OURAY HOT SPRING MOTELS, LODGES AND SPAS, OURAY, CO

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LOCATION

Ouray, Colorado lies in a natural amphitheatre in the upper Uncompahgre Valley in the northern portion of the San Juan Mountains at an elevation of 2,380 meters (7,800 ft.), Uncompahgre being a Ute Indian word for "hot water".

The town was incorporated in 1876 only a year after mining began in the area. Mining activity has been erratic and depends upon market conditions for gold, silver, copper, lead, and zinc, the primary minerals found in the area.

The city's large hot spring pool (see Geo-Heat Center, 2003) as well as the pools and spa facilities at a number of the city motels and lodges has made Ouray one of the most attractive vacation spots in Colorado. Ouray has also become the winter "ice climbing capital", with climbers coming from throughout the United States and abroad to challenge the numerous frozen water falls in the area.

Three of the major lodging establishments in the town—the Wiesbaden Hot Spring Spa and Lodgings, the Best Western Twin Peak Motel, and the Box Canyon Lodge and Hot Springs—have each capitalized on the natural hot springs in the area. Although all three have hot spring pools, use of the geothermal water for heating has met with mixed success.

RESOURCE

Ouray is located in a region of high heat flow, about 170 mW/m^2 (Zacharakis, 1981). Active faulting and a moderate to high level of seismic activity also characterize the region that lies in the northern portion of the San Juan Mountains, among the youngest mountains in Colorado. The San Juans are composed primarily of Tertiary volcanic rocks that were deposited upon an already varied topography of horst and graben, basin, and dome (McCarthy, 1981). Post volcanic caldera collapse and resurgence produced ring faults and radial fractures that provide an avenue for hydrothermal solutions and base metal precipitation (Burbank, 1941). The Ouray Graben is an east-west trending feature bordered by the Sneffels Horst to the south, and the Uncompahgre Uplift to the north-northwest (Baars and See, 1968). Ouray is bounded by the Ouray Fault to the south which is associated with the hot springs at Box Canyon. The Ouray Fault is one of several faults of NNW to ENE trend that make up the complex 5 km (3 miles) wide fault zone (Meyer *et al*, 1982).

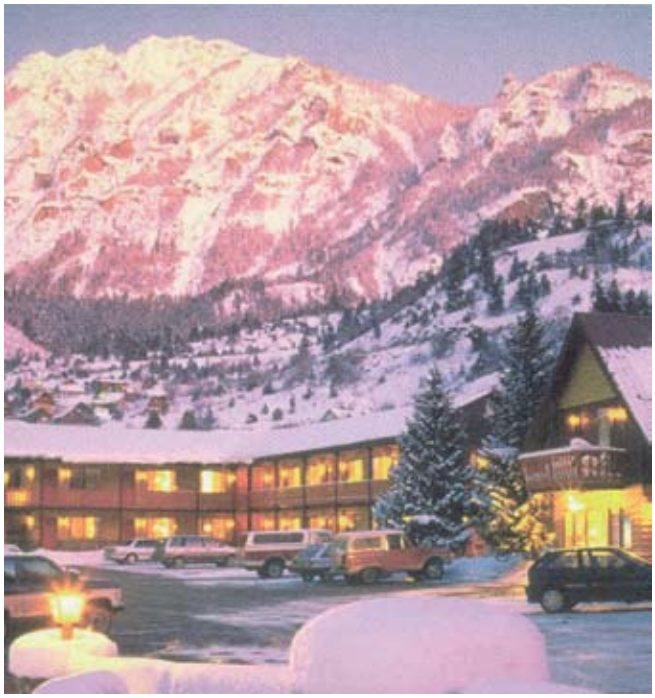
The geothermal springs are believed to be the result of deep circulation of meteoric waters in fractured permeable sedimentary rocks of the Ouray Graben. Recharge is most likely from the San Juan Mountains along the south flank of the graben (Meyer et al, 1982).

A number of springs occur in the area, the three primary ones include one at the mouth of Box Canyon, one at the Wiesbaden Lodge, and a third at the pool area. Total discharge from the spring is estimated to be up to 12.7 L/s (200+ gpm). Temperatures range from approximately 26.7°C to 66.7°C (80°F - 152°F), (Barrett & Pearl, 1976). McCarthy (1981) estimated that 238 x 10^9 MJ (2256 x 101^1 BTUs) of geothermal energy was available in the area. During the 1980's a number of wells were drilled in anticipation of building a geothermal district heating system. Although plans for district heating were never realized, one of the wells (Well OV-2) 8.5 L/s (134 gpm) at 51°C (124°F)) is used to provide water for the Ouray Hot Spring Pool (Geo-Heat Center, 2003).

USE

The Box Canyon Lodge and Hot Spring is one of Ouray's most popular inns. The lodge is situated near the mouth of Box

Canyon. Several 57°C to 65.5°C (135° to 150°F) springs surface on the property and provide geothermal waters for several soaking pools.



Box Canyon Lodge

Although at one time the rooms were heated with the geothermal energy, use was discontinued due to major problems associated with pumps and piping. Scaling was a major problem. The geothermal water continues to be used to heat domestic hot water. The hot water is heated through use of coils of piping placed into a large pool. Piping from the springs to the pool is plastic.

The Best Western Twin Peaks Motel is located next door to the Box Canyon Lodge and utilizes the same spring system as does the Box Canyon.

The owner, Michael Bazin, indicated that the main spring is 66.7°C (152°F). The geothermal water supplies a number of hot spring pools, soaking pools, and a whirlpool. The water is also used to heat water for the main swimming pool and for domestic hot water. Domestic and hot water are heated in a heat exchanger made up of coils of copper tubing in a shell heat exchanger.

Maintenance of the system is a major issue according to Mr. Bazin. There have been continuous problems with both pumps and piping. Plastic piping is used but scale has to be broken out at least every six months and more often when problems arise. Pumps appear to be an even greater cause for concern and generally have to be rebuilt on the average every 60 days.

The Historic Wiesbaden Hot Spring Spa and Lodgings had its beginning in 1879. The soaking facilities and mini pool are fed by the naturally flowing springs that range in temperature from 25.5°C to 53°C (78°F to 128°F). Temperatures of the

Best Western Twin Peaks

main pool range from 37°C to 39°C (99 to 102°F). One of the interesting features is the vapor cave that is located in and under the Wiesbaden's main lodge area. In the main vapor cave, the hot spring water is captured in an eighteen inch deep soaking pool ranging in temperature from 42°C to 43°C (107°F to109°F).

The Wiesbaden does use the geothermal water to provide space heating as well as domestic hot water. Although they originally used steel pipe, they have found that plastic pipe is preferable from a maintenance standpoint. The major maintenance issue is scale buildup in the pipes requiring that sediment be removed on a weekly basis.

OPERATING COSTS

None of the three facilities could supply operating costs. In truth, only minor pumping is required at two of the facilities. Maintenance costs had not been quantified and were considered to be just a necessary element of general maintenance duties. Although rebuilding or replacement of pumps was an ongoing problem, no detailed records as to cost incurred were available.

REGULATORY/ENVIRONMENTAL ISSUES

All of the facilities were established prior to the adoption of rules and regulations relative to water withdrawal or disposal.

The Twin Peaks Motel does use chlorinated city water in its main pool and in some of the soaking and whirlpools. The other facilities are flow-through and have adequate flow to

Wiesbaden Hot Spring Spa

avoid the need for chlorination. Water from the Twin Peaks is discharged to the city but does not go to the sewage treatment plant. Waters from the other facilities are discharged to local streams that ultimately flow into the Uncompahgre River.

Wiesbaden main vapor cave

The only serious regulatory issue that arose was in regard to a loss of flow from the spring at the Wiesbaden that resulted from the drilling of the city well that now supplies the municipal pool. The owner of the Wiesbaden, Lynda Minter, has been in litigation with the city over the loss of approximately 2 L/s (30 gpm) since 1987. At the time the facility was visited (late 2003) the issue had not been resolved although the city was proposing remedial measures.

PROBLEMS AND SOLUTIONS

The primary problems appear to be related to scaling. The waters are a calcium sulfate type and have a TDS from a low of 695 mg/l in one of the springs at the Wiesbaden to a high of 1,840 mg/l also from another spring at the Wiesbaden. The springs at the mouth of Box Canyon have a TDS of 1,650 mg/l.

Scaling has caused pump failure, requiring replacement or rebuilding on a regular basis—sometimes every two months. Scaling in the piping system requires removal every few months and at the Wiesbaden they indicated that they removed sediment from the piping weekly.

The scaling problem resulted in discontinuing the use of the geothermal water at the Box Canyon Lodge and the Twin Peaks Motel for heating, and causes ongoing maintenance problems at the Wiesbaden.

Many of the problems associated with providing space heat could be easily overcome by separating the geothermal water from the internal heat distribution system with a heat exchanger. Material as well as equipment selection would also seem to be areas that need further study.

In talking with the owners or operators of the three facilities, none were familiar with geothermal technical support that is available through, for example, the Geo-Heat Center at Oregon Institute of Technology.

Issues surrounding the loss of flow at the Wiesbaden due to the drilling of the pool water well are much more difficult to resolve. The city does appear to be prepared to replace the lost flow from another source.

CONCLUSIONS

The three facilities visited have all capitalized on the hot springs to establish thriving businesses. Unfortunately, through a lack of understanding and technical expertise in geothermal direct use applications, use of the geothermal waters to supply much of the energy needed for the three facilities for heating is not being realized and ongoing maintenance problems with existing facilities require a great deal of maintenance, repair, and replacement of system components.

REFERENCES

Baars, D. L., See, P. D., 1968, "Pre-Pennsylvanian stratiography and stratiography and paleotectonics of the San Juan Mountains, southwestern Colorado", *Geological Scientific American Bulletin, Vol. 79, No. 3*, pp.333-340.

Barrett, J. K., and Pearl, R. H., 1976, "Hydrogeological data of thermal springs and wells in Colorado", *Colorado Geological Survey Information Series 6*, 124 pp.

Burbank, K. W., 1941, "Structural control of ore deposition in the Red Mountain, Sheffels, and Telluride districts, Colorado": *Colorado Red Mountain Scientific Society Proc. Vol. 14, no. 5*, pp. 141-261.

Geo-Heat Center, 2003, "Ouray Hot Springs Pool, Ouray, Colorado", *Geo-Heat Center Quarterly Bulletin, Vol. 24, No. 2*, pp. 4-6.

McCarthy, Kevin P., 1981, "Ouray, Colorado, Resource Characteristics and Future Plans", *Geothermal Resource Council, Transactions, Vol. 5*, pp. 545-547.

Meyer, R. T., Prostka, H., Raskin, R., Zocholl, J. R., 1982. "Geothermal Resource, Engineering and Economic Evaluation for the City of Ouray, Colorado", *Geothermal Resource Council, Transactions, Vol. 6*, pp. 467-470.

Zacharakis, T. G., 1981, *Revised heat flow map of Colorado*, Colorado Geological Survey Map Series 18, scale 1:1,000,000, DOE/ET/28365-12