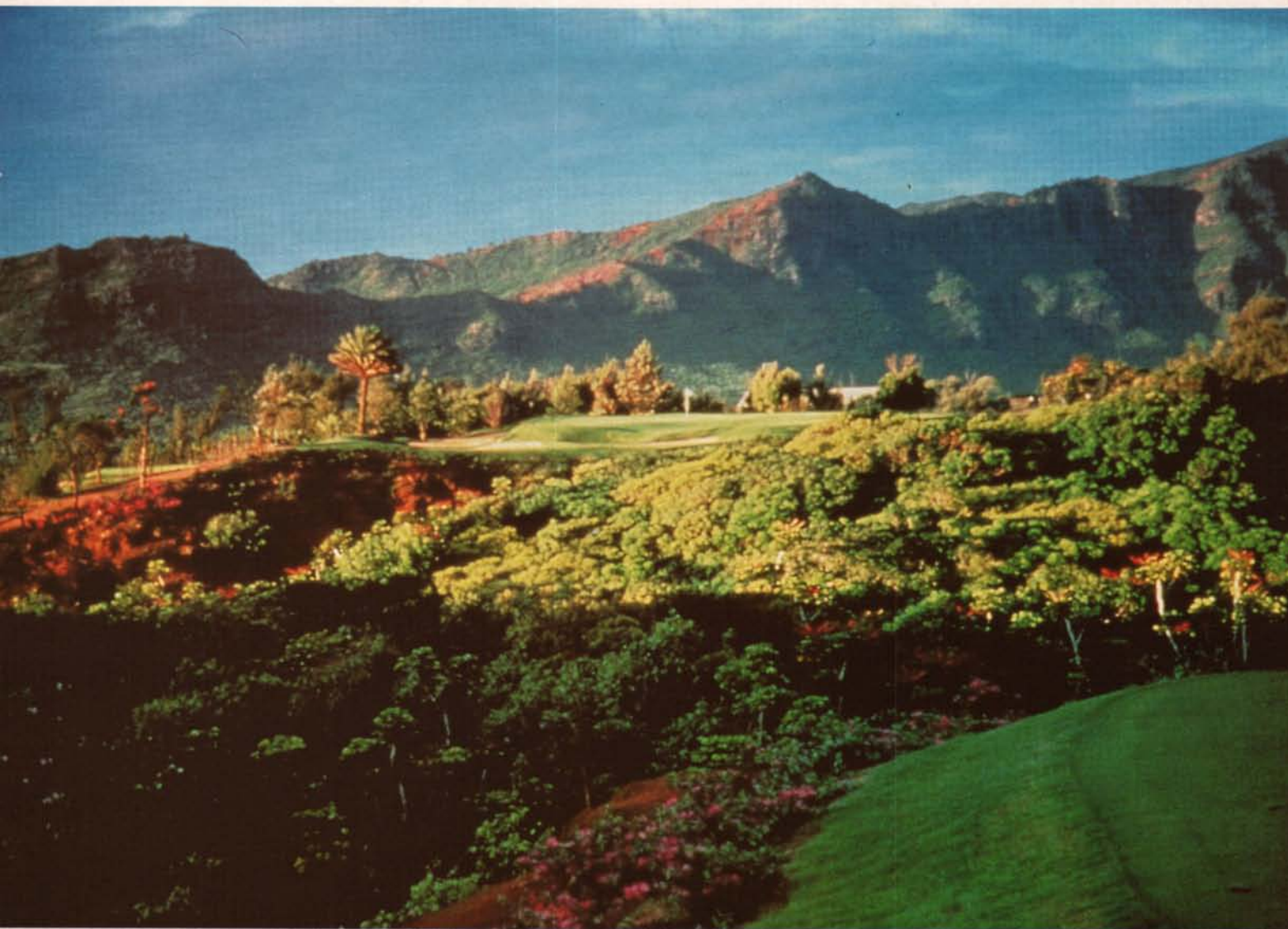


Kauai Lagoons: Hawaii's Latest Treasure



Golfers must drive over this densely-planted ravine on the Kiele course to reach the green on an oceanside bluff.

When Jack Nicklaus first laid eyes on 800 oceanside acres in Lihue on the Hawaiian island of Kauai, his response was, "This is the most magnificent piece of property I have ever seen." The amazing part is that he made this remark before he and developer Chris Hemminger began to redefine the term "exotic" in golf resorts. "These two men could reinvent the wheel," remarks Gaylon Coates, who designed the irrigation system for the massive complex.

The product of their vivid imaginations, the Westin Kauai Golf & Racquet Club, is

now winning accolades from the major national golf publications. *Golf Digest* named the resort's Kiele course the best new resort course in America for 1989. *Golf* magazine called Kiele the most varied and beautiful course Nicklaus has built to date, and recently named the Lagoons course one of the top ten resort courses in America. And Hemminger and Nicklaus still have another course to build.

Kauai Lagoons is a "destination resort," meaning that it is the perfect place to visit whether or not you are a hotel guest. It's all there: the tournament-quality golf course,

luxurious hotel and restaurant accommodations, golf and racquet club, a spectacular beach, the largest swimming pool in Hawaii, and a complete European spa and health center featuring aerobics, massages, and many other types of pampering. That would more than satisfy the typical vacationer, but not the type of individual Hemminger had in mind.

The spectacular coastal cliffs, the lush tropical vegetation, the backdrop of mountains born from volcanoes, and the sugar plantations on the slopes are all distinct treasures of Kauai. To this Hemminger

While the Hawaiian setting and the unique opulence of the facility would pique the interest of any well-healed traveler, it is the two golf courses carrying Nicklaus' signature that have attracted the attention of the world.



Aerial photo of resort with golf course in background.

added touches from Italy, Australia, Africa and Europe.

William Randolph Hearst would have felt at home on one of the mahogany launches or outrigger canoes on the resort's 40-acre lagoon. He also would have liked riding one of 35 carriages drawn by Clydesdales, Belgians, or Percherons over eight miles of crushed coral trails. He would have been comfortable in the 26,000-square-foot pool handcrafted with imported tile and surrounded by Grecian columns.

But not even Hearst, the creator of San Simeon, could boast of islands stocked with

wildlife representing countries from around the world. Protected and contained by the lagoons, monkeys, kangaroos, gazelles, zebras, and other exotic animals and birds live in a style that exceeds "creature comforts." Flamingos and swans frolic in the manmade system of waterways. In fact, the Kiele course has animals as its theme. Each hole is named for a particular animal or bird.

While the Hawaiian setting and the unique opulence of the facility would pique the interest of any well-heeled traveler, it is the two golf courses carrying Nicklaus's sig-

nature that have attracted the attention of the world. Perched on oceanside bluffs above Nawiliwili Bay and sculpted from an old sugar plantation, the Kiele course and the Lagoons course offer a challenge and beauty rivaled by few other courses in the world.

Wadsworth Golf Course Construction Company built both courses under the guidance of Nicklaus and irrigation designer Coates. The resort landscape was designed by Tongg, Clark & Mechler of Oahu and installed by Kauai Nursery and

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Landscaping, Inc. The extensive Rain Bird irrigation system was provided by Paradise Supply in Honolulu. But the grow-in and subsequent care of both has been the responsibility of Earl Sanders since 1987.

A project the size and complexity of Kauai Lagoons would boggle the mind of many superintendents. You'd expect Sanders to be a little arrogant and high-strung. Instead, he is very down-to-earth and unselfish, almost shy. But there is a well-organized and highly dedicated person behind this calm exterior. There has to be.

The 40-year-old Sanders started his career 18 years ago raking sand traps and trimming on a golf course in Phoenix, AZ. He didn't play golf, but he was captivated by the agronomics of the huge facilities, especially when it came to construction. His dedication was rewarded with assignments for irrigation maintenance and reshaping greens and tees. Before long he was on the construction crew at Royal Palms, a nine-hole executive course in Mesa, AZ. When the job was finished, he was asked to stay on to help manage the grow-in.

Sanders wanted to learn more about the technical side of golf course construction and maintenance. Dr. Bob Kneebone, professor at the University of Arizona in Tucson, convinced Sanders to study agronomics and plant genetics under him at the university. After completing his bachelor's degree in 1979, Sanders longed to get back out on a golf course to continue building and reshaping. He found the opportunity at Edgewood Country Club in Lake Tahoe, CA.

An offer to help build Camelback Golf Club in Scottsdale as assistant superintendent proved too good to pass up. Following the grow-in of that course, Sanders moved up to become superintendent at Mountain Shadows Country Club in Scottsdale. After a brief attempt at building his own landscape maintenance company in Phoenix,



The Lagoons course gets its name for the manmade water hazards which come into play on this peninsula green.

he realized that he belonged on a golf course.

Had it not been for Sanders' next job, he might never have latched onto the opportunity of a lifetime, the position at Kauai Lagoons. Phil Shoemaker, then superintendent at Desert Highlands, hired Sanders to be his assistant superintendent during grow-in. This was his entree into the realm of Nicklaus-designed golf courses.

Nicklaus is a strong believer in practice makes perfect. He surrounds himself with people who have experience and a proven track record. Once you've demonstrated a skill that's important to him, you become part of his team.

Sanders became a member of the Nicklaus team during the grow-in of Desert Highlands. When Shoemaker left to attend to the first of three courses at Mountain Shadows, Sanders moved up the ladder to

superintendent. Shoemaker has since become the superintendent at the Nicklaus-designed Loxahatchee Club in Jupiter, FL.

In 1987, when Nicklaus and Wadsworth were making progress on the Kiele course, the call went out among his cadre of superintendents for the job at Kauai Lagoons. Sanders took the bait, applied for the position, and got it. Hemmeter hired him primarily to monitor the various subcontractors on the project and supervise the grow-in of both courses.

"I'd been to Hawaii before," Sanders remarked, "but I was amazed when I saw the resort for the first time. My parents used to live on the big island of Hawaii. Kauai is much older than the other islands. Wind and rain over millions of years have broken the lava down into a thick layer of red clay."

The irrigation was just going in on the first hole of Kiele when Sanders arrived in July. "The pump station hadn't been installed and this was my first exposure to the MAXI [Rain Bird] system," he recalls. "The trade winds blew between 10 and 30 miles per hour most of the time. Some days we got up to six inches of rain! All these things were new to me."

The wind and rain were a constant challenge when seeding the common bermudagrass roughs and sprigging the Tifgreen fairways. Nicklaus designed the Lagoons course in "links" fashion with an abundance of mounds and undulations. On the Kiele course he used the crags and valleys near the ocean to create drops 50 feet or greater between tees and greens. From the top of the Lagoons course to the ocean-side hole of the Kiele the elevation changes by nearly 500 feet! More than once the seed was washed off the slopes by rainstorms.

The elevation, wind, and rain also presented Coates with an exceptional challenge during design and construction

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Large bunkers and heavily mounded fairways and roughs give the Lagoons course a the character of a Scottish links.

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of the irrigation system. But first he had to contend with the sheer size of the project. "The climate on one end of the property is considerably different from that on the other," Coates states. "It's enormous! The top of the Lagoons is windy, warmer, and drier. The Kiele is less windy and more humid. Even then, the weather can change in ten minutes from rain to bright sunshine. I'd never experienced anything like it before even though I've done other courses in Hawaii. ET [evapotranspiration] rates vary greatly within the resort."

Coates suggested that each course have its own computerized central control system and pump station. A weather station (Rain Bird) was placed between the two courses at approximately the midpoint in elevation. After all refinements were made, there was a total of more than 3,000 valve-in-head DR rotors per course. This compares to perhaps 600 heads for a typical 18-hole course in the Midwest or 1,500 heads per course in the Southwest, he explained. Head spacing was limited to between 60 and 65 feet on fairways to counteract the wind. An additional 4,000 sprinklers of various types for the resort landscape were tied into the two MAXIs. All 10,000 heads were staked by Coates during construction.

"We had to allow for any changes required during construction in addition to



Earl Sanders.

the resort's needs in the future," said Coates. "We had to create pressure zones that worked with the differences in elevation and then adapt these to changes made by Nicklaus during construction." For example, after the 16th hole on Kiele was graded and the irrigation installed, Nicklaus and Hemmeter didn't like the fact that you couldn't see the ocean from the tee. The green was lowered nearly 50 feet, requiring removal, redesign and replacement of the irrigation.

"The team made it come off," Coates reflects. "Everyone knew they were dealing

with something special and wanted to make it as perfect as possible. We made all kinds of field changes. It took tremendous cooperation to pull it off on time."

Wadsworth and Sanders had only four months to get the bermuda established on Kiele before opening. "We were concerned about the common bermuda invading the 328, especially with the weather," Sanders admits. "We seeded the roughs first with common and gave them seven to ten days to germinate. Then we turned the water off and sprayed the fairways with Roundup to kill any of the common that had been washed into them by the rain. After waiting a week, we spot sprayed the fairways and waited another three days before Wadsworth sprigged the fairways, tees, and green banks with Tifgreen."

Building the two courses required thousands of tons of sand. "We used nearly 12,000 tons just for the bunkers," said Sanders. Kiele required 6,000 tons for its 106 bunkers and the Lagoons course needed an equal amount for its 69 bunkers. One bunker on the Lagoons is nearly one acre!

When Sanders tested the sand from the island, he discovered it was weathered limestone with a pH of almost 9. "If you try to acidify the sand too rapidly it will degrade," he points out. For that reason he imported silica sand from California for top-

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dressing. "The silica sand has a pH of 7. By incorporating the silica sand into the local sand, we can bring its pH down slowly," he adds.

The greens were fumigated and then sprigged with Tifdwarf. Fertigation was used to help speed up the establishment of the greens, tees and green banks.

Sanders applied a new mowing technique on the undulating, Nicklaus-style greens. He placed 19-inch reels in the 22-inch frames of his Jacobsen walking greensmowers. This reduces scalping when the greens are cut daily at 9/64-inch

during the winter and 1/8-inch during the summer. Half of the greensmowers are equipped with groomers. Each week half the greens are lightly groomed while the other half are topdressed with silica sand.

Some of the tees are walk-mowed as well. "Jack likes a lot of tees," Sanders stated. "Every hole has at least four. One par three has seven! The gold tees are often too small for our tee mowers." All tees are topdressed at least once a month with sand and verticut every other week during the summer. The tees are cut at 5/16-inch year round.

One thing that bothered Sanders about the grow-in of Kiele is he didn't have time to

verticut the fairways. "I like to stay on top of thatch from the beginning," he remarked. With only four months to go before opening, he held off verticutting. To encourage density during grow-in, he cross-cut the fairways daily with lightweight mowers (Jacobsen LF-100s) at 1/2-inch. "We'll start verticutting the fairways once or twice a year," he adds.

The roughs require two different types of mowers due to their size and topography. Triplex mowers are used on the mounds while seven-gang units cover the remainder. The common bermuda is kept at 1 1/4 inch. The close rough and green banks are mowed at 3/4-inch with Jacobsen Tri-Kings.

To manage the 400-plus acres of golf turf, Sanders needed a skilled staff and an irrigation system that was flexible and convenient. He brought irrigation specialist Marty Alexander with him from Arizona. Alexander had experience with the MAXI system in Phoenix. Kelly Marvin, whom Sanders hired to construct the sand traps on Kiele, is now assistant superintendent of that course. Tim Canute from Maui is the assistant on the Lagoons course.

Carolyn O'Connell is the assistant superintendent of the extensive resort landscape. Marvin, Canute, and O'Connell each have crews of 15 or more to keep the complex in top condition. The entire team consists of nearly 100 people hand-picked by Sanders and his assistants.

Alexander's experience with the Maxi has helped Kauai Lagoons tap the full potential of the MAXI System IV. During grow-in it was imperative that the sprigs be continually moist without eroding sloped areas or flooding flat terrain. As with any new course, drainage is relatively unproven until the irrigation system and weather are fully coordinated.

Alexander programmed irrigation schedules that provided a total of 40 to 45 minutes of flow every 24 hours. To achieve this without erosion, he called for two and three minutes of station run time every hour during daylight and two or three short cycles at night. "Without computer control, keeping the entire course continually moist would have required a lot more water and a lot more people," he reveals.

The two irrigation systems are linked in two ways, hydraulically and electronically. Each PSI pump station delivers more than 3,100 gallons per minute of water from a single reservoir. An agreement with the city of Lihue for irrigation-quality effluent provides the majority of the water needed. The water has a pH of 7.1. A well supplements the effluent when necessary. Both pump stations are linked by a 12-inch main to make sure there is no interruption in irrigation in case of a breakdown.

The electronic link is between the weather station and the computers. Weather data, including temperature, solar radiation, wind, humidity, and rainfall, is downloaded to both computers. Six addi-

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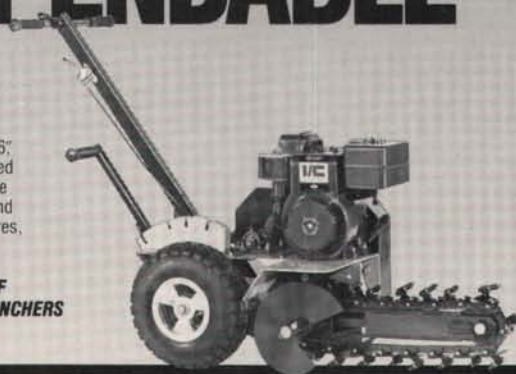
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tional rain gauges located throughout the resort monitor microclimates. All this information is used to adjust irrigation schedules on a daily or more frequent basis.

Golfers and maintenance are not the only constraints on the irrigation system. The lagoons, carriage trails, roads, and footpaths are intertwined with the golf courses. As a result, irrigation cannot begin in many areas until midnight and must be completed by 5:30 a.m., when the maintenance crew arrives. Scheduling the two huge systems to match this time frame in light of the erratic weather would be impossible without computers. Even then, balancing the flow requirements of the pump stations to control energy costs is a herculean task.

After the completion of the Kiele course and while the Lagoons course was growing in, Rain Bird introduced a more advanced version of its MAXI software. The new System IV software gave the computers the power to program irrigation schedules to maximize energy use by the pumps. It also refined the process of dividing water times up into segments which more closely matched the ability of slopes and other sensitive areas to absorb water.

Based upon ET data for the preceding day, Alexander can let the "Flo-Manager" software arrange the flow requirement of thousands of heads and valves to create a consistent demand on the pump stations. By eliminating peaks and valleys in the demand on the pumps, they can work at maximum efficiency. No longer do the pumps run above or below their designed potential. The computer groups the needs of different zones to match the optimum output of the pumps.

Alexander realized that in many instances he could shut down the jockey pump during the main irrigation schedule. He also discovered that the jockey pump alone was sufficient to handle fertigation, as well as drip programs for thousands of exotic plants, separately from the main schedule.

"The important factor," notes Sanders, "is



Horse-drawn carriages transport guests over eight miles of trails.

Golfers and maintenance are not the only constraints on the irrigation systems. The lagoons, carriage trails, roads, and footpaths are intertwined with the golf courses.

that now the pumps are running at their most efficient rates. We are able to pump an average of 662 gallons per kilowatt, compared to 570 gallons per kilowatt on the original system program. This enables us to pump approximately five to six million gallons per month for the same cost as before. And the overall watering time has been reduced from ten hours to essentially seven."

Alexander figures that the new software has reduced pump run time by 26 percent and cut electric bills by 29 percent. Projected over one year, these will amount to a savings of nearly \$40,000, he adds.

Sanders believes that the second feature of the new software, "Cycle & Soak," has improved the condition and appearance of the heavily mounded Lagoons course. "It has been a help while we work on refining our drainage system," he explained. "It takes a few years to locate and correct wet spots on any new golf course. Since we can adjust slope irrigation effectively, we can schedule drainage improvements to fit into our workload."

It took Alexander only three days to add the new software to his existing system. "Computer-controlled irrigation systems have a high initial cost," Sanders admits, "but the cost is justified when you consider the simplicity and economy of upgrading irrigation with advancing technology."

Hemmeter has plans to add a third 18-hole course to Kauai Lagoons in the coming years. Nicklaus, Coates, and Sanders are already working on the details. The planned course will be close to Lihue airport, where another unique microclimate will have to be considered. A third MAXI, a second reservoir, and possibly a second weather station may be required to meet the growing needs of the mega-resort.

"This is the largest resort in acreage in the world!" boasts Coates. "To think it is also one of the most recognized for quality is a real tribute to Chris Hemmeter, Jack Nicklaus, their staff and suppliers. You have to see it to believe it!"



Mahogany launches navigate the manmade waterways of the Westin complex.