

Keeping the City Running

by Mark Berkey-Gerard

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On the corner of Williams and Liberty Street, a new 30-story apartment building is going up, but before the luxury apartments are habitable, the construction workers must go underground and rip apart the city's guts - electrical cables, water pipes, gas mains, and sewers lines, replacing the crumbling pipes with new ones.

It is a precarious and disruptive project. Many of the old metal pipes are literally falling apart from years of rust. Workers with welding torches and saws crawl on their hands and knees through the tangle of pipes held up by ropes tied to wooden beams.

New Yorkers rarely think about the hidden systems that keep the city running, until a huge construction project gets in their way, a water main breaks, or until - like, most spectacularly, last August - the lights go out and everything shuts down.

"The blackout did not originate in New York, but people learned quickly that it affected

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everything," said Rae Zimmerman of the Institute of Civil Infrastructure at New York University.

When the electricity failed, thousands of commuters were trapped in subways. Residents who lived above the sixth floor of their apartment buildings could not get water. Sewage spilled into the city's waterways and shut down beaches. Cell phones failed.

But those who monitor the systems that keep the city running say it is not just events like September 11 or blackouts that pose a threat to the city. The biggest threat may be the everyday wear-and-tear on the city's systems.

There are thousands of potential hazards - most hidden from public view - that could paralyze the city.

In 1998, the City Comptroller released a 900-page report (in [pdf](#) format) detailing crumbling water mains, cracking sewers, and broken subway rails. The report estimated that it would take the city 10 years and \$48 billion to get the roads, subways, water, sewers, and sanitation systems in working order.

At the time, Mayor Rudolph Giuliani dismissed the report as a "wish list" and said New Yorkers could not afford an increase in taxes. But others warn that New Yorkers can no longer afford to ignore the city's aging public works.

"These systems are critical for an urban environment," said Richard Anderson of [the New York Building Congress](#). "It is absolutely essential that New York has reliable electricity, clean water, and working sewers."

ROUTINE REPAIRS

The city's infrastructure is old, with much of it being built 50 to 100 years ago. Just maintaining this system, which cracks and breaks every day, is a monumental task.

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Every time a water main breaks - which happens more than 500 times a year - not only are workers from the Department of Environmental Protection called in, but also police, fire department, and transit officials. Multiple utility companies also must monitor their own lines.

This year alone, the city has received 1,300 complaints about faulty cable TV reception, responded to 3,000 sewer backups, and issued more than 18,000 permits for road construction.

Although repair workers can often fix the problem by climbing into one of the city's 600,000 manholes, which were invented as a way to minimize street disruptions, New York streets are constantly being torn up.

Accidental damage to pipes and cables by construction remains one of the most common reasons for power outages, telephone trouble, and water leaks.

PAYING THE BILL

The city's ability to meet its ongoing repairs and plan for the future is limited by government regulations and a lack of funding.

Most of the city's capital projects - fixing roads, repairing sewers, and building new water treatment plants - are funded by debt. State law restricts the amount of loans the city can take. For example, the city's General Obligation Debt, which will provide about \$26 billion over the next 10 years, cannot exceed a specific percentage of the taxable real estate value in the city.

So the city seeks other funding, such as tobacco settlement money and state and federal aid. In the 1970's, when the city faced bankruptcy, many projects were simply delayed because of a lack of funds. This year, faced with another huge budget deficit, Mayor Michael Bloomberg cut the 2004 capital budget.

And for utilities like phones, gas, electricity, and water, customers pay the price to improve the systems in their monthly bills.

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"There is a saying out there, 'do more with less,' but that is not how it works in the real world," said Jameel Ahmad, a civil engineer who teaches at Cooper Union. "I expect we will see an erosion of our infrastructure. Every budget has been cut, and things will get worse."

CRITICAL ISSUES

A SLICE OF NEW YORK

While most of the city's cables and [pipes are](#) .) street, the systems that keep the city running go down as deep as the Chrysler

A foot under ground are the wires: 90,000 miles of electric cables - the largest power system in the world - and 32 million miles of telephone, television, and

Two feet down are 7,000 miles of gas mains.

Four feet below the surface of the street lay 6,000 miles of water mains.

Six feet beneath the earth, 100 miles of steam pipes bring heat to large buildings and apartments.

Subway tunnels - the part of the city's underground that New Yorkers see every day - run 30 to 200 feet below the surface.

And deep below the city, 200 to 800 feet down, huge water tunnels carry 1.3 billion gallons of water a day from upstate reservoirs to New Yorkers faucets.

Roads And Bridges

A 2003 [report card](#) on New York's infrastructure by the American Society of Civil Engineers, cited roads and bridges as the top infrastructure concerns. According to the study:

- 30 percent of New York's roads are in "poor" or "mediocre" condition
- A third of New York's bridges are "structurally deficient" or "functionally obsolete"
- Traffic on New York roadways has increased by 21 percent over the last ten years.

And even when repairs are done, engineers say, they are not done correctly.

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"New York City often mills the top surface of roadways when repaving. However they don't fix the base and subsurface and the problems keep coming back," one engineer wrote in the report. "On all highways within the city, everything a student is taught never to do is done."

Electricity

Con Edison maintains some 126,000 miles of cables, about two thirds of which are underground. And compared with the rest of the country, experts say Con Ed has one of the most reliable systems in the country.

"Because of the way the system is laid out and the maintenance, it is by far the most reliable system. No one even comes close to them," said Walter Zinger, an electrical engineer with the Electric Power Research Institute in a recent Gotham Gazette [article](#) .

Still there are over 2,000 power-line failures a year in the city and critics say that power companies are neglecting their old cables. A 2000 study released by the New York State Energy Planning Board found that capital investments in the power transmission system declined by nearly \$200 million between 1988 to 1998

Deregulation - the loosening of energy regulations in the late 1990's that allowed for more competition between power companies - presents additional problems. For example, Con Edison must maintain its power lines, but the New York Independent Operator, a state agency that manages the energy market, is responsible for the whole system.

Experts say there is little economic incentive or will to build new transmission wires or upgrade systems.

Water

The city gets its 1.3 billion gallons of daily water from two tunnels that run from upstate reservoirs into the city. In 1969, the city began building a third tunnel to meet growing demand and to serve as a backup in case one of the other tunnels failed. Some fear the project will still not be finished by the year 2020.

Tunnel 3, which runs 60 miles and weaves through four boroughs, has been called "the greatest nondefense construction project in the history of Western Civilization." Already 24 people have died digging the tunnel - roughly a man for every mile built.



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URBAN EXPLORATION

One night when they were teenagers, David Leibowitz and L.B. Deyo gave into a moment of "adolescent curiosity" and climbed to the rooftop of Grand Central Station.

"Someone knew a way up there and we thought it would be cool," said Leibowitz. The two ended up getting arrested, but it sparked an intense passion to see and go places that are off limits to most New Yorkers.

Over the years, the two have walked through Amtrak tunnels, located an online publication to document their efforts at "Urban Exploration" water aqueducts, and visited abandoned helicopter pads on the rooftops of buildings. In 1997

"The idea is to look at the city as a place to be explored and to see urban infrastructure not only as a facility for bringing you water or transporting you from one place to another," said Leibowitz, "but as a place with its own history and u

The Jinxes are not alone, though each group has its own motives (if not their own dress code). Some do it for the rush of being someplace they should not be. Others are into tunnels or high places.

There are of course risks to climbing down a subway shaft - live wires, rats, holes, and getting arrested by police who are on terrorism alert. The Jinxes took a break from urban exploration for about a year after 9/11. "We were concern

For curious New Yorkers who would like to explore the [City's Infrastructure Tour](#) offers a chance to see over 80 sites on October 11 and 12. The event is free.

Participants can tour the Tweed Courthouse, climb to the top of the Grand Army Plaza Arch, explore the catacombs of Green-Wood Cemetery, or visit the turn-of-the century Pratt Institute power plant.

Organized by Scott Lauer, an architect with New York's Anderson Architects, Open House New York was inspired by similar events in cities like London and Toronto.

What makes the project so critical, officials say, is that the other two tunnels are leaking badly. During the 1950's an effort to turn off Tunnel 1 for repairs failed because of old valves. In 2000, the tunnels lost more than a billion gallons a month through cracks, and repair crews have to descend in pressurized diving bells to weld them.

Some fear that the tunnels could collapse all at once, shutting down water to much of the city - if not all of it.

"There would be no water," Christopher Ward, the head of the city's Department of Environmental Protection, told the New Yorker magazine in a recent article. "These fixes aren't a day or two. You're talking about two to three years."

Because of the city's financial problems in the 1970's, construction on Tunnel 3 stopped for a decade and then proceeded slowly through the 1980's.

Mayor Michael Bloomberg, who has said that the "the city could be brought to its knees if one of the aqueducts collapsed," has increased funding for the Department of Environmental Protection, but other projects, like a new aqueduct and filtration plant, will consume much of the money.

Sewage

For the last ten years, the city's Department of Environmental Protection has spent 40 percent of its capital budget to [upgrade](#) the city's 14 sewage treatment plants. The city was required to do so by the federal Clean Water Act, which reduced the amount of sewage that could be released into the city's waterways.

But as the recent blackout demonstrated, not all of the systems are running smoothly.

When the electricity went out, backup generators at two of the city's fourteen wastewater treatment plants - Red Hook and North River - failed. And the 13th Street pump station on the East River does not have a

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backup generator even though the state issued an order to build one in 1995.

The result was that more than 490 million gallons of sewage spilled into the city's waterways, closing beaches and creating health and environmental hazards.

Telecommunications

As the terrorist attacks of September 11 and the recent blackout demonstrated, the city's telecommunications systems are susceptible to failure.

On September 11 2001, when 7 World Trade Center collapsed, Verizon lost an estimated 200,000 telephone lines and 3.5 million data circuits. Only one in 20 cell phone calls were connected. And emergency responders had trouble communicating.

Again during the August blackout, the top six cell phone carriers had [unreliable](#) service and landline systems were overloaded.

"The 9/11 attacks illustrated how fragile and poorly engineered our cellular communications system is," Anthony Townsend, a professor at New York University who specializes in telecommunications [told](#) CNET News. "It is incapable of dealing with crisis."

In an effort to create backup systems and lure high-tech business to New York, the city is converting unused water pipes under the city streets into conduits for fiber-optic cables.

However, the effort behind this resourceful idea diminished greatly with the dotcom bust. "Much of the fiber put down in the late 1990's was done haphazardly and some of those companies are gone now," said Townsend.

Sanitation

New York City generates more than 11,000 tons of garbage a day. For years, the trash went to the Fresh Kills landfill, but the dump closed in 2001.

Today, the waste is collected by nearly 1,500 sanitation trucks and transported to private waste transfer stations in the city and surrounding counties. There, most of the refuse is loaded onto 18-wheel trailers and transported to landfills in Pennsylvania and Ohio.

Residents in neighborhoods with a high number of waste transfer stations complain of heavy truck traffic through neighborhoods that cause noise, create pollution, and tear up local streets.

Meanwhile, the cost of disposing garbage has risen from \$44 per ton in 1997 to over \$88 per ton in 2001.

Public Transportation

New York has one of the most extensive public transportation systems in the world, which moves 2.4 billion passengers every year. Still it has been more than six decades since a new subway line has been built, in part because maintaining the current system is a monumental task.

"The top priority was, is, and will always be the maintenance and repair of the existing subway system," said Gene Russianoff of the Straphangers Campaign. "It is only in the last few years that our organization has come out in favor of expansion."

The MTA reports that subway tracks and switches are currently in a "state of good repair." The immediate focus is on renovating subway stations, which it hopes to complete by the year 2019.

Still the city is hoping to undertake several massive subway expansion that will tear up streets and cause disruptions to existing subway lines.

A new transportation [hub](#) in lower Manhattan will connect nine subway lines, the PATH train to New Jersey, and a high-speed link to Newark and John F. Kennedy airports. Mayor Michael Bloomberg has presented a plan for redeveloping the west side of Manhattan, which would include an extension of the project, the Metropolitan Transportation Authority is moving ahead with a plan for the [Second Avenue Subway](#) [7-subway](#) train. And despite lingering questions about how the city will pay for the

The Second Avenue subway project would be the most disruptive to traffic and the existing infrastructure. The 8.5-mile line will stretch from 125th Street to Hanover Square in lower Manhattan and will not be completed until 2020.

MTA officials plan to use a technique known as "tunnel boring," using large drills to cut underground with less noise and vibration on the street. However, much of the construction would require underground blasting of explosives, which can cause damage to existing pipes and cables near the surface of the street. Some of the subway line requires a "cut-and-cover" technique, which requires opening the street, digging the tunnel, and then rebuilding all of the cables and pipes and resurfacing the street.

How the city will pay for all of these projects and how traffic would be rerouted for the next two decades is still unclear. "Some of these projects will never happen," said Russianoff. "There are finite resources."

PRICE OF NEGLECT

In 1988, the city paid a high price for years of neglect on the Williamsburg Bridge. The bridge was declared unsafe; merchants near the bridge complained that business was down because people avoided the bridge.

The city was faced with a choice:

- Permanently close the bridge, which would have caused traffic congestion on other bridges.
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- Build a new bridge, which meant tearing down houses and building new roadways.
- Or repair the existing bridge.

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The city decided that repairing it would be the least disruptive option.

Engineers estimated that if the city had done regular repairs over the bridge's 100-year history, it would have cost about \$190 million in today's dollars. Instead it ended up costing more than \$600 million.

These types of problems will occur again and again, experts say, unless the city plans ahead.

"No one is looking at the whole picture," said Anderson. "Each level of government deals with the short term and what they control. But looking at all of the systems as a whole, thinking in the long term, and finding adequate financing - those things are not being done."