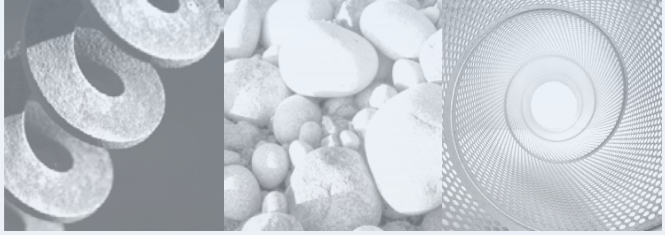

GEI Consultants

Consulting
Engineers and
Scientists

York Harbor/River Capacity Study

Town of York, Maine

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Project 1903595

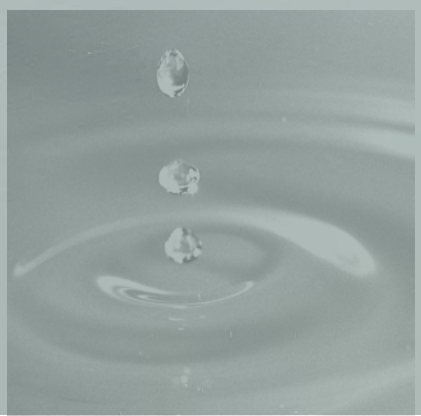

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Table of Contents

Tables

Figures

Appendices

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1. Introduction

1.1 Background

The Town of York, Maine is a coastal community with a year-round population of over 12,000. A popular resort community, the population is estimated to triple in the summer. The Town's coastline is characterized by its many beaches, bluffs, and river and harbor areas as well as it's abundant natural, cultural, and historic resources.

Fig. 1. York Harbor Drone Photo Looking Upriver from Above Stage Neck

Central to the Town's coastal identity is the York River, a 13+ mile long tidal river that flows from the Town's western border with Eliot to the Atlantic Ocean. The York River supports a wide range of boating infrastructure and activities including over 300 moorings, over 80 docks/piers, multiple commercial marinas, a yacht club, multiple working waterfront sites, and marine-dependent businesses. The River is a home port for commercial fishing, a popular location for fishing on river by boat and from shore, and the tidal flats support a limited amount of shellfish harvesting. A wide range of recreational uses occur on the River include recreational boating, canoeing/kayaking/paddle boarding, tubing/rafting downriver, swimming, bridge jumping, sightseeing, and others.

York Harbor, located downstream and east of Route 103, is a federally maintained harbor with two 8-ft anchorages and several channel areas that are dredged by the U.S. Army Corps of Engineers. The Harbor was last dredged in winter 2017-2018. This project involved the removal of 40,000 cubic yards (CY) of sediment in the two anchorages and main entrance channel which resulted in significant improvements to water depths in the Harbor.

York Harbor is shown on NOAA Chart 13283. The deep water and protected conditions make the Harbor an attractive anchorage. However, some sections of the River can be challenging to navigate at times due to narrow widths, high River currents, and exposed conditions at the harbor entrance. The charted head of navigation on the York River is at Sewall's Bridge, approximately 1.3 miles upstream of the mouth of the River. Sewall's Bridge is historically significant structure. The original bridge, constructed in 1761, included a draw span that permitted navigation upriver. In 1934 Sewall's bridge was replaced with a fixed bridge which limited clearance to approximately 4 ft at high water. Navigation above Sewall's Bridge has since been limited to primarily small powerboats and paddlecraft.

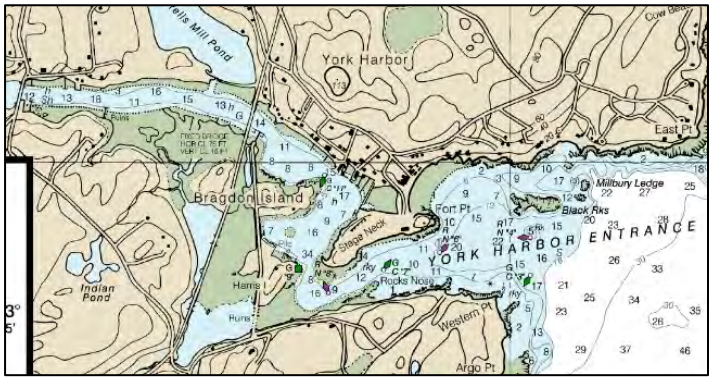


Fig. 2. Section of NOAA Chart 13283

The River has an important role in the local and regional economy. A 2016 Environmental Assessment by the U.S. Army Corps of Engineers documented $13.7 million in estimated economic activity related to York Harbor, as well as 100 jobs directly dependent on the Harbor being navigable, and 160 jobs indirectly dependent on the Harbor being navigable.

The York River is a valuable natural resource. A Class SB marine waterway under the Maine Water Classification Program, the River has free-flowing conditions that support abundant fish and wildlife habitat, aquatic plant life, and fringing marsh. These qualities were recognized recently by the National Park Service which in 2013 identified the York River as a good candidate for possible designation under the federal Wild and Scenic Rivers Act, noting multiple resources present that potentially meet the threshold for "Outstandingly Remarkable Values."

Over the past several years the River has been studied extensively as part of a local effort to designate portions of the River and its tributaries as Wild and Scenic River Segments. This work has been documented by the York River Study Committee, and is available to view on their website www.yorkriver.org. The effort is ongoing as of Fall 2019.

1.2 Purpose and Need

In July 2019, the Town of York retained GEI Consultants, Inc (GEI) to undertake a capacity study of the York River and Harbor. The primary purposes of the study were to assess the existing uses on the River and evaluate how those uses compare to River and Harbor capacity in order to inform management and regulatory decisions. The need for the project is based on increasing demand for use of the River, several examples of which are described in the following paragraphs. These increases will create additional pressure on the limited resource, and warrant careful consideration to minimize potential negative effects.

Demand for additional dockage and moorings on the River has been significant for many years. As of summer 2019 there were 270 names on the Town's mooring wait list. Completion of the federal dredge project in 2018 improved navigable areas and anchorages creating the potential for added moorings and berths. However, the current mooring and channel layouts are not optimized for capacity or channel safety. There are questions of how many additional boats the Harbor could support and where they should be located.

In addition to interest in moored and docked vessels, the Town has observed a significant increase in paddlecraft use in recent years. In 2005, the Town purchased a parcel of land at Strawberry Island which allowed for creation of a new public launch site adjacent to Town Dock #1. In 2018 a new walkway and kayak landing were installed adjacent to Route 103 just 0.1-mi to the north of Strawberry Island. Both of these actions have increased public access to the lower section of the River for paddlecraft, swimming, and other recreation, and are being heavily utilized. However, the location of both of these facilities in an already heavily used area of the River has brought congestion that needs to be carefully managed.

Another example is related to the demand for development of new private docks on the River. For many years the Town has maintained very stringent dock regulations that have kept the number of new docks on the River to a minimum. Several recent unsuccessful requests for new docks have led to questions of whether the existing ordinance structure should be modified, and if so, how, and what the implications of changes may be.

The River is a highly valuable resource and the Town is wise to manage it sustainably and responsibly. While State and Federal regulations provide minimum protections, local priorities may warrant more stringent regulatory standards and management approaches that reflect local values. It is important that the Town explore community values and identify priorities for the River through careful and ongoing discussion among the range of stakeholders. This work aims to inform and help guide those important discussions.

Fig. 3. Boats at Town Dock #1

1.3 Work Completed

This study was undertaken during the months of July through October 2019. The work completed during that time included:

1.3.1 Field Observations

GEI staff completed field observations on seven (7) separate days in July, August, and September 2019. Conditions and uses were observed and documented along the River length from shore, by boat, and by drone during high and low use times, at high and low tide conditions, in differing weather conditions, and at various times throughout the day corresponding to heavier commercial or recreational use.

Fig. 4. GEI Staff Performing Drone Survey from Strawberry Island, July 2019

1.3.2 Background Research

Additional background research was completed that included compilation and review of relevant reports, plans, and documents related to the York River, as well as correspondence with Local, State, and Federal agencies and stakeholder groups. References are summarized in Appendix A.

1.3.3 Harbor/River Inventory and Classification

An inventory of Harbor/River features has been prepared that consists of GIS based maps, quantitative data on physical features, uses, and facilities for sections of the River, boat demographic information, and waterway classifications based on U.S. Department of the Interior Water and Land Recreation Opportunity Spectrum (WALROS). The inventory data is presented in Section 3 and copies of maps are provided in Appendix B.

1.3.4 Issue Identification, Capacity Analysis, and Development of Recommendations

A framework for analyzing waterway capacity has been identified that groups influencing factors into four categories: Spatial Capacity, Facility Capacity, Ecological Capacity, and Social Capacity. Issues and observations were documented related to each of the four categories based on GEI's field observations, inventory data, and background research. These observations are summarized in Section 4. Analysis was then undertaken on a range of issues and recommendations were developed intended to improve capacity, better accommodate current uses, or better manage constraints. Recommendations and supporting analysis are presented in Section 5.

2. Capacity Analysis Methodology

2.1 Influencing Factors

Waterway capacity is influenced by a wide range of factors. These factors are related, but can also be in competition or conflict with one another. The factors can generally be grouped into four categories: Spatial Capacity, Facility Capacity, Ecological Capacity, and Social Capacity. Each of these categories is briefly described below, along with a summary of relevant analysis that has been undertaken for this study.

2.1.1 Spatial Capacity

Spatial capacity is a measure of how many boats can fit onto a waterway based on dimensional constraints/aspects of the waterway itself the boats using it, and their moorings, berths, and facilities. Relevant considerations include:

- Physical/geographical features, water depths, geometric constraints.
- Tidal range, exposure, and currents.
- Type, size, and quantity of vessels using the waterway.
- Minimum widths of channels and fairways.
- Type of moorings and berths utilized.
- Existing development (piers, bridges, dams).

Analysis of spatial capacity included a review of existing mooring densities and channel conditions, identification of areas of high use density or congestion, analysis of existing conditions based on published design standards, development of concept layouts for improved channel and mooring conditions in areas downstream of Sewall's Bridge, and consideration for options to improve separation of use to reduce congestion in high use areas.

2.1.2 Facility Capacity

In order for a harbor to effectively function there must be adequate facilities at shore to satisfy demands for access, parking, and dinghy storage, as well as support services such as fuel, pumpout, restrooms, and others.

Analysis of facility capacity involved reviewing locations and conditions at existing access facilities, and considering whether the existing facilities are adequate to meet current or

increased demand, where improvements may be warranted, and opportunities for construction of new facilities that could improve public access and better separate uses.

2.1.3 Ecological Capacity

Ecological capacity relates to the ability of a waterway to support uses without detrimental effects on the natural environment, air and water quality, fisheries and wildlife, etc. This is an important co-dependent relationship. Recreational boaters depend on good water quality for their enjoyment. Fishermen depend on the River supporting thriving fisheries. However, boating also has the potential to impact the environment. While state and federal agencies establish minimum standards for environmental protection, local priorities may justify more stringent protections in order to maintain and improve the quality of the resource.

Analysis undertaken in the area of ecological capacity involved a review of existing water quality data, review of literature related to environmental impacts of boating, documentation of field observations related to areas of concern, review of local ordinances to identify areas of potential improvement, and development of recommendations.

2.1.4 Social Capacity

Social capacity can encompass a wide range of important priorities and constraints, including:

- Local priorities for resource preservation.
- Conflicts between user groups.
- Perceptions of overuse/crowding.
- Impacts to user's desired experience (excessive noise or visual impacts).
- Boater behaviors (safety, responsibility, respect for other users).
- Compliance with rules and regulations.

Analysis related to social capacity involved the review of local reports, plans, and ordinances, correspondence with agencies, residents, and stakeholders, observation of use conflicts and user behaviors during field work, review of literature related to mixed use waterway management, review of local ordinances to identify areas of potential improvement, and development of recommendations.

2.2 Guiding Principles

Throughout the course of this study, several overarching themes have emerged. They have been summarized here as the five guiding principles of the study.

1. Waterway capacity is a balance of factors.

As described earlier in this section, capacity is influenced by a range of factors which can be grouped as: Spatial, Facility, Ecological, and Social. Many issues may involve aspects of multiple or all of these factors. Capacity will ultimately be dictated by the balance of priority for each of these factors that is appropriate for the community. The Town must work with residents, stakeholders, users, regulators, and managers to identify this appropriate balance.

2. The appropriate balance of factors will differ by area.

Sections of the River differ greatly in terms of uses, character, presence of ecological habitats and cultural resources, upland development, and other factors. The appropriate balance of capacity factors is not likely to be the same for all areas of the River. The Town's management approaches, regulations, goals, and priorities should reflect these differences.

3. Capacity is not just a matter of numbers but also a matter of behaviors.

The behavior of users has a significant influence on capacity. Simply put, a small number of users who act irresponsibly, unsafely, or without respect for the environment have the potential to create far more pressure on River capacity than a much larger number of safe, responsible users. Increasing user compliance with rules and regulations, promoting positive stewardship of the River, and educating to promote safe uses will allow the River to be able to better support existing and increased uses.

4. The York River is a mixed-use waterway.

The River supports a wide range of uses and user groups. Management of the varying needs of these groups is a key aspect to effective waterway management. Providing adequate separation of uses, through timing or location, is imperative to ensuring a safe and functional experience for the range of user groups.

5. The York River is a highly valuable resource. Sustainable management is critical.

The abundant environmental, recreational, historic, and cultural resources located on the York River make it a highly valuable resource that is truly limited and irreplaceable. The Town is wise to manage the resource sustainably. Sustainable management will require that use and development be regulated such that they do not outpace the Town's ability to safely and effectively manage harbor uses, protect the river environment, or maintain the desired River Character.

3. River/Harbor Inventory

3.1 River Areas

At the start of the project, two sections of the York River were identified for inventory: Upstream and Downstream, with the boundary between the two being Sewall's Bridge. Recognizing the differences in use and character that exist even within the Upstream and Downstream sections, the River was divided into six (6) areas for the inventory and analysis undertaken for this study. The areas are depicted in Fig. 5.

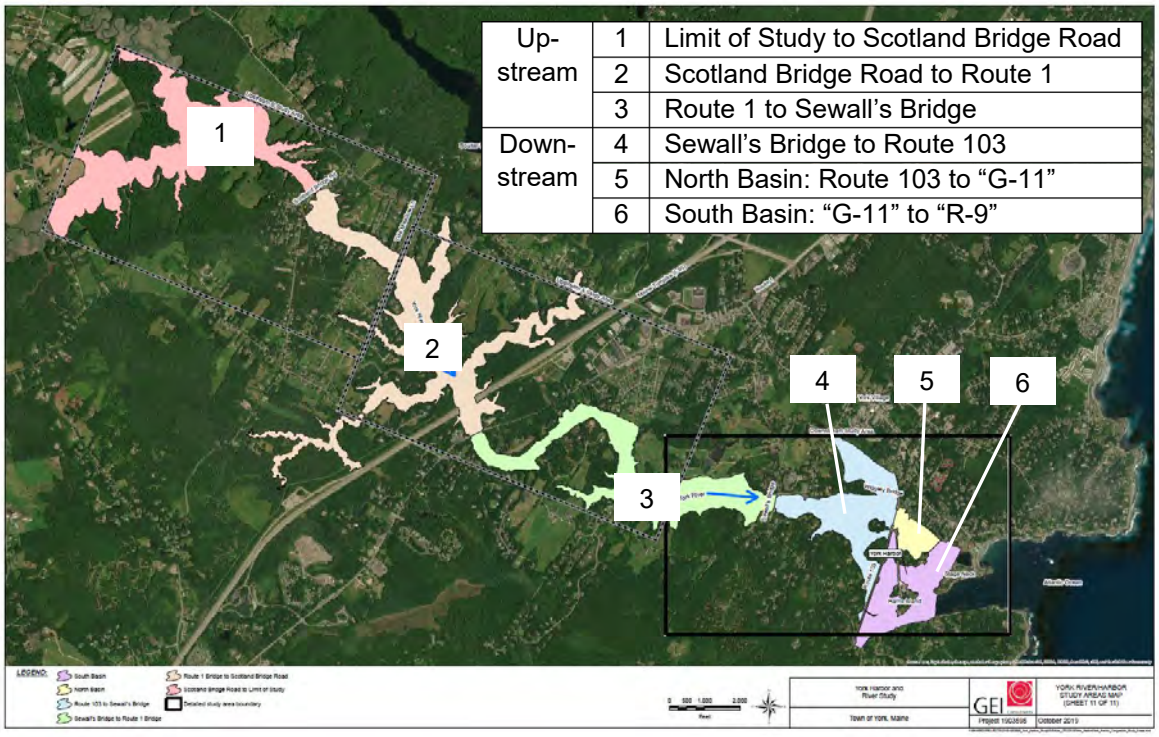


Fig. 5. River Study Areas

3.2 Spatial Characteristics

Table 1 includes spatial characteristics for the watersheet within each River Area.

The High Water Area was measured as the total area outshore of the Highest Annual Tide line published by Maine DEP. This represents all areas subject to influence of the tide including marshes, shallows, narrow tributaries, Barrell's Mill Pond, Wheeler Marsh, and other areas that are not navigable during any stage of the tide.

The Low Water Area was determined as the area outshore of the low water channel line of the York River, which was digitized by GEI using MaineGIS low-tide aerial imagery, NOAA

nautical charts, and USACE depth surveys. The Low Water Area represents the primary navigable area, however excluded areas may see use at high tide or by shallow draft vessels. This area is later used to calculate density of local boat use.

The ratio of Low Water Area / High Water Area has been calculated for each River Area to determine the percent navigable area. What can be observed from this calculation is that for all areas of the River, the navigable areas are a relatively small percentage of the total watersheet area. This is especially true in upriver areas where the shoreline is dominated by marsh and shallow intertidal areas. Overall, the navigable areas of the River include approximately 25% of the total high-tide watersheet area.

The length along the river thread has been measured along the approximate centerline of the low water channel for each of the six areas. This measurement is based on the main thread of the York River, and does not include the many inlets and tributaries (which are largely not navigable) or the complexities of the irregular shoreline which can result in a length along each shoreline that is much greater than the tabulated River thread length.

Table 1. Watersheet Characteristics

Area	No.	Description	High Water Area (acre)	Low Water Area (acre)	% Navigable	Length Along Thread (mi)
Up-stream	1	Limit of Study to Scotland Bridge	245	38.2	16%	4.0
	2	Scotland Bridge Road to Route 1	289	44.2	15%	1.7
	3	Route 1 to Sewall's Bridge	174	82.7	48%	2.1
		Total Upstream	**707**	**165**	**23%**	**7.8**
Down-stream	4	Sewall's Bridge to Route 103	120	25.4	21%	0.65
	5	North Basin: Route 103 to "G-11"	24.1	16.0	66%	0.27
	6	South Basin: "G-11“ to "R-9"	87.5	29.3	33%	0.37
		Total Downstream	**231**	**71**	**31%**	**1.3**
		Total River	**938**	**236**	**25%**	**9.1**

3.3 Waterfront Facilities

Table 2 presents an inventory of existing waterfront facilities within each River Area.

Boat launches include both public and private launches, for both trailered and hand carry vessels. The public facilities are further characterized in Section 4 of this report. The majority of access points to the River are concentrated in areas 4, 5, and 6, downstream of Sewall’s Bridge.

Working Waterfront sites include public and private piers that support the local fishing industry. All of the working waterfront sites on the York River are located downstream of Sewall’s Bridge, and the majority are in Area 4, between Sewall’s Bridge and Route 103.

The number of docks and piers within each river area is tabulated based on the GIS inventory. Dock density was then calculated as number of docks divided by the River thread length. This data shows that the majority of docks (63%) are located in the upstream section of the River, however the density of dock development is lower for the upstream section compared to the downstream section due to the much longer length. This data can be useful for understanding the relative density of dock development for each River Area. However, it should be noted that the density calculation is based on thread length, which does not take into account the complex shoreline geometry with small inlets, coves, and tributary streams, or the fact that each Area has two shorelines. As a result, the density does not reflect the spacing between docks along the shore – a number which may also be useful to understanding shoreline development.

Table 2. Waterfront Facilities

Area	No.	Description	Boat Launches	Working Waterfront Sites	Docks & Piers	Dock Density (docks /mi)
Up-stream	1	Limit of Study to Scotland Bridge	0	0	5	1.3
	2	Scotland Bridge Road to Route 1	1	0	13	7.6
	3	Route 1 to Sewall's Bridge	1	0	35	17
		Total Upstream	**2**	**0**	**53**	**6.8**
Down-stream	4	Sewall's Bridge to Route 103	1	5	13	20
	5	North Basin: Route 103 to "G-11"	1	1	6	22
	6	South Basin: "G-11“ to "R-9"	2	1	11	30
		Total Downstream	**4**	**7**	**30**	**23**
		Total River	**6**	**7**	**83**	**9.1**

3.4 Local Boat Usage and Boat Demographics

Understanding the quantity, type, size, and number of boats using a waterway is an important aspect in harbor planning and design of improvements. For this project, data on local vessels has been taken from the following sources:

- 2019 Mooring Database.
- 2019 Harbor Use Fee Database (includes boats on docks, dry storage, and trailered boats using York Harbor for more than 2 weeks per year).
- 2019 Mooring Wait List.
- Transient Mooring Usage Records for Years 2014, 2015, 2016, 2017, and 2018.
- Paddlecraft counts completed at Strawberry Island in 2017 and 2018.

- Information on dry-storage boats obtained from York Harbor Marine and Agamenticus Yacht Club.

- Field observations by GEI Consultants.

Local boats were inventoried by River Area to document the quantity and density of local boat use in each area. This data is presented in Table 3.

Boats on docks, slips, and dry storage, and boats on moorings were determined from the inventory data. Local boat density was calculated as the total number of local boats divided by the low water area of each River Area. This data shows that the density of local boats is significantly higher in Downstream sections of the River than Upstream. Additionally, the highest density of local boats is in Areas 5 and 6 due to the significant number of moorings in the two anchorages, and the boats in dry storage at York Harbor Marine and Agamenticus Yacht Club in Area 6.

The local boat inventory is useful for understanding the relative amount and density of local boat use, however several important points should be recognized. First, this inventory does not capture the entirety of use of the River as it does not account for day launches, visiting vessels, paddlecraft, or others that are not included in the Harbor Use or Mooring databases, but when combined can have a significant contribution to use. Second, it does not address the degree to which vessels on the harbor are utilized on any given day. A harbor that sees a higher utilization will have more vessels active at any given time and will be more busy and congested than one with lower utilization, where many boats sit on moorings or at docks the majority of the time. While utilization has not been established for York Harbor through this study, as an approximation, utilization of recreational vessels in municipal harbors is commonly in the range of 10%-20% on an average day, increasing to 35%-45% on the busiest days of the year. Commercial vessels tend to be utilized day in and day out and will see a much higher utilization percentage.

Typical vessels on the Harbor were observed to document the range of vessel types. Photos of a range of typical vessels are provided in Fig. 6. Using the local boat inventory, boats were then grouped into size categories in order to study the distribution of vessel sizes using the Harbor. The following size categories were used:

- Boats on docks and moorings: less than 18 ft, 18 ft to 25 ft, larger than 25 ft.

- Transients: 10 ft to 20 ft, 20 ft to 30 ft, 30 ft to 40 ft, 40 ft to 50 ft, 50 ft+.

Average length was calculated for each vessel category. For layout of channels, fairways, and slips it is also important to understand the average vessel beam (width). No data was available on vessel beam so estimates were made using a range of common length:beam ratios of 2.5-3.0:1. The actual beam of a specific vessel can vary greatly depending on the

type, size, manufacturer, and specifications, however this provides a reasonable approximation for preliminary sizing.

The distribution of vessel sizes for boats on moorings, the mooring wait list, and boats on docks, slips, and dry storage is plotted in Fig. 7. As can be seen from this data, approximately 70% of local vessels on York Harbor are 25 ft or less. A similar distribution is observed for the vessels on the mooring wait list. The average length for these vessel categories is 24 ft. The distribution of transient vessel sizes based on the five years of data reviewed is shown in Fig. 8. For transient vessels, the vast majority are in the range of 30 ft to 40 ft or 40 ft to 50 ft. The average length for transient vessels is 36 ft.

Finally, the distribution of transient use by month was analyzed for the five years of data reviewed. This data is plotted in Fig. 9. What can be observed from this data is that the majority of transient visits to York Harbor occur during the months of July and August (approximately 70%). June and September see some use, in the range of 10%-20% of the total seasonal volume. The remaining months see very low transient use. While long-term monitoring has not been completed to allow similar trends to be studied for boats on moorings and docks, as a municipal harbor that sees largely recreational use, similar usage trends can be expected for local boats.

Paddlecraft use is another area of interest as this is an increasingly popular activity on York Harbor. Observations of paddlecraft use were taken from the Town's 2017 and 2018 paddlecraft counts at Strawberry Island, which are summarized in Table 5, and field observations by GEI. The Town's paddlecraft counts document an average paddlecraft use of 30 per day in 2017, and 77 per day in 2018, with a peak observation of 120 paddlecraft in a single day on August 26, 2018. During GEI's field observations, Strawberry Island was observed to be heavily used by paddlecraft, while occasional use was observed at upriver locations.

Table 3. Local Boat Inventory

Area	No.	Description	Boats on Docks/ Slips/ Dry Storage	Boats on Moorings	Total Local Boats	Local Boat Density (boats/ acre)
Upstream	1	Limit of Study to Scotland Bridge	3	0	3	0.08
	2	Scotland Bridge Road to Route 1	5	0	5	0.11
	3	Route 1 to Sewall's Bridge	12	20	32	0.39
		Total Upstream	**20**	**20**	**40**	**0.24**
Down-stream	4	Sewall's Bridge to Route 103	18	69	87	3.4
	5	North Basin: Route 103 to "G-11"	4	98	102	6.4
	6	South Basin: "G-11" to "R-9"	116	128	244	8.3
		Total Downstream	**138**	**295**	**433**	**6.1**
		Total River	**158**	**315**	**473**	**2.0**

Table 4. Typical Boat Sizes

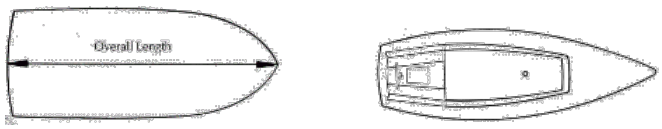
Boats on Moorings, Docks, Mooring Wait List	
	Mix of powerboats and sailboats Average Length = 24 ft Average Beam = 8-10 ft
Transients	
	Mix of Sailboats and Powerboats Average Length = 36 ft Average Beam = 10-14 ft

Table 5. 2017 and 2018 Paddlecraft Counts

Date	**Canoes**	**Kayaks**	**Paddleboards**	**Other**	**Total**
July 29, 2018	5	29	5	---	39
August 5, 2017	1	20	---	---	21
August 12, 2017	---	9	17	---	26
August 19, 2017	---	18	8	---	26
August 26, 2017	---	27	7	---	34
September 2, 2017	1	31	4	---	36
			Average per Weekend Day		30
July 28, 2018	---	48	13	2	63
August 5, 2018	---	66	22	3	91
August 19, 2018	---	34	7	2	43
August 26, 2018	---	84	31	5	120
September 2, 2018	---	43	23	1	67
			Average per Weekend Day		77

Commercial Fishing Boats kept on moorings and docks

Recreational powerboats kept on moorings and docks

Small sail and powerboats kept on moorings

Small trailered powerboats

Large visiting powerboats 50ft+.
Sailing dinghies (Optimists, Lasers)

Mid-size powerboats kept on slips and racks/dry storage

Stand up paddleboards used for recreation, paddleboard tours, paddleboard yoga, etc.

Canoes and kayaks

Fig. 6. Typical Vessels on York River/Harbor

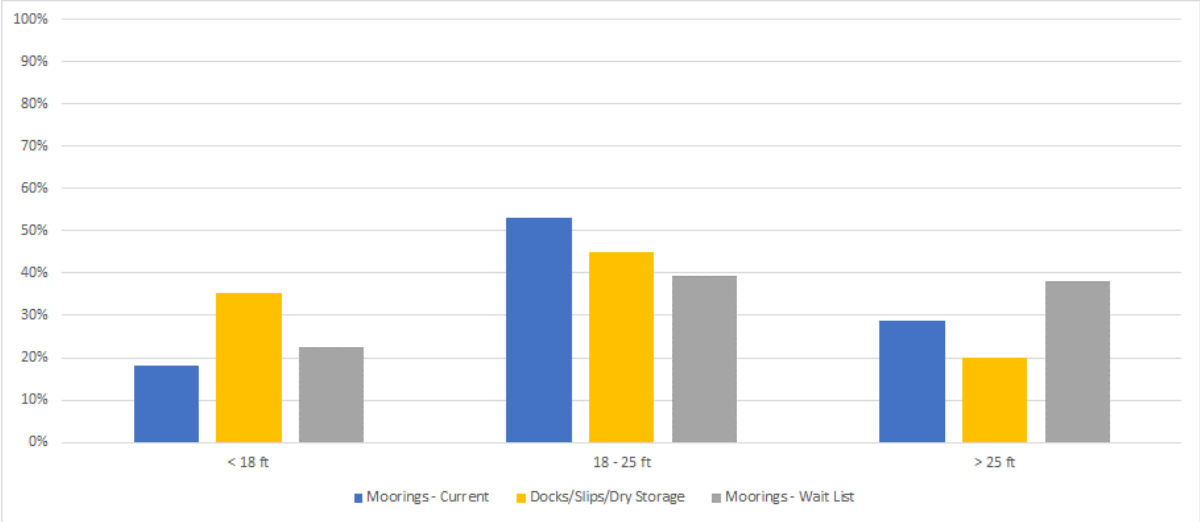


Fig. 7. Local Boat Size Distribution

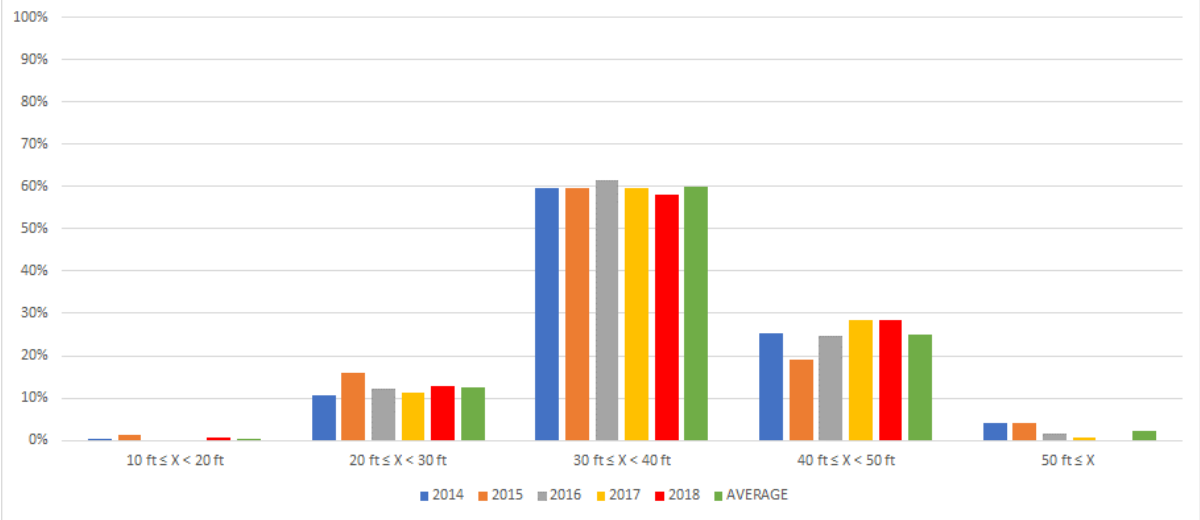


Fig. 8. Transient Boat Size Distribution

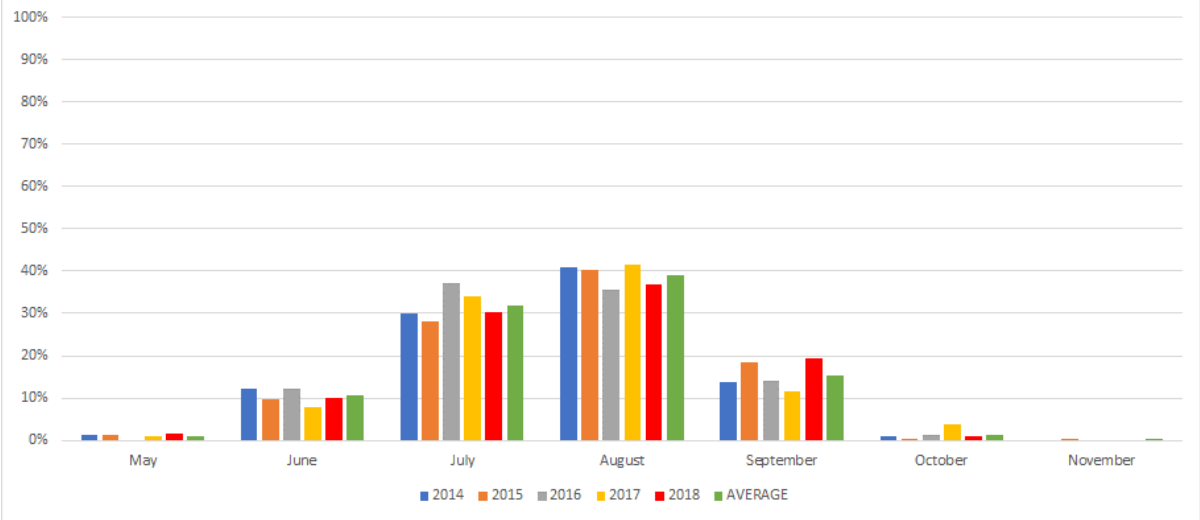


Fig. 9. Transient Use by Month

3.5 River Area Classification

In order to provide a context for describing these differences in character, use, and development of the six River Areas, each area was classified using the methodology in the Water and Land Recreation Opportunity Spectrum (WALROS) published by the U.S. Department of the Interior.

The WALROS identifies a range of waterway classes that vary from Urban (most densely used/developed, least sensitive) to Primitive (least densely used/developed, most sensitive). Representative photos for waterways in each of these classes are provided in Fig. 10. The classification considers waterway usage, development, degree of human presence, abundance of natural resources, and other factors to group areas into classes. Examples of some of the relationships between waterway class and capacity factors are summarized in Table 6 that include both features and issues present on each end of the spectrum.

		
Urban	**Suburban**	**Rural/Developed**
1	**3**	**5**
		
Rural/Natural	**Semi-Primitive**	**Primitive**
7	**9**	**11**

Fig. 10. Examples of WALROS Waterway Classes

Table 6. Relationship of waterway class to capacity factors

	Urban	Suburban	Rural / Developed	Rural / Natural	Semi-Primitive	Primitive
	←					→
Spatial	More boats/acre More shoreline development					Fewer boats/acre Less shoreline development
Facility	More established Marinas, docks					More natural Primitive access, paths
Ecological	Less sensitive Less frequent or lower value habitats					More sensitive More frequent or higher value habitats
Social	Greater user presence Closer to people/businesses Congestion & user conflicts					Less user presence More remote/peaceful/tranquil Noise and visual impacts

Using the WALROS system, and in consideration of the mapping, field observations, and inventory data, a WALROS class was applied to each of the six River areas for the York River. The suggested classifications are shown in Fig. 11. The intent of this classification is to provide context to differences in character in the River areas that will help to inform appropriate management and capacity considerations. These classes should not be viewed as immutable qualities of each River area. Class may change with time along with changes in uses, development trends, and other local initiatives which influence character.

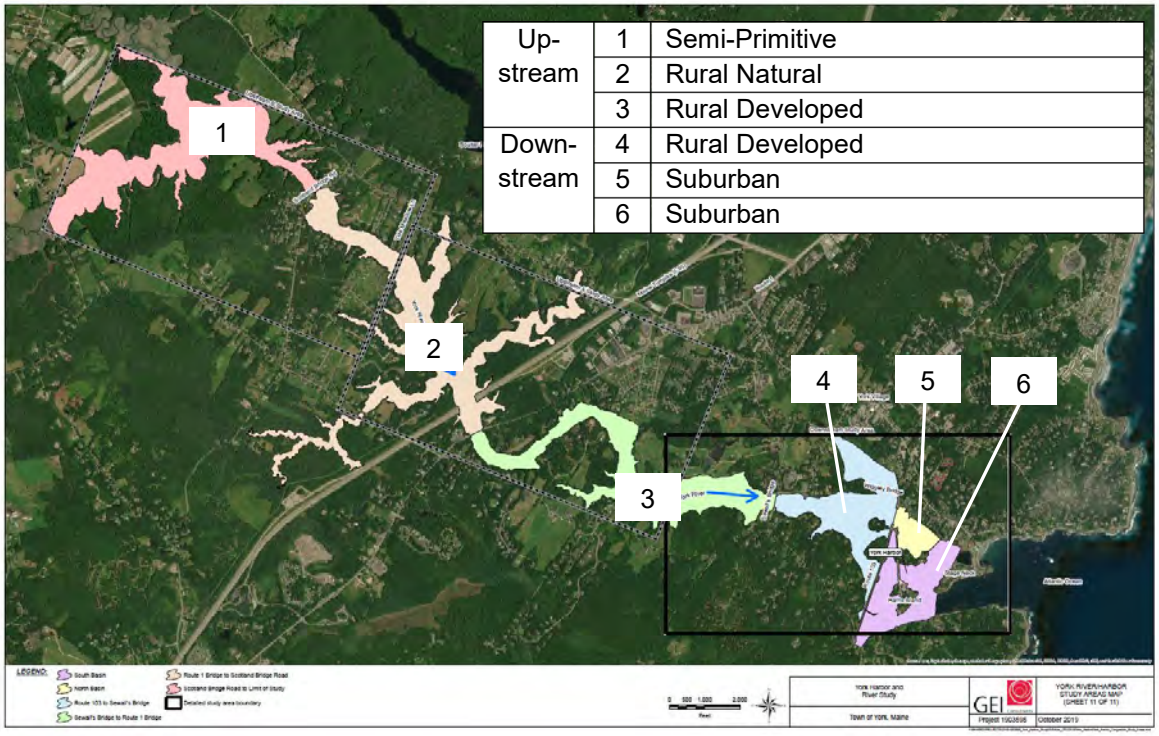


Fig. 11. River Area Classifications

4. Observations and Issues

The main observations and issues identified during this study are summarized by category below. These lists of observations and issues are informed by the Harbor/River Inventory, field observations, background research, analysis, and stakeholder input received.

4.1 Spatial Capacity

1. There is significant unmet demand for additional moorings. The current wait list has 270 entries.

2. Areas 5 and 6 lack a clearly defined navigation channel due to the irregularity of existing mooring layouts.

3. There are multiple locations in Areas 5 and 6 where the physical characteristics of the River and existing mooring layouts result in less than optimal channel width.

4. There are inefficiencies in the layout of existing mooring fields in Areas 4, 5, and 6 that could be improved to increase channel safety and mooring capacity

5. Certain high-use areas appear to be nearing their spatial capacity at heavy use times due to the amount and type of uses being accommodated within those areas. Better separation of uses could minimize this congestion. Examples include:

    a. Area near Route 103 bridge: commercial use of Town Dock #1, Paddlecraft use of Strawberry Island and new Kayak Landing, recreational use of boats in adjacent mooring fields, bridge jumping off Route 103 bridge and swimming near causeway to Wiggly Bridge. Individually these items may not exceed capacity but when combined there are congestion issues and safety concerns.

    b. Mouth of harbor: Heavy use by boats from York Harbor Marine as well as the adjacent mooring fields and AYC. The narrow channel at low tide and high currents at ebb tide add to navigation challenges at this location.

6. Areas upstream of Sewall's Bridge are underutilized spatially.

7. Additional docks and moorings on the River will increase spatial demands. New structures should be located properly to limit their contribution to congestion, avoid impacts to navigation, and minimize safety issues.

8. The volume of recreational use on the River and Harbor is highly dependent on season. July and August see the highest use and most potential for congestion. Use drops off significantly in the shoulder seasons.

9. Utilization of the harbor (i.e. the percentage of boats being used at any given time) has not been established through this study. This depends on many factors including the type of boats (recreational vs. commercial), residency of boat owners (local or visitors), tidal and exposure constraints, and many other factors. Understanding utilization would provide greater insight into River use which ma may warranted future study.

4.2 Facility Capacity

1. There is limited public access to the River upstream of Sewall's Bridge. Existing launches at Scotland Bridge and Rice's Bridge are tidally limited, not well improved, and have limited parking.

2. Two of the major paddlecraft access sites are located in one of the most heavily used areas of the River, near Route 103, which contributes to congestion during heavy use times.

3. Parking near the harbor is limited for current levels of use and would likely be inadequate to support significant increases in public moorings/berths.

4. Dinghy storage is limited for current levels of use and will likely be inadequate to support significant increases in public moorings/berths.

5. While the town maintains seven (7) moorings for transient vessels, there are limited support services for visiting boaters (e.g. docks with power pedestals, pumpout station, restroom/shower facilities, etc.)

6. In general, facility capacity is a limiting factor in all sections of the River. Significant increases in use are likely to require new or expanded facilities, or changes to management of existing facilities.

4.3 Ecological Capacity

1. The York River is a valuable resource with good water quality and relatively unimpacted conditions that supports recreation, fisheries, and many high value plant and animal habitats. Protection of these resources is critical.

2. As a result of water quality testing and shoreline surveys, Maine DMR has in recent years classified areas upstream of Sewall's Bridge (River Areas 1, 2, and 3) Prohibited from Shellfish Harvesting, and areas downstream of Sewall's Bridge to the mouth of the River (Areas 4, 5, and 6) as Conditionally Approved. The Conditionally Approved area is closed May 1 – Nov 30 due to the presence of boats in this area. In 2019, Maine DMR upgraded the section of River from Route 1 to Sewall's Bridge (River Area 3) from Prohibited to Restricted, allowing shellfish harvesting by licensed individuals subject to

certain permitted conditions. This is evidence of the good water quality and reduction in risk sources on the River.

3. There is currently no local vessel pumpout service on the River or in York. Boats with holding tanks must either travel to a facility with a pumpout (the nearest are in Kittery or Wells), or call for a pumpout vessel to come from Portsmouth.

4. The Town's Harbor Ordinance prohibits overboard discharges of waste, fuel, oil, contaminated bilge water, as well as depositing of trash, debris, etc. into the Town's waters. To the extent they are followed and enforced, these prohibitions address a major cause of potential pollution related to boating.

5. Excessive speed, prop wash, and wake are major contributors to ecological impacts of boating. Waves and wake can cause shoreline erosion, disturb fish and wildlife, and stir up bottom sediments that increase turbidity and reduce water clarity. The majority of the River is designated as a No Wake Zone and the Harbor Ordinance has strict regulations for vessel speed. To the extent these regulations are followed and enforced, they address a major cause of boating related impact.

6. There are several key issues not addressed by the Town's ordinances that, if included, would help to reduce the ecological impact of boating related activities. These include: regulating storage of floats on the marsh in the offseason, requiring docks to be adequately elevated above the marsh to minimize ecological impacts of shading, and regulating storage of small craft on the marsh.

7. While existing uses do not appear to exceed ecological capacity, a significant increase in use would create increased pressure on ecological capacity that should be carefully managed to avoid excessive impacts and minimize added risk.

4.4 Social Capacity

1. The need to accommodate a wide range of users in a small area leads to conflicts between user groups and congestion at high-use times in high-use areas. Separation of uses could help to minimize these conflicts.

2. Compliance with rules and regulations is an important factor in social capacity. Lack of compliance by some users can lead to increased user conflicts, safety issues, and ecological impacts. Issues observed by GEI during the course of this study include:

    a. Boats commonly exceeding headway speed along the length of the River.

    b. Users swimming from the new kayak dock at Route 103. Signage is already installed to prohibit swimming but the activity still occurs.

c. Tie-up of powerboats at the new kayak dock at Route 103. Signage is already in place to prohibit tie-up but the activity still occurs.

d. Paddlecraft users navigating throughout all areas of the channel. While signage is in place at public landings directing paddlecraft to use the edges of the channel, many users are likely not aware of these recommendations.

e. Paddlecraft users operating without lifejackets, which are legally required safety equipment aboard a small vessel.

f. Towing of recreational devices, which is prohibited on the York River by the Town's Harbor Ordinance.

GEI's limited observations did not establish the extent or frequency of these issues, but they are given as examples of areas where improved compliance could reduce pressure on social capacity.

3. Bridge jumping from the Route 103 bridge is a popular activity that the Town has long permitted to occur. This is a safety concern given the motor vehicle traffic on Route 103, vessel traffic on this heavily used section of the River, and potential for high River currents in this area. Additionally, this adds another use in one of the busiest areas of the Harbor. The Town has been reluctant to regulate this activity that residents and visitors enjoy, but should recognize the associated issues.

4. There is no formal paddlecraft management program that would provide the ability to regulate paddlecraft use or promote user education. In general, many paddlecraft users do not undergo formal safety training. Lack of knowledge and training likely contribute to non-compliance and safety issues observed among paddlecraft users.

5. Increase in demand for recreational uses creates increased pressure on traditional uses of the River. A balance must be found between the competing interests of recreational users and supporting traditional working waterfront users.

6. Increase in demand for development on the River brings demand for additional docks and mooring spaces. A balance must be found between the competing interests of development/access rights/individual property owner rights, and interests in conservation/management/protection of the public resource.

7. The length of the River makes monitoring and enforcement of upstream areas difficult. The Town's Harbormasters are located at Town Dock #2, at the far downstream end of the River. Increased presence upriver could help to improve the degree of compliance.

5. Recommendations and Analysis

Recommendations have been developed to address the issues and observations that are listed in Section 4. Seven (7) Primary Recommendations are presented, each of which is accompanied by several more detailed recommendations and relevant supporting analysis.

5.1 Primary Recommendation #1 – Improve Downstream Harbor Layout

There are multiple inefficiencies with the Harbor layout in areas downstream of Sewall's Bridge (Areas 4, 5, and 6) that reduce capacity, create constrictions, and add to apparent congestion. There is also significant unmet demand for additional moorings. The Town should consider implementing improved layouts that will improve channel safety, reduce congestion, and improve capacity.

5.1.1 Recommendations

1. Determine local goals for increased mooring field capacity in consideration of Spatial, Facility, Ecological, and Social factors.

2. Improve mooring field and channel layouts in Areas 4, 5, and 6.

3. Increase use of moored floats to allow for increased mooring density.

4. Promote use of conservation moorings to increase berth density and reduce impacts to seabed habitat.

5. Address needs for Parking and Dinghy Storage associated with increased quantity of vessels. See recommendations #3 and #4.

5.1.2 Supporting Analysis

Existing mooring and channel conditions were reviewed to understand existing use, mooring and berth configurations, boat densities, channel widths, and areas of constrictions or congestion. Conditions were compared with recommendations from published standards. Several relevant design parameters from ASCE 50 are summarized in Table 7.

There is currently a mix of single-point moorings, bow-stern moorings, and moored floats on the York River. There are many inefficiencies that result from using single-point mooring (which require large areas to accommodate mooring scope and vessel swing), the mix of mooring types, and the lack of an efficient, orderly layout. Reorganizing the mooring layouts provides an opportunity to both increase mooring capacity and improve channel conditions.

Conceptual layouts have been developed for improvements in Areas 4, 5, and 6 to demonstrate possible options for improvements. These concepts are presented in Appendix C. The quantity of boats and total density of local boats associated with these options is summarized in
Table 8 and compared with existing conditions. These concepts increase mooting field efficiency through increased use of moored floats, use of elastic mooring systems for single point moorings to reduce required scope, and the use of bow-stern moorings to reduce swing areas. In all cases, a minimum 100-ft-wide clear channel is included throughout the Harbor.

These concept-level plans are intended to demonstrate potential for expanded capacity. If the Town decides to move forward with one of these options, there are many factors that will need to be considered in detail which may result in changes to final layout, spacings, channel and fairway widths, and numbers of vessels from the concepts shown.

Table 7. ASCE 50 Recommendations for Channel and Fairway Sizing

Parameter	ASCE 50 Standard	York Harbor	
		Existing	**Recommended**
Channel Width	Minimum Channel Width = 5 x average vessel beam + 10% quantity of vessels served Increased width recommended at changes in direction, exposed conditions, areas with high current	Many areas <75' clear between moorings.	Minimum Channel Width = 5 x 10 ft + 10% x 500 = 100 ft At turn near R-9: 150 ft
Fairway Width	1.5 – 1.75 x longest boat served	Varies	50 ft – 60 ft interior fairways based on typical max. vessel of 30-40 ft.
Boat Density	15-25 boats/acre (includes entrances, aisles, turning areas, and maneuvering 35-40 ft boats)	4-6 boats/acre in north and south anchorages	Concept options vary. See Table 8.

Table 8. Comparison of Mooring Capacity in Areas 4, 5, and 6

No.	Description	Existing Boats on Docks/ Slips/ Dry Storage	Boats on Moorings			Total Local Boat Density (boats/ acre)		
			Existing	Concept #1	Concept #2	Existing	Concept #1	Concept #2
4	Sewall's Bridge to Route 103	18	69	69	69	3.4	3.4	3.4
5	North Basin: Route 103 to G-11	4	98	121	121	6.4	7.8	7.8
6	South Basin: G-11 to R-9	116	128	136	271	8.3	8.6	13.2
Total		**138**	**295**	**326**	**461**	**6.1**	**6.5**	**8.4**

5.2 Primary Recommendation #2 – Improve Upriver Access

There is a general shortage of access to upriver portions of the River. The facilities that exist lack adequate parking and are not well improved. Upriver areas are generally underutilized spatially. Promoting access to upriver areas can help to reduce congestion downriver, reduce parking demand near the harbor, and reduce conflicts between user groups in areas currently experiencing congestion. However, any increased use upriver must be consistent with the Town's goals for resource protection in more sensitive portions of the River.

5.2.1 Recommendations

1. Establish paddlecraft access at an upriver location. Consider Goodrich Park as a potential site for new paddlecraft access.

2. Consider improvements to boat launch at Scotland Bridge Road to improve safety and usability and increase parking, consistent with Town priorities for upriver access for trailered vessels.

5.2.2 Supporting Analysis

Analysis of public access and facilities considered where facilities currently exist, existing facility condition and capacity, and opportunities for new or expanded facilities to better serve the River users. Existing public facilities along the York River are shown in Fig. 12 and have been described in Table 9. For each site, existing conditions have been characterized in terms of launch conditions (type, construction, use, and tidal limitations), whether a dock is installed, available parking, and storage for dinghies/tenders.

Two of the main paddlecraft access points are located near Town Dock #1 and Route 103 – one of the busiest areas of the harbor – this has led to increased congestion and safety concerns. In order to better separate uses and reduce congestion in the area near Route 103, it is recommended that the Town consider adding a new paddlecraft access site at an upriver location. This would have the potential combined benefits of reduced congestion on the water near Route 103, reduced conflicts between user groups in a heavily mixed-use section of the River, and reduce demand for parking at the Harbor. Additionally, because paddlecraft use is generally a low impact activity, it is consistent with the sensitive environmental and social considerations in upriver areas.

Goodrich Park has been identified as a possible location for a paddlecraft landing as it is an existing Town-owned property that has onsite parking available, and is centrally located within Town and on the River. Two concepts have been developed for a new dock at Goodrich Park, which are described below and shown in Fig. 13.

- Concept 1 is an all-tide dock located on the main River channel with a single 10'x20' float located just beyond the low-water channel line to provide all-tide access.

- Concept 2 is a tidal launch that is located in a small inlet on the north shore of the property. The location allows for use of a smaller, less expensive structure, hides the structure from view minimizing viewshed impacts, and minimizes exposure to wind, waves, and currents which improves safety, however, the structure would only be usable for approximately half of the tidal range.

Prior to moving ahead with one of these concepts there are many important issues that need to be addressed. These include: investigating deed restrictions to confirm such a structure is permissible, addressing local permitting restrictions (the current Harbor Ordinance and Shoreland Zoning Regulations would appear to prevent such a structure from being permitted), confirming final location and design details, State and Federal permitting, and identifying funding sources for the project.

In addition, there is limited access to upriver areas due to the condition, geometric limitations, tidal limitations, and limited parking at both the Scotland Bridge Boat Launch and the Rice's Bridge boat launch. In order to improve access to upper portions of the River, the Town could consider improving the launch at Scotland Bridge Road by improving the ramp surface, extending the ramp to deeper water, and identifying locations for increased parking at or near the site.

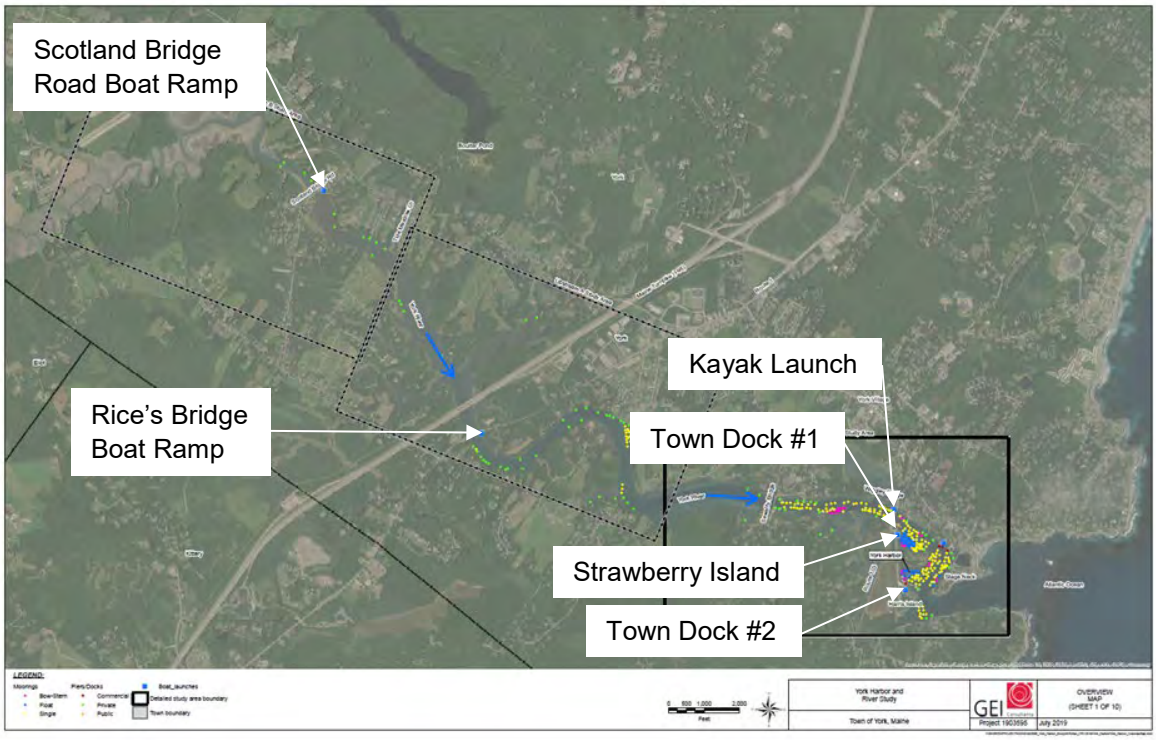


Fig. 12. Public Access Locations along York River

Table 9. Public Access Facilities on York River

River Area	Access Site	Launch	Dock	Parking	Dinghy/ Tender Storage
1	---	---	---	---	---
2	Scotland Bridge Road Boat Ramp	Hand carry and trailered. Gravel ramp. Tidal limitations	None	5-7 spaces not delineated	No
3	Rice's Bridge Boat Ramp	Primarily hand carry. Narrow gravel ramp allows for limited trailered launching. Tidal limitations.	None	15-16 spaces not delineated	No
4	Route 103 Kayak Launch	Hand carry only.	(1) Kayak launching float	14 permit spaces at Route 103.	No
5	Town Dock #1	None	Timber commercial pier w/ 83'+/- berthing at pier face. 580'+/- float face	12+/- spaces. Commercial Fishermen only.	Tie up at floats
	Strawberry Island	Hand carry during summer. Trailered launching during offseason. Gravel ramp. Tidal limitations.	None	21+/- spaces along Harris Island Road	On beach
6	Town Dock #2	None	Timber pier w/ 365'+/- float tie up. High water landing for ground vessel ground out.	40+/- spaces along Harris Island Road	Tie up at floats

Fig. 13. Concepts for Paddlecraft Dock at Goodrich Park

5.3 Primary Recommendation #3 – Parking

There is a general shortage of parking to supply demand near the Harbor and at public water access sites. This is apparent at current levels of use and will become a greater issue if use of the harbor is increased. The Town should consider options for expanding parking capacity to meet expectations for current and future demand.

5.3.1 Recommendations

1. Consider offsite parking at a town owned property with a shuttle service to landing sites. York Middle School could be a viable option given the proximity to the Harbor and the limited need for summer parking at the school.

2. Promote upriver use of River to alleviate parking demand at Harbor. See Recommendation #2.

3. Explore options for development of additional parking capacity near the harbor through property acquisition or a public-private partnership model.

5.3.2 Supporting Analysis

The approximate number of parking spaces available at each of the main public access sites has been counted and tabulated in Table 9.

Parking demand at waterfront sites will depend on the type and use of the site. For reference, several guidelines for recommended parking at waterfront sites are summarized below:

- The States Organization for Boating Access (SOBA) recommends that 20 to 30 parking spaces be provided per launching lane at low-turnover boat launches, and 30 to 50 parking spaces per launching lane at high-turnover launches.

- Institute of Traffic Engineers (ITE) recommends average parking at marinas that ranges from 0.3 space to 0.6 spaces per berth, depending on vessel utilization.

- The Town of York Zoning Ordinance does not include standards for off-street parking for waterfront facilities. While standards vary by municipality, a range of 1 space per mooring/slip to 1 space per 3 moorings/slips is typical in Maine.

By these standards, it is clear that existing parking supply is limited even for current levels of use. Onsite parking at all of the boat launches on the York River is well below the amount recommended by SOBA for public launching facilities. The 87+/- public parking spaces near the Harbor (which includes the fisherman spaces at Town Dock #1 and permit spaces along Route 103) could potentially support 87-290 boats if all were dedicated to use for the adjacent mooring field. Currently there are 120 boats on docks/slips/dry storage, and 226

additional boats on moorings between River Areas 5 and 6. While some of these boats will use other parking facilities such as private properties or marinas, this data shows that parking is limited even at its present levels. Other, none-boating uses near the Harbor place further pressure on parking availability. During summer 2019 field work, GEI observed parking areas at Scotland Bridge, Rice's Bridge, and along Harris Island Road nearly/completely utilized during the busiest summer days, which is consistent with the limited parking supply. With any increase in moorings/slips on the River, it is clear that the Town will need to consider options for increased parking.

5.4 Primary Recommendation #4 – Dinghies / Tenders

There are currently 161 tenders on the River associated with boats on the Harbor Use database. Existing tie-up/storage spaces are nearing or at capacity. Increased harbor use will require that the Town make accommodations for mooring access.

5.4.1 Recommendations

1. Consider establishing a shared dinghy program or jitney service to minimize demand for additional dinghies on the Harbor.

5.4.2 Supporting Analysis

Based on the Harbor Ordinance, each user that pays a Harbor Use Fee is permitted a tender/dinghy. There are currently 161 tenders in the mooring database with an average length of 11 ft. Many of these are tied up at Town Dock #1, Town Dock #2, or are stored on the shore at Strawberry Island. Field observations during summer 2019 indicate that the existing locations are heavily utilized and would have limited excess capacity to support additional vessels. Any increase in mooring capacity will come with an increase demand for dinghy storage. Two options that the Town could consider are described below.

Establish a shared-dinghy program. This would involve the Town purchasing and maintaining a small number of shared dinghies that can used for a short time (e.g. 30 minutes) to reach a moored boat, then returned for use by others. A marginal fee could be charged to each boater that takes part in the shared dinghy program to cover the cost of operation.

Provide a jitney service. The Town could keep a small boat/jitney and operator at a public access site such as Town Dock #2 that could shuttle boaters out to their moorings as needed. A marginal fee could be charged for this service to cover the cost of operation.

5.5 Primary Recommendation #5 – Protect Sensitive River Resources

The York River is a sensitive and valuable resource with good water quality that supports many high value habitats, fisheries, cultural, historic, and scenic resources, and recreational values. Activities that have potential to impact these resources should be carefully managed. This includes managing impacts from boating, waterfront facilities, and improving boater compliance with regulations that protect the waters and shoreline areas.

5.5.1 Recommendations

1. Increase education and enforcement to maximize compliance with no-wake zones and no-discharge regulations in River.

2. Consider adding a pumpout station in York Harbor. Options may include Town Dock #1, Town Dock #2, a pumpout float, or a private marina. Coordinate with Maine DEP Pumpout Program for project funding.

3. Promote Clean Marinas best management practices

4. Promote clean boating technology

5. Consider needs for access restrictions upriver to manage or reduce use in the most sensitive areas furthest upriver.

6. Consider revisions to Harbor Ordinance to reduce environmental impacts of new and existing docks. See Recommendation #7.

5.5.2 Supporting Analysis

The York River is classified by the State of Maine as a Class SB waterway. Class SB waters are the second highest statutory class and are described as waters which are *"of such quality that they are suitable for the designated uses of recreation in and on the water, fishing, aquaculture, propagation and harvesting of shellfish, industrial process and cooling water supply, hydroelectric power generation, navigation and as habitat for fish and other estuarine and marine life. The habitat must be characterized as unimpaired."* State statutes also set minimum water quality standards for Class SB waters including minimum dissolved oxygen content, and maximum levels of various contaminants, and prohibit discharges that would be detrimental to estuarine and marine species and biological communities.

Water quality monitoring performed by Maine DEP and Maine DMR on the York River generally attests to the good quality waters and unimpaired river conditions. The River has been documented to support a wide range of high value and protected Fish Species, including alewife, American eel, brook trout, rainbow smelt, striped bass, winter flounder, and others.

Additionally, the most recent data published by the Maine DMR part of the shellfish regulatory program has documented low contaminant levels and reduced risk factors in recent years, which in 2019 resulted in the area from Route 1 to Sewall's Bridge (River Area 3) being reclassified from Prohibited to Restricted for Shellfish Harvesting. Areas upstream of Route 1 (River Areas 1 and 2) remain closed to shellfish harvesting, which River Areas downstream of Sewall's Bridge (River Areas 4, 5, and 6) are conditionally approved, with closures during the boating season related to the presence of boats on the River. The Town also actively works with state agencies and stakeholder groups on efforts to monitor and improve water quality.

There are risk factors with excessive boating use that must be managed in order to avoid or minimize impacts to the River resources. Risks to water quality include upland sources such as outfalls, septic systems, upland runoff which can contain pesticides and fertilizers, as well as impacts that can come from boating activities through pollution and direct physical impacts. Because the focus of this study is on River capacity for boating use, the focus of this section is on potential impacts resulting from boat use. However, the relative contribution of boating related factors to upland factors and natural processes (such as sedimentation due to natural marsh erosion) has not been studied.

The potential ecological impacts of boating activities on a waterway include:

- **Impacts to Water Quality**

  The primary cause for impacts to water quality from boats is the discharge of pollutants. These can include spills of gasoline, discharge of wastewater from holding tanks, discharge of oil and unspent fuel from engines, discharge of bilge water that contains metals and chemicals, and litter and debris. These pollutants can affect the dissolved oxygen content, pH, and contaminant levels in the water.

- **Impacts to Water Clarity**

  Reductions in water clarity can be caused by increased turbidity and suspended solids that can be the result of boat propellers and turbulence that disturb bottom sediments, and excessive waves and wake that can erode shoreline sediments. Reduced water clarity can impact fish's ability to find food, dissolved oxygen content, water temperature, and aquatic plant growth.

- **Shoreline Erosion**

  Shoreline erosion can be caused or exacerbated by excessive waves and wake that are the result of boats operating at high speeds too near to shore. Boats wave and wake will vary with speed, type of boat, size of engine, distance from shore, and other factors, and the susceptibility of any section of shoreline to erosion will depend on the bank composition, geometry, vegetation, hardening, and other factors.

- **Impacts to Aquatic Vegetation**

  Boats operating in shallow water can impact aquatic vegetation through direct bottom contact and propeller contact that can clip growth. Impacts to dissolved oxygen or water clarity can also reduce ability of plant communities to grow.

- **Impacts to Fish and Marine Organisms**

  The presence of excessive boat traffic can have detrimental effects on fish and marine organisms. The release of pollutants can impact water quality that is vital to fish species survival. Turbulence, waves, wake, and noise caused by excessive boat speed can also disturb fish species. Excessive recreational use can result in overfishing and depletion of fisheries.

- **Impacts to Wildlife**

  Birds and animals that depend on the River and shoreline environment as habitat can be disturbed by excessive noise, waves, and wake, or directly impacted by contact with vessels and propellers.

On the York River, the areas most sensitive to impacts from excessive boating generally located upriver. These areas are shallower/narrower, and have the greatest presence of high value habitats. These features present the greatest potential for bottom and bank disturbance, and the highest potential for impacts to fish, wildlife, and aquatic vegetation. For example, the entirety of River Areas 1 and 2 are mapped as Moderate or High Value Tidal Wading Waterfowl Habitat. Area 1 includes significant areas of tidal marsh as well as areas of endangered, threatened, or special concern habitats. In order to minimize impacts to these sensitive resources, the Town should consider limiting the degree to which boating activities are promoted in these upriver areas.

One of the major contributors to ecological impacts of boating is excessive speed, which can cause bottom disturbance, turbulence, waves, and wake that can impact fish, wildlife, and aquatic vegetation, and increase shoreline erosion. Establishing and enforcing no-wake zones is one of the most effective approaches to reducing these potential impacts. The Town of York Harbor Ordinance currently has strict restrictions on excessive wakes, and the majority of the River is designated as headway speed only. However, observations by GEI during summer 2019 indicate that not all users abide by these restrictions. Efforts to increase compliance in this area would help to limit the effects of current and future levels of boat use.

Discharge of pollutants can occur at any location along the River where boats are present. Factors that influence the potential for this to occur include: the volume of vessels present, the percentage of boats with holding tanks, the type of vessels, and the behaviors of the users. The Town of York Harbor Ordinance contains strict restrictions on discharges into Town waters. In order to minimize the potential for discharges into the River, it is important that

users be educated on the potential sources of pollution and their potential effects on the River environment. Boater education about cleaner technology, proper fuel storage and transfer, and proper disposal of discharges and waste should be promoted to support clean boating practices.

Another major risk factor is discharge of human waste into the water rather than proper storage in holding tanks and disposal at a pumpout station. This can occur due to lack of access to suitable facilities and/or lack of understanding of the potential effects of pollutants. There is currently no marine pumpout located on York Harbor. Boats must either travel north 13+ miles to Wells or south 9+ miles to Kittery to the nearest pumpout, or call for a pumpout boat to come from Portsmouth. Sewage discharged by recreational vessels due to inadequate access to pumpouts can be a major source of pollution in marine waters. While the degree to which this is an issue in York Harbor has not been documented, a local pumpout would improve boater's ability to properly dispose of sewage from their holding tanks, reducing potential for discharges. Given the number of transient vessels using York Harbor (an average of 205 visits per season for the years of 2014-2018, based on Town records), a pumpout is likely to be a heavily used service. The State of Maine offers a pumpout grant program through Maine DEP that will pay for up to 90% of eligible costs for installation of a new municipal pumpout. The DEP Pumpout Program will also pay 90% of the cost of operation and maintenance of a pumpout system. More information on this program is available from Maine DEP. Maine DEP also publishes Best Management Practices for marinas and boatyards, which can be promoted among facilities in Town as an approach to minimizing potential for impacts on the River.

5.6 Primary Recommendation #6 – Mixed-Use Management

The York River is a small waterway that accommodates a wide range of recreational and commercial uses. Managing these varied uses to minimize conflicts between user groups and minimize impacts on the River will require a combination of techniques. These techniques range from facility planning to separate uses, to promotion of safety education and river stewardship to increase responsible boating, to increased enforcement of existing policies to address issues of noncompliance. Several recommendations related to improving management of mixed uses are outlined in this section.

5.6.1 Recommendations

1. Establish improved upriver paddlecraft access and promote use of upriver areas for paddlecraft. See Recommendation #2.

2. Consider paddlecraft registrations and day launch fees at busier launch sites.

3. Promote boater safety education among all users.

4. Improve enforcement of noncompliant activities.

5.6.2 Supporting Analysis

One of the major issues related to management of mixed-use waterways is the need to accommodate multiple uses with varying needs within a limited physical space. Improving separation of uses can be an effective means to mitigate user conflicts. Primary Recommendation #2 addresses this by promoting upriver use that could shift some of the existing recreational uses of the Harbor to alternate locations that see less spatially limited. Separation of varying uses can also be achieved through planning Harbor reorganization (Primary Recommendation #1) to group varying types of vessels into specific mooring areas.

Paddlecraft use has increased significantly on York Harbor in recent years. This has created additional congestion near Route 103 as two of the primary launch sites are in this location. Primary Recommendation #2 addresses an approach to separating uses to reduce congestion. It is also recommended that the Town consider establishing a paddlecraft management program to handle the increased pressures on the waterway that come with this use. Requiring paddlecraft registration would increase the Town's ability to understand and manage the volume of use occurring on the River. A registration program would also provide the Town with an opportunity to share important safety information with paddlecraft users in an effort to increase compliance with safety regulations, such as use of lifejackets, and rules of the road, such as appropriate use of channels alongside other vessels. The Town could also consider charging a small fee for launching at the public launch sites. Similar fees are commonly in the range of $5-10 for day launching are common in Maine communities.

Boater safety is another important aspect to mixed-use management. Many boaters do not participate in formal safety training. Each year the Town facilitates a water safety day which provides useful boating safety information that is aimed at children. This is a positive effort that should continue. The Town should also consider other opportunities to promote safety education. The U.S. Coast Guard offers many useful resources. For example, the USCG Auxiliary provides boating safety training that is applicable to all types of recreational power, sail, and paddlecraft users. The USCG also conducts marine safety training for commercial fishermen at various times throughout the year in Maine. Another resource that can be promoted is the use of the USCG App, a free smartphone app that provides safety information maps, hazard reporting, and automated float plans. This app could be especially helpful for small boat and paddlecraft users who do not have access to a radio or chart plotter when they are on the water, but likely do have a smartphone with them at most times.

Through GEI's field work, a number of noncompliant activities were observed including excessive wakes, unauthorized tie-up, swimming, and towing. These types of activities increase safety and capacity concerns on the River. Increasing compliance with local regulations will require a combination of education and enforcement. The Town should ensure that their harbormasters have adequate presence on the River to identify and enforce regulations in an effort to minimize the occurrence of noncompliant uses.

5.7 Primary Recommendation #7 – Dock Regulations

Managing the amount of additional dock development on the York River is a significant area of concern for the Town. One the one hand, there are concerns among stakeholders that excessive development of new docks on the River has the potential to increase congestion, impact navigation, increase environmental impacts, and fundamentally change the character of the River. On the other hand, there have been concerns expressed by some waterfront property owners that current regulations are overly restrictive of dock development.

Existing regulations in the Shoreland Zoning Ordinance and Harbor Ordinance are very restrictive, allowing for very limited new dock development on the River. The appropriateness of the current regulatory structure will depend on the Town's balance of priorities for spatial, facility, ecological, and social factors.

At the same time, there are several areas where the current ordinances could stand to be improved to better manage ecological impact of new and existing docks, reduce impact of new docks, and allow the regulations to be applied more uniformly from year to year, and more consistently and equitably.

This section takes an objective look at several local regulations related to dock development, identifies areas for potential improvements, and studies the effects of various ordinance changes on potential for new dock development.

5.7.1 Recommendations

1. Determine Town goals for tolerable levels of dock development. These will likely vary by River Area.

2. Consider revisions to Harbor Ordinance and Shoreland Zoning Ordinance consistent with identified goals that address needs to:

    a. Allow for tolerable levels of dock development.

    b. Better manage ecological impact of existing docks.

    c. Reduce impacts of new docks.

    d. Promote community docks.

    e. Improve ability to apply regulations consistently and equitably.

    f. Improve ability to manage uses of docks after they are installed.

5.7.2 Supporting Analysis

Dock Buildout Analysis

Construction of piers and docks in coastal wetlands is an activity that is regulated by multiple state and federal agencies. A typical dock construction project on coastal waters in Maine will require permits from Maine DEP, the U.S. Army Corps of Engineers, and a Submerged Lands Lease from the Maine DACF Submerged Lands Bureau. In addition, the Town of York has local regulations for dock development that are contained within the Harbor Ordinance, Zoning Ordinance, and Floodplain Management Ordinance.

Navigating the regulatory process for any individual project requires that many site-specific constraints be evaluated. The purpose of this analysis was to take a high-level look at the potential for additional dock construction on the River, therefore, the focus has been on specific areas of local regulation which could objectively disqualify a property from installing a dock. Specifically, this section considers dock setback definitions, effects of changing the setback standards, and potential for new dock development in a range of scenarios. The analysis then further considers the Town's shoreland zoning regulations and their effect of dock development on the York River.

It is important to note that many factors will influence whether a property can be permitted to install a dock which cannot assessed within a high-level study, such as whether a proposed dock would create an adverse impact to navigation, whether the presence of high value habitats would possibly lead to Maine DEP denying an application, whether there is suitable upland access to a dock site, or simply whether the property owner has the interest and means to install a dock. Each of these factors would generally serve to further reduce the number of potential docks from what is reported in this analysis.

High- to Low-Water Setbacks

The York Harbor Ordinance limits new dock construction to locations where the distance from the high water line to the low water channel is less than 50 ft upstream of Sewall's Bridge, and less than 84 ft downstream of Sewall's Bridge. Additionally, docks may extend no more than 10% the width of the low water channel, and may not extend closer than 100 ft from the opposite marsh.

For the purpose of these regulations, the High Water Line is defined based on the elevation of the Highest Annual Tide published by Maine DEP each year, and the Low Water Channel Line is defined based on the elevation of the immediately following low tide. Both of these elevations vary from year to year. As a result, the high- to low-water setback will also vary from year to year for any given location on the River. For properties close to the limiting setback, this could mean that whether a property is eligible to install a dock is dependent on the year in which the high- to low-water setback is measured. To study this issue, the relevant high- and low-water elevations were review for each year from 2000-2030 based on

the NOAA York Harbor Tidal Station (NOAA Station 8419518). During this period, the range of high- to low-water elevation varies from a minimum of 12.4 ft to a maximum of 13.4 ft, as much as 1 ft variation. The corresponding impact on high- to low-water setback will depend on the topography of the shoreline at any given location, but the general effect is that a lower tidal range will result in a lower setback, while a higher tidal range will result in a higher setback. A property which was ineligible to install a dock in a year of high tidal variation (e.g. 2016, tidal range of 13.4 ft), may be eligible if the application is made in a year with low tidal range (e.g. 2022, tidal range of 12.4 ft).

A secondary issue that arises with the high- to low-water setback regulations is the impact of future sea level rise. As with tidal range, the impact on any specific property is very site-specific, but for the general case of a site with shallow sloping intertidal frontage and a steep coastal bluff, the effect of an increase in mean sea level will be a reduction in high- to low-water setback. This could result in more properties becoming eligible for dock installation in the future as sea level rises.

The annual variations and impacts of sea level rise described above present issues with applying dock regulations consistently over time and among properties. In order to address these issues, it is recommended that the Town consider revising the Harbor Ordinance to redefine the high water line and low water line in a more robust manner. Suggested approaches are described below.

- High Water Line – Redefine based on Highest Astronomical Tide (based on 19-year tidal epoch). Consider addition of extra freeboard (e.g. Highest Astronomical Tide + 3 ft) to account for future rising sea levels.

- Low Water Line – Redefine based on Lowest Astronomical Tide (based on 19-year tidal epoch), or consider alternatives described below.

Use of the Highest and Lowest Astronomical Tide would effectively fix the high- to low-water elevation range at 13.4 ft. While this would address the year-to-year variations in setback measurements, it does not address the future impact of sea level rise. An alternate approach could be considered that would better accommodate future changes in water levels. These could include:

- Establish a ‘Channel Line’ that is adopted on a published plan that is based on objective criteria (e.g. maximum extension of existing docks).

- Replace the high- to low-water setback requirement with a maximum dock extension beyond high water, which would effectively limit total dock length. Consider in combination with a minimum depth of water beneath floats, which would prevent the installation of ground-out floats on properties with long intertidal frontage.

Effects of Increasing Setback Standards

Analysis was undertaken to understand the effects of increasing the high- to low-water setback standards from the current 50 ft upstream and 84 ft downstream.

There are currently 83 docks on the York River. Of the subset of properties that do not currently have docks, each property was reviewed to determine whether any location on the property meets the high- to low-water setback in each of the following scenarios: current setbacks (50 ft/84 ft), revised setbacks of 100 ft, 150 ft, 200 ft, and 250 ft. The quantity of properties meeting the setback was tabulated for each scenario within each River Area. The potential dock density was then calculated under each of these scenarios based on the assumption that all properties meeting the setbacks install a dock. The results of this analysis are summarized in Table 10 and Table 11.

Table 10. Properties meeting setbacks under a range of setback scenarios

Area	No.	Description	Existing Docks	Additional Properties Meeting Setbacks				
				50ft / 84 ft	100 ft	150 ft	200 ft	250 ft
Upstream	1	Limit of Study to Scotland Bridge	5	4	6	6	6	6
	2	Scotland Bridge Road to Route 1	13	4	12	22	28	34
	3	Route 1 to Sewall's Bridge	35	6	15	16	18	19
		Total Upstream	**53**	**14**	**33**	**44**	**52**	**59**
Down-stream	4	Sewall's Bridge to Route 103	13	0	1	4	5	6
	5	North Basin: Route 103 to "G-11"	6	5	7	7	7	7
	6	South Basin: "G-11“ to "R-9"	11	1	3	4	4	4
		Total Downstream	**30**	**6**	**11**	**15**	**16**	**17**
		Total River	**83**	**20**	**44**	**59**	**68**	**76**

Table 11. Dock density under a range of setback scenarios

Area	No.	Description	Existing Dock Density	Density if all eligible properties installed docks with setbacks revised to:				
				50ft / 84 ft	100 ft	150 ft	200 ft	250 ft
Upstream	1	Limit of Study to Scotland Bridge	1.3	2.3	2.8	2.8	2.8	2.8
	2	Scotland Bridge Road to Route 1	7.6	10	15	21	24	28
	3	Route 1 to Sewall's Bridge	17	20	24	24	25	26
		Total Upstream	**6.8**	**8.6**	**11**	**12**	**14**	**14**
Down-stream	4	Sewall's Bridge to Route 103	20	20	22	26	28	29
	5	North Basin: Route 103 to "G-11"	22	41	48	48	48	48
	6	South Basin: "G-11“ to "R-9"	30	32	38	41	41	41
		Total Downstream	**23**	**28**	**32**	**35**	**36**	**36**
		Total River	**9.1**	**11**	**14**	**16**	**17**	**17**

Several observations can be made from this analysis. First, some areas are much more sensitive to setback measurement than others. For example, River Areas 2 and 3 see a significant increase in the number of properties meeting the regulatory setback with only a small increase in the setback. On the other hand, Areas 4, 5, and 6 see only a small increase in number of eligible properties from even the largest increases in setback. Dock density can be a useful measure for normalizing this data to understand how areas of the River compare under differing levels of dock development. For example, if the setback was increased to 250 ft in River Area 2 and docks were installed at all properties that are eligible based on setbacks alone, the total potential for dock development could reach nearly the same density as the current dock density in Area 6.

It is important to recognize that the analysis reported above represent an upper boundary of potential dock development based on a single regulatory criteria, high- to low-water setback. There are many factors beyond regulatory setbacks that will further limit dock development, generally resulting in in less dock development than is reported. Several relevant that will significantly limit development from the numbers reported above are contained within the Town's Shoreland Zoning regulations, which are described in the following section.

Town of York Shoreland Zoning

The State of Maine requires that all municipalities adopt Shoreland Zoning regulations under the Mandatory Shoreland Zoning Act. Maine DEP Ch. 1000 provides minimum shoreland zoning standards that municipalities may adopt, and municipalities have the authority to adopt standards that are consistent with, or more stringent than, State minimums in order to regulate their shoreland zone consistent with local priorities.

With regard to regulation of docks on the York River, the Town of York has adopted very strict regulations within the Shoreland Zoning Ordinance that will have the effect of limiting new dock construction beyond what would be allowed under the Harbor Ordinance. Several relevant areas are summarized below:

1. Section 8.3.6.9 allows new docks to be constructed "only on a tract of land with river frontage on the York River existing as of March 5, 1977." In order to understand the history of parcel subdivisions on the River an extensive amount of deed research would be required, which would be beyond the scope of this study. Some insight into the history of development along the River can be gained from the Land Use maps that are part of the Town of York Comprehensive Plan. A section of the map "New Construction 1981-2003" dated January 5, 2004 is provided in Fig. 14. While specific parcels are not identified, this map demonstrates that a significant amount of new construction has occurred along the River corridor since 1981, with particularly high density of new construction occurring in River Areas 2 and 3. Some percentage of this new construction likely occurred on parcels that were created after March 5, 1977, which could make some of the associated properties ineligible for dock

installation. The history of land division on the River is an important issue to understanding the actual potential for dock development. The Town should consider studying this issue further.

2. Section 3.8.1.c expressly prohibits docks within the Resource Protection Subdistrict. Therefore, any location within the Shoreland Zone that falls under the Town's definition of resource protection is not eligible for dock installation. The Town has adopted a definition of the Resource Protection Subdistrict (Section 3.8.2.a) that is copied below:

a. Resource Protection Sub-district. This subdistrict shall include all areas that meet the criteria that follow. This designation shall supersede the classification of Limited Residential or Mixed-Use sub-district designations.

1. Coastal Wetlands. The wetland area itself.
2. Inland Wetlands. The wetland area itself for inland wetlands with a contiguous area of 4 or more acres, or that are contiguous to coastal wetlands.
3. Map-Designated Areas. All areas so designated on the Shoreland Overlay District Map.
4. Steep Slopes. Within the Limited Residential or Mixed-Use subdistrict, areas of 2 or more contiguous acres with sustained slopes of 20% or greater, as shown on the Shoreland Overlay District Map. The area of steep slopes may extend beyond the boundaries of the Shoreland Overlay District, but only that portion of the steep area that lies within the Shoreland Overlay District shall be designated as resource protection.
5. 100-Year Floodplain. Any Shoreland area included within the Velocity Zone on FEMA's Flood Insurance Rate Maps shall be classified as Resource Protection. Along the tidal reaches of the Cape Neddick River, York River and Brave Boat Harbor, any Shoreland area included in the 100-year floodplain on FEMA's Flood Insurance Rate Maps shall be classified as Resource Protection. Because the majority of these areas are narrow slivers of land which would not display legibly on the Shoreland Overlay District Map, these designations shall be determined on a case-by-case basis. - **AMENDED 11/04/2008**
6. Bird Habitat Areas. The Resource Protection Subdistrict shall include upland areas adjacent to wetlands which are rated "moderate" or "high" value waterfowl and wading bird habitat by the Maine Department of Inland Fisheries and Wildlife, as shown on the Shoreland Overlay District Map. - **AMENDED 11/04/2008**
7. Unstable Bluffs. The Resource Protection Subdistrict shall include the face of any unstable or highly unstable coastal bluff along tidal waters, as shown on the Shoreland Overlay District map. These areas are designated because they are subject to severe erosion or mass movement. The source of the data is mapping by the Maine Geological Survey. - **AMENDED 11/04/2008**

Copies of GIS Maps are provided in Appendix B. The following Resource Protection designated areas are identified on maps: Series 2 - map designated areas, the 100-year floodplain, unstable coastal bluffs, Series 3 - bird habitat areas. As can be observed from these maps, there are significant sections of the river designated as Bird Habitat Areas, including the entirety of River Areas 1 and 2, and significant portions of Areas 3-6. The entire shoreline of the River is within the 100-year floodplain, with portions of Area 4 and 5 designated as Velocity Zones. There are also significant sections of the River mapped as unstable bluffs and map designated resource protection areas. Combined, the current definition of Resource Protection will essentially encompass the entire York River.

As this section demonstrates, the Town's current shoreland zoning regulations are extremely limiting in terms of allowing new dock development, resulting in little to no new dock development that would be allowed under current shoreland zoning regulations. In order to balance the needs and priorities of the Town for protection of the resource with the needs of individual waterfront property owners for access to the resource, it is recommended that the Town consider revisions to these regulations to allow new dock development that is consistent with local goals.

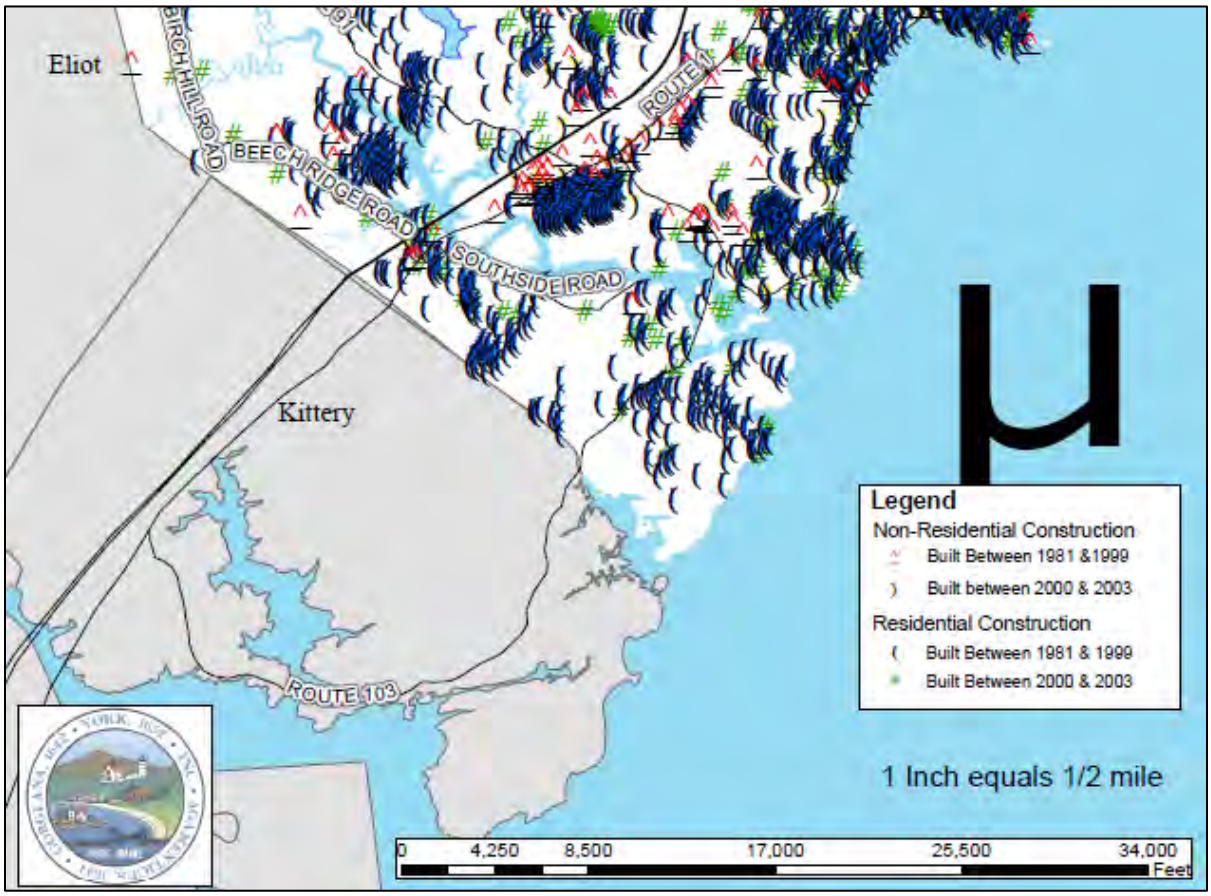


Fig. 14. Section of "New Construction, 1981-2003" map from York Comprehensive Plan

Additional Dock Regulations

In reviewing Local Ordinances, several additional areas were identified related to dock regulations that the Town could consider improving to limit the impact of new docks on the River, minimize impact of existing docks, and better control dock usage. These items are briefly summarized below.

1. Offseason Float Storage – The Harbor Ordinance currently does not include regulations related to offseason storage of floats. During GEI's field observations, there were many properties along the River where floats were observed stored on the marsh along a property owner's shoreline. Storage of floats on the marsh smothers vegetation which is an added environmental impact associated with the dock. Many Maine municipalities restrict float storage along the shoreline, requiring that floats be hauled away or stored on the upland property. In order to reduce the impact of current docks and future docks, it is recommended that the Town consider adopting regulations to manage offseason float storage.

2. Storage of Paddlecraft and Dinghies – Similarly, the Town does not currently have regulations to address the storage of paddlecraft/dinghies/small vessels on the marsh or in the intertidal area. Like floats, the storage of these small vessels on the marsh can smother vegetation. Additionally, small craft stored in the intertidal can float away if not anchored properly potentially becoming hazards to navigation, and requiring rescue efforts. It is also recommended that the Town consider adopting regulations to manage small vessel storage on shore.

3. Filing of Float Plans – Some communities require that as part of a dock application, the applicant file a float plan to document the proposed arrangement, size, and type of vessels that will use the dock. The Town may then establish enforcement authority for uses outside of the permitted use (i.e. docking much larger vessels, dockage of visiting boaters for extended periods of time, etc.). The Harbor Ordinance does not currently require that dock applications include a float plan. It is recommended that the Town consider this addition which would improve the Town's ability to understand impacts of new docks on vessel traffic and navigation, and help to manage vessel use of the River.

4. Height of structure above marsh – The Harbor Ordinance does not address height of docks above the marsh substrate. This is an important issue in dock design as docks that are too low can impede the public's ability to navigate across the intertidal area, can impact vegetation by increased shading, and are at greater risk of flood damage. Some communities have established regulations for minimum dock height above substrate to address these issues. The Town should consider addition of such standards.

5. Community Docks – Community docks are structures that are intended to provide access for a group of property owners rather than an individual private property. These structures can reduce the total number of docks installed, and their associated impacts, by allowing a single larger structure that serves many users. Promoting the use of these structures can be a good way to balance the needs for water access with goals for minimization of new dock construction. This type of structure could be especially applicable on the York River for some of the post-1977 developments that

have created new parcels that are unable to install docks under current regulations. A single community dock in a post-1977 development would provide shared access for the residents of the development, without excessive new dock development. The Town's Harbor Ordinance does not currently include provisions related to community docks. It is recommended that the Town review and consider incorporating similar community dock language into local ordinances.

6. Closing

This purpose of this work was to study the capacity of the York River and Harbor. Through this project, existing conditions and uses have been documented, issues have been identified related to four categories of capacity factors: Spatial, Facility, Ecological, and Social, and recommendations have been put forth to address these issues.

Waterway capacity is a complex balance of factors that involves careful consideration of the importance of each factor and often trade-offs between them. The appropriate balance for the York River must reflect the values and goals of the community, the users, and those responsible for managing the waterway. Identifying these goals is an ongoing process that will require continual review and adjustment as conditions and uses change. Maintaining a safe, functional Harbor and limiting impacts on the natural environment are baselines that must be achieved. The Town may also have other values related to River character, history, and other local interests that are important to consider.

In the current state, most locations of the River do not appear to exceed their spatial capacity, however there are spatial issues that should be addressed to improve safety and function. Facility capacity is generally a limiting factor along the entire River and will require consideration if significant increases in use are going to take place. The River does not appear to be exceeding its ecological capacity as demonstrated by the good and improving water quality at current levels of use however the River is a sensitive resource and both current and future levels of use need to be carefully managed to ensure resource impacts are kept to a minimum. Social capacity is largely dependent on the Town's values, which should be carefully considered to determine whether and where increases in use are tolerable.

After identifying values and goals for waterway management, the Town must ensure that local regulations and management strategies are in place that are consistent with these goals. Adequate resources must be available to facilitate waterway management, and the entities responsible for management and enforcement must be sufficiently empowered to do so.

Ultimately, the concerted efforts of Town staff, committee members, stakeholder, and other concerned individuals will be needed to ensure that the River capacity is managed and the resource is protected, preserved, and available for use for the future generations. This study is intended to provide the Town with information and tools that will support these necessary ongoing efforts.

Appendix A

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Appendix B

Inventory Maps

Inventory Maps

The three series of maps that have been developed for the York River for this study include:

1. Marine Uses & Infrastructure: Moorings, Docks, Boat Launches, Working Waterfront Sites, Marinas, Channels, Anchorages, Channel Markers, Regulatory Dock Setbacks.

2. Land Use & Regulatory: Town of York Shoreland Zoning, Unstable Bluffs, FEMA Flood Zones, National Wetlands Inventory Wetlands.

3. Environmental: Protected/High Value Plant and Animal Habitat, Shorebirds, Tidal Wading Waterfowl, Eelgrass, Shellfish, Endangered or Special Concern Species.

LEGEND:

Moorings
- Bow-Stern
- Float
- Single

Piers/Docks
- Commercial
- Private
- Public

Boat_launches

Parcels owned by Town of York

Parcels

Town boundary

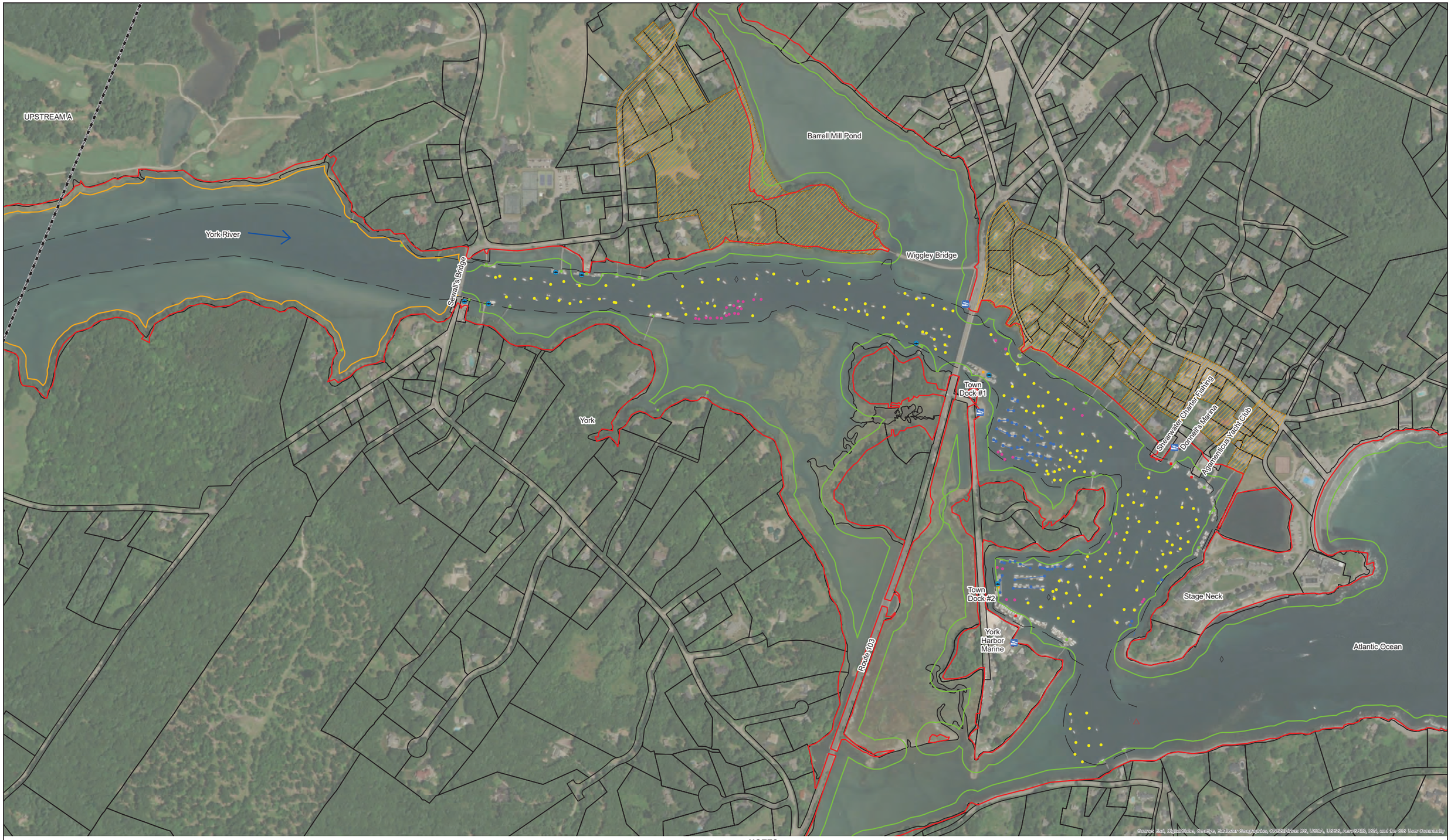
Detailed study area boundary

0 500 1,000 2,000
Feet

N W E S

York Harbor and River Study	GEI Consultants	OVERVIEW MAP (SHEET 1 OF 11)
Town of York, Maine	Project 1903595	October 2019

Y:\SHARED\PROJECTS\2019\1903595_York_Harbor_Study\GIS\Arcx_07012019\York_Harbor\York_Harbor_OverviewMap.mxd



LEGEND:

Moorings
- Bow-Stern
- Float
- Single

Piers/Docks
- Commercial
- Private
- Public

Channel marker
- Can-11
- Nun-8
- No wake/5mph/Sand bar markers

- Working waterfront site
- Boat launches
- Floats
- Approximate lower water line
- Highest Annual Tide (HAT) line
- 84 ft buffer - HAT
- 50 ft buffer - HAT
- Detailed study area boundary
- York local historic districts
- York parcels
- Town boundary

NOTES:

1. Approximate lower water line was digitized from low tide orthophotos (2010).

0 150 300 600
Feet

N W E S

York Harbor and River Study	GEI Consultants	MARINE USES AND INFRASTRUCTURE MAP DOWNSTREAM (SHEET 2 OF 11)
Town of York, Maine	Project 1903595	October 2019

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LEGEND:

Moorings
- Bow-Stern
- Float
- Single

Piers/Docks
- Commercial
- Private
- Public

Channel marker
- Can-11
- Nun-8
- No wake/5mph/Sand bar markers

- Working waterfront site
- Boat launches
- Floats
- Approximate lower water line
- Highest Annual Tide (HAT) line
- 84 ft buffer - HAT
- 50 ft buffer - HAT
- Detailed study area boundary
- York local historic districts
- York parcels
- Town boundary

NOTES:

1. Approximate lower water line was digitized from low tide orthophotos (2010).

0 150 300 600
Feet

York Harbor and River Study	GEI Consultants	MARINE USES AND INFRASTRUCTURE MAP UPSTREAM A (SHEET 3 OF 11)
Town of York, Maine	Project 1903595	October 2019

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LEGEND:

Moorings
- Bow-Stern
- Float
- Single

Piers/Docks
- Commercial
- Private
- Public

Channel marker
- Can-11
- Nun-8
- No wake/5mph/Sand bar markers

- Working waterfront site
- Boat launches
- Floats
- Approximate lower water line
- Highest Annual Tide (HAT) line
- 84 ft buffer - HAT
- 50 ft buffer - HAT
- Detailed study area boundary
- York local historic districts
- York parcels
- Town boundary

NOTES:

1. Approximate lower water line was digitized from low tide orthophotos (2010).

0 150 300 600
Feet

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

York Harbor and River Study	GEI Consultants	MARINE USES AND INFRASTRUCTURE MAP UPSTREAM B (SHEET 4 OF 11)
Town of York, Maine	Project 1903595	October 2019

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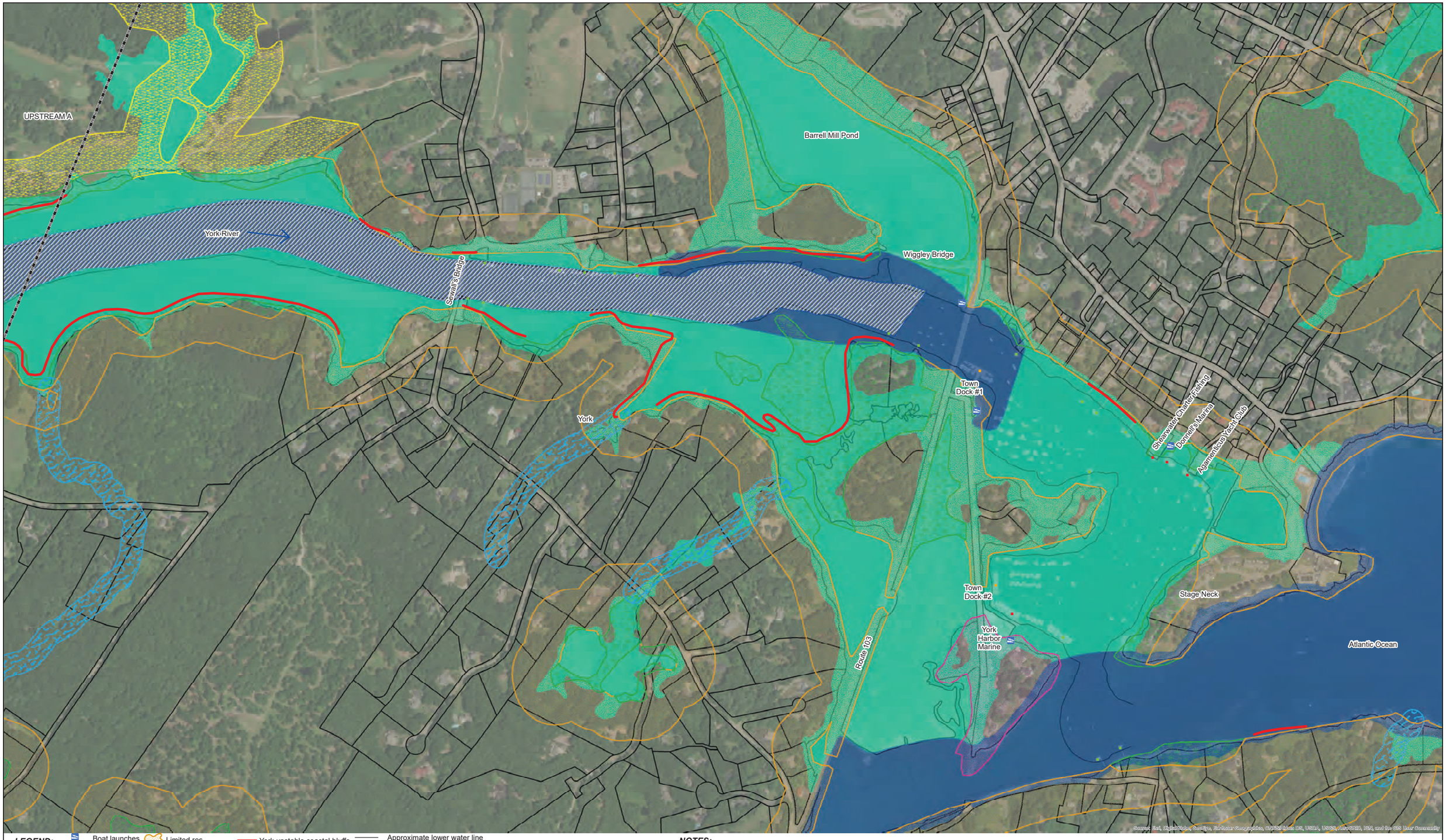

LEGEND:

- Boat launches
- Piers/Docks
  - Commercial
  - Private
  - Public
- Limited res.
- Mixed use
- Resource protection
- Stream protection
- Wetland
- York unstable coastal bluffs
- FEMA V zone
- FEMA A zone
- FEMA floodway
- Approximate lower water line
- Detailed study area boundary
- York parcels
- Town boundary

NOTES:

1. Approximate low water line was digitized from low tide orthophotots (2010).
2. FEMA layers represent preliminary boundaries for 2018.

0 150 300 600
Feet

N W E S

York Harbor and River Study	GEI Consultants	ZONING AND REGULATORY MAP DOWNSTREAM (SHEET 5 OF 11)
Town of York, Maine	Project 1903595	October 2019

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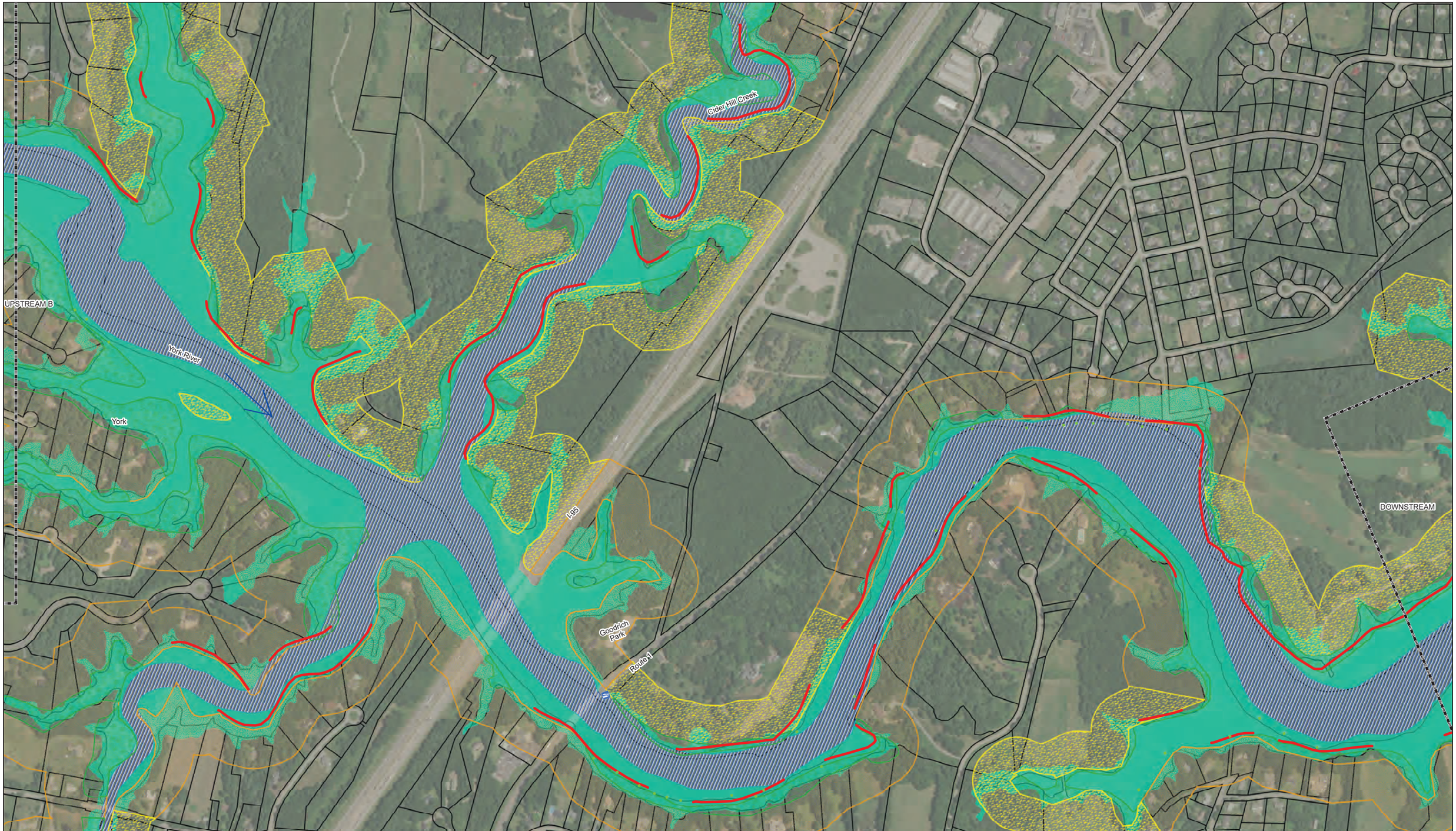

LEGEND:

- Boat launches
- Piers/Docks
  - Commercial
  - Private
  - Public
- Limited res.
- Mixed use
- Resource protection
- Stream protection
- Wetland
- York unstable coastal bluffs
- FEMA V zone
- FEMA A zone
- FEMA floodway
- Approximate lower water line
- Detailed study area boundary
- York parcels
- Town boundary

NOTES:

1. Approximate low water line was digitized from low tide orthophotots (2010).
2. FEMA layers represent preliminary boundaries for 2018.

0 150 300 600
Feet

N E S W

York Harbor and River Study	GEI Consultants	ZONING AND REGULATORY MAP UPSTREAM A (SHEET 6 OF 11)
Town of York, Maine	Project 1903595	October 2019

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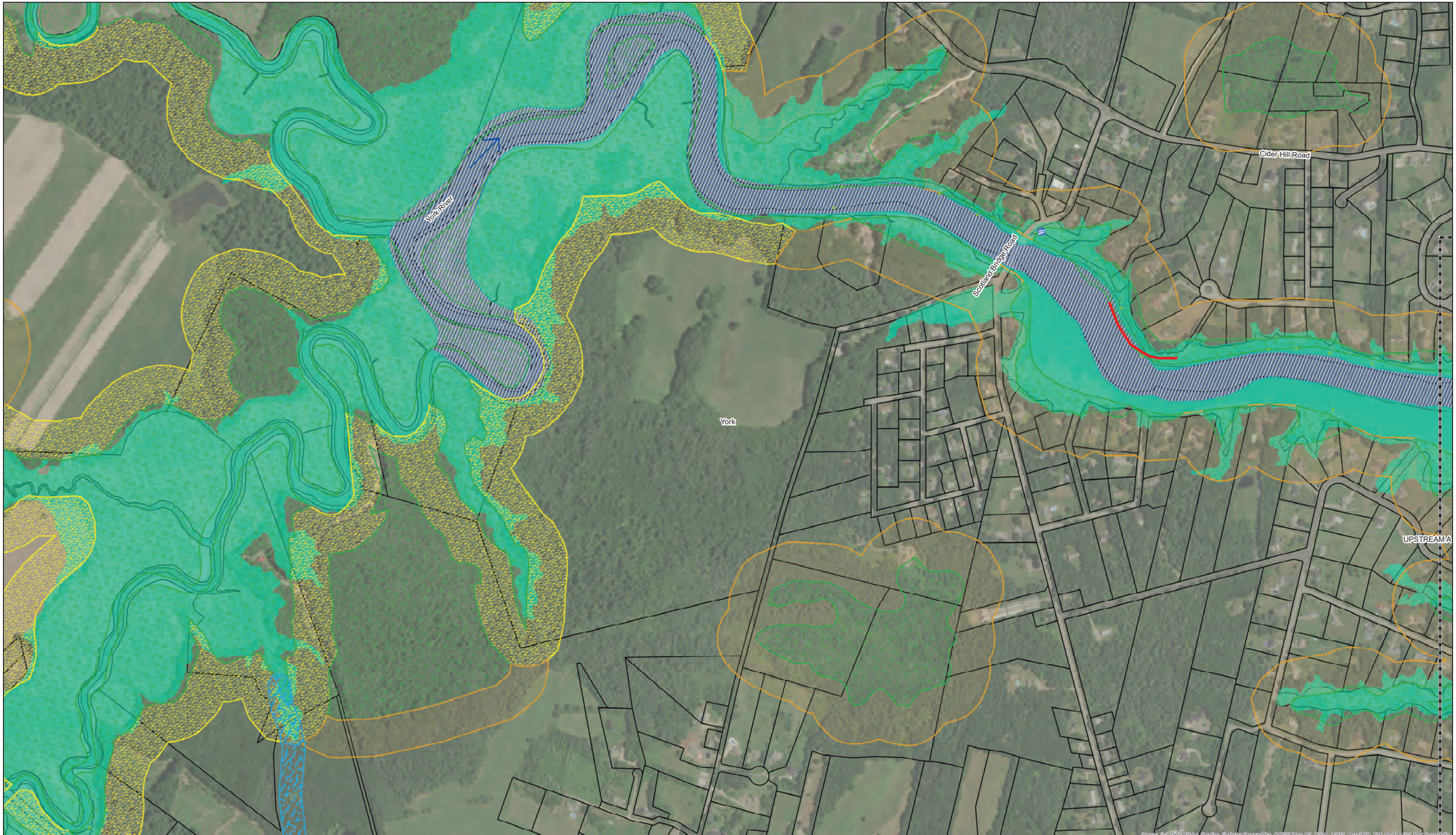

LEGEND:

- Boat launches
- Piers/Docks
  - Commercial
  - Private
  - Public
- Limited res.
- Mixed use
- Resource protection
- Stream protection
- Wetland
- York unstable coastal bluffs
- FEMA V zone
- FEMA A zone
- FEMA floodway
- Approximate lower water line
- Detailed study area boundary
- York parcels
- Town boundary

NOTES:

1. Approximate low water line was digitized from low tide orthophotots (2010).
2. FEMA layers represent preliminary boundaries for 2018.

0 150 300 600
Feet

York Harbor and River Study	GEI Consultants	ZONING AND REGULATORY MAP UPSTREAM B (SHEET 7 OF 11)
Town of York, Maine	Project 1903595	October 2019

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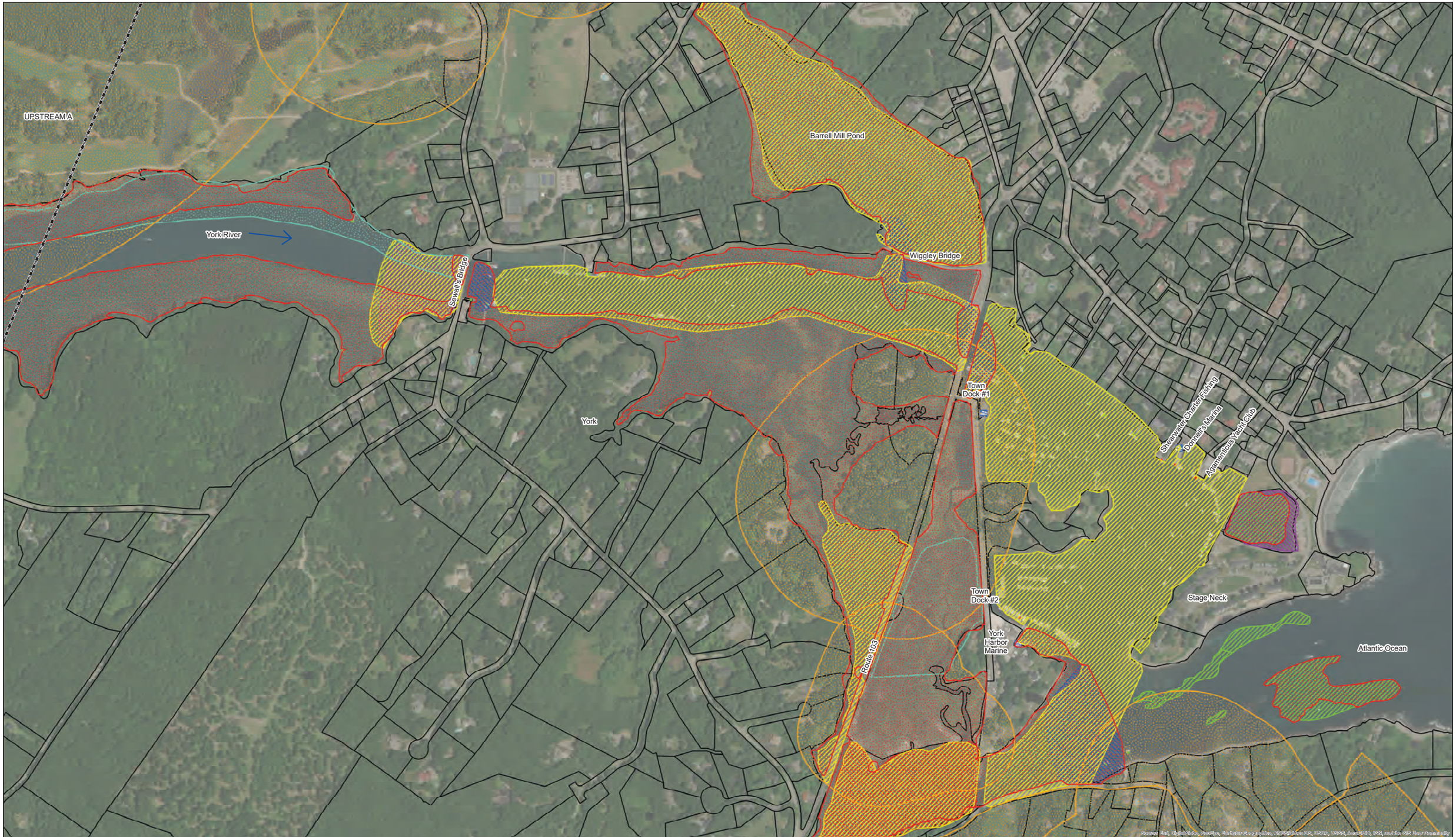

LEGEND:

- Boat launches
- Piers/Docks
  - Commercial
  - Private
  - Public
- Blue mussel
- European oyster
- Hard clam
- Softshell clam
- Shorebird habitat
- Tidal waterfowl and wading bird (high or moderate habitat rating)
- Endangered/threatened/special concern wildlife
- Eelgrass
- Detailed study area boundary
- York parcels
- Town boundary

0 150 300 600
Feet

N W E S

York Harbor and River Study	GEI Consultants	ENVIRONMENTAL MAP DOWNSTREAM (SHEET 8 OF 11)
Town of York, Maine	Project 1903595	October 2019

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LEGEND:

- Boat launches
- Piers/Docks
  - Commercial
  - Private
  - Public
- Blue mussel
- European oyster
- Hard clam
- Softshell clam
- Shorebird habitat
- Tidal waterfowl and wading bird (high or moderate habitat rating)
- Endangered/threatened/special concern wildlife
- Eelgrass
- Detailed study area boundary
- York parcels
- Town boundary

0 150 300 600
Feet

N E S W

York Harbor and River Study	GEI Consultants	ENVIRONMENTAL MAP UPSTREAM A (SHEET 9 OF 11)
Town of York, Maine	Project 1903595	October 2019

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LEGEND:

- Boat launches
- Piers/Docks
  - Commercial
  - Private
  - Public
- Blue mussel
- European oyster
- Hard clam
- Softshell clam
- Shorebird habitat
- Tidal waterfowl and wading bird (high or moderate habitat rating)
- Endangered/threatened/special concern wildlife
- Eelgrass
- Detailed study area boundary
- York parcels
- Town boundary

0 150 300 600
Feet

N E S W

York Harbor and River Study

Town of York, Maine

GEI Consultants

Project 1903595

ENVIRONMENTAL MAP
UPSTREAM B
(SHEET 10 OF 11)

October 2019

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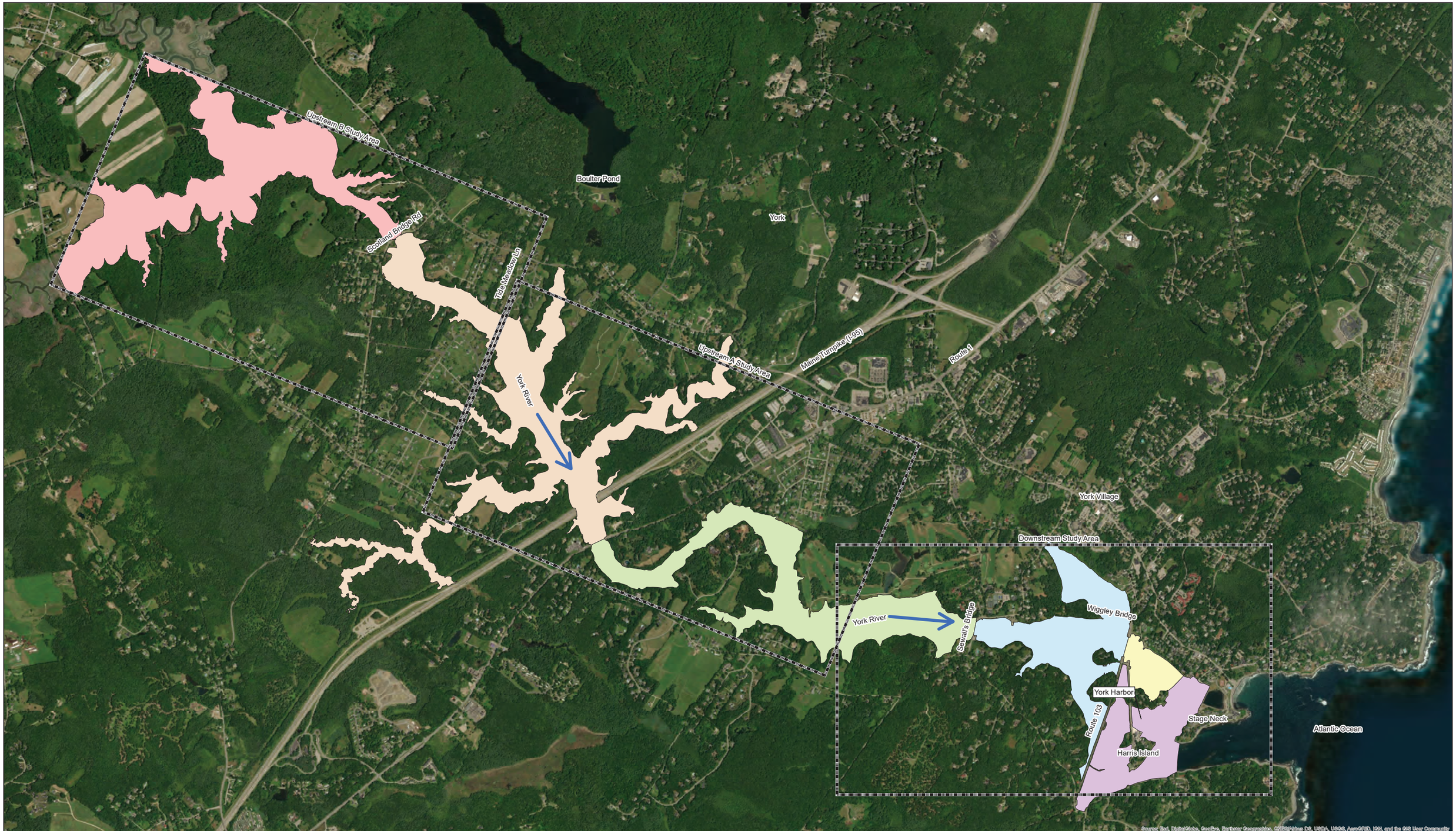

LEGEND:

- South Basin
- North Basin
- Route 103 to Sewall's Bridge
- Sewall's Bridge to Route 1 Bridge
- Route 1 Bridge to Scotland Bridge Road
- Scotland Bridge Road to Limit of Study
- Detailed study area boundary

0 500 1,000 2,000
Feet

N W E S

York Harbor and River Study	GEI Consultants	YORK RIVER/HARBOR STUDY AREAS MAP (SHEET 11 OF 11)
Town of York, Maine	Project 1903595	October 2019

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Appendix C

Concept Plans

NOTES:

1. LOCATIONS OF MOORINGS FROM TOWN GIS DATABASE
2. LOCATIONS OF DOCKS FROM GEI MAPPING.

SOURCE:

1. FEDERAL CHANNEL LIMITS AND CHANNEL MARKERS BASED ON 2017 USACE YORK HARBOR MAINTENANCE DREDGING PLAN.
2. AERIAL PHOTO FROM NEARMAP, DATED APRIL 25, 2019.

LEGEND:

- US ARMY CORPS CHANNEL
- SUGGESTED NAVIGATION CLEAR CHANNEL
- SINGLE POINT MOORING
- DESIGN VESSEL

0 125' 250' 500'

SCALE: 1" = 250'

York Harbor/River Study

Town of York, Maine

GEI Consultants

HARBOR AREAS 5 & 6
EXISTING CONDITIONS

Project 1903595 | SEPTEMBER 2019 | Fig. 1

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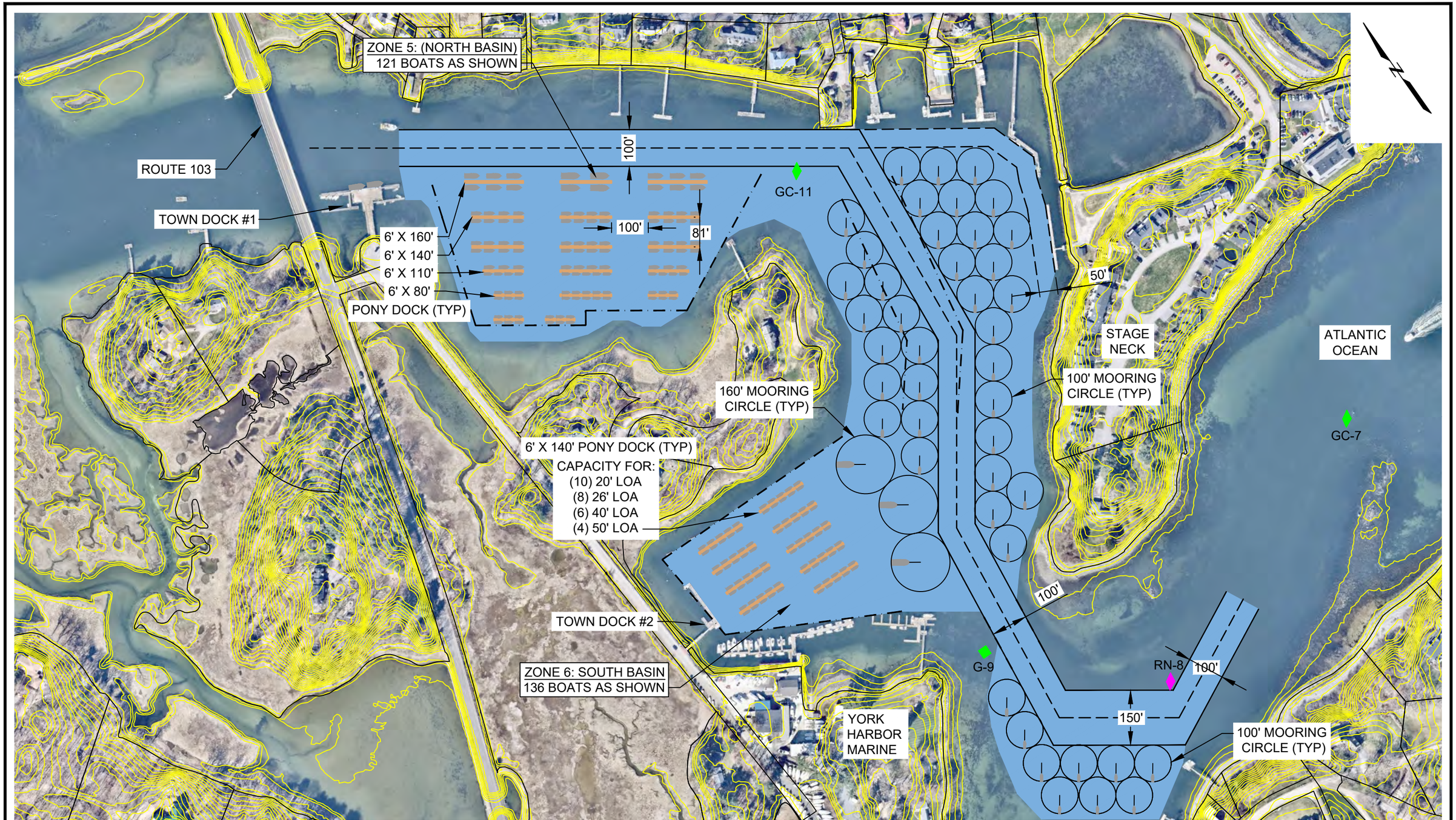

NOTES:

1. THIS CONCEPT PLAN IS FOR DEMONSTRATION ONLY AND SHOULD NOT BE TAKEN AS A FINAL DESIGN OR PROPOSAL.

SOURCE:

1. FEDERAL CHANNEL LIMITS AND CHANNEL MARKERS BASED ON 2017 USACE YORK HARBOR MAINTENANCE DREDGING PLAN.
2. AERIAL PHOTO FROM NEARMAP, DATED APRIL 25, 2019.

LEGEND:

- US ARMY CORPS CHANNEL
- SUGGESTED NAVIGATION CLEAR CHANNEL
- SINGLE POINT MOORING
- DESIGN VESSEL

0 125' 250' 500'

SCALE: 1" = 250'

York Harbor/River Study	GEI Consultants	HARBOR AREAS 5 & 6 CONCEPT LAYOUT 1
Town of York, Maine	Project 1903595	SEPTEMBER 2019 Fig. 2

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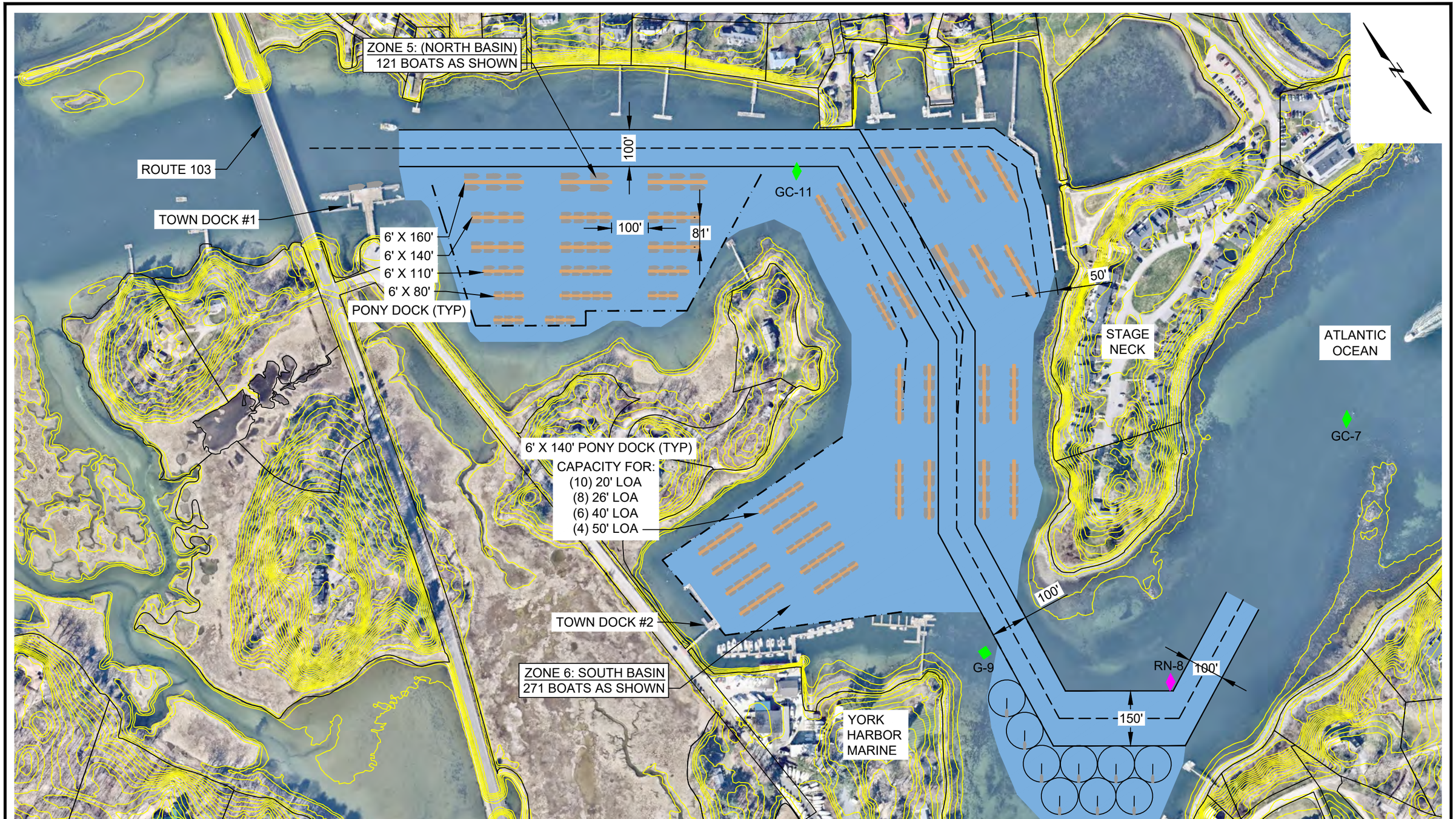

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SOURCE:

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2. AERIAL PHOTO FROM NEARMAP, DATED APRIL 25, 2019.

LEGEND:

- US ARMY CORPS CHANNEL
- SUGGESTED NAVIGATION CLEAR CHANNEL
- SINGLE POINT MOORING
- DESIGN VESSEL

0 125' 250' 500'

SCALE: 1" = 250'

York Harbor/River Study

Town of York, Maine

GEI Consultants

HARBOR AREAS 5 & 6
CONCEPT LAYOUT 2

Project 1903595 | SEPTEMBER 2019 | Fig. 3

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2. AERIAL PHOTO FROM NEARMAP, DATED APRIL 25, 2019.

LEGEND:

- US ARMY CORPS CHANNEL
- SUGGESTED NAVIGATION CLEAR CHANNEL
- SINGLE POINT MOORING
- DESIGN VESSEL

0 125' 250' 500'

SCALE: 1" = 250'

York Harbor/River Study

Town of York, Maine

GEI Consultants

HARBOR AREA 4
EXISTING CONDITIONS

Project 1903595 | SEPTEMBER 2019 | Fig. 4

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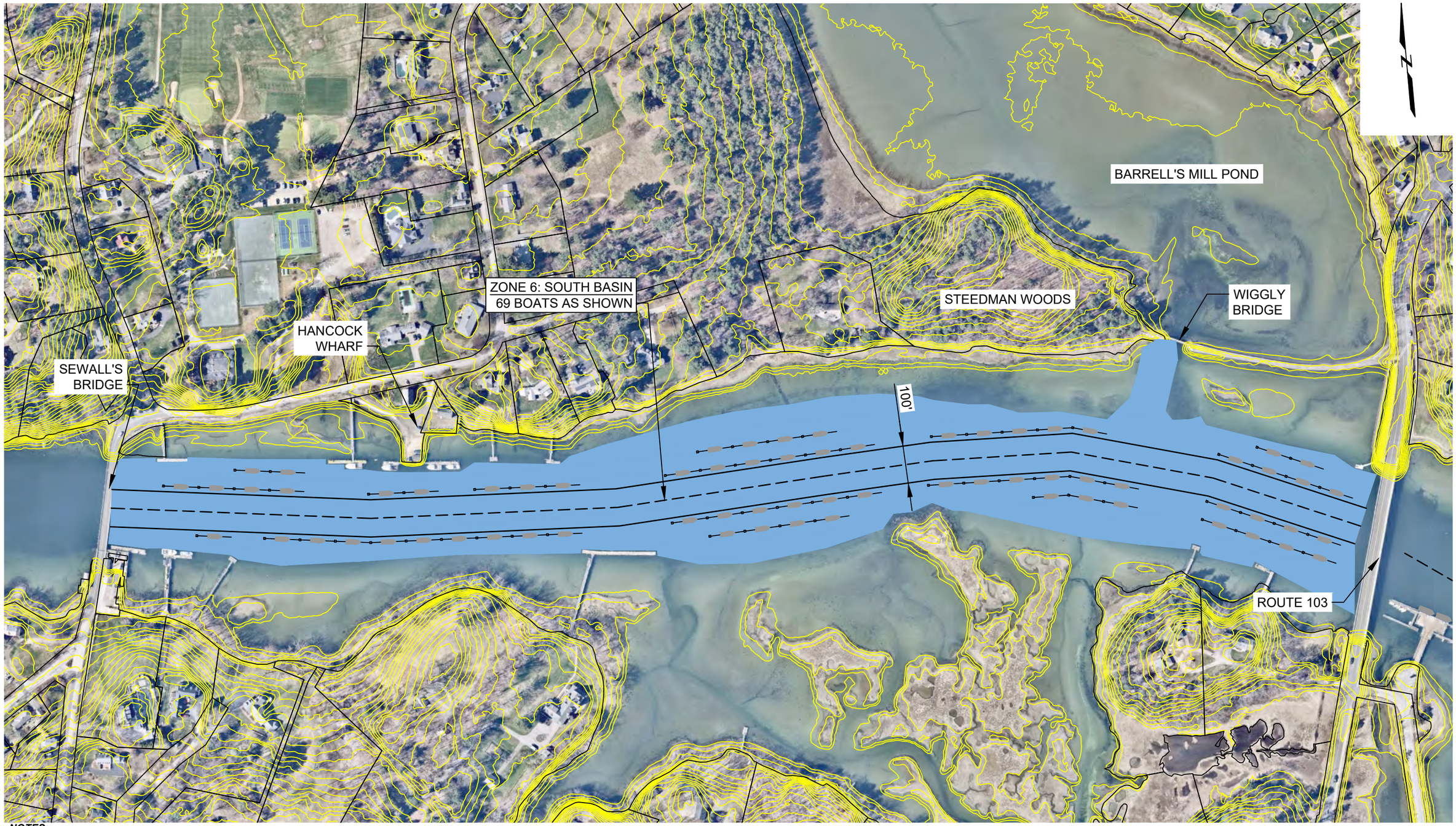

NOTES:

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SOURCE:

1. FEDERAL CHANNEL LIMITS AND CHANNEL MARKERS BASED ON 2017 USACE YORK HARBOR MAINTENANCE DREDGING PLAN.
2. AERIAL PHOTO FROM NEARMAP, DATED APRIL 25, 2019.

LEGEND:

- US ARMY CORPS CHANNEL
- SUGGESTED NAVIGATION CLEAR CHANNEL
- SINGLE POINT MOORING
- DESIGN VESSEL

0 125' 250' 500'

SCALE: 1" = 250'

York Harbor/River Study	GEI Consultants	HARBOR AREA 4 CONCEPT LAYOUT
Town of York, Maine	Project 1903595	SEPTEMBER 2019 Fig. 5

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NOTES:

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SOURCE:

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2. AERIAL PHOTO FROM NEARMAP, DATED APRIL 25, 2019.

LEGEND:

- US ARMY CORPS CHANNEL
- SUGGESTED NAVIGATION CLEAR CHANNEL
- SINGLE POINT MOORING
- DESIGN VESSEL

0 100 200

SCALE: 1" = 100'

York Harbor/River Study

Town of York, Maine

GEI Consultants

GOODRICH PARK
KAYAK ACCESS
CONCEPTS

Project 1903595 | SEPTEMBER 2019 | Fig. 6

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