



StreamLines

Quarterly Newsletter of the Office of the State Engineer

Elkhead Creek Dam Project

John R. Blair, Dam Safety Engineer, Division 6

The Elkhead Creek Dam enlargement project started with a bang last spring when Elkhead Creek saw one of its largest spring runoffs in history. The reservoir was initially lowered with the idea of creating a detour road around the upper end of the lowered reservoir to divert local traffic off the dam and allow the construction companies unlimited access to the dam site. Due to the high spring flows, the detour was shelved until later in the summer and was just made operational in November. Picture 1 illustrates the final work on the guardrails and shows the large culverts that were installed to handle the next runoff period in 2006. Delay of this aspect of the project did allow locals continued access across the dam for a full view of the construction project this past summer.

The construction schedule for this first year at the dam called for all concrete work to be completed.



Picture 1. Detour road across the drained upper reservoir



Picture 2. Outlet gate tower rising out of the excavated pit

Included in the schedule were the installation of a grout curtain across the bottom center-line of the dam, boring of the outlet tunnel, the installation and grouting of the new outlet pipes in the tunnel, construction of the multi-level outlet gate tower on the reservoir side, construction of the valve house for flow control on the downstream end of the outlet pipe, and construction of the new emergency spillway channel. Construction of the outlet tower first called for the excavation of a deep pit in the natural ground adjacent to the reservoir with the walls of the pit shotcreted for stability (Picture 2). Once the outlet is completed, the reservoir side of the pit will be excavated down to the bottom of the tower to flood the outlet gates. This work is yet to be completed this fall to make the new outlet operational for the duration of the construction project.

Besides the unruly spring runoff that greeted the start of the project, the

biggest problems encountered during the summer mainly related to tunnel boring, location of bedrock along the grout curtain, and to cement shortages. Hard cementitious rocks were encountered while boring the outlet through the softer shale and the gearbox on the boring machine was stripped requiring a complete rebuild at about mid-bore. Bedrock depth changes encountered

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Elkhead Creek Dam Project (cont.)



Picture 3. Outlet flow control structure below the tunnel.

along the grout curtain called for a slight shift in alignment. Find-

ing the proper cement for the grout curtain resulted in a search from Kansas to California that finally got that aspect of the project back on track. Other concrete pours on the outlet structure and the emergency spillway channel were to be completed by Thanksgiving for a winter close to the project, but crews are working in the snow the first of December to get the new outlet operational and the project ready for a winter break. These setbacks did mean some delays, but overall the

project has been going very well and the new earthen dam should start coming up next spring.



Picture 4. Splash pool for the new emergency spillway channel.

Staying Ahead of the Growth Curve

Val Valentine, Water Commissioner, Division 7

Winter diversions at 8,600 feet elevation in the upper San Juans is challenging and, in some years, futile. Yet the need to fill two raw water storage reservoirs in the Pagosa Lakes area is still necessary. Forest Service roads are closed after the first significant snow. Thus, access to the ditch and measuring structures is limited via snowshoes, cross-country skis or snowmobile. Recent labor-intensive diversions yielded 672 acre-feet in irrigation year 2002 and 1,166 acre-feet in irrigation year 2003 to storage from the Dutton Ditch. A bountiful snowpack in the winter of 2004-05 allowed a deferment of winter diversions.

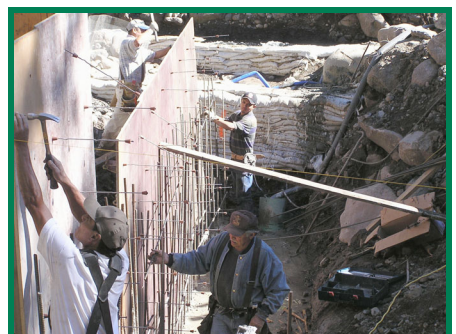
Assurance of adequate and reliable municipal supplies prompted the Pagosa Area Water and Sanitation District (PAWSD) to replace the Dutton Ditch and undertake the construction of a 5.3-mile pipeline. The idea of a pipeline originated more than 20 years ago. PAWSD has always been ahead of the growth curve in Archuleta County. In 1996, they

constructed the 16-inch Dutton Ditch extension, a pipeline that allows Dutton Ditch water to be stored in G.S. Hatcher Reservoir. In 2002, amidst "the driest year on record," PAWSD began operation of the San Juan River Intake, capable of delivering up to 4.6 cfs from the river to their treatment plant five miles west. These capital improvements, along with manageable watering restrictions, allowed the community to cope with the recent drought. These improvements to the infrastructure are part of the water supply matrix that is defined in the district's master plan, a blueprint for meeting the raw water needs of the community to the year 2040.

The Dutton Ditch is a trans-basin diversion. Its heading is located on Fourmile Creek, a tributary of the San Juan River in Water District 29, its place of use is two ranches in the Piedra River drainage and PAWSD's G.S. Hatcher Reservoir (1,735 acre-feet) and Stevens Reservoir (current capacity is 635 acre-feet, recently drained in preparation of its enlargement to 1,806 acre-feet). Decrees are relatively junior, and generally the ditch is called out around the Fourth

of July. In wet years, they may be in priority for an additional two to three weeks, such as this year and 1995; but in dry years like 1996 and 2002, users were out of priority in mid-April.

Continual maintenance and years of costly repairs of the Dutton Ditch are other reasons for converting to a pipeline. Also, over the years, the ditch lost two-thirds of its carrying capacity and irrigators were unable to divert the full decreed amount. Diversions rarely exceeded eight cfs. As a result, a portion of the Smith water right was placed on the 2000 Abandonment List. During the abandonment proceedings, it was stipulated that within



Framing forms for diversion works

Staying Ahead of the Growth Curve *(cont.)*

three years that Tom Smith would improve the ditch to carry and beneficially use all of his water. In the summer of 2004, he cleaned and graded the lower reach of the ditch to a capacity of about 20 cfs, and is a participator in the first 3,800 feet of the pipeline project.

A bond issue approved by voters within the PAWSD in November 2002 provided funds for the project. This measure also included funds for the enlargement of Stevens Reservoir Dam. Over three years of planning, engineering and permitting were required prior to issuing the contract for pipeline construction.

Since the Dutton Ditch heads on and traverses the San Juan National Forest, a special use permit had to be obtained. Stipulated in that permit is a bypass of three cfs for fish and environmental protection. Although highly controversial, the Forest Service during the special use permit renewal or modification process has the authority to impose a bypass flow in an effort to protect the natural environment. While some may consider the imposition of such a bypass a "taking," the PAWSD Board of Directors deemed the bypass would not materially reduce the sustained yield of the project. When discussions regarding administration of the bypass were held prior to the issuance of the special use permit, the local Water Commissioner reminded both PAWSD and the local district ranger

that state water officials measure and administer decreed water rights and not bypasses. The issue of administering the bypass was resolved by an engineering solution, construction of an additional mechanized headgate that PAWSD can control from their district office.



Laying 30-inch HDPE pipe at headgate

Construction began on July 7, 2005, two weeks before diversions were curtailed. The contractor planned to complete the project in 150 days. The upper reaches of the pipeline are 30 and 36-inch ductile iron, and 30-inch HDPE. The pipeline capacity is 35 cfs. Twenty-four inch ductile was used for 16,000 feet. The pipeline joins with the original Dutton Ditch. Irrigation water is diverted into the open ditch and measured in a Parshall flume. The last 9,000 feet is 18-inch ductile pipe, which joins the 16-inch Dutton Ditch Extension pipeline. It is anticipated that annual November to May diversions will be between 3,000 and 4,000 acre-feet, more than the present capacity of all of the

District's reservoirs.

Autumn in the San Juans was warm and dry to the delight of all associated with the project. During the last days of construction and testing of the line, two additional crews were brought in. The project was completed in 20 weeks. The cost of the project, including engineering, was near \$4 million or \$143 per linear foot.

On November 21, 2005, the first winter water, 0.5 cfs, was delivered to G.S. Hatcher Reservoir. According to Carrie Campbell, District Manager of the Pagosa Area Water and Sanitation District, "this project along with the enlargement of Stevens provides greater assurance of adequate raw water supplies and improved water quality. Also, maintenance on the pipeline should be far less than maintaining an open ditch. In the long run, it's a great savings to the District."

Gone are the days of getting winter ditch readings on snowshoes or skis because the headgates have been fitted with underground flumes and remote telemetry. As we head into a winter where current snowpack is very low (28 percent of average), and stream flows are below the 10-year average, residents within the PAWSD can be grateful for the foresight and diligence of the Board of Directors, management and staff of the PAWSD.

Human Resources—New Employees

Nolan Lloyd began working on November 28, 2005 as Chief Well Inspector in the Geotechnical Services Branch. He has extensive experience in managing and conducting drilling and pump installation operations. Mr. Lloyd began his drilling career in mineral exploration during the mid-sixties and has since spent more than 40 years in the drilling and water well industry. We are very excited to welcome this highly qualified person into our organization to take a lead role in the well inspection program.

Kim Pulis was hired on December 1 as the Administrative Assistant in the Division 2 office in Pueblo. Kim had been working in the family insurance business in Pueblo for the last eight years. Previously, she worked for the College for Financial Planning in Denver as administrative support. In addition to staying busy with her family, Kim is actively involved in her church and coordinates the children's educational program.



CALENDAR OF EVENTS

- January 24-25** Colorado Water Conservation Board Meeting, Denver, Colorado; for more information, contact Susan Maul at 303-866-3441
- February 7** Colorado Board of Examiners of Water Well Construction and Pump Installation Contractors Meeting, Denver, Colorado; for more information, contact Gina DeArcos at 303-866-3581
- February 17** Colorado Ground Water Commission Meeting, Parker Water & Sanitation District, Parker, Colorado; for more information, contact Marta Ahrens at 303-866-3581

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