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GARRY HOUSTON AND HIS TEAM GET THE MOST FROM A MICROFILTRATION WATER PLANT

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Great Taste,
No Chemicals

Ron Edwards, general manager of Big Sky County Water & Sewer District, examines one of two new wells. In the background is Big Sky's iconic Lone Peak.

THE BIG SKY COUNTY WATER & SEWER DISTRICT CHOSE UV DISINFECTION TO AVOID ADDING CHLORINE TO WATER THAT WON A NATIONAL TASTE COMPETITION

STORY: **Jim Force**
PHOTOGRAPHY: **Rich Addicks**

WHEN YOUR DRINKING WATER HAS WON 2015 STATE and national AWWA taste awards, why change anything?

That was a question the Big Sky County (Montana) Water & Sewer District wrestled with last year before deciding to avoid chlorination and install a UV system to meet new disinfection requirements.

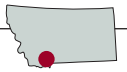
The district drilled two new groundwater wells to meet a growing summer demand for water. "The new wells had a static water level of around 15 feet below grade," says Ron Edwards, water and wastewater system manager and winner of Montana's 2015 William D. Hatfield Award. "Because the static water level was less than 25 feet deep, new wells were subject to disinfection requirements."

The Big Sky water board had no interest in adding chemicals to the clean, clear water available in this high-mountain community. "Chlorine was the cheaper option, but we had just won awards for the taste of our water, so we bent over backward and spent more just to keep from having to add chlorine," Edwards says.

The purity of the nearby Gallatin River, a world-class trout stream, reinforced the district's wish to avoid chemicals. The UV unit, supplied by Atlantium of Israel, achieves 4-log removal of viruses and provides real-time tracking and monitoring of critical data. It performed fairly smoothly last summer and proved easy to operate and maintain. It is the first Atlantium system used on groundwater for a public water system in Montana.

BIG SKY, PURE WATER

The Big Sky district was formed as a special-purpose county unit of government in 1993. It comprises 228 square miles and serves 2,600 customers



Big Sky County (Montana) Water & Sewer District Water Treatment Plant

BUILT: |	**1973, expanded 2015**
SERVICE AREA: |	**228 square miles**
CUSTOMERS: |	**2,600**
SOURCE WATER: |	**14 groundwater wells**
TREATMENT PROCESS: |	**UV disinfection**
SYSTEM STORAGE: |	**3.99 million gallons**
DISTRIBUTION: |	**15.5 miles of distribution lines**
ANNUAL BUDGET: |	**$900,000 (operations)**
WEBSITE: |	**www.bigskywatersewer.com**
GPS COORDINATES: |	**Latitude: 45°16′13.10″N; longitude: 111°18′9.81″W**

ZERO DISCHARGE

In Montana's high country, concern for the natural environment is also lofty. The Big Sky County Water & Sewer District's wastewater treatment operation, formerly consisting of aging aerated lagoons, was upgraded in 2004 to biological treatment. All effluent is stored during winter and is later used for golf course irrigation. No effluent is released to area waters, which include the Gallatin River, a famous trout stream.

Wastewater flows by gravity to the plant, where it is treated in a compact 600,000 gpd sequencing batch reactor (Aqua-Aerobic Systems). Average flow is closer to 300,000 to 400,000 gpd. Decanted water is filtered in Trident units (Evoqua Water Technologies) before discharge to two lined storage ponds with 130 million gallons combined capacity.

Solids from the process are digested and then composted with sawdust and wood chips. The cured compost is sold in bulk at $25 per cubic yard. "It's used as a soil amendment and fertilizer," says Ron Edwards, water and wastewater system manager.

The team at the Big Sky County Water & Sewer District includes, from left, Marlene Kennedy, administrative assistant; Grant Burroughs, wastewater superintendent; Jim Muscat, water superintendent; Ron Edwards; general manager; Nic Wellenstein, well operator; Eric Daniels, operator assistant; and Terry Smith, financial officer. Not pictured is Peter Bedell, water and sewer operator.

in the mountainous country 45 miles southwest of Bozeman. The plant lies 6,200 feet above sea level, and some of its service area — the downhill ski community in particular — is at 7,500 feet.

Water is drawn from a series of wells (Nic Wellenstein is the well operator) and is stored in several surface tanks and one fully buried concrete tank. Pipelines bring the water to the treatment plant and transport the treated water to customers. Pressure-relief valves control downhill pressures in the steep terrain.

Jim Muscat, water plant superintendent, explains how the expansion of the well system made the move to disinfection necessary. "We have a number of wells in the Meadow Village area that draw from the alluvial aquifer, as well as several wells in the higher-level Mountain Village ski area that draw from a bedrock aquifer," he says. "Our biggest demand for water comes in the summer when residents use it for lawn and garden irrigation."

The demand created the need for two more wells in the Meadow Village area. Since the water from those wells is blended with water from the existing wells, Big Sky was required to add disinfection to the entire flow, in accordance with U.S. EPA national groundwater rules, when either of the two new wells run. So far, the new wells run only in summer.

"We have great water here," says Edwards. "We had detected no coliform in the existing wells for over 40 years, and we petitioned the state for a deviation, but it was denied. That triggered a disinfection study."

The choice of the Atlantium UV equipment (total project cost $650,000) was driven by its small footprint and the fact that it required only two main UV channels to treat the full flow. "That makes the system easy to get at," says Muscat. That is important when bulbs need changing or when the system requires acid cleaning or other maintenance. *(continued)*

EFFICIENT DISINFECTION

Each channel handles 1,000 gpm, and Big Sky runs one train at a time. Quartz tubes containing the UV lamps extend diagonally across each channel. "It's easy to pull a tube and clean it," says Muscat.

Muscat also likes the controls and the reports the system generates. "The UV system validates the 4-log removal of viruses and 5-log removal of microbials in real time," he says. The system has two sensors per lamp and measures three critical parameters: UV intensity, UV transmittance and water flow rate, also in real time.

In addition, the system provides the minimum required dosage, rather than an average dose. It consumes only as much power as needed to achieve 4-log removal based on flow rate. UV lamp power is adjusted according to data feeds. "There's no wasted power," says Muscat.

The reports are just what the state regulatory agency wants. Each report verifies the disinfection levels and tracks key data; compliance reports can be generated at the push of a button. "We met with state officials to determine what data they would want," Muscat says.

The Atlantium software interfaces with a Micro Comm SCADA system and delivers data to the operator's laptop computer. "Initially, we had some issues running both systems," says Muscat. "It was a bit of challenge but it's going well overall."

> "Chlorine was the cheaper option, but we had just won awards for the taste of our water, so we bent over backward and spent more just to keep from having to add chlorine."
>
> **RON EDWARDS**

Flow rates are measured by a Badger Meter system. All controls are mounted on the interior wall next to the UV system. The choice of UV over chlorine has another benefit: The district doesn't have to worry about chlorine residual requirements, which would be challenging to meet in the far-flung distribution system. *(continued)*

ABOVE/BELOW: Jim Muscat looks after the UV disinfection system (Atlantium Technologies), first of its kind in the state, inside the Spotted Elk Well House.

The Big Sky County Water & Sewer District received 2015 state and national AWWA taste awards.

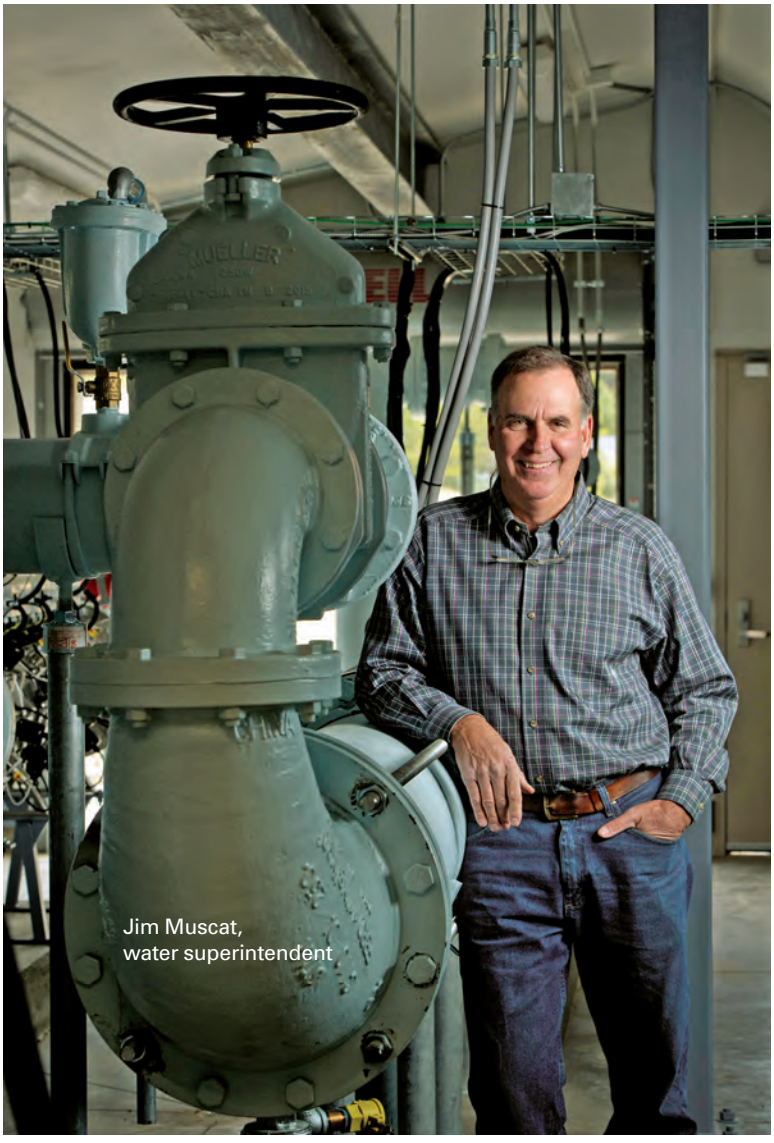
ATTRACTIVE BUILDING

To house the UV system, the district added on to its treatment plant, essentially doubling the size of the building. The structure's design is compatible with the architecture in the mountain community: "We're part of the neighborhood," says Edwards.

The Big Sky plant also fills a critical need for firefighting. "We're surrounded by national forest," says Edwards. In case of a wildfire, the plant and the storage system are available to supply water needed to control the blaze.

Water demand in summer is about 10 times what it is in winter. The district uses tiered rates to reward water conservation. Still, Muscat observes, "People come out here from the Midwest and they like to have lawns like they have back home."

People also come in winter to ski at Big Sky Resort, one of the most popular downhill ski areas in the western United States. Created in 1973, it was originally owned by the late television news anchor Chet Huntley. Today, the Big Sky area as a whole has more than 5,800 acres of skiable slopes, 300 runs and 34 lifts on four mountaintops.


Jim Muscat, water superintendent

> "We had detected no coliform in the existing wells for over 40 years, and we petitioned the state for a deviation, but it was denied. That triggered a disinfection study."
> **RON EDWARDS**

The Big Sky Resort ski bases are at 6,800 and 7,500 feet; the highest elevation is at 11,166 feet. Average snowfall is more than 400 inches per year.

The Powderhounds website describes Big Sky Resort this way: "The skiable terrain is the biggest of the Montana ski resorts at 3,832 acres, and when you include the interconnected Moonlight Basin ski resort, you get another 1,900 acres of terrain. The two resorts form a colossal ski area — the second biggest in North America and the largest in the USA. The vertical drop, at 4,366 feet, is also one of the biggest in North America."

The website doesn't say it, but Big Sky also has the country's best-tasting water. tpo

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