



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.

Problem

Provincetown Harbor is on the tip of Cape Cod. The recreational (beach tourism) and commercial uses (fishery) of the 4.33-square-mile harbor play a significant role in the local economy.

Commercial Street, the heart of the downtown commercial area, runs closely parallel to the beaches of Provincetown Harbor. After summer storms, beaches in Provincetown Harbor would regularly experience beach closures due to high fecal coliform bacteria levels that exceeded bathing beach standards. The limited amount of drainage on Commercial Street provided for no infiltration and treatment, allowing stormwater to flow directly into the harbor. The primary pollutants of concern in runoff were bacteria and sediments. Provincetown Harbor is currently listed on the 2014 Integrated List of Waters as a Category 4a with a total maximum daily load for fecal coliform.

Project Highlights

Porous pavement is a paved surface with a higher than normal percentage of air voids to allow water to pass through it and reach the subsoil. This porous surface replaces traditional pavement, allowing parking lot, driveway and roadway runoff to infiltrate directly into the soil. Depending on the design, paving material, soil type and rainfall, porous paving can infiltrate as much as 70 to 80 percent of annual rainfall. Porous pavement installation was a preferred alternative to other drainage options due to space limitations along portions of Commercial Street and the amount of utilities present. The Provincetown Harbor/Commercial Street Reconstruction project included drainage improvements and sidewalk reconstruction, in addition to the



Figure 1. Porous pavement installation on Commercial Street, during (top) and after (bottom) construction.

of porous asphalt (Figure 1). Each phase also incorporated the use of porous asphalt on the aprons of the intersecting streets to capture runoff before it reached Commercial Street.

Construction was completed in three phases (Figure 2). Phase 1 included excavation and paving from Winthrop to Johnson streets (2,700 linear feet) and was completed in 2013. Phase 2, from Winthrop Street to the West



Figure 2. The Commercial Street reconstruction project was implemented in three phases.

End Parking Lot (2,950 linear feet), was completed in 2015. Phase 3 will include 2,300 linear feet from Johnson to Howland streets and is expected to be completed by June 2017. This project has improved the water quality of the six ocean outfalls that currently discharge from this area into Provincetown Harbor.

A key approach that served the project well was the public notification component of the project. Road reconstruction in a downtown commercial area like Commercial Street can be disruptive and raises questions from the public regarding road closures, parking, deliveries, etc. The road layout is one-way, narrow, with many properties abutting the construction zones. As part of the education and outreach task of this project, a public forum was held with the engineer, contractor and members of the town present to discuss the planned project. A flyer was also developed and distributed at the forum and posted on the town's website. A page dedicated to the project was also developed through the town's website. Continued communication was important.

Results

Reducing the amount of stormwater runoff from Commercial Street to Provincetown Harbor has greatly improved its water quality. Figure 3 shows the number of closures for each beach in the project area starting in 2007. Beach sampling is conducted by the Barnstable County Department of Health and Environment and the town of Provincetown's Health and Environmental Affairs Department during the summer months. The data indicate that the porous pavement installation (2013–present) has contributed to a noticeable reduction in the number of beach closures.

Partners and Funding

The Massachusetts Office of Coastal Zone Management provided initial support by funding the 2003 stormwater assessment through the Coastal Pollution Remediation Program. Other efforts include the replacement of septic systems and construction of a new wastewater treatment plant in 2003.

The total cost for Phase 1 of the Provincetown Harbor/ Commercial Street Reconstruction project was \$1.46 million. \$1 million was provided by the MassWorks Infrastructure Grant Program under a Public Works Economic Development Grant, and the town contributed \$460,000.

Phase 2 costs totaled \$1.92M. The preliminary design of Phase 2 was developed with funding assistance from a U.S. Environmental Protection Agency (EPA) American Recovery and Reinvestment Act 604(b) Water Quality Management Planning Grant in 2009 (\$90,240). An EPA CWA section 319 Nonpoint Source Pollution Competitive Grant Program provided funding assistance in the amount of \$600,000 for implementation work in 2013. The town of Provincetown contributed \$400,000.

Phase 3 of the project is expected to start construction after Labor Day 2016 with a completion date of June 1, 2017. It includes \$1,960,000 from MassWorks and \$600,000 from the town. Provincetown hopes to continue with a Phase 4 which could be completed before June 1, 2019.

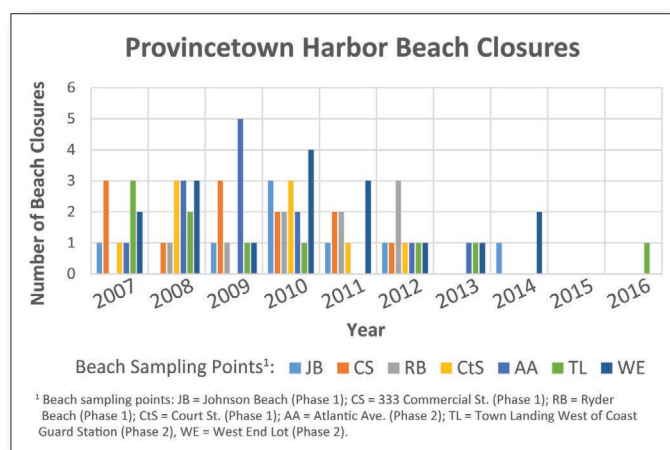


Figure 3. Provincetown Harbor beach closures have declined.



U.S. Environmental Protection Agency
Office of Water
Washington, DC

EPA 841-F-16-001NN
December 2016

For additional information contact:

Malcolm Harper
Massachusetts Department of Environmental Protection
508-767-2795 • Malcolm.harper@state.ma.us