

South Shore Site Readiness Study

Final Report

September 28, 2021

Acknowledgments

South Shore Site Readiness Study partners:



South Shore Economic Development Corporation, a subsidiary corporation of the South Shore Chamber of Commerce



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Contents

1	Introduction	... 04
2	Summary of the Analysis	... 12
3	Observations and Conclusions	... 20
4	Next Steps	... 31
5	Appendix	
	Memorandum: Selection of Example Properties	... A4
	Memorandum: Example Property Background Information	... A12
	Memorandum: Hypothetical Build-out Projections for Example Properties	... A36
	Memorandum: Hypothetical Water and Wastewater Projections for Example Properties	... A58

1 Introduction

1.1 Study Overview

Throughout the Greater Boston region, proactive planning for growth and investment is critical to encourage compact, sustainable, and well managed patterns of settlement that complement the existing assets of a municipality and strengthen the community. Water and wastewater systems are foundational infrastructure elements to support the type of settlement patterns that are most sustainable. The water and wastewater infrastructure already in place in the region requires regular maintenance and investment to meet existing needs. And, it is even more critical to proactively plan in locations where water and wastewater infrastructure needs and constraints may be present. In the South Shore, water and wastewater capacity is one of the leading factors that limit development and growth potential. These improvements and investments could be supported, in part, through closely coordinated development investments. This study is a first step to better understand the specific constraints and opportunities presented by the water and wastewater infrastructure in the South Shore, with broader applicability throughout the region.

The origin of this study came from the South Shore Economic Development Corporation. It identified a corridor along Route 3 that has seen development in the past, but may be a location that could support future development. The corridor passes through the five municipalities that became the focus of this study (Weymouth, Hingham, Norwell, Rockland, and Hanover). Each municipality may be constrained by the different water and wastewater infrastructure that is currently present. This corridor runs roughly between Route 53 in Hanover in the south and Weymouth in the north and generally bordered by Route 53 on the east side of Route 3 and over to Union Point on the west side. In order to analyze properties in this corridor, the study had to evaluate total water and wastewater services available for each of the five municipalities. The findings or recommendations may prove valuable to this specific area and to other communities exploring water and wastewater solutions.

In order to explore and analyze the water and wastewater constraints and opportunities, this study identified six example properties in the towns of Hanover, Hingham, Norwell, Rockland and Weymouth. The six example properties were analyzed with hypothetical build-out scenarios to provide a foundation for the water and wastewater analysis and recommendations. The evolution of the Union Point development planning and its future impact on water and wastewater considerations in the region was also considered as part of this study. This report identifies approaches to water and wastewater solutions that would help to address future infrastructure needs and create future development opportunities for key properties in the South Shore. The recommendations focus on the actions that are necessary to encourage investments and potential partnerships that will help to address infrastructure and future growth.

Study Goals

The goals of this study were as follows:

- Explore the water and wastewater infrastructure in the South Shore municipalities of Hanover, Hingham, Norwell, Rockland and Weymouth,
- Define the characteristics of the most appropriate areas for smart growth development and redevelopment based on example properties in these municipalities,
- Provide an analysis of the opportunities and constraints related to water supply and wastewater capacity in the participating municipalities.

Partners

The study partners include the South Shore Economic Development Corporation, South Shore Chamber of Commerce, MassDevelopment, Metropolitan Area Planning Council (MAPC), and Weston & Sampson. This project team advanced the work and engaged with project stakeholders including planning staff and leadership in the municipalities of Hanover, Hingham, Norwell, Rockland, and Weymouth, as well as property owners and developers associated with the selected example properties in these municipalities.

Funding Sources

The study was generously funded by the South Shore Economic Development Corporation, a subsidiary corporation of the South Shore Chamber of Commerce, MassDevelopment's Site Readiness Program, and technical assistance funding from the Metropolitan Area Planning Council.

1.2 Study Process

The study process was unique in that it was focused on the technical aspects of both infrastructure and development centered on water and wastewater constraints in the South Shore. The process involved stakeholders planning for the future of infrastructure in the region and the potential development of example properties. The process was not focused on engaging the broader community in this high level planning for potential future infrastructure needs. The process did build upon previous community processes that have occurred in each of the five participating municipalities through the identification of example properties based on previous planning efforts. The results of this study will be used to inform future community discussions around the infrastructure, growth, and development in the South Shore. The process involved close coordination with the following core team members and partners.

Core Team Engagement

The Core Team for the study led the analysis and worked in close coordination throughout the study process. The Core Team included the South Shore Chamber of Commerce, MassDevelopment, MAPC, Weston & Sampson, and two Chamber members from the development community. The Core Team met monthly through the duration of the study and provided guidance as the work was advanced. The principal components of the analysis and process were led by two members of the Core Team, MAPC and Weston & Sampson. The individual members of the Core Team are included below with their affiliations:

- Peter Forman, President & CEO, South Shore Chamber of Commerce
- Amanda Gregoire, VP Real Estate Services, MassDevelopment
- Betsy Cowan Neptune, Former Chief of Economic Development, MAPC
- Martin Pillsbury, Director of Environmental Planning, MAPC
- Josh Fiala AICP AIA LEED AP, Principal Planner, MAPC
- Tara McManus PE, Team Leader, Weston & Sampson
- Laurie Toscano, Team Leader, Weston & Sampson
- Gabe Crocker, Crocker Design Group
- Thomas Berkley, Senior VP Development and Operations, Union Point Development Company

Partner Engagement

The study process involved close coordination between the project partners throughout a series of study phases. The first phase of the process was the selection of example properties, followed by the calculation of hypothetical build-out scenarios for the example properties, then calculation of the water demands and wastewater capacity and needs of the example properties, and finally extrapolation of issues and recommendations based on this analysis and process. The partner meetings involved staff from the five municipalities involved in the study including Hanover, Hingham, Norwell, Rockland, and Weymouth. These meetings helped to guide the analysis and communicate initial findings and recommendations. Additional coordination occurred between the owners or developers of the six example properties that were selected for the specific analyses included in this study. An initial coordination discussion with each property owner occurred, followed by a discussion of the study process and initial conclusions.

1.3 Study Area

Municipalities

The study area targeted the five municipalities who agreed to partner in this effort. All of the analysis and the selection of example properties occurred within Hanover, Hingham, Norwell, Rockland, and Weymouth. The water and wastewater concerns explored in this study are not

unique to the targeted municipalities. These conditions are relevant to the entire South Shore and apply to other subregions of the Boston metropolitan region as well. Limitations to development in the five municipalities subject to this study include difficulties identifying adequate water supply and wastewater disposal capacities. The South Shore Site Readiness Study has been undertaken to look at specific example properties for potential future development for the purpose of examining these infrastructure limitations and defining potential solutions. The study does not seek to suggest a certain level of development or uses for particular properties, but aims to identify the water and wastewater challenges at the sites as a tool to better understand the long term needs of the region. Additionally, water resource boundaries are not the same as municipal boundaries so there are often regional opportunities that may be identified when studying these broader systems. The conclusions and recommendations of the study have broader applicability beyond these municipalities, but the analysis is grounded in the specific context of these municipalities and the example properties selected within them.

Example Properties

Example properties for this study were identified within this subarea of the South Shore. The identification of example properties was performed by MAPC through the review of previous planning documents in Weymouth, Rockland, Norwell, Hingham, and Hanover combined with conversations with municipal leadership and planning staff. The potential opportunity properties identified through this process defined six areas within the municipalities that each had a cluster of properties that provided a potential development and infrastructure investment opportunity. A map of these clusters is included in Section 2 of the report, the six clusters include:

- Properties in the vicinity of Route 53/Route 139 in Hanover
- Route 3 near Exit 13 and the Hanover Mall vicinity in Hanover and Norwell
- The vicinity of Commerce Road in Hingham and Rockland
- The vicinity of Route 3 around Exit 14 and Accord Park Drive in Norwell and Rockland
- Bristol Brothers properties near Old Derby Street in Weymouth and Hingham
- South Weymouth Naval Air Station properties in Weymouth and Rockland.

1.4 Site Readiness Program Context

The Site Readiness Program, administered by MassDevelopment, aims to increase the Commonwealth's inventory of large, well-located, project-ready sites; to accelerate private-sector investment in development projects; and to support the conversion of abandoned sites and obsolete facilities into clean, actively-used, tax-generating properties. In its first four years, the program has awarded approximately \$10.4 million to 48 projects in almost every region of the Commonwealth. This program is now part of the Community One Stop for Growth, a single application portal and collaborative review process for community and economic development

grant programs that make targeted investments based on a Development Continuum. This process streamlines the experience for the applicant and better coordinates programs and staff on engagement and grant making. It will also reorients the State from a passive reviewer of funding requests to an active partner in economic development strategy, priorities, and investment.

In this case the Site Readiness Program is being leveraged to study an infrastructure readiness issue that impacts investment in the South Shore. Solutions for the water and wastewater capacity would increase the inventory of large, well-located, project-ready sites.

Current Studies and Initiatives

Current and recent studies and initiatives of the five municipalities involved in this study were reviewed in order to better understand the context of water and wastewater infrastructure and potential development opportunities.

From Hanover's recent studies the following documents were reviewed:

- Hanover Open Space Residential Cluster Design Bylaw (2019)
- Hanover Master Plan (2018)
- Hanover Hazard Mitigation Plan (2016)
- Hanover Open Space and Recreation Plan, 2008-2012 (2008)
- Town of Hanover "Build-out Base Map" (2006)

From Hingham's recent studies the following documents were reviewed:

- Town of Hingham Hazard Mitigation Plan (2016)
- Hingham Master Plan Update (2014)
- Town of Hingham Open Space and Recreation Plan, 2009-2016 (2009)

From Norwell's recent studies the following documents were reviewed:

- Norwell Hazard Mitigation Plan (2020)
- Town of Norwell Housing Production Plan (2019)
- Norwell Economic Growth Plan (2018)
- Norwell Open Space and Recreation Plan, 2012-2019 (2012)
- Norwell Open Space and Recreation Plan 2005-2010 Appendices (2005)

From Rockland's recent studies the following documents were reviewed:

- Town of Rockland Community Resilience Building Workshop Summary of Findings (2019)
- Town of Rockland Open Space and Recreation Plan 2018 Update (2018)
- Rockland Housing Production Plan (2016)

From Weymouth's recent studies the following documents were reviewed:

- Open Space and Recreation Plan (2020)
- Town of Weymouth Housing Production Plan (2018)
- Town Master Plan (2001)

Other non-municipal documents and recent studies were also reviewed including:

- South Shore 2030 Housing Initiative Year in Review (2019)
- South Shore 2030 Housing Report (2017)
- South Shore 2030 Infrastructure Report (2017)
- The importance of housing supply to the South Shore (2017)
- South Shore 2030: Choosing Our Future (2016)

1.5 Water Infrastructure Context

Existing Water Supply Conditions

To adequately document the existing conditions related to water supply and distribution in the study area, the Core Team reviewed information available through the Massachusetts Department of Environmental Protection (MassDEP) including Water Management Act (WMA) permitted, and registered source information, and Annual Statistical Reports on water use trends in each municipality. Some supplemental information was also obtained from each of the individual municipalities regarding specific distribution system information and/or town policies. The following summaries provide a snapshot of the water infrastructure, capacity, and demand in each of the five study municipalities. One of the immediate observations is how decentralized the water infrastructure and management is in most of these municipalities.

Town of Hanover

The Town of Hanover Water Division provides drinking water to approximately 15,000 people through three groundwater treatment plants. Each water treatment plant (WTP) is located in the South Coastal Watershed. The combined Water Management Act (WMA) authorized daily annual average withdrawal volume from these three plants is 1.38 million gallons per day (MGD). Historically, Hanover has withdrawn water above their authorized volume, although they have been focused on reducing their water losses and in 2019 reported withdrawing 1.25 MGD. For proposed new developments, once water demand projections are provided by the developers, the Water Division can evaluate its ability to provide additional water based on potential source and treatment plant limitations, WMA authorized withdrawal volumes, and potential prior commitments to provide water to approved development projects. The condition of the existing water mains will also need to be evaluated in order to determine if the mains have the integrity and capacity to meet the fire flow and domestic water needs of the proposed development.

Town of Hingham

The Town of Hingham now owns the Weir River Water System (WRWS) which provides drinking water to approximately 30,500 people in the winter and 41,000 in the summer in Hingham, Hull, and North Cohasset. The various groundwater and surface water sources are all located in the Boston Harbor Watershed and piped to a single water treatment plant located in Hingham.

The combined WMA authorized daily annual average withdrawal volume for these sources is 3.51 MGD. Over the past five years, the water system has withdrawn an average of 3.24 MGD and in 2019 reported withdrawing 3.16 MGD. For proposed new developments, once water demand projections are provided by the developer, the WRWS can evaluate its ability to provide additional water based on potential source and treatment plant limitations, WMA authorized withdrawal volumes, and potential prior commitments to provide water to approved development projects. The condition of the existing water mains will also need to be evaluated in order to determine if the mains have the integrity and capacity to meet the fire flow and domestic water needs of the proposed development.

Town of Norwell

The Town of Norwell Water Department provides drinking water to approximately 11,500 people through two groundwater treatment plants. The Washington Street WTP is located in the South Coastal Watershed and the Grove Street WTP is located in the Boston Harbor Watershed. The combined WMA authorized daily annual average withdrawal volume from these two plants is 1.14 MGD with the potential to increase up to 1.21 MGD if additional WMA permit requirements are met. Over the past five years, the water system has withdrawn an average of 0.942 MGD and in 2019 reported withdrawing 0.923 MGD. For proposed new developments, once water demand projections are provided by the developer, the Water Department can evaluate its ability to provide additional water based on potential source and treatment plant limitations, WMA authorized withdrawal volumes, and potential prior commitments to provide water to approved development projects. The condition of the existing water mains will also need to be evaluated in order to determine if the mains have the integrity and capacity to meet the fire flow and domestic water needs of the proposed development.

Town of Rockland

The Abington & Rockland Joint Water Works provides drinking water to approximately 34,000 people in the Towns of Abington and Rockland through two surface water treatment plants located in the South Coastal Watershed and one groundwater treatment plant in the Taunton Watershed. The combined WMA authorized daily annual average withdrawal volume from these three plants is currently 3.11 MGD with the potential to increase up to 3.36 MGD if additional WMA permit requirements are met. Over the past five years, the water system has withdrawn an average of 2.742 MGD and in 2019 reported withdrawing 2.719 MGD. For proposed new developments, once water demand projections are provided by the developer, the Joint Water Works can evaluate its ability to provide additional water based on potential source and treatment plant limitations, WMA authorized withdrawal volumes, and potential prior commitments to provide water to approved development projects. The condition of the existing water mains will also need to be evaluated in order to determine if the mains have the integrity and capacity to meet the fire flow and domestic water needs of the proposed development.

Town of Weymouth

The Town of Weymouth Water Department provides drinking water to approximately 54,000 people through two water treatment plants from a combination of groundwater and surface water sources all located in the Boston Harbor Watershed. The combined WMA authorized daily annual average withdrawal volume from these two plants is 5.00 MGD. Over the past five years, the water system has withdrawn an average of 4.516 MGD and in 2019 reported withdrawing 4.501 MGD. For proposed new developments, once water demand projections are provided by the developer, the Water Department can evaluate its ability to provide additional water based on potential source and treatment plant limitations, WMA authorized withdrawal volumes, and potential prior commitments to provide water to approved development projects. For decades, Weymouth has considered the Massachusetts Water Resources Authority (MWRA) as a potential source for the water needed to redevelop the former South Weymouth Naval Air Station. Plans in the past have studied MWRA water for only that portion of the Town. However, within the past year Weymouth Mayor Bob Hedlund began the process to evaluate whether Weymouth should consider joining the MWRA to provide water to the entire town for a variety of environmental, water quality, and recreational benefits. The condition of the existing water mains will also need to be evaluated in order to determine if the mains have the integrity and capacity to meet the fire flow and domestic water needs of the proposed development.

1.6 Wastewater Infrastructure Context

Existing Wastewater Management Conditions

To adequately document the existing conditions related to wastewater management and available treatment and discharge capacity in the study area, information available through the United States Environmental Protection Agency (US EPA) was reviewed for wastewater treatment facilities (WWTF's) with a National Pollutant Discharge Elimination System (NPDES) surface water discharge permit and through MassDEP for WWTF's with a Groundwater Discharge Permit. Where available, recent discharge monitoring reports were reviewed to estimate potential remaining capacity. Some supplemental information was also obtained from each of the individual communities regarding specific collection system information and town policies for their sewer system, where applicable. The following summaries provide a snapshot of the wastewater infrastructure in each municipality

Town of Hanover

The Town of Hanover does not currently have a centralized wastewater management system (sewer). Existing development in Hanover relies predominantly on septic systems located on each property for wastewater treatment and disposal. Several larger developments and commercial properties have privately owned and operated wastewater treatment facilities of varying size with permitted groundwater discharges for the treated effluent. While in the past the Town has examined the option of creating a centralized sewer system and municipal wastewater treatment facility to serve the Route 53 corridor, there are no current plans to proceed with implementation phases, and wastewater management continues to rely on individual property owners.

Town of Hingham

The Town of Hingham does currently have two separate centralized wastewater management systems (sewer districts). The North Sewer District serves approximately 2,500 businesses and residences in northern Hingham along the coast and flows directly to the Massachusetts Water Resources Authority (MWRA) system for treatment and discharge. The Weir River Sewer District serves approximately 275 residences in the northwest section of town. Flow from this area, combined with approximately 300 residences in Cohasset is transmitted to the Town of Hull WWTF.

Town of Norwell

Similar to Hanover, the Town of Norwell does not currently have a centralized wastewater management system (sewer). Existing development in Norwell relies predominantly on septic systems located on each property for wastewater treatment and disposal. One larger development in Norwell has a privately owned and operated WWTF with a permitted groundwater discharge for the treated effluent. Wildcat Hill WWTF, located on Highfield Lane, treats approximately 24,000 gallons per day (gpd) of flow from this limited residential area.

Town of Rockland

The Town of Rockland does currently have a centralized wastewater management system (sewer). The Rockland municipal sewer system currently serves approximately 5,000 businesses and residences throughout the Town and transmits flow to the Rockland WWTF (located on Concord Street) for treatment and surface water discharge. The current permitted capacity for the Rockland WWTF is 2.5 million gallons per day (mgd), however the sewer system experiences significant inflow & infiltration, which taxes the existing facility and requires high-flow management actions to mitigate impacts. The Rockland WWTF also receives flow (up to 110,000 gpd) from the adjacent Town of Abington. In late 2019, the Town of Rockland contracted to have a Comprehensive Wastewater Treatment Plant Assessment and Evaluation performed. The findings of that effort are not yet finalized, but will likely include recommendations to improve the facility and restore capacity.

Town of Weymouth

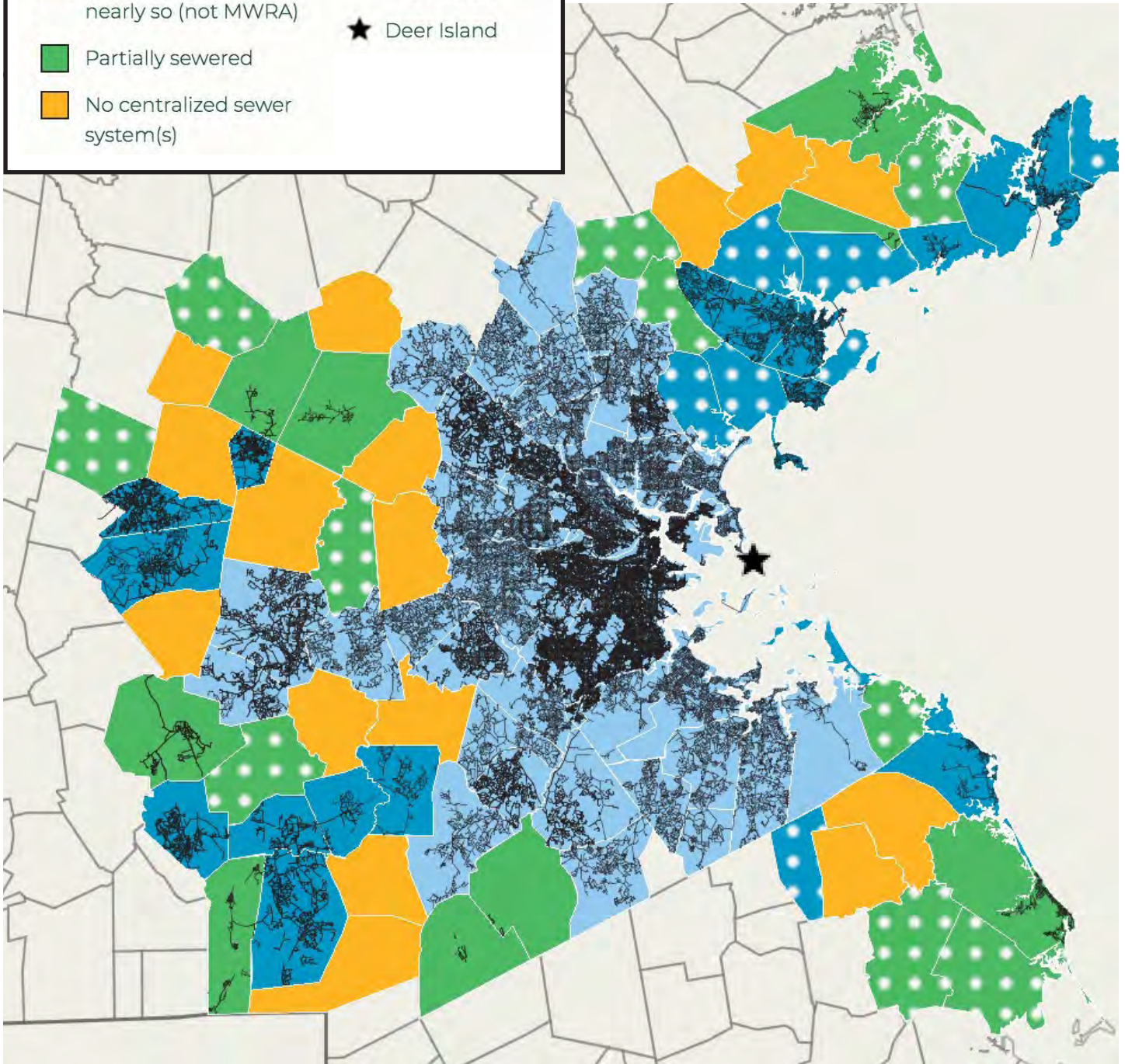
The Town of Weymouth is an MWRA municipality and all wastewater is transmitted to the MWRA system through multiple connections throughout the City. Weymouth currently contributes approximately 8.48 mgd to the MWRA.

Regional Wastewater Management

On the following page, these five municipalities are placed within the regional context. MAPC built on work previously conducted by MassGIS to define a basic data standard and compile data from municipalities, the U.S. Geological Survey, and the MWRA to depict wastewater management across the 101 municipalities that comprise the region. As can be seen on the map, wastewater infrastructure limitations are not only present in the South Shore, but also occur on the North Shore, and the southwest and northwest quadrants of the region. Most municipalities in the fully sewered category are served by the Massachusetts Water Resources Authority (MWRA), which sends wastewater to the Deer Island Wastewater Treatment Facility for processing.

Wastewater Management

- Light blue square: Fully sewered, or nearly so (by MWRA)
- Dark blue square: Fully sewered, or nearly so (not MWRA)
- Green square: Partially sewered
- Orange square: No centralized sewer system(s)
- Black line: Sewer line
- Open circle: Sewer line data unavailable
- Black star: Deer Island



2 Summary of the Analysis

2.1 Overview and Purpose

Six properties in the South Shore were selected as examples of potential development opportunities to explore through this study. The selection of specific properties enabled the exploration of potential hypothetical build-out scenarios for each example property and the analysis of water and wastewater constraints and opportunities based on these examples. The identification of example properties was performed by MAPC through review of previous planning documents in Weymouth, Rockland, Norwell, Hingham, and Hanover combined with conversations with municipal leadership and planning staff. Through this process 25 potential example properties were identified and then narrowed to six example properties that would be analyzed as part of the study. The 25 potential example properties form six clusters of properties that are geographically grouped together. In order to identify examples that were representative of larger opportunities, one example property was selected from each of these six clusters. The conclusions that are drawn from these six examples could be reasonably assumed to apply to other similar properties that are located nearby.

The following process and analysis was performed for each example property to investigate water and wastewater constraints and opportunities in the South Shore. Once the example property was identified the property information was explored through previous studies, available GIS data, and interviews with the property owners. Two hypothetical build-out scenarios were created for each example property based on the current zoning limitations and an additional hypothetical build-out scenario that explored development potential beyond current zoning. The build-out scenarios were then used to project water and wastewater needs and identify solutions. The findings and recommendations of this study are generalized from the more specific exploration of these example properties. The analysis of the example properties was conceptual in nature and developed to better understand the infrastructure limitations. This study does not represent specific planning or potential outcomes for any of the example properties.

2.2 Selection of Example Properties and Adjacent Clusters

The following map on page 14 shows all of the properties identified through the review of previous planning documents and conversations with municipal leadership and planning staff. Twenty-five potential example properties were identified across the five municipalities.

Through the mapping of these potential example properties across the five municipalities, six clusters of properties were identified and assisted in the identification of appropriate examples for this study. The six clusters of properties are evident on the following map and include:

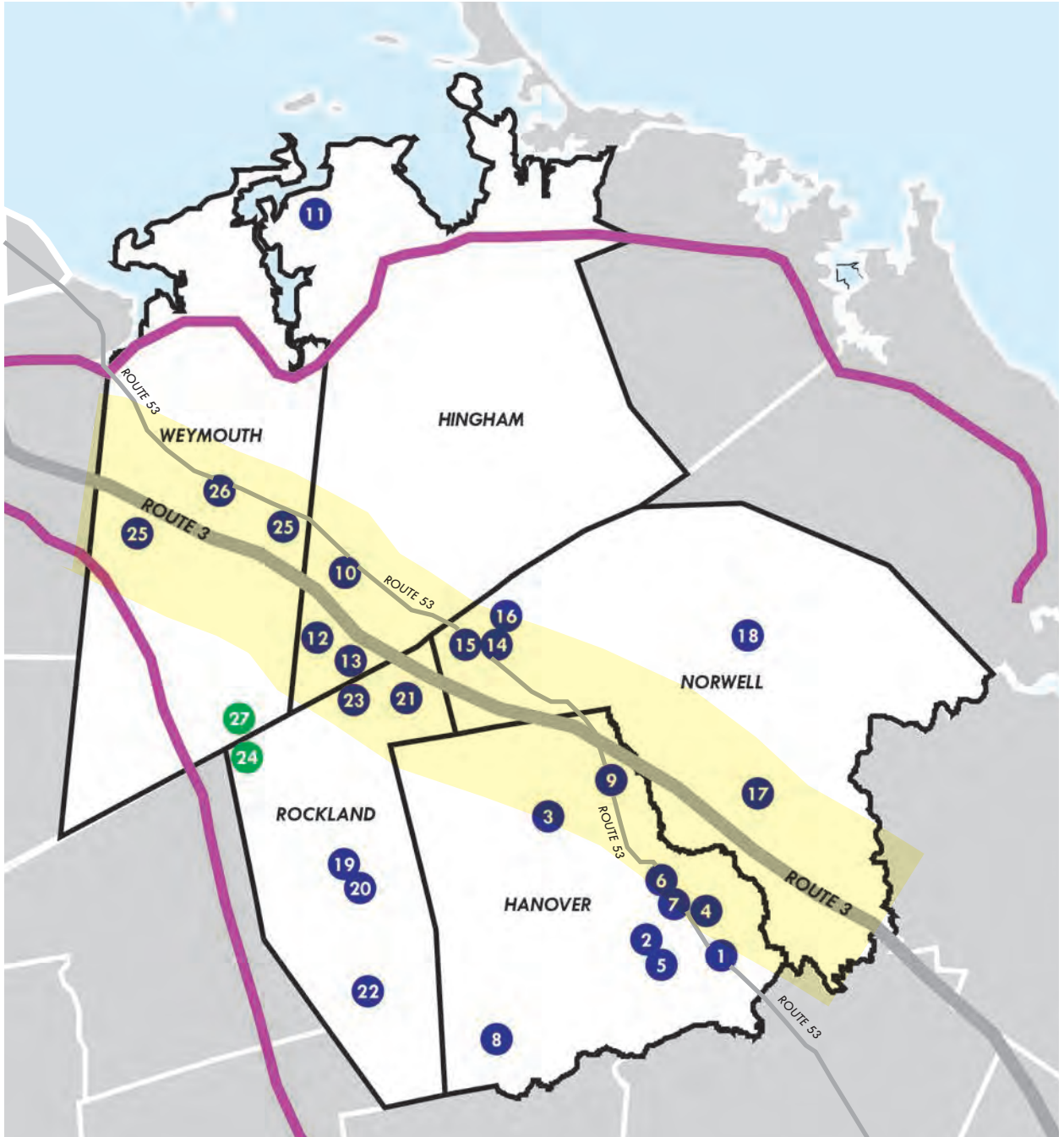
1. Route 53/Route 139 vicinity properties (Hanover)
2. Route 3 Exit 13/Hanover Mall vicinity properties (Hanover and Norwell)
3. Commerce Road vicinity properties (Hingham and Rockland)
4. Route 3 Exit 14 Accord Park Drive Vicinity properties (Norwell and Rockland)
5. Bristol Brothers properties near Old Derby Street vicinity (Hingham and Weymouth)
6. South Weymouth Naval Air Station properties (Rockland and Weymouth)

Within these clusters, the property characteristics of potential example properties were reviewed relative to property selection criteria that were identified further narrowed the properties. The property selection criteria included the following and were intended to select a variety of example development opportunities and circumstances based on the following:

- Current zoning
- Existing uses
- Past property/area uses
- Availability of water supply and wastewater treatment and discharge
- Surrounding context
- Representative of typologies
- Roadway access/transit
- Properties that leverage other opportunities around them
- Provide good examples that reinforce the South Shore Chamber's 2030 Housing Plan

Additional review for each property was performed relative to the following considerations, including the willingness of property owner to participate in this study and the MassDevelopment Site Readiness program criteria suggesting properties should include some industrial and commercial uses, with some suitable for high-tech manufacturing. Other encumbrances were reviewed at a high level based upon available GIS data for each property including a review of the presence of rare species, physical development constraints, environmental contamination, wetland features, topography, or other encumbrances.

Six example properties were selected based on the review of this information for the identified property clusters. The six properties are located within each of the five municipalities involved in the study and represent a variety of the property clusters shown on the preceding map. Each example property has been given a name based on its location for the purposes of this study. This name may not match the formal property name used by its owners. The six example properties include:



- Cardinal Cushing Rear Property, 405 Washington Street Rear, Hanover
- Unicorn Development Property, Blue Spruce Lane Rear, Hanover
- South Shore Park Property, 0 Southeast Expressway, Hingham
- Wildcat Lane Property, Pleasant Street, Norwell
- Land behind Home Depot, 0 Pond Street, Rockland
- Bristol Brothers Properties, 0 Pleasant Street, Weymouth

The example properties are representative of other properties in the Study Area that present both similar opportunities and similar infrastructure constraints that can be informed by the analysis that was performed. Additional information for each example property can be found in the Appendix. A summary of the analysis performed on each of the example properties follows.

2.3 Hypothetical Build-out Scenarios

Hypothetical build-out scenarios and projections were developed in order to analyze the constraints and opportunities associated with water and wastewater infrastructure on the example properties. The hypothetical build-out scenarios defined a range of potential outcomes that would need to be accommodated by water and wastewater solutions. No single property may develop as projected in these hypothetical scenarios, but the projections provide a potential range of the types of development opportunities for these example properties and indicate the type of development that may occur on other nearby properties of similar characteristics. It is important to reiterate that the development scenarios are hypothetical rather than prescriptive for these properties, with the goal of determining water demands and wastewater capacity needed to facilitate development. While these calculations result in concrete numbers for potential development yields, the yields themselves are not the focus of this work, the yields are a part of the process to examine the potential infrastructure needs and solutions. The calculations are specific enough to facilitate the assessment of infrastructure needs and have been prepared for that purpose. The detailed results of the build-out scenarios can be found in the Appendix.

The first step in examining water and wastewater infrastructure constraints was to define how much infrastructure is needed to serve hypothetical and projected development that could potentially occur. For each example property, two hypothetical build-out scenarios were developed to define potential water and wastewater infrastructure constraints and to analyze potential infrastructure solutions. The first scenario developed a hypothetical build-out projection that complies with the

current zoning constraints of the property. The second scenario developed a hypothetical build-out projection that goes beyond the constraints of the current zoning and is based on a more dense development with a development program that is derived from conceptual level discussions with the property owners or potential developers of the property. Other factors not considered as a part of this work may determine the development yields that are possible on any of the subject properties including the owner's plans for the property, the municipality's regulations, the community response to a development proposal, and the real estate market's absorption of the future development.

The method used for the current zoning built-out scenarios that were zoned residential was a mathematical approach to determine the number of single-family residential lots that could be defined on the study property as determined by the current zoning and property constraints. The method used for the other non-residentially zoned properties was a mathematical approach that derives total build-out based on a generalized effective floor area ratio (FAR) to calculate hypothetical potential commercial area. The variables used in the equation for these calculations vary depending on the zoning characteristics of each property. The build-outs were based on calculations and did not involve the creation of conceptual layouts. Conceptual layouts would help to further define the potential build-out and provide a check for the calculated ranges, but were not a part of the scope of this study.

The second development scenario for each example property went beyond the limitations of the current zoning characteristics. This is an important build-out yield to calculate as the build-out under current zoning may not represent a scenario that maximizes the use of these properties. To better assess the infrastructure needs, it is important to develop a build-out yield that is a closer approximation of a maximum build-out. The approach to this alternative set of development programs was generally framed by discussions with the property owners to reflect the scale and type of development that may be considered on the subject properties. In some cases, this scenario, unconstrained by current zoning, also reflects outcomes which may be more likely under a Chapter 40B comprehensive permit process. This approach to the calculations produced the greatest potential build-out yield and the difference in development program and yield is tracked in a summary table that compares current zoning build-out to the unconstrained build-out. Again, the focus of this study was not to determine the future development potential of any one property, but to derive build-out yields that are reasonably realistic to analyze water and wastewater infrastructure.

In addition to the two types of hypothetical build-out scenarios, each example property was calculated based on three distinct geographic areas. The first geographic area was the single primary property that was selected. The second geographic area was the combination of several abutting properties that were adjacent to the primary property and under the same ownership as the primary property. Not all example properties had an abutting property that could be assembled for a larger opportunity. The third geographic area was the compilation of potential hypothetical build-out of a similar character and density on the surrounding cluster of properties that were also identified as having development potential. The results of each of these hypothetical build-out scenario calculations are detailed in the Appendix.

Following up on the hypothetical build-out scenarios, potential projections for water demand and wastewater flows that would be generated from these types of example developments were estimated. As discussed above, while these projections seem very precise, they are based on hypothetical mixes of residential, commercial, and industrial development and have been provided only to better justify the various orders of magnitude for infrastructure limitations. In addition to the size of a potential development project, changes in types of use will also affect the amount of water demand that the project will require and thereby the amount of wastewater that will be generated. While these projections are specific only to the scenarios that have been run, the purpose was to provide specific examples of water and wastewater needs that could correspond to the broader development potential across each municipality and collectively in the South Shore.

2.4 Hypothetical Water Projections

The process undertaken to develop the water demand projections was conservative but tempered with some factors to account for Massachusetts-based water conservation measures. The very detailed analysis culminated in the creation of a spreadsheet that was used to consistently calculated values for the different build-out scenarios on the various example properties. The full calculation methodology and water demand and wastewater flow summary results are included in the Memorandum: Hypothetical Water and Wastewater Projections for Example Properties in the Appendix of this report. Design phase considerations outside the scope of this study such as fire protection flow requirements and system hydraulics (water supply, storage and pipeline volume and capacity) were not included in this preliminary analysis. Ranges of water demand for the five municipalities were compared to available permitted capacities in the existing water supply

systems to further identify potential future needs for drinking water with the hypothetical build-out scenarios.

All of the municipalities in this analysis have very comprehensive public water supply systems including two regional collaborations; the Abington and Rockland Joint Water Works which provides water to the towns of Abington and Rockland and the Weir River Water System (WRWS) which provides water to the towns of Hingham, Hull, and the northern portion of Cohasset. As discussed in earlier sections of this report, while the capacity of water supply varies between communities, each municipality has the ability, albeit minimal in some cases, to provide water for future development. The re-occurring theme of the comparison on the water supply side of available capacity was that there is a potential that some of the lower density scenarios of future build-out (under existing zoning) could be met. However, the higher intensity uses (build-out under future potential zoning revisions and expanded cluster build-out) would require increases in the available water supply or another alternative to meet the projected need. While source water may be available, the municipalities have expressed concern with providing water to any future development due to treatment plant limitations or limited water availability and/or water quality during times of drought. With respect to water infrastructure, each municipality has an existing water distribution pipeline network that abuts the majority of properties in town, including the six example properties. However, each municipality expressed a concern with the ability of their existing water system to treat and convey water to future development due to aging or limited capacity infrastructure. Overall, each town would need to review their existing water supply and infrastructure needs to determine their ability to provide water to existing customers as well as potential future development. The towns would also need to review water requests for proposed developments that are currently under review in greater detail and confirm upcoming and future development would not displace other allocated uses.

2.5 Hypothetical Wastewater Projections

A similar process was undertaken to estimate the wastewater flow projections based on the example properties' hypothetical build-out scenarios. Again, the estimates are conservative for this hypothetical planning, but do take into consideration consumptive uses (irrigation, etc.) from the water demand calculations that would not require treatment and discharge. Wastewater projections were added to the detailed spreadsheet that was used to consistently calculate the values for the different build-out scenarios on the various example properties. The full results are

included in the Memorandum: Hypothetical Water and Wastewater Projections in the Appendix to this report.

Unlike the water supply side, existing sewer systems are limited in this region. One of the municipalities in this analysis, the Town of Rockland, has an existing, centralized sewer system for wastewater treatment and disposal. Another municipality, the Town of Weymouth, transmits existing wastewater to the regional MWRA sewer system for treatment and disposal. The three additional municipalities, the towns of Hanover, Hingham, and Norwell, do not have any public or regional sewer in existence at this time. Several independent private sewer and treatment systems do exist in Hanover and Hingham. Ranges of wastewater estimated for the example properties were compared to available permitted capacities in the existing systems, where applicable, to further identify potential future needs for wastewater management with the hypothetical build-out scenarios.

The re-occurring theme of the comparison on the wastewater management side of available capacity was that more comprehensive sewer systems or an expansion of the regional system would be needed for most of the hypothetical build-out scenarios. There is a potential that some of the lower density scenarios of future build-out under existing zoning in Rockland and Weymouth could be met with extension of the existing sewer systems, however the towns would need to review this in greater detail and confirm it would not displace other allocated uses. The higher intensity uses (build-out under future potential zoning revisions and expanded cluster build-out) would require increases in available wastewater treatment and disposal or another alternative to meet projected need.

3 Observations and Conclusions

3.1 Smart Growth and Infrastructure

Although this study is specifically focused on water and wastewater infrastructure constraints and opportunities, the infrastructure should be viewed more broadly as enabling and supporting desirable land use patterns in the region. Water and wastewater infrastructure sets the foundation for the types of development patterns that can occur. The adequate capacity and management of resources through this infrastructure is necessary and ubiquitous. How these systems are designed and implemented can influence the economic prosperity, social equity, and environmental sustainability of a region. These systems are required to support a stronger, more sustainable South Shore.

Among, municipal master plans guiding future investments, the South Shore Chamber has developed the *South Shore 2030: Choosing Our Future* plan as a comprehensive approach to promote economic growth, job creation, and stronger communities with interesting, diverse, and attractive places to live, work, and enjoy a high quality of life. South Shore 2030 identified six strategies necessary for growing the economy. The six identified strategies include:

- Attract a younger workforce and be more welcoming to families
- Strengthen public and private sector collaboration to build stronger communities
- Strengthen and retain existing businesses in key target sectors
- Promote new business startups and entrepreneurship on the South Shore
- Recruit new businesses to the region
- Improve infrastructure capacity

Improving infrastructure capacity is highlighted specifically and is required to support most of the other identified strategies. Water and wastewater infrastructure is necessary to encourage more transit-oriented development in the South Shore and to leverage transit-oriented housing into broader commercial and economic activity. In addition to providing a basic foundation for investment, water and wastewater infrastructure also informs the type of development that is possible. The compact, walkable, vibrant, and active places that help to attract a younger workforce and be more welcoming to families may not be possible without the right water and wastewater infrastructure. Several specific features of growth and development patterns that are dependent on and related to the infrastructure are described below.

Encouraging Compact Mixed-use Development

South Shore 2030 envisions stronger centers of activity in most communities with smarter planning and management of available resources to support new housing and improved walkability, increased recreational opportunities closer to home or work, and much stronger employment opportunities in the area. The water and wastewater systems shape the feasibility of this vision. For example, the type of wastewater system employed on a property can place limitations on the amount of density, or compactness of the development. The density and compactness of the development patterns may reduce walkability and affect the mix of uses that is possible. Water and wastewater solutions designed for each individual property decrease the density of development and increase the distance between buildings and uses. The distance is required to properly space and buffer wellheads, water sources, and septic fields. In addition, water and wastewater facilities located on site occupy substantial portions of developable land and reduce the acreage that could be more productively devoted to the development program and limit the potential for compact, mixed-use developments.

As the South Shore 2030 vision acknowledges, the model of compactness for the South Shore is suburban. It is likely to be spread over a larger area than might be found in a city and will require some driving. However, the creation of more walkable, compact, and dense nodes of mixed activity would strengthen the quality of life and economic success of the South Shore. Encouraging these types of nodes of activity near transit has the potential to be transformative. Based on the analysis of the example properties, water supply and wastewater management capacity that is currently available in most communities would place limitations on both the density and the compactness of the development and reduce the likelihood that this vision could be implemented.

Zoning as Growth Management

In a municipality where water supply and wastewater management limitations exist, community members may feel that the infrastructure constraints protect the community from growth and the its perceived impacts. From this perspective, potential infrastructure investments and improvements may not be well supported as they can be viewed as an invitation to growth or that the constraint managing growth will be removed. However, the infrastructure constraints may be limiting the type of development and redevelopment investments that are desired by a community as well. The type of investments that will bring needed housing, job opportunities, and added amenities that will be attractive to the workforce and new residents. Instead of leaning on infrastructure constraints as the default growth management tool, a municipality's zoning code should be reviewed and updated as the most effective growth management tool. This zoning review and update should occur alongside infrastructure investments that may be needed to maintain and improve current systems.

Growth management anticipates and guides growth and development to align with the community vision and to achieve community priorities. A town-wide master plan is a critical tool of growth management that defines the community vision, priorities, and goals. Once a master plan process has documented and articulated the community preferences for the future, these preferences should then be integrated into the zoning districts and requirements of the town's bylaw. This type of approach aligns what is possible, in terms of growth and development, with how the community would like to see future investment and development patterns evolve. This alignment is independent from the water and wastewater systems and uncouples the infrastructure from growth management. Investments and improvements in infrastructure can then be explored and evaluated for their return on investment, sustainability, and environmental impact. This also allows infrastructure needs to be identified and resolved independent of growth and development concerns.

Mutual and Strategic Investments

In general terms, the status quo suburban development model for growth contributes to inefficient and unsustainable infrastructure use. The property value per unit of infrastructure is lower in suburban communities when compared to that of cities. In other words, a block of water main in the suburbs may serve far fewer buildings than in the city, but the pipe and the cost of its maintenance and operation would be similar. This disparity is a result of the comparative differences in the density of development and the availability and value of the land. In general, at urban densities infrastructure investments in sidewalks, sewers, and transit systems are more fiscally sustainable. At rural densities, it is easier to serve the needs of each property individually with an on-site private well and septic system. In between those two opposites, the most appropriate infrastructure solutions for the suburban context is less clear. A suburban development pattern that is low density and automobile dependent may not be dense enough to support city-like infrastructure, but may be too high of a density to properly isolate and separate on-site water and wastewater systems. A suburban system may also reach natural capacities associated with the available water resources. Additionally, all of these infrastructure systems, regardless of context, require maintenance and improvements to remain in good working order and in compliance with evolving regulations and safety standards.

Building more at the traditional lower suburban densities will not help to address potential capacity, maintenance, or improvement needs. However, encouraging nodes of higher density, compact, mixed-use development may be a substantial enough development investment that it could contribute to infrastructure investments and solutions, rather than just connecting to current systems. Collectively, these types of shared public and private investments in infrastructure could be mutually beneficial and support strategic growth that helps to both address infrastructure needs and aligns development with the vision and growth parameters established by the community through comprehensive planning and zoning modifications.

The step diagrams that follow for Water Supply Management Alternatives and Wastewater Management Alternatives illustrate this relationship between scale, density, and infrastructure solutions. The least dense and most land intensive development models do not require innovative solutions that are strategic and mutually beneficial. These types of properties have been served adequately by conventional approaches for many years. The overall capacity in the water systems in particular may not be able to support endless growth based on this model of development, but these simple infrastructure solutions will continue to be adequate. The other infrastructure solutions available require a certain scale of development to be able to support the investment in water and wastewater solutions. For some of the solutions, the costs would be too high for a single development project, but the development project could be a partner and contributor to the costs associated with the solution. For example, for a regional public water supplier to be viable, several municipalities and large-scale development opportunities may need to partner to make the costs of the initial connections feasible. Private development could be a partner in advancing improved public infrastructure. These potential improvements in public infrastructure would not only benefit the private development partners, but would be beneficial to the provision of public infrastructure and services.

Development Review and Assessment of Infrastructure Systems

The initial investment and life-cycle costs of water and wastewater systems need to be considered during the process of development review. Ideally, the costs of all available infrastructure systems should be compared and evaluated, including costs that would be the responsibility of the developer or land owner and costs that would be the responsibility of the municipality or infrastructure provider. A few approaches could be used by both municipalities and developers to more proactively assess water and wastewater infrastructure options during the pre-development and approval processes. For municipalities, exploring alternative and shared water and wastewater solutions could be part of the requirements of a pre-development or approval checklist for large development projects. The threshold for a large development project may need to be determined by the municipality based on recent permit data. This checklist may ask developers and property owners to have an exploratory conversation with municipal staff to discuss infrastructure constraints and possible solutions for the property. This may help to communicate the solutions that fall under private or public ownership, and collaborative approaches that are outlined in the following section. Another approach for a municipality to initiate exploration of these solutions would be to create an overlay zoning district based on the community vision established through a comprehensive planning process. For example, a water and wastewater overlay district may require property owners to seek combined wastewater solutions that establish multi-property de-centralized wastewater treatment plants or that require additional water conservation features to reduce water supply capacity concerns.

3.2 Water and Wastewater Alternative Solutions

Most people do not spend much time thinking about water and/or wastewater, so before cost expenditures or rate increases are brought to a community conversation, it is important to communicate what alternatives can be considered to provide a firm foundation for solutions that are readily supported. This section of the report provides some general information on water and wastewater alternatives and compares them to one another. As described in more detail below, the example properties and their build-out scenarios are integrated into the alternative solutions to provide context and to add tangible application to the alternatives.

Plateau Diagrams

To better communicate with a range of audiences, a graphical representation was created for the various alternatives for water supply and wastewater treatment and disposal. These graphics are included in the sections below with a summary description of the information shown and a correlation to the various development scenarios used as examples in this study.

Description of Water Supply Management Alternatives Plateau Diagram

As can be seen in the diagram on page 26, there are four main alternatives available for water supply: Individual Wells, Public Water Supplier/Community or Non-Community, Public Water Supplier, and Regional Public Water Supplier. The teal bar across the top of the diagram shows the ranges of typical ownership for each water supply alternative and the text between this bar and the blocks provides additional details about requirements for the various build-out scenarios created as examples for this study. Based on the maximum development average daily flow rates, the hypothetical development scenarios for the study parcels are further collated with the various options in the corresponding-colored text below the blocks.

The majority of the example properties in each of the five towns are provided drinking water by municipally owned public water suppliers. The first block in the plateau graphic is designated for minimal build-out developments that would typically require less than 10,000 gallons per day (gpd) of water. Similar to the property in Norwell, these types of development would normally consist of single-family or small multi-family homes or commercial/industrial properties that have less than 15 service connections and serve less than 25 people with potable drinking water. If connection to the existing public water system is not an option, these smaller developments would normally construct individual drinking water wells to support the development. Other than the two Norwell scenarios, all of the other hypothetical build-out scenarios have projected water demands

greater than 10,000 gpd. Therefore, the individual wells alternative is not applicable for the other properties, so it is not considered a viable solution.

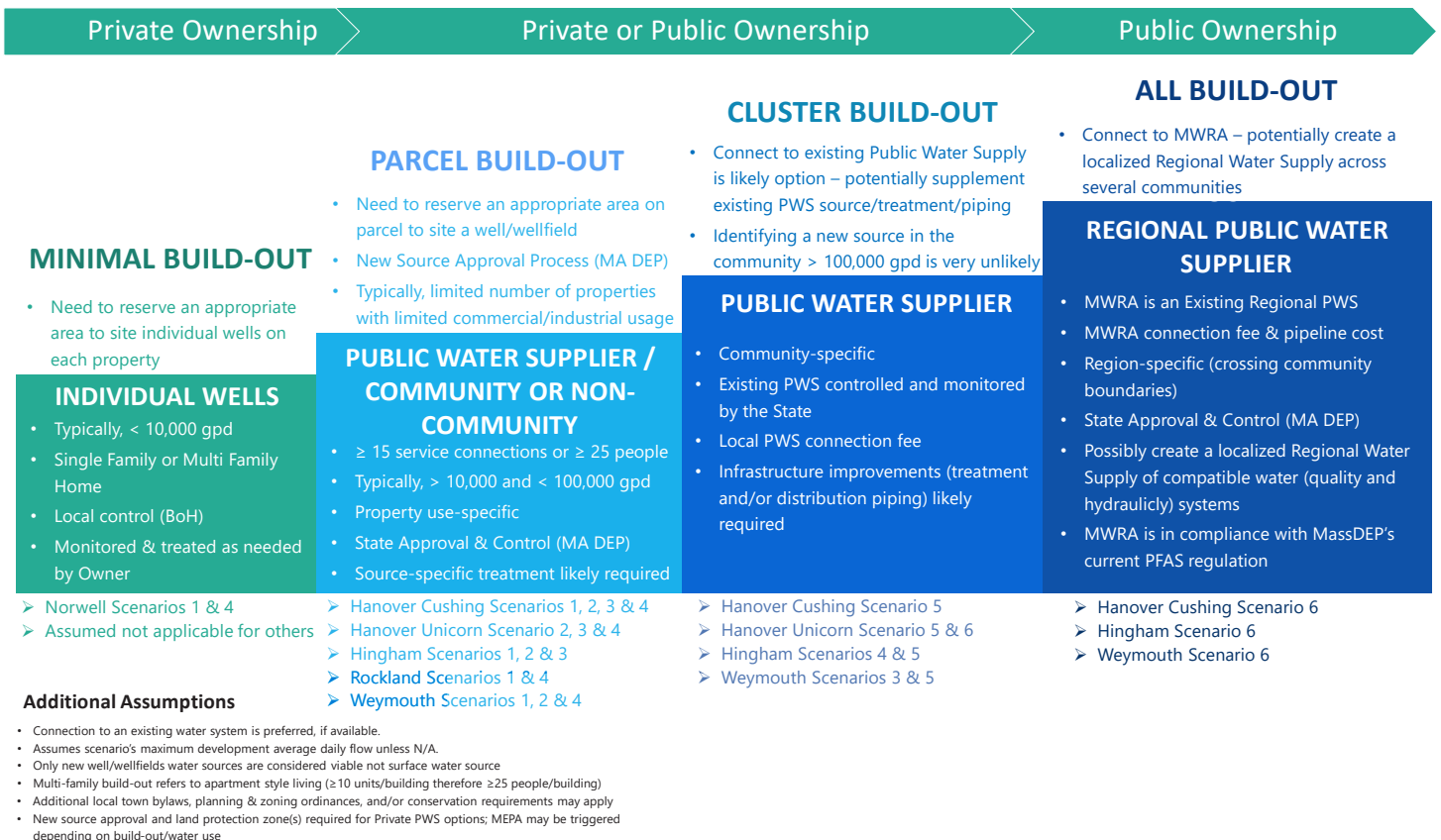
The second block represents parcel build-outs that would establish a public water system to provide water to a development that would typically require more than 10,000 gpd but less than 100,000 gpd. Types of water systems like this are broken out into Community and Non-community water systems. As defined by MassDEP, a Community water system serves at least 15 service connections used by year-round residents or regularly serves at least 25 year-round residents. A Non-Community water system is further classified as either Non-transient or Transient. A Non-transient Non-community water system has at least 15 service connections or regularly serves at least 25 of the same individuals or more approximately four or more hours per day, four or more days per week, more than 6 months or 180 days/year; such as a workplace providing water to its employees. A Transient Non-community water system has at least 15 service connections or serves water to 25 different persons at least 60 days per year. Some examples of these types of systems are restaurants, motels, campgrounds, parks, golf courses, ski areas, and community centers. The water demand volume and mixed-use property options corresponded with several build-out scenarios for each of the four remaining towns. Establishing a public water supply for developments such as these would require an initial investigation to determine a favorable hydro-geologic and permissible location(s) for a new groundwater source. Once a new source is located, the potential source would then need to go through MassDEP's new source approval permitting process, land protection zones would need to be established, and other local town bylaw, planning and zoning, and/or conservation requirements would need to be adhered to. This option would likely start out as a private ownership option with the potential to develop into a private/public partnership or transition fully to a public water system.

The third block represents cluster build-outs or larger community development that would require water demands greater than 100,000 gpd. Similar to the second block, the cluster build-out alternative would require establishing a public water system, if a new groundwater source was identified. However, as many municipal public water suppliers completed town-wide water supply investigations when their water sources and distribution systems were being developed, it is highly unlikely that a groundwater source greater than 100,000 gpd would be identified in the five towns. For this alternative, it is estimated that connecting to the existing municipal water system is the only viable option. This would also likely require a private/public partnership component to help supplement the existing water system with additional water source, treatment, and/or distribution (storage tanks and water mains) improvements.

The final block represents an all build-out scenario in which one or more municipalities would create a regional water system either across localized municipal boundaries or, as a farther-reaching benefit for the South Shore, by connecting to the MWRA's water system. The MWRA's water comes from the Quabbin and Wachusett Reservoirs which are both considered well protected and high-quality water sources. This alternative would require review of water quality blending potential with the existing municipal system(s) as well as a cost-benefit analysis comparing the existing municipal water system(s) improvement needs versus the MWRA connection and required infrastructure pipeline fees. The closest connection to the MWRA's water system is located in Quincy, Massachusetts. While Quincy is adjacent to Weymouth, the existing MWRA pipeline infrastructure is distant from the other study area communities. Any connection to the MWRA system would also require transmission through adjacent communities. Another consideration for this alternative is Union Point and the potential for Union Point to connect to the MWRA water system in the near future, which would improve the viability of this alternative.

Water Supply Management Alternatives

Types of Water Management for South Shore Site Readiness Build-out Scenarios



Description of Wastewater Management Alternatives Plateau Diagram

As can be seen in the diagram on page 28, there are four main alternatives available for wastewater management: On-site Septic Systems, De-centralized Wastewater Treatment Plants (WWTP) with Groundwater Discharge, Centralized/Community Wastewater Treatment Facilities (WWTF), and Regional/Multi-community Wastewater Treatment Facilities. There are also other emerging technologies that may someday change the landscape of wastewater management, including evaporation of effluent, however, currently this is not a proven alternative for consideration. The teal bar across the top of the diagram shows the ranges of typical ownership for each wastewater management alternative and the text between this and the blocks provides additional details about requirements for the various build-out scenarios created as examples for this study. The hypothetical development scenarios for the study parcels are further collated with the various options in the corresponding-colored text below the blocks.

One of the five municipalities in the study area, the Town of Norwell, relies exclusively on on-site septic systems for current wastewater management. While these systems do a fine job at managing wastewater treatment and disposal for an individual home or a small development, but the maximum flow allowed for these systems is a limitation to its use. That, coupled with the fact that treatment is dependent on the soils in the leaching field filtering out pollutants and proper maintenance (consistent pumping, etc.) of tank solids place limitations on the application of these systems. If these systems are located in an area that contributes groundwater eventually to water supply wells, excessive nutrients may accumulate over time, requiring a future need for increased treatment at the water supply.

Two of the municipalities in the study area, Hanover and Hingham, have properties that use private, de-centralized WWTP's to treat the wastewater generated on their sites and discharge it back to the ground to recharge the groundwater. The remainder of development in these two communities relies on on-site systems. The decentralized facilities provide a much higher level of treatment to the wastewater than on-site septic systems, as they have processes that remove pollutants and excess nutrients resulting in a cleaner effluent. These facilities do discharge the effluent in a similar manner as septic systems, however, state permits and consistent monitoring and reporting are required. This results in improved public health and environmental protection in the vicinity of the decentralized systems.

One municipality in the study area, the Town of Rockland, has a centralized/community sewer system and WWTF to treat the wastewater generated on the properties in the Town and discharge it back to a receiving water to recharge the surface water body. This recharge method is different than recharging the groundwater, but similarly requires a high level of treatment with multiple processes that remove pollutants and excess nutrients resulting in a very clean effluent.

One longer term action item for the towns without a community or regional sewer system would be to consider if a public WWTF could be sited and constructed to promote or support managed growth, development and/or re-development, while increasing the future level of wastewater treatment in that (or those) area(s) of Town.

The final block of the wastewater plateau diagram describes the multi-community or regional option. Weymouth is currently a member of the MWRA (Massachusetts Water Resources Association) regional sewer system. Wastewater from this community and many other member communities is transmitted to Deer Island WWTF for treatment and surface water discharge of effluent. Other communities in the study area may in the future consider connection to the MWRA system, however, remaining sewer capacity is limited, and the existing system is distant from the other study area communities and would require transmission through adjacent communities. Another form of this option may be to create an additional, new, multi-community WWTF with groundwater discharge in the region that is more centralized to the study communities.

Wastewater Management Alternatives

Types of Wastewater Management for South Shore Site Readiness Build-out Scenarios



MINIMAL BUILD-OUT

- Need to reserve areas on parcel for septic system
- Typically, one property owner

ONSITE SEPTIC SYSTEM

- $\leq 10,000$ gpd
- Local control (BoH)
- Limited treatment
- Monitored by Owner

> Norwell Scenarios 1 & 4

PARCEL BUILD-OUT

- Need to reserve areas on parcel for wastewater treatment plant (WWTP) and groundwater discharge (GWD)
- Typically, limited number of property owners

DE-CENTRALIZED WWTP'S with GWD's

- Typically, > 10,000 and < 100,000 gpd
- Property-specific
- State Control (MA DEP)
- Increased treatment
- Monitored by State Permit

> Hanover Cushing Scenarios 1, 2, 3 & 4
 > Hanover Unicorn Scenario 2, 3 & 4
 > Hingham Scenarios 1, 2, & 3
 > Rockland Scenarios 1 & 4
 > Weymouth Scenarios 1, 2, 3, 4, & 5

CLUSTER BUILD-OUT

- Need to reserve areas in vicinity for wastewater treatment facility (WWTF) and groundwater discharge (GWD)
- Typically, many property owners

CENTRALIZED/ COMMUNITY WWTF

- Typically, > 100,000 gpd
- Community-specific (may serve portions of adjacent communities)
- If GWD, State Control (MA DEP)
- If SWD, Federal Control (US EPA)
- Increased treatment
- Monitored by State/Federal Permit

> Hanover Cushing Scenarios 5 & 6
 > Hanover Unicorn Scenarios 5 & 6
 > Hingham Scenarios 4, 5 & 6
 > Weymouth Scenario 6

ALL BUILD-OUT

REGIONAL/MULTI-COMMUNITY WWTF

- Multi-community Centralized WWTF and GWD
- Typically, Intermunicipal (or other entity) Agreements required
- MWRA is an Existing Regional WWTF with limited wastewater capacity remaining
- Similar to Centralized WWTF option but across several communities
- Typically, > 1,000,000 gpd
- Region-specific (crossing community boundaries)
- If GWD, State Control (MA DEP)
- If SWD, Federal Control (US EPA)
- Increased treatment
- Monitored by State/Federal Permit

> Weymouth Scenarios may have a more feasible option to connect to the Existing MWRA Regional wastewater system, if system capacity constraints change

Additional Assumptions

- Connection to an existing wastewater system is preferred, if available.
- Assumes scenario's maximum development average daily flow unless N/A.
- Flow basis is regulatory for on-site systems, but typical for other options and based on per capita flows generated for this project.
- Additional local town bylaws, planning & zoning ordinances, and/or conservation requirements will apply.
- MEPA may be triggered depending on thresholds of specific project(s).

3.3 Water and Wastewater Considerations

Cost Benefit

While the range of potential costs increases as you move from left to right in ascending blocks of the plateau diagrams, benefits to public health and environmental protection also increase with each level of investment. Existing infrastructure systems require consistent operation, maintenance, and repair. Costs to support existing infrastructure are typically borne by the utility's ratepayers. Additionally, capital improvements due to changing regulations or the need for modernization/improvement will add to that cost burden as the systems continue to age. Some Commissions are hesitant to raise utility rates, which can lead to capital projects being deferred as they are unaffordable. There are opportunities to implement capital projects with hybrid financing scenarios, portioning out some of the costs to the tax base (those that have a general benefit), some to the user rates and some to betterments. There also may be an opportunity for communities to explore a surcharge on property tax bills for water and wastewater projects that are for the public good. These opportunities should be further developed for specific projects.

Future funding applicability will require comprehensive planning. With infrastructure awareness at the forefront of current government spending, it may be beneficial for communities to jointly consider requesting that MA DEP fund a regional planning effort for interested South Shore municipalities to build on analysis in this study and continue collaboration for a shared solution. This future study could further analyze the needs of current systems and investments needed to provide baseline information for cost comparisons of infrastructure solutions including maintenance, new requirements and regulations, and other needs. Data on rate setting in the region could be compiled and provide a baseline comparable for a multi-community alternative. This information could also explore available incentives, such as increased allowed density, or requirements to encourage multiple property collaboration for combined water and wastewater solutions.

Intermunicipal

This initial study has brought recognition to similarities between neighboring municipalities with regard to development and infrastructure limitations. Through the stakeholder participation process, the lines of communication have been established for continuing conversations regarding the need for increased water supply capacity and wastewater treatment and disposal capacity. The next steps will require collaboration to determine if communities in this study area can work together to resolve the capacity challenges to allow for managed growth.

Public/Private Partnerships

To achieve increased build-out potential, a public and private partnership would be beneficial for both water and wastewater considerations. On the water side, when considering the parcel

build-out alternative, in many cases the initial water source and infrastructure is completed by the private developer and then transitioned over to the public water system for ownership and/or operation and maintenance.

For the cluster and all build-out alternatives, the public water system will likely need assistance from the private developer(s) to upgrade their existing system or connect to the MWRA through Union Point, respectively. On the wastewater side, for future developments in areas where another area of a community could benefit from off-site wastewater management, there is an opportunity to partner and achieve multiple goals at once. One example of how partnerships have been successful in the past is having a developer make a significant portion of the capital investment and a community contributing by taking over future operation and maintenance of new infrastructure facilities. If appropriate land can be identified for GWD siting, oftentimes the community may consider participating in this component of the cost by using the power of eminent domain.

Private/Private Partnerships

Another option for future developments is a partnership between private parties. Since part of our audience for this study is developers (in addition to municipalities), this is an important opportunity to explore. Oftentimes there is some resistance to this because of potential competition or determining appropriate contractual and legal terms. However, if there is a situation where a potential water supply source is viable on one private developer's property, but they require land protections that cross over into another developer's land, an agreement for a shared water source may be the solution. On the wastewater side, this type of partnership may be formed if one property owner has a portion of their site that is conducive to effluent recharge and a partner property owner has a portion of their site that can be used to site a WWTP. In development, the less land that can be dedicated to infrastructure the more efficiently and profitably the remaining land can be used, so there is an opportunity for a balance to be found and mutual benefit achieved.

Regional Collaboration

The primary alternative reviewed for a regional water collaboration was a connection to MWRA's water system. This would require inter-municipal partnerships to convey the water through other towns and agreements with the MWRA for connection fees and associated infrastructure improvements. As previously mentioned, this alternative would be even more viable if Union Point connected to the MWRA water system. Organization of a multi-municipality conversation with MWRA to discuss potential future water connection would be beneficial to communicate in more detail the requirements and potential challenges associated with this alternative.

For decades, Weymouth has considered the MWRA as a potential source for the water needed to redevelop the former South Weymouth Naval Air Station. Plans in the past have studied MWRA water for only that portion of the Town, however. During the past year, Weymouth Mayor Bob

Hedlund began the process to evaluate whether Weymouth should consider joining the MWRA to provide water to the entire town. Under those circumstances, the change in water infrastructure would have other benefits, such as the Town's current drinking water sources could be converted to environmental and recreational resources. Herring could return to Great Pond, making Weymouth one of the largest herring spawning grounds on the East Coast of the United States. Swimming and boating could return to Whitman's Pond and Great Pond.

Weymouth residents would also benefit from the higher water quality of MWRA water, which has consistently been rated the highest quality of tap water in the United States. Additional water capacity from the MWRA would eliminate concerns over water use restrictions or bans, such as one Weymouth experienced in 2016.

"The concerns over water capacity are not new and only growing. The MWRA is the most accessible and abundant source of quality water. The Town, with the expertise of our DPW and engineering team, are working closely with the Southfield Redevelopment Authority (SRA) and the MWRA to help determine the Town's current and future capacity needs, including Union Point, and develop up to six alternatives for MWRA water supply. We will then analyze the costs and benefits for each alternative to determine which is the best solution for Weymouth and our residents.," said Mayor Hedlund. Weymouth officials continue to meet with state officials to further investigate the advantages of joining the MWRA as a town-wide water source.

South Shore Site Readiness Study

4 Next Steps

4.1 Implementation Strategy

In many ways this study points to the beginning of a larger and long term process to improve waster and wastewater infrastructure in the South Shore. The observations and conclusions resulting from the analysis of the example properties point to meaningful next steps and actions that should be coordinated across partners, these partners include at minimum the leadership and staff of the municipalities, the property owners and developers looking toward future investments in the South Shore, and the Chamber of Commerce and other entities supporting economic development there. The implementation strategy resulting from this study is, at its most basic level, to keep the conversation going among these partners and to identify the shared milestones that could help drive coordinated and mutually beneficial activity. The driving motivation behind this conversation has been illustrated by the example property analyses in this study; more options are available through shared and collaborative approaches than compared to a go it alone approach.

4.2 Potential Municipal Actions

Based on the conversations with municipalities throughout this process, many actions may already be underway, but should be emphasized or given a renewed focus in the context of water and wastewater infrastructure.

The first is increased communication and coordination within town departments, commissions, and leadership. Water supply and wastewater infrastructure in many communities is managed by a separate commission or department that is not always in close coordination with other core town functions such as planning, community development, public health, and town administration. The current population needs, community priorities articulated through a comprehensive plan, projected growth, development goals, and infrastructure challenges should be the topic of regular and transparent discussion between Select Boards, Water Commissions, Sewer Commissions, Water Departments, Sewer Departments, Planning Departments, Public Health Departments, and Town Administrators.

The second is continued outreach and discussion with members of the community regarding the challenges facing the municipality with water and wastewater infrastructure. Unlike roads and bridges, water and wastewater infrastructure is largely “out of sight” and therefore often “out of mind” until there is a problem that needs to be addressed. The public is often not aware of the challenges and costs of maintaining existing water and/or wastewater services, let alone planning for needed future upgrades due to regulations, replacement of older facilities, and accommodating planned growth.

The third communication and coordination recommendation would be extend this conversation from within a municipality to an external conversation that includes multiple adjacent municipal neighbors. One model for this may be to establish an internal working group focused on advancing coordination and shared understanding on water and wastewater infrastructure issues. One member of this working group could join an inter-municipal working group to advance regional coordination, guidance, and best practices. Multiple municipality water and wastewater systems are not a new concept with shared systems in use such as the Abington-Rockland Joint Water Works, and the Weir River Water System serving customers in Hingham, Hull, and Cohasset. The hope is that structuring these conversations will identify actions and priorities that are clear from the multiple perspectives involved and shared across municipal boundaries. Through this collaboration, joint systems with the benefits of economy of scale that occur could potentially be expanded in the future. If viable options are identified, the municipalities may be able to pursue feasibility studies and more technical analysis through the State Revolving Fund or possibly the additional Federal Infrastructure funding expected this year. These conversations could also serve as a forum for coordinating with land owners and developers on potential public private partnerships and collaborations to address infrastructure needs.

Municipalities could also review the feasibility of implementing a surcharge to assist with funding identified water infrastructure improvements. This type of funding mechanism enabled by Massachusetts General Law Chapter 40 Section 39M.

4.3 Potential Property Owners Actions

As seen in the individual example property analyses, there is a large gap between the potential build-out under current zoning and what could be built on many properties in the South Shore. As has been approached through many previous development processes, the property owners and developers must approach the municipalities with their vision for the property and advocate for zoning modifications to enable the investment. Based on the analysis, the water and wastewater infrastructure constraints need to also be determined and solutions advocated for at this early stage of development exploration.

This may include advocating for infrastructure investments with the community by offering supportive testimony at Town Meeting votes or other occasions where support from property owners is an important component. Property owners may also provide data and feasibility analysis that make the case for infrastructure improvements and highlight the economic benefits to the community. Opportunities may also be identified to partner with municipalities and nearby property owners to explore collaborative approaches to water and wastewater solutions. This may include partnering with municipalities on upgrading existing facilities or jointly developing new shared facilities that would benefit both the town and the participating private sector partners.

4.4 Potential Chamber or Other Stakeholder Actions

The South Shore Chamber of Commerce excels as a convener in the subregion. This role is in many ways, the most needed for the advancement of water and wastewater improvements in the South Shore. Through this role the Chamber could convene municipal partners for coalition building and strengthening partnerships and bring them together to explore potential opportunities for public and private collaboration. The Chamber could also focus on convening for public education on water and wastewater infrastructure needs and challenges facing the South Shore, and potential solutions that would require collaboration and public support. Finally, the Chamber could convene leadership at the legislative and state level to help build support and advocate for funding and public investment in water and wastewater needs, and administration of those funds in a flexible manner to address the needs of the South Shore communities.

The Chamber could also support future study in this area that would benefit all partners. One such effort identified through this work that could be useful would be a comparative cost analysis of the long-term life cycle costs associated with more conventional individualized water and wastewater infrastructure systems compared to more centralized, multi-municipality collaborative systems. This analysis could include both financial comparison and comparison of potential environmental and resiliency risks, as well as, the potential to support additional private investment. This type of analysis could also be used to evaluate current rate setting practices to better understand if rates are appropriately anticipating future investment needs for current systems.

**South Shore
Site Readiness Study**

Final Report

South Shore Site Readiness Study

Appendix

September 10, 2021

Acknowledgments

South Shore Site Readiness Study partners:



South Shore Economic Development Corporation, a subsidiary corporation of the South Shore Chamber of Commerce



Funding generously provided by:

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- South Shore Economic Development Corporation, a subsidiary corporation of the South Shore Chamber of Commerce
- Metropolitan Area Planning Council (MAPC) Technical Assistance

South Shore Site Readiness Study

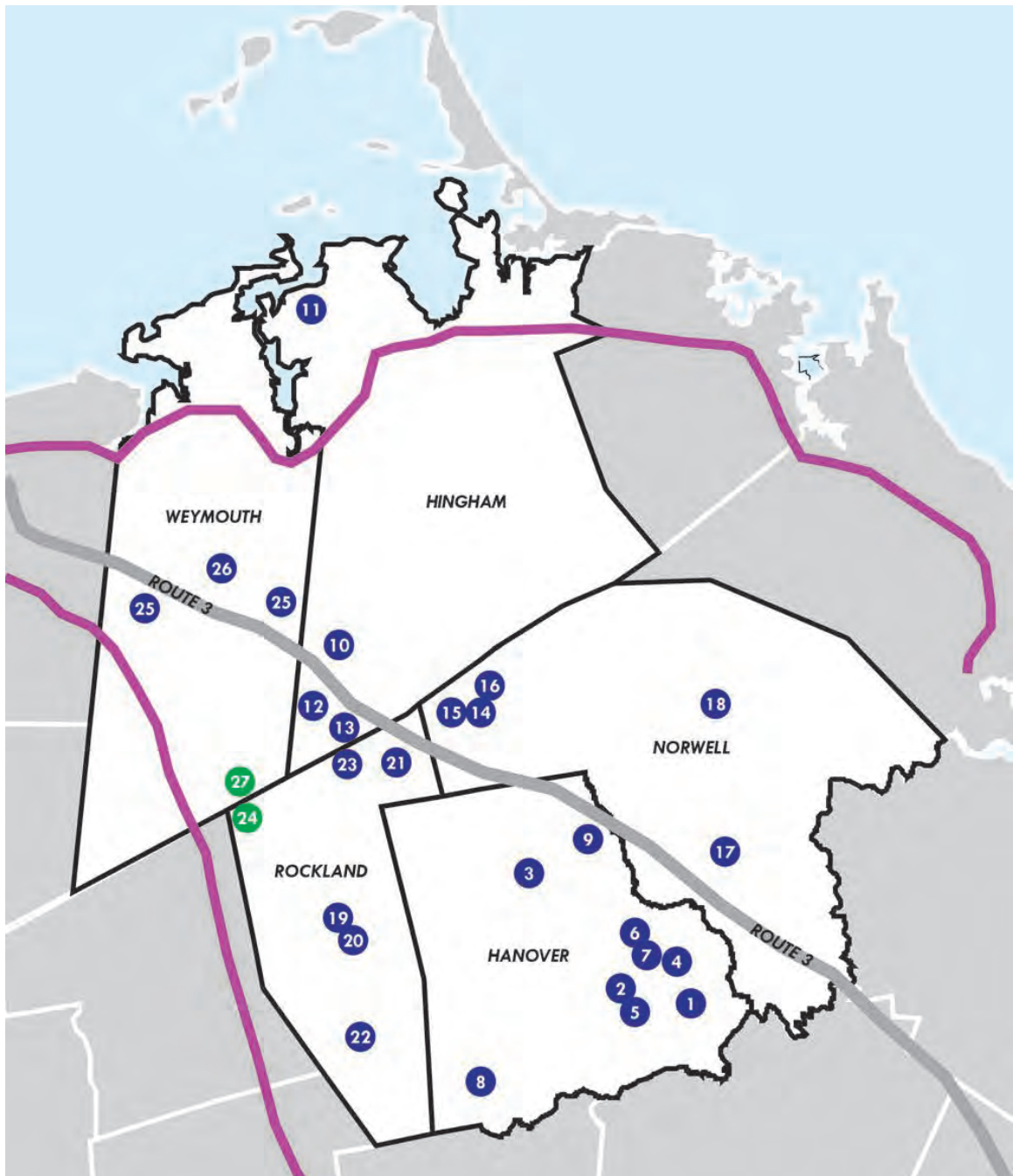
Contents

5	Appendix	
	Memorandum: Selection of Example Properties	... A4
	Memorandum: Example Property Background Information	... A12
	Memorandum: Hypothetical Build-out Projections for Example Properties	... A36
	Memorandum: Hypothetical Water and Wastewater Projections for Example Properties	... A58

Memorandum: Selection of Example Properties

Potential Site Candidates

The identification of potential site candidates was performed by MAPC through the review of previous planning documents in Weymouth, Rockland, Norwell, Hingham, and Hanover combined with conversations with municipal leadership and planning staff. The map and tables below show all of the sites identified through this process. The approximate site locations are shown on the map with numbers that correspond with the site descriptions and characteristics shown in the tables.



Through the mapping of these sites across the five municipalities, six clusters of sites were identified and assisted in the identification of sites for this study. The six clusters of sites are highlighted with yellow ovals on the following map and include:

1. Route 53/Route 139 vicinity properties (Hanover)
2. Route 3 Exit 13/Hanover Mall vicinity properties (Hanover and Norwell)
3. Commerce Road vicinity properties (Hingham and Rockland)
4. Route 3 Exit 14 Accord Park Drive Vicinity properties (Norwell and Rockland)
5. Bristol Brothers properties near Old Derby Street vicinity (Hingham and Weymouth)
6. South Weymouth Naval Air Station properties (Rockland and Weymouth)

Within these clusters reviewing site characteristics relative to site selection criteria that were identified further narrowed sites. The site selection criteria include:

- Zoning
- Existing uses
- Past site/area uses
- Availability of water supply and wastewater treatment and discharge
- Surrounding context
- Representative of typologies
- Roadway access/transit
- Sites that leverage other opportunities around them
- Provide good examples that reinforce the South Shore Chamber's 2030 Housing Plan

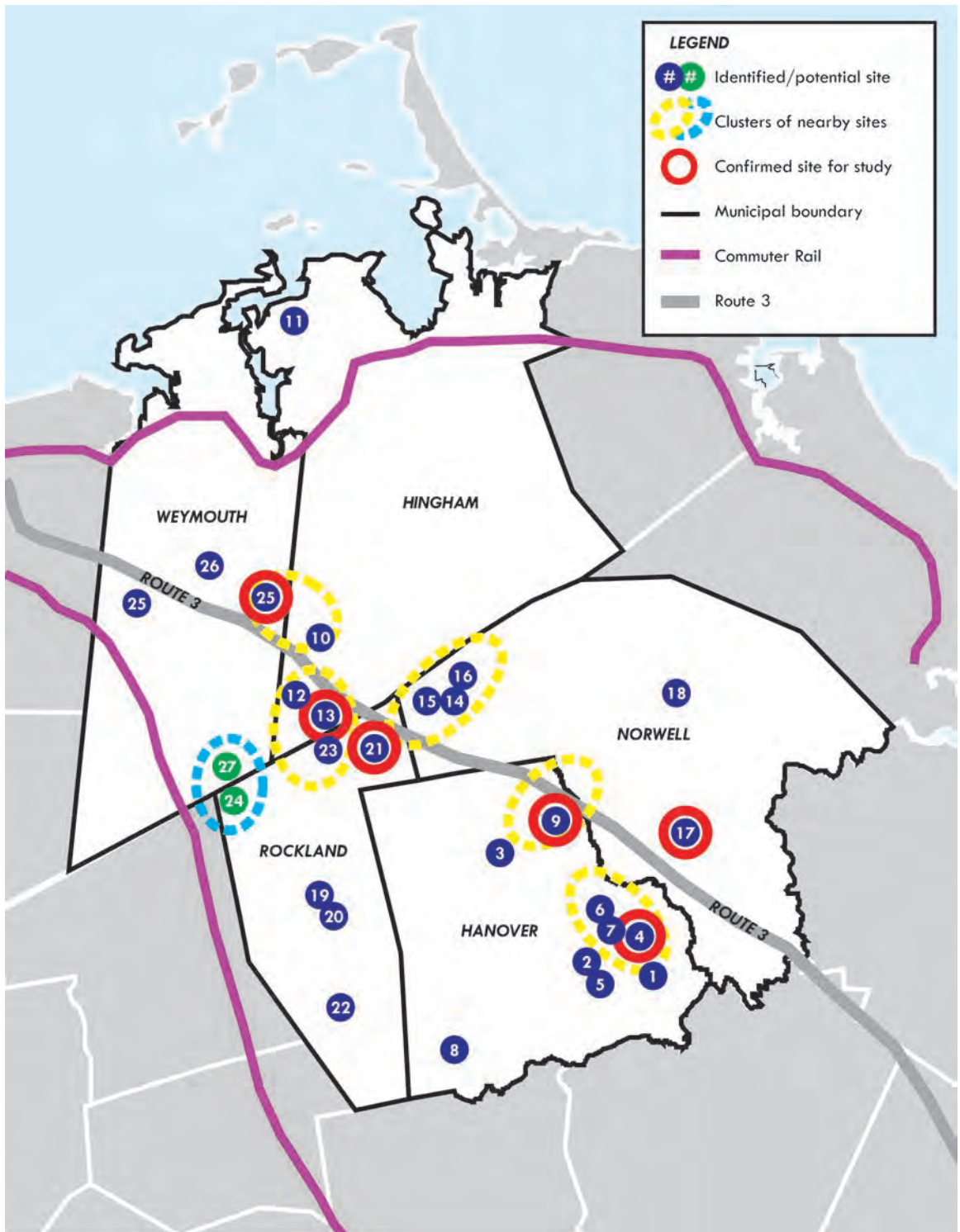
Additional review will be made relative to the additional considerations that include:

- Willingness of property owner
- Mass Development Site Readiness program criteria: The sites should include some industrial/commercial sites, with some suitable for high-tech manufacturing and other uses, not all residential or mixed-use
- Rare species
- Physical development constraints – contamination, wetland features, topography, other encumbrances

The map below shows the cluster of sites highlighted (yellow) and the individual sites to be studied within the clusters (numbers circled in red on map and rows highlighted in red on the tables). The six individual sites highlighted within these clusters include:

1. Map #9 – Blue Spruce Lane Rear, 20 acres, Hanover
2. Map #13 – South Shore Park, 161 acres, Hingham
3. Map #17 – Wildcat Lane Property, 74 acres, Norwell (not a part of one of the identified clusters)
4. Map #21 – Land behind Home Depot, 28 acres, Rockland
5. Map #25 – Pleasant Street, 31 acres, Weymouth
6. Map #4 Cardinal Cushing property, 139 acres, Hanover

The South Weymouth Naval Air Station “Union Point” (Map #24 and #27) sites will be used as a case study to inform the study of the six sites listed above, but will not be analyzed in the same way as the six sites listed above, given the current stage of development at the property and given the scale of the site.



Hanover

Map #	Name	Address	Acres	Current Owner	Current Use	Current Zoning	Source
Details verified – Potential Opportunity							
1	Salmond School property	188 Broadway	8.4	Town of Hanover	Town office for Public School District (former Salmond School)	Residence A	Open Space Residential Cluster Bylaw, Appraisal Report
2	Sylvester School	495 Hanover Street	21.0 (total) 3.6 (RFP)	Town of Hanover	Vacant	Residence A	Sylvester School RFP 2018
3	Former Curtis School site	848 Main Street	3.0	Town of Hanover	Vacant	Residence A	Master Plan
4	Cardinal Cushing property (rear portion of property)	405 Washington St Rear	139.0	Cardinal Cushing School	Active school at front, vacant at rear	Residence A	Norwell Coordination Call
5	St. Mary's (rear portion of property)	392 Hanover St	13.5	St. Mary's Roman Catholic Church	Active church at front, vacant at rear	Residence A	Norwell Coordination Call
6	Village Park	836 Washington Street	48.76	836 Washington Street Trust	Small commercial, rear vacant	Residence A, Limited Industrial	Hazard Mitigation Plan
7	Village Commons	0 Off Park Drive	58.89	FMNV Hanover Villages LLC	Vacant	Residence A, Limited Industrial	Hazard Mitigation Plan
8	Vacant sites in the Fireworks District	King St Rear	121.7	Town of Hanover	Conservation land	Residence A	Master Plan
9	Across from Hanover Mall	Blue Spruce Lane Rear	20.3+	Berry Realty Trust	Vacant	Residence A	Coordination Call - SSED
Details verified – No Apparent Opportunity							
NA	Former King St. School	624 Circuit Street	1.0	Private Owner	Single family home	Residence A	Master Plan
Details unable to verify							
NA	Fire Station 1 (dispose of property)	Unable to confirm	Unable to confirm	Unable to confirm	Unable to confirm	Unable to confirm	Master Plan p. 92
NA	Fire Station 3 (dispose of property)	Unable to confirm	Unable to confirm	Unable to confirm	Unable to confirm	Unable to confirm	Master Plan p. 92

Hingham

Map #	Name	Address	Acres	Current Owner	Current Use	Current Zoning	Source
Details verified – Potential Opportunity							
10	Bristol Brothers properties near Weymouth	0 Southwood Pointe Dr	118.2+ (multiple parcels)	Old Derby Nominee Trust	Vacant	Office Park	Hazard Mitigation Plan p. 51, Coordination Call
11	Hingham Shipyard - Russo Marine	335 Lincoln St	3.1	291 Mystic LLC	Marina	Waterfront Recreation	Hazard Mitigation Plan p. 51
12	South Shore Hospital	90 A Industrial Park Rd	5.3	90 Industrial Park JV LLC C/O A W Perry	Vacant	Industrial Park	Hazard Mitigation Plan p. 51
13	South Shore Park	0 Southeast Expressway	161.1	South Shore Industrial Park Trust	Vacant	Industrial Park	Hazard Mitigation Plan p. 51, 2014 Master Plan Update, Coordination Call
Details verified – No Apparent Opportunity							
NA	Hingham Shipyard Area – Old Building 19	319 Lincoln St	3.8	Hingham Shipyard Avalon	Multifamily housing	Waterfront Recreation	Hazard Mitigation Plan p. 51; 2014 Master Plan Update
NA	Anchor Plaza	211, 223, 225 Lincoln Street	1.9, 0.3, 3.2	Anchor Plaza Realty Trust	Commercial	Business	Hazard Mitigation Plan p. 51
NA	Bridges at Hingham	1 Sgt William Terry Dr	4.0	Hingham Terry Drive LLC	Assisted Living	Waterfront Recreation	Hazard Mitigation Plan p. 51
NA	Beal Street Residential Develop.	300 Beal Street	9.8	Bare Cove Investors	Multifamily housing	Office Park	Hazard Mitigation Plan p. 51
NA	Linden Ponds, Phase 3	300 Linden Ponds Way	108.5	Hingham Campus LLC	Senior Living Community	Residence E	Hazard Mitigation Plan p. 51
NA	Selectman's Housing	100 Beal Street	15.0	Hingham Housing Authority	Multifamily housing	Official and Open Space	Hazard Mitigation Plan p. 51
NA	South Shore Educational Collab.	75 Abington Street	8.25	Foxrock Research Realty	School	Industrial Park	Hazard Mitigation Plan p. 51
Details unable to verify							
NA	Hingham Square/Hingham Harbor	Unable to confirm	Unable to confirm	Unable to confirm	Unable to confirm	Unable to confirm	2014 Master Plan Update

Norwell

Map #	Name	Address	Acres	Current Owner	Current Use	Current Zoning	Source
Details verified – Potential Opportunity							
14	Accord Park	Accord Park Dr	5.5	Rose and Charles Tufankjian	Vacant	C-1	Coordination Call
15	101 Accord Park Drive	101 Accord Park Dr	Unable to confirm	Norwell Park LLC	Vacant Class B Office (redevelopment)	C-1	Economic Growth Plan
16	98 Accord Park Drive	98 Accord Park Dr	2.8	Alexander Argiros Trustee	Vacant auto retail (former Nissan dealership)	C-1	Economic Growth Plan
17	Wildcat Lane Property	Pleasant St	74.3	Town of Norwell	Vacant designated for affordable housing	Residence A	Housing Production Plan/ Hazard Mitigation Plan
18	Lincoln/Grove Street Property	Norwell Av (2 parcels)	2.1	Town of Norwell	Vacant for affordable housing	Residence A	Housing Production Plan
Details verified – No Apparent Opportunity							
NA	Area near Not-Your-Average-Joe's	111 Pond St	2.3	Charles Johnson Jr.	Restaurant	C-1	Coordination Call
NA	61 Accord Park Dr	61 Accord Park Dr	3.0	Accord Village LLC	Fully leased industrial building (redevelopment)	C-1	Economic Growth Plan
NA	Queen Anne Plaza	10 Pond St	17.0	Federal Realty	Commercial	B-4	Economic Growth Plan, Coordination Call
Details unable to verify							
NA	Norwell Commons	Unable to confirm	20.0	Unable to confirm	Unable to confirm	Unable to confirm	Hazard Mitigation Plan, 40B 200 units proposed in 2008

Rockland

Map #	Name	Address	Acres	Current Owner	Current Use	Current Zoning	Source
Details verified – Potential Opportunity							
19	Park Street warehouse redevelop.	76 Park St	1.1	Twenty-ten, LLC	Vacant	R4	Housing Production Plan
20	Lincoln School	99 Church St	1.7	Town of Rockland	Vacant	R4	Housing Production Plan
21	Land behind Home Depot	0 Pond St	28.6	Caparrotta Maurice Trustee	Vacant	H1	Housing Production Plan, 40B with eligibility letter/hearing open, need sewer
22	Land on Summer Street	0 Summer St, 0-Rear Summer St	15.6, 13.6	Richard and Leonora Delprete	Vacant	R1	Housing Production Plan
23	Commerce Rd	20 Commerce Rd, 0 and 968 Hingham St	16.8+	South Shore Indust Park Corp/A W Perry	Vacant	H1	Coordination Call
24	South Weymouth Naval Air Station	Unable to confirm	Unable to confirm	Unable to confirm	Unable to confirm	Unable to confirm	Coordination Call - SSED
Details verified – No Apparent Opportunity							
NA	Albion Street Senior Housing	101 Garden Terrace	4.6	Housing Auth.	Multifamily housing	R3	Housing Production Plan
NA	Land on Albion Court Current 40B	80 Norman St	13.3	Bryan McMillan	Vacant	R1	Housing Production Plan
NA	Emerson Shoe Loft	51 Maple St	3.7	51 Maple Street	Multifamily housing	I1	Housing Production Plan
NA	Back of Sandpaper Factory	83 East Water St	2.7	Sandpaper Factory	Mixed-use	I1	Housing Production Plan
NA	Mill site on Webster Street	379 Liberty St	2.25	Nelson Evelyn Trustee	Mixed-use	I1	Housing Production Plan
NA	McKinley Building	394 Union St	1.4	Town of Rockland	Daycare, preschool, services	B1	Housing Production Plan
NA	Hillcrest	401 Beech St	11.7	MHC Hillcrest MA LLC	Mobile home park	R1	Housing Production Plan
Details unable to verify							
NA	Rockland Town Center	Unable to confirm	Unable to confirm	Unable to confirm	Unable to confirm	Unable to confirm	Housing Production Plan

Weymouth

Map #	Name	Address	Acres	Current Owner	Current Use	Current Zoning	Source
Details verified – Potential Opportunity							
25	Bristol Brothers Properties	Pleasant Street and Sanderson Ave	31.4 (5 parcels, not contiguous)	Bristol Bros. Development Corp.	Vacant	R-3, R-1	Coordination Call
26	Golden Triangle (Route 18/53)	0 Washington Street	1.26 (parcel 1), 5.6 (parcel 2), 3.5 (parcel 3) 2.7 (parcel 4)	Kari Smith	Vacant	B-1	Housing Production Plan p. 101
27	South Weymouth Naval Air Station	0 Main St	65.36 acres	Southfield Redevelopment Authority	Vacant	NAS	Master Plan
Details verified – No Apparent Opportunity							
NA	Columbian Square	East of Route 18 near Fogg Library	Unable to confirm	Unable to confirm	Unable to confirm	Unable to confirm	Housing Production Plan p. 101
NA	Jackson Square	East Weymouth south of East Street	Unable to confirm	Unable to confirm	Unable to confirm	Unable to confirm	Housing Production Plan p. 101
NA	Arbor Inn Area	North Weymouth, west of Abigail Adams State Park	Unable to confirm	Unable to confirm	Unable to confirm	Unable to confirm	Housing Production Plan p. 101
Details unable to verify							
NA	None						

Memorandum: Example Property Background Information

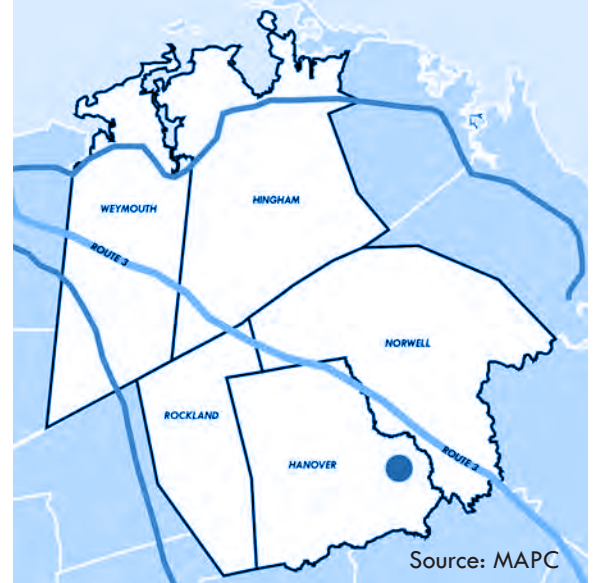
Cardinal Cushing Rear Property, Hanover

Study Property Summary

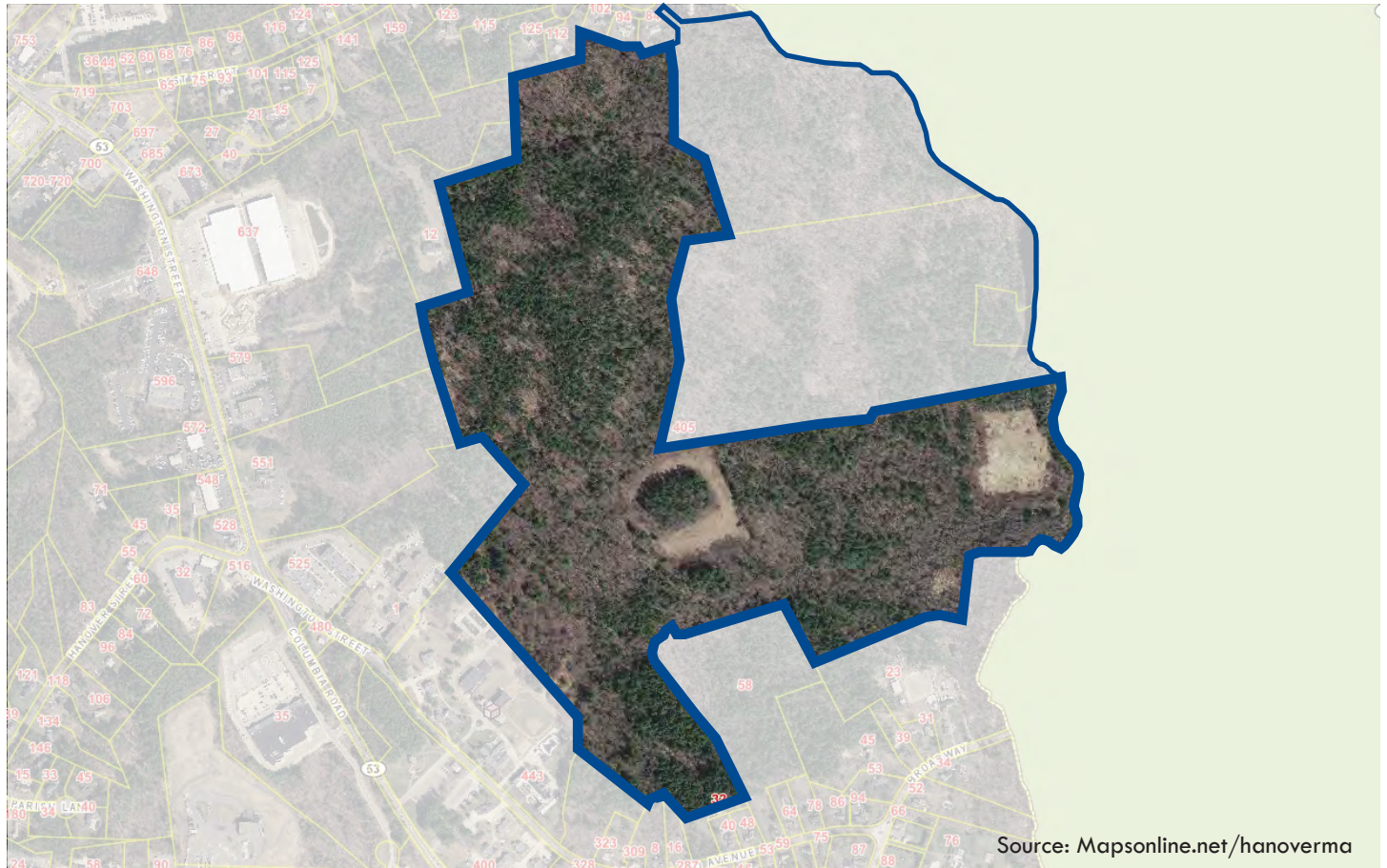
NAME	Cardinal Cushing Rear Property
ADDRESS	405 Washington Street Rear
MUNICIPALITY	Hanover
PARCEL ID	3143
ACRES	139.0
OWNER	Cardinal Cushing School and Training Center
CURRENT USE	Vacant charitable land
USE CODE	9500
CURRENT ZONING	Residence A
ASSESSMENT	\$1,070,300 (2020)
APPRAISAL	\$1,070,300 (2020)
SOURCE	Norwell Coordination Call

Source: Hanover Assessor's Data

Study Property Locus Map



Study Property Aerial



Cardinal Cushing Rear Property, Hanover

Study Property 3D Aerial



Study Property Street View Photos



Cardinal Cushing Rear Property, Hanover

Study Property Adjacencies

The frontage properties along Washington Street are mostly developed including the Cardinal Cushing Centers educational campus. Several other vacant properties are adjacent to the candidate property. Two vacant parcels on Washington Street are owned by the Town of Hanover Board of Selectmen with acreage of 3.85 and 3.43. Three vacant parcels adjacent to the Candidate Property are also owned by the Cardinal Cushing School. These three parcels have addresses listed as East Street Rear, East Street Rear, and Tiffany Pond. They have an area of 30.45, 42.0, and 2.63 respectively. These parcels could be combined with the Candidate Property to present a larger development opportunity.

Study Property Current Zoning

The property is currently zoned Residence A District in Hanover. The Residence A District is intended for rural, residential and non-commercial uses. Uses allowed included conservation areas, farming and horticulture, orchards, nurseries, forests, tree farms, barns, stables, kennels, one single-family dwelling per lot, display and sale for farm produce, accessory uses, incidental home occupation, pre-existing non conforming single-family or two-family residential dwelling. Uses permitted by Special Permit from the Zoning Board of Appeals include boarding houses, professional office or home occupation, conversion of a dwelling for inclusion of a second dwelling unit, museums and playgrounds, private schools, cemeteries, hospitals, and municipal senior centers. Uses permitted by Special Permit from the Planning Board include retreat lots. Uses permitted by Special Permit and with Site Plan Approval include a Planned Residential Development for Seniors (PRDS). The Dimensional Regulations include a minimum lot size of 30,000 square feet, lot frontage of 150 feet, front setback of 50 feet, side setback of 20 feet, rear setback of 40 feet, and lot coverage of 30%. The height of any building or structure shall not exceed 35 feet and shall not exceed 3 stories. Parking requirements are governed by Section 9 of the Zoning Bylaw with one parking space for each dwelling unit and sufficient off-street parking for visitors and employees, requirements for other uses are listed.

Study Property Previous Studies

None

Study Property Potential Access

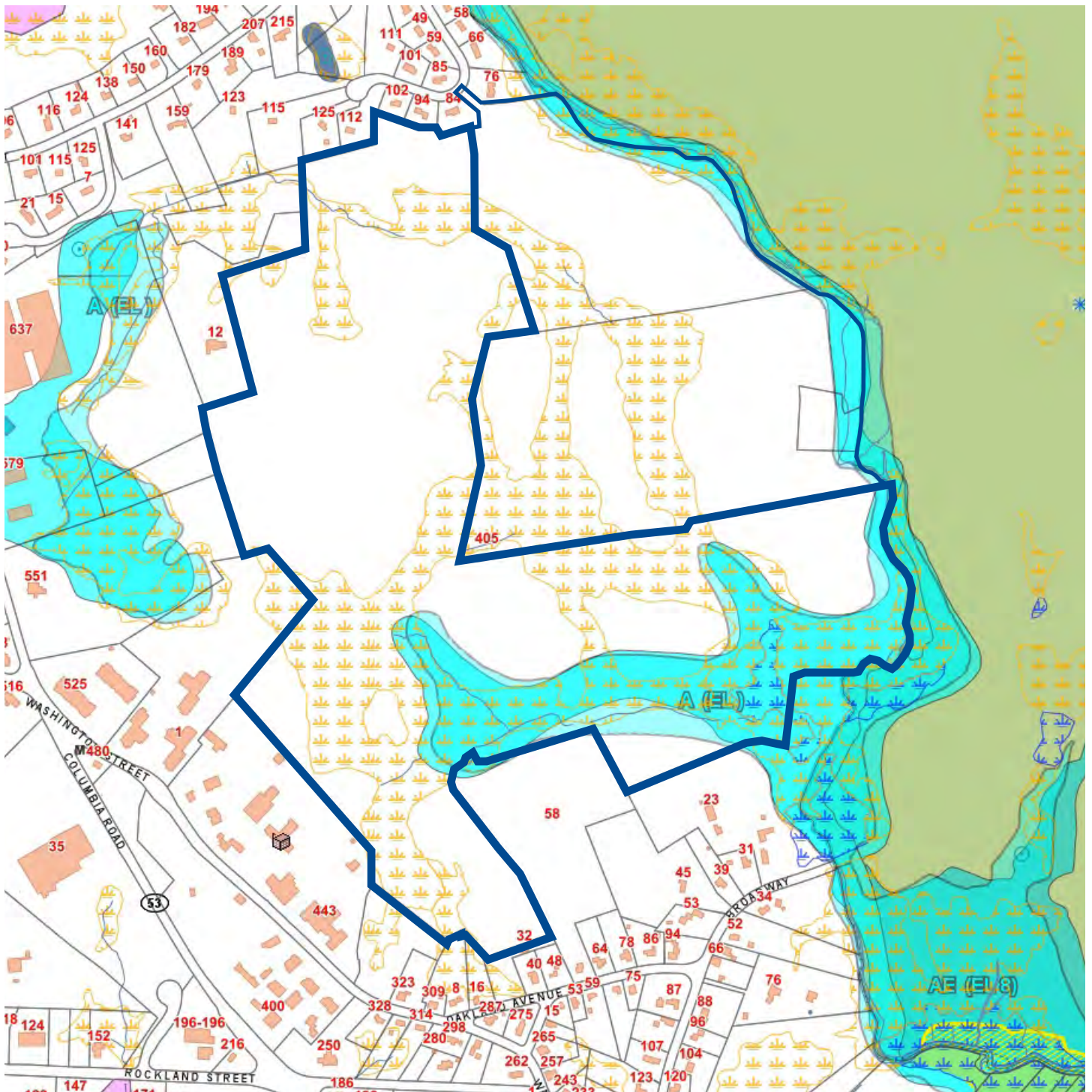
Potential access for the property could be achieved through an easement that passes through the Cardinal Cushing property at 443 Washington Street or the adjacent vacant Board of Selectmen property. If connected to the East Street Rear property access to East Street is available.

Study Property Potential Constraints

Approximately 50 percent of the Candidate Property's area appears to be wetland with streams existing at the northern and southern portions of the property.

Cardinal Cushing Rear Property, Hanover

Study Property Diagram



Source: Mapsonline.net/hanoverma

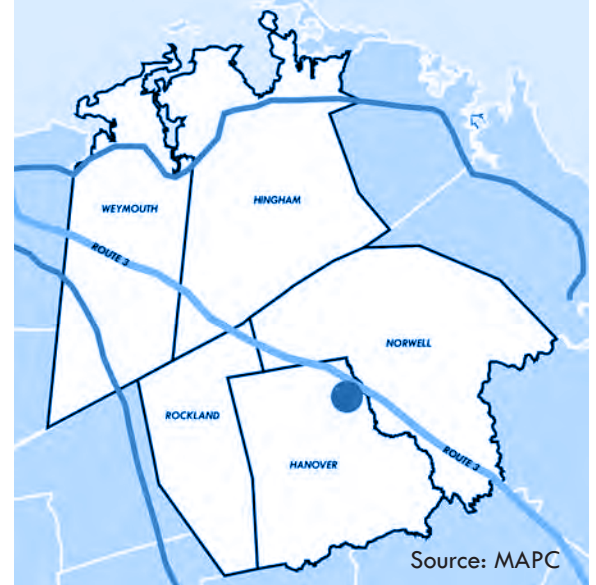
Unicorn Development Property, Hanover

Study Property Summary

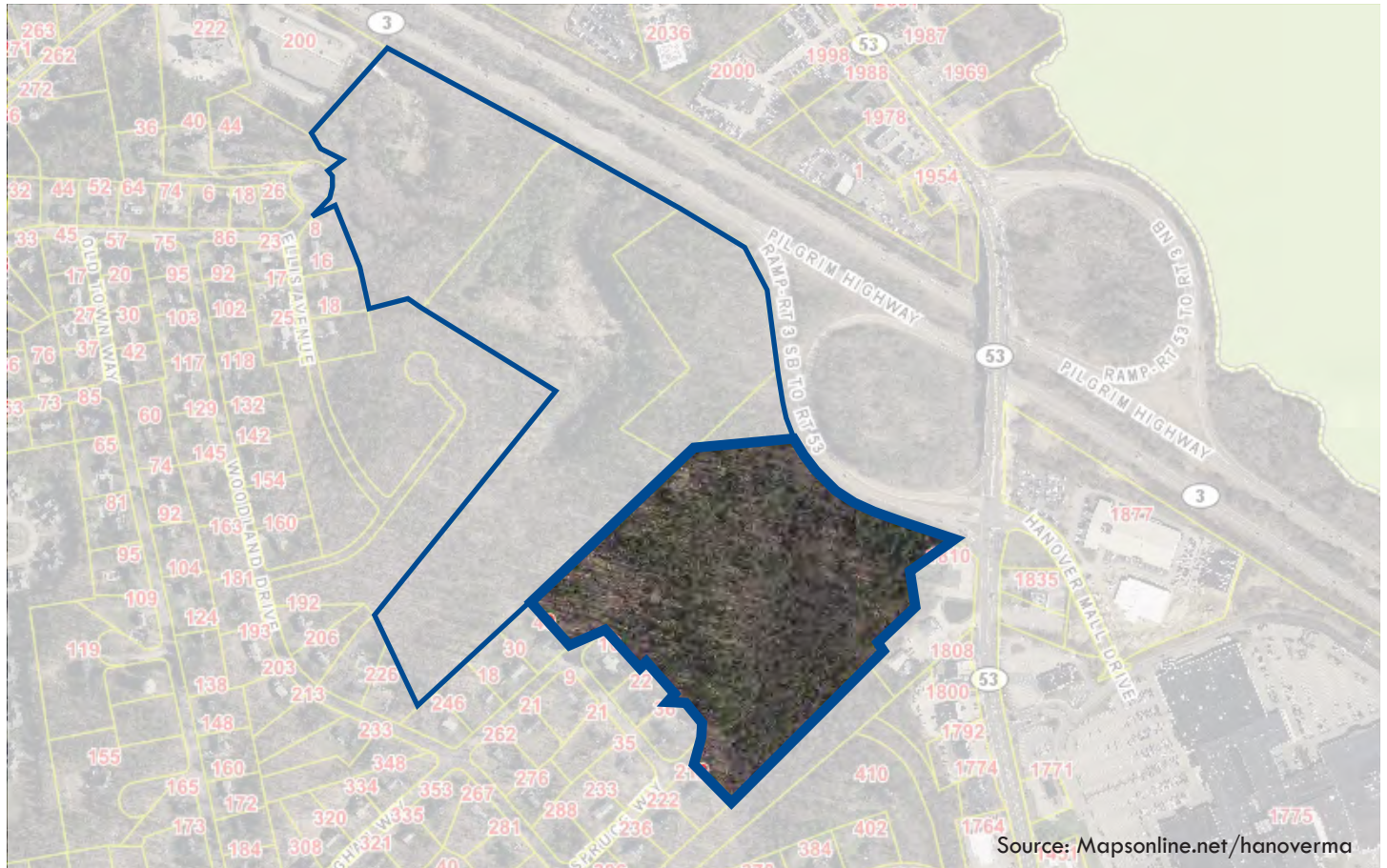
NAME	Unicorn Development Property
ADDRESS	Blue Spruce Lane Rear
MUNICIPALITY	Hanover
PARCEL ID	11-106
ACRES	20.32
OWNER	Berry Realty Trust
CURRENT USE	Vacant Land
USE CODE	1310
CURRENT ZONING	Residence A
ASSESSMENT	\$145,500 (2020)
APPRAISAL	\$145,500 (2020)
SOURCE	SSEDC Coordination Call

Source: Hanover Assessor's Data

Study Property Locus Map



Study Property Aerial



Unicorn Development Property, Hanover

Study Property 3D Aerial



Source: Bing

Study Property Street View Photos



Source: Google Street View



Source: Google Street View



Source: Google Street View



Source: Google Street View

Unicorn Development Property, Hanover

Study Property Adjacencies

Along the eastern edge of the property is the commercial frontage at Washington Street (Route 53). At the southern and western edge is a single family residential neighborhood at Woodland Drive. Several other vacant properties are adjacent to the candidate property. The northern edge of the parcel is the Route 3 and Route 53 interchange ramp. Five vacant parcels are to the west of the property with ownership listed as Brian Murphy, The South Shore-Hanover Realty Trust, and William Murphy Trustee. These five parcels have addresses listed as Washington Street, Route 3 Rear, Walnut Hill, Berry St Woodland Dr, and Berry St. They have an area of 0.60, 7.22, 28.26, 12.74 and 9.78 respectively. These parcels could be combined with the Candidate Property to present a larger development opportunity.

Study Property Current Zoning

The property is currently zoned Residence A District in Hanover. The Residence A District is intended for rural, residential and non-commercial uses. Uses allowed include conservation areas, farming and horticulture, orchards, nurseries, forests, tree farms, barns, stables, kennels, one single-family dwelling per lot, display and sale for farm produce, accessory uses, incidental home occupation, pre-existing non conforming single-family or tow-family residential dwelling. Uses permitted by Special Permit from the Zoning Board of Appeals include boarding houses, professional office or home occupation, conversion of a dwelling for inclusion of a second dwelling unit, museums and playgrounds, private schools, cemeteries, hospitals, and municipal senior centers. Uses permitted by Special Permit from the Planning Board include retreat lots. Uses permitted by Special Permit and with Site Plan Approval include a Planned Residential Development for Seniors (PRDS). The Dimensional Regulations include a minimum lot size of 30,000 square feet, lot frontage of 150 feet, front setback of 50 feet, side setback of 20 feet, rear setback of 40 feet, and lot coverage of 30%. The height of any building or structure shall not exceed 35 feet and shall not exceed 3 stories. Parking requirements are governed by Section 9 of the Zoning Bylaw with one parking space for each dwelling unit and sufficient off-street parking for visitors and employees, requirements for other uses are listed.

Study Property Previous Studies

None

Study Property Potential Access

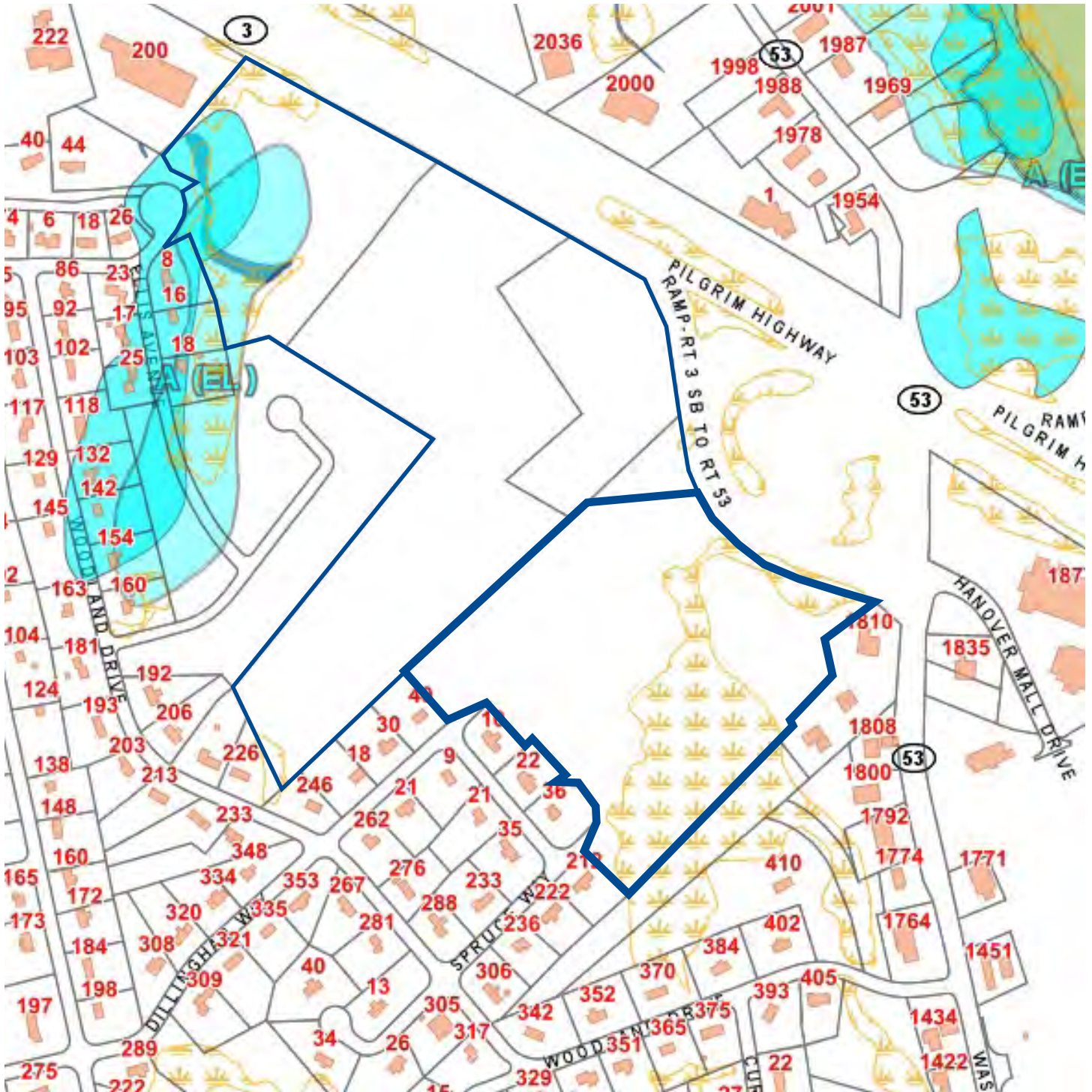
Potential access for the property could be achieved through an easement that passes through the Washington Street frontage properties or the extension of the residential streets Blue Spruce Lane or Spruce Way.

Study Property Potential Constraints

Approximately 30 percent of the Candidate Property's area appears to be wetland at the eastern portions of the property.

Unicorn Development Property, Hanover

Study Property Diagram



Source: Mapsonline.net/hanoverma

South Shore Park Property, Hingham

Study Property Summary

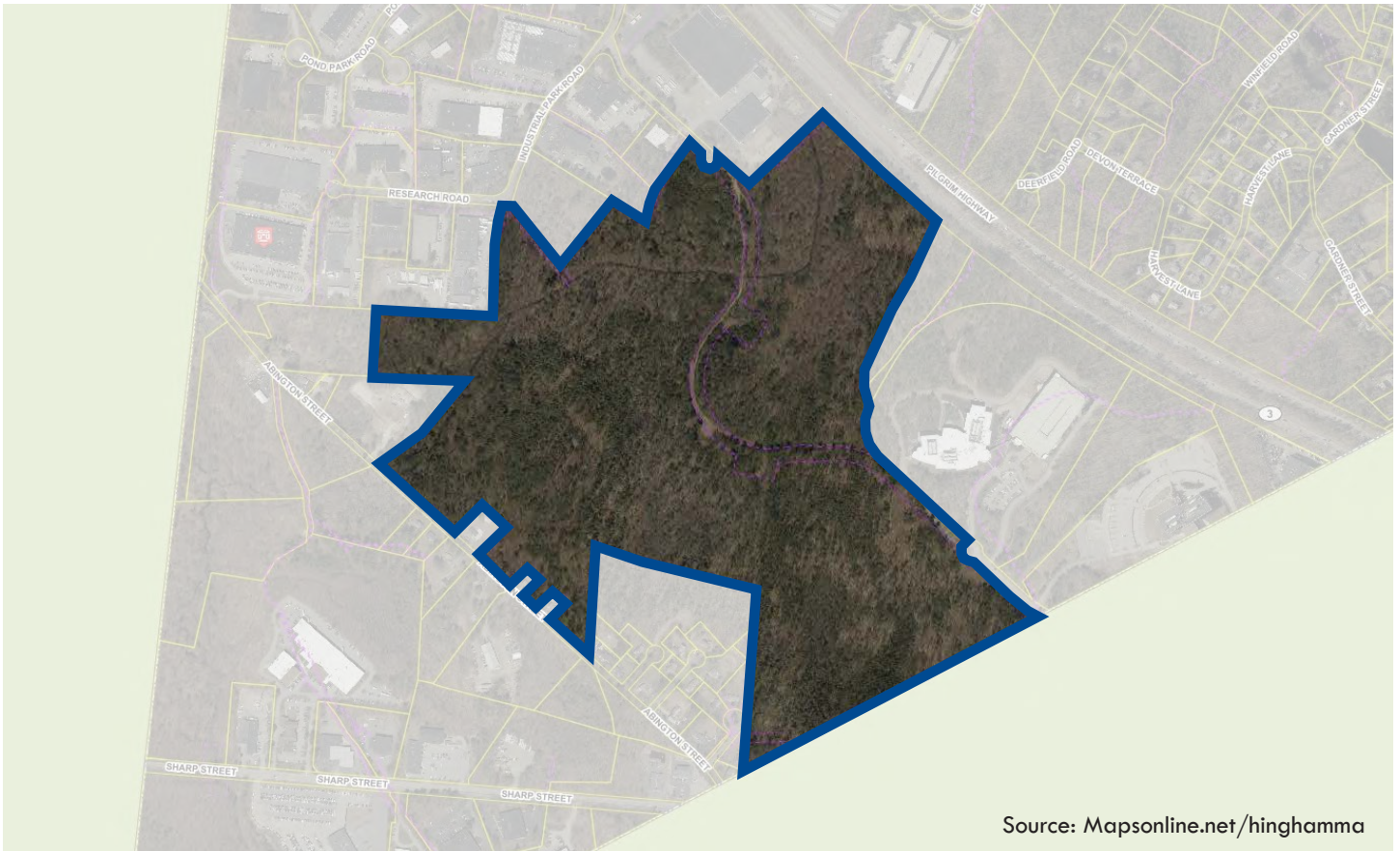
NAME	South Shore Park Property
ADDRESS	0 Southeast Expressway
MUNICIPALITY	Hingham
PARCEL ID	8316
ACRES	161.09
OWNER	South Shore Industrial Park Trust
CURRENT USE	Vacant
USE CODE	4410
CURRENT ZONING	Industrial Park
ASSESSMENT	\$1,660,100 (2020)
APPRAISAL	Not available
SOURCE	Hazard Mitigation Plan, Master Plan Update

Source: Hingham Assessor's Data

Study Property Locus Map



Study Property Aerial



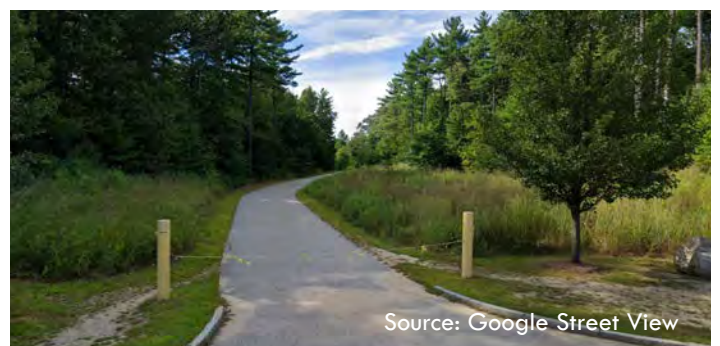
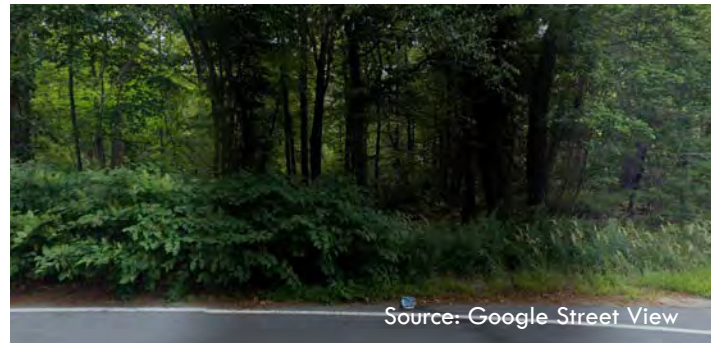
Source: Mapsonline.net/hinghamma

South Shore Park Property, Hingham

Study Property 3D Aerial



Study Property Street View Photos



South Shore Park Property, Hingham

Study Property Adjacencies

The Industrial Park Road area in Hingham is an industrial and office park with medical office, commercial and light industrial uses. Similarly, an industrial park exists in the Town of Rockland adjacent to the property with commercial uses on Commerce Road. Vacant parcels in Rockland on Commerce Road and Hingham Street are under the same ownership as the larger candidate property in Hingham.

Study Property Current Zoning

The property is currently zoned Industrial Park in Hingham. Uses allowed include garages, agricultural use, church, schools or playgrounds, public buildings, public utilities, greenhouses, offices, banks, and media or production studios. Uses permitted by Special Permit from the Zoning Board of Appeals include agricultural use, residence with agriculture, private schools, nursery school or daycare, library, museum, community center, country club, hospital, clinic, nursing home, veterinarian, commercial breeding, health club, storage trailers, heliport, hotel or motel, body art establishment, retail store, repair or storage garage, marina, warehouse, and light industrial uses.

The Dimensional Regulations include a minimum lot size of 2 acres, lot frontage of 250 feet, front setback of 35 feet, side setback of 35 feet, rear setback of 50 feet, and maximum lot coverage of 40%. The height of any building or structure shall not exceed 40 feet. The permitted floor area ratio (FAR) is 0.35 or 0.45 allowed by Special Permit. No building, structure, parking area, or septic system shall be constructed within 100 feet of a residence district. A minimum of 15% of the area of each lot shall be maintained in its natural state or landscaped including a 15 foot landscape strip along the entire street frontage.

The property is also located in the South Hingham Development Overlay District. In this district, for office use an FAR of 0.25 is permitted as-of-right, and up to 0.45 by Special Permit. Building Height is limited to 48 feet, but not more than 4 stories.

Parking requirements are governed by Section V of the Zoning Bylaw with two parking spaces for each residential unit, requirements for other uses are listed.

Study Property Previous Studies

None

Study Property Potential Access

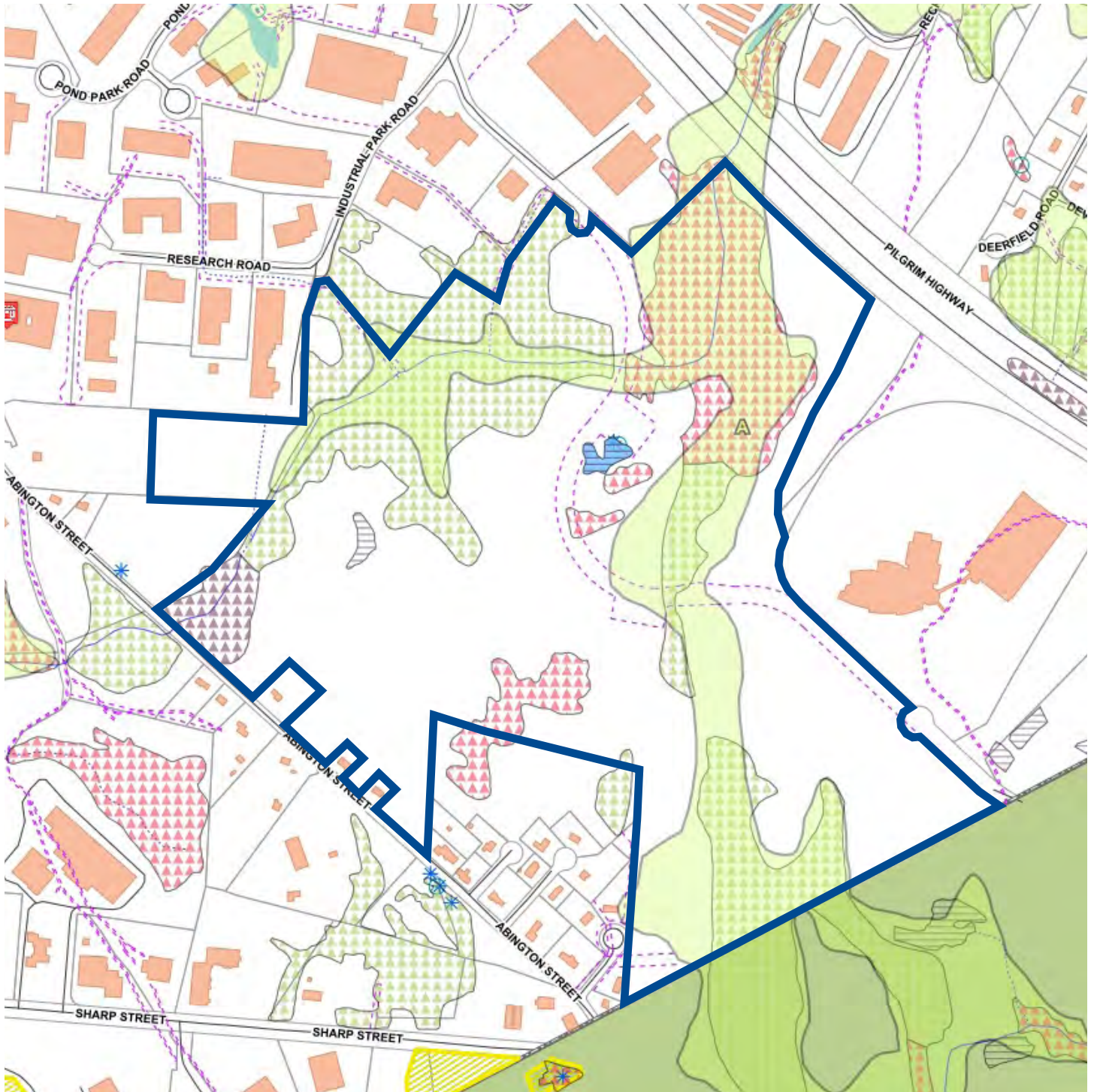
The property has potential access from Commerce Road, Industrial Park Road and Abington Street in Hingham and Commerce Road in Rockland. A full through connection of Commerce Road has been discussed for the property, running through its center.

Study Property Potential Constraints

Approximately 20 percent of the Candidate Property's area appears to be wooded swamp wetland with streams existing at the eastern portions of the property. A certified vernal pond appears to be near the center of the property.

South Shore Park Property, Hingham

Study Property Diagram



Source: Mapsonline.net/hinghamma

Wildcat Lane Property, Norwell

Study Property Summary

NAME	Wildcat Lane Property
ADDRESS	Pleasant Street
MUNICIPALITY	Norwell
PARCEL ID	3404
ACRES	74.33
OWNER	Town of Norwell
CURRENT USE	Vacant (designated for affordable housing)
USE CODE	9300
CURRENT ZONING	Residential District A
ASSESSMENT	\$713,100 (2020)
APPRAISAL	Not available
SOURCE	Housing Production Plan, Hazard Mitigation Plan

Source: Norwell Assessor's Data

Study Property Locus Map



Study Property Aerial



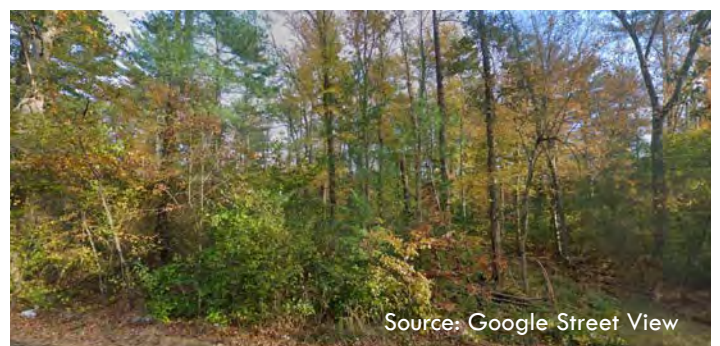
Source: Mapsonline.net/norwellma

Wildcat Lane Property, Norwell

Study Property 3D Aerial



Study Property Street View Photos



Wildcat Lane Property, Norwell

Study Property Adjacencies

The surrounding properties are primarily single family homes. An abutting property to the northeast is Donovan Farm, an age-restricted condominium development with 40 units. Two other vacant parcels abutting the property to the east are also owned by the Town of Norwell with acreage of 6.33 and 14.39. These three parcels have addresses listed as Pleasant St and Wildcat Ln. These parcels could potentially be combined with the Candidate Property to present a larger development opportunity.

Study Property Current Zoning

The property is currently zoned Residential District A in Norwell. Uses permitted include one-family detached dwellings, municipal buildings, public utility buildings, cemetery, educational and religious uses, and other institutional uses. Uses permitted by Special Permit from the Zoning Board of Appeals include business uses, private clubs, and conversion to add an accessory dwelling. The Dimensional Regulations include a minimum lot size of 1 acre, lot frontage of 80 feet, front setback of 50 feet, side setback of 20 feet, rear setback of 20 feet. The height of any building or structure shall not exceed 34 feet and shall not exceed 2 1/2 stories. Parking requirements are governed by Article 12 of the Zoning Bylaw with two parking spaces for each dwelling unit having 2 or more bedrooms and one parking space for each dwelling unit having fewer than 2 bedrooms, requirements for other uses are listed.

The property is also in the Aquifer Protection District. Article 19 of the Zoning Bylaw outlines the purpose and requirements of this district which is intended to protect groundwater.

Study Property Previous Studies

None

Study Property Potential Access

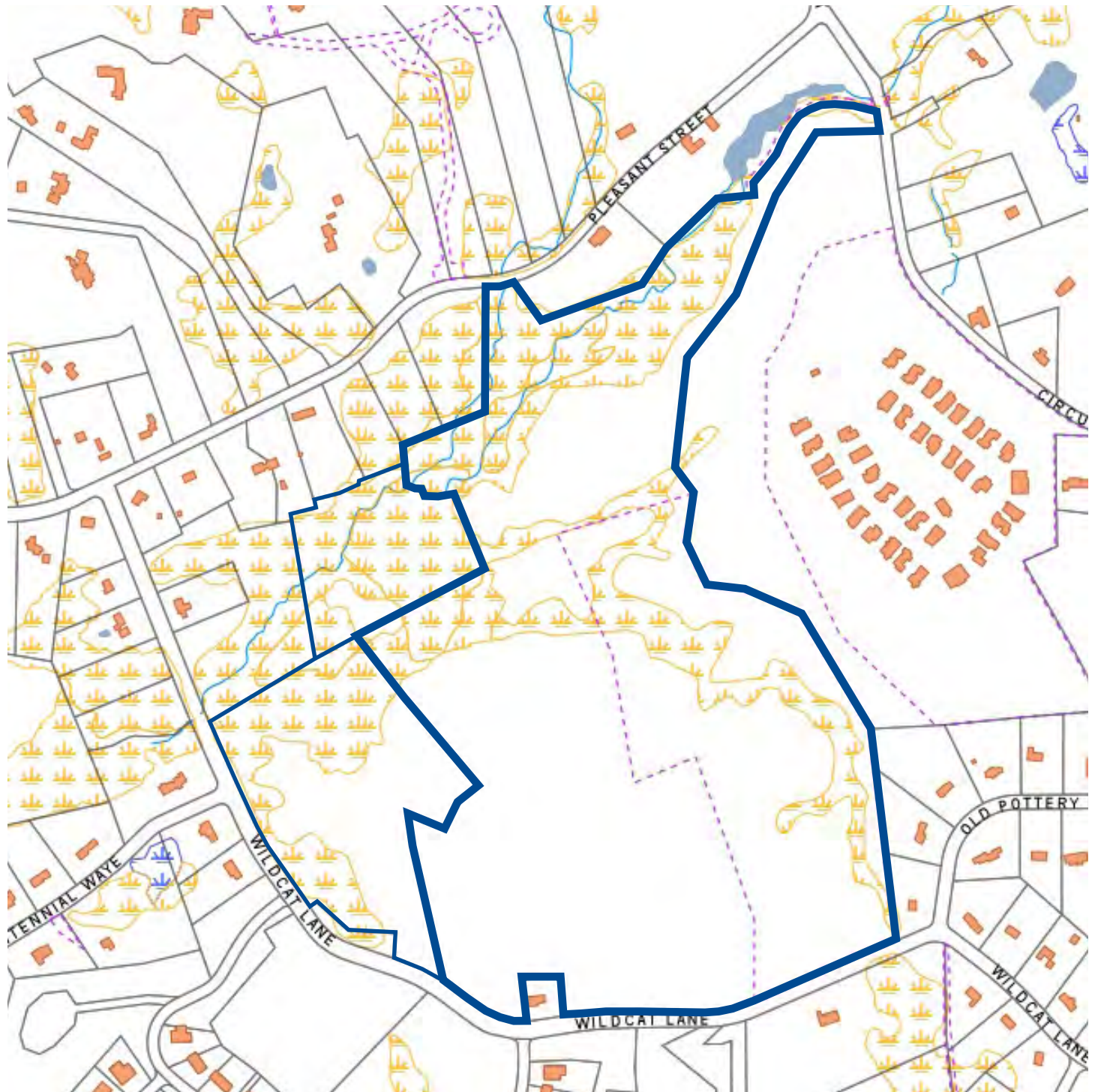
Potential access for the property could be achieved through its street frontages. The primary street frontage with the most length of frontage is along Wildcat Lane. The property also has frontage on Pleasant Street and a small length of frontage on Circuit Street.

Study Property Potential Constraints

Approximately 20 percent of the Candidate Property's area appears to be wetland with streams existing at the northern portions of the property and through the central portion of the property.

Wildcat Lane Property, Norwell

Study Property Diagram



Source: Mapsonline.net/norwellma

Land behind Home Depot, Rockland

Study Property Summary

NAME	Land behind Home Depot
ADDRESS	0 Pond Street
MUNICIPALITY	Rockland
PARCEL ID	9-13-0
ACRES	28.64
OWNER	Maurice Caparrotta Trustee
CURRENT USE	Vacant
USE CODE	4400
CURRENT ZONING	Industrial Park-Hotel H-1
ASSESSMENT	\$640,700 (2020)
APPRAISAL	Not available
SOURCE	Housing Production Plan, 40B with eligibility letter/hearing open

Source: Rockland Assessor's Data

Study Property Locus Map



Source: MAPC

Study Property Aerial



Source: http://maps.massgis.state.ma.us/map_01/rockland.php

Land behind Home Depot, Rockland

Study Property 3D Aerial



Study Property Street View Photos



Land behind Home Depot, Rockland

Study Property Adjacencies

The property frontage along Pond Street is adjacent to Home Depot to the northwest. On Pond Street to the east and south the property is adjacent to a residential neighborhood. On Hingham Street, the property is adjacent to an office building and hotel as its northern abutters. Not immediately adjacent, to the southwest of the property, is the Town-owned Hingham Street Reservoir.

Study Property Current Zoning

The property is currently zoned Industrial Park-Hotel (H-1) in Rockland. Permitted principal uses include offices, warehouse, wholesale, and retail distribution centers, food processing, packing and storage operations, bottling plants, and banks. Permitted accessory uses include parking, advertising signs and structures, and sale and service of products from principal use. Uses requiring a special permit include other industrial uses, repair shops, research laboratories, trucking terminals, adult establishments, manufacturing, municipal facilities, restaurants, coffee shops, eating or drinking establishments, movie theaters, telecommunication towers, hotel, motel, extended stay lodging, drive through/drive-up windows, liquor stores, wind energy facilities, commercial kennel, registered marijuana dispensary, commercial/recreation facilities, and marijuana establishments. The Dimensional Regulations do not include a minimum lot size or maximum number of dwelling units. The minimum required lot width is 110 feet. The minimum required lot frontage is 110 feet. The maximum building average percent of the lot is 50%. The maximum height is 3 stories or 36 feet. The minimum yard dimensions are 50 feet for the front, 30 feet for the rear setback, and 30 feet for the side setback, 50 feet if abutting a residential district. Parking requirements for residential uses require at least 3.0 spaces for each dwelling unit in a two-family or multi-family residence. For offices at least one space for each 250 square feet of occupied floor area and one space for every two employees are required.

Study Property Previous Studies

None

Study Property Potential Access

Potential access for the property could be achieved through its Pond Street frontage. Other access points may exist at the end of adjacent residential side streets including Wright Street, Curry Street, Wilson Street, and Colby Street.

Study Property Potential Constraints

Approximately 50 percent of the Candidate Property's area appears to be wetland with streams existing at the northern and western portions of the property.

Bristol Brothers Properties, Weymouth

Study Property Summary

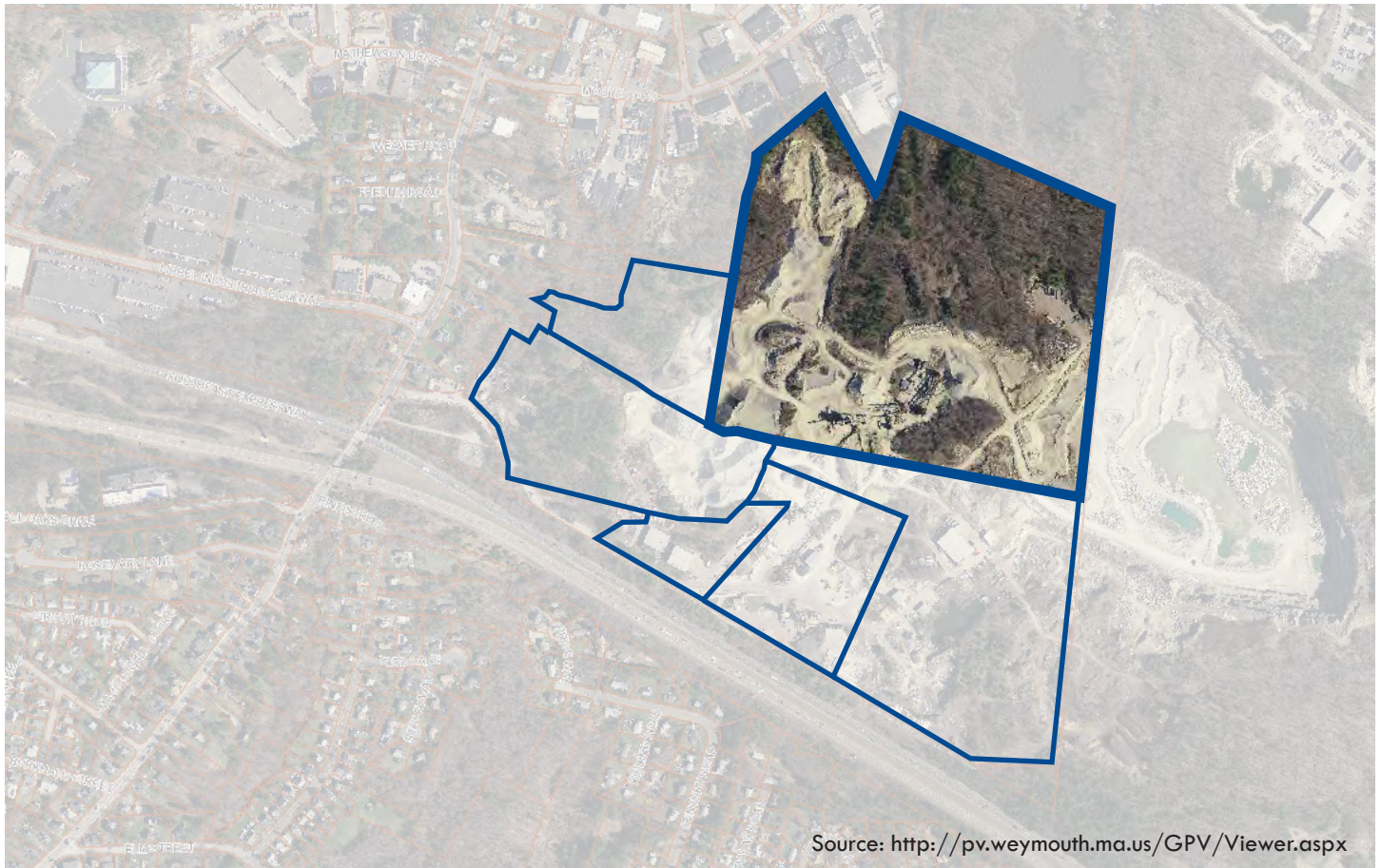
NAME	Bristol Brothers Properties
ADDRESS	0 Pleasant St
MUNICIPALITY	Weymouth
PARCEL ID	39-449-1
ACRES	59.01
OWNER	Bates Bros Seamface Granite Co
CURRENT USE	Industrial undeveloped land
USE CODE	4420
CURRENT ZONING	Limited Industrial I-1
ASSESSMENT	\$619,900 (2020)
APPRAISAL	Not available
SOURCE	Weymouth Coordination Call

Source: Weymouth Assessor's Data

Study Property Locus Map



Study Property Aerial



Bristol Brothers Properties, Weymouth

Study Property 3D Aerial



Study Property Street View Photos



Bristol Brothers Properties, Weymouth

Study Property Adjacencies

To the north of the property, the adjacent properties fronting on Moore Road are light industrial uses. To the west of the property, the adjacent properties fronting on Pleasant Street are residential uses including single family and multi family housing. To the south of the property is Route 3. To the east of the property is the municipal boundary with Hingham and vacant land in that town. Five vacant parcels to the west and south of the property are under the same owner and could be combined with the Candidate Property to present a larger development opportunity. These five parcels have addresses listed as 0 Pleasant St, 605 Pleasant St, 609 Pleasant St, 611 Pleasant St, and 613 Pleasant St. They have an area of 8.85, 16.17, 4.4, 11.58, and 29.39 respectively.

Study Property Current Zoning

The property is currently zoned Limited Industrial I-1 in Weymouth. The Industrial District includes permitted uses of trade school, sales of automobiles, office building, printing shop, caterer, research laboratory, wholesale business, helicopter landing facility, manufacturing, and registered marijuana dispensary. Uses permitted by Special Permit from the Zoning Board of Appeals include storage of flammable liquids, gases, or explosives, motor freight, bus terminal, open-lot storage, accessory uses, place of recreation or assembly. The Dimensional Regulations include do not include a minimum lot size, minimum lot area, minimum lot width, minimum front yard, side yard, rear yard, or maximum lot coverage. The maximum height of any building or structure shall not exceed 6 stories, not to exceed 80 feet. Parking requirements include two parking spaces for each dwelling unit, and one space for each 200 square feet of gross floor area, among other minimum requirements.

Study Property Previous Studies

None

Study Property Potential Access

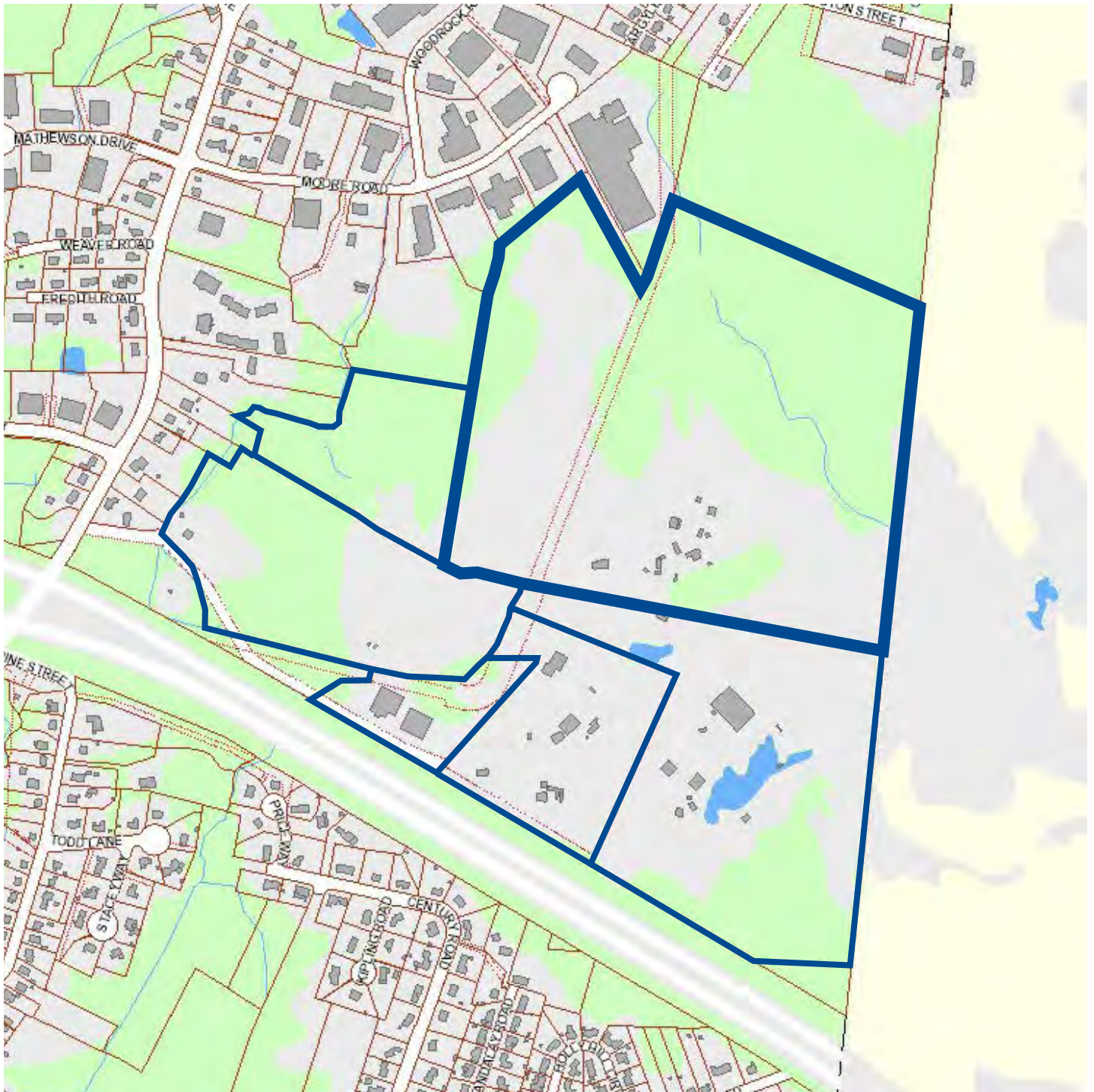
Potential access for the property could be achieved through a connection to Pleasant Street or Moore Road. Public access to the property is not currently provided.

Study Property Potential Constraints

A stream may be present in the northern portion of the property that is associated with a shrub swamp less than one acre in size. Near the center of the site a wooded swamp may be present that is less than one acre in size.

Bristol Brothers Properties, Weymouth

Study Property Diagram



Source: <http://pv.weymouth.ma.us/GPV/Viewer.aspx>

Memorandum: Hypothetical Build-out Projections

CURRENT ZONING BUILD-OUT PROJECTIONS

Study Property 1 – Cardinal Cushing Rear Property, Hanover

The current zone for this study property is Hanover's Residence A District. The Residence A District is intended for rural, residential, and non-commercial uses. The potential build-out yield is therefore based on a use of single-family homes and the dimensional regulations for the district. The Dimensional Regulations include a minimum lot size of 30,000 square feet, lot frontage of 150 feet, front setback of 50 feet, side setback of 20 feet, rear setback of 40 feet, and lot coverage of 30%. Parking is required at 1 parking space for each dwelling unit as per the Zoning Bylaw.

The total property area is 139 acres. If the parcel were fully available and accessible for development, then the property could simply be divided into minimum 30,000 square feet (0.69 acre) lots with one single-family home per lot. This would result in about 201 building lots and single-family homes.

However, the development of the land would not be that efficient and this calculation should account for two major constraints that would limit the build-out yield, namely existing wetland constraints on the site, the use of land for access roads, and other lot layout inefficiencies.

Wetland areas on the property are estimated to be approximately 2,480,505 square feet or about 57 acres. The wetland area was roughly measured in GIS (Geographic Information Systems) with the area measurement tool. This estimate does not include wetland buffers or stream and river setbacks. It is assumed that these buffers could be accommodated within a layout of the minimum 30,000 square feet lots while providing enough buildable area for a single-family home. This would reduce the developable property area to 82 acres. The amount dedicated to access roadways for the new building lots and other lot layout inefficiencies is roughly estimated to require about 15% of this land area or an additional 12 acres. This would leave 70 acres for the potential build-out.

Using this total property development area of 70 acres and dividing the property into minimum 30,000 square feet (0.69 acre) lots with one single-family home per lot would result in about 101 building lots and single-family homes.

Three additional abutting properties could expand this build out and are under the same ownership as the study parcel. They include an additional land area of 30.45, 42.0, and 2.63 acres. This is a total additional acreage of 75.1 acres. This would expand the potential build-out yield that has been calculated for the single parcel.

Near these properties is a cluster of other nearby potential development sites. These sites were identified during the potential site candidate research for this study and include Village Park at 836 Washington Street and Village Commons at 0 Off Park Drive. The parcels are 48.8 and 58.9 acres in size, respectively. This would add 107.7 acres of potential development land. About 10 acres of the properties may be impacted by wetlands, which would leave about 97.7 for development. The amount dedicated to access roadways for the new building lots and other lot layout inefficiencies is roughly estimated to require about 15% of this land or an additional 14.6 acres. This would leave about 83 acres for the potential build-out in this expanded cluster of parcels. Using this total property development area of 83 acres and dividing the property into minimum 30,000 square feet (0.69 acre) lots with one single-family home per lot would result in about 120 building lots and single-family homes.

For Study Property 1, Cardinal Cushing Rear Property, the current zoning potential build-out yield is estimated at 100 housing units on the single parcel or 166 housing units on the total combined parcels. The expanded cluster of development opportunities in this area would yield an estimated 286 total housing units.

Study Property 2 – Unicorn Development Property, Hanover

The current zone for this study property is Hanover’s Residence A District. The property is also in the Interchange Overlay District. The Interchange Overlay district supersedes the Residence A District and is intended to encourage and promote the development of projects that are characterized by commercial uses regional in nature that benefit from or require adjacent highway access. The Dimensional Regulations include a minimum lot size of 75 acres, a lot frontage of 150 feet, a minimum 150 feet wide buffer area, a building coverage of 17.5% for office, and lot coverage of 60%, and a maximum height of 48 feet or 4-stories, except for in the northeast corner of the site which could be up to 60 feet and 5-stories.

The total property area is 20.32 acres. The single parcel does not meet the minimum lot size of 75 acres defined by the Interchange Overlay District. Five additional abutting properties could expand this total property and are under the same ownership as the study parcel. They include an additional land area of 0.6, 7.22, 28.26, 12.74 and 9.78 acres. This is a total additional acreage of 58.6 acres. Adding this to the study property brings the total acreage to 78.92, which will comply with the minimum lot size.

Two major constraints that would limit the build-out yield are the existing wetland constraints on the site and the minimum 150 feet wide buffer area. Wetland areas on the property are estimated to be approximately 268,137 square feet or about 6 acres on the study property. Additional wetland areas on the abutting parcels are estimated to be approximately 135,036 square feet or about 3.1 acres. The total wetland area is estimated at about 9.1 acres. The wetland area was roughly measured in GIS with the area measurement tool. This estimate does not include wetland buffers or stream and river setbacks. It is assumed that these buffers could be accommodated within a layout of the development program. The 150 feet wide buffer area at the perimeter of the properties results in about 24.4 acres.

This would reduce the developable property area to about 45.4 acres. The amount dedicated to access roadways for the new buildings and other layout inefficiencies is roughly estimated to require about 15% of this land area or an additional 6.8 acres. This would leave 38.6 acres for the potential build-out. A simple commercial office program under the Interchange Overlay would result in about 536,000 square feet. The maximum building coverage would be about 8%, well below the 17.5% maximum with building footprints of about 134,000 square feet total. The building heights would maximize the 4-story height that is not geographically limited. The maximum lot coverage of 60% would result in parking areas that could be no larger than 875,000 square feet. At an average impervious area per parking space (including circulation) of 325 square feet per space this would result in about 2,700 parking spaces. At the rate of parking required for office buildings at 1 space per 200 gross square feet this would balance with the parking required by this scale of development. It would appear that the parking requirement is the major factor determining maximum yield under the Interchange Overlay zone.

Near these properties is another nearby potential development site. This site was identified during the potential site candidate research for this study. The property is the former Curtis School site at 848 Main Street with 3 acres in site area. The amount dedicated to access roadways for the new building lots and other lot layout inefficiencies is roughly estimated to require about 15% of this land or about 0.45 acres. This would leave about 2.6 acres for the potential build-out in this expanded cluster of parcels. Using this total property development area of 2.5 acres and dividing the property into minimum 30,000 square feet (0.69 acre) lots with one single-family home per lot would result in about 4 building lots and single-family homes.

For Study Property 2, Unicorn Development Property, the current zoning potential build-out yield is about 536,000 square feet of commercial uses on the total combined parcels. The expanded cluster of development opportunities in this area would yield an estimated additional 4 total housing units.

Study Property 3 – South Shore Park Property, Hingham

The current zone for this study property is Hingham’s Industrial Park District. The Industrial Park district includes offices, banks, and media or production studios. The potential build-out yield is therefore based on a generalized commercial space and the dimensional regulations for the district. The Dimensional Regulations include a minimum lot size of 2 acres, lot frontage of 250 feet, front setback of 35 feet, side setback of 35 feet, rear setback of 50 feet, and maximum lot coverage of 40%. The property is also within the South Hingham Development Overlay District. In this district, a Special Permit allows an FAR (Floor Area Ratio) of 0.45 for office use. Parking is required at 3.5 parking spaces per 1,000 square feet gross floor area for general business office space per the zoning bylaw.

The total property area is 161.09 acres. If the parcel were fully available and accessible for development, then the property could simply be divided into minimum 2-acre lots with one commercial building per lot. This would result in about 80 building lots. A 2-acre lot with a maximum coverage of 40% would result in a maximum building footprint of 34,848 square feet and a maximum FAR of 0.45 on a 2-acre lot would result in a maximum total building area of 39,204 square feet per lot. Therefore the 80 building lots could support about 3.1M square feet of commercial space by Special Permit under current zoning. This is much more development than has occurred on the adjacent properties that have been developed.

However, the development of the land would not be that efficient and this calculation should account for two major constraints that would limit the build-out yield, namely existing wetland constraints on the site, the use of land for access roads, and other lot layout inefficiencies. Additionally, an inventory of the existing development in the South Shore Industrial Park shows an average FAR of 0.18, which is far below the FAR allowed by the zoning.

Wetland areas on the property are estimated to be approximately 2,563,957 square feet or about 58.8 acres. The wetland area was roughly measured in GIS with the area measurement tool. This estimate does not include wetland buffers or stream and river setbacks. It is assumed that these buffers could be accommodated within a layout of the minimum 2-acre lots while providing enough buildable area for a commercial building. This would reduce the developable property area to about 102.3 acres. The amount dedicated to access roadways for the new building lots and other lot layout inefficiencies is roughly estimated to require about 15% of this land area or an additional 15 acres. This would leave 87.3 acres for the potential build-out.

Using this total property development area of 87.3 acres and dividing the property into minimum 2 acre lots with development occurring at about the average inventoried FAR of 0.20 would result in about 43 building lots and 760,000 square feet of generalized commercial/light industrial space.

Two additional abutting properties could expand this build out. One of the two is under the same ownership as the study parcel. They include an additional land area of 8.9 acres (15 Technology Place) and 8.03 acres (0 Dennis Road). This is a total additional acreage of 16.9 acres. This would expand the potential build-out yield that has been calculated for the single parcel.

Near these properties is a cluster of other nearby potential development sites. These sites are located in Rockland and were identified during the potential site candidate research for this study and include properties on Commerce Road with an additional 17 acres of potential development land. Dividing this area into 2 acre lots with development occurring at about the average inventoried FAR of 0.20 would result in about 9 building lots and 150,000 square feet of additional generalized commercial/light industrial space.

For Study Property 3, South Shore Park Property, the current zoning potential build-out yield is about 760,000 square feet of commercial/light industrial space or about 823,000 square feet of commercial/light industrial space on the total combined parcels. The expanded cluster of development opportunities in this area would yield an estimated 973,000 square feet of total commercial/light industrial space.

Study Property 4 – Wildcat Lane Property, Norwell

The current zone for this study property is Norwell's Residential District A. The Residential District A permits one-family detached dwellings, municipal buildings, public utility buildings, and other institutional uses. The potential build-out yield is therefore based on a use of single-family homes and the dimensional regulations for the district. The Dimensional Regulations include a minimum lot size of 1 acre, lot frontage of 80 feet, front setback of 50 feet, side setback of 20 feet, rear setback of 20 feet, and no maximum lot coverage. Parking is required at 2 parking spaces for each dwelling unit having 2 or more bedrooms and 1 parking space for each dwelling unit having fewer than 2 bedrooms as per the Zoning Bylaw.

The total property area is 74.3 acres. 23.1 acres are conservation restricted and 21.0 are reserved for recreation. This leaves 30.2 acres unrestricted or reserved that will be the basis for the potential build-out calculations. Although 30.2 acres are available, development of the land would not be that efficient and this calculation should consider two major constraints that would limit the build-out yield, namely existing wetland constraints on the site, the use of land for access roads, and other lot layout inefficiencies.

Wetland areas on the property are estimated to be approximately 948,377 square feet or about 21.8 acres. The wetland area was roughly measured in GIS with the area measurement tool. This estimate does not include wetland buffers or stream and river setbacks. It is assumed that these buffers could be accommodated within a layout of the minimum 1-acre lots while providing enough buildable area for a single-family home. It is not clear what portion of the wetlands intersects with the land that is unrestricted or reserved. An assumption that 30% of the 30.2 available acres is wetland would reduce the developable property area to 21.14 acres. The amount dedicated to access roadways for the new building lots and other lot layout inefficiencies is roughly estimated to require about 15% of this land area or an additional 3.2 acres. This would leave 17.94 acres for the potential build-out.

Using this total property development area of about 18 acres and dividing the property into minimum 1-acre lots with one single-family home per lot would result in about 18 building lots and single-family homes.

Two additional abutting properties could potentially expand this build out and are under the same ownership as the study parcel, but they are town conservation parcels that are almost entirely wetland.

No other potential development sites were identified in the vicinity of this property during the potential site candidate research for this study.

For Study Property 4, Wildcat Lane Property, the current zoning potential build-out yield is about 18 housing units.

Study Property 5 – Land behind Home Depot, Rockland

The current zone for this study property is Rockland's Industrial Park-Hotel (H-1) District. The Industrial Park-Hotel district includes offices, warehouses, wholesale and distribution centers, and banks, among other uses. The potential build-out yield is therefore based on a generalized commercial space and the dimensional regulations for the district. The Dimensional Regulations do not include a minimum lot size. The minimum lot width is 110 feet, and the minimum required lot frontage is 110 feet. The maximum building coverage percent of the lot is 50%. The minimum yard dimensions are 50 feet for the front, 30 feet for the rear, and 30 feet for the side. Parking is required at 1 parking space for each 250 square feet of occupied floor area and one space for every two employees required.

The total property area is 28.6 acres. The property has about 167 feet of frontage on Pond Street, but no frontage along other roadways. If Curry Street, Wilson Street, or Colby Street were extended into the property, then additional frontage may be available to subdivide the property. As currently configured, for this build-out analysis, the property will be considered one parcel that is not subdivided.

Wetland areas on the property are estimated to be approximately 678,544 square feet or about 15.6 acres. The wetland area was roughly measured in GIS with the area measurement tool. This estimate does not include wetland buffers or stream and river setbacks. It is assumed that these buffers could be accommodated within a layout of lot while providing enough buildable area for a commercial building. This would reduce the developable property area to about 13 acres.

Using this total property development area of 13 acres and maximizing the building area with the maximum building coverage of 50% would result in 283,140 square feet of commercial space. This leaves 283,140 square feet for parking that could support the building area. Assuming 400 square feet per parking space this amount of area would provide about 707 parking spaces. At a ratio of 1 space for each 250 square feet, 707 spaces would support 176,750 of commercial space. At the maximum building height of 3-stories this would result in a building footprint that is 58,916 square feet. This would leave 224,224 square feet unused. If three quarters of that space is allocated to additional parking and one quarter to additional commercial space it would add 168,168 square feet of additional parking or another 420 spaces that could support another 105,000 square feet of commercial space on the remaining 56,056 square feet of land. The total commercial space would be 176,750 square feet and the additional 105,000 square feet for a total of about 280,000 square feet.

This property does not have immediately adjacent parcels that could be combined for a larger development opportunity. It is close to other development clusters that were identified during the potential site candidate research for this study – the South Shore Industrial Park area in Hingham and the Accord Park area in Norwell.

For Study Property 5, Land behind Home Depot, the current zoning potential build-out yield is about 280,000 square feet of commercial space.

Study Property 6 – Bristol Brothers Properties, Weymouth

The current zone for this study property is Weymouth's Limited Industrial (I-1) District. The Limited Industrial District includes permitted uses of trade school, sale of automobiles, office building, printing shop, caterer, research laboratory, and wholesale business, among other uses. The potential build-out yield is therefore based on a generalized commercial space and the dimensional regulations for the district. The Dimensional Regulations do not include a minimum lot size, minimum setbacks, or maximum lot coverage. The maximum height of any building shall not exceed 6 stories. Parking requirements include one space for each 200 square feet of gross floor area.

The total property area is 59.01 acres. If the parcel were fully available and accessible for development, then the property could be divided into 2-acre lots with one commercial building per lot. This would result in about 59 building lots. A 2-acre lot with a maximum coverage of 40% would result in a maximum building footprint of 34,848 square feet and a maximum FAR of 0.45 on a 2-acre lot would result in a maximum total building area of 39,204 square feet per lot. Therefore the 59 building lots could support about 2.3M square feet of commercial space under current zoning.

However, the development of the land would not be that efficient and this calculation should consider two major constraints that would limit the build-out yield, namely existing wetland constraints on the site, the use of land for access roads, and other lot layout inefficiencies.

Wetland areas on the property are estimated to be approximately 112,545 square feet or about 2.6 acres. The wetland area was roughly measured in GIS with the area measurement tool. This estimate does not include wetland buffers or stream and river setbacks. It is assumed that these buffers could be accommodated within a layout of 2-acre lots while providing enough buildable area for a commercial building. This would reduce the developable property area to about 56.4 acres. The amount dedicated to access roadways for the new building lots and other lot layout inefficiencies is roughly estimated to require about 15% of this land area or an additional 8.5 acres. This would leave 47.9 acres for the potential build-out.

Using this total property development area of 47.9 acres and dividing the property into 2-acre lots with development occurring at about the average inventoried FAR of 0.20 would result in about 24 building lots and 417,000 square feet of commercial space.

Five additional abutting properties in Weymouth and additional property in Hingham could expand this build out and are under the same ownership as the study parcel. In Weymouth, the five abutting parcels include an additional land area of 8.85, 16.17, 4.4, 11.58, and 29.39 acres. This is a total additional acreage of 70.39 acres. This would expand the potential build-out yield that has been calculated for the single parcel.

Near these properties is a cluster of other nearby potential development sites in Hingham. These sites were identified during the potential site candidate research for this study and include multiple properties on Southwood Pointe Drive and Old Derby Street. The parcels combine to an additional 118 acres. About 10 acres of the properties may be impacted by wetlands, which would leave about 108 for development. The amount dedicated to access roadways for the new building lots and other lot layout inefficiencies is roughly estimated to require about 15% of this land or an additional 16.2 acres. This would leave about 91.8 acres for the potential build-out in this expanded cluster of parcels. Dividing this area into 2 acre lots with development occurring at about the average inventoried FAR of 0.20 would result in about 46 building lots and 800,000 square feet of additional generalized commercial/light industrial space.

For Study Property 6, Bristol Brothers Property, the current zoning potential build-out yield is about 417,000 square feet of commercial space on the single parcel or about 1.0 million square feet of commercial space on the total combined parcels in Weymouth. The expanded cluster of development opportunities in this area would yield an estimated 1.8M square feet of total commercial/light industrial space.

UNCONSTRAINED POTENTIAL BUILD-OUT PROJECTIONS

The unconstrained potential build-out projections consider a development potential that is not constrained by the current zoning regulations. For each study property the individual build-out potential has been estimated depending on the unique circumstances of that property and either the use of comparable development projects to estimate yield, or discussion with property owners regarding conceptual plans for the properties.

As a point of reference Union Point's projected potential build-out includes up to 4,000 residential units (estimated to be between 3,000 to 4,000 residential units), and up to 8 million square feet of commercial space (estimated to be between 2 million to 6 million square feet of commercial office, research and development, entertainment other uses). An updated master plan may increase the residential projections and decrease the commercial projections.

Study Property 1 – Cardinal Cushing Rear Property, Hanover

The potential zoning build-out projections are based on a mostly residential development program with the potential for a modest amount of retail or commercial space near biased toward Route 53.

The total property area is 139 acres. Wetland areas on the property are estimated to be approximately 2,480,505 square feet or about 57 acres. The wetland area was roughly measured in GIS with the area measurement tool. This estimate does not include wetland buffers or stream and river setbacks. It is assumed that these buffers could be accommodated within a layout for the conceptual development program described. These constraints reduce the developable property area to about 82 acres. The amount dedicated to access roadways for the new building lots and other lot layout inefficiencies is roughly estimated to require about 15% of this land area or an additional 12 acres. This would leave 70 acres for the potential build-out.

The potential zoning build-out projections use this total property development area of 70 acres and the comparable development program of the Modera Marshfield project (1 Chestnut Street, Marshfield, MA) for the conceptual residential development program. Larger acreage projects on the South Shore, such as Pine Hills in Plymouth have conserved approximately 70% of the land as part of the development plans. If this approach were applied on this property, only about 42 acres of the property would be developed, which also may be more realistic for the larger scale buildings and parking areas for this conceptual development approach to given the wetland constraints. For the residential development program, the comparable project developed townhouses and garden apartments at a density of 11.69 units per acre. This could result in a total range of from about 250 to 490 residential units depending on the layout and access through wetland areas.

Three additional abutting properties could expand this build out and are under the same ownership as the study parcel. They include an additional total land area of 30.45, 42.0, and 2.63 acres. This is a total additional acreage of 75.1 acres. The wetland constraints would reduce the developable area to about 37 acres. This would expand the potential build-out yield that has been calculated for the single parcel. At the same 11.69 unit density per acre, this could result in an additional range of about 250 to 430 residential units.

Near these properties is a cluster of other nearby potential development sites. These sites were identified during the potential site candidate research for this study and include Village Park at 836 Washington Street and Village Commons at 0 Off Park Drive. The parcels are 48.8 and 58.9 acres in size, respectively. This would add 107.7 acres of potential development land. About 10 acres of the properties may be impacted by wetlands, which would leave about 97.7 for development. The amount dedicated to access roadways for the new building lots and other lot layout inefficiencies is roughly estimated to require about 15% of this land or an additional 14.6 acres. This would leave about 83 acres for the potential build-out in this expanded cluster of parcels. Using this total property development area of 83 acres and the same 11.69 unit density per acre, this could result in an additional 500 to 970 residential units.

For Study Property 1, Cardinal Cushing Rear Property, the potential build-out yield is estimated at between 250 to 490 housing units on the single parcel or 500 to 920 housing units on the total combined parcels. The expanded cluster of development opportunities in this area would yield an estimated 1,000 to 1,890 total housing units.

Study Property 2 – Unicorn Development Property, Hanover

The total property area is 20.32 acres. Wetland areas on the property are estimated to be approximately 268,137 square feet or about 6 acres. The wetland area was roughly measured in GIS with the area measurement tool. This estimate does not include wetland buffers or stream and river setbacks. It is assumed that these buffers could be accommodated within a layout for the conceptual development program described. This would reduce the developable property area to 14.3 acres. The amount dedicated to access roadways for the new building lots and other lot layout inefficiencies is roughly estimated to require about 15% of this land area or an additional 2.1 acres. This would leave 12.2 acres for the potential build-out.

Using this total property development area of 12.2 acres and allocating portions of the property to modest retail or commercial uses oriented toward Route 53 at the east of the property results in about 4 acres of land devoted to retail or commercial uses and about 8.2 acres of land devoted to residential uses. The potential zoning build-out projections use this total property development area of 12.2 acres and the comparable development programs of the Modera Marshfield project (1 Chestnut Street, Marshfield, MA) for the conceptual residential development program and the Residences at Driftway Place/Village at Greenbush (247 Driftway Place, Scituate, MA) for the conceptual commercial development program. This results in 20,000 to 30,000 square feet of retail or commercial space and about 142 residential units of townhouse and garden apartments.

Five additional abutting properties could expand this build out and are under the same ownership as the study parcel. They include an additional land area of 0.6, 7.22, 28.26, 12.74 and 9.78 acres. This is a total additional acreage of 58.6 acres. This would expand the potential build-out yield that has been calculated for the single parcel. If an additional 4 acres of land oriented toward Route 123 was devoted to retail or commercial uses and about 85% of the remaining 54.6 were devoted to residential uses, the resulting 46.4 acres could yield an additional 200 to 542 residential units at a density of 11.69 units per acre.

Near these properties is another nearby potential development site. This site was identified during the potential site candidate research for this study. The property is the former Curtis School site at 848 Main Street with 3 acres in site area. The amount dedicated to access roadways for the new building lots and other lot layout inefficiencies is roughly estimated to require about 15% of this land or about 0.45 acres. This would leave about 2.6 acres for the potential build-out in this expanded cluster of parcels. At a similar density, the parcel may yield an additional 30 residential units.

For Study Property 2, Unicorn Development Property, the potential build-out yield is about 140 housing units on the single parcel with 20,000 to 30,000 square feet of retail or commercial space. Or the total combined parcels may result in a total of 340 to 684 housing units and 40,000 to 60,000 square feet of retail or commercial space. The expanded cluster of development opportunities in this area would yield an estimated 370 to 714 total housing unit and a total of 40,000 to 60,000 square feet of retail or commercial space.

Study Property 3 – South Shore Park Property, Hingham

The total property area is 161.09 acres. Wetland areas on the property are estimated to be approximately 2,563,957 square feet or about 58.8 acres. The wetland area was roughly measured in GIS with the area measurement tool. This estimate does not include wetland buffers or stream and river setbacks. It is assumed that these buffers could be accommodated within a layout for the conceptual development program described. This would reduce the developable property area to about 102.3 acres. The amount dedicated to access roadways for the new building lots and other lot layout inefficiencies is roughly estimated to require about 15% of this land area or an additional 15 acres. This would leave 87.3 acres for the potential build-out.

Using this total property development area of about 87.3 acres the property owner has defined a conceptual master plan for the potential development. The ranges of potential uses are based on these concepts and discussion with the property owner. Residential uses include both single family and multifamily units with about 100 to 125 single-family homes or cottages and about 350 to 400 multifamily or assisted living units. The commercial uses may include offices, a theater, restaurants, and hotel with about 215,000 to 300,000 square feet. A portion of the property near the existing South Shore Industrial Park may expand the light industrial and manufacturing uses that exist with about 125,000 square feet of additional light industrial space.

Two additional abutting properties could expand this build out. One of the two is under the same ownership as the study parcel. They include an additional land area of 8.9 acres (15 Technology Place) and 8.03 acres (0 Dennis Road). This is a total additional acreage of 16.9 acres. This would expand the potential build-out yield that has been calculated for the single parcel. These properties could result in additional hotel, retail, and restaurant space that may range from about an additional 121,000 to 150,000 square feet.

Near these properties is a cluster of other nearby potential development sites. These sites are located in Rockland and were identified during the potential site candidate research for this study and include properties on Commerce Road with an additional 17 acres of potential development land. The ranges of potential uses are based on a conceptual master plan for the potential development and include about 150,000 square feet of commercial space and 170 multifamily units.

For Study Property 3, South Shore Park Property, the potential build-out yield is about 215,000 to 300,000 square feet of commercial space, about 125,000 square feet of light industrial space, and about 450 to 525 housing units or about 336,000 to 450,000 square feet of commercial space, about 125,000 square feet of light industrial space, and about 450 to 525 housing units on the total combined parcels. The expanded cluster of development opportunities in this area would yield an estimated 486,000 to 600,000 square feet of total commercial space, about 125,000 square feet of light industrial space, and about 620 to 695 housing units.

Study Property 4 – Wildcat Lane Property, Norwell

The total property area is 74.3 acres. 23.1 acres are conservation restricted and 21.0 are reserved for recreation. This leaves 30.2 acres unrestricted or reserved that will be the basis for the potential build-out calculations. Wetland areas on the property are estimated to be approximately 948,377 square feet or about 21.8 acres. The wetland area was roughly measured in GIS with the area measurement tool. This estimate does not include wetland buffers or stream and river setbacks. It is assumed that these buffers could be accommodated within a layout for the conceptual development program described. It is not clear what portion of the wetlands intersects with the land that is unrestricted or reserved. An assumption that 30% of the 30.2 available acres is wetland would reduce the developable property area to 21.14 acres. The amount dedicated to access roadways for the new building lots and other lot layout inefficiencies is roughly estimated to require about 15% of this land area or an additional 3.2 acres. This would leave 17.94 acres or about 18 acres for the potential build-out.

A potential development concept based on the adjacent residential cluster development, Donovan Farm, would yield about the same amount of housing units as the standard subdivision calculations. Donovan Farm results in about 1 unit per acre. Applied to this property, this would result in about 18 units, compared to the 18 units that were calculated as allowed by right under current zoning with subdivided single-family lots. Another density benchmark is the Smart Growth 40R district density required for single-family homes, which is 8 units per acre. Using 8 units per acre on the 18 acres for potential development would yield 144 total units, which is likely too high for this property. Instead, a lower density between these two benchmarks of 2 or 3 units per acre is used for the 18 acres, which would result in a total of about 36 to 54 housing units.

Two additional abutting properties could potentially expand this build out and are under the same ownership as the study parcel, but they are town conservation parcels that are almost entirely wetland.

No other potential development sites were identified in the vicinity of this property during the potential site candidate research for this study.

For Study Property 4, Wildcat Lane Property, the potential build-out yield is about 36 to 54 housing units.

Study Property 5 – Land behind Home Depot, Rockland

The total property area is 28.6 acres. The property has about 167 feet of frontage on Pond Street, but no frontage along other roadways. If Curry Street, Wilson Street, or Colby Street were extended into the property, then additional frontage may be available to subdivide the property. As currently configured, for this build-out analysis, the property will be considered one parcel that is not subdivided. Wetland areas on the property are estimated to be approximately 678,544 square feet or about 15.6 acres. The wetland area was roughly measured in GIS with the area measurement tool. This estimate does not include wetland buffers or stream and river setbacks. It is assumed that these buffers could be accommodated within a layout for the conceptual development program described. This would reduce the developable property area to about 13 acres.

Using this total property development area of 13 acres and developing a potential residential development concept using the Modera Marshfield model of 11.69 units per acre would result in about 150 total units. The development may try to push that density higher to about 200 units total.

This property does not have immediately adjacent parcels that could be combined for a larger development opportunity. It is close to other development clusters that were identified during the potential site candidate research for this study – the South Shore Industrial Park area in Hingham and the Accord Park area in Norwell.

For Study Property 5, Land behind Home Depot, the potential build-out yield is about 150 to 200 residential units.

Study Property 6 – Bristol Brothers Properties, Weymouth

The total property area is 59.01 acres. Wetland areas on the property are estimated to be approximately 112,545 square feet or about 2.6 acres. The wetland area was roughly measured in GIS with the area measurement tool. This estimate does not include wetland buffers or stream and river setbacks. It is assumed that these buffers could be accommodated within a layout for the conceptual development program described. The amount dedicated to access roadways for the new building lots and other lot layout inefficiencies is roughly estimated to require about 15% of this land area or an additional 8.5 acres. This would leave 47.9 acres for the potential build-out.

Using this total property development area of about 47.9 acres. Building on its adjacent uses this property may develop as a mix of commercial and residential uses that transition to retail and residential uses on abutting properties to the east. The potential build-out could include 182,000 to 234,000 square feet of commercial space and 180 to 210 multifamily residential units.

Five additional abutting properties in Weymouth and additional property in Hingham could expand this build out and are under the same ownership as the study parcel. In Weymouth, the five abutting parcels include an additional land area of 8.85, 16.17, 4.4, 11.58, and 29.39 acres. This is a total additional acreage of 70.39 acres. This would expand the potential build-out yield that has been calculated for the single parcel. This additional area could add 270,000 to 350,000 square feet of light industrial space and 270 to 300 multifamily residential units.

Near these properties is a cluster of other nearby potential development sites in Hingham. These sites were identified during the potential site candidate research for this study and include multiple properties on Southwood Pointe Drive and Old Derby Street. The parcels combine to an additional 118 acres. About 10 acres

of the properties may be impacted by wetlands, which would leave about 108 for development. The amount dedicated to access roadways for the new building lots and other lot layout inefficiencies is roughly estimated to require about 15% of this land or an additional 16.2 acres. This would leave about 91.8 acres for the potential build-out in this expanded cluster of parcels. This additional area could potentially support 350,000 to 450,000 square feet of retail uses that may include a grocery store. Additionally, this area could support 350 to 400 multifamily residential units.

For Study Property 6, Bristol Brothers Property, the potential build-out yield is about 182,000 to 234,000 square feet of commercial space and 180 to 210 multifamily residential units on the single parcel or about 182,000 to 234,000 square feet of commercial space, 270,000 to 350,000 square feet of light industrial space and 450 to 510 multifamily residential units on the total combined parcels in Weymouth. The expanded cluster of development opportunities in this area could yield an estimated 182,000 to 234,000 square feet of commercial space, 270,000 to 350,000 square feet of light industrial space, 350,000 to 450,000 square feet of retail uses, and 800 to 910 residential units.

EXTRAPOLATING FROM BUILD-OUT PROJECTIONS

The following table summarizes and compares the build-out projections calculated under current zoning constraints and unconstrained by zoning for each study property, abutting properties, and clusters of nearby opportunity sites.

Location		Build-out Projections		
Study Property	Extent	Current Zoning	Potential	Change between current and potential
Study Property #1 – Cardinal Cushing Rear Property, Hanover				
Parcel	<i>Residential</i> Single-family: 100 units Multi-family: 0 units	<i>Residential</i> Single-family: 0 units Multi-family: 250 to 490 units	<i>Residential</i> Single-family: (-100) units Multi-family: +250 to +490 units	
	<i>Commercial</i> General/office: 0 SF (Square Feet) Retail: 0 SF Restaurant: 0 SF	<i>Commercial</i> General/office: 0 SF Retail: 0 SF Restaurant: 0 SF	<i>Commercial</i> General/office: 0 SF Retail: 0 SF Restaurant: 0 SF	
	<i>Light Industrial</i> Manufacturing: 0 SF Warehouse: 0 SF	<i>Light Industrial</i> Manufacturing: 0 SF Warehouse: 0 SF	<i>Light Industrial</i> Manufacturing: 0 SF Warehouse: 0 SF	
Assembled Parcels	<i>Residential</i> Single-family: 166 units Multi-family: 0 units	<i>Residential</i> Single-family: 0 units Multi-family: 500 to 920 units	<i>Residential</i> Single-family: (-166) units Multi-family: +500 to +920 units	
	<i>Commercial</i> General/office: 0 SF Retail: 0 SF Restaurant: 0 SF	<i>Commercial</i> General/office: 0 SF Retail: 0 SF Restaurant: 0 SF	<i>Commercial</i> General/office: 0 SF Retail: 0 SF Restaurant: 0 SF	
	<i>Light Industrial</i> Manufacturing: 0 SF Warehouse: 0 SF	<i>Light Industrial</i> Manufacturing: 0 SF Warehouse: 0 SF	<i>Light Industrial</i> Manufacturing: 0 SF Warehouse: 0 SF	
Potential Cluster	<i>Residential</i> Single-family: 286 units Multi-family: 0 units	<i>Residential</i> Single-family: 0 units Multi-family: 1,000 to 1,890 units	<i>Residential</i> Single-family: (-286) units Multi-family: +1,000 to +1,890 units	
	<i>Commercial</i> General/office: 0 SF Retail: 0 SF Restaurant: 0 SF	<i>Commercial</i> General/office: 0 SF Retail: 0 SF Restaurant: 0 SF	<i>Commercial</i> General/office: 0 SF Retail: 0 SF Restaurant: 0 SF	
	<i>Light Industrial</i> Manufacturing: 0 SF Warehouse: 0 SF	<i>Light Industrial</i> Manufacturing: 0 SF Warehouse: 0 SF	<i>Light Industrial</i> Manufacturing: 0 SF Warehouse: 0 SF	

Study Property #2 – Unicorn Development Property, Hanover			
Parcel	<i>Residential</i> Single-family: 0 units Multi-family: 0 units	<i>Residential</i> Single-family: 0 units Multi-family: 140 units	<i>Residential</i> Single-family: 0 units Multi-family: +140 units
	<i>Commercial</i> General/office: 0 SF Retail: 0 SF Restaurant: 0 SF	<i>Commercial</i> General/office: 0 SF Retail: 20,000 to 30,000 SF Restaurant: 0 SF	<i>Commercial</i> General/office: 0 SF Retail: +20,000 to +30,000 SF Restaurant: 0 SF
	<i>Light Industrial</i> Manufacturing: 0 SF Warehouse: 0 SF	<i>Light Industrial</i> Manufacturing: 0 SF Warehouse: 0 SF	<i>Light Industrial</i> Manufacturing: 0 SF Warehouse: 0 SF
Assembled Parcels	<i>Residential</i> Single-family: 0 units Multi-family: 0 units	<i>Residential</i> Single-family: 0 units Multi-family: 340 to 684 units	<i>Residential</i> Single-family: 0 units Multi-family: +340 to +684 units
	<i>Commercial</i> General/office: 536,000 SF Retail: 0 SF Restaurant: 0 SF	<i>Commercial</i> General/office: 0 SF Retail: 40,000 to 60,000 SF Restaurant: 0 SF	<i>Commercial</i> General/office: (-536,000) SF Retail: +40,000 to +60,000 SF Restaurant: 0 SF
	<i>Light Industrial</i> Manufacturing: 0 SF Warehouse: 0 SF	<i>Light Industrial</i> Manufacturing: 0 SF Warehouse: 0 SF	<i>Light Industrial</i> Manufacturing: 0 SF Warehouse: 0 SF
Potential Cluster	<i>Residential</i> Single-family: 4 units Multi-family: 0 units	<i>Residential</i> Single-family: 4 units Multi-family: 370 to 714 units	<i>Residential</i> Single-family: 0 units Multi-family: +370 to +714 units
	<i>Commercial</i> General/office: 536,000 SF Retail: 0 SF Restaurant: 0 SF	<i>Commercial</i> General/office: 0 SF Retail: 40,000 to 60,000 SF Restaurant: 0 SF	<i>Commercial</i> General/office: (-536,000) SF Retail: +40,000 to +60,000 SF Restaurant: 0 SF
	<i>Light Industrial</i> Manufacturing: 0 SF Warehouse: 0 SF	<i>Light Industrial</i> Manufacturing: 0 SF Warehouse: 0 SF	<i>Light Industrial</i> Manufacturing: 0 SF Warehouse: 0 SF
Study Property #3 – South Shore Park Property, Hingham			
Parcel	<i>Residential</i> Single-family: 0 units Multi-family: 0 units	<i>Residential</i> Single-family: 100 to 125 units Multi-family: 350 to 400 units	<i>Residential</i> Single-family: +100 to +125 units Multi-family: +350 to +400 units
	<i>Commercial</i> General/office: 210,000 SF Retail: 0 SF Restaurant: 0 SF	<i>Commercial</i> General/office: 175,000 to 260,000 SF Retail: 30,000 SF Restaurant: 10,000 SF	<i>Commercial</i> General/office: (-35,000) to +50,000 SF Retail: +30,000 SF Restaurant: +10,000 SF

		<i>Light Industrial</i> Manufacturing: 330,000 SF Warehouse: 220,000 SF	<i>Light Industrial</i> Manufacturing: 75,000 SF Warehouse: 50,000 SF	<i>Light Industrial</i> Manufacturing: (-255,000) SF Warehouse: (-170,000) SF
Assembled Parcels	<i>Residential</i> Single-family: 0 units Multi-family: 0 units	<i>Residential</i> Single-family: 100 to 125 units Multi-family: 350 to 400 units	<i>Residential</i> Single-family: 100 to 125 units Multi-family: 350 to 400 units	<i>Residential</i> Single-family: +100 to +125 units Multi-family: +350 to +400 units
	<i>Commercial</i> General/office: 220,000 SF Retail: 0 SF Restaurant: 0 SF	<i>Commercial</i> General/office: 274,000 to 388,000 SF Retail: 42,000 SF Restaurant: 20,000 SF	<i>Commercial</i> General/office: 274,000 to 388,000 SF Retail: 42,000 SF Restaurant: 20,000 SF	<i>Commercial</i> General/office: +54,000 to +168,000 SF Retail: +42,000 SF Restaurant: +20,000 SF
	<i>Light Industrial</i> Manufacturing: 360,000 SF Warehouse: 243,000 SF	<i>Light Industrial</i> Manufacturing: 75,000 SF Warehouse: 50,000 SF	<i>Light Industrial</i> Manufacturing: 75,000 SF Warehouse: 50,000 SF	<i>Light Industrial</i> Manufacturing: (-285,000) SF Warehouse: (-193,000) SF
Potential Cluster	<i>Residential</i> Single-family: 0 units Multi-family: 0 units	<i>Residential</i> Single-family: 100 to 125 units Multi-family: 520 to 570 units	<i>Residential</i> Single-family: 100 to 125 units Multi-family: 520 to 570 units	<i>Residential</i> Single-family: +100 to +125 units Multi-family: +520 to +570 units
	<i>Commercial</i> General/office: 259,000 SF Retail: 0 SF Restaurant: 0 SF	<i>Commercial</i> General/office: 276,000 SF to 390,000 Retail: 170,000 SF Restaurant: 40,000 SF	<i>Commercial</i> General/office: 276,000 SF to 390,000 Retail: 170,000 SF Restaurant: 40,000 SF	<i>Commercial</i> General/office: +17,000 SF to +131,000 Retail: +170,000 SF Restaurant: +40,000 SF
	<i>Light Industrial</i> Manufacturing: 427,000 SF Warehouse: 287,000 SF	<i>Light Industrial</i> Manufacturing: 75,000 SF Warehouse: 50,000 SF	<i>Light Industrial</i> Manufacturing: 75,000 SF Warehouse: 50,000 SF	<i>Light Industrial</i> Manufacturing: (-352,000) SF Warehouse: (-237,000) SF
Study Property #4 – Wildcat Lane Property, Norwell				
Parcel	<i>Residential</i> Single-family: 18 units Multi-family: 0 units	<i>Residential</i> Single-family: 36 to 54 units Multi-family: 0 units	<i>Residential</i> Single-family: 36 to 54 units Multi-family: 0 units	<i>Residential</i> Single-family: +18 to +36 units Multi-family: 0 units
	<i>Commercial</i> General/office: 0 SF Retail: 0 SF Restaurant: 0 SF	<i>Commercial</i> General/office: 0 SF Retail: 0 SF Restaurant: 0 SF	<i>Commercial</i> General/office: 0 SF Retail: 0 SF Restaurant: 0 SF	<i>Commercial</i> General/office: 0 SF Retail: 0 SF Restaurant: 0 SF
	<i>Light Industrial</i> Manufacturing: 0 SF Warehouse: 0 SF	<i>Light Industrial</i> Manufacturing: 0 SF Warehouse: 0 SF	<i>Light Industrial</i> Manufacturing: 0 SF Warehouse: 0 SF	<i>Light Industrial</i> Manufacturing: 0 SF Warehouse: 0 SF

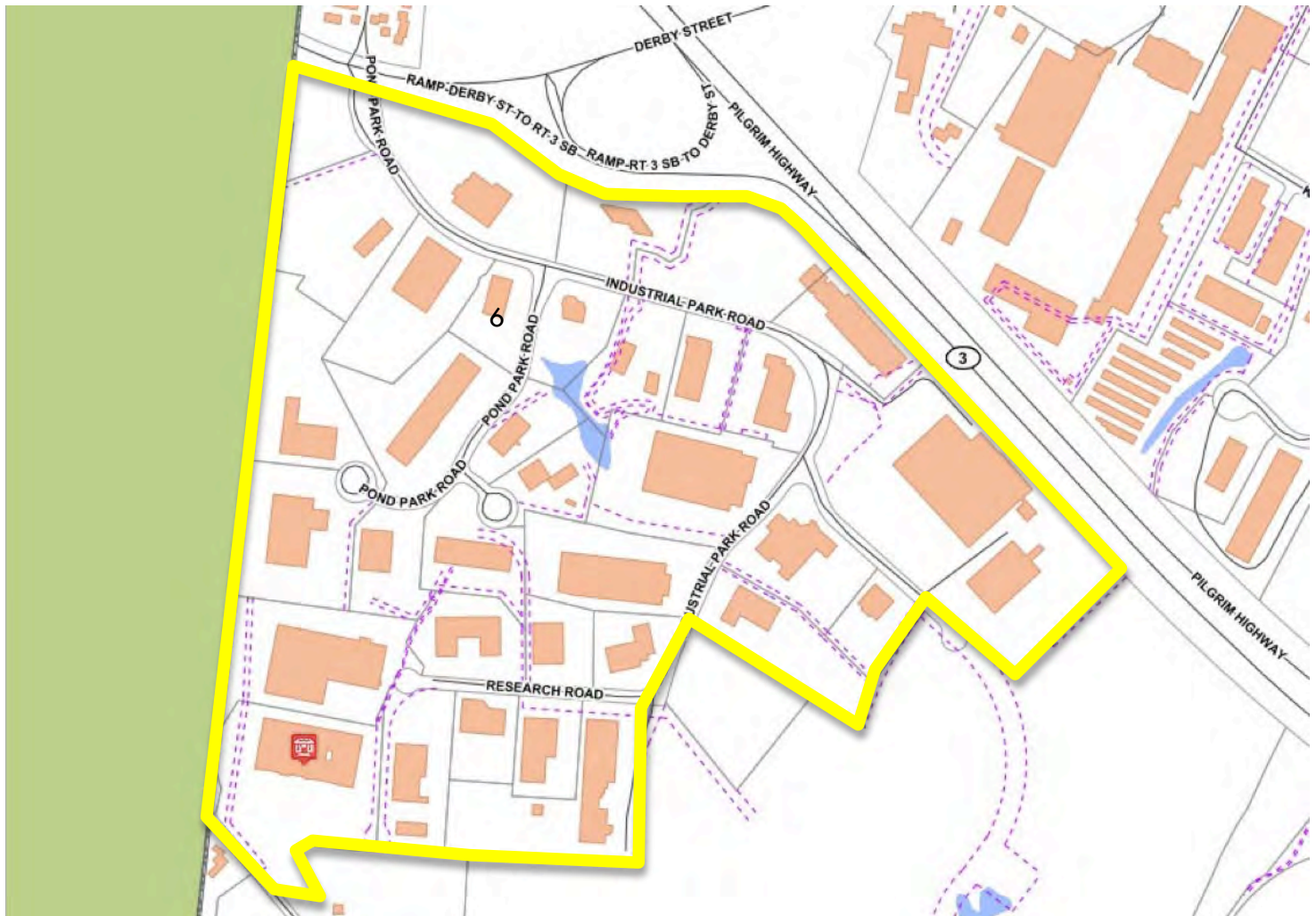
Assembled Parcels	There are no additional adjacent parcels available for parcel assembly.		
Potential Cluster	There are no additional potential development properties in the vicinity to form a potential development cluster.		
Study Property #5 – Land behind Home Depot, Rockland			
Parcel	<i>Residential</i> Single-family: 0 units Multi-family: 0 units	<i>Residential</i> Single-family: 0 units Multi-family: 150 to 200 units	<i>Residential</i> Single-family: 0 units Multi-family: +150 to +200 units
	<i>Commercial</i> General/office: 280,000 SF Retail: 0 SF Restaurant: 0 SF	<i>Commercial</i> General/office: 0 SF Retail: 0 SF Restaurant: 0 SF	<i>Commercial</i> General/office: (-280,000) SF Retail: 0 SF Restaurant: 0 SF
	<i>Light Industrial</i> Manufacturing: 0 SF Warehouse: 0 SF	<i>Light Industrial</i> Manufacturing: 0 SF Warehouse: 0 SF	<i>Light Industrial</i> Manufacturing: 0 SF Warehouse: 0 SF
Assembled Parcels	There are no additional adjacent parcels available for parcel assembly.		
Potential Cluster	The property is near two potential development clusters (South Shore Industrial Park in Hingham and Accord Park in Norwell), but neither cluster has been calculated as a larger potential development opportunity that could potentially be related to this site.		
Study Property #6 – Bristol Brothers Properties, Weymouth			
Parcel	<i>Residential</i> Single-family: 0 units Multi-family: 0 units	<i>Residential</i> Single-family: 0 units Multi-family: 180 to 210 units	<i>Residential</i> Single-family: 0 units Multi-family: +180 to +210 units
	<i>Commercial</i> General/office: 110,000 SF Retail: 0 SF Restaurant: 0 SF	<i>Commercial</i> General/office: 182,000 to 234,000 SF Retail: 0 SF Restaurant: 0 SF	<i>Commercial</i> General/office: +72,000 to +124,000 SF Retail: 0 SF Restaurant: 0 SF
	<i>Light Industrial</i> Manufacturing: 183,000 SF Warehouse: 123,000 SF	<i>Light Industrial</i> Manufacturing: 0 SF Warehouse: 0 SF	<i>Light Industrial</i> Manufacturing: (-183,000) SF Warehouse: (-123,000) SF
Assembled Parcels	<i>Residential</i> Single-family: 0 units Multi-family: 0 units	<i>Residential</i> Single-family: 0 units Multi-family: 450 to 510 units	<i>Residential</i> Single-family: 0 units Multi-family: +450 to +510 units
	<i>Commercial</i> General/office: 266,000 SF Retail: 0 SF Restaurant: 0 SF	<i>Commercial</i> General/office: 182,000 to 234,000 SF Retail: 0 SF Restaurant: 0 SF	<i>Commercial</i> General/office: (-84,000 to -32,000) SF Retail: 0 SF Restaurant: 0 SF
	<i>Light Industrial</i>	<i>Light Industrial</i>	<i>Light Industrial</i>

	Manufacturing: 439,000 SF Warehouse: 295,000 SF	Manufacturing: 162,000 to 210,000 SF Warehouse: 108,000 to 140,000 SF	Manufacturing: (-277,000 to -229,000) SF Warehouse: (-187,000 to -155,000) SF
Potential Cluster	<i>Residential</i> Single-family: 0 units Multi-family: 0 units	<i>Residential</i> Single-family: 0 units Multi-family: 800 to 910 units	<i>Residential</i> Single-family: 0 units Multi-family: +800 to +910 units
	<i>Commercial</i> General/office: 479,000 SF Retail: 0 SF Restaurant: 0 SF	<i>Commercial</i> General/office: 182,000 to 234,000 SF Retail: 320,000 to 420,000 SF Restaurant: 30,000 SF	<i>Commercial</i> General/office: (-297,000 to -245,000) SF Retail: +320,000 to +420,000 SF Restaurant: +30,000 SF
	<i>Light Industrial</i> Manufacturing: 790,000 SF Warehouse: 531,000 SF	<i>Light Industrial</i> Manufacturing: 162,000 to 210,000 SF Warehouse: 108,000 to 140,000 SF	<i>Light Industrial</i> Manufacturing: (-628,000 to -580,000) SF Warehouse: (-423,000 to -391,000) SF

Support for Allocation of General Build-out Area to Specific Commercial and Light Industrial Uses

The South Shore Industrial Park in Hingham was used as existing context to allocate the overall generalized commercial and light industrial square footage among different types of more specific uses. The specific commercial uses include general/office, retail, restaurant, and the specific light industrial uses include manufacturing and storage. The map and calculations below show the basis for these allocation assumptions.

The map below shows the existing area that was used to measure allocations of uses that, on some level, reflect the existing market context for build-out space in the vicinity. The area in yellow has been analyzed for total square footage and the proportion of specific uses within that area. The table below the map summarizes this information.



Summary of Specific Uses

Map Key	PID	Address	Use Code	Use Description	Acreage	Living Area	FAR
1	200-0-1	0 Derby Street	4410	Ind Ld Po	2.11 (91,911 SF)	0	0.0
2	7943	1 Pond Park Road	4010	Ind Whses	5.36 (233,481 SF)	9,600	0.04

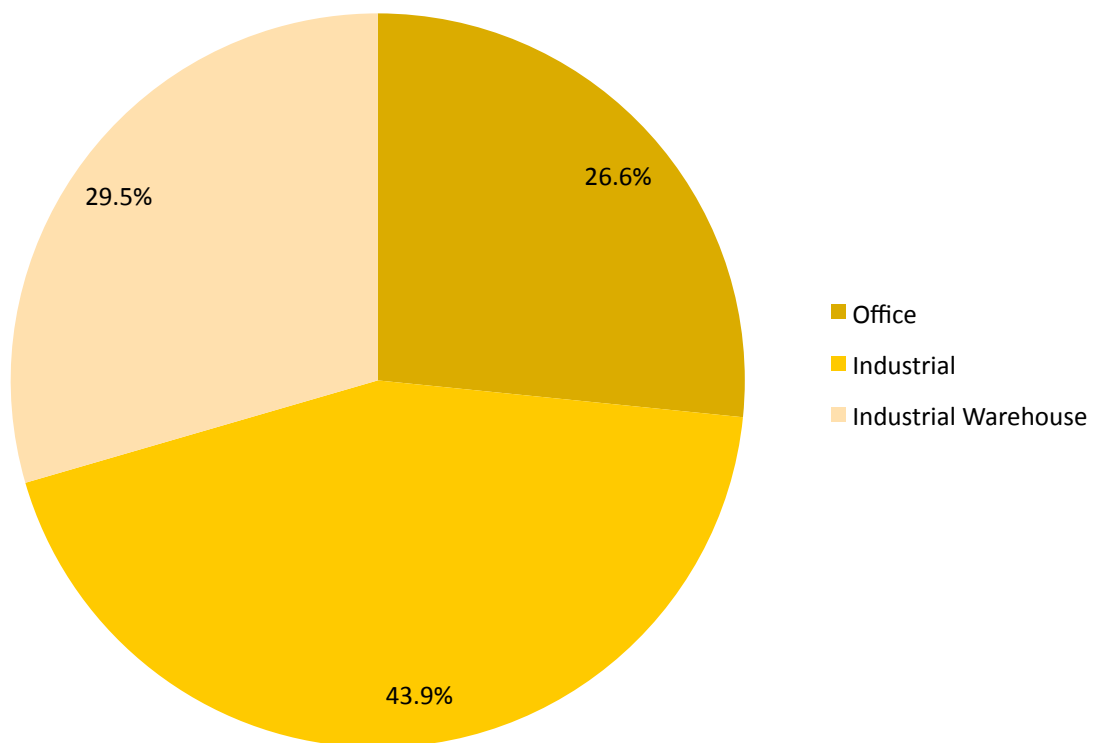
3	7959	3 Pond Park Road	4010	Ind Whses	4.89 (213,008 SF)	40,000	0.19
Map Key	PID	Address	Use Code	Use Description	Acreage	Living Area	FAR
4	7941	2 Pond Park Road	3420	Prof Bldg	6.29 (273,992 SF)	74,600	0.27
5	7952	4 Pond Park Road	3400	Office Bldg	3.39 (147,668 SF)	20,340	0.14
6	7951	5 Pond Park Road	4020	Ind Office	2.01 (87,555 SF)	12,160	0.14
7	201-0-3	90 A Industrial Park Road	440V	Ind Ld Dv	5.32 (231,739 SF)	0	0.0
8	7953	45 Industrial Park Road	3400	Office Bldg	2.37 (103,237 SF)	7,539	0.07
9	7954	55 Industrial Park Road	4000	Industrial	3.33 (145,054 SF)	4,000	0.03
10	7955	65 Industrial Park Road	4000	Industrial	2.43 (105,580 SF)	23,900	0.23
11	7956	75 Industrial Park Road	4000	Industrial	2.77 (120,661 SF)	34,025	0.28
12	7958	90 Industrial Park Road	4020	Ind Office	3.24 (141,134 SF)	59,991	0.43
13	8189	100 Industrial Park Road	4000	Industrial	17.05 (742,698 SF)	40,692	0.05
14	8201	35 Commerce Road	4010	Ind Whses	2.00 (87,120 SF)	10,000	0.11
15	8197	110 Industrial Park Road	4000	Industrial	4.02 (175,111 SF)	39,479	0.23
16	8196	120 Industrial Park Road	4010	Ind Whses	4.05 (176,418 SF)	22,259	0.13
17	8193	99 Industrial Park Road	4000	Industrial	6.74 (293,594 SF)	70,914	0.24
18	8188	125 Industrial Park Road	4000	Industrial	5.00 (217,800 SF)	69,600	0.32
19	8195	55 Research Road	4000	Industrial	2.00 (87,120 SF)	20,340	0.23
20	8192	75 Research Road	4010	Ind Whses	2.00 (87,120 SF)	21,280	0.24
21	8190	85 Research Road	4010	Ind Whses	3.04 (132,422 SF)	31,020	0.23
22	8191	30 Pond Park Road	4010	Ind Whses	3.23 (140,698 SF)	30,000	0.21
23	8198	10 Old Mine Rock Way	340I	Office Bldg	2.35 (102,366 SF)	13,882	0.14
24	7957	20 Pond Park Road	3400	Office Bldg	2.11 (91,911 SF)	11,480	0.12

25	7961-7965	35 Pond Park Road	4021	Ind Condo	Est. 6 (261,360 SF)	47,557	Est. 0.18
Map Key	PID	Address	Use Code	Use Description	Acreage	Living Area	FAR
26	7942	45 Pond Park Road	4010	Ind Whses	5.23 (227,818 SF)	26,104	0.11
27	8182	50 Pond Park Road	4010	Ind Whses	5.27 (229,561 SF)	49,096	0.21
28	8183	40 Pond Park Road	3510	Educ Bldg	2.69 (117,176 SF)	19,200	0.16
29	8185	100 Research Road	4000	Industrial	6.53 (284,446 SF)	99,075	0.35
30	8187	75 Abington Street	3510	Educ Bldg	8.25 (359,370 SF)	88,903	0.25
31	8202	90 Research Road	4010	Ind Whses	3.98 (173,368 SF)	5,782	0.03
32	8194	80 Research Road	4010	Ind Whses	2.00 (87,120 SF)	20,002	0.23
33	8199	70 Research Road	4000	Industrial	2.25 (98,010 SF)	29,250	0.30
34	8200	60 Research Road	4010	Ind Whses	6.70 (291,852 SF)	56,620	0.19

The average FAR across these properties is **0.18**. This is well below the FAR allowed by zoning.

The mix of specific uses in this district is represented in the chart below. These proportions provide a set of context-based assumptions that will be applied to the build-out calculations for commercial uses to allocate proportions of specific uses.

Allocation of Specific Uses



Support for Potential Build-out Based on Comparable South Shore Development

Potential zoning build-out uses comparison of comparable development projects to extrapolate the potential scale and build-out yield. The following comparable projects were identified in the South Shore to provide a basis for the estimation of extrapolations:

- **Modera Marshfield, 1 Chestnut Street, Marshfield, MA**
 - Completed in 2020
 - 248 units
 - About 62 affordable units
 - Townhouse (about 60) and garden apartment (about 210) development
 - 2-stories
 - Site was 21.2 acres of wooded site with 630 feet of frontage
 - No streams or wetlands on or near the property
 - Onsite wastewater treatment facility
 - All underground utilities
 - Municipal water from tow connections on Commerce Way
 - Permitted through ZBA as 40B project
 - Developed by Mill Creek Residential
 - 11.69 units per acre



- **Residences at Driftway Place/Village at Greenbush, 247 Driftway Place, Scituate, MA**

- Completed in 2020
- 78 rental units
- 109,842 gross square feet mixed-use development
- 3-stories
- 8,914 square feet of retail and commercial space
- 160 parking spaces
- 101,544 square feet (2.33 acres) property
- 33.48 units per acre



- **Lenox Farms, 550 Liberty Street, Braintree, MA**

- Completed in 2008
- 338 unit
- 3-story townhouses and one-story garden-style apartments
- 42 buildings



- **Hanover Crossing, 1775 Washington Street, Hanover, MA**
 - To be completed in 2021
 - 297 residential units
 - 582,000 square feet retail
 - Including entertainment, lifestyle and retail tenants including 10, auditorium, 1,000 seat, 42,500 square feet Showcase Cinemas



- **Donovan Farm, 25 Donovan Farm Way, Norwell, MA**
 - Completed in 2003
 - 40 single family homes
 - 55+ community
 - 2,000 to 2,200 square feet
 - Site area 43.89 acres

MEMORANDUM

TO: MAPC & Mass Development

FROM: Laurie Toscano & Tara McManus

DATE: April 28, 2021

SUBJECT: **South Shore Site Readiness Study**
Hypothetical Water and Wastewater Projections for Example Properties

The *South Shore Site Readiness Study* has been undertaken to look at specific sites in the study area communities of Hanover, Hingham, Norwell, Rockland and Weymouth for potential future development and to further examine the limitations and potential solutions to infrastructure limitations. Following up on the initial tasks of documenting existing conditions of water supply and wastewater treatment capacity and the development of build-out scenarios for the study properties in these communities, this memorandum summarizes the potential water demand and wastewater flow scenarios.

MAPC completed the site selection process and drafted current and future build-out scenarios for the six selected sites. Separate reports have been drafted for those tasks.

For each of the six (6) Study Area Parcels, there are up to six (6) build-out scenarios that have been generated by MAPC.

- The first three (3) build-out scenarios consider **current** site zoning and estimate (hypothetically) what could be built under those conditions. The differences between these first three (3) build-out scenarios are consideration as a single parcel, grouped with contiguously-owned adjacent parcels and grouped with cluster parcels.
- The second set of (3) build-out scenarios consider **future potential** site zoning and estimate (hypothetically) what could be built under those conditions. Again, these next three (3) build-out scenarios are as a single parcel, grouped with contiguously-owned adjacent parcels and grouped with cluster parcels.

Under each of these scenarios and for each parcel, a combination of residential, commercial and/or industrial uses was developed and summarized in *MAPC's February 2, 2021 report*. Following a virtual meeting with representatives of the study area communities, some of the scenarios were updated as summarized in *MAPC's April 8, 2021 report*. Where applicable, these revisions are incorporated into the projections below.

CALCULATION METHODOLOGY

Planning level calculation of potential water demands and corresponding wastewater generation was performed for this effort using a conservative approach, tempered with some factors to account for Massachusetts-based water conservation measures.

Approximate wastewater flow values for each potential use were calculated initially on the basis of *MA Title 5 System Sewage Flow Criteria (310 CMR § 15.203 (2) – (5))*. This basis generates a maximum daily flow, which is required to be used to size septic systems and groundwater discharge areas. However, due to the fact that the range of potential solutions will also consider sewer connection (if available), this basis generates a wastewater flow value that is too conservative and far exceeds the basis used to generate water demand for these potential development scenarios, where the Public Water Supply Annual Statistical Reports (ASRs) for the study area communities were reviewed. It should be noted that fire protection flow requirements are not addressed in this study. It is assumed that each community's water system supply and storage is adequately sized to provide the required fire protection for the six different build-out scenarios. The distribution pipeline network capacity to convey the required fire protection demands would need to be analyzed based on building size, type of use, material of construction, building densities, presence of sprinkler system, and other state and local fire protection requirements.

CALCULATIONS FOR RESIDENTIAL USES: To maintain consistency with the water supply calculations, a per capita flow calculation method was used to generate residential water demand and corresponding wastewater flows. As footnoted on the calculation tables (attached), residential demands and wastewater flows were calculated using the average household size (capita per residence, cpr) as provided by MAPC as: 2.92 cpr for Hanover, 2.63 cpr for Hingham, 2.93 cpr for Norwell, 2.56 cpr for Rockland, and 2.40 cpr for Weymouth. Water average daily per capita flow of 65 gallons per day was used in accordance with *Massachusetts DEP's Performance Standards for Public Water Supplies* and the *Massachusetts Water Conservation Standards*. Wastewater average daily per capita flow of 70 gallons per day was used in accordance with *TR-16 Guidelines for the Design of Wastewater Treatment Works* (and based on *MA Title 5* for a 2-bedroom residence with approximately 3 pph), but then reduced by 30% (to 50 gallons per day) to account for water conservation measures that will be required of any new future development in these communities.

CALCULATIONS FOR COMMERCIAL USES: Commercial wastewater flows were estimated by gross floor area and multiplying that by the *Title 5* recommended flow for office or retail space, as identified. Commercial Restaurant wastewater flows were estimated assuming 50% of the overall floor space was allocated for dining (versus kitchen, prep and ancillary spaces) and that 15 square feet per seat is needed for typical dining (not fast food or fine dining), in order to apply the *Title 5* basis. Commercial water demands include a 1.20 consumptive use factor and a 1.1 factor for unaccounted for water to provide an allowance for irrigation, which is site and use specific.

CALCULATIONS FOR INDUSTRIAL USES: Industrial wastewater flows were estimated by generating an employee density (from the *Trip Generation manual*, for Industrial park: 2 employees per 1,000 square feet of gross floor area) and multiplying that by the *Title 5* recommended flow for a Factory or Industrial Plant with a cafeteria. Like the Commercial uses, Industrial water demands include a 1.20 consumptive use factor and a 1.1 factor for unaccounted for water to provide an allowance for irrigation, which is site and use specific.

WATER DEMAND & WASTEWATER FLOW SUMMARIES

Summarized below is the range of water demand and wastewater flow projected for each community/site based on the build-out scenarios. For this write-up, we have compared average daily flow values, however, the full projection analysis also includes max day demands and peak wastewater flows, which will be used in the next phase of this study. Partnering opportunities between adjacent communities (if available) will also be considered in the continuing phase.

HANOVER

Two potential development sites were identified in Hanover, *Cardinal Cushing Rear Property* in southeast Hanover and *Unicorn Development Property* in northeast Hanover, both near the Norwell town boundary. Based on the methodology summarized above, the following water demands and wastewater flows were generated for the Hanover properties:

Water Demand and Wastewater Flow Projections		HANOVER			
		Cardinal Cushing Rear Property (Parcel ID 3143)			
		WAT ADF	WAT ADF	WWA ADF	WWA ADF
Min Dev	Max Dev	Min Dev	Max Dev		
Potential Development Scenario Generated by MAPC team		<i>gpd</i>	<i>gpd</i>	<i>gpd</i>	<i>gpd</i>
1	for Potential Build-out allowed under Current Zoning	18,980	N/A	14,600	N/A
2	for Assembled Parcels Potential Build-out allowed under Current Zoning	31,507	N/A	24,236	N/A
3	for Clustered Parcels with Potential Build-out allowed under Current Zoning	54,283	N/A	41,756	N/A
4	for Potential Build-out allowed under Potential Future Zoning	47,450	93,002	36,500	71,540
5	for Assembled Parcels with Potential Build-out under Future Potential Zoning	94,900	174,616	73,000	134,320
6	for Clustered Parcels with Potential Build-out under Potential Future Zoning	189,800	358,722	146,000	275,940

As can be seen above, there is a significant range of water demand that could be seen in the future with this type of development, from approximately 19,000 gpd to over 350,000 gpd. Based on Hanover's Water Management Act (WMA) permitted withdrawal (1.38 MGD) and the Town's 2019 water demand (approximately 1.25 MGD), there is a potential that some of the lower scenarios of this future demand could be met with extension of the water supply, however the Town would need to review this in greater detail and confirm it would not displace other allocated uses.

Corresponding wastewater flow projections range from just under 15,000 gpd to 275,000 gpd. Since Hanover does not have a centralized sewer system, treatment and discharge options for these flows would have to be created. The privately-owned wastewater treatment facility (WWTF) that is nearby to this site does not have the capacity to accept even the low range of the predicted flow, but other options will be considered in the next phase of this project.

The second site in Hanover was originally projected to have residential development throughout the various scenarios, however due to the confirmation that the property is located in the Interchange Overlay District, projections were revised to have commercial development throughout the various scenarios. The revised development projections changed the demand and flow projections, as follows.

<i>Potential Development Scenario Generated by MAPC team (Rev 4/8/21)</i>		Water Demand and Wastewater Flow Projections			
		HANOVER			
		Unicorn Development Property (Parcel ID 11-106)			
		WAT ADF	WAT ADF	WWA ADF	WWA ADF
		Min Dev	Max Dev	Min Dev	Max Dev
		<i>gpd</i>	<i>gpd</i>	<i>gpd</i>	<i>gpd</i>
1	for Potential Build-out allowed under Current Zoning	0	N/A	0	N/A
2	for Assembled Parcels Potential Build-out allowed under Current Zoning	53,064	N/A	40,200	N/A
3	for Clustered Parcels with Potential Build-out allowed under Current Zoning	53,823	N/A	40,784	N/A
4	for Potential Build-out allowed under Potential Future Zoning	27,892	28,552	21,440	21,940
5	for Assembled Parcels with Potential Build-out under Future Potential Zoning	67,172	133,783	51,640	102,864
6	for Clustered Parcels with Potential Build-out under Potential Future Zoning	73,625	140,236	56,604	107,828

This second site in Hanover would also have a range of water demand that could be seen in the future with this type of development, though it is lower than the first with between 27,000 gpd to over 140,000 gpd. Again, with limited volume remaining in Hanover's WMA permitted withdrawal versus the Town's 2019 water demand, there is a potential that some of the lower scenarios of this future demand could be met with extension of the water supply, however the Town would need to review this in greater detail and confirm it would not displace other allocated uses.

Corresponding wastewater flow projections range from just over 21,000 gpd to 107,000 gpd. As summarized above, Hanover does not have a centralized sewer system, so treatment and discharge options for these flows would have to be created. There are two privately-owned WWTFs that are nearby to this site. The Merchant's Way WWTF does not likely have the capacity to accept even the low range of the predicted flow, whereas the Hanover Mall WWTF may have some capacity for a partnering opportunity. This and other options will be considered in the next phase of this project.

HINGHAM

The potential development site identified in Hingham is the *South Shore Park Property* in southwest Hingham, near the Weymouth and Rockland town boundaries. The future build-out projections for this Hingham property were revised to include more of a blend of commercial and industrial development and updated water demands and wastewater flows were generated as follows.

<i>Potential Development Scenario Generated by MAPC team (Rev 3/4/21)</i>		Water Demand and Wastewater Flow Projections			
		HINGHAM			
		South Shore Park Property (Parcel ID 8316)			
		WAT ADF	WAT ADF	WWA ADF	WWA ADF
		Min Dev	Max Dev	Min Dev	Max Dev
		<i>gpd</i>	<i>gpd</i>	<i>gpd</i>	<i>gpd</i>
1	for Potential Build-out allowed under Current Zoning	49,830	N/A	37,750	N/A
2	for Assembled Parcels Potential Build-out allowed under Current Zoning	50,820	N/A	38,500	N/A
3	for Clustered Parcels with Potential Build-out allowed under Current Zoning	63,340	N/A	47,985	N/A
4	for Potential Build-out allowed under Potential Future Zoning	118,217	139,453	90,455	106,693
5	for Assembled Parcels with Potential Build-out under Future Potential Zoning	144,195	168,302	110,135	128,548
6	for Clustered Parcels with Potential Build-out under Potential Future Zoning	212,718	236,825	162,385	180,798

As can be seen above, there is a significant range of water demand that could be seen in the future with this type of development, from over 49,000 gpd to over 236,000 gpd. Based on Hingham's WMA permitted withdrawal (3.51 MGD) and the Town's 2019 water demand (approximately 3.16 MGD), there is a potential that some of the lower scenarios of this future demand could be met with extension of the water supply, however the Town would need to review this in greater detail and confirm it would not displace other allocated uses.

Corresponding wastewater flow projections range from just over 37,000 gpd to 180,000 gpd. Hingham’s existing sewer system is very distant from this site, so treatment and discharge options for these flows would have to be created. There are two privately-owned WWTFs that are nearby to this site, but neither likely has the capacity to accept even the low range of the predicted flow. Other options will be considered in the next phase of this project.

NORWELL

The potential development site identified in Norwell is the *Wildcat Lane Property* in southwest Norwell, near the Hanover town boundary. The future build-out projections for this Norwell property were revised based on information that much of this parcel is conservation restricted or reserved for recreation. Updated demand and flow projections are as follows.

<i>Potential Development Scenario Generated by MAPC team (Rev 4/8/21)</i>		Water Demand and Wastewater Flow Projections			
		NORWELL			
		Wildcat Lane Property (Parcel ID 3404)			
		WAT ADF	WAT ADF	WWA ADF	WWA ADF
		Min Dev	Max Dev	Min Dev	Max Dev
		<i>gpd</i>	<i>gpd</i>	<i>gpd</i>	<i>gpd</i>
1	for Potential Build-out allowed under Current Zoning	3,428	N/A	2,637	N/A
2	for Assembled Parcels Potential Build-out allowed under Current Zoning	0	N/A	0	N/A
3	for Clustered Parcels with Potential Build-out allowed under Current Zoning	0	N/A	0	N/A
4	for Potential Build-out allowed under Potential Future Zoning	6,856	10,284	5,274	7,911
5	for Assembled Parcels with Potential Build-out under Future Potential Zoning	0	0	0	0
6	for Clustered Parcels with Potential Build-out under Potential Future Zoning	0	0	0	0

A smaller range of water demand is projected in the future with this type of development in Norwell, from approximately 3,000 gpd to over 10,000 gpd. Based on Norwell’s WMA permitted withdrawal (1.14 MGD) and the Town’s 2019 water demand (approximately 0.92 MGD), there is a potential that all the scenarios of this future demand could be met with extension of the water supply, however the Town would need to review this in greater detail and confirm it would not displace other allocated uses.

Corresponding wastewater flow projections range from approximately 2,600 gpd to 7,900 gpd. Like several of the other communities in this study, Norwell does not have a centralized sewer system, so treatment and discharge options for these flows would have to be created. For the lower range flow values, a basic on-site (septic) system would be the most cost-effective solution.

ROCKLAND

The potential development site identified in Rockland is the *Land behind Home Depot* in northeast Rockland, near the Hanover/Norwell/Hingham town boundaries. Based on the methodology summarized at the beginning of this memorandum, the following water demands and wastewater flows were generated for the Rockland property:

<i>Potential Development Scenario Generated by MAPC team</i>		Water Demand and Wastewater Flow Projections			
		ROCKLAND			
		Land Behind Home Depot (Parcel ID 9-13-0)			
		WAT ADF	WAT ADF	WWA ADF	WWA ADF
		Min Dev	Max Dev	Min Dev	Max Dev
		<i>gpd</i>	<i>gpd</i>	<i>gpd</i>	<i>gpd</i>
1	for Potential Build-out allowed under Current Zoning	27,720	N/A	21,000	N/A
2	for Assembled Parcels Potential Build-out allowed under Current Zoning	0	N/A	0	N/A
3	for Clustered Parcels with Potential Build-out allowed under Current Zoning	0	N/A	0	N/A
4	for Potential Build-out allowed under Potential Future Zoning	24,960	33,280	19,200	25,600
5	for Assembled Parcels with Potential Build-out under Future Potential Zoning	0	0	0	0
6	for Clustered Parcels with Potential Build-out under Potential Future Zoning	0	0	0	0

As can be seen above, there is a smaller range of water demand that could be seen in the future with this type of development in Rockland, from approximately 27,700 gpd to over 33,000 gpd. Based on the Abington/Rockland Joint Water Works' WMA permitted withdrawal (3.11 MGD) and the Joint Water Works' 2019 water demand (approximately 2.72 MGD), there is a potential that the scenarios of this future demand could be met with extension of the water supply, however the Joint Water Works and the Town would need to review this in greater detail and confirm it would not displace other allocated uses.

Corresponding wastewater flow projections range from just over 21,000 gpd to 25,000 gpd. Rockland's existing sewer system is in proximity to this site and limited capacity may be available in the future, so treatment and discharge options will focus on sewer extension for this site. Other options will also be considered in the next phase of this project.

WEYMOUTH

The potential development site identified in Weymouth is the *Bristol Brothers Property* in eastern Weymouth, near the Hingham town boundary. The future build-out projections for this Weymouth property were revised to include more of a blend of commercial and industrial development and updated demand and flow projections are as follows.

Potential Development Scenario Generated by MAPC team (Rev 3/4/21)		Water Demand and Wastewater Flow Projections			
		WEYMOUTH			
		Bristol Brothers Properties (Parcel ID 39-449-1)			
		WAT ADF Min Dev gpd	WAT ADF Max Dev gpd	WWA ADF Min Dev gpd	WWA ADF Max Dev gpd
1	for Potential Build-out allowed under Current Zoning	27,047	N/A	20,490	N/A
2	for Assembled Parcels Potential Build-out allowed under Current Zoning	65,089	N/A	49,310	N/A
3	for Clustered Parcels with Potential Build-out allowed under Current Zoning	117,170	N/A	88,765	N/A
4	for Potential Build-out allowed under Potential Future Zoning	46,098	55,926	35,250	42,750
5	for Assembled Parcels with Potential Build-out under Future Potential Zoning	102,474	121,206	78,450	92,750
6	for Clustered Parcels with Potential Build-out under Potential Future Zoning	224,394	257,526	171,450	196,750

As can be seen above, there is a significant range of water demand that could be seen in the future with this type of development in Weymouth, from approximately 27,000 gpd to over 257,500 gpd. Based on Weymouth's WMA permitted withdrawal (5.0 MGD) and the Town's 2019 water demand (approximately 4.5 MGD), there is a potential that the scenarios of this future demand could be met with extension of the water supply, however the Town would need to review this in greater detail and confirm it would not displace other allocated uses.

Corresponding wastewater flow projections range from just over 20,000 gpd to 196,700 gpd. Weymouth is currently an MWRA community for wastewater collection, treatment and disposal. Based on the location of this site, a connection to the existing MWRA sewer system would potentially be the most feasible option but will be further evaluated as the project moves forward.

Attachments:

- Summary Table of Water Demand and Wastewater Flow Projections per Site Identified
- Table 1: Water Demand and Wastewater Flow Projections per Site Identified for Potential Build-out allowed under Current Zoning
- Table 2: Water Demand and Wastewater Flow Projections per Site Identified for Assembled Parcels Potential Build-out allowed under Current Zoning

- Table 3: Water Demand and Wastewater Flow Projections per Site Identified for Clustered Parcels with Potential Build-out allowed under Current Zoning
- Table 4: Water Demand and Wastewater Flow Projections per Site Identified for Potential Build-out allowed under Potential Future Zoning
- Table 5: Water Demand and Wastewater Flow Projections per Site Identified for Assembled Parcels Potential Build-out allowed under Potential Future Zoning
- Table 6: Water Demand and Wastewater Flow Projections per Site Identified for Clustered Parcels with Potential Build-out allowed under Potential Future Zoning

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		Water Demand and Wastewater Flow Projections HANOVER			
Potential Development Scenario Generated by MAPC team		Cardinal Cushing Rear Property (Parcel ID 3143)			
		WAT ADF	WAT ADF	WWA ADF	WWA ADF
		Min Dev	Max Dev	Min Dev	Max Dev
		<i>gpd</i>	<i>gpd</i>	<i>gpd</i>	<i>gpd</i>
1	for Potential Build-out allowed under Current Zoning	18,980	N/A	14,600	N/A
2	for Assembled Parcels Potential Build-out allowed under Current Zoning	31,507	N/A	24,236	N/A
3	for Clustered Parcels with Potential Build-out allowed under Current Zoning	54,283	N/A	41,756	N/A
4	for Potential Build-out allowed under Potential Future Zoning	47,450	93,002	36,500	71,540
5	for Assembled Parcels with Potential Build-out under Future Potential Zoning	94,900	174,616	73,000	134,320
6	for Clustered Parcels with Potential Build-out under Potential Future Zoning	189,800	358,722	146,000	275,940

		Water Demand and Wastewater Flow Projections HANOVER			
Potential Development Scenario Generated by MAPC team (Rev 4/8/21)		Unicorn Development Property (Parcel ID 11-106)			
		WAT ADF	WAT ADF	WWA ADF	WWA ADF
		Min Dev	Max Dev	Min Dev	Max Dev
		<i>gpd</i>	<i>gpd</i>	<i>gpd</i>	<i>gpd</i>
1	for Potential Build-out allowed under Current Zoning	0	N/A	0	N/A
2	for Assembled Parcels Potential Build-out allowed under Current Zoning	53,064	N/A	40,200	N/A
3	for Clustered Parcels with Potential Build-out allowed under Current Zoning	53,823	N/A	40,784	N/A
4	for Potential Build-out allowed under Potential Future Zoning	27,892	28,552	21,440	21,940
5	for Assembled Parcels with Potential Build-out under Future Potential Zoning	67,172	133,783	51,640	102,864
6	for Clustered Parcels with Potential Build-out under Potential Future Zoning	73,625	140,236	56,604	107,828

		Water Demand and Wastewater Flow Projections HINGHAM			
Potential Development Scenario Generated by MAPC team (Rev 3/4/21)		South Shore Park Property (Parcel ID 8316)			
		WAT ADF	WAT ADF	WWA ADF	WWA ADF
		Min Dev	Max Dev	Min Dev	Max Dev
		<i>gpd</i>	<i>gpd</i>	<i>gpd</i>	<i>gpd</i>
1	for Potential Build-out allowed under Current Zoning	49,830	N/A	37,750	N/A
2	for Assembled Parcels Potential Build-out allowed under Current Zoning	50,820	N/A	38,500	N/A
3	for Clustered Parcels with Potential Build-out allowed under Current Zoning	63,340	N/A	47,985	N/A
4	for Potential Build-out allowed under Potential Future Zoning	118,217	139,453	90,455	106,693
5	for Assembled Parcels with Potential Build-out under Future Potential Zoning	144,195	168,302	110,135	128,548
6	for Clustered Parcels with Potential Build-out under Potential Future Zoning	212,718	236,825	162,385	180,798

		Water Demand and Wastewater Flow Projections NORWELL			
Potential Development Scenario Generated by MAPC team (Rev 4/8/21)		Wildcat Lane Property (Parcel ID 3404)			
		WAT ADF	WAT ADF	WWA ADF	WWA ADF
		Min Dev	Max Dev	Min Dev	Max Dev
		<i>gpd</i>	<i>gpd</i>	<i>gpd</i>	<i>gpd</i>
1	for Potential Build-out allowed under Current Zoning	3,428	N/A	2,637	N/A
2	for Assembled Parcels Potential Build-out allowed under Current Zoning	0	N/A	0	N/A
3	for Clustered Parcels with Potential Build-out allowed under Current Zoning	0	N/A	0	N/A
4	for Potential Build-out allowed under Potential Future Zoning	6,856	10,284	5,274	7,911
5	for Assembled Parcels with Potential Build-out under Future Potential Zoning	0	0	0	0
6	for Clustered Parcels with Potential Build-out under Potential Future Zoning	0	0	0	0

		Water Demand and Wastewater Flow Projections ROCKLAND			
Potential Development Scenario Generated by MAPC team		Land Behind Home Depot (Parcel ID 9-13-0)			
		WAT ADF	WAT ADF	WWA ADF	WWA ADF
		Min Dev	Max Dev	Min Dev	Max Dev
		<i>gpd</i>	<i>gpd</i>	<i>gpd</i>	<i>gpd</i>
1	for Potential Build-out allowed under Current Zoning	27,720	N/A	21,000	N/A
2	for Assembled Parcels Potential Build-out allowed under Current Zoning	0	N/A	0	N/A
3	for Clustered Parcels with Potential Build-out allowed under Current Zoning	0	N/A	0	N/A
4	for Potential Build-out allowed under Potential Future Zoning	24,960	33,280	19,200	25,600
5	for Assembled Parcels with Potential Build-out under Future Potential Zoning	0	0	0	0
6	for Clustered Parcels with Potential Build-out under Potential Future Zoning	0	0	0	0

		Water Demand and Wastewater Flow Projections WEYMOUTH			
Potential Development Scenario Generated by MAPC team (Rev 3/4/21)		Bristol Brothers Properties (Parcel ID 39-449-1)			
		WAT ADF	WAT ADF	WWA ADF	WWA ADF
		Min Dev	Max Dev	Min Dev	Max Dev
		<i>gpd</i>	<i>gpd</i>	<i>gpd</i>	<i>gpd</i>
1	for Potential Build-out allowed under Current Zoning	27,047	N/A	20,490	N/A
2	for Assembled Parcels Potential Build-out allowed under Current Zoning	65,089	N/A	49,310	N/A
3	for Clustered Parcels with Potential Build-out allowed under Current Zoning	117,170	N/A	88,765	N/A
4	for Potential Build-out allowed under Potential Future Zoning	46,098	55,926	35,250	42,750
5	for Assembled Parcels with Potential Build-out under Future Potential Zoning	102,474	121,206	78,450	92,750
6	for Clustered Parcels with Potential Build-out under Potential Future Zoning	224,394	257,526	171,450	196,750

SOUTH SHORE SITE READINESS STUDY
Table 1: Water Demand and Wastewater Flow Projections per Site Identified
for Potential Build-out allowed under Current Zoning

Revised from 4/2/21 draft

Existing Development				WASTEWATER FLOW CALCULATIONS				WATER FLOW CALCULATIONS				
Measurement	Units ⁽¹⁾	Msmt. Units	No. Units	MA Title 5 Basis	AVG DAY	Peaking Factor ⁽⁵⁾	PEAK	Unit Flow	AVG DAY	Factor	MAX DAY ⁽⁶⁾	MAX DAY
					Flow (gpd)		Flow (gpd)	Flow (gpd)	Flow (gpd)		Flow (gpd)	Flow (gpd)
HANOVER- Cardinal Cushing Rear Property (Parcel ID 3143)												
Residential ⁽¹⁾ (single-family)	100	2.92	292	Capita per residence	14,600			65	18,980			
Commercial, office ⁽²⁾	0	1000	0	Square Footage	0			99	0			
Industrial ⁽²⁾	0	2	0	Employees per 1,000 sq. ft.	0			26	0			
TOTAL					14,600	5.5	80,300		18,980	1.7		32,266
HANOVER- Unicorn Development Property (Parcel ID 11-106)												
Residential ⁽¹⁾ (single-family)	0	2.92	0	Capita per residence	0			65	0			
Commercial, office ⁽²⁾	0	1000	0	Square Footage	0			99	0			
Industrial ⁽²⁾	0	2	0	Employees per 1,000 sq. ft.	0			26	0			
TOTAL					0	5.5	0		0	1.7		0
HINGHAM- South Shore Park Property (Parcel ID 8316)												
Residential ⁽¹⁾ (single-family)	0	2.63	0	Capita per residence	0			65	0			
Commercial, office ⁽²⁾	210,000	1000	210	Square Footage	15,750			99	20,790			
Industrial ⁽²⁾	550,000	2	1100	Employees per 1,000 sq. ft.	22,000			26	29,040			
TOTAL					37,750	5.5	207,625		49,830	1.7		84,711
NORWELL- Wildcat Lane Property (Parcel ID 3404)												
Residential ⁽¹⁾ (single-family)	18	2.93	52.74	Capita per residence	2,637			65	3,428			
Commercial, office ⁽²⁾	0	1000	0	Square Footage	0			99	0			
Industrial ⁽²⁾	0	2	0	Employees per 1,000 sq. ft.	0			26	0			
TOTAL					2,637	5.5	14,504		3,428	1.8		6,205
ROCKLAND- Land Behind Home Depot (Parcel ID 9-13-0)												
Residential ⁽¹⁾ (single-family)	0	2.56	0	Capita per residence	0			65	0			
Commercial, office ⁽²⁾	280,000	1000	280	Square Footage	21,000			99	27,720			
Industrial ⁽²⁾	0	2	0	Employees per 1,000 sq. ft.	0			26	0			
TOTAL					21,000	5.5	115,500		27,720	1.5		41,580
WEYMOUTH- Bristol Brothers Properties (Parcel ID 39-449-1)												
Residential ⁽¹⁾ (single-family)	0	2.4	0	Capita per residence	0			65	0			
Commercial, office ⁽²⁾	110,000	1000	110	Square Footage	8,250			99	10,890			
Industrial ⁽²⁾	306,000	2	612	Employees per 1,000 sq. ft.	12,240			26	16,157			
TOTAL					20,490	5.5	112,695		27,047	1.5		40,570

(1) Residential flows were calculated using the average household size as provided by MAPC as: 2.92 for Hanover, 2.63 for Hingham, 2.93 for Norwell, 2.56 for Rockland, and 2.40 for Weymouth. Water average daily per capita flow of 65 gallons per day was used in accordance with DEP's Performance Standards for Public Water Supplies and the Massachusetts Water Conservation Standards. Wastewater average daily per capita flow of 70 gallons per day was used in accordance with TR-16 Guidelines for the Design of Wastewater Treatment Works and reduced by 30% (to 50 gallons per day) to account for water conservation measures.

(2) Industrial wastewater flows were estimated by generating an employee density (from the Trip Generation manual, for Industrial park; 2 employees per 1,000 square feet of gross floor area) and multiplying that by the Title 5 recommended flow for a Factory or Industrial Plant with a cafeteria. Industrial water demands include 1.20 consumptive use and a 1.1 factor for unaccounted water. While the MA Title 5 basis is conservative, it should account for irrigation allowances which are site and use specific.

(3) Commercial wastewater flows were estimated by gross floor area and multiplying that by the Title 5 recommended flow for office or retail space, as identified. Commercial Restaurant wastewater flows were estimated assuming 50% of the space allocated was for dining (versus kitchen, prep and ancillary spaces) and 15 square feet per seat is needed for typical dining (not fast food or fine dining), in order to apply the Title 5 basis. Commercial unit flows (water demands) include a 1.20 consumptive use factor and a 1.1 unaccounted-for-water factor to provide an allowance for irrigation, which is site and use specific.

(4) Unit information for Potential Future Development based on Current Zoning and based on Potential Future Zoning was taken from the MAPC South Shore Site Readiness - Potential Build-out document, dated February 2, 2021.

(5) Wastewater Peaking Factors were determined using the Ratio of Extreme Discharges on Maximum and Minimum Days to the Average Daily Discharges of Domestic Wastewater from the ASCE Manual of Engineering Practice No. 37. Peak flows are used for sewer system design to prevent possible sewer backups or overflows.

(6) Maximum day demand to average day demand (MDD:ADD) ratios for each community were reviewed in recent Annual Statistical Reports (ASRs) and have a wide range. For this flow estimation the following were used: Hanover 1.7:1.0, Hingham 1.7:1.0, Norwell 1.8:1.0; Rockland (AbRoe) 1.5:1.0; Weymouth 1.5:1.0

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Revised 04/28/21



SOUTH SHORE SITE READINESS STUDY
Table 2: Water Demand and Wastewater Flow Projections per Site Identified for Assembled Parcels Potential Build-out allowed under Current Zoning

Revised from 4/27/21 draft

POTENTIAL FUTURE DEVELOPMENT (with Potential Zoning Changes)				WASTEWATER FLOW CALCULATIONS				WATER FLOW CALCULATIONS				
Measurement	Units ⁽⁴⁾	Mgmt. Units	No. Units	MA Title 5 Basis Unit Flow	AVG DAY Flow (gpd)	Peaking Factor ⁽⁵⁾	PEAK Flow (gpd)	Unit Flow	AVG DAY Flow (gpd)	MAX DAY Factor	MAX DAY Flow (gpd)	
HANOVER - Cardinal Cushing Rear Property (Parcel ID 3143)												
Residential ⁽¹⁾ (single-family)	0	2.92	484.72	50 gpd/capita	0	0	0	65	0	0	0	
Residential ⁽¹⁾ (multi-family)	0	2.92	0	50 gpd/capita	0	0	0	65	0	0	0	
Commercial, office ⁽²⁾	0	1000	0	75 gpd/sq. ft.	0	0	0	99	0	0	0	
Commercial, retail ⁽³⁾	0	1000	0	75 gpd/sq. ft.	0	0	0	66	0	0	0	
Commercial, restaurant ⁽³⁾	0	0.03	0	35 gpd/seat	0	0	0	46	0	0	0	
Industrial ⁽¹⁾ , manufacturing	0	2	0	20 gpd/person	0	0	0	26	0	0	0	
Industrial ⁽¹⁾ , warehouse	0	2	0	20 gpd/person	0	0	0	26	0	0	0	
TOTAL					24,236	5.5	133,298		31,507	1.7	53,562	
HANOVER - Untown Development Property (Parcel ID 11-106)												
Residential ⁽¹⁾ (single-family)	0	2.92	0	50 gpd/capita	0	0	0	65	0	0	0	
Residential ⁽¹⁾ (multi-family)	0	2.92	0	50 gpd/capita	0	0	0	65	0	0	0	
Commercial, office ⁽²⁾	536,000	1000	536	75 gpd/sq. ft.	40,200	0	0	99	53,064	0	0	
Commercial, retail ⁽³⁾	0	1000	0	75 gpd/sq. ft.	0	0	0	66	0	0	0	
Commercial, restaurant ⁽³⁾	0	0.03	0	35 gpd/seat	0	0	0	46	0	0	0	
Industrial ⁽¹⁾ , manufacturing	0	2	0	20 gpd/person	0	0	0	26	0	0	0	
Industrial ⁽¹⁾ , warehouse	0	2	0	20 gpd/person	0	0	0	26	0	0	0	
TOTAL					40,200	5.5	221,100		53,064	1.7	90,209	
HINGHAM - South Shore Park Property (Parcel ID R316)												
Residential ⁽¹⁾ (single-family)	0	2.63	0	50 gpd/capita	0	0	0	65	0	0	0	
Residential ⁽¹⁾ (multi-family)	0	2.63	0	50 gpd/capita	0	0	0	65	0	0	0	
Commercial, office ⁽²⁾	220,000	1000	220	75 gpd/sq. ft.	16,500	0	0	99	21,780	0	0	
Commercial, retail ⁽³⁾	0	1000	0	75 gpd/sq. ft.	0	0	0	66	0	0	0	
Commercial, restaurant ⁽³⁾	0	0.03	0	35 gpd/seat	0	0	0	46	0	0	0	
Industrial ⁽¹⁾ , manufacturing	330,000	2	660	20 gpd/person	13,200	0	0	26	17,424	0	0	
Industrial ⁽¹⁾ , warehouse	220,000	2	440	20 gpd/person	8,800	0	0	26	11,616	0	0	
TOTAL					38,500	5.5	211,750		50,820	1.7	86,394	
NORWELL - Wildcat Lane Property (Parcel ID 3484)												
Residential ⁽¹⁾ (single-family)	0	2.93	0	50 gpd/capita	0	0	0	65	0	0	0	
Residential ⁽¹⁾ (multi-family)	0	2.93	0	50 gpd/capita	0	0	0	65	0	0	0	
Commercial, office ⁽²⁾	0	1000	0	75 gpd/sq. ft.	0	0	0	99	0	0	0	
Commercial, retail ⁽³⁾	0	1000	0	75 gpd/sq. ft.	0	0	0	66	0	0	0	
Commercial, restaurant ⁽³⁾	0	0.03	0	35 gpd/seat	0	0	0	46	0	0	0	
Industrial ⁽¹⁾ , manufacturing	0	2	0	20 gpd/person	0	0	0	26	0	0	0	
Industrial ⁽¹⁾ , warehouse	0	2	0	20 gpd/person	0	0	0	26	0	0	0	
TOTAL					0	5.5	0		0	1.8	0	
ROCKLAND - Land Behind Home Depot (Parcel ID 9-134)												
Residential ⁽¹⁾ (single-family)	0	2.56	0	50 gpd/capita	0	0	0	65	0	0	0	
Residential ⁽¹⁾ (multi-family)	0	2.56	0	50 gpd/capita	0	0	0	65	0	0	0	
Commercial, office ⁽²⁾	266,000	1000	266	75 gpd/sq. ft.	19,950	0	0	99	26,334	0	0	
Commercial, retail ⁽³⁾	0	1000	0	75 gpd/sq. ft.	0	0	0	66	0	0	0	
Commercial, restaurant ⁽³⁾	0	0.03	0	35 gpd/seat	0	0	0	46	0	0	0	
Industrial ⁽¹⁾ , manufacturing	439,000	2	878	20 gpd/person	17,560	0	0	26	23,179	0	0	
Industrial ⁽¹⁾ , warehouse	295,000	2	590	20 gpd/person	11,800	0	0	26	15,576	0	0	
TOTAL					49,310	5.5	271,205		65,089	1.5	97,634	
WEYMOUTH - Bristol Brothers Properties (Parcel ID 39-49-1)												
Residential ⁽¹⁾ (single-family)	0	2.4	0	50 gpd/capita	0	0	0	65	0	0	0	
Residential ⁽¹⁾ (multi-family)	0	2.4	0	50 gpd/capita	0	0	0	65	0	0	0	
Commercial, office ⁽²⁾	266,000	1000	266	75 gpd/sq. ft.	19,950	0	0	99	26,334	0	0	
Commercial, retail ⁽³⁾	0	1000	0	75 gpd/sq. ft.	0	0	0	66	0	0	0	
Commercial, restaurant ⁽³⁾	0	0.03	0	35 gpd/seat	0	0	0	46	0	0	0	
Industrial ⁽¹⁾ , manufacturing	439,000	2	878	20 gpd/person	17,560	0	0	26	23,179	0	0	
Industrial ⁽¹⁾ , warehouse	295,000	2	590	20 gpd/person	11,800	0	0	26	15,576	0	0	
TOTAL					49,310	5.5	271,205		65,089	1.5	97,634	

(1) Residential flows were calculated using the average household size as provided by MAPCS as: 2.92 for Hanover, 2.63 for Hingham, 2.93 for Norwell, 2.56 for Rockland, and 2.40 for Weymouth. Water average daily per capita flow of 65 gallons per day was used in accordance with *Tit-5 Guidelines for the Design of Wastewater Treatment Works* and reduced by 30% (to 50 gallons per day) to account for water conservation measures.

(2) Industrial wastewater flows were estimated by generating an employee density from the *Trap Generation* manual for Industrial part; 2 employees per 1,000 square feet of gross floor area and multiplying that by the Title 5 recommended flow for a Factory or Industrial Plant with a cafeteria. Industrial water demands include 1.20 consumptive use and a 1.1 factor for unaccounted water. While the MA Title 5 basis is conservative, it should account for irrigation allowances which are site and use specific.

(3) Commercial wastewater flows were estimated by gross floor area and multiplying that by the Title 5 recommended flow for office or retail space as identified. Commercial Restaurant wastewater flows were estimated assuming 50% of the space allocated for dining (versus kitchen prep and ancillary spaces) and 15 square feet per seat needed for typical dining (not that food or fine dining). In order to apply the Title 5 basis, Commercial unit flows (water demands) include a 1.20 consumptive use factor and a 1.1 unaccounted-for-water factor to provide an allowance for irrigation, which is site and use specific.

(4) Unit information for Potential Future Development based on Current Zoning and based on Potential Future Zoning was taken from the MAPCS South Shore Site Readiness - Potential Build-out document, dated February 2, 2021.

(5) Wastewater Peaking Factors were determined using the *Ratio of Extreme Discharges on Maximum and Minimum Days to the Average Daily Discharge of Domestic Wastewater* from the *ASCE Manual of Engineering Practice No. 37*. Peak flows are used for sewer system design to prevent possible sewer backups or overflows.

(6) Maximum daily demand to average day demand (MDD:ADD) ratios for each community were reviewed in recent Annual Statistical Reports (ASRs) and have a wide range. For this flow estimation the following were used: Hanover 1.7:1.0, Hingham 1.7:1.0, Norwell 1.8:1.0, Rockland (AdRoC) 1.5:1.0, Weymouth 1.5:1.0

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SOUTH SHORE SITE READINESS STUDY
Table 3: Water Demand and Wastewater Flow Projections per Site Identified for Clustered Parcels with Potential Build-out allowed under Current Zoning

Revised from 4/21/21 draft

POTENTIAL FUTURE DEVELOPMENT (with Potential Zoning Changes)							WASTEWATER FLOW CALCULATIONS				WATER FLOW CALCULATIONS			
Measurement	Units ⁽¹⁾	Maint. Units	No. Units	MA Title 5 Basis Unit Flow	Avg Day Flow (gpd)	Peaking Factor ⁽⁸⁾	PEAK Flow (gpd)	Unit Flow	Avg Day Flow (gpd)	MAX DAY ⁽⁹⁾ Factor	MAX DAY Flow (gpd)			
HANOVER- Cardinal Cushing Rear Property (Parcel ID 3143)														
Residential ⁽¹⁾ (single-family)	0	2.92	0	50	0	0	0	65	0		0			
Residential ⁽¹⁾ (multi-family)	286	2.92	835.12	50	41,756	0	0	65	54,283		54,283			
Commercial, office ⁽⁵⁾	0	1000	0	75	0	0	0	99	0		0			
Commercial, retail ⁽⁵⁾	0	1000	0	50	0	0	0	66	0		0			
Commercial, restaurant ⁽⁶⁾	0	0.03	0	35	0	0	0	46	0		0			
Industrial ⁽²⁾ , manufacturing	0	2	0	20	0	0	0	26	0		0			
Industrial ⁽²⁾ , warehouse	0	2	0	20	0	0	0	26	0		0			
TOTAL					41,756	5.5	229,658		54,283	1.7	92,281			
HANOVER- Unicorn Development Property (Parcel ID 11-106)														
Residential ⁽¹⁾ (single-family)	4	2.92	11.68	50	584	0	0	65	759		759			
Residential ⁽¹⁾ (multi-family)	0	2.92	0	50	0	0	0	65	0		0			
Commercial, office ⁽⁵⁾	536,000	1000	536	75	40,200	0	0	99	53,064		53,064			
Commercial, retail ⁽⁵⁾	0	1000	0	50	0	0	0	66	0		0			
Commercial, restaurant ⁽⁶⁾	0	0.03	0	35	0	0	0	46	0		0			
Industrial ⁽²⁾ , manufacturing	0	2	0	20	0	0	0	26	0		0			
Industrial ⁽²⁾ , warehouse	0	2	0	20	0	0	0	26	0		0			
TOTAL					40,784	5.5	224,312		53,823	1.7	91,499			
HINGHAM- South Shore Park Property (Parcel ID 8316)														
Residential ⁽¹⁾ (single-family)	0	2.63	0	50	0	0	0	65	0		0			
Residential ⁽¹⁾ (multi-family)	0	2.63	0	50	0	0	0	65	0		0			
Commercial, office ⁽⁵⁾	259,000	1000	259	75	19,425	0	0	99	25,641		25,641			
Commercial, retail ⁽⁵⁾	0	1000	0	50	0	0	0	66	0		0			
Commercial, restaurant ⁽⁶⁾	0	0.03	0	35	0	0	0	46	0		0			
Industrial ⁽²⁾ , manufacturing	427,000	2	854	20	17,080	0	0	26	22,546		22,546			
Industrial ⁽²⁾ , warehouse	287,000	2	574	20	11,480	0	0	26	15,154		15,154			
TOTAL					47,985	5.5	243,918		63,340	1.7	107,678			
NORWELL- Wildcat Lane Property (Parcel ID 3404)														
Residential ⁽¹⁾ (single-family)	0	2.93	0	50	0	0	0	65	0		0			
Residential ⁽¹⁾ (multi-family)	0	2.93	0	50	0	0	0	65	0		0			
Commercial, office ⁽⁵⁾	0	1000	0	75	0	0	0	99	0		0			
Commercial, retail ⁽⁵⁾	0	1000	0	50	0	0	0	66	0		0			
Commercial, restaurant ⁽⁶⁾	0	0.03	0	35	0	0	0	46	0		0			
Industrial ⁽²⁾ , manufacturing	0	2	0	20	0	0	0	26	0		0			
Industrial ⁽²⁾ , warehouse	0	2	0	20	0	0	0	26	0		0			
TOTAL					0	5.5	0		0	1.8	0			
ROCKLAND- Land Behind Home Depot (Parcel ID 9-13-0)														
Residential ⁽¹⁾ (single-family)	0	2.56	0	50	0	0	0	65	0		0			
Residential ⁽¹⁾ (multi-family)	0	2.56	0	50	0	0	0	65	0		0			
Commercial, office ⁽⁵⁾	0	1000	0	75	0	0	0	99	0		0			
Commercial, retail ⁽⁵⁾	0	1000	0	50	0	0	0	66	0		0			
Commercial, restaurant ⁽⁶⁾	0	0.03	0	35	0	0	0	46	0		0			
Industrial ⁽²⁾ , manufacturing	0	2	0	20	0	0	0	26	0		0			
Industrial ⁽²⁾ , warehouse	0	2	0	20	0	0	0	26	0		0			
TOTAL					0	5.5	0		0	1.5	0			
WEYMOUTH- Based Brothers Properties (Parcel ID 39-449-1)														
Residential ⁽¹⁾ (single-family)	0	2.4	0	50	0	0	0	65	0		0			
Residential ⁽¹⁾ (multi-family)	0	2.4	0	50	0	0	0	65	0		0			
Commercial, office ⁽⁵⁾	475,000	1000	475	75	35,925	0	0	99	47,421		47,421			
Commercial, retail ⁽⁵⁾	0	1000	0	50	0	0	0	66	0		0			
Commercial, restaurant ⁽⁶⁾	0	0.03	0	35	0	0	0	46	0		0			
Industrial ⁽²⁾ , manufacturing	790,000	2	1580	20	31,600	0	0	26	41,712		41,712			
Industrial ⁽²⁾ , warehouse	531,000	2	1062	20	21,240	0	0	26	28,037		28,037			
TOTAL					88,765	5.5	488,208		117,170	1.5	175,755			

(1) Residential flows were calculated using the average household size as provided by MAPC as 2.92 for Hanover, 2.63 for Hingham, 2.93 for Norwell, 2.56 for Rockland, and 2.40 for Weymouth. Water average daily per capita flow of 65 gallons per day was used in accordance with DEP's Performance Standards for Public Water Supplies and the Massachusetts Water Conservation Standards. Wastewater average daily per capita flow of 70 gallons per day was used in accordance with TR-16 Guidelines for the Design of Wastewater Treatment Works and reduced by 30% (to 50 gallons per day) to account for water conservation measures.

(2) Industrial wastewater flows were estimated by generating an employee density (from the Trip Generation manual, for industrial park: 2 employees per 1,000 square feet of gross floor area) and multiplying that by the Title 5 recommended flow for a Factory or Industrial Plant with a cafeteria. Industrial water demands include 1.20 consumptive use and a 1.1 factor for unaccounted water. While the MA Title 5 basis is conservative, it should account for irrigation allowances which are site and use specific.

(3) Commercial wastewater flows were estimated by gross floor area and multiplying that by the Title 5 recommended flow for office or retail space, as identified. Commercial Restaurant wastewater flows were estimated assuming 50% of the space allocated was for dining (versus kitchen, prep and ancillary spaces) and 1/3 square feet per seat is needed for typical dining (not fast food or fine dining), in order to apply the Title 5 basis. Commercial unit flows (water demands) include a 1.20 consumptive use factor and a 1.1 unaccounted-for-water factor to provide an allowance for irrigation, which is site and use specific.

(4) Unit information for Potential Future Development based on Current Zoning and based on Potential Future Zoning was taken from the MAPC South Shore Site Readiness - Potential Build-out document, dated February 2, 2021.

(5) Wastewater Peaking Factors were determined using the Ratio of Extreme Discharges on Maximum and Minimum Days to the Average Daily Discharges of Domestic Wastewater from the ASCE Manual of Engineering Practice No. 37. Peak flows are used for sewer system design to prevent possible sewer backups or overflows.

(6) Maximum day demand to average day demand (MDD/ADD) ratios for each community were reviewed in recent Annual Statistical Reports (ASRs) and have a wide range. For this flow estimation the following were used: Hanover 1.7:1.0, Hingham 1.7:1.0, Norwell 1.8:1.0, Rockland (A/R) 1.5:1.0, Weymouth 1.5:1.0

Issued: local WSE Project/MA Map Development (20) MAPC South Shore Development Study, WAT, R, W, W, W, F, D, and WWA Flow Projections (SouthShorePlanning, WastewaterWaterandFlowProjections_Perchad_4.21.21.draft)

SOUTH SHORE SITE READINESS STUDY
Table 4: Water Demand and Wastewater Flow Projections per Site Identified for Potential Build-out allowed under Potential Future Zoning.

Revised from 4.21.21.dwg

MEASUREMENT	POTENTIAL FUTURE DEVELOPMENT (with Potential Zoning Changes)				WASTEWATER FLOW CALCULATIONS				WATER FLOW CALCULATIONS				WATER FLOW CALCULATIONS					
	Units		No. Units		MA THICK BASES		PEAK		AVERAGE		UNIT FLOW		MAX DAY		MAX DAY		MAX DAY	
	Min	Max	Min	Max	Flow (gpd)	Factor	Flow (gpd)	Factor	Flow (gpd)	Factor	Flow (gpd)	Factor	Flow (gpd)	Factor	Flow (gpd)	Factor	Flow (gpd)	Factor
HANOVER, Concord (Building Best Project) (Permitted ID 3143)																		
Residential ⁽¹⁾ (single-family)	0	292	0	1438.8	0	50	36,500	0	71,540	0	65	0	0	0	93,002	0	0	0
Residential ⁽¹⁾ (multi-family)	250	490	750	0	0	75	0	0	0	0	66	0	0	0	0	0	0	0
Commercial, office ⁽²⁾	0	1000	0	0	0	50	0	0	0	0	66	0	0	0	0	0	0	0
Commercial, retail ⁽³⁾	0	0	0	0	0	35	0	0	0	0	46	0	0	0	0	0	0	0
Commercial, restaurant ⁽⁴⁾	0	0.03	0	0	0	35	0	0	0	0	46	0	0	0	0	0	0	0
Commercial, manufacturing ⁽⁵⁾	0	0	0	0	0	20	0	0	0	0	26	0	0	0	0	0	0	0
Industrial ⁽⁶⁾ , warehouse	0	0	0	0	0	20	0	0	0	0	26	0	0	0	0	0	0	0
TOTAL																		
HANOVER, Unterra Development Project (Permitted ID 1186)																		
Residential ⁽¹⁾ (single-family)	0	292	0	408.8	0	50	20,440	0	20,440	0	65	0	0	0	26,072	0	0	0
Residential ⁽¹⁾ (multi-family)	140	292	408.8	0	0	75	0	0	0	0	66	0	0	0	0	0	0	0
Commercial, office ⁽²⁾	0	1000	0	0	0	50	1,000	0	1,500	0	66	0	0	0	1,980	0	0	0
Commercial, retail ⁽³⁾	0	0	0	0	0	35	0	0	0	0	46	0	0	0	0	0	0	0
Commercial, restaurant ⁽⁴⁾	0	0.03	0	0	0	35	0	0	0	0	46	0	0	0	0	0	0	0
Commercial, manufacturing ⁽⁵⁾	0	0	0	0	0	20	0	0	0	0	26	0	0	0	0	0	0	0
Industrial ⁽⁶⁾ , warehouse	0	0	0	0	0	20	0	0	0	0	26	0	0	0	0	0	0	0
TOTAL																		
HINGHAM, South Shore Park Project (Permitted ID 8340)																		
Residential ⁽¹⁾ (single-family)	100	125	263	328.75	0	50	13,150	0	16,438	0	65	0	0	0	21,369	0	0	0
Residential ⁽¹⁾ (multi-family)	350	400	924.5	1052	0	75	46,625	0	52,600	0	66	0	0	0	68,800	0	0	0
Commercial, office ⁽²⁾	175,000	200,000	1000	175	0	50	13,125	0	19,500	0	99	0	0	0	25,740	0	0	0
Commercial, retail ⁽³⁾	30,000	30,000	30	30	0	35	1,500	0	1,500	0	46	0	0	0	1,980	0	0	0
Commercial, restaurant ⁽⁴⁾	10,000	10,000	0.03	333	0	35	1,1655	0	11,655	0	46	0	0	0	15,385	0	0	0
Commercial, manufacturing ⁽⁵⁾	50,000	50,000	2	100	0	20	2,000	0	2,000	0	26	0	0	0	2,640	0	0	0
Industrial ⁽⁶⁾ , warehouse	50,000	50,000	2	100	0	20	2,000	0	2,000	0	26	0	0	0	2,640	0	0	0
TOTAL																		
NORWELL, Wildcat Lane Property (Permitted ID 3404)																		
Residential ⁽¹⁾ (single-family)	36	54	293	105.48	0	50	5,274	0	7,911	0	65	0	0	0	10,284	0	0	0
Residential ⁽¹⁾ (multi-family)	0	0	0	0	0	50	0	0	0	0	65	0	0	0	0	0	0	0
Commercial, office ⁽²⁾	0	0	0	0	0	50	0	0	0	0	66	0	0	0	0	0	0	0
Commercial, retail ⁽³⁾	0	0	0	0	0	35	0	0	0	0	46	0	0	0	0	0	0	0
Commercial, restaurant ⁽⁴⁾	0	0	0	0	0	35	0	0	0	0	46	0	0	0	0	0	0	0
Commercial, manufacturing ⁽⁵⁾	0	0	0	0	0	20	0	0	0	0	26	0	0	0	0	0	0	0
Industrial ⁽⁶⁾ , warehouse	0	0	0	0	0	20	0	0	0	0	26	0	0	0	0	0	0	0
TOTAL																		
WYOMOUTH, Best of Bricks Home Depot (Permitted ID 104340)																		
Residential ⁽¹⁾ (single-family)	0	256	0	0	0	50	0	0	0	0	65	0	0	0	0	0	0	0
Residential ⁽¹⁾ (multi-family)	150	200	384	512	0	75	25,600	0	25,600	0	65	0	0	0	33,280	0	0	0
Commercial, office ⁽²⁾	0	0	0	0	0	50	0	0	0	0	99	0	0	0	0	0	0	0
Commercial, retail ⁽³⁾	0	0	0	0	0	35	0	0	0	0	66	0	0	0	0	0	0	0
Commercial, restaurant ⁽⁴⁾	0	0.03	0	0	0	35	0	0	0	0	46	0	0	0	0	0	0	0
Commercial, manufacturing ⁽⁵⁾	0	0	0	0	0	20	0	0	0	0	26	0	0	0	0	0	0	0
Industrial ⁽⁶⁾ , warehouse	0	0	0	0	0	20	0	0	0	0	26	0	0	0	0	0	0	0
TOTAL																		
WYOMOUTH, Best of Bricks Home Depot (Permitted ID 294493)																		
Residential ⁽¹⁾ (single-family)	0	24	0	0	0	50	0	0	0	0	65	0	0	0	0	0	0	0
Residential ⁽¹⁾ (multi-family)	180	210	452	594	0	75	28,080	0	28,080	0	65	0	0	0	32,760	0	0	0
Commercial, office ⁽²⁾	18,000	20,000	92	124	0	50	17,250	0	17,250	0	99	0	0	0	23,166	0	0	0
Commercial, retail ⁽³⁾	0	0	0	0	0	35	0	0	0	0	66	0	0	0	0	0	0	0
Commercial, restaurant ⁽⁴⁾	0	0	0	0	0	35	0	0	0	0	46	0	0	0	0	0	0	0
Commercial, manufacturing ⁽⁵⁾	0	0	0	0	0	20	0	0	0	0	26	0	0	0	0	0	0	0
Industrial ⁽⁶⁾ , warehouse	0	0	0	0	0	20	0	0	0	0	26	0	0	0	0	0	0	0
TOTAL																		

(1) Residential flows were calculated using the average household size as provided by MAFC as 2.92 for Hingham, 2.93 for Norwell, 2.96 for Rockland, and 2.40 for Weymouth. Water average daily per capita flow of 65 gallons per day was used in accordance with DEP's Performance Standards for Public Water Supplies and the Massachusetts Water Conservation Standards. Wastewater average daily per capita flow of 70 gallons per day was used in accordance with DEP's Guidelines for the Design of Wastewater Treatment Works and reduced by 30% (to 49 gallons per day) to account for water conservation measures.

(2) Industrial wastewater flows were estimated by generating an employee density from the DEP Generation manual, for industrial park, 2 employees per 1,000 square feet of gross floor area and multiplying that by the Title 5 recommended flow for a Factory or Industrial Plant with a collector. Industrial water demands include 1.20 consumption use and a 1.1 factor for unaccounted water. While the MA Table 5 basis is conservative, it should account for irrigation allowances which are the water demands for the site and are specific.

(3) Commercial wastewater flows were estimated by gross floor area multiplied by the Title 5 recommended flow for office or retail space, as identified. Commercial restaurant wastewater flows were estimated assuming 50% of the space allocated for dining (versus kitchen, prep and ancillary spaces) and 15 square feet per seat is needed for typical dining (not fast food or fine dining), in order to apply the Title 5 basis. Commercial unit flows (water demands) include a 1.20 consumption use factor and 1.1 multiplier for unaccounted water for irrigation which is site and are specific.

(4) Unit information for Potential Future Development based on Current Zoning and based on Potential Future Zoning was taken from the MAFC South Shore Site Readiness - Potential Build-out document, dated February 2, 2021.

(5) Wastewater Peaking Factors were determined using the Ratio of Extreme Discharges on Maximum and Minimum Days to the Average Daily Discharges of Domestic Wastewater from the ASCE Manual of Engineering Practice No. 37. Peak flows are used for sewer system design to prevent possible sewer backups or overflows.

(6) Maximum day demand (MDD) ratios for each community were reviewed in recent Annual Statistical Reports (ASRs) and have a wide range. For this flow estimation the following were used: Haverhill 1.7:1.0, Hingham 1.7:1.0, Norwell 1.8:1.0, Rockland (ASR) 1.5:1.0, Weymouth 1.5:1.0

SOUTH SHORE SITE READINESS STUDY
 Table 5: Potential Water Demand and Wastewater Flow Projections per Site Identified
 for Assembled Parcels with Potential Build-out under Future Potential Zoning.

Measurement	POTENTIAL FUTURE DEVELOPMENT (with Potential Zoning Changes)				WASTEWATER FLOW CALCULATIONS				WASTEWATER FLOW CALCULATIONS				WATER FLOW CALCULATIONS			
	Min Dev	Units ^(a)	Max Dev	Max Dev	Min Dev	Units	Max Dev	Max Dev	Min Dev	Units	Max Dev	Max Dev	Min Dev	Units	Max Dev	Max Dev
HANOVER - Central Church Rear Property (Parcel ID 31413)	0	0	2,92	0	0	0	0	0	0	0	0	0	0	0	0	0
Capita per residence	0	0	2,92	0	0	0	0	0	0	0	0	0	0	0	0	0
Residential ⁽¹⁾ (multi-family)	0	0	1,460	0	0	0	0	0	0	0	0	0	0	0	0	0
Commercial, office ⁽²⁾	500	920	2,866.4	0	0	0	0	0	0	0	0	0	0	0	0	0
Commercial, retail ⁽³⁾	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Commercial, restaurant ⁽⁴⁾	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Industrial ⁽⁵⁾ , manufacturing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Industrial ⁽⁵⁾ , warehouse	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	2,92	0	0	0	0	0	0	0	0	0	0	0	0	0
HANOVER - Utkerka Development Property (Parcel ID 1146)	0	0	2,92	0	0	0	0	0	0	0	0	0	0	0	0	0
Capita per residence	0	0	2,92	0	0	0	0	0	0	0	0	0	0	0	0	0
Residential ⁽¹⁾ (single-family)	340	684	1,997.28	0	0	0	0	0	0	0	0	0	0	0	0	0
Residential ⁽¹⁾ (multi-family)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Commercial, office ⁽²⁾	40,000	60,000	100,000	40	60	50	50	50	50	50	50	50	50	50	50	50
Commercial, retail ⁽³⁾	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Commercial, restaurant ⁽⁴⁾	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Industrial ⁽⁵⁾ , manufacturing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Industrial ⁽⁵⁾ , warehouse	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	2,92	0	0	0	0	0	0	0	0	0	0	0	0	0
HINGHAM - South Shore Park Property (Parcel ID 8316)	100	125	2,63	263	328.75	50	50	50	50	50	50	50	50	50	50	50
Capita per residence	0	0	2,63	263	328.75	50	50	50	50	50	50	50	50	50	50	50
Residential ⁽¹⁾ (single-family)	0	0	1,605	1,605	1,605	0	0	0	0	0	0	0	0	0	0	0
Residential ⁽¹⁾ (multi-family)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Commercial, office ⁽²⁾	324,000	488,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Commercial, retail ⁽³⁾	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Commercial, restaurant ⁽⁴⁾	20,000	20,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Industrial ⁽⁵⁾ , manufacturing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Industrial ⁽⁵⁾ , warehouse	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	2,63	263	328.75	50	50	50	50	50	50	50	50	50	50	50
ROCKLAND - Land Behind Home Depot (Parcel ID 24140)	0	0	2,93	0	0	0	0	0	0	0	0	0	0	0	0	0
Capita per residence	0	0	2,93	0	0	0	0	0	0	0	0	0	0	0	0	0
Residential ⁽¹⁾ (single-family)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Residential ⁽¹⁾ (multi-family)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Commercial, office ⁽²⁾	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Commercial, retail ⁽³⁾	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Commercial, restaurant ⁽⁴⁾	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Industrial ⁽⁵⁾ , manufacturing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Industrial ⁽⁵⁾ , warehouse	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	2,93	0	0	0	0	0	0	0	0	0	0	0	0	0
WYOMOUTH - Bristol Brothers Properties (Parcel ID 39449-1)	0	0	2.4	0	0	0	0	0	0	0	0	0	0	0	0	0
Capita per residence	0	0	2.4	0	0	0	0	0	0	0	0	0	0	0	0	0
Residential ⁽¹⁾ (single-family)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Residential ⁽¹⁾ (multi-family)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Commercial, office ⁽²⁾	182,000	234,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Commercial, retail ⁽³⁾	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Commercial, restaurant ⁽⁴⁾	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Industrial ⁽⁵⁾ , manufacturing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Industrial ⁽⁵⁾ , warehouse	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	2.4	0	0	0	0	0	0	0	0	0	0	0	0	0

(1) Residential flows were calculated using the average household size as provided by MAFC as 2.92 for Hanning, 2.63 for Rockland, and 2.49 for Weymouth. Water averaged daily per capita flow of 65 gallons per day was used in accordance with DEP's Performance Standards for Public Water Supplies and the Massachusetts Water Conservation Standards. Wastewater average daily per capita flow of 70 gallons per day was used in accordance with DEP's Guidelines for the Design of Wastewater Treatment Plants and reduced by 50% (to 50 gallons per day) to account for water conservation measures.

(2) Industrial wastewater flows were estimated by generating an employee density (from the 1998 Generation manual for Potential Future Zoning was taken from the MAFC South Shore Site Readiness - Potential Build-out document, dated February 2, 2021).

(3) Commercial water flows were estimated by gross floor area and multiplying that by the Title 5 recommended flow for office or retail space as identified. Commercial Restaurant wastewater flows were estimated assuming 50% of the space allocated was for dining (versus kitchen, prep and ancillary spaces) and 15 square feet per seat is needed for typical dining (not fast food or fine dining), in order to apply the Title 5 basis. Commercial unit flows (water demands) include a 1.20 consumption factor and a 1.11 unaccounted-for water factor to provide an allowance for irrigation, which is site and use specific.

(4) Unit information for Potential Future Development based on Current Zoning and based on Potential Future Zoning was taken from the MAFC South Shore Site Readiness - Potential Build-out document, dated February 2, 2021.

(5) Wastewater Peak Factors were determined using the Ratio of Extreme Discharge on Maximum and Minimum Days to the Average Daily Discharge of Domestic Wastewater from the ASCE Manual of Engineering Practice No. 37. Peak flows are used for sewer system design to prevent possible sewer backups or overflows.

(6) Maximum daily demand to average daily demand (MDD/AD) ratios for each community were reviewed in recent Annual Statistical Reports (ASRs) and have a wide range. For this flow estimation the following were used: Hanning 1.71, 1.0; Hingham 1.21, 1.0; Norwell 1.81, 1.0; Rockland (ASR) 1.51, 1.0; Weymouth 1.51, 1.0.

**South Shore
Site Readiness Study**

Appendix