



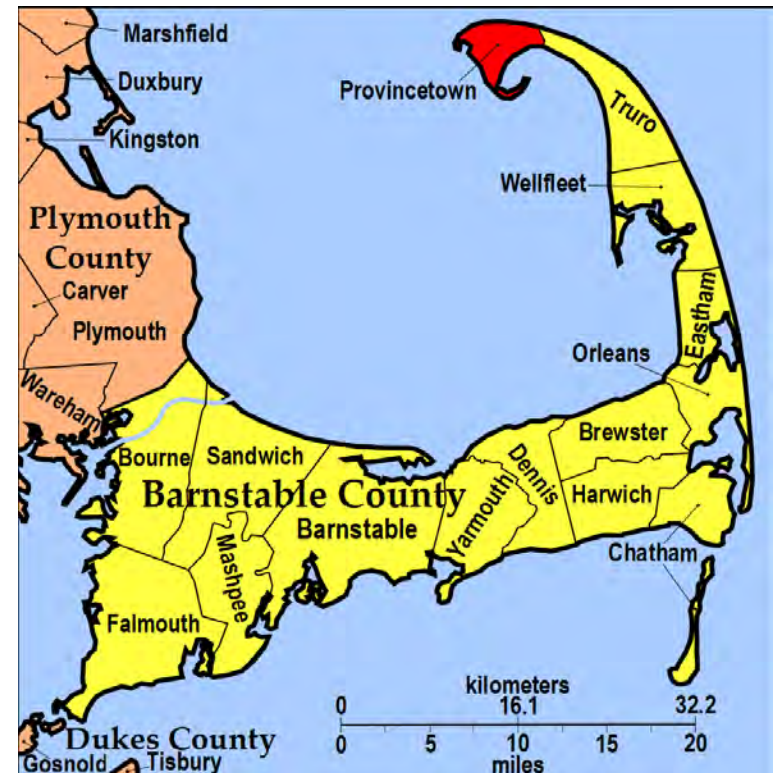
How Provincetown, MA used Porous Pavement to Reduce Beach Closures and Ended Up With an Unexpected Benefit

Marc Drainville | **GHD**

NEWEA 2020

Session overview

- 1 Background
- 2 Provincetown Harbor and 2003 stormwater assessment
- 3 Commercial Street projects
 - Phase 1 and Phase 2
- 4 Project successes
 - Water quantity
 - Water quality
 - Public acceptance



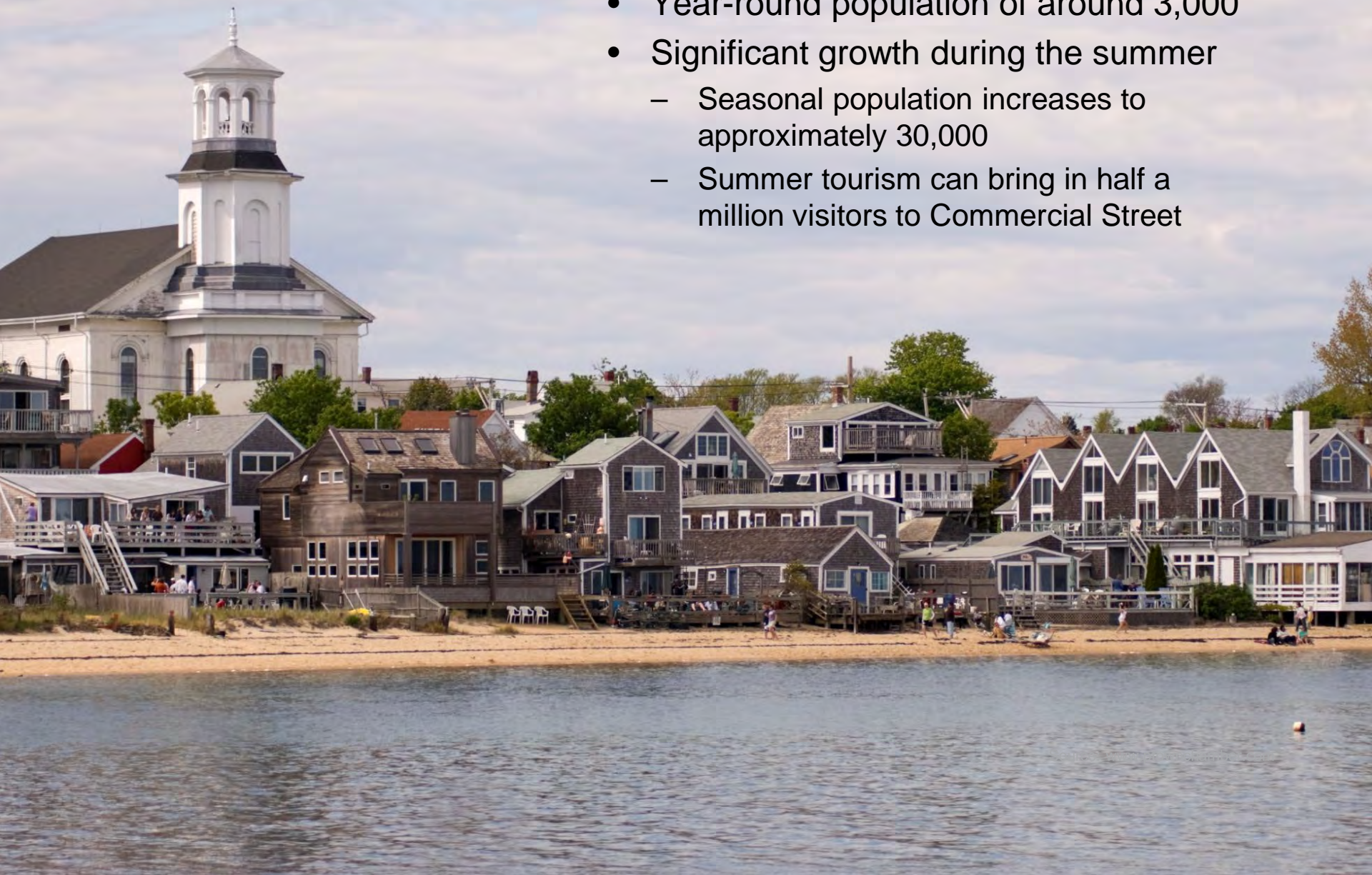
Source: www.provincetowntourismoffice.org

Background

Provincetown

- Provincetown is located on the outer tip of Cape Cod
- Commercial Street in Provincetown is the downtown “Main Street” of Provincetown
- Provides primary access to Provincetown Harbor





- Year-round population of around 3,000
- Significant growth during the summer
 - Seasonal population increases to approximately 30,000
 - Summer tourism can bring in half a million visitors to Commercial Street

Provincetown Harbor

- Listed on the Massachusetts 2012 Integrated List of Waters as a “Category 4a” water body – TMDL for pathogens
- Heavy recreational and commercial use
- Economic driver for the Town
- Beach closures affect economy and public perception
- Dense development and impervious areas contribute runoff to the Harbor



Provincetown Harbor and 2003 stormwater assessment



2003 stormwater assessment

- Stormwater Assessment funded by Massachusetts Office of Coastal Zone Management (CZM) in FY2003
- Assessment included
 - Sampling of 25 identified discharges (P-1 to P-25)
 - Mapping of contributory areas
 - Classification of surrounding land use, drainage area and runoff volumes
 - Prioritization of mitigation measures



P-1

P-2

P-3

P-4

P-5

P-6

P-7

P-8

P-9

P-10

P-13

P-13B

P-14

P-15

P-16

P-17

P-18

P-19

P-21

P-22

P-23

P-24

P-25



Commercial Street projects

Commercial Street projects

- Vacuum sewer installed in Commercial Street
- Other utility improvements
- Trench paving, pavement patches, rutting
- Roadway condition of Commercial Street was deteriorated
- Limited curb reveal
- Sidewalks needed improvements



Proposed Solution

Porous Pavement

- Project provides two benefits
 - Address stormwater issues **and**
 - Provide a means for road reconstruction along Commercial Street
- Costs and funding
 - >50% economic development grants
 - <50% local funding



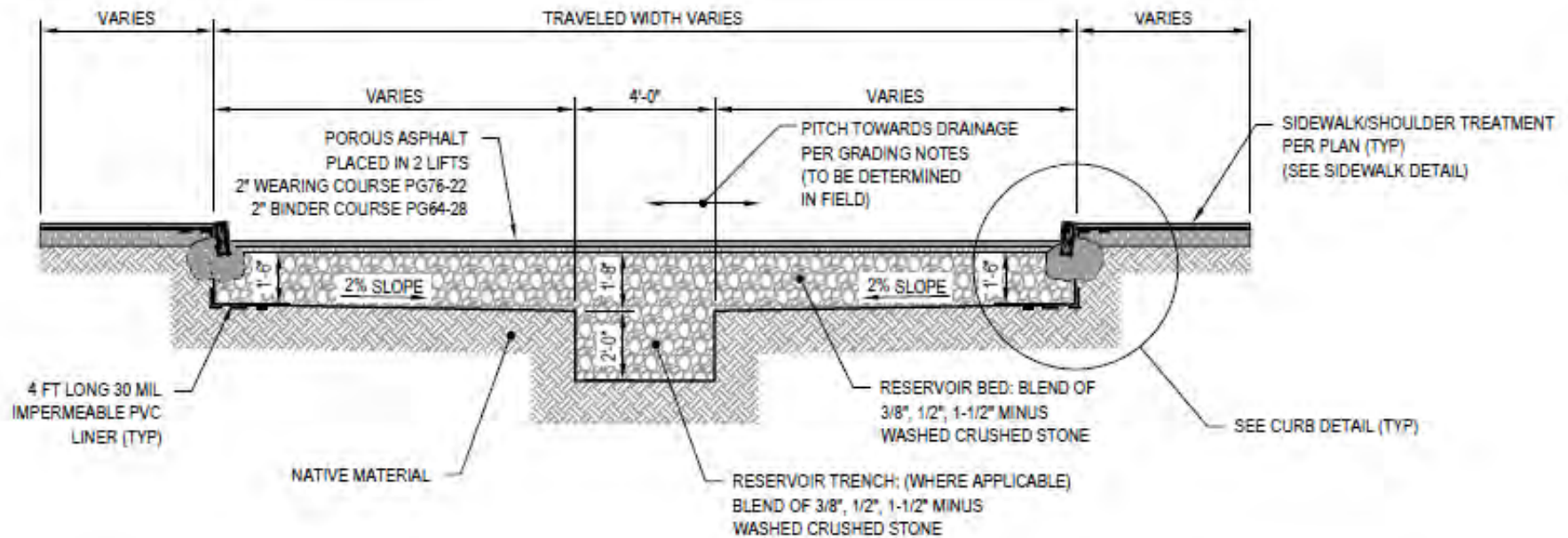
What is Porous Asphalt?

- *Regular asphalt with the smaller aggregate removed to allow for infiltration.*





Porous Pavement



Commercial Street projects



Source: www.ptownchamber.com

Commercial Street

- Commercial Street
 - Former footpath
 - Max 22 feet wide
 - Center of town activities



Commercial Street Phase 1

- Project includes
 - Stone bed and trench
 - Drainage replacement
 - 2 courses of porous pavement
 - New granite curbing, brick sidewalks and miscellaneous detail work

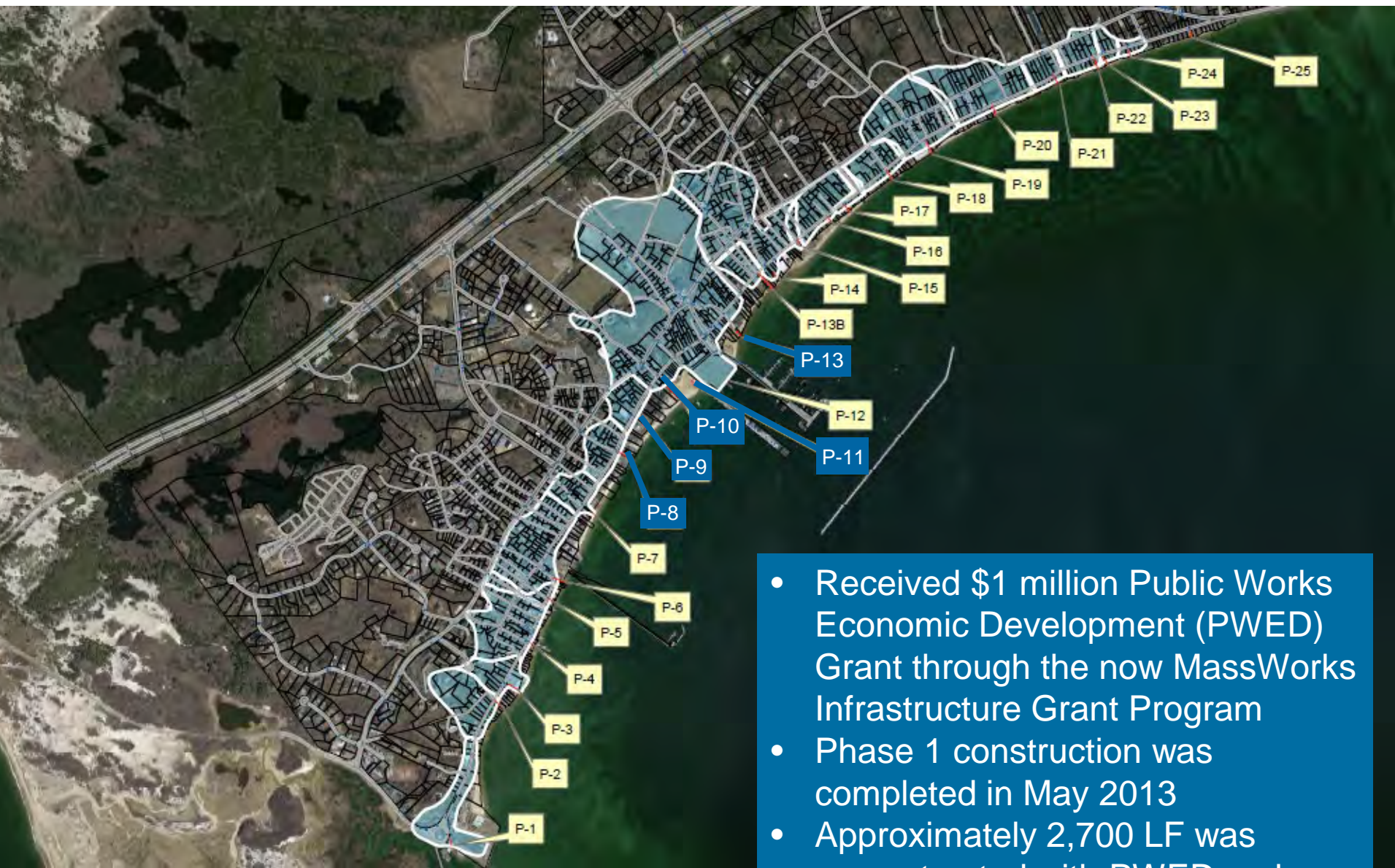




Commercial Street Phase 1

- 5 outfalls within project limits
 - P-8 Court Street
 - P-9 Post Office
 - P-10 Gosnold
 - P-11 Ryder Street
 - P-13 Lands End





- Received \$1 million Public Works Economic Development (PWED) Grant through the now MassWorks Infrastructure Grant Program
- Phase 1 construction was completed in May 2013
- Approximately 2,700 LF was reconstructed with PWED and Town funds

TOW ZONE
TROLLEY
PARKING
ONLY
6am to 9:30pm
TAXI STAND
ALL OTHER TIMES



ADAMS

21st Century
Choral Masterpieces
Beautiful new works by American composers
The Outer Cape Chorale
Presented by the Cape Cod and Provincetown Symphony Orchestra
Featuring works by Eric Whitacre, Morton Lauridsen, Ola Gjeilo,
Kentaaro Sato, Gwyneth Walker, Randall Stroupe and more
Accompanied by Jake Thomas, piano and eight string players from
the Cape Cod and Provincetown Symphony Orchestra
May 17 & 18 7:00 pm
Provincetown Town Hall
May 19 3:00 pm
Orleans Nauset Middle School
Free Admission
A Goodwill Collection will be taken



PACKARD GALLERY

ONE WAY

ARCH ST

Wynema

KING CRAB REALTY

Est. 1914

371-373

PEPE'S
WHARF
SEAFOOD
WATERFRONT DINING
Cocktail
COCKTAILS

UNDER GLASS
CUSTOM FRAMING

BOWERSOCK
GALLERY

MOTHER'S
LITTLE SHOP AROUND THE CORNER

Public Accessible

VAN ACCESSIBLE

Commercial Street Phase 2

- Commercial Street – Phase 2
 - Original project limits – Atlantic Avenue to West End Parking Lot (2,300 LF)
 - Expand back to pick up where Phase 1 left off (Winthrop St to Atlantic Avenue 420 LF)





Commercial Street Phase 2

- 5 active outfalls within project limits
 - P-7 Atlantic Avenue
 - P-6 Coast Guard Town Landing
 - P-5 Mechanic Street
 - P-4 West Vine Street (Captain Jack's)
 - P-3 West End Lot





- 50% Design was ARRA 604(b) Water Quality Management Planning funded
- Final design and construction funding assistance from s. 319 grant program (\$600K Grant + \$400K Town Match)
- Project completed May 2014



MONUMENT
SCHOOL



Commercial Street projects

Local challenges

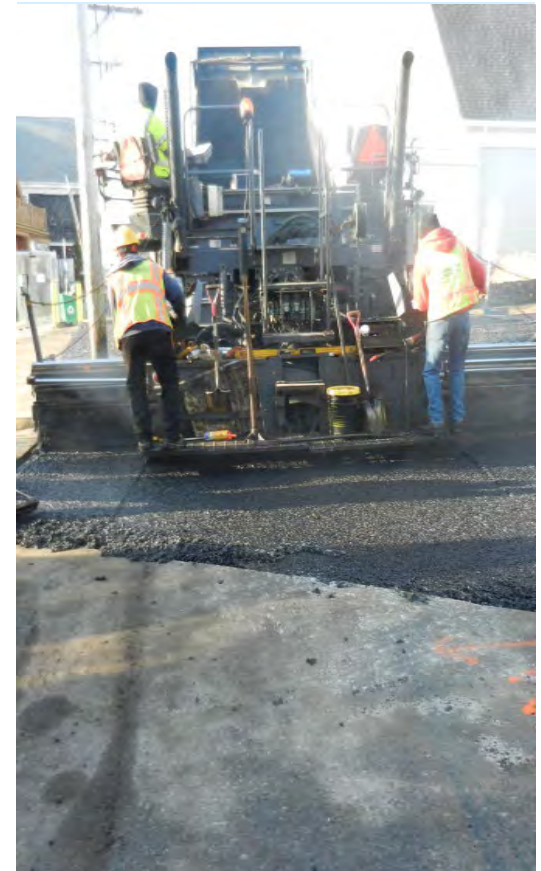
- Consensus Building
- Once porous pavement is placed, the surface is not drivable for 2-3 days
- Roadway closures and detours



Commercial Street projects

Technical challenges

- Road defined by existing structures and sidewalks
- Sidewalk replacement and site restoration
- Limited construction schedule
 - Work could not begin until October 15th
 - Work must be complete by May 15th
- Progress is weather dependent
- Small roadway layout – one-way traffic
- Location (tip of Cape Cod)
- Bid costs reflected the above issues



Project successes

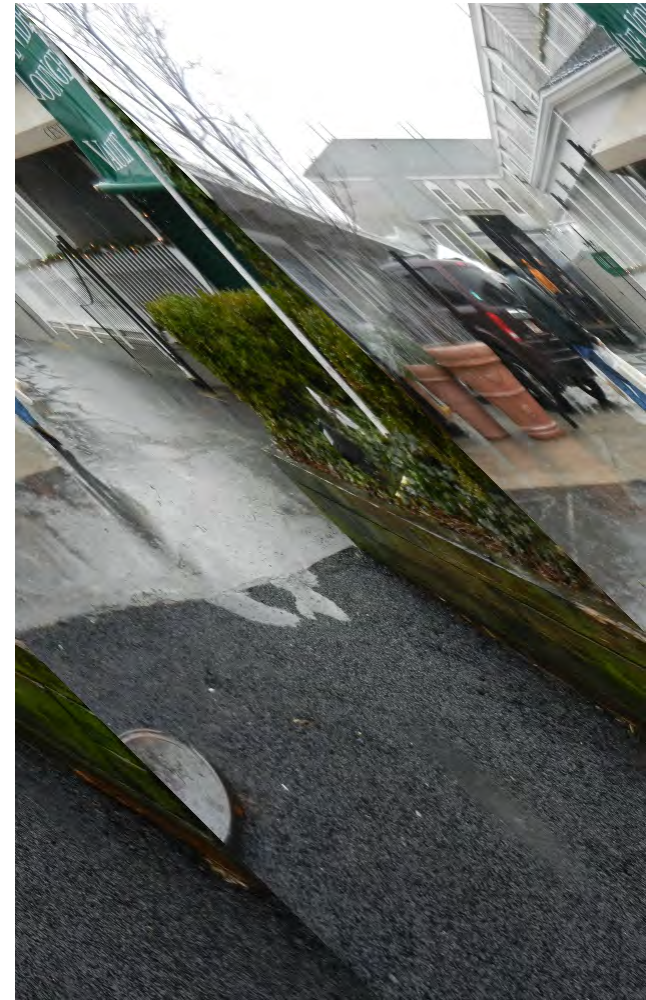
Performance Test



Performance test (sample)

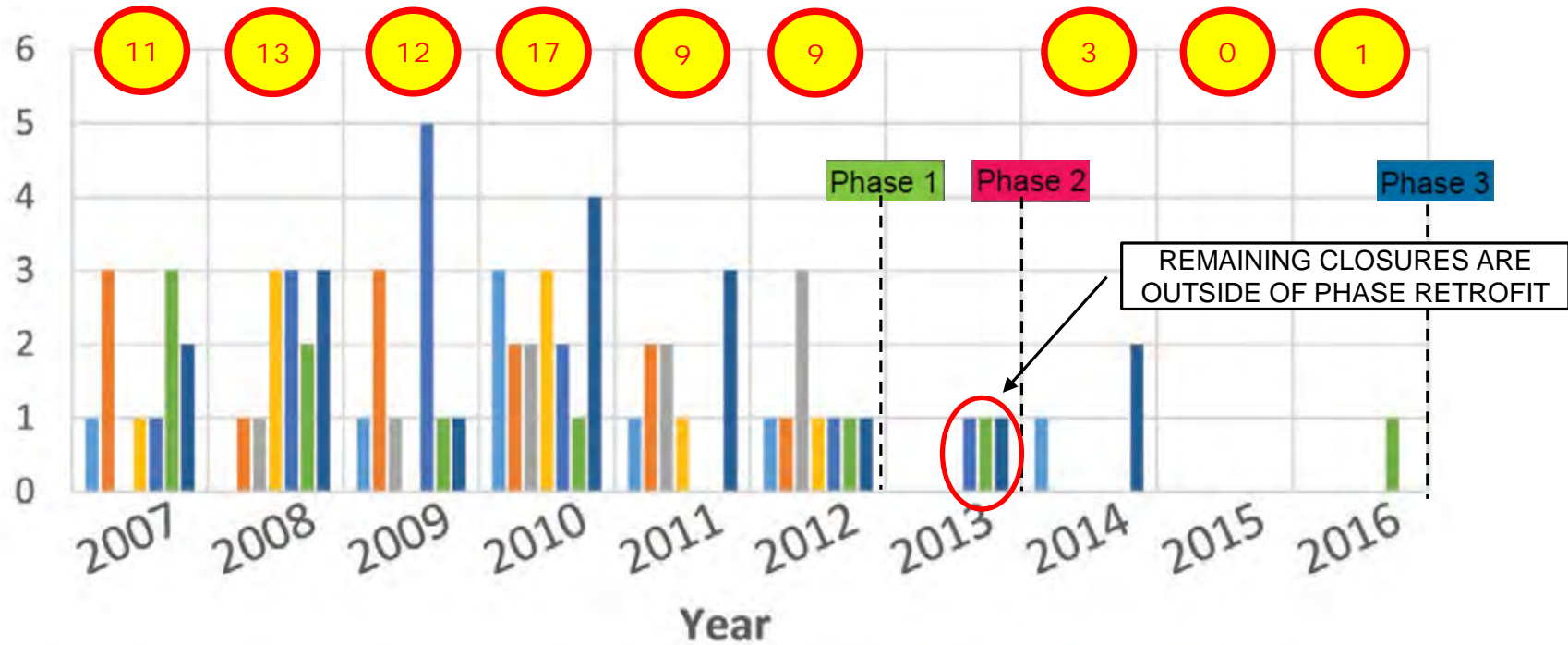


Water quality management



Successes – Harbor Beach Closures 2007-2016

Number of Beach Closures



REMAINING CLOSURES ARE OUTSIDE OF PHASE RETROFIT

Beach Sampling Points¹: JB CS RB CtS AA TL WE

¹ Beach sampling points: JB = Johnson Beach (Phase 1); CS = 333 Commercial St. (Phase 1); RB = Ryder Beach (Phase 1); CtS = Court St. (Phase 1); AA = Atlantic Ave. (Phase 2); TL = Town Landing West of Coast Guard Station (Phase 2), WE = West End Lot (Phase 2).



Successes – Harbor Beach Closures 2007-2016



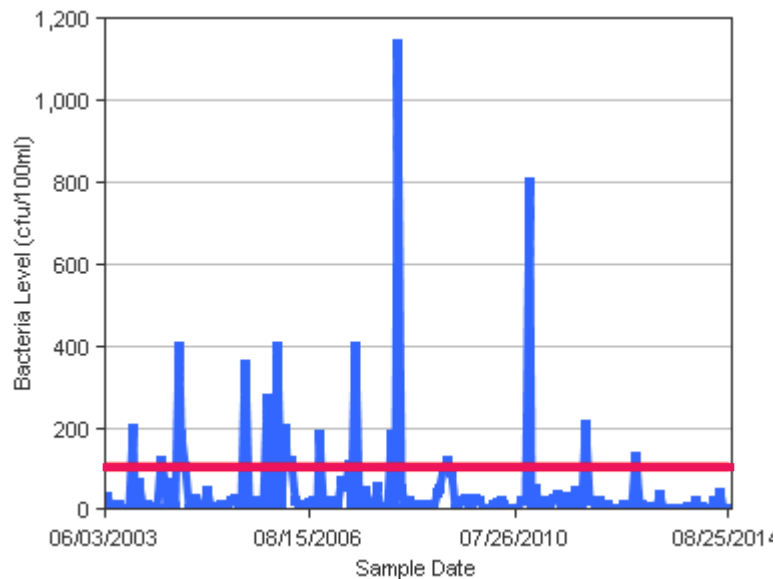
- Between 2007 – 2012, 7 sampling areas averaged ~ 12 closures per year
- Since 2013, 7 sampling areas averaged 1.3 closures per year
- Approximate reduction of closures by 88.9%



Water quality improvements

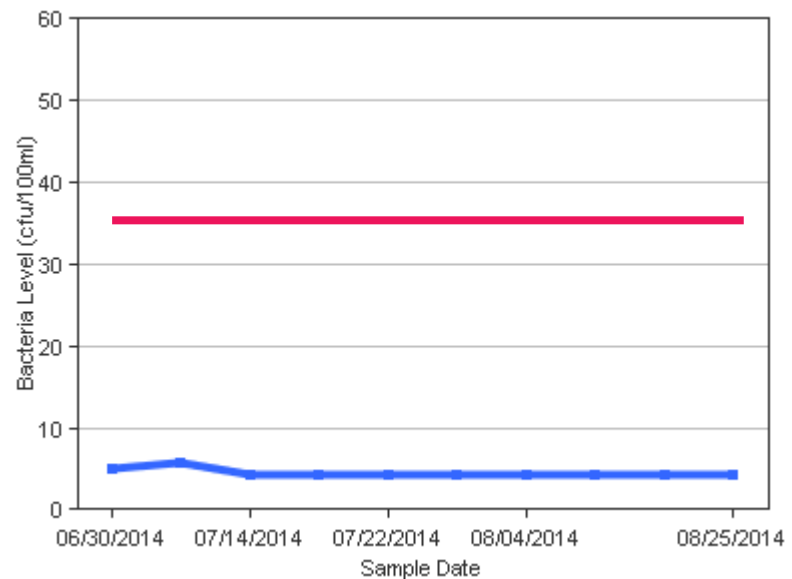
Town Landing West of Coast Guard (P-6) – State Tracking

Historical Sampling Results



Summers 2003 - 2014

Geometric Mean Trend



Summer 2014 (Post-Construction)

Public approval of projects

- Project planning
 - Town meetings
 - Public forums
 - Weekly drop-in hours
- During construction
 - Public meetings
 - Weekly e-blasts
 - On-site personnel accessibility
- Results
 - Town acceptance of next phases
 - Demonstrated appreciation of DPW's efforts





Maintenance

- Critical to success
- Patch damaged areas with regular asphalt as it will bind w porous asphalt
- Inspect high traffic areas for infiltration monthly (during rain events)
- Sand will clog the asphalt
 - Vacuum sweeping at least twice a year (Provincetown sweeps each night in summer and weekly in winter)



Costs

Commercial Street Reconstruction

Phase	Date	Grant \$	Town \$	Source
Phase I	2012-2013	\$1,090,000	\$460,000	MassWorks / 604(b) - DEP
Phase II	2013-2014	\$600,000	\$1,390,000	s.319 - DEP
Phase III	2016-2017	\$1,960,000	\$718,000	MassWorks
Phase IV EAST	2018	\$2,000,000	\$330,000	604(b) – DEP / NRCS
Phase IV West	TBD			
TOTAL		\$5,650,000	\$2,898,000	

Successes

- Overwhelmingly positive response from residents and business owners
- Merchants began to comment about the lack of puddles for tourists
- No longer need to leap away from passing vehicles to avoid being splashed
- Drastic improvements of handicap accessibility
- Overall aesthetic improvement to the project areas



Publicity



NONPOINT SOURCE SUCCESS STORY

Massachusetts

Porous Pavement Improves Provincetown Harbor Beaches

Waterbody Improved

Dense development and large amounts of impervious areas in the immediate vicinity of Provincetown Harbor have resulted in significant amounts of stormwater runoff reaching the harbor waters. The Massachusetts Department of Environmental Protection (MassDEP) placed Provincetown Harbor on its 1992 Clean Water Act (CWA) section 303(d) list of impaired waters for pathogens caused by polluted stormwater runoff. Beneficial uses impacted included shellfishing. To address this problem, a major construction project to install new porous pavement on Commercial Street began in 2012. As a result of these and other measures, Provincetown Harbor has already exhibited cleaner water, confirmed by significantly fewer beach closings. MassDEP expects Provincetown Harbor to meet all its designated uses by 2020.



Provincetown Stormwater Program Revitalizes Downtown and Improves Beach Water Quality using Porous Asphalt

Soak Up the Rain New England Webinar Series
January 24, 2018

FEATURE



Provincetown stormwater program revitalizes downtown and improves water quality

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RICHARD WALDO, P.E. Town of Provincetown Department of Public Works, Provincetown, MA
ROBERT ROSEN, Ph.D., P.E., GIWE, Hensley Wilton Group, Newburyport, MA

ABSTRACT Provincetown, Mass., has significantly reduced beach closures along Provincetown Harbor through a comprehensive multi-year stormwater management program. The most recent improvements addressed organic (bacterial) and non-organic loadings from untreated stormwater runoff from Commercial Street, which serves as the town's "Main Street" and provides primary access to the harbor and hundreds of businesses. The challenge of treating stormwater from this narrow and highly traveled corridor was solved by reconstructing the road using porous pavement laid over a stone reservoir bed. Two of the three phases of this project have been constructed (the third phase is in design). The project provides the dual benefit of improving harbor water quality and revitalizing the downtown through road reconstruction. Two summers have passed since completion of the first phase of the project, and the reduction in the number of beach closures is significant. Based on the water quality testing program there were no beach closures during the summer of 2013 and three beach closures in 2014 (all at the outer edges of the project improvements), reduced from nine closures in 2012 and seven in 2011. On average, more than 10 closures per season were experienced prior to 2011.

KEYWORDS Stormwater treatment, porous pavement, economics, project acceptance, Provincetown, Category 4a, pathogens, beach closures

INTRODUCTION
Development at the town of Provincetown, MA



about 2.5 miles is kilometers from the West End rising to its intersection with Broad Street near the Town Square. Commercial Street boasts a charming architectural and cultural environment combining residential, commercial, and government establishments. History, culture, dining, and recreational uses unique to Provincetown are all found on Commercial Street, which draws hundreds of thousands of tourists during summer. In fact, Provincetown's year-round population of approximately 5,000 increases to about 20,000 for the summer and to more than 30,000 tourists for Carnival Week in August. During the peak tourist season, vehicle traffic on Commercial Street is heavy and

is the best step toward eliminating beach closures along Provincetown Harbor.

BACKGROUND
The first step the town took was to address impacts from hundreds of antiquated septic systems and an aging sewer system. This effort led to the replacement of septic systems and construction of a new wastewater treatment plant completed in 2011. This, combined with public education about picking up pet waste, increased the safety for swimmers at harbor beaches. Concurrently, the town began planning to address impacts from stormwater

Commercial Street serves as the town's "Main Street" and provides primary access to the harbor and hundreds of businesses



EPA | 2019 Environmental Merit Award



Unexpected benefit

11/19/2018

A: Main

P'town flats full of oysters and bay scallops

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By Katy Ward

Banner Staff

PROVINCETOWN — For the first time in years, shellfishermen are harvesting oysters, bay scallops and quahogs from the West End flats.

“If you’re going to start recreational shellfishing in Provincetown, this is the year,” said Steve Wisbauer, the town’s shellfish constable. “It doesn’t get better than this.”

The West End breakwater area has always been rich in

“I can’t tell you what’s going to happen next,” he added. “They could keep coming up in this area all winter, or this could be it.”

The open area for scalloping is in front of the West End boat ramp and ends well before the private aquaculture grants. People can park at the town parking area by the boat ramp, then watch for the birds on the flats. They will be “looking bloated” from eating scallops, he said. Scallopers should walk towards the east.

Wisbauer urges people also to be mindful of the aquaculture grants, which are marked in yellow.

“You can walk through and look, but do not touch or take anything from a grant,” he said. “Not even a broken shell.”

Credit given to: “sewering and porous pavement [by] DPW ...”

Acknowledgements

Co-Authors

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Questions

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