

# MEMO

**TO:** IDWR File for Application for Transfer 84773

**FROM:** James Cefalo

**DATE:** September 1, 2021

**RE:** Capacity of Ditches Used to Fill Reservoir #2

Strong Arm Reservoir Irrigation Company ("SARIC") stores water from Battle Creek in two reservoirs: Strong Arm #1, which is located on Battle Creek and Strong Arm #2 which is an off-stream reservoir. Water rights 13-929, 13-2286, 13-2290, and 13-2305 authorize the storage of water from Battle Creek in Strong Arm #1 and Strong Arm #2. The original decrees and licenses for these rights did not include a "diversion to storage" element. Because one of the reservoirs is located off stream, the rights require a "diversion to storage" element. As part of Application for Transfer 84773, SARIC proposes to define a "diversion to storage" element for the four Battle Creek storage rights.

According to Application 84773, SARIC uses two ditches to fill Strong Arm #2. Water diverted through the ditches is injected into Twin Lakes Canal and is re-diverted out of the canal at an upstream location and into Strong Arm #2. Application 84773 states that the two ditches can convey up to 46 cfs from Battle Creek.

All of four of SARIC's Battle Creek storage rights refer to storage in two reservoirs. Strong Arm #2 has always been an off-stream reservoir. Therefore, the "diversion to storage" element was simply an undefined element of the old decrees and licenses. The "diversion to storage" element is similar to a beneficial use claim, because it has never been verified by the Department or an adjudication court. Prior to approving Transfer 84773, the Department should conduct a review to determine if the 46 cfs diversion to storage proposed by SARIC is supported by evidence.

On August 27, 2021, I conducted a field inspection of the two ditches used to divert water from Battle Creek for storage in Strong Arm #2. Neither of the ditches were diverting water during the inspection. This memo is intended to summarize the measurements and observations from that inspection.

The headgate for the first ditch ("Upper Ditch") is located approximately 2,000 feet downstream of the dam on Battle Creek for Strong Arm #1. The headgate and diversion works for the Upper Ditch are in poor condition, but are still functional. Just downstream of the headgate, the Upper Ditch is a rounded ditch, approximately ten feet wide at the top and two feet deep in the middle of the ditch. The elevation at the head of the ditch is 4,914 feet. The Upper Ditch is approximately 5,020 feet long. The elevation at the end of the ditch is 4,881 feet. The ditch drops 33 feet in elevation over the length of the ditch. This equates to a slope of 0.6%. Approximately 3,100 feet from the headgate, the ditch passes through a 2.0-foot corrugated steel culvert. Using the Manning's equation and assuming a slope of 0.006 ft/ft, a roughness coefficient of 0.025, the maximum rate of flow that can pass through the culvert is 9.6 cfs. The Hazen-Williams equation for full pipe flow yields a similar value (10.1 cfs).

The headgate for the second ditch ("Lower Ditch") is located approximately 4,200 feet downstream of the dam on Battle Creek for Strong Arm #1. Water is diverted into the Lower Ditch by placing pressure boards across the Battle Creek channel. There is no headgate for the Lower Ditch. Water will not flow into the ditch if the pressure boards are removed. The Lower Ditch is a rounded channel, approximately eighteen feet wide at

the top and three feet deep in the middle of the ditch. The elevation of the ditch near the headgate is 4,892. The elevation at the end of the ditch is 4,877. The lower ditch flows into the Twin Lakes canal without any control structure or drop. During the field inspection, I observed that water from Twin Lakes Canal was backing up into the Lower Ditch approximately 300 feet. The Lower Ditch is approximately 1,540 feet long. The ditch drops 15 feet in elevation over the length of the entire ditch. This equates to a slope of 0.9%. Approximately 400 feet from the diversion, the ditch passes through a 40-inch corrugated steel culvert. Using the Manning's equation and assuming a slope of 0.009 ft/ft, a roughness coefficient of 0.025, the maximum rate of flow that can pass through the culvert is 43.8 cfs. The Hazen-Williams equation for full pipe flow yields a similar value (48.4 cfs).

The ditches and culverts are sized to carry at least 46 cfs. The ditches are overgrown and cannot carry 46 cfs in their present condition. SARIC admits that the company has only diverted about 20 cfs to fill the reservoir in recent years. The rights, however, have been used consistently over time and Strong Arm #2 has is filled to capacity almost every year. Even if SARIC has not filled the reservoir at a rate of 46 cfs every year, the right to fill the reservoir at that rate has not been lost. Transfer 84773 should be approved with a "diversion to storage" element of 46 cfs for all four Battle Creek storage rights.



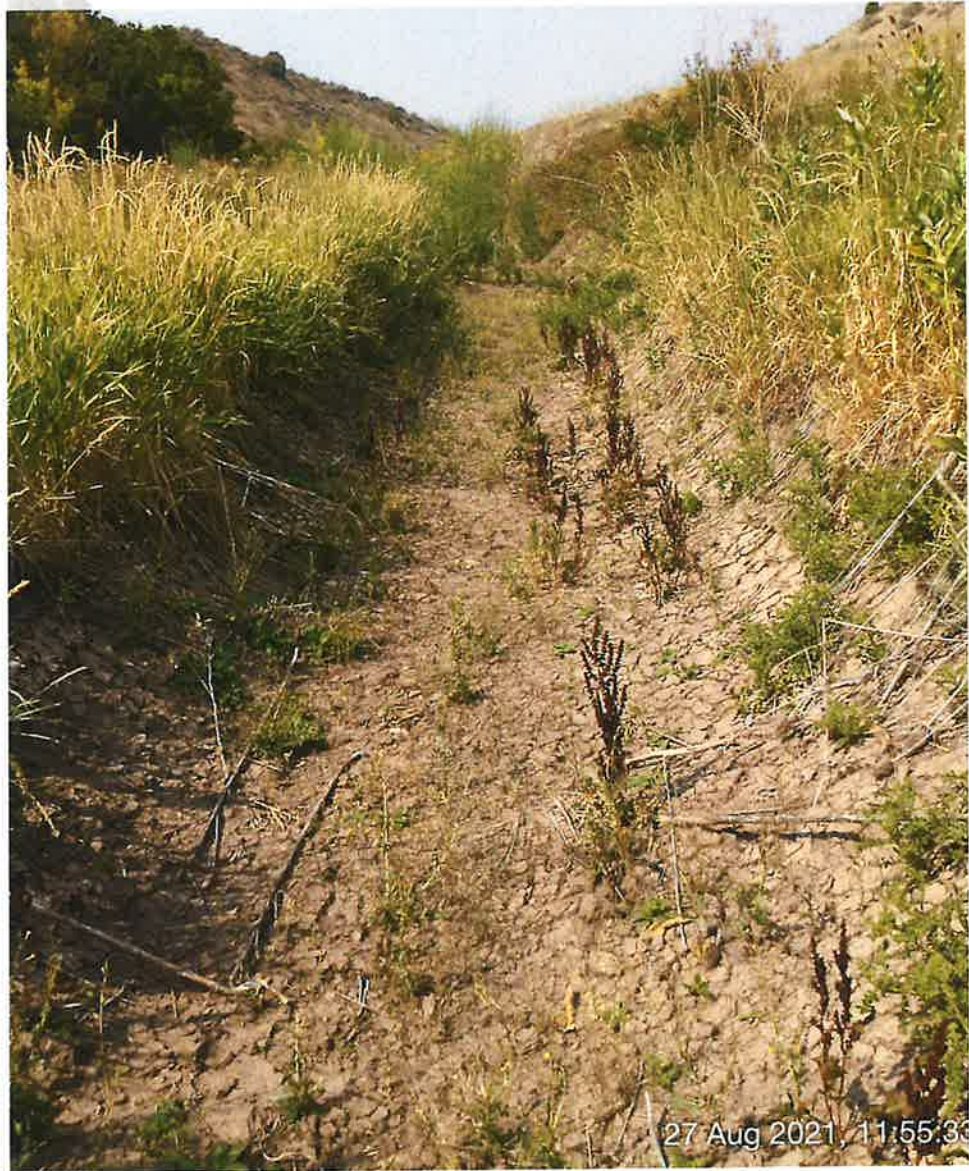
Diversion Dam and Headgate for Upper Ditch



Diversion Dam and Headgate for Upper Ditch



255°W (T) ● 42°13'50.47"N, 111°52'2.17"W ±16ft ▲ 4915ft



Upper Ditch below Headgate



Upper Ditch

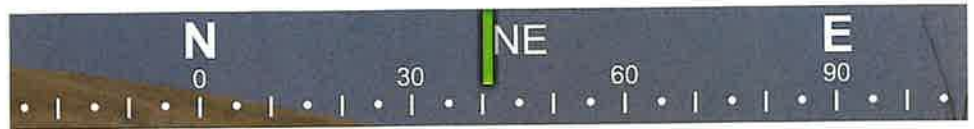


254°W (T) ● 42°13'40.03"N, 111°52'35.79"W ±16ft ▲ 4883ft



27 Aug 2021, 12:07:23

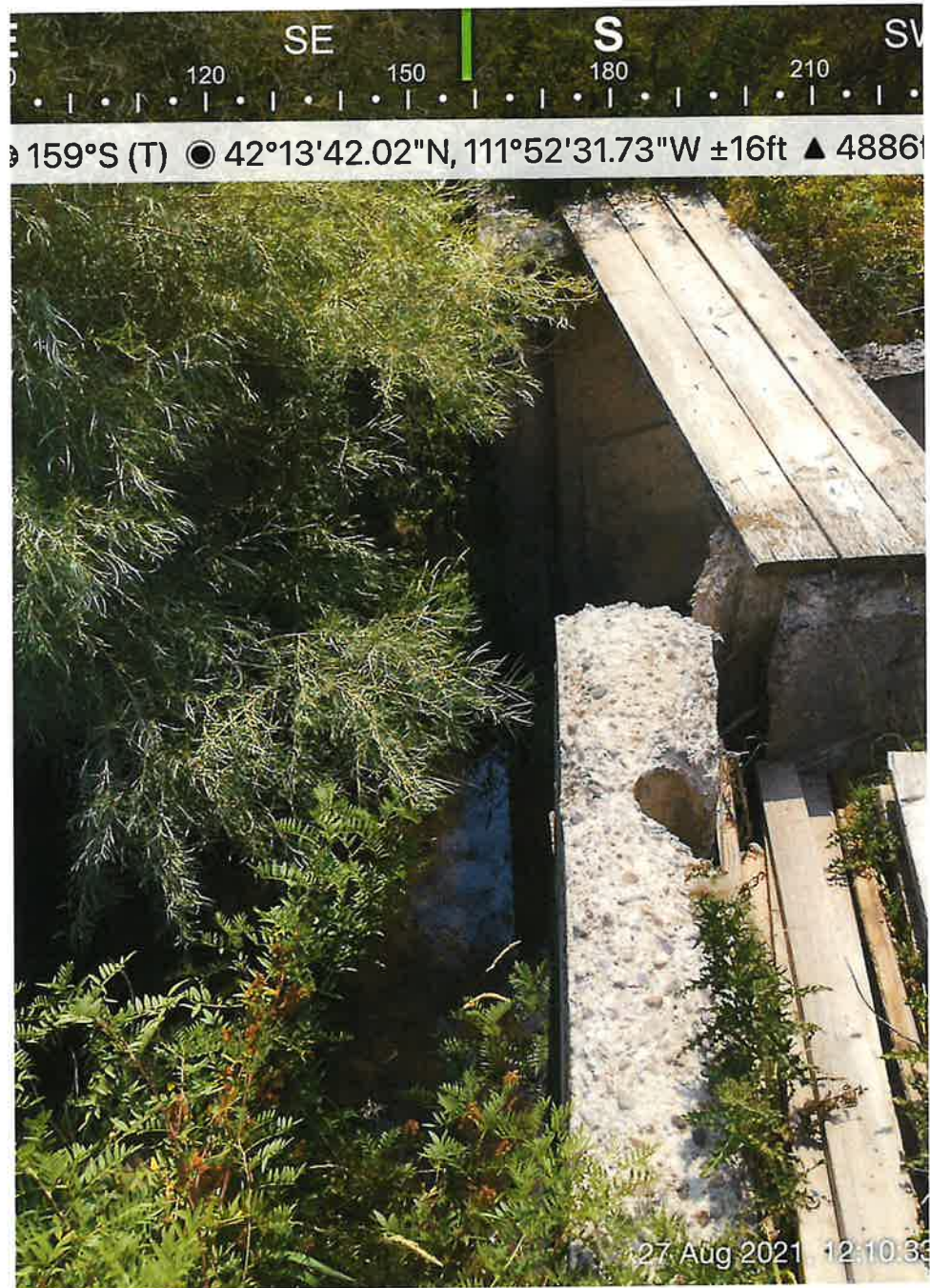
Upper Ditch at Culvert



➤ 41°NE (T) ● 42°13'33.02"N, 111°52'58.49"W ±16ft ▲ 4887ft



End Section of Upper Ditch



Diversion Dam for Lower Ditch



Vegetation in Lower Ditch



➤ 238°SW (T) ● 42°13'36.99"N, 111°52'48.44"W ±16ft ▲ 4890ft



End of Lower Ditch - Intersection with  
Twin Lakes Canal