

III. NATURAL & ECOLOGICAL RESOURCES



2014

Middletown, Rhode Island Comprehensive Community Plan

IN RECOGNITION THAT THE HEALTH OF OUR CITIZENS AND OUR LOCAL ECONOMY ARE DEPENDENT ON THE HEALTH OF OUR ENVIRONMENT, THE TOWN OF MIDDLETOWN WILL REFLECT GOOD STEWARDSHIP OF THE WATER, LAND AND AIR THROUGH LOCAL GOVERNMENT PRACTICES. THE TOWN AND ITS RESIDENTS WILL CHOOSE TO ACT COLLECTIVELY AND INDIVIDUALLY TO PRESERVE, PROTECT, AND RESTORE OUR ENVIRONMENT FOR THIS AND FUTURE GENERATIONS.

III. NATURAL & ECOLOGICAL RESOURCES

MIDDLETOWN, RHODE ISLAND COMPREHENSIVE COMMUNITY PLAN

Supporting Documents

- Rhode Island Ocean Special Area Management Plan (SAMP) Volume 1, Rhode Island Coastal Resources Management Council, October 19, 2010.
- Rhode Island Statewide Total Maximum Daily Load (TMDL) for Bacteria Impaired Waters, Prepared by FB Environmental Associates, Inc. for RIDEM & USEPA Region 1, September 2011.
- State Guide Plan 152, *Ocean State Outdoors: Rhode Island's Comprehensive Outdoor Recreation Plan*. 2009.
- State Guide Plan 155, *A Greener Path... Greenspace and Greenways for Rhode Island's Future*. 1994.
- Town of Middletown Phase II Stormwater Management Plan, The Louis Berger Group, Inc. for Town of Middletown, Revised 2009.
- Total Maximum Daily Loads for Phosphorus to Address 9 Eutrophic Ponds in Rhode Island, Office of Water Resources RIDEM, September 2007.
- West Side Master Plan, Prepared by The Cecil Group, Pare Engineering Corporation, SMWM, Edwards and Kelcey, Bonz and Company, Ninigret Partners, LLC for the Aquidneck Island Planning Commission & West Side Task Force, 2005.

INTRODUCTION

Careful management of the town's natural resources will maximize the environmental, economic, and social benefits they provide to the community. The Natural and Ecological Resources Element provides an inventory of the significant natural resource areas such as water, soils, prime agricultural lands, natural vegetation systems, wildlife, wetlands, aquifers, coastal features, flood plains and other natural resources and the policies for the protection and management of such

areas. This element, using maps and associated discussion, summarizes Middletown's natural environment and identifies the benefits and constraints of these resources as they relate to community development. Natural resources are a defining component of community character but also cross jurisdictional boundaries, and some are in jeopardy because of land use pressures and practices as well as climate change

Natural and Ecological Resources Vision Statement: In recognition that the health of our citizens and our local economy are dependent on the health of our environment, local government practices in Middletown will reflect good stewardship of the water, land and air. The Town and its residents will choose to act collectively and individually to preserve, protect, and restore our environment for this and future generations.

GEOLOGY AND LANDFORMS

The Narragansett Basin, composed of sedimentary rock, covers most of Eastern Rhode Island, including Middletown, and was formed some 300 million years ago. Weathering and erosion of the rock with the leveling effect of glaciation have resulted in Middletown's gently rolling terrain and rich soil ideally suited for agriculture. Farming began in the seventeenth century and has prospered through the town's history. As a result, a large portion of the land was cleared centuries ago and few wooded areas remain today.

Middletown ranges in elevation from sea level to 250 feet at the highest point at Slate Hill on East Main Road near the Portsmouth line. The land is generally a rolling terrain with hills ranging from 100 feet to 250 feet above sea level dotting the landscape, as shown in Map N-1 Elevation.

Along the Atlantic Coast, the shoreline is diversified. A rugged and rocky coast is found at First, Second and Third Beaches. Parts of Sachuest Point and nearby Paradise Hills are still in their natural state and have been preserved as wildlife sanctuaries.

An important geologic feature of the landscape is an area of out-cropping conglomerate rocks with bold rock faces and a series of parallel ridges at the south end of Middletown. This area is comprised of Paradise Rocks, Hanging Rock, a vast conglomerate ledge, and Purgatory Chasm, a 50-foot ravine cut into bedrock adjacent to the sea.

Information about bedrock is important to land use planning because in certain areas of the town, the rock creates an impermeable layer, which under shallow soils is a constraint to development. Bedrock layers also can present problems in building foundations, laying utility lines and making the construction of an OWTS (Onsite Wastewater Treatment System) nearly impossible.

SOIL CHARACTERISTICS

The soils of Middletown are largely comprised of glacial till with a slowly permeable soil. Most local soils are subject to a high seasonal water table that presents certain problems for community development. This is generally true of all of the Bay Island communities (Conanicut and Aquidneck Islands) whose geologic history is similar. The land is generally rocky and covered by a relatively thin layer of soil. The fragipan layer affects the permeability of the soil (quality of the soil that enables water or air to travel through it) and restricts downward movement of water. Soils in Middletown often have a moderate to high runoff potential due to this layer and many have a permanent high water table. Table N-1: Acreage Composition by Soil Series lists the soil types and their extent in the town.

TABLE N-1: ACREAGE COMPOSITION BY SOIL SERIES			
<i>SCS Symbol</i>	<i>Series Name</i>	<i>No. Acres</i>	<i>Percent of Town</i>
Pm	Pittstown	3,95	46.7
Ne	Newport	2,00	24.0
Mk	Matunuck*	80	1.0
Ba	Beaches*	80	1.0
Ma	Mansfield	120	1.4
Rp	Rock Outcrop-Canton Complex*	135	0.6
CaC	Canton-Chalton*	45	0.5
Se	Stissing*	1,040	12.5
UD	Udorthents-Urban Land	540	6.5
Ur	Urban Land	235	2.8
(All minor units 0.5%)		170	2.0
Total		8,340	100.0
* Soils prohibitive to development = 1,500 Acres (18%) Source: Soil Survey of Rhode Island, USDA, Soil Conservation Service (SCS), July 1981, pp112-114			

Of the soils listed, approximately 1500 acres, or 18%, have limitations so severe as to be generally prohibitive for community development. These extremely severe soils include the Matunuck (peat and tidal marsh); Beaches (sand and flood hazard); Mansfield (wet); Canton-Charlton (rock out crop complex) and the Stissing series (wetness). Other soils in the community exhibit varying degrees of limitations for community development.

The town requires a Special Use Permit for any construction in Zone 1 of the Watershed Protection District (Stissing and Mansfield soils). This provides the necessary reviews to determine the advisability of allowing construction in areas with poor soil types. Map N-2 Hydric Soils shows the location and extent of Stissing and Mansfield soils in Middletown.

The largest group, the Pittstown soils, consists of deep, moderately well drained soils on uplands. These soils have a fragipan at a depth of 20 to 30 inches; permeability is moderate in the subsoil but slow in the very firm material below. A seasonal high water table and slow permeability are the major limiting factors of this soil.

The Newport soils, the second largest group, consist of deep, well-drained medium textured soils of the uplands, found on the top and sides of elongated ridges composed of till which form Middletown's north-south valleys and hills. The depth to water table is more than four feet, but a slowly permeable fragipan occurs at a depth of 20 to 30 inches. This fragipan restricts the downward movement of water and will cause a temporary perched water table in the soil profile. The significant problem in these soils is their poor drainage qualities and their leaching capacity for on-site sewage disposal.

The density of residential development, particularly in areas lacking public sewers, should be closely related to soil characteristics. Minimum lot sizes should be established in view of soil types, slopes, and availability of public utilities, such as public water and/or sewers.

Certain soils that are exceptionally suited to agricultural purposes are designated as prime soils. The Newport and Pittstown silt loams fit this category and as a result, about 70 percent of Aquidneck Island is considered covered with prime soils. Agriculture, which in the past played a prominent role in the development of Aquidneck Island, is still an important land use today. Middletown and Portsmouth are two of the most intensively farmed towns in the state. They contain 15 percent of the state's prime farmland acres while covering only 2.8 percent of the state's total area. While, on one hand, prime soils are recognized as valuable, this resource is unfortunately also subject to damage and loss as a result of human activities. Map N-3 Agricultural Soils illustrates the extensive amount of prime farmland soils within Middletown.

DRAINAGE PATTERNS

WATERSHEDS

Middletown covers four major and two minor watersheds. The four watersheds, Bailey Brook, Paradise Brook, Maidford River, and Nelson Pond are served by the major brooks for which they are named. The watersheds, some of which extend into Portsmouth to the north, naturally drain the basins in a southerly direction where they feed three large ponds - Easton's / Green End, Gardiner and Nelson Ponds.

The two minor drainage basins are the eastern Narragansett Bay and eastern Little Creek areas. The area of West Main Road drains from the east to the west into Narragansett Bay. Little Creek drains its basin in a west to east direction directly into the Sakonnet River.

All of Middletown's rivers and streams are subject to periodic flooding, at low elevations surrounding the waterways. Map N-4 Surface Waters and Watersheds shows the drainage patterns for the five drainage basins in Middletown.

FLOOD PLAIN

A FIRM (Flood Insurance Rate Map) illustrates the extent of flood hazards in a community by depicting flood risk zones and Special Flood Hazard Areas. The most recent revised maps became effective on September 4, 2013. As a result of recent coastal hazard analyses and mapping by FEMA (Federal Emergency Management Agency), flood zone designations changed in many locations along the shoreline.

Low lying lands immediately adjacent to the coastline of Narragansett Bay and the Sakonnet River experience minor flooding, but the beach and marsh areas in the southeast part of the town along the Atlantic Ocean are much more flood prone. Development in the flood plains of these streams may exacerbate flooding due to increased runoff. Map N-5 Flood Hazard Areas shows the areas of Middletown subject to flooding.

Flooding is expected to increase along the coast due to sea level rise. Records of yearly mean sea level at Newport indicate that the sea level rose by about eight inches between 1930 and 2010 (RI Ocean SAMP). Increased storminess, sea level rise, and erosion will impact private and public property, facilities, and infrastructure with increased risk of flooding and other damages, as well as the loss of waterfront property and tax revenue. Federal funding is available for voluntary property acquisition of flood prone or flood damaged properties. Under this program, Middletown could purchase private land, typically at pre-flood fair market value utilizing grant funding. Once acquired, all structures would be removed, utilities capped, ground leveled and the property is deed-restricted to green space. Both Bailey Brook and the Maidford River have flooding characteristics that require detailed study. Bailey Brook empties into Green End Pond, from there to Easton Pond while the Maidford River feeds Nelson and Gardiner Ponds. Both ponds are public water supply reservoirs. Due to the potential for flooding and possible contamination of water supplies, development within the watersheds of these streams must be carefully controlled. In particular, changes in land use or vegetative cover in any of these watersheds have the potential for causing: damage from flooding; increased volume and velocity of water runoff; decreased ground water infiltration; decreased water quality; and increased sedimentation of waterways.

WETLANDS

According to Land Use 2011 data from RIGIS (Rhode Island Geographic Information Systems), Middletown has approximately 466 acres of open water and 456 acres of wetlands. Wetlands are scattered throughout Middletown and comprise 4.4% of the total land area. Map N-6 Forested Areas & Wetlands displays the approximate boundaries of upland forest and wetlands in Middletown. Freshwater wetlands, defined as areas where at least 50% of the plant communities are designated wetland types, include marshes, bogs and swamps. RIDEM is responsible for administering and enforcing the Fresh Water Wetlands Act (R.I. Gen. Laws Chapters 2-1-20.1, 42-17.1, and 42-17.6). The vegetation found in freshwater wetlands is strongly influenced by the depth of the

water. The shallower edges of wetlands generally contain cattail, pickerel weed and buried, while in deeper water, pond weed, bladderwort, and hornwort are common. Other freshwater wetland plants include alder, willow, sweet gale, and buttonbush as well as a variety of sedges, rushes and grasses.

Wetlands are particularly valuable as protective buffer strips around reservoirs used in the drinking water system. Wetlands are extremely productive ecosystems and excellent sources of nutrients and food for many types of wildlife. They are valuable wildlife habitats not only because they are rich in food resources, but also because they provide nesting sites, breeding grounds and protective cover to a diverse number of terrestrial and aquatic animal species.

The need to preserve wetlands in a natural state has not always been recognized. Previously, wetlands, swamps and marshes often were considered wastelands that were not valuable to the owner until drained or filled to create dry, usable land. Fortunately, a better understanding of wetlands has fostered recognition of their important role in the overall environment. As a result stronger laws were passed protecting wetland areas that make it illegal to alter a wetland without a permit.

INVASIVE SPECIES

The impacts of invasive species on natural plant and marine resource communities are a growing concern. Such species can displace native species and impact natural communities.

Middletown has had a program in place to combat *Carex kobomugi* and its impacts on our native dune environment. Middletown, in cooperation with the U.S. Fish & Wildlife Service has performed several herbicide sprayings with success reducing the total area *Carex kobomugi* from 88,000 square feet to less than 5,000 square feet. Hurricane Sandy in 2012, removed mostly all of the remaining 5,000 square feet and the town applied a treatment post storm.

Carex kobomugi has the ability to form dense stands on coastal dunes. It has been found in densities of up to 200 plants per square meter. This density effectively excludes the native beach grass, *Ammophila breviligulata*. *Carex kobomugi* actually makes dunes more susceptible to being blown out, and the native plant diversity found with this sedge is less than with native beach grass.

In the past phragmites has been identified as a potential source of bacteria loading impacting water quality by the moat. Once introduced phragmites australis has the ability to take over marsh communities producing dense mats, which crowd out native plant species, alter marsh hydrology and habitat and increase fire potential. Restoration of intertidal wetlands through eradication of Phragmites and revegetation with native, non-invasive plant species should net an overall improvement in habitat quality for fishery and wildlife species, and maintain marsh-open water trophic linkages. The aggressive spread of phragmites threatens the overall health of these ecosystems and must be held in check.

SALT MARSHES

Tucked among rocky headlands, along tidal rivers and behind barrier beaches, saltmarshes are essential to the quality of New England's coastal environment. Salt marshes are valuable wildlife habitats as their high productivity makes them vital sources of nutrients for a variety of organisms. The eggs and larvae of many fish and shellfish develop in marshes. Snails, insects, crustaceans and small fish thrive in the marsh and in turn provide food resources for birds and mammals. Herons, egrets, sandpipers, plovers, ducks and geese frequent saltmarshes. The provision of excellent cover as well as food also attracts visits from raccoon, mink and muskrats. Saltmarshes are also used extensively by migrating shorebirds and waterfowl. Due to its location within the Atlantic Flyway, a major migratory route between Canada and the southern United States, Middletown saltmarshes are visited by large flocks of wintering Canada Geese especially at Nelson and Gardiner Ponds.

Saltmarshes serve important functions in addition to wildlife habitat. They are protective buffers against storm damage, and help control flooding in coastal areas. They are noted for their ability to assimilate pollutants and purify both water and air. This function is particularly important in coastal areas where runoff affects the quality of coastal waters. Finally, similar to all other natural terrestrial ecosystems, saltmarshes provide recreational and educational opportunities, as well as scenic beauty.

Despite their ability to perform pollution abatement, salt marshes are fragile ecosystems easily obliterated by human activities. Over the past several centuries, New England's marshes have been ravaged by agriculture, development, and mosquito control. As noted by the Rhode Island Recreation Guide Plan, "coastal wetlands and ponds are often very delicately balanced so that the slightest alteration of either fresh or saltwater can completely alter the life cycle and substantially reduce marine plant and animal production." Within Middletown, the Sachuest Saltmarsh is home to hundreds of species of plants and animals, many of which are uniquely adapted to the rigors of a life spent half in and half out of salt water including *Spartina* grasses, fiddler crabs, and Marsh minnows. The Sachuest Saltmarsh is a 45-acre remnant of a much larger saltmarsh system. Early in the 20th century, the reservoir known as Gardiner Pond was built, turning much of the original marsh into a freshwater lake surrounded by an earthen berm. The hydrology of the remaining marsh was altered by the construction of the reservoir and later by road building, waste disposal, and military construction. A significant saltmarsh restoration effort at Sachuest Point National Wildlife Refuge was completed in 2004 as part of the former Middletown landfill capping project and resulted in the reclaiming of 6 acres of saltmarsh.

FORESTS & OPEN FIELDS

Due to the agricultural conversion of forestland that took place in Middletown during the seventeenth through twentieth centuries, only 3% or approximately 330 acres of forested areas remain in Middletown. The predominant forest vegetation is that of abandoned fields in a variety of stages and forests of immature hardwoods.

The woodlands and open fields of Middletown are important natural resources for several reasons. Vegetative cover contributes organic matter to the soils in an important part of the recycling of nutrients and also help hold soils in place. Disturbing vegetative cover can result in an increased volume and velocity of water runoff, increased soil erosion and sedimentation of waterways, and decreased water quality. The important relationships between vegetative cover, soil erosion and non-point pollution illustrate the need for development to be planned with a minimum of disturbance of vegetation, particularly in areas of steep slopes and adjacent to waterways. To accomplish this, large development projects should be constructed in stages so that vegetation on only a portion of a property is disturbed at any given time.

Finally, the woodland and open field ecosystems provide the additional benefits of open space, recreational opportunities and scenic value. They are an important part of our landscape, contributing to its character and providing buffer zones that allow transitions between incompatible land uses, protecting visual quality and minimizing environmental damage.

The Town, through the efforts of the Tree Commission, offers a variety of tree planting programs which have resulted in the planting of native shade trees and other plants throughout the Town. Trees are recognized for their aesthetic value, and those located along public rights-of-way and other public properties are regulated by the Tree Preservation and Protection Ordinance. The Town should make efforts to increase the town's tree canopy through reforestation, street tree plantings, and promoting private tree planting through incentives.

The Rhode Island Tree Council has developed a Champion Tree Database to stimulate public awareness about our tree resources and to educate citizens about our botanical heritage. The program's goal is to find and profile the biggest trees of their kind in Rhode Island. The Rhode Island Tree Council then works with the owners of these Champion Trees to preserve and protect them. As of 2013, there were six champion trees identified within Middletown.

WILDLIFE

The forests and fields of Middletown provide suitable habitats for deer, fox, raccoon, rabbit and similar animals. The wetland areas provide breeding grounds for reptiles, fish, amphibians and insects. Wildlife populations require a minimum of intact undisturbed habitat area below which most populations decline and eventually perish. The amount of habitat required varies with different types of wildlife.

In Middletown valuable wildlife habitat is subject to development pressure. Unless the important function of woodlands and open fields is recognized and fully considered in land use decisions, development will continue to destroy the remaining habitat areas. As a result, the additional benefits they provide in terms of recreational opportunities, scientific study and ecological integrity to the island will be lost.

Wildlife resources also fulfill an important role in the ecological balance of the island. As part of a complex food web, animal species are key participants in the continuous recycling of nutrients. Insects and birds further provide mechanisms for the fertilization of plants and dispersion of seeds.

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A healthy diversity of species also maintains an ecological balance that keeps populations of nuisance species, such as mosquitoes, in check.

The town supports a rather wide diversity of bird species; at least seventy species during the breeding season and 220 species during the migration season. The list of those birds sighted in Middletown is drawn from both the R.I. Coastal Resources Center and the Norman Bird Sanctuary.

The eastern coyote (*Canis latrans*) has created a great amount of controversy in Rhode Island recently. Coyotes, originally a prairie species, have successfully colonized all parts of the continental and nearshore U.S. in the past 100 years. They reached the islands of Narragansett Bay in the mid-1990's. Since then coyotes have become increasingly abundant and problematic in some island communities. In 2011, the Middletown Town Council voted to institute a coyote best practices protocol to address the increasingly aggressive animals.

The flora and fauna listed below are considered exemplary natural communities and rare species which are (or have been) inhabitants of Middletown. The demise of some of the communities may be attributed to the loss of agricultural lands that are so important to many species dependent on open pastures for their existence. Rare Species found in the area are listed below:

COMMON NAME	SCIENTIFIC NAME
Least Bittern	<i>Ixolrychus exidris</i>
Mash Wren	<i>Cistothorus palustris</i>
Barn Owl	<i>Tyto alba</i>
Sora	<i>Porzana carolina</i>
Leopard Frog	<i>Rana pipiens</i>
Roseate Tern	<i>Sterna dougallii</i>
Upland Sandpiper	<i>Bartramia longicauda</i>
Herb-Robert	<i>Geranium robertianian</i>
Pale Green Orchid	<i>Platanthera flava</i> var. <i>herbiola</i>
Smooth Gooseberry	<i>Ribes hirtellum</i>
Smooth Orache	<i>Atriplex glabriuscula</i>
Seabeach Amaranth	<i>Amaranth pumilus</i>

BEACHES

The town is richly endowed with beach areas that are primarily used for seasonal recreational purposes. These areas along with adjacent sand dune systems are unique natural resources whose maintenance and preservation in their natural form require a high priority of commitment from the town. Three of these beach areas lie on the eastern side of Middletown on Easton's and Sachuest Bays. The portion of First, or Easton's Beach, which lies within the Town of Middletown, is known as Atlantic Beach and is adjacent to the Newport-Middletown line. The 40 acre Second Beach is on Sachuest Bay in the southeastern portion of town. Third Beach is located on the Sakonnet River and consists of 10 acres directly opposite Second Beach.

All three beaches meet the criteria to be classified as “otherwise protected” by the Coastal Barrier Improvement Act. The Rhode Island Coastal Resources Management Program has classified the water adjacent to each beach area as Type I (Conservation Area) water. Map N-7 CRMC Water Type Classification shows water type classifications adjacent to Middletown. These waters are designated by the state for preservation and protection from activities and uses that have the potential to degrade scenic, wildlife, and plant habitat values, or that may adversely impact water quality and the diversity of natural shoreline types.

Another beach area on the eastern side of Middletown is Pebble Beach, a unique cobblestone beach on the Sakonnet River at the Portsmouth line. It is an unusual coastal feature in that the shape of the beach and the size and number of stones cause a great rumbling when waves wash over the rocks. Currently, no public beach or water access is presently available on the west side of Middletown on Narragansett Bay. However, a waterfront park is planned, for when excised land is transferred from the U.S. Navy to the Town.

Essential to the preservation of all beaches are the dunes which form the first line of defense against storm erosion by dissipating the energy of breaking waves. Dunes and their vegetation offer protection against storm driven high water and provide a reservoir of sand for rebuilding the beach. As such, access to the dunes for recreational uses should be prohibited.

Recent remediation activities of the former Middletown landfill now provide visitors to our beaches and the wildlife refuge vistas of rolling swales of native grasslands and habitable saltmarsh. Remediation of the 21 acre landfill was completed in 2005, following the removal of hazardous waste, refuge and recycling. Conditions at the former landfill, which became part of the U.S. National Wildlife Refuge in 1973, had the potential to leach contaminants into the groundwater system and impair water quality of nearby waterbodies including the Sakonnet River. The restoration project resulted in the reclaiming of 6 acres of saltmarsh and the remaining 15 acres was capped using the latest technology to eliminate potential leaching of contaminate to the environment. The 15 acre upland landfill cap was seeded with a custom mix of native Rhode Island species that included 14 different wildflowers and 6 different warm-season grasses. In addition, a native shrub mix of bayberry, dwarf sumac, pasture rose, and beach plum were planted along a 1500 foot stretch of road adjacent to the landfill cap. This new grassland compliments habitats on adjacent refuge lands, providing additional foraging and nesting areas for declining grassland bird species such as bobolink, short-eared owl, and northern harrier.

GREENWAYS

Greenways are linear corridors of land and water and the natural, cultural, and recreational resources they link together. They include bikeways, trails, wildlife corridors, and farm and forest greenbelts; and function to connect greenspace such as parks, scenic areas, and historic areas.

State Guide Plan Element 155 “A Greener Path...Greenspace and Greenways for Rhode Island’s Future” illustrates two primary natural greenways within Middletown – one running north south through the center of town, along the Maidford River, the other crossing the town from east to west from Sachuest Point to Newport’s Easton’s/First Beach. An additional north-south secondary

corridor running along Bailey Brook, to the west of the primary north-south greenway, is illustrated. One bikeway, running along the western border of town from the Newport Bridge northwards along the Bay into Portsmouth, is illustrated on the Plan.

A Greener Path... Greenspace and Greenways for Rhode Island's Future (1994) called for one-third of the State's land area to be greenspace by 2020. Greenspace would include linear greenways consisting of bikeways, trails, river corridors, and more. It called for greenspace to be located in every community and it set an objective that no Rhode Islander would live more than 15 minutes from a greenway.

The Aquidneck Land Trust (ALT) works to protect land within two greenways in Middletown, the Sakonnet Greenway and the Center Island Greenway. The ALT's Greenway Plan, shown in Map N-8 Greenways illustrates these greenways, as well as multi-use trails. The boundaries depicted on the map are meant to show the general location of these greenways; land preserved within these boundaries is also depicted. While a significant amount of land within these greenways is protected from development through fee simple ownership or conservation easements, opportunities to expand and connect protected lands within the existing greenways and to improve public access to these corridors should be pursued.

The Aquidneck Land Trust has been working with landowners over many years to create trail easements through the Sakonnet Greenway. The final section of the Sakonnet Greenway Trail was completed in October, 2012, making it the longest nature trail on Aquidneck Island. The Sakonnet Greenway Trail runs 10 miles in Portsmouth and Middletown and passes through recreational areas, active farmland, wetlands, and forest.

SCENIC AREAS

Middletown is a coastal community full of scenic beauty and natural wonders. Scenic areas in Middletown designated by RIDEM as noteworthy or distinctive include:

- Hanging Rock - This forty-acre site consists of a series of parallel ridges of conglomerate rock outcrops. The view from atop the steep sided rocks provides an excellent panoramic look at the surrounding coastal areas.
- Sachuest Marshes - These marshes comprise an extensive 75-acre system of tidal marshes, bays and flats under the management of the U.S. Fish and Wildlife Service and the Town of Middletown. The area is an extremely valuable wildlife habitat.

- ❑ Purgatory Chasm - The chasm is a two-acre state park containing a natural fifty-foot ravine cut into conglomerate bedrock adjacent to the sea. There is a separation of about six feet between the two vertical walls of the chasm.
- ❑ Sandy Point Lane Area - Peckham Land Beach - Also known as Pebble Beach, this D-shaped cobblestone beach apparently was formed by erosion of the conglomerate bedrock base. The shape of the beach, and number and size of the stones result in an unusual, loud rumbling sound when high surf washes over the shore.
- ❑ Mitchell's Lane - Albro Woods - This nine-acre site is a stand of mixed hardwoods dominated by beech trees. In certain locations, the stands are composed almost exclusively of huge beech trees. The woodland is surrounded by open farmland and divided by a well-used trail.
- ❑ Paradise Rock - Paradise Rock is a large conglomerate outcrop of the highest elevation in the parallel series of ridges that includes Hanging Rock and Purgatory Chasm. The site provides a superb scenic vista in all directions.

DRINKING WATER RESOURCES

Middletown's potable water resource is maintained by the Newport Water Department, which supplies water to residents of Newport, Middletown and Portsmouth. More than half of the land in Middletown has access to public water service. According to the town's 2012 records, there are over 4,300 property owners in Middletown who are Newport Water Department customers. The areas not served by the public supply depend solely on groundwater wells for domestic needs.

The source of raw water supply for the entire system is from nine surface water reservoirs located on Aquidneck Island, Tiverton and Little Compton. Four of these are in Middletown - Easton North and South Ponds, fed by Bailey Brook, and Nelson Pond and Gardiner Pond, fed by the Maidford River and Paradise Brook. Easton North and South Ponds are located in the southwestern portion of the town near the Middletown/Newport border. Nelson Pond (also known as Paradise Pond) and Gardiner Pond are located in eastern Middletown near Sachuest Beach. A regional multi-jurisdictional effort is required to protect the watershed areas of these reservoirs. Although Middletown is committed to protecting its public drinking water resources the town has limited control over the water supply and distribution system.

POINT SOURCES OF POLLUTION

Middletown has two identified point sources of pollution, which are discharges of waste directly into a water body. Overflows of the sewer system, located at the Wave Avenue and Coddington Highway Pumping Stations, discharge untreated wastewater to Easton's Bay and to Narragansett Bay, respectively. These overflows are not considered to be a serious threat to water quality as they occur only when a malfunction or breakdown takes place in the system. However, of particular concern is the fact that the Wave Avenue overflow does create an impact on the Easton's and Atlantic Beach recreational areas at Easton's Bay.

The discharge from the Newport Wastewater Treatment Facility is of some concern, also, because its discharge point is in Narragansett Bay near the western Middletown/Newport line. As a result of this discharge, the water in the area is designated SC which is suitable for most uses except bathing and drinking. If a breakdown should occur at this discharge point, the water quality in the area could be more adversely affected.

NON POINT SOURCE POLLUTION and TMDLs

Runoff is creating a significant threat to the surface water supplies of Middletown. Two categories of runoff occur in Middletown: urban runoff from commercial development, roads and residential neighborhoods and rural runoff from cultivated lands and open space. The primary pollutants, which enter water due to rural runoff, are sediments. Sediments can carry other pollutants as well, such as nutrients, pesticides and bacterial contaminants from animal waste. This type of pollution causes water quality degradation of Middletown's drinking water supplies, bathing and recreation resources, shellfish areas and wildlife habitats.

Many efforts to control nonpoint source pollution are driven by the Total Maximum Daily Load (TMDL) program, administered by U.S. EPA as part of the Clean Water Act. Section 303(d) of the federal Clean Water Act requires the State of Rhode Island to prepare a list of all surface waters impaired by pollutants. Waterbodies placed on the 303(d) list require the preparation of Total Maximum Daily Loads (TMDLs). A TMDL is the maximum amount of a pollutant, from point and nonpoint sources, that can be present in a water body while still meeting water quality standards. States must develop a TMDL for each pollutant of concern and then implement plans to achieve and maintain those TMDLs by allocating reductions among all sources. The goal is for all waterbodies to comply with state water quality standards.

TMDL's

TMDL FOR PHOSPHORUS TO ADDRESS 9 EUTROPHIC PONDS IN RHODE ISLAND

In 2007, a TMDL was developed to address phosphorus and phosphorus-related impairments to nine eutrophic ponds in Rhode Island including North Easton's in Middletown. North Easton Pond, along with eight other reservoirs, comprises the drinking water source utilized by the Newport Water Division.

The goals of the TMDL are to assess total phosphorus, chlorophyll-a, and dissolved oxygen concentrations within these water bodies, to identify and assess sources of the impairment, and to recommend mitigation measures to address the phosphorus related impairments and restore all designated uses.

Recommended implementation activities to address external sources to the ponds focus primarily on the control of stormwater runoff to the ponds and to a lesser extent on the control of loadings from waterfowl, stream bank and lakeshore erosion, and in some instances wastewater. To realize

water quality improvements in the ponds, both phosphorus concentrations in storm water and the volume of storm water discharged to the ponds must be reduced.

The implementation of Phase II Stormwater Management Program Plans (SWMPP) including illicit discharge detection and elimination, revision of local ordinances addressing phosphorus from new development and re-development, and the construction of stormwater BMPs at selected locations is expected to, in time, help reduce the nutrient impairments to the ponds. The town is in the process of implementing the recommendations that are within this TMDL including increasing the frequency of street sweeping and/or stormwater system maintenance.

The major sources of phosphorus to North Easton Pond, are Bailey's Brook and to a lesser extent an unnamed tributary, stormwater, waterfowl, wastewater, erosion/sedimentation internal cycling, and perhaps agricultural properties. The town received funding for and is in the process of conducting a feasibility study to determine the types and locations of BMPs that will be most effective in reducing stormwater volumes and phosphorus loading to the pond to the maximum extent feasible.

RHODE ISLAND STATEWIDE TMDL FOR BACTERIA IMPAIRED WATERS

WATERBODIES WITHIN MIDDLETOWN INCLUDED WITHIN THIS TMDL ARE BAILEY BROOK, THE MAIDFORD RIVER, AND PARADISE BROOK AS THEY DO NOT MEET RHODE ISLAND'S BACTERIA WATER QUALITY STANDARDS.

Bailey Brook

The Bailey Brook watershed is the most urban in the Newport Water Supply system. It covers an area of 3.1 square miles of which approximately 68% is developed. Bailey's Brook, a 4.8 mile stream, along with an unnamed perennial stream, discharge into a marsh located to the immediate north of North Easton Pond. Agricultural uses occupy 15% of the land area. Forests and other non-developed areas occupy 12%, and wetlands and surface waters occupy 4%.

Previous investigations have concluded that there are several potential sources of harmful bacteria in the Bailey's Brook watershed including stormwater runoff from developed areas, illicit discharges, and agricultural activities. A stream buffer survey conducted in 2005 found that 34% of the stream buffer was under high-intensity land use. Intensive land use near the brook is likely to result in increased adverse impacts because the natural land buffering system of the stream has been removed. The Bailey's Brook watershed has an impervious cover of 32%.

Maidford River

For the purposes of the TMDL document, RIDEM segmented the Maidford River into two sections; Segment 2A a 3.4 miles segment, and Segment 2B a 0.9 mile segment. The headwaters of the Maidford River begin in a small pond in the central part of the Town of Middletown. The river flows south through agricultural fields along Berkley Avenue and Paradise Avenue to Sachuest Point.

The Maidford River watershed of Segment 2A covers 3.5 square miles and is highly agricultural (48%), particularly in the northern and central portions of the watershed. It is 36% developed and is characterized by medium to high density residential development. The watershed of Segment 2A has an impervious cover of 11.5%. There are several potential sources of bacteria in the Maidford River watershed including agricultural activities, stormwater runoff from developed areas, and illicit discharges.

Segment 2B has a calculated impervious cover of 9%. As a general rule, impaired streams with watersheds having less than 10% impervious cover are assumed to be caused by sources other than urbanized stormwater runoff. Developed uses occupy approximately 29% of the land area of Segment 2B. Non-developed areas such as forests occupy 22% and include the Norman Bird Sanctuary and the Sachuest Point National Wildlife Refuge. Wetland and surface waters occupy 8% and other land uses combine to occupy 2%.

Due to its location within a drinking water supply and its designation as a critical habitat for rare and endangered species, the Maidford River Segment 2B has been designated by RIDEM as a Special Resource Protection Water (SRPW), providing it with special protections under RIDEM's Antidegradation Provisions. SRPWs are high quality surface waters that have been identified as having significant ecological or recreational uses and/or are public water supplies.

Paradise Brook

Paradise Brook is a 2.5-mile long stream with headwaters consisting of a marshy, agricultural area south of Fayal Lane in the northeastern section of the Town of Middletown. The brook flows south along Third Beach Road, before turning westerly into land occupied by the Norman Bird Sanctuary. The brook flows into Nelson Pond, which is connected via pipeline to Gardiner Pond. The ponds are operated by Newport Water as a single reservoir. These ponds are two of the four surface water drinking reservoirs on Aquidneck Island. Due to its location within a drinking water supply, Paradise Brook has also been designated by RIDEM as a Special Resource Protection Water (SRPW).

The Paradise Brook watershed covers 0.55 square miles and has an impervious cover of 6.5%. There are several potential sources of bacteria in the Paradise Brook watershed including agricultural activities, wildlife and domestic animal waste, stormwater runoff from developed areas, and illicit discharges. Agricultural uses occupy a large portion (38%) of the watershed. Non-developed areas such as forests including the Norman Bird Sanctuary occupy 31%. Developed uses (including residential and commercial) occupy approximately 27% of the land area. Wetland and surface waters occupy 2%, and other land uses combine to occupy 2%.

STORMWATER MANAGEMENT

Stormwater control and management is a critical aspect of maintaining and restoring the quality of waters in Middletown. The Rhode Island Pollutant Discharge Elimination System (RIPDES) Program enacted Phase II Storm Water regulations that require operators of municipal separate storm sewer systems (MS4s) to implement programs and practices to minimize pollution from storm water runoff. The regulations require MS4s within urbanized or densely populated areas, such as the Town of Middletown, to develop storm water management programs and to obtain RIPDES Phase II storm water permits. The Rhode Island Pollution Discharge Elimination System (RIPDES) Phase II regulations, require that regulated municipalities develop 6 minimum measures, which include a comprehensive range of activities as follows: Public Education and Outreach on Storm Water Impacts, Public Involvement/Participation, Illicit Discharge Detection and Elimination, Construction Site Storm Water Runoff Control Program, Post-Construction Storm Water Management in New Development and Redevelopment, and Pollution Prevention/Good Housekeeping for Municipal Operations.

Middletown's Storm Water Management Plan (SWMP) was adopted by the Town Council in December of 2003, revised 2009. The goal of the SWMP is to reduce adverse impacts to water quality, aquatic habitat and human health by instituting the use of controls on the unregulated sources of storm water discharges that have the greatest likelihood of causing continued environmental degradation.

The Town adopted a Stormwater Management Ordinance in February 2006 which establishes minimum requirements and procedures to control the adverse impacts associated with increased stormwater runoff. Proper management of stormwater runoff will minimize damage to public and private property, reduce the effects of development on land, control stream channel erosion, reduce local flooding, minimize adverse water quality impacts and maintain after development, as nearly as possible, pre-development runoff characteristics. This ordinance requires stormwater management controls that are consistent with the State of Rhode Island Stormwater Design and Installation Manual (as amended), and is intended to minimize water quality impacts and maintain pre-development runoff conditions.

The town has completed or is in the process of implementing several stormwater management projects including:

- The Esplanade Outfall Relocation Project which involved relocating an outfall to an offshore location to improve beach water quality at Easton's Bay.
- Bioretention Ponds Demonstration Project at Gaudet Middle School and Newport Avenue
- Catch Basin Retrofits

- ❑ Stormwater Mapping - The town acquired stormwater infrastructure GIS (Geographic Information Systems) data that will be utilized for mapping, maintenance, and reporting requirements
- ❑ Feasibility analysis of both upland and end-of-pipe stormwater attenuation and source reduction BMP's (Best Management Practices) to address phosphorus in stormwater in Bailey Brook watershed

The town has made significant progress in developing a credible stormwater management program and addressing stormwater related issues, but considerable work remains to be completed to protect public health, to preserve the quality of life of residents, and ensure compliance with all applicable state and federal regulations. In order to accomplish these goals a sustainable funding source is needed. The Town is investigating creation of a storm water utility enterprise fund to provide this funding.

SEWAGE DISPOSAL

A majority of Middletown's population has sewer service. Map F-2 shows Middletown's sewer system service area. In the remaining areas of the town, the population is serviced by OWTS (Onsite Wastewater Treatment Systems) which treat and dispose of household wastes. Poor siting, design, installation, and/or a lack of maintenance can result in a system's failure. A troubled septic system can pollute surface and groundwater supplies creating environmental and public health concerns including drinking water quality degradation and/or shellfish contamination. Leachates from septic systems contain several pollutants of concern: nutrients, suspended solids, oil, grease, and pathogens. The nutrients and pathogens are of greatest concern due to the inability of soils to trap these pollutants. Septic system density has become a critical issue when dealing with the subdivision of land. Aquidneck Island's impermeable soils have compounded the effect of having a large number of septic systems. The Town should establish a Wastewater Management District to ensure that OWTS within Middletown are inspected and properly maintained, repaired and replaced to prevent degradation of Middletown's surface and ground waters.

RENEWABLE ENERGY

Renewable energy has many benefits including reduction in use of fossil fuels and carbon footprint, reduced need for energy imports, elimination or reduction of new electrical infrastructure, substations, transmission lines and power generation facilities, and other environmental and economic benefits. Consensus exists in the town regarding the desire to promote renewable energy technologies. However, some renewable energy technologies, wind turbines in particular, are associated with concerns about aesthetics, noise, or other potential adverse impacts. Many residents are also concerned that wind turbine development could negatively alter the town's natural and historic scenic vistas. Additional concerns regarding shadow, flicker and decrease in property values also arise for residents located near proposed large-scale wind turbines.

The town currently has a wind turbine ordinance which regulates the siting of wind turbines in town. Recent amendments to the ordinance, passed in September of 2012, place greater restrictions on the development of wind turbines in town including the establishment of a 120 foot height limit as well as solely allowing wind turbine development on properties in active agricultural use.

Also in 2012, zoning ordinance amendments were adopted which allow for the installation of ground-mounted solar arrays as a principal use in most zoning districts by special use permit, subject to certain restrictions.

AIR QUALITY

Middletown's air quality is affected by the quality of air throughout the region. One source of air pollution is the buildup of carbon monoxide fumes from dense automobile traffic in the region that can create unhealthy conditions. Although we recognize that Middletown residents can have little effect on regional air quality individually, the community can encourage residents to utilize alternatives modes of transportation by creating safe and convenient environments for their utilization. The town and its residents can also improve air quality through tree planting and tree preservation programs.

NIGHT SKY LIGHT POLLUTION

Middletown recognizes the adverse impact resulting from light pollution. Excess and poorly designed lighting causes glare that can be problematic for drivers and adversely impacts residential neighborhoods. It reduces resident's ability to view the night sky, and impacts wildlife. The town's commercial development design standards call for the mitigation of such impacts through the use of dark sky compliant lighting in commercial development applications. The zoning ordinance calls for parking lot lighting to be directed away from abutting streets and residential properties. The town should take measures to ensure that light pollution is mitigated to the extent possible, including in new developments as well as existing situations, such as when considering street lighting fixtures. Adoption of a night sky light pollution ordinance should be considered. In drafting such an ordinance recommendations of the International Dark-Sky Association should be considered.

ADUIDNECK ISLAND SPECIAL AREA MANAGEMENT PLAN

The RI Coastal Resources Management Council (CRMC) is developing a Special Area Management Plan (SAMP) for Aquidneck Island in partnership with RI Sea Grant/URI Coastal Resources Center; the Aquidneck Island Planning Commission; the three island communities of Portsmouth, Middletown, and Newport; and Naval Station Newport. The SAMP will help implement the West Side Master Plan that was developed by the Aquidneck Island Planning Commission and will address specific development standards for the region and include public access requirements, open space and habitat preservation, CRMC water type designation changes, and natural hazard resilience, among other issues.

NATURAL & ECOLOGICAL RESOURCES – Goals, Policies, & Action Items

GOAL N-I: Ensure that new development takes place in an ecologically sound manner

Policies	Action Items	Responsible Department	Timeframe
N-I.A. Define and protect environmentally sensitive areas through strict zoning regulations, conservation style development designs, and the use of Overlay Districts	N-1.A.1. Define and inventory environmentally sensitive areas	Planning Department	Short-term (1-2 years)
	N-1.A.2. Research regulatory options for protecting environmentally sensitive areas	Planning Department	Short-term (1-2 years)
	N-I.A.3. Maintain the requirements relating to conservation subdivision development	Planning Board; Zoning Board	Ongoing
N-I.B. Protect the community and its residents from the effects of development on unsuitable soils, flood plains, and in coastal high hazard flood zones	N-I.B.1. Continue appropriate oversight of development in the Watershed Protection Districts, including requiring special use permit for more intensive types of development, particularly in soils with poor drainage	Planning Board; Zoning Board	Ongoing

GOAL N-II: Protect and preserve the town’s natural drinking water supply			
Policies	Action Items	Responsible Department	Timeframe
N-II.A. Minimize nonpoint source pollutants that feed into the town’s reservoirs	N-II.A.1. Identify sources of nonpoint source impairment of surface water bodies through the Phase II Stormwater Management Program Plan (SWMPP) planning process and work to implement the recommendations of the SWMPP	Public Works; Planning Department	Short-term (1-2 years) and Ongoing
	N-II.A.2. Establish a Wastewater Management District to ensure that Onsite Wastewater Treatment Systems (OWTS) /(septic systems) are inspected and properly maintained, repaired, and replaced	Public Works; Town Council	Medium-term (3-5 years)
	N-II.A.3. Continue collecting and updating Geographic Information Systems (GIS) stormwater data and utilize GIS to assist in the proper planning and protection of water quality	Planning Department, Public Works	Ongoing
	N-II.A.4. Encourage residents to maintain a healthy lawn free from chemicals through educational activities	Planning Department	Short-term (1-2 years)
	N-II.A.5. Continue necessary actions to remain in compliance with federal and state mandates to manage stormwater in accordance with Phase II stormwater permit requirements	Public Works; Building Inspection; Planning Department	Ongoing
	N-II.A.6. Increase inspections and create a condition index of constructed stormwater drainage systems and BMPs	Public Works; Engineering; Planning Department	Short-term (1-2 years)

III. NATURAL & ECOLOGICAL RESOURCES

N-II.B. Promote cooperation among the Aquidneck Island communities toward preservation of the quality and quantity of drinking water	N-II.B.1. Initiate the establishment of a regular forum for ongoing discussions, and collaboration among the City of Newport, Towns of Middletown and Portsmouth, the Navy, Portsmouth Water and Fire District (PWFD) regarding water treatment and distribution issues	Town Council; Public Works; Planning Department	Medium-term (3-5 years)
	N-II.B.2. Meet the water quality management standards under the direction of the RI DEM Total Maximum Daily Load (TMDL) Program	Public Works	Medium-term (3-5 years)
	N-II.B.3. Request that the Newport Water Department update watershed protection district signs	Public Works	Medium-term (3-5 years)
GOAL N-III: Protect and restore valuable coastal resources			
Policies	Action Items	Responsible Department	Timeframe
N-III.A. Protect and rehabilitate the sand dune systems	N-III.A.1. Establish a Dune Protection ordinance, including a provision to prohibit motorized vehicles of any type (e.g., automobiles, dirt bikes, SUVs, ATVs) on the sand dunes	Town Council; Town Solicitor; Police Department	Medium-term (3-5 years)
	N-III.A.2. Continue the use of wooden snow fences or other means to prevent and slow the wind-blown sand erosion from the dunes along the length of the existing parking lot and Sachuest Point Road	Public Works	Ongoing
	N-III.A.3. Continue the use of boardwalks to prevent walking on beach grass and dunes	Public Works	Ongoing
N-III.B. Restore and maintain the quality of coastal waters	N-III.B.1. Enforce “No Discharge” rules to insure that Type 1 Water Quality criteria are not violated	Harbor Master	Ongoing
	N-III.B.2. Enforce stormwater regulations and promote the use of best management practices (BMPs)	Engineering; Building Inspection	Ongoing
	N-III.B.3. Organize annual beach cleanups	Public Works	Ongoing

GOAL N-IV: Promote the preservation and restoration of ecological systems in Middletown			
Policies	Action Items	Responsible Department	Timeframe
N-IV.A. Protect native wildlife and native plant species	N-IV.A.1. Coordinate with the Rhode Island Natural Heritage Program to determine sensitive habitat locations and to assist in the review of proposed projects that may destroy habitat of rare and endangered species	Planning Department	Ongoing
	N-IV.A.2. Preserve contiguous tracts of open space for wildlife habitat using various methods including acquisition, easements and conservation style development	Town Council; Open Space & Fields Committee; Planning Department	Ongoing
	N-IV.A.3. Control invasive plant species at beaches and public properties, and educate residents as to the impact of invasives.	Public Works; Planning Department; Beach Commission	Ongoing
GOAL N-V: Protect the natural and rural character of Middletown			
Policies	Action Items	Responsible Department	Timeframe
N-V.A. Protect and promote a network of contiguous protected open space	N-V.A.1. Identify contiguous tracts of open land as potential corridors for greenways such as:	Planning Department; Open Space and Fields Committee	Medium-term (3-5 years)
	• Links between utility easements, nature conservation easements and other deeded open areas		
	• The Old Colony and Newport Railway 80-foot track easement		
	• Newport Water Department land as part of its Water Quality Protection Plan		
	• Land protected by development rights/restrictions owned by land trust conservancies, the state and town		
	N-V.A.2. Support the preservation of open space in watersheds, along the shore, and in other environmentally sensitive areas through acquisition, conservation easements, and purchase of development rights	Town Council; Open Space & Fields Committee; Planning Department	Ongoing

III. NATURAL & ECOLOGICAL RESOURCES

N-V.B. Encourage the preservation of farmland and open space in Middletown in order to maintain the Town’s agricultural base	N-V.B.1. Encourage the continuation of agriculture in Middletown through tax incentives and other means and by continuing to promote participation in the State's Farm, Forest, and Open Space Program	Town Planning Department; Town Council; Tax Assessor	Ongoing
	N-V.B.2. Promote use of conservation subdivision when farmland and other undeveloped land is being converted to residential use	Planning Board	Ongoing
	N-V.B.3. Draft agricultural overlay zoning to permit complimentary uses to be developed on farms.	Planning Board	Short-term (1-2 years)
N-V.C. Encourage the use of outdoor lighting that limits glare and light pollution	N-V.C.1. Consider regulations on outdoor lighting to limit night sky light pollution and glare.	Planning Board	Short-term (1-2 years)

GOAL N-VI: Preserve existing forested areas and increase the town’s tree resources

Policies	Action Items	Responsible Department	Timeframe
N-VI.A. Protect existing and establish new forested areas	N-VI.A.1. Keep Albro Woods as a natural parkland	Town Council	Ongoing
	N-VI.A.2. Permanently protect forested areas through acquisition and conservation easements	Town Council; Open Space & Fields Com.	Ongoing
	N-VI.A.3. Establish new and re-establish previously forested areas as appropriate	Tree Commission	Medium-term (3-5 years)
N-VI.B. Increase the town’s tree canopy	N-VI.B.1. In conjunction with the Middletown Tree Commission efforts, establish a plan for planting, maintaining, and replacing trees in public spaces.	Town Administrator, Town Council; Public Works; Tree Com.	Ongoing
	N-VI.B.2. Require developers to retain existing trees when possible and to provide deciduous street trees	Planning Board	Ongoing
	N-VI.B.3. Establish a preferred list of trees for use in reviewing landscaping plans during development plan review	Tree Com.; Planning Board	Medium-term (3-5 years)
	N-VI.B.4. Encourage the planting of native trees and plants	Planning Board; Tree Com.; Public Works	Ongoing

GOAL N-VII: Reduce the town’s vulnerability to climate change impacts			
Policies	Action Items	Responsible Department	Timeframe
N-VII.A. Gain a better understanding of the science and policy implications of sea level rise	N-VII.A.1. Educate and engage residents and businesses in addressing climate change by reducing greenhouse gas emissions	Planning Board; Planning Department; School Department	Long-term (6-10+ years)
	N-VII.A.2. Identify properties vulnerable to sea level rise and educate property owners of the risks.	Planning Department	Short-term (1-2 years)
GOAL N-VIII: Protect and maintain the air quality of Middletown and Aquidneck Island			
Policies	Action Items	Responsible Department	Timeframe
N-VIII.A. Increase local efforts to improve air quality on Aquidneck Island	N-VIII.A.1. Encourage the use of alternative transportation modes, such as carpooling, transit, and bicycling	Planning Board	Ongoing
	N-VIII.A.2. Increase the quality and quantity of trees in Middletown that contribute to carbon sequestration	Public Works, Tree Commission	Ongoing
GOAL N-IX: Promote energy conservation and the development of renewable energy resources			
Policies	Action Items	Responsible Department	Timeframe
N-IX.A. Strive to acquire power through renewable energy sources and minimize its energy usage through conservation and efficiency	N-IX.A.1. Explore means to reduce energy expenses and consumption	Town Council; Planning Department	Ongoing
	N-IX.A.2. Conduct energy audits of town facilities and operations and invest in energy efficiency improvements	Town Administrator	Medium-term (3-5 years)
	N-IX.A.3. Consider fuel utilization and efficiency when purchasing town vehicles	Town Administrator; Town Council	Ongoing
	N-IX.A.4. Apply for grants and other funding which promote renewable energy and/or energy efficiency improvements	Planning Department	Ongoing
	N-IX.A.5. Consider renewable energy sources for town facilities	Town Council; Town Administrator	Long-term (6-10+ years)

III. NATURAL & ECOLOGICAL RESOURCES

N-IX.B. Promote the use of renewable energy technology	N-IX.B.1. Consider incentives for renewable energy use in Zoning Ordinance and Subdivision Regulations	Planning Board	Medium-term (3-5 years)
	N-IX.B.2. Review town regulations and propose amendments as needed to allow for the installation of renewable energy technology in appropriate locations in town taking into consideration potential impacts on the community and the town's scenic, cultural, and natural resources	Planning Board	Medium-term (3-5 years)
	N-IX.B.3. Review town regulations and propose amendments as needed to ensure that new development addresses solar access.	Planning Board	Medium-term (3-5 years)