TOWN OF YORK, MAINE

Climate Action PLAN

Adopted
May 21, 2022

Amendments

On May 21, 2022, the Voters of York adopted the York Climate Action Plan, as was considered at a Selectboard Public Hearing on February 28, 2022, to be a non-binding set of recommendations for future policies and actions designed to prepare the Town for climate change vulnerabilities and reduce emissions.

The following is a true copy of the Town of York Climate Action Plan as adopted on May 21, 2022.

Attest: ______________________
Town Clerk

Date: 11/16/2022

York, Maine
February 2022

YORK CAP
CLIMATE ACTION PLAN

Acknowledgments

The Climate Action Plan (CAP) process began in 2019 with the recommendation of the York Energy Steering Committee, then chaired by Rozanna Patane, to cut the community's GHG emissions and join the 11,000 city Global Covenant of Mayors by pledging to reduce the community's greenhouse gas (GHG) emissions by 50% by 2030 and 100% by 2050. That commitment was adopted by the Selectboard in that same year.

This Plan has been in the making for a long time and many committed community members have worked in various capacities and ways to address climate change. We would like to thank Town leadership for supporting this Climate Action Plan planning process and Town staff and community volunteers for the hours of time they spent to get us to this finished product.

And while too numerous to mention, we offer gratitude to the hundreds of community members who attended meetings, answered survey questions, and offered feedback on the project website to ensure this plan reflects the needs and concerns of the people of York. Your efforts and time are greatly appreciated.

CAP Steering Committee

Wayne Boardman, Co-Chair
Gerry Runte, Co-Chair
Brenda Alexander, York School Committee
Karen Arsenault, York Water District
Lydia Blume, State Representative
Susan Covino, York Energy Steering Committee
Erin Ferrell, AmeriCorps VISTA Sustainability Associate
Catherine (Casey) Giffen, volunteer
Jennifer Hunter, Citizen-at-Large
Carol Libby, York Recycling Committee
Mac McAbee, York Ready for Climate Action
Ron McAllister, York Parks & Rec
Marilyn McLaughlin, Selectboard
Robert Palmer, Selectboard
Halley Smith, Citizen-at-large
Michelle Surdoval, York Community Service Association

Other Volunteer Committees

Planning Board
Kathleen Kluger, Chair
Wayne Boardman, Vice Chair
Kenneth Churchill
Al Cotton
Gerry Runte
Peter Smith
Ian Shaw

Energy Steering Committee
Susan Covino, Co-chair
Len Loomans, Co-chair
Wayne Boardman
Harry Mussman
Rozanna Patane
Gerry Runte

Working Group & Subcommittee Members

Buildings
Wayne Boardman, Co-Chair
Ben Lovell, Co-Chair
Richard Bilden
Michelle Marean
Rozanna Patane
Jennifer Ring
Michelle Surdoval

Transportation
Mac McAbee, Co-Chair
Harry Mussman, Co-Chair
Connor D'Aquila
Dan Eubank
Marsha Mazz

Infrastructure
Wayne Boardman, Co-Chair
Susan Covino, Co-Chair
Michael Bartner
Janet Drew
Peter Goodwin
Bill LaFleur
Michele Putko

Natural Resources
Karen Arsenault, Co-Chair
Jennifer Hunter, Co-Chair
Suzanne Berlin
Arthur Brennan
Zephania Cortesi
Dan Gardoqui
Gail Gilchrest
Lynn Zacharias

Food, Waste & Recycling
Carol Libby, Co-Chair
Deanna Waldrop, Co-Chair
Brenda Alexander
Dave Cohen
Erin Ferrell
Ron McAllister

Resilience, Health & Emergency Management
Gerry Runte, Chair
Chris Balentine
Lydia Blume
Owen Davis
Len Loomans
Mary Marshall
Nicole Pestana

Communications and Outreach Team
Erin Ferrell
Susan Glick
Laurie Macdonald
Ron McAllister
Carrie Mayo
Meg Raiano
Gerry Runte

Equity Subcommittee
Erin Ferrell, Chair
Marina Mails
Victoria Simon
Janie Sweeney
Jud Knox

Town Of York

Selectboard
Todd A. Frederick, Chair
Robert E. Palmer Jr., Vice Chair
Michael L. Estes
Kinley Gregg
Marilyn McLaughlin

Town of York Staff
Steve Burns, Town Manager
Dylan Smith, Planning Director
Elizabeth Hayden, Administrative Assistant Public Works
Brett Horr, GISP, Director of GIS and Technology
Dean A. Lessard, P.E., Director of Public Works
Rick Mace, Tax Assessor
Nicole Pestana, Emergency Management Specialist
Luke Vigue, Lister/Appraiser, Assistant Code Enforcement Officer

Other Entities Providing Important Input

York Water District
Don Neumann, Superintendent
Gary Stevens, Assistant Superintendent
Patrick Desrosiers, Financial Manager
Daniel J. Flaig, PE, Water Practice Group Leader for Maine, Wright-Pierce
Collin Stuart, PE, Project Engineer, Wright-Pierce

York Sewer District
Tim Haskell, Superintendent
Phil Tucker, Assistant Superintendent

Southern Maine Planning & Development Commission
Abbie Sherwin, Senior Planner and Coastal Resilience Coordinator
Karina Graeter, Sustainability Coordinator

Peter Slovinsky, Maine Geological Survey
Taylor LeBrecque, Maine Department of Transportation
Ed Hanscom, Maine Department of Transportation
Brian Beneski, Maine Department of Environmental Protection
Benjamin Miller, Massachusetts Energy and Environmental Agency
Erica Bayley, Municipal Solutions Manager, Casella Waste Systems, Inc.
Erin Banfield, Senior Business Manager, Casella Waste Systems, Inc.

Consultant Team

CivicMoxie, LLC, Project Lead
Susan Silberberg, Principal and Project Manager
Greg Hanafin, Planner and Assistant Project Manager
Clay Lin, Planner and Analyst
Annie Streetman, Planner and Graphics
Sue Kim, Senior Planner
Michael Rosenberg, Planner and Graphic Designer
Kelsey Hubbard, Graphics
Shanna Penna, Analyst
Sarah Saydun, Planning Intern
Gavin Lewis, Planning Intern
Robyn Lee, Planning Intern
Madeleine Kelly, Planning Intern

www.civicmoxie.com

with
Climate Advisory
Lisa Churchill, Principal
www.climateadvisoryllc.com

Technical assistance from:
Wright & Pierce, waste calculations
Weston & Sampson, precipitation calculations

Design assistance from:
Matt DeCotiis, Cicada

Cover Photos:
Marla Johnson
Carol Libby

What this Plan Will (and Won't) Do

This CAP is a set of recommendations and goals to guide the decision making of the Town of York and the broader community in the coming years. The CAP Steering Committee and Working Groups led a planning process that produced this plan. The CAP provides information and guidance to assist the Selectboard and residents of the town to build resilience toward the effects of climate change in the coming years as well as fulfilling Town emission reduction commitments (reduce community greenhouse gas emissions 50% by 2030 and 100% by 2050, from 2010 levels).

While this plan is meant to serve as a valuable guide for setting Town policies and making financial decisions, as well as identifying where funding and partnerships might be obtained, nothing can happen without actions by the Selectboard, the voters and other interested community groups. In addition, as noted in Chapters 7 and 8, there will be multiple roles by many parties. The Town cannot have sole responsibility for implementing many of these recommendations. CAP implementation will be a collaborative effort between the Town and various other public and private stakeholder organizations.

At the same time, by nature of its position, the Town...the Selectboard and voters...are the key to moving forward with CAP implementation. Town and voter/resident engagement will be essential to ensuring effectiveness of the overall plan and will help inform ongoing discussions, weighing of options, and ultimately make decisions improving the town's resilience to climate change and reducing its emissions. Let the work begin!

Table of Contents

Photo Credit: Gerry Runte

Photo Credit: Geneve Hoffman (16 Hoops Photography) and Williams Realty Partners

Summary

This Climate Action Plan (CAP) lays out a road map for the Town to move forward on climate action - preparing and adapting to the changes we know are coming and reducing our greenhouse gas emissions. The CAP outlines the planning process, outcomes, and recommendations and its appendices provide detailed information on the GHG Inventory and Vulnerability Assessment, methodologies, mapping, and the Working Groups products. This summary provides an overview of the plan, its recommended goals and actions, and immediate priorities if adopted by the public.

Overview

York's Commitments to Climate Action

In 2019, the Selectboard committed the community to reduce its greenhouse gas emissions when it joined the Global Covenant of Mayors (GCoM) initiative.[1] Developing a climate action plan was one of the commitments required to become a member. York has a long history of related actions beginning in 2008 with its signing the US Mayors Climate Protection Agreement, continuing with the addition of a sea level rise chapter to its Comprehensive Plan in 2013 and undertaking of several energy efficiency initiatives.

Most initiatives in York thus far have focused on reducing energy consumption and GHG emissions, York will need to significantly expand its actions to adapt to climate change. With its miles of coastline, tourism economy, and abundant natural areas, the town is at significant risk from climate change.

The CAP is the result of a collaboration among the town's consultant team CivicMoxie and Climate Advisory, over 50 volunteers, civic organizations, Town staff, and others. The public was also invited to participate in reviewing the plan through four public meetings.

The CAP's Purpose

The CAP addresses two key questions:

Adaptation/Protection

What can be done to protect York from the impacts of Climate Change? The focus is on protecting buildings, infrastructure, the natural environment, people, and the economic health of York, and increasing the town's resilience in the face of climate change.

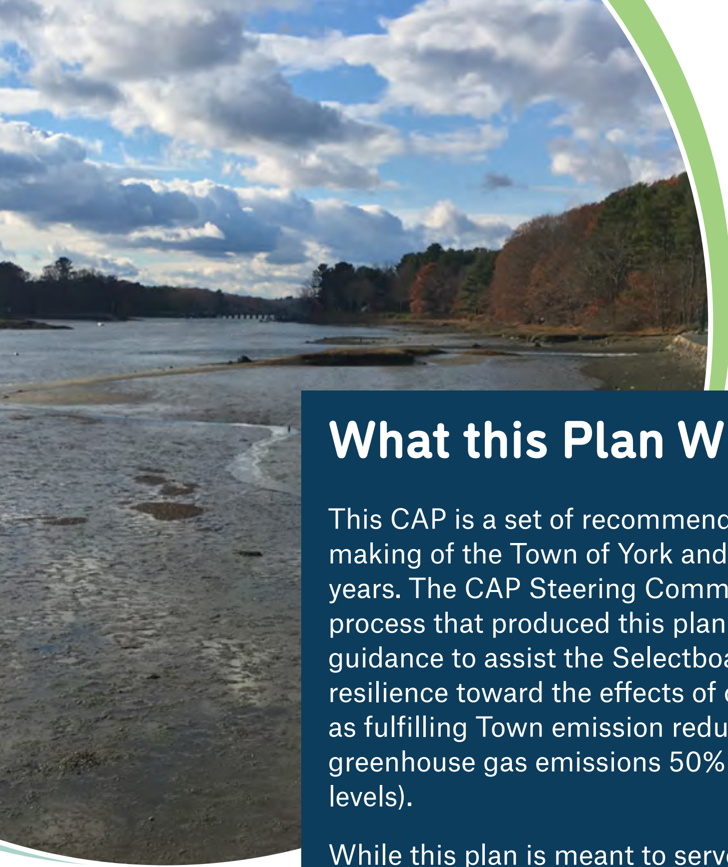
Mitigation/Reduction

What steps can the York community take to minimize the town's contributions to climate change? Emissions sources include buildings, transportation, and waste. GHGs are released into the atmosphere from the burning of fossil fuels to create energy.

York's economic health relies on property values and our strong tax base which is tied directly to our beaches, natural environment, historic character, and coastal beauty. Climate change will threaten all of this.

- Participant at June 2021 Project Kickoff Meeting

Photo Credit: Carroll Libby



What this Plan Will (and Won't) Do

This CAP is a set of recommendations and goals to guide the decision making of the Town of York and the broader community in the coming years. The CAP Steering Committee and Working Groups led a planning process that produced this plan. The CAP provides information and guidance to assist the Selectboard and residents of the town to build resilience toward the effects of climate change in the coming years as well as fulfilling Town emission reduction commitments (reduce community greenhouse gas emissions 50% by 2030 and 100% by 2050, from 2010 levels).

While this plan is meant to serve as a valuable guide for setting Town policies and making financial decisions, as well as identifying where funding and partnerships might be obtained, nothing can happen without actions by the Selectboard, the voters and other interested community groups. In addition, there will be multiple roles by many parties. The Town cannot have sole responsibility for implementing many of these recommendations. CAP implementation will be a collaborative effort involving, and perhaps creating, other entities to partner in this effort.

At the same time, by nature of its position, the Town—the Selectboard and voters—are the key to moving forward with CAP implementation. Town and voter/resident engagement will be essential to ensuring the effectiveness of the overall plan and will help inform ongoing discussions, weighing of options, and ultimately make decisions improving the town's resilience to climate change and reducing its emissions.

Let the work begin!

Photo Credit: Carol Libby

What's at Stake

We know that our climate is changing, and we see it every day. York can expect a rising sea level, more frequent storm surges, warming air temperatures, heavier precipitation, increased storm severity and flooding, as well as warming ocean temperatures in the coming decades. The Town must prepare for these events and minimize their impact. In addition, the reason these expectations are likely is well understood: climate change is the result from the large amounts of human-caused emissions of greenhouse gases in the atmosphere. The Town must also do its part to reduce its emissions as part of its place in the global community.

Climate change will have physical and fiscal impacts on the Town of York.

Loss of Property Value and Tax Base

Sea level rise (SLR) and increasing storm intensity will increase the risk of coastal flooding and precipitation-based inland flooding for many properties in York. Declining values in turn lower the property tax revenue collected by the Town, which could affect the Town budget and services (Fig. 1).

Loss of Dry Beach

With sea level rise and storm surges, beach area will be lost. With 1.6 feet of SLR, an estimated 42% of the dry beach area and 55% of dune area in York County will be lost. At 3.9 feet, this loss goes up to 75% and 92%, respectively.[2] With only 1.5 feet of sea level rise, the most conservative estimate, loss of beach area could result in more than 1 million fewer visitors and more than $130 million less spent by tourists per year in York County.[3]

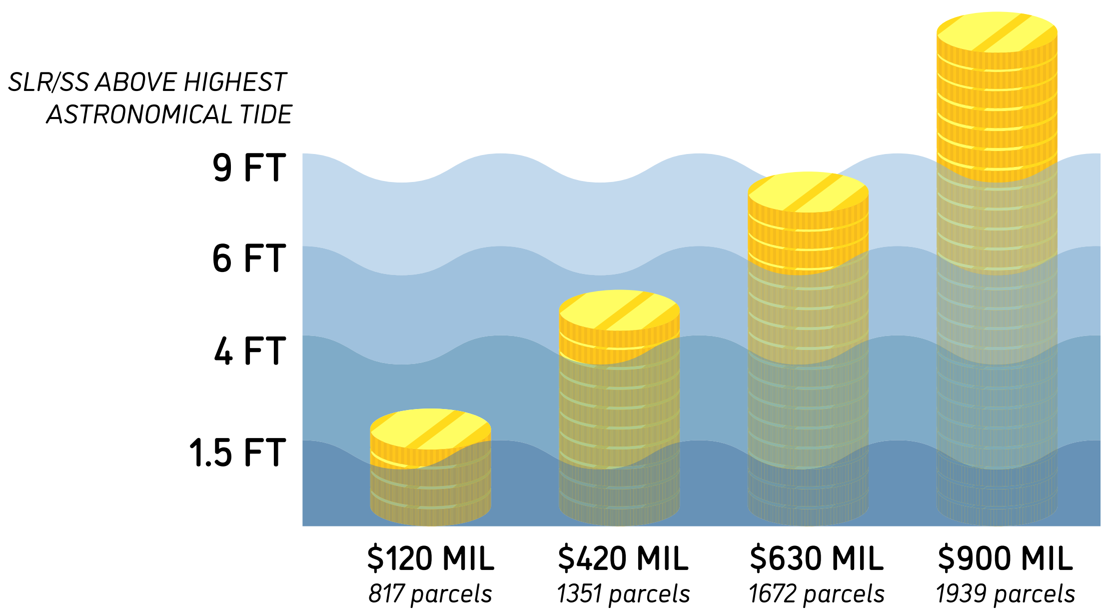
Risks to Infrastructure Including Transportation Disruptions

With a combination of six feet of storm surge and sea level rise, 600 addresses in York would be inaccessible because of flooded roads.[4] As little as 1.5 feet would inundate both town docks, the boat launch, and the Harbormaster office, eliminating York's only public harbor access points, as was most recently illustrated with the storm surge experienced on January 17, 2022.

Health Risks to Vulnerable Populations

Without global reductions in GHG emissions, by 2050 average temperatures in York are projected to be an additional 6 °F warmer. In the summer, this will cause temperatures that feel like 90 °F or hotter for 20 to 30 more days each year than we experience now.[5] In 2019, approximately 27% of York residents were over the age 65, and more than 7% of those over 65 were living alone.[6] Older adults are often more adversely impacted by extreme heat and air pollution.[7] Seasonal workers are also susceptible to health risks from increased number of high heat days, and loss of wages or employment owing to flooding of their workplace or declines in tourism.

Fig. 1. York Parcels and Assessed Value at Risk in Four Sea Level Rise (SLR) and Storm Surge (SS) Scenarios



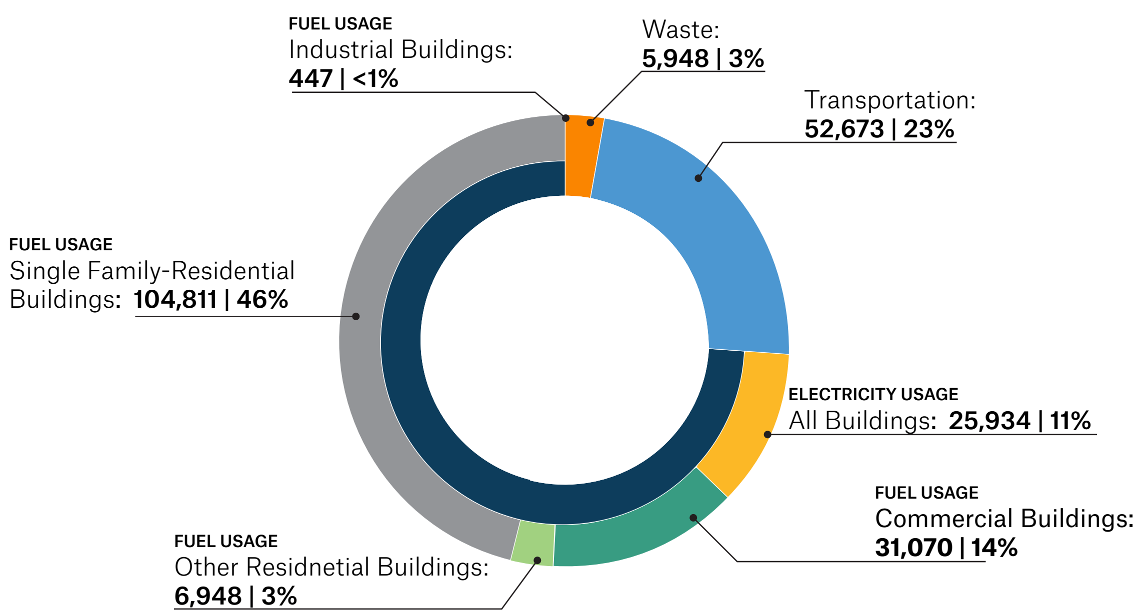
Source: See the York Climate Action Plan Appendix A for methodology and more information on the calculation of parcels and total property value affected in York.

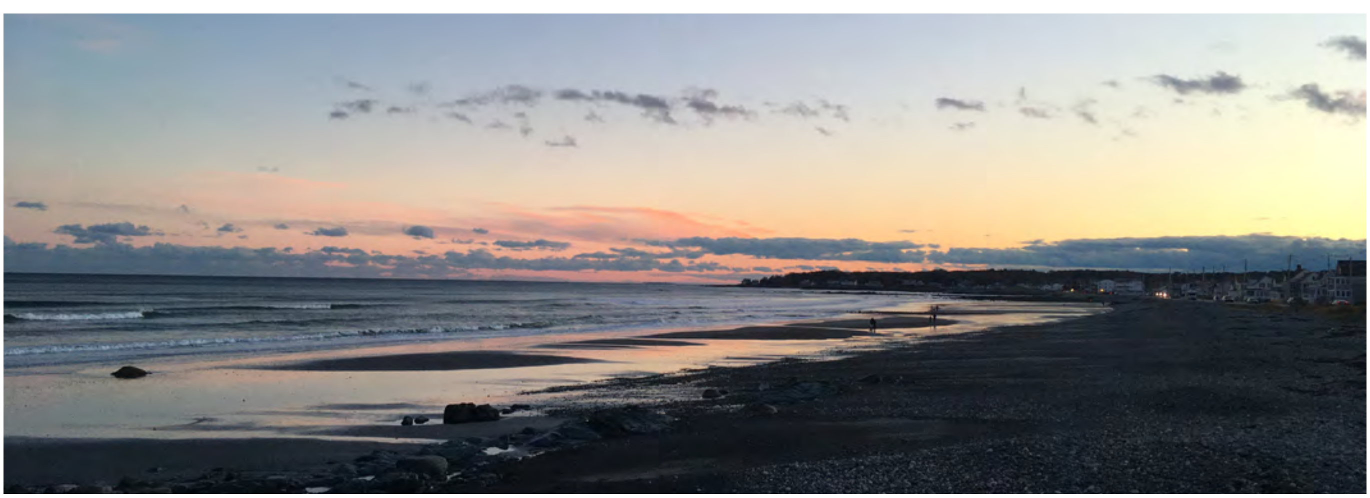
Emission Reduction Priorities

An inventory of York's 2019 GHG emissions reveals that the town's total emissions from buildings, transportation, and waste were approximately 230,000 MtCO2e, or around 17 $MtCO_2e$ per resident. Buildings contributed the most at 74% of the town's emissions, followed by transportation (23%) and waste (3%). The largest single source of emissions is fuel usage—mostly heating—in single-family homes, accounting for 46% of all of York's emissions (Fig. 2).

Comparing GHG emissions produced within each of the three sectors, York's top priorities for reduction strategies should focus on single-family residential and transportation emissions, which account for 46% and 23%, respectively, of York's total emissions.

Fig. 2. Total GHG Emissions in York, 2019





Engaging the York Community

Information about the CAP was communicated to the York community in many ways. Each of these engagement activities offered community members the opportunity to participate in the planning process by learning more about the CAP, asking questions, and providing input.

Goals and Recommended Actions

The assessment of York's vulnerability to climate change and the inventory of the town's contribution to GHG emissions, along with public feedback and discussion, provided the information that helped shape the 25 goals of this CAP, organized by eight focus areas below. On the following pages, information on the goals and recommended actions is provided in detail. Section 7 of the CAP provides detailed information about the goals and actions, key performance indicators, an assessment of opportunities and challenges, implementation roles for various entities, and an assessment how effective the goal is toward mitigation and adaptation.

1. **Buildings**
2. **Infrastructure**
3. **Access to Renewable Energy**
4. **Natural Resources**
5. **Mobility**
6. **Waste and Recycling**
7. **Community Resiliency and Equity**
8. **Leadership and Capacity**

Buildings

1

Buildings account for 74% of York's total GHG emissions, of which more than 90% comes from single-family homes, which represent the largest contribution to GHG emission in the town. Supporting home energy audits, a shift to electric heat pumps, and weatherization of buildings will need to be a priority in the coming years.

Goal 1.1
Reduce GHG emissions generated by existing residential and commercial buildings

Recommended Actions

- Create or support existing program to offer technical assistance (TA) and financial incentives to replace old/failed equipment and lighting with high efficiency equipment. This would provide follow-up/action steps after energy audit program.
- Promote via education and advocacy for all stakeholders.
- Work with Efficiency Maine and other organizations to identify grants or other financial incentives.
- Conduct a thorough review of ordinances and development regulations to understand opportunities for changes to promote CAP goals.
- Consider allowing existing homes to be split into two smaller units (more housing on smaller carbon footprint per household).
- Develop or support and advertise energy audit program to identify energy conservation opportunities.
- Support the addition of energy audits to buyer home inspections.
- Provide education about biofuels as an affordable bridge to heat pump use.

Goal 1.2
Adopt temperature and flood resilience standards for all new and heavily renovated buildings.

Recommended Actions

- Conduct a code review to identify necessary changes to incorporate resilience standards.
- Adopt zoning changes to require buildings in and near impacted areas to be designed to withstand the impacts of climate change through design, siting, changes in use categories, and other physical and operational modifications.
- Provide user-friendly guides to new standards and conduct public outreach campaign.
- Consider creation of zoning resilience overlays to help protect buildings and neighborhoods from climate emergencies, including sea level rise (SLR), storm surge, and inland flooding. This should include the adoption of a coastal zone overlay district that addresses the risks of SLR for new construction, renovations, and transportation/access points in affected areas, and considers limiting development in these areas.

Goal 1.3
Develop a plan to phase in energy building codes to reach net zero carbon emissions for new construction.

Recommended Actions

- Adopt the optional Maine Energy Stretch Code (IECC 2021) for greater energy savings.
- Provide training for builders, planning staff and board, and code enforcement personnel.
- Launch a promotional and public education effort to communicate the advantages of the stretch code and improve the chances of adoption via an ordinance by Town residents.
- Adopt regulations that promote development that creates less soil disturbance, less stormwater runoff, smaller building footprints/less impervious surfaces, maintains more natural landscape, and sustainable groundwater use.

Goal 1.4
Increase awareness and use of climate friendly Maine building products such as cross laminated timber and wood fiber insulation.

Recommended Actions

- Research Maine building products and partner with existing efforts to highlight climate-friendly materials.
- Create a list and information program (or use existing resources) for builders, architects, home owners, and other property owners.

Infrastructure

2

Some infrastructure in York is highly vulnerable to climate change and should be a priority for action. SLR will greatly affect the rate of beach loss (and subsequent loss of tourism revenue/tax base) and also will likely affect property values and the Town's tax base in coastal areas. Certain roads and town services are also at high risk, negatively impacting overall connectivity and neighborhood access/evacuation as well as emergency services.

Goal 2.1

Take steps to protect critical assets (water, sewer, public safety, access/evacuation roads, healthcare, Town services, dams, etc.) and other structures that will be impacted by sea level rise, storm surge, flooding and extreme weather events.

Recommended Actions

- Conduct review of CAP vulnerability assessment with all leadership (Town, quasi-public entities, healthcare providers, etc.) to determine coordinated steps needed for critical asset protection.
- Evaluate needed efforts in additional floodplain management necessary to increase/maintain Federal Emergency Management Agency's (FEMA) Community Rating System (CRS) rating to increase flood insurance premium discount.

Public Services/Safety:

- Evaluate SLR risks (and solutions) to York Beach Fire Department, Town Docks 1 & 2, and the harbormaster office.

Electric Grid

- Upgrade back-up energy systems to reduce downtime.

Water:

- Encourage communication and collaboration to support the York Water District's efforts to plan for climate adaptation and to implement resiliency. Utilize storm surge and SLR GIS mapping to identify critical water system infrastructure impacts and associated resiliency planning, design, and construction.
- Encourage and support the York Water District with prolonged drought planning and implementation. This would include regional cooperation with the Southern Maine Regional Water Council for water quality and quantity.
- Evaluate existing code enforcement ordinances with respect to potential impacts from prolonged drought impacts due to climate change.

Wastewater:

- Encourage and support the York Sewer District's efforts to plan and implement climate adaptation and resiliency. Utilize storm surge and SLR GIS mapping to identify critical wastewater system infrastructure impacts and associated resiliency planning, design, and construction.
- Utilize GIS mapping to identify storm surge and sea level rise impacts to on-site septic systems. Support Town efforts to notify property owners of potential impacts due to those projected impacts for systems that are identified to be impacted and work to build resilience.

Stormwater:

- Improve stormwater capture by commissioning an assessment/feasibility study to better inform stormwater management improvements. Evaluate how much money the Town spends on dealing with stormwater now and how much it will be required to spend in the future

Roads and Bridges:

- Assess the vulnerability (current and future) of the town's roads and bridges to the five types of flooding (Flash Flooding, River Flooding, Storm Surge, Tidal Flooding and Groundwater).
- Develop and implement a standardized protocol for documenting local flood impacts to roads and bridges.
- Establish a policy/plan of action and/or emergency fund to expedite post-disaster road/bridge repair.
- Require all municipal road and bridge projects to mitigate, to the greatest extent practicable, existing and potential future impacts of flooding and erosion.
- Ensure that culverts are properly sized and roadway ditches adequately designed to accommodate increased precipitation during peak storm events.

Goal 2.2

Install and improve coverage and quality of broadband service in York to minimize Vehicles Miles Traveled (VMT) and improve emergency services.

Recommended Actions

- Launch a marketing campaign and conduct a survey of residents and businesses to gauge demand for better internet service.
- Apply for grants and other support from ConnectMaine for a broadband study and efforts to improve service.
- Collaborate with SMPDC and neighboring towns to identify pockets of demand and make the case for installation of better service.
- Develop a targeted action plan to address the current shortfalls and anticipated demand and work with selected providers to plan for installation of better service.
- Pay particular attention to issues of equity with respect to access, coverage and affordability.

Access to Renewable Energy 3

Without "green" electricity sources, actions to shift to electric heat pumps for buildings and electric vehicles (EVs) will have little impact on reducing GHG emissions until electric power will be generated from burning fossil fuels and continue GHG emissions to the atmosphere.

Goal 3.1

Support the overall increase in the supply of renewable energy for all York citizens.

Recommended Actions

- Lobby State and Federal officials to increase renewable energy supply.
- Ensure that local codes and standards encourage and permit small-scale renewable energy generation, including solar systems, and battery storage.
- Promote and encourage on-site renewable generation, battery storage, and beneficial electrification, including EV's. Beneficial electrification should be accompanied by purchasing and consuming grid-based power generated by renewable sources.
- Explore bulk purchases of solar photovoltaic (PV) systems.
- Expand PV systems on municipal and school properties.
- Investigate changes to ordinances that incentivize solar systems.

Goal 3.2

Promote alternative means by which residents and businesses can access renewable energy without having to install, own or operate electricity generating systems, such as solar.

Recommended Actions

- Explore the possibility of solar power installations on underutilized land including rights of way (powerlines and turnpike) and the Witchtrot landfill.
- Seek necessary support/funding for community solar power projects.

Natural Resources

4

Natural resources provide a two-fold benefit to the town by protecting York from the impacts of climate change (heat, SLR, flooding) and by capturing and storing carbon to reduce the town's net GHG emissions.

Goal 4.1

Permanently conserve land, including wetlands and estuarine systems, and protect resources that provide carbon storage.

Recommended Actions

- Conduct a tree inventory and create a tree canopy map and plan for ongoing tree planting in the town.
- Allocate funding to permanently conserve forested areas.
- Support York Land Trust efforts to manage existing conservation lands and expand areas of permanently protected land in York.
- Work with the York and Kittery Water Districts to permanently protect District lands in York.
- Support incentives in forestry, agricultural, and lawn care practices that increase resiliency.
- Support forestry management and carbon capture plans with state forestry and University of Maine expert input.
- Allocate funding and conserve marsh migration areas.
- Establish development limits/restrictions in migration areas/SLR areas.
- Explore additional requirements such as a coastal zone overlay to strengthen protections for natural areas.
- Consider adopting most current FEMA maps and using additonal inland flooding mapping to assess flooding risks and inform development regulations and adaptation investments.
- Conduct additional inventory/research work for blue carbon opportunities.
- Research and pursue other high impact blue carbon strategies.
- Conduct educational/public outreach campaign regarding efforts, including any proposed development restrictions/building regulations.
- Review land cover and type information in the CAP and create detailed data for all relevant categories for tracking and observation (ecological, food production, forests, working lands, blue and green carbon, etc.)

Goal 4.2

Permanently conserve land and protect resources for climate resilience.

Recommended Actions

- Support York Land Trust efforts to manage existing conservation lands and expand areas of permanently protected land in York.
- Work with the York and Kittery Water Districts to permanently protect District lands in York.
- Support incentives in forestry, agricultural, and lawn care practices that increase resiliency (and carbon storage).
  - » Forest: support forestry management and carbon capture plans with state forestry and University of Maine expert input.
  - » Lawn: provide outreach/education for behavior changes and to increase demand for sustainable lawn care services by practitioners.
  - » Agriculture: promote regenerative practices and provide incentives and TA for same.
- Maintain marsh health
- Plan for marsh migration
- Maintain habitat connectivity.
- Manage invasives.
- Protect undeveloped habitats and large forested blocks.
- Protect wetlands and vernal pools.
- Protect headwater streams, natural stream buffers and floodplains.
- Provide more funding for land conservation efforts – goal of 30% of town land by 2030.

Goal 4.3

Evaluate economic value of natural resources (ecological services, blue carbon, green carbon, food production, forests, working lands) and use value in community decision making.

Recommended Actions

- Review land cover and type information in the CAP and create detailed data for all relevant categories for tracking and observation (ecological, food production, forests, working lands, blue and green carbon, etc.).
- Incorporate data into new Town GIS layers and continue to update and track as part of regular Town mapping and regulation/monitoring.
- Prepare a detailed assessment of the economic and other values of this land.
- Evaluate how existing land use and development regulations can be improved to sustain or enhance carbon storage of natural systems, minimize emissions from new developments, and improve overall coastal resilience; and implement changes to regulations and ordinances.

Mobility

5

Transportation contributes 23% of York's total GHG emissions. Providing EV infrastructure will be critical to supporting the transition to EVs and to solve the "chicken and egg" problem of needing adequate charging capability before people feel comfortable with purchasing EVs.

Goal 5.1

Expand Electric Vehicle (EV) ownership and use.

Recommended Actions

- Establish a program to educate York residents on the benefits of a transition to EVs to motivate them to purchase (social media, schools, etc.).
- Research and publicize incentives for low/moderate income drivers (purchase rebates, charging station installation, other).
- Explore ways to promote or facilitate the addition of a charger to existing housing.
- Explore the feasibility of a reduction on excise tax for certain income groups for annual tax on EV.
- Provide up-front price reductions for income-qualifying individuals (supported through Efficiency Maine Trust) so they can avoid having to put more money down and wait for a rebate for EV purchases.

Goal 5.2

Implement a green fleet policy for York municipal vehicle pool.

Recommended Actions

- Conduct an inventory of all existing municipal vehicles (school buses, code enforcement, police, fire, parks and recreation, public works, etc.).
- Evaluate "right sizing" vehicles to the needed application.
- Research available rebates and incentives, total cost of ownership, and develop a funding strategy.

Goal 5.3

Encourage the adoption of green fleet policies by quasi-municipal (water and sewer districts) and commercial fleets operating in York.

Recommended Actions

- Promote the adoption of "Green Fleet Policies."
- Create a program including education and information and tracking of purchase/adoption of EVs.
- Offer awards/incentives for those meeting pre-determined targets.

Goal 5.4

Provide a diversity of mobility options to serve different populations and needs to reduce Vehicle Miles Traveled (VMT).

Recommended Actions

- Expand and connect sidewalks and paths to make walking safer wherever possible.
- Expand and connect bike lanes and paths to make biking safer and more convenient. Prioritize: Route 1, Route 1A, Nubble, Ridge Rd, South Side Rd, Route 103, Route 91.
- Adopt zoning and growth policies that encourage walkable, connected development to decrease VMT.
- Conduct a needs assessment and survey to identify needs and potential barriers to access (seasonal, disabilities, comfort level, etc.). Create a program based on results.
- Calculate walking distances from multifamily and senior housing and schools to key services such as grocery stores, pharmacies, and York Hospital. Create a map, install distance markers, create public health programs and walking routes.
- List public transit and rideshare options, calculate average wait and travel times, as well as costs; compare with a case study of individual car ownership.
- Provide (or facilitate public-private partnership for) enhanced tourist-season mobility services (electric trolley and remote parking areas) that can also be used by residents.
- Offer demand-response transit and shared transit services for residents.
- Support improvements and extensions to regional transit services.
- Establish a Town transportation hub, to serve residents who are commuters, workers in town including seasonal workers, seasonal visitors.
- Provide consistent and user-friendly outreach and educational programs to alert all potential users about available services.
- Create public outreach and education programs about alternative mobility choices.

Goal 5.5

Facilitate, promote, and track the installation of EV charging infrastructure in York for residents, employees, and visitors.

Recommended Actions

- Encourage 3rd party owner-operator installation of charging stations at public parking, beach, recreation parking areas.
- Create a working group of hospitality and businesses dependent on tourism. Develop a plan for charging infrastructure. Offer incentives and/or information to businesses to support.
- Create a program to advertise York as an "eco-friendly" destination and offer a website map of charging locations.
- Enact ordinance with "charger-ready" requirements for all new single and two-family residences.
- Enact ordinances to require EV charging infrastructure in all new commercial, multi-family and subdivision developments (consider requirements such as a minimum of one EV charging station; for lots over 15 spaces, provide 15-20% of spaces with EV-chargers).
- Create a program for single-family home owners including information on rebates, choices, and possible Town incentives to install charging stations.

Waste and Recycling 6

While waste only accounts for 3% of GHG emissions in York, residents have great control over the waste they generate, which also impacts GHG emissions from packaging and transportation of products. In addition, given the very low rates of recycling for plastics (<8%), there is significant room to reduce use of plastics.

Goal 6.1

Reduce municipal solid waste (MSW).

Recommended Actions

- Pass ordinance to limit use of single-use water bottles, take-out containers and other plastics that are not biodegradable.
- Adopt a sustainable purchasing policy for goods and services purchased by the town.
- Establish target areas for prioritized sustainable "swaps" where surpluses of items are exchanged to ensure full utilization.
- Expand food composting and recycling programs to reduce residential and commercial solid waste.
- Mandate recycling for commercial uses.
- Explore a construction and demolition recycling policy to keep these materials out of landfills and ensure they are recycled.
- Develop comprehensive education for food, waste and recycling strategies.

Goal 6.2

Select municipal waste and recycling contractors based on multiple sustainability and climate criteria in addition to cost.

Recommended Actions

- Create criteria for evaluation of waste contractor proposals and adopt criteria.
- Apply criteria to procurement decisions.

Community Resiliency and Equity 7

Overall community health will depend on coordinated public, private, and nonprofit planning and response. Ensuring low and moderate-income residents do not have additional cost burdens for energy, building upgrades, and shifts to EVs should also be a key priority.

Goal 7.1
Create a Coordinated Climate and Health Response Team to address climate health and disaster risks in the community.

Recommended Actions

- Review membership in the COVID Coordinated Response Team and adjust list as necessary to include additional relevant entities for climate and health.
- Create a mission and goals statement and a communications plan.
- Supply information for separate effort for Town public awareness outreach efforts.
- Coordinate with regional and state entities with similar mission/goals.
- Train Emergency Management personnel and others to ensure Town is ready for response in times of climate emergencies.
- Ensure that emergency responder training includes familiarity with types of illnesses that might present from rising temperatures, including heat exhaustion, cardio-vascular and pulmonary stressors, and "new to Maine" vector-borne diseases preparation for patient surges during extreme events and the likelihood for increases in violence during extended heatwaves.
- Create and adopt policies as necessary.

Goal 7.2
Ensure public awareness of climate-related illnesses and health impacts.

Recommended Actions

- Work with Coordinated Climate and Health Response Team to determine important information to convey to public.
- Recognize potential language and cultural barriers in vulnerable populations to ensure messaging is accessible and relevant
- Partner with existing networks to reach vulnerable populations and solicit input on challenges and barriers that they experience, as well as input on potential solutions
- Identify state and local sources for information on anticipated changes to seasonal conditions in temperature and precipitation.
- Conduct a "best practices" review of other town actions to prepare for heat events level (towns with York population +/- 25%).
- Identify audiences and sub-groups for special information (vulnerable populations, seasonal workers, seasonal residents, etc.).
- Develop user-friendly graphics and information for dissemination.
- Convey information about emergency management activities and climate information in many different formats, and in multiple languages as appropriate for different communities to ensure equitable distribution.
- Create a streamlined information and communication system to allow Town to get timely information from sources. Use newsletters, social media, partnerships with major employers and nonprofits, etc., to target various audiences.
- Create a working group of local tourism organizations, businesses, nonprofits, and health organizations to assist in disseminating information in a timely manner.
- Educate the local community and businesses on availability of air quality phone Apps and sources for other climate-related health notices and updates.
- Develop an ongoing check-in to catalogue state and local funding sources for this effort.

Goal 7.3
Establish a town business sustainability award or recognition program.

Recommended Actions

- Allocate adequate budget for sufficient incentives.
- Create or support administrative structure for judging and administration.

Leadership and Capacity 8

Creating clear leadership with professional capacity is critical to ensuring that the CAP doesn't simply remain a set of ideas. The Town of York would only be responsible for a portion of the actions necessary to implement and achieve the goals of this plan. Many other local, state, and non-profit entities will need to be involved in moving this plan from paper to action.

Goal 8.1
Ensure sufficient Town capacity to take action.

Recommended Actions

- Assess capacity needed to take action on CAP recommendations.
- Evaluate Town staff availability, roles of nonprofit, for-profit, and other public entities in sharing implementation tasks.
- Allocate funding for Town staffing and other resources (space, equipment, etc.) or for support of other entities as necessary.
- Create protocols for collecting data throughout the year to calculate annual GHG emissions changes and complete required reporting as well as a "report card" on CAP implementation.

Goal 8.2
Incorporate considerations of climate risks in municipal decision making.

Recommended Actions

- Add a step to capital planning processes certifying that future climate risks have been carefully considered.
- Adopt a policy that all municipal development projects will utilize LID techniques and employ "climate design adjustments" to account for sea level rise and storm surge, extreme precipitation, and extreme heat.
- Adopt engineering practices that enhance and protect key infrastructure, using techniques such as vegetated berms, flood barriers, and elevated roadways.
- Develop a post disaster contingency plan to "build back safer and smarter" that increases resilience and reduces risk.

Goal 8.3
Lead by example in all new and existing municipal buildings and relevant infrastructure projects.

Recommended Actions

- Strengthen the energy efficiency standards for all buildings that use public funds.
- Buy-in by local government.
- Improved cost-effectiveness of high-efficient HVAC and lighting equipment/systems and building materials.
- Incorporate cooling locations in public locations and as part of public facilities improvements.

Goal 8.4
Educate local communities and businesses on climate change and the CAP.

Recommended Actions

- Create a centralized committee or compensated position with responsibility for developing information, programs and materials to educate various audiences within York.

Key Findings and Priorities

- This CAP comes at a timely moment. Federal and state funding, as well as technical assistance and programs are all coming on line. York will need to be ready to take advantage of these opportunities.
- Collaboration will be key to success. Many existing groups, committees, and organizations in the town, region, and across the state have the potential to contribute to York's CAP activities.
- Implementation of this CAP will take capacity and collaboration. Capacity, in the form of people and resources, is needed to coordinate actions, identify and pursue funding and financing opportunities, and to assess and report on the implementation of the CAP.

Priorities to Protect York from Climate Change Impacts and Meet GHG Emissions Reduction Commitments

Key Goals for Preparation and Protection

Preparation and protection efforts should be focused where the town is the most vulnerable:

1. The Town's tax base and property values are vulnerable to sea level rise and flooding. Considerations of infrastructure enhancements to protect assets from sea level rise or adapt structures should be a high priority. **(Goal 2.1)**
2. York's transportation system is particularly prone to impacts from flooding. There is the possibility that entire neighborhoods and sections of town could be stranded for extended periods of time. Take steps to protect critical assets and other structures that will be impacted. **(Goal 2.1)**
3. York could experience a multiday heat crisis or prolonged power outage during the summer. Older adults are particularly prone to heat-related illnesses. Create a Coordinated Climate and Health Response Team to address climate health and disaster risks in the community. **(Goals 7.1 – 7.2)**
4. Natural resources will be key to York's climate success – both in terms of continuing to store carbon as well as providing areas for absorption of excess stormwater, migration of the beaches and marshes, maintaining water quality and resources, and continuing to provide habitat for native species of plants and animals. Where feasible, permanently conserve these resources for climate resilience. **(Goals 4.1 – 4.3)**

Key Goals for GHG Emissions Reduction

The majority of GHG emissions in York are tied to buildings and transportation.

1. Substantially reduce the overall emissions from the building sector over the next eight years. **(Goals 1.1 – 1.4)**
2. Promote electric vehicles and facilitate charging infrastructure, as well as other policies to reduce vehicle miles traveled. **(Goals 5.1 – 5.5)**

Interim Implementation Committee and Moving Forward

Success in achieving the 25 goals of this report and making early headway on priorities will depend on proactive leadership with authority, accountability, and adequate funding. An entity external to Town government will be necessary to:

- Oversee the implementation of the recommendations.
- Coordinate the various stakeholder actions.
- Monitor success.
- Provide public education and communications services.

The Highest Immediate Priority for the Town is to Form an Interim Implementation Committee.

There are a number of ways an Interim Implementation Committee (IIC) entity could be established and organized. Once the CAP is approved by the voters an IIC should be chartered by the Selectboard to identify the ideal entity to implement the CAP and return with a recommendation as to the nature of that entity, no later than the end of the year, 2022.

Endnotes

1 Global Covenant of Mayors for Climate and Energy, Commitment of Town of York, Maine, signed 7/29/19 by Steve Burns, Town Manager.
2 Slovinsky (2020, unpublished). Maine Climate Council Scientific and Technical Subcommittee, Scientific Assessment of Climate Change and Its Effects in Maine, 131
3 rbouvier Consulting, Economic Analysis of SLR: Kennebunk, Wells, and York, 2020, 20.
4 https://maps.coastalresilience.org/maine/
5 Maines-Climate-Future-2020-Update-3.pdf (umaine.edu)
6 2019 five-year American Community Survey.
7 One Climate Future 2020 Update

Photo Credit: Geneve Hoffman (16 Hoops Photography) and Williams Realty Partners

Success in achieving the 25 goals of this plan and making early headway on priorities will depend on proactive leadership with authority, accountability, and adequate capacity.

Photo Credit: Dan Gardoqui

section 1

About this Plan

This section gives a summary of the plan's purpose and offers an overview of the planning process. It explains the difference between this plan's two areas of focus, mitigation and adaptation, and provides background information for the overall methodology. Lastly, this section includes a short description of each subsequent section and some suggestions on how to use this plan.

Highlighted words *are defined at the end of this section in "Terms to Know." A full glossary of all "Terms to Know" can be found at the end of this plan on page 171.*

What is the CAP's Purpose?

This Climate Action Plan (CAP) addresses two key questions:

1. *What can be done to protect York from the impacts of **Climate Change**? This includes protecting people, the natural environment, buildings, infrastructure, and the economy. This is known as "adaptation."*
2. *How can York (Town government, residents, businesses, visitors) reduce greenhouse gas emissions to minimize the town's contributions to climate change? This is known as "mitigation."*

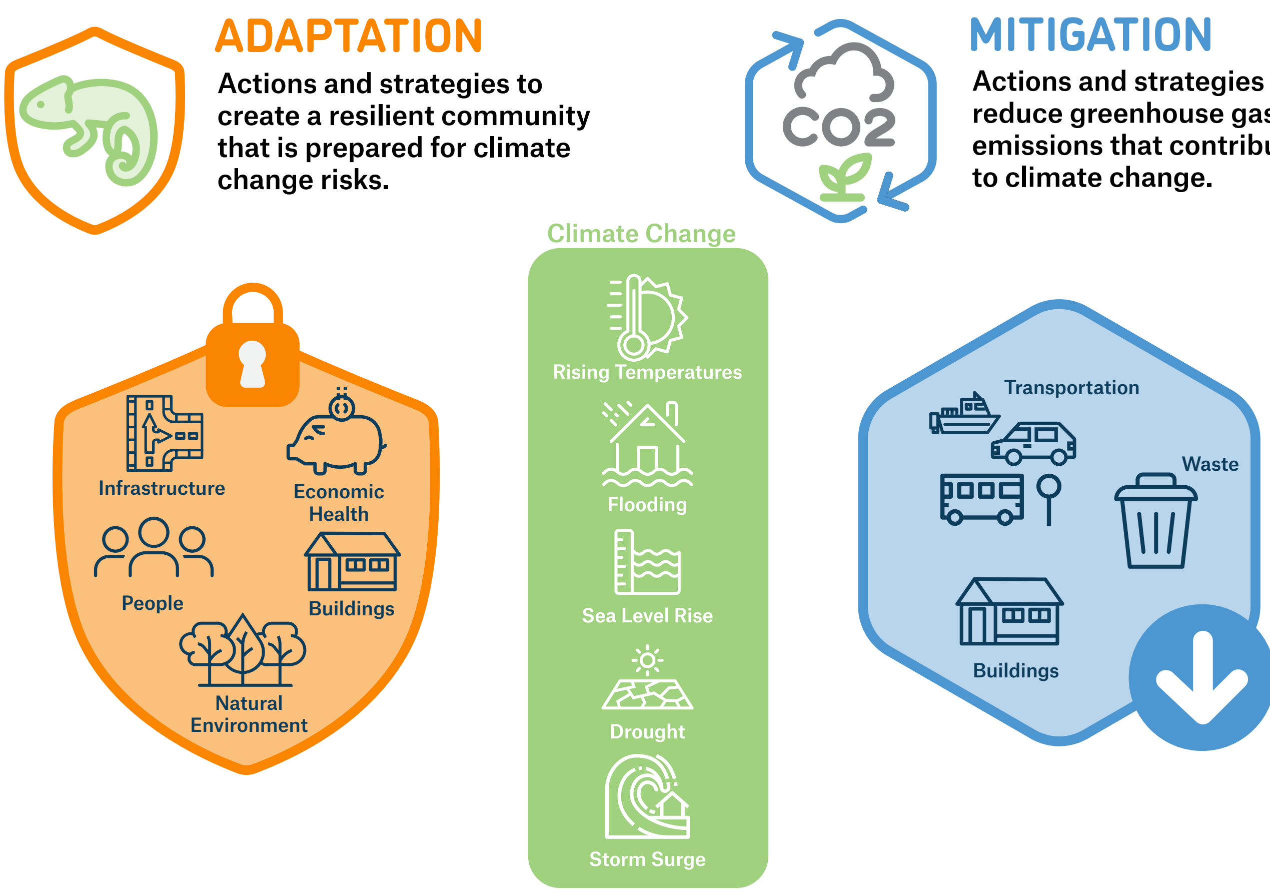
Here's a bit more about each...

Adaptation

Looks at strategies to address the physical impacts of climate change in York. The focus is on protecting buildings, **infrastructure**, the natural environment, people, and the economic health of York and increasing the town's resilience in the face of climate change. The physical impacts of climate change are caused by **sea level rise (SLR)**, **storm surge**, increased temperatures, drought, and inland precipitation-based flooding, and their potential fiscal impact is quantified where possible.

Mitigation

Focuses on reducing **greenhouse gas (GHG)** emissions in York. Emissions sources include buildings, transportation, and **waste**. GHGs are released into the atmosphere from the burning of fossil fuels to create energy. The goals for mitigation and this plan's approach are set by the York Selectboard 2019 commitment to the **Global Covenant of Mayors (GCoM)** to reduce 2010 **GHG emissions** by 50% by 2030 and by 100% (**carbon-neutral**) by 2050.



Goals for this Plan

Within the context of mitigating GHG emissions and adapting to climate change, specific goals for this plan include:

- Conduct a baseline assessment of GHG emissions and sources
- Provide a climate change vulnerability assessment
- Develop goals and actions to meet York's GHG emissions reduction goals
- Develop goals and actions to reduces risks and adapt to effects of climate change
- Ensure recommended actions consider the needs of all members of the community
- Identify links to existing or planned state, regional and Federal policies and financing/ funding opportunities
- Define **Key Performance Indicator (KPI)** metrics for measuring progress
- Mobilize community engagement in and collective ownership of implementation of the CAP
- Recommend means by which the Town and community implements the plan and a methodology to measure its progress.

Meeting Standardized Measurement and Reporting Requirements

York must follow standardized and transparent reporting requirements for its GHG emissions, as defined by the GCoM. The inventory presented in this plan complies with the GCoM requirements and, to ensure that it is standardized and replicable, it is supplemented with other data. The inventory in Section 5 uses a publicly accessible database and all methodology is outlined in Appendix B.

What this Plan Will (and Won't) Do

This CAP is a set of recommendations and goals to guide the decision making of the Town of York and the broader community in the coming years. The CAP Steering Committee and Working Groups led a planning process that produced this plan. The CAP provides information and guidance to assist the Selectboard and residents of the town to build resilience toward the effects of climate change in the coming years as well as fulfilling Town emission reduction commitments (reduce community greenhouse gas emissions 50% by 2030 and 100% by 2050, from 2010 levels).

While this plan is meant to serve as a valuable guide for setting Town policies and making financial decisions, as well as identifying where funding and partnerships might be obtained, nothing can happen without actions by the Selectboard, the voters, and other interested community groups. In addition, as noted in sections 7 and 8, there will be multiple roles by many parties. The Town cannot have sole responsibility for implementing many of these recommendations. CAP implementation will be a collaborative effort involving and perhaps creating other entities to partner in this effort.

At the same time, by nature of its position, the Town...the Selectboard and voters...are the key to moving forward with CAP implementation. Town and voter/resident engagement will be essential to ensuring effectiveness of the overall plan and will help inform ongoing discussions, weighing of options, and ultimately make decisions improving the town's resilience to climate change and reducing its emissions.

Let the work begin!

The Planning Process

Project Leadership and Volunteers

This CAP was developed under the purview of the York Planning Board, through a planning process that started with the hiring of the consultant team and the formation of the CAP Steering Committee, Working Groups, and Subcommittees.

The Steering Committee, led by two co-chairs representing the Planning Board and **Energy Steering Committee (ESC)**, oversaw the consultant team's work and facilitated the work of the Working Groups and Subcommittees. The Steering Committee and Working Groups, as well as special Subcommittees, were all volunteers, comprised of a broad range of stakeholders. These stakeholders brought varied expertises and represented different personal, professional, and geographic backgrounds within the York community. The Steering Committee also included two Selectboard members.

Working Groups

The Working Groups performed the core of the volunteer work around crafting goals and strategies for the plan. Six groups were formed, each led by a Steering Committee member, in the following topic areas:

- Buildings
- Transportation
- Infrastructure
- Natural Resources
- Food, Waste & Recycling
- Resilience, Health & Emergency Management

See more about the Working Groups and their process later in this section.

Communications and Outreach Team

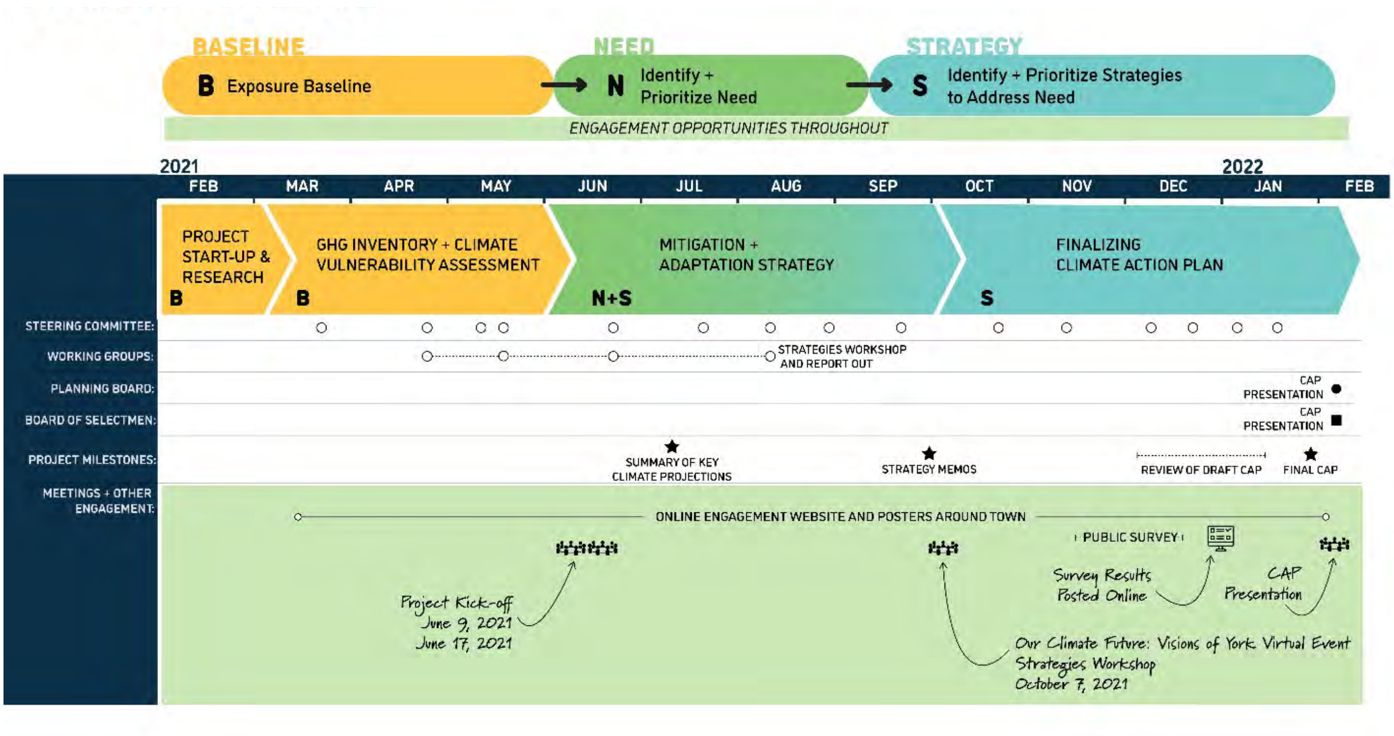
The consultant worked with the Communications and Outreach Team to craft an overall communications and outreach strategy for the plan. This work included outlining outreach strategies and specifics regarding target audiences, creating a menu of possible engagement opportunities, and compiling contact lists for communications. The team was responsible for outreach logistics, such as posting flyers and educating community members about opportunities to get involved. to events. Team members also wrote articles and opinion pieces and participated in interviews for social media and local news outlets.

Equity Subcommittee

Emphasis on equity is threaded throughout the CAP and was a priority of the planning process. The Equity Subcommittee was responsible for reviewing all materials, ensuring an equity lens was used when evaluating goals and strategies, and for providing input on implementation strategies and challenges to ensure that the plan addresses the needs of all members of the York community.

NOTE: "Town" is capitalized in this plan when it refers to Town government.

Project Process and Timeline

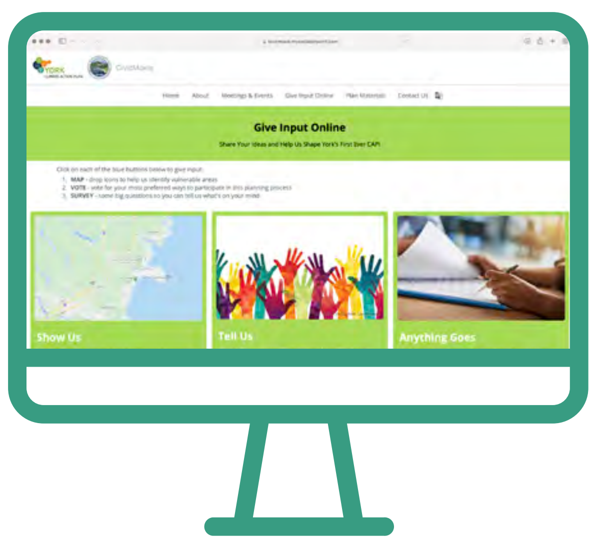


Community Outreach and Engagement

A community outreach and communications plan was developed to guide community engagement over the course of the project and the project website, offering opportunities for online engagement, was launched.

Outreach and engagement faced unique challenges due to the presence of the COVID-19 pandemic and its restrictions throughout plan development. While there were in-person activities, including the plan launch public meeting in June 2021, many meetings were virtual, over online platforms such as Zoom. In every instance, however, meetings of the Working Groups and the Steering Committee were prior noticed and open to the public for participation.

Details about engagement activities and feedback received can be found in Section 6: Engaging the York Community.



The project website provided an archive of all planning materials and offered numerous ways for the public to offer feedback.

Determining Goals and Strategies – The Working Groups

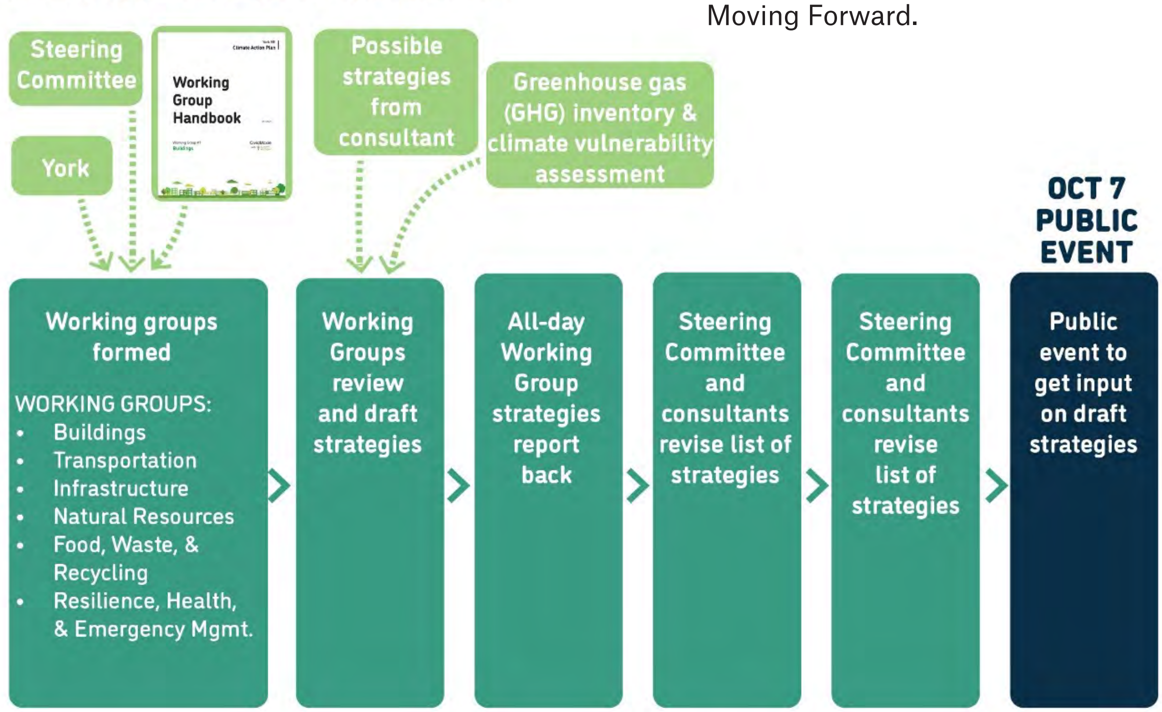
The CAP Working Groups were set up and charged with exploring potential strategies to reduce GHG emissions in York and to assist the Town in adapting to climate change. Each Working Group was provided with an individual Handbook for its topic area with their overall charge, background information, references, and information to help guide meetings. The Handbook included considerations of recently added chapters to York's current Comprehensive Plan, references to Maine's State Climate Action Plan, and the expertise of the consultant. The consultant also provided the Working Groups with preliminary results from York's GHG emissions inventory and an assessment of the town's vulnerability to climate change. A series of kick-off meetings were used to guide the Working Groups with an overview of potential strategies for their topic areas. Over the course of almost two months, the Working Groups met and discussed and refined appropriate strategies to fit the needs and culture of York. At an all-day public report-out session in early August 2021, each Working Group presented their top five strategies with background information on their choices (see Appendix D for these presentations). This was followed by a public joint meeting of all Working Groups and the Steering Committee that same evening to summarize and analyze the top strategies presented.

In addition to the recommended priority strategies and actions, the overall themes that emerged from the working groups were:

1. Education and messaging to the community are important.
2. The plan should be aligned with Maine's State Climate Action Plan and with federal climate action and initiatives.
3. This plan should identify actions that empower individuals to make changes.
4. The plan should build in transparency for future reporting and progress on the plan to make it easily accessible for everyone.
5. The Town of York should lead by example in all decisions, policies, and investments.
6. The CAP does not need to reinvent the wheel but still be cutting edge. Look at best practices and for those that apply, modify them to be manageable and effective in York.
7. Consider how CAP research and recommendations can inform the Town's Comprehensive Plan.
8. Partnering is essential and will be critical to success in implementation. The Town can't (and shouldn't) do it alone.
9. Many actions for mitigation and adaptation provide multiple sustainability benefits (e.g., ecosystem services, wildlife habitat, clean water and air, open space/recreation, long-term cost savings and improved health and safety)

These themes are woven into the CAP's recommendations and insights offered in Section 8: Moving Forward.

Working Group Process



Following the August Working Group report-out, the Steering Committee and consultant team merged and organized the recommended strategies into goals and actions to meet desired mitigation and adaptation outcomes. Eight focus areas emerged:

1. Buildings
2. Infrastructure
3. Mobility
4. Access to Renewable Energy
5. Natural Resources
6. Waste and Recycling
7. Community Resiliency and Equity
8. Leadership and Capacity

These goals and actions were reviewed and revised by Steering Committee and Working Group members throughout the fall of 2021. The final products of this effort are shown in Section 7: Goals and Actions.

Equity

The American Planning Association defines social equity as: "The expansion of opportunities for betterment that are available to those communities most in need, creating more choices for those who have few." An overall commitment to equity, as requested by the Selectboard, is reflected in both the planning processes and the report recommendations. In addition, considerations for equity are incorporated into the implementation matrix found in Section 8 to guide future actions.

A commitment to equity in the CAP is a commitment to fair inclusion of all in York who will be affected by either climate change or as the result of the goals and actions in this plan being implemented. The plan's considerations of equitable processes, outcomes, and impacts recognize that not every York resident, worker, and property owner is similarly situated financially, socially, and/or geographically. This plan must mitigate the potential for disproportionate harm or lack of choices faced by certain people in town who have fewer resources and therefore, may have a smaller voice in civic affairs. This commitment is consistent with York's culture of a caring community.

The plan uses the term "marginalized populations" to describe those people who may be disproportionately at a disadvantage from climate change impacts. Marginalized populations include those experiencing low to moderate household income, low literacy, limited connectivity (physically or digitally), disability, lower educational attainment, and those who are elderly, very young, first-generation U.S. citizens, people of color, or living in a household with no adult English speakers.

Social Equity:
The expansion of opportunities for betterment that are available to those communities most in need, creating more choices for those who have few.

What's in this Plan and How to Use It

The CAP is designed to be accessible for anyone, regardless of their familiarity with broad topic of climate change. When a technical or scientific word appears for the first time in the plan, it is highlighted and the definition is included at the end of the section in "Terms to Know." At the end of the plan, on page 174 a complete list of all "Terms to Know" is provided, along with a list of all abbreviations used in this CAP.

Based on the type of information you are looking for, there are four different ways you can read the CAP:

I want key takeaways

Read the Summary at the beginning of this plan, which is also available as a separate document.

I want to know recommended actions and next steps

Read section 8 for a road map of all recommended goals and actions to hit the ground running.

I want to dig into the background data and information that went into the CAP

The appendices at the end of the CAP provide in-depth information on the GHG Inventory and Vulnerability Assessment, methodologies, mapping, and the extensive work and documents of the Working Groups as they identified priority goals and actions.

I want an understanding of the entire CAP process and outcomes

Read sections 1 through 8, the main body of the CAP.

Section-by-section Overview:

Summary
The Summary contains the highlights of the plan, a five minute "elevator pitch" of what's important to know. It is written to be a standalone document.

1 About this Plan
This section (which you are reading right now!) offers information on the entire planning process, how York citizens have been involved and offered feedback, and tips on how to use the plan.

2 Why Climate Change Matters
A big picture summary of climate change - what has occurred in the last century and what measures need to be taken - is provided, and information on the most recent global actions and call for urgency is offered.

3 York and Climate Action: Setting the Context
An overview of how York residents have been working on climate action and Town commitments and goals. Local context is also offered here.

4 How York is Affected by Climate Change: Vulnerability Assessment
The assessment of York's vulnerability to climate change is here. How are critical aspects of the community (infrastructure, public health and community resources, etc.), people, natural resources, and economy impacted by sea level rise, increasing temperatures, changing precipitation patterns, and drought? This section provides the answers in summary while Appendix A provides the full methodology and assessment for climate vulnerability for those who want to dig into the data.

5 York's Contribution to Climate Change: GHG Inventory
The GHG inventory for York describes how the Town government, residents, businesses, and visitors contribute to climate change. This section provides an overview of where GHG emissions come from and how this knowledge can be used to develop emissions reductions strategies that fit York.

6 Engaging the York Community
This section summarizes feedback from the York community during the planning process. Residents, business owners, community organizations, those who work in the town, and property owners are all part of the community and had opportunities through a variety of methods to hear about the plan and offer their thoughts. An overview of outreach opportunities, information on who participated, and what the community said is provided here.

7 Goals and Actions
This section offers recommended goals and specific actions for reducing GHG emissions and building resilience to climate change. Goals and actions are organized by the eight focus areas that emerged from the top strategies provided by the CAP Working Groups. The section includes an overview of what achieving emissions reductions and climate resilience means for York, a summary chart of goals and actions, and more detailed information about each of the goals.

8 Moving Forward
This section provides a roadmap for the Town's government and the York community to meet its climate goals. Included in this section is a master grid of goals with recommendations on roles, an assessment on impacts, as well as links to other town initiatives, including financing and funding information.

Abbreviations used in this Plan
A list of acronyms and abbreviations used in this plan, along with their corresponding definitions.

Glossary of Terms to Know
A list of climate action terms is provided here. When a term is used for the first time in the plan, the definition is provided as a call out in the text.

Appendices
The appendices contain all the background information for those who want to dive in... detailed methodologies for the GHG inventory and climate vulnerability assessment, maps, and the working group strategies, including documents and report outs. Community survey results are also in this section.

Terms to Know

Carbon Neutrality/Carbon Neutral:
Achieving a net carbon footprint of zero, meaning carbon emitted is balanced or offset by carbon absorbed from the atmosphere.

Climate change:
A long-term shift in the average global and regional weather patterns.

Global Covenant of Mayors (GCoM):
A group of town and city leaders of the world (11,000 cities and local governments across 140 countries) committed to an aggressive and large-scale response to climate change that aims to meet and exceed the goals set out in the Paris Agreement.

Greenhouse gases (GHGs):
Gases (mainly water vapor, carbon dioxide, methane, ozone, nitrous oxide, and chlorofluorocarbons) in Earth's atmosphere that trap heat.

Greenhouse gas (GHG) emissions:
These emissions occur naturally and are also produced by human activities, primarily as emissions from the burning of fossil fuels. The more GHG in the atmosphere, the more heat that is trapped and the warmer the planet gets. The unprecedented and increasing rate of GHG emissions created from human activities in the last century is the main cause of climate change today.

Energy Steering Committee (ESC):
Formed by the York Selectboard in 2009 to advise the Board on matters of energy policy.

Infrastructure:
The system of fundamental facilities and structures that support an area (e.g. roads, public works buildings, power supplies).

Key Performance Indicators (KPIs):
A measurement that can be quantified that is used to evaluate performance or success.

Precipitation:
Water vapor that has condensed from clouds to fall either as rain, snow, or hail. Climate change can affect the intensity and frequency of precipitation.

Sea level Rise (SLR):
Increases in the height of the sea that can occur globally and locally. Global sea level rise can happen from the melting of land-based glaciers and ice sheets due to global warming. More local increases in the height of the sea can happen due to changes in water density, land collapse, upstream flood control, erosion, ocean currents, and variations in land height.

Storm surge:
Abnormal rise in seawater level during a storm. Caused primarily by wind pushing water onshore, the storm surge is the height of the water above the astronomical tide (usual tide level). Storm surge is determined primarily by strength and direction of the wind as well as the size, intensity and speed of the storm, along with other factors.

Waste:
Includes municipal solid waste (MSW) that is household and business trash collected curbside or in dumpsters by contractors, as well as construction waste, and wastewater treatment.

Photo Credit: Wayne Boardman

section 2 Why Climate Change Matters

Headlines about climate change permeate both the local and national news. What to make of all of this? This section provides an overview of climate change and the need for urgency as a foundation for this Climate Action Plan (CAP).

Highlighted words *are defined at the end of this section in "Terms to Know." A full glossary of all "Terms to Know" can be found at the end of this plan on page 171.*

What is Climate Change and Why does it Matter?

The climate of a place (a town, a state, a country, etc.) is the long-term average weather patterns of that place, over decades or more of observation. So, while weather can vary greatly from day-to-day and year-to-year, climate is naturally more stable. For example, York may experience some very hot weather days in the summer, but the town would still be considered to have a relatively mild summer climate because those very hot days are not the norm. For most of the earth's history, perceptible changes to climate have occurred over long periods of time, hundreds and thousands of years or more.

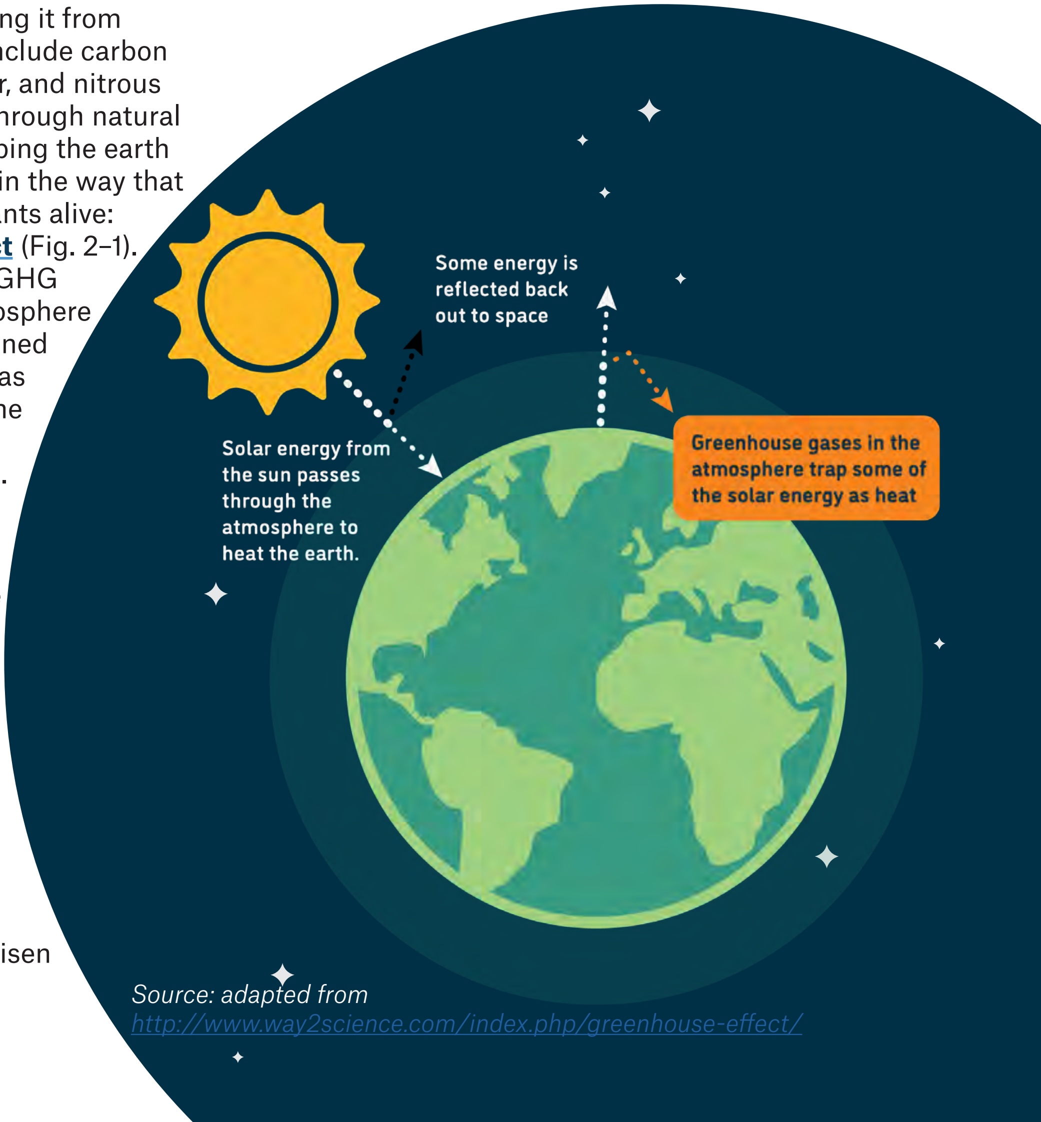
However, over the last century and a half, human activities have been causing the climate to change at global and local scales much faster than would naturally be expected. The primary driver of current climate change is greenhouse gas (GHG) emissions from burning **fossil fuels** like oil, coal, and natural gas to produce energy, though other activities like deforestation, industrial processes, and some agricultural practices also emit GHGs.[1]

GHG is an umbrella term for gases in our atmosphere that trap heat, preventing it from escaping into space. These gases include carbon dioxide (CO_2), methane, water vapor, and nitrous oxide, among others. GHGs occur through natural processes and are essential for keeping the earth warm enough to sustain life, much in the way that a greenhouse traps heat to keep plants alive: this is called the **Greenhouse Effect** (Fig. 2–1). Throughout earth's history, natural GHG levels and temperatures in the atmosphere have fluctuated gradually but remained in balance because the earth also has processes for taking GHGs out of the atmosphere that prevent rapid and catastrophic temperature increases.

The current rate at which humans are adding GHGs to the atmosphere is much faster than the earth can naturally remove them, leading to an increasingly higher amount of heat being trapped. CO_2 emitted by human activities is by far the most abundant GHG and the largest catalyst of climate change. Prior to the 1900s, CO_2 levels in the atmosphere had not risen above 300 parts per million (ppm) over the last 800,000 years, while in the last century they have risen

Photo Credit: Geneve Hoffman (16 Hoops Photography) and Williams Realty Partners

Fig. 1–1. The Greenhouse Effect

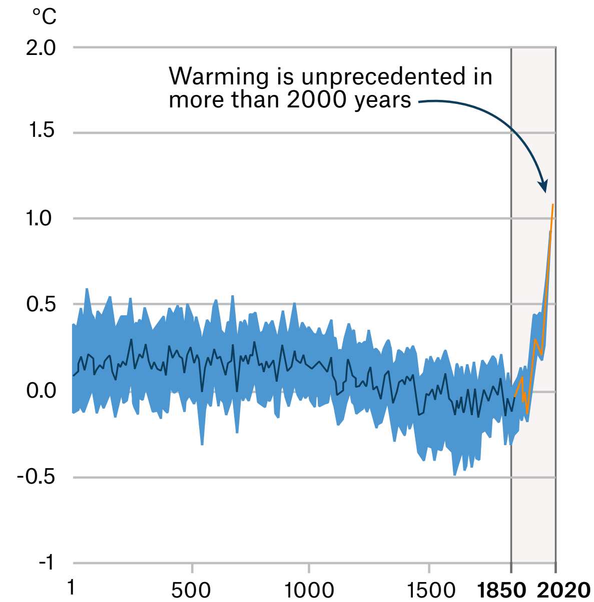


Source: adapted from http://www.way2science.com/index.php/greenhouse-effect/

to more than 412 ppm and continue to increase (Fig. 2–2 below). The increase in heat-trapping CO_2 and other GHGs in the atmosphere is spurring the climate trends being observed: increasing temperatures at both the global and local levels. Fig. 2–3 to the right illustrates the dramatic increase in global temperature since 1850, compared to any other time in the past 2000 years. Fig. 2–4 shows that rise in atmospheric CO_2 levels (orange line) has coincided with a rise in average annual global temperatures (blue bars) since 1960.

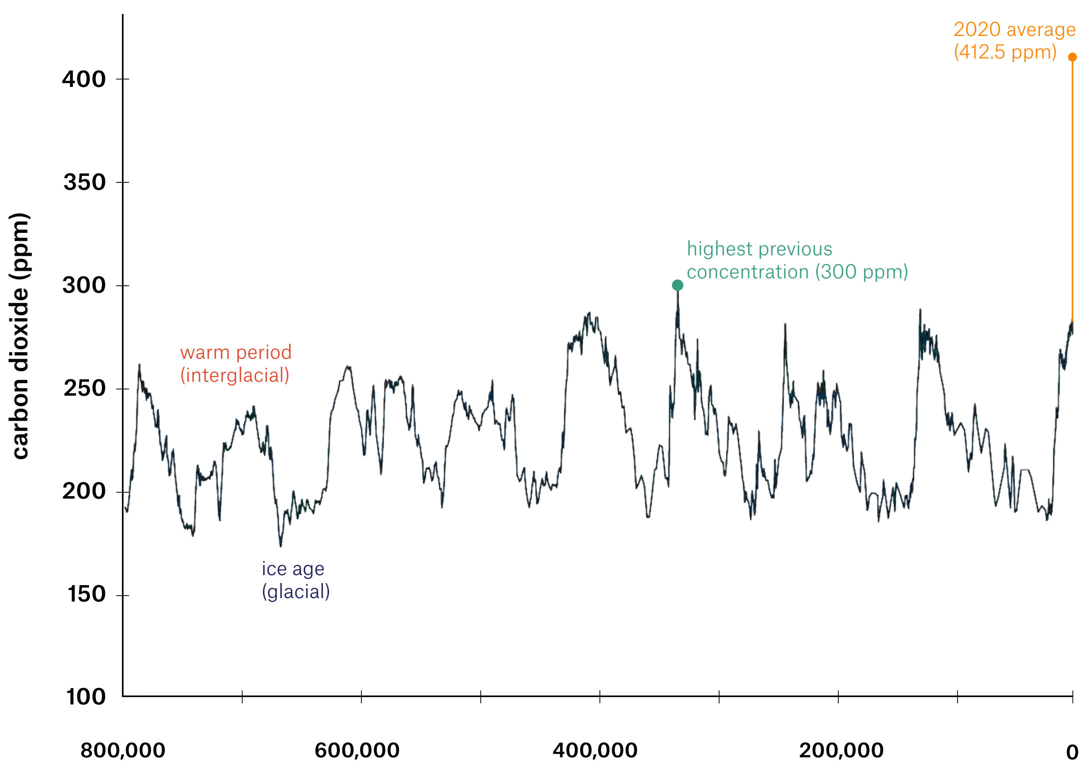
Small changes in climate can translate to large and potentially dangerous shifts in weather, including changes in rainfall that result in floods or droughts, more intense storms (hurricanes, tornadoes, Nor'easters, etc.), and severe heat waves. Oceans and glaciers are also experiencing big changes – oceans are warming and becoming more acidic, ice caps are melting, and sea levels are rising. As these and other changes become more pronounced, they will present greater challenges and threats for communities.[2] Left unaddressed, climate change will cause impacts that affect personal health and safety, as well as infrastructure, the natural environment, and the economy.

Fig. 1–3. Change in Global Surface Temperature Over the Past 2000 Years



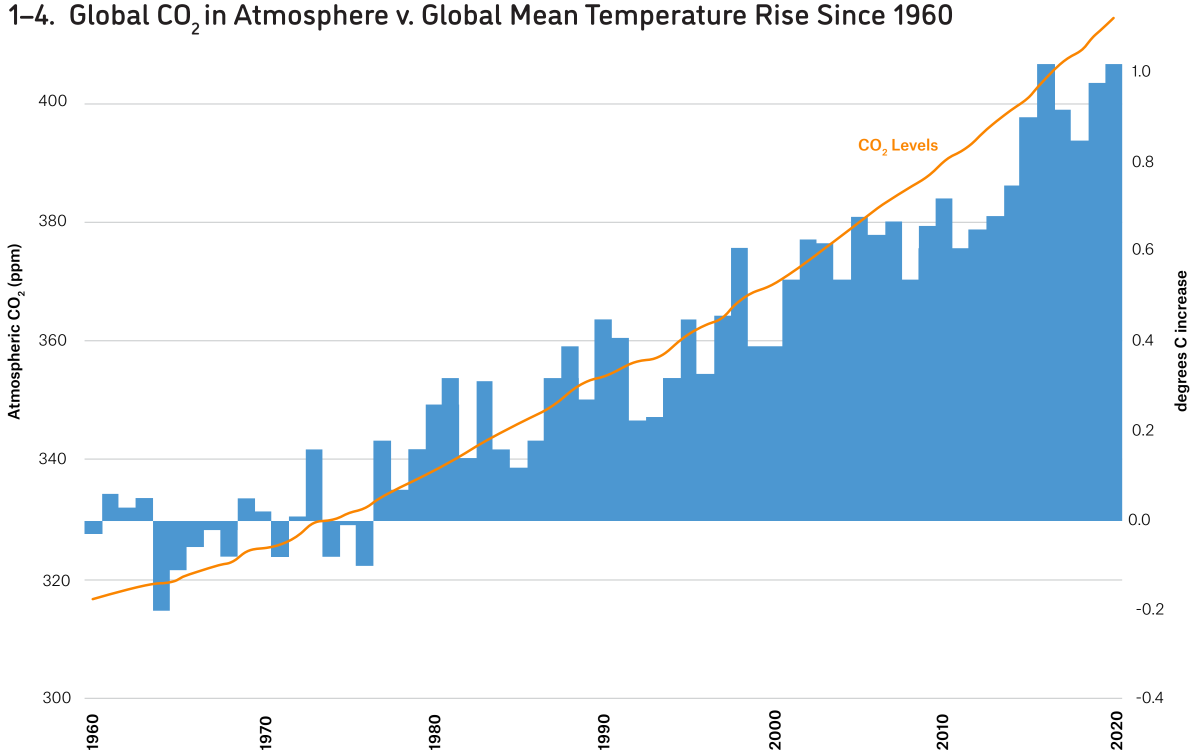
Changes in global surface temperature reconstructed from paleoclimate archives (solid navy line, years 1–2000) and from direct observations (solid orange line, 1850–2020), both relative to 1850–1900 and averaged over decades. The blue shading shows the very likely ranges for the temperature reconstructions.
Source: Adapted from https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_SPM_final.pdf

Fig. 1–2. Carbon Dioxide in the Atmosphere over the Last 800,000 Years



Source: Adapted from https://www.climate.gov/news-features/understanding-climate/climate-change-atmospheric-carbon-dioxide

Fig. 1–4. Global CO_2 in Atmosphere v. Global Mean Temperature Rise Since 1960



The rise in atmospheric CO_2 levels (shown in orange) has coincided with a rise in average annual global temperatures (shown in blue) since 1960 Source: NOAA. NASA.

A Matter of Urgency

Growing awareness of climate change and the need for action has prompted efforts at global and local levels to reduce GHG emissions (**mitigation**) and prepare for the physical impacts of climate change (**adaptation**). There is scientific consensus that climate change is occurring, and that the majority of that change is being driven by human activity.[3] There is also a consensus around the urgency to act, in meaningful and transformational ways.[4]

To put the urgency in context, the American Association for the Advancement of Science, the world's largest general scientific society, states the following about climate change:

> ***We face risks of abrupt, unpredictable, and potentially irreversible changes; and responding now will lower the risk and cost of taking action.***
>
> *Climate scientists agree: Climate change is happening here and now. From 1997 to 2012, 97% of climate related studies concluded that man was affecting climate; since 2012, 99.9% of climate studies came to the same conclusion, indicating scientific certainty.*[5]

> ***We are at risk of pushing our climate system toward abrupt, unpredictable, and potentially irreversible changes with highly damaging impacts.***
>
> *Earth's climate is on a path to warm beyond the range of what has been experienced over the past millions of years. The range of uncertainty for the warming along the current emissions path is wide enough to encompass massively disruptive consequences to societies and ecosystems. Disturbingly, scientists do not know how much warming is required to trigger such changes to the climate system.*
>
> ***The sooner we act, the lower the risk and cost. And there is much we can do.***
>
> *Waiting to take action will inevitably increase costs, escalate risk, and foreclose options to address the risk. The CO_2 we produce accumulates in Earth's atmosphere for decades, centuries, and longer. The effects of CO_2 emissions cannot be reversed from one generation to the next until there is a large-scale, cost-effective way to scrub CO_2 from the* atmosphere.[6]

IPCC 1.5 Report and 2021 Assessment

In August 2021, the **International Panel on Climate Change (IPCC)**, a conglomerate of the world's leading climate scientists, released its Sixth Assessment Report.[7] The First Assessment in 2018 **(IPCC 1.5 Report)** outlined the ways in which the world can achieve the 1.5 degrees Celsius (2.7 degrees Fahrenheit) goal that was established under the **Paris Agreement** (what is thought to be necessary to stabilize warming trends and avoid drastic and catastrophic impacts from climate change).

The 2021 Assessment Report offers harsh realities, including:

- Global surface temperature will continue to increase until at least the mid-century under all emissions scenarios considered. Global warming of 1.5 degrees Celsius and perhaps 2 degrees Celsius will be exceeded during the 21st century unless deep reductions in CO_2 and other GHG emissions occur in the coming decades.
- Many changes in the climate system become larger in direct relation to increasing global warming. Changes include increases in the frequency and intensity of hot extremes, **marine heatwaves**, and heavy **precipitation.** Other impacts are agricultural and ecological droughts in some regions, as well as reductions in Arctic sea ice, snow cover, and permafrost.
- Continued global warming is projected to further intensify the global **water cycle**, including its variability, global monsoon precipitation and the severity of wet and dry events.
- Under scenarios with increasing CO_2 emissions, the ocean and land carbon sinks are projected to be less effective at slowing the accumulation of CO_2 in the atmosphere.
- Many changes due to past and future GHG emissions are irreversible for centuries to millennia, especially changes in the ocean, ice sheets, and global sea level.

Everything you need to know about the Paris Climate Agreement

The Paris Climate Agreement is a significant international climate change accord that was created during the 21st United Nations Climate Change Conference (COP21). The agreement aimed to substantially reduce global GHG emissions in an effort to limit the global temperature increase in this century to 2 degrees Celsius above preindustrial levels, while pursuing the means to limit the increase to 1.5 degrees Celsius. Adopted in 2015 by the majority of the world's countries, the agreement requires all major GHG producing countries to reduce their GHG emissions and provides assistance to developing countries in their adaptation and mitigation strategies. With commitments from 197 countries to combat climate change, the agreement is recognized as a landmark climate accord. President Biden confirmed the United States' participation in this accord hours after taking office in January 2021.

Photo Credit: Bruce Boardman

COP26

The commitment laid out in the Paris Agreement during the **COP21** did not result in the level of commitment needed to limit global warming to the targeted increase of 1.5 degrees Celsius. The window for achieving this goal is closing, adding an ever-increasing urgency for action. In November 2021, world leaders convened in Glasgow, Scotland for the 26th Annual United Nations Conference on Climate Change (**COP26**) to take stock of progress toward achieving the goals set up in the Paris Agreement and detailed in the IPCC 1.5 Report.

The assessments and outcomes during COP26 underline, more than anything else, the urgency around addressing climate change and the importance of adopting adaptive measures to deal with the impacts of rising seas, increasing temperatures, changes in precipitation patterns, and increased drought. While progress was limited, countries collectively committed to halting and reversing forest loss, phasing out fossil fuel engines, and ending financing for fossil fuel industries, including coal mining, as well as the phasing down of coal use.

AT COP26, there was a call for countries to strengthen their 2030 targets by the end of 2022 in hopes of achieving Paris Agreement goals, and all countries were asked to submit 2050 goals if they had not already done so. Importantly, COP26 recognized the importance of both reducing GHG emissions and adapting and building resilience to impacts of climate change.[8]

York's Part

In the following pages, this CAP lays out York's part in reducing GHG emissions and the steps the Town should take to adapt to the impacts of climate change. Read on for a local picture of climate action, as well as context, at the state, regional, and town level.

Endnotes
1 Adapted from https://19january2017snapshot.epa.gov/climatechange/climate-change-basic-information_.html
2 Adapted from https://19january2017snapshot.epa.gov/climatechange/climate-change-basic-information_.html
3 https://climate.nasa.gov/scientific-consensus/
4 https://www.ipcc.ch/report/ar6/wg1/
5 https://iopscience.iop.org/article/10.1088/1748-9326/ac2966
6 https://whatweknow.aaas.org/get-the-facts/
7 https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_Headline_Statements.pdf
8 Adapted from https://www.wri.org/insights/cop26-key-outcomes-un-climate-talks-glasgow

There is overwhelming agreement that climate change is happening. The need for urgent action is also growing and this plan lays out a road map for York to act.

Photo Credit: Carrol Libby

Terms to Know

Adaptation:
Actions and strategies to address the physical impacts of climate change with a focus on protecting buildings, infrastructure, the natural environment, people, and economic health. Adaptation seeks to create resilient communities that successfully address climate change risks.

COP21:
The 21st United Nations Climate Change Conference held in Paris, France in November 2015. COP stands for "Conference of Parties" – referring to the countries that have committed to the United Nations Framework Convention on Climate Change (UNFCCC).

COP26:
The 26th United Nations Climate Change Conference held in Glasgow, Scotland in November 2021. COP stands for "Conference of Parties" – referring to the countries that have committed to the United Nations Framework Convention on Climate Change (UNFCCC).

Fossil fuels:
Fuel sources taken from underground deposits that contain hydrogen and carbon and can be burned for energy. The most common fossil fuels are oil, coal, and natural gas. They are known as fossil fuels because they are created from decomposing plants and animals. Burning fossil fuels creates GHGs that go into the atmosphere, with carbon dioxide being the most common.

Greenhouse Effect:
GHGs trap heat in the earth's atmosphere, preventing it from escaping into space, much in the same way that the glass in a greenhouse traps heat to keep plants alive. Increased GHGs act as insulation for our planet trapping more heat and causing temperatures to rise.

International Panel on Climate Change (IPCC):
The official United Nations body for assessing science related to climate change.

IPCC 1.5C and Sixth Assessment Reports:
The IPCC 1.5C Report was released in October of 2018, outlining ways in which the world can achieve the 1.5-degree Celsius (2.7 degrees F) goal that was established under the Paris Agreement. The IPCC Sixth Assessment Report is the sixth annual assessment of progress toward meeting goals and an update on climate change released in August 2021.

Mitigation:
Reduction of GHG emissions to slow impact of climate change. Emissions sources include buildings, transportation, and waste. The Goals for mitigation in York were set by the York Select Board in its 2019 commitment to the Global Covenant of Mayors to reduce GHG emissions from the town's base year of 2010 by 50% by 2030 and by 100% by 2050.

Marine heat wave:
Ocean temperatures that are hotter than normal.

Paris Agreement:

Pledge by 192 member countries of the United Nations Framework Convention on Climate Change (UNFCCC) to keep the global temperature limit well below 2 degrees Celsius (compared to pre-industrial levels), while pursuing efforts to limit the increase to 1.5 degrees Celsius.

Risk:
The potential for adverse consequences on adaptation and mitigation responses, lives and livelihoods, health and well-being, ecosystems, economic, social, and cultural assets, services, and infrastructure from a climate-related hazard.

Water Cycle:
The continuous movement of water across the globe, including the earth and the atmosphere. The cycle includes the entire system of liquid water evaporating, forming clouds, and then falling to earth as rain and snow precipitation. Also called the global water cycle.

Photo Credit: Geneve Hoffman (16 Hoops Photography) and Williams Realty Partners

section 3 York and Climate Action: Setting the Context

Many in York can point to instances when climate changes have directly impacted them. This section highlights commitments the Town has made toward reducing greenhouse gas (GHG) emissions, climate actions that have been taken by York residents to date, and how those actions will influence York's strategies moving forward. Information is also included on federal, state, and regional climate action planning. Details on York's history, population, and land use are also provided here to set the context for the Town's climate action planning.

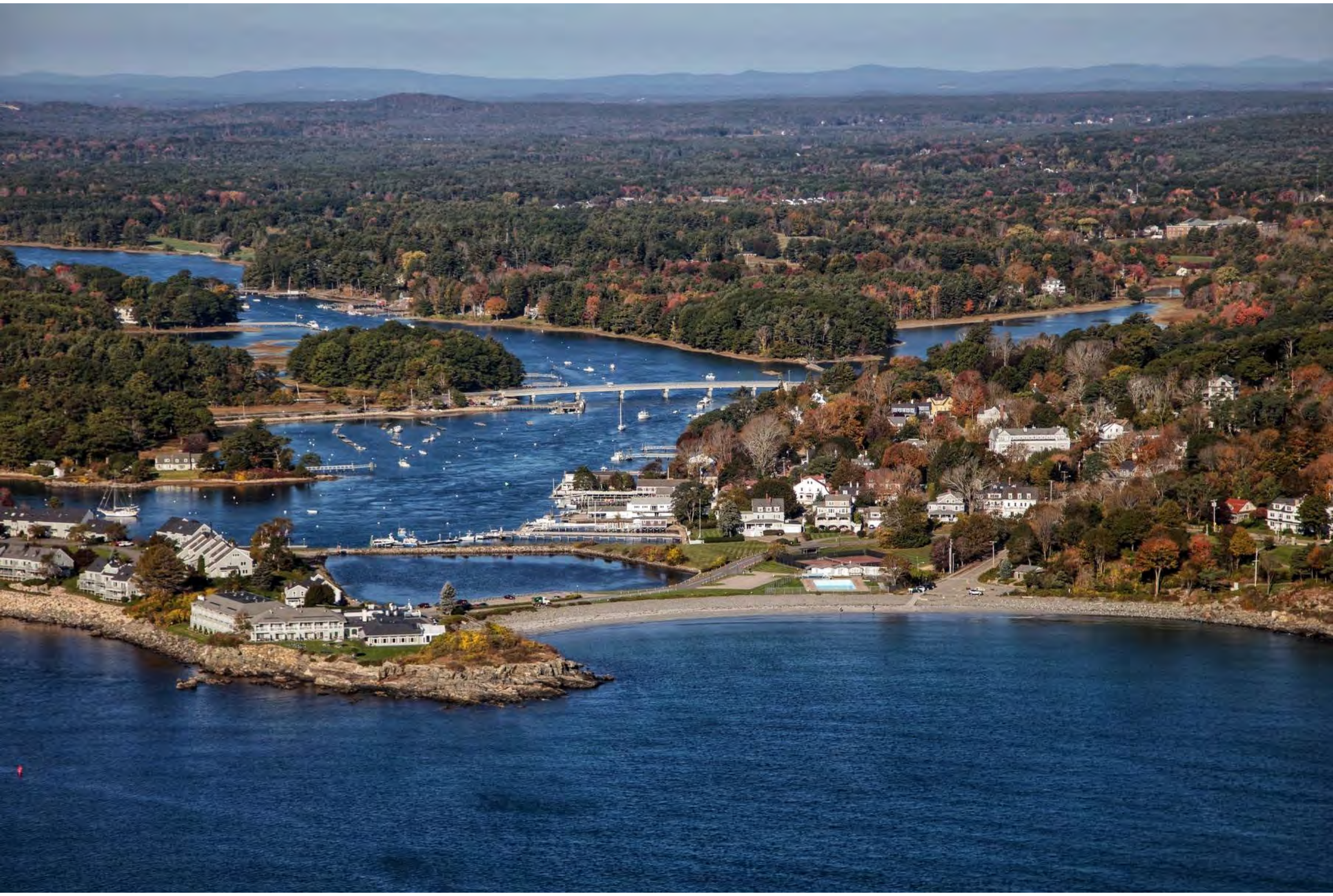
__Highlighted words__ are defined at the end of this section in "Terms to Know." A full glossary of all "Terms to Know" can be found at the end of this plan on page 171.

Climate Change in York

Climate change will have implications for York and throughout Maine. As a coastal community dependent on the natural environment, the beauty of its beaches, and its tourism economy, York has much to lose if the Town doesn't take action. The Southern Maine Planning and Development Commission (SMPDC) has been leading a Regional Sustainability and Resilience Program for six coastal Maine towns, including York, and has this to say about the urgency in planning for a **resilient** community:

> *Like most Maine coastal communities, municipal budgets within [York] are heavily dependent on revenue from local property taxes and coastal development provides a substantial portion of the municipal tax base, generating vital funds that sustain community operations, services, and programs. However, it is that same development that is most susceptible to coastal flooding, placing residents, visitors, and municipal fiscal health at risk. In addition, the coastal areas and resources, especially sandy beaches, that serve as the economic engine for towns, the region, and state are particularly vulnerable to storms and rising seas as increasing water levels lead to beach loss. Further compounding these threats is the fact that current municipal policies, land use regulations, and planning tools do not sufficiently account for existing or future risk associated with storm events and rising seas.*[1]

Photo Credit: Carol M Highsmith



York's Commitment to Climate Action

Climate action refers to efforts to reduce GHG emissions, increase resilience, and adapt to climate-related impacts. Climate action can include such things as adopting new policies to guide decision-making, building resilient infrastructure that withstands climate impacts such as rising sea levels and extreme heat, or changing investment and purchasing decisions to reduce GHG emissions from transportation, buildings, and our waste disposal. Climate action also includes education and technical assistance, financial incentives to encourage and support responsible actions, and a host of other actions meant to mitigate GHG emissions and adapt to climate impacts.

In 2019, the York Selectboard approved the York Energy Steering Committee's (ESC) recommendations to cut GHG emissions in York by 50% by 2030 and 100% by 2050. The Board also joined the Global Covenant of Mayors (GCoM) initiative[2] to address climate change at the local level, issuing the following statement:

> *Specifically, within three years of this commitment, we pledge to develop, adopt, use and regularly report on the following:*
>
> - *A community-scale GHG emission inventory, following the recommended guidance;*
> - *An assessment of climate risks and vulnerabilities;*
> - *Ambitious, measurable and time-bound target(s) to reduce/avoid GHG emissions;*
> - *Ambitious climate change adaptation vision and goals, based on quantified scientific evidence when possible, to increase local resilience to climate change;*
> - *An ambitious and just goal to improve access to secure, sustainable and affordable energy; and*
> - *A formally adopted plan(s) addressing climate change mitigation/low emission development, climate resilience and adaptation, and access to sustainable energy.*
>
> *The targets and action plans for mitigation/low emission development must be quantified and consistent with or exceed relevant national unconditional commitments defined through the **UNFCCC** (Intended) **Nationally Determined Contribution (NDC)**. The targets and action plans should be in line with National Adaptation Plans, where these exist; and should be consistent with the principles around energy access and urban sustainability embodied in the **Sustainable Development Goals (SDGs).***
>
> *We will explore the allocation of adequate staff resources and institutional arrangements. This includes governance processes, municipal structures and budget allocations to deliver on this commitment and secure continuity.*
>
> *We acknowledge that there may be additional regional- or country-specific commitments or requirements that we commit to follow, and that may be agreed through our city networks or through our direct engagement with local partners of GCoM.*
>
> *The Town of York, Maine acknowledges that continued engagement in GCoM and associated Regional or National Covenants, as established, is contingent on complying with the above requirements within established timeframes.*

This Climate Action Plan (CAP) is a direct response to this commitment. The CAP sets a roadmap for York's work to meet the Selectboard's commitments as part of the GCoM within the context of state and regional initiatives.

The Global Covenant of Mayors for Climate and Energy

In recognition of the fact that cities account for 70% of the world's GHG emissions, urban leaders of the world created the Global Covenant of Mayors for Climate and Energy to commit to an aggressive and large-scale response to climate change that aims to meet and exceed the goals set out in the Paris Agreement. The GCoM includes over 11,000 cities and local governments across 140 countries in six continents and addresses GHG emissions reduction targets and increasing availability of renewable energy. As a participant, the Town of York is held accountable for fulfilling its commitments through the measurement and reporting tools that are critical to the Covenant. The Town also has access to a network of sharing and best practice information.

A Recent History of Climate Action in York

Most initiatives in York thus far have focused on reducing energy consumption and GHG emissions, York will need to significantly expand its actions to adapt to climate change. With its miles of coastline, tourism economy, and abundant natural areas, the town is at significant risk from climate change.

2008
- York Selectboard signs the US Mayors' Climate Protection Agreement
- Citizens' committee York Energy Efficiency Committee is formed
- Voters approve a Green-Building ordinance developed by high-school students (applies Leadership in Energy and Environmental Design (LEED) standards to new Town buildings)

2009
- Selectboard creates the Energy Steering Committee

2010
- Energy Steering Committee led energy efficiency upgrades to municipal facilities, funded by voters.

2011
- Municipal energy efficiency/ renewable energy projects help reduce GHG emissions from municipal facilities/operations (not including vehicle fleet) by 18%

2012

2013
- Comprehensive Plan Sea Level Rise (SLR) chapter added (2013)

2014
- Creation of Keep York Warm weatherization program for low-income residents (with YCSA and Habitat for Humanity)

2015
- Town adopts Stormwater Chapter of the Comprehensive Plan

2016

2017
- Town adopts Bicycle and Pedestrian Master Plan as part of the Comp Plan
- Energy Steering Commitee develops, and voters approve, an energy chapter for York's Comprehensive Plan

2018
- First community-wide GHG inventory
- York Ready for 100% formed
- Opens Space Conservation Subdivision designs become a requirement for new subdivisions (2018)

2019
- Selectboard joins the Global Covenant of Mayors and commits to hiring a sustainability coordinator (2019) however the coordinator position is not approved by voters and goes unfilled.
- Selectboard commits to reducing GHG emissions by 50% by 2030 and 100% (carbon neutrality) by 2050

2020
- Town completes replacing streetlights with LEDs
- Town allocates funding for CAP to address it commitment to the Global Covenant of Mayors and to help the Town adapt to climate change impacts

2021
- Town Recycling Committee reestablished
- Town hires consultant and CAP planning commences

2022
- Completion of CAP

NOTE

Although the Energy Steering Committee completed a partial GHG inventory for York in 2018, this CAP work includes a town-wide inventory that meets the reporting requirements for the GCoM including the development of an inventory methodology that is standardized and replicable. The GHG emissions inventory contained in this plan employs an open-source database and documents the methodology and data sources used so that the Town or other collaborating entities can replicate the reporting process and track progress toward GHG emissions reductions over time.

Climate Action in Maine

In June of 2019, the Governor and Legislature created the Maine Climate Council, an assembly of scientists, industry leaders, bipartisan local and state officials, and engaged citizens to develop a four-year plan to put Maine on a trajectory to reduce emissions by 45% by 2030 and at least 80% by 2050. By Executive Order, the state must also achieve carbon neutrality by 2045. The Climate Council produced *Maine Won't Wait: A Four-Year Plan for Climate Action*, released in December 2020. York's efforts are in alignment with these state initiatives.

Maine Won't Wait also addresses key focus areas with respect to adaptation (preparing for the physical impacts of climate change). Some of these initiatives include protecting working lands and waters, adopting SLR projections, and investing in climate-ready infrastructure.

The Guiding Principles of the state's work include:

- Improve the resilience of Maine's communities, people, and industries to climate impacts
- Prioritize the welfare of Maine citizens—especially the most vulnerable communities
- Foster the value of the state's natural resources and natural resource industries
- Encourage diversity, inclusion and equity of all Maine communities and people
- Utilize the most recent scientific and technical information and measure progress

More about the *Maine Won't Wait* plan and state efforts can be found throughout this document, particularly in Section 8: Moving Forward.

Importance of Federal Actions

Climate actions implemented by the federal government can set regulations and create new funding opportunities that have implications for York. The Biden administration signaled a renewed commitment to federal climate action by re-signing the US onto the Paris Agreement in January 2021. A series of legislation, executive orders, and other federal actions in 2021, like the Infrastructure Investment and Jobs Act, are likely to support York's climate action efforts, especially if the Town is actively seeking and prepared to take advantage of new opportunities. Section 8 details recent federal actions and resources that are relevant to climate action in York and what the Town can do to make the most of them.

Why Local Action Matters

This plan is all about local actions. Yes, climate change is a global issue, but global actions alone will not make York more resilient to climate change. And how we live and work together in our community...the energy we use to heat and cool our buildings, the transportation methods we use, and the purchasing decisions we make...all contribute (or not) to GHG emissions. In addition, York is already experiencing impacts from climate change and must adapt to protect residents, its economic health, and that natural environment that contributes to the character and overall health of the town. The answer to our challenges then, is both local and global. The global and national focus on climate change drives government programs and assistance for communities like York. There are numerous funding and financing opportunities, programs, technical assistance initiatives and other opportunities that are available to protect against sea level rise (SLR), changes in precipitation, and rising temperatures, as well as to help communities reduce GHG emissions (see Section 8). Implementing the CAP will ensure that York is ready to take advantage of these opportunities.

York has an abundance of natural resources including forest land. The natural environment serves as a carbon sink...pulling GHG emissions from the atmosphere.

Local Context

York's History in Brief

York has a rich heritage, with the Native American Abenaki calling the York region home as early as 11,000 years ago. The Native American residents were displaced when European settlers took from them the land we know as York today. York's history of Euroamerican development began as a fishing village and as an early center of the lumber industry and was incorporated as York in 1652 when the Province of Maine was annexed by the Massachusetts Bay Colony. From 1641, York and its Charter played an important role in the larger community of the New England colonies. The town was a center of government and the economy and was relatively prosperous until the beginning of the nineteenth century when the American embargo along the Atlantic coast in 1807 stifled coastal trade and severely curtailed shipping from York. The forests at the headwaters of the York River had been cleared, and a heavy silt load was being dumped into the river. Trading in York never fully recovered. By the end of the War of 1812, the local economy had collapsed, and didn't begin to recover for many decades. During this same period, the county seat was pulled away to Alfred and York's prosperity and high regard among colonial communities declined.

York remained a small farming and fishing community until the post-Civil War period, when summer tourism began to broaden York's economy. During the late 1800s, as cities in the northeast industrialized and rail transportation made the York region more accessible to a larger segment of the population, tourism became a major industry and York became a fashionable summer resort by the early 1900s. Visitors to York appreciated the community's coastal location, its historic nature, and the beauty of both the coastal and riverine areas. York continues to this day to be a haven for summer tourists and the town has also evolved into a year-round community, with tourism remaining a key economic driver. Significant population growth began in York following World War II, and that growth continues to affect the Town today.

Demographics[3]

Understanding current year-round population characteristics as well as possible future trends is an important part of planning for climate change and the reduction of GHG emissions. In addition, tracking well-being indicators for the Town can help ensure that benefits are shared across the population while burdens are kept to a minimum, particularly for disadvantaged members of the community.

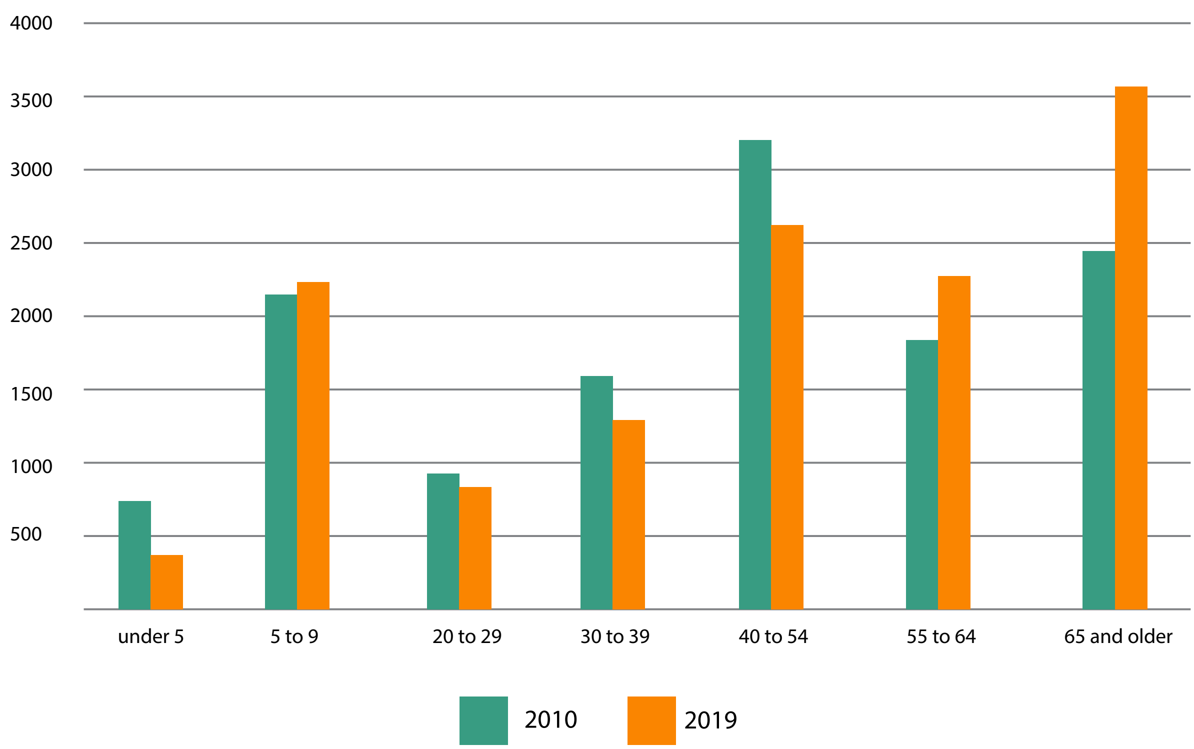
Current Town Population[4]

York has experienced a slow overall population growth over the past decade, growing from 12,720 residents[5] in 2010 to 13,070 in 2019, a 2.8% increase. This was a slower growth rate than York County's rate of 5.2% over this time, but faster than the State of Maine's rate of 1.2%.

York's growth over the past decade can largely be attributed to an influx of older residents, likely retirees or empty nesters, rather than to new families and children. From 2010 to 2019, median age in York increased from 46.5 to 56.3, much higher than the 2019 median ages for York County and Maine, which were 45.2 and 44.7, respectively. Population growth has been most pronounced among those aged 65 and older, and declines have been sharpest among adults aged 30 to 54 and children under 5 (Fig. 3–1).

The median household income in York grew from about $64,000 in 2010 to $93,333 in 2019, a 46% increase in less than 10 years. The town's 2019 median household income was substantially higher than for the county ($67,830) and state ($57,918). Even with a high median household income, a high percentage of renters in York in 2019 had "cost burdens" (44.9%), as did 22.9% of homeowners. The percentage of both renters and homeowners who are cost-burdened did decline between 2011 and 2019, (A household is considered "cost-burdened" when they spend 30% or more of their income on housing-related expenses). York is racially homogeneous, with 98.2% of residents estimated as White in 2019. This is slightly higher than the county and state.

Fig. 1–1. Population Change by Age in York, Maine, 2010-2019



Source: 2019 Five-Year American Community Survey

Table 1–1. Household and Resident Well-Being Indicators for York, York County, and Maine

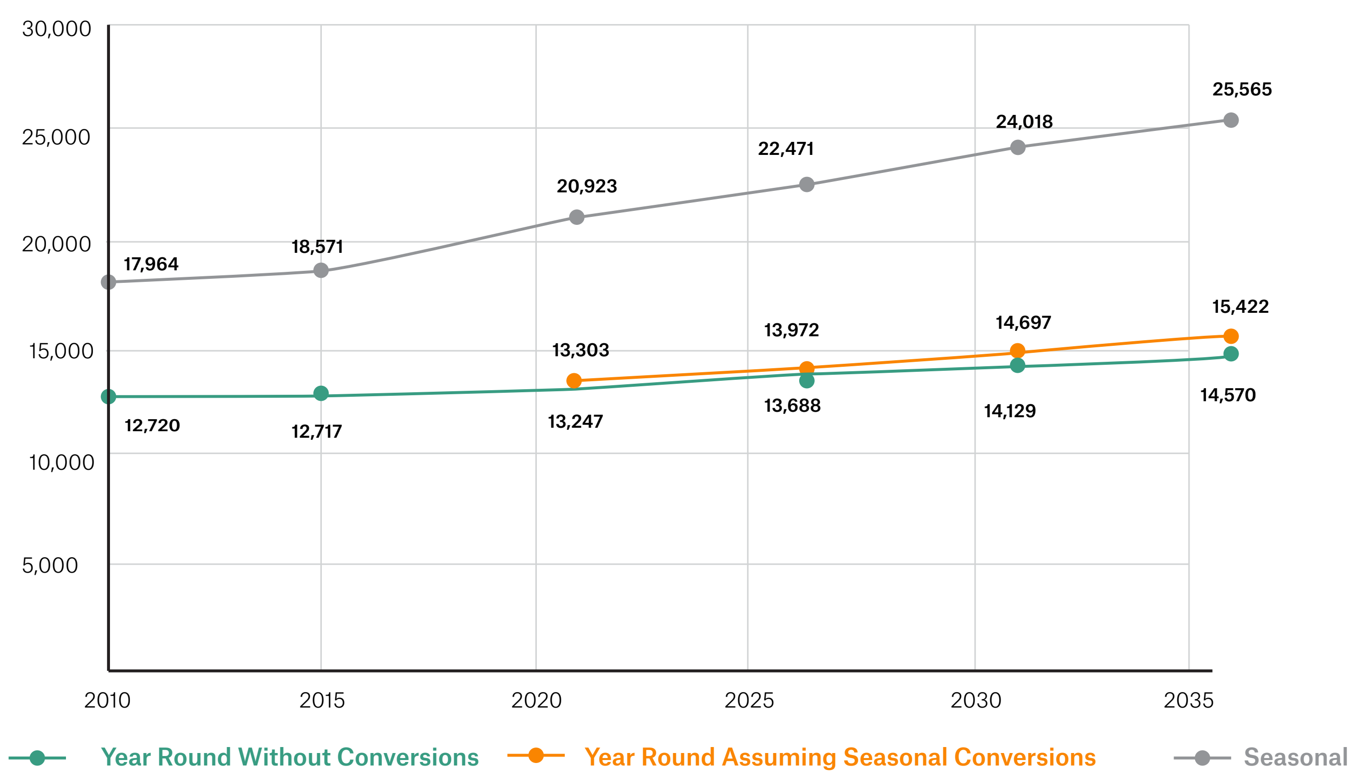
Indicator	York	York County	Maine
Median Age	52.2	45.2	44.7
Unemployment	2.5%	2.6%	2.6%
Median Household Income	$95,333	$67,830	$57,918
Poverty Rate—All Residents	4.1%	7.9%	10.9%
Under Age 18 Poverty Rate	4.6%	8.2%	15.1%
Age 65+ Poverty Rate	6.7%	6.7%	8.7%
Percent of Population 25+ with Bachelors Degree or Higher	52.2%	32.5%	31.8%
Self Employment Rate	6.3%	8.0%	8.4%
Employed in management, business, science, or arts occupations	49.4%	37.6%	40.1%

Source: 2019 Five-Year American Community Survey

Some well-being indicators (Table 3–1) are:

- In 2019, York's unemployment rate at 2.5% was similar to York County's (2.6%) and the state's (2.6%).
- Compared to the county and state, York's population is more educated and has lower rates of poverty. However, among all age groups, poverty rates are highest for those 65 and older, a growing proportion of the population.
- In 2020, nearly 50% of York's employed residents worked in Management, Business, Science, and Arts occupations, much higher than the rates for all of York County and Maine.[6]

Fig. 1–2. Year-Round Seasonal Population Trends and Projections for York (2010-2036)



Source: 2019 Five-Year American Community Survey and Levine Planning Strategies

Table 1–2. Current and Projected Year-Round Population of York by Age Cohort

	2015	2019	2031 (estimated)
5 to 14 years	1,361	1,391	1,514
15 to 17 years	382	634	1,558
15 to 44 years	3,561	3,577	3,762
16 years and over	10,886	11,069	12,052
18 years and over	10,593	10,660	11,243
60 years and over	4,095	4,646	6,672
65 years and over	2,760	3,543	6,364
75 years and over	1,183	1,375	2,072
Total Population	**12,717**	**13,070**	**14,697**
Median Age (years)	**50.3**	**52.2**	**56.0**

Source: 2019 Five-Year American Community Survey and Levine Planning Strategies

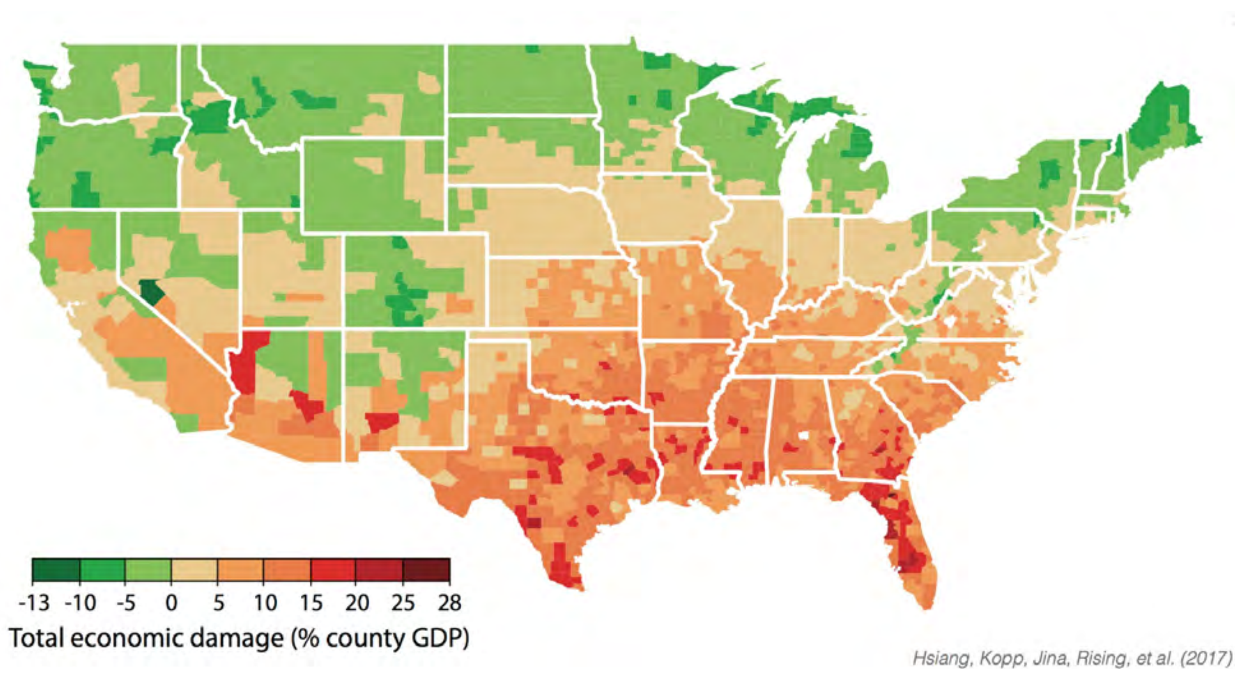
Future Population Trends & Potential Impacts

Making reasonable (but not definitive) assumptions about how a portion of seasonal homes may convert to year-round would mean that York's population would increase from approximately 13,972 in 2021 to 15,422 in 2031 as shown in the figure on the previous page (Fig. 3–2).

Projected town population by age group is shown in the table to the left. While all age groups will likely see an increase in numbers, the largest percentage increases will likely be in those age 60 and over (Table 3–2).

In addition, while difficult to quantify, migration into York due to climate change will certainly be a factor in changing demographics in the coming decades. While this possible in-migration should be considered because of shifting economic opportunity in the United States (Fig. 3–3), York's position as a coastal community and the potential changes to the natural environment and shoreline due to climate change may be a mitigating factor in what extent it experiences population growth from an influx of **climate refugees.**

Fig. 1–3. Potential Shifting Economic Opportunity Due to Climate Change



Land Use and the Natural Environment

The Town of York consists of approximately 55 square miles of land area, made up of 9,237 land parcels.[7] York's location on the coast, the attraction of its beaches and natural beauty for residents and visitors, and the large areas of natural area and forests west of I-95 are all factors in how the town adapts to climate change and mitigates GHG emissions.

According to 2020 Town Assessor's data, sorted by tax assessment land use categories, land area considered Residential is the largest land use category at approximately 39% of the town, and about 80% of the parcels.[8]

Undeveloped Land

While the Town Assessor's data indicates the use of property parcels throughout York, it doesn't tell us the actual percentage of parcels that are not developed; for a single-family home on a three-acre parcel, the entire parcel is considered a residential use even if the structure only covers a small portion of the lot. Another method of analyzing the amount of development in a community is to survey land cover. Land cover is a description of physical cover of the ground.

Land Cover analysis from 2019 National Land Cover Database data shows an estimated 82% of York's land area is undeveloped (a majority of that undeveloped land is classified as various forests and woodlands) and approximately 18% is developed (a majority of that being classified as open, low or medium intensity).[9]

Carbon Sinks and Carbon Sequestration

Understanding land cover and the extent of undeveloped areas in York such as forests, salt marshes, and wetlands is important because these areas act as **carbon sinks**, capturing CO_2 from the atmosphere and offsetting GHG emissions in the town. The map on the next page shows potential carbon sink land cover in the town (Fig. 3-4); more information on **carbon sequestration** potential of these lands and total acreage is provided in Appendix A.

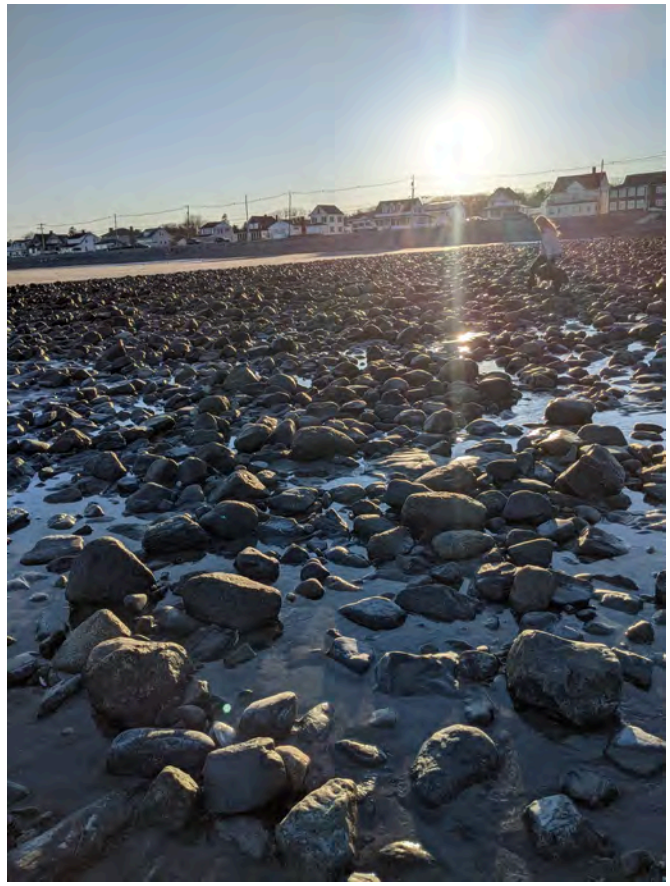


Photo Credit: Gery Runte

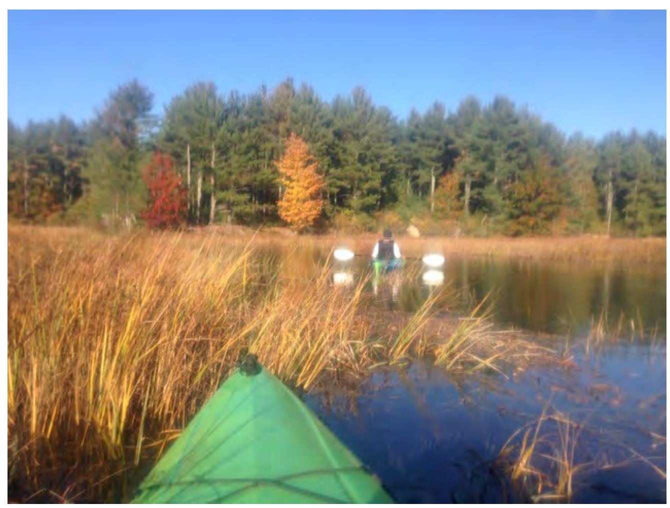
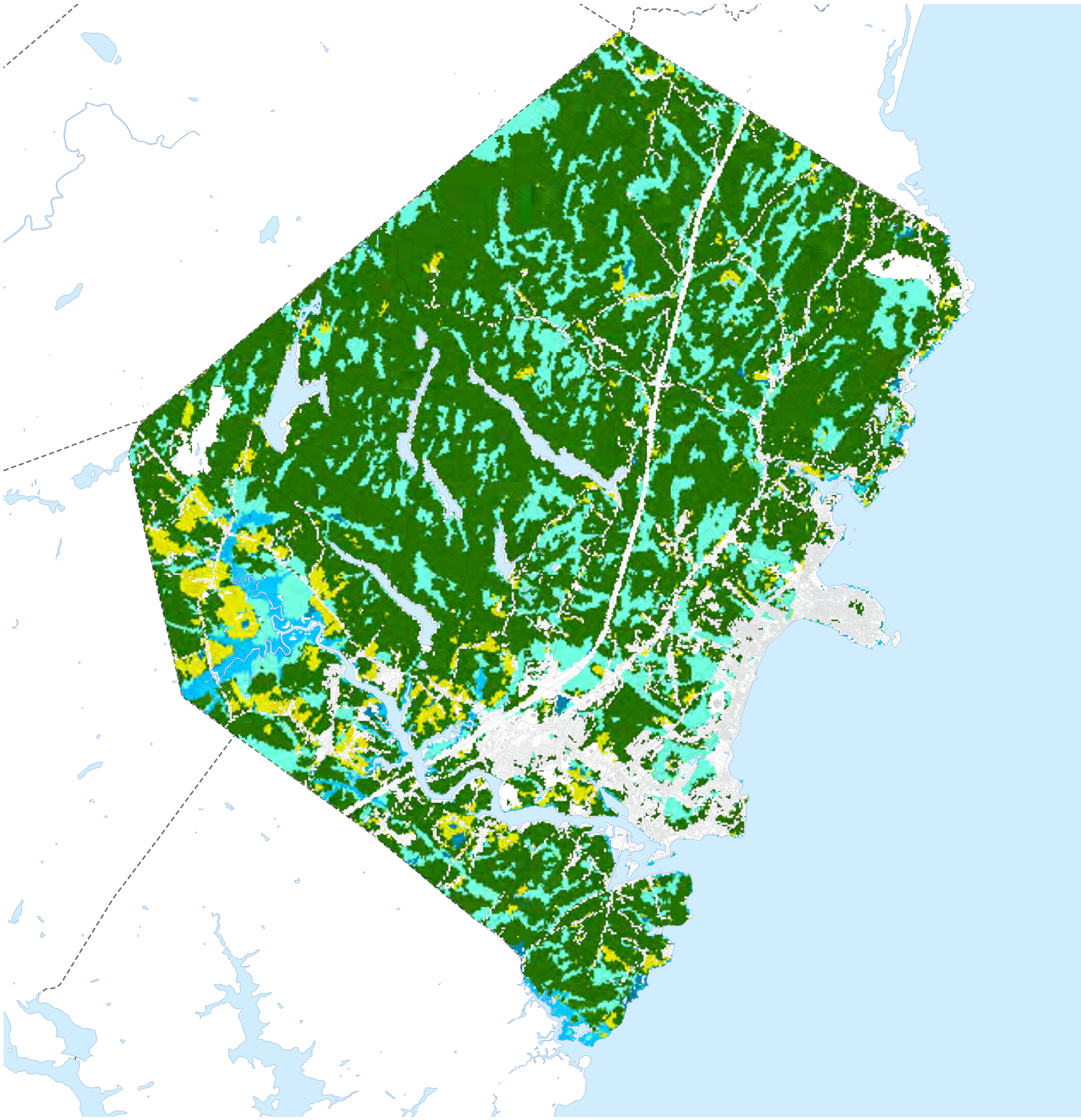


Photo Credit: Carol Libby

Fig. 1–4. Potential Carbon Sink Land Cover in the Town of York.



Forested, Grassland, Wetland Land Cover

2020 Town of York OpenData, Maine Geolibrary, USGS National Hydrography Dataset, NOAA Regional Land Cover

N

- Forested
- Agriculture + Open Grassland
- Palustrine Forest Wetland
- Palustrine Open Wetland
- Estuarine Open Wetland

Natural Resource Protection

In York, natural resources are protected in two ways:

- Several of the Town's Zoning Ordinance Overlay Districts are intended to protect resources in town, such as Watershed Protection Overlay District, Wetlands Protection Overlay District, and Shoreland Overlay District. Within the Shoreland Overlay District are areas considered Resource Protection Subdistricts that have specific restrictions for uses and development. (
- The Town of York manages the floodplains through its Floodplain Management Ordinance, which was most recently amended on May 19, 2012, and is consistent with state and federal standards. The Town also identifies and protects the floodplains through its Shoreland Overlay District, Wetlands Protection Overlay, and the Watershed Protection Overlay, in addition to using FEMA flood map data.

The next section provides an overview of climate change hazards and an assessment of York's vulnerability to climate change.

Endnotes

1 SMPDC Tides, Taxes, and New Tactics, July 2021.
2 Global Covenant of Mayors for Climate and Energy, Commitment of Town of York, Maine, signed 7/29/19 by Steve Burns, Town Manager.
3 Information on demographics is taken from CivicMoxie's work on the 2021-2022 York Comp Plan Update.
4 Population information taken from the 2019 Five-Year American Community Survey unless otherwise noted.
5 These are year-round residents. York also has a seasonal resident population of people who reside in the town part-time and call another place home, and a peak tourist season population that includes short term overnight visitors as well.
6 Maine Department of Labor Quarterly and Annual Industry Employment and Wages Dataset, https://www.maine.gov/labor/cwri/qcew1.hml
7 2020 Town of York's Assessor's Office
8 Land use figures and percentages were calculated using Town of York GIS and 2020 Tax Assessment data. Therefore, each parcel is counted towards only one specific land use based on its "primary use" category, with the sum of all parcels equating roughly to the town's overall land area.
9 https://www.mrlc.gov/data/nlcd-2019-land-cover-conus

Terms to Know

Carbon sequestration:
The process of capturing, securing, and storing atmospheric carbon dioxide (CO_2). CO_2 can be sequestered or removed and stored biologically (in oceans, soil, forests, grasslands), geologically (pumped underground geologic formations and rocks), and technologically (capturing the carbon in waste and turning it into graphene that can then be used to strengthen concrete, direct air capture, changing the shape of molecules in ways that attract and bind specific substances like carbon dioxide). Researchers and project developers are competing to develop lower cost and more effective techniques for capturing and storing CO_2.

Carbon sink:
Any natural or artificial reservoir that absorbs and stores atmospheric CO_2. The primary natural carbon sinks include plants, soil, and the ocean.

Climate Refugees:
A person who has left their home and region as a result of the effects of climate change on their environment.

Federal Emergency Management Agency (FEMA):
An agency under the US Department of Homeland Security that helps people before, during, and after disasters.

Nationally Determined Contribution (NDC):
Country by country GHG reduction goals which form the core of the Paris Agreement. NDCs are derived from national or local climate plans and represent the amount of emissions reduction each government has pledged to achieve, as their contribution to global climate action. The concept of NDCs recognizes each community's right to determine its unique contribution.

Resilience/Climate Resiliency:
The ability to anticipate, prepare for, and respond to hazardous events, trends, or disturbances related to climate. The capacity of social, economic, and environmental systems to cope and respond to a hazardous event, trend, or disturbance caused by climate change.

Sustainable Development Goals (SDG):
Seventeen United Nations goals considered a call for action by all countries – poor, rich and middle-income – to promote prosperity while protecting the planet. The SDGs goals are also mentioned in the Global Covenant of Mayors commitment.

United Nations Framework Convention on Climate Change (UNFCCC):
An international Treaty that became part of international law on March 21, 1994. Of the 197 countries committed to the UNFCCC, 192 have ratified and endorsed the Paris Agreement of 2015.

Photo Credit: Bruce Boardman

section 4 How York is Affected by Climate Change:

Vulnerability Assessment

How will climate change affect York and how will it affect our community, natural environment, infrastructure, and economy? This section summarizes the climate hazards that will be experienced in York and highlights the town's greatest vulnerabilities. A more detailed assessment of York's vulnerability to climate change can be found in Appendix A.

Highlighted words *are defined at the end of this section in "Terms to Know." A full glossary of all "Terms to Know" can be found at the end of this plan on page 171.*

Key Findings

York is already feeling the effects of climate change, including higher average temperatures, more days with extreme heat, rising sea levels and higher storm surges, and more frequent heavy rainfall. Without global reductions in greenhouse gas emissions, these and other changes will continue to accelerate, and their impacts on life in York will grow more severe. The risks that climate change poses to York were identified and assessed early in the Climate Action Plan (CAP) process. This information was used to develop the CAP goals and actions meant to minimize harm to the community. The following major risks were identified:

- **Loss of natural resources and environmental impacts**
- **Financial loss for property owners**
- **Harm to the local economy**
- **Transportation disruptions**
- **Health risks**
- **Deepening social inequities and vulnerabilities**
- **Lack of capacity to implement the CAP**

Photo Credit: Bruce Boardman

Without global reductions in greenhouse gas emissions, the number of extreme heat days, severe storm events, and sea level rise, as well as other changes will continue to accelerate and their impacts on life in York will grow more severe.

Climate Hazards

Climate change causes a variety of impacts, and many are hazardous to the well-being of people and the natural environment. The climate hazards projected to affect York fall into five major categories:

1. Warming air temperatures and more days with high heat
2. Warming ocean temperatures and **ocean acidification**
3. Sea level rise (SLR) and storm surge
4. Heavier precipitation, increased storm severity, and **inland flooding**
5. Greater risk of drought and wildfire


Photo Credit: Wayne Boardman

Warming Air Temperatures and Heat Islands

Warming air temperature is the most direct impact of climate change, caused by more heat being trapped in the Earth's atmosphere by greenhouse gases (GHGs). From 1895 to present average air temperatures have warmed 3.4 °F in coastal Maine towns and cities. Without global reductions in GHG emissions, by 2050 average temperatures in York are projected to be an additional 6 °F warmer. In the summer, this will cause temperatures that feel like 90 °F or hotter for 20 to 30 more days each year than we experience now.[1] It will feel even hotter in areas of town that are "**heat islands**," which are areas with a lot of buildings, pavement, and other hard surfaces that absorb and re-emit heat. In York, examples of heat islands are York Village and commercial areas of Route 1.

Warming Ocean Temperatures and Ocean Acidification

The Gulf of Maine is warming rapidly, faster than 96% of the world's oceans since 1982,[2] with its warmest recorded period during the last decade.[3] In combination with rising air temperatures, this is warming York's coastal waters[4] and, without emissions reductions, by 2050 York's coastal waters are expected to be as warm as Rhode Island's waters are today.[5] York's coastal waters are also becoming more acidic because of carbon dioxide (CO_2) emissions[6] and human activities, like the use of lawn fertilizers, which lead to higher concentrations of nutrients in the ocean.[7] These two factors will have a direct impact on York's commercial fishery industry.

Sea Level Rise and Storm Surge

Warming air and ocean temperatures are causing sea level rise, an increase in the average height of ocean water. In response to observed and projected sea level rise, the Maine Climate Council has recommended that the State commit to manage 1.5 feet of SLR and prepare to manage 3 feet of SLR by 2050. As sea levels rise, so does the risk and regularity of coastal flooding during high tides. Storm surge is the rise of water due to a storm. Storm surges can raise water levels dramatically above normal tide levels, causing severe flooding that extends well inland.[8] Elevated tide levels from SLR will increase the frequency and severity of flooding from storm surges, especially in important areas such as the Short Sands Beach area.

Photo Credit: Karen Arsenault

Heavier Precipitation, Increased Storm Severity, and Inland Flooding

Since 1895, average annual precipitation in Maine has increased by approximately six inches, or 15%, with a greater amount and proportion falling as rain.[9] The increase in rainfall has been accelerating over this time and is most pronounced since mid-2000.[10] Of significant concern for York is that heavy rainfall is becoming more frequent and intense,[11] and this trend is expected to continue throughout the 21st century.[12] Coastal communities such as York are experiencing even more heavy rainfall than elsewhere.[13] Increasing rain intensity and storm severity means more stormwater runoff that results in flash flooding by rapidly raising water levels of streams and rivers, backing up stormwater infrastructure, and over-saturating soils.

Drought and Wildfire

A warming climate can make droughts more frequent or severe and by 2050 the threat of widespread summer drought in Maine could increase by 70%.[14] Even with periods of heavy rainfall, drought has become more pervasive in York County in the most recent decade than the decade preceding, including two periods in the past five years during which most of the County was in an extreme drought (2016 and 2020). Wildfires have historically been infrequent in Maine, but not unheard of, compared to other regions of the United States.,[15] However projected increases in temperature and drought, two major causes of wildfire, suggest growing risk.

York's Vulnerability to Climate Hazards

Climate hazards will affect life in York in a number of ways. A full assessment of York's vulnerability to climate change can be found in Appendix A. The following pages summarize the town's greatest vulnerabilities.

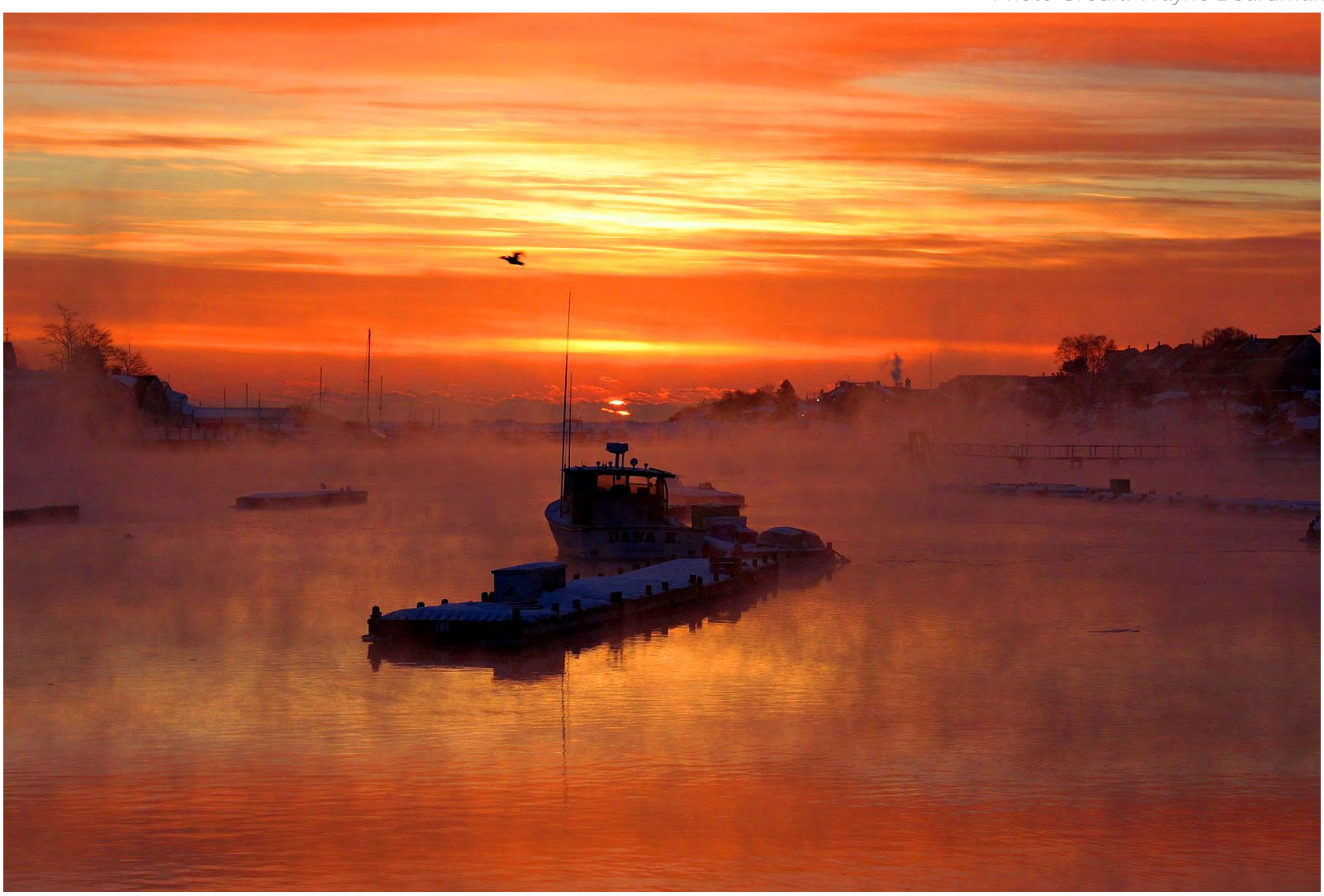
Loss of Natural Resources and Environmental Impacts

York's natural resources—from the town's beautiful beaches to its hiking trails—make it an incredibly attractive place to live and visit. Natural resources are also what York community residents are most concerned about losing, according to the CAP Community Feedback Survey conducted in the fall of 2021 (see Appendix E).

Further, York's forests, wetlands, and natural areas play a role in carbon sequestration, pulling CO_2 from the atmosphere and helping to offset GHG emissions. See Appendix A for more detailed information on the critical importance of these natural areas for mitigating GHG emissions and contributing to the town's climate resiliency.

How are natural resources most vulnerable? The town's natural areas, including forests, are vulnerable from changing land uses and development, as well as climate change as summarized below.

Photo Credit: Wayne Boardman

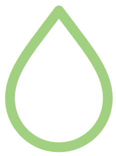


Coastal Erosion

Coastal or shoreline erosion occurs when storms, flooding, storm surge, SLR, and human-related activities wear away the rocks, soils, and/or sands along the coast over time. Erosion can occur due to an acute weather-related event or long-term change in the coastline. Erosion is a concern along York's Atlantic coast as well as the shorelines along its tidal rivers, including the York and Cape Neddick Rivers.

Coastal erosion reduces beach area and negatively impacts natural flood protection, species habitats, and **water filtration**.[16] With 1.6 feet of SLR, an estimated 42% of the dry **beach area** and 55% of **dune** area in York County will be lost. At 3.9 feet, this goes up to 75% and 92%, respectively.[17]

Water Resources



York's coastal waters as well as its rivers, ponds, and reservoirs are likely to be impacted by climate change in several ways. Projected increases in rainfall and more frequent and intense storms will mean more stormwater runoff that carries land pollutants (such as pesticides, fertilizers, and petroleum products) into natural water bodies. These pollutants and warmer water temperatures threaten York's water quality and wildlife by causing **algal blooms** and acidification. While algal blooms have occurred, York has taken measures to reduce potential runoff through actions such as the Watershed Protection Overlay District and the York Water District owns 90% of the Chases Pond watershed.

Harmful algal blooms (HABs) occur when toxin-producing algae grows out of control in fresh or marine water bodies. HABs can cause serious illness and sometimes death in people and animals when they release toxins into the surrounding water or air.[18] Both toxic and non-toxic algal blooms can also be damaging to aquatic wildlife by depleting oxygen levels and blocking sunlight from underwater plants.[19] Ocean acidification threatens the health of coastal habitats and wildlife in many ways, including inhibiting shelled species like lobsters, clams, scallops, mussels, and sea urchins from building healthy shells to protect against predators. It also compromises the functionality and health of many types of fish and invertebrate species.[20]

Forests

Approximately 60% of the land in York is covered by forest, which, along with York's beaches and rivers, is a defining feature of the town. York's forests are also its largest carbon sink, helping to mitigate climate change by pulling CO_2 out of the atmosphere through photosynthesis. More extreme rainfall, intermittent and more variable snowpack, and warmer temperatures are all expected to pose significant threats to trees, forest ecosystems, and forest management.[21]

Southern Maine is dominated by oak/pine forests composed of red oak, eastern white pine, red maple, eastern hemlock, white ash, and several hickories. Along coastal areas of Southern Maine, forests are also often abundant in wetland areas, containing species like Atlantic white cedar, ash, and hemlock.[22] As a transition zone, York's forests also include a mix of more northern softwood species, including spruce and fir.[23] Already in lower abundance in York, these northern softwood species are likely to decline in the future due to less snow and warmer winter temperatures.[24] On the other hand, hardwoods like oak and maple are projected to better tolerate changes.[25]

Warmer temperatures and droughts are also likely to encourage spread of key forest pests and threaten tree health; Maine already has some of the highest densities of non-native forest pests in the United States. Most notably, the Southern Pine Beetle and Hemlock Wooly Adelgid thrive and spread when winters are warmer. Without immediate and widespread interventions, hemlocks could disappear throughout the northeastern U.S.,[26] which would have a cascading impact as they play a significant role in managing and regulating the larger ecosystem and the plant and animal habitats within that system.

Tidal Wetlands

York's 926 acres of tidal wetlands are also threatened by SLR, which will cause wetlands to shift further inland or be replaced by open water or mudflats. As transition zones further inland between land and open ocean, tidal wetlands provide many community benefits by sustaining a healthy habitat for many species, protecting from coastal flooding and storm waves, filtering runoff and excess nutrients, and removing and storing large amounts of carbon.[27] Loss of wetlands is problematic from resilience and mitigation standpoints, as the rate of carbon sequestration from wetlands, known as "blue carbon," is even greater than that of land-based ecosystems like forests, known as "green carbon."[28] Research findings in 2011 calculated that salt marshes, a prevalent type of tidal wetland, sequester more than 40 times more carbon per square meter than temperate forests.[29]

Native Wildlife and Invasive Species

Increases in ocean temperatures will prompt many cold-water species in the Gulf of Maine to move northward and expand the geographic ranges of warm-water species. Shallow-water fish like Atlantic herring, winter flounder, haddock, and alewife are migrating northeast along the continental shelf, while others are shifting to cooler deeper waters in the southwestern Gulf. Right whales are having fewer calves and moving farther north as well.[30] Several fish species are expected to make a new home in the Gulf including Atlantic croaker, black sea bass, blue fish, butterfish, longfin squid, scup, and windowpane flounder.[31] The American lobster has also become significantly more abundant in the Gulf in recent years because of warmer temperatures, but is expected to decline with continued warming, a trend that is already being observed here. Increasing acidification prevents shelled animals from building healthy shells, which exposes them to predators and causes other health issues. Increases in ocean acidity also generally harm many types of fish and marine invertebrate species.

Invasive plants and wildlife are often more tolerant of environmental changes and can more quickly adjust to new climates compared to native species. Green crabs, Asian shore crabs, tunicates and invasive seaweed are common invasives that threaten marine ecosystem health.[32] Two common plant invasives in York are Japanese knotweed and Asian bittersweet.

Recreation

With SLR and storm surges eroding beaches and dunes, and with higher tides, the amount of dry beach area will shrink, meaning fewer opportunities to use the beaches and more crowding. Higher average summer temperatures and more extreme heat days will affect enjoyment of beaches as well as trails and other outdoor recreation areas. Further, higher temperatures will result in greater abundance disease-spreading ticks and mosquitoes, which will not only be of nuisance in wooded recreation areas but will also have public health implications.

Loss of Property Value and Tax Base

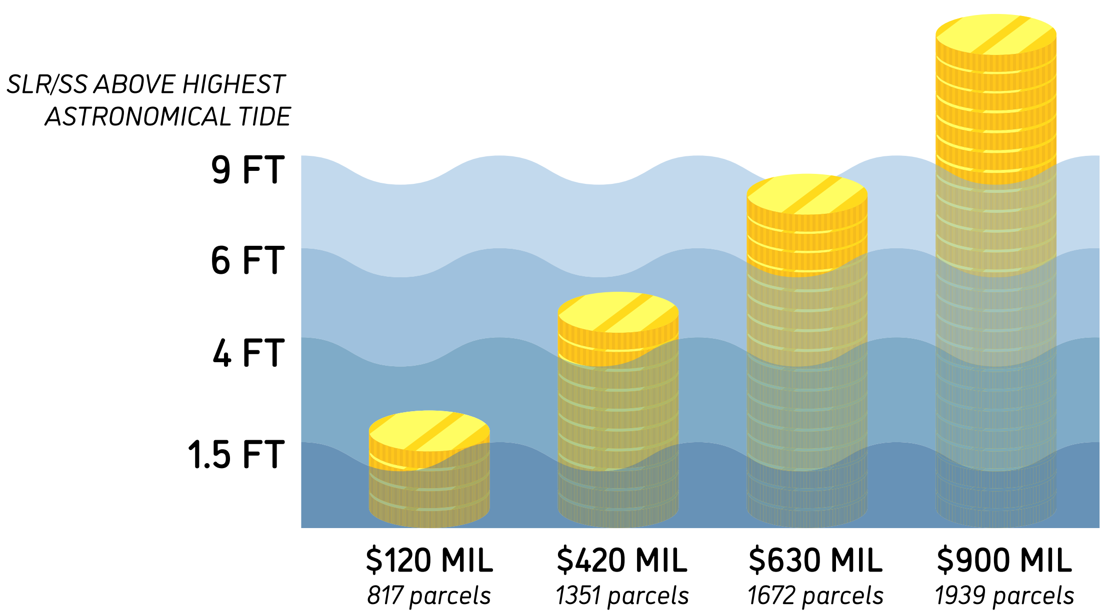
Climate impacts, especially flooding, can be very damaging to personal property, resulting in financial losses for property owners. As a coastal town with tidal rivers, flooding of homes and other personal property will be an increasing reality (if it isn't already) for many who live and own property in York. First Street Foundation, an organization that measures flooding risk, estimates an average yearly loss of $3,398 for Maine property owners currently in flood prone areas.[33] This doesn't mean that all York property owners in a flood area will have this expense each year; in a given year some will have much higher expenses while others will have none.

As the risk of flooding increases with climate change, so does the risk of flood-related damages and costs for York property owners including those with investment properties. The diagram below shows the number of parcels and total assessed property value at risk from flooding in York under different SLR and storm surge scenarios.

Increased threat of flooding could lower the values of many properties in York. Diminishing property values have already been observed in coastal communities. In Portland, Maine, cumulative property values in areas prone to tidal flooding are estimated to have declined by $701,833 between 2005 and 2019.[34] With SLR, the number of properties in these flood-prone areas will increase.

The cost of flood insurance will rise as flood risk increases and because of changes to FEMA's rating methodology.[35] In York, 64% of all current policy holders are expected to see increased rates in flood insurance: 48% of policy holders with an annual increase of up to $120 per year and 16% of policy holders with premium increases greater than $120. Among single-family home policy holders in York, 82% are expected to have rates increased; 71% up to $120 per year and 11% greater than $120 per year.

Fig. 1–1. York Parcels and Assessed Value at Risk in Four Sea Level Rise (SLR) and Storm Surge (SS) Scenarios



Source: See Appendix A for methodology and more information on the calculation of parcels and total property value affected in York.

Harm to the Local Economy

Climate change hazards and potential loss of tourism will threaten local businesses and industry as well as the Town's tax revenue.

An estimated 21 businesses in York would be directly impacted by 3.9 feet of SLR and storm surge and 30 businesses by 6.1 feet of SLR and storm surge, affecting 188 and 259 jobs, respectively.[36] Businesses in the restaurant, accommodations, and service industries are most at risk in the 6.1-foot scenario; about 7% of economic output and 24% of employment are within the restaurant industry alone.[37] Losses by businesses in the 3.9-foot and 6.1-foot flooding scenarios translate to an estimated $150,000 and $240,000 reductions, respectively, in annual non-land tax revenue for the Town of York.[38]

These businesses will be further harmed by reduced numbers of seasonal residents and day trippers, as the loss of the town's natural amenities because of climate change will make York a less attractive destination. York's beaches are its most valuable natural amenity from a tourism perspective and are at high risk from SLR. At 1.6 feet of SLR, loss of beach area could result in more than one million fewer visitors and more than $130 million less spent by tourists per year in York County. At 3.9 feet of SLR, this jumps to a potential loss of over six million visitors and $765 million in spending annually in the county.[39] The York Beach area, which has many businesses and seasonal residents, is one of the most vulnerable areas in town to SLR and storm surge. Loss of seasonal residents would have major implications for both businesses and the Town's tax revenue.

Natural resource-based industries like lobstering, farming, and forestry are also particularly vulnerable to climate change because of how climate is expected to change York's natural environment. Although overall a small part of the town's economy, these industries are still important to the local economy and culture. Lobstering is the largest of these industries in York and has been increasing for over a decade, with nearly 700,000 pounds of lobster harvested in 2020, worth more than $3 million.[40] Also, the local lobster dealers employ many people at their facilities. Continued warming, however, is likely to push lobster populations farther north and decrease productivity, a trend that Connecticut and Rhode Island have experienced over the past 10-15 years. Based on current warming trends, some projections estimate that by 2050 lobster abundance in Maine will decline by 45%,[41] with southern communities like York hit hardest.[42]

Transportation Disruptions

York's roadway network is most at risk of damage and disruption from climate change, primarily from flooding. York's critical infrastructure - roads and bridges - are necessary for access to basic needs like food, healthcare, and emergency services and are relied upon for Town services and the everyday travels of those living and working in York. The Nature Conservancy estimates that at just 2 feet of SLR and storm surge about 90 addresses in York will be inaccessible because of flooded roads. This increases to nearly 600 addresses with 6 feet of SLR and storm surge.[43]

The Southern Maine Planning and Development Commission (SMPDC) has compiled a list of all roads in York expected to be impacted by 1.6, 3.9, and 6.1 feet of SLR and storm surge. Some of York's most heavily used roads are at risk of closures with just 1.6 feet of SLR and storm surge, including Cider Hill Road, Shore Road, and Route 103. Many roads are also at risk of flooding and closures from heavy rainfall during extreme storms. This type of flooding has already been experienced in York, such as during the Mother's Day Storm of 2006 when nearly a foot of rain fell in town over a three-day period.[44]

As a harbor town, access to the water is an important part of York's infrastructure as well as the local economy. With as little as 1.5 feet of SLR and storm surge, both the town docks and the boat launch on Harris Island Road may be inaccessible, which would eliminate York's only public harbor access points.

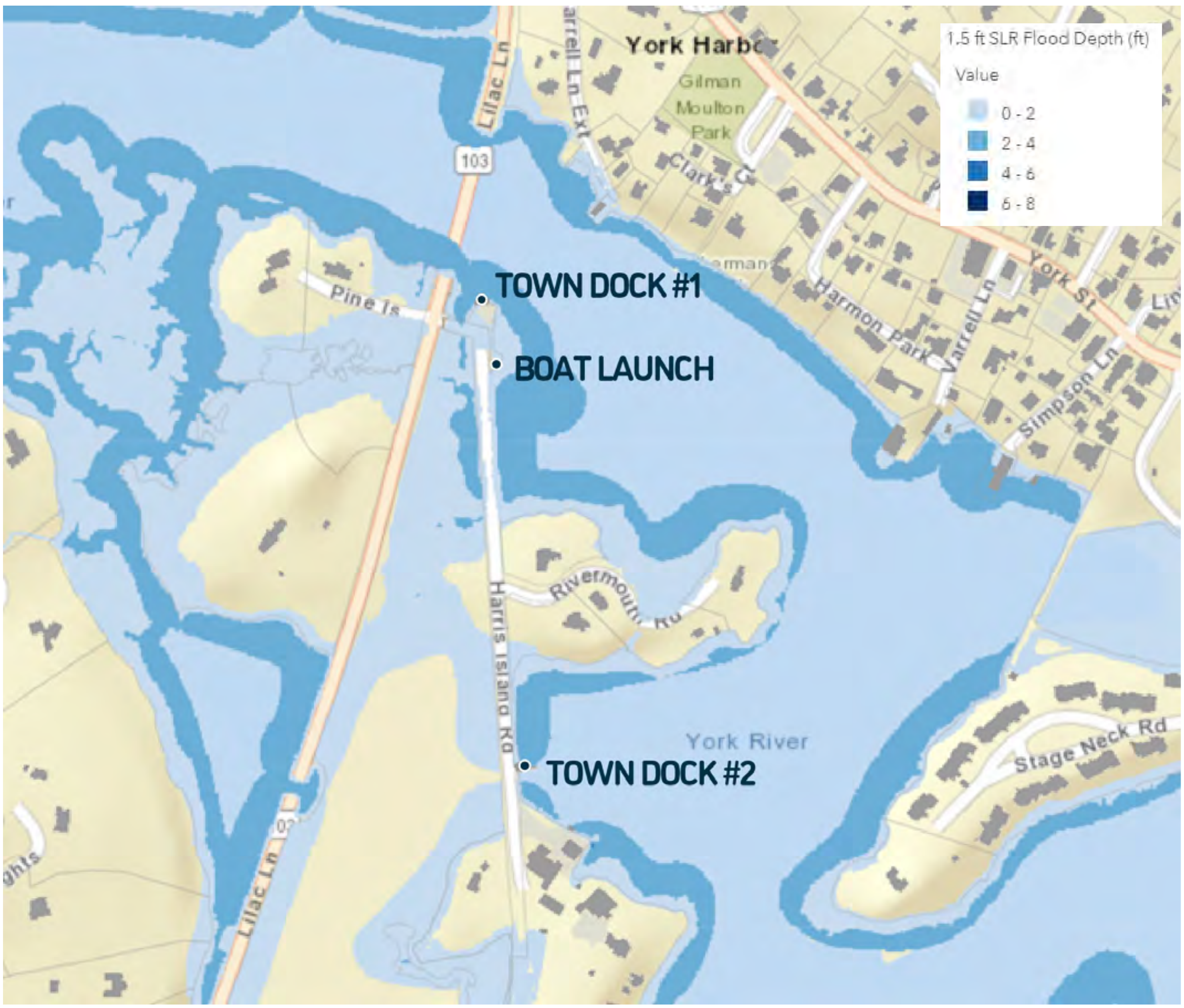

Photo Credit: Bruce Boardman

Table 1–1. Town of York Roads with Projected Impact by 1.6, 3.9, and 6.1 Feet of Sea Level Rise and Storm Surge.

Road	1.6 ft	3.9 ft	6.1 ft
Amherst Avenue		X	X
Barrell Lane E¤ist	X	X	X
Bay Haven Road	X	X	X
Bay Street		X	X
Bayview Avenue			X
Beach Ball Field Road			X
Beach Street			X
Beachside Court		X	X
Beacon Street			X
Beech Ridge Road	X	X	X
Beachwood Avenue			X
Bett Welch Road			X
Birch Hill Road	X	X	X
Braveboat Harbor Road		X	X
Broadway E¤tension		X	X
Burnetts Trailer Park Road			X
Caddys Way			X
Cape Neddick Road			X
Carey Street		X	X
Ciampa Drive		X	X
Cider Hill Road	X	X	X
Clark Road	X	X	X
Dingle Road	X	X	X
Emus Way			X
Ferry Lane South			X
Franklin Street	X	X	X
Garrison Point			X
Godfrey Pond Road		X	X
Gunnison Road			X
Guy Lane		X	X
Harbor Beach Road			X
Harris Island Road	X	X	X
Haskell Way		X	X
Hawk Street		X	X
I-95	X	X	X
Indian Trail			X
Jo Lenes Drive			X
Juniper Road		X	X
Kerry Road		X	X
Kiddie Corner Lane			X
Kings Road			X
Lawrie Avenue		X	X
Lindsay Road		X	X
Lois Lane			X
Long Beach Avenue			X
Long Sands Road			X
Main Street		X	X
Major McIntire Road		X	X
Maple Street		X	X
Marietta Avenue			X
Mary Street			X
Meadow Road		X	X
Midnight Drive		X	X
Mill Lane	X	X	X
Mitchell Road			X
Mooring Drive			X
Morningside Drive		X	X
Northwood Farms Road			X
Oak Street		X	X
Ocean Avenue		X	X
Ocean Edge Lane			X
Ocean House Way		X	X
Oceanside Avenue		X	X
Organug Road		X	X
Park Circle		X	X
Parker Street			X
Payne Road	X	X	X
Pepperell Way			X
Pequanac Place		X	X
Phillips Cove Road			X
Pine Island Road		X	X
Pine Street		X	X
Pinecrest Drive			X
Railroad Avenue		X	X
Railroad Avenue E¤tension		X	X
Ray Avenue			X
Reserve Street		X	X
Ridge Road			X
Ridge Road Court		X	X
River Farm Road			X
River Lane		X	X
River Road			X
Rivermouth Road		X	X
Riverside Street			X
Riverwood Drive			X
Route 103	X	X	X
Saltwater Drive			X
Schooner Landing	X	X	X
Scotland Bridge Road	X	X	X
Sea Rose Lane		X	X
Seabreeze Lane			X
Seabury Road	X	X	X
Shore Road	X	X	X
Short Sands Road		X	X
Sparhawk Way			X
Stage Neck Road	X	X	X
Stones Throw		X	X
Strawberry Lane		X	X
Summer Breeze		X	X
Surf Avenue		X	X
Surfore Road		X	X
Tabernacle Road			X
Tralee Road		X	X
US Route 1	X	X	X
Varrell Lane			X
Walnut Street		X	X
Wanaque Road	X	X	X
Webber Road		X	X
Western Point Road		X	X
White Birch Lane			X
Whittier Way			X
Wild Kingdom Road		X	X

Source: SMPDC, Tides, Taxes, and New Tactics, July 2021, graphic adapted by CivicMoxie. Note that the SMPDC study here included local roads whereas the additional assessment done in this CAP focused on primarily larger collectors and arterials.

Fig. 1–2. York Harbor with 1.5 Feet of SLR and Storm Surge.

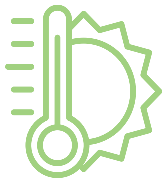


Source: Maine Geological Survey. Esri.

Health Risks

Climate hazards pose a number of serious health risks to the York community including high heat, worsening air pollution, increases in **vector-borne diseases**, degraded water quality, decreased mental health, and deepening social inequities and vulnerabilities. These hazards are summarized below.

High Heat

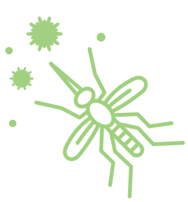


High heat days will become more frequent with climate change, and exposure to high heat will result in a number of negative health impacts, including heat stroke and effects on fetal health, as well as making existing respiratory and diabetes-related conditions worse. Older residents are especially at risk.[45] Air conditioning is one of the best ways to prevent heat-related health impacts, but its prevalence in Maine buildings is much lower than most of the country because of historically temperate summers.[46] Increasing regularity of high heat days means York residents and businesses currently without air conditioning will be burdened financially by new equipment and energy costs, and those without access to air conditioning will be increasingly vulnerable to high heat exposure. High heat is exacerbated by heat islands, areas of town with many buildings, pavement, and other hard surfaces that absorb and re-emit heat. Examples of severe heat island areas include York Village and commercial areas along Route 1.

Air Pollution

Worsening air pollution is expected because of climate change. York County already has among the worst air pollution in the state, scoring a C in the American Lung Association's *State of the Air 2021* report.[47] Ground-level ozone, one of the major pollutants of concern, can cause a variety of respiratory problems, including chest pain, coughing, throat irritation, and congestion, as well as worsen respiratory diseases, like asthma, that can damage the lungs. Ozone levels in Maine have decreased significantly over the past 20 years due to regional and local air quality controls. However ozone levels increase at higher temperatures, meaning a warming climate could slow or reverse the progress being achieved.[48] Particulate matter, another dangerous air pollutant, can cause severe health impacts, including respiratory diseases and adverse birth outcomes.[49] Like ozone, particulate matter levels have decreased in Maine in recent decades, but climate impacts may make conditions worse.[50] Wildfires in the western US and Canada are a major source of particulate matter that is carried in the upper atmosphere to Maine. These fires are growing in frequency and intensity, and even the local risk of wildfire may be greater with projected increases in temperature and drought frequency.

Vector-Borne Diseases



Mild winter temperatures and a shrinking frost season contribute to greater abundance of ticks and mosquitoes that carry diseases dangerous to humans and impact how Mainers and visitors can enjoy the outdoors.[51] Lyme Disease and other tickborne diseases have increased noticeably in the past 20 years, and experts expect this trend to continue.[52] Although observed cases declined sharply in 2020, the decline has at least partially been attributed to a combination of drier-than-usual June and July.[53]

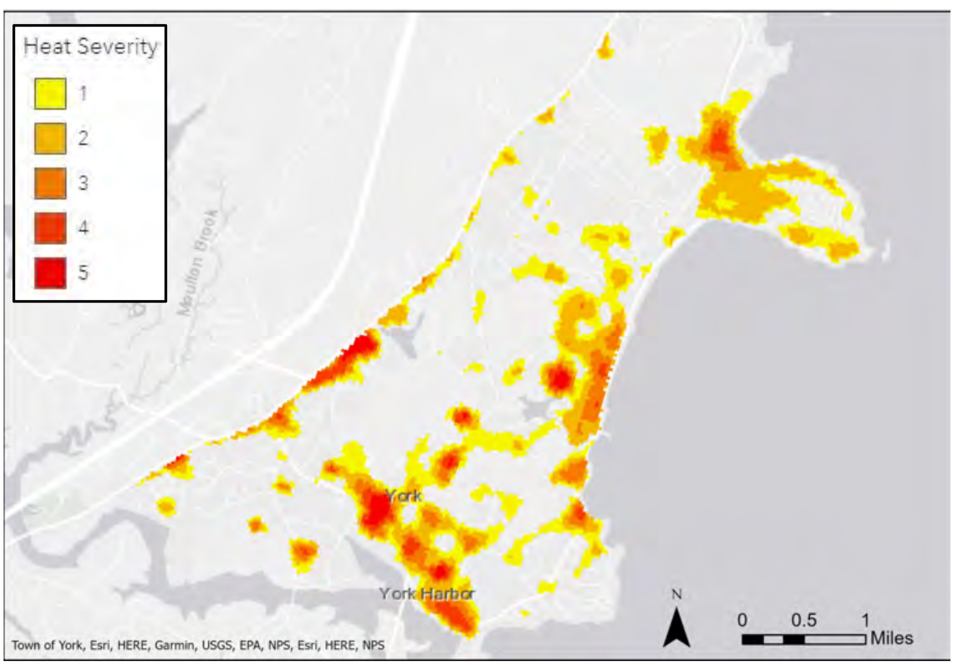
Water Quality

One of the most critical potential health impacts of flooding is water contamination. Runoff and pooling of floodwaters can deposit harmful bacteria and chemicals from the land into public drinking water sources, well heads, and recreational swimming areas.[54] Especially at risk are those who rely on private wells for drinking water, which are not regulated under the federal Safe Drinking Water Act or any state laws, meaning well owners are responsible for maintaining the water quality.[55] Maine has one of the highest rates of well use in the country, and the Maine Geological Survey has a record of approximately 1,000 private wells in use in York.[56] Freshwater algal blooms, which are caused by nutrient-rich runoff from heavy rainfall, also increasingly threaten York's drinking and recreational waters as heavy rainfall becomes more frequent because of climate change.

Mental Health

The effects of climate change are far-reaching and have a significant potential to negatively influence the mental health of residents living in climate-vulnerable areas. The trauma that follows a climate-induced disaster, such as the loss of a home, job, or loved one, can lead to consequential depression and anxiety.[57] Data suggest higher rates of suicide following catastrophic weather events and long periods of high heat.[58] Extreme weather events, such as extreme heat or cold, are additionally associated with increased rates of domestic violence and aggressive behaviors.[59] Climate change is also associated with negative mental health events at the community level. Damage to infrastructure, neighborhoods, and natural resources affect the quality of life for residents, and result in loss of identity, social support systems, sense of control and autonomy, and feelings of helplessness and fear.[60]

Fig. 1–3. York Heat Islands.



Key: Severity is measured on a scale of 1 to 5, with 1 being a relatively mild heat area (slightly above the mean for the town), and 5 being a severe heat area (significantly above the mean for the town). Source: Trust for Public Land.

Deepening Social Inequities and Vulnerabilities

While climate change will affect everyone who lives and works in York, it is important to acknowledge and understand that not everyone has the same ability to adapt and respond to such changes. Because of individual, household, and community differences in health, access to resources and support, and a variety of other factors, our reactions differ. Traditionally marginalized and under-represented groups are most at risk from the impacts of climate change, including children and older adults, people with disabilities, households with lower or moderate incomes, people who are new to our area, with limited English proficiency, with less formal education, and with limited physical and/or digital connectivity. People who identify with more than one of these groups may experience greater effects, compounding vulnerability.

In York, older adults and seasonal workers are large populations that are likely to experience higher vulnerability to climate change impacts. In 2019, approximately 27% of York residents were over the age 65, and more than 7% of those over 65 were living alone; both of these percentages are higher in York than in York County and Maine.[61] For older adults, climate change can pose a greater risk to those who have compromised immune systems and a higher sensitivity to health stressors. Pre-existing medical conditions can compromise the ability to adapt, respond, or recover to the impacts of climate change. Older adults are also often more adversely impacted by extreme heat and air pollution.[62]

Seasonal workers are more likely to have lower wages and unstable employment and housing, resulting in less ability to respond if they are affected by climate change. York's large number of seasonal summer residents and status as a summer tourist destination means that many jobs in the town, especially for service-based industries, are seasonal. Peak summer employment across all industries in York is 40% higher than winter employment, and this number is much higher for service and tourism industries.[63] Potential climate effects affecting seasonal workers include loss of wages or employment owing to flooding of their workplace or declines in tourism. The vulnerability of workers in service- and tourism-based industries was evidenced during the COVID-19 pandemic. The vulnerability of York's seasonal workers is amplified because many live in other nearby towns, owing to a lack of affordable housing options in York. A greater dispersion of the workforce makes it more challenging to identify potential exposure to climate impacts and provide assistance.

At 23%, York has a much higher percentage of residents aged 65 to 84 than the rest of the county or the state. This age group is also expected to grow as a percentage of overall town population in the coming years (2019 Five-Year ACS). Older adults in York face increased vulnerabilities from climate change.


Photo Credit: Wayne Boardman

Lack of Capacity to Implement the CAP

Beyond the assessment of how York is vulnerable to the effects of climate change, the ability of the Town to respond to climate change and minimize these vulnerabilities was also assessed. There is minimal capacity within Town Hall to implement measures to enhance community and infrastructural resilience, as well as a lack of other organizations or entities in town that could handle these responsibilities. A newly announced State program will provide climate planning guidance. It will also assist York's ability to identify funding sources and apply for grants. However, this is still not enough support to meet York's climate goals. Section 7 provides more detail about options for building capacity and suggests next steps to move this plan forward.

Endnotes

1 Maines-Climate-Future-2020-Update-3.pdf (umaine.edu)
2 https://www.gmri.org/stories/gulf-of-maine-warming-up-date-summer-2021/
3 GOPIF_STS_REPORT_092320.pdf (maine.gov)
4 GOPIF_STS_REPORT_092320.pdf (maine.gov)
5 GOPIF_STS_REPORT_092320.pdf (maine.gov)
6 GOPIF_STS_REPORT_092320.pdf (maine.gov)
7 GOPIF_STS_REPORT_092320.pdf (maine.gov)
8 CC scientific committee, 86
9 Maine climate future 2020 update.
10 CC scientific committee 23.
11 Maine climate future 2015 update.
12 Weston & Sampson, Memo on Future Climate Rainfall, York, ME, 12/15/21.
13 Agel et al. 2015 (Maine climate future 2020 update)
14 Maine's Climate Threats | States at Risk
15 MCC Scientific subcommittee, 237.
16 Troy, 2012 (ERG Cost of Doing Nothing, 48)
17 Slovinsky (2020, unpublished). Maine Climate Council Scientific and Technical Subcommittee, Scientific Assessment of Climate Change and Its Effects in Maine, 131
18 GOPIF_STS_REPORT_092320.pdf (maine.gov)
19 https://www.epa.gov/nutrientpollution/effects-dead-zones-and-harmful-algal-blooms
20 https://www.epa.gov/ocean-acidification/effects-ocean-and-coastal-acidification-marine-life
21 GOPIF_STS_REPORT_092320.pdf (maine.gov)
22 United States Department of Agriculture. Maine Forests. 2013. https://www.fs.fed.us/nrs/pubs/rb/rb_nrs103.pdf.
23 Natural Resources Chapter of the York Comprehensive Plan dated 11.5.2013
24 GOPIF_STS_REPORT_092320.pdf (maine.gov)
25 https://www.nrs.fs.fed.us/pubs/55635
26 https://grist.org/science/the-northeasts-hemlock-trees-face-extinction-a-tiny-fly-could-save-them/
27 One Climate Future Portland/S. Portland
28 Maine Climate Economic Impacts, 10
29 Mcleod, E., Chmura, G.L., Bouillon, S., Salm, R., Björk, M., Duarte, C.M., Lovelock, C.E., Schlesinger, W.H. and Silliman, B.R. (2011), A blueprint for blue carbon: toward an improved understanding of the role of vegetated coastal habitats in sequestering CO_2. Frontiers in Ecology and the Environment, 9: 552-560. https://doi.org/10.1890/110004.
30 GOPIF_STS_REPORT_092320.pdf (maine.gov)
31 Maine's Climate Future
32 GOPIF_STS_REPORT_092320.pdf (maine.gov)
33 The_Cost_of_Climate_FSF20210219-1.pdf (firststreet.org), pg. 56
34 Portland/S. Portland Vulnerability Assessment, 101
35 Risk Rating 2.0: Equity in Action | FEMA.gov
36 Tides, Taxes, and New Tactics, 32.
37 Tides, Taxes, and New Tactics, 32.
38 rbouvier Consulting, Economic Analysis of SLR: Kennebunk, Wells, and York, 2020, 13.
39 rbouvier Consulting, Economic Analysis of SLR: Kennebunk, Wells, and York, 2020, 20.
40 Maine DMR Landings Data, accessed 10/26/21
41 Le Bris et al., 2018 (ERG Cost of Doing Nothing, 62.)
42 ERG_MCC_Vol2_CostOfDoingNothing_9.29.2020.pdf (maine.gov)
43 https://maps.coastalresilience.org/maine/
44 USGS, Flood of May 2006 in York County, Maine, 3.
45 ERG_MCC_AssessingImpactsClimateChangeMaine_Summary_11.25.20.pdf
46 ERG_MCC_Vol2_CostOfDoingNothing_9.29.2020.pdf (maine.gov)
47 https://www.lung.org/research/sota
48 MCC Scientific committee, 311
49 MCC Scientific committee, 312. Nolte et al., 2018.
50 MCC Scientific committee, 312
51 Maine's Climate Future: 2020 Update (umaine.edu)
52 Maine's Climate Future: 2020 Update (umaine.edu)
53 Lyme disease cases fell sharply in 2020, with COVID-19 and weather likely playing a role - Portland Press Herald
54 S+T subcommittee, 303
55 S+T subcommittee, 303
56 https://www.maine.gov/dacf/mgs/pubs/digital/well.htm
57 American Psychiatric Association, 2019. https://www.psychiatry.org/patients-families/climate-change-and-mental-health-connections/affects-on-mental-health
58 USGCRP, 2016. https://health2016.globalchange.gov/
59 Watts et al. 2015. https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(15)60854-6/fulltext
60 American Psychiatric Association, 2017. https://www.apa.org/news/press/releases/2017/03/climate-mental-health
61 2019 five-year American Community Survey.
62 One Climate Future 2020 Update
63 Maine Center for Workforce Research and Information.

Terms to Know

Algal blooms:
A rapid increase or accumulation of algae populations in freshwater or marine water systems. Oftentimes, these blooms produce dangerous toxins that have harmful effects on people, fish, shellfish, marine mammals and birds. Algal blooms happen naturally but can become more prevalent with climate change.

Beach area:
Sandy area between the mean high tide line and the vegetation line along the coast.

Dune:
Inland mounds or hills of sand and gravel deposits associated with a coastal beach.

Heat islands:
An area where the temperature is higher than the surrounding areas, usually because of presence of paved and hard surfaces and lack of vegetation.

Inland flooding:
A type of flooding that derives from rain water, not ocean water, and occurs inland and not on the coast. Inland flooding can be caused by intense, short-term rain or by moderate rainfall over several days that overwhelms existing drainage infrastructure.

Ocean Acidification:
An increase of acidity of ocean water over an extended period of time. When concentrations of CO_2 in the atmosphere increase, oceans absorb more CO_2. This additional absorption causes the water to become more acidic and reduces its carbonate ions which are used by organisms to make shells and coral.

Vector-borne diseases:
Diseases that come from an infection transmitted through the bite of an infected insect or arachnid (e.g. mosquito, tick, spider).

Water filtration:
The process of removing or reducing the amount of particulate matter from water to produce water that is safer and cleaner for drinking.

section 5

How York Contributes to Climate Change:

GHG Inventory

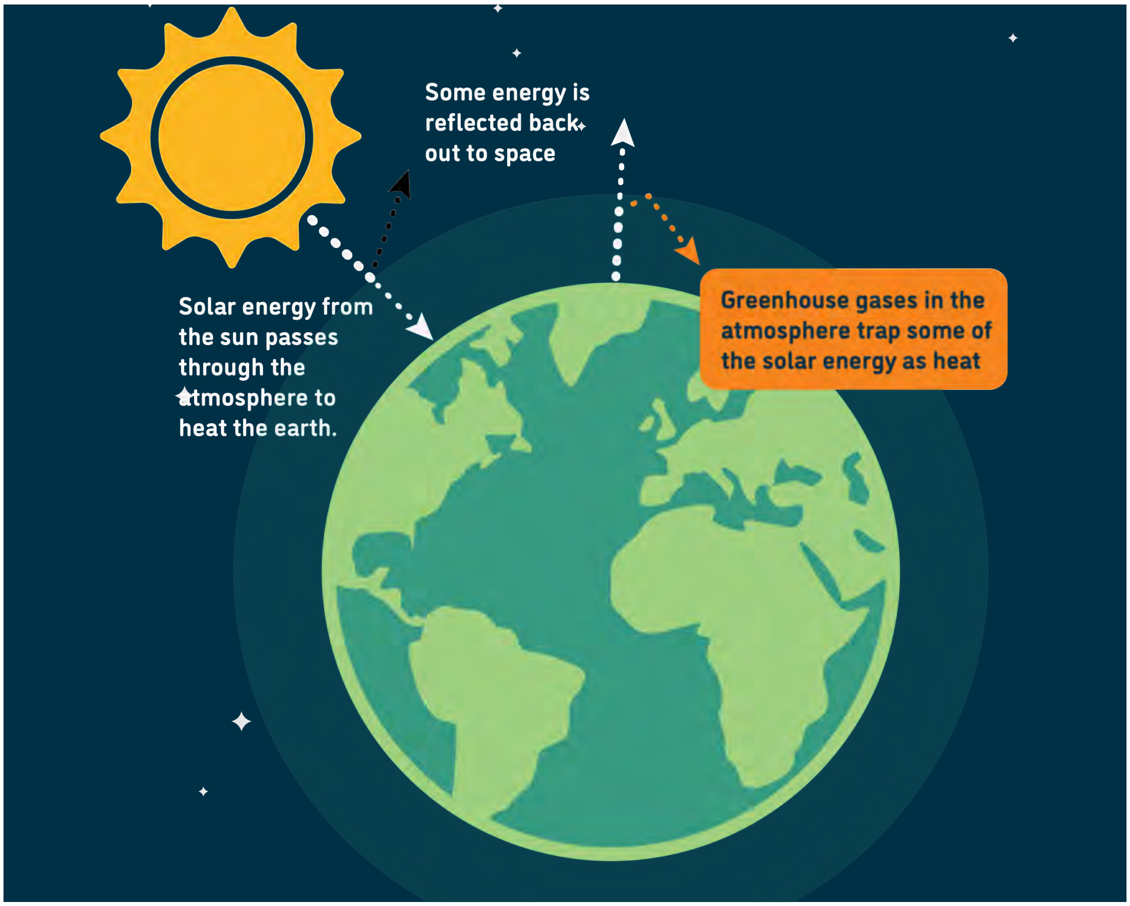
The greenhouse gas (GHG) inventory for York showcases how the town's residents, businesses, and visitors contribute to climate change individually and collectively. This section provides an overview of GHG emissions and why they are significant. It provides a detailed look at the sources of GHG emissions in York so that the Town can better understand the most appropriate and efficient reduction strategies and track its progress over time.

Highlighted words *are defined at the end of this section in "Terms to Know." A full glossary of all "Terms to Know" can be found at the end of this plan on page 171.*

Why the Focus on GHGs?

GHGs are an umbrella term for gases in the atmosphere that trap heat, preventing it from escaping into space (Fig. 5–1). GHG emissions produced by human activities are causing the earth to warm much faster than ever before, resulting in climate change. More information about GHGs and how they cause climate change can be found in Section 2.

Fig. 1–1. The Greenhouse Effect



Source: adapted from http://www.way2science.com/index.php/greenhouse-effect/

Scope 1, 2 and 3 Emissions: What does it mean?

GHG emissions were inventoried in three sectors – buildings, transportation, and waste, according to Global Covenant of Mayors protocols. Within each sector, emissions are evaluated through the lens of three scopes:

Scope 1: Emissions produced within York driven by activities in York, including on-road travel with destinations and/or origins within the town, heating emissions for all buildings, and emissions from waste generated in the town.

Scope 2: Emissions produced to generate grid-supplied electricity consumed in York.

Scope 3: Emissions included in York's footprint that do not fall within Scope 1 or Scope 2. Scope 3 emissions include things such as I-95 traffic that passes through York and **transmission and distribution losses** associated with the delivery of electricity to the end user.

Scope 3 emissions are difficult to determine and can not be controlled by York; these emissions are not required for reporting and are not factored into the town's emission profile in this plan.

Where do GHG Emissions Come from in York?

Understanding the source of York's GHG emissions enables the Town to develop strategies to meet its reduction committments (see Section 7 for specific reduction strategies). There are primarily three sources of GHG emissions in York:

Buildings

Buildings and structures produce GHG emissions onsite by heating fuels (oil, propane, wood, etc.). Heating fuels are largely used to generate heat and hot water. When **grid-supplied electricity** is used to provide lighting, cooling, and power for other appliances, GHG emissions are also produced where the electricity is generated.

Transportation

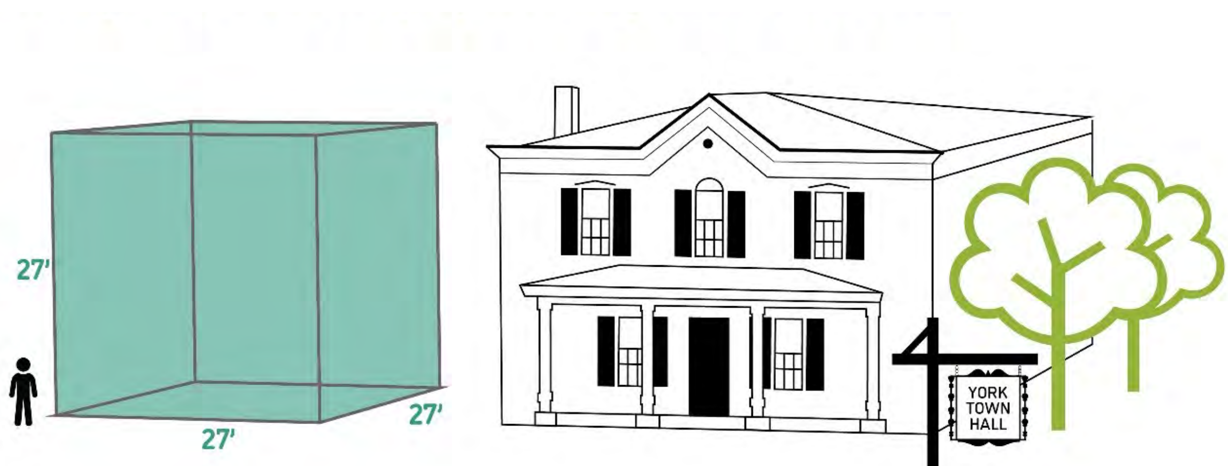
Vehicles that burn gasoline or diesel fuel produce GHG emissions. In York, these vehicles are mostly cars and light trucks (defined as SUVs and passenger pickup trucks), as well as larger short-haul trucks, buses, and motorcycles. York has no airports or fixed transit services.

Waste

Municipal solid waste (household and commercial trash) produces GHG emissions when incinerated or buried in a landfill. Energy-powered wastewater sewer treatment also generates GHGs.

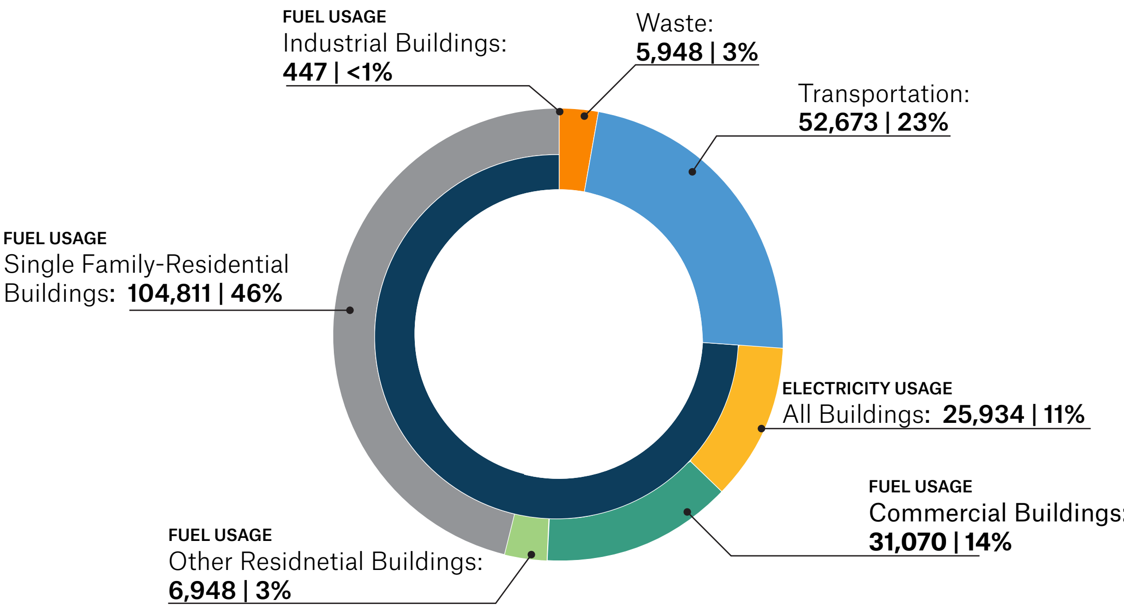
What's the volume of one metric ton of CO_2?

Imagine a cube roughly the height of Town Hall!



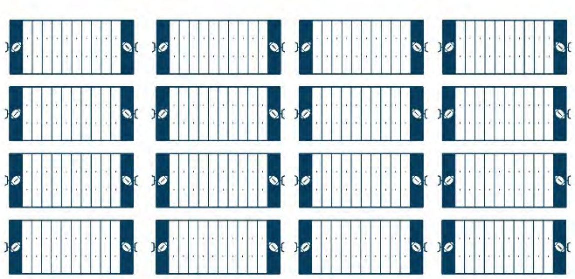
Because different GHGs trap heat at different rates, a unit of measurement has been created to standardize them based on carbon dioxide (CO_2). This unit is called "metric tons of carbon dioxide equivalent," or **$MtCO_2e$**. An inventory of York's 2019 GHG emissions revealed that the town's total emissions from buildings, transportation, and waste were approximately 230,000 $MtCO_2e$, or around 17 $MtCO_2e$ per resident. Buildings contributed the most at 74% of the town's emissions, followed by transportation (23%) and waste (3%). The largest single source of emissions is fuel usage—mostly heating—in single-family homes, accounting for 46% of all of York's emissions (Fig. 5–2).

Fig. 1–2. Emissions by Sector ($MtCO_2e$)



On average, a York resident emits 17 metric tons of CO_2 per year

It would take approximately 21 acres of trees to sequester (remove from the atmosphere) the amount of carbon produced by one York resident annually —that's about 16 football fields!

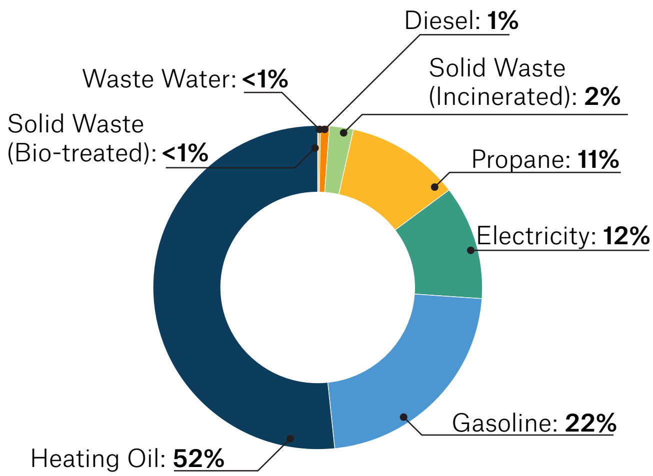


It would take a forest more than 6 times the size of York to sequester (remove from the atmosphere) the amount of carbon produced in York annually.

GHG Sources

To establish effective emissions reductions strategies, it is also important to understand emissions by their sources, or the fuels or processes that produce GHGs across the three sectors. In York, the largest sources of emissions are heating oil, used for heating buildings, and gasoline, used to power motor vehicles (Fig. 5–3).

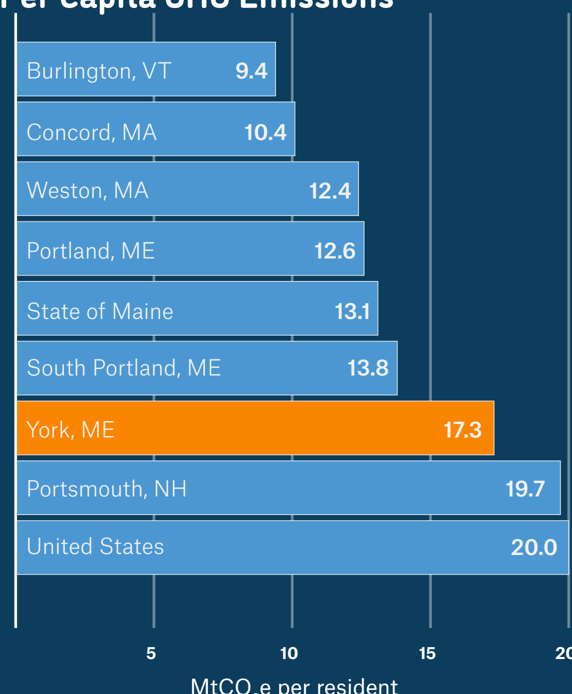
Fig. 1–3. Emissions by Source ($MtCO_2e$)



How Do York's GHG Emissions Compare?

York is one of the first municipalities in Maine to complete a GHG inventory and is among a limited group of small New England communities to do so. Therefore, it is difficult to make direct comparisons. Higher per capita emissions in York, like most of Maine, are likely due to greater reliance on heating oil, lack of public transportation, and lower residential density. It should be noted that York's per capita emissions were calculated based on the town's year-round population, as per US Census data. Factoring in seasonal residents, which represent more than a third of York's population during the summer, would somewhat lower per capita emissions, though to what degree is unknown because summer energy use differs from year-round energy use.

Per Capita GHG Emissions



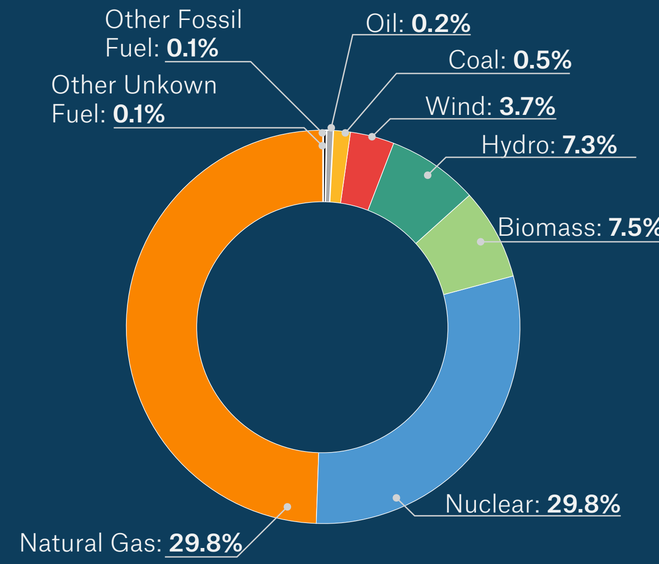
Note: GHG inventory data in the figure range from 2017-2019. Methodologies may vary by inventory.

Source: One Climate Future: Charting a Course for Portland and South Portland, 2020.; Maine DEP, Eighth Report on Progress toward GHG Reduction Goals, 2020.; US EPA, Inventory of US Greenhouse Gas Emissions and Sinks.; City of Portsmouth, NH, 2018 Municipal & Community Greenhouse Gas Inventory, 2019.; Weston, MA Climate Action and Resilience Plan, 2021.; Town of Concord, MA, Community Greenhouse Gas Emissions 2019 Progress Report, 2021.; Net Zero Energy, Burlington, VT, presentation, 2021.

A Note about Electricity

GHG emissions produced from electricity are not from the use of electricity itself but from the process of generating that electricity. In York, all electricity comes from the six-state New England grid and is generated from a variety of sources (York's electricity utility supplier, Central Maine Power, delivers the electricity but does not produce it). York's emissions from electricity use can be estimated by taking the GHG emissions caused by the generation of one kilowatt-hour (kWh) in New England and applying that estimate to the total kWh use in York. The graphic to the right shows the mix of electricity generation sources for the New England grid in 2019. Increasing the amount of electricity that comes from renewable sources like solar, wind, and hydro will reduce electricity emissions.

New England Electricity Grid Generation Mix, 2019



Source: https://www.epa.gov/egrid/power-profiler#/NEWE

Photo Credit: Carol Libby

A Deeper look at the GHG Inventory

The following pages highlight the findings of the inventory that informed strategies for reducing York's GHG emissions. For more extensive information on the methodology used to calculate York's inventory of GHG emissions, see Appendix B. It should also be noted that this inventory uses 2019 as a base year as the COVID-19 pandemic created anomalies in building use (and heating, cooling, and other electricity use) and transportation behavior in 2020. The year 2019 is a better baseline by which to track York's progress in reducing GHG emissions in the coming years.

York's Buildings

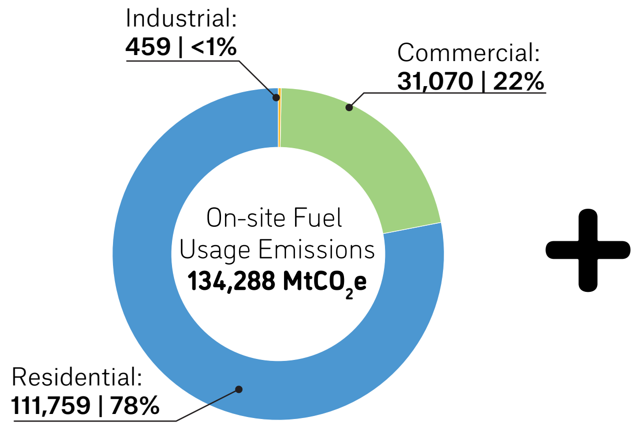
Buildings accounted for 74% of the town's total 2019 GHG emissions

Buildings accounted for 74% of the town's total 2019 GHG emissions. The vast majority (85%) of building emissions came from the use of fuel, such as heating oil and propane, and the rest came from electricity use. Fuel usage was especially intensive in residential buildings, while a relatively larger proportion of the emissions from commercial and industrial buildings comes from electricity usage (Fig. 5–4).

Residential buildings are by far the most prevalent building type in York. According to the 2019 Assessor's data, York had 9,671 residential properties, with over 90% being single-family homes. It's no surprise then, that single-family homes contributed the most to building GHG emissions, accounting for 94% of residential emissions and 75% of all building emissions (Fig 5–5).

In 2019, York's commercial buildings contributed 24% of building GHG emissions. Emissions varied by type of commercial activity, with lodging, municipal activities, and retail comprising the largest proportions. York's industrial building stock is minimal and contributed only 1% of the town's building GHG emissions.

Fig. 1–4. Fuel, Electricity, and Total Emissions for Residential Buildings



York's buildings can be divided into these categories

Residential

Commercial

Industrial

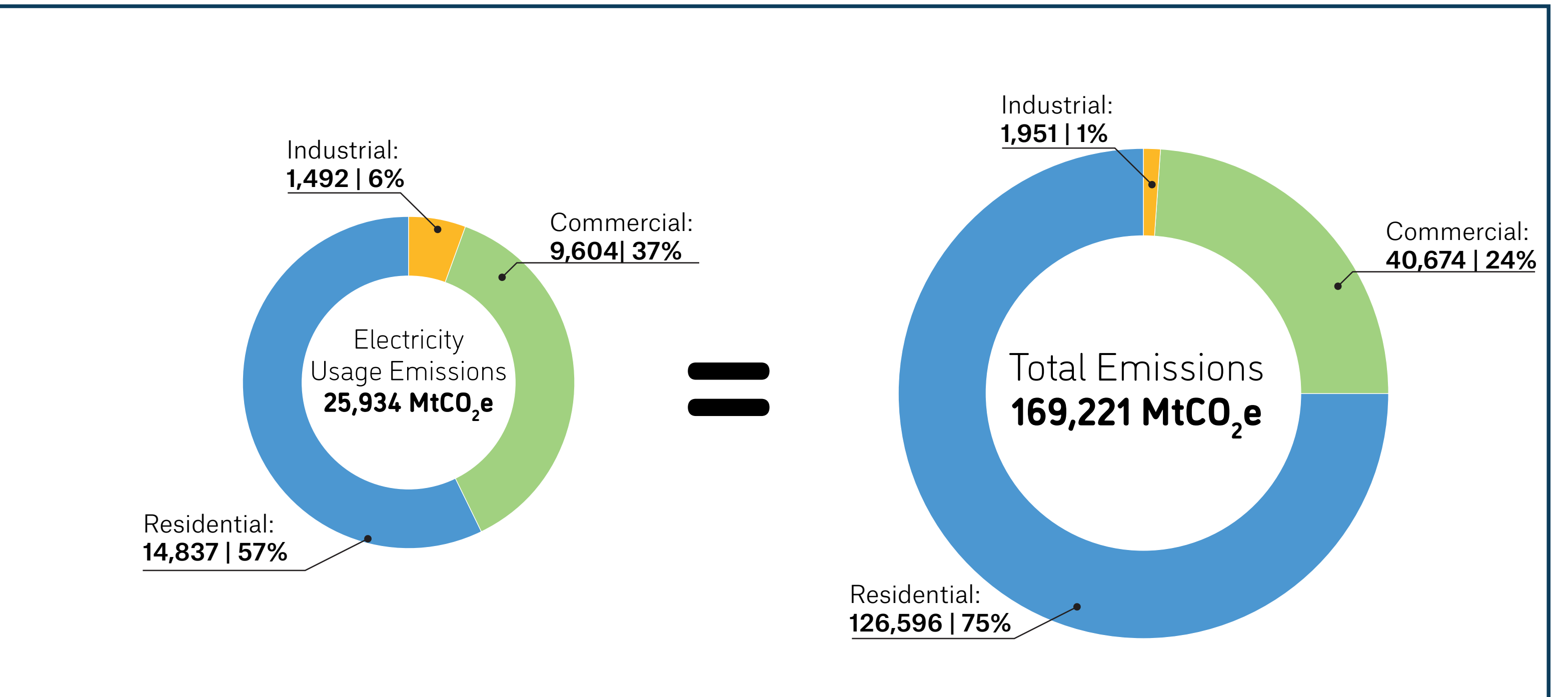
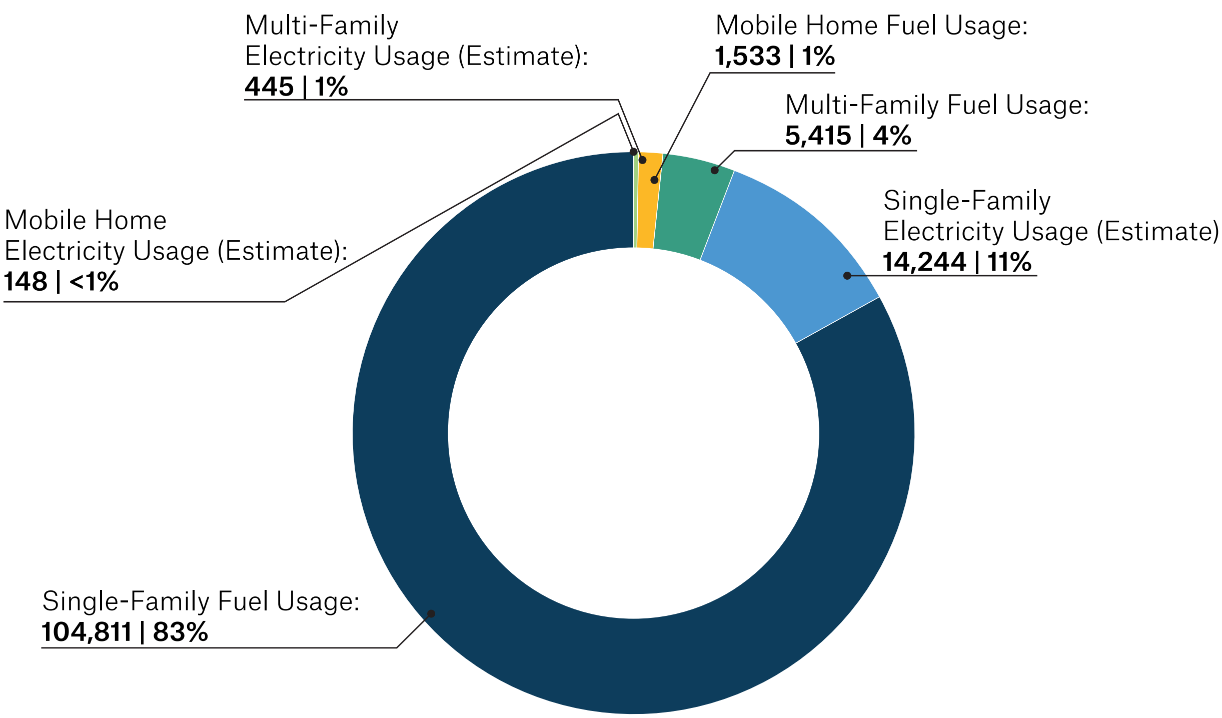


Fig. 1–5. Residential Building Emissions ($MtCO_2e$



Note: Electricity emissions were not provided for each residential building type, only the total for all residential buildings. Electricity emissions for each residential type were estimated based on proportion of square footage of each type.

York's Transportation

In-town transportation accounts for 23% of the town's total emissions

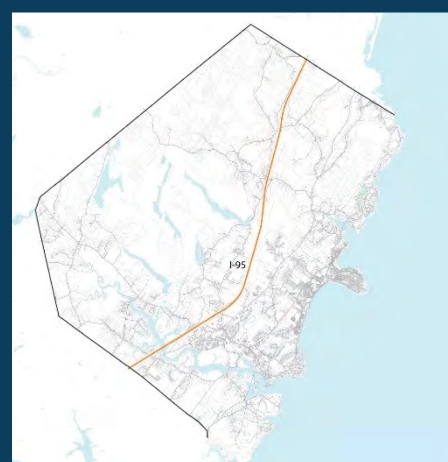
In the transportation sector, GHG emissions are produced by passenger and commercial vehicles traveling to and around York and those vehicles passing through the town on I-95. In-town transportation accounts for 23% of the town's total emissions. I-95 travel is beyond York's direct control and is not considered in calculations for York's GHG inventory, other than to acknowledge its extent.

Passenger cars and passenger trucks (pickup trucks and SUVs) comprise most of the vehicles on York's roads. As expected, they generated the most vehicle miles traveled (VMT) (Fig. 5–6) and produced the largest percent of emissions (Fig. 5–7). Because of lower fuel efficiency, passenger trucks generated a greater share of vehicle emissions compared to their share of total VMT.

Almost all transportation GHG emissions came from gasoline fuel, with a small percentage from diesel fuel. Electricity was not a significant contributor to transportation emissions (Figs 5–8 and 5–9); in 2020, York had 28 registered battery **electric vehicles (EVs)** and 27 registered plug-in hybrid EVs.

A Note about I-95 Traffic

Emissions produced by traffic on I-95 that passes through York but does not enter or exit the interstate within town boundaries were not attributed to York's **carbon footprint** in this GHG inventory. However, a high-level estimate of I-95 emissions was calculated for informational purposes and to provide context for potential future regional and state discussions. It was found that 2019 emissions produced from vehicles passing through York on I-95 were approximately 1.5 times greater than vehicle emissions produced within York's jurisdiction.



York's transportation can be divided into these categories

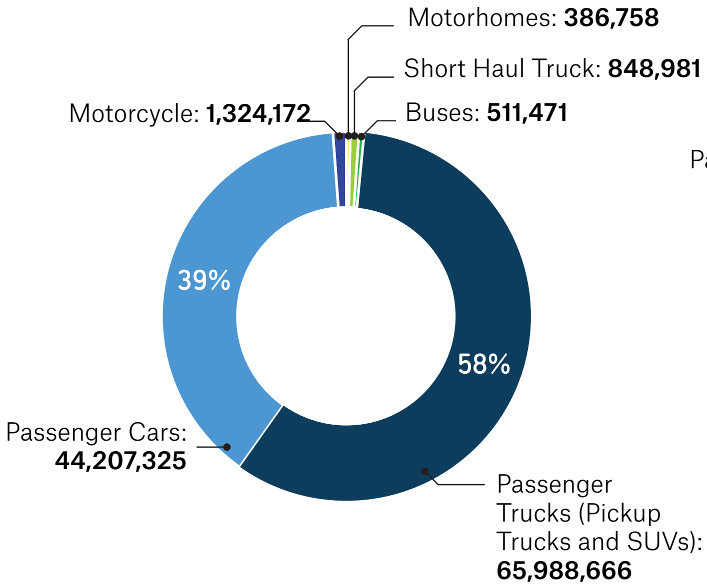
Passenger Cars

Passenger Trucks

Buses

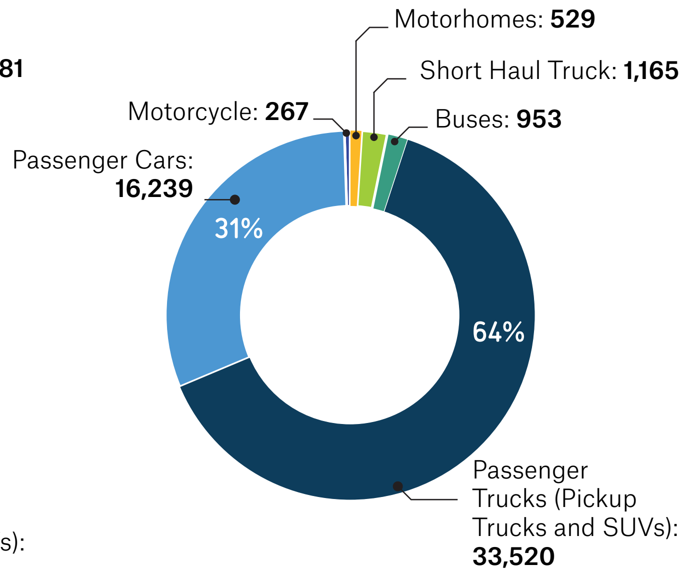
Commercial Trucks

Fig. 1–6. On-Road Vehicle Mileage by Type (miles)



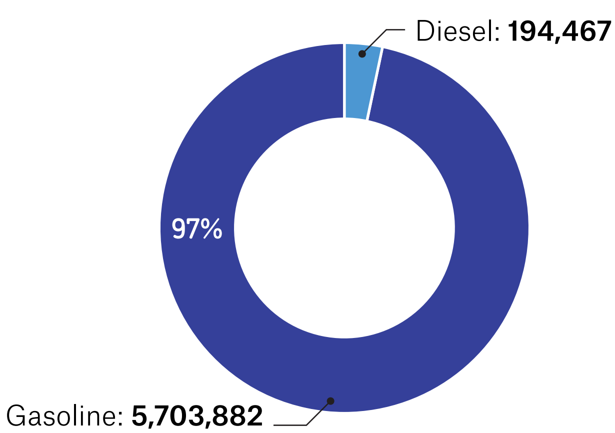
Total: **113,267,374 Miles**

Fig. 1–7. On-Road Vehicle Emissions by Type ($MtCO_2e$)



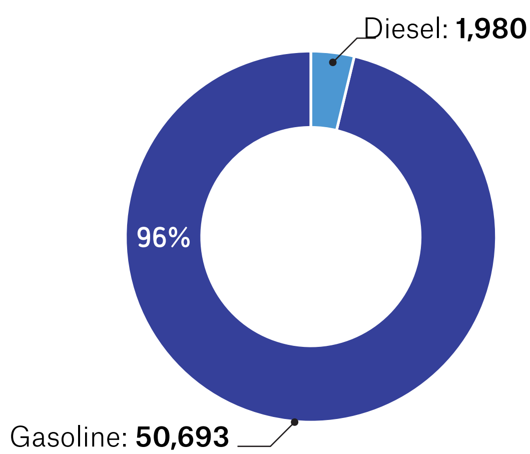
Total: **52,673 MtCO2e**

Fig. 1–8. On-Road Vehicle Fuel Usage (gallons)



Total: **58,983,489 Gallons**

Fig. 1–9. On-Road Vehicle Emissions by Fuel ($MtCO_2e$)



Total: **52,673 MtCO2e**

York's Waste

Solid municipal waste (SMW) and wastewater treatment account for 3% of the town's GHG emissions.

Municipal solid waste (MSW) and **wastewater treatment** account for 3% of the town's GHG emissions. Solid waste is produced from residential, commercial, and construction and demolition activities. Each of these contributes a large percentage of the overall solid waste. In 2019, 100% of solid waste produced in York was incinerated at a Maine facility outside of town. Incinerated waste produces 90% of York's total waste GHG emissions (Figs. 5–10 and 5-11)

GHG emissions attributed to wastewater treatment at the York Sewer District Wastewater Treatment Plant were produced from electricity needed to screen and treat wastewater and from processing and disposing of wastewater **sludge** (which is either composted or landfilled). In 2019, sludge was composted for the first two months of the year and then landfilled going forward.

A Note about Waste Emissions

This GHG inventory followed the reporting protocols of the Global Covenant of Mayors (GCoM), which focuses on GHG emissions produced within town boundaries. Therefore, many of the out-of-town waste emissions associated with the production, transportation, and disposal of materials used in York are not captured but are still an important part of the overall GHG emissions picture. This includes the resources and energy used to make products and transportation emissions from shipping and waste pickup. While out-of-town processes are largely out of the control of York, those in York do have control over reducing their consumption and buying locally, which reduces overall waste emissions. More information about actions to reduce waste can be found in Section 7.

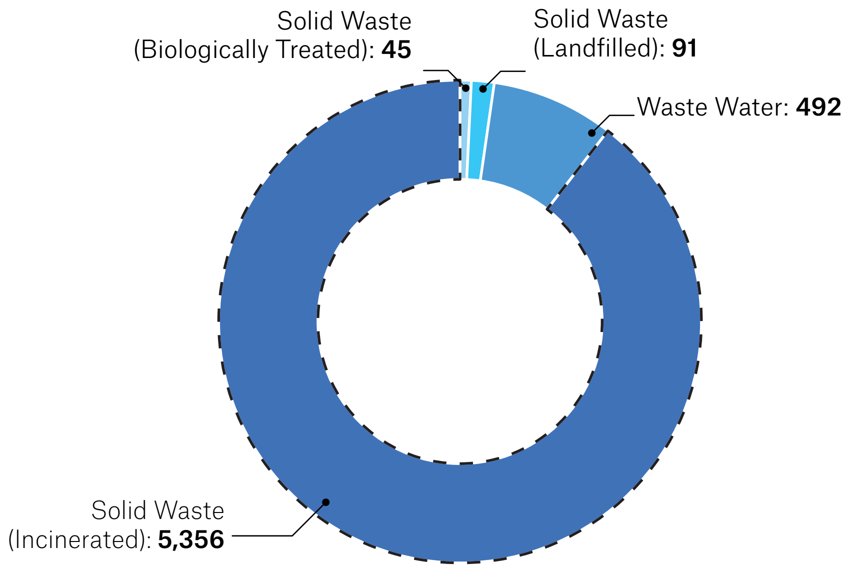
York's waste can be divided into these categories

Solid Waste

Incinerated Waste

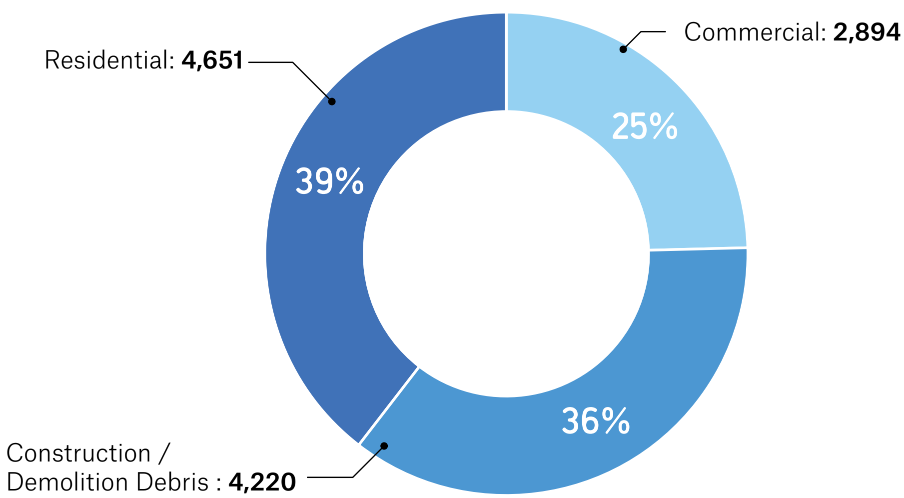
Waste Water Treatment

Fig. 1–10. Overall Waste Emissions by Type ($MtCO_2e$)



Total: **5,984 $MtCO_2e$**

Fig. 1–11. Incinerated Solid Waste Mass by Source (Mt)



Total: **11,765 metric tons**

Knowledge is power. We all will benefit from additional and ongoing/updated information [as York moves forward with climate action planning].

– Fall 2021 CAP Community Survey Participant

Key Takeaways from York's GHG Inventory

Comparing GHG emissions produced within each of the three sectors, York's top priorities for reduction strategies should focus on single-family residential Scope 1 and transportation emissions, which account for 46% and 23%, respectively, of York's total emissions. For single-family residential buildings, the greatest source of emissions is petroleum-based heating oil. For transportation, nearly all emissions come from gasoline-powered vehicles, with 64% from passenger trucks (including SUVs) and 31% from passenger cars.

Terms to Know

Carbon footprint:
The total GHG emissions caused directly and indirectly by an individual, organization, event, or product.

Electric vehicles (EV) vs hybrid vehicles:
Hybrid vehicles are propelled by a combination of electric motors running on a battery and a conventional gasoline engine, resulting in less gasoline burned overall. Electric vehicles rely solely on electric motors for propulsion and are powered by a battery. Both hybrid and electric vehicles provide opportunities to reduce GHG emissions.

Grid-supplied electricity:
Electricity provided through power lines from power plants to the end users. The GHG emissions that occur from grid supplied electricity to an end user can be estimated by prorating their share of the emissions of all sources of GHG used to generate that electricity.

Municipal solid waste (MSW):
The waste produced by residential, commercial, and industrial buildings and uses. The largest categories of MSW include food waste, paper, metals, plastics, textiles, and yard trimmings.

$MtCO_2e$:
Metric tons of carbon dioxide equivalent. Many emissions are a mix of the greenhouse gases, each with different warming potential. $MtCO_2e$ measures the equivalent amount of carbon dioxide that would equal the warming potential of a gas mixture.

Sludge (sewage):
The mud-like residue resulting from wastewater treatment. When wastewater and stormwater enter the sewage system, solid wastes are separated and processed. These processed solids are sewage sludge.

Transmission and distribution loss:
The amount of energy lost between electricity generation at the power station to its final point of use by consumers (electrical outlets). Most losses occur in power lines and transformers.

Wastewater treatment:
The process of removing as many solids as possible from wastewater before treating and discharging the remaining water back to the environment. Wastewater is made up of sewage, rainwater, and runoff from agricultural and industrial sources.

Photo Credit: Geneve Hoffman (16 Hoops Photography) and Williams Realty Partners

section 6

Engaging the York Community

This section summarizes public engagement during the Climate Action Plan (CAP) planning process. Residents, business owners, community organizations, those who work in the town, and property owners are all part of the community and had opportunities through a variety of methods to hear about the plan as it evolved, ask questions, and offer their thoughts. An overview of outreach opportunities, information on who participated, and what the community said is provided here.

Spreading the Word About the CAP

Information about the CAP was communicated to the York community in many ways. Each of these engagement activities offered community members the opportunity to participate in the planning process by learning more about the CAP, asking questions, and providing input.

4 in-person and virtual public events

16 public Steering Committee meetings

37 public Working Group meetings

A community feedback survey with **409** responses

Regular social media posts

1 all-day public Working Group report-back session with evening summary

A CAP website with up-to-date materials, opportunities to get involved, background information, and ways to give input

YORK CLIMATE ACTION PLAN

11 "Road Show" CAP presentations to a variety of community groups and Town boards and commissions

Presentations to the York Selectboard and Planning Board

Recurring Themes

As the engagement process unfolded, some key themes emerged:

- **Education is important!** The science and technical side of climate action can be daunting for most people and more information in simple language is needed.
- **Commitment is needed to both mitigation and adaptation.** Reducing GHG emissions is part of the Town's commitment to the Global Covenant of Mayors (GCoM), but we also need to protect all that we hold dear in York from climate change vulnerabilities.
- **Climate issues are equity issues.** Climate change will continue to affect all of us, some more than others. A core goal of the CAP must be ensuring equitable access to resources and information, while limiting cost burdens.
- **Residents want to know where they can directly take action to make a difference.** Many people in town recycle and actively think of ways to reduce their household waste. Direct actions are important to residents.
- **York is passionate about its natural resources.** In the CAP survey (as well as the Comp Plan survey) concern about protecting the town's natural environment and resources ranked as the highest priority.
- **It's time to find alternatives to gasoline-powered automobiles.** GHG emissions from vehicles are about a quarter of the town's GHG emissions. Electric Vehicles (EVs) and alternatives to personal vehicles such as biking, and walking should be encouraged.
- **Town government and the York community as a whole need to each lead in taking action.** The CAP will require collaboration of many different partners and entities to implement, including neighboring communities...no one entity, Town or otherwise, can do it all. This will be a collaborative, "all hands on deck," effort.

Photo Credit: Carol Libby

Comprehensive Plan Feedback

This CAP was developed at the same time that the Town's Comprehensive Plan update was underway. While these planning processes were separate, the CAP benefited from the community feedback received during the comp plan outreach and details on the comp plan survey results are offered in this section as they relate to the CAP.

The greatest level of concern at the Project Kickoff Meeting in June 2021 was sea level rise and the associated impacts on beaches, housing, York's economy, access to drinking water, and critical infrastructure.

Public Events

Public events were held to kick off the CAP, review draft actions, and review the final draft of the plan. What did you say?

Project Kick-off

June 9, 2021 Public Library & June 17th Zoom

WHAT YOU SAID:

Biggest Concerns

- Impacts of sea level rise on beaches, housing, economy, water security, and critical infrastructure
- Higher costs of living and development pressure from climate in-migration

Top Priorities

- Social justice and equity need to be operative principles of the CAP
- Encouraging individuals to reduce emissions
- Reduce emissions from residential buildings
- More efficient waste disposal
- Transition to EVs and renewable energy sources

65
PARTICIPANTS

Strategies Workshop

October 7, 2021 Zoom

WHAT YOU SAID:

- We need more widespread education to bring more people in. Technical strategies and actions need to be presented in succinct, plain language with more technical supporting material shown in the appendices.
- Actions need to take place at the individual, community, and municipal levels and with neighboring municipalities in our region joining together.
- Individual strategies can sometimes be expensive, which may create equity issues. Financial incentives can help overcome this.
- We must identify who will lead on implementation for the different strategies to turn planning into action.

68
PARTICIPANTS

Draft Plan Review

January 25, 2022 Zoom

WHAT YOU SAID:

- The CAP's completion is timely...York is out ahead of most municipalities in the state and we will be ready to take advantage of funding and other assistance.
- The CAP needs a marketing plan to get the word out to residents. This is different than education, which is also needed.
- Very important to get youth and teens involved...they are passionate about this.
- Get the details out on specific tasks and priorities as soon as possible.

49
PARTICIPANTS

Community Feedback Survey

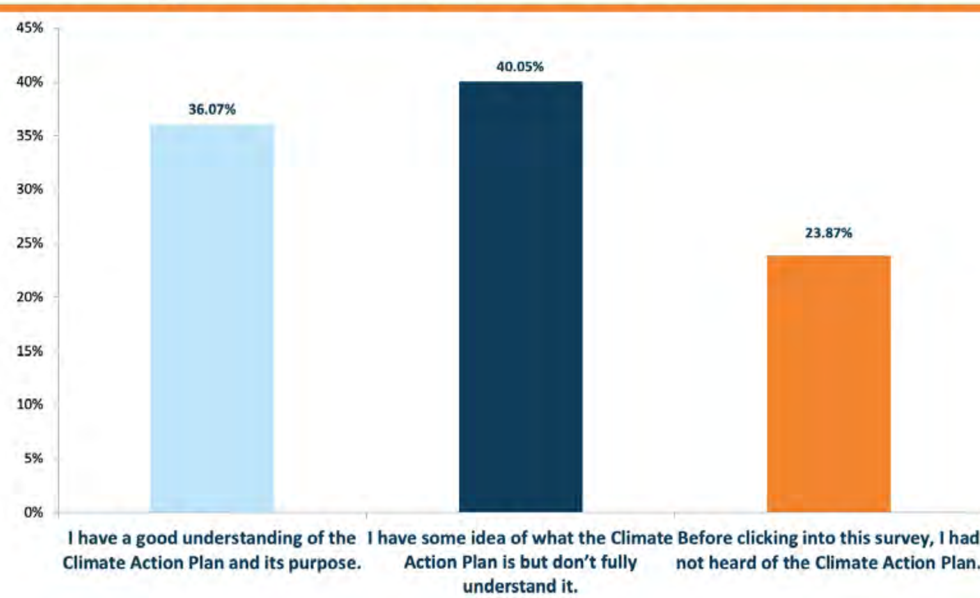
The CAP Community Feedback Survey in the fall of 2021 gathered input from a broad audience, including many who had not yet heard of or participated in the CAP process. It was the largest targeted outreach effort, with survey postcards mailed randomly to 8,500 York property owners and registered voters. The survey was also advertised on social media and on the CAP website, through mass email notifications, and cards distributed at tabling events. There were 409 responses to the survey, 34% of whom had not been involved in the planning process and had not seen materials for the CAP prior to taking the survey. The number of responses was a large enough sample for results to be statistically significant (95% confidence level, plus or minus 5%).

Respondents were given the opportunity to express any comments, questions, or concerns about the CAP in an open response format. Responses varied widely, with the most common being expressions of appreciation for the undertaking of the CAP. Among the most frequent concerns were respondents feeling that they were not informed enough about climate change and CAP to support the process and make the best personal decisions. Several respondents also expressed concern about whether actions stemming from the recommendations in the CAP will lead to higher local taxes and others questioned the science behind climate change declarations. Below are responses to a selection of questions from the survey. A full summary of the survey results can be found in Appendix E.

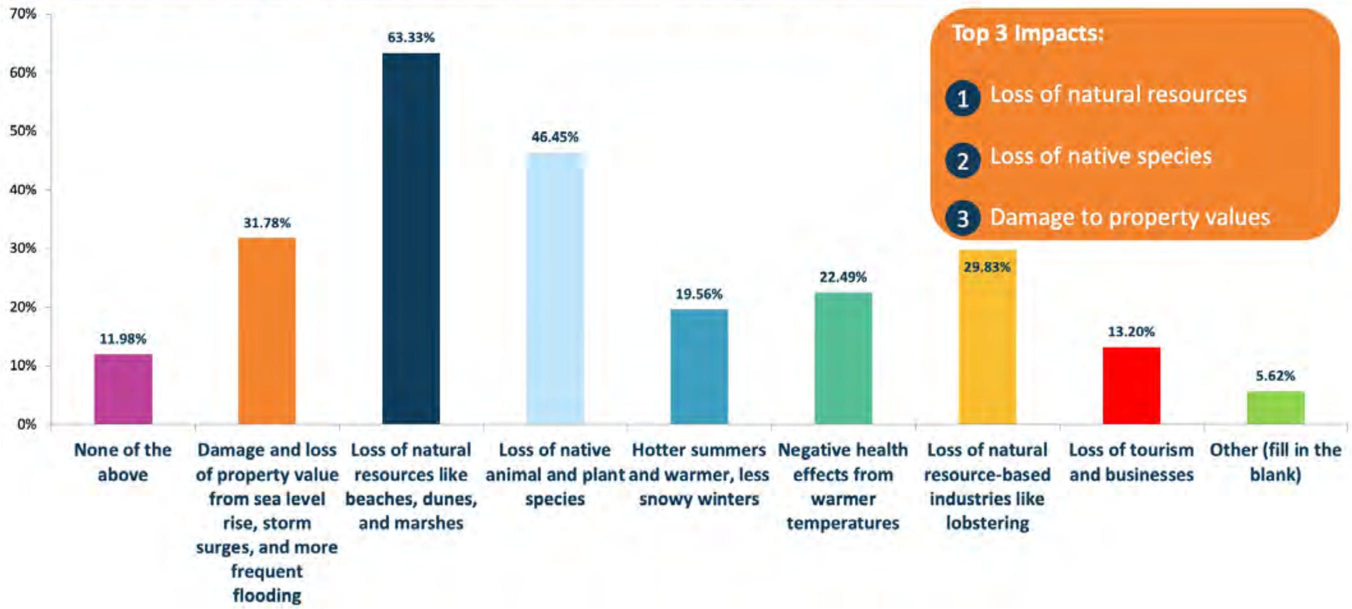
A Note on Sustainability and this Climate Action Plan

York is committed to recycling and reducing waste! When asked to select what steps they already take to reduce their greenhouse gas (GHG) emissions, 83% of survey respondents selected “reduce waste by recycling and/or composting more.” Notably, less than 4% of respondents selected “none of the above,” suggesting that the vast majority of those who took the survey have previously thought about and acted to reduce their personal GHG emissions and/or contribute to sustainability efforts. Residential recycling is required by Town Ordinance. The embrace of recycling and waste reduction is strongly linked to larger issues of sustainability. Sustainability, which is broader than the scope of this plan, is addressed regarding waste reduction in suggested goals and actions in Sections 7 and 8.

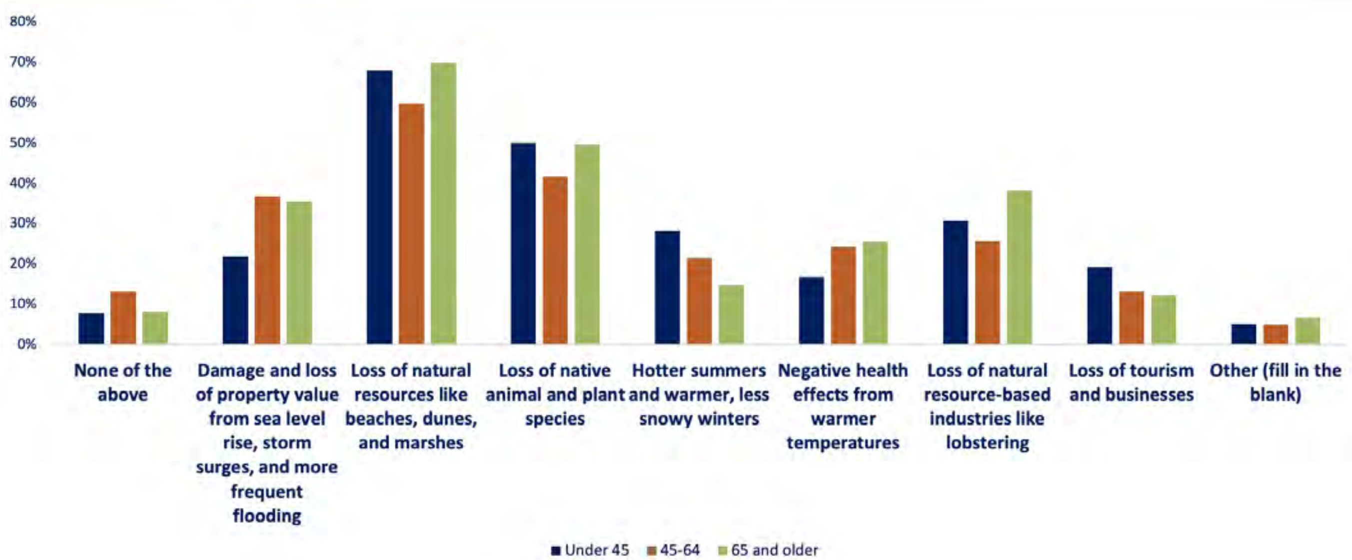
Which of the following best describes your understanding of the purpose or role of the CAP?



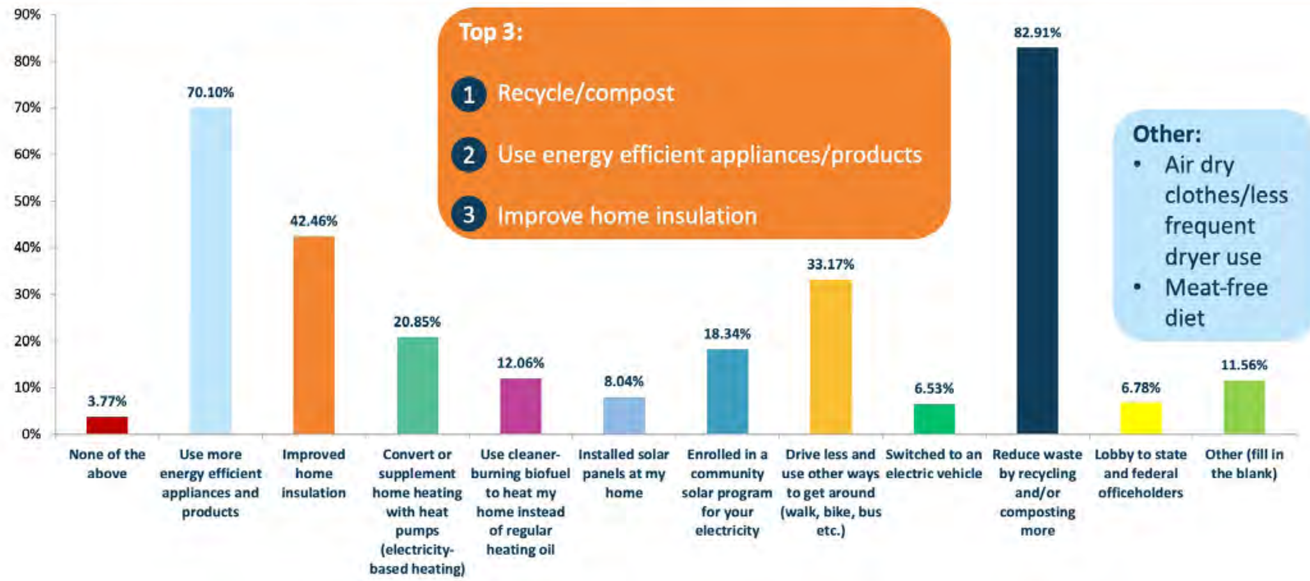
Which climate change impacts concern you most (choose up to 3)?



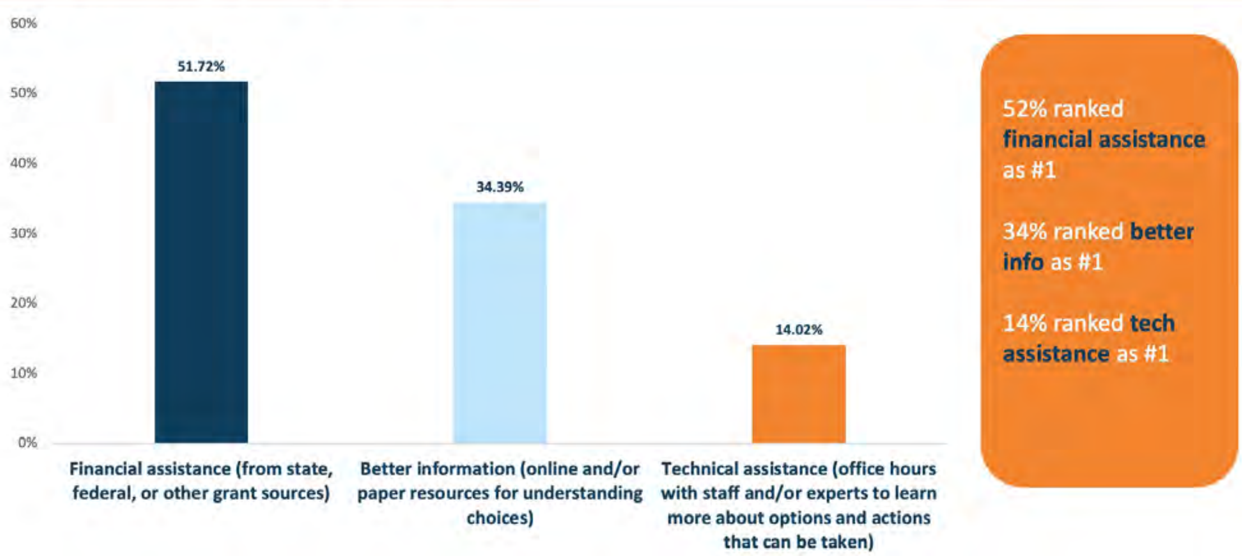
Which of the climate change impacts concern you most? (By Age)



Which of the following steps do you already take to help reduce GHG emissions? (Choose all that apply)



How would you rank the following as ways to best encourage members of the York community to adopt CAP recommendations?



Comprehensive Plan Community Survey

In early fall of 2021, the Comprehensive Plan Steering Committee sent a postcard with a link to all property owners and registered voters in York to an online survey and received 1163 responses. The comp plan survey contained some questions related to the CAP effort:

- **73% of respondents stated they are concerned about climate change.**
- **When asked how important it is to protect local and regional natural resources for a variety of reasons including climate change, 80% said very important and 17% said somewhat important.**
- **In a separate question, 70% of respondents said they believe that York's beaches and oceans are the most vulnerable natural resources. Other top vulnerable areas (with approximately 60-62% of respondents for each) included 1) the York River and Harbor, 2) waterfront areas including the Cliffwalk, and 3) the town's forests and wildlife habitats.**
- **When asked about the top three priorities for the Comp Plan, protecting the town from the impacts of climate change was the 3rd ranked overall priority (45% of respondents). Conserving forests, open space, and land was 1st ranked (57%). While not explicity identified with climate change, forests are iimpacted by climate change and have a role in storing carbon.**

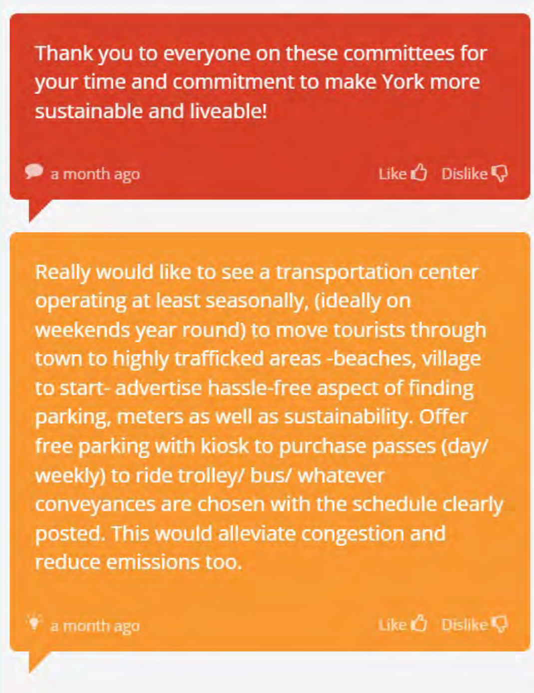
It's been hard to think about what will happen so many years in the future but it's here now, isn't it? We need tangible things we can do to make a difference.

- Participant at June 2021 Project Kickoff Meeting

Photo Credit: Gerry Runte

Website

Community members were invited to share their thoughts on York's climate vulnerabilities and GHG emissions on a public virtual "ideas wall."



CAP Road Show

To ensure that York community members from diverse populations and interests heard about the CAP and had the opportunity to give input and have questions answered, members of the Steering Committee took the CAP "on the road" by giving presentations directly to community groups, as well as Town Boards and Commissions. A total of 11 groups were presented to, reaching 143 people.

Group	Attendance
York Land Trust	15
Harbor Board	15
Budget Committee	8
Eco Club	25
Bike and Pedestrian Committee	6
Center for Active Living	6
Veterans Committee	10
York Hospital	5
Rotary	25
York Housing Authority	16
St. Georges Episcopal Church	12
Total	**143**

Social Media

Social media was an active and important part of the CAP engagement process. In the CAP Community Feedback Survey, social media was most frequently selected as the most effective way to reach people in York about CAP, especially among respondents under 45 years old. Social media was used to educate the community about CAP and highlight opportunities to get involved and give input. Facebook in particular was utilized heavily and reached many community members; at the end of 2021, posts on the CAP Facebook page had reached an estimated 8,300 viewers and CAP information was also regularly posted on several other community and school group pages. This included a recurring climate "Word of the Day" campaign that generated some of the highest engagement.

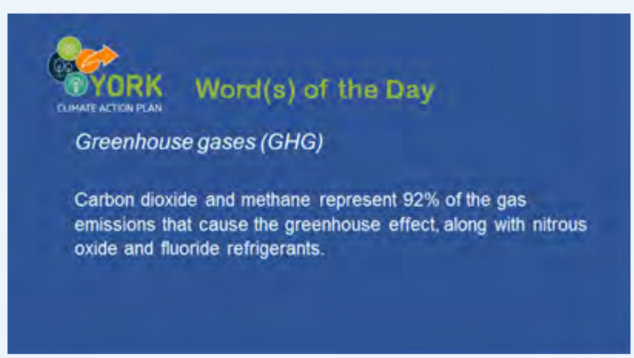


Photo Credit: Geneve Hoffman (16 Hoops Photography) and Williams Realty Partners

section 7

Goals and Actions

This section offers goals and actions for both greenhouse gas (GHG) emissions reduction and adaptation to climate change. These goals and actions are organized according to focus areas, and some goals address both adaptation and mitigation. The section begins with an overview of what kinds of climate actions are appropriate for York, followed by suggested priorities for action. The section ends with a summary chart of goals and actions, including information on key performance indicators and roles.

Highlighted words *are defined at the end of this section in "Terms to Know." A full Glossary of all "Terms to Know" can be found at the end of this plan on page 171.*

A Vision for York's Future

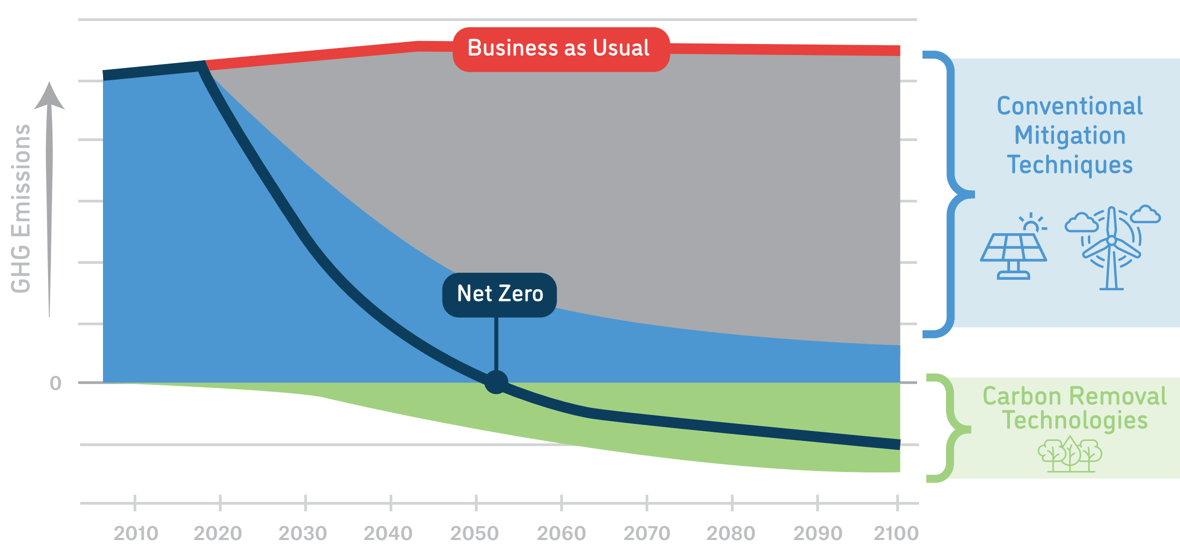
Achieving Net Zero

A commitment to **net zero** emissions means that there is a balance between the amount of GHG emissions that are released into the atmosphere and those that are removed. It is a combination of reducing (mitigating) GHG-emission producing activities, such as using fossil fuel for heating, and removing GHGs by capturing and storing them. Below is a graphical depiction of how those two processes act together to achieve net zero—or even negative—GHG emissions (Fig. 7-1).

York is fortunate to have opportunities to both reduce and remove these emissions. Many of the technologies needed to make this change are already available, although not fully implemented (e.g., charging stations for electric vehicles, **afforestation**). Fully achieving York's GHG reduction goals will require both local and regional effort.

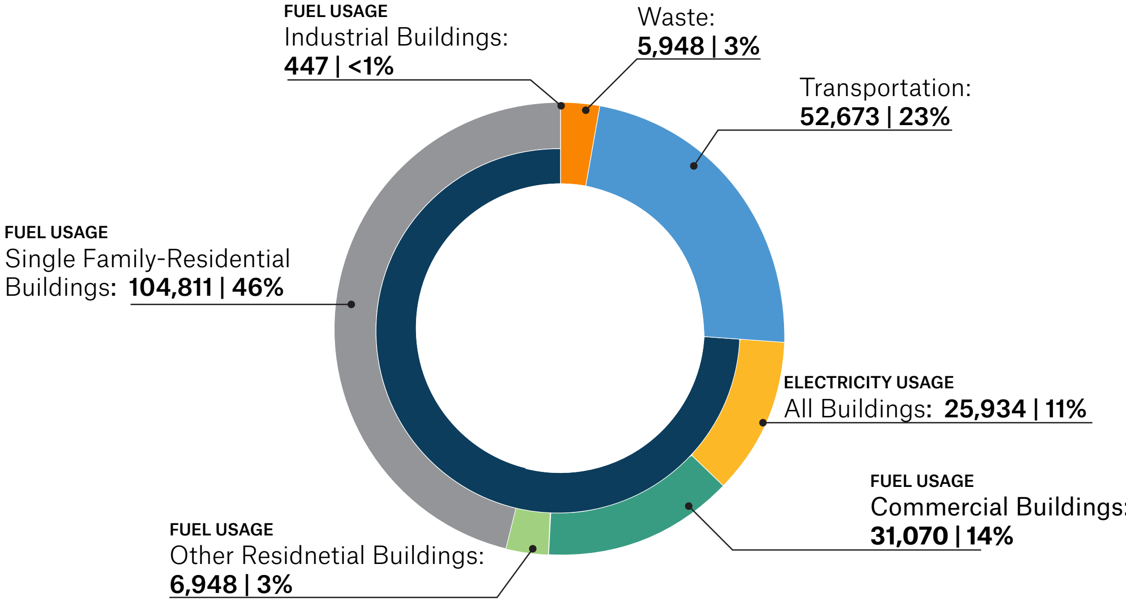
For York, the areas with the greatest levels of GHG emissions are in the building and the transportation sectors (Fig. 7-2). The majority of the building level emissions come from single-family residences while the majority of in-town vehicle emissions are from privately-owned vehicles. The greatest areas of carbon capture are within the forests, wetlands, and agricultural lands of York. Appendix A offers a detailed assessment of the town's carbon sinks and more details on GHG emissions can be found in Appendix B.

Fig. 1–1. How to Reach Net Zero Emissions

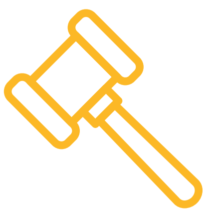


Source: World Resources Institute

Fig. 1–2. York GHG Emissions by Type ($MtCO_2e$)



Governance



Reducing emissions from new and existing building stock will require a commitment to regulations that assure reductions, such as policies and ordinances, as well as the resources to fund, implement, measure, and track those changes. Carbon sequestration and storage opportunities will likely require restoration and potential expansion of existing wetlands and forests. This may require land use and zoning changes and will require York to prioritize carbon sequestration benefits when considering trade-offs between built development and ecological restoration. It will likely also require collaboration with nonprofits focused on land conservation.

Need for State Actions

York's electricity consumption is entirely sourced from the six-state ISO electricity grid, the Independent System Operator-New England (ISO-NE). The electricity delivered over this grid is generated from a combination of fossil fuel fired power plants and renewable energy sources. Even with some of this generation coming from fossil sources, shifting to electrified heat or transportation reduces the amount of emissions that would otherwise have occurred from burning heating oil or using gasoline. In order to achieve net zero, however, ISO-NE electricity must become carbon-free. York does not have the ability to significantly influence the sources of energy used for grid-based electricity. However, the State of Maine does.

Funding

Many technology interventions to reduce emissions might not be possible or applicable to York and even those that are may be difficult to fund via traditional channels. The recent passage of the federal-level Infrastructure and Jobs Act and the pending Build Back Better Bill will provide a significant source of funding that could be tapped for these actions. However, that funding alone will be inadequate to fully address the extent of the changes needed to achieve net zero within York, new emission standards and temporary subsidies will unleash market forces including scale, scope and competition that drive down cost. Solar power, for example, is already cost competitive in many parts of the U.S. Funding these changes will require a significant commitment from both the public and private sectors. Business models will be necessary to implement these changes, coupled with incentives and disincentives to shape the market. Such incentives will be most effective if from the federal and state level.

> **"York's economic health relies on property values and our strong tax base which is tied directly to our beaches, natural environment, historic character, and coastal beauty. Climate change will threaten all of this."**
>
> **- Participant at June 2021 Project Kickoff Meeting**


Photo Credit: Bruce Boardman

Achieving Climate Resilience

Climate change will impact York on a variety of fronts, including increases in sea level, storm surge levels, inland flooding, and days with high heat. Without actions taken to adapt to these impacts and minimize harm, risks to those who live and work in York, as well as the town's infrastructure, economy, and services, will increase. Some climate impacts and vulnerabilities are already apparent, others will not be fully recognized until later.

For York, one of the areas of greatest vulnerability to climate change is in infrastructure, including the York Beach Fire Department, Town Docks 1 & 2 and the Harbormaster's office, and certain roads that are critical to neighborhood access and/or evacuation and emergency services. The potential loss of property value from SLR and inland flooding and corresponding tax base decline is a serious concern. For vulnerable populations such as older adults and lower income residents, more high heat days (feels like 90 F or above) and other risks pose a significant threat to health and quality of life. These vulnerabilities should be key priorities for action for the Town. Below is a summary of York's greatest vulnerabilities to climate change. A more detailed assessment of York's climate vulnerability can be found in Section 4 and Appendix A.

Loss of Natural Resources and Environmental Impact

York's natural resources are some of its greatest qualities and are the reason why so many want to live in and visit York. However, these natural resources are highly vulnerable to climate change. Among the potential impacts to natural resources are:

- Destruction of coastlines and coastal wetlands and loss of beaches, which eliminate natural barriers to flooding and impact recreational opportunities and York's tourism economy.
- Increased pollution of water resources, resulting from stormwater runoff during more frequent heavy rainfall.
- Declining forest health and shifting tree species ranges with warmer temperatures and greater prevalence of forest pests.
- Loss of native aquatic and land species as temperatures grow warmer, and replacement by invasive species.

Loss of Property Value and Tax Base

Sea level rise (SLR) and increasing storm intensity will increase the risk of coastal flooding for many properties in York. Property owners will feel this impact financially through direct damage to their property, declining property and real estate values, and increasing flood insurance rates. Declining property values in turn lower the property tax revenue collected by the Town, which can affect the Town budget and services.

Harm to the Local Economy

Businesses in York and the job security of their employees are likely to be impacted directly by flooding as well as by losses in tourism. Much of York's economy is closely tied to its natural resources and attractiveness as a summer destination. In particular, the loss of beach area could result in many fewer visitors and millions of dollars of lost spending in the local economy. A decline in seasonal residents, which make up a large percentage of York's population, could further have negative implication for the Town's tax revenue. Industries that are dependent on natural resources, such as lobstering, farming, and forestry are likely to experience losses and challenges as environmental conditions change.

Transportation Disruptions

Flooding events pose a significant risk to York's transportation system. The key function of roadways is to provide connectivity for goods, people, and services. Day-to-day mobility could be significantly impacted during extreme weather events, and, depending on the extent of damage, could remain impaired if substantial repairs are required after the events. With sea level rise, the geographic extent of the flooding, including the ability for storm surge and waves to reach further inland, will also present challenges. Emergency evacuation and alternative routes may need to be revisited as these impacts worsen with time. York's harbor infrastructure is another critical asset that is likely to be impacted by sea level rise.

Health Risks

The health of many in the York community is expected to be at greater risk because of climate change. Perhaps most notably, an increase in the number of days with high heat will put more people at risk of heat stroke and other heat related illnesses, as well as exacerbate pre-existing conditions. Higher average temperatures can also make air pollution worse and promote greater numbers and activity of ticks and mosquitoes that carry dangerous diseases. The risk of exposure to poor water quality, both in drinking and recreational waters, will also be heightened by more runoff and pooling of floodwaters during heavy rains.

Deepening Social Inequities and Vulnerabilities

The ability to adapt and respond to climate change varies widely based on individual and household resources, as well as existing social inequities. Traditionally marginalized and underrepresented groups, often already experiencing social inequities, are most at risk from the impacts of climate change. This includes children and older adults, persons with disabilities, households with lower or moderate incomes, people of color, those with limited English proficiency, those with less formal education, and those with limited physical and/or digital connectivity.

Determining Goals and Actions

The CAP Working Groups were charged with exploring potential strategies to reduce GHG emissions in York and to assist the Town in adapting to climate change. The Steering Committee and consultant team merged and organized the Working Groups' recommended strategies into goals and actions to meet desired mitigation and adaptation outcomes. These goals and actions were reviewed and revised by Steering Committee and Working Group members throughout the fall of 2021 and 8 topic areas emerged:

1. **Buildings**
2. **Infrastructure**
3. **Mobility**
4. **Access to Renewable Energy**
5. **Natural Resources**
6. **Waste and Recycling**
7. **Community Resiliency and Equity**
8. **Leadership and Capacity**

More information on the Workings Groups and their process can be found in Section 1 and in Appendix D.

Goals and Actions

Buildings 1

Buildings account for 74% of York's total GHG emissions, of which more than 90% comes from single-family homes, which represent the largest contribution to GHG emission in the town. Supporting home energy audits, a shift to electric heat pumps, and weatherization of buildings will need to be a priority in the coming years.

Goals

1.1. Reduce GHG emissions generated by existing residential and commercial buildings.

1.2. Adopt temperature and flood resilience standards for all new and heavily renovated buildings.

1.3. Develop a plan to phase in energy building codes to reach net-zero carbon emissions for new construction.

1.4. Increase awareness and use of climate-friendly Maine building products such as cross laminated timber and wood fiber insulation.

Infrastructure 2

Some infrastructure in York is highly vulnerable to climate change and should be a priority for action. SLR will greatly affect the rate of beach loss (and subsequent loss of tourism revenue/ tax base) and also will likely affect property values and the Town's tax base in coastal areas. Certain roads and town services are also at high risk, negatively impacting overall connectivity and neighborhood access/evacuation as well as emergency services.

Goals

2.1. Take steps to protect critical assets (water, sewer, public safety, access/ evacuation roads, healthcare, town services, dams, etc.) and other structures that will be impacted by sea level rise, storm surge, flooding and extreme weather events.

2.2. Install and improve coverage and quality of broadband service in York to minimize Vehicles Miles Traveled (VMT) and improve emergency services.

Access to Renewable Energy 3

Without "green" electricity sources, actions to shift to electric heat pumps for buildings and electric vehicles (EVs) will have little impact on reducing GHG emissions until electric power will be generated from burning fossil fuels and continue GHG emissions to the atmosphere.

Goals

3.1. Support the overall increase in the supply of renewable energy for all York citizens.

3.2. Promote alternative means by which residents and businesses can access renewable energy without having to install, own, or operate electricity generating systems, such as solar.

Natural Resources 4

Natural resources provide a two-fold benefit to the town by protecting York from the impacts of climate change (heat, SLR, flooding) and by capturing and storing carbon to reduce the town's net GHG emissions.

Actions

4.1. Permanently conserve land, including wetlands and estuarine systems, and protect resources that provide carbon storage.

4.2. Permanently conserve land and protect resources for climate resilience.

4.3. Evaluate economic value of natural resources (ecological services, blue carbon, green carbon, food production, forests, working lands) and use value in community decision-making.

Mobility 5

Transportation contributes 23% of York's total GHG emissions. Providing EV infrastructure will be critical to supporting the transition to EVs and to solve the "chicken and egg" problem of needing adequate charging capability before people feel comfortable with purchasing EVs.

Actions

5.1. Expand Electric Vehicle (EV) ownership and use.

5.2. Implement a green fleet policy for York municipal vehicle pool.

5.3. Encourage the adoption of green fleet policies by quasi-municipal (water and sewer districts) and commercial fleets operating in York.

5.4. Provide a diversity of mobility options to serve different populations and needs to reduce Vehicle Miles Traveled (VMT).

5.5. Facilitate, promote, and track the installation of EV charging infrastructure in York for residents, employees, and visitors.

Waste and Recycling 6

While waste only accounts for 3% of GHG emissions in York, residents have great control over the waste they generate, which also impacts GHG emissions from packaging and transportation of products. In addition, given the very low rates of recycling for plastics (<8%), there is significant room to reduce use of plastics.

Actions

6.1. Reduce municipal solid waste (MSW).

6.2. Select municipal waste and recycling contractors based on multiple sustainability and climate criteria in addition to cost.

Community Resiliency and Equity 7

Overall community health will depend on coordinated public, private, and nonprofit planning and response. Ensuring low and moderate-income residents do not have additional cost burdens for energy, building upgrades, and shifts to EVs should also be a key priority.

Actions

7.1. **Create a Coordinated Climate and Health Response Team to address climate health and disaster risks in the community.**

7.2. **Ensure public awareness of climate-related illnesses and health impacts.**

7.3. **Establish a town business sustainability award or recognition program.**

Leadership and Capacity

Creating clear leadership with professional capacity is critical to ensuring that the CAP doesn't simply remain a set of ideas. The Town of York would only be responsible for a portion of the actions necessary to implement and achieve the goals of this plan. Many other local, state, and non-profit entities will need to be involved in moving this plan from paper to action.

Actions

8.1. **Ensure sufficient Town capacity to take action.**

8.2. **Incorporate considerations of climate risks in municipal decision-making.**

8.3. **Lead by example in all new and existing municipal buildings and relevant infrastructure projects.**

8.4. **Educate local communities and businesses on climate change and the CAP.**

Reducing York's GHG Emissions and Achieving Resiliency: What are the most important things we can do?

Key Goals for GHG Emissions Reduction

The majority of GHG emissions in York are tied to buildings and transportation. Meeting the 2030 goal in the Global Covenant of Mayor's (GCoM) Commitment, would mean:

1. *The overall emissions from the building sector would need to be reduced by 50% over the next eight years, requiring significant investment and effort. In the residential sector alone, 4,000 homes would need weatherization and electrification (primarily installation of heat pumps to offset heating oil and propane as the main heating fuels). This also assumes that the electricity being used to heat those homes comes from zero carbon sources. In addition, any new buildings would have to be built as net-zero buildings, otherwise there would be additional contributions to the GHG footprint.*
2. *Implementation of a combination of the following measures will be needed to reduce overall emissions:*
    a. *Reduce the current overall local vehicle miles traveled by 50% over the next eight years—which translates to a reduction of approximately 56,635,000 miles.*
    b. *Shift at least 50% of those vehicle miles traveled to trips that are completed by electric vehicles – either privately-owned, or operated as public transit. To put this in perspective, the State of Maine is aiming for nearly 54% of all light duty vehicles to be electric vehicles by 2030.*

Key Goals for Climate Adaptation

Heat is often an overlooked impact but it is the one that is very challenging to solve since it is felt across the entire town, versus flooding impacts that are more geographically constrained. One of the key goals for York will be to ensure there is adequate cooling capacity within the existing shelters and buildings (such as schools, senior care facilities, and affordable housing units) that house vulnerable populations. There should also be an assessment of heat emergency planning response efforts should York experience a multi-day heat crisis and/or if there is a prolonged power outage during the peak of summer. Older adults are particularly prone to heat-related illnesses. Given that York has the oldest mean age of any town in Maine, and that Maine has the highest mean age of any state, this is an area that deserves further study.

With respect to infrastructure, York's transportation system is particularly prone to impacts from flooding. Depending on the extent and type of flooding, there is the possibility that entire neighborhoods and sections of town could be stranded for extended periods of time. Evacuation routes and the ability for emergency response vehicles to access areas, or for people to access critical services, could also be impaired during these events. York should work closely with the Maine Department of Transportation and the Maine Emergency Management Agency to prioritize those road sections with the most critical impacts and secure funding to address long-term solutions. Some potential improvements may be operational, while others may involve retrofitting existing infrastructure or constructing new infrastructure. The York Beach Fire Station and Town Docks 1 & 2, as well as the Harbormaster's office are most vulnerable to SLR.

The Town's tax base and property values are also vulnerable to sea level rise and flooding. As such, considerations of infrastructure enhancements to protect assets from sea level rise or adapt structures should be a high priority.

Finally, natural resources will be key to York's climate success – both in terms of continuing to capture carbon as well as providing areas for absorption of excess stormwater, migration of the beaches and marshes, maintaining water quality and resources, and continuing to provide habitat for native species of plants and animals. This is true of both the land-based and the water-based resources. As is often the case, the true value of these resources is rarely captured or quantified. However, as climate change further stresses our systems, the value of natural resources is becoming more apparent. Ecosystems contribute real value economically as well as from a quality-of -life perspective. Assessing the value of York's natural assets and the ecological benefits that they provide will go far in ensuring that they are given their due credit in the role they can continue to play in making York more resilient.

Estimated costs for flood mitigation for buildings exposed at 4 feet of SLR

If we assume an average upgrade of $105,000 for each building* with 365 buildings in jeopardy of flooding from 4 feet of SLR/storm surge by 2050, that means property owners would have to raise $38,325,000 over the next 28 years. For flooding, estimates are based on per residence However, there could be regional or community-based (e.g., beach renourishment and seawalls) and regional interventions (e.g., tidal barriers and placement and addressing main flood pathways) that are more cost-effective. Also note that flood mitigation for inland flooding is NOT included here.

*From: https://www.mdpi.com/2073-4441/10/11/1646 - A review of cost estimates for flood adaptation (www.mdpi.com/journal/water - Aerts, Jeroen. Water 2018, 10, 1646)
United States Average Building flood adaptation cost: $19,231–192,000 (average = 105 k) use $105k per building as a proxy

Goals and Actions

Each of the goals on the following pages is presented with information on targets (what we wish to achieve), key performance indicators (how we will measure success), and the individual actions needed to achieve the goal.

Actions are keyed according to the type of action required:

- Policy/Regulation
- Plan/Further Study
- Project
- Program
- Advocacy/Education

Other information provided with each goal includes an assessment by the Working Groups of opportunities and challenges, implementation roles for various entities, and an assessment of how effective the goal is toward mitigation and adaptation.

Photo Credit: Gerry Runte

Focus Area 1: Buildings

Goal

1. Reduce GHG emissions generated by existing residential and commercial buildings.

Who

Lead: Town or CAP entity

Collaborators: Energy Steering Committee, York EcoHomes, Efficiency Maine Trust, Faith Communities, York Commiunity Services Association, vendors, architects/builders/ developers

Participants: home/property owners, business owners

Our Targets

- Create a pool of residential applicants that is inclusive of marginalized populations to pursue funding for weatherization.
- Identify and develop partnerships with regional or State agencies or with nonprofits.
- By 2030, evaluate 50% of existing homes and upgrades for energy improvements and upgrades including heat pumps and weatherization, and upgrade 25% of existing homes.
- By 2030, total emissions from the residential sector have been reduced by 25%.
- By 2030, evaluate 30% of existing commercial buildings for energy improvements and upgrade 20% of existing buildings.
- By 2030, total emissions from the commercial sector have been reduced by 20%.

Key Performance Indicators

- Number and types of successful alterations (e.g., weatherization, installation of heat pumps, fuel switching)
- Square footage covered by types of residences included (single, multifamily)
- Estimated carbon reduction - yearly and out to 2030 and 2050 based on industry standards.
- Number of low- and moderate-income York homes improved with the assistance of regional, state, or federal financial incentives.

1.1

Mitigation

Reduces GHG

H

high

Actions

1. Create or support existing program to offer technical assistance (TA) and financial incentives to replace old/failed equipment and lighting with high efficiency equipment. This would provide follow-up/action steps after energy audit program
2. Promote via education and advocacy for all stakeholders.
3. Work with Efficiency Maine and other organizations to identify grants or other financial incentives.
4. Conduct a thorough review of ordinances and development regulations to understand opportunities for changes to promote CAP goals.
5. Promote via education and advocacy for all stakeholders.
6. Develop or support and advertise energy audit program to identify energy conservation opportunities.
7. Support the addition of energy audits to buyer home inspections.
8. Provide education about biofuels as an affordable bridge to heatpump use.

Opportunities and Challenges:

+ Efficiency Maine sponsors generous incentives for equipment retrofits, building envelope improvements, and systems that promote beneficial electrification such as heat pumps for HVAC and water heating.

+ Currently, Maine homeowners can borrow up to $15,000 over 10 years with no fees and low-interest rates. Efficiency Maine's C&I Prescriptive Program offers custom or "prescriptive project subsidies" for commercial, industrial, municipal, and other non-residential facilities to subsidize the cost of energy-efficiency projects. More efficient buildings lower the cost of energy, and may provide non-energy benefits such as increased comfort, safety, and air quality.

− Some Efficiency Maine incentives are greater or free for the income eligible but do not necessarily remove the barriers and obstacles for mid-to-low-income homeowners.

− Funding, tax incentives, and market transformation are uncertain and subject to federal and state leadership.

Adaptation

SLR/Storm Surge	Precipitation	Heat	Drought
n/a	n/a	n/a	n/a

Focus Area 1: Buildings

Goal

2. Adopt temperature and flood resilience standards for all new and heavily renovated buildings.

Who

Lead: Planning Director, Planning Board, Code Enforcement Office

Collaborators: Energy Steering Committee, York EcoHomes, vendors, architects/builders/developers

Participants: home/property owners, business owners

Our Targets

- Definition of resiliency standards for all new building stock to the physical impacts of flooding, based on certain levels of SLR and storm surge.
- Definition of building standards to ensure comfort during extreme heat events in ways that are in keeping with International Energy Conservation Code (IECC) 2021 criteria.

Key Performance Indicators

- Vulnerability analysis results and creation of standards.
- Adoption of zoning changes.
- Number of permits granted to address resiliency and comfort/safety standards.

1.2

Mitigation

Reduces GHG

n/a

Actions

1. Conduct a code review to identify necessary changes to incorporate resilience standards.
2. Adopt zoning changes to require buildings in and near impacted areas to be designed to withstand the impacts of climate change through design, siting, changes in use categories, and other physical and operational modifications.
3. Provide user-friendly guides to new standards and conduct public outreach campaign.
4. Consider creation of zoning resilience overlays to help protect buildings and neighborhoods from climate emergencies, including sea level rise (SLR), storm surge, and inland flooding. This should include the adoption of a coastal zone overlay district that addresses the risks of SLR for new construction, renovations, and transportation/access points in affected areas, and considers limiting development in these areas.

Opportunities and Challenges

+ Homes and buildings using the IECC 2021 will improve reduce carbon emissions, improve energy efficiency, lower operating costs, and improve resiliency.

– Some building construction and equipment costs will increase.

+/– Achieving net zero status for existing buildings is difficult, but the IECC 2021 will lower the carbon footprint of these buildings.

Adaptation

SLR/Storm Surge	Precipitation	Heat	Drought
high	high	high	n/a

Focus Area 1: Buildings

Goal

3. Develop a plan to phase in energy building codes to reach net zero carbon emissions for new construction.

Who

Lead: Planning Director, Planning Board, Code Enforcement Office

Collaborators: Energy Steering Committee, York EcoHomes, vendors, architects/builders/developers

Participants: home/property owners, business owners

Our Targets

- Adoption of net-zero carbon emissions in new construction building code for York by 2035
- All new buildings achieve net zero standards with no new emissions added to York's carbon footprint
- Adoption of Maine Energy Stretch Code (IECC 2021) for all new buildings in York by 2025 or earlier.

Key Performance Indicators

- Number of new buildings achieving net zero standards with no new emissions added to York's carbon footprint.

1.3

Mitigation

Reduces GHG

H high

Actions

1. Adopt the optional Maine Energy Stretch Code (IECC 2021) for greater energy savings.
2. Provide training for builders, planning staff and board, and code enforcement personnel.
3. Launch a promotional and public education effort to communicate the advantages of the stretch code and improve the chances of adoption via an ordinance by town residents.
4. Adopt regulations that promote development that creates less soil disturbance, less stormwater runoff, smaller building footprints/less impervious surfaces, maintains more natural landscape, and sustainable groundwater use.

Opportunities and Challenges

+ Homes and buildings using the IECC 2021 will improve reduce carbon emissions, improve energy efficiency, lower operating costs, and improve resiliency.

− Some building construction and equipment costs will increase.

+/− Achieving net zero status for existing buildings is difficult, but the IECC 2021 will lower the carbon footprint of these buildings.

Adaptation

SLR/Storm Surge	Precipitation	Heat	Drought
n/a	n/a	L — low	n/a

Focus Area 1: Buildings

Goal

4. Increase awareness and use of climate-friendly Maine building products such as cross laminated timber and wood fiber insulation.

Who

Lead: CAP entity or York Ready for Climate Action

Collaborators: vendors, Maine Climate Council and other programs, Energy Steering Committee, York EcoHomes

Participants: Town of York, architects/builders/developers, home owners, business owners

Our Targets

- Publicize product categories that meet the definition of a Maine-based, climate-friendly building product.
- Designers and developers recommend and source cost-competitive, Maine-based wood products for use in design and construction of homes.

Key Performance Indicators

- Existence of education programs and technical assistance initiatives.
- Number of people participating in education and technical assistance initiatives.
- Number of projects in York that use these building products.

1.4

Mitigation

Reduces GHG

L

low

Actions

1. Research Maine building products and partner with existing efforts to highlight climate-friendly materials.

2. Create a list and information program (or use existing resources) for builders, architects, home owners, and other property owners.

Opportunities and Challenges

- + Showcase and support local businesses that offer Maine-based, climate-friendly building products.
- + Use local products and reduce GHG emissions needed for transport of goods.

Adaptation

SLR/Storm Surge	Precipitation	Heat	Drought
n/a	n/a	n/a	n/a

Focus Area 2: Infrastructure

Goal

1. Take steps to protect critical assets (water, sewer, public safety, access/ evacuation roads, healthcare, town services, dams, etc.) and other structures that will be impacted by SLR, storm surge, flooding, and extreme weather events.

Who

Lead: Town of York, DPW

Collaborators: York Water and Sewer Districts, Kittery Water District, Maine Department of Transportation, York Fire Department, York Harbormaster, and other public safety entities

Participants: property owners

Our Targets

- Planning and actions of all impacted entities coordinated.
- Success in securing state, federal and other funding sources to underwrite the upgrade or protection of impacted infrastructure.

Key Performance Indicators

- Funding raised/allocated for infrastructure protection.
- Percentage of identified vulnerable infrastructure protected.

Actions

1. Conduct review of CAP vulnerability assessment with all leadership (Town, quasi-public entities, healthcare providers, etc.) to determine coordinated steps needed for critical asset protection.
2. Evaluate needed efforts in additional floodplain management necessary to increase/maintain Federal Emergency Management Agency's (FEMA) Community Rating System (CRS) rating to increase flood insurance premium discount.

<u>Public Services/Safety:</u>

3. Evaluate SLR risks (and solutions) to York Beach Fire Department, Town Docks 1 & 2, and the Harbormaster's office.

<u>Electric Grid:</u>

4. Upgrade back-up energy systems to reduce downtime.

2.1

Mitigation

Reduces GHG

n/a

Water:

5 Encourage communication and collaboration to support the York Water District's efforts to plan for climate adaptation and to implement resiliency. Utilize storm surge and SLR GIS mapping to identify critical water system infrastructure impacts and associated resiliency planning, design, and construction.

6 Encourage and support the York Water District with prolonged drought planning and implementation. This would include regional cooperation with the Southern Maine Regional Water Council for water quality and quantity.

7 Evaluate existing code enforcement ordinances with respect to potential impacts from prolonged drought impacts due to climate change.

Wastewater:

8 Encourage and support the York Sewer District's efforts to plan and implement climate adaptation and resiliency. Utilize storm surge and SLR GIS mapping to identify critical wastewater system infrastructure impacts and associated resiliency planning, design, and construction.

9 Utilize GIS mapping to identify storm surge and sea level rise impacts to on-site septic systems. Support Town efforts to notify property owners of potential impacts due to those projected impacts for systems that are identified to be impacted and work to build resilience.

Stormwater:

9 Improve stormwater capture by commissioning an assessment/feasibility study to better inform stormwater management improvements. Evaluate how much money the Town spends on dealing with stormwater now and how much it will be required to spend in the future.

Roads and Bridges:

11 Assess the vulnerability (current and future) of the town's roads and bridges to the five types of flooding (Flash Flooding, River Flooding, Storm Surge, Tidal Flooding and Groundwater).

12 Develop and implement a standardized protocol for documenting local flood impacts to roads and bridges.

13 Establish a policy/plan of action and/or emergency fund to expedite post-disaster road/bridge repair.

14 Require all municipal road and bridge projects to mitigate, to the greatest extent practicable, existing and potential future impacts of flooding and erosion.

15 Ensure that culverts are properly sized and roadway ditches adequately designed to accommodate increased precipitation during peak storm events; do the same for bridge spans and clearance.

Opportunities and Challenges

\+ Varied ownership and oversight

\- Expensive projects; funding and financing to be identified

Adaptation

SLR/Storm Surge	Precipitation	Heat	Drought
H high	H high	L low	n/a

Focus Area 2: Infrastructure

Goal

2. Install and improve coverage and quality of broadband service in York to minimize VMT and improve emergency services.

Who

Lead: Selectboard, Planning Board

Collaborators: Energy Steering Committee, SMPDC, ConnectMaine, neighboring towns, broadband service provider(s)

Participants: Business owners, home owners.

Our Targets

- All homes, businesses and public spaces in York have equitable access to affordable, reliable, and high-speed broadband by 2030, with subsidies for low-moderate income families.

Key Performance Indicators

- Number of homes, businesses and public spaces that have access to high-speed broadband.
- Relative percentage based on York's total homes, businesses, and public spaces..

2.2

Mitigation

Reduces GHG

L

low

Actions

1. Launch a marketing campaign and conduct a survey of residents and businesses to gauge demand for better internet service.
2. Apply for grants and other support from ConnectMaine for a broadband study and efforts to improve service.
3. Collaborate with SMPDC and neighboring towns to identify pockets of demand and make the case for installation of better service.
4. Develop a targeted action plan to address the current shortfalls and anticipated demand and work with selected providers for the installation of better service.
5. Pay particular attention to issues of equity with respect to access, coverage and affordability.

Opportunities and Challenges

+ Planning grants are offered by ConnectMaine to assist the town's assessment of need.
+ Working with SMPDC and neighboring towns can help make the case for greater demand and cost efficiency for providers.
- Providers of these services are challenging to work with.

Adaptation

SLR/Storm Surge	Precipitation	Heat	Drought
M med	M med	n/a	n/a

Focus Area 3: Access to Renewable Energy

Goal

1. Support the overall increase in the supply of renewable energy for all York citizens.

Who

Lead: Town of York or CAP entity; local, state and federal government

Collaborators: Efficiency Maine Trust, Energy Steering Committee, York EcoHomes, vendors

Participants: builders, York Community Services Assocation, residents, business owners

Our Targets

- An annually declining GHG content of grid electricity, allowing for zero GHG content by 2050.
- By 2050, all town residents and businesses have the ability and financial means to install their own renewable electricity generation units and battery storage or to purchase competitively priced renewable electricity from regional sources.

Key Performance Indicators

- Total carbon reductions in the energy grid supply and calculating relevant reductions for York's electricity related GHG emissions.
- Number of new households, businesses, municipal holdings that install renewable energy systems.

3.1

Mitigation

Reduces GHG

H

high

Actions

1. Lobby state and federal officials to increase renewable energy supply.
2. Ensure that local codes and standards encourage and permit small-scale renewable energy generation, including solar systems, and battery storage.
3. Promote and encourage on-site renewable generation, battery storage, and beneficial electrification, including EV's. Beneficial electrification should be accompanied by purchasing and consuming grid-based power generated by renewable sources.
4. Explore bulk purchases of solar photovoltaic (PV) systems.
5. Expand PV systems on municipal and school properties.
6. Investigate changes to ordinances that incentivize solar systems.

Opportunities and Challenges

+ There are ongoing new market opportunities and market transformations that will make this easier over time.
+ Current costs are high (expected to decrease over time).
- Not yet cost-effective (batteries) and/or currently immature technologies.

Adaptation

SLR/Storm Surge	Precipitation	Heat	Drought
n/a	n/a	n/a	n/a

Focus Area 3: Access to Renewable Energy

Goal

2. Promote alternative means by which residents and businesses can access renewable energy without having to install, own or operate equipment.

Who

Lead: Town of York or CAP entity, Selectboard, Planning Board

Collaborators: Energy Steering Committee

Our Targets

- 100% community participation in sourcing all electricity needs from renewable sources.

Key Performance Indicators

- Percentage of households without self-generation that access renewable electricity, either through Community Solar or offset programs.

3.2

Mitigation

Reduces GHG

M

med

Actions

1. Explore the possibility of solar power installations on underutilized land including rights of way (powerlines and turnpike) and the Witchtrot landfill.
2. Seek necessary support/funding for community solar power projects.

Opportunities and Challenges

+ Opportunities to pursue public private partnerships.
+ Lease the older capped landfill in town where 4 MW of solar capacity could be installed.
− Challenges include topography, wetlands, and the price of land.
− The cost of solar canopies in parking lots is cost prohibitive in the absence of incentives.

Adaptation

SLR/Storm Surge	Precipitation	Heat	Drought
n/a	n/a	n/a	n/a

Focus Area 4: Natural Resources

Goal

1. Permanently conserve land, including wetlands and estuarine systems, and protect resources to protect carbon storage.

Who

Lead: York Land Trust, MtA2c, Maine Coast Heritage Trust, National Oceanic and Atmospheric Administration

Collaborators: Town of York, CAP entity, Planning Board (zoning), emergency services

Participants: Fishermen (aquaculture/blue carbon potential), residents

Our Targets

Identification of current carbon storage areas, evaluation of carbon storage potentials and a strategy to:

- Maintain the uses and quality of lands which currently serve as carbon stores;
- Increase long-term carbon storage capabilities within those parcels;
- Permanently conserve those uses on those lands; and
- Look for additional land holdings with carbon storage opportunities, with an end goal to offset York's current emissions in a meaningful way.

Key Performance Indicators

- Acres of protected land with high carbon storage potential.
- Acres of permanent conservation easements created on significant parcels of previously unprotected land to allow those lands to minimize or absorb the physical impacts of climate change.
- Regulatory strategies and land management practices implemented.

4.1

Mitigation

Reduces GHG

M H

med / high

Actions

1. Conduct a tree inventory and create a tree canopy map and plan for ongoing tree planting in the town.
2. Allocate funding to permanently conserve forested areas.
3. Support York Land Trust efforts to manage existing conservation lands and expand areas of permanently protected land in York.
4. Work with the York and Kittery Water Districts to permanently protect District lands in York.
4. Support incentives in forestry, agricultural, and lawn care practices that increase resiliency.
6. Support forestry management and carbon capture plans with state forestry and University of Maine expert input.
7. Allocate funding and conserve marsh migration areas.
8. Establish development limits/restrictions in migration areas/SLR areas.
9. Explore additional requirements such as a coastal zone overlay to strengthen protections for natural areas.
10. Consider adopting most current FEMA maps and using additonal inland flooding mapping to assess flooding risks and inform development regulations and adaptation investments.
11. Conduct additional inventory/research work for blue carbon opportunities.
12. Research and pursue other high impact blue carbon strategies.
13. Conduct educational/public outreach campaign regarding efforts, including any proposed development restrictions/building regulations.
14. Review land cover and type information in the CAP and create detailed data for all relevant categories for tracking and observation (ecological, food production, forests, working lands, blue and green carbon, etc.)

Opportunities and Challenges

+ There are extra benefits with healthy marshes – fisheries, clean water, flood protection, biodiversity.

+ There is an opportunity to educate the public and safeguard assets.

– Limiting development potential will meet with resistance by some.

– Invasive species and water quality changes can impact existing saltmarsh; overuse/degradation.

– Community resistance to change (coastal zoning overlay).

Adaptation

SLR/Storm Surge	Precipitation	Heat	Drought
H high	H high	M med	M med

Focus Area 4: Natural Resources

Goal

2. Permanently conserve land and protect resources for climate resilience.

Who

Lead: York Land Trust, MtA2c, Maine Coastal Heritage Trust, National Oceanic and Atmospheric Administration, York Water District, Kittery Water District

Partners: Town of York, CAP entity, Town Planning Board (zoning), Emergency services, State agencies

Collaborators: Commercial fishermen (depends on aquaculture/blue carbon potential), citizens, landowners, ECOHomes (focus on yard care), Lawns to Lobsters/ Stormwater outreach, farmers & foresters

Our Targets

- Identify the flood and temperature mitigation benefits, such as water quality, habitat, etc., that are currently provided by nature-based services and resources. Identify how those values could be further increased either by using existing land parcels and/or improving and acquiring new parcels.

Key Performance Indicators

- Identification of key pieces of land (overall acreage, coverage, current use) that are essential for climate resilience.
- Creation of permanent conservation easements on significant parcels of unprotected land to allow those lands to minimize or absorb the physical impacts of climate change.
- Enhancement of growth restriction regulations in certain target areas.

4.2

Mitigation

Reduces GHG

L M

low / med

Actions

1. Support York Land Trust efforts to manage existing conservation lands and expand areas of permanently protected land in York.
2. Work with the York and Kittery Water Districts to permanently protect District lands in York.
3. Support incentives in forestry, agricultural, and lawn care practices that increase resiliency (and carbon storage).
4. Forest: support forestry management and carbon capture plans with state forestry and University of Maine expert input.
5. Lawn: provide outreach/education for behavior changes and to increase demand for sustainable lawn care services by practitioners.
6. Agriculture: promote regenerative practices and provide incentives and technical assistance for same.
7. Maintain marsh health
8. Plan for marsh migration
9. Maintain habitat connectivity.
10. Manage invasives.
11. Protect undeveloped habitats and large forested blocks.
12. Protect wetlands and vernal pools.
13. Protect headwater streams, natural stream buffers and floodplains.
14. Provide more funding for land conservation efforts – goal of 30% of town land by 2030.

Opportunities and Challenges

+ New regulations can support healthier ecosystem services/benefits including clean water, pollinator health.

− Current land development patterns are fragmented.

Adaptation

SLR/Storm Surge	Precipitation	Heat	Drought
H high	M med	L low	L low

Focus Area 4: Natural Resources

Goal

3. Evaluate economic value of natural resources (ecological services, blue carbon, green carbon, food production, forests, working lands) and use value in community decision making.

Who

Lead: Town of York or CAP entity

Collaborators: York Land Trust, York Water District, other major conservation and unprotected land owners

Our Targets

- Creation of an ecosystem services and natural resource baseline for York to be able to identify and quantify (where possible) the types of regulating (e.g., filtered water, clean air, flood protection) and provisional (e.g., food production, lumber) services that are currently provided and how those can be maintained, improved, and expanded to mitigate the impacts of climate change.

Key Performance Indicators

- A detailed assessment of land cover and type in York further informed by overall ecosystem services and natural resource value.
- An economic assessment of natural lands in York, showing value based on overall ecosystem services and contribution to climate resiliency.

4.3

Mitigation

Reduces GHG

M

med

Actions

1. Review land cover and type information in the CAP and create detailed data for all relevant categories for tracking and observation (ecological, food production, forests, working lands, blue and green carbon, etc.)
2. Incorporate data into new Town GIS layers and continue to update and track as part of regular Town mapping and regulation/ monitoring.
3. Prepare a detailed assessment of the economic and other values of this land.
4. Evaluate how existing land use and development regulations can be improved to sustain or enhance carbon storage of natural systems, minimize emissions from new developments, and improve overall coastal resilience; and implement changes to regulations and ordinances.
5. Conduct outreach and public education on the value of York's natural resources.

Opportunities and Challenges

+ The State of Maine is working in this area and can provide ongoing information to the town to help efforts.

− Even with the numbers and analysis in hand, it is important to note that what has value is still defined from a larger social context. Perceptions of value vary, and the importance and value of societal benefits differs among people.

+/− While there is considerable research regarding the valuation of ecosystem services – including provisioning and regulating services – it will still require input from specialists with backgrounds in ecology and economics, as well as a detailed assessment detailing York's particular areas of value

Adaptation

SLR/Storm Surge	Precipitation	Heat	Drought
M med	M med	M med	L low

Focus Area 5: Mobility

Goal

1. Expand Electric Vehicle (EV) ownership and use.

Who

Lead: Town of York (future sustainability coordinator), CAP entity

Collaborators: Energy Steering Committee, York Ready for Climate Action, York Community Services Association, SMPDC, Maine Climate Council, Governor's Office of Innovation and the Future, Effiiency Maine Trust (rebates for purchase of EVs), Drive Electric Maine

Our Targets

- Equitable access to EV vehicles either through ownership or usage (e.g., ride hailing, public transit).
- By 2030, 50% of all light duty vehicles are EV for all in-boundary York traffic.
- By 2050, 100% of vehicles either EV or powered by an alternative green energy source (e.g., green hydrogen).

Key Performance Indicators

- Number of light-duty EVs as a percentage of overall Light Duty Vehicles (LDVs) in York.
- Number of vehicles powered by alternative green energy source.
- Number of public transit and hailing services/vehicles powered by alternative green energy sources operating in York.

5.1

Mitigation

Reduces GHG

H

high

Actions

1. Establish a program to educate York residents on the benefits of a transition to EVs to motivate them to purchase (social media, schools, etc.).
2. Research and publicize incentives for low/moderate income drivers (purchase rebates, charging station installation, other).
3. Explore ways to promote or facilitate the addition of a charger to existing housing.
4. Explore the feasibility of a reduction on excise tax for certain income groups for annual tax on EV.
5. Provide up-front price reductions for income-qualifying individuals (supported through Efficiency Maine Trust) so they can avoid having to put more money down and wait for a rebate for EV purchases.

Opportunities and Challenges

+ This is a signficant opportunity, considering the number of vehicles driven in town and the growing ability to replace them with EVs.

− The success in achieving this goal depends on decarbonization of the grid in York.

− This is doable, but challenging since it will require an early transition to purchasing EVs, instead of Internal Combustion (IC) vehicles, if there is to be a significant penetration of EVs over time.

Adaptation

SLR/Storm Surge	Precipitation	Heat	Drought
n/a	n/a	n/a	n/a

Focus Area 5: Mobility

Goal

2. Implement a green fleet policy for York municipal vehicle pool.

Who

Lead: Selectboard, Town Manager

Collaborators: Energy Steering Committee, Town departments, other municipal entities, schools, SMPDC, Efficiency Maine Trust

Our Targets

- By 2050 100% of fleet either EV or powered by an alternative green energy source (e.g., green hydrogen) by 2050.
- 50% of all light duty vehicles used in fleet are EV by 2030.
- 100% of fleet either EV or powered by an alternative green energy source (e.g., green hydrogen) by 2050.

Key Performance Indicators

- Percentage of fleet vehicles either EV or powered by alternative green energy source.
- Tracking of emission reductions associated with the fleet's transition.

5.2

Mitigation

Reduces GHG

H

high

Actions

1. Conduct an inventory of all existing municipal vehicles (school buses, code enforcement, police, fire, parks and recreation, public works, etc.).

2. Evaluate "right sizing" vehicles to the needed application.

3. Research available rebates and incentives, total cost of ownership, and develop a funding strategy.

Opportunities and Challenges

+ Consider tools being developed by SMPDC, and by organizations in other states such as NY State or Mass Green Fleet technical and policy: https://climatesmart.ny.gov/actions-certification/actions/

− It can be difficult to get Town and other municipal entities to enact a policy, and then implement it.

Adaptation

SLR/Storm Surge	Precipitation	Heat	Drought
n/a	n/a	n/a	n/a

Focus Area 5: Mobility

Goal

3. Encourage the adoption of green fleet policies by quasi-municipal (water and sewer districts) and commercial fleets operating in York.

Who

Lead: Town of York or CAP entity, SMPDC

Collaborators: Energy Steering Committee, York Water and Sewer Districts, Efficiency Maine Trust

Participants: town businesses, York Hospital, other nonprofits

Our Targets

- By 2030 50% of all light duty vehicles are EV by 2030 for all in-boundary York traffic.
- By 2050 100% of fleet either EV or powered by an alternative green.

Key Performance Indicators

- Percentage of fleet vehicles either EV or powered by alternative green energy source.

5.3

Mitigation

Reduces GHG

H

high

Actions

1. Promote the adoption of "Green Fleet Policies."
2. Create a program including education and information and tracking of purchase/ adoption of EVs.
3. Offer awards/incentives for those meeting pre-determined targets.

Opportunities and Challenges

- + This is a significant opportunity to "jump start" introduction of EVs beyond cars into York.
- + Consider tools being developed by SMPDC, and by organizations in other states such as NY State or Mass Green Fleet technical and policy: https://climatesmart.ny.gov/actions-certification/actions/

Adaptation

SLR/Storm Surge	Precipitation	Heat	Drought
n/a	n/a	n/a	n/a

Focus Area 5: Mobility

Goal

4. Provide a diversity of mobility options to serve different populations and needs to reduce VMT (vehicle miles traveled).

Who

Lead: Selectboard, Planning Dept, Planning Board, Bike and Pedestrian Committee, Department of Public Works

Collaborators: York hospitality and other businesses, Chamber of Commerce, York Ready for Climate Action, SMPDC, Kittery Area Comprehensive Transportation System/ Metropolitan Planning Organization (KACTS MPO), York County Community Action Corporation, State of Maine, including DOT, Efficiency Maine Trust, potential private partners for transit services

Our Targets

- Affordable and convenient green mobility options for marginalized communities, as well as the community at large, are available.
- Barriers to access addressed.

Key Performance Indicators

- Number of feet of sidewalks and bike lanes constructed.
- Number of disconnected segments of sidewalks and bike lanes connected.
- Adoption of zoning and growth policies.
- Provision of demand response, ride share, and other transit services (hours/days offered, ridership data).

5.4

Mitigation

Reduces GHG

L M

low / med

Actions

1. Expand and connect sidewalks and paths to make walking safer wherever possible.
2. Expand and connect bike lanes and paths to make biking safer and more convenient. Prioritize: Route 1, Route 1A, Nubble, Ridge Rd, South Side Rd, Route 103, Route 91.
3. Adopt zoning and growth policies that encourage walkable, connected development to decrease VMT.
4. Conduct a needs assessment and survey to identify needs and potential barriers to access (seasonal, disabilities, comfort level, etc.). Create a program based on results.
5. Calculate walking distances from multifamily and senior housing and schools to key services such as grocery stores, pharmacies, and York Hospital. Create a map, install distance markers, create public health programs and walking routes.
6. List public transit and rideshare options, calculate average wait and travel times, as well as costs; compare with a case study of individual car ownership.
7. Provide (or facilitate public-private partnership for) enhanced tourist-season mobility services (electric trolley and remote parking areas) that can also be used by residents.
8. Offer demand-response transit and shared transit services for residents.
9. Support improvements and extensions to regional transit services.
10. Establish a town transportation hub, to serve residents who are commuters, workers in town including seasonal workers, seasonal visitors.
11. Provide consistent and user-friendly outreach and educational programs to alert all potential users about available services.
12. Create public outreach and education programs about alternative mobility choices.

Opportunities and Challenges

\+ Good opportunity to better serve residents, visitors and workers while reducing VMT; importantly, it can reduce congestion and pollution during tourist season.

\- Must get the necessary support from all of the involved organizations.

Adaptation

SLR/Storm Surge	Precipitation	Heat	Drought
med	med	med	n/a

Focus Area 5: Mobility

Goal

5. Facilitate, promote, and track the installation of EV charging infrastructure in York for residents, employees, and visitors.

Who

Lead: Town of York or CAP entity, Selectboard, Planning Board, Planning Dept

Collaborators: York hospitality and other businesses, Chamber of Commerce, SMPDC, Maine Climate Council, Governor's Office of Innovation and the Future, Efficiency Maine Trust

Participants: residents, visitors

Our Targets

- Equal access to charging infrastructure regardless of home ownership
- Adequate number of fast-charging ports to accommodate residents, businesses, and visitors

Key Performance Indicators

- Number of proposals for EV installation that come before the Planning Board, or other Town-based review process.
- Number of charging stations and other supporting infrastructure that are installed in York.
- Number of charging stations per capita - for York's tourist, summer, and year-round populations.

5.5

Mitigation

Reduces GHG

n/a

Actions

1. Encourage 3rd party owner-operator installation of charging stations at public parking, beach, recreation parking areas.
2. Create a working group of hospitality and businesses dependent on tourism. Develop a plan for charging infrastructure. Offer incentives and/or information to businesses to support.
3. Create a program to advertise York as an "eco-friendly" destination and offer a website map of charging locations.
4. Enact ordinance with "charger-ready" requirements for all new single and two-family residences.
5. Enact ordinances to require EV charging infrastructure in all new commercial, multi-family and subdivision developments (consider requirements such as a minimum of one EV charging station; for lots over 15 spaces, provide 15-20% of spaces with EV-chargers).
6. Create a program for single-family home owners including information on rebates, choices, and possible Town incentives to install charging stations.

Opportunities and Challenges

+ This is a significant opportunity as there are almost no chargers at this time in York.

- Challenging to get the necessary support from the many entities that need to install charging infrastructure, including getting the Town government and other municipal entities to install public chargers.

Adaptation

SLR/Storm Surge	Precipitation	Heat	Drought
M med	M med	n/a	n/a

Focus Area 6: Waste and Recycling

Goal

1. Reduce municipal solid waste (MSW).

Who

Lead: Town Manager, Planning Department, Selectboard

Collaborators: DPW, York Ready for Climate Action, Recycling Committee, Department administrators, York School District, York Adult Education, York Community Garden, Old York Garden Club, Faith Communities, UMaine Extension, Maine Organic Farmers and Gardeners Association

Participants: MSW contractors, residents, businesses, visitors

Our Targets

- Reduction in retail plastic waste (water bottles, takeout containers, etc.).
- Reduction in food waste.

Key Performance Indicators

- Ordinance passed banning or limiting certain plastics.
- Amount of compost collected or number of bins distributed
- New purchasing policy implemented.

6.1

Mitigation

Reduces GHG

L

low

Actions

1. Pass ordinance to limit use of single-use water bottles, take-out containers and other plastics that are not biodegradable.
2. Adopt a sustainable purchasing policy for goods and services purchased by the Town.
3. Establish target areas for prioritized sustainable “swaps” where surpluses of items are exchanged to ensure full utilization.
4. Expand food composting and recycling programs to reduce residential and commercial solid waste.
5. Mandate recycling for commercial uses.
6. Explore a construction and demolition recycling policy to keep these materials out of landfills and ensure they are recycled.
7. Develop comprehensive education for Food, Waste and Recycling strategies.

Opportunities and Challenges

+ Many York residents try to reduce their waste, providing a ready audience for other CAP initiatives and opportunities.
+ Waste reduction is something that all residents and businesses have direct control over immediate results.
- Getting buy-in from residents and businesses to make behavior changes.
- Getting political support for policies that reduce waste (plastic bottle ban, etc.).

Adaptation

SLR/Storm Surge	Precipitation	Heat	Drought
n/a	n/a	n/a	n/a

Focus Area 6: Waste and Recycling

Goal

2. Select municipal waste and recycling contractors based on multiple sustainability and climate criteria in addition to cost.

Who

Lead: Selectboard, DPW

Collaborators: School Department/School Committee for school waste contracts, Recycling Committee

Our Targets

- Reduce overall GHG emissions from town waste transportation and processsing.

Key Performance Indicators

- Reduction in contractor vehicle miles traveled to process/dispose of waste.
- Change in waste disposal/processing to more environmentally friendly methods.

6.2

Mitigation

Reduces GHG

L

low

Actions

1. Create criteria for evaluation of waste contractor proposals and adopt criteria.
2. Apply criteria to procurement decisions.

Opportunities and Challenges

- + Opportunity to influence waste company practice.
- – Limited companies in state to bid on waste contracts.
- – The distance/transfer from York to out-of-town disposal and incineration plants is quite far. In 2019 – 2021 all of the town's MSW was incinerated in Orrington, Maine, a distance of approximately 180 miles.

Adaptation

SLR/Storm Surge	Precipitation	Heat	Drought
n/a	n/a	n/a	n/a

Focus Area 7: Community Resiliency and Equity

Goal

1. **Create a Coordinated Climate and Health Response Team to address climate health and disaster risks in the community.**

Who

Lead: Town Emergency Response Coordinator, Health Officer

Collaborators: Town public safety and emergency management (police, fire, health, York Hospital, State and County agencies, Faith Communities, York Community Services Association, York Committee to Combat Racism and Bias

Participants: Chamber of Commerce

Our Targets

- Using the COVID-19 Coordinated Response Team operational model, create a Team with a broader mission to collaborate and create support during times of extreme events, pool resources, build resilience capacity of businesses and industries, develop response scenarios to combat public health crises caused vector-borne diseases, temperature-induced risks and precipitation, and educate the public on climate-related health risks.

Key Performance Indicators

- Creation of a Coordinated Climate & Health Response Team.

7.1

Mitigation

Reduces GHG

L

low

Actions

1. Review membership in the COVID Coordinated Response Team and adjust list as necessary to include additional relevant entities for climate and health.
2. Create a mission and goals statement and a communications plan.
3. Supply information for separate effort for Town public awareness outreach efforts.
4. Coordinate with regional and state entities with similar mission/goals.
5. Train Emergency Management personnel and others to ensure Town is ready for response in times of climate emergencies.
6. Ensure that emergency responder training includes familiarity with types of illnesses that might present from rising temperatures, including heat exhaustion, cardio-vascular and pulmonary stressors, and "new to Maine" vector-borne diseases preparation for patient surges during extreme events and the likelihood for increases in violence during extended heatwaves.
7. Create and adopt policies as necessary.

Opportunities and Challenges

+ CDC's Building Resilience Against Climate Effects (BRACE) framework provides a structure for response.
+ Assure any additional groups that are not now a part of COVID group are brought into the program.
- Will take time to implement.
- Climate-smart emergency management activities will likely require an increased commitment of staff time and expertise, materials and equipment, and other resources.

Adaptation

SLR/Storm Surge	Precipitation	Heat	Drought
L M	L M	L M	L M
low / med	low / med	low / med	low / med

Focus Area 7: Community Resiliency and Equity

Goal

2. Ensure public awareness of climate-related illnesses and health impacts.

Who

Lead: Town of York emergency response agencies, Town Manager

Collaborators: York Hospital, Community non-profits and organizations, Faith Communities, schools, grass roots organizations, Chamber of Commerce, Public Library, State (ME and NH Depts of Environmental Quality), : Communications providers and app developers; York Committee to Combat Racism and Bias

Our Targets

- Awareness of climate-related illnesses and health impacts (both short-term and cumulative) among public health and emergency preparedness & response communities. Integrate findings of climate vulnerability into all phases of emergency planning.
- Educate public about availability of air quality data and encourage behavior change on poor quality days.
- Work with the state, other entities, and York Hospital to educate public about air quality, temperature threats, and precipitation.

Key Performance Indicators

- Creation of a program to collect information and conduct public outreach campaigns on anticipated changes to seasonal conditions in temperature and precipitation.
- Number of inputs from Town and regional entities (information, data). Closest air quality monitoring system is in NH – multi-state information sources.
- Survey results offering information on how many people reached.
- Number of participating/catalogue of state and local sources.

7.2

Mitigation

Reduces GHG

n/a

Actions

1. Work with Coordinated Climate and Health Response Team to determine important information to convey to public.
2. Recognize potential language and cultural barriers in vulnerable populations to ensure messaging is accessible and relevant
3. Partner with existing networks to reach vulnerable populations and solicit input on challenges and barriers that they experience, as well as input on potential solutions
4. Identify state and local sources for information on anticipated changes to seasonal conditions in temperature and precipitation.
5. Conduct a "best practices" review of other Town actions to prepare for heat events level (towns with York population +/- 25%).
6. Identify audiences and sub-groups for special information (vulnerable populations, seasonal workers, seasonal residents, etc.).
7. Develop user-friendly graphics and information for dissemination.
8. Convey information about emergency management activities and climate information in many different formats, and in multiple languages as appropriate for different communities to ensure equitable distribution.
9. Create a streamlined information and communication system to allow Town to get timely information from sources. Use newsletters, social media, partnerships with major employers and nonprofits, etc., to target various audiences.
10. Create a working group of local tourism organizations, businesses, nonprofits, and health organizations to assist in disseminating information in a timely manner.
11. Educate the local community and businesses on availability of air quality phone Apps and sources for other climate-related health notices and updates.
12. Develop an ongoing check-in to catalogue state and local funding sources for this effort.

Opportunities and Challenges

- + Can provide good, early, credible education.
- + Specific training programs and drills needed for Emergency Management (EM) personnel and management.
- + Assurance that all EM planning incorporate climate/health considerations.
- − Gaining buy-in of various entities.
- − Must avoid this getting politicized: COVID threat and vaccinations.

Adaptation

SLR/Storm Surge	Precipitation	Heat	Drought
n/a	n/a	M med	n/a

Focus Area 7: Community Resiliency and Equity

Goal

3. Establish a town business sustainability award or recognition program.

Who

Lead: CAP entity or Town (sustainability coordinator)

Collaborators: Chamber of Commerce, Waste Reduction and Diversion group of York Ready for Climate Action, York Recycling Committee

Our Targets

- A business program that has high levels of participation and visibility that supports York as an eco-friendly destination and place to live.

Key Performance Indicators

- Creation of program.
- Number of applications each year.

7.3

Mitigation

Reduces GHG

L

low

Actions

1. Allocate adequate budget for sufficient incentives.
2. Create or support administrative structure for judging and administration.

Opportunities and Challenges

+ Raising visibility of climate issues.

- Creating a program with adequate visibility and incentives to ensure continuity over the long term; this can't be a one-time program.

Adaptation

SLR/Storm Surge	Precipitation	Heat	Drought
L low	L low	L low	L low

Focus Area 8: Leadership and Capacity

Goal

1. Ensure sufficient Town capacity to take action.

Who

Lead: Town Manager, Selectboard, Budget Committee

Collaborators: CAP Steering Committee or entity

Our Targets

- The Town has the capacity to apply for and comply with grants, partner with necessary entities, and create and oversee programs and initiatives.
- The Town has the capacity to collect data for tracking progress on meeting plan goals as well as completing yearly reports as part of the Selectboard's commitment to the Global Covenant of Mayors.

Key Performance Indicators

- Creation of assessment of capacity and a plan to ensure adequate resources.
- Approval of adequate funding for resources to implement CAP recommendations (Selectboard, voters).

8.1

Mitigation

Reduces GHG

M

med

Actions

1. Assess capacity needed to take action on CAP recommendations
2. Evaluate Town staff availability, roles of nonprofit, for-profit, and other public entities in sharing implementation tasks.
3. Allocate funding for Town staffing and other resources (space, equipment, etc.) or for support of other entities as necessary. Include staff resources for data collection to track progress on meeting CAP goals and collecting data for reporting.
4. Create protocols for collecting data throughout the year to calculate annual GHG emissions changes and complete required reporting as well as a "report card" on CAP implementation.

Opportunities and Challenges

+ Adequate capacity in the town will allow York to take advantage of federal and state funding and financing opportunities.
+ Staff resources will allow ongoing collection of data and smooth processes for annual reporting including requirements for the Selectboard's commitment to the Global Covenant of Mayors.
- Without direction from leadership, capacity, and professional staff, the Town can't move forward on its commitments to the Global Covenant of Mayors or protect the town from the impacts of climate change.

Adaptation

SLR/Storm Surge	Precipitation	Heat	Drought
M med	M med	M med	M med

Focus Area 8: Leadership and Capcity

Goal

2. Incorporate considerations of climate risks in municipal decision making.

Who

Lead: Town Manager and Selectboard, School Superintendent and School Committee, Budget Committee, Public Works, voters

Our Targets

- Incorporate considerations of sea-level rise, storm surge, and flooding associated with extreme rainfall events into all Town infrastructure design, siting, and capital investment decisions including but not limited to buildings, roads, bridges, culverts/ open drainage (swales), parks, and open space, as well as incorporate consideration of the economic value of natural resources.

Key Performance Indicators

- Adoption of new policies.
- Development of post-disaster contingency plans to "build back better."

8.2

Mitigation

Reduces GHG

M

med

Actions

1. Add a step to capital planning processes certifying that future climate risks have been carefully considered.
2. Adopt a policy that all municipal development projects will utilize LID techniques and employ “climate design adjustments” to account for sea level rise and storm surge, extreme precipitation, and extreme heat.
3. Adopt engineering practices that enhance and protect key infrastructure, using techniques such as vegetated berms, flood barriers, and elevated roadways.
4. Develop a post disaster contingency plan to “build back safer and smarter” that increases resilience and reduces risk.

Opportunities and Challenges

+ First costs may be higher, but maintenance and operating (M&O) expenses will be reduced over the facility’s useful life.
+ Non-energy impacts will have other benefits.

Adaptation

SLR/Storm Surge	Precipitation	Heat	Drought
H high	H high	H high	M med

Focus Area 8: Leadership and Capcity

Goal

3. Lead by example in all new and existing municipal buildings and relevant infrastructure projects.

Who

Lead: Town Manager, Selectboard, voters

Our Targets

- Lower the carbon footprint of the municipality overall on path to 50% reductions by 2030 and 100% by 2050 by adopting best practice construction techniques, installing high-efficiency HVAC and lighting systems, maintaining ongoing benchmarking, and pursuing beneficial electrification.

Key Performance Indicators

- Adoption of Town policies for strong efficiency standards for construction using public funds.

8.3

Mitigation

Reduces GHG

M

med

Actions

1. Strengthen the energy efficiency standards for all buildings that use public funds.
2. Buy-in by local government.
3. Improved cost-effectiveness of high-efficient HVAC and lighting equipment/systems and building materials.
4. Incorporate cooling locations in public locations and as part of public facilities improvements.

Opportunities and Challenges

+ Ability to pursue significant funding/grants at the federal and state levels for climate action work.
- Willingness to fund implementation.

Adaptation

SLR/Storm Surge	Precipitation	Heat	Drought
L low	L low	L low	L low

Focus Area 8: Leadership and Capcity

Goal

4. Educate local communities and businesses on climate change and the CAP.

Who

Lead: A Town-appointed committee or compensated position whose full focus is on this task (could be a temporary position created through grant funding, CAP entity

Collaborators: all town organizations and advocacy groups, SMPDC, schools, Faith Communities

Our Targets

- Presenting to major business organizations, non-profits, neighborhood groups, faith-based organizations, all schools (parents, teachers and student audiences) and every Town Department on findings and recommendations of the plan within the next 6-12 months.

Key Performance Indicators

- Creation of communications plan.
- Assignment of professional staff time to implement plan.
- Number of social media messages, follows, likes, etc.
- Number of contacts on mailing lists.
- Number of presentations to all target groups and audiences.

8.4

Mitigation

Reduces GHG

L

low

Actions

1. Determine who will be responsible for developing information, programs, and materials to educate various audiences within York.
2. Identify partner organizations for distribution and collaborative opportunities for educational materials.

Opportunities and Challenges

- The ability to create the committee or find funding for a compensated position within the months following plan completion.
- Uncertainty of Town's role in this education – is it simply to inform people of the work done to date? Is there an interest in the Town receiving feedback?
- Must determine strategies for how education will be put into action.
- Must determine how is this education campaign is aligned with the Selectboard's decision-making processes.
- Education must be timely to overlap with the pending town-wide vote in May.

Adaptation

SLR/Storm Surge	Precipitation	Heat	Drought
L M	L M	L M	L M
low / med	low / med	low / med	low / med

Terms to Know

Afforestation:
Practice of planting new forests on open land. As the forest matures, it naturally removes CO_2 from the atmosphere and stores it in its trees.

Biomass:
Biomass is a fuel that comes from plants and animals. This includes wood and wood process waste such as wood chips and pellets, crops and agricultural waste materials such as sugar cane, grasses, and algae, and municipal solid waste such as paper, cotton, wool, food and yard wastes. Biomass can also include animal manure and human sewage.

Decarbonization:
The process of achieving a low-carbon economy through decreases in GHG emissions.

Financing:
Focused on the terms of how that money will be paid back (e.g., the interest rate of the mortgage).

Funding:
Money or revenue generated to put towards payment (e.g., mortgage that is due every month).

Geothermal:
Geothermal energy is heat within the earth that is carried to the surface via water or steam and then used to generate electricity and heat buildings. It is a renewable (clean) energy source.

Heat pump:
A device used in a home or building that extracts heat from the outdoor air or underground water for heating and extracts heat from indoors for cooling. Heat pumps use electricity rather than fossil fuels for power. If the electricity is from clean energy sources (wind, solar, etc.) these devices reduce or eliminate GHG emissions from home heating and cooling processes.

Hydropower:
The natural flow of water is used to generate electricity.

Net zero emissions:
The balance between the amount of human-caused greenhouse gases produced and removed from the atmosphere.

Independent System Operator-New England (ISO-NE):
The operator of the high-voltage electric power gird serving Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont. ISO-NE controls grid operations; the wholesale power market, including which power plants operate; where and how electricity is delivered to retail utilities; and market prices. ISO-NE is an independent, non-profit Regional Transmission Organization (RTO), headquartered in Holyoke, Massachusetts.

Renewable energy sources/renewables:
Sources of electricity generated from renewable sources that are continually replenished. Major types of renewable energy sources include **biomass**, wind, solar, **hydropower**, and **geothermal**. “Renewable” and “zero carbon” are not synonymous, as some renewable energy sources do emit GHGs.

Geneve Hoffman (16 Hoops Photography) and Williams Realty Partners

section 8 Moving Forward

This section provides a roadmap for the Town and other parties to implement this plan. An overview of what the plan can (and can't) do is offered, as well as several possible approaches to administer and monitor its implementation. Additionally, information on financing and funding recommended actions is provided.

__Highlighted words__ are defined at the end of this section in "Terms to Know." A full Glossary of all "Terms to Know" can be found at the end of this plan on page 171.

Planning for Success: It's all about Capacity and Collaboration

Moving forward to implement the CAP will take capacity and collaboration. Capacity, in the form of people and resources, is needed to coordinate actions, identify and pursue funding and financing opportunities, and to assess and report on the implementation of the CAP. Collaboration will be key to success. Many existing groups, committees, and organizations in the town have the potential to contribute to York's CAP activities. These groups may need to act in new ways and take on new roles. While this is the Town of York's first climate action plan, it has been developed by leveraging the previous, current, and ongoing work of a broad range of entities and initiatives. Recognizing and understanding the political and organizational context of York, as well as regional, state-wide, and national efforts and trends in climate action planning is critical to the successful implementation of this CAP.

What are the important things to know? Section 7 offers recommendations for responsible parties for the plan's numerous goals and actions; this section offers additional information on funding and financing sources. This section reviews local capacity and organizations/entities who can help move things forward, and provides a broader perspective on regional, state-wide, and federal initiatives to ensure that the right partners and all possible funding and financing opportunities are identified.

Why Local Action Matters

This plan is all about local actions. Yes, climate change is a global issue, but global actions alone will not make York more resilient to climate change. The choices we make as individuals and as a community...how we heat and cool our buildings, which transportation methods we use, and the purchasing decisions we make...factor into this global problem. The answer to our challenges then, is both local and global. National and state policies and initiatives to mitigate climate change can provide assistance to communities like York. There are numerous funding and financing opportunities, programs, technical assistance initiatives and other opportunities that are available to protect against sea level rise, changes in precipitation, and rising temperatures, as well as to help communities reduce GHG emissions. Implementing the CAP will ensure that York is ready to take advantage of these opportunities.

Photo Credit: Carol Libby

Stakeholders and Participants

This Climate Action Plan was developed at the behest of the Town of York Selectboard to provide a roadmap for achieving the goals the Selectboard set out in its commitment to the Global Covenant of Mayors. A wide range of actions is recommended in this plan, most of which will require involvement from multiple parties and many of which may require further action by town voters to approve investments in York's climate-ready future. There are active organizations and Town staff and initiatives that can play a role in plan implementation, including Town boards and commissions, Town departments and staff, and quasi-public entities. Given the broad reach of these recommendations, however, the Town government and staff is but one of many stakeholders.

Individual entities such as York Hospital are addressing climate adaptation for their own operations and equipment. Quasi-public entities such as the York Water and Sewer Districts and the Kittery Water District (as a major land-owner in York) are also developing their own plans. In addition, there are a number of non-government organizations with a role to play in CAP implementation. Ultimately, the overall effectiveness and execution of the recommendations contained in this CAP depend on the collaborative and coordinated efforts of these entities. While the list to the right is not complete, and will change over time, it presents some potential roles for these entities. Given the diversity of stakeholders, an organizational framework to oversee implementation and coordination of York's climate action plan will be essential.

Comprehensive Plan

This CAP was developed while the Town comprehensive planning process was underway. Maps and data have been shared between these two planning efforts. The Comprehensive Plan begins its public review and comment period starting in May 2022. Findings from the Comprehensive Plan survey, conducted in November 2021, relevant to climate action planning are included in Section 6. Goals and actions the CAP Steering Committee believes have relevance to the Comprehensive Plan are noted in Section 7. The goals and actions listed here will inform the Comprehensive Plan as it enters its final development phase in the winter of 2022.

CAP Implementation: Roles and Possible Entities

Data tracking and reporting

- York Selectboard
  (overseeing Town staff decisions, spending, etc.)
- Energy Steering Committee
  (as part of a new initiative or advisory group)
- Planning Board
- York School District
- Town Staff
  (including potential new hires and positions)
  - Planning Department
  - GIS and Data

Mitigating GHG emissions

- Energy Steering Committee
- Bicycle & Pedestrian Committee
- Department of Public Works (DPW)
- Recycling Committee
- York Water District
- York Sewer District
- York Ready for Climate Action
- York Land Trust

Adapting to climate change

- Town Department of Public Works
- Cliff Walk Committee
- Town of York Emergency Response Coordinator
- York Fire Service Planning Committee
- Village Revitalization Committee
- York Water District
- York Sewer District

Funding and financing

- Budget Committee
- Selectboard
- Voters

Assuring equity

- York School District
- York Community Services Association
- Committee for Veterans' Affairs
- Committee to Combat Racism and Bias
- Senior Citizens Advisory Board
- York Housing Authority
- York Hospital

Preserving York's carbon sinks

- Conservation Commission
- York Land Trust
- York Water District
- Kittery Water District
- Harbor Board
- Shellfish Commission
- Historic District Commission
- Parks and Recreation Board

York Water and Sewer Districts

In York, key services such as the York Water and Sewer Districts are conducting or have conducted climate assessments at varied levels and their work adds to the overall body of knowledge and the collective efforts in the town.

Southern Maine Planning and Development Commission (SMPDC)

For many years, the SMPDC has been leading planning for coastal resiliency for York and adjacent towns. York is part of a consortium of seacoast towns working with the SMPDC on climate vulnerability assessments and regional cooperation on adaptation measures.[1] The consultant team coordinated with SMPDC during the preparation of this CAP and the Town's continued relationship with the Commission is critical to moving forward on climate change action.

Previous and ongoing adaptation work by the Southern Maine Planning and Development Commission (SMPDC) includes:

Tides, Taxes, and New Tactics sea level rise project

2-page summary for York

Summary of York community engagement workshop

GIS vulnerability assessment report

Socio-economic report

Tides, Taxes. and New Tactics: Adaptation Planning for Impacts of Sea Level Rise and Storm Surge in Southern Maine

Regional dredge feasibility study report

York sustainability and resilience assessment

Regional assessment (for full six-town group of which York is a part)

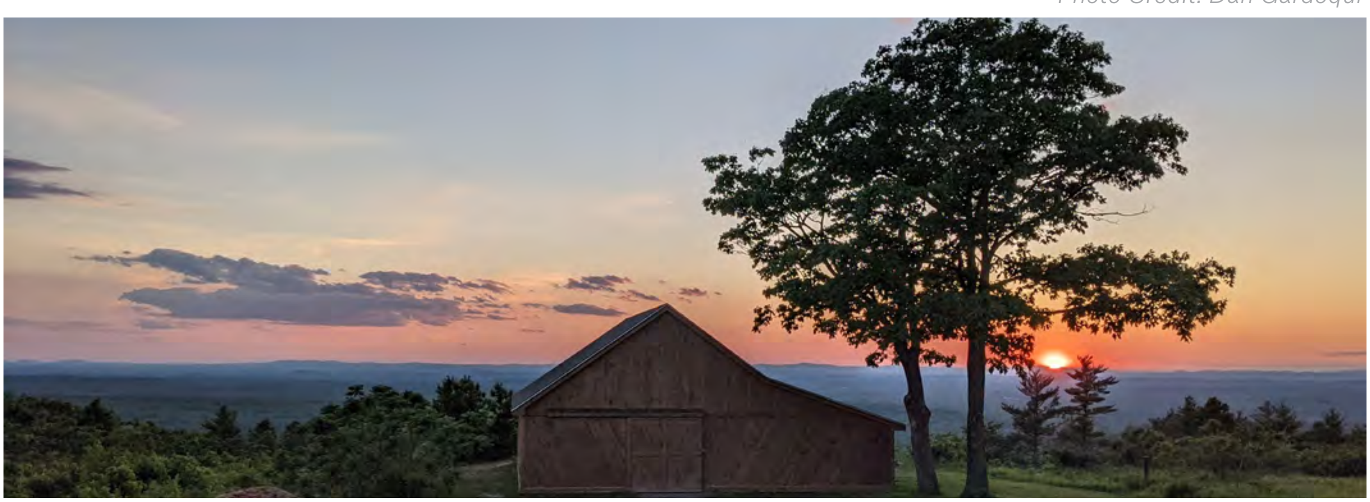
State and Federal

This CAP aligns with the goals and information developed by the Maine Climate Council (MCC) and the State's climate action plan *Maine Won't Wait*.[2] Relevant aspects of the Maine Climate Council's ongoing work are used in this CAP and the Town should continue to rely on updated data, assessment, and analysis by the state, including work of the Maine Geological Survey (MGS) in mapping of Sea Level Rise and Storm Surge[3] and ongoing work of the Maine Climate Council.

The Biden administration signaled its commitment to climate action by signing back onto the Paris Accord the first day of his presidency in January 2021. This action signaled a renewed interest and effort on the federal level to address climate change as a material disruptor with long term consequences for the social fabric and economic stability of our nation—and the world.

See "Upcoming Opportunities" at the end of this section for more information on state and federal funding availability.

Photo Credit: Dan Gardoqui



Implementation Chart

The chart on the following pages lists all the CAP goals organized by focus area and provides additional information for each of the following in the columns across the chart:

- **Mitigation:** To what extent does the goal address GHG emissions reduction goals ?
- **Adaptation:** To what extent does the goal help York protect and adapt for sea level rise, temperature, precipitation and/or drought?
- **Carbon Sink:** To what extent does the goal support the preservation and expansion of carbon sinks in York?
- **Equity:** How does the goal advance equity in York specifically in the areas of: H= housing, T= transportation, E= energy cost burden, and C= communications & connectivity
- **Health:** How does the goal address health considerations for marginalized and vulnerable populations? Issues considered include: P= public safety, H= heat preparedness, and W = wellbeing
- **Economic:** General assumptions about impacts to the Town tax base (+/-), regional implications, and relative cost ($-$$$) are provided here.
- **Timing and Feasibility:** What might be realized by 2030? By 2050? What is under the Town of York's control?
- **Roles:** Who will lead the effort for this particular goal? Assumptions about the leader (L), key collaborators (C), and participants (P)are listed. The key to the right provides information on each and the abbreviations used in the chart.
- **Alignment with other Initiatives:** How does this CAP goal align with Maine Climate Council and other goals and state initiatives?

Stakeholders Key:

AD: *App Developers*
A/B/D: *builders and developers*
BO: *business owners*
BPC: *Bike and Pedestrian Committee*
BSP: *Broadband Service Provider(s)*
Budget: *Budget Committee*
CAP: *CAP entity*
COC: *Chamber of Commerce*
Comm Gard: *York Community Garden*
Comm orgs: *grass roots, non-profits, social organizations*
Comm Prov: *Communications Providers*
DEM: *Drive Electric Maine*
DPW: *Department of Public Works*
EcoH: *York EcoHomes*
Emerg Resp: *Town emergency response entities*
EMT: *Efficiency Maine Trust*
ESC: *Energy Steering Committee*
FC: *Faith Communities*
Fish: *Commercial fishermen*
GOIF: *Governor's Office of Innovation and the Future*
H/L/P: *Home, land, property owners*
Hosp: *York Hospital*
KACTS MPO: *Kittery Area Comprehensive Transportation System*
KWD: *Kittery Water District*
MCC: *Maine Climate Council*
MCHT: *Maine Coast Heritage Trust*
MSW: *Municipal Solid Waste contractors*
MDoT: *Maine Department of Transportation*
MH: *Maine Housing*
MtA2c: *Mt A to the Sea*
MOFGA: *Maine Organic Farmers and Gardeners Association*
N: *York's neighbors/region*
NOAA: *National Oceanic and Atmospheric Administration*
OYGC: *Old York Garden Club*
PB: *Planning Board*
Pol: *York Police Department*
RC: *Recycling Committee*
Res: *York residents*
SB: *Selectboard*
Sch: *York Schools (superintendent and School Committee)*
SMPDC: *Southern Maine Planning and Development Commission*
State: *State of Maine agencies/programs*
State DEQ: *State (NH and ME) Department of Environmental Quality*
TM: *York Town Manager*
TofY: *Town of York (including any/all departments and staff and possible future sustainability coordinator)*
Tourism: *York hospitality and tourism businesses*
UMASCC: *University of Maine Advanced Structures and Composites Center*
UME: *University of Maine Exension*
V: *Vendors*
Visit: *Visitors*
YAE: *York Adult Education*
YCCAC: *York County Community Action Corporation*
YCCRB: *York Committee to Combat Racism and Bias*
YCE: *York Code Enforcement*
YCSA: *York Communicty Services Association*
YFD: *York Fire Department*
YLT: *York Land Trust*
YPD: *York Planning Department*
YPL: *York Public Library*
YRCA: *York Ready for Climate Action (formerly York Ready for 100)*
YRCC: *York Regional Chamber of Commerce*
YSD: *York Sewer District*
YWD: *York Water District*

P= public safety, H= heat preparedness, W = wellbeing
H= housing, T= transportation, E= energy burden, C= communications & connectivity
blank=no, 1=low, 2=medium, 3=high, Y=yes

Strategies (#) indicates notes found at the end of this matrix	Reduces GHG	Addresses Adaptation				Carbon Sink	Equity	Health
		SLR/SS	Precip	Heat	Drought			
FOCUS AREA 1: BUILDINGS								
1.1 Reduce GHG emissions generated by existing residential and commercial buildings.	3						H, E	W
1.2 Adopt temperature and flood resilience standards for all new and heavily renovated buildings.		3	3	3			H	W, P
1.3 Develop a plan to phase in energy building codes to reach net-zero carbon emissions for new construction.	3			1			H, E	W
1.4 Increase awareness and use of climate friendly Maine building products such as cross laminated timber and wood fiber insulation.	1					1	-	-
FOCUS AREA 2: INFRASTRUCTURE								
2.1 Take steps to protect critical assets (water, sewer, public safety, access/evacuation roads, healthcare, town services, dams, etc.) and other structures that will be impacted by sea level rise, storm surge, flooding and extreme weather events.		Y	Y	Y			H,T	W, P
2.2 Install and improve coverage and quality of broadband service in York to minimize VMT and improve emergency services.	1	2	2			1-1	T, C	P
FOCUS AREA 3: ACCESS TO RENEWABLE ENERGY								
3.1 Support the overall increase in the supply of renewable energy for all York citizens.	3						E	W
3.2 Promote alternative means by which residents and businesses can access renewable energy without having to install, own or operate equipment.	2						E	W

min=minimal, mod=moderate, +/- , model= model for others, reg = regional

Y=yes, N=no, M=maybe, P=partial

L= lead, C= collaborators, P=participants

Economic			Timing and Feasibility			Roles	Alignment with other initiatives
Tax base (+/-)	Regional, State	Relative Cost	Realized by 2030	Realized by 2050	Municipal Control?		
min	model	$$-$$$	M (1)	M	N	L: CAP C: ESC, EcoH, EMT, YCSA, V, B/D, FC P: H/L/P, BO	MCC: double current pace of home weatherization:min of 17.5k additional homes and businesses by 2025, including at least 1k low-income units; EMT, MH: Weatherize min of 35k homes and businesses by 2030.
+	SMPDC resiliency work, model	$$-$$$	Y	Y	Y	L: PD, PB, YCE C: ESC, EcoH, V, B/D P: H/L/P, BO	MCC: assess climate vulnerability and provide climate-ready design guidance; establish a state infrastructure adaptation fund; adopt official SLR projections
min	model	$$	Y	Y	Y	L: PD, PB, YCE C: ESC, EcoH, V, A/B/D P: H/L/P, BO	MCC: phase-in modern, energy efficient building codes by 2024 to reach net zero carbon emissions for new construction in Maine by 2035; train contractors & code enforcement
	more local jobs	$	Y	Y	N	L: CAP, YRCA C: V, State, ESC, EcoH P: TofY, B/D, H/L/P, BO	MCC: advance the design of and promote climate-friendly building products; establish the Univ. of Maine as the coordinating hub for state-applied research
min		$$$	Partial	Y	Y for most	L: TofY, DPW C: YSD, YWD, KWD, MDoT, YFD P: H/L/P	MCC: invest in climate-ready infrastructure; assess climate vulnerability, provide climate-ready design guidance; establish state infrastructure adaptation fund; Maine's Community Resilience Partnership program
+ (2)		$$-$$$	Y	Y	Y	L: SB, PB C: ESC, BSP P: BO, H/L/P	MCC: deploy high speed broadband to 95% of Maine homes by 2025 and 99% by 2030 (ConnectME Authority)
min		$-$$	Y	Y	Y	L: TofY, CAP C: EMT, ESC, EcoH, V P: A/B/D, YCSA, Res, BO	MCC: ensure adequate affordable clean energy supply
+ (3)	reg (6)	$	Y	Y	Y	L: TofY, CAP, SB, PB C: ESC, YRCA	same as above

P= public safety, H= heat preparedness, W = wellbeing
H= housing, T= transportation, E= energy burden, C= communications & connectivity
blank=no, 1=low, 2=medium, 3=high, Y=yes

Strategies (#) indicates notes found at the end of this matrix	Reduces GHG	Addresses Adaptation				Carbon Sink	Equity	Health
		SLR/SS	Precip	Heat	Drought			
FOCUS AREA 4: NATURAL RESOURCES								
4.1 Permanently conserve land, including wetlands and esturarine systems, and protect resources to protect carbon storage.	2-3	3	3	2	2	2-3	E	W, H
4.2 Permanently conserve land and coastal wetlands and protect resources for climate resilience.	1-2	3	2	1	1	2-3	-	W, H
4.3 Evaluate economic value of natural resources (ecological services, blue carbon, green carbon, food production, forests, working lands) and use value in community decision making.	1-2	2	2	2	1	1-2	-	W, H
FOCUS AREA 5: MOBILITY								
5.1 Expand Electric Vehicle (EV) ownership and use.	3						T, C, E	W
5.2 Implement a green fleet policy for York municipal vehicle pool.	3						N	W
5.3 Encourage the adoption of green fleet policies by quasi-municipal (water and sewer districts) and commercial fleets operating in York.	3						N	W
5.4 Provide a diversity of mobility options to serve different populations and needs to reduce VMT (vehicle miles traveled).	1-2	2	2 (9)	2 (10)			H, T	W
5.5 Facilitate, promote, and track the installation of EV charging infrastructure in York for residents, employees, and visitors.	1-2	2 (9)	2 (9)					W, P

min=minimal, mod=moderate, +/- , model= model for others, reg = regional

Y=yes, N=no, M=maybe, P=partial

L= lead, C= collaborators, P=participants

Economic			Timing and Feasibility			Roles	Alignment with other initiatives
Tax base (+/-)	Regional, State	Relative Cost	Realized by 2030	Realized by 2050	Municipal Control?		
+ (8)	reg (4)	$-$$$	Partial	Y	Partial	L: YLT, MtA2c, MCHT, NOAA C: TofY, CAP, PB, Emerg Resp, YWD, KWD, Res, H/L/P	MCC: develop new incentives to increase carbon storage; protect natural and working lands and water; expand outreach to offer information and technical assisstance; enhance monitoring and data collection to guide decisions
+ (8)	reg (4)	$-$$$	Partial	Y	Y and also others	L: YLT, MtA2c, MCHT, NOAA, YWD, KWD C: TofY, CAP, PB, Emerg Resp, State P: Fish, Res, H/L/P, ECOH	MCC: protect natural and working lands and water; expand outreach to offer information and technical assisstance; enhance monitoring and data collection to guide decisions
min to mod	reg (5)	$	Y	Y	Y	L: TofY, CAP C: YLT, YWD, KWD, MtA2c, MCHT	MCC: develop new incentives to increase carbon storage; protect natural and working lands and water; expand outreach to offer information and technical assisstance; enhance monitoring and data collection to guide decisions
none	reg (7)	$$	Y	Y	N	L: TofY, CAP C: ESC, YRCA, YCSA, SMPDC, MCC, GOIF, EMT, DEM	MCC: accelerate Maine's Transition to EVs; Efficiency Maine rebates for vehicle and charger purchases; develop a statewide EV Roadmap by 2022
minmal	reg (7)	$$	Y	Y	Y	L: SB, TM C: ESC; TofY, Sch, YWD, YSD, Hosp, SMPDC; EMT	same as above
	reg (7)	$$	Y	Y	N	L: TofY, CAP, SMPDC C: ESC, YWD, YSD, EMT P: BO, Hosp, Comm orgs	same as above
+ (11)	reg (7)	$$	Y	Y	Partial	L: TofY, SB, YPD, PB, BPC, DPW C: Tourism, COC, YRCA, SMPDC, KACTS MPO, YCCAC, State, MDoT, EMT	MCC: increase public transportation funding to the national median of $5 per capita by 2024; By 2024, strengthen land use policies and use state grants to encourage development that supports the reduction of VMT.
+ (11)	reg (7)	$$	Y	Y	Partial	L: TofY, CAP, SB, PB, YPD C: Tourism, BO, COC, SMPDC, MCC; GOIF, EMT P: Res, visitors	MCC: Develop, by 2022, a statewide EV Roadmap to identify necessary policies, programs and regulatory changes needed to meet the state's EV and transportation emissions reductions goals.

P= public safety, H= heat preparedness, W = wellbeing
H= housing, T= transportation, E= energy burden, C= communications & connectivity
blank=no, 1=low, 2=medium, 3=high, Y=yes

Strategies (#) indicates notes found at the end of this matrix	Reduces GHG	Addresses Adaptation				Carbon Sink	Equity	Health
		SLR/SS	Precip	Heat	Drought			
FOCUS AREA 6: WASTE AND RECYCLING								
6.1 Reduce municipal solid waste (MSW).	1							
6.2 Select municipal waste and recycling contractors based on multiple sustainability and climate criteria in addition to cost.	1							
FOCUS AREA 7: COMMUNITY RESILIENCY AND EQUITY								
7.1 Create a Coordinated Climate and Health Response Team to address climate health and disaster risks in the community.	1	1-2	1-2	1-2	1-2		H	W, P, H
7.2 Ensure public awareness of climate-related illnesses and health impacts.	1						H	W,P, H
7.3 Establish a town business sustainability award or recognition program.	1	1	1	1	1		-	-
FOCUS AREA 8: LEADERSHIP AND CAPACITY								
8.1 Ensure sufficient Town capacity to take action.	M	M	M	M	M	0	-	W, P, H
8.2 Incorporate considerations of climate risks in municipal decision making.	2	3	3	3	2	1-3 (15)	H, T, E, C	W, P, H
8.3 Lead by example in all new and existing municipal buildings and relevant infrastructure projects.	2	1	1	1	L		N	W
8.4 Educate local communities and businesses on climate change and the CAP.	1	1-2	1-2	1-2	1-2		N	-

min=minimal, mod=moderate, +/- , model= model for others, reg = regional

Y=yes, N=no, M=maybe, P=partial

L= lead, C= collaborators, P=participants

Economic			Timing and Feasibility			Roles	Alignment with other initiatives
Tax base (+/-)	Regional, State	Relative Cost	Realized by 2030	Realized by 2050	Municipal Control?		
+	+	$	Y	Y	Y	L: TM, YPD, SB C: DPW, YRCA, RC, TofY, Sch, YAE, Comm Gard, OYGC, UME, MOFGA, FC P: MSW, Res, BO, Visitors	
+	+	$	Y	Y	Y	L: SB, DPW C: Sch, RC	
min	model, (12)	$	Y	Y	Y	L: Emerg Resp, Health Officer C: Emerg Resp, Pol, YFD, Hosp, State, YCSA, YCCRB, FC P: COC	MCC: empower local and regional community resilience efforts; strengthen public-health monitoring, education and prevention
min	model, (12)	$	Y	Y	Y	L: TofY, Emerg Resp, TM C: Hosp, Comm orgs, Sch, COC, YPL, State, Comm Prov, AD, YCCRB, FC	same as above
min	model, (13)	$	Y	Y	Y	"L: CAP, TofY C: COC; YRCA; RC	MCC: recognize climate leadership by Maine businesses and organizations; empower local and regional community resilience efforts
-14	-14	$-$$	Y	Y	Y	L: TM, SB, Budget C: CAP	MCC: emphasize resilience through land-use planning and legal tools; strengthen public-health monitoring, education and prevention; empower local and regional community resilience efforts
(14)	(14)	$-$$	Y	Y	Y	L: TM, SB, Sch, Budget, DPW, voters	same as above
min	model	$$	Y	Y	Y	L: TM, SB, voters	MCC: emphasize resilience through land-use planning and legal tools; empower local and regional community resilience efforts
min	model, (13)	$	Y	Y	Y	L: A Town-appointed committee/ temp prof staff C: Comm orgs, SMPDC, sch, FC	MCC: empower local and regional community resilience efforts; raise awareness about climate change impacts and opportunities; increase public education offerings related to climate and energy

Implementation Matrix Notes:

(1) There are 8784 Single Family homes in York: 50% is an aggressive target of 550 homes weatherized yearly

(2) York more desirable to live, higher values—franchise considerations; local broadband authority

(3) Could be positive if Town collected fees; relied on installations for energy cost savings; shaving peak loads; formed Town power and light authority

(4) Thinking at ecosystem levels; coalitions across natural boundaries (e.g., watersheds, wildlife corridors, essential habitats), not simply jurisdictional ones

(5) Regional land initiatives and nonprofits

(6) Connects w/ regional energy system

(7) Conformance with larger transportation system; state and federal funding formulas

(8) Could protect assets from flooding losses; carbon sinks could generate other sources of revenue

(9) If sited with respect to flooding

(10) If sited with respect to shaded/vegetative coverage/cooling features

(11) Could enhance livability/desirability of town for residents, increase tax bse

(12) Pre-coordinated agreements with external statekholders (e.g., utilities, hosptial, etc.)

(13) Collaborative efforts with local groups and nonprofits (Chamber of Commerce, businesses, YESC, etc.)

(14) Greater resilience with respect to business continuity; reliability of services; more attractive to businesses, residents and other investors; potential credit rating and underwriting considerations

(15) Nature Based Solutions

Photo Credit: Geneve Hoffman (16 Hoops Photography) and Williams Realty Partners

Implementation Committee

There are eight focus areas in this plan with a total of 24 goals and multiple sub-actions for each. Success in achieving these goals will only happen if they are managed in a proactive way by an entity with authority, accountability and a budget. In other towns and cities, municipal actions are often managed by a Director of Sustainability or a similar position. Currently, there is no capacity in Town Hall to oversee CAP implementation and/or grant writing, nor any resources to administer and monitor the plan. No other entity in town currently has the mission or breadth to take on this role. The state has recently announced a program that could provide assistance to the Town in identifying sources of funding and pursuing grants. This state program would function through each of four appointed Resilience Coordinators. However, it should be noted that while this will certainly help with capacity, it will not provide the level of effort that is needed to fully realize the implementation of York's CAP goals: much of the CAP extends beyond the Town's jurisdiction and responsibilities.

The key challenge for the CAP is identifying or creating an entity external to Town government which will oversee the implementation of the recommendations, coordinate the various stakeholder actions, and operationalize the recommendations from the individual level across the business sector and infrastructure owners and operators. The mission of that implementing entity includes education and messaging. The additional expertise needed to support this work can be procured either through direct hires (which could be partially or wholly funded by grants) or the use of external consultants (which could also be supported by grants). Municipal activities would be coordinated as one of many elements among a portfolio of actions.

The bottom line? There are several ways this entity could be established and organized. Once the CAP is approved by the voters an Interim Implementation Committee should be chartered by the Selectboard to identify the ideal entity and return with a recommendation as to the nature of that entity, no later than the end of the year, 2022.

Interim Implementation Committee (IIC)

- Creation and membership of IIC endorsed by Selectboard at June 13, 2022 meeting
- Possible members of IIC
  - Town planning department
  - Subset of CAP Steering Committee
  - York Ready for Climate Action
  - York Land Trust
  - SMPDC
  - YCSA
- Reviews and discusses potential governance structures, pros and cons, stakeholders to be included, etc.
- Provides a recommended course of action to the Selectboard no later than September

The highest immediate priority for the Town is to form an Interim Implementation Committee.

Possible York CAP Implementation Organizations

CAP Implementation: What Happens when the Plan is Completed?

Steering Committee Continues to Work → **May Vote Passes** → **Interim Implementation Committee Formed/ Endorsed by BOS** → **Recommendations (may require additional ballot)**

Steering Committee Continues to Work

Tracking time-sensitive grant and funding opportunities to benefit the Town's efforts until Interim Implementation Committee established

Public review of this CAP, plan advanced to the Selectboard to prepare for public vote

Communicating about the plan and shepherding this plan through the public approval process in the Spring of 2022. Marketing to residents, boards and commissions, property owners, etc. Convey information about what the plan contains and why it is important (and what it will and won't do).

Interim Implementation Committee Formed/ Endorsed by BOS

MEMBERS:

- Town Rep
- CAP Steering Committee subset
- YRCA
- YCSA
- York Land Trust
- Regional Partners

Recommendations (may require additional ballot)

The following are examples of the kinds of entities or organizations that could be considered by the IIC:

1. Quasi-municipal entity

This model would be similar to the York Water and Sewer Districts in terms of organization and would operate independently but in alignment with the Town.

2. New or existing non-profit with leadership from the public and private sectors

Consider creating a new nonprofit or expanding the mission of a willing existing nonprofit. The goal is to provide flexibility and paid staff to have the capacity to convene all the stakeholders, pursue and oversee grants, and provide education to the community on CAP efforts.

3. Self-sustaining Town entity such as Parks & Recreation

Creation of a division within the Town that is self-sustaining and has some independence, including ability to involve nonprivate and private partners and leadership to guide efforts.

Assumptions

- No creation of fully staffed Town office feasible
- Significant grant funding necessary
- Funding could support either community or municipal needs
- Securing funding disconnected from regular municipal constraints
- An extra-municipal organization is essential for success

A Note about Funding, Financing and Upcoming Opportunities

At the time of publication of this plan, a number of state and federal programs were announced, although their timing and funding amounts were still uncertain. In addition, with the exception of infrastructure resiliency projects, many of the initiative and actions recommended in this plan cannot or should not be funded through the traditional Town budget. Full implementation of the CAP will require both funding and financing, including how debt is repaid. Each GHG mitigation and climate adaptation strategy/action may require one or a combination of funding sources. Information on funding, financing, and upcoming opportunities is provided in Appendix F.

Endnotes

1 https://smpdc.org/coastal
2 https://climatecouncil.maine.gov
3 https://www.maine.gov/dacf/mgs/hazards/slr_ss/index.shtml

Success in achieving the 25 goals of this plan and making early headway on priorities will depend on proactive leadership with authority, accountability and sufficient funding.

Photo Credit: Geneve Hoffman (16 Hoops Photography) and Williams Realty Partners

Abbreviations Used in this Plan

Many acronyms are used in this plan to describe government agencies, organizations, initiatives, and programs. Here's a list of the abbreviations used in this plan.

APNSA:
Assistant to the President for National Security Affairs

BRACE:
Building Resilience Against Climate Effects

BRIC:
Building Resilient Infrastructure and Communities

CAP:
Climate Action Plan

Cat:
Catastrophe (bond)

CCSO :
Climate Change Support Office

CDBG-DR:
Community Development Block Grant - Disaster Recovery

CDC:
US Center for Disease Control and Prevention

CEO:
Code Enforcement Officer

CH_4:
Methane

CIRIS:
City Inventory Reporting and Information System

CMP :
Central Maine Power

CO_2:
Carbon dioxide

CO-OPS:
Oceanographic Products and Services

COP21:
21st United Nations Climate Change Conference

COP26:
26th Annual United Nations Conference on Climate Change

CRF:
Common Reporting Framework

CRS :
Community Rating System

CSO:
Combined Sewer Overflow

DEP:
Department of Environmental Protection

DOT:
Department of Transportation

DPW:
Department of Public Works

EIA:
Energy Information Administration

EM:
Emergency Management

EMT :
Efficiency Maine Trust

EPA:
Environmental Protection Agency

EPR:
Extended Producer Responsibility

ESC:
Energy Steering Committee

ESG:
Environmental, Social and Corporate Governance

EUI:
Energy Usage Intensity

EV:
Electric Vehicle

FEMA:
Federal Emergency Management Agency

FIRMS:
FEMA's Flood Rate Insurance Maps

GCoM:
Global Covenant of Mayors

GHG:
Greenhouse Gas

GI :
Gastrointestinal Illness

GIS :
Geographical Information System

GWP:
Global Warming Potential

HAB:
Harmful Algal Bloom

HAT:
Highest Astronomical Tide

HVAC:
Heating, Ventilation, and Air Conditioning

IC :
Internal Combustion

ICT:
Information and Communications Technology

IECC:
International Energy Conservation Code

ILS:
Insurance-linked securities

IPCC:
International Panel on Climate Change

ISO:
Independent System Operator

KACTS MPO:
Kittery Area Comprehensive Transportation System/ Metropolitan Planning Organization

KKW:
Kennebunk, Kennebunkport, and Wells Water District

KPI:
Key Performance Indicator

KSD:
Kittery Sewer District

KWD:
Kittery Water District

kWh:
Kilowatt-hour

LED:
Light-emitting diode

LEED:
Leadership in Energy and Environmental Design

LEP:
People with limited English proficiency

LID:
Low Impact Development

LiDAR:
Light Detection and Ranging

M&O:
Maintenance & operating

MaineDOT:
Maine Department of Transportation

MCHT:
Maine Coast Heritage Trust

MGD:
Million gallons per day

MGS:
Maine Geological Survey

MOFGA :
Maine Organic Farmers and Gardeners Association

MS4:
Small Municipal Separate Storm Sewer Systems

MSW:
Municipal Solid Waste

MSZA:
Mandatory Shoreland Zoning Act

MtA2c:
Mt Agamenticus to the Sea Initiative

$MtCO_2e$:
Metric tons of carbon dioxide equivalent

MWCBS:
Maine Water Company Biddeford & Saco Division

NDC:
Nationally Determined Contribution

NOAA:
National Oceanic and Atmospheric Administration

Nox:
Nitrogen oxides

OSD:
Oguinquit Sewer District

P3:
Public-Private Partnerships

PACE :
Property-Assessed Clean Energy Program

PFA:
Per-and-polyfluoroalkyl

PM:
Particulate Matter

PM10:
Particles smaller than 10 micrometers in diameter

PV:
Photovoltaics

RCP :
Representative Concentration Pathway

RTO :
Regional Transmission Organization

SDG:
Sustainable Development Goals

SEaaS :
Sustainable Energy as a Service

SF:
Square Feet

SFHA:
Special Flood Hazard Area

SLR:
Sea Level Rise

SLTT:
State, local, tribal, and territorial

SMPDC:
Southern Maine Planning and Development Commission

TA:
Technical Assistance

TIF:
Tax Increment Financing

TIFIA :
Transportation Infrastructure Finance and Innovation Act

UNFCC:
United Nations Framework Convention on Climate Change

USAID:
United States Agency for International Development

USGS:
United States Geological Survey

VDATUM:
Vertical Datum Transformation

VMT:
Vehicle Miles Traveled

VOC:
Volatile Organic Compound

WIFIA:
Water Infrastructure Finance and Innovation Act

WWTP :
Wastewater Treatment Plant

YBFD :
York Beach Fire Department

YBVC:
York Beach Village Center

YCCAC:
York County Community Action Corporation

YCSA :
York Community Service Association

YSD:
York Sewer District

YVFD:
York Village Fire Department

YWD:
York Water District

Photo Credit: Geneve Hoffman (16 Hoops Photography) and Williams Realty Partners

Glossary of Terms to Know

We want this CAP to be accessible to everyone. Here are some terms that may be unfamiliar to those who are new to the “language” of climate change. The first time these terms appear in the plan, they are highlighted and their definition is included at the end of that particular section.

Adaptation:
Actions and strategies to address the physical impacts of climate change with a focus on protecting buildings, infrastructure, the natural environment, people, and economic health. Adaptation seeks to create resilient communities that successfully address climate change risks.

Afforestation:
Practice of planting new forests on open land. As the forest matures, it naturally removes CO_2 from the atmosphere and stores it in its trees.

Algal blooms:
A rapid increase or accumulation of algae populations in freshwater or marine water systems. Oftentimes, these blooms produce dangerous toxins that have harmful effects on people, fish, shellfish, marine mammals and birds. Algal blooms happen naturally but can become more prevalent with climate change.

Beach area:
Sandy area between the mean high tide line and the vegetation line along the coast.

Biomass:
A fuel that comes from plants and animals. This includes wood and wood process waste such as wood chips and pellets, crops and agricultural waste materials such as sugar cane, grasses, and algae, and municipal solid waste such as paper, cotton, wool, food and yard wastes. Biomass can also include animal manure and human sewage.

Carbon footprint:
The total GHG emissions caused directly and indirectly by an individual, organization, event, or product.

Carbon Neutrality/Carbon Neutral:
Achieving a net carbon footprint of zero, meaning carbon emitted is balanced or offset by carbon absorbed from the atmosphere.

Carbon sequestration:
The process of capturing, securing, and storing atmospheric carbon dioxide (CO_2). CO_2 can be sequestered or removed and stored biologically (in oceans, soil, forests, grasslands), geologically (pumped underground geologic formations and rocks), and technologically (capturing the carbon in waste and turning it into graphene that can then be used to strengthen concrete, direct air capture, changing the shape of molecules in ways that attract and bind specific substances like carbon dioxide). Researchers and project developers are competing to develop lower cost and more effective techniques for capturing and storing CO_2.

Carbon sink:
Any natural or artificial reservoir that absorbs and stores atmospheric CO_2. The primary natural carbon sinks include plants, soil, and the ocean.

Climate Change:
A long-term shift in the average global and regional weather patterns.

Climate Refugee:
A person who has left their home and region as a result of the effects of climate change on their environment.

COP21:
The 21st United Nations Climate Change Conference held in Paris, France in November 2015. COP stands for "Conference of Parties" – referring to the countries that have committed to the United Nations Framework Convention on Climate Change (UNFCCC).

COP26:
The 26th United Nations Climate Change Conference held in Glasgow, Scotland in November 2021. COP stands for "Conference of Parties" – referring to the countries that have committed to the United Nations Framework Convention on Climate Change (UNFCCC).

Dune:
Dunes are inland mounds or hills of sand and gravel deposits associated with a coastal beach.

Electric vehicles (EV) vs hybrid vehicles:
Hybrid vehicles are propelled by a combination of electric motors running on a battery and a conventional gasoline engine, resulting in less gasoline burned overall. Electric vehicles rely solely on electric motors for propulsion and are powered by a battery. Both hybrid and electric vehicles provide opportunities to reduce GHG emissions.

Energy Steering Committee (ESC):
Formed by the York Select Board in 2009 to advise the Board on matters of energy policy.

Federal Emergency Management Agency (FEMA):
An agency under the US Department of Homeland Security that helps people before, during, and after disasters.

Financing:
Focused on the terms of how that money will be paid back (e.g., the interest rate of the mortgage).

Fossil fuels:
Fuel sources taken from underground deposits that contain hydrogen and carbon and can be burned for energy. The most common fossil fuels are oil, coal, and natural gas. They are known as fossil fuels because they are created from decomposing plants and animals. Burning fossil fuels creates GHGs that go into the atmosphere, with carbon dioxide being the most common.

Funding:
Money or revenue generated to put towards payment (e.g., mortgage that is due every month).

Geothermal :
Geothermal energy is heat within the earth that is carried to the surface via water or steam and then used to generate electricity and heat buildings. It is a renewable (clean) energy source.

Global Covenant of Mayors (GCoM):
A group of town and city leaders of the world (11,000 cities and local governments across 140 countries) committed to an aggressive and large-scale response to climate change that aims to meet and exceed the goals set out in the Paris Agreement.

Greenhouse gases (GHG):
Greenhouse gases are gases (mainly water vapor, carbon dioxide, methane, ozone, nitrous oxide, and chlorofluorocarbons) in Earth's atmosphere that trap heat.

Greenhouse gas emissions:
Greenhouse gas (GHG) emissions occur naturally and are also produced by human activities, primarily as emissions from the burning of fossil fuels. The more GHG in the atmosphere, the more heat that is trapped and the warmer the planet gets. The unprecedented and increasing rate of GHG emissions created from human activities in the last century is the main cause of climate change today.

Greenhouse Effect:
GHGs trap heat in the earth's atmosphere, preventing it from escaping into space, much in the same way that the glass in a greenhouse traps heat to keep plants alive. Increased GHGs act as insulation for our planet trapping more heat and causing temperatures to rise.

Grid-supplied electricity:
Electricity provided through power lines from power plants to the end users. The GHG emissions that occur from grid supplied electricity to an end user can be estimated by prorating their share of the emissions of all sources of GHG used to generate that electricity.

Heat islands:
An area where the temperature is higher than the surrounding areas, usually because of presence of paved and hard surfaces and lack of vegetation.

Heat pump:
A device used in a home or building that extracts heat from the outdoor air or underground water for heating and extracts heat from indoors for cooling. Heat pumps use electricity rather than fossil fuels for power. If the electricity is from clean energy sources (wind, solar, etc.) these devices reduce or eliminate GHG emissions from home heating and cooling processes.

Hydropower:
The natural flow of water is used to generate electricity.

Independent System Operator-New England (ISO-NE):
The operator of the high-voltage electric power grid serving Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont. ISO-NE controls grid operations; the wholesale power market, including which power plants operate; where and how electricity is delivered to retail utilities; and market prices. ISO-NE is an independent, non-profit Regional Transmission Organization (RTO), headquartered in Holyoke, Massachusetts.

Infrastructure:
The system of fundamental facilities and structures that support an area (e.g. roads, public works buildings, power supplies).

Inland flooding:
A type of flooding that derives from rain water, not ocean water, and occurs inland and not on the coast.

Inland flooding can be caused by intense, short-term rain or by moderate rainfall over several days that overwhelms existing drainage infrastructure.

International Panel on Climate Change (IPCC):
The official United Nations body for assessing science related to climate change.

IPCC 1.5C and Sixth Assessment Reports:
The IPCC 1.5C Report was released in October of 2018, outlining ways in which the world can achieve the 1.5–degree Celsius (2.7 degrees F) goal that was established under the Paris Agreement. The IPCC Sixth Assessment Report is the sixth annual assessment of progress toward meeting goals and an update on climate change released in August 2021.

Key Performance Indicator (KPI) metrics:
A measurement that can be quantified that is used to evaluate performance or success.

Marine heat wave:
Ocean temperatures that are hotter than normal.

Mitigation:
Reduction of GHG emissions to slow impact of climate change. Emissions sources include buildings, transportation, and waste. The Goals for mitigation in York were set by the York Select Board in its 2019 commitment to the Global Covenant of Mayors to reduce GHG emissions from the town's base year of 1010 by 50% by 2030 and by 100% by 2050.

Municipal solid waste (MSW):
The waste produced by residential, commercial, and industrial buildings and uses. The largest categories of MSW include food waste, paper, metals, plastics, textiles, and yard trimmings.

MtCO2e:
Metric tons of carbon dioxide equivalent. Many emissions are a mix of the greenhouse gases, each with different warming potential. MtCO2e measures the equivalent amount of carbon dioxide that would equal the warming potential of a gas mixture.

Nationally Determined Contribution (NDC):
Country by country GHG reduction goals which form the core of the Paris Agreement. NDCs are derived from national or local climate plans and represent the amount of emissions reduction each government has pledged to achieve, as their contribution to global climate action. The concept of NDCs recognizes each community's right to determine its unique contribution.

Net zero emissions:
The balance between the amount of human-caused greenhouse gases produced and removed from the atmosphere.

Ocean Acidification:
Ocean acidification refers to an increase of acidity of ocean water over an extended period of time. When concentrations of CO_2 in the atmosphere increase, oceans absorb more CO_2. This additional absorption causes the water to become more acidic and reduces its carbonate ions which are used by organisms to make shells and coral.

Paris Agreement:
Pledge by 192 member countries of the United Nations Framework Convention on Climate Change (UNFCCC) to keep the global temperature limit well below 2 degrees Celsius (compared to pre-industrial levels), while pursuing efforts to limit the increase to 1.5 degrees C.

Precipitation:
Water vapor that has condensed from clouds to fall either as rain, snow, or hail. Climate change can affect the intensity and frequency of precipitation.

Renewable energy sources or Renewables:
Sources of electricity generated from renewable sources that are continually replenished. Major types of renewable energy sources include biomass, wind, solar, hydropower, and geothermal. “Renewable” and “zero carbon” are not synonymous, as some renewable energy sources do emit GHGs.

Resilience or Resiliency:
The ability to anticipate, prepare for, and respond to hazardous events, trends, or disturbances related to climate. The capacity of social, economic, and environmental systems to cope and respond to a hazardous event, trend, or disturbance caused by climate change.

Risk:
The potential for adverse consequences on adaptation and mitigation responses, lives and livelihoods, health and well-being, ecosystems, economic, social, and cultural assets, services, and infrastructure from a climate-related hazard.

Sea level rise (SLR):
Increases in the height of the sea that can occur globally and locally. Global sea level rise can happen from the melting of land-based glaciers and ice sheets due to global warming. More local increases in the height of the sea can happen due to changes in water density, land collapse, upstream flood control, erosion, ocean currents, and variations in land height.

Sludge (sewage):
The mud-like residue resulting from wastewater treatment. When wastewater and stormwater enter the sewage system, solid wastes are separated and processed. These processed solids are sewage sludge.

Storm surge:
Abnormal rise in seawater level during a storm. Caused primarily by wind pushing water onshore, the storm surge is the height of the water above the astronomical tide (usual tide level). Storm surge is determined primarily by strength and direction of the wind as well as the size, intensity and speed of the storm, along with other factors.

Sustainable Development Goals (SDGs):
Seventeen United Nations goals considered a call for action by all countries – poor, rich and middle-income – to promote prosperity while protecting the planet. The SDGs goals are also mentioned in the Global Covenant of Mayors commitment.

Transmission and distribution loss:
The amount of energy lost between electricity generation at the power station to its final point of use by consumers (electrical outlets). Most losses occur in power lines and transformers.

United Nations Framework Convention on Climate Change (UNFCCC):
An international Treaty that became part of international law on March 21, 1994. Of the 197 countries committed to the UNFCCC, 192 have ratified and endorsed the Paris Agreement of 2015.

Vector-borne diseases:
Diseases that come from an infection transmitted through the bite of an infected insect or arachnid (e.g. mosquito, tick, spider).

Waste:
Includes solid municipal waste (SMW) that is household and business trash collected curbside or in dumpsters by contractors, as well as construction waste, and wastewater treatment.

Wastewater treatment:
The process of removing as many solids as possible from wastewater before treating and discharging the remaining water back to the environment. Wastewater is made up of sewage, rainwater, and runoff from agricultural and industrial sources.

Water cycle:
The continuous movement of water across the globe, including the earth and the atmosphere. The cycle includes the entire system of liquid water evaporating, forming clouds, and then falling to earth as rain and snow precipitation. Also called the global water cycle.

Water filtration:
The process of removing or reducing the amount of particulate matter from water to produce water that is safer and cleaner for drinking.

Photo Credit: Geneve Hoffman (16 Hoops Photography) and Williams Realty Partners

Appendices

A. Climate Vulnerability Assessment and Methodology
B. GHG Emissions Inventory and Methodology
C. Maps
D. Working Group Information
E. Community Survey Results
F. Upcoming Opportunities, Funding, and Financing

YORK CLIMATE ACTION PLAN

Appendix A: York Climate Vulnerability Assessment and Methodology

February 2022

Table of Contents

List of Figures

List of Tables

Executive Summary

Why is York conducting this study?

The Town of York, Maine is committed to addressing climate change at the local level, formally joining the Global Covenant of Mayors' initiative in 2019. Addressing climate change requires both reducing the emissions of greenhouse gasses (GHGs), as well as preparing for the physical impacts of climate change. This memorandum focuses on the Town's vulnerability to the four key changes in:

1. Sea Level Rise (SLR)/Storm Surge
2. Precipitation
3. Drought
4. Temperature (air and water)

Additional narratives related to wildfire risk, air quality, biodiversity and other ecological shifts are included as well. The methodology for calculating the Town's GHG emissions is covered in a separate document.

Commitment to Change

In September 2019, the Town of York joined the Global Covenant of Mayors (GCoM) initiative[1] to address climate change at the local level, issuing the following statement:

> *Specifically, within three years of this commitment, we pledge to develop, adopt, use and regularly report on the following:*
>
> - *A community-scale GHG emission inventory, following the recommended guidance;*
> - *An assessment of climate risks and vulnerabilities;*
> - *Ambitious, measurable and time-bound target(s) to reduce/avoid GHG emissions;*
> - *Ambitious climate change adaptation vision and goals, based on quantified scientific evidence when possible, to increase local resilience to climate change;*
> - *An ambitious and just goal to improve access to secure, sustainable and affordable energy; and*
> - *A formally adopted plan(s) addressing climate change mitigation / low emission development, climate resilience and adaptation, and access to sustainable energy.*
>
> *The targets and action plans for mitigation / low emission development must be quantified and consistent with or exceed relevant national unconditional tv commitments defined through the UNFCCC (Intended) Nationally Determined Contribution (NDC). The targets and action plans should be in line with National Adaptation Plans, where these exist; and should be consistent with the principles around energy access and urban sustainability embodied in the Sustainable Development Goals (SDGs).*

[1] Global Covenant of Mayors for Climate and Energy, Commitment of Town of York, Maine, signed 7/29/19 by Steve Burns, Town Manager.

We will explore the allocation of adequate staff resources and institutional arrangements. This includes governance processes, municipal structures and budget allocations to deliver on this commitment and secure continuity.

We acknowledge that there may be additional regional- or country-specific commitments or requirements that we commit to follow, and that may be agreed through our city networks or through our direct engagement with local partners of GCoM.

The town of York, Maine acknowledges that continued engagement in GCoM and associated Regional or National Covenants, as established, is contingent on complying with the above requirements within established timeframes.

The climate vulnerability assessment and methodology outlined below is in direct response to this commitment.

Alignment with State and Regional Initiatives

This assessment of climate vulnerability was conducted to identify key climate impacts so that the Town can prioritize actions. This is the Town of York's first climate vulnerability assessment, but this work has been developed by leveraging information from previous studies, supplemented by York-specific data and pre-existing assessments.

Previous and on-going adaptation work by the Southern Maine Planning and Development Commission (SMPDC), and relevant aspects of the Maine Climate Council's ongoing work, are used in this assessment as well. Specifically, the baseline data for York's assessment uses the Maine Geological Survey (MGS) mapping of SLR and storm surge,[2] work of the Maine Climate Council and the *Maine Won't Wait*[3] Climate Action Plan, and regional work led by the SMPDC. Additionally, similar climate assessment work completed for the York Water and Wastewater Districts has been leveraged to further inform this assessment.

The consultant team used 2030 and 2050 for the Planning horizons and the International Panel on Climate Change (IPCC) emission scenarios, Representative Concentration Pathways (RCP) 4.5 and 8.5.

How is York Conducting this Study?

To understand York's vulnerability to climate change this assessment looks at the following:

1. What are the climate hazards and how will SLR, precipitation, temperature, and drought change in the coming years?
2. What is the exposure to climate hazards of critical assets and populations and to what degree?
3. What is the vulnerability of these critical assets and populations to these climate hazard exposures?
4. What are the consequences and overall risk associated with these vulnerabilities?

[2] https://www.maine.gov/dacf/mgs/hazards/slr_ss/index.shtml
[3] https://climatecouncil.maine.gov/

Climate Hazards

Flooding from Sea Level Rise/Storm Surge

Over the last century, sea levels along the coast of Maine have risen at a rate of about 0.6-0.7 feet/century, which is two times faster than during the past 5,000 years. This rate has accelerated in the last few decades to about 1 foot/century and continued acceleration of SLR is expected, with 3-5 feet of SLR likely by 2100.[4] The Maine Climate Council recommends committing to manage 1.5 feet of SLR and prepare to manage 3 feet by 2050. The Council recommends committing to manage 3.9 feet of SLR and preparing to manage 8.8 feet by 2100.[5]

Sea level rise is hazardous for two types of flooding: coastal nuisance (or chronic) flooding and storm surge flooding.

Coastal Nuisance Flooding

Analysis of historical tide levels in Portland, Maine revealed that a 1-foot increase in sea level rise will increase the frequency of nuisance flooding more than 15-fold, which is similar to projections for other New England cities.[6]

Storm Surge Flooding

A 1-foot rise in sea level would cause in a 10-fold increase in coastal flooding in Maine over the next 30 years from storm surges, not accounting for changes in storm intensity or frequency.[7]

Increasing Precipitation and Heavy Rainfall

Since 1895, average annual precipitation in Maine has increased by approximately 6 inches, or 15%, with a greater amount and proportion falling as rain. In that same time period, annual snowfall has decreased by more than 2.3 inches, or 20%.[8] The increase in rainfall has been accelerating over this time and is most pronounced since mid-2000.[9]

Long-term data from weather stations around Maine have shown overwhelmingly that extreme precipitation events greater than 2 inches/day have been much more frequent in the 21st century[10] and

[4] Maine Climate Council Scientific and Technical Subcommittee (MCC-STS). "Scientific Assessment of Climate Change and Its Effects in Maine. https://www.maine.gov/future/sites/maine.gov.future/files/inline-files/GOPIF_STS_REPORT_092320.pdf, 11-12.

[5] Maine Climate Council. "Maine Won't Wait: A Four-Year Plan for Climate Action. https://www.maine.gov/future/sites/maine.gov.future/files/inline-files/MaineWontWait_OneYearProgressReport_SinglePgs.pdf, 25

[6] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine.", 89. Ezer and Atkinson, 2014; Sweet et al., 2019.

[7] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine.", 12.

[8] Fernandez et al. "Maine's Climate Future 2020 Update." Orono, ME: University of Maine. https://digitalcommons.library.umaine.edu/cgi/viewcontent.cgi?article=1005&context=climate_facpub.

[9] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine.", 23.

[10] Fernandez et al. "Maine's Climate Future 2015 Update." Orono, ME: University of Maine. https://climatechange.umaine.edu/wp-content/uploads/sites/439/2018/08/Maines_Climate_Future_2015_UpdateFinal-1.pdf.

analysis from a Maine community revealed that most of the increase in annual precipitation has come from 1" and 2" rainfall events, with 3" and 4" events also becoming more frequent.[11] Projections for York show that a storm that has the likelihood of occurring every 5 years today will occur every two years by 2050. And a storm that today has only a 1 in 50 chance of happening any given year will increase to a 1 in 10 chance by 2070.[12]

Warming Air Temperature

Between 1895 and 2018, average annual temperature for the State of Maine increased by 3.2 degrees Fahrenheit (°F), and the state's six warmest years recorded have all come since 1998.[13] Coastal Maine, including York, warmed 3.4 °F during that time, slightly more than the state as a whole.[14] Under the RCP 8.5 scenario, which presumes the world's emissions continue unabated, the northeastern US will continue to warm faster than any other region in the country;[15] by 2050, temperatures in Maine are projected to have warmed by 6 °F above the historical average, and by 12 °F by 2100.[16] Without emissions reductions, the number of high heat index days per year (when it feels like 90 °F or hotter) in York are expected to increase by 20-30 days by 2050 and by 48-57 days by 2100.[17]

Winter is the fastest warming season in Maine, with average winter temperatures in the state rising 5.1 °F since 1895. Long-term trends over the last century show that average annual snowfall in Maine has declined about 17%[18] and average annual days with snow cover has declined by nearly 20 days in the northeastern US.[19]

Changing Ocean Conditions

Since 1982 the Gulf of Maine has been warming faster than 96% of the world's oceans,[20] and has experienced its warmest recorded period during the last decade.[21] Under a business-as-usual emissions scenario, experts project that temperatures in the Gulf of Maine will continue to warm to 4.3 °F above the baseline by 2050, at which point the water off the coast of York will feel like Rhode Island waters do today, and to more than 5.4 °F above the baseline by 2100.[22]

Because the ocean functions as a very effective carbon sink (making it an important resource for combating climate change), greater CO2 emissions lead to higher rates of CO2 absorption by the Gulf of

---

[11] Fernandez et al. "Maine's Climate Future 2020 Update."

[12] Weston & Sampson, Memo on Future Climate Rainfall, York, ME, 12/15/21.

[13] Fernandez et al. "Maine's Climate Future 2020 Update.".

[14] Fernandez et al. "Maine's Climate Future 2020 Update.".

[15] Consequences of Global Warming of 1.5 °C and 2 °C for Regional Temperature and Precipitation Changes in the Contiguous United States (plos.org)

[16] Fernandez et al. "Maine's Climate Future 2020 Update.".

[17] Fernandez et al. "Maine's Climate Future 2020 Update.", 25.

[18] Fernandez et al. "Maine's Climate Future 2020 Update.".

[19] Northern forest winters have lost cold, snowy conditions that are important for ecosystems and human communities - Contosta - 2019 - Ecological Applications - Wiley Online Library

[20] https://www.gmri.org/stories/gulf-of-maine-warming-update-summer-2021/

[21] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine."

[22] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine."

Maine, which makes it more acidic.[23] Excess nutrients stimulate algal blooms that consume oxygen and create CO_2, causing acidification and endangering marine species.[24]

Drought

While there has not yet been an observed increase in the occurrence of drought in Maine, a warming climate can make droughts more frequent or severe, and based on projections, by 2050 the threat of widespread summer drought in Maine could increase by 70%.[25] Higher-than-average temperatures in 2016 contributed to the occurrence and severity of a widespread drought in southern Maine that summer.[26] Drought has been more pervasive in York County in the most recent decade than the decade preceding, including two periods in the past five years during which most of the County was in an extreme drought (the aforementioned 2016 drought and another in 2020).

Climate Vulnerabilities

The climate adaptation assessment reveals that York is most vulnerable to climate change in the following seven areas:

- Loss of natural resources/negative ecosystem impacts
- Loss of property value and tax base
- Loss of tourism economy
- Road closures
- Greater social inequity
- Health and well-being impacts from high temperature days
- Lack of capacity to implement the CAP

A detailed assessment of the methodologies and results in each area is included in this document below.

Assessment Methodology Overview

This climate vulnerability assessment for the Town of York focuses on four key climate impacts: sea level rise (SLR)/storm surge, precipitation, drought, and temperature (air and water). While the Climate Action Plan acknowledges and encourages much broader collaboration and cooperation (climate change doesn't recognize municipal boundaries), the scope of this work is limited to impacts within York's boundaries and focused on things the Town and residents can control or influence. York is already part of a regional effort, led by the Southern Maine Planning and Development Commission (SMPDC), to assess climate adaptation risks and work cooperatively toward adaptation and this work supplements at a local and deeper level, the ongoing work of SMPDC. Working regionally will be necessary to address many climate change risks.

---

23 MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine."
24 MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine."
25 Maine's Climate Threats | States at Risk
26 MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine."

Establishing a Context and a Climate Hazard Baseline

This Climate Action Plan relies on the work of the Maine Geological Survey (MGS) and the Maine Climate Council and uses mapping and data developed for the ongoing work of the State in climate planning. This assessment also aligns with the planning horizons established by the State to make the most efficient use of data that has been developed by experts and vetted across the state, allowing us to use resources wisely and avoid duplication.

Planning Horizons and Emission Scenarios Used

The 2030 and 2050 planning horizons are used for both the greenhouse gas (GHG) inventory (mitigation) and climate vulnerability (adaptation) work in this Climate Action Plan. This is in keeping with York's previous commitments, as well as the State of Maine's recent Climate Action Plan, *Maine Won't Wait*.[27]

Climate projections are based on two possible futures. The first future assumes that the world is able to curb emissions to meet the goals established in the Paris Agreement of 2015, which includes limiting global average temperature rise above pre-industrial levels to no more than 2 degrees Celsius (°C) (3.6 degrees Fahrenheit (°F)) and pursuing efforts to limit the rise to 1.5 °C (2.7 °F). The 1.5 °C scenario future is referred to as RCP 4.5 and is largely seen as overly-optimistic.

The second possible future, RCP 8.5, captures the "business as usual" scenario and assumes similar economic growth with little or no significant reduction in GHG emissions and is more in line with our present day and near-term realities. The extent, intensity, and timing of climate projections will differ depending on which emission scenario is used. For this study, we have cited both possible futures in order to frame the range of possible outcomes, although RCP 4.5 is the planning basis scenario for the State of Maine.

Alignment with State and Regional Initiatives

This assessment of climate vulnerability was conducted to identify key climate impacts so that the Town can prioritize actions. This is the Town of York's first climate vulnerability assessment, but this work has been developed by leveraging information from previous studies, supplemented by York-specific data and pre-existing assessments.

The baseline data used for York's assessment is the MGS mapping of SLR and storm surge,[28] work of the Maine Climate Council and the *Maine Won't Wait* Climate Action Plan, and regional work led by SMPDC.

Standardization with MGS

This assessment leverages MGS data for SLR and storm surge. Mapping and calculations for this Climate Action Plan follow MGS methodology and protocols as noted below. Mapping SLR and storm surge is an inexact science; the MGS is careful to point out that a range of depths is possible within SLR scenarios.[29] For this reason, we have rounded SLR to the nearest integer to avoid the impression of exact predictions. More information on this topic is found in the SLR depth mapping methodology below.

[27] https://www.maine.gov/future/sites/maine.gov.future/files/inline-files/MaineWontWait_December2020.pdf
[28] https://www.maine.gov/dacf/mgs/hazards/slr_ss/index.shtml
[29] Phone call with Peter Slovinsky, MGS, 6/28/21. https://www.maine.gov/dacf/mgs/hazards/slr_ss/index.shtml

Alignment with Maine Climate Council

The Maine Climate Council recommends managing and planning for specific SLR scenarios while acknowledging that looking at historical trends cannot help us fully understand future acceleration of SLR.

> "The future path of climate and sea level impacts in Maine will depend on society's success in reducing emissions and feedbacks in Earth's climate system. Because of this, the Maine Climate Council has recommended that the State of Maine manage for 1.5 feet of relative SLR by 2050 and 4 feet by 2100.
>
> Maine SLR has accelerated since the early 1990s to about 1 foot/century (3 to 4 mm/year), up from ~0.6 feet/century (1.8 to 2 mm/year). Long-term average SLR in Maine has been 7 to 8 inches since the early 1900s, with more SLR expected until 2100 and beyond. Abrupt +/- 1 foot annual changes in sea level have happened on top of long-term SLR. "Nuisance" flooding and coastal storm impacts will be 10x more frequent with just 1 foot of SLR."[30]

The Maine Climate Council has made recommendations regarding SLR/storm surge climate planning that are followed in this assessment:

- Manage to an intermediate SLR scenario of 1.5 feet by 2050 (over baseline year of 2000)
- Manage to an intermediate SLR scenario of 3.9 feet by 2100
- Consider managing to 3 feet SLR by 2050
- Consider managing to 8.8 feet SLR by 2100

Considerations for managing to higher SLR projections above are dependent on the level of risk tolerance for different kinds of critical infrastructure. This plan follows the Maine Climate Council recommendations and more information is offered below in the critical assets exposure analysis.

Standardization with SMPDC Regional Efforts

The consultant team has coordinated with SMPDC to standardize adaptation reporting at the municipal level with actions at the regional level. York is part of a six-town consortium working with the SMPDC on climate vulnerability assessments and regional cooperation on adaptation measures.[31] The proposed methodology outlined here is in alignment with SMPDC's proposed standards (and in some instances is more detailed as more current information became available during this planning process than was available to SMPDC during the initial phases of its work; these instances are noted below where applicable).

York Water and Sewer Districts

In York, key services such as the York Water and Sewer Districts are conducting or have conducted assessments at varied levels and this work has informed this climate vulnerability assessment and is described in relevant sections below.

[30] https://climatecouncil.maine.gov/sea-level-rise-maine-accelerating-problem
[31] https://smpdc.org/coastal

Local Applicability/Availability of Data

While there are detailed analyses regarding SLR considerations for York (see listing below*), less information exists for other types of climate impacts, including precipitation and temperature considerations. The consultant supplemented the available data with readily-available and peer-reviewed sources of data, including temperature projections from the Climate Toolbox.[32] Because of concerns that precipitation projections at the regional or state-wide level would not have sufficient accuracy, York-specific precipitation projections were prepared for this study and are referenced below. This assessment also leverages relevant data from the Maine Climate Council's reports although these data will have less specificity at a local level than some of the previously mentioned sources such as SLR.

***SMPDC References related to SLR Vulnerability**

Tides, Taxes, and New Tactics SLR project

- 2-page summary for York
- Summary of York community engagement workshop
- GIS vulnerability assessment report
- Socio-economic report
- Tides, Taxes. and New Tactics: Adaptation Planning for Impacts of Seas Level Rise and Storm Surge in Southern Maine
- Regional dredge feasibility study report
- York sustainability and resilience assessment
- Regional assessment (for full six-town group of which York is a part)

Climate Hazards in York

Climate hazards were identified in order to understand the Town's exposure to climate change and to identify risk to infrastructure, the economy, people, and the natural environment.

Flooding from Sea Level Rise & Storm Surge

Warming air and ocean temperatures directly cause SLR, an increase in the height of ocean water. The two most significant drivers of current and projected SLR are 1) the expansion of seawater as it warms and 2) the increasing volume of ocean water with the runoff of melting land-based ice sheets and glaciers.[33]

Over the last century, sea levels along the coast of Maine have risen at a rate of about 0.6-0.7 feet/century, which is two times faster than during the past 5,000 years. This rate has accelerated in the last few decades to about 1 foot/century and continued acceleration of SLR is expected, with 3-5 feet of SLR likely by 2100.[34] In response to observed and projected SLR, the Maine Climate Council recommended in its 2020 *Maine Won't Wait* plan that the State commit to manage 1.5 feet of SLR and prepare to manage 3 feet by 2050. The Council recommends committing to manage 3.9 feet of SLR and

[32] https://climatetoolbox.org/tool/Future-Climate-Dashboard
[33] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine," 73
[34] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine," 11-12

preparing to manage 8.8 feet by 2100.[35] Actual levels of future SLR will be dependent on levels of GHG emissions and warming temperatures. The approach of committing to manage for a higher probability while also preparing to manage for a lower probability is one that has been adopted by several New England states and municipalities.[36]

SLR is hazardous for two types of flooding: coastal nuisance (or chronic) flooding and storm surge flooding.

Coastal Nuisance Flooding

Coastal nuisance flooding is minor and regular flooding in low-lying areas that occurs when high tides exceed the height of the coastal landscape. Nuisance flooding does not pose significant risks for public safety or cause major property damage but can inconvenience and put financial burdens on municipalities and individuals by disrupting day-to-day activities, straining infrastructure like roads and sewers, and causing minor property damage.[37] As sea levels rise, so does the risk and regularity of coastal nuisance flooding, as well as the potential extent of damage and disruption. This means that areas of York that flood every-once-in-a-while during high tide will flood increasingly often, and areas that flood frequently during high tide will experience more extensive flooding. Analysis of historical tide levels in Portland, Maine revealed that a 1-foot increase in SLR will increase the frequency of nuisance flooding more than 15-fold, which is similar to projections for other New England cities.[38]

Storm Surge Flooding

Storm surge flooding can be a much greater threat to public health and property damage than coastal nuisance flooding. Storm surge is the rise of water above the predicted astronomical tide due to a storm, caused primarily by heightened winds pushing greater amounts of water and intensified wave action onshore. Storm surges can raise water levels dramatically above normal tide levels, causing severe flooding that extends well inland. This is known as a storm tide.[39] In Portland, Maine the 1-year storm surge event (100% annual chance of occurring) rises 2 feet above normal tide level. The highest recorded storm surge in Portland was 4.6 feet above normal tide level.[40]

While the amplitude of any individual storm surge is dependent on a number of factors, including the direction and intensity of the storm and local landscape, increasing base tide levels from SLR increase the overall frequency and risk of flooding from storm surges.[41] For example, a 3-foot storm surge has approximately a 20% chance of occurring each year, compared to a 100% chance for a 2-foot storm surge (Table 1); however, on top of 1 foot of SLR, a 2-foot storm surge will have the same severity as a 3-foot storm surge with no SLR, but will happen more frequently.[42] This would result in a 10-fold increase

---

[35] Maine Climate Council. "Maine Won't Wait," 25

[36] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine," 72

[37] What Is Nuisance Flooding? Defining and Monitoring an Emerging Challenge - Moftakhari - 2018 - Water Resources Research - Wiley Online Library

[38] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine," 89. Ezer and Atkinson, 2014; Sweet et al., 2019.

[39] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine," 86.

[40] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine," 84-85.

[41] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine," 84.

[42] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine," 12.

in coastal flooding in Maine over the next 30 years, not accounting for changes in storm intensity or frequency discussed in the next section.[43]

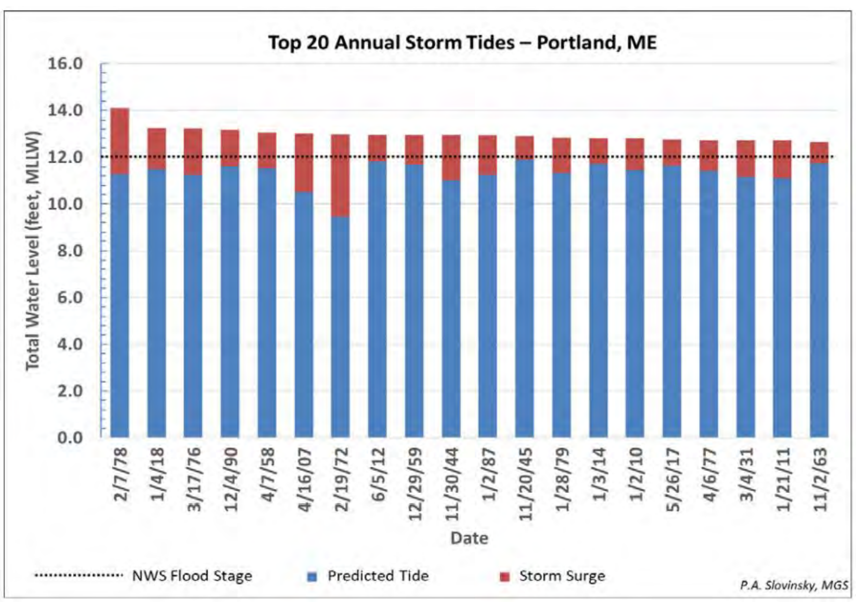
Table 1. Storm Surge Recurrence Intervals for Three Maine Tide Gauges.

Recurrence Interval (years)	% Annual Chance	Portland Storm Surge (feet)	Bar Harbor Storm Suge (feet)	Eastport Storm Surge (feet)
1	100%	2.0	1.8	2.0
5	20%	2.9	2.8	2.9
10	10%	3.3	3.3	3.3
25	4%	3.9	3.9	3.9
50	2%	4.3	4.3	4.3
100	1%	4.7	4.7	4.7

Source: Maine Climate Council Scientific and Technical Subcommittee Report. Data from NOAA CO-OPS.

The greatest potential for severe coastal flooding is when a storm surge occurs at the same time as a high astronomical tide (HAT). When this occurs, the storm surge does not need to be especially high to cause significant inundation because water levels are already elevated.[44] Of the top 20 annual storm tides (highest storm tide of the year) on record for Portland, Maine, the astronomical tide was far more influential than the height of the surge itself[45] (Fig. 1). This reinforces our understanding that as base tide levels become more elevated from SLR, the frequency and severity of flooding will increase in all storm scenarios.

Figure 1. Top 20 Annual Storm Tides for Portland, Maine.



Source: Maine Climate Council Scientific and Technical Subcommittee, pg. 87. Data from National Oceanic and Atmospheric Administration (NOAA) Oceanographic Products and Services (CO-OPS).

---

43 MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine," 12.
44 MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine," 86
45 MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine," 87.

Mapping Sea Level Rise & Storm Surge

MGS encourages using the full range of SLR maps during planning. While 9 feet of SLR seems in the distant future, the three tide markers located along the coast of Maine show surges from approximately 2 to 5 feet (Table 1). Adding surges to 4 feet of SLR makes 9 feet not that far-fetched as a worst-case scenario.[46]

Sea Level Rise/Storm Surge Inundation Mapping

SLR and storm surge maps use data[47] from MGS to identify the extent of inundation from SLR and storm surge for the Maine Coast. These maps and associated data are used for the York Climate Action Plan, ensuring alignment across planning as this information is used by the State Climate Council and by the SMPDC. As described by MGS,

> This [SLR/storm surge] dataset approximates the potential inland extent of inundation from several scenarios (1.2, 1.6, 3.9, 6.1, 8.8 and 10.9 feet) of SLR or storm surge along the Maine coastline on top of the Highest Astronomical Tide. That Highest Astronomical Tide layer displays the maximum predicted astronomical high tide for the current National Tidal Datum Epoch (1983-2001). The SLR scenarios were developed by using available long-term SLR data from Portland, Bar Harbor, and Eastport tide gauges and the US Army Corps of Engineers Sea-Level Change Curve Calculator (v. 2017.55) and SLR scenarios established by NOAA et al. (2017) prepared for the US National Climate Assessment. Scenarios include low, intermediate low, intermediate, intermediate high, high, and extreme SLR at the 50% confidence interval. The data were developed with a static ("bathtub") inundation model that uses Light Detection and Ranging (LiDAR) topographic data as a base digital elevation model, and first adjusts Highest Astronomical Tide tidal predictions to take into account variability in elevation datums along the Maine coastline, and then adds the storm surge/SLR scenarios to that initial starting elevation. The primary purpose of these data is to help inform storm surge and SLR vulnerability assessments and community planning.[48]

SLR/Storm Surge Depth Maps

The MGS has mapped the depth of inundation at two-foot increments; the MGS has not mapped smaller increments of depth because the margin of error in mapping is almost one foot which makes mapping smaller increments of depth misleading. For instance, there is a 10-15 cm variation for LiDAR and 11-13

[46] June 28, 2021 Phone call with Peter Slovinsky, Marine Geologist, Maine Geological Survey and Maine Climate Council Scientific and and Technical Subcommittee Report. Data from NOAA CO-OPS.

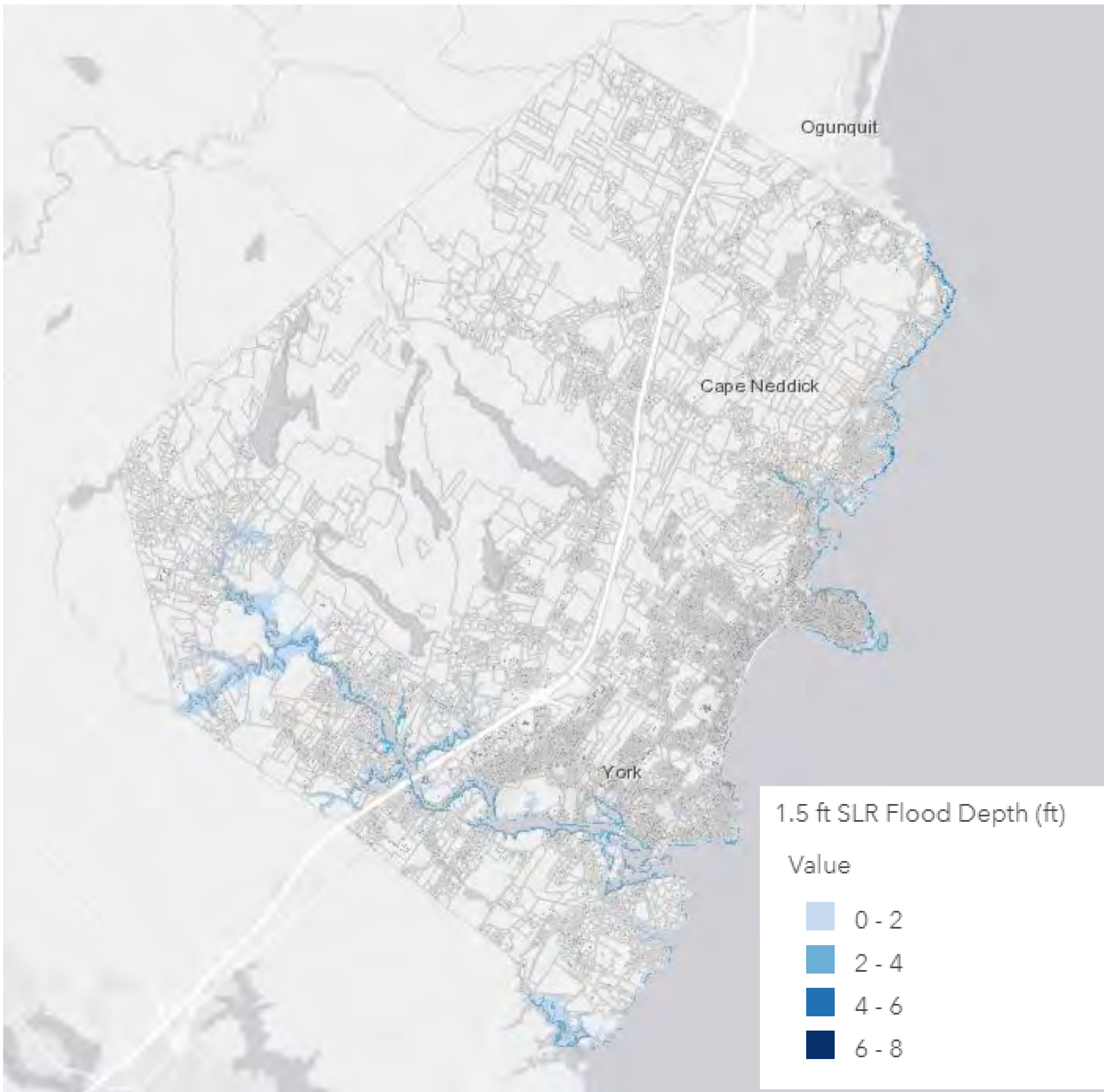
[47] Maine Geological Survey, 2019, Maine Sea Level Rise Storm Surge Scenarios 2018. Department of Agriculture, Conservation and Forestry, Augusta, ME. https://mgs-maine.opendata.arcgis.com/datasets/maine-sea-level-rise-storm-surge-scenarios-2018.
Maine Geological Survey, 2019, Maine Sea Level Rise Storm Surge Scenarios 2018 - Map Notes. Department of Agriculture, Conservation and Forestry, Augusta, ME. https://mgs-maine.opendata.arcgis.com/datasets/maine-sea-level-rise-storm-surge-scenarios-2018-map-notes.

[48] https://www.maine.gov/dacf/mgs/hazards/slr_ss/index.shtml.

cm variation for Vertical Datum Transformation (VDATUM) - giving a total margin of error range of up to 28 cm or 11 inches.[49]

The maps below (Figs. 2 to 5) illustrate the estimated inundation flood depth as calculated by MGS. A web viewer of the MGS SLR project maps can be found at: https://www.maine.gov/dacf/mgs/hazards/slr_ss/index.shtml.

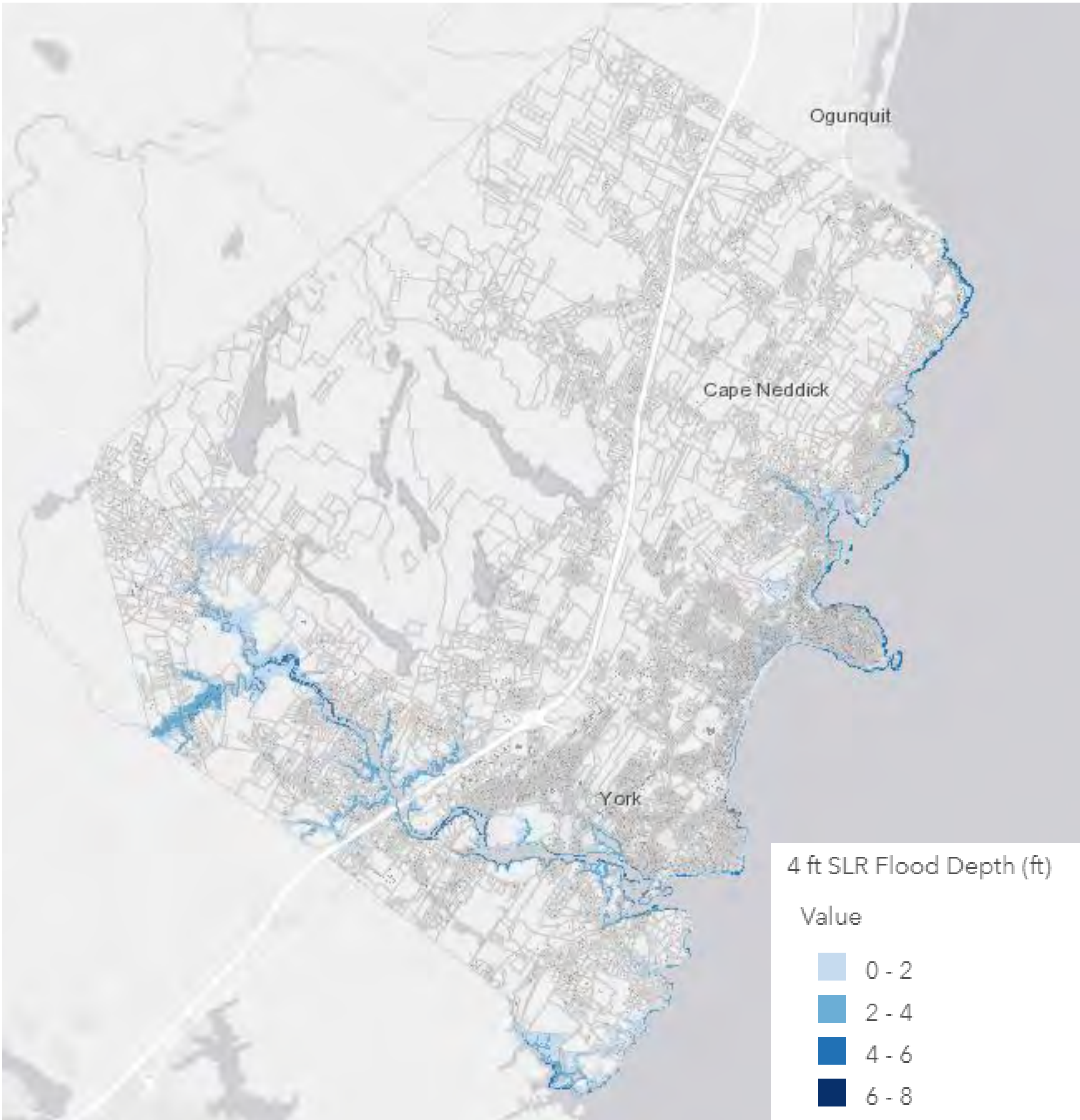
Figure 2. Estimated Inundation and Flood Depth (ft) at 1.5 Feet of SLR/Storm Surge.



Source: Maine Geological Survey, data downloaded by consultant on 6/29/21.

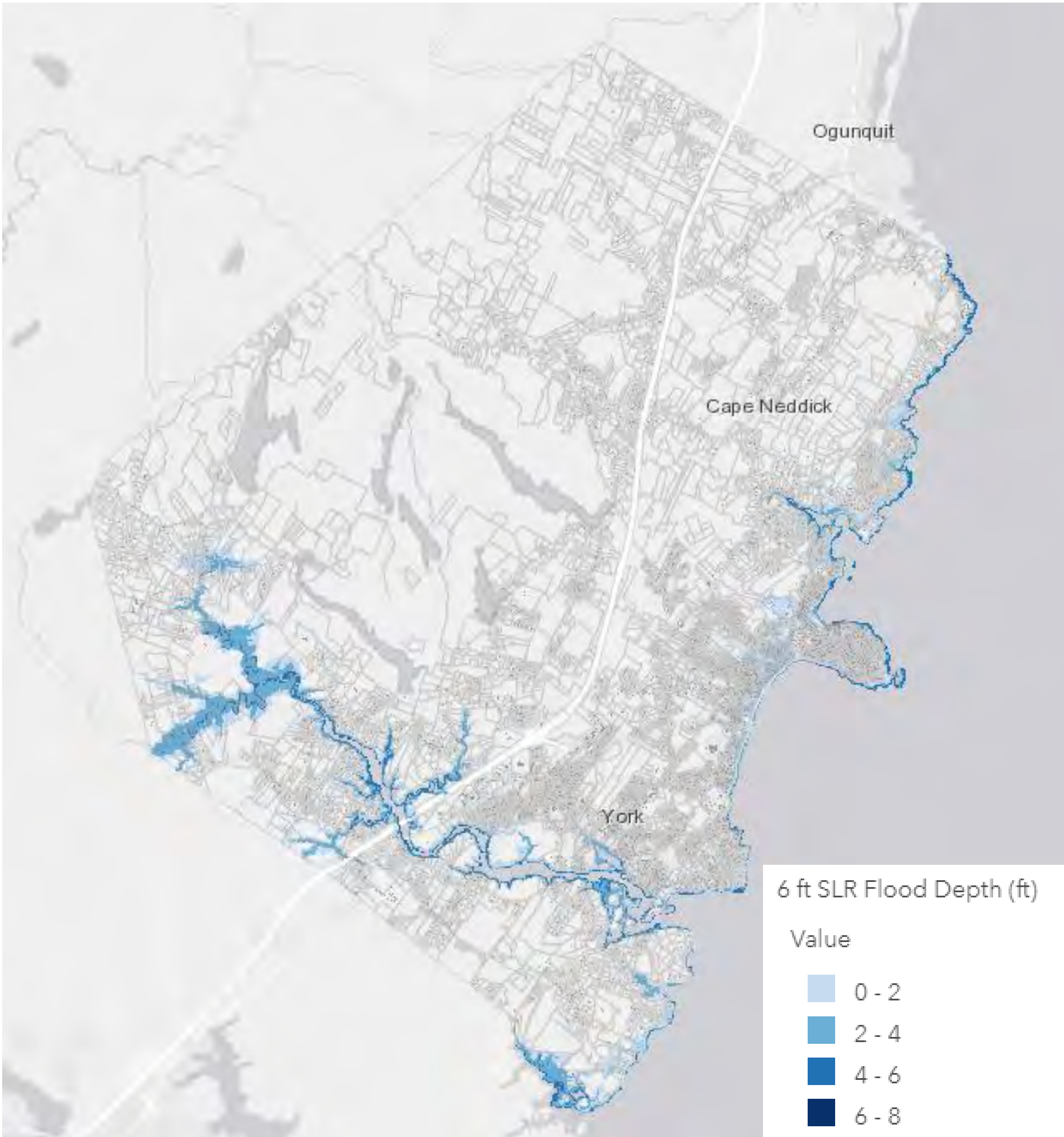
[49] June 28, 2021, Phone call with Peter Slovinsky, Marine Geologist, Maine Geological Survey and follow-up file transfer from MGS.

Figure 3. Estimated Inundation and Flood Depth (ft) at 4 Feet of SLR/Storm Surge.



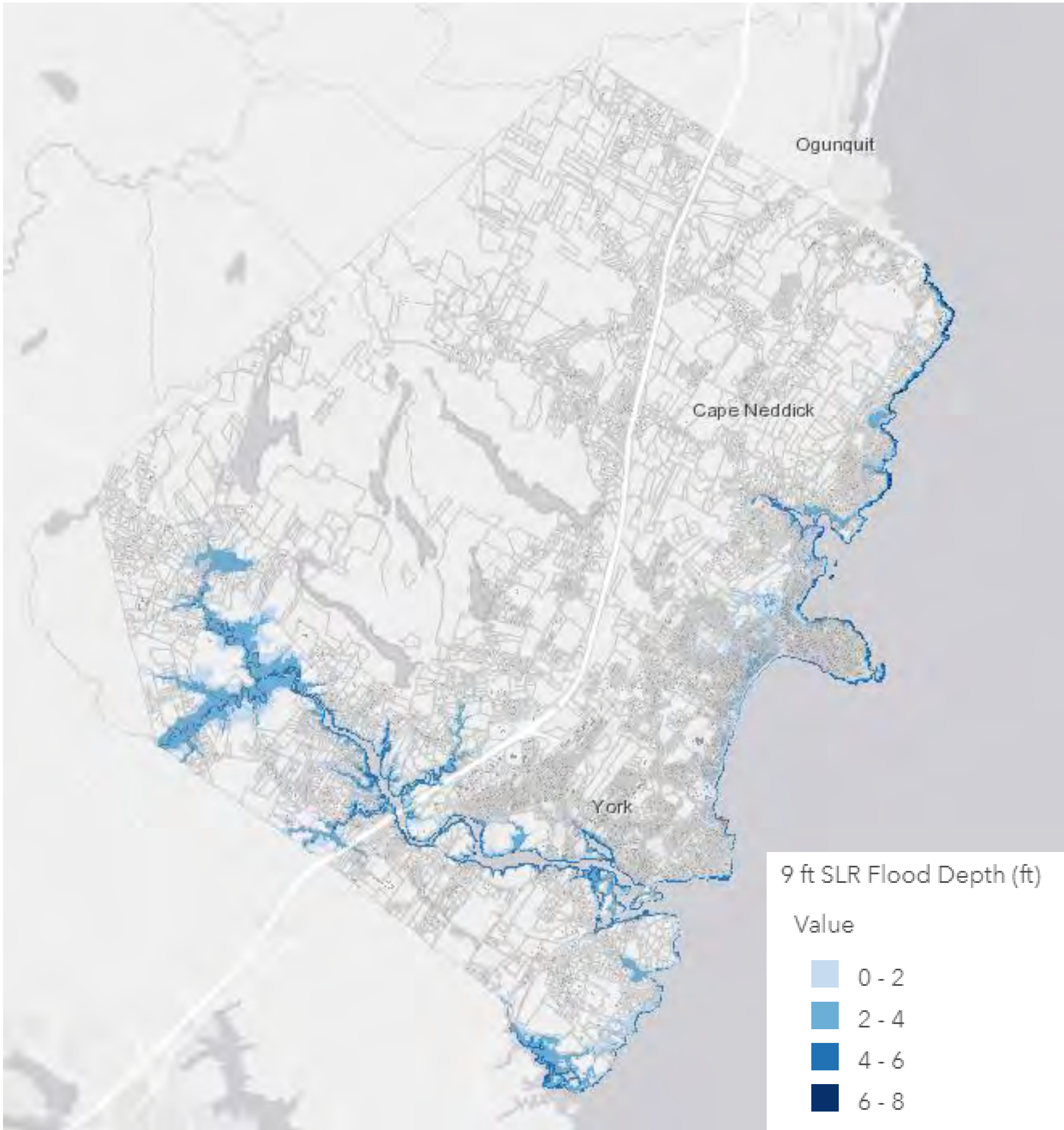
Source: Maine Geological Survey, data downloaded by consultant on 6/29/21.

Figure 4. Estimated Inundation and Flood Depth (ft) at 6 Feet of SLR/Storm Surge.



Source: Maine Geological Survey, data downloaded by consultant on 6/29/21.

Figure 5. Estimated Inundation and Flood Depth (ft) at 9 Feet of SLR/Storm Surge.



Source: Maine Geological Survey, data downloaded by consultant on 6/29/21.

Increasing Precipitation and Heavy Rainfall

Rising air and water temperatures have a significant effect on precipitation patterns by influencing rates of evaporation and conditions in the atmosphere. Warmer air and oceans increase rates of evaporation from the land and ocean, which in turn creates more moisture in the atmosphere. Depending on the local and regional climate, including things like wind patterns and ocean currents, higher rates of evaporation can produce varying impacts ranging from more and heavier precipitation to more frequent and extreme drought.[50] In Maine (and across the northeastern US), the trend has been toward greater overall precipitation from more frequent and heavier rainfall during storms.[51]

Since 1895, average annual precipitation in Maine has increased by approximately 6 inches, or 15%, with a greater amount and proportion falling as rain. In that same time period, annual snowfall has decreased by more than 2.3 inches, or 20%.[52] The increase in rainfall has been accelerating over this time and is most pronounced since mid-2000.[53]

Of significant concern for York is that heavy rainfall events are becoming more frequent and intense. Long-term data from weather stations around Maine have shown overwhelmingly that extreme precipitation events greater than 2 inches/day have been much more frequent in the 21st century[54] and analysis in Farmington, Maine revealed that most of the increase in annual precipitation has come from 1" and 2" rainfall events, with 3" and 4" events also becoming more frequent.[55] Greater moisture in the air from higher rates of ocean evaporation is a major driver of this pattern, producing intense rainfall when the air moves over land.[56] For this reason, coastal communities such as York are experiencing even more heavy rainfall than elsewhere.[57] Projections for York show that, under a high emissions scenario, the frequency of intense rainfall events will continue to increase dramatically throughout the 21st century (Table 2).[58] A storm that has the likelihood of occurring every 5 years today will occur every two years by 2050.[59] And a storm that today has only a 1 in 50 chance of happening any given year will increase to a 1 in 10 chance by 2070 (Fig. 6).

---

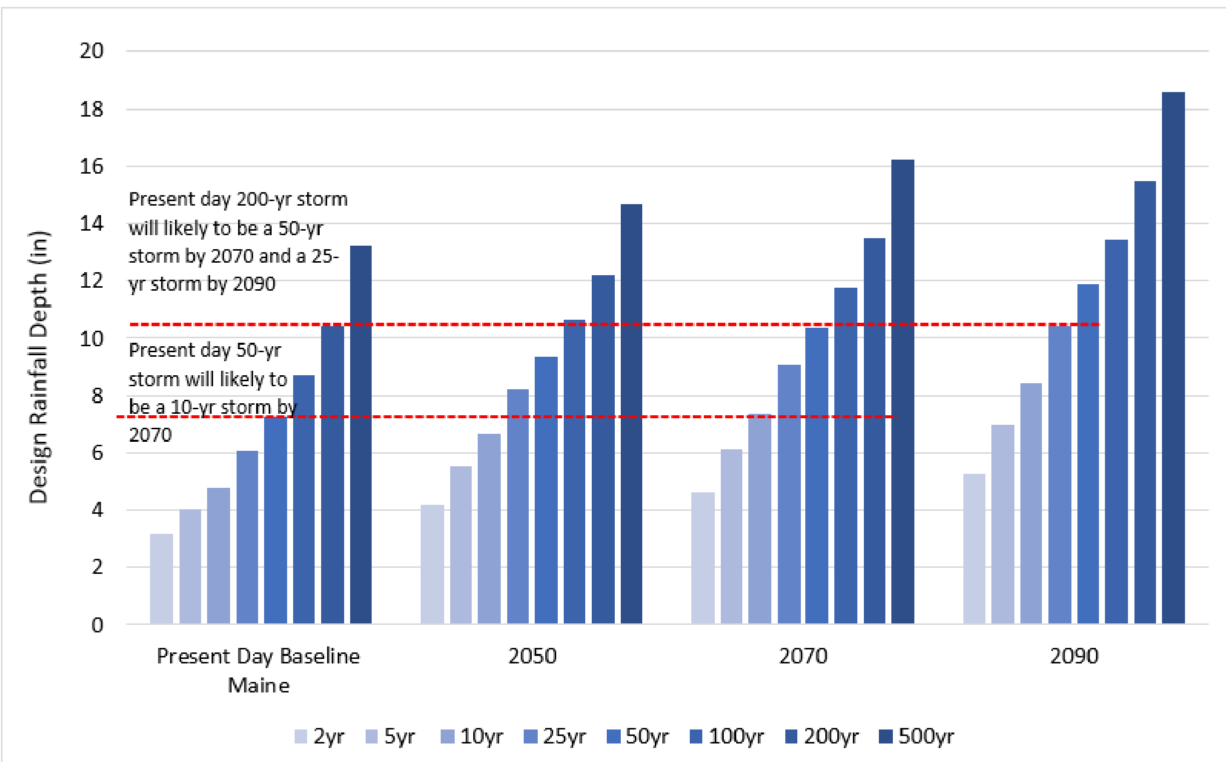
[50] Climate Change Indicators: U.S. and Global Precipitation | US EPA
[51] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine," 22.
[52] Fernandez et al. "Maine's Climate Future 2020 Update.".
[53] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine," 23.
[54] Fernandez et al. "Maine's Climate Future 2015 Update."
[55] Fernandez et al. "Maine's Climate Future 2020 Update.".
[56] Climate Change Indicators: Heavy Precipitation | US EPA
[57] Fernandez et al. "Maine's Climate Future 2020 Update."; Agel et al. 2015.
[58] Weston & Sampson, Memo on Future Climate Rainfall, York, ME, 12/15/21.
[59] Weston & Sampson, Memo on Future Climate Rainfall, York, ME, 12/15/21.

Table 2. Present and Projected 24-Hour Design Rainfall Depths in Inches (in) for York, ME Under High Emissions Scenario.

Recurrence Interval	Present Day Rainfall Depth (in)	2050 Rainfall Depth	2070 Rainfall Depth	2090 Rainfall Depth
2-yr	3.2	4.2	4.6	5.3
5-yr	4.0	5.5	6.1	7.0
10-yr	4.8	6.7	7.4	8.4
25-yr	6.1	8.2	9.1	10.4
50-yr	7.3	9.4	10.4	11.9
100-yr	8.7	10.6	11.8	13.5
200-yr	10.4	12.2	13.5	15.5
500-yr	13.2	14.7	16.2	18.6

Source: Weston & Sampson, Memo on Future Climate Rainfall, York, ME, 12/15/21.

Figure 6. Projected Stormwater Flooding Impacts Due to Changes in Future Extreme Rainfall Events.



Source: Weston & Sampson, Memo on Future Climate Rainfall, York, ME, 12/15/21.

More frequent, heavy storms can present severe flooding issues. Upon reaching the ground, much of the rain from a storm turns into runoff that travels downhill into water bodies, stormwater drains, or areas of low elevation. Increasing rain intensity means more runoff that results in flash flooding by rapidly raising water levels of streams and rivers, backing up stormwater infrastructure, and over-saturating soils. Flash flooding can damage private property and public infrastructure such as roads and bridges.[60] Flood waters also pose a contamination risk to public drinking water and private wells.[61]

Federal Emergency Management Agency (FEMA) Flood Maps

For flood insurance purposes, FEMA designates current flood hazard zones based on projected inundation from the 100-year (1% annual chance) and 500-year (0.2% annual chance) storm events. Hazard zones are mapped on FEMA's Flood Rate Insurance Maps (FIRMs), which are updated every five years. Areas within the 100-year flood zone are designated as Special Flood Hazard Areas (SFHAs) and properties with a federally backed mortgage within these areas are required to have flood insurance. The SFHA designation also guides land use regulations and provides guidance to prepare for flood hazards. FEMA's SFHAs provide the current national standard for comparison of flood risk between properties.

There are several zone designations within the SFHA, depending on the type of flood risk in that location:

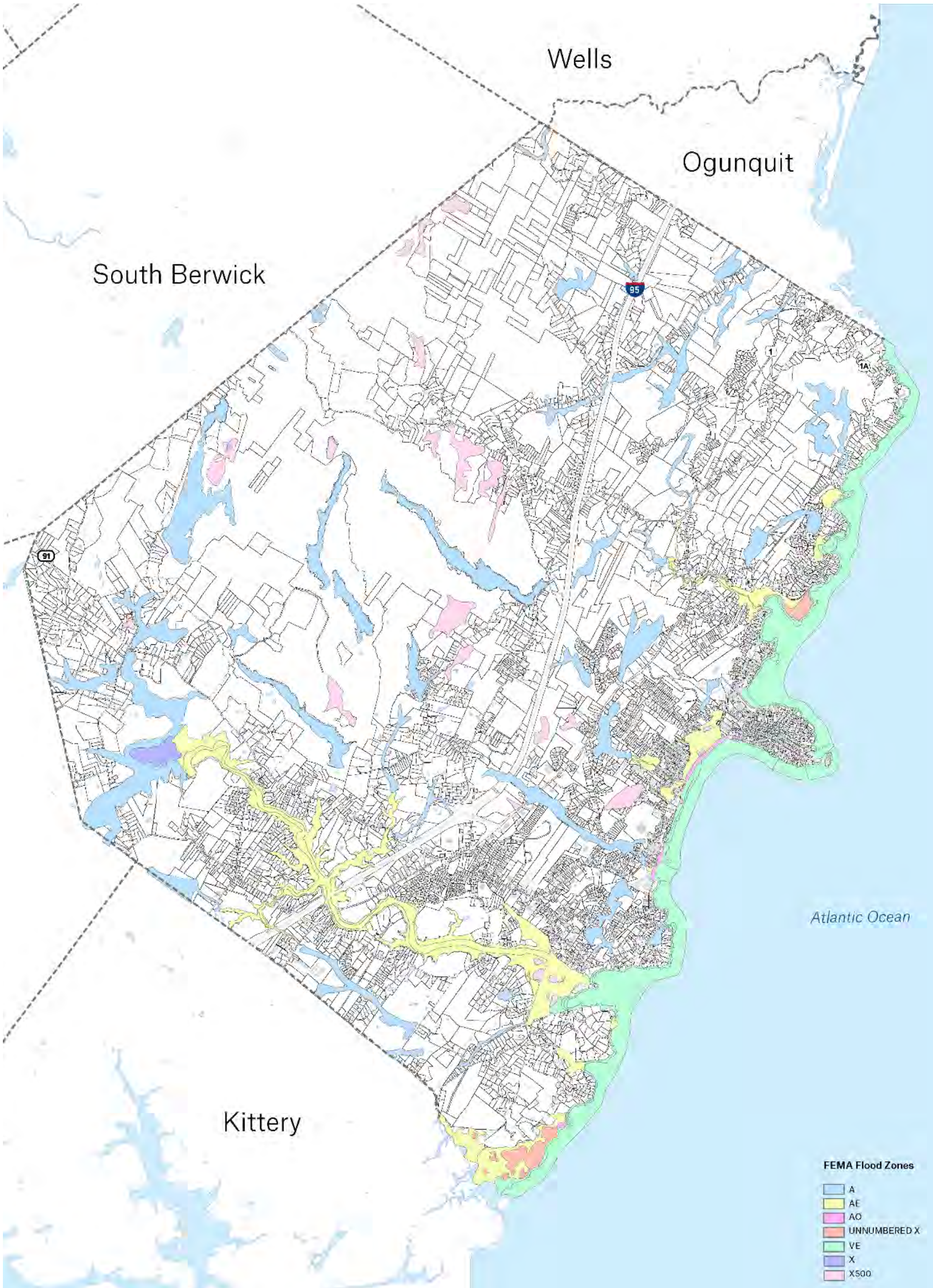
> V/VE (Velocity) Zone: Coastal high hazard area. Subject to inundation from the 100-year storm with additional hazards from storm surge.
>
> A/AE Zone: Subject to inundation from the 100-year storm. May be subject to storm surge if in a coastal area but do not meet the requirements to be designated as V/VE.
>
> AH Zone: Subject to shallow flooding in a 100-year storm, typically in the form of ponding, with average depths between 1 to 3 feet.
>
> AO Zone: Subject to shallow flooding in a 100-year storm, typically from sheet flow (runoff), with average depths between 1 to 3 feet.
>
> AR Zone: Subject to inundation from the 100-year storm, due to decertification of a previously accredited flood protection system that is determined to be in the process of being restored.
>
> A99 Zone: Subject to inundation from the 100-year storm, but will be protected upon completion of an under-construction Federal flood protection system.

Outside of the SFHA, FEMA designates on the FIRMs areas that have been deemed moderate or low flood risks up to and beyond the 500-year storm event. These zones are marked with the letters X, B, or C and properties within them are not required to have flood insurance. However, historically more than 20% of flood insurance claims have been made from flood insurance holders within these lower risk zones.[62] The map below (Fig. 7) shows the FEMA flood hazard zones that have been adopted by the Town of York.

---

60 Fernandez et al. "Maine's Climate Future 2020 Update.".
61 Fernandez et al. "Maine's Climate Future 2020 Update."; Warner and Saros 2019.
62 The_Cost_of_Climate_FSF20210219-1.pdf (firststreet.org), pg. 57

Figure 7. York FEMA Flood Hazard Zones, Adopted.



Source: Town of York GIS.

It should be noted that, while the FEMA FIRMs are the current national standard for flood risk, there are ongoing high-profile challenges to the accuracy of the maps in predicting flood risk. Several Maine municipalities in York and Cumberland Counties have jointly appealed the most recently updated FIRMs from 2018, claiming they overestimate flood risk in their communities and will unnecessarily raise insurance costs for property owners. These municipalities have hired a consulting firm to create new proposed flood maps as part of their appeal.[63] As a result of this controversy, many municipalities, including York, have not yet adopted the most recent FEMA maps, awaiting the outcome of the appeal. York and this climate vulnerability assessment continue to use the FEMA maps in effect in 2002.

First Street Foundation Flood Factor

The non-profit First Street Foundation has challenged that the FEMA maps underestimate flood risk in many communities because they are based on historical data and do not account for future environmental and climate change factors, particularly intense rainfall, as well as SLR and warming air and ocean temperatures.[64] FEMA's methodology of delineating at only the 100- and 500-year also does not show a complete picture and many of the FIRMs are out of date because of inadequate federal funding.[65] In response, First Street Foundation built its own flood model called Flood Factor[66] that accounts for elevation, rainfall, and coastal storm data to determine current and future risk. Across the US, Flood Factor estimates nearly double the number of properties at risk from flooding as FEMA.[67]

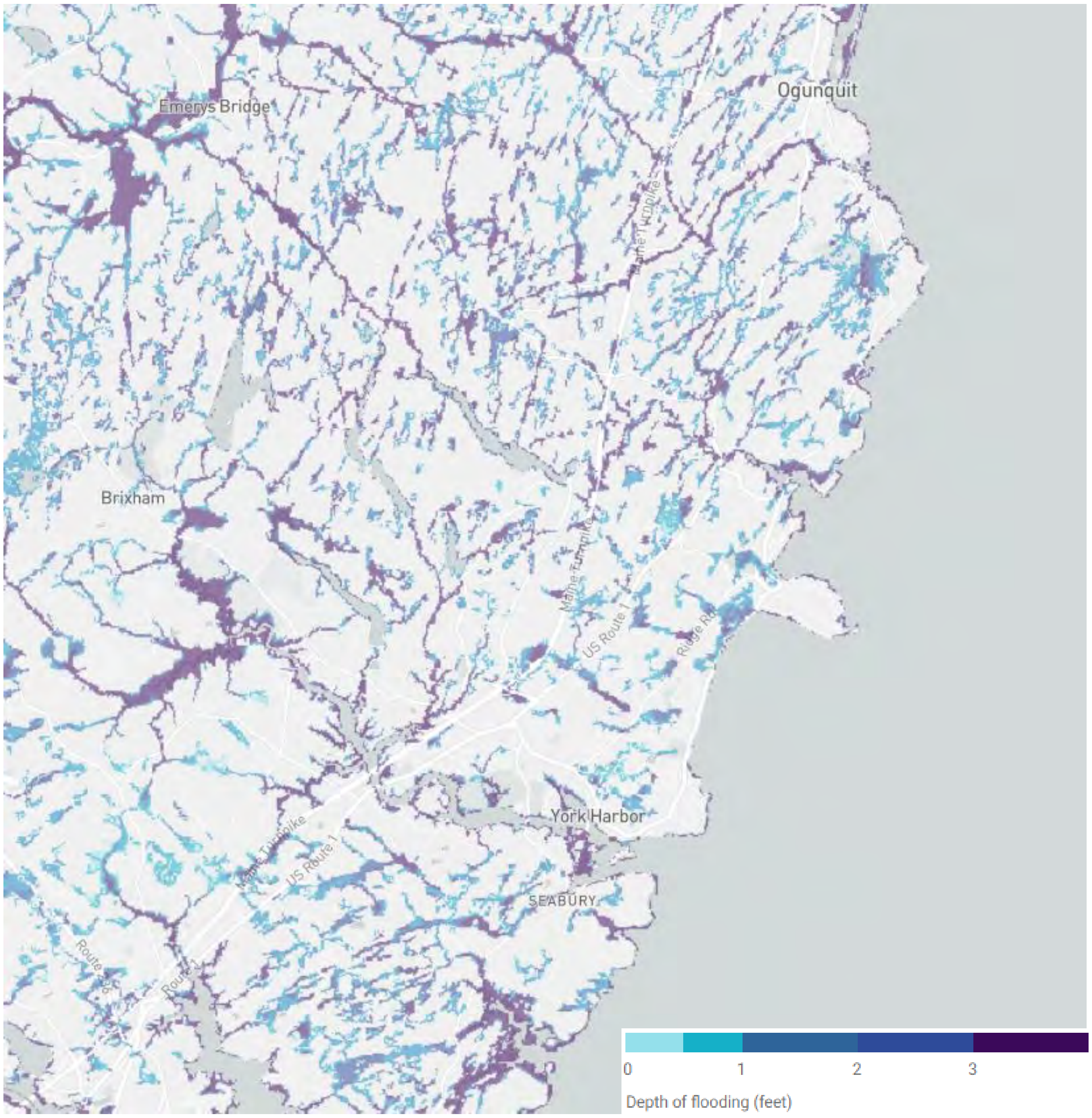
Flood Factor has some limitations of its own, including the potential to overestimate flood risk in some small municipalities because it does not capture all local flood-protection measures,[68] and is not intended to be a replacement for FEMA's maps. However, it is a peer-reviewed model[69] created through a partnership of scientists and top institutions,[70] and is a useful complementary resource to FEMA's data. The American Flood Coalition[71] advises that Flood Factor can be helpful for communities to understand potential gaps in FEMA maps and prioritize areas in need of future mapping.[72]

Flood Factor datasets were not available for download and comparison with all other Town and State Geographic Information System (GIS) data because of the Town's budget limitations for this project but the Town should consider acquisition of this data in the future to be able to do additional analysis of flooding areas and to plan accordingly. The consultant team has considered FEMA 500-year flood maps to understand an approximation of more severe flooding. In addition, the consultant team was able to visually locate specific critical assets on the First Street Floor Factor online maps to illustrate possible climate exposure that isn't captured by current FEMA maps (Figs. 8-13).

---

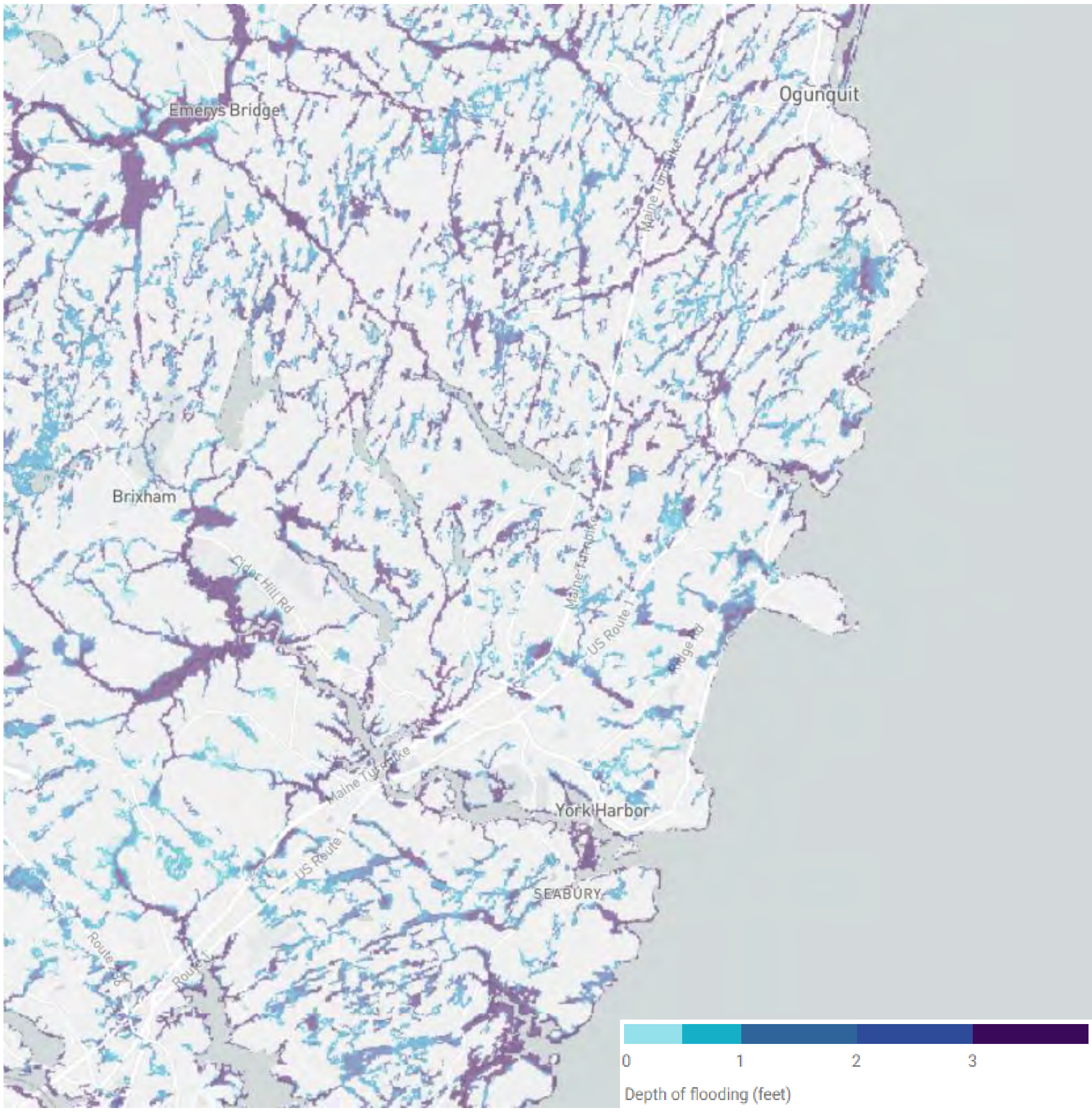
63 https://www.pressherald.com/2017/09/08/so-portland-joins-appeal-of-fema-flood-maps/.
64 https://www.nytimes.com/interactive/2020/06/29/climate/hidden-flood-risk-maps.html.
65 https://www.nytimes.com/interactive/2020/06/29/climate/hidden-flood-risk-maps.html.
66 https://firststreet.org/flood-factor/
67 https://www.nytimes.com/interactive/2020/06/29/climate/hidden-flood-risk-maps.html.
68 https://www.nytimes.com/interactive/2020/06/29/climate/hidden-flood-risk-maps.html.
69 https://help.floodfactor.com/hc/en-us/articles/1500000359741-What-is-the-First-Street-Foundation-Flood-Model-and-how-is-it-used-to-calculate-my-home-s-Flood-Factor-
70 https://firststreet.org/team/
71 https://floodcoalition.org/
72 https://floodcoalition.org/2020/06/afcs-perspective-on-first-street-foundations-flood-factor-launch/

Figure 8. Flood Factor 2021 100-Year Storm Flood Inundation Projection for York Area.



Source: First Street Foundation Flood Factor,
https://floodfactor.com/zip/03909/3909_fsid#flood_risk_explorer.

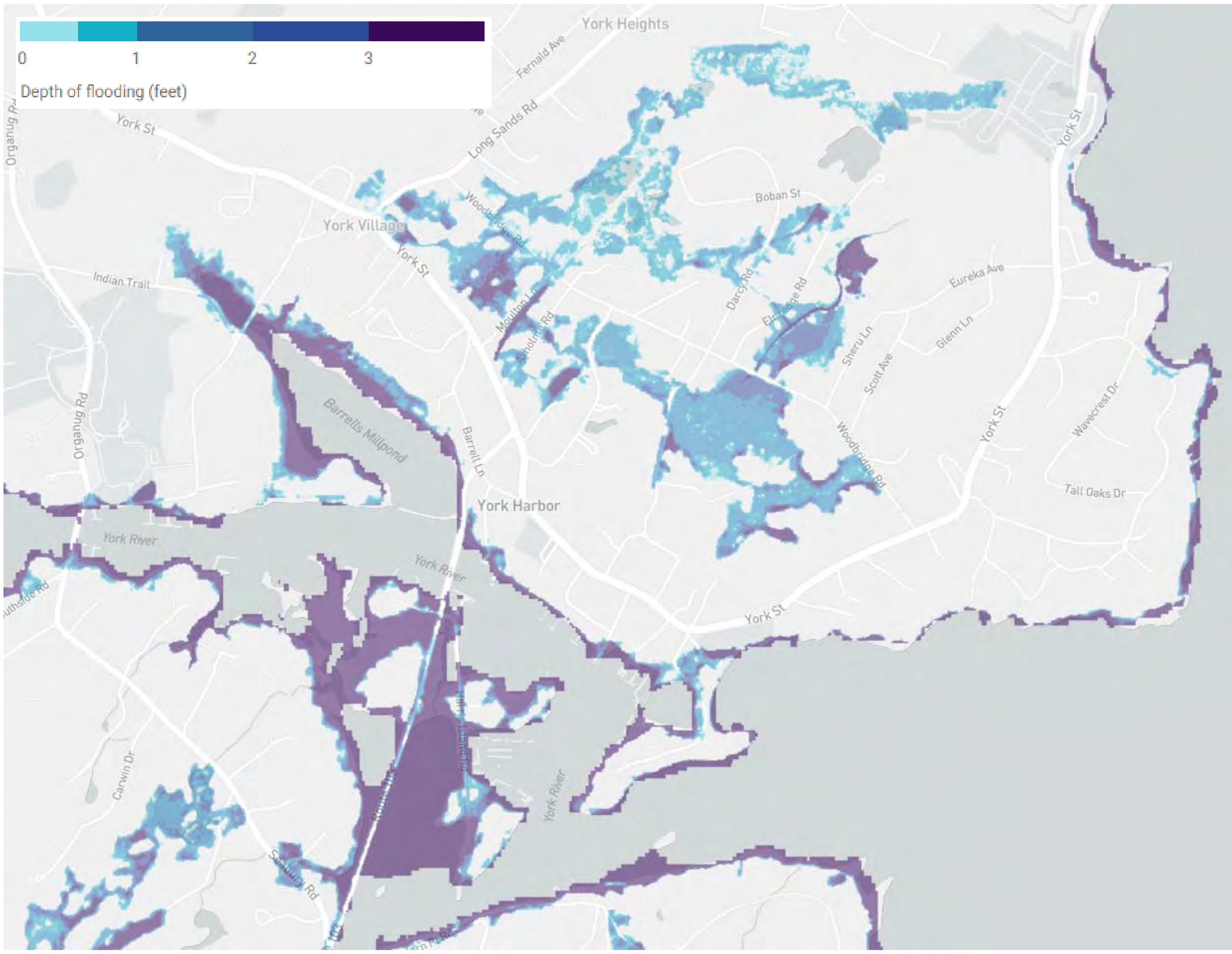
Figure 9. Flood Factor 2051 100-Year Storm Flood Inundation Projection for York Area.



Source: First Street Foundation Flood Factor,
https://floodfactor.com/zip/03909/3909_fsid#flood_risk_explorer.

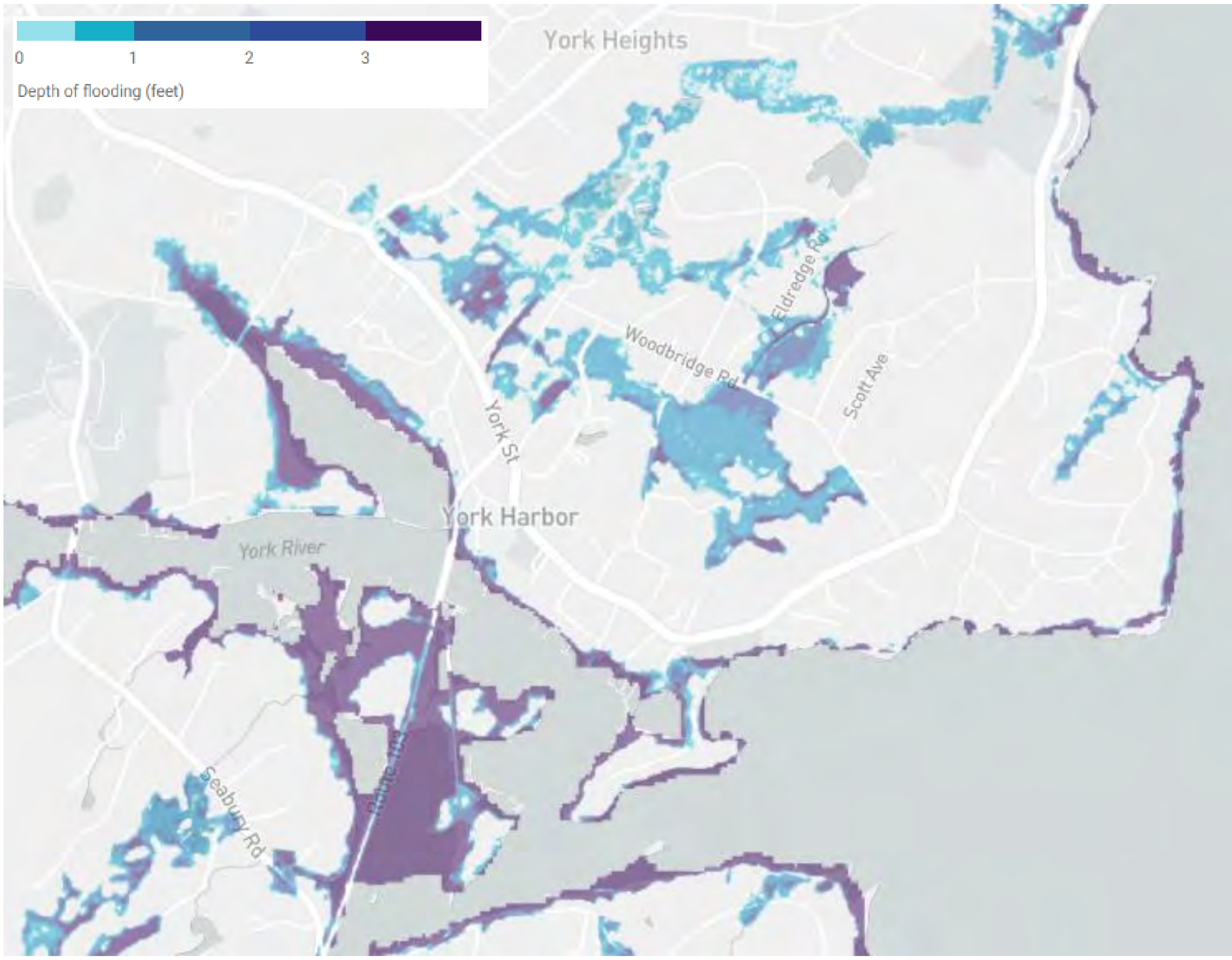
While FEMA's projections show more concentrated clusters of flood-prone areas in York, Flood Factor's projections are more diffuse and widespread throughout the town, although there is a slightly more concentrated area of 1-2 feet of flooding east of I-95.

Figure 10. York Village/Harbor 2021 100-Year Flood Map.



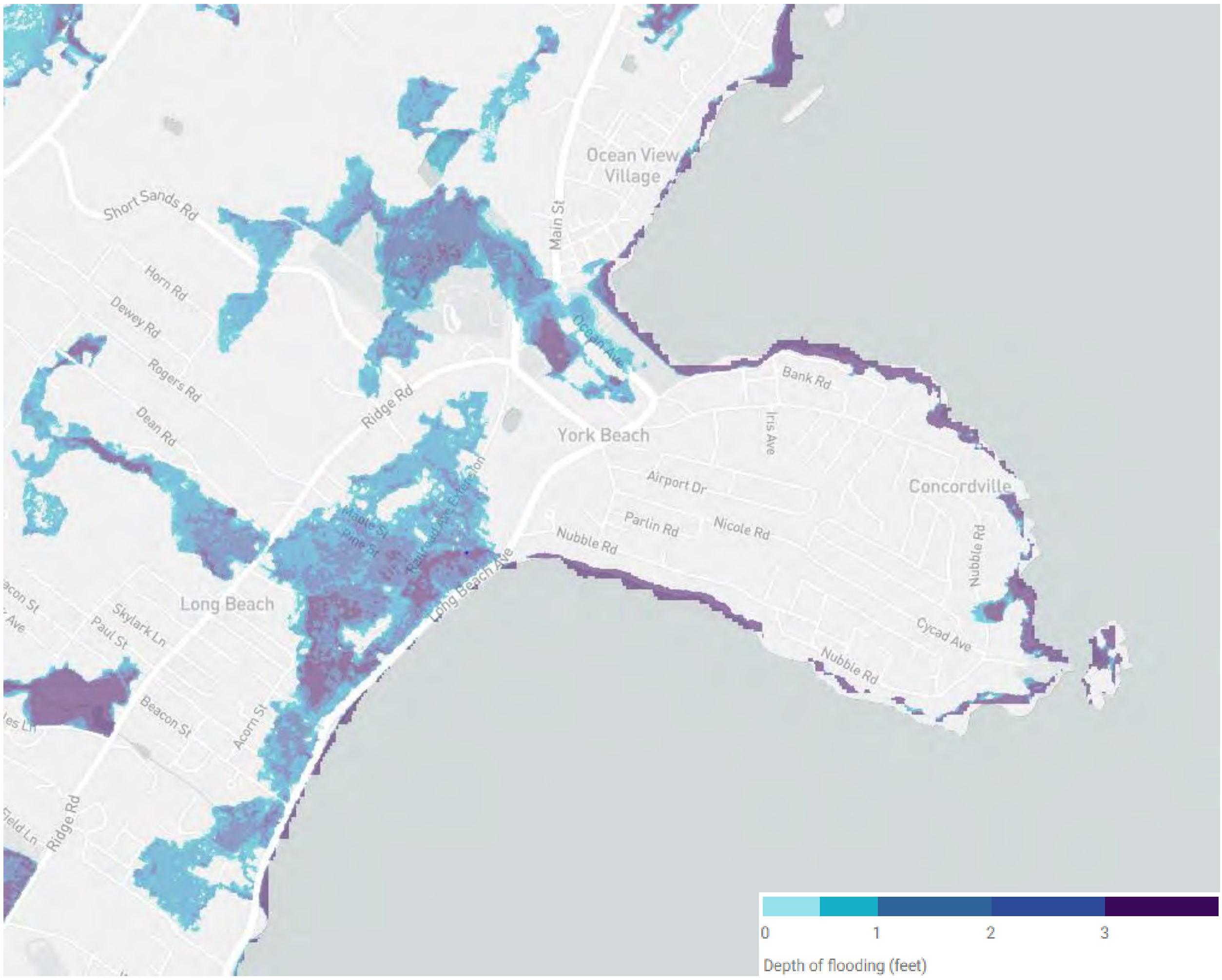
Source: First Street Foundation Flood Factor, *https://floodfactor.com/zip/03909/3909_fsid#flood_risk_explorer.*

Figure 11. York Village/Harbor 2051 100-Year Flood Map.



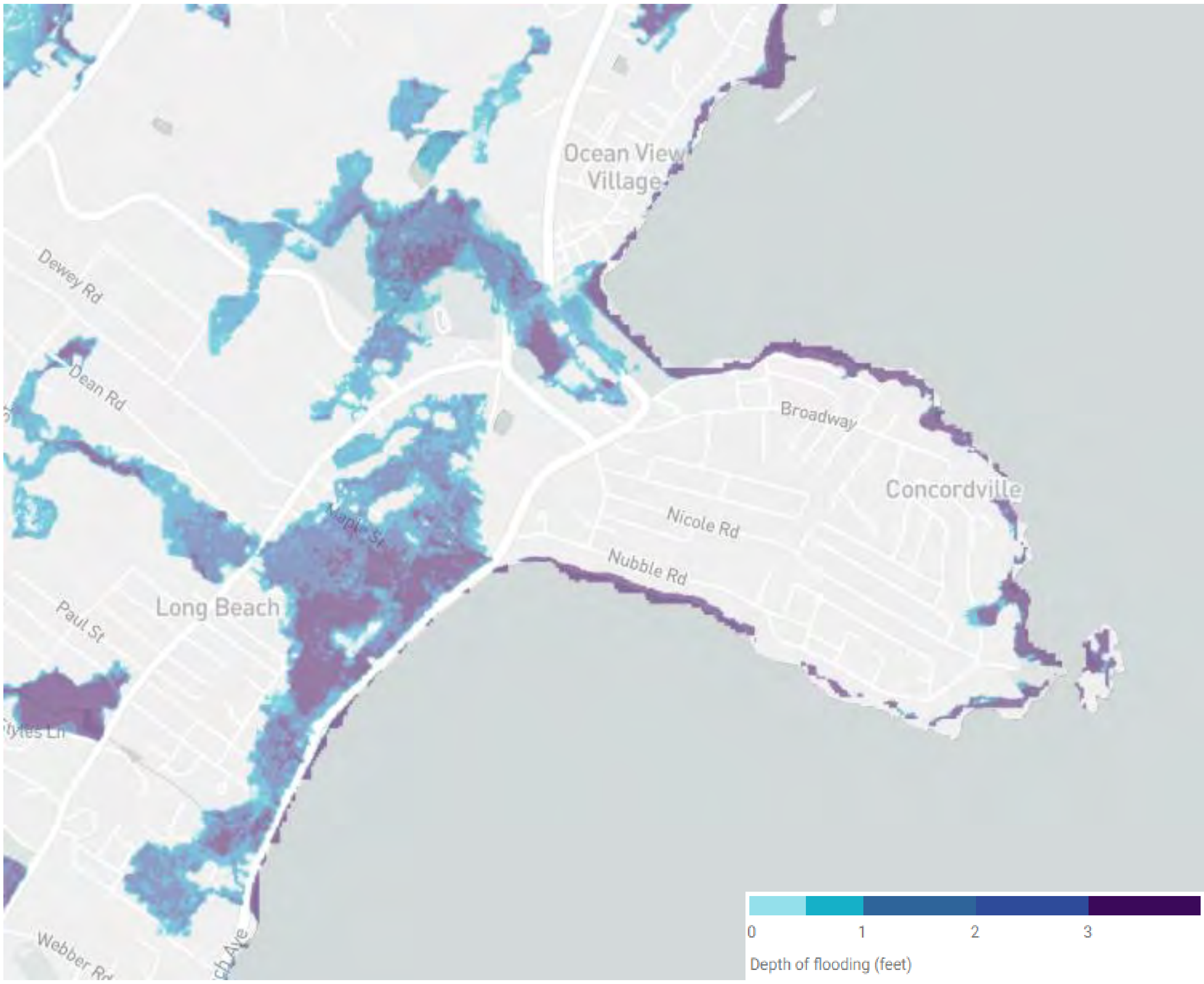
Source: First Street Foundation Flood Factor, [*https://floodfactor.com/zip/03909/3909_fsid#flood_risk_explorer*](https://floodfactor.com/zip/03909/3909_fsid#flood_risk_explorer)*.*

Figure 12. York Long and Short Sand Beaches 2021 100-Year Flood Map.



Source: First Street Foundation Flood Factor,
https://floodfactor.com/zip/03909/3909_fsid#flood_risk_explorer.

Figure 13. York Long and Short Sand Beaches 2051 100-Year Flood Map.

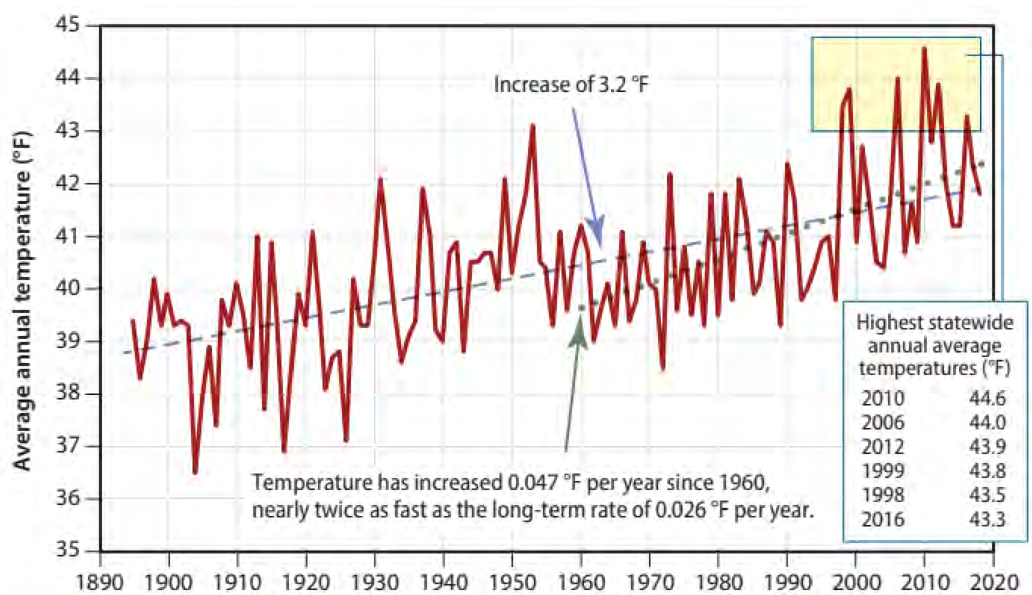


Source: First Street Foundation Flood Factor, https://floodfactor.com/zip/03909/3909_fsid#flood_risk_explorer.

Warming Air Temperature

The northeast of the United States has seen average air temperatures warming faster than anywhere in the country,[73] and Maine is no exception. Between 1895 and 2018, average annual temperature for the State of Maine increased by 3.2 °F, and the state's six warmest years recorded have all come since 1998[74] (Fig. 14). Coastal Maine, including York, warmed 3.4 °F during that time, more than the state as a whole[75] (Fig. 15).

Figure 14. Maine Average Annual Air Temperature, 1895-2018.

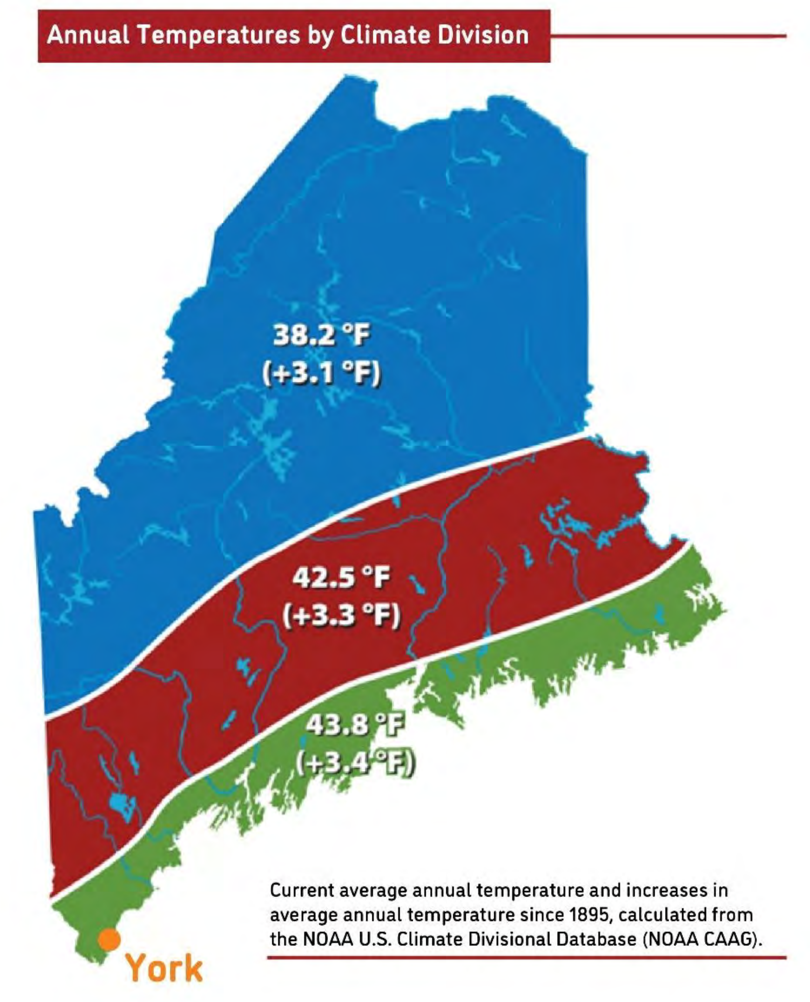


Annual temperature, 1895–2018, averaged across Maine based on monthly data from the NOAA U.S. Climate Divisional Database (NOAA CAAG). Linear trends calculated for the entire record (dashed line) and since 1960 (dotted line).

Source: Fernandez et al. Maine's Climate Future 2020 Update. Orono, ME: University of Maine. climatechange.umaine.edu/climate-matters/maines-climate-future/.

[73] Karmalkar AV, Bradley RS (2017), Consequences of Global Warming of 1.5 °C and 2 °C for Regional Temperature and Precipitation Changes in the Contiguous United States. PLoS ONE 12(1): e0168697. https://doi.org/10.1371/journal.pone.0168697.
[74] Fernandez et al. "Maine's Climate Future 2020 Update.".
[75] Fernandez et al. "Maine's Climate Future 2020 Update.".

Figure 15. Current Average Annual Temperature and Increases Since 1895.



Source: Map modified (York location dot) from source by: Fernandez et al. Maine's Climate Future 2020 Update. Orono, ME: University of Maine. climatechange.umaine.edu/climate-matters/maines-climate-future/. Calculated from the NOAA U.S. Climate Divisional Database. https://www.ncdc.noaa.gov/cag/statewide/time-series.

Between 1895 and 2018, average annual temperature for the State of Maine increased by 3.2 degrees Fahrenheit (°F), and the state's six warmest years recorded have all come since 1998.[76] Coastal Maine, including York, warmed 3.4 °F during that time, slightly more than the state as a whole.[77] Under the RCP 8.5 scenario, which presumes the world's emissions continue unabated, the northeastern US will continue to warm faster than any other region in the country;[78] by 2050, temperatures in Maine are

[76] Fernandez et al. "Maine's Climate Future 2020 Update.".
[77] Fernandez et al. "Maine's Climate Future 2020 Update.".
[78] https://doi.org/10.1371/journal.pone.0168697.

projected to have warmed by 6 °F above the historical average, and by 12 °F by 2100.[79] Without emissions reductions, the number of high heat index days per year (when it feels like 90 °F or hotter) in York are expected to increase by 20-30 days by 2050 and by 48-57 days by 2100.[80]

Heat Islands

Air temperatures are also affected by heat islands which are built-up areas that experience higher temperatures because buildings, pavement, and other hard surfaces absorb and reflect the sun's heat to a greater degree than natural areas containing a high proportion of trees and landscape.

The Trust for Public Land has developed an online model[81] using United States Geological Survey (USGS) data that shows images containing the relative heat severity for every pixel for every city and town in the contiguous United States. The Trust for Public Land used USGS Maps to develop these heat severity images:

> This 30-meter raster was derived from Landsat 8 imagery band 10 (ground-level thermal sensor) from the summers of 2019 and 2020.
>
> Federal statistics over a 30-year period show extreme heat is the leading cause of weather-related deaths in the United States. Extreme heat exacerbated by urban heat islands can lead to increased respiratory difficulties, heat exhaustion, and heat stroke. These heat impacts significantly affect the most vulnerable—children, older adults, and those with preexisting conditions.
>
> The purpose of this layer is to show where certain areas of cities are hotter than the average temperature for that same city as a whole. Severity is measured on a scale of 1 to 5, with 1 being a relatively mild heat area (slightly above the mean for the city), and 5 being a severe heat area (significantly above the mean for the city). The absolute heat above mean values are classified into these 5 classes using the Jenks Natural Breaks classification method, which seeks to reduce the variance within classes and maximize the variance between classes. Knowing where areas of high heat are located can help a city government plan for mitigation strategies."
>
> This dataset represents a snapshot in time...it is static between updates. It does not take into account changes in heat during a single day, for example, from building shadows moving. The thermal readings detected by the Landsat 8 sensor are surface-level, whether that surface is the ground or the top of a building. Although there is strong correlation between surface temperature and air temperature, they are not the same. We believe that this is useful at the national level, and for cities that don't have the ability to conduct their own hyper local temperature survey. Where local data is available, it may be more accurate than this dataset.[82]

---

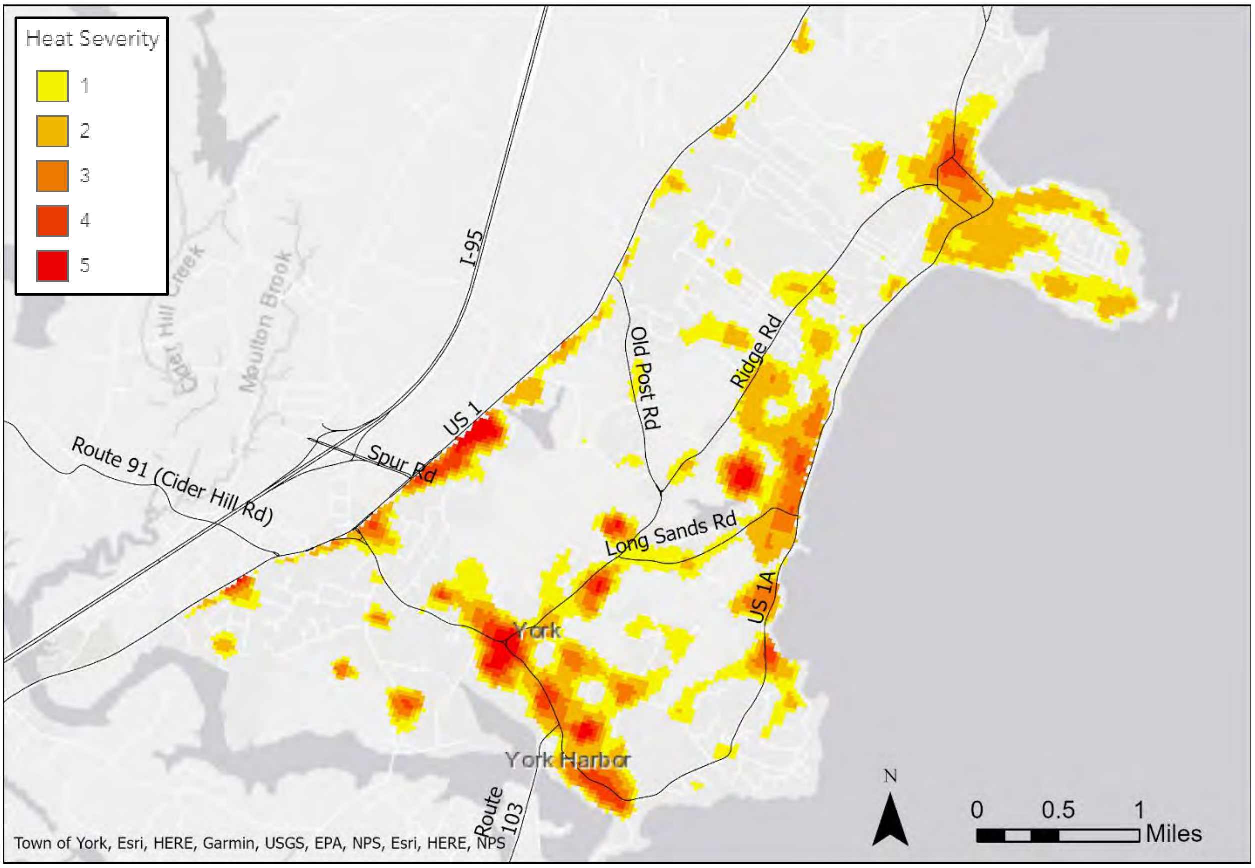
79 Fernandez et al. "Maine's Climate Future 2020 Update.".

80 Fernandez et al. "Maine's Climate Future 2020 Update.", 25.

81 https://www.google.com/url?q=https://www.arcgis.com/home/item.html?id%3D12171bbd2cee4d89bdba3598ae5cb18d&sa=D&source=docs&ust=1635326243667000&usg=AOvVaw3XzWZPFuHMrYXA9JKPVvjl

82 https://www.arcgis.com/home/item.html?id=12171bbd2cee4d89bdba3598ae5cb18d

Figure 16. York Heat Islands.



Key: Severity is measured on a scale of 1 to 5, with 1 being a relatively mild heat area (slightly above the mean for the town), and 5 being a severe heat area (significantly above the mean for the town).

Source: Trust for Public Land.

The map illustrates the relative heat severity for every pixel of York, Maine that has a heat island. The map shows heat islands in the more densely populated and developed areas along the coast between York Harbor and the Cape Neddick River, with additional areas along the Route 1 corridor. These areas contain more roads and parking lots, larger buildings, and more densely located development than other parts of town.

Winter Warming

Winter is the fastest warming season in Maine, with average winter temperatures in the state rising 5.1 °F since 1895. Warming winter temperatures are changing how York residents experience the winter season. Long-term trends over the last century show that average annual snowfall in Maine has declined about 17%[83] and average annual days with snow cover has declined by nearly 20 days in the northeastern US,[84] diminishing the opportunities to participate in winter activities such as skiing,

[83] Fernandez et al. "Maine's Climate Future 2020 Update.".

[84] Contosta, A. R. et al. Northern forest winters have lost cold, snowy conditions that are important for ecosystems and human communities. Ecological Applications 29(7):e01974. 10.1002/eap.1974.

snowshoeing, and snowmobiling, as well as putting the state's winter tourism economy at risk.[85] At the same time, winter weather has become more erratic in the 21st century, producing two winters with the lowest statewide snowfall on record (2004 and 2010) as well as two with very high snowfall (2008 and 2019).[86] Maine has also experienced more extreme short-term swings between thawing and freezing conditions, which hinder winter recreation, can cause ice dams and other property damage, and lead crops and flowers to bloom early only to die when freezing conditions return.[87] Other characteristics of this climate-induced "winter whiplash" include atypical winter storms in the fall and spring when leaves are on trees and towns are not yet winter-ready to plow, [88] more frequent winter rain, and major snowstorms during otherwise mild winters.[89]

Changing Ocean Conditions

Warming Ocean Temperatures

Ocean temperatures off the coast of York are rising dramatically because of climate change. Coastal Maine ocean temperatures respond dynamically to heating and cooling of the air temperature, as well as temperatures in the Gulf of Maine,[90] a gulf of the Atlantic Ocean extending from Cape Cod to the southern tip of Nova Scotia. Since 1982 the Gulf of Maine has been warming faster than 96% of the world's oceans,[91] and has experienced its warmest recorded period during the last decade.[92] In addition to changing ocean currents, the current period of warming has been attributed to increasing heat flux, or the passing of heat from the air to the ocean.[93] This has been especially prominent in two major marine heatwaves this decade, in 2012 and 2016, when temperatures in the Gulf of Maine spiked more than 3 °F above the baseline (1976-2005).[94] Under a business-as-usual emissions scenario, experts project that temperatures in the Gulf of Maine will continue to warm to 4.3 °F above the baseline by 2050, at which point the water off the coast of York will feel like Rhode Island waters do today, and to more than 5.4 °F above the baseline by 2100.[95]

Ocean Acidification

Maine's marine environment is also at risk from ocean and coastal acidification. Like warming temperatures, ocean acidification in the Gulf of Maine is driven largely by carbon dioxide (CO2) emissions. Because the ocean functions as a very effective carbon sink, greater CO2 emissions lead to

---

[85] http://climatecouncil.maine.gov/maines-climate.
[86] Fernandez et al. "Maine's Climate Future 2020 Update.".
[87] Casson, N. J. et al. (2019). Winter weather whiplash: Impacts of meteorological events misaligned with natural and human Systems in Seasonally Snow-Covered Regions. Earth's Future, 7, 1434– 1450. https://doi.org/10.1029/2019EF001224.
[88] https://doi.org/10.1029/2019EF001224.
[89] Fernandez et al. "Maine's Climate Future 2020 Update.".
[90] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine."
[91] https://www.gmri.org/stories/gulf-of-maine-warming-update-summer-2021/
[92] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine."
[93] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine."
[94] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine."
[95] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine."

higher rates of CO_2 absorption by the Gulf of Maine, which makes it more acidic.[96] The Gulf of Maine is particularly vulnerable to acidification, more so than the rest of the east coast, because it is already relatively acidic due to natural causes (CO_2 dissolves more easily in colder water) and human causes (it is downwind of coal fired power plants that deposit acidic compounds).[97] Coastal acidification of the waters near Maine's shoreline is accelerating even more rapidly by human activities, such as the use of lawn fertilizer, that increase the runoff of nutrients like nitrogen and phosphorus into streams and rivers that eventually reach the ocean. Excess nutrients stimulate algal blooms that consume oxygen and create CO_2, causing acidification and endangering marine species.[98] Further, some algal blooms produce toxins that can be harmful, and sometimes lethal, to humans if they are exposed to contaminated water, fish, or air.[99]

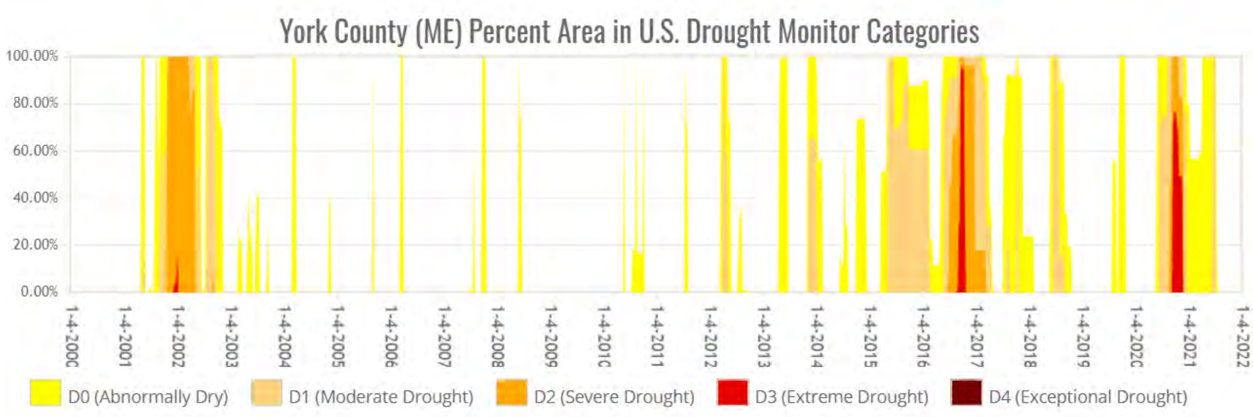
Drought

Droughts are often classified by three types, based on the cause: meteorological (reduced precipitation), agricultural (reduced soil moisture), and hydrologic (reduced runoff, streamflow, and groundwater levels).[100] While there has not yet been an observed increase in the occurrence of drought in Maine, a warming climate can make droughts more frequent or severe, and based on projections, the State's at Risk report card for Maine indicates by 2050 the threat of widespread summer drought in Maine could increase by 70%.[101] Drought periods may become more frequent even while annual precipitation increases if rainfalls are heavier and more concentrated during certain times of year, with dry spells in between.

Increased evaporation rates caused by higher temperatures, especially in the summer, contribute to drier surface soil;[102] drought is considered widespread when at least 30% of the state's soil is drier than usual.[103] Warmer winter temperatures and reduced snowpack mean less runoff from snowmelt in the spring, and potentially earlier spring runoff that water and agricultural infrastructures are not prepared to store.[104] Higher-than-average temperatures in 2016 contributed to the occurrence and severity of a widespread drought in southern Maine that summer.[105] Fig. 17 shows that drought has been more pervasive in York County in the most recent decade than the decade preceding, including two periods in the past five years during which most of the County was in an extreme drought (the aforementioned 2016 drought and another in 2020).

96 MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine."
97 MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine."
98 MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine."
99 https://www.niehs.nih.gov/health/topics/agents/algal-blooms/index.cfm.
100 MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine," 26.
101 https://statesatrisk.org/maine/drought.
102 MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine," 27.
103 https://statesatrisk.org/maine/drought.
104 MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine," 27.
105 MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine."

Figure 17. Percent Area of York County in Drought by Drought Level, 2000-2021.



Source: U.S. Drought Monitor, https://droughtmonitor.unl.edu/DmData/TimeSeries.aspx

Fig. 18 below lists historically observed impacts of drought in York County at different drought levels.

Figure 18. Historically Observed Drought Impacts in York County by Drought Level.

Category	Historically observed impacts
D0	Crop growth is stunted; planting is delayed
	Fire danger is elevated; spring fire season starts early
	Lawns brown early; gardens begin to wilt
	Surface water levels decline
D1	Irrigation use increases; hay and grain yields are lower than normal
	Honey production declines
	Wildfires and ground fires increase
	Trees and landscaping are stressed; fish are stressed
	Voluntary water conservation is requested; reservoir and lake levels are below normal capacity
D2	Specialty crops are impacted in both yield and fruit size
	Producers begin feeding cattle; hay prices are high
	Warnings are issued on outdoor burns; air quality is poor
	Golf courses conserve water
	Trees are brittle and susceptible to insects
	Fish kills occur; wildlife move to farms for food
	Water quality is poor; groundwater is declining; irrigation ponds are dry; outdoor water restrictions are implemented
D3	Crop loss is widespread; Christmas tree farms are stressed; dairy farmers are struggling financially
	Well drillers and bulk water haulers see increased business
	Water recreation and hunting are modified; wildlife disease outbreak is observed
	Extremely reduced flow to ceased flow of water is observed; river temperatures are warm; wells are running dry; people are digging more and deeper wells

Source: U.S. Drought Monitor, https://droughtmonitor.unl.edu/DmData/StateImpacts.aspx.

Wildfire Risk

Wildfires have historically been infrequent in Maine compared to other regions of the United States because the state's forests are typically too moist to burn easily.[106] However, projected increases in temperature and drought, two major causes of wildfire, suggest that there will be some growing risk, though to what degree is currently uncertain. While wildfire may not be among the highest direct climate change threats to York residents, there are important reasons for the Town to properly prepare for wildfire risks. First, because of low historical risk, the firefighting infrastructure and resources in most Maine communities are not designed to quickly respond to large or intense fires.[107] Further, much of York's housing stock, particularly west of I-95, is located close to forests, meaning many residents and their homes would be vulnerable in the event of an uncontrolled fire. These forests are often dense with both living and dead vegetation, which can support high-severity wildfire under dry conditions.[108]

There are also indirect impacts of wildfire to consider in planning and preparation for risks. Forests store large amounts of carbon and the burning of these forests by wildfire both generates significant GHG emissions and destroys an important resource for carbon sequestration. Additionally, the air quality impacts from wildfire smoke likely present the greatest wildfire risk to York residents. Fires are a major source of particulate matter (PM) that can cause severe respiratory disease and other health impacts.[109] (More information about particulate matter and other air pollutants can be found in the Health Vulnerability: Air Pollution section.) This is not just a concern from local wildfires, as wildfire smoke from the western US and Canada can travel hundreds of miles[110] on the prevailing winds, carrying smoke and particulate matter to Maine. These western wildfires that have been growing in intensity and frequency.[111] Across the United States in 2011, wildfires contributed 40% of emitted PM2.5,[112] very small particulate matter that is particularly dangerous to humans.[113]

Climate Vulnerability Assessment

This climate adaptation assesses York's vulnerability to climate change in the following areas:

- Infrastructure and Built Environment Vulnerability
- Natural Environment and Ecosystem Services Vulnerability
- Economic Vulnerability
- Health Vulnerability
- Social Vulnerability

It concludes with a relative ranking of vulnerability and overall risk for York's critical assets.

---

[106] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine," 237.
[107] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine," 237.
[108] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine," 237; McCaskill et al. 2016.
[109] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine," 312; Nolte et al., 2018.
[110] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine," 238; UsGCR 2018a
[111] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine," 312.
[112] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine," 312; Nolte et al., 2018.
[113] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine," 312; Brown et al, 2013.

Infrastructure & Built Environment Vulnerability

Buildings, transportation, energy, communications, stormwater infrastructure, water supply and sewer/waste management facilities are all part of the built environment in York. Most of these elements were not designed to withstand impacts from a changing climate and some recently rebuilt/built infrastructure such as the causeway at the Wiggly Bridge are already seeing impacts from SLR that are happening much sooner than expected.

> "It is important to recognize that SLR will have fiscal impacts on the expenditure side of the ledger, not just on the revenue side. According to the "Municipal Climate Adaptation Guidance Series," a series of guidance documents from the Municipal Planning Assistance Program and nine of Maine's Regional Planning Organizations (with funding from the Maine Coastal Program), infrastructure such as culverts, roads, bridges and stormwater-related infrastructure that was built to withstand historical conditions may need upgrades or replacement under future SLR conditions (Municipal Planning Assistance Program and others, 2017). Likewise, emergency management resources may not be adequate to a changing climate (see the extensive list of infrastructure and assets at risk in GEI Consultants' Vulnerability Assessment) (Pike & Gray, 2020)."[114]

This plan's assessment of critical infrastructure and impacts from climate change considered the following types of questions:

- Is the location of critical infrastructures subject to damage or disruption from flooding and heavy rainfall? Is there redundancy in the system/infrastructure?
- Are there populations that are at risk (cut off from services, health effects, connectivity, housing damage, etc.)?
- What will be the extent of projected changes in flooding and SLR and how will it affect development areas and future planning?
- Will increased flooding change land use patterns and put existing development at risk? Affect the economic health of the Town?

Specific criteria for each type of asset are provided in the vulnerability assessments below.

Critical Infrastructures Inventory

An inventory of critical infrastructure was developed to assess the potential impact to these assets from climate change-driven flooding. The inventory was developed in collaboration with the Town of York and reflects input from the Town Manager, Planning Director, Town GIS Manager, and other staff members.

The infrastructures in the inventory can be classified into two general categories: systems infrastructures (Table 3) and community infrastructures (Table 4). Systems are infrastructural networks, such as a network of roads, where an impact to one part of the network can have cascading implications on the functionality of the rest of the network. For the most part, systems infrastructures in York are

---

[114] rbouvier Consulting, "Economic Analysis of SLR: Kennebunk, Wells, and York," https://smpdc.org/vertical/Sites/%7B14E8B741-214C-42E2-BE74-5AA9EE0A3EFD%7D/uploads/Socio-Economic_Analysis_Final_Report_by_rbouvier_consulting.pdf.

part of larger systems that extend beyond York, and so can be affected by things happening outside the boundaries and control of the town. Community infrastructures are individual locations within York that provide a specific purpose important to the wellbeing of people who live and work in York. Community infrastructures are not as intrinsically linked to impacts outside of York's boundaries as systems infrastructure.

Table 3. York's Systems Infrastructures.

System	Key Sites/Assets in York	Site Address
Transportation	Major roads	Multiple
	Major bridges and culverts	Multiple
	Harbor Infrastructure	Harris Island Rd.
Drinking Water	York Water Treatment Plant	273 Chases Pond Rd.
	Kittery Water Treatment Plant	28 New Boston Rd.
	Chases Pond Screen House	270 Chases Pond Rd.
	Simpson Hill Water Storage Tank	99 Cape Neddick Rd.
	York Heights Water Storage Tank	5 Roots Rock Rd.
	Pump stations	Multiple
Wastewater	York Wastewater Treatment Facility	21 Bay Haven Rd.
	Pump stations	Multiple
	Manholes	Multiple
Stormwater	Outfalls	Multiple
Dams	Dams	Multiple
Energy	Brickyard electrical substation	28 Brickyard Ct.
	Woodbridge electrical substation	60 Woodbridge Rd.
	York Beach electrical substation	412 Ridge Rd.
Information and Communications Technology	Cell Towers	Multiple
	Emergency Communications Tower	36 Main St.
Coastal Resilience	Seawalls and rip-rap	Multiple

Public wastewater and water facilities and infrastructure information was provided by the York Sewer District (YSD) and York Water District (YWD), respectively. Information on roadway risk and evacuation routes was provided by Maine Department of Transportation (MaineDOT) and maps of seawall and riprap along York's coast were provided by the MGS.

Table 4. York's Community Infrastructures.

Community Benefit	Name	Address
Management	York Public Works Department	115 Chases Pond Rd.
	Superintendent's Office	469 US Route One
	York Town Hall	186 York St.
	York Water District Office	86 Woodbridge Rd.
	York Sewer District Office	21 Bay Haven Rd.
	York Parks and Recreation Office	200 US Route 1
	Harbormaster's Office	9 Harris Island Rd.
Public Health	Long Sands Bath House	171-175 Long Beach Ave
	York Ambulance Association	16 Salisbury Ave.
	York Beach Fire Department	18 Railroad Ave.
	York Police Department	9 Hannaford Dr.
	York Village Fire Station	1 Firehouse Dr.
	York Hospital	15 Hospital Dr.
	York Hospital Urgent Care	343 US Route One
Social Resource	Carriage House Apartments	14 Gorgeana Way
	Moorehouse Place (In Development)	296 US Route One
	Village Woods	117 Long Sands Rd.
	Yorkshire Commons	161 York St.
	Center for Active Living	36 Main St.
	Sentry Hill Senior Living Center	1&2 Victoria Ct., 1 Cameo Ct.
	York Community Service Association	855 US Route One
	Coastal Ridge Elementary School	1 Coastal Ridge Rd.
	Village Elementary School	124 York St.
	York High School	1 Robert Stevens Dr.
	York Middle School	30 Organug Rd.
Solid Waste	York Recycling and Compost Facility	65 Witchtrot Rd.
Food Security	Hannaford	5 Hannaford Dr.
	Island Spice Corner	647 US Route 1
	Seacoast Brothers Butcher Shop	459 US Route 1
	Anthony's	679 US Route 1
	Long Sands General Store	121 Long Beach Ave.
	The Oceanside Store	179 Long Beach Ave.
	The York Beach Bucket	9 Ocean Ave.
	Dollar Tree	647 US Route 1
	Walgreens	400 US Route 1
	Mr. Mike's	519 US Route 1
	Cumberland Farms	230 York St.
	Circle K	454 US Route 1

Critical Infrastructure Mapping

In parallel with the creation of the inventory, the consultant worked with the collaborating parties to compile GIS data for this infrastructure to conduct spatial analysis of flood vulnerability in ArcGIS Pro. GIS data to create layers for this infrastructure were collected from the Town of York (buildings and structures, culverts and drainage, stormwater outfalls), the Maine Department of Environmental Protection (DEP) (buildings and structures), the MaineDOT (major roads and bridges), and MGS (coastal flood resilience assets).

In ArcGIS Pro, these infrastructure layers were then overlaid with the Town of York's adopted flood hazard zone layers (data provided by the Town of York, originally from FEMA) and SLR/storm surge projection layers (data from the MGS) to illustrate current and future flooding vulnerability.

In addition, layers with affordable/senior housing, schools, community/senior services, and health services were overlaid on heat intensity maps (data from The Trust for Public Land/USGS) and this information can be found in the Social/Health Assessment below.

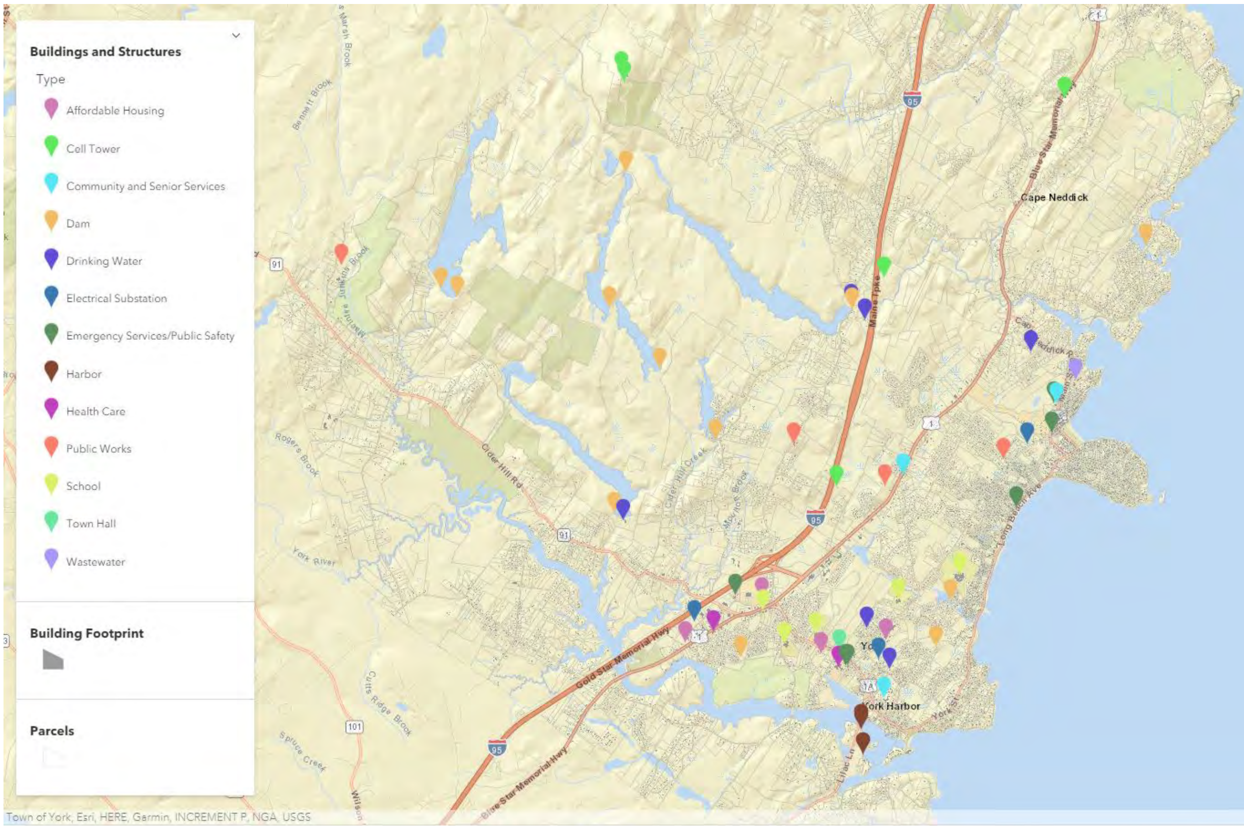
Flood Vulnerability StoryMap

To make flood vulnerability information more accessible and understandable for the public, an ArcGIS StoryMap[115]was created and published on the project website.

ArcGIS Pro layers were exported to a web map in ArcGIS Online. Using the web map data, four maps were displayed in an ArcGIS StoryMap showing flood vulnerability for critical buildings and structures (Fig. 19), culverts and drainage infrastructure, stormwater outfalls, major roads and bridges, and coastal flood resilience assets. For each of the critical infrastructure maps, the user can click buttons to toggle between displaying overlays of the FEMA flood hazard zones and SLR/storm surge projections for 1.5 feet, 4 feet, 6 feet, and 9 feet.

[115] https://arcg.is/4CWna.

Figure 19. Map of Critical Buildings and Structures from Flood Vulnerability StoryMap.



Sources: GIS data from Town of York GIS, York Town Manager's Office, York Department of Planning, Maine DEP.

Transportation Infrastructure

Roads and Bridges

York's critical transportation infrastructure consists of its roads and bridges. As driving is the primary mode of transportation, impacts to these infrastructure assets have public health, safety, and economic implications. Roads inundated or damaged by flooding may be inaccessible, preventing some residents from having access to emergency services and necessary health care. Closed roads are also likely to impact workforce commuting and delivery of goods and services.

All roads that are not designated as "local roads" in the federal functional classification[116] were considered major roads in this vulnerability analysis. The major roads in York are:

- Interstate 95 (I-95)
- Route 1
- Spur Rd

[116] A federal designation based on the designed use of a road.

- Route 1A (York St, Long Beach Ave, Ocean Ave, Railroad Ave, Church St, Main St, Cape Neddick Rd
- Route 91/Cider Hill Rd
- Route 103 (Lilac Ln, Brave Boat Harbor Rd)
- Shore Rd
- Long Sands Rd
- Ridge Rd
- Old Post Rd
- Beech Ridge Rd

Of those major roads, I-95, Route 1, Route 91, Route 103, Shore Rd, and Beech Ridge Rd have bridges in York. I-95, Route 1, Route 1A, Route 91, and Route 103 in York have been designated as evacuation routes by SMPDC.[117]

SLR/Storm Surge

MaineDOT is in the midst of developing a state-wide vulnerability assessment of transportation assets. The agency provided preliminary findings for York, which were used to analyze potential impacts to major roadway connections under MGS' four SLR and storm surge scenarios (Table 5 and Figs. 20-23). Also using the MGS scenarios, SMPDC compiled a list of all roads in York, including local roads, on which some portion is projected to be impacted by 1.6, 3.9, or 6.1 feet of SLR and storm surge (Fig. 24).

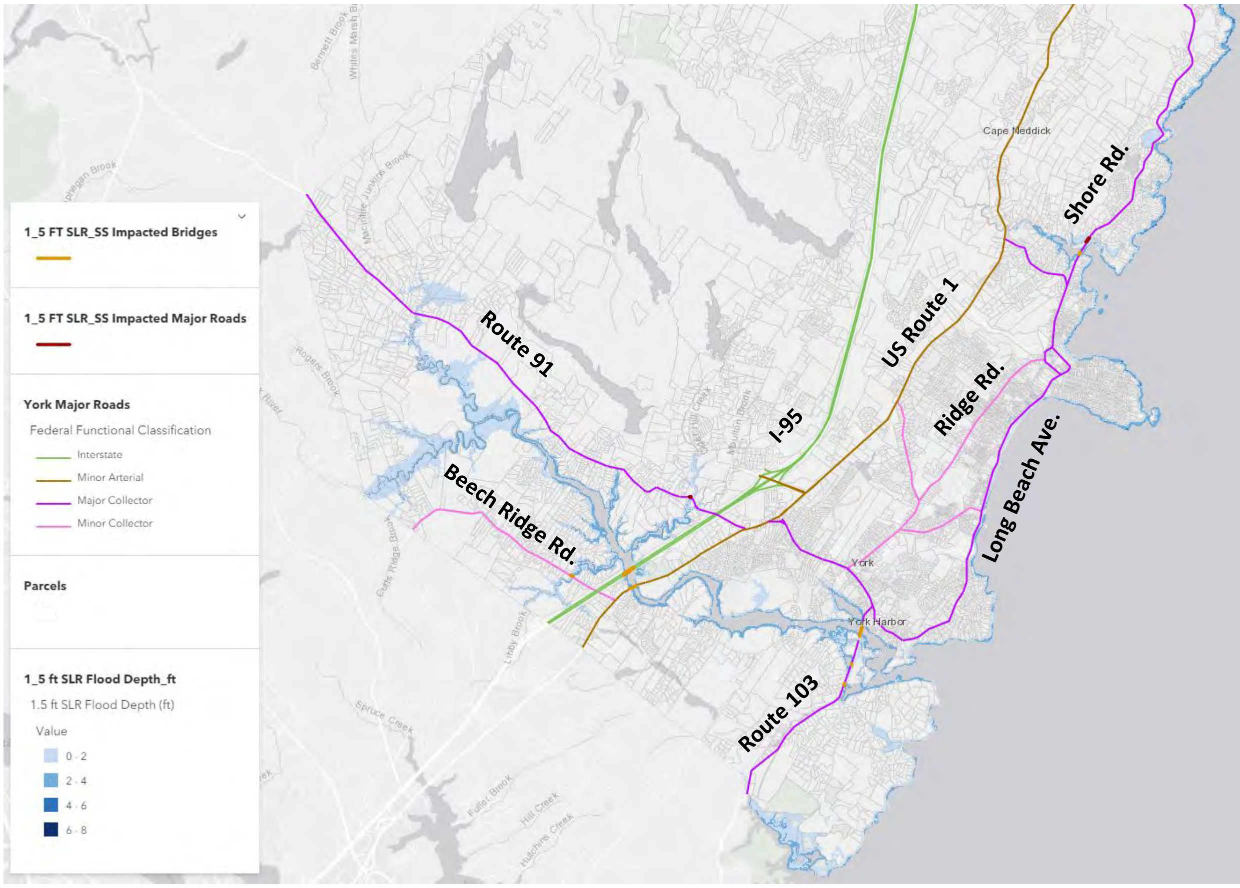
---

[117] https://smpdc.org/vertical/Sites/%7B14E8B741-214C-42E2-BE74-5AA9EE0A3EFD%7D/uploads/EvacSignsSheltersMap(1).jpg

Table 5. York Roads Potentially Impacted by SLR and Storm Surge Scenarios.

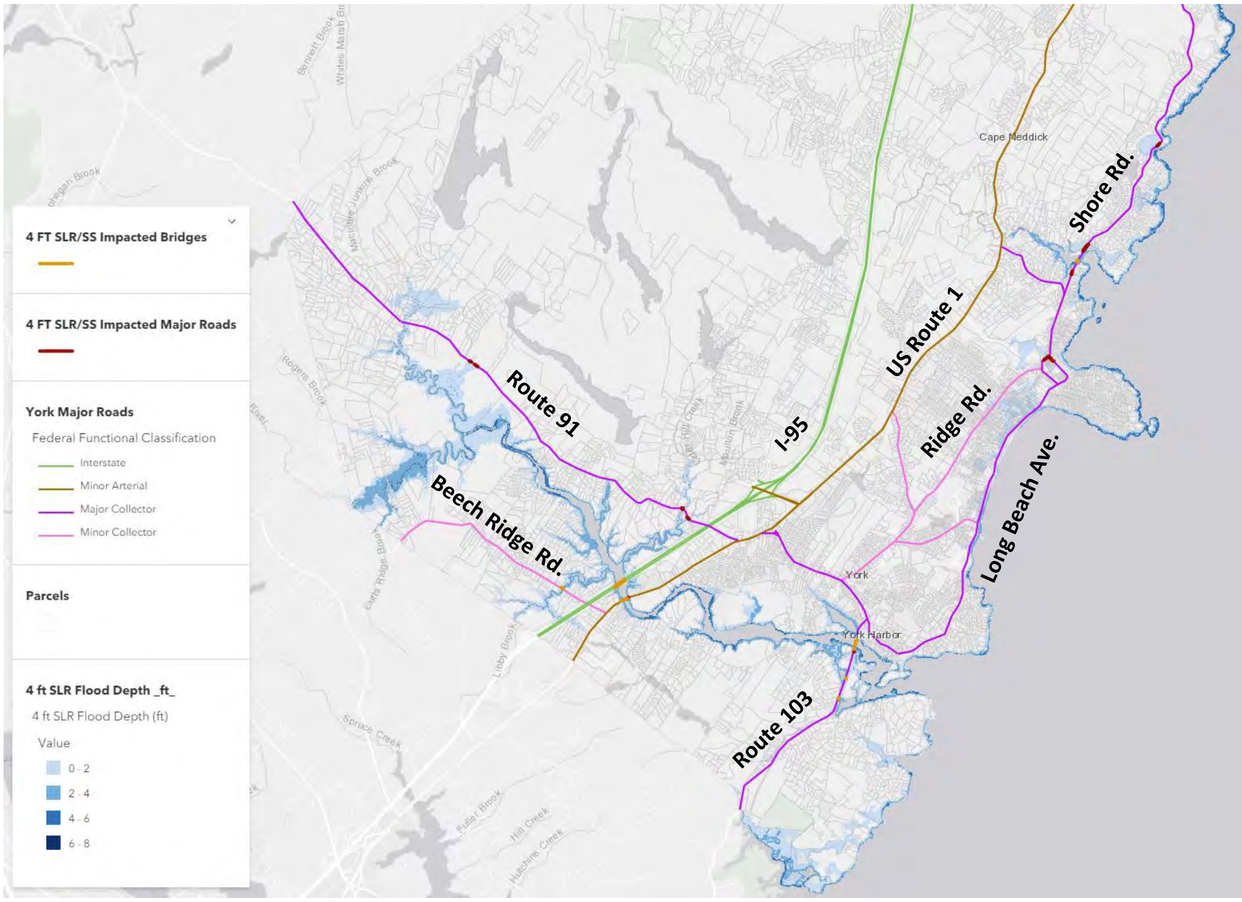
SLR/Storm Surge Scenario	Major Roads Potentially Impacted	Analysis
1.5 feet (Fig. 20)	I-95, Route 1, Cider Hill Rd (Route 91), Lilac Ln (Route 103), Shore Rd, Beech Ridge Rd	Bridges over the York River on I-95, Route 1, and Route 103 may be impacted, impeding access to emergency services and healthcare for those south of the river. Any bridge closures on these roads would also impact regional travel, causing significant delays and increased volume on alternative routes. Impacts to bridges on Route 103 may prevent access to locations on the York River islands. Potential closures on Route 91 and Beech Ridge Rd would also disrupt travel to the west. The bridge over the Cape Neddick River on Shore Rd may be impacted as well.
4 feet (Fig. 21)	I-95, Route 1, Cider Hill Rd (Route 91), Lilac Ln (Route 103), Shore Rd, Beech Ridge Rd, Ocean Ave (Route 1A), Railroad Ave (Route 1A)	Travel though the Short Sands area may be delayed or precluded by flooding on Ocean Ave and Railroad Ave. Flooding on Shore Rd by Phillips Pond could result in significant detours along that route.
6 feet (Fig. 22)	I-95, Route 1, Cider Hill Rd (Route 91), Lilac Ln (Route 103), Shore Rd, Beech Ridge Rd, Ocean Ave (Route 1A), Railroad Ave (Route 1A), Long Beach Ave (Route 1A), Main St (Route 1A), Cape Neddick Rd (Route 1A), Brave Boat Harbor Rd (Route 103), Long Sands Rd, Ridge Rd	Sections of Route 91 may be inaccessible. Locations along Main St may be inaccessible. Travel through the York Beach area may be impeded by flooding on parts of Long Beach Ave, Longs Sands Rd, and Ridge Rd, as well as significant flooding near Shorts Sands.
9 feet (Fig. 23)	I-95, Route 1, Cider Hill Rd (Route 91), Lilac Ln (Route 103), Shore Rd, Beech Ridge Rd, Ocean Ave (Route 1A), Railroad Ave (Route 1A), Long Beach Ave (Route 1A), Main St (Route 1A), Cape Neddick Rd (Route 1A), Brave Boat Harbor Rd (Route 103), Long Sands Rd, Ridge Rd, York St (Route 1A)	Substantial flooding along Long Beach Ave. The Long Sands, Short Sands, and Cape Neddick areas may be inaccessible.

Figure 20. Major Roads and Bridges Potentially Impacted at 1.5 Feet of SLR/Storm Surge.



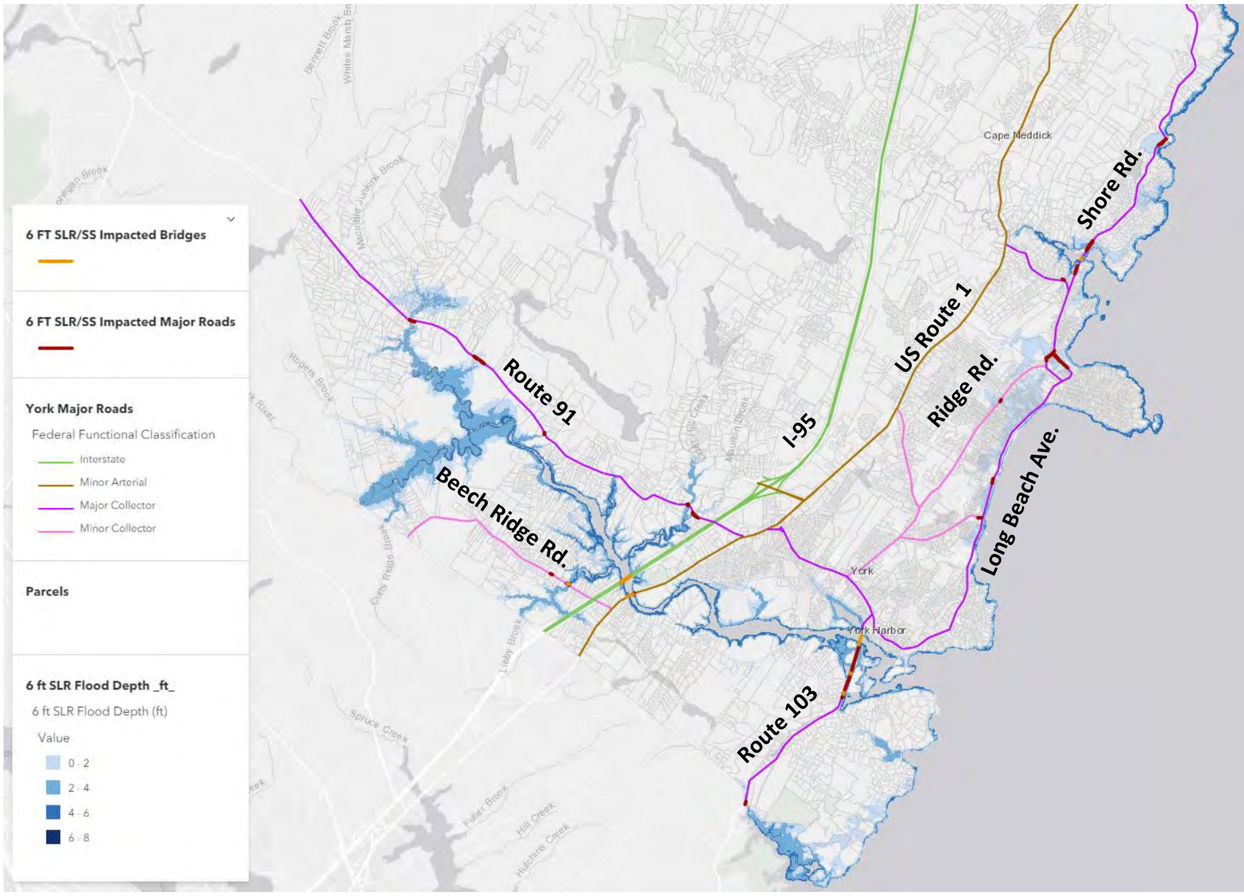
Source: Maine Geological Survey. MaineDOT. Town of York GIS.

Figure 21. Major Roads and Bridges Potentially Impacted at 4 Feet of SLR/Storm Surge.



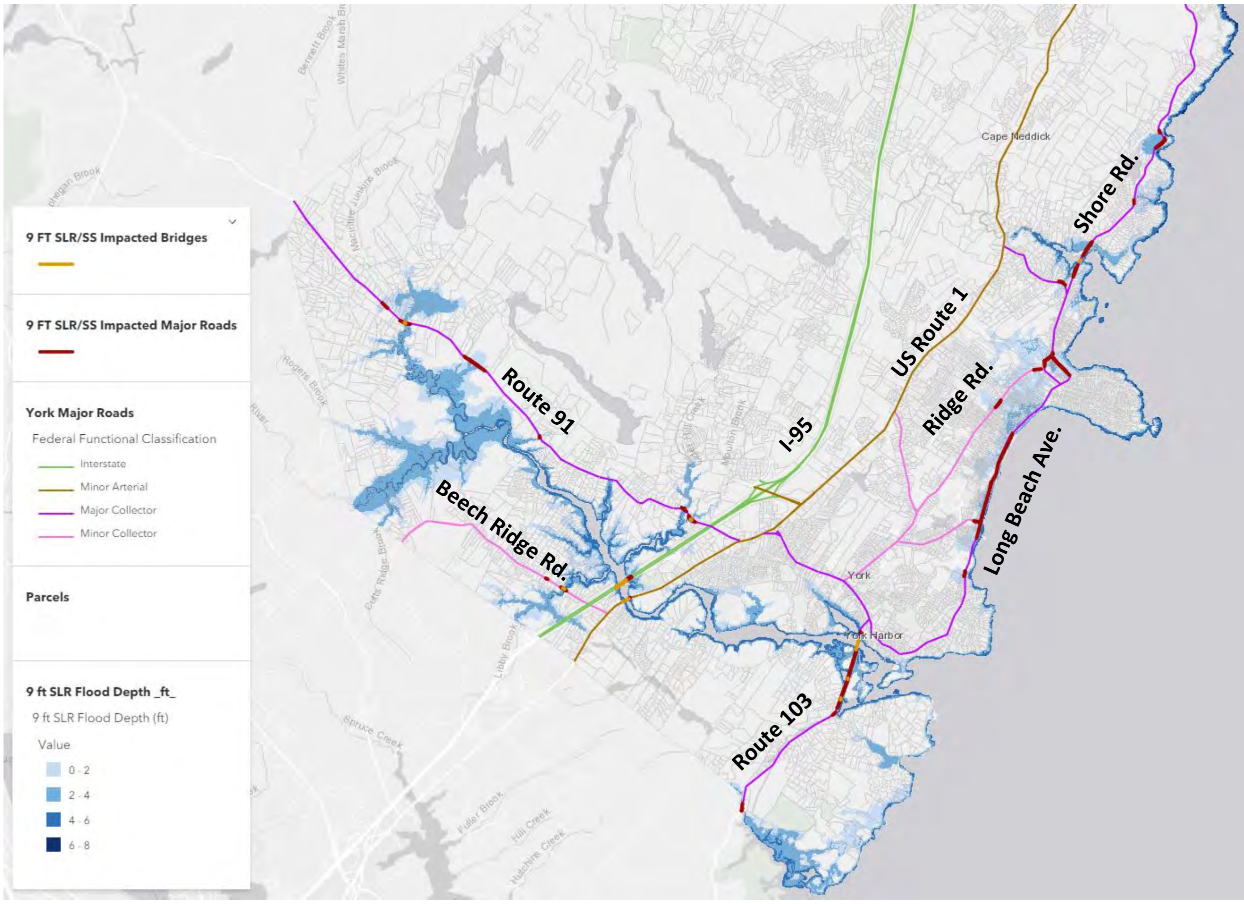
Source: Maine Geological Survey. MaineDOT. Town of York GIS.

Figure 22. Major Roads and Bridges Potentially Impacted at 6 Feet of SLR/Storm Surge.



Source: *Maine Geological Survey. MaineDOT. Town of York GIS.*

Figure 23. Major Roads and Bridges Potentially Impacted at 9 Feet of SLR/Storm Surge.



Source: *Maine Geological Survey. MaineDOT. Town of York GIS.*

__Figure 24. Town of York Roads with Projected Impact by 1.6, 3.9, or 6.1 Feet of SLR/Storm Surge.__

Road	1.6 ft	3.9 ft	6.1 ft
Amherst Avenue		■	■
Barrell Lane E¤ist	■	■	■
Bay Haven Road	■	■	■
Bay Street		■	■
Bayview Avenue			■
Beach Ball Field Road			■
Beach Street			■
Beachside Court		■	■
Beacon Street			■
Beech Ridge Road	■	■	■
Beachwood Avenue			■
Bett Welch Road			■
Birch Hill Road	■	■	■
Braveboat Harbor Road		■	■
Broadway E¤tension		■	■
Burnetts Trailer Park Road			■
Caddys Way			■
Cape Neddick Road			■
Carey Street		■	■
Ciampa Drive		■	■
Cider Hill Road	■	■	■
Clark Road	■	■	■
Dingle Road	■	■	■
Emus Way			■
Ferry Lane South			■
Franklin Street	■	■	■
Garrison Point			■
Godfrey Pond Road		■	■
Gunnison Road			■
Guy Lane		■	■
Harbor Beach Road			■
Harris Island Road	■	■	■
Haskell Way		■	■
Hawk Street		■	■
I-95	■	■	■
Indian Trail			■
Jo Lenes Drive			■
Juniper Road		■	■
Kerry Road		■	■
Kiddie Corner Lane			■
Kings Road			■
Lawrie Avenue		■	■
Lindsay Road		■	■
Lois Lane			■
Long Beach Avenue			■
Long Sands Road			■
Main Street		■	■
Major McIntire Road		■	■
Maple Street		■	■
Marietta Avenue			■
Mary Street			■
Meadow Road		■	■
Midnight Drive		■	■
Mill Lane	■	■	■
Mitchell Road			■
Mooring Drive			■
Morningside Drive		■	■
Northwood Farms Road			■
Oak Street		■	■
Ocean Avenue		■	■
Ocean Edge Lane			■
Ocean House Way		■	■
Oceanside Avenue		■	■
Organug Road		■	■
Park Circle		■	■
Parker Street			■
Payne Road	■	■	■
Pepperell Way			■
Pequanac Place		■	■
Phillips Cove Road			■
Pine Island Road		■	■
Pine Street		■	■
Pinecrest Drive			■
Railroad Avenue		■	■
Railroad Avenue E¤tension		■	■
Ray Avenue			■
Reserve Street		■	■
Ridge Road			■
Ridge Road Court		■	■
River Farm Road			■
River Lane		■	■
River Road			■
Rivermouth Road		■	■
Riverside Street			■
Riverwood Drive			■
Route 103	■	■	■
Saltwater Drive			■
Schooner Landing	■	■	■
Scotland Bridge Road	■	■	■
Sea Rose Lane		■	■
Seabreeze Lane			■
Seabury Road	■	■	■
Shore Road	■	■	■
Short Sands Road		■	■
Sparhawk Way			■
Stage Neck Road	■	■	■
Stones Throw		■	■
Strawberry Lane		■	■
Summer Breeze		■	■
Surf Avenue		■	■
Surfore Road		■	■
Tabernacle Road			■
Tralee Road		■	■
US Route 1	■	■	■
Varrell Lane			■
Walnut Street		■	■
Wanaque Road	■	■	■
Webber Road		■	■
Western Point Road		■	■
White Birch Lane			■
Whittier Way			■
Wild Kingdom Road		■	■

Source: Adapted from SMPDC, Tides, Taxes, and New Tactics, July 2021.

The Nature Conservancy's Coastal Risk Explorer[118] estimates that at just 2 feet of SLR and storm surge approximately 90 addresses in York will be inaccessible due to inundated roads. This increases to nearly 600 addresses with 6 feet of SLR and storm surge.[119] By SMPDC's analysis, total miles of roadway inundated in the 1.6-, 3.9-, and 6.1-foot scenarios are 1.1, 5.2, and 10.1 miles, respectively. Of note, a higher percent of York's sidewalks (8%) than roads (5%) are impacted with 6.1 feet of SLR and storm surge, suggesting some of the town's walkable areas are among the most vulnerable.[120]

FEMA Flood Hazard Areas

Several major transportation routes in York are within FEMA's 100- and 500-year flood zones, areas with a 1% and 0.2%, respectively, annual chance of flooding from heavy rainfall and storm surge events. Table 6 highlights the major roads exposed to the 100-year flood, according to FEMA's FIRMs.

Table 6. FEMA Projected 100- and 500-Year Flood Inundated Major Roads.

FEMA Flood Zone	Road Name	Flood Area
100-year	Long Beach Avenue	Just south of Juniper Road to just south of Nubble Road
	Route 103 (Lilac Lane)	South of Bragdon Island
	Shore Road	Wanaque Road to River Road
	Shore Road	East of Phillips Pond
	York Street	North of Lobster Cove to Long Sands Road
500-year	Route 103 (Lilac Lane)	Bragdon Island to Pine Island
	Shore Road	Cape Neddick River to Wanaque Road

Source: Google Maps, accessed October 21, 2021. FEMA.

While not on the FIRM, the York Beach Village area is known to be at risk of flooding, having flooded during the Mother's Day Storm of 2006 when nearly a foot of rain fell in York over a three-day period.[121]

A number of bridges and culverts in York along major roads are also within the FEMA 100-year flood zone and at risk of damage due to elevated water levels (Table 7).

Roads in York Beach Village flooded during the Mother's Day Storm in 2006. Photo: Bruce Boardman.

[118] https://maps.coastalresilience.org/maine/
[119] https://maps.coastalresilience.org/maine/
[120] Southern Maine Planning and Development Commission (SMPDC), "Tides, Taxes, and New Tactics," July 2021, https://smpdc.org/vertical/Sites/%7B14E8B741-214C-42E2-BE74-5AA9EE0A3EFD%7D/uploads/Tides_Taxes_and_New_Tactics_Project_Final_Report_SMPDC_July_2021.pdf, 31.
[121] USGS, Flood of May 2006 in York County, Maine, 3.

Table 7. Town of York Bridges and Culverts Within the FEMA 100-Year Flood Zone.

Road Name	Water Over
Bridges	
Interstate 95	York River
Route 1	York River
Route 103 (Lilac Lane)	York River
Shore Road	Cape Neddick River
Culverts	
Beech Ridge Road	York River
Interstate 95	Dolly Gordon Brook
	Little River
Long Beach Avenue	Prebble Brook
	Bridges Swamp Stream
Long Sands Road	Little River
Ridge Road	Little River
	Bridges Swamp Stream
Route 1	Little River
	Josias River
	Cape Neddick River
	Dolly Gordon Brook
Route 91	Cider Hill Creek
Route 103 (Brave Boat Harbor Road)	Brave Boat Harbor
Route 103 (Lilac Lane)	York River (tidal, south of Bragdon Island)
	Southside Brook
York Street	Little River

Source: Google Maps, accessed October 21, 2021. FEMA.

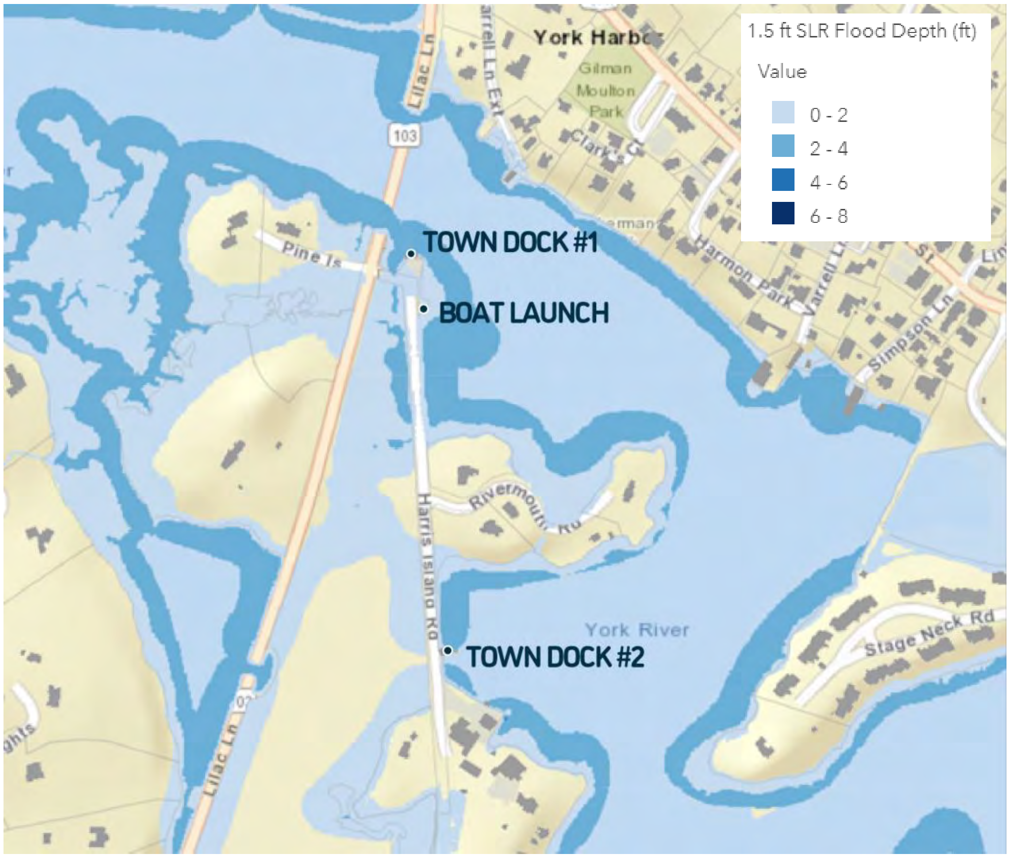
Harbor Infrastructure

York's public harbor infrastructure includes two town docks (Town Dock 1 and Town Dock 2), the Strawberry Island boat launch area, and a small Harbormaster office located on Town Dock 2. All are accessible via Harris Island Road. Both town docks, the boat launch, and the Harbormaster office are projected to be exposed to inundation with as little as 1.5 feet of SLR and storm surge (Fig. 25), which would eliminate York's only public harbor access points. The York Harbor Board has begun preliminary discussions about dock heights in regard to SLR, including initial planning on replacing Town Dock 2.[122]

Notably, Harris Island Road may become inaccessible at 1.5 feet of SLR and storm surge. This means that even if the harbor infrastructure itself was raised above inundation levels it still may not be usable without modifications to prevent flooding on Harris Island Road.[123]

[122] Email communication with Mike Sinclair, Town of York Harbor Board Chair, 12/12/21.
[123] Email communication with Mike Sinclair, Town of York Harbor Board Chair, 12/12/21.

Figure 25. York Harbor with 1.5 Feet of SLR and Storm Surge.



Source: Maine Geological Survey. Esri.

Maintenance

Maintenance for most transportation infrastructure in York is the responsibility of the York Department of Public Works (DPW). Notable exceptions are I-95, which is a federal road, and state roads outside of the Town's Urban Compact Area, which is a State-designated zone that spans roughly from Route 1 to the coast from west to east and from the Cape Neddick River to the York River from north to south.

Maintenance equipment is primarily housed at the DPW headquarters on Chases Pond Road and at DPW facilities on Route 1 and Rodgers Road. Some additional storage is held at the Recycling and Compost Facility on Witchtrot Road. DPW has reported limited indoor storage space at these facilities so that much of the department's equipment is left outdoors year-round.[124] Exposure to higher temperatures and more frequent and extreme storms as a result of climate change will put any exterior equipment at greater risk of damage and wear, which means higher costs incurred by the Town to replace. None of these facilities are at high risk of exposure to flooding from SLR, storm surge, or heavy precipitation.

[124] Correspondence with Town of York Department of Public Works.

Water Infrastructure

Public Drinking Water

The majority of York residents receive their drinking water from public water utilities. Public drinking water in York is provided by three different Water Districts. The YWD is the largest water supplier in York, serving almost 5,364 accounts as of 2020.[125] Part of southwest York, in the Route 91/Cider Hill Road area, is served by the Kittery Water District (KWD) and northeast York, in the Bald Head area, is served by the Kennebunk, Kennebunkport, and Wells Water District (KKW). Climate change can threaten drinking water access not only at the source but also along its distribution pathways.

Sources

All water for the YWD and KWD is sourced from within York: Chases Pond for the YWD[126] and Bell Marsh Reservoir, Boulter Pond, Folly Pond, and Middle Pond for the KWD.[127] The KKW does not source from York, pulling most of its water from Branch Brook in Wells and Kennebunk and supplementing with several groundwater wells.[128] The biggest challenges relative to climate change impacts are maintaining water quality and ensuring enough drinking water is available for all customers during droughts.

Water quality can be affected by heavy rains that contaminate drinking water reservoirs with pollutants and excess nutrients via runoff and by warmer temperatures that stimulate growth of bacteria and algae.[129] Declines in water quality could present potential public health hazards and place additional financial burdens on the water districts, and in turn the customers, to treat the water to acceptable standards for drinking. See the "Natural Environment & Ecosystem Service Vulnerability: Water Resources" section for more information about the impacts of climate change on water resources.

To prevent overdrawing water during a drought, each water source has a calculated "safe yield," which is the maximum daily volume that can be drawn during drought conditions to safely balance public use with the needs of wildlife and maintaining the biological health of the reservoirs and river systems.[130] Presently, all three water districts have sufficient safe yield to meet average daily demand projected out to 2030 for the KWD[131] and 2037 for the YWD[132] and KKW.[133] However, data from USGS stream gauges in Maine has shown more erratic stream flows in recent years due to more frequent, but less intense droughts, suggesting that safe yield analyses may need to be revised.[134]

---

125 Correspondence with the York Water District.
126 York Water District, "Water System Master Plan," 2018.
127 Kittery Water District, "Water System Master Plan," June 2020, https://drive.google.com/file/d/1YoseoxE3stziXTRtKeLIG2v8HFgD9dGI/view.
128 Kennebunk, Kennebunkport, and Wells Water District, "Water System master Plan Update," 2018, https://kkw.org/wp-content/uploads/2021/06/Master_Plan-ELECTRONIC_Reduced.pdf.
129 Cities of Portland and South Portland, "One Climate Future: Climate Change Vulnerability Assessment," https://www.oneclimatefuture.org/wp-content/uploads/2020/12/OneClimateFuture_VulnerabilityAssessment_Final.pdf, 40
130 York Water District, "Water System Master Plan," 2018, 4-8
131 Kittery Water District, "Water System Master Plan," 5-2
132 York Water District, "Water System Master Plan," 2018, 4-3
133 Kennebunk, Kennebunkport, and Wells Water District, "Water System master Plan Update," 4-10
134 York Water District, "Water System Master Plan," 2018, 4-7

Even under current safe yield conditions (Table 8), all three water districts are at risk of deficits if a drought coincides with a peak-demand period.[135] The YWD supply could be particularly vulnerable to more frequent droughts because the Chases Pond drainage area is relatively small, meaning a decrease in natural recharge from run-off can quickly result in a reduction of water availability.[136] For emergency scenarios such as droughts, system interconnections exist between the YWD and KWD and between the YWD and KKW systems to enable the districts to purchase supplemental water from each other. YWD has emergency triggers in Chase's Pond, based on historical water levels, that are used to determine when to supplement supply through one of the interconnections.[137] During an acute drought in 2016, YWD purchased additional water from the KKW system, which has the mechanical capability to transfer up to 2 million gallons per day (MGD).[138] Existing infrastructure allows for 1 MGD to be transferred between the YWD and KWD, with improvements under development that enable up to 3 MGD of transfer.[139] Increasing transfer capacity between the YWD and KWD will better position them to supplement each other during a drought because they have inverse peak-demand seasons (summer for the YWD and winter for the KWD).[140]

Table 8. Safe Yields and Projected Average and Maximum Daily Demands for the Three Water Districts Serving York.

Water District	Safe Yield (MGD)	Projected Average Daily Demand (MGD)	Projected Maximum Daily Demand (MGD)
York Water District	2.05	1.14 (2037)	2.7 (2037)
Kittery Water District	5.6	3.3 (2030)	4.95 (2030)
Kennebunk, Kennebunkport & Wells Water District	6.69	3.42 (2037)	7.77 (2037)

Source: YWD Master Plan (2018); KWD Master Plan (2020); Kennebunk, Kennebunkport, and WWD (2018).

Distribution

Unexpected failure in the drinking water distribution system can be caused by variations in water flow and pipe conditions due to climate change impacts of extreme precipitation, temperature variability, drought, and SLR. The following climate change-induced conditions can potentially damage infrastructure for delivering drinking water to York residents:[141]

---

135 York Water District, "Water System Master Plan," 2018, 4-3; Kittery Water District, "Water System Master Plan," 5-6; Kennebunk, Kennebunkport, and Wells Water District, "Water System master Plan Update," 4-10
136 York Water District, "Water System Master Plan," 2018, 4-8
137 York Water District, "Water System Master Plan," 2018, 4-5
138 York Water District, "Water System Master Plan," 2018, 4-4
139 York Water District, "Water System Master Plan," 2018, 4-3 - 4-4
140 York Water District, "Water System Master Plan," 2018, 4-6
141 Cities of Portland and South Portland, "Climate Change Vulnerability Assessment," 41

- Stress on pipes by ground movement from frequent freeze and thaw cycles and drought-induced changes to groundwater level
- Pipe corrosion and saltwater intrusion from increased groundwater salinity due to SLR and coastal flooding
- Damage from tree roots growing into pipes seeking a water source during drought

Emergencies resulting in the shutdown of drinking water treatment plants, such as flooding or loss of power from storms, can have implications on the delivery of water across the entire system. In 2007, the KKW water treatment plant had to be shut down for over four days for fear of cross contamination following inundation from Branch Brook overflow.[142] During such shutdowns, the Water Districts may rely on the aforementioned system interconnections and storage facilities.

The exchange of water via the interconnections is made possible by pumping stations that themselves are vulnerable to power failure. In the event of power failure, emergency generators can be used to power bi-directional exchange between YWD and KWD and exchange from KKW to YWD.[143] There is no emergency power to facilitate exchange from YWD to KKW (which supplies water to some York residents), however KKW can receive emergency water from the Maine Water Company Biddeford & Saco Division (MWCBS).[144]

Private Well Water

According to the MGS, there are approximately 1,000 private wells in use in York.[145] Because private wells are not regulated under the federal Safe Drinking Water Act or any state laws, those who get drinking water from private wells are especially vulnerable to water quality issues stemming from contamination from runoff and flooding.[146] More information about water quality concerns can be found in the "Health Vulnerability" section.

Wastewater

Public Wastewater Infrastructure

There are three quasi-municipal entities that operate wastewater systems in York. The YSD is the primary service provider, serving approximately 4,700 residential and commercial customers in the town.[147] The YSD network is concentrated east of Route 1 between the York and Cape Neddick Rivers,[148] and includes one wastewater treatment facility[149] and 12 pump stations.[150] The Ogunquit Sewer District (OSD) serves a small area of northeast York, with one privately owned pump station in the town.[151] The Kittery Sewer Department (KSD) serves one address on Route 1 at the York/Kittery border.[152]

---

142 Kennebunk, Kennebunkport, and Wells Water District, "Water System master Plan Update," 6-16.
143 York Water District, "Water System Master Plan," 2018, 2-55 - 2-56.
144 Kennebunk, Kennebunkport, and Wells Water District, "Water System master Plan Update," 6-16.
145 https://www.maine.gov/dacf/mgs/pubs/digital/well.htm.
146 MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine," 303
147 https://www.yorksewerdistrict.org/plant
148 https://www.yorksewerdistrict.org/collection-systems-map
149 https://www.yorksewerdistrict.org/plant-and-equipment
150 https://www.yorksewerdistrict.org/pump-stations-map
151 https://ogunsd.maps.arcgis.com/apps/webappviewer/index.html?id=c6194bb6962e46b0921c7b5a04bac971
152 Email communication with Timothy Babkirk, Superintendent of Sewer Services, Town of Kittery. June 1, 2021.

Climate change may put strain on sewer pipes. While York does not have any combined sewer overflows (CSOs), meaning stormwater and sewage are collected in separate pipes, more heavy rainfall will increase the likelihood and frequency of infiltration of stormwater into sewer pipes through cracks and poorly constructed or corroded manholes,[153] which can lead to overflows, blockages, and infrastructure damage.[154] SLR and storm surge similarly increase chances of infiltration,[155] with the additional risk of corrosion from saltwater intrusion.[156] SLR can also raise groundwater levels and submerge pipes,[157] which increases risk of infiltration as well as contamination of coastal waters if there are cracks in the wastewater infrastructure.[158] Wastewater pipes in the Long Sands and Short Sands areas are most at risk from exposure from SLR, storm surge, and heavy precipitation. Lastly, drought can indirectly impact pipes if water restrictions are put in place that reduce wastewater flow,[159] leading to more highly concentrated wastewater that increases the likelihood of blockages, corrosion, and odors.[160] YSD reports that clogging due to fats, oils, and greases is the most significant service delivery issue under normal operating conditions,[161] and more frequent drought could exacerbate this.

Many issues affecting pipes also pertain to pump stations.[162] Pump stations are a vital part of the sewer system because they move wastewater from low points to higher elevations so they can continue through the system with gravity. If a pump station were to malfunction, the flow of wastewater would be blocked at that pump station, causing backups in the preceding pipes and potential overflows into homes and other buildings. In addition to issues related to flow rates and composition, more extreme and frequent storms may put the structural and mechanical systems of pump stations at greater risk of damage and power loss.[163] Several pump stations in the YSD system are within inundation zones from SLR, storm surge, and heavy precipitation (Table 9), however YSD reports that most of its pump stations are constructed to operate under water and that critical operating equipment is above projected flood levels. YSD also has generators, should these pumps lose power.

[153] Ministry for the Environment, 2008b, ONeil, 2010 (https://www.sciencedirect.com/science/article/pii/S2212096320300528)
[154] https://www.sciencedirect.com/science/article/pii/S2212096320300528
[155] Hummel, Berry, & Stacey, 2018 (https://www.sciencedirect.com/science/article/pii/S2212096320300528)
[156] https://www.sciencedirect.com/science/article/pii/S2212096320300528
[157] May, 2020, Befus et al., 2020 (https://www.sciencedirect.com/science/article/pii/S2212096320300528)
[158] Kettle, et al., 2014 (https://www.sciencedirect.com/science/article/pii/S2212096320300528)
[159] Marleni et al., 2012, ONeil, 2010 (https://www.sciencedirect.com/science/article/pii/S2212096320300528)
[160] Marleni et al., 2012, Naidoo and Moolman, 2016, DeZellar and Maier, 1980 (https://www.sciencedirect.com/science/article/pii/S2212096320300528)
[161] Interview with York Sewer District. July 7, 2021.
[162] https://www.sciencedirect.com/science/article/pii/S2212096320300528
[163] ONeil, 2010 (https://www.sciencedirect.com/science/article/pii/S2212096320300528)

Table 9. YSD Pump Station Flooding Exposure.

Pump Station	SLR/Storm Surge Scenario	FEMA Flood Hazard Zone
Lobster Cove	9 feet +	-
Long Beach	4 feet +	100-year flood (coastal)
Short Sands	6 feet +	100-year flood (coastal)
Spring Pond	-	100-year flood
York River Farms	9 feet +	-

Source: YSD, York GIS, MGS.

The Contact Tanks at YSD's wastewater treatment facility in York are also shown to be at risk of flood exposure on SLR and storm surge projection maps from MGS. However, YSD reports that the tanks are protected from current and future flooding projections by elevated walls. Therefore, direct damage to the facility by flooding is likely to be low risk, though power outages and equipment damages from more frequent and severe storms also present potential impacts.[164] Of note, both the Bay Haven Road and Main Street entrances to the site are projected to be flooded with 9 feet or more of combined SLR and storm surge, which may impact facility access in this scenario.

Any impacts to the pipes and pump stations discussed above could ultimately have ramifications for the treatment facility. Increased flow from inundation along the network can dilute wastewater and affect the treatment process, which can cause public health and environmental hazards if improperly treated wastewater must be discharged. Conversely, low-flow, highly concentrated wastewater can cause blockages and corrosion.[165]

A thorough review and evaluation of all of the critical assets in the YSD system will be a part of YSD's climate action plan, which will be completed in 2022.

Septic Systems

Many properties in York are not served by the sewer system and use on-site wastewater systems, such as septic systems, for wastewater. As of 2020 the town had approximately 4,400 permitted on-site wastewater systems.[166] In New England, municipalities also often have a high number of on-site wastewater systems that pre-date the start of permitting in the 1970s. Because they pre-date existing regulations, many of these older systems may be substandard.

Climate change impacts to on-site systems can cause performance issues for the systems and hardships for system owners. Saturated soils from high-intensity rainfall and SLR can disrupt the treatment processes in on-site wastewater systems,[167] as can higher soil temperatures.[168] Changing groundwater levels can also damage on-site systems causing system failure or leakage,[169] which can result in

[164] https://www.sciencedirect.com/science/article/pii/S2212096320300528
[165] https://www.sciencedirect.com/science/article/pii/S2212096320300528
[166] https://apps.web.maine.gov/cgi-bin/online/mecdc/septicplans/search.pl.
[167] Cooper, Loomis, & Amador, 2015 (https://www.sciencedirect.com/science/article/pii/S2212096320300528)
[168] Amador, Loomis, & Kalen, 2014 (https://www.sciencedirect.com/science/article/pii/S2212096320300528)
[169] Auckland Council, 2015a, Auckland Council, 2015b (https://www.sciencedirect.com/science/article/pii/S2212096320300528)

environmental contamination, water quality and public health implications, and financial burdens for owners. On-site systems are known to be more susceptible to failure along the York River and the coast and, in fact, the YSD has already experienced this problem on the north side of the Cape Neddick River.[170] Septic tanks within the town's Watershed Protection Overlay District are required to be pumped at least every three years to ensure proper functioning.[171]

Stormwater

More frequent and intense precipitation events, as well as SLR and storm surge, will expose stormwater infrastructure to greater volumes of water than it has been designed to handle. This will put drainage pipes at risk of damage and increase the chances of backups and flooding at drainage points. Coastal flooding and SLR can also block stormwater outfalls, preventing the flow of stormwater or forcing ocean water into pipes and up through drains.[172] An assessment by SMDPC determined that 10% of drainage outfalls will be impacted with 1.6 feet of SLR and storm surge, and this increases to 24% and 37% under 3.9 feet and 6.1 scenarios, respectively.[173]

York's stormwater infrastructure is regulated under the General Permit for the Discharge of Stormwater from Small Municipal Separate Storm Sewer Systems (MS4). The complete separation of stormwater and sewer pipes in York significantly reduces the risk of wastewater contamination in stormwater discharge and backups during heavy rainfall events. Stormwater infrastructure is primarily maintained by the Town DPW; on state roads, stormwater infrastructure may be maintained by either MaineDOT or the Town depending on maintenance agreements.[174] The Town also requires proper operation and maintenance of privately-owned stormwater infrastructure (e.g., stormwater ponds) per the Post-Construction Stormwater Management Ordinance adopted in 2014.[175]

Dams

Dams are a critical water infrastructure because they control the flow of water, often to reduce flooding or to create a reservoir for drinking water. Climate change impacts, particularly extreme rainfall and SLR and storm surge, can threaten the integrity of dams if water levels rise greater than they are designed to handle. This could result in damage to dams or excess water flow that causes flooding downstream. There are a number of dams in York west of I-95, which control the flow of water from the reservoirs that supply water for the YWD and KWD systems. A complete analysis into the capacity and integrity of these dams is needed to determine if they are sufficient to withstand projected increases in intensity of extreme precipitation events.

---

[170] Correspondence with York Sewer District.
[171] York Zoning Ordinance Section 10.3.9.2
[172] SMPDC, "Tides, Taxes, and New Tactics," 10.
[173] SMPDC, "Tides, Taxes, and New Tactics," 31.
[174] Discussions with York DPW.
[175] Communication with York Department of Public Works.

Energy Infrastructure

Electricity

Electricity in York is supplied via the regional electrical grid. Electricity is generated at power plants located within the six-state New England region and imported from other bordering regions. It is then transmitted over high voltage lines to distribution utilities which, in York's case, is Central Maine Power (CMP), who then deliver power to end users. Climate change will likely affect electricity generation, transmission, and distribution components of this electricity delivery system.

A study by the US Department of Homeland Security (DHS) found that increases in average maximum temperature in Maine through 2050 could decrease power plant generation and transmission line capacity, while demand for electricity is expected to increase because of greater cooling needs in the summer.[176] Fig. 26 highlights a number of potential climate impacts to electric transmission and distribution infrastructure. Recognizing the need to upgrade the resilience of the electrical grid, in 2018 AVANGRID, the parent company of CMP, initiated a $2.5 billion improvement plan to minimize impacts from future severe storms in several northeast states, including Maine.[177] Any disruption in the supply of those energy sources, either at the power plants or over the system of transmission and distribution, will result in power outages and/or brownouts where less than full voltage is supplied.

Figure 26. Potential Climate Impacts to Electric Transmission and Distribution Infrastructure.

Climate Hazard	Key Impacts
Increased Temperatures	• Lower generation efficiency • Decreased solar PV efficiency • Reduced carrying capacity and increased losses in lines and transformers • Increased demand for cooling
Increased Precipitation	• Damaged power lines from snow and ice • Flooding of underground infrastructure • Damaged towers due to erosion
Sea Level Rise	• Flood damage to coastal and/or low-lying infrastructure
Severe Storms	• Damaged infrastructure from wind and extreme weather • Disruption of supply chains at the local and regional level • Damage to facilities due to erosion

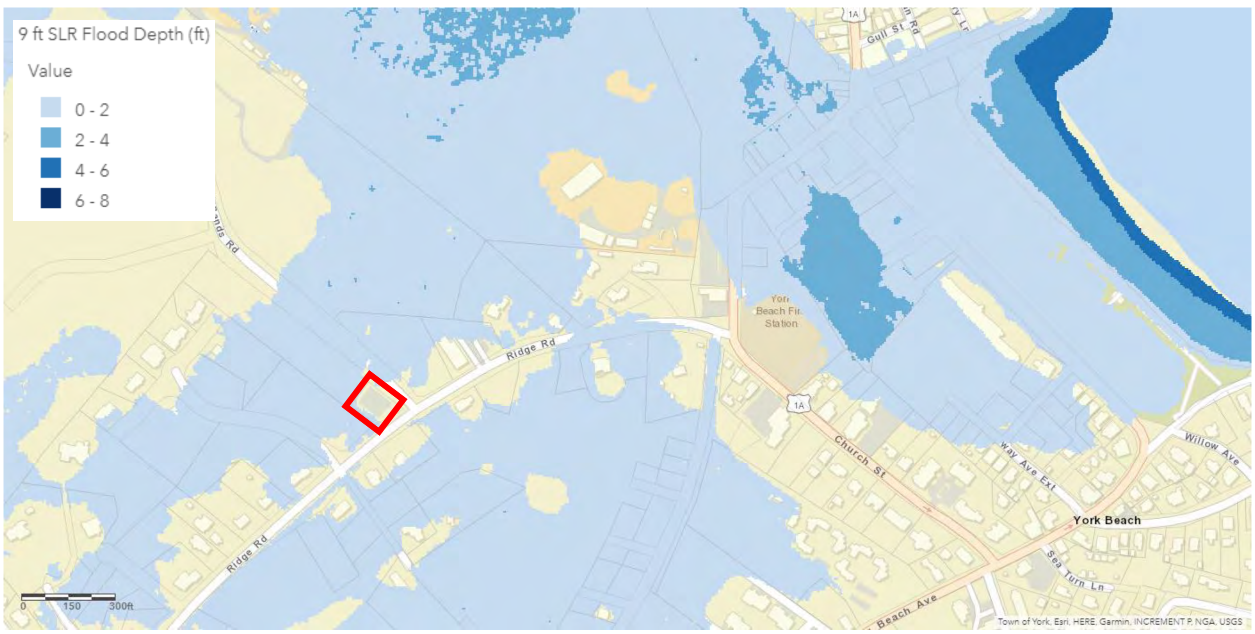
Source: Cities of Portland and South Portland, One Climate Future: Climate Change Vulnerability Assessment, 2019, pg. 37. Adapted from Burillo (2018).[178]

---

[176] U.S. Department of Homeland Security. (2016). Casco Bay Region Climate Change Resiliency Assessment. Regional Resiliency Assessment Program.
[177] https://www.businesswire.com/news/home/20180627006314/en/AVANGRID-Announces-Comprehensive-2.5-Billion-Resiliency-Plan-to-Harden-its-Power-Grid-and-Help-Minimize-the-Impact-of-Future-Storms-on-Customers-in-Maine-and-New-York
[178] Burillo, D. (2018). Effects of Climate Change in Electric Power Infrastructures. Retrieved from 10.5772/intechopen.82146.

Electricity in York is distributed from three electrical substations. Substations are pivot points in the electrical grid's transmission and distribution systems, with important functions include lowering voltage so that electricity is suitable to distribute to homes, splitting electrical currents in multiple directions, and housing circuit breakers to protect the system from damage.[179] Damage to a substation from extreme weather could result in power outages for many York residents. The York Beach substation is located near a floodplain and could be vulnerable to flooding from heavy rain, SLR, and storm surge (Fig. 27). Climate planning information was not available from CMP for this assessment; the assumption used here is that these substations have no redundancy and if operations are down due to flooding, there is no backup source of power for residents served from that location, although CMP does have some number of mobile substations that can be brought in for emergencies. Further information from CMP is needed to understand specific risks from flooding and high heat and the utility's climate action plan to adapt to these changes.

Figure 27. York Beach Substation (Red Box) with 9 Feet SLR and Storm Surge



Source: Maine Geological Survey. Esri.

York does not have any large-scale electricity generation infrastructure, such as power plants or municipal or community solar arrays. For individual property owners with private solar panels, extreme weather could present greater risk of damage from debris and falling tree limbs, though this is not likely to be a major issue.[180]

---

[179] https://energyeducation.ca/encyclopedia/Electrical_substation

[180] Cities of Portland and South Portland, "Climate Change Vulnerability Assessment," 38.

Petroleum

Petroleum, also known as crude oil, is widely used in Maine for both heating and transportation fuel;[181] petroleum-based fuels, such as heating oil and kerosene, are the most common source of energy for home heating in York.[182] As of 2016, half of the petroleum consumed in Maine came through the Port of Portland.[183] A vulnerability assessment of the City of Portland suggests that SLR and heavy storms may impact the terminals and storage areas associated with petroleum operations, as well as access to land-side infrastructure by oil tankers in order to distribute petroleum shipments.[184] Further, petroleum reserves in the region are typically limited,[185] meaning any disruptions in the supply chain could have immediate ramifications for the state.[186] The reliance on imports and lack of reserves also means Maine is subject to the volatility of national and world petroleum prices and availability.[187]

Natural Gas

There is no natural gas supply in York for residential or commercial customers (more information in Appendix B: Greenhouse Gas Inventory), though natural gas is the fuel used for generating about 50% of the electricity power in the regional grid.[188] Over 90% of the New England natural gas fired power plant fleet is located outside the state of Maine and have their own vulnerabilities to continuity of fuel supply.

Propane

Propane is the second most common home heating fuel in York.[189] Propane is created as a by-product of both natural gas processing and petroleum refining[190] and supply chain interruptions for either of those energy sources could also have implications for the availability of propane.

Wood and Biodiesel

Wood and, to a lesser extent, biodiesel are other heating options utilized in York. Biodiesel is a liquid fuel created by combining alcohol with vegetable oil, animal fat, or recycled cooking grease.[191] The distribution of wood and biodiesel is less complex and more secure than petroleum, natural gas, and propane because both fuels are produced from renewable resources available in the region. Forestry is an important part of Maine's economy[192] and, as of December 2020, there is one biodiesel producer in Maine and five in New England.[193] Further, wood is the least expensive energy source available in

---

[181] U.S. Energy Information Administration. (2016). State Energy Data System, Table C1. Energy Consumption Overview: Estimates by Energy Source and End-Use Sector

[182] 2019 Five-Year American Community Survey. Table B25040.

[183] U.S. Department of Homeland Security. (2016). Casco Bay Region Climate Change Resiliency Assessment. Regional Resiliency Assessment Program.

[184] Cities of Portland and South Portland, "Climate Change Vulnerability Assessment," 38-39.

[185] U.S. Department of Homeland Security. (2016). Casco Bay Region Climate Change Resiliency Assessment. Regional Resiliency Assessment Program.

[186] Cities of Portland and South Portland, "Climate Change Vulnerability Assessment," 39.

[187] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine," 356.

[188] https://www.epa.gov/egrid/power-profiler#/NEWE

[189] 2019 Five-Year American Community Survey. Table B25040.

[190] https://afdc.energy.gov/fuels/propane_production.html

[191] https://www.energy.gov/eere/bioenergy/biofuel-basics

[192] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine," 341.

[193] https://www.eia.gov/biofuels/biodiesel/production/

Maine.[194] At the regional level, the greatest threats to wood production from climate change are changes to climate that impact the health and range of tree species. More information about this can be found in the "Natural Environment: Forests" section.

While still recognized as a near zero net carbon fuel by some regulatory agencies, wood, when combusted, releases more GHG per unit energy than coal. While these gases do get reabsorbed if they come from renewable forests, it could take 50 to 75 years to fully recapture the carbon. In the meantime, use of wood energy increases atmospheric concentrations of GHG.

Information and Communications Technology (ICT)

ICT infrastructure facilitates the use of communication devices, applications, and networks like the internet, phones, computers, television, and radio.[195] This infrastructure includes:

- Transmission infrastructure (cables, cell towers, etc.)
- Wireless signals (radio, satellite, etc.)
- Buildings and equipment (data centers, etc.)[196]

Damage to ICT infrastructure in York could reduce service quality and availability, which in turn may interfere with social connections, economic activity, and communications and access to information during emergencies.[197] For this reason, ICT infrastructure needs installation and maintenance plans that consider the scope, severity, and frequency of climate hazards in the future, particularly infrastructure with longer service lives, such as cabling and buildings.[198] ICT plans must also consider that the highest level of use and bandwidth needed are likely to be during emergencies and sufficient redundancy will minimize impacts if part of the network is lost.

York does not have any data centers or buildings critical to ICT, so the infrastructure assets most at risk are cellular towers and overhead and underground cables. Table 10 describes potential impacts to ICT infrastructure and services in York from climate change. York has several cellular towers that are not in areas at risk of flooding but are still vulnerable to damage from storm impacts such as high winds, lightning strikes, and snow and ice. The Town has a radio communications tower located behind the Center for Active Living at 36 Main Street that is used for Town operations, including DPW, Police, Fire, and emergency medical services (EMS).[199] This tower is also not exposed to projected flooding but has similar vulnerabilities to storms as the cellular towers.

[194] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine," 353.
[195] https://www.sciencedirect.com/science/article/pii/B9780128037737000085
[196] USAID. (2013). Addressing Climate Change Impacts on Infrastructure: Preparing for Climate Change. Washington DC, 29.
[197] USAID. (2013). Addressing Climate Change Impacts on Infrastructure: Preparing for Climate Change. Washington DC, 29.
[198] Cities of Portland and South Portland, "Climate Change Vulnerability Assessment," 67.
[199] Email communication with Nicole Pestana, Town of York Emergency Management Specialist, 12/9/21.

Table 10. Impacts to ICT Infrastructure and Services from Different Climate Change Hazards.

Climate Change Hazard	ICT Impacts
Increased Temperature	● Damage to cables from increased solar radiation ● Increased heat-related health and safety risks for maintenance workers
Heavier Precipitation Events	● Increased flooding of low-lying/underground infrastructure, particularly in coastal areas and floodplains ● Exposed cables due to erosion ● Decline in stability of tower structures and foundations from changes in soil moisture or flooding
SLR and Storm Surge	● Increased flooding and salt water corrosion of infrastructure in low-lying/coastal areas ● Decline in stability of infrastructure from changes in groundwater levels
More Frequent and Extreme Storms	● Fallen cell towers or telephone poles from high winds or fallen trees ● Increased damage to above-ground infrastructure ● More outages for services relying on radio waves transmitted through the air, like satellite services and radio broadcasts

Source: United States Agency for International Development (USAID), "Addressing Climate Change Impacts on Infrastructure: Preparing for Climate Change," December 2013.; USAID, "Overarching Guide for Incorporating Climate Change Adaptation in Infrastructure Planning and Design," September 2017.

Community Infrastructure

Public Health

York's public health infrastructure includes emergency services, shelters, public safety, and healthcare facilities. This infrastructure is crucial to the health and wellbeing of those who live and work in York, as well as those visiting the town, and any impacts to public health services are likely to have community-wide ramifications.

Flooding

Most public health infrastructure in York is not at risk of exposure to flooding from SLR, storm surge, and heavy precipitation. Two facilities are at risk, however: the York Beach Fire Department (YBFD) and the Long Sands Bath House.

The YBFD station, located on Railroad Avenue, is responsible for providing coverage to most of the northern half of York, while the York Village Fire Department (YVFD) covers the southern part of the town. According to projections by MGS, the station will be partially exposed to flooding from 4 feet of combined SLR and storm surge and fully inundated from 6 feet or more of combined SLR and storm surge (Fig. 28). In a scenario where YBFD's operations were impacted or shut down by flooding, the YVFD would provide cover. Both York fire departments are also part of mutual aid pacts through which assistance can be requested from neighboring towns in the event of an emergency.[200] The YBFD station also serves as an emergency shelter but may not be a viable shelter option during a flooding emergency, which could strain the capacity of other emergency shelters in town or result in some people being unable to access an emergency shelter.

Figure 28. YBFD (Red Box) with 4 Feet (Top) and 6 Feet (Bottom) of SLR and Storm Surge

Source: Maine Geological Survey. Esri.

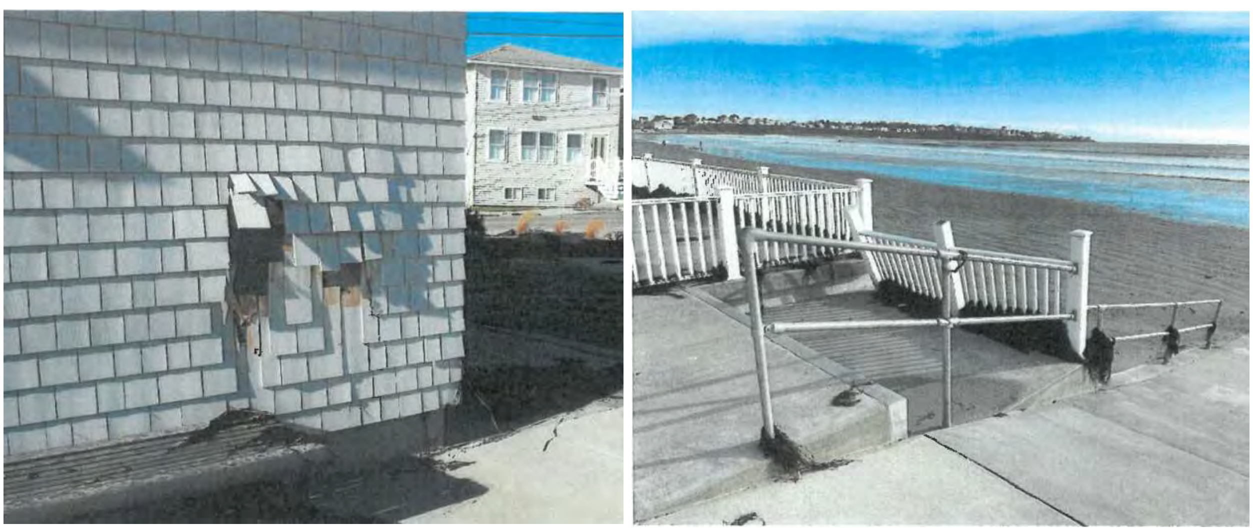
The Long Sands Bath House is the headquarters for the lifeguards and first aid for Long Sands Beach. The facility is projected by MGS to be fully inundated by 9 feet or more of combined SLR and storm surge (Fig. 29). However, the facility is known to be at risk of minor flooding and damage with as little as 2 feet of storm surge during high tide. On January 17, 2022, a storm surge of at least 2 feet from Winter Storm Izzy resulted in minor exterior damage and flooding inside requiring extensive cleaning; clean-up from

[200] Email communication with Chief Balentine (YVFD) and Chief Welch (YBFD), 12/9/21.

this storm was quoted at $1,905 and an insurance claim was filed for repairs.[201] More extensive damage to this resource could require the relocation of lifeguards to a different facility located further from Long Sands Beach, such as the York Beach Fire Station, which would reduce their capacity to provide emergency care.[202]

Figure 29. Long Sands Bath House (Red Box) with 9 Feet of SLR and Storm Surge

Source: Maine Geological Survey. Esri.



Exterior damage to the Long Sands Bath House from Winter Storm Izzy on January 17, 2022. Photos: Town of York.

---

201 Town of York Board of Selectmen meeting packet, January 24, 2022. https://www.yorkmaine.org/AgendaCenter/ViewFile/Item/1143?fileID=11818.

202 Email communication with Nicole Pestana, York Emergency Management Specialist, 12/9/21.

Aftermath of flooding at the Long Sands Bath House from Winter Storm Izzy on January 17, 2022. Clean-up costs were quoted at $1,905. Photos: Town of York.

Heat

High heat will impact public health infrastructure in two critical ways. First, it puts additional strain on systems and equipment that can interfere with operations and service. Second, it exposes those utilizing public health infrastructure, who are likely to already have heightened vulnerability, to more extreme conditions. All public health infrastructure will be impacted to some degree by increases in temperature and more frequent high heat days, though some will have greater exposure and sensitivity if they are in a heat island and/or have more vulnerable users.

Both York Hospital in York Village and the York Hospital Urgent Care facility on Route 1 are located in heat islands with the highest and second highest relative heat exposures, respectively. The York Hospital facilities are among the most critical infrastructure assets in York because they provide services that cannot be easily moved. If hospital and urgent care operations were impacted it could require the transfer of patients to other nearby medical facilities, which could lead to interruptions in care and increases in vulnerability for those patients. York Hospital reports that they try to ensure that they have equipment with adequate cooling capacity, though in general, high heat taxes their chillers, resulting in higher operational costs and occasionally leading to chiller failure.[203] Strain on cooling equipment will grow as temperatures increase with climate change.

All eight of the Town's emergency shelters are located in heat islands of varying relative exposure. Table 11 lists each of the shelters, their relative heat exposure above the town mean, and if they have air conditioning. A lack of sufficient air conditioning may restrict the usage of an emergency shelter during hot weather and disqualifies it as a potential cooling center.

[203] Email communication with Robin LaBonte, Chief Financial Officer of York Hospital, 12/13/21.

Table 11. Relative Heat Exposure and Air Conditioning Status of York's Emergency Shelters.

Emergency Shelter	Relative Heat Exposure Above Town Mean (1 - lowest, 5 - highest)	Air Conditioning
Center for Active Living	1	Window units
Coastal Ridge Elementary School	5	Window units for classrooms
Superintendent's Office	2	Yes
Village Elementary School	4	Yes
York Beach Fire Department	4	Yes
York High School	5	No
York Middle School	3	Yes in 2001 addition; No in rest
York Village Fire Department	5	Yes

Source: Email communication with Nicole Pestana, York Emergency Management Specialist, 12/9/21. Email communication with Chief Balentine (YVFD) and Chief Welch (YBFD), 12/9/21.

Emergency Preparedness, Capacity, and Access

With climate change, extreme storms and other weather emergencies will more frequently and intensely impact the operations and services of public health infrastructure, including in ways that are not a result of direct site exposure. Backup power sources will need to handle potentially more frequent and longer grid power outages. The capacity of healthcare facilities and emergency services may become more strained by both short-duration crises, like extreme storms and heat waves, and long-term trends, like more vector-borne disease cases. Emergency preparedness must also account for reduced access during flooding and storm events, both the ability for emergency services to access those in need and for individuals to access healthcare facilities. More information about where access may be limited in different scenarios can be found in the "Transportation Infrastructure" section.

Social Resources

York has a number of social resources that support the needs of its residents. These include essential services like schools, affordable and senior housing properties, and resources that promote residents' well being like the Center for Active Living. The services provided by these social resources are especially critical because they support some of York's more vulnerable populations. More information about populations that are more vulnerable to climate change impacts can be found in the "Social Vulnerability" section.

Several of York's social resources are located in heat islands, putting those who use the facilities at risk of exposure to increasing high heat. This includes all of the town's public schools; historically high heat in schools was not a major cause of concern because school is not in session during the hottest months of the year. However, climate change will make high heat days increasingly more likely during the fringe summer months of June and September. Any summer uses of school buildings will be even more impacted by high heat. Presently only Village Elementary School has air conditioning throughout the building. York Middle School has air conditioning only in its 2001 addition and Coastal Ridge Elementary School has window units for the classrooms. York High School does not have any air conditioning.[204]

The York Housing Authority owns and operates several affordable and senior housing properties in York, which are home to some of York's residents with the most heightened vulnerability to climate change impacts and greatest risk of negative health implications from heat exposure. Of their properties, the Village Woods site is located in a heat island. York Housing provides air conditioning in the common areas of all of their buildings and encourages residents to purchase window units for their apartments. For low-income residents, York Housing subsidizes air conditioning units based on their individual budgets. Air conditioning is also provided in the Baldwin Center Cafe and Community Room at the Village Woods site.[205]

The Center for Active Living and York Community Service Association office, which both provide services for older adults and other more vulnerable populations, are both air conditioned, as well as the York Public Library.[206] None of York's social resources are at high risk of exposure to current and future flooding.

Municipal and Quasi-Municipal Management

Management, operations, and planning of critical services in York are primarily overseen by Town departments and the quasi-municipal YWD and YSD. Staff offices are located throughout York and the ability for these staff to maintain their daily functions is a critical need for services in York to continue uninterrupted.

Of the municipal and quasi-municipal offices in York, only the Harbormaster's Office, located on Town Dock 2, and the YSD Office, located on the site of the Wastewater Treatment Facility, are at risk of exposure from SLR and storm surge. Like the rest of the harbor infrastructure described in the "Transportation Infrastructure" section, the Harbormaster's Office is at risk of flooding from as little as 1.5 feet of combined SLR and storm surge. If the office were damaged, the Harbormaster would be able to work out of an office in the York Police Station, though it would make it difficult for them to operate effectively as they need to be within sight of the harbor and have access to the docks. Rebuilding the Harbormaster's Office to be more resilient to flooding is currently on the Harbor Board's list of capital projects.[207]

The YSD office itself is at risk of exposure to flooding from 9 feet or more of combined SLR and storm surge, however road access to the office may be cut off with 6 feet or more. In the event that staff were not able to access the office, they would be able to work in other parts of the Wastewater Treatment Facility or remotely in any location with internet access. A new office will also begin construction in the spring of 2022, which will have a flood elevation of 17 feet.[208]

[204] Email communication with Nicole Pestana, York Emergency Management Specialist, 12/9/21.
[205] Email communication with Fiona McQuaide, Assistant Director for York Housing, 12/13/21.
[206] Email communication with Nicole Pestana, York Emergency Management Specialist, 12/9/21.
[207] Email communication with David Webber, 12/9/21.
[208] Email communication with Tim Haskell, 12/9/21 & 12/13/21.

Several municipal and quasi-municipal offices are located in heat islands, but all have air conditioning and staff activities would not be interrupted by high heat.[209]

Solid Waste Management

Solid waste is the waste people and businesses dispose of, such as trash, recycling, and compost. If solid waste is not managed properly, it can lead to rodent infestations, disease, and groundwater contamination.[210] Climate change puts potential stresses on solid waste collection by York's trash and recycling services, as well as solid waste processing and disposal after it has been collected. Fig. 30 highlights a number of potential impacts.

Figure 30. Potential Climate Change Impacts on Solid Waste Infrastructure and Services.

	Collection	Processing	Disposal
Temperature Change	• Increased odor and pest activity requiring more frequent waste collection • Overheating of collection vehicles requiring additional cooling capacity, including to extend engine life	• Overheating of sorting equipment	• Altered decomposition rates • Increased maintenance and construction costs due to thawing permafrost • Increased risk of fire at disposal sites
	• Greater exposure of workers to flies, which are a major cause of infectious diseases (flies breed more quickly in warm temperatures and are attracted to organic waste)		
Precipitation Change	• Flooding of collection routes and landfill access roads, making them inaccessible • Increased stress on collection vehicles and workers from waterlogged waste	• Increased need for enclosed or covered sorting facilities	• Increased flooding in/around sites • Increased leachate that needs to be collected and treated • Potential risk of fire if conditions become too dry and hot
Sea Level Rise	• Narrowed collection routes • Potentially increased waste in a concentrated area as people crowd into higher elevations within an urban area	• Damage to low-lying processing facilities • Increased need for sorting and recycling to minimize waste storage needs	• Deterioration of impermeable lining • Water infiltration of pit leading to possible overflow of waste
	• Permanent inundation of collection, processing, and disposal infrastructure		
Storm Surge	• Temporary flooding of and diminished access to roadways, rails, and ports for waste collection, sorting, and disposal • Closure of facilities due to infrastructure damage		
Extreme Wind	• Dispersal of waste from collection sites, collection vehicles, processing sites, and landfills • Reduced access to collection and landfill access routes due to damage and debris		

Source: USAID, "Solid Waste Management," November 2012.

Within the boundaries of York, the greatest exposure is at the collection phase. Higher temperatures and extreme storms and wind will impact collection across the town and flooding from SLR, storm surge, and heavy precipitation will present additional challenges in coastal and low-lying areas. Additionally, flooding creates large quantities of waste itself by moving debris and coastal flooding can lead to solid waste pollution in coastal waters.[211]

---

[209] Email communication with Nicole Pestana, York Emergency Management Specialist, 12/9/21. Email communication with Tim Haskell, 12/9/21. Email communication with Don Neumann, Superintendent of the YWD, 12/9/21.
[210] https://www.climatelinks.org/sites/default/files/asset/document/Infrastructure_SolidWasteManagement.pdf.
[211] http://www.annexpublishers.com/articles/JEPC/2103-Interrelation-between-Climate-Change-and-Solid-Waste.pdf.

Residential solid waste produced in York is collected and disposed of/processed outside of town by the Town's curbside waste contractor Casella Waste Systems. Commercial entities in town hire waste contractors privately and this waste is also collected and disposed of/processed outside of town. While disposal and processing do not occur in York, climate change impacts on the efficiency and capacity of processing and disposal/processing facilities could have implications for the entire system, including disruptions to collection in York.

York does have a recycling and compost facility on Witchtrot Road that accepts a variety of items, including landscaping waste, food waste, appliances and electronics, scrap metal, and some fluid waste, among others. Materials are collected here and transported off-site. One day per year, York residents can dispose of hazardous waste, such as oil-based paints and other toxic fluids.[212] The facility is not at high risk of exposure to flooding, being inland and not in a flood zone.

Medical waste from York Hospital is sorted and treated separately from municipal solid waste. York Hospital has a contract with the company Stericycle, which removes the hospital's medical waste and incinerates it out of state.[213] The local vulnerability of this process is therefore most directly tied to potential flooding of roadways that would interfere with transportation of the medical waste. Similar to the Town's municipal solid waste contractor, any climate change impacts to Stericycle's disposal facilities could have cascading implications for the company's operations with York Hospital.

Food Security

Climate change may increasingly impact access to food for York residents. At the local level, most of York's food outlets (the places people buy food) are located in heat islands, as they are all in more developed areas along Route 1, in York Village, and in York Beach. More frequent high heat days are likely to put strain on the operations of food outlets, including higher cooling costs, and customers, especially those in groups more vulnerable to heat illness like older adults and children.

York's largest grocery store, Hannaford, is not at risk of exposure to flooding, though some of the town's smaller food outlets are. Three outlets, the Long Sands General Store, Oceanside Store, and York Beach Bucket, are at risk of exposure to flooding from SLR and storm surge (Table 12). These are the only food outlets in the York Beach area. One outlet, Anthony's Food Shop on Route 1, is at risk of exposure to flooding from the 100-year precipitation event.

Table 12. York Food Outlets at Risk of Exposure from SLR and Storm Surge.

Food Distributor	Address	SLR and Storm Surge Exposure	Estimate Flood Depth
Long Sands General Store	121 Long Beach Ave.	4 feet or more	0-2 feet
York Beach Bucket	9 Ocean Ave.	4 feet or more	0-2 feet
Oceanside Store	179 Long Beach Ave.	6 feet or more	0-2 feet

Source: FEMA. MGS. Google Maps.

[212] https://www.yorkmaine.org/DocumentCenter/View/295/Solid-Waste-and-Recycling-Guide-PDF
[213] Email communication with Robin LaBonte, Chief Financial Officer of York Hospital, 12/13/21.

Beyond direct impacts to food outlet locations, access by York residents and deliveries from regional food distribution warehouses could be disrupted by road closures during emergencies. This is notable because there are no major food distribution warehouses or distribution centers within York and, other than Hannaford, York's food outlets are small with limited stock capacity. Further, if food costs rise due to supply chain disruptions, this could increase food insecurity among lower-income residents in York.[214]

Coastal Resilience Infrastructure

At points along the coast of York, two types of structures have been engineered to protect the land from flooding and eroding due to waves and high tides. The first is rip-rap, a layer of piled, large rocks that absorbs the impact of waves and minimizes damage to the underlying sand or soil. The other type of coastal engineering utilized in York is a seawall, a solid structure with flat, often vertical, elements that similarly absorbs wave impact while holding the land behind it in place.[215]

Examples of rip-rap (top) and seawall (bottom) along Long Sands Beach.

[214] Cities of Portland and South Portland, "Climate Change Vulnerability Assessment," 108.
[215] https://www.nps.gov/articles/seawalls-bulkheads-and-revetments.htm

In addition to engineered coastal structures, dunes serve as a natural defense against flooding and erosion. There are several small stretches of dunes in York.

Small dunes at Cape Neddick Beach.

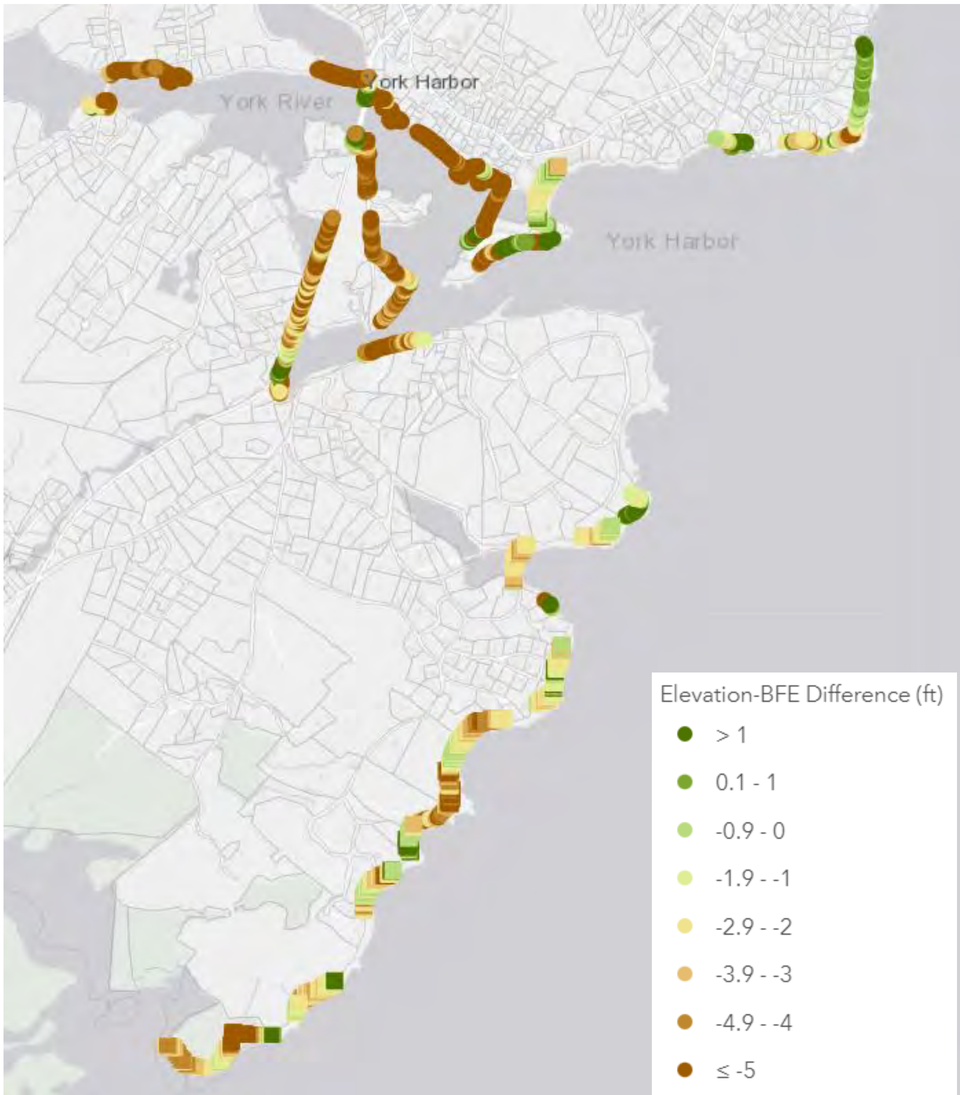
Coastal engineering is only fully functional if it is not overtopped by ocean water. To evaluate the effectiveness of Maine's coastal engineering structures, MGS analyzed the elevation of existing structures compared to the base flood elevation (BFE) of FEMA's predicted 100-year coastal flood.[216] In the four maps below (Figs. 31-34), darker brown points show where coastal structures are more vulnerable to being overtopped because the 100-year flood BFE is higher than the elevation of the structure. In reality, the structures are mostly continuous but they are represented in the maps as a series of round points in order to show variation in vulnerability at different points on the structure. The maps also show dune crests as square points. MGS's analysis reveals a number of places in York where coastal engineering and natural dunes are vulnerable to overtopping by the 100-year flood, including along the York River, Long Sands Beach, Short Sands Beach, Cape Neddick River, and Shore Road at Phillips Cove. Tracking the condition and functionality of York's coastal engineering structures is a key part of assessing vulnerability and determining where additional protection may be needed, including future vulnerability from SLR and more frequent extreme storms.

[216] https://www.maine.gov/dacf/mgs/hazards/csdciop/index.shtml

Figure 31. Coastal Engineering Structures (Circles) and Dunes (Squares) Elevation Above the 100-Year Flood BFE.

Source: MGS [Coastal Structure and Dune Crest Inventory and Overtopping Potential](), 2021. Esri.

Figure 32. Coastal Engineering Structures (Circles) and Dunes (Squares) Elevation Above the 100-Year Flood BFE: Southeast York and York River.



Source: MGS [Coastal Structure and Dune Crest Inventory and Overtopping Potential](), 2021. Esri.

Figure 33. Coastal Engineering Structures (Circles) and Dunes (Squares) Elevation Above the 100-Year Flood BFE: Long Sands Beach.

Source: MGS [Coastal Structure and Dune Crest Inventory and Overtopping Potential](), 2021. Esri.

Figure 34. Coastal Engineering Structures (Circles) and Dunes (Squares) Elevation Above the 100-Year Flood BFE: Short Sands Beach, Cape Neddick River, and York Cliffs.

Source: MGS Coastal Structure and Dune Crest Inventory and Overtopping Potential, 2021. Esri.

York Land Use/Zoning

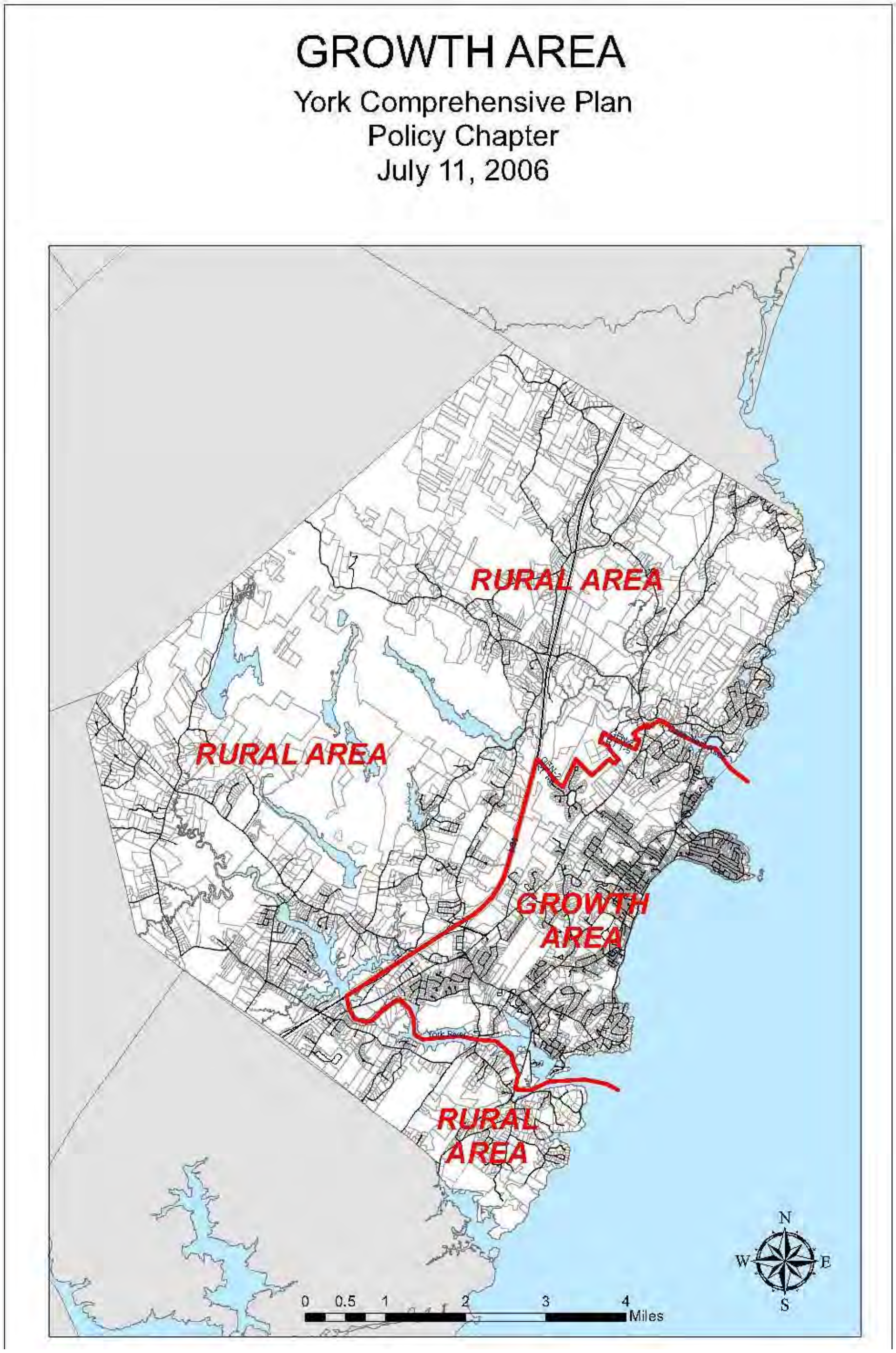
Historical patterns of settlement in York concentrated mostly along the coast in the villages. Patterns of existing land use and Town land use regulations shape how climate impacts affect the population of York, including residents, businesses, and visitors (the tourism economy).

Existing Land Use and Town Growth Boundary

Current zoning and land use regulations, along with public water and sewer service areas, reinforce traditional settlement patterns east of I-95. York's development patterns have traditionally centered on the villages along the Atlantic coast, and then later, expanding westward to the Route 1 corridor and I-

95. The York Water and Sewer Districts serve areas of town that roughly align with the Town of York Growth Area Boundary, adopted in the York Comprehensive Plan, 2006 (Fig. 35).

Figure 35. Town of York Growth Area.



Source: Town of York Planning Department.

The current Growth Area Boundary encourages growth and density between the coast and I-95 and the Cape Neddick and York Rivers. Approximately 42.6% (5,572 people out of 13,070) live within the Growth Area.[217] The area within the Growth Boundary contains all of the town's heat islands (this is where the densest development and most impervious surface/asphalt is located. In addition, much of the town's coastline (with associated SLR/Storm Surge climate risks) is in this Growth Area as well.

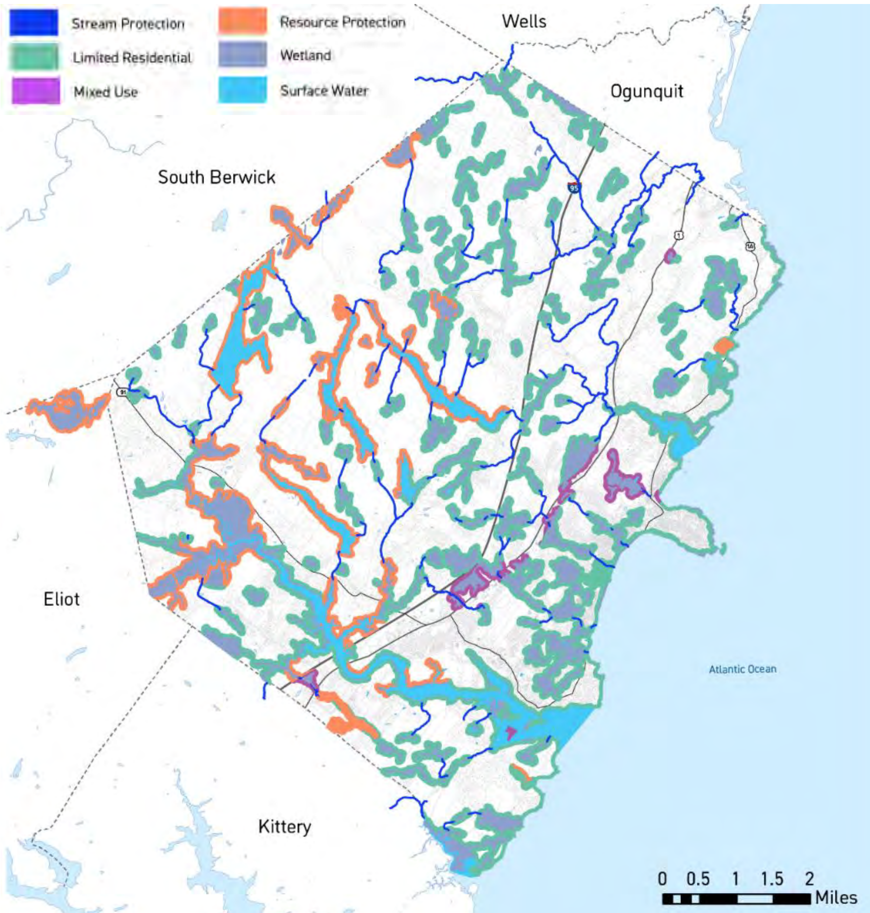
Shoreland Overlay District (Article 8)

The Shoreland Overlay District includes a 250-foot area surrounding water bodies, wetlands, and a 75-foot area surrounding protected streams. The Shoreland Overlay District specifies dimensional standards and permitted and prohibited land uses in the shoreland zone. Many uses require a permit from the Code Enforcement Officer (CEO). Resource protection sub-districts include resource protection (coastal wetlands, inland wetlands, map-designated areas, steep slopes, 100-year floodplain, bird habitat areas, and unstable bluffs), limited residential, mixed-use, and stream protection.[218]

It should be noted that some elements of the Town's Shoreland Overlay District map, shown in Fig. 36, are outdated and need to be updated. See Articles 3.8 and 8 of the York Zoning Ordinance[219] for full details about the Shoreland Overlay District, including language that supersedes what is shown on the map.

[217] This is a rough estimate as U.S. Census block groups don't quite align with the growth area boundaries. This estimate is based on the 2019 5-year American community Survey estimates.
[218] Town of York Zoning Ordinance, Amended 11/2/21, Article 8: Shoreland Overlay District, pg. 142.
[219] https://www.yorkmaine.org/DocumentCenter/View/902/Zoning-Ordinance-PDF

Figure 36. Shoreland Overlay District.



Source: Town of York OpenData, Maine GeoLibrary, USGS National Hydrography Dataset.

The purposes of the Shoreland Overlay District are:

- to further the maintenance of safe and healthful conditions;
- to prevent and control water pollution;
- to protect fish spawning grounds, aquatic life, bird and other wildlife habitat;
- to protect buildings and lands from flooding and accelerated erosion;
- to protect archaeological and historic resources;
- to protect commercial fishing and maritime industries;
- to protect freshwater and coastal wetlands;
- to control building sites, placement of structures and land uses;
- to conserve shore cover, and visual as well as actual points of access to inland and coastal waters;
- to conserve natural beauty and open space; and
- to anticipate and respond to the impacts of development in shoreland areas[220]

[220] Town of York Zoning Ordinance, 1.3.3.

The Town of York has an online mapping system[221] that, among other features, allows developers and property owners to explore the overlap of the Shoreland Zone and its sub-districts with existing unstable coastal bluffs, steep slopes, and areas with known archaeological sites. The York River Watershed Study Regulatory and Non-Regulatory Recommendations Report (SMPDC, May 2018) examined shoreland zoning across four towns in the York River watershed (York, Eliot, Kittery, and South Berwick). The Report states that York's shoreland zoning ordinance can be considered the most progressive of the four towns and contains multiple provisions that exceed the state minimums, including regulation of land use around all wetlands rather than just those required by the Mandatory Shoreland Zoning Act (MSZA).

Alignment with Climate Impact Considerations

The Shoreland Overlay District applies to all Atlantic coast properties within 250 feet from the water. The majority of these coastal properties are in the Shoreland Overlay "Limited Residential" Subdistrict with small, scattered areas in the "Stream Protection" Subdistrict and one area in the "Mixed-use" Subdistrict.

The Overlay District has dimensional requirements for lots (minimum lot size according to use, minimum shore frontage, minimum width, and maximum lot coverage regulations). Minimum lot size and shore frontage requirements are different for lots fronting tidal and non-tidal water bodies. For the most part, these Subdistricts mostly regulate uses, mentioning tidal and non-tidal fronting properties with respect to lot dimensional requirements only. The Shoreland Overlay District does not specifically address projected SLR or storm surge risks.

Coastal Resilience

York does not have a comprehensive coastal resilience ordinance (coastal resilience overlay) that addresses the Town's need to protect critical assets, including building values and the natural environment from climate change threats such as SLR, storm surge, coastal erosion, and associated flooding. Creating a model for such an ordinance is the current project of the SMPDC which is working with five Maine coastal communities (Kittery, Wells, South Portland, Tremont, Vinalhaven) to develop an ordinance[222] that addresses natural resources and the environment, buildings, and infrastructure in order to enhance climate resiliency in the state's coastal communities.

SMPDC's review of land use and zoning regulations as part of that project includes a comprehensive list of ordinances and considerations, as well as accompanying provisions, that enhance municipal climate resiliency (Fig. 37). While the Town has some land use and zoning regulations in place that contribute to climate change resiliency, York should consider a self-assessment and appropriate incorporation of model ordinances that come out of the SMPDC project into Town regulations as a next step toward increased coastal climate resilience.

---

221 https://www.axisgis.com/yorkme/

222 https://smpdc.org/index.asp?SEC=EB353312-031E-4651-8CE5-4B482BABB42A&DE=610B6C36-DB91-4ED7-BD39-96F98BC9EE91

Figure 37. Coastal Resilience Land Use and Zoning Regulations Review Criteria, SMPDC.

Land Use and Zoning Regulations	
Subcategory	Provision
Floodplain Management Ordinance	Present Advanced substantial development / improvement threshold Applies to areas outside of SFHA on FIRM? Advanced septic provisions
Septic Ordinance	Pump out and/or periodic inspection required
Shoreland Zoning Ordinance	Applicability beyond state requirements Subdistricts for special considerations
Wetlands	Wetland Protection Ordinance Marsh migration considered and/or mentioned
Stormwater Management	Low Impact Development (LID) requirements and/or standards Standards for post-construction stormwater management Advanced requirements via Site Plan Review
Subdivision Ordinance	Cluster, Open Space
District	Harbor Overlay District, Shipyard District, Harbor Shoreland District, Harbor Zoning District, or Wellhead Protection Overlay District
Resilience Overlay Zone	Present
Aquifer Protection Ordinance / District	Present
Budget and expenditure policies	Limit/prohibit municipal funds for development in existing/potential/future flood hazard areas, unless expressly for adaptation/resilience measures
Capital Improvement Planning	Integrate resilience into capital planning

Source: SMPDC Coastal Resilience Ordinance Review, January 2021.

York's Floodplain Management Ordinance

York's Site Plan and Subdivision Regulations lay out requirements for construction in the town's flood hazard areas:

When any part of a Site Plan or subdivision is located in a SFHA (Zones A, A1- A30, AE, AO, AH, V1-V30 and/or VE as identified by the Federal Emergency Management Agency), the plan shall indicate that all principal structures in the development shall be constructed with their lowest floor, including the basement, at least two feet above the 100 year flood elevation and that all other conditions of the Town of York Flood Management Ordinance shall be met. Such a restriction shall be included in the deed for any lot which is included or partially included in the flood hazard area.[223]

As per the table in Fig. 37 above, SMPDC suggests considering additional provisions for Floodplain Management Ordinances including:

- advanced substantial development/improvement threshold

[223] https://www.yorkmaine.org/DocumentCenter/View/694/Floodplain-Management-Ordinance-PDF

- applies to areas outside of SFHA or FIRM
- Advanced septic provisions

Vulnerability of Archaeological Sites, Historic District Parcels, Town Parks

Because of the Town's historic patterns of settlement, Historic Districts and archaeological sites are concentrated near the villages and Atlantic coastline and York and Cape Neddick Rivers, making them vulnerable to SLR/Storm Surge and flooding. SMPDC assessed the vulnerability of York's Historic District parcels, archaeological sites, and Town parks at varied levels of SLR/Storm Surge shown in the table in Fig. 38 below. Archaeological sites are most impacted by SLR/Storm Surge, with approximately 60% of sites impacted. Interestingly, there is very little difference between the number of sites and parcels impacted at the three SLR/Storm Surge levels studied (1.6, 3.9, and 6.1 Feet).

> Areas with the greatest impacts include York River, Cape Neddick, Long Sands Beach neighborhoods, and Short Sands Beach area along Ocean Avenue. The Fisherman's Walk and Cliff Walk, significant cultural and recreational resources, are also particularly vulnerable to flooding and erosion.[224]
>
> Impacted historic district parcels include those in the York Harbor and Lindsay Road Local Historic Districts. Most of the areas in York that are vulnerable to flooding are residential, with some commercial areas along Short Sands Beach and Ocean Avenue and around the harbor. The York Beach Village Center (YBVC) district is extremely vulnerable to coastal flooding.[225]

Historic buildings and parcels can be difficult to protect from climate change because of the sensitive nature of older materials, impracticality of moving buildings/taking structures out of historical context, and the costs involved. Protecting archaeological sites is just as challenging. Some areas are known sites that have not been fully explored and documented and risk loss from SLR/Storm Surge. Town parks will also be impacted by SLR/Storm surge but to a much lesser extent…with between 2-5% of park area affected.

Figure 38. Vulnerability of Archaeological Sites, Historic District Parcels, and Town Parks in York from 1.6, 3.9, and 6.1 Feet of SLR/Storm Surge.

Flooding Scenario	1.6 ft	3.9 ft	6.1 ft
Archaeological Sites	59%	59%	60%
Historic District Parcels (sq ft)	11%	12%	14%
York Municipal Parks (sq ft)	2%	3%	5%

Figure 28 *Subset of assets impacted by each of the three scenarios of sea level rise or storm surge in York.*

Source: SMPDC, Tides, Taxes, and New Tactics, July 2021

Information on natural areas and carbon sinks/sequestration potential for York lands is provided in the next section.

---

[224] SMPDC, "Tides, Taxes, and New Tactics," 29.
[225] SMPDC, "Tides, Taxes, and New Tactics," 33.

Natural Environment & Ecosystem Services Vulnerability

York's natural environment is a critical and defining feature of the town, providing recreation opportunities that make it an attractive place to live and visit, supporting a diversity of plant and animal life across different ecosystems, and benefiting the local economy via tourism and natural resources industries. Boasting beaches, coastal wetlands, forests, rivers, reservoirs, and more, much of York lies within three Focus Areas[226] of the Maine Natural Areas Program, which are designated for their "exceptionally rich concentrations of at-risk species and natural communities and high quality common natural communities, significant wildlife habitats, and their intersection with large blocks of undeveloped habitat."[227]

The impacts to York's natural environment from climate change will not only harm local ecosystems and the character and economy of the town, they will also destroy some of the best tools for climate change mitigation and resilience; the natural environment plays crucial roles in removing CO2 from the atmosphere and buffering the built environment against flooding and severe weather.

Coastal Erosion

Coastal or shoreline erosion occurs when storms, flooding, storm surge, SLR, and human-related activities wear away the rocks, soils, and/or sands along the coast over time. Erosion can occur due to an acute weather-related event or long-term change in the coastline. Erosion is a concern along York's Atlantic coast as well as the shorelines along its tidal rivers, including the York and Cape Neddick Rivers. The York River Study Committee reported that most of the York River archaeological sites recorded by Henry Mercer in 1891 has been destroyed due to shoreline erosion.[228]

The loss of York's natural shoreline to erosion will result in the loss of crucial ecosystem services, including flood protection, species habitats, and water filtration. The loss of natural barriers to erosion reduces their ability to buffer inland areas from storm surges, threatening adjacent properties and infrastructure and coastal ecosystems.[229] In addition, erosion destroys species habitats, impacts water filtration, and can steepen shorelines and increase the likelihood of abrupt landslides or chronic land loss.[230] SLR and high storm tides are both projected to induce additional flooding that can increase the frequency of erosion.

Analysis conducted for the Maine Climate Council projected future erosion of York County's beaches and dunes under different SLR scenarios (Tables 13 and 14). With 1.6 feet of SLR, 42% of the county's dry beach (above the high tide line) and 55% of its dunes will be at risk of inundation. Dunes that have been developed are especially at risk (84%). With 3.9 feet of SLR, 75% of dry beach and 92% of dunes are

---

226 Mt. Agamenticus, York River Headwaters, and Brave Boat Harbor and Gerrish Island Focus Areas.

227 https://www.maine.gov/dacf/mnap/focusarea/index.htm

228 York River Watershed Stewardship Plan. Prepared by the York River Study Committee. August 2018. http://www.yorkrivermaine.org/wp-content/uploads/2018/09/York-River-Watershed-Stewardship-Plan-August-2018.pdf.

229 Cities of Portland and South Portland, "Climate Change Vulnerability Assessment."

230 Eastern Research Group, "Cost of Doing Nothing Analysis," https://www.maine.gov/future/sites/maine.gov.future/files/inline-files/ERG_MCC_AssessingImpactsClimateChangeMaine_Summary.pdf, 48; Troy, 2012.

projected to be lost. Eastern Research Group (ERG) has estimated the ecosystem service value of Maine's beaches and dune at about $105,000 per acre.[231]

Table 13. York County Dry Beach Loss with SLR.

SLR Scenario	Remaining Dry Beach (Acres)	Lost (Acres)	% Lost
Existing	143	-	-
1.6 feet	82	61	42%
3.9 feet	36	107	75%
9 feet	2	141	99%

Source: Adapted from Slovinsky (2020, unpublished). Maine Climate Council Scientific and Technical Subcommittee, Scientific Assessment of Climate Change and Its Effects in Maine, 131.

Table 14. York County Dune Inundation Under Three SLR Scenarios.

Scenario	Undeveloped Dune Area (acres)	Developed Dune Area (acres)	Total Dune Area (acres)
Existing	819	724	1543
1.6 feet SLR Inundation	239 (29.1%)	607 (83.8%)	846 (54.8%)
3.9 feet SLR Inundation	721 (88.0%)	694 (95.8%)	1415 (91.7%)
8.8 feet SLR Inundation	771 (94.1%)	722 (99.7%)	1493 (96.8%)

Source: Adapted from Slovinsky (2020, unpublished). Maine Climate Council Scientific and Technical Subcommittee, Scientific Assessment of Climate Change and Its Effects in Maine, 131.

Water Resources

Pollution from Stormwater Runoff

Stormwater runoff is generated from rain and snowmelt that flows over the land and is not absorbed into the ground, either because a surface is impervious, such as a road, or the soil of over-saturated. Runoff accumulated with pollutants, sediment, and bacteria often flows in lakes, rivers, streams, and coastal waters if not captured by stormwater infrastructure. In developed areas like York, common sources of stormwater pollution are pet waste, failed septic systems, lawn fertilizer, trash, and fuel and oil from cars and boats.[232]

---

[231] Eastern Research Group, "Cost of Doing Nothing Analysis," 48; Troy, 2012 (2018$ adapted from 2011$).
[232] Cities of Portland and South Portland, "Climate Change Vulnerability Assessment."

With York's projected increase in rainfall and more frequent and intense flooding events, a greater volume of stormwater carrying these pollutants containing high concentrations of nutrients and other harmful substances will end up in the town's natural water resources. Excess nutrients in York's waters can promote shifts to less-desirable species like invasive species, cyanobacteria, and toxin-producing algal species.[233] Pollutants and bacteria can harm aquatic life and make water unsafe for swimming, resulting in closures to beaches and other swimming areas.

The Maine Healthy Beaches (MHB) program, which coordinates routine monitoring of Maine's coastal saltwater beaches, states that "moderate to heavy rainfall is often associated with an increased risk of bacterial contamination at the beach."[234] Maine uses an EPA-approved threshold of 104 colony-forming units of bacteria per 100 milliliters of water for determining if a beach is safe for swimming. Beach advisories are either contamination advisories, which are issued due to elevated bacteria results from testing, or precautionary rainfall advisories, which are issued pre-emptively based on local precipitation, typically following one or more inches of rainfall in a 24-hour period. Beaches are not often closed as a result of a single exceedance of the bacterial safety threshold; closures are often based on a known contamination or chronic, unsafe conditions related to elevated bacteria levels. The decision to post an advisory or close a beach is based on a beach's Risk Assessment Matrix.[235] In 2021, York beaches were under pre-cautionary rain advisory for 19 total days and York Harbor Beach was under contamination advisory for 3 total days. There were no beach closures in York in 2021.[236]

York also contains several important reservoirs that supply drinking water to the YWD and KWD systems and are vulnerable to water quality issues from increased stormwater runoff. More information about York's reservoirs and potential climate impacts can be found in the "Infrastructure and Built Environment Vulnerability: Water Infrastructure" section.

Harmful Algal Blooms

Harmful algal blooms (HABs) occur when toxin-producing algae grows out of control in fresh or marine water bodies. HABs can cause serious illness and sometimes death in people and animals when they release toxins into the surrounding water or air. People can be exposed to toxins from a HAB by swimming or drinking the water, breathing in airborne toxins near the water, and eating fish that has been exposed to the toxin. HAB toxins cannot be destroyed by cooking contaminated seafood or boiling contaminated water. HABs in coastal marine waters, commonly referred to as "red tide," can contaminate shellfish and make them unsafe to eat.[237] Both toxic and non-toxic algal blooms can also be damaging to aquatic ecosystems by depleting oxygen levels and blocking sunlight from underwater plants.[238]

Climate change is expected to impact the range, frequency, and severity of HABS, as well as increase associated illnesses in people. Among the climate impacts that can promote growth in HABs are higher water and air temperatures and more frequent heavy rainfall that increases the concentration of algae-

---

[233] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine."
[234] https://www.maine.gov/dep/water/beaches/monitoring.html
[235] https://www.maine.gov/dep/water/beaches/monitoring.html
[236] https://www.maine.gov/dep/water/beaches/beach-status.html
[237] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine."
[238] https://www.epa.gov/nutrientpollution/effects-dead-zones-and-harmful-algal-blooms

boosting nutrients like nitrogen in water bodies via stormwater runoff. Within the past decade, the Gulf of Maine has experienced blooms of new species of HABs, which may have been transported and stimulated by the climate-induced incursion of Gulf Stream waters into the Gulf of Maine. However, there is a lack of consensus about the future projection of HABs in the Gulf of Maine, with some research suggesting higher water temperatures will reduce toxic blooms in southern Gulf waters in favor of non-toxic species.[239] Regardless, the State of Maine has indicated that robust monitoring of HABs in freshwater and marine environments and their associated public health impacts should be a priority.[240]

Acidification

Ocean acidification caused by CO2 emissions, nutrient-laden runoff, and algal blooms threaten the health of coastal habitats and wildlife.[241] Higher levels of CO2 reduce the amount of minerals, particularly calcium, in the ocean and inhibit the ability of organisms to build healthy calcium carbonate shells. With thinner or dissolved shells, these organisms, which include clams, scallops, mussels, and sea urchins, lose protection and often experience health impairments. Increases in ocean acidity can also compromise the functionality and health of many types of fish and invertebrate species. Larvae lose the ability to avoid predators or develop properly, affecting the growth and proliferation of adult populations.[242]

Future changes in the Gulf of Maine like increased temperatures and water salinity will intensify acidification processes, threatening the larger ecological systems and complex food web that exist.[243] In addition, increased mixing of fresh water from melting arctic ice, more frequent extreme precipitation and runoff events, and increasing average annual rainfall will make the region more sensitive to the effects of acidification.[244]

Marshes and Marsh Migration

Tidal marshes are coastal wetlands built by successive generations of marsh plants and grasses interwoven with tidal creeks and pools. Marshes exist in transition zones between uplands and the open ocean, serving as a vital habitat for many species and a natural buffer from coastal flooding and storm waves. In addition, marshes can filter runoff and excess nutrients, minimize the impacts of erosion, and sequester large quantities of GHGs from the atmosphere. Due to these benefits and the sensitivity of tidal areas to climate hazards, understanding how marsh communities may respond to SLR is key for preservation and restoration efforts.[245]

There are approximately 926 acres of coastal wetlands in York. However, as sea levels rise, this will likely change as marshes migrate and lose suitable habitat. Both an increase in sea levels and the intensity and frequency of storms will affect location and extent of marshes. As storm surges and strong winds

---

[239] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine."
[240] Maine Climate Council. "Maine Won't Wait."
[241] Fernandez et al. "Maine's Climate Future 2020 Update.".
[242] https://www.epa.gov/ocean-acidification/effects-ocean-and-coastal-acidification-marine-life.
[243] Fernandez et al. "Maine's Climate Future 2020 Update.".
[244] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine."
[245] Cities of Portland and South Portland, "Climate Change Vulnerability Assessment."

eliminate more coastal forest canopy, SLR and flooding suppress forest regeneration and favor the expansion of low-lying salt marshes inland into previously forested areas. This process of marsh migration occurs naturally, but climate change factors can accelerate and simulate additional migration.[246]

On the other hand, SLR can cause marsh loss or marsh conversion when adjacent lands are steep or developed like much of York's coast, which prevents further inland migration. As a result, salt marshes turn into open water or mudflats, impacting plant and animal habitats and reducing protection for inland areas from storm surge. While coastal development prevents marshes from shifting, infrastructure that crosses tidal wetlands like roads, bridges, dams, and railroads can also interfere with marsh resilience by disrupting tidal flows and increasing water velocity.[247] Loss of marshes is problematic from resilience and mitigation standpoints, as sequestration rates from coastal wetlands, known as "blue carbon," are even greater than terrestrial ecosystems like forests.[248] Mcleod et al. (2011) calculated that salt marshes sequester more than 40 times more carbon per square meter than temperate forests.[249]

By understanding the potential for migration of tidal marshes into new areas, steps can be taken to preserve these areas and allow passive migration to minimize tidal marsh losses from sea level rise. MGS has mapped[250] potential marsh migration along the coast of Maine for scenarios of 1, 2, 3.3, and 6 feet of SLR. Table 15 shows the potential marsh migration area in York for each of these scenarios. With 6 feet of SLR, the potential marsh migration area in York represents approximately 68% of the town's current total coastal wetland area of 926 acres. Most of the potential marsh migration area is along the York River, where the majority of York's marshes are today (Fig. 39). Other areas with some potential for marsh migration are Brave Boat Harbor and the Cape Neddick River (Figs. 40 and 41).

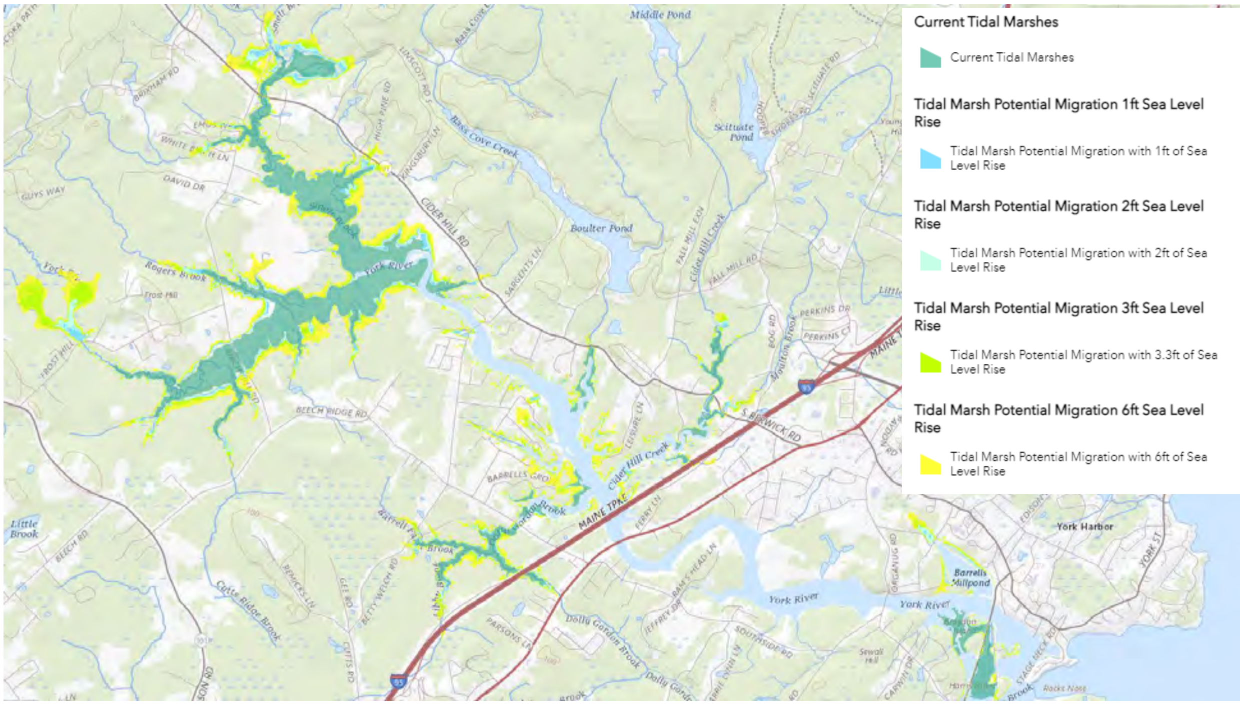
Table 15. Potential Marsh Migration Area in York in Four SLR Scenarios

SLR Scenario	Potential Marsh Migration Area (Acres)
1 ft	86.46
2 ft	174.82
3.3 ft	310.12
6 ft	628.74

Source: Data from Maine Geological Survey.

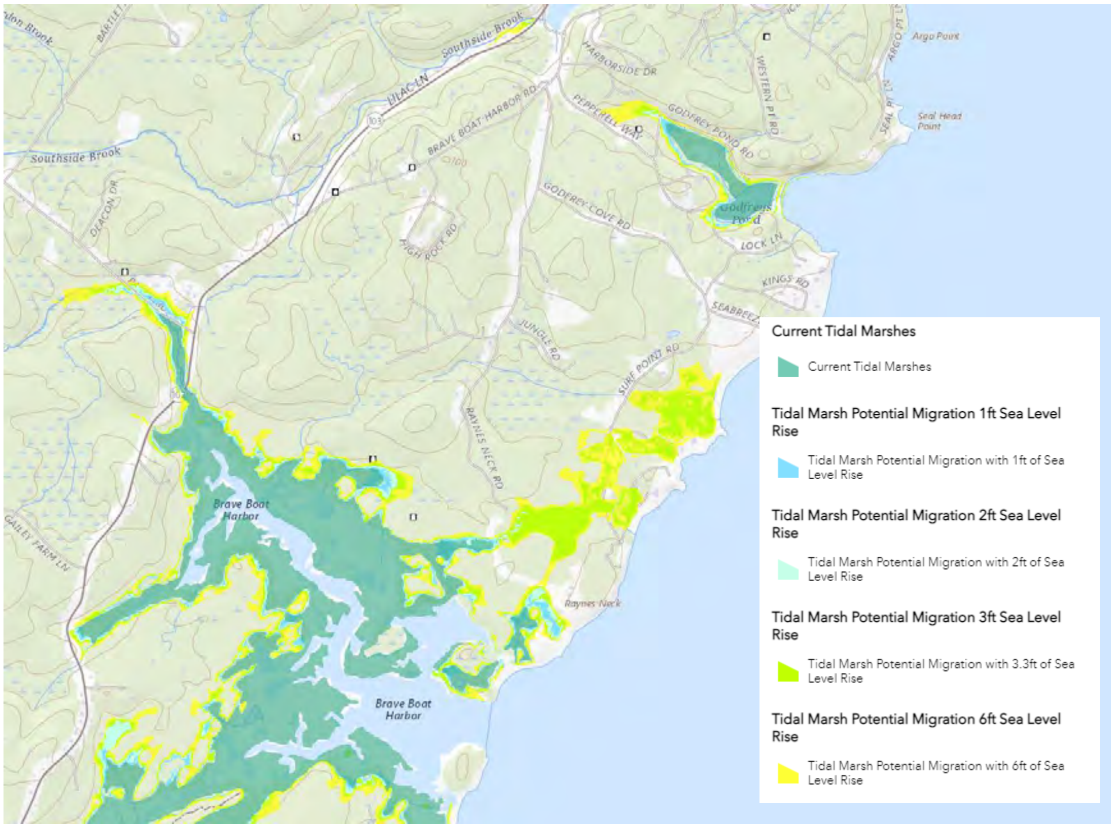
246 Cameron, Donald and Slovinsky, Peter A., "Potential for Tidal Marsh Migration in Maine" (2014). Geology Documents. 145. https://digitalmaine.com/geo_docs/145
247 Cities of Portland and South Portland, "Climate Change Vulnerability Assessment."
248 Eastern Research Group and Synapse Energy Economics, "Summary Report," https://www.maine.gov/future/sites/maine.gov.future/files/inline-files/ERG_MCC_AssessingImpactsClimateChangeMaine_Summary.pdf, 10
249 Mcleod, E., Chmura, G.L., Bouillon, S., Salm, R., Björk, M., Duarte, C.M., Lovelock, C.E., Schlesinger, W.H. and Silliman, B.R. (2011), A blueprint for blue carbon: toward an improved understanding of the role of vegetated coastal habitats in sequestering CO2. Frontiers in Ecology and the Environment, 9: 552-560. https://doi.org/10.1890/110004.
250 https://www.maine.gov/dacf/mnap/assistance/marsh_migration.htm

Figure 39. York River Potential Marsh Migration.



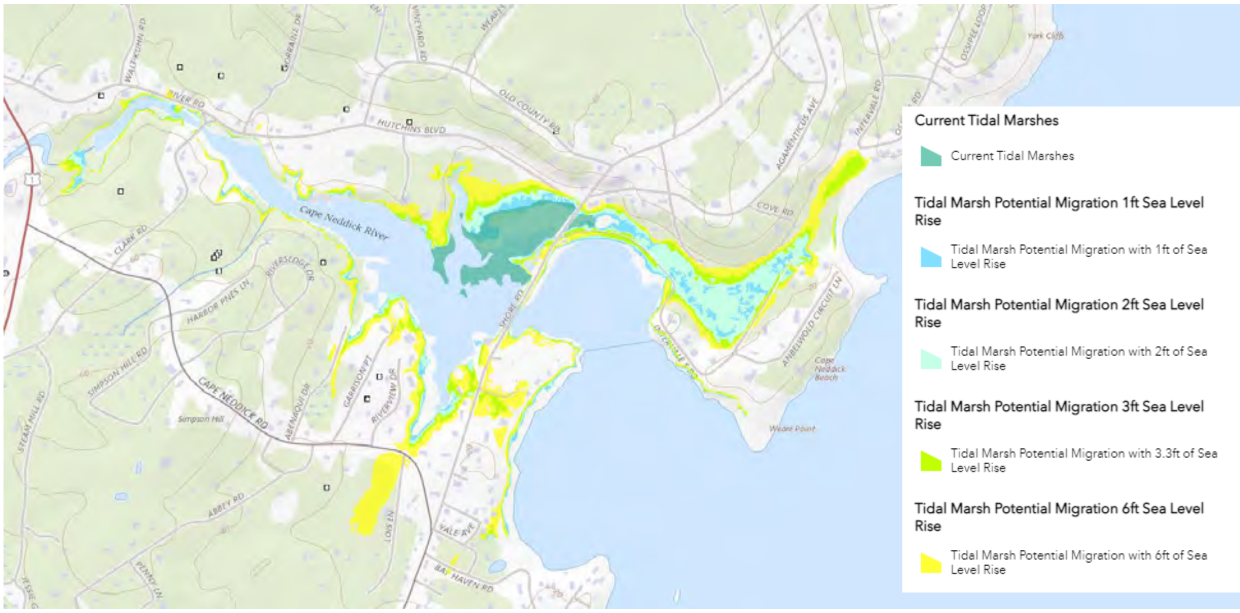
Source: Maine Geological Survey. https://www.maine.gov/dacf/mnap/assistance/marsh_migration.htm

Figure 40. Brave Boat Harbor Potential Marsh Migration



Source: Maine Geological Survey. https://www.maine.gov/dacf/mnap/assistance/marsh_migration.htm

Figure 41. Cape Neddick River Potential Marsh Migration



Source: Maine Geological Survey. https://www.maine.gov/dacf/mnap/assistance/marsh_migration.htm

Forests

More extreme precipitation events, less continuous and more variable snowpack, and warmer temperatures are all expected to pose significant threats to trees, forest ecosystems, and forest management in Maine.[251] Years of high heat and low growing season precipitation may stifle growth of seedling and saplings; however, longer growing seasons and increased CO2 concentrations can promote overall growth of trees. Warmer temperatures and droughts are likely to encourage spread of key forest pests and increase risk of tree mortality. Forests will also be more vulnerable to wildfires with higher temperatures and increased variation in fuel moisture.[252]

Forests also uniquely store carbon by taking in carbon from atmospheric CO2 through photosynthesis, turning it into various organic compounds, and returning carbon to the atmosphere as CO2 when the organic matter is decomposed. Interest in using forest's ability to reduce atmospheric GHG concentrations has gained traction, but recent studies underscore the importance of providing financial incentives to drive management alternatives and more extensive monitoring and measuring of carbon cycling in Maine.[253]

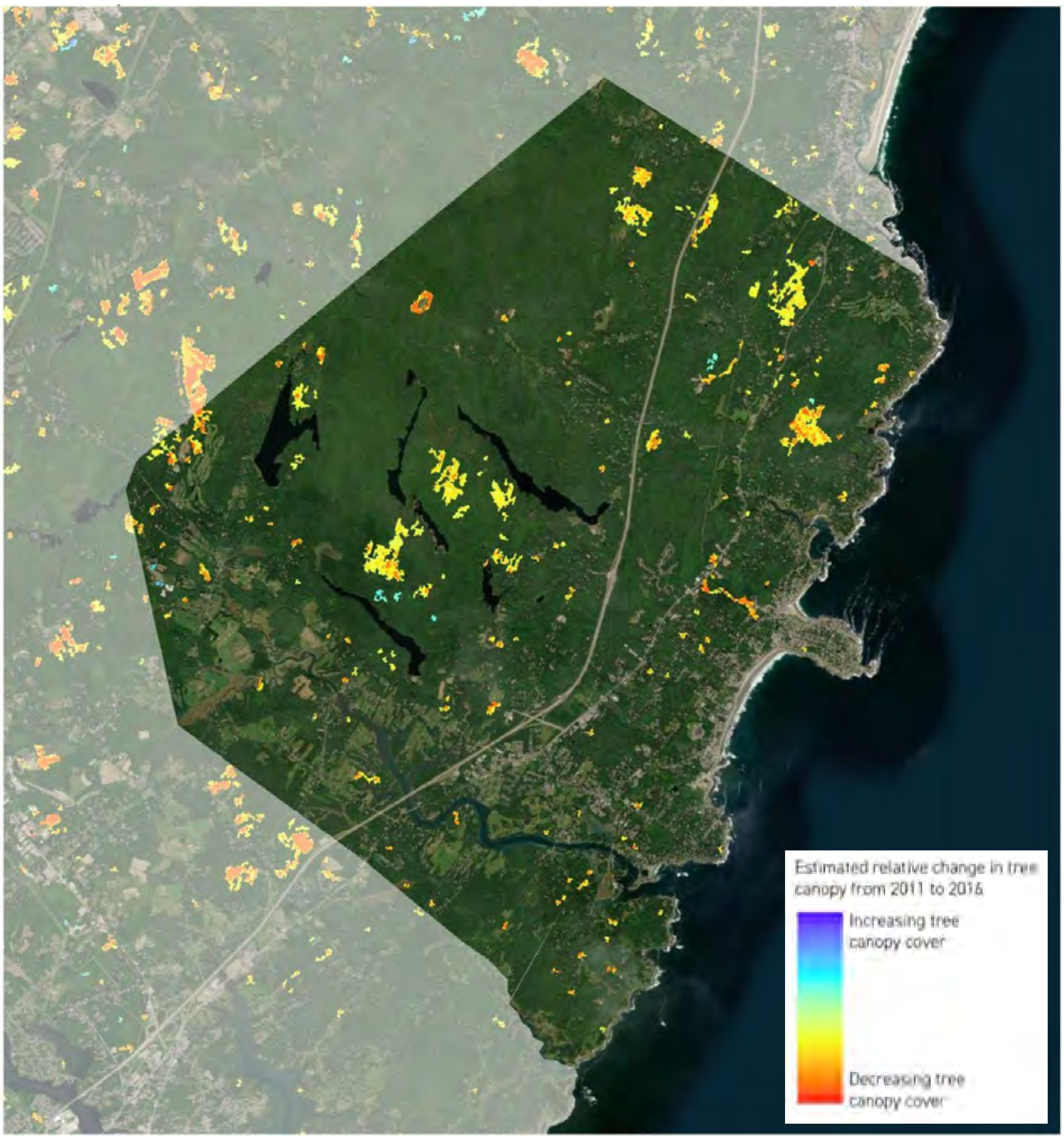
---

[251] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine."
[252] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine."
[253] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine."

The longer-term effects of climate change on forests in Maine continue to remain uncertain. As new factors arise in the landscape and process of change become apparent, the complex interactions that occur in Maine forests require more research and monitoring.

Approximately 60% of the land area in York is covered by forest, much of which is conserved land or controlled by the York and Kittery water districts. While minimal, Fig. 42 shows that between 2011 and 2016 tree canopy cover declined in several pockets in the town.

Figure 42. Change in Tree Canopy Cover in York Between 2011-2016.



Source: National Land Cover Database (NLCD) 2011 to 2016 Tree Canopy Change, August 31, 2019; Esri World Data Imagery; Town of York Open Data.

Shifting Species Composition

Forests

In Maine's forest ecosystems, changes in temperature, precipitation, atmospheric concentrations of CO2, and other air pollutants are projected to affect species composition. While forests will continue to be abundant, the composition and growth patterns of trees in the future will continue to change. Southern Maine is dominated by oak/pine forests composed of red oak, eastern white pine, red maple, eastern hemlock, white ash, and several hickories. Along coastal areas of Southern Maine, forests are also often abundant in wetland areas, containing species like Atlantic white cedar, ash, and hemlock.[254] As a transition zone, York's forests also include a mix of more northern softwood species, including spruce and fir.[255] Already in lower abundance in York, these northern softwood species are likely to decline in the future due to less snow and warmer winter temperatures.[256] On the other hand, hardwoods like oak and maple are projected to tolerate regional changes adequately,[257] while American beech is projected to substantially increase in abundance partly due to higher temperatures and precipitation.[258]

Maine currently has some of the highest densities of non-native forest pests in the US, and climate change and human behavior are expected to increase pest populations in the next decade. Warmer winter temperatures and increased variation in precipitation can expand the range and intensity of pest infestation in forest ecosystems. Most notably, the Southern Pine Beetle and Hemlock Wooly Adelgid die at extreme cold temperatures (between -20 to -30 °C) and proliferate when winters are warmer, affecting forest health and productivity. Exotic pests like Emerald Ash Borer can also threaten key cultural aspects of forests.[259] Beech bark disease can also become more prominent during warmer winters and drier summers.[260] In addition, drought can increase risks of tree mortality and gypsy moth defoliation due to reduced parasitic fungal infections.[261]

Hemlocks are experiencing ever increasing threats from the Wooly Adelgid. The changing patterns of weather due to climate change – including longer durations of drought and warmer temperatures – further stress the hemlocks, making them more susceptible to the Wooly Adelgid. Without immediate and widespread interventions, hemlocks – an important foundation species – could disappear throughout all of the northeastern US.[262] The disappearance of hemlocks would have a cascading impact as they play a significant role in managing and regulating the larger ecosystem and the plant and animal habitats that have evolved within that system.

---

[254] United States Department of Agriculture. Maine Forests. 2013. https://www.fs.fed.us/nrs/pubs/rb/rb_nrs103.pdf.
[255] Natural Resources Chapter of the York Comprehensive Plan dated 11.5.2013
[256] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine."
[257] https://www.nrs.fs.fed.us/pubs/55635
[258] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine."
[259] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine."
[260] http://onlinelibrary.wiley.com/doi/10.1111/j.1439-0329.2011.00742.x/abstract
[261] https://portal.ct.gov/-/media/CAES/DOCUMENTS/Gypsy_Moth/Gypsy-Moth-Fact-Sheet-Update-2019.pdf
[262] https://grist.org/science/the-northeasts-hemlock-trees-face-extinction-a-tiny-fly-could-save-them/

Marine Species

The Gulf of Maine has historically had a subarctic ecosystem that supports fish such as the Atlantic cod and Atlantic herring, right and humpback whales, and seabirds like Atlantic puffins and tern species. However, climate change impacts like SLR, warmer temperatures, ocean acidification, and increased precipitation are likely to pose challenges to the health of these ecosystems and species that live within them. Climate change is expected to shift species composition, alter marine and coastal food webs, and make these coastal ecosystems less resilient to other stressors like invasive species, habitat destruction, and elevated nutrient levels.[263]

Most notably, increases in ocean temperatures will prompt many cold-water species in the Gulf to move northward and expand the geographic ranges of warm-water species. Shallow-water fish like Atlantic herring, winter flounder, haddock, and alewife are migrating northeast along the continental shelf, while others are shifting to cooler deeper waters in the southwestern Gulf. Right whales are having fewer calves and moving further north as well.[264]

Among Maine's cold-water species, Atlantic salmon are particularly sensitive to climate change during their time in freshwater and transition to saltwater as smolts. For species which primarily inhabit lakes and ponds like Eastern brook trout, Arctic charr, lake whitefish, and lake trout, warming temperatures are often coupled with other anthropogenic threats like pollution and introduction of invasive species, impeding the fish species' ability to adapt and migrate. Atlantic cod are also highly vulnerable to warming waters, with populations already declining in the Gulf and some shifting northward to waters in Canada.[265]

Several fish species expected to find new habitat in the Gulf include Atlantic croaker, black sea bass, blue fish, butterfish, longfin squid, scup, windowpane flounder. These species are more accustomed to warmer waters and less vulnerable to changes in their environment.[266] The American lobster has become significantly more abundant in the Gulf in recent years, with populations shifting up the New England coast to water temperatures of 12-20 °C. Compared to 10,000 metric tons/yr of lobsters landed in the 1950s, Maine's lobster harvest has increased to six times that amount since the late 1980s. However, it is important to note the long-term impacts of warming, which can lead to measurable declines in female size maturity, suffocation due to limited oxygen, and mass die-offs from heat waves.[267]

Invasive Species

In both terrestrial and marine habitats, climate change can open up invasion widows of harmful species. Invasive plants and wildlife are often more tolerant of environmental changes and can more quickly adjust to new climates compared to native species. In Maine's forests, invasive plants can develop self-sustaining populations, reduce habitat, affect forest regeneration, and outcompete native species for

[263] Cities of Portland and South Portland, "Climate Change Vulnerability Assessment."
[264] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine."
[265] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine."
[266] Fernandez et al. "Maine's Climate Future 2020 Update.".
[267] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine."

nutrients, water, sunlight, or pollinators. In addition, warming temperatures appear to increase the harmful capacity of invasive weeds and earthworms.[268]

Warmer temperatures and increasing nutrients in water bodies will likely favor the proliferation of invasive species in marine ecosystems as well. Increasing nutrients from stormwater will shift biota in aquatic ecosystems to invasive species, cyanobacteria, and possibly toxin-producing harmful algal bloom species. Green crabs, Asian shore crabs, tunicates and invasive seaweed are common invasives that will continue to threaten marine ecosystem health.[269]

Recreation

Summer Recreation

Climate change will affect York residents' ability to enjoy the natural summer recreation amenities the town has to offer. Most notably, SLR and storm surge will erode beaches and dunes, tides will be higher, and the amount of dry beach area will shrink. This means there will be fewer opportunities to use the beaches and more crowding if the same number of visitors have less space and shorter tidal windows. Higher average summer temperatures and more extreme heat days will also impact residents' enjoyment of beaches as well as trails and other outdoor recreation areas in York. Further, higher temperatures will result in greater abundance and activity of disease-spreading ticks and mosquitoes, which will have public health implications and generally be of nuisance in wooded recreation areas. More information about vector-borne disease can be found in the "Health Vulnerability" section.

Winter Recreation

Over the last century, late winter snowpack has changed significantly, decreasing in density and depth. Snowmelt-related runoff is occurring earlier and will continue to do so.[270] Lake ice-out dates, or days when a lake is free of ice, have also increased by an average of 4.5 days per year over the last 75 years, with larger changes occurring in southern Maine.[271] Warmer temperatures (particularly during March-April), increased winter rain, and associated changes to regional snowpack are all projected to impact winter recreation. Seasons for winter sports like skiing, snowboarding, ice fishing, and snowmobiling will be shorter, snowmaking will become more customary, and operating costs will increase.

Carbon Sinks

While we often discuss the impacts that climate change will have on the natural environment, natural areas also represent one of our greatest opportunities for mitigating GHG emissions because of their ability to remove CO2 from the air through carbon sequestration.

---

[268] Fernandez et al. "Maine's Climate Future 2020 Update.".

[269] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine."

[270] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine."

[271] Hodgkins, G.A. The importance of record length in estimating the magnitude of climatic changes: an example using 175 years of lake ice-out dates in New England. Climatic Change 119, 705–718 (2013). https://doi.org/10.1007/s10584-013-0766-8

Land Area Inventory

To understand the capacity of York's natural environment, a land area inventory was conducted of York's potential carbon "sinks," the land uses that sequester carbon. The inventory was conducted for 1996 and 2016, using land cover data from the National Oceanic and Atmospheric Administration (NOAA).[272] The following carbon sinks were included in the inventory:

> **Agricultural/open grasslands:** Cultivated lands, grasslands, pasture, and shrubland
>
> **Forested areas:** Deciduous, evergreen, and mixed forests
>
> **Estuarine wetlands:** Tidal wetlands where saltwater and freshwater ecosystems meet, such as salt marshes
>
> **Palustrine wetlands:** Inland, primarily, freshwater wetlands that may be either heavily vegetated, like forest swamps, or "open" wetlands with less dense vegetation, like open floodplains.

Table 16 shows the land area inventories for 1996 and 2016, as well as the gross area change and percent change for each of the land use types. The carbon sink classes are listed from top to bottom in order of their relative carbon sequestration rates (i.e., estuarine wetlands sequester the most carbon per acre and agricultural/open grasslands sequester the least carbon per acre). These are general rankings as, in reality, carbon sink potential can vary by individual location and based on a number of factors. These tabulations should be considered first-order proxies for interim use while the State of Maine completes its statewide inventory of carbon stocks, the results of which are expected in 2023 (strategy E, Goal #2 of the Maine Climate Council's *Maine Won't Wait* report).[273]

[272] C-CAP Regional Land Cover and Change. NOAA. https://coast.noaa.gov/digitalcoast/data/ccapregional.html.
[273] https://www.maine.gov/future/sites/maine.gov.future/files/inline-files/MaineWontWait_December2020.pdf.

Table 16. Town of York Carbon Sink Inventory, 1996 and 2016.

Category	Carbon Sink Class	1996 Area (Acres)	2016 Area (Acres)	Change in Area (Acres)	% Change
Carbon Sink	Estuarine Wetland	926.09	925.64	-0.44	0.0%
	Palustrine "Forested" Wetland	6,259.82	6,264.86	5.04	0.1%
	Palustrine "Open" Wetland	291.48	270.21	-21.28	-7.3%
	Forested Areas	21,582.08	21,357.16	-224.92	-1.0%
	Agricultural/Open Grassland	1,707.70	1,737.00	29.30	1.7%
	Total	**29,841.08**	**29,629.23**	**-212.30**	**-0.7%**
Not Carbon Sink	High Intensity Developed	150.47	162.70	12.23	8.1%
	Medium Intensity Developed	592.54	624.12	31.58	5.3%
	Low Intensity Developed	2,530.61	2,621.70	91.09	3.6%
	Developed Open Space	855.50	927.77	72.28	8.4%
	Unconsolidated Shore	242.96	242.30	-0.67	-0.3%
	Bare Land	100.80	103.69	2.89	2.9%
	Total	**4,472.88**	**4,682.28**	**209.41**	**4.7%**

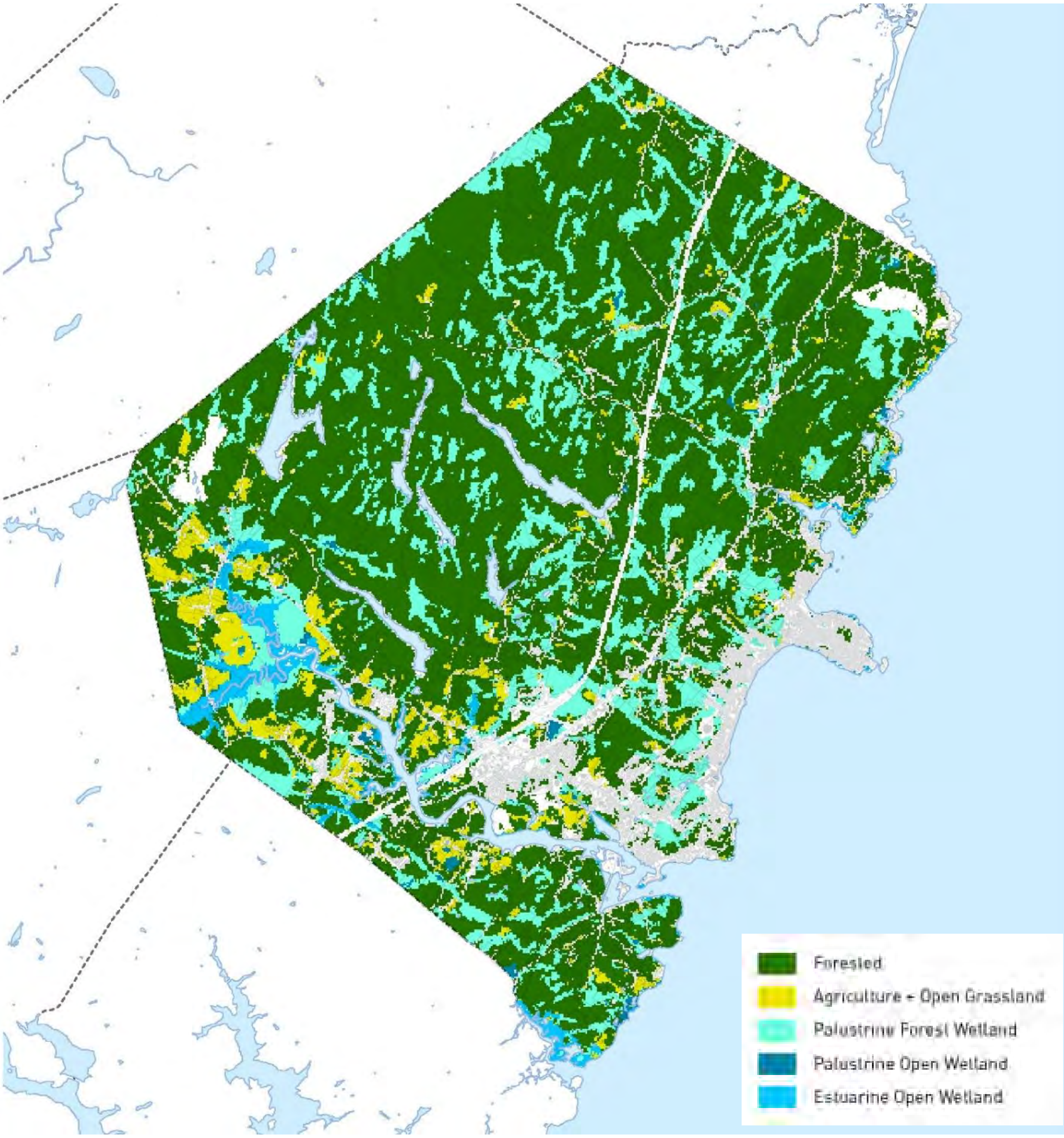
Source: Land coverage percentages were generated using NOAA's land use GIS data (2016 and 1996 NOAA C-CAP Regional Land Cover); relative rankings of carbon sink potential were based on McLeod et al 2011 (https://esajournals.onlinelibrary.wiley.com/doi/full/10.1890/110004).

The inventory revealed that approximately 87% of the land area in York (not including open water) was covered by potential carbon sinks in both 1996 and 2016. Over these 20 years, about 212 acres of potential carbon sink area was lost, though this represents less than a 1% total decline. The greatest gross loss from any carbon sink category was 225 acres from forested areas, a 1% decrease. Perhaps most notable was the loss of approximately 21 acres of open palustrine (inland freshwater) wetlands; though not as large of a gross loss as forested areas, this represented a 7% loss of area of these wetlands. Positively, the total area of estuarine, or tidal, wetlands remained approximately the same between 1996 and 2016. It is unclear if marsh migration contributed to this. Both agricultural/open grassland and forested palustrine wetlands had minor gains.

Almost all of the nearly 210 acres of non-carbon sink land area gained between 1996 and 2016 was due to development, with a mix of high, medium, and low intensity development, as well as developed open space. Low intensity development is the most prevalent development type in York, suggesting that many property owners may be able to make individual changes on their private land to increase their carbon sink potential of their land by minimizing hard surfaces and adding more vegetation. The approximately three-acre difference between carbon sink area lost and non-carbon area gained could suggest that this land was lost due to encroachment of open water or could be a small statistical anomaly between the datasets for the two years.

Fig. 43 shows a map of the distribution of each of the carbon sink land cover classes in 2016.

Figure 43. Potential Carbon Sink Land Cover in the Town of York.



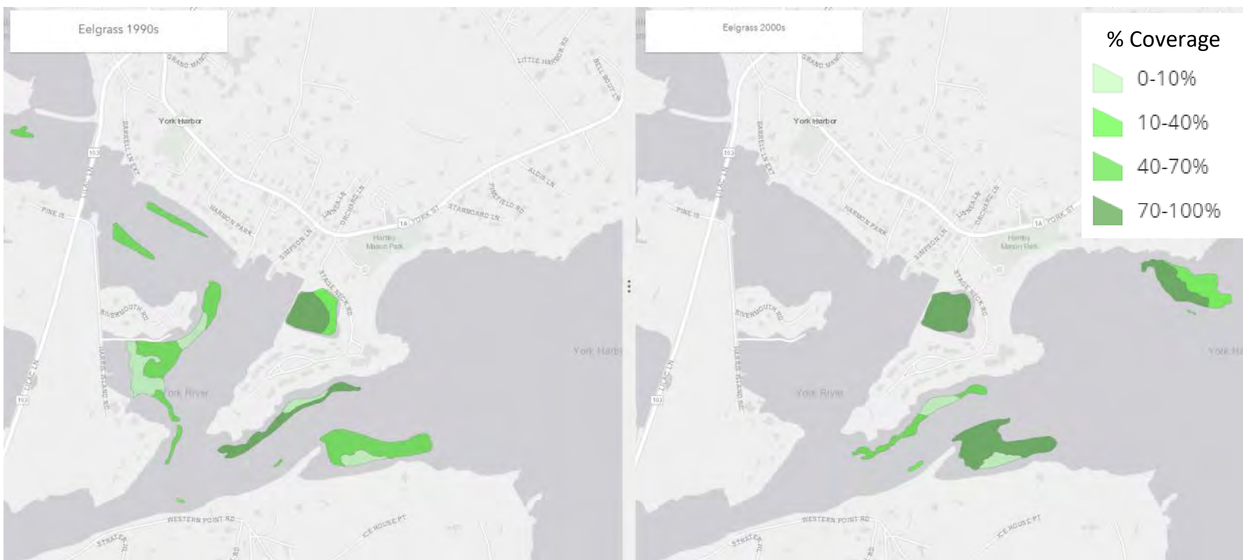
Sources: [2020 Town of York OpenData](), [Maine Geolibrary](), [USGS National Hydrography Dataset](), [2016 NOAA C-CAP Regional Land Cover]().

Eelgrass

Another important carbon sink in York's natural environment is eelgrass, a marine plant that grows in beds in shallow waters of the shore. Like tidal marshes, eelgrass is a strong "blue carbon" that can absorb and store carbon at much higher rates than most other carbon sinks. Eelgrass also provides other important ecosystem services, such as habitats and spawning areas for marine species, food for migratory birds, buffers against shoreline erosion, and water filtration and removal of excess nutrients.[274]

Eelgrass beds were mapped of the coast of York in 1993 and 1995 and again in 2010. Between the 1990s and 2010, York's eelgrass beds shrunk from about 18 acres to about 13.5 acres.[275] In the 1990s eelgrass was present in York Harbor, Cape Neddick Harbor, and Brave Boat Harbor. By 2010 Brave Boat Harbor's eelgrass had disappeared and there was some migration of beds in the other harbors. Figs. 44-46 show how eelgrass conditions changed between 1993/95 and 2010. In July 2021, the State of Maine approved legislation requiring the mapping of eelgrass beds, as well as salt marsh vegetation, to be updated to be updated every five years, starting no later than 2027 for York's coastal waters.

Figure 44. York Harbor Eelgrass Coverage, 1990s and 2000s



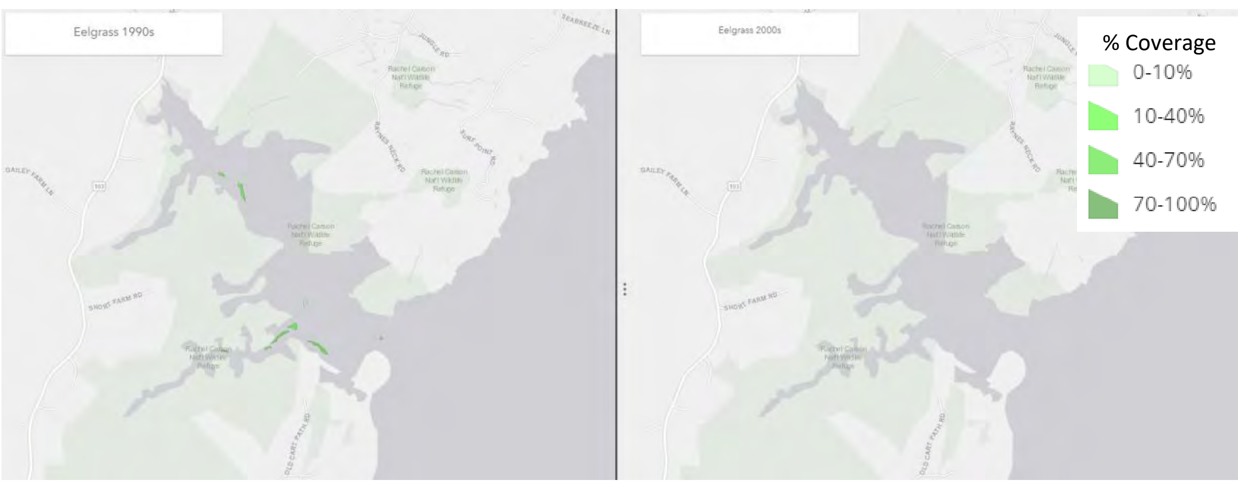
Source: Maine Department of Marine Resources. https://maine.maps.arcgis.com/apps/MapSeries/index.html?appid=ac2f7b3d29b34268a230a060d6b78b25&entry=2

[274] https://hhltmaine.org/eelgrass-mapping/
[275] Maine Department of Marine Resources Open Data.

Figure 45. Cape Neddick Harbor Eelgrass Coverage, 1990s and 2000s

Source: Maine Department of Marine Resources.
https://maine.maps.arcgis.com/apps/MapSeries/index.html?appid=ac2f7b3d29b34268a230a060d6b78b25&entry=2

Figure 46. Brave Boat Harbor Eelgrass Coverage, 1990s and 2000s



Source: Maine Department of Marine Resources.
https://maine.maps.arcgis.com/apps/MapSeries/index.html?appid=ac2f7b3d29b34268a230a060d6b78b25&entry=2

Economic Vulnerability

Business & Industry

Climate impacts can negatively affect the business economy directly by damaging property as well as indirectly by altering environmental conditions, especially for industries that rely on natural resources.

Flooding from SLR/Storm Surge

Of the direct climate impacts, flooding from SLR/storm surge is the greatest threat to physical business locations. Reporting from SMPDC projects that 21 businesses in York would be directly impacted by 3.9 feet of SLR/storm surge and 30 businesses by 6.1 feet of SLR/storm surge, in turn affecting 188 and 259 jobs, respectively (Table 17).[276] Businesses in the restaurant, accommodations, and services industries are most at risk in the 6.1-foot scenario; about 7% of economic output and 24% of employment impacted are within the restaurant industry alone.[277]

Table 17. York Businesses and Employment Impacted Under Two Flooding Scenarios.

Flooding Scenario	3.9 feet	6.1 feet
Number of businesses directly impacted in York	21	30
Employment numbers in impacted businesses	188	259
Impacts as % of total employment in York	2.3%	3.2%

Source: SMPDC, Tides, Taxes, and New Tactics, 2021.

Impacts to businesses in the 3.9-foot and 6.1-foot flooding scenarios translates to an estimated $150,000 and $240,000 lost, respectively, in annual non-land tax revenue for the Town of York[278] (Table 18). This does not include state or federal taxes.

Table 18. Lost Town of York Tax Revenue from Businesses Impacts Under Two Flooding Scenarios.

Flooding Scenario	3.9 feet	6.1 feet
Sales/Excise Tax Lost (meal, lodging, and "sin" taxes)	$2,200	$3,500
Commercial Property Tax Lost (business property tax other than land)	$146,300	$233,100
Other Taxes Lost (licenses and fees)	$2,600	$4,100
Total Taxes Lost	$151,100	$240,700

Source: rbouvier Consulting, Economic Analysis of SLR: Kennebunk, Wells, and York, 2020.

[276] SMPDC, "Tides, Taxes, and New Tactics," 32.
[277] SMPDC, "Tides, Taxes, and New Tactics," 32.
[278] rbouvier Consulting, Economic Analysis of SLR: Kennebunk, Wells, and York, 13.

Fishing/Lobstering

Commercial fishing, primarily lobstering, has long been important to the local and state economy and culture. With climate change, warming water temperatures and changes in stream flows threaten the productivity and distribution of Maine's wild capture fisheries. Warmer temperatures often shift the geographical range and distribution of species, bringing more lucrative species up the coastline, squeezing out cold-water species, or providing opportunities for invasive species to thrive. More information about impacts to species can be found in the "Natural Environment & Ecosystems Vulnerability: Shifting Species Composition" section.

On average, the weight and value of lobster harvested in York have been increasing for over a decade, with nearly 700,000 pounds of lobster harvested in 2020 worth more than $3 million.[279] Additionally, the local lobster dealers employ many people at their facilities. The growth in lobster harvesting productivity over this time can be at least partially attributed to ocean warming that has expanded lobster habitat in Maine in recent years. However, continued warming is likely to push lobster populations farther north and decrease productivity, a trend that Connecticut and Rhode Island have experienced over the past 10-15 years (Table 19). In the waters off the coast of these states, over 30% of lobsters have epizootic shell disease, which is caused by high water temperatures.[280] Warming can also lead to measurable declines in female size at maturity, suffocation due to declines in oxygen in seawater, and mass die-offs during ocean heat waves.[281] Based on current warming trends, some projections estimate that by 2050 lobster abundance in Maine will decline by 45%.[282] Communities in southern Maine, like York, are most at risk of losses to the lobstering industry.[283]

Beyond the fisheries themselves, climate change will affect York's commercial fishing industry through impacts to infrastructure and access to working waterfront areas, including York Harbor. More information about the impacts of SLR and storm surge on York Harbor can be found in the "Infrastructure & Built Environment Vulnerability: Transportation" section.

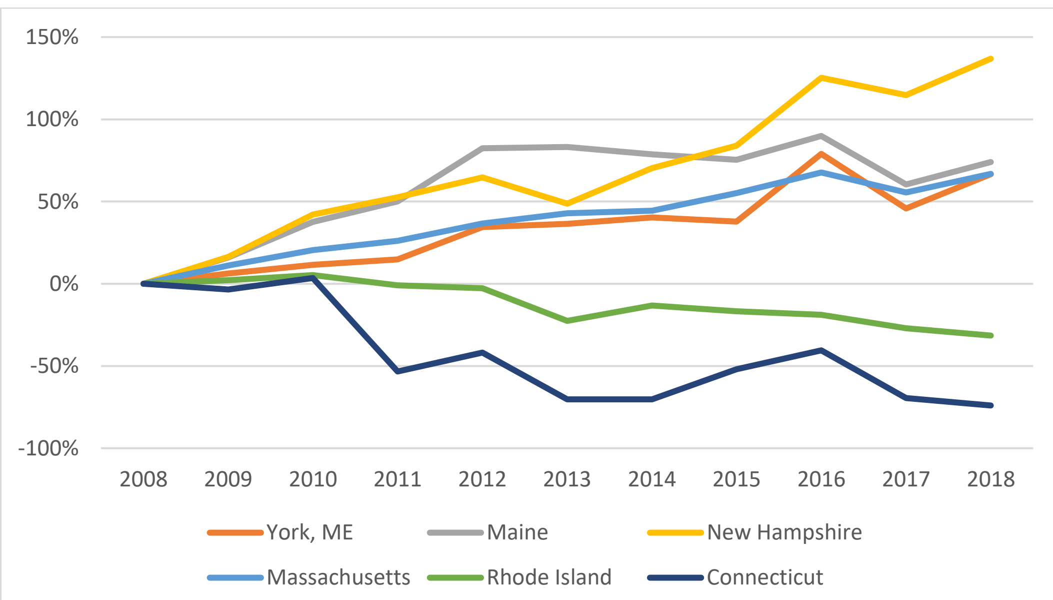
[279] Maine DMR Landings Data, accessed 10/26/21
[280] Eastern Research Group, "Cost of Doing Nothing Analysis,"63.
[281] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine."
[282] Eastern Research Group, "Cost of Doing Nothing Analysis," 62; Le Bris et al., 2018)
[283] Eastern Research Group, "Cost of Doing Nothing Analysis,"

Table 19. Lobster Landings, 2004-2018 (millions of lbs.).

Year	York, ME[1]	Maine[2]	New Hampshire[2]	Massachusetts[2]	Rhode Island[2]	Connecticut[2]
2004	N/A	71.574	2.851	11.676	3.059	0.647
2005	N/A	68.730	2.364	11.291	3.175	0.714
2006	N/A	75.346	2.357	12.100	3.752	0.793
2007	N/A	63.987	2.469	10.046	2.300	0.569
2008	0.495	69.909	2.568	10.607	2.782	0.427
2009	0.526	81.124	2.987	11.790	2.842	0.412
2010	0.552	96.244	3.648	12.772	2.929	0.442
2011	0.568	104.957	3.919	13.385	2.754	0.199
2012	0.666	127.464	4.229	14.486	2.706	0.248
2013	0.675	128.016	3.818	15.159	2.156	0.127
2014	0.695	124.941	4.375	15.313	2.413	0.127
2015	0.682	122.686	4.722	16.450	2.316	0.205
2016	0.886	132.750	5.782	17.785	2.260	0.254
2017	0.722	112.171	5.514	16.493	2.031	0.130
2018	0.825	121.654	6.083	17.697	1.906	0.111

Data Source: [1]Maine Department of Marine Resources Landings Data. https://mainedmr.shinyapps.io/Landings_Portal/. [2]Eastern Research Group, Assessing the Impacts Climate Change May Have on the State's Economy, Revenues, and Investment Decisions: Volume 2: Cost of Doing Nothing Analysis, 2020.

Figure 47. Change in Annual Weight of Lobster Landings over 2008.



Source: Data Source: [1]Maine Department of Marine Resources Landings Data. https://mainedmr.shinyapps.io/Landings_Portal/. [2]Eastern Research Group, Assessing the Impacts Climate Change May Have on the State's Economy, Revenues, and Investment Decisions: Volume 2: Cost of Doing Nothing Analysis, 2020.

Agriculture & Forestry

Agriculture and forestry represent small parts of the York economy, but these industries have the potential to be greatly impacted by several aspects of climate change. Forested areas and farms[284] are particularly vulnerable to drought, which, in addition to decreasing water uptake, can cause insect and disease outbreaks on stressed trees and crops and increase fire risk.[285] Increasing temperatures and changing weather and precipitation patterns will influence the types of tree species and crops that grow in York, growth rates, and the timing of growing seasons, which will have economic implications on these industries if farmers and foresters are not able to adapt their practices. For agriculture particularly, additional risks include earlier growth being killed by spring frost and damage from more frequent heavy rain and flooding.

Warmer temperatures and a longer growing season can benefit yields and survivability of many Maine crops, but their utility is dependent on frost dates. Increases in precipitation intensity and frequency during the growing season can cause localized flooding in fields, increase losses of planted crops, and increase soil erosion and compaction. Increased variability in water and temperature can also bring reduced predictability and underscore the need for technology tools for climate change adaptation.[286] Between 2011 and 2018, 31% and 6% of tree fruit crop insurance payments in Maine from the US Department of Agriculture (USDA) were for excess or deficient water, respectively[287] (Fig. 47).

---

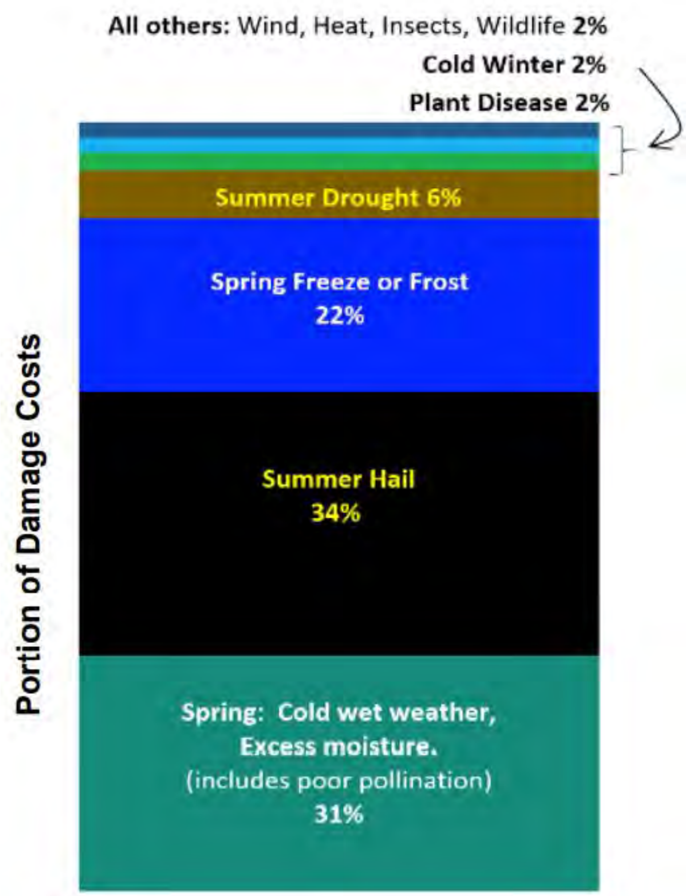
[284] The State of Maine Current Use Program database indicates that there are 876 acres in the tree growth tax credit program and a total of 887 acres (308 farmland and 579 woodland) in the farmland tax credit program in York. This is private land and doesn't include land in nonprofit conservation or Water District lands. Source: 2019 Municipal Valuation Return Statistical Summary, State of Maine, Maine Revenue Service, Property Tax Division, https://www.maine.gov/revenue/sites/maine.gov.revenue/files/inline-files/2019mvrstats.pdf

[285] Clark, J.S. et al. (2016), The impacts of increasing drought on forest dynamics, structure, and biodiversity in the United States. Glob Change Biol, 22: 2329-2352. https://doi.org/10.1111/gcb.13160.
James M. Vose, et al., Ecohydrological implications of drought for forests in the United States, Forest Ecology and Management, Volume 380, 2016, Pages 335-345, https://doi.org/10.1016/j.foreco.2016.03.025.

[286] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine."

[287] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine."

Figure 48. Distribution of USDA Tree Fruit Crop Insurance Payments in Maine, 2011-2018.



Source: Roche and Koehler, 2019. Maine Climate Council Scientific and Technical Subcommittee, 2020.

Adapting to a changing climate can often place added financial stress on smaller farmers, but new conditions can also provide opportunities for alternative practices. Wetter and drier conditions can force farmers to establish raised bed systems, divide fields in smaller parcels, add berms, plant fast-growing turf grass species to protect against erosion, select drought-resistant pasture grasses, and adopt strategies to enhance soil conditions like installing irrigation systems and using cover crops.[288]

Tourism

Beach Loss

In addition to their protection against climate impacts, York's natural amenities are an important driver of the Town's tourism economy. Collectively, the coastal communities in York County attracted over 13 million visitors in 2018.[289] Seasonal residents, vacationers, and day-trippers who come to York for its

[288] Fernandez et al. "Maine's Climate Future 2020 Update.".
[289] Eastern Research Group and Synapse Energy Economics, "Summary Report," 12

natural amenities spend money at local businesses, which supports a vibrant business community, employment, and local tax revenue. The loss of natural amenities due to climate change will make York a less attractive place to visit and threaten the tourism economy the Town currently relies upon.

York's beaches are its most valuable natural amenity from a tourism perspective, and are at high risk from SLR. An analysis conducted for the Maine Climate Council estimated the amount of dry beach (above the high tide line) in York County that will be lost at different SLR scenarios and how this will affect the number of visitors and tourist spending (Table 20).[290] At 1.6 feet of SLR, which the Climate Council considers likely by 2050, the study estimates that York County will lose over 40% of its dry beach area, which will result in more than 1 million less visitors and more than $130 million less spent by tourists per year. At 3.9 feet of SLR, which is possible by 2050 under a high emissions scenario and likely by 2100 under a lower emissions scenario, this jumps to 75% dry beach loss and a loss of over 6 million visitors and $765 million in spending annually. With 8.8 feet of SLR, possible by 2100 under a high emissions scenario, nearly all of the dry beach area and $1.7 billion in spending are estimated to be lost. It should be noted however, that there is still much unknown about how tourist behaviors will change in response to climate impacts, especially if beaches in other parts of Maine and New England (which would serve as alternative options) are suffering similar impacts.[291]

Table 20. Estimated Tourism and Spending Loss in York County from Dry Beach Loss.

SLR Scenario	% Total Dry Beach Loss	Estimated % Lost Attendance	Estimated # of Tourists Lost	Estimated Annual Spending Loss (2018$)
1.6 feet	42%	8%	1.1 Million	$136 Million
3.9 feet	75%	45%	6.1 Million	$765 Million
8.8 feet	98%	98%	13.3 Million	$1.7 Billion

Eastern Research Group, Assessing the Impacts Climate Change May Have on the State's Economy, Revenues, and Investment Decisions: Volume 2: Cost of Doing Nothing Analysis, 2020.

Loss of Seasonal Housing

Further threatening York's tourism economy is that the York Beach area, which has a high percentage of seasonal housing, is particularly vulnerable to flooding from SLR and storm surge. According to SMPDC's July 2021 report *Tides, Taxes, and New Tactics*, the two block groups encompassing most of this area have 1842 residences, of which nearly 80% are unoccupied year-round, meaning they are primarily seasonal. At 6.1 feet of SLR, these block groups have the highest assessed property value that will be impacted.[292] When factoring in storm surge, these properties are vulnerable at even lower levels of SLR. While seasonal residents are typically higher income and may have more capacity to adapt to flooding, there will be significant economic implications if flood risk and impacts lead many to locate elsewhere outside of York.[293]

[290] Eastern Research Group, "Cost of Doing Nothing Analysis," 48-50; Dickson, Slovinsky, & Kelley, in preparation.
[291] rbouvier Consulting, Economic Analysis of SLR: Kennebunk, Wells, and York, 20.
[292] SMPDC, "Tides, Taxes, and New Tactics," 34.
[293] SMPDC, "Tides, Taxes, and New Tactics," 33.

Increasing Summer Temperatures

While there are no specific projections or estimates, it is reasonable to assume that increasing summer temperatures will have some implications for the tourism economy in York. However, the direction and degree of the impact is uncertain due to unknowns about how tourist behaviors will respond to climate change. One possibility is that hotter temperatures will cause current seasonal residents and visitors to seek out other, milder destinations, which would damage the local economy. However, it is also possible that the number of seasonal residents and visitors will continue to increase as temperatures become even hotter and less attractive in more southern destinations. This scenario would likely benefit the local economy, but would produce other implications for York and its residents, including more traffic congestion and higher home prices.

Property Value & Tax Base

Climate impacts can negatively affect property values, and thus property tax revenue, directly by damaging land and property as well as indirectly by influencing real estate and migration patterns.

In York's case, flooding and flood risk will have the greatest direct and indirect impacts on property value and, as a coastal town, flooding from SLR and storm surge in particular. Diminishing property values have already been observed in coastal communities; a study conducted in Miami found that properties expected to flood during a tidal flood in the next 15 years were declining in value by over $3 per square foot annually. Homes within a quarter mile of a road expected to flood in 15 years were similarly declining in value.[294] The same methodology was applied to Portland and South Portland, Maine, with estimates of cumulative property value losses of $701,833 and $460,033, respectively, between 2005 and 2019.[295]

The consultant used the following methodology to estimate direct at-risk land and property value in York for combined SLR/storm surge scenarios of 1.5, 4, 6, and 9 feet (Table 21):

1. Parcels were selected based on intersection with SLR extent on the MGS GIS layers.
2. Parcels were then evaluated in each SLR scenario in two categories: parcels where building footprint intersects SLR extent, and parcels where buildings *do not* intersect SLR extent.
3. Land Value affected and Building Value affected were then calculated separately:
    a. Building Value:
        i. For parcels where building intersects with SLR extent, full value of building is considered affected. Full value was used as the default as there is no way to calculate extent of loss and consistency in applying criteria across all parcels was desired.
        ii. For parcels where building does not intersect with SLR extent, no value of building is considered affected.
    b. Land Value

[294] McAlpine, S.A. & Porter, J.R. (2018). Estimating Recent Local Impacts of Sea-Level Rise on Current Real-Estate Losses: A Housing Market Case Study in Miami-Dade, Florida. Population Research and Policy Review. 37(6): 871-895.
[295] Cities of Portland and South Portland, "Climate Change Vulnerability Assessment," 101

    i. Land value affected is calculated directly based on percentage coverage of parcel by SLR extent (i.e. if 20% of parcel is covered by SLR extent, then 20% of land value is affected).

4. In cases where parcel is in both the intersected and non-intersected categories (i.e. potentially caused by multiple buildings on site, and not all buildings intersecting with SLR extent), full building value is considered affected and parcel is counted as intersected. Land value was checked for duplicates in the Assessor Database to ensure value was only counted once in cases where buildings and land are listed multiple times.

Note: This valuation differs from the SMPDC valuation of loss of property value and tax base because additional information was available at the time of this assessment (GIS building footprint data for the Town of York) than what was available to SMPDC at the time of its study.

Table 21. Town of York Property Value and Taxes at Risk with 1.5, 4, 6, and 9 Feet of SLR/Storm Surge.

Flooding Scenario	1.5 feet	4 feet	6 feet	9 feet
Total # of parcels at risk	817	1351	1672	1939
Assessed Value at risk	$120 Million	$420 Million	$630 Million	$900 Million
% of Townwide Assessed Value at Risk	2.50%	8.70%	13%	18.90%
Property Taxes at Risk*	$1,332,000	$4,662,000	$6,993,000	$9,990,000
% of 2020 Town Budget at Risk (based on property taxes at risk)	5.9%	20.8%	31.2%	44.6%

**Based on 2020 municipal tax rate of $11.10 per thousand. Data Source: Town of York Assessor's data. Chart and analysis adapted and updated from Tides, Taxes, and New Tactics, SMPDC.*

Flood Insurance and Expenses

In addition to property value loss, increased risk of flooding from climate change means more York property owners will have higher flood-related expenses. For Maine properties at risk of financial loss from flooding in 2021, First Street Foundation estimates average annual losses to be $3,398 per property. For these same properties, projected average annual losses will grow to $3,755 in 2051 because of changing climate conditions that will increase the likelihood of flooding.[296] This does not suggest that all York property owners in a flood zone will have this expense each year; because it is an average, in a given year some will have much higher expenses while others will have none. However, as risk of flooding increases with climate change, the chances of any property owner having flood-related expenses goes up.

As the risk of flood-related damage and expenses continues to increase, so too will the cost of flood insurance, which all homes and businesses within a high-risk flood area (SFHA) with a government-backed mortgage are required to have[297] (see "Increasing Precipitation and Heavy Rainfall: FEMA Flood

[296] First Street Foundation, "The Cost of Climate: America's Growing Flood Risk," February 2021, https://assets.firststreet.org/uploads/2021/02/The_Cost_of_Climate_FSF20210219-1.pdf, 56.
[297] FloodSmart. "Who's required to have flood insurance?" https://www.floodsmart.gov/am-i-required-have-flood-insurance.

Maps" section for more information on SFHAs). Properties in a high-risk flood area that have previously received federal disaster assistance are also required to have flood insurance to be eligible for future federal disaster aid.[298]

Flood insurance policy holders in York can already expect rates to increase in the near future: by April 2022 all new and existing policies will be subjected to an updated FEMA rating methodology, Risk Rating 2.0, that will raise rates for most.[299] In York, 64% of all current policy holders are expected to see increased rates; 48% up to $120 per year and 16% greater than $120. Among single-family home policy holders in York, 82% are expected to have rates increased; 71% up to $120 per year and 11% greater than $120 per year. The reason for this increase is that FEMA has historically underestimated the cost of flooding, resulting in a nearly $40 billion deficit for the National Flood Insurance Program (NFIP) over the past 50 years ($60 billion collected in premiums, $96 billion in costs).[300]

First Street Foundation suggests that even these insurance rate increases do not meet the true cost of flooding. The Foundation calculated the average expected annual damage cost per Maine property within a SFHA to be $4,381, while the average insurance premium for these properties is only $1,285.[301] Flood risk and cost outside of SFHAs has also been historically underestimated; only 2% of policies are for properties outside of SFHAs, yet these policies account for 20% of all NFIP claims and receive 33% of federal disaster assistance for flooding.[302] If flood insurance rates within and outside of SFHAs were raised to accurately value risk and expected costs, property values of at-risk properties would depreciate significantly.[303]

It should be noted that York is a participant in FEMA's Community Rating System (CRS), a voluntary incentive program that recognizes and encourages community floodplain management practices that exceed the minimum requirements of the NFIP.[304] Flood insurance premium rates are discounted in CRS communities to reflect the reduced flood risk resulting from the community's efforts.[305] CRS communities are rated on a scale of 1-10, with 1 being the best rating.[306] As of October 1, 2021, York had a rating of 7; flood insurance policy holders in a SFHA received a 15% discount and policy holders outside of a SFHA received a 5% discount.[307]

---

298 FloodSmart. "Who's required to have flood insurance?"
299 https://www.fema.gov/flood-insurance/risk-rating.
300 https://www.fema.gov/sites/default/files/documents/fema_rr-2.0-equity-action_0.pdf.
301 First Street Foundation, "The Cost of Climate: America's Growing Flood Risk," 57.
302 First Street Foundation, "The Cost of Climate: America's Growing Flood Risk," 57.
303 First Street Foundation, "The Cost of Climate: America's Growing Flood Risk," 57.
304 Email communication with Amber Harrison, Director of Code Enforcement and CRS Coordinator, York, ME. January 13, 2022.
305 https://www.fema.gov/floodplain-management/community-rating-system
306 Email communication with Amber Harrison, Director of Code Enforcement and CRS Coordinator, York, ME. January 13, 2022.
307 https://www.fema.gov/sites/default/files/documents/fema_october-2021-crs-eligible-communites.pdf

Health Vulnerability

Extreme Heat

Exposure to high heat is linked to a number of negative health impacts, including heat stroke and effects on fetal health, and it can make existing respiratory and diabetes-related conditions worse. Older residents are especially at risk.[308] In addition to the dangers of high heat itself, heat waves often produce stagnant air that traps pollutants and reduces air quality.[309] Air conditioning is one of the best ways to prevent heat-related health impacts, but its prevalence in Maine buildings is much lower than most of the country because of historically mild summer temperatures.[310] Increasing regularity of high heat days means York residents and businesses currently without air conditioning will be burdened financially by new equipment and energy costs, and those without access to air conditioning will be increasingly vulnerable to high heat exposure.

The maps below illustrate locations of relative heat severity in York, or heat islands. The map shows more severe heat islands in the more densely populated and developed areas along the coast between York Harbor and the Cape Neddick River, with additional areas along the Route 1 corridor. These areas contain more roads and parking lots, larger buildings, and more densely located development than other parts of the town; these built structures absorb and re-emit more heat than natural landscapes.[311] Further removal of trees for development can limit opportunities for shade.

When mapped with affordable/senior housing, schools, healthcare, and community services, the map illustrates that most of these assets are heat islands, further exacerbating increases in air temperature.

---

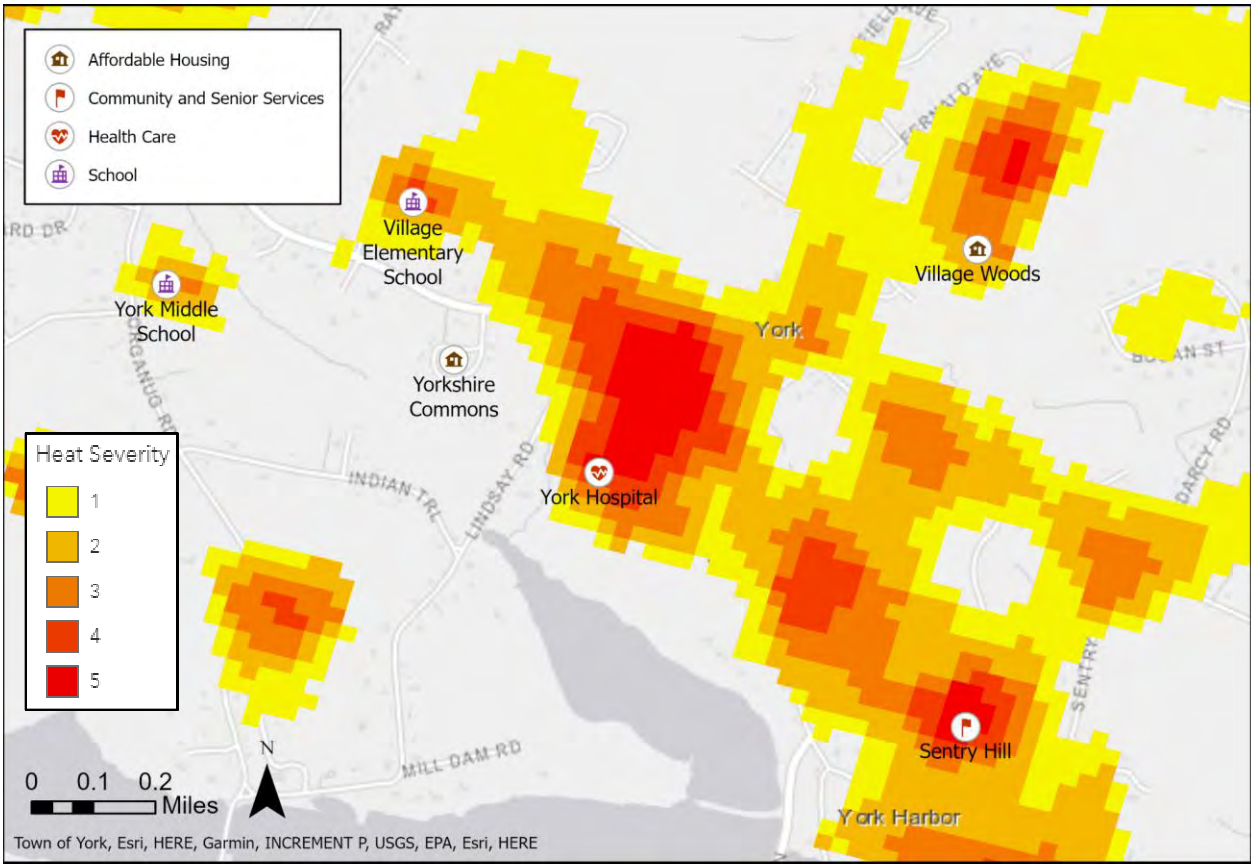
308 Eastern Research Group and Synapse Energy Economics, "Summary Report."

309 Thomas C. Peterson, et al. (2014) Changes in weather and climate extremes: State of knowledge relevant to air and water quality in the United States, Journal of the Air & Waste Management Association, 64:2, 184-197, DOI: 10.1080/10962247.2013.851044.

310 Eastern Research Group, "Cost of Doing Nothing Analysis."

311 https://www.epa.gov/heatislands

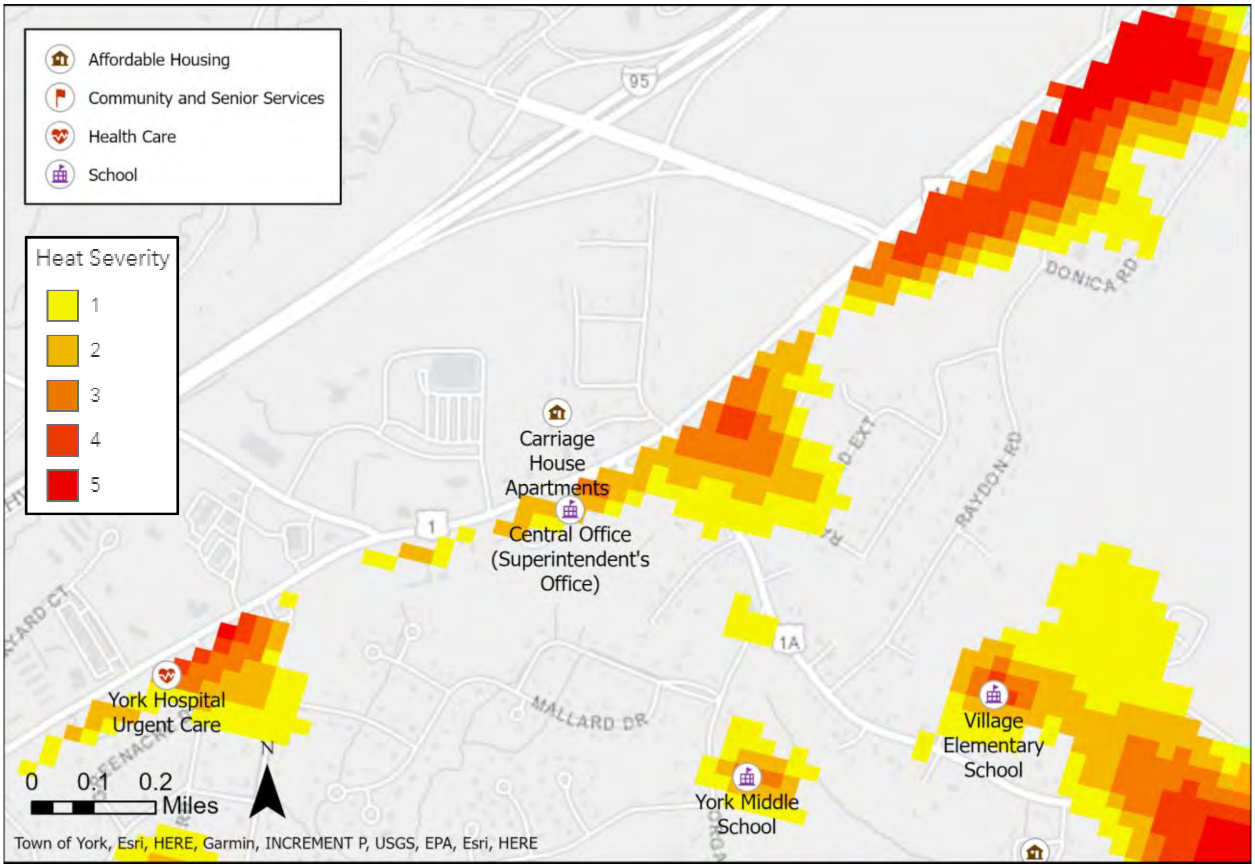
Figure 49. York Village Heat Islands.



Key: Severity is measured on a scale of 1 to 5, with 1 being a relatively mild heat area (slightly above the mean for the town), and 5 being a severe heat area (significantly above the mean for the town).

Source: Trust for Public Land.

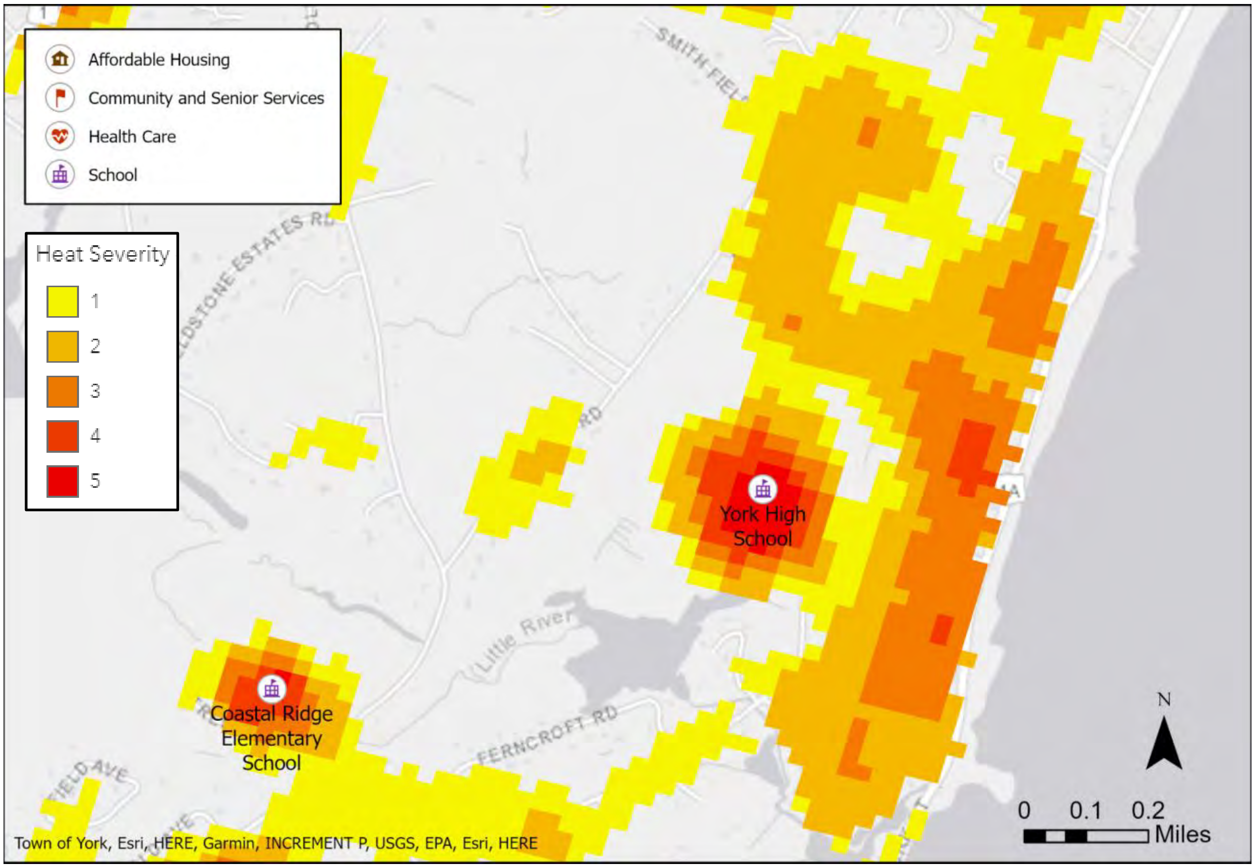
Figure 50. Route One Heat Islands.



Key: Severity is measured on a scale of 1 to 5, with 1 being a relatively mild heat area (slightly above the mean for the town), and 5 being a severe heat area (significantly above the mean for the town).

Source: Trust for Public Land.

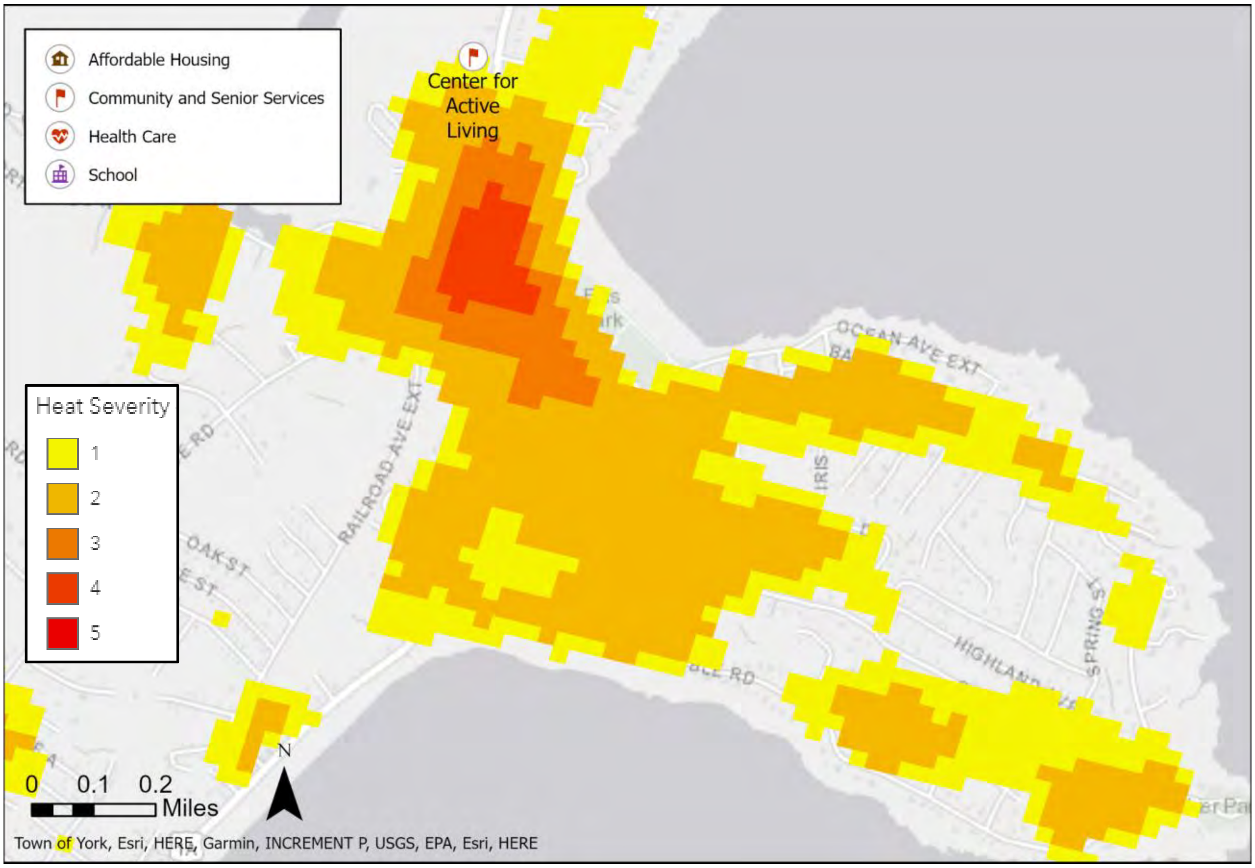
Figure 51. Long Sands Heat Island.



Key: Severity is measured on a scale of 1 to 5, with 1 being a relatively mild heat area (slightly above the mean for the town), and 5 being a severe heat area (significantly above the mean for the town).

Source: Trust for Public Land.

Figure 52. Short Sands/Cape Neddick Heat Islands.



Key: Severity is measured on a scale of 1 to 5, with 1 being a relatively mild heat area (slightly above the mean for the town), and 5 being a severe heat area (significantly above the mean for the town).

Source: Trust for Public Land.

Air Pollution

Worsening air pollution is an expected indirect health impact on York residents as a result of climate change. This is cause for concern for York residents, as York County already has among the worst air pollution in the state, scoring a C in the American Lung Association's *State of the Air 2021*[312] report. The source of pollution is in large part out of York's and Maine's control, as a significant portion is blown into the region from metropolitan areas and emission sources to the west and southwest.[313] Regardless, it is important to be aware of the issue and actions that can be taken to protect York residents. The major air pollutants of concern are:

1. Ozone
2. Particulate matter

[312] https://www.lung.org/research/sota.
[313] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine," 311

Ground-level ozone (the type people are exposed to) is created by a reaction of two types of chemicals, nitrogen oxides (NOx) and volatile organic compounds (VOC). Exposure can cause a variety of respiratory problems, including chest pain, coughing, throat irritation, and congestion, as well as worsen respiratory diseases like asthma and damage the lungs. Fortunately, ozone levels in Maine have decreased significantly over the past 20 years due to regional and local air quality controls that reduced NOx and VOC emissions. However, the production of ozone is accelerated at higher temperatures, meaning a warming climate could slow progress being achieved by emissions reductions or induce ozone levels to trend upwards, along with associated health impacts.[314]

Particulate matter refers to a variety of small particles in the air, including sulfate, nitrate, organic and black carbon, mineral dust, and sea spray. Particulate matter comes in different sizes with smaller particles being more dangerous. Particles smaller than 10 micrometers in diameter (PM10) can be inhaled through the nose or mouth and particles smaller than 2.5 micrometers in diameter (PM2.5) can reach deep into the lungs.[315] As such, high exposure to PM2.5 is typically associated with the most severe health impacts, including respiratory diseases and adverse birth outcomes.[316] Like ozone, particulate matter levels have decreased in Maine in recent decades, but climate impacts may make conditions worse.[317] As discussed above, wildfires in the western US and Canada are a major source of particulate matter, which can blow hundreds of miles to Maine. These fires are growing in frequency and intensity, and even the local risk of wildfire may be greater with projected increases in temperature and drought frequency.

Figure 53. Health Effects at Varied Air Quality Index Levels.

Air Quality Index	Air Quality Descriptor	Health Effects	Color Code	Averaged Values	
				Ozone	Particle Pollution
0-50	Good	**No Health Notice**. No health impacts expected in this range. It's a great day to be active outside!	GREEN	0-54	0-12.0
51-100	Moderate	**Limited Health Notice**. Sensitive people should consider reducing prolonged or heavy exertion. Watch for symptoms such as coughing or shortness of breath. These are signs to take it easy.	YELLOW	55-70	12.1-35.4
101-150	Unhealthy for Sensitive Groups	**Health Notice**. People with heart or lung disease, the elderly, teenagers and children should reduce prolonged or heavy exertion. It is okay to be active outside, but take more breaks and do less intense activities. Watch for symptoms such as coughing or shortness of breath. Asthmatics should follow their action plans and keep quick relieve meds handy. Those with heart disease should watch for palpitations, shortness of breath or unusual fatigue and contact your health provider of necessary.	ORANGE	71-85	35.5-55.4
151-200	Unhealthy	**Health Advisory**. People with heart or lung disease, the elderly, teenagers and children should avoid prolonged or heavy exertion and consider moving activities indoors or rescheduling. Everyone else should reduce prolonged or heavy exertion. Take more breaks during all outdoor activities.	RED	86-105	55.5-150.4
201-300	Very Unhealthy	**Health Alert**. People with respiratory or heart disease, the elderly, teenagers and children should avoid any outdoor activity. Move activities indoors or reschedule to a time when air quality is better. Everyone else should avoid prolonged or heavy exertion. Consider moving activities indoors or rescheduling to a time when air quality is better.	PURPLE	>105	>150.4

Source: https://www.maine.gov/dep/air/ozone/airqualityindexandhealth.html.

[314] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine," 311
[315] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine," 312; Brown et al., 2013.
[316] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine," 312; Nolte et al., 2018.
[317] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine," 312

Figure 54. Populations Most at Risk from Ozone and Particle Pollution.

Your Health

Who is most at risk from ozone and particle pollution?

- **Children and Teenagers** - Their respiratory systems are still developing and they breathe more per pound of body weight than adults
- **Individuals with a lung disease** - Ozone and particle pollution put additional stress on the lungs in addition to causing various reactions within the lungs. People with existing lung disease have less tolerance for the effects of pollutants.
- **Individuals with heart disease** - Particle pollution has long been known to negatively impact heart function but recent studies are also finding a link between ozone and negative impacts on heart function. People with existing heart disease have less tolerance for the effects of pollutants.
- **The Elderly** - As people age their bodies have less tolerance for the effects of pollutants.
- **Individuals who are exerting themselves** - At higher levels of pollutants even healthy adults who are exerting themselves will bring in more air and thus more pollution into their lungs.
- **New or expectant mothers** may also want to take precautions to protect the health of their babies.

Sensitive individuals who limit their exposure to poor air quality will reduce the likelihood of the need for additional medication, emergency department visits, and hospitalizations. DEP staff meteorologists remind you to 'Keep an eye on the AQI.'

Source: https://www.maine.gov/dep/air/ozone/airqualityindexandhealth.html.

It is important to have an effective and accessible warning system for high air pollution days, especially for vulnerable groups, including those with respiratory and heart diseases, older and younger people, those who are pregnant, and those who are active outdoors.[318] Existing resources for York residents include the Environmental Protection Agency's (EPA's) AirNow interactive online map and mobile app, both of which can be used to check current and forecast local air quality information.

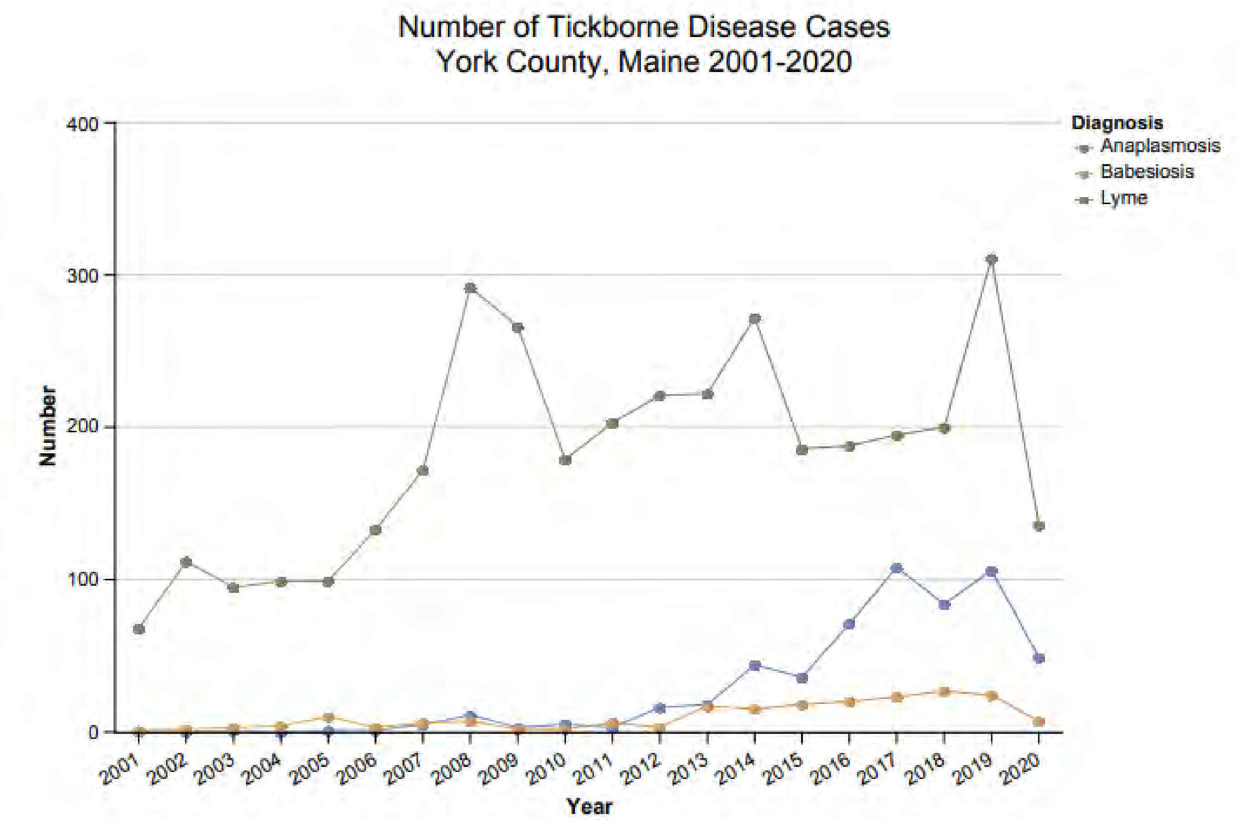
Vector Borne Diseases

Mild winter temperatures and a shrinking frost season contribute to greater abundance and activity of ticks and mosquitoes that carry diseases dangerous to humans and impact how Mainers and visitors can enjoy the outdoors.[319] Lyme Disease and other tickborne diseases have increased noticeably in the past 20 years, and experts expect this trend to continue.[320] Though observed cases declined sharply in 2020, this has at least partially been attributed to a combination of a drier-than-usual June and July that year and a higher number of untreated, and thus uncounted, cases due to reluctance to go to the hospital because of the COVID-19 pandemic.[321]

---

[318] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine," 310, 312.
[319] Fernandez et al. "Maine's Climate Future 2020 Update.".
[320] Fernandez et al. "Maine's Climate Future 2020 Update.".
[321] https://www.pressherald.com/2021/03/22/lyme-disease-cases-fell-sharply-in-2020-with-covid-19-and-weather-likely-playing-a-role/.

Figure 55. Number of Tickborne Disease Cases, York County, Maine 2001-2020.



Source: Maine Center for Disease Control and Prevention, "Maine Tracking Network Data Portal: Tickborne Diseases."

Water Quality and Security

Flooding

One of the most critical potential health impacts of flooding is water contamination. Runoff and pooling of floodwaters can deposit harmful bacteria and chemicals from the land into public drinking water sources, well heads, and recreational swimming areas.[322] According to the US Center for Disease Control and Prevention (CDC), the following hazards are among those that could be contained in floodwaters:[323]

- Human and livestock waste
- Household, medical, and industrial hazardous waste
- Coal ash waste that can contain carcinogenic compounds such as arsenic, chromium, and mercury
- Other contaminants that can lead to illness

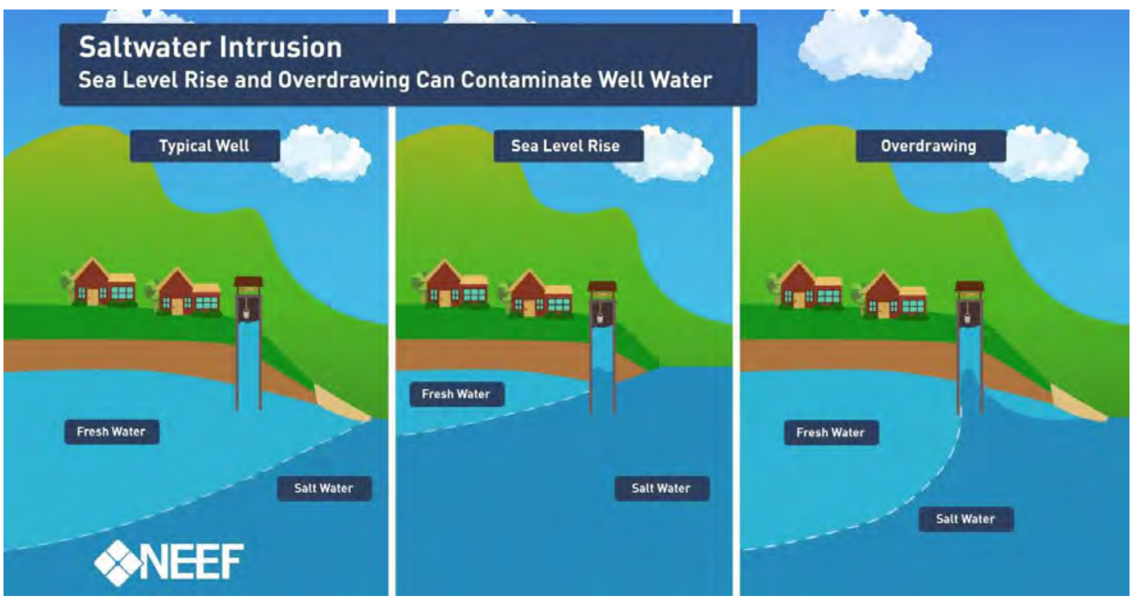
[322] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine," 303
[323] https://www.cdc.gov/healthywater/emergency/extreme-weather/floods-standingwater.html

Extreme precipitation events have been linked to outbreaks of generalized gastrointestinal (GI) illness as well as specific outbreaks of campylobacteriosis, salmonella, and cryptosporidiosis.[324] Especially at risk are those who rely on private wells for drinking water, which are not regulated under the federal Safe Drinking Water Act or any state laws, meaning well owners are responsible for maintaining the water quality.[325] Maine has one of the highest rates of well use in the country, and the MGS has a record of approximately 1,000 private wells in use in York.[326] In addition to risk of illness, more flooding around private wells puts additional responsibility on owners to clean and disinfect the wells.[327]

Saltwater Intrusion

SLR raises the risk of saltwater intrusion into groundwater aquifers that supply drinking water to wells in York. This is especially problematic for wells near the coast, where saltwater currently flows under freshwater underground due to its higher density, but the line of delineation could migrate upwards to well level as sea levels rise (Fig. 55). Saltwater intrusion can threaten both deep bedrock aquifers and shallower sand and gravel aquifers.[328] Saltwater intrusion and changes in groundwater levels associated with SLR can also damage underground public drinking water and wastewater infrastructure, as well as septic systems. Contamination of drinking water infrastructure and failure and leakage of wastewater systems can present significant potential water quality and public health concerns. More information on these impacts and their implications can be found in the "Infrastructure & Built Environment: Water Infrastructure" section.

Figure 56. Saltwater Intrusion.



Source: https://www.neefusa.org/nature/water/groundwater-and-rising-seas.

---

[324] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine," 303; Jagai et al., 2015; Soneja et al., 2016; Jiang et al., 2015.
[325] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine," 303
[326] https://www.maine.gov/dacf/mgs/pubs/digital/well.htm.
[327] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine," 303
[328] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine," 93; Caswell, 1987; 1979.

Drought

Households in York that rely on shallow dug wells for water are at risk of going dry more often if droughts become more frequent. An estimated 17,000 wells went dry in Maine between 1999-2002 due to severe drought, and dry wells were reported across the state during severe droughts in 2016 and 2020.[329]

Algal Blooms

Freshwater algal blooms, which are exacerbated by nutrient-rich runoff from heavy rainfall events, will increasingly threaten York's drinking and recreational waters as heavy rainfall becomes more frequent due to climate change. Some algal blooms produce cyanotoxins that are harmful to people (HAGs); two cyanotoxins, microcystin and cylindrospermopsin, have been issued health advisories by the US EPA for drinking water[330] and recreation.[331] Other potentially harmful cyanotoxins from algal blooms have been identified, though have not yet been issued national advisories.[332] More information about harmful algal blooms can be found in the "Natural Environment & Ecosystem Services: Water Resources" section.

Mental Health

The impacts of climate change are far-reaching and have a significant potential to negatively influence the mental health of residents living in climate-vulnerable areas. The trauma that follows a climate-induced disaster, such as the loss of a home, job, or loved one can lead to consequential depression and anxiety.[333] Data suggest higher rates of suicide following catastrophic weather events and during longer-term impacts like long periods of high heat.[334] Extreme weather events, such as extreme heat or cold, are additionally associated with increased rates of domestic violence and aggressive behaviors.[335]

Climate change is also associated with increased mental health impacts at the community level. Damage to infrastructure, neighborhoods, and natural resources impact the quality of life for residents, which consequently can lead people to move elsewhere either by need or by choice. For a community this can cause a loss of identity, social support systems, sense of control and autonomy, and feelings of helplessness and fear.[336] Climate change has been observed to increase hostility, interpersonal and intergroup aggression, and the loss of social cohesion and connectedness. Further, vulnerable

[329] https://www.pressherald.com/2016/09/28/as-drought-deepens-homeowners-with-shallow-dug-wells-get-desperate/; https://www.newscentermaine.com/article/news/dry-well-survey-maine/97-f5251341-469b-4672-b17d-7d9a8f72c117.

[330] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine," 54-55; USEPA, 2015.

[331] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine," 54-55; USEPA, 2019.

[332] MCC-STS. "Scientific Assessment of Climate Change and Its Effects in Maine," 54-55

[333] American Psychiatric Association, 2019. https://www.psychiatry.org/patients-families/climate-change-and-mental-health-connections/affects-on-mental-health

[334] USGCRP, 2016. https://health2016.globalchange.gov/

[335] Watts et al. 2015. https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(15)60854-6/fulltext

[336] American Psychiatric Association, 2017. https://www.apa.org/news/press/releases/2017/03/climate-mental-health

populations, discussed in the next section, are likely to experience disproportionate mental health impacts.[337]

Social Vulnerability

Social Equity

While climate change will affect everyone who lives and works in York, it is important to acknowledge and understand that not everyone has the same ability to adapt and respond to climate change impacts because of individual, household, and community differences in health, access to resources and support, and a variety of other factors. Traditionally marginalized and underrepresented groups are most at risk from the impacts of climate change, including children and older adults, persons with disabilities, households with lower or moderate incomes, people of color, households with limited English proficiency, households with less formal education, and households with limited physical and/or digital connectivity. More information about the potential vulnerability of each of these groups is outlined in this section. People who identify with more than one of these groups may experience greater compounding vulnerability.

From the beginning of the CAP process, the Steering Committee emphasized a commitment to social equity, creating a Social Equity subcommittee to review documents, offer input on planning processes and recommendations, and support careful consideration of populations in York that are most vulnerable to climate change impacts. Recognizing that most climate issues are equity issues, the Steering Committee established as one of its top priorities to ensure that the health, safety, and wellbeing of vulnerable populations are supported through the CAP strategies and actions.

Age

While the vulnerability of both older adults and children varies significantly with age, health, family and socio-economic circumstances, these populations are more likely to lack the physical and social capacity to adapt to climate change.

For older adults, climate change can pose greater risk to many who have compromised health and a higher sensitivity to the health impacts of climate hazards. Since older adults are more likely to experience pre-existing medical conditions, these existing stresses can often compromise the capacity older adults have to adapt, respond, or recover to the impacts of climate change. Older adults are also more often adversely impacted by climate hazards like extreme heat and air pollution.[338]

Children are vulnerable to climate change due to their immature physiology, biological sensitivities, unique behaviors, and limits to their adaptive capacity. Physiologically, children have less capacity to adapt to high heat and are more susceptible to respiratory problems from air pollution and exposure to vector-borne disease. In addition, family support and household circumstances greatly influence the

[337] American Psychiatric Association, 2017. https://www.apa.org/news/press/releases/2017/03/climate-mental-health
[338] Cities of Portland and South Portland, "One Climate Future."

safety, wellbeing, and adaptive capacity of infants, children, and adolescents. Exposure to climate hazards can also affect children's cognitive development, mental health, and academic performance.[339]

In York in 2019, approximately 27% of residents were over the age 65, and more than 7% of residents were over 65 and living alone. These groups make up a relatively larger proportion of the York population when compared to York County and Maine, both of which have about 20% of their populations 65 years and older and a little more than 5% of their populations 65 years and older and living alone. York's population under 18 years old was consistent with the county and the state between 18-19%.[340]

Disability

Disabilities encompass a range of functional limitations, and the vulnerability of people with disabilities to climate change largely depends on their need for environmental accessibility and accommodations for their impairment(s). These disabilities can create physical, mental, and social challenges, including reduced mobility, inability to drive. added stress and disorientations during emergencies, limited financial resources. Certain disabilities can also amplify sensitivities to climate factors like extreme heat.[341] People with these disabilities also disproportionately experience other social vulnerabilities and risk factors, compounding risks posed by functional impairments. The experiences of people with disabilities requires additional research, documentation, and integration into decision-making and planning processes.[342] In 2019, about 10% of households in York identified as having at least one person with a disability.[343]

Financial Insecurity

People with lower incomes often disproportionately experience negative impacts from climate hazards due to their increased exposure to external health risks, limited financial security, and high levels of emotional stress. Oftentimes, residents facing poverty live in poorer quality living environments that promote exposure to toxins and particulate matter. These households are also less likely to have property insurance or savings for added costs of resources, damage, or transport during climate hazards. Additionally, over 30% of adults in Maine who make less than $15,000/yr have reported poor mental and physical health.[344] Even as low-income populations experience heightened exposure to degraded air quality, extreme heat events, infectious diseases, and food insecurity, they lack the capacity to adapt. Populations with lower incomes are less likely to evacuate in response to a climate warning due to financial and social factors. As a result, these communities often accumulate emotional stress during and after these extreme climate events without access to affordable mental health care. In 2019,

[339] https://health2016.globalchange.gov/populations-concern
[340] 2019 Five-year American Community Survey.
[341] Cities of Portland and South Portland, "One Climate Future."
[342] https://health2016.globalchange.gov/populations-concern
[343] 2019 Five-year American Community Survey.
[344] MaineHealth. (2017) "Health Index 2017 Report: Measuring Our Success in Improving the Health of Maine." Portland, ME.

approximately 4% of York residents were below the poverty level, 2.5% of residents were unemployed, and nearly 6% did not have health insurance.[345]

Race and Ethnicity

While race and ethnicity are key factors in vulnerability and risk to climate hazards, they remain closely linked and connected to other socioeconomic and geographic factors. In addition, the challenges that communities of color face in adapting to climate change are largely indicative of historic patterns of structural racism and inequity. Challenges of limited financial resources, lower access to health care, higher likelihood of living in risk-prone areas, greater incidence of chronic medical conditions, social isolation, and limited transportation are often compounded with other socioeconomic and educational factors, exacerbating vulnerabilities. Communities of color thus face major impediments in their ability to prepare for, respond to, and cope with climate-related health risks.[346] In 2019, 2.3% of York residents identified as people of color (those identifying other than as both White and non-Hispanic/Latinx).[347]

Language and Immigration

People with limited English proficiency (LEP) and certain immigrant groups, especially those who are undocumented, face further vulnerability due to language barriers and disorientation in unfamiliar contexts and cultures. High poverty rates, language and cultural barriers, and citizenship status impede straightforward navigation healthcare, social services, professional, educational, financial, transportation systems in York. As a result, LEP and undocumented persons often have limited or restricted access to these services and are hesitant to seek out help in case it compromises their immigration status.[348] In 2019, 2.3% of York's population was foreign-born, though 0% of the population was estimated to have LEP.[349]

Education

Globally, studies have shown that educational attainment is one of the most significant indicators of a person's capacity to adapt to climate change due to its influence on many socioeconomic factors. In addition, education can provide greater access to other people and information through strong social networks, communications resources, risk information, and long-term thinking. In particular, individuals who did not complete high school can experience limitations in their ability to adapt without these networks of support and knowledge.[350] In 2019, about 48% of York residents 25 and older had an educational attainment less than a Bachelor's degree and 1.5% had not graduated high school.[351]

---

345 2019 Five-year American Community Survey.
346 Cities of Portland and South Portland, "One Climate Future."
347 2019 Five-year American Community Survey.
348 https://health2016.globalchange.gov/populations-concern.
349 2019 Five-year American Community Survey.
350 Cities of Portland and South Portland, "One Climate Future."
351 2019 Five-year American Community Survey.

Mobility and Access to Information

Key resources like transportation and access to information and communications equipment largely determine the capacity to which a person can gather information and respond to and recover from a climate hazard. Lack of access to these resources can decrease a person's mobility and increase their vulnerability. Personal automobiles are especially critical for mobility in York because public transportation and on-demand transportation services are extremely limited and would likely be even more so during an emergency. In 2019, over 7% of York households did not have a vehicle, a higher percentage than both the county and the state. About 9% of households did not have broadband internet and about 1% did not have telephone service.[352]

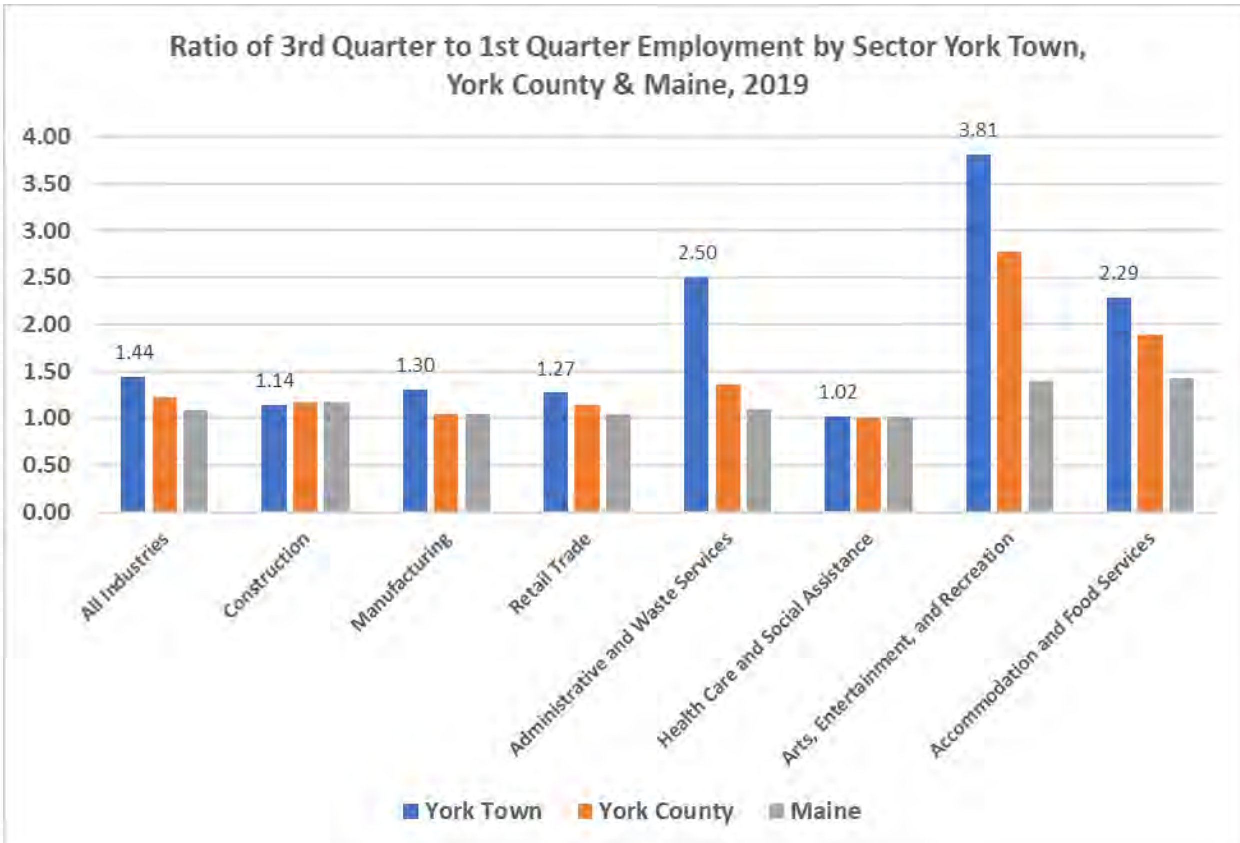
Seasonal Workers

Seasonal workers are more likely to have lower wages and unstable employment and housing, resulting in less ability to respond if they are impacted by climate change. York's large number of seasonal summer residents and status as a summer tourist destination means that many jobs in the town, especially for service-based industries, are seasonal. Peak summer employment across all industries in York is 40% higher than winter employment.[353] Figure 56 shows that for the administrative and waste services, arts, entertainment, and recreation, and accommodation and food services industries, York's summer employment (3rd quarter) is more than double its winter employment (1st quarter). This seasonal difference is more significant in York than for York County and Maine as a whole. In 2019, the average annual wages in York for these industries, as well as other seasonal industries of retail and manufacturing, ranged between approximately $30,000-39,000, less than the average annual wage in York across all industries, $46,696, (Table 22) and well below the average annual income of households living in York, $112,327.[354]

Potential climate impacts affecting seasonal workers include loss of wages or employment due to flooding of their workplace or declines in tourism. The vulnerability of workers in service- and tourism-based industries was evidenced during the COVID-19 pandemic. The vulnerability of York's seasonal workers is amplified because many live outside of town due to a lack of affordable housing options in York. A greater dispersion of the workforce makes it more challenging to identify potential exposure to climate impacts and provide assistance.

[352] 2019 Five-year American Community Survey.
[353] Maine Center for Workforce Research and Information.
[354] Maine Center for Workforce Research and Information; 2019 Five-year American Community Survey.

Figure 57. Ratio of 3rd Quarter to 1st Quarter Employment by Sector in York, York County, and Maine.



Source: Maine Center for Workforce Research and Information.

Table 22. 2019 Average Annual Wages for Workers in Various Industries in York.

Industry	2019 Average Annual Wage in York
Total, All Industries	$46,696
Construction	$54,496
Manufacturing	$38,792
Wholesale Trade	$98,592
Retail Trade	$32,552
Transportation and Warehousing	$45,864
Information	$61,412
Finance and Insurance	$62,868
Real Estate and Rental and Leasing	$61,412
Professional and Technical Services	$78,520
Management of Companies and Enterprises	$132,964
Administrative and Waste Services	$38,532
Health Care and Social Assistance	$59,332
Arts, Entertainment, and Recreation	$29,068
Accommodation and Food Services	$30,160
Other Services, Except Public Administration	$27,768

Source: Maine Center for Workforce Research and Information.

Ranking of Vulnerability and Risk

Vulnerability

The first step in ranking relative vulnerability among York's critical assets and population was identifying exposure to climate change impacts. The impacts considered for exposure were flooding from SLR and storm surge, inland precipitation-based flooding, and high heat from heat island effects. This step was binary; assets and population were either "yes" or "no" for exposure, and only those projected to be exposed were considered for the ranking.

After compilation of the pool of exposed assets, assets were ranked by relative sensitivity and adaptive capacity. Sensitivity measures how much the functionality of an asset is affected by a climate impact and adaptive capacity measures the ability of the asset to respond and recover from the impact.[355] Sensitivity was ranked from 1-4, with 1 meaning minimal or no effect on functionality and 4 meaning the asset is no longer functional. Adaptive capacity was ranked from 0-2, with 0 meaning that most or all functionality can be met elsewhere and 2 meaning any loss in functionality cannot be met elsewhere (no redundancy).

After the sensitivity and adaptive capacity of each exposed asset was ranked, they were plotted by the two measures. Those assets with the highest sensitivity and lowest adaptive capacity were considered

[355] City of Somerville, "Climate Change Vulnerability Assessment," June 2017, https://www.somervillema.gov/sites/default/files/6-13-2017_Somerville%20CCVA%20Final%20Report.pdf, 10.

to be the most vulnerable. For heat vulnerability, adaptive capacity was combined with relative heat island exposure (1-5) to create a heat index score from 1-7, with 1 being a very low heat index and 7 being a very high heat index.

Figs. 57-59 show the relative vulnerability for each asset in York exposed to SLR and storm surge, inland flooding, and heat islands. Assets in the most top-right boxes (bordered in red) are the most vulnerable and those in the bottom left are least vulnerable. The assets in York most vulnerable to sea level rise and storm are primarily transportation infrastructures, including several major roads and all of the harbor infrastructure. The only non-transportation asset among the most vulnerable to sea level rise and storm surge is the York Beach Fire Department. The assets most vulnerable to inland flooding similarly are all major roadways. On the other hand, the assets most vulnerable to high heat exposure are all buildings, which makes sense considering that buildings are major contributors to heat island effect. These include York Hospital and urgent care, all of the Town's public schools, both Fire Departments, the public library, and the Village Woods and Sentry Hill housing properties.

Figure 58. Relative Vulnerability of York Assets Exposed to SLR and Storm Surge.

		No sensitivity	Low sensitivity	Moderate sensitivity	High sensitivity
		1	2	3	4
No Adaptive Capacity	2			I-95 @ York River Bridge; Route 1 @ York River Bridge	Town Docks 1 & 2
Some Adaptive Capacity	1		York Sewer District Office; Long Sands Bath House	Route 1A; Route 91/Cider Hill Rd; Route 103; Shore Rd; Long Sands Rd; Ridge Rd; Beech Ridge Rd; Strawberry Island boat launch; York Beach Fire Department	Harbormaster's Office
High Adaptive Capacity	0	Lobster Cove wastewater pump station; York River Farms wastewater pump station; Short Sands wastewater pump station; Long Beach wastewater pump station			

Figure 59. Relative Vulnerability of York Assets Exposed to Inland Precipitation-Based Flooding.

		No sensitivity	Low sensitivity	Moderate sensitivity	High sensitivity
		1	2	3	4
No Adaptive Capacity	2			I-95 @ Little River; Route 1 @ Little River; Route 1 @ Cape Neddick River; Route @ Josias River extension	
Some Adaptive Capacity	1			Route 91/Cider Hill Rd; Route 103; Shore Rd; Long Sands Rd; Ridge Rd	
High Adaptive Capacity	0	Spring Pond Wastewater pump station			

Figure 60. Relative Vulnerability of York Assets Exposed to Heat Islands.

		No sensitivity	Low sensitivity	Moderate sensitivity	High sensitivity
		1	2	3	4
High heat index	6-7			York Hospital; York High School; Coastal Ridge Elementary School	
Moderate heat index	4-5		Town Hall; York Ambulance Association	York Village Fire Department; York Beach Fire Department; York Middle School; Village Elementary School; York Library; York Hospital urgent care	Village Woods; Sentry Hill
Low heat index	1-3	York Heights water storage tank; Spring pond wastewater pump station; Nubble Light wastewater pump station; Nubble Road wastewater pump station; Short Sands wastewater pump station; Long Beach wastewater pump station	Superintendent's Office; York Water District Office; York Community Service Association	Woodbridge electrical substation; Center for Active Living	

Overall Risk

The assets identified as the most vulnerable can be further ranked based on the probability of their occurrence and the consequence of their failure. Together, these measures of probability and consequence of the most vulnerable assets tell us their relative overall risk from sea level rise and storm surge, precipitation-based inland flooding, and high heat exposure.

Relative proxies of probability can be based on likelihood of the event happening today (very high probability - 3), of it happening by 2050 under a low GHG emission scenario (high probability - 2), by 2050 under a high emission scenario (medium probability – 1), or no impact either today or by 2050 (low probability – 0).

The relative consequence score for each of the assets is determined based on the extent and the severity of the impact across social indicators, with respect to the built environment, economic considerations, and environmental indicators (Fig. 60). This provides a high-level assessment of priorities based on the criteria used within those analyses.

Figure 61. Asset Consequence Scoring Methodology.

Consequence Score	% of Pop. impacted	Vulnerable Populations	Critical Asset Impact	Economic Impact	Environmental Impact
3	50% or more	2 or more	Town-wide	Regional	Major
2	>30 to <50%	At least one	Neighborhood-wide	Town-wide	Moderate
1	<30%	None	Very localized	Local	Minor

Figs. 61-63 show the relative overall risk to the assets most vulnerable to sea level rise and storm surge, precipitation-based inland flooding, and high heat exposure, based on probability and consequence. As with the vulnerability plots, the most at risk assets are those in the top right boxes and the least at risk in the bottom left boxes. For sea level rise and storm surge, the most at-risk assets are Shore Road, Route 91, Route 1A, the York Beach Fire Department, and all of the Harbor Infrastructure, including the Town Docks, Harbormaster's Office, and Strawberry Island boat launch. For inland flooding, the most at-risk assets are I-95 at the Little River and Route 1 at several river crossings. For high heat, the most at-risk assets are York Hospital and urgent care and all of the public schools.

Figure 62. Relative Risk to York Assets Most Vulnerable to SLR and Storm Surge.

		Low Consequence	Moderate Consequence	High Consequence	Very High Consequence
		5	6-8	9-11	12-15
Very High Probability (Impact Today)	3		Route 91/Cider Hill Rd		
High Probability (Impact by 2050 in Low Emissions Scenario)	2		Town Docks 1 & 2; Strawberry Island boat launch; Harbormaster's Office	Shore Rd	
Medium Probability (Impact by 2050 in High Emissions Scenario)	1		Route 103	Route 1A; York Beach Fire Department	
Low Probability (No Projected Impact by 2050)	0		Long Sands Rd; Ridge Rd; Beech Ridge Rd		I-95 @ York River Bridge; Route 1 @ York River Bridge

Figure 63. Relative Risk to York Assets Most Vulnerable to Precipitation-Based Inland Flooding.

		Low Consequence	Moderate Consequence	High Consequence	Very High Consequence
		5	6-8	9-11	12-15
Very High Probability (Impact Today)	3		Route 91/Cider Hill Rd; Route 103; Long Sands Rd; Ridge Rd	Shore Rd	I-95 @ Little River; Route 1 @ Little River; Route 1 @ Cape Neddick River; Route 1 @ Josias River extension
High Probability (Impact by 2050 in Low Emissions Scenario)	2				
Medium Probability (Impact by 2050 in High Emissions Scenario)	1				
Low Probability (No Projected Impact by 2050)	0				

Figure 64. Relative Risk to York Assets Most Vulnerable to High Heat Exposure.

		Low Consequence	Moderate Consequence	High Consequence	Very High Consequence
		5	6-8	9-11	12-15
Very High Probability (Impact Today)	3		Village Woods; Sentry Hill	York Beach Fire Department; York Village Fire Department; York Library	York Hospital; York Hospital urgen care; York High School; York Middle School; Coastal Ridge Elementary School; Village Elementary School
High Probability (Impact by 2050 in Low Emissions Scenario)	2				
Medium Probability (Impact by 2050 in High Emissions Scenario)	1				
Low Probability (No Projected Impact by 2050)	0				

YORK CLIMATE ACTION PLAN

Appendix B: York Greenhouse Gas Inventory and Methodology

January 2022

Table of Contents

List of Figures

List of Tables

Executive Summary

The Town of York, Maine is committed to addressing climate change at the local level, formally joining the Global Covenant of Mayors' initiative in 2019. Addressing climate change requires both reducing the emissions of greenhouse gasses, as well as preparing for the physical impacts of climate change. This memorandum focuses on the mitigation of emissions. The methodology for climate vulnerability and adaptation is covered in a separate document.

A town-wide inventory of greenhouse gas emissions was conducted to identify key sources and prioritize actions. The data was collected for the year 2019, the year prior to the onset of the Covid-19 pandemic and therefore more representative of "normal" operations. The Town has publicly committed to a 50% reduction in GHG emissions by 2030 and a 100% reduction by 2050. These planning horizons also align with those set at the state level[1] and those used by the Southern Maine Planning and Development Commission (SMPDC).

Prior to this work, no base year had been formally identified or adopted. The base year is the year against which the emission reduction targets will be measured (e.g., a 50% reduction by 2030 over emission levels of 1990). After discussion with the CAP Steering Committee Chairs, the decision was made to adopt 2010 as the base year based on the assumed availability of relevant data to support analyses. Subsequent analysis revealed significant data gaps in 2010, so proxy baselines (see below for further discussion) were developed to serve as the benchmarks against which the emission reductions were set.

The 2019 inventory reveals that buildings had the greatest carbon footprint (74%) in that year, followed by transportation (23%), and waste (3%) (Figures 1 and 2). A detailed assessment of the methodologies and results per sector and fuel type is included in this document.

GHG emissions are required for BASIC reporting. Green cells on the chart above indicate the minimum reporting standards that are required. Scope 1 emissions include all GHG emissions created within the town. Scope 2 includes the emissions that were produced as a result of electricity generation. Scope 3 emissions are defined differently for each sector and consist of a variety of potential sources. For York, we focused on transportation for all I-95 traffic that passed through the town, and for buildings, we calculated the transmission and distribution losses that were associated with the transport of electricity to the end-users. A more detailed explanation of Scopes 1, 2, and 3 is provided in the next section and shown in Figure 3.

[1]State of Maine 2020 Climate Action Report: *Maine Won't Wait* https://climatecouncil.maine.gov/

Figure 1. Greenhouse Gas Emissions Summary for York, 2019

Sector		Total by scope ($MtCO_2e$)		
		Scope 1 (Territorial)	Scope 2	Scope 3
Stationary Energy	Energy Use	143,288	25,934	1,323
Transportation (all II emissions)		52,673	- [1]	83,409
Waste	Generated in the City	492	-	5,492 [2]
Total		**196,453**	**25,934**	**90,224**

Graphic Source: GPC document, page 41. https://ghgprotocol.org/sites/default/files/standards/GHGP_GPC_0.pdf

Sources required for BASIC reporting

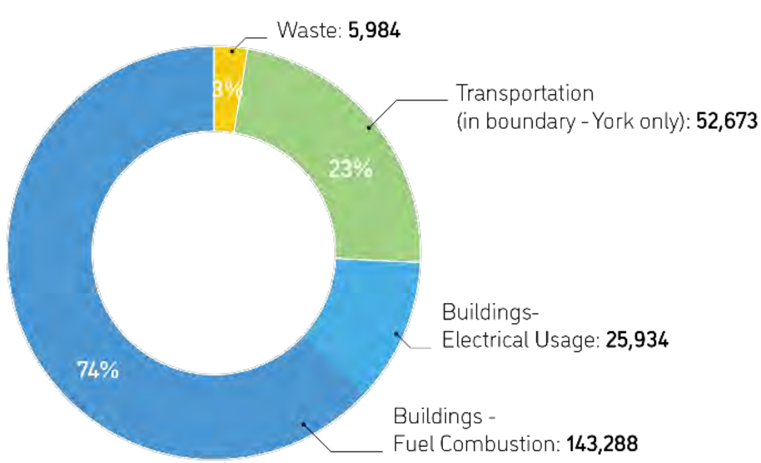
\+ Sources required for BASIC+ reporting

Non-applicable emissions

1 Scope 2 emissions associated with transportation are negligible at this point; any such emissions are assumed to be captured in the Scope 2 emissions associated with Stationary Energy (i.e., home or business vehicle charging) as charging station infrastructure is not yet built out in York.

2 Scope 3 waste includes landfilled (75%) and composted (25%) wastewater sludge.

Figure 2. GHG Emissions by Sector in York, 2019 ($MtCO_2e$)



Total: **227,879 MtCO2e**

Commitment to Change

In September 2019, the Town of York joined the Global Covenant of Mayors initiative[2] to address climate change at the local level, issuing the following statement:

> *Specifically, within three years of this commitment, we pledge to develop, adopt, use and regularly report on the following:*
>
> - *A community-scale GHG emission inventory, following the recommended guidance;*
> - *An assessment of climate risks and vulnerabilities;*
> - *Ambitious, measurable and time-bound target(s) to reduce/avoid GHG emissions;*
> - *Ambitious climate change adaptation vision and goals, based on quantified scientific evidence when possible, to increase local resilience to climate change;*
> - *An ambitious and just goal to improve access to secure, sustainable and affordable energy; and*
> - *A formally adopted plan(s) addressing climate change mitigation / low em1ss10n development, climate resilience and adaptation, and access to sustainable energy.*
>
> *The targets and action plans for mitigation / low emission development must be quantified and consistent with or exceed relevant national unconditional tv commitments defined through the UNFCCC (Intended) Nationally Determined Contribution (NDC). The targets and action plans should be in line with National Adaptation Plans, where these exist; and should be consistent with the principles around energy access and urban sustainability embodied in the Sustainable Development Goals (SDGs).*
>
> *We will explore the allocation of adequate staff resources and institutional arrangements. This includes governance processes, municipal structures and budget allocations to deliver on this commitment and secure continuity.*
>
> *We acknowledge that there may be additional regional- or country-specific commitments or requirements that we commit to follow, and that may be agreed through our city networks or through our direct engagement with local partners of GCoM.*
>
> *The town of York, Maine acknowledges that continued engagement in GCoM and associated Regional or National Covenants, as established, is contingent on complying with the above requirements within established timeframes.*

The inventory and methodology outlined below is in direct response to that commitment.

[2] Global Covenant of Mayors for Climate and Energy, Commitment of Town of York, Maine, signed 7/29/19 by Steve Burns, Town Manager.

GHG Inventory Methodology

Reporting Protocol

The Greenhouse Gas Inventory methodology is in alignment with the GHG Reporting Protocol for Community-Scale Greenhouse Gas Emissions, which is the recognized accounting and reporting standards for cities and towns by the Global Covenant of Mayors. The inventory of GHG emissions was conducted in accordance with guidelines using the City Inventory Reporting and Information System CIRIS database to structure data collection, aggregation, and reporting. For both the GHG inventory and climate assessment work, readily available sources of information were used to create standardized and replicable processes, using industry-accepted practices, for data collection and analysis (Figure 3).

This work aggregates data and evaluates emissions in three sectors – buildings, transportation, and waste. Within each sector, emissions are evaluated under three scopes and subcategories.

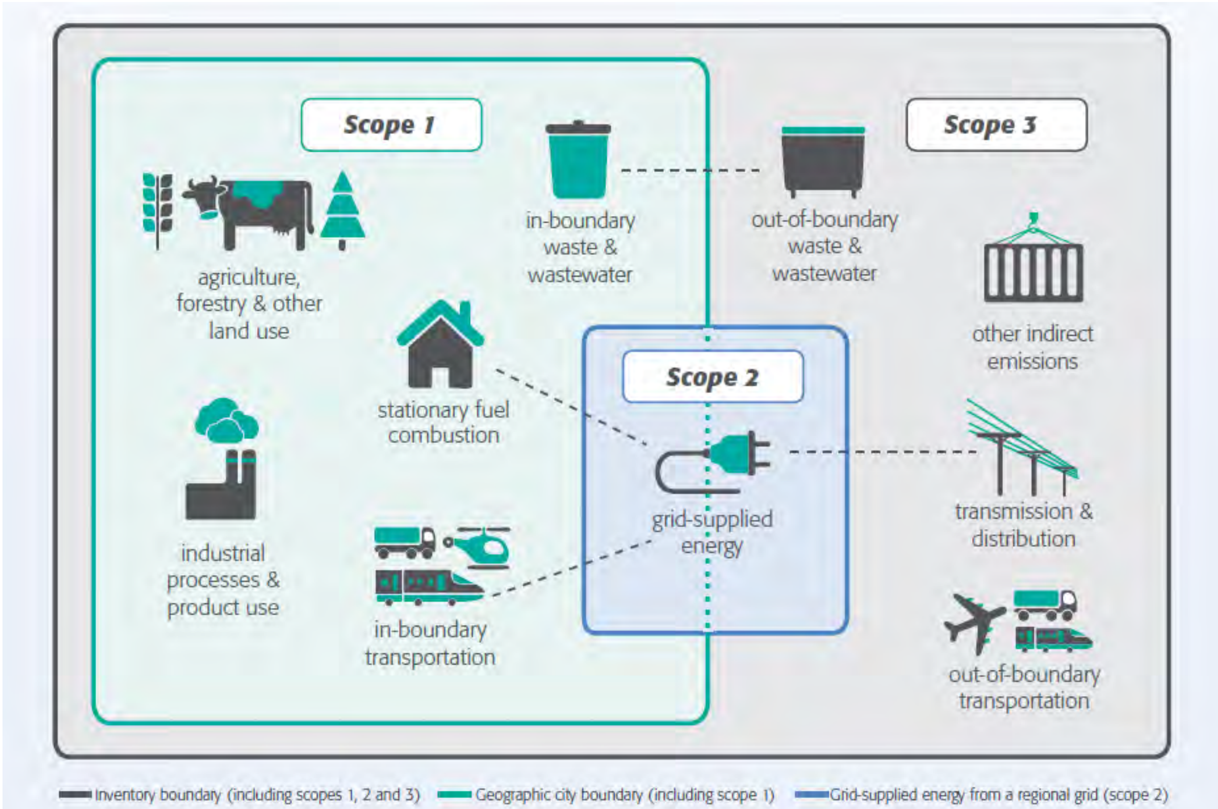
Scope 1 emissions include all GHG emissions created within the town. This includes on-road travel with destinations and/or originations within the Town of York, heating emissions for all buildings, and emissions from waste generated in the town.

Scope 2 includes the emissions that were produced as a result of electricity generation. All emissions from grid-supplied electricity (plug load) consumed in the town are included here.

Scope 3 emissions are defined differently for each sector and consist of a variety of potential sources. For York, we focused on the following Scope 3 emissions for each sector. For transportation, Scope 3 emissions were calculated for all I-95 traffic that passed through the Town of York but did not stop in York. For the buildings sector, we calculated the transmission and distribution losses that were associated with the transport of electricity to the end-users[3] (Table 4 in the buildings section below).

[3] The NEWE EGRID Gross Loss has been estimated at 5.1 %. (source: https://www.epa.gov/sites/production/files/2021-02/documents/egrid2019_summary_tables.pdf)

Figure 3. Global Protocol for Community-Scale GHG Emission Inventories



Source: Global Protocol for Community-Scale GHG Emission Inventories.

Reporting Years

The Town of York had previously developed a baseline GHG inventory for the year 2018, which was presented to the Board of Selectmen in September 2019, prior to the consultant engagement for the Climate Action Plan (CAP). This inventory, created with the assistance of a Vista Member and leveraging ICLEI resources, provided a solid starting point to understand the various sources of emissions within York. However, critical documentation, methodologies and data sources were often missing or incomplete, and were not recoverable by either the consultant team or past contributors to that work. In the end, the former analysis did not meet the standards of reporting or levels of transparency and replicability as set forth in the Global Covenant of Mayors guidance. For these reasons, York's updated 2019 GHG inventory results could not be further incorporated or leveraged for this current project.

Because of the global COVID-19 pandemic during much of the year 2020, commuting and home heating and cooling patterns during this time were an anomaly for the region because of stay-at-home orders, changed shopping and dining patterns, increased remote work, and less travel. For this reason, the base year of 2019 was used for the GHG inventory in this plan as the last full year of data available prior to the pandemic.

York has made commitments of carbon reductions against the Baseline Year of 2010. No comprehensive inventory of city-wide emissions was collected for that period and such a task was beyond the current scope of the Climate Action Plan project. A high-level estimate was developed based on proxy data and generalized back-casting of 2019 data, with more information on the method used included below.

Data Sources

The GHG inventory reporting uses the City Inventory Reporting and Information System CIRIS database to structure data collection, aggregation, and reporting. This CIRIS[4] tool from C40 Cities,[5] is compliant with the Global Covenant of Mayors Common Reporting Framework (CRF).[6] This database is an open source, readily available tool for the Town of York to use in the future. The consultant developed a modified database tool because of breaks in some of the online database cell relationships and inaccessible algorithms that made the tool unusable in its existing format. The modified database is in alignment with the CRF's overall design; it will allow the Town of York greater ability to edit particular cells and to see equations and emissions factors used to calculate emissions. This increased transparency and functionality will make future reporting easier for the Town. This modified database, in compliance with the CRF framework, is part of the final deliverables for this Climate Action Plan.

The consultant used previously collected utility and transportation data and supplemented that information with primary data and/or industry-accepted proxies. For data that was not readily available (e.g., heating fuel usage or electrical consumption per property or building typology), the consultant used industry standards and professional judgement to create robust proxies that were used to calculate GHG footprints. The U.S. Energy Information Administration (EIA), Environmental Protection Agency's Greenhouse Gas Emissions Inventory of U.S. GHG Emissions and Sinks and relevant data and guidance from the Greenhouse Gas Protocol were leveraged as the primary sources for these data and proxies. All sources and assumptions are outlined below. The emission factors (e.g., the carbon footprint associated with different fuels and energy types) are based predominantly on current EPA Emission Factors for Greenhouse Gas Inventories, unless otherwise noted.

Level of Analysis

As recommended by the GPC and Global Covenant of Mayors guidance, the collection and reporting of GHG inventory uses the BASIC level of reporting as shown in Figure 4 below. BASIC reporting requires data sources that are readily available and relatively easy to assemble and report…an important feature of the inventory when looking ahead to future reporting requirements that the Town may be undertaking with Town staff resources. In transportation and buildings, additional information is included for Scope 3 emissions This information highlights some of the contributions in GHG which occur outside of York's jurisdictional control and that will require regional and state-level coordination for

[4] GHG Protocol, Global Protocol for Community-Scale Greenhouse Gas Emission Inventories (GPC) Washington, DC: World Resources Institute. https://ghgprotocol.org/greenhouse-gas-protocol-accounting-reporting-standard-cities

[5] 2 C40 Cities. Reporting GHG emissions inventories https://resourcecentre.c40.org/resources/reporting-ghg-emissions-inventories

[6] Global Covenant of Mayors for Climate and Energy. Global Common Reporting Framework. https://www.globalcovenantofmayors.org/our-initiatives/data4cities/common-global-reporting-framework/

reductions strategies. There are definitely other sources of Scope 3 emissions that York may wish to investigate in future years but these represent two easily quantifiable sources that can be easily tracked in subsequent inventories.

Figure 4. Greenhouse Gas Emissions Summary for York, 2019

Sector		Total by scope ($MtCO_2e$)		
		Scope 1 (Territorial)	Scope 2	Scope 3
Stationary Energy	Energy Use	143,288	25,934	1,323
Transportation (all II emissions)		52,673	- [1]	83,409
Waste	Generated in the City	492	-	5,492 [2]
Total		**196,453**	**25,934**	**90,224**

Graphic Source: GPC document, page 41. https://ghgprotocol.org/sites/default/files/standards/GHGP_GPC_0.pdf

Sources required for BASIC reporting

\+ Sources required for BASIC+ reporting

Non-applicable emissions

1 Scope 2 emissions associated with transportation are negligible at this point; any such emissions are assumed to be captured in the Scope 2 emissions associated with Stationary Energy (i.e., home or business vehicle charging) as charging station infrastructure is not yet built out in York.

2 Scope 3 waste includes landfilled (75%) and composted (25%) wastewater sludge.

Buildings

Building Typologies

The source for all buildings data was the Town of York 2019 Assessor's Database, supplied by the Town of York Assessor's office. The database included use codes for each structure, total square footage, and number of stories, as well as year built. Using the Assessor's database, the consultant created typologies based on use (residential, commercial, industrial) and then created subsets of 15 building-uses across the three basic building uses. The more detailed sub-categories represent physical design (size, structure) and use (office space, health care, etc.). The 15 typologies are defined in Table 1. Parcels were sorted into the typologies by Assessor land use code, with additional segmentation based on land use data, as described in Table 2.

__Table 1. Building Typology Definitions__

Category	Building Typology	Description
Residential	Single Family/Single Story	Single family buildings that have 1.9 stories or less.
	Single Family/Multi Story*	Single family buildings that have 2 or more stories. Includes 2-story townhome style public housing facilities, and seasonal housing.
	Multi Family/Single Story	Multifamily buildings that have less than 1.9 stories.
	Multi Family/Multi Story	Multifamily buildings that have 2 or more stories. Includes multi-story public housing facilities and independent living senior housing.
	Mobile Home**	Includes manufactured homes.
Commercial	Municipal	Municipally owned buildings, including utilities, water and sewer.
	Municipal Streets	Street Lighting.
	School	Private, public, and boarding.
	Lodging	Hotels, motels, inns, RV parks and campgrounds.
	Office	All single- and multi-story office buildings, commercial condos, and mixed-use buildings with offices.
	Restaurant	Includes restaurants and clubs.
	Retail	Includes convenience stores, laundromats, health clubs, gyms, auto shops, mixed use retail buildings, and marinas.
	Health care/ Hospital	Buildings providing medical and surgical treatment, including outpatient facilities, animal hospitals, and laboratories. Nursing homes also included here, assuming that nursing homes have more medical equipment than a typical medical office.
	Other	Includes York Wild Kingdom (a zoo and amusement park) golf courses, day care, the post office.
	Warehouse/Storage	Storage facilities.
	Institutional	Churches, masonic lodges, museums, other cultural buildings, fraternal orgs.
Industrial		Factories, utilities, and other premises for manufacturing or processing goods.

*There are a significant number of seasonal residential complexes in the town. According to the York Water District, there are 901 seasonal customers in York. The York Water District calculated this number by looking at data on seasonal customers (those requesting establishment of service from deep water mains beginning in April, and disconnection no later than December 31st) and summertime customers (those taking water service from a summer service pipe and water main, which only supply premises between May 1 and October 1). The consultant team then used the combined data to estimate a percentage of seasonal houses in the Town in order to calculate them separately from year-round residences. Note that in addition to these residences that only have seasonal water service, there are more vacation or second homes in York but there are no data on how these homes are used during the year and because water service is continuous, assumptions can’t be made about vacancy in off season.

** There are just under 700 mobile homes in York. Given that their EUI is significantly higher than the other residential types, these are shown separately from single family residences.

Table 2. Land Use Codes used in Typology Mapping

Category	Building Typology	Land Use Codes
Residential	Single Family/Single Story	1020*; 0363; 0101*; 0109; 0111; 0303; 1010*; 1011*; 1012*; 1013*; 1042*; 1090*; 1091*; 3030; 9070; 102C; 302C;
	Single Family/Multi Story	0101*; 1010*; 1011*; 1012*; 1013*; 1020*; 1042*; 1090*; 1091*; 1110; 3030; 9080; 011C; 102C; 102R; 910C**
	Multi Family/Single Story	1040*; 1041; 1050*; 010J; 1010*
	Multi Family/Multi Story	1040*; 1050*; 1051
	Mobile Home	1030; 1031; 3865; 101T; 103E;103R;
Commercial	Municipal	9030; 903C; 903I; 903T; 905I
	Municipal Streets	
	School	1210
	Lodging	0301; 0302; 3000; 3010; 3011; 3020; 3860; 386I; 386R; 386U;
	Office	0340; 0402; 3400; 3401; 4020
	Restaurant	0326; 3260; 326R; 0322***
	Retail	0322***; 0335; 0337; 0338; 0342; 0352; 0355; 0376; 0377; 0394; 3110; 3210; 3220; 3221; 3240; 3250; 3310; 3320; 3700; 3740; 3760; 0321; 032R;
	Health care/Hospital	910C**; 0307; 3040; 3041; 3050; 3070; 9051; 910I; 910O****; 910R
	Other	0108; 0322; 0323; 0325; 0332; 0337; 0338; 3150; 3160; 3222; 3230; 3260; 3410; 3420; 3421; 3500; 3520; 3680; 3730; 3740; 3800; 3840; 9020; 300I; 301I; 301R; 322I; 322K; 326R; 380I; 388I; 901I; 910O****; 910C**
	Warehouse/Storage	0316; 3160;
	Institutional	910C**; 9031; 9060; 920C; 920I; 920R;
Industrial		0401; 4000; 4010; 4022; 4130; 4240; 4300; 9050

*Segmented across residential typologies based on attributes in the land use data.

**Segmented into single family/multi story, healthcare/ hospital, commercial – other, and institutional typology based on attributes in the land use data.

***Segmented across restaurant and retail

****Segmented into health care/hospital and commercial – other typology based on attributes in the land use data.

Building Square Footage

In 2019, there were over 41 million square feet (SF) of buildings in York. Residential buildings represent 84%, while commercial and industrial represent 15% and 1% respectively (Fig. 5 and Table 3).

Figure 5. Buildings Area by Category (sq ft)

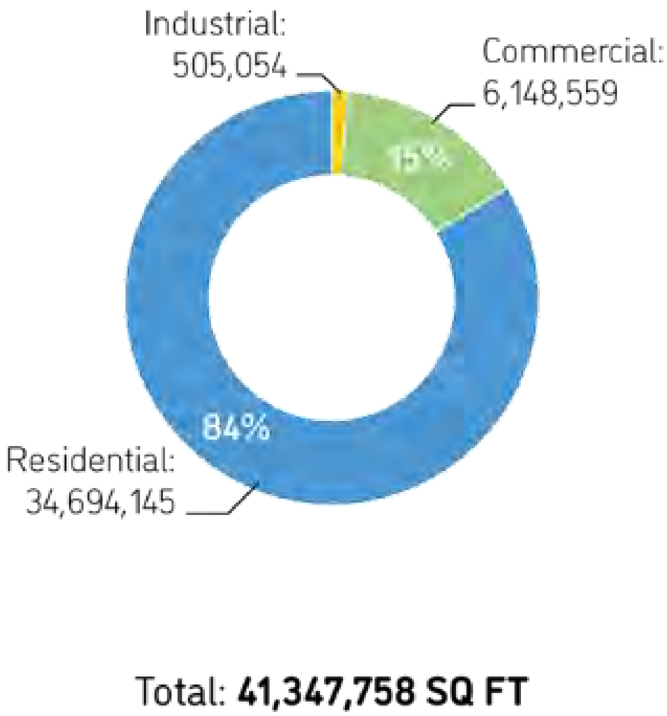


Table 3. Square Footage by Building Type

York Category	**Total Square Footage**
Residential - Single Family	33,376,331
Residential - Multi Family	966,828
Residential - Mobile home	350,986
Residential Total	**34,694,145**
Commercial-other	865,348
Hospital	254,983
Institutional	379,513
Lodging	1,430,305
Municipal	886,585
Office	445,662
Restaurant	211,813
Retail	1,413,550
School	23,074
Warehouse/storage	237,726
Commericial total	**6,148,559**
Industrial	505,054
Industrial - light	
Industrial - medium	
Industrial - heavy	
Industrial total	**505,054**
total	**41,347,758**

Source: Data from Town of York Assessor database for 2019.

Scope 2 Electricity Usage (plug load)

Central Maine Power (CMP) provided electricity consumption data for York for 2019 to the Town. These data included information on the consumption per building type (residential, commercial, industrial) but did not contain more finely grained information such as single-family vs multi family or mobile home data. For this reason, Scope 2 emissions calculations show total emissions per each of the general building types but not the subtypes. While not a part of the BASIC reporting requirements, the consultant calculated an approximate Scope 3 Transmission and Distribution loss for each building type (Table 4).

Table 4. Scope 3 Transmission and Distribution Loss Calculations

Calculating Scope 3 T&D loss MTCO2e for each sector	Scope 2 MT CO2e	NEWE EGRID Gross Loss (5.1%)**	Total MT CO2e losses from T&D
Residential	14,837	0.051	757
Commercial (street lights included)	9,604	0.051	490
Industrial	1,492	0.051	76
Total	25,934		**1,323**

Heating Fuel Types

No primary source data were available for heating fuel use in the Town, as there is no requirement for either customers or providers to report the type or usage of fuel used or volume consumed. Because of this, the consultant team had to rely on proxy data to determine an estimate of fuel types per use and square footage. That process is outlined below.

In general, the Town of York has no natural gas supply source and multiple companies deliver fuel oil, propane, and wood to customers in the town, while others may heat by electricity. The consultant team used SMPDC methodology (census-data based) to determine relative usage of the major remaining heating fuel types– fuel oil, propane, wood, and electricity. After assigning a proportion of these four heating fuels to York buildings, based on the SMPDC methodology,[7] wood and electricity usage (and that percentage of square footage of buildings) were removed from the overall calculations and the remainder (heating oil and propane) was included in the overall inventory (Table 5 and Table 6).

[7] Maine House Heating Fuel Characteristics from the ACE for 2016-2019 (following SMPDC guidance as outlined in Southern Maine GHG inventory protocol).

Table 5. Building Square Footage and Heating Fuel Use

Category	Square Footage	Propane $MtCO_2e$	Heating Oil $MtCO_2e$	Total Emission $MtCO_2e$ for Heating Fuel Use
Residential	**34,694,145**	**18,827**	**92,932**	**111,759**
Single Family	33,376,331	17,656	87,154	104,811
Multi Family	966,828	912	4,503	5,415
Mobile Homes	350,986	258	1,275	1,533
Commercial	**6,148,559**	**6,753**	**24,316**	**31,070**
Others	865,348	1,067	3,773	4,839
Hospital	254,983	108	380	488
Institutional	379,513	468	1,655	2,122
Lodging	1,430,305	2,012	7,116	9,128
Municipal	886,585	1,093	3,865	4,958
Office	445,662	549	1,943	2,492
Restaurant	211,813	244	864	1,108
Retail	1,413,550	1,022	3,614	4,636
School	23,074	6	21	28
Warehouse/storage	237,726	184	1,085	1,269
Industrial	**505,054**	**-**	**447**	**447**
Office	15,285	-	89	89
Warehouses	98,084	-	**358***	358
Other	391,685	-	-	-

Table 6. Percentage of Households Using Each Heating Fuel Type

HOUSE HEATING FUEL			
Occupied housing units	85,314	±938	85,314
Utility gas	2,373	±340	2.8%
Bottled, tank, or LP gas	11,435	±748	13.4%
Electricity	6,198	±671	7.3%
Fuel oil, kerosene, etc.	57,287	±1,060	67.1%
Coal or coke	97	±85	0.1%
Wood	6,083	±483	7.1%
Solar energy	167	±116	0.2%
Other fuel	1,336	±268	1.6%
No fuel used	338	±128	0.4%

Source: SMPDC Maine House Heating Fuel Characteristics from the ACE for 2016-2019 (following SMPDC guidance as outlined in Southern Maine GHG inventory protocol).

It should be noted that estimated electrical usage for heating was removed from the calculations because this electrical consumption is already counted in Scope 2 Electricity Usage. Wood was removed from the calculations because according to GHG Reporting protocol, wood is considered a carbon neutral fuel source as it does not contain “fossil carbon” and is renewable. While there is controversy about the overall scientific merit and policy implications of this assumption, from a reporting perspective, it is in keeping with the accounting protocols and has been reported as neutral for this phase of work (Table 7).

Table 7. Allocation of Heating Fuel to York Households

Propane - 16%
Fuel Oil + Kerosene - 67%
Not counted (wood, solar, electricity) - 17% (remove 17% of square footage from EUI calcs)

Heat and Domestic Hot Water Usage

The consultant used energy usage intensity (EUI) proxies for heat and domestic hot water usage based on data provided by Massachusetts Executive Office of Energy and Environmental Affairs,[8] based on their recent analysis and publication: *MA Decarbonization Roadmap Buildings Work*.[9] EUIs represent the average energy usage per square foot based on general building type and energy uses. The EUIs used in the EEA study account for both space and water heating needs and, from that perspective, the team felt were more inclusive and representative of actual energy usage than other available proxies. Plus, the overall regional heating needs of Massachusetts are generally representative of those in southern Maine. The gallons needed to heat buildings were backed out of the total numbers based on those applicable EUIs, the building typologies, and the overall square footage. With gallons of fuel used for different building types based on square footage, the team was then able to calculate the overall carbon footprint of each building type (Table 8).

[8] Database outputs and underlying technologies, methodologies and assumptions kindly provided by Benjamin Miller, Massachusetts Executive Office of Energy and Environmental Affairs with additional assistance from Mia Mansfield.

[9] A thank you to the following individuals for their help in procuring the data in a form that we needed (all EEA contacts):
EUI Data from: Buildings Sector Report of the MA Decarbonization Roadmap (2020) -https://www.mass.gov/info-details/ma-decarbonization-roadmap#final-reports-
Database outputs and underlying technologies, methodologies and assumptions kindly provided by Benjamin Miller, Massachusetts Executive Office of Energy and Environmental Affairs.

Table 8. Overall Carbon Footprint for Each Building Type

York Category	Total Square Footage	Adjusted for Residential (see fuel usage tab)	EUI Fuel Oil - heating + DHW	EUI Propane - heating + DHW
Residential - Single Family	33,376,331	25,239,158	52.7	52.7
Residential - Multi Family	966,828	742,117	94	94
Residential - Mobile home	350,986	239,901	73.3	73.3
Residential Total	34,694,145	26,221,176		
Commercial-other	865,348		78.6	78.6
Hospital	254,983		26.9	26.9
Institutional	379,513		78.6	78.6
Lodging	1,430,305		89.7	89.7
Municipal	886,585		78.6	78.6
Office	445,662		78.6	78.6
Restaurant	211,813		73.5	73.5
Retail	1,413,550		46.1	46.1
School	23,074		17.3	16.7
Warehouse/storage	237,726		49.3	82.3
	6,148,559			
Industrial	505,054			
Industrial - light			375.6	375.6
Industrial - medium			539.3	539.3
Industrial - heavy			726.8	726.8

Calculating $MtCO_2e$ Values

The consultant assigned $MtCO_2e$ values to both the Scope 1 (heating/onsite combustion) and Scope 2 (electricity use) using the emission factors for each fuel component (carbon, methane and nitrous oxide) and correcting for Global Warming Potentials (using IPCC AR5 values for methane and nitrous oxide) – see spreadsheets for conversion factors and actual values (Tables 9, 10, and 11).

Table 9. Emission Factors for Electricity

1. Subregion Output Emission Rates (eGRID2019)

eGRID subregion acronym	eGRID subregion name	Total output emission rates lb/MWh							Non-baseload output emission rates lb/MWh							Grid Gross Loss (%)
		CO_2	CH_4	N_2O	CO_2e	Annual NO_x	Ozone Season NO_x	SO_2	CO_2	CH_4	N_2O	CO_2e	Annual NO_x	Ozone Season NO_x	SO_2	
AKGD	ASCC Alaska Grid	1,114.4	0.098	0.013	1,120.8	6.2	6.1	0.7	1,333.0	0.123	0.017	1,341.0	6.6	6.7	0.8	5.4%
AKMS	ASCC Miscellaneous	549.3	0.026	0.004	551.3	8.1	7.8	0.7	1,520.2	0.067	0.012	1,525.4	22.6	22.8	2.0	5.4%
AZNM	WECC Southwest	952.3	0.068	0.010	956.9	0.6	0.6	0.2	1,445.3	0.100	0.014	1,451.9	0.9	0.9	0.3	5.1%
CAMX	WECC California	453.2	0.033	0.004	455.3	0.4	0.4	0.0	964.0	0.058	0.007	967.6	0.8	0.8	0.1	5.1%
ERCT	ERCOT All	868.6	0.057	0.008	872.4	0.5	0.5	0.6	1,277.2	0.083	0.012	1,282.7	0.9	0.8	0.9	5.1%
FRCC	FRCC All	861.0	0.055	0.007	864.5	0.3	0.3	0.2	1,029.5	0.054	0.007	1,033.0	0.3	0.3	0.2	5.1%
HIMS	HICC Miscellaneous	1,185.6	0.143	0.022	1,195.6	8.1	8.4	4.1	1,549.5	0.107	0.018	1,557.6	12.3	12.8	5.3	5.5%
HIOA	HICC Oahu	1,694.5	0.185	0.028	1,707.6	3.7	4.1	7.0	1,704.1	0.158	0.025	1,715.6	4.5	4.6	8.1	5.5%
MROE	MRO East	1,502.6	0.147	0.022	1,512.6	0.8	0.9	0.4	1,577.7	0.145	0.021	1,587.4	0.8	0.9	0.4	5.1%
MROW	MRO West	1,098.4	0.119	0.017	1,106.4	0.8	0.8	1.1	1,806.8	0.188	0.027	1,819.6	1.4	1.3	1.7	5.1%
NEWE	NPCC New England	488.9	0.077	0.010	493.8	0.3	0.3	0.1	839.9	0.089	0.012	845.5	0.4	0.4	0.1	5.1%
NWPP	WECC Northwest	715.2	0.068	0.010	719.9	0.6	0.6	0.4	1,617.5	0.156	0.022	1,628.1	1.6	1.5	0.9	5.1%
NYCW	NPCC NYC/Westchester	553.8	0.021	0.002	555.1	0.2	0.2	0.0	1,016.2	0.022	0.002	1,017.5	0.4	0.4	0.0	5.1%
NYLI	NPCC Long Island	1,209.0	0.157	0.020	1,218.9	0.9	0.9	0.2	1,300.6	0.044	0.005	1,303.3	0.8	0.8	0.2	5.1%
NYUP	NPCC Upstate NY	232.3	0.017	0.002	233.0	0.1	0.1	0.0	890.2	0.047	0.006	892.6	0.4	0.4	0.2	5.1%
PRMS	Puerto Rico Miscellaneou	1,537.3	0.084	0.013	1,543.3	3.5	3.9	3.2	1,587.9	0.056	0.010	1,592.3	4.5	5.1	5.0	0.0%
RFCE	RFC East	695.0	0.053	0.007	698.5	0.3	0.3	0.3	1,237.9	0.089	0.012	1,243.8	0.7	0.6	0.7	5.1%
RFCM	RFC Michigan	1,189.3	0.114	0.016	1,197.0	0.7	0.7	1.0	1,766.9	0.177	0.025	1,778.8	1.2	1.2	2.1	5.1%
RFCW	RFC West	1,067.7	0.099	0.014	1,074.4	0.8	0.6	0.7	1,831.6	0.178	0.026	1,843.7	1.5	1.1	1.3	5.1%
RMPA	WECC Rockies	1,242.6	0.117	0.017	1,250.6	0.7	0.6	0.4	1,578.8	0.126	0.018	1,587.3	0.8	0.8	0.4	5.1%
SPNO	SPP North	1,070.0	0.112	0.016	1,077.6	0.6	0.6	0.2	1,958.6	0.200	0.029	1,972.2	1.1	1.2	0.4	5.1%
SPSO	SPP South	1,002.0	0.070	0.010	1,006.7	0.7	0.8	0.8	1,543.7	0.108	0.015	1,550.9	1.2	1.2	1.3	5.1%
SRMV	SERC Mississippi Valley	806.8	0.043	0.006	809.6	0.6	0.6	0.7	1,200.1	0.068	0.010	1,204.7	0.9	1.0	1.4	5.1%
SRMW	SERC Midwest	1,584.4	0.169	0.025	1,595.9	1.0	0.8	2.4	1,960.9	0.216	0.031	1,975.6	1.2	1.1	2.8	5.1%
SRSO	SERC South	969.2	0.071	0.010	974.0	0.4	0.4	0.2	1,389.5	0.101	0.015	1,396.4	0.8	0.7	0.4	5.1%
SRTV	SERC Tennessee Valley	949.7	0.087	0.013	955.6	0.5	0.5	0.6	1,565.2	0.139	0.020	1,574.6	0.7	0.8	0.9	5.1%
SRVC	SERC Virginia/Carolina	675.4	0.058	0.008	679.1	0.3	0.4	0.2	1,349.2	0.116	0.017	1,356.9	0.7	0.8	0.4	5.1%
U.S.		**884.2**	**0.075**	**0.011**	**889.2**	**0.6**	**0.6**	**0.5**	**1,420.2**	**0.114**	**0.016**	**1,427.8**	**1.0**	**0.9**	**0.9**	**5.1%**

Created: 2/23/2021

Source: https://www.epa.gov/sites/production/files/2021-02/documents/egrid2019_summary_tables.pdf

Table 10. Emission Factors for Heating Fuels

Fuel Type	Heat Content (HHV)	CO_2 Factor	CH_4 Factor	N_2O Factor	CO_2 Factor	CH_4 Factor	N_2O Factor
	mmBtu per short ton	kg CO_2 per mmBtu	g CH_4 per mmBtu	g N_2O per mmBtu	kg CO_2 per short ton	g CH_4 per short ton	g N_2O per short ton
Coal and Coke							
Anthracite Coal	25.09	103.69	11	1.6	2,602	276	40
Bituminous Coal	24.93	93.28	11	1.6	2,325	274	40
Sub-bituminous Coal	17.25	97.17	11	1.6	1,676	190	28
Lignite Coal	14.21	97.72	11	1.6	1,389	156	23
Mixed (Commercial Sector)	21.39	94.27	11	1.6	2,016	235	34
Mixed (Electric Power Sector)	19.73	95.52	11	1.6	1,885	217	32
Mixed (Industrial Coking)	26.28	93.90	11	1.6	2,468	289	42
Mixed (Industrial Sector)	22.35	94.67	11	1.6	2,116	246	36
Coal Coke	24.80	113.67	11	1.6	2,819	273	40
Other Fuels - Solid							
Municipal Solid Waste	9.95	90.70	32	4.2	902	318	42
Petroleum Coke (Solid)	30.00	102.41	32	4.2	3,072	960	126
Plastics	38.00	75.00	32	4.2	2,850	1,216	160
Tires	28.00	85.97	32	4.2	2,407	896	118
Biomass Fuels - Solid							
Agricultural Byproducts	8.25	118.17	32	4.2	975	264	35
Peat	8.00	111.84	32	4.2	895	256	34
Solid Byproducts	10.39	105.51	32	4.2	1,096	332	44
Wood and Wood Residuals	17.48	93.80	7.2	3.6	1,640	126	63
	mmBtu per scf	kg CO_2 per mmBtu	g CH_4 per mmBtu	g N_2O per mmBtu	kg CO_2 per scf	g CH_4 per scf	g N_2O per scf
Natural Gas							
Natural Gas	0.001026	53.06	1.0	0.10	0.05444	0.00103	0.00010
Other Fuels - Gaseous							
Blast Furnace Gas	0.000092	274.32	0.022	0.10	0.02524	0.000002	0.000009
Coke Oven Gas	0.000599	46.85	0.48	0.10	0.02806	0.000288	0.000060
Fuel Gas	0.001388	59.00	3.0	0.60	0.08189	0.004164	0.000833
Propane Gas	0.002516	61.46	3.0	0.60	0.15463	0.007548	0.001510
Biomass Fuels - Gaseous							
Landfill Gas	0.000485	52.07	3.2	0.63	0.025254	0.001552	0.000306
Other Biomass Gases	0.000655	52.07	3.2	0.63	0.034106	0.002096	0.000413
	mmBtu per gallon	kg CO_2 per mmBtu	g CH_4 per mmBtu	g N_2O per mmBtu	kg CO_2 per gallon	g CH_4 per gallon	g N_2O per gallon
Petroleum Products							
Asphalt and Road Oil	0.158	75.36	3.0	0.60	11.91	0.47	0.09
Aviation Gasoline	0.120	69.25	3.0	0.60	8.31	0.36	0.07
Butane	0.103	64.77	3.0	0.60	6.67	0.31	0.06
Butylene	0.105	68.72	3.0	0.60	7.22	0.32	0.06
Crude Oil	0.138	74.54	3.0	0.60	10.29	0.41	0.08
Distillate Fuel Oil No. 1	0.139	73.25	3.0	0.60	10.18	0.42	0.08
Distillate Fuel Oil No. 2	0.138	73.96	3.0	0.60	10.21	0.41	0.08
Distillate Fuel Oil No. 4	0.146	75.04	3.0	0.60	10.96	0.44	0.09
Ethane	0.068	59.60	3.0	0.60	4.05	0.20	0.04
Ethylene	0.058	65.96	3.0	0.60	3.83	0.17	0.03
Heavy Gas Oils	0.148	74.92	3.0	0.60	11.09	0.44	0.09
Isobutane	0.099	64.94	3.0	0.60	6.43	0.30	0.06
Isobutylene	0.103	68.86	3.0	0.60	7.09	0.31	0.06
Kerosene	0.135	75.20	3.0	0.60	10.15	0.41	0.08
Kerosene-Type Jet Fuel	0.135	72.22	3.0	0.60	9.75	0.41	0.08
Liquefied Petroleum Gases (LPG)	0.092	61.71	3.0	0.60	5.68	0.28	0.06
Lubricants	0.144	74.27	3.0	0.60	10.69	0.43	0.09
Motor Gasoline	0.125	70.22	3.0	0.60	8.78	0.38	0.08
Naphtha (<401 deg F)	0.125	68.02	3.0	0.60	8.50	0.38	0.08
Natural Gasoline	0.110	66.88	3.0	0.60	7.36	0.33	0.07
Other Oil (>401 deg F)	0.139	76.22	3.0	0.60	10.59	0.42	0.08
Pentanes Plus	0.110	70.02	3.0	0.60	7.70	0.33	0.07
Petrochemical Feedstocks	0.125	71.02	3.0	0.60	8.88	0.38	0.08
Petroleum Coke	0.143	102.41	3.0	0.60	14.64	0.43	0.09
Propane	0.091	62.87	3.0	0.60	5.72	0.27	0.05
Propylene	0.091	67.77	3.0	0.60	6.17	0.27	0.05
Residual Fuel Oil No. 5	0.140	72.93	3.0	0.60	10.21	0.42	0.08
Residual Fuel Oil No. 6	0.150	75.10	3.0	0.60	11.27	0.45	0.09
Special Naphtha	0.125	72.34	3.0	0.60	9.04	0.38	0.08
Unfinished Oils	0.139	74.54	3.0	0.60	10.36	0.42	0.08
Used Oil	0.138	74.00	3.0	0.60	10.21	0.41	0.08
Biomass Fuels - Liquid							
Biodiesel (100%)	0.128	73.84	1.1	0.11	9.45	0.14	0.01
Ethanol (100%)	0.084	68.44	1.1	0.11	5.75	0.09	0.01
Rendered Animal Fat	0.125	71.06	1.1	0.11	8.88	0.14	0.01
Vegetable Oil	0.120	81.55	1.1	0.11	9.79	0.13	0.01
Biomass Fuels - Kraft Pulping Liquor, by Wood Furnish							
North American Softwood		94.4	1.9	0.42			
North American Hardwood		93.7	1.9	0.42			
Bagasse		95.5	1.9	0.42			
Bamboo		93.7	1.9	0.42			
Straw		95.1	1.9	0.42			

Source:
Federal Register EPA; 40 CFR Part 98; e-CFR, June 13, 2017 (see link below). Table C-1, Table C-2, Table AA-1.
https://www.ecfr.gov/cgi-bin/text-idx?SID=ae265d7d6f98ec86fcd8640b9793a3f6&mc=true&node=pt40.23.98&rgn=div5#ap40.23.98_19.1

Note: Emission factors are per unit of heat content using higher heating values (HHV). If heat content is available from the fuel supplier, it is preferable to use that value. If not, default heat contents are provided.

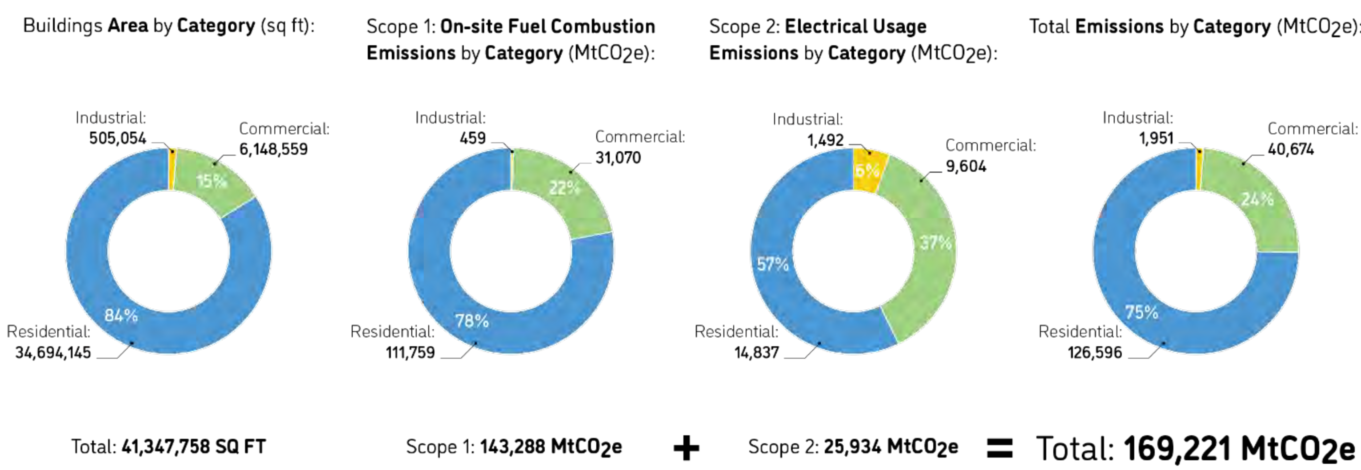
Source: https://www.epa.gov/sites/production/files/2020-04/documents/ghg-emission-factors-hub.pdf

Table 11. Global Warming Potential (GWP) Values Relative to CO_2

Industrial Designation or Common Name	Chemical Formula	GWP Values Fifth Assessment Report (AR5)
Carbon Dioxide	CO_2	1
Methane	CH_4	28
Nitrous Oxide	N_2O	265

Source: https://www.ghgprotocol.org/sites/default/files/ghgp/Global-Warming-Potential-Values%20%28Feb%2016%202016%29_1.pdf

Figure 6. Buildings GHG Information



Transportation

GHG emissions from transportation in York was calculated for on-road vehicles only. York has no train station nor passenger rail lines running in-boundary in the town, nor does it have an airport or cruise ship terminal. There were 1008 boats registered in York[10] in 2019; the consultant omitted boats from the GHG transportation inventory because their overall footprint would be minimal compared to the other sources, the numbers relatively challenging to obtain based on variability in user behavior, lack of information around actual engine and fuel types, and the inability to easily track miles traveled and speed.

[10] Town of York Annual Report, 2019-20, page 11.

As the vehicular fleet in York shifts to more electric vehicles (versus the traditional internal combustion engines), the emissions associated with transportation will likewise shift from Scope 1 (onsite combustion) to Scope 2 (electricity generation). The overall carbon footprint of an EV will be determined by the fuel mix that is used to generate that electricity. Traditional fossil-fueled sources will still have carbon footprints associated with them. Whereas a renewable energy source that is used to generate electricity could result in carbon neutrality with respect to Scope 1 and Scope 2 emissions. This will be an important area for significant carbon reductions IF the grid is decarbonized at the same time as EV adoption.

Vehicle Miles Traveled (VMT)

The consultant created two categories of Vehicle Miles Traveled (VMT) – Scope 1 and Scope 3 -- and calculated the VMTs from each. Scope 1 emissions includes all in-boundary traffic in York that included at least an origin or destination in York and/or both. Scope 3 emissions include all traffic that was simply pass-through with no stops in York; these VMT include I-95 traffic Southbound and Northbound (note: traffic on off-ramps and on-ramps for I-95 was calculated as in-boundary Scope 1 VMT). While this Climate Action Plan GHG inventory looks only at reporting and addressing mitigation strategies for Scope 1, the consultant kept account of Scope 3 traffic because it is over half of the GHG emissions from transportation in York and this information will be useful as the Town collaborates regionally and with the State to address these emissions, over which it has no direct control.

Table 12. Vehicle Miles Traveled (VMT) for York for Scope 1 (in-boundary) and 3 (I-95)

	Total VMT	Gallons Consumed	Emissions $MtCO_2e$
Scope 1 - Gasoline	110,700,917	5,703,882	50,693
Scope 1 - Diesel	2,566,457	194,467	1,980
Scope 1 - Total	**113,267,374**		**52,673**
Scope 3 - Gasoline	153,649,668	6,484,201	57,628
Scope 3 - Diesel	30,031,944	2,532,375	25,781
Scope 3 - Total	**183,681,612**		**83,409**

Source Data: Provided by the Town of York; analyzed and compiled by MaineDEP in 2017. VMT data was updated to reflect 2019 values using a 0.5% annual escalation rate for traffic. Source for traffic escalation kindly provided by Ed Hanscom, MaineDOT.

Scope 1 VMT Disaggregation

Overall GHG emissions were calculated via Vehicle Miles Travelled (VMT) per fuel type and their corresponding emissions factor. VMT per fuel type was calculated by proxy using the EPA Chart for Fuel Consumption Per Vehicle Type and Town of York's Vehicle Registration information:

1. VMT was provided by the Town of York[11], however, these data did not show miles disaggregated to vehicle or fuel type.

[11] Town of York Vehicle Miles Traveled information (Data from 2017; Prepared by ECB,RIO,Source: TIDE)

2. VMT was provided for 2017, and was projected forward to 2019 following a 0.5% increase per information provided by State of Maine Department of Transportation (DOT). [12]
3. Using Town of York Vehicle Registration's disaggregated vehicle count[13] by type and fuel, and the EPA Chart for Fuel Consumption Per Vehicle Type,[14] VMT was calculated for each vehicle type, separated for each fuel type. (i.e. passenger vehicle – gasoline, passenger vehicle – diesel, motorcycle – gasoline, bus – gasoline, bus – diesel etc.).
    a. VMT was calculated by weighing EPA VMT data to base data on a single vehicle type (i.e. if buses travel an avg of 50000 VMT per year and passenger cars travel an avg of 25000 VMT per year, passenger car counts would be reduced by 50% in weighted calculations in relation to bus counts).
    b. In combination with Vehicle Count, an aggregate weighed VMT for each vehicle type was calculated.
    c. VMT is divided by EPA's Miles per Gallon to obtain Gallons of Fuel.

Scope 1 + 3 Emissions Calculations

Emissions were calculated using EPA's emissions factors[15] from 2020 for gasoline and diesel and multiplying those by the gallons consumed for each fuel type:

1. For **Gasoline**: an emission factor of 8.8875 kg CO_2e per gallon is used.
    a. Emission MT CO_2e = Gallons of Fuel x 8.8875 kg CO_2e x 1 MT / 1000 kg
2. For **Diesel**: an emission factor of 10.1805 kg CO_2e per gallon is used.
    a. Emission MT CO_2e = Gallons of Fuel x 10.1805 kg CO_2e x 1 MT / 1000 kg

---

[12] Email from Ed Hanscom, maine DOT, 4/2/21. 0.5% increase in traffic volume (VMT) - both intown and for I-95- from 2017 – 2019, and moving forward.
[13] Town of York Vehicle Registration information (Data from York Town Clerk; All vehicles registered to York Residents broken down by year, type, and fuel use.)
[14] https://afdc.energy.gov/data/
[15] https://www.ghgprotocol.org/sites/default/files/ghgp/Global-Warming-Potential-Values%20%28Feb%2016%202016%29_1.pdf

Figure 7. On-Road Fuel Usage and Vehicle Emissions by Fuel

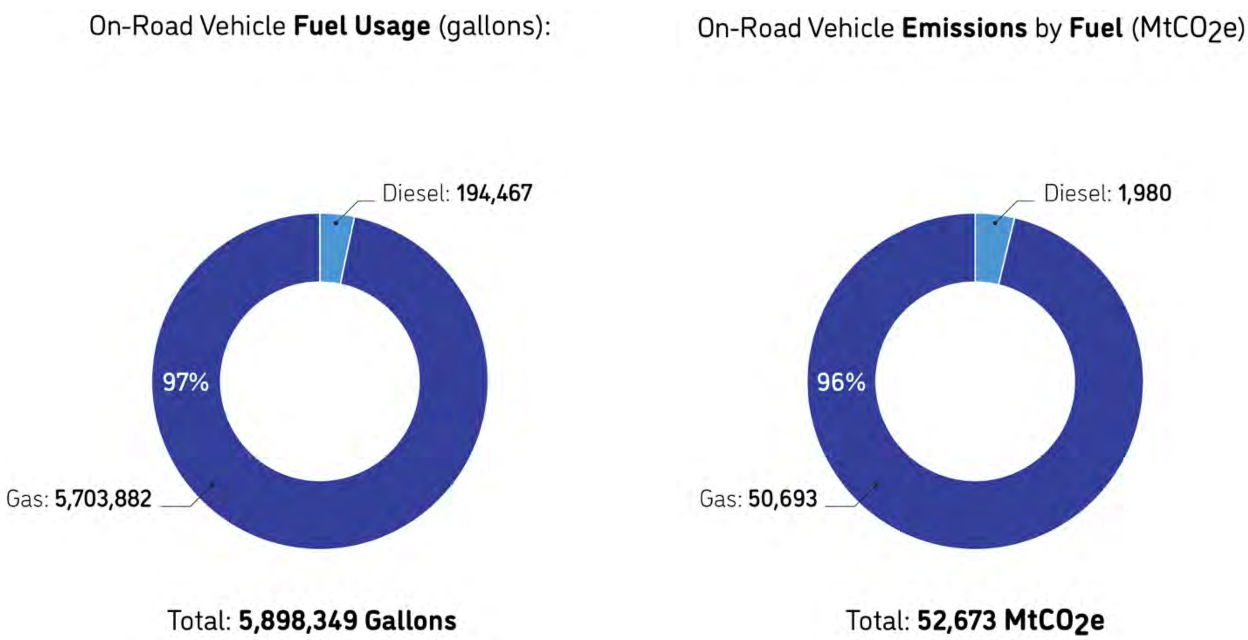
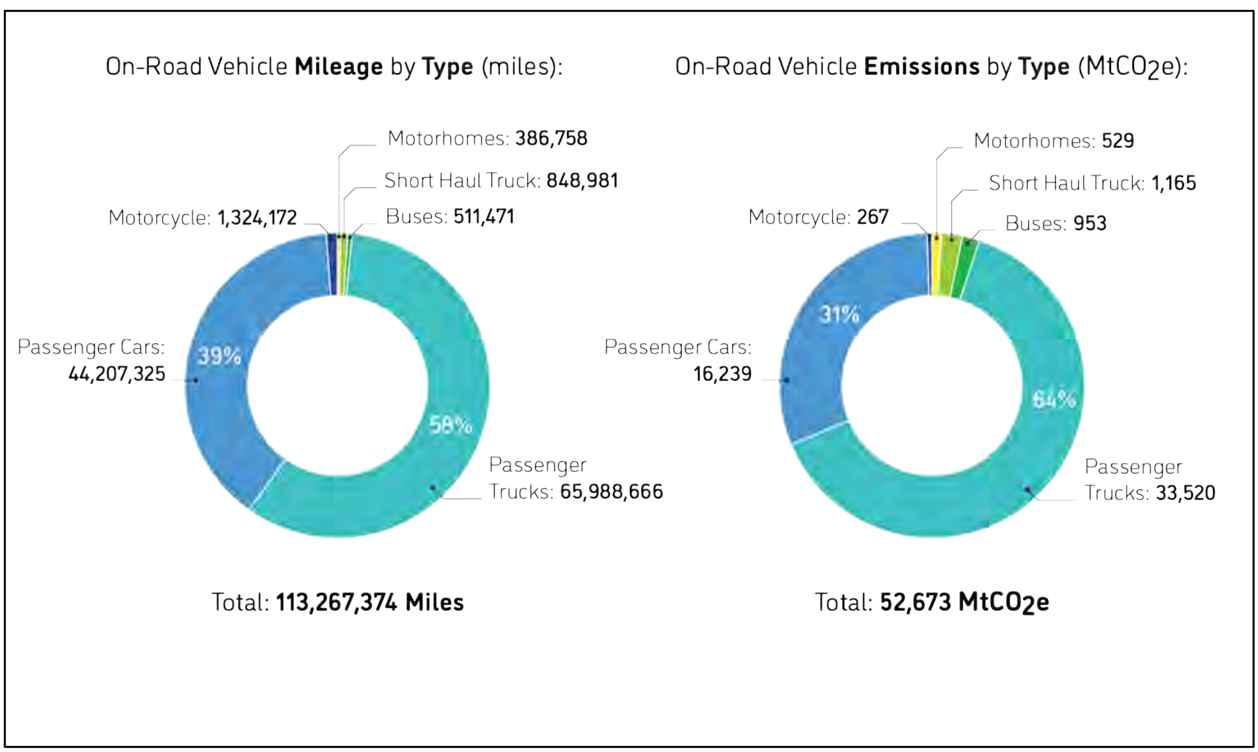


Figure 8. On-Road Vehicle Mileage and Vehicle Emissions by Type



Waste

Waste GHG emissions were analyzed from three categories of waste production: residential, commercial, and wastewater treatment. Waste data was collected, where available, from primary sources, as well as by estimates using 2019 Town of York U.S. Census data and per capita waste consumption estimates calculated by the Maine Department of Environmental Protection (DEP).

Waste calculations used the town population information shown in Table 13.

Table 13. Population Information

Maine population (7/1/19 estimate)	**1,344,212**	residents	https://www.census.gov/quickfacts/ME
York population (7/1/19 estimate)	**13,290**	residents	https://www.census.gov/data/tables/time-series/demo/popest/2010s-total-cities-and-towns.html

Residential Municipal Solid Waste

In 2019, Casella had the Town contract for residential curb-side municipal solid waste (MSW) collection and provided data to the consultant on the total annual weight of both solid residential waste and recycling waste.[16] Casella also had private commercial contracts for solid waste pick-up at businesses in York but could not provide data on commercial solid waste for two reasons: 1) Casella waste trucks pick up commercial waste from multiple towns on each run, making it impossible to pull out York-specific data 2) multiple companies have commercial waste contracts in York, not just Casella, so any data from Casella would be incomplete, with data from other companies likely also lacking specific information for York. Casella confirmed that all residential solid waste was incinerated at the Orrington PERC.[17]

Commercial Municipal Solid Waste

To determine commercial MSW in York, the consultant used data from the *Maine DEP Biennial MSW Report* which provides average overall per capita waste generation figures for Maine that includes both residential and commercial waste. Using Casella 2019 data for residential solid waste and converting it to a per capita figure for York, the consultant deducted this figure from the DEP overall per capita waste figure to determine the remaining commercial solid waste for York.[18] Casella confirmed that all commercial solid waste collected from private business contracts was incinerated at the Orrington PERC.[19] The consultant used incineration as the disposal method for all commercial solid waste in York. While an exhaustive search for, and discussion with each commercial solid waste contractor was not conducted for the inventory, the consultant believes it is a fair assumption that all commercial solid waste was incinerated in 2019. It should be noted that waste disposal methods (and the regulatory framework for them) can be somewhat fluid and a year-to-year assessment of how waste is being disposed is likely warranted. In addition, the July 2021 passage of the Extended Producer Responsibility

[16] Email from Erica Bayley, Casella, on 5/21/21.
[17] Email from Erica Bayley, Casella, on 5/24/21
[18] This approach was discussed and vetted with Maine DEP, Lisa Churchill phone call with Brian Beneski, Bureau of Remediation and Waste Management on 6.8.21.
[19] Email from Erica Bayley, Casella, on 6/4/21.

(EPR) law LD 1541[20] that will require manufacturers to pay towards recycling costs will have an impact on how much packaging waste gets generated moving forward. In the future, changes in the industry (rather than consumer-related changes in behavior) may be the largest driver of changes in waste generation.

The commercial MSW data is a conservative estimate. The methodology used to calculate residential MSW accounts for overnight visitors to York who stay in private home rentals as the MSW generated by these visitors is included in the MSW curbside pickup for 2019. However, the commercial MSW was calculated using per capita formulas, and the actual tonnage may be slightly higher in reality based on the number of visitors staying in hotels and motels that use commercial MSW pick-up services. This could be an area for further study in the future, including the implementation of reporting methods that capture actual commercial MSW generated in York instead of using per capita estimates.

Emissions

The consultant used the incineration algorithms to calculate emissions from residential and commercial MSW. Maine DEP verified and provided data on the type of incinerator used at the PERC facility in Orrington, ME which enabled the consultant to determine the appropriate conversions factors in the emissions calculations.

Wastewater Treatment

The York Sewer District owns and operates the wastewater treatment plant (WWTP), which is located at 21 Bay Haven Drive in York, Maine. The plant provides secondary treatment for an average daily flow of 3.0 million gallons per day (MGD) of wastewater and discharges into the Atlantic Ocean Major treatment processes at the plant include preliminary screening, grit removal, secondary treatment via aeration basins to promote biological activity and clarifiers to settle out solids, and chlorination/dichlorination prior to effluent discharge. The dewatered wastewater sludge from the plant is approximately 16.5% solids (dry mass/mass sludge) and wasted sludge is sent to Casella Waste Management, where it is either composted or landfilled.[21]

Casella managed the 2019 Town contract for hauling the sewage sludge from the York wastewater treatment plant and provided the amount of sludge in tonnage for that year.[22] Casella indicated that all of the sewage sludge was composted and processed at the Hawk Ridge Casella Composting Facility in Unity, Maine or disposed of at the State-owned landfill at Juniper Ridge.[23] In 2019, sludge was landfilled from March 2019 forward.[24]

For the purposes of this analysis, two scenarios representing 100% and 75% of the total wastewater sludge (by weight) was assumed to be landfilled, with the remainder being composted at Casella's facility.

---

[20] https://www.newscentermaine.com/article/tech/science/environment/maine-becomes-first-state-in-the-country-to-pass-law-that-charges-corporations-that-do-not-use-sustainable-packaging-materials-recycling/97-a972cb36-74ab-45f1-a84a-0d779c0995e5

[21] Wright-Pierce Greenhouse Gas Emissions for York, Maine Wastewater, Memorandum dated 8/9/21.

[22] Email from Erica Bayley, Casella, on 5/21/21

[23] Email from Erica Bayley, Casella, on 6/4/21.

[24] Zoom call with York Wastewater District, Tim Haskell and Phil Tucker on July 7, 2021.

Like other landfills, the Juniper Ridge Landfill produces methane (CH4) gas as a result of the anaerobic decomposition of the waste within the landfill. This flammable gas is collected through a network of horizontal and vertical pipes within the landfill and then flared (burned off) to prevent explosions, reduce greenhouse gas emissions, and control odor. For purposes of this analysis, scenarios representing 100% and 0% flaring of landfill gas was assumed to show a range of possible methane emissions from the landfilling of wastewater sludge (Table 14).[25]

Table 14. Landfilled Sludge Emissions Summary

Emission Scenario	Ch_4 value, metric tons	GWP Correction	CO_2 eq Value, $MTCO_2$
Landfilling 100% Sludge			
100% methane flared	0	28	0
0% methane flared	44.4	28	1242
Landfilling 75% Sludge			
100% methane flared	0	28	0
0% methane flared	33.3	28	932

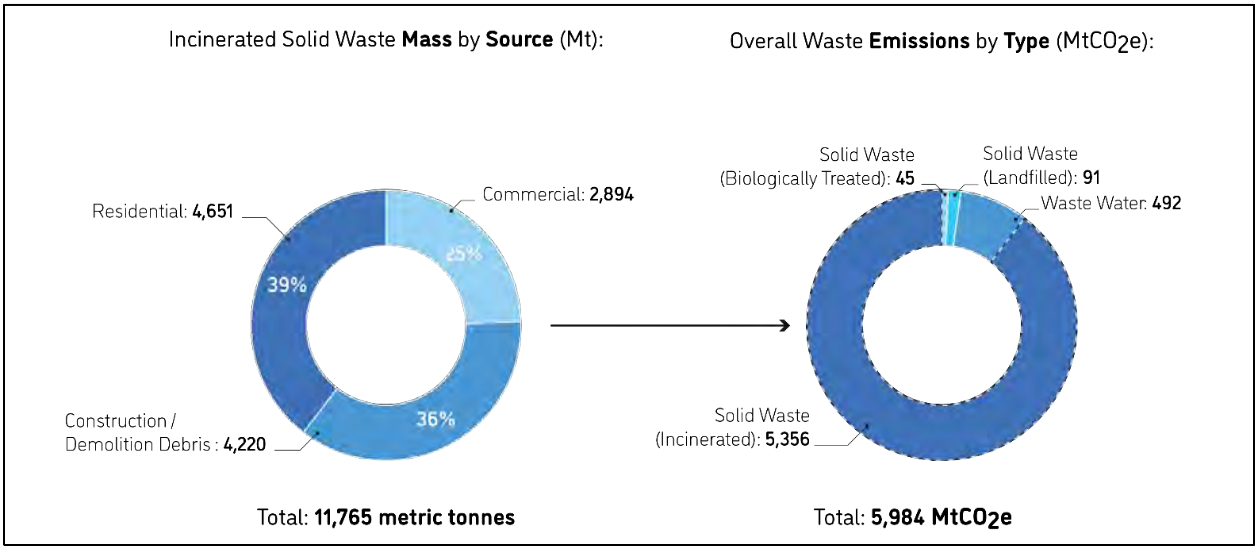
Although each wastewater treatment plant is unique in its operation, the facilities in Portland (both the East End plant and Peak's Island plant), South Portland, and York are similar in that each has secondary treatment prior to discharge. For the purpose of this analysis, it was assumed that the emissions produced by the on-site biological treatment of wastewater was comparable across the plants (per MGD of treated wastewater). The emissions for York Sewer District were calculated by averaging the emissions produced per MGD of treated wastewater at the Portland and South Portland plants and multiplying the value by the average daily flow of York Sewer District's facility, 3.0 MGD. The results can be seen in Table 15 below.[26]

Table 15. Onsite Treatment Emissions Summary

Treatment Facility	Daily Average Flow (MGD)	Wastewater Emissions $MTCO_2$
Portland	East End: 19.8 Peaks Island: 0.2	2649
South Portland	6.7	1310
York Sewer District	3.0	492

[25] Wright-Pierce Greenhouse Gas Emissions for York, Maine Wastewater, Memorandum dated 8/9/21.
[26] Wright-Pierce Greenhouse Gas Emissions for York, Maine Wastewater, Memorandum dated 8/9/21.

Figure 9. Incinerated Waste Emissions and Overall Waste Emissions by Type



Baseline 2010 Year Calculations

The Town of York selected 2010 as the baseline report year for the Town's commitment for GHG Emissions reduction. The Town has committed to a 50% reduction in GHG emissions for 2010 by 2030. Because data is not readily available for 2010 in the transportation and waste sectors, the consultant team used proxies and estimates for the GHG emissions inventory for that year. Below are the calculations for GHG emissions in each of the sectors for 2010.

Buildings

To calculate the 2010 GHG emissions for buildings, the consultant back-cast the square footage for the various building categories for 2010, using data from the Town of York Assessor.[27] The consultant sorted all buildings in the database listed as built in 2011-2018 by land use code and assigned the square footage for each land use code. Codes were then grouped according to the categories outlined in Table 2. These square foot totals were then used to calculate an estimate of GHG emissions for 2010 using the same methodology described for the 2019 GHG emissions inventory (Table 16).

[27] Town of York Assessor, email 8/5/21.

Table 16. Building Square Footage in 2010, Compared to 2019

Building Type	2019 Square Footage	2011-2018 SF new construction	2010 Square Footage
Single Family	33,376,331	1,705,808	31,670,523
Multi Family	966,828	20,435	946,393
Mobile Homes	350,986	67,107	283,879
Residential Total	**34,694,145**	**1,793,350**	**32,900,795**
Commercial-other	865,348	71,362	793,986
Hospital	254,983		254,983
Institutional	379,513		379,513
Lodging	1,430,305	85,030	1,345,275
Municipal	886,585	190,344	696,241
Office	445,662	42,779	402,883
Restaurant	211,813		211,813
Retail	1,413,550	24,301	1,389,249
School	23,074		23,074
Warehouse/storage	237,726		237,726
Commercial Total	**6,148,559**	**413,816**	**5,734,743**
Industrial-warehouses	505,054	27,644	477,410

Data source: Town of York Assessor's Data 2010 and 2019.

Based on those calculations, the 2010 Scope 1 building emissions is estimated to be 137,163 MtCO$_2$e. As expected, with new building development in the town comes an increase in overall carbon emissions. Given that 2019 levels are greater than 2010 (Table 17), meeting a 50% reduction goal in 2030, based on the 2010 baseline year, will require significant commitment to change.

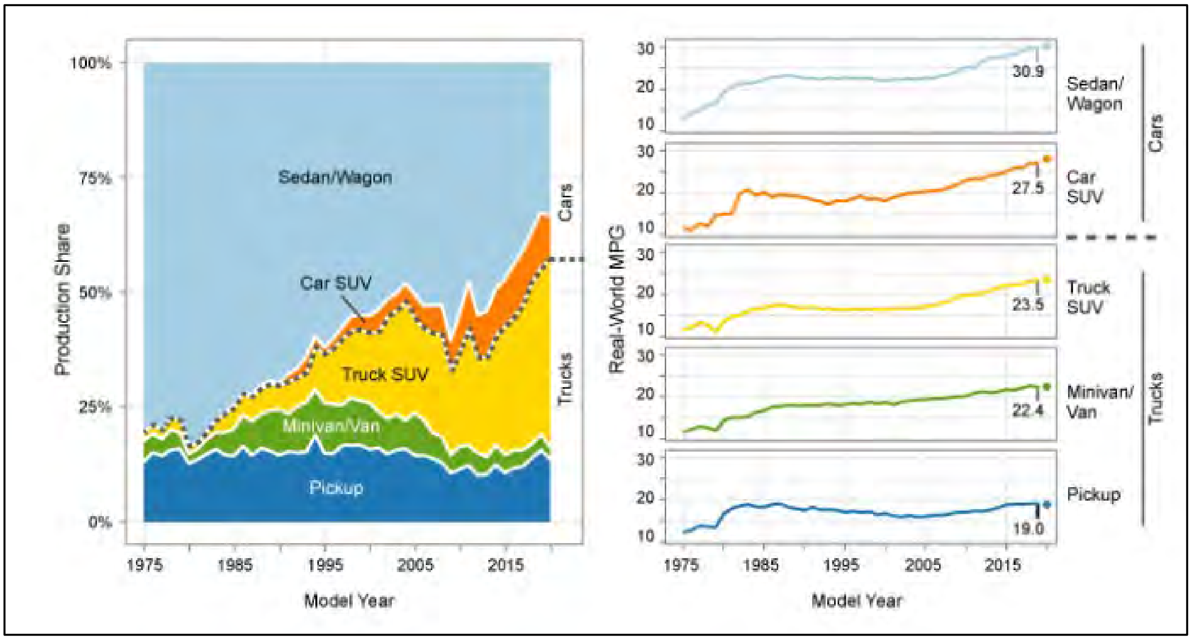
Table 17. Buildings GHG Emissions for 2010, compared to 2019

MtCO$_2$e	2010	2019
Residential	105,955	111,759
Commercial	28,744	31,070
Industrial	454	459
Total	**137,163**	**145,307**

Transportation

The consultant used MaineDOT traffic escalation data to estimate historic traffic volumes and develop a VMT figure for Scope 1 (in-bound) traffic. [28] Considerations for fuel efficiencies were also made to account for technological improvements during the past decade and were based on a high-level assessment of EPA's automotive trends highlights (Figure 10). Assumptions included adopting the same mix of vehicles as observed today and an average 5% decrease in overall fuel efficiency compared to today's fleet.

Figure 10. Production Share and Fuel Economy by Vehicle Type



Source: https://www.epa.gov/automotive-trends/highlights-automotive-trends-report

Based on those calculations, the estimated 2010 Scope 1 transportation emissions is estimated to be 52,562 $MtCO_2e$. This is very similar to what has been calculated for 2019 (52,673 $MtCO_2e$) which illustrates just how much more work needs to be done over the next nine years to meet a 50% reduction by 2030.

[28] 4/1/21 and 10/6/21 Emails from Ed Hanscom of MaineDOT with data for back-casting to 2010.

Waste

Waste data for 2010 was generated using 2010 Census population data, MSW residential disposal volumes for 2019 provided by Casella and Maine DEP per capita waste estimates (Table 18).[29]

Table 18. Change in Town of York Waste Generation from 2010 to 2019

	2019 Volumes	2010 Volumes	% change from 2010 to 2019
Statewide Average (from MDEP MSW report 2021; 2017)	0.63	0.57	11%
Residential per capita tonnage	0.39	0.35	11%
Commercial tonnage	0.24	0.22	10%
Ratio of Residential to Commercial (assume same ratio for 2010)	1.625	1.625	0%
$MtCO_2e$ (assumes MSW processed the same in 2010 as 2019)	5356	4767	12%

It is interesting to note that the State has set a reduction goal of 0.55 per capita by January 2019 and a further reduction of 5% every five years thereafter.[30] The latest numbers (MDEP 2021) indicate an opposite trend.

Because of the various variables included in calculating wastewater treatment, including flow rates, storm events, population, fluctuations in usage and processes, as well as associated disposal practices, we assumed the same overall carbon footprint in 2010 as 2019 for the purpose of setting a baseline.

[30] 2017 MDEP MSW Generation and Disposal Capacity Report: Calendar Year 2015 - From: https://www.maine.gov/decd/sites/maine.gov.decd/files/inline-files/Waste_CapacityReport%202017.pdf

YORK CLIMATE ACTION PLAN

Appendix C: Maps

January 2022

List of Figures

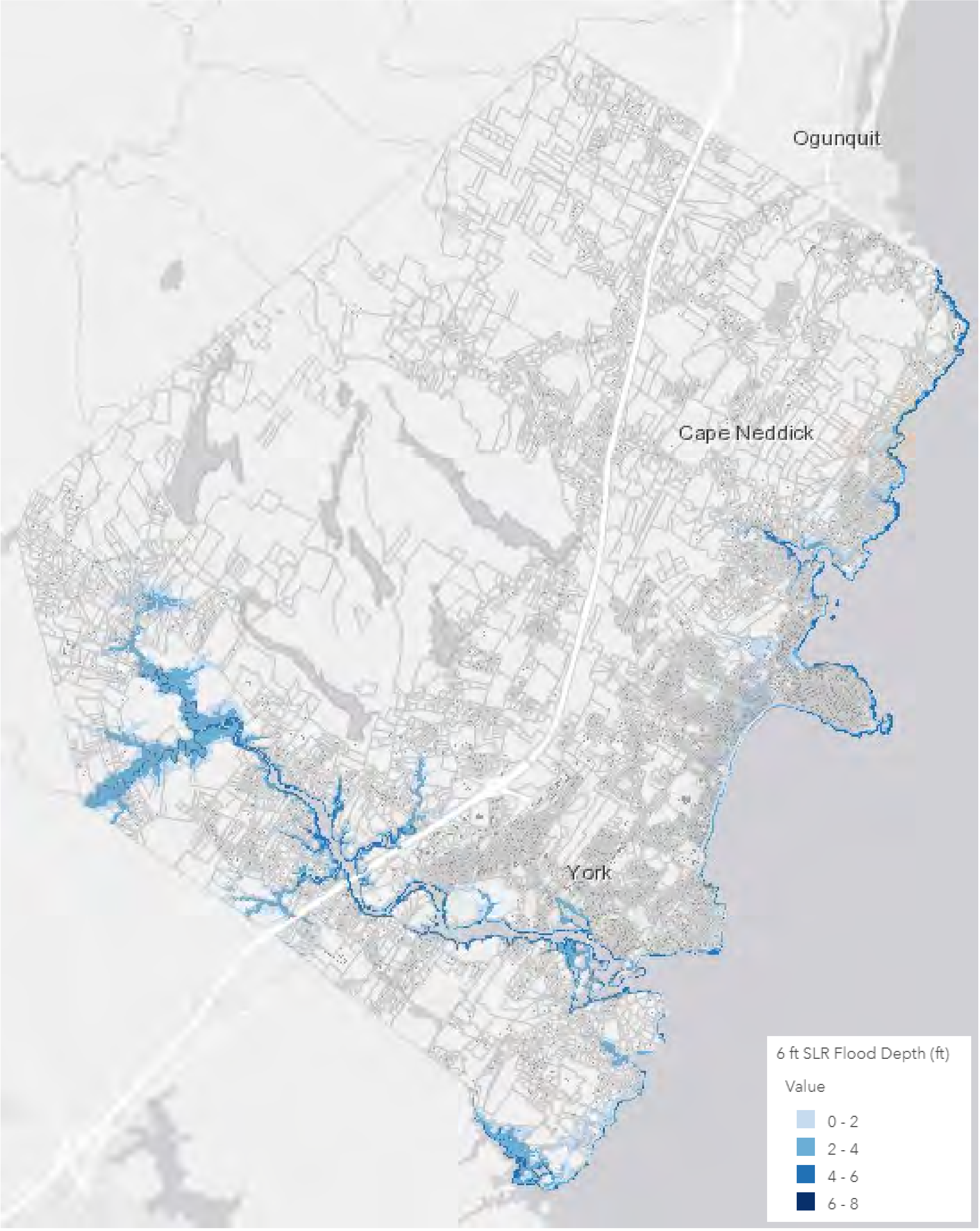
Figure 1. Estimated Inundation and Flood Depth (ft) at 1.5 Feet of SLR/Storm Surge.

Source: Maine Geological Survey, data downloaded by consultant on 6/29/21.

Figure 2. Estimated Inundation and Flood Depth (ft) at 4 Feet of SLR/Storm Surge.

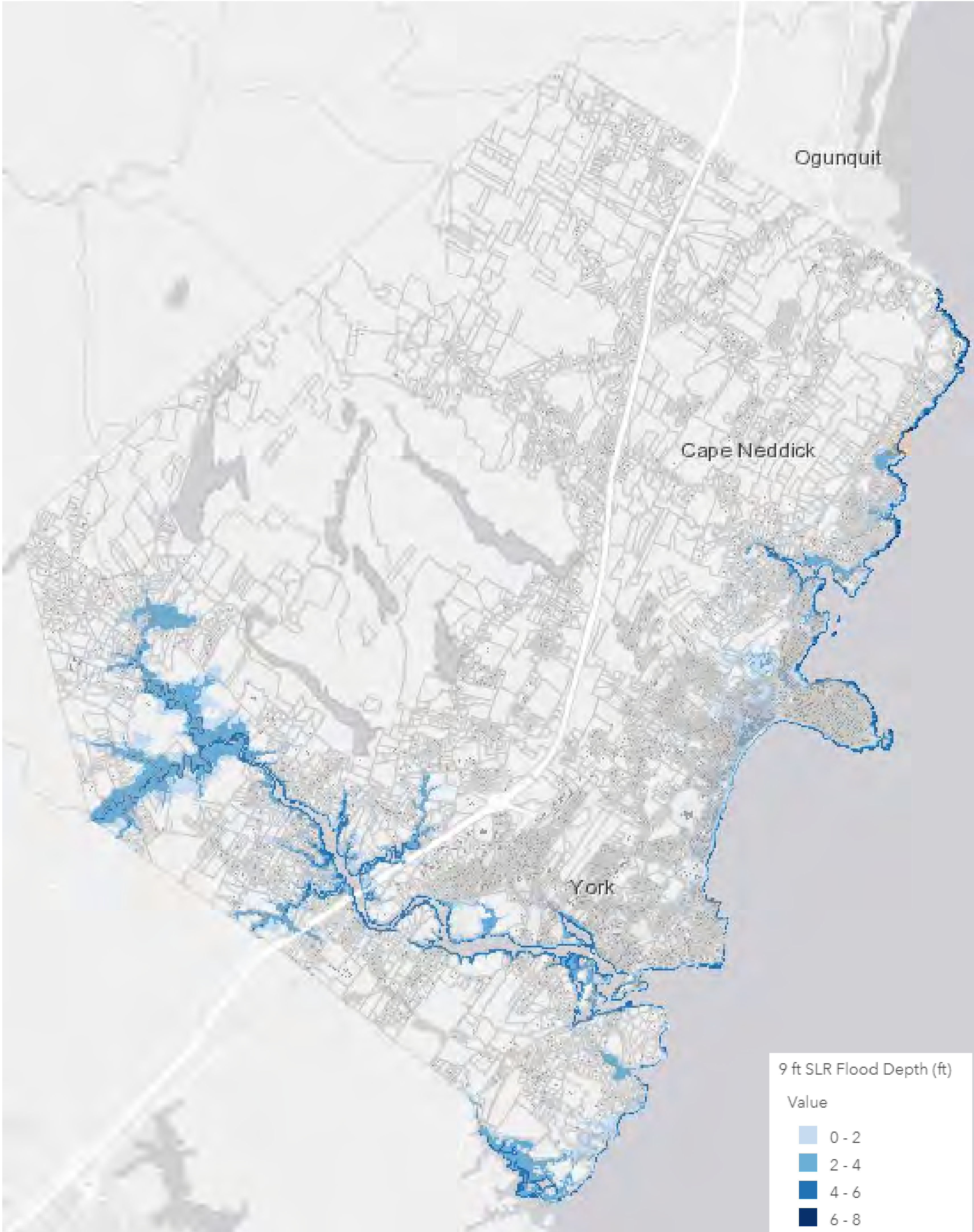
Source: Maine Geological Survey, data downloaded by consultant on 6/29/21.

Figure 3. Estimated Inundation and Flood Depth (ft) at 6 Feet of SLR/Storm Surge.



Source: Maine Geological Survey, data downloaded by consultant on 6/29/21.

Figure 4. Estimated Inundation and Flood Depth (ft) at 9 Feet of SLR/Storm Surge.



Source: Maine Geological Survey, data downloaded by consultant on 6/29/21.

Figure 5. York FEMA Flood Hazard Zones, Adopted.

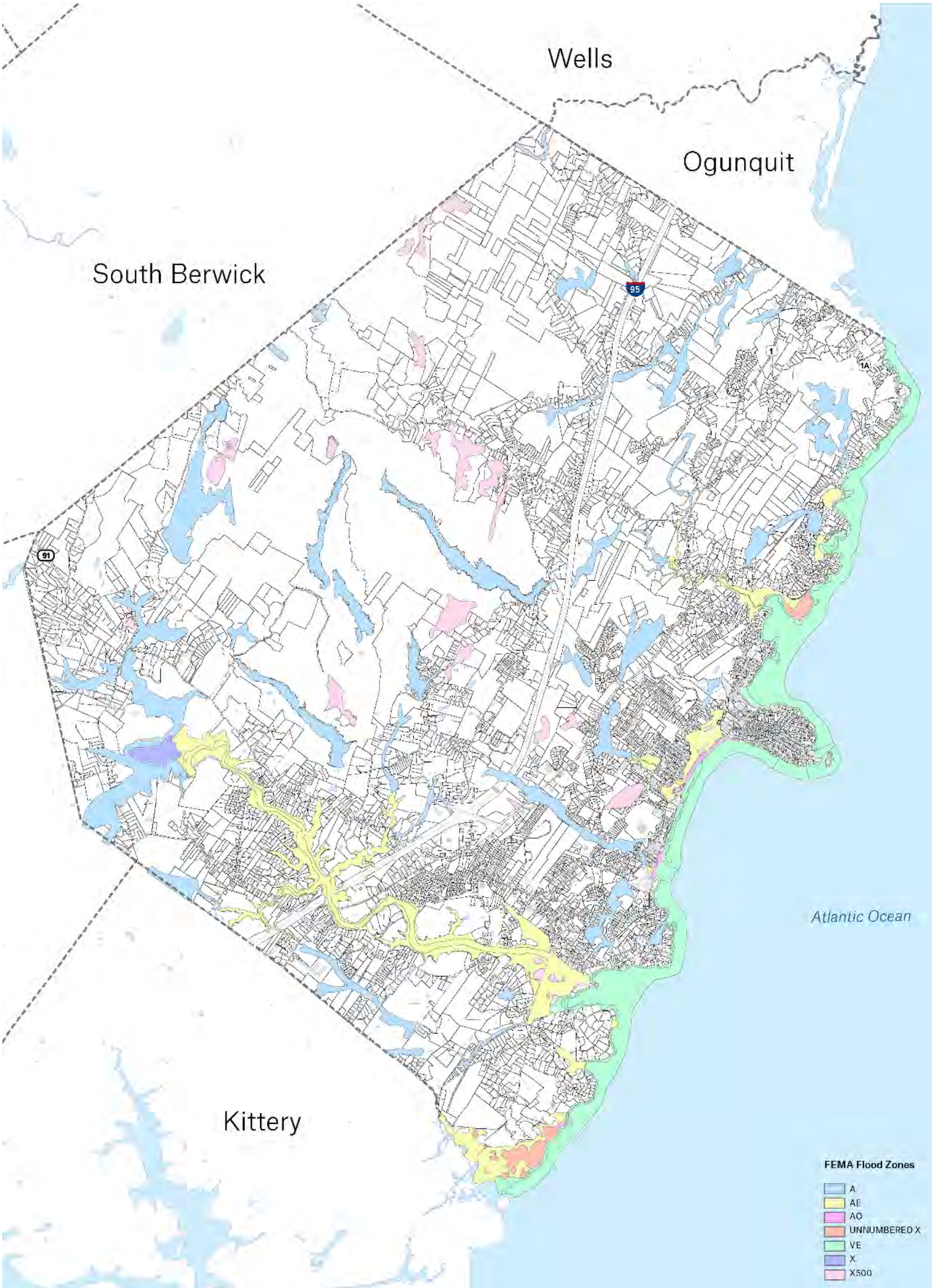
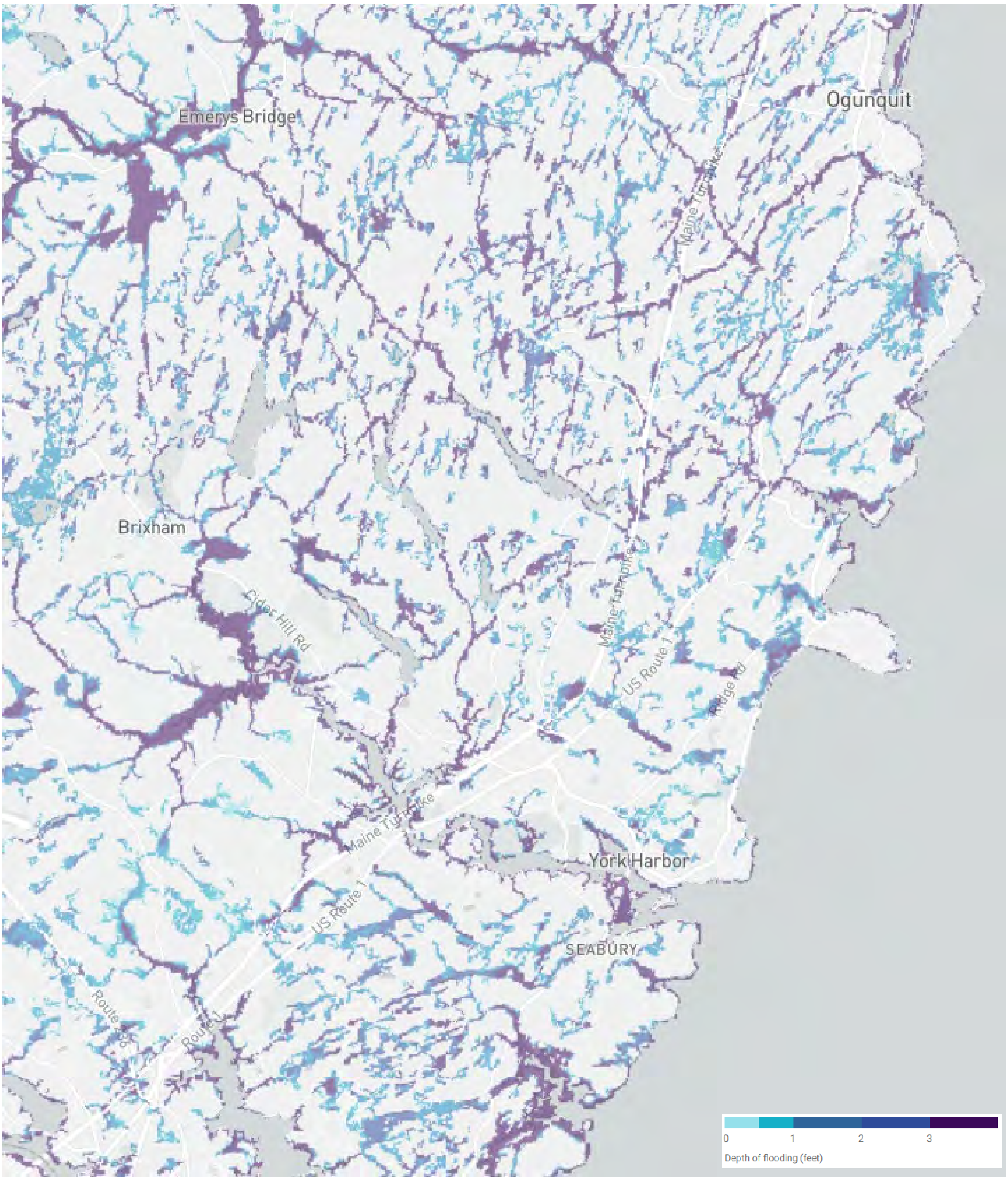


Figure 6. Flood Factor 2021 100-Year Storm Flood Inundation Projection for York Area.

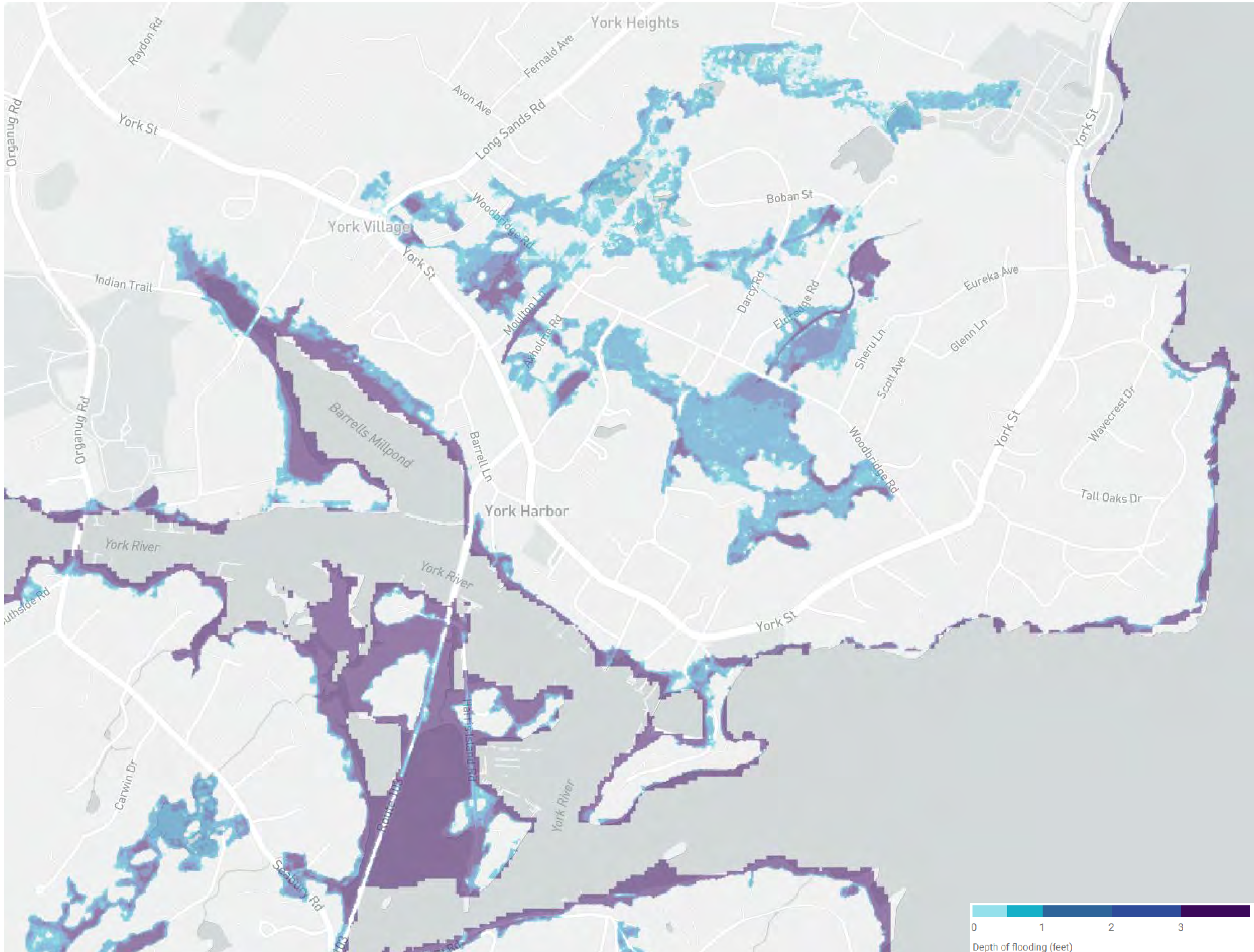
Source: First Street Foundation Flood Factor, https://floodfactor.com/zip/03909/3909_fsid#flood_risk_explorer.

Figure 7. Flood Factor 2051 100-Year Storm Flood Inundation Projection for York Area.



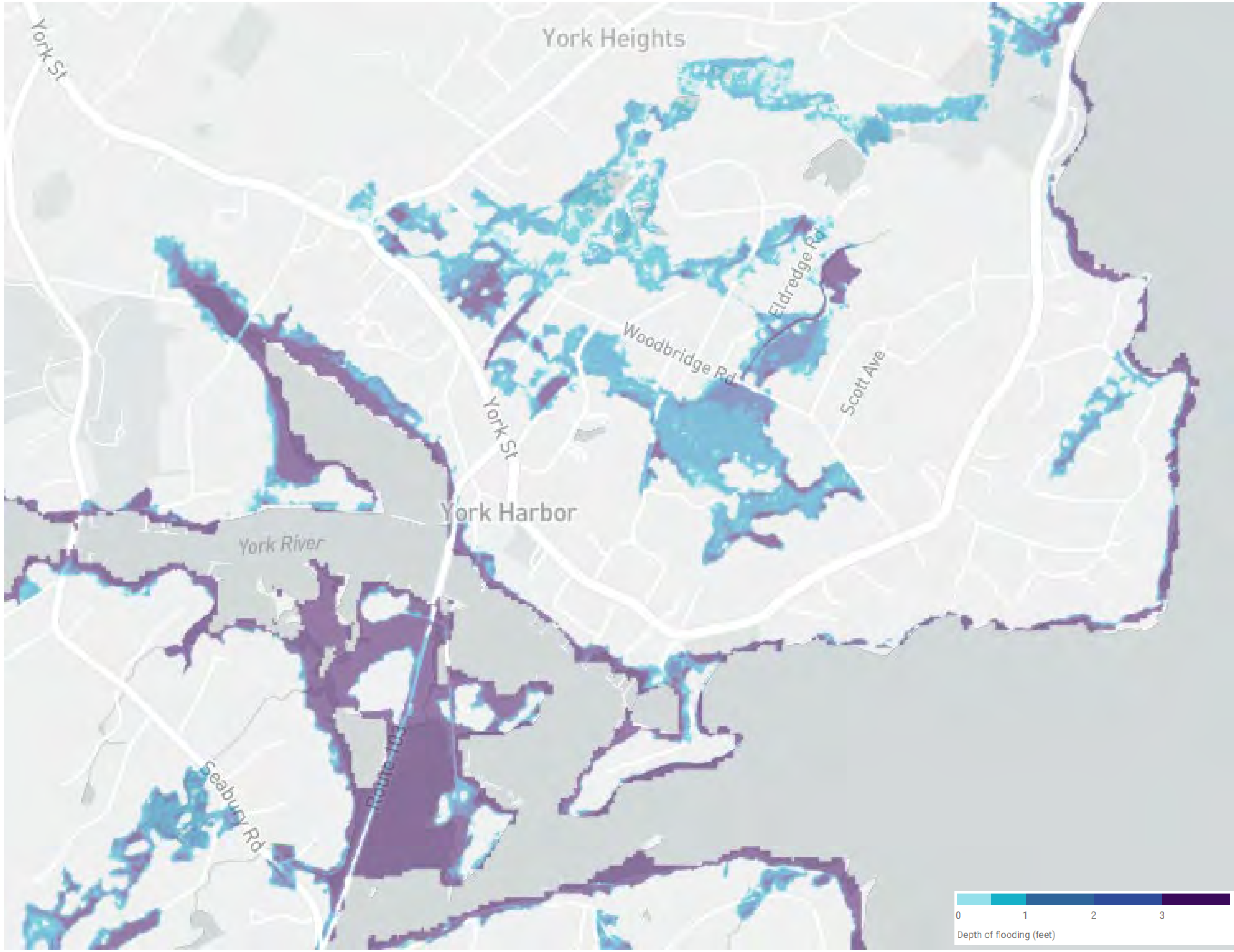
Source: First Street Foundation Flood Factor, https://floodfactor.com/zip/03909/3909_fsid#flood_risk_explorer.

Figure 8. York Village/Harbor 2021 100-Year Flood Map.



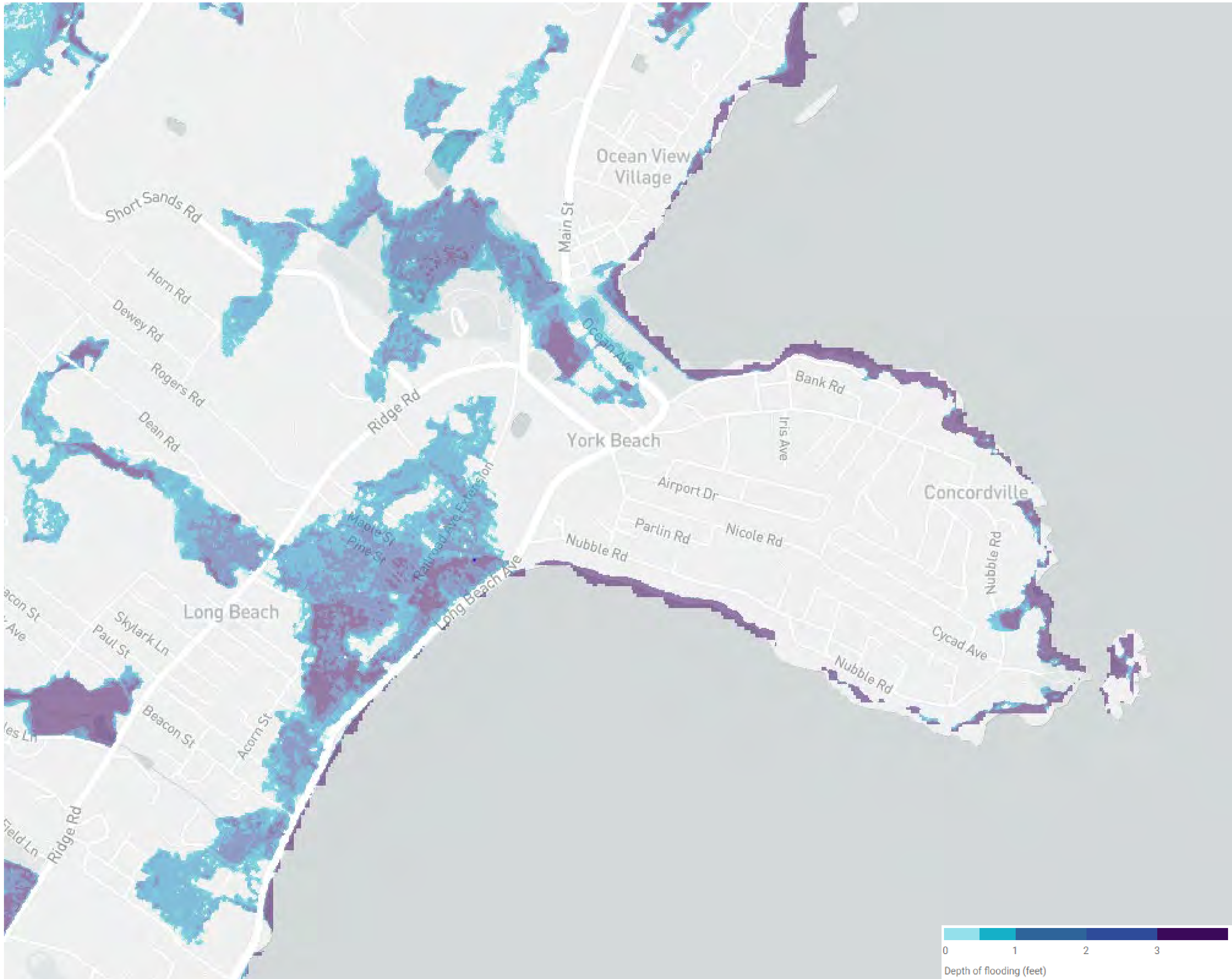
Source: First Street Foundation Flood Factor, https://floodfactor.com/zip/03909/3909_fsid#flood_risk_explorer.

Figure 9. York Village/Harbor 2051 100-Year Flood Map.



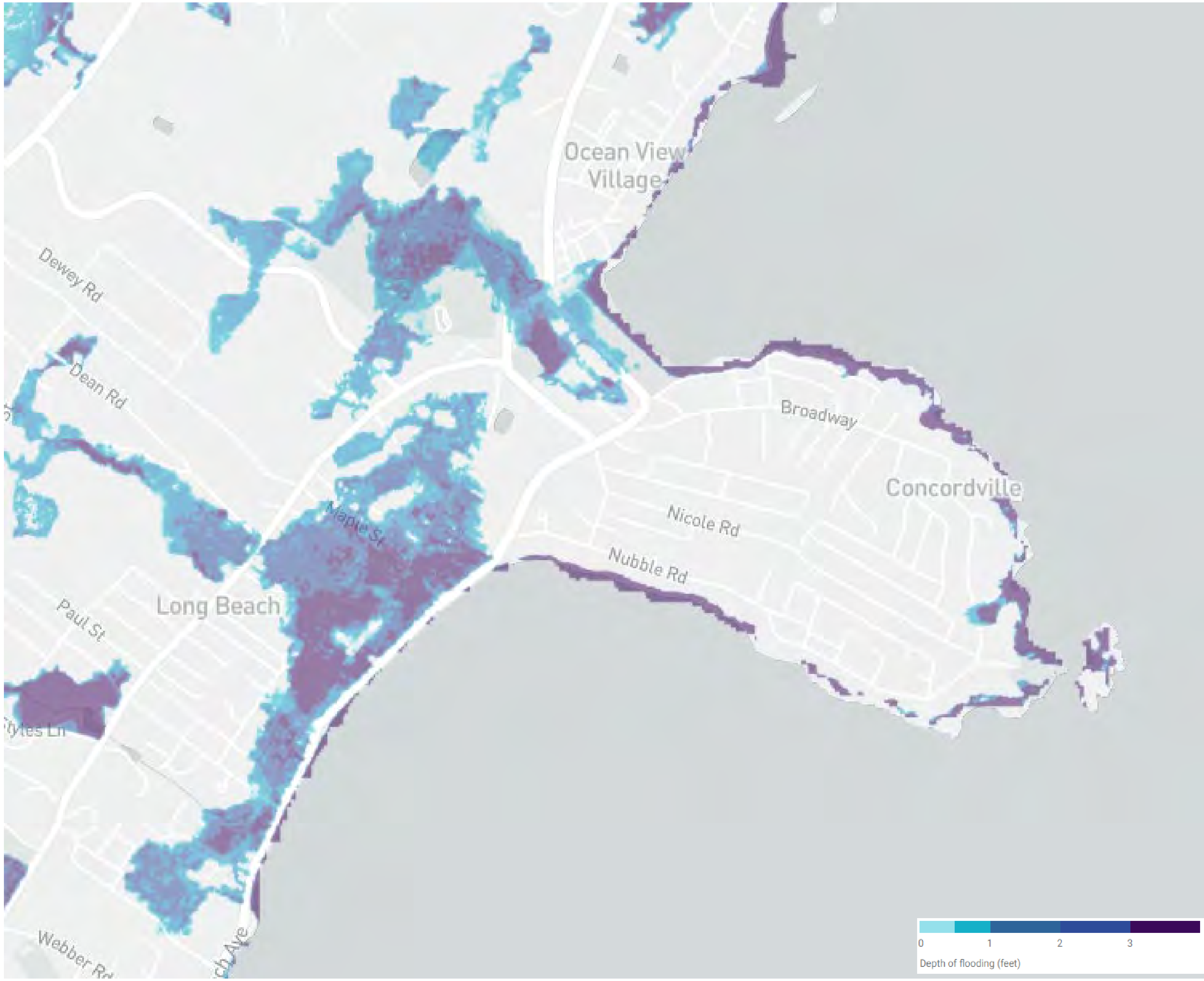
Source: First Street Foundation Flood Factor, https://floodfactor.com/zip/03909/3909_fsid#flood_risk_explorer.

Figure 10. York Long and Short Sand Beaches 2021 100-Year Flood Map.



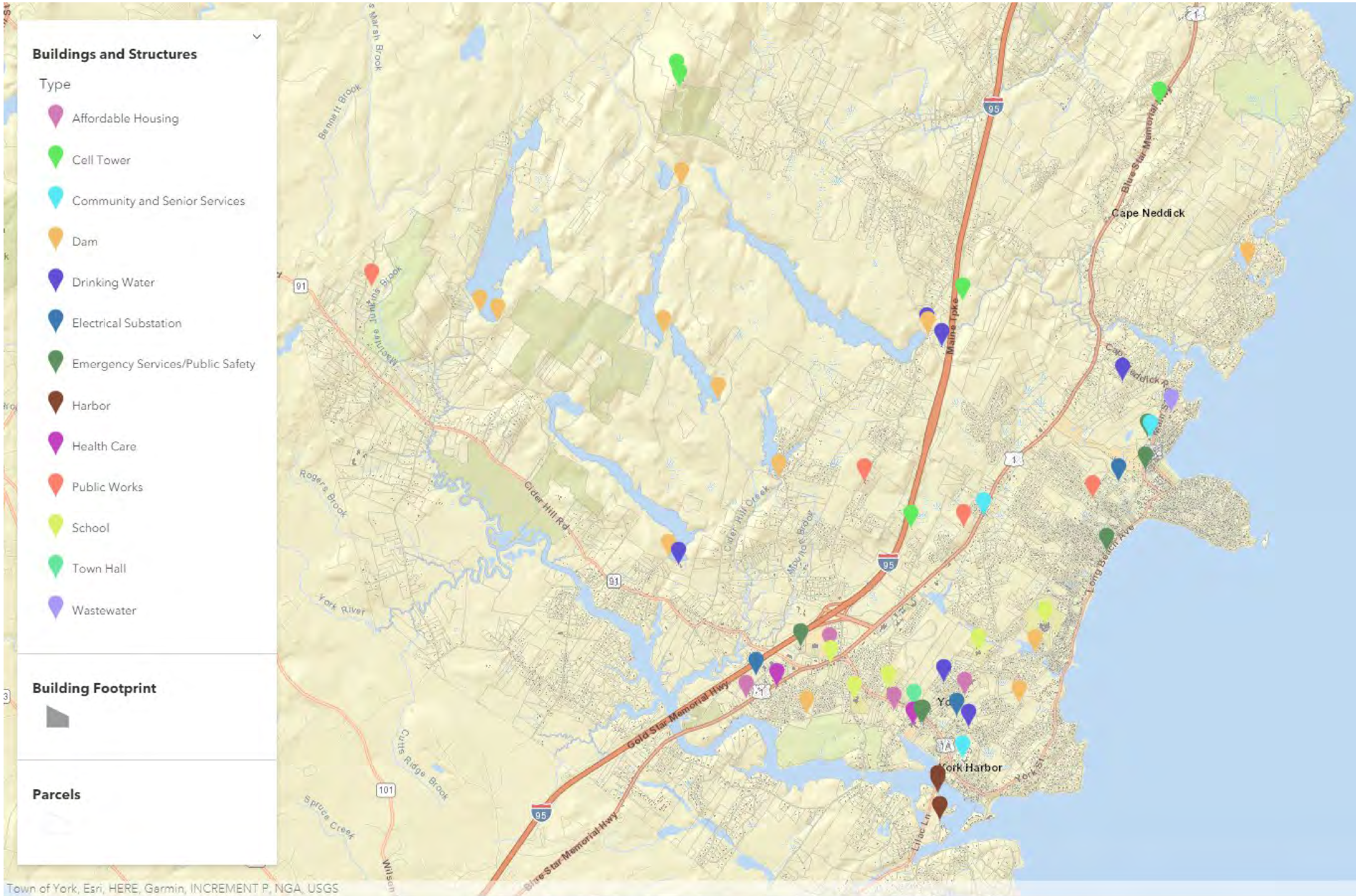
Source: First Street Foundation Flood Factor, https://floodfactor.com/zip/03909/3909_fsid#flood_risk_explorer.

Figure 11. York Long and Short Sand Beaches 2051 100-Year Flood Map.



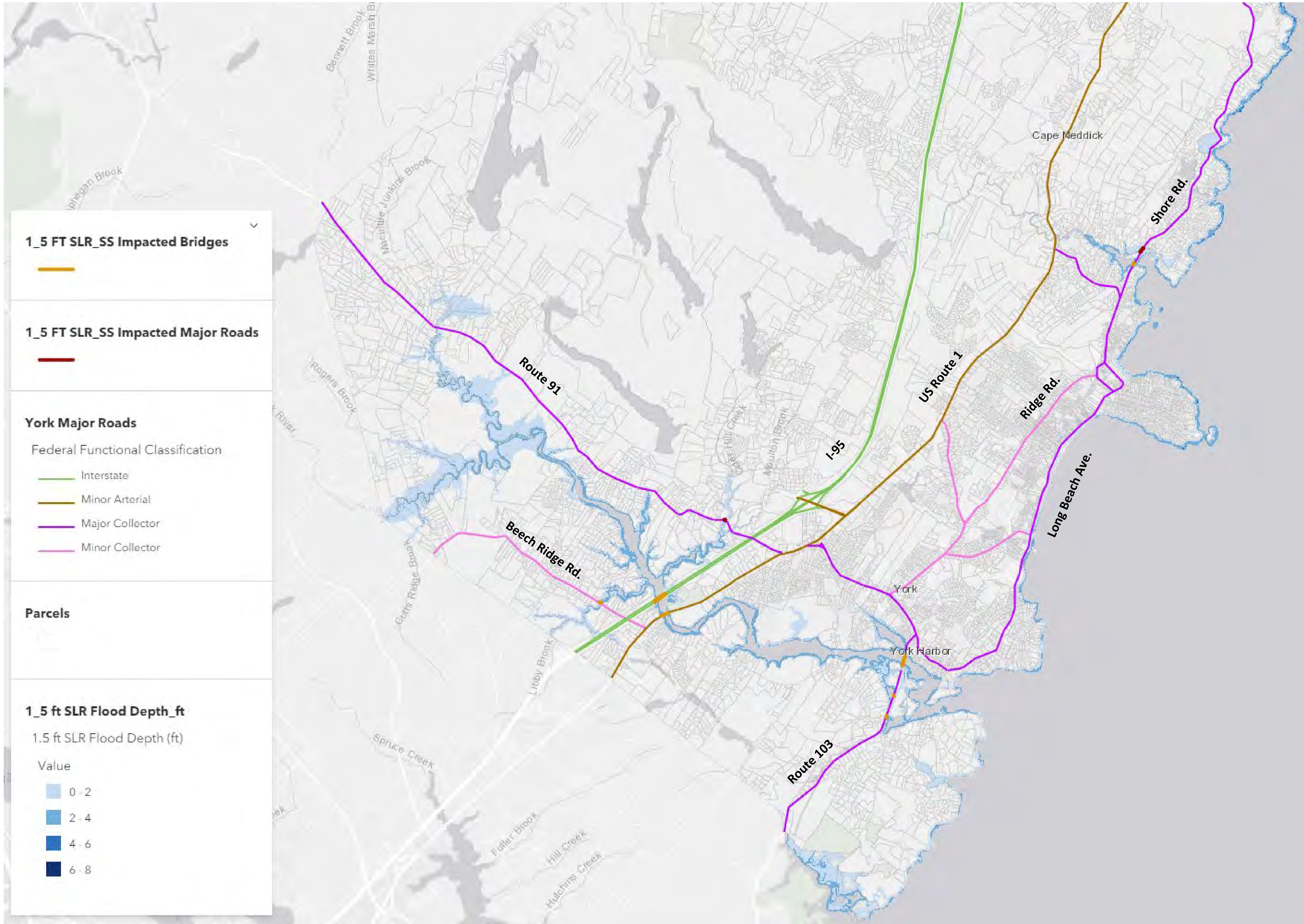
Source: First Street Foundation Flood Factor, https://floodfactor.com/zip/03909/3909_fsid#flood_risk_explorer.

Figure 12. Map of Critical Buildings and Structures from Flood Vulnerability StoryMap.



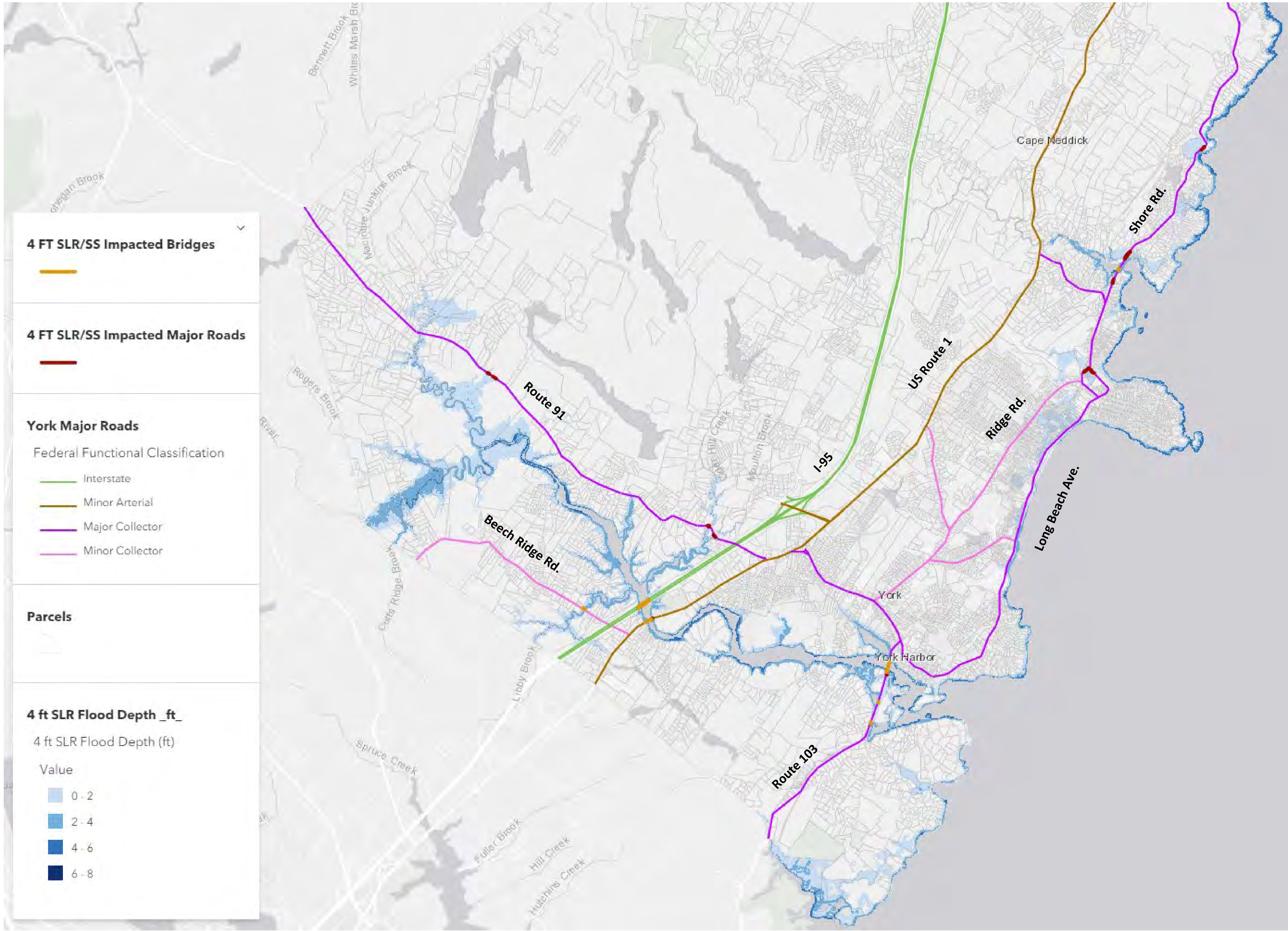
Sources: GIS data from Town of York GIS, York Town Manager's Office, York Department of Planning, Maine DEP.

Figure 13. Major Roads and Bridges Potentially Impacted at 1.5 Feet of SLR/Storm Surge.



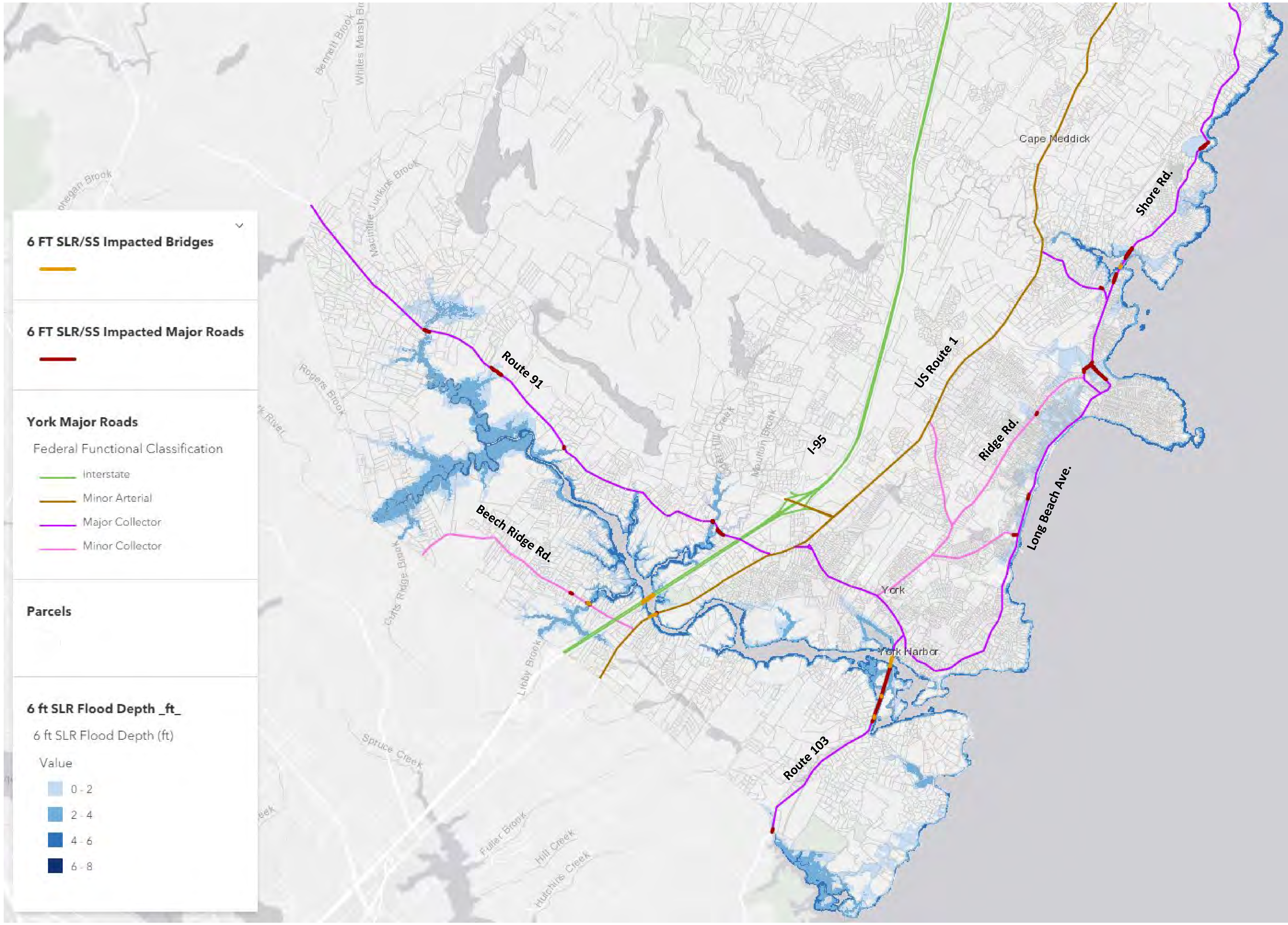
Source: Maine Geological Survey. MaineDOT. Town of York GIS.

Figure 14. Major Roads and Bridges Potentially Impacted at 4 Feet of SLR/Storm Surge.



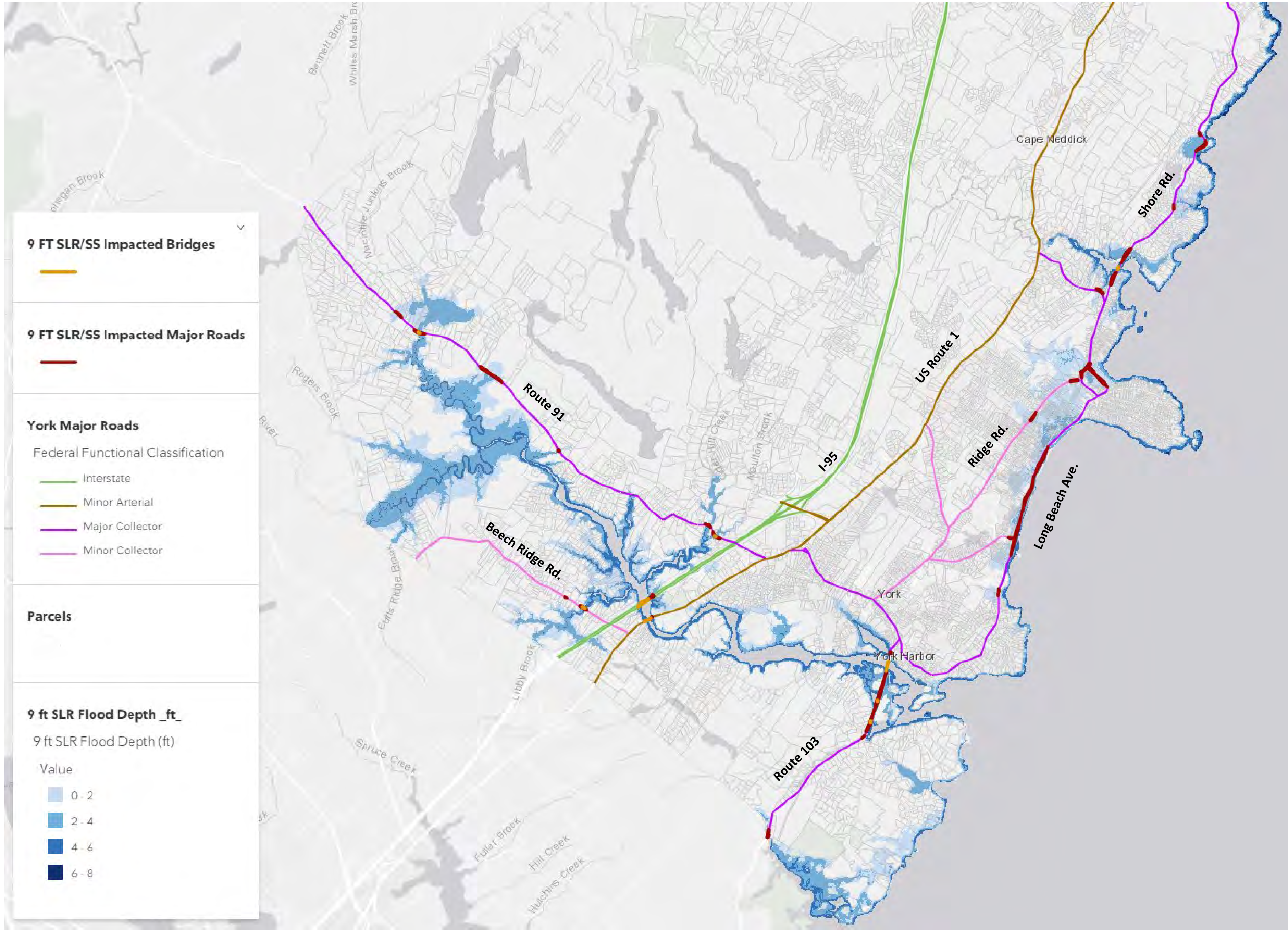
Source: Maine Geological Survey. MaineDOT. Town of York GIS.

Figure 15. Major Roads and Bridges Potentially Impacted at 6 Feet of SLR/Storm Surge.



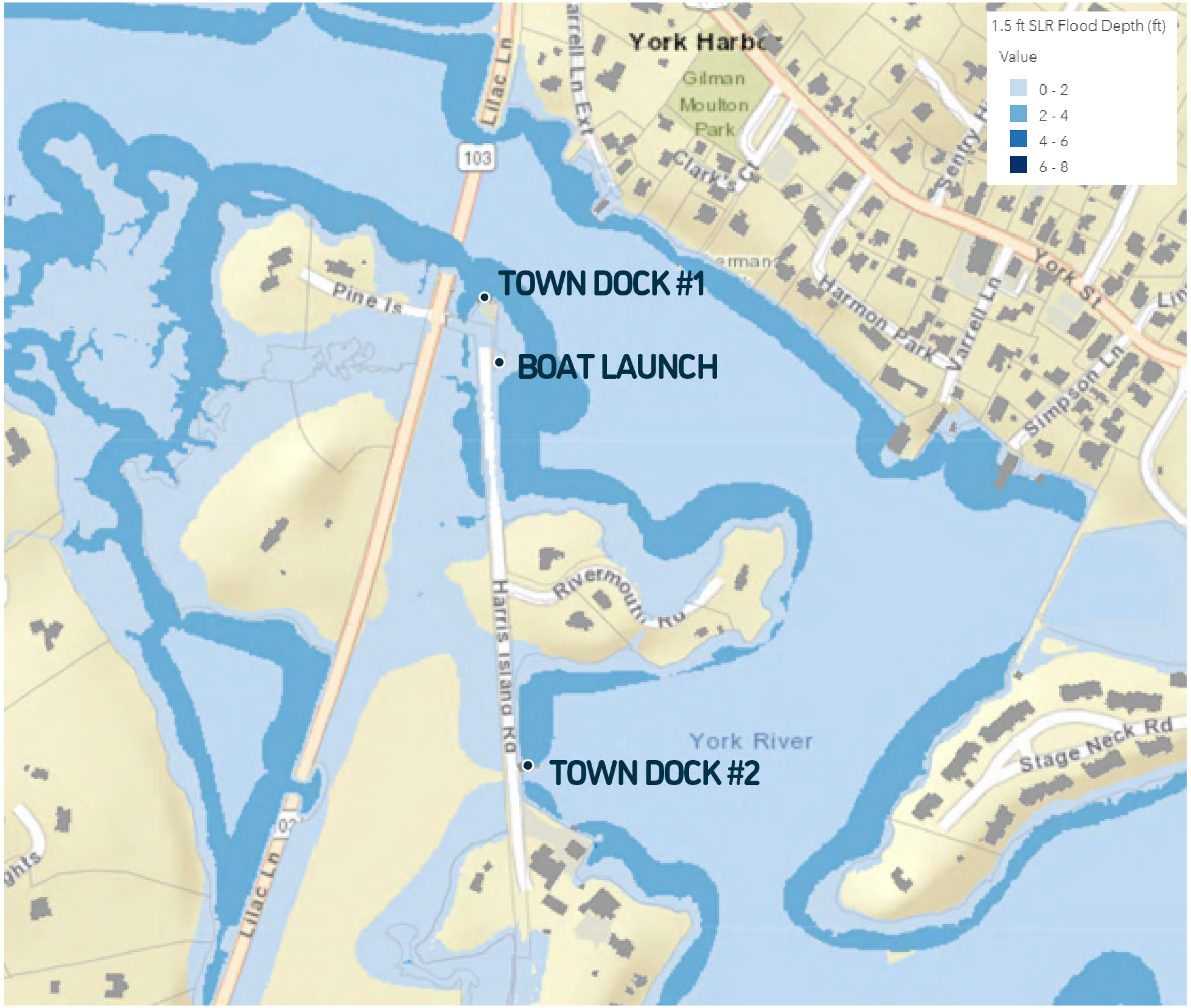
Source: *Maine Geological Survey. MaineDOT. Town of York GIS.*

Figure 16. Major Roads and Bridges Potentially Impacted at 9 Feet of SLR/Storm Surge.



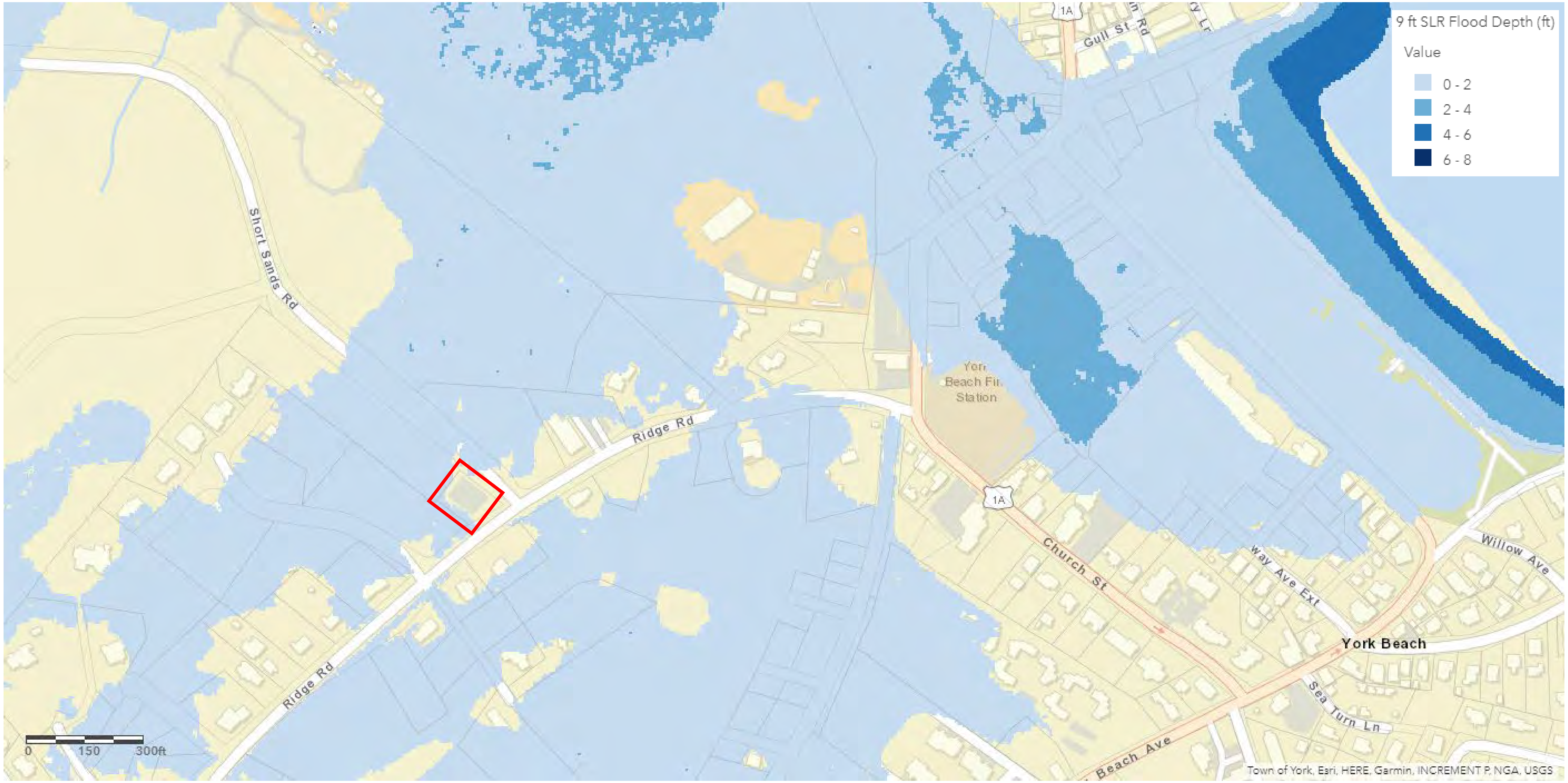
Source: *Maine Geological Survey. MaineDOT. Town of York GIS.*

Figure 17. York Harbor with 1.5 Feet of SLR and Storm Surge.



Source: Maine Geological Survey. Esri.

Figure 18. York Beach Substation (Red Box) with 9 Feet SLR and Storm Surge



Source: Maine Geological Survey. Esri.

Figure 19. YBFD (Red Box) with 4 Feet of SLR and Storm Surge

Source: Maine Geological Survey. Esri.

Figure 20. YBFD (Red Box) 6 Feet (Bottom) of SLR and Storm Surge

Source: Maine Geological Survey. Esri.

Figure 21. Long Sands Bath House (Red Box) with 9 Feet of SLR and Storm Surge

Source: Maine Geological Survey. Esri.

Figure 22. Coastal Engineering Structures (Circles) and Dunes (Squares) Elevation Above the 100-Year Flood BFE.

Source: MGS [Coastal Structure and Dune Crest Inventory and Overtopping Potential](), 2021. Esri.

Figure 23. Coastal Engineering Structures (Circles) and Dunes (Squares) Elevation Above the 100-Year Flood BFE: Southeast York and York River.

Source: MGS [Coastal Structure and Dune Crest Inventory and Overtopping Potential](), 2021. Esri.

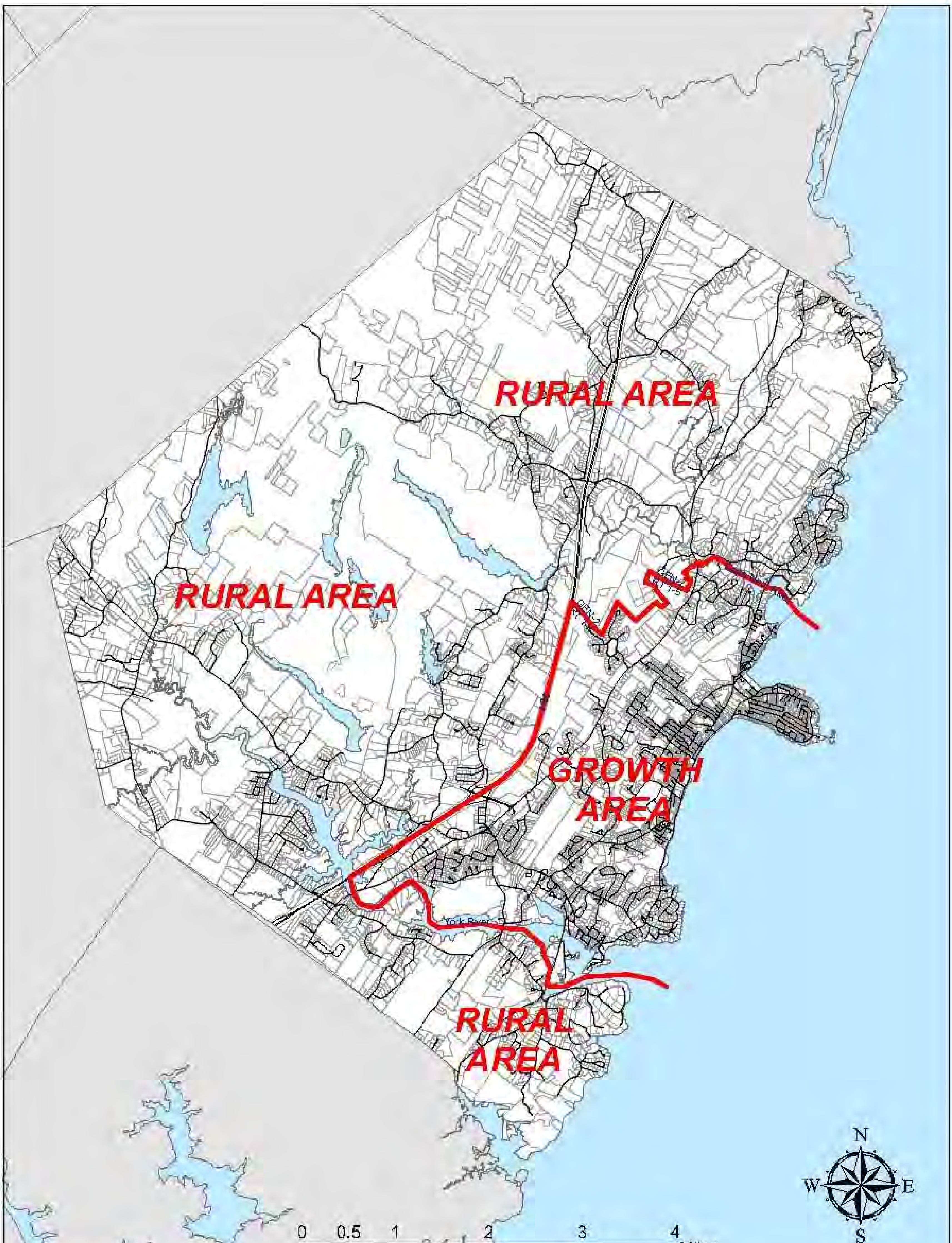
Figure 24. Coastal Engineering Structures (Circles) and Dunes (Squares) Elevation Above the 100-Year Flood BFE: Long Sands Beach.

Source: MGS [Coastal Structure and Dune Crest Inventory and Overtopping Potential](), 2021. Esri.

Figure 25. Coastal Engineering Structures (Circles) and Dunes (Squares) Elevation Above the 100-Year Flood BFE: Short Sands Beach, Cape Neddick River, and York Cliffs.

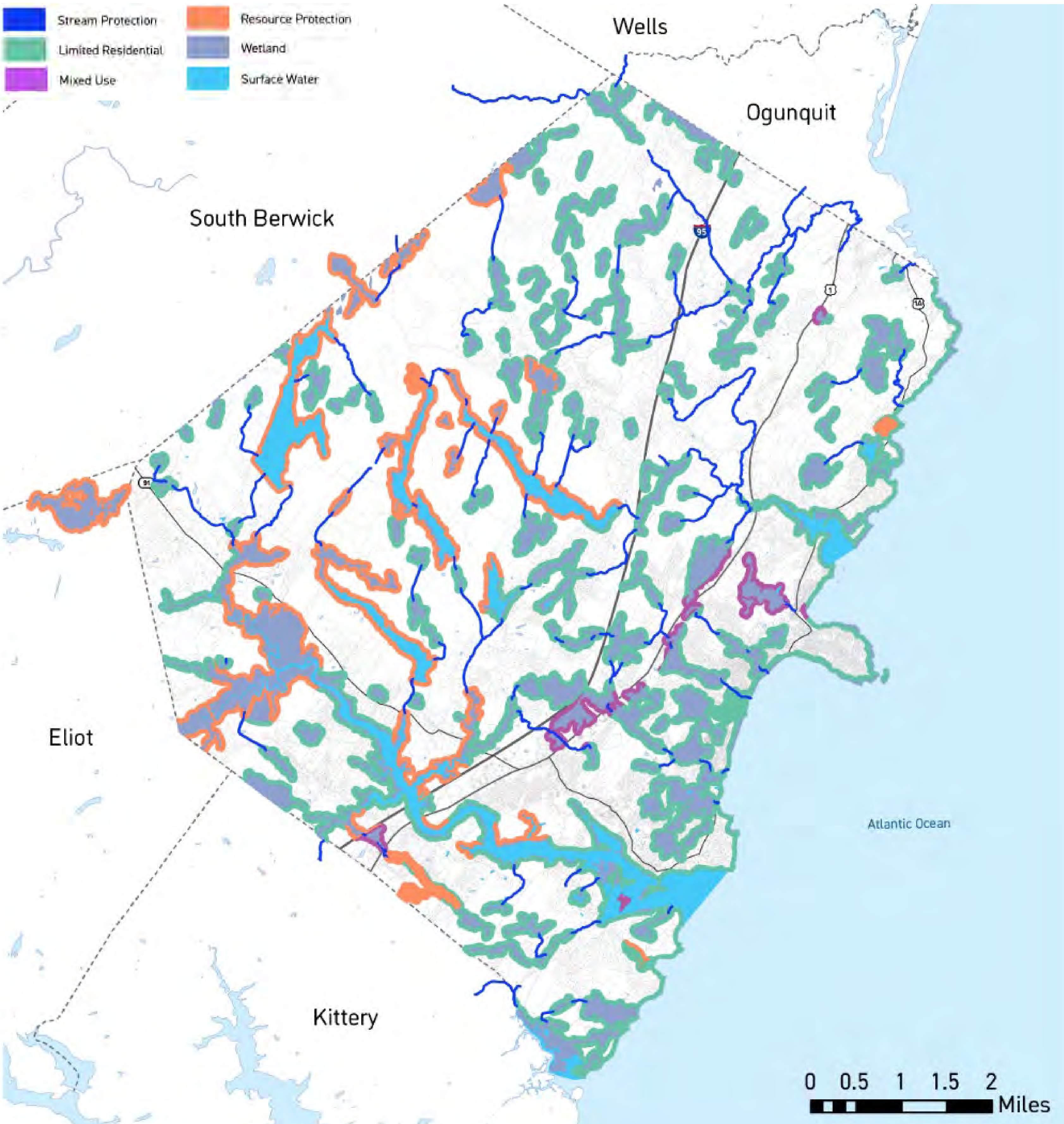
Source: MGS [Coastal Structure and Dune Crest Inventory and Overtopping Potential](), 2021. Esri.

Figure 26. Town of York Growth Area, July 11, 2006.



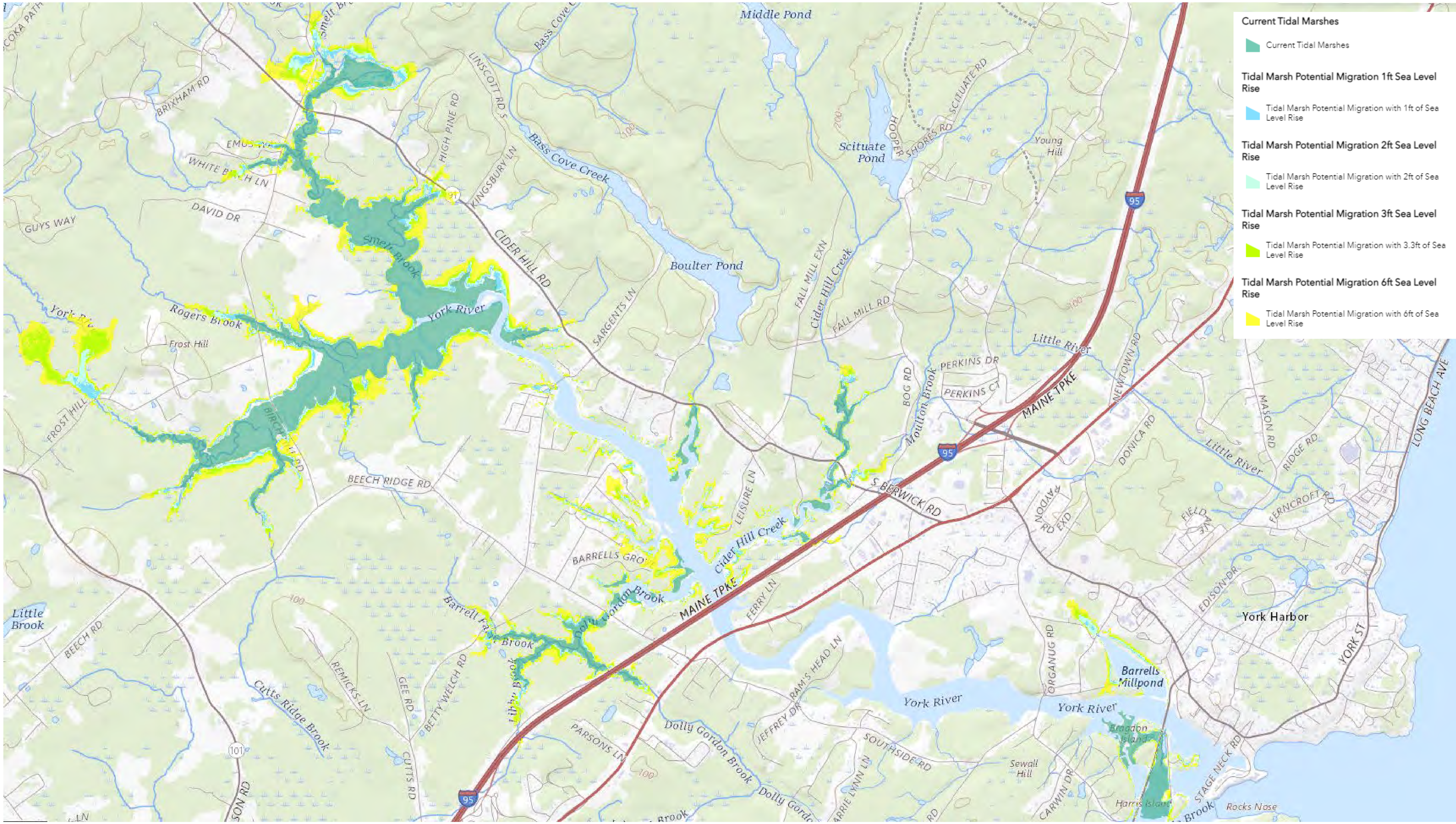
Source: Town of York Planning Department.

Figure 27. Shoreland Overlay District.



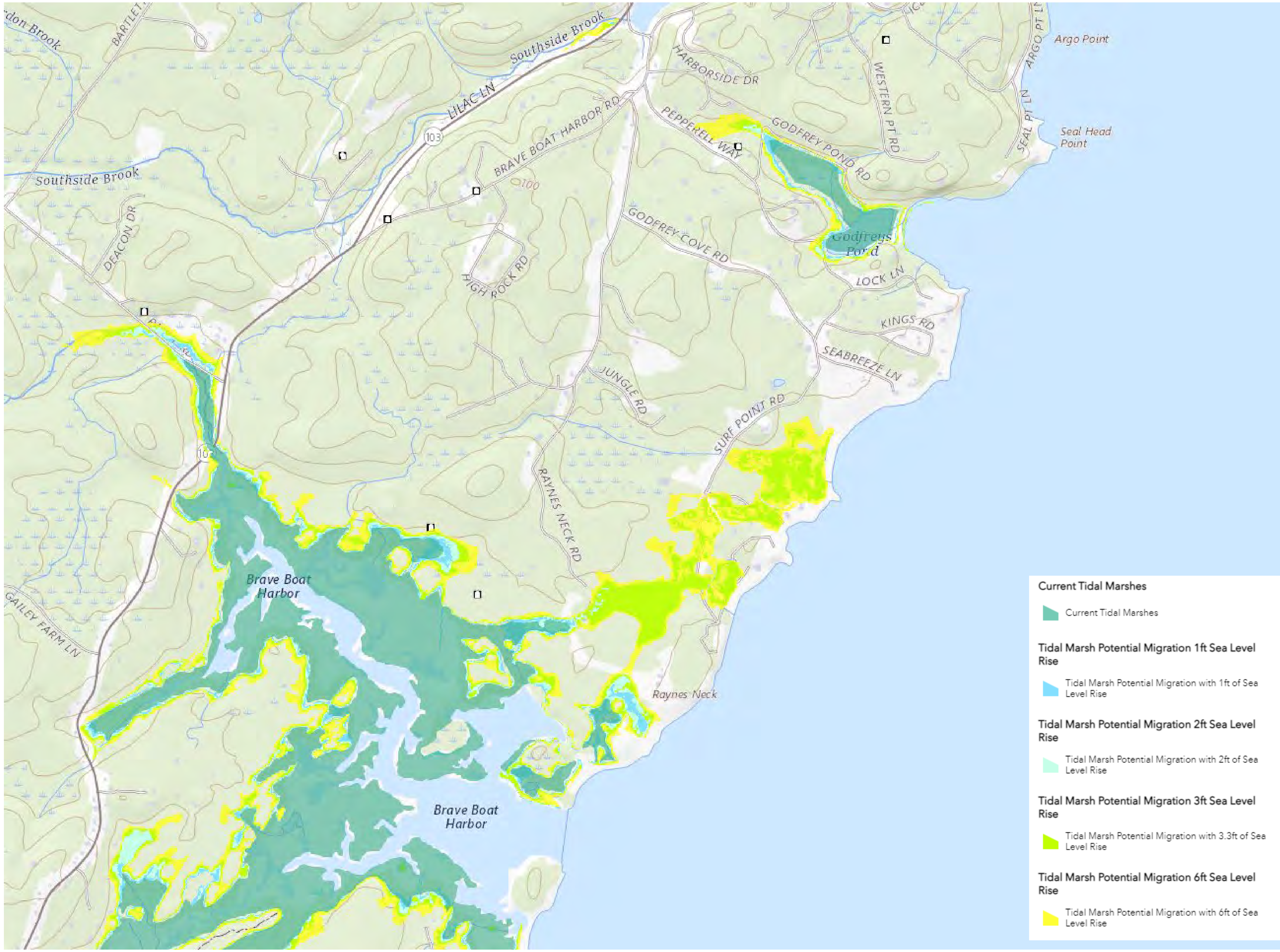
Source: Town of York OpenData, Maine GeoLibrary, USGS National Hydrography Dataset.

Figure 28. York River Potential Marsh Migration.



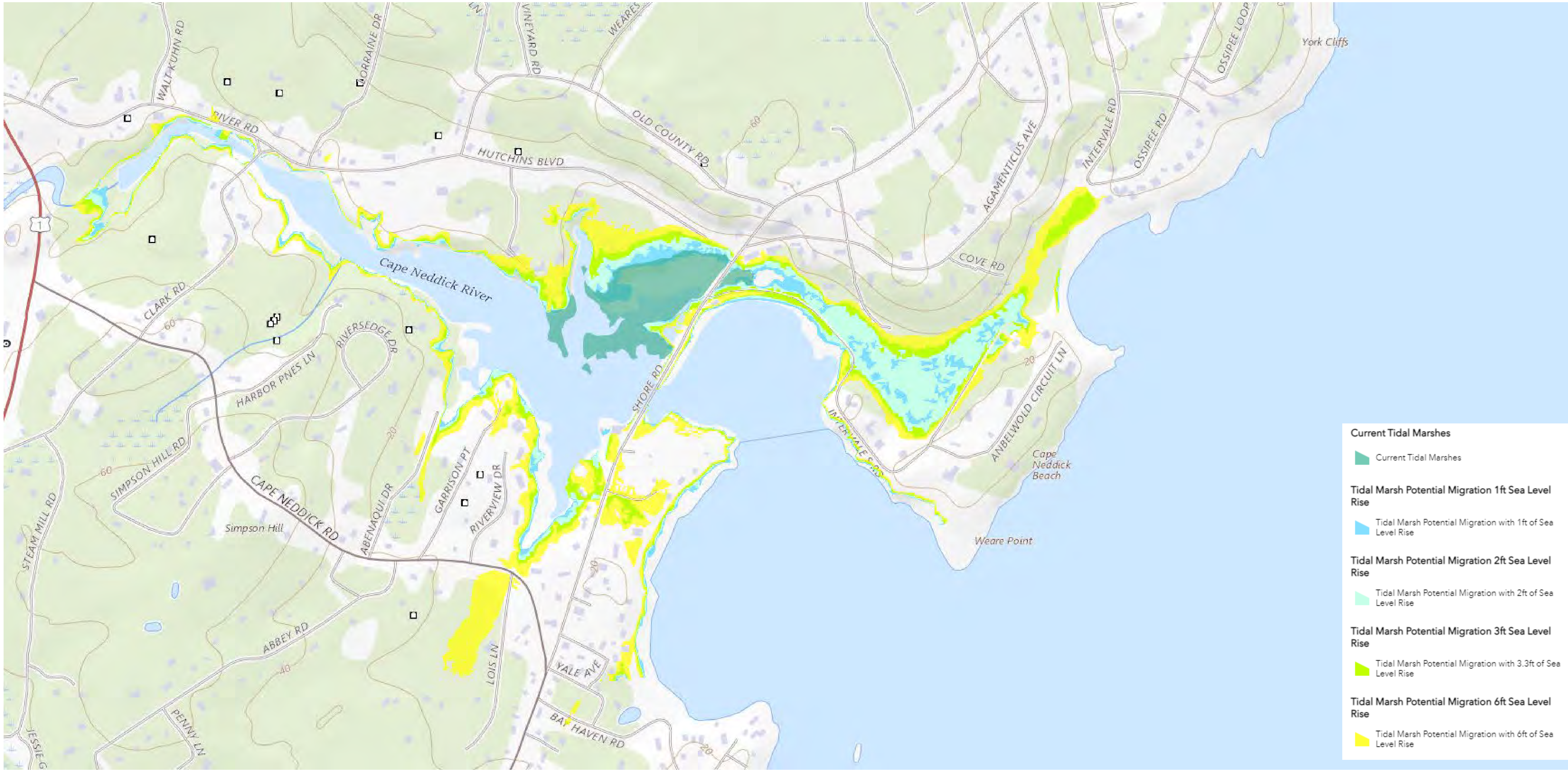
Source: Maine Geological Survey. https://www.maine.gov/dacf/mnap/assistance/marsh_migration.htm

Figure 29. Brave Boat Harbor Potential Marsh Migration



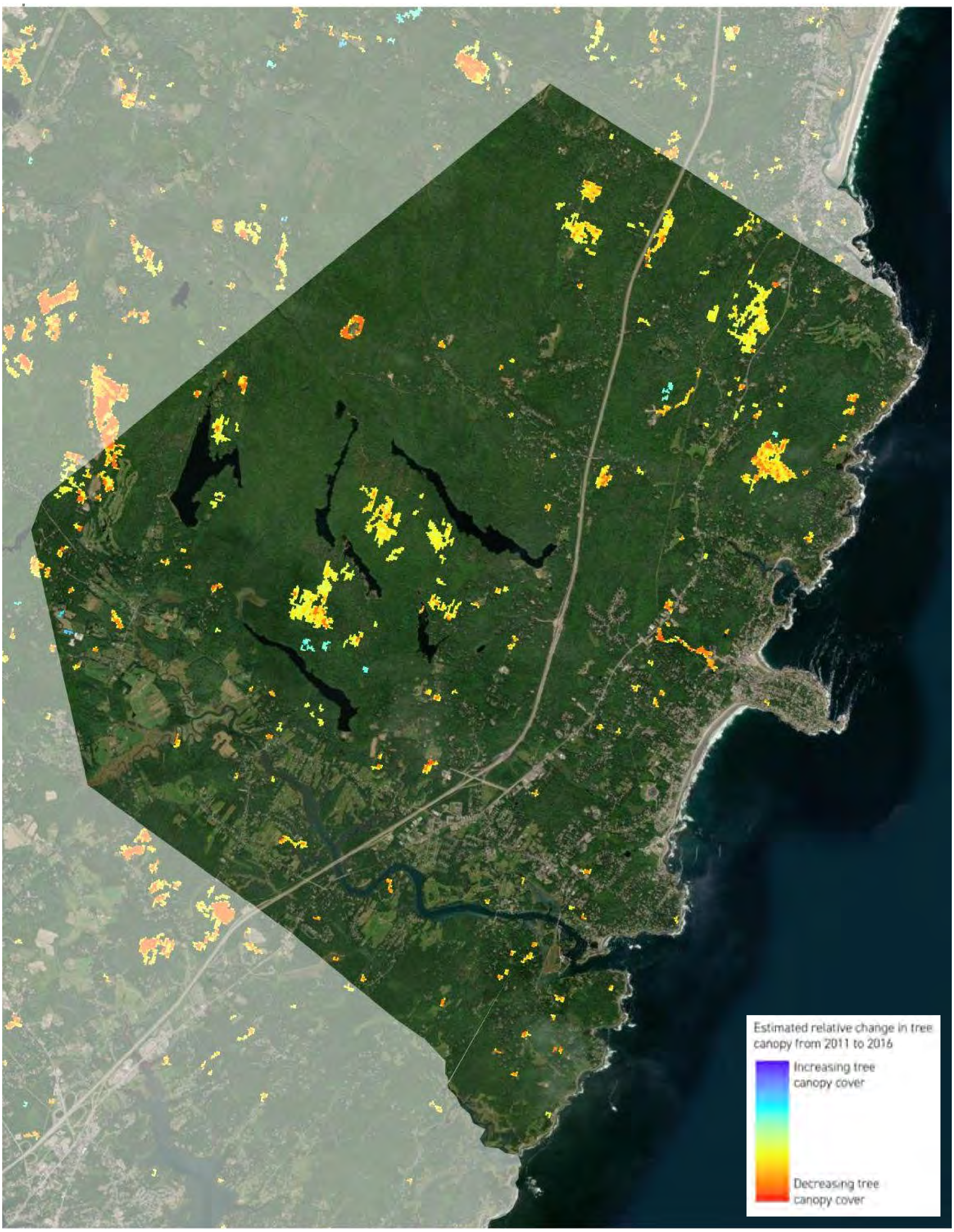
Source: Maine Geological Survey. https://www.maine.gov/dacf/mnap/assistance/marsh_migration.htm

Figure 30. Cape Neddick River Potential Marsh Migration



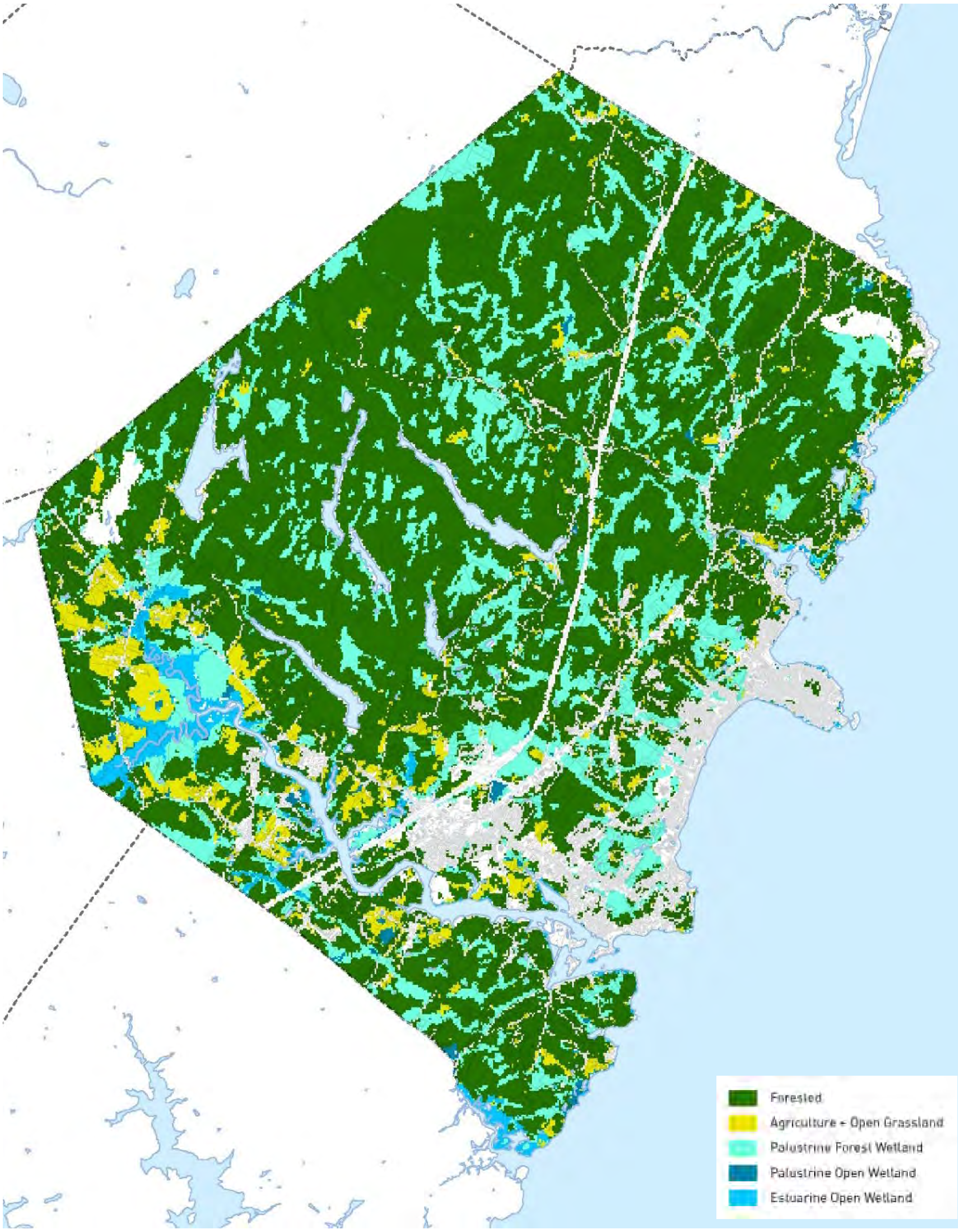
Source: Maine Geological Survey. https://www.maine.gov/dacf/mnap/assistance/marsh_migration.htm

Figure 31. Change in Tree Canopy Cover in York Between 2011-2016.



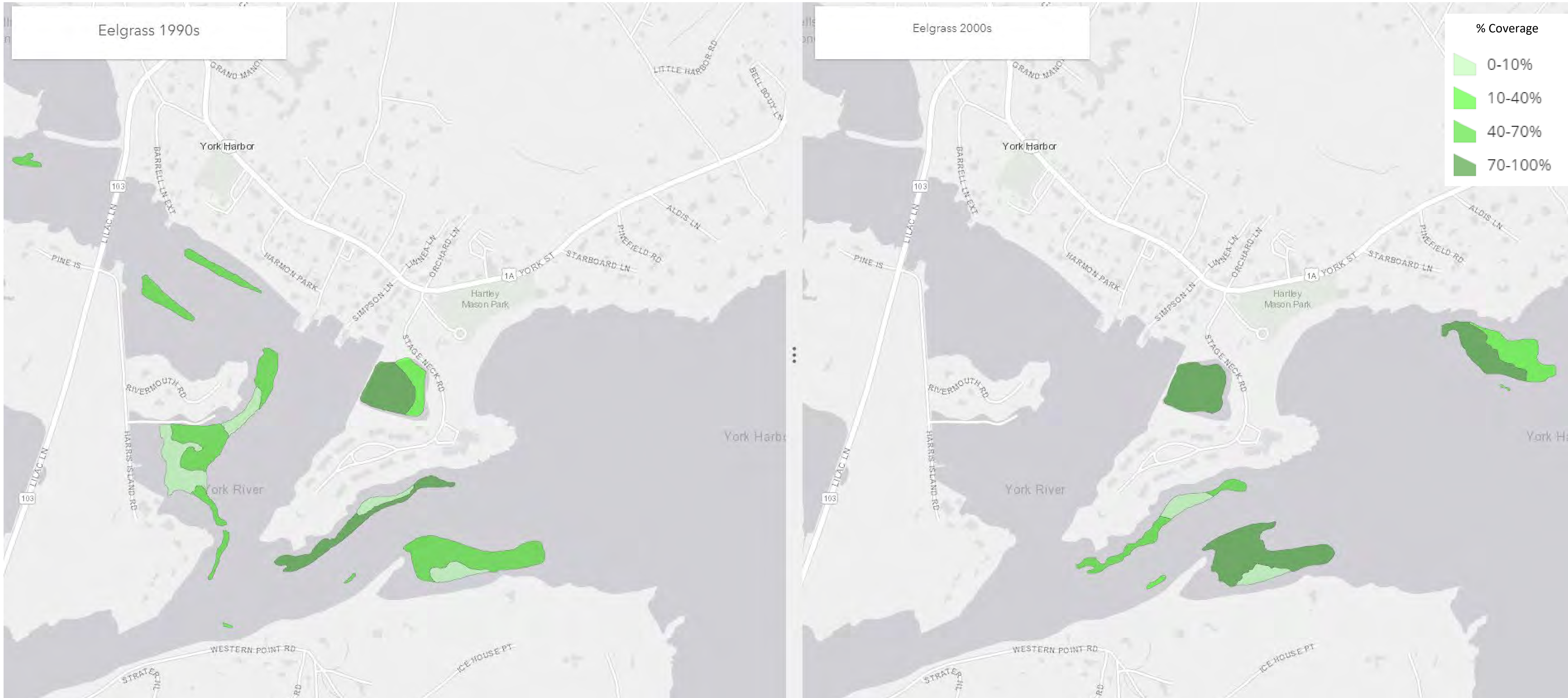
Source: National Land Cover Database (NLCD) 2011 to 2016 Tree Canopy Change, August 31, 2019; Esri World Data Imagery; Town of York Open Data.

Figure 32. Potential Carbon Sink Land Cover in the Town of York.



Sources: [2020 Town of York OpenData](), [Maine Geolibrary](), [USGS National Hydrography Dataset](), [2016 NOAA C-CAP Regional Land Cover]().

Figure 33. York Harbor Eelgrass Coverage, 1990s and 2000s

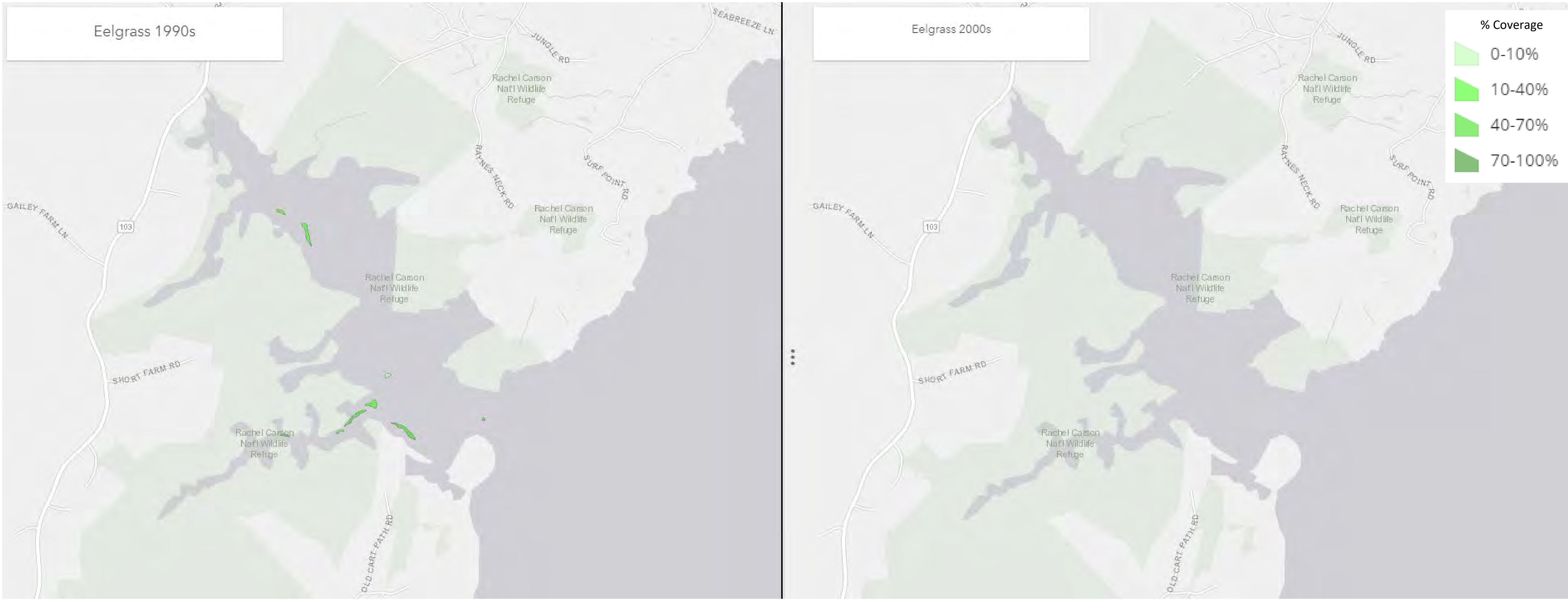


Source: Maine Department of Marine Resources. https://maine.maps.arcgis.com/apps/MapSeries/index.html?appid=ac2f7b3d29b34268a230a060d6b78b25&entry=2

Figure 34. Cape Neddick Harbor Eelgrass Coverage, 1990s and 2000s

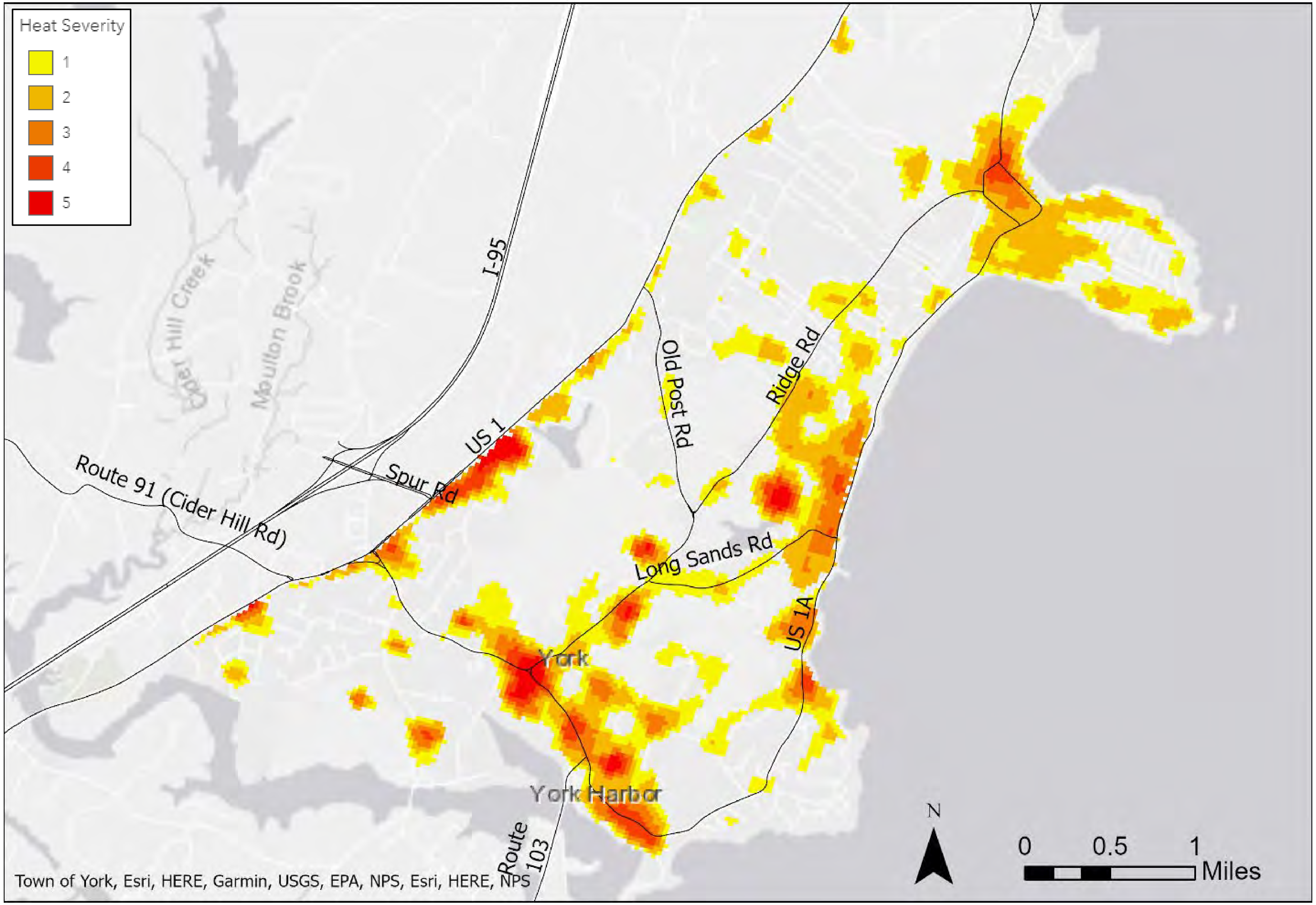
Source: Maine Department of Marine Resources. https://maine.maps.arcgis.com/apps/MapSeries/index.html?appid=ac2f7b3d29b34268a230a060d6b78b25&entry=2

Figure 35. Brave Boat Harbor Eelgrass Coverage, 1990s and 2000s



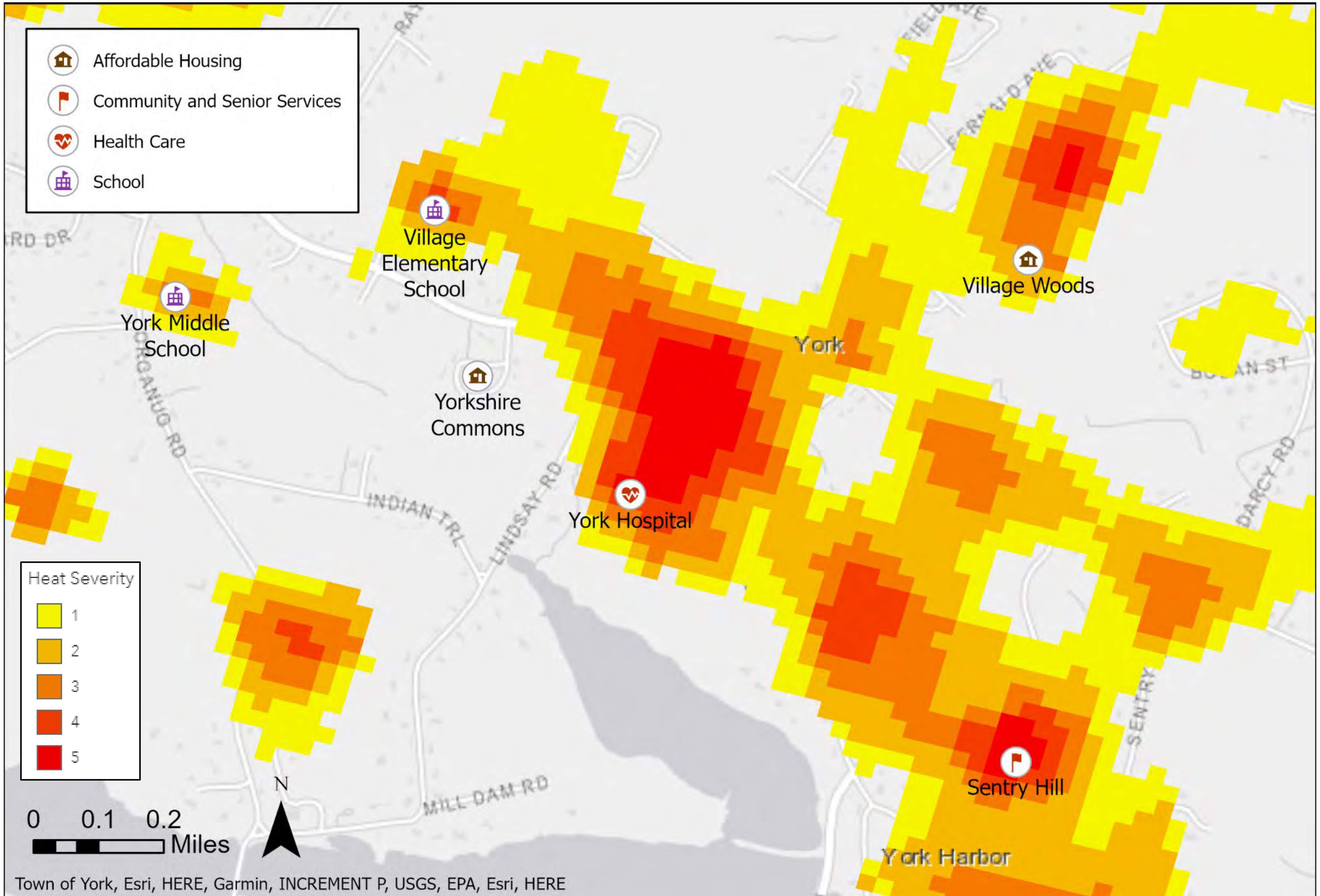
Source: Maine Department of Marine Resources. https://maine.maps.arcgis.com/apps/MapSeries/index.html?appid=ac2f7b3d29b34268a230a060d6b78b25&entry=2

Figure 36. York Heat Islands.



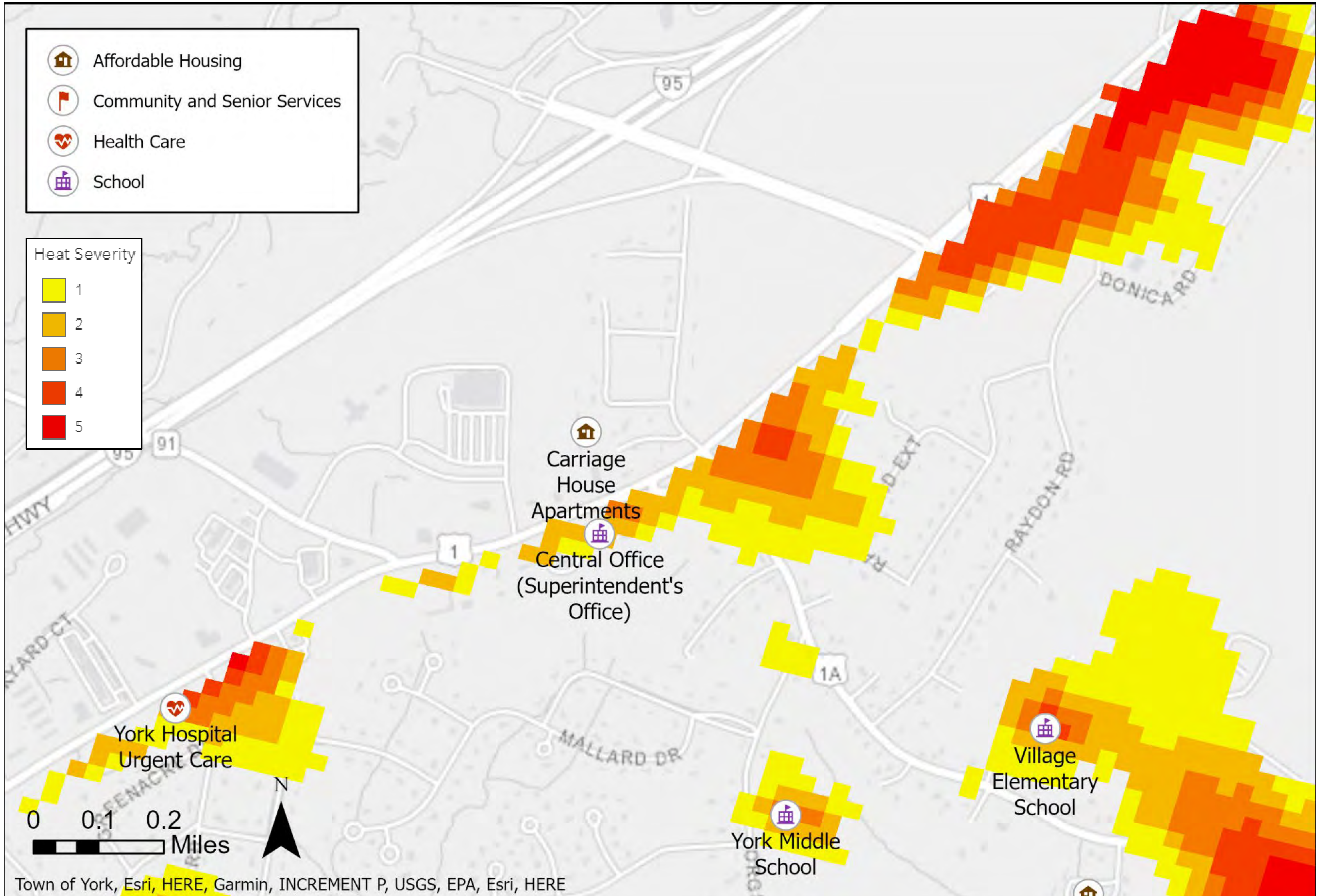
Key: Severity is measured on a scale of 1 to 5, with 1 being a relatively mild heat area (slightly above the mean for the town), and 5 being a severe heat area (significantly above the mean for the town). Source: Trust for Public Land.

Figure 37. York Village Heat Islands.



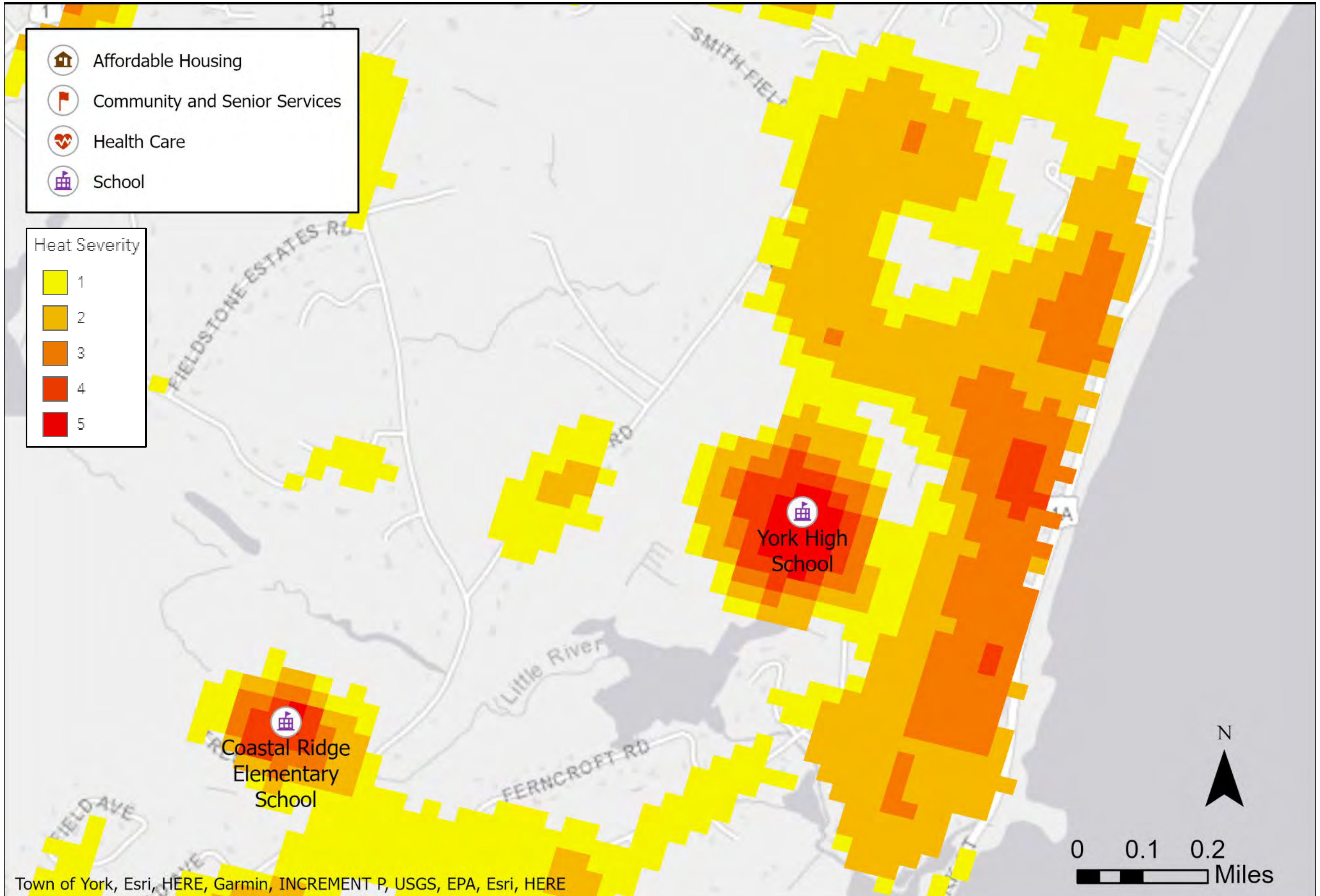
Key: Severity is measured on a scale of 1 to 5, with 1 being a relatively mild heat area (slightly above the mean for the town), and 5 being a severe heat area (significantly above the mean for the town). Source: Trust for Public Land.

Figure 38. Route One Heat Islands.



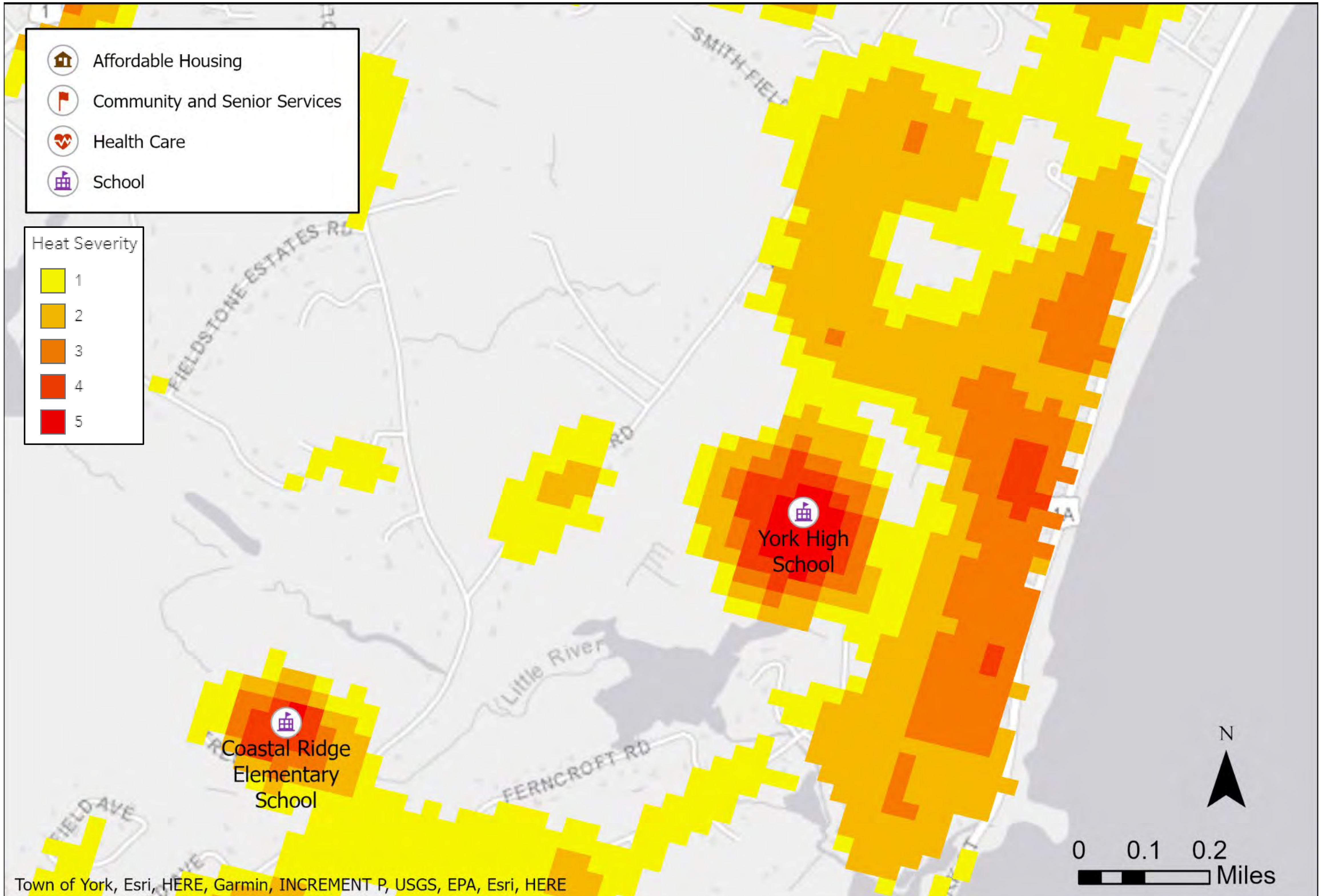
Key: Severity is measured on a scale of 1 to 5, with 1 being a relatively mild heat area (slightly above the mean for the town), and 5 being a severe heat area (significantly above the mean for the town). Source: Trust for Public Land.

Figure 39. Long Sands Heat Island.



Key: Severity is measured on a scale of 1 to 5, with 1 being a relatively mild heat area (slightly above the mean for the town), and 5 being a severe heat area (significantly above the mean for the town). Source: Trust for Public Land.

Figure 40. Long Sands Heat Island.



Key: Severity is measured on a scale of 1 to 5, with 1 being a relatively mild heat area (slightly above the mean for the town), and 5 being a severe heat area (significantly above the mean for the town). Source: Trust for Public Land.

Appendix D: Working Groups

January 2022

Formation and Purpose

At the inception of the project in the Spring of 2021, the Climate Action Plan Steering Committee Co-chairs issued a call for volunteers for Working Groups for the plan in six areas:

- Buildings
- Transportation
- Natural Resources
- Resilience
- Infrastructure
- Food, Waste, and Recycling

Working Groups were formed that included both Steering Committee members and other volunteers from the community who had expertise and/or interest in the specific topic area of each group. The consultant created Working Group Handbooks (see Appendix D of the Climate Action Plan for an example) for each of the Working Groups that provided an overview of their role in the project, tasks, timeline, and information to get the groups started. Information was also provided on other plans and sample strategies and meeting templates were offered to help the chairs of the Working Groups run meetings and organize materials.

As stated to the Working Group members in the Handbooks:

> You will explore strategies and actions to achieve York's aggressive emissions reduction targets, as well as climate adaptation strategies in your topic areas. Working Groups provide specialized knowledge and support to the Steering Committee and the CivicMoxie / Climate Advisory consultant team. No one knows York better than you!
>
> The consultant team provides the content based on years of experience in planning and climate action, drawing on technical expertise and wide knowledge of strategies and innovative work

across the country (and world!). As Working Group members, you provide the context: what strategies will work in York? How can York be innovative and what are the challenges to be expected for various mitigation and adaptation strategies and how can we overcome them? These are the types of questions you will be asking and answering as you work.

A number of worksheets were provided to the Working Groups in the Handbooks and in separate digital files to prepare them for their work, including Worksheet #3 which was an Excel spreadsheet template for "Draft Strategies" so the groups could familiarize themselves with expected work over the course of the coming months.

Process

From April 2021 through September, the Working Groups were formed and then set to identifying, vetting, and selecting strategies to meet plan goals. The process included:

- 4/27/21 Joint Steering Committee/Committees/Working Group Kick-off Meeting
    - This meeting introduced all the volunteers to the consulting team and the project and offered an overview of the Climate Action Plan work and goals. Information was provided on the role of the Working Group and schedule for tasks.
- 5/17/21 Joint Steering Committee/Working Group Meeting
    - The Working Group Handbooks were issued and reviewed at this meeting and details offered on the tasks and schedule moving forward.
- 6/17/21 Launch of the CAP - Public Meeting #1
    - Many Working Group members attended this meeting where the results of the GHG inventory and climate vulnerability assessment were presented.
- 6/23/21 Joint Steering Committee/Working Group Meeting
    - The consultant team gave lists of potential strategies to the Working Groups for consideration over the coming six weeks. At this meeting, the potential strategies and suggested considerations and criteria were introduced and discussed. The consultant team created broad and inclusive lists of possible strategies to reduce GHG emissions and adapt to climate change vulnerabilities
- 7/19/21 Working Group Status Updates during Regular Steering Committee Meeting
    - During this meeting, Working Groups offered status updates on their progress and had the opportunity to ask questions of the consultant team.
    - Details of the 8/11/21 report back session were reviewed and criteria for prioritized strategies discussed.
- 8/11/21 All-day Working Group Report Out
    - from 8am through the evening, each Working Group had one hour to report back on their strategy priorities. The Groups were given presentation templates and asked to provide the following information:
        - **5 minutes** Welcome + Introductions
        - **5 minutes** Big Picture Message/Theme (top 3-5 strategies) from the Working Group
        - **20 minutes** Presentation of recommended top 3-5 strategies and walk through these strategies – slide for each of the recommendations
        - **10 minutes** What else do you want to tell us? Remaining issues/questions, suggestions, etc.

        - **10 minutes** Discussion
        - **10 minutes** Issues to be resolved/next steps
    - After the six groups reported back, the Steering Committee, Town Planner, and consultant team met to discuss themes across the groups and summarize the work of the day.
    - In the evening, a joint meeting was held with the Steering Committee and Working Groups to present summaries of the day and key themes. Next steps were outlined.
    - After the session, the Working Groups submitted their strategy spreadsheets to the Steering Committee.
    - The presentations from this report-out day are included in Appendix D of the Climate Action Plan.

Criteria for Refinement and Prioritization of Working Group Recommendations

After the 8/11/21 all-day Working Group report back and evening joint meeting, the consultant team worked with the Steering Committee Co-chairs to prioritize the strategies and refine these into goals and actions.

Consequences were prioritized based on the following criteria/questions:

- How effective is this strategy at helping York reach GHG emissions reduction goals?
- What proportion of the population of York is affected?
- What are the consequences of failure?
- How does this affect marginalized populations?
- What are the impacts to critical infrastructure?
- What are the economic impacts?
- What are the environmental impacts?

A matrix was developed that provides information on all the goals and can be found in Chapter 7: Moving Forward, of the Climate Action Plan.

York Climate Action Plan Buildings WG Report Out

August 11, 2021

YORK CLIMATE ACTION PLAN

CivicMoxie

CLIMATE ADVISORY

Working Group Members

1. Wayne Boardman – Co-chair
2. Ben Lovell – Co-chair
3. Dick Bilden
4. Michelle Surdoval
5. Michelle Marean
6. Greg Gosselin

Top Strategies Summary

1. Promote energy efficiency in existing residential, non-residential, and municipal buildings and ensure load growth created by EV adoption is served from renewable sources. Examples include energy audits to identify conservation opportunities, optimizing existing equipment efficiency through increased M&O, improvements to the building envelope, installing high efficiency equipment upon replacement or failure, adopting high-efficient lighting equipment and systems, and benchmarking.

2. Promote and encourage on-site renewable generation, battery storage, and beneficial electrification, including EV's. Beneficial electrification should be accompanied by purchasing and consuming grid-based power generated by renewable sources.

3. "Lead by Example" in all new and existing municipal buildings and relevant infrastructure projects by adopting best practice construction techniques, installing high-efficiency HVAC and lighting systems, ongoing benchmarking, and pursuing beneficial electrification to lower the carbon footprint of the municipality overall on the net-zero path to 50% reductions by 2030 and 100% by 2050.

4. Future adoption of the Maine energy "stretch code" (IECC 2021) Future adoption of the Maine energy "stretch code" (IECC 2021) to lower the carbon footprint of the municipality overall on the net-zero path to the 2050 goals.

5. Develop incentives and guidance to encourage buildings near impacted areas to be designed to withstand the impacts of climate change through design, siting, changes in use categories, and other physical and operational modifications.

Strategy #1 Promote energy efficiency in existing residential, non-residential, and municipal buildings

Why was it prioritized?

- Many buildings in York are aging and energy inefficient. Buildings account for 74% of York's total GHG emissions, of which more than 90% comes from single-family homes.

Challenges and opportunities?

- Efficiency Maine sponsors generous incentives for equipment retrofits, building envelope improvements, and systems that promote beneficial electrification such as heat pumps for HVAC and water heating. Some incentives are higher or free for the income eligible but do not necessarily remove the barriers and obstacles listed above.
- Currently, Maine homeowners can borrow up to $15,000 over 10 years with no fees and low-interest rates. Efficiency Maine's C&I Prescriptive Program offers custom or "prescriptive "project subsidies" for commercial, industrial, municipal, and other non-residential facilities to subsidize the cost of energy-efficiency projects. More efficient buildings lower the cost of energy, and may provide non-energy impacts such as comfort, safety, and air quality.
- Funding, tax incentives, and market transformation waxes and wanes with federal and state leadership which can change on a dime every 4 years.

What actions are needed?

- Promotion via education and advocacy for all stakeholders. Work with Efficiency Maine and other organizations to identify grants or other financial incentives.

Responsible parties and essential partners?

- Home and business owners, vendors, state program administrators (EMT), Energy Steering Committee, York EcoHomes, YCSA, local, state and federal government,

Strategy #2 Promote and encourage renewable generation, battery storage, and beneficial electrification

Why was it prioritized?

- Significant impact on lowering GHG emissions
- On-site renewable generation and battery storage can improve resiliency

Challenges and opportunities?

- Current costs (expected to come down over time).
- Not yet cost-effective (batteries) and/or currently immature technologies
- Market opportunities and market transformation

What actions are needed?

- Explore bulk purchases of solar PV systems.
- Expand photovoltaic systems on municipal and school properties.
- Investigate changes to ordinances that incentivize solar systems.

Responsible parties and essential partners?

- EMT, vendors, builders, Energy Steering Committee, York EcoHomes, YCSA, residents, business owners, local, state and federal government

Strategy #3 "Lead by Example" in all new and existing municipal buildings and relevant infrastructure projects

Why was it prioritized?

- The Town can set a good example of adoption of climate-friendly measures and construction while and save operating expenses over the useful life of the facility.
- Achieves significant contribution to 50% reductions in emissions by 2030 and 100% by 2050

Challenges and opportunities?

- First costs may be higher, but M&O expenses will be reduced over the facility's useful life.
- Non-energy impacts

What actions are needed?

- Strengthen the energy efficiency standards for all buildings that use public funds.
- By-in by Local government
- Improved cost-effectiveness of high-efficient HVAC and lighting equipment/systems and building materials

Responsible parties and essential partners?

- Town Manager, Town government, school superintendent and school committee, ad hoc building committees
- Voters
- Architects and builders

Strategy #4 Future adoption of the Maine energy “stretch code” (IECC 2021) to lower the carbon footprint of the municipality overall on the net-zero path to 50% reductions in emissions by 2030 and 100% by 2050

Why was it prioritized?

In order to reach the town’s GHG emissions goals, it is critical to reduce their carbon footprint. This can be achieved if new buildings are designed and built to net zero energy standards.

To smooth the transition to net zero energy, York should consider adopting Maine's stretch code (IECC 2021) which is approximately 15% more energy efficient than the existing 2015 IECC code. By 2030, net zero energy construction may become standard practice, so this goal should be attainable.

Challenges and opportunities?

Some building construction and equipment costs will increase. However, homes and buildings using the IECC 2021 will improve reduce carbon emissions, improve energy efficiency, lower operating costs, and improve resiliency. Achieving net zero status for existing buildings is difficult, but the IECC 2021 will lower the carbon footprint of these buildings.

What actions are needed?

Training for both builders, planning staff and board, and code enforcement personnel.

A promotional and public education effort should be launched to communicate the advantages of the stretch code and improve the chances of adoption via an ordinance by Town residents.

Investigate other mechanisms to incentivize voluntary adoption of the stretch code.

Responsible parties and essential partners?

Planning Director, Planning Board, Code Enforcement Office, Energy Steering Committee

Strategy #5 Develop incentives and guidance to encourage buildings near impacted areas to be designed to withstand the impacts of climate change

Why was it prioritized?

- Adaptation to protect structures, investments, York's economic health
- Ensure health and safety of occupants and first responders

What actions are needed?

- Education
- Comp plan recommendations
- Code review

Challenges and opportunities?

- Upgrades are expensive
- Restrictions imposed by current building code (height, footprint)

Responsible parties and essential partners?

- Insurance companies, builders, architects, planning board, local government, emergency service providers, voters

York Climate Action Plan Food, Waste & Recycling WG Report Out

August 11, 2021

YORK CLIMATE ACTION PLAN

CivicMoxie

CLIMATE ADVISORY

Working Group Members

1. Carol Libby - Workgroup Co-Chair
2. Deanna Waldrop – Workgroup Co-Chair
3. Ron McAllister
4. Dave Cohen
5. Brenda Alexander
6. Erin Ferrell
7. Diane Kleist (stepped down in mid-July)

Top Strategies Summary

1. Develop comprehensive education for Food, Waste and Recycling strategies.
2. Expand food composting program to reduce residential and commercial solid waste.
3. Limit use of single-use water bottles, take-out containers and other plastics that are not biodegradable.
4. Select municipal waste and recycling contractors based on multiple sustainability criteria in addition to cost.
5. Adopt a sustainable purchasing policy for goods and services purchased by the town.

Strategy #1 **Develop comprehensive education for Food, Waste and Recycling strategies.**

Why was it prioritized?

- Increased awareness & knowledge is critical to all steps that follow.
- Every strategy has a component of education needed & we feel a coordinated effort across topics & target audiences would be most effective.

What actions are needed?

- Educate public on very low rates of recycling for plastics (<8%), what is truly recyclable and impact on climate change with emphasis on reduction, alt materials & reuse.
- Educate public, commercial & municipal about local food, transport & packaging impacts on climate change & key actions.
- Create adult education programs about composting & gardening.

Challenges and opportunities?

- Reaching a substantial audience
- Engaging children/schools as a key way to reach parents

Responsible parties and essential partners?

- Town leadership
- York School District, York Adult Education
- York Ready for 100 (WRAD, EcoHOMES)
- York Community Garden, Old York Garden Club
- UMaine Extension, MOFGA

Strategy #2 **Expand food composting program to reduce residential and commercial solid waste.**

Why was it prioritized?

- It builds on existing practices for businesses and residents.
- With material and process support, it would be easy to implement.

What actions are needed?

- Explore possibility of expanding food waste drop-off program. Find more sites.
- Incentivize residents' use of 3rd party composting contracts or start a backyard bin.
- Educate residents and businesses about composting.

Challenges and opportunities?

- Unwanted wildlife/pests
- New routines for collecting food waste needed for businesses and residents
- Increased use of gas for transportation
- Plan for compost generated

Responsible parties and essential partners?

- Department of Public Works/Selectboard
- Related volunteer groups (for education)
- Local businesses

Strategy #3 **Limit use of single-use water bottles, take-out containers and other plastics that are not biodegradable.**

Why was it prioritized?

- York's history as leaders in this approach: plastic bag and polystyrene foam bans
- Other places have done it

What actions are needed?

- Work with Hannaford and other businesses to learn their perspective & get their support.
- Pass new ordinances.

Challenges and opportunities?

- Educating citizens to get buy-in, also tourists and seasonal residents
- Business resistance

Responsible parties and essential partners?

- Responsible: Town Manager, Planning Director
- Essential: DPW, York Ready for 100, Recycling Committee

Strategy #4 **Select municipal waste and recycling contractors based on multiple sustainability criteria in addition to cost.**

Why was it prioritized?

- Transportation, distance, and type of waste disposal contribute to GHG emissions
- 3 years remaining on current contract

What actions are needed?

- Citizens come together to decide the criteria (ex. Recycling Committee)
- DPW agreement: covered bins, technology of collection, ultimate fate of materials

Challenges and opportunities?

- Opportunity to influence waste company practices (EV trucks?)
- Limited companies in state to bid on waste contracts
- Distance/transfer from York to out-of-town disposal

Responsible parties and essential partners?

- Department of Public Works/Selectboard
- School Department/School Committee for school waste contracts
- Recycling Committee

Strategy #5 Adopt a sustainable purchasing policy for goods and services purchased by the town.

Why was it prioritized?

- Purchasing/contracting practices already established across departments, relatively easy to add sustainability criteria

What actions are needed?

- Create a catalogue of more local vendors and contractors
- Establish target areas for prioritized sustainable "swaps"

Challenges and opportunities?

- Available vendors and associated cost increases
- Distributed decision-making across departments
- Increase cost-sharing/bulk price town-wide for needed goods and services

Responsible parties and essential partners?

- Selectboard
- Department Administrators (Town-wide)

Other Relevant Strategies (not prioritized)

1. Provide recycling and composting infrastructure at public locations.
2. Mandate recycling for commercial uses.
3. Explore a construction and demolition recycling policy to keep these materials out of landfills and ensure they are recycled.

Synergies with other WG initiatives?

- Natural Resources – agricultural land use, also fishing
- Resilience – local food sources in case of supply chain disruption
- Transportation – reducing food & waste/recycling transit costs

Synergies with other local, state, and federal initiatives?

- York Recycling Committee and York Energy Steering Committee
- York Ready for 100 (YorkEcoHOMES, WRAD)
- York High School EcoClub
- Southern Maine Planning & Development Commission
- Maine Extended Producer Responsibility (EPR) policy, under development
- Maine Climate Action Plan
- Maine Organic Farmers & Gardeners Association
- Proposed Federal legislation: Break Free from Plastic Pollution, Zero Food Waste Act and the Cultivating Organic Matter through the Promotion Of Sustainable Techniques (COMPOST) Act

Other thoughts, ideas, & suggestions

- Work with schools, continue to include students
- Need (more) members of the business community involved in all aspects of CAP
- Need someone in town government responsible for sustainability standards
- Sustainability festival....local foods festival....sustainability director for schools....tool-lending program at library...community sustainability dashboard

Next Steps

- Evaluate current state in each strategy area
- Fully develop strategies with specific action plans & clear ownership
- Partner with existing groups to avoid duplicate efforts and wasting volunteer time.

York Climate Action Plan Infrastructure WG Report Out

August 11, 2021

YORK CLIMATE ACTION PLAN

CivicMoxie

CLIMATE ADVISORY

Working Group Members

- Wayne Boardman, Co-Chair
- Susan Covino, Co-Chair
- Michael Bartner
- Janet Drew
- Peter Goodwin
- Bill LaFleur
- David Michniewicz
- Michele Putko

Top Strategies Summary

1. **Municipal Solar Power:** Explore solar power installations on underutilized land including rights of way (powerlines and turnpike) and the Witchtrot landfill.
2. **Broadband and Cell Service:** Build reliable, resilient, safe, and efficient broadband (high speed internet) and cell phone service for York.
3. **Incorporate Climate Risks in Decision Making:** Incorporate considerations of sea-level rise, storm surge, and flooding associated with extreme rainfall events into all Town infrastructure design, siting, and capital investment decisions including but not limited to buildings, roads, bridges, culverts/open drainage (swales), parks, and open space.
4. **Low Impact Design (LID) and Climate Design Adjustments:** Adopt a policy that all municipal development projects will utilize LID techniques and employ “climate design adjustments” to account for sea level rise and storm surge, extreme precipitation, and extreme heat.
5. **Improve stormwater capture:** Conduct a feasibility study to determine what options, including but not limited to a stormwater utility, might fund stormwater improvements throughout town while incentivizing Low Impact Development practices that infiltrate and reuse stormwater on-site.

1. Municipal Solar Power: Explore solar power installations on underutilized land including rights of way (powerlines and turnpike) and the Witchtrot landfill.

Why was it prioritized?

Contributes to town's GHG reduction goals. It can be accomplished in the short term and have a significant impact.

What actions are needed?

Assess potential sites for municipal solar arrays and seek necessary support/funding for the projects.

Challenges and opportunities?

Challenges include topography, wetlands, and the price of land. Opportunities to pursue public private partnerships. The cost of solar canopies in parking lots is cost prohibitive in the absence of incentives.

Responsible parties and essential partners?

Select Board, Planning Board, Energy Steering Committee

2. Broadband and Cell Service: Build reliable, resilient, safe, and efficient broadband (high speed internet) and cell phone service for the town.

Why was it prioritized?

Critical for reducing commuting trips and for public safety to ensure that communications are reliable during emergencies.

What actions are needed?

Assess the quality of these services in the town and develop a targeted action plan to address the current shortfalls and anticipated demand.

Challenges and opportunities?

Providers of these services are challenging to work with. A municipal/regional service/network should be considered.

Responsible parties and essential partners?

Select Board, Planning Board, neighboring towns, and the Southern Maine Planning and Development Commission

3. Incorporate Climate Risks in Decision Making: Incorporate considerations of sea-level rise, storm surge, and flooding associated with extreme rainfall events into all town infrastructure design, siting, and capital investment decisions including but not limited to buildings, roads, bridges, culverts/open drainage (swales), parks, and open space.

Why was it prioritized?

The town must ensure money isn't spent on capital investments that may be subject to damage during the design life.

What actions are needed?

Add a step to capital planning processes certifying that future climate risks have been carefully considered.

Challenges and opportunities?

This is a relatively low-cost action that simply needs to be institutionalized.

Responsible parties and essential partners?

Town Manager and Select Board, School Superintendent and School Committee, Budget Committee

4. Low Impact Development (LID) and Climate Design Adjustments: Adopt a policy that all municipal development projects will utilize LID techniques and employ “climate design adjustments” to account for sea level rise and storm surge, extreme precipitation, and extreme heat.

Why was it prioritized?

Municipal construction projects on or near public beaches and parks as well as on public rights-of-way can protect both public and private properties from adverse climate impacts as well as preserve emergency access/evacuation routes. Reference

What actions are needed?

Adopt engineering practices that enhance and protect key infrastructure, using techniques such as vegetated berms, flood barriers, and elevated roadways.

Challenges and opportunities?

Solutions may be expensive, but they must be weighed against the potential costs of extensive damage and repair in the future. LID practices improve surface water quality as well as reduce the risk of flood damage.

Responsible parties and essential partners?

Director of Public Works, Town Manager, Select Board

5. Improve stormwater capture: Conduct a feasibility study to determine what options, including but not limited to a stormwater utility, might improve stormwater capture while incentivizing Low Impact Development practices that infiltrate and reuse stormwater on-site.

Why was it prioritized?

As development leads to more impervious surfaces, stormwater runoff from more frequent and extreme weather events can lead to erosion, flooding, property damage, and degradation of water quality in streams, rivers, and the ocean.

What actions are needed?

Commission an assessment / feasibility study to better inform stormwater management improvements. Evaluate how much money the town spends on dealing with stormwater now and how much it will be required to spend in the future . (See 2020 Feasibility Study for Concord, NH)

Challenges and opportunities?

Challenges include the cost/potential resistance of implementing a stormwater utility. Flood control is only one of the potential benefits of improving stormwater management.

Responsible parties and essential partners?

The town's Stormwater Manager/Assistant CEO, the Planning Director, the Planning Board

Other thoughts, ideas, & suggestions
Water

1. Encourage and support the York Water District on their efforts with climate adaptation planning and resiliency implementation. Utilize storm surge and sea level rise GIS mapping to identify critical water system infrastructure impacts and associated resiliency planning, design, and construction.

2. Encourage and support the York Water District with prolonged drought planning and implementation. This would include regional cooperation with the Southern Maine Regional Water Council for water quality and quantity.

3. Evaluate existing code enforcement ordinances with respect to potential impacts from drought impacts due to climate change.

Other thoughts, ideas, & suggestions
Wastewater

1. Encourage and support the York Sewer District on their efforts with climate adaptation planning and resiliency implementation. Utilize storm surge and sea level rise GIS mapping to identify critical wastewater system infrastructure impacts and associated resiliency planning, design, and construction.
2. Utilize GIS mapping to identify storm surge and sea level rise impacts to on-site septic systems. Support Town efforts to notify property owners of potential impacts due to those projected impacts for systems that are identified to be impacted and work to build resilience.

Other thoughts, ideas, & suggestions
Roads and Bridges

1. Assess the vulnerability (current and future) of the town's roads and bridges to the five types of flooding (Flash Flooding, River Flooding, Storm Surge, Tidal Flooding and Groundwater).
2. Develop and implement a standardized protocol for documenting local flood impacts to roads and bridges.
3. Establish a policy/plan of action and/or emergency fund to expedite post-disaster road/bridge repair.
4. Require all municipal road and bridge projects to mitigate to the greatest extent practicable, existing and potential future impacts of flooding and erosion.
5. Ensure that culverts are properly sized and roadway ditches adequately designed to accommodate increased precipitation during peak storm events; do the same for bridge spans and clearance.

York Climate Action Plan Infrastructure WG Report Out

August 11, 2021

YORK CLIMATE ACTION PLAN

CivicMoxie

CLIMATE ADVISORY

Working Group Members

- Wayne Boardman, Co-Chair
- Susan Covino, Co-Chair
- Michael Bartner
- Janet Drew
- Peter Goodwin
- Bill LaFleur
- David Michniewicz
- Michele Putko

Top Strategies Summary

1. **Municipal Solar Power:** Explore solar power installations on underutilized land including rights of way (powerlines and turnpike) and the Witchtrot landfill.
2. **Broadband and Cell Service:** Build reliable, resilient, safe, and efficient broadband (high speed internet) and cell phone service for York.
3. **Incorporate Climate Risks in Decision Making:** Incorporate considerations of sea-level rise, storm surge, and flooding associated with extreme rainfall events into all Town infrastructure design, siting, and capital investment decisions including but not limited to buildings, roads, bridges, culverts/open drainage (swales), parks, and open space.
4. **Low Impact Design (LID) and Climate Design Adjustments :** Adopt a policy that all municipal development projects will utilize LID techniques and employ "climate design adjustments" to account for sea level rise and storm surge, extreme precipitation, and extreme heat.
5. **Improve stormwater capture.** Conduct a feasibility study to determine what options, including but not limited to a stormwater utility, might fund stormwater improvements throughout town while incentivizing Low Impact Development practices that infiltrate and reuse stormwater on-site.

1. Municipal Solar Power: Explore solar power installations on underutilized land including rights of way (powerlines and turnpike) and the Witchtrot landfill.

Why was it prioritized?

Contributes to town's GHG reduction goals. It can be accomplished in the short term once current market disarray is resolved. It can have a significant impact on GHG reduction goals.

What actions are needed?

Assess potential sites for municipal solar arrays and seek necessary support/funding for the projects.

Challenges and opportunities?

Challenges include topography, wetlands, and the price of land. Opportunities to pursue public private partnerships. The cost of solar canopies in parking lots is cost prohibitive in the absence of incentives.

Responsible parties and essential partners?

Select Board, Planning Board, Energy Steering Committee, Central Maine Power, the Maine Legislature, the Maine Public Utilities Commission, and the Governor's Energy Office.

2. Broadband and Cell Service: Build reliable, resilient, safe, and efficient broadband (high speed internet) and cell phone service for the town.

Why was it prioritized?

Critical for reducing commuting trips, for public safety to ensure that communications are reliable during emergencies, and for better control of the electric distribution grid.

What actions are needed?

Assess the quality of these services in the town and develop a targeted action plan to address the current shortfalls and anticipated demand.

Challenges and opportunities?

Providers of these services are challenging to work with. A municipal/regional service/network should be considered.

Responsible parties and essential partners?

Select Board, Planning Board, neighboring towns, and the Southern Maine Planning and Development Commission

3. Incorporate Climate Risks in Decision Making: Incorporate considerations of sea-level rise, storm surge, and flooding associated with extreme rainfall events into all town infrastructure design, siting, and capital investment decisions including but not limited to buildings, roads, bridges, culverts/open drainage (swales), parks, and open space.

Why was it prioritized?

The town must ensure money isn't spent on capital investments that may be subject to damage during the design life.

What actions are needed?

Add a step to capital planning processes certifying that future climate risks have been carefully considered.

Challenges and opportunities?

This is a relatively low-cost action that simply needs to be institutionalized.

Responsible parties and essential partners?

Town Manager and Select Board, School Superintendent and School Committee, Budget Committee

4. Low Impact Development (LID) and Climate Design Adjustments: Adopt a policy that all municipal development projects will utilize LID techniques, employ "climate design adjustments" to account for sea level rise and storm surge, extreme precipitation, and extreme heat, and employ "nature-based solutions."

Why was it prioritized?

Municipal construction projects on or near public beaches and parks as well as on public rights-of-way can protect both public and private properties from adverse climate impacts as well as preserve emergency access/evacuation routes. Reference

What actions are needed?

Adopt engineering practices that enhance and protect key infrastructure, using techniques such as vegetated berms, flood barriers, and elevated roadways.

Challenges and opportunities?

Trends demonstrate the likelihood of extensive damage in the future. Solutions, including their cost, must be evaluated in this context. Also, LID practices have the co-benefit of improving surface water quality.

Responsible parties and essential partners?

Director of Public Works, Town Manager, Select Board. Additional resources include Environmental Impact Bonds (Goldman Sachs) and the community ratings of First Street Foundation.

5. Improve stormwater capture. **Conduct a feasibility study to determine what options, including but not limited to a stormwater utility, might improve stormwater capture while incentivizing Low Impact Development practices that infiltrate and reuse stormwater on-site.**

Why was it prioritized?

As development leads to more impervious surfaces, stormwater runoff from more frequent and extreme weather events can lead to erosion, flooding, property damage, and degradation of water quality in streams, rivers, and the ocean.

What actions are needed?

Commission an assessment / feasibility study to better inform stormwater management improvements. Evaluate how much money the town spends on dealing with stormwater now and how much it will be required to spend in the future . (See 2020 Feasibility Study for Concord, NH)

Challenges and opportunities?

Challenges include the cost/potential resistance of implementing a stormwater utility. Flood control is only one of the potential benefits of improving stormwater management.

Responsible parties and essential partners?

The town's Stormwater Manager/Assistant CEO, the Planning Director, the Planning Board

Synergies with other WG initiatives?

References herein and in the Infrastructure Working Group's more detailed list of Strategies (attached) show synergies with the following working groups:

Natural Resources

Transportation

Resilience, Health & E.M.

Synergies with other local, state, and federal initiatives?

Please see references herein and in the Infrastructure Working Group's more detailed list of Strategies (attached).

Other thoughts, ideas, & suggestions
Electric Grid:

1. Upgrade back-up energy systems to reduce downtime.

Other thoughts, ideas, & suggestions
Water

1. Encourage and support the York Water District's efforts to plan for climate adaptation and to implement resiliency. Utilize storm surge and sea level rise GIS mapping to identify critical water system infrastructure impacts and associated resiliency planning, design, and construction.

2. Encourage and support the York Water District with prolonged drought planning and implementation. This would include regional cooperation with the Southern Maine Regional Water Council for water quality and quantity.

3. Evaluate existing code enforcement ordinances with respect to potential impacts from drought impacts due to climate change.

Other thoughts, ideas, & suggestions
Wastewater

1. Encourage and support the York Sewer District's efforts to plan and implement climate adaptation and resiliency. Utilize storm surge and sea level rise GIS mapping to identify critical wastewater system infrastructure impacts and associated resiliency planning, design, and construction.
2. Utilize GIS mapping to identify storm surge and sea level rise impacts to on-site septic systems. Support Town efforts to notify property owners of potential impacts due to those projected impacts for systems that are identified to be impacted and work to build resilience.

Other thoughts, ideas, & suggestions
Roads and Bridges

1. Assess the vulnerability (current and future) of the town's roads and bridges to the five types of flooding (Flash Flooding, River Flooding, Storm Surge, Tidal Flooding and Groundwater).
2. Develop and implement a standardized protocol for documenting local flood impacts to roads and bridges.
3. Establish a policy/plan of action and/or emergency fund to expedite post-disaster road/bridge repair.
4. Require all municipal road and bridge projects to mitigate to the greatest extent practicable, existing and potential future impacts of flooding and erosion.
5. Ensure that culverts are properly sized and roadway ditches adequately designed to accommodate increased precipitation during peak storm events; do the same for bridge spans and clearance.

York Climate Action Plan Natural Resources+ WG Report Out

August 11, 2021

YORK CLIMATE ACTION PLAN

CivicMoxie

CLIMATE ADVISORY

Working Group Members

1. Karen Arsenault, Co-chair
2. Suzanne Berlin
3. Arthur Brennan
4. Zephy Cortesi
5. Dan Gardoqui
6. Gail Gilchrest
7. Jennifer Hunter, Co-chair
8. Lynn Zacharias

Top Strategies Summary

1 – Sustain and improve landscape level climate resiliency and carbon storage, and accelerate permanent land conservation

2 – Protect and restore coastal wetlands and plan for/maximize marsh migration with sea level rise; Research and pursue other high impact blue carbon strategies

3 – Encourage new development/redevelopment projects with smaller ecological footprints

4 – Implement coastal resiliency overlay zoning to maximize natural resilience and minimize damage to property

5 – Incentivize and undertake forestry, agricultural, and lawn care practices that reduce GHG emissions and enhance carbon storage

1 – Sustain & improve landscape level climate resiliency and carbon storage, and accelerate permanent land conservation

Why was it prioritized?

- York is mostly forested – best chance for sustained carbon storage
- Range of benefits from these actions (biodiversity, wildlife, etc.)

What actions are needed?

- maintaining habitat connectivity
- maintaining healthy forests
- managing invasives
- protecting undeveloped habitats & large forested blocks
- wetlands and vernal pools protection
- protecting headwater streams, natural stream buffers and floodplains
- more funding for land conservation efforts – goal of 30% of town land by 2030

Challenges and opportunities?

C: Development and fragmentation of landscape

O: Ecosystem services/benefits – clean water, pollinator health

Responsible parties and essential partners?

- Land trust, water districts
- Citizens
- Town/planning board
- State agencies / landowners

2 – Protect and restore coastal wetlands and plan for/maximize marsh migration with sea level rise; Research and pursue other high impact blue carbon strategies

Why was it prioritized?

- Importance of salt marshes for carbon storage and as a key habitat
- Blue carbon potential

What actions are needed?

- Focused conservation for marsh migration areas (funding)
- Set development limits in migration areas/SLR areas
- Inventory/research for blue carbon

Challenges and opportunities?

C: development potential; invasive species and water quality changes can impact existing saltmarsh; overuse/degradation

O: extra benefits with healthy marshes – fisheries, clean water, flood protection, biodiversity

Responsible parties and essential partners?

- Land trust, MtA2c, MCHT, NOAA
- Commercial fishermen (depends on aquaculture/blue carbon potential)

3 – Encourage new development/redevelopment projects with smaller ecological footprints

Why was it prioritized?

There is continuous development pressure to meet needs and demands

Challenges and opportunities?

C: In-migration and development pressure; balance among development, conservation, and consumer demand

O: environmentally sound buildings, improved energy efficiency; promote York as a sustainable community

What actions are needed?

- Actions that promote development that creates less soil disturbance, less stormwater runoff, smaller building footprints/less impervious surfaces, maintains more natural landscape, and sustainable groundwater use
- Ordinance changes / development standards – comprehensive and professional review needed

Responsible parties and essential partners?

- Town/planning board/appeals board
- Builders/developers
- Citizens/homebuyers

4 – Implement coastal resiliency overlay zoning to maximize natural resilience and minimize damage to property (include resource protection strategies, floodplain protection & management, development restrictions, building codes, land uses, etc.)

Why was it prioritized?

Importance as a coastal town to be ready for climate impacts

What actions are needed?

- Comprehensive new zoning
- Outreach
- Input from Town Planner/Planning Board

Challenges and opportunities?

C: community resistance to change

O: educate; safeguard assets

Responsible parties and essential partners?

- Town/planning board
- Emergency services
- Citizens

5 – Incentivize and undertake forestry, agricultural, and lawn care practices that reduce GHG emissions and enhance carbon storage

Why was it prioritized?

- Important part of the landscape and land management
- Anyone with a yard can play a part in the solution

Challenges and opportunities?

C: funding/incentives; getting technical resources and info to landowners

O: improved biodiversity, soil health, water quality

What actions are needed?

- Lawn: replace grass with deep-rooted shrubs/trees or wildflowers; minimize or eliminate fertilizer and pesticide use; reduce mowing frequency; convert to battery-powered mowers; choose lawn cover types that create healthier soils and require less water & energy inputs; and create rain gardens and maintain vegetated buffers to prevent stormwater runoff
- Ag: regenerative practices
- Forest: forestry management plans with state forestry expert input
- Lawn: outreach/education for behavior changes and to increase demand for sustainable lawn care services by practitioners
- Ag & Forestry: incentives and technical assistance

Responsible parties and essential partners?

Any landowner

ECOHomes – focus on yard care

Lawns to Lobsters / Stormwater outreach

Farmers & foresters

Synergies with other WG initiatives?

- 15+ strategies – noted in worksheets and shared with other groups
- Coastal resiliency overlay zoning – needs infrastructure, buildings, emergency services, and planning/code coordination

Synergies with other local, state, and federal initiatives?

- York River W&S designation
- 30% by 2030
- Research and technical assistance from Maine Climate Planning Group
- Continued focus on regional landscape conservation (MtA2C & state ecological focus areas)

Other thoughts, ideas, & suggestions

- Land use related strategies involving zoning and ordinances need comprehensive review
- Worksheet notes include some areas that were missing strategies (soils, yards/lawncare, working farms/forests, septic systems, groundwater, invasives, etc.)
- Workgroup proposed some additional strategies/actions
- Relative importance may change with baseline data on carbon storage/sinks and emissions inventory

Next Steps

York Climate Action Plan
Resilient Health and Emergency Management WG Report Out

August 11, 2021

YORK CLIMATE ACTION PLAN

CivicMoxie

CLIMATE ADVISORY

Working Group Members

1. Gerry Runte
2. Chris Ballentine
3. Lydia Blume
4. Len Loomans
5. Mary Marshall
6. Nicole Pestana

Top Strategies Summary

1. Using the COVID 19 Coordinated Response Team operational model, create a Team with a broader mission to collaborate and create support during times of extreme events, pool resources, build resilience capacity of businesses and industries, develop response scenarios to combat public health crises caused vector-borne diseases, temperature-induced risks and precipitation, and educate the public on climate related health risks.

2. Ensure awareness of climate-related illnesses and health impacts (both short-term and cumulative) across the larger public health and emergency preparedness & response communities and integrate findings of climate vulnerability into all phases of emergency planning

3. Create a framework to identify state and local sources to educate the local community and businesses on anticipated changes to seasonal conditions in temperature and precipitation

4. Work with the state and/or York Hospital to educate public about availability of air quality data on phone apps and to encourage behavior change on poor quality days.

5. Establish a town business sustainability award or recognition program.

Strategy #1 Using the COVID 19 Coordinated Response Team operational model, create a Team with a broader mission to collaborate and create support during times of extreme events, pool resources, build resilience capacity of businesses and industries, develop response scenarios to combat public health crises caused vector-borne diseases, temperature-induced risks and precipitation, and educate the public on climate related health risks.

Why was it prioritized?

- CRT proven effective over last 18 months; established players;
- CRT model directly relatable to climate issues;
- Addresses multiple communities;
- Identified good pathways of communication;
- Already includes linkage to state and county officials

Challenges and opportunities?

- Assure any additional groups that are not now a part of COVID group are brought into the program;
- Will take time to implement.
- Climate-smart emergency management activities will likely require an increased commitment of staff time and expertise, materials and equipment, and other resources.

What actions are needed?

- Execution will require several subtasks that deal with the variety of communities and health risks.
- CDC's Building Resilience Against Climate Effects (BRACE) framework provides a structure for response.

Responsible parties and essential partners?

- Town emergency management (police, fire, health);
- York Hospital,
- state and county agencies; overall leadership is in town of York (health officer);
- Chamber of Commerce

Strategy #2 **Ensure awareness of climate-related illnesses and health impacts (both short-term and cumulative) across the larger public health, emergency preparedness and response communities; and integrate findings of climate vulnerability into all phases of emergency planning.**

Why was it prioritized?

- First line of response is emergency management in terms of immediate threats to health. Their education is vital to their mission.

What actions are needed?

- Newsletters;
- Auto notifications to social media targeted to various audiences;
- Training of EM person
- Policy development and promulgation

Challenges and opportunities?

- Specific training programs and drills for EM personnel and management
- Assurance that all EM planning incorporate climate/health considerations
- Gaining buy-in of various entities

Responsible parties and essential partners?

- Town management;
- Town emergency response agencies
- York Hospital

Strategy #3 Create a framework to identify state and local sources to educate the local community and businesses on anticipated changes to seasonal conditions in temperature and precipitation.

Why was it prioritized?

- Public health is all about the public; there is only so much EM can do- community must be educated.

Challenges and opportunities?

- Must avoid this getting politicized, ala COVID threat and vaccinations.
- Good, early, credible education.

What actions are needed?

- Develop a ongoing check-in to catalogue state and local funding sources
- Electronic newsletters; auto notifications to social media, targeted to various audiences

Responsible parties and essential partners?

- Town management;
- town emergency response agencies;
- hospital;
- schools;
- grass roots organizations;
- chamber of commerce;
- social organizations,
- library

Strategy #4 **Work with the state and/or York Hospital to educate public about availability of air quality data on phone apps and to encourage behavior change on poor quality days.**

Why was it prioritized?

- Increased ozone and worsened allergy/asthma likely:
- Air quality has direct impact on vulnerable populations including the elderly - York has the oldest median age in the state

Challenges and opportunities?

- Closest AQM system is in NH – multi-state information sources
- Assuring adequate education of public in terms of finding and using information.

What actions are needed?

- Use/develop phone apps;
- Partnership with local TV outlets;
- Link with emergency texting systems- all of which link to Portsmouth AQM system.
- Define and address gaps in health and climate knowledge

Responsible parties and essential partners?

- AQM data is primarily a state generated resource- both ME and NH departments of environmental quality play a role;
- Communications providers and app developers

Strategy #5 Establish a town business sustainability award or recognition program.

Why was it prioritized?

- High visibility promotes further education
- Promotes participation;
- Incentivizes goals;
- Highlights the actions that others might copy/mimic.

What actions are needed?

- Adequate budget for sufficient incentive;
- Judging and administration.

Challenges and opportunities?

- Creating a program with adequate visibility and incentives to ensure continuity over the long term can't be a one-time program.

Responsible parties and essential partners?

- Likely requires administration by a new sustainability committee.

Other Relevant Strategies (not prioritized)

1. Issue climate equivalent to catastrophe bonds to create funding for public health and emergency management programs and equipment.
2. Commission a “best practices” review of other town actions to prepare for heat events level (towns with York population +/- 25%).
3. Develop a post disaster contingency plan to “build back safer and smarter” that increases resilience and reduces risk.
4. Evaluate needed efforts in additional floodplain management necessary to increase FEMA CRS rating to increase flood insurance premium discount.
5. Ensure that emergency responder training includes familiarity with types of illnesses that might present from rising temperatures, including heat exhaustion, cardio-vascular and pulmonary stressors, and “new to Maine” vector-born diseases preparation for patient surges during extreme events and the likelihood for increases in violence during extended heatwaves.
6. Recommend Comprehensive Plan incorporate cooling locations as a standard element for new zoning regulations.
7. Convey information about emergency management activities in many different formats, and in multiple languages as appropriate for different communities to ensure equitable distribution.

Synergies with other WG initiatives?

- Infrastructure likely to have the highest synergy
- Transportation impacting air quality
- Natural Resources

Synergies with other local, state, and federal initiatives?

- Town Government
- Maine Climate Council
- Maine DEP
- NH DEP
- York County Emergency Management Association
- Maine Emergency Management Association
- Maine state and York County CDC
- FEMA
- DHHS via CDC

Other thoughts, ideas, & suggestions

- Health aspects water quality and supply- addressed in other WG strategies?

Next Steps

- WG stand ready to support CM’s plan development

York Climate Action Plan Transportation WG Report Out

August 11, 2021

YORK CLIMATE ACTION PLAN

CivicMoxie

CLIMATE ADVISORY

Transportation Working Group Members

1. WG Co-Chair: Mac McAbee
2. WG Co-Chair: Harry Mussman
3. Member 1: Connor D'Aquila
4. Member 2: Dan Eubank
5. Member 3: Marsha Mazz

Top Strategies Summary

1. **Electric Vehicles (EVs):** Promote and track the broad adoption of electric vehicles (EVs) by residents in York, in collaboration with regional and state initiatives, which, coupled with the necessary supporting infrastructure and ongoing decarbonization of regional grid, will significantly reduce GHG emissions.

2. **Green Fleet Policies:** Promote the adoption and implementation of "Green Fleet Policies" by all entities in York who have fleets, to prioritize the purchase of EVs, to reduce municipal transportation emissions and to "lead by example".

3. **EV Charging Infrastructure:** Promote and track the installation of EV charging infrastructure in York, to support the transition to EVs, for residents, businesses and visitors.

4. **Mobility Options:** Identify and implement mobility options that allow York residents, visitors and workers minimize their use of single-occupant vehicles, maximize social connectivity, and reduce Vehicle Miles Traveled (VMT).

Strategy #1: Electric Vehicles (EVs): Promote and track the broad adoption of electric vehicles (EVs) by residents in York, in collaboration with regional and state initiatives, which, coupled with the necessary supporting infrastructure and ongoing decarbonization of the regional grid, will significantly reduce GHG emissions.

Why was it prioritized? High priority, since transportation is largest contributor (50%?) to GHG emissions in York.

Challenges and opportunities? 1 Doable, but challenging since it will require an early transition to purchasing EVs, instead of Internal Combustion (IC) vehicles, if there is to a significant penetration of EVs over time.

Large opportunity, considering the number of vehicles driven in town and the growing ability to replace them with EVs.

What actions are needed? Four actions identified: educate residents, track adoption, incentivize low and moderate income drivers, and promote decarbonization of electricity supply to York. See detailed list. See also Equity WG.

Responsible parties and essential partners?
Town of York Sustainability Coordinator, Energy Steering Committee (ESC); York Ready for 100; York Community Service Association (YCSA); Southern Maine Planning District Commission (SMPDC); State of Maine Climate Council; Governor's office of Innovation and the Future; Efficiency Maine Trust; Drive Electric Maine.

Important: Maine "Clean Transportation Roadmap", due Dec 2021.

Strategy #2: Green Fleet Policies: Promote the adoption and implementation of "Green Fleet Policies" by all entities in York who have fleets, to prioritize the purchase of EVs, to reduce municipal transportation emissions and to "lead by example".

Why was it prioritized? High priority, since Town and all municipal entities can "lead by example", while reducing "total cost of ownership".

Challenges and opportunities? 2 Maybe, but challenging since difficult to get Town and other municipal entities to enact a policy, and then implement it.

Large opportunity to "jump start" introduction of EVs beyond cars into York.

What actions are needed? Six actions identified, to promote the adoption of "Green Fleet Policies", and to promote and track the adoption of electric work trucks, electric school busses, and electric emergency vehicles. See detailed list.

Responsible parties and essential partners?

Town of York Selectmen, Manager, Sustainability Coordinator; ESC; town departments; other municipal entities, schools, water, sewer; York Hospital; SMPDC; Efficiency Maine Trust.

Consider tools being developed by SMPDC, and by organizations in other states.

Strategy #3: EV Charging Infrastructure: Promote and track the installation of EV charging infrastructure in York, to support the transition to EVs, for residents, businesses and visitors.

Why was it prioritized? High priority, since essential to support the transition to EVs, to solve the "chicken and egg" problem.

Challenges and opportunities? 1 Doable, but challenging to get the necessary support from the many entities that need to install charging infrastructure, including getting the Town government and other municipal entities to install public chargers.

Large opportunity, since almost no chargers at this time in York.

What actions are needed? Four actions identified, to install charging infrastructure at hospitality businesses, other businesses, and at municipal locations; also, enact ordinances to require EV charging infrastructure in all new commercial, multi-family and subdivision developments. See detailed list.

Responsible parties and essential partners?

All Town entities, including identified sustainability coordinators; York hospitality and other businesses, Chamber of Commerce; SMPDC; State of Maine Climate Council; Governor's office of Innovation and the Future; Efficiency Maine Trust; also Town government, planning dept and planning board.

Strategy #4: Mobility Options: Identify and implement mobility options that allow York residents, visitors and workers to minimize their use of single-occupant vehicles, maximize social connectivity, and reduce Vehicle Miles Traveled (VMT).

Why was it prioritized? Medium priority, since this would have only a modest reduction in GHG emissions

Challenges and opportunities? 2 Maybe, if we can get the necessary support from all of the involved organizations.

Good opportunity to better serve residents, visitors and workers while reducing VMT; importantly, it can reduce congestion and pollution during tourist season.

What actions are needed? Eleven actions identified, including tourist-season services, demand-response transit services, shared transit services, improved regional transit services, a town transportation hub, and improvements in bike lanes and walking paths, plus outreach to alert all potential users to available services. See detailed list.

Responsible parties and essential partners?
All Town entities, including sustainability coordinators; Bike and Pedestrian Committee; York hospitality and other businesses; Chamber of Commerce; York Ready for 100; SMPDC; KACTS MPO; York Community Action Corporation (YCCAC); State of Maine, including DOT; Efficiency Maine Trust. Key initiatives need to be included in Town of York Comp Plan.

Synergies with other WG initiatives?

Equity WG, for including low- and medium-income residents

Infrastructure WG, for adaptation of transportation facilities

Synergies with other local, state and federal initiatives?

Many regional and state initiatives, as noted.

In particular, Maine "Clean Transportation Roadmap", due Dec 2021; SMPDC doing survey of mass transit needs; pending Maine DOT study of demand-response transportation services.

Federal initiatives for EVs and charging infrastructure should become important, but cannot yet be quantified.

Other thoughts, ideas and suggestions

We are very concerned about ever getting enough support from the many entities identified, starting with Town government.

When will we get a York Sustainability Coordinator? Will they have any power, time or budget?

And how can we get other municipal entities involved? Businesses?

One bright spot is the Southern Maine Planning District Commission (SMPDC), but how can we get York to be more involved with them?

Next steps

Where can we publish our detailed list of strategies and actions, plus supporting information?

What is the plan to get Action after the CAP is published? Who will be the driving force(s) in York that can push forward with these strategies, and work cooperatively with the regional and state entities? Will the WGs carry forward?

Where will the Town of York find the necessary funding for these initiatives? Budget? Bonds? Reinvest savings? Grants? Gifts?

YORK CLIMATE ACTION PLAN

Appendix E: Community Feedback Survey Results Summary

January 2022

The following is a summary of the responses received from the CAP Community Feedback Survey, which was open from November 16 to December 13, 2021. There were 409 responses in total.

Also included are relevant questions from the Comprehensive Plan Town-Wide Community Survey, which was open from October 15-31, 2021.

York Climate Action Plan

Community Feedback Survey Results

November 16 – December 13

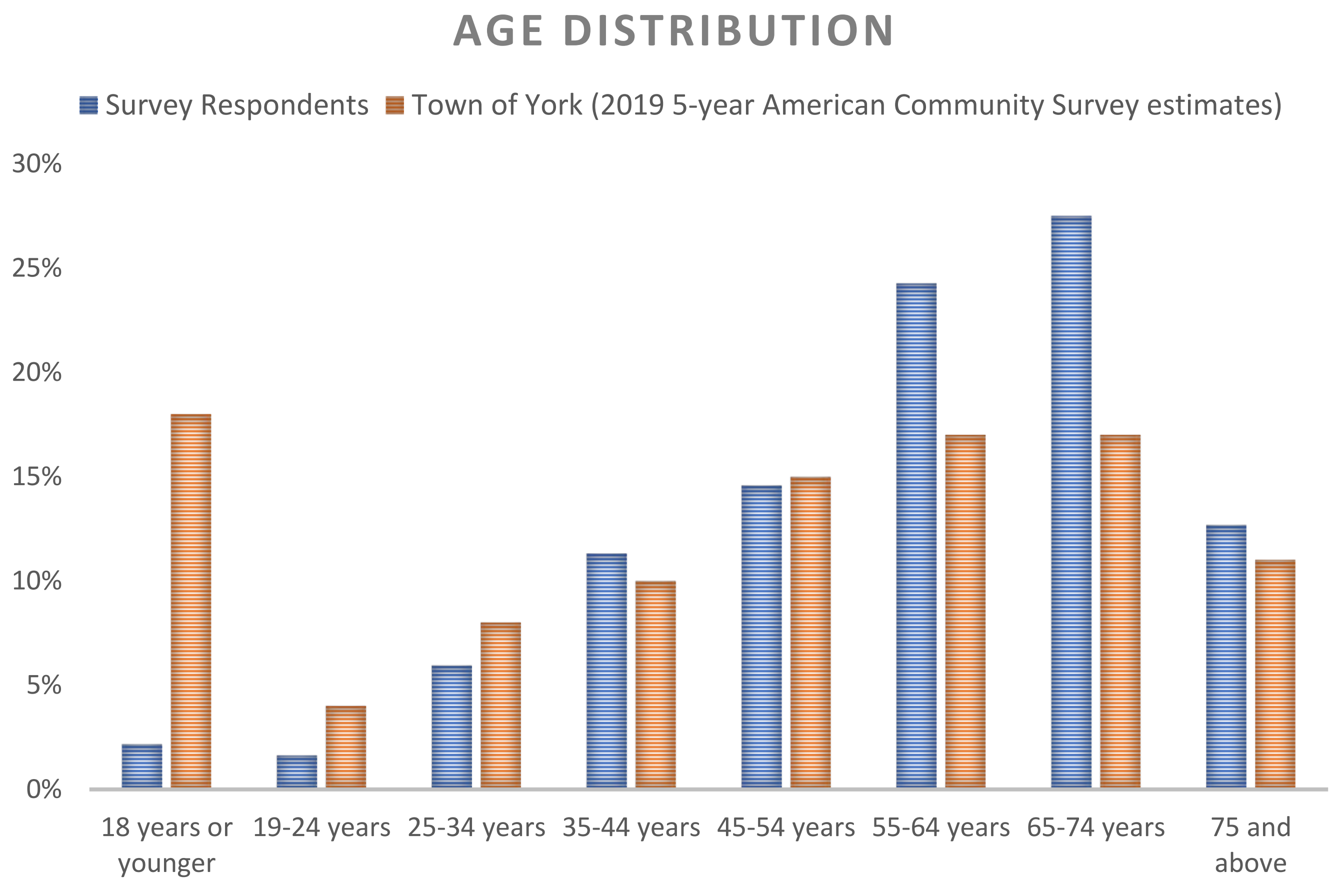
YORK CLIMATE ACTION PLAN

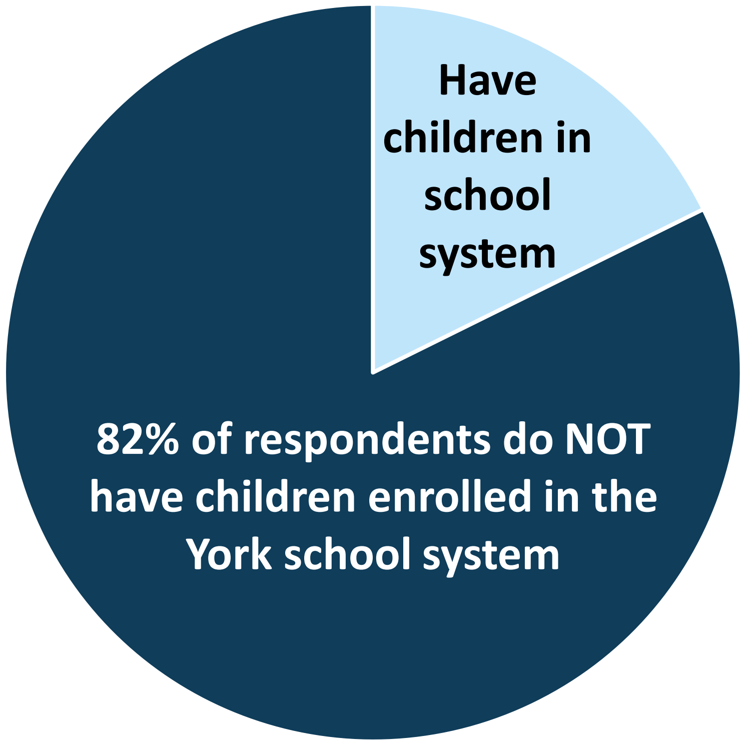
409
responses

CivicMoxie

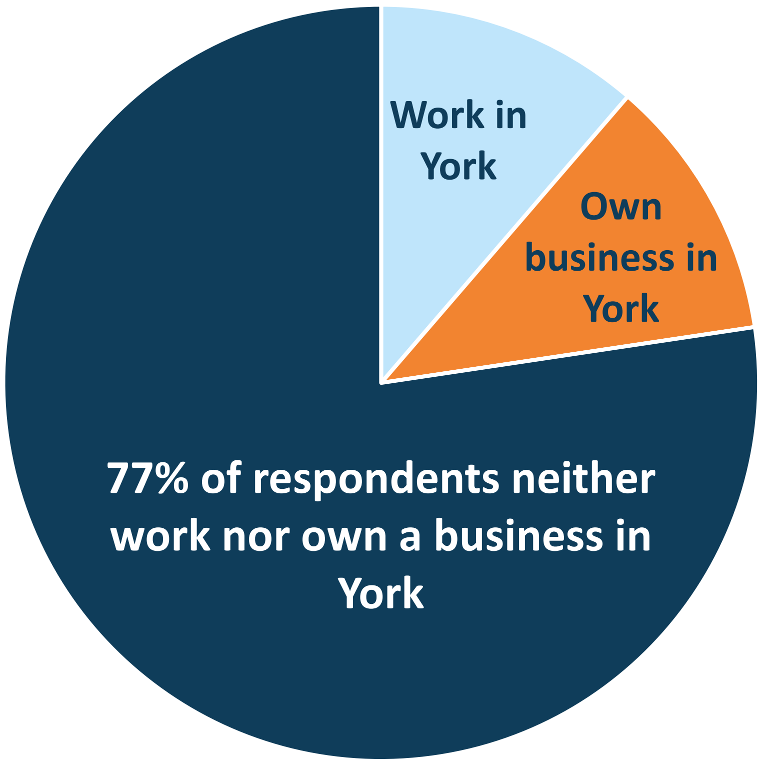
CLIMATE ADVISORY

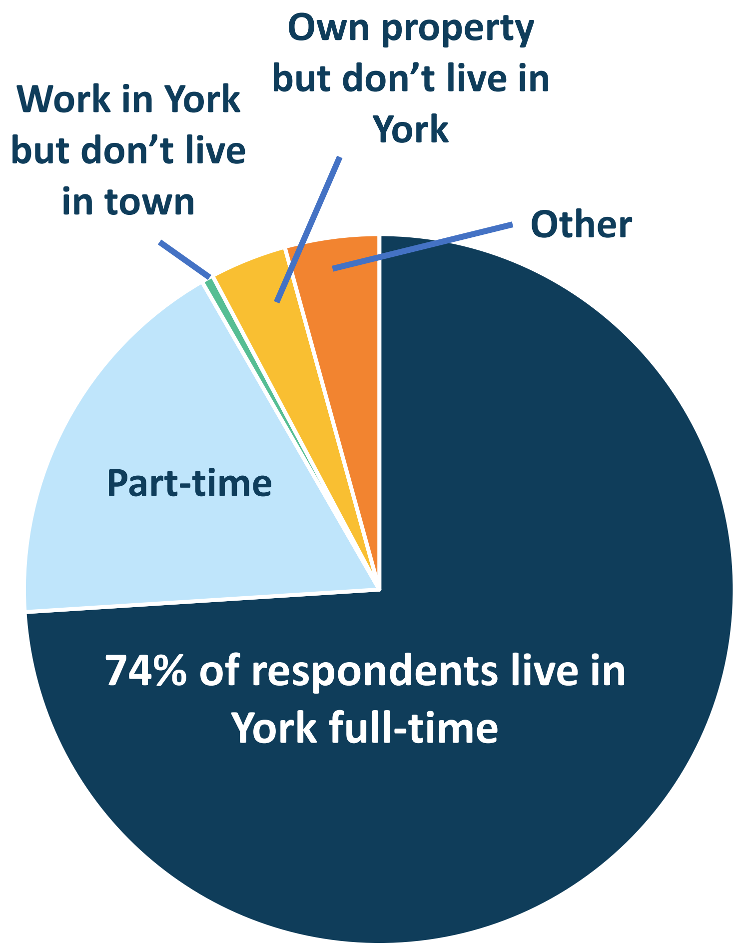
Who did we hear from?

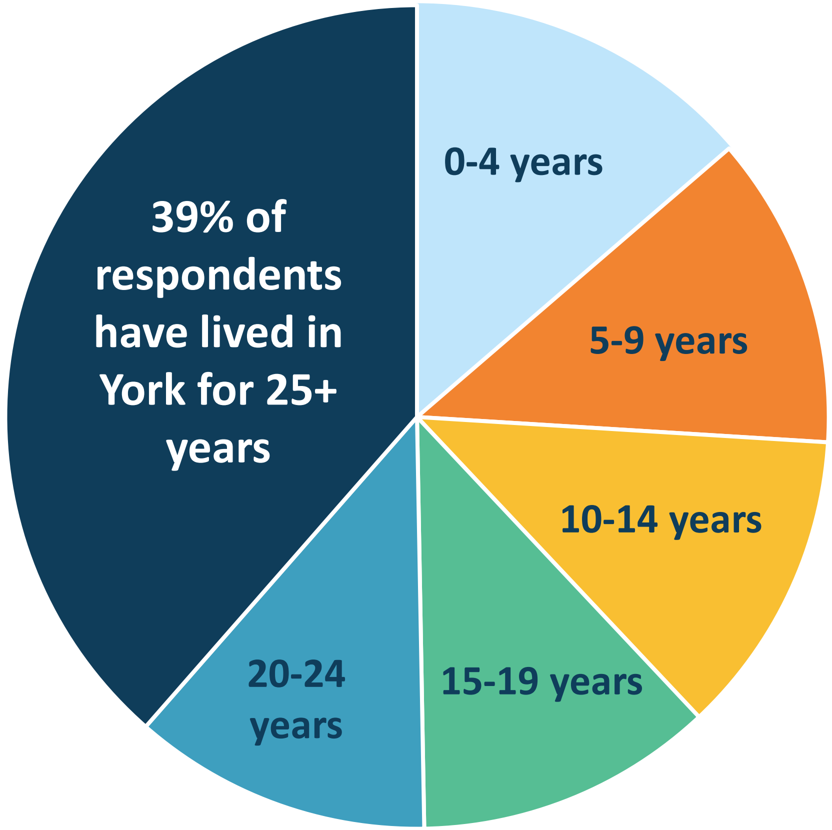




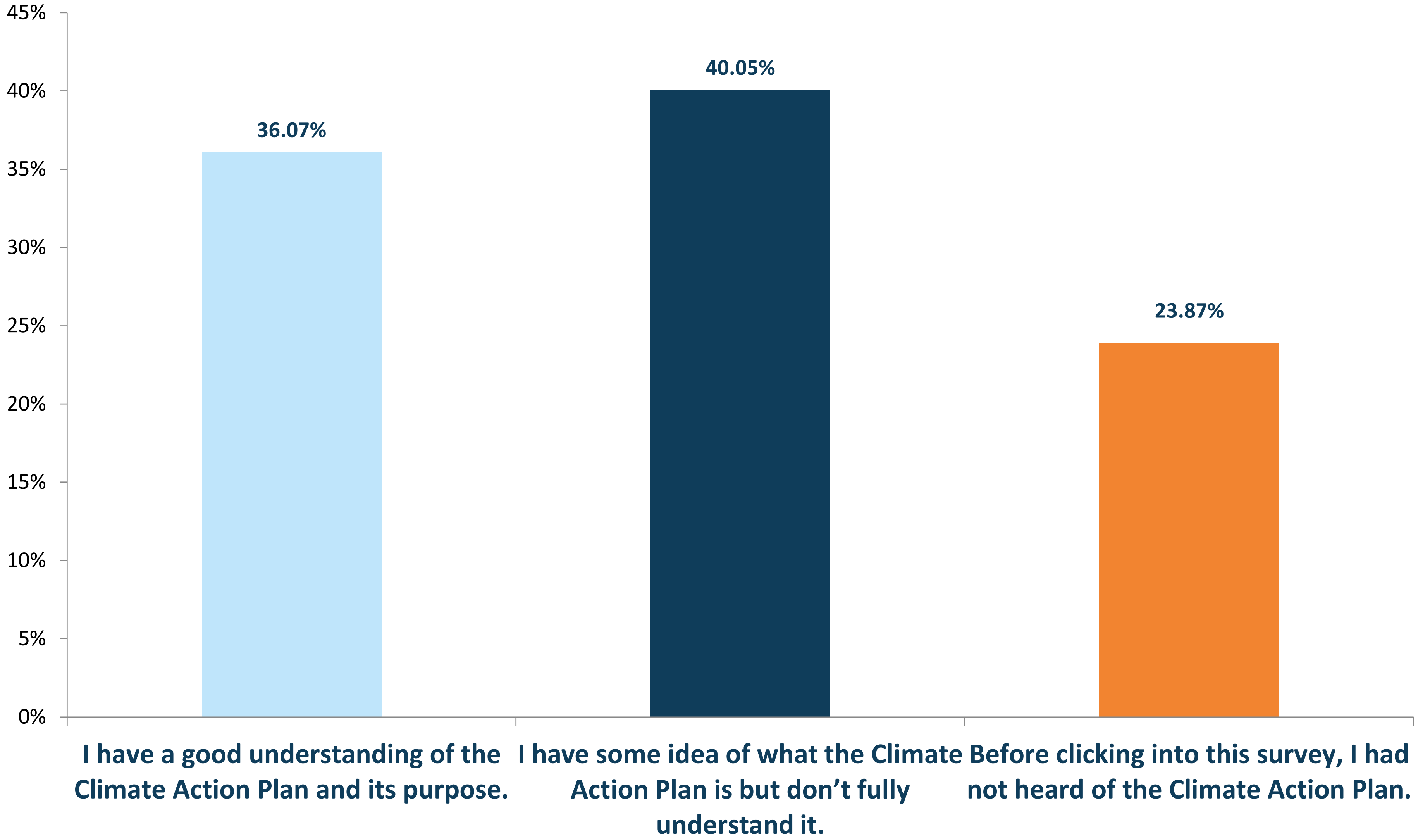
Who did we hear from?



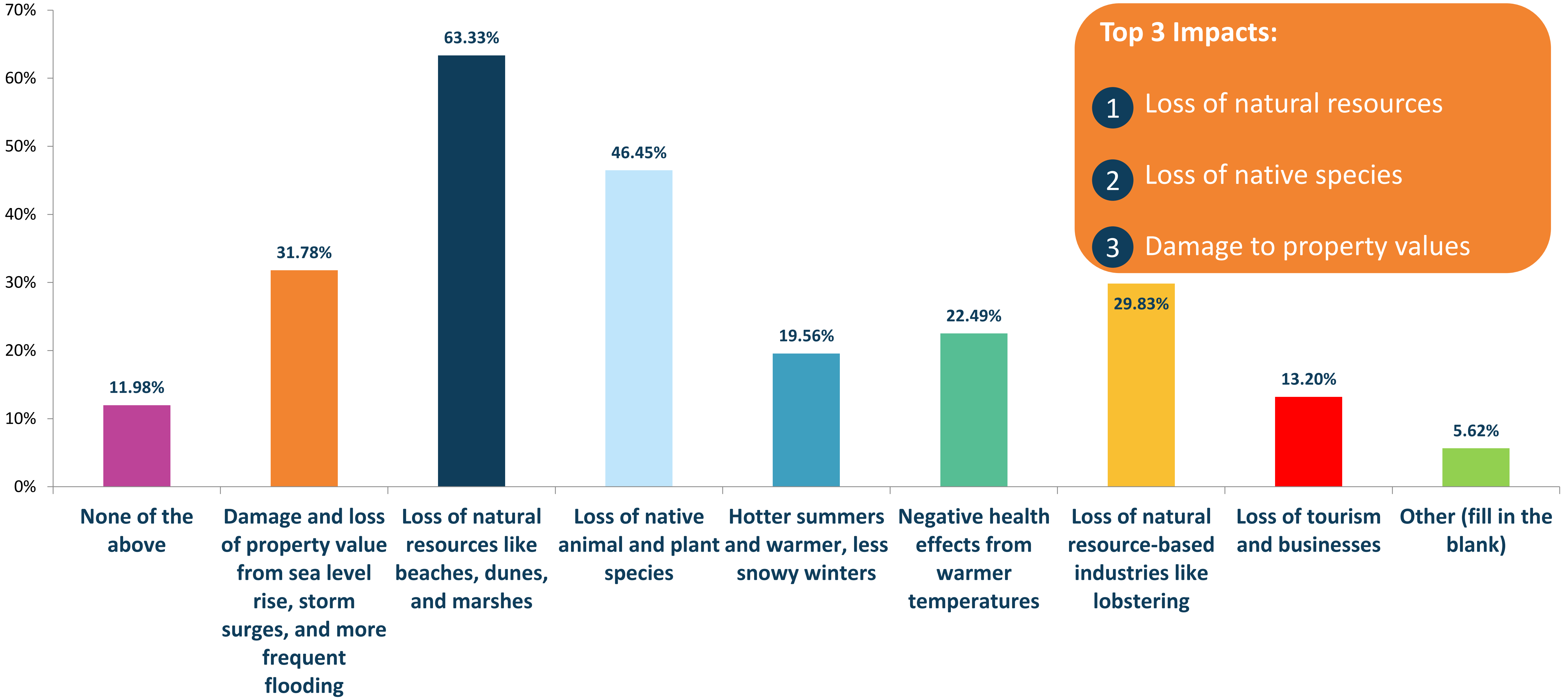




Which of the following best describes your understanding of the purpose or role of the CAP?



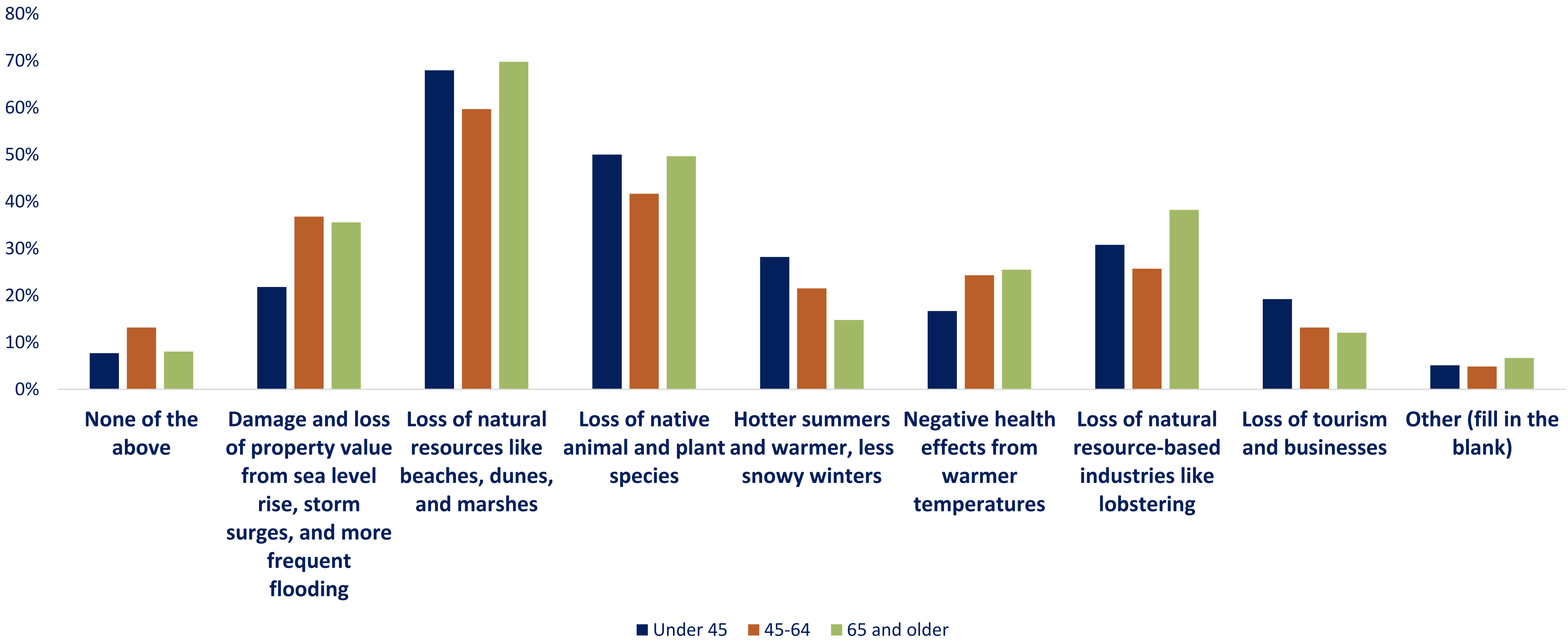
Which climate change impacts concern you most (choose up to 3)?



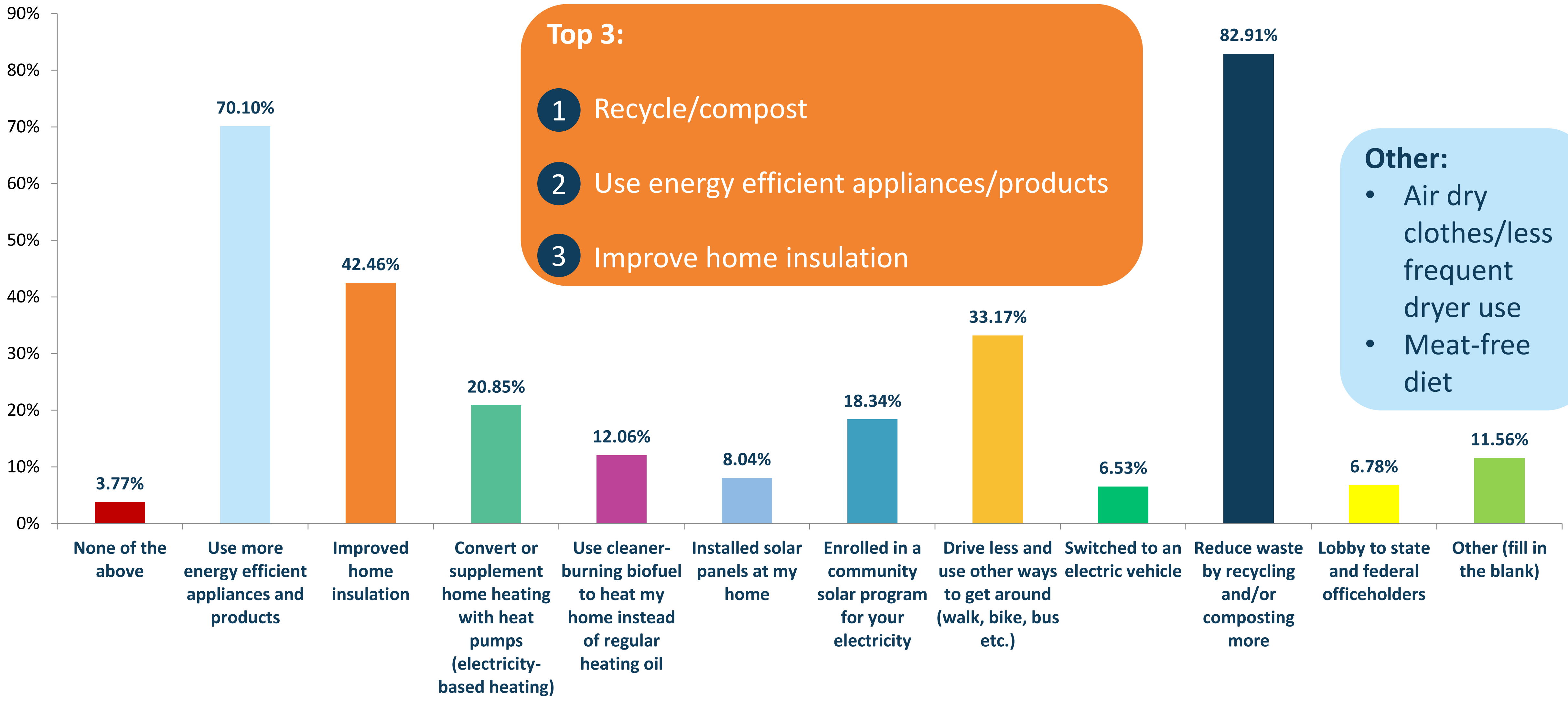
Top 3 Impacts:

1. Loss of natural resources
2. Loss of native species
3. Damage to property values

Which of the climate change impacts concern you most? (By Age)



Which of the following steps do you already take to help reduce GHG emissions? (Choose all that apply)



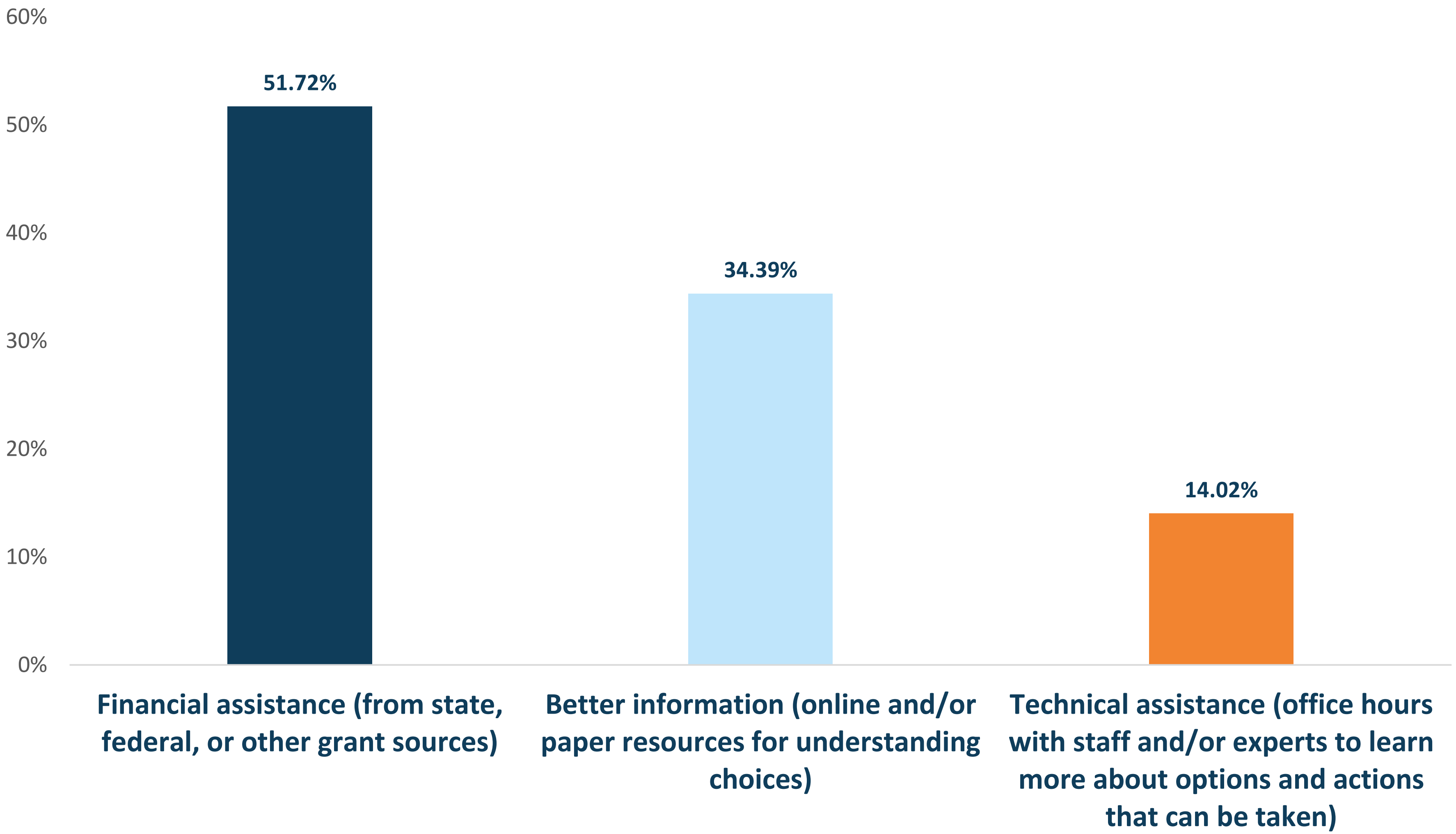
Top 3:

1. Recycle/compost
2. Use energy efficient appliances/products
3. Improve home insulation

Other:

- Air dry clothes/less frequent dryer use
- Meat-free diet

How would you rank the following as ways to best encourage members of the York community to adopt CAP recommendations?

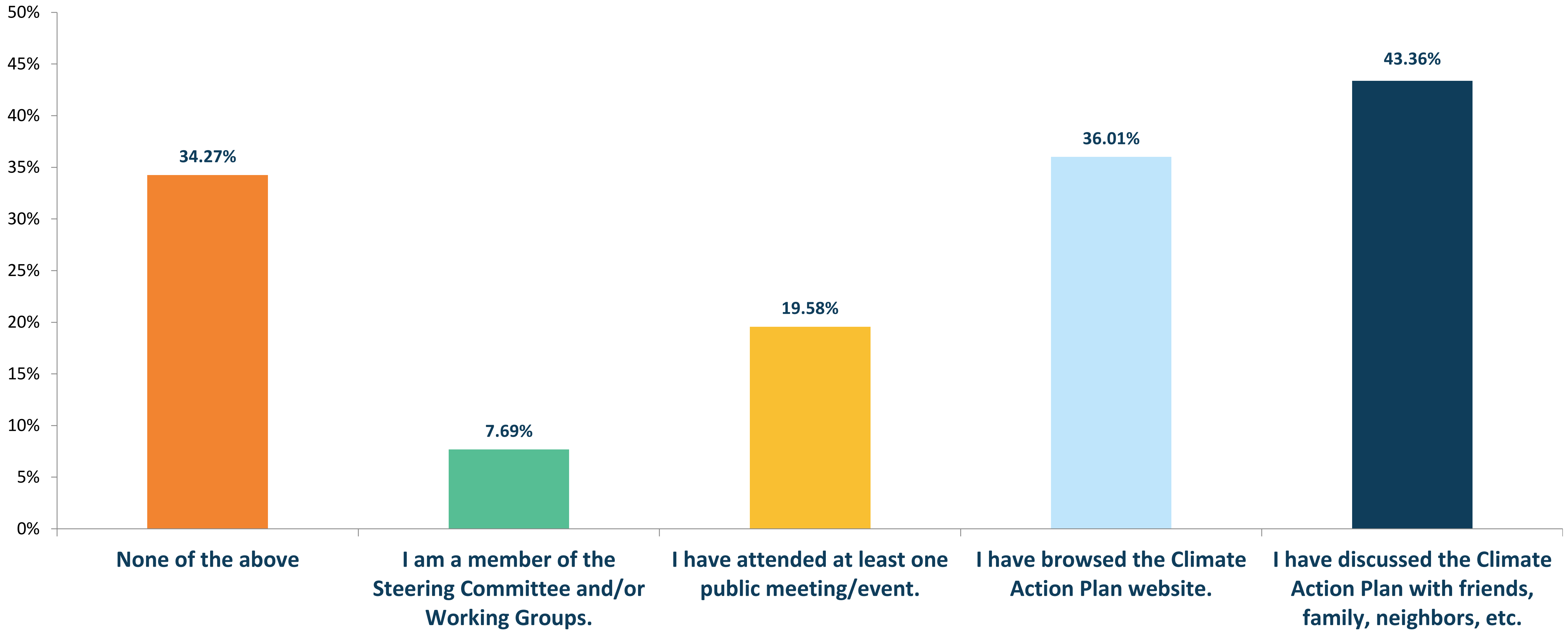


52% ranked **financial assistance** as #1

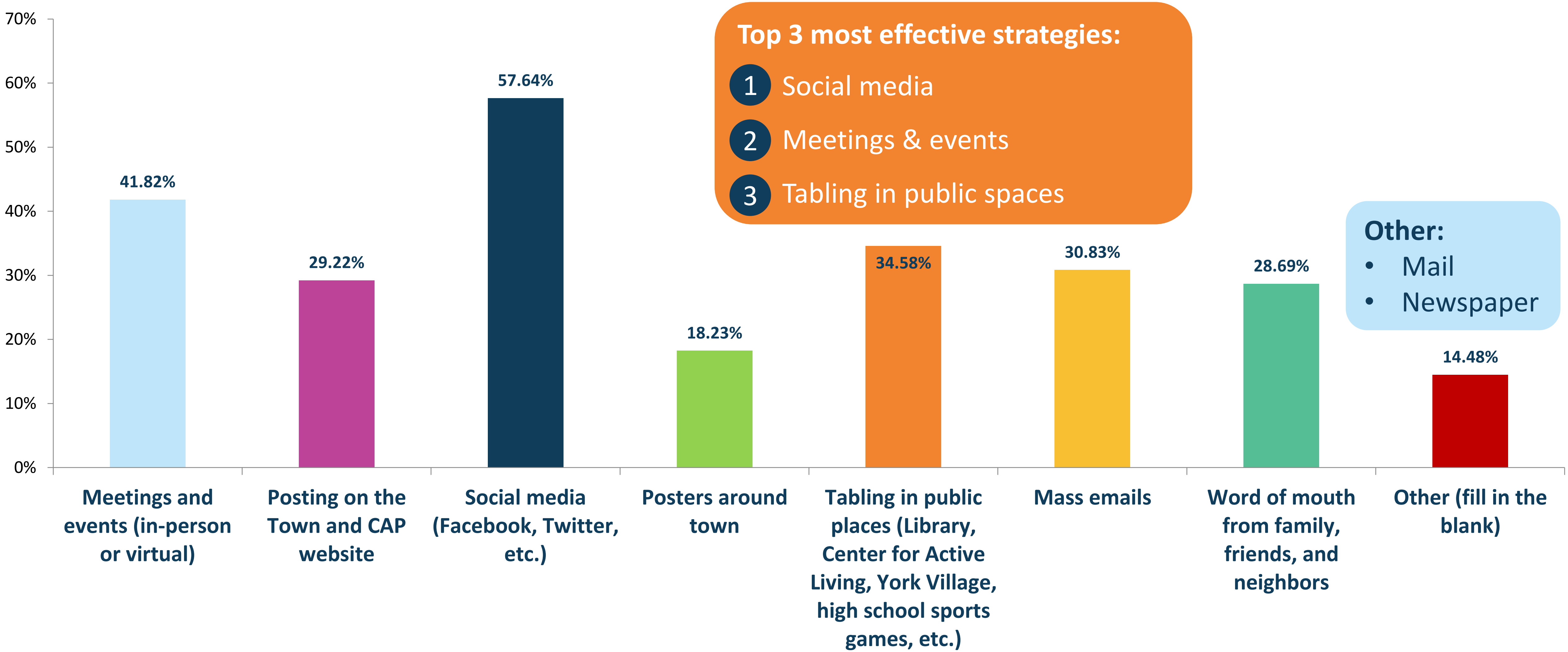
34% ranked **better info** as #1

14% ranked **tech assistance** as #1

Which of the following best describes your personal involvement in the CAP process? (Choose all that apply)



What do you think are the most effective ways to reach people in York about the CAP? (Choose up to 3)



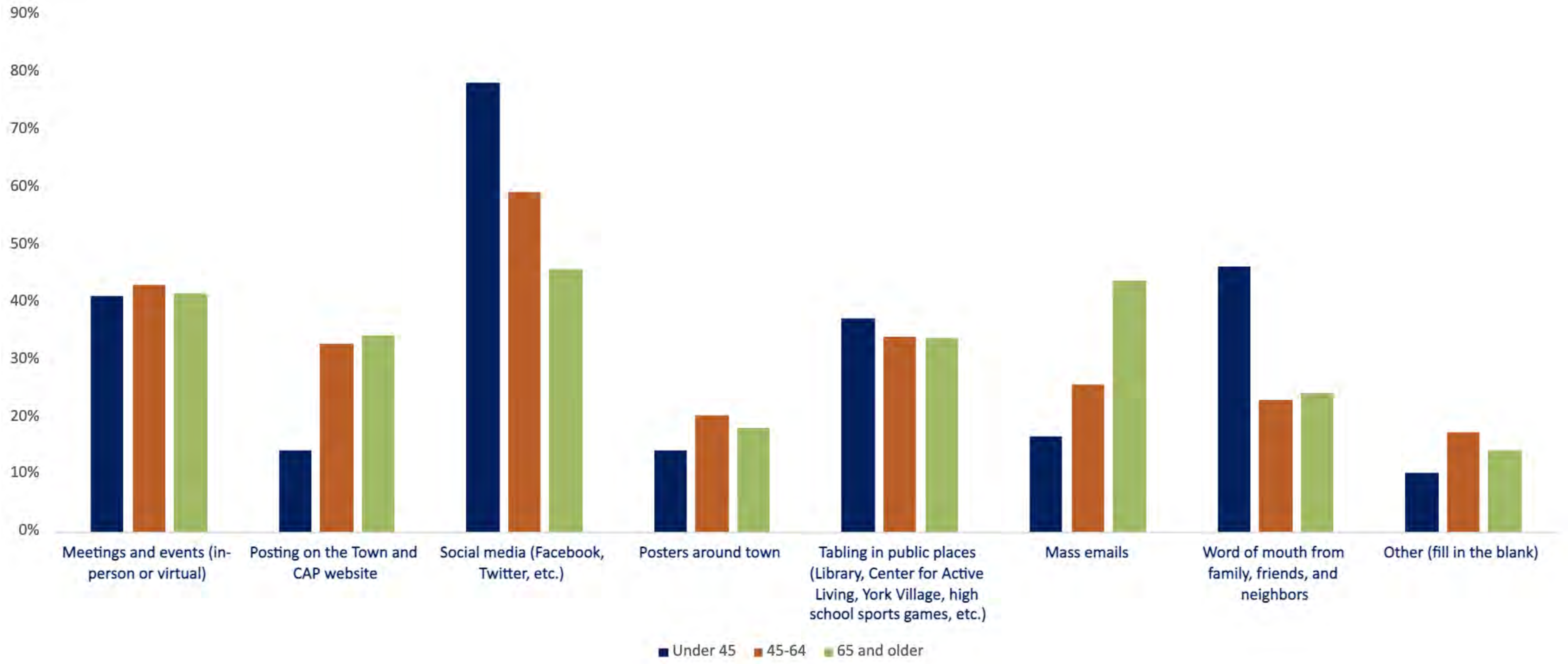
Top 3 most effective strategies:

1. Social media
2. Meetings & events
3. Tabling in public spaces

Other:

- Mail
- Newspaper

What do you think are the most effective ways to reach people in York about CAP? (By Age)



Frequent Comments, Questions, & Concerns

- 18 Appreciation for CAP!
- 15 Need more information/resources on climate change & CAP
  1. How to personally support CAP?
  2. Need to better understand climate change
- 13 Climate denial
- 5 CAP will drive up local taxes – too expensive
- 3 Climate change is a global issue – nothing should be done at the local level
- 2 Stop politicizing climate change

Comprehensive Plan Town-wide Community Survey

1,163

RESPONSES

OCTOBER 15, 2021 – OCTOBER 31, 2021

CivicMoxie

Protection of natural resources?

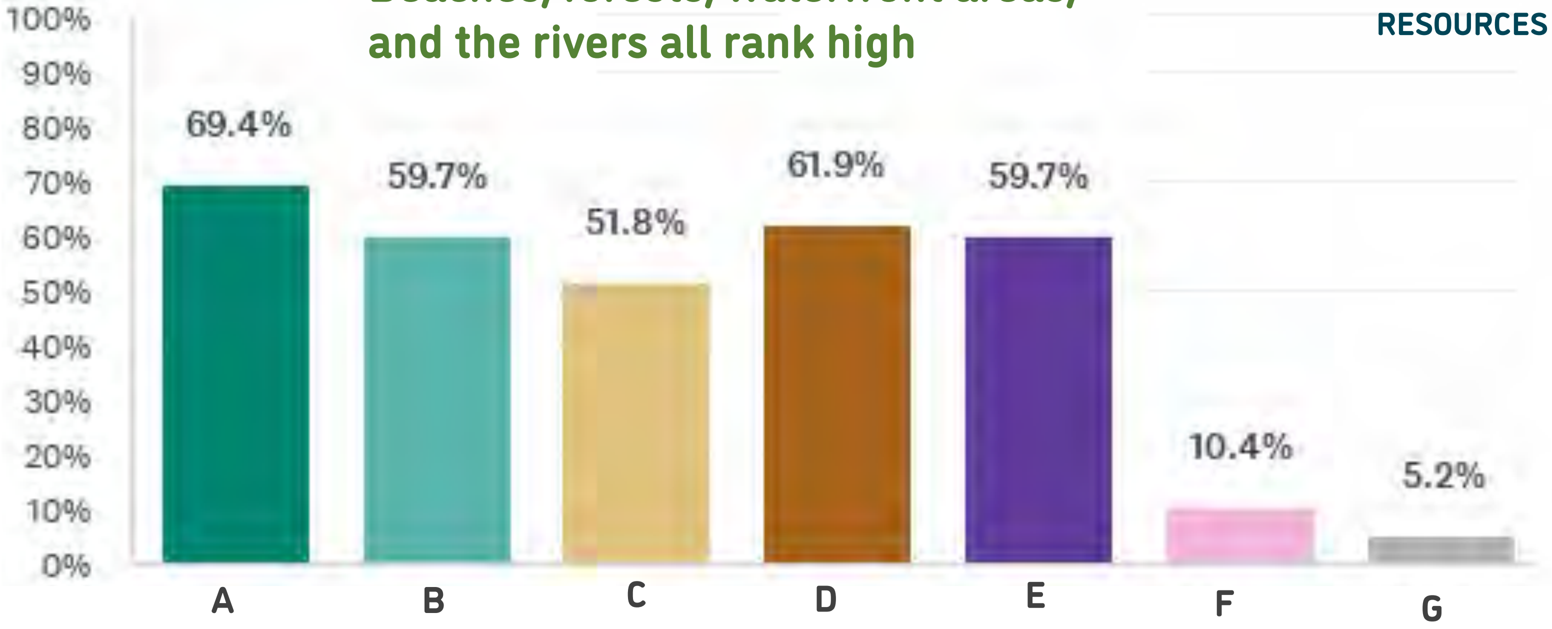
NATURAL RESOURCES

More than 80% of survey respondents think it is very important to conserve and protect natural resources in York.

10% of respondents believe resources in York don't need additional protection.

73% are concerned about climate change.

Beaches, forests, waterfront areas, and the rivers all rank high



A – York's beaches + ocean

B – The York River + Harbor

C – The Cape Neddick River

D – Forests and wildlife habitats

E – Waterfront areas, such as the Cliff Walk and Fisherman's Walk

F – None – resources are well protected

G – Other

Top write-in answers under 'Other': Wetlands/marshes (9); open areas (4); Mt A; trees/forests (3); nowhere (2); agricultural areas (2); Cape Neddick beach (2)

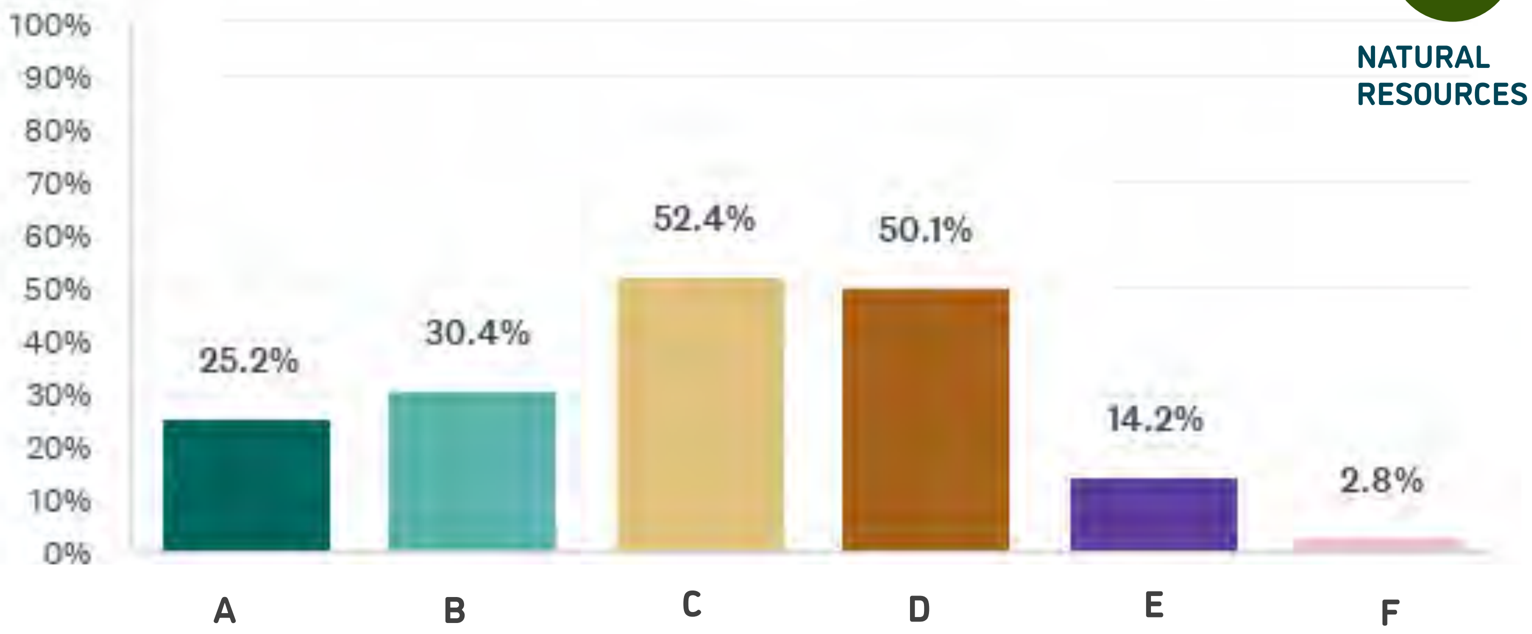
Priorities for planning for the York River/Harbor?

NATURAL RESOURCES

Top 2 priorities:

1. Protection of marine ecosystems (52%)
2. Reduction of contamination and runoff from surrounding properties (50%)

14% of respondents believe the current use/restrictions are adequate and no change is necessary.



A – Access for commercial fishermen

B – Access for recreational users (such as paddlecraft, recreational boaters, clamming, etc.)

C – Protection of marine ecosystems

D – Reduction of contamination and runoff from surrounding properties

E – The current use/restrictions of the York River and Harbor are adequate; no change is necessary

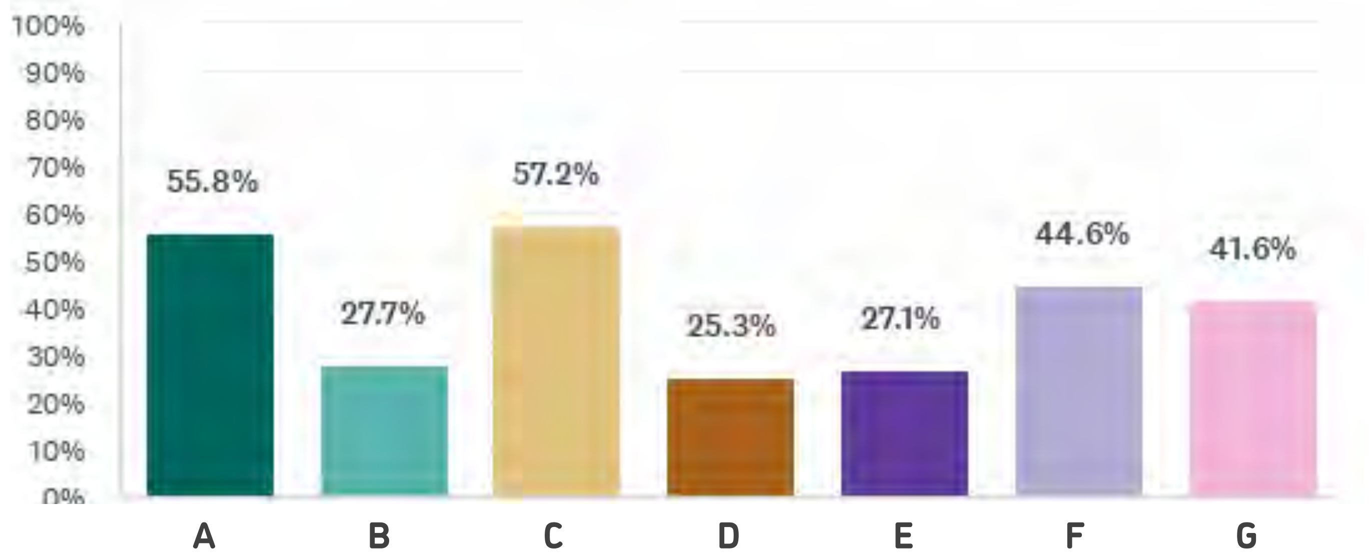
F – Other

Top write-in answers under 'Other': Combination of all or several options (4); responsibly built docks (2); recreational access (2); shoreland zoning (2)

What is most important to you?

Top 4 overall priorities for the Comp Plan:

1. Conserve our forests, open space, and land (57%)
2. Preserve historic character, buildings, and spaces of York (56%)
3. Protect our town from impacts of climate change (45%)
4. Manage seasonal tourism impacts, such as traffic congestion, parking, access to services, etc. (42%)



A – Preserve the historic character, buildings, and spaces of York.

B – Provide more affordable housing and variety of housing types.

C – Conserve our forests, open space, and land.

D – Grow the employment and commercial tax base of the town.

E – Expand our recreational resources and opportunities.

F – Protect our town from impacts of climate change (sea level rise, flooding, loss of property value, extreme heat, and loss of forests/land, etc.).

G – Manage seasonal tourism impacts, such as traffic congestion, parking, access to services, etc.

YORK CLIMATE ACTION PLAN

Appendix F: Upcoming Opportunities, Funding, and Financing

February 2022

Upcoming Opportunities

This is an overview of upcoming funding and financing opportunities at the federal, state, and local levels, and through private sources and programs.

It is important to note that the state currently (issued December 2021) has issued a Request For Proposals (RFP) to establish regional climate service providers and regional coordinator providers to help municipalities identify projects and sources of funding. This is part of the State's Community Resilience Partnership and taking advantage of state assistance in this regard is mentioned on the list of next steps at the end of this section.

Federal

There has been a flurry of executive orders, special working groups, and pending legislation during 2021, including the recent passage of the Infrastructure Investment and Jobs Act and the pending Build Back Better bill. It is a dynamic time and difficult to keep up with all of the changes. Below is a representative listing of some of those actions.

The Federal Infrastructure Bill[1]

The Federal Infrastructure Bill has passed BUT a lot of the economic stimulus is in the Build Back Better Bill that is still pending. Federal infrastructure and clean energy funds are typically funneled through state governments, which are responsible for establishing specific application and eligibility requirements and procedures.

What's in the Federal Infrastructure Bill?

Public Transit
The deal will invest $66 billion to provide healthy, sustainable transportation options for millions of Americans by modernizing and expanding transit and rail networks across the country. It will replace thousands of transit vehicles, including buses, with clean, zero emission vehicles.

Electric Vehicle Infrastructure
The Bipartisan Infrastructure Deal will invest $7.5 billion to build out the first-ever national network of EV chargers in the United States. The deal will provide funding for deployment of EV chargers along highway corridors to facilitate long-distance travel and within communities to provide convenient charging where people live, work, and shop – and funding will have a particular focus on rural....

Clean School Buses
The Bipartisan Infrastructure Deal will deliver thousands of electric school buses nationwide, including in rural communities, to help school districts across the country buy clean, American-made, zero emission buses and replace the yellow school bus fleet for America's children. The deal invests in zero- and low-emission school buses, in addition to more than $5 billion in funding for public transit agencies to adopt low- and no-emissions buses.

Modern Infrastructure
The Bipartisan Infrastructure Deal invests $17 billion in port infrastructure and $25 billion in airports to address repair and maintenance backlogs, reduce congestion and emissions near ports and airports, and drive electrification and other low-carbon technologies. Modern, resilient, and sustainable port, airport, and freight infrastructure will support U.S. competitiveness by removing bottlenecks and expediting commerce and reduce the environmental impact on neighboring communities.

Resilience
The Bipartisan Infrastructure Deal is the largest investment in the resilience of physical and natural systems in American history. The deal makes our communities safer and our infrastructure more resilient to the impacts of climate change and cyber-attacks, with an investment of over $50 billion to protect against droughts, heat, and floods – in addition to a major investment in the weatherization of American homes.

Clean Drinking Water
The Bipartisan Infrastructure Deal will expand access to clean drinking water to all American families, eliminate the nation's lead service lines and help to clean up the dangerous chemical PFAS (per- and polyfluoroalkyl). Currently, up to 10 million American households and 400,000 schools and child care centers lack access to safe drinking water. The Bipartisan Infrastructure Deal will invest $55 billion to expand access to clean drinking water for households, businesses, schools, and child care centers all across the country.

Legacy Pollution
The bill will invest $21 billion to clean up Superfund and brownfield sites, reclaim abandoned mine land, and cap orphaned oil and gas wells. These projects will remediate environmental harms, address the legacy pollution that harms the public health of communities, create jobs, and advance long overdue environmental justice

Clean Energy Transmission

The Bipartisan Infrastructure Deal's more than $65 billion investment is the largest investment in clean energy transmission and the electric grid in American history. It upgrades our power infrastructure, including by building thousands of miles of new, resilient transmission lines to facilitate the expansion of renewable energy. It creates a new Grid Deployment Authority, invests in research and development for advanced transmission and electricity distribution technologies, and promotes smart grid technologies that deliver flexibility and resilience. It also invests in demonstration projects and research hubs for next generation technologies like advanced nuclear reactors, carbon capture, and clean hydrogen.

Agency Specific Resources for Climate Resilience

FEMA Resources for Climate Resilience[2]

Issued in December 2021, FEMA Resources for Climate Resilience provides a roadmap of Federal Emergency Management Agency (FEMA) programs and initiatives that advance community climate resilience (Fig. 1). FEMA Resources for Climate Resilience assists FEMA's state, local, tribal, and territorial (SLTT) partners in navigating the FEMA resources that are available to support communities in mitigating impacts of climate change.

FEMA supports building climate resilience by:

- Providing information about climate-related risks
- Supporting the use of climate forecasting information for planning and project design
- Supporting risk reduction actions and nature-based or green infrastructure solutions
- Providing access to and encouraging the use of disaster insurance
- Supporting coordinated partner approaches to building community adaptation strategies

Fig. 1. Community Resilience Cycle

Source: FEMA Resource for Climate Resilience, December 2021

Fig. 2. FEMA Program Reference Matrix

	Hazard Focus			Disaster Life Cycle		Grant Types				Direct Assistance
Program	Flood	Fire	All Hazard	Annual Programming	Post-Disaster	Mitigation Project Grants	Mitigation Planning Grants	Capability/Capacity Building, Building Code Administration, & Technical Assistance Grants	Nature-Based Solutions Projects	Training, Preparedness, Technical Assistance from FEMA
Sea Level Rise & Flood Maps	✓			✓						✓
Mitigation Planning			✓	✓	✓		✓			✓
Building Resilient Infrastructure and Communities			✓	✓		✓	✓	✓	✓	✓
National Flood Insurance Program	✓			✓			✓	✓		
Flood Mitigation Assistance	✓			✓		✓	✓	✓	✓	
National Exercise Program			✓	✓						✓
Fire Adapted Communities		✓		✓						✓
Public Assistance			✓		✓	✓		✓	✓	
Hazard Mitigation Grant Program			✓		✓	✓	✓	✓	✓	
Hazard Mitigation Grant Program Post Fire		✓			✓	✓			✓	

Source: FEMA Resource for Climate Resilience, December 2021

One example of FEMA funding sources is the Building Resilient Infrastructure and Communities (BRIC)[3] program, designed to support communities in building capability and capacity to mitigate the increasing impacts of climate change (Fig. 2). The program includes:

- annual grant funds to SLTT governments for hazard mitigation planning, mitigation projects, and building community capacity and capability
- shift of the federal focus from reactive disaster spending toward research-supported, proactive investment in community resilience as identified in planning
- under the Biden Administration, the BRIC Program doubled to $1 Billion in FY2021

For FY2021 the priorities of BRIC were:

- Mitigating risk to public infrastructure
- Incentivizing resilient investments in disadvantaged communities, as referenced in EO 14008 (Tackling the Climate Crisis at Home and Abroad)
- Mitigating risk to one or more community lifelines
- Incorporating nature-based solutions
- Enhancing climate resilience and adaptation
- Increasing funding to applicants that facilitate the adoption and enforcement of the latest published editions of building codes

Recent Executive Orders from the Federal Government

Federal Executive Orders issued in 2021 illustrate the dramatic shift in federal policy with respect to the role that climate change will play in the "whole of government approach" and also highlight potential focus areas for climate change initiatives and funding. The policy decisions outline below will be transformed into programs--- many of which will come with funded mandates and grant opportunities. Significant money available to York for climate change initiatives (especially with respect to infrastructure) is going to come from the federal level with the state often acting as the arbitrator of those funds.

Strengthening American Leadership in Clean Cars and Trucks[4]

Executive Order 14037 of August 5, 2021

This order sets the policy that America must lead the world on clean and efficient cars and trucks, which means bolstering the domestic market by setting a goal that 50 percent of all new passenger cars and light trucks sold in 2030 be zero-emission vehicles, including battery electric, plug-in hybrid electric, or fuel cell electric vehicles. This will include setting clear standards, expanding key infrastructure, spurring critical innovation, and investing in the American autoworker.

Climate-Related Financial Risk[5]

Executive Order 14030 of May 20, 2021

The intent of this order is to set a policy that will help mitigate the climate-related physical and transition risks and drivers in response to intensifying impacts of climate change that present physical risk to assets, publicly traded securities, private investments, and companies, in addition to the global shift away from carbon-intensive energy sources and industrial processes.

Establishment of the Climate Change Support Office[6]

Executive Order 14027 of May 7, 2021

This order allows for the establishment of the Climate Change Support Office (CCSO), a temporary organization whose purpose is to support bilateral and multilateral engagement to advance the United States initiative to address the global climate crisis, led by the Department of State and in coordination with other executive departments and agencies.

Rebuilding and Enhancing Programs to Resettle Refugees and Planning for the Impact of Climate Change on Migration[7]

Executive Order 14013 of February 4, 2021

In additional to broader and larger amendments to national immigration policies, this act includes a request for the preparation and submission to the President a report on climate change and its impact on migration (international), including forced migration, internal displacement, and planned relocation by the Assistant to the President for National Security Affairs (APNSA), in consultation with the Secretary of State, the Secretary of Defense, the Secretary of Homeland Security, the Administrator of the United States Agency for International Development, and the Director of National Intelligence.

Tackling the Climate Crisis at Home and Abroad[8]

Executive Order 14008 of January 27, 2021

PART I—PUTTING THE CLIMATE CRISIS AT THE CENTER OF UNITED STATES FOREIGN POLICY AND NATIONAL SECURITY. This order builds on and reaffirms actions already taken to place the climate crisis at the forefront of the United States' foreign policy and national security planning, including the United States rejoining the Paris Agreement. In implementing—and building upon—the Paris Agreement's three overarching objectives (a safe global temperature, increased climate resilience, and financial flows aligned with a pathway toward low greenhouse gas emissions and climate-resilient development), the United States will exercise its leadership to promote a significant increase in global climate ambition to meet the climate challenge.

PART II—TAKING A GOVERNMENT-WIDE APPROACH TO THE CLIMATE CRISIS. As part of this order, the Administration will organize and deploy the full capacity of its agencies to combat the climate crisis to implement a Government-wide, coordinated approach that reduces climate pollution in every sector of the economy; increases resilience to the impacts of climate change; protects public health; conserves lands, waters, and biodiversity; delivers environmental justice; and spurs well-paying union jobs and economic growth, especially through innovation, commercialization, and deployment of clean energy technologies and infrastructure.

Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis[9]

Executive Order 13990 of January 20, 2021

This order states that the Federal Government must advance environmental justice by recommitting to empower workers and communities; promote and protect public health and the environment; and conserve national treasures and monuments. This order includes the immediate review of agency actions taken between January 20, 2017, and January 20, 2021 that are or may be inconsistent with, or present obstacles to, the environmental justice policy set forth in this order.

Additional information on climate change initiatives and programs can be found here:

USEPA – United States Environmental Protection Agency
https://www.epa.gov/

NOAA – National Oceanic and Atmospheric Administration
https://www.noaa.gov/

HUD – United States Department of Housing and Development
https://www.hud.gov/

ACOE – United States Army Corps of Engineers
https://www.usace.army.mil/

American Flood Coalition
https://floodcoalition.org/

State

There are various opportunities at the state level. The *Maine Won't Wait* summary is shown below; much of the state funding is relying on federal funding that Maine can then redistribute through state programs; there is some state funding available (e.g., for resilience).

The state has taken advantage of several revenue streams, including federal grants, dedicated state budget items, as well as revenues collected from energy utilities and the Regional Greenhouse Gas Initiative to fund climate resilient work in municipalities, for businesses and at the individual level. A summary of the funding set aside to date was recently detailed in the One Year Progress Report:[10]

Clean Transportation

***$234 million** from the Infrastructure Investment and Jobs Act over five years to improve public transportation options across the state.*

***$19 million** from the Infrastructure Investment and Jobs Act to expand public electric vehicle charging.*

***$8 million** from the Maine Jobs & Recovery Plan to expand municipal and public electric vehicle charging.*

***$150 million** from the federal American Rescue Plan Act to create the Maine Connectivity Authority to expand broadband Internet access. Expanding broadband will create greater access to virtual work, education, and health care and help reduce commuting miles and costs.*

***$100 million** from the Infrastructure Investment and Jobs Act to help provide broadband coverage across the state, including providing access to the at least 42,000 Mainers who currently lack it.*

***$5 million** from the Maine Jobs & Recovery Plan for workforce transportation pilot projects to expand public transportation, ride-sharing programs, and develop innovative public transportation options in rural areas to reduce commuting miles and costs.*

Buildings & Efficiency

$36.9 million *(estimated) from the Infrastructure Investment and Jobs Act for the Weatherization Assistance Program, which helps low-income families improve the energy efficiency of their homes, to reduce energy bills and greenhouse gas emissions.*

$50 million *from the Maine Jobs & Recovery Plan for energy efficiency programs, such as residential weatherization and efficiency upgrades, matching funds for municipal efficiency projects, and industry and business efficiency incentives.*

$50 million *from the Maine Jobs & Recovery Plan for affordable housing, which includes assistance for communities, developers, and builders to encourage construction or production of affordable, energy efficient housing units close to service and employment centers and to reduce commuting time and transportation costs.*

$20 million *in the Maine Jobs and Recovery Act was allocated for forest product innovation, which includes development of climate-friendly building materials such as wood-fiber insulation and cross-laminated timber.*

$1.9 million *(estimated) from the Infrastructure Investment and Jobs Act for the Energy Efficiency and Conservation Block Grant Program, to provide grants to communities, cities, and tribal governments for clean energy programs and projects*

Clean Energy

$8 million *from the Maine Jobs & Recovery Plan for advancing clean energy partnerships and initiatives to grow workforce and innovation in Maine's clean energy sector, in support of Governor Mills' goal of 30,000 clean energy jobs in Maine by 2030.*

$3.1 million *from the biennial budget for studies, research, and staff to support power sector transformation, grid modernization and offshore wind.*

$4.4 million *(estimated) from the Infrastructure Investment and Jobs Act for the Governor's Energy Office to provide grants to develop and implement clean energy programs and projects that will create jobs.*

$884,000 *(estimated) from the Infrastructure Investment and Jobs Act for the Energy Efficiency Revolving Loan Fund Capitalization Grant Program to support energy efficiency projects.*

Climate Resilience

$1.3 billion *for federal-aid highway apportioned programs and* ***$225 million*** *for bridge replacement and repairs from the Infrastructure Investment and Jobs Act over five years.*

$390 million *from the Infrastructure Investment and Jobs Act over five years to improve water infrastructure across the state and ensure that clean, safe drinking water is a right in all communities.*

$40 million *in the biennial budget for land conservation, contributing to Maine's fight against climate change by maximizing carbon storage, supporting working farms and forests, and ensuring valuable ecosystems remain in place for future generations.*

$20 million *from the Maine Jobs & Recovery Plan to support adaptation and resilience of state and local infrastructure vulnerable to climate change.*

$4.75 million *from the biennial budget for community, tribal, and regional action grants to prepare for climate change effects, reduce carbon emissions, and transition to renewable energy.*

$3 million *from the biennial budget to upgrade municipal culverts at stream crossings.*

$300,000 *for eelgrass mapping;* ***$200,000*** *for HFC, sea level rise, and appliance standards rulemaking; and* ***$400,000*** *for forest carbon mapping to the Department of Environmental Protection from the biennial budget.*

Local

On bill financing, TIFs, taxes, and pursuing grants are all municipal options to generate funding. Other alternatives include partnerships with private entities whereby the upfront costs of the projects are paid back gradually based on energy savings. Below are two examples of those types of engagements.

Energy Performance Contracting (EPC)

Energy Services Companies (ESCOs) develop, install, and secure financing for projects that improve the energy efficiency for building owners. With a service contract typically between 7 to 20 years, ESCOs typically bear the responsibility for turn-key project development, as well as the technical and performance risks. The York Schools have successfully used EPCs in the past to accomplish major upgrades to building HVAC systems.

Sustainable Energy as a Service (SEaaS)

Sustainable Energy as a Service (SEaaS), an innovative pay-for-performance business model that provides financing for businesses' clean energy projects. Installing new technologies typically involves a large upfront investment. Rooftop solar, for example, when owned and operated by the homeowner, requires significant capital. A solar provider offering SEaaS, for example, would install, own, operate and maintain a system, charging a monthly fee for that service to the homeowner. The solar industry has been very successful in applying this model to increase market share. SEaaS can be applied to any such investment, including heating and cooling systems, provided that the ultimate fees to the user are economic. SEaaS works in three stages: first by developing the project through identifying the needed upgrades, designing the project scope and structuring the financing solution. Secondly SEaaS focuses on the finances, funding 100% of the project's costs, owning the project assets, and monetizing the available incentives. Lastly, the company helps in the operation stage by measuring performance and savings, covering ongoing maintenance costs, and identifying new savings opportunities. The goal is to develop and finance large-scale energy efficiency and renewable energy projects.[11]

Examples of two firms using these business models are summarized below. These firms are listed to illustrate how the concept could work; their listing here should not be interpreted as an endorsement on the behalf of the Town or members of the Climate Action Committee.

BlocPower *is an energy technology startup whose goal is to make American cities more energy efficient. It offers building owners its smart, all electric heating, cooling, and hot water systems and then uses its unique software for analysis, leasing, project management, and monitoring. Founded in 2012, the Brooklyn-based company has completed retrofit projects in nearly 1,000 buildings, helping customers and tenants save 20-40% on their energy bills annually. Its clean energy projects are focused on schools, small businesses, non-profits, churches, synagogues, and other community organizations in financially underserved/low-income communities within the U.S. Using the BlocPower service, investment in a project allows access and tracking of the financial and impact statistics of the project and a return of principal. Once a project is fully funded, BlocPower uses the invested capital to fund the installation, financing or refinancing of clean energy technologies for the project.*[12] *It is not yet clear whether BlocPower's business model is economically viable in Maine.*

Metrus Energy *is another example of a company that uses SEaaS to develop clean energy projects but with more of a focus on businesses and institutions. Like BlocPower, it is able to offer upfront financing to cover project costs and includes solutions ranging from high efficiency HVAC systems to battery storage. Services include upgrading equipment, enhancing resilience and meeting sustainability goals.*

Endnotes

1 https://www.whitehouse.gov/briefing-room/statements-releases/2021/11/08/fact-sheet-the-bipartisan-infrastructure-deal-boosts-clean-energy-jobs-strengthens-resilience-and-advances-environmental-justice/
2 https://www.fema.gov/sites/default/files/documents/fema_resources-climate-resilience.pdf
3 https://www.fema.gov/grants/mitigation/building-resilient-infrastructure-communities.
4 https://www.federalregister.gov/documents/2021/08/10/2021-17121/strengthening-american-leadership-in-clean-cars-and-trucks
5 https://www.federalregister.gov/documents/2021/05/25/2021-11168/climate-related-financial-risk
6 https://www.federalregister.gov/documents/2021/05/12/2021-10139/establishment-of-the-climate-change-support-office
7 https://www.federalregister.gov/documents/2021/02/09/2021-02804/rebuilding-and-enhancing-programs-to-resettle-refugees-and-planning-for-the-impact-of-climate-change
8 https://www.federalregister.gov/documents/2021/02/01/2021-02177/tackling-the-climate-crisis-at-home-and-abroad
9 https://www.federalregister.gov/documents/2021/01/25/2021-01765/protecting-public-health-and-the-environment-and-restoring-science-to-tackle-the-climate-crisis
10 https://www.maine.gov/future/sites/maine.gov.future/files/inline-files/MaineWontWait_One-YearProgressReport_SinglePgs.pdf.
11 https://metrusenergy.com/
12 https://www.blocpower.io/