

United States Department of the Interior
National Park Service



National Register of Historic Places Registration Form

This form is for use in nominating or requesting determinations for individual properties and districts. See instructions in National Register Bulletin, *How to Complete the National Register of Historic Places Registration Form*. If any item does not apply to the property being documented, enter "N/A" for "not applicable." For functions, architectural classification, materials, and areas of significance, enter only categories and subcategories from the instructions. Place additional certification comments, entries, and narrative items on continuation sheets if needed (NPS Form 10-900a).

1. Name of Property

historic name GREAT WESTERN SUGAR COMPANY EFFLUENT FLUME AND BRIDGE

other names/site number 5LR.1828

2. Location

street & number CACHE LA POUUDRE RIVER, 1/2 MILE WEST OF TIMBERLINE RD.

N/A	not for publication
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city or town FORT COLLINS

N/A	vicinity
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state COLORADO code CO county LARIMER code 069 zip code 80524

3. State/Federal Agency Certification

As the designated authority under the National Historic Preservation Act, as amended,
I hereby certify that this X nomination request for determination of eligibility meets the documentation standards for registering properties in the National Register of Historic Places and meets the procedural and professional requirements set forth in 36 CFR Part 60.

In my opinion, the property X meets does not meet the National Register Criteria. I recommend that this property be considered significant at the following level(s) of significance:

 national X statewide local

[Handwritten Signature]

Deputy State Historic Preservation Officer

5/16/14
Date

State or Federal agency/bureau or Tribal Government

In my opinion, the property meets does not meet the National Register criteria.

Signature of commenting official _____ Date _____

Title _____ State or Federal agency/bureau or Tribal Government

4. National Park Service Certification

I hereby certify that this property is:

entered in the National Register determined eligible for the National Register

 determined not eligible for the National Register removed from the National Register

 other (explain): _____

[Handwritten Signature: Jon Edson H. Beall]
Signature of the Keeper

11.19.14
Date of Action

GREAT WESTERN SUGAR COMPANY EFFLUENT FLUME AND BRIDGE

LARIMER, COLORADO

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5. Classification

Ownership of Property

(Check as many boxes as apply.)

- private
- public - Local
- public - State
- public - Federal

Category of Property

(Check only **one** box.)

- building(s)
- district
- site
- structure
- object

Number of Resources within Property

(Do not include previously listed resources in the count.)

Contributing	Noncontributing	
		buildings
		sites
2		structures
		objects
2	0	Total

Name of related multiple property listing

(Enter "N/A" if property is not part of a multiple property listing)

N/A

Number of contributing resources previously listed in the National Register

N/A

6. Function or Use

Historic Functions

(Enter categories from instructions.)

INDUSTRY / processing site

Current Functions

(Enter categories from instructions.)

VACANT / NOT IN USE

7. Description

Architectural Classification

(Enter categories from instructions.)

OTHER / suspension bridge

OTHER / flume

Materials

(Enter categories from instructions.)

foundation: CONCRETE

walls:

roof:

other: METAL

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NARRATIVE DESCRIPTION

Summary Paragraph: The Great Western Sugar Company Effluent Flume and Bridge are located along the Cache la Poudre River corridor over a mile-and-a-half east of downtown Fort Collins and Colorado State University. They are also found about the same distance southeast of the former Fort Collins beet sugar factory, a large industrial complex that was constructed in 1903 and operated through 1955. Approximately two acres in size, the site most noticeably holds a suspension bridge that spans the river. However, rather than being used by pedestrians or automobiles, this bridge carried an open metal flume that extended across the fields to the north and southeast of the river crossing. In addition to the flume that is still supported by the bridge, segments remain on the ground nearby in their original locations. All of these structures date from 1926, when the Great Western Sugar Company pushed its factory waste disposal away from the city and into the fields along the Cache la Poudre River. They have been out of use since the plant closed in the mid-1950s.

Setting & General Features: The Great Western Sugar Company Effluent Flume and Bridge span the Cache la Poudre River and run a short distance through the fields to the north and south. Situated east of downtown Fort Collins, south of Mulberry Street and one-half mile west of Timberline Road, the site spans two adjacent parcels (#87181-00-970 and #87172-00-987) and is located within the city-owned Kingfisher Point Natural Area. This corresponds to the southeast $\frac{1}{4}$ of the northwest $\frac{1}{4}$ of the northeast $\frac{1}{4}$ of Section 18, Township 7 North, Range 68 West. Access to the resource can only be gained on foot or bicycle from the Poudre River Trail, which runs along the south side of the river. The paved trail passes between the bridge and the detached southeast segment of the flume. Located along a riparian corridor, the bridge and flume are immediately surrounded by riverbank covered with a mature growth of cottonwood trees, shrubs and grasses.

The Cache la Poudre River runs generally from northwest to southeast through the Fort Collins area, carrying water from the mountains to the plains. However, at the nominated bridge and flume site, the river runs on an east-west axis for about one-half mile along its otherwise southeasterly course. An open field, the Cache la Poudre Reservoir Inlet ditch (5LR.11409), and commercial buildings that face north onto Mulberry Street occupy the area north of the flume and bridge, which is outside the nomination boundary. The river corridor occupies the areas to the east and west. To the south, the landscape extends across a small area of woods, with an expanse of fields to the southeast.

CONTRIBUTING STRUCTURES

Suspension Bridge (1926): This large structure is visually the primary feature on the site because of its prominence along the river corridor and the fact that it is a rare type of resource in the region. It is constructed of a combination of cast-in-place concrete, metal parts ordered from a supply house ready to install, and other metal parts that were customized locally for this specific bridge.

Two tall concrete towers, or pylons, support the single-span suspension bridge. These face each other and rise over 20' above the riverbank and bridge deck, with another 8' of exposed concrete work extending down toward the waterline. Additional concrete buried in the embankments at the bases of the towers provide solid foundations for the two structures. Both of the towers narrow as they rise in height. The width of each is 11' at the base, narrowing to about 8' at the top. Similarly, the depth tapers from approximately 9' to 2'. This tapered shape helped to buttress the towers against physical forces imposed by the weight of the structure itself, the weight and movement of liquid wastes traveling along the flume, and environmental factors such as wind and water. Short lengths of untrimmed wire ends project from the board-formed concrete faces. Each tower has an arched portal through which the flume passes. These openings are 4'-3" wide and 8' in height.

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Two parallel 1- $\frac{3}{4}$ " wire rope suspension cables support the bridge deck and flume. Draped over the top of each tower, the cables extend about 30' beyond, where they terminate in heavy metal clamps and eyebars. At the ground, these are pinned to metal brackets embedded in large buried concrete anchor blocks. Atop each tower, the cables rest upon saddles that are essentially moveable steel carriages. Each is constructed with four approximately 10" diameter wheels, with two wheels on each axle. As they pass over the saddles, the cables ride on the axles between the wheels, supported by cylindrical metal brackets that keep them from coming loose. Beneath the wheels are short sections of standard gauge steel rails. Bent upward at the ends, the rails allowed the carriages and cable to move back and forth as the bridge and flume flexed with the weight of waste effluent, while stopping the saddles from being pulled off the towers.

Steel suspender rods, 1" in diameter and shaped into eyes at the top and bottom, hang vertically from the cables at equidistant points along their lengths. Each suspender actually consists of two rods, one at the bottom and one at the top, that are attached to one another in the middle with turnbuckles. The upper rods are connected to the cables above with bolted metal plates, adjacent to which are U-bolts in several locations. The bottom rods along the bridge's central span are attached with bolted metal clamps to the steel girders below that form the lower chords of the deck. Adjustment of the turnbuckles between the rods allowed the bridge's builders and later maintenance crews to adjust the suspenders as needed to provide some rigidity to an otherwise flexible structure. Beyond the towers, additional suspenders hanging from the cables are mounted at the bottom in concrete blocks that are buried in the ground.

Hanging from the cables and suspenders, the bridge framework consists of a rectangle of I-beam girders that are connected to one another with riveted splice plates. Within the steel framework, which measures approximately 5'-4" x 138'-8" the open interior of the rectangle holds numerous perpendicular and diagonal angle bars and T-bars. These are attached to the outer I-beams with riveted gusset plates. Some of the steel members are stamped with the word "Colorado," suggesting that they may have been purchased from the Colorado Fuel & Iron factory in Pueblo. Rather than being bolted to the towers, the entire metal floor structure is floating and only connects to the towers through horizontal springs. A single set of diagonal braces in the form of an X provides lateral support to the cables and lower framework in the middle of the bridge at the lowest point of the catenary arch.

Hanging below the floor structure, the U-shaped flume crossing the bridge is mounted with a series of large $\frac{1}{2}$ " diameter U-bolts that run along its outside and connect to the perpendicular angle bars above. The flume has a depth of 2' and a width of 3'-2". It is constructed of $\frac{1}{8}$ "-thick steel in multiple linear segments that are welded together at the seams.

Alterations – The suspension bridge and its hanging flume exhibit few signs of alterations, either historic or recent. The only item noted involves the installation of a small number of U-bolts where some of the vertical suspenders connect to the cables. These were installed to keep the metal plates holding the upper suspender rod ends from sliding down the sloped cables. This alteration appears to have taken place prior to the time when the bridge went out of use in 1955, however, the exact date is unknown.

Effluent Flume (1926): The approximately 140'-long segment of the flume that is suspended below the bridge is discussed above as part of the bridge structure itself. However, additional flume segments extend along the ground to the north, south and southeast of the bridge. These are also constructed of short $\frac{1}{8}$ "-thick, U-shaped sections, approximately 3'-2" wide and 2' deep, that appear to be of lower quality metal than that found along the bridge. Rather than being welded together, the segments overlap one another where their ends meet. Resting in a trough that was excavated along the ground, the north, south and southeast flume segments are supported laterally by a series of concrete blocks and lateral wood bracing.

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Immediately north of the bridge, the flume extends for about 54' beyond the tower, where it has been terminated. No remnants of the flume are known to exist north of this location. Low angled concrete walls flank the flume end, indicating that it narrowed as it approached the bridge. Vertical slots in the concretework also suggest that a gate was located there to control the rate of flow. The concrete walls and metal flume are both stained white from the lime waste. Along the tops of the concrete walls, workers inscribed their initials and a date. One wall contains initials that appear to be "HAS." The other wall holds the initials "CWL" and the date "Aug. 20. 1926."

Just south of the bridge, the flume extends about 60' beyond the tower before it comes to an abrupt end at the top of a slope. As on the north, this length is also set into the ground although it is partially filled with soil and some vegetation. The next section of flume, which was approximately 100' in length, is no longer extant. It evidently curved downward toward the southeast across land that is now bisected by the Poudre River Trail. On the other side of the trail, it connected with the southeast flume segment, which remains in its original location. This segment is 97' in length and begins with a metal headgate that is stained with lime waste. Near the headgate, the flume was constructed of 1/8"-thick steel. However, much of the remaining segment to the southeast consists of lesser grade sheet metal that appears to be tin. Otherwise, the segment is virtually identical to those that are closer to the bridge.

A deteriorated concrete diversion box is located adjacent to the headgate along the southeast flume segment. The lack of staining on the exposed sidewalls of the diversion box suggests that it was not used to distribute lime waste, but was instead an agricultural feature related to earlier use of the property prior to 1926.

Alterations – The flume originally extended for a mile-and-a-half to the northwest, where it connected with the sugar factory. Except for the short length just north of the bridge, the rest of the flume in this direction has been obliterated from the landscape over the past six decades. To the southeast, it extended an unknown distance to a series of settling basins. These basins were also abandoned decades ago and are now open fields. The flume in this direction has also been truncated. Because the effluent disposal system as a whole was abandoned, the flume sections that remain near the bridge are the only remaining evidence of its existence and its construction details. Since the mid-1950s, the only alteration to this length of the flume has involved removal of a section from the field southeast of the bridge. This occurred during the 1980s when the Poudre River Trail was constructed.

INTEGRITY

Today the site retains most of its historic features from the period of significance. Although the flume was somewhat altered in recent decades by the removal of a short section south of the bridge, this did not diminish the site's overall character and ability to convey its significance. As a whole, the effluent flume and bridge continue to tell the story of their original use and their historical connection to the operation of the sugar factory. This story may be augmented in the future through the completion of an archaeological assessment.

The structures on the site exhibit a high degree of physical integrity with regard to location, setting, materials, workmanship, feeling, association and design. They also retain their original materials that date back to the period of construction. In addition, the surrounding terrain has remained largely undisturbed, allowing the historic features to rest among the open fields and river corridor. At the same time, the land within and surrounding the nominated property is filled with a thick layer of white lime waste from the factory, as much as 4' deep. The proposed boundaries around the bridge and flume will include something of these grounds, which also speak to the purpose and impact of the waste effluent system and their historic relationship to beet sugar production.

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8. Statement of Significance

Applicable National Register Criteria

(Mark "x" in one or more boxes for the criteria qualifying the property for National Register listing.)

- A Property is associated with events that have made a significant contribution to the broad patterns of our history.
- B Property is associated with the lives of persons significant in our past.
- C Property embodies the distinctive characteristics of a type, period, or method of construction or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components lack individual distinction.
- D Property has yielded, or is likely to yield, information important in prehistory or history.

Criteria Considerations

(Mark "x" in all the boxes that apply.)

Property is:

- A Owned by a religious institution or used for religious purposes.
- B removed from its original location.
- C a birthplace or grave.
- D a cemetery.
- E a reconstructed building, object, or structure.
- F a commemorative property.
- G less than 50 years old or achieving significance within the past 50 years.

Areas of Significance

(Enter categories from instructions.)

INDUSTRY

ENGINEERING

Period of Significance

1926-1955

1926

Significant Dates

1926

Significant Person

(Complete only if Criterion B is marked above.)

N/A

Cultural Affiliation

N/A

Architect/Builder

GUSTAF CARL EK (design engineer)

JOHN RASMUSSEN (construction engineer)

Period of Significance (justification): The period of significance for this property runs from 1926 to 1955 for Industry and is limited to the year 1926 for Engineering. This covers the year that the bridge and flume were constructed, 1926, and extends through closure of the Fort Collins sugar factory in 1955. These structures continued to be used throughout this period.

Criteria Considerations: Not Applicable

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STATEMENT OF SIGNIFICANCE

Summary Paragraph

The Great Western Sugar Company Effluent Flume and Bridge are significant on a statewide basis under **Criterion A** in the area of *Industry* for their long association with twentieth century beet sugar manufacturing and industrial waste disposal in the Fort Collins area. They are also significant on a statewide basis under **Criterion C** in the area of *Engineering* as good examples of a suspension bridge and flume designed for industrial use. The historic engineered structures on this property represent a type, period and method of construction consistent with suspension bridge and flume design of the era, locally built and adapted to a particular need for industrial waste disposal.

Narrative Statement of Significance

While the extractive mining industry dominated Colorado news and development throughout the second half of the nineteenth century, as the years drew closer to the turn of the century, the beet sugar industry rose in importance to the state's agricultural sector. In large part, the decline of the mining industry and the investment of mining wealth in agricultural pursuits helped the farm economy gain a foothold and thrive. In fact, historians have long argued that the beet sugar industry ultimately had a far greater impact upon the state's economic development and success than all of the gold and silver pulled from alpine mines. This is in large part because sugar beets were a renewable resource that could be replanted year after year, and they proved more lucrative than other crops. Twenty-two sugar factories were ultimately constructed in Colorado, and the beet sugar industry supported tens of thousands of farmers, field hands and factory workers over many decades. It also provided those farmers and workers with income that was spent in area towns, boosting the economies and growth of numerous communities throughout the state.

Factory purchases also supported a network of rail lines, quarries, coal mines, teamsters and truckers, industrial supply houses, machinery manufacturers, bag-makers, printers, advertising agencies and a host of other businesses throughout Colorado. Beet tops, spent cosettes and molasses from the factories offered the livestock industry a new source of feed that was rich in nutrients, spurring the cattle and hog industries to greater growth. With their need for reliable sources of water, the factories promoted the development of irrigation canals to support crop fields and the manufacturing plants. This encouraged the construction of numerous ditches, not only to the factories but also into regions of the state that benefitted from the availability of irrigation water for crop production of all kinds. The humble sugar beet brought an element of stability to Colorado's economy in and beyond the agricultural sector. Consequently, it had a tremendous trickle-down effect that in some way or another impacted all of the state's residents, whether they were aware of it or not.

In 1903, a beet sugar factory was constructed across the Cache la Poudre River northeast of downtown Fort Collins. Two years later, this facility came under the ownership of the Great Western Sugar Company, the firm that soon dominated the Colorado beet sugar industry. The Fort Collins plant continued to operate for the next fifty years, producing millions of pounds of sugar that were marketed throughout the country. During this entire period, managers of the industrial plant struggled to secure adequate sources of water. Massive volumes were used to float arriving beets into the factory, wash them of dirt and debris, and to clean the refined sugar toward the end of the manufacturing process. Water was also employed in the plant's boilers to provide heat and power machinery. In addition, the company had to figure out how to dispose of the millions of gallons of waste effluent, both chemical and biological, that emerged from the sugar manufacturing process every year. Similar to a living organism, these two issues, water and waste, were continuously tied together as they served as one integrated system. In essence, a beet sugar plant was a chemical factory that produced edible products. And if either the water or effluent streams were to fail, the factory could not function.

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Across the nation during the first half of the twentieth century, it was standard practice for factory wastes to be disposed of through dumping onto the land or into nearby bodies of water. These methods of industrial effluent disposal, treating the earth and its waterways as a giant sewer system, survived from the previous century and were a lingering product of the industrial revolution. Over many decades, big industry dominated the economy, politics and public discourse, and big industry didn't want to invest in expensive waste treatment programs and technologies. Although the land and waterways became fouled, and public health was put at risk, the prevailing view was that little could be done to reduce the environmental impact of industrial waste streams. Yet, these same careless methods of disposing of factory wastes led to the rise of an environmental ethic and the emergence of the environmental movement during the decades following World War II.

The Colorado beet sugar industry was no exception. Throughout the period from 1903 to 1955, the Fort Collins factory dispatched its effluent by pipe or open flume, referred to at the time as "sewers." Wastes were disposed of either directly into the Cache la Poudre River or into nearby settling ponds or lagoons. Effluent sent directly to the river decimated the fish population, disrupted the food chain, and damaged aquatic plants. Downstream, it was diverted through headgates into irrigation ditches and reservoirs, and into municipal water supplies. The settling ponds on factory property received a liquid slurry composed of water, lime mud, boiler ash, acids, sanitary sewage, and pulverized beet pulp. Resting in the ponds for a brief time, many of the solids in this murky brew settled to the bottom. The remaining wastewater topped the spillways and flowed into the river, still carrying chemical and biological wastes. Not only did these practices foul the land and waterways surrounding the factory, but the waste effluent and settling ponds emitted offensive odors that wafted through Fort Collins and the surrounding countryside.

Although the Great Western Sugar Company went to great lengths to secure its water supply and manage its effluent disposal system, it did little to address the fact that the Fort Collins factory was spewing massive volumes of hazardous wastes into the environment. During the first half of the century, little thought was given to such concerns. What concerned managers more was making sure they had adequate space to dispose of the solid wastes before dumping the wastewater into the river. As the settling pond just south of the plant began to fill with solids by the mid-1910s, the company purchased tracts of land farther to the southeast along the river corridor. The main waste flume was extended into this area, one-and-a-half miles from the factory, and for the next ten years a sizable basin north of the river received the effluent.

By early 1926 it was determined that the basin had reached its capacity and lands the company owned south of the river were needed. A company engineer designed a suspension bridge to carry the flume over the river to the southern lagoons, and factory workers were employed in their construction. Finished in time for the fall campaign, the bridge and flume remained in use until the plant closed in 1955. The choice of a suspension bridge, designed and built by the Great Western Sugar Company, suggests that it was viewed as the best option to carry liquid wastes across the river. The bridge's design allowed for it to tolerate strong horizontal winds, and the metal trusswork deck that carried the flume flexed to handle the heavy load. Had the new bridge and settling ponds not been constructed at that time, the factory would have had to shut down. During the early 1950s, a combination of issues finally drove the company to close the Fort Collins factory and abandon its waste disposal system. These included ongoing drought, increasing environmental regulation and government oversight, failure on the part of the company to modernize its facilities, and the fact that the settling ponds were all almost completely full.

While most of the Fort Collins factory complex was demolished in the 1960s, the bridge and nearby flume segments survived to the present time because they were located far from the plant in an area along the river that never came under development pressure. Today the site exhibits an excellent level of integrity from its period of significance between 1926 and 1955. The nominated property includes all of the surviving features, which continue to convey their significant industrial and engineering history.

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Criterion A – Industry. Constructed in 1926 and utilized until 1955, the Effluent Flume and Bridge are significant for their association with the industrial development, operation and demise of the beet sugar factory in Fort Collins during the first half of the twentieth century. The factory provided the community with a half-century of jobs and economic prosperity. At the same time, it drew massive amounts of water from the Cache la Poudre River and deposited huge volumes of effluent onto nearby lands and back into the river. Much of the factory complex was demolished during the 1960s, leaving just two warehouses (5LR.1616) and the Effluent Flume and Bridge standing. The warehouses were remodeled a few decades ago for use by the city's streets department, and in 1992 and 2001 the factory site was determined to be ineligible for the National Register.

Located a distance from the factory along the river corridor, the Effluent Flume and Bridge survived the decades and continue to exhibit an excellent level of integrity. Today they convey the story of not only beet sugar production, but also industrial waste disposal during the first half of the twentieth century. The tale told by these structures spans an era that started with the unregulated free-market approach to getting rid of factory effluent no matter the costs to the environment and public health, through the birth of the American environmental movement and emergence of related government regulation following World War II. Significantly, the public health concerns related to industrial pollution that arose in the late 1940s and early 1950s ultimately contributed to the Great Western Sugar Company's decision to close the Fort Collins factory for good. Today the Effluent Flume and Bridge no longer carry wastes across the river, but serve as a vehicle for the telling of this important story.

Criterion C – Engineering. The Effluent Flume and Bridge are significant in the area of engineering for serving as good examples of the type, period and method of construction of a suspension bridge and flume designed for the disposal of industrial wastes. Constructed in 1926, these features were designed by a mechanical engineer employed with the Great Western Sugar Company and constructed by a local crew under the supervision of a factory foreman. While many of the metal parts were ordered from supply houses and delivered to the site, others were fabricated or customized locally, possibly in the factory shops in Fort Collins. The concrete towers were poured in place and the bridge and flume assembled on the site. These structures were not intended for public use, but were utilitarian and industrial in both purpose and character.

Prior to the nineteenth century, primitive but innovative suspension bridges had been built across numerous waterways and gorges throughout the world, primarily for pedestrians. During the 1800s, civil engineers in Europe and the United States applied modern scientific principles to bridge designs and greatly improved upon the earlier structures. By the 1860s and 1870s, suspension bridges had advanced to the point where they were capable of spanning great distances and carrying massive loads. As many of these bridges became ever larger and longer and more expensive, the refined technology of the suspension bridge also lent itself to smaller, more affordable construction. Despite the fact that many suspension bridges of the late 1800s and early 1900s were erected for vehicular and pedestrian use, their sturdy but flexible character also worked for industrial and other purposes, such as moving pipelines, effluents and livestock across rivers. No matter their use, location or size, all of these bridges share a common lineage and similar structural details.

While Colorado has numerous historic bridges of other types, the state holds a very small number of suspension bridges. The most famous of these is the 1929 Royal Gorge Bridge (NRIS.83001303, 5FN.687) over the Arkansas River near Canon City. Still popular today as a tourist attraction, the bridge was listed in the National Register of Historic Places in 1983. Less well known is the Brown's Park Bridge (5MF.1364), located in a remote area of far northwestern Colorado. Area ranchers used this bridge to carry livestock across the Green River. Originally constructed in 1928, it collapsed in 1950 and was completely rebuilt four years later by contractors working for the Bureau of Land Management. In 2003, the bridge was found to be eligible for the National Register of Historic Places as a regionally important crossing of a major Colorado river.

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The remaining dozen or so suspension bridges in Colorado range in date from the 1920s through recent years. Most of these are small structures designed to carry pedestrians, livestock or pipelines across rivers and creeks. Very few are historic and other than the Royal Gorge Bridge and Brown's Park Bridge none have been designated or determined to be eligible on any level. The one still-existing historic bridge that is most similar to the Great Western Sugar Company's Effluent Bridge in Fort Collins is the James Craig Bair Sheep Ranch Suspension Bridge across the Colorado River at Dotsero (there is no evidence that this bridge has been documented prior to this time). This bridge is constructed with concrete towers with arched portals, wire rope cables, and iron rod suspenders that support a narrow wood deck used to convey livestock. Although not identical to the Fort Collins bridge, the two share a number of common features.

According to the *Colorado Plains Historic Context* (Mehls, 1984), "Resources that document the importance of or growth of the beet sugar industry to Colorado between 1900 and 1945 should be considered important, as should those that document or further understanding of the technology of beet sugar processing." Mehls went on to state that features related to beet processing should retain adequate physical integrity "to make method of operations, dimensions, spatial relationships and materials of construction readily apparent."

In his *Colorado Engineering Context* (1984), Joseph E. King addressed bridges along with buildings and structures related to the beet sugar industry in two separate chapters. According to King, during the early twentieth century the use of concrete and steel changed bridge building, including the employment of steel cable in suspension bridges. However, suspension bridges were not employed in most Colorado locations due to cost and because greater rigidity was required. The document asserted that the Royal Gorge Bridge was the only suspension bridge to be constructed in the state. However, King's primary focus was upon bridges used by automobiles and railroads. He stated that to be eligible for landmark designation, "The structure should be in place, substantially unaltered, and dated accurately." King also commented that in addition to automotive and railroad bridges, other privately owned and built bridges exist in the state that were used for other purposes, and that these should be considered as well.

In his chapter on beet sugar, King provided a list of cultural resource types that include flumes but not bridges, as these appear to be very rare resources related to this industry. The document stated that "All resources associated with this major industry in the state should be judged important until a complete inventory permits greater selectivity." Regarding structures, King emphasized that these "should be in place and with sufficient integrity to reveal their function."

Clearly, the Great Western Sugar Company's Effluent Flume and Bridge meet all of these criteria and contextual standards. The bridge is a rare example of suspension engineering in Colorado and the flume and bridge together are surviving examples of a historic industrial effluent disposal system. For these reasons, they should be considered eligible at the state level of significance.

HISTORIC CONTEXT

The Early Cache la Poudre River Corridor

For centuries prior to the arrival of Euro-Americans in what is now northern Colorado, Native Americans and wildlife carved informal trails along the Cache la Poudre River just east of the Rocky Mountains. The river and its adjacent lands served as a corridor between the mountains and plains, offering shelter and sustenance to humans and animals that walked along its banks, swam in its waters, and flew in the skies. While various tribes visited the area, starting around the late 1700s it became part of the Northern Arapaho homeland. By the 1860s, the nomadic Arapaho continued to visit the valley, although by decade's end they were pushed permanently north into Wyoming. They and their fellow Native tribes, contemporary, historic and even

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prehistoric, left behind abundant evidence of their campsites, burials, and tool-making sites throughout the lands of the Cache la Poudre River Valley.

Starting in the 1820s and 1830s, American and French-Canadian trappers began using the Cache la Poudre corridor as a route into and out of the central Rocky Mountains. During the mid-1830s, according to legend, one party of French-Canadian trappers stopped before entering the mouth of the canyon and unloaded supplies into a pit they excavated prior to heading into the mountains. Since that time, the river has been known as the Cache la Poudre, for the temporary "hiding of gunpowder" that reportedly took place there. Over the following decades, the river continued to serve as a preferred route for Native tribes and the relatively small number of trappers who continued to ply their trade. In 1843, American John C. Fremont also traveled up the river with his party of exploration, presaging major changes to come for this sparsely populated and still pristine area of the western frontier.¹

By the 1850s, the fur trappers and mountain men were aging and they began to see their years of journeying coming to an end. Around that same time, the mountains had become largely depleted of fur-bearing animals and the eastern market the trappers supplied had begun to change. Many of the men who survived the ordeals of frontier life married Native American women, had children, and began to settle down. A number of them built log cabins along the Cache la Poudre River just east of the canyon mouth in a small settlement they called Laporte (French for "the gate" or "the door"). The river corridor, from its mouth to its confluence with the South Platte River more than thirty miles downstream, was about to change with the arrival of thousands of Euro-Americans eager to start new lives for themselves on the Colorado frontier. However as it awaited these immigrants, the Cache la Poudre continued to host the few visitors and residents who visited its banks during a period of relative quiet and undisturbed beauty.

The Emergence of Agriculture

The single event that changed the course of frontier Colorado's history was the discovery during the summer of 1858 of placer gold in the river bottom soils at the confluence of Dry Creek and the South Platte River, where Denver is located today. The following spring and summer, rich lodes of gold were discovered in the mountains to the west and the pristine plains and foothills of what was to become Colorado were changed forever. The gold rush that followed these initial strikes brought thousands of prospectors and entrepreneurs up the South Platte River and into Denver. From there, many continued west to the emerging mining camps and towns in the mountains. Each immigrant to the frontier carried modest worldly possessions across the prairie, together with dreams of a new life. Denver and the mountains were flooded daily with new arrivals, men, women and children willing to endure the hardship of the weeks-long journey to seek their future.

For many, their future was not to be found in mining the hard, unforgiving rock of the mountains. Instead, their destiny played out in the softer valleys below. Throughout the 1860s and into the 1870s, thousands of pioneers from the eastern states crossed the Great Plains and traveled up the South Platte River and its tributaries not in search of gold, but seeking frontier homesteads where they could start farms and ranches. Along the rivers and streams they constructed log cabins and began the process of establishing new lives for their families. Enough people endured the arduous journey that in 1861 the Colorado Territory was established. The following year, during the Civil War, Congress passed the Homestead Act, which allowed any adult to lay claim to 160 acres of government surveyed land. Each claimant could gain free legal title to the property after five years if they built a residence and improved the land through cultivation. A second option entitled the claimant to gain ownership after six months if they established residency, made minor improvements, and paid the government \$1.25 per acre. However, the earliest settlers couldn't claim legal rights to the land, which had yet to be acquired from the

¹ Thomas J. Noel and Ron Sladek. *Fort Collins & Larimer County: An Illustrated History*. Carlsbad, CA: Heritage Media Corp., 2002.

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native tribes and surveyed. As the Native Americans were removed from tribal lands through a series of treaties and forceful evictions, the land was surveyed and pioneers entered the vacuum to establish claims that protected their rights of ownership.

Along the river corridors below the eastern flank of the Rocky Mountains, thousands of pioneers began to plow the short grass prairie. Particularly attractive were parcels located close to the rivers and streams, which provided water for farmsteads and crops. Persevering against the semi-arid climate and plagues of grasshoppers, their sweat and toil began to pay off as they successfully planted and grew a variety of food and grain crops and an agricultural economy began to emerge. Before long, the region's farms moved beyond subsistence to supplying the growing plains communities and alpine mining camps above with vital food products for human and livestock consumption.

While the soil proved to be rich with minerals, it soon became apparent that in the dry climate irrigation would be key to making agriculture thrive. Irrigation ditches began to be constructed in the 1860s, drawing water from the numerous streams that emerged from the mountains. By the end of the century, the landscape of the plains east of the mountains radically changed due to the matrix of irrigation ditches large and small that had been constructed. Irrigation made water reliable throughout the growing season in an environment where average annual precipitation was limited to between fifteen and twenty inches per year.

Colorado's pioneer farmers and ranchers busied themselves with improving their properties as the new century approached. And for a time they had no idea that the agricultural economy they were building would some day become dominated by sugar beets, a labor- and capital-intensive crop that proved too lucrative for many to ignore. However, one early sage of the frontier recognized that the sugar beet would eventually play an important part in Colorado agriculture. In November 1866, the *Rocky Mountain News* published an editorial titled "Beet Sugar" that included the following excerpt:

The past seasons have demonstrated that the soil of Colorado has no superior in the world for producing the sugar beet. It is a singular fact that there are no manufactories for making sugar from this vegetable, on this side of the Atlantic, notwithstanding the superior excellence of the product and great demand for it. We are of the opinion that its manufacture here would prove a good paying investment, besides saving to the country a large amount of capital that now goes east for the purchase of this staple.²

William N. Byers, the paper's founder and editor, penned these words and this view into the future. Little did he know that his grand vision for the humble sugar beet would take more than thirty years to bear fruit. But it did eventually happen, and in a way that would change the course of Colorado history.

Early Development of the Colorado Beet Sugar Industry

Sugar beets arrived in Colorado during the early to mid-1860s, when Peter Magnes planted test crops on his Platte Valley farm seven miles south of Denver. There he determined that they could be grown successfully on the high altitude frontier. Another farmer, L. K. Perrin, began growing test crops of his own in the Clear Creek Valley northwest of Denver around 1866. Both men fed their harvests to livestock, but were convinced that sugar production could become viable with the crop.³

Professor Jacob Schirmer, a metallurgist and assayer who received an appointment as superintendent of the United States Mint in Denver, made the first laboratory tests of early sugar beet crops grown in Colorado. He conducted his tests on the beets and soil conditions, finding in his 8 December 1869 report that "The area of

² "Beet Sugar," *Rocky Mountain News*, 3 November 1866.

³ Alvin T. Steinel, "History of Sugar Beet Production" in *History of Agriculture in Colorado, 1858-1926*.

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the fertile soil in Colorado for the culture of sugar beets is of vast breadth, extending for hundreds of miles north and south of Denver, large enough to furnish all the sugar to supply the whole nation, and thousands of hogsheads besides for exportation.” Schirmer went on to conclude that “our climate and soil is well adapted for the culture of the beet, and...it is my honest belief that no other country on the face of the globe has equal advantages, if a proper system of irrigation is inaugurated. In short, there is nothing to hinder it to make Colorado the greatest sugar producing state in the world.” Although his glowing language overestimated how much sugar could be produced in Colorado, his words did encourage serious discussion of the possibility of launching a sugar industry in the territory.⁴

In 1871, samples of beets grown by Peter Magnes were sent to the U.S. Department of Agriculture, where they were tested and found to contain higher sugar levels than those grown in Germany. Although these results were also promising, the beet sugar industry took a few decades more to develop in Colorado. This was not due to an inability to grow the crop, but because manufacturing technology was still unproven, expertise remained unavailable, and there were no manufacturing plants in the region. Just as significant, economics and legislation as they related to the production and importation of sugar needed time to evolve before a western sugar beet industry could become viable.

In 1888, the Colorado Agricultural College in Fort Collins began experimenting with growing sugar beets. Experimental plots were also planted in the vicinity of Grand Junction. The test crops proved that the soils and temperate climate were in fact conducive to the growth of healthy beets loaded with sugar. On 27 February 1892, the Denver weekly *Field and Farm* published an article about the success of beet-growing experiments in northern Colorado. According to the article, “The success obtained at Fort Collins in sugar beet culture...has never been equaled in the United States.” Proponents believed that the only remaining obstacles to the establishment of a profitable beet sugar industry in the state were the development of irrigation and construction of manufacturing plants. However, inexpensive cane sugar imported from Hawaii, the Philippines and the Caribbean still dominated the marketplace. This had the effect, for at least a few more years, of dampening efforts to launch a new Colorado industry.⁵

The sugar industry finally arrived in Colorado during the late 1890s, following decades of mostly failed attempts to develop profitable beet sugar plants in the United States. Of these early efforts, it wasn't until the 1880s that small factories in California began successfully producing beet sugar. In the meantime, German and French manufacturers made great strides toward perfecting the manufacturing process. American entrepreneurs traveled to Europe and learned how to build successful growing and refining operations. Among these, the Oxnard brothers from California established factories at Grand Island and Norfolk, Nebraska during the early 1890s. These were the first sugar plants to be opened on the Great Plains. Around the same time, the Utah Sugar Company in northern Utah began operating a plant of its own. These early efforts proved that the climate and soils of the plains and Rocky Mountain regions were conducive to growing sugar beets.⁶

Years of uncertainty and stagnation were fueled by the economic depression of the 1890s. As economic conditions began to improve, Congress passed the Dingley Act of 1897, which established a heavy tariff on imported sugar. Suddenly, conditions ripened for the development of a domestic industry. In 1898, prominent Grand Junction businessman Charles N. Cox launched a serious effort to create a beet sugar industry in the community. After securing 1,500 acres of land and pledging farmers to grow the crop, he rallied a group of notable Colorado businessmen who formed the Colorado Sugar Manufacturing Company. By the 1890s, these prominent men had formed a syndicate that sought new lucrative fields for investment. Well known at the time, their names still resound through Colorado history: Charles Boettcher, John Champion, Eben Smith and J. J. Brown. As individuals, they had already built successful mining, hardware, banking, cement, lumber, and

⁴ Ibid.

⁵ Ibid.

⁶ Wilbur Fisk Stone. *History of Colorado*. Chicago: The S. J. Clarke Publishing Co., 1918; Harry A. Austin, *History and Development of the Beet Sugar Industry*. Washington, DC: U.S. Beet Sugar Association, 1928.

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meatpacking businesses. If anyone in the state knew how to create a successful industry, these men were among the best in terms of vision, capital, power and business acumen.⁷

As Cox smartly recognized, the syndicate provided exactly what was required to launch a successful beet sugar industry in Colorado. In 1899, a plant was constructed in Grand Junction, and although its start proved challenging, the facility slowly began to thrive. Ownership was soon sold to a group of local investors and Colorado had its first profitable beet sugar plant in operation. This was followed by the first factory to appear on the state's eastern plains, where in 1900 the American Beet Sugar Company opened a plant at Rocky Ford along the Arkansas River. Another factory opened later that year at Sugar City.⁸

Realizing that the beet sugar industry would soon make its way to the central and northern plains of Colorado, the Boettcher syndicate decided to form another sugar company and promote development of the industry closer to Colorado's more populated towns and markets. In 1901, they founded the Great Western Sugar Company and began developing plans for the construction of factories. However, other sugar companies formed by competing investment groups were busy working to construct factories in the same communities and the race began. After usurping the efforts of Charles Cox to develop a plant in Loveland, the Great Western Sugar Company opened the first factory in northern Colorado there in 1901. Over the next two years, the company erected additional plants in Greeley, Eaton and Windsor.⁹

Within a few years more, many Plains farmers were starting to realize that growing sugar beets offered them an opportunity to participate in the most lucrative agricultural opportunity that had come along in a long time. Different from other crops, where the price was set at harvest, in the sugar industry the companies contracted with the farmers before the growing season started. In this way, the farmer knew before he planted the crop what it was going to bring him at harvest time. The assurance of a specific market price encouraged many farmers to jettison their previous crops in favor of the growing sugar beets. And not only could the beets be sold to the nearest sugar factory, the waste products consisting of beet tops and pulp provided farmers and ranchers with nutritious livestock feed. Yet this was a new crop unfamiliar to most farmers. To address this lack of knowledge, factory fieldmen and agricultural experts from the Colorado Agricultural College in Fort Collins began providing the farmers with technical advice on how to plant, cultivate and harvest successful sugar beet crops. At the same time, chemists and engineers were constantly engaged in innovating and improving the factory machinery and techniques that were so critical to the beet sugar refining process.

Beet Sugar Arrives in Fort Collins

Watching the emergence of sugar factories in nearby communities, a group of enterprising Fort Collins businessmen began to organize and promote their community as the next best place for a beet sugar plant. The town of Fort Collins had emerged from the presence and then closure of a modest 1860s cavalry post by the same name along the Cache la Poudre River on the plains several miles east of the foothills. The permanent settlement that took hold on the open landscape grew in response to the surrounding agricultural district that emerged, and before long it had become the most substantial market center in the region. A street grid was platted and both residences and commercial buildings rose from the prairie, initially laid out in a triangular area now known as Old Town that faced diagonally toward the river and recently abandoned fort.

⁷ Steinel.

⁸ Stone.

⁹ Steinel, p. 305; Stone, *History of Colorado*; William John May, *The Great Western Sugarlands*. New York: Garland Publishing Inc., 1989.

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In the early 1870s, town builders and speculators arrived from the Union Colony (later the City of Greeley) to establish a new colony that operated as the Larimer County Land Improvement Company. Broad streets aligned with the primary compass points were laid out adjacent to the original settlement, lots were placed on the market, and the town of Fort Collins began to grow in earnest. The Colorado Central Railroad arrived in 1877, and the following year the state legislature established the Colorado Agricultural College on open land just south of town. Over the following two decades, Fort Collins grew into a regional market center, home of higher education, and the seat of county government. The surrounding region became filled with farms and ranches, many of them supplied by the numerous irrigation ditches that crossed the landscape.

Progressive leaders continued to improve the town with construction of an opera house (1881), waterworks plant (1882), electricity and telephones (1887), a county courthouse (1887), and sanitary sewers (1889). By the end of the century, Fort Collins was graced with newspapers, fraternal organizations, houses of worship, and fine schools. The local economy was partly based upon the college, supplying its students and faculty with housing, goods and services. Fort Collins also served as a market and supply center for the numerous farms, cattle ranches, sheep feeding operations and quarries of northern Larimer County, extending its economic reach far into the surrounding countryside.¹⁰

As the business community coalesced around the idea of launching a local factory, a public meeting was held in Fort Collins on 2 January 1902. During the meeting, area farmers pledged to grow a combined total of more than 5,000 acres of sugar beets if a plant were built. Several days later, a committee was formed to secure financing for the project, estimated to require an investment of one million dollars. Members of this committee included flour mill and grain elevator owner B. F. Hottel, merchant C. R. Welch, banker and cement plant owner James Arthur, rancher James Brown, rancher and county commissioner William Bennett, mayor Fred Baker, and bankers Abner Loomis, Peter Anderson, T. A. Gage and Franklin Avery. All were pioneers who had risen to positions of prominence and respect in the community.¹¹

The committee then sent Peter Anderson and James Arthur east to explore the sugar beet factories in Michigan. In addition, they were tasked with seeking capital for the project and meeting with representatives of the Kilby Manufacturing Company of Ohio, which had recently erected the Loveland plant. In addition to committing their own funds to the project, Anderson, Arthur and the other committee members solicited a substantial investment from sugar magnate Henry O. Havemeyer, owner of the American Sugar Refining Company. Havemeyer's company was already heavily invested in sugar beet factories in Michigan, and was the largest cane sugar producer in the country. Controlling much of the domestic sugar industry, the company had become known as the Sugar Trust, and Havemeyer was quietly determined to exert his financial power to control the nascent Colorado beet sugar industry in the coming years.¹²

Havemeyer agreed to provide one-third of the financing needed to build a plant in Fort Collins as long as his personally appointed representative could serve on the board of directors. Successful in their fundraising efforts, the committee announced that a plant would be built. On 6 August 1902, the committee founded the Fort Collins Sugar Manufacturing Company, capitalized at \$350,000 with 3,500 shares valued at \$100 each. Havemeyer and the Boettcher syndicate, represented by mercantile magnate Chester Morey of Denver, secured substantial blocks of shares in the company. Despite his ownership interest, Havemeyer soon announced that the Sugar Trust planned to build a competing factory nearby. This was simply a ploy to get the committee to fold and sell out to the sugar behemoth. Despite this nuisance, the local directors of the Fort Collins Sugar Manufacturing Company held firm and moved forward with their plans.¹³

¹⁰ Noel and Sladek; Ansel Watrous, *History of Larimer County, Colorado*. Fort Collins, CO: Courier Publishing Co., 1911.

¹¹ Bert Nelson, "History of the Fort Collins Factory District: The Great Western Sugar Company, 1903-1955."

¹² Nelson; Candy Hamilton, *Footprints in the Sugar: A History of the Great Western Sugar Company*. Ontario, OR: Hamilton Bates Publishers, 2009.

¹³ Ibid.; Eric Twitty, "Silver Wedge: The Sugar Beet Industry in Fort Collins," Westminster, CO: SWCA Environmental Consultants, August 2003..

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The Fort Collins Sugar Manufacturing Company purchased the 120-acre farm of Alexander Barry, located across the Cache la Poudre River northeast of downtown Fort Collins, for \$18,000. In addition, it purchased an adjacent 480-acre parcel for \$48,000 from Boulder banker Charles Buckingham. The company signed three-year contracts with the farmers who had recently committed to planting 6,483 acres of sugar beets. In September, the Kilby Manufacturing Company of Cleveland, Ohio was engaged to construct the plant and install all of its machinery. This was initially estimated to cost \$650,000. However, the following month the Fort Collins Sugar Manufacturing Company was reincorporated as the Fort Collins-Colorado Sugar Company. With this change, the company was re-capitalized at \$1,000,000 and the Kilby Manufacturing Company received notification that revised plans for the factory included doubling its processing capacity to handle 1,200 tons of beets per day (one ton of beets yielded about three hundred pounds of sugar).¹⁴

On 12 November 1902, ground was broken at the site although it would be a few months before buildings emerged due to the onset of winter. Sturdy foundations of stone, gravel and concrete were completed in March 1903 to support not just the buildings themselves, but also the heavy machinery that would be installed inside. This required the construction of railroad tracks and sidings before the structural steel and sugar-processing machinery could be delivered to the site. Included among these items would be a sugar pan weighing 125 tons, along with eighteen fifty-ton crystallizers and ten large boilers. The pace of work sped up that spring as 350 workers were hired to complete the massive construction project. J. J. Cook & Company, under contract with the Fort Collins-Colorado Sugar Company, constructed a brick factory among the hogbacks west of Fort Collins near clay deposits in Soldier Canyon (this is now underneath Horsetooth Reservoir). Workers there toiled day and night to fabricate the three million pressed bricks needed to erect the factory buildings.¹⁵

Over the following months, one of the most advanced beet sugar plants yet constructed grew to dominate its surroundings. As the buildings were constructed through the summer of 1903, workers had to carefully install a complicated mass of piping and machinery in just the right order so that everything would fit in place before the walls were bricked in and the roof finished. In the meantime, company managers busied themselves acquiring additional acreage, securing water rights, and constructing a rail line twelve miles north to the Wellington district. Months passed as the project extended into the fall and early winter.

As it reached completion, the site included the main processing building surrounded by an office building, rail sidings, a water tower, a lime kiln, a pulp silo, and a 150'-tall smokestack. Surrounding these was an east-west county road to the north (now Vine Drive) along with open lands in all directions. Four stories in height, the main brick building with interior steel framework had a footprint of 70' x 300' and held all of the primary beet processing and sugar producing equipment. Adjacent to this was the large power plant filled with coal bins, a steam engine, and ten boilers. A 70' x 200' warehouse held packaged sugar waiting to be shipped to consumers. The two immense beet sheds were each 400' in length and divided on the interior into multiple compartments. Also present on the site was a small laboratory building, where chemists continuously monitored the plant to ensure the production of high quality sugar. Limestone for the manufacturing process was secured from the Ingleside Quarry in the foothills northwest of Fort Collins. Transported to the factory site by rail, the crushed rock was roasted in a coke oven contained in the 75' x 100' lime house. Additional buildings and features on the site were used for the weighing of wagons/trucks and beets, processing of molasses, storage of spent cosettes and pulp, and maintenance operations.¹⁶

In February 1903, Fort Collins growers had received 200,000 pounds of beet seed shipped from Hamburg, Germany. However, the farmers were accustomed to grain and hay crops and knew very little about how to plant and cultivate sugar beets. The Fort Collins-Colorado Sugar Company responded by dividing the beet-

¹⁴ "The Sugar Factory An Immense Affair," *Fort Collins Weekly Courier*, 4 March 1903; Nelson; Twitty.

¹⁵ Nelson; *Fort Collins Weekly Courier*, 4 March 1903.

¹⁶ *Fort Collins Weekly Courier*, 4 March 1903; Fire Insurance Maps, Sanborn Map Company, 1906.

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growing region around Fort Collins into five field districts. Each of these was placed under the guidance of a fieldman who helped the farmers understand what needed to be done. To accommodate those farmers whose fields were situated more distant from the plant, eleven receiving stations, or beet dumps, had been prepared during the summer of 1903 along rail lines throughout the countryside. Over the years, the number of dumps operated by the Fort Collins factory grew to twenty-five, most of them along the Colorado & Southern Railway.¹⁷

The first growing season got off to a challenging start. Of the 9,090 acres contracted by the company, 7,399 were planted and 6,669 acres made it to harvest. This amounted to a total of 67,536 tons of beets harvested in 1903, for which the farmers were paid \$4.50 per ton. As the harvest started to arrive at the unfinished factory in October, workers stored the beets in the large sheds on the site. There, the beets shrank and their sugar content diminished. Construction drew to a close by the end of the year, and on 6 January 1904 the factory whistle announced to all of Fort Collins that its years of planning and anticipation had come to fruition. The factory was ready for the late beet sugar campaign. Around two hundred men hired to work at the plant powered up the new machinery and the flumes washed the first sugar beets from the sheds into the plant for processing. Although the shortened campaign lasted just forty-five days and resulted in somewhat substandard sugar production, it resulted in the packaging of 79,000 bags that were placed on the market. The Fort Collins plant and its management, the farmers and factory workers, all proved ready to handle the harvests of future years.¹⁸

The Sugar Trust and the Great Western Sugar Company

Not long after the Fort Collins-Colorado Sugar Company opened its factory, Henry Havemeyer and his American Sugar Refining Company purchased the plant in a series of strategic moves designed to monopolize the Colorado sugar industry. Over the previous few years, the Sugar Trust had been providing the independently owned sugar companies in northern Colorado with massive loans, compromising their founders' ownership stakes. Acquisition of the Fort Collins plant was simply the result of Havemeyer's well-laid plans, and before long the Sugar Trust began to exert its influence and buying power throughout the region. One of the Sugar Trust's primary targets was the Great Western Sugar Company, owned by the Boettcher syndicate. By September 1903, just two years after the Loveland plant opened, Havemeyer had become the primary stockholder in the Great Western Sugar Company. Through these means, the Sugar Trust secured the plants in Fort Collins, Loveland, Greeley, Eaton, Longmont and Windsor.¹⁹

On 13 January 1905, Havemeyer incorporated the Great Western Sugar Company in New Jersey and the Fort Collins beet sugar factory, along with the others acquired by the Sugar Trust, became part of its growing empire. Overnight, Henry Havemeyer had become the single largest producer of both cane and beet sugar in the United States, and the primary beet sugar producer in Colorado. The growth of numerous communities and lives of many thousands of Colorado residents would be impacted by these developments, in a predominantly positive way, throughout the following decades. Determined to make his investment successful, Havemeyer restructured the Great Western Sugar Company, installing his own management staff and technical experts. The individual plants also greeted new chemists and engineers transferred from the American Sugar Refining Company. These men brought experience in the field of sugar production, applying their technical expertise to the previously struggling factories. The factories soon began to operate more efficiently, resulting in rising company profits.²⁰

¹⁷ Nelson; Hamilton.

¹⁸ Ibid.; Twitty.

¹⁹ Hamilton.

²⁰ Ibid.

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By 1910, the company had built or acquired additional factories in Sterling, Brush and Fort Morgan. It also purchased factories in Billings, Montana and Scottsbluff, Nebraska. Twenty years later, the company was operating twenty-five factories located in Colorado and five other states. Great Western Sugar acquired interests in area coal mines and opened lime rock quarries at Ingleside, Colorado northwest of Fort Collins and at Horse Creek, Wyoming northwest of Cheyenne. It also established its own transportation company, the Great Western Railroad, which integrated the movement of raw materials and sugar and kept transportation costs in-house. In 1909-1910, the Great Western Railroad was connected to the main rail lines running north out of Denver. The railroad allowed many farms more distant from the sugar plants to grow beets and ship them by rail.²¹

The Great Western Sugar Company and its extensive network of beet growers and sugar factories changed the economic and agricultural landscape of northern Colorado. Looking back after two decades of growth, in August 1920 the *Fort Collins Courier* published a full-page article on the industry, with a glowing recognition of its impact upon Larimer County:

Beet production in Larimer county and this region and the attendant manufacture of sugar is the most important industry of northern Colorado, and means more to the rapid growth and the prosperity of Fort Collins and her neighboring communities than any other activity in which the people are engaged. Something of the magnitude of the industry and of its importance in the well being of Larimer county may be realized when it is pointed out that the total of money brought into the county by the industry, including that paid to the farmers for their beets and the payrolls of the factories in the county, is between \$4,000,000 and \$5,000,000 annually.²²

Over the following decades the beet sugar factories in Colorado continued to produce millions of pounds of sugar annually that were marketed nationwide. The Great Western Sugar Company and its many factories, including the one in Fort Collins, weathered severe drought, withstood economic booms and busts, survived legislation that periodically reduced or increased tariffs on imported sugar, and held out against diseases that rose to decimate crops. The industry also provided a good living to thousands of farmers, factory workers, contractors and suppliers, boosting the economic health, development and population growth of towns throughout the region. A small number of additional plants were constructed into the mid-1920s in Colorado and Nebraska, at which time the era of factory building came to an end.

The Processing of Sugar Beets²³

As early tests conducted by the Colorado Agricultural College proved, the sugar beet was in fact ideally suited to agriculture in a region dominated by high altitude, soils rich in minerals, and a dry climate. A root plant, the sugar beet draws nutrients and water from the soil through a deep, slender taproot. This taproot, along with a series of smaller roots, pulls nutrients into the plant's main root. Energy for the plant's growth comes through its thick bundle of leaves. There photosynthesis combines with the nutrients and water drawn from the taproot to cause a chemical reaction that results in the storage of sugar in the beet's main root. Extracting the sugars from this root involved a complicated mechanical and chemical process that required an industrial process to be efficient and cost-effective. A sugar content of around twelve percent per beet-mass was the minimum necessary to make processing viable. In Colorado, ideal growing conditions that offered rich soils, irrigation water, and abundant sunlight led to beets that offered between fifteen and seventeen percent sugar by mass.

²¹ Ibid.; Stone.

²² "Larimer County's Leading Industry – Sugar Beets and Sugar," *Fort Collins Courier*, 28 August 1920, p. 10.

²³ This section is derived from the following sources: Hamilton, *Footprints in the Sugar: A History of the Great Western Sugar Company*; "Process for Beet Sugar, Basic Flow Diagram," Great Western Sugar Company, circa 1955; Ware, *Beet-Sugar Manufacture and Refining*; "State-of-Art, Sugar Beet Processing," Sugar Beet Development Foundation, 1971; "Larimer County's Leading Industry – Sugar Beets and Sugar," *Fort Collins Courier*, 28 August 1920, p. 10.

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Different from crops such as wheat, alfalfa or vegetables, which could be easily processed into food for humans and animals, sugar beets were grown to supply the raw materials needed by modern factories for the production of sugar. They required careful, labor-intensive, capital-demanding attention in regard to soil preparation, planting, thinning, blocking, weeding, irrigation and harvesting. Much of this work had to be done by hand. A workforce of low-wage immigrants typically planted the beets in March and then harvested the crop starting in late September or early October. This period of harvesting and sugar production was referred to as the year's "annual campaign."

After being pulled from the ground, the beets were manually topped (the leaves were removed) before they were delivered as quickly as possible to the factories. Transportation had to take place soon after the harvest as the beets immediately began losing their sugar content. Farmers with fields within ten miles of a factory often transported their beets directly to the sugar plant by wagon, and later by truck. For more distant farms, the sugar factories established beet dumps adjacent to rail lines. There the beets were stored in massive piles until they could be loaded into rail cars.

Upon arriving at the factory by wagon, truck or rail, the beets were placed into vast outdoor piles or large storage sheds. From there they underwent mechanical processing followed by a complex process of chemical treatment designed to extract sugar from the root. A sugar beet factory was in essence a chemical plant, bringing together the practical employment of advanced chemistry, mechanical processing and the latest in technological innovation. To start the process, workers shoveled or dumped the beets into wet hoppers and water-filled flumes, and they floated into the plant. Along the flumes, a series of screens separated out as much of the accompanying soil, rocks, weeds and debris as possible. While the water originated from nearby rivers, ditches or wells, much of it was re-circulated back to the head of the flume. As soon as the beets entered the factory-warmed water, the sugar began to diffuse, so they had to be processed as quickly as possible.

Once inside the plant, the beets entered a series of washing tanks to clean off any remaining debris. They were then raised mechanically into hoppers high in the factory so the rest of the process could be accomplished with the assistance of gravity. From the hoppers, the beets moved into vertical tubes, at the bottom of which were corrugated blades that cut off V-shaped slices known as cosettes. These fell onto conveyor belts that took the slices to diffusion cells where hot water extracted the sugar to form what was termed "raw juice." Each battery of these diffusion cells consisted of eleven to fourteen pressurized tanks, and each of the two-story-tall tanks was filled with three to six tons of cosettes. With the process complete, the spent cosettes were removed from the tanks and air-dried, after which they were bagged and marketed as livestock feed.

The thick liquid juice that emerged from the diffusion tanks was high in sugar content but contained impurities such as beet pulp that had to be removed. To accomplish this, the liquid traveled by pipes to a set of machines where it was mixed with crushed lime rock. In many factory locations, the crushed rock was roasted on the grounds in a coke oven. In other places, the roasted lime was delivered in bags, ready to use. In any case, the lime neutralized acids and coated the larger solid impurities in the juice. These and other suspended impurities were then removed as the juice was forced through large filter presses. The filter cake that collected in the filters was re-suspended and sent back through the process to extract any additional sugars.

Cleaned of all impurities, the sugar beet juice traveled by pipe to a series of carbonation tanks. There, carbonic acid gas was introduced to remove the dissolved lime and balance its pH. After passing through additional sets of filter presses, the juice was boiled with sulfurous acid, which again adjusted the pH and bleached the sugar. This refined the juice into a product known as standard liquor, ready for the last stages of processing. What remained was to crystallize the standard liquor, which consisted of between fifty and sixty-five percent sugar. This was accomplished by pumping the liquid through a series of large evaporators, where

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excess water was boiled off and the sugar became concentrated. The syrupy liquid was placed into vacuum pans, ten to fourteen feet in diameter, where it crystallized over a period of two to three days. Further processing utilizing centrifuges separated the sugar crystals from the remaining syrup. In addition to producing white sugar, the process also resulted in brown sugar and molasses, all of which were sent to market.

Factory Water Supply and Use

Essentially a form of heavy industry applied to small-town settings, beet sugar factories impacted the manufacturing sites, utilized large amounts of natural resources, and changed the surrounding countryside for miles around. No matter the location, every sugar plant depended upon securing a reliable source of water for floating the raw beets into the plant along flumes, cleaning the beets to remove soil and debris, filling the steam boilers and pipes, for worker consumption and restrooms, and for washing waste lime effluent into lagoons and dump sites. During the mid-1900s, it was estimated that 20,000 to 25,000 gallons of water were required to produce a ton of beet sugar.²⁴ Without access to massive amounts of water, the manufacturing plants could not operate.

Water supply for the Fort Collins factory proved to be problematic since plans were initially developed for the plant in the early 1900s. During its first year of operation the company secured processing water directly from the city, delivered through a ten-inch pipeline constructed by the sugar company. Prior to the second campaign, a small reservoir was constructed near the factory and filled with irrigation water from the Cache la Poudre River. Water was pumped to the plant for the 1904-05 campaign, after which the reservoir was kept full for emergency use. However, a legal conflict erupted as this water storage interfered with the senior rights of two Fort Collins flourmills. The sugar company responded by running pipes between its pump house and the river, drawing fresh water from below the first mill and returning used water above the second mill's headgate. This water was used to wash the beets through the flumes and into the factory. Drought conditions in 1911 led the factory's management to install two test wells. However, these proved inadequate to meet the plant's substantial needs and the wells were abandoned. Over the following years, the reservoir continued to be used as a reserve and a combination of river water and filtered city water filled the factory's needs.²⁵

Additional water for the plant was drawn from the Josh Ames Ditch (5LR.1829), which had been constructed in 1867 to irrigate crop fields northeast and east of Fort Collins. The ditch ran from west to east through the field across the county road north of the factory. While the ditch company held many of its meetings in local attorneys' offices, during the 1920s some of these took place at the Great Western Sugar Company factory. This underscored the ditch company's relationship with the plant. Although little is known about the exact nature of this business relationship, it is understood that the ditch provided water to the factory for many years. This was diverted from the ditch at a concrete junction box (this still exists) and then traveled through a buried 12" diameter pipeline that ran directly into the factory's eastern wing. The location of the junction box and pipeline suggests that the water may have been used to wash the beets before they were sliced.²⁶

In October 1910, the *Fort Collins Weekly Courier* printed an article that revealed additional details about the sugar factory's water usage. The subject arose because the plant had reportedly been exceeding the limits of its water supply contract with the city. Prior to that time, the City of Fort Collins and the Great Western Sugar Company had agreed to a contract that would provide the factory with a maximum daily supply of 650,000 gallons of filtered water. The cost of this water was fixed at a rate of \$300 per month, with no provision made for excess usage, and a meter was installed on the pipeline to the factory. With the city contract secured, the factory had reportedly shut down its pumping system that piped water directly from the river.²⁷

²⁴ "The Problem of Industrial Wastes," *The Betz Indicator*, July 1949.

²⁵ Nelson.

²⁶ Ron Sladek, "Josh Ames Ditch: Cultural Resource Analysis of the Headgates, Diversion Structure & Segments West of College Avenue, Fort Collins, Colorado." June 2013.

²⁷ "Sugar Factory's Water Bill For Excess Use \$850," *Fort Collins Weekly Courier*, 20 October 1910, p. 14.

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Shortly after the fall 1910 campaign began, it was brought to the attention of city council that throughout mid-October the plant had been using more than one million gallons per day. On October 14th that amount had risen above two million gallons. This was half of the city's daily supply of filtered water, and over the course of one week the plant had consumed an amount almost five million gallons in excess of its contract. The city council responded by ordering that the sugar company be billed \$850 for the additional water at the minimum meter rate of eighteen cents per thousand gallons. And if payment were not forthcoming, the city would simply turn the water off at the meter each day when the maximum threshold was reached.²⁸

The sugar company responded by providing reporters from the three local newspapers with a tour of the factory. Along the way, the plant's managers explained that the city was in error in its calculations. While the company was certainly purchasing water provided by the city filter plant, they reported that the factory also employed its pumping plant and pipeline that drew water directly from the river. The city water was used only for processing stages where filtered water was required. Their direct pipeline from the river provided the much larger amount needed to float the beets into the plant and wash them. According to the tour guides, the city could not possibly supply enough water for the factory to operate. In addition, the managers complained that the city supply was often so low during the fall campaign that the company was forced to rely upon its other sources of water. They insisted that the plant's in-house meter, installed on the city line into the factory, showed that nowhere near the amounts claimed by the city had been used. The Great Western Sugar Company would not pay the city's erroneous bill. City managers promised to keep a close eye on the water plant's meter and to determine whether some unknown factor might be leading to false readings.²⁹

Water supply again became a serious problem during the drought years of the 1930s. Flow along the Cache la Poudre River was so deficient that concern arose that the factory might have to skip its annual campaigns. In addition, all of the reservoirs above the plant were dry, eliminating any possibility of purchasing water. The only hope was Chambers Lake, located high in the mountains above, just below Cameron Pass. Chambers Lake still held a fair amount of water, however it could not be released because the level was below the outlet structure. The Great Western Sugar Company made arrangements with the Water Supply and Storage Company to deepen and reconstruct the outlet in exchange for the needed water. When the project was finished, water from Chambers Lake traveled down the Cache la Poudre River and was diverted to a reservoir near Laporte to be stored until needed by the factory.³⁰

By the mid-1900s, the main source of water for the Fort Collins plant continued to be the Cache la Poudre River. Much of this was transported along the Lake Canal, diverted through its large headgate on the west side of College Avenue just north of downtown. After traveling along the canal for three-quarters of a mile, the water passed through a company weir over Dry Creek and dropped into a reservoir with a capacity of twenty-one acre-feet. This reservoir was located in the fields north of the factory. The water was then pumped to the plant as needed through a 360'-long, 22" diameter wood stave pipe and a 480'-long, 24" diameter cast iron pipe. Seepage from the dam was caught in the Josh Ames Ditch and pumped back into the reservoir. This raw water was used for all of the factory's operations except for drinking, the final refinement of white sugar, and other uses where treated water was required. For these purposes, the city continued to supply the plant with 350,000 gallons of treated water each day.³¹

By 1953, the Cache la Poudre Water Users Association informed the Great Western Sugar Company that the Fort Collins factory would not be able to secure its water supply from the river in the future and that other

²⁸ "Factory Officials Adopt Familiar Missouri Method," *Fort Collins Weekly Courier*, 27 October 1910, p. 6.

²⁹ Ibid.

³⁰ Nelson.

³¹ Fort Collins Waters, Sample Results, 11 February 1953, Great Western Sugar Co. Collection, Norlin Library, University of Colorado; Letter from Fort Collins factory manager John Stewart to southern district manager J. R. Mason, 19 January 1953, Great Western Sugar Co. Collection, Norlin Library, University of Colorado

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sources would need to be located. In September 1954, as the fall campaign approached, plant managers worried about the supply of water as drought had substantially reduced flow along the Cache la Poudre River. According to the river commissioner, all of the river's water was needed for irrigation. The company quickly purchased about 800 acre-feet of Grand Lake water to avoid having to shut down the factory. Of this, 195 acre-feet came from the Northern Colorado Water Conservancy District, 221 acre-feet was from the Whitney Ditch, 375 acre-feet came from the City of Fort Collins, and about ten acre-feet was available from the Josh Ames Ditch. Factory managers believed this would carry them through until reservoir storage season began, and it did need to be used in full. In addition, the company opened negotiations with the Cache la Poudre Water Users Association, securing a five-year extension on its agreement for the use of river water during the reservoir storage season. This would provide an adequate supply of water for beet sugar processing when the irrigation season ended.³²

If this problem were not enough, in early 1954 the City of Fort Collins substantially increased its water rates by almost thirty-seven percent above previous years. This left the factory with greatly increased production costs for the 200,000 gallons of treated water that the company still purchased from the city each day. Managers suggested that the company look into the possibility of using more raw water from the river in the factory and reducing the use of treated city water to just what was needed for drinking. In addition, they wanted the company to look into drilling wells, although this proved ineffective back in 1911 when the last wells were attempted there. The combination of drought, demand from irrigators, and population growth in Fort Collins placed pressure upon the factory's water supply, which was becoming increasingly problematic as time passed.³³

No matter how it got to the factory, all of the water used there originated in the mountains and traveled to Fort Collins down the Cache la Poudre River. At the manufacturing entry point, the arriving beets were floated into the plant along a flume and then washed before they were sliced. Water was also used in the liming and sugar washing stages. It played an important role in the steam plant, which provided the facility with motive power for the machinery and warmed the syrupy liquid sugar extracted from the beets so that it would flow through the processing system. Toward the end of the sugar production process, the resulting wastewater laden with lime sludge was transported out of the factory by pipe and flume to be deposited in lagoons. Some farmers used this wastewater, rich in organic nutrients, as a fertilizer for their fields. However, this was only available to farms in close proximity to the sugar factories. The vast majority of the murky liquid waste was placed into area lagoons, also referred to as settling ponds or basins, which were eventually abandoned, dried out, and left the ground white and powdery for generations to come.

Disposal of Factory Effluent

As the Great Western Sugar Company sought to secure and maintain reliable sources of water for the Fort Collins factory, it also searched for places to deposit the large volumes of wastewater and waste lime slurry that flowed out of the plant every day. Wastewater associated with fluming and washing the beets, primarily filled with dirt and plant material, was first piped back to the river. By 1918, this exited the south end of the processing building and turned east along Lateral No. 3. Traveling along the lateral, this water appears to have been used to irrigate large beets fields located across the dirt road (now Lemay Avenue) east of the factory and east of the Andersonville neighborhood. Excess water in the lateral may have terminated a short distance farther east in Dry Creek. Either way, this wastewater from the factory either evaporated or eventually

³² Letter from southern district manager J. R. Mason to a Mr. Kemp, 23 September 1954, Great Western Sugar Co. Collection, Norlin Library, University of Colorado.

³³ Letter from southern district manager J. R. Mason to district superintendent Lloyd Jensen, 25 February 1955, Great Western Sugar Co. Collection, Norlin Library, University of Colorado.

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made its way back into the Cache la Poudre River. Getting rid of the lime waste and other factory effluents proved to be more difficult.³⁴

During the early decades of sugar manufacturing, many factories deposited their biological and chemical effluents directly into nearby streams. Naturally, this resulted in a variety of significant environmental problems. Biological wastes led to the growth of toxins and bacteria that fouled waterways and depleted oxygen needed to support aquatic plants and animals. Chemicals from the factories included waste lime mud, boiler ash, and acids that left the streams contaminated with sludge and toxic compounds. The large volumes of waste products also produced terrible odors that hung in the air. Nearby residents, agricultural irrigators, and downstream towns dependent upon river water complained bitterly about the negative environmental impacts of the sugar manufacturing operations.³⁵

As the years passed, the Great Western Sugar Company's factory engineers and chemists began to acknowledge that effluent from the plants was a serious concern that needed to be addressed. In 1921, chemist and sugar processing expert Dr. Franz Murke stated "this water is directly poisonous to fish, etc., and especially so after it has started to ferment."³⁶ Shifting from direct river disposal and its obviously negative environmental impact, the sugar factories began depositing wastes into nearby containment lagoons. There the solids settled and the remaining water either evaporated or was directed along flumes or ditches, or simply over a spillway, and into the nearby river. This practice left the lagoons with thick layers of sludge that emitted powerfully offensive odors. And the essentially untreated wastewater still made its way into the rivers, traveling downstream only to be diverted into irrigation ditches, lakes, and municipal water systems.³⁷

The Fort Collins plant was no stranger to these waste disposal practices and concerns. Since the factory began operating in early 1904, water carried the waste lime slurry and other effluents along an open flume for disposal in a 15.9-acre lagoon located south of the factory and just east of the Buckingham neighborhood. This settling basin was located in a former crop field that was slightly lower in elevation than the plant, so that gravity could be utilized to keep the flume flowing. Referred to as a sewer, the open flume regularly became clogged with lime mud and debris, requiring frequent attention to ensure it functioned properly. To the surrounding community, the basin was little more than a visual and olfactory blight on the landscape. However, its usefulness was coming to an end as it was filling with effluent solids. The company needed to develop new waste disposal sites at a reasonable distance from the factory and the city.³⁸

In February 1862, Alfred F. Howes filed a preemption claim along the Cache la Poudre River in the open, largely unpopulated countryside several miles southeast of the frontier village of Laporte, which he was instrumental in establishing. This property included the north half of the northeast quarter of Section 18, the southern area of which was occupied by the river corridor. By the mid-1860s, the 160-acre parcel had grown to more than eight hundred and the Howes Ranch turned into a major regional supplier of hay. Along with a successful farming operation, Alfred went on to serve as a county judge and was appointed to the Territorial Board of Agriculture. He was also instrumental in securing the Colorado Agricultural College for Fort Collins and later served as a state senator.³⁹

During the late 1880s, the Howes Ranch was transferred to Alfred's sons Robert and Henry. Henry ended up with the acreage along the river. By around 1910, the property was owned by a leading Larimer County

³⁴ Fire Insurance Maps, Sanborn Map Company, 1906, 1909, 1917, 1925

³⁵ Rachel Carson, *Silent Spring* Boston, MA: Houghton Mifflin Company, 1962; Philip Shabecoff, *A Fierce Green Fire: The American Environmental Movement*. New York: Hill & Wang, 1993.

³⁶ Franz Murke, *Condensed Description of the Manufacture of Beet Sugar*, New York: John Wiley & Sons, 1921, p 20.

³⁷ Max Levine, "Purification of Beet Sugar Wastes," *American Journal of Public Health*, June 1933, p. 585.

³⁸ Nelson.

³⁹ Alfred F. Howes, Preemption Claim, 20 February 1862, Larimer County Clerk & Recorder, Book A, Page 12; Watrous; Chain of Title, Larimer County Clerk & Recorder, 1862-1916.

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irrigation enterprise known as the Water Supply & Storage Company, which had been incorporated in 1891 to serve numerous farmers in the Cache la Poudre Valley. In July 1916, the Great Western Sugar Company paid the Water Supply & Storage Company \$8,000 for a 92.93-acre tract of land a mile-and-a-half southeast of the factory where it planned to locate new waste settling ponds.⁴⁰ Locating the lagoons along the river was critical so that the excess wastewater could be deposited into the river after the solids settled out. The grounds purchased in 1916 formed part of the historic Howes Ranch and were located both north and south of the Cache la Poudre River. Over the next ten years, the almost forty acres north of the river were utilized for the disposal of lime slurry and other effluents, and it proceeded to fill with a thick white layer of waste.

In 1923, the Fort Collins Chamber of Commerce actively but unsuccessfully tried to get the company to do something about the old lagoon near the factory and Buckingham neighborhood, if only to erect a wooden fence to hide it from view.⁴¹ By 1926, the Fort Collins factory's contracted acreage for sugar beets had grown to 20,000 and the plant was operating at full capacity. Factory managers watched their new settling basin in the countryside to the southeast fill with waste, and determined that the time had come to establish new lagoons on the open land the company had purchased ten years earlier south of the Cache la Poudre River. This acreage was divided into three side-by-side settling basins, divided by berms and labeled No. 1, No. 2 and No. 3 from west to east. Each basin was about nineteen to twenty acres in size. However, for the new basins to be used the liquid waste had to be transported somehow across the river. The best way to accomplish this would be to construct a bridge that would carry the flume.⁴²

During the spring of 1926, Gustaf Carl Ek of the Great Western Sugar Company's general office staff in Denver visited Fort Collins to talk with plant managers about designing an extension to their primary lime waste disposal sewer. Born in Sweden on 15 August 1876, Ek had immigrated to the United States in 1898. By 1910 he was living in East Orange, New Jersey, where he worked as a draftsman in a machine shop. He and his wife Helga then moved to Scottsbluff, Nebraska, where by 1918 Gustaf had secured employment as a mechanical draftsman at the Great Western Sugar factory. Sometime over the following years, Ek attended college and became a mechanical engineer in the Great Western Sugar Company's Denver headquarters.⁴³ Ek determined that the Fort Collins factory needed a sturdy but flexible bridge to carry the waste flume, heavy with liquid effluent, across the river. Initial plans for the bridge called for it to be 160' long, with the deck and flume placed about 10' above the water line. The bridge would be of the suspension type, supported by wire rope cables that passed over 20'-tall concrete towers along each bank. Construction began during the early summer under the supervision of the factory's chief engineer, John Rasmussen. Born in Denmark around 1890, Rasmussen had immigrated to the United States in 1910 and by the mid-1920s had become a foreman at the Great Western Sugar Company's Fort Collins plant. The structure began to take shape by mid-summer, and the following appeared in the August issue of *The Sugar Press*, the company's monthly employee magazine: "The new 'Brooklyn Bridge' over the Poudre River is forming into shape and Chief Engineer John Rasmussen says she will be a daisy. The fact is, it is a big job and is being very well done."⁴⁴

The structure was completed in September 1926, extending the factory's lime waste flume to the almost sixty acres of settling basins on the south side of the river. That October, *The Sugar Press* reported that the finished bridge was 140' long with 28'-tall concrete towers and concrete anchors at either end. Thirteen hundred cubic feet of concrete was used in its construction and the steel truss deck supported the metal flume that would carry the lime waste. Steel tension rods and turnbuckles helped the bridge to withstand the horizontal impact of winds. The bridge cost the company \$16,656.60 for the materials and another \$3,470.24 for the labor. However, this did not include the flume, which cost another \$1,406 to construct. Although

⁴⁰ Warranty Deed, Water Supply & Storage Company to the Great Western Sugar Company, 1 July 1916, Book 345, Page 298.

⁴¹ "The efforts of the Chamber of Commerce..." *Fort Collins Courier*, 20 June 1923, p. 2.

⁴² Nelson.

⁴³ Gustaf Carl Ek, Population Schedules, US Department of Commerce, Census Bureau, 1900-1940.

⁴⁴ "Fort Collins," *The Sugar Press*, Great Western Sugar Company, June 1926, (p. 24) & August 1926 (p. 31).

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various materials and parts for the bridge and flume were ordered and delivered to the site, others were fabricated by hand, possibly in the factory's own shop. For example, the metal carriages resting atop the concrete towers and supporting the wire rope cables included short, bent segments of rail. Other metal parts on the bridge were hammered to the shapes needed. Segments of the flume were assembled from sheet metal that was curved on the site when installed. Other flume parts may have been purchased from one of a host of Colorado suppliers, including the nearby Gidding Manufacturing Company in Fort Collins.⁴⁵

Suspension Bridges & Flumes⁴⁶

Determined, innovative human beings had been constructing bridges, including suspension bridges, across rivers and chasms for many hundreds, if not thousands, of years prior to the twentieth century. This was the case among many cultures, going back to the earliest days and most primitive tribes. These structures evolved from simple crossings of vines and ropes, to ancient arched Roman bridges of stone, to the first major engineer-designed iron bridges that were erected in the early nineteenth century. During this long period of innovation, iron chains, steel beams, reinforced concrete and wire cables eventually replaced the materials of yesteryear. And as bridges grew larger and more complex, their designers incorporated advances that allowed them to span greater distances and carry increasing amounts of weight.

Suspension bridge construction in the United States emerged with the Jacob's Creek Bridge, designed by engineer and inventor James Finley. Constructed in Westmoreland County, Pennsylvania in 1801, the bridge's design incorporated the novel concept of a deck suspended by trusses. However, until the 1810s even the most advanced suspension bridges in Europe employed iron chains or linked bars as their primary support. In 1816, America saw its first wire-cable suspension bridge erected. This was the Spider Bridge, a small temporary pedestrian crossing at the Falls at Schuylkill near Philadelphia. The first major bridge of this type was the Wire Bridge at Fairmount, also in Philadelphia. Erected in 1842 and designed by Charles Ellet, the bridge had a span of more than 350'.

From that time on, bridge engineers made regular advances in the designs of wire-cable suspension bridges. In the mid-1800s, American civil engineer John Roebling introduced two major innovations to suspension bridge design. After designing earlier suspension bridges over the preceding decades, in the 1860s Roebling pioneered the use of a rigid deck platform of girders stiffened with cross-braced diagonal beams and the twisting of steel rope on the construction site to form the cables. Erected during the years following the Civil War, Roebling's Brooklyn Bridge (NRIS.66000523) was the first to make use of steel wire cables. For the first time, steel rather than iron became the material of choice for building state-of-the-art bridges. And although towers were often constructed of steel, sometimes faced with stone, others were fabricated of reinforced concrete.

As the nation entered the twentieth century, the need for heavy railroad bridges declined in favor of structures designed for the automobile. The number and diversity of suspension bridges skyrocketed throughout the early 1900s as engineers continued to experiment with a variety of design options. At the same time, while many of these bridges were erected for vehicular use, the sturdy but flexible nature of suspension bridges lent themselves to industrial and other purposes, such as moving pipelines and livestock across rivers. In addition, suspension bridges were useful where lighter and less expensive structures were desired. No matter the location, every suspension bridge has to be engineered for its specific site and purpose, accommodating

⁴⁵ "Flume Bridge Completed at Fort Collins," *The Sugar Press*, Great Western Sugar Company, October 1926 (p. 18); Appraisal Documents, Great Western Sugar Company Collection, Norlin Library, University of Colorado, 1932.

⁴⁶ This section is derived from the following sources: Brown, *Bridges: Three Thousand Years of Defying Nature*; Denison, *How to Read Bridges: A Crash Course in Engineering and Architecture*; Litvak, *Spanning Generations: The Historic Bridges of Colorado*; Steinman & Watson, *Bridges and their Builders*; Mann, "A History of the Development of the Suspension Bridge."

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factors such as geology, the span of water or gorge being crossed, prevailing winds, and the weight of people, vehicles or materials using the structure.

In general terms, a flume is little more than a man-made channel designed to carry water. Different from a ditch, they typically include walls that are raised above the surrounding terrain (although flumes are used along irrigation ditches to measure flow volume). These have been constructed of materials such as rocks, wood, concrete or metal. And in contrast to an aqueduct, the flume's purpose is often to carry more than water. Over the centuries, they have been employed as millraces, in logging, and in hydraulic mining. Flumes have also been used to carry waste effluents away from factories, where they can be deposited on the land or into bodies of water.

Over the three decades after they were built, massive volumes of lime waste and other effluents traveled from the Great Western Sugar Company's Fort Collins factory along the flume and over the suspension bridge, where they continued to be dumped into the settling basins south of the river. In the lagoons, the solids settled out of the slurry, leaving behind thick layers of bleached ground that supported an abundance of weeds when the basins were later abandoned and dried up. And although many of the solids settled out of the wastewater, leaving behind a somewhat cleaner liquid, a problematic amount of the water-borne chemicals and suspended biological wastes still traveled over the spillways and into the Cache la Poudre River.

Continuing Waste Disposal Issues

While establishment of the Environmental Protection Agency was still decades away, government regulation of industry and industrial practices tightened during World War II. After the conflict ended, the nation began to deal with the fact that decades of largely unrestricted industrial waste disposal had polluted many of its rivers, lakes and other waterways. State and federal agencies were becoming increasingly involved in regulating industrial wastes throughout the United States, specifically to protect water quality and public health. In 1948, the Eightieth Congress passed the Water Pollution Control Act, establishing nationwide water quality standards and a nascent regulatory program. It also provided for loans to interstate agencies, municipalities and states to assist with the reduction of water pollution problems. This program was placed under the jurisdiction of the Public Health Service of the Federal Security Agency. Studies completed by this department over the following years revealed that the beet sugar industry was one of the nation's worst offenders when it came to the issue of water pollution.⁴⁷ Unable to escape the growing reach of regulators and the impact of public opinion, the beet sugar industry found itself in the middle of a difficult situation. Ideally, this should have forced the industry to address its impacts to the environment.

As the 1940s drew to a close, the Great Western Sugar Company did start to look more closely and critically at its waste disposal practices. In March 1949, V. H. Babbitt, the company's district engineer, suggested that changes be made to the Fort Collins factory's waste disposal procedures that would allow it to deposit all sewage into the Cache la Poudre River through the settling basins. This would require expansion of the basin near the factory and changes to the wastewater and lime mud flow as they made their way via the flume to the southeast dumpsites. At the lagoons or basins, the solids would settle out and the liquid wastes would flow over spillways into the river. However, this plan sounded just like what the company had already been doing for decades.⁴⁸

⁴⁷ Shabecoff; "The Problem of Industrial Wastes," *The Betz Indicator*, July 1949; Eman A. Pearson & Claire N. Sawyer, "Beet Sugar Process Waters – Treatment and Utilization," *Chemical Engineering Progress*, American Institute of Chemical Engineers, August 1950, p. 380.

⁴⁸ Letter from Great Western Sugar Company district engineer V. H. Babbitt to vice-president D. J. Roach, Great Western Sugar Company Collection, Norlin Library, University of Colorado, 23 March 1949.

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By early 1949, the No. 1 and No. 2 basins south of the river were full, but the No. 3 basin still had capacity for waste lime disposal. Babbitt suggested to company officials that additional land would need to be purchased in the near future, or else the existing settling basins would need to be adapted to hold more waste. The following year, the company acquired acreage from Charles Evans along the south side of the river just southeast of the existing basins. Evans owned extensive lands east of Fort Collins and had served as manager of the Fort Collins Beet Growers Association.⁴⁹

A few months later, on 20 and 25 May 1949, a group of men met in Denver to discuss a proposal for cooperative waste treatment studies that would be completed during that year's beet campaign. The goal of these studies would be to supplement a U.S. Public Health Service investigation of water pollution in the South Platte River Basin. Nine members of the Great Western Sugar Company's management and technical staff attended the meetings, including executive vice president D. J. Roach, chief engineer George W. Rienks, district engineer V. H. Babbitt, and several of the firm's top chemists. Also attending were Lewis A. Young, director of public health engineering with the Colorado Department of Health and three engineers from the US Public Health Service. The meeting was called due to complaints filed against the Great Western Sugar Company regarding its methods of handling beet sugar refinery wastes.⁵⁰

According to the complaints received by regulators, the company's practices had resulted in "offensive odors, sludge deposits in streams and irrigation ditches, and oxygen depletion...from promiscuous discharge of these untreated wastes." In particular, these actions had negatively impacted conditions in two irrigation reservoirs in the vicinity of Fort Collins, most likely Timnath Reservoir and Fossil Creek Reservoir. While the planned disposal tests would take place at the Windsor factory, no longer would the deposit of untreated wastes into lagoons and dumpsites be acceptable, and the release of untreated wastewater into the Cache la Poudre River would no longer be an option.⁵¹ By the summer of 1949, state legislatures throughout the country were also working to pass laws creating pollution control boards and establishing water quality standards. The Great Western Sugar Company had no choice but to do something in the near future to address these issues, or simply close its factories.

In 1950, the company's in-house research laboratory began sampling and testing liquid factory waste from the Fort Collins facility. Wastewater samples were collected from the inlet and outlet points of the settling basins. Laboratory testing focused upon gathering results for items such as the amount of oxygen consumed, dissolved solids, suspended solids, and volatile solids. Also of concern was the water's biochemical oxygen demand, or B. O. D., which provided an indication of whether the amount of oxygen remaining in the water would support or damage aquatic life. The results of these studies showed that the settling basins were working to reduce solids in the factory effluent. However, the remaining water still held levels of solids that made river disposal an ongoing problem.⁵² Searching for a solution, in January 1951 the vice president of the Great Western Sugar Company reached out to management of the Holly Sugar Corporation in Colorado Springs asking for information about that company's reported success with re-burning waste lime for reuse in their factories, thus reducing the amount of effluent. The following year, the Great Western Sugar Company also assigned its Process Development Laboratory in Loveland to address the analysis and refinement of waste disposal practices at all of its factories in northern Colorado.⁵³

⁴⁹ Letter and map from Fort Collins factory manager John Stewart to southern district manager J. R. Mason, Great Western Sugar Company Collection, Norlin Library, University of Colorado, 13 December 1952.

⁵⁰ Memorandum from U.S. Public Health Service sanitary engineer Hayse H. Black to Great Western Sugar Company district superintendent C. H. Criswell, Great Western Sugar Company Collection, Norlin Library, University of Colorado, 25 May 1949.

⁵¹ Ibid.

⁵² Certificate of Analysis, Great Western Sugar Company, Research Laboratory, 27 October 1950.

⁵³ Letter from Great Western Sugar Company vice president D. J. Roach to R. M. Daniels, general superintendent of the Holly Sugar Corporation, Great Western Sugar Company Collection, Norlin Library, University of Colorado, 5 January 1951; Letter from the superintendent of the Great Western Sugar Company's Process Development Laboratory in

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With factory waste disposal becoming a challenge for the company as a whole, by the early 1950s the problem had become a topic of frequent and detailed discussion among the firm's highest levels of management. Writing on 16 September 1952 to vice president H. L. Hartburg, assistant to the president A. A. Clark recommended that the Fort Collins factory consider the possibility of recirculating its flume water and only depositing the cleaner excess condenser water into the river. At the very least, this would fulfill the company's obligation to return "reasonably uncontaminated" water above the headgate for Timnath Reservoir. It was also recommended that a pump and distribution system be installed adjacent to the suspension bridge over the river that would separate suspended solids from the water in the lime waste slurry before it was deposited in the settling basins. By the end of the year, company managers were considering the idea of abandoning the settling basins altogether in favor of other, as yet undetermined methods of waste disposal.⁵⁴

In May 1953, the company distributed an internal report on waste disposal practices, with a separate section on each factory. For perhaps the first time in the company's history, this document provided substantial details and a more comprehensive picture of the Fort Collins factory's waste disposal system and procedures. According to the report, the Fort Collins factory owned about 160 acres of land along the north and south sides of the Cache la Poudre River that had been used for years as settling basins. By the early 1950s, it was estimated that about sixty percent of the settling ponds were filled to such an elevation that they were no longer usable for waste disposal through gravity flow from the factory. In addition, a small settling lagoon of about ten acres that had been constructed just west of the factory was also almost full to capacity.⁵⁵

For an unknown amount of time, possibly as early as 1920, beet flume water and excess condenser water had been transported into the west basin, where the dirt settled out of the water. From there, the water drained directly into the river. The rest of the factory waste, which included sanitary waste, lime sludge, pulp water and pulp silo drainage was transported to the southeast through what was known as the Coy sewer line. This 24"-diameter pipeline traveled through the fields and emerged into an open ditch or flume just south of Highway 14. Once the large basin north of the river filled to capacity, as discussed above, the liquid slurry was then transported over the river via the suspension bridge and flume to be deposited in the nearby settling basins.⁵⁶

Water from the basins continued to top the spillways as late as the early 1950s and was discharged into the river. From that point, the discharged wastewater from the factory made its way down the river and into Timnath Reservoir and Fossil Creek Reservoir, both of which were used for irrigation. None of the wastewater was otherwise treated or aerated along the way to reduce the impact of organic compounds that acted as pollutants and damaged aquatic life in the river and lakes.⁵⁷ In July 1953, the U.S. Department of Health, Education and Welfare released a report titled "A Comprehensive Program for Control of Water Pollution." One section of this document provided details about each of the numerous Great Western Sugar Company factories. None had an adequate pollution control program in place. The Fort Collins plant was listed as a primary polluter generating biochemical oxygen demand discharges equivalent to a population of 710,000 people, far beyond almost all of the other factories. The second largest polluter was the factory in Longmont.⁵⁸

Loveland to the chief chemists at the sugar factories in Bayard, Loveland, Longmont, Greeley, Brighton, Fort Collins and Eaton, Great Western Sugar Company Collection, Norlin Library, University of Colorado, 14 October 1952.

⁵⁴ Letter from assistant to the president A. A. Clark to vice president H. L. Hartburg, Great Western Sugar Company Collection, Norlin Library, University of Colorado, 16 September 1952.

⁵⁵ Factory Waste Disposal Facilities, Great Western Sugar Company Collection, Norlin Library, University of Colorado, 1 May 1953. (This document includes a map of the waste disposal system that includes the flume and bridge.)

⁵⁶ Ibid.

⁵⁷ Fort Collins Waters, Sample Results, Great Western Sugar Company Collection, Norlin Library, University of Colorado, 11 February 1953.

⁵⁸ "A Comprehensive Program for Control of Water Pollution," *Water Pollution Series No. 56*, U.S. Department of Health, Education and Welfare, July 1953.

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Perhaps spurred on by this report, on 12 January 1954 A. A. Clark issued another internal report, this one titled "Factory Waste Disposal Facilities: Recommended Improvements." The section on the Fort Collins factory stated that the waste disposal problem there "is quite complicated due to restricted available land area and also to the Company's obligation to return to the River a substantial portion of the water used in the plant, such return to be made at a point upstream from the Timnath Reservoir intake." In this report, Clark simply put forward the same suggestions as those found in the 1952 letter he sent to vice president Hartburg. This made it clear that over the previous two years, and despite pressure from government regulators, no advances had been made in how the factory's wastes were being processed.⁵⁹

Although numerous internal letters, reports and memoranda flew back and forth between the company's managers, both in Fort Collins and Denver, no substantive changes were made over the years to the factory's discharge and disposal of waste effluents. The Great Western Sugar Company seemed either stymied by how to proceed or resistant to changing its practices. It also became apparent that the company was failing to modernize its factories. At some time in the near future, the company was going to be forced into dealing, fully and effectively, with its emissions from the Fort Collins factory.

Sugar Production in Fort Collins Comes to an End

By the mid-1950s, the Colorado beet sugar industry was plagued by a variety of ongoing problems. These included persistent government price controls, water shortages caused by another drought, substantial waste disposal concerns related to the filling of settling basins, an increase in state and federal government regulation of effluents that would require substantial investment to properly address, and the fact that farmers were turning toward other profitable crops such as wheat and corn. Production costs also increased in the new era of modern technology and innovation and the Great Western Sugar Company, for whatever reason, was failing to upgrade its factories. Under the pressure of these conditions, the company completed the 1954 campaign unsure of whether the factory would reopen.

During the early spring of 1955, as farmers prepared to plant their crops, factory managers announced that area farmers would have to arrange for their future harvests to be delivered to other factories in northern Colorado. The Fort Collins factory was shuttered. Water no longer flowed to the plant, smoke no longer poured from the chimney, the machinery sat silent, the parking lot was empty, and waste no longer flowed down the flume, across the bridge and into the settling basins. A half-century of industrial production that had created thousands of jobs, boosted the regional economy, served as a source of pride, and changed the community's history and landscape forever had come to an abrupt end.⁶⁰

After sitting dormant for a decade, much of the factory complex was demolished in 1967, leaving the two large red brick warehouses on the site (these are now occupied by the City of Fort Collins streets department). A distance from the central complex, the abandoned suspension bridge and effluent flume remain standing over the Cache la Poudre River. Due to their location along the river corridor, neither was in the way of development projects and they managed to survive as the city grew around them. Eventually, much of the flume from the factory was demolished, leaving intact the stretch carried by the bridge and short lengths in the fields to the north and southeast. Today these are all that remain of the plant's once-extensive waste disposal system.

⁵⁹ Factory Waste Disposal Facilities, Great Western Sugar Company Collection, Norlin Library, University of Colorado, 12 January 1954.

⁶⁰ Nelson.

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Letter from Great Western Sugar Company vice president D. J. Roach to R. M. Daniels, general superintendent of the Holly Sugar Corporation, 5 January 1951. (This letter requested information on the Holly Sugar Corporation’s reportedly successful re-burning of waste lime for reuse in their factories.) Accession 2, Series 3, Box 11, Folder 69.

Letter from the superintendent of the Great Western Sugar Company’s Process Development Laboratory in Loveland to the chief chemists at the sugar factories in Bayard, Loveland, Longmont, Greeley, Brighton, Fort Collins and Eaton, 14 October 1952. (This letter requested that the chief chemists set up routine controls for waste testing so that the information could be reported back to the main laboratory.) Accession 2, Series 3, Box 8, Folder 69U.

Letter from assistant to the president A. A. Clark to vice president H. L. Hartburg, 16 September 1952. (This letter addressed waste disposal concerns at the Fort Collins factory and made recommendations for how to process waste water.) Accession 2, Series 3, Box 8, Folder 69U.

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Letter and map from Fort Collins factory manager John Stewart to southern district manager J. R. Mason, 13 December 1952. (This letter discussed the recent purchase and use of additional lands for waste disposal from Charles R. Evans.) Accession 2, Series 3, Box 8, Folder 69U.

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Letter from Fort Collins factory manager John Stewart to southern district manager J. R. Mason, 19 January 1953. (This letter addressed the current status of water usage at the Fort Collins plant and raised concerns about the future availability of water from the Cache la Poudre River.) Accession 2, Series 3, Box 8, Folder 69U.

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Factory Waste Disposal Facilities, 1 May 1953. (This internal report, produced by assistant to the president A. A. Clark, addressed the current status of waste disposal at all of the company's factories. In the separate section on the Fort Collins factory, the report included a map of the plant's waste disposal system.) Accession 2, Series 3, Box 8, Folder 69U.

Factory Waste Disposal Facilities, 12 January 1954. (This internal report, produced by assistant to the president A. A. Clark, addressed the current status of waste disposal at all of the company's factories. In the separate section on the Fort Collins factory, the report made suggestions for changes to the effluent system that were identical to those found in his September 1952 letter to vice president Hartburg.) Accession 2, Series 3, Box 9, Folder 69U.

Letter from southern district manager J. R. Mason to a Mr. Kemp, 23 September 1954. (This letter provided a report on the outlook for factory water supplies.) Accession 2, Series 3, Box 10, Folder 77.

Letter from southern district manager J. R. Mason to district superintendent Lloyd Jensen, 25 February 1955. (This letter addressed the recent increase in rates for treated water purchased from the City of Fort Collins.) Accession 2, Series 3, Box 10, Folder 77.

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Previous documentation on file (NPS):

preliminary determination of individual listing (36 CFR 67 has been requested)
 previously listed in the National Register
 previously determined eligible by the National Register
 designated a National Historic Landmark
 recorded by Historic American Buildings Survey # _____
 recorded by Historic American Engineering Record # _____
 recorded by Historic American Landscape Survey # _____

Primary location of additional data:

State Historic Preservation Office
 Other State agency
 Federal agency
 Local government
 University
 Other
Name of repository: Norlin Library, University of Colorado
Morgan Library, Colorado State University

Historic Resources Survey Number (if assigned):

5LR.1828

GREAT WESTERN SUGAR COMPANY EFFLUENT FLUME AND BRIDGE

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10. Geographical Data

Acreage of Property 2 acres

(Do not include previously listed resource acreage.)

The UTM reference point was derived from heads up digitization on Digital Raster Graphic (DRG) maps provided to OAHF by the U.S. Bureau of Land Management.

UTM References (NAD 83)

(Place additional UTM references on a continuation sheet.)

1 13 496 179 4491 925
Zone Easting Northing

3 _____
Zone Easting Northing

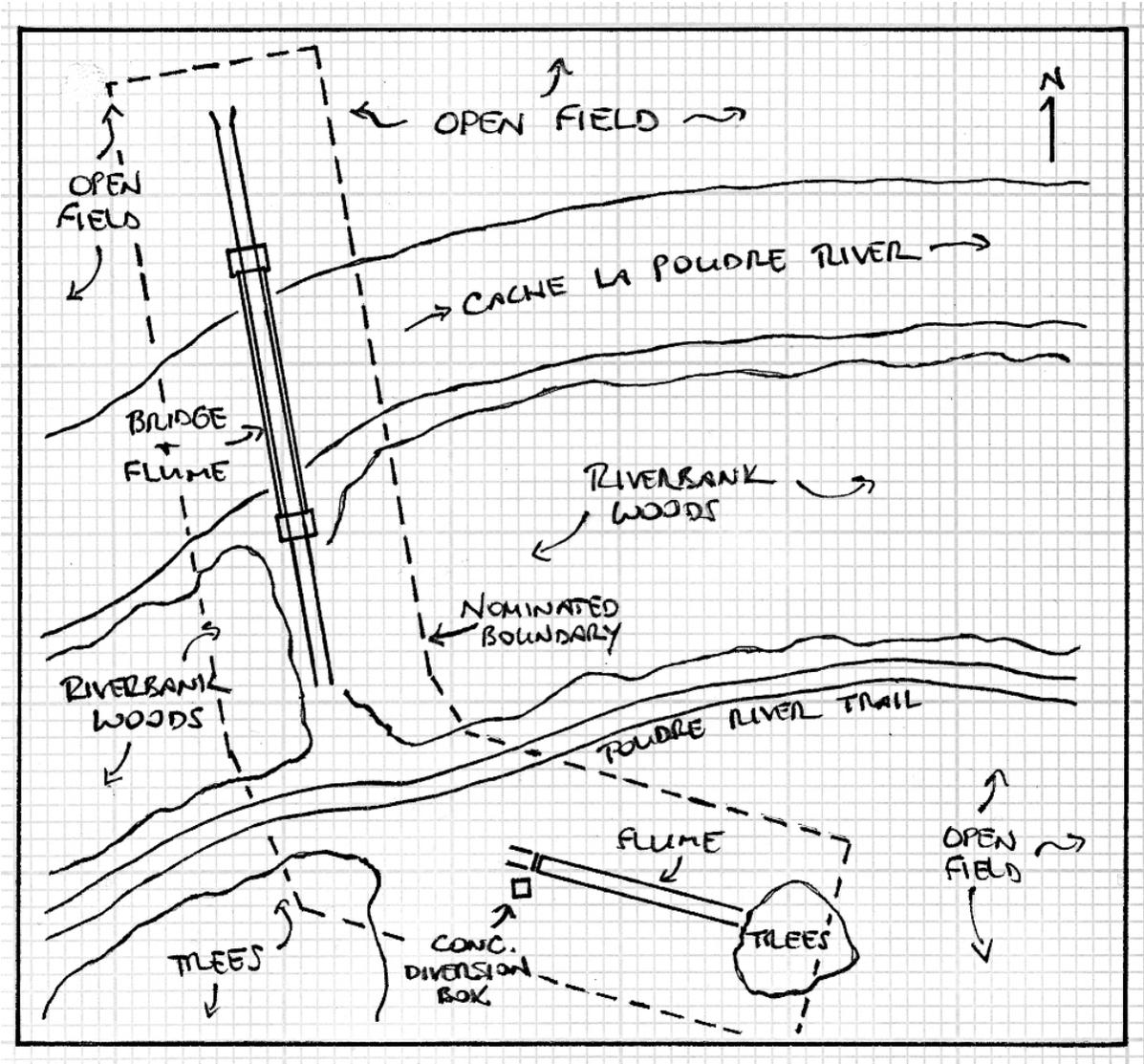
2 _____
Zone Easting Northing

4 _____
Zone Easting Northing

Verbal Boundary Description: The boundaries of the nominated property encompass an area of approximately two acres in the southeast ¼ of the northwest ¼ of the northeast ¼ of Section 18, Township 7 North, Range 68 West. For the purpose of this nomination, the long boundary lines along the east and west of this linear site will be located parallel to the bridge and flume at a distance of one hundred feet on either side, measured from the centerline of these features. To the north and southeast, the boundaries in these directions will extend fifty feet from the ends of the flume segments.

Boundary Justification: The nominated boundaries for this linear site are intended to preserve and protect the structures, along with the immediately surrounding setting that acknowledges and honors their historic riparian and rural character. The Effluent Flume and Bridge were constructed in this location in 1926 because of its setting outside the city and along the river. This was done at a time when effluent disposal on the land and in the waterway were critical to the operation of the beet sugar factory, yet these needed to be moved a distance away from the city. The importance of the setting as well as the structures themselves justifies the establishment of the proposed boundaries.

Site Diagram



Great Wester Sugar Company Effluent Flume & Bridge

Fort Collins, Larimer County, Colorado

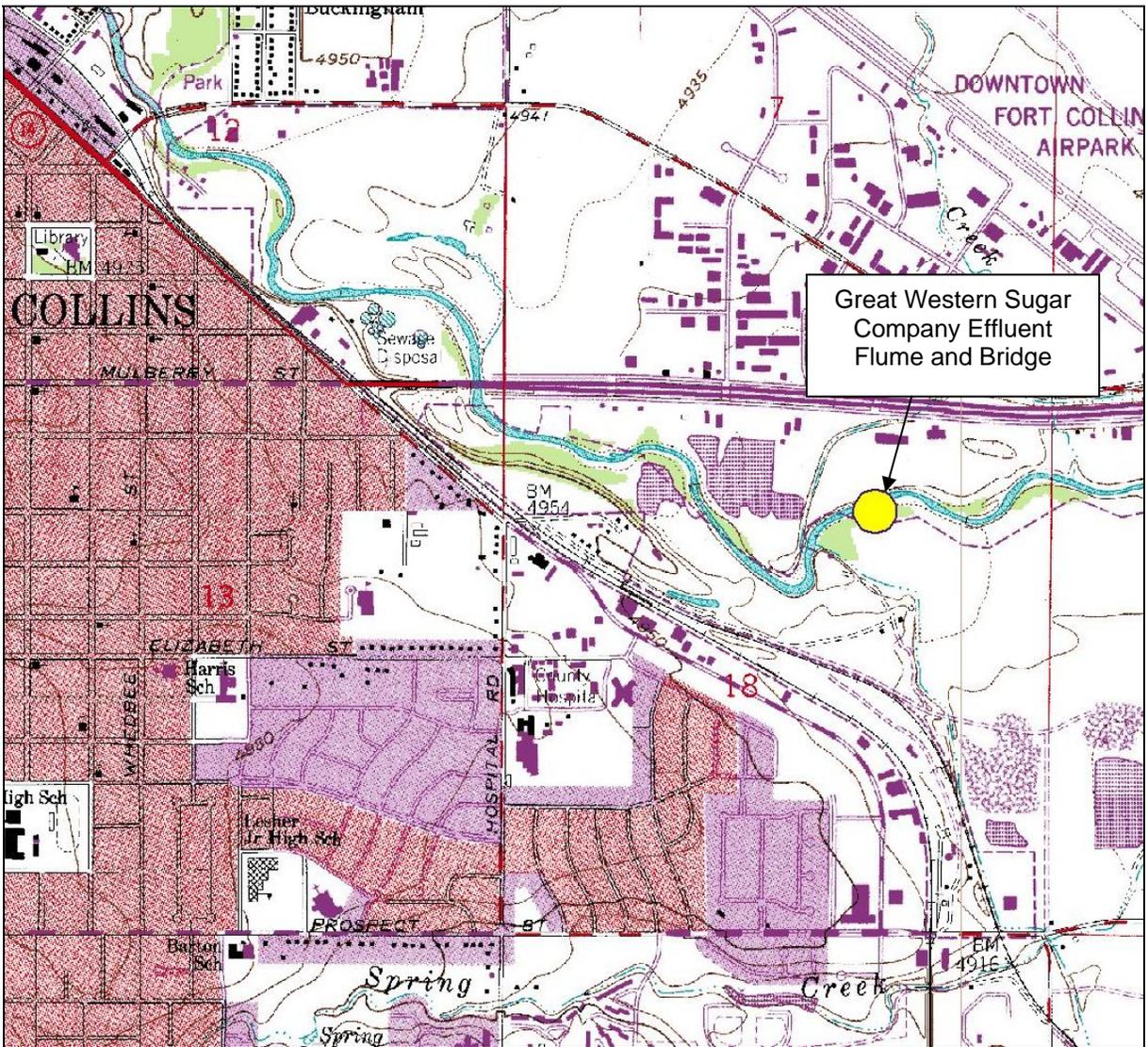
Diagram drawn by Ron Sladek, September 2013

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USGS Quadrangle
7.5 minute series
Fort Collins quadrangle

Elevation 4910'

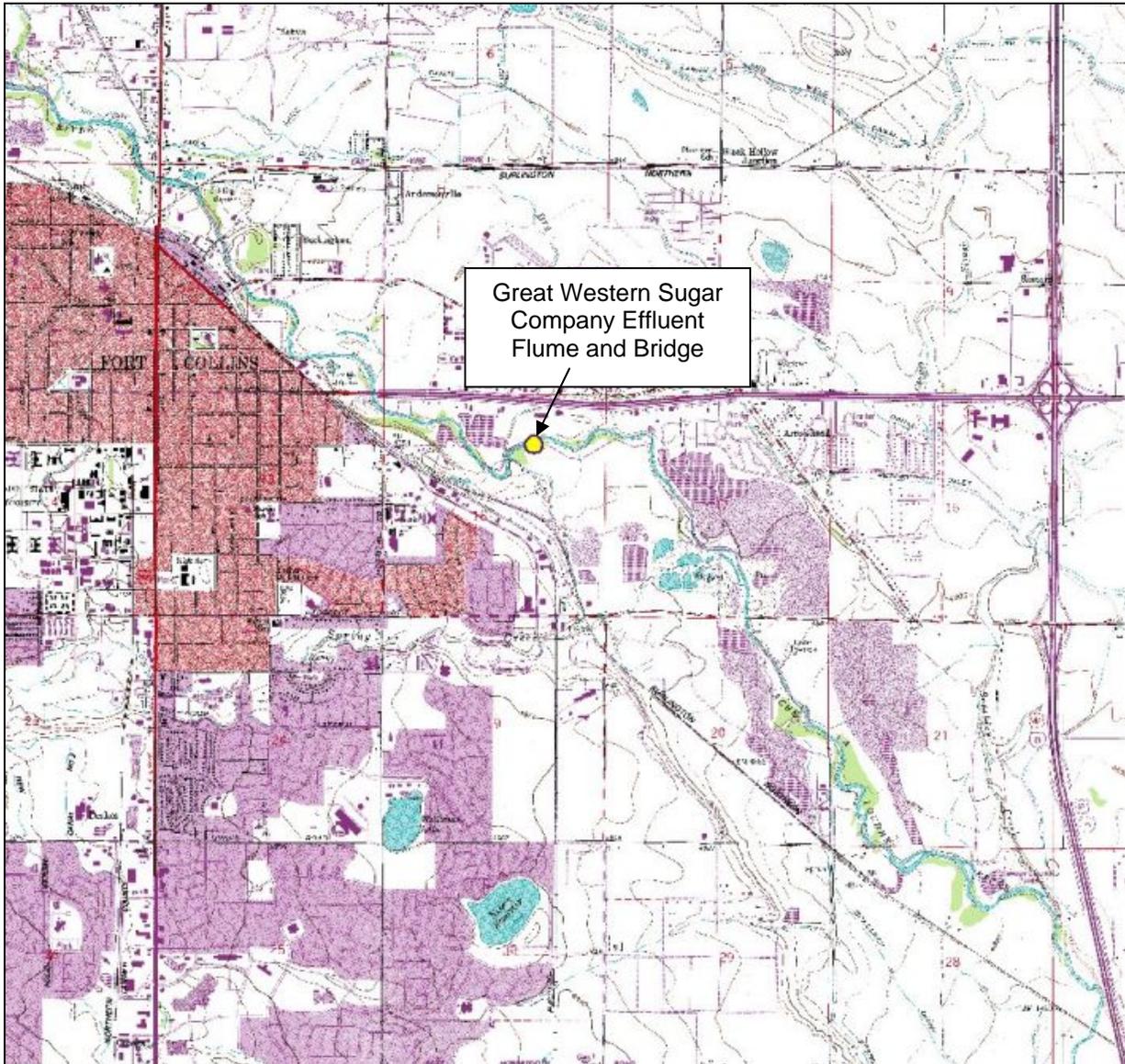


GREAT WESTERN SUGAR COMPANY EFFLUENT FLUME AND BRIDGE
Name of Property

LARIMER, COLORADO
County and State

USGS Quadrangle— regional perspective
7.5 minute series
Fort Collins quadrangle

Elevation 4910'



GREAT WESTERN SUGAR COMPANY EFFLUENT FLUME AND BRIDGE

Name of Property

LARIMER, COLORADO

County and State

11. Form Prepared By

name/title RON SLADEK, PRESIDENT (for property owner)

organization TATANKA HISTORICAL ASSOCIATES INC.

date 4 OCTOBER 2013 (revised 9/24/14)

street & number P.O. BOX 1909

telephone 970/221-1095

city or town FORT COLLINS

state CO

zip code 80522

e-mail tatanka@verinet.com

Photograph Log

The following information applies to all of the black and white photographs submitted with this form:

Name of property:	Great Western Sugar Company Effluent Flume and Bridge
City, county and state:	Fort Collins, Larimer County, Colorado
Photographer:	Ron Sladek
Date photographed:	25 April 2013 & 30 July 2013
Location of originals:	Tatanka Historical Associates Inc. P.O. Box 1909 Fort Collins, CO 80522 TIFF images on file with National Register, Washington, D.C.

Photograph #1: View of the bridge from the north. View to the south.

Photograph #2: View of the bridge and flume from the south. View to the northwest.

Photograph #3: View of the south tower from the middle of the bridge. View to the southeast.

Photograph #4: View of the north tower and flume from the north. View to the south.

Photograph #5: View of the north tower. View to the northwest.

Photograph #6: Detail view of the north tower's north face. View to the southeast.

Photograph #7: View of the bridge and flume from the north tower. View to the southeast.

Photograph #8: View of the bridge and flume from the middle of the bridge. View to the northwest.

Photograph #9: Detail view of the saddles and cable passing over the south tower. View to the northwest.

Photograph #10: Detail view of a cable anchor connection.

Photograph #11: Detail view of a cable anchor connection.

Photograph #12: Detail view of a suspender rod attachment to the cable.

GREAT WESTERN SUGAR COMPANY EFFLUENT FLUME AND BRIDGE

LARIMER, COLORADO

Name of Property

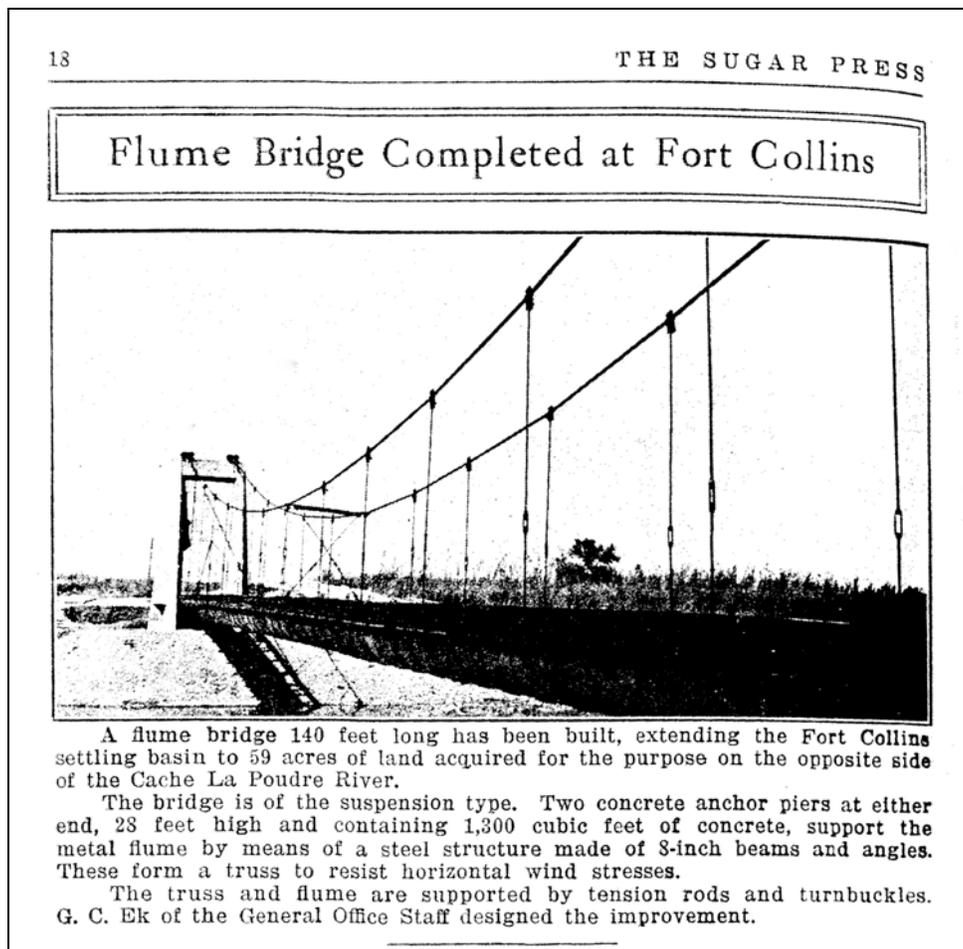
County and State

- Photograph #13: Detail view of a suspender rod anchor beyond the main bridge span.
- Photograph #14: Detail view of a gusset plate where the bridge deck structure meets a tower.
- Photograph #15: View of the flume approaching the bridge from the north. View to the southeast.
- Photograph #16: View of the flume extending to the north beyond the north tower. View to the northwest.
- Photograph #17: Detail view of a cable anchor connection north of the bridge.
- Photograph #18: View of the flume north of the bridge. View to the northwest.
- Photograph #19: View of initials and a date inscribed in concrete along the flume north of the bridge.
- Photograph #20: View of initials inscribed in concrete along the flume north of the bridge.
- Photograph #21: View of the southeast segment of the flume, with the bridge in the background. View to the northwest.
- Photograph #22: View of the southeast segment of the flume, with the headgate at its north end and the adjacent concrete diversion box. View to the east.
- Photograph #23: View of the headgate at the north end of the southeast flume segment. View to the east.
- Photograph #24: View of the headgate and diversion box at the north end of the southeast flume segment. View to the north.
- Photograph #25: View along the southeast flume segment. View to the southeast.

Historic Image Log

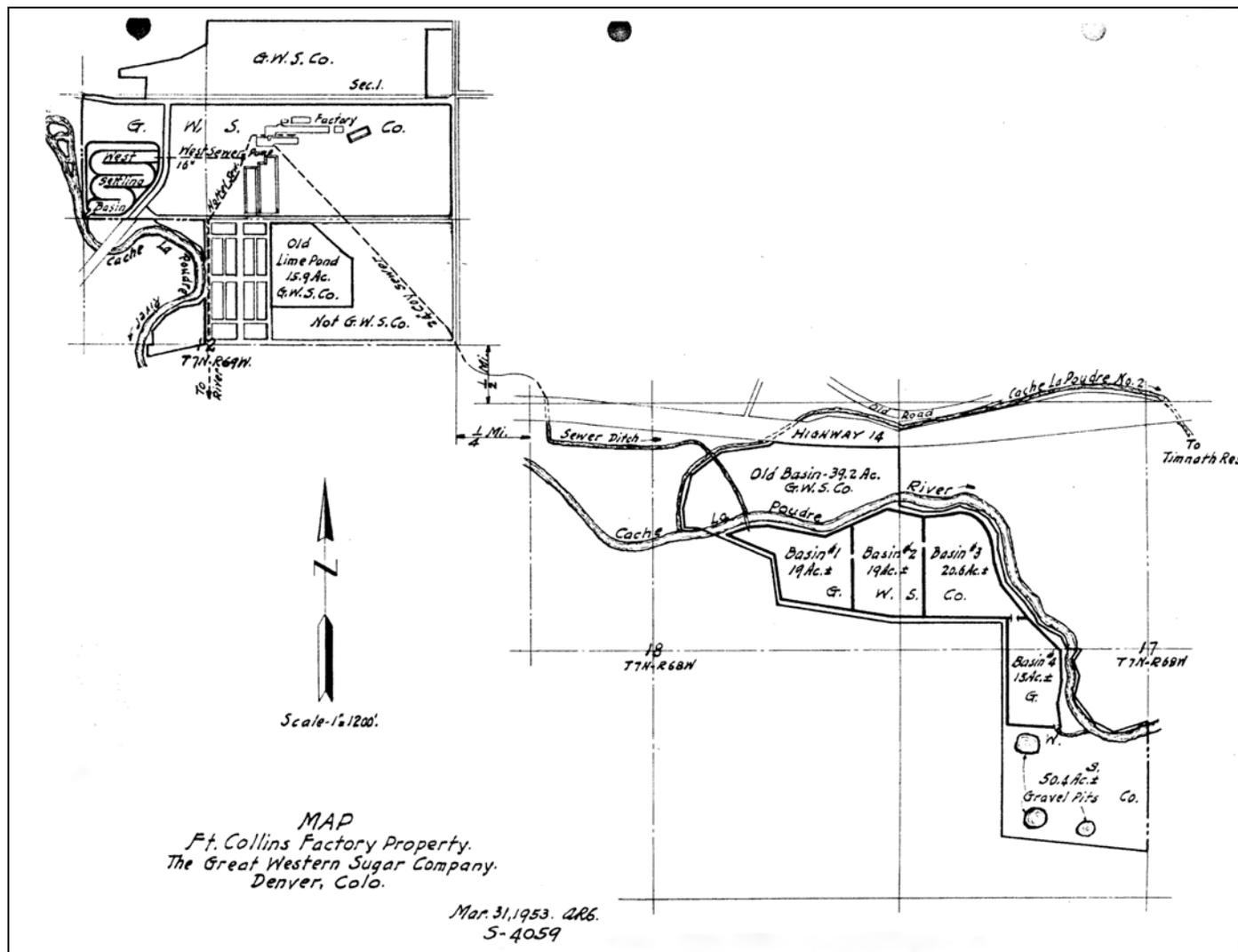
Figure No.	Description
1	Article from <i>The Sugar Press</i> , Great Western Sugar Company, October 1926, p. 18.
2	Map of the Fort Collins Beet Sugar Factory's Effluent Disposal System, Great Western Sugar Company, 31 March 1953.
3	Enlarged Map of the Fort Collins Beet Sugar Factory's Effluent Disposal System – with close-up of the bridge and flume area. Great Western Sugar Company, 31 March 1953.

Figure 1
Historic Photograph and Article



The Sugar Press
Great Western Sugar Company
October 1926

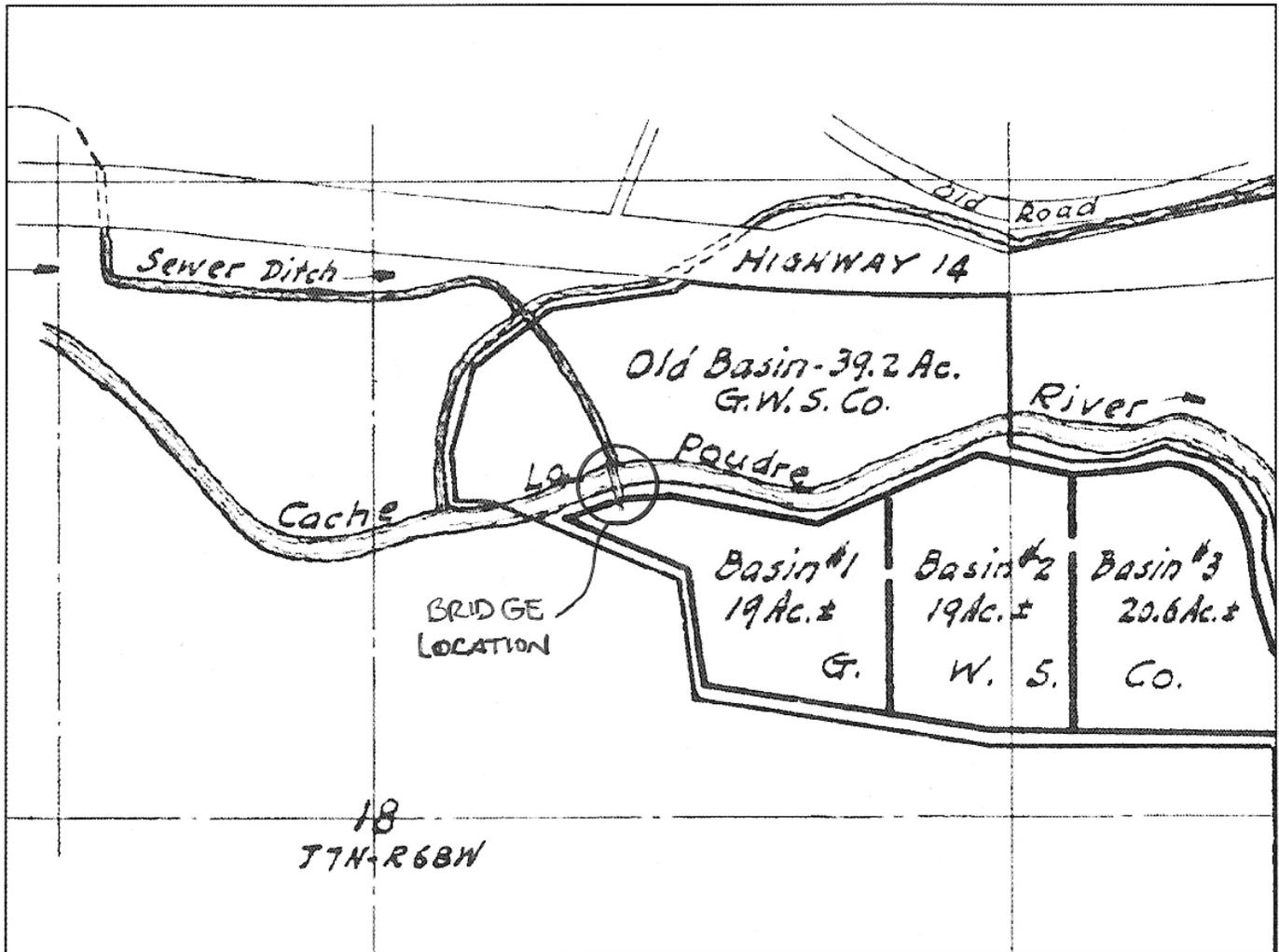
Figure 2
Map of the Fort Collins Beet Sugar Factory's
Effluent Disposal System



Great Western Sugar Company
31 March 1953

The nominated Bridge and Flume are shown crossing the Cache la Poudre River in the northeast quarter of Section 18 near the center of the map (close-up map of bridge and flume follows as figure 3).

Figure 3
Enlarged Map of the Fort Collins Beet Sugar Factory's
Effluent Disposal System – with close-up of the bridge and flume area



Great Western Sugar Company
31 March 1953

GREAT WESTERN SUGAR COMPANY EFFLUENT FLUME AND BRIDGE
Name of Property

LARIMER, COLORADO
County and State

Property Owner:

(Complete this item at the request of the SHPO or FPO.)

name CITY OF FORT COLLINS (Karen Mancj, contact)

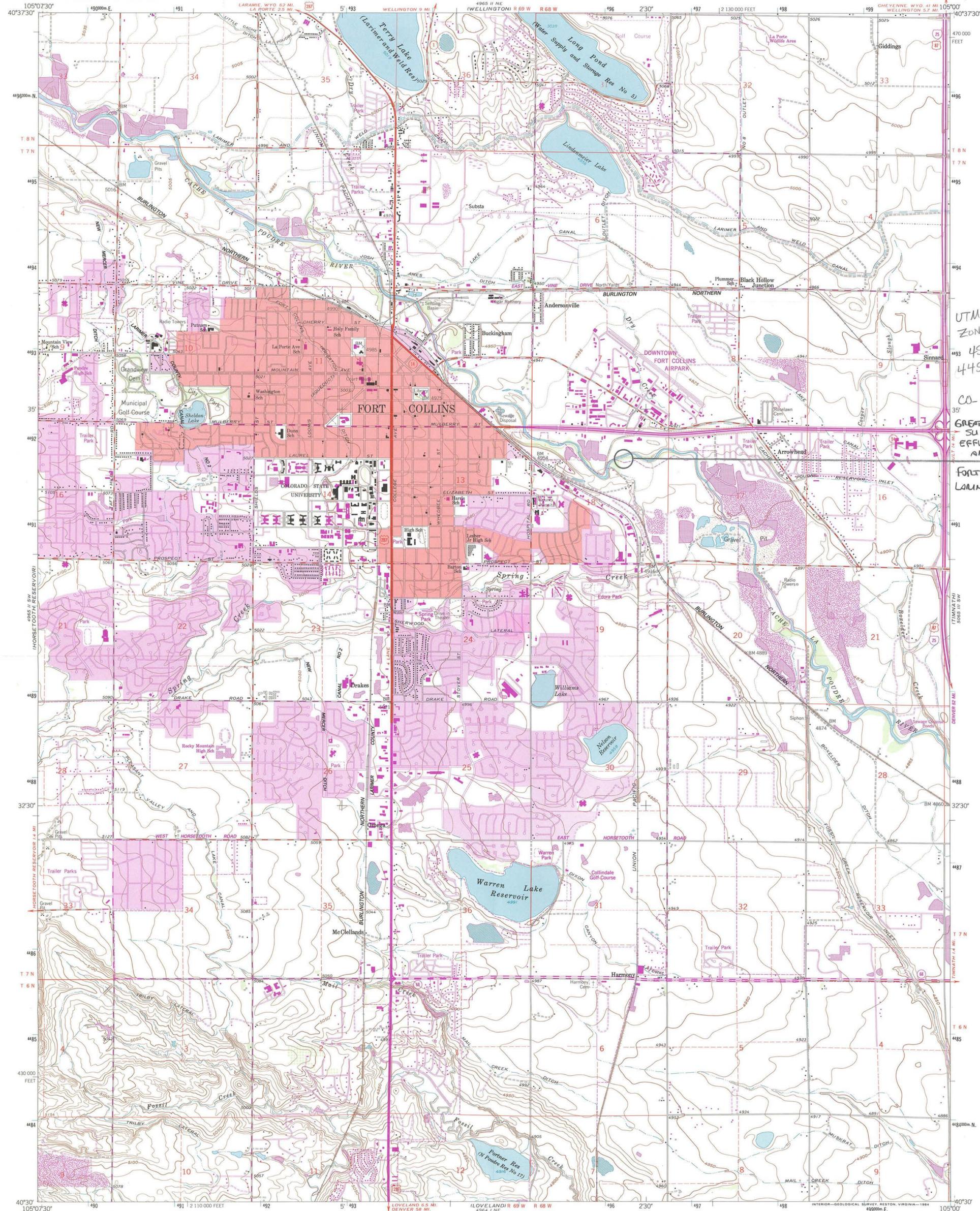
street & number 300 LAPORTE AVE.

telephone 970/221-6515

city or town FORT COLLINS

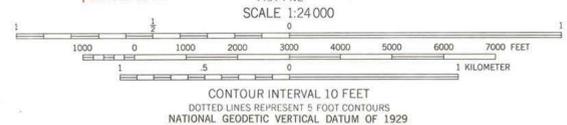
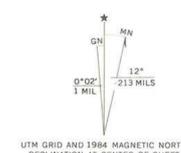
state CO

zip code 80521



UTM:
ZONE 13i
496 179 ME
4491 925 MN
CO. LARIMER
GREAT WESTERN
SUGAR COMPANY
EFFLUENT FLUME
AND SLUDGE
FORT COLLINS,
LARIMER COUNTY, CO

Mapped, edited, and published by the Geological Survey
Control by USGS and NOS/NOAA
Topography by photogrammetric methods from aerial
photographs taken 1958. Field checked 1960
Polyconic projection. 1927 North American Datum
10,000-foot grid based on Colorado coordinate system,
north zone 1000 meter Universal Transverse Mercator grid ticks,
zone 13, shown in blue
Red tint indicates areas in which only landmark buildings are shown
Fine red dashed lines indicate selected fence and field lines where
generally visible on aerial photographs. This information is unchecked
Purple tint indicates extension of urban areas
To place on the predicted North American Datum 1983
move the projection lines 6 meters north and
47 meters east as shown by dashed corner ticks



ROAD CLASSIFICATION

Heavy-duty	Light-duty
Medium-duty	Unimproved dirt
Interstate Route	U.S. Route
	State Route



THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U.S. GEOLOGICAL SURVEY, P.O. BOX 25286, DENVER, COLORADO 80225
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

Revisions shown in purple and woodland compiled from
aerial photographs taken 1978 and other source data
This information not field checked. Map edited 1984

FORT COLLINS, COLO.
40105-E1-TF-024
1960
PHOTOREVISED 1984
DMA 4965 II SE-SERIES V877







This is not a bridge
and is not safe for use.
Do not cross, climb or
access this structure.





This is not a bridge
and is not safe for use.
Do not cross, climb or
access this structure.





















DORRILL









UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

NATIONAL REGISTER OF HISTORIC PLACES
EVALUATION/RETURN SHEET

REQUESTED ACTION: NOMINATION

PROPERTY NAME: Great Western Sugar Company Effluent Flume and Bridge

MULTIPLE NAME:

STATE & COUNTY: COLORADO, Larimer

DATE RECEIVED: 10/03/14 DATE OF PENDING LIST: 11/03/14
DATE OF 16TH DAY: 11/18/14 DATE OF 45TH DAY: 11/19/14
DATE OF WEEKLY LIST:

REFERENCE NUMBER: 14000927

REASONS FOR REVIEW:

APPEAL: N DATA PROBLEM: N LANDSCAPE: N LESS THAN 50 YEARS: N
OTHER: N PDIL: N PERIOD: N PROGRAM UNAPPROVED: N
REQUEST: N SAMPLE: N SLR DRAFT: N NATIONAL: N

COMMENT WAIVER: N

ACCEPT RETURN REJECT 11.19.14 DATE

ABSTRACT/SUMMARY COMMENTS:

Entered in
The National Register
of Historic Places
Historic Places

RECOM./CRITERIA _____

REVIEWER _____ DISCIPLINE _____

TELEPHONE _____ DATE _____

DOCUMENTATION see attached comments Y/N see attached SLR Y/N

If a nomination is returned to the nominating authority, the nomination is no longer under consideration by the NPS.



OFFICE of ARCHAEOLOGY and HISTORIC PRESERVATION



September 26, 2014

Carol Shull
Acting Keeper of the National Register
National Register of Historic Places
1201 Eye "T" Street, N.W. 8th Floor (MS 2280)
Washington, D.C. 20005-5905

Re: National Register Nomination for the Great Western Sugar Company Effluent Flume and Bridge, Cache
La Poudre River, ½ mile west of Timberline Rd. Fort Collins, Larimer County, Colorado (5LR.1828)

Dear Ms. Shull:

We are pleased to submit for your review the enclosed National Register of Historic Places nomination of the Great Western Sugar Company Effluent Flume and Bridge. In accordance with the new submission policy, enclosed please find:

- CD with a PDF nomination for the Great Western Sugar Company Effluent Flume and Bridge
Note: **The enclosed disk contains the true and correct copy of the nomination for the Great Western Sugar Company Effluent Flume and Bridge to the National Register of Historic Places.**
- CD with TIF images
- USGS map
- Physical signature page with original signature

The State Review Board reviewed the nomination at its meeting on May 16, 2014. The board voted unanimously to recommend to the State Historic Preservation Officer that the nomination met the criteria for listing in the National Register.

We look forward to the listing of this nomination. If you have any questions, feel free to contact me at (303) 866-4684 or at heather.peterson@state.co.us.

Best regards,

Heather Peterson
National & State Register Historian

Enclosures above noted