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Meurer Research (MRI) Helps Rescue Water Supply For Fire-Ravaged Colorado Community

Following a Colorado wildfire, the City of Glenwood Springs faced the risk of abnormally high solids in their raw water supply. To ensure their water treatment plant could handle the expected higher sediment loads, a unique solution featuring technologies from Meurer Research was fast-tracked ahead of the 2021 spring runoff.

The Grizzly Creek Fire, which started in late summer 2020, burned over 32,000 acres in western Colorado's Glenwood Canyon. The burn area included two of the main watersheds that provide raw water for the City of Glenwood Springs. From their experience with wildfires, the city knew to expect abnormally higher sediment loads in the coming spring runoff. Realizing that their treatment facility — *the Red Mountain Water Treatment Plant (WTP) — was not equipped to manage this increase, the city retained* Carollo Engineers to fast-track water system improvements to expand their solids-handling capacity.

The biggest challenge facing Glenwood Springs was the prospect of extreme turbidity from severe rain events, which can impact upstream water transport systems and damage downstream equipment like filters and membranes. Mitigating these risks called for quick upgrades to the water treatment process to ensure the city would continue to produce safe drinking water that meets federal standards. Treatment technologies were also needed that could operate efficiently during both acute and normal periods.

Carollo determined that some type of pre-sedimentation system was needed, but the mountain topography of the area made it very difficult to find a suitable location for constructing a large sedimentation basin. Fortunately, another option was available in the form of an abandoned water treatment plant in a cave upstream from the city's raw water conveyance system. The cave (No Name Cave) previously served as a seldom-used overflow diversion.

However, retrofitting the cave, which housed 1960s-era micro-strainer screens, required creative thinking and custom equipment sizing due to the space constraints of the basin. Moreover, the non-conventional solution would have to be engineered and built under an extremely compressed timeline to ensure completion ahead of the spring runoff season while the world was experiencing a pandemic.

Red Mountain WTP featuring MRI Inclined Plate Settlers with "break-down style" cartridges and MRI Hoseless Cable-Vac Sludge Collectors.

Customized Design, Fast-Tracked Delivery

With over 40 years of experience and process expertise in custom solutions for demanding water and wastewater applications, *Meurer Research (MRI)* was chosen to design the treatment system for No Name Cave. Carollo selected MRI for the design flexibility of their technologies and for their dependability to complete a custom project under an accelerated timeline. MRI engineers, fabricates, and tests all their equipment in-house at their Golden, CO, facility, allowing them full control and greater predictability over the manufacturing process.

MRI Inclined Plate Settlers in No Name Cave are custom designed, featuring larger-diameter openings on the patented top tube distribution surface. These openings handle higher loading rates to accommodate for the limited available space.

Working collaboratively, the city selected MRI's Inclined Plate Settlers for No Name Cave. Plate settlers were determined to be a best-fit solution for two key reasons. First, MRI could engineer a system optimized to the constrained parameters of the space. Second, as static systems, plate settlers have no mechanical pieces or pumps. This provides the benefit of limited maintenance and operation with little oversight — a major advantage considering the cave's remote location.

To adapt to the space restrictions of the basin, MRI's plates had to fit in an area that was about half the size of what was typically specified, requiring compact plate cartridges. Dealing with this limitation also meant that the system was bound by an abnormally high loading rate roughly five times the normal loading rate for plate settlers.

Minor adjustments were made to MRI's typical design to accommodate the higher loading rate. Given the critical need for even flow distribution across the entire surface of the settlers, MRI designed larger-diameter openings on their patented top tube distribution system to handle the higher flows that would be passing through the plates. Additionally, the spacing between each plate was increased to help prevent solids from building up on the plate surfaces. Unique to MRI's plate settler design is a head loss across each plate surface of 1 to 2 inches at design flow, which provides flow distribution across the entire plate width and plate-pack length — enabling full utilization of the settling area and effective turbidity reduction even under high solids loading conditions.

Glenwood Springs also installed MRI's Inclined Plate Settlers at their Red Mountain WTP along with MRI Hoseless Cable-Vac™ Sludge Collectors. The plate settler system for the treatment plant incorporated "break-down style" cartridges, a feature unique to MRI that allowed the equipment to be disassembled upon arrival to fit through the plant's small doorway, rather than removing the roof. Once inside, the system could then be reassembled.

The WTP upgrades increase the plant's overall capacity, provide a better-quality effluent, and give the plant more flexibility for managing turbidity spikes. Carollo designed a system to monitor multiple water sources for extreme turbidity events with an automated system that will divert water to the No Name preset area if certain levels are reached. Owing to MRI's rapid service, what would typically take six months from order to delivery was completed in under two and on schedule.

MRI received the PO for equipment in mid-January and the entire project was installed and operating at the end of May 2021. Just two months later, a significant rain event occurred directly over one of the burn scars. Turbidities entering the No Name Cave pre-sedimentation system exceeded 2,000 NTU and were decreased by 50 percent — performance that helps unburden the city's water treatment plant downstream.

Parameter	No Name and Grizzly Creek (pre-fire)	During WQ Event (July 31, 2021)	Day After WQ Event (August 1, 2021)
Turbidity max. (NTU)	50	4,000	40
TOC max. (mg/L)	2.6	Not sampled	2.14 [1]
Total Copper (mg/L)	Non-detect	1.03	0.01
Total Lead (mg/L)	Non-detect	0.77	Non-detect
Total Nickel (mg/L)	Non-detect	0.68	Non-detect
Total Zinc (mg/L)	Non-detect	4.57	0.05
Total Arsenic (mg/L)	0.24 [2]	0.26	0.004
Total Cadmium (mg/L)	Non-detect	0.02	Non-detect
Total Molybdenum (µg/L)	0.26 [3]	23.30	0.56

1. Sampled on June 30, 2021 after initial water quality event
2. Samples from March 10, 2021
3. Samples averaged over multiple 2021 data points

Comparison of No Name and Grizzly Creeks' water quality prior to debris flow events during and after summer 2021

MRI agreed to a performance guarantee for the Red Mountain WTP that includes a maximum 1 NTU effluent if influent is between 1 and 10 NTU daily average; a maximum 2 NTU effluent if influent is between 10 and 100 NTU daily average; and 98% removal if influent is above 100 NTU and below 200 NTU daily average. The treatment solution has exceeded this criteria with no issues.

For additional information on MRI's plate settler and sludge collector, visit MRI's products page. ■