

GEOTHERMAL PIPELINE

Progress and Development Update
Geothermal Progress Monitor

CALIFORNIA

Historical Perspective - Coso Hot Springs Resort

The earliest written record describing Coso Hot Springs dates to 1860, when a miner at nearby Silver Peak named M. H. Farley mentioned “boiling hot springs to the south.” An 1881-survey of the area by the U.S. government noted “thousands of hot mud springs of all consistencies and colors,” and early maps show “Hot Sulphur Springs” at the location referred to today as Coso Hot Springs.

In 1895, William T. Grant was deeded a quarter interest in the Coso Hot Springs area and by 1909, had established a health resort there. The first documented owner and proprietor of the Coso Hot Springs Resort was Frank Adams, who lived on the site from 1912 until approximately 1920. Some believe that Adams was hired by Grant and his partner Dr. I. J. Woodin to manage the property that they actually owned.

Claims of medicinal value of Coso waters, mud and steam ranged from cures for venereal disease to constipation. In 1917, an advertising brochure issued by the Owl Drug Co. announced availability of mud from Coso Hot Springs at the bargain price of “\$3.00 per jar”—a hefty sum for that period. Water was also bottled and sold bearing the promise of, “Volcanic Health and Beauty from Natures’s Great Laboratory.” The bottle bore the claim that it, “...is a vitalizing blood builder which aids digestion, destroys invading bacteria and is especially recommended in cases of gastritis, stomach and intestinal catarrh. The water acts directly upon the liver and kidneys, thus eliminating toxic water, the neglect of which so often causes nervousness, high blood pressure and rheumatism. Recommended four doses daily.”

Clientele at the Coso Hot Springs Resort during the early years were primarily residents of nearby Rose Valley, Owens Valley, and a doctor from Santa Maria. Later visitors, able to take advantage of the newfangled “horseless carriage,” came from the Los Angeles Basin, San Bernardino, and as far away as San Francisco.

The resort remained in operation until 1943, when the U.S. Navy began purchasing land for their China Lake Naval Ordnance Test Station (forerunner of today’s Naval Air Weapons Station). By 1947, all land purchases had been completed and the Coso Resort Hot Springs—now located within the boundary of the Navy base—was permanently closed.

(Edited from *A Land Use History of Coso Hot Springs, Inyo County, California*. Naval Weapons Center Administrative Publication 200, 1979, 233 p. - published in the *Geothermal Resources Council Bulletin*, Vol. 31, No. 5 (2002) - Ted Clutter, editor)

Lassen Volcanic National Park - “A Nose for Viruses”

“Extreme” viruses that live in reeking volcanic pools are being studied by microbiologist, Ken Stedman, from Portland State University. The microorganisms, called thermophiles for their ability to live in geothermal hot springs, bear a primeval resemblance to human cells. They look like bacteria, but belong to a completely different category of organisms called archaea. These viruses could provide clues to the way human viruses attack us; since, they are parasites and penetrate a cell and take over the cell’s reproductive ability. Biotechnology companies are studying the viruses as they might trigger thermophile genes responsible for certain biochemical catalysts. Many industrial processes, such as paper pulping and animal feed milling, rely on expensive chemicals that work in harsh, high-temperature environments.

Dr. Stedman’s work have taken him to Kamchatka, in eastern Siberia and more recently to Yellowstone and Lassen Volcanic national parks. At Lassen, he worked at the Sulphur Works, Bumpass Hell and Devil’s Kitchen - looking especially for a particular archaean thermophile called *sulfolobus*. The *sulfolobus* habitat is in water around 176°F and an acidic environment that is identified by the hydrogen sulfide “rotten egg” smell.

The samples taken in the Park are returned to the lab and allowed to grow and be experimented with to determine their DNA sequences. As a result, Dr. Stedman and a handful of other scientists have described about 40 new archaean viruses. For him, the beauty of the viral biology itself is more appealing than potential applications for swine feed and paper pulping. He is trying to understand the biology instead of just crunching DNA up and spitting it out. Industry, on the other hand, is hoping the virus cells contain the genetic codes for thousand of enzymes, proteins that act as catalysts for chemical reactions. Dutch scientists may have triggered *sulfolobus* to produce the enzyme that breaks down cellulose, the woody material in paper. Paper companies, who pulping processes operate at high temperatures, are interested. Diversa, a San Diego-based biotech company, is looking at the possibility for the animal feed market—which could enhance nutrient digestion in pigs and chickens, and reduce the harsh wastes the animals produce. (Eric K. Hand, 2002. “A Nose for Viruses,” *Oregonian* (August 21), Portland, OR, pp. A17-A18).

HAWAII

Tropical Ponds Hawaii, Puna, Hawaii

Tropical Ponds Hawaii are located on the “Big Island” near Puna adjacent to the PGV 30-MWe geothermal power plant. This is an aquaculture facility consisting of 34 ponds with two acres of water surface. They have been raising sword tails, platties, guppies and gourami since 1993, which are shipped to the West Coast market. The facility uses a well provided by PGV with 110°F water at about 10 gpm. The ponds are kept at 72°F. Plans are to expand to 10 acres. (Personal visit by John Lund, Jan. 2004).

AUSTRALIA

Sit and Soak - Brothers with a Dream are Tapping Geothermal Water under Victoria, Australia for a Japanese-Style Resort and Spa Complex

Charles and Richardson Davidson have a dream—to tap vast reservoirs of geothermal water lying under the southern region of Victoria in Australia for a Japanese-style spa resort. The brothers are making that dream a reality with development of a \$30-million complex on a 42-acre property in the rolling hills of “The Cups” on the Mornington Peninsula, about an hour’s drive south of Melbourne.

Before selecting and purchasing the property, the brothers engaged geothermal consulting firm Sinclair Knight Merz (SKM - Auckland, NZ) to identify the optimal location for a reliable and sustainable supply of high-quality geothermal water, and to provide siting advice for the spa and resort.

SKM Senior Hydrogeologist David Stanley says the existence of low-temperature (86 to 158°C) geothermal groundwater has been known across Victoria for years, from drilling for petroleum and water wells for stock, irrigation and urban supplies. “The major Selwyn Fault runs across the Mornington Peninsula,” says Stanley. “It is believed that the origin of geothermal water in the region is an upwelling of deep circulating fluids along the fault,” he explains. “As they rise toward the surface, the geothermal waters are accessible by drilling in the vicinity of the fault line.”

Preliminary sampling studies carried out on a groundwater observation borehole near the proposed resort site confirmed that mineralized water—at a temperature of about 122°C—is present at depths of little more than 1640 ft that can be produced at flow rates of 320 gpm. “Hydrochemical analysis established that the water is somewhat saline and contains elevated bicarbonate levels, making it ideal for spa bathing applications,” Stanley said. Wells drilled within the development site subsequently confirmed the tests.

Extraction wells are complete and waters have begun to flow, making it possible for the Davidsons to move to the next phase of their project to bring geothermal hot spring bathing to Victoria. “We are currently evaluating the extraction bore test results and considering other options for using the geothermal water, such as hydronic heating and aquaculture,” says Stanley. “We are also planning a 130-ft well into a shallow aquifer lying under the Davidson’s property to provide additional water at a temperature of 15°C, suitable for irrigating the resort’s gardens and topping off its proposed lakes.”

To ensure that the development has a sustainable outcome, the resort’s geothermal water delivery process will include injection back into the underlying aquifer. SKM has supervised critical phases of the geothermal drilling process and has represented the Davidson brothers at local government meetings. In addition, SKM successfully negotiated and secured the project’s extraction and injection licenses from Southern Rural Water and the Victoria Environmental Protection Agency.

All planning approvals for the Davidson’s Bathe Peninsula Hot Springs Resort have been secured and master plans completed. Design is being carried out by Gregory Burgess Pty., Ltd. Architects (Victoria, Australia), with construction expected to be completed within two years. The complex will offer both indoor and outdoor geothermal bathing, complete with a hotel, private cottages, convention facilities, massage and therapy services, a restaurant, gift shop and geothermal education facilities. The resort will also feature its own food production area with greenhouses, aquaculture and a vineyard.

In January, the Davidsons built a significantly smaller spa within a 5 min walk from the Bathe resort site. Called Mizu, it is meant to draw local attention to Japanese-style spa bathing in anticipation of the larger facility to come. With groundwater heated by natural gas, Mizu offers a complete bathing, culinary and relaxation experience on a 7-acre property with a vineyard, cellar, sauna and steam room, two outdoor baths, relaxation room and pool. Called a “boutique” spa, Mizu is limited to six overnight visitors, making it among the most intimate of private resort spas.

Sinclair Knight Merz is a leading multi-disciplinary consulting firm, employing close to 3,000 people in offices across Australia, New Zealand, Europe, South East Asia, the Pacific and South America. It is highly regarded for its hydrogeological and hydrological project work, and for its development of geothermal power stations across the globe. For further information on the Bathe Resort and Spa Project, contact David Stanley, Senior Hydrogeologist, Sinclair Knight Merz, 25 Tead Street, PO Box 9806, Newmarket, Auckland, New Zealand. Phone: +613 9248 3306. Email: dstanley@skm.com.au. The Davidson’s website can be found at: www.bathe.com.au.