ACKNOWLEDGMENTS

Gail O. Mellow, President, LaGuardia Community College/CUNY

Hon. Michael R. Bloomberg, Mayor, City of New York
Hon. Christine C. Quinn, Speaker, Council of the City of New York
Hon. Helen M. Marshall, Queens Borough President, City of New York
Hon. Eric Gioia, Member, Council of the City of New York

Matthew Goldstein, Chancellor, The City University of New York
Jay Hershenson, Senior Vice Chancellor and Secretary of the Board of Trustees, The City University of New York

Tom Newell, Vice President, Brooklyn-Queens Electric Operations, Consolidated Edison Company of New York, Inc.

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This publication is sponsored, in part, by public funds from the Council of the City of New York and The New York City Department of Cultural Affairs, and by a grant from the Consolidated Edison Company of New York, Inc. We would particularly like to thank Hon. Kate Levin, Commissioner, Department of Cultural Affairs, City of New York.


See also the following websites:
New York City Department of Environmental Protection:

Catskill Watershed Corporation:
http://www.cwconline.org/programs/pub_edu/pe.html

Virtual New York City: http://www.virtualny.cuny.edu/

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This curriculum and a teacher's guide will soon be available on our website at www.laguardiawagnerarchive.lagcc.cuny.edu
FOREWORD

Supplying clean water to a population that has grown from 202,000 in 1830 to over 8,000,000 people today has been a great challenge. It was carried out using foresight, hard work, and determination by New York City’s leaders and workers.

Our water supply system has always depended on the men and women whose hard work built and now maintain the reservoirs, aqueducts, and tunnels that supply our thirsty city. This booklet uses letters, newspaper articles, maps, charts, cartoons, photographs, and interviews to tell their story.

You will learn how our city in the 1830s, faced with deadly disease and fire, built the Croton Water System that supplied New York with its first reliable supply of clean water. As the city’s population grew rapidly during the nineteenth and twentieth centuries, those immigrants from Ireland, Italy, and the Caribbean built needed additions to the water supply system. You will explore their role in making this happen. You will also discover how the city built public baths so that residents could stay clean and, later built pools for fun. The story of supplying water to New York continues today as 500 workers dig Tunnel 3 more than 600 feet below the city’s streets at a cost of six billion dollars.

Note: See the glossary on page 48 for definitions of words in bold print, which you may not know.

FRONT COVER
Astoria Pool, 1936. Courtesy of the New York City Department of Parks and Recreation, Photo Archives

BACK COVER
INTRODUCTION

HOW DO WE USE WATER?

How do we use water today? List three ways.

1. 

2. 

3. 

We use water every day in many ways, to fulfill our needs and to keep us healthy and safe. The pictures below show some of the ways in which we use water in our daily lives. Write a caption for each. If you are not sure what a picture shows, use your imagination. (The pictures are identified on the inside back cover.)

PICTURE #1

CAPTION:


PICTURE #2

CAPTION:


Photo courtesy of The Brooklyn Paper.

Where do you think our water is coming from? 

The water that you drink every day comes from over a hundred miles away. It has traveled by gravity over a system of reservoirs, aqueducts, and tunnels before it enters pipes in our homes, schools, and places of business. In this booklet you will learn the history of our water system and the way in which water comes to us from the mountains. You will discover the major role water played in the growth of our city by allowing so many people to live together safely and comfortably.
When New York (New Amsterdam) was first settled in 1624, its Dutch inhabitants dug wells to get water, or drew it from creeks and ponds. The English settlers who arrived in 1664 did the same. Until the early 1800s, New Yorkers continued to rely on these same sources.

In the 19th century the city’s population grew rapidly. There were 60,489 people in 1800. In 1810, there were 96,973. In 1820, 121,706 people lived in New York. (In the early 19th century, population figures for New York represent only Manhattan.) In only twenty years—one generation—the city’s population doubled. As the number of people increased, the need for water did, too. More people also meant that fresh water sources became polluted. Before plumbing was brought indoors, there were no flush toilets. Human waste was dumped outside and usually ended up, eventually, in the water supply. Horses were commonly used to pull carts and carriages. In 1835 New York had 10,683 horses (and 270,089 humans). A thousand-pound horse makes anywhere from 30 to 50 pounds of manure a day. Between 300,000 and 500,000 pounds of manure were dumped on the city’s streets daily. The city’s well water became contaminated by horse manure, along with garbage from homes and businesses.

Some attempts were made to get clean water for the city, but none of them were successful. For example, Aaron Burr, who would later become the country’s third vice president, started the first water company in 1799. It was called the Manhattan Company. Although it did provide some water for the city, its main business soon became banking. (Today it is JP Morgan Chase.) Since water was not its main concern, the company did little to help the city. The water from wells in the city was of poor quality and there was not enough of it to provide for most New Yorkers.

Like today, New Yorkers needed water for various reasons. The chart opposite, from 1835, shows the kinds of “water takers” and how much water they might pay for if they had all the water they needed.
# NEW YORK'S WATER TAKERS, 1835

<table>
<thead>
<tr>
<th>DESCRIPTION OF WATER TAKERS</th>
<th>Number of water takers</th>
<th>Average amount water per day</th>
<th>Total of the year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dwelling houses</td>
<td>20,000</td>
<td>38 00</td>
<td>$160,000 00</td>
</tr>
<tr>
<td>Back tenements</td>
<td>2,000</td>
<td>4 00</td>
<td>8,000 00</td>
</tr>
<tr>
<td>Taverns</td>
<td>2,666</td>
<td>15 00</td>
<td>30,690 00</td>
</tr>
<tr>
<td>Baths</td>
<td>3,000</td>
<td>4 00</td>
<td>12,000 00</td>
</tr>
<tr>
<td>Livery stables</td>
<td>60</td>
<td>53 00</td>
<td>3,280 00</td>
</tr>
<tr>
<td>Horse stables</td>
<td>4,000</td>
<td>1 50</td>
<td>6,000 00</td>
</tr>
<tr>
<td>Manufactories</td>
<td>70</td>
<td>90 00</td>
<td>6,300 00</td>
</tr>
<tr>
<td>Bake houses</td>
<td>267</td>
<td>13 00</td>
<td>3,464 00</td>
</tr>
<tr>
<td>Hatters</td>
<td>78</td>
<td>15 00</td>
<td>1,170 00</td>
</tr>
<tr>
<td>Sugar houses</td>
<td>7</td>
<td>150 00</td>
<td>1,050 00</td>
</tr>
<tr>
<td>Brew houses</td>
<td>13</td>
<td>80 00</td>
<td>1,040 00</td>
</tr>
<tr>
<td>Tanners, curriers and moroc-co manufactories</td>
<td>20</td>
<td>40 00</td>
<td>800 00</td>
</tr>
<tr>
<td>Dyers</td>
<td>30</td>
<td>30 00</td>
<td>600 00</td>
</tr>
<tr>
<td>Distilleries</td>
<td>63</td>
<td>100 00</td>
<td>6,300 00</td>
</tr>
<tr>
<td>Printing offices</td>
<td>176</td>
<td>10 00</td>
<td>1,760 00</td>
</tr>
<tr>
<td>Steam engines</td>
<td>63</td>
<td>35 00</td>
<td>2,100 00</td>
</tr>
<tr>
<td>Slaughter houses</td>
<td>100</td>
<td>13 00</td>
<td>1,300 00</td>
</tr>
<tr>
<td>Soap and candle factories</td>
<td>559</td>
<td>60 00</td>
<td>33,540 00</td>
</tr>
<tr>
<td>Pottery cellars</td>
<td>10</td>
<td>10 00</td>
<td>100 00</td>
</tr>
<tr>
<td>Marble and stone cutters</td>
<td>43</td>
<td>35 00</td>
<td>1,505 00</td>
</tr>
<tr>
<td>School houses</td>
<td>69</td>
<td>15 00</td>
<td>1,035 00</td>
</tr>
<tr>
<td>Large hotels</td>
<td>40</td>
<td>150 00</td>
<td>6,000 00</td>
</tr>
<tr>
<td>Boarding houses</td>
<td>240</td>
<td>10 00</td>
<td>2,400 00</td>
</tr>
<tr>
<td>Boarding schools</td>
<td>23</td>
<td>10 00</td>
<td>230 00</td>
</tr>
<tr>
<td>Victualling and refectories</td>
<td>100</td>
<td>23 00</td>
<td>2,300 00</td>
</tr>
<tr>
<td>Shipping</td>
<td>4,004</td>
<td>6 00</td>
<td>24,024 00</td>
</tr>
<tr>
<td>Gas works</td>
<td>2</td>
<td>1000 00</td>
<td>2,000 00</td>
</tr>
<tr>
<td>Chemical works</td>
<td>1</td>
<td>800 00</td>
<td>800 00</td>
</tr>
</tbody>
</table>

Total: 310,518 00

Look at the column “Number of water takers”. Circle the top six water takers.

List three water takers that you have never heard of. Explain why each one would be a water taker.

1. 
2. 
3. 

Which animal is listed as a water taker? 

Why do you think this animal was listed and not any others? 

Which of the water takers needed the most water? 

Why do you think this is so?
CHOLERA IN NEW YORK

DIRTY WATER GETS US SICK

In 1832, with limited clean water available, New Yorkers became victims of a terrible cholera epidemic. (See the glossary on page 48 for definitions of words in bold print, which you may not know.) The disease killed 3,513 people out of a population of 225,000. (The same death rate in today's city of eight million would be more than 100,000). Cholera is caused by bacteria. When New Yorkers infected by these bacteria used backyard outhouses—there were no bathrooms—their waste sometimes got into the well water, and sometimes into food. People who drank the infected water or ate the contaminated food would also get cholera. Cholera spread rapidly, killing many. Doctors at the time did not know how people were infected with cholera. Many New Yorkers mistakenly thought that people became sick from poisonous gases escaping from rotting food. Although many realized that polluted water caused people to get sick, they were not sure why.

Cholera victims suffer from vomiting, muscle cramps, and severe diarrhea. Diarrhea causes the body to lose great amounts of water. This is called dehydration. It is very dangerous. The body goes into shock and internal organs begin to stop working. Once this happens, a person can die within a few hours.

Cholera hit New York City in July of 1832. The population in that year was 225,000. By August, 100,000 people had left the city in fear for their lives, fleeing in steamboats up the Hudson River and by horse and carriage to the countryside. (What percentage of the city’s population left? ________)

Philip Hone, a wealthy merchant who was mayor of New York from 1826 to 1827, kept a diary from 1828 to 1851. On the next page is his diary entry written on the Fourth of July, shortly after cholera struck the city. (See Mayor Hone’s portrait to the right on this page. Also, see Philip Hone’s house on the far right in the drawing on page 9.)
DIARY OF PHILIP HONE, 1832

WEDNESDAY, JULY 4. — It is a lovely day, but very different from all previous anniversaries of independence. The alarm about the cholera has prevented all the usual jollification under the public authority. There are no booths in Broadway, the parade which was ordered has been countermanded, no corporation dinner, and no ringing of bells. Some troops are marching about the street, "upon their own hook," I suppose. Most of the stores are closed, and there is a pretty smart cannonade of crackers by the boys; but it is not a regular Fourth of July. The disease is here in all its violence, and will increase. God grant that its ravages may be confined and its visit short!


What does Hone mean when he says it was a "lovely day?"

What do you think the "booths on Broadway" might have been?

What do you think a "cannonade of crackers" might have been?

According to Hone, what had caused this Fourth of July to be different from earlier ones?

List three ways in which the festivities that year were different.

1

2

3

Imagine you are living in New York City in July of 1832. Write a diary entry describing the general feeling of the city on July 4, 1832.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

THE THREAT OF DISEASE
On July 23, 1832, William Bayley wrote a letter to his daughter, Magdalena Bayley. He affectionately calls her Little Piggy. We do not know how old she is. In his letter, Mr. Bayley tells Magdalena about the cholera epidemic happening in New York. Below is the first page of the original letter in Mr. Bayley’s handwriting, as well as a transcript.

New York July 23, 1832
Dear Little Piggy,

You cannot imagine how dreary the street looks. Since you are Mr. Keeler and Mrs. Stout have likewise taken their departure, and those who remain keep their houses shut the livelong day to exclude I suppose the pestilential air. . . .

On Sunday (yesterday) the Park was black with persons anxiously waiting for the day’s report. Today people look rather better and Broadway I am told was better filled. The cases for this day are less than 250 about the same as yesterday. The disease will probably reach its maximum this week. The Doctor thinks it will abate daily, that we have had the worst. . . . In a word, this disease is so completely spread that we were counting yesterday and could not recollect a street in which it had not been with the single exception of Park Place. . . .

Tell Sarah that my prophecy has come true, we have had the cholera as badly as the people of Paris. It will abate now. Since the 5th of July the cases amount to 2,612 and the deaths 1,111. It now rages most violently among the better class of poor.
How do you feel after reading this letter?

Why did Mr. Keeler and Mrs. Stout leave the city?

What did the people who stayed behind do?

What day of the week was July 23, 1832? (Hint: look at the fourth line of the letter.)

Mr. Bayley says the Park was “black with persons” waiting to hear the day’s report. What report do you think they were waiting to hear?

What was Mr. Bayley’s prophecy?

How many days are there between July 5, 1832 and the writing of this letter?

What was the average number of deaths each day?

According to Mr. Bayley who is the disease now attacking?

Broadway opposite City Hall Park, 1831, where cholera struck the next year. Philip Hone’s house is on the far right. Courtesy of The New York Public Library, Astor, Lenox and Tilden Foundations.
The dirty water that caused the spread of cholera was not the only reason why New Yorkers needed lots of water. Fires were a constant threat. Without enough water, the city could not protect its buildings and other property from being burnt down. At that time, most of the city's buildings were made of wood. In fact, the city had suffered many fires in its history, some of them devastating. The most important was the Great Fire of 1835.

On December 16, 1835, the fire started in a warehouse in lower Manhattan. The city had built a reservoir on 13th Street between present day Third and Fourth Avenues to store water in case of just such an emergency. However on this night there was not enough water as most had been used for fires that had broken out earlier in the week. The water fire fighters did have provided no help as below zero temperatures froze the city's wells.

The Great Fire of 1835 destroyed nearly twenty million dollars' worth of property. And, in 1835, you could buy all the property in New York for 200 million dollars.

Opposite are two paintings of the Great Fire of 1835. Imagine you are living at that time and are a witness to it. Choose one painting and describe what you are seeing and how you are feeling as you watch the city burn.
PAINTING A


PAINTING B

Burning of the Merchants' Exchange, New York, Dec. 16th and 17th, 1835, Nicolino Calyo. Courtesy of the Museum of the City of New York. (See Back Cover).
A few days after the fire, Philip Hone (see Lesson 1, page 7) visited the scene and wrote a description in his diary of what he saw.

**DIARY OF PHILIP HONE, 1835**

**December 22**  The weather since the fire has become more mild. This day is very pleasant. This is a happy circumstance, for it facilitates the labors of an immense number of workmen who are employed in removing the rubbish. Goods and property of every description are found under the ruins in enormous quantities, but generally so much damages as to be hardly worth saving. Cloths, silks, laces, prints of the most valuable kinds, are dug out partly burned, and nearly all ruined. A mountain of coffee lies at the corner of old Slip and South street. The entire cargo of teas, arrived a few days since in the ship Paris, lies in a state not worth picking up, and costly indigo and rich drugs add to the mass of mud which obstructs the streets.

From *The Diary of Philip Hone, 1829–1851*. Edited by Bayard Tuckerman.

*These words can be found in the glossary on page 48.*

circumstance  facilitates  immense  indigo  obstructs

According to Hone, why is it a "happy circumstance" that the weather was now mild? ________________

______________________________

List four kinds of goods that were ruined in the fire.

1  _______________________________

2  _______________________________

3  _______________________________

4  _______________________________

What do you think "rich drugs" are? _______________________________

______________________________
LESSON 3

THE SOLUTION
CROTON WATER ARRIVES

Some city officials realized they could not wait any longer to find a clean source of water for New York. They had to take action right away, and the man who led them was Myndert Van Schaick. In 1832, Van Schaick was a member of the city's Board of Aldermen and treasurer of the Board of Health. During the cholera epidemic, when 100,000 New Yorkers fled the city, Van Schaick chose to stay and help the many victims. He decided that the city could no longer rely on its polluted wells and had to get clean water from a river outside its limits.

Van Schaick wrote the law that set in motion the plan to bring water to the city. The state legislature in Albany passed the law in 1835 and a group of water commissioners was appointed to decide on the best plan. The commissioners hired engineer DeWitt Clinton, Jr. to investigate the various water sources the city might use. (De Witt Clinton, Jr. was the son of the famous late state governor, De Witt Clinton, Sr.) Several sources were suggested, including the Passaic River in New Jersey, the Bronx River near the city, and the Croton River forty miles away in Westchester. Clinton recommended, and the commissioners chose, the Croton River because it had the most and the cleanest water. Other engineers were hired to plan the building of the dams, reservoirs, and aqueducts that would actually bring the water into the city. All this took time. Although plans for the Croton Aqueduct had already been drawn up, nothing had yet been built when the Great Fire of 1835 broke out (see Lesson 2, page 10).

The Van Schaicks, a Dutch family, settled in Beverwyck in 1652. (The name Beverwyck was later changed to Albany.) Myndert was born in 1782. His father was a patriot hero in the American Revolution and his mother came from a well known Dutch family. In 1815, Myndert married Elizabeth Hone, the niece of Philip Hone (see Lesson 2). Myndert Van Schaick was a member of the Board of Aldermen, a State Senator, and a founder of New York University.
THE WORKERS

Under chief engineer John B. Jervis, construction of the Croton water system began in May, 1837. It would take five years and nearly twelve million dollars to complete. The laborers who built New York City's Croton Aqueduct water system were mostly Irish immigrants, who lived in camps along the construction site. The work was hard and dangerous. Sometimes the men would strike and refuse to work until they were paid better wages. During the strikes, fights often broke out. The newspaper article below from 1840 reports one of these strikes. (Note that Manhattanville is located in today's West Harlem, below Washington Heights.)

CROTON WORKERS STRIKE

STRIKE FOR WAGES--RIOT.
The laboring men employed on the Croton Water Works, in Westchester county, struck last Thursday for higher wages. The wages they have recently received are seventy-five cents a day, and they demanded a dollar.

On the same day they crossed the Harlem river, and compelled the laborers on the water works in the county of New York to leave their employment, and to go with them into Westchester county.

On Friday they again came into this county and drove from the works the carpenters and masons, detached the horses from the wagons employed in the construction of the aqueduct, and turned them loose.

Since that time, we learn that they have been tolerably quiet until this morning, when, finding that their demand for higher wages was not granted, they congregated in Manhattanville to the number of nine hundred or a thousand men. It is reported that they have declared that if the contractors do not comply with their demands, they will destroy their lives and property, and will also destroy the works so far as they are completed.

Application has been made by Alderman Tieman of the Sixteenth Ward, who is at Manhattanville, to the Mayor for a force to quell the disturbance. Arrangements were immediately made for that purpose. We hear that a detachment of artillery, under General Sanford has been ordered out, and has marched for Manhattanville.

These words can be found in the glossary on page 48.

congregated
comply
detachment

From The New York Evening Post, April 6, 1840.

Where were the men working when they decided to strike?_____________________________________

How much money were they receiving each day for their work?_______________________________

How much more did they want to receive?___________________________________________________
How did the men get more people to join them in the strike?

Why do you think there were horses on the construction site?

Why do you think the men turned the horses loose?

How many men does the article say were striking?

**WAGES—ANTEBELLUM AMERICA**

The graph below shows the average daily wages earned by workers in the northeastern United States from 1820 to 1855. Skilled workers practiced trades such as carpentry and masonry. Unskilled workers had jobs that did not require special skills. The men who dug the tunnels for the water system were unskilled laborers. They worked hard, but did not necessarily know a special trade.

![Graph showing growth of wages, Northeast U.S., 1820-1855](image)


How much did skilled workers earn in 1840?

How much did unskilled workers earn in 1840?

Why do you think skilled laborers earned more money than unskilled laborers?

Based on these numbers, do you think the men had a right to strike for higher wages? Why or why not?
The article on page 14 tells us that a member of the Board of Aldermen had sent out soldiers to stop the strike. This event had become known as the “Croton War,” even though it was not a real war. The 1840 cartoon below makes fun of the fact that some people called it a war.

The Croton Campaign. From the New York Morning Herald, April 13, 1840.

Describe what is going on in this scene.

What kinds of weapons are the men on the left holding?

What kinds of weapons would the soldiers be using?

Who seems to be winning?
The men on the left are the Irish immigrant workers. They are portrayed as a **stereotype**: poor men who drank too much liquor. Give one detail in the cartoon that suggests that these Irish protestors are poor.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

Give one detail that reveals that the Irish workers like to drink liquor.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

What does this tell you about how Americans felt about the Irish?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

Do you feel there are stereotypes about your ethnic group that are not true? If so, what is one of them?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

What parts of the drawing do you think are the silliest, which suggest that the artist saw this “war” as a joke?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

According to the cartoon, was anyone killed in the Croton War? If so, who?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
WATER FLOWS INTO THE CITY

The Croton water system worked like this: a dam was built in the Croton River to hold back the water and create a reservoir from which the release of water could be controlled. By gravity alone (like riding one long water slide), the water flowed all the way from this reservoir to the Bronx through an underground brick-lined tunnel that was 8 ½ feet high and 7 ½ feet wide. A “High Bridge” then carried the flow across the Harlem River to 174th Street in Manhattan, which then was still open countryside.

![High Bridge Aqueduct](image)

From there the water flowed through underground pipes, to a big reservoir in the middle of Manhattan. It was called the York Hill Reservoir, or the “receiving reservoir” because it received water from the aqueduct. This reservoir was built in open land that later became Central Park. From the receiving reservoir, the water was piped down to another reservoir called the Murray Hill Reservoir, or the “distributing reservoir” because from there the water was distributed to lower Manhattan through a network of small pipes. When the Murray Hill Reservoir was built, it was on the outskirts of the city where the intersection of Fifth Avenue and 42nd Street is today. The reservoir is no longer there. It is now the site of the New York Public Library (see photo on page 23).

After five years of hard work, the Croton water system opened to the public with a great celebration on October 14, 1842. Tens of thousands of people came out for the event. The day began with a firing of cannons and the ringing of church bells as water spurted out of the city’s new fountains. It was a day of grand parades, speeches, and songs. Banners and flags decorated the buildings and people wore **commemorative** badges and medals. The drawing opposite shows the celebration. You can just see the top of City Hall sticking up behind the fountain, which still flows today.

How can you tell from the drawing that this was a special celebration? List three ways.

1. 
2. 
3. 

Why would the people of New York have a parade to celebrate water?

What occasions today do New Yorkers celebrate with parades?

List two ways in which today’s celebrations are the same as in 1842.

1. 
2. 

List two ways in which they are different.

1. 
2.
HIGH BRIDGE

The Croton Aqueduct was an engineering feat, the first long-distance water supply system ever built in this country. (We now call it the Old Croton Aqueduct because another one was built later.) Water came by gravity alone—there were no pumps bringing it from Westchester to Manhattan. It flowed forty-one miles into the city through tunnels and pipes crossing ridges, valleys, and rivers. High Bridge was just one portion of the Old Croton Aqueduct. High Bridge stands 138 feet above the Harlem River. A walkway was built along its top so that people could stroll over the bridge for enjoyment. High Bridge is no longer used as an aqueduct or as a pedestrian bridge. It is now part of Highbridge Park, which is run by the New York City Department of Parks and Recreation.

Opposite are three pictures of High Bridge from three different time periods: 1850, 1920, and 2008. Number the pictures from 1 to 3 in the order that shows the passage of time and write in the year of each scene.

How would you describe the way this part of Manhattan looked in 1850? ____________________________________________________________

____________________________________________________________________

What do you see in 1920 that was not present in 1850? (Hint: it is used for long trips.) ____________________________

____________________________________________________________________

What kind of energy powered this object? ____________________________________________________________

____________________________________________________________________

What changes took place in the neighborhood of High Bridge between 1850 and 1920, and between 1920 and 2008? ____________________________________________________________

____________________________________________________________________
Courtesy of the Museum of the City of New York.

Photo by Stephen Weinstein.

Courtesy of the Museum of the City of New York.
YORK HILL, NEW CROTON, AND MURRAY HILL RESERVOIRS

Below is a drawing of York Hill Reservoir (the square structure). Behind it is the New Croton Reservoir, an additional reservoir built in 1862.

The York Hill Reservoir was completed in 1842. Why do you think the city would have added a new reservoir in 1862? (Hint: see Lesson 5.)

The York Hill Reservoir held 180 million gallons of water. It reached from 79th Street to 86th Street between 6th and 7th Avenues and was located where Central Park is now. Today, the park's Great Lawn is where the reservoir used to be. The 1862 reservoir is still there in Central Park between 86th and 96th Streets, but it is no longer part of our water system.
A third reservoir, the Murray Hill, reached from 40th Street to 42nd Street between 5th and 6th Avenues. It held 24 million gallons of water. Above is a drawing of what it looked like in 1850. It was located where Bryant Park and the New York Public Library are now.

Compare the scene above with the modern photo of this area today.

List three things that are different.

1. __________________________________________
2. __________________________________________
3. __________________________________________

Does anything look the same to you? If so, what? ________

__________________________________________

__________________________________________

__________________________________________
The population of New York City continued to grow after the Croton Aqueduct was built. (See chart on page 28 in Lesson 5.) The Consolidation of 1898, which created the Greater City of New York, increased the city’s population by nearly 1.4 million people. By the early 1900s the city had to start building even more dams, aqueducts, and reservoirs to supply water to the great number of people living in New York. But even with more water, fires could still be a problem. Spraying would only put out flames if the water coming through the fire hoses had enough force, or pressure. By 1904, the Fire Department had come to realize that it needed a better water-supply system to successfully fight Coney Island’s frequent fires. But in 1911, Brooklyn’s firemen still did not have enough water pressure at their command to put out a blaze that burned down part of Coney Island.

In the late 1800s and early 1900s, Coney Island had three different amusement parks: Luna Park, Steeplechase Park, and Dreamland Park, each with its own rides, attractions, and shows. One of the attractions at Dreamland Park was called Hell Gate, which was like a haunted house tour. But instead of going through a creepy house, visitors to Hell Gate took a scary tour through a place created to look like Hell. At about 1:30 am on May 27, 1911, workers were boiling tar to fix the roof of the Hell Gate attraction to have it ready for the next day. People believe that the burning tar set the building’s woodwork on fire. The workers tried to put out the fire themselves but could not. Before long, every firehouse in Brooklyn had been called for help. As the fire raged out of control, panic spread through the surrounding neighborhood. Wild animals from Dreamland’s live-animal act, including lions and elephants, ran through the streets in terror. Although the owners tried to get the animals into cages to save them, many died from the fire. Other animals had to be killed so that they would not endanger people as they fled the area.

The seriousness of a fire is judged by the number of alarms sent out. The higher the number, the more firemen and equipment that are needed to put out the blaze. The Deputy Fire Chief in charge of Brooklyn ordered the signal two-nines to be given. Never before had there been a nine-alarm fire in Brooklyn. It brought nearly every piece of fire equipment in Brooklyn to Coney Island.
The article below describes what happened on May 27, 1911.

FIRE ENGULFS DREAMLAND

The Start of the Blaze.
How the fire started was not established yesterday, but it is known that in the Hell Gate show in Dreamland men were working all Friday night with boiling tar to get it in order for the crowd expected yesterday. At 1:30 A.M., half an hour before the first alarm was turned in, a man went to the drug store of Albert Chambers on Surf Avenue and asked that

Englestein and his mates, however, did not turn in an alarm immediately. They tried to put out the blaze themselves, and in this way, the firemen said afterward, lost valuable minutes.

Meanwhile Lallis and Policeman Fred Snyder had run through the park awakening the 100 or so employees who slept there. Many of them were waiters employed in the Considine restaurant on Dreamland Pier, and they were able to escape without much difficulty, but lost everything but the clothes in which they stood.

The firemen soon found that they were hampered by an entirely insufficient water supply. On the first alarm all three of the Coney Island companies under Battalion Chief William H. Rogers had responded and had run two lines of hose from the side entrance of Dreamland to Hell Gate. But they could barely throw water as high as the first floor of an ordinary house.

From The New York Times May 28, 1911.

What mistake did Mr. Englestein and his co-workers make?

After the fire started, what did Mr. Lallis and Policeman Fred Snyder do?

How high were the firemen able to throw water with their hoses?

Why were the firemen unable to put out the flames?
As they watched the fire destroy Dreamland, Brooklyn's firemen were unable to do much to control it. They found that the water in the hoses was not strong enough to put out the flames. Some said this happened because too many people were using the water to wet nearby buildings so the fire would not spread. If the water was being used this way at the same time firemen were trying to fight the fire, there would not have been enough water pressure for a strong flow into the fire hoses. Eventually, the fire burned itself out. Dreamland was completely destroyed.
The table below gives information on all the major fires in New York City in 1911. (Note that Staten Island is called Richmond in the table.) The number of alarms shows how serious each fire was—the higher the number, the worse the fire. The last column of the table shows the value of the property that was lost in each fire. Property includes buildings and all other material goods. These numbers do not show loss of lives.

**NEW YORK CITY’S MAJOR FIRES, 1911**

Manhattan, The Bronx and Richmond.

<table>
<thead>
<tr>
<th>Date</th>
<th>Street</th>
<th>Alarms</th>
<th>Class of Building</th>
<th>Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan. 6</td>
<td>69-71 Wooster st.</td>
<td>3d</td>
<td>Business building</td>
<td>$380,000</td>
</tr>
<tr>
<td>Jan. 10</td>
<td>176-178 Grand st.</td>
<td>2d</td>
<td>Business building</td>
<td>110,000</td>
</tr>
<tr>
<td>Jan. 11</td>
<td>108-110 Duane st.</td>
<td>2d</td>
<td>Business building</td>
<td>130,000</td>
</tr>
<tr>
<td>Mar. 24</td>
<td>37-41 E. 18th st.</td>
<td>1st</td>
<td>Business building</td>
<td>80,000</td>
</tr>
<tr>
<td>Mar. 25</td>
<td>23-29 Washington pl</td>
<td>4th</td>
<td>Business building</td>
<td>290,000</td>
</tr>
<tr>
<td>Apr. 14</td>
<td>Polo Grounds</td>
<td>2d</td>
<td>Hall field</td>
<td>200,000</td>
</tr>
<tr>
<td>Apr. 18</td>
<td>Harlem River</td>
<td>3d</td>
<td>Boat houses</td>
<td>115,000</td>
</tr>
<tr>
<td>May 24</td>
<td>305-307 W. 115th st.</td>
<td>3d</td>
<td>Business building</td>
<td>94,500</td>
</tr>
<tr>
<td>June 5</td>
<td>613-615 E. 24th st.</td>
<td>3d</td>
<td>Business building</td>
<td>164,450</td>
</tr>
<tr>
<td>June 16</td>
<td>613-625 W. 54th st.</td>
<td>4th</td>
<td>Business building</td>
<td>165,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>$1,728,950</strong></td>
</tr>
</tbody>
</table>

Brooklyn and Queens.

<table>
<thead>
<tr>
<th>Date</th>
<th>Street</th>
<th>Alarms</th>
<th>Class of Building</th>
<th>Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan. 21</td>
<td>86 Meeker ave.</td>
<td>3d</td>
<td>Glass factory</td>
<td>$71,655</td>
</tr>
<tr>
<td>Jan. 26</td>
<td>34-49 Stockton st.</td>
<td>3d</td>
<td>Fur factory</td>
<td>101,020</td>
</tr>
<tr>
<td>Jan. 28</td>
<td>69-85 Union st.</td>
<td>3d</td>
<td>Wall paper factory</td>
<td>147,075</td>
</tr>
<tr>
<td>Feb. 8</td>
<td>30-32 St. Felix st.</td>
<td>4th</td>
<td>Chocolate and cocoa factory</td>
<td>130,000</td>
</tr>
<tr>
<td>Apr. 28</td>
<td>23-41 John st.</td>
<td>4th</td>
<td>Sugar refinery</td>
<td>281,250</td>
</tr>
<tr>
<td>May 27</td>
<td>Coney Island</td>
<td>4th and Sim. call. Dreamland</td>
<td>Park</td>
<td>1,627,555</td>
</tr>
<tr>
<td>July 10</td>
<td>200-2 VanBrunt st.</td>
<td>4th</td>
<td>Cork factory</td>
<td>89,550</td>
</tr>
<tr>
<td>July 19</td>
<td>26 Flatbush ave.</td>
<td>4th</td>
<td>Furniture building</td>
<td>136,650</td>
</tr>
<tr>
<td>Dec. 22</td>
<td>424 N. 11th st.</td>
<td>4th</td>
<td>Book manufactory</td>
<td>492,000</td>
</tr>
<tr>
<td><strong>Total, Brooklyn and Queens</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>$3,076,765</strong></td>
</tr>
<tr>
<td><strong>Total, Manhattan, The Bronx and Richmond</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>$1,728,950</strong></td>
</tr>
<tr>
<td><strong>Grand Total</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>$4,805,715</strong></td>
</tr>
</tbody>
</table>

From the Fire Department City of New York Annual Report, 1911. Courtesy of City Hall Library, City of New York.

One dollar in 1911 is worth $92 in 2008, according to the United States Bureau of Labor Statistics.

In which fire was the most property lost? ________________________________

Compare the Coney Island fire with other fires in Brooklyn and Queens. How many dollars’ worth of property was lost in those boroughs? ________________________________

How much of that amount was lost in the Coney Island fire? ________________

How many dollars’ worth of property was lost in all five boroughs? ________________
More Water For the Growing City

Bringing Water From the Mountains

The city continued to grow after the Croton water system was built—and the availability of pure Croton water allowed and encouraged this growth. The chart below shows the population of New York City from 1840 to 1894. The last column shows how many gallons of water were used by New Yorkers in each year.

THE DEPARTMENT OF PUBLIC WORKS.

The city's water-supply remained in a critical condition until the New Croton Aqueduct was brought into service in 1890 and increased the head of water twenty to twenty-five feet.

The following table shows the increase in the consumption of water from 1842, when it was first introduced, to 1895:

<table>
<thead>
<tr>
<th>Date</th>
<th>Population</th>
<th>Average Daily Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>1840</td>
<td>312,710</td>
<td>12,000,000</td>
</tr>
<tr>
<td>1842</td>
<td>515,547</td>
<td>40,000,000</td>
</tr>
<tr>
<td>1855</td>
<td>805,658</td>
<td></td>
</tr>
<tr>
<td>1860</td>
<td>805,658</td>
<td></td>
</tr>
<tr>
<td>1865</td>
<td>805,658</td>
<td></td>
</tr>
<tr>
<td>1870</td>
<td>942,292</td>
<td>77,000,000</td>
</tr>
<tr>
<td>1875</td>
<td>942,292</td>
<td>95,000,000</td>
</tr>
<tr>
<td>1880</td>
<td>1,206,299</td>
<td>92,000,000</td>
</tr>
<tr>
<td>1885</td>
<td>1,206,299</td>
<td>100,000,000</td>
</tr>
<tr>
<td>1890</td>
<td>1,515,301</td>
<td>145,000,000</td>
</tr>
<tr>
<td>1894</td>
<td>1,515,301</td>
<td>183,000,000</td>
</tr>
</tbody>
</table>

From the New York City Commission on Additional Water Supply, November 30, 1903. Courtesy of City Hall Library, City of New York.

How many more people were living in New York in 1860 than in 1840? ________________________________

How many more were living in New York in 1890 than in 1840? ________________________________

Of the numbers shown, during which year was the city’s population greatest? ________________________________

How much more water did New Yorkers use in 1850 than in 1842? ________________________________

How much more in 1894 than in 1842? ________________________________

What does this chart tell you about the number of people living in New York in the 1800s and how much water they used? ________________________________
By the 1880s, the Croton Aqueduct was no longer large enough to serve all the city’s needs. In 1885, the Aqueduct Commission of the City of New York ordered a larger system to be built—the New Croton Aqueduct. The New Croton Aqueduct, which opened in 1890, supplied three times as much water as the Old Croton Aqueduct did. Today it supplies about one-tenth of the city’s water.

By this time, more Italian than Irish immigrants were coming to America. As the newest immigrants, the Italians were easier to exploit. Bosses took advantage of low-skilled newcomers who didn’t speak English and paid them less money. As a result, Italians largely replaced Irish laborers at construction sites in New York. Because most of those working on the New Croton Aqueduct were Italian, signs in and around the construction area were usually put up in Italian and English. Below are two signs that say the same thing in both languages.

**KEEP OUR WATER SHEED CLEAN**

**NOTICE**

Extract from the Rules and Regulations of the State Board of Health for the Sanitary Protection of the Croton Water Shed.

***No clothes or unclean objects of any kind shall be washed in any lake, pond or reservoir, or in any spring, stream or water-course tributary thereto.***

Neither shall any person swim, bathe or wash in any of said lakes, ponds or reservoirs, or in any stream tributary thereto.

A penalty of not less than fifty nor more than one hundred dollars is hereby imposed upon any person guilty of violating the above rules.

See Section 2 of Chapter 543. Laws 1885.

---

**AVVISO !**

Estratto dalle leggi e regolamenti dell’Ufficio d’Igiene per la Inspezione Salutari (or Sanitaria) del bacino acquatico di Croton.

***È proibito rigorosamente di lavare panni vestimenti e qualsiasi altri oggetti in lago, laghetti, sorgenti, ruscelli o corsi d’acqua tributari (or alimentanti) del lago.***

Nel suddetto posto, è pure proibito rigorosamente bagno, lavarsi, o miscela. Una multa non minore di 50 dollari ed estensibile fino a 100 sarà imposta ai trasgressori di queste leggi.

---

In what year were these signs posted? ________________________

What does the word “Avviso” mean in English? ________________________

According to the sign, what were people forbidden to do? *(Hint: Cholera Lesson)* ________________________

Why do you think they were forbidden from doing this? *(Hint: go back to what you learned in Lesson 1.)* ________________________

How much did those who broke the rules have to pay? ________________________

In 1880, laborers made about $1.43 a day. In 1890, they made $1.56. Do you think the fine for breaking the rules was fair? Why or why not? ________________________
NEW YORK'S POPULATION BOOM

By the beginning of the 1900s, New York City's population had grown tremendously. Immigrants from Southern and Eastern Europe had left their homelands and were coming to America in great numbers. Some, like the Italians, came for better opportunities to make a living. Others, like the Jews, were also fleeing persecution in their own countries. Many of these immigrants settled in New York. The record for the number of immigrants was set in 1907, when 1,004,000 stepped ashore on Ellis Island. April 17 of that year, when 11,747 people landed, set the all-time record for a single day.

Before 1898, New York City was made up of Manhattan and part of the Bronx. Brooklyn was a separate city which shared the present Borough of Brooklyn with many smaller towns, while Queens and Staten Island were home to farms and fields as well as villages and towns. In 1898, these five counties joined together to form the city we know today. This union was called Consolidation. After Consolidation, the city’s population became even greater because everyone living in Brooklyn, Queens, and Staten Island was now a resident of New York City. By 1900, the city’s population was 3,437,202. By 1910, it had risen by nearly a third to 4,766,883.

With so many more people living in New York, the city needed even a greater supply of water than it was getting from the New Croton Aqueduct. In 1905, the State legislature gave its permission to bring water from upstate to New York City. This meant building new dams, aqueducts, and reservoirs to channel water all the way from the Catskill Mountains. The main reservoir would be built at Ashokan. This new aqueduct system would cost the city $182,000,000.

But what about the people who lived in the places where the water system was to be built? The people and their towns had to go. Some of the towns upstate were moved. The houses and stores were lifted up by horses and man-power and brought to new locations. Other towns were burnt and then flooded after their inhabitants had moved away. Reservoirs were built right over them so that these towns are now under water. Residents were paid for the buildings they lost.

Many of the townspeople were outraged that their towns were being destroyed so that New York City could have a water supply. Many lost businesses as well as homes. Families were uprooted and whole communities disrupted. But city and state officials said it was necessary for some people to move so that many more people in the city could get the water they needed. Hundreds of people brought their complaints to court. Even those people who were not forced to move had problems. Laura Every was one such person.

Laura Every lived in Olive, New York, and ran a laundry business. At that time in upstate New York there were not many hotels. Guests, called boarders, stayed in the homes of local farmers. Laura did laundry for these boarders. In 1912, Laura went to court. She claimed that she lost $1,000 worth of business when the Ashokan Reservoir was being built. Laura wanted the court to order New York City to pay her for her loss. On the next page is part of the testimony she gave to explain her problem.
ASHOKAN RESERVOIR CLAIMS TESTIMONY

Q About how many customers did you have in 1904?
A I had from six to eight customers.

Q Did you go out to do your washing or did you do it at your house?
A I done some at my house, that I went after and carried there, and sometimes I went out.

Q How were you paid for this washing?
A A dollar a dozen.

Q Can you tell this Commission in the years 1904 and 1905 how much you took in a week during the summer season for this washing?
A Six to eight dollars.

Q During the winter did you continue to do washing?
A I made three to four dollars.

Q About how long did the summer season last?
A Four or five months.

Q The summer season?
A Between three and four.

Q Tell us what happened to your business in the years 1909?
A Those boarders left.

Q Why did they leave?
A Because the water works drove them out.

Q And you lost that custom [business], did you?
A I lost that custom; I didn’t have any more to do.

Q And were you able to get any more customers in their place?
A No, I was not able.

Q And did you try to?
A Yes, I tried to.

Ashokan Reservoir Transcripts, courtesy of the Ulster County Clerk’s Office, Kingston, New York.

West Shokan, New York ca. 1906, one of the towns that had to be moved to build the Ashokan Reservoir. Courtesy of the Town of Olive, New York Archives.
Describe Laura's problem in your own words. ________________________________

Why do you think the boarders left the area when the Ashokan Reservoir was being built? ____________

In the end, the judge did not agree that Laura deserved to be paid for her loss, so she did not receive any money.

The building of the Catskill water system was a major event. It was so important that songs were written about it. Below are the lyrics to part of a tune found in a booklet called, “Reservoir Songs.” It tells what it was like for some of the water system’s engineers to live in the homes of local farmers and their wives.

List three complaints the engineers have.

1. ________________________________
2. ________________________________
3. ________________________________

Do the engineers feel they are being cheated? How do you know? ________________________________

Do we write songs like this today to commemorate a special building or project? ________________________________

In your opinion, what does this tell you about the times in which this song was written? ________________________________

Song lyrics are like poetry. They express feelings. Also like some poetry, song lyrics often use rhymes. Imagine you are asked to leave your home so that the city can destroy it to build a new highway. Write a four-line poem about how you would feel about this.

"In Ulster County."

Aim: “Over the Banister.”

In Ulster County there dwells a race,
Of landladies fat and beguiling,
And scarcely an engineer dares to face
Their devilish grub and grinning.
The meat burns down to the pot below,
Nobody sees it spoiling,
The coffee causes us looks of woe,
When served up in the morning.

The eggs are purchased by the case,
The yolk is yolk and the white is white,
We cannot get used to their taste,
Even after a half hour's boiling,
The ham is taken from skinny hogs,
Nobody sees one fattening,
Rooting away in the rocky fields,
Half way up the mountain.

The bread is soggy and never sweet,
It's always spoiled in the baking,
While the pie is hardly fit to eat.
And the cookies not worth making.
But for this we pay one dollar a day,
Every one saw us coming,
And every night we hope you'll pray
That we may live till morning.

Courtesy of the Town of Olive,
New York Archives.

These words can be found in the glossary on page 48.

beguiling
scarcely
grub
WORKERS’ CAMPS

While the towns of the Catskills were being moved or burned and flooded, other towns, or camps, were being built for the laborers who would build the new water system. Most of the workers who built the new system were Italian immigrants. There were also Irish immigrants and African Americans from the South.

AFRICAN AMERICAN MULE DRIVERS: BUILDING THE CATSKILL WATER SYSTEM. EXACT LOCATION UNKNOWN, CA. 1910. Many African American men, like the mule drivers shown here, came up from the South to build the Catskill water system. Mules were used as work animals and these men were often expert at handling them. Courtesy of the Town of Olive, New York Archives.

The article below tells about Brown's Station, a town built for the men who worked on the Ashokan Dam and their families. At the time the article was written, Brown's Station had not been completed.

**MODEL TOWN**

**MODEL CAMP BUILT AT ASHOKAN DAM**

*With Schoolhouse, Hospital, Water Supply, Gardens, and Cottages for the Married.*

Brown's Station, the centre of activity, is a tiny town at which only the local trains of the Ulster & Delaware Railroad stop. Here it is that a town of over 3,000 diggers, carriers, foremen, and engineers has sprung up in a few months, like the mushroom cities of Oklahoma and the West. So rapid has the expansion been that the story is told of a foreman who almost got lost on his way home. He came to the familiar corner where he stood a house. There he saw two houses. The foreman rubbed his eyes and stood there until the carpenter came along and asked him what he thought of the new house they had put up that afternoon.

Before the reservoir is finished the camp will have a population of 6,000 laborers. Not only is this a very busy place, but it is also a model camp.

List three kinds of buildings found in the town.

1. ________________
2. ________________
3. ________________

How many workers lived in Brown's Station at the time the article was written? ________________

When the article was written, how long had the town been lived in? ________________

Why did the foreman think he was seeing double? ________________

How many people were expected to live in the town after it was completed? ________________


**WORKER HOUSING.** Worker town at Kensico Reservoir, 1910.

WATER WORD SEARCH

The word search puzzle below has words that appear in this lesson. See how many you can find. (Answers are on the inside back cover.)

ASHOKAN  CATSKILLS  CROTON
TESTIMONY  RESERVOIR  DAM
CONSOLIDATION  AQUEDUCT  IMMIGRANTS

O S O T O C I M E E C G Q M K
D Q S T C I D L D O I M N A C
R T D O A U O A E R M N O T O
T U I T S G D E M M M M E L K I
S M T S N L C E T L I O A L I
R T E E A A L M U O G E O T I
O I S O R E T I L Q R S C C O
C S T T T A E M K I A N R T N
N O I T A D I L O S N O C S C
A G M I A E T V H N T C O O K
M O O M E O R O L O S A I N A
A T N C I E K T N O A M C T I
A R Y T S A A O S I R T D A C
S E T E N R N R D E R T M A O
M N R C R I I R L L I N I S L
In the late 1800s most people did not have the luxury of having bathtubs in their homes. Most of New York City’s working class lived in tenements, where several families had to share a toilet in a tiny room in the hallway or use an outhouse in the building’s yard. In 1897, only one-third of the city’s tenements had running water and only 306 of the 255,033 persons living on the Lower East Side, where many of the tenements were located, had bathrooms in their apartments.

To encourage people to bathe more often, the city opened public bath houses. These places allowed all New Yorkers the chance to bathe for free. They were located in parts of the city where tenements were located so that the residents could wash.

New York’s first free public bathhouses were opened in June, 1870. The bathhouses were built on the river and so were known as “floating baths.” They were made of wood and included changing rooms and decks in addition to the actual baths. These large structures were held up by pontoons, or floats, right on the river. The bath in each bathhouse was a large pool in the middle of the structure. This pool was made of slats, or wide strips of wood. The slats were close enough together so that the bathers would not fall into the river, but far enough apart so that the river water could flow through.

Public baths were used by both males and females. Women and girls used the baths on different days of the week than men and boys. Women and girls wore bathing suits that had legs and skirts. Men bathed naked. There was usually a twenty-minute time limit for bathing because the baths were meant for washing and not for recreation.

Floating baths were not a new idea in 1870. In 1817, the city had two private floating baths. By 1830, these private baths had become fashionable, but visitors had to pay a fee, so they were used only by those who could afford them. Public floating baths gave all New Yorkers the chance to bathe, swim, and cool off in hot weather.

Fill in the words to complete the sentences on the next page. Write down the letters that are in the circles. Then unscramble the circled letters to discover the words that complete the caption to the drawing.
1. In the late 1800s, most people did not have _ _ _ _ _ _ in their homes. (htash)

2. _ _ _ _ _ _ class families lived in tenements. (krowgin)

3. At public baths, New Yorkers could bathe for _ _ _ _ . (efer)

4. Bath houses were _ _ _ _ _ _ on the river. (uitlb)

5. The city's first free public baths were opened in _ _ _ _ , 1870. (njeu)

6. The bath houses were held up by _ _ _ _ _ _ _ _ . (nsootnop)

7. The bath was a large pool made of _ _ _ _ _ _ _ . (lstas)

8. The baths were meant for washing, not _ _ _ _ _ _ _ _ . (cracernoti)

(Answers are on the inside back cover.)

A law called the Tenement House Law of 1901 required that all new tenements be built with private toilets in the apartments. Many builders also included private bathtubs in addition to the toilets. Because of this, the use of public baths fell dramatically by 1910. In 1887, only about 23% of city homes had bathtubs, but by the mid-1910s about 50% had them.

In 1915, the Department of Health closed the floating baths because the river water became polluted. The baths were later re-opened, but the city closed the slats so that there was no longer river water flowing in. Instead, water was pumped in using the new Catskill water system and the baths became floating pools for swimming.
Public swimming pools soon became popular in other American cities and in European cities. In 1936, Robert Moses, Commissioner of the Parks Department, under Mayor Fiorello H. La Guardia, opened eleven new swimming pools for the enjoyment of all New Yorkers. The largest and grandest of these was the Olympic-sized pool at Astoria Park in Queens. Astoria Pool was built to hold 3,000 people. On the pool’s opening day, July 4, 1936, the finals of the Olympic swim tryouts were held there. They were held a second time at Astoria Pool in 1964.

The photos below show visitors in 1939 at the Betsy Head Pool in Brownsville, Brooklyn.

BETSY HEAD SWIMMING POOL, BROWNSVILLE, BROOKLYN, 1939.
All photos: The Library of Congress, Prints and Photographs Division, Gottscho-Schleisner Collection.

Have you ever gone swimming in a public pool? If so, describe the experience. If not, imagine you are one of the boys or girls waiting in line and this is the first time you are visiting a public pool. Describe your experience. Did you enjoy it? Did you like the other kids you met there? What did it feel like to swim in a pool so large with so many other people?
LESSON 7

A COLLOSSAL SYSTEM
WATER FOR THE FUTURE

In 2008, New York City's water comes from three different places, each with its own system of dams, reservoirs, and aqueducts. You have already learned about the Croton system in Lesson 3 and the Catskill system in Lesson 5. In 1967, the city completed a third system, called the Delaware system, located 125 miles northwest of New York City.

The reservoirs and lakes in the three systems hold a combined total of about 580 billion gallons of water for drinking, cooking, washing, putting out fires, and playing in. Two chemicals are added to the water: chlorine to kill bacteria and fluoride to keep our teeth from decaying. Almost all the water—about ninety-five percent of it—flows to the city over aqueducts and through tunnels by gravity alone. Only about five percent has to be pumped to where it is going.

Once the water reaches the city, it is distributed through a network of over 6,000 miles of water mains. These mains supply the water that goes into our pipes and flows out of our faucets. The water pressure within these pipes is strong enough to push water up from below the ground to a height of six stories. Buildings taller than six stories require a pump that pushes the water up to a rooftop water tower, which acts as a little water reservoir storing the building's water. When you turn on your faucet, gravity pushes water from the water tower down through your building's pipes and into your sink.

The map opposite shows where the city’s water tunnels are located.

The Croton Aqueduct is located in which direction from the Delaware Aqueduct?

*Circle one:* NORTH SOUTH EAST WEST

The Kensico Reservoir is located in which county? ____________________________________________

In which borough is the Jerome Park Reservoir located? ______________________________________

The Hillview Reservoir is

*Circle one:* NORTH SOUTH EAST WEST NORTHEAST SOUTHWEST

of the Jerome Park Reservoir.
The Richmond Tunnel sends water from ______________________ to ____________________.

City Tunnel No. 1 hooks up with City Tunnel No. 2 in which borough? ______________________

Which river does City Tunnel No. 2 cross? ___________________________________________
TUNNEL NO. 3

City Tunnel No. 3 is shown on the map as a dotted line because it has not been completed. It is expected to be finished in 2020, cost an estimated six billion dollars, and span sixty miles. Tunnel No. 3 will be an important addition to the city's water system. Right now, all of the city's water is flowing through the two tunnels that were built in the 1800s and early 1900s. We know that water is being lost from the Delaware Aqueduct tunnel, a water tunnel that supplies nearly one-half of New York City's drinking water. Two leaks in this tunnel lose between 14 and 36 million gallons of water a day. These leaks need to be repaired so that the tunnels can continue to provide a reliable source of water to the city.

But the city cannot stop the flow of water in these tunnels to check them because if it did, the city's water supply would be so extremely reduced that many homes and businesses would be without water, and there would not be enough to take care of fires and other emergencies. When Tunnel 3 is complete, the city's water can be redirected into it and the two older tunnels can be closed, checked, and when leaks are found, repaired. Afterwards, some of the water can be directed back into the first two tunnels. New York will then have three water tunnels.

Depending on where we are walking on the sidewalks of New York at any given time, workers may be building the third tunnel 800 feet below us. Like those who created our water system in the 1800s and 1900s, the builders of Tunnel 3 have a hazardous job. They sometimes work with dynamite to blast through rock and earth, although today much of the digging is done using a special boring machine. No sunlight reaches them—the darkness is lit only by electric lights. These workers are called sandhogs. (The name was first used in the 1870s to describe the men who worked on the Brooklyn Bridge. Working in water-proof boxes set on the bottom of the East River, these men dug into the soft river bottom so that the foundations for the heavy towers that support the bridge could be built there.) Sandhogs are members of a close-knit community. People who become sandhogs tend to come from families where a parent was a sandhog and often a grandparent as well.

SANDHOGS OF NEW YORK,
OUTSIDE ENTRANCE TO TUNNEL
From the collection of Diane Galusha.
Below is an excerpt, or part, of a novel about sandhogs. The story takes place in the early 1900s, when the Catskill water system was being built (see Lesson 5). Even though it is fiction, this novel gives a true picture of a sandhog’s life and work during that time.

Morrison was shown to a bunk in a hut that slept sixty, including a thin Italian in the next bunk who wore a heavy jacket in bed. The Italian tried to sit up, gasped for air, was exhausted by the effort, and fell back. Morrison was summoned outside, where he boarded a wagon that took him to the shaft and the fourteen-hundred-foot ride down to the tunnel, which most of those working it referred to as “the mine.” His first job was to help a man from County Kerry who drilled holes in the rock face. The holes were then stuck with dynamite and the rock face blown up. After the first explosion, Johnny’s head became heavy from the nitroglycerin fumes hanging in the air.


Why do you think the Italian sandhog in the story had such a hard time breathing? ________________

__________________________________________________________________________________________

What did the sandhogs call the shaft that led down to the tunnel? ________________________________

__________________________________________________________________________________________

Why do you think they called it that? ___________________________________________________________

__________________________________________________________________________________________

The dynamite the men used to blow up the rock gave off fumes, or a smell. This smell was caused by a chemical in the dynamite called nitroglycerine. Johnny’s head “become heavy” from this smell. What do you think this means? ________________

__________________________________________________________________________________________

What words would you use to describe the work of a sandhog in the early 1900s? ________________

__________________________________________________________________________________________

Sandhogs today face many of the same challenges and dangers as those who worked on the Catskill water system. One improvement, however, is the use of the boring machine, nicknamed “the mole.” The mole uses steel cutters to chip off rock and is twice as fast as drilling and blasting. After the rock is chipped, it moves through the machine on a **conveyer belt**, is loaded into rail cars and moved to the head of the shaft that leads down into the earth. There it is sifted, crushed, and lifted up to the surface using another conveyor belt.
On April 24, 2005, Lesley Stahl, from the television show “60 Minutes,” visited Tunnel 3 and talked with the sandhogs. Below is part of the narration from the 60 Minutes show. (Interview courtesy of CBS News Archives, 60 Minutes.)

**LESLEY STAHL** These days the work never stops. At dawn, when the **graveyard shift** heads out, the day shift is reporting for work.

The miners building Tunnel No. 3, and all tunnels in New York, call themselves “sandhogs.” They start and end their workday in a place called the “hoghouse,” where they can grab a bite, change clothes, and clean up at the end of their shift.

Every sandhog is a **jack of all trades:** They’re all carpenters, mechanics, electricians, and, of course, miners.

In the tunnel, the work can be **claustrophobic,** dusty and so noisy that a lot of the men have hearing loss. They’re supposed to wear earplugs, but often they don’t. Thousands of sandhogs have worked on Tunnel No. 3. Most are either Irish American or from the West Indies. It’s been that way for generations.

**LESLEY STAHL** “Do most sandhogs come in through their families?”

**IRISH AMERICAN** “Pretty much all the sandhogs down here have their father in the business or something like that,” says one miner, whose father and grandfather were sandhogs.

**WEST INDIAN** “I got a brother here, too.”

**LESLEY STAHL,** looking at another West Indian who is sitting next to him “And you, too?”

**WEST INDIAN** “I got a father.”

**IRISH AMERICAN** “Brother and Father. That’s my brother right there. Me and him are fourth generation.”

**LESLEY STAHL** “Fourth generation! And did your father want you down here?”

**IRISH AMERICAN** “None of their fathers wanted their sons in it. My old man never wanted me in it.”

**LESLEY STAHL** “But he brought you in it?”

**IRISH AMERICAN** “But once it gets you, once it gets in your blood, there’s no other job like it.”

Most sandhogs are from two ethnic groups. What are they?

1. 

2. 

Why do you think fathers did not want their sons to become sandhogs? 

—

—

—

—

44  **LESSON 7**
Yet the sons became sandhogs anyway. According to one sandhog, why is that so?

Do you enjoy something that you would say is “in my blood”? Describe it.

While sandhogs are usually men, many women work to keep our water supply running safely and efficiently. Tina Johnstone (TJ) is the Director of Operations for the Bureau of Water Supply. Stephen Weinstein (SW), of the La Guardia and Wagner Archives, interviewed Ms. Johnstone in March 2008 at her job site in Valhalla, NY, near the Kensico Dam.

**SW** Currently you’re the Director of Operations of the Bureau of Water Supply. Can you describe what a typical day would be like for you?

**TJ** There is no such thing as a typical day... The main focus of the job obviously is to be able to get adequate and clean water to the City of New York and its outside communities that we supply. It ends up being about nine million consumers. Everyday we’re making decisions on how much water to take from which reservoirs and where to send it, depending on what the demand is that day. You want to keep the reservoirs balanced with each other, you want to have a balanced system, but you also want to make sure that you’re sending the cleanest water down to the city.

**SW** Do you supervise other women...?

**TJ** I do supervise other women, yes. There are other women engineers. Some are in charge of compliance, which means we have to make sure we are **abiding** by all of our safety rules and regulations... so there are engineers that make sure we are doing that. There are also engineers who are helping to run the system on a day-to-day basis. They are part of the chlorinating process and the fluoridating process, and they assist in deciding which flows we send from which reservoir to the city.

**SW** How many people do you supervise and how many of them are women?

**TJ** In the Directorate of Operations of the BWS, there are about 360 people. I would estimate that about 10% or maybe 30 are women.
SW Could you talk a little about the camaraderie among women engineers in the BWS?

TJ Sure, there are engineers, there are very few women engineers and ... we support each other, we are very proud of each other, ... and often we have questions and the first thing that we do is to get on the phone and call each other. It's challenging being a woman in the BWS much less a woman engineer and it's also extremely rewarding. I very rarely think of myself as a woman engineer; I think of myself as an engineer. You definitely have to work above normal standards at times, just because you are a woman. You want to make sure that you are getting the job done.

SW As a woman engineer and a person with high authority, have you ever had any particular problems working within the BWS?

TJ The one problem, the one issue that does come to mind is that when I first went up and accepted the job as section engineer for the Pepacton and Cannonsville Reservoirs I was 24-years old. I had 25 people working for me who were all men and were all older than me and they saw me come in and there was definitely an attitude there of "what does she know, what is she going to do." It took me a long time, it took me about a year to earn their respect and to get them to understand that I'm here to do a job and that I can do the job, and I did earn their respect and to this day there are still some of those folks working there, and I talk to them on a very regular basis and we have a lot of respect for each other.

SW I understand you recently took a tour of Tunnel No. 3?

TJ That was actually amazing and I was really lucky to be able to take part in that tour. We went into one of the shaft sites in Manhattan, it was a four-minute elevator ride and we went 600 feet underground, under the streets of Manhattan and the sandhogs were down there. ... It was like a little city down there, really. It was humongous, open with rock all around. Certain portions were already lined with concrete, so we were walking in a dry concrete tunnel. The tunnels are about 8 to 10 feet in diameter. Then it was another four-minute elevator ride back up. It was wet and damp—there is always ground water seeping in. The ground where you are walking, it is dark, though there are lights and electricity down there. It would be pitch black down there without the lights. It's always 52 degrees, so it's great to go down there in the winter and it's great to go down there in the summer.

SW The sandhogs have a tradition believing that a woman down in the tunnel brings bad luck. Did anything like this happen to you when you were down there?

TJ We had heard the stories from years ago that they didn't like women to be down there because they were superstitious and they thought it was bad luck and something bad might happen. But in recent years, that superstition has gone away and there have been many women taking tours down there.
But there are no female sandhogs today.

In her job, how many people does Tina Johnstone make sure get water every day? ______________________

List two jobs women engineers do.
1 ______________________
2 ______________________

What word would you use to describe how the women at Ms. Johnstone's job get along? ________________

What was the main problem Ms. Johnstone faced as a woman engineer? ____________________________

List two words Ms. Johnstone used to describe Tunnel No.3.
1 ______________________
2 ______________________

Why did men sandhogs not want to work with women sandhogs? ________________________________

Are there any women sandhogs today? ________________________________

**FINAL ESSAY**

Now that you've read the history of New York City's water supply system, why do you think water is so important to a large city like New York. Also, how does water play a part in the everyday lives of people who live in New York. Write your answer on a separate piece of paper.
GLOSSARY

abate  to put an end to
abiding  accepting; sticking to a decision
antebellum  period in the nineteenth century prior to the United States Civil War, before 1861
aqueduct  a tunnel built to carry water by gravity from one place to another, or a passageway on arches across a valley or river
beguiling  charming; able to fool someone
Board of Aldermen  New York City's legislative branch of government before the City Council
boring  drilling a hole
cannonade  continuous fire from cannon
circumstance  a situation; the facts of an event
claustrophobic  characterized by a fear of small and cramped spaces
commemorative  in remembrance of a special event or occasion
commissioners  officials in charge of a government department
comply  to act in agreement with another's wishes
congregated  gathered together
Consolidation  the forming of New York City into five boroughs in 1898
conveyor belt  part of a machine that carries objects forwards or backwards on a moving belt
countermanded  canceled; called off (in the case of a rule or law)
crackers  firecrackers
detachment  a group sent away from a larger, main group in order to perform a service
devastating  able to destroy almost completely
epidemic  the spread of disease among many persons or disease hosts, such as animals or insects, within an area or between areas in a certain period of time
facilitates  makes easier
feat  a deed that is out of the ordinary
foreman  the person in charge on a job site
graveyard shift  work hours that begin late at night and go through the early morning, when most people are asleep
grub  food
hazardous  dangerous
immense  extremely large
indigo  a blue dye made from plants
insufficient  not enough
intricacies  details
jack of all trades  a person who is skillful at many different kinds of jobs
jollification  a party or celebration
legislature  a part of government empowered to make, change, or end laws
masonry  the part of a structure built with stone or brick
obstructs  gets in the way of
outhouse  (or "privy") the type of toilet that was used before indoor (or any) plumbing came into use. It was a small building with one or more "toilet seats" that covered a deep hole in the ground.
persecution  to cause someone else to suffer, especially for religious or political reasons
pestilential  causing, or having the nature of, a deadly epidemic disease
prophecy  a prediction of future events
ravages  destroys
recollect  remember
recreation  fun; leisure activities
reservoir  a large man-made lake where a great amount of water is collected and stored to be piped to a city
scarcely  hardly; very limited
stereotype  an image of someone or some group that is based on popular opinion and not necessarily true
tenement  a building of minimal standards divided into apartments, especially in poor, crowded neighborhoods
testimony  a statement, either spoken or written, made under oath
The pictures on pages 2–3 are:

3. “Getting ready for supper at the newsboys’ lodging house.”
5. “Waterbug” ride at the New York World’s Fair, 1940.
6. Fire helmet, 1952. (Water is used to put out fires.)

Answer to Word Search, page 35:

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A B C D E F G H I J K L M N O
1 O S O T O C I M E E C G Q M K
2 D Q S T C I D L D O I M N A C
3 R T D O A U O A E R M N O T O
4 T U I T S G D E M M M E L K I
5 S M T S N L C E T L I O A L I
6 R T E E A A L M U O G E O T I
7 O I S O R E T I L Q R S C C O
8 C S T T T A E M K I A N R T N
9 N O I T A D I L O S N O C S C
10 A G M I A E T V H N T C O Q K
11 M O O M E O R O L O S A I N A
12 A T N C I E K T N O A M C T I
13 A R Y T S A A O S I R T D A C
14 S E T E N R N R D E R T M A O
15 M N R C R I I R L L I N I S L
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K8, SW Ashokan
K2, S immigrants
C5, S testimony
C15, ME reservoir
M12, NW Catskills
F9, SW dam
M9, W Consolidation
N7, NW Croton
K8, NW aqueduct

Answers to Word Scramble, page 37:

1. baths
2. Working
3. free
4. built
5. June
6. pontoons
7. slats
8. recreation

Caption Floating Bath