

History of Flagstaff's Water System

The City of Flagstaff was established in 1882 as a railroad stop for train water and passengers and first utilized spring water near what is now known as "Old Town Spring" adjacent to Mars Hill. This water source was very limited and a new supply was soon needed. After the City became incorporated in 1884 with only 1,500 residents, Mayor Abineau began the City's first of three major water supply importation projects from miles outside its corporate limits. The vision of the City's first reliable water supply came from within the San Francisco Peaks where a 12 mile, 6-inch clay pipeline was constructed from the Inner Basin through Shultz Canyon to a 2.5 million gallon reservoir located north of Flagstaff along what is now Shultz Pass Road (Figure 1.1). An 8-inch cast iron pipeline continued on into town providing the railroad and citizens its first reliable water supply. Additional improvements of Jack Smith Spring, Flagstaff Spring and Snowslide Spring located between 9,600 feet and 11,020 feet were conducted by the City and Arizona Lumber & Timber Company in 1899 and 1900, respectively. The new water system went into use with approximately 300 customers where residences paid \$2/month, which at the time was a day's wage for most men (Cline, 1994). The original monthly fee is equivalent to \$52.41 in 2010 dollars (USBLS, 2010).

Seeking additional surface water supplies in early 1905, T.A. Riordan constructed lower Lake Mary Dam over six miles away southeast of the City limits in what was then known as Clark Valley. This dam took advantage of the surface water within Walnut Creek watershed and represents the City's second major water supply importation project (Figure 1.2). Lake Mary and the dam obtained their name from Riordan's oldest daughter, Mary.

As the City's water demands grew, the City purchased the small, private sewer company that contained over 4,500 feet of 12" main in 1917 (Cline, 1994). This was important given that with a new water system, many buildings were then constructed with toilets and then came the problem of sewage disposal. The discharge point of the sewer was into "sewer canyon" south east of town, in the vicinity of today's Butler Avenue and the Rio de Flag. According to Cline (1994), the cost of the sewer company was \$60,000 or \$1.205 million in 2010 dollars (USBLS, 2010). Since most citizens in rural America at the time had never had to pay for sewer services, the connection fee to the sewer system of \$60 was a sticking point (\$1,025 in 2010 dollars (USBLS, 2010)). Additionally, each customer was then charged an annual fee of \$9 or \$0.75 per month (\$12.81/month in 2010 dollars (USBLS, 2010)).

The Santa Fe Railway constructed a new 50 million gallon storage reservoir to expand Inner Basin water storage capacity in 1914 at the Shultz Pass Road facility. The City then voted in 1925 to construct a second 52 million gallon storage reservoir, upsize the pipeline from the Inner Basin to 14-inch and purchase the water rights and infrastructure from the railroad for \$475,000 or \$5.9 million in 2010 dollars (USBLS, 2010) (Figure 1.1).

Due to intermittent nature of the flows in Walnut Creek and the high infiltration rates in the bottom of lower Lake Mary, a second dam was constructed up-gradient (Figure 1.2). Upper Lake Mary Dam and Lake Mary Water Treatment Plant (WTP) were constructed in 1941 for \$200,000 (\$2.97 million in 2010 dollars (USBLS, 2010)) in order to store, treat and deliver this surface water directly to the citizens of Flagstaff. The dam was then raised an additional 10 feet in 1951 to its current height and has a storage capacity of 16,300 acre-feet (AF) (Hornerwer and Flynn, 2008),

In 1950, Arizona health standards required the City to spend \$192,000 (or \$1.74 million in 2010 dollars (USBLS, 2010)) to replace old sewer lines and extend new ones. However, in lieu of building a wastewater treatment plant at the time, the City simply extended the sewer outfall ½ mile further downstream in the Rio de Flag (Figure 1.2). One of the benefits of this effort was to essentially eliminate all of the outdoor privies that remained in the City.

Also during the 1950s, drought required the City to look for a more reliable water supply beyond surface water. The City conferred with U.S. Geological Survey geologist John Harshbarger about drilling a well in the Woody Mountain (Mtn) area located over five (5) miles southwest of town (Cline, 1994). Not only did this source of groundwater become the City's first use of groundwater but also represents the City's third major water supply importation project. The first well was drilled and completed in 1954 (Figure 1.2).

The City's first wastewater treatment plant was constructed and began operating in the Rio de Flag, upstream of today's Foxglenn Park in 1956 (Cline, 1994). The plant capacity was 1 million gallons per day (MGD) and cost \$530,000 or \$4.26 million in 2010 dollars (USBLS, 2010).

In 1958, the urgency of water matters had become so demanding that the City Council established a citizens advisory group that was the precursor to today's Water Commission. Six members were appointed to the Water Use and Utilization Commission which also included the Mayor and City Manager (Cline, 1994).

The City continued the expansion of groundwater supplies by developing a well field adjacent to Lower Lake Mary starting in 1963 (Figure 1.2). Additionally, a new 8 MGD Lake Mary WTP was constructed adjacent to the original 1941 facility to take advantage of Upper Lake Mary stored surface water.

In 1971, due to federal and state agency warnings about the quality of the wastewater being discharged into the Rio de Flag, the Wildcat Hill wastewater treatment plant (WWTP) was constructed at a cost of \$3.1 million or \$16.75 million in 2010 dollars (USBLS, 2010). The 3 MGD plant located in east Flagstaff became operational in November of that year (Cline, 1994). The plant capacity was subsequently increased to 6 MGD in the 1981.

Along with several other municipal water providers, the City of Flagstaff was designated as having an Adequate Water Supply on May 17, 1973 as part of the State's Water

Adequacy Program. However at the time, the City was never required to prove hydrologically that it had adequate water supplies that could support existing and projected water needs 100-years into the future (ADWR, 2008).

The City's first direct use of reclaimed water was at the Continental Country Club golf courses in 1975 where the water came from the ~1 MGD Wastewater Plant #1 (Turner, 2010). The City expanded its reclaimed water system with the construction of the 4 MGD Rio de Flag Water Reclamation Facility (WRF) and the two million gallon storage tank at Buffalo Park in 1993. The tank was converted from potable water to reclaimed water in order to provide for a reliable storage and delivery.

While the first development of surface water supplies outside of the City limits occurred back in the late 1880s, the first development of groundwater supplies within the City limits occurred nearly 110 years later. In 1997 the City began drilling water wells locally and now has seven (7) in operation and one (1) not yet connected to the distribution system due to current financial constraints (Stonehouse Well) (Figure 1.2).

In order to address the continued increase in water use within Flagstaff, the City Council adopted the first water conservation ordinance in November 1990. This first ordinance established the City's water conservation program and required water saving devices, such as low flow toilets, etc.

In 2009, the City expanded its reclaimed water system in two ways. First, the City upgraded the treatment technology at its Wildcat Hill WWTP to produce Class A+ water in addition to constructing an additional booster facility and pipeline to facilitate reclaimed water delivery. These additions now connect the plant to the City-wide reclaimed water distribution system and the storage tank at Buffalo Park. These upgrades will increase system reliability and allow for increased use of reclaim water within the City.