

REPORT CARD FOR
Rhode Island's
INFRASTRUCTURE 2020



Photo Credit: Sean Pavone

Rhode Island Section of the American Society of Civil Engineers
[INFRASTRUCTUREREPORTCARD.ORG/RHODEISLAND](https://www.infrastructurereportcard.org/rhodeisland)

2020 INFRASTRUCTURE
REPORT CARD



ASCE
AMERICAN SOCIETY OF CIVIL ENGINEERS



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EXECUTIVE SUMMARY

Good infrastructure is among the key elements that contribute to a high quality of life. From our roads, bridges, ports, and rail, which impact our ability to move people and cargo; to our drinking water and wastewater, which impact the health of our residents and businesses; to our energy sources, which power our daily lives - Rhode Island's infrastructure is essential to supporting the needs of those who call it home or are welcomed to its shores. While many Rhode Islanders might not think about infrastructure every day, Rhode Island's civil engineers do! We work hard to build and maintain our infrastructure systems for the public's health, safety, and welfare.

As a state with a significant coastline, Rhode Island must adequately invest in its critical infrastructure, such as wastewater facilities, drinking water systems, and port structures, to ensure they can protect the natural environment and withstand sea level rise and impacts from extreme weather events. In addition, Rhode Island has been challenged by underinvestment in roads and bridges, leading to structural deficiencies. However, leaders in the state are addressing these challenges head on, by prioritizing investment in roads and bridges to improve safety and reliability. Beyond mitigation, Rhode Island looks to the future by proactively improving its rail systems and maintaining its leadership in the growing renewable energy industry.

The 2020 Report Card for Rhode Island's Infrastructure was developed to inform citizens and policy makers of the status and needs of seven categories of Rhode Island's Infrastructure.

ASCE has assessed the overall grade to be:





Groundwork for improvement has begun in several areas including:

RhodeWorks has been developed as a program to rebuild roads and bridges by increasing funding to transportation infrastructure, repairing more than 150 bridges that are currently structurally deficient, and conducting preventative maintenance of 500 more bridges. One goal is to bring bridges to 90% sufficiency by 2025.

RIDEM has exceeded its goal of reducing nitrogen input into Narragansett Bay by 50% by 2014 through regulations on wastewater management facilities emptying into the Bay. Some areas of the Bay still have not met the goals due to increased urbanization, and fish biomass remains low. The Narragansett Bay is a strong example of progress and more is yet to be done.

Rhode Island is working to meet its commitments to clean energy, including increasing the state's clean energy ten-fold by the end of 2020 and achieving 100% renewable by 2030. Rhode Island's 100% clean energy goal is one of the most ambitious in the country.

Rhode Island is equipped with industrial potential, natural resources, and strong communities. As Rhode Island strives to meet these infrastructure goals and more, significant work remains. Given the analysis of this report, immediate action is needed to maintain Rhode Island's quality of life, economic growth, and ability to meet challenges and opportunities.



ABOUT THE INFRASTRUCTURE REPORT CARD

ASCE-RI's 2020 Report Card Committee is a group of dedicated civil and environmental engineers from Rhode Island, who volunteered their time to support development of the final Report Card. The committee worked with ASCE's Committee on America's Infrastructure and ASCE Infrastructure Initiative staff to provide Rhode Island with a snapshot of the state of our infrastructure, as it relates to us at home and nationally.

GRADING CRITERIA

The Report Card Sections are analyzed based on the following eight criteria:

CAPACITY - Does the infrastructure meet current and future demands?

CONDITION - What is the infrastructure's existing and near-future physical condition?

FUNDING - What is the current level of funding from all levels of government for the infrastructure category as compared to the estimated funding need?

FUTURE NEED - What is the cost to improve the infrastructure? Will future funding prospects address the need?

INNOVATION - What new and innovative techniques, materials, technologies, and delivery methods are being implemented to improve the infrastructure?

OPERATION AND MAINTENANCE - What is the owners' ability to operate and maintain the infrastructure properly? Is the infrastructure in compliance with government regulations?

PUBLIC SAFETY - To what extent is the public safety jeopardized by the condition of the infrastructure and what could be the consequences of failure?

RESILIENCE - What is the infrastructure system's capability to prevent or protect against significant multi-hazard threats and incidents? How able is it to quickly recover and reconstitute critical services with minimum consequences for public safety and health, the economy, and national security?

GRADING SCALE



EXCEPTIONAL: FIT FOR THE FUTURE

The infrastructure in the system or network is generally in excellent condition, typically new or recently rehabilitated, and meets capacity needs for the future. A few elements show signs of general deterioration that require attention. Facilities meet modern standards for functionality and are resilient to withstand most disasters and severe weather events.



GOOD: ADEQUATE FOR NOW

The infrastructure in the system or network is in good to excellent condition; some elements show signs of general deterioration that require attention. A few elements exhibit significant deficiencies. Safe and reliable with minimal capacity issues and minimal risk.



MEDIOCRE: REQUIRES ATTENTION

The infrastructure in the system or network is in fair to good condition; it shows general signs of deterioration and requires attention. Some elements exhibit significant deficiencies in conditions and functionality, with increasing vulnerability to risk.



POOR: AT RISK

The infrastructure is in poor to fair condition and mostly below standard, with many elements approaching the end of their service life. A large portion of the system exhibits significant deterioration. Condition and capacity are of significant concern with strong risk of failure.



FAILING/CRITICAL: UNFIT FOR PURPOSE

The infrastructure in the system is in unacceptable condition with widespread advanced signs of deterioration. Many of the components of the system exhibit signs of imminent failure.



ROADS



Photo Credit: Geosciences Testing & Research, Inc.



SUMMARY

For many years, roadways in Rhode Island suffered from chronic underinvestment, and the maintenance backlog grew. Fortunately, Rhode Island significantly increased investment in its roads beginning in 2016 in an effort to improve safety, travel time reliability, and to reduce congestion. The state has pledged \$5 billion through its RhodeWorks program to bring transportation infrastructure into a state of good repair by 2025. The Ocean State has also incorporated considerations for climate change into its planning efforts. Despite increased funding, there continues to be an investment gap for road and highway improvements - a problem shared by many states. The Rhode Island Department of Transportation (RIDOT) has identified more than \$378 million in unfunded pavement maintenance and reconstruction needs. Rhode Island's share of rural roads in poor condition is ranked as the highest in the nation.



Condition & Capacity

Rhode Islanders depend on a network of more than 6,000 miles of public roads and highways owned by local, state, and federal entities. The road and highway system is critical for safe and efficient movement throughout the state. About 23 % consists of rural roads while 77 % are urban. Due to the state’s geographic location, harsh winters result in ice and snow accumulating on roads and highways. To make these surfaces safe for travel, de-icing agents have been used for decades. However, the combination of water and salts in the de-icing agents accelerate deterioration in the concrete. These harsh winter conditions in combination with decades of underinvestment means Rhode Island roads and highways are in significant need.

The Rhode Island Department of Transportation (RIDOT) measures annual pavement performance through the federal Highway Performance Monitoring System (HPMS - Table 1) and the state’s Pavement Structural Health Index (PSHI - Table 2). More than 80 % of Rhode Island’s non-interstate National Highways System (NHS) is in either poor or fair condition. Furthermore, the Ocean State leads the nation with the highest percent of rural roads with poor pavement condition. According to TRIP, a national transportation research nonprofit, driving on roads in need of repair cost Rhode Island motorists \$620 million a year in additional car repairs and operating fees, or \$823 per driver.

Table 1: Current Pavement Condition According to HMPS Rating System

Highway System	RIDOT Owned & Maintained			Other Owned & Maintained		
	% Good	% Fair	% Poor	% Good	% Fair	% Poor
Interstate NHS	55.05	44.95	0	0	0	0
Non-Interstate NHS	18.01	62.08	19.91	4.39	72.74	22.87

Table 2: Current Pavement Condition According to PSHI Rating System

Highway System	RIDOT Owned & Maintained					Other Owned & Maintained				
	% Excellent	% Good	% Fair	% Poor	% Failed	% Excellent	% Good	% Fair	% Poor	% Failed
Interstate NHS	79.60	16.60	3.80	0.00	0.00	Not Applicable				
Non-Interstate NHS	26.20	30.20	24.60	15.60	3.40	30.40	17.30	24.20	19.90	8.20
Non-NHS Federal-Aid Eligible State	TBD	TBD	TBD	TBD	TBD	Not Applicable				
Non-Federal-Aid Eligible State	TBD	TBD	TBD	TBD	TBD					



In assessing the life cycle of pavement, RIDOT also monitors traffic volume and congestion on major roads. During peak hours of travel, 63 % of Rhode Island's urban interstates experience congestion. In 2019, Providence's I-95 at I-195 ranked 35th out of 100 in the American Transportation Research Institute's (ATRI) top locations for congestion. State planners note that a good indicator of congestion is vehicle speed, and forecasting through the Rhode Island Travel Model reveals that motorists can expect to drive about 10 miles per hour slower in 2037 than they were able to in 2012.

Vehicle miles traveled in the state are on the decline. From 2011 to 2015, Rhode Island's annual VMT averaged between 7.8 and 8 billion, but in 2017, the VMT totaled roughly 5.6 billion.

Operation & Maintenance

For several years, funding levels were insufficient in addressing operation and maintenance needs. Rhode Island's reliance on bond funds for matching federal funds depleted the available resources for roadway maintenance, resulting in a \$30 million funding gap in RIDOT's operating budget. In 2011, the Rhode Island General Assembly enacted legislation to gradually replace bond borrowing with revenue from registration and license fees, along with Rhode Island Capital Plan (RICAP) funds.

RIDOT manages road operation and maintenance through the pavement capital and the pavement maintenance programs. To facilitate both programs, RIDOT collects data from towns and cities in order to assess pavement needs and life cycle. RIDOT's Planning Division and Project Management Division coordinates with municipalities to establish timelines and parameters for road projects. Pavement resurfacing and rehabilitation projects are given priority over maintenance and preservation. In coming years, once resurfacing projects are completed, preservation work will become a larger focus of RIDOT's planning. By 2027, RIDOT will implement a new pavement lifecycle management strategy by combining pavement preservation and resurfacing activities.

During the winter season, roads and highways are pre-treated and maintained through RIDOT's winter storm management division. The Department contracts with vendors throughout Rhode Island to equip their operational force with 450 plow trucks. Winter Operations is the largest maintenance field within RIDOT, with an annual operating budget of \$20 million.

Funding



While funding for roads and highways comes from a variety of sources, the largest contributors are state and federal motor fuel taxes. In July of 2019, Rhode Island increased its motor fuel tax from 33 cents per gallon to 34 cents per gallon. (For comparison, the average state gasoline tax 23.5 cents per gallon.) This adjustment was made by the state's division of taxation, which assesses the user fee every two years to determine whether an inflationary increase is necessary. In 2014, gas tax legislation was passed adjusting for inflation. The one-cent increase, which applies to both gasoline and diesel fuels, marks the first since July of 2015. It is important to note that such inflationary increases merely maintain spending power as material and labor costs increase. The state's gas tax in 1992 was 26 cents per gallon, marking a 23.5 % increase in less than three decades. RIDOT projects gas taxes will generate \$364 million in revenue from 2018 to 2021.

The state also generates roughly \$85 million annually through motor vehicle registration fees; these fees are deposited into the Rhode Island Highway Maintenance Account.

RhodeWorks became law in 2016, providing \$5 billion from a host of sources to bring Rhode Island's transportation infrastructure into a state of good repair by 2025. One-tenth of the overall budget will be generated through bridge tolls levied against tractor trailers. While the program has a heavy focus on improving bridge conditions across the state, RhodeWorks has invested \$81.26 million in paving 100 miles of roadway since its implementation. In 2019, Rhode Island passed an amendment to the FY 2018-2027 Statewide Transportation Improvement Plan (STIP), reallocating funds from pedestrian and bicycle improvements to roads and bridges.

The Rhode Island General Assembly established the Rhode Island Infrastructure Bank (RIIB) in 1989, and later expanded its charter to manage road and highway infrastructure investments. The RIIB oversees the Municipal Road and Bridge Revolving Fund (MRBRF), providing loans to municipal agencies at 33 % below-market interest rate. To date, RIIB has granted \$74.7 million in road and bridge loans to 20 Rhode Island communities.

A number of federal programs provide funding for Rhode Island's roads and highways, including the National Highway Performance Program (NHPP), the Surface Transportation Block Grant Program (STBG), and the Highway Safety Improvement Program (HSIP).



Future Need

RIDOT's Transportation Asset Management Plan (TAMP) outlines Rhode Island's highway infrastructure needs throughout the next decade. Using a pavement management system called Deighton Total Infrastructure Management Systems (dTIMS), RIDOT gathers data on current conditions to assess the likelihood of pavement deterioration. With dTIMS monitoring, RIDOT has identified 352 resurfacing and rehabilitation projects for completion within 10 years. These projects are represented in the Pavement Capital Program of Rhode Island's STIP.

The STIP projects the Pavement Capital Program costs at \$888 million. The total expense for safety improvements, categorized under the Traffic Safety Capital Program, is estimated at \$301 million. RIDOT's TAMP management plan identified a funding gap of \$378.22 million for pavement maintenance and reconstruction needs.

Public Safety

To address safety initiatives, RIDOT develops a separate Strategic Highway Safety Program to guide long-term safety and mobility improvements. This program, updated every five years, determines safety needs and improvements by analyzing statewide traffic and crash trends. Additionally, RIDOT launched the Rhode Island Strategically Targeted Affordable Roadway Solutions (RI*STARS) program to provide rapid, short-term action for critical safety needs.

In 2018, Rhode Island's fatality rate was 0.74 per 100 million VMT. While this figure is lower than the national average of 1.13, the state has seen fluctuations in recent years, moving from 0.84 in 2013, to 0.64 in 2016, and increasing sharply to 1.04 in 2017. The amount of fatalities occurring on rural non-interstate roads (2.57 per 100 million miles) is significantly higher than on all other roads in the state (0.92).

To improve the overall safety of highways, RIDOT's Strategic Highway Safety Plan focuses on enhancing infrastructure and road design. Rhode Island plans to adopt a safety corridor program to reduce crashes on high speed roads. One of the strategies includes lane reductions on all multi-lane full access roads. RIDOT is also working to decrease roadway departures by adding curve delineation, high friction surface treatments, and roadside hazard removals to road segments in high-risk areas.



Resilience & Innovation

According to “Rhode Island Statewide Climate Resilience Action Strategy,” a one percent storm surge could flood 337 miles of public roads. Additionally, the combination of a storm surge with a seven-foot rise in sea level would impact 573 miles of Rhode Island’s roads. Culverts, which are designed to divert water flow away from low-lying roads, will be ineffective during frequent and intense storm events caused by climate change.

Because of these climate-related threats, RIDOT has factored climate and resilience into its 10-year plan, and continues to explore innovative technologies for asset management. RIDOT is developing an Environmental Resilience Tool to forecast the vulnerability of infrastructure and to assist state agencies in developing sustainability plans.

Rhode Island participates in the Federal Highway Administration (FHWA) Every Day Counts program, which aims to reduce project delivery timelines. FHWA partners with state agencies to implement innovative methods and technologies at a local level. RIDOT worked with FHWA during 2019 to incorporate e-Construction technology into the reconstruction of Route 6/10 interchange, which is the state’s largest design-build project. RIDOT adopted new document management software that reduced the amount of time spent on design review from several months to just a few short weeks.

Rhode Island is part of a multi-state Transportation & Climate Initiative (TCI), which is developing a regional program to cap and reduce greenhouse gas emissions from the transportation sector across the Northeast. The proceeds from the program would then be invested into cleaner, more resilient, and more equitable low carbon transportation systems. Cap-and-Invest is a policy too that has been utilized in the United States to limit the total amount of emissions from various sources.



Recommendations to Raise the Grade

In order to improve Rhode Island's roads grade, the following recommendations are supported:

- **Prioritize maintenance and preservation to extend the lifespan of roads.**
- **Tackle congestion through policies and technologies that maximize the capacity of the existing road network and create an integrated, multimodal transportation system.**
- **Support research and development of innovative materials, technologies, and processes to modernize and extend the life of infrastructure, expedite repairs or replacement, and promote cost savings.**
- **All levels of government need to think long-term about how to fund their roads and consider potential alternatives to the motor fuel taxes, including further study and piloting of mileage-based user fees.**
- **Support tax incentives aimed at reducing carbon emissions from the transportation sector, such as implementing a carbon tax through the Transportation Climate Initiative (TCI). TCI is a multi-state program focused on reducing greenhouse gas emissions from the transportation sector.**



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BRIDGES



Newport Pell Bridge (RITBA)

Photo Credit: Olga Enger



BRIDGES
GRADE: D-

SUMMARY

Rhode Island is home to the highest percentage of structurally deficient (SD) bridges in the country. In 2019, 22.3 % of bridges were structurally deficient and Rhode Island residents and out-of-state drivers crossed these bridges a combined average of nearly four million times a day. In an effort to reverse decades of underinvestment, the state established a sweeping program, RhodeWorks, designed to make significant upfront investments in road and bridge infrastructure. The program is funded through a combination of new truck tolls and innovative financing tools. By utilizing an asset management approach that includes condition reports and life cycle forecasting, RIDOT is prioritizing improvements and updating the department's inventory to a state of good repair. Modest progress has been observed during the first three years of the program; the number of SD bridges decreased from 192 in 2016 to 174 in 2019.



Capacity & Condition

Rhode Island's bridges connect students to schools, the workforce to employment centers, and residents and visitors to all the Ocean State has to offer. However, in the northeast corner of the United States, Rhode Island is subject to harsh winters with accumulations of ice and snow. To make bridges safe for travel, de-icing agents have been used for decades. The combination of water and salts in the de-icing agents accelerate deterioration in the concrete and steel of the state's bridges. Unfortunately, harsh winter conditions in combination with decades of underinvestment means Rhode Island bridges are the worst in the nation. In 2019, according to the Federal Highway Administration (FHWA), 22.3 % of bridges were classified as structurally deficient. While structurally deficient bridges are not unsafe, should they experience continued use without substantial improvements, some could become unsafe and need to be closed.

Every two years, FHWA requires each state department of transportation to inspect all traffic-carrying bridges that are at least 20 feet in length. That information is used to develop the FHWA's National Bridge Inventory (NBI). Of the 779 Rhode Island bridges assessed in the 2019 NBI, 18 % were in good condition (rating of seven or higher out of a zero to nine scale), 60 % were in fair condition (rating of five or six), and 22 % were in poor condition (rating of four or lower). Poor condition is roughly equivalent to a structurally deficient designation.

Beginning with 2018 data, FHWA has redefined the term "Structurally Deficient." The classification is now given to a bridge that has any component – deck, superstructure, substructure, culvert, structural condition or waterway adequacy – rating four or lower.



BRIDGES
GRADE: D-

According to the NBI, 174 Rhode Island bridges were structurally deficient in 2019, a decrease from the 192 in 2016. This is an indication that modest improvements are beginning to be observed from RIDOT's RhodeWorks program, which was implemented in 2016. While structurally deficient bridges are considered safe for traffic, the rating indicates a need for significant maintenance, rehabilitation, or in some cases, replacement.

In assessing the condition of a bridge, engineers consider whether the structure is capable of safely transporting normal traffic loads in its current condition. Poor or structurally deficient bridges may be posted for lower weight or closed to traffic, redirecting large service vehicles such as commercial trucks, school buses, and ambulances. At present, 117 Rhode Island bridges have a posted load restriction, hampering the total size and weight of vehicles that may cross. Although necessary for safety, these restrictions impede traffic flow, contribute to congestion, restrict commerce, lead to higher transportation costs, and increase greenhouse gas emissions.

Of the state's 10 most traveled structurally deficient bridges, five are on Interstate 95, a significant north-south artery stretching from Maine to Florida. All but one of the top 10 most traveled structurally deficient bridges were built in the 1950s and 1960s. According to a Rhode Island Department of Transportation (RIDOT) report published in January of 2014 - over five years ago - 50 % of Rhode Island's bridges were 40 years or older; this age is fairly consistent with the national average, which is 45 years.

While RIDOT manages the majority of the state's 779 bridges included in the NBI, 191 are managed by towns, cities, other state agencies, private companies, and the Rhode Island Turnpike and Bridge Authority (RITBA). Of those 191 bridges, 49 are in good condition, 98 are in fair condition, and 44 are in poor condition. The 588 bridges owned by the state fall into the following condition categories: 89 are good, 369 are fair, and 130 are poor. Two bridges are owned by the Federal government, both of which are in fair condition. Inadequate funding for bridge maintenance coupled with harsh winters and salt application, are the factors largely responsible for the current condition of Rhode Island's bridges.

The Rhode Island Turnpike and Bridge Authority (RITBA) manages 14 bridges, including the historic Mt. Hope and Newport Pell Bridges, all with a condition rating of fair or better.



Operation & Maintenance & Future Need

Recognizing the state's transportation infrastructure challenges and needs, in 2016 the Rhode Island state legislature passed RhodeWorks, a funding and prioritization plan to fix more than 150 structurally deficient bridges in the state and make repairs to another 500 bridges to prevent them from becoming deficient. Preservation work will involve, but is not limited to: joint replacement, zone painting, deck repairs, bridge washing, concrete or steel superstructure repairs, moderate substructure repairs, culvert repairs and concrete sealing.

The full, ten-year budget for RhodeWorks is \$5 billion, one tenth of which will be raised through a new commercial truck tolling program, which was initiated in 2018. The tolls are collected at twelve locations and each location is associated with a bridge or bridge group. RIDOT will use this revenue to repair or replace bridges.

According to RIDOT, RhodeWorks places an emphasis on reaching a state of good repair for bridges. Goals include: designing, preserving, and maintaining resilient bridges and culverts; minimizing the number of load-posted, load-restricted and closed bridges. RIDOT seeks to invest in bridge preservation efforts up-front in an effort to more cost-effectively address bridge deterioration; the department finds that bridge replacement is six times more expensive than bridge preservation.

In its 2018- 2027 State Transportation Improvement Plan (STIP), RIDOT anticipates that investment in bridge maintenance and preservation in the near-term will avoid \$950 million in future bridge reconstruction and replacement costs. RIDOT's STIP directs just over one quarter of its funds between the Bridge Capital Program (\$1.6 billion) and Bridge Maintenance Program (\$167 million), making bridge investment the state's largest allocation. The Bridge Capital Program was developed using an asset management approach to identify and develop a structured sequence of preservation, repair, rehabilitation, and replacement actions that will achieve and sustain a desired state of good repair at minimum cost.

In accordance with this process, RIDOT conducts the frequency of NBI bridge inspections based on condition ratings. NBI bridges with condition ratings between 5-Fair and 9-Excellent are inspected biennially, while bridges rated as "4-Poor" are inventoried every year. By utilizing condition reports and life cycle forecasting, RIDOT evaluates the value and risk associated with each bridge in order to prioritize improvements and update the department's inventory to a state of good repair.



Funding

Bridge projects and programs, along with all other road needs, in Rhode Island are primarily funded by state and federal motor fuel taxes. In July of 2019, the state increased its motor fuel tax from 33 cents per gallon to 34 cents per gallon. It is important to note that such inflationary increases merely maintain spending power as material and labor costs increase. Rhode Island's gasoline tax is the 15th highest in the nation. RIDOT anticipates that gas tax collections between 2018 and 2021 will total roughly \$357 million.

In 1989, the Rhode Island General Assembly created the Rhode Island Infrastructure Bank (RIIB). Although RIIB invested initially in water, energy, and brownfield projects, the RIIB's charter was expanded to include other types of infrastructure. The RIIB manages a financing program, the Municipal Road and Bridge Revolving Fund (MRBRF), which provides long-term financing to municipalities for transportation infrastructure projects. The MRBRF offers borrowers a below-market interest rate. According to RIIB, as of 2019, the rate is 33 % below an independently determined market rate. The RIIB has made \$74.7 million in road and bridge loans in 20 communities across the state.

The Rhode Island Turnpike and Bridge Authority (RITBA) has the ability to construct, acquire, maintain, and operate bridge projects. It currently operates and maintains four bridges and a section of highway: the Mount Hope Bridge, the Jamestown Verrazzano Bridge, Route 138 through Jamestown, the Newport Pell Bridge, and the Sakonnet River Bridge. Tolls are collected on the Newport Pell Bridge and account for the majority of RITBA's revenue, supplemented by additional funds from investments held by RITBA. Beginning in 2014, RITBA now receives a percentage of gas tax revenue, as well.

Federal funding is provided to states through a number of programs. National Highway Performance Program (NHPP) funds must be used to improve safety, mobility, infrastructure condition and freight movement on the National Highway System (NHS). Investment in bridge infrastructure is an accepted expenditure under the NHPP. Surface Transportation Block Grant (STBG) program funds may be invested in bridges that are not on federal aid highways. The 2015 surface transportation law created the National Highway Freight Program, which allows funds to be invested in a bridge project that improves freight flow on the National Highway Freight Network. In 2019, the state received a \$25 million Infrastructure for Rebuilding America (INFRA) grant to rebuild part of the Washington Bridge.



Jamestown Verrazzano Bridge (RITBA)

Photo Credit: Anthony Ricci

The federal gasoline tax rate is 18.4 cents per gallon and the rate for diesel is 24.4 cents per gallon. Revenues collected are used to fund all of the federal programs mentioned above and many more. Rhode Island anticipates receiving an average of \$271 million annually through 2015's federal surface transportation law, which expires in September 2020. Federal funds must be matched by the state, typically at a ratio of 80 % federal to 20 % state.



Public Safety & Resilience

Rhode Island is particularly vulnerable to storm surges and sea level rise due to the state's 400 miles of coastline and major inland watersheds. According to the Rhode Island Statewide Climate Resilience Action Strategy, sea level in the state is expected to rise 10 feet by 2100. The Division of Statewide Planning analyzed the vulnerability of transportation infrastructure and determined the impact of rising water levels on bridges. They found 90 Rhode Island bridges could be at risk in the event of a seven-foot increase in sea level. If exposed to a one percent storm surge in addition to the sea level rise, 163 bridges in the state could be impacted.

Currently, RIDOT is creating an Environmental Resiliency Tool to assist in identifying environmental risks related to asset management in a coastal state. This project combines the use of Geographic Information System (GIS) models with asset inventory data and Rhode Island's STIP. As new data becomes available, RIDOT is programing the tool to incorporate storm surge and sea level risks in addition to other coastal hazards such as inland flooding, a matter pertinent for protecting public safety.

Innovation

Rhode Island is implementing various innovative technologies throughout its bridge maintenance and repair programs. Through RhodeWorks, RIDOT adopted an asset management program that utilizes element-level deterioration to determine the life-cycle cost analysis, which allows RIDOT to predict life-cycle fluctuations and monitor significant changes over time.

New construction methods are also being employed in the state. As a recent example of project innovation, Rhode Island is applying accelerated bridge construction methods to rebuild the I-95 Oxford Street Bridge. RIDOT is completing the project by using pre-manufactured Northeast Extreme Tee (NEXT) beams. This technology combines concrete decks and beams that are installed side-by-side to reduce construction time and impact on traffic and congestion.



Recommendations to Raise the Grade

In order to improve Rhode Island's bridge grade, the following recommendations are supported:

- **Continue to support the RhodeWorks plan and its emphasis on reaching a state of good repair for bridges.**
- **Advocate for additional long-term federal and state funding programs for bridges to deliver consistent, reliable funding that is adjusted for inflation.**
- **Use alternate project delivery methods such as Design-Build, when appropriate, in lieu of Design-Bid-Build to achieve cost savings to expedite construction. This could reduce the number of structurally deficient bridges for large scale infrastructure projects at a quicker pace and reduced cost.**
- **Continue routine inspection and evaluation programs that incorporate state-of-the-art investigative and analytical techniques, especially of older bridges which were not designed and constructed to current design, loading, and geometric standards.**



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GRADE: D-

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DRINKING WATER



Photo Credit: Dan Logan



DRINKING WATER GRADE: C+

SUMMARY

Over the years, Rhode Island's largest water utility has increased capital spending to rehabilitate its water mains, reduce the risk of pipe leakage and contamination, and ensure that safe, high-quality drinking water is distributed to its customers. Utilities in the state have adopted innovative asset management technology to detect structural leaks and make repairs, saving both time and money. Despite these strategic investments, several infrastructure challenges remain. Lead connection pipes remain in service on many private properties. Providence Water has several programs to address lead service connections including testing, financing for replacement, and treatment to prevent leaching.

As a state with significant coastline, Rhode Island is particularly vulnerable to the impacts associated with climate change, including sea level rise and the growing frequency and severity of significant weather events. To increase resiliency and promote asset conservation, the state conducted an extensive assessment of the vulnerability of its water supply structures to environmental stressors and identified steps to mitigate impacts.



Introduction

As of 2017, Rhode Island Department of Health (RIDOH) reports there are 481 public water systems across the state serving its population of 1.06 million people. Ocean State residents consume an average of 58 million gallons of water per day (mgd), with the peak demand reaching 90 mgd in 2018. Surface water reservoirs supply approximately 85 % of public water in Rhode Island. The Scituate Reservoir is the largest source of Rhode Island's surface water supply, with approximately 60 % of Rhode Islanders receiving their drinking water from its basin. About 150,000 Rhode Islanders drink groundwater supplied by a private well on their property and RIDOH requires that residents test their well water at the time of well installation and when property changes ownership.

Condition & Capacity

Rhode Island depends on an efficient network of infrastructure in order to provide its population with potable drinking water. With the proper rehabilitation and maintenance of pipes and treatment facilities, the state's water suppliers are able to ensure that public water is safe for consumption. As the state's largest water utility serving about 60 % of Rhode Island's residents, the Providence Water system is comprised of 1,040 miles of distribution and transmission mains. Rehabilitation of its water system has been a primary focus of the utility's 20-Year Infrastructure Replacement Plan.

At nearly 100 years old, Providence Water's treatment plant continues to deliver high-quality drinking water due to improvements and expansions completed in the 2000's to keep up with demand and technology. It is the largest treatment facility in New England and can treat up to 144 mgd. The percentage of non-revenue water, or the average water lost due to leakage or metering inaccuracies, is frequently used to determine the efficiency of drinking water infrastructure. Providence Water has a non-revenue water rate of 11.6 % (leading to an annual loss of over \$934,000), which is lower than the 16 % national average of non-revenue water.

Throughout the state, ninety-five percent of the public water systems serve fewer than 3,300 people. Sometimes small public water systems have more difficulty maintaining their infrastructure and meeting state and federal regulations due to limited expertise and/or resources. In 2017, RIDOH began providing on-site technical assistance to small systems struggling to achieve compliance. The Department assists small public water systems in completing system assessments, water sampling, and facility improvement plans.



DRINKING WATER
GRADE: C+

Operation & Maintenance

As infrastructure ages and water quality standards change, Rhode Island has taken various measures to improve and protect its water supply infrastructure. In 1974, Congress passed the Safe Drinking Water Act, or SDWA, in an effort to regulate public drinking water to protect public health. The SDWA authorizes the Environmental Protection Agency (EPA) to set drinking water standards that must be adhered to by every public water system in the country. States perform the most direct oversight of these programs by providing routine operation and maintenance (O&M). Rhode Island applied for and received "primacy," which means it met or exceeded EPA's standards and now it is the state's responsibility to: ensure water systems test for contaminants; review plans for water system improvements; conduct on-site inspections and sanitary surveys; provide training and technical assistance; and take action against water systems not meeting standards. An example of maintenance activities performed by Providence Water includes their Unidirectional Flushing Program to improve water quality in specific areas. Under this program, 96 miles of their distribution system was flushed in 2018.

Furthermore, in 2019 the state of Rhode Island issued 4 boil advisory notices to its residents. Boil advisories are issued to notify consumers when their drinking water is at risk for or has been contaminated by pathogens.

Funding & Future Need

A 1996 update to SDWA created the Drinking Water State Revolving Loan Fund (DWSRF) program, a federal-state partnership that provides financing for water systems and state safe water programs. Seed money for the fund is provided by the federal government and each state's allotment is based on a needs assessment produced by the EPA. It is the state's responsibility to match these funds at a rate of 20 %. Rhode Island manages its DWSRF, which is administered through the Rhode Island Infrastructure Bank (RIIB) with coordination from the RIDOH. According to RIIB, it has provided \$450 million in loans to Rhode Island public water systems since DWSRF's creation. In 2017, RIIB funded three loans including \$16 million to Providence Water for cleaning and replacement of water mains and replacement of public side lead service lines; \$3 million to Cumberland Water for the development of two water wells; and \$2 million to East Providence for rehabilitation of a pedosphere water tank. Rhode Island budgets set-asides from the DWSRF to provide financial, managerial and technical assistance to small public water systems (those serving less than 10,000 people).

According to Providence Water's Annual Quality Water Report, "since 1996, Providence Water has reinvested \$460 million into its system (capital improvements and infrastructure replacement combined), during which time the utility company has expended about \$118 million on the rehabilitation of approximately 452,034 feet (86 miles)." While some of Providence Water's major projects are financed through the RIIB, the majority of its infrastructure projects are paid for on a cash basis from rate revenue. Rates must be authorized by the Rhode Island Public Utilities Commission (PUC). In 2017, the PUC authorized a Providence Water rate increase of 8.5 %, which resulted in an additional \$1.9 million in revenue that year. According to a survey of 234 water utilities conducted by the American Water Works Association, between 2016 and 2018 charges increased an average of 7.2 %. The current average monthly water bill for rate payers calculates to ~\$43 dollars including consumption charges, services charges, and a Rhode Island Water Fund Fee. This falls in the middle of the range of average water bills for the 50 largest cities in the United States.

Rhode Island's population increased by a modest growth of 0.4 percent between the 2010 and 2018 United States Censuses. In 2013, RIDOH's SafeRI Program Report found that increased water consumption from the Scituate Reservoir could diminish the sustainability of the state's surface water supplies. Rhode Island's water utilities will need to utilize new groundwater sources to keep pace with increased drinking water consumption. Drought can also impede the distribution of groundwater. Due to decreased seasonal precipitation, groundwater is used at a faster rate than it is replenished, resulting in saltwater intrusion where seawater can contaminate supplies. This is a large concern for southern Rhode Island because it depends heavily on coastal ground water as its source for drinking water.



Every four years, the EPA provides Congress the Drinking Water Infrastructure Needs Survey and Assessment (DWINSA), an assessment of public drinking water system infrastructure funding needs, projected 20 years into the future. Data for this report is produced by surveying public water systems. The estimate covers infrastructure needs that are eligible for the DWSRF, including installation of new drinking water infrastructure and the rehabilitation, expansion, or replacement of existing infrastructure. This information is used to determine the amount of Federal funding distributed through the DWSRF.

In 2015, Rhode Island's 20-year needs for its large systems was \$715.2 million. The largest percentage of funding needs is typically for rehabilitation and replacement of transmission and distribution infrastructure, however Rhode Island did not report funding needs by type in the 2015 assessment.

Rhode Island's smaller systems will require \$97.4 million over the next 20 years. Smaller systems typically receive less funding than larger utilities.

Public Safety & Resilience

In accordance with the Safe Water Drinking Act, Rhode Island publishes an annual drinking water compliance report. In 2017, Rhode Island accumulated 387 violations of the Rules and Regulations Pertaining to Public Drinking Water. Out of the total violations, 56 were for water quality, 192 pertained to monitoring and reporting, 32 were given for treatment techniques, and 107 were given as an additional violation to suppliers who failed to notify the public of initial violations. Thirty nine public water systems received a total of 56 quality violations for excess levels of contaminants. Of those, 52 were bacteriological violations, three were for disinfection byproducts and one was for nitrate.

Since 1986, it has been illegal to build water systems in the United States using lead pipes. EPA's maximum contaminant level goal for lead in drinking water is zero because lead is a toxic metal that can be harmful even at low exposure levels - particularly for children, infants and fetuses. But, like many New England states, Rhode Island's drinking water systems were constructed with lead piping prior to what is now wide-spread knowledge of lead's dangers.



In an effort to monitor and address this problem, twice a year Providence Water analyzes lead concentrations in water samples collected from 300 homes in its distribution network. If at least 90 % of homes tested have lead levels less than the action level of 15 parts per billion (ppb), the EPA determines there is no lead exceedance. EPA has not established a maximum containment level (MCL) for lead because lead in water is often caused by privately owned water system piping. Results of Providence Water's lead testing program show exceedances of the action level. A pattern has emerged whereas lead levels are typically below the 15 ppb action level in the first half of the year, but exceed the action level during the second half of the year. This is true for each year from 2012 to 2019. However, the magnitude of the exceedances have dropped due to changes in treatment and implementation of the unidirectional flushing program in 2013. For instance, lead levels were detected at 16 ppb during the second half of 2019. Lead levels have been as high as 30 ppb in both 2009 and 2013. According to its 2018 Annual Water Quality Report, Providence Water is working with a panel of nationally recognized corrosion experts to optimize treatment and reduce exposure to lead.

Rhode Island is in the process of passing regulations on the amount perfluoroalkyl substances (PFAS) allowable in drinking water. The RIDOH has initiated an expansive testing program for PFAS in public drinking water systems, and as of November 2019 had tested all public water systems serving more than 10,000 people, all of the schools in the state, and about half of the smaller community systems. In the latest round of testing, no water systems had PFAS levels greater than 35 ppt.

Resilience & Innovation

Drinking water infrastructure is affected by natural disasters and volatile weather conditions. To prepare for these events, RIDOH analyzed the level of risk that would be borne by the state's water utilities if subjected to rising temperatures, hurricanes, flooding, drought, and sea level rise. The study discovered that Newport Water Division, Jamestown Water Division, and Bristol County Water Division are increasingly vulnerable to coastal flooding. Additionally, storm surges caused by hurricanes and coastal storms will be a primary threat to Aquidneck Island's main reservoir and could significantly deplete its capacity. Sea level rise threatens the safety of well water, which could be contaminated by saltwater making its way inland. Modeling predicts that Rhode Island's sea level will rise nearly three feet by 2084. SafeWater RI modeling estimates that total costs of replacement for utilities destroyed in storm surges will be approximately \$22.3 million through 2022.



DRINKING WATER GRADE: C+

To increase drinking water infrastructure resiliency, Rhode Island coordinates with public and private entities to ensure that water asset vulnerability is properly addressed. As an example, the Rhode Island Emergency Management (RIEMA) oversees the Critical Infrastructure and Key Resources (CIKR) Advisory Group, which assists infrastructure sectors in preparing for emergency weather and climate events.

To prepare for water shortages and droughts, many Rhode Island municipalities developed contingency plans to provide water to limited access regions. For example, the Kingston Water District entered into an emergency water agreement with the University of Rhode Island to provide the school with drinking water in times of shortage.

Recognizing that the availability of clean drinking water may shift with extreme weather and sea level rise, there have been various water conservation efforts and education campaigns across the state. The city of Warwick created a water conservation initiative to teach consumers about the importance of maintaining sustainable levels of drinking water in the coming years. Each resident received a water conversation kit containing a kitchen aerator, toilet tank displacement bag, shower head with aerated stream, shower timer, leak detecting dye tablets, and a home water audit book.

Providence Water has adopted innovative technology to conserve resources and identify structural weaknesses throughout its distribution mains. The utility improved operational efficiency through the use of automated meter readings (AMR) and materialized view log (MLOG) sensors to provide earlier detection of leaks and allow the utility to recapture lost revenue. Prior to these technologies, Providence Water conducted water audits and leak surveys every 10 years, which frequently allowed significant repair needs to go undetected and increase the risk of mainline blowouts.



Recommendations to Raise the Grade

In order to improve Rhode Island's drinking water grade, the following recommendations are supported:

- **Creation of affordability programs to ensure low income populations are not disproportionately affected by increasing water rates; develop rate payer assistance programs.**
- **Increase funding and programming for water quality improvements that remove lead in water systems, targeting those with the highest concentration exceedances of lead and copper.**
- **Encourage municipalities to adopt asset management technologies aimed at reducing waste and deferred maintenance costs.**
- **Support programs that mitigate weather and climate related threats to drinking water infrastructure.**



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WASTEWATER



Photo Credit: Vastram



WASTEWATER GRADE: C

SUMMARY

Most of Rhode Island relies on municipal wastewater treatment plants for sewage disposal. Routine maintenance and upgrades have protected outdated facilities from falling into disrepair, but many of the pipelines are in need of renewal and replacement. Over the last two decades, Rhode Island's primary wastewater facility has been working towards a 40-year construction project to abate pollution associated with wastewater discharges. Focused efforts on water quality monitoring and infrastructure maintenance have prevented further degradation of Rhode Island's waterways. However, there remains more than \$1.8 billion needed in the wastewater sector for infrastructure investments and operational improvements. Additionally, impact studies reveal wastewater plants across the state will need infrastructure improvements in order to withstand increased flooding due to climate change. Specifically, substantial investments will be needed to ensure Rhode Island's 19 municipally-owned treatment facilities can withstand elevated water levels.

Condition & Capacity

Seventy-three percent of Rhode Island's 1.06 million residents are served by wastewater treatment plants (WWTP). This represents a three percent increase in the total of Rhode Islanders served since 2016. The average RI treatment plant is 69 years old, however, 16 out of 19 facilities have received major upgrades since 2000. In Rhode Island's recent management plan entitled Water Quality 2035, the state was unable to determine the age of its 2,600 miles of pipe in the collection system, but the report noted that portions were "decades old" or vulnerable to leakage. However, the owner of the two largest WWTPs reported most of its pipelines serving Rhode Island municipalities have surpassed their 50-year life cycle, especially in Providence, Pawtucket, and Central Falls, where the average pipe age is 100 years old. Rhode Island's 19 treatment plants treat approximately 120 million gallons per day (mgd). Based on 2019 data, the state's two largest plants have an average daily flow of 65 mgd, which is well below the total capacity.

Rhode Islanders that do not use public WWTPs are serviced through onsite wastewater treatment systems (OWTS). OWTS are private sewage systems that collect, treat, and discharge treated wastewater into surrounding soil instead of the state's waterbodies. In 2016, there were roughly 154,000 OWTS. The Rhode Island Department of Environmental Management (RIDEM) OWTS Program oversees the permitting, design review, and installation of these systems.

To operate their facilities, WWTPs obtain authorization through the National Pollutant Discharge Elimination System (NPDES) (known in Rhode Island as RIPDES), a permit program within the Rhode Island Department of Environmental Management (RIDEM). Prior to authorization, water quality evaluations are conducted to assess the condition of WWTPs and their collection systems. This program, established through the Clean Water Act, monitors the discharge of pollutants from treated wastewater into waterways. NPDES also enforces discharge limitations for combined sewer overflows (CSO) and sanitary sewer overflows (SSO). A CSO site refers to an area of a collection system where sewage and stormwater are carried in the same pipe. Most of the sewer systems in Rhode Island's larger cities consist of combined systems and carry stormwater runoff. CSO events occur when wastewater and stormwater runoff inundate the capacity of the system, allowing untreated combined sewage to flow into receiving waterbodies. The Field's Point WWTP, one of the two largest wastewater facilities, has 64 CSO sites that dispense 2.2 billion gallons of untreated combined sewage into Rhode Island's waterways each year. RIDEM approved a three-phase CSO plan to reduce Field's Point's overflows to less than four per year. As of 2017, this project has resulted in the capture and treatment of over 8.3 billion gallons of sewage at Field Point.



WASTEWATER GRADE: C

Rhode Island's wastewater facilities are located at low elevations, which increases the likelihood of flooding and SSO during heavy rainfall. SSOs occur when additional flow from rain or groundwater, called inflow and infiltration (I&I), overloads collection systems and expels the untreated sewage into water bodies. Between 2010 and 2014, the state's WWTPs experienced a total of 353 SSO events. While challenges to address overflows remain, Rhode Island facilities have taken considerable steps to improve their sewer systems. Wastewater operators in East Providence and Bristol, for example, have planned to reduce SSO events by increasing the capacity of pump stations and by constructing new drainage infrastructure.

Operation & Maintenance

Timely upgrades and repairs are essential to ensure Rhode Island's wastewater infrastructure operates at the maximum level of efficiency. Each facility is responsible for their own operation and maintenance (O&M). The O&M plans for WWTPs are submitted to RIDEM for approval but there are no requirements for how often they must be updated. Plans are typically revised when a new need arises such as funding assistance for system upgrades and/or expansion. Establishing a regular schedule for upgrading O&M plans could be beneficial to extending the lifespan of WWTPs.

Rhode Island's two largest WWTPs, Field's Point and Bucklin Point, are owned and maintained by the Narragansett Bay Commission (NBC). NBC's 2019 Financial Report states that O&M expenses increased 6.3 % (\$477,224) over the previous year.



Funding & Future Need

As a federal method of financing state wastewater projects, the Clean Water Act Amendments of 1987 established the Clean Water State Revolving Fund (CWSRF) Program. To capitalize state loan funds, the EPA provides CWSRF grants to states and requires them to match the amount by 20 percent. Rhode Island's CWSRF is regulated by RIDEM and financed through the Rhode Island Infrastructure Bank (RIIB). Since the creation of CWSRF, RIIB has distributed \$1.3 billion in loans to Rhode Island communities, NBC, and Providence Water Supply Board. In 2019, NBC received \$269 million in funding from EPA's Water Infrastructure Finance Act (WIFIA) Program to complete the final stage of its CSO Abatement project. WIFIA funding covers 49 % of the total cost for infrastructure projects. WIFIA loans are competitive and only a select number of states are invited to apply each year, indicating the significance of Rhode Island's CSO program.

While wastewater infrastructure receives federal financing, the majority of revenue is generated through rate-based user fees. On a monthly basis, the average rate payer's sewer fee is \$45. The Rhode Island Public Utilities Commission (RIPUC) authorized a 2.88 % rate increase across the state, effective January 1, 2019, which is expected to yield over \$6 million in additional revenue for NBC. In 2019, NBC dedicated a larger portion of annual expenditures towards infrastructure maintenance than it had for 2018. The percentage of NBC's capital asset investment increased by 2.7 % (\$32.7 million) over the last year to accommodate construction and repair initiatives.

To address future needs, NBC develops five-year plans identifying the total investments needed to maintain its infrastructure. According to its Capital Improvement Plan (CIP) for 2021-2025, NBC will invest in 49 projects estimated to cost \$559.5 million. Eighty-eight percent of this expenditure will be used to complete the final phase of the CSO project and the remaining 12 % will support ongoing maintenance of plant and collection system infrastructure. Every four years, EPA conducts the Clean Watershed Needs Survey (CWNS) to evaluate the capital costs needed for each state to meet federal quality standards. Based on the most recent 2012 survey, EPA estimated \$1.8 billion in funding will be required to address Rhode Island's wastewater needs.



Public Safety

CSOs pose a significant threat to public safety and the state's aquatic habitats. The metals, oil, and bacteria in combined sewage can have significant impacts on the health of Rhode Islanders who swim in CSO polluted water or consume shellfish contaminated by these pollutants. As a precaution, beginning in 1995, Rhode Island permanently closed several areas of the Narragansett Bay to shell fishing, and over 11,000 acres are temporarily closed when there is more than one-half inch of rainfall. Rhode Island's largest WWTP developed an extensive program to protect public health and achieve compliance with federal regulations. In June 2001, NBC implemented the CSO Abatement Plan to reduce the level of pollutants released into Rhode Island's waterways. Now in the final phase of this program, which involves the construction of a 2.2-mile-long deep rock tunnel, NBC expects project completion by 2041.

In 2004, the Rhode Island Assembly amended Chapter 46-12 of Rhode Island General Law, which adopted rigorous standards for nutrient loadings from wastewater facilities. An excess of nutrients in waterbodies, such as nitrogen and phosphorous, can cause widespread fish kills and harmful algal blooms. Over the past 15 years, Rhode Island's WWTPs have decreased nitrogen loadings to adjacent waterways by 55 % and phosphorous by 45 %.

In 2004, RIDEM and the Office of Water Resources (OWR) introduced a new monitoring program that has been successful in addressing large data gaps and meeting EPA requirements for increased surveillance of state waters. The agencies sampled 300 stations over five-year increments to compile a dataset on Rhode Island's water quality. Enhancing the collection of water samples throughout the state will improve the ability to identify and resolve quality issues.

To ensure compliance with national wastewater discharge standards, EPA collects water samples from facilities with NPDES permits to monitor "effluent limitations," or discharge levels for specific pollutants. Within the past three years, nine WWTPs have received a total of 74 effluent violations. Westerly WWTP incurred the most with 21 total violations during this time period.

Resilience & Innovation

In Rhode Island, most wastewater systems were constructed in floodplains to allow gravity-fed flows. Facilities were designed to withstand certain degrees of water elevation, but increased flooding brought on by climate change threatens their resilience and sustainable operation. In 2010, four WWTPs were rendered inoperable because their flood protection barriers had not been designed to withstand higher degrees of flooding.

The implications of climate change prompted RIDEM to conduct a study measuring the resilience of Rhode Island's 19 WWTPs. Base Flood Elevation (BFE) assessments, established by the Federal Emergency Management Agency (FEMA), determine coastal and river flooding depths spanning 100 years for the 1% chance flood or 100-year flood event. In 2017, the Department issued "Implications of Climate Change for RI Wastewater Collection and Treatment Infrastructure" to outline future systematic upgrades and adaptive strategies specific to each facility. Based on its findings, RIDEM will require existing WWTPs to include flood response and recovery tactics in all facility designs. The goal is to promote the resilience of RI's plants through strong management practices such as incorporating BFE assessments into facility designs.

Finally, in 2018, Rhode Island passed the Environment, Recreation, and Water Infrastructure Bond, which grants \$5 million in matching grants for wastewater treatment improvements focused upon resilience.

Recommendations to Raise the Grade

- **Increase available financing for aging wastewater infrastructure through the Clean Water State Revolving Fund (CWSRF) loan program, Water Infrastructure Finance Innovation Act (WIFIA), and other viable funding sources at the federal, state, and local levels.**
- **Encourage municipal wastewater treatment plants (WWTP) to adopt a schedule for asset management and facility plans.**
- **Accelerate treatment system and infrastructure projects related to climate change to ensure resiliency is achieved.**
- **Continue programs aimed at reducing combined sewer overflows (CSO) and sanitary sewer overflows (SSO). State regulatory agencies should encourage a statewide effort to reduce overflows and repair failing collection systems.**



WASTEWATER
GRADE: C

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PORTS



Photo Credit: Wangkun Jia



PORTS GRADE: C

SUMMARY

Rhode Island's seaports, terminals, and working waterfronts support a wide range of activities, including cargo movement, ferry boat operations, commercial fishing fleets, and pleasure cruises. The Narragansett Bay is home to the Port of Providence, the Port of Davisville, the Tiverton Marine Terminal, and Newport Harbor, providing access to the Atlantic Ocean and the Block Island Sound, while the Port of Galilee is located on the Block Island Sound. Ongoing investment is necessary to upgrade outdated infrastructure, plan for future growth, and protect facilities against sea level rise. State residents recognize the economic significance of these seaports and have approved bond measures to support upgrades, capacity expansions, and increased land development, including projects that increase access along departure roads to support reliable cargo movement.

Condition & Capacity

In 2018, the state's ports moved a combined total of just over nine million tons of freight. Imports make up about eight million of those tons. The Port of Providence has a 40-foot-deep Federal Navigation Channel and moves the largest volume of freight in Rhode Island, accounting for nearly eight and a half million tons. The Port of Providence ranks 60th in the nation by tonnage moved, handling cement, chemicals, coal, cobblestone, heavy machinery, liquid petroleum products, lumber, perlite, salt, scrap metal, project cargo, and steel products. Significant to New England's energy needs, the port receives fuel products and refined petroleum from facilities in New Jersey, Pennsylvania, Canada, and Europe.

The Port of Providence has no umbrella governing body, such as a port authority, and all the terminals and waterfront facilities are privately owned and operated. In 1994, ProvPort, a 501(c)(3) nonprofit organization, purchased what was formerly known as the "City of Providence Municipal Piers" and currently holds title to 105 acres of port assets including six berths, 300,000 square feet of warehousing, on-dock storage facilities and high-performance harbor cranes. In 2036, the City of Providence will have the option of purchasing the ProvPort, the Port of Providence's largest terminal.

ProvPort has sufficient capacity to handle current cargo operations, but expansion will be needed to support growth projections. Expansion includes 25 acres of land in the City of Providence which will be leased to ProvPort with the option to sublease the land to private terminal operators. While the Port of Providence terminals are in close proximity to Interstate 95, in certain locations, trucks must use narrow local roads to exit the facility, resulting in increased congestion and delays, as well as undesirable impacts on communities. Improving accessibility along departure roads will support reliable cargo movement.

The Port of Davisville - managed and operated by the quasi-state agency Quonset Development Corporation - is an important node for the automobile industry and consistently one of the top 10 auto ports in North America. In 2019 the Port handled 338,448 automobiles; 296,707 arrived by ship, 34,550 by rail, and 7,191 by truck. From the Port of Davisville, vehicles are distributed to dealerships across the Northeast. Seafreeze, Ltd., the largest producer of frozen fish on the East Coast, is also a Port of Davisville tenant. Seafreeze has a cold storage capacity of approximately 23 million pounds and can load and unload reefer vessels, refrigerated containers, refrigerated railcars and trucks.

The Port of Davisville depends upon a 14-mile short line railroad, Seaview Railroad, which provides a connection to regional and Class I railroads in the Northeast. It has four berths and five terminals with over 60 acres of laydown and terminal storage. An important piece of the state's economy, the Port of Davisville estimates a \$333 million business output and over 1,500 direct, indirect and induced jobs.

Operated and managed by the Rhode Island Department of Environmental Management (RIDEM), the Port of Galilee is home to an active and diverse commercial fishing fleet with 40 piers providing dockage for over 250 fishing vessels. In 2018, these vessels brought in 48 million pounds of fish and shellfish worth \$64 million, making the Port of Galilee's haul the fourth most valuable on the East Coast. A 2016 report examining the economic impact of Rhode Island's fisheries and seafood sector found the industry supports 4,381 jobs and an output of \$419.83 million across the state.

Newport's State Pier #9 is the only state-owned commercial fishing facility in Newport Harbor and supports approximately 50 fishing vessels. Newport, known as the "Sailing Capital of the World," has hosted many prestigious regattas, including America's Cup and the Volvo Ocean Race. According to an economic impact study commissioned by Sail Newport, the 2015's Volvo Ocean Race resulted in a total economic impact of \$47.7 million and direct spending created 353 full or part time jobs.

Operation & Maintenance

The Army Corps of Engineers has completed 18 navigation projects in Rhode Island. While some of these projects began in the 19th century, most of the navigation work has been constructed over the last 50 years and totals \$33.3 million. In Providence, the Army Corps of Engineers estimates that about 1 million cubic yards need to be removed to return the channel to its authorized dimensions. The Army Corps of Engineers is developing a Dredged Material Management Plan that will anticipate dredging needs for the channel over the next 20 years and determine how to dispose of dredged sediments.

Currently under construction, the Port of Davisville's Pier 2 project updates a pier constructed by the U.S. Navy in 1956. Upgrades will increase the pier's life cycle design by 50 years with a new steel bulkhead for the north, south and east faces of the pier; dredging of Narragansett Bay to accommodate larger ships; and extension of Pier 2 by 232 feet to the north, thereby creating a third berthing space at the port for unloading cars and other cargo. Quonset Development Corporation expects the project will be completed in 2022, on time and \$5 million under the project's \$90 million budget.



PORTS
GRADE: C

Funding & Future Need

Recognizing the significance of Rhode Island's ports to the state's economy, in 2016, voters approved a ballot initiative allowing \$70 million for port project bonds. The measure provided the Port of Davisville with \$50 million to reconstruct Pier 2, while ProvPort was awarded \$20 million for land acquisition to increase terminal capacity.

The Port of Davisville's Port Master Plan calls for an investment of \$120 million that includes: adding capacity for offshore wind logistics; maintaining infrastructure for auto imports; constructing a new pier at Terminal 5, dredging and rehabilitating Pier 1 which was built in 1941.

In the coming year, ProvPort's tenants plan to spend \$33 to \$55 million on capital improvements. Since its establishment, ProvPort has invested \$21.9 million in capital improvements. In that same time, the port's estimated economic output is \$164 million for the City of Providence and \$211 million for the state of Rhode Island.

Rhode Island ports have successfully applied for federal discretionary grant programs. The Transportation Investment Generating Economic Recovery (TIGER) program is a significant federal funding source for ports. With TIGER funds, the Port of Davisville and the Port of Providence were able to complete critical upgrades to infrastructure, expand terminal capacity, and accommodate larger container operations. The Port of Davisville has also received federal funding through the Maritime Administration's (MARAD) Marine Highway Grant Program.

In 2017, the Port of Galilee received \$1.6 million to continue infrastructure improvements initially funded by the U.S. Economic Development Administration to support the port's active and economically significant fishing fleet. The Port plans to invest \$5 million to replace three of its largest fishing piers and perform bulkhead repairs at the end of 2020. The port has identified an additional \$20 million investment needed to maintain strong operations, including investments aimed at resilience in the face of sea level rise. The port will pursue federal and state resources to fund those improvements.

Public Safety

Through the Port Security Grant Program (PSGP), a federal program established to reduce the risk of potential terrorist attacks Rhode Island has improved the public safety of its ports by addressing port security, risk management, port security training, and port recovery and resilience efforts.

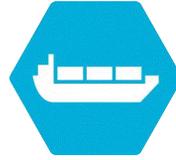
Resilience

In 2012, Hurricane Sandy hit Rhode Island causing \$11.2 million in damages and leaving the state without power for days. Concerns of storm surge and sea level rise due to climate change have pushed state and federal agencies to increase planning efforts. In 2017, emergency bypass connections were installed at two Davisville pumping stations to improve sewage and debris removal during extreme events. Additionally, developing resiliency strategies has allowed ports to mitigate damage and put efforts into practice to resume operations more quickly after storm events. In March of 2019, the Army Corps of Engineers initiated a Coastal Storm Risk Management feasibility study that will help ports improve their emergency preparedness and response to coastal storms and sea level rise.

Innovation

STORMTOOLS is an online mapping program created by the Coastal Resources Management Council and University of Rhode Island that illustrates exposure to storm surge and sea level rise throughout the entire coast of Rhode Island. In 2019, STORMTOOLS released the Coastal Environmental Risk Index (CERI) for Warwick, Barrington, Bristol, Warren, and Charlestown which assesses risk and damage from storm surges, sea level rise, coastal erosion, and wave conditions to structures and infrastructure.

ProvPort's operator and manager, Waterson Terminal Services, joined the Green Marine environmental certification program to enforce sustainability measures at port locations. By participating in this program, the port has committed to reduce its environmental footprint beyond regulatory required levels. Finally, this infrastructure sector is also revealing the critical and innovative links between energy and ports. ProvPort and the Port of Davisville supplied Deepwater Wind with access to their facilities and terminal areas in order to assemble and construct wind turbines. This project and others on the horizon will create 800 construction jobs and 50 permanent operations and maintenance jobs with Ørsted and Eversource committing \$40 million in infrastructure improvements at the ports.

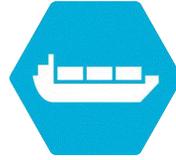


PORTS
GRADE: C

Recommendations to Raise the Grade

In order to improve Rhode Island's ports grade, the following recommendations are supported:

- **Continue dredging operations and pier repairs to maintain and improve shipping capacity needed to support regional commerce. Seek and promote federal investment opportunities where applicable.**
- **Improve multi-modal freight and landside connections to strengthen the entire freight system and reduce congestion that is costly to industries, local governments, and the state's economy when moving goods.**
- **Continue to develop port resiliency plans that address human impacts, sea level rise, and natural disasters.**
- **Leverage synergies between existing infrastructure and the need for future improvements among Rhode Island's ports and offshore wind industry.**



PORTS
GRADE: C

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ENERGY



Photo Credit: Sergey Golotvin



ENERGY
GRADE: C+

Summary

The energy story in Rhode Island is one of legacy and innovation. Forty-four percent of Rhode Island's gas lines are over 50 years old, ranking the network as the fourth oldest in the country. However, infrastructure owners, including National Grid, are making improvements and closely monitoring older infrastructure. Electric rates remain high - currently 20 cents per kWh -driven up by the regional supply of natural gas which has been limited by pipeline capacity and major plant closures within New England. However, the state is committed to reigning in costs. Rhode Island is tied with Vermont for the third most energy efficient state in the country, according to a recent report. Most notably, Rhode Island is nationally recognized as a leader in renewable energy. Home to the country's first operational offshore wind farm, the Ocean State is repositioning to capture its own energy rather than relying on imported natural gas.



Condition & Capacity

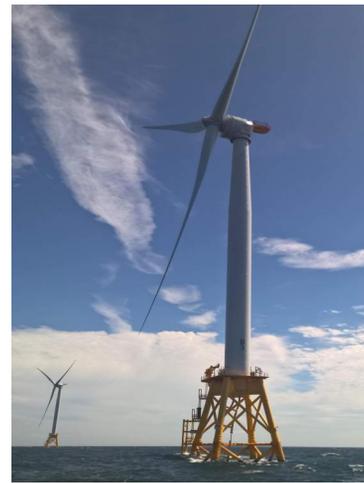
As a whole, Rhode Island consumes nearly 190 trillion British Thermal Units (BTU) of energy per year. The major sources of energy include natural gas, fuel oil, and renewables with consumers spanning the commercial (24.3%), industrial (12.5%), residential (30.7%), and transportation sectors (32.5%). With a 174 BTU consumption per capita, Rhode Island ranks lowest in energy use per person in the country.

Power plants in Rhode Island produce a combined capacity of just over 2 gigawatts (GW), barely exceeding consumers' peak demand of 1.9 GW during the summer months. 93% of that power is produced from natural gas and 7% from renewables. The top four power plants that account for the state's capacity are Entergy RI State Energy (Johnston), Manchester Street (Providence), Ocean State Power I/II (Burrillville), and the Tiverton Power Plant (Tiverton). Rhode Island's T&D infrastructure and reliable and resilient power delivery are dependent on diverse sources of both in-state and regional power plants, proper configuration of growing renewables, and the regional grid managed by Independent System Operator - New England (ISO-NE). Continued investment to overcome aging is necessary to accommodate growth and to stay ahead of future outages.

The state's T&D network is comprised of 16 miles of high voltage and 403 miles of low voltage transmission lines. National Grid is the primary distribution company providing retail delivery of power to the state while Pascoag Utility District and Block Island Power Company also distribute power to local communities.



Block Island Wind Farm Construction 2016



345 kv single line from West Farnum, MA to Warwick, RI

Photo Credit: Chad Morrison

To accommodate population growth, the Aquidneck Island Reliability Project (AKA OnIsland) is rebuilding and replacing substations, converting lines from 69 kv to 115 kv, and completing other improvements. In a recent report drafted by ISO-NE, a not-for-profit electricity corporation stretching across the six New England states, several time-sensitive T&D lines have been identified and are scheduled to be addressed by the end of 2021.

Additionally, many residents depend on energy infrastructure associated with fuel oil and natural gas pipelines for residential heating. Forty-four percent of Rhode Island's gas lines are over 50 years old, ranking the network as the 4th oldest in the country. Old pipes made of cast-iron and bare steel are prone to corrosion. Peak natural gas demand during cold weather often yields low pressure and inadequate supply at customer delivery points; investment in gas infrastructure is needed to overcome both supply challenges and aging and unreliable piping systems. Consideration could also be given to alternative use of ground- and air-source heat pumps to reduce reliance on natural gas.

Numerous renewable energy plants have come online in recent years, allowing RI to capture its own energy resources. The Block Island offshore wind farm and the state's largest onshore wind farm in Johnston produce 30 megawatts (MW) and 21 MW of power, respectively. An underwater transmission line was laid to connect the island to the mainland to enable the grid to receive any surplus power. Since 2019, capacity from solar installations, installed by private developers, more than doubled to over 5,000, producing a combined output of 189 MW. The largest community solar project was recently erected on a Superfund site in North Smithfield and produces 12.4 MW. Projected lifespans of renewable energy projects range from 20 to 35 years.

Operation & Maintenance (O&M)

Overall, the private companies or utilities that own the energy infrastructure are also responsible for operation and maintenance (O&M).

Aging gas lines continue to be replaced throughout the state. National Grid recently replaced 1,600 feet of pipe dating back to the 1940s in Providence, along with 1,200 feet in East Providence. Inspectors for National Grid complete a walking survey with hand-held detectors of the entire network every three years. Cast-iron pipes are checked every two to three weeks with mobile detection equipment during the winter months.

Furthermore, maintenance projects for T&D infrastructure identified by ISO-NE include installing a new switching station, reconductoring lines, installing new lines, separating double circuit towers, and adding reactive support to maintain voltage.



Funding

Energy infrastructure is funded through user rates, state and federal grants, and state and federal funding mechanisms.

Rhode Islanders pay more for electricity than any other state, except for Hawaii. The average rate for residential, commercial, and industrial users is currently 20 cents per kWh. Pricing is driven by the regional supply of natural gas which has been limited by pipeline capacity and major plant closures within New England, each driving costs up. In contrast, the current cost per kWh for energy from the Block Island wind farm stands at 26 cents.

Rhode Island offers a variety of incentives and programs to encourage development of solar technology including \$1.5 million in funds for state agencies, colleges, and universities to install solar panels. The Rhode Island Commerce Corporation awarded over \$4.6 million in grants for small, commercial, and community scale solar projects through its Renewable Energy Fund in 2019.

The cost recovery system established by the state's decoupling law requires National Grid to make regular investments to improve distribution infrastructure. Enacted in 2010 to provide an incentive for utilities to invest in energy efficiency, "revenue decoupling" separates a utility's income from the amount of energy it sells by breaking the link between utility profits and sales volume. Instead, the distribution charge is linked to the cost of maintaining distribution system infrastructure. The utility must justify such costs in a rate proceeding before Public Utilities Commission (PUC). If the utility over-collects, customers receive a credit; if the utility under-collects, customers pay a surcharge. Rhode Island's statute requires decoupling of both gas and electricity prices.

The Rhode Island Infrastructure Bank (RIIB) offers two financing programs focused on improving energy efficiency. Commercial Property Assessed Clean Energy (C-PACE) is an innovative financing program for energy efficiency and renewable energy projects in the commercial and industrial property space. Additionally, the Efficient Buildings Fund (EBF) has provided \$28 million in loans to municipalities and quasi-public agencies for completion of energy efficient projects, such as retrofits in public buildings that will improve heating and electric efficiency by at least 20 %. Through National Grid, the state also offers free energy home audits where owners can qualify for rebates, upgrades, and incentives for improving energy efficiency.

Future Need

On January 17, 2020 Governor Gina Raimondo issued an executive order setting a new goal of meeting Rhode Island's demand for electricity with 100% renewable resources by 2030. A significant leap into renewable energy is the \$1 billion Revolution Wind venture led by Orsted and Eversource to build a 704 MW offshore wind farm 15 miles off the coast. 400 MW of power will be delivered to Rhode Island with the rest being shared with Connecticut. \$40 million of the budget will be spent on improvements for the ports of Providence and Davisville to further support the emerging industry. The project is slated to begin construction in 2021 and be operational by 2023.

National Grid invests significant funds to maintain and upgrade electrical and gas distribution across the state. ISO-NE projects \$327 million is needed to address all transmission maintenance and upgrades needed in RI and southeastern MA. The OnIsland initiative has a \$93 million budget. Approximately \$50 million is spent annually replacing gas lines and the LNG plant has an estimated cost of \$180 million.

Energy sources for transportation are shifting nationwide and Rhode Island is no exception, with over 80 charging stations for electric vehicles. This growing trend is further reinforced because, by 2021, the Rhode Island Public Transit Authority (RIPTA) will phase in 16 to 20 electric buses as part of its Zero Emissions Vehicle Program.

Public Safety

Electric service in Rhode Island ranked among the top in the country for reliability. Only Wyoming experiences less blackouts. Outages are typically due to downed transmission lines during Major Event Days (MED) when severe storms, blizzards, and hurricanes occur. Rhode Island typically experiences 1-2 MED per year.

During extreme weather events in the recent past, state electricity providers and weather services underestimated the severity of imminent storms and therefore did not have an adequate number of crews mobilized to respond for restoration. Addressing the shortcomings, investments were made in weather forecasting tools and Damage Prediction Modeling.

When high demand for natural gas occurs during winter months, low pressure at the end of the lines may impact resource availability, limiting heat to thousands of homes. Addressing areas of operational readiness, contingency and gas supply planning, ultrasonic meter inspection and testing procedures, timely intercompany communication of operational issues, and system enhancements improve the pipeline's ability to provide critical heat and protect public safety.



ENERGY
GRADE: C+

The U.S. Department of Transportation's Pipeline and Hazardous Materials Safety Administration records safety incidents for gas lines. In the past 20 years, the state has had 12 incidents, resulting in four injuries, no fatalities, and \$1.2 million in damages. Each incident was related to excavation, construction, frost heaves, or vandalism. A culture of jobsite safety, which includes inspections by state officials and calling Dig Safe, remains key to avoiding most incidents.

Innovation

Rhode Island's virtual net metering program allows consumers to receive credits on their bills from installations that are not on their property. Moving solar installations away from forest and green spaces, the PUC is initiating a pilot program to spur development of solar canopies over parking lots. Developers of so-called "solar carports" will be able to sell their power at higher rates to National Grid than other solar installations. There are currently four solar carports installations.

Resilience

Using funding from the federally administered Hurricane Sandy Community Development Block Grant Disaster Recovery (CDBG-DR), Rhode Island's Office of Energy Resources commissioned a report on resilient microgrids. Microgrids are localized electricity networks with a local power source and sometimes battery storage that can disconnect and operate independently from the larger grid. Benefits of microgrids include autonomous operation during external power outages, mitigation against grid disturbances, and strengthened grid resilience. In late 2019, the political advocacy groups Rhode Island Progressive Democrats and Ocean State Community Energy began developing a microgrid blueprint for the city of Cranston. The project includes building a series of small solar and wind microgrids connected to a central microgrid.



Recommendations to Raise the Grade

- **Continue to inspect gas lines and prioritize the replacement of pipes over 50 years old.**
- **Increase in-state capacity of electricity generation to increase supply in an effort to reduce cost, ease regional market effects, and recoup expenses.**
- **Continue to support private developers in renewable power generation with financial incentives, regulations that promotes growth, and industrial/logistics resources.**
- **Continue to provide residents with energy options and efficiency guidance. Listen to their needs and concerns during the transition to renewable sources.**
- **Upgrade the electrical grid using federally-vetted codes and standards to enhance reliability, improve resilience, and withstand fluctuations from susceptible power sources.**



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RAIL
GRADE: B-

SUMMARY

Rhode Island's railroads date back to the mid-19th Century, but recent improvements have ensured the system will remain a vital backbone for the state well into the future. In recent years, Rhode Island has seen high speed rail, extended commuter service, and revitalization of historic freight lines. Automobile deliveries to Quonset Point have continued to set records, with 34,550 vehicles arriving by rail in 2019, making them the most carried freight. Other industries that benefit from the rail as a cost effective and energy efficient transportation option are plastics, lumber, metals, and seafood. Ridership has increased modestly with trip incentives, updated facilities, and more capacity coming online. While the Freight Line Improvement Plan has been implemented to reduce congestion and eliminate height and weight restrictions throughout the state, bottlenecks still exist. In general, however, Rhode Island's rail infrastructure is meeting current needs and is well positioned to handle increased demand.



Capacity

Passenger Service

The majority of rail in Rhode Island is part of Amtrak's Northeast Corridor (NEC), owned and operated by Amtrak. The busiest rail line in the United States links Boston to Washington, DC and is served by the Northeast Regional and Acela Express trains. With introduction of Acela Express service in 2000, ridership has steadily increased in recent years. Annual boardings and alightings in Rhode Island stand near 1 million. Improvements to Westerly and Kingston Stations allow Acela to bypass other trains, making the state one of the few locations where the train can reach its top speed in excess of 150 mph. New Acela trainsets are scheduled to start operation in 2021, offering 25% more passenger capacity and improved amenities.

Massachusetts Bay Transit Authority (MBTA) provides commuter rail service to the state of Rhode Island under the Pilgrim Partnership Agreement and the South County Commuter Rail Operating Agreement. Running along the NEC, service extends from the border 35 miles south to the new Wickford Junction. In 2010 a rail station was added to the state's largest and only international airport. Ridership has been low at both stations, averaging 230 daily boardings each despite fee promotions. Providence is the most popular stop on the MBTA Providence/Stoughton commuter line, so much so that the MBTA Board has recently expressed desire to increase departures to Boston every 20 minutes.

Freight Service

Inbound traffic accounts for 93% of Rhode Island freight activities. Cars and plastic are delivered to Quonset Business Park, while cement and ethanol head to the Port of Providence, and forest products arrive in Pawtucket.

The Providence & Worcester (P&W) Railroad operates along 516 miles of track connecting Massachusetts, Connecticut, New York, and Rhode Island. The network in RI is comprised of 29.3 miles of P&W owned track, 8.9 miles of state-owned track, and trackage rights from Amtrak. As a Class II, regional railroad, it serves as the state's only connection to Class I national networks. Connections to CSX and Norfolk Southern are in Worcester, MA and Gardner, MA, respectively.

The P&W Main Line is 37 miles connecting Worcester, MA to the principal rail yard in Valley Falls, Cumberland, RI. The East Providence Branch continues from Cumberland providing access to the Pawtucket Yard. The 2.35-mile-long Harbor Junction Wharf Industrial Track is owned by the city of Providence and links the Port of Providence with the NEC. The South Harbor Track extends service even further into the port.

The Seaview Railroad, a Class III switching railroad, operates along 20.36 miles of state-owned track within Quonset Business Park. The railroad extends from the West Davisville Switch along the NEC where it connects with the P&W. It provides access to industries within the park, Davisville Waterfront piers, and on-dock services for the pier.

Conditions

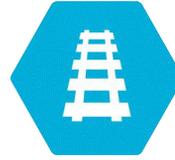
Tracks conditions are rated in accordance with Federal Railroad Administration (FRA) standards, which determine the maximum allowable speeds. The NEC is rated at Class VI or Class VII for speeds in excess of 125 mph. Freight lines in Rhode Island range from Class I to Class III with the top speed reaching 60 mph.

P&W has repaired four bridges and replaced one bridge located in MA, whose service line stretches to Rhode Island. These bridge improvements have lifted weight restrictions, allowing cars to be loaded up to 286,000 pounds. Bridges in Rhode Island which cross P&W have been rebuilt to accommodate double stack containers. However, limited clearance in other states has prevented this feature from being utilized to its full potential.

The Rhode Island Department of Transportation (RI DOT) owns several historic stations which have complete rebuilding and restoration efforts over the years.

Table 1: Station Rehabilitations

Station	Built	Rebuilt	Restored	Served By	Cost
Westerly	1837	1913	1999	NR	\$2 million
Kingston	1837	1875	2017	NR	\$41 million
Wickford	1844	2012		NR & MBTA	\$60 million
TF Green Airport	2010			MBTA	\$22.9 million (station) \$172.8 million (facilities)
Providence	1837	1986	Ongoing	NR, Acela, & MBTA	\$25 million
Pawtucket/CF	1916		Ongoing	NR & MBTA	\$47 million
Woonsocket	1882		1970s	Seasonal Excursion	



Operations & Maintenance

Station improvements made by the state have improved Amtrak service and accessibility. A new lift is currently being installed at Westerly Station in order to comply with the Americans with Disabilities Act (ADA). Features added to Kingston Station include ADA high-level platforms, drainage, retaining walls, and bypass track. Rhode Island Public Transit Authority (RIPTA) bus connections are offered at Kingston, Wickford, and Providence helping passengers complete the final leg of their rail trip.

The P&W currently has two operating restrictions. Hazardous freight is prohibited from passing through Providence Station while passengers are present on the platform. A 5-mile segment of the NEC between Warwick and Quonset remains two tracks, meaning it is shared by passenger and freight services. Amtrak has right-of-way at both locations restricting freight operations during daytime hours. As passenger service increases, the time available for freight traffic will decrease.

Efforts to improve service of the Seaview Railroad listed in the RI 2014 Rail Plan are underway. A three-track rail yard has been constructed to increase rail car storage capacity. A relocation of the business park's turnout track will open space for additional development is currently in the design and engineering phase.



Excavation to install lift required to comply with ADA regulations at Westerly Station – Spring 2020



Funding

As the primary owner of rail facilities, RI DOT is the leading source of funds for rehabilitation. Costs for recent restorations of stations are listed in Table 2. Generally, Amtrak and federal funds are used to offset much of the cost. For Pawtucket Station, the city is also a contributor.

In exchange for MBTA service, RI DOT is responsible for funding capital improvement projects, any costs not covered by fares, and monthly fees to Amtrak for use of the main line and preventative maintenance of the third track.

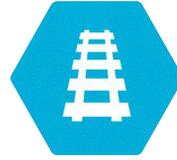
Genesee & Wyoming purchased the P&W rail line in 2016 for \$126.2 Million and are investing resources to return the railroad to self-funded profitability. \$5 Million has already been spent on bridge restoration. In 2017, P&W received nearly \$1 million in federal funding for safety improvements.

The Seaview Railroad is self-funded, but leases rights to state-owned track. The state is spending \$4.5 million dollars for the new turnout track. RI DOT is responsible for overseeing a \$629,000 contract for a highly visible project to replace tracks in downtown Newport.

Approximately \$1.1 million of federal funds are applied through the state's Traffic Safety Program to upgrade at least two crossings per year.

Table 2: Commuter Rail Projected Disbursements by Funding Source per RI Capital Budget FY 2019

	Pre-FY 2018	FY 2018	FY 2019	FY 2020
Total	\$63,231,694	\$8,700,763	5,767,600	\$1,435,752
State (P.L. 2008 Ch. 100 Issued)	\$2,649,237	\$920,763	-	-
Federal Transit Administration	\$19,972,457	\$3,880,000	\$2,767,600	\$1,435,752
MBTA	\$660,000	\$3,900,000	\$3,000,000	-
Private Funding	\$10,000,000	-	-	-
Federal Stimulus Funding	\$29,950,000	-	-	-



Future Needs

Amtrak is currently unable to stop at TF Green Airport Station because the tracks are not electrified. Should over-track wires be installed, Amtrak will be able to offer faster service to the station. However, installation of the lines will likely require a state and federal partnership.

Expansion of commuter rail is seen as an economic driver for residents of Rhode Island. The new Pawtucket and Central Falls station is intended to open job opportunities around the Boston area for residents of both communities. It is also envisioned as a focal point of activity for urban renewal. Restoration of commuter service between Woonsocket and Worcester is also being proposed by a private carrier.

The state has invested heavily to bring commuter rail to its residents, but increased ridership is needed to provide the economic return on investment. Continued incentives are needed to entice commuters to ride the rails rather than drive. Tourism campaigns are also needed to attract visitors to Rhode Island's charming villages, also increasing ridership.

Logistical and funding solutions are needed to eliminate the two freight line bottlenecks at Providence Station and along the NEC. Operating window protocols are sufficient to maintain service, capacity but are anticipated to become more constraining in the future.

The state is exploring the following options to alleviate the bottleneck at Providence Station; changing protocol to widen the operating window for freight, constructing a firewall between tracks, bypassing hazardous freight to Connecticut, or constructing more track around the city. The safest, most efficient options of constructing a firewall or additional track will require significant state, federal, and city funds to complete. Construction of a third track or other means of bypass is required to alleviate the last freight bottleneck along the NEC. As with any work along the NEC, the state will likely be able to apply for federal grants needed to complete the work.

Public Safety

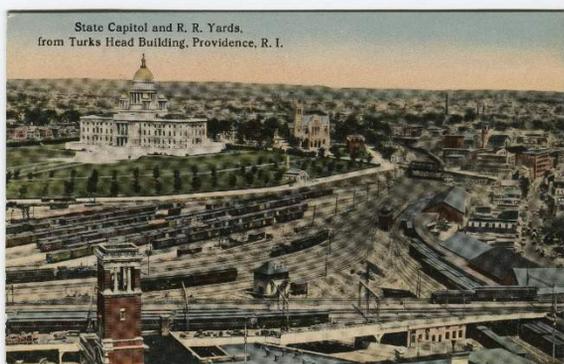
The FRA uses a database to track all accidents/incidents that occur on all railroads operating in the state. In the past decade accidents/incidents have increased with 26 being reported in 2019. The annual number of fatalities remains level with an average of 2, typically involving trespassing. Rates in Rhode Island are lower than the national average given the limited number of areas where the tracks are publicly accessible.

At-grade crossings are the greatest hazard to the general public, but with only 67, Rhode Island has relatively few compared to other states. RI DOT works with P&W and Seaview to assess safety at each crossing and generates a priority list for improvements. The state improves at least two crossings annually. Upgrades include signals, lights, and gates which can be activated automatically by an approaching train.

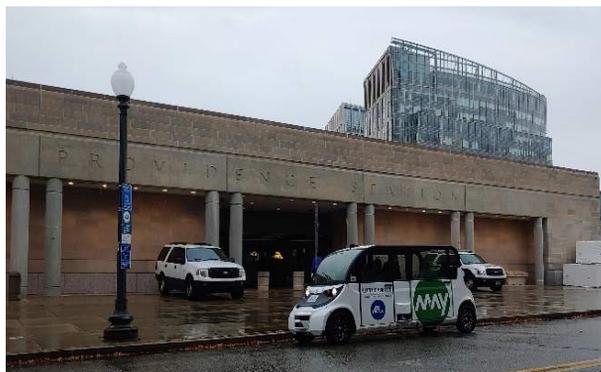
Positive train control (PTC) is a technical system used to stop or slow trains automatically to prevent accidents. Should warnings be missed, it can override an operator to prevent collisions and derailments due to excessive speed, incursions on to tracks undergoing maintenance, and switches left in the wrong position. The Rail Safety Improvement Act of 2008 required PTC to be implemented on all trains operating on along the Northeast Corridor by 2015. P&W has implemented PTC along its entire network.

Innovation

Rhode Island continues to find creative ways to reuse and repurpose abandoned railroads for tourism and recreation. A new experience from Rail Explorers departs Portsmouth Station, allowing guests to ride the rails on pedal cars.



Historic Providence Cityscape



RI DOT autonomous passenger shuttle at Providence Station



Recommendations to Raise the Grade

- **Relieve congestion along line shared by passenger and freight services.**
- **Eliminate the need for restricted freight operations at Providence Station by constructing a firewall or bypass tracks.**
- **Promote commuter rail beyond Providence stations with incentives for riders and awareness of local destinations.**
- **Provide electric rail access to TF Green Station to accommodate Amtrak service.**
- **Continue to develop attractive recreation reuse options for abandoned railways.**
- **Work with private developers to restore commuter service between Woonsocket and Worcester.**
- **Continue to implement safety improvements and promote a culture of safety along all railroads.**



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