

Victory Against Nature: Chicago, Sewerage, and the Artificial River

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Submitted for his Advanced Project, May 5, 2006. Used with permission of the author. Annotations by Joseph Hemmerling, Research Assistant, and Michelle Navarre Cleary, Assistant Professor and Writing Coordinator, The School for New Learning, DePaul University.

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Commentaire : A table of contents, though not required, can be a useful service to your readers if your paper is long, giving them a quick reference guide to finding information in your paper.

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Preface

In 1998 John Waller, Assistant Commissioner of the Chicago Department of Sewers, contacted the Chicago Public Library about what might be done with boxes of photographs the Sewer Department had located in one of its warehouses, and previously

Commentaire : The preface of this paper tells “the story behind the story.” This includes the history of the project, how the author got involved, and the research methodologies employed in bringing it into being.

presumed to be lost. The photographs covered a number of sewer projects in Chicago between 1920 and 1960.

As part of the Library's Computer Services Department I was assigned by my supervisor, Director Joyce Latham, to digitize a selection of these images and find a way to display them on the Internet. For the project, I worked with Mr. Waller to select a representative collection of sewer photos. The problem was, in my mind, what to do with pictures of old sewers that might make them interesting enough for visitors to the Chicago Public Library's Web site, then only a few years old.

In researching the history of Chicago's sewers, I realized that the history of Chicago, originally a planned community envisioned as the terminus of the Illinois and Michigan Canal, had been defined by its epic struggle with sewage. Chicago built the nation's first comprehensive sewers system, and the second in the world after Hamburg, Germany. As such, the historic sewer photographs were placed in the context of an online "digital collection" and history which I titled *Down the Drain*.

The original digital collection or exhibit was also meant to be a "pilot project" or example for what a Public Library might produce as original content for publication on the Web.

Down the Drain was mentioned as a successful example of a digital collection by employees of the Library of Congress, several faculty members at MIT, and other public libraries in various publications. Robert D. Putnam, a Harvard Professor and Lewis Feldstein, President of New Hampshire Charitable Association mentioned *Down the Drain* in their 2003 book, *Better Together: Restoring the American Community*. Parts of *Down the Drain* were also used by PBS to produce its documentary *Chicago: City of the Century* for the *American Experience*. Most gratifying have been the many area high school students who have used *Down the Drain* as the basis of their annual Metro History Fair projects.

For this project I have returned to my interest in Chicago's historic infrastructure and have sought to expand and build on the earlier work. I have added a considerable amount of new text and additional material to the original *Down the Drain*. For this project, I have attempted to develop and explain the original material further, and done much new research. In an effort to make the material more concise, I have limited this present work to founding of the town of Chicago in 1833 to the construction of the Sanitary and Ship Canal, which opened in 1900.

Also included as part of this project are digitized historic images primarily from the Chicago Public Library's extensive special collections and photographic surveys made by myself in March, April, and May 2006. For the photographs I used a Canon digital camera, which I acquired for this project. Descriptions accompany the photographs. Some of these photos are included in the Web pages I have created for an attached CD, which accompanies this project [not attached to this version of the paper].

The photographs include a survey of several of the regions' important natural areas including the historic Chicago Portage and Illinois Beach State Park, which is substantially similar to Chicago as it was in its natural state prior to settlement in 1833. I believe these photographs help explain what the early residents of Chicago faced from their environment. I have also included photographs of the Chicago River, Sanitary and Ship Canal, and the Illinois and Michigan Canal.

The Illinois and Michigan Canal is particularly important to this story in that

Commentaire : The first paragraph wastes no time getting us into the meat of the preface. We learn the nature of the project under discussion, what organizations were involved, and when this all began.

Commentaire : The author sets up a problem that his project needs to solve. Then, the next paragraph reports on how his project solves this problem. For many papers, a problem-solution template like this can be a good way to set up your project.

Commentaire : This paragraph acts as a kind of mini-résumé, explaining to the readers the impact and significance of this project. In doing this, the author establishes his credibility and authority. Like this author, be sure to establish your expertise early in your paper when writing about your work.

Chicago was a planned community envisioned as the terminus for the Canal. Were it not for the construction of the old I & M Canal, the city simply would not be here. The Canal also played a prominent part in Chicago's attempt to defeat its sewage crisis. Between 1865 and 1871 the Canal was cut an additional 8.5 feet deeper in a failed attempt to drain the Chicago River of sewage and reverse its natural flow.

Today the City of Chicago, a world class city of over three million, and other regional public bodies, remain international leaders in the sewage treatment and infrastructure the City pioneered in its first seven decades. Its commitment to environmental protection in the 21st Century was born in its struggle with the environment and its crisis of sewage in the 19th Century.

As a final note on methodology, most of this paper was based on research conducted in April and May of 2006. All photographs in the photographic survey were taken by myself during the same period. For my research, I have found the Chicago Public Library's Special Collections and Preservation Department to be most valuable. DePaul University Libraries maintain an excellent Chicago collection. I-Share and interlibrary loan have been fast and efficient. Above all the DePaul University Electronic Library and Databases have been most invaluable.

Introduction

"When the fire swept over our city and laid it in ashes, the world said Chicago and its boasting are now gone forever. But Chicago said, we will rebuild this city better than ever, and Chicago has done it! Two years ago this two thousand acres covered by these palaces was the home of the muskrat. Look at it now!"

*Mayor Carter Henry Harrison
Address to America's Mayors
World's Columbian Exposition
October 28, 1893*

Beneath our feet lies a vast labyrinth of pipes and tunnels. These passageways, the sewer and water systems, are central to the health of the cities and towns of northeast Illinois. Today most Chicagoans, like residents of other urban areas, take the existence of the sewer system, and its related infrastructure the water system, for granted. Yet without these technologies the City of Chicago, or any major city as we know them today, would not and could not exist as habitable communities.

For most of the City's first seven decades the defining struggle for Chicago's continued existence was not the Great Fire of 1871, but its battle with sewage. In the process of that struggle streets were raised; channels were dug; an industrial empire launched; tunnels bored miles beneath Lake Michigan; and new technologies invented.

Early Chicago was anything but a "City in a Garden," Chicago's ironic civic slogan. Built in a bog, the sewage-choked city that Chicago's founding generation built was a paradise only for flies. Chicago, for most of its first seven decades was a terrible disease-ridden hellhole. Called "shock city" by 19th Century visitors for its unbridled capitalism, the most shocking thing about the place was probably its incredible filth.

Faced with environmental crisis, Chicago built the nation's first comprehensive sewer system and only the second in the world, after Hamburg, Germany. As the City

Commentaire : A quotation that opens a literary work is called an "epigraph." A good epigraph will pique the reader's interest and have a deep literal or metaphorical significance to the work it opens. The reference to Chicago as the "home of the muskrat" will appear several more times in this paper.

Commentaire : This is a superb, attention-grabbing opening line. Most people would be intrigued to think of Chicago's sewer system as a "vast labyrinth" sprawling beneath our feet. Don't be afraid to make creative use of language when it's appropriate to your subject.

Commentaire : A good way to get a reader's attention is to challenge a common belief as the author does here when he says that the sewage, rather than the Chicago Fire, was the city's defining struggle.

Commentaire : This transitional phrase allows the student to move smoothly from a description of Chicago's sewage problem to a discussion of how the city took steps to deal with it.

grew, Chicago extended its sewer system into the world's longest public municipal infrastructure, as it remains today. Chicago also dug a tunnel, then the world's longest, two miles under Lake Michigan in search of clean water. Chicago's sewer and water pipes beneath the streets, as much as the ribbons of pavement that made up the surface of its streets, defined the city's network pattern of growth, most of which occurred before 1900.

Commentaire : Notice the metaphor, "ribbons of pavement." Strong, vivid language improves the overall quality of any paper and makes for more interesting reading.

Virtually everything we recognize to be Chicago today was shaped by the filth and stench that plagued 19th Century Chicago. When customers to Potter Palmer's Lake Street store held handkerchiefs over their noses to hold back the nearby river's smell, Palmer moved to State Street, then just a small back street, to escape the miasmic air and created Chicago's most famous retail district. Chicago's current street grade is at least twelve feet higher than the natural ground level on which the town was first built.

Commentaire : This concrete, historical example offers evidence in favor of the point the student is trying to prove; namely that Chicago's struggle with sewage was crucial to the development of the city.

Chicago is not the only planned community to be built in a swamp. When Jean-Baptiste Le Moyne de Bienville chose a low rise on the bend on the Mississippi River to site the location of New Orleans in 1718, he chose the location for strategic reasons of access to trading routes and protection of the river, not its natural drainage. But where New Orleans tried to hold back nature, Chicago sought to overcome it. When Hurricane Katrina hit New Orleans in 2005, the "Crescent City" finally lost its struggle with the swamp.

When faced with a similar crisis to Chicago when explosive population growth overwhelmed the drainage of the Thames River in 1858, Parliament responded to the "Great Stink of London" by employing engineers to build that city's sewer system. Victorian England hailed the achievement as the "wonder of the world" long after Chicago had already done the same thing without benefit of a great national mandate. More importantly, where London and other cities had always enjoyed ample natural drainage, Chicago employed sewers to drain waste from a stagnant swamp.

Commentaire : By giving these two historical examples, New Orleans and London, the student offers a basis for comparison, making the uniqueness of Chicago's sewer system appear all the more remarkable.

A greater "wonder of the world" was the rise of municipal government, led by Chicago's example. Termed an "unheralded triumph" by historian Jon C. Teaford, city government rose from a village council to a professional urban bureaucracy with a large workforce, complex division of labor, and professional boards and commissions. Municipal services, like sewers and water, were brought under public management where they were planned and standardized. City services were paid for by local tax levies and financial devices like bond issues.

Commentaire : By repeating this phrase from the previous paragraph, the student knits these two paragraphs together while making his case for the exceptional characteristics of Chicago.

Perhaps the most astonishing "wonder" was the decision of northeastern Illinois' many competing communities to band together and form the first regional government authority in the United States with the power to tax and condemn property.

Between 1892 and 1900 Chicago and this regional body, the Sanitary District, took the astonishing step of reversing the Chicago River, making it the first river to flow *away* from its mouth. The feat was called one of the seven engineering marvels of the world, and up to that time it was the largest earth moving project in history. In 1922, the flow of a second river, the Calumet, would also be reversed.

Today Chicago's labyrinth of subterranean tunnels remains the most extensive municipal sewer system in the world and continues to grow. These many miles of sewers remove waste from a city that is 227 square miles. The system is coordinated with the vast municipal area and the Municipal Water Reclamation District, successor to the Sanitary District organized in 1889, is still the regional authority charged with

administering the vast regional systems that now include a massive intercepting system dug deep into bedrock along the Chicago River system called “deep tunnel.”

No longer the home of the muskrat, Chicago today is, and seems likely to remain, a world leader in the treatment of water and sewage that makes the modern city of over three million possible. Chicago’s broad avenues, boulevards, and civic plantings have turned the former bog and marsh into something more like the “city in a garden” that the City’s slogan promised in 1837 when the phrase was coined for the City crest.

I. City in a Swamp

Lying just a few miles to the west of Lake Michigan's shore is a natural sub-continental drainage divide which runs roughly along the path of modern Harlem Avenue. To the east, rivers drain through the Great Lakes and St. Lawrence River to the Atlantic Ocean. To the west of the divide, waters flow to the Mississippi River and the Gulf of Mexico. In its natural state, the south branch of the Chicago River originated at a marsh called Mud Lake east of this drainage divide. To the west were the DesPlaines and Illinois Rivers, the land between became known as the Chicago Portage. When water was high the distance between these two water systems was nearly nonexistent, allowing canoes to move unimpeded between the two water systems.

In July 1673, French-Canadian explorer Louis Jolliet and Father Jacques Marquette crossed the Chicago Portage on his return route from the Mississippi River. Marquette described the region as ideal, “We have seen nothing like this river that we enter, as regards its fertility of soil, its prairies and woods; its cattle, elk, deer, wildcats, buzzards, swans, ducks, parroquets, and even beaver. There are many small lakes and rivers. That on which we sailed was wide, deep and still, for 65 leagues. In the spring and during part of the summer there is only one portage of half a league.” Jolliet called the area “most beautiful and most suitable for settlements.” (Greenberg 1).

Above all, Jolliet was ecstatic about the portage. The explorer was quick to recognize its strategic value. Following his return to Canada, Jolliet reported to Comte de Frontenac, Governor of New France and Father Claude Gabron, his patrons at Quebec. Jolliet suggested that by cutting a canal through the “river of portage” and placing a fort and town to protect it, New France would be assured of controlling the vast interior of North America (Larson 5-6).

Jolliet and Marquette crossed the Chicago Portage when water levels were relatively high. At other times the portage could become a grueling quagmire. Chicago pioneer Gurden S. Hubbard led employees of the American Fur Company across the portage in 1818. For three grueling days the party waded through waist high muck, dragging their boats across Mud Lake “battling mosquitoes, leeches and other such black plagues” (Hubbard 207).

Most of Chicago lies on marshy soil only a few feet above the level of Lake Michigan. The area is called an ecotone, an area where sandy shoreline and a broad savannah mark the transition from hardwood forest to the east to tallgrass prairie to west. In the period before settlement wildfires frequently tore across the savannah stripping it of ground cover (Greenberg 2-3). Most of the area comprising present day Chicago was filled with flat expanses of sandy soil and shallow marshes.

Because of its swampy soil, Native Americans had no permanent settlements at the site of Chicago. Marquette, a Jesuit Priest, briefly visited the area a second time when he returned to convert the Kaskaskia Indians in 1674. His party camped briefly along the

Commentaire : References to Chicago as “home of the muskrat” and the “city in a garden” allude to statements made earlier in the paper and give the overall piece a greater sense of unity.

Commentaire : The transition “above all” signals a move from a general discussion of the aspects of Chicago’s geography that appealed to Jolliet to a focused description of one element that was singularly important to the explorer.

Commentaire : This is an example of a paraphrase. The student took information from an outside text and broke it down into his own words before putting it in his paper. When transmitting historical data, it is usually a good idea to paraphrase the text. Direct quotation should be reserved for particularly powerful passages, or those passages where the wording is crucial to its meaning. However, when paraphrasing, be sure to put any words or phrases taken from the source in quotation marks as the author does here for “river of portage.”

north bank of the South Branch of the Chicago River near present day Ashland Avenue. By 1699 the French missions ceased, though French Canadian trappers still came for furs. The canal and strategic town Jolliet envisioned were never constructed by the French.

Jean Baptist Point DuSable, the areas first permanent settler did establish a trading post in the 1779 at the mouth of the Chicago River. Born in Saint-Domingue (Haiti), DuSable was born of French and African ancestry. As a trapper and trader he established himself at Chicago. He was among the French speaking voyageurs that traded for furs with Native Americans and moved the furs on to Quebec. DuSable sold his post in 1800 following the American Revolution, when the area was transferred to control of the United States, and resettled in French speaking St. Charles, Missouri west of the Mississippi River.

Americans followed DuSable and the French Canadians, among them Gurden Staltenstall Hubbard who the Natives called "Swift Walker." Hubbard conducted travelers across the wilderness. John Kinzie, a brawling American settler given to hard drinking, acquired the former DuSable trading post. In 1803 the United States established Fort Dearborn at the strategic site on the south bank of the Chicago River across from Kinzie's post.

The United States saw the strategic possibilities of a canal at Chicago that Jolliet had envisioned in 1673. In 1795, the new nation signed the Treaty of Greenville and acquired a six square-mile parcel of land at the mouth of the Chicago River and another parcel of land along the Illinois River from the Iroquois confederacy. The treaty also required the Iroquois tribes to allow American citizens free access to the rivers and harbors that adjoined Indian lands. In 1816, the United States also acquired from the native tribes a ten mile wide strip connecting all the land along the proposed canal route between Chicago and the Illinois River (Hill 55).

Fort Dearborn, garrisoned to protect the strategic strip of land and encourage settlement, was constructed to enforce the provision of these treaties. In 1819, Secretary of War John C. Calhoun gave a report to Congress recommending construction of the Illinois and Michigan Canal, though nothing would be done more than a decade.

In 1834, as preparations were made to construct the canal, soldiers from Fort Dearborn were the first to modify the Chicago River, cutting a channel through a sandbar that had blocked the mouth of the Chicago River. The new channel provided direct access to the river creating a navigable harbor for ships. In 1836 funds to build the canal were finally raised, partly by William B. Ogden, who would become Chicago's leading early booster.

When William Butler Ogden arrived in Chicago in 1835 to take possession of his brother-in-law's speculative land investment near the proposed canal route, he found most of the land underwater. At first he was greatly discouraged, he believed his brother-in-law had been swindled. "There is no value in the land," he wrote back to New York, "and won't be for a generation." Yet Ogden more than recouped the cost of the land by draining and selling a third of it for \$100,000 (Solzman 22-23). Flush with new cash, Ogden reversed his first impression of Chicago and decided to stay.

Ogden was to figure heavily in the early history of the new community. A native of New York, he first managed his father's and then his brother-in-law's business affairs. In Chicago in 1833 he purchased a wide stretch of riverfront property along the north shore of the Chicago River, including Wolf Point, a muddy point that jutted into the river

where the North and South Branch joined to form the main stem of the Chicago River.

Building on business partnerships in New York, Ogden helped raise the funds necessary to begin work on the Illinois and Michigan Canal and served on its board of directors. By the time the Canal was completed in 1848, Ogden had switched his bet to railroads. Unable to raise funds for his new venture in New York, he chartered the Chicago and Galena Union Railroad and raised funds from farmers along the proposed route. The Chicago and Galena Union would grow into the Chicago and Northwestern Railway, now a major part of the Union Pacific Railroad.

In 1836, Butler established a land and trust company and began extensively trading in property (Arnold 45). The company still exists and bears his name. Butler also entered politics. In 1837 William B. Ogden defeated pioneer trader John Kinzie to become Chicago's first mayor. He served one term.

Land speculation, by Ogden and others, was driven by the prospect of cutting the proposed Illinois and Michigan canal between the Chicago and DesPlaines rivers much as had been envisioned by Jolliet. In 1818, Chicago was included in the new State of Illinois in anticipation of such a canal. The northern Illinois boundary was moved from its old territorial frontier which extended west from the southern tip of Lake Michigan to the present border with Wisconsin, adding a substantial strip of territory to the northern part of Illinois.

With the successful conclusion of the Black Hawk Indian War in 1832, the interior of the northern Illinois was opened to trade, settlement and agriculture. The proposed canal, connecting the Lake to this region, would bring settlement and would create an unbroken water route between the Niagara frontier and the Gulf of Mexico.

With the construction of the canal, agricultural goods from throughout vast lands that drained into the Mississippi River could be moved through the new canal and east by way of the Great Lakes to the Erie Canal in Buffalo and on to markets on the east coast. Chicago would become the "golden funnel" through which all this commerce would flow. In preparation for the Canal, the U. S. Government secured the sale of the Chicago River from the Pottawatomie, the areas' indigenous Native Americans, who were relocated west of the Mississippi River.

In 1827 the U.S. Congress gave Illinois 284,000 acres for the route of the canal. In 1829 the Illinois Legislature established a canal commission which surveyed a 96 mile route between Chicago and Peru, Illinois. In 1835 the Legislature passed a canal bill authorizing construction, the funds to be raised through land sales. By June of the following year construction was begun on the Illinois and Michigan Canal with funds from raised partly by Ogden in New York.

In 1830 James Thompson surveyed and published street plats for Chicago and Ottawa, Illinois, the proposed east and west terminus of the Canal. The Thompson Plat is the first legal designation of Chicago as a location in Illinois records. By 1833, three years after the Thompson Plat was published, Chicago was incorporated as a town. Chosen for its strategic location, not its natural drainage, the town site posed a sanitation problem from the start.

New settlers, drawn by Canal speculation, brought livestock to the new settlement, and along with them human and animal waste. Chicago's earliest residents had used the river as their source of water and sanitation. Garbage was fed to livestock. As the village grew, the new residents built further back from the river. They dug pit

Commentaire : Throughout this paper, the student frequently introduces his sentences with prepositional phrases beginning with "By." These "by" phrases move the action of the historical narrative forward, such as in this example, where the student transitions from the funding of the canal to its completion in 1848.

toilets which quickly contaminated nearby shallow wells. When rain fell on Chicago's low-lying soil, filth collected in shallow bogs and sinkholes leaving "pools of indescribable liquid" (Miller 122-123).

Hogs and cattle were kept in Chicago's alleys. Manure from barns was dumped into Chicago's streets. Dead livestock were piled along the waterfront. On July 27, 1847, the editor of the *Chicago Journal* appealed to the town for the removal of the "unfortunate horses and innocent cattle" that had been "denied the rights of civilized burial" (*Chicago Daily Journal*).

As conditions worsened, the frontier town dug ditches and built streets slanted toward the river, so that waste would drain away when it rained. Garbage was hurled into the ditches and clogged drainage. Filth seeped under plank streets to rot. Even when the primitive system of sanitation worked, it merely shifted the sewage into the drift less river creating cesspools the consistency, according to an early settler, of "rich pea soup" (Miller 123). A traveler remarked that Chicago should be called the "City of pestiferous odour" (Peirce 204-205).

As the river became clogged with sewage, peddlers brought fresh water from the lake to Chicago residents for 25 cents a barrel. Other businesses dredged outhouses and carted away sewage, invariably dumping it into the sluggish river (Hill 98).

In the first decade following Chicago's incorporation, its population had risen from 350 to 12,000. Sewage was already choking the City's wetlands. By 1845, Chicago already faced an environmental crisis.

II. Raising Chicago

Cholera struck Chicago in the summer of 1849. One in thirty-six residents died. Four hundred and thirty died in 1850; six hundred and thirty in 1852. In 1854 the disease took 6 percent of the population. Chicagoans died at the rate of sixty a day. By July the City's streets were lined with coffins. Hundreds fled.

The exact cause of the disease was unknown. Some believed it was air borne and sealed their houses against the "death fogs." Others blamed Irish and Norwegian immigrants who had come to dig the Illinois and Michigan Canal. Stricken immigrants were quarantined in a warehouse (Miller 123).

Six successive years of cholera and dysentery epidemics convinced the Illinois State Legislature to establish a permanent Board of Sewerage Commissioners in February 1855. William B. Ogden was appointed to head the three member commission (Hill 98-99).

Ogden brought Boston engineer Ellis S. Chesbrough to Chicago to design the first comprehensive system of underground sewers in the United States. Born in Baltimore, Chesbrough's engineering training was associated with railroads. In 1846 he accepted a position as chief engineer of the Boston Water Works, and was made City Engineer of Boston in 1851. On October 1, 1855 Chesbrough accepted the newly created position of Chief Engineer of the Chicago Board of Sewerage Commissioners. For the next thirty years Chesbrough would play a central role in the design and development of Chicago (Miller 124-130).

Chesbrough's report of December, 1855 to the Board of Sewerage Commissioners offered four options for sewer drainage of the City: Discharge sewage directly into the Chicago River; Discharge sewage directly into the lake; Pump sewage into artificial reservoirs to be "farmed" and used as manure; or, dig a deepened steamboat canal along

Commentaire : The student uses his sources very economically here; rather than reproducing the entire quotation from Miller's original text, he picks a single, meaningful phrase and uses it to his advantage.

Commentaire : Note the parallel structure of these three sentences: "Hogs and cattle were piled.... Manure from barns was dumped.... Dead livestock were piled...." This repetition has a rhetorical effect of building towards a climax delivered in the following sentence.

Commentaire : These two paragraphs are very short (two and three sentences long, respectively) but they act as transitions. The allusion to environmental crisis brings the first chapter of this paper to a climax and sets the stage for the one to follow.

the route of the I&M canal and discharge the City's sewage in the direction of the Illinois River. The Commissioners adopted the first plan, the dumping of sewage into the Chicago River, in order to limit the cost and extent of the proposed sewer system (Hill 99).

By the spring of 1856 Chesbrough had convinced the Commissioners that the level of Chicago's streets was much too low to adequately drain the City's new sewers. He proposed the radical measure of raising the grade of the streets six to ten feet. In this way sewers could be laid on top of existing streets and covered with dirt. New guttered streets would be paved at the new level. Raising the street level created space, not only to accommodate the new sewer pipes, but gas and water mains as well. At the end of May business owners sought an injunction against Chesbrough's proposal, which was in turn rejected by the Courts.

Having established a new grade, the process of lifting the City out of the muck began. The Chicago River was dredged to deepen it for sewage. The dredged soil from the river bottom was used to raise the fill level of the streets. Owners lifted buildings to meet the new street level. In some cases whole blocks were raised at a time. Four and five story buildings were hoisted as much as twelve feet. Horse-car tracks, lamp posts, even shade trees were lifted to the new level.

Businesses were expected to raise structures on their own. Most did, but some business owners refused the expense. Chicago's boarded walkways became a roller-coaster of up and down stairways as steps led from the new street level to the old.

In some cases business owners created a new main shop level on the second story of their buildings, while the old first story became a basement. New housing in some parts of the City adopted the arrangement as a building style. Homeowners built the main quarters of their houses at street level on the second floor, using the ground level beneath the street for storage (Miller 127-136).

George M. Pullman, a house mover from Albion, New York, raced to Chicago to open a new business. Pullman and his brother lifted buildings using jackscrews. Workers placed wooden pilings under the hoisted structures, followed by masons who rapidly built new foundations under the structures. Pullman quickly gained a reputation for sound work. In 1857 he raised a full block of brick buildings using his method. In 1858 Pullman lifted the stylish six-story Tremont Hotel while guests remained in their rooms. To accomplish the feat he supervised the simultaneous turning of 5000 jackscrews by 1200 men. The job was completed with out breaking a single pane of glass (Leyendecker 31-37). Pullman used his earnings to invest in a new enterprise which equipped railway cars with sleeping facilities.

In December, 1856 the Commission dispatched Chesbrough to Europe. Over the next several months Chesbrough would tour the cities of Great Britain and Europe. In March 1858 he presented his report to the members of the Chicago Commission.

Chesbrough's *Chicago Sewerage Report: Examinations made in relation to sewerage in several European cities, 1856-57* became the principal manual for sewer design for a generation, and remains the most comprehensive existing description of European infrastructure in the mid-19th Century.

Included were extensive descriptions of existing sewerage systems in Britain, France, Germany and the Netherlands. Of these, Chesbrough was most impressed with the circular brick sewers and clay pipe being developed in London, as well as the

Commentaire : Note the transitional phrase that moves us into the next phase of construction.

Commentaire : Vivid, fascinating historical details like these build your reader's interest and grant you credibility as an author.

labyrinth system of pipes which moved water and in Manchester. He also commented extensively on the proliferation of mechanical water closets and flush toilets he found in Victorian Britain (Chesbrough 8-22).

In Hamburg, the site of the world's only comprehensive sewer system, Chesbrough was most impressed with the interlocking system of drainage sewers operated by gravity, ventilators and intercepting sewers. Hamburg's sewage was systematically dumped into the Elbe River where the waste was washed out to the North Sea. Chesbrough was disappointed to find Hamburg's terrain radically different than Chicago's. Only in an area in the east of the city where housing was constructed on flat landfill did Chesbrough find an area similar to Chicago.

Chesbrough, no doubt to ratify his recommendation to Chicago, went to some length in the *Sewerage Report* to note that in this section of Hamburg, the city had raised streets as much as ten feet to construct new sewers (Chesbrough 29-32).

Of the remaining cities, Chesbrough found the flat shallow expanse and broad streets of Berlin to most resemble those of Chicago, though Berlin possessed few sewers (Chesbrough 33-34). According to the *Sewerage Report*, Chesbrough took the most innovative ideas he found on the continent and reported them back to engineering colleagues in London before returning to Chicago to present his full report.

The result of Chesbrough's study was the rapid expansion of Chicago's sewers. For most of the 19th Century Chicago would have the longest sewer system in the world. Perhaps Chicago's greatest innovation of the 1850's was not the construction of sewers, but the decision that City's water and sewer systems should be publicly funded and administered by the municipality.

Historian Ann Durkin Keating writes, "Initially there was little debate over the use of bond issues and general tax revenues for sewer construction. By 1872 the city had close to three million dollars in outstanding sewerage bond, an amount which staggered the imaginations of many residents. Especially since the city seemed to have no way of reducing the debt" (Keating 42).

Whatever the cost, Chicago believed that its sewer and water system must be administered in the public interest by government. Under Mayor Roswell Mason's leadership, independent water systems were acquired and along with the sewers, the systems were then run by the City. Mason, an engineer himself, and a former executive for the Illinois Central Railroad gained the support of the City's business community for the public works (Smith 70).

Existing private water systems, with all their mismatched delivery systems, that had been acquired by Chicago's government were standardized and rationalized. The need for water and sewer systems made the Mayor and City Council more important. The appointment of plutocratic commissioners, appointed for their technical expertise and not their political allegiance, made local government more "respectable" in the public mind (Teaford 70).

Other cities followed Chicago's lead. In 1857, the New York State Legislature authorized the creation of the Brooklyn Board of Sewer Commissioners. Like Chicago, Brooklyn hired engineers to devise a plan to build sewers like Chicago had. Like Chicago, Brooklyn turned to public administration and financing (Goldman 109).

Chicago captured the imagination of the nation. More cities followed the Chicago model. Among them were Providence in 1869, Cincinnati and Indianapolis in 1870, New

Haven in 1872, Boston in 1876. Several of these other cities turned to Ellis Chesbrough for consultation (Melosi 92-93).

The construction of public water and sewer systems permitted residents of Chicago and other cities, which followed Chicago's lead, to install indoor plumbing. These fixtures included sinks, bathtubs and toilets. By the 1860's American housing far outpaced European housing in this regard, with over half of all urban housing having indoor water closets. By the 1880's American cities, led by Chicago had more than twice the mileage of sewer and water pipes as European cities (Teaford 220).

Of all American cities, Chicago's pioneering water and sewer systems grew the most rapidly. The daily supply of water in Chicago rose from daily usage of 2,991,413 gallons with a capacity of 20 million gallons in 1858 to 23,464,877 million gallons with a capacity of 35 million gallons in 1871. In 1858 Chicago had 72.4 miles of publicly owned water pipe. By 1871 this had risen to 287.7 miles in use (Andreas 70). Between 1855 Chicago had constructed 151.52 miles of publicly financed sewers (Andreas 65).

Chicago also looked to the Federal government for help. Seeking to take advantage of the Civil War, Chicago proposed the replacement of the Illinois and Michigan Canal with a deep steamboat canal. The new waterway was a military necessity, according to Chicago's politicians, to move gunboats to the Mississippi to fight the south. The canal would also have the added benefit of moving Chicago's sewage downstream. Wisconsin politicians objected to what they saw as a brazen attempt by Chicago to grab federal funds during wartime for its own economic interests. The steamboat canal proposal was killed in Congressional committee by the powerful Ways and Means Chairman, Thaddeus Stevens of Pennsylvania (Putnam 131-134).

Even without the added drainage of a new steamboat canal, Chicago's new sewer system worked well for a time. But as the city grew, Chicago's sewers were rapidly extended, taxing the system. The City's water systems were extended faster than the sewers, compounding the problem. By 1861 four thousand more buildings were connected to the water system than the sewer system. The City did not force property owners to connect to the sewer system until 1862, when it passed an ordinance mandating private connections.

Though Chicago had pioneered these two public works, at first with great success, rapid population growth soon taxed the system. With rapid growth and such uneven development between the water and sewer development, the City was soon once again overwhelmed with Sewage (Keating 41).

III. Typhoid City

By 1855 Chicago's water system was no better than its sewer system. As wells became contaminated, Chicagoans turned to water wagons which hauled clean water from the lake. Residents greeted the wagons with buckets. In 1836 the Illinois legislature granted a seventy year charter to the Chicago Hydraulic Company for the supply of water to the town. Due to financial difficulties Chicago Hydraulic did not complete its pumping works until 1842.

A pier extending 150 feet off Lake Street provided water intake. Water was pumped into a wooden reservoir and flowed by gravity through wooden pipes into the town. The system quickly proved inadequate for the rapidly growing population. Furthermore, fish entered the system and frequently clogged faucets. Hotel guests complained of having to bathe in chowder (Miller 75-76).

Commentaire : This paragraph helps to place the events discussed in this paper within the larger, more familiar context of American history.

Commentaire : Another excellent, vivid detail.

Water drawn only a few feet from the mouth of the Chicago River proved no cleaner than the old shallow wells had been. In 1851, the legislature authorized the City to establish its own water works, making it the first municipally owned water system in the United States.

The City established its pumping works at Chicago Avenue and Pine St. (Michigan Ave.). A wooden water intake was extended 600 feet into the lake at Chicago Avenue. Water was pumped through eight and a half miles of cast iron pipe to three wrought iron reservoirs. This system also soon proved inadequate for the growing city, and hardly more healthful. Even at the distance of Chicago Avenue, a mile from the river mouth, gross pollution of the lake caused by the dumping of sewage contaminated the City's water supply.

In 1861 the Board of Sewerage Commissioners and the Board of Water Commissioners were merged to form the Bureau of Public Works. Ellis Chesbrough was named to head the new public body. Chesbrough attempted to solve the problem by digging a tunnel two miles under the lake, the longest tunnel ever bored up to that time.

Chesbrough built a water intake crib on shore and floated it out onto the lake where its base was loaded with bricks until it sank firmly into the clay lake bottom. Irish immigrants were employed to dig the tunnel under the lake bed. Working sixteen hours a day, two teams, one from shore and one from the offshore crib dug a tunnel 5 feet in diameter and thirty feet under the lake bed. Bricklayers worked the other eight hour shift lining the tube with masonry (Miller 127-136).

Chicago dedicated the new water intake system in March, 1867. However, even this extraordinary attempt to provide clean water for the City failed as rainstorms and spring flooding pushed sewage from the river far out into the lake past the water intake crib. Without addressing the discharge of the river into the lake new water crib and tunnel simply could not work.

The solution was to send the filth someplace else. Ellis Chesbrough proposed deepening the Illinois and Michigan Canal. Chesbrough believed that the regions near level natural terrain would allow the Canal to pull the Chicago River west down the Canal and away from the Lake, essentially reversing the flow of the river. The Bridgeport pumps would do the rest. The project, started in 1865 and completed in 1871, cost over \$3 million dollars, half the cost of the original Canal (Walker 6).

When the deepened canal was finished, Chesbrough's extraordinary feat seemed to work. The river slowly turned to flow down the Canal. The City engineer was feted by Chicago's business community for the accomplishment. With the river reversed the City could finally rely on Chesbrough's Lake Michigan tunnel for clean water. They presented him with a testimonial and eleven thousand dollar reward for devising a plan to purify the City without "interfering with large and rapidly increasing manufacturing interests" (Miller 130).

Sir John Leng, a British visitor to Chicago, was awestruck by Chicago's accomplishments. He wrote extensively about Chicago's Lake tunnel and sewers, but nothing amazed him more than the "deep cut." Leng wrote, "Chicago has achieved wonders!" (Pierce 224-225). A French visitor was equally impressed with the infrastructure and the deep canal, calling Chicago the most "modern" city in the world. He wrote, "None of the new inventions, which our own (European) cities fail to adopt, are missing here" (Teaford 218).

Not everyone was cheering Ellis Chesbrough's accomplishment. Canal towns downstream from Chicago were soon choking with the City's sewage. "Ever since the water from the Chicago River was let down the Illinois River," wrote a Morris, Illinois resident, "the stench has been almost unendurable. What right has Chicago to pour its filth down into what was before a sweet and clean river, pollute its waters, and materially reduce the value of property on both side of the river and canal, and bring sickness and death to its citizens?" Joliet threatened to fill in the Canal and "let Chicago stink itself to death!" (Wade 132).

In 1872, a year after the deepening of the Canal was accomplished; land promoters William Ogden, Chicago's first mayor and John Wentworth essentially did just that. Ogden and Wentworth dug a ditch cutting into the Des Plaines River to drain Mud Lake, the natural source of the Chicago River. The muddy water silted in the Illinois and Michigan Canal. The Chicago River resumed its natural course and once again sewage flowed to the Lake (Walker 6).

Ellis Chesbrough began to doubt the effectiveness of the Illinois and Michigan Canal "deep cut." He warned that the City would not be able to discharge its sewage "into the river for all time to come without producing injurious results" (Miller 130).

In 1877 high spring floods surged into the Chicago River and far out into the Lake. Alarmed, Chesbrough experimented with pumps to drive the sewage into the north branch of the Chicago River, but the north side of the City became unbearable and he abandoned the idea. The pumps were halted and sewage flowed freely out into the Lake (Wade 132).

To make matters worse, the Chicago Union Stockyards opened in 1865 and quickly grew to occupy a full square mile. Into its pens thundered hundreds of thousands of pigs and cattle, whose excrement flowed onto Chicago's muddy south side streets and into the river. Dead carcasses were hurled into the river as well. Soon the stockyards became Chicago's leading nuisance industry.

Older pollution ordinances were enforced against the stockyards and a new "stink ordinance" was rushed though the Chicago City Council. Heavy fines were levied by the City, but the courts reversed them, slapping minimal penalties on the packing houses. In the case of the City of Chicago v. the Packinghouse and Provision Company, the jury found the packers guilty. Judge William H. Moore fined the packers a mere \$25.00. Chicago's press was appalled and demanded stiffer laws (Walker 136-137).

Chicago responded by annexing territory far beyond the stock yards to gain more control over dumping and passing stiffer ordinances on it and other "nuisance" industries. The City also tried to clean up the mess. During the Civil War, Chicago used prisoners of war to clean up the debris (Hill 101).

In the face of regulation, the industry struggled to police itself. Phillip Armour believed the refuse would be better used as marketable byproducts and in the process avert the menace to the public. Armour used fat to make soap, bones to make buttons and combs, hoofs became glue and gelatin (Cronon 250).

Octave Chanute, a railroad engineer hired by the Union Stockyards to solve the waste problem as well as create a usable service road system to move animals, meat and materials laid an elaborate grid of sewers though the facility. However he concentrated on roadways. The sewers were allowed to drain into the South Fork of the Chicago River whose source was just outside the Union Stock Yards (Walker 50-52).

Once a bucolic natural stream where the children of Irish American settlers in Bridgeport caught bullfrogs, the South Fork was transformed into a foul open sewer. Carcasses and organic debris rotting at the bottom of the South Fork caused the surface to bubble as if it were boiling. Because of this, the South Fork was dubbed “bubbly creek.” At times the putrid stream crusted over and chickens walked across the top of it. The South Branch became the most horrific stretch of the river. It remains the most polluted section of the River and continues to bubble from organic matter even today.

Commentaire : Still another wonderful detail. Notice the use of a concrete, active verb: the river “crusted over.”

Beyond “Bubbly Creek,” the slow moving Illinois and Michigan Canal was insufficient to cleanse the river. Even huge pumps installed at Bridgeport to push water down the canal failed to keep sewage from reaching the lake. Furthermore, the “deep cut” canal was dug to depth eight feet above the bottom of the Chicago River. The lowest and most polluted levels of the river failed to drain (Miller 130).

Faced with mounting pollution, the business-oriented Citizens Association of Chicago decided the “deep cut” had been a mistake. It had only served to spread to pollution while failing to cleanse the Chicago River. In 1879 Ellis Chesbrough resigned (Walker 132-133). Without Chesbrough, Chicago cast around for some kind of permanent solution.

Chicago's waste disposal system was overwhelmed. Unchecked growth only added to the problem. Outlying areas were annexed. Outlying towns could not provide the types of services that Chicago offered its citizens, and had sewage problems of their own. These towns, adjoining the City soon sought the benefits of Chicago's sewer and water systems. To solve the issue of water and sewage in their own towns, they joined the City. Rogers Park and Norwood Park, for example, eagerly sought to join the City to acquire Chicago's services. Both communities were annexed in 1893. West Ridge quickly followed (Keating 113).

Added sewers further taxed Chicago's systems. High rains in 1879 also caused mounting problems, overwhelming the pumps at Bridgeport. During the summer the Chicago River discharged sewage into the Lake thirty five times (Cain).

As the City grew, smallpox, dysentery and typhoid continued to strike its population at alarming rates. In 1881, five hundred sixty eight died of typhoid. Throughout the decade of the 1880's, thousands more died. In 1891 the death toll reached 1,997, a rate of 178 per 100,000 of population. Typhoid deaths in Chicago exceeded those of any other city worldwide. By comparison the Great Chicago fire of 1871 had claimed the lives of only three hundred.

Commentaire : The transition “as the City grew” connotes simultaneity; the events discussed in this paragraph happen at the same time as those discussed in the previous one.

By the beginning of the 1880's Chicago's mounting environmental problems had once again become overwhelming. For the moment the City simply adapted to a faltering infrastructure and mounting death and disease.

IV. From ‘Shock City’ to the Flood of August 2, 1885

By the 1880's, Chicago had become the economic engine of the nation, a model of unregulated capitalism. In Chicago fortunes were made, lost, and made again. While a few made millions, thousands of others flocked to the new metropolis to just to make a living. Immigrant communities, Irish, Germans, Poles, Italians, Russians, Jews, and others flocked to its Lake Michigan shore. African Americans arrived from the south. New neighborhoods sprawled across the prairie, stretching Chicago far back from the Lake.

By 1880 Chicago was the busiest port in the United States. More ships called at

the City's harbor than New York, San Francisco, New Orleans, Boston, Baltimore and Philadelphia combined. Chicago's population grew at an unprecedented rate. From a village of only a few hundred in 1835, Chicago grew to a city of 503,185 according to the U.S. Census of 1880, and doubled to 1,099,850 in 1890. Chicago was the fastest growing city in human history.

As Chicago's population exploded, the City seemed ungovernable. The Democratic Party "machine" that ruled City Hall parceled out graft in return for votes. Inspectors were on the take, or looked the other way as ward healers collected booty. Elections that couldn't be won were simply stolen. The city seemed on the verge of chaos as labor took up arms against management. The "Haymarket Tragedy" of 1886 gripped the world's imagination. Eight labor "martyrs" were tried, convicted and four of them hung as conspirators, even though they couldn't be connected to any crime. In Chicago life itself seemed to hold little value.

19th Century visitors to Chicago likened the city to a working machine with the cover removed. Skyscrapers, the steel-framed behemoth structures developed in Chicago as engines of commerce, towered above the "Loop." The whole place seemed to be under construction. Elevated trains thundered and squealed over sooty streets. Tourists flocked to Chicago simply for the opportunity to be horrified. The reeking Union Stock Yards, the killing grounds where pigs and cattle were dispatched with industrial precision, became the City's leading tourist attraction. Most visitors were appalled. They called the second city a "hell hole." Chicago was dubbed "shock city."

Max Weber, German economist and sociologist, was among those that Chicago shocked. Weber wrote:

"As far as one can see from the clock tower of the firm of Armour and Son-nothing but cattle lowing, bleating endless filth-in all directions-for the town goes on for miles and miles until it loses itself in the vastness of the suburbs-churches and chapels, storage elevators, smoking chimneys (every large hotel has its own elevator run on a steam engine) and houses of every kind. This is why the town is so extraordinarily far flung; the areas of the city are distinguished from each other in degrees of cleanliness in accordance with the nationality of the residents. The devil has broken through in the stockyards: a lost strike with great numbers of Italians and Negroes brought in as strike-breakers; shootings daily with dozens dead on both sides; a trolley car was pitched over and a dozen women were crushed because a 'non-union' man was sitting in it. There were threats of the use of dynamite against the 'elevated-railway' on which a car was derailed and fell into the river. Close to our hotel, a cigar dealer was killed in broad daylight, a few streets away at dusk three Negroes robbed a trolley car-all in all a unique flowering of culture! There is a swarming interaction of all peoples of the human race on every street. Greeks are polishing the shoes of Yankees for 5 cents, the Germans are waiters, the Italians do the dirtiest heavy labor. The whole powerful city-more extensive than London-resembles a human being with his skin removed, and in which one can see all the physiological processes going on." (Spears 3-4)

Commentaire : In longer papers like this one, it's alright to use very long quotations, so long as they are relevant to the topic you're discussing. This particular quote is from a primary source-- a source written at the time under discussion-- and it does a marvelous job painting a picture of Chicago circa 1900.

As Chicago's reputation for unregulated capitalism, labor unrest, anarchy, noise and filth spread, Chicago took steps to fight against its "shock city" image. In 1890 the City lobbied Congress for the right to host the international exposition commemorating Columbus's landing in the new world and out-bid its rival New York to get it. Claiming to be the only truly American city and the nations' most innovative, Chicago's breathless politicians earned the City its nickname "the Windy City," a slur made by the New York press, but quickly adopted with pride by Chicago.

As Chicago's boosters prepared to celebrate the World's Columbian Exposition of 1893, investors feared that Chicago's reputation as "typhoid fever city" would discourage visitors from traveling to the City. Chicago attempted to raid Waukesha, Wisconsin for its water. Waukesha residents turned back the raid but agreed to sell Chicago water. Nervous fair organizers took the extraordinary measure of piping fresh spring water to the fairgrounds from Waukesha, a distance of over one hundred miles. City water was pasteurized at the fairgrounds as an added precaution. Chicago advertised these precautions to the world (*A Century of Progress in Water Works* 39).

Chicago's reputation as "typhoid city" was well earned, and world's fair organizers had reason to fear the City's reputation for disease might hurt tourism. Only a few years before on August 2, 1885 disaster struck when a massive rainstorm dumped 6.19 inches of rain on Chicago. The resulting flood knocked out the Illinois and Michigan Canal's steam-driven pumps at Bridgeport and storm water choked the Chicago River. The massive surge of water into the River pushed the flood far out into the Lake. Ward Walker wrote, "A great foul black cloud pushed far out into Lake Michigan and back into the City's water intake cribs. Within days the City was filled with death and disease" (Walker 7).

In the following days the *Chicago Daily News* reported, "The rainfall... is... carrying out filth unspeakable and polluting the water far beyond the crib. This is what the people of Chicago will have to drink for days to come" (Cain).

By August 6 the *Chicago Tribune* was reporting a sharp rise of typhoid deaths. Despite assurances from City Hall that the water was safe, the *Tribune* continued to sound the alarm for the following several days. The Lakeview and Hyde Park communities were reporting water quality problems. On August 12 the *Tribune* reported that Mayor Harrison had admitted the Bridgeport pumps were out of service and likely to remain so for several weeks (Chicago Tribune).

By the end of August Chicago was in the grip of a typhoid, dysentery and cholera epidemic. During the final months of 1885 as many as 80,000 to 90,000 residents were reported to be killed by the epidemics stemming from the flood of August 2 (Malec). Many in the business community joined the newspapers in demanding action. The business oriented Citizens Association of Chicago demanded that the City address its sewage issue "once and for all" (Cain).

V. The Big Ditch

Early in 1886 the Chicago City Council authorized the formation of a blue-ribbon commission appointed to study the problem and work out a plan that would solve Chicago's sewage problem and protect its water supply forever (Cain).

The resulting Drainage and Water Supply Commission revived Ellis Chesbrough's "deep cut" concept and went the old engineer one better. The commission proposed an entirely new Canal to be dug deep and wide enough to permanently reverse

the flow of the Chicago River and to construct intercepting sewers along the lakefront to catch storm water.

A new canal was a necessity, the commission argued, to protect the health of Chicagoans, and it would become a valuable commercial asset. Furthermore, they said, the new canal would be of great strategic value. They pointed to the blockade of the Mississippi by the Confederacy at the start of the Civil War, and noted that the "new river" would become an immeasurable asset in the event of war with Great Britain (Moses 549-555).

Commentaire : Transitions like "furthermore," "moreover," and "additionally" show agreement between two clauses or sentences and are good for linking together two related ideas.

Proponents believed the pollution issue that had so plagued the "deep cut" down stream would be solved with the dilution by large volumes of Lake water. Engineers believed dilution was preferable to simply dumping sewage into the waterway (Melosi 163).

The commission proposed the extraordinary creation of a new regional governmental authority to accomplish the task with an independent taxing authority and powers of eminent domain. On July 1, 1889 the Illinois legislature passed the authority for the new Sanitary District. On November 5, 1889 voters approved the creation of the District by referendum by a vote of 70,958 to 242 (Walker 7-9).

On September 3, 1892 ground was broken for the Chicago Drainage Canal, later renamed the Sanitary and Ship Canal. The new 28 mile canal would run parallel to the old Illinois and Michigan Canal for 28 miles from Chicago to Lockport, Illinois. The new Canal would not have the traditional system of locks, but rather be a continuous waterway, which engineers dubbed "the ditch"(Moses 549-554). Designed to carry a normal flow of 10,000 cubic feet of water per second, the Sanitary District claimed that sewage would be "sanitized" by the time it reached Joliet.

Built to a depth of 25 feet, the Sanitary and Ship Canal is 160 feet wide at its narrowest point and 306 feet wide at its widest. It was larger than the Suez Canal in Egypt, and represented the largest earth-moving project in the world. Built to the same depth as the Niagara River in New York, the new channel would confine waters all the way to Niagara Falls.

Working ten-hour days for fifteen cents an hour, 8,500 laborers, including African-Americans and Chicago's first Polish immigrants, used wheel barrows, mule drawn plows, steam shovels, rock drills, dynamite and bare hands to move 29,558,000 cubic yards of earth and 12,261,000 cubic yards of rock.

New methods of earth moving and new machines to move it were invented in the eight year process of building the Sanitary and Ship Canal. These new technologies became known as the "Chicago School of earth moving," and would later be employed in the construction of the Panama Canal (Walker 9-18).

In December 1899, with work nearing completion, the State of Missouri sought an injunction against the opening of the Sanitary Ship Canal claiming that it would imperil the St. Louis water supply. Fearing the massive eight-year project was in danger, the Sanitary District decided to act secretly, without the knowledge of either the Mayor or Governor. At dawn on January 2, 1900, the nine Chicago Sanitary District Commissioners, along with two hand-picked newspaper reporters, gathered to watch the detonation of a temporary dam which separated the Chicago River from the new channel (Garry).

Commentaire : Again the student shows the larger historical significance of his subject matter. One way of keeping your readers interested is to make your topic seem relevant to their lives.

The City awoke to discover that the flow of the Chicago River had been

permanently reversed, the first river in the world to flow away from its mouth. In 1906 Chicago constructed its first intercepting sewers along the lake shore. The new sewers, built below the City's existing grid of sewer mains, diverted storm water to pumping stations along the River.

The opening of the Sanitary and Ship Canal resulted in an ongoing series of litigation that continues to this day. In a case dismissed by the Supreme Court in 1906, Missouri claimed that typhoid was transported along the 387 mile waterway to St. Louis. Surrounding States objected to the diversion of Lake Michigan water. Chicago based its right to divert lake water on a permit issued by the Secretary of War May 8, 1899. In 1930, the U.S. Supreme Court ordered the District to cut down its diversion of lake water. In 1934, the District constructed a lock at the mouth of the Chicago River to regulate the flow of water into the river (Garry).

While the Sanitary and Ship Canal resulted in 91% drop in the rate of typhoid deaths in Chicago by 1908, Chicago's water supply was not truly safe until the addition of chlorine to the water in 1912. By 1917 Chicago's typhoid death rate had fallen to lowest of any major city in the nation.

Conclusion

While the Sanitary and Ship Canal worked as engineers had predicted to lower Chicago's typhoid rate to the lowest in the nation, only the addition of chlorine to city drinking water beginning in 1912 completely eradicated the disease. In chemically treating the municipal water supply Chicago was again among the first adopters and most avid supporters of a new technology. Chicago remains among the most aggressive leaders of new sewage and water treatments to this day.

After its experience of fighting sewage and other problems in the 19th Century, Chicago has never again rallied behind the idea of unregulated capitalism or unrestricted development. Chicago is anything but a hotbed of libertarianism. Since the 19th Century Chicago has generally been quick to rely on government to solve its problems, regulate its industries, and monitor its water. Chicago has supported a very large bureaucracy. Today the Chicago area supports a lot of government. There are more than 230 separate government bodies in Cook County alone, most with taxing authority. Within those bodies are thousands of boards, commissions, committees, and districts.

Despite its reputation for waste, duplication of services, and legendary lapses in ethics, Chicagoans are generally content with local government. Only three times since 1930 has an elected city administration been turned out of office by voters. In 1955 Chicago's political establishment dumped Mayor Martin Kennelly and elected Richard J. Daley when Kennelly's reform credentials were no longer needed. In the watershed elections of 1979 and 1983 Chicago first ousted Mayor Michael Bilandic and elected Jane Byrne, then turned out Jane Byrne in favor of Harold Washington four years later. In both cases the incumbent lost largely for failing to provide government services; snow removal in the case of Bilandic and equitable municipal services to minority communities in the case of Byrne.

In the 21st Century Chicago is nothing like the stinking swamp of the 19th Century. Today Chicago is frequently named among the nations "greenest" cities and a frequent winner of the Environmental Protection Agencies environmental rewards. In its commitment to environmentalism Chicago remains a leader. In 2001 Chicago completed a roof garden pilot project on the roof of City Hall. The wildflower and prairie grass

Commentaire : The "while" clause acts as a transition between the previous chapter and the current one. Syntactically, "while" clauses acknowledge a fact (the contribution of the sanitary ship canal to the decrease in typhoid deaths), yet they also signal that the independent clause in this sentence is the one readers should pay attention to (the chlorination of the water). Transitions like "while" and "although" are useful for showing distinctions between two closely related ideas.

Commentaire : With this paragraph, the student draws out the political implications of the facts he has discussed in his paper. This is an excellent strategy to use in your conclusions. Rather than simply restating the points of your paper, find some deeper truth or ramification that arises out of the points you made.

garden was constructed as an energy saving and oxygen producing example for private development. Some private businesses and high-rise housing structures have followed the example. In 2006 Chicago has 295,600 square feet of roof garden, far ahead of any other city in the world.

Above all Chicago has been the jealous policeman of Lake Michigan water quality. The City of Chicago has frequently sued its lakefront neighbors, particularly Milwaukee, for sewage discharges into the Lake. Chicago's litigation forced Milwaukee to take action and construct a large intercepting tunnel. The September 28, 2005 *Milwaukee Journal-Sentinel* wrote, "Before Milwaukee's deep tunnel sewer system opened in 1994, Milwaukee wastewater overflowed into the lake, on average, about 50 times a year. Overflows... have since been reduced to a handful of times each year, and the state estimates that the average annual volume of sewer overflows has since been reduced by more than 80%-an improvement, but not the virtual cure-all that was promised by the \$3 billion project."

Today Chicago is anything but the home of the muskrat on which it was built. Like the Sanitary and Ship canal, the city itself is largely a product of man-made engineering, complete with its extensive garden plantings. The city as it appears to us today would never have been possible were it not for the many hundreds of miles of tunnels and extensive channels and canals that were conceived and constructed in Chicago's epic struggle against its sewage in the 19th Century.

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Commentaire : In this final paragraph, the student ties Chicago's current condition of environmental cleanliness directly to the efforts of the 19th century engineers he previously discussed. This is a tangible, real-world connection that gives importance to his studies.

Commentaire : The works cited page the student gives is annotated, meaning he gives a brief description of the information found in each item on his list. It is not always necessary to write annotations for your Works Cited, but doing so is a great service to any reader interested in learning more about your topic.

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Appendix A:

Digital Images of Historic Chicago, Chicago Maps, Chicago's Water Facilities, Chicago's Sewers, and Chicago's Historic Waterways and Sanitation Systems

Commentaire : Appendices are collections of supplementary materials that offer further evidence of the claims you made in your paper. The information should not be absolutely essential to your argument (for if it was, it would belong in the paper itself), but rather a convenient source of further information for the curious reader. The photographs for these appendices are not included in this online version of the paper.

Appendix B:

Before Chicago: Photographs of the Natural Regions Near Chicago

Appendix C:

The Illinois and Michigan Canal

In April 1848, the *General Fry* locked through the Illinois and Michigan Canal and reached Bridgeport, the Irish American enclave at the edge of Chicago, where the Canal joined the Chicago River and its final stretch to Lake Michigan. Instantly the newly opened Illinois and Michigan Canal marked a turning point in trade and migration in the United States that persists to this day. Prior to the opening of the Canal, trade had moved from south to north. After the opening of the Canal, trade and migration moved from south to north and was reoriented from east to west.

The Illinois territory prior to 1818 did not include Chicago. Illinois' boundary with Chicago extended west of the southern tip of Lake Michigan. The possibility of a canal led Illinois to convince Congress include the section of land north of the Lake Michigan line to the present Wisconsin border within its territory at statehood in 1818.

Surveys for a canal were begun in 1818, 1824 and 1829. A cheaper alternate route through the Sag to the Calumet River which would have by-passed Chicago was rejected when lawmakers pointed out that the expense for this route would fall on Illinois, while the benefits would be reaped by Indiana.

In 1830, two canal towns, Chicago and Ottawa were platted by James Thompson for the State. The two towns were intended as terminuses for the canal. The Thompson Plat constitutes the first official designation of Chicago as a place in Illinois records, though fur traders like Jean Baptist Pointe DuSable had previously established posts at the mouth of Chicago River and Fort Dearborn had been built there.

Attempts to raise money through the sale of market shares failed raise the necessary funds and construction was delayed. In 1835 the Illinois legislature authorized the sale of land to raise the necessary funds to begin construction. Work on the Canal was begun in June of 1836, with the official groundbreaking taking place on July 4.

Eastern recruiters and advertisements for laborers brought Irish immigrants to Chicago and other communities along the canal route. Working six days a week, they dug ninety six miles of canal by hand, using picks and shovels. Hundreds died of cholera and other waterborne diseases. In the period of the construction of the canal, the Irish established themselves at Bridgeport, the first neighborhood outside the central town of Chicago.

The Canal was extended beyond its originally intended western terminus and instead joined the Illinois River at Peru, just west of LaSalle. Towns like Lemont, Lockport, Morris, Seneca and Utica grew along the canal.

Canal construction continued through the economic depression of 1837. After a nearly bankrupt State of Illinois ceased construction in 1841, William B. Ogden, Chicago's first Mayor, and an early speculator, organized other to raise the to complete

the Canal. The Illinois and Michigan Canal opened in 1848 at a cost of \$6.1 Million Dollars.

On April 10, 1848 mule drawn canal barges began the day-long journey ninety six mile journey between the steamboat basin off the Illinois River at Peru and Chicago. At 7:30 p.m. the first boat, the *General Fry*, locked through the canal and was floating in Lake Michigan.

The depth of the canal was dug at 6 feet, the width a minimum of 60 feet. Canal boats stepped up and down through fifteen locks between the Bridgeport turning basin and Peru. Pumps pushed water into the Illinois and Michigan Canal between Bridgeport and Lockport; the Dupage River fed the Canal west of Channahon.

During its first season Chicago became the nations' largest inland port. Grain and coal from Illinois, sugar molasses and coffee from New Orleans, and lumber from Wisconsin and Minnesota soon shipped through the canal to Chicago. The canal terminus and port at Chicago attracted trunk railroads. In the decade following the opening of the canal the City was firmly established as the nations' rail hub, led by the Chicago and Galena Union, William B. Ogden's line and The Chicago, Rock Island, and Pacific, which paralleled the Canal.

The Illinois and Michigan was the last major canal constructed in the United States. In the decades following its opening the railroad gained supremacy as the nation's mode of shipping and transportation. Passenger traffic ended on the canal soon after its opening. By the early twentieth century canal barges were primarily transporting waste material from Chicago. In 1933, following the channelization of the DesPlaines and Illinois Rivers, the I&M Canal ceased operations.

Illinois and Michigan Canal Photographs

The following photographic survey of the Illinois and Michigan Canal were taken by myself over several weekends in April, 2006. They cover the length of the Canal between Bridgeport and Peru.

The Canal is now a part of the Illinois and Michigan Canal National Heritage Corridor, the first industrial heritage National Park. It is a major recreational facility administered by National, State, and local authorities. Portions of the Canal are filled in, however much remains intact. Restoration south and west of Lemont, Illinois is ongoing.

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Appendix D:

The Chicago River and Sanitary and Ship Canal

As Chicago grew in the 19th Century, the Chicago River became a hard-working commercial artery. It also became an open sewer, as the City's growing population and commercial enterprises used the waterway to drain waste. The river was quickly overwhelmed, leading to disease and environmental crisis.

The South Branch of the river was particularly noxious. "Bubbly Creek" became an open sewer draining Chicago's Stock Yards, which opened in the 1860's. Bubbly Creek remains the most polluted section of the river to this day.

Desperate for fresh water, Chicago built the world's longest tunnel two miles under Lake Michigan in 1861, but sewage simply swept into the intake crib.

Chicago then deepened the Illinois and Michigan Canal, in an attempt to reverse the river's natural flow and began to push the Chicago River's filth west toward canal towns inland from the city. The deepening worked when the river wasn't high, but failed in springtime and during rain storms. The filth also infuriated towns downstream along the Canal.

In 1889, the City formed a new regional authority, now called the Metropolitan Water Reclamation District to permanently reverse the flow of the river and to dig a massive sewage and shipping canal to the Illinois River south of Joliet. When the Canal opened in 1900, it was the most massive earth moving project in history.

The technology developed to build the "big ditch" would be used again to build the Panama Canal.

In 1892, Chicago led the world in incidences of Typhoid. After 1900, when the canal opened, Chicago dropped to last among large cities. The disease was not eradicated until 1917, however, when chlorine was added to Chicago's drinking water.

After 1900 a lock at the mouth of the Chicago River was added to control the flow of Lake Michigan water into river and intercepting tunnels were dug along the lake shore to control the flow of storm water into the lake.

A north channel was dug to Wilmette in 1908, flushing water down the existing

Ship Canal. In 1933, the Calumet-Sag channel was dug from Lake Calumet to the Sag near Lemont, Illinois where it connected to the older Canal. Together these form the Metropolitan Water Reclamation District's system of waterways.

Today the Chicago River and Sanitary Ship Canal, along with the channelized Illinois River is hard working commercial waterway system connecting the Chicago and the Mississippi River.