By Ken Kopp, P.G., Water Rights/Source Water Specialist

Failure of Marysville's Historic Low-Head Dam on the Big Blue River

Remnants of the Marysville dam on May 7, 2018, facing downstream.

Sometime in the early morning hours of Friday, May 4, 2018, a low-head dam on the Big Blue River, near Marysville in Marshall County, gave way under the rush of water flowing down the river following heavy rainfall earlier that week. The more than century old dam was one of Kansas' last relics of days gone by when water power was a key component to a community's success and viability. Dams like the one near Marysville were commonplace across Kansas. Perhaps some of the more well-known examples are the Soden's mill dam on the Cottonwood River at Emporia, which still stands as a popular fishing attraction, and the Bowersock mill dam on the Kansas River at Lawrence, which began life providing water power to the Jenny Wren flour mill and continues operation for hydro-electric power generation. Much smaller communities across the state such as Arrington, Ozawkie and Muscotah were also home to such dams which powered various types of mills. An 1881 publication, "Reports on Water-Power of the United States," by the U.S. Census Bureau details nearly a hundred dams in Kansas, including a dam that was constructed on the Delaware River near Valley Falls that powered a gristmill, woolen-mill, and a grain elevator, as well as providing water to a nearby railroad water tank for steam locomotives.

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The Big Blue River, the report states, was well-suited for water power due to its "good fall" and numerous exposures of bedrock limestone, which provided a stable foundation on which to construct a dam in the stream channel. The report also details several upstream dams on the Big Blue River at the Nebraska communities of Crete, Wilbur, Caldwell, Beatrice, Blue Springs, Barneston, and also Oketo, Kansas.

According to the census report, another extensively developed water-power project on the Big Blue River at that time, was at Blue Rapids. A dam there on the Big Blue River, downstream from its confluence with the Little Blue River, provided power to a gristmill, woolen mill, paper mill, plaster mill and a foundry. A wheel in the Blue Rapids mill also pumped river water to town. Downstream, the Rocky Ford dam on the Big Blue River at Manhattan was used to power a grist and saw mill.

According to William G. Cutler's *History of the State of Kansas*, Francis J. Marshall established a ferry across the Big Blue River in 1849, located approximately nine miles downstream from the current city of Marysville. When the federal government later opened a military road in 1850, beginning at Fort Leavenworth, heading northwestward to Fort Kearny, Nebraska, Marshall was granted permission to open a second ferry upstream on that trail to capitalize on what would likely be the bulk of the emigrants and gold seekers passing through that area on the way to California. While a member of the first

Big Blue River as it appeared on October 3, 2014, with approximately 9,000 c.f.s. spilling over the dam. Erosion of the face of the dam is clearly evident on the far end. Streamflow over the dam on May 4, 2018, when it ultimately failed was approximately 4,000 c.f.s.

Kansas Legislature, in 1855, Marshall had a county laid out with the Big Blue River running through the center and established the county seat at his northern ferry location naming the town Marysville, in honor of his wife, Mary.

Emma Fortner wrote in her *History of Marshall County, Kansas*, that Perry Hutchinson, a native of Chautauqua County, New York, arrived in the community in October 1859, where he initially worked as a field hand. He purchased 80 acres of land on both sides of the Big Blue River located 1.5 miles west of Marysville and began construction of the dam. In 1864, after serving a 20-month stint in the Kansas Infantry, he completed the dam and built his first sawmill on the east side of the river, which reportedly supplied all the lumber used in building the stations of the Holliday Stage Line, between Marysville and Denver. Later that same year he opened the first flour mill to be operated west of the Missouri River. His flour was initially sold as far east as Lawrence and wheat was brought to the mill by growers from a 150-mile radius. A grain elevator was built on the site in 1877 with a capacity of 50,000 bushels. A rail-spur from the St. Joe & Western Railroad was then constructed to the elevator and mill in 1878.

Fortner further indicates that the remodeled operation, named the Excelsior Roller Mills, was the first in Kansas to be equipped with such improved rollers. A few years later, the *Marshall County News* of October 5, 1883, reported the capacity of the mill was up to 300,000 barrels of flour per day. Flour from the expanded mill was sold principally to large baking entities, with St. Louis being the chief market and receipts totaling $400,000 per year. The census report from that time indicates there was an abundance of water year-round and that a large amount of water "runs to waste" over the "loose rock" dam throughout all seasons. Like Marshall, Hutchinson also served in the Kansas Legislature, having been elected to the senate in 1880. He died in December 1914.

In 1929, the Big Blue Power Company was formed, and construction began on a double turbine hydro-electric power plant adjacent to the Excelsior Roller Mills on the west end of the dam to provide electricity to the city. At that time, the dam reportedly consisted of wood cribs filled with rock. With the construction

William G. Cutler in his *History of the State of Kansas* described Perry Hutchinson's early flour mill operation at Marysville as follows:

The first floor (Hutchinson) occupied as a saw-mill, and in the second story he placed two run of burrs, with which he did "custom work". This combination mill was operated by him until 1867, when, on the west bank of the river, he erected a three-story stone structure, 40 x 80 feet. In the construction of this building 1,100 perch of stone were used, and when completed employed five run of burrs, with a capacity of one hundred barrels of flower [sic] per day. This mill, as well as the first one, was run by water-power furnished by the Big Blue River. In order to furnish the new mill with sufficient power, Mr. Hutchinson was obliged to construct a tunnel which, at that time was one of the greatest undertakings in the West. This tunnel forms a semi-circle under the bank, and the mill stands directly over the shaft. The reservoir, from the mouth of the shaft, is ninety feet long, twenty-four feet wide, and eight feet high, and is capable of containing a body of water the weight of which is equal to a pressure of one hundred tons. The tunnel itself, including a canal at its inlet and outlet, is 435 feet in length, 185 feet of which are cut through solid rock. In the summer of 1882, the entire mill was remodeled and enlarged at an expense of $40,000. Seventeen pairs of Stevens' improved rollers, manufactured at Buffalo, N. Y., were put in operation, which gives the mill a capacity of 250 barrels of flour every twenty-four hours.

Marysville dam as it looked on October 3, 2014, with above-normal streamflow of approximately 9,000 c.f.s. Streamflow over the dam on May 4, 2018, when it ultimately failed was approximately 4,000 c.f.s.

The graffiti covered disused power plant remains standing at the site; no significant improvements were made to the dam following the 1929 modifications.

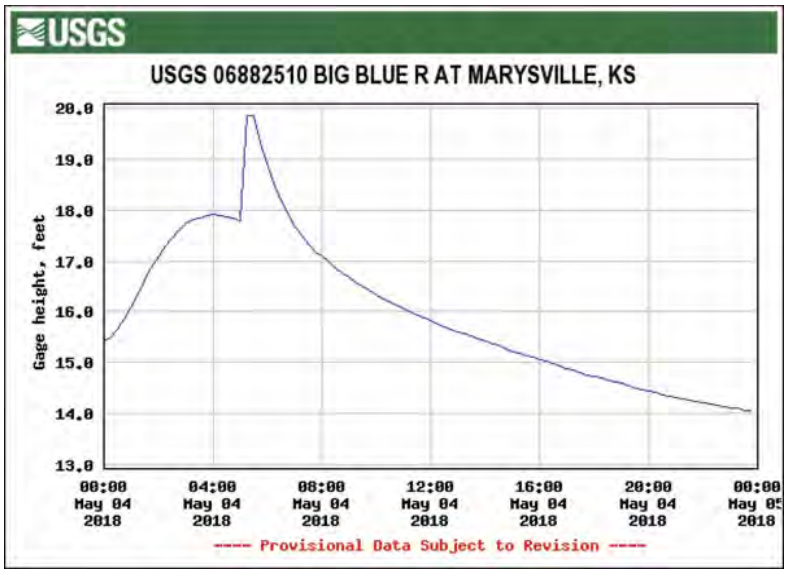
of the power plant, additional improvements were made to the dam by adding a two-foot thick vertical concrete wall on the upstream side of the dam and placing a concrete slab over the top of the rock-filled wooden cribs. The powerplant operated through the late 1960s, with the city of Marysville taking ownership of the dam from the power company after the plant ceased power production. The graffiti covered disused power plant remains standing at the site; no significant improvements were made to the dam following the 1929 modifications.

Impact on water supplies

In 1984, as the city of Marysville contemplated constructing a new surface water intake upstream of the dam, George Austin, P.E., Dam Engineer, and Guy Ellis, Hydrologist, both with what was then the Kansas State Board of Agriculture's Division of Water Resources conducted an inspection of the remaining structures. Austin concluded in his 1984 report that the dam was deteriorating at a rate that would result in failure within three to five years. He further recommended repair of the dam, should the city decide to construct a new intake upstream. But nothing was done to the already failing structure after the city instead decided to invest in a new well-field southeast of town.

Rehabilitation of the dam was considered again as recently as 2009. A feasibility study was conducted by Schwab-Eaton, P.A., Manhattan, Kansas for Washington County RWD No. 1, funded by the Kansas State Conservation Commission, following a 2006 report by Ground Water Associates, Wichita, which concluded that failure of the dam and loss of the mill pond could result in a lowered

Remains of the Hutchinson Flour Mill as it appeared on January 26, 2013. The mill still stands adjacent to the powerhouse on the west end of the dam.



This USGS Hydrograph from May 4, 2018, shows the likely timing of dam failure, with a sharp spike in surface water flows at the downstream gage at approximately 5:00 a.m. after the river had already crested.

groundwater table that could adversely impact the district's four public water supply wells located approximately 1.5 miles upstream from the dam. Four alternatives were proposed by the engineers, from constructing a new cofferdam immediately upstream, to constructing a new cofferdam immediately downstream, to removing the existing dam and building a new concrete gravity dam in its place. The fourth proposal was to repair the existing dam with more durable materials. Repair and rehabilitation of the existing structure was deemed to be the most practical but still came with a cost-prohibitive minimum price tag of $4.36 million. Ultimately, the district elected to drill additional wells elsewhere to mitigate any deterioration in the aquifer should the dam fail. The district received cost share funding through the Conservation Commission to develop those new well sites to offset any potential loss in production.

Having grown up near Marysville, I often visited the low-head dam over the years, especially during high flow events, and wondered how much longer it could survive and what type of event would ultimately bring about its demise. During my recent visits after the dam failed, I visit with local residents who lament the loss of the dam. It was somewhat of a local attraction and the local residents have nostalgic memories of fishing and swimming at the dam. Although nothing was damaged by the dam failure and no critical infrastructure was lost, as stated in the *Marysville Advocate*, the dam remained a special spot in Marysville's collective memory.

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