

**2015**

**REPORT CARD  
FOR NEW YORK'S  
INFRASTRUCTURE**

**An independent review of the current  
state of infrastructure needs, capacity and  
funding in the State of New York by the  
American Society of Civil Engineers'  
New York State Council**

**September 2015**

**ASCE**  
AMERICAN SOCIETY OF CIVIL ENGINEERS

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## What is infrastructure and why is it so important?

**Infrastructure makes up our roads and transit systems, water pipes and water treatment, as well as our parks and waste facilities, to name just a few. Most people don't typically think about infrastructure unless, of course, it's not working.**

**Infrastructure:** the basic equipment and structures that are needed for a country, region, or organization to function properly

New York's infrastructure was built to help both citizens and our state's economy. Our grandparents and their grandparents spent generations building infrastructure that today is essentially seamless, but older infrastructure can't be expected to perform without maintenance and investment to keep it working for a growing population who rely on these systems.

## Why an Infrastructure Report Card?

Infrastructure supports daily life and the state's economy. With thousands of entities and officials in charge of the state's network of infrastructure, rarely is information about the state's infrastructure gathered in one place and looked at as a whole. ASCE's New York State Council created this Report Card for New York's Infrastructure to report on the condition of the infrastructure and provide solutions to improve it.

As civil engineers charged with managing the care of many of the key pieces of New York State's infrastructure, we understand the challenges it faces and have used our expertise to condense complex data into an easy-to-understand analysis. When you're sick, you ask a doctor to diagnose the problem; civil engineers are the doctors of infrastructure so the Report Card is our diagnosis and prescription to treating New York's infrastructure.

## How's New York's infrastructure doing?

Using a simple "A" to "F" school report card format, this *Report Card for New York's Infrastructure* provides a comprehensive look at New York's current infrastructure conditions and needs, assigning grades to indicate how it's doing overall and making recommendations to raise those grades. The Report Card has an overall Infrastructure G.P.A. of **C-** based on eight critical criteria: capacity, condition, funding, future need, operation and maintenance, public safety, resilience, and innovation. The Report Card also individually grades 9 critical infrastructure types:

Aviation .....	<b>C</b>	Drinking Water ..	<b>C</b>	Solid Waste .....	<b>B-</b>
Bridges .....	<b>D+</b>	Parks .....	<b>B-</b>	Transit .....	<b>C-</b>
Dams .....	<b>C-</b>	Roads .....	<b>D-</b>	Wastewater .....	<b>D</b>

**New York's  
Infrastructure GPA**



## What's the Story Behind The Grades?

- **New York has a vast network of intertwined infrastructure that serves New York's citizens and economy.**

New York's infrastructure includes many significant assets which are aging. Keeping up with maintenance and modernizing them for the future is an ongoing challenge.

- **Our infrastructure can't just be ignored—it needs to be maintained and upgraded as needed so it will work tomorrow and in the future.**

Properly maintaining infrastructure today is a great way to save on replacing infrastructure in the future.

- **New York's not going to take another Sandy without a fight.**

While we're fixing our infrastructure, we also need to build resiliency into it so that we're prepared for the next Super Storm Sandy. While we're rebuilding, we should be reinforcing and preparing our infrastructure to rebound.

# 2015 REPORT CARD FOR NEW

## Aviation

C

New York State's aviation system includes 18 large commercial airports, like LaGuardia and Buffalo, as well as 67 smaller public airports. Airport passenger traffic is projected to increase to 150 million passengers by 2030, and airports across the state will exceed capacity—JFK (130%), Westchester (112%), Buffalo (106%), and LaGuardia (103%). The three New York City region airports already are a major contributor to airplane delays across the country and will require 188 projects worth \$4.7 billion over the next decade. 75% of these will be for state of good repair work. Federal, state and local funding of airport capital investments amounts to less than 2% of the \$50 billion each year in economic gains created by New York's airports.

## Bridges

D+

New York has 17,456 bridges—essentially one bridge for every seven miles of roadways in the state, and enough bridges to stretch from Albany to Miami. More than 50% of New York's bridges are 75 years old, and over 400 of New York's bridges are 100 years old. New York also has 2,012 structurally deficient bridges that require consistent maintenance or improvements to safely operate for freight and commuters. Overall, New York's local bridges are often in worse condition than the State bridges. For example, recently only 385 state and local bridges were scheduled for repair over two years, which is less than 10% of the bridges that were in need of repair. Approximately 100 bridges in New York State are currently closed because of serious deficiencies.

## Dams

C-

New York state has over 7,000 dams that provide for drinking water, irrigation, flood control, fire protection, recreation, and hydropower. The average age of New York's dams is 69 years, and 400 of those structures are classified as High Hazard dam structures. Of the state's high hazard dams, 392 now have Emergency Action Plans in place for public safety. Since New York State's Dam Safety Regulations were updated in 2009, work on 58 dams commenced improving safety. However, challenges remain as \$152 million is needed to repair the deficient High Hazard and Intermediate Hazard dams in New York.

## Drinking Water

C

In New York State, 10,147 regulated water systems provide clean water to 20 million of New York's citizens. Nearly 95% of New York's population receives water from the state's public water supply systems. Unfortunately, 95% of the submitted improvement projects to the Drinking Water State Revolving Fund program remain unfunded due to the overwhelming demand. The latest estimate of repairing, replacing, and updating New York State's drinking water infrastructure is \$38.7 billion over 20 years. With almost half of New York City's pipes put in place prior to 1941, it would take 100 years or more to upgrade its aging pipes at current replacement rates. From frequent pipe breaks to large system upgrades to rebuilding from storm damages, New York State's aging drinking water network has no shortage of challenges.

## Parks

B-

New York is home to the first state park in the nation, Niagara Falls State Park, and the largest public park in the U.S., Adirondack Park, along with 179 other state parks, 35 state historical sites, and nearly 335,000 acres of land. Hosting 62 million people each year, New York ranks first in the nation for operating facilities and campsites. However, New York's park system has seen hard times. Reaching a crisis in 2010, almost half of the parks were almost closed due to a \$1 billion backlog of projects, almost half because of immediate health and safety needs. However, New York changed course in 2011, and committed to catch up on infrastructure decay with 279 capital improvement projects at 109 parks and historic sites. By 2020, New York's park system should see a \$900 million investment in state parks using both private philanthropy and public dollars as well as innovative best practices.



# YORK'S INFRASTRUCTURE

## Roads

D-

New York State's 240,000 mile road network is critical to the State's economy and everyone's quality of life. However, one-third of New York's major highways are considered to be in poor or fair condition, even as miles driven by New York's citizens are on the rise, creating crippling congestion and climbing operating costs. In fact, New York City-area drivers, accounting for half the state's population, each waste 53 hours per year just sitting in traffic. The combination of rough roads and congestion costs motorists a total of \$6.3 billion statewide—that's \$694 per driver in NYC, \$504 for Albany, and \$477 for Syracuse. Poor roads also cost rural areas where fatalities are three times more likely than on other roads in New York. Both the typical state funding programs and special initiatives, like New York Works, are being used to combat the backlog. By 2030, New York needs to spend about \$40 billion on roads to keep up with road conditions.

## Solid Waste

B-

Solid waste includes any discarded or abandoned materials that must be safely disposed of like household trash, commercial waste, and recycling. New Yorkers generated 5.15 pounds of trash per person per day, which is 12% higher than the national average. However, New York's overall waste sent to landfills has been reduced by half over the last 20 years—from 14.6 million tons in 1990 to 7.7 million tons in 2012. Also, the number of landfills has been significantly reduced from 348 in the 80s to only 59 today with the closures of small, local municipal landfills that violated federal and state regulations, but even with a decrease in the number of landfills and combustors, the state has an estimated remaining capacity of 21 to 25 years. New York State has stepped up on managing waste through reduction, reuse and recycling, including composting of organic waste and changing electronic waste practices, but shifting the focus from disposing of waste to decreasing waste will keep up the progress made.

## Transit

C-

Transit systems across New York are being forced to stretch beyond capacity—more riders, aging vehicles, capital funding gaps, and structures built over 100 years ago that must be more resilient today than ever before. New York's Metropolitan Transportation Authority extensive subway and bus system serving over 7 million riders daily, and the state's transit network outside of New York City includes over 100 transit systems across New York State providing over 550,000 people with essential service in urban, suburban and rural areas. Upstate and suburban transit systems require \$1 billion over the next five years to maintain infrastructure in a state of good repair and add capacity to address ridership demand. However, the anticipated funding will only cover 43% of transit infrastructure needs, leaving a \$577 million funding gap. New York City's transit system needs \$68 billion in the next twenty years along with new technologies to replace aging system components and improve the quality of transit service. While transit systems continue to find innovative solutions to improve efficiency and attract riders, these innovations will not replace the need for future infrastructure funding.

## Wastewater

D

Across New York State, 610 small and large wastewater treatment facilities are dedicated to keeping water clean and safe. However, aging infrastructure has become a critical problem for the state - 1 in every 4 of New York's wastewater facilities are operating beyond their 30-year useful life expectancy, wastewater treatment plant equipment also averages 30+ years old, and 30% of the 22,000 underground miles of sewers are 60+ years old and operating beyond their useful lives. To repair, replace, and update New York's wastewater infrastructure would cost \$36.2 billion over 20 years. New York's wastewater funding program is simply insufficient to drive even half of the reinvestment needed in infrastructure; for every dollar needed only 20 cents is provided to clean New York's water.

# RECOMMENDATIONS TO RAISE NEW YORK'S INFRASTRUCTURE GRADE

## **1** Modernizing New York's Infrastructure Should be a Top Priority

Safe and reliable infrastructure comes from making good decisions about maintenance and investment. Elected officials need to lead the efforts to improve New York's infrastructure for today and in the future.

## **2** Let's Rebuild Better—Make New York's Infrastructure Resilient and Sustainable

Infrastructure improvements must be durable and designed to work in a dynamic environment. Change is constant, and infrastructure has to stand up to this test.

## **3** Expedite Project Delivery

Time is money. New York needs to build on current common sense reforms and streamline approvals by eliminating and combining steps to make projects a reality sooner.

## **4** Innovate Today

Innovation needs to be part of the solution to address New York's infrastructure needs. Using new ideas, materials, methods and tools is part of the solution to the infrastructure problem.

## **5** Be Part of the Solution—It's Your Infrastructure

You live here and use the infrastructure so consider asking a few questions about it. How is it being maintained? Are there new plans for your area? Go ahead—you might be surprised what you find out.



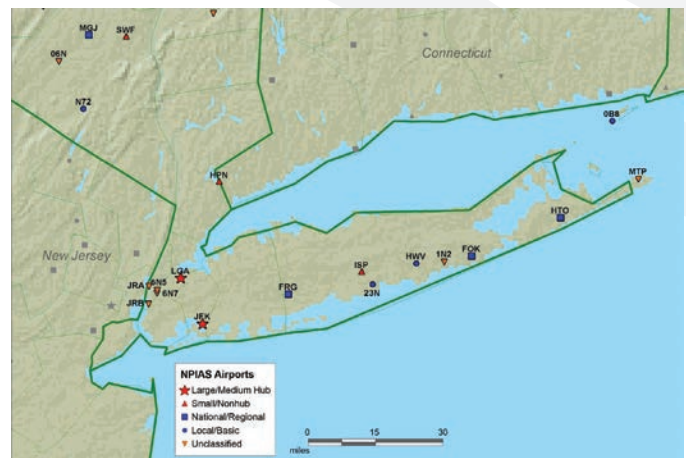
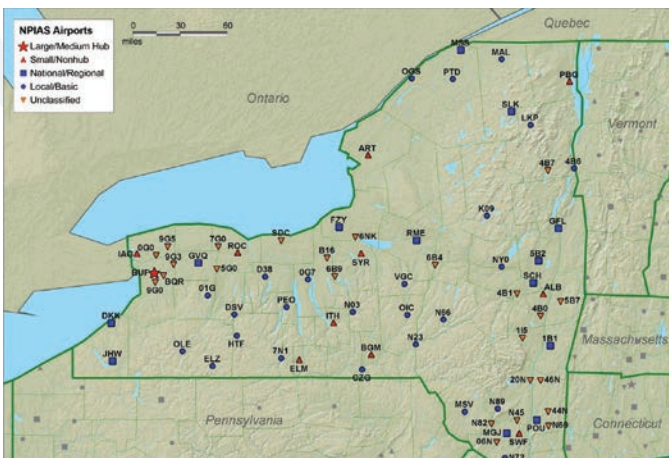
Photo by Jeffrey Milstein.

New York State's aviation system includes 18 large commercial airports, like LaGuardia and Buffalo, as well as 67 smaller public airports. Airport passenger traffic is projected to increase to 150 million passengers by 2030, and airports across the state will exceed capacity—JFK (130%), Westchester (112%), Buffalo (106%), and LaGuardia (103%). The three New York City region airports already are a major contributor to airplane delays across the country and will require 188 projects worth \$4.7 billion over the next decade. 75% of these will be for state of good repair work. Federal, state and local funding of airport capital investments amounts to less than 2% of the \$50 billion each year in economic gains created by New York's airports.



## What You Should Know About New York's Airports

New York State's aviation system includes 67 smaller public airports, 18 larger commercial service airports, 6 seaplane bases, and 5 heliports. The future of New York State as a center for global commerce, finance, and innovation requires a quality and ever-improving air transportation system that operates at maximum efficiency using the latest technology on the ground and in the airspace. Over 80 million travelers each year use New York's top two airports, and the aviation industry is estimated to contribute over \$50 billion in annual economic activity in New York State and almost 400,000 state residents work in aviation or aviation-related industries. As a whole, aviation generates \$18 billion in payroll and \$4.5 billion in state and local tax revenue annually. This benefit is not exclusively from





larger airports—non-airline airports yield a portion of this economic activity and provide businesses and residents with access to air transportation while relieving congestion at busy commercial service airports.

The New York City region airports also serves as a key domestic and international aviation center for the U.S. and this had led to new attention and improvements being planned. However, the efficacy of this powerful economic engine and its benefits to New York's citizens is threatened by a critical lack of infrastructure investment, competition from other states and nations, and delayed decisions although the future may bring improvements to not just one airport but many.

## Conditions and Capacity

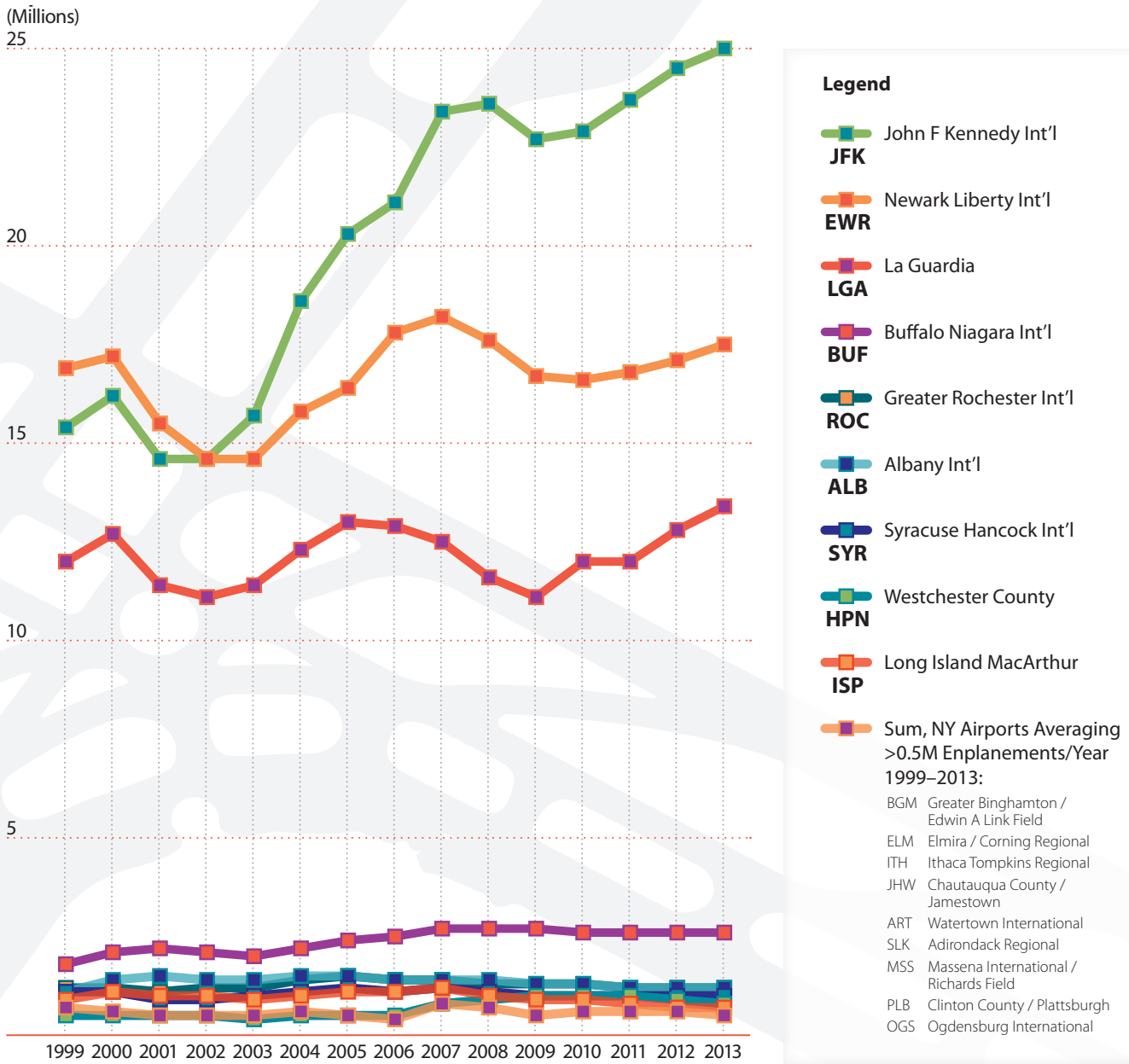
Passenger traffic is projected to increase from 104 million passengers in 2010 to 150 million passengers by 2030. The growth is fueled by global economic expansion, the continuing increase in visitors to the state, and growth in the region's population, from 22.4 million people today to an expected 27.3 million by 2040. The expansion potential for New York City regional airports is limited by physical space on the ground (for terminal, runway and parking expansion) as well as limited air space capacity. The persistent delay caused by New York airports is felt nation-wide. Federal, state and local funding of airport capital investments amounts to only 1.2% of the \$50.3 billion annual economic impact generated by New York State's airports.

The capacity of New York's major hub airports is going to be exceeded in the near future. The New York City region is served by three large commercial airports operated by the Port Authority of New York and New Jersey (PANYNJ); they are: John F. Kennedy International (JFK) and LaGuardia (LGA), within the city limits, and Newark Liberty International (EWR) in nearby Newark, New Jersey. These three airports account for the majority of airplane delays in the country. By 2030, JFK is expected to exceed its current capacity by 130% while LaGuardia will exceed its capacity by 103%. Buffalo Niagara International (106%) and Westchester County (112%) will also exceed their current capacities. Seven other commercial service airports will exceed 60% of their current capacities.

Most commercial airports, especially JFK and LaGuardia, are geographically constrained for airside and landside expansion. By far, the most serious constraint is the airspace available to incoming and outgoing aircraft. The FAA is implementing a satellite navigation system called the Next Generation Air Transportation System (NextGen) to replace the WWII-era radar navigation system, which is intended to mitigate the airspace constraint. NextGen will enhance safety, reduce delays, save fuel, and reduce aircraft exhaust emissions, and allow approximately 20 more airplane landings per hour in the New York City Region. While this will increase the capacity of the region's facilities to about 26 million more passengers annually, airspace over the New York City regional airports will remain congested. Finally, airport ground transportation access remains a major constraint due to highway congestion and the lack of mass transit access.

The condition of the runways at airports is the primary public safety concern at airports so they are closely monitored and repaired; however, often the improvements to the airport structures and the connection points that make an airport effective are delayed. LaGuardia is a case study for this—the main terminal is 50 years old and its condition has

**Figure I. Passenger Data for New York Airports**  
(Preliminary Airport Passenger Data as Reported by Airports to NYSDOT\*)



\*May differ from federally reported USDOT data

been widely criticized. JFK also has challenges with older terminals and cargo facilities. However, improvements seem to be coming. A new \$4.2 million maintenance and repair hangar at the Albany International Airport in Colonie, Albany County is now open and will provide 100 new jobs to the area. Also, a recent announcement was made to begin major \$4 billion redevelopment of LaGuardia to improve not only the condition of the facilities but to improve the interconnections of the airport through site footprint changes including parking and transportation.





## Funding and Future Needs

Investments in New York's aviation assets will ensure a system that will continue to serve and provide positive economic impacts. Commercial service airports are funded by a combination of the airport's own operating revenue from rents, parking fees and other business activities; revenue and general obligation bonds; federal, state, and local grants (including the federal Airport and Airway Trust Fund), and Passenger Facilities Charges. As the Airport Council International's recent report on aviation capital trends states, "the improving economic environment, increasing passenger travel, and aging infrastructure have forced airports to plan or begin capital projects that were previously postponed or canceled."

As a case study, New York City region airports are more than 50 years old and budgeted upgrades and replacement projects from 2012 through 2020 will require \$6.5 billion of additional capital spending. According to capital plans, 188 projects need to be addressed over a 10 year period, and 75% of these are for state of good repair work. On the operations side, they are generally earning sufficient revenues to support their operations, even providing a surplus income of about \$280 million annually. However, their operation actually subsidizes many of the other PANYNJ transportation operational units, such as Port Authority Trans-Hudson (PATH), bus terminals, ports, and ferries. The agency is fairly aggressive in positioning the airports to enhance their revenue generating.

**Figure 2. PANYNJ Capital Program 2011–2020 for New York Major Hub Airports**

Projects	Mandatory	Security	State of Good Repair	Systems Enhancing Projects	Revenue Producing Projects	Total
LGA Redevelopment	\$ -	\$ -	\$ 175	\$ 300	\$ 605	\$ 1,080
JFK Rehab RW 4I-22R	\$ -	\$ -	\$ 440	\$ -	\$ -	\$ 440
RW Safety Area Improvements	\$ 269	\$ -	\$ -	\$ -	\$ -	\$ 269
JFK Delta Term. 3 & 4	\$ -	\$ -	\$ -	\$ -	\$ 215	\$ 215
Airtrain (Incl EWR)	\$ 39	\$ 11	\$ 67	\$ 64	\$ 20	\$ 201
SWF Rehab RW's 9-27 & 16-34	\$ -	\$ -	\$ 148	\$ -	\$ -	\$ 148
<b>Sub Total, Funded Projects</b>	<b>\$ 308</b>	<b>\$ 11</b>	<b>\$ 830</b>	<b>\$ 364</b>	<b>\$ 840</b>	<b>\$ 2,353</b>
Remaining Capital Requirement	\$ 282	\$ 423	\$ 1,897	\$ 484	\$ 206	\$ 3,292
Funded Beyond 2020	\$ 60	\$ -	\$ -	\$ -	\$ -	\$ 60
<b>Unfunded Projects</b>	<b>\$ 222</b>	<b>\$ 423</b>	<b>\$ 1,897</b>	<b>\$ 484</b>	<b>\$ 206</b>	<b>\$ 3,232</b>
<b>Unconstrained Projects</b>	<b>\$ 590</b>	<b>\$ 434</b>	<b>\$ 2,727</b>	<b>\$ 848</b>	<b>\$ 1,046</b>	<b>\$ 5,645</b>

Amounts in millions of 2011 dollars | Source: Navigant Phase II Study, 2013

Funding for the remaining 15 commercial airports and the nearly 70 general aviation airports is provided by revenue producing commercial operations, the State of New York, and the federal government. The table on the facing page (Figure 3) shows those funding needs for the 5 year period between 2011 and 2015.

**Figure 3. Statewide Airport Capital Program 2011–2015  
Excluding New York City Region Airports**

<b>Airport Categories</b>	<b>2011–2015</b>
Medium Hub	\$ 8,920
Small Hub	\$ 8,057
Non-Hub	\$ 6,281
Commerical Services	\$ 1,071
Retriever	\$ 3,964
General Aviation	\$ 11,835
<b>Total</b>	<b>\$ 40,128</b>

Amounts in millions of 2011 dollars | Source: ACI-NA Survey and FAA NPIAS

Most of the future funding needs will be in the form of capital rehabilitation and reconstruction because most of the infrastructure is reaching the end of its design lifetime. However, because of operational requirements, preventive and restorative maintenance must take on a higher than usual priority.

## Operations and Maintenance (O&M)

Maintenance is required at various intervals for all airport facilities. In addition, there are always a limited number of facilities that will require replacement. Examples of current and upcoming projects include the Westinghouse building at Buffalo International Airport, the reconstruction of Terminals 3 and 4 at JFK, the rehabilitation of the two main runways at Stewart International Airport, and the reconstruction of the Central Terminal Area at La Guardia Airport. Rehabilitation of runways and appurtenant pavements to extend useful life as determined by FAA is essential to prevent delays. O&M also includes rehabilitation of terminals and hangars to reach acceptable conditions in order to extend useful life and replacement of terminals and hangers at the end of useful life, as determined by NYSDOT inspections and airport documentation. Operations may require additional facilities based upon FAA approval and demonstrated need using enplanement and operation data.

## Resilience

The events of September 11, 2001, changed the way all U.S. airports operate, and steps have been taken to secure airports in New York and nationally. The ability of New York airports to operate efficiently during substandard conditions or during a period of crisis can greatly impact the government's ability to react and recover from the crisis. This ability to react and recover was recently observed as each of the New York major hub airports were flooded as a result of the storm surge brought about by Sandy in October of 2012. JFK airport was back in operation in three days, and LaGuardia was back in service in four days. To continue the progress, New York City region airports will receive 10% of the resiliency program funds to implement a series of projects from 2014-2023, with \$77 million being spent from 2014-2018 and \$117 million being spent from 2014-2023.



## Recommendations to Raise the Grade

- Increase that federal, state and local funding of airport capital investments to meet future needs in balance with the economic return it can provide
- Recognize the increasing demand for maintenance and rehabilitation due to the aging infrastructure and fund accordingly.
- Accelerate efforts to modernize the air traffic control system by implementing the NextGen System and provide training to key personnel.
- Intensify efforts to provide alternate regional transportation modes to reduce regional jet traffic at major airports.

To accomplish O&M activities to improve airport function, airport managers and policymakers should:

- Move preventative maintenance funding to a higher priority to maintain aircraft operations and help prevent delays,
- Improve asset management practices by having them guided by comprehensive automated decision support systems to identify treatment locations and facilities and treatment strategies.
- Focus on new ice and snow control strategies.

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- Navigant Consultants, Inc., 2012, Phase II Report to the Special Committee for PANYNJ, [bit.ly/panynj-phase2-rothschild](http://bit.ly/panynj-phase2-rothschild)
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- Airport Capital Development Needs: 2015-2019, Airport Council International, [bit.ly/2015AirportCapitalNeeds](http://bit.ly/2015AirportCapitalNeeds)



New York has 17,456 bridges—essentially one bridge for every seven miles of roadways in the state, and enough bridges to stretch from Albany to Miami. More than 50% of New York’s bridges are 75 years old, and over 400 of New York’s bridges are 100 years old. New York also has 2,012 structurally deficient bridges that require consistent maintenance or improvements to safely operate for freight and commuters. Overall, New York’s local bridges are often in worse condition than the State bridges. For example, recently only 385 state and local bridges were scheduled for repair over two years, which is less than 10% of the bridges that were in need of repair. Approximately 100 bridges in New York State are currently closed because of serious deficiencies.



## What You Should Know About New York’s Bridges

New York’s bridges provide powerful connections for its citizens and for citizens of the world. For millions of people, 18 landmark bridges provide access to tNew York City. The state’s seven international bridges provide trade routes between Canada and the U.S. in Upstate New York. The two bridges that connect New York to Vermont over Lake Champlain provide local residents access to employment and recreation. New York’s 17,000 other bridges, large and small, serve our 19 million residents in a myriad of ways on a daily basis.

Bridges are a critical component of daily life and safety in New York State. Ownership of bridges in New York State is shared by numerous agencies and municipalities across the state’s jurisdictional boundaries. NYSDOT identifies three main ownership categories:

1. State owned bridges (many of which are eligible to receive federal funding for repairs);
2. Bridges owned and managed by authorities (such as the Port Authority of New York and New Jersey) and,
3. “Local” bridges owned by cities, towns, and counties

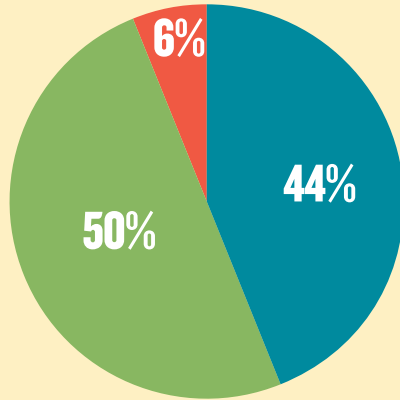




**Bridges**

**17,456**

**NEW YORK STATE BRIDGES TOTAL**

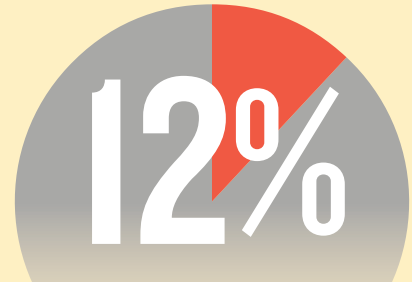


**OWNERSHIP**

- NYSDOT
- Municipalities
- State & local authorities, commissions & railroads

**2,012**

**STRUCTURALLY DEFICIENT**



New York has more structurally deficient bridges than the national average, and almost 22% of our total bridge deck area (driving surface) is in need of repair. Structurally deficient bridges are safe for travel, though they often need maintenance or improvements to correct obsolete features.

**APPROXIMATELY**

**100**

**CLOSED BRIDGES STATEWIDE**

Bridges in New York State can be closed for structural and condition reasons. Many have no established date of repair due to budgetary limitations.

Seven agencies including the state's tolling authorities manage approximately 50% of the state's bridges and, include most of the largest, most traveled and, most well-known bridges. Here are the agencies:

- New York State Department of Transportation (NYSDOT)
- New York State Thruway Authority (NYSTA)
- New York State Bridge Authority (NYSBA)
- Port Authority of New York & New Jersey (PANY&NJ), and
- Metropolitan Transportation Authority Bridges & Tunnels (MTAB&T)

New York's other bridges (local bridges) are managed by counties and/or other local municipalities and other small agencies. The local bridges are critical since they are essential for local mobility and for maintaining the continuity of the overall bridge/highway system.



New York State bridges have not received the attention and funding necessary to maintain them as reliable components of New York State's transportation system. The availability of bridges and roads is often taken for granted in modern society, and yet without keeping these assets in a state of good repair (SOGR), society could not function, and certainly could not advance. In fact, we don't often notice them until the system breaks down and closures or restrictions are required.

**Figure I. Condition of Urban Bridges**

Urban Area	Structurally Deficient	Functionally Obsolete
Albany	10%	30%
Buffalo	9%	27%
New York City	9%	48%
Rochester	9%	33%
Syracuse	14%	25%

Source: TRIP analysis of Federal Highway Administration data

According to the National Bridge Inventory (NBI), New York's bridges compare unfavorably with bridges in most of the other states:

- New York ranks 13th among the states with the highest number of bridges.
- There are 17,456 bridges in the state inventory as reported to the Federal Highway Administration (FHWA). This averages out to one bridge for every seven miles of roadways in the state. In addition, NYSDOT owns 60 railroad bridges.
- New York is the 12th worst state in structurally deficient bridges. Structurally deficient bridges require significant maintenance, rehabilitation, or replacement. These bridges must be inspected at generally every year since critical load-carrying elements were found to be in poor condition due to deterioration or damage. These bridges often have weight limits that restrict the gross weight of vehicles using the bridge which can cause costly detours to freight and commuter traffic.
- The State accounts for 6% of all the structurally deficient bridge deck area nationally.
- New York ranks 2nd worst in the nation in functionally obsolete bridges, which means that over 27% of the state's bridges do not meet current bridge operational and design standards such as substandard lane widths, lack of shoulders and height restrictions. These standards ensure bridges are built and maintained for maximum safety, longevity, operational efficiency, and cost-effectiveness.
- Approximately 100 bridges in New York State were closed for structural and conditional reasons. Many have no established date of repair due to budgetary limitations. In addition to structural and condition reasons, some bridges may require roadway realignment.

## Recent Bridge Failures In the U.S. to Learn From

Incidences of bridge infrastructure failure have occurred in the past:

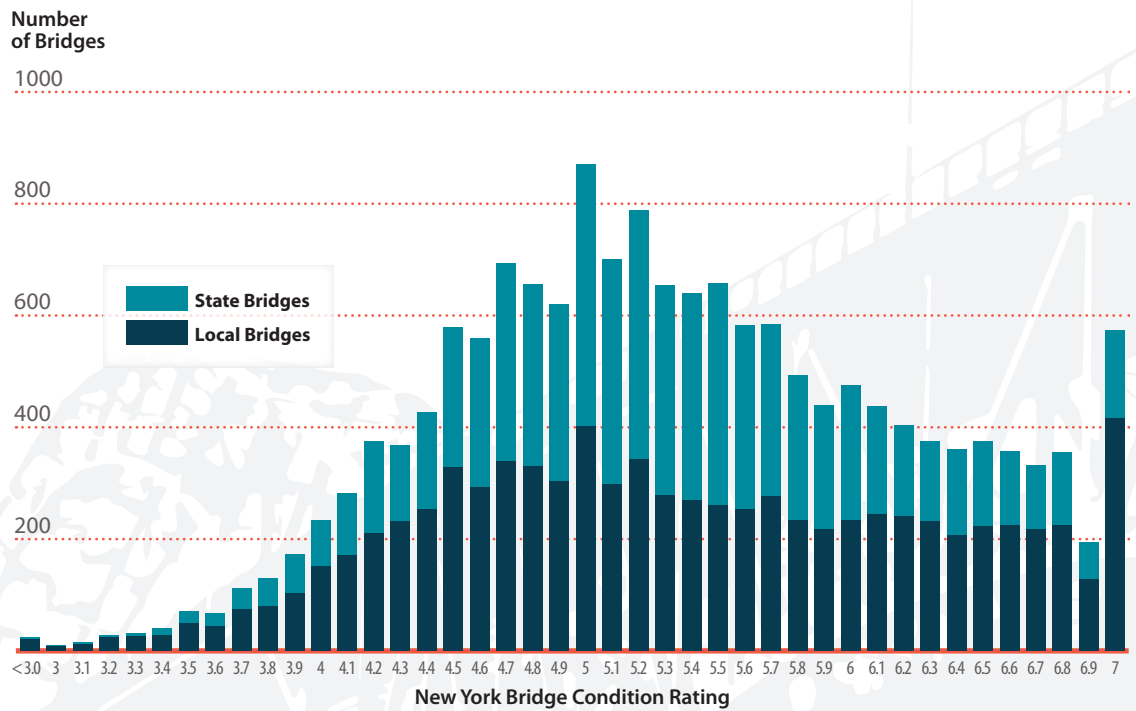
- April 5, 1987, the swollen and fast-moving Schoharie Creek in Florida, Montgomery County, NY, undermined and collapsed an I-90 NY State Thruway Bridge (after three decades in service) killing 5.
- June 28, 2001, an I-88 culvert in Sidney, Delaware County, NY washed away, killing 2.
- In 2009, the Lake Champlain Bridge was closed due to advanced structural deterioration, creating a daily 100-mile detour for thousands.
- In 2011, Tropical Storm Irene collapsed 15 bridges across eastern New York. These failures happened primarily on older bridges.

New York State's large population, high volume of bridge users, and high percentage of older bridges highlight the need for increased funding for bridge upgrades.

## Condition and Capacity

More than 50% of New York's bridges are 75 years old, and over 400 of New York's bridges are 100 years old. Overall, New York's local bridges are in worse condition than the State bridges. The ability of New York State's bridges to meet current and future demand is questionable due to the high average age of the state's bridges and impending service of life of many bridges. Most of New York's bridges date back to the middle of the 20th Century and a large number of those predate the post-World War II construction boom. Since then, the population of the state has tripled and the vehicle-miles traveled have increased more than four times. According to the FHWA's NBI, New York has 4,733 bridges that are functionally obsolete, the 2nd highest in the nation after Texas.

**Figure 2. Deficient Bridge Wave**



Data Source: 2011 Official Bridge Data; Bridge Needs Assessment Model (BNAM2008)

The NYSDOT has adopted bridge preservation strategies as opposed to strict a replacement strategy due to budget restrictions. The percentage of structurally deficient bridges has been reduced from 57% in 1992 to 12% in 2014, due to New York State's repair programs.

New York State's bridges are inspected at least every two years by professional engineers. If it is judged that the bridge can no longer perform its intended function, the bridge will be restricted to fewer travel lanes, or to load restrictions, and if necessary, closed. The decision to restrict travel or close lanes is made through a process that includes the Regional Bridge Engineer.

## Funding

Every dollar spent on road, highway and bridge improvements results in smaller vehicle maintenance costs, fewer delays, less fuel consumption, improved safety, reduced road and bridge maintenance costs and reduced emissions as a result of better traffic flow. However, funding for maintenance, rehabilitation, and replacement of roadways and bridges remains well below the need. According to NYSDOT, over the next two years, only 385 state and local bridges will be programmed. This is less than 10% of the bridges that are in need of repair.

Often additional costs are incurred by not having appropriate budgets at the appropriate time. Bridge projects that were once ready to begin construction have been delayed and rescheduled due to funding limitations but then may need to secure new permits to move forward again. For example, construction of the Rikers Island Bridge was originally scheduled in the 2002 plan for construction in 2006. But in the latest plan dated 2009, it has been rescheduled for construction in 2020.

Ensuring enough funding is available at the right time is also critical to local areas. When locally owned bridges are included in federally funded bridge rehabilitation work, FHWA will provide 80% of the cost of the work, but the state and or local government funding must provide the remaining 20%. When municipalities cannot budget their 20% for their portion of the project, corrective action may have to be deferred, resulting in more expensive repairs “down the road” causing greater inconvenience to the public.

Simply stated, the shortfall in funding obstructs bridge work from efficient implementation. Advanced under the concept of “component rehabilitation,” the construction work is only programmed for the most deteriorated bridge elements. “Component rehab” is an innovative way to address the fact that funding shortfalls are commonplace. But instead of allowing for all of the important work to be performed in one project, multiple projects are required thus stretching out the total time to complete needed work, increasing the amount of time travel will be disrupted as well as the overall cost.

## Future Need

Future needs can be best assessed with the number of structurally deficient and functionally obsolete bridges. New York’s large backlog of structurally deficient and functionally obsolete bridges means that future needs will only increase. Major bridge projects will be required in the years ahead. Future funding availability will also be insufficient. In the last long range plan developed by NYSDOT, the funding to meet future needs for road and bridge repairs was far below the level needed to achieve a state of good repair. The combined road and bridge funding needs through 2030 were estimated at approximately \$31 billion. In addition, the New York State Thruway Authority’s (NYSTA) 20-year needs have been estimated at \$3.4 billion, with \$980 million needed by other State authorities.

The longer term funding needs will be contingent on how well the state’s bridges are maintained. If a comprehensive and robust maintenance program is put in place now, the useful life of many of the state’s bridges can be extended thus reducing life cycle costs over the longer term. Deferring needed maintenance will reduce the useful life of the bridge.

The neglected infrastructure in time will only get worse if we don't act in a timely manner. Bridges which are not maintained will likely eventually be closed or weight-restricted causing economic disruption in local communities and throughout the region.

## Operation & Maintenance

Despite the limited resources, New York State has performed well in managing and operating its bridges. New York was one of the first states in the nation to institute a comprehensive inspection program, and it is still in use today.

But management and operation of New York's roads and bridges also varies among counties and municipalities who own and maintain 50% of the state's bridges. State owned bridges and roads are managed through the NYSDOT. Whether or not a bridge is on the Federal Aid highway system will also impact federal funding eligibility. NYSDOT is critical to the successful management of the bridge inventory since the state owns and maintains 44% of the bridges statewide.

The sufficiency ratings system that forms the basis of federal funding is based on the structural deficiency and functional obsolescence. Addressing these two related but separate components complicates the bridge condition assessment process. To assist in establishing funding levels, FHWA has developed the National Bridge Inventory Assessment System.

Management and operation could be improved in three ways:

1. The first is related to the inspection procedures. In special cases, the inspection procedures could be improved so that greater attention is paid to structural deficiencies that may be difficult to analyze. A case in point is an out-of-state interstate bridge that was recently closed due to unsafe conditions, namely the Sherman Minton Bridge. While some of the deficiencies had been identified as far back as 20 years ago, more comprehensive state of the art studies were conducted to identify the bridge rehabilitation work that was critically needed. Other high risk conditions at bridges should be monitored more closely with pending budget cuts.
2. The second is related to getting the word out to the public on our bridges' needs. In public documents, the message is typically based on how well we have spent the dedicated funding to fix our bridges. While important to outline our successes, we should also be candid regarding the complexity and expense of achieving and maintaining a state of good repair.
3. The third aspect of managing our bridges that could be improved is related to the first, namely identifying how the work required must be prioritized. While "component rehabilitation" bridge work is a good start in this direction, the need for more clearly identifying the state of good repair needs must be made clearer. Due to the limited funding streams projected, structurally deficient bridges and functionally obsolete bridges should be prioritized separately rather than together with priority given to addressing physical deterioration. The current replacement of the Tappan Zee Bridge, without a rapid transit component is a perfect example of how this subject could be addressed noting the need to replace the bridge for structural reasons but also noting



the importance of having a replacement bridge that includes significant operational upgrades. Also, the replacement of the Kosciuszko Bridge is another example of prioritized construction.

New York is in the early phases of implementing a new Bridge Management System (BMS), that is integrated with the bridge inspection, culvert and diving inspection programs AgileAssets Bridge Data Information System (BDIS). This will help in analyzing all the infrastructure needs and spending maintenance, rehab and replacement dollars in the most efficient and effective manner. NYSDOT is also implementing (as mandated by MAP 21) to American Association of State Highway and Transportation Officials (AASHTO) element level inspection program starting in October 2014 and fully converting by 2016. This provides a national standard for reporting the bridge condition. The lessons learned by the FHWA in the 1980s –that postponing regular maintenance is a costly proposition—still holds true today. If our bridges are not properly cared for, the needed repairs will be much greater than they would have been if they had received the necessary attention in the first place.

## Public Safety

The safety of the traveling public is the number one priority. Bridges are inspected by professional engineers every two years and even more frequently, if their condition requires. It is essential that public safety needs be met and New York State's government takes this mandate seriously. When bridges are deemed to be unsafe, "make safe" repairs are implemented and/or the bridge is closed or restricted to traffic.

NYSDOT has developed a Bridge Maintenance Program (BMP) that has been acknowledged as a very effective example of best management practices. State, local, and federal engineers address and prioritize any repair or reinforcement work that may be necessary.

Another good example of how aggressively our bridges are cared for is the program of NYCDOT which manages over 500 bridges and which has put in place, an aggressive bridge capital and maintenance program.

## Resilience

The resilience of a bridge is a function of a number of parameters to include the design, materials, vehicular load, and sufficient ongoing maintenance. A well designed and properly constructed and maintained bridge will last many years. However, bridges require regular maintenance to remain in a state of good repair. Conversely, when they are not properly maintained, they will deteriorate to the point where components will need to be rehabilitated or replaced and closure or restricted use of the bridge may become necessary.

## Innovation

The evaluation, implementation and strategic use of innovative techniques, products and project delivery methods is a path forward practicing engineers can share with policy makers in meeting their challenge of reducing the bridge project backlog with limited funding. Utilizing "lessons learned" and redefining repair/rehabilitation/replacement priorities should be a key part in improving product delivery methods.



## Bridges

Accelerated bridge construction (ABC) techniques have the potential to minimize traffic disruptions, promote traffic and worker safety while improving the overall quality and durability of bridges. Innovative programs such as the Accelerated Bridge Program provided \$212 million for work to include the removal and replacement of bridge decks, and other improvements that will enhance and strengthen New York's bridges currently considered deficient. The program is intended to improve the overall condition ratings of the bridges, in order for them to be removed from the deficient bridge list. Utilizing ABC methods, NYSDOT constructed 15 precast deck bridges throughout the state including 5 precast decks in five consecutive weekends on I-690 in Syracuse, NY. NYSDOT used the innovative material Ultra High Performance Concrete (UHPC) on 14 bridges including the construction of UHPC Link Slab joint, the first such joint in the nation. The NYSDOT's ABC Program, Phase 1B, will consist of four Design-Build Contracts that will provide for the rehabilitation and repair of potentially fifty-three bridges located in several regions throughout New York State in order for them to be removed from the deficient bridge list.

The NY Works Program was an innovative construction initiative designed to reduce the backlog of deficient roads and bridges while creating thousands of construction jobs. NY Works provided \$1.2 billion for work to improve more than 2,000 lane miles of roads and rehabilitate more than 100 bridges across the state. NY Works projects were underway by 2012, repavement was scheduled for completion in 2014, and bridge completion dates were scheduled for the end of 2013. Typical bridge project work included the removal and replacement of bridge decks, and other improvements that will enhance and strengthen the service life of New York's bridges currently considered deficient.

The NYSDOT is looking at new methods and resources to deliver bridge improvement projects more rapidly and effectively, thereby minimizing life-cycle costs for this group of bridges. The program will help improve the state's economic condition, address critical transportation infrastructure needs, and provide long-term benefits New York's taxpayers.

## Recommendations to Raise the Grade

- **Create a Prioritization Program** to assess the bridge needs starting from existing bridge asset management programs and based on state and national standards for uniformity across the country. Coordinate the Prioritization Program by incorporating the concept of "component rehabilitation".
- **Evaluate Funding Alternatives** and plan in sync with a Prioritization Program to address the bridge project backlog.
  1. Generate revenue appropriate to the established needs: sales tax, user tax, fuel tax, tolls, bonds, and vehicle registration.
  2. Increase private sector participation with industrial partners, economic development areas, sports facilities entertainment venues.
  3. Solicit and use donations to repair historic bridges that are in need of repair, rehabilitation or closed.
- **Establish the Value of Long-term and Stable Funding Mechanisms** by supporting a fix to the federal Highway Trust Fund and reforming state bridge funding by passing legislation like the "Bridge and Road Investment and Dedicated Fund Guaranteed

Enforcement (BRIDGE) Reform Act that would firewall intended bridge funding for much needed construction and prevent diversions.

- **Identify innovative construction techniques and the potential of new materials** including but not limited to roll-in, lift-in, float-in, construct on-site, precast components, staged construction, night-time closures, weekend staging, and accelerated construction methods.
- **Consider project delivery methods best suited for accelerated bridge construction** i.e.: design-build, construction manager/general contractor, CM/CG, incentive/disincentive I/D clauses, lane rental, and early purchase of materials.

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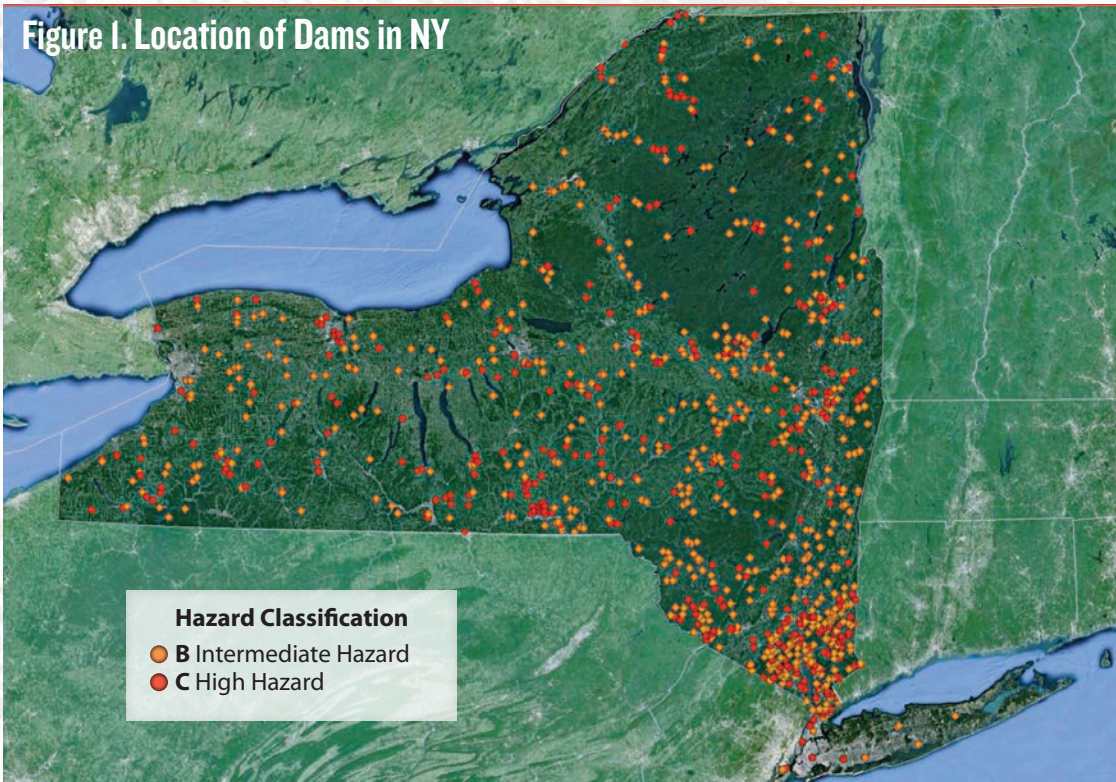


# DAMS

New York state has over 7,000 dams that provide for drinking water, irrigation, flood control, fire protection, recreation, and hydropower. The average age of New York's dams is 69 years, and 400 of those structures are classified as High Hazard dam structures. Of the state's high hazard dams, 392 now have Emergency Action Plans in place for public safety. Since New York State's Dam Safety Regulations were updated in 2009, work on 58 dams commenced improving safety. However, challenges remain as \$152 million is needed to repair the deficient High Hazard and Intermediate Hazard dams in New York.



Figure 1. Location of Dams in NY



Source: New York State Department of Environmental Conservation Inventory of Dams



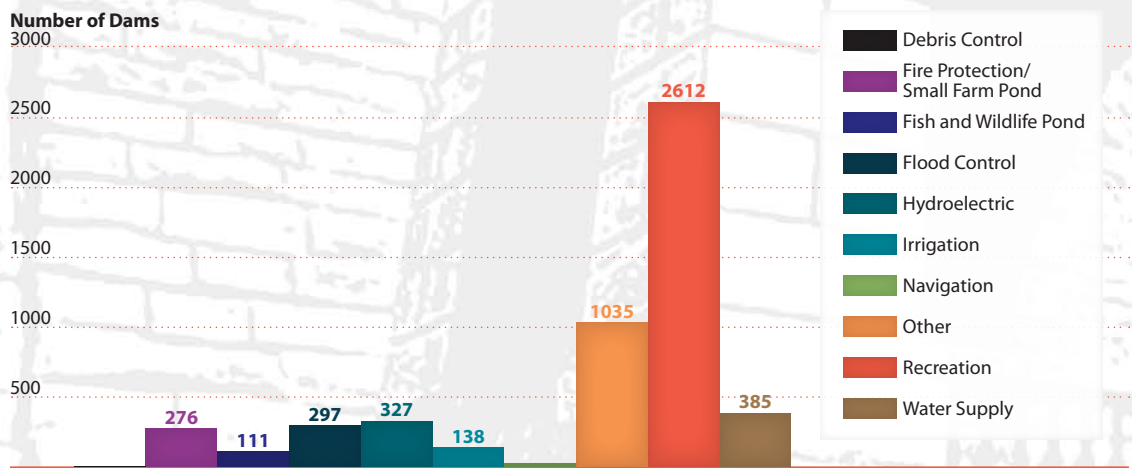
## What You Should Know About New York's Dams

Dams are an essential part of New York's infrastructure, which enhance the state's rich and abundant water resources. New York State has over 7,000 dams that provide for drinking water, irrigation, flood control, fire protection, recreation, hydropower, navigation and wildlife habitats. The average age of New York's dams is 69 years. Of the state's 400 high hazard dams, 392 have Emergency Action Plans. The state employs 11 inspectors to monitor 5,243 dams, equating to about 476 dams per inspector—far above the national average. Consistent funding to address the needs of New York's aging dams is a challenge.

Dams are a portion of New York State's aging infrastructure that requires routine inspection to provide for public safety. The failure of dams during tropical storm Irene, the recent highly publicized and scrutinized rehabilitation projects at Swinging Bridge and Gilboa Dams, and the failure of the Hadlock Pond Dam, are examples of where repair and rehabilitation is needed at dams in New York.

New York defines a dam as any artificial barrier, including any earthen barrier or other structure, together with its appurtenant works, which impounds or will impound waters. There are 7,073 dams throughout New York. Figure 1 shows the distribution of dams across the state. Figure 2 summarizes the primary purposes these dams serve throughout the state.

**Figure 2. Purposes of Dams in New York State**  
(there may be secondary purposes of dams)



New York has 400 High Hazard dams, 660 Intermediate Hazard dams and 4,209 Low Hazard dams. In addition, there are 1,283 Negligible/No Hazard dams and 521 Unclassified dams in the state. The number of High Hazard dams will likely continue to increase almost yearly, as hazard classifications are reassessed, and the hazard class is raised due to development within the potential breach inundation zone downstream of these structures. The number of High and Intermediate Hazard dams in the state may potentially decrease due to hazard reclassifications based on a dam breaching analysis and an assessment of the potential breach inundation zone downstream of a dam.



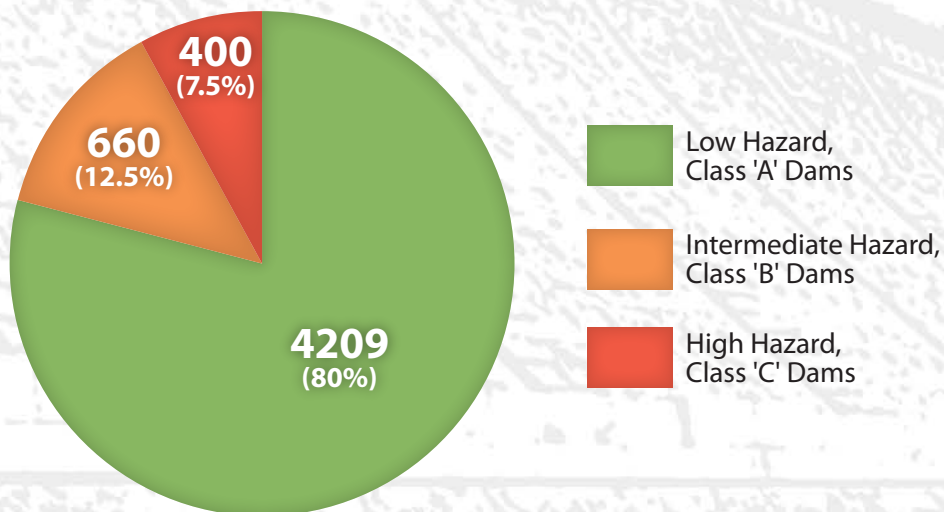
## Hazard Classifications

In New York, a dam's hazard potential is classified on the basis of the anticipated consequences of failure, not the condition of the dam. New York classifies dams as High Hazard, Intermediate Hazard, Low Hazard and Negligible or No Hazard, as follows:

- **High Hazard (Class 'C') Dams** - Failure may result in widespread or serious damage to homes, main highways, industrial or commercial buildings and/or important utilities such that the loss of human life or widespread substantial economic loss is likely.
- **Intermediate Hazard (Class 'B') Dams** - Failure may result in damage to isolated homes and main highways, and may result in the interruption of important utilities, but are otherwise unlikely to pose the threat of personal injury and/or substantial economic loss or substantial environmental damage. Loss of human life is not expected.
- **Low Hazard (Class 'A') Dams** - Failure is unlikely to result in damage to anything more than undeveloped lands and buildings; is unlikely to result in the interruption of important utilities, and/or is otherwise unlikely to pose the threat of personal injury, substantial economic loss or substantial environmental damage.
- **Negligible or No Hazard (Class 'D') Dams** - A dam that has been breached or removed, or has failed or otherwise no longer materially impounds waters, or a dam that was planned but never constructed. Class "D" dams pose negligible or no hazard.

Approximately 49% of New York's High and Intermediate Hazard Dams are publicly owned by federal, state, and local governments while approximately 51% are privately owned by individuals, corporations, farmers, and homeowner's and lake owners' associations.

**Figure 3. State Regulated Dams by Hazard Potential**



## Dam Safety

New York has been monitoring the safety of dams since the early 1900s. New York's dam safety statutes are contained in the Environmental Conservation Law (ECL), Article 15, Title 5, which was last amended in 1999. The New York State Department of Environmental Conservation (NYSDEC) implements and enforces the Dam Safety Regulations. Within NYSDEC is a Dam Safety Section (DSS), whose functions include: safety inspection of dams; technical review of proposed dam construction or modification; monitoring of remedial work for compliance with dam safety criteria; monitoring dam owners' safety programs, and emergency preparedness.

The NYSDEC DSS has 11 full-time equivalent employees and an annual budget of approximately \$1.3 million to regulate 5,243 dams (High, Intermediate and Low Hazard dams). This equates to 476 dams per staff member, which is higher than the national average of about 200 dams per staff member. It is estimated that the NYSDEC DSS staff's time is allocated 25% towards inspections, 45% towards permitting/design reviews, 25% enforcement, 10% towards emergency response/EAP preparedness and 5% towards other tasks.

In New York, the ultimate responsibility and liability for a dam's safety rests on the shoulders of the dam's owner. The law requires that "any owner of a dam shall at all times operate and maintain the dam and all appurtenant works in a safe condition." Dam owners may be required to prepare, implement and maintain the following items, based on the hazard classification assigned to a dam:

- An Inspection and Maintenance Plan;
- An Emergency Action Plan;
- An Annual Certification;
- Notification of Auxiliary Spillway Flow;
- Recordkeeping and Response to Request for Records;
- Notices of Property Transfer;
- Safety Inspections; and
- Engineering Assessments.

Under certain circumstances, the NYSDEC may find it necessary to safeguard life or property or to protect natural resources, and direct a dam owner to conduct studies, investigations and analyses to evaluate the safety of the dam; and either remove the dam or construct, reconstruct or repair the dam within such reasonable time and in such manner as shall be specified in an order of the DEC commissioner.

Current regulations allow NYSDEC to seek civil penalties. A violation of a dam permit requirement is a misdemeanor punishable by fine of up to \$10,000 or imprisonment of up to one year, or both, in addition to a civil penalty of up to \$5,000. Violation of an order to repair or remove a dam is punishable by fine of up to \$5,000 for each offense; in case of a continuing violation, every day's continuance is a distinct offense.

## Emergency Action Plans

Emergency action plans (EAPs) are documents that are essential to notify and facilitate the evacuation of people residing downstream of the dam through local and state emergency management organizations in the event of a dam failure. As of 2009, the owner of a dam that assigned a Hazard Classification of Class 'C' or 'B' is required to prepare an EAP and annual updates are to be submitted to the NYSDEC and to local emergency management officials. In 2012, owners of 15 High Hazard dams received Notices of Violation and proposed consent orders for failure to submit an EAP. The majority of these dam owners have signed the consent orders and completed EAPs. NYS is performing ahead of the 2015 national average in number of dams with EAPs, with approximately 25% more than the national average for High Hazard dams.

## Safety Inspections

In New York, dam owners of High Hazard, Class 'C' or Intermediate Hazard, Class 'B' dams are required to undertake Safety Inspections on a regular basis as identified in the Inspection and Maintenance Plan for each dam. These inspections are required to be performed by a licensed and registered professional engineer.

In addition to the dam owner, the NYSDEC DSS makes Field Inspections of dams. The frequency of inspections performed by the NYSDEC DSS is by planning policy, and not by statute or regulation. The goal of the NYSDEC DSS is to make inspections of High Hazard, Class 'C' dams every two years and Intermediate Hazard, Class 'B' dams every four years. Low Hazard, Class 'A' dams are generally inspected as needed by the NYSDEC DSS. Dams regulated by the Federal Energy Regulatory Commission (FERC) may not be included in this schedule.

## Engineering Assessments

Engineering assessments are an evaluation of the existing structure against current dam safety criteria. New York Dam Safety Regulations requires the preparation of an Engineering Assessment (EA) Report, which must be submitted to the NYSDEC for all High Hazard, Class 'C' and Intermediate Hazard, Class 'B' dams every 10 years. The first EA Reports for Large (dam either has a height greater than or equal to 40 feet, or impounds 1,000 acre-feet or more at normal water surface), High Hazard, Class 'C' dams were to be submitted to NYSDEC by August 2012. For dams that are classified as Small (dam has a height of less than 40 feet and impounds less than 1,000 acre-feet at normal water surface), High Hazard, Class 'C' structures the first EA Report is required to be submitted by August 2014. And for dams that have been assigned as Intermediate Hazard, Class 'B' structures, the first EA report needs to be submitted by August 19, 2015.



Dams

## How Dam Safety Is Improving in New York

- Approximately 98% of New York State's High Hazard dams have EAPs in place, which is higher than the national average. NYSDEC has used their authority to issue Notices of Violation and proposed consent orders for failure to submit EAPs.
- In August 2009, New York updated the state's Dam Safety Regulations to include mandates to dam owners, such as requiring owners to prepare and implement Inspection & Maintenance Plans and EAPs, and have Safety Inspections and Engineering Assessments made on a routine basis.
- Current New York State Dam Safety Regulations give NYSDEC the authority to issue Notices of Violation and proposed consent orders, as well as stronger measures, for failure to meet the required mandates.
- NYSDEC DSS is above the national average of 74% (2010) in inspections of High Hazard dams.
- Dam rehabilitation is well underway in New York, with 35 High Hazard dam remedial projects completed between 2009 and 2011, and 11 Intermediate Hazard and 12 Low Hazard dams being repaired in 2010 and 2011.

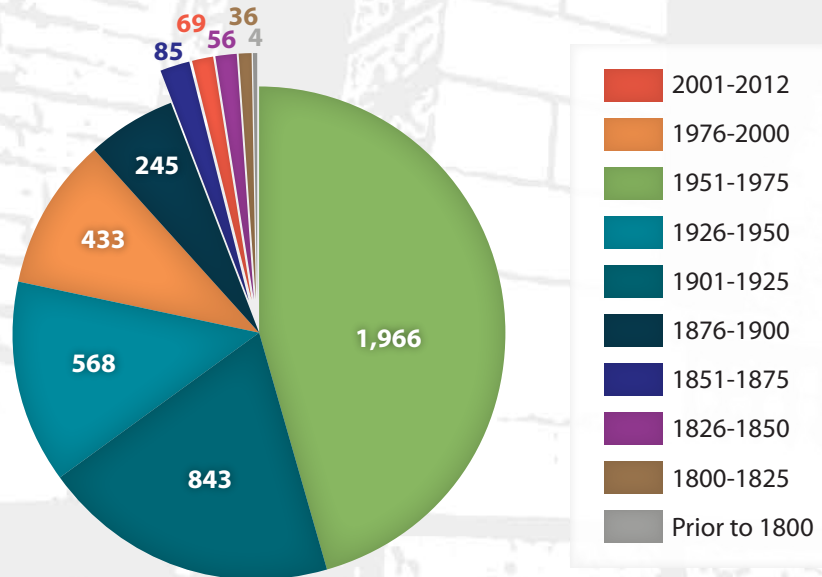
## Condition Ratings

The NYSDEC DSS may assign a Condition Rating to any dam. The Condition Ratings that may be assigned are:

- **Unsafe** - Dams with deficiencies of such a nature that failure of the dam is imminent and immediate action is required to eliminate or reduce the danger
- **Unsound** - Dams with deficiencies of such a nature that the safety of the dam cannot be assured;
- **Deficiently Maintained** - Dams with physical or operational deficiencies which do not require further significant engineering analysis; and
- **No Deficiencies Noted** - A Safety Inspection or Engineering Assessment, and/or investigation by the NYSDEC DSS, did not reveal deficiencies.

Based upon its discretion and upon consideration of public safety and special characteristics of a dam and its location, the NYSDEC DSS can require an Enhanced Safety Program be implemented for a particular dam (e.g., require increased frequency of Safety Inspections, require the normal pool elevation be lowered until repairs can be made to a dam, require financial assurance).

Figure 4. Number of Dams Built in New York by Year



## Remediation and Removal

New York has approximately 426 dams that were constructed prior to 1900. The average age of New York State's dams is approximately 69 years. As shown in Figure 4. A majority of the current dams in service were constructed between 1900 and 1975.

Remediation projects reported by the NYSDEC completed in 2013 included nine High Hazard, Class 'C' dams and about eight Intermediate Hazard, Class 'B' dams. In addition, one High Hazard and one Intermediate Hazard dam were breached or removed during this same time period. It is estimated that during the period from 2009 to 2012, owners of High Hazard and Intermediate Hazard dams spent approximately \$40 million to repair 58 dams.

Recently, there are five dams under Consent Order from the NYSDEC. In addition, four dams have had Notices of Hearing and Complaint issued (i.e.: formal enforcement has been initiated). Over the next few years, it is likely that more of New York's dams will be determined to be deficient as a result of the additional scrutiny driven by the new regulations that have uncovered deficiencies such as: aging; deterioration; unsafe conditions; and lack of maintenance. In addition, nationwide, dams are now more frequently being deemed unsafe or deficient as a result of increased scientific and engineering knowledge about large flood events and earthquakes. Additionally, when downstream development occurs within the area affected by flooding in the event of a dam's failure, existing dams may be reclassified to a higher hazard level, which typically requires costly rehabilitation to bring the dams up to the higher hazard standards.

## Funding & Future Investment Needs

It is estimated that approximately \$152 million is needed to repair the deficient High Hazard and Intermediate Hazard dams in New York. Many of the remaining deficient dams are privately owned, and those dam owners typically have significantly less funding for repairs than public owners. While not included in the estimate for repairing all High Hazard and Intermediate Hazard dams, Low Hazard dam repairs are generally less expensive, but the cumulative cost of these repairs are estimated to be as much as \$115 million.

New York's 1996 Clean Water/Clean Air Bond Act devoted \$1.75 billion to protect and restore the state's environment. As part of the Act, \$15 million in funding was available to help small municipalities improve the safety of dams throughout New York. During initial years, the program provided a maximum of \$300,000, with the maximum increased to \$1 million, both with a maximum 75% state share. This relatively modest program spurred more than 40 municipal dam safety projects. All of these funds have since been allocated and most have been expended. In 2012, as part of the 2012-2013 Budget Agreement, The New York Works Funds designated \$18.5 million to repair NYSDEC-owned dams. While these two taxpayer funded measures for publically-owned dams have been effective in improving the safety of dams, a more consistent stream of funding would help public entities to better plan for safety improvements to their dams.

## Recommendations to Raise the Grade

- Develop more consistent funding sources of funding (i.e., grants and/or low-interest loans) and support the creation of dam rehabilitation program and provide subsequent funding at the federal and state levels for public and private owners of High Hazard and Intermediate Hazard dams;
- Increase the NYSDEC DSS staff to be more in line with the national average of 200 dams per staff member;



## Dams

- Make improvements to the NYSDEC DSS system for tracking critical information (i.e., change in condition rating) about High Hazard and Intermediate Hazard dams. This includes developing a system to determine and track dam owners as properties change titles over time. NYSEC DSS's system for tracking changes in condition ratings of dams has been reported to be less than adequate.
- Address the issue that more of the state's dams will be determined to be deficient as a result of aging, deterioration, lack of maintenance, additional scrutiny driven by the new regulations, an increase in scientific and engineering knowledge about large flood events and earthquakes and continued downstream development resulting in a change in hazard classifications.
- Conduct a Statewide Probable Maximum Precipitation (PMP) study to provide improved estimates of the maximum rainfall potential (PMP) for developing the Spillway Design Flood for High Hazard dams;
- Provide the results of dam breach analyses performed on High and Intermediate Hazard dams to the New York State Department of Transportation for incorporation into their Statewide Flooding Vulnerability Assessment; and
- Develop a means to communicate the expected flooding zones resulting from a dam failure to local planning and zoning officials for use in evaluating the effects of a dam breach on proposed development. While local officials are not required to consider such information when evaluating proposed development, such information could serve to assist designers in the designing of projects that are safer from the consequences of an upstream dam failure.

## Conclusion

In the coming year, more dams will be found to be deficient as a result of required investigations as outlined in the new regulations, an increase in scientific and engineering knowledge about large flood events and earthquakes and continued development downstream of structures resulting in a change of hazard classifications. Repairing and rehabilitating deficient dams in New York State is critical, as dams are a vital part of New York State's infrastructure. If dams fail, there is potential for tragic loss of life, property, environmental damage and costly damage to other critical infrastructure. NYSDEC is charged with regulating the safety of New York State's dams, and while the agency is doing better than many other states relative to having the authority to regulate dams and performing Safety Inspections, there are still improvements that need to be made in order to ensure the safety of New York State dams and the public. In addition, NYSEC DSS's system for tracking changes in condition ratings of dams has been reported to be less than adequate.

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- Association of State Dam Safety Officials, The Cost of Rehabilitating our Nations Dams, January 2009
- Environmental Conservation Law, Article 1 Title 3; Article 3 Title 3; Article 3 sections 0301[2][aa] and [m]; Article 15 Title 5; Article 15 sections 0501, 0503, 0507, 0511, and 0516.
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- NYSDEC-DSS
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Photo by Adi Talwar.



In New York State, 10,147 regulated water systems provide clean water to 20 million of New York's citizens. Nearly 95% of New York's population receives water from the state's public water supply systems. Unfortunately, 95% of the submitted improvement projects to the Drinking Water State Revolving Fund program remain unfunded due to the overwhelming demand. The latest estimate of repairing, replacing, and updating New York State's drinking water infrastructure is \$38.7 billion over 20 years. With almost half of New York City's pipes put in place prior to 1941, it would take 100 years or more to upgrade its aging pipes at current replacement rates. From frequent pipe breaks to large system upgrades to rebuilding from storm damages, New York State's aging drinking water network has no shortage of challenges.



Crews worked to pump water from the track bed and restore N, Q and R train service after a 36-inch water main broke at 23rd Street and Broadway on February 1, 2013.

## What You Should Know About New York's Drinking Water

In New York State there are 10,147 regulated water systems (3,312 community water systems, 6,080 non-community transient water systems, and 755 non-transient non-community water systems), serving a population of approximately 20 million people. Nearly 95% of New York's population receives water from the state's public water supply systems. The rest of the state's population is served by a variety of other drinking water sources, including privately-owned water supply companies serving municipalities, to schools with their own water supply, to small stores in rural areas serving customers water from their own wells. Unacceptably, 95% of the projects submitted for inclusion in the Drinking Water State Revolving Fund program remain unfunded due to a lack of available funds.



## Capacity & Condition

About 12,100 million gallons per day (Mgal/d) of fresh surface and ground water and saline surface water were withdrawn from New York's rivers, streams, lakes, estuaries, bays, and aquifers. Freshwater withdrawals comprised about 7,080 Mgal/d of this total. With a total population of 19 million people in New York State, the total freshwater withdrawals represent an average of more than 370 gal/d (gallons per day) per capita.

Regulated Water Systems have worked hard to keep up with the ever tightening federal regulations. Megaprojects like New York City's (NYC) Third Water Tunnel, Croton Filter Plant and Catskill-Delaware Ultraviolet Disinfection have taken billions of capital with little outside help. In 2012, New York City completed its \$1.6 billion Catskill/Delaware UV facility, the largest of its kind in the world. In 2015, NYC will begin operating its \$3 billion Croton Filter Plant and Stage 2 of City Water Tunnel No.3, which started construction in 1971.

With over half of New York City's pipes put in place prior to 1941, it would take 100 years or more to update its aging pipes at current replacement rates. New York City has implemented the Water for the Future program to supplement DEP's water supply, and to help meet water demands in an emergency. One major component of DEP's Water for the Future program is aimed at addressing the known leaks in the Rondout-West Branch Tunnel section of the Delaware Aqueduct, which conveys more than 50% of the daily drinking water for New York City. In November 2010, DEP unveiled a design to repair leaks in the 85-mile Delaware Aqueduct to ensure the integrity of New York City's vital infrastructure. The construction of the bypass tunnel, and the repair of the lining, will ensure that DEP can continue to deliver high quality drinking water every day for decades to come. DEP began work on the bypass tunnel in the spring of 2013, and plans to connect to the Delaware Aqueduct in 2022.



## TAKE A CLOSER LOOK AT New York City's Catskill-Delaware Ultraviolet Disinfection Facility

Providing safe water for New York City's residents has been ongoing for over 100 years. From replacing the Collect Pond in Manhattan with the Croton River in Westchester to the current watershed protection program NYC has constantly worked to assure the health of its residents. With the passage of the federal Safe Drinking Water Act new requirements were put on the City including filtering the over one billion gallon a day supply. A provision of the law allows a waiver from filtration if it can be shown that the water supply meets federal requirements and measures are in place to assure the long term protection of the supply.

EPA now requires that most surface drinking water supplied by municipalities be filtered. Due to New York City's \$1.5 billion investment in watershed protection programs, the federal government allows New York City to continue receiving unfiltered drinking water from the Catskill and Delaware watersheds. The holistic approach exempts New York City from being required to build a filtration plant that could cost \$10 billion or more. However under the requirements of the Long Term 2 Enhanced Surface Treatment Rule (LT2ESWTR), Catskill/Delaware water is required to have two types of disinfection. The water is already disinfected with chlorine, and the Catskill/Delaware Ultraviolet (UV) Disinfection Facility, provides the federally-required secondary level of disinfection against potentially harmful microbiological contaminants such as *Cryptosporidium* and *Giardia*.

Site preparation for the UV Disinfection Facility began in 2006 and construction of the facility began in 2008. The plant, which began operation in December, 2012, is located on New York City-owned Eastview site, a 153-acre property situated in the towns on Mount Pleasant and Greenburgh in Westchester County. The UV Disinfection Facility, the largest disinfection of its kind in the world, consists of fifty-six 40-million-gallon-per-day UV disinfection units and is designed to disinfect a maximum of 2.4 billion gallons of water per day.

## Funding

Ongoing funding for water is primarily provided by individual and commercial rate payers who are provided reliable and clean water based on use. Historically, major capital costs for water have been granted or matched by federal and state programs to keep water rates affordable for citizens. For example, since the start of the Drinking Water State Revolving Fund (DWSRF) program, the state has received approximately \$948 million in DWSRF capitalization grants from the federal government and contributed an additional \$355 million in match dollars. Since that time, New York State has executed over \$4 billion in financing to assist communities with drinking water infrastructure projects through the DWSRF program.

In 2008, New York received \$36.2 million from the federal government for the DWSRF program, down from \$59.2 million in 1997. Despite receiving only \$967.5 million over the last 12 years, New York State's DWSRF program has successfully leveraged those funds and provided approximately \$2.38 billion in financing to 330 water systems. To make use of these programs, communities often need to increase water user rates to help leverage these cost-effective programs and make necessary improvements. This financing includes low interest loans, State Assistance Payment grants totaling \$90 million, and Federal Assistance Payment grants totaling \$151.5 million.

## Future Need

Although the DWSRF program has been very successful in providing funding for water system improvement projects, the majority of the projects which apply to the DWSRF cannot be reached for financing due to lack of funds, indicating that the financial need is significantly higher than the DWSRF alone can provide. Additional revenues are needed to replace systems, upgrade systems and properly operate and maintain systems.

The conservative cost estimate of repairing, replacing, and updating New York's drinking water infrastructure is \$22 billion over the next 20 years. In 1996, the DWSRF was created by the federal and New York State governments to provide low interest loans and grants for water system improvement projects. Since that time, New York State has executed over \$4 billion in financing to assist communities with drinking water infrastructure projects through the DWSRF program.

**Figure 1. Total New York State Drinking Water State Revolving Fund**  
Financings through April 30, 2013

Type	Total Financings		State Grants		Federal Grants	
	Count	Amount	Count	Amount	Count	Amount
Long-Term Direct	308	781	67	90,000,000	80	781,483,992
Leveraged	315	2,179,289,063	0	0	0	0
Short-Term Direct	192	1,045,761,914	0	0	81	124,426,470
<b>Totals</b>	<b>815</b>	<b>4,006,534,969</b>	<b>67</b>	<b>90,000,000</b>	<b>161</b>	<b>905,910,462</b>

Source: NYS Environmental Facilities Corporation. Data provided to ASCE by Michael Montysko, PE, NYS DOH Bureau of Water Supply Protection.

Notes: 1) Total financing amount includes SAP and FAP amounts

2) Counts are not mutually exclusive. They represent the number of financings that included at least one of the grant types



The last 30 years have seen a significant increase in the number of drinking water regulations, covering systems of every size and water source. As research technologies change and improve, additional regulations may be enacted as new potential health effects are discovered. The cost of complying with new and increasingly stringent regulations is a challenge that all water systems face.

**Figure 2. Twenty-Year Estimate of Drinking Water Infrastructure Needs in New York**

<b>Data Category</b>	<b>Estimate of Needs</b>
2007 Drinking Water Infrastructure Needs Survey (DWINS) estimate for non NYC community water systems serving more than 3,300 people (raw data)	\$1.7 billion
2007 DWINS estimate for non-NYC community water systems serving more than 3,300 people (estimated and extrapolated)	\$6.5 billion
2003 DWINS estimate for community water systems serving less than 3,300 people	\$2.0 billion
New York City (2007 DWINS estimate plus estimation and extrapolation)	\$28.0 billion
<b>Total Preliminary Estimate</b>	<b>\$38.7 billion</b>

Source: Drinking Water Infrastructure Needs of New York State, November 2008, New York State Department of Health

The NYC Capital Improvement Program (CIP) is \$11.3 billion for fiscal years 2013-2021. In it NYC has allocated approximately \$2.9 billion for the protection, expansion and distribution of the City's water supply including \$205 million for the Croton Filtration Plant and \$929 million for trunk and distribution mains as well as \$1.2 billion for on-going water quality preservation and protection. NYC replaced 735 miles of water mains in the 10 years 2002-2012. It would take 100 years to replace all 7,000 miles.

## Operation & Maintenance

Operations and routine maintenance of facilities and pipes is often shorted in times of budget cuts and increasing capital needs. Shortchanged operations and maintenance are reflected through incident and issue reports of violations and enforcement actions taken by the New York Health Department. USEPA's Enforcement and Compliance History Online (ECHO) shows 47 "Informal Enforcement Actions/ Notices of Violation (NOVs)" in the last five years for the 15 large systems. The state report for 2010 says there were 3,967 systems that had violations. 97% reported no maximum contaminant level violations, 98% had no treatment system techniques violations. 61% had no monitoring and reporting violations. This would indicate adequate operation of the systems.

The state Health Department's Source Water Assessment Program (SWAP) and Wellhead Protection Program would give an indication of the water quality of the supply systems. They show generally good water quality. In addition NYC's Watershed Protection Program has received a USEPA Filtration Avoidance Determination.

EPA estimates that 240,000 distribution main breaks occur nationally a year or 650 a day. In 2012, there were 347 breaks in the NYC network of nearly 7,000 miles of water mains (six per 100 miles), down from a high of 632 in 2003.

## Public Safety

The importance of modern, reliable and efficient water treatment systems is self evident. The health of our communities, the protection of our waterbodies, the prospects for energy savings, and future economic growth and development, are linked to our ability to maintain, and as necessary, upgrade these facilities. However, aged systems are failing, and municipalities do not have the funds to adequately repair and replace the necessary infrastructure.

## Resilience

New York has experienced extreme weather events, including storms Irene, Lee and Sandy. Some of New York's water treatment facilities were severely damaged and temporarily shut down. While Sandy happened in 2012, efforts are still underway to correct issues and to rebuild in a more resilient way so that New York is prepared for the next storm.

The resilience experts on the NYS2100 Commission made recommendations to address the risks to water infrastructure posed by floods, coastal surges and power outages. Here are a few of the recommendations related to drinking water:

- Take immediate steps to address sensitive infrastructure and implementing engineering asset management plans that provide a blueprint for resiliency.
- Building smarter with resiliency by exploring enhanced engineering criteria for new, expanded or rebuilt structures. This will include programs to enhance resiliency by such steps as: elevating structures, using flood-proof engineering criteria or incentivizing the purchase of flood damaged residences in very hazardous areas.
- Waterproof low-lying facilities and other critical infrastructure that supports the cleaning of water such as energy infrastructure.
- Update design standards for drinking water systems
- Improve long-term maintenance and planning

## Recommendations To Raise The Grade

- Raise awareness for the true cost of water. Current New York State water rates do not reflect the true cost of reliably conveying and treating wastewater. Replacing antiquated sewer pipes and treatment equipment will require significant local investment, and users should be aware of what their water rates will pay for.
- Implement the resiliency recommendations for drinking water provided by the NYS2100 Commission and rebuild our wastewater facilities with resilience in mind.
- Explore the potential for a state Water Infrastructure Finance Innovations Authority (WIFIA) that would access funds from the state treasury and use those funds to support loans and other credit mechanisms for water projects.
- Reinvigorate the federal State Revolving Loan Fund (SRF) program under the Safe Drinking Water Act by reauthorizing minimum federal funding of \$7.5 billion over five years

## Find Out More

## Drinking Water

- Caution Ahead: Overdue Investments for New York's Aging Infrastructure, Center for an Urban Future, March 2014, [www.nycfuture.org/research/publications/caution-ahead](http://www.nycfuture.org/research/publications/caution-ahead)
- 2010 State of New York Public Water Supply Annual Compliance Report, NYS Department of Health
- Comprehensive Annual Financial Report, NYC Municipal Water Finance Authority, December 12, 2012
- Drinking Water Infrastructure Needs of New York State, November 2008, New York State Department of Health, [bit.ly/DrinkingWaterFacts](http://bit.ly/DrinkingWaterFacts)
- New York City 2014 Drinking Water Supply and Quality Report, [www.nyc.gov/html/dep/pdf/wsstate14.pdf](http://www.nyc.gov/html/dep/pdf/wsstate14.pdf)
- NEW YORK WATER-USE PROGRAM AND DATA, 2000, U.S. Geological Survey, U.S. Department of the Interior, September 2005
- NYC Department of Design and Construction Presentation, NY Municipal Engineers, April, 2013
- NYCDEP Press Release, "Improved Maintenance Contributes..." December 12, 2012
- USEPA 2011 Drinking Water Infrastructure Needs Survey and Assessment





New York is home to the first state park in the nation, Niagara Falls State Park, and the largest public park in the U.S., Adirondack Park, along with 179 other state parks, 35 state historical sites, and nearly 335,000 acres of land. Hosting 62 million people each year, New York ranks first in the nation for operating facilities and campsites. However, New York's park system has seen hard times. Reaching a crisis in 2010, almost half of the parks were almost closed due to a \$1 billion backlog of projects, almost half because of immediate health and safety needs. However, New York changed course in 2011, and committed to catch up on infrastructure decay with 279 capital improvement projects at 109 parks and historic sites. By 2020, New York's park system should see a \$900 million investment in state parks using both private philanthropy and public dollars as well as innovative best practices.

## What You Should Know About New York's Parks

Parkland and open space are two of New York State's most valuable, nonrenewable resources. They enhance the quality of life by improving our physical and physiological health, strengthening our communities, and making our cities and neighborhoods more attractive places to live. From the salt marshes of Long Island to the alpine tundra of the Adirondack High Peaks, New York State boasts some of the most spectacular scenery and terrain in the nation. The lands comprising New York State's parks represent a legacy of more than 100 years of land conservation and stewardship. A great example of this is the Niagara Falls State Park, which celebrated the 125th anniversary in 2010, as the first state park in the nation and one that was designed by two of the country's most famous park designers, Frederick Law Olmsted and Calvert Vaux.

Today, the New York State park system, maintained and operated by the New York State Office of Parks, Recreation and Historic Preservation, has grown to 179 state parks and 35 state historical sites covering nearly 335,000 acres. Nearly 80% of the park system features a wide range of geological features, ecological habitats and species of plants and animals. These include the extensive forested areas of Allegany and Sterling Forest State Parks, the gorges of the Finger Lakes parks, islands in the St. Lawrence and Hudson Rivers, cliffs



at Minnewaska, and the beaches and sand dunes of Long Island. Including open spaces such as the Adirondack and Catskill Forest Preserves and federally managed sites totals over 5 million acres of government managed landholdings that are often used for recreation purposes.

## Capacity & Condition

New York ranks first in the number of operating facilities and the total number of campsites across the nation. New York ranks fifth in total acreage and second in total annual visitation. Attendance at Niagara Falls State Park is greater than that of Grand Canyon and Yosemite National Parks combined, and more than twice as many people visit Jones Beach each year than visit Yellowstone. Also, Washington's Headquarters State Historic Site is the first property acquired with public funds for the express purpose of historic preservation and tourism.

The Office of Parks, Recreation and Historic Preservation (OPRHP) is responsible for the operation and maintenance of the state parks system. The agency has an "all funds" operating and capital budget of approximately \$331 million and is staffed by 1,719 permanent employees and more than 4,400 seasonal positions. OPRHP is directly responsible for operating an extensive network of public recreational facilities that include: 5,000 buildings, 29 golf courses, 36 swimming pools, 67 beaches, 27 marinas, 40 boat launching sites, 18 nature centers, 817 cabins, 8,355 campsites, more than 2,000 miles of trails, extensive utility systems, 104 dams, hundreds of miles of roads and 604 bridges.

The New York State Department of Environmental Conservation (DEC) administers 4.3 million acres of land (including 3 million acres of forest preserve, over 784,500 acres of state forest, and over 199,000 acres of wildlife management areas), over 907,000 acres of conservation easements, 52 campgrounds, several day-use areas, 12 fish hatcheries, 1,300 miles of easements for public fishing rights, over 400 boat launch and fishing access sites, three submerged heritage preserves, and about 4,000 miles of trail, as well as several environmental education centers and summer camps.

New York State recreational facilities include 5,351 city/village, 2,107 town and 461 county-operated facilities. Almost every town, village or city, no matter how small, has at least one green space. Green spaces range from simple sports fields to elegantly landscaped spaces funded by wealthy donors. In addition, many communities are connected by greenways, hiking trails and bike trails. For many people, local parks may be the only nearby open space.



## Take a Closer Look at ADIRONDACK PARK

The Adirondack Park was created in 1892 by the State of New York amid concerns for the water and timber resources of the region. Today the park is the largest publicly protected area in the contiguous United States, greater in size than Yellowstone, Everglades, Glacier and Grand Canyon National Park combined. The boundary of the Park encompasses approximately 6 million acres. In the Adirondack Park, there are 2,700,000 acres of Forest Preserve; and over 600,000 acres of public recreation rights under conservation easements on private forest lands. The Catskill Park contains 281,000 acres of Forest Preserve lands.

The Adirondack Park Agency was established in 1971 to "ensure the optimum overall conservation, protection, development and use of the unique scenic, aesthetic, wildlife, recreational, open space, ecological and natural resources of the Adirondack Park." The Adirondack Park Agency has its own operating budget, separate from OPRHP. For 2011–2012, the NYS Executive Budget recommended \$5.8 million in funding, a \$512,000 decrease from 2010–11 spending levels.

## Parks

To have citizen input into the land acquisition decisions made by the DEC and OPRHP, in 1990, New York State began an official Open Space Conservation Program, and in 1992, a formal Open Space Conservation Plan followed. The plan is periodically revised in order

to adapt to shifting conservation priorities. The latest Plan was published in 2009 and the 2014 Draft NYS Open Space Conservation Plan is now available. It lists New York's Open Space Conservation goals and principles and also provides guidance for open space planning and protection at the State, regional and community level. One of the listed goals is to provide accessible, quality outdoor recreation and open space to all New Yorkers.

Every five years, New York State produces a Statewide Comprehensive Outdoor Recreation Plan (SCORP). The SCORP is the primary planning tool used by the State to assess existing and future recreational demands, evaluate current recreational opportunities and estimate present and future recreational needs.

## Maintenance & Public Safety

Approximately 62 million people visit the State's parks and historic sites each year. The system has grown substantially in recent years, from 184 total sites in 1992 to 213 in 2009. The land managed by OPRHP has grown from 257,000 acres in 1992 to nearly 350,000 today. Although New York State's parks remain usable, the challenge to maintain the wide park system and to catch up on backlogged work remains daunting. In the face of annual budget cuts, OPRHP is tasked with maintaining a system that is aging, deteriorating, and sometimes failing. According to the report titled *Protect Their Future: New York's State Parks in Crisis*, many parks have significant health and

safety problems, such as outdated water supply systems, aging wastewater treatment plants that don't meet current standards, outdated electrical systems, landfills that were never closed to state standards, underground petroleum storage tanks that don't meet current regulations, and dams that have been placed on the state's high-hazard list. In addition, many park buildings and facilities—visitor centers, recreational facilities, cabins, campgrounds, swimming pools, bathhouses, playgrounds, nature centers, boat launches, and historic buildings—are deteriorating. Repairs are also needed on basic infrastructure, such as roofs, heating and plumbing systems, park offices, recreation fields, bathrooms, roads, parking areas, and maintenance centers.

## Funding & Future Needs

Taxpayer dollars are a major source of support for New York's State parks providing nearly 57% of the total funding. Patron user fees pay for approximately 40% of annual costs, while federal grants and other miscellaneous funds comprise the remaining revenues. The state

### TAKE A CLOSER LOOK AT

## Forest Preserve Act: How New York Kept Its Wild Side

By the 1880s, less than 25% of New York State was forested, and the remaining uncut forests in the Catskills and Adirondacks were quickly being logged. In 1885, our State created the Forest Preserve Act to protect portions of our lands in the Catskills and Adirondacks from further exploitation. This Act was strengthened in 1894 by the "forever wild" amendment to the New York State Constitution, creating the first state-protected wilderness in the world, ensuring that Forest Preserve lands... "shall not be leased, sold or exchanged, or be taken by any corporation, public or private, nor shall the timber thereon be sold, removed or destroyed." Today, New York's Forest Preserve is the largest state-designated wilderness in the country.



park system in 2010 faced a capital backlog exceeding \$1.1 billion, including \$460 million in immediate health and safety needs (drinking water, sewage treatment, electrical systems) and \$595 million for worn-out facilities needing rehabilitation (campgrounds, cabins, shelters, pools, bathhouses). The Land and Water Conservation Fund, a federal fund that provides grants to states for park and recreation needs, reported a \$1.3 billion unmet need in 2012 for New York. According to *Protect Their Future: New York's State Parks in Crisis*, New York State should invest at least \$100 million annually—for a total of \$1 billion over the next decade—to restore the park system's deteriorated facilities and address pressing health and safety issues. To facilitate this, the group recommends that New York State establish a new, dedicated funding stream for the state park system.

In February 2010, the funding outlook for New York's parks was grim and in a crisis. For the first time in the 125-year history of the New York State park system, budget cuts led to as many as 88 state parks and historical sites possibly being closed. Fortunately, after New York's citizens voiced universal opposition and outrage to the proposed park closings, in May 2010, the Governor and State Legislature restored \$11 million to OPRHP's operating budget, avoiding the need for park closures. However, OPRHP has eliminated 1,500 permanent and seasonal workers, curtailed or eliminated a number of agency programs, shortened days and seasons of operation, reduced mid-week services, and eliminated on-site services at certain parks and historic sites in an effort to make up for these budget cuts. In addition, the purchases of needed park supplies, replacement vehicles, and computer equipment have been cancelled.

However, New York has recently changed course and has committed to make long-term investments in State parks and historic sites to bring modern transformations to highly visited state parks and catching up on infrastructure decay problems caused by a lack of maintenance. New York State has begun 279 capital improvement projects at 109 parks and historic sites since 2012. By 2020, New York's park system should see a \$900 million investment in state parks using both private philanthropy and other public dollars to advance hundreds of capital design and construction projects.

To enhance park facilities and support events, OPRHP continues to foster public-private partnerships, including corporate sponsorships, for fireworks displays, playground construction and the Empire State Games. With private sector support and expertise, the Black Course at Bethpage State Park was the first public course ever to host the U.S. Open national golf championship in the summer of 2002 and again in 2009. Over three years alone, \$5.6 million in private support was raised to support the State Park System.

## Recommendations to Raise the Grade

- Follow through on commitment to fully fund NY Parks 2020: A 7-Point Vision for Transforming NYS Parks.
- Improve the operation sustainability of the parks by promoting energy conservation, community partnerships and good stewardship.
- Energize local economies by supporting opportunities for private businesses to enhance park services.
- Continue to offer and expand opportunities for children and adults to learn about outdoor activities available through the parks system such as Free Fishing Clinics, Junior Hunter and Junior Trapper Mentoring Programs, and Environmental Education Camps.
- Support renegotiation of franchise fees with concessionaires of park and recreation facilities where necessary to support operation and maintenance of facilities.
- Leverage partnerships between the National Park Service and other recreation facilities operators and private groups to better utilize facilities and compensate for usage.

## Resources

- 2009 New York State Open Space Conservation Plan
- 2010 New York Statewide Trails Plan
- 2012 Annual Report, Land and Water Conservation Fund, [www.nps.gov/lwcf](http://www.nps.gov/lwcf)
- 2012 City Park Facts, The Trust For Public Land, Center for City Park Excellence [www.tpl.org/ccpe](http://www.tpl.org/ccpe)
- 2014 Draft NYS Open Space Conservation Plan - [www.dec.ny.gov/lands/317.html](http://www.dec.ny.gov/lands/317.html)
- Backlog is available at <http://bit.ly/NYParksBacklog>
- 2013 Annual Report, New York State Council of Parks, Recreation and Historic Preservation
- New York State Office of Parks, Recreation and Historic Preservation, Statewide Comprehensive Outdoor Recreation Plan (SCORP), 2014–2019
- NY Parks 2020: Renewing the Stewardship of our State Park System [bit.ly/NYParks2020](http://bit.ly/NYParks2020)
- PlaNYC, Parks and Public Space [bit.ly/PlaNYC-PublicSpaces](http://bit.ly/PlaNYC-PublicSpaces)
- Protect Their Future: New York's State Parks in Crisis, Alliance for NYS Parks and Parks & Trails NY, November 2010
- State of New York Financial Condition Report for Fiscal Year Ended March 31, 2014 [bit.ly/NYS-2014-FinancialCondition](http://bit.ly/NYS-2014-FinancialCondition)
- State of New York Snowmobile Trail Plan (Statewide Snowmobile Plan)
- Statistical Report of State Park Operations: 2010–2011, Annual Information Exchange, National Association of State Park Directors, [www.naspd.org](http://www.naspd.org)





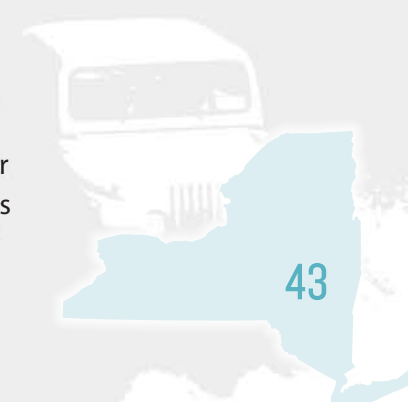
New York State's 240,000 mile road network is critical to the State's economy and everyone's quality of life. However, one-third of New York's major highways are considered to be in poor or fair condition, even as miles driven by New York's citizens are on the rise, creating crippling congestion and climbing operating costs. In fact, New York City-area drivers, accounting for half the state's population, each waste 53 hours per year just sitting in traffic. The combination of rough roads and congestion costs motorists a total of \$6.3 billion statewide—that's \$694 per driver in NYC, \$504 for Albany, and \$477 for Syracuse. Poor roads also cost rural areas where fatalities are three times more likely than on other roads in New York. Both the typical state funding programs and special initiatives, like New York Works, are being used to combat the backlog. By 2030, New York needs to spend about \$40 billion on roads to keep up with road conditions.



## Condition & Capacity

The 240,000 mile road network in New York State is a vast system made up of many sub-systems owned and operated by a variety of government agencies. New York's local and state road systems are critical to the State's economy and overall quality of life; however, much of the State's road mileage is in need of improvements due to physical deterioration and less than optimal designs to meet today's demands. Some roads do not meet current design standards because they were designed and built when travel speeds were lower and vehicle operation characteristics were different. Other roads require major rehabilitation or reconstruction due to the deteriorating effects of traffic and general wear and tear over the years.

The deficient physical condition of the highway system adds to the overall level of congestion statewide and to total vehicle, passenger, and ton-hours of delay. Poor ride quality due to distressed pavement as well as substandard road geometrics results in lower operating speeds by all vehicles. Pavements that are potholed and distressed force vehicles to slow down or change lanes unnecessarily. Forty-five percent of New York's major urban highways are congested. In fact, New York City often claims three of the top ten most



Roads

# BY THE NUMBERS

## New York's Road System Extent and Usage

- The highway system is owned by 1,600 local governments in New York State.
- Highways owned by towns comprise 60% of total local mileage
- Over 5200 miles of local jurisdiction highways are classified as 'arterials' and as such by definition, are among the most important and heavily travelled roads in the state
- 46% of the 350 million daily vehicle-miles of travel (VMT) in New York State take place on local jurisdiction highways
- New Yorkers drive approximately 131 billion miles on the State's roadways annually.
- Total travel still places New York as the 4th busiest state regarding vehicle miles travelled
- 75% of miles travelled are on urban roads in the State's metropolitan areas.
- 45% of New York's major roads are considered in poor or fair condition.
- Deteriorated roads have forced New York motorists to spend \$4.9 billion a year on vehicle repairs and operating costs, or \$433 per motorist.

congested corridors in the nation and was named one of the 10 worst cities for traffic in the country, as the average New York City area driver wastes 53 hours sitting in traffic according to INRIX. The largest portion of highway congestion in New York State occurs in NYC which contains approximately half of the State's population. While congestion rates could slow in the future, delays caused by congestion, even at current levels, have a significant adverse impact on the economy of the State.

New York's citizens drive approximately 131 billion miles on the State's roadways annually. While growth in VMT has slowed, total travel still places New York as the 4th busiest state regarding vehicle miles traveled. Seventy-five percent of these miles traveled are on urban roads in the State's metropolitan areas. Thirty-eight percent of New York's major roads are considered in poor or fair condition. Deteriorated roads have forced New York motorists to spend \$6.3 billion a year on vehicle repairs and operating costs, and depending where you live, up to \$694 per driver.

**Figure I. NY Urban Road Conditions and Vehicle Operating Costs**

Urban Area	Road Condition				Annual VOC*
	Poor	Mediocre	Fair	Good	
<b>Albany</b>	25%	26%	27%	22%	\$504
<b>Buffalo</b>	12%	20%	15%	53%	\$294
<b>New York City</b>	43%	30%	11%	16%	\$694
<b>Rochester</b>	21%	16%	24%	40%	\$402
<b>Syracuse</b>	28%	17%	15%	40%	\$477

\*Vehicle Operating Costs: Average annual extra vehicle operating costs per motorist as a result of driving on rough roads  
 Source: TRIP, <http://bit.ly/TRIPNY2015>

Congestion's impact is not limited to just the NYC metro area. From 1990 to 2011, vehicle travel on New York's highways increased by 36%, while the population grew by just 9% during that same time period. Additionally, 72% of the \$550 billion worth of commodities delivered annually from sites in New York are transported by truck on the State's highways. If the structural and operational deterioration of the highway system is not addressed, the ability of the system to meet the goods movement demands will be severely impaired with serious consequences for the State's economy and its ability to compete.



## Maintenance and Capital Planning

The New York State Department of Transportation (NYSDOT) undertakes highway and related construction/reconstruction through the Department's Capital Program. Developed by the Commissioner of Transportation and approved by the Governor and legislature, these programs are usually two to five years in duration and use a variety of funding sources. The programs set priorities for highway projects on the State owned facilities. NYSDOT has developed several recent capital program submissions:

- 2009–2014** Multi-Modal Transportation Program Submission
- 2010–2015** Capital Program
- 2010–2012** Two-Year Capital Program  
(Stop-Gap pending passage of a new FA Multi-Modal funding bill and new Surface Transportation Program and stabilization of the State's economy)
- 2013–2015** New York Works For Investment In Transportation Infrastructure  
(Forward Four Program)

Each one of these programs included different funding scenarios, and the Forward Four Program included three different scope of work scenarios. Fiscal constraints, uncertainty with Congress' commitment to renewing the national surface transportation funding for states and other factors led to the development of the 2-year interim program rather than a longer term program. The Forward Four Program was an outgrowth of the Governor's *New York Works* initiative, which added \$1.2 billion over and above the \$1.7 billion already allocated in the core program for infrastructure renewal.

A comparison of projected results between programs is problematic since the different programs are based on different definitions as to what highway system is being assessed. For instance, the 2010–12 program is based on the State Touring Route system, which includes non-State owned mileage. What is significant is that the "best case" scenario among all the programs shows that approximately 50% to 60% of pavement is in poor or fair condition. Figure 2 on the next page shows a comparison of the different programs in terms of projected and pavement end condition as a measure of progress.

**Figure 2. 2008–2013 Capital Program Development**

Capital Program		Lane-Miles of Pavement Improved	Impact on Pavement End Condition (Percent with a Good to Excellent Rating)	
			Projected	Actual
<b>Multi-Modal Transp. Program</b> (2009–14)		2,031	61%	-
<b>Capital Program Proposal</b> (2010–15)		1,300	52%	-
<b>2010–2012 Capital Program</b>		1,100	45%	60%
<b>New York Works for Investment in Transportation Infrastructure</b> (Forward Four) (2013–15)	<b>Scenario #1</b>	5,923	54%	-
	<b>Scenario #2</b>	12,464	60%	-
	<b>Scenario #3</b>	13,459	62%	-
<b>New York Works Special initiative</b> (2012–13)			50%	62%



**Figure 3. Potential Investment Alternatives, SFY 2013-14 to SFY 2014-15**  
Incremental Investment Levels

	Strategic I Investment Level	Strategic II Investment Level	Strategic III Investment Level
Construction and Program Support*	\$ 4,763	\$ 1,828	\$ 3,354
System Maintenance & Operations	\$ 718	\$ 276	\$ 567
Local Roads and Bridges	\$ 806	\$ 310	\$ 568
Modal Infrastructure	\$ 233	\$ 170	\$ 170
Subtotal Incremental Investment	-	\$ 2,584	\$ 4,659
<b>Plan Total</b>	<b>\$ 6,520</b>	<b>\$ 9,104</b>	<b>\$11,179</b>

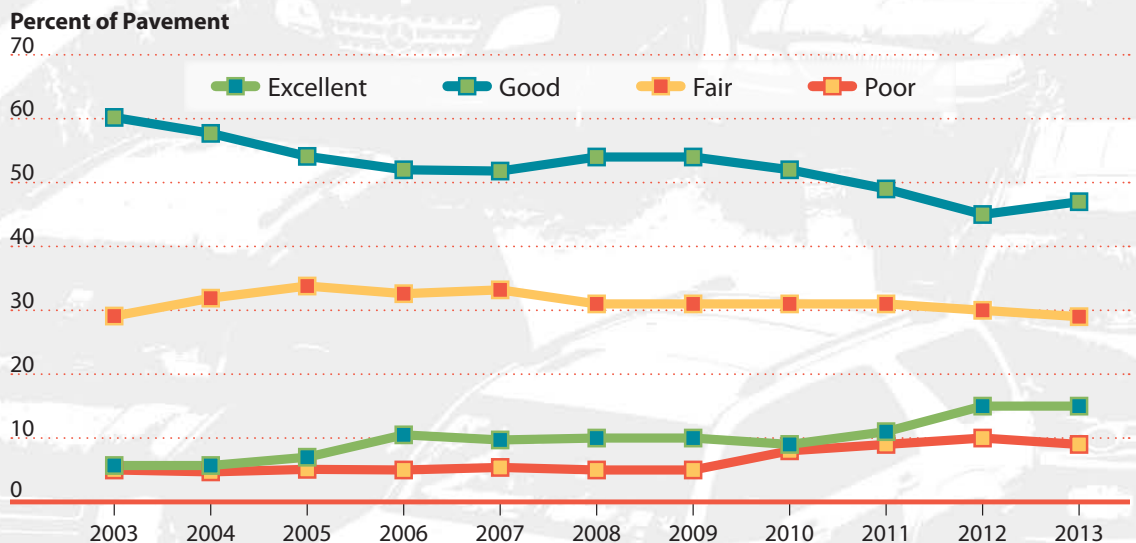
Amounts in millions

Source: 'New York Works For Investment in Transportation Infrastructure/Submission to New York Works Task Force, NYSDOT, 2012, page 12

\* Includes state and local construction and program support costs (including engineering, administration, right of way and other capital costs) required to deliver the highway and bridge program. The highway and bridge program accomplishments apply to the State Highway System. This includes more than 38,000 lane miles of highways (16% of all roads in the State including the most heavily traveled and strategically important highways)

With the levels of investment envisioned in recent capital programs and the priority given to addressing the most heavily used highway segments, NYSDOT expects some improvement in pavement by the close of the program in 2015 on higher level roadways. However, non-national Highway System and local Federal Aid highways will experience a decline in condition. The level of investment that was proposed under the 2010–15 Capital Program would have maintained Interstate Highway system pavement at 2010 conditions (61% good to excellent). Data now exist through 2013 showing actual pavement condition making it easier to compare what proposed programs predicted by way of pavement condition, and what was actually measured.

**Figure 4. New York Pavement Condition\***

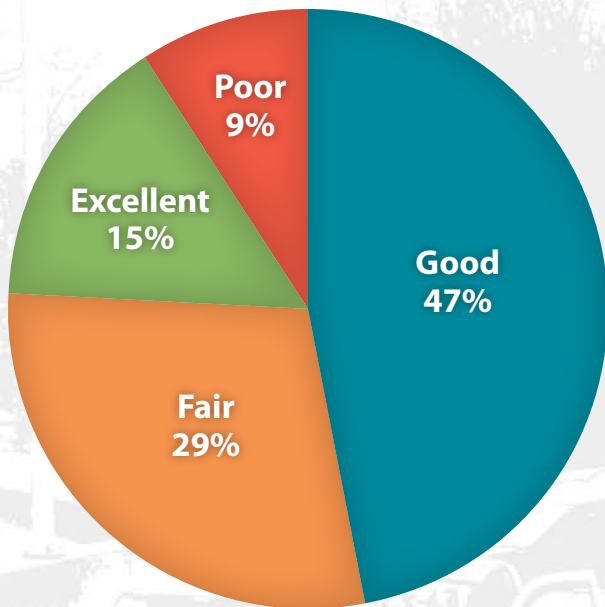


\* Data for the year 2009 was not available; therefore, 2009 values were estimated by averaging data from 2008 and 2010

Source: 'Pavement Reports,' Pavement Management/Office of Technical Services, NYSDOT, 2002-13

## Figure 5. Current Pavement Condition (2013) based on Surface Scoring

Surface Condition by Lane Miles Statewide



Source: 'Pavement Report-2013', Pavement Management/Office of Technical Services, NYSDOT, 2014, page 4

Figure 4 shows how pavement condition is trending and was developed from actual historical pavement surface scoring and highlights condition trends going back to 2003. NYSDOT has set as a goal to improve pavement condition on the State's roadways on a 12-year cycle. However, the percentage of sub-standard pavements across the network, after declining in the 1990s, has begun to increase over the past decade. Through the end of 2015, pavement condition on the State's highway system categorized as "Good to Excellent" is projected to decline from 55% to only 43%. New York should be repaving or reconstructing

approximately 3,500 lane miles annually. Under the completed two-year 2010–12 Capital Program, only 2,200 lane miles were programmed for major repaving or reconstruction. The Forward Four Program projects improvements to approximately 6,000 miles of highway pavements.

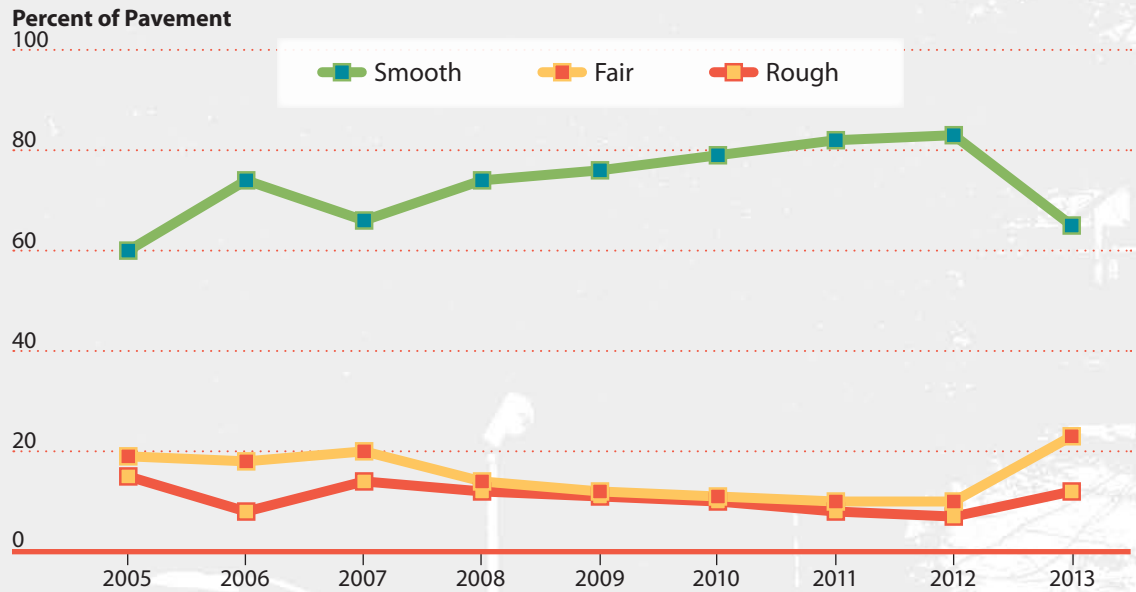
No one score or measurements can address the comprehensive condition of a road. While surface score is a good measure of pavement condition, these scores can be misleading as to the overall quality of the roadway. Other roadway elements are evaluated independently, some in a comprehensive Asset Management System. However, all too often problems are only addressed when they arise. The NYSDOT has improved its asset management techniques over the years and is heading in the right direction but there need to be more resources available to address the core problem aspects of the deteriorating roadway system rather than the symptoms.

The NYSDOT also measures pavement rideability using the International Roughness Index (IRI). The IRI measures the ride quality of a pavement as experienced by the riders. Roughness is calculated by using an electronic measuring device which runs over a section of pavement and measures the depth of ruts, and the bounce of the vehicle yields the IRI score measured in inches per mile. The higher the IRI score, the poorer the pavement and ride quality on a 220 point scale of less than 60 being very smooth and more than 220 being very rough. Figure 6 below shows the trends in IRI on the State maintained portion of the Touring Route system from 2005 to 2013; rideability remained relatively constant with 60 to 80% of pavement providing a smooth ride but showing an upturn of fair and rough pavement in recent years and a downturn in smooth pavement.

## Roads

## Figure 6. How Rough is New York's Ride?

International Rideability Index (IRI) for the State Touring Route System (2005–2013)\*



Note: No data was provided for the year 2009. Therefore, 2009 values were estimated by averaging data from 2008 and 2010.

## Where Does Road Funding Come From?

Funding for highway construction and maintenance comes from a variety of sources including but not limited to:

- Federal Aid Allocations, provided by the Highway Trust Fund
- State Funding/State Dedicated Fund (SDF) (generally used to match federal aid funding and other projects where use of federal funding is not desirable)
- Special Federal Programs, such as the American Reconstruction and Recovery Act (ARRA)
- Local funds

## Funding

The need to develop a comprehensive program of pavement improvements to raise the overall condition of State highways is occurring during a period of financial uncertainty at all governmental levels. The *New York Works Program* has helped but may not be sustainable on a long term basis. In addition, other one-time cash infusions programs such as the Federal American Recovery and Reinvestment Act (ARRA Program) were helpful, but did not fix the long-term problems. Approximately one-third of all highway mileage in New York qualifies for Federal funds, or about 88,000 of the State's 240,000 lane-miles of road (this includes state and non-state owned). The remaining two-thirds must rely solely on State and local resources.

The *Multimodal Investment Needs and Goals for the Future* report estimated that between 2010 and 2030, \$40 billion would be needed to bring pavements to a state of good repair, or \$2 billion per year. This amount is exclusive of additional amounts spent on other roadway elements such as guiderail, traffic operations, etc. which contribute significantly to system safety and operation but do not directly affect pavement condition.

In 2012–13, NYSDOT spent \$317 million on State owned highways pavement projects that contribute directly to improved pavement scores. Since 2008, NYSDOT has spent over \$400+ million per year on average for pavement improvements. This amount falls far short of estimated needs to bring pavements to a state of good repair. The proposed capital programs as shown in Figure 8 requested amounts far greater than actual expenditures as shown in Figure 9.



**Figure 7. Program Pavement Funding Request**

Program	Years in Program	Annual Investment	Total Investment
20 Year Needs	20	\$ 2.00	\$ 40.0
2009–14 Program	5	\$ 0.84	\$ 4.2
2010–15 Program	5	\$ 1.16	\$ 5.8
2010–12 Capital Program	2	\$ 1.80*	\$ 3.6
Forward Four Program	2	\$ 1.15**	\$ 2.3

Amounts in billions of 2011 dollars

\* This figure includes both bridges and pavement (pavement expenditures were not split out) and includes some work on non-State highways

\*\*This program included three funding scenarios. Scenario #1 is assumed here since it represents the funding amount shown in the State's most recent financial plan. Other scenarios represent enrichments to come closer to a state of good repair which cannot be assumed at this time.

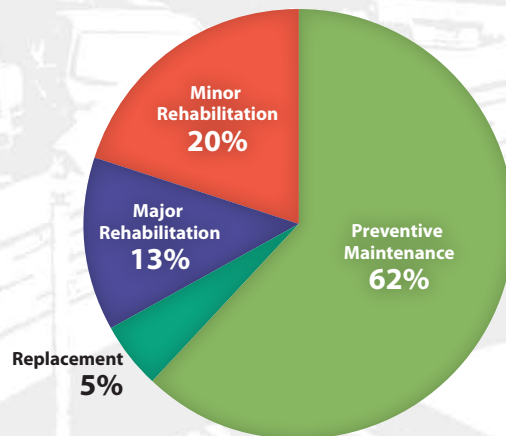
**Figure 8: Actual Pavement Expenditures**

Year	Amount
2007	\$ 425
2008	*
2009	\$ 551
2010	\$ 360
2011	\$ 384
2012	\$ 317
<b>Average Annual Funding</b>	<b>\$ 407</b>

Amounts in millions | \*Data not available

Source: 'Pavement Reports', Pavement Management/ Office of Technical Services, NYSDOT 2008-2013

**Figure 9: Paving Program Expenditures**



In 2012, the Governor implemented the *New York Works Program*, which provided funding for pavement and bridge projects Statewide. This funding infusion was over and above the \$3.3 billion NYSDOT Multi-Modal Program, which includes \$1.7 billion in 'core' highway and bridge projects. However, even with the infusion of funds from the New York Works Program, funding does not come up to levels needed to achieve a state of good repair.

The State recently increased funding for counties, towns, and villages for local highway, road, and bridge repair projects through the Consolidated Local Street and Highway Improvement Program. The State legislation increased the amount of available funds by \$75 million, up to \$438 million, for the 2013–14 fiscal year. Unfortunately, the available funds still do not close the investment gap that the state is facing. Figures 8 through 10 highlight the anticipated funding impacts on pavement condition over the State System.

The Federal Highway Trust fund (HTF) has been pushed to the brink of insolvency by Congress and requires annual general fund "patch" transfers to maintain current spending. Congress continues to debate the best approach to providing a dependable and predictable source for the future as well as what a renewed program would implement. At the State level, the State Dedicated Fund cannot afford to pay existing commitments without substantial general fund support. With regard to Federal funding, New York received over \$1.6 billion in funds under the federal surface transportation program,

MAP-21 for Federal fiscal year 2014. These funds were used by the State for the repair, construction, and maintenance of federal aid system roads and on-system bridges.

## Operations & Maintenance and Resilience

Road resilience is primarily dependent on two factors: 1) a program of corrective, preventive, and demand maintenance as well as 2) a capital program of new construction/ rehabilitation including capital maintenance projects. The NYSDOT's Capital Program proposed for 2010–15 cites the following as a key Guiding Principle relating to facility resilience<sup>4</sup>:

- Preservation of Transportation Assets:** The preservation of existing infrastructure for all modes of transportation is essential to the economic competitiveness and livability of New York State. Proven asset management principles that balance preventive maintenance and capital investment are critical to preserve the system and to avoid the expense and service dislocations of premature reconstructions and replacement. Priorities will be determined by the importance of an asset to the system, regardless of ownership.

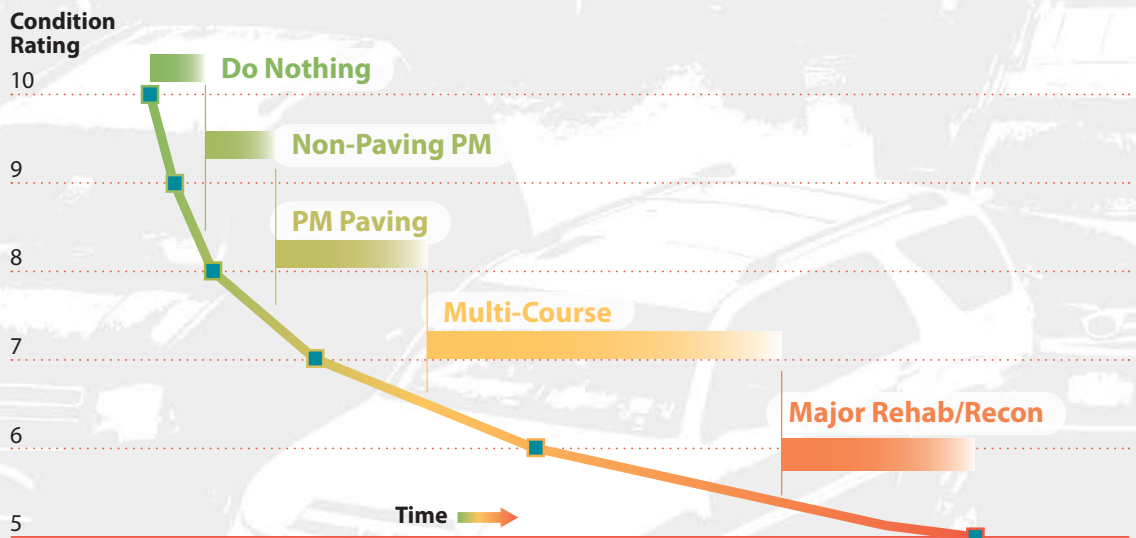
The recent Forward Four Program stated as a similar key objective:

- Preservation First:** To ensure the State's transportation system can continue to support future commerce and personal travel demands and address emergencies and unforeseen circumstances, NYSDOT will focus first on preserving the existing infrastructure. This includes focused investment in current infrastructure on preventive, corrective and demand maintenance. The highest priority of infrastructure investment will be to preserve the functionality of the existing transportation system

Summarizing the Forward Four approach, the following is noted:

- 1) Preservation first
- 2) System, not projects
- 3) Maximize return on investment;
- 4) Make it sustainable.

**Figure 10: Hierarchy of Pavement Capital and Maintenance Actions\***



<sup>4</sup> Resilience as used in this discussion applies only to infrastructure condition.

The NYSDOT Core Program emphasizes the use of appropriate, timely maintenance treatments including overlays and state of the art industry practices to prolong pavement life and reduce the cost to maintain and sustain pavements, extend their useful life and minimize damage during periods of extreme stress due to weather events, large numbers of heavy vehicle cyclic loadings, and general wear-and-tear. While New York State's agencies responsible for maintaining the State's roads are performing their work well considering the limited funding for accomplishing the work at hand, the proposed capital programs concedes that a dearth of resources will result in a decline of pavement condition/resilience on certain major elements of the system.

When damaged by out of the ordinary circumstances, such as extreme weather events, the cost of road repairs will mount considerably. Recent capital programs were crafted to achieve the greatest system resilience through a comprehensive approach to setting priorities (state of good repair) and system management thus achieving the greatest cost effectiveness per project. In recent years, New York State DOT has emphasized a pavement preservation approach by scheduling preventive maintenance treatments at the appropriate time well before deterioration requires reconstruction or replacement to preserve more of the good roads at less cost. This is why the traveler may see a road that looks to be in good condition being paved, when other roads are in worse shape. The Department also prioritized work on the higher-volume roads first, such as Interstates and heavily traveled corridors on the National Highway System.

## Public Safety

Nationwide, roadway condition is a significant factor in approximately one-third of traffic fatalities. New York's traffic fatality rate of 0.92 fatalities per 100 million vehicle miles of travel is slightly better when compared to the national average of 1 per hundred million. However, over 1,100 fatalities still occurred on New York State roads in 2011. When looking at just rural road fatalities, New York fares worse than the nation with a fatality rate of 1.98. This is approximately three times the rate on all other roads in the State. These vehicle accidents cost New York \$19.5 billion annually, or \$1,027 for each resident, in medical costs, lost productivity, travel delays, workplace costs, insurance costs, and legal costs. Therefore, where appropriate, highway improvements are possible to reduce fatalities such as:

- Improving sight distances and curvature,
- Removing or shielding obstacles,
- Adding or improving medians,
- Widening lanes and shoulders,
- Upgrading road capacity through the addition of lanes and improving road markings and traffic signals should be used to reduce traffic accidents, and
- Improve traffic flow to relieve congestion through reduction in incident-related delay.

Funding constraints restrict the New York State DOT to addressing the most immediate and documented safety issues on any roadway. Additional funding and priorities would allow the incorporation of comprehensive safety improvements, similar to those discussed above, into most routine projects.



## Innovation

The New York State highway initiative regarding innovative highway transportation is called *New York Moves*. The goal of the New York MOVES program is to improve the public's transportation—through the use of new transportation systems and technologies.

*New York Moves* is advancing Intelligent Transportation Systems (ITS) implementation in upstate and downstate regions, in both rural and urban areas. New systems will facilitate travel for motorists, transit riders, commercial vehicle operators and public safety providers. The program emphasizes cost-effective deployment that will result in:

- Area-wide, real-time operation of the transportation system
- Integration of an enhanced, multi-modal transportation system
- Development of user-friendly transportation services

Improved transportation management can only be achieved through the coordinated efforts of a variety of agencies. Accordingly, the ITS program places a strong emphasis on providing leadership in establishing interagency transportation partnerships on a local, regional and national basis.

Major initiatives have included implementation of ITS in a number of regions to include the capital district, Long Island, New York City, Buffalo and Rochester; weather information to motorists, international projects at the State's border with Canada, vehicle identification systems, implementation of the 511 information system statewide. The program continues to expand in both depth and breadth of services offered and technologies being developed and implemented.

## Recommendations to Raise the Grade

Strategies such as comprehensive maintenance over the life of an asset and a long-term capital program were implemented to make the most cost-effective use of available resources. However, the current level of resources will not be able to improve pavement condition and address current levels of congestion. To significantly improve system condition, more focus and resources are needed. A variety of strategies should be considered:

- Evaluate the funding viability of other revenue generators to include:
  - Congestion pricing and strategies for deploying it
  - Implementation of special tolls
  - Better aligning highway user taxes to actual highway use such as consideration of the VMT tax which is being tested by other states
  - Increase existing taxes and fees with allowance for inflations to meet a publically approved level of service
- Increase investment from the federal, state and local level, as well as the private sector, to repair and improve the New York's highway systems

Beyond funding and to provide improvements, the following should be considered:

- Develop performance-based investment strategies which will ensure that available resources are directed to those projects with the highest performance return on investment
- Optimize usage of existing highway capacity to ensure the most cost-effective use of available funding
- Encourage the use of asset management programs to provide for the most efficient maintenance and repair investment
- Use freight movement efficiency as a measure of the overall system's performance and contribution to economic strength
- Implement plans to increase road resiliency over time.

## Sources

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Solid waste includes any discarded or abandoned materials that must be safely disposed of like household trash, commercial waste, and recycling. New Yorkers generated 5.15 pounds of trash per person per day, which is 12% higher than the national average. However, New York's overall waste sent to landfills has been reduced by half over the last 20 years—from 14.6 million tons in 1990 to 7.7 million tons in 2012. Also, the number of landfills has been significantly reduced from 348 in the 80s to only 59 today with the closures of small, local municipal landfills that violated federal and state regulations, but even with a decrease in the number of landfills and combustors, the state has an estimated remaining capacity of 21 to 25 years. New York State has stepped up on managing waste through reduction, reuse and recycling, including composting of organic waste and changing electronic waste practices, but shifting the focus from disposing of waste to decreasing waste will keep up the progress made.

## What You Should Know About New York's Waste

Solid waste includes any discarded or abandoned materials no matter the form—solid, liquid, semi-solid or even containerized gaseous material. The efforts to reduce and reuse waste have been in existence for decades. Solid waste is generated and managed through a combination of collection and transportation practices, recycling, processing and disposal. The primary disposal methods in New York State continue to be by landfilling and waste combustion connected with some energy recovery. The export of waste out of state for disposal is also practiced with New York's waste traveling as far as South Carolina and Ohio.

Looking at the last 20 years in solid waste trends in New York, a total of 7.7 million tons of solid waste was disposed in state landfills in 2012 and that dropped to 10.6 million tons in 2009, which shows considerable progress since the 14.6 million tons reported in 1990. The number of landfills has been significantly reduced over the years, due to closures of small, local municipal landfills that violated federal and state regulations. In addition, New York State has successfully authorized many waste recycling facilities that process the organic fraction of solid waste and residuals from publicly-owned wastewater treatment facilities.



However, unlike a few other states in the Northeast and California, there is no statutory or regulatory mandate that presently requires the separation and recycling of organic wastes.

Organic materials come from living plants and animals and are best managed as a resource rather than a waste. From animal manure and crop residue; to leaves and grass; to the uneaten food generated daily in cafeterias, restaurants and homes; to food processing waste—organic materials are a part of life. Managing these materials through reduction, reuse and recycling, including composting, is a high priority for the New York State Department of Environmental Conservation (NYSDEC) and New York State (NYS).

Reduction and reuse are at the top of the materials management hierarchy, followed by recycling and then disposal. Recycling organic materials by composting, anaerobic digestion, land application and other organics recycling technologies reduces the generation of greenhouse gases; creates soil amendments, energy and jobs; and reduces reliance on waste disposal. Unlike neighboring states, NYS has not mandated organics recycling, but strongly promotes organics handling facilities and supports many facilities in New York. The NYSDEC materials management program in New York is more robust than most other states, with mandated local recycling laws, product stewardship programs, and more stringent policies and regulations.

## Capacity

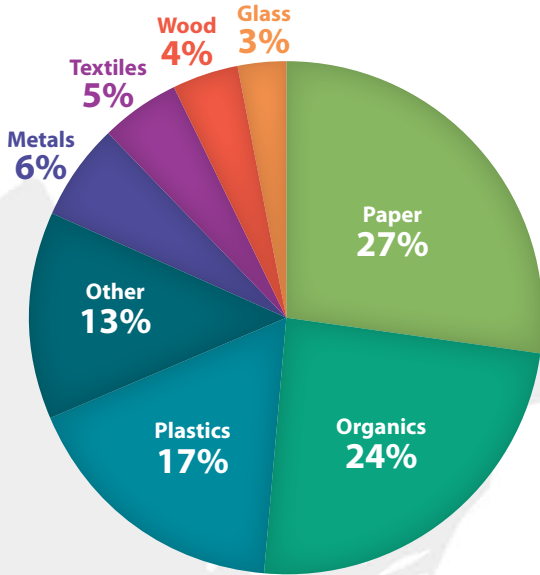
The number of active municipal solid waste (MSW) landfills in New York has been drastically reduced. In 1987, there were 348, mostly unlined, MSW landfills in New York. As of 2012, New York State had 59 landfills, categorized by its deposited material:

- 26 municipal solid waste (MSW) landfills (everyday wastes from households, industries, and commercial establishments);
- 16 Industrial/commercial waste landfills (coal ash, paper mill sludge and similar materials);
- 12 construction and demolition (C&D) landfills (debris from building or destruction projects); and
- 5 Long Island landfills, two of which were ash monofill landfills (ash from the combustion of MSW).

In 2010, the number of municipal waste combustors (MWC) also decreased from 13 to 10 for several reasons, including financial and technical issues. The newer landfills operate with the latest in landfill design and operation. The number of municipal waste combustors (MWCs) has also been decreasing from, at one point, 13 MWCs, to 10 remaining in operation in 2010.

New Yorkers generated about 5.15 pounds of MSW per person per day, a rate 12% higher than the national average of 4.6 pounds per person per day that the U.S. Environmental Protection Agency (EPA) estimates for the average citizen. While waste generation rates have remained fairly constant recently, MSW generation generally continues to grow with population growth. With the goal of self-sufficiency, New York State depends heavily on privately owned facilities in other states for the disposal of 16,500 tons of MSW every day (6 million tons per year), including virtually all of the solid waste disposed from the City of New York and much of Long Island. In 2008, facilities in New York State managed a total of more

**Figure 1: Estimated Composition of MSW Disposed in New York State**



### Solid Waste Is More Than Trash

Solid waste consists of putrescible (meaning likely to decay) and non-putrescible waste products; refuse; residual products from wastewater treatment facilities, water supply treatment facilities, or air pollution control facilities; and other discarded materials including solid, liquid, semi-solid, or contained gaseous material resulting from residential, institutional, industrial, commercial, mining and agricultural operations.

**Figure 2: Active MSW, C&D Debris, Industrial Commercial, Long Island and MWC Ash Monofill Landfills, and Municipal Waste Combustion Facilities**



than 36 million tons of materials and waste, with more than a third being placed in landfills. However, even with a decrease in the number of landfills and combustors, the state has an estimated remaining capacity of 21 to 25 years.

## Condition

Solid waste facilities in New York are maintained in generally good condition. The facilities are operated under regulations that protect the public health and environment. Improvements in the recycling, waste prevention and composting rates were encouraging in the 1990s, but this may have been short lived progress as NYS communities now report recovery rates are stagnant and may be dropping. The 2010 NYS Electronic Equipment Recycling and Reuse Act required that manufacturers of electronic equipment establish a convenient system for the collection, handling, and recycling or reuse of electronic waste, with a disposal ban for covered electronic wastes in effect since 2015. New York also has passed legislation for product stewardship programs for rechargeable batteries and mercury-containing thermostats. Other proposals for the state's stewardship program have also been considered to include toxic or bulky materials such as; paint, carpet, packaging and printed products, and household hazardous waste, which are difficult to dispose.

In 2008, 10.5 billion cubic feet of landfill gases were destroyed through flaring. Fourteen billion cubic feet were used to generate 564,000 megawatt-hours of electricity in 2008, or an average of \$93 million worth of electricity. Landfill gas collection has become increasingly prevalent, while gas-to-energy conversion is more common in larger landfills. However, gas-to-energy projects have been inhibited by the significant costs for connecting the landfills' generating system to the local electrical power grid and installing gas collection, recovery, and generation systems in small, inactive landfills.

## Funding

Local solid waste collection and disposal is generally self-funded through tax collection and direct fees paid by the public. However, additional capital is necessary to meet future needs. The Environmental Protection Fund (EPF), which is one major funding source for solid waste management projects from NYS, can cover up to 50% of the capital costs for local infrastructure. In its first year in 1994-95, EPF allocated the largest portion of its budget (42% or \$13 million) to solid waste management. However, as EPF funds increased, the percentage allocated towards solid waste became significantly smaller. Only \$14 million or 9% of EPF funding is provided for solid waste management—a decrease of 33%. Even so, significant funding has been provided over the years for municipalities, and there is a significant waiting list for additional funding. The Environmental Protection Fund Works estimates that there is a 27% shortfall in the funding levels for all of the EPF funds. This would equate to approximately \$3.8 million for solid waste programs.

## Operation & Maintenance

The majority of the landfills in New York are privately owned, and the operation and maintenance are owners' responsibilities. It is imperative that the state continue to provide oversight to ensure that the landfills meet or exceed the existing standards. For publicly-



## Solid Waste

owned landfills and waste-to-energy facilities, it is imperative that the state supports local planning agencies with implementing ongoing and new strategies that advance state materials management goals.

**Figure 3. Municipal Solid Waste Landfill Capacity**  
(Alphabetical listing as of December 2012)

Facility Name	County	2012 Waste Quantity (tons)	Existing Annual Permit Limits (tons/year)	Remaining Existing & Entitled Capacity Under Permit (tons)
Albany Rapp Road SLF (01S02)	Albany	225,897	275,100	2,988,111
Allegany County Landfill (02S15)	Allegany	46,528	56,680	99,607
Allied/BFI Niagara Falls Landfill (32S11)	Niagara	652,264	800,000	6,400,000
Auburn Landfill No. 2 (06S14)	Cayuga	89,995	96,000	454,258
Ava Landfill (33S15)	Oneida	234,124	312,000	23,305,692
Bath Sanitary Landfill (51S21)	Steuben	109,905	151,500	2,458,524
Bristol Hill SLF (38S14)	Oswego	40,558	100,000	2,851,298
Broome County Landfill (04S07)	Broome	168,230	232,000	9,820,128
Chaffee Landfill (15S14)	Erie	278,378	600,000	4,800,000
Chautauqua Landfill (07S12)	Chautauqua	218,003	408,000	2,004,178
Chemung County Sanitary Landfill (08S02)	Chemung	178,763	180,000	507,328
Chenango County Landfill (09S16)	Chenango	27,544	41,550	1,689,532
Clinton County Landfill (10S20)	Clinton	146,875	175,000	4,858,016
Colonie (T) Sanitary Landfill (01S26)	Albany	170,291	170,500	1,940,274
Cortland County Landfill Westside Extension (12S10)	Cortland	27,544	44,500	607,530
Delaware County SWMF (13S18)	Delaware	15,759	52,800	248,856
Development Authority of the North Country Landfill (23S13)	Jefferson	205,054	346,320	2,645,071
Franklin County Regional Landfill (17S21)	Franklin	50,698	125,000	142,093
Fulton County Landfill (18S20)	Fulton	75,931	134,000	11,128,865
High Acres West. Exp. LF (28S32)	Monroe	579,245	1,074,500	45,475,000
Hyland Landfill (02S17)	Allegany	237,406	312,000	7,207,662
Madison County West Side Extension LF (27S15)	Madison	45,192	61,000	6,161,436
Mill Seat SLF (28S31)	Monroe	524,873	598,650	4,256,000
Modern Landfill (32S30)	Niagara	767,594	815,000	27,345,000
Ontario County SLF (35S11)	Ontario	836,118	1,200,000	3,036,459
Saratoga County LF*	Saratoga	N/A	106,000	1,425,000
Seneca Meadows LF (50S08)	Seneca	1,771,431	2,190,000	24,096,540
<b>Totals:</b>		<b>7,724,625</b>	<b>10,658,100</b>	<b>197,952,458</b>

\*Existing Capacity constructed but not planned to be used for an undetermined period of time

"Existing Annual Permit Limits" based on limits set in current permits.

"Remaining Existing & Entitled Capacity Under Permit" is the total capacity for which a facility has undergone environmental review and permitting; use of this capacity may require construction of additional cells.

"Proposed Capacity Not Under Permit" is capacity which has been proposed to NYSDEC in an application, but for which approvals have not been completed.

Source: NYDEC ([bit.ly/NYLandfillCapacity](http://bit.ly/NYLandfillCapacity))

Beginning with data for 2006, NYSDEC started using facility report data as the basis for estimating both the total recovery rate and the MSW recycling rate by using the EPA methodology and supplementing with data from other sources. Using these data sources, the state's MSW recycling rate was 20% in 2008, and the total recycling rate was 36%. The 20% MSW recycling rate is well below both EPA's estimated national recycling rate of 33.4% and the Biocycle Magazine "State of Garbage In America Survey" estimate of 28.6%.

## Public Safety

If a landfill failure occurs, it can potentially cause air and groundwater pollution on nearby properties, which requires substantial remediation costs and duration. However, New York State has implemented landfill regulations that exceed the federal performance criteria and provide monitoring of the performance of our landfills which, in general, are very protective of the environment. From the 2013 annual reports submitted by local planning units, the active and inactive "lined" landfills collected more than 740 million gallons of leachate for proper treatment. These lined landfills account for a total of more than 2,500 acres of lined footprint. Over 30 years of extensive groundwater monitoring has substantiated that these lined facilities protect groundwater quality with no known groundwater impacts on leakage from the landfill's designed liner system.

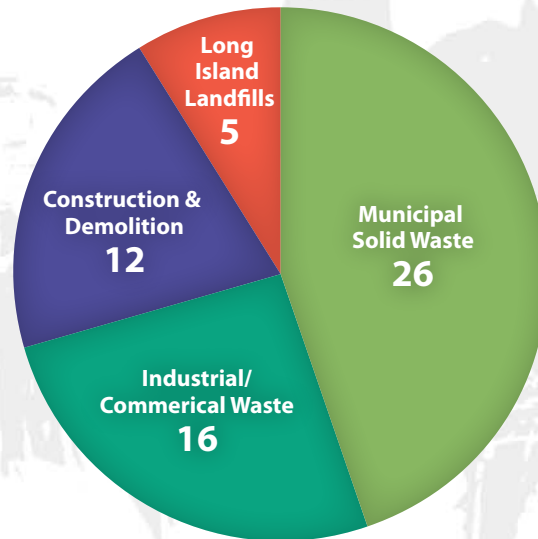
Landfills also produce methane emissions from decomposing organic waste, which significantly contributes to climate concerns. In addition, challenges persist in the treatment of home products such as household hazardous waste (leftover household products that contain corrosive, toxic, ignitable, or reactive ingredients), pharmaceuticals, mercury-containing products, paint, automobiles, carpets, office furniture, roofing shingles, appliances and tires. The release of hazardous agents may cause environmental contamination. Hazardous waste (not including household hazardous waste) must be properly treated, stored, and disposed in environmentally protected facilities.

All but two of New York State's active municipal solid waste landfills have active methane collection and landfill gas-to-energy operations, which greatly reduce methane emissions. Many of these landfills also incorporate product stewardship approaches into their operations to reduce the amount of waste being disposed or to deal with difficult-to-manage waste products.

## Resilience

Despite progress, improvements can still be made to the state's materials management program to be more resilient. However, many of these needs are connected to the resilience

**Figure 3: Number of New York State Landfills**



## Solid Waste

of energy and transportation infrastructure which solid waste disposal relies on. Solid waste is transported through roads, rail and shipping to landfills. A reduction in the level of service by these facilities will have a negative impact on the management of solid waste and will increase costs to the end user. Energy is utilized in the transportation of solid waste, during solid waste combustion and in the generation of electricity from landfill gas. The loss of landfills in the state would impose economic distress and would potentially impair the public health and safety and environment.

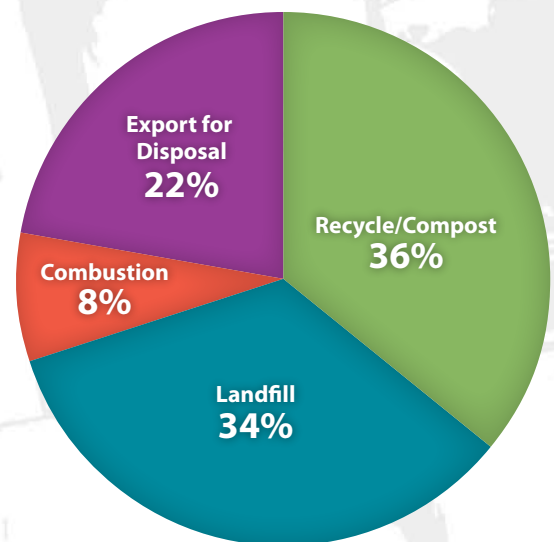
## Conclusion

Capacity of the existing state landfills is adequate for the immediate future, but there is still a large amount of waste exported to other states makes New York State dependent upon others. The closure of most of the older landfills, together with improvements to the remaining facilities, has improved their overall condition. State funding has been decreasing, while operation and maintenance of the primarily privately owned solid waste operations has been left to the operators and funded through tip fees to users—resulting in some of the highest tip fees in the country. Changes to solid waste regulations and policy initiatives have been drafted but have stalled in reaction to the economic downturn in recent years. Although the state has tried to implement policy guidance through Local Solid Waste Management Plans, this is only required through local government actions, and the private sector has limited responsibilities. This has resulted in some cost inefficiencies at the local level in effectively managing waste to achieve the state's program goals. Solid waste operations are relatively resilient to major catastrophes but are dependent upon other infrastructure facilities. Public safety and the environment could be affected dramatically without adequate safeguards, while some new regulations still need to be implemented. Overall, the State of New York has been slightly above average relative to implementation of solid waste management strategies.

## Future Needs and Recommendations

Even with these accomplishments, the overall efficiency, safety, and sustainability of New York waste materials management systems can be improved. The high amounts of waste generated by New Yorkers indicate the need for additional source reduction and comprehensive material management and planning. Long-term strategies, such as product stewardship programs, organics separation and recycling are needed to move into the future. Some future goals include and are in concurrence with those in the New York State Solid Waste Management Plan:

**Figure 4: Materials and Waste Management in New York State**





1. Shift the focus to sustainable management programs. Shift the focus from “end-of-pipe” techniques to looking upstream or more comprehensively on how materials that would otherwise become waste could be used and integrate methods so that the waste stream can be more sustainably managed;
2. Expand educational efforts for the public on waste prevention, reuse, recycling and organics separation and management;
3. Lead by example, and have the state illustrate to municipalities, institutions and businesses how to reduce waste and increase reuse and recycling. Provide technical assistance and outreach to develop sustainable materials management programs;
4. Develop reuse, recycling and composting infrastructure, and end-use markets;
5. Offer incentives or funding support for development of new technologies for energy recovery and organics separation and recycling. Technically and financially support more comprehensive materials management and planning, and;
6. Minimize greenhouse gas emissions and promoting landfill gas conversion to energy.

## Sources

- New York State Department of Environmental Conservation, “Beyond Waste”, Adopted 12-27-10, [bit.ly/BeyondWaste](http://bit.ly/BeyondWaste)
- News from Assemblyman Alan Maisel, Chair Legislative Commission on Solid Waste Management, “New York State Solid Waste Examiner”, Summer 2012, [bit.ly/SWExaminer2012](http://bit.ly/SWExaminer2012)
- We Love New York, [eeprotectingny.com/the-epf](http://eeprotectingny.com/the-epf)
- New York State Department of Environmental Conservation, [bit.ly/NYSWLandfills](http://bit.ly/NYSWLandfills)
- PlaNYC - Sustainability - Waste and Recycling, [bit.ly/PlaNYCSustainability](http://bit.ly/PlaNYCSustainability)
- *Biocycle Magazine* “State of Garbage In America Survey”



# TRANSIT



Transit systems across New York are being forced to stretch beyond capacity—more riders, aging vehicles, capital funding gaps, and structures built over 100 years ago that must be more resilient today than ever before. New York’s Metropolitan Transportation Authority extensive subway and bus system serving over 7 million riders daily, and the state’s transit network outside of New York City includes over 100 transit systems across New York State providing over 550,000 people with essential service in urban, suburban and rural areas. Upstate and suburban transit systems require \$1 billion over the next five years to maintain infrastructure in a state of good repair and add capacity to address ridership demand. However, the anticipated funding will only cover 43% of transit infrastructure needs, leaving a \$577 million funding gap. New York City’s transit system needs \$68 billion in the next twenty years along with new technologies to replace aging system components and improve the quality of transit service. While transit systems continue to find innovative solutions to improve efficiency and attract riders, these innovations will not replace the need for future infrastructure funding.

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## UPSTATE NEW YORK AND SUBURBAN DOWNSTATE NEW YORK TRANSIT

### What You Should Know About New York’s Statewide Transit

Over 100 transit systems in New York State provide essential service in urban, suburban and rural areas in addition to New York’s Metropolitan Transportation Authority (MTA) transit system. The mobility provided by these systems supports the state and local economy by transporting people to jobs, healthcare, education and recreation. To serve this growing ridership, transit systems need additional vehicles to add capacity and new services. At the same time, transit infrastructure continues to age and requires capital investment to rehabilitate, modernize and replace aging assets. The lack of resources for regular

investment has delayed capital asset renewal and worsened infrastructure conditions. For example, the lack of adequate funding for capital investment forces many transit systems to operate buses beyond their useful life. These conditions negatively impact the reliability of transit service and result in more vehicle breakdowns, ridership losses and an unnecessary increase in vehicle maintenance expenses. Transit funding at the federal, state and local level has been flat for many years and the lack of future funding growth will lead to further declines in infrastructure conditions. While transit systems continue to find innovative solutions to improve efficiency and attract riders, these innovations will not replace the need for future infrastructure funding.

## Capacity

New Yorkers are using transit in record numbers, with ridership growing across the state. Each day, over 550,000 people use transit services provided in upstate New York and the downstate suburbs. Examples of ridership growth include:

- Binghamton (BC Transit)—up 1.4% in 2014
- Capital District (CDTA)—up 3% in 2014-2015; set a new ridership record in 2014-2015
- Rochester (RGRTA)—up 1% in 2014-2015
- Syracuse (CNYRTA)—up 3% in 2014-2015
- Utica (CNYRTA)—up 23% since CNYRTA takeover in 2006

As ridership grows, service capacity is needed to meet this demand. Transit systems with growing ridership need additional vehicles to accommodate this demand. Bus Rapid Transit service has been successfully implemented in the Capital Region and this region, as well as other regions in the state, are studying BRT and other opportunities to improve operations such as transit signal priority.

## Condition

Transit infrastructure investment needs are reported for “Core” infrastructure—capital assets related to existing levels of service, and “Capacity Expansion”—projects that increase transit service or expand the network (additional buses to meet ridership growth or implementation of Bus Rapid Transit routes). Core infrastructure includes projects to improve the state of good repair, normal replacement of assets at the end of useful service life, and system improvements that upgrade or improve assets to modern standards (new fare collection equipment for smartcards). Core needs are presented in the following categories:

- Vehicle costs (replace transit vehicles)
- Facilities costs (repair or construct transit maintenance, terminals and customer facilities)
- Other capital costs (repair or purchase equipment like fare boxes, shop equipment, software)



## Transit

UPSTATE &  
SUBURBAN  
DOWNSTATE

The top priority of all transit systems is to preserve their existing infrastructure; this means:

- **Preservation of Existing Assets:** Providing safe and reliable service requires capital assets that are modern, dependable and efficient. Transit vehicles are the largest capital component, the one that the public sees every day, but there are many other supporting parts of infrastructure. These include vehicle maintenance, fueling facilities and passenger terminals; fare collection and communication equipment; and, bus stop signs and shelters. Keeping these assets in a state of good repair and replacing them as they wear out requires regular capital investment.
- **System Improvements:** The public is demanding better service and more technology. Improvements include new traveler information, convenient fare collection and real time bus location.

The Federal Transit Administration (FTA) threshold for the useful life of a transit bus is 12 years. Lack of funding and the harsh climate in upstate NY tax the ability of transit systems to meet this guideline. As buses exceed their 12-year life, they become prone to in-service breakdowns and require more maintenance and increased operating expenses. Examples of worsening infrastructure conditions include:

- BC Transit in Binghamton—57% of the fleet is beyond its useful life, resulting in increased bus maintenance costs.
- CDTA in Capital Region—21% of the fleet is beyond its useful life (14 years old), costing twice as much to maintain as the rest of the fleet.
- CNYRTA in Syracuse—The 20-year-old Compressed Natural Gas (CNG) fueling facility, which fuels over 50% of the bus fleet, requires replacement. This critical infrastructure must be replaced to avoid disabling public transportation in Onondaga County.
- NFTA in Buffalo—46% of the fleet is beyond its useful life; average vehicle miles operated between service interruptions has worsened by 8%.
- RGRTA in Rochester—40-year-old central maintenance facility is decaying, with a leaking roof, corrosion from winter salt, and antiquated shop equipment needing replacement.

## Funding and Future Needs

Being good stewards of public funds and efficiency measures has reduced the cost of providing transit service, but infrastructure continues to age and requires capital investment to rehabilitate, modernize and replace aging assets. The lack of resources for regular investment has delayed capital asset renewal and worsened infrastructure conditions. As these conditions negatively impact the reliability of transit service, the result is more vehicle breakdowns, ridership losses and an unnecessary increase in vehicle maintenance expenses.

Upstate and suburban transit systems require \$1 billion over the next 5 years to maintain infrastructure in a state of good repair and add capacity to address ridership demand. Table 1 shows an estimate of the multi-year capital needs, resources and funding gaps for upstate and downstate transit systems (other than the MTA) that operate in urbanized areas. The results are based on transit agency multiyear capital programs and surveys of system capital needs. The cost to replace existing transit vehicles is \$512 million over the next 5 years, which represents 61% of core infrastructure needs. This would purchase about 1,219 buses

upstate. Repairs and improvements to existing maintenance facilities require \$133 million. The remaining core capital need of \$188 million is to upgrade other capital items including fare boxes and communications equipment, and light rail systems infrastructure in Buffalo such as track, escalators and stations.

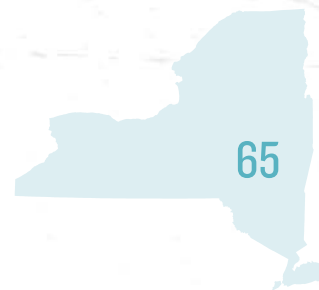
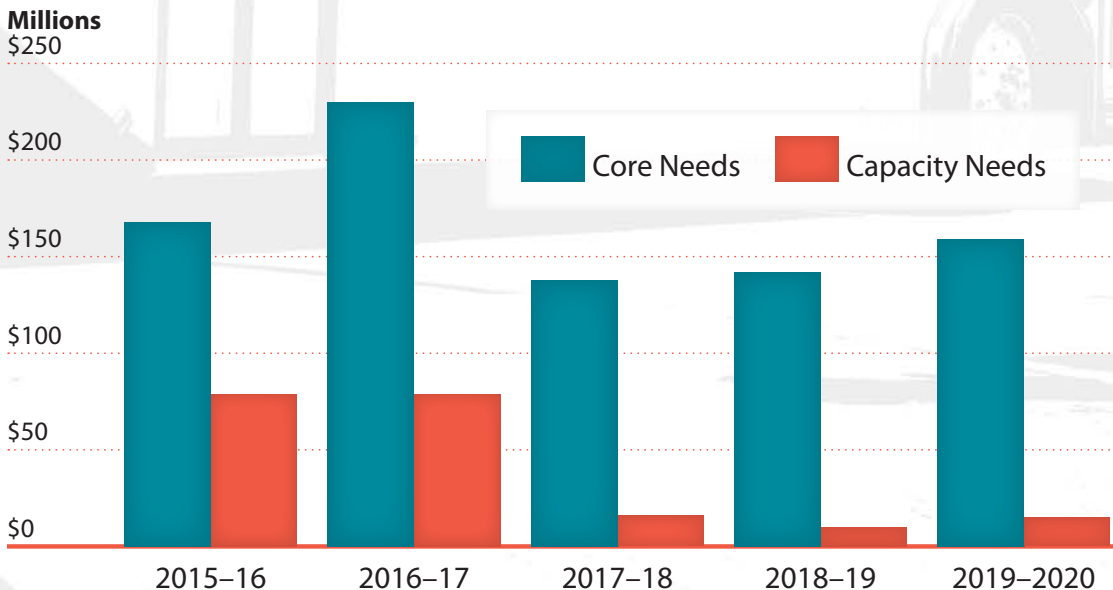
**Figure 1: Upstate Capital Needs: State Fiscal Year 2015-16 to 2019-20 Capital Program**

Category	Upstate	Downstate Suburban	Total Need
<b>Core System Needs</b>			
Vehicle Cost	\$ 236	\$ 276	\$ 512
Facilities Cost	\$ 98	\$ 35	\$ 133
Other Capital Cost	\$ 132	\$ 56	\$ 188
<b>Total Core Need</b>	<b>\$ 466</b>	<b>\$ 367</b>	<b>\$ 833</b>
<b>Capacity Expansion</b>			
Vehicle Cost	\$ 27	\$ 1	\$ 28
Other Cost (e.g. BRT)	\$ 111	\$ 41	\$ 152
<b>Total Capacity Need</b>	<b>\$ 138</b>	<b>\$ 42</b>	<b>\$ 180</b>
<b>Total Capital Need</b>	<b>\$ 604</b>	<b>\$ 409</b>	<b>\$ 1,013</b>

Amounts in millions.

Capacity expansion projects that were identified total \$180 million, and primarily consist of additional vehicles (\$27 million for 42 new vehicles) for several upstate systems to accommodate growing ridership, two new BRT routes in the Capital District, and implementation of BRT in Suffolk County. Suffolk County Transit also needs 25 additional paratransit vehicles over the next 5 years to meet growing demand.

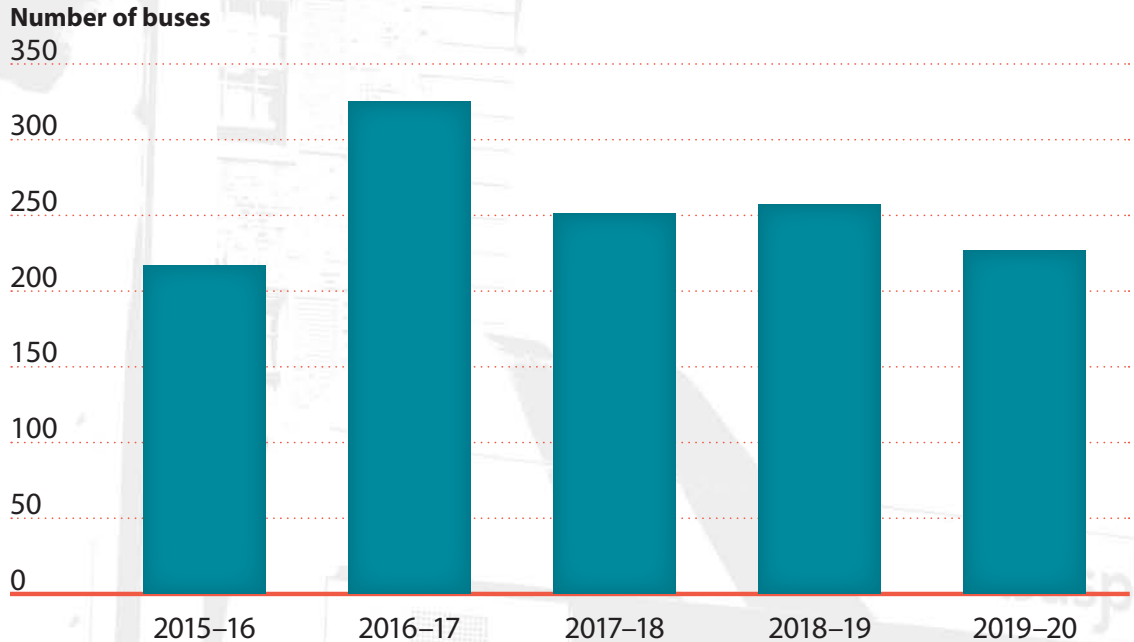
**Figure 2. Annual Transit Infrastructure Needs**



## Transit

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**Figure 3. Number of Buses Needed Annually**



Meeting these needs will allow transit facilities and equipment to get much needed repairs, such as roof replacements, modernization of fueling facilities, regular replacement of hybrid bus batteries and upgrading antiquated vehicle communications systems. The 30 year old NFTA light rail system has a critical need to replace track, rebuild aging escalators, and improve tunnel ventilation. System improvement projects would provide customers with modern fare collection and fare media, vehicle location technology, real time schedule information and transit signal priority. Adding capacity, expanding BRT, and implementing system improvement projects will entice more customers to transit, which yields environmental and social benefits and also reduces the need for roadway expansion.

## Future Funding

The anticipated funding will only cover 43% of transit infrastructure needs, leaving a \$577 million funding gap. Capital funding for transit infrastructure comes from funding provided through the federal transit program, along with legislatively required state and local matching funds. Table 2 shows the estimated resources available for transit capital projects based on flat levels of funding.



**Figure 4: Upstate and Suburban County Capital Resources  
SFY 2015/16 to 2019/20 Capital Program**

Category	Upstate	Downstate Suburban	Total Need
Federal Formula	\$ 161	\$ 70	\$ 231
Federal Other	\$ 27	\$ 19	\$ 46
State Match	\$ 22	\$ 10	\$ 32
State Other	\$ 10	\$ 9	\$ 19
Local Match	\$ 22	\$ 10	\$ 32
Local Other	\$ 45	\$ 31	\$ 76
<b>Total Resources</b>	<b>\$ 287</b>	<b>\$ 149</b>	<b>\$ 436</b>
<b>Total Capital Need</b>	<b>\$ 604</b>	<b>\$ 409</b>	<b>\$ 1,013</b>
<b>Funding Gap</b>	<b>\$ 317</b>	<b>\$ 260</b>	<b>\$ 577</b>

Amounts in millions.

- Federal Formula Funding:** Capital funding for Upstate and downstate suburban transit infrastructure is largely from formula funds provided by the Federal Transit Administration. In recent years, federal discretionary grant programs, which were available to cover large, unique capital projects, were eliminated. It should be noted that a significant amount of federal capital funding is used by transit systems to fund preventive maintenance activities in their operating budgets and not available for capital projects.
- State Funding:** The State provides a 10% matching share to federally funded capital projects. In the past, the state provided additional capital funding through the State Dedicated Transportation Fund and the 2005 Rebuild and Renew New York Transportation Bond Act, but there is no regular annual capital funding program for transit systems other than the MTA.
- Local funding:** Local governments and regional authorities are required by the state to provide a 10% matching share to federally funded transit capital projects. Few systems have access to local capital funding beyond the required match, as local government budgets are strained.

Future funding resources are based on flat levels of federal transit aid along with the required state and local matching shares. Federal transit aid has been flat for several years and there is no current program to increase this funding. There is no assumed transit funding from the State Dedicated Transportation Fund or other potential state sources other than the required match to federal aid. Any other federal, state or local aid (including past balances of federal aid, federal grants or local resources) is shown in the year when used to fund a capital project.

## Preventive Maintenance

The lack of growth in operating assistance, especially in upstate New York, is forcing transit systems to increase the use of federal capital funding for preventive maintenance in their operating budget. Transit systems are compelled to fund the costs to maintain capital assets in their operating budgets. Federal guidelines allow transit capital funding to be used for “preventive maintenance” activities funded in operating budgets. The shortfall in funding

**Transit**

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DOWNSTATE**

for transit operations requires New York's transit systems to use a significant amount of their federal capital funds (one-third to half of each year's formula allocation) in their operating budgets for these preventive maintenance activities. As a result, these funds are not available to invest in infrastructure repair or replacement, leading to delays in replacing buses and modernizing facilities. Preventive maintenance investment will average over \$60 million annually for upstate and downstate systems over the next 5 years, a large portion of which will come from federal capital funding. Additional operating aid would allow these "preventive maintenance" funds to be used for capital investments and reduce the need for new capital resources.

## Funding Gap

Following is a summary of the combined Upstate and Downstate Suburban transit infrastructure needs, resources and funding gap. Appendix 2 contains the capital needs of individual transit systems.

**Figure 5. Total Upstate and Downstate Suburban County Needs and Resources**

Category	Core Vehicles and Facilities	Capacity	Total Need
Total Capital Needs	\$ 833	\$ 180	\$ 1,013
Total Resources	\$ 436	\$ 0	\$ 436
<b>Total Funding Gap</b>	<b>\$ 397</b>	<b>\$ 180</b>	<b>\$ 577</b>

Amounts in millions.

## Innovation

New York's transit systems are at the forefront of innovation and efficiency. They have reduced operating and capital costs, increasing productivity and improving services. Transit professionals recognize their responsibility to evaluate the efficiency and effectiveness of their organizations before asking for more assistance from customers or public officials. They are partnering with business and universities to increase ridership and raise revenue. Preventive maintenance programs have extended the useful lives of buses and reduced capital costs. Other innovations and efficiencies include:

- Continuous route monitoring to adjust service based on ridership patterns;
- Installing energy efficient systems in transit vehicles and facilities;
- Providing customers with more convenient fare media and technology

# NEW YORK CITY SUBWAY & BUS SYSTEM

Transit

NEW YORK CITY

## What You Should Know About New York City's Subway & Bus System

The circulatory system of the heart of New York City is the transit system running constantly below and above ground. Linking the five boroughs of New York City and serving as the base of the iconic sky scraper skyline, the subway of New York City is a system started in 1869 and still working for New Yorkers today. Much of the subway infrastructure is old—the tunnels with their associated drainage facilities and pumping stations, cross ties, track, signals, and electrical systems; nearly 500 stations; elevated track and associated structures; and maintenance yards and track. The subway is a tremendously large, extensive, and well-used system, but it also has tremendous challenges as age takes a toll on its condition.

The subways of the City of New York currently service over 7 million riders daily. These 2.5 billion trips per year keep people moving and the economy of the City functioning. Today's system consists of 20 subway lines that were actually not designed or intended as one system. Early in the 20th century, the subways consisted of lines owned by privately owned subway operating companies, the Independent Rapid Transit (IRT), and the Brooklyn Manhattan Transit (BMT). The IRT is now called the A Division and consists of most numbered lines (1, 2, 3, 4, 5, 6 lines). The BMT are the lettered designated lines (A, B, C, D, E, F, G, J, L, Z and Number 7 lines). They are now owned by the Metropolitan Transportation Authority (MTA) and operated by its subsidiary, New York City Transit.

Bus service on the streets of Manhattan began in 1905. Today, New York City Transit (NYCT) operates over 4,400 buses in all five boroughs on approximately 200 local and 30 express routes. The newest member of the MTA family, the MTA Bus Company was formed in 2004 to merge seven private operations. With nearly 1,300 buses, it provides service on some 80 local and express bus routes serving the Bronx, Brooklyn, Queens, and Manhattan. Buses are replaced on a 12-year cycle, and currently, 91% of the buses are in a state of good repair. However, buses also depend on traffic and road conditions. While buses help in mitigating some traffic issues, their efficiency still suffers in traffic congestion choke points even with dedicated lane use.

Figure 6. New York City Subway System





## Condition, Operations & Maintenance, and Capacity

In the “city that never sleeps,” NYCT runs a much needed 24-hour service, but that non-stop service causes tremendous wear and tear on the system and all its elements and little time for major track improvements. The most critical elements of the MTA’s core system—its rolling stock and tracks—have been rebuilt or replaced. One way of considering the condition of the system is to look at the Investment Systems and their status as to State of Good Repair (SGR). Some very important elements of the system including train cars, mainline track and switches are in SGR (100%). Many other elements, such as pumps, mainline signals, and stations meet the required percentage of being in a state of good repair. However, there are failing components in the system, Power and High-Priority Ventilation. The most obvious element of the infrastructure that affects the health, safety, comfort and convenience of the public and one of the most back-logged are stations, signals, communications, tunnel lighting, power, and high-priority ventilation.

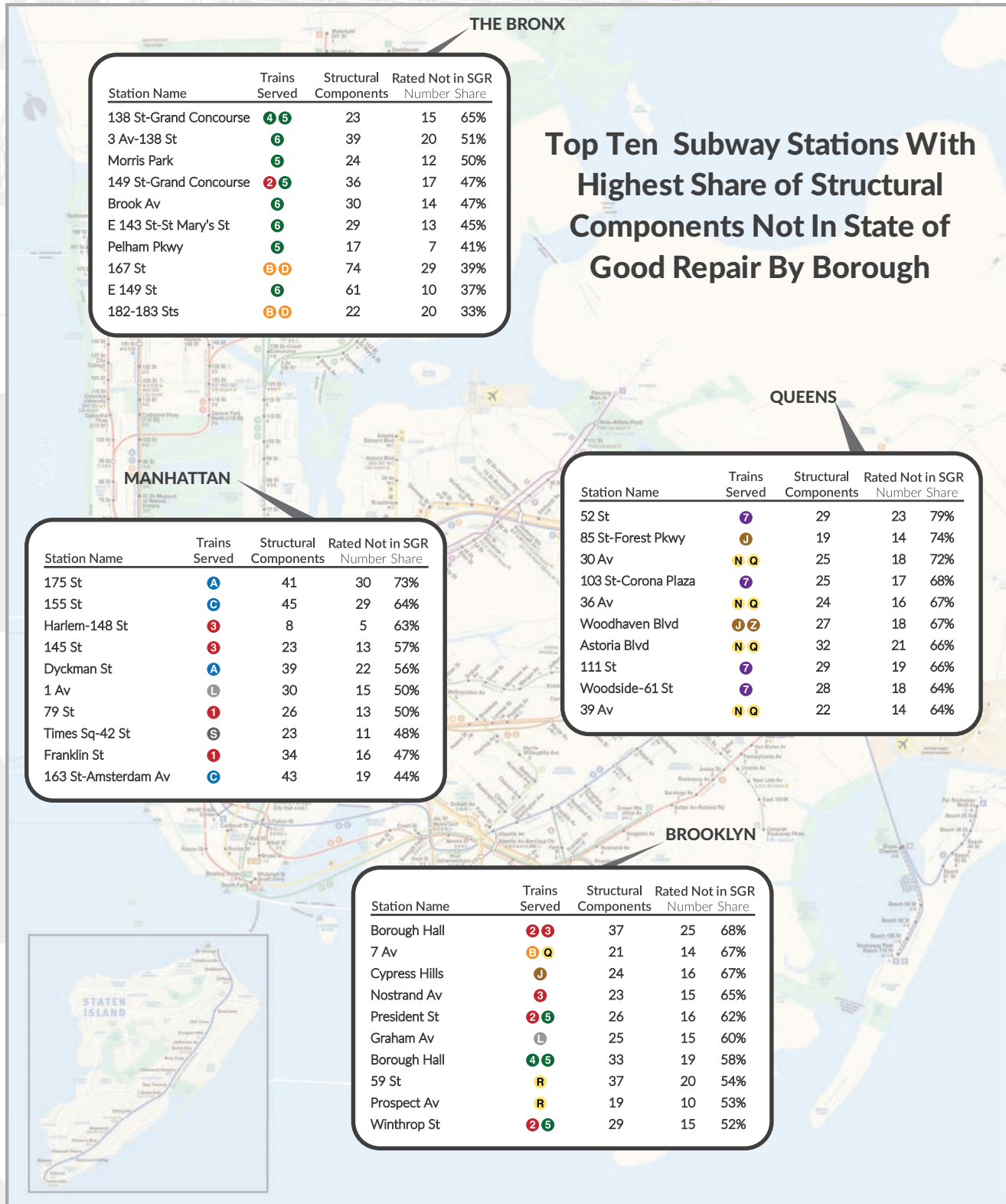
**Figure 7. The System Investment Condition Status**

Investment Category	SGR
Subway Cars	100%
Mainline Track/Switch	100%
Buses	91%
Pumps & Deep Wells	89%
Elevators & Escalators	82%
Bus Shops & Depots	81%
Stations	78%
Mainline Signals	74%
Communications	72%
Tunnel Lighting	70%
Power	62%
High-Priority Ventilation	60%
Subway Shops	46%

Since the NYCT operations are financed by fare revenues and some state and local subsidies, its operations and maintenance are paid for by the ridership. Several subway lines have reached or passed their operational limits in terms of train frequency and passengers. The A division lines regularly operate with about 7% more late or canceled trains than the B division. The A division is stretched to its limit in two ways: no additional trains can be added to the schedule during rush hours because the tracks they use are already handling the maximum number possible, and most of the rush hour trains are already crammed with an overflow of riders. Crowding is so bad that on the 4, 5, 6 and L lines, trains during the morning rush exceed the transit agency’s loading guidelines, which state that each rider should have at least a three-square-foot space to stand. Crowded trains cause delays because it takes more time to load cars and people jammed against the doors prevent train doors from closing the first time. However, the real problems come from the crowded tracks. The headways (the distance or time between vehicles) are such that there must be enough distance between trains to allow the train to stop to avoid collisions. With short headways, slight delays can have major impacts on the entire system.

The MTA has a separate subsidiary for performing major capacity expansion, the MTA Capital Construction (MTACC). They have several long-term capacity expansion projects. The 2<sup>nd</sup> Avenue Subway has its first phase currently under construction and is being funded with federal subsidies and state bonds. It has the potential to relieve some of the stress on the 4, 5, and 6 lines. Similarly, the 7<sup>th</sup> Avenue line extension is currently under construction. This line will permit easier access to the Westside of Manhattan but will not help to mitigate existing capacity stresses. The East Side Access will bring many more commuters to the Lexington Avenue Line (4, 5, 6) which will add considerably more passengers to an already over-crowded line. Whether or not the 2<sup>nd</sup> Avenue line will compensate for this increase is unknown.

The serious problem now and in the future is that of capacity. Aging system components and increasing demand requires a continuous funding stream. Major capital funding now and continuing into the future for the East Side Access, Second Avenue Subway, Number 7 subway extension, and subway station renovation is essential. However, these projects will not effectively increase the capacity of the system.



Source: Citizens Budget Commission: [bit.ly/10Stations](http://bit.ly/10Stations)

## Transit

## NEW YORK CITY

**Figure 9. MTA NYC Transit Summary of Needs: 2015–2034**

Investment Category	Total
Passenger Stations	\$ 9,449
Track	\$ 5,671
Line Equipment	\$ 3,439
Line Structures	\$ 3,015
Signals	\$ 15,610
Communications	\$ 2,633
Traction Power	\$ 3,100
Shops & Yards	\$ 2,473
Depots	\$ 2,271
Service Vehicles	\$ 714
Passenger Security	\$ 56
Added Capacity	\$ 1,500
Miscellaneous Emergency	\$ 3,068
Staten Island Railway	\$ 609
<b>Total</b>	<b>\$ 68,225</b>

Notes: Numbers do not total due to rounding.  
Amounts are in millions of 2015 dollars.

**Figure 10. Summary of Continuing Needs: 2012–2034: NYCT**

5-Year Period	Investment Level
2015–2019	\$ 16,256
2020–2024	\$ 16,703
2025–2029	\$ 19,472
2030–2034	\$ 15,897
<b>Total</b>	<b>\$ 68,237</b>

Amounts are in millions of 2012 dollars.

## Funding and Future Needs

The transit system was in serious trouble in the early 1980s because of the earlier financial crisis. The state legislature approved a historic investment program in 1982, and continued through today of over \$78 billion on maintenance, rehabilitation and new construction. These investments have brought the MTA back from the brink of collapse. The MTA Twenty-Year Capital Needs Assessment 2015–2034 (Needs Assessment) by the MTA focuses on continuing to rebuild and replace the huge amount of assets that makeup the MTA transportation system infrastructure system. The estimated asset value of the infrastructure of NYCT is more than \$700 billion in replacement value.

NYCT forecasts a need of \$68 billion through 2034 to continue to maintain, replace, and upgrade all its capital assets. This excludes investments in new routes and extensions, including capital expansion projects (Second Avenue Subway, East Side Access, and Seventh Avenue Subway extension) currently underway. More than half of all needs, \$45 billion, focus on: signal systems investments; subway cars; buses, subway track, and passenger stations. Signal systems alone will cost \$15.6 billion.

Based on thorough analysis of the NYCT needs, the agency has identified an investment level in each five-year period over the next 20 years (Table 4) to accomplish the repair and replacement needs of the system.

The total continuing need of the Metropolitan Transportation Authority that consists of the Long Island Railroad, Metro-North Railroad, MTA Bus Company, MTA Bridges and Tunnels, and MTA Police and Security as well as the NYC Transit Authority is nearly \$106 billion. These moneys are provided from various revenue sources but depend heavily on New York State legislative appropriations. On a fully unconstrained basis, the NYCT needs are even greater than what is included in this assessment since more backlogged state of good repair needs exist than can be implemented. The “Rail Modernization Study,” an April 2009

report to Congress by the FTA found that more than one-third of the assets of the nation’s seven largest transit agencies, including the MTA, are near or have already exceeded their useful lives. The FTA has subsequently estimated that the SGR backlog in the nation is about \$92 billion to eliminate the current backlog and keep the backlog from growing larger.



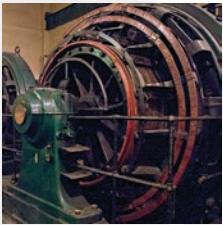
## Subway Elements Requiring Attention



**Subways cars:** Subways cars are also critical assets in the performance of the NYCT mission. There are 6,334 cars in the system. Each of the railcars are on a normal replacement rotation. The investment in the replacement of railcars makes up 12% of the total Needs Assessment investments. The investment is needed to maintain a high level of service. Past investments have increased reliability from 7,000 miles between breakdowns in 1982 to more than 130,000 miles today. Each car has an approximate life of 40 years with adequate periodic maintenance.



**Ventilation:** There are 194 ventilation plants protecting all under-river tubes and a share of the rest of the system. In an emergency, they are used to direct heat and noxious fumes away from passengers and evacuation routes. NYCT plans to construct 50 new or expanded fan plants by 2029 scheduled on a priority ranking and other site considerations



**Power:** NYCT operates 216 power substations in the subway system. They receive high-voltage AC power from Con Edison and convert it into 600-volt DC power for train propulsion. The distribution system consists of traction power cables and circuit breaker houses. About 45% of the substations have conditions requiring capital investment. Generally, substations with multiple backlogged components will receive a modernization type project while substations with only a few backlogged components will receive component-only investment.

## Resilience and Innovation

A number of major improvements to flood-proof the subways have been made since flooding incidents like Hurricane Irene in 2010. However, while the system was shut down during the major flooding, it was back on line and running normally later the day of the storm. The latest major disaster was Super Storm Sandy. A 14-foot tidal surge (5 foot high tide with 9 foot storm surge) hit the Battery in Manhattan and flooded 7 of the 14 East River subway tunnels and numerous other stations and tunnels. Entire platforms were submerged, and underground equipment, some of it decades old, was destroyed. The damage was the worst that the system had ever seen. Less than two weeks after Sandy hit, The New York Times front page headlines read "Subway Repairs Border 'on the Edge of Magic.'" After the worst disaster to hit the subways in their 100+ year history, part of the subway system service was restored within three days and most major lines were back within a week. Repairs came so quickly in some cases that the Authority was ready before Consolidated Edison had restored power. In less than two weeks, all subway systems are back in service. The NYCT subways are indeed resilient systems.

In addition to resilience, innovations are happening in the work of maintaining the subways. The NYCT has changed the way they rehabilitate subway stations. Rather than

## Transit

### NEW YORK CITY

closing stations and doing a total rehabilitation, they are approaching station repair and rehabilitation in a more flexible manner that allows them to attack several components at a station quickly and spend a short duration during late-night hours that reduces passenger inconvenience. Studies have shown that deficiencies in the 11,107 components in the 468 stations can be corrected more rapidly using this approach.

## Recommendations to Raise the Grade

- Increase access to transit in urban, suburban, and rural communities so that all citizens have more and better transportation choices
- Adequately fund maintenance of transit vehicles and facilities to keep systems in state of good repair and reduce life-cycle costs
- Replace buses that are past their useful lives through a five year plan, which will improve transit conditions while lowering operating and maintenance costs.
- Address the future use of new technologies, such as the high-temperature superconducting magnetic levitation systems. Revolutionary changes in transportation technology will be required to make major improvements in system capacity.
- Continue federal investment in transit through a robust surface transportation program (authorization and appropriation) and a solvent Highway Trust Fund
- Require transit systems to adopt comprehensive asset management systems to maximize investments
- Include transit in state and local project development processes and metrics to track performance of transportation systems
- Local, regional, and state government entities—especially in smaller urban and rural areas—should prioritize transit investments that can enhance sustainable land-use decisions

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# WASTEWATER

Across New York State, 610 small and large wastewater treatment facilities are dedicated to keeping water clean and safe. However, aging infrastructure has become a critical problem for the state—I in every 4 of New York’s wastewater facilities are operating beyond their 30-year useful life expectancy, wastewater treatment plant equipment also averages 30+ years old, and 30% of the 22,000 underground miles of sewers are 60+ years old and operating beyond their useful lives. To repair, replace, and update New York’s wastewater infrastructure would cost \$36.2 billion over 20 years. New York’s wastewater funding program is simply insufficient to drive even half of the reinvestment needed in infrastructure; for every dollar needed only 20 cents is provided to clean New York’s water.



## What You Need to Know About New York’s Wastewater

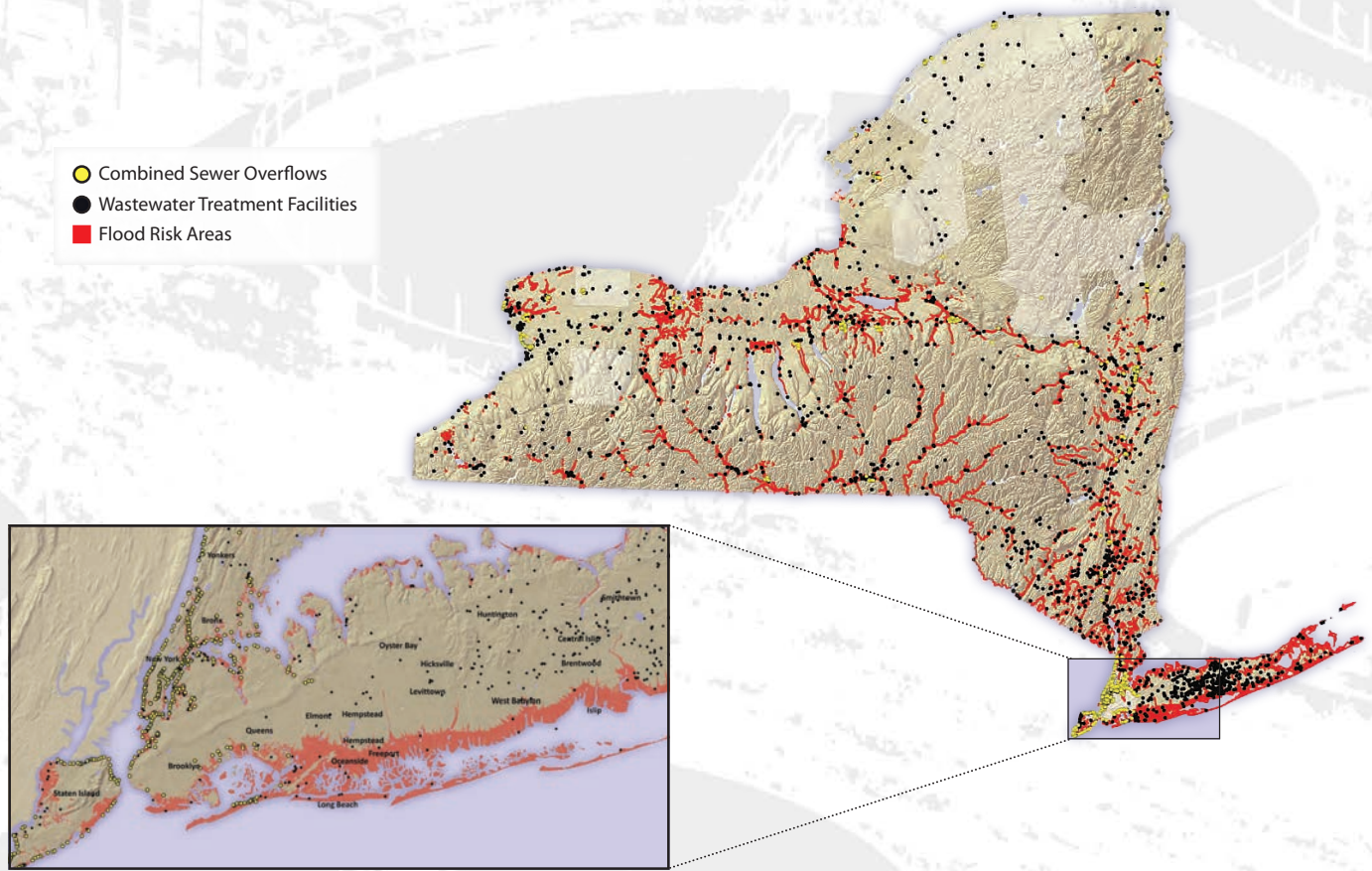
New York State’s 610 wastewater treatment facilities serve 1,610 municipalities. The facilities range in size from New York City’s vast system that processes 1.3 billion gallons of wastewater a day through 14 facilities, to small village systems that process less than 100,000 gallons a day. These facilities provide wastewater treatment for more than 15 million people across the state.

### Condition and Capacity

Generally, the 610 municipal wastewater plants in New York are currently meeting baseline technology limits, yet a growing number will slip away from these standards as their infrastructure ages beyond its expected useful life. According to a Department of Environmental Conservation (DEC) survey of the 1,060 sewage collection systems in New York State, there are 22,000 miles of sewers, more than 30% of which are in excess of 60 years old and beyond their expected useful life. Also, one in every four of New York’s wastewater facilities are operating beyond their useful life expectancy which is about 30 years. About 23% of municipal wastewater treatment plant equipment is more than 30 years old.





**Figure I: Wastewater Facilities and Issue Areas**

Source: Water-related Infrastructure, New York State (State of New York, 2012) c/o NYS 2100 Commission: Recommendations to Improve the Strength and Resilience of the Empire State's Infrastructure, [bit.ly/NYS2100](http://bit.ly/NYS2100)

## Funding and Future Need

New York State has already invested over \$11 billion to construct the existing wastewater infrastructure systems, yet these systems have deteriorated with age. The conservative cost estimate of repairing, replacing, and updating New York's municipal wastewater infrastructure comes in at \$36.2 billion over the next 20 years. In the past, the federal and state governments provided significant funding for infrastructure repair and replacement, but this is no longer true today. In the 1990s, the federal Construction Grants Program was replaced by a low-interest loan Clean Water State Revolving Fund (CWSRF) program, which requires locals to match federal investments making it harder for many communities to address their infrastructure needs.

From the Fund's inception through 2012, the CWSRF financed over 1,550 projects totaling over \$12.5 billion, using a total subsidy of over \$2.2 billion. While New York's CWSRF program has been very well-managed and continues to provide necessary funding for municipalities, the funding mechanism is simply insufficient to drive even half of the reinvestment needed in infrastructure. For example in 2013, only \$1.4 billion of the \$6.6 billion in identified needs were funded which means for every dollar needed only 20 cents was provided to clean New York's water.

Wastewater

TAKE A CLOSER LOOK AT  
**Newtown Creek Wastewater Treatment Plant**

Opened in 1967 in Greenpoint, Brooklyn, New York City's Newtown Creek Wastewater Treatment Plant serves portions of Queens, Brooklyn and Manhattan. The plant featured modified aeration activated sludge designed to remove 60 to 70% of pollutants which was deemed adequate for the East River where it discharged. Within five years with the passage of the Clean Water Act (CWA), it was out of date. The Clean Water Act required the best available technology of step feed aeration activated sludge for secondary treatment regardless of where a plant discharged. To meet the new standard of 85% removal of pollutants meant new Newtown Creek needed upgrading. Because nine of the City's other treatment plants needed upgrading and were older, Newtown Creek awaited a federal Consent Order to implement secondary treatment. A decade and over \$4 billion dollars later, Newtown Creek has achieved secondary treatment and nears completion.



In the future, the NYS Environmental Facilities Corporation (EFC) and NYS Department of Environmental Conservation (DEC) expect to provide more expansive project eligibilities and funding mechanisms, seeking new opportunities to maximize the financial services EFC offers to its clients.

**Figure 2: 20-Year Estimate of Municipal Wastewater Infrastructure Needs in New York**

Source	Estimate of Needs
<b>Clean Watershed Needs Survey Data</b>	
• Municipal Wastewater Treatment Facility Upgrades	\$ 13.6
• Collection and Conveyance Systems	\$ 6.6
• Combined Sewer Overflow Correction	\$ 7.5
• Nonpoint Source Pollution Control	\$ 3.0
<b>Other Existing Data Sets</b>	
• Maintaining Facilities & Appurtenances	\$ 2.1
• Operation & Maintenance; Auxiliary Power	
• Restoring Water Quality	\$ 0.7
• Unsewered communities	
<b>Future Infrastructure Needs Data</b>	
• Protecting Water Quality	\$ 1.7
- MS4 Retrofits; New TMDLs; Enhanced Water Quality Standards; Pharmaceuticals & Personal Care Products	
• Protecting Water Resources	\$ 1.0
- Water Shortages	
<b>Total Preliminary Estimate</b>	<b>\$ 36.2</b>

Amounts in billions

Source: Wastewater Infrastructure Needs of New York State, NYSDEC, March 2008



## Operation and Maintenance

During 2008 to 2009, the Department of Environmental Conservation (DEC) received discharge monitoring data from nearly 1,600 permitted facilities. These data detail various biological, chemical, and physical characteristics of the water being discharged by these facilities. Factors contributing to the compliance status of a State Pollutant Discharge Elimination System (SPDES) permitted facility include this self-reported data, DEC staff inspections, and other regulatory oversight activities. Input from citizens and civic groups provide an additional level of oversight at the community level.

The vast majority of discharge data that DEC receives are within the limits detailed in the SPDES permit. For example, in state fiscal year 2008/09, DEC received over 228,000 values indicative of the quality of water being discharged. Of these reported values, approximately 9,400 were violations of a SPDES permit (approximately 4% of the total).

One requirement for each municipal wastewater treatment facility in the state is to annually certify the flow and pollutant loading received. The amount of flow and what is contained in the wastewater are of concern to NYSDEC, as they indicate the capacity and performance of the collection and treatment systems. Knowing the volume of flow a treatment facility receives is important because it can indicate the facility is close to its design limit. Excessive flow to a treatment facility can negatively impact treatment, cause permit violations, result in raw sewage overflows, or indicate possible leaks in the collection system. In 2011, approximately 11% (69 total) of municipal treatment plants were approaching their design flow limit, indicative of deteriorating infrastructure.

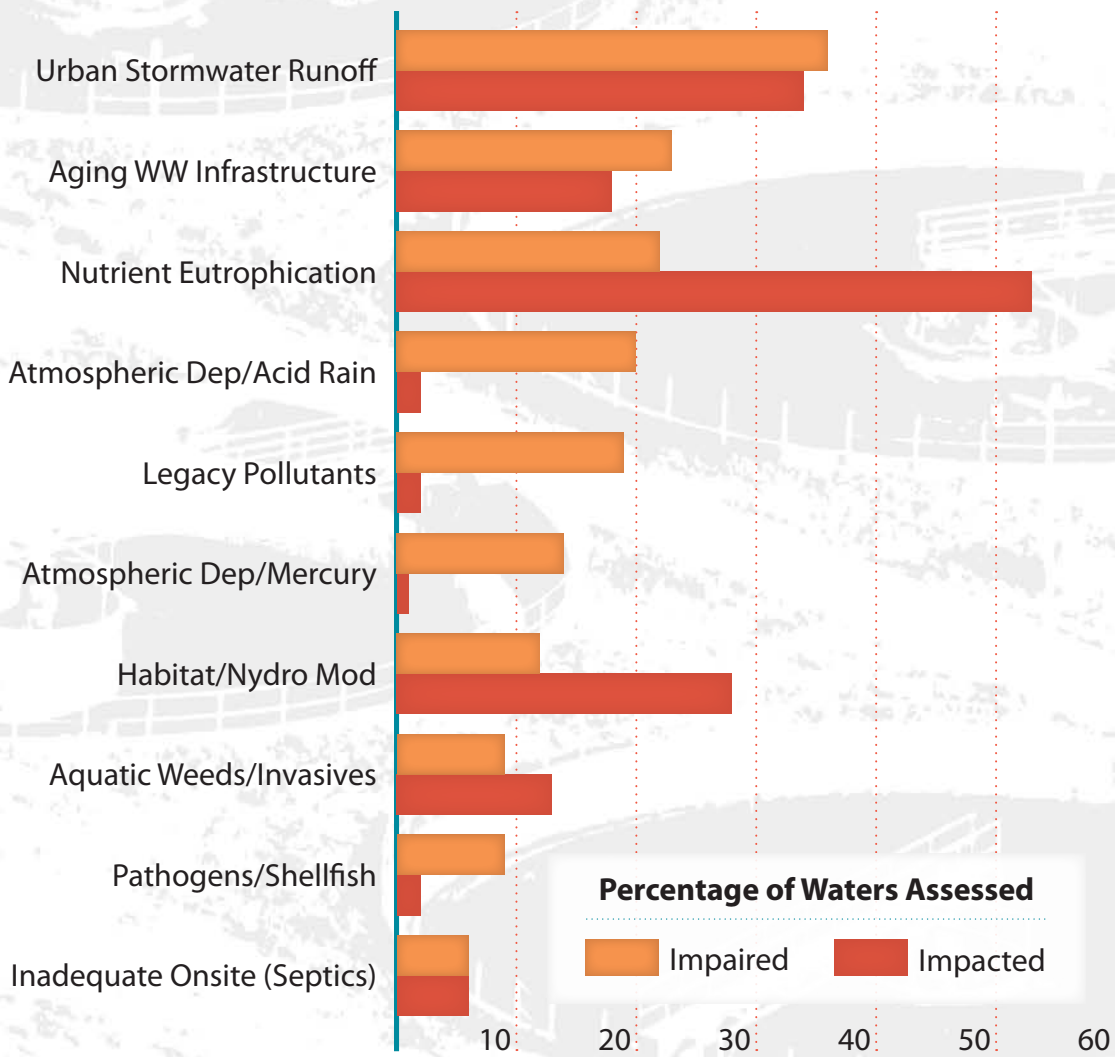
## Public Safety

The NYSDEC Water Quality Assessment Program has identified the top 10 most prevalent causes and sources of water quality issues in the assessed waters of New York State:

Figure 2 shows the frequency for which a specific cause/source is noted as a significant contributing factor in New York State waters. It illustrates the occurrence of each cause/source as a percentage of all waters assessed as impaired (red) or impacted (yellow).



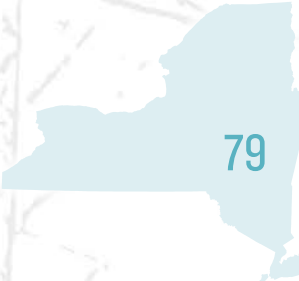
Figure 2. Frequency of the Top 10 Water Quality Issues in New York



Note: Frequency totals do not equal 100% because categories are not mutually exclusive

## Resilience

In recent years, New York has been hit with extreme weather events, including storms Irene, Lee and Sandy. Many of New York’s wastewater treatment facilities are vulnerable to flooding and were severely damaged and temporarily shut down. Super Storm Sandy alone caused \$100 million in damage to wastewater treatment facilities. This included the Bay Park Sewage Treatment Plant on Long Island and the Yonkers Joint Wastewater Treatment Plant, both of which were inundated with salt water. Similarly, the Binghamton-Johnson City area was hit with a record flood due to Lee, which caused extensive damage to its sewage treatment plant and collection system. It will take years to complete repairs at our current rate of completing projects. The damage also led to hundreds of millions of gallons of raw sewage overflowing into nearby waterways causing both public health concerns and commercial fishing closures.



## Wastewater

Recent storms have sent everyone a strong message; wastewater treatment facility operators heard it clearly—we need to achieve resiliency for storm events and rising waters at our facilities and throughout our systems. While grants for recovery projects, including \$115 million for New York City's wastewater, future funding must continue to address these challenges before the next storm.

### Recommendations to Raise the Grade

- Following the storms, it was clear that statewide action was needed. The resilience experts on the NYS2100 Commission made recommendations to address the risks to wastewater infrastructure posed by floods, coastal surges and power outages. Here are a few of the recommendations related to wastewater:
  - Take immediate steps to address sensitive infrastructure and implementing engineering asset management plans that provide a blueprint for resiliency. This could mean implementing disinfection systems, coupled with backup power, at “vulnerable” plants to prevent large pathogen discharges during outages.
  - Building smarter with resiliency by exploring enhanced engineering criteria for new, expanded or rebuilt structures. This will include programs to enhance resiliency by such steps as: elevating structures, using flood-proof engineering criteria or incentivizing the purchase of flood damaged residences in very hazardous areas.
  - Waterproof low-lying wastewater treatment plants and other infrastructure.
  - Fortify wastewater infrastructure and require disinfection of stormwater discharges in flood-prone plants to protect public health.
  - Require installation of disinfection systems
  - Update design standards for wastewater systems
  - Improve long-term maintenance and planning
- Raise awareness for the true cost of water. Current New York State water rates do not reflect the true cost of reliably conveying and treating wastewater. Replacing antiquated sewer pipes and treatment equipment will require significant local investment, and users should be aware of what their water rates will pay for.
- Implement the resiliency recommendations for wastewater provided by the NYS2100 Commission and rebuild our wastewater facilities with resiliency in mind.
- Explore the potential for a state Water Infrastructure Finance Innovations Authority (WIFIA) that would access funds from the state treasury and use those funds to support loans and other credit mechanisms for water projects.

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- NYS 2100 COMMISSION: Recommendations to Improve the Strength and Resilience of the Empire State's Infrastructure, [bit.ly/NYS2100](http://bit.ly/NYS2100)
- Descriptive Data of Wastewater Treatment Plants in New York



## APPENDICES

## The Eight Components for Grading our Infrastructure

- **Capacity:** Evaluate the infrastructure's capacity to meet current and future demands.
- **Condition:** Evaluate the infrastructure's existing or near future physical condition.
- **Funding:** Identify the current level of funding (from all levels of government) for the infrastructure category and compare it to the estimated funding need.
- **Future Need:** Evaluate the cost to improve the infrastructure and determine if future funding prospects will be able to meet the need.
- **Operation & Maintenance:** Evaluate the owners' ability to operate and maintain the infrastructure properly and determine that the infrastructure is in compliance with government regulations.
- **Public Safety:** Evaluate to what extent the public's safety is jeopardized by the condition of the infrastructure and what the consequences of failure may be.
- **Resilience:** Evaluate the infrastructure system's capability to prevent or protect against significant multi-hazard threats and incidents and the ability to expeditiously recover and reconstitute critical services with minimum damage to public safety and health, the economy, and national security.
- **Innovation:** Evaluate the implementation and strategic use of innovative techniques and delivery methods.

## Definition of ASCE's Grades

The definition of the final grades of each of the infrastructure systems is based on the following:

### A 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 resilient to withstand most disasters and severe weather events.

### B 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.

### C MEDIOCRE: Requires Attention

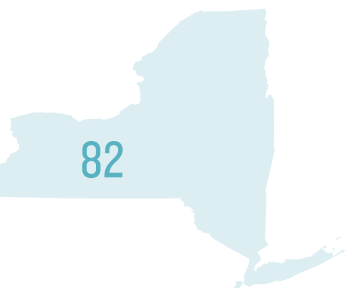
The infrastructure in the system or network is in fair to good condition; it shows general signs of deterioration and requires attention. Some elements exhibit significant deficiencies in conditions and functionality, with increasing vulnerability to risk.

### D 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.

### E 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.



**The New York Council offers their sincere appreciation for the dedication and diligence of the civil engineers who participated in this Report Card Committee who have provided this effort with their professional expertise and insight into the infrastructure of New York.**



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Griffis is Professor of Construction Engineering and Management in the Department of Civil and Urban Engineering at NYU Polytechnic School of Engineering. He is a Professor Emeritus at Columbia University and a former Principal in the firm of Robbins, Pope and Griffis Engineers, P.C. of New York. He retired as a Colonel from the U.S. Army Corps of Engineers in 1986 after serving as Commander and District Engineer of the New York District. For the 20 years, he commanded Corps of Engineers Construction and Combat Units in the U.S., Korea, Viet Nam, Israel, and Germany. He holds a B.S. degree from the U.S. Military Academy at West Point, two Master degrees, and a Ph.D. in Civil Engineering from Oklahoma State University. Griffis is a highly esteemed member of the ASCE community as a Fellow, former National Board of Directors member, and Director and Past President of the Metropolitan Section. He served as Research chair for the Report Card for New York's Infrastructure and is a member of the National Committee for Infrastructure Research and Policy as well as the Committee for Implementation of Vision 2025.

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Menda has over 35 years experience as a transportation planner and project coordinator in New York City. His work in both the private and public sectors focused on infrastructure projects in highways, streets and transit facilities. He is currently working as an administrative project manager at the New York City Department of Transportation. Mr. Menda served as principal coordinator of the ASCE Report Card of New York's Infrastructure.

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Adamski is a graduate of City College of NY has over 50 years of experience in environmental engineering including Deputy Commissioner at NYC Department of Environmental Protection. He is a Lieutenant Colonel and Fellow in the Society of American Military Engineers. Adamski is a recipient of the ASCE Herbert Howard Government Engineer of the Year, NY Water Environment Association Public Education Award, and was inducted into the Fort Hamilton H.S. and NYWEA Halls of Fame.

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Andonian is working for HDR as a Senior Structural Engineer with over 20 years of extensive experience for analysis and design of bridges, and viaduct structures for both highway and railroad bridges. Her diversified experience includes complex modeling for the purpose of seismic evaluations, load rating, fatigue evaluations. She received her Master's Degree in Structural Engineering from Columbia University, New York and holds a Bachelor's degree in Structural Engineering from the Technical University of Civil Engineering. Andonian has been an active participant with the Structures Group (Chair 2011-12), Metropolitan Section Director (2012-14), and Media Relations Committee Chair (present).

**Edwin S. Anthony, P.E., F.ASCE, ASCE Fellow**

Anthony has 37 years of experience as an engineering practitioner in bridge design. At Steinman Boynton Gronquist & Birdsall in NYC, he worked on the Brooklyn Bridge Rehabilitation Project. In upstate New York at Erdman Anthony and Associates, he participated in the award-winning system design of the Combined Sewer Overflow Abatement Bridge as well as the Frederick Douglass Susan B. Anthony Memorial Bridge in Rochester, NY. Anthony is an ASCE New York State Council Delegate and Rochester Section President, and in 2014, he was honored as the Engineer of the Year. He currently teaches at the University at Buffalo and previously at the Rochester Institute of Technology.

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Everleth is a graduate of Rensselaer Polytechnic Institute with over 20 years of experience in geotechnical and construction materials engineering. Presently, she is a Senior Geotechnical Engineer at CHA Consulting, Inc. in Colonie, New York, providing dam safety engineering services to dam owners. These services entail preparing responds to RFPs, performing dam safety inspection, preparing Emergency Action Plans and I&M Plans, making engineering assessments of structures, developing drawings and technical specifications for repairs needed to bring dams into compliance with NYS Dam Safety Regulations, and overseeing construction of repairs and modifications. She is a Past President of the Mohawk-Hudson Section of ASCE and served as the Section's newsletter editor for over 10 years.

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Jaworski has more than 35 years of experience as a bridge design engineer and is currently an Adjunct Professor in the Department of Civil and Environmental Engineering at New Jersey Institute of Technology. Jaworski has public and private sector experience with short and long span bridges includes fixed and movable highway and railroad bridges. Jaworski also served as an industry and technical advisor at the Advanced Technology for Large Structural Systems Research Center, Lehigh University. His research includes metal fatigue/failure and life-cycle cost analysis. Jaworski is a past committee member of a Transportation Research Board of the National Academies structures subcommittee for bridge aesthetics. He holds a Bachelor of Science degree from New Jersey Institute of Technology.

### **Peter King**

King is a graduate of the University of Cincinnati where he earned a Bachelor's degree in Civil Engineering. He has graduate degrees from Carnegie-Mellon University and Pace University in New York. Upon his retirement from the New York State Department of Transportation in 2010 where he had over 40 years of experience, he held the title of Director, New York City Planning and Program Management. As Planning/Program Director he had responsibility for assembling and advancing New York State DOT's arterial highway capital program in New York City. King's major projects included the replacement of the Kosciuszko Bridge, contra flow HOV lanes on the Gowanus and Staten Island Expressway, and investment studies in Staten Island and the Bronx.

### **Andrew W. Herrmann, P.E. SECB, F.SEI, Former ASCE President**

Herrmann is a partner emeritus of Hardesty & Hanover, LLP, Consulting Engineers, headquartered in New York City, ASCE's 2012 national president, and the past chair of the Report Card for America's Infrastructure. During his over 40 years in transportation, Herrmann has been responsible for the design, inspection, rehabilitation, construction support, analysis, and rating of fixed and movable bridges, highways, railroads, and major transportation projects.

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McCormick is a Project Engineer for Regional Transit Service in Rochester, NY, and previously worked on environmental site assessments/remediation and geotechnical investigations at Stantec. McCormick received her B.S. in Environmental Management & Technology from Rochester Institute of Technology and her M.S. in Civil Engineering from the University of Maine. Ms. McCormick has been an ASCE Rochester Section board member since 2010, and is now Region 1 Governor.

### **Russell Porter, P.E., LEED AP, M.ASCE**

Porter earned his AAS from Monroe Community College in 1973 and his BS in Civil Engineering from the University at Buffalo in 1975. Over the course of his career, Porter worked for various consulting engineering firms, the NYSDOT, and Wegmans in various capacities – from construction inspector to senior project manager and senior project engineer. He was involved with a myriad of projects including land development, highway design, utility design, planning, municipal improvement projects, geotechnical engineering, traffic engineering, environmental site assessments/impact statements, wetlands, water supply, waste water, storm drainage, erosion and sedimentation control, flood plains, and mitigation. In addition, during his career, he assisted in the recovery efforts associated with major disasters such as flooding and hurricane events (Charley, Katrina, Wilma), and reviewed and reported on the recovery efforts associated with the 9-11 terrorist attacks at the World Trade Center. Porter passionately served in numerous capacities within ASCE including this Report Card Committee until his passing in 2014.

### **Beth Ann Smith, PE BCEE, M.ASCE**

Smith has over 28 years of experience in civil and environmental engineering with special emphasis in the area of geotechnical engineering. Her experience includes consultant work on solid waste facilities, site investigation and remediation facilities, earthen and concrete dams, regulatory compliance for dams, preparing geotechnical engineering evaluations, performing construction monitoring, and supervising quality assurance/quality control testing. She holds an M.S. and B.S. in Geotechnical Engineering from Syracuse University. She has been involved in ASCE leadership since her college years and is presently the ASCE Ithaca Section President and acting New York Council Chair.



**Additionally, the following individuals and organizations have been integral to the research and outreach process for this Report Card:**

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Association of State Dam Safety Officials

Land and Water Conservation Fund

Metropolitan Transportation Authority

National Association of Town Superintendents of Highways

National Transportation Research Group

New York City Department of Transportation

New York City Transit Authority

New York Public Transit Association

New York State Bridge Authority

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New York State Department of Environmental Conservation

New York State Department of Transportation

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