

# PART V SUSTAINABLE SYSTEMS

*“[Warwick’s] status as a central hub for...different modes of transportation is beginning to be recognized.... City services have always been the best.” – WARWICK RESIDENT*

## Transportation and Circulation

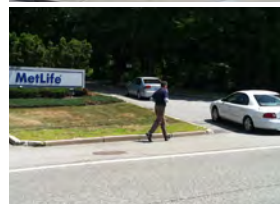
- “Complete Streets” where feasible that incorporate walking, biking and transit.
- Limit curb cuts to control traffic congestion.
- Improved commuter rail and bus service and better bus connections among city destinations.
- Traffic calming in locations with persistent speeding.
- More bicycle routes and sidewalks to make a connected network.
- Mitigation of negative impacts of airport operations and development.
- An update of the city’s Harbor Management Plan.

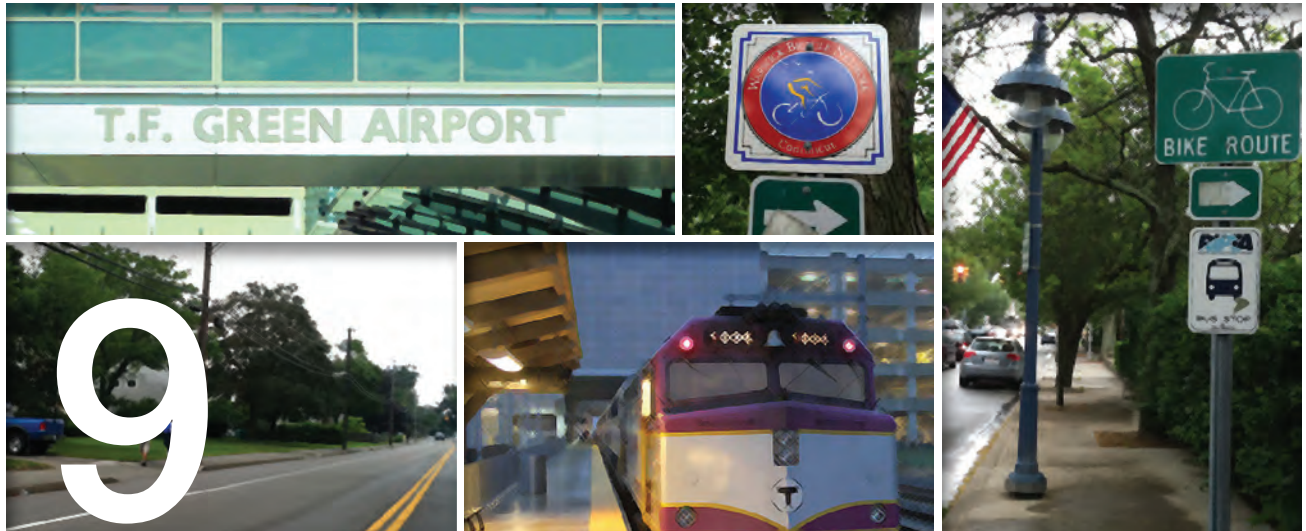
## Public Facilities and Services

- Implementation of water-system management and capital plans.
- The Wastewater Treatment Facility protected from flooding.
- Implementation of the Mandatory Sewer Connection Program, elimination of cesspools, and best practices management for remaining unsewered areas.
- Compliance with state and federal stormwater-management requirements and best practices for drainage.
- Investment in a Geographic Information System (GIS) to bring the City’s land register into the 21st century and an associated asset-management system for efficient maintenance programs.

## Resilience and Sustainability

- A hazard-mitigation plan that receives regular updates.
- A committee to raise awareness of and work with the state on climate change and sea level rise.
- Continued energy conservation projects and efficiency programs.
- Regulations to support renewable energy installations, green building, and best practices to reduce impervious surfaces and promote infiltration of stormwater
- City government practices and facilities as models of sustainability.





# Transportation and Circulation

FROM A WARWICK RESIDENT

*“[Warwick’s] status as a central hub for various different modes of transportation is beginning to be recognized.”*

*“I am a public transportation/bike commuter and I find the lack of adequate public transportation and the lack of bike lanes the least desirable thing about living in Warwick.”*



# A GOALS AND POLICIES

## GOALS

Establish the city of Warwick as a model for efficient and flexible multimodal transportation.

An efficient road network that responds to existing and future development patterns while reducing auto congestion and improving circulation.

An improved pedestrian and bicycling environment that better connects Warwick's neighborhoods.

A convenient public transit network that better meets the needs of Warwick residents and workers.

Enhanced intercity and intermodal transportation with improved passenger rail service, and airport facilities.

An accessible, easily navigable marine transportation system.

## POLICIES FOR DECISION MAKERS

- Ensure that all local plans and planning decisions employ a holistic approach in considering and accommodating various modes of transportation.
- Leverage the city's intermodal connectivity assets to foster sustainable transit and reduce dependency on the automobile as the primary mode of travel for commuters.

- Ensure that roads are maintained to a high standard for long term use.
- Support roadway projects that reduce traffic congestion, particularly along east/west routes and major commercial corridors.
- Promote best practices to strengthen access management and improve traffic flow.
- Encourage the use of effective traffic-calming techniques in neighborhoods.

- Support initiatives that will provide more bicycle and pedestrian facilities in Warwick.
- Ensure that all local plans employ a holistic approach in considering and accommodating various modes of transportation.

- Work with RIPTA to enhance service within the City of Warwick to improve connectivity and help reduce single-occupancy automobile trips.

- Support initiatives to improve and expand intercity travel options.
- Ensure that the proposed expansion of TF Green Airport addresses all land use, and environmental impacts (including air, noise, water quality, wetlands, etc) and implements all mitigation measures.

- Support initiatives that improve access to, and navigation in, Warwick's marine environment.



## B FINDINGS AND CHALLENGES

### findings

The primary mode of transportation in Warwick is the automobile.

Pedestrian and bicycle facilities within Warwick are extremely limited and need repair.

Warwick has significant connectivity problems for drivers, bicyclists and pedestrians.

Public transit routes do not offer intra-city connectivity, rather are oriented to Providence.

Numerous factors contribute to significant congestion along Warwick's roadways including relatively high population densities, roadway development along historical trails, lack of sufficient east-west routes, and poor access management.

Commuter rail service at the new InterLink station now connects residents to jobs and activities in Providence and Boston.

### challenges

Funding all road maintenance needs.

Improving arterial traffic flow, particularly along east-west routes like Airport Road and West Shore Road.

Identifying and developing a citywide green network of linked multi-use paths to encourage and improve movement of pedestrians and bicyclists.

Working with RIPTA to provide improved intra-city public transportation routes and amenities.

Increasing commuter rail service to Providence and Boston



## WHAT THE COMMUNITY SAID

Public comment that focused on transportation emphasized the following issues:

- Improvements to mitigate traffic congestion are needed, such as limiting curb cuts to one per business.
- Residents want to see more bike paths, lanes, and routes to connect destinations throughout the city.
- More frequent commuter rail and bus service is needed.
- When asked which two transportation investments they would support most (out of seven choices), respondents chose “Improved maintenance of existing roads” as the top priority by a large margin, with “Build Amtrak platform at Warwick Station” and “Improved sidewalk conditions” tied for the second priority.



## EXISTING CONDITIONS

### 1. Transportation Planning in Warwick

Today, Warwick faces the same transportation and circulation concerns as most metropolitan areas nationwide, including vehicular congestion, urban sprawl, the rising cost of fuel and other resources, shifts in commuting patterns, municipal budget limitations, and economic uncertainty. Increased awareness of the potential impacts of transportation on human health and the environment has also spurred the need to identify solutions that are efficient, cost-effective, and sustainable, both economically and environmentally. Certain attributes unique to Warwick, most notably T.F. Green Airport and the city’s location along the I-95 Northeast Transportation Corridor and Narragansett Bay, pose further challenges to identify and implement such sustainable transportation policies and practices.

This Comprehensive Plan element has been developed in accordance with the Rhode Island Department of Administration, Division of Planning *Handbook on the Local Comprehensive Plan* (Handbook 16, 2003 Update) and for consistency with *Transportation 2030*, State Guide Plan Element 611 (2010, as amended).<sup>1</sup> This document provides extensive information on current conditions, policies, and demographic and travel trends throughout the state, a comprehensive inventory of the state’s transportation system and needs, financial and environmental analyses, and policy recommendations in fourteen facets of modern transportation. These topic areas, along with their respective goals (as disseminated in the Recommendations section of *Transportation 2030*), are reproduced in Table 9.1.

<sup>1</sup> Transportation 2030 is the Division of Planning, Statewide Planning Program document addressing Rhode Island’s transportation needs over the forthcoming decades, setting forth objectives, policies, and strategies for the statewide and metropolitan transportation system—see <http://www.planning.ri.gov/transportation/trans2030.pdf>. The Statewide Planning program has recently issued a Draft update to the State’s Long Range Transportation Plan, entitled Transportation 2035 (October 2012). Further information on this limited Plan update is available through the Statewide Planning Program website: <http://www.planning.ri.gov/transportation/default.htm>





**TABLE 9.1: Rhode Island Statewide Planning Program, Transportation 2030 Plan Goals**  
(State Guide Plan Element 611, Amendment #1, May 13, 2010)

ELEMENT	GOAL
Bicycle (B)	Maintain and expand an integrated statewide network of on-road and off-road bicycle routes to provide a safe means of travel for commuting, recreation, and tourism in order to improve public health, and reduce auto congestion and dependency.
Design (D)	Strive for excellence in design of transportation projects to enhance safety, security, mobility, environmental stewardship, aesthetic quality, and community livability.
Economic Development (ED)	Support a vigorous economy by facilitating the multi-modal movement of freight and passengers within Rhode Island and the northeast region.
Emergency Response (ER)	Develop transportation and communication systems that serve Rhode Islanders and the region in the event of natural disasters, accidents, and acts of terrorism in a manner that minimizes injury, loss of life, and disruption to the economy; facilitates evacuation of people; and allows emergency response and recovery activities to occur.
Environment (EN)	Recognize, protect and enhance the quality of the state's environmental resources and the livability of its communities through well-designed transportation projects and effective operation of the transportation system.
Equity (EQ)	Ensure that the transportation system equitably serves all Rhode Islanders regardless of race, ethnic origin, income, age, mobility impairment, or geographic location.
Finance (F)	Provide a sustainable financial base for the transportation system that is adequate for supporting needed infrastructure and services with an emphasis on preservation and management of the existing system.
Highway (H)	Maintain the highway and bridge network in a safe, attractive, and less congested condition to carry passenger vehicles, commercial vehicles, government vehicles, and transit vehicles, as well as bicycles and pedestrians. Recognize roadways as vital public spaces that accommodate travel, commerce, community activities, and utility infrastructure.
Intermodal (I)	Provide convenient intermodal facilities and services offering seamless connections for passengers and freight.
Land Use and Travel Corridors (LU)	Continue to integrate land use and transportation planning using a travel corridor framework and promote responsible development practices in the public and private sectors.
Pedestrian (PE)	Create and maintain safe and attractive walkable communities to encourage more walking trips, enhance transit usage, improve public health, and reduce auto congestion and dependency.
Planning (PL)	Conduct a comprehensive, cooperative and continuing planning process that responds to public interests and concerns, strives to meet the needs of underserved communities, and fosters productive relationships with elected and appointed officials from all levels of government and the private sector.
Safety (S)	Improve the safety of all transportation modes through education, enforcement, and engineering solutions.
Transit (T)	Provide a safe, robust, and convenient network of transit and shared ride services with seamless intermodal connections in support of increased employment opportunities, improved environmental quality, and reduced congestion and auto dependency.

*Note: Refer to Section 5 of the Transportation 2030 plan for the specific objectives, policies, strategies and performance measures associated with each goal. These goals remain unchanged in the October 2012 Draft of the limited Plan update (Transportation 2035).*



## 2. Roadway Network

### FUNCTIONAL CLASSIFICATIONS

The Rhode Island Department of Administration, Statewide Planning Program *Highway Functional Classification System for the State of Rhode Island 2005–2015* (Technical Paper 155)<sup>2</sup> establishes the functional classification of all public roadways within the state based on purpose and function, and location relative to major population centers (urban or rural, based on the most recently available census data). As the entirety of Warwick is located within the Greater Providence urbanized area, roadway segments within the city's corporate limits fall within one of the following urban classifications:

**2005-2015 Functional Classification Mileage, City of Warwick Roads**

CLASSIFICATION	MILEAGE
Interstate	9.3
Freeways & Expressways	3.6
Principal Arterials	37.1
Minor Arterials	13.1
Collectors	100.2
Local Roads	375.0

Mileages taken from *Statewide Planning Technical Paper 155* (local road mileage estimated from RIGIS data).

Functional Classifications consist of the following:

- Interstate Highways—Interstate Routes 95 and 295 (I-95, I-295)
- Freeways and Expressways—State Routes 4 and 37, Airport Connector Road
- Arterials—These types of major roadways provide a higher level of mobility for through traffic movements, and depending on classification, offer limited access to adjacent properties
- Principal Arterials—e.g., U.S. Route 1 (Post Road), State Route 117 (including Centerville Road, West Shore Road, and Warwick Avenue), State Route 5 (Greenwich Avenue)
- Minor Arterials—e.g., Cowesett Road, Jefferson Boulevard, Sandy Lane

- Collectors—These roads provide a balance between traffic mobility and property access. Examples within the City of Warwick include Narragansett Parkway, Buttonwoods Avenue, and Ives Road
- Local/Non-Classified—These roads emphasize access to property and consist of local (primarily residential) streets and roads.

Figure 1 depicts the functional classifications of the city's roadways as established by the State. In general, the classification of highways determines the jurisdictional responsibility (i.e., state or local ownership, maintenance responsibility) and whether improvements to the infrastructure are eligible for funding under the federal-aid system. Highways classified as Interstate, Other Freeways and Expressways, and Principal Arterials are within state jurisdiction, whereas Minor Arterials (within cities), Collectors, and Local roads fall under local jurisdiction.<sup>3</sup> For urbanized areas such as Warwick, highways listed in the *Highway Functional Classification System* are eligible for federal aid funds for capital projects involving the maintenance, rehabilitation and/or improvement of these roadways, whereas local roads are not.

### BRIDGES

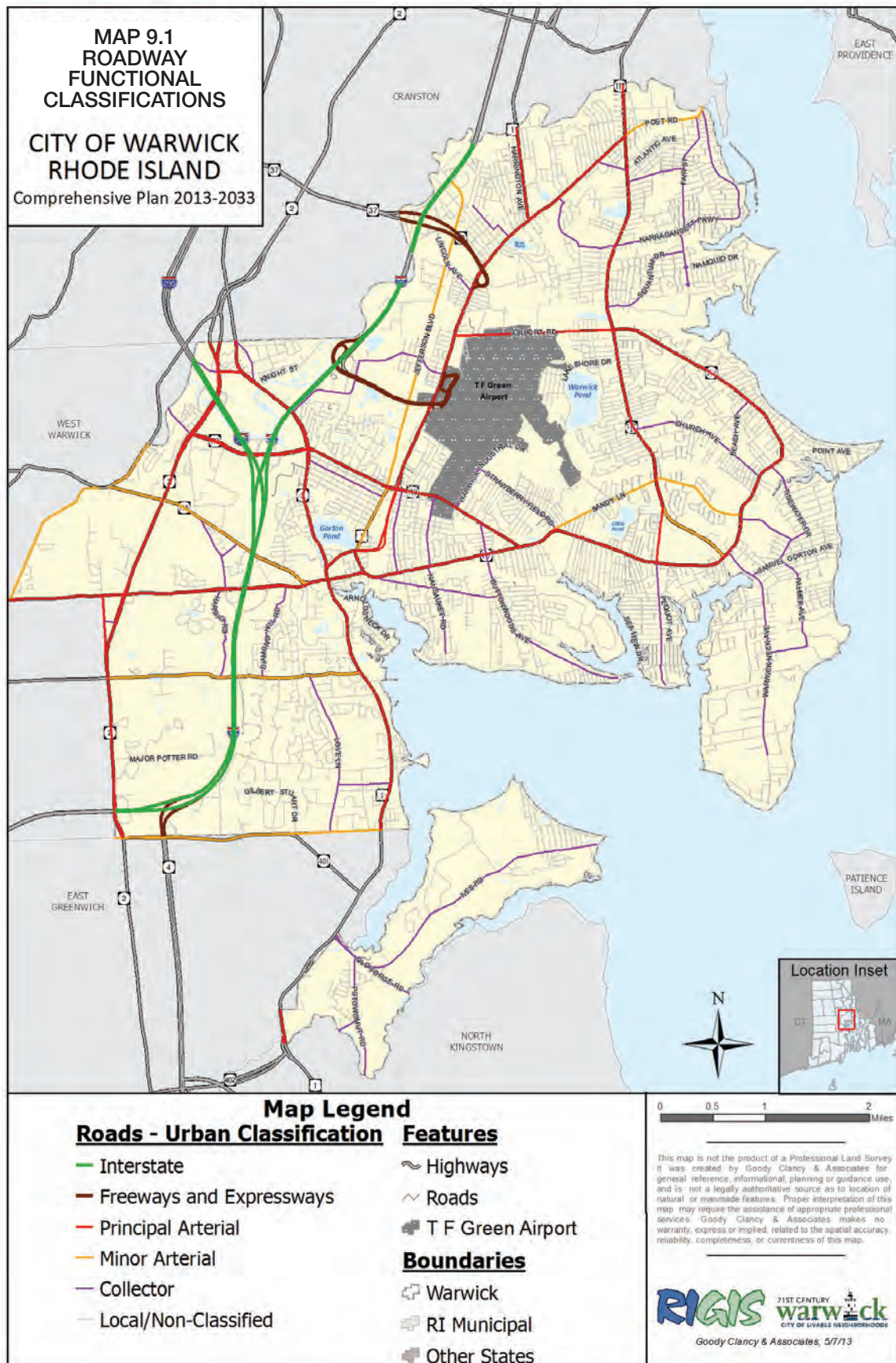
Warwick contains 53 bridges listed in the National Bridge Inventory (NBI).<sup>4</sup> The Rhode Island Department of Transportation (RIDOT) is responsible for the inspection of all numbered NBI bridges and maintains a bridge condition inventory.<sup>5</sup> Of the 53 NBI bridges within Warwick, 52 are state-owned (including 3 at T.F. Green Airport). The Forge Road Bridge spanning the Potowomut River is city owned.

<sup>3</sup> Table 2 of Technical Paper 155 lists Functional Classifications and "Proposed Jurisdiction" on the basis of previous Statewide Planning technical papers and pavement management legislation passed in 1988 (though, as noted therein, never fully implemented).

<sup>4</sup> Includes all bridges and culverts that carry vehicular traffic over spans greater than 20 feet along the centerline of the structure. Smaller structures (e.g., culverts) not listed in the NBI spanned by public rights-of-way are subject to state/local jurisdictional responsibility based on the functional classification of the associated transportation facility.

<sup>5</sup> <http://www.dot.ri.gov/engineering/bridges/condition.asp>

<sup>2</sup> <http://www.planning.ri.gov/transportation/155/index.htm>







Currently, three bridges within the City of Warwick are posted for load restrictions, limiting the weight of vehicles that may use the facility<sup>6</sup>:

- Pawtuxet River Bridge Southwest No. 491 (Route 2/Bald Hill Road)—14 tons (2-axle only)
- Pawtuxet River Bridge Southeast No. 490 (Route 2/Bald Hill Road)—14 tons (2-axle only)
- Natick Bridge No. 383 (Route 113/East Avenue over the Pawtuxet River)—3 tons (all vehicles)

Six Warwick bridges on the NBI are classified as “structurally deficient.” Such bridges must be monitored, inspected and maintained, and must also be repaired or replaced at an appropriate time to maintain its structural integrity. However, according to RIDOT, structurally deficient does not imply that it is unsafe. Additionally, 27 Warwick Bridges are classified as “functionally obsolete” due to their non-conformance with current best practice design standards. A bridge listed as functionally obsolete does not imply that it is inherently unsafe.

Scheduled RIDOT bridge improvement projects for Warwick in 2012 include the replacement of three load-restricted bridges, as well as repairs to four others, including:

- Division Street Bridge No. 760
- South County Freeway Bridge No. 686
- Wellington Avenue Railroad Bridge
- Jefferson Boulevard Bridge No. 634
- Barton Corner Bridge No. 518

## TRAFFIC VOLUMES AND CONGESTION

A relatively high volume of traffic uses Warwick’s highways. Where use demand and volumes exceed the handling capacity of roadways and intersections, congestion, delays, and susceptibility to accidents consequently occur. Major contributing factors to congestion within Warwick’s roadway network include:

- A relatively high population density dependant on auto travel (including a significant suburban population that commutes to work destinations outside the city);
- An existing system of primary thoroughfares that evolved from traditional roads and trails, many of which existed prior to the automobile and modern transportation planning practices;
- The land take and severance associated with the creation of (and subsequent expansions to) T.F. Green Airport, located near the city’s geographic center;
- The city’s location within Rhode Island and the Northeast region, including constraints as a West Bay shoreline community, as well as its location relative to the regional transportation system (including proximity to Interstate Routes 95 and 295);
- Past development of land uses with many curb cuts that produce many turning/access movements along arterial roadways, often conflicting with the through traffic objectives of the functional classification (e.g., commercial development along Route 2);
- Suburban street patterns that create “pod” neighborhoods which require all the traffic from a subdivision to empty into one arterial, rather than flowing through a grid.
- The lack of an east-west limited-access freeway to provide more efficient access between neighborhoods west/south of the airport (particularly Wards 1, 4, 5 and 6) and the freeway system.

RIDOT periodically issues traffic count data as *Traffic Flow Maps*,<sup>7</sup> listing average annual daily traffic (AADT) volumes along various major roadway segments throughout the state. *Table 9.2* summarizes the most recently AADT volumes published by the RIDOT major roadway segments within the City of Warwick. While traffic volumes throughout the city and the State of Rhode Island exhibited steady rises in the latter decades of the 20<sup>th</sup> century (following similar trends in population and vehicle registrations), more data collected by the RIDOT since 2008 has shown modest decreases in traffic volumes from those listed in *Table 9.2*, as well as along other highways throughout the state. This follows

6 <http://www.dot.ri.gov/engineering/bridges/postedbridges.asp>

7 <http://www.dot.ri.gov/documents/gis/maps/SM02.pdf>



TABLE 9.2: Average Annual Daily Traffic (AADT) for Major Warwick Roads, 2004–2008

NAME AND LOCATION	SEGMENT	FUNCTIONAL CLASS	DIRECTION OF TRAVEL	2004-2008 AADT
I-95	Between Rte 4 and 113	Interstate Highway	North—South	148,700
I-95	Between Rte 37 & Airport Connector	Interstate Highway	North—South	151,100
Airport Road	East of Post Rd	Principal Arterial	East—West	32,900
Bald Hill Road	Between Centerville Rd & Quaker Ln	Principal Arterial	North—South	19,200
Centerville Road (Route 117)	East of I-95	Principal Arterial	East—West	25,600
Centerville Road (Route 117)	West of I-95	Principal Arterial	East—West	25,400
Main Avenue (Route 113)	Between Greenwich Ave & Post Rd	Principal Arterial	East—West	20,100
Post Road (U.S. 1)	Between Airport Conn and Airport Rd	Principal Arterial	North—South	31,700
Post Road (U.S. 1)	South of Centerville Rd/Apponaug	Principal Arterial	North—South	13,900
Warwick Avenue (Route 117A)	South of Airport Road/Hoxsie	Principal Arterial	North—South	26,300
West Shore Road (Route 117)	Between Main Ave and Sandy Ln	Principal Arterial	East—West	28,200

Source: State Highway Map of Rhode Island, Traffic Flow Map, RIDOT, 2009

the recent national trend in decreasing motor vehicle trips per capita as a result of the Great Recession and subsequent slow economy, elevated gasoline prices, and increased use of telecommuting technologies.

Transportation 2030 designates the following Warwick highways segments as congested based on traffic volume to capacity (v/c) ratios computed through the Rhode Island regional travel demand forecasting model:

- I-95—all segments through Warwick
- Airport Connector Road
- Warwick Avenue (State Routes 117/117A)—from West Shore Road/Oakland Beach Avenue north to the Cranston City line. The City continues to work with the Oakland Beach Association and others to support dredging of Brush Neck Cove.

The model for years 2015 and 2030 forecasts these segments as remaining congested with I-295 becoming congested in model years 2015 and 2030 as well.

Limited data is available on a citywide level for congestion metrics such as AADT volumes and Level of Service (LOS).<sup>8</sup> The recently issued *Final Environmental*

*Impact Statement for the T.F. Green Airport Improvement Program* (EIS, Federal Aviation Administration, 2011)<sup>9</sup> does however include an assessment of existing and anticipated conditions of surface transportation facilities potentially affected by the airport program, which consists of a number of capacity, safety, and operational infrastructure improvements, including runway expansion. Through the baseline conditions evaluation, the following signalized intersections in the vicinity of the airport /City Centre Warwick were identified as presently operating under poor/congested conditions (LOS E or F) during morning and evening peak hours:

- Post Road (Route 1) at Lincoln Avenue (near Route 37 freeway interchange);
- Airport Road at Warwick Avenue (Route 117/117A), colloquially known as Hoxsie Four Corners.

Further operational assessments determined that the following intersections in the area have lane groups that are currently operating at LOS E or F during the morning or evening peak hours:

- Post Road (Route 1) at Lincoln Avenue
- Post Road (Route 1) at Airport Road
- Airport Road at Warwick Avenue (Route 117/117A)
- Post Road (Route 1) at Coronado Road
- Main Avenue (Route 113) at Industrial Drive

<sup>8</sup> Employing an index ranging from A to F (with LOS “A” representing the best operating conditions and LOS “F” representing the worst/most congested operating conditions), the Level of Service for a particular roadway or intersection is evaluated through traffic engineering analysis considering number of factors, including traffic demands, roadway geometry, speed, signal operations, travel delay, and freedom to maneuver.

<sup>9</sup> <http://www.vhb.com/pvd/eis/>



- Main Avenue (Route 113) at Jefferson Boulevard
- Jefferson Boulevard at Coronado Road/Kilvert Street

The baseline conditions assessment provided in the EIS further notes that “the on-Airport signalized location where Airport Connector intersects with Terminal Loop Road operates at capacity due to high demands, short storage bays, inefficient intersection geometry, and a high number of signal phases. This poor condition contributes to long delays and queues along the entire southern portion of Terminal Loop Road.” All ramp merges/diverges and freeway segments within the Airport Study Area operate at LOS C or better, and the sole unsignalized node within the study area currently operating under poor conditions (LOS E and F) during peak hours is the intersection of the Airport Connector off ramp with Jefferson Boulevard. As presented in the EIS, these baseline results indicate that State Route 37 and Airport Connector have sufficient capacity to accommodate merging/diverging maneuvers from on-ramps and overall roadway traffic during weekday peak hour conditions.

## DANGEROUS INTERSECTIONS

Intertwined with issues of congestion and levels of service, traffic safety remains a critical concern. A 2011 report found that 13 of the 50 most dangerous intersections in Rhode Island are located within the City of Warwick:

- Route 37 East/Post Road (Route 1)
- West Shore Road/Warwick Avenue (Route 117/Hoxsie Four Corners)
- Warwick Avenue (Route 117A)/Church Avenue
- Ginsu Way/Quaker Lane (Route 2)
- East Avenue (Route 113)/Bald Hill Road (Route 2)
- Bald Hill Road (Route 2)/Toll Gate Road (Route 115)
- Interstate 95 South/Centerville Road (Route 117)
- Long Street/West Shore Road (Route 117)
- Elmwood Avenue/Post Road (Route 1)
- Quaker Lane (Route 2)/Division Street (Route 401, East Greenwich town line)
- Main Avenue (Route 113)/Post Road (Route 1)

- Interstate 95 North/Route 37
- Post Road (Route 1)/Airport Road

Only the first three intersections listed above are targeted for intersection improvements and are currently in the engineering design stage.

## TRUCK ROUTES AND TRAFFIC

High truck volumes can have a number of adverse impacts on the surface transportation network, particularly along roads not suited (or under-suited) for truck traffic. These generally include increased loading and wear on roadway pavement (reducing its service life), increased congestion, and decreased mobility, visibility, and driver comfort for other motorists. In Warwick, the greatest truck volumes occur along the city’s interstates and freeways (I-95, I-295, Routes 37 and 4, Airport Connector Road) and its principal north-south arterials (Warwick Avenue, Post Road, Greenwich Avenue, Bald Hill Road, Quaker Lane) and east-west arterials (Centerville Road, West Shore Road, East/Main Avenue, Airport Road). Driving routes to and from areas of the city supporting industrial uses (including Jefferson Boulevard, Warwick Industrial Drive) also by their nature receive higher volumes and percentages of truck traffic.

At the state level, highway freight transport is addressed in the Statewide Planning Program’s *Freight Planning Needs Assessment*, which provides a brief overview of national and state policies, freight and traffic volumes, and truck parking/rest facilities. As noted therein, the portions of Interstate Routes 95 and 295 passing through Warwick are part of the “Providence Beltline Corridor,” a segment designated as a High Priority Corridor in the National Highway System (NHS).<sup>10</sup> Highways are listed in the NHS for its importance to the nation’s economy (as intercity truck corridors), defense, and mobility. Other Warwick highway segments listed on the NHS are State Route 37, Route 1/Post Road (from Route 37 to T.F. Green Airport), and Airport Connector Road.

While there are no highways or other roads designated as truck routes at the municipal level, the City of War-

<sup>10</sup> <http://www.fhwa.dot.gov/planning/nhs/>



wick Code of Ordinances<sup>11</sup> contains provisions which prohibit trucks from using certain city streets under normal circumstances. The extensive lists of roads on which such traffic is prohibited (§76–86) consists of primarily of local roads generally unsuited for large vehicles due to a variety of factors, including residential uses, inadequate paved widths or pavement conditions, etc. This ordinance also applies to certain roads for the purpose of deterring “cut through” truck traffic on local connecting roads, thus ensuring that trucks remain on the city’s arterials and other appropriate roadways.

## MAINTENANCE, STATE OF REPAIR, AND NEW STREETS

### Maintenance

Routine and non-routine maintenance of roads within the City of Warwick is conducted by the city’s Department of Public Works (Highway Division) or the RIDOT Highway and Bridge Maintenance Division (Kent and Washington North Maintenance Districts) according to jurisdictional responsibility. In general, RIDOT is responsible for the maintenance of all interstates, freeways, expressways, and principal arterials, whereas the upkeep of minor arterials, collectors and local roads is the responsibility of the Department of Public Works. Where a city-maintained road is listed on the Highway Functional Classification (i.e., Minor Arterials and Collectors), the city’s responsibilities for repair and/or reconstruction of

the roadway may be assisted through Federal Aid System funding administered by the FHWA.

Routine maintenance activities conducted by the Department of Public Works include pavement repairs such as pothole patching and crack sealing, striping and re-striping of pavement markings, maintaining paved and grassed road shoulders, maintaining roadway drainage systems, and conducting plowing and sanding/salting operations in response to winter storm events. The RIDOT Maintenance Division conducts similar maintenance for the 50 miles of state-maintained highways within city limits. As in other states and municipalities, maintaining roadway infrastructure in the context of increasing budgetary constraints is a challenge.

Existing state roads are evaluated for structural preventative maintenance (e.g., resurfacing) through pavement management evaluation and assessment by RIDOT. The Department of Public Works employs a qualitative pavement management system to evaluate the structural condition of city-maintained streets based on the presence of surface wear and defects such as potholes, cracks, rutting, and utility patches, all of which may adversely impact motorist safety and comfort. The system is used to track the conditions on a rolling basis, and results are tabulated to formulate a prioritized schedule of repairs.

Federal stimulus funding in 2009 through RIDOT enabled the City of Warwick to make needed repairs to

11 [http://www.warwickri.gov/index.php?option=com\\_content&view=article&id=786&Itemid=136](http://www.warwickri.gov/index.php?option=com_content&view=article&id=786&Itemid=136)

TABLE 9.3: Roadway Investment—Local Equity Aid Program (RI-LEAP), City of Warwick

CLASSIFICATION	MAINTENANCE/REPAIR ACTIVITIES	STATUS	INCLUDED ROADS
Non-Federal Aid System Local Roads (State Funds)	Resurfacing, Crack Sealing	Completed	Arnold Avenue, Hall Street, Hewett Street, Bellows Street, O’Keefe Lane, Laura Street, Remington Street, Perry Avenue, Airway Road, Ernest Avenue, Edythe Street, Greer Street
Federal Aid System (Federal Funds)	Crack Sealing	In Development	Commonwealth Avenue, Metro Center Boulevard, Pilgrim Parkway, Kilvert Street, Potowomut Road, Oakland Beach Avenue, West Natick Road, Fair Street, George Arden Avenue, Atlantic Avenue, Buttonwoods Avenue, Church Avenue, Commonwealth Avenue, Cowesett Road, Diamond Hill Road, Draper Avenue, Fairfax Drive, Groveland Avenue, Hardig Road, Harrison Avenue, Jefferson Boulevard, Long Street, Longmeadow Ave, Narragansett Pkwy, Nausauket Road, Oakland Beach Avenue, Palmer Avenue, Rocky Point Avenue, Sandy Lane, Strawberry Field Road, Tidewater Drive, Toll Gate Road, Warwick Industrial Drive

Source: RI-LEAP Status Update, RIDOT, February 2011





a number of local roads with state funds, which were completed in 2010, as well as repairs along several of its Federal Aid System roads. In total, \$1.08 million has been allocated to Warwick through RI-LEAP.

### New Streets

New streets that are proposed as part of subdivisions are subject to design standards in Appendix D of the City of Warwick's *Development Review Regulations*.<sup>12</sup> Through its subdivision and land development review processes, the city accepts a new street when the surface of the roadway, drainage systems, and sidewalks are completed. The amount of new roadway construction within the city over the past decade has declined, due to prevailing economic conditions and because there is limited remaining developable land within the city limits.

## 3. Pedestrian Facilities

### SIDEWALK CONDITIONS

Sidewalks exist in a limited number of circumstances in Warwick. With few exceptions, most of the city's urban arterial thoroughfares have sidewalks along their entire length. Segments that do not have sidewalks such as Oakland Beach Avenue between Warwick Avenue and West Shore Road typically have paved shoulders. The majority of Route 2 has a sidewalk only along one side, although by its nature pedestrians using sidewalk facilities along this heavy retail corridor are few and far between. Elsewhere throughout the city, there are fewer sidewalks associated with decreasing functional classification. The majority of the city's collectors (e.g., Long Street, Warwick Neck Avenue, Love Lane, Narragansett Parkway) lack sidewalks along significant portions of their length, and sidewalks are virtually nonexistent in many of the city's neighborhoods. This is the result of decades of not requiring sidewalks in new developments. The lack of sidewalks causes pedestrians to walk on the street, a potentially hazardous condition due to conflicts with motorists and cyclists.

In 1985, the city adopted a policy that required sidewalks to be installed in all new residential subdivisions. Because the construction of sidewalks occurs in front

yards within city rights-of-way, residents may perceive this is a loss of yard/property rather than a gain of a sidewalk. Less impervious surface supports low impact development (LID) efforts for stormwater management, which aim to protect receiving waters from the adverse environmental impacts associated with urban runoff. Sidewalk programs should be developed on a neighborhood basis with full citizen participation and consider alternatives to traditional impervious surface sidewalks..

### PEDESTRIAN ACCESSIBILITY

Several elements contribute to poor pedestrian accessibility within the City of Warwick. In particular, rapid suburbanization in the 20<sup>th</sup> century led to high volumes of traffic along the city's roadway network, a sprawling development pattern of residential areas, and non-residential auto-dependent commercial strip destinations throughout the city (particularly the concentration of commercial developments along Route 2, Post Road, and Warwick Avenue). As a result, most Warwick residents remain heavily reliant upon auto travel for routine travel needs such as access to schools, markets, and civic facilities.

Due in large part to their age, existing roadways and pedestrian facilities in many of Warwick's neighborhoods and villages do not currently conform to the accessibility requirements of the Americans with Disabilities Act (ADA) of 1990. Federal guidelines, which apply to all new construction and reconstruction projects in the public right-of-way, require that pedestrian facilities meet the safety and mobility needs of disabled persons, including those who are visually impaired. The United States Access Board recently issued its *Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right of Way* in July 2011, which addresses access to newly constructed and altered public streets and sidewalks covered by the ADA.<sup>13</sup> Released for public comment, the access provisions include pedestrian access routes including sidewalks, street crossings, and curb ramps, detectable warning surfaces, pedestrian signals, roundabouts, on-street parking and passenger loading zones, transit stops and shelters, and street furniture and amenities. States and municipalities will not be

<sup>12</sup> <http://www.warwickri.gov/pdfs/planning/development%20review%20regs.pdf>

<sup>13</sup> <http://www.access-board.gov/news/row-nprm.htm>



required to modify existing streets and sidewalks to meet these guidelines, as they do not apply to existing public rights-of-way outside of planned alterations) Local officials may however voluntarily consult the guidelines in undertaking access improvements at existing streets and sidewalks.

## SIDEWALK MAINTENANCE

The City of Warwick is responsible for the maintenance of sidewalks along all local and state roads within the city, as by state law, the maintenance of sidewalks on state roads is the responsibility of the municipality. The Department of Public Works employs a management system to inventory and track conditions of pedestrian facilities, through which repairs and improvements are prioritized accordingly. Chapter 70 of the Code of Ordinances sets forth the city's regulations pertaining to streets and sidewalks, including repairs, excavations, poles and wires, and responsibilities for snow and ice removal by abutting owners.

# 4. Bicycle Facilities and Multi-Use Paths

Warwick has seen a renewed interest in providing dedicated bicycle/multi-use facilities and more bicycle-friendly thoroughfares. Through its Intermodal Planning section and the “Bike Rhode Island” program,<sup>14</sup> RIDOT continues to proactively develop dedicated paths and striped/signed bicycle routes throughout the state, including the City of Warwick. Information on cycling in Rhode Island is provided on the RIDOT's Bike Rhode Island website, including a “Guide to Bicycling in the Ocean State,” maps, safety and bike-to-work tips, and updates on bike path and lane/route development.

## EXISTING FACILITIES

Figure 2 highlights existing, designated state and local bicycle facilities within the City of Warwick, which consist of two principal elements: the Washington Secondary Bike Path and the Warwick-East Greenwich Bicycle Network.

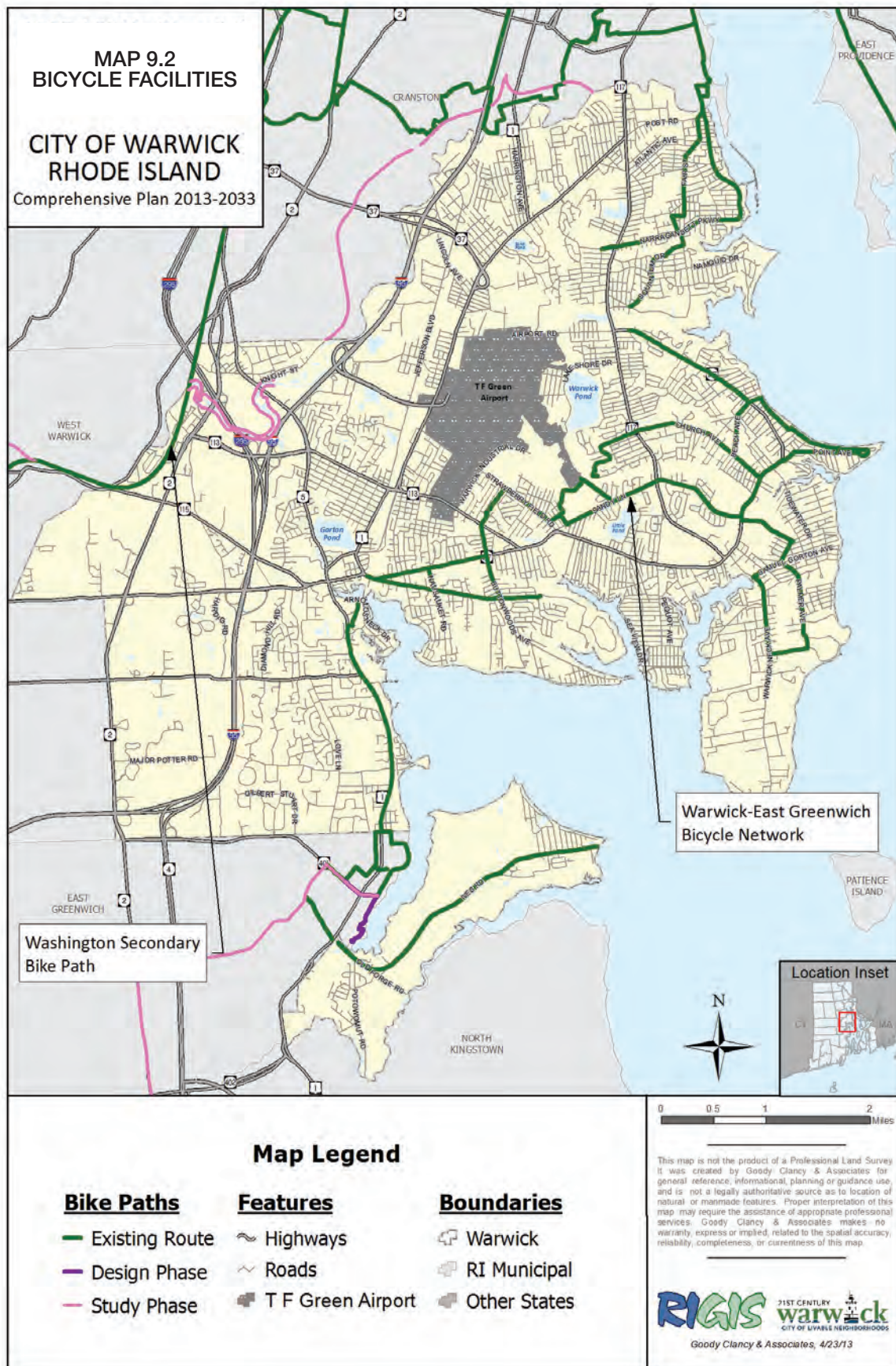
The *Washington Secondary Bike Path* is a dedicated 14.2-mile multi-use path constructed along a former railroad corridor, beginning at Garfield Street in Cranston and running in a generally southwesterly and westerly direction through Cranston, Warwick, West Warwick and Coventry. The 1.6-mile Warwick Bike Path segment of the path is located along the westerly fringe of the city (Ward 8) and lacks dedicated public parking in the immediate vicinity. Regular use of the Warwick Bike Path by residents tends to be those residing in close proximity to the path.

The *Warwick-East Greenwich Bicycle Network* includes 28 miles of signed routes along local, collector, and arterial roads in the eastern and southern wards of the city, including loops and spurs to Conimicut Point, Warwick Neck/Rocky Point, City Park in the Buttonwoods neighborhood, and Potowomut Neck/Goddard State Park (see Figure 2). Major city roads shared by the network include Narragansett Parkway, West Shore Road, Church Avenue, Sandy Lane, Buttonwoods Avenue, and Post Road. The network also includes designated roads through East Greenwich, which link to Potowomut neighborhoods. Other segments link with signed bike lanes in Cranston and continue north into Providence.

Although extensive, the network presently does not link to key City of Warwick locations, including Apponaug Village and Hoxsie Four Corners, both of which are subject to high volumes of motor vehicle traffic and associated congestion, which may pose difficulties for less experienced cyclists. Discussed in Section 9, the RIDOT's Apponaug Circulator (Bypass) Long-term Improvements project will serve to connect the southerly portion of the Warwick-East Greenwich Bicycle Network with the portion of the network south and east of the airport, in part through the construction of a designated bike lane along the Apponaug Village segment of Post Road.

Beyond the facilities noted above, cycling conditions along rights-of-way throughout the city are highly variable and dependent upon a number of factors, including roadway width (and availability of paved shoulders), motor vehicle traffic volume and speeds, provision (or prohibition) of on-street parking along paved shoulders and curb lines, and pavement conditions. In general,

<sup>14</sup> <http://www.dot.ri.gov/bikeri/index.asp>







local and minor collector roads in primarily residential areas are safer and more accommodating of bicycle traffic due to their lower volumes of traffic and intensity of adjacent uses.

## PROPOSED BICYCLE FACILITIES

Both the City of Warwick and the State of Rhode Island are committed to improving the availability and accessibility of bicycle facilities, as well as conditions for and awareness of bicycle use on roadways in general. While opportunities for the enhancement of safe bicycle routes will continue to be explored throughout the city, currently identified proposed improvements include a number of improvements to the Warwick-East Greenwich Bicycle Network that will provide circulation, safety, and recreational benefits for cyclists.

- The **Hoxsie Multi-Use Path/Connector**, which will shortcut the Hoxsie Four Corners intersection by linking the currently disconnected West Shore Road and Squantum Drive segments across the Spring Green Pond stream via a the Landsdowne Road right-of-way;
- The **Buckeye Brook Multi-Use Path**, which will link portions of the existing network in the vicinity of the Mickey Stevens Sports Complex through the provision of a new path a brook crossing to Rodney road;
- An **Oakland Beach loop**, which would connect to the existing network at the public library along Sandy Lane and run south, crossing West Shore Road and continuing to Oakland Beach;
- The **Maskerchugg River Bridge Multi-use Path**, which will connect the East Greenwich portion of the network along Greenwich Cove/Crompton Avenue to the Potowomut on-road segment through the construction of a new dedicated multi-use path and bridge.

While the Hoxsie and Buckeye Brook connections have been planned for some time, neither project was recommended for inclusion in the state's Transportation Improvement Program (TIP) for Fiscal Years 2013-2016 (see Section 9). The Oakland Beach loop is in early conceptual phases with no timetable for implementation. The Maskerchugg River Bridge Multi-use Path was recently recommended for inclusion in the TIP, with

program monies allocated for final design and construction.

Construction of the Apponaug Circulator, which will involve a major reconstruction of roadways in and around Apponaug Village, has been designed to be bicycle tolerant (minimum 4-foot paved shoulder widths), and a dedicated bicycle lane is proposed along the one-way segment through Apponaug Village proper. These elements and other design improvements will serve to make this urban center more conducive to bicycle and pedestrian circulation.

Other state bicycle projects include:

- **Coventry Trestle Trail Extension.** This 10-mile project is under construction and will extend the Washington Secondary Bike Path to the Connecticut state line. The extension will allow Warwick residents to bike to the Connecticut line, but it is not located in Warwick.
- **Pawtuxet Riverwalk.** The project, which is in the preliminary study and development stage, would include 1.8-mile footpaths along both the Warwick and Cranston sides of the river, beginning at the Washington Secondary Bike Path and running east.

## 5. Transit Network and Service

### RIPTA

Public transit for the City of Warwick is primarily provided by the Rhode Island Public Transit Authority (RIPTA), the quasi-public, independent organization authorized to operate public transit (primarily bus services). Bus service to and from the City of Warwick is currently provided by ten RIPTA bus routes (See Figure 3). RIPTA buses are ADA-accessible and equipped with bus racks. Fares are \$2.00 per trip (\$0.50 per transfer) with discounts for seniors and the disabled and monthly passes/voucher programs also available. The three park and ride lots see moderate use on weekdays, with the Route 117 lot generally operating at a higher percentage of its capacity (typically 100 vehicles or more). RIPTA also operates the "RIde" program, which provides para-transit services to qualifying individuals in the city.



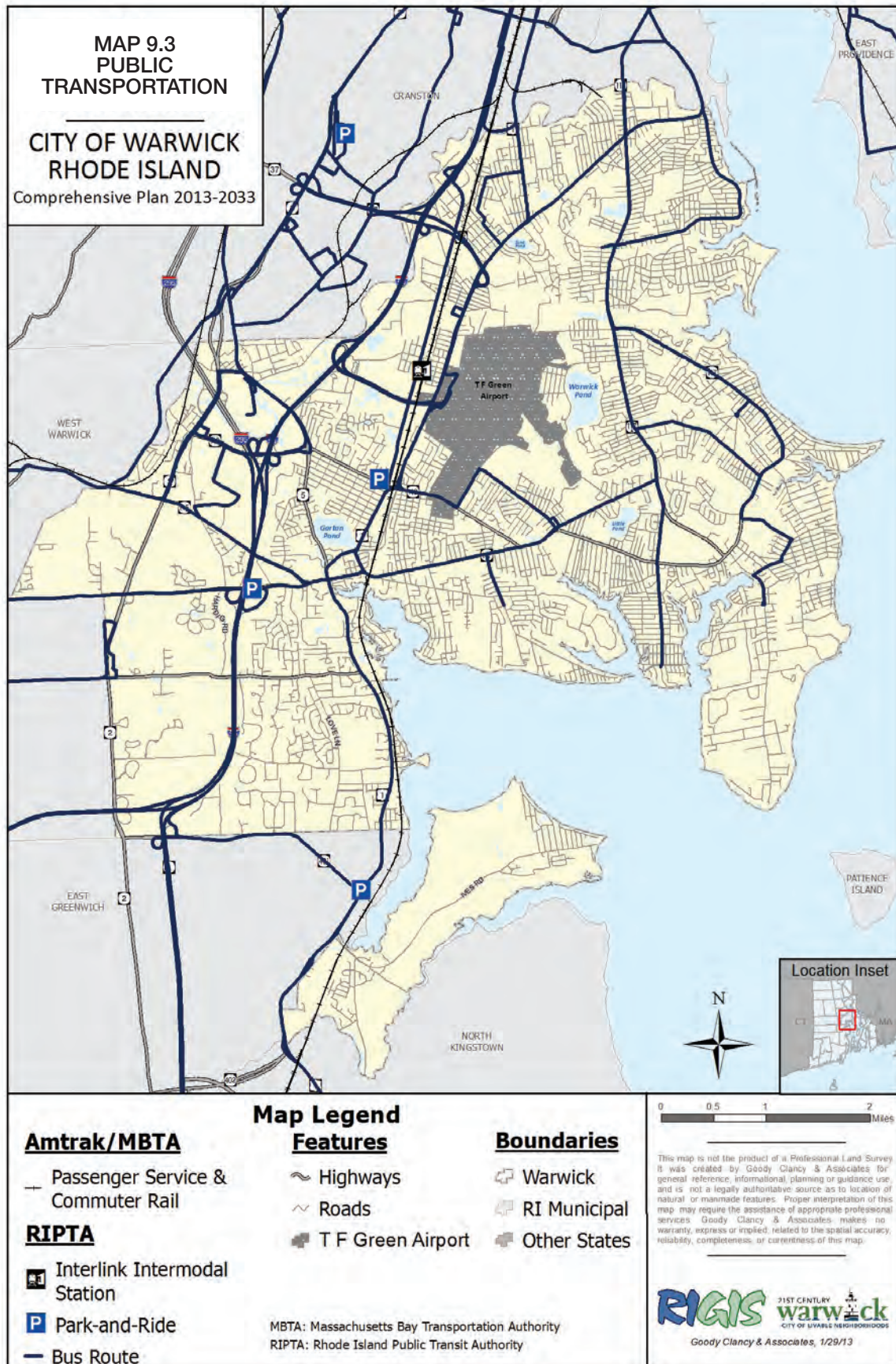




Table 9.4: RIPTA Bus Routes Serving Warwick

ROUTE NO.	NAME	WEEKDAY SPAN	WEEKDAY FREQUENCY (PEAK)	WEEKDAY FREQUENCY (OFF-PEAK)	WEEKDAY FREQUENCY (NIGHT)	SAT. SPAN	SAT. FREQ.	SUN. SPAN	SUN. FREQ.
1	Eddy/Gaspee	536a – 1123p	12m	19m	48m	636a – 1046p	42m	716a – 913p	54m
3	Warwick Ave	511a – 931p	24m	29m	47m	559a – 946p	1h00m	648a – 846p	53m
8 *	Jefferson Blvd	605a – 609p	10 trips	3 trips	-	No Service	No Service	No Service	No Service
14	West Bay	450a – 828p	27m	58m	50m	745a – 741p	1h28m	No Service	No Service
20	Elmwood Ave	507a – 1244a	23m	18m	43m	455a – 1128p	44m	458a – 939p	46m
22	Pontiac Ave	517a – 1216a	31m	28m	47m	530a – 1131p	53m	542a – 800p	43m
29	Kent County Connector	540a – 650p	1h23m	1h18m	-	700a – 645p	1h20m	No Service	No Service
30	Arlington/Oaklawn	509a – 1024p	38m	35m	37m	646a – 735p	49m	742a – 758p	47m
66	URI/Galilee	515a – 1135p	19m	43m	1h11m	752a – 1112p	1h14m	752a – 1112p	1h15m
90 *	Park and Ride	630a – 624p	6 round trips	-	-	No Service	No Service	No Service	No Service

\* denotes park-and-ride service | Source: RIGIS/RIPTA

With the exception of the Kent County Connector (Route No. 29, weekdays), all Warwick routes provide service to and from the RIPTA hub at Kennedy Plaza in Downtown Providence. This predominantly radial service pattern has remained intact over the past several decades, despite changes in the spatial distribution of population, employment, and economic activity. As a result of this orientation, the routes do not provide connectivity to and from destinations within Warwick itself. However, the relatively higher densities of employment and education in Providence continue to generate ridership, but not nearly to the levels that once occurred.

Intermodal travel to and within Warwick is supported by the West Bay (No. 14) and Elmwood Avenue (No. 20) routes which provide service to the T.F. Green passenger air terminal, and the Jefferson Boulevard (No. 8) route to the MBTA commuter rail station and skywalk to the airport. No Sunday or holiday service is offered along No. 14.

## TRANSWICK

Transwick is a local para-transit service for senior citizen residents of Warwick administered through the city's Department of Human Services. Started in 1988 with three para-transit buses, Transwick provides destination and activity-based transit for over 750 riders, including weekly grocery shop trips, pharmacy transportation, shopping trips, and service to all recreational programs at the city's senior and community centers (including the Pilgrim Senior Enrichment Center at which Transwick is based.) Transwick costs 50 cents per round trip, and is available to "any Warwick resident who is 55 years of age or older, disabled, or does not possess any available means of transportation."<sup>15</sup> A comprehensive list of services and schedules is available through the city website. Like many municipal social service programs throughout the state, Transwick continues to operate in a climate of increasing budgetary constraints, which will undoubtedly pose tangible challenges to the continued success of the program in years ahead.

<sup>15</sup> [http://www.warwickri.gov/index.php?option=com\\_content&view=category&id=65&Itemid=175](http://www.warwickri.gov/index.php?option=com_content&view=category&id=65&Itemid=175)



## 6. Parking

### ON-STREET PARKING CONDITIONS

City parking regulations are codified in Chapter 76 (Traffic), Article IV of the City of Warwick Code of Ordinances. An extensive list of parking restrictions for specific streets is set forth in Section 76-192 of the Code, and Section 76-193 charges the city with erecting and maintaining proper signage indicating locations where parking is restricted. With the exception of locations specified in Section 76-200, overnight on-street parking is permitted within the city. Other articles of Section 76 establish the city's ordinances on designated loading zones, taxicab stands, reserved parking for handicapped persons, removal and impounding of illegally parked vehicles, emergency no parking, etc. At present, there are no pay/metered parking spaces in the city.

On-street parking conditions throughout the city have not changed significantly over recent decades. In most residential areas, available on-street parking meets demand, since regulations also require sufficient off-street parking based on residential unit type (single-family, multi-family, etc.). Parking restrictions have been effected and are enforced in areas where parked vehicles pose a risk to motorists, pedestrians, or public service vehicles. While the Department of Public Works has indicated that it is presently unaware of any neighborhood-specific traffic or parking issues, citizen concerns brought to the attention of the Department are investigated, and where warranted, appropriate corrective action is taken.

On-street parking is not a significant concern along the city's more recently developed/redeveloped retail corridors (e.g., Route 2), as zoning regulations have required that businesses and establishments provide off-street parking capacity appropriate to the use's expected parking demand. In and around the city's village districts, on-street parking may at times be insufficient to meet user demand (due to narrow road widths, grandfathered uses with nonconforming off-street parking, and/or other site-specific factors). Recognizing these constraints, the city's new Village District zoning designation (Code of Ordinances, Appendix A) includes on-street park-

ing allowances (§701), providing a degree of latitude for development/redevelopment in these areas.

### OFF-STREET PARKING CONDITIONS

Off-street parking conditions have remained largely unchanged since the last comprehensive plan update. Municipal off-street parking facilities in the city, which include lots at the City Hall and Annex in Apponaug, public schools, and recreational facilities continue to adequately serve their respective functions but may operate near or at capacity during peak periods. With the more recent economic downturn, many retail and commercial uses have seen a decline in business, and a number of commercial establishments have closed, resulting in a surplus of off-street parking. Elsewhere, off-street parking conditions are very much intertwined with those for on-street parking; in the city's villages and other areas where uses are nonconforming by parking or where demand exceeds the available off-street parking, this can result in both inconvenience for visitors and patrons and disruption to surrounding uses. The previous comprehensive plan recommended working with area merchants to identify land parcels that could potentially be developed into shared parking facilities, although to date this has been largely unrealized.

### PARK AND RIDE FACILITIES

RIPTA provides service to two park and ride lots within the city: Greenwood Community Church (Route 113 and Jefferson Boulevard) and the state-owned lot at the Route 117/Interstate 95 Interchange. Additionally, one city-designated park and ride facility is located along Post Road (Route 1) just south of the Apponaug Four Corners intersection. As with the city's other off-street parking facilities available to the public, these lots are in fair to good structural condition and sufficiently meet their present use demand.

## 7. Inter-City Travel

### AIR—T.F. GREEN AIRPORT

Occupying over 1,100 acres of land near the geographic center of the city, Theodore Francis Green Airport (T.F. Green Airport—PVD) is a state-owned airport provid-



ing inter-city commercial carrier service for the greater Rhode Island area. T.F. Green is designated by the Federal Aviation Administration (FAA) as a medium-hub primary commercial service airport and is administered by the Rhode Island Airport Corporation (RIAC),<sup>16</sup> the quasi-public agency responsible for planning and operation of the state's airports. The airport is considered a reliever airport for Logan International Airport in Boston, providing an alternative point of departure for a range of destinations in the Atlantic and Midwest regions. Carriers presently operating from the facility's 22 commercial passenger gates include Delta, Southwest, United, and U.S. Airways. According to the U.S. Department of Transportation, Bureau of Transportation Statistics (BTS),<sup>17</sup> the most-traveled domestic routes from T.F. Green include Baltimore, Philadelphia, Orlando, Charlotte, Atlanta, and Chicago, each serving over 100,000 passengers over the period of June 2010 through May 2011.

T.F. Green Airport currently accommodates over 200 aircraft operations (arrivals and departures) per day, serving a total of approximately 3.8 million passengers in 2013. The facility is integral to the regional economy, and as detailed in the *Final Environmental Impact Statement for the T.F. Green Airport Improvement Program* <sup>18</sup>:

The Airport plays a vital role in fulfilling anticipated local, regional, and national demands of business and leisure travel, as well as providing air cargo capacity for the eastern New England region. According to a 2006 [RIAC] Economic Impact Study, the Airport is a critical catalyst for economic growth in the State of Rhode Island, generating directly and indirectly approximately \$1.96 billion in economic activity from sales taxes on additional goods and services and \$603.9 million in earnings from additional direct and indirect jobs. The Airport provides over 2,000 jobs directly, and indirectly supports hotels, rental car agencies, parking facilities, gas stations, and other travel-related businesses in the City of Warwick. (Executive Summary, p. ES-7)

Since opening in 1931, T.F. Green has undergone significant expansions in both its operations and its facilities. Its main passenger terminal was fully reconstructed to modern standards and rededicated as the Bruce Sundlun Terminal in 1996, and in 2010 a new intermodal station, the InterLink, was opened, connecting the airport to commuter rail services via a new skywalk. Infrastructure development at T.F. Green has generally coincided with steady rises in passenger traffic, which grew by over 130 percent from 1990 to 2004. Although passenger traffic has declined during the recent economic downturn, long-term forecasts anticipate modest growth in passenger traffic at T.F. Green Airport, which is projected to serve approximately 6.5 million passengers annually by 2025.

T.F. Green Airport is also addressed in the *Rhode Island State Airport System Plan*.<sup>19</sup> As the strategic plan for the six state-owned airports, the ASP identifies goals, policies, and strategies needed to ensure that Rhode Island maintains an airport system that is capable of meeting the state's long-term transportation and economic needs. A draft update to the original and largely outdated 1984 ASP was issued in August 2011 by Statewide Planning Program, and identifies the need for a balance between airport operational safety, efficiency and host community values at all state airports; and) recognizes the NEPA Environmental Impact Statement (EIS) process as the appropriate vehicle to resolve T. F. Green Airport's optimal runway length and Airport Improvement Program. Subject to final approval following a public hearing and comment period, the plan update is also intended to project airport roles for the next 15-20 years, monitor airport performance, and aid in consistency determinations (including local comprehensive plans and intergovernmental review) as well as capital improvement programming.

RIAC's 2002 *Master Plan Update* <sup>20</sup> for T.F. Green Airport identified a number of recommended capital improvements to the airport's infrastructure in order to address needed improvements to enhance safety, efficiency and serviceability, most notably improvements to

<sup>16</sup> [http://www.pvdairport.com/main.aspx?sec\\_id=15](http://www.pvdairport.com/main.aspx?sec_id=15)

<sup>17</sup> <http://www.transtats.bts.gov/>

<sup>18</sup> <http://www.vhb.com/pvd/eis/>

<sup>19</sup> (ASP—State Guide Plan Element 640), <http://www.planning.ri.gov/transportation/default.htm>

<sup>20</sup> [http://www.pvdairport.com/main.aspx?sec\\_id=89](http://www.pvdairport.com/main.aspx?sec_id=89)





the airport's primary and secondary runways (Runways 5-23 and 16-34) to meet modern aviation safety requirements, as well as the possible lengthening of runways to accommodate the presently unmet demand for longer-haul nonstop service routes. Planned capital improvements are discussed later in this element.

## FREIGHT

Freight transport within and through the City of Warwick is presently conducted through three principal modes: air (cargo operations through T.F. Green Airport), rail (via the Amtrak Northeast Corridor), and truck (focused along the I-95 and I-295). The *Freight Planning Needs Assessment* presents a broad overview of freight movement in the state by mode, current freight planning efforts on both the state and regional level, and freight planning needs for the Statewide Planning Program.<sup>21</sup>

**Air freight.** T.F. Green Airport supports a significant throughput of cargo, by freight carriers (such as the United Parcel Service and Federal Express) and commercial airlines which carry mail and goods as “belly cargo” on their passenger routes. According to the Bureau of Transportation Statistics, approximately 25 million pounds of freight, express, and mail goods passed through T.F. Green over the 12-month period from June 2010 through May 2011. Although this is up slightly from similar periods ending in 2009 and 2010, it is significantly off from the peak volumes of over 40 million pounds as recently as 2007. Additional cargo capacity is part of the airport master plan

**Rail freight.** The Amtrak Northeast Corridor, which passes through Warwick, is used for cargo transport in the Northeast Region. Upgrades to this corridor were recently implemented in 2006 through the Freight Rail Improvement Project (FRIP), a new rail line constructed along and parallel to the two Amtrak passenger lines to serve freight movements between Central Falls and Quonset.

Local freight service is operated principally through the Providence and Worcester Railroad, which has freight

service easements along the Amtrak Shoreline. However, virtually no loading or unloading of cargo occurs along the Warwick segment—there is no intermodal freight connection between air and rail. And contrary to its name, the 0.9-mile Warwick Industrial Track (which spurs off of the main line in Cranston and is still in operation) no longer extends into Warwick, with the useable segment of the railroad stopping at the Pawtuxet River just short of the city line.

**Roadway freight.** As previously noted, the Providence Beltline Corridor (which includes Interstate Routes 95 and 295 through Warwick) is a crucial element in the regional and national ground transport infrastructure. Although two freeway interchanges bounding the Warwick segment of I-95 have been identified as bottlenecks due to congestion and delays, these bottlenecks are being actively addressed at the state level both through the recently completed “I-Way” interchange reconfiguration at I-195 and through the ongoing study and development of an improved interchange system at Route 4.

## PASSENGER RAIL SERVICE AND INTERMODAL TRANSPORTATION

A boost to the Rhode Island's intermodal transportation efficiency was realized in October 2010 with the opening of the InterLink,<sup>22</sup> the \$267 million intermodal station located along Jefferson Boulevard and the Amtrak Shore Line. Hosting a multi-level parking garage, train platform, and consolidated rental car facility, the state-owned station (operated by the RIAC) is connected to T.F. Green's main passenger terminal by a ¼-mile long elevated skywalk. Effectively connecting air, rail, automobile, and bus modes of travel, the InterLink recently received an America's Transportation Award from the American Association of State Highway and Transportation Officials (AASHTO) in the Innovative Management category, which recognizes creative transportation solutions that improve the movement of people, goods and services, and that enhance community life. The city recently approved the *Warwick Station Development District Master Plan*<sup>23</sup> which outlines a vision and strategy for the redevelopment of approximately 95 acres of land in

21 Technical Paper 158, 2006

22 [http://www.pvdairport.com/main.aspx?sec\\_id=62](http://www.pvdairport.com/main.aspx?sec_id=62)

23 <http://www.warwickri.gov/pdfs/planning/WSRDMasterPlanAUGUST2011.pdf>



the area of the intermodal facility, both as a new public destination and center of economic activity.

Through agreement with the RIDOT and Amtrak, commuter rail service to the InterLink station is provided by the Massachusetts Bay Transit Authority (MBTA) by extension of its Providence/Stoughton Commuter Rail Line from Boston. MBTA service to/from the InterLink rail line is provided through ten inbound (northbound) and ten outbound (southbound) trains each weekday. One-way fares between T.F. Green and Providence are \$2.25, and travel between T.F. Green and Boston costs \$8.25 each way. A 50 percent discount is given to seniors and persons with disabilities, and children ride at no cost when accompanied by a paying adult. According to current MBTA schedules, inbound trips to Boston's South Station take approximately 90 minutes, whereas outbound trips are approximately 75 minutes. Daily and monthly commuter parking rates are offered for the InterLink garage (\$6.75 and \$110 respectively), with approximately 650 spaces available for commuters.

The provision of MBTA rail service to T.F. Green Airport is one element of a wider RIDOT initiative to provide commuter rail service to communities south of Providence along the existing Amtrak corridor. The 2001 *South County Commuter Rail Service Operations Plan*,<sup>24</sup> assessed the operational feasibility and projected costs of establishing commuter rail service over the 43.8-mile section of the Northeast Corridor between Providence and Westerly. The preferred service alternative identified in the plan, which is currently being implemented through partnership with the MBTA, involves the incremental, staged expansion of existing MBTA service to the Warwick intermodal station and Wickford Junction, approximately 11 miles south of the InterLink in North Kingstown. Commuter service to Wickford Junction has commenced. The RIDOT is also presently undertaking a Phase II Study of future commuter rail expansion, which may involve the extension of service to Westerly and connections to the Connecticut Shoreline East service, as well as stops at existing passenger stations such as Kingston Station and proposed commuter facilities.

Amtrak provides service to major metropolitan areas in the Northeast including Boston, New York City, Philadelphia, and Washington, D.C. At present, no Amtrak services stop at the Warwick InterLink station, due primarily to the fact that the FRIP line serving the station's platform is not electrified—a requirement for all Amtrak trains (MBTA commuter trains providing service to Warwick are diesel powered). Although it is understood that Amtrak is studying the ridership potential of a stop at the InterLink, there are presently no plans to provide such service.

While much less prominent in the public eye than the InterLink, a number of other existing facilities provide intermodal access opportunities to Warwick residents. These include bicycle racks on all RIPTA full-size buses, the city's two park and ride lots, and the existing Warwick-East Greenwich Bicycle Network and Washington Secondary Bike Path. For the former, dedicated multi-use path segments are currently in design for the former at Buckeye Brook and Hoxsie Four Corners which, upon completion will provide tangible benefits to both the bicycle network and local pedestrian accessibility.

## 8. Marine Terminals and Facilities

Warwick is host to several mooring areas, marinas, and public boat launches, supporting a range of commercial and private recreational boating uses. Warwick's marine infrastructure is the purview of the Warwick Harbor Management Commission, a 7-member panel charged with enforcing the provisions of the *Harbor Management Plan* as well as recommending additional policies, rules and regulations for the implementation of the *Harbor Management Plan*. Regulations pertaining to harbors and harbor management are codified in Chapter 24 of the city's Code of Ordinances, and the Chief Harbormaster is responsible for day-to-day operations and enforcement of policies and regulations.

The Rhode Island Coastal Resources Management Council (CRMC) is the state's coastal zone management authority having jurisdiction over all activities occurring within tidal waters of the state and along the coastline. In accordance with CRMC regulations and guidance, the

<sup>24</sup> <http://www.dot.ri.gov/intermod/index.asp>



*Harbor Management Plan* has been developed to document the city's findings, policies, objectives, issues, and implementation strategies with respect to the following:

- Mooring Management
- Dredging
- Public Access/Rights-of-Way to the Shore
- Harbor Facilities and Boat Ramps
- Emergency Response
- Shell fishing and Environmental Quality
- Coordination of Harbor Management Jurisdictions
- Water Use Compatibility
- Derelict Vessels and Debris
- Management of Harbormaster Activities
- Harbor Management Budget

Although out of date, the most recent *Harbor Management Plan* remains the effective planning document for the city's marine facilities, as a plan update is currently under development but has not yet been issued. The inventory of existing marine facilities contained in this section is based on the most recently available data compiled in the preparation of the updated plan.

The *Harbor Management Plan* was created for the purpose of ensuring that the city's marine facilities are operated, maintained, and planned in a manner that best serves the interests and needs of the community while protecting the coastal environment. Within the vision statement of the most recent *Harbor Management Plan* (1996-2001),<sup>25</sup> the aims of the Harbor Management Commission are to:

- To maximize the compatibility of harbor uses in a manner that provides for the safe, orderly, and efficient use of the water and the waterfront;
- To improve, expand, and maintain public access and opportunities for people's use and enjoyment of coastal and marine resources;

- To provide for the efficient and equitable distribution and management of commercial, transient, and private moorings
- To improve navigation by encouraging and supporting appropriate dredging projects;
- To promote and encourage the prudent use of coastal and marine resources in a manner that stimulates economic development and protects the coastal environment; and
- To work to improve natural resources and habitats within the city's waters by supporting policies and programs to reduce pollution.

The city currently administers 13 designated mooring areas, with an additional two designated transient vessel anchorage areas (as required by federal regulations). Current city-designated mooring areas are located in the following coves:

- Apponaug Cove (5 areas)
- Pawtuxet Cove (1 area)
- Warwick Cove (5 areas)
- Greenwich Cove (2 areas)

Mooring permits in Warwick are fee-based and issued on a first come, first served basis. No moorings are allowed in city waters without a permit, and current holders of permits must renew their permit annually to avoid forfeiture. The U.S. Army Corps of Engineers (ACOE) maintains three federal anchorage areas within the city's waters (Apponaug Cove, Pawtuxet Cove and Warwick Cove), which are managed by the city in the interest of the general public. While these federal areas must be open to all on an equal basis, no private commercial moorings are allowed within the mooring areas themselves. All coves and mooring areas along Warwick's coastline are designated as "no-discharge zones" (no releases of treated or untreated sewage) in accordance with federal regulations.

In addition to the above general mooring areas, riparian homeowners may, at the discretion of the Harbormaster, be permitted to place up to two moorings in the waters fronting their property. Such moorings also require a

<sup>25</sup> <http://www.warwickri.gov/pdfs/planning/Harbor%20Management%20Plan.pdf>

permit and must not interfere with navigational safety or another property owner's riparian rights.

As of 2006 there were 709 legally registered moorings in the city (both in the above designated mooring areas and other approved locations), of which 251 were registered to commercial operators. Of the 458 private moorings, 322 (70%) were held by Warwick residents.

**TABLE 9.5: Legally Registered Moorings by Location**

LOCATION	TOTAL PRIVATE	TOTAL COMMERCIAL	TOTAL
Apponaug Cove	89	44	133
Brush Neck Cove	42	0	42
Greenwich Cove	85	197	282
Pawtuxet Cove	72	3	75
Warwick Cove	57	7	64
Open Water	113	0	113
<b>Totals</b>	<b>458</b>	<b>251</b>	<b>709</b>

Source: Warwick Office of the Harbormaster, 2006

Demand for licensed spaces within the city's designated mooring areas currently exceeds capacity: as of 2006 the waiting list for moorings in Warwick's harbors was 67. As demand for additional mooring space continues to increase, the city is considering the creation of additional mooring areas, an initiative that is currently in the preliminary design stages of development.

The city's shoreline is also host to a number of harbor facilities, consisting of public, private and commercial marinas, yacht clubs, boatyards, docks, and boat ramps. As of 2006, there were 20 marinas, boatyards and yacht clubs operating in the City of Warwick, with facilities located along Greenwich Cove, Apponaug Cove, Brush Neck Cove, Warwick Cove, Pawtuxet Cove, and Greenwich Bay. These marinas contain over three thousand two hundred (3,200) slips and provide various services and amenities for commercial and private users. 18 of the city's 20 marinas provide restrooms, 12 provide sewage pump-out facilities, and 6 are equipped with fuel service pumps.

In accordance with CRMC regulations, all marinas must have an Operations and Maintenance Plan to ensure that best management practices are employed

in marina activities including operation and maintenance of pump-out, fueling facilities. Several marinas serving Greenwich Bay are in the process of upgrading their facilities to keep pace with the increased demand for boat slips for boats, and there have been numerous requests for expansions or perimeter changes at many of these marinas. The most recent inventory of facilities shows that the number of total marina slips in Warwick increased by over 10% since the previous tabulation in the late 1990s.

City docks are situated in Apponaug and Warwick Coves and are available for public use. Currently there is only one private dock, located in Apponaug Cove, available for commercial fishermen. A number of residential docks are located along the city's vast coastline, several of which however are not approved by CRMC (and thus are not legal). The city also maintains a number of public boat ramps at various locations along its shoreline. (See Table 6). Based on the most recent inventory of these facilities, many structures originally meant for launching boats in Warwick are no longer viable for public use. Many small boat ramps are located in densely developed neighborhoods with inadequate parking. Additionally, deteriorating infrastructure and siltation have rendered many neighborhood ramps difficult to use. Ensuring that there are useable boat ramps in each cove of the city is a stated objective of the *Harbor Management Plan*, although it is acknowledged that costs and permitting complexity render boat ramp redevelopment extremely difficult. The Harbor Management Commission is coordinating with the Planning Department and Department of Public Works in the continued development of plans for both long-term maintenance and prioritized capital improvements.

Maintaining adequate depths in the navigation channels that provide access to the city's coves and harbor facilities is essential to the serviceability of the marine infrastructure. In recent years dredging projects have become increasingly complex due to the recognized need to dispose (or reuse) dredged material in an environmentally prudent manner consistent with state and federal regulations. The ACOE has a program to provide maintenance dredging of public channels and mooring areas at the request of local and state governments, and





TABLE 9.6: Public Boat Ramps and City Docks

LOCATION	STATE OF REPAIR	TYPE	ACCESS	PARKING
Passeonquis Cove/ Gaspee Point Drive	Good	overlook, cement boat ramp	direct, paved road, broken asphalt approach	10 spaces (recently improved)
Conimicut Point/ Shawomet Ave.	Poor	concrete ramp	direct, paved road	10-15 spaces
Bayside Beach, Longmeadow—Samuel Gorton Highway	Good—Fair	concrete ramp	direct, paved road	10 spaces
Arnolds Neck/ Harrop Ave.	Poor	asphalt ramp	direct, paved road	10 spaces
Goddard Park	Good	concrete ramp	crushed rock approach, paved road; shallow at low tide	15-20 spaces
Apponaug Cove	Good	dock, moorings	direct paved	10-15 spaces
Pawtuxet Park/Asprey Boat-house	Fair	concrete ramp, dock	paved approach; shallow at low tide	5 spaces
Salter Grove— Narragansett Parkway	Poor	rock ledge	direct, very steep hill; very shallow	5 spaces
Edgewater Beach— Oaktree Ave.—Darrow Dr.	Fair	2 gravel & sand ramps	sand road (potholed)	10 spaces (on-street)
Robert Ave./Potowomut	Poor	asphalt ramp	asphalt approach (undermined); shallow	None
Waterfront Street/ Second Point Ave.	Poor	concrete ramp	gravel approach; shallow	None
Warwick Cove/ Suburban Parkway	Good	dock	end of city street	None
Warwick Cove/ Oakland Beach	Good	concrete ramp	asphalt paved, handicap accessibility	29 paved vehicle and trailer spaces; staging area

Source: *Warwick Office of the Harbormaster, 2006*

in the mid-2000s the Providence River dredging project was completed, which included the dredging of Pawtuxet Cove, and improving navigability and public access through the restoration of pre-existing channel and mooring field depths. Both Warwick Cove and Apponaug Cove have not been dredged in over 40 years, presenting significant constraints to navigation and the mooring of vessels, and the Harbor Management Commission supports initiatives to restore water depths to historic levels in the city's channels and coves to provide safe navigation and efficient use of mooring areas. The city also supports the development of comprehensive state-wide dredging plan that includes the beneficial reuse of dredged material.

## 9. Planned Roadway and Transit Projects

A number of capital projects are currently in development to maintain and improve the transportation infrastructure in and around the city. Major roadway and transit projects in the state are prioritized by their listing in the *Transportation Improvement Program (TIP)*,<sup>26</sup> which establishes a program of projects that the State of Rhode Island intends to implement using U.S. Department of Transportation (USDOT) funds. By their nature and location, most all major transportation projects within the city are developed by the state (the bulk of which are administered by RIDOT) in conjunction with

<sup>26</sup> <http://www.planning.ri.gov/transportation/default.htm>

the branch of the USDOT overseeing the particular mode of transportation (e.g., Federal Highway Administration, Federal Aviation Administration) and through coordination with local authorities.

The TIP is a multi-year program of Bicycle/Pedestrian, Bridge, Congestion Management Air Quality (CMAQ), Enhancement, Highway, Interstate, Major Projects, Pavement Management, Planning, Study and Development, Traffic Safety, Transit, Administration, and Earmark projects that are eligible to receive federal funding. As the current TIP period (Fiscal Years 2009-2012) has drawn to a close, the State Planning Council (Statewide Planning Program) has developed the program for the next TIP for federal Fiscal Years 2013-2016. Of particular relevance is the current transportation funding crisis in Rhode Island and the nation at large, which is expected to result in a decrease in annual federal highway funding to Rhode Island for the future TIP of approximately 24 percent (down from approximately \$210 to \$160 million).

A critical component of developing the new TIP is the prioritization/reprioritization of local projects. Each municipality submits a prioritized list of projects. To aid cities and towns in this effort, the Statewide Planning Program prepared a status report of projects listed in the 2009-2012 TIP by municipality, which identified those projects that have been completed, those where the State is committed to implementation, and those that are not likely to be implemented prior to the close of the 2009-2012 TIP period due to anticipated funding constraints (a second status report was prepared by the Statewide Planning Program listing state projects in the current

TIP for similar prioritization by RIDOT). The Statewide Planning Program's recommendations for the 2013-2016 TIP can be found in the Appendix. The City's top five priorities are listed in Table 9.7.

Two major projects are in development that will likely have appreciable effects on the future of transportation in Warwick: (1) the T.F. Green Airport Improvement Program and (2) the Apponaug Circulator Long-term Improvements Project. In addition to these, a number of other projects listed in the current TIP are expected to provide tangible benefits to surface transportation safety, serviceability, and efficiency upon their completion, particularly the Route 5 Reconstruction Project, which is currently in final design. Natick Bridge (East Avenue over the Pawtuxet River) is scheduled for replacement in 2012 and will restore a key transportation link between Warwick and West Warwick that is currently saddled by weight restrictions. Implementation of the Warwick Avenue Arterial Traffic Signal Synchronization, which is nearing design completion, will serve to alleviate much of the congestion currently afflicting the Route 117/117A corridor.

### T.F. GREEN AIRPORT IMPROVEMENT PROGRAM

As previously noted, RIAC proposes to implement a program of major improvements to the existing infrastructure at T.F. Green State Airport. With the Final EIS approved by the FAA with a Record of Decision (ROD) issued in September 2012, RIAC intends to complete the final design and commence construction of the

TABLE 9.7: City of Warwick TIP Priorities (FY 2013-2016)

PRIORITY	PROJECT NAME/LIMITS	PROGRAM	TIP RECOMMENDATION
1	<b>Route 5 Reconstruction Contract 1</b> Mayfield Ave. (Cranston) to I-95	Highway Program	Recommended
2	<b>Ramp Hazard Elimination Contract 5</b> Route 37 eastbound off-ramp at Post Road (Route 1)	Highway Safety Improvement Program	Recommended
3	<b>Warwick Interlink—Coronado Road Improvements</b> Post Road to Amtrak Railroad Bridge	Study & Development Program	Recommended
4	<b>2015 STC Contract 7: Warwick Interlink—Post Road and Airport Connector Improvements</b>	State Traffic Commission (STC)	Recommended (Study Only)
5	Conimicut Shoals Lighthouse	Enhancement Program	Recommended (Future)



improvements in 2013, with certain key elements of the program expected to be complete by 2017.<sup>27</sup>

The T.F. Green EIS notes that the purpose of the Airport Improvement Program (AIP) is to enhance airport safety and the efficiency of the airport and the New England Regional Airport System to more fully meet the current and anticipated demand for aviation services. To address the former, the following safety elements are proposed within the scope of the AIP:

- The upgrading of crosswind (secondary) Runway 16-34 Runway Safety Areas (RSAs) to meet current FAA requirements;
- The demolition of Hangar No. 1 (located in close proximity to the northwest end of Runway 16-34) to remove its present encroachment on designated airspace;
- The relocation of Taxiway C to increase the current lateral separation between Taxiway C and Runway 16-34.

Located at each end of the runway, the RSAs associated with Runway 16-34 do not meet current FAA design standards, and in accordance with new federal runway safety requirements, all commercial passenger airports must upgrade RSAs by 2015 to meet acceptable airport design standards. The EIS Re-Evaluation determined that Runway 16-34 RSA improvements will remain on airport property, which will not require Airport Road to be relocated.

To achieve the stated efficiency objectives, the AIP includes several proposed enhancements to the airport's existing infrastructure, including the addition of up to seven commercial service gates, reconfiguration of the airport's system of taxiways to improve traffic flow, and the provision of relocated and expanded cargo facilities to meet space needs and anticipated demand. Central amongst the efficiency enhancement elements is the proposed extension of Runway 5-23 "to fulfill New England Regional Airport System needs and more fully accommodate existing and anticipated demand for commercial non-stop service to the West Coast" (Executive Summary,

p. ES-10). Lengthening of this runway by approximately 1,530 feet at its southerly end (to a total length of 8,700 feet) will also require the realignment of Main Avenue (Route 113) to accommodate the clearances and setback associated with the extended primary runway.

The Final EIS provides an overview of the alternatives analysis undertaken in the development of the AIP, which consisted of various levels of screening and refinement (based on consistency with the project purpose and anticipated environmental impacts) leading to the selection of final alternatives ("B2" and "B4") and ultimately the identification of B4 as the preferred alternative. Through extensive analyses of the potential for impacts to the natural and human environment, it was determined that the final alternatives could have a significant adverse effect in a number of NEPA impact categories, most notably Noise (through increased noise associated with intensified use, including larger aircraft), Compatible Land Use (through both noise and required property acquisitions), and Wetlands (through impacts to wetland features in the immediate vicinity required for expansion). To offset the potential for significant impacts, a program of mitigation measures is proposed, which includes voluntary property acquisitions (as part of the RIAC's ongoing Noise Compatibility Program in accordance with 14 CFR Part 150, *Airport Noise Compatibility Planning*), and sound insulation for impacts related to a significant increase in noise to noise-sensitive land uses (residential) as well as non-residential noise-sensitive sites such as schools. In identifying the preferred alternative, the EIS notes that Alternative B4 would have the least environmental impacts (compared to B2 and other alternatives eliminated in earlier screening phases) and that all significant impacts could be mitigated. The FAA Record of Decision (ROD) was issued in September 2011, approving preferred alternative B4.

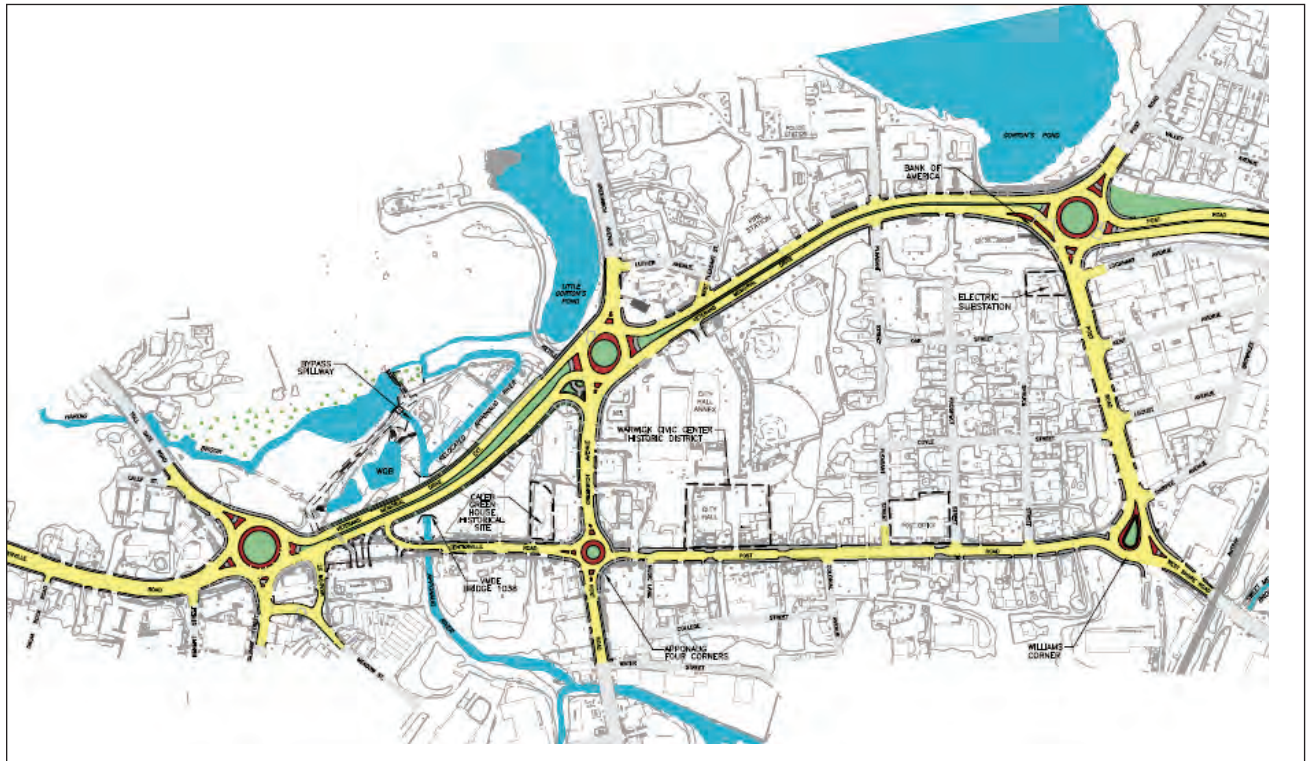
## APPONAUG CIRCULATOR

RIDOT is currently in the final design phase (75% design stage) of a project to construct intersection and alignment improvements to the existing Apponaug Circulator, a one-way system around Apponaug Village.

<sup>27</sup> The reader is referred to the Executive Summary of the T.F. Green EIS for a more thorough treatment of the proposed Airport Improvement Program (AIP), its anticipated impacts, and the measures proposed to mitigate adverse impacts.



FIGURE 4: Apponaug Circulator



The primary objective of the proposed project is to improve traffic conditions in the area through the construction of a bypass around Apponaug Village, the section of Post Road between Apponaug Four-Corners and Williams Corner. Implementation of such a bypass will divert the majority of traffic around this segment, significantly reducing traffic volumes, alleviating congestion, and allowing the City of Warwick to pursue its long-range plan for redevelopment of this area. In coordination with the City of Warwick, the Apponaug Area Improvement Association's vision for the revitalization of Apponaug Village has recently been published in the *Apponaug Village Master Plan* (Veri Waterman Associates, Inc., April 2011).

Identified by the RIDOT early in the planning process, the principal needs for long-term improvements to the existing one-way circulator system include the following:

- A very high volume of traffic travels through the heart of Apponaug Village (Post Road, between Apponaug Four-Corners and Williams Corner) every day. This traffic (with its associated noise, pollution, unsafe pedestrian environment, and congestion) is viewed as

being primarily responsible for the decline of the “Village” from a social and economic viewpoint.

- Numerous roadway deficiencies exist along the Circulator, including narrow lane widths, narrow or nonexistent shoulder widths, insufficient horizontal curves, poor curb reveal, and poorly defined curb openings.
- Weaving conflicts exist on two legs of the Circulator, conditions which contribute to congestion and adversely impact traffic safety.
- Poor levels of service currently exist within the Circulator and are projected to worsen by year 2020.
- Four major intersections and two roadway segments in the study area currently have accident rates higher than state and national averages.

Through the required NEPA process for the project (which included public consultation and the drafting of an Environmental Assessment), the preferred alternative was identified, which involves the extension of Veterans Memorial Drive to the existing intersection of Centerville Road (Route 117) and Toll Gate Road, creating a two-way bypass to carry the bulk of through traffic around Apponaug Village and Apponaug Four Corners.





As development of the project design was advanced, the RIDOT further evaluated ways in which safety and traffic flow could be improved upon along the proposed alignment. These efforts subsequently led to the current design, under which the five major signalized intersections in the project area will be replaced with modern roundabouts (see Figure 4). Consisting of a one-way, circular intersection without traffic signals in which traffic flows around a center island, modern roundabouts are specifically engineered to reduce speeds, maximize safety, and improve traffic flow/throughput. Implementation of the project will involve the construction/reconstruction of approximately 2.32 miles of roadway in total, including five intersection roundabouts; a new bridge carrying the Veterans Memorial Drive Extension over the Apponaug River; roadway drainage and stormwater management facilities; curbing, sidewalks, and pedestrian facilities; and appropriate landscaping measures. Based on the current RIDOT schedule, it is anticipated that construction will commence in 2013, and that the Apponaug Circulator Long-term Improvements will be completed by 2015.

## ROUTE 5 RECONSTRUCTION

Under Contract 1, the RIDOT plans to reconstruct an approximately 1-mile segment of State Route 5 (Oaklawn Avenue/Greenwich Avenue/Lambert Lind Highway) from Mayfield Avenue in Cranston south to the Interstate 95 overpass. This project will provide improved access and circulation along the eastern fringe of the Warwick Mall, through modifications to the existing road geometry (intersections, turning lanes), improved traffic signal designs, ADA-accessible pedestrian facilities, and a proposed two-lane roundabout at the Greenwich Avenue/Knight Street/mall entrance intersection. In addition to tangible safety and efficiency improvements, the upgrading the existing, substandard geometry at this intersection to a modern roundabout design will greatly facilitate economic redevelopment of the former Pontiac Mills site along Knight Street (just west of the intersection).

## E RECOMMENDATIONS

### GOAL 1

The City of Warwick is a model for efficient and flexible multimodal transportation.

#### POLICIES

- Ensure that all local plans and planning decisions employ a holistic approach in considering and accommodating various modes of transportation.
- Leverage the city's intermodal connectivity assets (Inter-Link, City Centre Warwick) to foster sustainable transit and reduce dependency on the automobile as the primary mode of travel for commuters.

### STRATEGIES

- A. Require that pedestrian movement, bicycle transportation, accessibility for the disabled, and streetscape aesthetics be incorporated in the design of roadway construction/reconstruction projects.**

Where appropriate, encourage redevelopment of urban corridors as “complete streets” that support improved bicycle and pedestrian mobility, are compatible with adjacent uses, and incorporate low impact development and green infrastructure. Provide improved east-west access across the Northeast Rail Corridor for pedestrians, bicyclists, and motor vehicles.

#### Actions:

1. **Identify and prioritize existing corridors for viability as complete streets “vision projects”, such as Route 2, Route 5, and Jefferson Boulevard.**  
Identify and prioritize opportunities for providing bicycle storage areas (e.g., covered bike racks) at key linkages between existing/planned bicycle and transit networks, such as bus stops and park and ride lots.



Encourage the development of multi-use paths that interconnect residential areas, provide access to retail and community centers, and integrate with the existing Warwick-East Greenwich Bicycle network. Include the Hoxsie and Buckeye Brook multi-use path projects on future TIP Proposals (these projects were not recommended for the FY 2013–2016 TIP).

---

#### **B. Promote the economic, environmental, and quality of life benefits of mass transit.**

---

Seek to diminish the prevailing perception of public transit (bus, rail) as a “means of last resort” by advocating for improved service, providing incentives, and promoting increased synergy between bicycle/pedestrian and mass transit modes of travel.

##### **Actions:**

1. **Advocate for more frequent commuter rail service at the Warwick Station and support initiatives to increase ridership.**  
Evaluate the potential for economic incentives to promote the use of alternatives to single occupant vehicles among Warwick commuters, such as reduced fares, commuter lot vouchers, and/or tax deductions.
2. **Promote development of the Proposed InterLink/Coronado Street Improvements Project, and evaluate the feasibility of providing enhanced and/or new linkages across the rail corridor at other locations.**

## **GOAL 2**

Warwick has an efficient road network that responds to existing and future development patterns while reducing auto congestion and improving circulation.

### **POLICIES**

- Ensure that roads are maintained to a high standard for long-term use. Maintain roadway facilities and their ancillary elements (including sidewalks, lighting, drainage, streetscape/landscape features where present) in a state of good repair.
- Support state planning and implementation efforts to reduce vehicular congestion and improve safety on/at major roadways, intersections, and interchanges throughout the city.
- Support roadway projects to reduce traffic congestion throughout Warwick, particularly along east/west routes and along major commercial corridors.
- Promote best practices to strengthen access management to improve traffic flow.

## **STRATEGIES**

---

### **A. Allocate sufficient resources for maintenance and street repairs.**

---

#### **Actions:**

1. Continue to seek state and federal funding assistance for the maintenance of local roadway infrastructure (through opportunities such as the RI-LEAP program).
2. Regularly monitor street conditions and advance projects to address problems before they grow larger and more expensive to fix.
3. Implement a citywide geographic information system (GIS), asset management system, and/or other technologies to more efficiently and effectively inventory, track, and manage city infrastructure and resources.
4. Coordinate road repairs with other infrastructure improvements to increase efficiency, and preserve roadway quality.
5. Identify, prioritize, and promote projects to address the transportation infrastructure needs of the city for inclu-



sion in the state's Transportation Improvement Program (TIP).

### B. Reduce traffic congestion throughout Warwick, particularly along east/west routes and along major commercial corridors.

#### Actions:

1. Upon their completion, assess the performance of the modern roundabouts constructed under the Apponaug Circulator and Route 5 projects in increasing safety and alleviating congestion, and identify other locations within the city where the benefits of these facilities could potentially be realized.
2. Continue to conduct an open and transparent process for selecting projects to include in the future TIP Proposals, and ensuring that the city's most pressing needs are prioritized accordingly.
3. Limit multiple access points on the City's major arterial roadways, and where possible, seek to consolidate and/or eliminate redundant accesses and curb cuts.
  - Strengthen and enforce existing access management regulations.
  - Minimize the potential for traffic impacts by efficiently integrating access to new developments into existing transportation networks.
  - Amend city ordinances pertaining to redevelopment to encourage the elimination or consolidation of accesses and discourage the creation of new accesses and curb cuts.
4. Ensure that Main Avenue (Route 113) continues to serve effectively as an east-west arterial and a hurricane evacuation site.  
As it is presently a hurricane evacuation route and one of the city's major east/west arterials, ensure that Main Avenue (Route 113) continues to adequately serve these functions both during and following construction of the Airport Improvement Program. Actively participate in, and coordinate with the RIDOT and RIAC on the final design of the proposed Main Avenue relocation to ensure that the needs and interests of residents are addressed.

### C. Encourage the use of effective traffic-calming techniques in neighborhoods.

#### Actions:

1. Solicit input from the community (residents, neighborhood groups, public officials) as to the specific locations within the city where traffic calming measures are most needed and appropriate.
2. Implement traffic calming measures (e.g., curb bump outs, speed humps) at locations along local and residential roads where speeding is persistently problematic.

## GOAL 3

Warwick has improved the pedestrian and bicycling environment with routes that better connect Warwick's neighborhoods.

#### POLICY

- Support initiatives that will provide more bicycle and pedestrian facilities in Warwick.

## STRATEGIES

- ### A. Identify and pursue opportunities for developing dedicated bicycle and multi-use pedestrian rights-of-way to create linkages between residential neighborhoods, parks, commercial areas and other destinations.

#### Actions:

1. Continue to work with the state to develop and expand the city's system of signed bicycle routes.
2. Continue to require sidewalks for all new residential developments and ensure that pedestrian accessibility and circulation are addressed.
3. Regularly monitor the condition of sidewalks and provide sufficient funding for repairs.
4. Ensure that redevelopment projects within the city's village districts provide for pedestrian safety and mobility,



and address applicable accessibility requirements for persons with disabilities.

5. Require that new development and redevelopment proposals, where applicable, include appropriate amenities for bicyclists (e.g., bicycle racks).
6. Enforce federally-mandated guidelines for accessibility in accordance with the Americans with Disabilities Act (ADA).

#### GOAL 4

Warwick has a convenient public transit network that better meets the needs of Warwick residents and workers.

##### POLICY

- Advocate for RIPTA to enhance service within the City of Warwick to help reduce single-occupancy automobile trips.

#### STRATEGIES

- A. Discourage the elimination of fixed bus routes providing service to the city and further reductions in service frequency along established routes.

##### Actions:

1. Advocate for improved connectivity between RIPTA service, the InterLink, and key points (e.g. Village Districts) throughout the city.
2. Identify potential new routes, or Providence route realignments, to better meet inter-city transportation needs.
3. Evaluate the feasibility of implementing demand-based transit services (similar to RIPTA's Flex Service offered elsewhere in suburban and rural "flex zones") for to increase intra-city mobility.
4. Maintain and operate the city's para-transit service (Transwick) in a manner that best serves the mobility needs of the elderly and disabled residents.
5. Review all RIPTA proposals for changes to service (routes, frequency) and, where appropriate, submit written comments during the public notice period that

represent the concerns and interests of the city and its residents.

6. Develop and offer recommendations to RIPTA for improved synergy between bus and other modes of transit within the city.

#### GOAL 5

Warwick's intercity and intermodal transportation includes improved passenger rail service and airport facilities.

##### POLICIES

- Support initiatives to improve and expand intercity travel options.
- Ensure that the expansion of TF Green Airport addresses all impacts including land use, traffic and environmental impacts (including air quality, noise, water quality, wetlands, etc) and implements all mitigation measures to address them.

#### STRATEGIES

- A. Engage with the RIDOT and Amtrak to further leverage the city's key intermodal assets (location and infrastructure) for intercity travel.

##### Actions:

1. Promote the InterLink station as an efficient and sustainable means of providing access between air, rail, automobile, and bus modes of travel.
2. Ensure that the redevelopment of the City Centre Warwick is conducted in a manner that complements and encourages transit ridership.
3. Work with RIDOT and the MBTA to increase the frequency of commuter rail service to and from Providence and Boston.
4. Encourage the Rhode Island Department of Transportation (RIDOT) to expand commuter rail services to points south of the city along the Northeast Corridor.
5. Work with RIDOT and Amtrak to build a platform at Warwick Station to connect travelers to major destinations along the Northeast Corridor route.





- 
- B. Work with the State of Rhode Island, the Rhode Island Airport Corporation (RIAC), and the Federal Aviation Administration (FAA) to mitigate any potential negative impacts of airport development activities on the residents, businesses, and institutions of the City of Warwick.**
- 

#### Actions:

1. Ensure that all mitigation measures committed to in the Final Environmental Impact Statement Record of Decision (ROD) are implemented in a manner that improves east/west circulation, and minimizes traffic, noise and other impacts on adjacent properties, and that the provisions of the Memorandum of Understanding (MOU) between the RIAC and the City of Warwick are upheld.
- 

- C. Coordinate the implementation of Transportation and Circulation recommendations with other elements of the Comprehensive Plan and the City Centre Warwick Master Plan to ensure the measured and sustainable development of the Station District and its environs.**
- 

## GOAL 6

An accessible, easily navigable marine transportation system.

#### POLICY

- Support initiatives that improve access to, and navigation in, Warwick's marine environment.

## STRATEGIES

- 
- A. Work with the Rhode Island Coastal Resources Management Council (CRMC) to complete an update to the city's Harbor Management Plan.**
- 

#### Actions:

1. Expedite completion of the updated Harbor Management Plan to accompany this Comprehensive Plan update.
- 

- B. Address the need for dredging to restore navigable depths within the city's navigation channels and mooring fields through coordination with the CRMC and U.S. Army Corps of Engineers.**
- 

#### Actions:

1. Gain support from congressional delegation and CRMC.
  2. Continue to support dredging of Brush Neck Cove.
- 

- C. Maintain and improve public access opportunities for the use and enjoyment of coastal and marine resources.**
- 

#### Actions:

1. Enforce the harbor ordinance to prohibit the blocking impeding or private annexing of CRMC rights-of-way, city rights-of-way as well as platted improved and unimproved roadways to the coastline.



## Public Facilities and Services

**FROM A WARWICK RESIDENT**

*“City services have always been the best—schools, police, fire, recreation, snow and trash removal—all done professional and at a fair price.”*



## GOALS AND POLICIES

### GOALS

**Excellent quality and quantity of drinking water to meet all current and future needs of Warwick.**

**Efficient and reliable sewer service and wastewater treatment throughout the city.**

**Stormwater management and drainage systems that are effective, reliable and incorporate best practices.**

**Continuing to exceed the state's 35% recycling requirement and meeting or exceeding the state's 50% solid waste diversion goal.**

**City facilities that are state-of-the art and/or maintained for long term use.**

**Police and fire facilities that meet best practice performance standards throughout the City of Warwick.**

**Effective services to support a growing senior citizen population.**

### POLICIES FOR DECISION MAKERS

- Ensure a reliable and efficient supply of clean drinking water for Warwick residents, businesses, and institutions.
- Support sustainable systems and programs for the safe, efficient, and effective collection and treatment of sewage and recovery of water resources and protection of the environment.
- Support use of best practices, including natural drainage systems, when feasible, to manage stormwater runoff and mitigate adverse impacts, including pollution quality, flooding, and erosion and sedimentation.
- Require all new development and redevelopment projects to meet or exceed the standards in the latest edition of the *Rhode Island Stormwater Design and Installation Standards Manual*.
- Minimize the quantity of solid waste sent to the landfill by promoting recycling and other waste reduction measures.
- Support investment in an asset management system.
- Provide high quality educational facilities that meet the current and future needs of Warwick students.
- Fund all public safety departments so that they are able to meet best-practice standards.
- Continue to support Community Policing and other public safety programs.
- Support programs that help senior citizens age in place.



# B

## FINDINGS AND CHALLENGES

### findings

Approximately 27,000 customers (about 88%) of residents) receive drinking water from the Warwick Water Division, which it purchases from Providence and the Kent County Water Authority. The Kent County Water Authority (KCWA) provides drinking water to the rest of the city from a combination of Providence Water and groundwater well sources.

Approximately 65% of the developed parcels in Warwick are severed. Where sewer lines are available, about 3,000 property owners chose not to connect.

The WSA is implementing a program to encourage tie-in of all parcels with access to sewer lines because current onsite wastewater treatment systems are major contributors of pollution to Greenwich Bay. Sewer connections are increasing because of the program.

The wastewater treatment facility was flooded in 2010 and its levee system is being upgraded.

Warwick completed a stormwater management plan but has not implemented some elements required by the state.

Warwick has the highest rate of recycling among Rhode Island cities.

School closing and consolidations have occurred due to declining enrollments.

### challenges

Funding for the sewer extension program

Full funding of water infrastructure replacement program that meets the 20-year progressive replacement identified in the law.

Funding for measures to comply with the State's requirements for stormwater management

Adding multi-family and commercial recycling

Finding appropriate uses for closed school facilities





## WHAT THE COMMUNITY SAID

Warwick residents had very positive comments about some city services such as trash removal. The areas of greatest concern to a number of residents were the following:

- Elimination of cesspools, sewerage, and best practices for unsewered areas
- Maintenance of public spaces, parks and open space
- Road maintenance
- Condition of public school facilities
- Drainage and repeated flooding in some areas
- High level of taxes



## CURRENT CONDITIONS

### 1. Drinking Water Supply

#### DRINKING WATER SERVICE

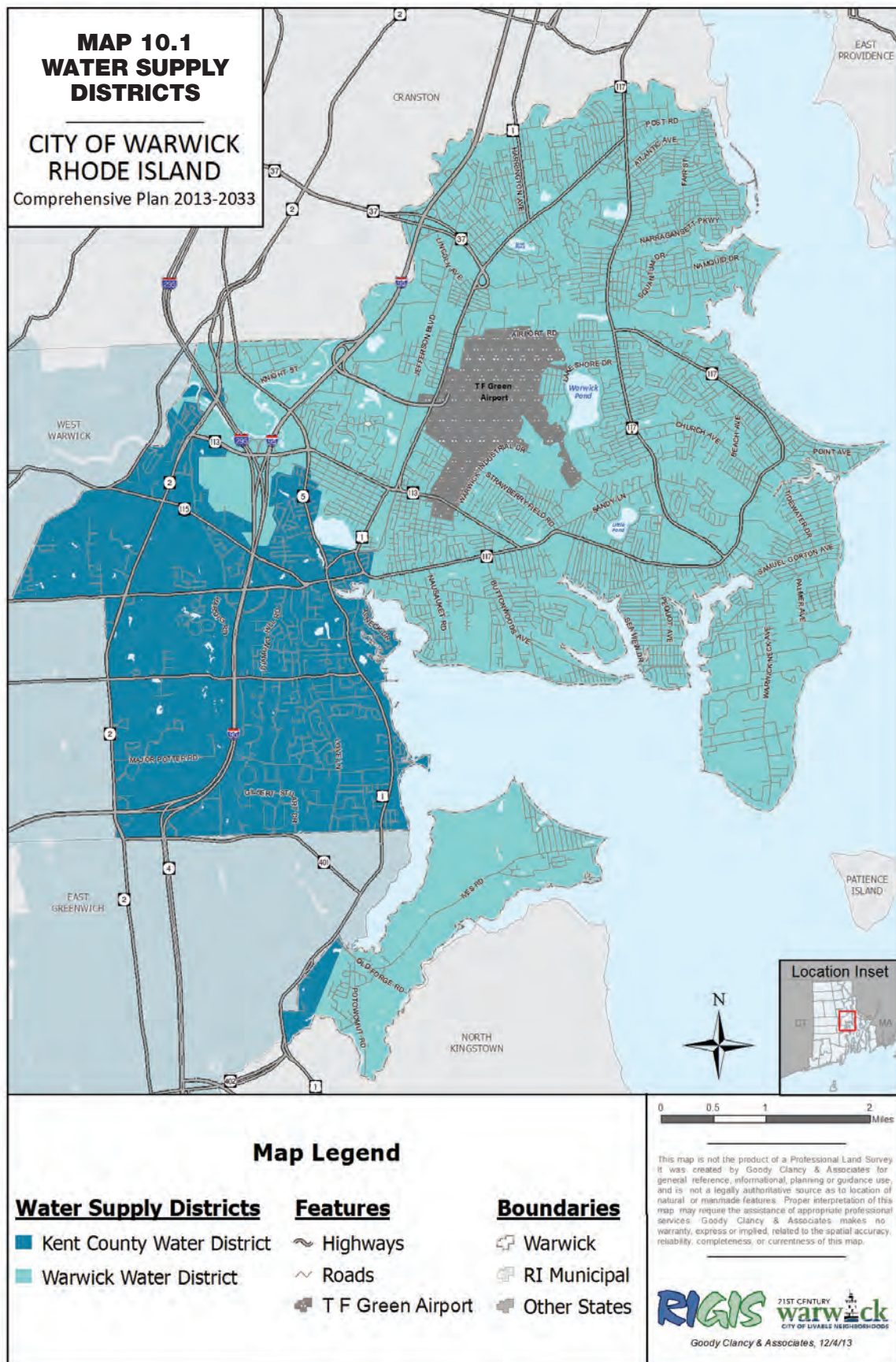
Within the City of Warwick, drinking water service is provided by two suppliers: (a) the city's Department of Public Works, Division of Water (Warwick Water Division)<sup>1</sup> and (b) the Kent County Water Authority (KCWA).<sup>2</sup> The Warwick Water Division serves approximately 88 percent of the city's population, while the Kent County Water Authority provides service to residents in the western section of the city (including the Cowesett, Natick, Apponaug, and Toll Gate neighborhoods). Both entities obtain most of their water from the Scituate Reservoir through interconnections with the Providence Water Supply Board (PWSB). They maintain extensive pipe networks and various infrastructure elements (pumps, valves, hydrants, etc.) throughout their respective service areas. There are no reservoirs, drinking water wells, or water treatment plants in the City of Warwick, except for a KCWA well.

The Warwick Water Division system is comprised of two geographically separate service areas: the Potowomut System and the Warwick System. All of the water supply to the Warwick System is purchased directly from the PWSB and water provided to the Potowomut System is purchased from the KCWA. The Kent County Water Authority obtains approximately 80–90 percent of its supply through wholesale purchase from the PWSB, and connects with Warwick Water off the PWSB aqueduct, with the remainder drawn from KCWA-owned groundwater wells.

The Division of Water provides service to approximately 27,000 customers and serves an average daily demand of approximately 9.5 million gallons per day (MGD). Although the KCWA covers a much larger

<sup>1</sup> [http://www.warwickri.gov/index.php?option=com\\_content&view=article&id=866&Itemid=183](http://www.warwickri.gov/index.php?option=com_content&view=article&id=866&Itemid=183)

<sup>2</sup> <http://www.kentcountywater.org/>





service area that includes West Warwick and portions of Warwick, Coventry, North Kingstown, West Greenwich, East Greenwich, and Scituate, it serves roughly the same total number of customers (27,000) and has an average demand of 8 MGD.

State oversight of public water suppliers is administered principally through the Rhode Island Water Resources Board (and Board Corporate),<sup>3</sup> which is the executive state agency charged with managing the proper development, utilization and conservation of water resources, and the Rhode Island Department of Health (HEALTH), Office of Drinking Water Supply,<sup>4</sup> which is responsible for ensuring compliance with state and federal laws and regulations pertaining to drinking water quality.

The primary responsibilities of the state Water Resources Board (WRB) are the strategic planning and management of the withdrawal and use of the water resources of the state.<sup>5</sup> “The WRB meets these responsibilities through the strategic planning initiatives, development of policy and guidelines, promulgation of rules and regulations, and a wide variety of capital projects that benefit all Rhode Islanders.” The WRB is the lead state agency for water policy development, and at the time this plan is being written, the WRB is developing a Draft Rule for Water Use and Efficiency for major water suppliers as well as working with the Statewide Planning Program to consolidate existing state guide plans pertaining to water resources (including State Guide Plan Element 721, *Water Supply Policies for Rhode Island*<sup>6</sup> and related elements). The WRB is also responsible for resource management, review of Water Supply System Management Plans (WSSMPs) of major water suppliers in the state, and administration of an ongoing Water Supply Interconnection Program for adjacent water suppliers to supply redundancy, backup, and increased safety.

3 <http://www.wrb.ri.gov/index.htm>; the Water Resources Board Corporate is a quasi-public corporation separate from the Board and serves as the water facilities and infrastructure financing arm of the Water Resources Board—see website for further information.

4 <http://www.health.ri.gov/programs/drinkingwaterquality/index.php>

5 <http://www.wrb.ri.gov/reports/2010AR.pdf>

6 <http://www.planning.ri.gov/sgp/pdf/721.pdf>; note that this document is an abstract of the full plan element—see <http://www.wrb.ri.gov/lawsregs.htm> for more information.

In addition to performing annual reviews of the billing rates of major water suppliers in the state, the Board has recently assessed the current capital needs of the State’s major water suppliers to ensure continual reinvestment in water supply infrastructure. The Water Use and Efficiency and Clean Water Infrastructure (RIGL §46-15.6) Acts require rate stabilization and reserves accounts to ensure continual reinvestment in water supply infrastructure. WRB data on the rates and infrastructure funding needs of Warwick’s two public water suppliers is provided in Table 10.1 below. As evident in this table, there remains a significant difference in the rates paid by the customers of each supplier: for the same amount of water delivered, KCWA customers are charged nearly twice the amount as Warwick Water Division customers. This is likely due in part to a number of variables, including differences in overhead, capital improvement program, and system maintenance costs; and the fact that the Warwick Water Division does not own or maintain any source or treatment infrastructure. KCWA rates reflect costs associated with compliance with state law requiring an infrastructure replacement plan with a 20-year cycle. KCWA spends \$5.4 million annually on infrastructure replacement.

The HEALTH Office of Drinking Water Quality is responsible for regulatory oversight of public drinking water systems in Rhode Island, which includes ensuring compliance with the Safe Drinking Water Act and the *Rules and Regulations Pertaining to Public Drinking*

**TABLE 10.1: Rhode Island Water Resources Board Rate and infrastructure Surveys**

	WARWICK WATER DIVISION	KENT COUNTY WATER AUTHORITY
2006 Annual Cost per Household <sup>(1)</sup>	\$207.59	\$378.48
2010 Annual Cost per Household <sup>(1)</sup>	\$254.19	\$497.80
Capital Requirements for Infrastructure Replacement (next 20 years)	\$12,928,450	\$103,282,440 <sup>(2)</sup>

Notes: (1) Based on 73,000 gallons annual usage per household, including consumption costs and annual charges. Under the Water Use and Efficiency Act, the target consumption per capita per day is 65 gallons (approximately 60,000 gallons per year for an average household); (2) Estimate is for entire KCWA service area.

Source: Rhode Island Water Resources Board





Water,<sup>7</sup> engineering and plan review of new and replacement infrastructure projects, water quality monitoring and sampling, and financial assistance through the DWSRF (administered in conjunction with the Clean Water Finance Agency). HEALTH requires that major water suppliers such as the KCWA and Warwick Water prepare and distribute to customers annual Water Quality Consumer Confidence Reports in accordance with U.S. Environmental Protection Agency (EPA) requirements. As indicated in the testing results reported for 2012, neither supplier had contaminant concentrations in their water supply exceeding EPA standards for water quality.

In cooperation with other state agencies, HEALTH conducted source water assessments for both the KCWA and PWSB Source Water Protection Area (SWPAs) in 2003. These studies considered a number of susceptibility factors, including intensity of watershed development, the presence of businesses and facilities that handle, store, or generate potential contaminants, and the pathways through which contaminants may enter the supply. Based on HEALTH assessment guidelines, it was determined that Scituate Reservoir source has “low risk” of contamination, whereas the KCWA supplies have a “moderate” susceptibility to contamination (an average ranking for a water supply).

HEALTH, in conjunction with the Rhode Island Clean Water Finance Agency,<sup>8</sup> currently oversees the Drinking Water State Revolving Loan Fund, a program to assist public water systems in ensuring safe drinking water by providing a financing mechanism for infrastructure projects through an annual EPA capitalization grant. In this capacity, HEALTH develops a priority system for funding projects based on Safe Drinking Water Act criteria, ranks the projects as to how well they meet the established priorities, and recommends funding of projects based on priority ranking. Recently, HEALTH has made loans through the American Reinvestment and Recovery Act to improve drinking water infrastructure.

A brief discussion of the facilities and operations of each public water supplier to the city Warwick is provided in

the respective subsections below. It is important to note that as with most all institutions in the public sector, suppliers and state agencies are facing appreciable fiscal challenges and budgetary constraints amidst the recent economic downturn. While effort has been made to obtain the most up to date information possible, it is possible that a number of planned capital and infrastructure reinvestment initiatives may be deferred beyond their originally programmed timeframe for financial reasons.<sup>9</sup>

## WARWICK WATER DIVISION

As part of the city’s Department of Public Works, the Division of Water provides approximately 3 billion gallons of potable water annually to nearly 27,000 customers (approximately 88% of the city’s residents). The Division purchases about 3 billion gallons a year and sells some to the KCWA, resulting in net usage to retail customers of about 2.2 billion gallons a year on average. The Water Division is responsible for ensuring that all water quality testing requirements are met, for quarterly billing customers, and for upgrading, replacing, and rehabilitat-

<sup>9</sup> For more info, see websites and public points of contact of the City of Warwick, KCWA, WRB, and HEALTH for further information.

**TABLE 10.2: Warwick Water Division Critical Components**

OPERATIONAL AREA	COMPONENT
Wholesale Water Purchase	<ul style="list-style-type: none"> <li>• Pettaconsett Connection to Providence</li> <li>• Natick Connection to Providence</li> <li>• Post Road / Forge Road Connection to Kent County (Potowomut)</li> </ul>
Transmission/Distribution	<ul style="list-style-type: none"> <li>• Bald Hill Storage Facility</li> <li>• Warwick Neck Storage Facility</li> <li>• State Street Booster Pumping Station</li> <li>• 42” transmission main from Natick Connection to Bald Hill Road</li> <li>• 36” transmission line from Bald Hill Storage Facility</li> <li>• 30” transmission line from Pettaconsett Connection to Post Road</li> <li>• 12” &amp; 10” transmission lines from State Street Booster Pumping Station south along Warwick Neck Avenue</li> <li>• 10” transmission main along Forge/Ives Road to Potowomut</li> </ul>

Source: 2008 Water Supply System Management Plan, WRB

<sup>7</sup> <http://sos.ri.gov/documents/archives/regdocs/released/pdf/DOH/5536.pdf>

<sup>8</sup> <http://www.ricwfa.com/index.html>





ing transmission and distribution systems using water system revenues. The Water Division owns 375 miles of distribution main, 18 miles of transmission main, 1,800 fire hydrants, 5 interconnections, 3 storage tanks, and one pump station.

According to its 2008 Water Supply System Management Plan, the goals of the Warwick Water Division

are to conserve water through the implementation of various programs, reduce non-account water, maintain water quality in accordance with the Safe Drinking Water Act, and conform to the goals of State Guide Plan Element No. 721. As of 2012, the Division is in the process of updating its Water Supply System Management and Clean Water Infrastructure Plans in accordance with

**TABLE 10.3: Warwick Water Division Water Supply System Management Plan Implementation Schedule**

ELEMENT	ACTION	SCHEDULE	OUTCOMES / REMARKS	COST
Residential Retrofit Program	Distribute Retrofit Kits	Ongoing	Approximately 8,000 kits distributed to date	
Public Education Information	Conservation Promotional and informational bill stuffers	Ongoing	Create conservation awareness	\$2,500 annually
	Participate in "Water Week" Public Education Program	Annually	Create conservation awareness	Limited to WWD staff time
Major Users Technical Assistance Program	Continue high volume meter retrofit program	Ongoing	Reduce consumption	\$10,000
	Conduct follow-up site visits of major users	Ongoing	Evaluate effectiveness of program	\$10,000
Building Code Enforcement	Require low-flow plumbing fixtures	Ongoing	Reduce consumption	No cost to WWD
Water Rates and Pricing	Complete water study rate	2007/2008	Analyze adequacy of current rates	\$15,000
	Revise rate schedule	To be determined	Stability in rates	In rate study
Leak Detection and Repair	Leak Detection Survey	2008	Reduce non-revenue water	\$30,000 per survey
	Repair located leaks	2008	Reduce non-revenue water	\$20,000 Annually
Preventative Maintenance Program	Uni-directional Flushing	Annually (beginning 2008)	Cleaner water	\$20,000 plus WWD staff time
	Enhanced Valve Exercising	Annually	Prevent broken valves	WWD staff time
Rehabilitation of Distribution / Transmission System	Five Year Capital Improvements Program	To be determined	Address system deficiencies and rehabilitation needs	\$2 million per year
Meter Installation, Maintenance and Repair Program	Meter replacement	2006-2010 / ongoing	Replace meters every 15-20 years	\$200,000 / year beginning in 2007
	Meter testing	2008	Meters 2" and larger	\$10,000 / year plus WWD staff time
Water Quality Protection	Water quality monitoring	Ongoing	Sampling sites are continuously monitored	
	Coordination with local governments	Ongoing	Represent WWD interests in local planning process	Limited to WWD staff time
Emergency Management	Implement Plan	Ongoing	Update annually and after each emergency	\$2,500 annually

Source: 2008 Water Supply System Management Plan, WRB



regulatory requirements. The Water Division is currently finalizing a rate study as well, through which it intends to appropriate approximately \$2 million annually to its Capital Improvement Program (CIP). In 2009 the Division expended approximately \$1.5 million on infrastructure replacement, \$500,000 on capital improvements, and \$150,000 on renewal/replacement initiatives.

The Division has in place a suite of management programs to ensure regulatory compliance and high levels of service, including demand management (Residential Retrofit, Major User Technical Assistance, and Public Education Programs), system management (Meter Installation/Maintenance and Repair, Leak Detection and Repair, and Preventative Maintenance Programs) and emergency response (including an Emergency Response Action Plan). See Table 10.4.

## KENT COUNTY WATER AUTHORITY

The Kent County Water Authority is a state-regulated independent authority supported by user charges. The KCWA is governed by a five-member Board, including one member appointed by the Warwick City Council with management and operations carried out by a staff of 34 employees.

The Authority owns four groundwater wells in Coventry and one located in Warwick at the Warwick-East Greenwich line that draws from the Hunt River Aquifer. However, it purchases approximately 80% of its water from the PWSB. The KCWA's system-wide infrastructure also includes approximately 445 miles of distribution and transmission mains, nine storage tanks, four pressure-boosting pumping stations, four wells, and over 2,364 fire hydrants. In addition to the authority's capital improvement and renewal/replacement programs, the KCWA has drafted a *Water Conservation Action Plan*<sup>10</sup> and will need to comply with the state's Water Use and Efficiency Act requirements.

**Table 10.4: Kent County Water Authority Capital Improvement Program**

FISCAL YEAR	PRIORITY CATEGORY	DESCRIPTION	TOTAL FISCAL YEAR COST*
2012	E	Mishnock Water Main	\$2,640,000
			\$2,640,000
2013	N	Bald Hill Road/New London Ave Loop Connection	\$210,000
	N	Wakefield Street Storage Tank - Water Main Upgrades	\$610,000
	N	Quaker Lane Pump Station - High Service Pumps	\$290,000
	N	High Service Transmission Mains - Quaker Lane Pump Station	\$4,290,000
			\$5,400,000
2014	E	East Greenwich Well Upgrade and Treatment	\$6,720,000
	E	Oaklawn Service Gradient Emergency Pressure Reducing Valve	\$450,000
			\$7,170,000
2015	E	Spring Lake Well Upgrade and Treatment	\$5,830,000
	E	I-295 Water Main Bridge Crossing at Providence Street	\$450,000
			\$6,280,000
2016	E	Replace KCWA Facility	\$8,880,000
	N	Division Road (High Service Reinforcement/Expansion)	\$2,780,000
	N	Shippettown Road (High Service Reinforcement/Expansion)	\$390,000
			\$12,050,000
2017	N	Middle Road (High Service Reinforcement/Expansion)	\$650,000
	N	Middle Road (High Service Reinforcement/Expansion)	\$310,000
			\$960,000
<b>Total Cost - All Fiscal Years:</b>			<b>\$34,500,000</b>

E = Essential | N = Necessary | \* Rounded to nearest \$10,000

Source: KCWA Water Supply System Five Year Capital Improvement Program Update, 2012-2017



## DROUGHT and FUTURE NEEDS

RI Division of Planning population projections for the City show continued population decline through 2040, with a projected loss of 7,971 residents by this date. The City currently operates at a surplus based on the allocated 150 gallons per day allotment from the Providence Water Supply Board. Appendix C of Rhode Island Water 2030 shows that Warwick maintains a surplus of available water through the next twenty years with the 20 year Average Daily Demand being 9.60 (MGD) and the Available water being 11.35 (MGD) resulting in a surplus of available water. Impacts of drought can include reduced flow in rivers and streams, low water levels in reservoirs, potable water shortage, dried up surface waters, crop and livestock losses and fire risk. In the event of a declared long-term drought, the City will coordinate and communicate with the RI Water Resources Board and Warwick Water/KCWA to preserve water supplies through water conservation, including taking a role in preparing for and managing all stages of drought at the community level. The City will work with local water suppliers and the RI WRB to implement drought preparedness measures as necessary as well as coordinating with adjacent municipalities and their water suppliers to ensure emergency interconnections. The City of Warwick Water Department also would implement drought management measures such as implementing mandatory water conservation.

## 2. Sanitary Sewer System

### WARWICK SEWER AUTHORITY

As the City of Warwick experienced rapid population growth and development in the latter half of the 20th Century, policy makers recognized the need to protect groundwater and surface water resources from the potential impacts of water pollution as a result of wastewater (domestic and commercial/industrial) treated and disposed via individual sewage disposal systems (cesspools and septic systems). By Rhode Island Public Law 1962, Chapter 254, the Warwick Sewer Authority

(WSA)<sup>11</sup> was created in 1962 as an enterprise fund for the collection and treatment of wastewater for the city.

In 1965, the city's wastewater treatment facility (WWTF) and a small core of a sewerage system was completed and brought on line. The 4.5 MGD secondary treatment facility was located on the banks of the Pawtuxet River at the terminus of Service Avenue (Arthur W. Devine Boulevard) near the Lincoln Park neighborhood. At the time of its construction the treatment facility was state of the art, consisting of an activated sludge secondary treatment facility designed to reduce suspended solids and organic loading to the then heavily-polluted Pawtuxet River. In 1979 the WSA completed a comprehensive sewer facilities plan, which established a program for extending the municipal sewer system over the next 20 years.

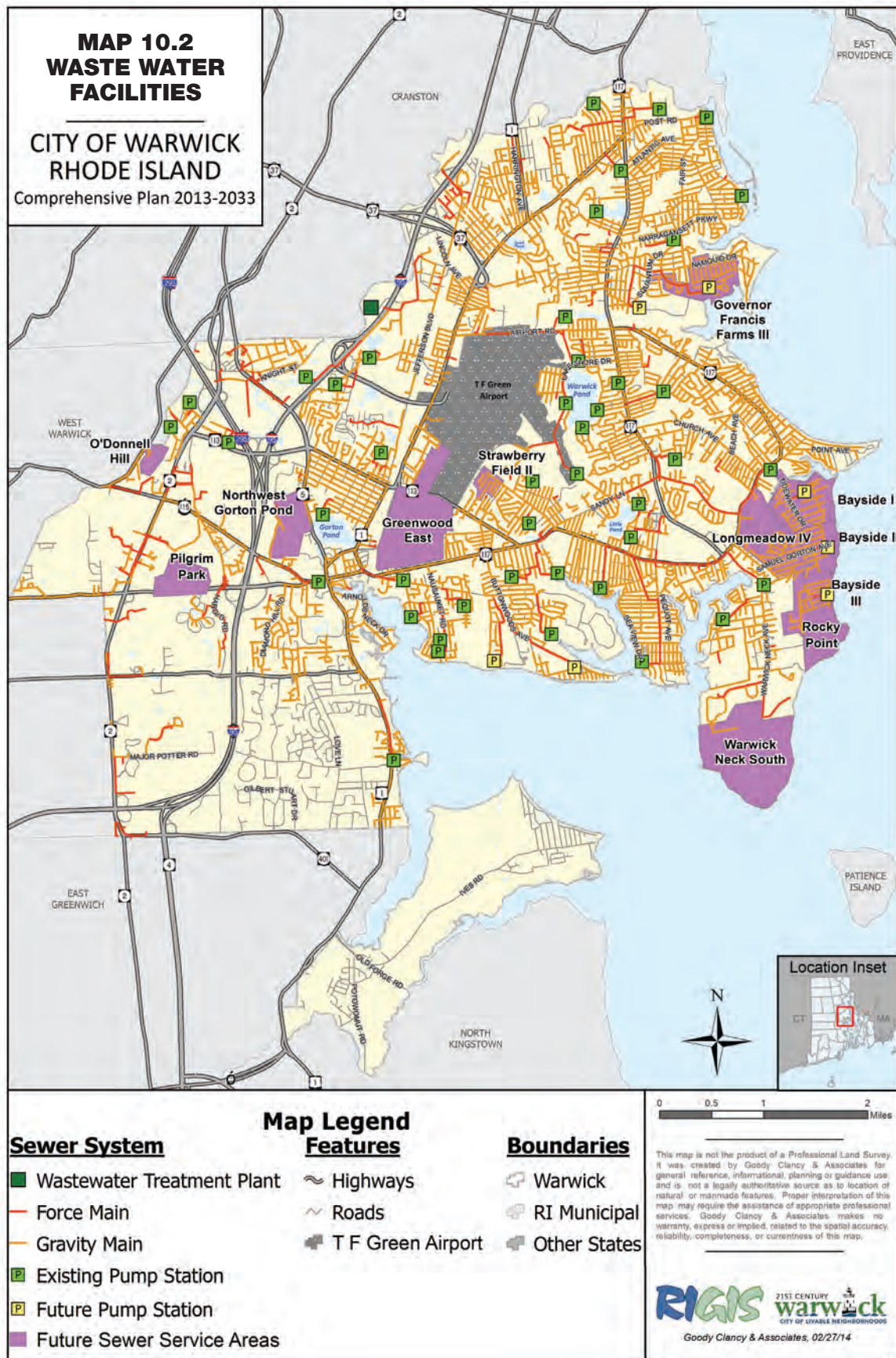
In 1989, RIDEM issued Warwick, West Warwick and Cranston new permits under the RIPDES—the regulatory program under which treatment facilities are permitted to discharge),<sup>12</sup> which set more stringent limits on the discharge of metal, nitrogen, phosphorus and other materials. As meeting these requirements was not attainable with existing secondary treatment facilities, the RIDEM entered into consent agreement with each community in 1990, directing each to develop a plan and a program to achieve the allowable limits of discharges.

The WSA's Facilities Plan was updated in 1992 to address these new regulations. City voters approved the authorization of a \$130 million general obligation bond in 1994 to finance the mandated upgrades at the wastewater treatment facility and to expand the sewer system to virtually all serviceable areas of Warwick. The \$32 million upgrade to the WWTF was completed in September 2004, and the plant is now equipped with a biological nutrient removal process that is able to reduce concentrations of total nitrogen and total phosphorus below the limits established under the facility's RIPDES permit. In 2008, RIDEM issued WSA a new permit that requires WSA to meet even lower nutrient standards. The WSA is in the construction bidding stage for these

<sup>11</sup> <http://www.warwickri.gov/wsa/index.html>

<sup>12</sup> Refer to the RIDEM website for further information regarding the regulation of wastewater treatment facilities and discharges:  
<http://www.dem.ri.gov/programs/benviron/water/permits/ripdes/index.htm>  
<http://www.dem.ri.gov/programs/benviron/water/permits/wtf/index.htm>









latest upgrades, which are estimated to be completed in late 2016 and cost approximately \$14 million.

In concert with amendments to the WSA's Facilities Plan in 1997 and 2004, the city continued its commitment to reduce water quality impacts on Greenwich Bay and Narragansett Bay in 2004 with the approval of an ordinance authorizing the WSA to issue up to \$50 million in revenue bonds to continue its capital plan. Recent efforts have been focused on providing for the sewerage needs of the Greenwich Bay Watershed: in 2005 the RIDEM issued a *Total Maximum Daily Load Analysis for Greenwich Bay Waters* (TMDL)<sup>13</sup> to address fecal coliform bacteria impairments to Greenwich Bay (including its coves and tributaries), which includes recommendations for ensuring adequate treatment of wastewater (i.e., sewer service extensions, proper operation and maintenance of existing individual sewage disposal systems). In an effort to meet the pollution reduction goals set forth in the TMDL as well as other objectives of the RICRMC GBAY Special Area Management Plan, the WSA was required (in order to obtain a CRMC Assent for constructing the Conimicut North sewer project) to institute a phased Mandatory Sewer Connection Program (MSCP) that requires homeowners to tie in to the sewer system where available. However, the main enforcement mechanism for this project was never implemented. Further information regarding the MSCP can be obtained through the WSA website.<sup>14</sup>

## ADMINISTRATION AND RATE STRUCTURE

The WSA is overseen by a five-member board which convenes on a monthly basis, with meetings open to the public. Members are appointed by the Mayor (subject to the confirmation by the Warwick City Council) and serve for a term of five years. Significant actions or decisions by the Board require the advice and consent of the Mayor.

The Executive Director of the WSA is in charge of the Authority's facilities and reports directly to the Mayor

and Board Members of the Authority. The Superintendent and operations personnel, who are required to be licensed, are responsible for maintaining the equipment and operating the unit processes in a manner that meets and exceeds the requirements of the RIPDES permit for the Warwick WWTF.

There are two classes of sewer system users: residential and commercial/industrial. Bills are issued quarterly. For FY 2014, residential users are billed a service charge of \$30.49 per unit and a consumption fee of \$45.95 per 1,000 cubic feet. Commercial/industrial users are billed a service charge based on the size of their water meter, ranging from \$34.97 for a 5/8-inch meter to \$1,033.75 for an 8-inch meter, and a consumption fee of \$69.67 per 1,000 cubic feet. All users are charged a Renewal and Replacement fee of \$.47 per 1,000 cubic feet. All consumer charges are based on 100 percent of water usage.

In October 2009, the WSA retained a consultant to conduct a comprehensive cost of service study. However, the 2010 floods wiped out the treatment facility as well as six pumping stations along the Pawtuxet River, after which the WSA Board directed its consultant to update the rate study to reflect post-flood finances. The rate study was eventually implemented in 2011. The current report<sup>15</sup> on which the proposed fiscal year 2012-2016 rates are based is available through the WSA website.

Where sewers are available, residences are charged an assessment of \$82.00 per foot of frontage for sewer construction costs. For large lots (1+ acres) the assessment is based on a formula established to account for the development potential of the parcel. Assessments are payable over 20 years and the assessment charge is applied whether or not the property is connected. The WSA's enabling legislation allows it to charge a "connect capable fee" for owners who have sewer service available but have not connected to the system. However, this fee has never been implemented.

The WWTF also accepts septage from licensed haulers for \$47.00 per 1000 gallons. Septage is accepted only from Warwick residents, and each load is monitored for

<sup>13</sup> <http://www.dem.ri.gov/programs/benviron/water/quality/rest/pdfs/gbtmdl.pdf>; see also

<http://www.dem.ri.gov/programs/benviron/water/quality/rest/index.htm>

<sup>14</sup> [www.warwicksewerauthority.com](http://www.warwicksewerauthority.com)

<sup>15</sup> <http://www.warwickri.gov/pdfs/wsa/wsa%20may%202011%20use%20rates.pdf>



compliance with WSA standards to prevent any toxicity to the biological processes employed at the treatment facility. The WSA limits the volume of septage received on a given day to 25,000 gallons. With the implementation of its MSCP, the WSA anticipates a gradual decline in the volume of septage received for treatment.

## COLLECTION SYSTEM

At present, approximately 65 percent of the developed parcels in the City of Warwick are sewerred. Where sewer lines have been installed, roughly 3,000 residential properties have elected not to connect to the sewer system. To address growing concerns about the environmental impact of on-site septic systems leaching pollutants into Greenwich Bay, the WSA has developed the Mandatory Sewer Connection Program (MSCP). The WSA has no ability to enforce connections to the collection system except in the case of some emergency situations or within one year after the sale of a property.

There are approximately 294 miles of sanitary sewer in the city, ranging in size from 2-inch diameter low pressure force mains to 48-inch diameter gravity interceptors. Due to the diverse topography throughout the city, particularly the low lying coastal regions, the sanitary sewer system uses 48 sewage pump stations owned, operated and maintained by the WSA to convey wastewater to the

Warwick WWTF. In addition to these publicly owned stations, there are approximately 100 privately owned pump stations that discharge into the sanitary sewer system.

Individual grinder pumps and low pressure force mains are also used in several sections of the City that could not be serviced with conventional gravity sewers.

Except for limited areas of the western part of Warwick, the public sewerage system is tributary to the Warwick Wastewater Treatment Facility. Sewer service is also available to the western sections of the city through the terms of an inter-municipal agreement between Warwick and the Town of West Warwick, which owns and operates its own regional wastewater treatment facility along the Pawtuxet River in Natick. Most of the connections in Warwick to the West Warwick WWTF have occurred through individual private agreements with the Town of West Warwick and with the approval of the WSA. The West Warwick Agreement established a reserve capacity at the town's facility, and at present about 40% of the 253,200 gallons per day allocated to the City of Warwick remains available at this time. The WSA also pays the Town of West Warwick a flow-based proportion (2.4%) for the capital costs incurred for the upgrades to the West Warwick facility.

**TABLE 10.5: Warwick Sewer Authority Preliminary Sewer Extension Schedule**

PROJECT NAME	STATUS	ESTIMATED COST	# OF RESIDENTIAL UNITS
Governor Francis III	Dependent on funding 2015	\$4,600,000	241
Bayside I	Dependent on funding & resolution of archeological issues; 2018	\$5,636,000	396
Bayside II	Dependent on funding & resolution of archeological issues; 2018	\$4,370,000	248
Bayside III	Dependent on funding & resolution of archeological issues; 2018	\$3,900,000	242
Northwest Gorton Pond	Dependent on funding 2016	\$4,900,000	295
Greenwood East	Dependent on funding 2020 & RIAC airport expansion	\$13,362,000	577
Pilgrim Park	Dependent on funding 2020	\$4,250,540	125
O'Donnell Hill (East Natick III)	Dependent on funding 2015	\$2,115,000	77
Strawberry Field II	Postponed due to contamination issues; dependent on funding 2020	\$860,500	76
Warwick Neck South	Dependent on funding	\$11,048,800	279
Rocky Point Park	75,000 gpd reserved for property per agreement with previous owners	N/A	N/A



Due to the ongoing sewer construction program and new connections to the expanding sewer system, the number of persons served by the WSA system continues to grow. There are currently over 21,000 customer accounts total, which are split between residential and commercial services. Over the last four years there has been a 10% increase in the number of customer accounts. This increase is projected to continue at a rate of as many as 500 new service connections per year for the next six or seven years.

The WSA has recently completed an update to its Facilities Plan, which included a capacity analysis of the major pumping stations and collection system interceptors. With only a couple of exceptions, the current sewer collection system and hydraulic capacity at the treatment facility are adequate to safely convey present and projected (2030) wastewater flows. The sewer extension schedule currently developed for the plan update is reproduced in Table 10.5. The WSA notes that this preliminary schedule is highly dependent on a number of factors including funding availability, approval of the WSA Board, completion of design, issuance of permits, and project management staff availability and is subject to change as new information becomes available. Individual project maps for both ongoing and planned sewer extension projects are available through the WSA website.<sup>16</sup>

The update to the Facilities Plan also included an evaluation of the feasibility of providing sewer service to all sections of the City, including Warwick Neck, Cowesett, and Potowomut/Sandy Point. Previously, sewers were not recommended for Cowesett and Warwick Neck since large lot sizes and soil types were deemed favorable for on-lot sewage disposal systems. However, the continued presence of high pathogen levels in Greenwich Bay because high groundwater levels on Warwick Neck result in a high septic system failure rate, led to a reassessment and Warwick Neck was put on the list.

Although the southwest Potowomut and Sandy Point neighborhoods are several miles from the nearest connection point to the city's collection system, concerns with the relatively high failure rate of on-site treatment

systems (and the potential for impacts to Greenwich Bay and the Hunt River Aquifer) have necessitated consideration of alternatives for the collection and treatment of wastewater within this section of Warwick. A preliminary study of wastewater management options and costs was completed for the WSA in 2009, which evaluated the feasibility of constructing a new collection system and pumping infrastructure to convey flows to an existing treatment facility (the Warwick WWTF or other nearby facilities in Quonset Point or East Greenwich), as well as alternatives such as shared/community on-site treatment systems, a satellite wastewater treatment facility, and implementation of an on-site wastewater management district. Given the extremely high capital costs associated with the new build alternatives, the city engaged with the Town of East Greenwich in 2011 to discuss alternatives. As a result of these discussions, a "hybrid" approach—in which Southwest Potowomut would be sewerred and the more remote Sandy Point neighborhood managed by on-site systems—was identified for further consideration as a more viable, cost-effective solution. The city has not yet committed to any alternative for improved wastewater management in these areas, and several logistical issues (particularly with respect to connecting to the East Greenwich Sewer System, funding, and maintenance) need to be resolved in order to proceed.

## TREATMENT SYSTEM

The WSA owns and maintains a 7.7 million gallons per day (MGD) advanced wastewater treatment facility which discharges into the Pawtuxet River. As previously noted, a \$34 million upgrade to the WWTF was completed in 2004. Other facility improvements that were implemented included:

- a new administration building
- renovations to the operations building and laboratory
- a new PC-based operating and supervisory control system, including a radio frequency telemetry system for the 48 remote pumping stations throughout the city
- inlet and preliminary treatment facilities
- primary sedimentation and sludge/scum pumping
- process aeration and automatic control

<sup>16</sup> <http://www.warwickri.gov/wsa/construction/index.html>



- final clarification and sludge/scum pumping
- odor control
- chemical feed systems
- sludge thickening

The upgraded facility has a capacity to treat an average daily flow of 7.7 MGD and a peak hourly flow of 17.7 MGD. The average daily flow for 2005 was 5.0 MGD, of which 30% was from commercial/industrial sources and 70% from residential sources. As of 2012, however, the average daily flow continues to hover at 5 MGD, despite thousands of new connections. The WSA attributes this to water conservation efforts.

The WSA implements an Industrial Pretreatment Program (IPP) to protect the existing sewer collection system, treatment facility, Pawtuxet River and Narragansett Bay by preventing the discharge of toxic pollutants and excessive conventional pollutants from the industrial/commercial user base. This is accomplished through the issuance of wastewater discharge permits for all Warwick-based industrial and commercial facilities discharging wastewater, either directly or indirectly, into the Warwick Sewer System. There are currently 633 permitted businesses in Warwick regulated under the IPP, including 343 industrial/commercial users, 288 restaurants/food preparers and 2 septage haulers.

WSA/IPP personnel monitor the incoming waste stream to the WWTF on a 24-hour per day basis to ensure that elevated levels of pollutants are not present. If elevated levels of pollutants are detected, 24-hour sampling devices are deployed in select manholes throughout the City in order to determine the origin of the elevated pollutants. Non-compliant discharges are traced back to the business in violation of their permit discharge limits and enforcement action ensues.

As with all utility operators, the WSA is responsible for the physical and fiscal planning in replacing and modernizing its aging infrastructure elements. This key operations element is addressed in the 2011 rate study, addressing costs such as projected increases in treatment/commodity/disposal prices, reduced revenue from reduced water consumption, and existing debt obliga-

tions through a revised rate structure for residential and commercial customers, assessments, and enforcement of the connect capable fee under the Authority's MSCP.

In the wake of the record flooding along the Pawtuxet River in 2010, the WSA has recently completed the design of improvements to the existing levee system of the WWTF to provide enhanced flood protection and mitigation. The improvements involved raising the elevation of the existing levee (by extending the earthen embankment, construction of a levee wall, or combination thereof) to contain the 500-year flood event. Inclusive of appurtenant elements (toe drain system and interior drainage), implementation the flood protection and mitigation improvements is estimated to cost in the range of \$3.5 to \$5 million.

### ONSITE WASTEWATER TREATMENT SYSTEMS

The City of Warwick is investigating a Wastewater Management Ordinance and the establishment of Wastewater Management Districts for those areas of the City that will remain unsewered. Such a program would seek to assist the unsewered population with the management of their Onsite Wastewater Treatment Systems (OWTS) to ensure proper upkeep and maintenance for better operation and longer life. OWTS can provide a cost-effective, viable alternative to sewers in those areas of Warwick not included in the Facility Plan for sewers. Such a program would benefit both water quality and eligibility for various grant and loan programs to assist Warwick residents with the expense associated with new or upgraded OWTS.

## 3. Drainage Infrastructure and Stormwater Management

### STORMWATER MANAGEMENT OVERVIEW

The proper management of stormwater runoff has long been a challenge in urbanized areas where higher percentages of impervious surfaces generate significantly more surface runoff than rural or undeveloped lands of similar size. The record floods of early 2010 served as a



**TABLE 10.6: RIPDES Phase II Minimum Measure Requirements for MS4 Operators**

MEASURE	MINIMUM REQUIREMENTS *
1. Public Education and Outreach	<ul style="list-style-type: none"> <li>• Implement a public education program (through partnerships, distribution of informational literature, etc.)</li> <li>• Determine appropriate BMPs and measurable goals (brochures/fact sheets, educational programs, event participation, etc.)</li> </ul>
2. Public Involvement/ Participation	<ul style="list-style-type: none"> <li>• Comply with applicable State and local Public Notice Requirements</li> <li>• Determine appropriate BMPs and measurable goals (volunteer clean-ups, stewardship/citizen panels, storm drain stenciling, etc.)</li> </ul>
3. Illicit Discharge Detection and Elimination	<ul style="list-style-type: none"> <li>• Develop a storm sewer map showing the location of all outfalls</li> <li>• Develop ordinances or other regulatory mechanisms to prohibit non-storm water discharges into the MS4</li> <li>• Develop and implement a plan to detect and address non-storm water discharges</li> <li>• Educate the public about the hazards associated with illegal discharges and improper disposal of waste</li> <li>• Determine appropriate BMPs and measurable goals</li> </ul>
4. Construction Site Runoff Control	<ul style="list-style-type: none"> <li>• Develop an erosion and sediment control ordinance for construction sites</li> <li>• Implement a construction plan review process to assess potential water quality impacts (including inspections and enforcement)</li> <li>• Establish procedures for the receipt and consideration of information submitted by the public</li> <li>• Determine appropriate BMPs and measurable goals</li> </ul>
5. Post Construction Runoff Control	<ul style="list-style-type: none"> <li>• Develop and implement strategies which include structural and/or nonstructural BMPs for the control of runoff quality/quantity</li> <li>• Develop an ordinance or other regulatory mechanism requiring the implementation of post-construction runoff controls</li> <li>• Ensure adequate long-term operation and maintenance of controls</li> <li>• Determine appropriate BMPs and measurable goals</li> </ul>
6. Pollution Prevention / Good Housekeeping	<ul style="list-style-type: none"> <li>• Develop and implement an operation and maintenance program to prevent/reduce pollutant runoff from municipal operations into the storm sewer systems (routine street sweeping, catch basin cleaning, etc.)</li> <li>• Provide employee training on how to incorporate pollution prevention and good housekeeping techniques into municipal operations</li> <li>• Determine appropriate BMPs and measurable goals</li> </ul>

Note: \* Summarized for informational purposes only—see RIPDES regulations for program requirements.

Source: RIDEM

harsh reminder of the need for improved stormwater infrastructure, management and maintenance in Warwick.

The EPA's Storm Water Phase II Rule of 1999 requires operators of municipal separate storm sewer systems (MS4s) to obtain permits and establish a stormwater management program that is intended to improve waterbodies by reducing the quantity of pollutants that can enter storm sewer systems during storm events. As it is classified as a regulated Small MS4 Operator, the City of Warwick must apply for a Rhode Island Pollutant discharge Elimination System (RIPDES) permit and develop a Storm Water Management Program Plan (SWMPP) describing the Best Management Practices (BMPs) to be implemented in the six minimum measure areas listed in Table 10.6 on the following page.

The SWMPP for Small MS4 Operators must contain the measurable goals for each minimum control measure as well as an implementation schedule including interim milestones and frequency of activities and reporting of results. Additional permit requirements may also be required of MS4 operators based on total maximum daily load (TMDL) restrictions placed on impaired waterbodies.<sup>17</sup>

Depending on the location and nature of the activity, private and public entities wishing to construct new developments or redevelopments in the State of Rhode Island must prepare and implement a Stormwater Manage-

<sup>17</sup> <http://www.dem.ri.gov/programs/benviron/water/quality/rest/index.htm>



ment Plan in accordance with the recently issued Rhode Island Stormwater Design and Installation Standards Manual (RIDEM & CRMC, 2010)<sup>18</sup> as a component of required regulatory approvals from the CRMC (Coastal Assent) and/or RIDEM (e.g., Freshwater Wetlands Program, Underground Injection Control Program, Water Quality Certification). Policies set forth in the manual require that the Stormwater Management Plan and site design mitigate the potential for adverse water quality and quantity (flooding, erosion) impacts to receiving waters through application of the following minimum stormwater management standards (where applicable):

- Low Impact Development (LID) Planning and Design Strategies
- Groundwater Recharge
- Water Quality Protection Measures
- Conveyance and Natural Channel Protection
- Overbank Flood Protection
- Redevelopment and Infill Projects (Alternative Requirements)
- Pollution Prevention
- Mitigation of Land Uses with Higher Potential Pollutant Loads (LUHPPLs)
- Illicit Discharge Detection and Elimination
- Construction Erosion and Sedimentation Control
- Stormwater Management System Operation and Maintenance

The stormwater manual also sets forth standards, policies, and design guidance for structural BMPs (Best Management Practices), such as retention/detention basins that may be employed to meet water quality and quantity control criteria.

Additionally, proposed development projects involving land disturbances greater than one acre must seek coverage under the RIPDES General Permit for Storm Water Discharge Associated with Construction Activity.<sup>19</sup> Conditions of the permit require that the proponent

file a Notice of Intent (NOI) with the RIPDES Program and prepare a Construction Site Storm Water Pollution Prevention Plan (SWPPP), a working document that describes the erosion and sediment control measures and pollution prevention techniques that will be employed during an active construction project.

## EXISTING SURFACE DRAINAGE AND INFRASTRUCTURE

A multitude of publicly and privately owned drainage systems convey surface runoff to receiving waterbodies/watercourses within Warwick. The drainage network includes open (drainage swales, channels) and closed (catch basins, drainage manholes, and piping systems) elements, as well as include BMPs such as detention basins, wet swales, and/or hydrodynamic separators. In general, structures and systems located within the public right-of-way are owned and maintained by either the City of Warwick or the State Department of Transportation. It is also not uncommon for systems operated by the city to be interconnected with those of the RIDOT at various locations.

The Greenwich Bay Special Area Management Plan (SAMP, 2005)<sup>20</sup> makes stormwater management recommendations which are largely identical to the requirements of MS4 Operators under the RIPDES Program, including the mapping stormwater outfalls; identifying, eliminating and preventing illicit discharges; planning and implementing structural BMPs to improve water quality and reduce runoff; and updating municipal ordinances to enforce proper stormwater management. Amongst these recommendations, the SAMP also specifically recommends that:

Warwick should conduct BMP feasibility studies to identify locations for installing stormwater BMPs in the Greenwich Bay watershed that address bacteria and nitrogen concentrations as well as stormwater volume, once such BMPs are identified by CRMC and RIDEM. The draft TMDL identifies Brush Neck Cove and Apponaug Cove as priority areas for Warwick (RIDEM, 2004a). BMP feasibility studies should include outfalls with large impervious drainage areas, the outfalls priori-

18 <http://www.dem.ri.gov/programs/benviron/water/permits/ripdes/stwater/t4guide/desman.htm>

19 <http://www.dem.ri.gov/pubs/regs/regs/water/ripdesca.pdf>

20 [http://www.crmc.ri.gov/samp\\_gb.html](http://www.crmc.ri.gov/samp_gb.html)



tized by SRICD,<sup>21</sup> and the direct storm water discharges identified by URI-CVE<sup>22</sup> as large bacteria loads to Greenwich Bay. While physical constraints at these locations may exist, they should be considered first for BMP construction. (§470.5B.13)

(See Chapter 6, *Natural Resources*, for more about the SAMP.)

## MUNICIPAL MANAGEMENT AND COMPLIANCE

In 2008 the City of Warwick commissioned the preparation of its SWMPP to comply with RIPDES requirements, which included sections addressing resource protection (identification of impaired waters and critical habitats), existing drainage systems (sub-watershed descriptions), and the six minimum control measures described in Table 10.6 (including mechanisms and timeframes for implementation). Although the SWMPP has been completed, the City of Warwick is currently in receipt of a Notice of Noncompliance from the RIDEM for not satisfactorily addressing the requirements of its RIPDES MS4 Permit (#RIR040031), including failure to submit annual reports documenting compliance and progress towards achieving SWMPP goals in the six minimum measures required of all MS4 operators.<sup>23</sup>

Largely due to a lack of available funding and resources (coupled with the sheer area and extensive stormwater infrastructure throughout the city), the City of Warwick has to date been unable to complete the most labor-intensive elements required under its RIPDES permit:

**Mapping of all stormwater outfalls.** Outfall sampling is required under the Illicit Discharge Detection and Elimination minimum measure. Updating of city ordinances (e.g., Soil Erosion and Sediment Control) for consistency with current best practices. Although the city effectively meets certain requirements through completed or continuing efforts (such as storm drain stenciling, annual street sweeping and catch basin

cleaning), it is imperative that the city renew its commitment to the RIPDES MS4 program to avoid the assessment of fines for noncompliance and to meet the stormwater management goals and policies of the preceding planning period, on which limited headway has been made to date.

## Needs

The City of Warwick Stormwater Management Program Plan identifies the following future priority needs:

- Continue to develop outreach strategies and partnership arrangements and expand the city website to provide educational information and encourage involvement with the storm water program.
- Continue implementing the CRMC Special Area Management Plan for Greenwich Bay.
- Inspect City discharges and conduct dry-weather surveys as required.
- Review all construction project plans and SWPPPs for construction projects within the regulated area.
- Track all Building Permits and Planning Review Applications.
- Complete inspections for all construction projects within the regulated area that discharge or have the potential to discharge to the MS4.
- Develop an operations and maintenance program for BMPs, storm sewers, and catch basins.
- Conduct inspections on all BMPs, storm sewers, catch basins and clean as required.
- Sweep all roads annually.
- Sweep critical environmentally sensitive areas twice per year.
- Conduct outfall and erosion control inspections, as required.

## 4. Solid Waste Collection, Disposal, and Recycling

### RESIDENTIAL WASTE AND RECYCLING

Warwick's regulations pertaining to garbage, debris, and rubbish are set forth in Chapter 22 of the city's Code of Ordinances, which contains articles and statutes pertaining to collection; storage of trash/debris and litter; recycling; leaf and yard waste; and the protection of specific

<sup>21</sup> Southern Rhode Island Conservation District

<sup>22</sup> University of Rhode Island, Department of Civil and Environmental Engineering

<sup>23</sup> The last Annual Report submitted by the city was for Reporting Year 4 (2007).



natural resource areas (i.e., the Pawtuxet River, Buckeye Brook, and the Greenwich Bay Watershed) from the adverse impacts of illegal dumping.

Residential waste and recycling collection is handled by Warwick's Department of Public Works (DPW) Recycling and Sanitation Division. Implemented in 2003, the automated residential recycling and trash collection program uses specialized collection trucks with mechanical lifting devices to empty trash and recycling roll-out containers directly. The automated system is designed to improve the efficiency of collection operations, make garbage disposal easier for residents, improve the appearance of the city, and reduce the potential for employee injuries. City residences are provided city-owned roll-out containers for refuse (gray) and recyclables (blue and green) at no cost.

The Sanitation and Recycling Division website includes collection calendars, guidance on roll-out cart use, frequently asked questions, and lists of items that can/cannot be disposed or recycled. Developed with a grant from the Rhode Island Resource Recovery Corporation (RIRRC), the website also includes information for residents on the city's white goods/appliances recycling, motor oil recycling, and yard waste collection programs, as well as guidance on home composting and the disposal of household hazardous waste.

## THE CENTRAL LANDFILL AND MATERIALS RECYCLING FACILITY

**TABLE 10.7: 2012 Municipal Waste Management, Diversion and Recycling Data**

	CITY OF WARWICK	STATE AVERAGE
Tons of Trash Landfilled per Household Served (Annual)	0.90	0.89
Bin / Materials Recycling Facility (MRF) Recycling Rate (1)	27.3%	22.3%
Mandatory Recycling Rate (MRF + yard waste + other recyclables) (1)	50.0%	32.7%
Rate of Overall Material Diversion from Landfill (2)	50.3%	33.4%

Notes: (1) As percentage of gross total waste stream; (2) In addition to recycling and composting, includes all other materials diverted from landfilling, including special wastes such as tires, mattresses, clean wood, clothing and shoes, books, motor oil and filters, cooking oil, etc.

Source: RIRRC

The City's municipal waste and recyclables are disposed at the Central Landfill and Materials Recycling Facility in Johnston, Rhode Island. The 1200 acre facility is owned and operated by the Rhode Island Resource Recovery Corporation (RIRRC), the state's self-funded, quasi-public agency responsible for providing the public with environmentally sound programs and facilities to manage solid waste. In addition to the landfill, the site includes a materials recycling facility, a construction and demolition waste processing facility, the Eco-Depot and landfill gas power generation plants.

The Central Landfill presently receives approximately 2,500 tons of waste per day, of which approximately 40% is from municipal/residential sources and 60% from commercial waste generators. As of the Fiscal Year 2012 rate schedule, municipalities pay \$32 per ton of waste disposed at the landfill, whereas recyclables are accepted at no charge. Waste beyond the municipality's "cap," based on estimated waste per capita, are assessed higher rates as an incentive for cities and towns to increase recycling and composting programs.<sup>24</sup> Because of Warwick's recycling and diversion programs, it has not exceeded its municipal cap in recent years (2011 data is in Table 10.7). While municipal solid waste costs are generally borne by local government budgets, the RIRRC has to date provided substantial financial assistance to municipalities for waste management, including funding of recycling program start-up costs, grants, and acceptance of recycled materials and household hazardous waste free of charge.

## RHODE ISLAND COMPREHENSIVE SOLID WASTE MANAGEMENT PLAN

The Rhode Island Comprehensive Solid Waste Management Plan (CSWMP, State Guide Element 171, 2007) was developed to address the disposal of solid waste, in large part to extend the life of the Central Landfill. Thus, the state's four priorities for the management and disposal of solid waste are (in order of priority):

- Reduction of the amount of source waste generated;
- Source separation and recycling;

<sup>24</sup> See RIRRC website for the Accepted Materials and Rates FY2012 schedule (including rates for commercial and miscellaneous special wastes). See RIRRC website and State Guide Plan Element 171 for further information on municipal caps and waste diversion efforts.





- Waste processing to reduce the volume of waste necessary for land disposal;
- Land disposal.

Under Rhode Island General Law § 23-18.9-1,<sup>25</sup> every city or town that enters into a contract with the RIRRC to dispose of solid waste is required to recycle a minimum of thirty-five percent (35%) of its solid waste and to divert a minimum of fifty percent (50%) of its solid waste by a target date of July 1, 2012. The RIRRC periodically publishes data on the performance of each municipality towards achieving the target recycling and diversion rates.<sup>26</sup> The City of Warwick's recycling and diversion rates for the year 2010 are listed in Table 10.8, alongside the average rates for municipalities across the state. Amongst the twelve municipalities in the state serving over 10,000 households with curbside collection, Warwick has the highest rates of recycling in all three recycling and diversion metrics, and currently meets the 2012 target for percentage of its total solid waste stream diverted from landfill disposal. These figures can be credited largely to the city participation in the RIRRC's Maximum Recycling Program, the effectiveness of the city's automated collection program, and the participation efforts of city residents, through which over 10,000 tons of material from Warwick households are currently recycled per year.

As with most all areas of state and local government, both the RIRRC and Warwick DPW are presently facing significant budgetary constraints. In addressing the need for adequate financing for the implementation of its recommendations, policies, and action items, the CSWMP emphasizes that "While this Plan cannot mandate funding for... waste diversion programs, it can be stated with confidence that continued failure to adequately fund and staff the programs and activities recommended in this Plan will shorten the projected life of the Central Landfill...from approximately 26 to 19 years."

## COMMERCIAL WASTE AND RECYCLING

The City of Warwick does not provide collection service for commercial, institutional and apartment/condomin-

ium sites. Disposal is typically through a private hauler. Depending on contract arrangements with the RIRRC, disposal rates at the Central Landfill are significantly higher—up to \$75 per ton—than the \$32 municipal under-cap rate.

Commercial waste accounts for roughly 60% of the waste material received at the Central Landfill, and as such requires increased recycling and diversion efforts in order to extend the longevity of the landfill. While commercial recyclables are now accepted at no charge, at the time of the issuance of the CSWMP the state-wide commercial recycling rate was less than 3 percent. Amongst the key recommendations set forth in the plan, the following is stated with respect to CSW:

- Increased enforcement of solid waste regulations,
- The incorporation of recycling into facility permitting,
- The acceptance of commercial material at RIRRC's Material Recycling Facility (MRF),
- Eliminating the "put or pay" provision in RIRRC commercial disposal contracts, and

**Table 10.8 : Warwick Public Schools**

AREA	HIGH SCHOOL	JR. HIGH SCHOOLS	ELEMENTARY SCHOOLS
Pilgrim Area	Pilgrim High School	Aldrich Jr. High	Francis Holden Holliman Hoxsie Norwood Wyman
Veterans Area	Warwick Veterans High School	Gorton Jr. High	Lippitt Oakland Beach Park Sherman Warwick Neck
Toll Gate Area	Toll Gate High School	Winman Jr. High	Cedar Hill Greenwood Robertson Scott Wickes

Source: Warwick School District

<sup>25</sup> <http://www.rilin.state.ri.us/Statutes/TITLE23/23-18.9/23-18.9-1.HTM>

<sup>26</sup> <http://www.rirrc.org/customers/municipal-recycling/>



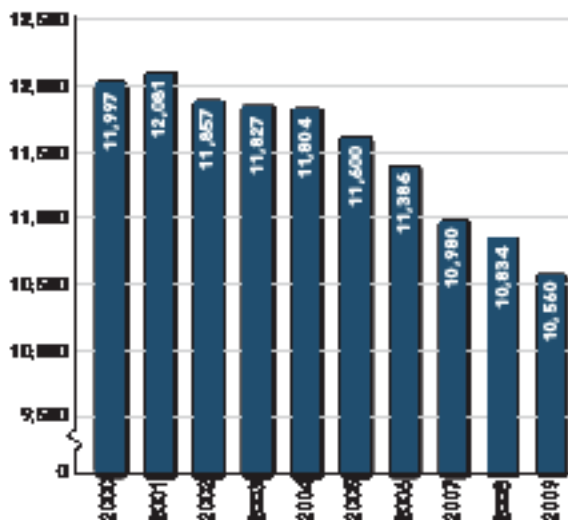
- Allowing municipalities to collect and deliver non-residential recyclables to the MRF.

Because multi-family residential housing is treated as commercial waste instead of municipal waste, recycling rates for multi-family housing are very low. This plan calls for the statewide institution of residential multi-family recycling. (pp. ES-2—ES-3)

Although budgetary limitations effectively constrain the City from collecting and delivering non-residential recyclables, a number of state initiatives targeting business waste are currently being implemented by the RIRRC.<sup>27</sup> In an effort to address the financial obstacles to commercial recycling in the state, the RIRRC is currently promoting the switch to a “single stream” program for commercial recycling. Single stream requires only one dumpster for all eligible recyclables, which can make recycling more fiscally viable for businesses, as the frequency of pick-up (and associated hauling costs) can be reduced.

<sup>27</sup> <http://www.rirrc.org/business/>

**Figure 10.1: Warwick Public School Population 2009–2009**



Source: RI Department of Education, 2011

## 5. School Facilities

### WARWICK PUBLIC SCHOOL DISTRICT

The Warwick Public School District currently operates sixteen elementary schools, three Junior High schools, and three High Schools. The District organizes schools into three areas, all of which feed into one of the three public high schools.

The School District also runs the Drum Rock Early Childhood Center and the Warwick Area Career and Technical Center (high school), both of which are located at the Toll Gate/Winman Complex. Drum Rock offers educational programs for preschool and kindergarten students, and for children with disabilities, Autism spectrum disorders and other behavioral challenges. Families pay a fee based on number of days attended per week, except for children identified as needing special education through an IEP (Individualized Education program), who attend for free. The Warwick Area Career and Technical Center is a high school offering career and technical programs for students attending Toll Gate, Veterans, Pilgrim, East Greenwich and West Warwick High Schools.

### STUDENT POPULATION AND FACILITY NEEDS

Perhaps the greatest challenge facing the Public School District in terms of facility management is the decline in student population. Between 2001 and 2009, the number of students enrolled in Warwick schools has declined by over 14 percent, or more than 1,500 students.

Since the previous comprehensive plan, declining enrollment has resulted in a round of school consolidation,

**TABLE 10.9: Schools - Planned Capital Projects**

PROJECT TYPE	TOTAL FUNDS	YEARS
Fire System Improvements	\$9,254,162	2011-2015
Building Improvements	\$2,307,183	2011-2013
Mechanical Systems	\$3,163,085	2010-2016
Site Improvements	\$466,022	2010-2016

Source: City of Warwick 2011-2012 Capital Improvements Program Budget

tions, leading to the closure of several schools, among



them the John Greene Elementary School in Ward 5, the Potowomut Elementary School in Ward 9, and the Rhodes School in Ward 2. To address continued declining enrollment and funding gaps, a committee was formed in 2011 to look at opportunities for consolidating additional elementary as well as secondary schools. While no recommendations have been made, the issue may be addressed as soon as 2013.<sup>28</sup>

School closing can be difficult for neighborhood residents, who identify with their local schools. Empty school buildings in other communities have been transformed into condominiums, senior housing, offices, art centers, and other beneficial community uses. In Warwick, no studies for reuse have been performed to date.

In addition to school closings, existing facilities are aging, resulting in the need for additional maintenance and repairs throughout the city to bring facilities up to code. While it will not address all needs, such as technology improvements, the School Department is seeking a bond issue for repairs to its fire systems, general building improvements, mechanical system improvements, and additional site improvements. As detailed in the Capital Budget for 2012, the following repairs are required:

- **Fire System Improvements:** Repair and upgrades, including means of egress, fire detection systems, and other improvements, to all fire systems are required to bring them in compliance with revisions adopted in 2004 into the State Fire Code.
- **Building Improvement:** Repair and renovation projects include roof replacements, new auditorium seating and stage improvements at high schools.
- **Mechanical Systems:** Projects include filter replacement, steam systems, elevator improvements, lighting improvements, emergency generators, boiler replacements and more.
- **Site Improvements:** Projects include sewer connections (Francis, Greene, Gorton and Veterans), paving improvements, curb work, and athletic track resurfacing at Pilgrim and Veterans.

In addition to public schools there are several private schools located in Warwick. This includes several Catholic schools such as Bishop Hendricken High School, Overbrook Academy middle school, and the elementary school, Cedar-Hurst School to name a few. Numerous private pre-schools are also found throughout the city.

## 6. Police Department

The Warwick Police Department is housed in a facility located at 99 Veterans Memorial Drive. The facility, built in 1977, meets most requirements of the department at present staffing levels. In the years 2002 through 2005, a public safety bond allowed additions to be built to the headquarters building that created a new communications dispatch center, administrative services division offices and computer training room, and a new training room for the patrol division and an area that houses an incident command center. Up to the year 2008, the headquarters facility provided support facilities to 180 uniformed police officers and 55 civilian support personnel. In 2009, due to the difficult economic conditions facing the City of Warwick and with agreement during collective bargaining negotiations, the uniformed police personnel organization was reduced to 163 officers. At present the personnel organization for the department is 163 sworn uniformed personnel, 53 civilian support personnel, and 23 crossing guards: 107 officers/employees in the Patrol Division, 22 officers/employees in the Community Services Division, 31 detectives/supervisors/employees in the Detective Division, 36 officers/employees in the Administrative Services Division, 5 in the Professional Standards Division, 8 officers/employees in the Prosecution Division, and 7 officers/employees in Headquarters.

The department is committed to increased efficiency in its operations through improved technology. The department continues to update its Computer Assisted Dispatch (CAD)/Records Management System that handles the basic patrol operations and civilian support systems that deliver basic constituent services to the public. The department employs its mobile data terminal project in its uniformed patrol division that allows the officer increased efficiency in its tactical patrol operations in

28 Horoschak, Peter, "Warwick considers school consolidation." [http://www.wpri.com/dpp/news/local\\_news/west\\_bay/warwick-school-committee-considers-consolidation](http://www.wpri.com/dpp/news/local_news/west_bay/warwick-school-committee-considers-consolidation)



dealing specifically with taking constituent complaint reports, order maintenance, and crime control functions. The department also uses technology that assists the detective division/patrol division in crime analysis, computer forensic and AVID forensic investigations. Technology partnership with the RI Department of Corrections assists the department in community reentry projects for court probationers, prison parolees, and sex offender management programs. The department has also entered into a new program that tracks its purchasing and resource capabilities thru City administration procedures.

**Community policing.** Community/intelligence-led policing is an important community strategy that incorporates a close interaction between patrol/community services divisions allowing for closer cooperation with residents working together to prevent crime and improve the quality of life in the neighborhoods of the city. Beat officers work closely with the district community police officer and interact closely with the residents in the area to solve an array of problems within the specific geographic area. Crime analysis technology assist police and informs the public where the crimes are occurring and allows police a specific focus with the goal of crime reduction and increased quality of life. The patrol/community services function also provides constituent mediation and problem solving, sex offender registration/monitoring, traffic enforcement, alcohol enforcement, crime prevention, elderly affairs advocacy and safety, bike safety programs. The department also employs a school resource officer program in the Warwick Schools and administers to the crossing guard program during school hours. The Police Athletic League (PAL) also falls under the Community Services Division and works with over 1300 of the city's youth in over eight different sports. The PAL Office works out of a City owned facility that is leased to the PAL organization located at 80 Bend St. The Community Services Division also sponsors and supervises the Police Explorer Program. The Community Services Division has a traffic services unit that handles not only accident/serious accident reconstruction investigation and the traffic enforcement function but also handles

constituent complaints & traffic studies. This unit is resident in the Community Services Division.

The Community Services Division has its community police officers staff the three district sub-stations:

- The District One Office located at 759 West Shore Road serves the neighborhoods of Lakewood, Conimicut, Hillsgrove, Pilgrim Park, Spring Green, Lincoln Park, Massasoit Terrace, Gaspee, Norwood, Pawtuxet, and Governor Francis.
- The District Two Office located at the Boys & Girls Club located at 340 Oakland Beach Ave. serves the neighborhoods of Riverview, Bayside, Oakland Beach, Buttonwoods, Nausauket, Wildes Corner, Longmeadow, Warwick Neck, and Meadow View.
- The District Three Office located at 145 Greenwich Ave. serves Pontiac, Cowesett, Centerville, Apponaug, Natick, Potowomut, Greenwood, Arnolds Neck, Providence St., and Route 2 Business Corridor.

**Table 10.10: Warwick Fire Stations**

STATION	ADDRESS	NEIGHBORHOOD
1	111 Veterans Memorial Drive	Apponaug
2	771 Post Road	Lakewood/Norwood
3	2373 West Shore Road	Oakland Beach
4	1501 West Shore Road	Bayside
5	450 Cowesett Road	Cowesett
6	456 West Shore Road	Conimicut
8	1651 Post Road	Hillsgrove
9	314 Commonwealth Avenue	Ward 8

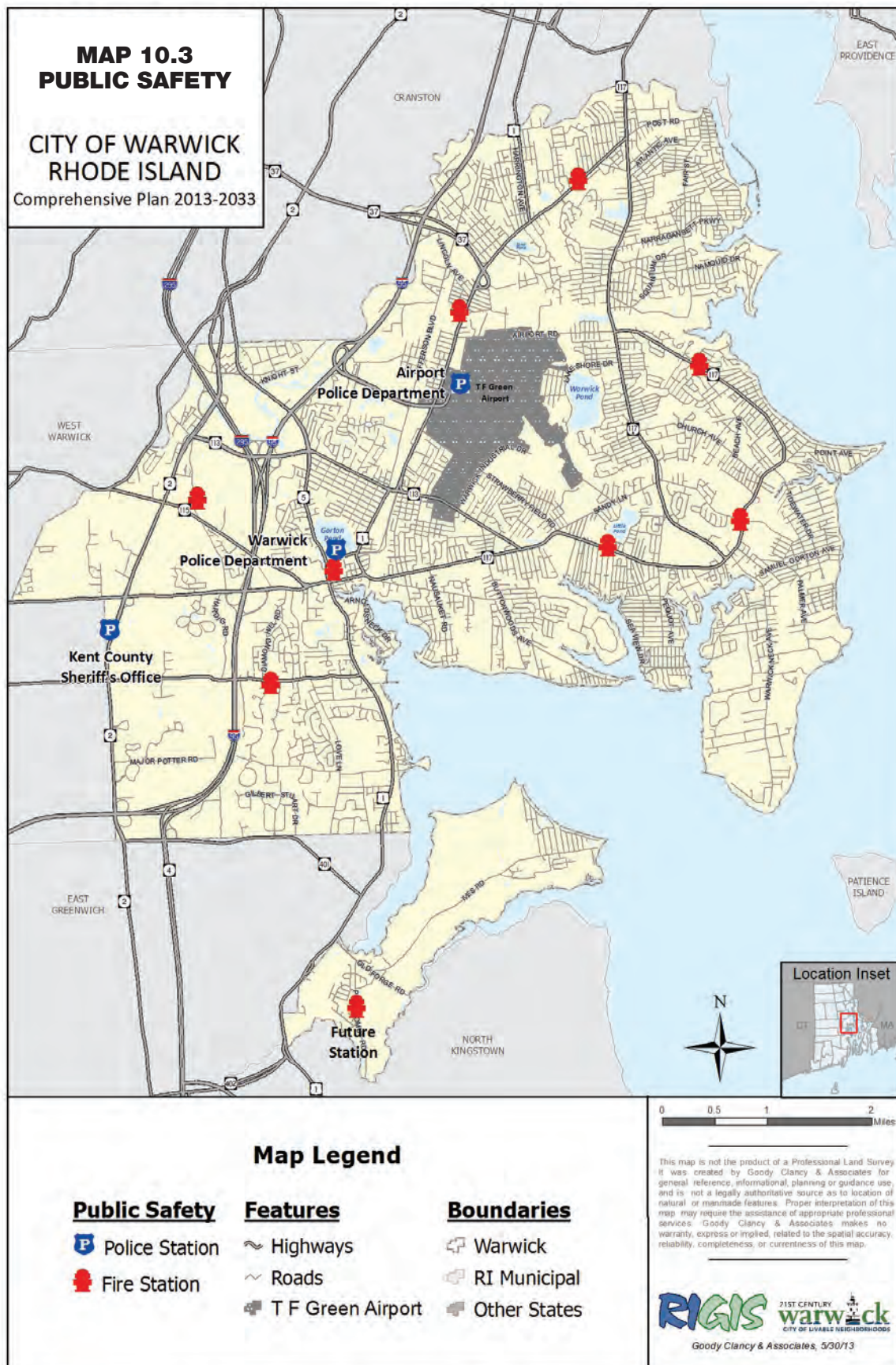
Source: [www.warwickfirefighters.org](http://www.warwickfirefighters.org)

**TABLE 10.11: Fire Department - Planned Capital Projects**

YEAR	TOTAL FUNDS	EQUIPMENT
2013-2014	\$1,175,000	Ladder 2, Engine 4
2014-2015	\$750,000	Ladder 3
2015-2016	\$425,000	Engine 5
2016-2017	\$435,000	Engine 9

Source: City of Warwick 2011-2012 Capital Improvements Program Budget







**Animal Control.** The department also supervises an animal control division that responds to all complaints involving animals and enforces state law and city ordinances regarding animals.

**Community service officers.** The City Charter and the Police Collective Bargaining recognizes the use of retired Warwick police officers and civilian volunteers, appropriately named community service officers, to assist police during major public events and natural disasters. The community service officers maintain their eligibility by volunteering their time to provide traffic control for Sunday church events and other public service events. The Police Collective Bargaining Agreement allows for both retired and community service officers to take paid traffic details.

**Firing range.** The Warwick Police Department maintains a weapons firing range facility in the Wildes Corner area of the city near the DPW Solid Waste Landfill Facility. The range allows for officers to qualify with their firearms in accordance with RI General Law and also provides a primary location for the department's SWAT and EOD Teams to train.

## 7. Fire and Rescue Services

The Warwick Fire Department operates out of eight stations throughout the city, including a headquarters station (Station 1) at 111 Veterans Memorial Drive in Apponaug village. The headquarters facility is home to all administration offices, including fire prevention, training, and EMS. The facility also houses fire and emergency vehicles including equipment including Engine 1, Ladder 1, and Rescue 1 emergency ambulance.

**Service Areas.** There are nine fire districts within the city, and residents are taxed equally regardless of where they live. The only area within the city that does not have a city-owned station and unit is Potowomut. This area is first served by the East Greenwich Fire Department, as well as by Station 5 in District 6. With the exception of

**Table 10.12: Warwick Public Libraries**

LIBRARY	LOCATION
Warwick Central Library	600 Sandy Lane
Apponaug Branch	3267 Post Road
Conimicut Branch	55 Beach Avenue
Norwood Branch	328 Pawtuxet Avenue

small areas in Buttonwoods and Warwick Neck, all areas are served by stations within suggested drive times, however at peak traffic hours, response times are more likely to be affected. This has been the case since the previous comprehensive plan.

**Staffing.** There are currently 213 active firefighters within the department. Staffing at the department is sufficient to handle existing and projected populations. With a standard of 5 firefighters per 1,000 housing units, the city would require approximately 189 firefighters; therefore, the city is well above the standard. However, given the amount of commercial and light industrial development within Warwick, particularly along Jefferson Avenue and along Rte. 2, the surplus is not as large as it may appear.

**Facility and Equipment Needs.** No additional fire stations are needed currently, nor will anticipated changes in population and land uses warrant additional locations. Routine maintenance and updated equipment, however, will be required. Funding for new equipment, including replacement of Ladders 2 and 3, and Engines 4, 5 and 9 is currently included in the City of Warwick Capital Improvements Plan and Budget. Funds are anticipated to be spent between the years 2013 and 2017. An analysis of conditions at each of the facilities for needed repairs should be undertaken.

## 8. Public Libraries

The Warwick Public Library provides materials and services to meet the information needs of the community. The collections within the four-library system emphasizes recreational and leisure materials in addition to current information in a variety of formats.



Warwick is served by the main public library, the Warwick Central Library, and three branch libraries located in Apponaug, Conimicut, and Norwood. The Central Library on Sandy Lane, built in 1964, with major renovations in 1997, is a 22,350 sf facility. It has the longest hours, offers the largest collection within the system and serves as a community center offering meeting room space for public use, numerous computer terminals, and programs for people of various ages. A complete list of programs is listed on their website, [www.warwicklibrary.org](http://www.warwicklibrary.org).

The neighborhood branches are older structures which have not been updated in recent decades. They are typically open for approximately 20 hours a week, offer smaller collections, and do not provide community rooms. Reading hours are the only scheduled activities.

**Funding and Maintenance.** The library system is funded by the City, State and by federal grants, and its activities are overseen by the Board of Library Trustees. Total municipal funding for the library for fiscal year 2011-2012 is just under of \$2.6 million, with an additional \$638,711 in funding from Public Library Grant-in-Aid. This covers personnel, materials maintenance, utilities, and other public service costs. Currently, there are no capital projects budgeted for libraries, nor are any planned. However, repairs, renovations and maintenance are needed.

Currently, maintenance projects are covered through the shifting of municipal funds (e.g., the \$20,000 Central Library roof replacement in 2011), or through grant funding. The primary source of grant funding has been through the Champlin Foundation. In recent years, grants from the foundation have paid for renovations at the Central Library including a new teen room, the reconfigured parking lot, and a \$100,000 reconfigured reference area that provides additional computer space.

Additional needs include the renovation of a former cafeteria to usable space at the central branch library, and an assessment of building conditions to all branch libraries. None of the branches are handicapped accessible, bathrooms are often located in basements, and one does not provide parking. Other improvements, such

as roof replacements and interior painting, may also be needed. Associated costs for these improvements have not been determined.

## 9. Community Centers and Senior Services

The City of Warwick maintains a number of venues that serve the local and citywide needs for public community meeting space including the Warwick Public Libraries, the Police Department Community Room, and the Pilgrim Senior Center. Buttonwoods Community Center serves the needs of the community by providing enriching health, recreational, educational, and social experiences in a welcoming environment. The BCC offers programs for all ages such as adult dancing, crafts and fitness programs. Additionally the center offers music lessons for children, youth and family support services including truancy and substance abuse and senior social activities. The center continues to evolve its programming according to the needs and desires of the local community.

To expand future community offerings the City is currently seeking to expand its recreational program by obtaining the Cooper Armory located on Sandy Lane for use as a city recreational center under the guidelines established by the Base Realignment and Closure Act (BRAC). The 26,000 square foot building is located close to the Mickey Stevens Sports Complex and is envisioned to provide additional recreation opportunities for city and state residents.

As Warwick's population continues to age, the need for services to support the city's senior population will increase. It is estimated that by 2030, nearly 1 in 5 residents will be 65 or older. However, despite this growth in the elderly population, budget constraints have led to closing two of the three city Senior Centers. Today, the Pilgrim Senior Center, a 16,000 sf facility at 27 Pilgrim Parkway, is the only active City-owned and operated senior center. The two facilities no longer operating are the JONAH Senior Center, and the Buttonwoods facility, though Buttonwoods remains open as a larger community center.





Services provided at the Pilgrim Senior Center by its staff and 200 volunteers, include meal service (lunches each weekday, and dinner on Tuesday), health seminars, affordable housing assistance, transportation assistance, as well as senior exercise and enrichment classes such as swing dance, adult yoga and needlework workshops. Seniors also receive vouchers for use at local farmers' markets.

The Senior Center operates 8 buses within Warwick to assist seniors with getting to and from the center, and for shopping excursions. According to the Director of the Pilgrim Senior Center, there is a growing need for more. Additional needs include a fitness center for seniors, and additional staff to assist with social services, particularly for senior housing assistance.

The greatest challenge facing the center will be to serve the growing number of seniors as the Baby Boom continues to age into the 65+ demographic, as well as a growing "fragile" population, those 85+. The mindset of this new generation of seniors, which prefers more active lifestyles, poses challenges such as providing and funding facilities appropriate for this group such as fitness centers, but also walking facilities such as multi-use paths, which is a larger citywide transportation and recreation issue. "Fragiles" on the other hand will require more assistive services, such as equipment rentals and transportation, and more that are not currently available. An assessment of needs and costs is required.

**Friends of Warwick Senior Centers, Inc.** To supplement funding from the city and state, a non-profit organization, Friends of Warwick Senior Centers, Inc, was formed by seniors in the 1990s to help raise additional funds to support senior programs and services within the city. The group holds fundraising events throughout the year to raise funds, and today is overseen by a 21-member Board of Directors.

## E RECOMMENDATIONS

### GOAL 1

Excellent quality and quantities of drinking water to meet all current and future needs of Warwick.

#### POLICY

- Provide a reliable, efficient supply of clean drinking water for of the City's residents, businesses, and institutions.

### STRATEGIES

**A. Ensure that the potable water delivered to the customers of both the Warwick Water Division and the Kent County Water Authority (KCWA) meets all drinking water quality standards established by the state Department of Health and the U.S. Environmental Protection Agency.**

#### Actions

1. **Protect existing and potential future water supply sources from contamination and over-withdrawals.**
2. **Support state planning efforts to identify auxiliary, redundant potable water supply sources to supplement the Scituate Reservoir, which supplies the bulk of the city's drinking water.**
3. **Coordinate with and support the KCWA in its efforts to continue implementing and updating supply management and system infrastructure renewal and replacement plans.**

**B. Continue to implement and update the Warwick Water Division's Water Supply System Management Plan and Clean Water Infrastructure Plan.**





This plan addresses the infrastructure replacement and capital improvements needs of the city's water distribution system, including programs to reduce/eliminate dead end mains, pressure drops, and non-account water (e.g., infiltration losses).

#### *Actions:*

1. **Amend the Warwick Water Division's rate schedule as appropriate to account for expected declines in metered use (through increased conservation efforts) and develop a revenue structure to sustain the city's state-mandated maintenance, replacement, and capital improvement programs.**

### **C. Promote and encourage water conservation efforts to meet the requirements of the state's Water Use and Efficiency Act of 2009.**

#### *Actions*

1. **Continue public education to raise awareness about water conservation.**

## **GOAL 2**

Efficient and reliable sewer service and wastewater disposal throughout the city.

#### **POLICY**

- Provide sustainable systems and programs for the, safe, efficient, and effective disposal of sewerage and protection of the environment.

## **STRATEGIES**

### **A. Upon completion of regulatory review and public comment processes, implement the Facility Plan Amendment for the Warwick Wastewater Treatment Facility.**

#### *Actions*

1. **Include programs for the maintenance of and capital improvements to existing system infrastructure (collection, pumping, and treatment**

**facilities) and the prioritized expansion of the collection system to areas not presently served.**

2. **Expedite implementation of the proposed flood protection and mitigation improvements at the WWTF (raising of the levee crest) to better protect the facility and assets from extreme storm and river flow events, and identify other WSA infrastructure (e.g., pump stations) that require enhanced protection from flooding.**
3. **Continue to engage with the Town of East Greenwich, residents, and other stakeholders to develop environmentally and economically sustainable strategies for improved wastewater management in the Potowomut section of the city.**

### **B. Ensure that the wastewater system and on-site wastewater systems operate with best practices and at the highest level.**

#### *Actions*

1. **Consistent with the findings of a recent comprehensive rate study prepared for the Warwick Sewer Authority (WSA), ensure the balancing of costs of continued maintenance and capital improvements in system infrastructure with equitable revisions of the sewer rate schedule, and ensure the pursuit of program and improvement financing through the state's Clean Water State Revolving Fund (SRF) loan program.**
2. **Support state programs for the protection and restoration of surface and groundwater quality through continued implementation of WSA's Mandatory Sewer Connection Program, including enforcement of connect-capable fees where applicable.**
3. **Where new development or redevelopment projects are proposed in un-sewered areas, require proven, best-practice siting and design of on-site wastewater treatment systems, particularly in locations near environmentally sensitive wetland and coastal resources.**
4. **Continue to implement the Industrial Pretreatment Program (through the issuance, monitoring, and enforcement of wastewater discharge permits) to protect WSA facilities and receiving waters from the discharge of toxic and/or excessive conventional pollutants.**



5. **Develop and distribute educational materials to discourage disposal of harmful materials into on-site disposal systems and the municipal sewer system.**

### GOAL 3

Stormwater management and drainage systems that are effective and reliable and incorporate best practices.

#### POLICY

- Provide adequate, efficient and environmentally sensitive programs and practices to manage stormwater runoff and mitigate adverse impacts on receiving waters, including water quality, flooding, and erosion and sedimentation.

### STRATEGIES

#### A. Reestablish compliance with the city's Rhode Island Pollutant Discharge Elimination System (RIPDES) General Permit for Stormwater Discharge from Small Municipal Separate Storm Sewer Systems (Small MS4s)

##### Actions

1. **Implement and continue adherence to the required minimum measure elements contained in the City's Stormwater Management Program Plan (SWMPP). Actions required under the RIPDES Phase II include, but are not limited to, the following:**
  - public education, outreach, and participation programs to raise awareness of stormwater runoff and its impact on the environment
  - mapping of city-owned stormwater infrastructure (including collection systems and best management practices) and detection/elimination of any illicit discharges to these systems

- development and enforcement of ordinances requiring construction-phase and post-construction runoff control through the implementation of erosion/sedimentation and stormwater best management practices (BMPs)
- preparation of annual reports in accordance with RIPDES requirements
- development of amendments to the city's SWMPP to address approved Total Maximum Daily Load (TMDL) requirements, which are established by the Rhode Island Department of Environmental Management to reduce pollutant loadings to impaired surface waters of the state.

2. **Identify and prioritize existing drainage systems for the construction of appropriate BMPs to improve the quality of runoff discharged to receiving waters.**
3. **Amend planning and zoning regulations to require reporting and enforce maintenance of privately owned BMPs and drainage systems.**

#### B. Require all new development and redevelopment projects to adhere to the applicable design, construction, and maintenance requirements set forth in the latest edition of the Rhode Island Stormwater Design and Installation Standards Manual.

##### Actions

1. **Encourage proponents of new development and redevelopment projects to incorporate low-impact development (LID) techniques for the avoidance, reduction, and source management of potential stormwater impacts.**



## GOAL 4

Continuing to exceed the state's 35% recycling requirement and meeting or exceeding the state's 50% solid waste diversion goal.

### POLICY

- Provide safe and efficient programs for the recycling and disposal of municipal household solid wastes and minimize the quantity of solid wastes that are permanently landfilled.

## STRATEGIES

### A. Operate the city's waste collection and recycling programs (including the automated system for the collection and transport of residential solid waste and recyclables) in a manner consistent with the State's Comprehensive Solid Waste Management Plan.

#### Actions

1. **Coordinate with the Rhode Island Resource Recovery Corporation (RIRRC) in continuing to develop and implement initiatives for (a) reducing in the amount of source waste generated per capita and (b) diverting waste material from landfill disposal through effective recycling, composting, and other waste-diversion programs.**
2. **Continue to maintain the amount of municipal waste disposed of at the state's Central Landfill within the municipal caps/quotas established under state law.**
3. **Support the development of programs to increase recycling and diversion in commercial and other non-residential sectors.**

## GOAL 5

City facilities that are state-of-the-art and maintained for long-term use.

### POLICY

- Support investment in an asset-management system.
- Repurpose and renovate existing municipal buildings, if possible, before building new ones.

## STRATEGIES

### A. Acquire and implement a municipal asset management system to improve the capital planning process, as well as support more efficient maintenance.

The physical systems and structures owned by the City represent a huge community investment. These are long-term assets purchased with public funds and should be designed, built, maintained and managed with life-cycle costs in mind. Asset management involves taking care of these physical systems and structures so that they deliver the desired level of service at the most reasonable cost.

A number of software systems are available to help governments keep track of the condition of their assets and support decision making about maintenance and replacement. These systems are connected to GIS (geographic information systems), so assets are mapped and their locations connected to a database containing information on when they were put in service, expected service life, condition, and how much annual maintenance they require. Managers need this information in order to make the most cost-effective decisions while maximizing service and to drive decisions on whether and when to maintain, repair, or replace assets. While it requires an initial investment, training, and improved data systems, asset management ultimately saves money. An asset-management system can be built incrementally, as assets are improved, built or acquired and added into the system.



### Actions

#### 1. Develop a plan for establishing and implementing an asset-management system.

The steps in establishing an asset-management system should include:

- Identification of best-practice examples of municipal asset management.
- A report and presentation documenting the long-term costs and benefits of implementing an asset-management system and funding.
- A plan for training personnel after acquisition of the system, but before department-wide installation and implementation.

#### 2. Determine specific and detailed asset-management needs of each municipal department.

A complete asset-management system addresses the needs of all municipal departments, including documented roadway, utility, vehicle, building and other conditions. Should funding be limited, however, most asset-management software allows municipalities put a system in place incrementally.

#### 3. Determine if additional school consolidations are warranted and plan for building reuse.

- Review enrollment projections.
- Identify strategies to use existing facilities more efficiently.
- Include consideration of open space and recreation needs in any study of future reuse of schools.
- Support adaptive reuse strategies consistent with land use policies to bring closed school facilities back into use and include neighborhood residents in the planning process.

#### 4. Consider augmenting the internally-created schools facilities plan with additional technical assistance.

## GOAL 6

Police and fire facilities that meet best-practice performance standards.

### POLICY

Continue to support all public safety departments so that they are able to meet best-practice standards.

## STRATEGIES

**A. Continue regular review and planning for manpower, service areas, facilities and equipment, and response times to insure adequate protection and adherence to best-practice standards throughout the city.**

### Actions

#### 1. Continue to support Community Policing and other community-based public safety programs.

## GOAL 7

Effective services that support a growing senior citizen population.

### POLICY

Support programs that help senior citizens age in place.

## STRATEGIES

**A. Develop a plan for senior services and aging-in-place programs.**

Recognizing the aging of the population and especially changing needs as the aging of the Baby Boom generation occurs, a number of communities have developed plans to help them combine government supported and grassroots initiatives to help the growing senior citizen population age in place—for example, *Aging in Cam-*





bridge (<http://www.cambridgema.gov/CDD/Projects/Planning/Aging.aspx>).

### *Actions*

**1. Survey senior citizens and retirees about their needs and preferences in services.**

Senior citizens in different age groups require different services, and the Baby Boom generation is already showing evidence of re-defining retirement and old age as it begins to age.

**2. Review existing services and programs in Warwick and the region to see where service and support gaps exist.**

**3. Explore grassroots service “village” programs to help seniors age in place.**

As they age, people typically prefer to stay in their own homes—to “age in place”—if possible. To support that desire, grassroots organizations have emerged around the country that create service and community-connection programs known as “aging-in-place villages.” One of the first of these was founded in 2001 in Boston as Beacon Hill Village. It is a membership-based group for anyone over the age of 50 living in downtown Boston. It provides information and referral services, wellness programs, shopping trips, social and recreational events and many other services. Discounted memberships are available for low-income members. These kinds of grassroots communities coordinate with and add to services available through the city senior services programs.

## **EXECUTIVE SUMMARY**

### **WARWICK DEPARTMENT OF PUBLIC WORKS WATER DIVISION WATER SUPPLY SYSTEM MANAGEMENT PLAN**

2007 NOV 1 AM 11:23:29

#### **GENERAL**

The Water Division of the Water Department of Public Works completed the Water Supply System Management Plan in 2001 in accordance with the State of Rhode Island Water Resources Board "Rules and Procedures for Water Supply System Management Planning". This Executive summary was developed to highlight the findings and recommendations of Warwick's Water Supply System Management Plan. The five year update will only highlight major changes since the last 30 month update. A comprehensive overview of all sections of the WSMP will take place in the future as required by regulation.

#### **GOALS**

The goals of the Warwick Water Division are to conserve water through the implementation of various programs, reduce non-account water, maintain water quality in accordance with the Safe Drinking Water Act, and conform to the goals of State Guide Plan Element No. 721.

#### **SYSTEM OVERVIEW**

The Warwick Water Division serves about 88% of the population of the City of Warwick. The Cowesett, Natick, Apponaug, Tollgate, and portion of the Greenwood sections of Warwick are served by the Kent County Water Authority.

The Warwick Water Division receives all of its water from interconnections with the Providence Water Supply Board and the Kent County Water Authority, which serves the Potowomut section of Warwick. The Warwick Water Division does not produce any water. The Warwick Water Division owns no water sources and does not operate a treatment plant.

The Warwick Water Division also sells wholesale water to the Kent County Authority through its interconnection on Quaker Lane.

The Warwick Water Division water system includes over 110,000 linear feet of transmission main; approximately 314 miles of distribution main, 5 active or emergency interconnections, 3 storage tanks, and one pump station.

## **WATER QUALITY**

The Warwick Water Division receives treated water from the Providence Water Supply Board and the Kent County Water Authority. It is the responsibility of the Warwick Water Division to protect the quality of the water until it reaches the customer. The Warwick Water Division routinely tests the water as required by Safe Drinking Water Act (SDWA). The 2006 Consumer confidence Report stated that water supplied by the WWD has consistently met all SDWA standards.

## **AVAILABLE WATER VS. DEMAND**

The comparison of available water vs. demand for the 5-year and 20 year planning period is:

YEAR	AVAILABLE WATER* (MGD)	AVERAGE DAILY DEMAND (MGD)	SURPLUS WATER (MGD)
2007	11.35	9.54	1.81
2020	11.42	9.60	1.82

\*-available water was determined by multiplying the service area population (75,511 people in 2000) by 150 gallons per capita per day according to the agreement with PWSB.

## **DEMAND MANAGEMENT**

The Warwick Water Division has instituted several programs to reduce demand and promote water conservation including a Residential Retrofit Program, Major User Technical Assistance Program, and Public Education Program.

Under the current Residential Retrofit Program, over 8,000 kits have been distributed to customers. In 2008 THE Warwick Water Division will begin annual notification of the Residential Retrofit Program through the insertion of “stuffers” in the water bills subject to resources being approved by the City Council.

Warwick Water Division personnel currently participate in the Rhode Island Water Works Association education programs. The Warwick Water Division will review available educational information for use in the schools and will work with the school department to provide information for use in the classroom.

The Warwick Water Division has started the basis of a Major User Technical Assistance Program (MUTAP) by interviewing all major users. The Warwick Water Division is concentrating on completing the high volume meter retrofit program prior to establishing any additional major user program. The Major User Technical Assistance Program has been instituted by the Warwick Water Division in 2002 and will continue for the foreseeable future subject to resources being approved by the City Council.

## **SYSTEM MANAGEMENT**

To reduce non-account water, the Warwick Water Division has instituted a Meter Installation and Maintenance and Repair (MIMR) Program, a Leak Detection and Repair Program (LDR), and a Preventative Maintenance Program.

### **Meter Installation and Maintenance and Repair (MIMR) Program**

The Warwick Water Division began an accelerated meter replacement program in the mid 1990's when older residential meter were replaced and remote reading systems were installed on a turnkey contract such that more than 99% (>17,000) of the remaining residential meters were upgraded and equipped for remote reading.

The Water Supply System Management Plan had required installation of remote meter reading system by July 1, 2001. The Warwick Water Division is essentially in full compliance with the requirement that all accounts are metered and all meters are read remotely.

The Water Supply System Management Plan had required all water systems to implement reading and billing at less than a 1 year interval by July 1, 2001. Warwick Water has implemented a plan to quarterly meter read and water bills all of its customers. The resources necessary to implement the reading and billing process was approved in the budget for the foreseeable future.

### **Leak Detection and Repair (LDR) Program**

The Warwick Water Division is planning to implement a Leak Detection and Repair (LDR) program in 2008, pending approval of resources by the City Council during the Fall of 2007. The LDR program will cover the entire system over the 2008 calendar year. It is recommended that the LDR Program be repeated every 3-5 years thereafter.

### **Preventative Maintenance Program (PM)**

The Warwick Water Division's present Preventative Maintenance (PM) Program includes hydrant flushing, valve exercising, pump station maintenance, storage tank maintenance, and interconnection maintenance. The Warwick Water Division is scheduled to enhance its preventative maintenance program. The hydrant flushing program will be formalized to a unidirectional flushing program during 2008. The valve exercising program will be increased so that each valve is exercised in conjunction with the unidirectional flushing program, the storage tanks will be inspected and repainted during the 2008 calendar year. The existing pump station and interconnection maintenance programs have continued since the last update.



## **EMERGENCY MANAGEMENT**

The Warwick Water Division has completed a Vulnerability Assessment and developed an Emergency Response Action Plan which is in the appendix the Water Supply System Management Plan. The following tables identify the Critical Facility Components identified through the Vulnerability Analysis.

### **CRITICAL COMPONENTS WATER QUALITY RELATED**

Tier NP Quality Condition Components	Operational Area
Pettaconsett Connection to Providence	Wholesale Water Purchase
Natick Connection to Providence	Wholesale Water Purchase
Bald Hill Storage Facility	Transmission/Distribution
Warwick Neck Storage Facility	Transmission/Distribution
State Street Booster Pump Station	Transmission/Distribution
Post/Forge Rd Connection to Kent County	Wholesale Water Purchase

### **CRITICAL COMPONENTS WATER QUALITY RELATED**

Tier 2 Quantity Condition Components	Operational Area
<b>WARWICK SECTION</b>	
Natick Connection to Providence	Wholesale Water Purchase
42inch transmission main from Natick Connection to Bald Hill Rd	Transmission/Distribution
42inch transmission main in Bald Hill Rd From Tollgate Road south to Bald Hill Storage Facility and Quaker Lane connection to Kent County Water Authority	Transmission/Distribution
Bald Hill Storage Facility	Transmission/Distribution
36inch transmission line from Bald Hill Storage Facility	Transmission/Distribution
Pettaconsett Connection to Providence	Wholesale Water Purchase
30inch transmission line from Pettaconsett Connection to Post Road	Transmission/Distribution
12 and 10 inch transmission lines from State Street Booster Pumping Station south along Warwick Neck Ave	Transmission/Distribution

<b>POTOWOMUT SECTION</b>	
10 inch transmission main along Forge/Ives Rd to Potowomut	Transmission/Distribution
<b>Tier 3 Quantity Condition Components</b>	<b>Operational Area</b>
<b>WARWICK SECTION</b>	
Two Providence Connections at same time	Wholesale Water Purchase
<b>POTOWOMUT SECTION</b>	
Forge/Post Road connection to Kent County Water Authority	Wholesale Water Purchase

### **IMPLEMENTATION SCHEDULE**

The following schedule has been developed to implement the programs discussed in the Water Supply System Management Plan:

IMPLEMENTATION PLAN FOR WATER SUPPLY SYSTEM MANAGEMENT PLAN					
Elements to be addressed Action		Responsible Agency	Schedule	Remarks Est. Cost	
DEMAND MANAGEMENT					
Residential Retrofit Program	Distribute Retrofit Kits	Warwick Water Division	Ongoing	Approx 8,000 kits distributed o date	Kits provided to customers
Public Education Information	Conservation Promotional and informational bill stuffers	Warwick Water Division	Ongoing	Create conservation awareness	\$2,500 annually
	Participate in “Water Week” Public Education Program	Warwick Water Division	Annual		Cost limited to WWD staff time
Major Users Technical Assistance Program	Continue high volume meter retrofit program	Warwick Water Division	Ongoing	Reduce Consumption	\$10,000
	Conduct follow-up site visits of major users	Outside Contractor/staff	Ongoing	Evaluate effectiveness of program	\$10,000

Building Code Enforcement	Require low-flow plumbing fixtures	Warwick Building Department	Ongoing	Reduce Consumption	No cost to WWD
Water Rates and Pricing	Complete water study rate	Outside contractor	2007/2008	Analyze adequacy of current rates	\$15,000
	Revise rate schedule	Outside Contractor	To be determined	Stability in rates	In rate study
SYSTEM MANAGEMENT					
Leak Detection And Repair	Leak Detection Survey	Outside Contractor	2008	Reduce non-revenue water	\$30,000 per survey
	Repair located leaks	Warwick Water Division	2008	Reduce non-revenue water	\$20,000 per year

## IMPLEMENTATION PLAN FOR WATER SUPPLY SYSTEM MANAGEMENT PLAN

Elements to be addressed	Action	Responsible Agency	Schedule	Remarks	Est. Cost
Preventative Maintenance Program	Uni-directional Flushing	Outside Consultant and Warwick Water Division	Annually (beginning 2008)	Cleaner Water	\$20,000 plus WWD staff time
Preventative Maintenance Program	Enhanced Valve Exercising	Warwick Water Division	Annually	Prevent Broken Valve	WWD staff time
Rehabilitation of Distribution/Transmission System	Five year capital improvements program	Outside Contractor	**to be determined	Address system deficiencies and rehabilitation needs	\$2 million per year
Meter Installation, Maintenance and Repair Program	Meter replacement	WWD Staff	2006-2010 ongoing	Replace meters every 15-20 years	\$200,000 every year beginning in 2007
	Meter testing	Outside Contractor and Warwick Water Division	2008	Meters 2" and larger	\$10,000 every year and WWD staff time
<b>SUPPLY MANAGEMENT</b>					
Water Quality Protection	Water quality monitoring	Warwick Water Division	Ongoing	Sampling sites are continuously monitored	\$15,000 annually
	Coordination with local governments	Warwick Water Division	Ongoing	Represent WWD interests in local planning process	Cost limited to WWD staff time
Emergency Plan	Implement Plan	Outside Consultants and Warw Water	Ongoing	Update annually and after each emergency	\$2,500 annually



## **FINANCIAL MANAGEMENT**

The Warwick Water Division hired an engineering consultant to develop a computerized hydraulic model of the Water System. The model is finalized and was completed by the summer of 2002. The hydraulic model was developed to assist in the preparation and implementation of the Water System Master Plan. The Water System Master Plan will include a capital improvements program that has identified specific upgrades to the water system along with a schedule for implementation.

The Warwick Water Division will commission a rate study to be completed during the first six months of 2008. The new rate study will hopefully include approximately \$2,000,000 annually for implementation of the Capital Improvements Program.

The Water Division has maintained a rate structure that includes a service charge based on the size of the meter and a consumption charge that is charged at a flat rate. Other charges to customers are based upon the actual cost of providing service; e.g. private fire protection, service installations, etc.

Currently meters are billed on a quarterly basis. The Water Division has completed installation of new remote reading meters for all customers. The resources necessary to implement the quarterly reading and billing process have been approved in our annual budget for the foreseeable future.

## **COMMENTS**

The Warwick Water Division takes pride in the high quality of the water delivered to its customers. The Water Division is constantly striving to operate the system to benefit the citizens and businesses of Warwick while maintaining efficiency such that the rates and charges are appropriate to operate, maintain, and protect the integrity of the water system.



### **Background**

This Water Supply System Management Plan (WSSMP), as amended, has been prepared as required under the Rhode Island General Laws (RIGL) 46-15.3, as amended and titled, "The Water Supply System Management Planning Act" (Act). The legislative authority to effectuate the goals and policies of this Act has been conferred to the Rhode Island Water Resources Board (RIWRB). To this end, the RIWRB has promulgated the Rules and Regulations for Water Supply System Management Planning, October 2002, as amended to implement the provisions of this Act.

Under this regulation, the Kent County Water Authority (KCWA), as a water purveyor supplying over 50 million gallons of water per year, is responsible for the preparation and adoption of a WSSMP. It also requires that the KCWA update this WSSMP periodically, as significant changes warrant but at a minimum of every five years, or as otherwise stipulated in the Regulations.

WSSMP's are prepared in order to provide the proper framework that will facilitate the effective and efficient conservation, development, utilization and protection of the natural water resources of the State as utilized by the water purveyor. Further, the overall goals incorporate the applicable policies and recommendations of the Rhode Island Water 2030, State Guide Plan Element 721. The purpose of this WSSMP is to outline the objectives of the Water Supply System Management Planning process for the KCWA water supply system, and to serve as a guide to employ the proper decision-making processes toward meeting that goal.

This WSSMP contains a detailed description of the water system and includes the policies and procedures related to the general function, operation, and management of the water system. The water quality protection component of the plan is contained, separately, under Volume II. The Emergency Management section, Volume III, relates to the vulnerability assessment of the water system for use in emergency planning. It shall be incumbent upon the KCWA to implement the recommendations and procedures outlined in this WSSMP in order to comply with the overall requirements of the Act.

## **Water System Description**

The KCWA was established by legislation of the General Assembly of the State of Rhode Island and Providence Plantations in 1946. Formation of the KCWA entailed the consolidation of three water companies: the Warwick and Coventry Water Company, the Pawtuxet Valley Water Company, and the East Greenwich Water Supply Company. The 1956 General Laws empowered the KCWA to own, operate, and maintain a water supply system (including all water supply sources, pumping stations, transmission facilities and distribution piping) in Kent County, and to serve the communities that comprise Kent County (i.e., Coventry, East Greenwich, West Greenwich, Warwick, and West Warwick). Moreover, since 1956, the KCWA has supplied water to localized outlying regions of Cranston, North Kingstown and Scituate. The service population is comprised mainly of residential, commercial, and government customers of which there are over 26,560 metered accounts. The total service population has been estimated at 88,781 persons.

The primary source of water supply for the KCWA water system is wholesale water purchased from the PWSB and City of Warwick which accounts for approximately 93% of system demand for the year 2011. The KCWA also owns three independent wellfields (Mishnock, Spring Lake, and East Greenwich) that collectively supplied approximately 12% of the total system demand in the year 2011. Currently, the East Greenwich Well is the only operating and active well source.

The KCWA will be placing the Mishnock Water Treatment Facility on line in 2013. At this time, groundwater is disinfected at each of the production wells via injection of a diluted 15% hypochlorite solution. In addition to disinfection, potassium hydroxide is added for pH adjustment and corrosion control.

The transmission and distribution system consists of approximately 402 miles of water main, with sizes ranging from 2-inch diameter in older areas that serve domestic supply only, to 24-inch diameter transmission mains, which transport water from the supply sources and storage tanks to the distribution system. Transmission mains, which are defined as water mains 12 inches or greater in diameter, total approximately 38.4 miles, or 9.7 percent of the total system piping.

The service area is operated as eight (8) distinct service areas (pressure gradients), each operating at varying hydraulic grades. Three of the pressure gradients serve the majority of KCWA's customers.

There are ten water storage facilities that are operated by the KCWA and maintain the pressure gradients. The KCWA owns and operates three (3) booster pumping stations (Setian Lane, J.P. Murphy Boulevard and Johnson Boulevard Pump Stations) and two (2) transmission pumping stations (Clinton Avenue and Quaker Lane Pump Stations), in addition to the four (4) well pump stations (with only the East Greenwich Well active).

The KCWA maintains four interconnections to neighboring water purveyors – two each with Providence Water and the City of Warwick. Three of the four interconnections supply the KCWA with finished water on a daily basis, while one of the interconnections to the City of Warwick (Potowomut) conveys finished water to the City of Warwick. The KCWA also has four emergency interconnections, one with the Quonset Development Corporation, one with the Town of North Kingstown, one is offline in the City of Warwick and one is with the Providence Water Emergency Interconnection on Hoover Street in West Warwick.

Kent County service area comprises five communities in central Rhode Island (Coventry, East Greenwich, West Greenwich, Warwick, and West Warwick). The general laws of Rhode Island permit the KCWA to own, operate and maintain a water supply coterminous the county's political boundaries. In addition to serving all or parts of those communities, KCWA service has been extended outside of its legislative boundaries to contiguous bordering areas in need of public water supply. Currently, its service area also incorporates parts of Oaklawn in Cranston, Western Cranston, southeastern Scituate, and the extreme northeast corner of North Kingstown.

The following table indicates the breakdown of KCWA customer account distribution for the year 2011.

<b>Type of Account</b>	<b>Number of Accounts</b>
Residential	24,912
Commercial / Industrial	1,351
Governmental	297
Other (Dry – Non Metered Fire Lines)	144
<b>Total</b>	<b>26,704</b>

The KCWA does not have the ability to accurately record actual population served for each water use classification (i.e., residential, commercial, industrial, government). Census information represents an



average population for residential occupancy. A reasonable estimate of total residential population served within the service district can be derived using statewide planning standards and utilizing various sources of data including the number of residential services, population figures, number of households (actual and projected), and persons per household.

#### **Population Per Community versus Population Served by KCWA**

<b>Community</b>	<b>2010 <sup>1</sup></b>	<b>2011 Population Served <sup>2</sup></b>	<b>Percent Served</b>
Coventry	35,014	26,971	77%
Cranston*	81,131	2,257	3%
East Greenwich	13,146	12,010	91%
North Kingstown*	26,486	28	0%
Scituate*	10,325	1,364	13%
Warwick	85,620	15,504	18%
West Greenwich	6,135	1,728	28%
West Warwick	29,191	28,947	99%
* No projected Increase	<sup>1</sup> Taken from 2010 Census	<sup>2</sup> Taken from Actual Census Track	

The water supply and distribution system is 100% metered. Master meters located at each individual well station and interconnection to neighboring purveyors, meter 100% of the water produced and purchased via wholesale interconnections. Every service connection within the water distribution system is metered at the point of sale, with the exception of a small amount of dry non-metered fire services, yielding 99.4% metering. Since 2010, the KCWA has begun the process of replacing the water meters with radio frequency reading systems. Commercial meters and large meters over 2 inches are not being replaced as part of this program. The large meter replacement and/or testing program has been implemented. Some customers have been resistant to comply with the Public Utilities Commission's regulations requiring the testing of large meters on an annual basis. It is anticipated that the large meter replacement/calibration program will continue to fall short of the prescribed 100% testing goals due to customer resistance to comply with PUC requirements. Legislative reform and/or amendment to PUC regulations are necessary to assist water purveyors in compelling customer compliance (i.e. violation with fine).

A review of production data totals for the past ten (10) years (2002 - 2011) reveals an average production rate of 3,348 million gallons per year (mgy), with a high of 3,874 mgy occurring in 2005, and a low of 2,860 mgy occurring in 2009. Based on the total production, the current Average Day Demand for calendar year 2011 computes to 8.02 million gallons per day (mgd) for the entire system. The

current Average Day Demand for calendar year 2011 based on total system production is 8.02 mgd. The current Average Day Demand for calendar year 2011 based on the total volume of water metered at the point of sale (water purchased ie. residential, commercial, etc.) computes to 6.78 mgd for the entire system. The volume of water sold to residential customers in 2011 totaled 1,869.05 million gallons, which averages to a daily residential consumption of 5.1 mgd. Based on the estimated residential service population of 88,781 persons, the current per capita system demand for residential users is approximately 57.67 gpcpd.

The KCWA supplied water to forty-eight (48) major users in 2011. Kent County's major water user class varies greatly ranging from hospitals, to a yacht club, to laundromats and private multi residential properties. The majority of the major users, however, are either residential entities (i.e. mobile home parks, condominium associations, etc.) or large industrial enterprises. In 2011, major user water consumption totaled approximately 495.7 million gallons.

The KCWA has maintained an average of 7.62% non-account water since 2002, and 8.2% for the year 2011. This rate is below the goal of 10% set forth in 2011 Water Use and Efficiency Act, RI General Laws §46-15.3-22(b). The success KCWA has achieved is largely due to the large meter testing program, residential retrofit program, the meter replacement program, and the aggressive leak detection and repair program that it maintains.

No specific legal obligations or contract agreements exist between any city or town regarding the KCWA's provision to supply water to undeveloped territory. Agreements do exist for wholesale supply from the PWSB and the City of Warwick to obtain supply. KCWA also has an interconnection agreement with the North Kingstown Water Department the Quonset Development Corporation and the City of Warwick to provide water under emergency circumstances.

Water conservation initiatives are defined as the "methods, procedures and devices designed to promote efficient use of water and to eliminate waste of water." The KCWA uses seasonal press releases to encourage efficient outdoor watering techniques, provide tips on how to check your home for leaks, encourages the installation of low-flow retrofit devices, and recently developed a Water Conservation Action Plan.

## **Recent System Improvements**

The KCWA maintains an ongoing, aggressive Capital Improvement Program (CIP) in order to provide its customers with a safe and reliable supply of potable water. What follows is a list of major system improvements that are planned for the future or have taken place in recent years.

- |  |                    |
|--|--------------------|
| • Quaker Lane pump station rehabilitation study            | Feb 2007           |
| • Mishnock Wells Water Treatment Facility                  | under construction |
| • Water Conservation Action Plan                           | Jan 2007           |
| • Evaluation of the Clinton Avenue Pump Station            | 2008               |
| • Distribution Storage Tank Hydraulic Evaluation (ongoing) | Dec 2006           |
| • Computer Model Upgrade                                   | Feb 2006           |
| • Major Users Technical Assistance Program                 | Jan 2006           |
| • Distribution system computerized model update            | 2005               |
| • Infrastructure Rehabilitation pipeline database update   | 2009               |
| • Emergency Response Plan                                  | 2012               |
| • Five-Year Capital Improvements Program Report            | Jan 2012           |
| • East Greenwich Well sequestering study                   | 2004               |
| • East Greenwich Well Treatment Study                      | 2012               |

## ***Water Quality Protection***

Volume II of the WSSMP fulfills the requirements of the water quality protection component of the plan. An update of the 2011 Kent Count and North Kingstown Source Water Assessment Plan (SWAP) for the KCWA was developed in accordance with the Guide to Updating Source Water Assessments and Protection Plans, final draft October 2011. The final risk ratings for the East Greenwich, Spring Lake, and Mishnock Wellhead Protection Areas were determined to be consistent with the 2006 ratings.

## **Current and Future Demands**

Kent County has grown moderately over the past ten years and over this same span, however, the average day demand has remained fairly constant, indicating the effective employment of water

conservation measures. Anticipated future demands for the 5- and 20-year planning periods were developed utilizing population projections for each service community as well as information from hydraulic modeling reports. The following table shows the estimated ADD and MDD for 5- and 20-year planning periods.

	<b>ADD</b>	<b>MDD</b>
<b>5-year</b>	11.6	22.4
<b>20-year</b>	13.4	25.6

Theoretical Water Supply values were developed for the current year and 5-and 20-year planning periods.

#### **Theoretical Water Supply**

	<b>Present*</b>	<b>5-Year (2010)*</b>	<b>20-Year (2020)*</b>
Clinton Avenue	25.00	25.00	25.00
Oaklawn Avenue	0.19	0.19	0.19
Quaker Lane	4.60	10.10	10.10
East Greenwich Well	2.00	2.00	1.60**
Mishnock Wellfield	0.00	2.4	1.92**
Spring Lake Well	0.00	0.26	0.21**
<b>Total</b>	<b>31.79 mgd</b>	<b>39.95 mgd</b>	<b>39.02 mgd</b>

**\*Pump station values are based on the maximum capacity (both high and low service gradient pumps operating) of the facility and may not be achieved over extended periods due to operational system constraints. Over time, all wells will see a reduction in capacity due to aging of the well through general use. Values are used for planning purposes only and should not be construed as actual available water supply.**

**\*\*20% reduction in well capacity due to aging of well.**

Comparison of the anticipated future demands verse the theoretical water supplies revealed that the KCWA will be able to meet demands for both the 5- and 20-year planning periods.

## **Conservation and Education**

The Hunt River Wellhead Protection Area Planning Committee was comprised of members from the KCWA, Rhode Island Economic Development Corporation, and the Towns of East Greenwich, North Kingstown, and the City of Warwick. It was intended that this Committee's first task be the update of the Hunt Aquifer WHPP. This did not occur and the sunset imposed by the Town of East Greenwich regarding this committee action plan ran out. KCWA has met with the other two water suppliers, North Kingstown and QDC, who use this aquifer as their source of supply to develop a coordinated management plan for this source. This plan was presented to the RIWRB in April 2007. The plan was accepted by the RIWRB and is now being actively implemented.

## **Demand and System Management**

The KCWA had periodically distributed educational flyers to service area businesses and residents. Funding for periodic newsletters was denied by public utilities commission effectively cutting off one method of communicating these types of concerns to the customers. The KCWA has implemented an "E" News letter on its website as an alternative communication mechanism to offset the debilitating affect cancellation of the printed version has on customer communications. The KCWA published a Conservation brochure and Water Audit mailer focused on education and assisting its customers with the elements of conserving water. One flyer, entitled "Lake Mishnock," is a foldout pamphlet that educates readers on water quality issues, protective measures, volunteer efforts, and regional hydrology.

The KCWA implemented a residential retrofit program in 1999 and remains active. The KCWA also developed a Water Conservation Action Plan in January 2007. KCWA started its Major Users Technical Assistance Program (MUTAP) in July 2004 and identified sixty-four (64) customers, at the time, as major users. Major Users are defined as customers that use approximately 3 million gallons of water or more each year (KCWA expanded this at the time to include customers under but close to the 3 million gallons per year threshold).

Outdoor water use contributes to double the average daily demand on most, if not all, water systems throughout the State. With the passage of the Water Use & Efficiency Act, the State has adopted



cohesive statewide conservation regulations to demonstrate a firm commitment to conservation that can be equitably implemented across all local, state and municipal boundaries.

The KCWA employs a Meter Installation, Maintenance and Replacement (MIMR) Plan as well as an aggressive Leak Detection and Repair program. As previously mentioned, with the exception of some fire services, the KCWA meters 100 percent of the water supplied to its customers. Other exceptions of water used include municipal, fire fighting, and water system maintenance. The KCWA maintains an aggressive Leak Detection and Repair (LDR) program. For over fifteen years, the KCWA has been performing in-house leak detection and repair services on a routine basis by trained personnel using electronic leak detection equipment.

The KCWA performs preventive maintenance on its water system, the extent of which is limited by the workforce currently available to accomplish this work. Preventive maintenance practices are largely limited to aboveground activities such as exercising emergency power at the pump stations, changing oil, checking gauges, and semi-annual flushing of water mains. The KCWA is looking to expand and formalize its preventive maintenance program.

The KCWA is not contemplating any planned extensions of the water system infrastructure in or outside of the water service district. Any desired expansion of the water system must be applied for, approved by the KCWA, and financed independently.

The KCWA has demonstrated full compliance with all of the water quality provisions of the Safe Drinking Water Act and its subsequent amendments and RIDOH regulations.

### **Emergency and Drought Management**

The Emergency Management section, Volume III, of the Plan establishes the responsibilities and authority within the KCWA for responding to most probable emergencies and outlines specific tasks for carrying out functional and constructive solutions based on a review of the potential emergencies and risks. The procedures outlined are generally consistent with the goals of the Rhode Island Water Emergency Response Plan. It is also intended that this document provide guidance to ensure that the primary aspects of recovery from an emergency are addressed in an organized manner to aid in an efficient response and in maintaining drinking water quality and quantity.

The KCWA developed a Demand/Drought Management Policy that was approved in April 16, 2003 and revised February 15, 2006. This policy provides the KCWA the ability to proactively prepare and manage potential drought occurrences. The use and development of this policy demonstrates KCWA's commitment to drought management.

### ***Implementation, Financial Management, and Coordination***

The KCWA has developed a 20 year Implementation Schedule for system improvements. A detailed schedule outlining the individuals or entity responsible, timing, and costs associated with recommendations of this plan has been developed and is presented within the WSSMP. Where work can be accomplished by the KCWA, the responsibility has been designated "In-House." It is intended that where outside consultants and/or contractors are required, the KCWA shall take the necessary steps to advertise for and contract with such resources. The costs developed for each recommendation include an estimate of the capital, operating and maintenance costs associated with each implementation.

It is evident from review of these documents that KCWA's continued revenue stream and control of expenses has provided a solid foundation for the Authority to continue to provide the quality service to its customers, as well as provide repayment of the debt issuance. PUC authorized rates have failed to realize the full funding needs of all programs and operational cost. KCWA will continue to file for increases as necessary to compensate for budget shortfalls associated with reduction in sales due to variation in consumer water use patterns.

KCWA water rate charges consist of a combination of a *Consumption Charge* (Rate varies according to meter size), a *Service Charge* (Flat Rate), and a State imposed *Water Quality Protection Charge*. The Consumption Charge is of a uniform block rate structure, whereby customers are charged a constant rate per 100 cubic feet of water metered. Service charges are based on size and use.

The WSSMP is intended to be reasonably consistent with the goals and policies of the Comprehensive Community plans for the communities serviced by the KCWA. Naturally, these communities must also take into consideration the ability of the KCWA to extend water service in an area zoned for development without adversely impacting existing customer service or rates for the constituents of the communities served.



# Sustainability and Resilience

FROM A WARWICK RESIDENT

*“During last year’s floods and the hurricane in 2011, the city did a superb job of communicating with residents and handling emergency needs.”*



## GOALS AND POLICIES

### GOALS

### POLICIES FOR DECISION MAKERS

#### SUSTAINABILITY

**The City implements practices to conserve energy and use renewable energy.**

- Promote energy efficiency in municipal facilities and practices.
- Encourage energy efficiency by private property owners.

**The City implements and promotes resource conservation and waste reduction.**

- Reuse materials, facilities and structures when possible.

**City facilities and practices are a model of sustainability.**

- Choose sustainable materials, methods and practices, when possible.

#### RESILIENCE

**Warwick has an up to date hazard mitigation plan**

- Support timely updates to the plan.

**Warwick is preparing for the impacts of extreme weather events and climate change.**

- Integrate mitigation and adaptation to climate change into City practices and plans.
- Work with the state's climate change commission.

Broad sustainability goals inform Rhode Island's state plan and this comprehensive plan. Sustainability initiatives include recommendations to create compact, mixed-use, walkable centers in City Centre Warwick, villages and neighborhood centers; provide more transportation alternatives and encourage walking; diversify the housing stock in type and affordability; and reduce nonpoint and other forms of pollution.

This chapter concentrates especially on energy and resource efficiency and on hazard mitigation and resilience, particularly in relation to the potential impacts of extreme weather events and climate change, which in Warwick means flooding, coastal storm surge, and sea level rise.



## B FINDINGS AND CHALLENGES

### findings

Warwick is dependent on fossil fuels for energy.

The municipal government has conducted preliminary feasibility analysis for wind turbines on City properties.

The City has begun to adopt energy saving technologies in City buildings.

Solar and wind energy technologies have been installed by some private and non-profit businesses in Warwick.

The City has a strong recycling program.

The zoning and building codes need to be updated to incorporate regulations and incentives to encourage energy efficiency and reductions in energy demand.

Climate change impacts on Rhode Island are documented. In the future, Rhode Island is expected to experience more frequent extreme weather events with potential flooding, more severe hurricanes and noreasters, and an accelerated rise in sea levels.

With its coastal location and 39 miles of shoreline, Warwick is vulnerable to the impacts of climate change and sea level rise.

State government has convened the Rhode Island Climate Change Commission to help communities prepare for the impacts of climate change.

Warwick is already taking steps to protect its wastewater facility from a repetition of the 2010 flood.

### challenges

Raising public awareness of energy efficiency and demand reduction options

Changing behaviors to conserve energy and reduce greenhouse gas emissions

Funding for adoption of additional energy efficiency strategies for municipal facilities

Raising public awareness about the potential future impacts of climate change on Warwick.

Planning, funding, and implementing programs to adapt City facilities and activities to be resilient to climate change impacts.

Working with private property owners over time in vulnerable locations.





## WHAT THE COMMUNITY SAID

- Despite the 2010 flood, residents did not express much concern about potential future flooding or climate change impacts.
- Residents support retaining existing trees and planting more.
- Residents suggested installing electric vehicle recharging stations and converting the City fleet to energy efficient vehicles.
- There is strong support for the City's recycling program.



## CURRENT CONDITIONS

### 1. Energy and Resource Use

Access to affordable, clean energy is critical to the city and its residents. Energy use, cost and conservation are integrally tied to many of the traditional elements of the comprehensive plan, including housing, transportation, economic development, community services, and natural resources. For much of the 20th century, the availability of relatively cheap oil spurred the consumption of fossil fuels. Energy conservation and efficiency are cost-effective and reduce air pollution and negative impacts on other natural resources. Techniques for promoting energy demand reduction and efficiency include energy conservation, installation of energy efficient technologies, and use of renewable and alternative energy sources.

**Conventional Energy.** The City of Warwick and its residents buy electricity from Narragansett Electric, which is owned by National Grid. National Grid provides natural

gas to Warwick. Table 11.1 shows the City government's energy usage and cost by energy type.

**Electricity.** In Fiscal Year (FY) 2011, the City reduced its electricity usage for municipal buildings by 2.9% over the average usage for the previous two years, from 9,162,214 kilowatt hours to 8,893,093 kilowatt hours. However, because the cost per kilowatt hour increased by 9.5%, the total cost of electricity increased by 6%. The two largest municipal users of electricity in 2011 were the Sewer Authority (3,015,750 kWh) and the Thayer Ice Arena (1,826,600 kWh).

National Grid is in the process of implementing a \$250,000 Reliability Project, which involves updating its electrical systems. Project components include the installation of new equipment in the Warwick substation, and reconstruction of additional new transmission lines in Warwick. The system is designed to handle periods of peak energy demand, such as summer when air conditioning systems can strain delivery.

**Natural Gas.** Natural gas usage in municipal buildings increased by 7.4% in FY2011 compared to the average annual usage for the prior two years. Because of a 7.4% increase in the unit cost of natural gas, the City's overall expenditure on natural gas increased by 11%.

**Oil and Propane.** Many private fuel distributors provide fossil fuels to individual residents, businesses and government. In FY2011, the City used 1,613 gallons of oil for heating municipal buildings, a decrease of 32.9% from the average amount used in the previous two years. However, the price per gallon for heating oil increased by 49.5%, leading to a 0% change in total dollars expended on oil. In FY2011, only two municipal buildings, the Apponaug and Conimicut Libraries, used oil for heating. As of the summer of 2012, these buildings use only electricity and natural gas, and the City has eliminated its use of oil for heating.

The City fleet and the majority of commercial and private vehicles registered in Warwick are gasoline or diesel powered. In an effort to encourage alternative fuel vehicles, URI has launched The Rhode Island "Top 50"

Table 11.1: City of Warwick: Municipal Government Energy Usage and Costs—All Buildings<sup>1</sup>

PERIOD <sup>2</sup>	ELECTRICITY (KWH)	NATURAL GAS (THERMS)	OIL (GALLONS)	TOTAL ENERGY (KBTU)
'08-'10 Consumption	18,324,428	673,204	4,806	130,500,595
Baseline Consumption	9,162,214	336,602	2,403	65,250,297
'10-'11 Consumption	8,893,093	349,112	1,613	65,474,453
% Change Consumption – Baseline to '10-'11	-2.9%	3.7%	-32.9%	0.3%
'08-'10 Cost	\$2,313,024	\$832,064	\$9,782	\$3,154,870
Baseline Cost	\$1,156,512	\$416,032	\$4,891	\$1,577,435
'10-'11 Cost	\$1,227,577	\$463,494	\$4,907	\$1,695,978
% Change Cost – Baseline to '10-'11	6%	11%	0%	8%
Unit Cost Baseline	\$0.126	\$1.236	\$2.035	\$0.024
Unit Cost '10-'11	\$0.138	\$1.328	\$3.042	\$0.026
% Change Unit Cost – Baseline to '10-'11	9.5%	7.4%	49.5%	7.1%

<sup>1</sup> The data included in this table was collected by the University of Rhode Island as part of an EPA Showcase Grant. The work being conducted under the grant is a collaboration between URI and the communities of Warwick, East Greenwich, North Providence and South Kingston. The data in the table is not normalized in order to show direct energy consumption.

<sup>2</sup> Data was collected for the period July 2008 through June 2010. The Baseline represents an average for these two years. The '10-'11 period is from July 2010 through July 2012.

Source: University of Rhode Island Outreach Center.

Electric Vehicle Recharging Station Project, aimed at locating 50-60 electric vehicle recharging stations around the state. URI has approached the City about participating by locating a station at City Hall. However, the City would be required to pay for the station, and City officials questions whether there is enough traffic at City Hall to justify the investment. City officials are exploring options to site a facility at a more heavily trafficked establishment, such as the Warwick Mall.

**Hydropower.** In the winter and summer of 2012, City officials participated in Hydropower Workshops as part of the Renewable Energy Siting Project being conducted by the University of Rhode Island. The purpose of the workshop was to explore opportunities for river restoration and low impact hydropower development, as well as how to use existing dams in an effort to create opportunities for hydropower. No projects have been proposed for Warwick at this time.

**Energy Efficiency and Conservation Initiatives.** In 2009, the City was awarded an \$835,200 American Recovery and Reinvestment (ARRA) Energy Efficiency and Conservation Block (EECBG) Grant to develop and implement a Comprehensive Energy Strategy. In response to the grant award, Honeywell Corporation completed a complimentary energy audit for the City of

Warwick to identify energy efficiency projects that could be funded with the grant. The audit identified approximately \$20 million in projects that the City could undertake to improve energy efficiency. With limited funding, the City identified projects that could be done using the ARRA grant. Much of the grant was used to install energy efficient light bulbs in 22 municipal buildings, replacing over 6,400 fixtures. The project is projected to save 433,000 kWh of electricity and reduce carbon dioxide emissions by nearly 171 metric tons annually. The project is also expected to save \$1.02 million in annual energy and operating expenses.

The Thayer and Warburton Arenas and the McDermott Pool are the highest energy users among municipal facilities in Rhode Island. In 2012, the Thayer and Warburton Arenas and McDermott Pool participated in National Grid's Whole Building Assessment Initiative, a program designed to help commercial and municipal customers assess the energy performance of their buildings and to identify opportunities for improvement.<sup>1</sup> Through the program, B2Q Associates performed an on-site assessment of the energy usage of each of these facilities, and prepared a report with recommendations for steps the City can take to reduce the energy usage of

<sup>1</sup> B2Q Associates, Inc., 'Thayer and Warburton Arenas Whole Building Energy Assessment, prepared for National Grid, August 24, 2012.



each. In each report, recommendations for energy saving ranged from no or low-cost items to more expensive capital projects.

The City has begun implementing the recommendations proposed in the B2Q reports. The City spent over \$100,000, partially funded with the ARRA grant, to install low-emissivity (Low-e) ceilings in the City's two skating rinks. These ceilings reflect heat and light, requiring less energy to keep the ice cold and people warm. In addition, three new energy efficient boilers have been installed at McDermott Pool, at a cost of \$109,000, minus a \$12,000 rebate from National Grid. The City used its contingency fund to pay for the boilers. The boilers are fueled by natural gas, and are expected to run at 97% efficiency, compared to 36% efficiency for the old boilers. The pool and rinks are among the highest energy users in the state, and these projects will help reduce that energy usage.

The City of Warwick, in partnership with South Kingston, North Providence, and East Greenwich, and the University of Rhode Island, received an EPA Showcase grant in 2009. The City's share of the grant is \$150,000. City officials are evaluating recommendations of the Honeywell energy audit to determine what projects can be funded with the EPA grant money. Additional energy saving projects at the skating rinks, such as options for recapturing heat from the water compressors used to freeze the ice, and variable speed pumps to improve energy efficiency as the ice is cooled, are under consideration.

National Grid has also worked with the City to promote energy efficiency in municipal buildings. A program entitled "See the Light" was launched in fall of 2012 to encourage workers in City Hall to adopt energy efficient behaviors such as turning off lights and computers when they leave a room. The program is designed as a competition between departments to see which department can save the most energy over a set time period.

In the fall of 2011, National Grid offered all Warwick residents free energy audits, and helped participants identify opportunities for energy efficiency and con-

servation. Participants were also eligible to receive free energy efficient light bulbs, low-flow showerheads, and energy-efficient faucet aerators. The company also offered assistance paying for weatherization and air sealing costs.

Energy consumption in Warwick municipal buildings increased by just .3% between the FY2008-2010 and FY 2011. The projects described above should result in a decrease in usage in future years.

## Renewable Energy

**Solar energy.** Warwick has not installed solar panels on any of its municipal buildings. No municipal ordinances have been adopted that address solar installations within the city. However, there are several private solar installations. In May 2009, New England Institute of Technology (NEIT) had 135 photovoltaic panels installed on its Electrical Technology Building. Each panel can produce 175 watts of electricity, or 23 watts per hour. Actual output depends on sun angles, cloud cover, length of day, and other variable environmental factors<sup>2</sup>. Any excess energy produced returns to the National Grid system and the school will be credited. The TD Bank branch on West Shore Road includes a solar panel on the drive-through window to provide some of the energy for the facility. In addition, a developer of a private garage at the airport has proposed installing a solar canopy on the facility, and has received city support for the project, which is seeking tariff approval from National Grid.

**Wind energy.** The City of Warwick completed a Wind Turbine Screening Study in July 2011 as a preliminary step in assessing the feasibility of the possible future installation of a large-scale (+100kW) wind turbine on City-owned property<sup>3</sup>. The study consultants, in conjunction with the City of Warwick Planning Department, identified five city-owned sites, as listed in Table 11.2, that would potentially be suitable for a large-scale turbine. These sites were screened based on wind speeds, availability of sufficient land to construct the turbine and

2 New England Institute of Technology web page. Accessed on September 26, 2012. <http://technet.neit.edu/files/TechNews200908.pdf>

3 Weston and Sampson, City of Warwick Rhode Island Wind Turbine Screening Study Site Suitability Assessment, prepared for Crossman Engineering, July 2011.

provide adequate distance from abutters, FAA height limitations, environmental concerns, reasonable access to electrical interconnections, and financial feasibility. Upon completion of the screening, only the Rocky Point and Toll Gate sites emerged as both economically and technically feasible for a 600 kW or larger turbine, although both were only marginally feasible. The report recommended a more detailed feasibility analysis of these two sites, to include “visual impacts (simulations), noise and shadow impacts, specific approvals and permits, processes and procedures, timeframes, interconnection and engineering requirements, and other aspects of the project” before proceeding<sup>4</sup>. At this time, the City is not pursuing any wind turbines on municipal land. To date, the City has not adopted any ordinances that address the construction or use of wind turbines either on city or private property.

Table 11.2: **Potential Wind Turbine Site List**

SITE NAME	ACRES	CURRENT LAND USE
125 Arthur W. Divine Boulevard	275	Wastewater Treatment Facility
Rocky Point Avenue	93	Open Space
Toll Gate Complex	44	High School and Elementary School
Barton Farms	66	Farmland
Conimicut Point	14	Open Space

Source: Weston and Sampson, *City of Warwick, Rhode Island Wind Turbine Screening Study Site Suitability Assessment*, July 2011

NEIT and Shalom Housing have each installed small-scale (100 kW) wind turbines to provide energy for their facilities. NEIT installed a 100-kilowatt, 156-foot tall wind turbine at its Access Road campus in July 2011. At the time of installation, planners estimated that the turbine could produce 164,029 kW hours annually, enough to provide electricity to 16-20 homes. The energy produced will be fed into National Grid’s system, and the college will be credited for the electricity produced. The school will also incorporate the wind turbine into coursework on renewable energy, economics and the environment.<sup>5</sup>

<sup>4</sup> Ibid., p. 28.

<sup>5</sup> New England Institute of Technology web page. Accessed on September 26, 2012. <http://www.neit.edu/About-Us/New-England-Tech-Wind-Turbine-Photo-Voltaic>

In November 2009, Shalom Housing received a \$1.4 million “green” stimulus grant from the US Department of Housing and Urban Development to both retrofit its 100 unit, 30-year old senior housing project with energy efficient systems and appliances, and add a wind turbine to reduce energy costs.<sup>6</sup> The 100-kilowatt wind turbine was installed in February 2011.<sup>7</sup> It will reduce electricity costs for the facility and for tenants.

**Tidal energy.** Tidal energy comes from the motion of water as tides shift from low to high and back again. The cost of producing tidal energy is very site specific, and varies based on geography, speed and volume of the currents, and distance to the grids. The energy is captured with turbines located under the water. One drawback of tidal energy production is that it can alter the ecosystem of an estuary through erosion and reduced flushing. Another is that the energy from tides is spread over vast areas, and finding efficient, environmentally safe ways to harness enough energy from tides has proven difficult. To date, tidal energy is used in only four places worldwide, none of which are in the United States. Trials are underway elsewhere, including in the East River in New York City, San Francisco Bay, and Cobscook Bay and Western Passage near Eastport, ME. Warwick has not explored opportunities for tidal energy. However, with its 39 miles of coastline, tidal energy may provide a future opportunity for the City.

**Wood energy.** Some residents in Warwick use wood stoves to heat their homes. Wood is delivered to these homes from companies located in more rural areas outside of Warwick.

## Resource Conservation and Efficiency

**Recycling.** The City of Warwick has a well-established and successful recycling program, including an automated recycling and trash collection system. The City provides garbage containers and a container for single-stream recycling with once-a-week collection for all resi-

<sup>6</sup> A Turbine Grows in Warwick, *The Providence Phoenix*, November 4, 2009. Retrieved from the World Wide Web on September 26, 2012 at <http://providence.thephoenix.com/News/92580-turbine-grows-in-Warwick>.

<sup>7</sup> Public to Celebrate Warwick Wind Turbine, *The Providence Journal*, February 1, 2011. Retrieved from the World Wide Web on September 26, 2012 at <http://bizblog.projo.com/2011/02/public-to-celeb.html>



dents. Residents must place at least one recycling bin outside each week with the garbage bin, or garbage will not be collected. This mandate is an effort to encourage more recycling. In addition to curbside recycling, items such as grills, bicycles, lawn chairs, unpainted wood and clothing can be dropped off at the Municipal Recycling Center on Sandy Lane, open Monday through Saturday from 7:00 am to 3:00 pm.

Since 1993, Warwick has offered a yard waste collection program that operates once per week during the spring and summer, and every other week during the fall. Residents can bag grass, leaves and garden debris in 30 gallon biodegradable paper yard waste bags or in barrels marked yard debris, and bundle sticks for roadside pickup. The yard waste is taken to the Municipal Recycling Center and composted into soil. The City recycles approximately 12,000 tons of yard waste annually.

The White Goods Recycling Program offers residents an opportunity to recycle appliances such as washers and dryers, refrigerators, air conditioners, water heaters, etc. Residents can call the city for curbside pickup, or can drop off the appliances at the Municipal Recycling Center. The city avoids disposal fees by removing chemicals such as chlorofluorocarbons and selling the goods for scrap metal, thereby generating money for the City.

## 2. Watersheds, Water Bodies and Waterways

The City of Warwick maintains a Hazard Mitigation Strategy (HMS) document that follows the requirements of the Federal Emergency Management Agency (FEMA) in order to maintain the City's eligibility for grant funding. This document identifies and assesses potential hazards and risks and includes action plans to mitigate risk and impacts of potential hazards before they happen. The HMS must be updated every five years. Warwick's current HMS received City Council approval on May 22, 2012 (R-12-54).

**Hazard mitigation and sustainable communities.** The HMS explicitly links hazard mitigation to the concept of sustainable communities and to the idea of resilience:

“Disaster resilient” communities employ a long range, community-based approach to mitigation.... When natural hazard mitigation is combined with the standards of creating sustainable communities, the long-term beneficial result is smarter and safer development that reduces the vulnerability of populations to natural disasters.... Resilient communities may bend before the impact of natural disaster events, but they do not break. They are constructed so that their lifeline systems of roads, utilities, infrastructure, and other support facilities are designed to continue operating in the midst of high winds, rising water and shaking ground.... Resilient and sustainable communities' structures are built or retrofitted to meet the safest building code standards available. It also means that their natural environmental habitats such as wetlands and dunes are conserved to protect the natural benefits of hazard mitigation that they provide.”<sup>8</sup>

The natural hazards of most interest for Warwick that the HMS addresses are classified as atmospheric, hydrologic, or seismic. Atmospheric hazards are hailstorms, nor'easters, severe winter storms, temperature extremes, thunderstorms and lightning, tornados, and tropical cyclones. Hydrologic hazards include coastal erosion, droughts, floods and storm surges. Seismic hazards are earthquakes. In addition, the strategy also includes technological hazards of dam failure and hazardous materials events (such as chemical spills on highways). The Strategy update found that the highest risk scores for Warwick were for the following types of events: tropical cyclones (hurricanes and tropical storms), nor'easters, and severe winter storms, with flood, drought, and storm surge the next highest in risk.

Warwick's location and proximity to water on the western shore of Narragansett Bay, is a community asset, but it is also the potential source of the community's most damaging and destructive hazards. Warwick's prehistoric settlements were shaped by its proximity to waters for fishing and its relatively flat coastal plain that supported farming. Today, the water attracts residents, recreational uses, and shellfishing.

<sup>8</sup> Ibid., p. 1.3





## Warwick Hazard Mitigation Strategy Mission and Goals

### Mission

The purpose of the Warwick multi-hazard Mitigation Strategy is to:

1. Provide a coordinated consistent set of goals for reducing or minimizing: human and property losses; major economic disruption; degradation of ecosystems and environmental critical habitats; destruction of cultural and historical resources from natural disasters;
2. Provide a basis for intergovernmental coordination in natural hazard mitigation programs at the state and local level;
3. Develop partnerships between the City and private sector, local communities and non-profit organizations in order to coordinate and collaborate natural hazard mitigation programs;
4. Identify and establish close coordination with local government departments and agencies responsible for implementing the sound practices of hazard mitigation through building standards and local land use development decisions and practices;
5. Provide for continuing public education and awareness about the risks and losses from natural-disasters, in addition to natural hazard mitigation programs, policies, and projects.

*Warwick Hazard Mitigation Strategy, February 2011, p. 2.1*

### Goals

The goals of the Warwick Multi-hazard Mitigation Strategy are to:

1. Protect public health, safety and welfare;
2. Reduce property damages caused by natural disasters;
3. Minimize social dislocation and distress;
4. Reduce economic losses and minimize disruption to local businesses;
5. Protect the ongoing operations of critical facilities;
6. Reduce the dependence and need for disaster assistance funding after natural disasters;
7. Expedite recovery disaster mitigation efforts during the recovery phase;
8. Promote non-structural flood and coastal erosion measures to reduce the risk of damage to the surrounding properties and environmental habitats;
9. Establish a local Hazard Mitigation Committee to support, implement and revise the Warwick multi-hazard mitigation strategy and to provide the support necessary for an ongoing forum for the education and awareness of multi-hazard mitigation issues, program, policies and projects; and to
10. Provide for adequate financial and staffing resources to implement the Warwick Hazard
11. Mitigation Strategy.
12. Maintain an updated, FEMA-approved Local Mitigation Plan in accordance with 44 CFR 201 such that the City of Warwick is eligible to apply and receive assistance under federal hazard mitigation assistance programs.

The primary hazard Warwick continues to face is flooding. Approximately 3,379 acres in Warwick are located in a Special Hazard Flood Zone Area designated by the Federal Emergency Management Agency (FEMA). Flood risk in Warwick comes from three sources: flooding from the Pawtuxet River, heavy rains, and hurricane-related storm surge, all of which are exacerbated by the city's low-lying terrain in the vicinity of the Pawtuxet River. Other hazards include wind, erosion, rising heat and sea level change, winter storms, and earthquakes, as well as those resulting from the location of significant interregional roadways and the airport in the city, such as chemical spills. The concept of "risk" is also more complex and variable than most people generally think because risk is linked not only to probability but also to consequences. For example, the annual 1 percent prob-

ability of a 100-year storm means there is a 39 percent probability of the storm over 50 years. This can be more or less risky, depending on the situation and on actions taken to reduce the consequences of a storm. Moreover, a "1-in-100-year storm" does not mean that a storm of this magnitude would really strike at this frequency. In actuality, it is possible that multiple 100-year storms can strike in consecutive years or even in the same year.

In urban areas, flash flooding is an increasingly serious problem due to the removal of vegetation and replacement of ground cover with impermeable surfaces such as roads, driveways and parking lots. In these areas, and drainage systems, flash flooding is particularly serious because the runoff is dramatically increased. In addition stormwater runoff and debris flows also negatively



impacts public infrastructure such as roads and bridges as water collects and can create ponding conditions that may make certain roads impassible. This may interrupt road transportation and damage low elevation buildings. Road closures can be a critical issue in certain areas of Warwick as these events have the potential to isolate communities. The City should continue to implement mitigation measures and consider overall impacts of future developments within the local watersheds relative to flooding.

**Hurricanes and Severe Storms.** The highest risks for Warwick are associated with tropical cyclones, or hurricanes and other severe storms. Warwick has experience with the destructive potential of such storms. The Hurricane of 1938 created flood tides of over 12 feet above the normal high water line in Greenwich Bay, and resulted in the loss of over 700 permanent residences and over 100 summer homes along the coast of Warwick, as well as the complete destruction of Rocky Point Amusement Park on Warwick Neck. The Warwick Point Lighthouse, which sits on a 20 foot tall cliff, was undermined by a 38 foot recession due to heavy erosion. After the hurricane, the lighthouse was moved landward by 75 feet. The erosion and changing coastline not only damaged local infrastructure but also had an impact on habitats within the bay. Hurricane Carol in 1954 had sustained winds of 80 to 110 mph, and resulted in over \$3,000,000 worth of property damage in Warwick; flash flooding in Apponaug; and an estimated \$250,000 worth of damage to the recently rebuilt Rocky Point. Oakland Beach was the most heavily battered section of Upper Narragansett Bay. Apponaug, Chepiwanoxet, and Potowomut shores were littered with damaged houses, industrial structures, docks, and trees. Hurricane Bob in 1991 resulted in the spillage of over 100 million gallons of raw sewage into Narragansett Bay, resulting in a nine day shellfish bed closure.

Repeated coastal hazard impacts are particularly likely over the coming century with anticipated increases in extreme weather events and sea level rise resulting from climate change. These storm impacts will threaten human populations, harm infrastructure, and criti-

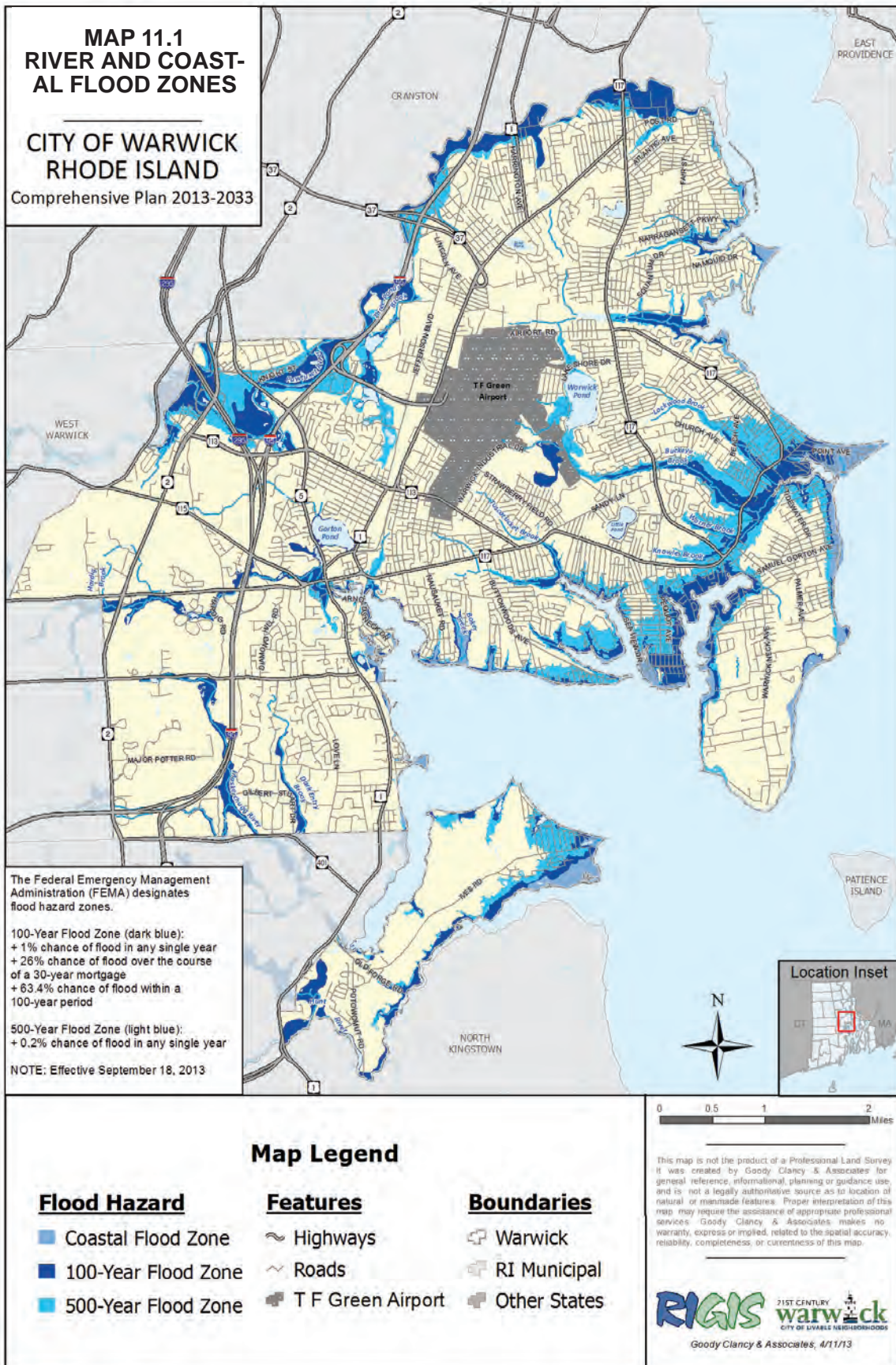
cal ecosystems. Climate change is discussed in greater detail later in this chapter.

## Flood Mitigation and Management

**Flood Prone Areas.** The City of Warwick uses the FEMA Flood Insurance Rate Maps (FIRM) to determine the location of flood zones and flood prone areas. These maps were last updated in 2013. In Warwick, 3,379 acres of land, including hundreds of structures are located within a FEMA designated Special Flood Hazard Area (SFHA). An SFHA is delineated on a FIRM, and is mapped as Zone A. In coastal situations, Zone V is also part of the SFHA. SFHA's are areas subject to inundation by a flood having a one percent chance or greater of occurring in any given year. This type of flood, which is referred to as the 100-year flood (or base flood), is the national standard on which the floodplain management and insurance requirements of the Nation Flood Insurance Program (NFIP) are based.

The City of Warwick adopted a new Flood Ordinance in 2013 and also adopted the new Digital Flood Insurance Rate Maps (DFIRMs) as provided by FEMA. To further mitigation efforts the City is currently seeking to become a member of the Community Rating System (CRS) a program that supports flood mitigation efforts and provides flood insurance premium incentives for reducing risk within a community. The City is also working with RI EMA and property owners to elevate repetitive loss structures above the BFE.

**Hazards and Critical Facilities.** Of particular importance in mitigating a natural disaster in a timely manner is the continued operation of critical facilities. "Critical facilities" include those that deliver vital services, protect special populations, or have other special functions that if lost, or temporarily not operational, present an immediate threat to life, public health and safety. Critical facilities in Warwick include fire stations, police stations, schools, City Hall, hospitals, bridges with utilities, sewage treatment plant and lift stations, water distribution system and water tanks, Red Cross approved shelters, evacuation routes, and traffic control points. The vulnerability of a community includes the potential for direct







damage to residential, commercial, and industrial property as well as schools, government and critical facilities.

**Evacuation areas and routes.** The following neighborhoods would have to be evacuated in case of a hurricane: Warwick Neck, Oakland Beach, Buttonwoods, Apponaug Cove, and Potowomut. Primary evacuation routes in Warwick are: Post Road, Warwick Avenue, Elmwood Avenue, Bald Hill Road/Route 2, Centerville Road, Toll Gate Road, Division Road, as well as I-95, Route 37 west, Route 4 and Route 295 north.

**Emergency shelters.** There are three Red Cross approved emergency shelters in the Warwick section of the Greenwich Bay watershed; in the Warwick's section of the Greenwich Bay watershed, Toll Gate, Pilgrim, and Warwick Veterans High Schools, each of which can accommodate about 1,000 people.

## MARINE

The marine trades are a significant economic and social asset to Warwick. Greenwich, Apponaug and Warwick Coves contain some of the densest marina and boating facilities in the state. There are an estimated 30 marinas/yacht clubs providing almost 4,000 boat slips. Boating related business real estate in Greenwich Bay generates between \$500,000 and \$1million in tax revenue (HMS). In the event that a natural hazard destroys a portion of the tax base, even those property owners not directly impacted by the event would potentially be impacted by increased property taxes. In this context, it is important that the potential economic impacts of a natural disaster continue to be assessed in future hazard mitigation plans so that the resulting policy accounts for these potential impacts.

**National Flood Insurance Program.** In order to continue to participate in FEMA's flood insurance program, the City has adopted a new Flood Ordinance and the new Digital Flood Insurance Rate Maps (DFIRMs) effective December 3, 2010 (FEMA) and September 18, 2013. It also has adopted and enforces floodplain regulations.

**2012 Hazard Mitigation Action Plan.** The hazard mitigation action plan includes the following items<sup>9</sup>:

For the Planning Department:

- Elevate structures: help get financial assistance for Conimicut and Oakland Beach property owners
- Boat relocation sites: identify and secure agreements with property owners outside the floodplain for relocation of boats during major storm events
- Voluntary acquisitions: purchase and demolish about 25 properties at high risk of repetitive flood losses and restore the land
- Bellows Street mitigation study: develop and evaluate flood mitigation alternatives for the Bellows Street industrial park area

For the Warwick Sewer Authority:

- Protect sewer pump stations: identify and implement flood protection improvements, or relocate sewer pump stations in flood prone areas
- Relocate the Bellows Street sewer pump station
- Relocate the Knight Street sewer pump station
- Evaluate and upgrade the treatment facility levee

For the Engineering Department:

- Dam management plan: develop a plan to manage floodwaters in the Pawtuxet River through coordinated flow control at existing dams

For the Water Department:

- Water valve relocation: relocate the 42-inch water main valve subject to inundation

For the Emergency Management Agency:

- Identify and secure an alternative site for the Emergency Management Command

For the Public Works Department:

- Drainage inventory: complete a comprehensive drainage inventory and prepare a digital GIS map
- Road inventory: tie the existing road database to a GIS map

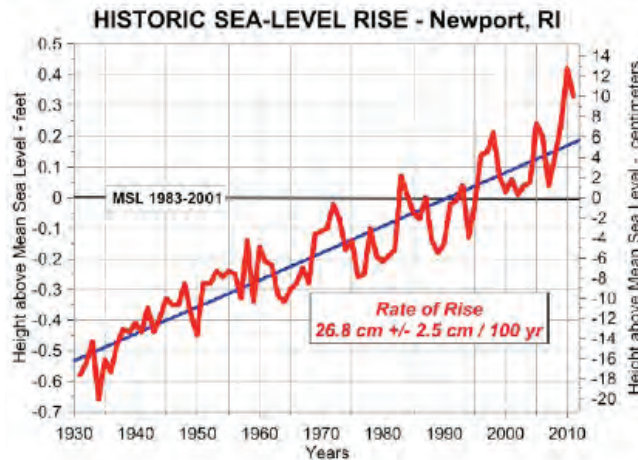
---

<sup>9</sup> 2010 update, page 10.5



**Figure 11.1: Newport, RI Sea Level Rise**

Difference between average sea level at Newport, R.I., from 1983 to 2001 and mean annual sea level plotted for each year between 1930 and 2011. The blue trend line shows a 10.6 inch (26.8cm) increase in sea level per century. Graph courtesy of Jon Boothroyd, 2012. Data from: [http://tidesandcurrents.noaa.gov/sltrends/sltrends\\_station.shtml?stnId=8452660](http://tidesandcurrents.noaa.gov/sltrends/sltrends_station.shtml?stnId=8452660)



For the Building Department:

- Infrastructure inventory: inventory all private structures in the floodplain

The City is pursuing some of these actions, such as protecting the Wastewater Treatment Plant with better levees. Other actions await funding. For example, the City cannot put any inventories into a GIS system because it does not have GIS capacity.

### Climate Change and Sea Level Rise

Climate is defined as the long-term weather average observed within a geographic region, and climate change refers to fluctuations in the Earth's climate system as a result of both natural and manmade causes. The main issues surrounding climate change over the long-term are rising global temperatures, and the resulting increase in weather extremes such as more frequent floods, droughts and rising sea levels. Climate change and sea level rise may seem like relatively new issues facing coastal communities, but the reality is that these issues have been affecting communities like Warwick for several decades. In other words, climate change and sea level rise are not issues that are looming on the horizon or may at some point in the future be an issue, they are here now. In addition to the potential for displacement of coastal populations, threatened infrastructure, and intensified coastal flooding, consequences may also

include salt intrusion into aquifers that will contaminate drinking water supplies and that higher water tables will compromise wastewater treatment facilities in coastal areas. In Rhode Island, long-term records from the Newport tide gauge show that relative local sea level has risen 10.1 inches (plus or minus 1.2 inches) over the last century (Figure 11.1). At the same time, the land surface in Rhode Island is sinking at a rate of approximately 6 inches per century, according to a report in the Journal of Geophysical Research.

As a result of sea level rise, both hurricanes and “nor’easters” will be more damaging to property in Warwick, and coastal flooding effects will be felt farther inland. For instance, storm surge heights will increase as sea level rises, resulting in many more properties being damaged or destroyed during a storm—including inland properties that have never before experienced flood damage. Warwick’s coastal wetlands are also vulnerable to rapid changes in sea levels. Salt marshes will be inundated, causing significant loss of habitat for fish, shellfish, birds, and other wildlife, and making nearby recreation areas and public spaces more vulnerable to flooding.

Furthermore, infrastructure along Warwick’s coast will become increasingly susceptible to complications from rising sea levels. Residential and commercial structures, roads, and bridges will be more prone to flooding. Sea level rise will also reduce the effectiveness and integrity of existing seawalls and revetments, designed for historically lower water levels. Future increase in the relative sea level will increase the extent of flood damage over time. Lower elevation areas of the City that were formerly spared storm damage will become increasingly susceptible to flooding as storm surge reaches further inland due to both sea level rise in concert with a probable increase in the frequency and intensity of storms predicted from climate change.

### Rhode Island Coastal Resources Management Program and Sea Level Rise

In January 2008, the CRMC revised its Coastal Resources Management Program (Section 145) to better address the realities of sea level rise and climate change and to set the stage for adopting future regulations. The





**Figure 11.2: Potential Impacts from Sea Level Rise in 2100**



Source: Sea Grant Rhode Island

new policy called for accommodation of a base rate of expected 3 to 5 foot rise in sea level by 2100, and that the CRMC should review these figures frequently and adjust them as necessary. This rate of sea level rise will guide the coastal program and the Rhode Island State Building Commission as they work to adopt coastal construction standards for siting, design, and implementation of public and private coastal activities. New standards may eventually incorporate considerations of increased freeboard into the state building code. In July 2008, the state building commission adopted the International Building Code standards, which implement stricter flood zone requirements. These include a one-foot freeboard elevation and more stringent building requirements in special flood hazard areas along the coast.

### Rhode Island Climate Change Commission

The state legislature passed the Rhode Island Climate Risk Reduction Act in 2010 (RIGL 23-84) and established the Rhode Island Climate Change Commission with 28 representatives from the legislature, executive agencies, business and environmental organizations, and community groups. The Commission is charged with studying the projected impacts of climate change on Rhode Island, identifying methods to adapt to climate





change impacts, and identifying ways to mainstream climate adaptation into existing municipal and state plans and programs. The Commission has three working groups: Key Infrastructure and the Built Environment, Natural Resources and Habitat, and Human Health and Welfare.

The Commission has met twice as of November 2012. The Commission's 2012 progress report lists a number of programs and initiatives underway in Rhode Island that can be resources for climate change and sea level planning in Warwick. The most important action the City can take now is to explicitly recognize the potential impacts of climate change and sea level rise on the City of Warwick and begin integrating planning for these impacts in all relevant areas. Because the City will not be able to mitigate all these impacts with its own resources, it is important that the City forge strong relationships with the Rhode Island Climate Change Commission and its working groups.

The vulnerability of the built environment in Warwick and the value of insured property suggests that sea level rise is a serious threat to life and property. Storm surge floods could erode coastal areas and result in loss of life, property and infrastructure. Road transportation may be interrupted by ponding water, potentially isolating communities and damaging low elevation buildings. Future land use decisions should consider the impact of climate change. To help assess and consider the impact; shoreline change maps (1939–2003) are attached as in the appendix for use as a reference tool.

## Flood Risk MAP Report

The Department of Homeland Security (DHS), Federal Emergency Management Agency's (FEMA) Risk Mapping, Assessment, and Planning (RISK MAP) completed (2012) a report for Kent County Rhode Island to provide the community with flood risk information and tools to use to increase resilience to flooding and better protect citizens. The study focused on approximately 57 miles of shoreline in Kent County utilizing detailed coastal analysis to develop flood hazard parameters. Utilizing census block data the report showed a reduced risk to Warwick resulting in a decrease of Special Flood Hazard Area in the amount of 1.01 square miles and a reduction of 1436 structures at risk.



## RECOMMENDATIONS

### GOAL 1

The City implements practices to conserve energy and use renewable energy.

#### POLICIES

- Encourage energy efficiency in municipal facilities and practices.
- Encourage energy efficiency by private property owners.

### STRATEGIES

**A. Develop a five year capital plan for adopting energy efficient systems and practices for municipal buildings and equipment to aim for a 25% reduction in energy use by 2033.**

#### Actions

1. Prioritize recommendations from the Whole Building Assessment Initiative reports for the pool and arenas and the Honeywell Energy Audit based on energy efficiency benefits and capital costs.
2. Develop a timeline for implementing the recommendations included in these plans.
3. Develop a plan for converting the municipal fleet to fuel efficient and alternative fuel vehicles.
4. Identify an appropriate location for electric vehicle charging stations.

**B. Develop and implement an energy demand reduction campaign.**

#### Actions

1. Develop an energy efficiency campaign for the public in conjunction with National Grid.

The campaign can include information on how to improve energy efficiency in homes and buildings through techniques such as using energy efficient



light bulbs, wrapping pipes, installing insulation, using draft blocks, replacing aged heating and cooling systems, replacing single pane windows, and so on.

2. **Use state, federal and non-profit sources to promote energy efficiency.**  
Support and promote weatherization programs offered through state and federal agencies (Weatherization Assistance Program of US Dept of Energy).
3. **Create a program to recognize businesses that adopt energy efficient/conservation techniques.**

### C. Adopt land use policies and regulations that encourage reductions in energy demand.

#### Actions

1. **Encourage, incentivize and incorporate, as appropriate, use of energy efficient technologies in building and landscape projects.**  
Adopt zoning and building codes that reward builders who incorporate energy efficient technologies, designs, and landscaping in their projects.
2. **Support policies in other elements of this plan that promote efficiency through compact growth patterns, improved road connectivity and alternative transportation modes.**
3. **Create a program to recognize businesses that adopt energy efficient/conservation techniques.**

### D. Replace fossil fuels with renewable energy sources.

#### Actions

1. **Review the findings on wind energy on municipal properties to consider next steps and investigate installing solar panels on municipal buildings.**
2. **Provide regulations for renewable energy installations on private property in zoning and other ordinances, as appropriate.**  
This includes reviewing the building code to identify and eliminate regulatory barriers or deterrents to renewable energy generation; ensuring that electric vehicle charging stations are an allowable

use; and providing for installation of small scale wind turbines and solar panels. Guidelines for how these technologies can be incorporated into building design should be included.

3. **Streamline and reduce regulatory barriers to green buildings, and develop incentives to encourage green construction.**
4. **Provide more convenient parking and/or free parking for energy efficient vehicles in municipal parking facilities and encourage similar practices by commercial property owners.**

## GOAL 2

The City implements and promotes resource conservation and waste reduction.

#### POLICY

- Reuse materials, facilities and structures when possible.

## STRATEGIES

### A. Continue the City's high performance in recycling.

#### Actions

1. **Develop a program to include multi-family developments and commercial properties in recycling programs, either through the City or through private companies**

## GOAL 3

City facilities and practices are a model of sustainability.

#### POLICY

- Choose sustainable materials, methods and practices when possible.





## STRATEGIES

- A. Make a checklist of sustainable criteria to be used in capital planning, operations and purchasing in order to promote energy efficiency and other sustainable practices.**

### *Actions*

1. Use tools such as the STAR Community rating system ([www.starcommunities.org](http://www.starcommunities.org)), to create a set of tools and criteria to be used in Warwick.

## GOAL 4

Warwick has an up-to-date hazard mitigation plan.

### **POLICY**

- Support timely updates to the plan and implementation of action items.

## STRATEGIES

- A. Keep the City's Hazard Mitigation Strategy current and implement the action plan.**

### *Actions*

1. Prepare the 2015 update.
2. Incorporate coastal restoration, including wetland and marsh restoration, as an integral part of the hazard mitigation strategy.
3. Ensure that there is adequate funding and administrative support to implement the recommendations in the Hazard Mitigation Strategy.

## GOAL 5

Warwick is preparing for the impacts of extreme weather events and climate change.

### **POLICY**

- Integrate mitigation and adaptation to climate change into City practices and plans.
- Work with the state's Climate Change Commission.

## STRATEGIES

- A. Educate the public to better understand the concept of community resilience and the meaning of probabilities and risk, especially for stream and coastal flooding.**

### *Actions*

1. Create an Emergency and Disaster Preparedness section on the City website with information for individual households and on the City and state's preparedness.
2. Work with the state and FEMA to make brochures and other information available on the City website, in the library, and at other city destinations, such as community centers.

- B. Improve the City's stormwater management system to enhance infiltration and expand stormwater retention areas**

1. Implement green infrastructure stormwater management strategies and actions in chapters 4 and 10.



---

**C. Begin planning to accommodate a base rate of expected 3 to 5 foot rise in sea level by 2100 in the siting, design, and implementation of public and private coastal activities.**

---

*Actions*

1. Work with CRMC on the Rhode Island Shoreline Change Special Area Management Plan (Beach SAMP) as well as appoint a Climate Change Task Force to work with the Rhode Island Climate Change Commission, City departments, and the public.
2. Study impacts and create adaptation and mitigation measures and require City departments to consider climate change impacts in all long-range planning and critical public infrastructure projects.
3. Ensure consistency between the Hazard Mitigation Plan, the Comprehensive Plan, SAMP plans, and the city's land use regulations.
4. Enhance education and community engagement through increased understanding of climate change and its potential impacts on the community.
5. Enforce building and zoning codes along the coast to protect residents from potential hurricane and tropical storm impacts, and to protect coastal wetlands.
6. Develop examples of attractive design solutions for elevating existing buildings and for development of new elevated buildings.

A voluntary design manual could be developed by architecture students at Roger Williams or RISD for distribution to property owners, contractors, and architects in relevant parts of Warwick.