EPA Southeast New England Program Watershed Grant **Stormwater Management at Cape Cod Public Boat Ramps** 2021-2023 **Association to Preserve Cape Cod** FINAL REPORT Executive Summary



Waquoit Bay Landing (or Seapit Landing) in July 2022. Photo credit: APCC.

The Cape Cod Public Boat Ramp Stormwater Project was supported by Southeast New England Program (SNEP) Watershed Grants. SNEP Watershed Grants are funded by the U.S. Environmental Protection Agency (EPA) through a collaboration with Restore America's Estuaries (RAE). For more on SNEP Watershed Grants, see www.snepgrants.org

Executive Summary

Project Background & Goals

Freshwater ponds and coastal embayments across Cape Cod are significantly degraded by nutrient and bacteria impairment. Land uses, including stormwater runoff and fertilizer use, contribute 20 percent (on average based on the Cape Cod Commission 208 Plan) of the controllable nitrogen load that leads to algal blooms and lethal hypoxic (low oxygen) conditions within our coastal watersheds. Additionally, bacterial contamination in stormwater discharge regularly causes closures of shellfish areas and beaches across Cape. This EPA SNEP-funded project aimed address this issue through green stormwater to infrastructure (GSI) control measures at public boat ramps. Boat ramps are often locations of direct discharge with little to no treatment of stormwater, but by implementing GSI Photo credit: APCC. systems in these areas, the natural processes of soil



Figure 1: Ockway Bay Boat Ramp in Mashpee. The Town's shellfish propagation operation is located under the dock at the end of the boat ramp. Photo credit: APCC.

infiltration and plant nutrient uptake can treat and control the runoff at these sites before it enters the waterbody.

The short-term objectives of this project were to 1) complete a regional assessment and prioritization of public boat ramps on Cape Cod based on stormwater improvement needs, 2) develop conceptual designs for twenty high priority boat ramps, and 3) advance designs to permit-ready level at up to five priority boat ramp sites. The long-term objectives involve permitting, final design, and implementation of the stormwater retrofits which reached permit-ready designs as well as securing funds to finish design, permitting, and construction for the other boat ramp sites.

Project Results

The Association to Preserve Cape Cod (APCC) collaborated with ten towns on Cape Cod and the MA Department of Fish and Game Office of Fishing and Boating Access (OFBA) to develop a list of twenty priority boat ramp sites where improved stormwater management would mitigate impacts from nutrient and bacteria impairment. Sites were selected based on one or a combination of the following factors: known impairments to the adjacent waterbody, poor condition of the parking area or ramp that necessitated maintenance in the near-term, and/or lack of sufficient stormwater control either through observed failure of current infrastructure or lack thereof. Boat ramp sites from Barnstable, Bourne, Brewster, Dennis, Falmouth, Harwich, Mashpee, Orleans, Sandwich, and Yarmouth, and OFBA were used to develop the list of twenty priority sites.



Figure 2: Horsley Witten meets project team members at Oak Crest Cove Boat Ramp for initial site investigation. Photo credit: APCC.

APCC contracted Horsley Witten Group in March 2022 to complete onsite inspections and concept designs for the stormwater retrofits at all twenty boat ramp sites. See Figure 3 for a map of all twenty sites. The field investigations were completed in July 2022 and the concept designs were completed in October 2022.

The concept designs were ranked based on a previously agreed-upon set of criteria, were reviewed by the project team, and were reexamined with the local community, including representatives of non-profit and

tribal stakeholder groups, through two public meetings in November 2022.

Based on the rankings and the feedback received through the review process, APCC selected an initial set of four public boat ramps sites for Horsley Witten to continue stormwater designs to permit-ready (75%) level. APCC and Horsley Witten continued to meet with respective project teams for each site throughout 2023 to achieve the permit-ready designs. Permit-ready designs were successfully completed for all four SNEP-funded sites in November 2023. Furthermore, with additional grant funds awarded through the MA Office of Coastal Zone Management, APCC selected another three sites to move forward to permitready designs. See Figure 3 for a map of all twenty sites which received concept designs as well as the seven sites which advanced to 75% designs.

Project Impacts

Utilizing green stormwater infrastructure (GSI) design, Horsley Witten developed conceptual plans for all twenty sites. These plans were informed by drainage area, general site characteristics (soil types, known utilities and other infrastructure), and area of impervious surface. After the selection of high priority sites, the respective plans were advanced using additional information gathered during the site surveys (groundwater depth, elevation, and GPS coordinates of all utilities and other infrastructure). Pollutant removal was modeled for each of the seven high priority sites.



Figure 3: Map of priority public boat ramps selected for green stormwater infrastructure planning and design.

The table below (Table 1) provides conservative estimates of improvement to stormwater management at the four SNEP-funded sites, Ashumet Pond, Electric Avenue, Herring River, and Oak Crest Cove boat ramps, based on Horsley Witten's design modeling. At all of the sites, the green stormwater infrastructure retrofits will remove some percentage of Total Suspended Solids (TSS), Total Phosphorus (TP), Total Nitrogen (TN), and Bacteria. Horsley Witten proposed some kind of bioretention area at all of the high priority sites. A bioretention area is a shallow depression used to treat stormwater runoff using a specific planting soil and plants to filter runoff. The method combines physical filtering and adsorption with biogeochemical processes to remove pollutants. The system consists of an inflow component, a pretreatment element, a shallow ponding area planted with appropriate native plant species (tolerant to both wet and dry periods as well as other site conditions such as wind, salt, shade, etc.), an overflow structure, and an emergency overflow weir.

Boat Ramp Site	Town	Existing Drainage Area	Existing Impervious Area	Proposed Impervious Area	WQv Provided	Runoff Depth Treated	TSS Removal	TP Removal	TN Removal	Bacteria Removal
		(ac)	(ac)	(ac)	(cf)	(in)	(%)	(%)	(%)	(%)
Ashumet Pond	Falmouth	1.53	0.77	0.59	2,003.76	1.0	89%	98%	100%	100%
Electric Avenue	Bourne	2.00	1.00	0.85	2,874.96	0.9	82%	90%	92%	91%
Herring River	Harwich	0.38	0.24	0.23	348.48	0.5	44%	37%	23%	41%
Oak Crest Cove	Sandwich	9.42	1.45	0.94	3,876.83	0.7	63%	73%	73%	73%

Table 1: Conservative estimates of improvement to stormwater management at subset of priority public boat ramps on Cape Cod. Results are based on green stormwater infrastructure design and modeling by the Horsley Witten Groun

The greatest reductions will likely be at Ashumet Pond in Falmouth where the full one inch of stormwater runoff will be treated to nearly 100% pollutant removal. The proposed retrofits for Ashumet Pond included the following: resurfaced parking lot and boat ramp access road to better direct runoff while maintaining current parking spaces and required drive aisle and parking space dimensions; GSI including two bioretention areas and porous asphalt; reduction in overall impervious cover; buffer restoration; and protection of as many existing mature trees as



Figure 4: Ashumet Pond Boat Ramp parking lot looking east. Photo credit: APCC.

possible. Pretreatment will be provided with sediment forebays, and overflows from large storm events will flow out of the stormwater control measure inlets and/or an overflow structure.

Conversely, Herring River in Harwich shows the lowest percent removal of pollutants due to the limitations in space for treatment practices and the close proximity to the groundwater table. However, this site floods during most spring high tides, so there are additional benefits to the proposed practices in stabilizing sediment and providing salt marsh habitat that are not reflected in the stormwater modeling results. In total, the Herring River proposed retrofits consist of resurfaced entrance/exit driveways Figure 5: Herring River Boat Ramp in Harwich from and parking lot to better direct runoff while the parking lot facing west. Photo credit: APCC.



maintaining current parking spaces, adequate drive aisle and required parking space dimensions, traffic flow, and stabilization of the parking lot surface; GSI including two wet bioretention areas; reduction in overall impervious cover through permeable paver system; and revegetation and protection of salt marsh areas to promote regrowth.

At most of the boat ramp sites, the volume of stormwater runoff is reduced in the proposed retrofit designs by removing some area of impervious surface. The greatest reduction in impervious surface will be at Oak Crest Cove where roughly 0.37 acres and 0.17 acres are proposed as porous pavement in the upper parking lot and the basketball court, respectively. Reducing the volume of stormwater discharge by removing impervious surface area improves the water

quality in the adjacent waterbody by increasing the proportion of precipitation that percolates into the soil, a process that helps remove nutrients and bacteria before the water reaches the groundwater table. Additional stormwater improvements in the retrofit proposal include a bioretention area, a surface infiltration basin, and underground infiltration. Pretreatment will be provided with sediment forebays, and overflows from extreme events will flow through structures and spillways. These practices, if implemented, will improve slope stabilization on the existing eroded steep slope and reduce pollutants from entering

Peters Pond by treating roughly 3,900 cubic feet of stormwater.

Lastly, the retrofits proposed at Electric Avenue Boat Ramp will treat roughly 2,800 cubic feet of stormwater through a large bioretention area and underground infiltration trench. Pretreatment will be provided with proprietary water quality units, and overflows from extreme events are designed to bypass catch basin grates and flow down the boat ramp. Additional benefits of this design include resurfaced boat ramp access road to better direct runoff, formal sidewalk to improve pedestrian access to boat





Figure 6: Oak Crest Cove basketball court and upper part of boat ramp (top) and lower boat ramp and dock (bottom). Photo credit: APCC.



Figure 7: Electric Avenue Boat Ramp and Buttermilk Bay. Note failed stormwater drain in foreground. Photo credit: APCC.

ramp dock; coastal bank planting for stabilization and resiliency; and reduction in overall impervious cover.

In addition to the site designs, other significant project impacts included: 1) network building through meetings with the town staff, the Office of Fishing and Boating Access, the Natural Resources Conservation Service (NRCS), and the Cape Cod Conservation District; 2) transferring knowledge regarding the benefits of green stormwater infrastructure to the project team, general public, pond associations, and other partners; and 3) leveraging this initial SNEP award to obtain \$143,552.25 in additional funds from the Massachusetts Office of Coastal Zone Management (CZM). The CZM funds were applied towards supplementing funding gaps in outreach, assessment, and design and towards completing permit-ready (75%) designs for three additional high priority boat ramps (Dr Lords Common Landing in Dennis, Mashpee-Wakeby Boat Ramp in Mashpee, and Follins Pond Boat Ramp in Yarmouth.

Challenges & Lessons Learned

Challenges: APCC and Horsley Witten encountered a few minor challenges as part of the prioritization process. First, the group had to discuss how to apply valuation of the estimated construction costs for a site as part of the ranking criteria. It was unclear whether the towns and state would benefit more from placing higher value on smaller projects which would be easier to implement ("low hanging fruit") or larger, more expensive projects that would remove a greater percentage of the pollutants entering the waterbody ("best bang for your buck"). In the end, the team chose to place lower value on higher costs but gave more weight to the potential pollutant removal category.

Second, the team had to grapple with how to rank existing stormwater infrastructure that was functioning poorly. For example, at the Follins Pond Boat Ramp in Yarmouth, the existing infrastructure was theoretically reducing the drainage area of runoff to the ramp (Figure 8). However, in actuality, the catch basins were not effectively intercepting the runoff due to the steep slope of the roadway. The team discussed and agreed that it was important to address the failing infrastructure. In the Follins Pond case, changing the drainage area to address these poorly functioning catch basins pushed the site from near the bottom of the list into the one of the highest ranked spots.

Lessons Learned: APCC realized early on that the proposed budget would not adequately meet the needs of the project.



Figure 8: Follins Pond Road Boat Ramp in Yarmouth. Arrow indicates existing catch basin. Photo credit: APCC.

Although APCC had experience managing grants for greens stormwater infrastructure projects through the EPA SNEP Barnstable Three Bays Stormwater Project, the added logistics and coordination required for a regional project across ten towns (versus one) added more time and expense to the project than anticipated. Moreover, the original budget for the site survey and development of Existing Condition Plans was based on several assumptions: 1) multiple site assessment activities could be scheduled for one or more sites in a day, 2) smaller drainage areas with fewer utilities and other infrastructure to survey, and 3) fewer meetings for coordination of town and state partners. However, due to the complexity of the project and working with multiple partners, site assessments had to be scheduled site by site. Additionally, the survey and assessment efforts were more extensive due to the large area of each site selected, and more meetings were required to coordinate with the team and partners.

Through careful planning and coordination, APCC was able to overcome the budget shortages by seeking and securing additional funds from the Massachusetts Office of Coastal Zone Management to fill these funding gaps and expand the project scope to address three additional priority sites. The process provided a valuable lesson that project management logistics do become more time consuming the larger the extent and scale of the project. Also, design budgets do not extend as far across stormwater improvement sites with very large drainage areas because of the additional onsite survey work required. In the future, APCC will take these factors into consideration when planning and prioritizing a regional-scale project with finite resources for design.

Recommendations & Next Steps

The long-term goals of the project are to implement the proposed stormwater retrofits by developing final designs, acquiring permits, and completing construction. For a few high-ranking sites that were not selected in November 2022 for 75% designs, APCC secured \$73,800 in private foundation funds to move the Waquoit Bay Landing (or Seapit Landing) in Falmouth, Willimantic Drive on Shubael Pond, and Scargo Landing on Rout 6A in Dennis from concept designs to 25% designs by spring 2024. APCC contracted Horsley Witten to continue these designs and tasks include site surveys, existing condition plans, and 25% design.

For the sites with 75% (permit-ready) designs, the next step is to secure funding to finalize designs, apply for permits, and subcontract a construction company to make the plans a reality. APCC applied to funding opportunities through Southeast New England Program (SNEP) Watershed Implementation Grant administered by Restore America's Estuaries and the SNEP Stormwater Infrastructure Grant administered U.S. Environmental Protection Agency during the summer of 2023 in order to complete permitting and construction for a subset of the priority sites, but neither application was accepted. However, APCC secured

\$36,936 in private foundations to meet the permitting objective for all four SNEP-funded sites (Electric Ave in Bourne, Ashumet Pond in Falmouth, Herring River in Harwich, and Oak Crest Cove in Sandwich) by May 2024 and will continue to pursue funding opportunities to meet the long-term construction objective.

For the three CZM-funded sites (Follins Pond Road in Yarmouth, Dr Lords Common Landing in Dennis, and Mashpee-Wakeby Pond in Mashpee), an FY24 CZM Coastal Habitat and Water Quality grant of \$761,137 was awarded to APCC in October 2023 to complete permitting, final design, and construction for Dr Lords Common Landing and the Scargo Landing on Route 6A as well as to complete permitting for Follins Pond and Mashpee-Wakeby. The CZM sites also required an additional \$15,000 to finish out 75% designs for Dr Lords and Follins Pond, and this supplemental funding was also provided through a private foundation.

One significant challenge to future progress for the Ashumet Pond and Oak Crest Cove sites is the limited number of funding opportunities for isolated freshwater ponds in this area. While the CZM grants are available for systems with coastal connections, like Herring River and Electric Avenue, SNEP funding is one of the few options to acquire construction funding for the other two locations.



Compliance

Figure 9: Ashumet Pond Boat Ramp in Falmouth.

Since the project was funded through an EPA SNEP grant, the required Quality Assurance Project Plan (QAPP) was developed by Horsley Witten with support from APCC. Horsley Witten submitted the QAPP in May 2022 for review and it was approved by EPA in June 2022. Horsley Witten also coordinated with respective town Conservation Commissions regarding permitting requirements for soil test pits. The soil test pits (up to 10ft deep) were necessary for the soil evaluation which will inform the existing conditions documentation and 25% designs. In all cases, the town staff agreed to assist with filing any approval requests. Where necessary, the Director and Chief Engineer for the Office of Fishing and Boating Access submitted a letter to the Massachusetts Historical Commission (MHC) inquiring as to potential historical or archeological assets within the respective project areas. MHC determined that no archeological assets would be disturbed during survey or construction of the stormwater infrastructure.

Project Partners

The following people were involved in the project meetings and design review and were considered key points of contact for each town, organization, or agency: Amanda Lima (Yarmouth, Town Engineer); Amber Unruh (Barnstable, Senior Project Manager – Special Projects); Ashley Fisher (Mashpee, DNR Director); Chris Miller (Brewster, DNR Director), David Deconto, DNR Director, and Paul Tilton, Town Engineer (Sandwich); Doug Cameron (MA DFG Office of Fishing and Boating Access Doug Cameron, Director); Gregg Fraser (Falmouth, Director of the Marine and Environmental Services Department); Heinz Proft (Harwich, DNR Director) and John Rendon (Harwich, Harbormaster); Tim Lydon (Bourne, Engineering Department); Tom Andrade (Dennis, Town Engineer); Tom Daley (Orleans, DPW Director); Michelle West (Project Manager) and Gemma Kite (Horsley Witten Group).

Additionally, members of the Natural Resources Conservation Service (NRCS), the Cape Cod Conservation District, the Mashpee Wampanoag Tribe and several pond associations were invested in the project, attending the larger public meetings and the more focused design review meetings. Those participants, whom we referred to as key stakeholders, included: Donald Liptack, Stormwater Specialist, Cape Cod Conservation District; Martha Craig, Program Director, Cape Cod Conservation District; Lisa Petruski, NRCS; Steve Spear, NRCS; Debra and Paul Hennessey, Friends of Ashumet Pond; Susan Dangel, President of Save Mashpee Wakeby Pond Alliance; Christine Dennis, Friends of Peters Pond; and Dale Oakley, Assistant Director of Natural Resources, Mashpee Wampanoag Tribe. APCC developed strong collaborative relationships with each of the stakeholder groups that will be vital in moving the projects into the next stages of permitting, construction, and ongoing maintenance.

Outreach & Public Involvement

APCC hosted a public meeting to introduce the project to the community and potential stakeholders on June 9th, 2022, via Zoom; 23 people participated. There was also strong community involvement in the regional public meetings held virtually via Zoom on November 1, 2022, and November 3, 2022. APCC provided these latter public meetings to receive feedback from stakeholders on 10% concept designs. The feedback for the project was overwhelmingly supportive. The total number of attendees at the November public meetings was roughly 82 (42 participants on Nov. 1 and ~40-45 on Nov. 3). Additionally, we received written comments from another ten stakeholders, including members from respective pond associations, abutting homeowners, and owners of local businesses).

Outreach Materials: APCC developed a fact sheet regarding stormwater management at boat ramps and distributed it with the announcements for the public meeting held on June 9,

2022. APCC also developed outreach materials (meeting registration webpage, announcement flyer and letter to abutters) for the public meetings held on November 1 and November 3, 2022. At least two weeks before each of the aforementioned meetings, the meeting announcements and other associated materials were shared with the project team partners (state and town staff), posted on the APCC e-newsletter for two weeks preceding the meeting, and posted on the APCC social media pages (Facebook and Instagram). Municipal and state staff were encouraged to share the announcement with other departments and post it as desired in town halls and/or social media outlets. Direct invites were also sent electronically via email to key stakeholders including regional entities, such as the Cape Cod Commission, the Cape Cod Conservation District, and the Waquoit Bay National Estuarine Research Reserve, as well as local pond associations and coalitions, tribal communities, and other affiliated groups. Lastly, the announcement materials were shared with Restore America's Estuaries and EPA SNEP communications staff.

In summer of 2022, APCC developed a website for the project. It included a registration portal for stakeholders and members of the public to sign up for notifications regarding public meetings and other project updates. Prior to the public meetings held in November, the website also provided a means to register and gain access to the Zoom meeting links. In December, APCC updated the website with the final sites selected to advance to 75% (permit-ready) stormwater designs. <u>https://apcc.org/stormwater-management-at-public-boat-ramps/</u>

Following the public meeting, APCC was interviewed by Jamie Costa of Sandwich Enterprise and a short article about the project ran in the Sandwich, Mashpee, Bourne, and Falmouth news outlets on June 17, 2022. APCC was also interviewed by Sam Houghton of WCAI regarding the boat ramp project and a short summary of the project aired on the radio in mid-to-late June 2022. Lastly, APCC provided a press release to local and regional news organizations regarding the November public meetings on October 14, 2022. In addition to the press release that APCC submitted, there was coverage of the public meetings in Cape News.

Presentations: APCC provided presentations to the Mashpee Environmental Coalition and the Falmouth Water Quality Management Committee in October 2022 to update members on the public boat ramp project and encourage attendance at the November public meetings. APCC also attended the Cotuit Library Harvest Festival on October 8th to educate the public on green infrastructure stormwater best management practices as well as spread the word about the public boat ramp project and upcoming public meetings.

In collaboration with Horsley Witten, APCC developed a Restore America's Estuaries (RAE) Summit presentation entitled "How to choose: criteria for selecting stormwater remediation sites when there is overwhelming need and finite resources." Ms. Mora provided the inperson presentation at the RAE Summit in New Orleans in December 2022.

Lastly, APCC provided a presentation as part of the Land to Sea Series organized by Clean Ocean Access in Rhode Island on February 21, 2023. The presentation covered the ecological benefits of green system infrastructure stormwater design, methods for building a stormwater master plan, as well as a brief overview of the Public Boat Ramp project and lessons learned.

Budget

Of the initial \$148,871 awarded to APCC under the SNEP21 grant, \$148,863.83 was spent. The funds covered APCC personnel and expenses (supplies and travel) for project management as well as an engineering subcontract to develop conceptual (10%) green stormwater infrastructure (GSI) designs for twenty public boat ramps on Cape Cod as well as permit-ready (75%) GSI designs and associated materials for four of the top-ranking sites. APCC was also awarded an FY23 Coastal Zone Management Coastal Habitat and Water Quality grant (\$143,552.25) which provided additional support for project management and design development in 2022 through January 2024. The CZM funds also provided support to expand the number of boat ramps advancing to 75% designs by an additional three sites for a total of seven sites receiving permit-ready designs.

The combined match exceeded the original SNEP21 budgeted amount of \$49,185 by roughly \$114,000. The CZM grant provided approximately \$142,318.75 in match as of December 2023. APCC provided \$3,176.28 in match related to staff, GIS consultant time, and indirect costs. The state and staff team members tracked \$17,697.05 of in-kind match for the project prior to August 2022.

In total, the SNEP21 and the CZM grants along with in-kind match, provided by APCC and partners, contributed \$312,055.91 to the first phase of the project, "Stormwater Management at Cape Cod Public Boat Ramps," between November 2021 to December 2023. For the next phase of the project, \$125,736 was secured through private foundation funds to complete 25% designs for three sites (Waquoit Bay Landing, Willimantic Drive on Shubael Pond, and Scargo Landing on Route 6A), final 75% designs for two sites (Follins Pond Road and Dr Lords Common Landing), and permitting for four sites (Electric Avenue, Ashumet Pond, Herring River, and Oak Crest Cove). Also, \$761,137 was awarded by CZM through the FY24 Coastal Habitat and Water Quality grant to complete permitting, final design, and construction for two sites (Dr Lords and Scargo Landing) as well as permitting for Mashpee-Wakeby Pond and Follins Pond. All combined, \$1,198,929 has been allocated through this project towards improving stormwater management at Cape Cod's public boat ramps.