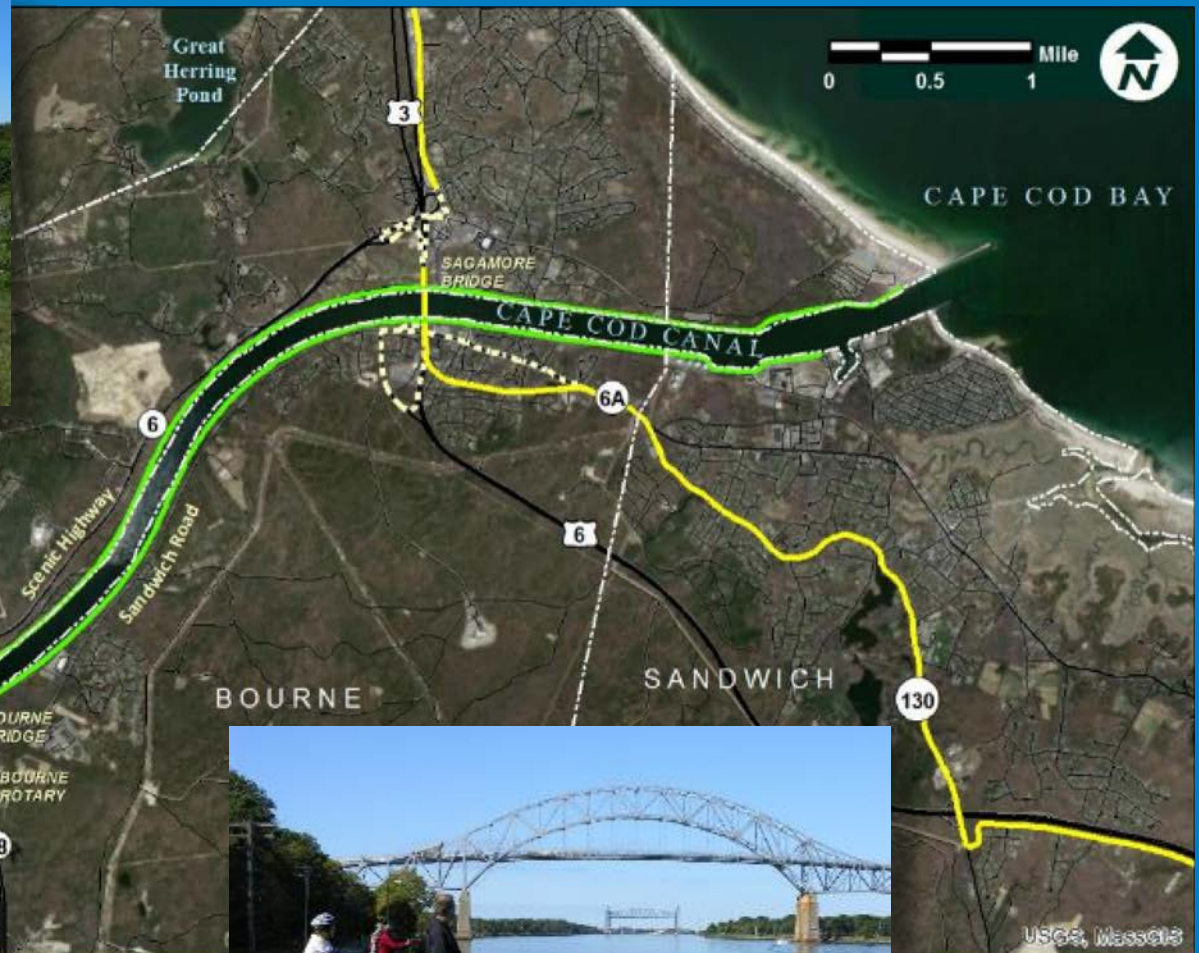
Bicycle Facilities.



Statewide Bicycle Facilities

- Existing Off Road
- Existing On Road

Bicycle Facilities.



- Statewide Bicycle Facilities**
- Existing Off Road
 - Existing On Road
 - - - Envisioned Off Road
 - - - Envisioned On Road



Pedestrian and Bicycle Volumes.

	S U M M E R						F A L L					
	AM		PM		Weekend		AM		PM		Weekend	
	Bikes	Peds	Bikes	Peds	Bikes	Peds	Bikes	Peds	Bikes	Peds	Bikes	Peds
Adams St & Sandwich Rd	0	0	4	1	1	2	0	0	0	0	0	0
Bourne Rotary	0	2	0	1	5	0	0	0	1	0	0	0
Nightingale Rd and Scenic Hwy	0	1	14	0	2	0	0	0	0	1	0	0
Tupper at Old Kings Hwy	4	5	5	7	7	4	0	0	0	0	6	0

An aerial photograph of a wide river flowing through a lush, green forested landscape. A bridge with multiple spans crosses the river in the middle ground. The river curves to the right in the foreground. The background shows a mix of dense trees and some open fields under a clear sky.

Questions?

Comments and feedback can be emailed to
Ethan Britland - ethan.britland@state.ma.us

Schedule and Next Steps

Study Schedule.

	2014			2015											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
TASK 1															
Study Area															
Goals/Objectives															
Evaluation Criteria															
Public Involvement Plan															
Working Group Meeting		◆													
Public Meeting				◆											
TASK 2 Existing Conditions, Future No-Build															
Existing Conditions/Data Collection															
Traffic data/analysis summer and fall															
Crashes															
Land Use/Economic															
Environmental															
Public Health															
Future Conditions/Model/Analysis															
Issues and Opportunities															
Constraints Identification															
Working Group Meeting							◆								
Public Meeting							◆								

Study Schedule.

	2014			2015											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
TASK 3 Alternatives Development															
Working Group Meeting									♦						
Public Meeting										♦					
TASK 4 Alternatives Analysis															
Mobility/Accessibility Analysis															
Safety Analysis															
Environmental Effects Analysis															
Land Use/Economic Development															
Community Effects/TitleVI/EJ															
Cost Analysis															
Working Group Meeting											♦				
Public Meeting												♦			
TASK 5 Recommendations															
Draft report															
Working Group Meeting												♦			
Public Meeting													♦		
TASK 6 Final Report															

Next Steps.

- Public Meeting April 16 at Mass Maritime (7:00 pm to 9:00 pm).
- Project and analyze 2035 No-Build Traffic Volumes.
- Complete economic analysis.
- Begin consideration of improvement alternatives.

An aerial photograph of a wide river flowing through a densely forested landscape. A bridge with multiple spans crosses the river in the middle ground. The river curves to the right in the foreground. The surrounding land is covered in green trees, with some cleared areas and buildings visible in the distance. The sky is a pale blue.

Questions?

Comments and feedback can be emailed to
Ethan Britland - ethan.britland@state.ma.us