A HISTORY OF FORT COLLINS WATER UTILITIES

FROM SNOWCAP TO WATER TAP

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City of Fort Collins Utilities

“You get it out of the hills,
you treat it, you bring it to town,

you spread it out,
you give it to the people,

you gather it back up,
you take it down,

treat it and put it back in the river.

Now that’s basically what we do.

And it’s interesting.”

– **Ed Hilgenberg**
Former Superintendent of Water and Sewer
City of Fort Collins

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Firefighters work to contain the High Park Fire in June 2012

Courtesy of Jim Lynxwile, Poudre Fire Authority Archives

Introduction

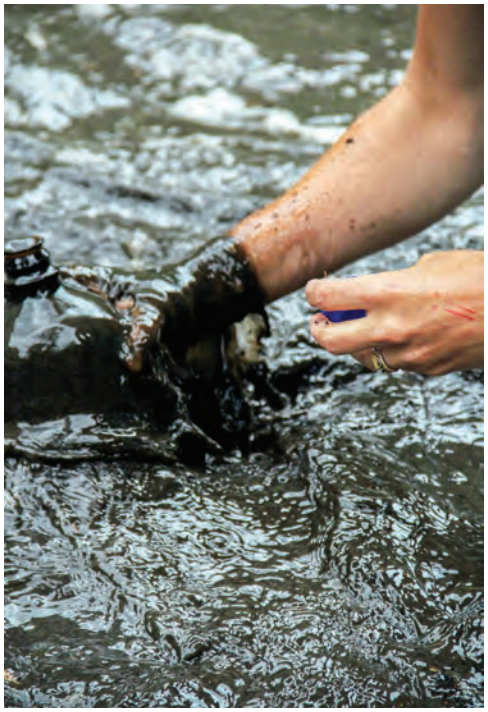
Supplying water to Colorado's Front Range is a complex business. The water supply must be healthy and reliable while also protecting people and nature. In over 130 years, the City of Fort Collins has developed a nationally recognized set of tools and policies for water supply and management that address the challenging conditions of Northern Colorado. Fort Collins Utilities customers now are accustomed to reliable, uneventful service that controls and mitigates disaster and drought. But occasionally, natural events compounded by human-caused factors challenge the City and its systems. These moments, like floods and fires, have affected the city's systems, supply and residents since its founding in the 19th century.

Flooding and fires are at the heart of the story of water supply in Fort Collins. In the 1880s, structural fires in downtown led to the creation of the city water system. Nearly 130 years later, in the context of climate change and vulnerable forests, fires in the nearby watersheds continue to influence downstream municipal water operations and the delicate balance of urban and agricultural water needs. Because of this history, Utilities has developed a series of proactive reactions to crises like the Hewlett and High Park Fires and the 2013 flood.

On May 14, 2012, a camper's stove ignited a fire on the Hewlett Gulch Trail in the Poudre Canyon northwest of Fort Collins. By the time firefighters achieved 50 percent containment of the 7,600-acre Hewlett Fire, a rainstorm provided much needed moisture on the burn area. Although the rain relieved the nearby community and eased concern that the fire would spread, officials at Utilities feared the potential effects of the blaze on its operations. All land use activity in the Cache la Poudre River canyon affects the City's oldest and most pristine water source and leaves traces that Utilities accounts for in its water treatment. Because of this, they monitor and protect the watershed to ensure safe drinking water for the community.

Even though the good fortune of timely rainfall aided the Hewlett Fire containment, it subsequently affected the Poudre River's integrity as a water source. Ash and debris filled the mountain stream causing Utilities to close its intake in the Poudre Canyon, preventing the unsafe water from entering the treatment facility. Fort Collins relies on the Poudre River and the Colorado-Big Thompson Project (C-BT), including Horsetooth Reservoir, as its main water supply for nearly 150,000 residents. The water utility had closed the Poudre diversion only a few other times


FIRE



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Jill Oropeza collects a water sample from the Poudre River following the 2012 fires.

Courtesy of Fort Collins Utilities

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Swelling along the Poudre River looking south down College Avenue during the September 2013 flood.

Courtesy of Fort Collins Utilities

in the past, mostly for vehicle accidents in the river that degraded the water quality. After the fire caused the diversion to close, operators relied solely on treated water from the adjacent Horsetooth Reservoir and waited until the raw water from the Poudre River was safe again.[1]

Less than a month later, on June 9, 2012, lightning struck the dry foothills of Paradise Park west of Fort Collins, igniting the High Park Fire. The fire burned more than 87,200 acres, destroyed 259 homes and took one human life before it was contained on July 1. It was the most destructive fire in Larimer

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Covering the exposed Town Ditch, or Arthur's Ditch, circa 1930s. Constructed in 1873 to provide for irrigation needs, the exposed Town Ditch became a nuisance to Fort Collins residents as the population grew. Efforts to cover the ditch to increase public health also created jobs.

Courtesy of Fort Collins Museum of Discovery, H20073

County history and the second largest in Colorado history at the time. The High Park Fire displaced thousands of residents in the surrounding communities and filled Fort Collins with heavy smoke. The mass charring caused by the High Park and Hewlett Fires had a significant impact on the future course of Fort Collins water management.

After the High Park Fire, a team from the National Interagency Fire Center concluded that major damage to the watershed was very likely to occur within one to three years unless swift and multifaceted mitigation began. Along with the localized devastation, the High Park Fire threatened Utilities' properties and water supply. The fire's heat upset the soil composition, causing the ground to repel rain water. Erosion and flash flooding could adversely affect life, property and drinking and irrigation water. Heavy rains would threaten to drain debris into the Poudre River or cause a flood on the unstable terrain, sending dangerous amounts of water to the heavily populated city below and clogging Utilities' Poudre River intake.[2]

Over time, the City has acquired additional water supplies to supplement its water rights from the Poudre River. The ownership and availability of Horsetooth Reservoir shares gave the City flexibility in its water treatment and delivery strategy when the Poudre River ran black with ash. After the 2012 fires, the diversion dam in the Poudre Canyon remained sealed as the City dealt with lingering water quality issues. Unable to channel Poudre River water to the treatment plant, Fort Collins continued to depend on Horsetooth water. By the end of 2012, Utilities' Water Resources Manager Donnie Dustin announced the likelihood of water restrictions for the coming year due to the uncertainty of the available water supply. In an effort to increase available supplies for treatment, Fort Collins offered to exchange some of its Poudre River water supplies to local farmers for their Horsetooth Reservoir supplies.[3]

Water restrictions were put in place in April, but abundant spring snows brought the snowpack back to normal, and the restrictions were lifted in June. In fact, 2013 turned out to be an unusually wet year—so wet that in mid-September, several days of record-breaking rainfall created devastating flood conditions along Front Range rivers, including the Poudre. While flooding along the river was less extreme than in watersheds further south, it created serious short-term hazards and resulted in severe road and property damage. Even with all the destruction, the flood also scoured and cleansed the riverbed of the heavy loads of ash and silt from the 2012 fires, leaving in its wake a purified river with improved wildlife habitat and water quality conditions for downstream users.

Along with environmental emergencies, the history of Utilities reflects legislative changes, population growth and its own evolving management philosophy to meet the future needs of the growing community. This short history of those events and decisions revisits the content of the 1983 history, *From Bucket to Basin*, which tells the story from the early 1980s to the present. This book also explains how the water utilities in Fort Collins fit within this story and offers a framework for understanding past decisions and present circumstances.

Water has crucially influenced Fort Collins development and the quality of life that flourished within the city. From the city's early ditches to the Poudre Rivers's complex watershed and ecologically sensitive stormwater drainage basins, the history of Fort Collins Water Utilities—water, wastewater and stormwater—demonstrates the relentless challenge of managing a reliable water supply and system of infrastructure in a semi-arid region. Management of urban growth with careful planning and consideration of environmental consequences demonstrates a significant evolution for the city since the

late 19th century when Fort Collins was characterized by haphazard development with sole reliance on seasonally available water. Like other public entities, Utilities and its history reflect changing attitudes about the environment and public health needs.[4]

In the 20th century, Fort Collins city officials worked to secure a safe and reliable water supply through the acquisition and development of water rights, water treatment and water distribution. The collection and treatment of wastewater reduced pollution and promoted health, and the later development of stormwater drainage systems improved the impact from runoff and increased flood protection. Statewide and national trends in water management techniques and policy influenced local activities and decisions in Fort Collins. Utilities operations typically kept up with public expectations about water services and also began to anticipate future changes that would be required to meet the community's specific needs.

Along with economic and social changes, the geography of Fort Collins also plays a role in this story. The semi-arid climate not only contributes to its rugged beauty, but also presents a fundamental challenge that requires complex solutions to meet human needs. In 1803, after the acquisition of western land with the Louisiana Purchase, the U.S. government deployed surveyors to inventory the nation's interior and its resources. Manifest Destiny—the belief that the American nation was meant to expand its influence and territory across the continent—the dream of individual land ownership, the promise of abundant natural resources such as precious metals and beaver pelts, and the healthy arid climate lured Americans westward.

But the dry climate required western travelers and settlers to seek proactive solutions for a basic need: water. They had to consider where to obtain it, how to harness a reliable supply and how to manage its uses fairly among settlers. In Colorado, disputes over this scarce resource resulted in a unique set of related laws known as the Colorado Doctrine, which contains four basic principles. First, it establishes that all surface and groundwater is a public resource for beneficial use by public agencies and private citizens. Second, it defines a water right as the legal permission to use a portion of this public resource. The doctrine also allows for water rights owners to build necessary infrastructure to move water across others' property and use of existing streams and aquifers for transporting and storing water. Those who divert water maintain the rights to that water by virtue of a plan for beneficial use, with the goal of avoiding water waste. In times of short supply, water users with earlier court-decreed rights can access water before those with junior rights. Westerners referred to this as the Doctrine of Prior Appropriation or "first in time, first in right." Like all Colorado water users, Utilities operates within this complicated system of water law that has driven the City's water acquisition and administration strategies over time.

In the 21st century, Fort Collins Water Utilities has grown into a multipurpose entity with interrelated departments that treat and manage water as it travels from the mountains to the city and is then returned to the river. Utilities provides nearly 9 billion gallons of water to customers in its service area, which includes some customers outside city limits and excludes others within it who are served water by Fort Collins-Loveland Water District or East Larimer County Water District. This patchwork arrangement reveals the pattern of city growth over time.

Fort Collins has three distinct water utilities that, along with Light and Power, form Fort Collins Utilities. The water utility manages water supply, watershed health and water resources, including water shares, distribution,

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Fort Collins Utilities employees outside their Walnut Street office (left) and at the Poudre Canyon Plant (right), circa 1952. Since the Utilities inception in 1882, the number of employees and internal departments has grown steadily along with its water system and services.

Courtesy of Fort Collins Museum of Discovery, H08699 and H08702

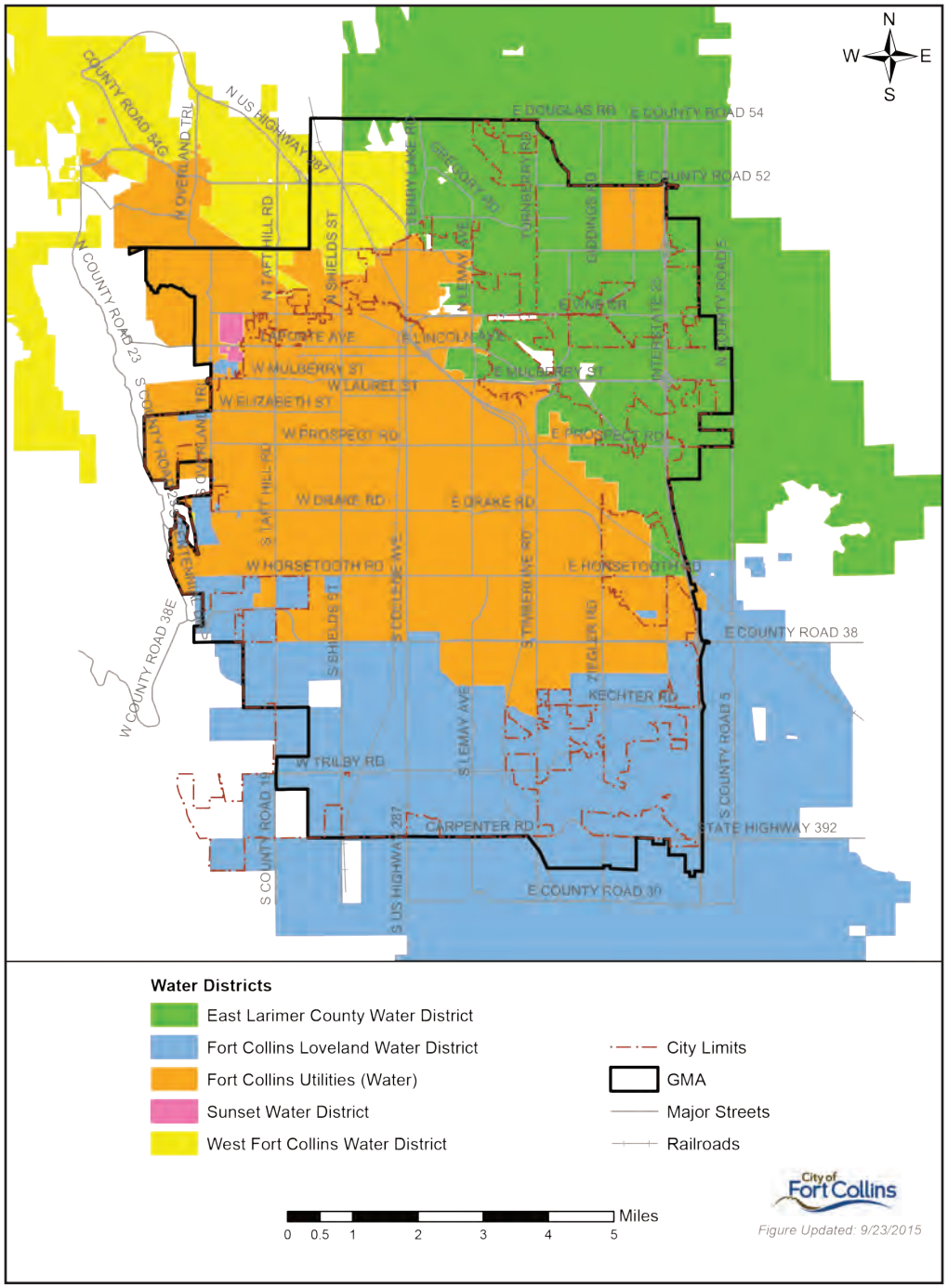
treatment and conservation. Those responsible for water supply ensure that enough water consistently reaches the treatment plant. There the treatment processes ensure that safe and reliable drinking water is available for the community. Distribution superintendents satisfy customer expectations that safe and pressurized water will flow when the faucet is turned on.

The wastewater utility oversees wastewater collection, treatment and biosolids reclamation work. Wastewater reclamation facilities collect and clean the water, return an ample supply to the river and efficiently handle biosolids.

The stormwater utility constructs and maintains drains and collection basins. Stormwater drains and pipes protect people and property from flooding and the river from polluted drainage.

These individual utilities appear independent, but as they embraced more complicated water processes and technology over time, the water flowing through their systems unites them.

The history of Fort Collins Utilities reflects general development trends in modern cities as well as important individual decisions that determined its course and led to an era of water management that required infrastructure maintenance and consideration of environmental implications. To understand Utilities in the 21st century, it is important to consider how settlers, community members and Utilities employees dealt with the relationship between resources, technology and expertise beginning in the mid-19th century.



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Area water districts.

Courtesy of Fort Collins Utilities

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Camp Collins on the banks of the Poudre River

Courtesy of Fort Collins Museum of Discovery, H00842

1

Settlement:
Meeting Basic Needs

1840s–1880s

Before European-American settlements in the mid-19th century, various Native peoples inhabited and moved through the Fort Collins area. The Arapahoe, Cheyenne, Ute and Comanche crisscrossed the foothills hunting and trading and engaging in warfare over resources and territory. Their nomadic cultures were mobile communities that pursued food and water supplies on a seasonal basis. Unlike the tribes living in settled communities further south, these Native groups did not practice irrigated agriculture and instead adapted their lifestyle to the seasonal flows and naturally occurring provisions of their environment.

In this era before the construction of dams and reservoirs, the Poudre River flowed freely without human intervention, its mountain watershed shaded by lodgepole and ponderosa pine, Engelmann spruce, Douglas fir and cottonwood trees. Falcons, eagles and osprey soared overhead. Bighorn sheep scaled the granite rock framing the Poudre River, while beaver and Greenback Cutthroat trout inhabited its clear waters. Whitewater rapids roared in narrow valleys and slowed to pools in wide bends. Relentless spring sunshine melted mountain snow at the high elevations, bringing seasonal flooding to the Poudre River's lower reaches until the snowmelt fully dissipated. Early explorers of the region noted that the rivers ran full near the foothills and depleted as they reached the plains. In 1859, Horace Greeley remarked that these mountain streams were so different from the eastern rivers he had known, saying that the prairie began to "drink them up from the time they strike it."[5] In this thirsty region, the Poudre River attracted human settlement and wildlife along its banks.[6]

Migrants from the eastern states moved into the western territories in pursuit of fur, gold and land, bringing with them eastern and European ideas about land and water use based on agricultural practices from very different bioregions. New European-American settlements, reliant upon crops grown for the market, clashed with and disrupted the established regional practices of the Arapahoe, Ute and Cheyenne peoples. Conflict arose between these groups, and the U. S. government deployed federal soldiers to forts in the western territories to protect American citizens and investments, including settlements, commerce trails and property.

In 1863, the F and B companies of the 11th Ohio regiment of volunteer cavalry commanded by Lieutenant Colonel William O. Collins established Camp Collins to

protect the Overland Trail from bandits and conflicts with Native peoples. The camp's strategic location on the banks of the Poudre River seemed logical to those who did not understand the magnitude of the natural flood cycles. Within a year of its establishment, the spring runoff flooded the camp and forced the inhabitants to move Camp Collins farther east, along the south side of the river. In 1864, after the flood and relocation, inhabitants renamed their camp Fort Collins, suggesting a more permanent settlement.[7]

In the late 1860s, shortly after Fort Collins' reestablishment, the U.S. government's conflict with Native peoples began to wane with the development of reservations. As a result, military encampments consolidated, and the soldiers left Fort Collins. Various squatters remained and platted the area in anticipation of legal homesteading. In 1872, the government opened the territory to preemptive homesteading, which gave squatters priority to the land. By this time, a distinct mark of human settlement in the arid West—irrigation ditches—was already present in the Fort Collins landscape.

Many traveled to Colorado for its natural resources like mining and agriculture. These people dug some of the first ditches in the Fort Collins area to water their vegetable, fruit, hay and grain crops. In 1860, G.R. Sanderson built the Poudre River's first ditch to water the Yeager homestead in Bellvue. The Yeager Ditch had first priority water rights on the Poudre River. A group from Mercer, Pennsylvania arrived in 1869 and began constructing their own ditch to irrigate the intended agricultural colony; however, the group ran out of funds before the project's completion, since ditch digging required extensive time, labor and money.[8]

As the local population grew, entrepreneurs offered solutions to the intimidating endeavor through the creation of ditch companies. They constructed large-scale projects and absorbed failed attempts, such as the New Mercer Ditch. In the 1870s, longer canals opened up more area for farming further away from the Poudre River, including the Fort Collins Irrigation Canal, or Arthur Ditch, which was constructed in 1873 by a group led by James B. Arthur.

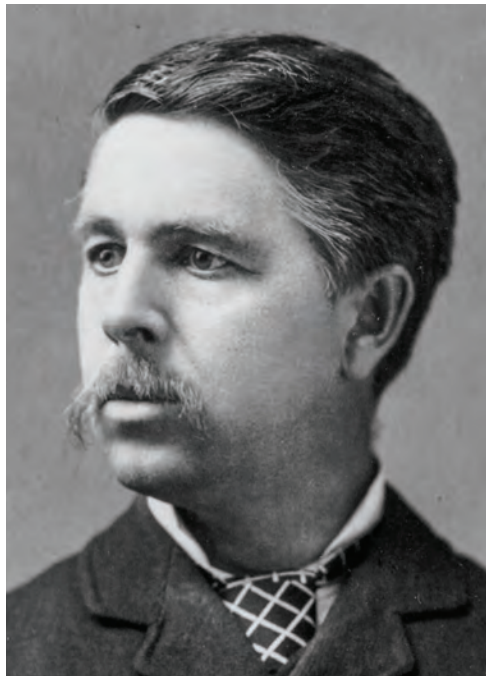
Between 1873 and 1874, Benjamin Eaton and his crew constructed Larimer County Canal No. 2. Nearly 50 irrigation channels ran through the Poudre region by the early 1880s with the potential to irrigate 150,000 acres. Companies, cooperative groups and individuals continued to divert Poudre River water, and by 1881 a local farmer diverted the nineteenth priority on the river. The extensive landscape changes suggested these settlers held the dry western land to the same expectations as moist eastern soil, in both appearance and capacity to produce.[9]

Encouraged by development boosters making bold, idealized claims about western landowning opportunities, more Americans traveled from the east to Colorado expecting to find fertile soil and lush landscapes. Controlling the location and year-round availability of water with ditches and reservoirs allowed settlers to quickly cultivate productive farms and fast-growing residential areas in the Poudre valley. However, the 30-inch difference in average yearly precipitation between the wet eastern states and the dry western territories created new obstacles. The natural stream-flow cycle of the Poudre River further complicated this challenge. It collected a higher rate of mountain precipitation and surprised the settlers with its impressive quantity of spring and summer runoff. Together, a surging river and a surging population were two conditions for disaster. Careful planning for a western town required consideration of the climate and the Poudre River flows.

In 1872, the newly established Fort Collins Agricultural Colony, with a population of more than 700 residents, recruited Franklin C. Avery to plat its new farming community. Avery, a native New Yorker, had been a surveyor for the nearby utopian agricultural community, the Union Colony (Greeley). Taking advantage of the vastness of the location, Avery developed the area with wide streets that ran north-south and east-west, rather than orient them toward the Poudre River as the "old town" had been. The platting also accounted for the Colorado Agricultural College on land purchased for the newly established school by local businessmen. Avery's influence on early Fort Collins development also included founding the First National Bank and serving as president of the Larimer County Ditch Company, later the Water Supply and Storage Company, which built one of the largest irrigation systems in Colorado. In 1873, three years before Colorado statehood, Larimer County incorporated Fort Collins as a town. Platted streets, an agricultural college and the arrival of the Colorado Central Railroad in 1877 became the foundation for a settled farming and ranching community and established Fort Collins as a promising commercial and cultural hub.[10]

Fort Collins development progressed with short-term solutions to meet immediate needs. The necessities of water, food and shelter were met quickly with raw river water, small-scale farming and wooden structures. Implementing long-term solutions required time and money that the new town lacked. The community built more wood-frame structures as Fort Collins grew, and a town emerged on the landscape. While the growing population used the various local ditches for irrigation water, residents also used the same ditches for sewage disposal and domestic needs in their homes, a practice which introduced the risk of disease. Two entrepreneurs capitalized on the lack of an in-town water supply and sold buckets of water, first from a horse-drawn travois in 1877 and later from a water wagon by the bucket- or barrel-full.[11]

These short-term solutions sustained the town until crisis resulted in the formation of Fort Collins' first long-term public service project: a city-developed water supply system. On the night of Feb. 3, 1880, a large fire destroyed the Welch Block on the northwest corner of College and Mountain avenues, killing two people. The wooden town was at high risk of fire because of the lack of water and adequate



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Franklin C. Avery (1849–1923) invested time, ideas and money into the early development of Fort Collins, including its water development.

Courtesy of Fort Collins Museum of Discovery, H11075

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1873 Avery Map of Fort Collins. Notice the "old town" oriented toward the river, while the "new town" embraced a modern rationale of gridded streets based on the north-south, east-west directions.

Courtesy of Fort Collins Museum of Discovery, H08092


MAP
OF THE TOWN OF
FORT COLLINS
LARIMER COUNTY
COLORADO
JANUARY 16 1873.
SCALE 300 FEET • ONE INCH
CACHE LA POUDRE
CACHE LA POUDRE AVE
VINE ST
ELM
SYCAMORE ST
CHERRY ST
MAPLE ST
LAPORTE AVE.
MOUNTAIN AVE
OLIVE ST
OAK ST
SHERWOOD
MELDRUM
COLLEGE AVE
HOWES
MASON
COURT HOUSE SQUARE 101
HIGH SCHOOL
WASHINGTON PARK
GRAND ISLAND
HILL ISLAND
SPRUCE ST
WILLOW ST
PINE ST
JEFFERSON ST
WALNUT ST
LINDEN ST
CHESTNUT ST
LINCOLN AVE
RIVERSIDE AVE
LINCOLN PARK
LINCOLN PLACE
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A hand powered water pump provided pressurized water without the benefit of a citywide water system.

Courtesy of Rocky Mountain National Park Museum

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The "water wagon" brought Poudre River water into the expanding town where Fort Collins residents could buy a domestic supply and avoid trekking to the river.

Courtesy of Fort Collins Museum of Discovery, H19525

firefighting equipment. In the latter decades of the 19th century, as the U.S. population grew and communities became more densely populated and quickly developed, fires were common throughout the nation and included many large-scale examples, such as the Great Chicago Fire of 1871.[12]

One month after the Welch Block fire, Fort Collins residents petitioned for a water supply system to travel by gravity-flow from Claymore Lake, located northwest of town, with the goal of getting pressurized water to neighborhoods for firefighting. As a result, Fort Collins' board of trustees considered several additional locations for a water works. One option was to install pumps near the millrace on the corner of Willow and Lincoln. Another option was to build a reservoir that would be fed by the Town (Arthur) Ditch. The board abandoned this last option because it questioned whether the Town Ditch could supply the necessary flows. On May 11, 1881, taxpayers voted in a special election on the millrace option, but it lost by eight votes due to the low-lying location of the millrace and fear that the water would become contaminated. The election delayed the construction of a water works and showed that voters prioritized quality and reliability of water over the convenience of a nearby supply, despite the need for fire protection.[13] In a letter to the editor of the *Fort Collins Courier* on Feb. 2, 1882, local resident "S.M." stated, "As to whether the time has come for water works or not, I don't know. But the time has come when our town must have better protection [against fire]."[14]

Later that year, on April 4, a turning point was reached when taxpayers voted 268 to 44 in favor of a water works 3.5 miles from town. For the deciding voters, this location offered close access for both firefighting and filtered water from the Poudre River. Civil engineer H.P. Handy steered the water works construction. Handy prepared a report on domestic and fire water supply for a population of at least 15,000 people. Longmont, Denver, Salida, Cañon City, Pueblo and Colorado Springs provided representative examples of systems for the engineer to consider. Handy and a special committee advertised for bids on the City's first public infrastructure project, and debate arose about what kind of system to build and how much money a suitable system required. Again, conflict delayed water works construction and the sense of urgency faded away.[15]

Soon another crisis re-emphasized the importance of a municipal water works. On Sept. 15, 1882, a fire burned the Keystone Block on the southwest corner of Jefferson and Linden streets. With two more lives lost, the City committed to action. On Sept. 20, 1882, the City accepted the $77,000 plan presented by contractors Russell and Alexander of Colorado Springs. The 1880 Welch Block fire encouraged officials to select a location for its water system, but it took a second structural fire to motivate officials to agree on how to construct the infrastructure.

The primary purpose for the new water works was to create pressurized water for firefighting. The drop in elevation from the chosen location to town created insufficient pressure for this, so officials agreed on a pumping system to meet their needs. Excavation for the structure, settling reservoir and pipeline began before the end of the year. In early 1883, pump house technology and piping equipment arrived and building commenced. On June 8, 1883, the recently established board of trustees accepted the water works from Russell and Alexander, who hosted a dinner for the community officials to celebrate the City's water supply network.

Lacking an original river diversion of its own, the City constructed a supply canal that carried water from the river to the pump house. Water entered the facility for two reasons: to provide hydropower and to be pumped into town. The water for supply was

filtered through sand. The additional water powered an internal water wheel, creating pressure for distribution. The water used to power the wheel returned to the river through a tailrace while the spinning wheel pushed filtered water into wrought iron pipes that sent it to town for fire protection. The water works supply network included the strategic installation of 20 double fire hydrants downtown. For domestic use, residents could pay to hook up to the City water system, but this service got a slow start as the Poudre River and various ditches satisfied most residents' needs. An 1889 City ordinance listed water service for a four-room private dwelling at a cost of $10 per year.[16]

The picturesque Gothic Revival architectural style of the water works building contrasts with the site's function as an industrial pump house. The label "water works," as opposed to the pre-industrial term "water house," emphasized the mechanical function of the site. The pump house was a modern engineering achievement in an era when rapid innovations began to allow communities to harness nature using science and technology. The site celebrates the individuals involved with a sandstone plaque engraved with the names of City officials who supported its construction. City Treasurer Charles H. Sheldon's name also is engraved in the sandstone doorsill just under the original plaque. Debate continues about whether the structure once included an external water wheel. There are no photographs of the wheel, but popular memory asserts that one sat outside the structure into the mid-20th century. The water wheel mystery, as well as the building's unique architectural style, contributes to the charm of this late 19th century Fort Collins landmark.[17]

After the City met the challenge of water distribution, it confronted yet another predicament. In May 1891, the contagious bacterial disease, diphtheria, infected at least four citizens. Some local citizens blamed filthy streets and alleys, along with the new water system, and they campaigned for the system's enhancement. In 1894 and 1895, the City budget allowed for water works improvements. The City constructed a brick retaining wall, enlarged the storage reservoir, added a boiler room that housed a boiler and steam-powered pump to provide additional pressure and a filtration room that utilized sand filtration and provided the city with clearer water. After improvements, the property included the three-room pump house and accompanying retaining wall, a spillway that allowed excess reservoir water to return to the river and the tailrace that directed the discharged water. It also included the superintendent's 1883 residence, a 1930s apple orchard, barn and chicken house and a unique habitat of cottonwoods and native grasses.[18]

In 1889, the low flow of the Poudre River caused a water shortage for the region's growing communities and farms. Neighboring ditch companies and towns, including Greeley, accused Fort Collins of diverting prior-appropriated water for its supply canal, contributing to the scarcity of the resource. Because of this, the City obtained its first water right by purchasing the John R. Brown Ditch, priority No. 14 on the Poudre River, from Thomas Gilkinson. The John R. Brown Ditch's high priority on the Poudre River provided an advantageous position for the town that a new diversion could not offer. As the Poudre River's location and cycles dictated Fort Collins' early settlement patterns, so too would its many uses promote increasing settlement and industry while invoking strong feelings about water within the Fort Collins community that molded the city's character.[19]

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Cherry Street looking east at the Town Ditch, circa 1917.

Courtesy of Fort Collins Utilities

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The southeast face of the original 1882–83 pump house, including the spillway in the background and the tailrace in the foreground. The property is open seasonally for tours.

Courtesy of Poudre Landmark Foundation

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This USDA map from "The Reservoir System of the Cache la Poudre Valley" by E.S. Nettleton shows irrigation canals in 1901.

2

Development:
Harnessing Nature

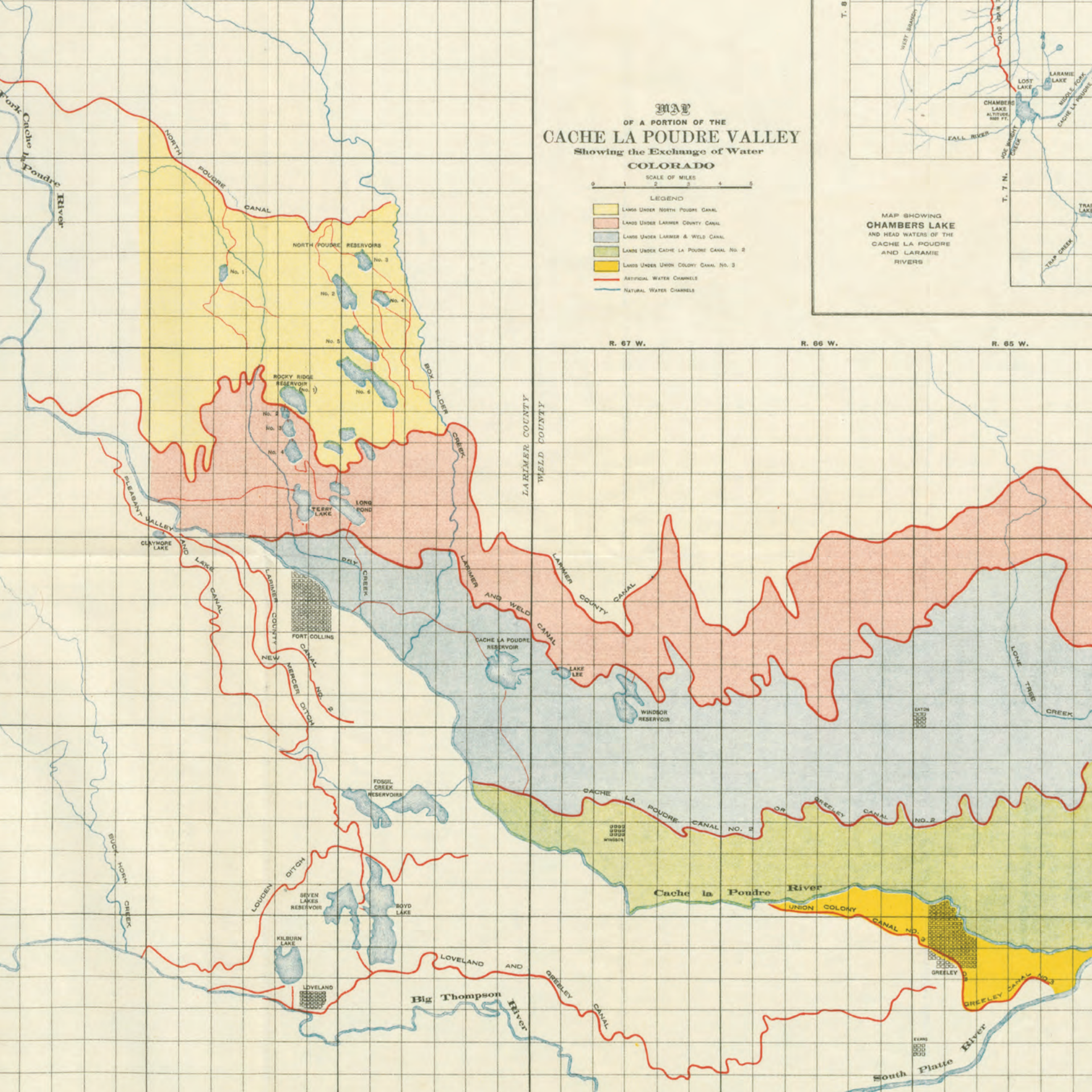
1880s–1930s

Water treatment and distribution lured more settlers and industry to Fort Collins. By 1900, the town had grown to more than 3,000 residents and was surrounded by an active matrix of farms and ranches that took their water from five major ditches coming off the Poudre River. After the first water works was constructed to serve the town's residents, water service "became an integral part of life in Fort Collins."[20] As more people settled in northern Colorado, the pressure of meeting the needs of a rapidly growing population drove the decisions of early water managers. In the following decades, additional technological advancements allowed for increased understanding and management of water and also brought unpredictable challenges associated with providing water to a rapidly changing urban environment.[21]

With the water works in motion, the Poudre River watershed became an important issue for Fort Collins decision makers, and the City invested in the river's upstream health. Water influenced the City governmental organization and what departments were needed, including the formation of a Water Works committee, later the Water Committee, as an extension of City Council and a precursor to Fort Collins Utilities. The Water Works Committee was originally comprised of three City aldermen. By 1899, water supervision transitioned to the City Clerk's duties, officially adding Superintendent of Water, Sewers and Drains, with an $83.33 per month salary, to his title and responsibilities. Council also hired an Assistant Water Superintendent to aid the City Clerk, with a $60 per month salary. An understanding of the Poudre River's many components increased the complexity of municipal water services. Over the following years, Fort Collins officials confronted disease, flood and drought.[22]

Adequate water quantity was becoming an ongoing challenge. Between 1900 and 1910, the population of Fort Collins more than doubled, from 3,053 to 8,210, surpassing Colorado's rate of population growth during the same period, which jumped from just under 500,000 to more than 1 million residents. The development of the sugar beet industry in northern Colorado increased the population and diversity of Fort Collins as Germans, African Americans and Hispanics arrived to meet the labor needs of farms and factories.

Residential development and expanding industry strained the original water system. In Fort Collins and across the state, population


MAP
OF A PORTION OF THE
CACHE LA POUDRE VALLEY
Showing the Exchange of Water
COLORADO
SCALE OF MILES
0 1 2 3 4 5
LEGEND
Lands Under North Poudre Canal
Lands Under Larimer County Canal
Lands Under Larimer & Weld Canal
Lands Under Cache la Poudre Canal No. 2
Lands Under Union Colony Canal No. 3
Artificial Water Channels
Natural Water Channels
MAP SHOWING
CHAMBERS LAKE
AND HEAD WATERS OF THE
CACHE LA POUDRE
AND LARAMIE
RIVERS
T. 8 N.
T. 7 N.
CHAMBERS LAKE ALTITUDE 9985 FT.
LOST LAKE
LARAMIE LAKE
MIDDLE FORK
CACHE LA POUDRE
WEST BRANCH
FALL RIVER
JOE WRIGHT CREEK
TRAP CREEK
R. 67 W.
R. 66 W.
R. 65 W.
North Fork Cache la Poudre River
NORTH POUDRE CANAL
NORTH POUDRE RESERVOIRS
No. 1
No. 2
No. 3
No. 4
No. 5
No. 6
ROCKY RIDGE RESERVOIR (No. 1)
BOX ELDER CREEK
LARIMER COUNTY
WELD COUNTY
PLEASANT VALLEY AND LAKE CANAL
TERRY LAKE
LONG POND
CLAYMORE LAKE
DRY CREEK
LARIMER COUNTY CANAL
LARIMER AND WELD CANAL
FORT COLLINS
NEW MERCER DITCH
LARIMER COUNTY CANAL NO. 2
CACHE LA POUDRE RESERVOIR
LAKE LEE
WINDSOR RESERVOIR
LONE TREE CREEK
EATON
FOSSIL CREEK RESERVOIRS
CACHE LA POUDRE CANAL NO. 2
OR GREELEY CANAL NO. 2
WINDSOR
Cache la Poudre River
UNION COLONY CANAL NO. 3
GREELEY
GREELEY CANAL NO. 3
BUCK HORN CREEK
LOUDEN DITCH
SEVEN LAKES RESERVOIR
BOYD LAKE
KILBURN LAKE
LOVELAND
LOVELAND AND GREELEY CANAL
Big Thompson River
EVANS
South Platte River

growth caused some officials, including Colorado water commissioner Hiram Prince, to consider solutions such as diverting water from the less-populated Western Slope. Prince requested that the Colorado Legislature provide funding to survey the Continental Divide in an effort to find a suitable route for a west-to-east-slope diversion. In 1889, Prince used $20,000 provided by the Legislature to survey a tunnel from Monarch Lake to St. Vrain Creek. However, the difficult terrain delayed several transmountain diversion attempts. The first ditch that diverted water from the Western to the Eastern Slope was the Grand River Ditch, begun in 1890. Employed by the Grand River Ditch Company, Japanese and Mexican laborers dug the ditch by hand to divert water from the Never Summer Mountain Range to the Poudre River.[23]

Additionally, public concern about water grew beyond basic supply and fire protection to include public health issues. At the time, the germ theory of disease was beginning to replace the long-held common belief that disease spread through bad odors, or "miasmas," caused by impure air and stagnant water. Foul odors emanating from waste in the outhouses were seen as a dangerous source of disease. The turbulence and flow of running surface water was thought to purify it, making it safe for human consumption. Although the miasma theory was fading amongst scientists in favor of germ theory, the solution of diluting human waste in the river still seemed logical to most. In 1888, Fort Collins introduced its first sewer mains that piped sewage directly into the Poudre River. Many businesses lined up along College Avenue so they could connect their structures to the sewer lines, demonstrating their belief that they had created a modern and sanitary downtown district.[24]

Even with germ theory taking hold in the 1890s, putrid odors remained a concern in the community. In an 1891 *Fort Collins Weekly Courier* article, Mrs. Mary J. Carpenter quoted

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Hiram Prince, Colorado water commissioner (1880–1885), former justice of the peace, Republican Colorado State Representative in the lower house and ancestor of Fort Collins Utilities employee Errin Henggeler.

Courtesy of Errin Henggeler

"Dr. Lincoln's prize essay, 'School Hygiene,'" where he wrote, "The common sense of civilized races suspects them [bad air and stenches], and there is no doubt that they may promote debility, headache, loss of appetite and digestive tone, and general depression of vitality."[25] This method of contamination soon proved to be faulty.

The construction of the first water works had addressed the town's first priority of firefighting and the new sewer pipelines removed unwanted human waste, but the dangers of unaddressed and poorly understood sanitation issues immediately loomed. At the pump house, sand filtration offered only a physical, not a chemical, treatment of the drinking water. This system satisfied Fort Collins residents until another crisis heightened public awareness. A typhoid outbreak from 1900 to 1901 sparked fear throughout town. State Board of Health bacteriologist, Dr. William C. Mitchell of Denver, investigated the potential sources of the disease from the Fort Collins water supply to dairy farms to various points along the Poudre River. By testing water throughout the town for bacteria and tracing typhoid victims, his study concluded that the outbreak resulted from the actions of a nurse in Bellvue who had dumped contaminated waste into a ditch that led to the Poudre River. Typhoid bacteria in the water reached the pump house and dispersed the organism through town. As a result, a discussion about the location of the city's water intake ensued.[26]

In December 1900, Dr. Mitchell recommended that Fort Collins stop diverting water from its present location in favor of a higher diversion point, ideally off the main stem of the Poudre River above its confluence with the North Fork. He specified this area because the land surrounding that headgate "could be purchased and preserved free from intrusion by campers, and such a supply would offer immunity against typhoid fever."[27] Mitchell also suggested that only updating the pump house was insufficient because the problematic location of the diversion was the largest factor in the typhoid epidemic. Fort Collins citizens were fearful as well as frustrated because typhoid seemed to be preventable with an improved system. City engineer William Rist subsequently conducted a survey that examined the cost and feasibility of moving the main intake above the North Fork of the Poudre River and offered options to use either iron or wood stave pipes.[28]

The residents of Fort Collins felt the need to improve their first water works as the availability of technological solutions increased, new scientific knowledge spread,

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Employees of the Grand Irrigation Ditch Company digging the Grand Ditch, which was the first diversion of water from the Western Slope to the East, circa 1890.

Courtesy of Fort Collins Museum of Discovery, H07700

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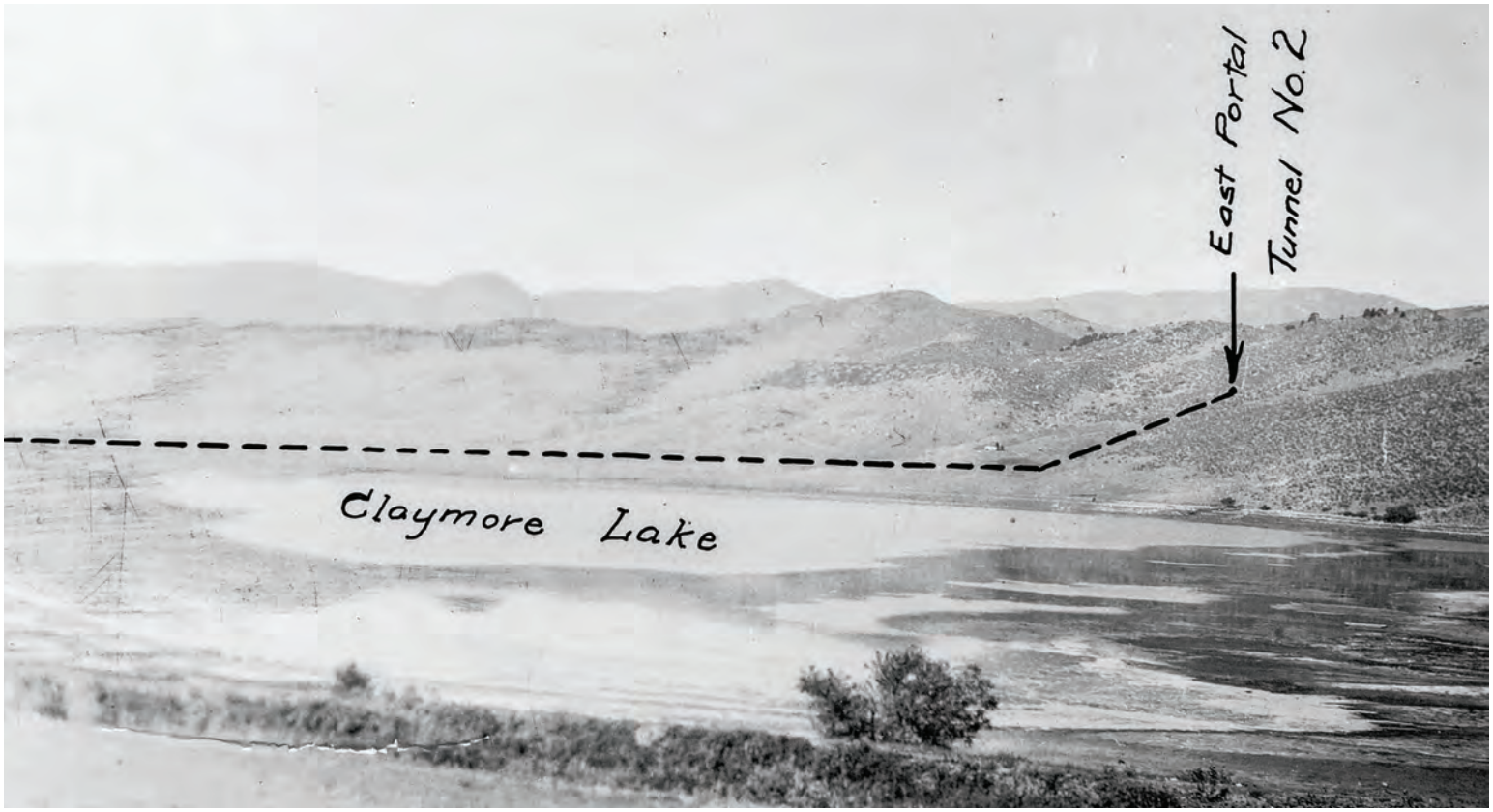
Poudre Canyon Water Treatment Plant, circa 1910.

Courtesy of Fort Collins Museum of Discovery, H08701A

the population grew and disease remained a problem. Local physicians advocated for improved treatment processes and pipe networks to combat the pressures of managing a growing population and its increasingly sullied environment. On March 4, 1903, the City Council resolved to hold a special election on the water works intake location. Six days later, Fort Collins taxpayers voted in favor of relocating the diversion point. The City moved its intake further up the Poudre Canyon, 15 miles from Fort Collins above where the North Fork converges with the main Poudre River



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Bingham Hill Reservoir pipeline alignment in the 1920s.

Courtesy of Fort Collins Museum of Discovery, H19505

corridor, in an effort to avoid contamination from users and downriver settlements. The new water works, completed in 1905, housed only a filtration system, yet leaders felt that the purer diversion point was a major step in improving the city's water supply. The 1882-1883 water works remained on stand-by from 1905 to 1916 and subsequently was used for storage by the City.[29]

Along with infrastructure improvements, the pending update to the Fort Collins water system inspired an increased desire for a secure water supply. In 1904, Fort Collins purchased 2.651 second-feet—cubic feet per second flow—of first priority rights on the Poudre River from the Yeager Ditch for $3,500. On June 10, 1905, Fort Collins completed the Poudre Canyon Water Treatment Plant. The new water facility used a cost-effective gravity system for distribution, an improvement on the pump system at the 1882-1883 water works. Another update from the first facility was the use of wood stave pipes, which decreased the friction and corrosion of wrought iron pipes.

This second water facility evolved into Fort Collins' first water treatment plant. However, the public debated whether to incorporate "mechanical" (chemical) treatment. A 1908 *Fort Collins Weekly Courier* article proposed the need for a settling basin at the new water works building in order to maintain not just clear, but pure, water during spring and summer runoff when bacteria and filth entered the river.[30] Water clarity seemed to be the priority, with purity as the second motivation for treatment. Because the source was now farther up the canyon and presumably provided cleaner raw water, opponents of mechanical treatment believed additional purification efforts and expenses were unnecessary. A 1909 *Express Courier* article argued that sand filtration was sufficient given the new Fort Collins plant's proximity to the pure source. However, later that month, the paper predicted that planned road construction projects in the Poudre Canyon would bring large amounts of laborers, "who would be mostly foreigners," and warned of the danger of their "careless[ness] of sanitary regulations."[31] This fear contributed to the argument that the City's water treatment methods should be extended.[32]

During this period of expansion, the number of water administration personnel also grew. In 1909, the Fort Collins City Council approved new positions to work

with its Water Works and Sewers and Drains committees: Robert S. Fedder as Superintendent of Sewers and Drains, John Cameron as Assistant Water Superintendent, Lon James as Engineer and John Glendenning as Head Water Works Engineer.[33]

Months later, the City Council voted on the filter question. The Council weighed the need to provide clear water during spring runoff against worries about the cost of construction and operation of a mechanical filter plant. In July 1909, despite arguments that slow sand filtration would suffice, the Council selected a mechanical filtering method that used an aluminum-based coagulant as one part of the filtration process, along with sand filtration. The coagulant purifies water by attracting impurities in the liquid to its exposed solid surface in a process known as adsorption. With this decision, Fort Collins water management incorporated a more thorough water treatment process. In 1910, to store the greater quantity of treated water that provided insurance against a contamination event, the City constructed Bingham Hill reservoir on Bingham Hill Road between Bellvue and Overland Trail. This covered concrete "clearwater" reservoir stored more than 4 million gallons of treated water from the Poudre Canyon Plant to meet the City's peak distribution demands.[34]

As Fort Collins' industry and population continued to expand, the Poudre Canyon Plant received ongoing updates to its original operating capacity to serve the growing customer base. In 1913, the City added six new sand filters, which increased treatment capacity to 6 million gallons per day. The sand filtration process was slow and the added sand filters allowed the plant operators to treat more water in less time. The City continued improvements in other areas of its water operations, including obtaining more water rights. In 1921, Fort Collins purchased the last of the Yeager priority and first rights on the Poudre River from Oda Mason for $2,125.[35]

A secure water supply required not only adequate quantity and appropriate treatment and delivery systems, but also a protected watershed to ensure quality. In the 1920s, the completion of the Poudre Canyon Road enticed travelers to the foothills west of Fort Collins as an escape from the bustling urban areas that continued to emerge across the Front Range. The Colorado National Forest, established in 1910 and renamed Roosevelt National Forest in 1932 to honor Theodore Roosevelt, protected watersheds, provided a lumber source and offered recreational opportunities. In the 20th century, federal agencies such as the United States Forest Service and municipal entities such as Fort Collins Water Utilities were called upon to meet more diverse and complex needs, including resource protection. Therefore, they were required to cooperate to address the needs of an entire region.

Watershed protection was a primary area of mutual interest. City officials observed that more traffic in the adjacent foothills compromised the Poudre River's quality. In May 1923, the City of Fort Collins and the City of Greeley asked the U. S. Forest Service to create a partnership to protect the Poudre River's Little South Fork watershed. The area had potential to become a lucrative tourist attraction with its dense forests and clear streams beckoning campers with its distinct Colorado scene. Fort Collins and Greeley wanted to help regulate activity in the area and appealed to the Forest Service that the cities would enforce the Forest Service's health regulations and eliminate the possibility of invading homesteaders with the cities' constant presence in the area.

The resulting contract between the United States Department of Agriculture (which encompasses the U.S. Forest Service), Fort Collins and Greeley stated that the cities' activities in the area assisted water supply protection. The two cities further established their presence near the Little South Fork watershed when they jointly purchased the L.O. Rockwell ranch, about 40 miles northwest of Fort Collins, for $14,250 in an effort to prevent development of summer cottages on the land. The cities then leased campgrounds where they could enforce health regulations and used the income to pay interest on their loans. Fort Collins and Greeley also purchased the Dixon homestead near Fort Collins to secure the health of the river closer to home. In the 1920s, the two cities, along with Larimer County, paid the salary of a full-time, year-round employee to protect and patrol the watershed area to prevent excess waste disposal and contamination of the Poudre River—an early example of watershed monitoring and protection that has matured into a full-fledged profession and the "waterkeeper" movement.[36]

With the water source secured, Fort Collins turned its attention to other water-related concerns. Since the first public water system began in 1882, the City had met relentless population growth with technological solutions and budgetary allocations to meet its water needs. As development expanded in the region, the City Council passed an ordinance in 1924 allowing the creation of outside water districts in new development areas surrounding the city—a decision that would prove prescient as the urban growth area spread beyond the utility's service area in the 1960s. As the population grew and moved beyond the city limits and services, Fort Collins could not provide water services to these new neighborhoods. The ordinance also stipulated that only tax-paying residents within the city limits should benefit from the City's infrastructure. Developers created the water districts with consideration of where Fort Collins would expand and shouldered the costs of bringing water service to the new neighborhoods.[37] Because City leaders chose not to provide water services to these areas, it would have to contend with the long-term consequences of lack of control and oversight at its margins.

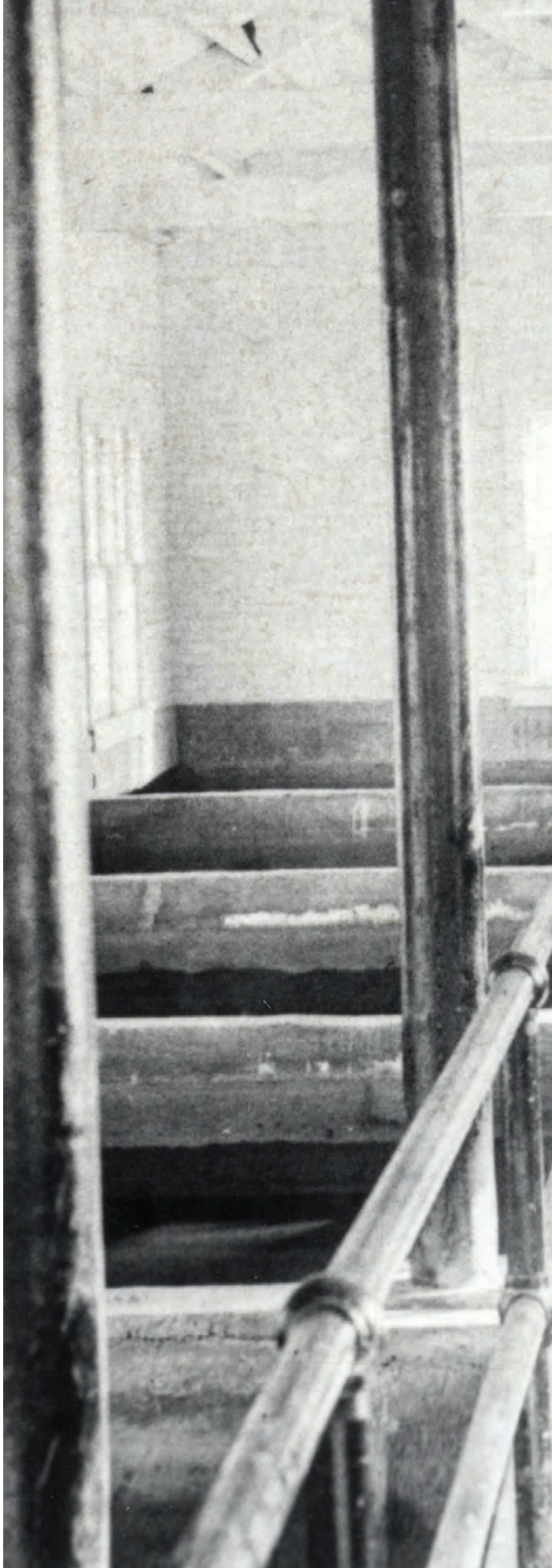
For its existing water customers, the City already had reached maximum capacity to deliver safe water in reliable quantities. In 1924, Commissioner of Public Works Frank P. Goeder (a position first held by D.C. Armitage when Fort Collins adopted the commission-form of government in 1913) and City Engineer E.A. Lawyer submitted a report to City Council that stated the population had grown to a point where the current water system had no flexibility to accommodate for the unpredictable, whether that be a "series of cloud-bursts" or an "unusual consumption of water."[38]

In 1925, City budget invested in the current water system. The City upgraded the Poudre Canyon Plant in an effort to anticipate and promote the growth of Fort Collins and constructed a new filter plant, adding six more sand filters to replace the 1913 filters. A 185,000 gallon washwater tank replaced the original pump system with a gravity backwash system. The new facilities also included a new pre-sedimentation basin, a flocculation-sedimentation basin and a chemical feed and storage facility, which increased treatment capacity to 9 million gallons per day from 6 million gallons per day. The Poudre Canyon Plant also converted to chlorine gas for disinfection (a relatively new treatment innovation at the time), installed additional power generation and built another pipeline to the city. In the following year, the City constructed Soldier Canyon Reservoir, another reservoir for treated water along with Bingham Hill, near the base of the foothills. Rather than raw water storage, reservoirs for treated water increased the volume available within the plant and compensated for fluctuations in demand.[39]

Fort Collins added more modern conveniences during the early decades of the 20th century. Effective storm drainage was a matter of civic pride for communities, including Fort Collins, but the city had a history of flooding, with major events in 1864, 1902, 1904 and 1923. The construction of storm sewers was rudimentary in an era lacking defined maps of floodplains and dedicated staff for addressing flooding and runoff management. Early storm drainage construction occurred in conjunction with street paving operations in the 1910s and 1920s.[40]

Fort Collins residents had viewed the open channel of the Arthur Ditch (also known as the Town Ditch) running through the growing city as a safety concern and health risk since the town expanded to cross the waterway at the turn of the century. Feasibility studies were directed at the problem of how to cover it or transfer the water to another ditch. In 1934, after much debate and petitioning from residents, the City moved forward with the project using municipal bonds and federal New Deal funding through the Federal Emergency Administration of Public Works (later renamed the Public Works Administration) to fund the costs of covering sections of the ditch.[41] An uncovered segment of the main ditch still runs across the Colorado State University campus west of the Lory Student Center.

In the 1930s, water-related concerns in Fort Collins shifted from flooding to drought. The Great Depression and severe drought of that decade caused Coloradans to consider the reliability of their water supply. During that devastating period, westerners lacked a dependable water supply for irrigation, and topsoil from the hardest hit states on the Great Plains blew away in dust clouds. The federal government responded with multipurpose projects designed on an unprecedented scale. The C-BT project was conceptualized by the Bureau of Reclamation in 1937. It addressed various water needs in the growing Front Range region, which required increased irrigation and domestic supplies. The project



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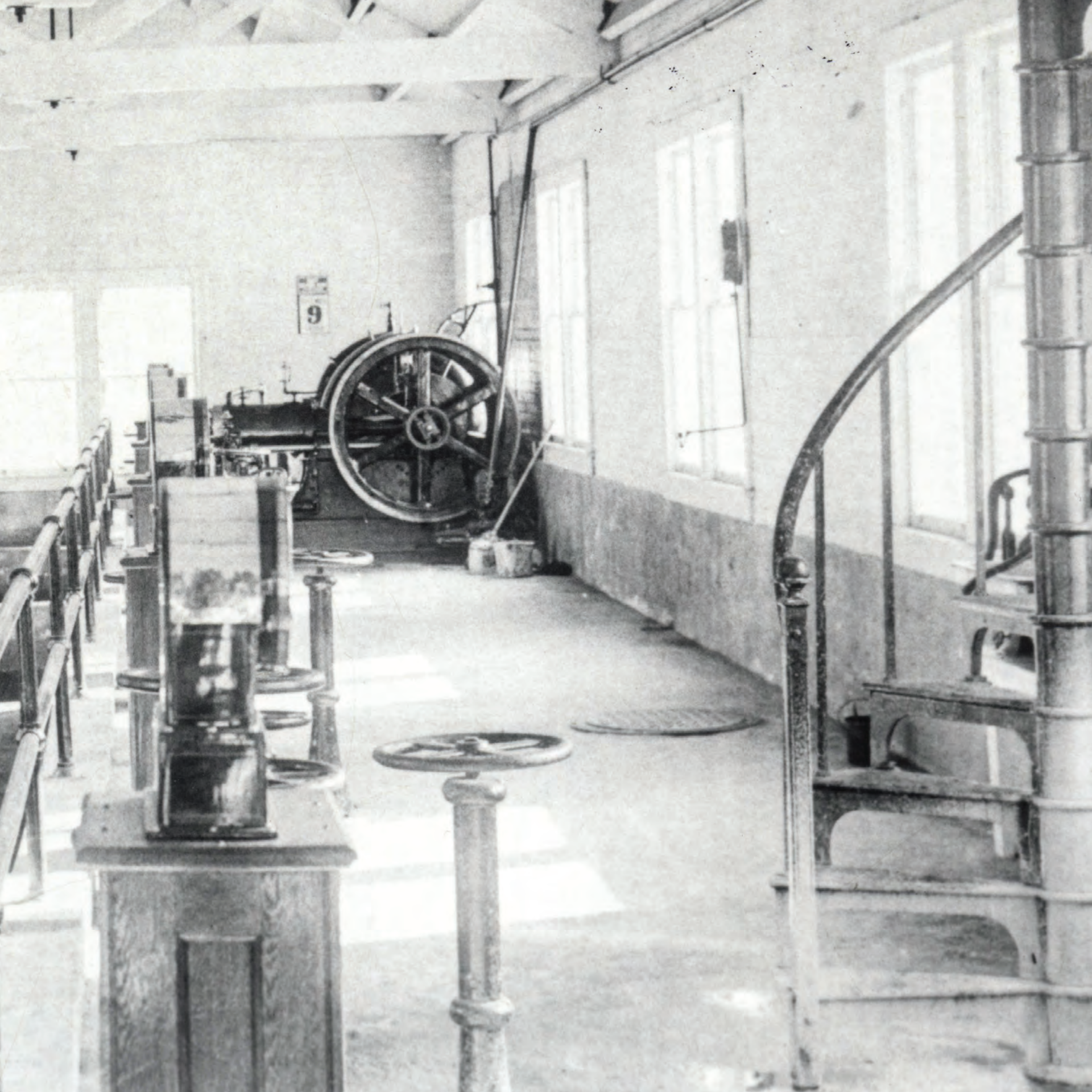
The original six sand filters constructed at the Poudre Canyon Plant in 1913.

Courtesy of Fort Collins Museum of Discovery, H21882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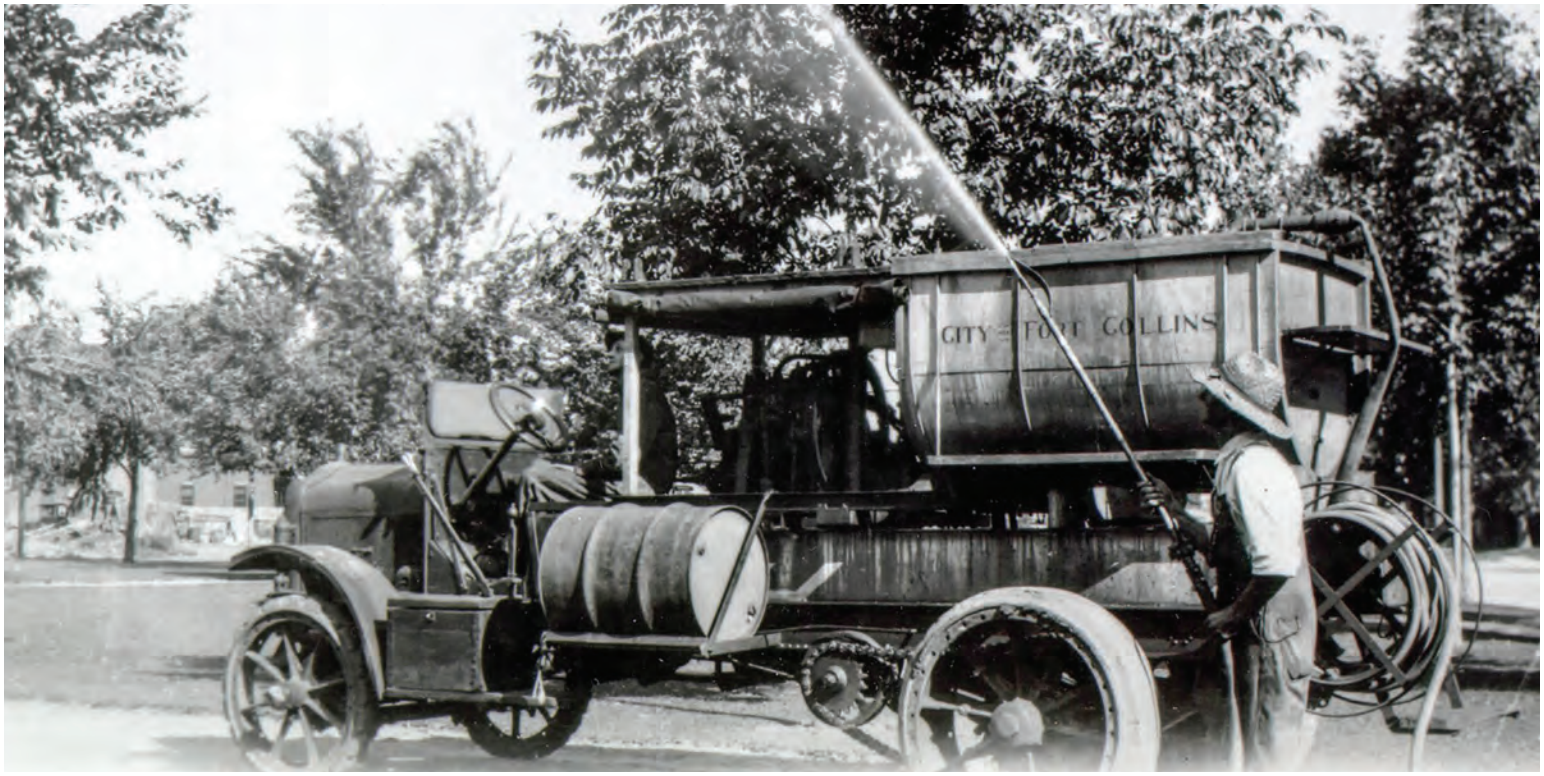

The 1920s Fort Collins water system added to the aesthetics of the city by sprinkling lawns as well as dirt streets to keep the dust down.

Courtesy of Fort Collins Museum of Discovery, H14858

was contentious because it required diversion of water across the Continental Divide from Colorado's mountainous Western slope to the heavily-populated and urbanizing Front Range. In 1937, Colorado Governor Teller Ammons signed the Water Conservancy District Act that created water districts throughout the state to manage its water resources under consideration of conservation and beneficial use. The new law led to the establishment of the Northern Colorado Water Conservancy District (NCWCD), which managed C-BT construction and resources.[42]

After the Bureau of Reclamation finished the Hoover Dam in 1936, its purpose expanded beyond building western irrigation projects solely for agriculture, and it began planning developments with multiple uses. The Bureau strived to provide the growing Front Range populations with more water through the C-BT project. The C-BT project embraced this multipurpose method of water management on a large scale, and Fort Collins would eventually benefit from these advancements that supplemented its water needs. On July 5, 1938, the C-BT project began with the signing of the contract between the United States and newly created NCWCD to manage the project.

Although the C-BT project had multipurpose intentions from its inception, the goals varied in importance. Water for irrigation remained the highest priority in the project's early years, while electric power production, recreation and urban growth also benefited. However, C-BT water use changed over time. In 1974, 12 percent of C-BT water served municipal and domestic uses. By 2009, municipalities owned two-thirds of C-BT water units, leasing some units back to farmers and using 40 percent for municipal and domestic purposes.[43]

As planning and construction ensued for the C-BT project, wastewater operations in Fort Collins developed simultaneously. For

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1923 Flood, looking northwest from Ault Road (now Lincoln Street). Buckingham Place neighborhood is visible in the upper right.

Courtesy of Fort Collins Museum of Discovery, H06528

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Stanley Case in 1982, just before his retirement from the City of Fort Collins.

Courtesy of Larimer County Water Ways Project

decades, sewage from Fort Collins residences and businesses flowed untreated into the Poudre River—a common practice in most Colorado cities at the time. In May 1932, S.R. McKelvy, M.D., Secretary and Executive Director of the State of Colorado Division of Public Health, confronted Fort Collins and 50 other Colorado cities about pollution from their sewage disposal practices. The widespread neglect of proper wastewater treatment throughout Colorado reflected the cities' inability to manage the water and sanitary needs of a rapidly growing population. Sewage from upstream cities such as Fort Collins increased pollution for downstream populations. From 1932 to 1948, the City designed and constructed its first wastewater treatment facility, now known as a wastewater reclamation facility, on Mulberry Street, a necessary step in the modernization of the Fort Collins Water Department that represented the increasing complexity of municipal water administration.[44]

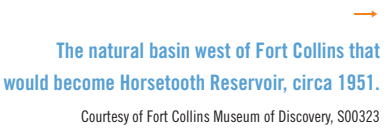
The new emphasis on growth planning required the City to make proactive decisions that would meet immediate utility service needs and anticipate future needs. In 1938, a City ordinance created the Department of Utilities under one entity with the Manager of the Light and Power Department, Guy Palmes, as administrator of all water projects and City services. In 1939, City Council created the position of City Manager, and Palmes transferred to the new position and remained until 1961. Palmes' administrative position was split: Stanley R. Case filled Palmes' position as Manager of Light and Power and Charles Liquin succeeded Palmes' position as manager of Water and Wastewater.[45] Increased complexity in water management and infrastructure demanded creative solutions to meet multiple needs.[46]

In this intense period of modernization from the 1880s to the 1930s, the Fort Collins water system grew from hand-carried buckets and primitive irrigation ditches to a complex network of water and wastewater treatment plants, reservoirs, pipes, hydrants, multiple water rights and shares and an official government entity to manage operations. The foundation laid during these decades would be challenged and expanded as Fort Collins experienced exponential population growth in the following years.

3

Growth:
Water and Infrastructure Management

1940s–1960s



The natural basin west of Fort Collins that would become Horsetooth Reservoir, circa 1951.

Courtesy of Fort Collins Museum of Discovery, S00323

In August 1956, Ralph Parshall addressed the Fort Collins Rotary Club about his observations of the changing western climate, and therefore landscape, over the last 50 years. A professor at CSU, Parshall was a pioneer of civil engineering and hydrology and inventor of the still-used Parshall flume that accurately measures water flow in channels. Describing the evidence behind his concerns about future water supply, he stated that "mean temperatures are increasing and precipitation is decreasing," citing the cause as an "astronomical effect." [48]

The Great Depression and World War II slowed life and development in Fort Collins. However, when the war ended, Fort Collins, like much of the United States, confronted the challenge of providing for population booms like never before. Postwar population growth caused many in the crowded eastern United States to look for new opportunities in the vast western landscape. The West had plenty of land but it lacked sufficient water supply and infrastructure to accommodate rapid growth. Despite this limitation, the GI Bill, industrial growth, baby boom and expansion of the Colorado Agricultural and Mechanical College (Colorado A&M) into Colorado State University (CSU) more than doubled the Fort Collins population from 12,251 residents in 1940 to 25,027 residents in 1960. To support this growth, Fort Collins was progressive in its attempts to secure water rights and storage for its community. The water utility needed to make crucial decisions related to growth, planning and infrastructure, water supply, delivery and treatment that affected the rate and distribution of city expansion.

As the C-BT project progressed, Fort Collins continued to improve its local infrastructure. In 1947, new public health codes required disinfection of surface waters and promoted filtration. Fort Collins water treatment was ahead of this regulation, yet it progressed further with a new flocculation-sedimentation basin and a new chemical feed storage building at the Poudre Canyon Plant.

In 1948, Fort Collins completed construction of its first wastewater treatment plant, now known as Mulberry Water Reclamation Facility, which included a "comminutor and flume structure, primary and secondary clarifiers, trickling filters, digesters, control houses, sludge drying beds, piping and connections to the sewer system." It was anticipated to treat an average of 3 million gallons per day.[47] This system pulverized solids in the comminutor, then measured them with a Parshall flume and deposited them in settling chambers where sludge settled to the bottom and oils rose to the surface to be skimmed off by a primary clarifier. The effluent, or liquid wastewater with the solids removed, passed to


KLZ

The crowd that gathered for the 1951 dedication of Horsetooth Reservoir.

Courtesy of Fort Collins Museum of Discovery, S00325

The history of Fort Collins Water Utilities would be incomplete without special mention of the Alexander family. Herb and Esther Alexander, and later their son, Ben Alexander, made a substantial impact on Utilities' services. Herb started working for Utilities in 1942 and retired from his position as Poudre Canyon Plant Superintendent in 1979. Herb and Esther lived at the Poudre Canyon Plant site and took their responsibility very seriously. In a 1984 oral history conducted by local historian Charlene Tresner, Esther Alexander commented, "The telephone was in the house—if they needed anything, I was the one that was called. And of course, you live right there, you live with it. Your kids are learning it. You learn everything about the water works." She added, "And it's like herding sheep. You've got to be with the water all the time."[54] Many Utilities employees acknowledge the contributions of both Herb and Ben Alexander. Herb played a large role in the planning and eventual acquisition of the Michigan Ditch system, and Ben implemented many of the first-class water treatment practices that are admired by industry experts throughout the world.

the trickling filter where organisms consumed the biological material, then the liquid passed through another sedimentation basin, the secondary clarifier, and was piped back into the river. The sludge that settled out of the effluent was placed on drying beds.

In 1955, the Poudre Canyon Plant also received additional upgrades. More filters increased treatment capacity to 18 million gallons per day, and 12 miles of new 27-inch steel pipeline was constructed from the plant to the City's distribution system. The completion of the wastewater treatment facility and expansion of the Poudre Canyon Plant allowed for postwar growth of the city. It treated the increased water needs of the growing population, which would grow even more in the following decade when Fort Collins Utilities began to rely on C-BT water stored in Horsetooth Reservoir as additional supply.[49]

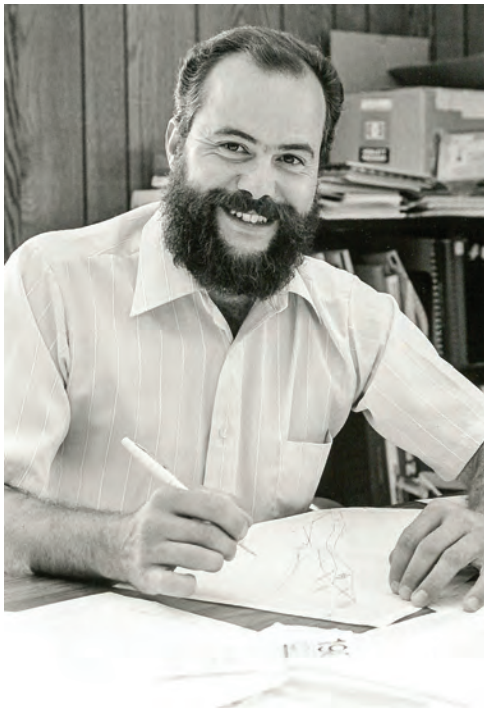
The Bureau of Reclamation and NCWCD completed Horsetooth Reservoir in 1949 with a capacity of 156,735 acre-feet, and the first water was stored in 1951. In 1958, the City of Fort Collins purchased 6,052 units of the C-BT system for delivery from Horsetooth. This acquisition provided a cushion for drought years and surplus water for summer irrigation. The Poudre River and Horsetooth Reservoir remain the City's two main sources of water supply.[50]

Concerns about a perpetual water supply surfaced in the 1950s, sparking a debate that foreshadowed 21st century dialogue about climate change and water conservation. A 1953 Louisiana newspaper article reported that Gerald S. Parker, senior geologist for the U.S. Geological Survey, told Colorado A&M students that "this nation is not, by any means, running out of water," apart from some scattered areas where "water mining" is taking place and may be detrimental if continued.[51] He asserted that there were no overall signs of either an increase or decrease in water in the future. The observations of Ralph Parshall proved to be more prescient. These conflicting concerns influenced how City officials approached water acquisition. Low precipitation meant a thin snowpack and decreased seasonal river flows. The swelling population demanded more water, yet the fear of changing climate patterns further complicated Utilities' operations.

The postwar population boom required quick decision making in water operations, which sometimes led to conflicts with other water users. In the 1950s, Fort Collins purchased 8 cubic feet per second (cfs) of priority No. 13, the Coy Ditch, and attempted to move the point of diversion 13 miles upstream to the Poudre Canyon Plant in order to satisfy the beneficial use requirement. The proposed change in diversion would affect many downriver water rights holders, particularly local farmers. This plan led Fort Collins and local farmers to the Colorado Supreme Court.

Because junior water users would be adversely affected by the change in diversion, the Supreme Court questioned the plan. While water rights usage can legally change from agricultural to municipal, junior water users have the right to protect their property. Senior water right holders return excess water to the river as return flows, which junior water right holders can access. A change in diversion affects junior water rights if the amount of water historically returned to the river is decreased. In Conrad C. Green, et al., v. The Chaffee Ditch Company, et al., the court ruled that the location of the original diversion could not be detached from the right itself, as it would upset historic flows. Also, more junior appropriators had expectations for their flow to remain as it did at the time of appropriation and the rights that they held had to be considered. The farmers won the case because the City's needs were not a sufficient claim to take away water from junior appropriations.[52]

The controversy led to a general understanding that the City of Fort Collins needed a stronger planning process to ensure an adequate water supply. It also needed to repair relations with the local agricultural community and other downstream users. City Council member Harvey Johnson was elected mayor while also serving as president of the Water Supply and Storage Company. With expertise in resolving supply and delivery problems and connections in the water community, Johnson was the right person at the right time to address the City's strategic planning needs. Johnson immediately created a Water Board to provide guidance



to City Council. The board was comprised of knowledgeable members with a variety of backgrounds who could advise on thoughtful and strategic water development. Initially, it focused on distribution and how to balance the needs of the community with the needs of other basin users. Later, the Board refocused its attention from distribution to supply.[53]

The traumas of the Great Depression, Dust Bowl and World War II sparked change throughout the United States. The lack of resources during those trying times led to an increased governmental role in the provision for and protection of United States citizens. New projects aimed to meet long-term needs. Projects focused on multiple purposes to make full use of funding, infrastructure and labor. More federal aid, postwar mass consumption and more young people attending college changed the mentality and landscape of the country. As the growing population used more resources, the health of the environment gained attention. The creation of the Water Board in the 1960s improved strategic planning and relationships with downstream users. The following decades emphasized that Water Utilities also had to consider its environmental impact, from its mountain watershed to downstream habitats. In the final decades of the 20th century and into the 21st century, federal regulation, water conservation and resource security guided the water utilities toward more sustainable practices for both water supply and infrastructure development.

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Ben Alexander

Courtesy of Fort Collins Utilities

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Herb Alexander in front of the Poudre Canyon Plant, circa 1955.

Courtesy of Fort Collins Museum of Discovery, H10254

4

Maintaining
a Thriving Community

1970s–PRESENT

Beginning in the 1970s, Fort Collins Utilities transformed again as a reflection of the interconnected functions of water use and community planning. The water utility upheld their mandates to provide the community with safe, reliable drinking water, keep the Poudre River unpolluted and protect life and property. These factors required them to remain flexible and adapt to the changing needs of a developing community. After the 1970s, regulation increased and a new conservation ideal spread. The City's water supply and infrastructure depended on sustaining the existing system—both its natural and man-made components.[55]

Water Acquisition: Growing Resource and Infrastructure Management

In the 1960s, environmental problems associated with urban development spurred new laws and regulations. Fort Collins Water Utilities confronted the challenge of providing water to its growing community while protecting water quality and quantity. Unpredictable droughts and floods added to the challenge of effective water management. The expansion of supply, treatment facilities and the distribution system allowed Fort Collins to prepare for increased population, federal regulation and unpredictable weather.

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Construction of the Water Treatment Facility at Soldier Canyon provided additional water treatment to accommodate the growing city.

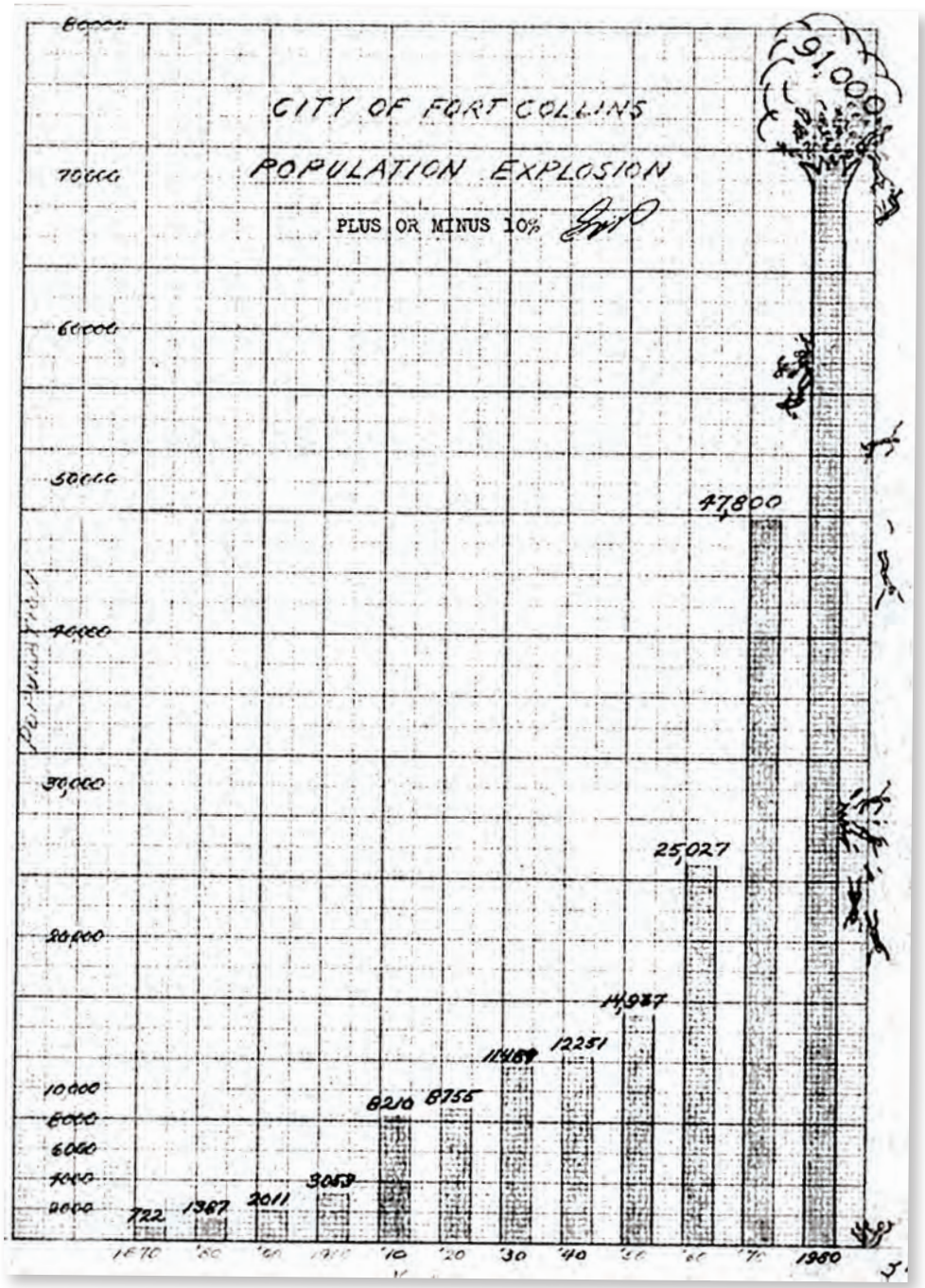
Courtesy of Fort Collins Utilities

Fort Collins Water Utilities' development mirrored the ever-changing relationship between watersheds, water treatment and wastewater. Adding new raw water to the system led to the need for greater treatment capacity and an expanded distribution system. Expansion of wastewater reclamation facilities naturally followed suit. These changes allowed the City to accommodate the rapid population growth and expansion of municipal boundaries. After the 1958 purchase of C-BT water, Fort Collins needed additional water and wastewater treatment plants, particularly

in the summer months when irrigation competed with municipal supply needs. Between 1967 and 1969, the City constructed the Water Treatment Facility at Soldier Canyon adjacent to Horsetooth Reservoir. It aided the Poudre Canyon Plant during peak summer months to meet the season's increased irrigation needs. Additionally, Wastewater Treatment Plant No. 2, now known as the Drake Water Reclamation Facility (DWRF), opened in 1968.

The City's acquisition of C-BT units supplemented its water supply but did not totally meet the projected needs related to population growth. In 1971, to protect its current supplies and to plan for future water demands, the City acquired the Michigan Ditch and Joe Wright Reservoir near Cameron Pass. North Poudre Irrigation Company (NPIC) traded the historic ditch and reservoir for the City's shares in the New Mercer, Larimer County No. 2, Josh Ames and Arthur ditches. The Michigan Ditch system dated back to 1902 when William Rist and John McNabb diverted water from the Michigan River, a tributary of the North Platte, over Cameron Pass to Joe Wright Creek, a tributary of the Poudre River. The men later sold the ditch to Mountain Supply and Ditch Company, which then transferred it to NPIC in 1908. NPIC extended the ditch with 2,000 feet of wooden stave pipe in 1923, and it reached Lake Agnes in 1925. By 1971, when Fort Collins Water Utilities bought the ditch and reservoir system, it needed extensive renovations to reach its full potential, resulting in one of the largest projects Fort Collins Water Utilities had undertaken to date.

The Water Board, led by president Ward Fischer and Fort Collins City Council under mayor Harvey Johnson, considered other options for meeting Fort Collins' water supply demands, including investment in the Windy Gap project, purchasing more units of C-BT water or expanding Joe Wright Reservoir to hold more water. After consultation with



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A 1963 graph showing Fort Collins' projected "population explosion" represents the challenge anticipated by water resources managers and potential harm to the community if they failed to meet the growing community's needs.[56]

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Michigan Ditch (horizontal line through the trees) carries water from the Michigan River over Cameron Pass to Joe Wright Reservoir where water then flows into the Poudre River. The ditch redirects the water flow to Fort Collins from its natural route toward Wyoming.

Courtesy of Fort Collins Utilities

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Mayor Harvey Johnson, (right) pictured at a ceremony as he left office in 1967. Johnson served on the Water Board for more than 20 years, and helped secure a stable water supply in Fort Collins during the population boom of the 1960s.

Courtesy of Fort Collins Museum of Discovery, CO1248

Fort Collins Mayor, Harvey Johnson, created the Water Board in 1963 to advise City Council on water issues, recognizing that shifts from agricultural to urban water uses needed interdisciplinary and diplomatic attention. In a 1974 oral interview conducted in the Poudre Canyon, Johnson remarked, "There's a lot of history wrapped up in this old canyon right here." Johnson also was the longtime president of the Water Supply and Storage Company and known for being a "walking encyclopedia." When asked about the field of water, Johnson replied, "A lot of theory … we do not control the weather, weather controls us." Johnson served as an active member of the Water Board for 20 years and became an honorary member from 1983 to 1990.[57]

the Water Board, the City Council chose to acquire more water within the Michigan Ditch-Joe Wright system. The Board identified this as the preferred alternative because it was the "most cost-effective means of supplying the needs of Fort Collins," as Fischer explained. It also gave the City freedom to manage its water supply more effectively through total utilization of the Michigan Ditch-Joe Wright system rather than merely overseeing portions of the Windy Gap or C-BT project.[58]

In 1980, the conclusion of the enlargement project at Joe Wright Reservoir and Michigan Ditch raised the storage capacity from 800 acre-feet to 7,200 acre-feet—an important contribution to the City's raw water holdings with an increase of 182 percent between 1972 and 1982.[59] The City also provided recreational opportunities at the scenic reservoir that met the Forest Service's requirements for recreational use, including visitor facilities and a 600 acre-foot minimum level to maintain fish survival.

From Fort Collins to Pueblo, the population along Colorado's Front Range continued to increase in the 1970s. A 1975 Forest Service report on the Michigan Ditch-Joe Wright project explained that water planning and development would become "a growth facilitator rather than a growth inducement force."[60] Fort Collins relied on this very strategy. In a 1989 interview, Fischer recalled that the City's limited planning efforts in the mid-20th century created an opening for the Water Board to use water as a "planning tool" for urban development. For example, in 1978

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Built in 1978, Hewlett-Packard in Fort Collins initially included three buildings.

Courtesy of Fort Collins Museum of Discovery, H08121

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Aerial view of Joe Wright Reservoir.

Courtesy of Dick Stenzel at the Applegate Group

when Hewlett-Packard (HP) constructed the facility on Harmony Road, many Fort Collins residents voiced concern about the city extending that far southeast. As a "matter of policy," the Water Board recommended that the City provide water service to HP rather than allow surrounding water districts to provide the water. With the inevitability of Fort Collins' southward growth, the City successfully anticipated the expansion and benefited from the relationship between water services and infrastructure development.

The water and sanitation districts that were developed to provide services beyond the city limits in the early 1960s, and that eventually serve 50 percent of the urban growth area, played an important complementary role. Known as the "Tri-Districts," the East Larimer County Water District, the North Weld County Water District and the Fort Collins-Loveland Water District, also exchange water with the City of Fort Collins, but remain separate, quasi-municipal entities that are not governed by the Fort Collins City Council, even though many of the customers they serve now live within the city limits due to annexation.[61]

The City eventually outgrew the 1905 Poudre Canyon Treatment Plant due to size limitations and very old infrastructure dating from 1914–1987. In 1987, Fort Collins Water Utilities decommissioned the facility, which brought sadness and nostalgia for many employees. Treatment was consolidated at Water Treatment Plant No. 2 near Horsetooth Reservoir. As water left the river at the Poudre Canyon Plant diversion (now Gateway Natural Area), it flowed to the new plant for treatment, bypassing the Poudre Canyon works entirely. While the old plant was an important part of Fort Collins municipal history, Water Treatment Plant No. 2 (now the Water Treatment Facility) allowed Utilities to employ advanced water quality engineering methods based upon the employees' knowledge of the characteristics of both river and reservoir water. At the new plant, operators mixed pure, yet more variable Poudre River water with the fairly stable Horsetooth Reservoir water to create the best quality raw water for treatment.[62]

In March 2017, a new Chlorine Contact Basin was placed into service at the Water Treatment Facility. This $9 million project consisted of a 2.5 million gallon baffled tank that provides contact time for disinfection of the City's drinking water supply. Other benefits of the basin project included delaying the need for new water storage tanks, providing emergency water storage and operational flexibility for the treatment facility and improving water quality for Utilities customers. The basin was constructed using almost 1 million pounds of reinforcing steel and over 4,500-cubic yards of concrete.

In addition to improvements in water treatment, the City continued to emphasize an adequate and secure supply of water for its growing populace. Halligan Reservoir, northwest of Fort Collins, was built in 1910 by NPIC to store water for its shareholders. In 1993, Fort Collins Water Utilities acquired the rights to the reservoir and surrounding land, but not the water in the reservoir. To provide a reserve for drought years, Fort Collins Water Utilities aimed to enlarge the dam to store spring runoff water that the City owned but could not hold.[63] The City's 2003 Water Supply and Demand Management Policy also pointed to the need for additional long-term water storage to capture surplus in wet years for use in periods of drought and high demand. As a key component of that strategy, the proposal to enlarge Halligan Reservoir required compliance with federal environmental law to determine its potential impact and suitability as the best alternative for meeting the required storage needs. That process began officially in 2006 when the City of Fort Collins and the City of Greeley sought permits with the intent to enlarge both Halligan Reservoir and Greeley's Seaman Reservoir. In 2015, the permitting process for Halligan and the Seaman reservoirs was separated. The draft Environmental Impact Statement (EIS) required by the National Environmental Policy Act (NEPA) for Halligan Reservoir is expected to be completed in 2017 and will determine the environmental effects of the reservoir enlargement project on the North Fork of the Poudre River.

Additionally, reservoirs not owned or used by the City still influence its current operations. In 2004, the NCWCD, now known as Northern Water (NW), proposed a water storage and distribution plan called the Northern Integrated Supply Project (NISP). A keystone of the proposed project requires damming the Poudre River to form Glade Reservoir northwest of Fort Collins. With a capacity of 170,000 acre-feet, Glade Reservoir would be 20 percent bigger than neighboring Horsetooth Reservoir. Its purpose would be to store water that otherwise runs to downriver states for 15 participating northern Colorado water

providers, including cities, towns and water districts. Proponents of NISP see the capture of water otherwise lost and recreational opportunities for northern Colorado.

Opponents of the project fear diverting water from the Poudre River will degrade the river's quality, compromising its habitats, and require more costly treatment for the City of Fort Collins. In 2008, Fort Collins created an interdisciplinary team to review the U.S. Army Corps of Engineer's (the Corps) Draft Environmental Impact Statement (DEIS) for NISP. The team's comments highlighted concerns about the project's effects on drinking water quality and costly treatment processes. As the federal agency that assesses and regulates environmental impacts, the Corps received extensive public comment on its first DEIS and is compiling a Supplemental Draft Environmental Impact Statement (SDEIS) as of 2017.[64]

Trans-mountain water had not been running in Michigan Ditch in the Poudre Canyon for two years due to an ongoing landslide in 2015. Portions of the ditch were open, but a stretch of it carried water through a cast iron pipeline. The landslide separated the pipeline at its joints, filling it with mud and taking the ditch out of commission.

Rather than continue to spend time and money on temporary repairs, the City

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The lag and ring Michigan Ditch tunnel, bored through solid rock at 10,000+ feet elevation, is 8 feet in diameter and 760 feet long.

Courtesy of Fort Collins Utilities

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Map of Fort Collins Water Supply System.

Courtesy of Fort Collins Utilities

determined that a tunnel was the best option to protect the water as it travels to Joe Wright Reservoir. A 760-foot rock tunnel was bored through the mountain and new pipe was installed during the summer of 2016. The ditch will make full use of Fort Collins water rights by springtime 2017.

Michigan Ditch provides Fort Collins with approximately 4,000 acre-feet of raw water in a typical year. In addition to providing for our water supply needs, also it is used to meet terms of water agreements with several entities, including Platte River Power Authority, Water Supply and Storage Company, and the City of Greeley. The market value of water supplied through the Michigan Ditch-Joe Wright Reservoir system is estimated at $183 million.

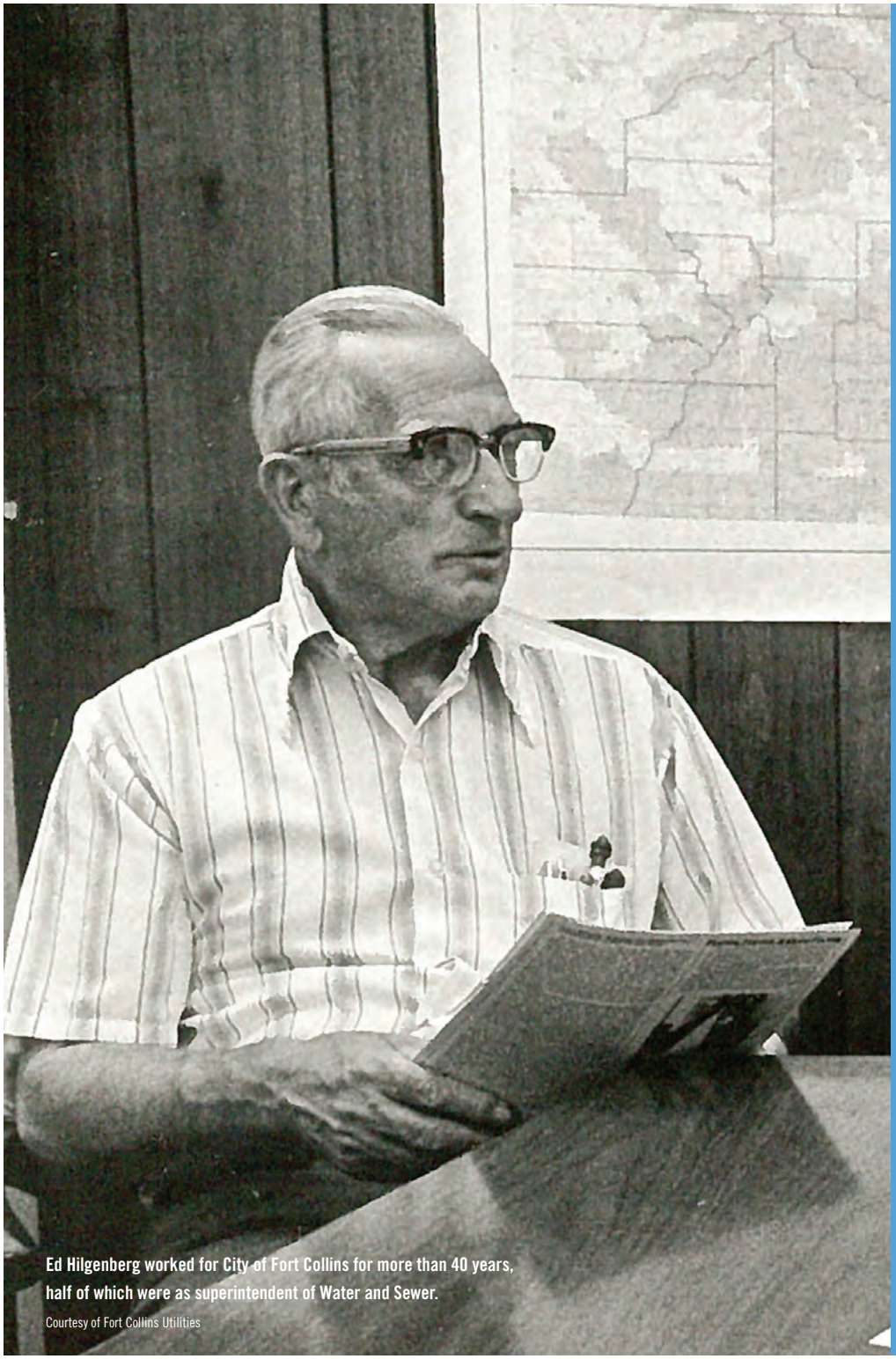
Construction began as soon as the snow could be cleared in early May 2016 and used two full construction crews who worked seven days a week, including two weeks of round-the-clock shifts to meet the time constraint due to winter weather approaching. The project was finished ahead of schedule in October, under budget and with no safety issues despite the logistical challenges of working at 10,000+ feet above sea level in a remote mountain area.

The tunnel was bored through the mountain using a custom built tunnel boring machine and lined with wood planks and steel rings. Similar to a Fiberglas lining, 60-inch diameter Hobas pipe was laid inside the tunnel and grouted in place. The capacity of the pipe is approximately 100 cubic feet per second (cfs), the maximum water right.

While short periods of no supply from Michigan Ditch do not have a great impact on the water supply outside of severe drought conditions, multiyear outages could have serious consequences. This investment in invaluable water rights infrastructure will protect one of Fort Collins' most valuable assets for generations to come.

Water Pollution and the Cross-Contamination of Sheldon Lake in City Park

During the 1960s and 1970s, the federal government's increased involvement in public health and environmental legislation affected how municipal utilities treated water. On Jan. 4, 1965, in his State of the Union address, President Lyndon B. Johnson demanded "that we end the poisoning of our rivers." His admonishment reflected the growing



Ed Hilgenberg worked for City of Fort Collins for more than 40 years, half of which were as superintendent of Water and Sewer.

Courtesy of Fort Collins Utilities

In 1932, the Great Depression hit Fort Collins, and Ed Hilgenberg left his studies at Fort Collins High School to help his father on the farm. In a 1980 oral interview, Hilgenberg says, "I don't think I'm any the worse off for living on a farm and roughing it … I think I learned a lot of things." After marrying his wife, Freida, Hilgenberg decided he needed to make a living and, in 1939, asked the City Engineer for a job. Hilgenberg began work digging graves and raking cemeteries. He worked for the City of Fort Collins until 1981, becoming the superintendent of Water and Sewer in 1959. He was introduced to the water utilities through his father-in-law who was the caretaker for Bingham Hill reservoir. "So the Water Department just kind of fell to me, and I liked it, and I learned it, and here I am … that's me," he says. Hilgenberg is remembered for his strong work ethic and common sense in his job, which greatly influenced his employees—the current "old timers" at Utilities. Hilgenberg offered sound advice when he said, "I think probably as long as you remember that you're working for the public and service is your role and ambition … you just do what you have to do, and do the best job you know how." Hilgenberg earned several awards during his career, including the American Public Works Association's prestigious Samuel Greeley Award in 1963 and Fort Collins Community Builder of the Year Award in 1977. The detailed photograph collection he donated to the local archive demonstrates his extensive knowledge and deep care for his job.[69]

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A May 1979 public awareness campaign expressed the importance of water conservation.

Courtesy of Fort Collins Utilities

ecological awareness of America's population increase, well-educated middle class that created a strong demand for environmental protection. The popularity of Rachel Carson's *Silent Spring* in 1962, the passage of the NEPA in 1969, the launch of Earth Day in 1970, the Safe Drinking Water Act of 1972 and the Endangered Species Act of 1973, reflected this growing political influence. It also increased awareness of the effects of urban development on the natural resources required for human survival. Within this broader context, planning related to Fort Collins water use, delivery and treatment also began to consider the needs and limitations of the entire Poudre River basin rather than just the needs of the local community.

New regulations on interstate rivers also influenced Fort Collins Water Utilities' adoption of water management and development practices that reflected regional environmental concerns. Fort Collins' principal water supply, the Poudre River, converges with the South Platte River just east of Greeley, then flows northeast into Nebraska and into the Mississippi River basin. On Jan. 18, 1965, Congress passed the Water Quality Act that amended the Water Pollution Control Act of 1956. This new law established the Federal Water Pollution Control Administration and allowed funding for research, development and construction of municipal wastewater treatment facilities to prevent the degradation of interstate rivers. The bill summed up the program for water pollution control and stated: "water pollution results from a man's use of a stream to carry away his wastes in the cheapest (to the polluter) possible manner and from natural events: such as erosion … most events leading to pollution of a river are interrelated … the logical approach to the control or prevention is on the river basin or watershed unit."[65] The Water Quality Act of 1965, amended again in 1972 to create the Clean Water Act, explicitly defined rivers as interrelated systems that required consideration of the various factors present in their basins and various uses. As a tributary of an interstate waterway, the Poudre River fell under the purview of the newly-created Water Pollution Control Administration.[66]

Because the municipal water system is interconnected with the river, water quality legislation affected all divisions within Fort Collins Water Utilities. Chemical additives to ensure healthy drinking water ended up in the wastewater, which received additional treatment at the reclamation facility before its return to the Poudre River. Also, storm drains carried rain and snow from the urban landscape to the Poudre River. The Water Quality Act of 1965 required Fort Collins Water Utilities to consider downstream water users, including municipalities, rural districts, natural habitats and industries. As a result, water management in Fort Collins grew in complexity.

In the mid-1960s, federal regulation required professional expertise that the water and wastewater utilities did not have on staff. Consequently, the City contracted services to keep up with the increasing regulations. When it came time for routine water sampling, for instance, samples were sent to the State Health Department in Denver because it did not have a certified in-house laboratory.[67]

Fort Collins Water Utilities also met the demands of its expanding customer base by increasing the number of professionals in their administrative organization. Both water and wastewater utilities augmented their procedures, and supervisory roles began to change. During the 1960s and 1970s, supervisors such as Herb Alexander, Ed Hilgenberg and Cotton Morgan who had all worked for the City since World War II, had developed flexible, spontaneous, yet thorough and deeply committed approaches to water services. Their intimate knowledge of their jobs and strong work ethics influenced incoming employees. Increased federal regulation changed this personal approach,

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Lab technicians Janie Dodd (left) and Keith Elmund (right) evaluate water samples from the Fort Collins area, circa 1970.

Courtesy of Fort Collins Utilities

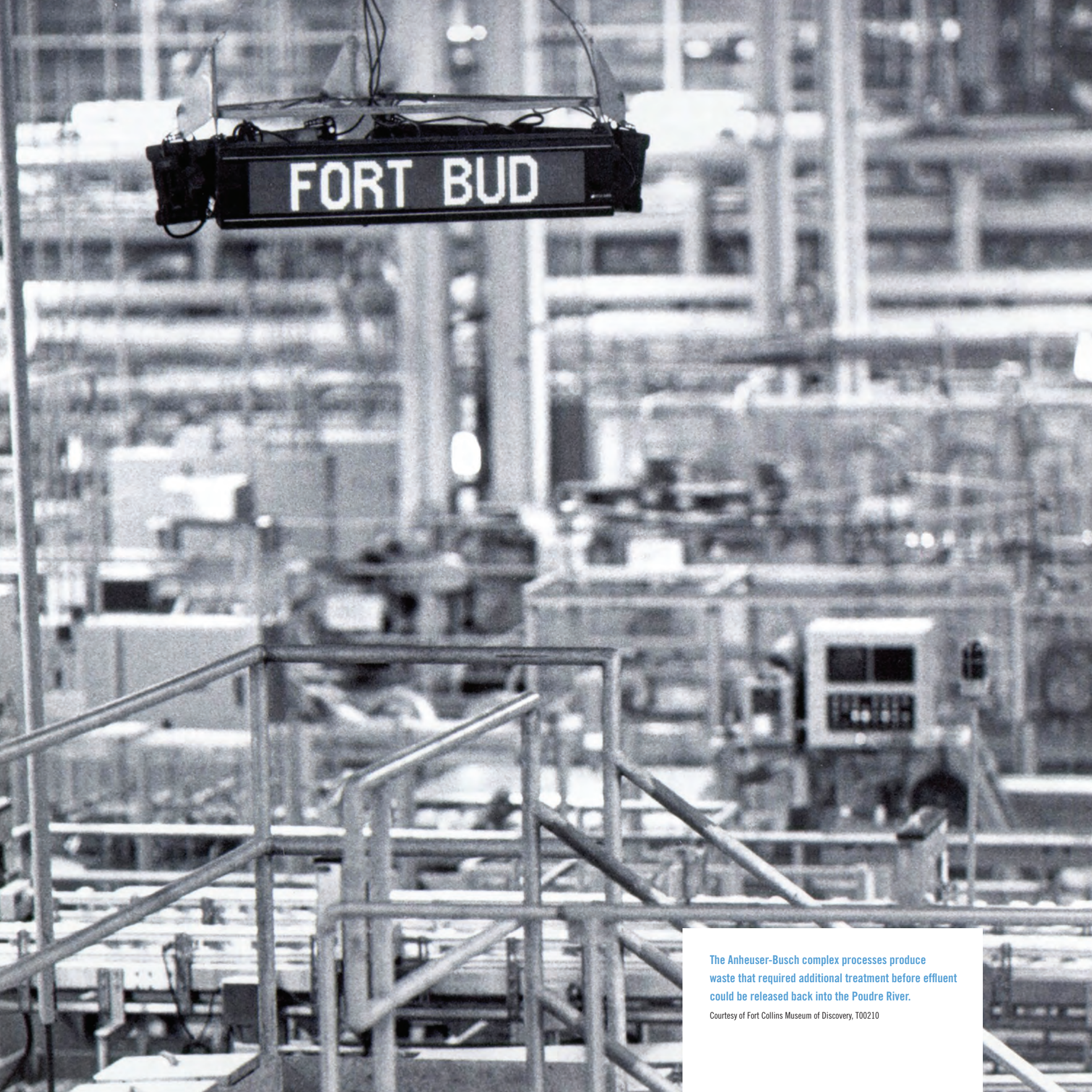
requiring specific professional certifications and expertise for incoming managers, along with increased regulatory oversight of operations.[68]

In the late 1970s, a pollution problem and consequent public relations incident challenged the water utility's good reputation in the community. In July 1977, the City detected bacteria in drinking water after the surrounding City Park neighborhood voiced complaints of cloudy water, odor and health issues ranging from nausea to high fever. Local residents felt the water utility did not communicate effectively with the public. Although the utility was state-of-the-art and had earned public confidence, it still lacked an in-house laboratory, which led to a delayed response to the incident.

The water utility sent samples to Denver, which required a 3-10 day wait for results. This inefficient system created frustration for both the utility's employees and the community. The Triangle Review, a local newspaper, reported that the City failed to contact the Larimer County Health Department and the press. Larimer County Health Director Dr. Robert Sherwood reflected his confidence in the City when he stated, "One of the last things you'd suspect would be a City water supply."[70] The bacteria appeared in sporadic testing results.

After weeks of confusion and frustration, on Aug. 15, 1977, the water utility identified the source as a cross-contamination between City domestic supply lines and the Sheldon Lake lines used to irrigate City Park. Dr. Keith Elmund, former Environmental Services Division Manager, had been working as a Pollution Control Lab Technician for only four months when the cross-contamination occurred. He remembered that Roger Krempel, Director of Public Works, disconnected the pipe and threw it into Sheldon Lake, that caused the contamination. This incident demonstrated how seriously some employees took their responsibility to protect the health of their fellow Fort Collins residents. Fort Collins began to cope with the complex problem of regulating water quality and distribution with reliable infrastructure, which caused the water utility to react progressively to meet the community's needs.[71]

With this incident, the water utility successfully confronted a management challenge by adopting revolutionary changes. It accelerated the Water Quality Control Division's ability to test water samples in-house. This new state-of-the-art division performed City and state-level testing and eliminated the need to send samples to CSU



The Anheuser-Busch complex processes produce waste that required additional treatment before effluent could be released back into the Poudre River.

Courtesy of Fort Collins Museum of Discovery, T00210

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Drake Water Reclamation Facility

Courtesy of Fort Collins Utilities

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Mulberry Water Reclamation Facility

Courtesy of Fort Collins Utilities

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Meadow Springs Ranch

Courtesy of Fort Collins Utilities

or Denver. Now the City had the capability to test bacterial contamination every time there was a complaint and deliver results within hours, rather than days or weeks, and increase mitigation if necessary. The division also set up a customer service hotline for Fort Collins residents to report complaints and request water testing in an efficient manner. The important services managed by the water utility became more evident to the public, and its proactive approach to improvement contributed to its positive reputation. City employees managed the situation with public health and safety as the goal, and the utility emerged from the City Park controversy with a proactive Water Quality Control Lab and improved customer service.[72]

Fort Collins Water Utilities continually reassessed its water supply and wastewater treatment needs in response to its growing industrial and residential sectors. Growth brought in more revenue but also produced more waste that required treatment. In the mid-1980s, while the City worked behind the scenes to secure the construction of an Anheuser-Busch (A-B) plant along I-25, it presented a sizable challenge for the wastewater utility. To obtain the 4,200 acre-feet it would need for brewery operations, A-B signed a three-way agreement with the City and Platte River Power Authority (Platte River) to use water from the newly completed Windy Gap Project. According to the terms of the agreement, Fort Collins uses and treats between 6,000 and 8,000 acre-feet of reusable water from Water Supply and Storage Company (WSSC) and the Michigan Ditch-Joe Wright Reservoir system in order to produce 4,200 acre-feet of reusable effluent. Platte River uses the effluent at the Rawhide Power Plant and repays the City with 4,200-acre-feet of Windy Gap water intended for the A-B plant. The A-B effluent is subsequently reused via land application. The City also returns 1,890 acre-feet of C-BT water to WSSC in exchange for use of the transmountain WSSC water. The overall benefit to the City of these complicated exchanges is about 2,300 acre-feet of water per year.

In addition to the need for a reliable, high-quality water supply, A-B also produced large amounts of chemical waste that put pressure on the existing infrastructure and required pretreatment before it mixed with other domestic, business and industrial wastewater. Two years later in 1987, the wastewater utility began its largest improvement projects to date, totaling $30 million, with expansions at both the DWRF and Water Treatment Plant No. 2 (now Water Treatment Facility). In 1987, because it successfully managed complexities of water management in a growing community, DWRF received the Environmental Protection Agency's (EPA) highest regional award. The 1987 Operations and Maintenance Excellence Award recognized the best operated facility in the six-state region, including Colorado, Montana, Wyoming, Utah, North Dakota and South Dakota. In 1993, the EPA again honored the work of the wastewater utility with both a regional and national award for work at DWRF that recognized the impact of discharged water in the local ecosystem—an honorable and highly valued achievement.[73]

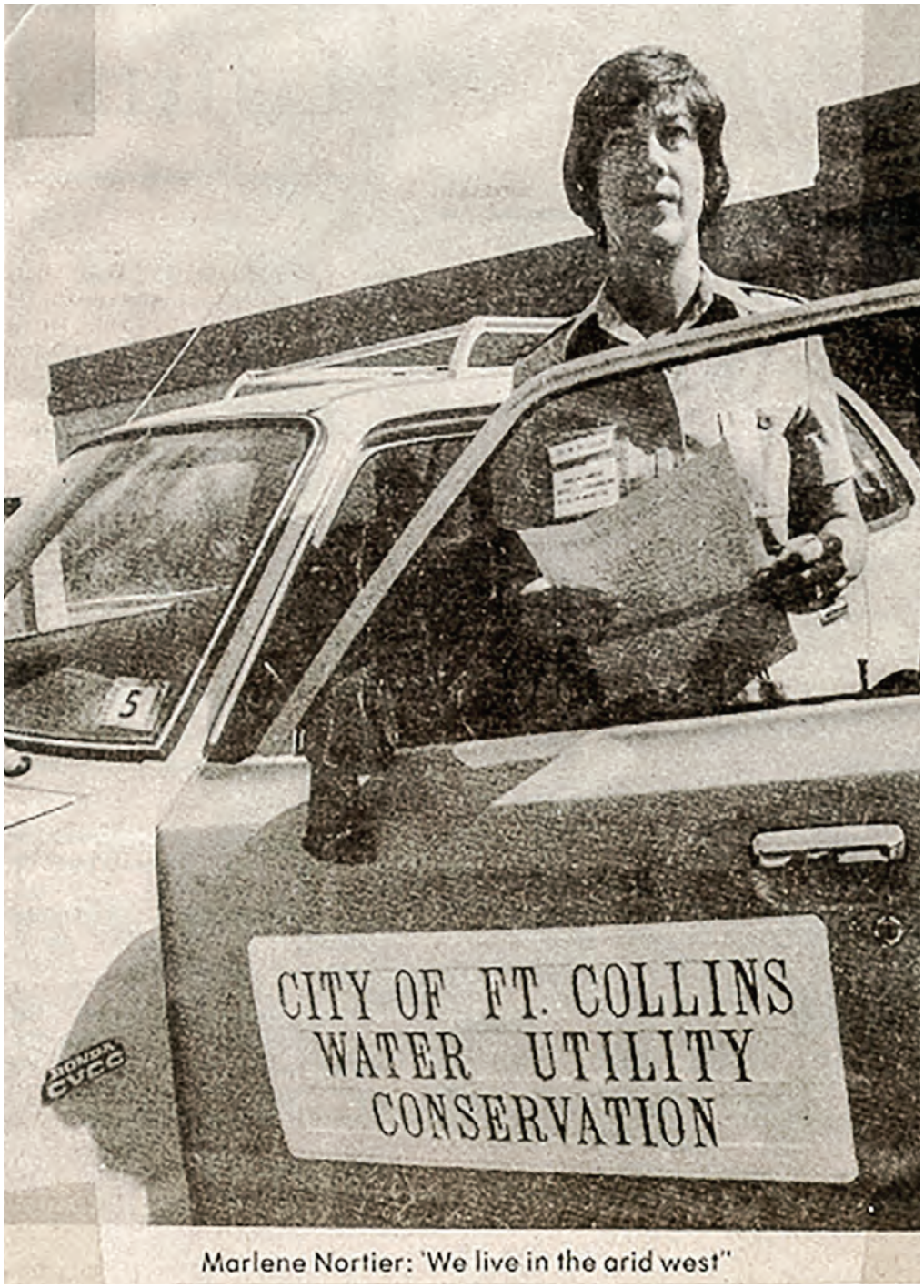
Fort Collins also stayed abreast with another important national trend in waste disposal methodology. In 1984, the City established the Resource Recovery Farm at the southwest corner of Prospect Road and I-25 to experiment with the beneficial reuse

After a severe drought in 1977, Fort Collins Water Utilities hired Molly Nortier as its first water conservation officer. Originally a part-time position, Nortier educated the community on smart water use. Nortier also was the editor of the water utility's monthly employee *Pipelines* newsletter where her sense of humor and commitment to both water and people showed. Known as the "party girl" around the office, Nortier planned celebrations for retiring employees and other special occasions and also served as the Water Board secretary. Molly Nortier and Mike Smith co-wrote the 1982 utilities history, *From Bucket to Basin*, a treasured story by many Utilities employees.[77]

of municipal biosolids from the wastewater reclamation facilities.[74] Sludge and biosolids are synonymous terms for the organic solid waste removed from the effluent, or liquid wastewater. At the Resource Recovery Farm, dried sludge was used to fertilize crops that would not end up in the human food chain. The high cost of sludge disposal led Fort Collins, along with many other cities around the country, to explore this method of waste disposal. The experiment was so successful that in 1990 the City bought the 26,000-acre Meadow Springs Ranch near the Wyoming border to expand its sludge reclamation work.[75]

Water Conservation and Metering

Awareness of the positive benefits of water conservation also influenced City management decisions in the late 20th century. Throughout its history, the aggressive acquisition of water rights set Fort Collins apart from other municipalities, but environmentalism and drought conditions shifted the approach from acquisition to conservation. Through



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Molly Nortier was the first water conservation officer in 1977.

Courtesy of Fort Collins Utilities

the mid-1960s and 1970s, federal and state governments passed increasing regulations in response to booming urban and suburban populations. More people inhabited already densely populated areas and relied on existing natural resources and public services. Additionally, severe drought nationwide further encouraged a growing environmental awareness in this era. Water conservation again became a prominent topic. Conservation influenced how Fort Collins Water Utilities maintained a safe and reliable municipal water supply, contributed to determinations regarding the size of plant expansions, guided water rates, and even affected wastewater treatment and the effluent returned to the Poudre River.

The drought was a reminder of the need to face the challenges of urban growth in the city. Acquiring water shares from local ditch companies provided more water for the increasing municipal customer base, but it also required the construction of reservoirs to store the water for use during drought years. A related program relied on the community's water conservation efforts to create a supply buffer. A 1965 City ordinance had passed to prohibit waste of municipal water while sprinkling lawns and gardens, but a larger conservation awareness program was still needed. Facing a particularly difficult drought in 1977, Fort Collins Water Utilities hired its first water conservation officer, Molly Nortier, to focus on encouraging conservation awareness and practices. While this was a part-time position until 1990, it provided momentum for identifying opportunities and techniques residents could use to reduce household demand.

The Fort Collins community also began to discuss metering as a possible water conservation tool in the 1970s. Metering to reduce the overall volume of water use offered the promise of reducing costs associated with acquiring additional raw water supply, as well as reducing costs associated with expanding

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This Fort Collins Water Utilities marketing brochure for meter installation featuring Mayor Ann Azari was a humorous approach to spreading the word about mandatory metering.

Courtesy of Fort Collins Utilities

water treatment needs. Some saw metering as a method for creating economic equity—those who used more water would pay for their use and those who conserved would no longer subsidize water consumption for their neighbors. It would not restrict household water use, but rather allow residents to monitor their monthly water usage. Metering was not without precedent on the Front Range. Boulder adopted it in 1963 and saw up to 33 percent savings in water usage. In the 1970s, the water utility thoroughly researched conservation practices and water metering. Ed Hilgenberg's 1973 report estimated the total cost for meter installation at $1,746,800. In his 1975 master's thesis, Daniel Lau concluded that investment in Joe Wright Reservoir proved more cost effective as a

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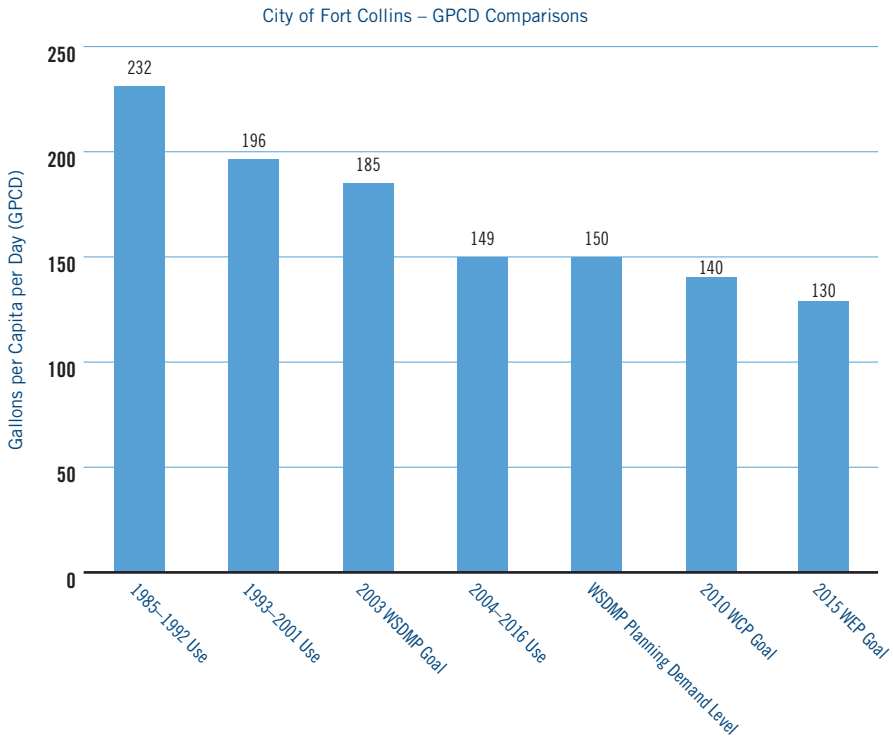
Advanced meters for electricity and radio modules for water meters were deployed between March 2012 and June 2013. Water meters have a separate radio module that transmits meter readings every four hours.

Courtesy of Fort Collins Utilities

means of meeting current and future needs than universal metering. Fort Collins chose to postpone metering, partly due to the enormity of labor and funds required to install meters while the City invested in the renovation of Joe Wright Reservoir.[76]

Fort Collins was slow to adopt universal metering even though many understood it could serve as a fundamental tool for solving water supply problems via water conservation. Like many cities, Fort Collins often had created new policies and reforms in response to crises. In the early 1880s, two structural fires prompted the formation of a public water works. The spread of disease in the early 20th century stimulated decisions about moving the Poudre diversion point. Rapid population growth in the 1950s encouraged an effort to purchase senior water rights. Agricultural and urban tensions in the 1960s resulted in the creation of a Water Board. Drought in the late 1960s encouraged consideration of water conservation methods. But in the case of metering, conflicting opinion on City Council and the Water Board about the best use of funding led to a delay in metering for Fort Collins.



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This graph shows declining consumption in the era of water conservation practices.

Courtesy of Fort Collins Utilities

Purchasing water shares for long-term municipal needs had long been a staple of the Fort Collins water management philosophy. While acquisition remained a core strategy, water conservation and a balanced management approach began to challenge that longstanding practice. Two basic questions drove the debate: "Should the City acquire more water rights and secure a substantial raw water supply while affordable opportunities to do so were within reach?" or, "Should the City invest in the installation and implementation of universal metering to maximize efficient use of the current water supply?"

The Water Board included both pro- and anti-metering members. Some opponents worried that residents conscious of their water usage would water their lawns less, causing the city's lawns, gardens and large trees to die and degrade Fort Collins' aesthetic environment and overall quality of life. Some members balked at the multimillion dollar price tag for meter installation while others argued that metering would negate the benefit of the City's senior water rights because without reservoirs to store conserved water, it would simply flow to downstream users. Raymond L. Anderson, a resource economist at CSU and Water Board member who opposed metering, believed that meters were unnecessary because Fort Collins had "ample raw water supplies to serve the city." He also argued that metering in cities such as Boulder led to brown lawns and that the City should invest instead in additional water storage options to meet future demands.[78] While some members of the Water Board and City Council agreed with Anderson, the general debate also reflected an understanding that metering would be unavoidable eventually. Opponents believed that delaying the process would make more funds available for raw water purchase in the short term.[79]

The argument that the City could not afford to simultaneously pursue both water rights acquisition and meter installation led to decades of delay, so universal metering in Fort Collins was achieved incrementally. City Council passed an ordinance during the 1977 drought requiring meter yoke installation in all newly constructed homes. But by 1985, only 200 homes inside city limits, 900 outside the limits and less than 5,000 commercial and multifamily units were metered. A consultant hired by the City estimated that unmetered flat rate residential customers were using 25 to 50 percent more water than the metered customers.

City Council first adopted a Water Supply Policy in 1988. In 1990, the state Legislature passed the Colorado Water Metering Act—the long-anticipated state requirement that effectively forced Fort Collins to require metering. Fort Collins expanded the water conservation officer position to full-time, and in 1992, the Fort Collins City Council adopted its Water Demand Management Policy that established a dozen water conservation measures and two water use goals. In 1997,

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A 2007 Stormwater project at Dry Creek, a tributary to the Poudre River that extends from the Wyoming boarder. This basin is part of a flood control project that will help stop flooding along the creek.

Courtesy of Fort Collins Utilities

the City finally instituted a universal metering program that began on a volunteer basis and transitioned to mandatory metering to meet legislation mandates by 2005. Poking fun at the inevitability of water metering, a 1999 Fort Collins Coloradoan article stated, "Nothing's certain in life except death, taxes and water meters."[80]

Also in 1997, Fort Collins Water Utilities merged with Fort Collins Light and Power to create Fort Collins Utilities. The combined services area, now the largest in the City, had water, wastewater, stormwater and the electric utilities.

Another drought in 2002 validated the need for further conservation measures. In 2003, the two existing policies were combined to form the Water Supply and Demand Management Policy (WSDMP). The policy included water use goals to be achieved by 2010, including reducing water use to 185 gallons per capita per day (gpcd) for annual water consumption and 475 gallons per capita for peak daily demand. It also recommended that the City pursue additional storage capacity, maintain a water supply shortage response plan, make use of surplus raw water and protect its quality, foster regional cooperation and encourage stream flow protection for ecological and recreational benefits.

The State of Colorado Water Conservation Act of 2004 became the next standard for compliance and the City adopted a new Water Conservation Plan (WCP) in 2010 to reflect its guidelines. As of November 2012, when the City adopted Resolution 2012-099, a revised WSDMP, the reduction goals decreased further to 140 gpcd and 350 gallons per capita for peak daily demand by 2020. The policy also addressed inherent uncertainties in water supply planning for a rapidly growing city by setting the water supply planning demand level slightly higher at 150 gpcd, which the City uses to plan for acquisitions. To achieve these more aggressive goals, the City expanded the permanent water conservation staff to three full-time positions who would, among other tasks, continue to develop targeted educational components and public information campaigns directed at the specific water use practices of both residential and commercial customers.[81]

Domestic water savings also resulted from the availability of more efficient plumbing fixtures, including 1.6-gallons-per-flush toilets, 2.5-gallons-per-minute showerheads, and 2-gallons-per-minute faucets. To promote consumer awareness of products that offer a 20 percent efficiency improvement, Fort Collins became a partner in the EPA's voluntary WaterSense program in 2007.[82] Water conservation reduced expenses related to raw water treatment, treatment plant capacity and infrastructure wear and tear. It also gave the City the option to lease excess water to outside users. But the City experienced a loss of revenue as water users began to conserve, which led to an increase in water rates to meet budgetary demands. In 2003, Fort Collins implemented a usage-based, tiered water rate structure to promote water conservation. Single-family and duplex water users were charged an incrementally higher rate for higher water use.[83]

2012 brought some of the highest temperatures in recorded history, with a mean daily temperature of 53.5 degrees Fahrenheit. At the same time, total annual precipitation was well below average at 10.8 inches. Total water demand was about 106 percent of projected demand, and the City's peak day use of 46.8 million gallons occurred weeks earlier than usual, on June 22.

Daily per capita use increased from 141 gallons in 2011 to 166 gallons in 2012. But when this

occurred, the City and the nearby districts had in place to cope with the challenge. Rebate programs for high-efficiency appliances, the Zero Interest Loans for Conservation Help (ZILCH) program to assist customers with service, and replacement of water lines and the purchase of efficient appliances and sprinkler system audits created additional support for residents to improve water conservation at home.

The "Utility for the 21st Century" sustainability plan, completed in 2009, attempted to fulfill customer expectations "within the context of being a developer of natural resources and a steward of natural resources." A sustainability team comprised of Utilities employees, stakeholders and R.W. Beck consultants, developed the plan, providing a tangible path toward the challenging goal of sustainability through green building programs, residential and commercial water and energy efficiency plans, and increased metering technology. Utilities and water district customers widely accepted the necessity of conservation practices and City-sponsored programs established in the late 1990s and early 2000s helped the overall conservation program continue to gain momentum and shift the community to a water-wise culture.[84]

In 2015, Water Conservation staff began work on an updated Water Conservation Plan, now titled the Water Efficiency Plan (WEP). The draft WEP was developed with input from City boards and commissions, community organizations and a technical advisory group that included Utilities staff, City staff and Water Board members. The WEP provides goals, indicators, and implementation principles that will guide and prioritize activities undertaken by the Utilities Water Conservation Team. The update was timed to support the Budgeting for Outcomes (BFO) process and the WEP aligns with related efforts, including the Colorado Water Plan and the Fort Collins Climate Action Plan framework. The WEP was approved and adopted by the Fort Collins City Council on March 1, 2016 (Resolution 2016-023) and was submitted to the CWCB for State approval in early 2017.

The new WEP changes the existing 140 gpcd by 2020 goal to 130 gpcd by 2030. Also, the WEP identifies areas of opportunity for expansion of water conservation programs that are selected for their significant water savings potential, the potential scope of customer impact and in alignment with the City's Strategic Plan Outcome and Objectives. The WEP uses three implementation principles: 1) employ sophisticated data-driven processes and decision-making, 2) cultivate new and bolster existing community and statewide partnerships, and 3) coordinate and support symbiotic efforts within Utilities and across the City.

Because Utilities does not provide water service to all customers within the city limits, nor the growth management area (GMA), there are a number of water districts such as East Larimer County Water District (ELCO) and Fort Collins-Loveland Water District (FCLWD) that provide service to a portion of Fort Collins' residents and businesses. Utilities provides some water conservation programs to residents in the water districts and, as noted above, the Water Conservation team hopes to expand these offerings and partnership in the future.

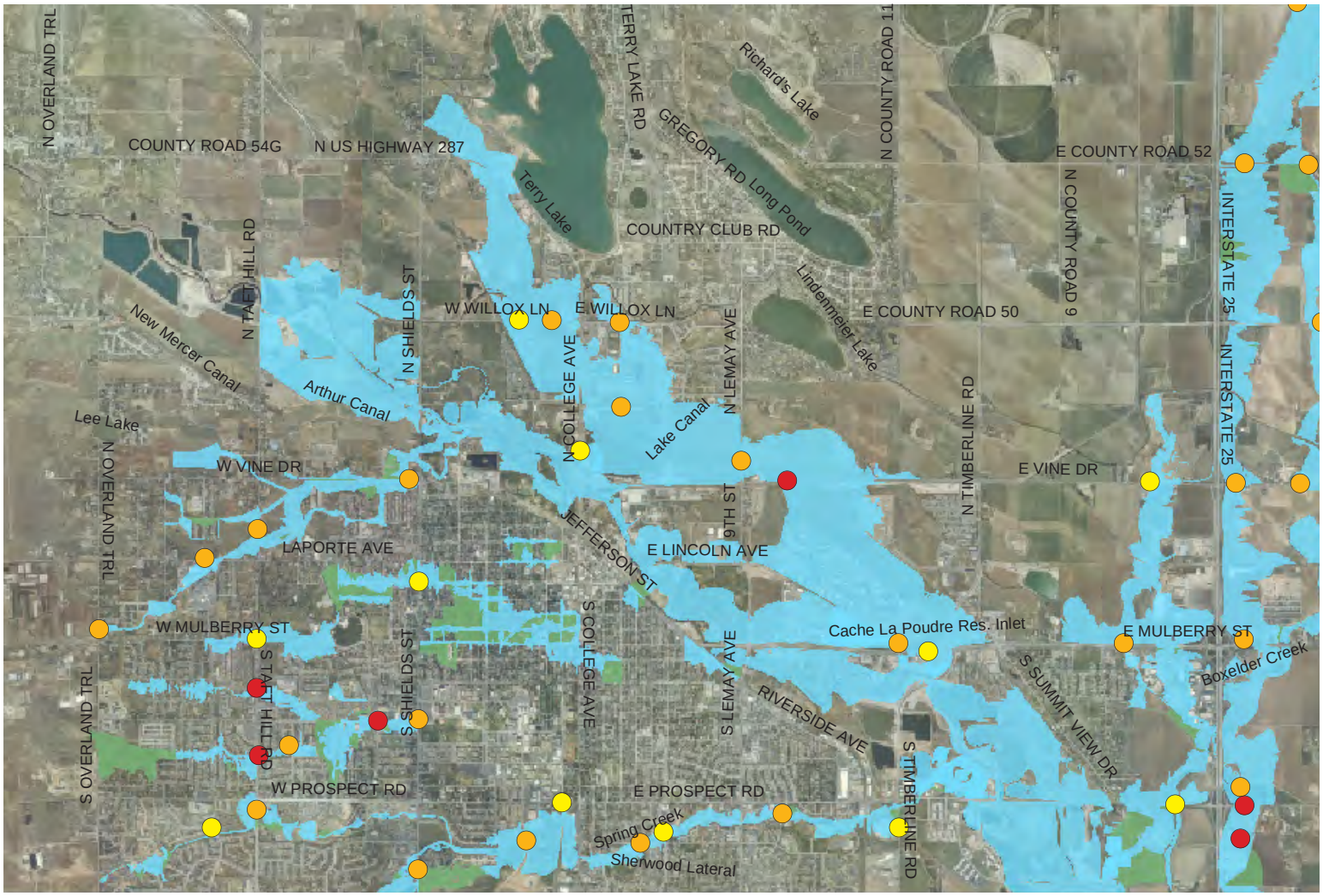
On March 7, 2017, City Council adopted Resolution 2017-029 approving the Charter of the Regional Collaboration Steering Committee. The Steering Committee is composed of members of governing boards and staff of Fort Collins Utilities, ELCO, and FCLWD. The proposed Steering Committee Charter articulates key regional water issues identified by the Steering Committee and the purpose and intended outcomes of regional water collaboration. One of the three identified key issues is "Coordination of water conservation and shortage response plans in the GMA. Such coordination will be focused on providing consistent water conservation programs, improving water efficiency, and aligning water shortage responses for each water provider across the GMA."

Floodplain Regulations and Stormwater Management

Until the 1960s, urban development in Fort Collins included inadequate drainage facilities that were not designed to accommodate major flood events and stormwater runoff. Pavement and structures covered the area's natural drainage ways and open space, making these neighborhoods vulnerable to flooding. New developments in the 1960s began to include drainage facilities that could accommodate runoff from larger storms, but the densely developed older sections in the urban floodplains remained vulnerable.

In the 1970s, Utilities further evolved its ability to predict and prepare for flooding in vulnerable areas. The City developed its first maps of the Poudre River floodplain in 1975. In the following year, a major flash flood event on the Big Thompson River south of Fort Collins killed 139 people and raised the awareness of potential flood risk among the residents and business owners in northern Colorado.

A progressive City Council began to focus on long-term, citywide flood control planning and regulatory needs. The 1976 Storm Drainage Ordinance established a Storm Drainage Board to create design criteria, divide the city into 11 identified drainage basins and create a separate master plan for each basin. The ordinance also established that the property owners, who would benefit most from the establishment of adequate drainage in each basin should bear the costs of construction. But drainage improvements were only possible with tax-based financing and stormwater projects often did not compete well against more visible projects.



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LEGEND

- High Risk Floodplain
- Moderate Risk Floodplain
- 0–1
- 1–2
- 2+

Map showing depth of flood water overtopping roads during a 100-year storm for northern Fort Collins, based on the 2003 Stormwater Master Plan Executive Summary.

Courtesy of Fort Collins Utilities

The City also made several failed attempts to create a special district for stormwater management, but City Council continued to advocate for a stronger approach to drainage management. In 1979, Fort Collins entered the National Flood Insurance Program and adopted its first floodplain regulations. City officials moved forward with a groundbreaking fee-based program to support the stormwater utility. In 1980, City Council adopted the stormwater utility fee with the passage of Article VII of the Fort Collins Municipal Code. The new fee allowed all stormwater management to be consolidated into one stormwater utility to operate and maintain the stormwater system for the City and develop capital improvement projects that would reduce flood risk.[85]

With the major components of an effective stormwater utility in place, the 1980s was a decade of progress for flood control. To support the new utility, residents began to pay monthly stormwater fees in 1981. Monthly stormwater capital improvement and development fees began in the following year. In 1984, the City also adopted new flood mitigation design criteria and construction standards that would guide all development to the present and allow the full maturation of a comprehensive flood management program for Fort Collins. Although the City was just beginning to address the backlogged improvement needs in older developments, other cities began to recognize and emulate its cutting edge model for stormwater management.[86]

Expanding upon the immediate goal to protect human life and property, the City then turned to the impact of stormwater on habitat and downstream communities with the adoption of the "Watershed Approach to Stormwater Quality" in 1995. The management method improved wildlife habitat and water quality by raising community awareness about stormwater system design. Residents learned that stormwater runoff brought pollution from the community to the streams as it washed over roofs, roads, yards and debris along its path. Community members began to understand that the city itself was part of the watershed and became more conscious of the built environment's relationship to the natural environment.[87]

In the mid-1990s, the population of Fort Collins hit 100,000 and more people than ever lived and worked in the floodplain. By 1996, the City's mitigation efforts had earned a Class 6 rating in the Federal Emergency Management Agency's (FEMA) Community Rating System (CRS), which recognizes efforts that go beyond minimum federal requirements and rewards communities with flood insurance discounts. On the evening of July 28, 1997, disaster struck. A storm system drifted over the Front Range and released tiny, needle-like raindrops in dense waves primarily in western Fort Collins. The uneven weather with its peculiar precipitation produced heavy flooding on the west side and significantly less rainfall on the east side, causing initial confusion followed by great alarm throughout the city as news of the flood spread.

The storm dropped 14.5 inches of rain in 31 hours, overflowing the stormwater infrastructure, natural channels and ditches. The excess water inundated adjacent neighborhoods and CSU. Five people died as a result of the flood, 54 people were injured, 200 homes were destroyed, and the city suffered more than $200 million in damage. The devastating flood along Spring Creek became a turning point for flood mitigation and floodplain regulations in the city. But the flood also reinforced the benefits of measures the City had begun to put into place for new developments. On Fossil Creek, the rainfall was less intense but still qualified as a 50-year flood event. Because development in that basin followed a 1982 Master Plan that allowed development only outside of the floodplain, no structures were damaged.[88]

Although it recognized that complete protection from floods of that magnitude was an unrealistic goal, City Council and Stormwater Utility employees agreed that much more could be done to protect Fort Collins from 100-year floods. The 1997 flood tested the major features of the system and exposed weak components and the need to plan for extraordinary events. As a result, an automated flood early warning system based on rainfall and stream gauge data became a priority and was installed in 1999. Also in that year, the City began three major stormwater outfall projects in the downtown area on Howes, Locust and Oak streets.

A Precipitation Study Task Force provided guidance for a new study of historical rainfall records, which led to the development of new rainfall criteria for mapping floodplains and designing adequate stormwater infrastructure. The new rainfall standard, raised from 2.89 inches over a two-hour period to 3.67 inches, identified more homes and infrastructure that would be damaged in a 100-year flood. The decade ended with a much stronger sense of urgency for mitigating citywide drainage problems.[89]

In the first decade of the 21st century, the City continued to improve upon environmental standards and goals and build on the momentum that the 1997 Flood provided for floodplain management in Fort Collins. The stringency of the regulatory environment was evolving and the City continued to improve upon its planning documents as well as execute the requirements. In 2004, City Council adopted a new Stormwater Master Plan to address flooding and water quality concerns in the community, and in 2005–2006, Fort Collins updated its floodplain regulations. In 2008, the City entered into an intergovernmental agreement with the Town of Wellington and Larimer County for stormwater cooperation in the Boxelder Basin.

The next year, Utilities reviewed its stormwater program to further reflect the City's increasing emphasis on environmental protection and

enhancement, while continuing the goal of public safety and reduced flood damages. In 2012, Utilities began to update the Stormwater Master Plan with a "watershed approach" to improve stormwater quality in anticipation of increasingly stringent federal water quality regulations. The update also addressed the need to rehabilitate urban streams with unstable banks and erosion problems, which have public safety and ecological consequences.[90]

While City officials understood the ongoing danger of flooding and worked to prevent another major disaster like the 1997 flood, a long period of drought and the fires of 2012 created temporary complacency about the flooding danger in the general population. On Sept. 9, 2013, a convective rain storm over northern Colorado's Front Range began to drop precipitation that would continue for a week, washing away roads and bridges and leaving a wake of destruction in multiple communities. The flood devastated nearby communities of Estes Park, Drake, Lyons and sections of Loveland, Greeley and Boulder, but Fort Collins was fortunate. It was only a 50-year flood on the Poudre River, even though peak flow at the mouth of the canyon on Sept. 13 at 3:45 a.m. was 10,400 cfs. In the Poudre River watershed, nearly 12 inches of rain fell in certain areas. But by comparison to neighboring communities in Larimer, Boulder and Weld counties, damage to infrastructure and homes in Fort Collins was minimal. The upstream reservoirs, Halligan and Seaman, happened to be relatively empty at the time and were able to serve unexpectedly as storage for the excess flow, and the flood conditions grew slowly enough to allow water managers time to react. Rainfall quantity was lighter in Fort Collins than in communities farther south, and the city also benefited from measures that Utilities had implemented since the 1997 flood. All of these factors meant that the 2013 flood had a much less serious impact on Fort Collins than other communities and also was far less severe in terms of overall impact than the 1997 flood.[91]

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Sign near the Spring Creek/College Avenue intersection indicating water levels that occurred in that area during the 1997 flood.

Courtesy of Fort Collins Utilities

Stormwater and floodplain management in Fort Collins changed fairly radically between 1997 and 2013. The stormwater utility's professional staff grew in size and expertise and adopted the Incident Command System (ICS), developed in the fire management profession, to respond to emergency events. Flood management projects constructed between 1999 and 2012 reduced flood impact in several areas along the Poudre River basin. In 2004, the City constructed the earthen Oxbow Levee from Linden Street south to Lincoln Avenue to protect the Buckingham and Andersonville neighborhoods from 100-year floods that might enter from the east. This FEMA-certified levee performed as expected during the 2013 flood, as did the Timberline Road Levee, constructed in 1999 to prevent the Poudre River from overtopping and flooding the road and properties near the intersection of Prospect and Timberline roads. Near Riverbend Ponds, where the Poudre River flows just east of Timberline, the L-Path Spill Project was developed to create a side-spill channel for flood events that would not damage the natural area.[92] Additionally, the Canal Importation Ponds and Outfall Project was completed in 2012.

Fort Collins also made significant progress in limiting and reducing development in the city's floodplains. From 1998 to 2007, the City removed approximately 2,480 structures from the floodplain. By 2013, through the creation of natural areas and parks, the City had preserved as open space 66 percent of the total 1,485 acres of land in the Poudre's 100-year floodplain. Adding to the open space solution for floodplain mitigation, the "Willing Seller, Willing Buyer Program" launched in 2000. With this program, residential and business owners in or around the floodplain can sell their properties to the City for removal. Before 2013, only four structures had been purchased, but the flood renewed recognition for the program as a key component for effective floodplain management.[93]

The new standards for development in the floodplain meant that Fort Collins' residential and commercial development in the new century proceeded with some assurance that damage and risk from future flood events would be minimized within the city and for its downstream neighbors. The new construction requirement of a 2-foot freeboard above the 100-year flood water surface elevation in the Poudre River basin assured minimal structural damage to those buildings. In addition, Fort Collins had established a floodplain regulation

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The L-Path Spill overtopped during the 2013 flood and performed as designed. The embankment held in place and the main flood flows stayed within the channel banks.

Courtesy of Fort Collins Utilities

for the Poudre River basin that banned floatable materials such as metal drums, storage tanks, pallets, vehicles and construction supplies. This standard was a critical mitigating factor in the 2013 flood, particularly along the Lincoln Avenue corridor where all properties were in compliance before the flood occurred.[94]

The Fort Collins Flood Warning System (FWS), a network of 75 rainfall and streamflow gauges, was critical for monitoring the flood event and identifying neighborhoods and structures that might be at risk so that emergency responders and Utilities officials could take preventative measures and notify the public.[95]

Finally, despite some degree of drought-inspired complacency, the citizens of Fort Collins benefited from ongoing educational public outreach regarding flood awareness and safety procedures in both standard media outlets and via social media using the City's Facebook, YouTube and Twitter accounts. The ability to make instant contact with customers who also could easily share information with each other was a great advantage over disaster response efforts in the previous century. During the 2013 flood, local residents received a constant broadcast of information and, in turn, shared that information with others. The City also set up a special storm information website for the 2013 flood that served as a central informational hub, including links to interactive GIS maps with precipitation information and flood-related photographs. Fort Collins earned national recognition and moved up to a Class 4 ranking in the National Flood Insurance Program's Community Rating System (CRS), the fifth highest rating in the country, and continued to pass on 30 percent discounts in flood insurance rates to its citizens.[96]

To further improve Fort Collins' stormwater infrastructure, several projects have been completed since the 2013 flood including the West Vine Outfall (2014), Lincoln/Willow Storm Sewer Upgrades (2016), Boxelder Stormwater Improvements on Prospect Road (2016) and the Northeast College Corridor Outfall, still in progress as of 2017. The largest stream rehabilitation project to date, which addressed steep eroding banks and improved aquatic habitat, was at Fossil Creek in 2015.

On May 1, 2016 Fort Collins earned a Class 2 rating in the National Flood Insurance Program's CRS. This makes Fort Collins one of five communities nationwide with the same rating or higher and provides up to a 40 percent discount in flood insurance rates for citizens and businesses.

5

Service through Sustainability: Over 130 Years of Water Service in Fort Collins

View of Fort Collins with the Water Treatment Facility in the foreground.

Courtesy of Fort Collins Utilities

Fort Collins Utilities manages water, the resource most critical to human settlement and activity in this semi-arid, northern Colorado community. Its story is consistent with the overall history of resource management in the United States, which can be understood in three broad, chronological stages. During the first phase, from the late 19th century to the 1930s, public entities focused on extracting and storing natural resources to meet economic and social needs. Without much regard for environmental consequences, they oversaw widespread deforestation efforts and the construction of massive dams to provide farmers with reliable irrigation water. The second stage spanned from the 1930s to the 1970s and emphasized multiple uses that reflected changing social values and modernization efforts. When agencies designed new projects, they considered many potential functions—recreation, irrigation, flood control and energy production, among others. The third and current phase introduced an ecological approach based on growing cultural and scientific awareness of the human-nature relationship. These stages provided the context for the development and growth of public entities all over the country, including Utilities.[97]

In addition to water use policies and procedures, cities need physical infrastructure—a system of treatment plants, delivery and collection pipes and stormwater drains developed with experience and ingenuity—to provide for and protect their residents. Until the late 19th century, water infrastructure in Fort Collins was characterized by quick construction projects meant to thwart the spread of disease. From the late 19th century to World War II, scientific understanding of issues such as the effects of bacteria on public health influenced decisions. During this phase, cities like Fort Collins focused on the design of systems, policies and regulations that would provide long-term solutions for growing cities. After the war, attention shifted from growth of infrastructure to the maintenance and expansion of existing systems.[98]

The development and growth of Utilities over the decades fits into these larger national patterns and includes periods of struggling to keep up with the city's needs as well as examples of progressive, forward-thinking solutions that placed the community ahead of the norm. The three water utilities—water, wastewater and stormwater—have evolved to share the burden of responsibly in managing water in order to provide predictable service. This effort has required increasingly thorough communication and cooperation as the water system becomes more complex. Utilities' customers, local irrigation companies, nearby municipalities and water districts have a stake in the process and opinions on how the City manages water, which further complicates Utilities' decisions and operations. As the expanding local economy and urban boundary swallowed up agricultural land and strained the infrastructure, tensions increased surrounding use of the Poudre River—the water source that made Fort Collins possible. As a major user of the river, Utilities must confront this community dialogue as it continues to manage the local water supply in the present and anticipate future needs.

Both the history and future of Fort Collins are based in water. Water has been necessary to foster growth, control development and provide a particular quality of life for its users. But water, as part of nature, also acts on its own accord. Floods, droughts and its essential, life-supporting function mean that water managers and users always have to respond to water as much as they seek to control it and plan for the unknown. The green spaces, healthy population and thriving recreational opportunities convey a story of the City's successful relationship with water over time. And water itself has played an active, essential role in the city's historical development.

Fort Collins is dependent on access to water and the continuing activities of Utilities and its employees. Since the 1880s, it has supplied water for the people and the landscape of the city in an increasingly complex supply, treatment and flood management system that maintains a healthy community and assures downstream users of a healthy supply to enjoy the same services. For over 130 years, Utilities has continued to adapt to anticipate and adapt to the city's growing needs.

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