CH2MHILL®

Building a Better World

TRANSFORMATIONAL MILESTONES

1946 to
2009

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Dedication

Ralph Peterson
1944 – 2009

Everyone who met Ralph Peterson has a story to tell. Some stories are funny. Others are inspirational. Some indicate the breadth and depth of his intellect. And some, well, as a friend who knew Ralph well would attest, were enough to "make a gritty sailor blush." But encounters with Ralph were always memorable. Ralph had that way about him.

The very idea of this book came from Ralph. As chief executive officer, he had been sent a number of corporate histories, what he called and almost despised as "coffee table" books. Mostly, he saw such histories as either tributes to the egos of CEOs or whitewashes that ignored the heart and soul—and even the warts—of a company. He dismissively set these books aside, resolving that CH2M HILL would not engage in such folly.

But then something happened that caught Ralph's attention. His predecessor and mentor as CEO, Harlan Moyer, talked to Ralph about creating a book based on the underlying philosophies and core values of the company's founders and in particular what employees knew as co-founder Jim Howland's *Little Yellow Book*. Ralph often stated that whatever successes he had as CEO were possible because he was "standing on the shoulders of giants"—a college professor and three of his engineering students along with a California entrepreneur whose last names are embedded into the company's name, CH2M HILL. Ralph agreed with Harlan that, if a book could be fashioned to capture their legacy and the spirit of the company's employees, he would authorize and fund the effort.

But from the outset with his initial endorsement, through the crafting and writing, and then to a final draft, the process with Ralph was not easy. Some things were just not easy with Ralph. He had that way about him.

He was insistent that this was not a business book, and he didn't want a boring chronological recitation of facts and figures. He never said it exactly this way, but he made it clear that the book had to be alive, give people a sense of the company history and culture, and be true to the core values that the founders had instilled and passed on to successive generations of employees. In essence, Ralph wanted the book to reflect what he passionately believed every day during his forty-four years at CH2M HILL: It is a great place to work, has the best people in the industry, and they are working on "really cool" projects for world-class clients.

An early draft of the book was given to Ralph in May 2007. He read it from cover to cover, and called Harlan over a weekend to pronounce his satisfaction. He stated that, with relatively little work on his part, particularly in the latter third of the history (his tenure), he would release the book for publication.

Unfortunately, Ralph never finished his work on the book. The demands on his time as CEO, involvement in global causes such as the World Economic Forum, and then sadly his battle with stomach cancer, took precedence.

Ralph left CH2M HILL and the world in September 2009. At his funeral, Joseph A. "Bud" Ahearn, a retired U.S. Air Force general and former vice chair of the CH2M HILL board, captured the essence of Ralph Peterson with these words:

> *"Few of us have ever lived nor worked with a person with such expansive talents, interests, skills, and passions—when we think of instruments of regional, national, or global power—political, psychosocial, economic, technology, and the forces for security—Ralph did not hesitate to engage, to contribute, and, in many cases . . . to lead. Nowhere was this more evident than his global advocacy for delivery of sustainable community development around the globe. We would find Ralph in universities, professional societies, business forums, and significant political gatherings, fostering the values and winning commitments to learn and to change. Indeed, he inspired tangible, positive changes in economic opportunity, social justice, and environmental stewardship, which are key elements of major projects being done around the globe."*

These words would be humbling to Ralph, but he would have been proud to point out that they in fact describe the company he loved so dearly and to which he dedicated his entire professional career. While indeed standing on the shoulders of giants, Ralph led CH2M HILL's growth over nearly two decades, almost a third of the firm's existence. Like Ralph, the company and its people share expansive talents, interests, skills, and passions. They don't hesitate to engage, to contribute, and to lead. They can be found in universities, professional societies, business forums, and significant political gatherings. And, like Ralph, the employees of CH2M HILL inspire tangible, positive changes in economic opportunity, social justice, and environmental stewardship on major projects around the globe.

This book is dedicated to Ralph because he epitomizes the spirit of CH2M HILL. He had that way about him.

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This book is for the employees of CH2M HILL,
past, present, and future.

Acknowledgments

This book is the product of a host of passionate people who made contributions to it over several years. Many lent their technical knowledge or contributed photographs, anecdotes, and insights. Others were involved in administrative and production support. And some simply provided encouragement. All of them deserve special thanks.

Much of the book's content for the early history was inspired by and gleaned from the oral histories of Jim Howland, Burke Hayes, Holly Cornell, Clair Hill, Archie Rice, Ralph Roderick, Harlan Moyer, Sid Lasswell, Earl Reynolds, and Jim Poirot.

Various chapters were researched, written, and edited by talented and caring people, both current and former employees. Most notably, this group included David Miller, who worked closely with Harlan Moyer in establishing the content, setting the tone, and taking the reins of overall management. It was David's ongoing involvement and perseverance that made this book possible. Other major contributors include Gene Suhr, Tom Gibbs, Andre Armstrong, Rick Thornton, and Lee Overcamp.

Kathy Ehler led the book's final design, layout, and production of hardcopy and electronic versions. Sherri Boness provided administrative support from the beginning.

Millard Robbins contributed to Chapter 10, the story of Upper Occoquan Sewerage Authority (UOSA). Millard is a dear friend and was a long-time client of CH2M HILL.

Editorial support came from professionals outside the firm who helped give the book objective balance, a consistent voice, and organizational structure. They include Jane Albritton, Tripp Baltz, Sam Hill, Josh Hyatt, Leigh Phipps, and Joan White.

Lastly, the book wouldn't have come to fruition without the support of CH2M HILL leadership, namely, Ralph Peterson, Bill Dehn, and Lee McIntire.

Beyond those mentioned, the past and present employees of CH2M HILL are what make this company—and this book—special. Whether mentioned by name, this book is for and about them and the clients they serve around the world.

Prologue

Building a Better World, Transformational Milestones from 1946 to 2009 is about a dedicated, multi-generational group of people, rather than a few elite individuals. It is a discovery of intriguing accomplishments, large and small. It's about employee ownership and sharing the wealth, quality corporate citizenship, and a sustainable business based on integrity and sound ethics. The book reveals foibles, public scrutiny, organizational adaptation, and challenges brought on by rapid revenue growth and geographic expansion. And, as the title implies, it's about working in communities around the globe.

The book's purpose, beyond chronicling this exceptional group of people doing challenging, innovative, and sometimes unprecedented work, is to provide employees an understanding of the legacy they inherit and the values and business philosophy they are expected to preserve and enhance.

The story of CH2M HILL begins in the United States at the end of World War II. Five down-to-earth guys, each shaped by the Great Depression and the war, set out to make ends meet by applying their skills and business principles to help clients build new infrastructure and protect the natural environment. In 1946, three former students and a professor—Holly Cornell, Jim Howland, Burke Hayes, and Fred Merryfield—formed an engineering partnership in (CH2M) Corvallis, Oregon. At about the same time, the fifth, Clair Hill, began as a sole entrepreneur in Redding, California.

Fueling their businesses was pent-up demand for improving civil infrastructure that had been neglected for decades. That, combined with entrepreneurial spirit, the hiring of quality employees, and the all-important drive to do right by their clients was a recipe for rapid growth, all the while operating from rural surroundings. Their goals were never grandiose; rather, they wanted to take care of their young families and make a reasonable living. As Jim Howland summed it up in what has become the company mantra:

> *"Do good work. Make a profit. Enjoy life."*

Fortuitously, the two companies began working together on a variety of projects during the 1950s and '60s. Over the years of collaboration, it became apparent as they expanded their geographic reach in America's Great Northwest that they would have to either join forces or become

head-to-head competitors. In 1971, after completing a landmark project together that received international acclaim, CH2M and Clair A. Hill and Associates became one. But even then, the notion of building an expansive organization with tens of thousands of employees was beyond anyone's wildest dreams.

Forward nearly forty years, during which time CH2M HILL became a $6 billion global organization with more than 23,500 employees. Along the way, employees and subcontractors demonstrated that "the impossible is possible" when they decommissioned, cleaned up, and closed a highly contaminated Cold War-era plutonium processing facility. Nestled in the Colorado foothills of the Rocky Mountains, today Rocky Flats is a thriving wildlife refuge. Employees have showed their moxie time and again by rapidly responding to some of the world's most devastating disasters, including the Indian Ocean tsunami and Hurricanes Katrina and Rita. They are leading some of the largest, most complex projects in the world—providing program management for the expansion of the Panama Canal and the design and construction of facilities and infrastructure for the London 2012 Olympic and Paralympic Games. As the company continues to expand into the industrial and energy sectors, employees are bringing to bear their technical and operational expertise to projects from Prudhoe Bay, Alaska, to Shanghai, China.

Simple but highly ethical management and business principles are woven through the cultural fabric of this employee-owned company, and that is reflected in its growth, longevity, and in the honors that have been bestowed upon CH2M HILL. In recent years, the company has been named as one of the *World's Most Ethical Companies*, has been on Fortune's lists of *100 Best Places to Work For* and *Most Admired Companies*, and was bestowed the *Catalyst Award* for the advancement of women in the workplace.

Awards aside, often the greatest accolades a company can receive are from employees. Jory Abrams aptly described CH2M HILL in a note to her colleagues at the time of her retirement:

> *What makes this a great place to work and why have I been a career-long employee? It is mostly about you [fellow employees], our clients, and projects. It is also about the enduring values and culture of this company, which seep into each of us as we join and then become part of something bigger. Along the way, we start to value and care for the gift we have been entrusted with. It is extremely rare to have a company this large, this complex that is owned 100 percent by the employees. It gives each of us a unique stake in the future and a unique responsibility that is very different than if this were a publicly held and traded firm or if it were controlled by a few major owners.*

From left to right:
James C. Howland, Holly A. Cornell, Fred Merryfield, and Thomas Burke Hayes

CHAPTER 1

Origins of CH2M

CH2M:
Cornell, Howland, Hayes, and Merryfield

CH2M HILL, a company dedicated to "building a better world," traces its origins to a pivotal time in American history, a time when the country was just emerging from a world war that had pulled it out of economic and emotional malaise. In 1946, America was poised to enter a period of prosperity, growth, and technological development unparalleled in history. The five founders of CH2M HILL—Holly **C**ornell, Jim **H**owland, Burke **H**ayes, and Fred **M**erryfield in Corvallis, Oregon, and Clair A. **H**ill in Redding, California—epitomize that time and the values which continue to serve as the company's foundation. They received their education during these critical years, both at the schools they attended and in wartime service. They learned, under the most trying times, the values of honesty, integrity, and giving back to their communities and their country; the meaning of hard work; and—it must be said—the value of their own lives and the contributions they could make.

Fred Merryfield served as a fighter pilot with the Royal Flying Corps in World War I

From Dream to Reality

Four of the five, the CH2M part of the equation, began their "rendezvous with destiny" at what was then Oregon State College (now Oregon State University) in Corvallis.

Fred Merryfield, the son of a foundry man and garment weaver in Bury, Lancaster, England, arrived in Oregon around 1920. He had served as a fighter pilot with the Royal Flying Corps in World War I and was on his way to Fiji, looking for opportunity. Instead, he fell in love with the Oregon countryside and stayed. In quick order, Merryfield enrolled in, was graduated from, and began to teach at the college. After earning his master's degree in sanitary engineering from the University of North Carolina, he returned to Corvallis to head up the sanitary engineering program where he taught and inspired students—including Cornell, Howland, and Hayes. A dedicated educator, Merryfield taught at the college for more than thirty years.

Cornell was a sophomore when he took his first class with Merryfield and remembered the day when his professor was writing a hydraulic problem on the blackboard. With his eraser in his hand, he asked the class, "What's next in this formula?"

"Somebody gave him some kind of outlandish answer," Cornell recalled. "He yelled out, 'Oh, my God!' and drop-kicked the eraser out an open window. It brought down the house."

But just as Merryfield had a flair for the dramatic, he also had a knack for spotting and supporting talent. He arranged for Holly Cornell to go to Yale to study for his master's under noted engineering professor Hardy Cross.

He encouraged Jim Howland to apply for a Tau Beta Pi Fellowship, which took Howland to the Massachusetts Institute of Technology. Burke Hayes, another of Merryfield's students, went to MIT as well. As a result, the West Coast connection became the East Coast connection. The bonds remained in place when World War II sent Cornell to Europe (where he was awarded the Bronze Star), Howland to Saipan (where he received the Legion of Merit and the Bronze Star), Hayes to the Mediterranean, and Merryfield (then 41 years old) to New Guinea.

Throughout the war, the men corresponded; as the war wound down, the three students and their professor exchanged a flurry of telegrams discussing a pending partnership. On August 26, 1945, Holly Cornell wrote to Jim Howland about Merryfield's belief that this was a unique time for engineers. For over fifteen years, construction had been slowed to a near standstill—first by the Great Depression and then by the war. As Cornell saw it, there were unparalleled opportunities that Merryfield could help them land.

> *Fred is all wound up in a stream pollution survey in the Willamette River. Oregon has a new law that Fred is very enthusiastic about. It is a big start toward cleaning up Oregon streams. It means, according to Fred, that almost every town and city will have to treat their sewage. All the cities have plenty of money now and are begging for engineers so they can get started on post-war construction.*

Merryfield was specific about the opportunities he envisioned in a letter dated September 15, 1945, to Cornell and Howland:

> *It is my reaction that water filter plants and sewage treatment plants will be in demand throughout the Pacific Northwest for the next ten or fifteen years. Many of the present gravity systems of water are on their last legs, and many of the sewer systems are in a pitiful condition.*

Cornell was the first of the three students to return to Corvallis, arriving from Camp Gruber, Oklahoma, in late 1945 after his release from the military. Immediately, Cornell began to work on estimates and designs for projects Merryfield had lined up. His wife, Cleo, typed project reports using a manual typewriter and lots of carbon paper. Before they could go to bed at night, the Cornells had to fold up a homemade drafting table, which was hinged to the wall of their cramped bedroom.

On November 25, 1945, Cornell wrote to Howland to update him on the state of their potential business. Howland was still on Saipan, where he was head of the design section for the Island Engineers. The construction of airport runways, utilities, harbor facilities, and hospitals made the island a

"They used to tell me I was building a dream. And so I followed the mob. When there was earth to plow or guns to bear I was always right there on the job."

— from the song "Brother, Can You Spare A Dime?"

well-established forward base to support the invasion of Japan. Howland's work there had earned him medals; more importantly, it gave him valuable experience. He read Cornell's letter with great interest.

> *Fred and I are now definitely committed on work that will take us alone until at least April 1 (1946) to complete. There is a lot more work that we can get if we could handle it. With you coming, now we plan to go ahead and take it.*

In early December, Howland replied.

> *From my observations a group of enterprising fellows with reasonable intelligence and some technical background can manage all right in most any situation. Particularly if they will stick together.*

Stick together they did, for decades to come.

Foremost in their minds was not the money they could make, but the fact that they could use the postwar opportunities to build their business. As Cornell put it, "[If] we can get in at the start of expansion, get acquainted with the people, establish a reputation and some good will, we will have work continually coming to us for some time." Their focus from the outset was providing service to clients and establishing a reputation for quality work—hallmarks that became the foundation of their partnership.

Howland and his wife, Meisy, returned to Corvallis in January 1946. They had spent most of the prior years apart from each other, but they cut their postwar vacation short to return home. Howland was anxious to get started with the new partnership. In his war correspondence with Cornell, he had already talked about their potential office arrangements. On October 15, 1945, he wrote:

> *I have been doing a little super long range dreaming when, perhaps, I should have been doing beams and pipes, and have laid out a mythical suburban tract that would include our office building, for which I made preliminary designs and an individual home for each firm member.*

Burke Hayes returned to Corvallis with his wife, Billie, in February 1946. Through the war years, he had continued to correspond with Howland and wrote of their potential work together on August 30, 1945:

> *The end of the war brings much closer the familiar question—and my hope—of going into business together. I was pleased in hearing of the progress you made during your stateside leave in that direction. I, too, am of the opinion that the Northwest could stand some more engineers in private practice.*

CORNELL, HOWLAND, HAYES & MERRYFIELD
Consulting Engineers
CORVALLIS, OREGON

Prior to the return of Howland and Hayes, Merryfield and Cornell had established enough work to move their "base of operations" from Cornell's house to a one-room, second-floor office above a hardware store. The reunion of the three engineers and their professor, coupled with Merryfield's extensive connections with potential clients, required them to rent an adjacent room to this office—adding another $10 a month to their operating expenses. The partnership of Cornell, Howland, Hayes & Merryfield, Consulting Engineers had been transformed from a prewar dream to reality. The names were listed in the order the partners were released from military service, except Merryfield, who felt that his three syllable name sounded better at the end.

Although reunited, the partners had little time to sit back and reminisce. Work was picking up and, in Howland's words, "[We] were just trying to get the jobs done and get the people hired that we needed and get facilities." Within the first few months of starting their fledgling business, they hired a stenographer and began to subcontract for some services. They needed the help because with each partner responsible for his own projects, it was difficult to manage day-to-day operations.

They quickly recognized that, given the frenetic pace of their new venture, one among them would need to serve as the manager. Initially, Cornell was assigned the job, for no other reason than the fact that his name was listed first. The partners agreed—consensus management at the earliest stages—that the manager position would rotate every six months. After a year, however, there were three key reasons that they decided upon a permanent manager: six months was not enough to settle into the job; there was a general reluctance to take the assignment; and, most importantly, Howland seemed to be the right guy for the job. Hayes stated later:

> *Jim wanted to be an engineer, but he knew that we had to have a manager, so he managed. There are many contributions that everyone made, but the most important one Jim made was the one of management, early management. Keeping things together and headed in some reasonable direction—that was Jim.*

It sounded so simple, so logical, and so practical at the time. Howland had special instincts, a feel for people issues, and a penchant for teamwork. This fundamental decision, to put the management of the new partnership in Howland's capable hands, set the tone of the firm for decades to come. As manager, Howland was first among equals. Despite the apparent hierarchical structure, however, important decision making continued to be done by consensus among all the partners.

The complementary skills of the partners were critical to their early successes with myriad reservoir, waterline, sewer, electrical, and solid-waste projects. Cornell's expertise was structural and hydraulics. Howland focused on soil mechanics and hydraulics. Hayes provided electrical and mechanical engineering. And Merryfield, still teaching but working part time for the firm, reviewed sanitation projects and made invaluable client contacts.

The pent-up demand for construction, from both the Depression and World War II, was enormous. Merryfield's particular interest in environmental issues and his contacts were vital to getting work cleaning up municipal and industrial wastewater pollution. In fact, there was so much work it became apparent that the four initial partners could not handle it all on their own. The next two members of the firm, hired within nine months of its opening, became as much a part of CH2M's early successes as the four founders. Both Archie Rice and Ralph Roderick were strong sanitary engineers and were such an important and dynamic force that, by 1948, they became equal partners with the founders.

CH2M + 2 Rs

Archie Rice had a discussion about joining the firm in August 1946 while sitting on a sawhorse in an unfinished office above a J.C. Penney department store, the firm's soon-to-be second home. Rice was another Oregon State engineer, although he recalls that he initially clashed with Merryfield.

> *I didn't like him. I didn't like anything about him. I didn't like his course. I didn't like the material. I didn't like the way he presented it. I didn't like the way he didn't comb his hair.*

Laughing about it later, Rice recalled that Merryfield convinced him over time that he "really wasn't an ogre." (Indeed, when Rice married, Merryfield served as his best man.) Rice was not that fond of school, which in his words was a "kind of an unpleasant interlude between summers." But at Oregon State, he learned from Merryfield that engineering could combine a number of his passions: mathematics and chemistry, construction, cleaning up rivers and streams, and controlling his own destiny.

Rice's addition to the firm contributed not only to his own destiny, but also to the destiny of the new firm. The four partners quickly recognized that Rice's experience and technical skills added unique capabilities to CH2M. Rice had worked with a San Francisco-based engineering firm and had helped design a wastewater treatment facility out of a project office at Camp White near

Archie Rice

Medford, Oregon. He then became the assistant sanitary engineer for the Oregon State Sanitation Authority.

Backed by a recommendation from Merryfield, Rice took a position as chief engineer at Camp Adair near Corvallis. In that capacity, he managed the water and wastewater treatment plants and distribution systems for 50,000 military personnel stationed at the camp. Following three years of service with the Army's Sanitation Corps in Georgia, Rice and his wife, Jane, returned to Oregon, where he reestablished his contacts with Merryfield and met the other three partners.

In addition to his extensive sanitary engineering experience, Rice brought what the partners later described as a "flair for business." Many of the firm's early business decisions were based on his ideas, and he was responsible for developing the firm's matrix organization years later.

Rice was offered a salary of $250 per month, the same as the partners' drawing account. Rice said he could get $260 per month at the state. The partners promptly raised their offer.

The second addition to the firm in 1946 was Ralph Roderick. Unlike the other five, Roderick was not an Oregon State graduate. But he, too, had a Merryfield connection.

After working for a construction company in the late 1920s, Roderick got his engineering degree from Kansas State University in 1932. He struggled to find a job during the Depression but was finally employed by an engineering firm in Salina, Kansas, which had just won a job on an earthen dam for a flood control project. During the next six years, Roderick gained invaluable experience, not only supervising construction on water and wastewater treatment plants, but also participating in the inner workings of a consulting engineering firm.

Like the others, Roderick had served a stint with the military. In five years with the U.S. Coast Artillery Corps, he worked in harbor defense, calculating trajectories of long-range artillery at Puget Sound near Seattle, Washington, and at Dutch Harbor, Alaska.

Roderick and his wife, Mary, wanted to relocate from Kansas to the West Coast, somewhere where it was cooler in the summertime. As they traveled in the Northwest in August 1946, Roderick contacted a number of engineering firms about possible jobs. He kept hearing about four guys in the Willamette Valley who had just set up shop. Roderick's recollection of his interview with Merryfield is memorable:

I talked to Fred Merryfield, or I should say, I listened to Fred Merryfield. They were moving their office from one building to another down on Third Street. Here he stood for an hour or two talking to me with his arm full of books. My wife was sitting in the car along with my sister and her husband. I talked to Fred in the middle of the sidewalk, and if you know Fred, you don't talk to him about engineering in a few minutes. It takes a while.

Ralph Roderick

Following the "interview," Merryfield suggested that Roderick go talk to the other partners. The partners met to discuss a job possibility for Roderick, but there was concern over whether they could afford another engineer. They had been in business only about nine months, and they had just recently hired Roderick's brother-in-law, Charlie Bayles, to be the resident engineer on a nearby project in Forest Grove. But one month after the couple returned to Kansas from their Oregon trip, Roderick got the call from Corvallis that would relocate his family and redirect his career.

With Rice and Roderick on board, CH2M was better positioned to help industries and communities clean up the rivers and streams of the Northwest and comply with state mandates. Although it was not easy for the young firm to break into the market, competing against well-established big-city firms, they did have certain advantages: youthful energy; knowledge of advanced engineering technologies and techniques; and Merryfield's gold mine of connections through Oregon State, as well as within the American Water Works Association.

They also did a lot of door knocking, introducing themselves to civic leaders and utility managers. In the first few years, the firm tackled projects for communities in and around the Willamette Valley—including McMinnville, Forest Grove, and Salem—as well as Camas, Washington. This early work provided much-needed cash flow and broad experience. Studies led to design projects and successful, money-saving projects led to client referrals. In 1948, CH2M designed its first hydropower station, and by the end of the decade, the firm had completed two hundred projects, including the first water treatment plant for the city of Forest Grove.

From the outset, the partners and their employees demonstrated a can-do attitude, trying to be a full-service firm. In an interview years later, Hayes said he could not recall turning down a project in the early years. They either thought that they could do the job themselves, given the variety of complementary skills among the partners, or they could use their network to find someone with the expertise to help them.

By 1951, after just five short years, the firm had forty-one employees and had opened a second office in Boise, Idaho, managed by Earl Reynolds (an Oregon State and Yale graduate). Their reputation for innovation, common sense, and money-saving solutions was growing. Their knowledge of the latest engineering techniques and quest for innovation gave them an advantage over older, more established firms.

For example, the firm took an existing technology related to water pipelines and applied it in a more effective and efficient way. The standard method had involved estimating the size of pipe needed to deliver enough water to end users. Hardy Cross of Yale, with whom Cornell had studied, had developed an innovative system for the analysis of water pipeline grids.

The Birth of the Name "CH2M"

Somewhere along the line in the early years, the name of the firm was transformed from "Cornell, Howland, Hayes & Merryfield" to something more manageable, more memorable, and even a bit mystical: CH2M. It's not clear when it happened or who was responsible for the change. Some say it came from a client, and some say it was created to sound like a chemical or engineering formula. Still others maintain it was the result of a word game. No one will ever know for sure, but the name stuck with the founders, employees, and clients. CH2M was and is today a name people always ask about; once they've heard it, it's unlikely they'll ever forget.

Applying Cross's methodology, the firm sold the service to water superintendents, demonstrating how they could derive savings from the use of smaller pipes. Years later, Howland described how they used these early contacts as a springboard for more work. The goal was always getting more work from repeat customers:

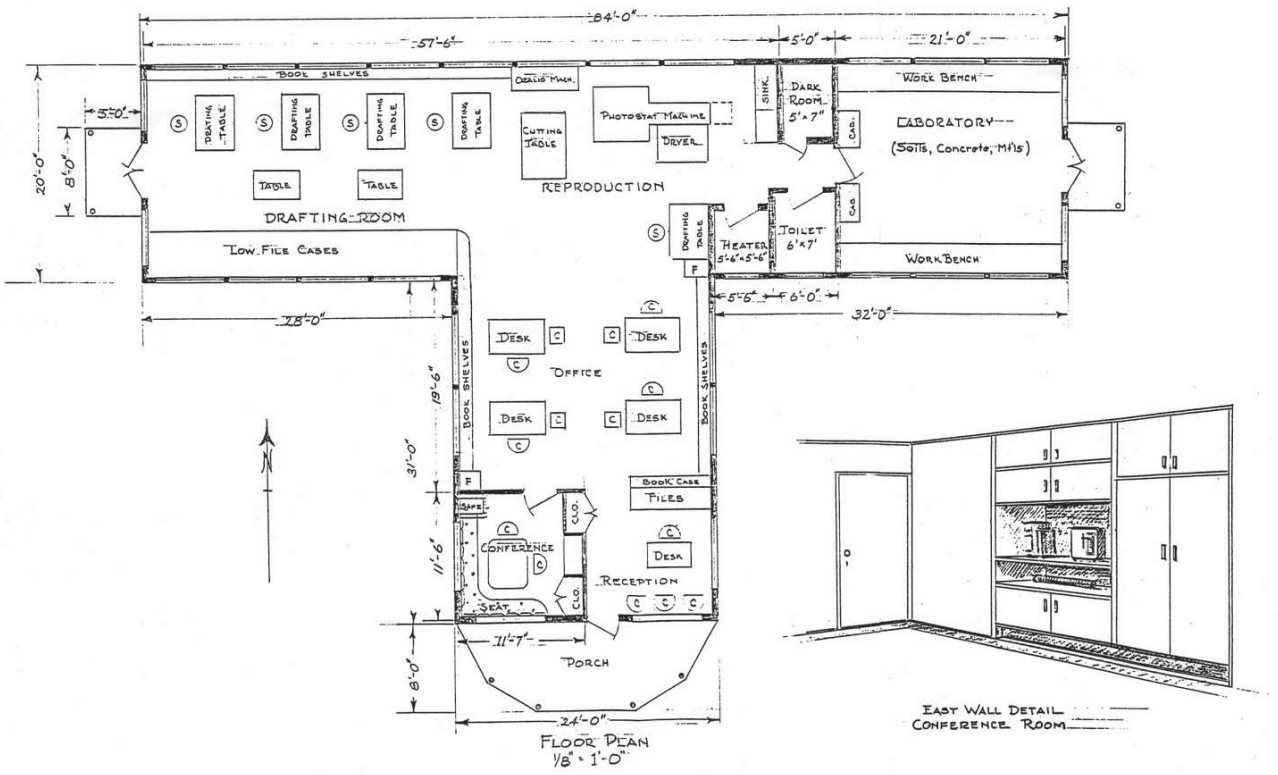
> *Quite a few cities hired us to [analyze their pipelines]. And that, of course, got us acquainted with them, and then when they had other work to do, if they were satisfied with what we did, they'd ask us about doing that [work].*

The partners built on their reputation for providing quality work—project by project, client by client—always seeking to find unique solutions.

Reflecting on Early Values

Nearly forty years after the founding of the firm, Jim Howland and Burke Hayes were interviewed about its origins and the early days of making ends meet. The results of the interview were telling, both about the firm's history and about the character of the people of CH2M, a business that did not just happen, but which was planned from the very beginning as a joint venture of four idealistic, ambitious, and energetic men with a dream of working together.

One of the most striking things about their perceptions was their humility about their role in the creation of a firm that, by the mid-1980s, had grown to approximately twenty-one hundred employees and $172 million in revenue. They were amazed at how large and diverse the company had become; however, what they were most proud of was to have helped build an organization in which "nice people could do interesting work."



Jim Howland's sketch of an office floor plan, which he drew while stationed on Saipan.

CH2M's first office building in 1950
Burke Hayes, Jim Howland, Archie Rice, Ralph Roderick, and Holly Cornell

Clair A. Hill, Redding office

CHAPTER 2

Origins of Clair A. Hill and Associates

Just as the fledgling CH2M was gaining attention in Oregon, another small engineering firm south of the state line was also beginning to grow and make its name known.

Unlike the partners in Corvallis, Clair A. Hill had opened his one-man shop as the sole proprietor in the small logging town of Redding, California. It was 1938, on the heels of the Great Depression, when Hill—a man who, someone later said, "wouldn't put a dime on a card game"—took a major gamble in starting up a consulting engineering business in a remote, rural town. The young California native had only a civil engineering degree from Stanford University, a few hundred dollars in seed money, and a healthy dose of self-confidence with which to start his business.

Hill could not have foreseen that, in just ten years, his shoestring venture would mushroom into one of the largest engineering firms in northern California. By the decade after that, his organization—with its string of impressive private- and public-sector projects—would be turning heads nationwide. Nor could Hill have envisioned that his continued partnering with CH2M would result in a powerful merger, setting the stage for the two firms to become one of the most respected names in engineering.

Hill was a Redding native, born in the Sacramento Valley community in 1909. His childhood and adolescence in and about the Trinity, Siskiyou, and Sierra Nevada mountains fostered in him an appreciation for the outdoors that would ultimately influence not only his choice of career, but also the way he would apply his knowledge and expertise.

For a time, the young man considered a career in forestry, studying briefly at Oregon State College. He spent his summers working in logging camps, splitting firewood, and hauling timber for the U.S. Forest Service. The hard labor sharpened his determination for a career outdoors, but it also convinced him there might be a brighter future in another line of work. In 1930, he enrolled in Stanford's civil engineering program. Engineering offered a path that would give Hill the chance to use his intellect and his respect for the outdoors in a way that would allow him to see his work being put to good use. Upon graduation, he took a position in San Francisco with the Standard Oil Company, but Hill quickly soured on urban life. Looking back on it, Hill said, "At first it was a job, and it was fine. But the longer I stayed there and looked around, the more I concluded that I didn't like the confines of a big city office."

Hill took a job with the California State Bridge Department as an assistant resident engineer. He and his new bride, Joan, spent the next three years moving from project to project across the state. The job not only returned

"I like talking to engineers best. They build bridges, they're very precise, very disciplined, yet I find they have roving minds."

— Ralph Richardson

the young engineer to his beloved outdoors but also provided him with the experience needed to gain state registration as Civil Engineer No. 5438.

As a registered engineer, Hill was now in a position to go into business. He was independent and self-sufficient. But more than anything, he wanted to control his own destiny. In 1938, he and Joan moved back to Redding, and Hill opened his own business in that quiet community of 5,000. Years later he wrote how much—despite an early hand-to-mouth existence—he relished this change:

> *…working for myself, just making a living. All of the activity is the appeal. Every day is different. I've designed bridges, buildings, water systems, sewer systems, and what have you, but I really like the construction better than the designs. That is what it all boils down to: the activity and something different all the time.*

The late 1930s were hardscrabble times in Redding, especially for a young engineer with little experience. The national economic lassitude combined with prewar anxieties made new jobs and business opportunities nearly nonexistent in the Shasta County seat. Hill scraped out a living by surveying and working any other small jobs he could find.

He managed to keep his business afloat until World War II changed his course. Called away for duty in Alaska, Hill spent the next five years working for the U.S. Army Corps of Engineers. His stint as post ordnance officer on Adak Island had little to do with engineering, but he made the best of it, worked hard, and rose to the rank of captain.

When he returned to Redding in 1945 to reopen his shuttered office, Hill initially found the economic climate as dismal as he had left it. Unlike Corvallis, Redding lacked any linkage to a major university with its potential for funding and talent sources. Hill made ends meet doing $25 and $50 mapping jobs and moonlighting as a deputy county surveyor. He personally handled small engineering projects until the first wave of postwar students earned their degrees.

"Then I started hiring them," he said, simply.

Gradually, his business began to gain momentum, helped along by character references from satisfied customers who liked the young engineer's earnest manner and the thoroughness and determination with which he approached jobs. Years afterward, Hill alluded to the benefits of client testimonials. "I think our clients are our best salesmen. I'd say, 'I'd like to have some people contact you. Is it okay?' And I never had one of them turn me down. Basically, we always made every attempt to do a good job for our clients."

Hill's son, Alan, recalled how his father explained to him the value of doing a good job:

> *Dad would take me on job trips sometimes. Once, when I was 10 or 12, we went to Hayfork, a small town in the mountains west of Redding. He had a water system job there, under construction, and the contractor was in trouble. Dad went to a meeting with the client and contractor. When he left the meeting, he told me "This doesn't look good, and it's probably going to cost me a bunch of money to get out of this mess." I said, "Why do you have to stay with it?" Dad said, "I have to be sure this job is finished and is done right. I want to come back to Trinity County and cannot leave a client with a bad job."*

Jim Lonnberg

As his practice and the pool of available engineers grew, Hill added employees, including Jim Lonnberg, a licensed surveyor who had spent the war with the U.S. Army Corps of Engineers at Pearl Harbor. Lonnberg's presence was key because it enabled Hill to concentrate on branching his practice into other fields, such as land development and water. Hill knew that northern California had a critical need for new municipal infrastructure. He also noted the growing calls for water resources management and environmental safeguards. Similar to the new environmental laws that Merryfield was tracking in Oregon, California laws enacted to protect municipal water supplies and upgrade sewage disposal were becoming tighter as well. These events inevitably increased the demand for design and construction work, and Hill, as one of the few regionally based engineers, was ideally positioned to respond.

With the U.S. economy beginning to awaken from fifteen years of somnolence, he realized the importance of making contacts and developing relationships to win jobs. Hill plunged into civic and community endeavors, becoming active in the local and state chambers of commerce. He also joined a key professional group, the Sacramento section of the American Society of Civil Engineers (ASCE). In all ways, Hill took a proactive approach to growing his business. He said:

> *I would hear about a bridge that had to be built, and I'd go [to the client] and tell them that I would like to design it for them… I learned what their problems were and then figured out how I thought they could be solved… In the early years, there weren't too many engineers around in the rural areas. Most of the private engineers were in the metropolitan areas, and so you just really worked at it.*

Still, the late 1940s were not easy years, because few clients were willing to provide advances or retainers. Growing a practice required a commitment to sixty-hour weeks and an incessant need for funds to meet payroll and office expenses, and to acquire surveying and lab gear. Hill bought an aging bungalow on Court Street, gutted and remodeled the five-room structure into offices, and moved in with his small staff.

By 1948, the practice had expanded sufficiently for Hill to add three more engineers and another surveyor. He also signed on technicians to bolster two survey crews, as well as a draftsman and clerical help. That same year, his firm won its first big project, designing pumping stations and updating canals for a sprawling irrigation project on the Sacramento River, about sixty miles south of Redding.

Hill continued to serve his community. In 1949, he was appointed by the governor to the California Water Commission, a new panel that would grow in importance as water assumed a critical dimension in state planning and politics. As Southern California demanded greater shares of the north's rivers and reservoirs, Hill assumed vigorous guardianship of the region's resources and interests. He served with distinction on the commission for thirty-two years, a record that still stands today.

Indeed, Hill's water board appointment was pivotal to his firm's destiny because it opened a wealth of potential client contacts. He met people throughout the state, especially when he chaired a panel and held hearings on the California Water Plan, an ambitious blueprint for statewide growth.

"I was able to talk to them about projects," Hill said. "If I'd hear about a project early before it was known, I would go talk to the people involved and sell them on doing the project for them."

Hill had realized that he would need to reach far beyond his hometown if he hoped to significantly grow his business, so he scouted the countryside for hundreds of miles looking for potential clients. Hill also had to scout for employees because there was no hometown university (as CH2M had) to provide him with a well-educated supply of engineers.

Hill's ties to ASCE helped him recruit several key employees. As president of ASCE's Sacramento section, Hill frequently visited the student chapter at the University of Nevada to interview prospects. One of his first hires was Harlan Moyer, a young engineer recently graduated from the University of Nevada, Reno. Many years later, Moyer would become the chief executive officer of the combined firm CH2M HILL, the first non-founder to hold the top leadership position. Hill subsequently hired several more University of Nevada graduates, including Jack Jensen, Don Showalter, Grant Engstrom, and Alan Hill.

Clair Hill, like Merryfield, had a knack for spotting talent. He placed little importance on grade point averages, preferring instead levelheaded candidates with judgment and integrity. He later made note of another vital trait: the ability to get along with people. Good people skills were especially important because his firm, unlike many other engineering outfits of the day, was an all-purpose shop that took on projects from highways to sewer systems. Its staffers needed to be conversant on all types of projects and with all kinds of clients.

Harlan Moyer

Hill was recognized as a skillful manager. The congeniality and freedom of the work atmosphere seemed to inspire hard work, as well as camaraderie. In 1952, after less than a year on the job, Moyer was delighted to find his $342 monthly paycheck supplemented with a $20 Christmas bonus—the forerunner, he would learn, of an informal profit-sharing plan. Hill's determination to share earnings as early as he could helped him solidify employee bonds and deepen loyalties.

By the end of 1952, Hill's company was officially named Clair A. Hill and Associates and had become the largest California engineering firm north of Sacramento. The staff of twenty included seven engineers and three surveyors. They were working on public and private projects across northern California that ranged from small airports, subdivisions, and schools to water treatment plants and irrigation lines. It was truly a full-service operation, or, as Hill liked to declare, "from concept to completion."

As a man not averse to taking business risks, it was time for another gamble. Hill sensed a new importance for topographic map-making in the then-bustling postwar economy, as subdividers and builders began developing the untrammeled West. He decided to pour what monies he could into the budding technology of photogrammetric mapping, which entailed creating topographic maps by means of aerial photos and with a minimum of ground surveys.

Drawing on his early experience on survey crews, mapping land, timber, and mineral sites by mule train in often rugged backcountry, Hill concluded that the savings with the new technique could be sizable. Fortunately, he already had full aircraft capability, in the form of two Cessnas and a Stinson "station wagon," a vintage propeller plane in which he could pack three passengers.

Hill had obtained his pilot's license a few years earlier and encouraged others of his staff to do likewise in order to circumvent the lengthy driving times on twisting mountain roads between distant points. He even footed the bill for flight training for some of his staff.

Clair A. Hill & Associates
Consulting Engineers

The investment paid off handsomely in saved time. The trip from Redding to Lake Tahoe, for example, which could consume nearly a full day on the road, could now be done in an hour by light plane. Hill also used the aircraft for promotional purposes, flying clients and ranking politicians to view important projects.

In the early 1950s, Hill won his first truly major project. A Pacific Gas and Electric (PG&E) contract, the project called for the siting and placement of high-voltage transmission lines between Redding and Eureka on the coast. The job, which entailed extensive surveying, mapping, and design across a 250-mile stretch of remote and often-mountainous terrain, spanned several years and brought the Redding group several hundred thousand dollars in revenue, far more than they had ever seen on previous jobs.

Competing against an array of other engineering companies, some of them much larger, Hill managed to convince the utility's executives to go with a local firm—his. Plus, his memberships and connections through ASCE and the Engineers Club of San Francisco also gave him an edge.

The successful completion of that job paved the way for another PG&E mega-challenge: the Pit-McCloud hydroelectric project. This project involved both the mapping of vast watersheds in near-wilderness terrain along the two tributaries of the Sacramento River and the designing and locating of powerhouses and diversion tunnels for a sprawling hydroelectric complex. While the new aerial mapping technique worked well up to a point, mule trains and horses also were needed in the wild and rugged country. As many as five three-man survey crews were used over a two-year period.

Hill's key to growth came down to networking and branching. Once, on a flight home from Washington, he ran into the city manager of Santa Cruz. They struck up a conversation, and Hill learned that the California city needed new bridges. He landed a contract, and the city became a longtime client. By the mid-1950s, Clair A. Hill and Associates had branched into even more areas of the engineering business and had amassed several hundred satisfied clients.

Despite its success, however, one lucrative area of opportunity continued to elude the company: business with the federal government. One reason was that the government, with its bureaucratic agencies and mammoth resources, tended to keep much of its work in-house, preferring to do its own design and construction.

"I would hear about a bridge that had to be built, and I'd go (to the client) and tell them that I would like to design it for them… I learned what their problems were and then figured out how I thought they could be solved…"

— Clair A. Hill

In 1955, that practice was about to change. The U.S. Army Corps of Engineers, known primarily for its dam-building expertise, sought assistance in designing a series of radar towers for the air force. The structures, known as "gap fillers," would be located at rural sites in northern California, Nevada, and Oregon as part of the North American Aerospace Defense Command's burgeoning early-warning net against bomber attacks. Hill, with his contacts in Sacramento, heard about the project, submitted a proposal, and won the contract. It was the company's largest job to date, spanning two years and involving the construction of eight 100-foot-high towers, as well as access roads to them.

As the rural California market began to open up, Hill's firm had a distinct advantage: he was a native from Redding, a homegrown product. He worked this angle to the maximum when water jobs and surveying assignments came up. It is generally thought that his roots helped him convince the Redding city manager in 1956 to hire him for a major sewer system expansion and upgrade. It was probably the deciding factor the following year, when he was awarded a huge housing project at Beale Air Force Base that would set the stage for the merger a decade later with CH2M.

As the 1950s drew to a close, Clair A. Hill and Associates was a robust consulting engineering company, with a staff in excess of sixty and a growing emphasis on larger engineering projects, although survey and mapping remained a strong element. With hundreds of varied accomplishments under its belt, the firm was leaving an indelible imprint across the top half of the California and beyond.

By the dawn of the 1960s, the firm was well established in the nation's engineering ranks, with a reputation for integrity and quality. The same basic truths of hard work, honesty, and competence—that had launched Hill's company two decades earlier and were carrying it to success—were shared by Hill's colleagues across the border at CH2M. Little did they both know that the most rewarding years, when they would be combined as one company, lay ahead.

"While other firms had a flat, chain-of-command structure, we had great flexibility and freedom."

— Harlan Moyer

A Dam Fine Legacy

Clair Hill left his mark on much of what he created. He built his company from a one-man shop in 1938 to an organization that bears his name more than six decades later and has tens of thousands of employees. He was a principal author of the California Water Plan and served on the California Water Commission for more than thirty years, helping to meet the goals he had originally outlined. Hill left a legacy that continues to benefit the community in which he lived and worked—a project that not only met water rights needs, but also preserved a wilderness and a way of life that Hill valued.

In the early 1920s, California's Central Valley Project (CVP) was part of a comprehensive program to increase the supply of irrigation water in the Sacramento and San Joaquin valleys. CVP required diverting the Trinity River flows into the Sacramento River north of Redding. Hill's first involvement in the project was as a concerned resident looking out for his community. He enlisted the support of the Redding Chamber of Commerce, the Redding City Council, and the Shasta County Board of Supervisors to urge that the project be designed to provide long-term economic benefits to the local community. Among other accomplishments, he developed the concept of a reservoir and powerhouse at Whiskeytown that would more than double the power capacity of the diversion. On his own time, Hill prepared a report "selling" this concept. He successfully lobbied the federal Bureau of Reclamation and the U.S. Congress, and the Whiskeytown Dam, Reservoir,

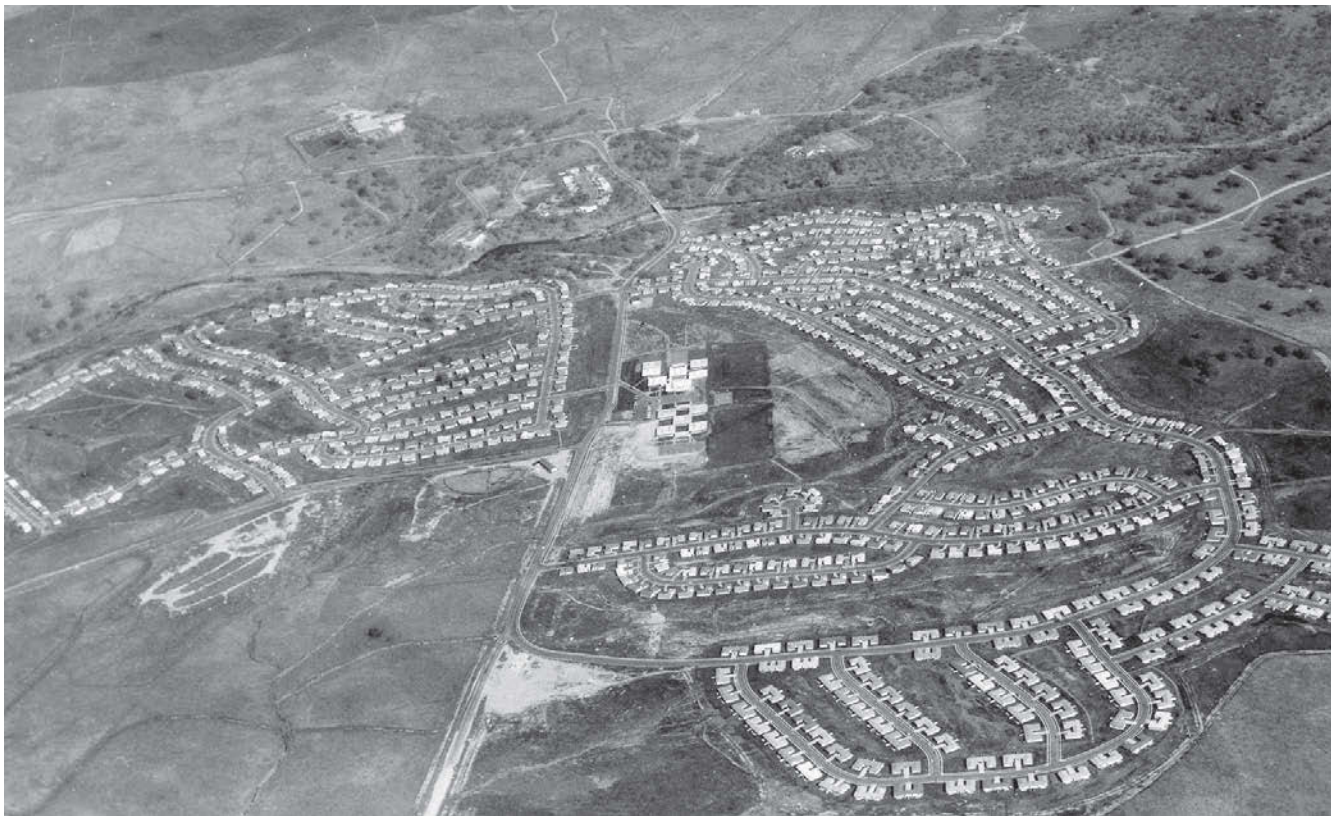
and Powerhouse were included as part of the CVP. By any measure, even Hill's, the project was a success. Hill recalled later:

"I was really proud when the Bureau accepted my concept of a dam at Whiskeytown to store 250,000 acre-feet of water and control the floods on Clear Creek. I worked hard on that. I felt pretty good about that. It was a real accomplishment for the area."

When President John F. Kennedy visited Whiskeytown Dam in September 1963 to dedicate it, he noted in his speech, "It may not come before you immediately, but it will make it possible for your children to live better.… Every time we build these great projects, we develop the water resources, we set recreational areas, we can be sure they are going to be used."

In November 1965, Congress designated the Shasta, Trinity, and Whiskeytown lakes as a National Recreation Area. This designation provided for public recreational use and for conservation of the scenic, scientific, and historic values of the area.

Honoring Hill's visionary contributions to this project, the Congress and President Ronald Reagan renamed the dam the "Clair A. Hill Whiskeytown Dam" on June 9, 1989—a rare honor for a living person. This dam combines the best of what Hill stood for: conservation and protection of natural resources, fine engineering and problem solving, and an end result benefiting the community far into the future.



1957 Beale Air Force Base

CHAPTER 3

Getting Together

As CH2M and Clair A. Hill and Associates grew and prospered, forces seemed to draw them closer together. History is replete with tales of entrepreneurs who have thrived and prospered on their own. But the giants of industry and commerce have often been the products of mergers and acquisitions.

Heading into the 1960s, both CH2M and Clair A. Hill and Associates were thriving businesses. Hill's firm was handling projects—both big and small—across the range of public and private sectors. The company's water resources activities in flood control, irrigation, and municipal treatment plants were coming of age, thanks to a key hire in 1958. Joe Patten, an acquaintance of Hill's, came to the firm from Shasta County, where Hill had helped place him as its first water resources manager. The veteran engineer brought with him a wealth of contacts that proved instrumental in securing future contracts.

CH2M's record was equally illustrious. The partners, now numbering nearly a dozen, had overseen several important projects in the Willamette Valley and across the Northwest. They ranged from power company substations and airfields to major sewage and water treatment plants. Along the way, CH2M perfected innovative new techniques and developed several patented technologies. Among these were FLOmatcher, a variable speed sewage pump, and MicroFLOC, a water-filtration process (see Chapter 6) that would become a showpiece of the high-visibility Lake Tahoe sewage treatment plan project (see Chapter 4).

From the beginning, employee morale at both companies was high. Employees were treated with respect, and professional growth was supported and encouraged. The core values of integrity, dedication, and competence attracted the best and brightest engineers and other professionals to each company. And virtually from their inception, both firms saw the value in sharing the wealth with their workers—early decisions that made the companies leaders in American business because, at the time, few companies offered any sort of formal profit-sharing plans. These common approaches to business, rooted in the core values of each organization, would later facilitate their integration.

Profit sharing at CH2M came about as monies were distributed on a regular basis to all employees, with an additional bonus to the partners. At Clair A. Hill and Associates, the process began more informally in the early 1950s with Christmas bonuses, when Hill could afford them. Later, as the firm grew, a few key staff members were given yearly bonuses. But beyond the payouts, both firms' penchant for recognizing and rewarding their employees' accomplishments helped create positive and fulfilling work environments.

"I think it boiled down to we either had to merge or become head-to-head competitors."

— Clair A. Hill

Joe Patten

Both organizations also demonstrated a commonality of purpose when it came to supporting their respective staffs. For example, Hill mentored and encouraged his employees, particularly the young engineers, to think independently. He rewarded innovation and provided counsel. Hill and his wife, Joan, were also quick to minister to families in difficulty. Harlan Moyer recalled being given extensive time off at his first Christmas to care for his flu-ridden wife and four children. Upon learning that the Moyers had no food but beans for their holiday dinner, Joan provided a feast.

These factors assuredly contributed to the steady growth of both firms. The fact that business was good and getting better, however, posed a potential problem for both companies: How much further could the engineers grow their companies and take on fresh talent without additional infusions of money? Both firms had occasionally experienced the strain of meeting payroll and office expenses. Capital needs continued to mount. Furthermore, competition in the engineering field was growing, and both firms began to encounter some formidable rivals.

As CH2M and Hill staked out more turf in what was becoming a communal backyard, the firms could foresee more competition between themselves. As Hill later observed:

> *I think it boiled down to we either had to merge or become head-to-head competitors because sooner or later they [CH2M] had to move into California, and I really didn't feel like head-to-head competition with them.*

It was a chance meeting of two acquaintances in 1954 that would lead to the first of much collaboration between the two firms. Hill's team was working on a residential subdivision project just over the California border in Brookings, Oregon. Ed Word, one of Hill's early employees, was the surveyor for the job. In the midst of mapping the prospective layout, he bumped into Archie Rice, who was down from Corvallis working on a sewerage job. The two knew each other from the war years when both had worked at Camp White, an army base near Medford, Oregon. They chatted and reminisced before parting ways.

The following year, when Hill won the job of designing an expansion to Redding's sewerage system, Word recalled his encounter with Rice. Hill needed another firm experienced in sewage treatment to help on the Redding project, but he was wary of bringing in a Bay Area or Sacramento company that might make competitive inroads. Word mentioned CH2M to Hill, who recalled that he had briefly met Fred Merryfield back in the 1930s when he was a forestry student at Oregon State. Hill liked the idea of an

Oregon associate and proceeded to propose a linkup with the professor. CH2M agreed to team with Hill on the project.

Ralph Roderick was dispatched to Redding, where he met with Harlan Moyer and Jack Jensen. Roderick, experienced in sewage treatment, briefed the pair, and together the trio tackled the job. The old treatment plant had never worked well, but the new facility that resulted from the partnership exceeded the expectations of the city's staff by operating well beyond the required levels. Roderick knew how to save the city money as well. The original plans called for a conventional pump station along the Sacramento River that would be quite costly. Instead, he proposed a smaller facility making use of the FLOmatcher, a newly patented CH2M device that adjusted pumping capacity to the rate of flow. Smaller and less expensive to install and operate, the system met the approval of Redding officials. This first successful hands-across-the-border liaison left the people at Hill and Associates and CH2M with satisfied clients and a growing admiration for each other's work.

Ed Word

Next, the city of Redding handed Hill another assignment: to look into the feasibility of using waters diverted by the U.S. Bureau of Reclamation from the Trinity River, some 40 miles away, as a domestic supply. The study required water treatment expertise, which Hill's company did not offer, and so another call went out to CH2M. This time, CH2M sent Rice, who, working with Jack Jensen, produced a study that again impressed the municipality. The project, although deemed feasible, was not built for reasons unrelated to the study. Nonetheless, the CH2M–Hill alliance once more paid off in quality work and good feelings all around.

By the late 1950s, as both companies grew and diversified, they continued to solidify their mutual relationship. If there had been any initial doubts about how two firms with somewhat contrasting management styles would meld, those had been laid to rest as they worked side by side. Each firm demonstrated a common approach to serving their clients—an approach characterized by honesty, hard work, and meeting or exceeding their clients' objectives.

It would take a large project, however, to truly test the compatibility of the two firms. That test came in 1957 at Beale Air Force Base near Marysville, California.

A one-time infantry training center for the army, Beale is located in rolling hills between Redding and Sacramento. The military post was being converted into a Strategic Air Command base with a runway nearly three miles long to accommodate the long-haul B-52 bombers. The air force needed family housing for the base—some 1,200 units. The job of designing and overseeing construction of what, in effect, would be an entire community was a far bigger job than Hill had ever undertaken. It promised sizable returns in addition to considerable logistical hurdles.

Jack Jensen

The Principles of Winning Work

How Hill nailed the contract is part happenstance and part old-fashioned initiative. His staff was winding up the Gap Filler Radar Station construction. Moyer, the project manager, had developed a good working relationship with Roan Aiklen, the Corps of Engineers' program manager. In May 1957, Moyer was in Sacramento, turning in the last bit of paperwork, and he asked Aiklen if there was more work available. "Nothing immediate," Aiklen replied, but he had heard that the air force was going to select an architect-engineer for the first 570 housing units at Beale.

Aiklen offered to call the base commander, whom he had recently met, and arrange a meeting. "Great," said Moyer, and they got Colonel Floyd Creasman on the phone. After some pleasantries, the colonel asked when Moyer could stop by and discuss the project. "This afternoon," he replied, although the base was more than one hundred miles away. Moyer promptly gathered up his boss, Hill, who was at the capital on other business. The two boarded the company Cessna and were at the colonel's office within an hour.

For years afterwards, it astounded Hill's team that they had won the contract, competing as they did against larger, more seasoned firms. "Something we did was right," said Moyer, noting that the proposal they put together was their first for a project of such magnitude. They turned to their proven colleagues at CH2M to partner on the mechanical and electrical work and asked a Redding architect, Smart and Claybaugh, to step in as well. There was plenty left for Hill and his engineers to do when work began a few months later.

Creasman, a World War II bomber pilot and career officer, was something of an eccentric. He wanted nothing but the best housing for his officers and enlisted men, and that meant a woodsy site in the Sierra foothills that was twelve miles east of the runways and operations areas.

The subdivision-like community—with freestanding homes, roadways, and community buildings—was to be set in the natural terrain to take advantage of the contours, the native oaks, and creeks in order to produce a high-quality residential environment.

"Small opportunities are often the beginning of great enterprises."

— Demosthenes

With full air-conditioning and the latest in appliances, these residences promised to be a comfortable contrast to the truncated barracks that typified military housing.

Somehow, Creasman managed to get his plans approved by air force brass in Washington, yet they stipulated that the project had to be completed within the military cost ceiling of $10,800 per unit. Because that limit was established for far cheaper construction, Beale presented Hill's group with a real challenge. In addition to developing a new town in a remote area populated largely by deer and coyotes, they had to build access roads and bring in all the required utility services—water, sewers, and electricity—from the distant base infrastructure.

Designing the structures to blend in with the countryside and routing the utilities proved difficult enough. There also was considerable sparring with the contractor, who came in under the ceiling but then barraged the engineers with requests for changes and substitutions. The substitution shuffle involving a Texas-based subcontractor is noteworthy.

The Texas company was tasked with providing the heating and air conditioning, which, as designed, used the CH2M system of underfloor and ceiling air ducts and electric heat pumps not normally found in tract-type construction. This company, evidently shocked when it realized the full costs, proposed a series of design changes to the air force and implied that they would improve performance at no added expense. The company offered no details but offered to pay the expenses for the design engineers to fly to Tyler, Texas, and review the request. Moyer made the trip with Wayne Phillips of CH2M.

To their surprise, the pair were met at the airport by a limousine, taken to a luxury hotel and wined and dined. That treatment raised immediate warning signals for the two small-town engineers. The next day, the subcontractor staged a meeting with a dozen engineers and managers, and a vice president. The Texas company proposed major changes to the heating system that would greatly lower cost,

"The people who are living in them, without exception, say they are the finest quarters they have ever occupied in their military service."

— Colonel Floyd Creasman

but would adversely impact the comfort and design of the system. No mention was made of a credit to the military for the cheaper setup, but it was implied that there would be some sort of payback for the engineers and their companies if they supported the plan.

Moyer and Phillips politely pointed out the deficiencies in the new proposal. The atmosphere immediately chilled, and most of the Texas company staff left the room. The vice president suggested that he had influence with the air force and could probably get the changes made without the two engineers' approval and have them taken off the job as well. Moyer and Phillips resisted, bid goodbye, and left for the airport in a taxi.

Back at the base, they reported the incident and recommended no changes in original plans. Apparently the Texas firm's clout amounted to nothing. Not only did Moyer and Phillips stay on the job, but the air force subsequently awarded Hill a contract for an additional 400 units, and after that another 220 units. The project, in total some $20 million, was a considerable boost for both Hill and CH2M. All told, Hill's firm kept a presence at Beale for the next thirteen years, until 1968, working primarily on housing but doing other projects as well.

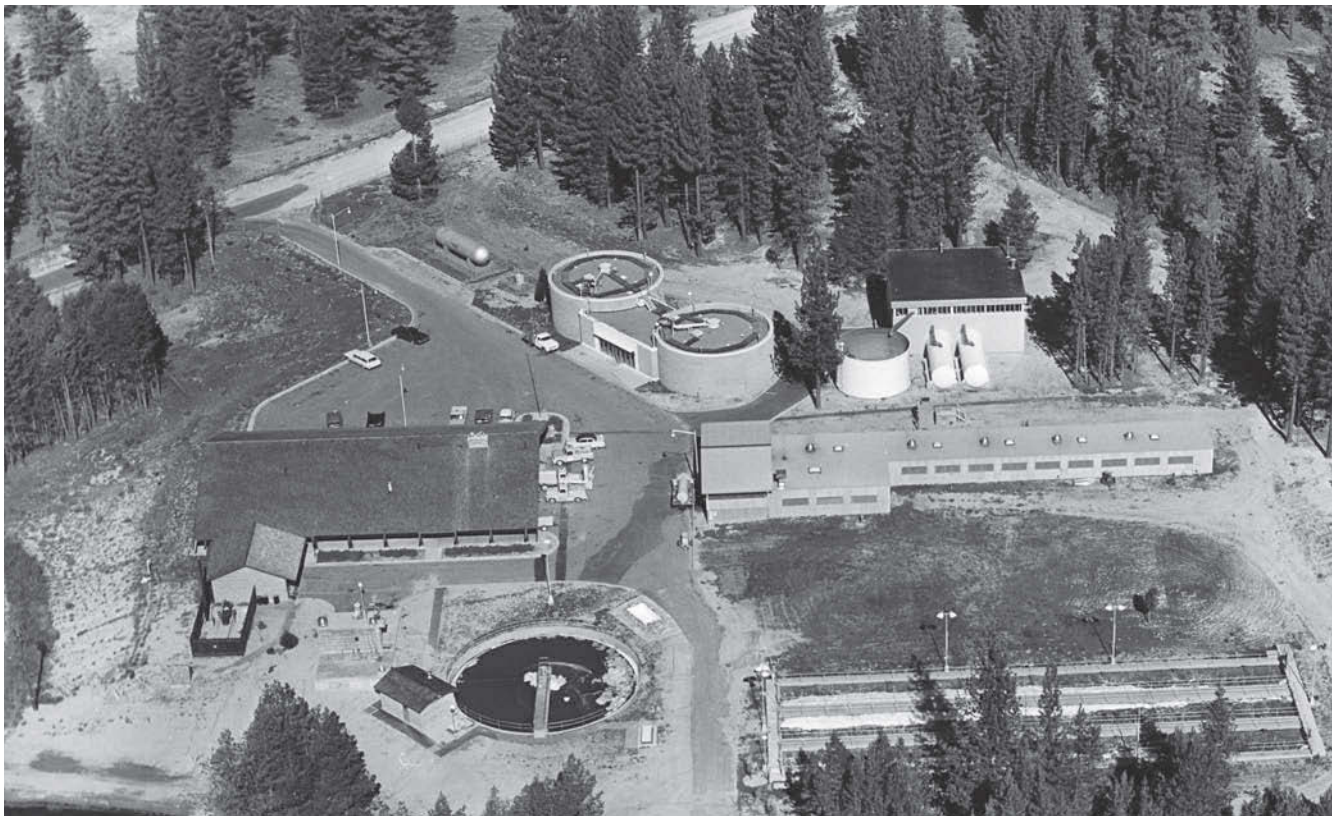
On completion, Creasman lauded the firm for the caliber of its work. In a letter to Hill, he wrote:

> *[T]he many problems presented in the design and supervision ... taxed you and your associates to the utmost. Yet [they] were solved with alacrity and with an outstanding, cooperative spirit.*

Many complimentary remarks have been received from highly placed individuals within the Air Force and the construction industry testifying to the outstanding quality of design and construction. More to the point, the people who are living in them, without exception, say they are the finest quarters they have ever occupied in their military service.

The hard work bore out the guiding maxims of the two companies: perform quality work, satisfy the client, and good things will happen. It also demonstrated another shared value: performing ethically was more important—always—than making a quick buck.

The project provided the opportunity for CH2M and Hill staffers to work closely together for extended periods, learn more about each other, and further cement their budding relationship. Beale marked the first major collaboration between the two firms. Prior to their 1971 merger, other projects would follow, foremost among them Lake Tahoe, which blazed new trails in water pollution cleanup. Ultimately, though, their continued work together allowed each firm to realize a mutual respect and admiration for the way the other conducted business—clearing the way for their eventual merger.



South Lake Tahoe: Design and construction of world's first full-scale, advanced wastewater treatment facility

CHAPTER 4

South Tahoe Public Utility Project

Nestled in the Sierra Nevada and Carson mountains, Lake Tahoe is one of the clearest and deepest lakes in the world. At 1,645 feet deep, twenty-two miles long, and twelve miles wide, the alpine lake claims seventy-five miles of spectacular shoreline. A haven for tourists, skiers, casino gamblers, and outdoor enthusiasts, the lake, with its environs, is both an icon of the nation's scenic treasures and an economic driver for the local community.

In 1956, the Tahoe basin, which rests on the California and Nevada border, had fewer than three thousand residents. Then came the 1960 Winter Olympics at Squaw Valley. Before the decade ended, the year-round population had mushroomed more than 500 percent to fifteen thousand, and the visiting population seasonally brought the total to some seventy-five thousand.

The history of the area's rapid growth is reflected in the development, expansion, and struggles of the South Tahoe Public Utility District, the area's largest provider of wastewater treatment. In the early 1950s, the district's area of responsibility covered a mere 140 acres. The district used two redwood septic tanks and disposed of the effluent by spraying it on open land. But as increasing numbers of people were attracted to the area, the district's responsibilities rapidly expanded, and it was forced to scramble to meet the needs of the community. In 1960, the district built a 2.5-million-gallon-per-day activated-sludge treatment plant. Because of state regulations that barred the discharge of conventionally treated effluent into Lake Tahoe or area streams, the district had no choice but to continue its problematic practice of disposing of the effluent on land.

At issue was the phosphorus- and nitrogen-rich effluent that would feed the lake's algae which, in turn, would cloud Tahoe's historically pristine waters. As the volume of wastewater being treated increased, so did trouble for the district. Time and again, an overabundance of effluent flowed off already-saturated, often frozen and snow-covered land, only to wash into the lake. It was an ongoing environmental nightmare that haunted the district's beleaguered board of directors, who were under pressure from government entities that included two states, various federal agencies, and five counties—with a total of more than sixty-five government agencies—as well as the Tahoe community.

In 1961, Earl Pankost, the utility's director, called on Clair A. Hill and Associates for help. The company had recently designed a sewer-collection system for South Lake Tahoe, and Pankost and the board looked to Hill's company to come up with options for a permanent, environmentally safe wastewater solution. With Harlan Moyer leading the effort, two options beyond the status quo were brought to the utility district board: (1) develop an advanced

"The only way we could make this water any better," Rice told a newspaper reporter while demonstrating the technology, "would be to add bourbon to it."

— Archie Rice

method of wastewater treatment that might allow effluent to be disposed of in the lake basin, or (2) find feasible routes for removing effluent (that would be treated to near-drinking-water quality) from the lake basin and negotiate an agreement that would allow disposal of the effluent into a watershed outside the basin.

Both options called for a complex system that would take raw sewage in and produce odorless, clear, near drinking-quality water—a process that had not yet been developed anywhere in the world. Both plans would also require time for planning, community hearings, regulatory approval, financing, and construction. Meanwhile, an interim plan was needed to expand land disposal efforts until a permanent solution could be developed and facilities built.

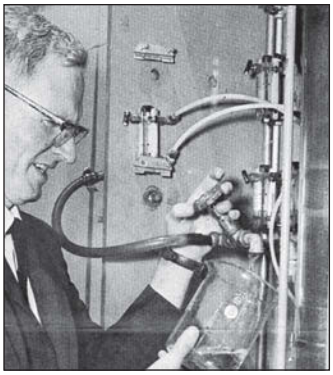
The district's board of directors turned to Hill to help determine the better alternative. Hill's engineers believed they had the wherewithal to perform the design and the construction management for either option the board approved, but they called upon their colleagues at CH2M for guidance in sanitation technology. In a phone conversation with Ralph Roderick, Moyer recalled him saying, "Heck, I think we can develop a third-stage treatment system to remove solids, phosphorous, and nitrogen, and then we can discharge the effluent anywhere, including into Lake Tahoe."

CH2M had already developed a water filtration system that Roderick believed could, if combined with other industry technology, be the end-all cure for the South Lake Tahoe problem. MicroFLOC, as it is known today, is a rapid multimedia filtration system that was born out of the federal government's work at the Hanford nuclear site in Washington, home to the world's first full-scale nuclear reactor (see Chapter 6). CH2M's Walt Conley and Ray Pitman had developed Pitcon, MicroFLOC's predecessor. Pitcon was a filtering process using sand and coal to treat water from the Columbia River, drawn on to cool the reactors used to manufacture plutonium for the nation's nuclear arsenal.

Archie Rice had recently hired Conley to conduct research and development for the firm's subsidiary, MicroFLOC Corporation. Conley and other staffers set about working to improve the two-media filtration process by adding garnet, a fine material, as the third filtration medium. With the higher degree of filtration, the process could be used for municipal water treatment. This sophisticated work was being carried out in a rented garage belonging to a local Corvallis radio station.

In that garage, Conley and his team developed a portable plant called the Water Boy. It was capable of drawing in what the local newspaper,

The Oregonian, described as "grossly contaminated water" and producing potable water. Water Boy, which can treat as much as 150,000 gallons a day, continues to be used worldwide. "The only way we could make this water any better," Rice told a newspaper reporter while demonstrating the technology, "would be to add bourbon to it."



Walt Conley draws a sample of product from MicroFloc

The tertiary, or three-part, treatment process caught Roderick's eye and the attention of others at CH2M who were working in the sanitary engineering discipline. The development of the multimedia coarse-to-fine filtration technology was a breakthrough in filtering water, and it made filtering of wastewater feasible. CH2M's Russell Culp helped lead the effort to further enhance the technology for use in sanitation treatment by adding a filter backwash system. The backwash system would be an integral component to the success of the technology, if it were to be converted for treatment of wastewater.

Moyer, reflecting on the meeting when he and Roderick discussed the new method with the South Lake Tahoe District's board, said:

> *Ralph, in his down-home manner, described the work done at the Hanford nuclear reservation and how his colleagues had developed a successful filtering system and how phosphorus could be removed by a lime treatment process. He also discussed how activated carbon could be used to remove color and dissolved organics from the effluent. The board became more enthusiastic the longer Roderick spoke.*

After hours of discussion, board members asked the two engineers what it would take to implement an advanced wastewater treatment system. Their response was that funding would be needed for a small pilot plant, bringing together conventional treatment, the MicroFLOC processes, alum treatment (eventually replaced with lime), carbon columns, and carbon regeneration equipment.

Board members questioned what this pilot plant would cost, and after a brief one-on-one discussion, the engineers calculated that it would require roughly $30,000 to launch. Roderick and Moyer were confident enough in the technology and the pilot's eventual success that they offered $15,000 as seed money. Before the meeting wrapped up, the board—still reeling from public and regulatory scrutiny and criticism, as well as from election recall efforts—gave the engineers a green light to proceed. Although the pilot plant would fit on a small trailer and treat just a few gallons a minute, the board's decision was an unprecedented and bold move; nowhere else was sewage effluent being transformed into water almost good enough to drink.

Sid Lasswell, then head of CH2M's water and wastewater division, said that from the beginning the project was a high risk/high reward proposition:

> *We designed that plant in the Corvallis office, Gene Suhr and Russell Culp and several others. There was a certain amount of risk involved in that. [But] it was such an opportunity and the money was so good for those days; we thought we were smart enough to wrap enough technical people around it and be sure that there wasn't a major pitfall there somewhere to pull the thing off. We were, and we did.*

Once the pilot was under way, additional funding to support the project came from grants provided by the U.S. Public Health Service. The pilot was successfully completed in 1963, and it led to the design and construction of the world's first full-scale, advanced wastewater treatment facility, capable of processing 2.5 million gallons a day. Culp and Suhr led the unique design of the plant, which was an unqualified success. Lasswell recalled:

> *Gene is one of our heroes. He and John Filbert were the backbone of our water and wastewater industry for 40 years. We sold them like drunken prizefighters. Two or three hundred percent of them everywhere. And they'd go almost anywhere, and did almost anything, and were highly technically proficient. They made a lot of sacrifices.*

Upon completion, however, the facility was immediately overloaded by the skyrocketing growth of the Tahoe area. Again, the South Lake Tahoe District called on the collaborative efforts of Hill and Associates and CH2M for help in expanding the facility. By the mid-1960s, it had been expanded threefold, with funding provided by the district, the state of California, and the federal government.

Refinements to the treatment process, such as using lime rather than the more expensive alum as a coagulant for removing solids and precipitating phosphorus, were introduced throughout the facility's expansion. A key benefit of using lime was that it could be processed onsite and reused, which also resulted in reduced solids disposal costs. Another key synergy was that lime treatment elevated the pH of the water, allowing ammonia nitrogen to be removed economically. An ammonia stripping tower was added in 1968 capable of removing up to 95 percent of ammonia from the water.

Meanwhile, despite the near drinking-water quality of the effluent, stringent regulations still would not allow the facility's output to flow into Lake Tahoe. The district continued its land disposal of effluent, leasing additional land, year after year. State and federal agencies urged the district to export the effluent outside the Tahoe basin. After considering three export options, the district's

final choice was to build a twenty-seven-mile pipeline on the California side over Luther Pass to Diamond Valley. This plan required a pumping station to move the water more than 1,440 feet up over the pass before emptying it into Indian Creek Reservoir, constructed to receive the effluent. The dam and reservoir were a key and final component of the project. The effluent was declared pure enough for the reservoir to be used for recreational activities and as an ongoing irrigation source for local farms.

From 1961 through 1968, more than $28 million was spent on the South Tahoe Public Utility project. Some funding for these projects came from the U.S. Environmental Protection Agency, including money for two notable demonstration grants. This funding in part allowed CH2M and Clair A. Hill and Associates to support the startup and operation of the facilities. It also allowed employees from the two companies to collect and publish data demonstrating how well the technologies worked and to conduct tours and make presentations to hundreds of visitors.

Culp went on to become the district's general manager in 1968. Moyer was the project manager from 1960 through 1972 and served as the district's consulting general manager for two separate stints, in 1961 and from 1966 to 1968.

At the completion of various stages of the near decade-long project that applied never-before-used technology, local and state politicians and other interested parties—learning of this—flocked to the tertiary sewage treatment facility. Said Lasswell:

> *It was in the later years of the project when all the publicity started: the governor drinking the water—or supposedly drinking the water. We didn't have a lot of awareness of what the press could do for you. We were just working to make a living.*

The Tahoe project attracted political notables such as Oregon Governor Tom McCall, as well as California Congressman Harold T. "Bizz" Johnson, who was instrumental in bringing federal funding and the attention of the nation's lawmakers to the project. California Governor Ronald Reagan narrated an educational film on the Lake Tahoe treatment facility, saying:

> *I consider this to be an outstanding example of how to provide for both today's use and enjoyment of the lake and to ensure that it remains an unimpaired natural resource to be enjoyed by our children and their children's children. The technology now being employed at Lake Tahoe could well become an important weapon in the fight to clean up America's waters.*

"The Tahoe plant has clearly demonstrated that there is no need for wastewater, or the by-products of its treatment, to pollute the environment."

— William D. Ruckelshaus

William D. Ruckelshaus, the first administrator for the U.S. EPA, commented:

> *Our best example of advanced wastewater treatment is that practiced at Lake Tahoe… The Tahoe plant has clearly demonstrated that there is no need for wastewater, or the by-products of its treatment, to pollute the environment.*

The treatment facility became a destination point for academics, wastewater engineers, officials from regulatory agencies worldwide, and even the general public. It was featured in a variety of publications, including *The New York Times, The Denver Post, Reader's Digest,* the *Los Angeles Times,* and the "bible" of the industry—the *Engineering News-Record*.

On April 11, 1972, Richard Nixon issued a presidential citation to Ralph Roderick, Harlan Moyer, and Gene Suhr for their work on the Tahoe project. "Congratulations are properly yours for this splendid contribution to our nation's efforts on behalf of our national heritage," Nixon stated. The citations were hand-carried to the Corvallis office by U.S. Senator Mark Hatfield. The presidential citations were routinely used in proposals and helped in winning increasingly complex projects.

As word spread about tertiary treatment and attracted the attention of wastewater districts nationwide, a wellspring of client interest developed for the two engineering firms. In a December 1969 letter he wrote to Moyer concerning the city and county of Denver's short list of engineering consultants to build a pilot wastewater reclamation facility, Ralph Roderick stated, "We are able to run with the big boys. Now we have to move on and lead them."

And lead they did. The Lake Tahoe treatment plant—with the $15,000 investment from Clair A. Hill and Associates and CH2M—had a tremendous, positive impact on the health of the planet and the lives of people worldwide as tertiary treatment became widely used. Moreover, it brought together two fairly small engineering firms with shared values and common interests in exceeding client expectations.

"There isn't any question about the success of Tahoe," Lasswell said. "It got us into the national arena, got our name out there into the marketplace, and allowed us to rapidly expand into the East Coast."

"We are able to run with the big boys. Now we have to move on and lead them."

— Ralph Roderick

The merged CH2M HILL would go on to tackle such projects as the massive Upper Occoquan Sewerage Authority* (UOSA) program in northern Virginia; the design of a planned facility in Montgomery County, Maryland; the Tahoe-Truckee Advanced Waste Treatment Plant; and the Denver Water Board Successive Reuse project.

To put it into perspective, Rice said, "All of a sudden, we didn't have to come up with an explanation as to where Corvallis was."

Conservationist and Sierra Club founder John Muir in 1873 called Lake Tahoe the "queen of lakes." In a letter to a friend, he wrote, "The soul of Indian summer is brooding this blue water, and it enters one's being as nothing else does. Tahoe is surely not one but many. As I curve around its heads and bays and look far out on its level sky fairly tinted and fading in pensive air, I am reminded of all the mountain lakes I ever knew, as if this were a kind of water heaven to which they all had come."

"The technology now being employed at Lake Tahoe could well become an important weapon in the fight to clean up America's waters."

— California Governor
Ronald Reagan

** Now known as the Upper Occoquan Service Authority.*

A presidential citation delivered to the Corvallis office by Oregon U.S. Senator Mark Hatfield (center) was presented to Ralph Roderick (front, left), Gene Suhr (right), and Harlan Moyer for the work at the South Lake Tahoe project. In the background at right is Suhr's father, Len Suhr. At the time of the presentation, Moyer was on the East Coast working on the Upper Occoquan project.

A Referral for the South Lake Tahoe Project

In the spring of 1960, when a woman with fire in her eyes entered the office of Clair A. Hill and Associates, little did anyone know that the visit would result in the firm taking on its most important, influential project. It seems she had learned that her estranged husband had married again without first seeking a divorce.

The culprit, who was associated with the upstanding folks at Clair A. Hill and Associates, crept out the back door and left California posthaste. He took up residence in Nevada and became a superintendent for a construction contractor that was building a sewer system for none other than the South Lake Tahoe Public Utility District.

As happenstance would have it, the district's board chairman was at odds with the district's resident engineer, who had supported a recall effort to remove the chairman from office. Lo and behold, the wayward husband—remembering the fine folks at Clair A. Hill and Associates—recommended the firm. The chairman met with Hill, who readily accepted the task to design the next phase of a sewer system and serve as the district's engineer.

Clair A. Hill and Associates worked continuously for the district for more than a decade and, along with CH2M, helped keep Lake Tahoe a crystal clear alpine lake and a national treasure.

1950 office building, Corvallis, Oregon

CHAPTER 5

Sharing the Rewards—Part One

History did not record the moment. There may not have been a formal meeting. Even if there had been a meeting, the partners could not have recognized the significance of what they were doing.

Somewhere in the early days of the firm, however, Holly Cornell, Jim Howland, Burke Hayes, and Fred Merryfield had to decide how they were going to "divide the spoils" of their new venture. Given their backgrounds, their early spirit of entrepreneurship, and the bonds of friendship from Oregon State, there was probably never even much of a question. What was earned was to be shared among those who had worked hard for it—pretty simple in concept, but profound in its consequences for decades to come.

One of the earliest financial records of the firm, dated March 1948, reflected the profits for the prior year's work: $2,839.02. The record also reflects how the sum was to be divided: 13 percent was to be paid to five employees (Ralph Roderick, Archie Rice, Charles Bayles, and two others). The balance—87 percent, or the approximate sum of $2,370—was to be distributed to the partners' capital accounts.

Reflecting back over the history of CH2M, it is difficult to imagine dealing with such small sums or, more significantly, the financial struggles of the partners in their early years. Cornell recalled the firm's impoverished beginnings:

> *We were in a tight cash flow position. We didn't have enough operating capital. The only way we could meet the payroll was by getting paid for the work we were doing, and there was a period of time when the partners didn't pay themselves. I can remember once, it was my turn to be the business manager, and we didn't have enough money to pay the quarterly payment to the IRS for the withholding. For a couple of weeks there I didn't sleep very well because I was afraid every morning that I might come and find the door padlocked by the Internal Revenue Service. Fortunately, someone paid us, and we paid it up and never got caught.*

In those tough financial times, perhaps as a result of their survival experiences from World War II, the partners took the attitude that "we're all in this together." In hindsight, Howland gave it a name—the firm's "management philosophy." He said:

> *The management philosophy kind of evolved. I don't really like conflict very much; in fact, I don't like conflict at all. And so I guess in order to prevent conflict, you needed to plan things out ahead and get people knowing what's going to happen and also make people have an interest, an interest like in the ownership; then you really don't have to manage*

"Let's everybody be generous. It is especially important that those at or near the top of the heap be willing to spread the returns in dollars and recognition. The gymnast on top is dependent on all those solid people who support him."

— Jim Howland's
"Little Yellow Book"

> *them much. Everybody will get in and work hard. So we very early took Ralph Roderick and Archie Rice in as partners for 10 percent each and the rest of us had 20 percent instead of 25 percent like we had to start with. Then we felt like it was only fair since they were making such a contribution that we be equal partners so we each had 16 2/3 percent.*

Rice saw this management philosophy as an evolution as well, but also as a response to and a differentiator from other engineering firms. He later compared CH2M to two other firms prominent in Oregon at the time, John Cunningham & Associates and Stevens & Thompson, referring to them as "extreme egotists, real prima donnas" who managed "with something of an iron hand." In his colloquial fashion, Rice saw class distinctions between those "who made the decisions and cracked the whips" and the ones who did the hard work—"the peons that worked out on the drafting boards." The owners at these other firms refused to share with those who contributed, behavior Rice found both offensive and inconsistent with how CH2M operated. He said:

> *They owned the firm, and they weren't about to be piddling that out to somebody else. That wasn't the way [for us] to go, because here we were—a group of young fellows who would not have been comfortable working under that type of arrangement. [We] recognized as time went on, one way or another, you were going to have to transfer ownership of this thing, and that if you are going to attract the type of people… that we were, that somehow or another you had to share with them some of the same opportunities that you had. And, therefore, if you wanted to hire the Holly Cornell types of individuals you had to create an atmosphere that made it attractive for them to come work for us.*

In today's parlance, the heart of the matter was recruitment and retention of the best talent CH2M could find. The four original partners expanded to six in 1948, adding Roderick and Rice. Earl Reynolds—who opened up the first out-of-state office in Boise, Idaho, in 1950—became a partner in 1960. In 1961, Sid Lasswell, Wayne Phillips, and Bob Adams came on as partners. Two more partners, Fred Harem and Bill Watters, were added in 1964.

The early years may have been a struggle for the young company, but the founders never lost faith or their sense of balance. Earl Reynolds recalled that Holly Cornell had the ability "to sit down and see both sides of the situation, which is awfully helpful when you're trying to work out a solution."

And there were plenty of solutions that needed to be worked out. Cornell later related, "Maybe we just didn't know enough to realize how bad a situation we might have been in." The company had no assets to put up for

a bank loan—including the first one from the Benton County State Bank for around $6,000—and so for a good many years the four original partners had to sign the notes individually. "All our assets, our homes, our cars, everything else was on the line as far as paying the debt was concerned," said Cornell.

The loans were for operating capital. It was the only way to pay end-of-the-month salaries. The partners had plenty of work, but they often had to wait until the middle of the next month to get paid. With cash flow so tight, the number of employees growing to meet client and project demands, and the threat to their personal assets in the event of default to the bank, why then were the partners so committed to sharing what little wealth they had? Recorded years later, the unassuming responses from three of the original partners answer the question. Noted Cornell:

> *Oh, I don't know that it was that tough, you know. We were interested in what we were doing, and though we worried a lot about it, we enjoyed it. So we managed to make out; nobody starved to death.*

Jim Howland, always focused on the human side of the business, put it this way:

> *We thought [the newer partners] were tremendously valuable people and… we didn't want them to go anywhere else. I think also that it was a matter of just feeling that the right way to run a firm is that the people that contributed ought to share in the returns in money and satisfaction too.*

Rice affirmed the policy:

> *The one thing that [the original partners] had in common was this feeling that what's good for one is good for all type of thing. [T]hat you are better off with a reasonably small piece of something which is good, and something which is reasonably going and growing, than you are to want to take the whole thing.*

These men, and the employees they added to their new venture, never set out to get rich. In fact, the revenues and profits of the early years were almost laughable.

There were, however, other compensations. From these early struggles emerged the patterns and practices of a durable management philosophy: attract the best people available, reward them for their contributions, and give them the incentives to succeed. These principles formed the foundation for the employee-ownership programs that evolved in the years to come.

This evolution, beginning in the mid-1960s, included the designation of and rewards to "key employees" and, at the turn of the century, the creation of CH2M HILL's "Ownership and Incentive Compensation Program." (See Chapters 12 and 21.)

History did not record the moment. In fact, it was not a moment in time at all, not the result of a carefully planned meeting, and not built on the advice of a management consultant. CH2M's approach to sharing the rewards with those who earned them was not a decision at all. It was simply the right thing to do.

Year	Revenues	Profits
1946	$30,000	$ 0
1948	$95,000	$14,000
1950	$141,000	$ 9,000

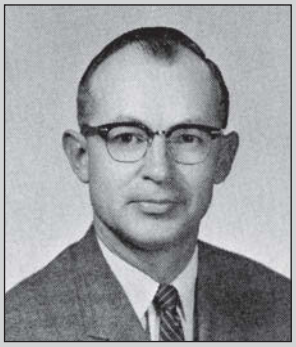
"Imagine the possibilities if everyone in your organization believed in the purpose of your business. Imagine the possibilities if everyone in your organization believed in the reward for exercising initiative in creating value for your customers and profit for your business. When all employees in your organization share these beliefs, you have created an ownership culture."

— *Act Like An Owner*,
Robert Blonchek
and Martin O'Neill

CH2M adds six more partners

Earl Reynolds, 1960

Bob Adams, 1961

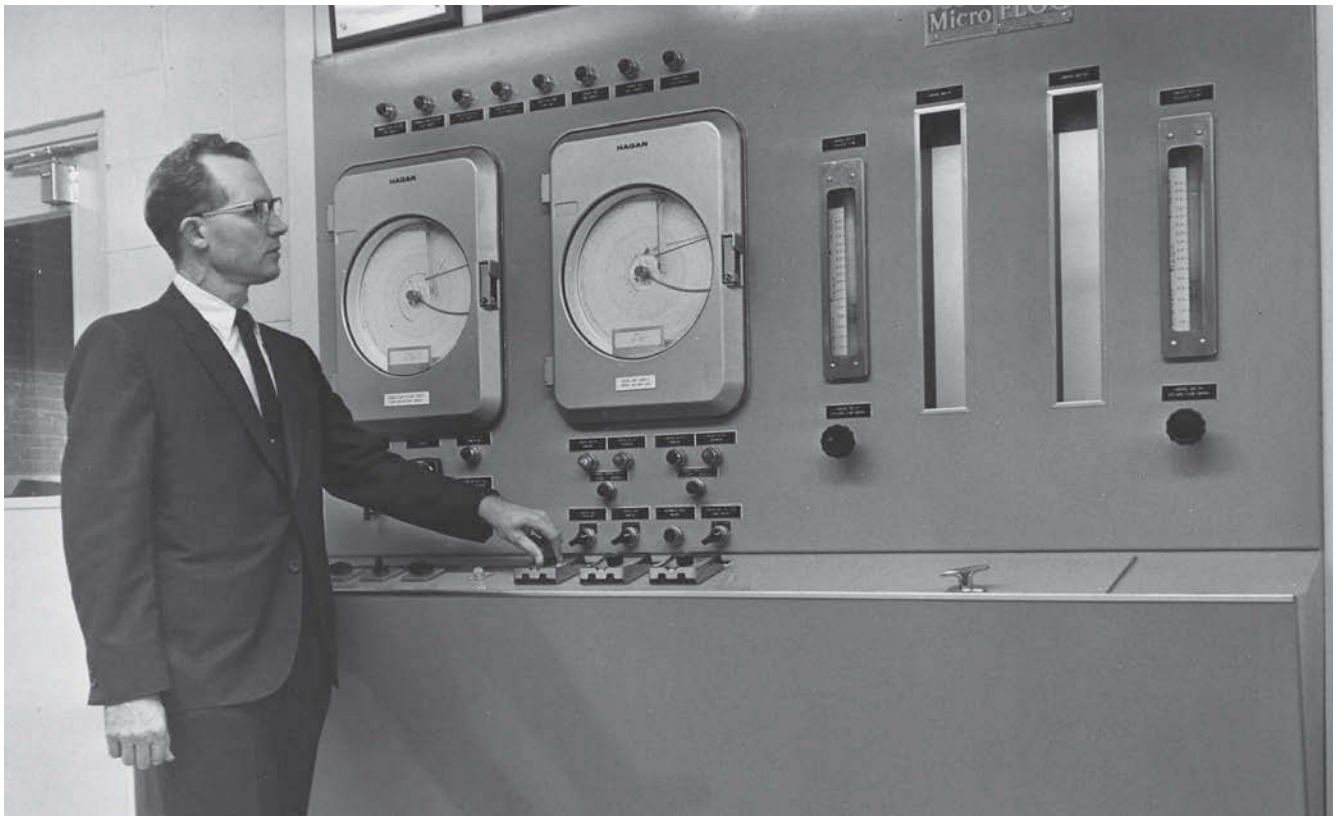


Sid Lasswell, 1961

Fred Harem, 1964

Wayne Phillips, 1961

Bill Watters, 1964



MicroFLOC

CHAPTER 6

Quest for Innovation

Following the lead of the founders from the early days, employees at CH2M focused their efforts on serving their clients the best way they knew how. Status quo was never good enough. The company's uniquely collaborative atmosphere, which supported and encouraged creative problem solving, set the firm apart from its competitors and led the partners into several ventures that reached beyond what might have been expected from a professional services firm. Yet in all matters, the intent remained constant: using innovation to solve problems.

Two of the early partners in particular—Burke Hayes and Ralph Roderick—constantly sought out new, creative engineering applications. Terrifically analytical, Hayes was always thinking, tinkering, and creating something new. He said:

> *I think some people have an interest in solving problems…. You have to be more than a tinkerer; you have to be something of an analyst besides. Tinkering helps. But… if you aren't an analyst, you can't really be a good engineer, in my opinion.*

For his part, Roderick had made a commitment to himself to include something new and better in each sewage plant he designed:

> *I had one goal that was dominant; we had to do something different. We needed to think, "Why are we doing this?" Not just because we did it [that way] last time. Every time, consider something about the plant that you last built that could have been better… and come up with a new something or other, a new process or a new means of doing something…. It was this thing that was important to us—that we become known as innovators in the field.*

As an example, Roderick was not satisfied with the conventional design of sewage pump stations as constructed in the 1950s. In those days, the typical station would pump on an "on/off" cycle. Incoming sewage flowed into a "wet well." When the stored sewage reached a certain level, the pump would turn on, pump out the sewage, and turn off. The cycle would be repeated as often as necessary. Drawbacks to this conventional design included undesirable odors that emanated from the stored sewage, as well as the settling of solid materials to the bottom of the well.

Believing that there must be a better way, Roderick brought the problem to Hayes. "How can we solve this problem? Is there a way to match the pump capacity to the varying flow rate of the incoming sewage?"

"To face tomorrow with the thought of using the methods of yesterday is to envision life at a standstill. To keep ahead, each one of us, no matter what our task, must search for new and better methods—for even that which we now do well must be done better tomorrow."

— James F. Bell

Hayes considered the problem and conceived of a system where wound-rotor, variable-speed motors would be used on the pumps. He also recommended installing a system with a water rheostat that would connect to the well and serve as the controller for the motors. As the sewage level changed, Hayes concluded, the resistance of the rheostat would change, and the speed of the motor would increase or decrease to match the flow. The "FLOmatcher"—a unique solution to a nasty problem—was born.

Sid Lasswell, who personally installed the first FLOmatcher in the Corvallis treatment plant, remembers with clarity Burke Hayes's original design:

> *The original FLOmatcher was a series of stainless steel plates, and as the water rose between these plates, it would reduce the connectivity/ resistance and increase the current as the motor and pump increased speed. So, as the water rose on these plates, the pump moved faster, and as the water decreased, the pump moved slower. But the problem was [that] these plates were down in this wet well, which is not a very nice place to be. It was hard to install and hard to maintain….*

Nevertheless, use of the FLOmatcher dramatically changed the design of sewage pump stations. The stations no longer required the large, deep wells for storage of rank sewage made necessary by an on/off pump. New pump stations could use smaller, shallower wells, eliminating the buildup of stale sewage. In addition, costs of construction were markedly reduced, particularly in stations located where the ground conditions were difficult or wet. The FLOmatcher benefited CH2M's clients in two ways: (1) it solved the odor problem, and (2) it reduced the capital cost (and—in most cases—the power costs) for pumping.

CH2M saw great potential in marketing and selling this innovative new device. In the January 1954 Corvallis office newsletter, Howland wrote:

> *We propose to make more out of the variable speed pumping set-up the electrical department has developed, and on which we have patent rights…. Just how we are going to handle this equipment on a national scale has not yet been completely decided. It will either be handled through an equipment organization that has national distribution, or we will set up a separate company and do it by technical publication advertising.*

The second alternative was subsequently chosen. CH2M established General Services Corporation (GSC) to handle the FLOmatcher, with the intent that this company would also manage other similar devices and inventions. By March 1957, GSC was up and running with General Manager Vic Bredehoeft,

Chief Engineer Milt Haynes, and a slogan—"FLOmatcher, gravity's closest competitor."

Less than one year later, Howland reported progress on the new company: "Our program on the FLOmatcher and the product itself [are] meeting with a marvelous reception. We are over the hump with a downhill push from now on."

In keeping with the firm's philosophy of continually looking for better ways to engineer solutions, the early model FLOmatcher was soon to be replaced by a new and improved model. The Model B FLOmatcher was the brainchild of Carl Ryden, a CH2M mechanical engineer. He asked himself, "Why can't we translate the sewage level to a remote speed controlled at ground level and cut down on construction cost still more?" This new model offered numerous advantages over its predecessor, addressing Lasswell's original concerns with installation and maintenance. As Lasswell recalled:

> *Carl figured out a way to get the equipment up and out of the water and just sense the water level by air pressure. It greatly reduced the size of the wet well, which was the thing that really determined the size of the whole pump station.*

The Model B could be set at almost any location within the well. Information regarding the water level was transmitted to the unit by means of a bubbler tube and simple air pressure. As the water level rose at the pump, more pressure was required to bubble the air, resulting in more pressure on the closed portion of the box. The water level was then raised on the rheostat plates. With this extended control, the FLOmatcher could be raised above the pumping liquid, thus reducing the cost of the pumping station.

By connecting the FLOmatcher to the output of a pneumatic controller, it could be controlled by virtually any measurable variable. This feature opened up a new, even larger market for the device because the FLOmatcher was quickly perceived as a breakthrough in sewage pump-station design. Not only did it reduce the size of pump stations, it also created a uniform flow, which made the downstream treatment system more efficient and effective.

The business grew rapidly, and by 1960, GSC was comfortably ensconced in a new manufacturing facility in Corvallis. Increasing demand for the product resulted in an impressive sale of 114 units in 1961 and nearly double that in 1962, with 206 FLOmatchers sold nationwide. The FLOmatcher and the company it spawned were an unqualified success. GSC, however, was not created just to manage FLOmatcher. Other innovations were under way as well.

Archie Rice was to "clean water" as Roderick was to "dirty water." Although the men had markedly different personalities, they both shared a common vision: continue to seek new and innovative solutions to our clients' problems.

Rice's skills had enabled CH2M to build a meaningful portfolio of experience in municipal water treatment plant design. That experience was crucial to CH2M's winning a project in the late 1950s to design a water treatment plant for the Atomic Energy Commission (AEC) at its Hanford site in Washington. It was there that Rice met Walter Conley and Ray Pitman, employees at General Electric's Hanford facility. Conley and Pitman had developed a two-media advanced filtration process (coal over silica sand). Treated water drawn from the Columbia River was used to cool reactors dedicated to the manufacture of plutonium for the nation's nuclear arsenal. It was the world's largest water treatment plant, supplying up to 250 million gallons per day to each of the reactors.

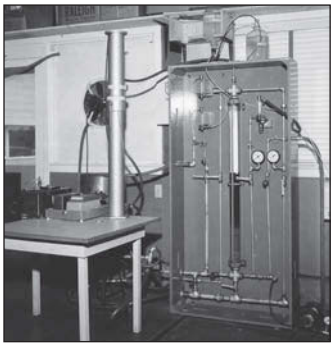
Rice was impressed with the work the men had done; their approach was right up his alley. From Conley, he learned that the men were working on a new water filtration process that would improve the filter beds. By using polymers (an innovative new product just on the market), they had developed a filtration method that allowed larger quantities of water to be processed through a sand filter bed than had previously been possible.

When Rice set about to incorporate their new process into the CH2M Hanford design, however, he was dismayed to find that the details of the method were protected under the secrecy requirement of the AEC. Even so, Rice did not give up easily. He worked diligently to require the AEC to place this information in the public domain. Once the information was public, Rice would apply the new filtration processes to other CH2M projects.

CH2M was known for attracting and hiring some of the best and brightest minds in the industry, and Rice knew engineering brilliance when he saw it. He successfully persuaded Conley to become part of the CH2M team. And, recognizing the importance of the advanced water filtration technology, CH2M formed a company to manage this process. Pitcon Filtration, Inc. (Pitcon)—derived from the names Pitman and Conley—was placed under the General Services Company umbrella. GSC now had two products.

Pitcon successfully completed two jobs using the advanced filter technology. Rice then formed another company, MicroFLOC Corporation (a subsidiary sales organization that shared its name with MicroFLOC, the product). MicroFLOC Corporation contracted with Pitcon Filtration to sell Pitcon's capabilities.

With Conley on board, research and development of improved filtration processes accelerated at CH2M. One of Conley's first assignments was to develop and test a sophisticated mixed-media filter, which would use three or more granular materials with varying densities and particle sizes to create filter beds graded coarse to fine in the direction of filtration. The result of this innovation was that filter beds could be created which could operate at much higher filtration rates while producing superior filtrate quality, which was a major technical advance. The final iteration of the process resulted in a tri-media bed composed of coal, silica sand, and garnet sand. This process, along with the use of polymers regulated by a coagulant control center, became the defining feature of MicroFLOC, a high-rate water filtration process.



Early Pitcon (later MicroFLOC) test equipment

This "clean water" work caught Roderick's attention, and he wondered if the same process that filtered extremely dirty river water would also filter sewage effluent. To test the idea, Roderick, Rice, and Conley set up a pilot MicroFLOC unit at the Corvallis Sewage Treatment Plant. This test would prove to be successful beyond Roderick's dreams. (See Chapter 4 for more information about the development and use of this technology.)

With two successful products, FLOmatcher and MicroFLOC, GSC had become a significant business that could no longer be run on a part-time basis. The partners decided that Rice would take a five-year leave of absence from CH2M so that he could take on the leadership of GSC. Soon after joining it full time, however, Rice identified conflict-of-interest concerns between CH2M's consulting engineering business and the FLOmatcher product. Engineers specifying a product they owned was considered a conflict of interest by many clients (and competitors). There was no other choice: Rice sold FLOmatcher, leaving MicroFLOC as GSC's only product.

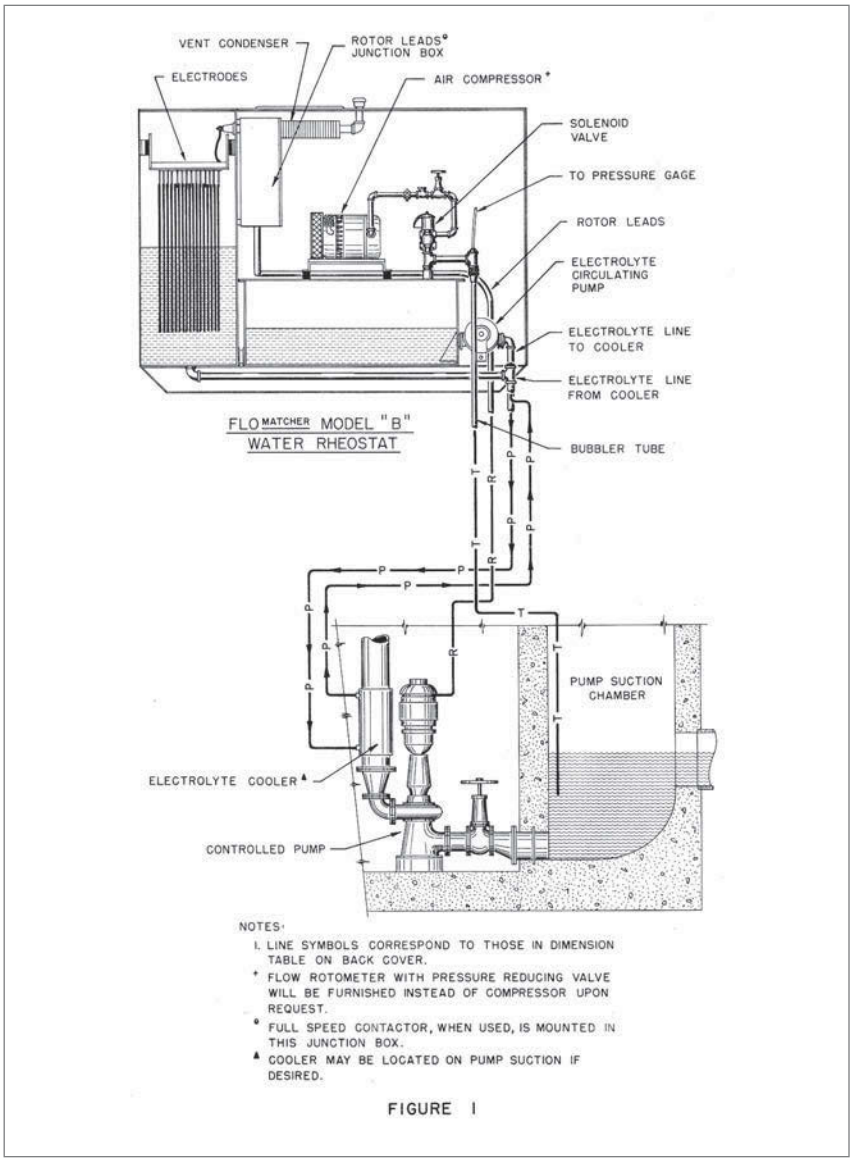
GSC now concentrated solely on improving the water filtration process. Sales boomed as the success and nationwide visibility of the South Tahoe Advanced Wastewater Treatment project focused attention on MicroFLOC. The water treatment market was eager to use the new MicroFLOC technology, thereby creating a strong market demand. In turn, that demand created a desperate need for expansion capital that GSC simply could not generate fast enough. Rice believed that the partners would see a better return on their investment if they sold MicroFLOC rather than keeping it and trying to boost its growth. With the approval of the partners, Rice set out to find a buyer.

He found the Neptune Meter Company, a small company that was interested in expanding into the environmental field. They were ready to buy, and GSC was ready to sell. One of the terms of the sale, however, was that Rice would stay with MicroFLOC for five years as president of the new company,

Neptune-MicroFLOC, Inc. Rice remained on the board of CH2M. At the end of the five-year period, he negotiated a final settlement with Neptune and returned to CH2M as a full-time partner.

Rice's experience with Neptune, a public company, gave him valuable business insight. He brought that knowledge to CH2M, and the company began to reap the benefits of that experience.

In the final analysis, both FLOmatcher and MicroFLOC were successful products, and both made money for the CH2M partners. However, this foray into manufacturing had an even greater educational value. The partners learned about the difficulties inherent in trying to operate a successful professional services firm while concurrently operating a manufacturing company. This digression led them to conclude that the firm was better off focusing its energy on what it did best—working in the professional services market. The partners agreed to concentrate their efforts on selling the firm's greatest asset—the employees of CH2M.



This illustration is of a pilot test of FLOmatcher Model B at the Corvallis Sewage Treatment Plant. The water level is actuated from the old water rheostat chamber. The pilot model was originally designed for a 20-horsepower motor but operated quite well while connected to a 75-hp motor. (The CH2M Electrical Department was heard to comment, "With a factor of safety like that, we should qualify as structural engineers.")

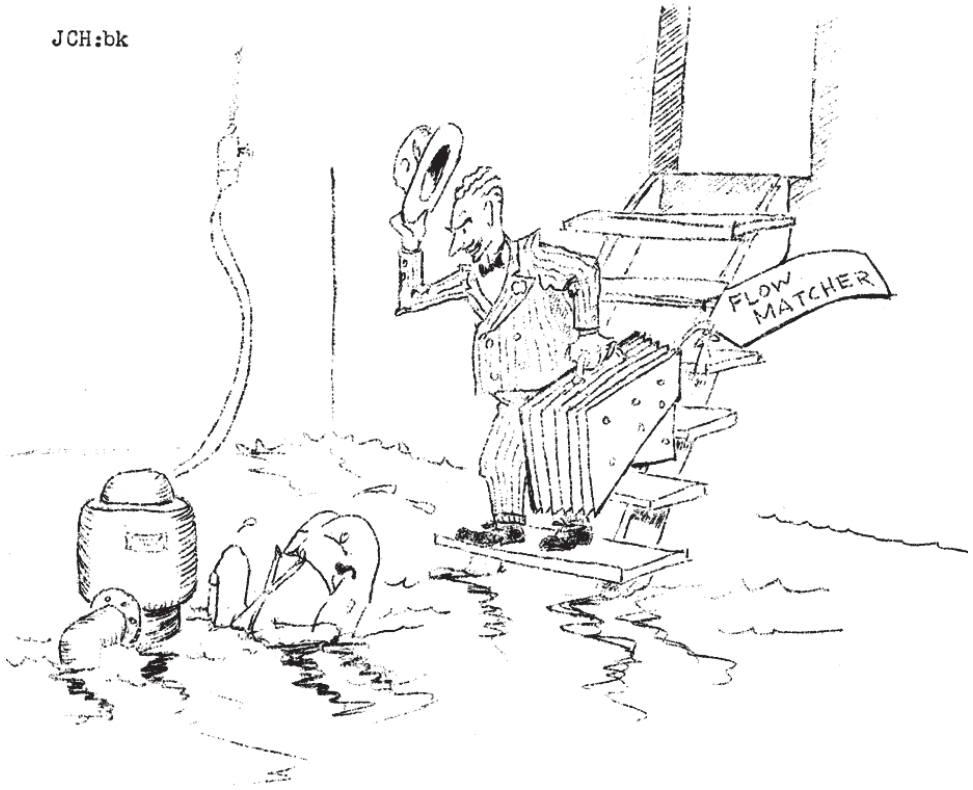
Roderick on Innovation

Innovation has been a core value since the firm's inception. To work smarter, less expensively, more efficiently—all these were implicit goals from the beginning. One of the original six partners, Ralph Roderick, epitomized the firm's emphasis on innovation. It drove his approach to every project.

"What really launched the firm was the innovative ability of the firm on projects," he remembered. "We didn't just take what we did the last time and do it the next time and the next time and the next time and never improve. [Our goal was] to innovate and improve. We found things that needed to be done differently, and there wasn't anybody else doing it, so we led and actually… made these things."

CH2M HILL's approach to innovation has always been based on the needs of its clients—innovation with a purpose and innovation to meet a need. As Roderick said, "It became known that this was an innovative, new idea firm. So when there is something that is real tough, why, your name comes to the forefront to be selected." The firm was, in fact, selected repeatedly by clients who sought unique solutions to their pressing needs.

To this day, the culture of the firm continues to support and encourage innovation, drawing some of the best and the brightest to the ranks of CH2M HILL. "The thing the firm has to offer is all this talent: They've got brains in the firm from one end to the other, all this variety of mechanical, chemical, structural, all the electrical, all these things," concluded Roderick. "I couldn't have done it without the skills of the other people… It's such a grand bunch of guys with tremendous ability. You just don't see how you could possibly have found better."



"Pardon me, would ya want to buy a FLOWMATCHER?"

Jim Howland original, circa 1954

1971 merger—Jim Howland and Clair A. Hill

CHAPTER 7

CH2M–Clair A. Hill Merger

By the mid 1960s, both CH2M and Clair A. Hill and Associates were well-established, growing businesses with strong reputations and loyal clients. Hill's firm had grown to 140 persons, with a gross income of $2 million. Hill remained the primary owner, and the company continued to be headquartered in Redding, California, with satellite offices in Anchorage and Juneau, Alaska. CH2M's staff totaled two hundred, and its gross income had risen to $3.3 million. The company had expanded from Corvallis, Oregon, to Portland, Oregon; Seattle, Washington; and Boise, Idaho.

Although CH2M was well established in the Northwest, its leaders knew that a much larger market for their services lay south of the Oregon border in California. While a highly desirable market, California also presented many challenges with its diverse and complex needs. The challenge of establishing CH2M in the Golden State in a meaningful way seemed almost insurmountable.

CH2M had experienced a taste of the California market through project work that had been secured by Clair Hill, whose extensive contacts had already won several major projects on which the two companies had worked together: Beale Air Force Base, the South Tahoe Public Utility District, and the American River hydroelectric project. In each case, Hill had called on CH2M to provide technical specialties and additional staff capability to execute these large and technically demanding projects.

Both firms had realized a financial profit from these projects, but more significantly, CH2M and Hill's company had solidified a powerful working relationship based on professional respect. Working together, the employees of both firms acknowledged a fundamental compatibility that became a major factor in pursuing a merger between the two organizations. Their core values were comparable, the people respected one another, and they truly enjoyed working together.

Testing the Waters

Discussions regarding a potential merger began in earnest in July 1966. Records from CH2M and Hill indicate that both firms were beginning to consider seriously joining forces on a more permanent basis. A mid-July memo from Clair Hill to his key staffers noted, "Recently, Jim Howland approached me to see if we were interested in exploring the possibility of a merger with CH2M. We have since discussed the subject and are studying the advantages and disadvantages of a merger." Simultaneously, Howland raised the merger issue at a board of directors meeting. On July 25, the board agreed to "obtain

"None of us has made any particular moves on the Clair Hill-CH2M proposition. Our same old problem—too many immediate things that seem to keep coming up."

— Jim Howland

sufficient information on Clair A. Hill and Associates' operations to provide a frame of reference for analysis."

In separately considering merging the two entities, both firms listed advantages and disadvantages to the move. CH2M's list indicated that the acquisition of Hill's firm would provide benefits that included the expansion of CH2M's operations in California, the ability to take advantage of Hill and Associates' extensive network of contacts, and the effective elimination of Hill and Associates as a competitor. Additionally, CH2M knew that the acquisition would instantly broaden the scope of technical staff and services they offered to their clients. The potential downside of the merger came down to the integration of the two groups: Would the acquisition change the culture, slow the decision-making process, or in any way dilute the regional force that CH2M had become?

Not surprisingly, Hill's assessment of the potential integration of the two organizations was remarkably similar. In his July 12, 1966, memo to key staff, Hill noted that the merger would result in a centralized management structure, with an organization offering its clients a broader scope of services and a wider geographic reach. He also felt that the merger would provide long-term security to the firm's owners and employees, allowing them to offer more specialized technical expertise and providing them with greater opportunities for professional growth and advancement. Similar to CH2M's analysis, Hill expressed some concerns that a larger organization might slow down the ability to respond quickly by adding more administrative red tape, processes, and paperwork.

Although the analytical process began in 1966, the ongoing demands of their respective businesses delayed activity on the merger for more than two years. The CH2M partners were stretched to their limits with the continued expansion of the firm. Major projects under way at the time included work on the Boeing 747 plant in Renton, Washington, and a freeway design for the Washington State Department of Transportation, both of which required significant time and energy from CH2M management.

Meanwhile, Hill continued to make the structural changes to his firm that moved the original sole proprietorship closer to the shared ownership in place at CH2M. He had incorporated his firm in 1960, and in 1967, he sold a portion of the business to five associates: Alan Hill, Jack Jensen, Jim Lonnberg, Harlan Moyer, and Joe Patten. Hill retained 50 percent of the common stock; the five new associates each purchased 10 percent. Hill also retained a substantial part of the equity or net worth in the form of a preferred non-voting stock.

The transaction was structured so that the new owners could acquire equity at a price within their means.

Merger discussions between the two firms began heating up again in 1968. By that time, Hill's organization had broader employee ownership—similar to CH2M—making the possibility of integration much easier.

Alan Hill in his youth, far right, with dad, Clair and brother, Malcolm, on a fishing trip

Distractions and Decisions

On September 17, 1968, Holly Cornell led a group of CH2M staff to Redding in order to meet with Hill and his key associates. He had also surveyed Clair A. Hill and Associates' operations with an analytical eye, noting how the two organizations might integrate. Cornell reported the experience:

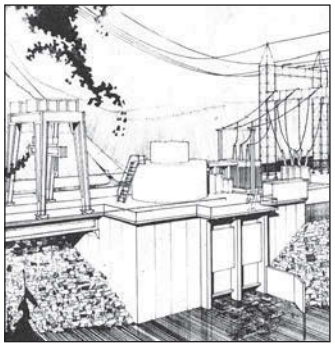
> *The Hill people [are] a compatible group, with many of the same interests as ours. CAHA is stronger in surveying, photogrammetry, and irrigation design than CH2M. [They are] well known in Northern California, not strong in Southern California, and do some work in central and eastern Oregon. The Hill principals seem to favor a merger.*

Cornell also noted, however, that Hill was a "one-man gang" and questioned how much authority he had actually delegated. He concluded, "[Hill] does not know all about each part of his operation, and therefore his top men probably have quite a bit of authority in their areas."

Two months later, nothing had come of Cornell's visit. In a November 1968 letter to Hill, Howland expressed frustration with the lack of progress. "None of us has made any particular moves on the Clair Hill-CH2M proposition. Our same old problem—too many immediate things that seem to keep coming up."

Both firms had other distractions besides engineering projects that delayed the merger process. CH2M had been contacted more than once regarding its possible acquisition by a larger corporation. They had also been encouraged to go public. In 1969, they received an unsolicited but firm offer from a publicly held corporation, the Planning Research Corporation, but declined in favor of remaining employee owned. CH2M had also been contacted for merger discussions with a Southern California architecture-engineering firm—Daniel, Mann, Johnson & Mendenhall. The partners determined that the cultural fit between the two organizations was not appropriate.

Clair A. Hill and Associates also attracted serious inquiries from other companies, including a major engineering-construction firm, International Engineers, a subsidiary of the Morrison-Knudsen construction company.



Ralston Power Plant, one of four American River hydroelectric projects

Like the CH2M partners had done, Hill and his associates decided that the philosophies and culture were too different, and so they declined to pursue the opportunity.

During this time frame, CH2M's leaders considered broadening the merger discussions to include other firms in a potential three- or four-way merger. They considered Boyle Engineering, a firm located in Southern California with a practice and size similar to Hill's and their own. They also looked at W. A. Wahler and Associates, a small soils engineering-geotechnical firm located in the San Francisco Bay Area. Both of these firms were considered, in large part, because of their geographic coverage of California. Hill and Associates had an extensive client base in northern and central California, but had little work and visibility in the Bay Area and in Southern California—the two regions with the bulk of California's population.

By late 1969, however, CH2M questioned the efficacy of a four-way merger. During a September board of directors meeting, several key players weighed in on the potential plan. Cornell was concerned that CH2M might create what he called a "larger mediocrity," that is, a firm that was bigger but less effective in serving clients. Trying to blend four firms would also add overhead and dilute the firm's technical capabilities.

Earl Reynolds held similar concerns based on his belief that CH2M should continue to grow—but not too quickly. "We must make changes, and there are many ways to go," he said. "It is more important to change ways rather than to change size. By doubling in size, we may be taking a step backwards in getting qualitative change."

Ralph Roderick expressed a contrary view and supported a merger: "We got where we are because we are leaders in our work. With the merger, we will have the resources to fund the effort it takes to keep in the lead."

Although discussion on the four-way merger continued throughout the remainder of 1969, both CH2M and Hill ultimately concluded that a four-way merger would be too difficult to negotiate. Boyle and Wahler were dropped from consideration after CH2M determined that merging with Hill and Associates could provide them with sufficient capability to penetrate the Bay Area, as well as the Southern California markets.

Howland wrote to Hill in December 1969:

> *Our board met last week and, after considerable deliberation, proposed that, if acceptable to you, CH2M [will] take the lead and make an offer to you to put our operations together. We have a formalized ownership*

transfer plan and a rather well formalized compensation system. With these two features as a base upon which to work, it seems CH2M could be the vehicle used to get the merger job done.

After thirteen years of working side by side on many major projects, and four years of discussion and analysis, it appeared that both sides were now more serious than ever about joining forces. The proposal had been made; it was now time to work out the details.

Hammering Out the Details

By May 1970, CH2M developed a merger plan, which involved a tax-free exchange of shares and keeping Clair A. Hill and Associates as a wholly owned subsidiary of CH2M. The Hill and Associates owners would hold CH2M stock and receive the CH2M Key Employee Bonus (KEB) and Key Employee Bonus After Retirement (more on the key program in Chapter 12). This proposal would result in an immediate 15 percent increase in the value of the existing CH2M shares. Hill and Associates stockholders were to receive twenty-thousand shares of CH2M common stock, worth about $225,000. Additionally, Hill and Associates preferred stock would be exchanged for CH2M preferred stock.

One feature of the merger proposal understandably caused concern for the staff of Hill's firm. It required that Hill and Associates' key employees receive one-half of the normal KEB paid to the equivalent CH2M key employees for a period of five years following the merger. From CH2M's perspective, this feature was deemed necessary in order for the CH2M key employees to receive an increased benefit from the merger. As a result of the merger, CH2M felt that Hill's employees were getting highly valued CH2M stock, but CH2M's key employees were "diluting" their interests by adding Hill's people as key employees—further dividing up the profit "pie."

Despite this concern, and recognizing that the merger with CH2M was the best long-term course, Hill's people accepted this condition. Fortunately, in the five years following the merger (1971 to 1975), the firm produced reasonable profits, and a KEB was paid each of those years. Unfortunately, in 1976, the first year that Hill and Associates' key employees were eligible to receive a full KEB, the firm failed to make a profit for the first time in history. With no profit, there was no KEB. After waiting for five years to receive a full bonus, the Hill and Associates key employees received no bonuses—the same as their CH2M counterparts.

Separate from the core terms of the deal, the merger also had to take into account the gradual integration of the two organizations. The merger plan

"Coming together is a beginning; keeping together is progress; working together is success."

— Henry Ford,
Ford Motor Company

allowed employees of both firms to participate in the CH2M General Bonus Plan, while also allowing Hill and Associates staff to continue with their own deferred profit-sharing plan (funded from the allocation made for the general bonus). Both firms committed to work toward establishing a common salary and benefit program. The intent was to create a single, seamless organization in all its particulars, including compensation and benefits.

A six-member board of directors governed the merged firm. During the first five years, two key employees from Hill and Associates served as members of the board, resulting in a two-thirds dominance by CH2M. After that, the board was elected annually, without consideration of where the proposed members originated. Corvallis, Oregon, was selected as the corporate headquarters of the newly merged organization. Howland, the CH2M president, led the merged firm. Hill retained his title of president of Clair A. Hill and Associates and also continued as the Redding regional office manager.

The respective stockholders of CH2M and Clair A. Hill and Associates approved the proposed merger plan. On January 1, 1971—five years after the discussions had begun—the merged firm became a reality.

One question remained: what to call the new organization. All parties agreed that CH2M-Clair A. Hill and Associates was too long. Rice proposed sticking with CH2M, but that suggestion didn't sit well with Hill. Finally, Howland recommended that "Hill" be added to the firm's name.

The merged firms, now CH2M HILL, had a total staff of 460 people, 330 from CH2M and 130 from the Hill organization. Their combined 1970 gross revenues were $9.3 million. They now operated from eight locations: Redding and San Francisco, California; Corvallis and Portland, Oregon; Boise, Idaho; Seattle, Washington; and Anchorage and Juneau, Alaska.

CH2M HILL's board of directors issued a policy statement that defined the course for the new organization. As part of their Reorganization and Profit Improvement Plan, the policy stated:

The objectives of CH2M HILL are stated to be as follows:

To annually increase the dollar return to Key Employees.

To continually provide greater professional challenge for the entire staff—thus a return in satisfaction.

The following are the steps to be taken towards these objectives:

INITIAL STEP
The initial step toward fulfilling the CH2M HILL objective will be the development of a major, multi-discipline, professional organization in the thirteen western states, and the development of a national and international reputation for CH2M HILL and its professional experts.

FINAL STEP
The final step towards fulfilling the CH2M HILL objective will be to develop a major, multi-discipline international professional systems-oriented organization, owned and controlled by professionals.

A reasonable timing for the initial step is completion by the end of 1975. The final step should mature by 1980.

The merger captured many of the key objectives that both organizations sought. They now had a strong start toward achieving their goal of geographic coverage of the states west of the Rocky Mountains. By joining forces, they were no longer competitors, but a single, powerful organization. They had broadened the scope of services and technical expertise they could offer their clients. Now they had to determine how to achieve the greatest synergy possible in their newly united organization.

From Flying Solo to Co-Piloting

For a fiercely independent man like Hill, the merger with CH2M was a 180-degree turnaround from the way he had been running his business. Although he incorporated Clair A. Hill and Associates in 1960 and sold a portion of the business to five associates in 1967, Hill had been averse to the idea of a partnership. "I never wanted a partnership," he said. "Most of the partnerships that I knew did not turn out well."

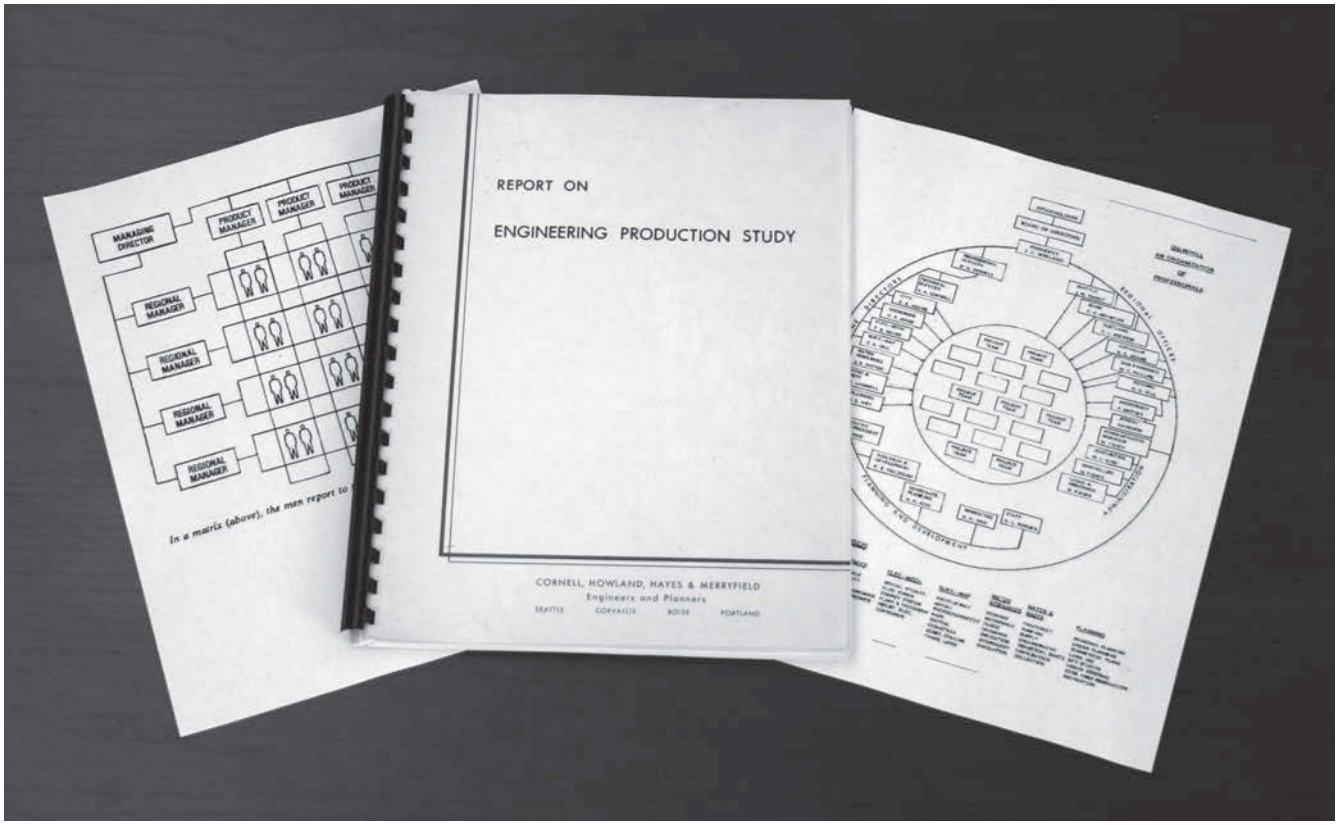
The choice to incorporate and share ownership was not an easy one for Hill, but it became part of his vision and, eventually, his legacy. While enjoying the ability to shape his organization as he saw fit, Hill also took a more pragmatic and long-term view for his company, knowing that he wanted the organization to endure beyond his lifetime. "It was a difficult thing to work out," he remembered. "But I felt that, well, nobody has a lease on life, and you'd better prepare for a contingency. [Plus] there was a group of people that had really helped me get to where we were, and I really wanted them to participate in the ownership."

The merger with CH2M was something of a two-edged sword for Hill personally, and his later reflections illustrate the internal tension he felt. On the one hand, he realized that he could provide long-term stability for the first-rate organization he had built up from a one-man shop in 1938. Hill was sixty-one years old in 1970, the year leading up to the merger. "It seemed to me," he said, "that all the good people that we had would be better off with an ongoing company."

But with a merger, he knew he would give up the independence and single-mindedness that had been a hallmark of his leadership. He had to change from operating as the unquestioned leader of a thirty-two-year-old business, to participating as an active partner in a consensus-managed organization. Ultimately, he made the commitment to ensure both a future for his employees and continued service to his valued clients.

"It was beyond my comprehension that a partnership like that could work, but I could see that it did work," he said years later. "I guess the reason it worked is, in spite of differences in all individuals, if they have a common goal and want to accomplish it, they can successfully work together. I think it was amazing."

Clair A. Hill and Associates, circa 1952



Engineering Production Study

CHAPTER 8

Organization for Impact

Even before the merger with Clair A. Hill and Associates, CH2M's rapid growth had been impressive. By 1967, the company had completed over forty-five hundred projects and was ranked seventeenth in the listing of the Top 500 Design Firms by *Engineering News-Record*. But even positive growth can have its downsides in duplication of efforts and organizational inefficiencies. Although the company strongly encouraged project meetings and direct communications, the four existing CH2M offices did not always communicate well, and coordination of work between them was becoming more and more challenging. Doubling the number of offices in the merged organization would only exacerbate the existing problems. And, as the business continued to expand, competition for "ownership" of staff with sought-after technical skills created the potential for discord and made clear the need for a creative response.

The Reports of Cornell and Rice

In 1968, prior to the merger, Holly Cornell made the first attempt to review CH2M's organizational structure. He issued a report, called the "Engineering Production Study," which began to lay down concepts for a long-range plan for the firm. As Jim Howland recalled:

> *The big and most lasting thing that came from Holly's study was his recognition that the computer was going to impact the way we were going to do virtually everything, from projects to accounting. He saw to it that we became computerized, often well in advance of our competition.*

The study prompted Cornell to turn over management of the Seattle office to an up-and-coming employee, Jim Poirot (who would later become chairman of the board), so that Cornell could devote his time to exploring the uses of technology in engineering. The need for technology seemed self-evident. How to resolve the organizational problems was less clear. Cornell had this to say about the organizational issues:

> *The one thing the study didn't do was work out a solution to the problem which we faced, which was with regional offices. There was a tendency for each region to try to build capability so that they could handle any kind of project that came up. That's not a very economical thing because it means that you're duplicating staff in all these places.*

Cornell had begun the first step toward the creation of what was to become a major new organizational structure for the firm. He added, "We started

"The art of progress is to preserve order amid change and to preserve change amid order."

— Alfred North Whitehead,
mathematician and philosopher

working on that [concept], and Archie [Rice] got to working with it. It was Rice who eventually came up with the concept of the discipline system."

At the end of 1970, just prior to the completion of the merger with Clair A. Hill and Associates, Rice tasked himself with creating an organizational structure that would allow CH2M HILL to manage the expanded firm more efficiently. Enjoying the prospect of mulling over a complex problem, Rice began to develop a system where the operations of the newly combined organization would be united with a common set of goals and objectives. He closeted himself in his office and dug in.

Years later, Jim Howland recalled that Rice was difficult to talk to during this intense study period. But out of his study came a recommendation to reorganize the merged firm using a "matrix" organization. Howland said, "Although Rice and I differed on some aspects of implementation, it was a stroke of genius on Rice's part to first get the concept [of the matrix system] and then to push getting it all together."

The outcome of Rice's labors resulted in a report entitled *Reorganization and Profit Improvement Plan*. Rice presented his report to the board in December 1970. In his introduction, Rice explained why change was necessary:

> *[The firm] is an extremely complicated professional organization handling a broad spectrum of projects, each of which—for the best interests of the client and the company—requires a slightly different approach. Therefore, no organizational change of and by itself is going to eliminate the need for cooperation, understanding, and independent decision making on the part of dedicated and intelligent individuals. The best the organizational structure can do is to make it easier for these things to occur.*

The report noted that CH2M's organization had evolved into a group of autonomous and relatively small engineering offices. The general manager of the firm was the only formal point of coordination between the offices. Rice recalled:

> *We were moving from the time when we were a series of small regional offices to the point where we were picking up major projects across the country. There was no way that you could have in every regional office the top sanitary engineer in the firm. Therefore, you had to have an organizational structure which would make it possible to bring to bear on these major projects the best capabilities that you had across the firm.*

Rice believed that a more synergistic relationship between offices was necessary, particularly in the merged and expanded organization. In reviewing the existing organizational structure, Rice saw no path for the development of this synergy.

As it was then configured, the firm did not effectively provide a way to make use of its top technical talent companywide. Nor was there any consistent means for transferring technology between offices. Such deficiencies in the firm's structure were occasionally overcome by the individual efforts of employees who operated outside of organizational lines. This ad hoc approach was haphazard at best. Communication and cooperation between eight offices in the merged company would be much more difficult, and it would be nearly impossible with the eighteen to twenty offices that CH2M HILL's leaders envisioned were necessary to cover the thirteen western states.

The Discipline System—a Matrix Organization

With his typical attention to minute details, Rice's report defined thirty-six different kinds of projects of varying size and type, all of which he believed were necessary to the firm's financial well-being. CH2M HILL's new organization needed to empower the staff to complete any type of project, while providing access to all of the firm's resources. Rice's recommendation: Create a matrix organization with one arm representing the various technical disciplines and another arm recognizing the need for a geographic presence through the regional offices. He felt that this configuration would most effectively assure efficiency and uniformity of technical excellence in project execution.

As Rice envisioned it, every employee would essentially wear two hats: one for technical expertise, and the other for geographic location. This matrix allowed the firm to maximize its technical capabilities on behalf of clients, moving the best experts to the location of the client's project, while still maintaining a geographic presence in multiple locations.

To support the technical discipline side of the matrix, a new and powerful position was proposed: "discipline director" for each of the firm's major engineering disciplines. These positions would support specific technical areas on a firmwide basis. According to his report, the discipline director would be responsible for:

- Supporting technical excellence within their discipline
- Executing all assigned projects
- Managing sales within and outside of specific regions
- Hiring, motivating, educating, and retaining staff within their discipline
- Coordinating and cooperating among other disciplines and regions

For each region's organizational support and management, Rice recommended retaining the position of regional manager, albeit with slightly less authority than before. Regional managers would be responsible for:

- Establishing and maintaining regional contacts and regional sales
- Administrating staff within their region
- Coordinating between the firm's client and discipline staff
- Supporting project execution
- Ensuring project profitability

The board initially reviewed Rice's report and his "two-boss" approach in December 1970. Then, a committee of senior managers reviewed and discussed the proposal during a three-day meeting in January 1971. Howland would later recall that the concept was not initially universally endorsed, but that Rice remained convinced that it was a necessary step:

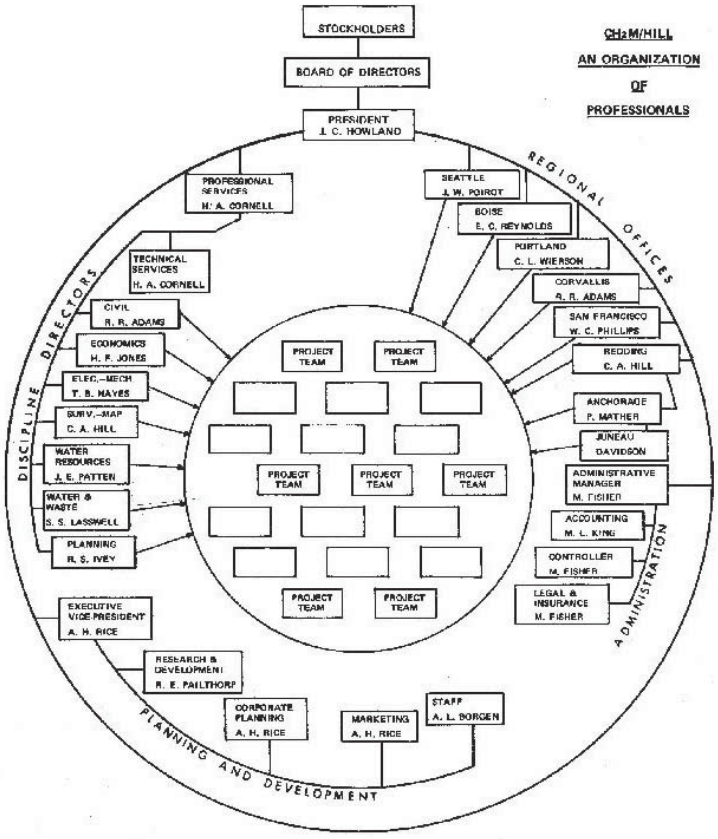
> *The reception [to the report] was pretty cool to start with. It meant changing the way we'd been doing things and, you know, people are resistant to change…. But the basic concept of the thing, and the thing that also led to our growth, was Rice's [concept] and nobody else's. He dreamed it up, and he pushed it through.*

The final organizational structure was hammered out during the January meeting. The senior managers made a few modifications to Rice's original recommendations. The existing regional office structure remained in place. Eight disciplines were identified and added to the matrix. Each discipline director would report to the firmwide director of professional services. The director of professional services would report to the president, as did the existing managers of the regional offices and corporate staff. This position would provide the necessary linkage across technical and geographic lines that Rice felt was critical.

Making It Happen

Issuing a firmwide memo defining the new organization was simple. Implementing the actual organizational change was more challenging.

As Howland had noted, people tend to resist change. Questions about the concept of a matrix organization flooded in from the staff. What are discipline directors and what do they do? Why do we need them, anyway? How will having another boss help us get the work done? Who has primary responsibility?



This organizational chart from 1971 depicts CH2M HILL's matrix organization. Although the matrix would continue to be modified throughout the years, the basic concept is still in use today. It is interesting that this diagram is drawn as a circle—reflecting equal importance of the disciplines, regions, and administrative functions, all in support of project teams.

"Organization is the art of getting men to respond like thoroughbreds. When you cluck to a thoroughbred, he gives you all of the speed and strength of heart and sinew he has in him. When you cluck to a jackass, he kicks."

— C. R. House

Cornell and Howland mobilized. They traveled to each of the eight offices to explain the purpose of the matrix organization. Likewise, each of the newly appointed discipline directors met with the staff in each office and solicited support for the new structure. The annual stockholders meeting, held February 1971 in Corvallis, devoted much of the agenda to a discussion of the discipline system.

Support for the new approach came gradually. It evolved as the staff began to understand how the structure could help them better perform their jobs and serve the needs of their clients. As they started to put the matrix system into practice, they soon realized that they could now easily call upon the best practitioners in the firm for their projects, irrespective of where those people were located. Slowly, the system began to find the synergy that it was designed to achieve.

One of the first tests of the new organization came in 1971 when CH2M HILL was selected to supply engineering services for the UOSA in Manassas, Virginia (see Chapter 10 for the full story). Located on the East Coast, far from any regional office, this project soon demonstrated the strength of the new matrix organization. The project team, "borrowed" from several offices, was composed of key staff—some of whom had never before worked together—from several disciplines. The UOSA project essentially forced the disciplines (technical expertise) and the regions (available people) to work together to execute the project on time and within budget. This powerful example did much to convince the staff of the desirability of the new organization.

Accommodating Change

When the discipline structure was initially developed, each of the eight disciplines was subdivided into specialized technical groups. For example, the water and wastewater discipline featured subgroups of wastewater treatment, wastewater collection, industrial waste treatment, and municipal water. Each of these subgroups was headed by a "group director." Group directors held the same responsibilities for their technical specialty as did the discipline director.

Between 1971 and 1986, two more disciplines were added, and the total number of subgroups or technical specialties eventually rose to forty. The new disciplines and subgroups were an outgrowth of CH2M HILL's response to emerging markets by adding new technical capabilities to the firm's services.

The disciplines continually evolved to meet changing market needs. One of the most significant changes occurred with the creation of the industrial

processes discipline. Although this discipline had originally served as a subgroup under the water and wastewater discipline, it soon became apparent that industrial waste treatment was a specialty market better suited to its own technical discipline.

CH2M HILL's industrial waste practice grew to include solid wastes. By 1980, the discipline had expanded to include the emerging markets of hazardous and toxic waste. With the advent of the U.S. EPA's Superfund program, this once embryonic discipline quickly became one of the firm's most significant markets. In 1982, the hazardous waste and industrial processes discipline succeeded in winning a major U.S. EPA contract that set the firm on a new course. Chapter 14 tells the Superfund story.

An Organization that Worked

The matrix organization was developed to meet a number of objectives. The intent was to develop a more workable organization with clearer lines of responsibility. As a result, clients benefited from an organization that was designed to respond quickly to their needs with the highest quality services, augmented by technical experts as required. And finally, the matrix simply made it easier to get work done, to assemble the right staff at the right time, and to move them among projects in different locations.

Advancement opportunities opened up for the technical staff. Prior to the advent of the discipline organization, the road to advancement lay in the regional offices. The prescribed path had been for project engineers to become project managers and project managers to become department or division managers. The ultimate goal was to become a regional manager. With a finite number of offices, however, there were limited opportunities for those seeking advancement.

With the creation of the discipline system, the technical arm of the firm now assumed a new and much more prominent role in the organization. Over time, staff choosing a technical path could achieve recognition and compensation equal to that of their peers in the regional side of the operation. Regional office management no longer provided the only opportunity for career growth.

Employees realized other advantages through the matrix organization. Personal technical development—key to the advancement of any engineer—was much more easily attained when in the company of peers with similar skills and interests. Communication within and among the disciplines and subgroups began to flourish as the engineers capitalized upon their ability to share best practices with others who spoke their technical language.

"If CH2M HILL can develop an organization operating on the principle of centralization of technical expertise, and decentralization of project management, it will have a decided edge on the large office firms."

— Holly Cornell

According to Cornell, the advantage of CH2M HILL's organization has always been a local presence. He believed that large, single office firms fail because of a lack of local sensitivity to the needs of the client:

> *If CH2M HILL can develop an organization operating on the principle of centralization of technical expertise, and decentralization of project management, it will have a decided edge on the large office firms. The matrix system is one of Rice's major contributions. That is the thing that has made it possible for us to grow as large as we have and still maintain the technical excellence and provide all the projects with whatever expertise is necessary.*

In hindsight, it is clear that Rice's creation of the discipline system and its subsequent implementation was one of the more important turning points in CH2M HILL history. It made possible the securing and execution of future mega-projects such as UOSA, the Milwaukee Water Pollution Abatement Program, Superfund contracts, and, ultimately, the design-construct and nuclear-waste remediation markets.

Rice was, by all accounts, the father of the discipline system. His matrix concept is still the foundation of CH2M HILL's organization today. Employees can still be identified by their area of expertise and where they work. During the following quarter century, from 1970 to 1995, the firm grew from 450 people to more than 6,000. Rice's 1971 *Reorganization and Profit Improvement Plan* had succeeded beyond his and anyone else's imagination.

Engineering + Business Acumen = Success

Can CH2M HILL's success be attributed to its engineering talent and its cadre of problem solvers? Or has the firm succeeded because it marshaled the intellectual capacity of its staff through business strategies that positioned the firm for growth? Likely, it was a little bit of both.

One of the six original partners, Rice epitomized both the sound engineering skills and the powerful business acumen that were crucial to CH2M HILL's early successes. By his own admission, Rice was not a scholar: "School was kind of an unpleasant interlude between summers…." What Rice did bring to the firm was unequalled business judgment, gained in part by working for his father—an independent construction contractor—from the time he was twelve.

A self-described devil's advocate, Rice consistently challenged the firm's approach to its clients, markets, business organization, and new ventures. "We had him on the CH2M HILL board because he was so probing in his analysis and he knew a lot about business," remembered Howland. "I used to say that my life as chairman of the board would have been a lot easier during board meetings if Rice wasn't there. But I knew in the long run my life would be a lot easier, because at the end of the year… I would report a profit and a bonus, where if we hadn't listened to Rice, we wouldn't have been able to."

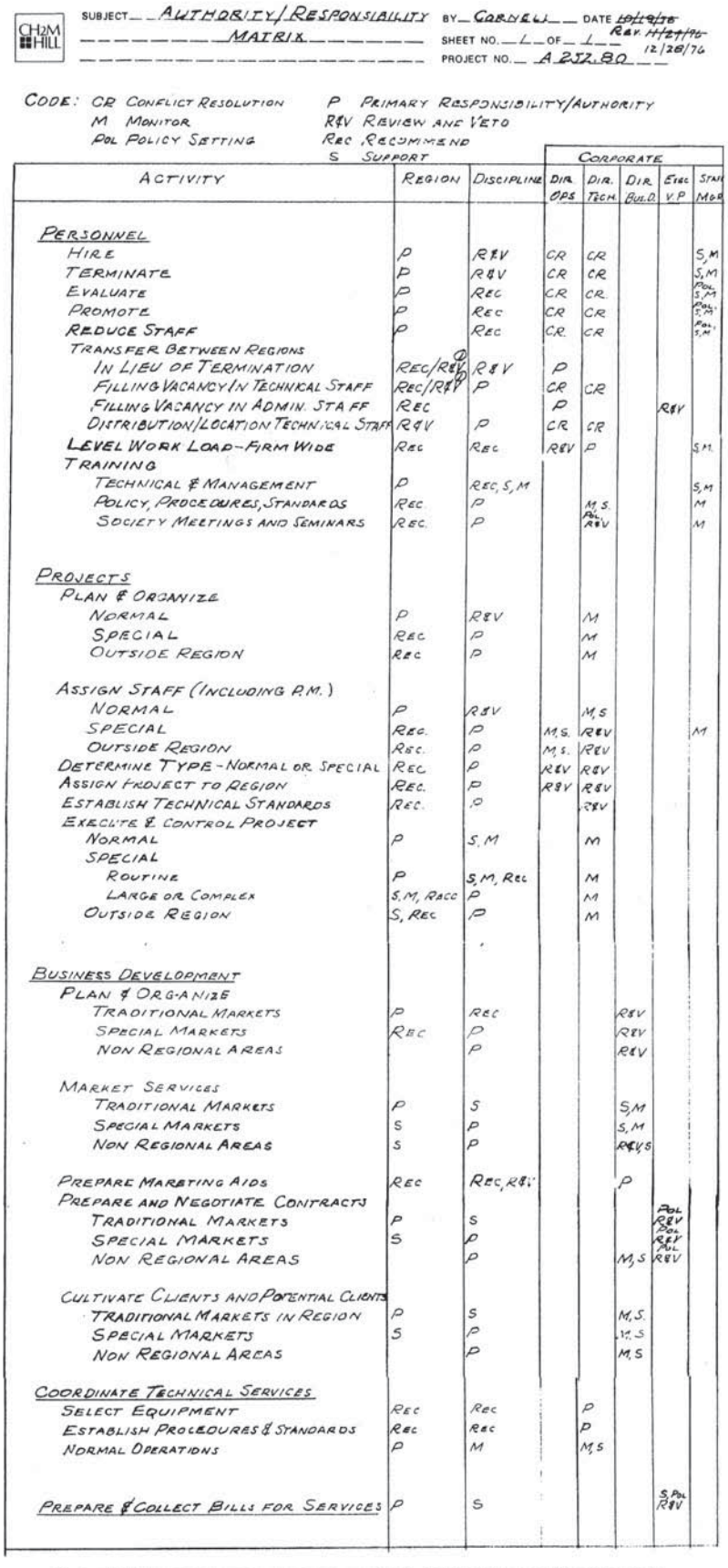
Rice's contributions to the firm included engineering innovations such as MicroFLOC. His years of experience in running the independent MicroFLOC organization further honed his business skills. Rice was also able to turn his incisive mind to business challenges. His return to CH2M HILL in 1970 heralded further innovation in the organization of the firm.

"Engineering is… a method of thinking," noted Rice. "A problem typically has several facets with a lot of details. The engineer has an approach to the problem that says 'All right, let's first separate this thing into its parts. Now let's identify which are really important. Let's work on these and get something that's a reasonable answer.' There is a tendency for people not trained in that way to get to worrying about a whole bunch of things that really don't make a bit of difference." This approach was simple enough for Rice, perhaps, but it was not as easy for just any engineer to make the leap from engineering to the development of sophisticated business models.

Volatile. Witty. Persuasive. Opinionated. These are what made up the character of Rice. "I always tremendously appreciated him, even though… Rice would sometimes upset the apple cart," noted Howland. "But I think almost always he was right."

A Discipline Timeline

Holly Cornell served as the first leader of the disciplines. As director of professional services, he was responsible for implementing the organization change starting in 1971. In 1976, Cornell became president of CH2M HILL, and Sid Lasswell moved from his role as director of the water and wastewater discipline to become the director of technology, a new title for the director of professional services. Lasswell managed the discipline side of the organization from 1976 until 1987, guiding the technical arm of the firm during a period of sustained growth. In 1987, Ralph Peterson moved from being director of the hazardous waste and industrial processes discipline to become the director of technology, a position he held until 1991, when he succeeded Harlan Moyer as president and chief executive officer. Peterson was succeeded by Craig Zeien as technology director, who was the last person to hold that position. In 1995, the disciplines were replaced by a new organization centered on business lines. The new organization still retained the matrix concept but the many disciplines and discipline groups were consolidated into business lines.



SUBJECT AUTHORITY/RESPONSIBILITY MATRIX BY CORNELL DATE 10/19/70 Rev. 11/27/95 12/28/76
SHEET NO. 1 OF 1
PROJECT NO. A 252.80

CODE: CR CONFLICT RESOLUTION; M MONITOR; POL POLICY SETTING; P PRIMARY RESPONSIBILITY/AUTHORITY; REV REVIEW AND VETO; REC RECOMMEND; S SUPPORT

ACTIVITY	REGION	DISCIPLINE	CORPORATE: DIR. OPS	DIR. TECH.	DIR. BUS. D.	EXEC V.P.	STAFF MBR
PERSONNEL							
HIRE	P	REV	CR	CR			S, M
TERMINATE	P	REV	CR	CR			S, M
EVALUATE	P	REC	CR	CR			POL, S, M
PROMOTE	P	REC	CR	CR			POL, S, M
REDUCE STAFF	P	REC	CR	CR			POL, S, M
TRANSFER BETWEEN REGIONS							
IN LIEU OF TERMINATION	REC/REV ①	REV	P				
FILLING VACANCY IN TECHNICAL STAFF	REC/REV ①	P	CR	CR			
FILLING VACANCY IN ADMIN. STAFF	REC		P			REV	
DISTRIBUTION/LOCATION TECHNICAL STAFF	REV	P	CR	CR			
LEVEL WORK LOAD–FIRM WIDE	REC	REC	REV	P			S, M
TRAINING							
TECHNICAL & MANAGEMENT	P	REC, S, M					S, M
POLICY, PROCEDURES, STANDARDS	REC	P		M, S			M
SOCIETY MEETINGS AND SEMINARS	REC	P		POL, REV			M
PROJECTS							
PLAN & ORGANIZE							
NORMAL	P	REV		M			
SPECIAL	REC	P		M			
OUTSIDE REGION	REC	P		M			
ASSIGN STAFF (INCLUDING P.M.)							
NORMAL	P	REV		M, S			
SPECIAL	REC	P	M, S	REV			M
OUTSIDE REGION	REC	P	M, S	REV			
DETERMINE TYPE–NORMAL OR SPECIAL	REC	P	REV	REV			
ASSIGN PROJECT TO REGION	REC	P	REV	REV			
ESTABLISH TECHNICAL STANDARDS	REC	P		REV			
EXECUTE & CONTROL PROJECT							
NORMAL	P	S, M		M			
SPECIAL							
ROUTINE	P	S, M, REC		M			
LARGE OR COMPLEX	S, M, REC	P		M			
OUTSIDE REGION	S, REC	P		M			
BUSINESS DEVELOPMENT							
PLAN & ORGANIZE							
TRADITIONAL MARKETS	P	REC			REV		
SPECIAL MARKETS	REC	P			REV		
NON REGIONAL AREAS		P			REV		
MARKET SERVICES							
TRADITIONAL MARKETS	P	S			S, M		
SPECIAL MARKETS	S	P			S, M		
NON REGIONAL AREAS	S	P			REV, S		
PREPARE MARKETING AIDS	REC	REC, REV			P		
PREPARE AND NEGOTIATE CONTRACTS							
TRADITIONAL MARKETS	P	S				POL, REV	
SPECIAL MARKETS	S	P				POL, REV	
NON REGIONAL AREAS		P			M, S	POL, REV	
CULTIVATE CLIENTS AND POTENTIAL CLIENTS							
TRADITIONAL MARKETS IN REGION	P	S			M, S		
SPECIAL MARKETS	S	P			M, S		
NON REGIONAL AREAS		P			M, S		
COORDINATE TECHNICAL SERVICES							
SELECT EQUIPMENT	REC	REC		P			
ESTABLISH PROCEDURES & STANDARDS	REC	REC		P			
NORMAL OPERATIONS	P	M		M, S			
PREPARE & COLLECT BILLS FOR SERVICES	P	S				S, POL, REV	

NOTE ① TRANSFERRING OFFICE RECOMMENDS, RECEIVING OFFICE MAY VETO.

This "authority/responsibility matrix" from 1970 illustrates how the matrix system began to define clear lines of responsibility for the firm's managers.

Lake Tahoe

CHAPTER 9

Cleaning the Nation's Water

During the first half of the twentieth century, the United States saw massive changes: dramatic industrialization; growth in the nation's cities; the Great Depression; the drought, dust, and agricultural decline of the Dust Bowl; and two world wars. After World War II, Americans again began to focus on issues at home. Growth, change, and modernization were welcomed by the nation as it sought to move forward. Industries thrived, but development came with a price: the polluting of our own back yards, particularly the waterways.

The first meaningful federal legislation mandating a cleanup of the nation's waterways, the Federal Water Pollution Control Act, was passed in 1948. Not coincidentally, the engineering firms of CH2M and Clair A. Hill and Associates began to grow at that time as they responded to the need to clean up blighted rivers, lakes, and streams. Earl Reynolds recalled that, at the time he opened the Boise office in 1960, there were few wastewater plants in the state: "Wastewater treatment was becoming a real problem in most little towns. They basically poured effluent into the rivers because there weren't enough people living there for it to be a whole lot of problem."

Even so, the population grew and began to overpower the capacity of Idaho's river system to cleanse itself. Farmers began to complain that the waste was ruining the irrigation system and threatened to sue. The terms of the Federal Water Pollution Control Act did not have enough muscle to enforce stream quality standards.

Despite its limitations, the 1948 act stands as the first comprehensive statement of federal interest in clean water programs. It provided state and local governments with technical assistance funds to research and address water pollution problems. While research grants were permitted both under the original act and its successor legislation, actual grants awarded were relatively rare. Notwithstanding this hurdle, CH2M and Clair A. Hill and Associates received research grants for the early pilot plant work at the South Lake Tahoe Public Utility District. Even more unusual, the U.S. Public Health Service twice renewed these grants.

Four new laws amended the original legislation between 1948 and the early 1960s. The amendments extended federal jurisdiction from the original concept of protecting only interstate waters to the inclusion of all navigable intrastate waters. The amendments also provided federal assistance to municipal and industrial dischargers in the form of federal grants for sewage treatment facilities. Concurrent with the federal grant money, however, came federal enforcement programs for all wastewater dischargers. Initially, the Public Health Service and the newly created Federal Water Pollution Control Agency administered both the monetary grants and enforcement.

By the late 1960s it became apparent that existing enforcement procedures were not producing timely results. The premise that wastewater discharges could be controlled simply by the adoption of water-quality standards proved ineffective. It was next to impossible for the government to prove a link between one particular discharger and the specific violations of stream-quality standards.

The public became increasingly frustrated over the slow pace of pollution cleanup. Available control technologies were being developed but not consistently applied. Increased public interest in environmental protection set the stage for a complete overhaul of water-pollution abatement legislation, with what became known as the Clean Water Act of 1972. The act was drafted in 1971, and the House Public Works Committee began hearings on the bill. Congressman Harold "Bizz" Johnson, serving northern California's second congressional district, was chairman of the House subcommittee assigned to the bill.

Johnson and Clair Hill had long worked together on California water plants. In the past, both Hill and Harlan Moyer participated in Congressional hearings at Johnson's request. Johnson was also familiar with the South Lake Tahoe Tertiary Treatment Facility, which at the time represented the cutting edge of wastewater treatment technology. When it came time to craft powerful pollution control legislation, Johnson came to Hill for assistance.

By pure coincidence, Moyer and Gene Suhr were in Washington, D.C., at the time, working on the preliminary engineering report for the Occoquan project (see Chapter 10). Johnson invited the two engineers to lunch. While plying them with the Congressional dining room's renowned bean soup, he sought their input concerning the provisions for the legislation. Although facing an imminent deadline for completion of the Occoquan report, the pair agreed to help. Assistance came in the form of a lengthy memo from Suhr to Johnson outlining several suggestions for improving the bill. These suggestions included guidelines for best practical control technologies (BPT) and best available technologies (BAT), which were subsequently incorporated into the final version.

Suhr fondly recalled the meeting:

> *Here was a great opportunity for CH2M HILL to do what it did best: improve the environment through application of sound engineering practice. Bizz trusted us to give him fair, objective, and technically sound advice. We knew that we had a financial stake in the legislation, but more importantly we knew we could use our firm's expertise to solve an environmental problem.*

"Man has lost the capacity to foresee and to forestall. He will end by destroying the earth."

— Albert Schweitzer,
humanitarian, theologian, missionary, organist, and medical doctor

The 1972 legislation declared as its objective the restoration and maintenance of the chemical, physical, and biological integrity of the nation's waters. Two specific goals were incorporated into the Clean Water Act: (1) an interim goal of water quality that was both "fishable" and "swimmable," where possible and (2) a final goal of zero discharge of pollutants.

The act defined rigorous standards to achieve higher levels of pollution abatement. Industries were given a deadline of July 1, 1977, to install BPT to clean up waste discharges. Municipal wastewater treatment plants were required to meet an equivalent goal, termed "secondary treatment," by that date. The primary focus of BPT was to control the discharge of conventional pollutants, such as suspended solids, biochemical-oxygen-demanding materials, fecal coliform and bacteria, and hydrogen (ion) concentration.

For industrial dischargers, the act required pollutant cleanup standards that were more rigorous than the BPT guidelines. The specifications within the legislation required that industries use the "the best technology that was economically achievable." BPT regulations controlled biodegradable substances, while the BAT regulations were focused on the control of toxic substances.

Finally, in what would prove to be a major springboard for CH2M HILL's growth, the Clean Water Act created a new federal agency, the U.S. EPA. The agency was to be responsible for the administration of federal pollution-abatement programs and enforcement of water-quality protection laws.

Moyer recalled the birth of the EPA:

> *We knew that we were helping Bizz Johnson create something special. The words "environmental protection" had been critical to the earliest successes of the firm, both with Fred Merryfield's work to clean up the Willamette River in Oregon and Clair Hill's work with various water agencies in California. We, of course, did not understand the magnitude of what we helped to create, but we knew it was big.*

Since its initial passage in 1972, the Clean Water Act has been amended several times, and it still governs much of the nation's water-quality policies today. Its original focus was directed at readily identifiable discharges from pipes or manmade channels—what was termed a "point-source" discharge. In 1987, the focus of the act was expanded to include nonpoint discharges. This new category included pollution sources such as stormwater runoff from agricultural lands, forests, construction sites, and developed and undeveloped urban areas. As stormwater travels across land, it picks up pollutants, including sediments, toxic materials, and conventional wastes.

"Only within the moment of time represented by the present century has one species—man—acquired significant power to alter the nature of his world."

— Rachel L. Carson,
author, *Silent Spring*

Early in the twenty-first century, this runoff was estimated to represent more than 50 percent of the nation's remaining water-pollution problems.

Congressional funding for these efforts was enormous. Between 1972 and 1987, EPA awarded $44.6 billion in grants for its sewage-treatment construction program. The 1987 Clean Water Act amendments authorized an additional $18.0 billion for construction grants through 1990, as well as a state revolving loan program. Of this amount, $9.6 billion was authorized for continuation of construction grants, and at least $8.4 billion was for use as capitalization grants to set up the program.

Over the years, CH2M HILL benefited from the large infusion of federal money into the pollution-control industry, and the firm gave back its expertise to the nation's benefit. Often working pro bono in the public interest, just as Suhr and Moyer did for the initial draft of the Clean Water Act, CH2M HILL engineers have subsequently assisted Congress in drafting pollution-abatement regulations based on appropriate and affordable technology.

The Clean Water Act brought environmental work to the forefront in the collective American consciousness. Since the act's inception, CH2M HILL has continued to work with municipal and industrial clients across the U.S., bringing hundreds of cost-effective facilities online. Indeed, given the huge increase in environmental work brought about by the act, Suhr noted that it was not surprising that the firm grew rapidly between 1972 and 1990:

> *During those eighteen years, gross income for the firm rose from $16 million to $500 million, a compound growth rate of about 21 percent per year. At the same time, the firm grew from 624 full-time equivalent employees to 4,665.*

Tom Gibbs, former CH2M HILL water business group manager and later the architect of CH2M HILL's twenty-year effort to clean up water pollution for the City of Milwaukee (see Chapter 13) said:

> *The Clean Water Act essentially activated the wastewater industry. It provided lots of opportunities that hadn't been there before, and CH2M HILL was very well suited to the market that this legislation created. The Clean Water Act had a monumental impact on the firm.*

Tom Gibbs

CH2M HILL grew because its staff brought innovative and effective solutions to some of the country's most complex environmental issues. This dedication to "doing the right thing"—a value instilled from the firm's earliest days—is what caused federal agencies, such as EPA and the health department, to notice this up-and-coming firm. CH2M HILL staff were known and respected by professional organizations and were sought out as leaders in their field.

Thirty years later, Don Evans, head of CH2M HILL's substantial water and wastewater practice, looked back at the importance of this early legislation:

> *One cannot overestimate the importance of the Clean Water Act to CH2M HILL and to the entire country. Starting at the federal level with strong legislation and partnering with local governments and industries with grant money, this act altered the destructive path of pollution we were on. By understanding and helping to implement the initial act and its many subsequent amendments, CH2M HILL felt it was doing its part—as one of the firm's taglines states—"to build a better world."*

In the span of less than two decades, CH2M HILL became one of the preeminent environmental engineering firms in the U.S. Part of this growth was the result of opportunities, such as the relationship with Bizz Johnson and the crafting of the Clean Water Act. Taking advantage of these opportunities, CH2M HILL then built its reputation solidly on the back of its expertise and innovation, just as it always had—one project and one client at a time.

Creating a Legacy: Association of Metropolitan Sewerage Agencies

Known for recruiting the best and the brightest to its ranks, in 1974, CH2M HILL recruited a true leader and pioneer in the field of wastewater treatment: Tom Gibbs. Formerly the executive director for one of the nation's large metropolitan wastewater districts, Seattle Metro, Gibbs also led the industry by literally shaping the future for sewerage agencies across the nation.

In the late 1960s, Gibbs felt that the existing federal wastewater legislation discriminated against larger wastewater agencies, including Seattle Metro. He sent letters to his counterparts across the nation to test the waters and see if they felt the same pressures. A meeting in September 1969 affirmed common concerns among these agencies. As a result, in April 1970, individuals from twenty-two large municipal agencies created a new organization: the Association of Metropolitan Sewerage Agencies (AMSA). Gibbs was named AMSA's first president, and he served in this role from 1970 to 1973.

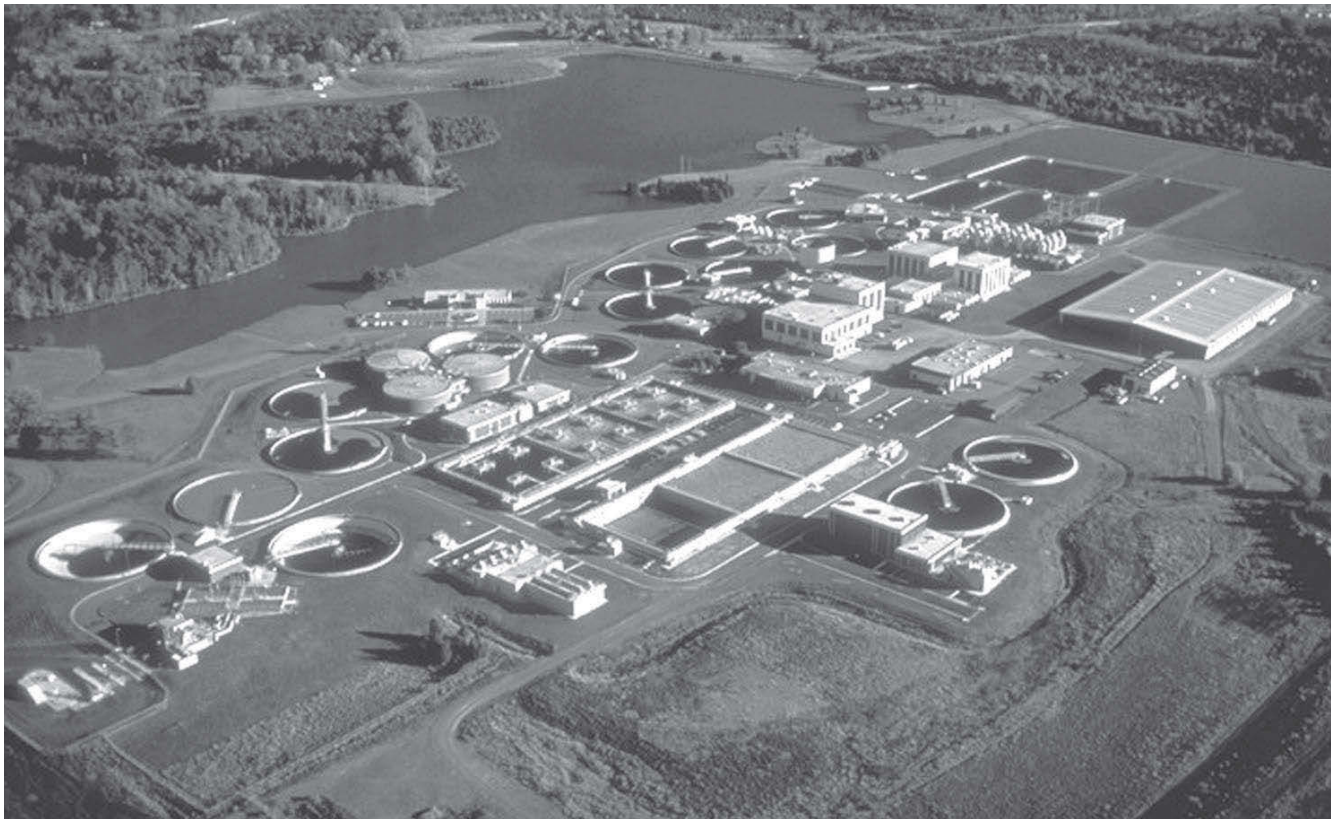
With a common goal of securing funding for municipal wastewater treatment and shaping the discussion on the improvement of the nation's waters, AMSA began by lobbying two powerhouse committees on Capitol Hill: the Public Works Committee (House) and the Public Works and Environment Committee (Senate). Their objectives were threefold: (1) eliminate grant limits so that large metropolitan districts could obtain grants of substance for wastewater projects; (2) obtain waivers for secondary treatment for coastal discharges; and (3) retroactively obtain full grant coverage for projects that currently had only minimal grant coverage. Their efforts paid off, and subsequent legislation leveled the playing field for all wastewater treatment agencies, large or small.

Gibbs recalled how AMSA garnered the respect of one of the nation's powerful government agencies:

> "Prior to the formation of AMSA, my large city colleagues and I had been given lip service by the commissioner of the Federal Water Pollution Control Agency, David Dominick. At one point, I met with Mr. Dominick to discuss the needs of Seattle Metro, and he was obviously not happy at being bothered by such a request. When I arrived at his office, he made me wait for a long time and then reluctantly gave me a few minutes of his time. During the meeting, he was uninvolved, almost to the point of being rude. Nothing happened as a result of my meeting.
>
> Shortly after AMSA's formation, we asked Mr. Dominick to meet with our group. He had to be persuaded to attend our meeting, and was not happy about the intrusion into his schedule. We were seated in a meeting room with nameplates identifying our cities—San Diego, Orange County, Los Angeles, Portland, Seattle, Denver, St. Louis, Kansas City, Chicago, Milwaukee, Cleveland, Cincinnati, Boston, Dallas, Ft. Worth, Houston, and Bergen County and Middlesex County, New Jersey. Dominick entered the room with a scowl, stopped dead in his tracks, saw the millions of votes that our group represented, and did a complete transformation. He stayed with us for more than an hour and listened intently to the needs of the big cities. I've never seen anyone do such a quick political evaluation and change accordingly. I still chuckle at the memory of the scene."

Gibbs's role in the formation of AMSA allowed him to foster close personal relationships with managers of the many metropolitan agencies that made up the association. When he joined CH2M HILL as a business development director in 1974, he was directly involved in the pursuit of work from these large wastewater agencies. "At that time, CH2M HILL was essentially unknown to most of these agencies, so my entrée to their top officers was a huge advantage," recalled Gibbs.

Today, AMSA (now the National Association of Clean Water Agencies, or NACWA) remains a powerful national organization focused on water-quality protection. The organization still follows the vision defined by Gibbs and the other founding members, pursuing opportunities to develop and implement scientifically based, technically sound, and cost-effective environmental programs.



Upper Occoquan Sewerage Authority

CHAPTER 10

Story of a Project—Upper Occoquan Sewerage Authority

By 2003, CH2M HILL had completed more than thirty years of continuous years of engineering services for northern Virginia's Upper Occoquan Sewerage Authority* (UOSA). Now known as one of the premier wastewater authorities in the world, UOSA was born in the 1970s amidst political turmoil, without fiscal support from its founding entities and tasked with meeting the requirements of what were, at the time, unprecedented discharge standards. UOSA's future was far from assured at its creation. And given that, at its start on April Fool's Day, 1971, UOSA was penniless, why would CH2M HILL, a firm with its roots—and its offices—on the West Coast have any interest? In 1971, the merger between CH2M and Clair Hill and Associates had just been completed, and the firm had committed itself to a market strategy that encompassed the thirteen western states—not the eastern geography of the thirteen original colonies.

Two major forces drove CH2M HILL's interest. The first of these was the unbridled enthusiasm and confidence of a young engineering staff eager to prove that they could make major contributions to the field of environmental engineering. The second was the powerful vision of a young, veteran U.S. Navy nuclear engineer, Noman Cole.

The Occoquan watershed and reservoir forms the major source of potable water for northern Virginia's Fairfax County, adjacent to Washington, D.C. Fairfax County's population began to grow rapidly beginning in the mid 1960s, fueled by a seemingly inexhaustible supply of jobs in the region and aided by the opening of an interstate highway through the heart of the watershed. As a result, Occoquan became one of the more desirable urban development areas because of its easy commuting distance to Washington, D.C. With growth, however, came water quality problems.

> *Water quality studies showed that the Occoquan Reservoir had been seriously degraded for use as a public water supply. The problem: inadequately treated sewage discharged from more than twenty-four small treatment plants tributary to the reservoir. As the first step in addressing the problem, the Virginia State Water Control Board commissioned a study in partnership with the affected counties of Fairfax, Fauquier, and Prince William, as well as the Fairfax Water Authority. Three possible solutions came as a result of the study, listed in order of their judged capability to minimize water quality problems in the reservoir: (1) export all wastewater out of the watershed,*
> *(2) apply advanced waste-treatment methods, export water for reuse, and limit allowable population within the watershed, and (3) limit the population to not more than 100,000 people and apply advanced waste-treatment methods.*

** Now known as the Upper Occoquan Service Authority.*

"We are not permitted to choose the frame of our destiny. But what we put into it is ours."

— Dag Hammarskjöld,
secretary-general of the United Nations, Nobel Peace Prize winner

These recommendations were refined and subsequently embodied in a comprehensive long-range sewerage development plan. The northern Virginia governmental representatives agreed that a regional approach was needed, but they objected to the cost of the plan, estimated at $429 million. They also questioned Virginia's authority to export wastewater to the proposed end point, the Potomac estuary, knowing that it would add to already high nitrogen and phosphorus concentrations. This concern was realized in August 1970 when the U.S. EPA advised the board that discharge of secondary treated effluent was not acceptable and that a high degree of advanced waste treatment would be required.

Around the same time, Virginia Governor Linwood Holton appointed Cole, an outspoken environmentalist, to the board, a move that was to significantly influence the approach to the problem. In September 1970, Cole was elected chairman. Soon after, he visited the South Lake Tahoe Public Utility District's advanced treatment plant. The following month, Cole presented his draft report (*Tahoe East for the Occoquan*) to the jurisdictional leaders. He proposed the design and construction of high-performing advanced treatment facilities within the watershed, similar to what he had just seen in operation three thousand miles to the west. The reaction to the plan was positive.

In many ways, Cole's proposal overcame the concerns of the various counties within the watershed. In particular, Fauquier County had been violently opposed to an export option. Fauquier County contains the upper reaches of the Occoquan watershed; export lines from this watershed would be long and costly. The county was projected to generate only 12 percent of sewage flow, yet its share of capital expense for export would have exceeded 28 percent. Cole's recommendation of advanced treatment also offered savings to Fairfax and Prince William counties, as well as to the incorporated cities of Manassas and Manassas Park.

Coupled with the final version of the *Tahoe East* report in January 1971, the board adopted a policy for waste treatment and water-quality management. The policy specifically required that the design of treatment facilities be similar to that of the Lake Tahoe plant—a requirement that would later prove to be a critical factor in CH2M HILL's decision to head east.

Meanwhile, Fairfax and Prince William counties and the towns of Manassas and Manassas Park joined forces to form the UOSA. The more remote, sparsely populated Fauquier County had been excluded from the Occoquan policy. The newly created UOSA would own and operate a high-performance advanced treatment plant required by the Occoquan policy.

Although they agreed upon the formation of an authority, the eight original directors, two from each jurisdiction, agreed upon little else. The four jurisdictions were dissimilar in the extreme. Fairfax County was urban and prosperous; Prince William County was largely rural. Compared to the counties, the two towns were small. Because of the size discrepancies, they did not agree on how to assign costs or apportion capacity in a treatment facility. Issues were further compounded by the need, in some cases, to rebuild existing sewers because of poor construction and massive infiltration problems. As Harlan Moyer later observed in his typically understated fashion, "I believe it is fair to say there was not complete unanimity among the political subdivisions about some or all aspects of the situation."

UOSA directors did agree on one significant step forward. They issued a request for proposal from leading engineering firms for a preliminary engineering report that would help conceptualize the overall project in conformance with the Occoquan policy. Twenty-five engineering firms were invited to submit proposals. CH2M HILL was invited—not because the Occoquan board thought of them as a "leading firm," but because their work at Tahoe had formed the basis for Cole's *Tahoe East* report.

In spite of their self-imposed geographic limitation, CH2M HILL submitted a proposal, knowing that their success with the Tahoe plant made them a strong contender. CH2M HILL was "short listed" for the project in July 1971 and invited to interview with the authority. Sid Lasswell, Gene Suhr, and Moyer were the CH2M HILL interview team. Despite two days of interviews, however, the authority was unable to agree upon a clear winner. In an attempt to break the deadlock, Moyer visited the authority again in August and committed to establishing a permanent Virginia office to support the project. He also personally offered to relocate to the area, as would Suhr, for the duration of the work on the report. Given these promises, the board selected CH2M HILL.

"August 8, 1971, is a date that will live forever in my memory," Moyer wrote in his diary. "I arrived in Manassas to sign a contract to provide engineering services for the UOSA project. At that time, UOSA had a name, a board of directors, and a direction to implement the Occoquan policy. UOSA did not have any staff, any offices, any physical works and, as I subsequently learned, no money!"

UOSA's lack of funds was no small issue to CH2M HILL. The recent CH2M and Hill merger, as well as the firm's recent expansion into Colorado, had been capital intensive. Plus, the CH2M HILL board of directors had recently approved a five-year loan and a line of credit that was tied to receivables. Under its terms, the credit line had to be completely paid off for a thirty-day

"August 8, 1971, is a date that will live forever in my memory."

— Harlan Moyer

period each year. In spite of these financial challenges, the board lined up squarely in favor of the UOSA project.

In September 1971, Jim Howland optimistically reported to the firm's directors on the potential for the Occoquan project:

> *Today [the Occoquan Project] appears to offer the greatest single opportunity that we have for becoming a truly major factor in professional services on a national basis. It is hard to imagine a more opportune situation than that which faces us on the east coast. We were selected over 24 of the nation's leading engineering organizations to design the first major [advanced waste treatment] plant on the east coast in the shadow of Washington, D.C. In the past, much of our work has been on relatively small projects. Our job now is to prove that we are big enough, dedicated enough, and smart enough to make a success of the challenge and opportunity which has been presented to us!*

Work on the report began in earnest. The firm's newly adopted matrix organization was pushed into service to provide resources for the project. Specialists were assigned from all necessary disciplines and from whichever regional office could best supply the needed talent. Project assignments were both long- and short-term.

Moyer and Suhr led the core team. "Gene joined me a few days after I signed the contract, and we began the preparation of the (preliminary engineering report)," remembered Moyer. "Over the next six months, we worked essentially seven days a week to complete the work. During this time, Gene and I roomed together and became known throughout the firm as the 'odd couple.' Of course, Gene was Oscar!"

As the work progressed, the team was increasingly impressed with the requirements that Cole had embedded within the Occoquan policy. This document embodied ideas that were unique in the design of wastewater reclamation and sewerage systems. Cole's leadership in developing the policy was to play a significant role in changing the way wastewater treatment facilities are designed—a legacy that continues to this day.

An alumnus of Admiral Hyman Rickover's nuclear submarine program, Cole was also a man with a mission. He believed that the conventional design of wastewater treatment plants was woefully unreliable. Too often, plants allowed bypassing of raw or partially treated sewage as a result of mechanical breakdowns. This lapse was unacceptable to Cole. He felt that treatment plants should be designed to provide complete treatment even in the face of mechanical or other malfunction.

As a result of Cole's mission, the engineering team was faced with rigorous treatment requirements and design standards that were a complete departure from the accepted engineering practice at that time. Reliability requirements were greatly enhanced, methods for determining plant capacity were drastically altered, power source requirements were made more stringent, and overflow containment was required.

Gene Suhr

In addition to the technical difficulties associated with the design of the facility, the CH2M HILL crew also faced another unique challenge. Bull Run is a tributary stream to the Occoquan. Both Bull Run and the town of Manassas are steeped in Civil War history. Trying to find sewer rights-of-way and facility construction sites that were not historical sites proved vexing. Fortunately, CH2M HILL's matrix system brought an expert to the team; Bill Watters from the Corvallis office led the effort to locate suitable sites. Watters astounded the locals with his knowledge, not only of the region's history, but also of the current and past ownership of the proposed sites.

Although the original treatment processes employed at Occoquan have changed, the overall concept has remained remarkably consistent with the system described in the report. It was designed to use biological processes for the bulk removal of conventional pollutants and physical-chemical processes for the remaining treatment. The cost savings afforded by biological treatment helped to minimize overall costs at the facility; the more expensive physical-chemical processes were only used to augment overall treatment.

The completed report was submitted in February 1972, and the UOSA board adopted the entire program.

"Gene Suhr was the principal author of the (report)," said Moyer. "He was the engineer responsible for meeting all the technical requirements of the Occoquan policy. Noman Cole, the policy's author, was very impressed with Gene's technical ability." Indeed, the report was noted to be the best ever received by the Virginia State Health Department.

Yet for all of that, UOSA still had no staff and no money to begin design and construction. The UOSA board asked its attorney, Turner Smith, and Harlan Moyer to prepare a service contract between UOSA and the four impacted political subdivisions. An engineer from Cole's staff at the Virginia State Water Control Board, Millard Robbins, Jr., also aided in the process. UOSA could sell bonds that would finance the project, but only after the service contract was signed. After several months of effort, Fairfax County and the two towns had signed the service contract; Prince William County remained recalcitrant. Moyer's diary humorously but accurately reflected the turmoil:

> *On a dark and stormy night, Turner, Robbins, and I attended a Prince William County supervisors' meeting and at the eleventh hour the supervisors finally approved the service contract. It had been raining buckets all day, and as we came out of the meeting in the early morning hours, it was still raining buckets. Robbins looked up to the sky and said 'OK, Noman [Cole], you can shut it off now.' [It was then that] Hurricane Agnes ended.*

In July 1972, the authority sold its first municipal bonds, paid CH2M HILL for the report, and authorized final design of the first 15 million gallons per day (mgd) of treatment capacity. The final design was created in the Redding office, led by Larry Kepple as the principal design engineer. With few exceptions, the design followed the concepts developed by Gene Suhr. Now all the authority needed was an executive director. The UOSA board turned to Moyer for help in finding a person able to fill that role. Moyer prepared a job description that, as he put it, required "that the director walk on water."

"We advertised nationwide, winnowed through the responses, and found no one who could even wade through water," Moyer recalled. "It was discouraging. Then one day I spoke to Robbins about the notable lack of success. Robbins replied, 'I might be interested.'"

In March 1973, Robbins became the first executive director of UOSA. He served in that capacity for almost 27 years, until he retired in February 2000.

In 1973, UOSA began construction of the regional water reclamation plant, five pumping stations, and 150,000 feet of interceptor sewers and force mains. The water reclamation facility opened in July 1978 and has consistently met the most stringent wastewater treatment requirements of any permitted plant in the United States.

By the early 1980s, the rapid population growth rate in northern Virginia required UOSA to begin planning to increase the treatment capacity of its water reclamation plant. CH2M HILL recommended that expanding the existing plant to its full potential capacity of 27 mgd was necessary to meet the area's population growth. The firm designed the next-stage expansion in 1984 and supervised its construction from 1985 to 1987.

While the expansion was under construction, inflow rates to the existing facility rapidly increased. The increased volume began to overload the existing secondary treatment capabilities, and it began to show signs of complete nitrification failure. Fortunately, the construction contractor for the expansion project was able to build and make operational the additional aeration basin tanks and secondary clarifiers that were needed before the

ability to achieve complete nitrification was lost. This experience was not lost on the staff at UOSA and clearly demonstrated that future expansions would need to be planned for and implemented more proactively.

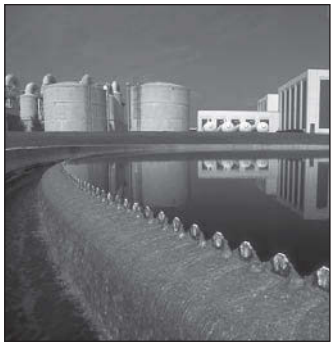
In 1985, UOSA solicited revised twenty-year population growth and flow projections from its four member jurisdictions for the years 1995 to 2015. Consistent with growth throughout metropolitan Washington, D.C., the new projections reflected significant growth within the four UOSA jurisdictions. UOSA immediately initiated the process to plan, design, and construct the facilities necessary to convey and treat the projected increase in wastewater flows. It again turned to CH2M HILL to provide a preliminary engineering report that would define the projects and enhancements that would help to meet those needs. CH2M HILL's 1985 report to UOSA was approved, and the firm proceeded with the design of the recommended treatment facilities.

In the report, CH2M HILL had recommended that the plant capacity initially be expanded to 45 mgd, with a later expansion to 54 mgd. Planning for this massive future growth hit a temporary bump in the road in the early 1990s when a major recession slowed growth in the area. UOSA elected to delay construction of the plant expansion project until the long-term treatment needs could be predicted with greater certainty. However, the jurisdiction still needed additional short-term treatment capacity as a "bridge" before the newest treatment facilities were constructed. In 1992, CH2M HILL designed facilities that would achieve an interim treatment capacity of 32 mgd. The facilities went online in 1996.

UOSA took advantage of the economic slowdown in the early 1990s to work with CH2M HILL to identify ways to improve the performance and simplify the maintainability of several of the plants' unit processes. UOSA requested that Suhr again move to Virginia to lead the design effort. Suhr willingly accommodated. "That was the best decision I ever made," remarked Robbins. "It shaved months and thousands of dollars off of the project."

When the economic doldrums lightened up and rapid growth resumed, UOSA again acted decisively and, in 1995, approved the 54 mgd facility for construction. Design of the expansion was completed in 1996, and a single $200-million, four-year construction contract was awarded.

The total capital cost of the facilities from 1971 to 2004 exceeded $500 million. This investment not only preserved the Occoquan Reservoir, but also enabled the four political jurisdictions to meet the population growth demands during the thirty-year span and to prepare for future demands.



UOSA today

More than three decades after the formation of UOSA, CH2M HILL remained its prime design consultant, a position built on mutual respect and a common understanding of the goals UOSA works to achieve. Cole's aggressive vision in 1971 helped to create two powerhouses: (1) a remarkable, progressive, and visionary authority that uses cutting-edge technologies for wastewater treatment and (2) a consulting engineering firm that rose to the challenge and built long-term solutions for its client.

Noman Cole's Legacy and the Value of Rigorous Design

Many of the rigorous design requirements required by the Occoquan policy have since found their way into what is today termed the "standard of excellence" by which design of sewerage facilities is judged. As head of Virginia's State Water Control Board, Noman Cole led the effort at Occoquan. The innovations that resulted from his policy are too numerous and technically complex to address in their entirety, but a few examples demonstrate both Cole's foresight and their impact on the industry.

First, with his background in nuclear submarines and as consulting nuclear engineer, Cole knew the value of backup systems. He felt that a system could not be considered reliable unless two or more redundant systems were available to continue operation in the face of nearly any conceivable malfunction.

For example, a treatment plant might require four primary clarifiers in order to provide treatment for a given flow. One form of redundancy, termed "in-kind," would be to provide a fifth clarifier that could be pressed into use in the event that one of the operating units failed. Another form of redundancy might be to design the clarifiers such that only three operating units could accept the peak flow condition, albeit at a somewhat reduced efficiency.

Second, Cole's policy changed the way treatment plants rated capacity. Wastewater facilities are typically designed to accept a certain amount of peak loading conditions in excess of their average design loadings. Common practice is to express design capacity as the facility's capability, assuming that the largest single machine in a given unit process is out of service. Thus, if a sewage pump station had a complement of one 20 mgd pump and four 15 mgd pumps, its peak capacity would be 4 x 15, or 60 mgd, since the largest pump (20 mgd) will be, at some point, out of service. Under the Occoquan policy, however, if the sewer's tributary to the pump station delivers peak flows in excess of average flows for any significant period, then the average capacity, or design capacity, is less than 60 mgd and the facility would be rated at less than 60 mgd. Under Cole's policy, treatment plant capacities are rated significantly lower than they would be under less stringent design criteria.

Third, Cole required dual independent power supplies in order to avoid downtime. In the early 1970s, conventional wisdom was to design crucial sewerage facilities with dual power supplies. By contrast, the Occoquan policy requires independent power supplies. They are deemed independent only if a failure anywhere in one system has no impact on the remaining system's ability to deliver uninterrupted power.

Fourth, Cole initiated unique approaches to the thought process of designing a facility. A term unknown to treatment facility designers at the time was "failure mode and effects analysis." Such analyses were common in nuclear submarine design, but not in the practice of sewage treatment facility design. This analysis systematically describes every possible malfunction and prescribes the actions needed to ensure uninterrupted operation. These descriptions help conscientious designers in two ways: (1) they must determine potential problems and design the means to ameliorate these problems and (2) they must combat malfunctions by investigating multiple avenues of action and designing ready access to those avenues that best contain the problem.

Finally, the Occoquan policy required that the design of the tertiary treatment facility be completely self-sufficient. A system to compost digested sewage solids as a way to convert them into a usable by-product was part of the innovative UOSA facility design. The system minimized the need for complex mechanical equipment by mounding solids into long, dike-like rows that were periodically mixed and aerated. The system, termed "static-pile composting," proved to be an effective, extremely reliable means of converting sewage sludge into an environmentally safe and useful by-product.

Cole's vision, coupled with UOSA's drive to succeed and its trust in CH2M HILL's designers, left a lasting imprint far beyond UOSA's geographic and jurisdictional boundaries.

National American Consulting Engineers Council (ACEC) award ceremony (from left): George W. Barnes, president, ACEC; Harlan E. Moyer, president CH2M HILL; Garnett Y. Carpenter, chairman, UOSA; Millard H. Robbins, Jr., executive director, UOSA; George Gunn, CH2M HILL

Millard Robbins: a Profile

A recounting of the story of the UOSA would be incomplete without mentioning the role that was played by the authority's first executive director. Millard H. Robbins, Jr., served in that role continuously from 1973 through 2000. Prior to his selection as executive director, he was involved in the promulgation of the Occoquan policy and the review of the original preliminary engineering report as an engineer on the Virginia State Water Control Board staff. UOSA's directors have fittingly recognized his leadership by their naming the present facility the Millard H. Robbins, Jr., Regional Water Reclamation Plant. At the ceremony honoring Robbins, numerous CH2M HILL staff members were present, including the now retired original "odd couple," Harlan Moyer and Gene Suhr, as well George Gunn, who for decades supervised construction of UOSA projects beginning in 1973.

No Bath Tonight

On a hot and humid summer day in Virginia, Gene Suhr had spent most of a Saturday morning collecting sewage samples from eleven treatment plants. His plan was to freeze the samples and then fly them back to Corvallis for testing. He had purchased two five-gallon jerry cans and had dutifully dipped up samples at each plant. "Our new office manager's household goods had recently been delivered," remembered Suhr. "I was pretty sure I could store the samples overnight in their freezer, which I knew stood empty in their garage."

Unfortunately, Suhr had not counted on the office manager's wife. "For some strange reason," he said, "housewives don't take kindly to having sewage samples stored in their freezers!"

Suhr was stranded on a hot summer's day with ten gallons of highly perishable sewage. At the time, he was sharing a room with Harlan Moyer at the Dulles Marriott Hotel. Ever the problem solving engineer, he developed an alternate solution.

"The best idea I could come up with was to put the jerry cans in the hotel bathtub and pack them in ice from the hotel ice machines. Since it takes a lot of ice to do this, I roamed the corridors of the hotel with a wastepaper basket as an ice bucket. I probably emptied about four or five ice machines and depleted at least three wings of the hotel before I had filled the tub with ice."

As Suhr was bringing in the last basketful, he happened to overhear two of the hotel chambermaids in conversation. "Hey, Maybelle, there's gonna be one helluva party in 217 tonight!"

As it turned out, the maids weren't the only people surprised by Suhr's impromptu sample cooler. "Imagine Harlan's surprise when he returned to our room with the intention of taking a nice cool shower only to step into a tub full of ice," grinned Suhr.

1975
Top row, left to right: Holly A. Cornell, Harlan E. Moyer, Archie H. Rice, Earl C. Reynolds, Jr.
Bottom row, left to right: James C. Howland, Joseph E. Worth, Joseph E. Patten, L. Gene Suhr

CHAPTER 11

The Second Generation

Since its inception, long-term, stable leadership has characterized CH2M HILL. The staying power of the firm's leaders was attributable not only to their competence, but also to the skillful, thoughtful, and often fortuitous transitions from one generation of leadership to the next. Each generation built upon the foundations that the previous generation laid; each generation relied on the core values and enduring culture that was built by the organization's first leaders.

When the initial CH2M partnership was formed, the partners necessarily operated as a consensus management group, although that would hardly have been the parlance they would have used. It did not take long, however, for them to realize that managing a business by committee was not efficient. Therefore, they tried rotating the management from founder to founder in six-month stints, an experiment that had an unexpected but fortunate result.

In 1947, it was Jim Howland's turn to lead the fledgling firm as the managing partner. "My memory was that we said, 'We'll start with Cornell, and he'll be the manager for six months, and then we'll get to Howland, and then we'll go to Hayes,'" recalled Howland. "At the end of my six months, they kind of said, 'Well, you know, Jim, why don't you stay on and keep doing it? It really isn't very good to change every six months because you just kind of get into it (in that time).' And my memory is, I felt, well, that's right."

Howland could hardly have foreseen that he would end up leading the organization for nearly three decades: as managing partner until 1966, the year CH2M incorporated, and then as president and general manager until 1974.

Of all the partners, Howland most clearly saw the need for the overall management of the firm if the business was to succeed and grow. Although he was also a knowledgeable engineer, Howland truly hit his stride as the leader of the new organization. Some of his partners would later say that he became the "soul" of CH2M. His approach to leadership was built on disarmingly simple concepts: Give information freely, trust others to do the right thing, and generously share the fruits of success.

Characteristic of Howland's view of his management role, in 1974 at age fifty-six—and years from retirement—he felt it was time to introduce new leadership. "The power and prestige, I guess, didn't mean that much to me," remembered Howland. "It seemed like I'd been at it long enough, and maybe my style of management wasn't what the firm needed at that point. It needed something different."

In that same year, Clair Hill turned sixty-five, the age at which the firm's policy stated that senior managers were to retire from management or policy-making

In August 1974, Moyer had the opportunity to step into some very large shoes, those of the man who had hired him more than 20 years before.

positions. Hill had been the sole owner of his company from its inception until 1968, when he sold 50 percent to five long-term employees; a year later, he sold a smaller percentage of his organization to six additional employees. Unlike Howland, Hill never really intended to step out of his leadership role. Prior to the merger in 1971, at age sixty-one, Hill had shared his feelings about retirement. He said, "This has been bugging me that… you have to retire at sixty-five. I'm in no mood to contemplate retiring four years down the line."

But CH2M HILL's policy was clear. In 1974, Howland and Hill negotiated a new employment agreement that would allow Hill to continue to work as a senior employee until age seventy, although he would be required to turn over management of the Redding office and California operations.

That year was the beginning of a major management transition for the firm. Howland and Hill stepped aside so that younger people could lead the company. As one might expect, there was considerable interest in the transition by members of the "second generation" of CH2M HILL's top managers. Who would be selected to replace these two giants? How would the organization respond? Could the firm maintain the culture and core values of its founders under new leadership?

The plan for Clair Hill's successor was less complex than the transition plan for Howland. In fact, the decision for Hill's replacement as manager of the Redding office and the California operations had, in fact, been made in 1971. Although not publicly announced, Harlan Moyer had been chosen by Howland and Hill as Hill's logical successor.

Moyer, a Hill and Associates employee since 1952 when he graduated from the University of Nevada, had served on the CH2M HILL board since the merger. He had earned credibility in his role as manager for the Beale Air Force Base project, the South Tahoe Public Utility District project, and the Upper Occoquan Sewerage Authority project, each of which provided him with opportunities to connect with CH2M staff and to develop a deeper understanding of that side of the organization. Both Howland and Hill agreed that the Redding office and California operations would be more amenable to having a Hill person in charge. In August 1974, Moyer had the opportunity to step into some large shoes—those of the man who had hired him more than twenty years before.

Hill continued to work full time as a water resources senior consultant until the age of seventy and worked part time for several more years after that. Hill also stayed on with the California State Water Commission until he was in his eighties. After he had stepped down from his leadership role, Hill made

a concerted effort not to voice any criticism or interfere in any way with his successors. Hill trusted them to lead and to succeed. In 1998, at age eighty-nine, Hill passed away, leaving behind an incomparable legacy of service, skill, and single-mindedness of purpose.

"Clair Hill was a gentleman of the first order, and a fine engineer," remembered Moyer. "He loved his work, his country, and his family. Clair was my mentor for nearly forty years, and he had a profound impact on my life and my career."

While the Hill succession came to a predictable conclusion, the 1974 Howland succession question continued to be the hottest topic in the boardroom and in coffee rooms around the firm. Some believed the best solution would be for Howland to continue in his current role for a few more years. But he was adamant about his intention to step down. Howland continued to say that it was time—for him and for the organization.

The board reluctantly agreed and set about to make a momentous decision. There were several "second-generation" candidates from the CH2M group. The board—Rice, Suhr, Hill, Moyer, Les Wierson, Cornell, and Howland as the non-voting chairman—began the succession discussions. Rice led the group in evaluating the options.

In several long sessions, the board discussed and evaluated all potential candidates, but reluctantly decided that the time was not ripe to choose a second-generation president. Rice then proposed an alternative: allow Cornell take over as president. Rice's plan envisioned Howland serving as chairman of the board part time, while Cornell ran the business as president for a few years. Then the board would select the next president, and Cornell would then serve as chairman of the board. The board debated Rice's proposal with great vigor and then agreed to the selection of Cornell.

"The board was having a real problem trying to come up with the right answer," said Cornell. "When it came down to it, they [asked me] to be president for a period of two or three years as a kind of transition from Jim."

Cornell began his tenure as president in 1975. Howland served as chairman, as well as taking on a new position, director of operations, to oversee CH2M HILL's growing regional office operations. Cornell's former position, director of professional services, was renamed director of technology; Sid Lasswell took on that position, becoming responsible for managing the firmwide discipline system. Gene Suhr succeeded Lasswell as discipline director for water and wastewater.

During Cornell's tenure, the firm continued to grow, despite a difficult time in 1976 when, for the first time since its inception, the firm recorded no profit. Federal grant funds for wastewater construction had been frozen, resulting in a major slowdown in the wastewater market. Cornell calmly navigated these suddenly still waters with no loss of key staff. Moreover, he identified an opportunity on the East Coast that ultimately led to a major expansion of CH2M HILL. The firm at that time had only one office on the East Coast: the Reston, Virginia, office established in 1971 for the Upper Occoquan Sewerage Authority project. The office was doing well, but did not qualify CH2M HILL as a major East Coast player. A call from a professional acquaintance changed all that.

While serving with the American Water Works Association, Cornell had met Fred Eidsness, principal of Black, Crow and Eidsness (BC&E), an environmental firm headquartered in Gainesville, Florida. Like CH2M, BC&E went into business after the end of World War II, starting out as an environmental testing laboratory and then moving into water and wastewater engineering. By the late 1960s, BC&E had become a leading engineering firm in the southeastern United States.

In February 1970, BC&E was acquired by Hercules, a specialty chemical company that had decided to enter the environmental service market as part of a strategic diversification plan. BC&E had been approached by Hercules as early as 1964, but the BC&E principals had repeatedly refused to sell. Ultimately, Hercules made an offer that was just too good to pass up. BC&E operated under the Hercules organization for several years and did well. However, by 1975 Hercules concluded that the environmental business was not a suitable fit and decided to divest BC&E. They offered BC&E the option to buy back the company or find another owner of their choice. That was when, in 1976, Fred Eidness contacted Holly Cornell to determine if CH2M HILL had an interest. It did.

Acquiring BC&E had several clear advantages, including the addition of a strong professional staff and a strong marketing presence in the southeast. With BC&E's four offices in Florida; one in Montgomery, Alabama; and one in Atlanta, Georgia, the acquisition would give CH2M HILL geographic coverage of the East Coast from Washington, D.C. to Florida. By 1977 the acquisition was complete, and CH2M HILL had grown by 25 percent.

The year of the acquisition coincided with another pivotal year in the leadership of the firm. The board felt that the transition period with Cornell at the helm could end and that it was time to select the new president. Cornell and the board outlined a two-step process. First, a committee was

appointed to review the organization and identify the responsibilities for the positions of president and chairman of the board. This committee included board members and two outside members. Both of the outside members were familiar with CH2M HILL: John Grey, president of OMARC Industries, a Portland, Oregon, company; and James R. Ellis, an attorney with Preston, Thorgrimson, Ellis, Holman & Fletcher from Seattle, Washington.

The committee concluded that the president should serve as the chief executive officer (CEO). This position would report to the board and be responsible for all operations of the firm and its subsidiaries, excluding only those matters specifically reserved to the board. The chairman of the board would be responsible for long-range planning, the Key Employee (ownership) program, and the general policies and conduct of board meetings. The committee prepared detailed position descriptions for each job and recommended these position descriptions become part of the company's bylaws, a rather unusual feature.

> *As the second step in the process, a selection committee was appointed. This group was composed of eight members, all from CH2M HILL. The committee first identified a long list of candidates for the position of president. There was no need to identify candidates for the chairman of the board, since the plan had been clear that Holly Cornell would move into this position. After reviewing a large number of candidates, the committee created a short list of potential prospects. Each candidate on the list was interviewed by the board and then tested by an industrial psychologist, Bob Cresera, who had extensive experience in assessing candidates for similar positions, both outside and within.*

On December 29, 1977, Cornell announced the selection of Moyer as the new president and CEO. Cornell's announcement included this statement:

> *The selection process itself was a careful one, covering a period of over six months and involving first a criteria committee, which set up the procedures and developed the qualifications. Outsiders—friends of CH2M HILL who had been through the process in their own experience—helped us in this first step. Another committee representing the diverse geographic and technical interests of the firm made the actual recommendation to the board. The committee was convinced, when it completed its work, that CH2M HILL is blessed with many strong, capable leaders. The choice was a difficult one among highly qualified people.*

"When Harlan became president, it really eliminated any differences we'd had between the two organizations. His relationship with the CH2M folks really enhanced the synergism between the two sides."

— Joe Patten

"He has a feel for the business aspects of the business," said Archie Rice of Moyer. "When it comes to the management end of the operation—the ability to read the balance sheet, the ability to dig into the details of the [profit and loss] statement to find out why things are going on—and to have an interest in that area, and then the toughness to do something about it, why those are the things that I think are attractive as far as Harlan's management style is concerned."

Moyer moved from Redding to Corvallis and began his tenure as president and CEO. Cornell, as planned, took over as chairman. Cornell was available to mentor and advise Moyer, but just as Hill had done, Cornell did not offer Moyer unsolicited advice.

"When Harlan became president, it really eliminated any differences we'd had between the two organizations," remembered Joe Patten, a Hill employee since 1958. "His relationship with the CH2M folks really enhanced the synergism between the two sides."

As part of this transition, Howland stepped aside as chairman and as director of operations. For a little more than a year, he took on the role of project director for a major wastewater program in San Diego. He then returned to Corvallis at Moyer's request to become the firm's first personnel director. Howland enthusiastically took on the challenge and created the forerunner of the human resources department.

Although he retired in 1982, Howland remained active in the firm for two more decades. He continued to travel the country to present his eagerly awaited and well-attended show on the events and philosophies that shaped the firm. His *Little Yellow Book*—a booklet that, in a few pages, demonstrates the firm's culture, ethics, and values to "do the right thing"—is in the hands of thousands of employees and friends of the firm and is available in several languages.

Cornell served as chairman until 1981, when he retired from full-time work. He continued working with the firm for several years as a special consultant, most notably bringing his skills to the Milwaukee Water Pollution Abatement program. Cornell died in 1997, leaving a legacy of unmatched professionalism.

Earl Reynolds replaced Cornell as chairman of the board. Reynolds, a CH2M HILL employee since 1948, had spent almost his entire career in Boise, Idaho. He opened that office for CH2M in 1950 and managed its successful growth for thirty years. He remained in Boise during his three-year tenure as chairman. One of the challenges facing Reynolds as chairman was the relocation of the firm's corporate offices from Corvallis to Denver, a bigger city in a more convenient travel location and time zone. When reflecting on

the move, Jim Poirot noted that, many years before, Clair Hill had intuitively understood that there were all kinds of benefits to being located in a major city.

"I believe that is why Clair Hill took membership in the San Francisco Engineers Club, to have a connection with a big city," Poirot said. "The Denver decision had one other element, and that was the one-hour time difference. It gave us a lot more coordinating time with the East Coast. So that time difference really cut out the Seattle or San Francisco options."

The move to Denver also offered significant business opportunities, starting with the design of the Foothills Water Treatment Plant for the Denver Water Board, led by Holly Cornell. Reynolds recalled later, however, that not everyone supported moving the headquarters from Corvallis: "It wasn't a universally popular move. I think Holly and Jim felt that I would be a good person to lead in the transition since I wasn't part of the 'old guard' in Corvallis."

During his term, Reynolds's also helped establish the firm's first Washington, D.C. office so that CH2M HILL could maintain closer relations with governmental agencies and serve as a liaison with Congress on behalf of its clients. Reynolds retired in 1983 and remained in Boise—still one of CH2M HILL's biggest fans.

Following Reynolds' retirement, Jim Poirot stepped in as chairman. Poirot, a CH2M HILL employee since 1956, had served as the Seattle office manager, Northwest District manager, and Eastern District manager. He served in the role of chairman from 1983 to 1993. His tenure was a busy one. In addition to managing the firm's long-range planning and leading the process to identify new ventures and acquisitions, he actively presented CH2M HILL to the outside world. Among other accomplishments, he served with distinction as president of the American Consulting Engineers Council and president of ASCE. In 1988, Poirot was named "Man of the Year" and was the cover story in *Engineering News-Record*, the premier publication of the engineering industry. His peers recognized him for his contributions to the profession, including his leadership of a three-year effort to produce the widely anticipated *Manual of Professional Practice for Quality in the Constructed Project*.

Regarding the manual's reception, Poirot—a man given to understatement—said simply: "The manual, which described how to go about designing and constructing projects with high quality and safety, received broad recognition."

Indeed. The impact of the manual and Poirot's recognition were, in fact, significant. It prompted an invitation to Poirot and Suhr to lecture in China, both on safety and on the matrix organization for engineering. The relationships

1988
Jim Poirot,
"Man of the Year"
Engineering News-Record
cover

they developed, particularly with an engineer named Mr. Dai who came to study with CH2M HILL in the Seattle office, materialized into major sanitation projects funded through the World Bank. Most of CH2M HILL's work evaporated after the debacle at Tiananmen Square in 1989, however, and did not grow for years thereafter.

Poirot retired from CH2M HILL in 1993, yet remained active in professional engineering society work.

Rice retired in 1980. He remained in Corvallis and continued part-time work for the firm for several years, occasionally called on by Moyer to work on special projects. His death in 1995 marked the loss of a great engineer and entrepreneur.

Both Burke Hayes, who retired in 1978, and Jim Howland remained strong supporters of the firm until their deaths in 2007 and 2008, respectively. They are fondly remembered by thousands of employees worldwide for the cultural foundation they and the first generation of employees established.

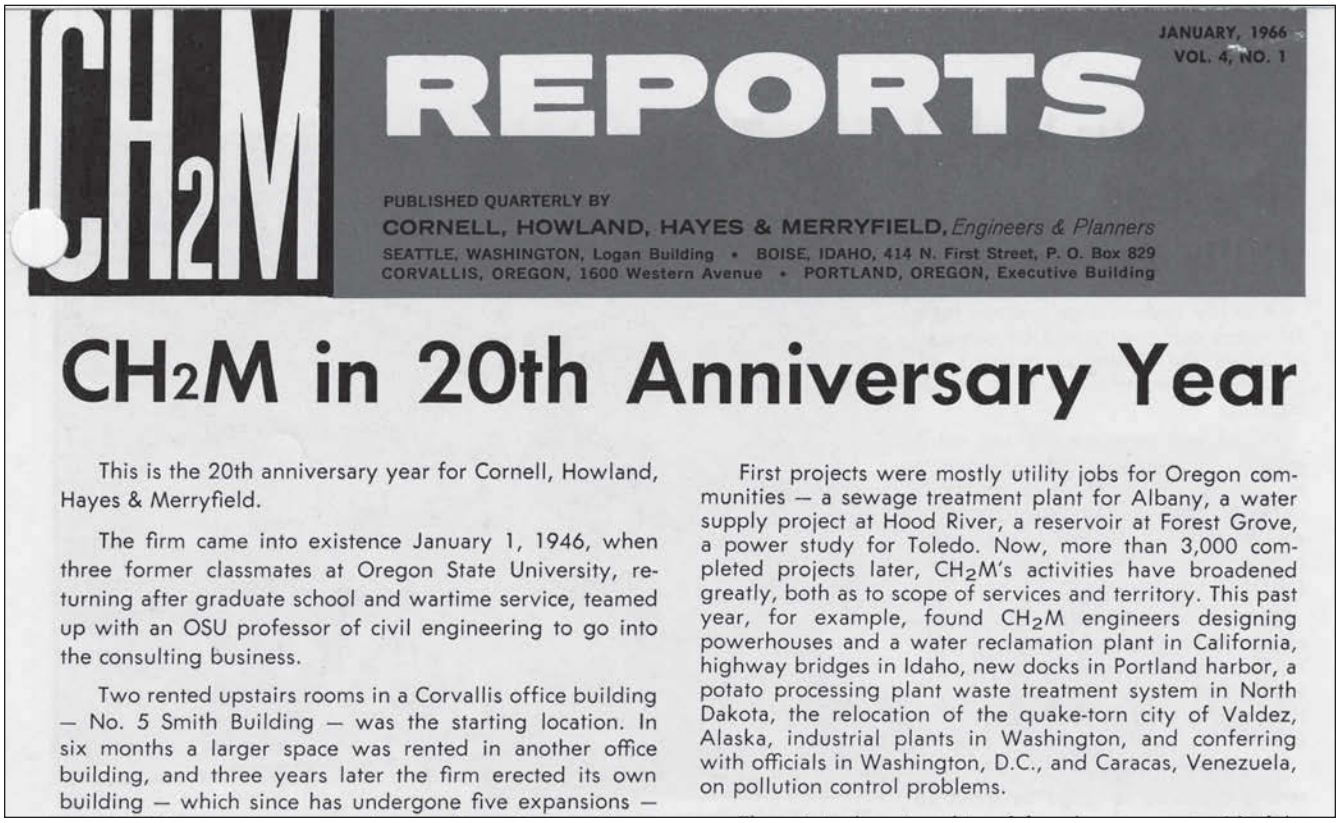
The management transition process that began in 1974 left the firm in the hands of a new generation. The new leadership team, however, was still composed of CH2M and Hill veterans. The president, chairman, director of technology, regional and district managers, discipline directors, and corporate staff were, with rare exception, people with twenty to thirty years of longevity with the firm. For many of these people, CH2M HILL was the only firm they had worked for after graduating from college.

One of the many great achievements of the firm's founders was the successful manner in which the leadership transition was implemented. There was no loss of momentum, no dramatic change in direction or policies. And there was no loss of key staff members. There was a universal acceptance of the new leaders—an acceptance that allowed the "second generation" to lead CH2M HILL to new heights.

In his book *Built to Last*, Jim Collins notes that "it is not the quality of the leadership that most separates the visionary companies from the (other) companies. It is the continuity of quality leadership that matters—continuity that preserves core (values)."

In passing the baton to a new generation of leaders, the founders understood that, at such an important juncture in the company's history, home-grown management would best serve the company's vision. The men who were selected to lead the firm into its next generation embraced and preserved the values and the culture that were built upon the foundations of the two firms from Corvallis, Oregon, and Redding, California.

Jim Howland, Holly Cornell, and Harlan Moyer on the day Moyer became president and chief executive officer.



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CH2M in 20th Anniversary Year

This is the 20th anniversary year for Cornell, Howland, Hayes & Merryfield.

The firm came into existence January 1, 1946, when three former classmates at Oregon State University, returning after graduate school and wartime service, teamed up with an OSU professor of civil engineering to go into the consulting business.

Two rented upstairs rooms in a Corvallis office building — No. 5 Smith Building — was the starting location. In six months a larger space was rented in another office building, and three years later the firm erected its own building — which since has undergone five expansions —

First projects were mostly utility jobs for Oregon communities — a sewage treatment plant for Albany, a water supply project at Hood River, a reservoir at Forest Grove, a power study for Toledo. Now, more than 3,000 completed projects later, CH_2M's activities have broadened greatly, both as to scope of services and territory. This past year, for example, found CH_2M engineers designing powerhouses and a water reclamation plant in California, highway bridges in Idaho, new docks in Portland harbor, a potato processing plant waste treatment system in North Dakota, the relocation of the quake-torn city of Valdez, Alaska, industrial plants in Washington, and conferring with officials in Washington, D.C., and Caracas, Venezuela, on pollution control problems.

Reports, January 1966, a long-running newsletter for clients.

CHAPTER 12

Sharing the Rewards—Part Two

A common thread unites many of industry's most powerful leaders and visionaries: They willingly share their power. Weaker leaders rule by intimidation and fear, withholding information, or refusing to empower those who work for them. Strong leaders freely share information, actively seek the advice of others, and appropriately reward those who contribute to the success of a venture. They recognize that true success is gained by the efforts of many, not just a few.

Much of CH2M HILL's success can be tied directly to the firm's approach to rewarding some of the best and brightest minds in the industry. The founders' values of inclusion and ownership brought them and the company they formed extraordinary benefits that they had never envisioned.

By 1960, after years of successful business growth, CH2M had expanded to more than two hundred employees with revenues of $1.5 million. Believing that they needed to expand ownership to perpetuate the firm, the partners began to work on a concept that would allow more employees to share in the firm's profits. They understood that the success of CH2M did not rest with a few leaders but, rather, with a larger group of employees who actively contributed to the success of the organization.

To the original CH2M partners—Holly Cornell, Jim Howland, Burke Hayes, and Fred Merryfield—Archie Rice and Ralph Roderick were added almost immediately. Several more partners were added in the early 1960s, including Earl Reynolds (1960) and Bob Adams, Sid Lasswell, and Wayne Phillips (1961). In 1962, Fred Harem and Bill Watters joined the team. The partnership had now tripled.

In hindsight, the partners' decision to broaden the ownership represented a major turning point for the firm and established a core value that remains a powerful driver to this day. They chose to share the ownership—and the rewards that accompany ownership—with the people who were contributing to the success of the firm. Nothing required them to take this path. They had a successful business—well established, and with a solid reputation for quality work and client service. The first partners (the founders plus Rice and Roderick) could have chosen to continue to hold on to the firm as their own, reaping substantial benefits when they retired. They could have chosen to sell the company to a larger engineering firm looking to expand its reach, or to sell stock to people outside of the firm by going public. Instead, they chose to share the risks, responsibilities, and—they hoped—the rewards of ownership. It was a move borne of generosity and humility, and of the understanding that the whole is greater than the sum of its parts.

"We should do some real soul-searching to see if we really want to grow as we have said we want to. If we do, then I cannot see how we can become a multi-million dollar organization by operating as a partnership."

— Archie Rice

To Incorporate or Not?

With a dozen partners now managing more than two hundred employees in four offices, the partnership arrangement was workable, if somewhat unwieldy. Discussion of forming a corporation was a sensitive matter; the prospect was raised and revisited many times. In a partners' meeting in January 1965, a lengthy discussion considering incorporation raised questions and concerns. Howland noted that some of the engineers felt it was unethical to incorporate. "They felt that once you stamped a drawing or report, you should not be able to 'hide behind the corporate veil,'" he said.

Proponents of incorporation engaged in animated discussions with those who opposed the move. Demonstrating his visionary approach to the evolution of the company, Rice spoke up: "We should do some real soul-searching to see if we really want to grow as we have said we want to. If we do, then I cannot see how we can become a multimillion-dollar organization by operating as a partnership."

At the conclusion of the meeting, there still was no decision, but they had decided to study the matter further. The partners passed a resolution directing the management committee to develop a detailed corporate plan. Only one partner opposed. This approach to dealing with difficult issues within the CH2M organization became standard procedure: Study the issue thoroughly, seek consensus, and proceed cautiously.

The decision to delegate further study to a committee did not by any means end the discussions. Some of the partners continued to encourage incorporation, while others did not see the need to change from a structure that was already working. According to Howland, Rice remained a staunch proponent of change. "Archie was a great advocate of (incorporating), something the rest of us dragged our feet on. But he felt it was the way to go, and I think it was because it allowed us to develop our ownership system."

"We should keep in mind what we are trying to accomplish," said Rice in one of many discussions on the subject. "We want to keep people here, and we want the future owners to set the future policy of the firm. Salary can accomplish one thing, but shared ownership accomplishes another."

Perhaps the most cautious of the founders, Howland carefully examined the pros and cons of incorporation. He had struck up an acquaintance with Clair Hill and would, on occasion, chat with Hill about particular business issues on which he was working, as well as about a merger and working together. Although Hill was the sole owner of Clair A. Hill and Associates, he had operated as a corporation soon after beginning his engineering business.

He understood that the corporate structure allowed him to limit his personal liability, gain certain tax advantages, and realize other benefits and operating efficiencies. Hill confirmed to Howland the course Rice had advocated: If CH2M was to continue sharing the ownership, a corporate structure was most likely a better vehicle than a partnership. Howland was now convinced.

Although some issues remained, the benefits of incorporation ultimately outweighed the concerns. At a partners' meeting in October 1965, Hayes made a motion to authorize the signing of formal articles of incorporation. Reynolds seconded. The motion to incorporate was passed unanimously by the partners. CH2M would commence doing business as a corporation on January 1, 1966.

Incorporation was clearly an important step, but the question remained as to how to reward the former partners after incorporation. How could their efforts and contributions be acknowledged and rewarded in a fashion that was similar to the profit sharing of the partnership?

Rewarding the Key Contributors to the Firm

As the structure of the new corporation took shape, one of the goals was to develop a reward-sharing system that was similar to the former partnership. During the incorporation process, the concept of the "Key Employee" (KE) program was born. The intent of the KE program was to mirror the broader ownership structure of the partnership, particularly with ownership transfer and bonus payments. From the outset, the term "employee" was intended to be synonymous with the term stockholder or owner, and the use of the term "key" recognized that rewards would go to those critical staff who contributed the most to the firm's success.

As the CH2M leaders envisioned, the KE program was intended to forge an unbreakable connection between exceptional projects, profitable financial performance, and superior people. s were the leaders and owners of the firm. Their contributions to the success of the firm were to be rewarded financially, beyond their salaries.

The KE bylaws made this linkage clear, stating that the ownership policy was in place to "define the policy of the corporation to maintain ownership of its stock by compatible persons actively contributing to the success of its operations. This policy is based on the belief of the original stockholders that stock ownership by competent, loyal, contributing employees will be of continuing benefit to the corporation."

Although there were certainly financial rewards with respect to becoming a KE, the benefits and responsibilities extended far beyond compensation. Election as a KE served as recognition of one's value to the firm and provided additional career enhancement and professional development opportunities. Just as important, KEs were responsible for contributing to the future direction of the firm by providing their input and comments on issues critical to organization. If they were successful, the financial rewards included cash and stock, the latter given to enhance their long-term financial position.

One significant benefit of KE membership was the privilege to attend, at company expense, the annual KE meeting. These meetings were originally held in Corvallis, Oregon. KEs from around the firm met to learn about each other, learn about the firm's premier projects, discuss business issues, elect the board of directors, and vote on candidates proposed for KE status. The meetings created a sense of belonging. Excited and energized, KEs returned to their jobs with a renewed sense of purpose.

Owning a part of the firm through stock was a necessary and integral component of the program. The overall value of the firm, which could then be used to set a stock price, was based on a formula, which set the stock value at book value plus 1.5 times the average net operating income over the past five years. The stock valuation formula using these two primary components—book value (representing the built-up value over time) and income (or annual profitability)—has been substantially modified over the years, but remains the foundation of CH2M HILL's stock valuation to this day.

KEs earned stock in the organization through the KE bonus (KEB). Initiated in 1966, KEB was paid in stock, with cash sufficient to pay the income tax on the bonus. Stock was not "liquid" and could only be redeemed for cash upon retirement, resignation, dismissal from the company, incapacity, or death. As CH2M continued to grow and succeed, KEs saw the value of their stock escalate. In good years, senior KEs could significantly raise their annual compensation via their KEB.

Initially, distribution of the KEB was somewhat arbitrary. During the first year, it was issued at the sole discretion of the board. For the next three years, in classic CH2M fashion, the board distributed the KEB based on a mathematically precise point system, which took into account an employee's position, tenure with the firm, and annual evaluation. Although the point system solved the arbitrary nature of bonus distribution, it was complicated. Additionally, the system did not allow much flexibility to differentiate among employees who made greater or lesser contributions. Following the merger with Clair Hill and Associates in 1971, the board felt that a new bonus distribution process was

needed. Turning to Rice, the board asked him to head the development of a new, fair, and more equitable program.

Recognizing engineers' need for precision, Rice developed a new bonus formula. This new calculation looked at the employee's length of time as a KE, with a distribution weighted at 35 percent of his salary, and 65 percent of salary multiplied by longevity. The board adopted the new formula in 1971. Occasionally, application of the formula did not add up to a bonus amount that, according to the board, reflected a particular individual's value to the firm. Accordingly, the board would exercise discretion and make an adjustment—either up or down—to the amount of a bonus awarded. As long as the KE population was small and the people were known to the board, these individual adjustments could be handled fairly easily.

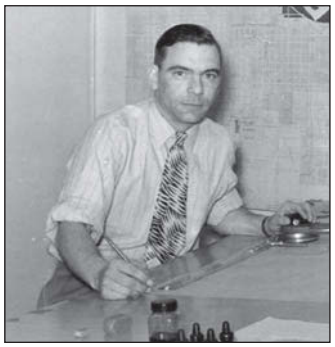
Who Is Key?

CH2M had incorporated. The KE program had been defined and implemented. The next step was to bring in the first new KE. In 1966, the first year of incorporation, CH2M elected fifteen KEs. The process of adding KEs was to become an annual ritual—almost a rite of passage for those who were selected. To gain entry into what became an exclusive "club," the current KEs reviewed candidates and voted on who would become new KEs.

While the criteria for becoming a KE did not limit selection to those who were engineers or other professionals, the first couple of elections added twenty-seven new KEs, all of whom were engineers. Over time, however, ownership was expanded to include an engineering technician, Neils "Swede" Nordquist, a long-time employee who had continued to "actively contribute to the success of the operations." The decision to recognize that first "non-engineer" may have initially seemed controversial, but it was a step that significantly differentiated CH2M from most of the other professional-service firms at that time. The emphasis was on rewarding those who contributed to the firm's financial success, irrespective of job description.

After CH2M had operated as a corporation for a few years, it became apparent that KE elections would benefit from a more formalized process that would theoretically remove much of the subjective nature of candidate selection. As was often the case when CH2M engineers tackled a problem, they developed yet another formula to facilitate the process of KE candidate selection.

The formula criteria were based on the salary grade and rating system originally developed by Fred Merryfield. Recognizing that there would occasionally be viable candidates who did not fall directly in line with the



Neils Nordquist

formula conditions, a "kicker" was added to permit the inclusion of special people who had, for whatever reason, not met the criteria, but who were deemed valuable because of their contributions. One of the first KEs who fell under this "special" criteria was Charles V. "Tom" Gibbs, who was made a KE in 1976, only two years after he joined the firm—an early entry into the KE program. Gibbs had been instrumental in landing the Milwaukee Water Pollution Abatement Program (see Chapter 13), and the leaders did not want to wait for Gibb's tenure to meet the formula requirements.

As with any program of reward and recognition, the KE program had its share of controversy. Some employees felt that they were competent, loyal, and contributing, yet wondered why they were not made KE. This issue was tackled in the mid-1970s, when the board asked Rice to take on the challenge of broadening the ownership benefits for all employees.

Rice was ahead of his time when he made his next series of recommendations, many of which would not be implemented until twenty-five years later. First, he recommended that the ownership program be revised to allow all permanent employees to purchase stock, irrespective of whether they were KEs. He felt that all staff would be motivated to increase profits if they were owners of the firm. Expansion of the ownership program would also bring the added benefit of providing greater operating capital for the company as employees paid for (invested in) stock. Second, Rice recommended increased stock liquidity for the existing stockowners. The stock was then a long-term retirement vehicle, but employees could not buy or sell it until they retired or left the company.

The board was not ready for such radical changes to the program. After carefully considering Rice's recommendations, the board concluded that they would leave the existing program in place for the time being. Rice, however, remained interested in changing the ownership program to meet the original objectives. Undeterred by the board's rejection of his earlier recommendations, he again approached the board in 1977. His report concluded that achievement of the goal to "motivate and keep our key employees" was questionable. Too many valuable employees were not being elected as KEs, and thus not being recognized for their contributions. CH2M HILL had lost several important employees during the 1970s, and Rice felt that the program was not helping retain the staff members who were critical to the success of the firm.

In considering Rice's report this time, the board began to reexamine expansion of the KE program, as well as a broadened ownership program that would touch more employees. As a result, two significant changes were made to the ownership program in 1977.

Benefits for All

First, an employee stock-ownership program (ESOP) was created to offer some of the benefits of ownership to all employees. The program was developed consistent with Rice's belief that stock ownership would be a motivator for all employees, encouraging them to work toward increasing profits for the firm. CH2M HILL's ESOP was administered similarly to a profit-sharing plan. On an annual basis, the company made contributions to the ESOP on behalf of all CH2M HILL employees. Employees then received an allocation of stock based on their salary.

Second, the KE program was modified to provide KEs the opportunity to obtain cash for their stock while they were still actively working. This new provision also allowed individual KEs to purchase additional stock, up to the full amount of their bonus, providing that other KEs were willing to sell an equivalent number of shares from their bonus. This modification was well received, but was terminated two years later because of concerns that the internal buying and selling of stock would cause the KE program to be subject to the regulations of the Securities and Exchange Commission.

Both of these changes, while well intentioned, still did not fully meet the need for broadened ownership and stock liquidity. It took a different CH2M HILL board nearly a quarter of a century later to solve the ownership puzzle the way Rice had earlier envisioned (see Chapter 21).

Sharing the Wealth

Yearly profits for CH2M HILL were allocated in three major categories: retained (or reinvested) earnings, general employee benefits, and the KEB. The first priority for funding was retained earnings—reinvesting profits back into the firm as the principal source of capital to keep it healthy and growing.

General employee benefits were the second priority. These rewarded the entire employee population and acknowledged everyone's contribution to the success of the organization. These benefits included a pension program, the ESOP, and a general cash bonus. The general cash bonus was paid at year end to all employees. Some form of cash bonus was paid every year from 1946 to 2000 (when the stock program changed), with the exception of one unprofitable year in 1976.

The KEB was funded as the third and final priority. KEs were rewarded with a bonus only when the firm had performed well enough to fund the first two categories.

"No man, who continues to add something to the material, intellectual, and moral well-being of the place in which he lives, is left long without proper reward."

— Booker T. Washington,
educator and activist

Major Projects Beget Major Rewards

The firm grew rapidly in the 1970s, in large part because of the "megaprojects" it took on, such as the Upper Occoquan Sewerage Authority and the Milwaukee Water Pollution Abatement Program. These projects contributed significantly to CH2M HILL's growth, not only financially, but also by enhancing the firm's reputation as a major player in the industry. The employees who had primary responsibilities for winning and delivering these projects were also of major value to the firm even if they were already getting recognition as KEs. Their contributions needed to be recognized, and the question arose as to how to best reward these critical staff members.

From this need evolved yet another permutation of the KE program: the performance incentive bonus (PIB). Implemented in 1978, this bonus was funded from the KEB pool and was a supplemental bonus paid to a select group of crucial employees to reward outstanding current performance. The PIB differed from the KEB in that it was paid in cash, not stock, and was intended to recognize one-time contributions, as opposed to the KEB formula that was driven by position and tenure.

While the first year saw the PIB awarded to a small group of employees, in subsequent years, the PIB was expanded to include a much larger group. The bonus was based on a percentage of the employee's salary, as well as a performance factor based on their most recent annual evaluation. PIB bonuses could range from 8 to 60 percent of an employee's salary—a substantial and meaningful reward.

A Rewarding Program

The KE program began in 1966 and remained in effect until the end of 1999. By that time, the ranks of KEs had swelled to more than one thousand. This successful thirty-three year program had been developed when there were only a couple of hundred employees and the firm was still CH2M. By the time the program was replaced with a formal and detailed stock ownership program, the firm had more than nine thousand staff and was now CH2M HILL, a major player on a worldwide scale. There had certainly been a few growing pains along the way, but the KE program adapted, grew, and evolved along with the firm.

Based on the founders' beliefs that loyalty and contribution to the firm should be rewarded, the KE program was a success. The firm prospered in large part because recognition of KEs, coupled with a meaningful reward program, ensured that CH2M HILL was able to retain some of the best and the brightest minds in the industry. Because KEs were empowered through their ownership of the firm, these dedicated and committed employees helped the firm continue to succeed. Howland noted:

> *I think one of the reasons that we have been able to do what we've done is that we took the long-range view to decision-making… we set up our benefits to the people pretty much on a long view basis. The people who benefit the most from the firm through our bonus system are the people that stay with it a long time and make it progress over a long time. The right way to run a firm is that the people who contributed ought to share in the returns in money and satisfaction, too.*

Bob Chapman

You've Arrived

Bob Chapman was Fred Merryfield's last student at Oregon State, and Merryfield's only student for a sanitary engineering design course. As a result, arrangements were made that they would meet at Merryfield's home one afternoon a week. The professor's wife, Anne, discovered that Chapman was working on his master's thesis (researching the effectiveness of virus removal by coagulation and filtration), and that he was using pilot equipment scrounged from Walt Conley at CH2M. Chapman, though, knew little about how to culture and quantify virus. With her background, which included a PhD in biology, Anne soon obtained a specimen culture from Texas and arranged for a biology professor at the university to train the student.

Through all of this, not once did Merryfield discuss Chapman's potential for working for the firm. However, Merryfield later sent Ralph Roderick to the Corvallis water treatment plant where Chapman was the chief operator, and where he was also running his pilot project. Chapman recalled:

> *This fellow came into the plant while I was engrossed in getting the pilot working. He was wearing a suit and tie and hat, and I mistook him for a chemical salesman. I asked him to hang out in the office and that I would talk to him later. Boy, was I surprised and chagrined when he explained who he was and that he was there to offer me a job.*

Chapman joined CH2M in 1966 fresh out of college and ended up spending his entire career with the firm. "I came right to CH2M HILL and never left…I never felt there was a better opportunity elsewhere," he said.

One of his first jobs was to work on the advanced waste-treatment demonstration plant at South Lake Tahoe. Progressively taking on more challenging assignments, in 1974, when he was thirty-one years old, he was leading the design of the benchmark Foothills Water Treatment Plant project for the Denver Water Board—a 500-mgd facility in Colorado. "It was incredible to be given the chance by Holly Cornell and Fred Harem to take on the responsibility for that size project," Chapman said.

His efforts did not go unrecognized. That same year, he was elected to participate in the KE program. Howland personally sat down with Chapman to congratulate him and explain the program's benefits. Being elected a KE gave Chapman "the feeling that you'd earned respect from the senior leadership of the firm."

The honor was so great for Chapman that he did not immediately absorb many of the other benefits that accompanied KE status. "The financial aspect of becoming a KE didn't dawn on me for some time. My 'class' (of KEs) was the last one that had to actually purchase our initial shares out of our own pockets (versus a bonus). I remember discussing with my wife, Meredith, how we were going to come up with that $1,000…we really had to scrape. I had no idea it would be the best investment I ever made, but I certainly was motivated to make it pay off."

Chapman still views his induction into the KE program as a highlight of his tenure with the firm. "More than anything, it was such a motivator. It was an opportunity to feel included, to catch the spirit and be a part of something bigger."

Deep tunnels, capable of holding up to 400 million gallons of wastewater, were the heart of the Milwaukee program.

CHAPTER 13

The Milwaukee Water Pollution Abatement Program

The Native Americans who first lived near what is now Milwaukee, Wisconsin, were drawn to the area by its water resources. They called their home, "Mahn-a-wau-kie seepe"—gathering place by the waters. Three hundred years ago, fur traders and French missionaries also came to the area because of the plentiful water resources. Describing the lower Milwaukee River in 1836, James Buck wrote, "Between the bluffs ran the river, like a silver thread in which the Indian could detect and spear a fish at the depth of 12, and even 18, feet and upon whose surface sparkled the rays of the morning sun, as upon a mirror."

In 1846, the City of Milwaukee was chartered. As it grew, so did the need for infrastructure such as water and sewer systems. Plans for such facilities were first commissioned by the city council in 1868, yet no provisions were made for wastewater treatment. Further, much of the system constructed to serve Milwaukee consisted of combined sewers—storm and sanitary waste conveyed in the same conduit—a design decision that would seriously complicate pollution control efforts one hundred years later.

Milwaukee's Pollution

By the late 1800s, the local rivers and the shores of Lake Michigan were polluted. Combined sewer overflows occurred at nearly every street end along the Milwaukee River, changing it from an aesthetic asset for Milwaukee residents to a repugnant open sewer. In 1913, the city's Sewerage Commission was established. By 1921, the need for sewer service in the outlying portions of Milwaukee County prompted the formation of the Metropolitan Sewerage Commission of Milwaukee County, whose function was to construct trunk and interceptor sewers to convey sewage to the treatment plant. In 1925, the commission completed the largest plant in the nation to use an activated sludge process—the Jones Island Wastewater Treatment Plant.

Over the next few decades, it became apparent that more treatment capacity was needed and that the service area for treatment facilities would need to include Milwaukee and the surrounding counties. So, in 1960, the Milwaukee Metropolitan Sewerage District was created to provide the institutional structure for the city and county sewerage commissions to function as a single unit. The district received authority to require Milwaukee County to levy taxes to meet its operating and capital expenses.

Huge growth in the district had, by 1974, created a demand for trunk and interceptor sewers that was not being met. The suburban communities connected to the district's system allowed rainwater to enter their sewers, resulting in raw sewage overflow during storms. Despite the completion of

the South Shore treatment plant in 1968, severe rainstorms overwhelmed the district's system, and massive flows literally washed the biological culture out of the plant and into Lake Michigan.

In 1972, the states of Illinois and Michigan had seen enough and sued the district in federal court. That same year, Congress passed the Clean Water Act, which empowered the U.S. EPA to do three things: (1) issue permits for treatment plants containing effluent limitations, (2) set deadlines for achieving such limitations, and (3) require industrial customers served by a community's treatment plant to pay their fair share of the costs via a user charge.

One year later, the state of Wisconsin's Department of Natural Resources issued discharge permits to the district for its two treatment plants. The parties failed to reach an accord on the terms and schedule of the permits, so they sued each other.

CH2M HILL Enters the Fray

In response to the federal requirement that industrial users pay their fair share, the district issued a request for proposal (RFP) to conduct what became known as the User Charge/Industrial Cost Recovery (UC/ICR) study. CH2M HILL's Corvallis, Oregon, office received a copy of the RFP in December 1974. No one in the firm had any relationship with the district except for Charles V. "Tom" Gibbs, who had joined the firm in June of that year after successfully leading Seattle Metro's cleanup of Lake Washington and Puget Sound. The firm was attracted to Gibbs because of his success in Seattle and for his contacts with major sewerage agencies throughout the country. He had been the founder of the Association of Metropolitan Sewerage Agencies in 1969 and had served as its president until 1974. The association had played an active role in writing the Clean Water Act and its implementing regulations.

Sid Lasswell, CH2M HILL's water and wastewater discipline director, handed the RFP to Gibbs and said, "See what you can do with this." Gibbs had never been to Milwaukee, but knew two of the district's top managers from their affiliation with the association—Don Weiland, director of engineering, and Chuck Hintze, director of finance.

Gibbs flew to Milwaukee and visited the district's UC/ICR project manager, Wayne St. John. Gibbs learned that the district was planning a $600-million capital improvement program to alleviate the overflow and flooding problems. Gibbs understood that an outsider like CH2M HILL would need local associates who knew the intricacies of the district's system and who could provide legal and accounting advice. Gibbs assembled a team with

J.C. Zimmerman, a local engineering firm with strong ties to the district; the accounting firm Arthur Young; the law firm of Quarles & Brady, whose partner Richard Cutler was widely respected in Milwaukee; and Envirex, whose research director William Katz was closely allied with the district's efforts to develop new treatment technologies.

In the middle, Mike Anglea, drawing a water sample.

Gibbs returned to Corvallis to get approval for the proposal effort. He recommended a budget of $25,000 (a huge amount for CH2M HILL), justifying the expenditure on the basis that winning the UC/ICR study would position the firm for a role in the $600-million capital improvement program. Cornell and Lasswell agreed to proceed and, with the help of Earl Reynolds convinced a young project manager from that office, Mike Anglea, to join Gibbs in the proposal effort. Anglea was told that if CH2M HILL won the project, he would lead the effort and manage a new office to be opened in Milwaukee.

The team won the study contract. The project was started in 1975, and the firm opened its "Milwaukee" office in nearby Wauwatosa on Mayfair Road. Early on in the study work, Anglea and Don Marske, another CH2M HILL employee who transferred to Milwaukee, recognized the need for a community relations perspective. They hired Barkin, Herman, Solocheck, and Paulsen, one of Milwaukee's premier public relations firms, to assist in the study. Norm Paulsen was the firm's principal on the project, and he became an invaluable resource for CH2M HILL. Whenever public relations and media expertise were needed—the UC/ICR project and, later, the pollution abatement program were often subject to intense public scrutiny—Paulsen was called upon for his advice.

In spring 1976, on one of Gibbs's trips to Milwaukee as principal-in-charge for the study, Anglea reported to Gibbs that, at a recent meeting, one of the district's commissioners had acknowledged that the district's staff was too small to manage the upcoming $600-million capital program. At the same time, the county executive created a task force to study the district's needs for managing the capital program. The task force, at the urging of District Commissioner Harry Williams, recommended hiring a program manager.

Gibbs went to Bob Borchardt, the district's executive director, and offered to make a presentation on the benefits of a program management approach. Given the green light, Gibbs and Anglea immediately began to assemble a team of consultants. J.C. Zimmerman, already a subcontractor to CH2M HILL, signed on. Don Dupius, the manager of HNTB's local office, saw the potential of such an association, as did Len Anhalt, a partner in Graef, Anhalt, and Schloemer. Gibbs and Anglea traveled to Sheboygan to explore an association

with Donohue and Associates, a firm with strong ties to the district. They signed on and offered Keith Garnett as their participant on the team.

Sensing that the use of minority firms would be critical, Gibbs asked Gene Bentley of Cleveland's Polytech to join the team. Bentley agreed to open an office in Milwaukee if the team was selected.

In July 1976, Gibbs met with Borchardt in his district office at the Jones Island Treatment Plant and asked if CH2M HILL's chances of being selected would be helped if Gibbs were program manager. Borchardt thought he "could persuade people with that ammunition." Gibbs made the decision on the spot; his future plans would include a move to Milwaukee.

The leaders of CH2M HILL's water and wastewater discipline had a hard time fully grasping the potential of the Milwaukee project. When asked for nominees to staff key positions, none of the discipline's stars were suggested. Instead, two individuals with no background in wastewater projects were selected: Bob Schilling, an electrical engineer, and Frank Jenes, a transportation specialist. Gibbs decided that Schilling would be given the title of "technical services director" and made responsible for managing support services, while Jenes would be "deputy program manager." Gibbs also asked Harry Teel, the firm's construction management discipline director, to join the team.

Anglea and Gibbs then approached the associate firms for nominees for the proposed management team. Each firm responded by offering key people who would become pivotal to the project's success: HNTB—John Hribar and John Curtis; Donohue and Associates—Keith Garnett; Graef, Anhalt, and Schloemer—Dave Kluge; J.C. Zimmerman—Al Sobscak; and Polytech—Gene Bentley. Each firm was contractually committed to perform a certain percentage of the work, as measured by dollar volume. CH2M HILL retained 51 percent of the work, while the other firms' percentages were based on a number of factors, including technical capabilities, defined needs of the district, and size of staff in Wisconsin.

The district's RFP was published in October 1976 and produced forty-three responses. After receiving the proposals, Borchardt appointed a blue-ribbon committee to screen them and select a short list. The committee selected three teams to interview. The CH2M HILL team (along with Harza Engineers and STR) was told to prepare for a three-hour interview on March 3, 1977. After many rehearsals, the team presented itself at the Red Carpet Inn at Mitchell Field, the interview site.

"This is the time for the tough to get going. Do what you have to do to save the job."

— Holly Cornell

The interview lasted more than three hours. Gibbs was asked repeatedly about the firm's willingness to accept liability for its actions. He assured the committee that the firm would stand behind its work.

Harry Teel

Afterward, Gibbs left for the weekend in Seattle via Chicago, where he booked a hotel room in preparation for an early morning flight. Anglea called at 10:00 that evening and said, "Get packed, you're coming to Milwaukee!"

Developing a Master Agreement

Gibbs returned to Milwaukee the following Monday and met with Borchardt and Katz to begin preparing a contract. By this time, Katz had become the district's director of technical services, to whom Gibbs was directly reporting. Katz suggested that the contract include a master agreement (MA) and follow-on task orders (TOs). The MA provided for complete reimbursement of all expenses associated with the program management office (PMO), including payment for relocating all staff assigned from outside Milwaukee. TO No. 1 included the PMO mobilization and preparing a facilities plan for the $600-million capital improvement program. People in Corvallis initially did not seem to understand what program management was all about. Lasswell complained about "all of the administrative crap. Let's get on with the study and then design something."

Borchardt, Katz, and Gibbs kept Wisconsin's Department of Natural Resources Paul Guthrie and U.S. EPA's Region V water and grants staff apprised of the progress toward agreement. On one trip to Chicago, EPA staff instructed Gibbs to remain in the waiting room while Borchardt, Katz, and Guthrie were invited into a meeting. After an hour, Borchardt emerged from the meeting and said to Gibbs, "It's over. I have to go back and select individual consultants for each of the elements of the facilities plan. EPA will not approve the program management approach." Gibbs was shell-shocked, but said to Borchardt, "Bob, we've been working on this together for nine months. Give me a week to turn this around before you kill the program."

Gibbs left the EPA, went back to his hotel, and made two phone calls. The first was to Cornell. Cornell was devastated, but said, "This is the time for the tough to get going. Do what you have to do to save the job."

The second call was to Hal Cahill, EPA's chief of construction grants, with whom Gibbs had worked on Association of Metropolitan Sewerage Agencies activities. Two years prior, Cahill asked Gibbs to help him find ways to expedite EPA grant-supported projects. Together, they had jointly developed two successful program management projects in Oregon and Idaho. Gibbs and

Anglea went to Washington, D.C., the next week with all of the material used in the interview. Cahill asked them to go through the interview for him and one of his staff. He asked for a copy of the MA and TO No. 1, and then asked that Gibbs bring Katz to D.C. for another meeting the following week.

The following week, Katz met with Cahill, but Gibbs was asked to wait in his hotel room. Late in the day, both Cahill and Katz appeared at Gibbs's hotel door with the message that the Milwaukee program management project was approved. They gave Gibbs their notes and asked him to prepare a memorandum of understanding (MOU) outlining the roles and responsibilities of the district, EPA, Wisconsin's Department of Natural Resources, and the PMO. A "liquid-based" celebration ensued, according to Gibbs.

The resulting MOU defined CH2M HILL's responsibility for all planning, design, and construction management aspects of what became Milwaukee's Water Pollution Abatement Program (WPAP). All parties signed the MOU, and the district and the commissions approved the MA and TO No. 1 in late May. Notice to proceed was given on July 1, 1977.

The Program Begins

Shortly after approving the PMO contract, the district and Wisconsin's Department of Natural Resources reached agreement on their legal dispute. A stipulated order of the Circuit Court of Dane County specified the effluent standards for discharge into Lake Michigan, mandated eliminating overflows from the separate sewer system, limited the frequency of overflows from the combined sewer system, and set a timetable for completing the necessary construction of facilities. The entire program was estimated to cost $1.9 billion—over three times the initial projections for Milwaukee's capital improvements program.

The doors of CH2M HILL's Milwaukee PMO opened for business in early July. John Hribar of HNTB immediately began to prepare a set of standards for PMO products. These proved invaluable in creating an integrated staff and producing documents that met the standards of a professional office. Frank Jenes, a CH2M HILL employee, started programming a computer-based project management tool—SPAAM (staff planning, accounting, and management). All project managers were required to use this tool; with it, none of the eventual hundreds of TOs overran their professional services budgets.

Meanwhile, on July 29, 1977, Judge John Grady of the U.S. Court of Appeals for the Ninth Circuit ruled in favor of Illinois and Michigan in the suit they had filed against the district five years earlier. He ordered the district to eliminate all overflows from both the separate sewers and from the combined sewers. Judge Grady further directed that discharges from the treatment plants into Lake Michigan had to meet Illinois' standards—a stringent form of advanced waste treatment. He ordered the district to present, by September 9, a schedule within which his order would be accomplished.

There were now two conflicting legal rulings: one in Circuit Court for Dane County, Wisconsin, between the district and Wisconsin's Department of Natural Resources, and the newer decision from the United States Court in Illinois. Because of concerns that the district's outside counsel was not up to the challenge of responding to Judge Grady, Gibbs approached Katz with the suggestion that the two of them begin to work on a compliance schedule, despite believing that it would not be possible to create a legally binding document in the time allocated by the judge. Together, they approached Harry Williams, who had just been appointed chairman of the Sewerage Commission. Gibbs and Katz recommended that the district retain Richard Cutler of Quarles & Brady, Milwaukee's second largest law firm, to represent the district. Williams and the commission agreed, so Cutler and the PMO immediately worked on the response to Judge Grady. A schedule was negotiated with Illinois' engineers and attorneys; Judge Grady approved it on November 15, 1977.

When the PMO outgrew its initial office, Gibbs was "advised" that the mayor expected the PMO to be downtown and that space was available in the First Wisconsin Bank Building at the corner of Water and Mason Streets. Gibbs leased an entire floor in that building, an unpopular decision with the PMO staff, who believed that being located downtown would greatly add to their commute. Politics aside, the move proved to be fortuitous. The district moved its entire administrative and engineering operation into another floor of the bank building, thus affording excellent communications between the two staffs. This "salt and pepper" intermingling of PMO and district staff, at one time taking up four floors of the building, became one of the cornerstones of success for the program.

Jones Island Treatment Plant

Success—Against the Odds

Once the initial "thrill of victory" in winning the program management job wore off, the hard work of rehabilitating the entire Milwaukee sewage system began in earnest. The challenges the district, CH2M HILL, and the associate firms were about to take on can be better viewed in retrospect with a few mind-boggling statistics. By the time the PMO was shut down nearly twenty years later, in the mid-1990s, the Milwaukee WPAP would go on record as the largest single civil infrastructure improvement program in Wisconsin.

The total program cost, including design and construction, was $2.3 billion, within about 4 percent of the budget set at the outset of the program (adjusted for inflation). Construction involved seventeen miles of deep tunnels ranging in size from six to thirty-two feet in diameter. Drop shafts to those tunnels ranged from 270 to 325 feet deep. More than sixty-two miles of near-surface tunnels and sewers were installed. All of these parts of the program, plus related construction work, were undertaken through over eight hundred construction contracts. All together, the contractors' bids were within 1 percent of the total of the engineers' estimate at the time of bid.

The deep tunnels, capable of holding up to 400 million gallons of wastewater, were the heart of the program. This deep underground labyrinth became the control mechanism for the combined sewer overflow problem (clean water plus sewage), which had caused the pollution in Lake Michigan and led to the initial lawsuits. The nine access shafts used during construction of the deep tunnel system were between fifteen and twenty-seven feet in diameter, wide enough for the construction itself and for removal of dirt, rock, and other materials from three hundred feet below the surface. During nine years of construction, more than 250,000 truckloads of waste rock were removed. Upon completion, there were twenty-four drop shafts, ranging from six to fifteen feet in diameter. On August 9, 1993, shortly after completion, the tunnels collected 7l.5 million gallons of sewage overflow.

At the peak of the WPAP construction, more than one thousand people were involved, and the district spent more than $300 million in annual construction costs. The construction teams came from 108 different companies, 60 percent of which had local representation and 17 percent of which were minority- and woman-owned companies. One contract alone, for the construction of a drying and dewatering building to convert treated sewage sludge to fertilizer, was for $114 million.

The PMO, populated by as many as six hundred engineers from eighty-eight different companies, including associate firm employees, proved up to the task. During the course of its existence, the PMO never missed a construction bid date. And the PMO never allowed a single permit violation, despite having to take some of the district's facilities out of service while new facilities were being constructed. Amazingly, the original partners to CH2M HILL at the PMO—HNTB; J.C. Zimmerman; Donohue and Associates; Graef, Anhalt, and Schloemer; and Polytech—continued their partnership and worked through the WPAP.

There is little doubt of the value-added benefits of the WPAP. The original intent of improved water quality in local rivers and Lake Michigan was met. Sewer system connections were made for ten thousand homes, which had previously used septic systems. Nineteen smaller treatment plants in outlying areas were closed. And, in perhaps one of the most interesting side benefits of the WPAP, rock waste from the tunnels was used to protect against erosion at the Lake Michigan lakefront, reconstruct McKinley Beach, and create an island—Summer Island—which is now a lakeshore site for community events.

Despite this ultimate success, however, some thorny issues that arose during the life of the WPAP sometimes threatened the entire program. An entire book could probably be written documenting the eighteen-year history of the WPAP. In fact, the program is one of the major focuses of *Greater Milwaukee's Growing Pains, 1950–2000 (An Insider's View)*, by Richard W. Cutler, one of Gibbs's initial team members in pursuing the Milwaukee work. The impact of the project on CH2M HILL and its influence on the WPAP can be seen through a look at four vignettes which overshadowed much of the program: (1) the legal conflicts that hovered over the project, (2) the district's legal battle with surrounding communities, (3) the ongoing audit screening of the program, and (4) the building of the North Shore tunnel. These events were not pleasant or easy to deal with, but they helped to form the character of CH2M HILL as a major programs player in the engineering and construction industry.

Legal Conflicts

Two court-ordered programs—one from Dane County and the other from federal court (Judge Grady)—were simply incompatible with each other. The Dane County order permitted up to two sewage overflows per year, while Judge Grady's July 29, 1977, order mandated elimination of overflows altogether. Taken literally, Judge Grady's order would have required elimination of the combined sewers, which would then be replaced with

separate sanitary (wastewater) and storm (rainwater) sewers. The Dane County order, by contrast, recognized that overflows were inevitable and directed the planning effort to focus on a "store and treat" concept, with storage facilities holding the overflows until the treatment plants had capacity to treat the stored water.

The district and CH2M HILL faced a potentially unsolvable dilemma. Should the facilities plan assume sewer separation, involving hundreds of miles of relatively small-diameter pipelines (Judge Grady's order), or move toward construction of large-diameter, near-surface interceptor sewers, coupled with large-diameter, deep-tunnel storage, and conveyance capabilities? In the end, the PMO did both. Not knowing which court and which concept would ultimately prevail, two separate facilities plans were drafted. By the time Judge Grady's order was vacated by the U.S. Supreme Court in April 1981, the district had already adopted an alternate plan using deep tunnels and the store and treat alternative. The district commissioners adopted that plan in June 1980. It is estimated that this decision saved the district nearly $600 million over Judge Grady's order.

The decision, although clearly the right one in hindsight, was not well received in Milwaukee. First, the local contracting community saw the potential magnitude of their work drop dramatically. Second, the suburban communities were outraged that they would be forced to pay a share of what they saw as Milwaukee's pollution problem. At one public hearing in a suburban community, a suburban mayor bused in protesters to swell the meeting's attendance to nearly two thousand people.

Milwaukee vs. the Suburban Communities

In his book on Milwaukee's "growing pains," Cutler devotes an entire chapter to what he calls "The Sewer Wars, 1982–1996." He describes the origins of the battle between Milwaukee and the suburban communities, along with the various players who fought the battles, and concludes that "the wars left a lamentable legacy of destructive mistrust" among the Milwaukee communities.

As in many other disputes, money was at the center of this battle: Who would pay and in what proportion for the over $2-billion WPAP? From the suburbs' perspective, their prospective bill was staggering. They contributed 6.6 percent of the sewage flow, yet they accounted for nearly 17 percent of the value of the property served by the district. If they paid on the same basis as their Milwaukee counterparts (based on property values), their rates could double or triple—and predicted suburban growth would only exacerbate the problem.

The dispute led to parties' taking sides. The combatants were the FLOW communities (twenty-seven suburban communities who called themselves the organization for "Fair Liquidation of Waste"); versus JOBS, a group of "wet industries" (e.g., brewers, tanners, food processors, and others), who generally supported the district's positions; and the city of Milwaukee and the district.

The battles were fought in the Wisconsin courts, in the state legislature, with Governor Tommy Thompson, before the Public Service Commission, and in the local media. The ultimate resolution took nearly fourteen years because of three factors. First, the Wisconsin Supreme Court ruled on November 13, 1992, that a lower court's decision in favor of FLOW was in error. Second, on June 12, 1994, an appellate court approved the Public Service Commission's finding that charging on a property basis was not unreasonable. And third, by October 1996, the suburban communities realized that annual contract charges for construction of the project had become almost as high as the property-value-based charges. They were better off settling with the district than incurring longer-term debt. They paid $140 million to the district for back charges and interest.

Where was CH2M HILL in all of this? From the outset, CH2M HILL was the district's consultant, helping to analyze alternate methods for charging the suburban communities for capital costs. The firm prepared the initial report, dated August 28, 1980, recommending that the district charge all communities on a property-tax basis. Three CH2M HILL employees—Frank Lanou, Mike Matichich, and Tom Gibbs—were directly involved in supporting the district's position, giving numerous depositions, attending public hearings, and providing court testimony.

The impact on the company went far beyond its direct involvement. Hank Padgham, the PMO's director from 1981 to 1988, and Gary Beech, director from 1988 to 1991, both recalled later how it seemed that every major decision taken before the commission was contentious because it was scrutinized for cost by the FLOW communities and by the district in light of the ongoing litigation.

Beech said later, "It was incredibly difficult, first for Hank and then for me. We had a program to run, and the fight between our client and the FLOW communities was a distraction. We wanted to focus on the planning, and the engineering, and the oversight of construction; that's what we were paid to do. Yet, we had to justify every major move we made to the district, knowing that it would be questioned somewhere by a judge, the Public Service Commission, or in the [*Milwaukee Wisconsin Journal Sentinel*]."

"All of us felt like we were under attack, not just to defend our costs, but almost to defend our honor."

— Gary Beech

Defense of the WPAP—Auditors

Big dollars attract attention. In the case of the WPAP, there was little doubt that EPA, the state of Wisconsin, and CH2M HILL's client, the district, wanted to ensure that the $2.3 billion was being properly spent.

The first major audit of the program was by EPA in 1979. The U.S. government provided matching funds for the program, and EPA undertook a "construction operations review" to look at, among other things, the constructability of the PMO's designs as they moved into the construction phase. EPA's conclusion was simple and direct: The WPAP was being managed in a satisfactory manner.

EPA's second foray into the costs of the program was two years later. This time, the focus was on the PMO's designs of the treatment plants at South Shore and Jones Island, where all the stored waste was to be shipped and treated. EPA's data, published in 1981, showed that CH2M HILL's secondary treatment plant designs were 15 to 20 percent less costly to build than the average of all such plants constructed with EPA money.

That same year, the U.S. General Accounting Office got into the act at the request of Wisconsin's Representative Henry Reuss. In the midst of what would become a controversial issue in the sewer wars, the General Accounting Office concluded that the deep-tunnel concept was a fundamentally sound way to handle the combined sewer overflow, thus validating the PMO's recommendation of the store-and-treat alternative to the district.

In 1982, Wisconsin's Department of Natural Resources engaged Arthur Young to evaluate the program. The department was the state's regulatory agency, and its concerns were the costs of the program and ensuring there were no permitting violations during the course of construction. Among Arthur Young's conclusions was the fact that the engineering costs—by CH2M HILL and the associate firms—were reasonable.

CH2M HILL and the PMO were prepared for and expected these external inquiries. The WPAP was simply too big to ignore, the expense too great, and the interest too broad at the state and federal levels. What was surprising, however, was the often-contentious relationship with the client, the district. As each new executive director came in to the program (there were seven of them, not counting various people who took on interim or "acting director" roles), it seemed to CH2M HILL that they wanted to demonstrate their fiscal control over the program. That meant cost savings, irrespective of the number of independent audits being performed by other entities.

One of the low points of the program, from CH2M HILL's perspective, was in 1988, when Director Wallace White engaged the nationally renowned firm, Hill International, to scrutinize the performance of the PMO. Audits were one thing, but White announced his intent to save millions of dollars and recoup them from CH2M HILL. One year and over $1 million later, Hill International found no significant deficiencies, and CH2M HILL made no payment to the district.

Beech, deputy director of the PMO at the time, had been designated by Padgham to respond to Hill International's inquiry. "The PMO was populated with people from the district's own staff, as well as engineers from CH2M HILL and the associate firms. All of us felt like we were under attack, not just to defend our costs, but almost to defend our honor."

That "honor" was never tarnished during the course of the WPAP. In a brochure published at the end of the program, the district lauded the program, recognizing that the $2.3 billion was an investment that permanently enhanced Lake Michigan and the three rivers that fed into the lake. The brochure "documents the events, technical breakthroughs, and human effort required of that civic investment. Moreover, it offers a glimpse at the return on investment that we can expect to reap in the years to come."

The brochure offered a nice postscript to what had been a repeatedly and closely audited program.

North Shore

It is hard to imagine the scope and complexity of what was done in Milwaukee, but one begins to get a picture of this engineering and construction marvel by looking into the deep-tunnel system. Three tunnels, totaling seventeen miles in length—North Shore, Crosstown, and Kinnickinnic-Lake Michigan—essentially follow the course of the three local rivers that empty into Milwaukee Harbor in Lake Michigan.

The tunnels were constructed three hundred feet underground for three reasons. First, the rock at that depth acts as a natural tunnel liner, eliminating some of the costs of forming and pouring concrete to form the tunnel walls. Second, in theory, tunneling at that depth could be done without major changes to the boring techniques because the soil and rock conditions did not change significantly. Third, and perhaps most importantly, the tunnels were to be situated below the deepest of the river valleys.

The tunnel-boring machine was awesome: seventy feet long, weighing 675 tons, and powered by twelve two hundred-horsepower electric motors.

The cutting head could be as large as thirty-two feet in diameter, had laser-guided accuracy, could mine up to 170 feet per day (with a daily average of nearly 100 feet), and carried out the rock and soil using a series of expandable horizontal conveyors, running up to three miles in length.

The whole system, from the surface through the drop-shafts to the tunnels, was engineering at its best. The most critical features of the drop-shafts—dropping hundreds of thousands of gallons of liquid to a three hundred-foot depth—were vortex generators with ramps slanting downward at a twenty-seven degree angle and the spiraling design of the shafts, which dissipated more than 60 percent of the falling liquid's energy. At the end of the tunnel system is a pumping station where three pumps can lift as much as 150 million gallons of wastewater a day to the treatment plant, back above the ground.

Construction of the North Shore tunnel as designed would have been a significant feat, even if all had gone as planned. Two forces, however—one geological and the other political—intervened to impact CH2M HILL and to bring its relationship with the district to the brink of collapse.

Through September 1987, the boring of the North Shore tunnel had gone essentially as planned. The district's construction director, Tom Lutzenberger, and CH2M HILL's counterpart, John Ramage, were cautiously optimistic that the underground conditions were manageable and that the boring could be completed on schedule. Then, on a day the PMO people will never forget, the contractor on the North Shore tunnel, Traylor Brothers/Frontier Kemper, JV, encountered what it claimed were changed conditions. Huge water inflows began in the tunnel. Nothing the engineers had seen in prior soil borings had prepared them for this eventuality, and there was simply nothing the district and the PMO could do except halt construction, analyze the problem, and devise a solution.

Lutzenberger and Ramage gathered the best minds of the PMO and world-class geotechnical and tunneling consultants. After hundreds of painfully tense hours of work, they devised a brilliant solution: bore holes from the surface at an angle through hundreds of feet and multiple layers of underground rock and pump a special grout to prevent water inflow through cracks in the rock. The two later described the process as analogous to poking long toothpicks through phyllo dough, in hopes of holding fragile baklava together. In addition to this innovative grouting solution, the contractor was required to dramatically change its method of rock support, resulting in two miles of tunnel supported with massive steel "ring beams" and wooden lagging. It was anything but simple, incredibly expensive (over $100 million),

but ultimately successful. Without this innovative solution, the North Shore tunnel would have been abandoned, requiring design and construction to be completely restarted for this segment.

The PMO was justifiably proud of its achievement, and the district paid the contractor for its extra work, the unforeseen materials it needed to complete the tunnel, and delay costs. The geological problem was solved; the political problem had just begun.

In 1996, despite Lutzenberger's partnership with Ramage to solve what clearly seemed to be unforeseen conditions, the district sued CH2M HILL for $58 million, claiming the firm was negligent in not taking the flooding into account in planning and designing the tunnel. At issue was whether CH2M HILL should have known that the rock three hundred feet below the surface would be so badly fractured that water from the river above would flood the tunnel; the district contended in hindsight that each section of the tunnel should have been concrete lined—contrary to one of the fundamental reasons the tunnels were built so far underground. The decision not to completely line all tunnel segments had saved the district hundreds of millions of dollars.

Lawsuits are never "black and white," but CH2M HILL fought back with everything it had, including tunneling and geotechnical experts, a bevy of lawyers, and the full support of its insurance carrier, CNA. In the end, however, CH2M HILL and CNA determined that the cost of litigation and the risk of losing were too great. The case was settled for $24 million. The costs of the litigation and settlement were largely covered by insurance; what remained was allocated among CH2M HILL and the associate firms. CH2M HILL had never before had a claim of that magnitude brought against it by a client, nor paid (directly or through insurers) a larger amount in settlement.

The relationship among CH2M HILL, the PMO, and the district was damaged dramatically. Despite the overwhelming success of the PMO from its inception in 1977 through WPAP completion in 1995, the North Shore claim hung like a cloud over the project. Absent this one differing site condition event, the total cost of the program was right on the $2.3-billion budget.

There is a positive, if somewhat ironic, end to the North Shore saga. Despite the damaged relationship between CH2M HILL and the district because of the North Shore claim and litigation, the district continued to seek CH2M HILL's input and assistance for various aspects of its continued underground work. In 2003, three members of the original PMO staff were asked to again run district construction contracts, including one underground tunnel contract of greater length than any of the construction contacts issued under the program.

Nearly three decades after Gibbs began to pursue the dream of working in Milwaukee, CH2M HILL maintained one of its larger offices there and continued to serve the needs of clients, including the district.

Conclusion

In the end, the story of the Milwaukee project is a story about people and the relationships they formed to develop, win, staff, and execute a $2.3-billion, twenty-year program. From the outset, Gibbs sought to foster those relationships: with people like Katz, initially as an advisor and later as the district's director of technology; with the five associate firms that served the program faithfully over its life; with valued advisors like Norm Paulsen, who counseled the PMO on political and public relations issues through some dark times, like the North Shore claim; and through literally thousands of CH2M HILL, district, and contractor employees who performed the work. The success of Milwaukee's pollution abatement program cannot be overstated. Its impact on the people, the reputation, and the future growth of CH2M HILL is unmistakable. CH2M HILL had staked its claim in the U.S. heartland as a mega-program manager. The firm had demonstrated its ability to handle its clients' most complex problems, unify diverse professionals into a formidable team, and provide exceptional client service—on schedule and within budget—under the most difficult circumstances. Most importantly, and largely unknown to people at the time, CH2M HILL had begun to chart a different course—from a regional, mostly water/wastewater engineering firm to a national and eventual global engineering and construction firm.

In many respects, the best was yet to come.

In 1980, President Jimmy Carter signed into law the first federal legislation that would identify and clean up America's most hazardous waste sites while recovering cleanup costs from the parties responsible for the contamination.

CHAPTER 14

Birth of an Environmental Firm

In the early 1900s, a new residential neighborhood called Love Canal, located in upstate New York, was intended to be a dream community. By harnessing power via a canal from the nearby Niagara River, developer William T. Love hoped to deliver inexpensive hydroelectric power to homes and industries in the area. But economic fluctuations, combined with the discovery of a more economical alternating current, dashed Love's vision, and in the 1920s his dream canal was turned into a municipal and industrial dumpsite. The site had multiple owners, including the Hooker Chemical Company, which owned and operated the dumpsite from 1942 to 1953. During Hooker's span of ownership, the company disposed of more than twenty-one thousand tons of hazardous wastes at Love Canal, including acids, chlorides, mercaptans, phenols, toluenes, pesticides, chlorobenzenes, and sulfides. In 1953, Hooker ceased dumping at the canal, capped it with dirt, and sold it to the city for one dollar. The city would not discover the extent of the contamination it had inherited for more than two decades.

The nightmarish amount of chemical contamination began to surface in the small working-class community after a summer of record rainfall in 1978. A front-page story in *The New York Times* broke the news to the nation: more than eighty different compounds—including eleven suspected carcinogens—had begun to percolate upward through the soil. Chemicals entombed in eroding drums had been leaching into the backyards and basements of a hundred homes and a public school. Love Canal was the first significant episode of chemical contamination of this magnitude in the United States, and it became emblematic of the ugly image of what industrial waste could do to the environment.

The discovery at Love Canal ignited public fears. Communities across the nation grew apprehensive about similar contamination in their own backyards. The nation looked to the federal government to take action to protect them from chemical "time bombs" located in their own neighborhoods.

While earlier legislation had given the U.S. EPA control over the generation, transport, treatment, and disposal of hazardous wastes, it did not encompass the depth and breadth of the problem, nor had it been enacted soon enough to prevent problems such as the Love Canal catastrophe. As a first step, Congress passed the 1976 Resource Conservation and Recovery Act to control hazardous wastes, end open dumping, and promote conservation of resources. While the move was well intentioned, the writers of the act did not comprehend the magnitude of the waste disposal issue and allowed for treatment and disposal options that would later require remediation.

Ralph Peterson

Then, in 1980, President Jimmy Carter signed into law the first federal legislation that required not only identifying and cleaning up America's most hazardous waste sites, but also required those responsible for the contamination to pay the cleanup costs. It was titled the Comprehensive Environmental Response, Compensation, and Liability Act, but quickly became known as Superfund. Administered by EPA, this program initially allocated $1.6 billion over five years and set the wheels in motion that would dramatically change how the nation addressed chemical contamination. And Superfund would forever change the course of CH2M HILL.

Ralph Peterson, then the director of CH2M HILL's industrial processes discipline, saw the Superfund program as a "game-changer"—one that would change the rules and the hazardous waste industry in an unprecedented manner. Peterson was convinced that CH2M HILL's involvement in the early stages of Superfund would position the firm to capitalize upon this emerging, challenging, and complex new world.

Contrary to Peterson's belief that the cleanup should be done by private contractors, Congress initially thought that the most logical contractor for Superfund would be the Army Corps of Engineers. The Corps' forte was megaprojects, and it had a reputation in the nation's capital that was well-known and respected. Competing against the Corps would be a challenge for any engineering company. Peterson believed that the private sector had what EPA needed and could do the job faster, better, and possibly even cheaper.

"We had to create the opportunity before we could capitalize on it," remembered Governmental Affairs Director Dick Corrigan. "It was a brand new program, and it was controversial, too. The discussion (on Capitol Hill) focused on who would implement the program."

CH2M HILL worked on several fronts to encourage private-sector competition for the Superfund contracts. Enlisting the backing of other industry allies and trade associations, Corrigan and his aides lobbied Congress and sought to gain credibility with the Office of Management and Budget (OMB), a key agency that would have much to say about the organizations that would work on Superfund. He carefully garnered the support of key senators and committee operatives who were close to the Superfund contract. "We had about one year to convince Congress and the OMB to make this a private-sector project," said Corrigan.

The lobbying efforts paid off, but the job was far from over. Congress and U.S. EPA decided that the private sector would be allowed to compete for the site engineering and design contract. As its next step, U.S. EPA had to

"In nature there are neither rewards nor punishments; there are consequences."

— Robert G. Ingersoll,
lawyer, orator, philosopher

define the parameters of the contract. A relatively new agency, EPA had not previously administered large construction programs. CH2M HILL's program management specialists offered their expertise and helped EPA staff understand the mechanics of the procurement process. When it came time to bid on the project, however, CH2M HILL was not shown favoritism. The firm became just one of many engineering firms pursuing what were to become several major contracts.

At stake were base contracts for remedial planning and field investigation teams (REM/FIT) to investigate, assess, and remediate an undetermined number of toxic waste sites. Two REM/FIT contracts were put out for proposals—one for the eastern half of the country, and one for the west. CH2M HILL pursued the western contract, where it had a strong geographic network.

REM/FIT projects were likely to span many years and generate hundreds of millions of dollars in revenues. Beyond the contract value, Peterson saw REM/FIT as a burgeoning new business opportunity. He was convinced that the mounting public outrage over hazardous wastes heralded a powerful future direction for CH2M HILL, and Chief Executive Officer Harlan Moyer fully concurred. CH2M HILL poured its resources into the bid effort, assigning more than twenty engineers and technicians to the proposal. Led by a young chemical engineer, Bill Wallace, the team labored for more than a month, creating a comprehensive proposal that outlined the firm's knowledge and expertise.

"We knew we couldn't win on price," said Wallace. "We spent a lot of effort and resources to produce a proposal that would stand head-and-shoulders above the competition. We spent more than our competitors did, but we knew what was at stake. And as it turned out, this investment was small compared to the ultimate returns."

In October 1982, EPA notified CH2M HILL that it had been awarded the western REM/FIT contract. Though its bid was not the lowest, the firm had made its case that competence, integrity, reputation, and technical expertise would meet EPA's needs. When Wallace heard the news, he elatedly announced it over the office public address system and then raced out to buy champagne. "It was an amazing win," he said. "We couldn't believe that we had done it." He would later recall that the Superfund contract "took us to a whole new level. But we had no idea at the time how much it would mean to the company."

Bill Wallace

CH2M HILL had just landed what was then the largest contract in its history.

In the coming months, as the elation faded, the reality began to set in. The daunting task of coping with hazardous waste problems in twenty-nine states arrived at CH2M HILL's doorstep. In June 1983, Seattle-based engineer Bill Dehn was made point man for the REM/FIT program. Dehn had been in line for the regional manager position in the Seattle office. "Harlan knew that I wanted to be regional manager," recalled Dehn, "but he told me that he wanted me to do something that was more important for the company." Two weeks after meeting Peterson to discuss the project, Dehn was in Reston, Virginia, managing the massive contract.

Dehn's first significant hurdle was assembling a staff infrastructure that would take on work assignments across the western half of the country—west from Chicago and reaching from the nation's northern to its southern borders. CH2M HILL needed to respond to work requests from six distinct EPA regions, often in locations where the firm did not have offices. Dehn met the logistics challenge by creating the "Zone Project Management Office," in the Washington, D.C., area, where he and others could be close to their client, EPA. He also created decentralized geographic regions that mirrored the EPA regions and assigned key personnel to each.

Throughout his career, Dehn had cultivated and refined his major program management expertise. He had been managing large projects and significant programs for years, but the challenge of Superfund was much bigger. "I think (the firm's management) felt that they needed someone to think about this contract programmatically—beyond the technical challenges," said Dehn. "I'd been with the firm for fifteen years at that point, and I felt that I could help fit this contract into the existing organization."

Meanwhile, public reports of hazardous sites cascaded into EPA headquarters, far surpassing the early estimates. In the wake of Love Canal, an alarmed public barraged the agency with sightings of toxic dumps, leaking oil drums, and contaminated runoff. The media and Congress wanted to identify the "next" potential Love Canal and save the public from impending disaster. Each of the calls required follow up and meticulous investigation. In the first five years of the program, EPA developed its national priorities list that identified and prioritized the most contaminated cleanup sites.

At sites where remedial action was required, such as the diversion of a contaminated stream or the shoring up of a landfill, it was the engineers' responsibility to devise a solution. Where the task was more urgent, such as removing leaking barrels of toxic waste, CH2M HILL was to be on the

scene. "The EPA couldn't give us work fast enough," remembered Wallace. "Our contract capacity was quickly exhausted, and the EPA kept adding more extensions."

Bill Dehn

This type of work was new to CH2M HILL. Prior to Superfund, the firm's environmental engineers were expert at handling traditional chemical process issues in water and wastewater treatment, with identified chemical compositions all fully contained in tanks and lagoons. The EPA work, by contrast, brought mixed and hazardous waste of unknown quantities and composition that were buried or dumped underground in locations that were difficult to characterize.

"The technology to clean up these problems didn't even exist," noted Wayne Sellman, contracts manager for CH2M HILL's Superfund program. "We had to learn as we delivered." The staff at EPA was also on a learning curve. "It was a very collegial atmosphere. We were very integrated with EPA as we were all trying to work out what the program needed and how to deliver the solutions."

For a time, CH2M HILL groped for its part of the solutions. Recalled Wallace, "We had to acknowledge that a good engineer couldn't do everything." The Superfund era ushered in a new approach to engineering at CH2M HILL, because toxics treatment was not yet a specialty taught at engineering schools. The traditional process engineering approach would not work on a hazardous waste site, so the mentality shifted to an approach where site characterization was crucial to the start of the project. The engineers needed to learn the nature and the extent of the contamination, understand the natural setting in which the waste was situated, and identify the sensitive populations (human, animal, insect, or plant) that were affected by the contamination.

Personnel needs shifted with the change in approach to Superfund projects. Several of civil and sanitary engineers were co-opted from the water/wastewater group to learn the ropes in this newly emerging field. Some eagerly responded to the challenge; others resisted the move. "When they were pulled into the Superfund project, some of our staff felt that it took them away from the opportunities to make their way up the water/wastewater career ladder," Dehn recalled. "Interestingly, however, the people who have been involved in the delivery of the firm's most significant projects—such as Superfund—have ended up as the leaders of the company."

Separate from the engineering aspects of Superfund, numerous specialty fields were now necessary to address the complex issues involved with

hazardous-waste contamination. "We brought in many of the sciences beyond traditional engineering: biologists, ecologists, hydrogeologists, geologists, economists, as well as a platoon of community involvement specialists," noted Dehn. "We needed to hire the types of people we hadn't traditionally hired in the past." All were necessary as part of the investigation and assessment of the sites. Scores of non-engineer professionals were needed for the often-gritty fieldwork of sampling and assessing soils and water contamination. Griping was sometimes overheard as some of the engineers resented the intrusion of too many "damn 'ologists."

Dehn and the other leaders worked hard to integrate the two diverse groups into one cohesive team. They spent a considerable amount of time educating others in the firm about the potential that the hazardous waste business held for CH2M HILL. "The local offices didn't always see a benefit in hiring people with the sciences skill sets," said Dehn.

"Other engineering firms also had Superfund work, but CH2M HILL tended to fare better," observed Mike Tilchen, program manager for later EPA contracts. "Why? I think it was because (we) did a better job of absorbing a huge number of new people and instilling the philosophy and culture of the firm. That's what sustained us during our period of intense growth."

Dehn instituted periodic gatherings at the Colorado headquarters and other locations within the western United States. These site-manager meetings brought together a medley of professionals, new and old, for give-and-take sessions. "The meetings got the new people aligned and explained how things work," said Dehn. "We tried to create a cachet, a pride about working in this new industry."

Despite the great unknowns, CH2M HILL's leadership was eager to enter this new market. The firm had been extraordinarily successful in the water and wastewater arena. Moyer and Peterson were excited to find another frontier to conquer. "It was a wonderful opportunity," Moyer recalled. "A huge market was shaping up that might last decades. It looked like we could do great things."

Many "great things" were to come. The EPA contract was open-ended, ensuring virtually unlimited challenges for as long as hazardous waste problems and the public passion to remove them existed. By the mid-1980s, just three years after the start of the contract, Superfund work accounted for more than one-fourth of all CH2M HILL revenues. From a startup staff of ten people, the ranks in the hazardous waste sector had swelled to more than one thousand—nearly 30 percent of CH2M HILL's entire workforce.

"The Superfund program provided us with the opportunity to develop the contracts management capabilities of the firm."

— Wayne Sellman

The blend of scientists and engineers attacked the growing list of problem sites on EPA's priority list, which included scores of abandoned landfills, oil discharges, mine tailings, and polluted lakes. CH2M HILL enlisted the assistance of subcontractor Ecology and Environment, a Buffalo, New York, science firm with experience in preliminary site investigations and assessments and toxics response. As the subcontractor scoped and sampled contaminants, CH2M HILL's specialists focused on identifying the cause and extent of the problems and fashioning solutions.

CH2M HILL gained high marks for dealing with some of EPA's nastiest problems—among them the infamous Times Beach, Missouri, where dioxin runoff from street spraying had literally closed down the small community. The firm assisted in that 1983 cleanup after EPA had relocated two thousand residents and torn down most of the homes and businesses.

In California, CH2M HILL aided in the disposal of chemicals from the notorious Stringfellow Waste Pits at Riverside and in the containment of rocket solvent runoffs that threatened several San Gabriel Valley communities. In Washington, engineers devised an ingenious array of pumping towers to aerate contaminated groundwater that threatened a farming town. In another community in the Midwest, they successfully disposed of asbestos-laden trailers and helped to reclaim the area.

By 1984, CH2M HILL teams were working on dozens of projects in a score of western states. Although there had been early speculation that EPA work might play out, those worries lessened as the assignments continued to pour in, fed by mounting national awareness. In 1985, the project backlog had grown so large that EPA extended the REM/FIT contract another two years.

Over time, the increased national awareness became something of a double-edged sword. A concerned public began to clamor for actual cleanup of sites, not just the characterization and design work that CH2M HILL had been doing. As one of the contractors performing the work, CH2M HILL was labeled as part of the problem. Why wasn't more progress being made, in general, in the cleanup of hazardous waste sites nationwide?

Separate from the technical challenges, CH2M HILL faced another complex issue that challenged its existing systems. Work with the federal government, in general, required detailed record keeping and numerous reports. Under Superfund, EPA required meticulous record-keeping and cost-reporting systems from their contractors. This documentation was critical as EPA sued and sought to recover costs from the parties responsible for the contamination, known as potentially responsible parties.

"At EPA, you work for a cause that is beyond self-interest and larger than the goals people normally pursue… You're not there for the money, you're there for something beyond yourself."

— William D. Ruckelshaus,
first administrator for the U.S. Environmental Protection Agency

As the number of projects grew, the company found itself working under scores of binding legal agreements, which required careful drafting, review, and administration. Sellman was key to improving CH2M HILL's contracting, procurement, and record-keeping systems. A veteran company finance specialist, Sellman took charge of the contract machinery and oversaw development of project- and management-control systems. "In order to manage a program with so many work assignments—nearly two hundred separate projects that covered the entire western United States—the project tracking systems had to be significantly improved over what we had in the past," he said. "The Superfund program provided us with the opportunity to develop the contracts management capabilities of the firm." He helped to devise computer programs such as the firm's first project control system that enabled project managers to track materials purchasing and deployment across diverse operations, gauging precisely where they stood on budgets and warning them of potential overruns.

Dehn, Sellman, and others in senior management also worried about a devil that lurked in the details of nearly every hazardous waste contract—liability. The absence of any legal safeguards or indemnity protection left CH2M HILL frighteningly exposed. The firm's employees worked in the field, digging up and disposing of old toxic waste and fashioning corrective remedies. In the background was always the fear that, years after a job was finished, someone or some company would bring liability claims against the firm. Because EPA often engaged CH2M HILL in its litigation with the potentially responsible parties, company leaders understood that potential damages were significant. "In the early stages of Superfund, the notion of liability was not well-established," said Sellman. "Without indemnification from the government, we felt vulnerable."

In fact, fears of financial disaster from a Love Canal-type debacle haunted company officials as its workers probed dozens of old landfills and dumps, some of them deserted for years and with murky ownership. The firm's legal vulnerabilities seemed all the greater because energy companies and other major industry players had owned a number of the waste sites; there was a possibility that these potentially responsible parties might go after CH2M HILL if they were sued. Superfund imposed strict liabilities; responsible parties were inclined to attach these liabilities to other companies if they could. If CH2M HILL were to make an error on a hazardous waste site, the firm could be liable for the entire cost of the cleanup.

The firm eventually won limited legal indemnity from EPA. The expectation was if CH2M HILL was sued as a result of its work for EPA, the federal government

would provide legal and financial support under certain circumstances. Additionally, the firm was allowed to bill EPA for liability insurance as a direct cost under the terms of the program. Dehn described the firm's new thinking on risk:

> *This was the first time that we really had to think about the risks and rewards of programs like this. We didn't want to put the company at risk just to be able to work in this area. We had to think about the risks of going into these new markets and how to protect the firm. We were owners of the company—we had a stake in this. Contract terms and risk management were taken much more seriously from here on. This really was one of the first steps that led the way to CH2M HILL's future work in construction management.*

In 1986, EPA rolled out for bid a second and much larger contract, called REM IV. This contract was essentially an extension of the work that had already been accomplished, focusing primarily on investigations, but also including site cleanup. CH2M HILL again competed against major firms and won. If there had been any doubt that CH2M HILL was a serious player in the environmental field, it was now dispelled. What had been initially viewed as somewhat of a risk for the firm was now a centerpiece of the company's business.

The REM IV contract moved CH2M HILL into a higher profile role with greater design responsibilities on large remedial projects. Subsequent contracts stretching into the 1990s gave the company actual construction responsibilities as well, a challenge that thrilled some engineers and terrified others. CH2M HILL historically had been involved as a client's representative on construction sites, but rarely had been directly contracted to do the work.

With these new responsibilities came additional risks that would necessitate crafting an entirely new discipline in risk assessment. Toxics work was imprecise, at best. Coping with substances of unknown potency that often had been seeping and moving through soils for years was daunting, even for a company filled with the best specialists.

The Superfund successes were at their peak throughout the 1980s, with a dozen contracts and add-ons that enhanced the firm's capabilities in the hazardous waste and project management field, while also contributing greatly to the firm's earnings. The work continued into the 1990s, even after EPA decentralized contract procurement and assigned overseeing work projects to its ten regional districts. This move required CH2M HILL to compete for projects in many different geographic areas, as opposed to the national contracts like REM/FIT and REM IV. But the organization continued to win a

Tar Creek

significant number of contracts, such as major mine reclamation projects in Oklahoma (Tar Creek), Idaho (Bunker Hill), and California (Iron Mountain).

In retrospect, CH2M HILL's decision to pursue Superfund work led to its growth as a federal contractor and established the firm as one of the premier EPA contractors. Since the work began in the 1980s, CH2M HILL received EPA's highest award—the Administrator's Award—six times during the first seven years that the award program was in place. In addition, the firm received a string of awards for its practice of hiring minority and disadvantaged firms as subcontractors and for mentoring smaller companies in business practices.

Counsel from Ruckelshaus

In 1970, President Nixon's administration consolidated all federal environmental activities under a single governmental agency, known as the Environmental Protection Agency. As the first administrator of this newly formed agency, William D. Ruckelshaus took on the task of defining the agency's mission, determining priorities, outlining an organizational structure, and putting a capable staff in place. During his two-and-a-half year tenure with the agency, Ruckelshaus built a solid organization that was strongly supported by the American public. He left EPA in 1973 to take on another governmental role.

Ten years later, at the request of White House Chief of Staff James Baker, Ruckelshaus returned to EPA to find an agency severely demoralized by inept management. During the next two years, he rebuilt the agency by refocusing its staff on its critical missions, adding competent staff, and raising the public confidence in the agency. He remained with EPA until 1985.

Ruckelshaus found his work with EPA to be extraordinarily rewarding. "At EPA, you work for a cause that is beyond self-interest and larger than the goals people normally pursue," he noted. "You're not there for the money, you're there for something beyond yourself."

Over the years, CH2M HILL developed an association with Ruckelshaus. Long-time CH2M HILL employee Tom Gibbs had a professional relationship with Ruckelshaus and introduced him to others at the firm, including Chairman of the Board Jim Poirot. At the conclusion of Ruckelshaus's second term at U.S. EPA, Poirot approached him with a proposition: would he consider sitting in on CH2M HILL's board meetings in an advisory role? Ruckelshaus agreed.

The experience that the firm gained in hazardous waste and megaproject management spawned other important ventures that continued to shape CH2M HILL's future, such as the nuclear cleanup project at Rocky Flats in Colorado (see Chapter 20) and the Hanford nuclear facilities in Washington. "We transformed ourselves from back-office designers to people who were capable of taking on these other major projects," said Dehn. "Looking back, what we had was culture shock. But at the time, it was just business, and doing what we had to do. Superfund was a confidence builder for us. It proved that we could take our skill set into unfamiliar territory and be successful. It made us believe that we could do a lot of other things."

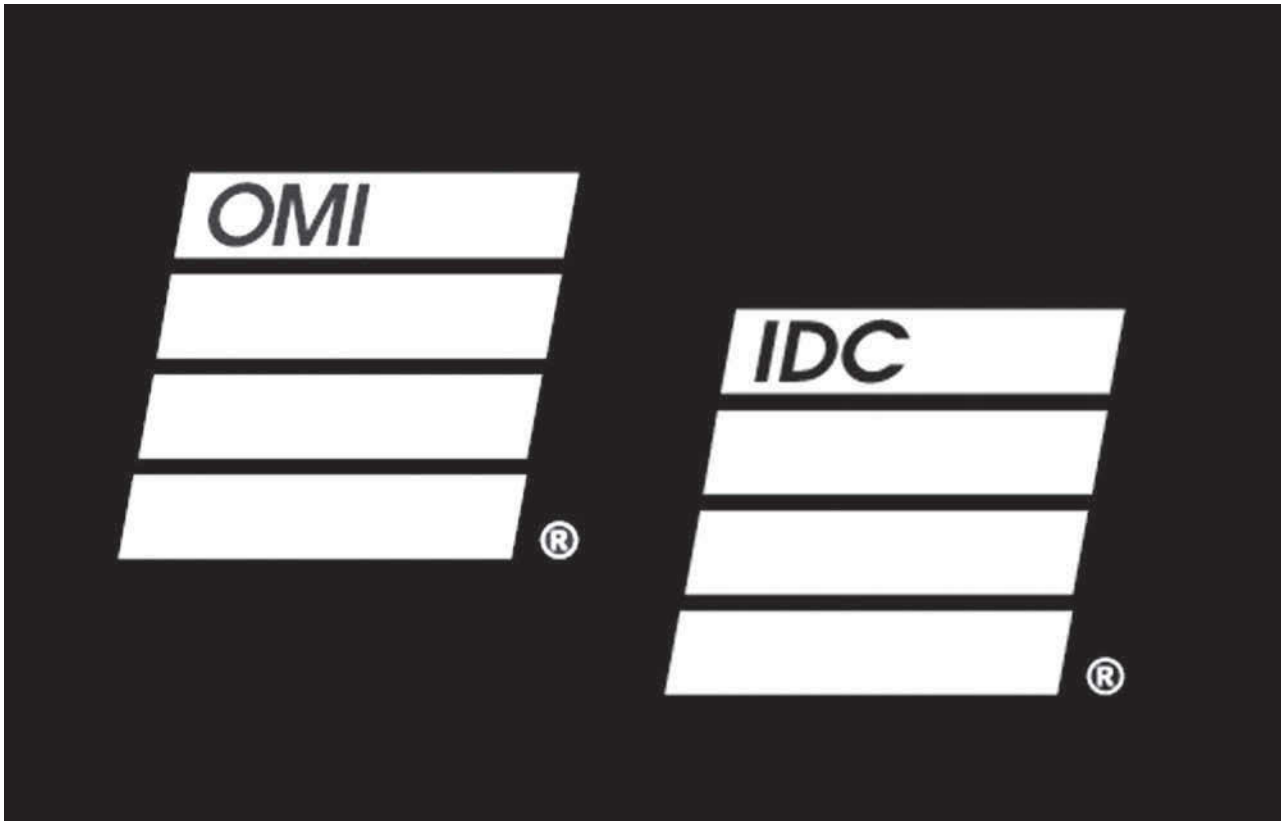
Iron Mountain

During the mid- to late 1980s, Ruckelshaus attended many of the firm's board meetings. His mission was broad: "We wanted his advice in any area where he wished to comment," said Poirot. "He was an attentive listener and thoughtfully questioned the board. He discussed consulting engineering issues relative to the hazardous waste industry and shared perspectives based on his broad business and government expertise."

Ruckelshaus's philosophy and approach—that environmental work is beyond self-interest and represents a universal human goal—reinforced the values that CH2M HILL had always championed. "Bill could easily articulate the value of setting a high priority to address environmental issues for the betterment of the public, outside of the realm of profitability and business decisions," recalled Poirot.

Ruckelshaus left his role as special advisor to CH2M HILL in 1988 when he joined Browning-Ferris Industries, a CH2M HILL client, as its chief executive officer.

"His perspective was extremely valuable to CH2M HILL," said Poirot. "He encouraged us to examine how we would be measured: not only within the U.S. and overseas, but also as a global citizen."



CHAPTER 15

Market Diversification—Creation of OMI and IDC

By the early 1980s, CH2M HILL could claim some thirty-five years of successful operations and growth. The firm had come a long way from its first small jobs in Oregon and California to the successes of major programs at Tahoe, Milwaukee, UOSA, and Superfund. CH2M HILL had a strong national reputation and hundreds upon hundreds of satisfied clients. Many organizations might have been happy to rest on their collective laurels and continue what had proven to be a successful formula—but CH2M HILL had other plans.

Looking beyond the traditional field of consulting engineering, the leadership believed there were other opportunities that would help them diversify CH2M HILL's portfolio of services. The board of directors encouraged the exploration of markets, as long as it related to the firm's core businesses. As one of the board's directors stated, "We should be in a business that makes money while we sleep." This wish was not intended as "pie-in-the-sky" rhetoric. Rather, the leaders recognized that CH2M HILL's business was competitive, built on the hard work of its employees, and dependent on relatively low margins. CH2M HILL aspired to have the best and brightest minds in the industry. Were there other ways to add value for clients while making more money for employee shareholders?

The Origins of OMI

Since its inception, CH2M HILL built a strong practice in the water and wastewater treatment fields. Projects such as South Tahoe and UOSA solidified CH2M HILL's reputation as one of the nation's premier experts in wastewater treatment. As the firm continued to develop this core expertise, the staff gained a greater understanding of the market and began to see opportunities beyond the design of treatment facilities.

In the mid-1970s, Bob Chapman was CH2M HILL's water and wastewater division manager in Redding, California. Earlier in his career, he was heavily involved in treatment plant operation and startup, performance testing, and operator training, particularly at the South Tahoe and UOSA projects. Chapman had a keen sense that enhancing staff capabilities with experienced operators was important to the ultimate success of the projects designed by the firm, and thus the firm's reputation; he was an early advocate for offering operational capabilities to clients. He brought his vision of contract operations to the discipline group director for wastewater treatment, John Filbert. Filbert had joined CH2M HILL in 1962 as a wastewater reclamation specialist. He had worked on many high-profile projects for the firm: project engineer and technical advisor for the sewerage master plan for Alexandria, Egypt; and project director for the 43-mgd Oceanside Wastewater Treatment Plant in San

Bob Chapman

Francisco. These projects had given him solid knowledge of the market that Chapman intended to explore.

As he studied that market, Filbert concluded that the only way CH2M HILL could compete would be through a separate company—one that was not encumbered with as high an overhead rate as the consulting company's. Filbert proposed a new company to Gene Suhr, water and wastewater discipline director; Sid Lasswell, technology director; and Harlan Moyer, CEO.

Enthusiastic about the prospect of tapping into this potentially lucrative market, the three men endorsed the concept. Their excitement was tempered, however, by several concerns. A company of this sort would employ blue-collar workers—different from the white-collar world of professional engineering. Moreover, these employees would be "inherited" from clients; taking over contract operations would require accepting the client's workforce, along with the facility. Employing blue-collar workers also had the potential for opening the door to organized labor—an area in which CH2M HILL had no experience. Finally, if CH2M HILL marketed both types of services to the same client—the design of treatment plants, as well as facilities operation—would it be a conflict of interest? It was clear that further study was required before the firm was willing to step into this market, a characteristic course of action when CH2M HILL confronted a major issue.

At about the same time, in mid-1979, CH2M HILL brought a new senior expert on board, Kent Robinson. An authority in the wastewater treatment field, Robinson offered experience in and knowledge of the European wastewater treatment sectors, including contract operations. Robinson was hired to help CH2M HILL explore new business areas and expand its geographic regions. One of his first assignments was to study the contract operations and maintenance (O&M) market and develop a proposal based upon his findings.

Robinson's European experience proved invaluable. He knew that two large French water and wastewater contractors—operating at the time under the names of Degremont and ODA—were jockeying to enter what appeared to be lucrative markets in United States to design and build water and wastewater facilities. At the time, most states had laws prohibiting this type of project delivery, instead relying on the traditional design-bid-build. Robinson knew that the French firms saw an alternate way into these markets by contracting O&M services to U.S. treatment facilities. Once they gained this entree, it was only a matter of time before they could convince these clients to use their services for design-build. Robinson and the CH2M HILL leadership saw this as a critical vulnerability for U.S. companies. Simultaneously, a U.S.-based company also had begun aggressively marketing wastewater

O&M services to several of CH2M HILL's clients. Robinson recommended the formation of a contract O&M services business, if for no other reason than as a defense against the potential loss of CH2M HILL's existing clients.

John Filbert

In early 1980, CH2M HILL won an engineering and O&M contract for a wastewater facility in Maui, Hawaii. Soon after that, the Mississippi Gulf Coast Authority selected CH2M HILL as the program manager of its wastewater program, which included program management, engineering, and O&M services. As one of the conditions of the contract, CH2M HILL was required to provide O&M services through a company separate from the engineering company. Although this move had been contemplated for some time, CH2M HILL's newest company was rushed into formation for this strategic contract.

The board approved the new subsidiary in fall 1980. Robinson and Mike Fisher, CH2M HILL's chief financial officer, developed the preliminary structure for the new company, including legal, financial, and organizational precepts. They decided at the outset that the new organization would not use the CH2M HILL name, nor would it employ any existing CH2M HILL employees. To overcome potential claims of conflict of interest, the company would operate as an arm's-length subsidiary, which meant that it gained little advantage, at least initially, from being part of CH2M HILL. This approach was a significant departure for the company. In prior ventures, such as the merger of CH2M and Clair A. Hill and Associates, the intent had been to blend cultures and seek leverage from both companies.

Moreover, CH2M HILL's risk management and insurance issues were different from those of the new company, and Fisher was concerned that a new company might allow outsiders to "pierce the corporate veil"—allowing a plaintiff to recover a judgment against both the new company and its parent, CH2M HILL. "[Fisher] structured the company to avoid conflict in any areas," Robinson said. "This subsidiary would have a different logo, accounting system, personnel policies, phone systems… you name it, it was different. But we were so anxious to get this going that we agreed to anything."

The name of the new company also was not tied to CH2M HILL. Originally called "Operations and Maintenance, Inc.," or OMI, the name was subsequently changed to Operations Management International. OMI was incorporated and held its first board meeting on April 14, 1981.

In selecting a person to lead OMI, the search criteria focused on candidates who had the entrepreneurial skills to take on a fledgling company and build it into something substantial. No one from within CH2M HILL was considered.

Kent Robinson

"We looked outside of the company for a couple of reasons," said Robinson. "First, we wanted to find a candidate that was genuinely entrepreneurial—someone who had done something like this before. And second, some of our folks thought it would be better to bring in someone from outside of the company, thereby avoiding any appearance of conflict of interest."

Harlan Moyer hired Mike Stark. Stark came to the new organization from U.S. Filter, where he had served as president. Archie Rice, who had recently retired from CH2M HILL, was elected chairman of the board. Other members of the board included Moyer, Robinson, Fisher, and the firm's lawyer, Len Weber.

The new organization hit the ground running virtually from its inception. First, the Maui O&M contract was transferred from CH2M HILL to OMI. Soon after, three more O&M contracts with the Mississippi Gulf Coast Authority were transferred to OMI's control. Within a few months of its incorporation, OMI was operating as a profitable corporation. CH2M HILL had made an initial investment of $300,000, and OMI never again required financial support from the parent company. Its "hot start" helped, but identifying a hot market was what truly helped OMI succeed from the beginning.

The formation of OMI provided CH2M HILL with some of the skills needed in order to pursue and perform design-build projects in subsequent years. For most of its existence, CH2M HILL had worked on the front end of projects, doing consulting and design. Understanding the operations side of treatment plants gave the firm invaluable experience once the facilities were built. "I don't think we would have been in that business (design-build) without OMI," noted Robinson. "Our experience with OMI gave us the ability and the operating capability to take on this next step."

History has proved that CH2M HILL made the correct strategic move to gain a stronghold in this market. "I had recommended the formation of OMI as a defensive measure—almost like 'The French are coming! The French are coming!'" said Robinson. "It's interesting to note that OMI's most significant competitors today are still the French firms."

It is also worth noting that, in 2005 when OMI celebrated its twenty-fifth anniversary, the company managed 180 water and wastewater facilities worldwide and 10 public works departments. By that time it had won more awards, including the 2000 Malcolm Baldrige National Quality Award, than all its competitors combined. In winning the Baldrige award, sponsored by the U.S. Department of Commerce, OMI became the first water-sector organization to be so recognized.

Also notable in OMI's subsequent history were its disaster responses. In 2001, OMI associates responded to the 9/11 terrorist attacks in New York by driving trucks of bottled water to Ground Zero, where they distributed the water to firefighters and other rescue workers. Three years later, thousands of tsunami survivors in Indonesia's hardest-hit region had safe drinking water, thanks to a treatment facility operated pro bono by OMI.

Not a bad record for a company begun as a defensive measure.

Mike Fisher

The Creation of IDC

Soon after the formation of OMI, the seeds for another company began to germinate. Up until then, CH2M HILL's business had primarily focused on the public sector. Its roots in water and wastewater treatment were strongly associated with government agencies. Laws and regulations (e.g., the Clean Water Act) drove the work, public funding provided the capital, and the clients were governments at the federal, state, and local levels. There was a strong desire within the firm to significantly expand the client base into the industrial arena.

At CH2M HILL's office in Portland, Oregon, engineer Ken Durant had been cultivating industrial work for years. "It was evident that CH2M HILL was not competitive in the industrial sector," he said. This was because of the necessity to charge higher overhead rates for federal work (the preponderance of CH2M HILL's work at that time). To perform its ongoing work for the federal government, CH2M HILL had to build a more extensive overhead structure, with resulting higher charging rates. Those rates, however, had prohibited CH2M HILL from winning many private-sector jobs where margins were much tighter and typically based on labor cost plus a fairly low multiplier. This challenge was similar to the one the firm had faced before forming OMI.

The need to reconsider a lower overhead structure for the private sector was driven home by one of CH2M HILL's clients, the electronics division of Union Carbide. Based in San Diego, California, the division operated a sophisticated industrial project for its government work. The high cost of power in California prompted the facility manager to explore the possibility of building a plant in a less expensive area of the country—in this case, in Washougal, Washington, located on the north bank of the Columbia River, just upstream of Portland, Oregon. CH2M HILL performed the initial design for the facility—design work that ultimately enabled the facility manager to successfully pitch the project to his superiors.

Ken Durant

However, after considering further work with CH2M HILL, Union Carbide found the overhead rates much too high. Durant and Lasswell flew to Union Carbide's corporate headquarters in New York to discuss costs with the head of procurement. "He spent most of the day explaining to us why our costs were too high," recalled Durant. "We spent most of the day justifying the costs of our services. Near the end of the day, he explained it to us this way: 'Once you qualify as a vendor, we pay for your services like we pay for nuts and bolts.' Our time was a commodity, we realized, and our overhead rates were preventing CH2M HILL from becoming a larger player in the industrial sector."

Durant began to lobby within CH2M HILL for a separate organization that would serve the industrial community with a fully integrated range of engineering services, from mechanical and electrical engineering, to civil and structural expertise, as well as architectural and construction management expertise. Durant proposed a company that would offer "one-stop shopping" for industrial clients looking to produce complex facilities in a tight time frame. This approach, which depended on what Durant called "speed to market," required fundamental operational changes. Success required three new approaches: (1) rapidly building and decreasing the work force based on the projects currently under way, (2) working directly on construction, and (3) staffing a lean overhead and operational structure.

This proposed organization was to become CH2M HILL's first entry into the engineering-procurement-construction (EPC) arena. The board of directors saw the opportunity to broaden CH2M HILL's horizons while targeting a potentially rewarding market segment. On June 28, 1984, the board approved the establishment of a new subsidiary company, Industrial Design Corporation (IDC), and named Durant president.

"Our goal is to achieve a rapid and orderly penetration of a new, significant, and growing market," noted Moyer in a memo to his key staff. "The EPC business is characterized by firms with the ability to rapidly expand and contract production staff based on project workload. IDC will…operate in this manner."

As with OMI, the creation and launch of IDC was not without controversy. Key staffers shared their concerns with Moyer. A subsidiary focused solely on design for the industrial community would likely siphon off design work that CH2M HILL discipline staff had pursued with industrial clients. Additionally, the new company would pull senior staff from CH2M HILL into IDC, thus diminishing CH2M HILL's expertise in some areas, and potentially eliminating the Industrial Wastewater Treatment discipline. Moreover, as

with any new organization, it was difficult for CH2M HILL staff to see how the two organizations would, or could, work together; skeptics viewed IDC as a competitor for business that had typically belonged to CH2M HILL.

As one way of eliminating the possibility of competition between CH2M HILL and IDC, Moyer assigned several specific industries that would be the exclusive domain of IDC when it came to the pursuit of industrial EPC work. These industries included high-tech manufacturing, biomedical, pharmaceutical, food, metals, and pulp and paper. Additionally, it was agreed that IDC would not pursue organic waste-treatment work—that would remain in the CH2M HILL domain. And, similar to the formation of OMI, IDC was structured in such a way as to create distance between it and CH2M HILL and not jeopardize the CH2M HILL overhead rate.

Thirty-seven staff members from CH2M HILL left to form IDC. While some were concerned about the risks they were taking, there was a sense of pride, determination, and even a feeling of adventure and excitement about the prospect of forming a new subsidiary. "We all knew each other very well and had all worked together for a very long time," Durant said. "We trusted each other completely. We knew everyone's strengths and weaknesses. I'm convinced that much of our success was attributable to it being the right people in the right place at the right time."

In spite of concerns, most employees, senior executives, and the board saw the formation of IDC as a positive move. The firm intended to capitalize on IDC's strengths in industrial design, while meeting its clients' demands for reduced costs through a lean organizational structure.

IDC's initial successes came from serving the booming high-tech market. As with the construction of most manufacturing plants, the traditional approach to building high-tech manufacturing facilities had been via an architect-led process. Architects would conceptually design a facility and then consult with scientists on the specialized systems needed to support the operation of clean-room facilities. However, as the complexity of microelectronics manufacturing continued to increase, so did the complexity of the facility requirements. Engineering began to take precedence over architecture.

"We realized that, in the electronics industry, the buildings were actually part of the process," said Durant. "The engineers began to design facilities, and they consulted with architects for guidance in particular areas." The approach to designing for the high-tech industry had taken a 180-degree turn.

IDC quickly built, and has maintained, a national and international reputation based on its clean-room design expertise. For more than twenty years after

its founding, IDC was one of few firms in the world with the technical depth and expertise to serve the increasingly complex microelectronics industry. Throughout its history, IDC remained committed to providing its clients advanced strategies for cost reduction, risk minimization, improved return on investment, and technology leadership. The IDC story was one of CH2M HILL's great success stories, but it was not without significant challenges.

IDC rose to prominence with the boom of the electronics industry, and its financial success helped carry the rest of CH2M HILL in some of its leaner times, such as the economic recession of the early 1990s. In tandem with the cyclical downturns within the electronics industry, IDC saw its fortunes recede as well, forcing the downward turn of its revenues and workforce in the late 1990s. IDC's strength was also its greatest weakness: dependence on the "boom-and-bust" nature of the semiconductor industry.

In the spirit of CH2M HILL, IDC looked for positive ways to motivate employees who might have only a short-term relationship with the company.

"IDC does some innovative things to motivate their people who are hired for projects and then laid off when the project is completed," said Phil Hall, former chairman of the board. "For one thing, they used to pay partial bonuses to former employees who contributed to success in any calendar year, even if those people had gone to work for competitors at the time bonuses were paid."

As the century turned, IDC—like the industry it served—was forced to do some retooling, including diversifying its client base, shrinking its workforce, and tying its future more closely to the "mother ship" of CH2M HILL.

The IOTECH Experiment

Both OMI and IDC met CH2M HILL's need for diversification, although their markets still were closely related to the firm's core businesses. Neither business, however, met the sought-after dream of "making money while you sleep."

"We'd met our technical objectives, but we weren't certain we could ever meet our business objectives."

— Kent Robinson

In 1983, a unique opportunity came CH2M HILL's way, and all the signs indicated a potentially rewarding business. The U.S. Department of Energy (DOE) had actively begun to market cesium-137 (Cs-137), a radioactive by-product from the nation's nuclear weapons program, for use in the private sector. CH2M HILL had some experience with the material, having used it in a pilot plant to sterilize sewage sludge. Two entrepreneurial engineers, Bob Pailthorp and Kent Robinson, proposed a business to use Cs-137 to sterilize medical products. They saw this opportunity as another means of expanding the firm's horizons. A study to determine the feasibility of the process and assess the market was promising, hence the birth of IOTECH in 1984.

The IOTECH facility, located in Northglenn, Colorado, was designed, constructed, financed, and owned by the firm, a first for CH2M HILL. It was built to stringent standards—including regulations outlined by the U.S. Nuclear Regulatory Commission. Both DOE and the Colorado State Health Department signed off on the facility and licensed it for commercial use.

Meeting the regulations had slowed down the pace of construction, but after many delays, the facility was completed and operational by 1985. "By that point, I think the business was already 'dead on arrival,'" remembered Robinson wryly. "We'd put so much money into meeting all of the regulations that we weren't sure we could make a profit at it. We'd met our technical objectives, but we weren't certain we could ever meet our business objectives."

Operations began slowly. The customer base was small, but improving, and future indications showed the potential for growth. But four years later, disaster struck.

A medical products irradiation company in Georgia (unrelated to IOTECH) had also leased DOE's Cs-137 capsules for use in sterilization. The Georgia facility used a process that cycled the cesium capsules into and out of water. (In contrast, IOTECH's process used the capsules in "dry mode" and only placed the capsules in water for maintenance.) The process at the Georgia facility caused the capsules to shrink and then swell, ultimately resulting in fractures of the welds on the capsules. Radioactive cesium leaked from the capsules and contaminated the Georgia facility. DOE stepped in and shut it down. Despite the operating differences, DOE also shut down IOTECH, even though IOTECH had not experienced any safety problems. DOE believed failure was possible and was not willing to take the risk. IOTECH's business came to a swift and sudden end.

A lawsuit and resulting negotiations with DOE resulted in the return of the Cs-137 capsules to permanent storage at the Hanford, Washington, nuclear reservation. As part of the settlement, DOE paid CH2M HILL for the loss of its investment. "I think we all heaved a great sigh of relief to have settled this issue," said Robinson.

Although this foray into a market that was dramatically different from CH2M HILL's core markets had not paid off, it did offer one bright side, noted Robinson. "I think our experience with IOTECH was definitely a factor in winning the work at Rocky Flats [a nuclear decommissioning project detailed in Chapter 20]. We were seen as a company that understood how to deal with these types of materials. And we had a great reputation with the regulators in Colorado, who had observed our history in addressing these types of risks."

Conclusion

CH2M HILL always understood that its success depends on making money the old-fashioned way: through hard work and understanding its clients. The push for diversification in the 1980s resulted in two outstanding successes for CH2M HILL: OMI and IDC. Both subsidiaries became robust companies and leaders in their respective markets. The IOTECH venture was not successful, but in hindsight it provided a valuable learning experience. In particular, the firm learned that "making money while we sleep" was likely not in the cards for CH2M HILL.

"The most fatal illusion is the settled point of view. Life is growth and motion; a fixed point of view kills anyone who has one."

— Brooks Atkinson,
journalist, editor, naturalist, and conservationist

Not-So "Hot" Start

The leaders at CH2M HILL launched IDC in 1985 with a "hot start"—a major project to tackle—which was designed to help ensure the success of the fledgling organization. They thought they had found that project in an $80-million design-build job for Wacker Siltronics. IDC began hiring staff and even relocated some professionals to take on the new challenge. The project accounted for about 90 percent of the company's workload at the time.

Shortly after the project was under way, the client called Ken Durant and told him that the project was being cancelled.

"Well," responded Durant, "give us a couple of weeks to pull all of the files and work together so that when the project starts up again, we can jump right on it."

"You don't understand," replied the client. "After Friday, we're not paying you for anything else. The project has been cancelled. For good."

It was a devastating blow at the time. IDC had lost its main project. The company laid off 20 percent of its staff that week. Several recently relocated employees filed suit against IDC.

"We got it sorted out," recalled Durant, "but it was really difficult. But the value in this experience was that it happened when it did. If this job and others had continued, we would have continued to grow. We would have been much bigger before we hit rough ground. We learned how to deal with the extreme fluctuations in this business early on."

Although certainly a challenge, IDC weathered this early storm. As Durant pointed out, it allowed IDC to define its hiring policies—"the right to employ"—and develop employment contracts that outlined, up-front, the cyclical nature of the business. Unlike CH2M HILL's philosophy of steady growth and a culture built on long-term tenure, IDC built a culture that depended on delivering quality projects in a challenging environment, and then releasing employees until the next project. Over time, IDC employees knew that quality work meant a call back when work resumed; loyalty and the ability to work on challenging projects became a "win" for both IDC and its returning staff.

Undercover at OMI

When OMI was formed, CH2M HILL's leadership opted to keep the two organizations separate. There were legal and financial reasons for doing so, but the intent was also to prevent competitors from crying foul because of perceived conflicts of interest. The resulting separation between CH2M HILL and OMI created a humorous dance for the two organizations.

In late 1981, OMI initiated an aggressive marketing campaign with the goal of gaining recognition within the marketplace. The company hired a New York public relations firm to conduct its campaign, which included a major press event in New York City at Club 21—a prestigious location for a press conference.

In addition to members of the trade press, OMI's leaders were all in attendance at the press conference. CH2M HILL leaders had been encouraged not to attend, but Kent Robinson, who was intimately involved in the startup of the company, wanted to come. He was issued press credentials for something called "Tie Line" and attended the press conference incognito. Tie Line was the name of CH2M HILL's employee newsletter.

"In hindsight, I don't think we should have set up OMI to be as separate as it was," said Robinson. "I don't know that it worked as well as it could have to have two wholly separate companies with little communication between the two. I think it would have benefited OMI to have tied itself to the CH2M HILL name. No matter how good you are—and they're a great company—it's a good business move to identify two strong companies with one another."

The 1980 annual report documented the firm's gross revenues at $125 million. In 1990, gross revenues had reached $500 million.

CHAPTER 16

Moving Toward Industry Leadership

As the 1980s drew to a close, CH2M HILL was no longer the same organization that it had been at the beginning of the decade. Even as staff and revenues continued to grow, a remarkable transformation had taken place, reflecting a radical change in the scope and makeup of the organization. The firm had managed to adapt to substantial changes within the industry, all the while managing its own rapid internal growth. CH2M HILL's history, solid foundation, core values, and strength of vision served it well in navigating the sea of changes it faced in this tumultuous decade.

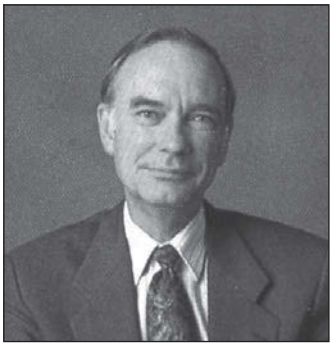
Not Just Bigger, Better

The 1980 annual report documented that CH2M HILL had become a fairly significant company: Gross revenue was $125 million, and its staff numbered eighteen hundred. But just ten years later in 1990, the annual report described a company that had become dramatically larger. Gross revenue had reached $500 million—a four-fold increase—and the staff count had nearly tripled to more than five thousand. What factors had contributed to this extraordinary growth?

Even as it grew beyond the boundaries of Corvallis, Oregon, CH2M had primarily operated as a regional engineering firm strongly identified with the Pacific Northwest. The opening of the Boise, Idaho, office in 1950 gave CH2M an early presence in what the firm considered the Northwest, and the merger with Clair A. Hill and Associates expanded its reach into California and Alaska. Yet while the company was a highly respected organization, it was virtually unknown east of the Rocky Mountains. The South Lake Tahoe project catapulted CH2M HILL into the national limelight, but the project was still a regional one based in the west. During the 1970s and 1980s, two other major programs transformed the company into a major force that was national in scale.

The Milwaukee Water Pollution Abatement Program was the largest program in the history of the firm (see Chapter 13). Prior to that project, which began in 1977, the firm focused on engineering challenges and typically relied on single projects and small teams as the "bread and butter" to produce income for the firm. The Milwaukee project was challenging from virtually every angle: political, legal, technical, and actual construction. During the nearly two-decade-long course of the project, CH2M HILL developed and refined its major program management skills, a step that would set the stage for taking on even larger and more complex projects in the future.

The second program that launched the firm's national presence began with the 1980 legislation that ignited the national Superfund program (see Chapter 14). With a burgeoning list of Superfund sites to address, CH2M HILL began



Les Wierson

a significant expansion of both its geographic reach and its portfolio of services. In the 1980s, the firm became more than just a water/wastewater company as it made the transition into an environmental service provider and a recognized federal contractor.

Both programs represented fundamental turning points. They created decades-long, ongoing efforts and required staffs of hundreds of people dedicated to a single program. Both also created new opportunities, while enabling CH2M HILL to stretch beyond its geographic and technical boundaries.

Beyond U.S. Borders

During the 1980s, the firm began to make a more focused move outside the United States. The earliest attempts to find business opportunities beyond the country's borders had not yielded much work. "Our policy was that anyone could go anywhere in the world to find work as long as you had a signed contract and could cover expenses," remembered Les Wierson, who would later become the head of CH2M HILL's first formal international organization.

CH2M HILL won its first overseas project in the late 1960s. Founder Holly Cornell had secured a project in Pakistan to design steel grain storage tanks. CH2M HILL completed the work successfully, but currency restrictions did not allow Pakistani currency to be taken out of the country. Instead, the project funds were used to purchase Persian rugs, which were sent along as payment in full.

"Eventually the rugs showed up," recalled Howland. "One rug went to Holly and another to Les Wierson, then heading up international. The rest were sold through a Portland rug dealer." Wierson's carpet remained in his office. "It was a reminder to me to get jobs where we could get our payments out of the country," he said. (Wierson's rug today is displayed in the firm's corporate headquarters in Denver, Colorado.)

In 1971, the firm served as lead engineer on a project for Trinidad and Tobago to develop a major new domestic water system. The project included an earth-filled dam on the Caroni River, a new 72-mgd water treatment plant, several booster pump stations and reservoirs, and nearly one hundred miles of pipeline. The project lasted more than ten years and served as an important training ground for future offshore assignments.

Project manager Bill Watters and his wife, Vivian, moved to Trinidad as the project began. A cadre of other CH2M HILL professionals followed to help get the state-of-the-art water treatment system up and running. "While

I served as the on-site project manager, we also brought along other key people to help train the local staff to perform complicated installations. Some staff was also brought down to complete the very complex parts of the project, such as instrumentation and controls for the facilities," said Watters. Although CH2M HILL partnered with a local firm, CH2M HILL bore primary responsibility for the project.

Bill Watters inspects an outlet conduit on Arena Dam.

Camaraderie was an important component of this project. "We felt it was very important to socialize with the people that had come down to work on the project," Watters recalled. "Vivian organized a get-together at our house about once a month. We had CH2M HILL people there, and other people involved on the project. This gave us a chance to talk about things other than work, too."

By mid-1970, international demand for U.S. engineering services—particularly for water and wastewater facilities design—was growing. Wierson was asked to assess the actual demand and to take on international business development. He recalled CH2M HILL's early interest in tapping the global market:

> *"There were a number of reasons why we decided to form an international district at that time. We knew that we needed recognition for the firm beyond the West Coast—we wanted to become known worldwide. Plus, we needed to coordinate our efforts and accountability for international work under a central umbrella. We also felt that by expanding into international markets, it would help us hedge against U.S. recession worries. And finally, we needed to provide these types of opportunities for our staff, who were looking for the challenges of overseas work."*

Wierson initially targeted the oil-rich Middle East where demand for engineering services and technologies was high and where governments had the financial resources to pay for services in U.S. dollars. In 1978, CH2M HILL was awarded a contract to provide city-planning services for Dammam and Al-Khobar, Saudi Arabia.

By pursuing work in specific countries, the firm avoided working where corruption and graft were part of the local culture. "The CH2M culture was such that we were brought up to avoid corruption," said Wierson.

These first few successful projects laid the groundwork for more growth in international markets in the 1980s. During this period, CH2M HILL actively pursued and completed work funded by the U.S. Agency for International Development, the World Bank, and other funding agencies. These types of organizations focused on the critical infrastructure needs and environmental

Alexandria sewerage system project in Egypt

problems in many third world countries. There was plenty of work to be done, and CH2M HILL won a sizable number of these projects. By seeking projects through these funding institutions, CH2M HILL gained experience in working outside the United States, and it learned a valuable lesson: Make sure the project is funded before deploying resources.

As CH2M HILL began to take on more international projects, it trained approximately 100 full-time employees who were interested in working overseas. "We hired staff that we could move from project to project as the needs arose," said Wierson. "We spent quite a bit of time training them before they worked on our international projects. It was crucial that they understood the culture and the values of the parent company before they represented us overseas."

The firm's first significant international project win of the 1980s, and a major milestone, was its selection along with joint-venture partner Metcalf & Eddy to perform planning and design for the Alexandria, Egypt, sewerage system. The project, which ultimately cost more than $1 billion to construct, was completed over the course of more than fifteen years. The Alexandria sewerage system was an important success for the firm and for the city of Alexandria. Even after the completion of the project, CH2M HILL continued to work for the city on other tasks.

"The firm was very forward-thinking in terms of taking care of its employees," recalled Jim Schwing, who helped develop the biosolids and sludge management program for the Alexandria project. "We were given a significant orientation session that helped us understand what to expect when we got over there. Of course, no matter how much we were told, it wasn't the same as actually experiencing it!"

During the remainder of the 1980s, CH2M HILL's ongoing relationship with the U.S. Agency for International Development and the World Bank led to water and environmental project assignments in other parts of the world. These projects enabled the firm to develop staff capability in international assignments—a necessary prerequisite for major projects that helped fuel CH2M HILL's international growth in the 1990s.

Closer to home, CH2M HILL began to move its operations across the U.S. border into Canada, starting first in Calgary in 1978. "We realized—really by reading the papers—that Canada definitely had the markets for our services," said Jim Poirot, then Northwest district manager, based in Seattle. "We knew that we would have to have local offices—a physical presence in Canada—if we were to compete for these projects." The Canadian operation outlined

"The firm was very forward-thinking in terms of taking care of its employees."

— Jim Schwing

a dual mission: to become the dominant firm in high-technology water and wastewater treatment, and to establish a presence within the energy and petrochemical industries.

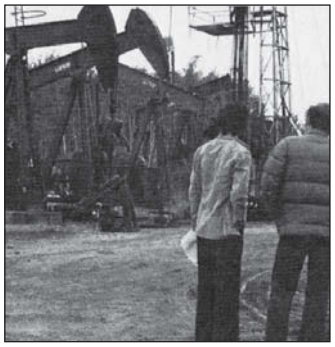
Canada was the first country outside the U.S. where CH2M HILL established a permanent location staffed with full-time residents. Steve Lackey, CH2M HILL's Seattle municipal waste department manager, relocated to Calgary to become the first Canadian employee and manager of the Canadian operations.

The firm landed the first large project for its new Canadian operations in 1978. The design of a major wastewater project for the Cold Lake Heavy Oil Facility was the largest project of its kind serving Alberta's oil industry. Similar projects followed, and by 1981, CH2M HILL's Canadian arm had established a strong reputation in water treatment process design. The acquisition of Watson Engineering, a small petroleum-engineering firm, bolstered CH2M HILL's pursuit of industrial work.

In the mid-1980s, a slump in the oil and gas industry led to an economic recession in Canada's western provinces. In eastern Canada, however, the economy was unaffected and business was booming. CH2M HILL took advantage of this opportunity to open an office in Toronto. The growing firm developed an association with Canviro Consultants, a prominent Ontario environmental engineering firm led by Earl Shannon, a former CH2M HILL employee. Within a year, the firm acquired Canviro, firmly entrenching CH2M HILL in eastern Canada as well.

The Canadian growth continued, and with operations from Vancouver to Toronto, CH2M HILL achieved the two missions it had defined for itself a decade earlier: becoming a strong and viable presence in water and wastewater treatment, and establishing itself as a service provider for the energy and petrochemical industries.

CH2M HILL's growth in Canada in the 1980s also laid the foundation for a key acquisition in the 1990s. Gore & Storrie was one of the first consulting engineering firms in Canada, established in Toronto in 1919. The fledgling organization quickly gained a reputation in municipal and industrial process and design, which fostered its strong and consistent growth. As CH2M HILL continued to develop its own opportunities in Canada, the firm often partnered with Gore & Storrie, a solid organization known for innovative approaches to its clients' needs. It was apparent that the two organizations shared values, cultures, processes, and future goals. And so, in a move that helped to build an even stronger presence within Canada, CH2M HILL acquired Gore & Storrie in 1995.



Cold Lake Heavy Oil Facility

Delivering Projects Differently

Geographic expansion—in the U.S., Canada, and overseas—helped growth, but it did not change the fabric of the firm; CH2M HILL simply delivered core competencies in broader geographic areas. Markets were changing, however, and clients were asking for more from their consultants. To be successful, organizations had to deliver their services in new and different ways. Rather than the traditional separation and segmentation of services, often referred to as "design-bid-build," clients began to look for firms that could perform the range of services in a single package, a sort of "one-stop shopping." Known by various names such as alternative project delivery, the concept at its simplest is called "design-build," having a single point of accountability for the entire project—including both design and construction.

Design-build was more than a phrase—it was a new way to deliver projects. This new method of project delivery offered many benefits to the client: single-source accountability, more effective communication, reduced change orders, lower administrative costs, and more flexibility. And for the firms that had the capabilities, the design-build process ensured that what was being built was what had been designed. Design-build was a classic business challenge: higher risks (given the total control of the project from inception to completion) with the potential for higher financial rewards.

CH2M HILL had long been involved in the construction process, providing services during construction and construction management services on projects it had designed. Those services, however, were more akin to acting as the eyes and ears of clients. The clients themselves had the direct contractual relationship with general contractors, who bore the risks of construction. Developing a design-build capability was deemed critical to the continued success of the firm, but it involved the willingness to take on greater legal, insurance, and financial risks in directly managing construction projects. Both the Superfund program and the creation of the subsidiary company IDC had initiated the firm into the design-build business, and it was apparent that this market would become increasingly important to the firm.

"For a long time, we told our clients we weren't in the construction business," said Gary Beech, a senior program manager who was one of the program directors for the twenty-year Milwaukee project. "But at some point, we realized that, hey, if our clients wanted this, we'd better figure out a way to provide it."

CH2M HILL's entry into the design-build market was initially slow and cautious. The first few design-build projects came about from conventional contracts that led to design-build opportunities. "We kind of fell into it,"

"The most effective way to cope with change is to help create it."

— L. W. Lynett,
former IBM executive

remarked John Ramage, a senior program manager. Ramage had been the leader of the firm's construction management discipline and the CH2M HILL lead for construction of the Milwaukee project before succeeding Beech as program director.

A milestone project that catapulted CH2M HILL into the design-build market was for Wacker Siltronics. The project—the design and construction of a silicon wafer manufacturing facility—was, at the time, the largest industrial project CH2M HILL had ever taken on. CH2M HILL served as prime consultant on the project, designing the facility; then it partnered with Hoffman Construction to carry out the actual construction. "I'm not sure that we ever even talked about it being a design-build contract—we were just doing what the client wanted," said Ramage.

The market for this type of service continued to grow, and the companies that offered design-build services to their clients grew along with the markets. "It was very apparent that we would begin to be shut out of the design-services markets if we couldn't offer construction services, too," said Beech.

Although CH2M HILL entered this new market with its characteristic caution, design-build has proven to be yet another aspect of the firm's ability to succeed in an environment where the business rules are constantly changing. By listening to its customers and adapting the firm's business model to better serve its clients, CH2M HILL also secured its own future.

Conclusion

As the firm entered the 1990s, CH2M HILL was a different organization. Not only was it larger, but also—in the course of a single decade—it had changed the very nature of its business. Its geographic reach had extended east of the Rocky Mountains to cover the entire country, north to Canada, and over the oceans to a number of challenging international locations. It had taken on megaprojects: long-term, complex projects that required enormous staffs and senior leadership. And it began to formalize one of its newest capabilities—design-build—to meet the demands of a changing marketplace.

It is unlikely that anyone could have predicted the massive sea of changes that transpired during the 1980s. But in that time, the foundation had been laid for CH2M HILL to become a global environmental design-build firm. The challenge that lay ahead was to find the leaders and the organizational structure that would support this "new" firm.

Ralph Peterson and Fred Merryfield

CHAPTER 17

The Third Generation

Introduction—the Global Leadership Conference

There wasn't a dry eye in the massive hotel conference room, including the speaker's. About 250 of CH2M HILL's leaders from across the globe were gathered in October 2000 for what was billed as the Global Leadership Conference. It was intended to become a regular gathering to ensure a common sense of direction for the company.

Ralph Peterson, as CEO and head of the firm's executive leadership team, had planned the conference for months. Vignettes of projects, overviews of major strategies, and—most importantly—an opportunity for networking among colleagues were the objectives of the two-day session. Peterson planned to deliver the closing remarks, but to make them relevant and meaningful, he had to write them during the course of the conference. He wanted his remarks to convey key points from the conference presentations, as well as his observations of the participants.

The only planned part of his remarks was something he had been thinking about for a number of months: the mantle of leadership and how that mantle needed to be passed from one generation to the next. He had a desire to convey to the attendees his own sense of how he had become a leader, by looking back at those who had influenced him at key points in his career.

He had carefully scripted his remarks, focusing on three "personal heroes" who, for him, had made CH2M HILL what it was in 2000. He wanted his words to have an impact on the audience. He wanted them to reflect on their own heroes and to commit themselves to becoming personal heroes to others across the firm.

The planned script and his reflections on two of the heroes went exactly as Peterson had planned. He first spoke about Burke Hayes, who had befriended Peterson when he was still an undergraduate at Oregon State University. Hayes, he said, was a "fellow [who] didn't care so much about my credentials as he did about my willingness to work and learn what he had to pass on." Peterson went on to describe what he had inherited from Hayes:

> *What I learned from Burke I couldn't begin to capture in a simple sentence or paragraph. What it amounted to was a real-world classroom where the assignments were genuine projects for genuine clients. I can't point to one great lesson Burke taught me. It was more like day after day of lesson after lesson that accumulated over time.*

Craig Zeien

His third "hero" was also well received. He described everyone in the audience as his collective hero. He named people in attendance at the Global Leadership Conference, describing in a few words how they had moved him over the past couple of days:

> *The hero I most admire, respect, and look to for inspiration today is the one that's alive and kicking in every one of you and your colleagues. There's a hero in each one of you that deserves to be recognized and congratulated.*

He challenged each of the attendees to reach out to others in the firm who are "performing heroic work for our company." He thanked them and let them know that they should be proud to work at a firm populated by professionals of the highest integrity and honor.

But those who were there that day were most moved by Peterson's second hero—and a moment Peterson had never scripted at all. Peterson wanted to pay a personal tribute to a colleague who was not at the conference, Craig Zeien. Zeien had died about a year earlier on November 5, 1999, following surgery and subsequent complications from brain cancer. All of the people in the audience had known Zeien, or at least knew his story from all-employee communications. They knew Zeien as a member of the executive leadership team, knew he had been a potential successor to Peterson as CEO, and knew that he had tragically died before his time.

But few knew how profound the loss was for Peterson, both personally and professionally. The text for his closing remarks had been carefully written so Peterson could tell these leaders that Zeien could be a hero for them. Get through this one quickly, Peterson thought; get to the third hero and the rest of the closing remarks. Close the conference.

Then the tears came, first for Peterson and then for the audience. Peterson struggled mightily to get the message out:

> *Working alongside [Zeien] taught me that regimented discipline didn't have to be regimented drudgery. No one could get more accomplished in a single day than Craig. But what was truly amazing was that his daily accomplishments weren't limited to the office or project sites. They included a full workout at the health club, quality time with wife and family, and spirited good-natured fun with co-workers.*

Peterson then talked of the leadership lesson that Zeien had faithfully practiced. It was in bold print on Peterson's text: "The measure of a person's character lies not in accepting credit for good work, but in passing credit on to others."

"The measure of a person's character lies not in accepting credit for good work, but in passing credit on to others."

Craig Zeien

To this day, no one who was at the conference can tell you whether Peterson ever completed his prepared remarks. Those in attendance, however, will never forget the sight of their CEO, who many regarded as a tough, disciplined, and sometimes harsh critic, sobbing at the podium.

Building the Third Generation

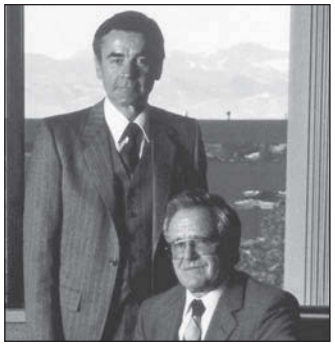
Peterson and the executive leaders present at the October 2000 Global Leadership Conference represented CH2M HILL's third generation.

The first generation, of course, consisted of the founders and the early employees of the firm. Their era began in the shadows of World War II and continued into the early 1970s, culminating in the merger between CH2M and Clair A. Hill and Associates in 1971. The growth, from two separate seedlings in Oregon and northern California to a nationally recognized and respected engineering and consulting firm, was the direct result of the personal leadership and influence of that group.

The second generation, led by Harlan Moyer as CEO, was made up of the first group's handpicked successors. All except Fred Merryfield were alive and still active in the 1970s and early 1980s. Their influence, their legacy, and their "fingerprints" marked their successors for success. A hallmark of the second generation was their direct linkage to the firm's first group of leaders. The founders were still, in many ways, the guideposts for this generation. No one in the second group would have described himself as operating at the direction of the founders, but each would acknowledge that his decisions, his belief in and adherence to core values, and his passion for CH2M HILL came from the almost spiritual guidance he felt in connection with that first generation. Moyer himself later recalled:

> *I never was told how to do things after I took over as CEO—not by Jim Howland or Burke Hayes or Holly Cornell, and not even by Clair Hill, who hired me in 1952. But I always felt that they were watching to make sure what they had created lived on. This was not a challenge or a burden; it was a guidebook for many of the decisions I got to make as a leader of CH2M HILL.*

The selection, growth, and development of the third generation, however, were more removed from the early origins and founders. By the end of the 1980s, as Moyer, Jim Poirot (the chairman of the board), and the board itself began to evaluate successors, they looked at a firm that had undergone an incredible transformation in a single decade: from 1,800 employees and revenues of $125 million in 1980, to 5,000 employees and $500 million in revenues in 1990.



Jim Poirot and Harlan Moyer

As the leaders contemplated the future of CH2M HILL, they believed that the next generation was likely to face significant growth, many new and diverse challenges, and expansion into newer and more risky areas of business. In the 1980s, the firm had expanded geographically and the concept of becoming a global firm seemed more reachable. Through OMI and IDC, the company had demonstrated its ability to diversify. And, for the first time, the leadership was beginning to contemplate the prospect of CH2M HILL's taking an active role in construction, rather than simply providing consulting services to clients while projects CH2M HILL had designed were being constructed by others.

Hindsight, as they say, is 20:20. From the vantage point of 2000, as Peterson spoke to the new generation of leaders at the Global Leadership Conference, his selection as CEO and the selection of leaders for the various business units of the firm seemed logical, almost preordained. But what marked the third generation as distinctly different from its predecessors was the willingness on the part of the firm to find and embrace "new blood"—people who had not grown up as "lifers," but who had an expertise that could not be grown from within. Within the short span of about ten years, CH2M HILL underwent a metamorphosis of sorts, finding an incredible blend of long-time employees and new players to take the company into the new millennium.

The most significant step in that process would be the selection of Peterson as CEO, but it was not the only key decision, by any means. Since the creation of a holding company, CH2M HILL Companies, Ltd. (LTD), in 1983, Moyer had held the position of CEO for the entire company, as well as serving as president of CH2M HILL, Inc. (INC), the core consulting engineering business. Moyer was a peer of sorts to the presidents of IDC (Ken Durant) and OMI (which had a series of leaders, most notably in this era, Don Evans), but he also was the overall head of the entire firm.

With Moyer scheduled to retire in 1991 at the age of sixty-five, the board and Moyer agreed to separate the positions of CEO and INC president. In addition, Poirot announced his plan to retire as chairman of the board in 1993. Thus, the board faced changes in the firm's three top positions within a short period. By June 1989, the board agreed on the selection process and the timing for filling the three positions:

- Summer 1990: selection of INC president
- Summer 1991: selection of new LTD president and CEO
- Early 1993: selection of new chairman of the board

The board set up its selection committee, consisting of Moyer and Poirot; the board's two outside directors, Ralph Cox and Jerry Geist; and three non-board employees, Bill Wallace, Les Wierson, and Gene Suhr. The goal was to

announce all three changes at once, even though the transition would take place over several years. As CH2M HILL had done with all major decisions in its history, the goal was to find consensus candidates, to show a united front on the selected group, and to make sure that employee shareholders saw only the final result—not the process behind it.

Ralph Peterson and Phil Hall

Today, there are no minutes of the selection committee's deliberations. No one recalls how much dissension there was among the members, or how they came to resolution. What is clear is that the selection of the three key leaders—Lyle Hassebroek as president of INC. Peterson as LTD president and CEO, and Phil Hall as chairman of the board—had the endorsement of both the first and second generations of leaders.

That these three were well prepared to lead was no accident, Phil Hall recalled:

> *The Moyer/Poirot team allowed Peterson/Hassebroek/Hall to go get top-notch training: Peterson and Hall at the Harvard Business School, and Hassebroek at the Stanford Business School. That willingness to invest in serious management training showed our company's realization of the increasing sophistication needed to operate what had become a very large organization.*

In the October 1990 issue of the CH2M HILL employee newsletter, *Tie Line*, Cornell served as the spokesperson for the earlier generations, both in style and substance. He sought a fine balance, looking back at the forty-five-year history that the new leaders would inherit and looking forward to a bright future for the firm:

> *So another turn of the wheel brings up a new set of leaders. Following a long tradition it was not a selection by a super "honcho," but a consensus developed by a board of directors sensitive to and in tune with those who make CH2M HILL go—all of the firm's people. As has been amply demonstrated, the old myth is wrong that a "good manager can manage anything"—particularly in the technology business. The top leaders must understand and really know the business. The new hierarchy knows and has grown up with the consulting business, and our unusual structure and innovative method of operation. This tradition is why we have surpassed the old names in the field, who started long before us, and the hundreds who have started since, many of whom no longer exist.*
>
> *The new group of leaders was selected because of their obvious stature, experience, capability, and fit to the job. This selection is not a reward for past service but a demand for future service of an exceptional order.*

"Following a long tradition it was not a selection by a super "honcho," but a consensus developed by a board of directors sensitive to and in tune with those who make CH2M HILL go—all of the firm's people."

— Holly Cornell

To those active in CH2M HILL, I say, support this new leadership—not for them but for yourselves. This is the way, as the past 45 years attests CH2M HILL can go on to even greater success.

Who were these people accepting the mantle of leadership?

Peterson had begun his CH2M HILL career as a part-time surveyor while still a student at Oregon State University. He became a full-time employee upon graduation in 1969 as a wastewater project manager and then went on to earn a master's degree in environmental engineering from Stanford University in 1970. Peterson held various positions over the next two decades, including director of industrial processes in 1977; REM/FIT (Superfund) program manager in Reston, Virginia, in 1985; and director of technology in Denver in 1988.

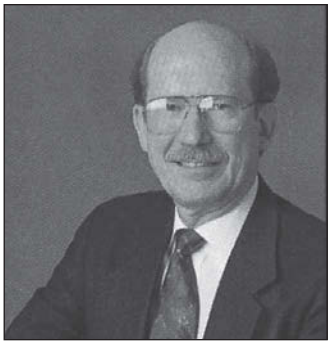
Those who knew Peterson applauded his selection as CEO. He had a quick and fertile mind, a constant thirst for knowledge, and—above all—a passion for CH2M HILL. His work habits and long hours became legendary. He often surprised people who came to work early in the morning, just as he was finishing his late night/early morning workday.

Hall's selection as chairman also seemed logical. He joined the firm as an engineer in Seattle in 1966, after graduating from the University of Michigan. As with Peterson, Hall held a variety of jobs over a twenty-year period. He served as a water and wastewater project manager and in 1970 he moved to San Francisco, California, where he eventually became regional manager and then Southwest district manager. In 1987 he relocated to Denver, Colorado, and became the central district manager.

What distinguished Hall was his feel for people. Many saw him as the descendant, of sorts, of Jim Howland because of his care and concern for his clients and the CH2M HILL employees under his direction. His engaging personality was a complement to Peterson and a positive face for CH2M HILL to the outside world.

Hassebroek's election as president of INC made sense as well. A graduate of the University of Wisconsin in 1963, Hassebroek had started in CH2M HILL's Corvallis, Oregon, office before moving to Seattle, Washington, in 1965. After serving as a project manager on numerous water and wastewater projects, he became regional manager in 1978, and eventually Northwest district manager. He took on a special assignment to help establish CH2M HILL's presence in Wisconsin and served as proposal manager to win one of the major EPA

Superfund contracts, known as REM IV. He moved to Atlanta, Georgia, in 1983 to head CH2M HILL's eastern district and then to Denver as INC president.



Lyle Hassebroek

Throughout his career, Hassebroek was seen as a calm, effective, and fairly quiet manager. He was not as outgoing as Hall and not as intellectual as Peterson, but a well-rounded addition to the leadership team. During 1992 and 1993, Hassebroek helped lead a major reengineering initiative (see Chapter 18). During those efforts, CH2M HILL's leadership team placed strong emphasis on putting the most qualified people in each designated position, without regard to their current assignments. The goal was to look objectively at the needs of the firm in the coming years. After careful thought and deliberation, Hassebroek decided to step down as INC president and recommended to Ralph Peterson that Craig Zeien be his replacement. Hassebroek felt that the dynamic business environment the firm faced required different skills at the top and that Zeien was best suited to meet those needs. Peterson accepted Hassebroeck's recommendation and appointed Zeien as INC president. Hassebroek became chief administrative officer until he and his wife retired to Seattle in 1996.

Peterson's leadership team, all long-term CH2M HILL employees, was now in place. In addition to Hall and Zeien, Peterson had Durant at IDC and Evans at OMI. Change would not be easy for many people, and the leaders knew that more changes would be coming. Using a personal touch and candor unheard of in many public companies, the August 1993 memo from Peterson and Hall acknowledged what employees must have been thinking at the time:

> *One final note to you. You, the people of CH2M HILL, are CH2M HILL. Our desire is to provide the best possible leadership for the collective benefit of all of you who make up this fine organization. The pace of change today may be uncomfortable to some of you. We understand that. But the fact is that our world has changed, fundamentally, forever, and to wish that it were different will not make our competitive world go back to what seems now like a more stable, predictable past. The successful firms of the future will be those that recognize the new realities around them, and who respond boldly, positively, and creatively. We believe we are doing this with our new structure. We will work with all of you to implement changes with the highest respect and regard for you.*

Little did employees know how prescient this memo would prove to be.

Joseph A. "Bud" Ahearn

Blending Long-term and Newer Leaders

With Peterson, Hall, Zeien, Durant, and Evans, the third generation began to form. However, over the next decade of Peterson's tenure as CEO, five individuals with radically different backgrounds, experience, and points of view came with new leadership perspectives on CH2M HILL and helped transform it into the company it became in the early years of the twenty-first century.

The first of these was Joseph A. "Bud" Ahearn. Ahearn's career formation was in the Air Force, where he served with distinction from 1958 to 1992, retiring as a two-star major general. Recruited by Jim Poirot, Ahearn came to CH2M HILL in April 1992, with his first assignment as regional manager in the Reston (later Herndon), Virginia, office. Peterson wanted Ahearn, in addition to leveraging his military connections and leadership skills, to establish more formality to a growing part of CH2M HILL's transportation business. The firm had done a number of highway and bridge design projects, some airport design work, and some light-rail consulting and design work over a number of years. But the engineers who did the work were not a recognized force or separate business unit within the company. Ahearn, through his high-profile client contacts and his forceful leadership, helped form the transportation business group, eventually leading it to "top 10" status in *Engineering News-Record*. Ahearn served as president of the business group from January 1996 to May 2003, when he stepped aside to allow development of other executives and to serve as vice chairman of the board of directors.

Beyond his leadership of the transportation group, Ahearn was passionate about career development, succession planning, and what he called development of the "whole person." Through connections with the University of Michigan, Ahearn helped create CH2M HILL's Foundations of Leadership course, an intensive "boot camp" for up-and-coming executives. Every quarter, the executive leadership team became the faculty for about thirty hand-picked, CH2M HILL developing executives who learned about the company, its business and financial underpinnings, and—as the name itself implies—the fundamentals of becoming a leader.

Sam Iapalucci, hired as chief financial officer in 1994, became the next critical piece of Peterson's leadership puzzle. Peterson, during his years as a rising executive and his early years as CEO, was increasingly concerned about the long-term financial stability of the company. Although the firm was privately held by its Key Employees (KE), Peterson was concerned about the sort of "hand-to-mouth" existence. Every year, about 70 percent of the firm's pre-tax profits were given to the employees in the form of annual bonuses. This arrangement left only

30 percent of pre-tax profit retained in the firm. Consequently—from Peterson's perspective—the firm's net worth was increasing too slowly. To compete in the new markets Peterson envisioned, it was imperative to build a much stronger balance sheet (i.e., increased net worth). Peterson and Iapalucci set in place a program to do just that. Iapalucci brought broad-based industry and monetary expertise, banking knowledge and connections, and a hard-line commitment to a rock-solid financial base. He had started his career as a public accountant working for Coopers & Lybrand. He then progressed in the financial world with positions of growing responsibility, including Equibank N.A.; Allegheny International, Inc.; and OHM Corporation. As chief financial officer for Allegheny, a New York Stock Exchange-listed remediation company, Iapalucci had seen both the highs and lows of financial management, including seeing the company through Chapter 11 bankruptcy proceedings.

Sam Iapalucci

In less than a decade, Iapalucci oversaw a positive transformation of CH2M HILL's financial picture. Perhaps the best evidence of increased financial strength was its ability to acquire the engineering construction firm, Lockwood Greene, in late 2003. With a purchase price of over $95 million, Iapalucci helped orchestrate the acquisition, using CH2M HILL's line of credit only temporarily. Within weeks of the acquisition, the credit line was back to full capacity.

One of Iapalucci's lasting impacts, part of his legacy, will likely be his role as the "architect" of the firm's move from the KE program to the Employee Ownership program, which began on January 1, 2000 (see Chapter 21). As part of his plan to build financial strength, Iapalucci believed in two fundamentals: (1) that more of the firm's wealth had to be kept as retained earnings, and (2) that all employees—not just a select few—should benefit from the firm's financial success. He oversaw both the development of the firm's stock program (shepherding it through the legal maze of the Securities and Exchange Commission) and the implementation through a series of "road shows" to employees, similar to an initial public offering of stock in a new corporation.

As a result, employees at every level of CH2M HILL became eligible to own stock in the firm. From its inception in 2000 through 2005, CH2M HILL's stock outperformed both the U.S. stock market and the public stock of all CH2M HILL's competitors.

"The new ownership program allowed money to be stashed away for significant growth developments and investments. As long as we continue to build our financial base and all the related strengths that entails, we could probably weather something pretty catastrophic."

— Sid Lasswell

Looking at the changes from the perspective of retirement, Sid Lasswell was clear about what he perceived as a significant improvement in the company's financial base (and, since his son Mark works for the firm, he still had something of an interest):

> *The new ownership program that Ralph [Peterson] and Sam Iapalucci initiated has been a major benefit to the firm. The new ownership program allowed money to be stashed away for significant growth developments and investments. As long as we continue to build our financial base and all the related strengths that entails, we could probably weather something pretty catastrophic.*

No single individual had a greater impact on the growth of CH2M HILL since the mid-1990s than the third "outsider," Jim Ferris. Peterson recognized that one of the critical areas of growth for the firm would be in construction, and he needed people who knew that side of the industry.

After graduating from Marquette University with a degree in English, Ferris went on to receive his doctorate in biological sciences from Rensselaer Polytechnic Institute in 1970. He later completed the Advanced Executive Management Program at Wharton in 1982. Ferris had spent his career in and around construction. After working in a variety of positions, Ferris was elevated to president and CEO of Ebasco Environmental Corporation and Ebasco's Federal & Strategic Programs Unit, a position he held from 1975 to 1994. He was well known to Peterson and others in CH2M HILL through work on the Superfund contracts, where Ebasco, under his leadership, emerged as a major EPC hazardous waste cleanup company.

Ferris respected CH2M HILL for its history and culture, and the timing to make a career shift was opportune. He saw the move as an opportunity to help develop and grow CH2M HILL into a formidable industry player.

Ferris was initially hired to start up and run a separate legal entity for the federal group, which was bringing in revenues of only about $100 million when he arrived in January 1994. Within a short time, however, all federal work within the firm was consolidated under his leadership, as well as the environmental business for state government and private clients. By the early years of the new millennium, Ferris had become the president of CH2M HILL's energy and environmental systems business group, which accounted for about half of the firm's revenue and profits. This business group included all of the company's federal business, its environmental work for federal and nonfederal clients, a growing energy portfolio, and telecommunications.

From the mid-1980s through 2005, CH2M HILL was able to double its revenues about every five years. Many people and a host of market factors contributed to this extraordinary growth, but one of the cornerstones of the expansion was

Ferris's leadership on the pursuit and win of the Rocky Flats contract in 1995 for the Department of Energy (see Chapter 20). That one project generated more than $7 billion in revenue over a ten-year period. More importantly, it put CH2M HILL on the map as a significant competitor for major construction projects for the federal government. Ferris was both the visionary who saw CH2M HILL's major projects capabilities as applicable to such a project and the strategist who could align the necessary partners to achieve success.

Jim Ferris

Those who worked for Ferris respected him for his strategic vision and strong leadership. Beyond his gruff exterior, they also knew he cared deeply about the people he led and about CH2M HILL. At a surprise party for his sixtieth birthday, Peterson told a gathering of Ferris's friends and family: "When I am grappling with difficult issues, there are two people in my life I go to without hesitation: my wife, Betty, and Jim Ferris. I can always count on Jim for sage advice when I need it the most."

Don Evans was a classic CH2M HILL "lifer." Born and raised in Idaho, Evans grew up in the rural western culture so typical of many of CH2M HILL's employees, including its founders with their Oregon roots. After receiving his bachelor's and master's degrees in civil engineering and another master's degree in business administration from Stanford, Evans joined the company in 1973, excited about applying his "book learning" to the real world problems that CH2M HILL was working on.

Like so many engineers who established their careers at the company, Evans held a variety of positions, in different geographies, on projects for clients around the globe. His principal expertise was in water and wastewater, working on projects from California to New Jersey. As CH2M HILL expanded its global reach, Evans expanded his role as well, serving as the project director for restoration of Kuwait's sanitary system after the Iraqi invasion of 1990 (the Gulf War) destroyed it. He also served as principal-in-charge for the Manukau Wastewater Treatment Plant in New Zealand, the thirty-mile deep tunnel sewage project in Singapore, and the design of a massive water-treatment plant in Singapore (with an eventual construction cost of more than $1 billion).

As Peterson built his leadership team, he turned to Evans for some of the most challenging management assignments. Evans took over the management of OMI at a time when two of its principals had been convicted of individual criminal conduct using an undisclosed business partnership to defraud OMI. Evans then held dual leadership positions as lead of both OMI and the water business group in the late 1990s and early years of the twenty-first century. In 2004, Peterson tapped Evans to be chief executive of CH2M HILL's civil infrastructure group, a combination of all of the firm's water, transportation, and operations businesses.

Don Evans

Evans became famous (or some might say infamous) for his both exuberant and positive outlook, and for the number "3." Any client presentation, any concept, any communication, Evans believed, should be distilled down to three points: things people could remember easily, both in giving information and in receiving it. It was a simple concept, but one that members of Evans's teams took to heart. And in a respectful but fun sort of way, people described Evans the same way: By 2005, he was running three business groups, held three degrees from Stanford, and had served CH2M HILL for over three decades.

Among his three proudest accomplishments: Evans led the campaign that resulted in OMI receiving the 2000 Malcolm Baldrige National Quality Award; served as chair of the Water Partnership Council; and was elected chair of the Design Build Institute of America.

With a bachelor's in civil engineering, a master's in environmental engineering from Stanford University, and a PMD (program for management development) from Harvard University, Bob Card was hired directly after graduation in 1977 into CH2M HILL's Seattle office. Typical of many young and energetic engineers, Card took on a variety of projects, primarily in the water and wastewater sector. Following assignments in the U.S. and Canada, Card moved to Denver as a key strategist on the pursuit of the Rocky Flats nuclear-waste cleanup contract. Card became president and CEO of Kaiser-Hill, the limited liability corporation that owned the contract. He served in that capacity from July 1995 to April 2001, setting the stage for closure of the site some fifty years earlier and for $30 billion less than previously forecasted.

The assignment to Kaiser-Hill took Card out of the mainstream operations of CH2M HILL; the intent of the Kaiser-Hill joint venture was to run the project independently of both parent companies, CH2M HILL and ICF Kaiser. The years on the project site gave Card an outsider's perspective, allowing him to appreciate the core values and history of CH2M HILL, yet operating in a time-sensitive, even autocratic environment where CH2M HILL's consensus approach to decision making would not have worked as well.

In 2001, Card received what he perceived as the career opportunity of a lifetime, an offer he simply could not refuse. Newly elected President George W. Bush asked Card to take on the role of Under Secretary of Energy, the number three position at the DOE. Despite hardships on himself (he had to divest himself of his CH2M HILL stock), his family (who had to move to Washington), and Peterson (who saw Card as a potential successor as CEO), Card took the position. The job gave him a much broader perspective on DOE, the U.S. government, and world energy issues, and it gave him insight into how other organizations approached complex energy-related challenges.

"A leader has two important characteristics; first, he is going somewhere; second, he is able to persuade other people to go with him."

— Maximilien Francois Robespierre,
French Revolutionary leader

Some people were shocked at Card's departure: How could a "lifer" leave the company in mid-career, at the peak of a major project? Even more were surprised at Card's return three years later, given the fact that he could have leveraged his governmental experience into other high-paying or high-profile opportunities. But CH2M HILL was part of Card's heritage, and his loyalty to Peterson and the firm took priority over potential prestige and money he might have achieved elsewhere. In the latter part of 2004, Peterson wooed Card back to his roots with a challenging assignment: take CH2M HILL to the next level as a truly global company. Both of them believed that Card's experience at Rocky Flats and DOE would bring fresh perspective on the firm's strategic growth, its competitors, and its profile inside and outside the United States.

Bob Card

Card came back as a member of Peterson's inner circle, part of what Peterson called the Office of the CEO. This group included two long-term employees (Evans and Card) and four newer leaders (Ahearn, Ferris, Iapalucci, and Bob Allen, as head of human resources). In 2006, Peterson brought in a new Chief Operating Officer, Lee McIntire—an industry-recognized leader, whose role was to strengthen the organization. (McIntire succeeded Ralph Peterson as CEO in January 2009, and was elected Chairman of the Board of CH2M HILL in 2010.) This blending of career experience and competencies added a kind of hybrid vitality to the firm, which welcomed the entire third generation as part of the family. Together, they represented the strategic future of CH2M HILL—the leadership that set the course of continued growth of the firm as it approached its sixtieth anniversary in 2006.

What few realized at the time was how different this third generation of leaders was from its predecessor generations.

Conclusion

As Peterson looked out at the global-leadership audience in October 2000 and talked of Zeien, he was conveying his loss of both a friend and a valued professional colleague. Zeien's death had left a void in his life, in his leadership team, and in his own succession planning.

As he spoke, Peterson was trying to exhort this group of leaders—and perhaps himself—to carry on and set a new course. Using his own heroes, Hayes and Zeien, as inspiration, Peterson wanted this group to look to the future and find others who could inspire them and who they could inspire as well.

This then defined the third generation: cognizant of the past and the legacy left by prior generations of CH2M HILL leaders, challenged by the present demands of growth in new markets and geographies, and led by people who saw a bright future. Peterson wanted them to be heroes for the modern era.

Navigating a highly maneuverable vessel would require better and faster decision making, with leaders who were comfortable with change.

CHAPTER 18

Moving the Battleship: Reengineering—a New Organization

The buzz at CH2M HILL's headquarters in Denver was spreading through the hallways in the early 1990s. No one was sure what it meant yet, but the leadership was sending out signals that major changes were in the works. Across America, businesses were using a new term, "reengineering," and it resonated immediately within CH2M HILL. How could anyone be better at reengineering than a company of engineers?

Leaders in Denver and across the company began to contemplate both leadership and organizational changes. Coupled with reengineering, another impressive-sounding term soon entered the dialogue: total quality management (TQM). The professionals at CH2M HILL immediately embraced that term as well. After all, TQM did not sound much different from quality assurance and quality control, processes embedded in design projects the company had worked on throughout its history.

Shortly after the buzz began, a new symbol began to appear in offices across the United States. It was the universal "no" sign (the red circle with a diagonal slash) covering what looked like a battleship. The firm's general counsel, S. Wyatt McCallie, was particularly excited about the symbol when he brought news back to the legal department from a firmwide quality improvement symposium. At the symposium, CH2M HILL's president, Lyle Hassebroek, made the keynote address and listed some changes the company needed to make:

> *We said in the past many times, referring to our way of doing business, that it takes a long time to turn this battleship. Well, I want to sink this battleship and get into a jet boat that can move fast, turn quickly, and adeptly maneuver through the rocky rapids.*

McCallie had been in Admiral Hyman Rickover's nuclear navy, and he enthusiastically endorsed the symbolism—CH2M HILL had become too big to change direction quickly. What reengineering was all about, McCallie mused with his colleagues, was getting the company to move more quickly, to become a PT boat rather than a battleship. Navigating a highly maneuverable vessel would require better and faster decision making, with leaders who were comfortable with change.

Indeed, CH2M HILL had become as complex and difficult to maneuver as a battleship. Over the past couple of decades, a company with just seven offices concentrated in the Northwest had grown to include twenty-three fairly autonomous regions across the U.S., with other offices around the world. Ten disciplines, focused primarily on water and general civil engineering, had grown to forty-four, ranging from general civil engineering, to hazardous and

"Even if you are on the right track, you'll get run over if you just sit there."

— Will Rogers,
actor, humorist, and social commentator

industrial waste, to construction management. When the disciplines on one axis of the matrix organization were overlaid with growing geographies on the other axis, the organizational picture confounded the comprehension of clients, other outsiders, and newer CH2M HILL employees.

The cry of "ban the battleship" made a lot of sense to those at the top. Three leadership meetings were arranged at different locations across the company where these new concepts of reengineering and TQM could be explored. In classic CH2M HILL fashion, a twenty-six-member reengineering team was set up, and the meetings were designed to reach more than two hundred of the firm's leaders. The goal was consensus, but even the process of outlining what needed to change was complex and potentially cumbersome.

For those involved in the leadership meetings, it was clear that significant changes were in the offing. For the vast majority of employees, however, it was business as usual. They had clients to serve, projects to win and deliver, schedules and deadlines to meet, invoices to send, and money to collect. They had little time to think about reengineering, TQM, or the complexity of the battleship they were on, let alone its direction.

Employees read the memos, saw the "ban the battleship" stickers, and… went back to work. On a daily basis, not much seemed to change.

Yet despite the initial skepticism and near indifference of most employees, reengineering and TQM would have profound impacts on the organization, the clients CH2M HILL came to serve, and the perception of CH2M HILL within the industry. The decade of the 1990s became one of the most significant times of change in CH2M HILL's history.

The leaders know they had to reengineer the battleship. The question was: How?

The Need to Reengineer

By the early 1990s, the engineering profession as historically practiced within CH2M HILL was undergoing significant change. Tensions were growing within the firm as leaders recognized three trends that could potentially leave CH2M HILL behind.

First, more of the firm's competitors were moving aggressively toward globalization, not only following U.S.-based clients into other geographies, but also establishing offices and executing projects beyond U.S. borders. CH2M HILL had performed work in the Middle East and in other geographies

but was not adept at working internationally, where projects had rarely returned profits to the firm's shareholders.

Second, many of the company's more significant competitors were becoming "full service," offering clients the range of capabilities from consulting and engineering, to construction and operations. CH2M HILL was highly regarded in the engineering field, had a recognized construction management discipline, and had established OMI to operate water and wastewater treatment systems. But when clients wanted "one-stop shopping," including construction, CH2M HILL was not seen as a viable competitor. In the CH2M HILL lexicon, "construction management" meant serving as the eyes and ears of the client during construction, not actually performing or directing the construction work.

Third, the successful pursuit of major projects was beginning to require greater capital investment. With some 70 percent of the annual profits being distributed back to its key employees, CH2M HILL had not built a solid financial foundation; by some accounts, the firm was living a precarious "hand-to-mouth" existence.

These three trends—globalization, full service, and the need for capital—equally affected many of CH2M HILL's traditional competitors in the engineering industry. The issue for CH2M HILL's leaders was whether the company could compete with the bigger competitors—Bechtel, Fluor, and Jacobs—which were taking on major construction projects around the world.

Perhaps more disturbing than these industry trends was a growing negative perception about CH2M HILL among some of its clients. The firm had engaged an outside consultant to videotape some clients and competitors at a major annual water convention. Participants in a "special session" were asked about industry leaders and probed about their impressions of CH2M HILL, as well as other companies (to keep the purpose of the study "blind"). Using two-way mirrors, the consultant videotaped the session, which revealed some strongly negative attitudes about the firm. While several of the participants praised CH2M HILL for its ability to tackle tough projects, the quality of its people, and its innovative engineering expertise, there were two recurring negative comments: CH2M HILL's people were often arrogant, and the company was too expensive.

Further discussions with clients provided additional negative feedback. The firm was too inwardly focused, overhead costs were too high, and CH2M HILL did not offer a competitive range of services.

It was clear that CH2M HILL needed to change if it was going to remain a major industry player.

Recognizing the three trends and ambivalent client attitudes helped explain what was already painfully obvious: slumping profitability. Core markets in water and environment, particularly Superfund revenues, were flat or declining. Coupled with a recession and an overhead rate among the highest in the industry, this made it clear that CH2M HILL needed to change if it was going to remain a major industry player. Yet many of the firm's leaders seemed to be in denial or inclined to minimize the need for change, the extent of the changes required, or the urgency. After all, the discipline system had served the firm well for decades and had become a major differentiator in the industry—the matrix organization placed equal value on those who contributed technical and management skills.

Even advice from an outside management consultant engaged to evaluate where the firm was and what was needed to chart a future course did not initially sway some leaders from the belief that change was not necessary. The consultant's advice, based on just a cursory review of the facts, was blunt: "You have gone through a typical S-curve of maturation, and now your markets and revenues are flat or declining. If you want to survive you must change and change dramatically. If you don't, you will decline or even cease to exist."

The news was a hard blow to an organization that prided itself on being client focused, and it was initially rejected—and the consultant was promptly fired. There does not appear to be any record of his name in the firm's archives.

Stronger, less entrenched voices began to be heard in the early 1990s, and senior leaders began to recognize that it would take an outsider to help bring about needed change. Most of the leaders were long-term employees who had grown up in the CH2M HILL culture, a culture founded on mutual respect, consensus-oriented decision making, and frequent selection of the path of least resistance. Only an outsider, unencumbered by having to "play nice," could hold up a mirror to the company's leaders, ask tough questions, and suggest changes that might impact some individuals' jobs or status within the firm.

Dr. Harold (Hal) Resnick, founder and president of Work Systems Associates of Boston, became the right man for the job, although that was not immediately apparent to him or to the leadership of the company. Years later, Resnick recalled how his firm was selected for what became a pivotal assignment for his company and CH2M HILL:

> *I recall my first experience with CH2M HILL with a mix of humor and amazement. I was at home one evening and the phone rang. It was*

"I recall my first experience with CH2M HILL with a mix of humor and amazement . . . After all, what kind of a crazy name is that for a company?"

— Dr. Harold (Hal) Resnick,
founder and president of Work Systems Associates of Boston

> *someone from CH2M HILL who told me that they were looking for a consulting firm to help them with their TQM efforts and I had been selected as one of the finalists. Since I had never heard of CH2M HILL and never responded to any inquiry, I was naturally suspicious. After all, what kind of a crazy name is that for a company?*

But they said that they had heard of me and wanted me to come to make a presentation in Denver the next week. So I went to Denver, made my presentation, and thus began our relationship together.

Resnick was later described by Phil Hall, then CH2M HILL's chairman, as having "the right blend of pugnacity, listening skills, and willingness to positively confront" the leaders of the firm. His extensive experience with reengineering other companies had helped him develop and refine a tool kit of techniques that allowed participants in any meeting to make meaningful contributions to the dialogue. One of the simplest and most effective of these tools was "dot voting." Each participant in a given meeting could apply his or her dots to help determine priorities from among a list of potential actions. The process gave equal weight to the opinions of those who were outspoken and those who were more reticent to voice opinions.

Resnick was also adamant about adhering to a prescribed set of rules at every meeting, including such basics as critical listening, adherence to the agenda, active participation of all attendees, and the ability to voice dissenting opinions without being criticized. Perhaps his most fundamental rule was to leave your title and job at the door as you enter the meeting room—a signal that Resnick expected attendees to be on an equal footing, while he controlled the process and directed the group toward positive accomplishments. It took only one meeting to test his approach. He later commented:

> *Within a month the company called a management meeting—there were about 120 people in the room and all the regions and about sixty offices were represented. I listened to the general discussions and arguments for a while and then blurted out: "You're not a company. You're a fiefdom of semi-autonomous mini-empires that agree to work together and pay some modest homage to the central federation." The room went dead silent and I thought to myself: This is going to be the shortest consulting engagement of my career. So I asked whether the silence meant that I was totally out of line. One person responded, "No. You just nailed us." And that began the process in earnest.*

"You're not a company. You're a fiefdom of semi-autonomous mini-empires that agree to work together and pay some modest homage to the central federation."

— Dr. Harold (Hal) Resnick

Establishing his authority was relatively easy; the actual work of reengineering CH2M HILL was much harder. Resnick and his team began by analyzing the work processes of the firm, and it became clear that there was no consistent method for delivering the myriad projects CH2M HILL worked on across the company. Every discipline and every major office seemed to have its own methods, which were not generally replicated on other projects in other offices. Resnick's team and CH2M HILL's director of quality, Dave Ellison, analyzed several thousand projects, comparing expected profitability at the start of a project to the actual profits when the project was completed.

The result, which Resnick said was largely unexplained and which he called project leakage, was appalling. The team discovered that CH2M HILL was generating only about 50 percent of its expected profitability. Further analysis revealed some of the root causes of the shortfall: lack of project planning, poorly defined roles and responsibilities among the project team members, and no consistent methodology for delivering projects. Each project manager seemed to be reinventing the wheel, with little accountability for the final results. When Resnick sought to bring in some of the most respected project directors from the business lines, the challenge was bigger than he had anticipated:

> *The initial resistance was incredible. They would not acknowledge that sufficient commonality existed among their business lines to even contemplate any commonality in their project delivery process. We actually had to begin by agreeing that projects did have a starting point, did have an ending point, did have some defined deliverables, and stuff happened in between to create the deliverables. Then we proceeded to define the "stuff" in the middle. Over time we overcame the resistance and developed a common method that was so enthusiastically embraced by the company that a number of the more senior project managers wrote a book describing the company's project delivery process.*

While Resnick was helping to sow the seeds of change, he was also respectful of the firm's history and culture. Under his team's guidance, Resnick used a series of focus groups to help the company redefine what it was and how it wanted to be recognized by clients and within the industry. Under the tagline "CH2M HILL—Making a Difference," the firm's leaders adopted their new vision (what the firm aspires to) and mission (what the firm does). These documents represented a unifying theme for the firm, its first attempt as a major industry player to define itself with clients and differentiate CH2M HILL from competitors. Placards with the statements were framed and displayed

"Over time we overcame the resistance and developed a common method that was so enthusiastically embraced by the company that a number of the more senior project managers wrote a book describing the company's project delivery process."

— Dr. Harold (Hal) Resnick

in offices across the country, and employees carried smaller versions with them. As with any such statements, they represented a "snapshot" of what CH2M HILL was at the time and they remained in use for the next decade or so.

Vision:

CH2M HILL—making a difference in the quality of America's built and natural environment through people, service, and knowledge.

The employer of choice for the best people in our business.

Our clients' preferred consultant, setting the performance standard for service and technical excellence.

Industry leaders, serving our clients, communities, and professions as valued partners

Mission:

Our mission is to provide competitive engineering, planning, economic, and scientific consulting services to public and private clients in the U.S. water, environmental, transportation and related infrastructure markets, and explore new markets that enhance the value of our services and sustain growth.

Through our geographic and technical network, we give our clients consistent access to the highest quality resources and cost-effective, responsive, innovative solutions. As a service company, our clients set the standards for our performance.

Through managed growth, financial strength, and supportive working environment, we have the opportunity to achieve excellence and satisfaction in our careers.

We support our family of companies by sharing technological, financial, and human resources to maximize our collective success.

To fulfill these statements, Resnick and his team helped the firm identify and codify the factors that were necessary to achieve longer-term growth. Though simple on their surface, these six critical success factors became the benchmark for all of Resnick's work in reengineering:

- Become client focused
- Adopt market-driven strategies

- Integrate all our strengths
- Foster creativity and innovation
- Become responsive, flexible, and adaptable
- Add value for our clients in all we do

Beginning and ending the list was a reminder of what the firm's business was: delivery of successful projects to clients to help them "build a better world." Each of the statements, in its own way, was recognition and a reminder that some of the leaders of the firm had lost sight of the basics. That is, leaders had to remain focused on their business markets, use the technical strengths of the firm, be more innovative in finding solutions for clients, and be more respectful of and responsive to what clients wanted. The videotape that captured clients talking about CH2M HILL's "arrogance" and high costs had been a chilling wake-up call for many of them.

Finally, as both a tribute to the firm's legacy and a reminder of why CH2M HILL was in business, Resnick facilitated the listing of the company's core values. The list was not hard to create, but when the exercise was completed, the participants recognized that they were committing themselves to a course of conduct by which they wanted all of the firm's activities to be judged:

Values:

Honesty and integrity

Client focus

Emphasis on people

Continuous quality improvement

Quest for innovation

Collaborative environment

Financial strength for long-term growth

Community commitment

In essence, the vision, mission, critical success factors, and values became a rallying cry for change. Resnick's work got people to understand that CH2M HILL had become too internally focused. The discipline system, for example, was how CH2M HILL's employees defined themselves ("I'm a 33—hazardous waste engineer," or "I'm in the 80s—construction management"), rather than who the clients were or what they needed. This new statement

The videotape that captured clients talking about CH2M HILL's "arrogance" and high costs had been a chilling wake-up call for many of the company's leaders.

of "who we are and what we do" was a defining moment, a commitment to change and, at the same time, a reaffirmation of what CH2M HILL had always been to its clients.

A third track for the reengineering efforts, in addition to revamping the project delivery process and shifting the focus from an internal to an external view, was to analyze how money was being spent to pursue and win projects, known throughout the firm as business development. Resnick's analysis indicated that, like the project delivery process, the pursuit of work was often unplanned, somewhat haphazard, and not very methodical. Like the project managers, the business development people each did their own thing, adhering to no consistent approach.

A working group developed what became known as the 4-P process for business development. Like many innovations, the process seems almost self-evident. It was simply a codification of the four elements of winning work with clients: plan, position, procure, and perform. But its impact was profound, as Resnick recalled:

> *The new process was presented, with significant emphasis on the front-end positioning work plus a rigorous [go/no-go] decision process. It was received with general hostility and the demand that it be validated through a rigorous pilot test prior to serious consideration. Tom Cutting—who was the company's internal sponsor for the development of this process—then announced that it had been subjected to just such a test over the past six months on ten major bids. Of these bids, seven had been won, two had not been won, and the last was still in process. Another pregnant pause and silence followed by: "So why have you waited so long to bring this to us?"*

The most critical element for CH2M HILL's business development people was the need to recognize that the decision on whether to pursue a project had to be made before substantial business development money was spent. Too often, those pursuing business had committed substantial efforts and resources without sufficient analysis of whether CH2M HILL could be successful. The 4-P process fundamentally changed the decision-making process, holding the business development professionals more accountable for go/no-go decisions, how money was being spent, and the increased ratio of successful proposals.

Years later, people within the firm reflected on how significant these reengineering changes were for the firm. A senior project manager from

The 4-P process fundamentally changed the decision-making process, holding the business development professionals more accountable for go/no-go decisions, how money was being spent, and the increased ratio of successful proposals.

the Denver office, Tom Heinemann, recognized the painful beginning and a positive result:

> *It was a tense time, as we were proud of our matrix organization and also were concerned that too much bottom-line focus would result in becoming less people oriented. But management provided good reasons why the changes were needed, and we have thrived with the end result. We still have the good aspects of a matrix without the baggage and high cost.*

Cliff Thompson, who later became one of four U.S. regional managers in the new organization, talked of the personnel impact among the firm's leaders:

> *We realized we must become more profitable, but were careful and thoughtful in our execution of changes. Gap analysis showed where breakthrough improvement was needed, not just incremental change. Of our top-ranked one hundred people, ninety changed their responsibilities. For a time it took a toll on our people, but the results were profoundly successful, and were achieved with greater individual commitment to the firm.*

Resnick was asked, many years after the fact, to reflect on the reengineering efforts, from both a personal viewpoint and what he saw as the impacts on CH2M HILL. He talked of the many changes that reengineering had helped to facilitate: opening new lines of business, making globalization more profitable through the careful selection of geographies, setting up a separate division to focus on federal clients, enhancing the company's financial capabilities for full lifecycle support of water treatment plants, and chartering project teams so they could deliver projects more consistently and profitably. Resnick watched with pride as the reengineering process took hold and led to further changes over the ensuing years:

> *Throughout these many activities the company continued to grow and thrive in new markets. Revenue and profitability both increased. Change became the norm rather than the point of resistance. The company shifted dramatically from an internal to an external focus. Performance and accountability were both expected and rewarded. A new generation of leaders was groomed and began to influence the direction of the company. CH2M HILL flexed the muscle of its competence, its client focus, its talent, and the breadth of its products and services across many new markets and service areas.*

Beyond his impact as a general consultant, Resnick and members of his firm also became part of the proposal effort that helped CH2M HILL win the Rocky Flats contract (Chapter 20). In fact, many years later, Bob Card acknowledged the impact of reengineering. Having served as president of the company that held the Rocky Flats contract and then as under secretary for the DOE, Card stated unequivocally: "Without reengineering, CH2M HILL would not have won the Rocky Flats job." As a subcontractor to the Kaiser-Hill team that took over the project for DOE, Resnick helped guide the development of the business model which was used on the site, breaking down the entire process into discrete projects that could be individually managed.

While Resnick had a profound impact on the firm, his personal reflections demonstrate that the firm touched him deeply:

> *I remember being presented my first CH2M HILL coffee mug with the immortal founding phrase: "Do Good Work. Make a Profit. Enjoy Life." That phrase so captured the essence of the spirit of the company that it was immediately and forever burned in my mind and heart as the soul of CH2M HILL. CH2M HILL is a company that cares deeply. It cares about its clients; it cares about the quality of its work; it cares about the environment in which it works; and most importantly it cares about its people. I am proud to have had the privilege of being part of its growth during a challenging, tumultuous yet profoundly enriching time.*

Organizational Impacts—Reengineering Continues

Most of Resnick's reengineering work was completed from 1993 to 1994. From an organizational standpoint, there were two primary changes.

First, there was a shift from the internally focused discipline system to the externally focused business line structure. Initially, within CH2M HILL, Inc. (the core business, excluding OMI and IDC), these business lines evolved to reflect the four primary markets in which the company was operating: federal, water, environmental, and transportation. These business lines operated almost exclusively within the United States initially, reflecting 85 to 90 percent of the firm's revenues.

Second, as reflected in some of the comments above, there were numerous changes among the leadership at the top of the firm. These are described in greater detail in Chapter 17. A one point, there were so many changes going on within the business lines and the various geographies that an apocryphal story began to circulate. As the story goes, a senior leader called a CH2M HILL

"Without reengineering, CH2M HILL would not have won the Rocky Flats job."

— Bob Card

office in California, looking for a particular engineer. The engineer had an appointment outside the office and supposedly left the following instruction with his assistant: "I will be gone for a couple of hours. If my boss calls, please find out his or her name, so I know who to call back."

Whether the story is true or not, the employees of CH2M HILL were about to experience even more organizational changes, building on the foundation laid in 1993.

In 1995, the business lines were changed to business groups and given global scope rather than simply jurisdiction in the U.S. Craig Zeien, the president of CH2M HILL Inc., was placed in charge of the three geographic regions where the business groups would operate: North America, the Europe-Middle East Region, and the Asia Pacific Region. IDC and OMI were also designated as business groups, as well as being separate legal entities and profit centers.

Two years later, Peterson and Zeien sought to reduce the management density within the different geographies, a further recognition that the business groups were the dominant driver of the firm's businesses. Consolidation within the U.S. reduced the number of regions to four—northeast, northwest, southeast, and southwest—plus the Canadian operations.

The combined impact of these three organizational changes—the major overhaul in 1993, the move to business groups, and the regional consolidation in 1997—was both significant and profound. While still adhering to the matrix organization, the matrix had essentially been rotated 90 degrees; instead of being regionally dominated, the regions were now a support mechanism for the business groups. The drivers of the overall strategy were the business groups, with the regions housing the people and resources to deliver the projects. In addition, the consolidation process necessarily made the regions less provincial or jurisdictional by redefining their mission so their focus was more supportive and less autonomous.

The 1990s marked perhaps the most significant period of organizational change in CH2M HILL's history. There were some grumblings, to say the least, as new changes were announced and new leaders were identified. In hindsight, however, the firm's own statistics graphically display the impact of these changes. In 1993, the firm's client ratio, the work done for clients as a percentage of total employee hours, had dropped under 59 percent—the lowest in the firm's history. By 1994, the client ratio climbed to nearly 63 percent, and it reached management's goal of over 65 percent by the end of the decade.

Yet despite all these changes, if CH2M HILL employees thought that reengineering was over as the new millennium approached, they had another "think" coming.

LOCKWOOD GREENE
ENGINEERING & CONSTRUCTION

Reengineering in the New Millennium

The impacts of reengineering the company could still be seen in the early years of the new century. Peterson and his executive leadership team continued to look at further changes, with particular emphasis on breaking down barriers among the business groups and finding greater synergies across the organization. Two significant events completed Peterson's enterprise vision, which had begun in the early 1990s.

First was the acquisition of Lockwood Greene in the latter part of 2003 (much more on this in Chapter 24). The second event to complete Peterson's goal of operating as a unified enterprise began with the announcement of a new organizational structure to become effective January 1, 2004. The groundwork had been laid with the board and the executive leadership team for the previous year and a half. Spurred by the need to develop a succession plan for the highest executives and a career development path for the next generation of leaders, Peterson's executive leadership team developed an organizational framework based on the three primary client groups the firm served: the federal government, state and local governments, and the industrial sector.

Roughly equal in size, these client groups could recognize critical differences in client requirements (the business groups), while still bringing the power of the enterprise to bear when needed (the three client groups: federal, civil infrastructure, and industrial). For example, Peterson stated, "We might provide airport design or construction services to the city of Denver at Denver International Airport, to the U.S. Air Force at a military base in Germany, or to DuPont or Procter & Gamble for landing its corporate aircraft." Although housed in one business group—transportation—the enterprise was serving three distinct types of clients.

Peterson also created the Office of the CEO, the successor to the executive leadership team, to ensure that decisions within particular business groups benefited the whole enterprise, not simply the top line or bottom line of one segment of the business.

Conclusion

CH2M HILL's reengineering efforts will never be completed. There will be continued business challenges, an ever-changing marketplace, and new client requirements that may well require a different organizational model. During Peterson's tenure as CEO, however, he steered CH2M HILL a long way from what Resnick had described as "a fiefdom of semi-autonomous mini-empires" that paid modest lip service to a central governing body. Though hardly an agile PT boat—given fourteen thousand employees in 2004, several hundred offices in countries around the globe, and ten complex business groups—the seaworthy CH2M HILL was clearly moving a bit faster and in the right direction.

Working in the Pits

For many CH2M HILL employees in the early 1990s, the concepts of reengineering and TQM were little more than the latest industry buzz words or trends that had little impact on their daily work. However, management at CH2M HILL wanted to find a way to get employees at every level to believe that they could make a difference and that quality was a necessary component of their jobs.

Under the direction of Dave Ellison, selected as the leader of quality improvement in 1992, the company sought to leverage the principles of TQM into the infrastructure of the firm without creating any additional bureaucracy. One of the tools management began to use was the "process improvement team" or PIT.

The firm's overall mission had been identified as serving customers and building financial strength. To achieve that mission, management sought to map and evaluate the firm's various business processes into five broader categories: planning, acquiring customers and projects, managing and delivering projects, managing human resources, and managing financial resources. As PITs were set up and chartered, the intent was to identify improvements that could be made to existing business processes. PIT members were empowered to take on existing processes, to challenge "the way we've always done it," and to find efficiencies.

In March 1993, an executive team running U.S. operations met to prioritize the quality-based initiatives that were being identified. The group created an issue management board to guide the PITs as they worked on issues such as client relationships, project management, the discipline structure, marketing and planning, human resources, and information technology.

Many of the PITs were formal, requiring a high level of leadership and funding. The best known of these PITs was set up to reevaluate and revamp the firm's entire approach to business development, what became known as the "4-P process:" plan, position, procure, and perform. Too many of

PIT members were empowered to take on existing processes, to challenge "the way we've always done it," and to find efficiencies.

CH2M HILL's project pursuits were unsuccessful because the firm was simply responding to requests for proposals when they were issued by clients. The PIT working on this issue created a complex flow chart that recognized that the procurement process (responding to requests for proposals) was only one of four "Ps." Long before the request for proposal was issued, CH2M HILL had to **plan** its business strategy and identify its prospective client's needs, and then **position** itself with the prospective client. Responding to the request for proposal, the assigned team had to **procure** the project and **perform** the work for the client.

The new process was not, as they say, rocket science. But for the PIT and for the business development people, the 4-P process was a breakthrough. Successful delivery of projects depended on the 4-Ps. The resulting process changes doubled the company's proposal success rate, while reducing business development costs by nearly 30 percent.

The beauty of the PIT process was that it went deeper than addressing the firm's complex business practices. Smaller, shorter-term, office-based PITs were set up to address problems in various locations across the country. A group of trainers on the basics of TQM traveled to major CH2M HILL offices to "preach the gospel" of quality, spawning the creation of these PITs and engaging people at all levels of the firm to help make changes.

Like many business trends, the focus on TQM was fairly short-lived. But for CH2M HILL employees in the early 1990s, there was an understanding that all employees could apply the principles of TQM to their work and that they were empowered to participate in the PIT process to bring about needed changes.

For a couple of years, when CH2M HILL employees were asked about their work environment, they responded: "It's the PITs." And that was a good thing.

"A good test to determine if a contemplated action is ethical is to ask, 'Would I want to see it in the headlines tomorrow morning?'"
–Jim Howland

CHAPTER 19

Standing the Test of Public Scrutiny

On page one of Jim Howland's *Little Yellow Book*, a short compendium of what amounts to the moral compass for CH2M HILL business practices is a simple rule of thumb: "A good test to determine if a contemplated action is ethical is to ask, 'Would I want to see it in the headlines tomorrow morning?'"

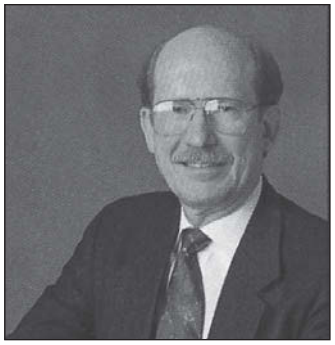
For decades, that simple principle has stood as the categorical founding plank of integrity upon which CH2M HILL built its reputation for honesty, excellence, and trustworthiness. On the occasions when CH2M HILL did garner headlines, the news was often associated with technological progress that delivered tangible benefits to clients and communities, most frequently in relation to sustainable development, environmental protection, and remediation. In the world of water and wastewater treatment in particular, CH2M HILL was living proof that building a better mousetrap could indeed lure the world to beat a path to your business door.

In the 1990s, however, Jim Howland's simple "headlines test" of ethical practices would become much more than a guiding philosophy. It would lead to ongoing drama on the national stage, played out in headlines, newscasts, regulatory proceedings, the courts, and the halls of the U.S. Congress. The public scrutiny CH2M HILL encountered initially tarnished the firm's sterling reputation, but ultimately highlighted integrity as the enduring foundation of its business practices.

In those years, two events drew CH2M HILL into the media spotlight—a congressional investigation and regulatory accusation about job-site safety. In both cases, CH2M HILL stood front-and-center in the public eye, facing allegations ranging from project and financial mismanagement to billing improprieties and professional misconduct. For a company that prided itself on a heritage of impeccable integrity, these accusations represented a totally unfamiliar challenge to its character. Suddenly, CH2M HILL stood at an important crossroads. It could either back off the forty-year growth track that had brought it to national prominence, or defend itself on a new, larger public stage.

The ''Dingell Episode''

Among people who worked at CH2M HILL during the early 1990s, it is known simply as the "Dingell episode." Any mention of the events surrounding the hearing led by Representative John Dingell of Michigan, chair of the Subcommittee on Oversight and Investigations of the House Committee on Energy and Commerce, elicited a roll of the eyes and look of disdain from anyone familiar with the events of that era.



Lyle Hassebroek

The two-year ordeal began in spring 1991, when federal auditors of the Government Accounting Office and the U.S. EPA Office of Inspector General began to investigate CH2M HILL's indirect costs billing and accounting practices. Specifically, auditors examined CH2M HILL's billing records for the period of 1987 to 1989, when the firm served as lead contractor on the Superfund program.

On Friday, July 5, 1991, in what was to become a pattern of end-of-the-week news releases, CH2M HILL received its first notice of the subcommittee's investigation. It came in a letter sent from the subcommittee to EPA Administrator William Reilly, copied to CH2M HILL President Lyle Hassebroek. The stinging letter pointed to deficiencies in EPA contract management and specifically cited CH2M HILL for "stonewalling" Office of Inspector General requests, interfering with floor checks by EPA auditors, refusing auditor access to records, and admitting timekeeping errors.

The subcommittee simultaneously released the Reilly letter to the news media. This sequence of events resulted in news agencies seeing the letter before CH2M HILL received it and CH2M HILL first learning about the alleged contract mismanagement charges from news reporters who were seeking a response to the allegations contained in the letter.

In preparation for an extended wave of negative publicity and high-visibility media coverage, the company quickly assembled a response team assigned to keep employees, clients, and project partners informed of audit issues and milestone events. Members of the team were assigned to monitor ongoing media coverage, contact and build reliable lines of communication with employees and clients, and reinforce established time and expense reporting policies and procedures across the organization. At the same time, the company vowed to cooperate fully with government auditors, complying with document requests for thousands of billing records.

For the next year, CH2M HILL was under the most intense public scrutiny it had ever faced. Government auditors and investigators meticulously scoured the firm's billing and accounting records. Media fed by government news sources regularly sought CH2M HILL's response to accusations of misusing taxpayer dollars. Competitor firms supplied potential clients with news articles citing alleged—but unsubstantiated—charges against CH2M HILL.

In response to the onslaught, people within CH2M HILL strengthened their resolve to defend the company's professional integrity. Reflecting on how the events surrounding the EPA audits affected the morale and confidence of CH2M HILL employees, Mike Kennedy, who served as manager of the CH2M HILL Portland, Oregon, office at the time, recalled, "No one that I

talked with thought that our leadership had ever done, or would do, anything that would even come close to compromising our firm's integrity. No one. In fact, my personal confidence was increased because the firm's leadership was open, got us information in a timely way, and would answer any question about anything, at any time."

Mike Kennedy

Public scrutiny of the firm reached its peak in March 1992, when a team of CH2M HILL executives was called to testify before Dingell's subcommittee. On the weekend leading up to the subcommittee hearing, *NBC Nightly News* aired a report questioning CH2M HILL's performance as an EPA contractor, citing allegations of overhead-cost improprieties.

On the day of the hearing itself, March 19, 1992, *USA Today* reported, "A company hired to clean up toxic waste sites has billed the government at least $2.3 million for 'overhead costs' that included a reindeer suit." The release of the page-one *USA Today* story before the hearing became part of CH2M HILL lore because of the national attention it drew to the firm and for the absurdity of the specific charges. The subcommittee hearing itself focused largely upon Office of Inspector General claims that CH2M HILL overcharged the government for inappropriate costs such as reindeer suits for a company Christmas party, sporting event tickets, dining and entertainment costs, unwarranted travel for spouses, and even "designer chocolates" bearing CH2M HILL's logo.

CH2M HILL executives testifying before the subcommittee steadfastly disputed the charges, making the consistent point that taxpayers never paid for any inappropriate costs from CH2M HILL. Coverage of the hearing and associated audits appeared in the news for months as government auditors concluded their investigation.

In his testimony, Hassebroek stated, "The suggestion that we have been anything other than responsible, prudent professionals is dead wrong. We want to clear up anything that suggests otherwise." And in what ultimately was to prove profoundly prophetic, he added, "We are confident that as you discover the facts about our business, you will share our conviction that CH2M HILL serves the taxpayer wisely and well."

In all, more than two hundred news outlets carried reports of the alleged billing abuses. News coverage included television networks, local radio, television stations, and major print publications, including *The Washington Post*, *The New York Times*, *USA Today*, and *Engineering News-Record*, as well as local and regional newspapers. CH2M HILL was even featured in a front-page headline in *The National Enquirer*, alongside stories on Princess Diana and Oprah Winfrey.

"We are confident that as you discover the facts about our business, you will share our conviction that CH2M HILL serves the taxpayer wisely and well."

— Lyle Hassebroek

With much less fanfare than when it began, the Dingell episode concluded quietly and anti-climactically for those who wanted to see CH2M HILL pay a price for alleged abuses. On March 17, 1993, more than two years after the government first launched its audit, EPA concluded an audit agreement with CH2M HILL that included a stunning admission. The EPA letter that resolved the audit agreement included the following statement: "…the Government will owe CH2M HILL approximately $550,000 to $600,000… ."

Despite EPA and congressional attacks on its reputation and professional integrity, CH2M HILL voluntarily chose not to accept any payment owed by the federal government, essentially turning down $500,000. And though it had done nothing wrong, the company further agreed to establish an internal cost-review board to guard against any inappropriate costs being passed on to taxpayers.

Under the headline, "Auditors exonerate CH2M HILL," the *Portland Oregonian* reported simply, "A two-year investigation has failed to show that CH2M HILL… overcharged the Environmental Protection Agency for indirect costs during the 1987–1989 period." And on its editorial page, under the heading "CH2M HILL's integrity," the *Seattle Post-Intelligencer* concluded its commentary on the audit findings by saying, " …it is laudable to see a contractor willing to go to such lengths to ensure the taxpayers get their money's worth."

When Phil Hall recounted the last scene in the Dingell episode, it was clear that the rigors of defending his company had not damaged Ralph Peterson's sense of humor:

> *In the final meeting Ralph and I had with Congressman Dingell and his lead staff person, Dingell told us, "I was never out to get CH2M HILL. We were after the EPA because we didn't think they were managing their contractors aggressively. It's kind of like duck hunting. You don't always hit the duck you were aiming at."*
>
> *Ralph immediately responded. "Well, that may be, Mr. Chairman, but from our position, we now understand the viewpoint of the duck!" This cracked everybody up, and we left feeling this episode was finally behind us.*

The investigation was finished, but the fallout remained. Notwithstanding the government's ultimate findings that CH2M HILL had done nothing wrong, the company had to defend itself against the lingering whiff of impropriety for several years. The company unquestionably paid a price as a result of the congressional investigation, but the employees of CH2M HILL realized how critical it was to adhere to the values of honesty and integrity established by its

founders. Even the appearance of unethical conduct could have devastating and long-lasting consequences.

Taking a Stand for Construction Site Safety

During the same time period, CH2M HILL was being challenged on another integrity front. While the circumstances did not create as high profile a news story as the Dingell episode, CH2M HILL faced a gut-wrenching challenge to its professional, ethical, and legal integrity following a fatal accident in 1988 on the Milwaukee Water Pollution Abatement Program.

As in the EPA audit, CH2M HILL faced highly volatile, discrediting charges. The company strongly defended itself against the accusations, both for its own sake and for the benefit of the engineering profession. What was at stake was a challenge to standing legal precedents that assigned responsibility for construction site safety to construction contractors. On November 10, 1988, the morning construction shift for one of the near-surface tunnels was brought to a halt when a concentration of methane gas was detected underground near the tunnel-boring machine. Following established safety procedures for the site, the eleven workers in the tunnel were safely evacuated.

Site safety guidelines enforced by the construction contractor, S.A. Healy, Co., required an evacuation and recovery plan be put into effect under such circumstances. The plan required the contractor's construction superintendent to follow a five-step process: (1) account for all workers on site, (2) shut down all construction equipment, (3) ventilate the tunnel, (4) wait a prescribed period of time, and (5) monitor methane levels before allowing workers to return to the tunnel. Tragically, long before ventilation procedures had been completed, Healy's site superintendent, safety engineer, and shift foreman reentered the tunnel; soon after, a methane blast killed them.

As could be expected, the fatal accident became headline news in Milwaukee and throughout the construction industry. Likewise, it became the focus of a major safety investigation by the Occupational Safety and Health Administration (OSHA).

On May 5, 1989, after a nearly six-month investigation, OSHA cited construction contractor Healy with sixty-eight willful site safety violations, each carrying a $10,000 fine. Then, in an extraordinary, precedent-setting step, OSHA cited CH2M HILL with forty-seven willful safety violations, alleging that the company had failed in its obligations to ensure the safety of the construction site and enforce the contractor's safety policies and procedures. OSHA hoped to expand responsibility for site safety beyond construction contractors to project

"Conscience is the inner voice which warns us that someone may be looking."

— H. L. Mencken,
American journalist, social critic

engineers, under the assumption that the engineers could then pressure the contractors to be safer.

Not only was CH2M HILL's professional reputation on the line, but safety and liability ramifications for the entire design and construction industry were also at stake. If liability for site safety could be extended to design professionals—even when they were not contractually obligated to enforce safety and were not physically present on the site—that could dilute the well-established role of construction contractors as the ultimate responsible party to oversee site safety, including responsibility for equipment standards and training of construction crews. For the next decade, CH2M HILL would stand its legal and professional ground, challenging OSHA's citations and safety findings.

CH2M HILL's legal defense against the citations faced several challenges, the first of which it appeared to have won. On August 25, 1993, a Department of Labor administrative judge dismissed all charges. In his decision, the judge stated that it was unequivocally clear that CH2M HILL, despite its role as the overall program manager, did not control the construction site where the explosion had occurred. In his ruling, Judge Paul L. Brady followed the prior law that engineers are not "engaged in construction work" unless they exercise "substantial supervision over actual construction."

In its coverage of what it described as "the hottest of hot buttons in the industry," *Engineering News-Record* recognized the firm's apparent victory with the headline, "CH2M HILL cleared in tunnel explosion case." But the magazine did not stop there. In an editorial reprimanding OSHA for trying to extend site safety responsibility to architects and engineers, it stated, "Safety is a responsibility that in the end must rest on a single set of shoulders." Commending the precedent-setting decision, *Engineering News-Record* cited Ralph Peterson: "The real winners will be the workers on the site who are going to be safer in the future… ."

Judge Brady's decision would eventually lead to a benchmark decision for the construction industry, but not before an intervening challenge. OSHA appealed Judge Brady's decision to the OSHA Review Commission, which overturned the judge's ruling on April 21, 1997. The commission created a new rule that stated, "Where an engineering or architectural firm… is directly and substantially engaged in activities that are integrally connected with safety issues, the construction standards will apply, notwithstanding contract language expressly disclaiming safety responsibility (for the design professional)." In its ruling, the commission applied an unprecedented test of professional responsibility by finding that, although CH2M HILL "was expressly denied control over (the contractor's) 'means and methods' and safety precautions, contractors effectively deferred to CH2M HILL on a major issue involving safety."

"The real winners will be the workers on the site who are going to be safer in the future."

— Ralph Peterson

The commission remanded the case to Judge Nancy J. Spies, who had replaced the retired Judge Brady. In accordance with OSHA's new standard, Judge Spies ruled that CH2M HILL had violated OSHA standards pertaining to requirements for using "explosion-proof" electrical equipment.

Seeking to reverse the lower court's decision, CH2M HILL appealed both Judge Spies's ruling and the commission's new rule to the United States Court of Appeals for the Seventh Circuit. On September 23, 1999, more than ten years after the fatal tunnel accident, the court vacated the findings of violations and fines against CH2M HILL and cleared the company of any wrongdoing. More importantly, the court's decision curtailed OSHA's practice of citing design professionals for construction site safety violations committed by construction contractors.

Considering the ten-year length and millions of dollars in legal defense costs, it is worth noting that, at one point, the company could have chosen to settle out of court. CH2M HILL General Counsel Wyatt McCallie later recalled the events this way:

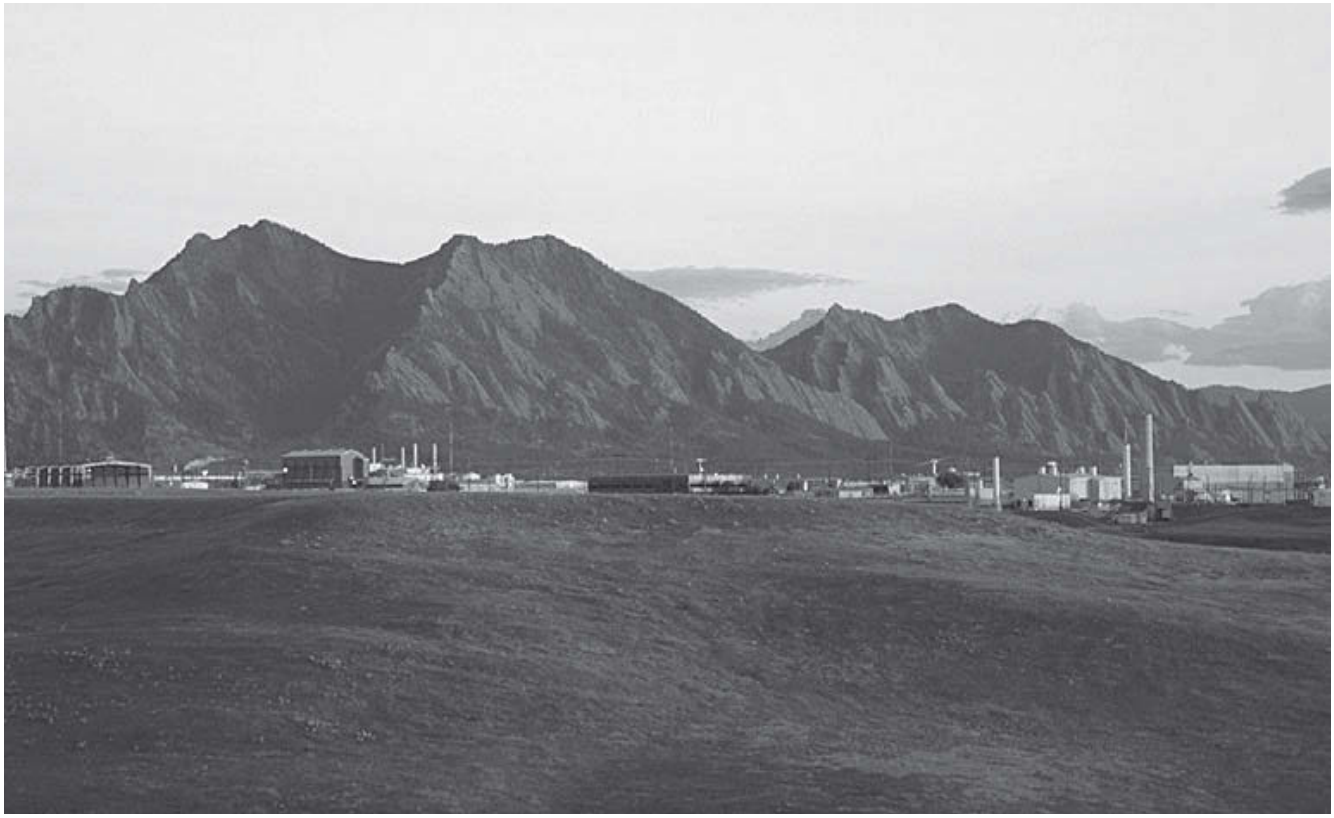
> *I advised CH2M HILL President and CEO Harlan Moyer that we had received an offer from OSHA to settle for about $200,000. That amount was probably less than what it would take to litigate the matter to conclusion, but I quickly added that I hoped we would not settle.*
>
> *I vividly remember Harlan looking straight at me and saying: Wyatt, I know that lawyers and litigation are expensive. But until I know what our people did wrong, I will not pay one cent to anyone. Sometimes the firm must pay the price of leadership, and this is one of those times.*

Conclusion

Judging by Howland's "headlines test" of ethical practices, CH2M HILL survived two of its toughest tests in the 1990s and emerged with its integrity intact. No longer a regional niche design firm, CH2M HILL had come of age. The firm was not only capable of managing the technical aspects of world-class projects, but also of demonstrating the business character and integrity to withstand the intense public scrutiny that comes with working in the national spotlight.

Phil Hall put it this way:

> *One of the lessons of this time was that we were no longer a bunch of "good old boys" who could fly under the radar. We were big, and we were vulnerable. Our governmental affairs program was stepped up in intensity ever thereafter.*



The Rocky Flats facility was located 16 miles northwest of Denver, Colorado.

CHAPTER 20

Story of a Project—Rocky Flats

The Rocky Flats Mission

On March 23, 1951, against a backdrop of increasingly strained Cold War relationships between the United States and the Soviet Union—plus a new phenomenon called the arms race—the U.S. Atomic Energy Commission announced that the nation was building a top-secret nuclear weapons plant in a ranching area in Jefferson County, Colorado. *The Denver Post* heralded the decision with a front-page headline: "There's good news today." Within one year, the Rocky Flats plant was producing nuclear weapons components. Little did anyone—in the Denver area, the federal government, or across the United States—know that this good news was a harbinger of a massive environmental cleanup. Rocky Flats would come to be designated as one of the most hazardous and contaminated sites in the country, with a projected cleanup cost of $37 billion over a sixty-year period.

Long before Rocky Flats became synonymous with radioactive contamination at its most dangerous, the site had a clearly defined mission, and its employees were passionately focused on serving their country. As aggression by the Soviet Union and the People's Republic of China aggravated military tensions with the United States, production of weapon components at Rocky Flats accelerated in the 1950s and 1960s.

Plant operations focused on precision metalworking. Among the duties of the highly talented workers was to shape plutonium, uranium, and other metals into one of the most highly engineered devices ever made: the plutonium trigger that provides the initial explosion in nuclear bombs. Workers also operated numerous chemical processes to reclaim plutonium from scrap and conducted research and development activities in concert with the national laboratories.

In the thirty-five-plus years of fast and furious weapons production, Rocky Flats became a small city with a workforce topping eight thousand. Because most of the activities at the site were top secret, entry to most facilities required the highest level of civilian security clearance. It was a time of great pride for the workers at Rocky Flats. Military personnel were on the front lines, but behind the scenes at places like Rocky Flats, thousands of workers were building the nuclear deterrent.

Yet times change: By 1989, four years after Mikhail Gorbachev assumed power in Moscow, the collapsing Soviet economy, caused in part by a massive military buildup, culminated in an announcement to the world by Gorbachev that "the postwar period is over." George H.W. Bush's administration agreed that the world had "clearly outgrown" the post-1945 superpower clash.

"If you want to be a rodeo champion, you have to be willing to ride the meanest, orneriest bronco in the corral."

— Bob Card

Rocky Flats found itself at the crossroads of those historical events and movements. The established mission of nuclear deterrence was suddenly called into question.

From Production to Environmental Liability

In 1989, the Federal Bureau of Investigation, in conjunction with the U.S. Environmental Protection Agency, raided Rocky Flats for alleged violations of environmental laws. By the end of the year, all nuclear operations were suspended to address environmental and safety concerns. The civilian operator of the plant at the time eventually paid what was then the largest environmental fine in history: $18 million.

Ironically, the sudden termination of operations at Rocky Flats resulted, over time, in problems worse than those that prompted the suspension in the first place. All processes were stopped in midstream, as if operations would resume shortly. As weeks became months and months became years, corrosive liquids containing plutonium began to eat away at aging plant tanks and piping systems, often resulting in leaks. Plutonium metals were hastily packaged in plastic bags and, after time, began to breach containment. Thousands of drums of plutonium scraps that, during plant operations, were routinely chemically processed to reclaim the pure plutonium sat neglected and unmonitored in the rooms and corridors of the site's buildings. Hazardous materials previously used in weapon production, which were placed in shallow deposit areas or simply dumped on the ground, were largely left untouched.

Rocky Flats became an environmental time bomb. In 1994, the DOE (the successor to the Atomic Energy Commission, which created the site) reported that Rocky Flats was home to the top two most vulnerable plutonium facilities in the DOE complex. Three other buildings were in the top ten. The worst, Building 771, was dubbed by ABC News *Nightline* as "the most dangerous building in America."

The Creation of Kaiser-Hill

From its nearly euphoric beginnings four decades earlier, Rocky Flats had become a poster child for environmental contamination. DOE recognized that simply managing the site was not enough; it was time for a new beginning and a redefined mission. In 1994, DOE announced that the management contract at Rocky Flats was up for bid under a new performance-based contract to shut down and begin cleaning up the site. CH2M HILL, which had already entered the DOE market, took interest.

The firm first began working for DOE in 1986 at the government's Oak Ridge, Tennessee, facility, providing environmental monitoring services. CH2M HILL evaluated air, water, aquatic ecology, vegetation, soil, terrestrial biology, and gamma radiation at Oak Ridge, as well as at DOE sites in Paducah, Kentucky, and Portsmouth, Ohio. In addition, the firm performed environmental work at DOE's Hanford site in Washington. By 1994, CH2M HILL had more than 250 employees working onsite at nuclear facilities. The company's leaders believed that its diverse technical capabilities, specialized workforce, and program management experience on large environmental projects (Superfund and the Milwaukee Water Pollution Abatement Program) positioned the firm to take on a large and complex DOE project.

KAISER•HILL COMPANY

Why would CH2M HILL want to enter this nuclear and environmental quagmire? CH2M HILL's Bob Card said, "If you want to be a rodeo champion, you have to be willing to ride the meanest, orneriest bronco in the corral." Card went on to become president of Kaiser-Hill, the joint-venture management company formed to compete for the Rocky Flats bid. He served in that position from 1996 until 2001.

As Kaiser-Hill, CH2M HILL's partner was ICF Kaiser, a construction company with a forty-year history of working at DOE facilities. Paired with CH2M HILL's program management capabilities and extensive environmental experience, the two organizations were well suited to take on this challenge.

Kaiser-Hill spent nearly a year assembling the world's most qualified subcontractors—Westinghouse, Babcock & Wilcox, Morrison-Knudsen, and British Nuclear Fuels, Ltd.—each having extensive experience working with nuclear materials. Kaiser-Hill also enlisted DynCorp, an infrastructure support specialist; Wackenhut, a respected security services contractor; and Quanterra, an environmental laboratory based in Denver. This powerful team provided access to 90 percent of the nation's capability in working with plutonium and special nuclear materials. They offered DOE expertise in special nuclear material management; radioactive waste management; environmental cleanup; nuclear facility decontamination, decommissioning, and demolition; safety and quality systems management; community outreach; site operations; and security.

DOE awarded Kaiser-Hill an integrated management contract in the spring of 1995, one of the first contracts under the agency's new contract reform initiative. The performance-based contract required 85 percent of Kaiser-Hill's fee to be based on meeting specific, measurable goals and adhering to an aggressive timetable. Prior DOE contracts were management and

operations, which essentially paid the contractors an award fee based largely on the size of the contract and subjective metrics.

Kaiser-Hill assumed management responsibilities on July 1, 1995. After nearly forty years of production and six years of stagnation, Rocky Flats started undergoing a dramatic change.

When Kaiser-Hill first arrived, many onsite employees believed that Rocky Flats would resume nuclear production, returning to its role in national defense. Decommissioning the facility was counter to their decades-long mission, but cleaning it up was precisely what DOE was asking Kaiser-Hill to do. On its first day on the job, Kaiser-Hill demolished two guard shacks at the entrances to Rocky Flats. This symbolic act sent a message to site workers that the mission at Rocky Flats had changed: It would never again be used for weapons manufacturing.

In its first two years, Kaiser-Hill focused on reducing the most immediate risks. Employees safely stabilized and repackaged plutonium, mitigated hydrogen hazards (a by-product of radiation's effects on organic materials), and developed strategies to manage other high-risk materials. As the most serious risks were neutralized, Kaiser-Hill senior managers began to wonder why DOE estimated that full cleanup and closure of the site was expected to span sixty years and cost $37 billion.

From Cleanup to Closure

Kaiser-Hill developed numerous planning scenarios demonstrating that cleanup could be significantly accelerated at just a fraction of the cost. Ultimately, the team created an aggressive plan to close the site by the end of 2006 at a cost of tens of billions of dollars less and decades sooner than previous government forecasts.

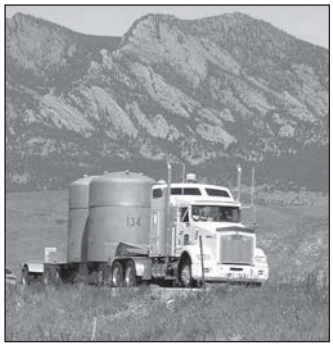
It was an outrageous proposition. None of DOE's weapons complex sites were scheduled to be closed for decades, yet Kaiser-Hill had created a credible plan for systematically cleaning up and closing one of its worst sites at a significantly accelerated pace. Based on Kaiser-Hill's solid record of performance, DOE accepted the proposal concept and awarded a first-of-its-kind closure contract to the company in 2000.

In an April 1994 report, the U.S. General Accounting Office concluded there was only a 1 percent chance of closing the site by the end of fiscal year 2010. There were no previous planning models or solutions to some of the site's most difficult problems: the safe handling and disposal of one hundred tons of plutonium residues, the packaging of plutonium for long-term storage, and

safe demolition of rooms containing lethal levels of airborne radioactivity. In short, no one had ever before dismantled any plutonium facility the size and complexity of those at Rocky Flats, with more than one 3.5 million square feet of space.

Nevertheless, the team pressed forward. The site became known as the Rocky Flats Closure Project. Workers used ingenuity to solve perplexing problems. Radioactive and hazardous waste shipments accelerated. Acres of contaminated land were cleaned up. The most contaminated buildings were decontaminated and toppled. Workers disposed of fifteen hundred contaminated production gloveboxes and 700 tanks, drained and processed thirty thousand liters of plutonium and enriched uranium solutions from aging tanks and pipes, investigated 360 areas of potential contamination and provided environmental remediation as needed, and shipped enough radioactive and hazardous waste to fill a string of railcars more than one hundred miles long. Regulators, elected officials, citizens, and Kaiser-Hill worked together in transparency as cleanup and closure progressed.

In October 2005, what many scientists and politicians and Colorado's residents thought impossible became fact. The first major and most complex nuclear cleanup project in the world was completed. Remarkably, this work was finished more than fifty years ahead of 1995 estimates and at a savings of $30 billion. Furthermore, the work was accomplished with a safety record that was among the best in DOE's complex of nuclear facilities.



In short, no one had ever before dismantled any plutonium facility the size and complexity of those at Rocky Flats, with more than 3.5 million square feet of space.

The Rocky Flats Legacy

Former Secretary of Energy Spencer Abraham said, "DOE's Rocky Flats site in Colorado should be used as a model for all cleanup programs." The project was selected as the Project Management Institute's 2006 Project of the Year and also earned a Project Merit Award from the *Environmental Business Journal* in 2005.

What does the Rocky Flats story mean for CH2M HILL? For one, it helped launch CH2M HILL as a major player in the global nuclear services industry. CH2M HILL became a leader in the DOE market, subsequently managing large-scale nuclear operations in Washington, Ohio and Idaho and fulfilling various responsibilities at other sites.

The Rocky Flats story is also an affirmation of CH2M HILL's culture—an example of talent meeting opportunity. Using program management and project delivery capabilities, CH2M HILL clearly distinguished itself from the crowd of major DOE contractors. Through Kaiser-Hill, the company created

"DOE's Rocky Flats site in Colorado should be used as a model for all cleanup programs."

— Spencer Abraham,
former secretary of energy

a vision of accelerated closure and established what became known as the Rocky Flats Closure Project Baseline. The baseline contained more than thirteen thousand activities, making it the largest and most comprehensive of its kind at that time in the DOE complex. Among its most important innovations, the DOE contract with Kaiser-Hill authorized the entire scope of the closure project. Previously, work plans were reviewed and approved annually by DOE, and changing these plans was extremely onerous. The closure contract, on the other hand, allowed Kaiser-Hill flexibility to change plans as conditions changed and maximize efficiencies as work progressed.

CH2M HILL also brought to the project its expertise in working across complex regulatory environments. The original Rocky Flats Cleanup Agreement—signed in 1995 by the State of Colorado, the EPA, and DOE—created a new regulatory framework for planning and executing work. The agreement outlined a unified vision of the Rocky Flats "end-state," defined clear roles and responsibilities, set sitewide standards, and streamlined the decision-making process. Regulators, including the Defense Nuclear Facilities Safety Board and the Colorado Department of Public Health and the Environment, worked in offices onsite, allowing daily interaction as complex issues were discussed and work plans were developed. This partnership of public and private organizations was committed to moving waste, not piles of paper.

In addition, Kaiser-Hill insisted that it would create a transparent cleanup, making information widely available to the public. Kaiser-Hill and DOE created a new era of openness with residents, local elected officials, and other stakeholders by routinely involving them in the details of site cleanup planning and execution. Public understanding of the cleanup decision allowed issues to be resolved early and created public support for Rocky Flats goals.

The Rocky Flats story also provided lessons applicable to other parts of CH2M HILL's operations. In employee relations strategies, for example, Kaiser-Hill learned much from inheriting a workforce that was demoralized by the termination of the weapons mission and the reality of an uncertain future. To refocus workers from weapons production to cleanup and closure, Kaiser-Hill established a close relationship with the site's unions, shared 20 percent of the company's profits with employees, and provided spot incentives for outstanding performance. Workers performing hands-on work were involved in all stages of work planning, creating ownership, and capitalizing on their unique institutional knowledge.

As cleanup progressed and closure became more of a reality, Kaiser-Hill recognized that the success of safe operations depended on employees who were focused on their work rather than what would happen to them when it

was over. The company created a successful workforce transition program to help workers prepare for life after Rocky Flats, greatly reducing anxiety about the future.

Another Rocky Flats lesson involved the creation of a culture that cultivated creativity. Kaiser-Hill did not need to spend millions of dollars on research and development to solve some of the site's most technically challenging problems. Rather, the answers often involved adapting existing technology to nuclear cleanup in ways never attempted before. For example, employees adapted a spray-on coating, the type used to protect pickup truck beds, to become the over-the-road packaging material for large pieces of contaminated equipment. It eliminated both the need to cut equipment into pieces that fit inside standard waste containers and the hazards this work presented.

Kaiser-Hill recognized that the success of safe operations depended on employees who were focused on their work rather than what would happen to them when it was over.

Employees attempting to clean the fifteen hundred gloveboxes—stainless steel containers with gloves and viewing ports where most nuclear operations were performed—developed a low-cost, low-tech chemical decontamination solution that cleaned deeply contaminated surfaces to levels not imaginable before. This solution allowed the company to dispose of gloveboxes as low-level radioactive waste, the least difficult waste to package and ship.

There are countless other examples of employees finding a new use for an off-the-shelf product. Concrete shaving equipment used to level uneven concrete or to smooth damaged concrete highways was adapted to shave layers of contamination from structural concrete in plutonium-contaminated facilities. Plasma-arc torches were used to cut up gloveboxes, performing the job in a fraction of the time. Wireless fire and smoke alarm systems used throughout industry allowed workers to disconnect the power to a building prior to dismantling to eliminate the potential for electric shock when ripping out building components. These ideas saved millions of dollars, and many have been imported to other DOE sites, extending the savings.

The most important aspect of the accelerated Rocky Flats cleanup and closure is that it was performed safely. When Kaiser-Hill arrived in 1995, the accident rate at Rocky Flats was 7.6 per two hundred thousand work hours, a rate consistent with the industry norm. In 2005, the rate was less than one—an 800 percent improvement and ranked among the best in DOE operations. Kaiser-Hill improved safety while performing some of the most dangerous work on earth by listening to employees, engaging the site unions, and working tirelessly to identify hazards and implement controls.

"Rocky Flats is the best example of a nuclear cleanup success story ever… These workers labored tirelessly to clean up and close one of the most dangerous sites in America, demonstrating that the impossible is possible when people cooperate in order to meet a common goal."

— Wayne Allard,
Colorado senator

Colorado Senator Wayne Allard said it aptly: "Rocky Flats is the best example of a nuclear cleanup success story ever… . These workers labored tirelessly to clean up and close one of the most dangerous sites in America, demonstrating that the impossible is possible when people cooperate in order to meet a common goal."

Over a half century after *The Denver Post* announced the "good news" of Rocky Flats, the cleanup and closure of the facility was indeed good news. Sixteen miles from the state capitol of Denver, the site—once a liability that posed a serious risk to the approximately 2.5 million area residents—has become a wildlife refuge: a 6,200-acre asset, returned to the Colorado landscape.

"In the rhetorical speeches of the Soviets, Mr. Krushchev said we will bury you. I don't subscribe to this point of view. It would be such an ignorant thing to do, if the Russians love their children too."

— Sting,
musician, songwriter, lyrics from "Russians"

Before and after the Rocky Flats Closure Project

"There is something intrinsically wrong when the stockholders of a company don't know or don't care how much their stock is worth."

–Ralph Peterson

CHAPTER 21

Sharing the Rewards—Part Three

As he looked out across the gathering of KEs, CEO Ralph Peterson was disappointed, but not particularly surprised. He and other members of the company's leadership had seen a consistent and somewhat disturbing pattern develop over the years.

These employees were not just the leaders of the firm; they literally owned it through its stock. And yet, when he asked them if they knew the current stock price or how the price was calculated, very few of them could answer. Ownership of the stock simply had no meaning to them because the stock had no liquidity—they could not buy or sell it until they retired or left the firm. And for most KEs, the prospects of retirement were far enough away that stock value had little relevance.

In fact, Peterson and other leaders generally had to deal with stock value on only two occasions: When the board set the price annually (applying a complicated and somewhat anachronistic formula), and when determining how to buy out a KE who left the firm. There was, as far as Peterson could tell, little pride in ownership and none of the entrepreneurial spirit the founders had envisioned when they determined that CH2M HILL would remain employee owned. At the time, Peterson would lament: "There is something intrinsically wrong when the stockholders of a company don't know or don't care how much their stock is worth."

Peterson and the other executives who set up and ran these KE meetings knew that something had to be done. The current stock program was not motivating the leaders of the company; they were not acting like owners of the business.

The question was: How could they change employees' attitudes about the stock program?

Setting a New Course

Turning points in the history of companies can come in many forms. Some arrive in the form of external factors, such as newly dynamic markets or technological breakthroughs; others come in the form of internal factors, such as executive leadership changes, organizational restructuring, or workplace transitions. As CH2M HILL approached the end of the millennium, it faced a turning point in its history triggered by a convergence of internal and external forces.

"The goal is not just to reward people for the work they do, or to maximize profits for their own sake, or to enhance shareholder value, improve cash flow, or whatever. Rather, equity is used to involve people in the process of making a difference in the world."

— Jack Stack,
A Stake in the Outcome

Externally, the company faced a changing landscape in the engineering and construction industry. Market demands had reshaped the competitive balance of the business. A new two-tiered field seemed to be taking shape with industry giants (often created by mergers, acquisitions, and consolidation) at the top and specialized, niche-market firms below. In between, mid-sized companies scrambled under pressure to merge, be acquired, downsize, or be run out of business.

Internally, CH2M HILL was experiencing the strains of growing capital requirements to compete for major projects. The costs of submitting proposals on these projects were significant, and clients increasingly demanded a sizable balance sheet as the price of entry because of the financial risks. There also was pressure to develop, attract, and retain the best and brightest from a shrinking pool of qualified science and engineering graduates, many of whom were lured to high-flying, high-tech businesses. At the same time, many KE shareholders were disenchanted with the lack of liquidity of their CH2M HILL stock and its relatively feeble performance compared to skyrocketing stock prices in the broader public market. In addition, non-KE employees, ineligible to own CH2M HILL stock, resented what they perceived as their second-class status in the company and wondered why the firm valued their contributions less than those of their KE counterparts. Were they not key to the company's success as well?

Though they were still a preferred employer among the leading firms in the industry, the CH2M HILL team spirit—what Archie Rice had described as "what's good for one is good for all"—faced a stern test. While still seen by many as a model program of employee ownership, the long-standing KE program was showing signs of stress and strain. As the company approached and surpassed $1 billion in annual gross revenue and moved toward ten thousand employees, people at all levels of the organization began to question the program's value and effectiveness.

In a new global era of grand-scale projects requiring full-service design, build, own, and operate delivery models, the KE ownership program was failing to generate the kind of capital needed to compete effectively. At the same time, however, the one thousand employees who already participated in the stockholder program simply could not be expected to forfeit their vested stake in the company without receiving some tangible benefit in return.

In May 1998, the board of directors assigned a special task force to investigate the firm's ownership and incentive compensation program. In its August

report to the board, the task force identified four major failings of the existing KE and incentive bonus program:

1. At the current profit level, the company could not retain sufficient earnings to compete financially with industry giants. Too much money was being paid out in stock and bonuses, and not enough was being held in retained earnings.

2. In-place incentive compensation programs failed to retain KEs, some of whom left for higher compensation, without regard for the longer-term value of CH2M HILL stock. On the hiring side, managers were developing many customized work-around packages to recruit strategic new hires, attempting to compensate more senior employees not yet eligible as KEs.

3. The KE program often served to demotivate staff by creating perceived winners and losers among employees.

4. Existing bonus incentive programs inadequately compensated high achievers and insufficiently penalized low achievers. One executive went so far as to classify the KE program as offering "barely breathing bonuses." As long as a KE was breathing, he or she was entitled to an annual bonus.

To address these issues, the task force proposed developing a wholly new ownership and incentive compensation program that would expand ownership opportunities to all staff, tie compensation incentives more directly to performance, and establish greater liquidity of stock for shareholders.

With board authorization to proceed, plans to develop an expanded ownership program moved forward for program rollout in 1999. To get the expanded ownership program up and running, management outlined a four-step process:

1. Develop the complete, formal details of a comprehensive new ownership and incentive compensation program to replace the KE program.

2. Gain a vote of approval from KE stockholders to sanction the new program.

3. File and get approval of the Securities and Exchange Commission (SEC) and state "Blue Sky" commission registrations.

4. Develop from scratch a system of rules, regulations, and procedures for establishing and administering an internal stock market.

While not completely unprecedented, the type of employee ownership program that the task force envisioned—accommodating regular stock trades in an internal market—represented a groundbreaking effort. Only a

In May 1998, the board of directors assigned a special task force to investigate the firm's ownership and incentive compensation program.

handful of companies had ever undertaken such an endeavor. None had ever done so in an electronic era and in the paperless fashion that CH2M HILL would eventually develop.

To turn the vision of the task force into reality, the company assigned a technical team composed of legal, accounting, information technology, compensation, and benefits experts to develop the new program. For external guidance, the company turned to Science Applications International Corporation (SAIC), the nation's largest employee-owned science research and engineering firm and one of the few companies that operated its own independent internal market for buying and selling its company stock.

Founded in 1969 by Dr. J. Robert Beyster and a small group of scientists, SAIC built itself into a Fortune 500 company through employee ownership. In addition, Beyster established the Foundation for Enterprise Development, dedicated to fostering employee ownership and participation.

With the SAIC employee ownership program serving as a model, the CH2M HILL technical team crafted a wholly electronic employee stock ownership program in eighteen months. Expanding upon the SAIC model, the CH2M HILL program was designed to enable all full-time employees to participate in ownership. Consistent with history, only current employees would be able to buy, sell, or own the stock; employees would be required to sell their stock back to CH2M HILL upon leaving the firm. The program also established safeguards to protect shareholders' interests, including limiting employee stockholdings to no more than thirty-five thousand shares (less than 1.5 percent of company stock at the time), as well as full registration and compliance with SEC oversight regulations.

With comprehensive program development well under way, the company approached its second major hurdle, gaining program approval by KE stockholders.

For KEs, it was not initially clear what the new stock ownership program had to offer. On its face, it appeared to many that they personally had a lot to lose by approving the new ownership plan. Many foresaw a potential dilutive effect on the stock value by expanding ownership to all employees. Others saw heightened risk in a new stock price formula that changed from a five-year to a four-quarter financial valuation model. And, although not publicly acknowledged, there was a perception that KEs would lose what they saw as their entitlement to annual bonuses.

Perhaps the largest drawback KEs perceived was that more incentive compensation would be paid in the form of CH2M HILL stock rather than cash. One of the cornerstones of the new program was a change in the percentage of profits that would be paid out versus kept in retained earnings. Under the KE program, incentive compensation payments totaled 70 percent of profits; the new program was to pay out only 50 percent. For employees accustomed to receiving a handsome cash bonus annually, the idea of sacrificing that personal cash payout for the greater good of the company's financial strength did not seem particularly attractive.

The effort to win support required a focused campaign to educate and inform KEs about the proposed stock ownership program. That campaign was launched in October 1998, when the CH2M HILL executive management team hosted the first of what was to become a regular series of global leadership conferences. The company's top 250 leaders, including all major stockholders, were invited to attend. Past and present executive leaders of the company were enlisted to explain, endorse, and respond to questions about the new ownership program. Among those lending their support for the new ownership model were founding partners Jim Howland and Burke Hayes; Harlan Moyer, retired president and CEO; Ralph Peterson, current CEO; Craig Zeien, president of operations; and Chief Financial Officer Sam Iapalucci. In addition, the president of SAIC's Foundation for Enterprise Development, Ron Bernstein, and noted lecturer Jackie Freiberg, author of the book, *Nuts! Southwest Airlines' Crazy Recipe for Business and Personal Success*, evangelized to the leadership gathering about the inherent benefits of employee ownership to CH2M HILL and its employee shareholders.

A second phase of the campaign involved a series of KE meetings across the company. Designed to share full details of the new program and respond directly to shareholder questions and concerns, these face-to-face meetings turned out to be a key factor in gaining KE support. When presented with the straightforward details of the new stock program in a consensus-building fashion, KEs not only came to support the proposed ownership changes but also became its advocates.

By December 1998, when stockholders voted to adopt the expanded ownership plan, KEs endorsed the new program with a 97 percent approval rate.

"When we launched the program on January 1, 2000, we knew we had to design it with a new information age and new millennium in mind."

Stan Vinson,
CH2M HILL treasurer and VP of employee stock ownership

Launching the Ownership & Incentive Compensation Program

Once the KE shareholders approved the program, there was no turning back. CH2M HILL had one year to put together a fully functioning stock trading program—approved by federal (SEC) and state (Blue Sky) regulators—that would give all employees the ability to own CH2M HILL stock. Stan Vinson, CH2M HILL treasurer and vice president of employee stock ownership, described the challenges:

> *Putting together an employee ownership and stock trading program from scratch and getting it registered with the SEC and state regulatory commissions represented a major challenge. It would take the full-out effort of an intently focused, high-performance team of legal, finance, accounting, securities, compensation, benefits, and information technology professionals to pull it off.*
>
> *If that weren't enough, however, we decided to build the first-ever fully electronic, paperless internal stock trading market as well. When we launched the program on January 1, 2000, we knew we had to design it with a new information age and new millennium in mind.*

While the technical team set about developing the underlying systems, policies, processes, rules, and regulations for the ownership program and internal stock market, employees across the enterprise had to be introduced to the new program, designated the Ownership & Incentive Compensation Program. Although KE shareholders had approved the expanded program, it was still not clear whether employees at large would actually participate. For many, this would be the first time they considered buying stock of any kind. This program required all employees to understand how CH2M HILL stock was valued so they could make informed decisions to buy or sell. KEs had simply been awarded stock.

To prepare people for the new ownership opportunities, the company conducted ownership "road shows" throughout the second half of 1999. Open to all employees and conducted similarly to companies going through an initial public offering, these events were hosted in all major offices across the company. They provided a town hall forum for employees to raise questions and concerns, not just about the program, but also about basic company operations and management direction of the company.

David Miller, senior vice president of corporate affairs, who orchestrated the campaign to educate employees on the benefits and risks of the program, described the challenges:

> *Winning the hearts and minds of employees to support and participate in a CH2M HILL stock ownership program seems like a slam-dunk today. You have to keep in mind, though, that we were rolling out the CH2M HILL stock ownership program at the height of skyrocketing stock prices and "irrational exuberance" on the NASDAQ and New York Stock Exchange. For many employees, especially those who had seen the value of their 401(k) savings accounts advance to all-time highs, the thought of investing in a stable, long-term growth stock like CH2M HILL seemed conservative at best, at worst a poor investment.*

Our major selling point was pretty basic. The more you know about a company, the better your chances of making a good investment. What better place to invest than in the company you and your fellow employees work for?

Ownership road shows became highly anticipated events in local offices across the company. The introductory shows were well attended at all stops along the way, with a good cross section of staff in attendance. It became apparent to Miller and the trained team of presenters that employees were interested in an investment they could understand and could directly influence. As employee owners, they recognized that the company's success meant their own financial success as well.

One stop in particular where large crowds listened intently and critically analyzed the benefits and risks of the expanded ownership program was CH2M HILL's birthplace, Corvallis. Like many road show stops, the Corvallis event was warmly received, but for those who had designed the new program, Corvallis was something of a litmus test. It was CH2M HILL's biggest single office and had many of the company's longest-tenured employees. As the home of CH2M HILL's first owners, the endorsement of Corvallis employees was critical.

At the conclusion of the event, one distinguished part-time employee approached road show presenters to ask if he, too, could purchase CH2M HILL stock. Though he was told that part-time employees were not eligible to participate, stock program administrators took it as a promising sign that this particular part-time employee wanted to invest in the company: The employee was Jim Howland.

"Whenever you work for a company as an owner, you tend to invest more in what you do every day, the way you behave and the way you work with others. By helping the company succeed financially, I succeed as well."

— George Wiker

By the end of 1999, all systems were in place to launch the program. For the first time in company history, beginning January 1, 2000, any full-time U.S. employee in the CH2M HILL family of companies could become a shareholder and owner of the company. (The initial rollout was limited to the United States because of legal restrictions in the countries where CH2M HILL was working. Bonuses equivalent to stock value were given to employees outside the United States until these restrictions could be further analyzed.)

In addition to being able to purchase stock directly, employees could participate in the payroll deduction stock purchase program, allowing them to set aside a portion of their pay to purchase stock at a 10 percent discount. By March 2000, employees could buy and sell stock in the internal market at the first-time-ever trading price of $6.34 per share.

While the timing of the initial road show events seemed problematic, coinciding as they did with a runaway, Internet-driven, speculative stock market, in retrospect the rollout of the new ownership program could not have been more perfectly timed. Within a year, employees used to seeing escalating stock market investments now watched the bottom fall out on Wall Street and the high-tech market, while CH2M HILL stock performed at a remarkable pace.

By 2001, when the road show made return appearances to many offices, presenters observed two interesting phenomena. First, in contrast to the introductory ownership events, most employees who attended road show events could now cite the current price of CH2M HILL stock without hesitation. Second, employees who held CH2M HILL stock in their 401(k) accounts identified those stocks as the best-performing investment in their retirement portfolio during the stock market's downturn year.

Ownership & Incentive Compensation Program Success

In its first five years, the ownership program established itself as a benchmark ownership, incentive compensation, and financial-growth program both for the company and for individual employee owners. By the last trading quarter of 2005, CH2M HILL's stock price had nearly quadrupled from its established 1999 value of $4.31 a share (before the program was launched) to $16.73. Employee participation in ownership had grown from one thousand KEs (one in seven employees) to more than sixty-five hundred direct shareholders.

In addition to its availability for direct purchase by employees, CH2M HILL stock became a key component of retirement benefit plans managed in trust

for employees. Stock was also used to recruit and retain employees through three key incentive compensation programs—stock options and short-term and long-term stock incentives. Stock options, vesting over a three-year period, could be used both to attract strategic hires and retain key staff. Short-term incentive compensation replaced the annual bonus program and was awarded on a personal performance basis (60 percent cash and 40 percent CH2M HILL stock). Finally, long-term incentive compensation was awarded to key business leaders of the firm, depending on three-year cycles of business performance (40 percent cash and 60 percent stock).

By March 2000, employees could buy and sell CH2M HILL stock in the internal market at the first-time-ever trading price of $6.34 per share.

While CH2M HILL stock performed well as an investment for shareholders, the leading beneficiary of the expanded ownership program was the CH2M HILL business enterprise itself. From a company with net worth of $40 million at the inception of the expanded ownership program, net worth climbed to nearly $320 million by year's end 2005. With this newly found financial strength, the company could invest in and compete for projects that were previously out of reach, explore joint-venture and project partnerships, and maintain financial resources in reserve for future strategic investment (e.g., acquisitions).

By the end of 2005, the ownership program held value to employees far beyond a stock investment. To people across the organization, "acting like owners" had become an ingrained standard of practice that held deep personal meaning—especially for employee shareholders. This outcome was exactly what Peterson and the other executives hoped for. Employees actually tracked the stock price and cared about performance of the company. After all, they owned it.

One employee owner, George Wiker, described the benefits of the system succinctly, "Whenever you work for a company as an owner, you tend to invest more in what you do every day, the way you behave and the way you work with others. By helping the company succeed financially, I succeed as well."

This sense of what's good for one is good for all was precisely what the founders of the firm envisioned when they talked about sharing the rewards. As Jim Howland eloquently notes in his *Little Yellow Book*:

> *Let's everybody be generous. It is especially important that those at or near the top of the heap be willing to spread the returns in dollars and recognition around. The gymnast on top is dependent on all those solid people who support him.*

CH2M HILL enters the construction industry.

CHAPTER 22

From CCI to EPC, and Other Parts of the "Alphabet"

Introduction

As businesses grow and evolve, it is axiomatic that their legal complexities expand as well. One of the many mechanisms businesses can use is the creation of multiple legal entities under a single umbrella, recognizing and legally segregating differing aspects of a complex operation.

Over the years, CH2M HILL moved from its origins as a partnership (CH2M) and a sole proprietor (Clair Hill) to formal incorporation as its business interests grew. By the early years of the twenty-first century, there were dozens of legal entities tied to a holding company called CH2M HILL Companies, Ltd. Some of these represented completely separate businesses (OMI and IDC), some were tied to partnering relationships on projects (Kaiser-Hill, the company that cleaned up Rocky Flats), others were tied by geography (CH2M HILL Canada, Ltd.; CH2M HILL Michigan, Inc.; and CH2M HILL International, Ltd.), and some were set up to meet legal requirements (e.g., for political contributions, the company created CH2M HILL PAC).

In 1997, a new CH2M HILL legal entity was created and registered. The event was somewhat off the corporate radar screen, with no major announcement or fanfare, but it fundamentally shook the foundations that CH2M HILL had been built upon for over half a century. For its entire existence, CH2M HILL, as an engineering and consulting firm, had viewed construction contractors as fundamentally different from itself. The company had always seen itself as the "eyes and ears" of its clients, trying to ensure that its clients received from contractors what had been designed. Moreover, some engineers and some contractors simply lacked mutual respect, regarding each other with white-collar versus blue-collar suspicion.

With the creation of CH2M HILL Constructors, Inc., immediately abbreviated as CCI, CH2M HILL signed up to become what some of its people had always seen as "the other side:" a construction contractor.

Origins of CCI

On December 3, 1992, nearly five years before CCI was created, Lyle Hassebroek (as president of CH2M HILL, Inc.) sent a memo to the board of directors summarizing the work and recommendations of the Alternative Project Delivery (APD) Task Force, which had been chaired by Bud Ahearn. Recently retired as a general from the U.S. Air Force, Ahearn had been asked by Ralph Peterson and Craig Zeien to lead a study on how CH2M HILL could become more engaged in the full life cycle of a project: from concept and design through construction and operations. Although Ahearn was new

to the company, this was a project suited to his talents. In the air force, he had overseen these kinds of projects, often referred to as design-build, turnkey, or fast-track construction. He was also familiar with "privatization," where a government agency partnered to build infrastructure projects, with the private sector responsible to the government for project initiation and planning, engineering, construction, operation, and even ownership, financing, and revenues.

The memo was classic CH2M HILL: thorough, detailed, and analytical. The executive summary alone was nine pages and began with a historical context, which may have been a bit overstated: "The evolution of processes used to deliver complete engineering projects has been under way at least 6,000 years. The first recorded history of mankind spoke of the master builders who were both designers and builders and accountable to kings."

Despite this dramatic introduction, the memo then got to the heart of the matter, defining the missions, the market drivers, expected obstacles, key terms, potential areas where APD could be used, client/market assessments, risks, and most importantly, recommendations for the board to consider. The carefully crafted language not only described what Ahearn's task force felt was needed, but also accurately characterized CH2M HILL at a crossroads in the early 1990s:

> *The APD Task Force sees a strong need for APD capabilities in INC.'s core markets, with an immediate need in hazardous-waste remediation. Further, INC. cannot become a benchmark firm in these markets simply through alliances with firms offering construction services; we must have access to APD capabilities in-house. However, INC.'s culture (conservative style, consensus–type decision making, etc.) and organization are not conducive to the development of a nimble, "lean-and-mean," competitive APD enterprise, and INC. does not have the type of "hard-dollar" people with the experience and savvy necessary to make APD work as a significant long-term business unit.*

To implement the INC side of the equation, the memo proposed that Ahearn lead what was termed the APD Center of Excellence and find key resources in support, marketing, and project management. The budget for 1993 start-up was set at $250,000. The initial target market was hazardous waste APD projects.

The board endorsed the recommendations of Ahearn's team, and APD efforts were off and running. A more detailed announcement was made to the firm in February 1993, and specific policies for development and execution of APD

projects were issued on July 1 of that year. Policy documents methodically outlined the "roles and missions, authorities, resources, general operating policy, risk management, and project-delivery management control systems" needed to perform APD work. In considerable detail (fifteen pages, plus nineteen pages of attachments), the memo announced the firm's intent to enter the APD world, with APD defined as "a delivery system in which CH2M HILL is primarily responsible ('at risk') for design and construction."

High aspirations indeed, but interviews years later with some of the key principals in the early efforts indicate that the path followed was significantly different than the course charted.

Mark Alpert was one of the earliest APD recruits from outside the company. Initially hired in 1986 from Wheelabrator, a subsidiary of Waste Management, Alpert had talked with Harlan Moyer, Peterson, and Gene Suhr, among others, and was convinced that CH2M HILL was moving toward becoming an EPC contractor. Development was frustratingly slow, so Alpert left and went to work for Air & Water Technology. Returning to the firm in 1991, Alpert worked in the water group and then became part of Ahearn's APD Task Force. Alpert later related:

> *Initially, there was a lot of hand wringing about getting involved in APD. At the regional level, there was a number of "skunkworks"—regional folks like Bob Bailey and Jim Bloomquist were pursuing potential projects, but mostly with CH2M HILL acting as a project manager, not directly involved in construction. But, Ralph Peterson, Craig Zeien, and Bud Ahearn did not want the regions pursuing construction work; this had to be directed and controlled at the corporate level because of the risks.*

One of the earliest steps in the pursuit of APD projects was to set up a screening process to analyze risks. Alpert and others created what became known as the Opportunity and Risk Evaluation form. Filling it out forced those involved in business development to assess the viability of projects and CH2M HILL's ability to execute them before any substantial money was invested.

From Concept to Construction Contractor

Progress in the early days of APD was slow, methodical, and tentative, at best. Although senior management initially thought the firm was best suited to execute environmental projects, it was the water group—eventually led by Don Evans—that made the mark. Alpert recalled that the first APD job

Zeien was emphatic about the commitment and the mission: CH2M HILL needed to manage its risk profile and guard against potential losses in an unfamiliar area of business.

was only $10 million, a wastewater treatment plant for the Irvine Ranch Water District in Southern California. By contrast, and despite business development investments of several million dollars, CH2M HILL lost critical jobs to a major competitor, Black & Veatch, in Milwaukee and Detroit. In Seattle, CH2M HILL entered into its first design-build-operate competition and lost the project to a consortium of Camp Dresser & McKee and Phillips Utilities.

Peterson, Zeien, Evans, Jim Ferris, and others were committed, however, to the APD course they had charted. Among other things, they realized the need to bring in outsiders to help, both in strategy and execution. One of the earlier hires, in 1995, was Peter Hughes, a lawyer from Bechtel. According to Hughes, Zeien was emphatic about the commitment and the mission: CH2M HILL needed to manage its risk profile and guard against potential losses in an unfamiliar area of business. Alleviating these concerns involved creating basic construction documents (modeled early on from Hughes's Bechtel experience) and building the needed infrastructure to deliver projects.

Among the major decisions was the creation of a separate legal entity to do construction work. OMI (discussed in Chapter 15) already existed for projects requiring operations. The finance group, led by Chief Financial Officer Sam Iapalucci, had created CAPCO, an entity to help finance potential projects. And there was a Canadian entity, CH2M HILL Waterworks, Ltd., to pursue construction work there.

But a debate ensued, not only about the creation of a construction entity, but also about the business model to be followed. Should there be a separate profit and loss for construction, or should it be driven through the existing business groups (water, environment, and transportation)? Ultimately, the leaders concluded that the business groups would make the business-development decisions and that the created legal entity would be a service provider, a cost center to be allocated to the businesses, not a separate profit and loss.

The next issue involved determining the firm's "appetite" for risk. The initial focus was on water projects, where the market for the design-build method of project delivery was emerging and the interest of CH2M HILL's water leaders was strong. The leadership set its target size project in the $30 million to $50 million range—a decent-sized water or wastewater treatment plant for a medium-sized city—where CH2M HILL's share of risk in any joint venture with a contractor was limited to 50 percent. For larger projects, it was agreed that CH2M HILL would only take a smaller share of the risk, say 15 to 20 percent, with an equity investment capped by Iapalucci at $3 million.

The next issue involved determining the firm's "appetite" for risk.

From 1996 to 1999, recalled Hughes, it was under Evans's leadership that major projects were pursued and the momentum was established for building an APD segment of the water business. (The terminology was later revised to "integrated project delivery," but ultimately shortened over time to design-build or simply construction projects.) Once the projects got started, the business became sustainable. By the early years of the twenty-first century, construction work was a viable and growing part of the CH2M HILL portfolio.

Hughes recalled both the early struggles and the eventual successes:

> *Once we set up CCI as a legal entity in 1997, we began to populate it with true construction professionals, developed formal processes and procedures, and began to win and deliver real projects. An early success was the Dartmouth water treatment plant in Halifax, Nova Scotia. In parallel to CCI's design-build efforts, IDC had partnered with Hoffman Construction on several projects—but they were frustrated when Hoffman got the lion's share of the margins as the contractor, even though the split was 50/50 on profit and loss. It wasn't until we partnered with M.A. Mortenson on several pursuits that we really understood the importance of margin-based project accounting and how to operate as a contractor.*

By 2001, CH2M HILL's start-up organization had matured and become more competitive in the industry. The business fly-wheel was turning, and the intended three-year start-up period was over. As the company's financial strength improved, sureties that provided critical bonding gained confidence that CH2M HILL could successfully deliver design-build projects. That year, the firm landed its first project without a joint-venture partner: a $100 million design-build-operate contract for Seattle Public Utilities, called the Cedar River Water Treatment Facility. CCI for construction, OMI for operations, and the water business group partnered to win the project.

In retrospect, the creation of a construction legal entity, CCI, was the easy part. CH2M HILL could label itself as a construction contractor. The hard part was changing the fundamental underpinnings of the firm: its engineering mentality. Years later, Ahearn reminisced about his initial assignment to lead the APD Task Force and the strategy that CH2M HILL employed. He had become a self-described student of APD projects while still in the military, joining the Construction Industry Institute (sponsored by the University of Texas School of Engineering) and the Design Build Institute of America.

CH2M HILL gave him the opportunity to put into practice what he had learned. He later recounted the origins of CH2M HILL's entry into construction:

> *The work we did on the APD Task Force confirmed that there was a client and market demand for lower-cost, higher-speed delivery of projects. Some of our consulting competitors looked at the market and chose to stay as pure consultants. But CH2M HILL saw the opportunity to "link and learn," evolving from early projects as a teaming partner to taking the lead on major construction projects. In military parlance, we had to gain "air speed and altitude" as a co-pilot before we could fly on our own.*

Partnering for Success

One of the major breakthroughs in the learning process came when CH2M HILL landed a job with the Foothill/Eastern Transportation Corridor Agency in Orange County, California, known as the Eastern Transportation Corridor project. Partnered with Flatiron Structures Company, in a joint venture called Silverado Constructors, CH2M HILL was a team member for the design and construction of an $800-million tollway in Southern California. Rather than waiting for matching federal funds and erecting the tollway in a traditional design-bid-build fashion, the agency created a public district, sold bonds, and hired the Silverado team to build it. Repayment of the bonds came from tolls once the highway was operational, so timing was critical. The project was daunting: 72 bridges; 63 million cubic yards of earthwork; 10 toll plazas; construction of a 50-acre wetland; and preservation and revegetation of nearly 300 acres of a coastal sage scrub habitat.

To execute a project of such magnitude, the agency recognized that the major players would have to work effectively as a team. At a formal partnering workshop held shortly after the initial notice to proceed, forty-five people representing fourteen different parties attended, including the agency itself, Caltrans (California's transportation regulatory agency), key players from the Silverado joint venture, and Lockheed Martin (the toll system contractor). During the course of design and construction, regular partnering meetings were used to provide project updates, exchange information, and address concerns in real time.

According to Jeff Mather, one of CH2M HILL's senior business development leaders who helped negotiate the contract with Silverado, the team partnering was more than an attitude; it was necessary to the financial success of the

project. The Silverado team's bid was $110 million lower than the next bidder, and the design team led by CH2M HILL agreed that it would take no profit unless the joint venture earned at least $40 million.

The project was a success by any measure. CH2M HILL earned more than $90 million in design fees, plus a percentage of the joint venture's $135-million profit. By linking CH2M HILL's design experience with Flatiron's construction experience, the Silverado Constructors joint venture completed the twenty-six-mile toll road fourteen months ahead of schedule, allowing the agency to collect tolls and pay off the bonds.

In retrospect, Mather reflected many years later, the Eastern Transportation Corridor project was another turning point for CH2M HILL: "A company is branded, not by advertising its capabilities, but by successfully executing major projects. The [Eastern Transportation Corridor] project branded CH2M HILL as a major projects company and as a transportation firm."

Mather's comment is telling. The project was a success in and of itself, but that project and Ahearn's stewardship of APD led to another significant—and unrelated—turning point in CH2M HILL's growth.

The Growth of the Transportation Business Group

Long before the tollway project, CH2M HILL had completed design and consulting projects in the transportation industry.

Despite having worked on these projects, however, CH2M HILL was not seen as a major competitor in the transportation industry. Zeien sought to change that perception and sought to apply "a full court press" in finding high-level talent, an industry icon, to jump-start the transportation business. Zeien's vision was to make a competitive business unit, similar to what CH2M HILL had built in the water and environmental industries. In 1994, the board of directors endorsed that vision, and the leaders of the firm began a concerted effort to recruit an outside talent from the industry.

In what Ahearn later viewed as an ironic twist of fate, the recruitment efforts were unsuccessful. Potential senior transportation industry leaders shied away from a firm that appeared to be dabbling in transportation, not steeped in or fully committed to it. CH2M HILL's reputation was strong in its historical markets, but players from major competitors were not willing to leave their employers for the promise of things to come.

The leadership discussed its alternatives. Ahearn had run some transportation projects while in the air force. But was he sufficiently versed in CH2M HILL, having directed the APD Task Force and served only a couple of years as a regional manager in Reston, Virginia?

Ahearn accepted the challenge, moved to the Denver headquarters, and began to build the more formal infrastructure for a business group. With the board's endorsement, the group was tasked to focus on winning work—even if the project margins were tight. Within a few short years, the transportation group grew from a smattering of scattered projects to a "top 10" ranking among transportation design firms in *Engineering News-Record*. Work was varied, including highway and bridge design; projects for state departments of transportation; designs for major airport runways and taxiways in the United States and the Middle East; and work for ports in California, Texas, and Florida.

In 2001, Ahearn led a group which successfully acquired a Florida company with about two hundred employees, Gee & Jensen, with expertise in ports and the cruise industry, land development, and general civil design. The acquisition and CH2M HILL's project successes, particularly the Eastern Transportation Corridor, signaled to the transportation industry that CH2M HILL was becoming a major player, successfully building a new facet to its growing and diverse business portfolio.

Conclusion

The legal actions required to create a legal entity are fairly straightforward. Often times, it is a nearly perfunctory art of filing appropriate papers with the secretary of state's office in the state where the company does business.

The creation of CCI was anything but a simple act, and a far cry from mere legal maneuvering. For CH2M HILL, it was a bold—some might say either courageous or foolhardy—move into uncharted waters. Years later, over a decade after the recommendations of the APD Task Force were endorsed by CH2M HILL's board, there were still skeptics inside the firm, a "we-they" mentality between traditional consultants and the new breed of construction-oriented professionals.

The road was not easy, Ahearn reflected a number of years later. But Ahearn believed there were four drivers for CH2M HILL's success in building its APD portfolio. Those who knew Ahearn often heard him speak philosophically, and his words reflected the determination of CH2M HILL's leaders to become an EPC company:

> *First, it took a commitment to live with purpose. Our purpose, our mission, our intent in Ralph Peterson's Strategic Road Map was to become an industry leader. Second, we needed to build and belong to a potent human force to achieve that purpose. That is, we had to build a unified team of engineers and contractors dedicated to making this happen. Third, we had to subordinate our own interests to re-engineer our business units to better serve the needs of our clients. Our clients were demanding full service, "one-stop shopping." And finally, we had to be transcendent, combining our ability to serve and our ability to lead. That is, we had to lift up those we serve and those with whom we serve. Our foray into the APD world, becoming an EPC force in the industry, required us to follow initially, but move over time into the position of leadership we now hold.*

CH2M HILL saw huge growth in the 1990s, driven by the firm's commitment to becoming a construction contractor. The number of employees increased from 5,091 in 1990 to 10,494 by 2000. Businesses diversified, with transportation growing substantially and adding to water, environment, electronics (IDC), and operations (OMI) capabilities. And in revenues, the numbers went from $474 million in 1990 to $2.1 billion in 2000.

No change was more significant than the shift from the traditional design and consulting work the firm had done for more than fifty years to the brave new world of construction.

Origins of a New Business

By the mid-1960s, engineers at CH2M had done a wide variety of consulting and design projects, mostly in the northwestern United States. The eventual merger with Clair Hill was still a few years away, and the "bread and butter" was in water and wastewater. From time to time, however, CH2M landed a job outside its core competencies, sowing seeds for its eventual diversified portfolio of businesses. One such project was a highway design project for Clark County, Washington.

Otto Vydra was recruited to the firm based on his experience with the Illinois interstate highway program, along with a host of other players under the direction of Bill Watters in the Seattle office. The project consisted of preliminary design and final plans, specifications, and estimates for construction on an eleven-mile stretch of Interstate 205. Along the highway, there were thirty-six bridges, a number of large drainage structures, existing infrastructure that had to be relocated, and five major interchanges. CH2M's fee was about $1.5 million—the largest job on the firm's books at the time.

Vydra recalled that the task was daunting, given the company's lack of transportation experience, the complexity of the job, and the demands of the Washington State Highway Department (the client). In fact, the client insisted that the project team be located in Vancouver, Washington, which became CH2M's fifth office after Corvallis, Boise, Portland, and Seattle. Perhaps the greatest challenge in retrospect was the technology, Vydra recalled:

> *Technology of the project execution was, of course, viewed from the twenty-first century engineering perspective, very primitive. Slide rule still ruled; for more complex and accurate calculations a COGO (Coordinated Geometry) computer program was the only available tool. The Corvallis hardware was accessible via a perforated*

tape fed through a telefax machine. Several hundred drawings were completed on Mylars by hand, including lettering. The office did not have a decent copying machine, except for an obsolete AB Dick; the copy was a curling, glossy and a kind of yellowish paper, which faded after a few months' period. Interestingly, the size of the project files was, in comparison with today's practice, almost ridiculously small. I guess that's because we did not have any printers; we just did not print those reams of paper.

Despite these limitations, the project was completed over a three-year period, from 1967 to 1970. The success of the project led to additional highway and bridge work, namely several miles of improvements along State Road 500 in Vancouver, Washington, and improvements for State Road 14 in the municipality of Camas, Washington, a long-time water client. Vydra recalled a memorable anecdote from the time:

On one Christmas Eve, at about 4 p.m., Gordon Elliott [the I-205 project manager] suggested we could finally relax a bit and allowed us to open a bottle of bourbon from the case given to us by Kiewit [the general contractor] as a Christmas present after [we had] already won the construction contract. In the same minute, the CH2M company car No.1, a pretty shabby old Ford called "blue beast," stops in front of the office. A smiling Jim Howland walks in and wishes us all a "Merry Christmas," sniffs around a little and, recognizing the characteristic smell of bourbon, stops smiling and inquires into "during-the-work-hours-undesirable-habit" of drinking. We not only had to empty the remainder of the bottle into the toilet but were strongly requested to take the case back to Kiewit. We had to actually buy that missing bottle in the liquor store so as to return the case "untouched." We still love Jim.

Modest—and dry—beginnings for CH2M HILL's transportation business. It would be nearly a quarter century later that the firm formally established transportation as a separate business unit.

CH2M HILL employees volunteered to aid in Hurricane Katrina recovery work in New Orleans, Louisiana.

CHAPTER 23

Breadth, Depth, and Diversity

The Board Retreat Conundrum

The tension in the meeting room was palpable. The participants at the annual board of directors' retreat in October 2003 were clearly not comfortable with the issue at hand. In retrospect, and maybe even at the time, people seemed to sense that CH2M HILL might be at something of a crossroads, but no one was sure what it meant for the firm or for its leaders.

Despite the tension in the room, the setting was idyllic: the Sunriver Resort in central Oregon. The location of the retreat had been carefully chosen, because it was a place to get away from the normal business environment and it was just across the mountains from the firm's roots in Corvallis. For many of those invited, the Sunriver area was sort of like going home. In fact, many of the early leaders of the company vacationed, bought property, or even retired there. Its sunny climate was often a contrast to the typically cloudy and rainy Corvallis weather.

The annual board retreat had become a significant event for Ralph Peterson and his executive leadership team (ELT). The participants were a carefully selected group—board members and current up-and-coming leaders, those who were willing to voice opinions on difficult topics and help craft and analyze new directions for the firm. Peterson was adamant about limiting the size to about thirty people, which caused some interesting jockeying for position among ELT members who wanted their own leaders to get an invitation. Participation in the annual retreat was recognition that you were a valued leader.

Intuitively, Peterson and the ELT knew that the 2003 retreat was going to be significant. Day one involved a review of some major organizational changes the ELT was planning to implement in early 2004. As was customary, Peterson had planned a series of breakout groups to get differing opinions on some of the concepts, hoping to avoid "group think."

The second day was to be highlighted with a presentation by a research consultant, Jennifer Sosin, from KRC Research in Washington, D.C. KRC had done blind interviews with more than one hundred strategic clients, and Sosin planned to tell the group that CH2M HILL was not nearly as well known or differentiated from its competitors as the leaders assumed it was. At the end of day two, a nationally recognized speaker on branding, Sam Hill, the CEO of Helios Consulting, was going to talk about what was needed to change the outcome of KRC's research in the eyes of CH2M HILL's clients. He called his talk "Ten Things Engineers Should Know About Branding."

Day three would be a review of the firm's strategic plan, during which the attendees would address and interpret the plan and its implications for the various business units. Peterson's agenda included the blunt question he wanted attendees to consider: What have we learned?

At the heart of all these issues, and what was creating tension in the room, was a memo given in advance to those invited. At the prior year's retreat, the board's outside directors had requested a more detailed review of clients and competitors to "better assess our position in the marketplace." This suggestion led to the research done by KRC and to a specific instruction to the business units as they engaged in their annual strategic-planning process. The instruction, listed in the memo, seemed fairly straightforward:

> *Who are the top 20 clients (plus or minus), by name, and what percentage of revenue do they produce (both in the current year and in the past 3 to 5 years)? For the remaining percentage of revenue, how many clients do we have? (Note: The goal here is to use the "80/20 rule," i.e., our assumption is that a finite number of key clients in each business group produce most of the revenues.)*

The data, which had been gathered from the business units in preparation for the retreat, were striking. Across the enterprise, over 40 percent of CH2M HILL's revenues came from the firm's top ten clients, with nearly 50 percent from the top twenty. Overall, even more starkly than predicted, about 80 percent of the company's revenues came from 10 percent (about three hundred) of its nearly three thousand active clients.

If the point was not apparent to the attendees, the cover memo for this portion of the retreat drove it home:

> *To state the obvious, it is the "care and feeding" of these most significant clients, which determines much of our future success. Each BG [business group] recognized this in the respective [strategic] plans, and their strategies are necessarily focused on ensuring that we continue to grow our revenues with these clients.*

This conclusion was little short of heresy, flying directly in the face of what many believed had made CH2M HILL successful since its inception: serving a wide array of large and small clients and solving their problems across multiple geographies. Years earlier at a KE meeting, Peterson himself had declared somewhat euphemistically that CH2M HILL's mission was to serve "all clients, at all levels, on any project where the firm had expertise, anywhere in the world." And one of the ELT leaders working for water and operations clients,

Don Evans, was known for touting that the size of a client simply didn't matter. In referring to his municipal clients, he stated proudly, "No muni too puny!"

To add further fuel to the fire, the cover memo challenged the retreat participants to consider the consequences for those clients generating less than 10 percent of the firm's revenues. What should the company do about this bottom tier? Each business unit served literally hundreds of smaller, lower-revenue-producing clients; collectively, approximately twenty-five hundred of the company's three thousand clients generated only 10 percent of the revenues.

The discussion at the retreat was vocal, almost strident at times, and perhaps more divisive than Peterson had imagined. To some, it appeared that the ELT had reached a predetermined conclusion (i.e., these bottom-tier clients actually diminished the firm's economic value). The cover memo, some suggested, implied that size (in revenue dollars) was a surrogate for profit or margin contribution.

Perhaps the most vocal critic was Mike Kennedy, president of the transportation business group and a nearly thirty-year veteran of the firm. Kennedy was not content to wait for the Sunriver discussion. Several days before the retreat, he wrote a memo to Peterson voicing his concerns and asking him to reconsider how the discussion was framed. Using classic CH2M HILL bulleted format, Kennedy echoed the sentiment of many longer-term employees:

> *We ignore completely the myriad nonfinancial benefits of smaller clients, and the value that these benefits contribute to CH2M HILL. Some of these benefits include:*
>
> - *Enduring life-long relationships formed early in career for both client and CH2M HILL staff member.*
> - *Low risk training ground for project delivery skills.*
> - *Developing relationships with emerging S/D/WBE [small, disadvantaged, women-owned business enterprise] firms.*
> - *High visibility and/or "pet" projects for community leaders.*
> - *Small projects that position us for larger projects or with other larger clients.*
> - *No (or low) business development costs.*
> - *Small tests of market or service expansion opportunities.*
> - *Workload balancing for junior staff.*

The tension at the retreat was real and heartfelt. There was no right answer. Peterson and the ELT had indeed come to grapple with a substantive balancing act: how to grow the firm with larger strategic clients, while still retaining the founders' legacy of serving smaller clients.

Projects—Providing Value to Clients and the World

CH2M HILL's history is filled with thousands of projects, across multiple engineering disciplines, in hundreds of offices, for clients in locations around the globe. While many aspects of this story can be told through key turning-point projects (Tahoe, UOSA, and Rocky Flats, among others), the firm's success had been literally built one project and one client at a time. Certainly, as the company grew and prospered, it was a stretch to take Peterson's desire to serve "any client, anywhere" too literally; there were some projects and clients that could not afford and would not pay for CH2M HILL.

Nevertheless, what differentiated CH2M HILL from many competitors in its industry was—and is—the depth, breadth, and diversity of projects that the company has completed and clients whose requirements have been successfully met. Kennedy and others at the 2003 retreat were right. It was not the size of the client, the amount of revenues generated, or the magnitude of the problem solved. Rather, it was CH2M HILL's ability to craft unique solutions to complex problems that have been the hallmark of the company.

That ability began with Fred Merryfield's belief that he and his partners could help clean up the polluted Willamette River in the late 1940s. That same sense of dedication, problem solving, and client satisfaction continued in the late 1990s and in the early years of the twenty-first century. Even a cursory sampling of projects drawn from CH2M HILL's annual reports and some of its internal publications demonstrates what Peterson, Kennedy, and others tried to convey at the 2003 retreat. Although the vast majority of the firm's revenues were indeed derived from a relatively finite number of clients, a critical differentiator for the company was its extensive network of local offices, where clients of all "shapes and sizes" could be effectively served. A brief sampling of these projects confirms the premise.

Responding to Disaster

Tsunami Recovery and Reconstruction

Throughout CH2M HILL's history, the firm and its employees have responded to natural disasters, addressing core human needs. Such was the case

following the December 26, 2004, tsunami that ravaged Indonesia, Sri Lanka, India, and Thailand.

The impact was difficult to fathom. More than 270,000 people died. Millions more were injured or stripped of life's basic necessities: clean water, shelter, food, clothing, and basic sanitation.

Working with global and local partners, CH2M HILL deployed employees to the region to start assessment work and to begin addressing the most pressing need: potable water. The company partnered with General Electric in taking a leadership role in Banda Aceh, Indonesia, to set up a portable water treatment unit. Employees operated the system twelve to fifteen hours per day to meet the area's distribution capacity, which equated to about 125,000 gallons daily. The CH2M HILL-GE partnership also installed a second drinking water treatment system in Sri Lanka.

Disaster Recovery Work Comes from the Heart (Katrina)

Within days of Hurricane Katrina's devastating the Gulf Coast of the United States in August 2005, CH2M HILL was on the ground supporting recovery efforts and helping residents and businesses in Alabama, Mississippi, Louisiana, and Texas recover and rebuild.

While watching media coverage of the water pouring into the streets of New Orleans, Louisiana, a CH2M HILL engineer proposed an innovative solution to a significant problem: Use thirty-eight hundred specially designed polypropylene fabric bags—typically used to transport nuclear waste—as sixteen thousand-pound sand bags to dam the levee breaks and stop the flow of water into the Crescent City.

Later, when clients such as the Federal Emergency Management Agency, United States Air Force, the Environmental Protection Agency, and the U.S. Army Corps of Engineers requested help, CH2M HILL employees volunteered to staff the projects. With more than six hundred employees, many of them living in less than desirable conditions for months, CH2M HILL provided some of the area's first housing by installing twenty-four thousand temporary homes for the Federal Emergency Management Agency, constructing temporary classrooms that allowed eight thousand Mississippi schoolchildren to return to school, safely removing thousands of tons of debris from the streets of New Orleans, assessing Superfund sites, aiding military bases with rebuilding, and working with numerous private clients to get plants back online and ensure continuity of operations. For CH2M HILL employees, it was not about pay and profit—it was work that came from the heart.

Improving the Environment: Urban and Remote

Preserving the River Thames—London Tideway Tunnels

The River Thames is set to become cleaner and healthier thanks to the London Tideway Tunnels, one of London's largest capital improvement programs. The tunnels will overhaul the city's sewerage system, substantially reducing discharges of untreated sewage to the River Thames from London's Victorian-era sewers and diverting the excess flows to Beckton Sewage Treatment Works in the east of the capital.

CH2M HILL has been working with Thames Water to develop the tunnels since March 2008. The work includes overseeing the projects from planning to construction, securing planning agreements, preliminary and final design, construction, stakeholder communication, and the commissioning and startup of new facilities.

London's sewerage system was an engineering wonder when it was first unveiled in the mid-1800s. But despite major improvements throughout the twentieth century, the system is regularly overwhelmed with more wastewater than it can handle. Urban development and population growth have contributed to the problem, limiting the natural spaces in and around London that could absorb rainfall.

In an average year, an estimated 39 million cubic meters of untreated sewage water discharges to the River Thames in up to sixty overflow events. The consequences to the river and nearby communities are profound—litter and pollution, a threatened ecosystem, and health hazards to users of the river. When completed in 2020, overflow events will be reduced to three or fewer per year.

The Thames Tunnel will run up to 32 kilometers (20 miles) through central London, intercepting thirty-four combined sewer overflows. The shorter Lee Tunnel will tackle the largest single combined sewer overflow at Abbey Mills near Stratford, capturing some 16 million cubic meters of untreated sewage each year.

At up to 75 meters (262 feet), the tunnels will be the deepest ever constructed in London. Understanding the ground conditions along the proposed routes is critical. To that end, project teams drilled 130 boreholes to gather information on soil types and properties. Tunnel construction, pending planning approval, is expected to begin in 2013.

The tunnel systems will be supplemented by construction of diversion facilities and an underground pumping station, as well as a major upgrade at the Beckton facility and two other wastewater treatment plants to increase treatment capacity.

Challenges abound in a project of this scope and complexity, particularly one that is situated in the center of one of Europe's largest and oldest cities. Because the tunnel route and surface facilities will run through some of London's most densely populated areas, mitigation will be critical to control impacts on residents and businesses.

It's rare that a single project has the potential to dramatically improve the quality of life for millions of people. In 2020, when the system goes online, the River Thames, a true national asset, will be protected for future generations.

Alexandria Wastewater Treatment Plant

Shipyard to Backyard—Remediation and Restoration in California

The City of Vallejo, California, wanted to turn the former Mare Island Naval Shipyard into new residential, commercial, and industrial development. They needed a creative way of integrating land cleanup and redevelopment in less time and at greater cost savings. Working for the Department of the Navy, CH2M HILL helped master developer Lennar Mare Island and helped the city juggle dual tasks of cleanup and redevelopment simultaneously. This program was a first of its kind and one of the largest early transfers of a military base in terms of cleanup costs since Congress granted early transfer authority to the Department of Defense in 1996.

CH2M HILL played a leading role in developing an innovative environmental cleanup, forging strong partnerships with a local government and a commercial partner, and successfully executing a contract with the federal government. As a result, Lennar Mare Island created more than eight hundred acres of usable land for Vallejo; seven thousand new jobs, more than 6 million square feet of industrial and commercial space; and fourteen hundred residential units.

Wastewater Awareness for the Mediterranean's Pearl

CH2M HILL had worked in Egypt for more than twenty years, primarily on water and wastewater projects funded by the U.S. Agency for International Development. Under the umbrella of the "Institutional Strengthening and Policy Reform" project begun in 1998, Alexandria overhauled the city wastewater utility's financial and management systems, bringing in computerization and customized software programs. The CH2M HILL team, supported by OMI, developed a privatized management model designed to

Johnston Atoll

track the compensation of the utility's five thousand employees and helped the city make the cultural shift to becoming a fee-based operation, serving more than four million citizens.

To inform the public about the complexities of sanitary services, the project created a broad-based public awareness program. It included a thirteen-part television series, miscellaneous printed materials, and a school-learning program. One of the students recognized the benefits of CH2M HILL's work, echoing sentiments on which the company had built much of its business: "I learned that if we keep the wastewater network from blockage, there will be no flooding or pollution, and we won't have infectious diseases."

From Bombs to Birds

Since the 1920s, the military had used a tiny island called Johnston Atoll—some seven hundred miles southwest of Hawaii—as a staging area and testing site. Its remote setting made it a suitable location for stockpiling weapons, destroying chemical ordnance, and conducting atmospheric nuclear testing.

CH2M HILL was hired by the U.S. Air Force Center for Environmental Excellence to clean up the atoll and close the military base there. Work included treating contaminated soil and groundwater; demolishing 235 structures (1 million square feet), many of which contained lead-based paint, asbestos, and ceiling tile with arsenic; and shipping hazardous materials off the island for disposal to permitted landfills.

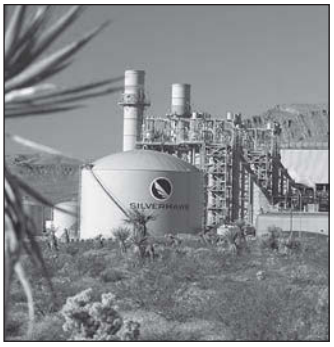
The day before the military's last C-130 plane came to pick them up, CH2M HILL's forty-seven team members demolished their lodging quarters. With no place to sleep and the remaining tasks to be completed, the crew worked through the night to finish the project. Then—tired but successful—they boarded the plane for home, leaving behind a wildlife refuge in the middle of the Pacific Ocean.

Supporting Sustainable Development

Energy and Innovation in the Desert

CH2M HILL (under a contract signed by Lockwood Greene before it was acquired) provided integrated engineering, procurement, and construction to deliver the Silverhawk Power Station, a 570-megawatt combined cycle plant for Pinnacle West Energy in Apex, Nevada, twenty-two miles north of Las Vegas. Featuring two Siemens Westinghouse 501F combustion turbine generators, two heat-recovery steam generators, and one reheat condensing

steam generator, Silverhawk provides power to the growing Clark County area and the western plains.



Silverhawk Power Station

To construct this $300-million power plant on an aggressive schedule, CH2M HILL overcame a number of challenges. The confining ninety-acre tract required careful staging of all construction phases, including equipment delivery and setup, so that crews did not overcrowd the site and impede progress. Craft labor working entirely outdoors year-round endured temperatures ranging from 6 to 116 degrees Fahrenheit (3 to 64 degrees Celsius). To meet permitting regulations requiring zero liquid discharge, CH2M HILL integrated innovative dry-cooling technology, making the plant environmentally sustainable. Supply delays caused by the Iraq War required contingency plans to maintain the schedule.

CH2M HILL successfully brought the plant online one month ahead of schedule and without a single lost-time accident in over a million work hours. Pinnacle West Energy cited CH2M HILL for "excellent cost, schedule, quality, and safety performance…and contribution to the success of Pinnacle West Energy."

Powering Up Down Under

A consortium of CH2M HILL and GE was contracted by Origin Energy to construct the 640-megawatt Darling Downs Power Station in northeastern Australia. The $660 million plant is the largest combined-cycle power station in the country. At full capacity, the plant generates enough power to supply 400,000 homes.

Because of the region's drought-prone climate, the client had exacting design requirements for water consumption at the plant. The design team's solution was a 240-megawatt capacity steam turbine with an innovative air-cooled—rather than water-cooled—condenser. The result was an astonishing 97 percent reduction in water use compared with traditional coal-fuelled power stations.

To complement the steam turbine, Darling Downs also uses three 130-megawatt GE 9E class gas turbines. The plant is fuelled by locally available natural gas and coal seam gas, which are piped to the facility from Origin's reserves in southwest Queensland.

The power station's environmentally friendly design reduces greenhouse gas emissions by half, compared with coal-fired plants. This is equivalent to taking more than half a million cars off the road. The station also has set new

Changi Water Reclamation Plant, Singapore

standards for noise exposure for staff and noise emissions with background levels of just thirty-six decibels, which is extremely low for the industry.

A large, highly skilled construction team worked multiple shifts to bring the project in on time. CH2M HILL helped design and implement a rigorous safety program at the construction site. The construction of the project was completed with no lost time injuries for the more than 2 million labor hours expended.

The power station was commissioned by May 2010 and achieved practical completion in June 2010. The reliability trial was completed with 100 percent reliability.

Projects like Darling Downs extend far beyond the plant's fenceline. The net economic benefit to the Queensland area around Dalby has been estimated at more than $1 billion.

Sustainable Development Solutions

To meet the burgeoning water demand of its 4.2 million people, Singapore's Public Utilities Board turned to CH2M HILL to bring creative and sustainable water-supply solutions. Taking advantage of the latest technologies, CH2M HILL designed a demonstration project and water-reclamation plants to produce potable water from reclaimed secondary effluent. Beginning in 1997, CH2M HILL also provided planning, design, construction management, and commissioning services for a unique, large-scale wastewater deep-tunnel conveyance and treatment system.

The Deep Tunnel Sewerage System featured approximately thirty miles of ten- to twenty-foot-diameter conveyance tunnels installed under the island nation. The Changi Water Reclamation Plant, on the eastern side of the island, became one of the world's largest greenfield wastewater reclamation facilities. The plant, commissioned in 2009, was designed to have an initial average capacity of 211 million gallons per day. It will be expanded in subsequent phases to provide a final capacity of 634 million gallons per day.

The entire $4.5 billion program will help Singapore meet its infrastructure needs for the next forty years and will result in cleaner waters around the island, a healthier environment for the people of Singapore, and the enhancement of Singapore's reputation as a high-tech center in Asia.

Energizing Economies and Quality of Life

Connecting Continents—The Panama Canal Expansion Program

Since its opening in 1914, the Panama Canal has been one of the world's most vital transportation corridors, linking east and west and fostering trade, travel, and the expansion of global markets. In spite of the immense scale of the original project and the engineering brains and brawn that designed and cut the fifty-mile waterway through the jungles of Panama, by the early twenty-first century, the canal was at risk of becoming obsolete.

Panama Canal Expansion Program

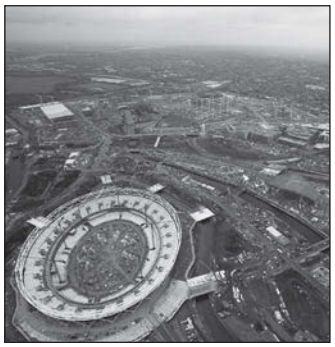
The architects and designers of the canal could not have foreseen that in 100 years' time, the size of ships would grow to such an extent that the canal would be unnavigable for many of the world's largest freighters.

For the canal to remain efficient and economically viable in the years to come, it needed a dramatic engineering overhaul to increase capacity and accommodate today's larger ships. To address this need, the Autoridad del Canal de Panamá (ACP) launched the $5.25 billion Panama Canal Expansion Program.

CH2M HILL is assisting the ACP in the program management of the Panama Canal Expansion Program, which will add a third set of locks to the historic waterway. The new locks will provide an additional lane of traffic, doubling the canal's tonnage capacity and allowing the transit of much longer, wider, Post-Panamax ships through the waterway.

CH2M HILL is assisting ACP in managing numerous contracts, including those for design and construction of the new locks on the Atlantic and Pacific sides of the canal. CH2M HILL provides expertise directly or through subcontracts with firms from around the world on every aspect of the program.

Seldom has there been a project so interwoven with the pride and identity of a nation. It was an engineering marvel in 1914, when the first steamship entered its eastern locks. No less impressive will be the canal of 2014, designed and constructed for the people of Panama and the future of global trade.



London 2012 Olympic and Paralympic Games

London 2012 Olympic and Paralympic Games

Deadlines don't come much harder than this. The job? Transform a neglected industrial area in East London into a massive world-class sports complex—the platform for the London 2012 Olympic and Paralympic Games. Planning, procurement, design, and construction must all be accomplished within the space of just a few years.

Although events are scheduled to be held at venues all across the United Kingdom, the heart of the 2012 Games is the vast Olympic Park complex in East London along the River Lea.

The Olympic Delivery Authority's £8.1 billion (more than US$15 billion) program for the Olympic Park is one of Europe's largest infrastructure and regeneration efforts. It includes construction of an 80,000-seat stadium, an aquatics center, a velopark for cycling events, an Olympic Village for athletes, and related transportation and infrastructure improvements.

To deliver a program of this magnitude and complexity, the ODA selected CLM Delivery Partner, a consortium of CH2M HILL and two British firms, Laing O'Rourke and Mace. The members of CLM have experience on seven Olympic Games and a track record for success both in large-scale international program management and in the growing sport market.

In 2007, CLM began working closely with the ODA to oversee all facility and infrastructure development for the London Games. In just fourteen months, they completed initial planning and platform work for the Olympic Park. Large-scale construction began in summer 2008.

The facilities designed and constructed for the London 2012 Olympic and Paralympic Games will be a lasting legacy for the people of London well beyond the Games themselves.

From the earliest planning stages, the post-Games revitalization of the Lower Lea Valley has been a top priority for Games organizers. The ODA has been actively coordinating legacy development efforts with numerous municipal agencies.

When the Games conclude in September 2012, all land and facilities will be transformed for legacy use. The Olympic Park will become one of Europe's largest urban parks, and the Olympic Village will be converted to 3,000 homes for Londoners.

Destination: London

Crossrail Programme, London, England

In March 2009, Crossrail Ltd. appointed CH2M HILL the Programme Partner for the UK's largest rail infrastructure program in a half century. Crossrail will provide an affordable, world-class rail system that spans the breadth of London, from Maidenhead and Heathrow in the west to Shenfield and Abbey Wood in the east. The seventy-four-mile rail line is currently the largest civil engineering effort in Europe, and as a critical investment in London's future, substantial economic benefits will flow from Crossrail beyond London's boundaries to the rest of the UK.

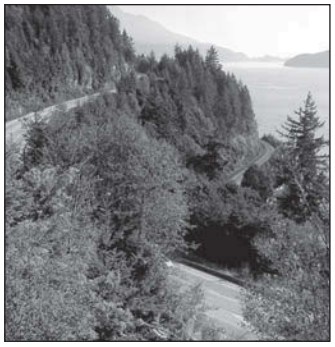
Crossrail will expand the city's rail capacity and enhance the efficiency of London's busy transit system. Its mainline-sized trains will accommodate more than 1,500 passengers each. The high-frequency train service will help put an estimated 1.5 million Londoners within easy reach of Heathrow Airport, central London, and the city's key business and tourism centers.

CH2M HILL and its joint venture partners have a combined workforce of 2,000 employees dedicated to the Crossrail program. The team will work in step with the client to ensure that safety, quality, and budget are maintained, while looking for innovative approaches to the engineering and logistical challenges faced by a program of this size and complexity.

The scope of the engineering and construction effort is awe-inspiring. Massive twin-bore tunnels in Central London and a second tunnel network linking the system to Heathrow Airport are centerpieces of the project. All told, twenty-six miles of new tunnels will be dug. Two twenty-foot-wide tunnels will link to each other and the surface at regular intervals, providing ventilation and access for operations and maintenance. Once construction is under way, work crews will operate eight massive tunnel boring machines around the clock.

The program calls for construction of eight new stations in central London, with extensive renovations at another twenty-eight existing rail stations. The Crossrail system will comprise thirty-seven stations overall. The new Tottenham Court Road station, which in 2009 was one of the first stations to enter construction, will be a central crossover hub for Crossrail and London's Tube system. More than 200,000 people are anticipated to pass through the station every day.

At Shenfield and Abbey Wood in the east, Crossrail joins the UK's Great Western and Great Eastern railway networks, linking London's transit systems and national rail lines in an unprecedented way. Crossrail Ltd. anticipates that the program will expand London's transit infrastructure by 10 percent when the first trains begin running in 2017.



Sea-to-Sky Highway, Vancouver, British Columbia

Bringing Home the Gold

In July 2003, the City of Vancouver's selection as the host of the 2010 Winter Olympic Games increased the urgency for making highway improvements along the one hundred-kilometer stretch of dangerous, narrow, two-lane highway between the city and Whistler Mountain ski resort. Within twenty-four hours of the International Olympic Committee's announcement, CH2M HILL was selected by the British Columbia Ministry of Transportation to act as the procurement manager, working with Partnerships BC (the government entity established to manage all public-private partnerships in the province) to develop the project's procurement strategy.

The scope of work for the technically challenging Sea-to-Sky Highway Improvement Project included conventional construction methods for some sections of the road and design-build delivery models for others. One section was to be delivered as a $40-million design-build project with CH2M HILL as the section manager. Additional passing lanes, lane widening, and curve straightening would increase highway safety, reliability, and capacity between the Olympic venues, and it would boost provincial gross domestic product by about $300 million.

"CH2M HILL's valuable services contributed to the ministry's success in securing this design-build-finance-operate contract, and in winning the Gold Award in project financing at the 2005 National Awards for Innovation and Excellence for public-private partnerships," said Peter Milburn, assistant deputy minister for the Ministry of Transportation.

A Fountain of Creativity: Art and Engineering

The Loussac Library ice fountain was designed by artist Carl Neajar for the City of Anchorage, Alaska, in the late 1980s. Water was sprayed over steel arches laced with cables in the winter; the freezing water clung to the steel and was naturally sculpted by the winds. The engineering of the sculpture, however, was not sound, and the intricate plumbing system often froze and broke, leaving the fountain nonfunctional for nearly ten years.

Spurred on by a local community activist, eight CH2M HILL employees worked with a long-time client, the Anchorage Water and Wastewater Utility, to redesign the plumbing to withstand Alaskan winters. In May 2004, the redesigned fountain came to life, heralded with fanfare by a front-page article in the *Anchorage Daily News*.

The Splendor of Design-Build

Port of Galveston Cruise Terminal

In 2002, the decision makers at the Port of Galveston, Texas, recognized that the coming cruise industry boom offered them an extraordinary opportunity to stimulate their local economy and tax base. Financing such expansion, however, was an issue. Appreciating the port's need for an innovative funding mechanism to finance expansion, CH2M HILL proposed that the port use a public-private partnership (a first for a Texas port project), coupled with design-build delivery, for new cruise facility expansion.

On September 9, the Port of Galveston approved a cruise terminal agreement with Royal Caribbean and Carnival Cruise Lines. About a week later, the port hired CH2M HILL to upgrade a dilapidated warehouse with a leaky roof, modify one hundred feet of wharf facilities, and construct access and circulation roads to accommodate new service for the passengers and crew of Royal Caribbean's *Splendour of the Seas*—scheduled to arrive just seven weeks later.

Taking a fast-track approach to meet the immovable deadline, the CH2M HILL team mobilized onsite just three days after the contract was awarded. Despite skepticism about completing the job on time, the design-build team met the schedule and shared more than $100,000 in cost savings with the port. On November 11, when the *Splendour of the Seas* docked in Galveston with its sixteen hundred passengers, the wharf, roadways, and terminal building were ready.

Working in Wine Country

The marriage of technology and winemaking can produce surprising benefits. In northern California's wine country, Ceágo Vinegarden and its owner, Jim Fetzer, established its mission "to blend new information technologies and sustainable farming practices to improve crop quality, operating efficiency, and environmental performance of viticulture operations." The vineyard was already using geospatial (GIS) technologies to track its operations, but it needed a world-renowned systems integrator to coordinate the GIS data layers, the computer server, weather stations, and sensor pods.

Relying on CH2M HILL's experts in Web services, wireless technologies, GIS, and environmental sciences, the goal of the project was to monitor grape yield and quality, including sugar levels and pH, while reducing costs. Critical to success was CH2M HILL's ability to track growing methods, weather conditions, and timing of the harvest.

The project was successful. Records do not reflect whether the project team reaped any liquid rewards for their efforts.

Conclusion—Quality, Not Quantity

In his November 2003 report to the board of directors, Ralph Peterson summarized major issues from the Sunriver retreat the prior month. Despite having only a short time to digest the discussions, it was clear to Peterson and the executive leadership team that they were not going to find an easy resolution to the conundrum of "top-tier" versus "bottom-tier" clients.

Peterson told the board that "there were two aspects of the data we assembled which we felt needed to be explored: (1) the vast majority of our revenues in each [business group] comes from a finite number of clients; and (2) each [business group] serves a significant number of clients who generate less than 10 percent of our revenues." The retreat attendees understood and discussed both facets of the data, ultimately concluding that CH2M HILL needed both larger and smaller clients to remain successful. Peterson's memo summarized a number of key points to capture the discussions.

The first—obvious to anyone in business—was that the central issue had to be profits, not the size of clients. CH2M HILL could thrive with thousands of profitable yet smaller clients, and it could suffer major debilitating losses with bigger clients. The metric for success had to be focused back on one of Jim Howland's early mantras, paraphrased: While doing good work and having fun, the ultimate goal [is] making a profit.

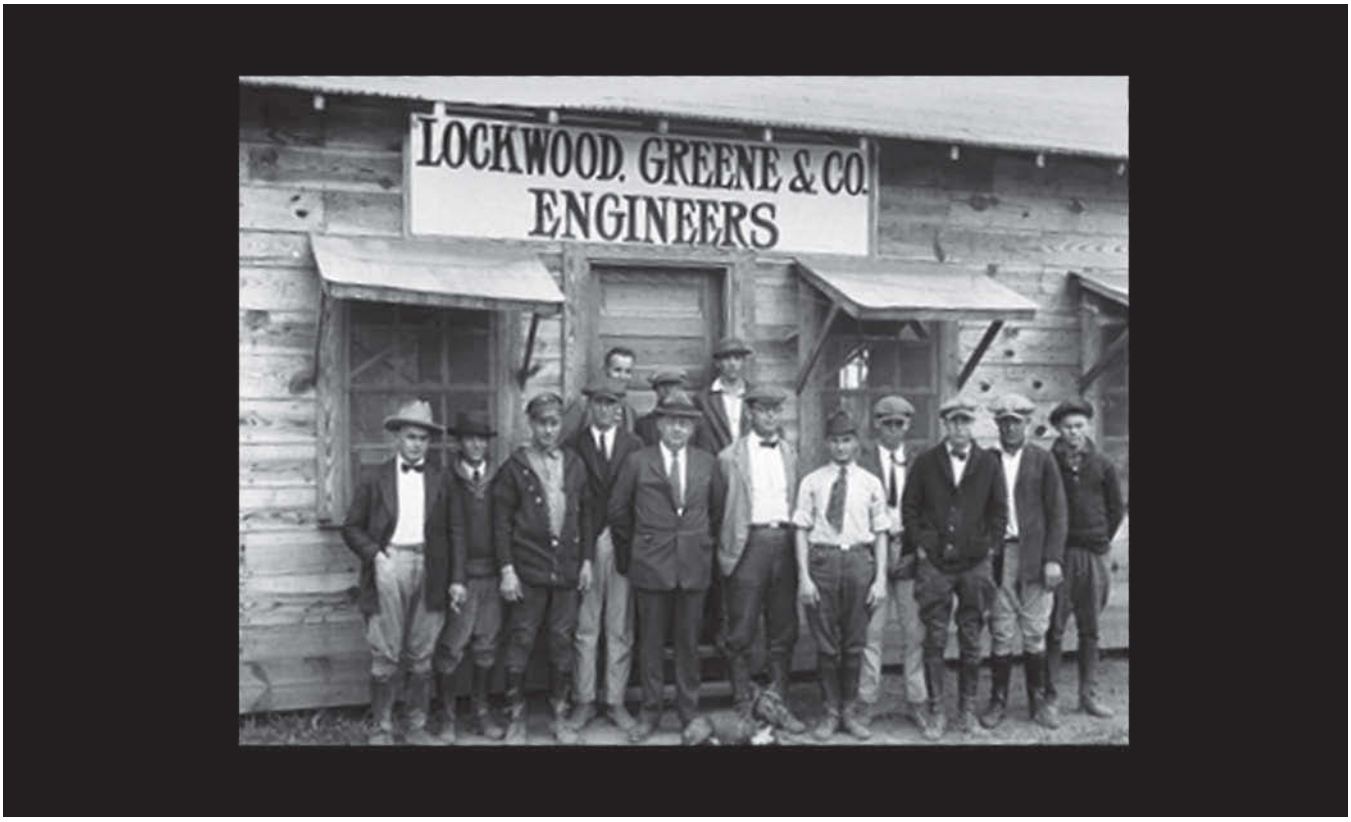
The memo also recognized that no one wanted or believed in "a wholesale cut of some percentage of clients." In fact, the retreat leaders recognized and affirmed that some businesses—particularly water, transportation, and OMI (the operations subsidiary)—built their businesses on smaller clients and smaller jobs. That would continue, Peterson stated, but all of the business units needed to recognize that "on lower revenue/margin producing clients, more analysis is likely to suggest that we not continue to serve some clients."

Ironically, the retreat group had come to an unexpected conclusion as well. Not only was there a danger in arbitrarily cutting off a percentage of smaller clients, there was a potential downside to investing too much in major clients: "…when too much of our revenue is derived from a finite number of clients, there is a concern if one of the big clients goes away."

Finally, the memo stated, CH2M HILL would have to continue to find and promote attributes that differentiated the company from its competitors. As projects got larger, the competition was often tougher against bigger, financially stronger, and politically connected firms. CH2M HILL had proven its ability to compete at that level, but it could still effectively serve smaller clients at the local level.

One has to believe that the founders would have smiled at both the retreat discussions and at the conclusions Peterson reported to the board of directors in November 2003. "What was the dilemma?" they might have asked. The keys to success from the earliest days of Cornell, Howland, Hayes, Merryfield, and Clair A. Hill and Associates were precisely the same as those for CH2M HILL in the early years of the twenty-first century: Know your clients and understand their needs; nurture those clients you can serve effectively; and gracefully exit from those you cannot serve effectively or efficiently. And, if you do these things, you can make a profit so you can share the rewards with all the other employee shareholders across the company.

How hard is that? As every business owner knows, sometimes the most basic lessons are the most profound. The October 2003 board retreat was a reminder of business fundamentals.



CH2M HILL acquires Lockwood Greene, America's oldest professional services firm.

CHAPTER 24

Come Together

Lockwood Greene Acquisition

On the evening of December 10, 2003, CEO Ralph Peterson waited anxiously for the call. His hand-picked team was in Charlotte, North Carolina, for an event that would have a profound effect on the future of CH2M HILL. Lockwood Greene, America's oldest professional services firm, had entered a bankruptcy divestiture process, effectively putting the firm up for sale, and CH2M HILL was vying for the company.

The Spartanburg, South Carolina-based engineering and construction firm had been founded more than 180 years earlier. By 2003, Lockwood Greene was a profitable business with a solid client base and an outstanding reputation in the industrial marketplace.

It had, however, the misfortune of having a financially unhealthy parent. Germany's Philipp Holzmann AG, which owned J.A. Jones, which in turn owned Lockwood Greene, fell into serious financial trouble in the late 1990s and had been draining the firm for years. At one point, the German government stepped in to save the company—to no avail. Holzmann was now facing liquidation. In fall 2003, through no fault of its own, Lockwood Greene found itself for sale.

Ken Durant, president of CH2M HILL subsidiary IDC, had been tracking Lockwood Greene for years. From IDC's vantage point, the company was well respected in the food and pharmaceuticals industries, two areas of IDC's projected growth. The acquisition of Lockwood Greene would substantially enhance CH2M HILL's profile in the industrial marketplace.

Durant's persistence led Sam Iapalucci, chief financial officer, and Mike Brown, investment director, to reach out to the bankers representing Holzmann in 2000, 2001, and again in 2002, expressing interest in Lockwood Greene. Each time, they were rebuffed. But Durant was not one to be put off. He insisted that Lockwood Greene had the attributes that could jumpstart a great industrial business for CH2M HILL.

With Holzmann's collapse in 2003, Lockwood Greene was taken into Chapter 11 bankruptcy. In early November, the court announced a compressed schedule for the sale of the company, one that would condense due diligence into an almost unbelievably short timeframe. Now the pressure was on. And the clock was ticking.

On November 6, Jim Ferris, president of Energy, Environmental & Systems (EE&S); George Lemmon, who had replaced Durant as president of IDC after Durant's retirement; and Brown traveled to Lockwood Greene's Spartanburg

headquarters for a preliminary session that outlined the process for the sale. The competing companies each gave a brief presentation on their operations, and then lots were drawn for the due diligence process. The lots determined the order in which the companies would be allowed access to Lockwood Greene's data room. Nearly thirty companies participated. As luck would have it, CH2M HILL's assigned day fell on November 8, which gave just one day to mobilize and prepare.

The core team went into overdrive, pulling in lawyers, accountants, contracts specialists, technical people, and a host of other operations personnel from across the firm to take on due diligence. Iapalucci recalled: "On a moment's notice, we went from zero to having fifty personnel involved in examining Lockwood Greene's operations." The team spent that day poring over records and then settled in to preparing and compiling a detailed assessment of the firm.

Peterson then held a meeting with the core team to discuss the results of the work to date. The more they discovered about the company, the more excited they became about the possibility of a deal. "We had done our work and had a sense of what it was worth to us," added Iapalucci. "The team did an amazing job in the field. We had a sense of what assets we wanted and what we didn't want. We knew a lot."

As the firm's leaders debated the pros and cons of the Lockwood Greene deal, Ron Campbell, president of CCI, CH2M HILL's construction arm, stepped up with some pivotal insights that had a tremendous influence on the process. Campbell, more than anyone else, knew Lockwood Greene's business from having competed in the marketplace. He recognized that Lockwood Greene's experience building gas turbine plants could catapult CH2M HILL almost overnight into a major player in the power marketplace.

"Campbell thought that Lockwood Greene would be an excellent fit and that they would help us to become a full-service EPC company," Iapalucci added. "He felt that their power business was already there. In hindsight, that observation turned out to be brilliant and absolutely right on. He helped convince people that this was the right move."

Ferris, who was the sponsoring operating executive with the responsibility for integrating and running Lockwood Greene should CH2M HILL be the successful bidder, became wildly enthusiastic about Lockwood Greene's potential to boost CH2M HILL in the energy and power markets. Peterson, who at an earlier point in his tenure as CEO had been skeptical of mergers and acquisitions, fully supported the effort.

The court had an unusual process for selling the company. It established a "stalking horse"—a preferred bidder who would set the initial bid and would help negotiate the lead contract. Other firms would then be pitted against that company. A German company was selected as the stalking horse.

One evening in mid-November, an event occurred that propelled CH2M HILL from just another face in the crowd to the front runner. Margaret McLean, chief legal counsel; Catherine Santee, senior vice president of finance; Iapalucci; and Brown were working late at the office in Denver. A call came in from an executive at Lockwood Greene. Negotiations with the German firm that was the stalking horse had run aground. Would CH2M HILL be interested in stepping up at that price as the stalking horse?

Peterson was on a plane at the time and out of reach. The group discussed the details and their implications and made the decision to push ahead. After all-night negotiations among the CH2M HILL team, Lockwood Greene's CEO Fred Brune and chief financial officer Wendell Stidham, and representatives from the court, a contract was negotiated to make CH2M HILL the stalking horse.

The court decided that it would conduct the final phase of the sale at J.A. Jones's offices in Charlotte to be held in early December. In the meantime, the board of directors met to discuss an authorized price, finances, a negotiation strategy, and other details.

As the sale date drew nearer, Lockwood Greene's suitors had thinned out considerably, unable or unwilling to meet the base price established by CH2M HILL as the stalking horse. From about thirty at the outset, it now came down to two firms.

The day before the sale, Peterson's team flew to Charlotte with a firm strategy in hand and a price authorized by the board of directors. Representing CH2M HILL were Iapalucci; Ferris; Lemmon; McLean; Santee; JoAnn Shea, chief accounting officer; and Brown as the team's spokesperson.

After an exhausting day with twenty-seven rounds of bidding, the sale finally ended a little after 6:00 p.m. Iapalucci phoned Peterson with the good news. That day, December 10, 2003, marked the firm's single largest expansion since the merger of CH2M and Clair A. Hill and Associates—Lockwood Greene was now part of the CH2M HILL family.

The next morning, Ferris and Lemmon set out by car to visit Lockwood Greene's headquarters. They drove from Charlotte to Spartanburg in a downpour—a frigid, mid-winter rain beating against the windshield. They were eager to meet with employees and welcome them to the company.

A Short History of Lockwood Greene

In 1832, the same year that Andrew Jackson was elected to a second term as the seventh president of the United States, a young engineer named David Whitman established a consulting engineering practice in Providence, Rhode Island. Focused on America's predominant textile industry that was centered at that time in New England, Whitman developed a reputation for helping his clients solve their manufacturing problems and became widely known as the "Mill Doctor."

In 1858, Amos Lockwood obtained Whitman's practice and formed A.D. Lockwood & Co. The company sustained its concentration on the textile business and benefited from an unprecedented boom in the industry that occurred with the migration of textile operations from New England to the southern United States during Reconstruction after the Civil War. When Amos Lockwood relocated the business to Boston, Steven Greene joined him as a partner in 1882 and established Lockwood Greene & Company.

Through the late 1800s and early 1900s, Lockwood Greene continued to diversify and grow as it expanded into new industries such as automotive, manufacturing, metals, and processed foods. The company's position and reputation in industrial engineering was built on innovative projects. One example was the first electrification of an industrial plant in the U.S. for Columbia Mills, during which Lockwood Greene hired the budding General Electric Company to help deliver the project in Columbia, South Carolina.

As industrial markets expanded in the twentieth century, so did Lockwood Greene. The company diversified into emerging markets that included consumer products, glass, ports, and publishing, and it also began providing services to the U.S. military. Then with advanced technologies in the 1970s and 1980s, Lockwood Greene migrated into high-value markets such as aerospace, biotechnology, fibers, microelectronics, pharmaceuticals, power generation, and specialty chemicals.

In 1981, Lockwood Greene sold 80 percent of the company to Philipp Holzmann AG, a global engineering and construction firm based in Frankfurt, Germany, to satisfy both organizations' globalization strategies.

Over the next twenty years, Lockwood Greene grew from five domestic offices and one thousand employees into a global network of engineering and construction operations with twenty-four hundred professionals in fourteen U.S. locations and ten international offices. In 1998, Holzmann decided to consolidate its U.S. holdings and merged Lockwood Greene with fellow subsidiary J.A. Jones as part of a restructuring plan. As financial problems continued to plague Holzmann, the corporation was declared insolvent in 2001.

By late 2002, J.A. Jones began to divest the nine companies that comprised the corporation. Simultaneously, CH2M HILL made the decision to grow its business in the private sector and began to look for a strategic acquisition that would expand its position in the industrial marketplace worldwide. Lockwood Greene was targeted for acquisition by CH2M HILL when, in October of 2003, it was made available for divestiture.

With compatible cultures and markets, along with complementary services and geographies, CH2M HILL and Lockwood Greene were a logical strategic fit. CH2M HILL's leadership approved an initiative to explore the acquisition of Lockwood Greene and deployed a management team to assess its business and pursue the purchase. After a complex series of negotiations and fierce competition with rival suitors, CH2M HILL acquired Lockwood Greene in December in 2003.

Branded as CH2M HILL Lockwood Greene, the organization continues its legacy as America's oldest professional services firm. CH2M HILL Lockwood Greene has since become a major contributor to the CH2M HILL global enterprise.

When Ferris and Lemmon finally arrived at Lockwood Greene's headquarters, they found that the J.A. Jones sign—with its distinctive horse head logo—had been taken down, replaced with CH2M HILL's logo. Lockwood Greene employees greeted them warmly, announcing: "The head is dead."

Peterson announced the acquisition to employees, touting the values, history, and complementary nature of Lockwood Greene's business:

> *Through this acquisition, CH2M HILL and Lockwood Greene's combined strengths and capabilities will lead to a continued and expanded delivery of engineering and construction excellence on any project of any size, worldwide. As a well established player in the chemical, pharmaceutical, food and beverage, advanced manufacturing, and power industries, Lockwood Greene is a natural and strategic fit with CH2M HILL.*

The purchase price of $95.5 million for a company with $600 million in revenues seemed a bargain by any standard. The deal was closed the following week. Soon after, Ferris and his team set off on a whirlwind Welcome to the Family tour, visiting offices and clients. From the time lots were first drawn to the time the check was paid, which included due diligence, financing, the divestiture process itself, the closing, and the structuring, the entire deal was accomplished in just thirty-five days. In one short but concentrated period, CH2M HILL had grown by more than 25 percent, increasing its employee population to fourteen thousand and its revenues to about $2.7 billion.

Expanding Markets and Geographies

Although a smaller firm than CH2M HILL in terms of revenues, employees, and offices, Lockwood Greene's international business stood at about 50 percent of CH2M HILL's international business in late 2003, in terms of footprint coverage.

With the acquisition, CH2M HILL immediately expanded its international base. In 2003, Lockwood Greene had permanent offices in Moscow, St. Petersburg, Krakow, Dublin, Mexico City, São Paulo, Buenos Aires, Shanghai, Singapore, Bangkok as well as in Puerto Rico in addition to its fourteen offices in the United States.

But more than offices were brought into the fold. Experienced and skilled engineers, designers, project managers, construction staff, and finance and administration professionals all became part of the CH2M HILL family. And the depth of client relationships and breadth of project work were far beyond

anything that CH2M HILL had experienced in the international marketplace up to then.

CH2M HILL's international strategy before the acquisition primarily involved flying in expatriates to an overseas location for the duration of a single, defined project. Lockwood Greene's philosophy had been to establish, where appropriate, an office with indigenous talent and have local professional teams run the projects and programs—a model that has worked so well that CH2M HILL has adopted it for the majority of its international operations. The upshot was long-term client relationships and local employees with in-depth knowledge of the projects, agencies, stakeholders, cultures, and communities in which they served.

At the time of the acquisition, CH2M HILL owned IDC, which was principally involved in the semiconductor and microelectronics markets. IDC had tried to enter the pharmaceutical and biotech markets, but progress was slow. With the acquisition, CH2M HILL gained Lockwood Greene's pharmaceutical and biotech businesses. Because Lockwood Greene stood among the top five firms for engineering, design, and validation of pharmaceutical plants, CH2M HILL gained immediate prominence in that market.

Lockwood Greene was strong in industrial manufacturing—the design and construction of automobile plants, truck plants, food and beverage plants, consumer product plants—a market that CH2M HILL had not been involved in at all.

A well-established chemicals business—the design and construction of chemical plants—also came from Lockwood Greene. CH2M HILL had done environmental work for some of those same clients but now gained footing on the capital infrastructure side.

Lockwood Greene had been, as Campbell recognized, a leader in the power market with the design-build EPC of major combine-cycle power plants. CH2M HILL had not been doing at-risk construction at that level of sophistication and size. The Lockwood Greene energy business formed the basis of what would become a major contributor to the enterprise in years to come.

In addition to injecting a healthy dose of new projects and businesses into the firm, the acquisition also brought in people with fresh insights, diverse viewpoints, and tremendous business and leadership acumen. Who better to run the new industrial businesses than the men and women who were already achieving success?

Senior executives at Lockwood Greene rose to some of the top positions in CH2M HILL. From the presidents of business groups to members of the board of directors, Lockwood Greene's presence was felt immediately.

Brune became president of the government, facilities, and infrastructure business group—previously associated with EE&S—delivering work in the U.S. and around the globe on behalf of the U.S. government.

Mike McKelvy, head of Lockwood Greene's Southeastern U.S. operations, became president and group chief executive of CH2M HILL's Government, Environmental and Nuclear Division, overseeing the three government business groups. McKelvy also earned a spot on the board of directors.

Manuel Aguirre, who led Lockwood Greene's operations in Argentina, became Latin and South America international regional manager. Aguirre is also the first employee from CH2M HILL's international operations to sit on the firm's board of directors.

In addition, Don Zabilansky, a Lockwood Greene vice president in charge of the firm's power and global construction services, stepped in to lead CH2M HILL's power business group. Mike Gearhart, who had nearly twenty years of experience in project management and delivery with Lockwood Greene before the acquisition, served as president of CH2M HILL's manufacturing and life sciences business group. Stidham, Lockwood Greene's chief financial officer, became business manager of the Facilities and Infrastructure Division.

"It was an incalculable boon," Brown remarked. "We couldn't have gone out in the street and hired those people. Those people were not out looking for jobs and were not available."

According to Brown, the acquisition also went a long way in raising CH2M HILL's profile among bankers, investors, and other industry professionals: "The Lockwood Greene deal told the rest of the world that we would do acquisitions. And that's huge. We started having people run opportunities by us. We began to be in the mix in a way that we weren't beforehand. It put us on the scoreboard in terms of deal space out there and changed the way our company was perceived by third parties in a very positive way."

Integration followed in 2004, with CH2M HILL Lockwood Greene becoming one of the firm's ten business groups. Talent was pooled to strengthen the biotech and pharmaceutical sides. The portions of Lockwood Greene that did microelectronics, and had formerly competed with IDC, moved into IDC. Communications work at Lockwood Greene was moved over into the

enterprise management solutions business group. The net result was a consolidation of who was best in what.

"I don't think we would have bought just any firm for our first major acquisition," Brown recalled. "It took a firm like Lockwood Greene that had a history and culture that was impressive, which would complement our history and values—a company that we could be proud of."

In 2004, a reporter for the *Charlotte Business Journal* contacted some former Lockwood Greene employees about how the former J.A. Jones subsidiaries were faring after the divestiture sale. "It's been a fairy tale experience for us to have gone from such difficulty to such opportunity in such a short amount of time," one executive told him. "We're in a better place than we've ever been." The same might well be said for CH2M HILL.

The Lockwood Greene acquisition completely repositioned CH2M HILL on the industrial side of its business, providing a much healthier diversification in the industrial market. Once the company had a firmer foundation in the industrial sector, Peterson and his leadership team recognized that the firm remained underrepresented in one critical area. They began looking for a complement to the Lockwood Greene deal in the oil and gas space.

VECO Acquisition

Prudhoe Bay, North America's largest oil field, is a 215,000-acre stretch of tundra between the Brooks Range to the south and the Arctic Ocean to the north. At its center lies an estuary, frozen for much of the year, where the Colville River empties into the Arctic Ocean. Prudhoe Bay is not a city. It's not even a town. The U.S. Census refers to it as a "census-designated place," and lists the official population at five. Yet thousands of seasonal workers make this stretch of Alaska's North Slope their home on a part-time basis.

This area marks the northern terminus of the trans-Alaskan pipeline and the location of Pump Station 1, the first of eleven pump stations that power the flow of product between the North Slope and the pipeline's southern terminus at Valdez, 800 miles to the south.

Outside the VECO compound in the North Slope community of Deadhorse, the line of vision in all directions is infinitely flat, with the horizon broken only occasionally by buildings and warehouses, trucks, and the ever-present pipeline. The landscape of scrub and marsh is cut by roads and crisscrossed by waterways that wind through the stubby tundra.

Although VECO's operations center is almost 500 miles from the nearest large city (Fairbanks), daily newspapers are readily available at the general store near the small airfield in Deadhorse. By October 2007, and for months on end, VECO employees had seen their company on the front pages. And the news was demoralizing.

The previous summer, the FBI and the Internal Revenue Service opened an investigation into links between a handful of senior VECO executives and prominent Alaskan politicians. Newspapers pilloried the firm in daily headlines. But the real firestorm began when news broke that one of Alaska's senators was also under investigation. What had been a local and state story was suddenly headline news across the country.

Those were dark days for VECO's employees. The men and women who made their living in the oil fields on the North Slope—drillers, welders, pipefitters, craftspeople, mechanics, drivers, managers, and support personnel—were justifiably proud of their work. They were also proud of how that work helped sustain the economy and provide a stable domestic supply of oil and gas.

On a cloudy day in early October 2007, the thermometer read eleven degrees Fahrenheit, and the wind blew gently out of the southwest but with a biting chill. VECO's work crews on Alaska's North Slope had been bracing for the change of seasons. The long days were over. But today, employees gathered in a conference room at the VECO compound in Deadhorse. An air of excitement and expectancy filled the room. CH2M HILL had acquired VECO in September. Projects, key assets, and employees were now being transitioned to CH2M HILL. Representatives from CH2M HILL's legal and corporate communications groups had arrived by bush plane the day before. Today's gathering was one of the first steps in that integration process. The meeting included a welcome to the company, a presentation on CH2M HILL's history and values, administrative information for bringing the new employees on board, and a question-and-answer session.

Andre Armstrong, a manager in CH2M HILL's corporate communications group and a member of the CH2M HILL orientation team, summed up their reception: "The VECO people were so welcoming and so happy to become a part of this organization. In addition to the formal orientation and presentation, employees would seek you out at the mess hall and come over and talk to you. They wanted to learn about the company and share their thoughts about what needed to change in their organization."

This visit to the North Slope was just one of a series of such road trips and presentations. The goal was to reach out to every single employee, in face-to-face meetings, within 30 days. By the end of October 2007, VECO's 4,000 employees, ranging from Sakhalin Island in Russia's far east to Abu Dhabi, had officially been brought on as new members of the CH2M HILL family.

An Oil and Gas Services Powerhouse

At the time of the acquisition, the Anchorage-based oil services company was ranked by *Engineering News-Record* as one of the top 25 design firms, with reported revenues of about $900 million.

VECO was founded in 1968 and cut its teeth supporting the Alaskan field operations of some of the largest oil and gas companies in the world. Employees set up drilling stations, operated and maintained the heavy machinery, transported equipment and product, all the while establishing a solid reputation as a tough, knowledgeable, and efficient workforce.

VECO came to national prominence in 1989 when the company played a major role in the cleanup of the Exxon *Valdez* spill. As the prime contractor for the multi-billion dollar cleanup effort, VECO employees worked tirelessly to restore Prince William Sound. The experience helped shape a company culture that emphasizes health, safety, and stewardship of the environment above all else.

The VECO acquisition was the result of years of research and preparation, dating back to Peterson's Vision 2015 plan, which outlined for the first time an enterprise energy initiative. The goal was to fill a strategic hole in the industrial sector where Peterson and the ELT felt that CH2M HILL was underrepresented—energy services and operations.

The acquisition search began in earnest in late 2005. Sixty firms were evaluated. The search quickly narrowed, with VECO emerging as the top candidate. In May 2007, CH2M HILL and VECO signed a letter of intent, the first step toward acquisition.

Peterson and the ELT launched an extensive review of VECO's operations. "Our 65-person team literally visited all corners of the world," said Peterson. "We deployed our key financial, legal, and operational staff to meet with VECO's owners, their workforce, and their clients. We also specifically reviewed the legal issues associated with individuals in their firm as well as VECO's business practices and ethics."

The lengthy and exhaustive due diligence process resulted in the following key conclusions about VECO, its operations, and its workforce:

- Unequivocal commitment to safety
- Top quality workforce
- Good projects and clients
- Extensive oil and gas capabilities
- Solid track record and history of performance
- Similar culture to that of CH2M HILL

In June, the two companies agreed to terms. The deal was finalized on September 7, as VECO operations were officially rolled into CH2M HILL's organizational structure as the energy services and operations business group. The VECO sign on top of the firm's Anchorage office building, its global headquarters, was replaced by the CH2M HILL logo.

Peterson spoke eloquently about the strategies behind the acquisition:

> *We are taking a giant leap in building out the business foundation that we need to succeed with the acquisition of VECO. Inherent in our diverse portfolio is the ability to serve the two most critical needs facing the world: water and energy. Nobody can dispute our firm's reputation in the water market. However, we recognized the need to complement this water expertise with a better position in the energy markets to meet our clients' and society's phenomenally challenging energy needs in the future.*

With the VECO acquisition, CH2M HILL plunged headlong into this new market segment. The numbers tell an important part of the story. In 2006, *Engineering News-Record* ranked VECO twenty-fourth overall in its list of Top 500 Design Firms: first in maintenance, second in cogeneration, second in pipelines, sixth in petroleum, and seventh in refineries and petrochemical plants. Its core capabilities included engineering, project management, procurement, construction, and operations and maintenance.

Over the previous forty years, VECO had built a nearly $1 billion business serving a wide range of markets: oil refining, upstream oil and gas, pipelines and terminals, power generation and electrical distribution, chemical, pharmaceutical, biotechnology, mining and metals, and infrastructure, among others. The industrial components served as a complement to IDC and the industrial-sector businesses brought in from the Lockwood Greene acquisition.

Although about half of VECO's four thousand employees were based in Alaska, the company also had a major hand in oil and gas operations across the globe at some of the world's richest oil fields, from Russia's eastern edge to the deserts of Abu Dhabi.

In addition to the firm's global headquarters in Anchorage, Alaska, major offices had been established in Fairbanks, Kenai, and Prudhoe Bay, Alaska; Vancouver, British Columbia; Calgary, Alberta; Bellingham, Washington; Denver, Colorado; Abu Dhabi, United Arab Emirates; and Yuzhno-Sakhalinsk, Russia. VECO had successfully delivered industrial-sector projects on nearly every continent on the globe.

As part and parcel of having a thriving oil and gas services business, CH2M HILL became a company with a hand in operations and maintenance. It found itself with millions of dollars, worth of heavy equipment and machinery—from tanker trucks to drilling equipment to complete mechanical shops. The ownership, care, and maintenance of industrial equipment represented another new direction for the company.

No fewer than four construction entities joined the CH2M HILL family through the VECO acquisition, bringing in both union and non-union industrial construction capabilities.

Commonwealth Construction, based in Burnaby, British Columbia, was acquired by VECO in 1998. A full-service union builder, Commonwealth specializes in project management, construction management, general construction, and design-build contracting. Its markets include oil and gas services, mining operations, power generation, and pulp/paper. The company celebrated its 100th birthday in 2007.

Norcon, an Alaska-based full-service industrial contractor, formed in 1974 as a union civil construction firm. Norcon specializes in oil and gas processing and civil engineering, including roads, power plants, and power transmission facilities. Norcon has been active on Alaska's North Slope since 1992, primarily as the go-to union contractor for BP. The company has offices in Prudhoe Bay, Fairbanks, and Anchorage.

The Anchorage-based non-union construction entity VECO Alaska, since rebranded as CH2M HILL Constructors Alaska, produces modules for oil and gas operations. Completed modules are then sea-lifted or trucked to drill sites on the North Slope. BP's Northstar facility, situated in the Beauford Sea off Alaska's North Slope, was constructed using modules fabricated in VECO's module shop in Anchorage. Northstar is now one of the state's top-producing oil and gas sites.

Quest, an Alliance Corporation based in Calgary, Alberta, was acquired by VECO in 1998. Rechristened CH2M HILL Construction Ltd., the company is a full-service heavy industrials constructor with labor affiliation to the CLAC (Christian Labour Association of Canada) union. CH2M HILL Construction specializes in project management, construction management, general construction, and design-build construction in the oil and gas industry.

These construction firms, along with two others that came in through the Lockwood Greene acquisition, further diversified CH2M HILL's growing portfolio of industrial services.

Trigon Acquisition

In 2006 and 2007, CH2M HILL teamed up with Trigon EPC, a Colorado-based oil and gas services company, on the design and construction of a pipeline and related facilities between Salt Lake City, Utah, and Las Vegas, Nevada. The partnership was so successful that CH2M HILL broached the idea of an acquisition. A deal was quickly negotiated, and in October 2007, Trigon became the newest member of CH2M HILL's emerging energy business.

Trigon specialized in pipelines and oil and gas facilities and provided engineering, procurement, construction management, and related pipeline services. With 320 employees and revenues of about $50 million, Trigon was an important player in the oil, natural gas, and energy sectors in the continental U.S. The company's expertise in linear pipelines filled a significant gap in CH2M HILL's capabilities and expanded the suite of services it could offer to clients.

In 2008, former VECO and Trigon operations were combined with legacy CH2M HILL chemical and energy operations and rolled into the newly established energy and chemicals business group, led by Garry Higdem and Lemmon. Right out of the starting gate, the business group's five thousand two hundred employees made a significant impact on the firm's bottom line, bringing in nearly a quarter of CH2M HILL's annual revenues.

Conclusion

By the late 1990s, Peterson and the ELT had recognized a fundamental imbalance in the company's client base. With the federal sector and the municipal/state sector each making up roughly 40 to 45 percent of the firm's overall business, the industrial sector was seriously underrepresented.

Peterson understood that the company of the future would need a more balanced portfolio. Ultimately, he concluded that the company needed to search for an acquisition in the industrial space. And with the ownership program changes in 1999 and 2000, CH2M HILL now had sufficient capital to take advantage of opportunities.

Admittedly, acquisitions were risky. But as Peterson had seen with the IOTECH and Wacker Siltronics projects—both IDC "startups" that had come back to bite the firm—building businesses from the ground up also involved heavy risks.

Nevertheless, the acquisitions of 2003 to 2007 were successful and tipped the scales, with the federal, municipal/state, and industrial sectors each accounting for about one-third of the firm's revenues.

So how did this all play out financially? In 2003, before the acquisitions, CH2M HILL's share price stood at just under $12. The company posted gross revenues of $2.2 billion. At the end of 2007, after completion of the VECO and Trigon deals, and the thorough integration of Lockwood Greene's industrial businesses, annual revenues stood at more than $5 billion, with a share price of nearly $28. Over that time, the firm's workforce jumped from about eleven thousand to more than twenty-four thousand.

Many factors contributed to enterprise growth over this time period. But all could agree that after bringing on Lockwood Greene, VECO, and Trigon, CH2M HILL was a stronger, more diverse, more profitable company than ever before.

Smithsonian Donation

Curators at the Smithsonian Institution's National Museum of American History were astounded. Never before had the museum received such a large collection of original material witnessing to the industrial revolution and rise of manufacturing in America.

The Lockwood Greene collection, donated between 1998 and 2008, is the single largest assemblage of engineering and architectural designs, illustrations, and photographs of the American industrial revolution within the Smithsonian's collection. The donation included ink on linen drawings, blueprints, and original photographs dating back to 1870—more than 36,000 items in total. A further financial donation was made to support the archiving and conservation of these materials.

"These drawings provide a glimpse into the evolution of engineering and immortalize the industrial revolution by showcasing some of the first textile mills and manufacturing facilities," said CEO Ralph Peterson. "Helping to archive and preserve these drawings for future generations is a privilege and helps to honor the legacy of Lockwood Greene, the oldest American engineering and construction firm in continuous operation."

The items were discovered in 1996 in a warehouse once used to store munitions during the early 1800s in Boston, where Lockwood Greene at one time had a strong presence. As luck would have it, the cool, dry conditions appropriate for a munitions warehouse were also ideal for the preservation of documents and photographs.

Since transferring the materials from Boston to Lockwood Greene's Spartanburg headquarters, the collection had been in the care of CH2M HILL Lockwood Greene's David Rush, facilities manager at the firm's Spartanburg office. Rush was responsible for sorting through and cataloging the materials in preparation for the Smithsonian donation.

"What's so exciting about this collection is that manufacturing includes so many areas of life—automotive manufacturing, furniture making, newspapers, high-rise buildings in New York City and more—so we have captured slices of so many areas," Rush said.

The documents provide a pictorial account of America during the industrial revolution. The drawings handcrafted on linen parchment represent some of the most prominent textile mills, manufacturing facilities, mechanical processes and buildings of the nineteenth century.

Donated items included architectural and engineering drawings of manufacturing plants for some of the nation's most recognized companies: Baldwin Piano Company, Palmolive, Piedmont Manufacturing Company, American Cigar Company, and Gillette, among hundreds of others.

"There are drawings in this collection that are works of art," said William Worthington, engineering specialist for the National Museum of American History. "Lockwood Greene's archives provide us with an extremely important picture of how American engineering practice has evolved over the last century, revealing engineering details that are recorded nowhere else. Researchers and engineering historians will have a field day with this information."

Now preserved for posterity, the museum's Science, Technology, and Culture Department has compiled an index of the Lockwood Greene collection. Researchers and interested members of the public can review the index on the Smithsonian's website and make an appointment to see the materials in person.

New corporate headquarters opened in 2002

CHAPTER 25

CH2M HILL in the Twenty-first Century

The question seemed a simple one at first, a sort of "softball" question from the audience. Several of the former leaders of CH2M HILL had been invited to Denver to see the new campus, designed to consolidate all Denver-area employees into a single location with three buildings. The group of distinguished guests included Jim Howland, Burke Hayes, Earl Reynolds, Harlan Moyer, Jim Poirot, and Phil Hall.

The date, November 6, 2003, had been chosen to coincide with the board's quarterly meeting. The guests attended an informal dinner the night before to get reacquainted; some of them had not seen each other for years. That morning, they had spent several hours learning about CH2M HILL's current strategic direction. It served as an overview of the broad and diverse company that each of them had played a major role in building.

The group had just completed a tour of the new 375,000-square-foot facilities, which housed CH2M HILL's global headquarters, the regional office for the Denver area, and the headquarters for OMI. The buildings had been designed with employee comfort and convenience in mind and the campus included a beautiful cafeteria; a well-designed fitness center; a major, state-of-the-art conference center; and an exceptionally functional layout for working on projects and meeting with clients. All of the major decisions on the campus had been made by an Employee Steering Committee—CH2M HILL consensus decision making at its best. And each of the three buildings had been designed and would ultimately be certified by the U.S. Green Building Council as meeting its LEED (Leadership in Energy and Environmental Design) criteria, consistent with CH2M HILL's long-standing commitment to the environment.

Howland looked out across a gathering of about one hundred employees. All of the honored guests had an opportunity to speak, highlighting some aspect of the firm's history or something they had observed on their visit. In the question-and-answer session that followed, an employee asked Howland a straightforward question: "Did you ever imagine that you would see CH2M HILL grow to a firm like what you have seen today?"

The question seemed simple enough, but Holly Cornell, Jim Howland, Burke Hayes, Fred Merryfield, and Clair Hill were humble men, rarely taking credit for the accomplishments of the company that bore their names. Howland in particular never wanted credit for his contributions. He saw himself as a pretty ordinary guy, lucky enough to have worked with people he cared about, doing work he loved, and solving problems for clients who needed help.

His response was simple, honest, and direct:

> *Let me tell you what I imagined in 1945 and 1946. I was stationed in Saipan in World War II. I had been corresponding with the other three about starting up an engineering and consulting firm after the war.*
>
> *One night, I sat down and sketched out what I thought would be ideal. I drew a box representing an office, where the four of us would work, including four drafting tables. We used drafting tables in those days, you know. I also had a space for a receptionist who could answer the phone if we were lucky enough to have clients calling us. Then, I drew four boxes around the offices, representing the homes where we could all live in Corvallis and commute to work.*
>
> *That was as much as I imagined at the time.*

The audience was quiet, but you could see smiles on the faces of the people who knew Howland and the other guests on the podium. Each had contributed significantly to the growth and development of CH2M HILL, but none would have taken credit for imagining a multibillion-dollar company, let alone building one.

What did those guests learn during their visit to CH2M HILL on that chilly November afternoon in Denver? What they had seen in their tour, heard about in the strategic presentations, and discussed in their conversations was, in many ways, a different company than the one Howland imagined when he was stationed on Saipan. In other ways, they knew that the firm was much like they had imagined it would become.

Orders of Magnitude

By the early years of the new millennium, CH2M HILL had indeed become a much different firm than the founders could ever have imagined. Statistics told part of the story: people, revenues, demographics, number of offices, and countries in which the company worked.

From its roots with a professor and three students in Oregon, and a determined entrepreneur in California, CH2M HILL had grown to more than twenty-three thousand employees by 2009, with revenues topping $6 billion. One could almost hear the founders marveling at these numbers. They could remember their early years, when employee numbers—given sequentially to each new employee—were double digits and when really big jobs were measured in thousands of dollars.

The original partners might also marvel at the look of the workforce. In the early years, diversity was not an issue, although the partners set the tone for it in the future by seeking out and supporting excellence where they found it. In those days, men became engineers, and so men were hired. In 2008, by contrast, women made up 26 percent of the employee population, including two women among the eight employee board members and one woman of five outside directors. Demographics showed 17 percent minorities across the firm. Beyond statistics, the firm had embraced a formal, written policy of diversity, and leaders talked of diversity in its broadest sense: gender, race, ethnic origin, sexual preference, and opinion.

In the early years of the twenty-first century, the network of offices across the United States and around the globe was extraordinary and growing. What made CH2M HILL different from its major competitors was its ability to provide services for clients at the local level, through more than one hundred and seventy local offices, in more than forty countries. All told, CH2M HILL has performed work in one hundred forty-four countries and on all seven continents.

Despite the executive leadership team's constant adherence to becoming a global company, research that CH2M HILL commissioned in 2003 showed that most of its clients did not want or need a global company; they wanted assurance that the services they required would be delivered locally by CH2M HILL people who lived and worked in the local communities, and who could be expected to remain after a particular job was finished. At the same time, CH2M HILL could promise global clients that its network of offices, abundance of resources, and breadth and depth of technical capabilities could take on any challenge, on any project, virtually anywhere in the world.

The small firm of the early years was no longer unrecognized by the industry. In 2009, the firm made the Fortune 500 for the first time, one of only twelve engineering and construction companies. *Engineering News-Record* 2009 rankings put CH2M HILL at the top position in a host of categories, including Program Management Firms and Environmental Firm in Engineering/Design.

Within about a decade (1998 to 2009), CH2M HILL had accumulated an impressive set of prestigious awards:

- *Fortune* magazine's "100 Best Companies to Work For" in 2003, 2006, 2008, 2009; named six times to "America's Most Admired Companies"
- Ethisphere Institute's "World's Most Ethical Companies" list in 2009 and 2010

Fortune *magazine's "100 Best Companies to Work For®" in 2003*

- Catalyst Award in 2009 honoring innovative organizational approaches that advance women in the workplace; the firm became the first in the heavily male-dominated engineering and construction industry to receive this prestigious award
- Dwight D. Eisenhower Award for Excellence in 2007 by the Small Business Administration for small business subcontracting
- The Malcolm Baldrige National Quality Award in 2000 (awarded to OMI)

Recognition by its industry peers had also become a source of pride for the company over the prior decades. The American Council of Engineering Companies had three times given its most prestigious Grand Conceptor award to CH2M HILL: first in 1968 for the South Tahoe Public Utility District Advanced Waste Treatment Plant; in 1978 for a bioconversion facility in Lamar, Colorado, for Bio-Gas of Colorado; and again in 1991 for the Carolina Bay Natural Effluent Disposal System in Horry County, South Carolina.

One of its biggest clients, the U.S. EPA, honored CH2M HILL with three significant awards over the years—all in recognition of performance in small business contracting and promotion of EPA's socioeconomic goals. CH2M HILL was recognized in 1983 and 1985 with the EPA Administrator's Award and then was given the agency's Prime Contractor of the Year Award in 1988.

Awards alone would not have impressed the founders and leaders who visited the Denver campus in November 2003. They would have been let down if CH2M HILL was not at the same time using its size, its people, and its resources to give back to the engineering profession and to the communities in which CH2M HILL was working. They were not disappointed when they learned about some of the firm's activities in this arena.

In general terms, employees at CH2M HILL across the firm had been encouraged to contribute in a host of different ways:

- By serving on boards and committees of local charities and professional organizations
- Through activities in national, state, and local government affairs, including political fundraising and contributions to CH2M HILL's political action committee
- By making financial donations to local community groups, colleges, and universities
- Through in-kind contributions, ranging from donated engineering expertise to used computers

Some of these activities became national or even global in scope. For example, beginning in 1997, CH2M HILL has been a national sponsor of Engineers Week, a program designed to foster greater understanding and interest in the engineering profession. The firm became a major sponsor of the Hispanic Engineers National Academic Achievement Corporation, encouraging Hispanic achievement in engineering, science, technology, and math.

OMI won a Malcolm Baldrige National Quality Award in 2000

CH2M HILL executive Ken Miller joined some American Water Works Association colleagues in 1991 to found Water For People, a nonprofit organization that provides clean drinking water and clean water habits in eleven distressed areas of the world, including Bolivia, Guatemala, Honduras, and Malawi, among others. Since then, CH2M HILL's support for the organization has never wavered. CH2M HILL hosted the non-profit's first employee giving campaign and each year continues to raise the bar on employee contributions.

CH2M HILL also became the first corporate sponsor of Engineers Without Borders-USA, a non-profit organization helping build sustainable infrastructure and improve the lives of people in developing communities around the world, while training future engineers to be socially responsible and culturally aware. In addition to financial, leadership, and in-kind support, a growing and active network of nearly 100 employees contributes countless hours and substantial passion and technical expertise to help grow the Engineers Without Borders-USA organization, mentor students, serve as public speakers and ambassadors, and bring sustainable engineering projects to life in countries such as Guatemala, Thailand, and Mali.

CH2M HILL created a special award to recognize individuals and companies who, like CH2M HILL, have made significant contributions to making the world a better place. Aptly named the Building a Better World Award, recipients have included Bill Ruckelshaus, former head of the EPA; Sir Mark Moody-Stuart, former CEO of Royal Dutch Shell; Chad Holliday, former CEO of DuPont (who joined CH2M HILL's board in 2009); and Tommy Koh, Singapore civic leader and international diplomat.

November 6, 2003, was a special day for the founders and early leaders of CH2M HILL. They reflected on the company—their company—which was several orders of magnitude beyond what any of them had ever envisioned during their years of service. During that visit, the group saw how dramatically different the projects were from what they had experienced. On an annual basis in these first years of the twenty-first century, CH2M HILL performed about three thousand projects, ranging in size from thousands to billions of

dollars. Although the average size of all these projects was relatively modest (research done by CH2M HILL, Inc., in 2003 estimated the average project fee at $75,000), the group learned of some projects that were mind-boggling in their complexity.

One particular project caught their attention. In 1997, CH2M HILL had been selected as the program manager for the $3-billion deep-tunnel wastewater program in Singapore. Upon completion, the program would serve millions of people—plus industry—with a massive sewerage infrastructure, comparable to the Milwaukee project (Chapter 13). The project would feature forty miles of conveyance tunnels, two deep tunnels as much as two hundred feet underground, and two water reclamation plants. One of the plants, the Changi Water Reclamation Plant, one of the world's largest, was designed by CH2M HILL in thirty months. The three hundred person engineering team spent eighty person years on the project, producing a stack of drawings—seventy-eight hundred to be exact—two-and-a-half-feet high. The design was created electronically and delivered to the construction contractors in a three dimensional format. At one point during construction, there were twenty-two contractors with five thousand employees working to build the Changi treatment plant, with CH2M HILL providing construction management services.

By the end of their long day on the Denver campus, the group was tired, but suitably impressed. At a board dinner that night in their honor, they shared some of their impressions from the day. They commented on the growth and complexity of projects, complimented the board on its leadership, and remarked that they simply had no idea what the firm had become.

Nancy Tuor was one member of the board of directors who attended the dinner. Tuor, in her twenty-five years of service, had risen from an entry-level environmental planner to the chief executive officer of Kaiser-Hill, the joint venture accomplishing the Rocky Flats project (see Chapter 20). That evening, listening to the comments of the founders and the others, Tuor reflected on her career.

> *I could not have imagined twenty-five years ago that I would be with the firm this long. Back then, CH2M HILL already had a reputation for people building their entire careers here. So I knew, of course, that it was a possibility I would be around for a while. And I have found CH2M HILL to be a firm that rewards hard work.*

"It's great to make money, but you have to love the work you do, and be dedicated to the people you work with and the clients you serve."

— Nancy Tuor

It would not have been possible for the firm to be as successful as it is without adhering to the rich values the founders established. It is the foundation we work from even today. It's great to make money, but you have to love the work you do, and be dedicated to the people you work with and the clients you serve. It is all about the people, our great employees, and serving the client.

Nancy R. Tuor

For Tuor and others at the dinner that night, the evening provided a snapshot of what CH2M HILL had become. What they realized, however, was something remarkable: Contrary to outward appearances, CH2M HILL had not fundamentally departed from the founders' concepts of how to run a successful, client-oriented, employee-owned business.

The More Things Change...

Harlan Moyer often remarked that CH2M HILL was the "biggest little engineering firm in the world." In his more than fifty years of service to the company, since his hiring by Clair Hill in 1952, Moyer had experienced firsthand the extraordinary growth of the company. But he was simply trying to articulate a fundamental truth: CH2M HILL's success was built one project, one client, one employee at a time.

Success on massive projects like Rocky Flats, the Milwaukee WPAP, UOSA, and the Changi and deep-tunnel projects in Singapore was critically dependent on the same delivery of quality services the company had provided for decades. These quality services were provided to the municipality of Forest Grove, Oregon, since 1946; to the Glenn-Colusa Irrigation District in the Sacramento Valley, California, since 1948; or to U.S. government clients such as the Department of Defense, EPA, and the Department of Energy over the past several decades.

Engineers who came to the firm in the 1950s and 1960s were no different than those who joined in the 1990s and beyond. They wanted opportunities to grow and develop as professionals, enhance their technical skills, make a client happy, and deliver a project on schedule and within budget. As Ralph Peterson was known to exclaim to groups of employees, with nearly boyish enthusiasm, "We work on really COOL projects!"

The ability to make a difference and contribute to building a better world was more than a slogan; it was intended as a way of life within the company. Merryfield had that vision when he wanted to help clean up pollution in the Willamette River in the 1940s. CH2M HILL professionals had the same vision in subsequent decades, offering technical and monetary assistance after

The ability to make a difference and contribute to building a better world was more than a slogan; it was intended as a way of life within the company.

earthquakes in San Francisco and Iraq, working for the Port Authority of New York and New Jersey in the aftermath of September 11, 2001, and rushing to support relief efforts after the tsunami in December 2004 and Hurricanes Katrina, Rita, and Wilma in 2005.

The heart of CH2M HILL today, no different from in 1946, is the people. CH2M HILL technical experts and thought leaders remain forward-looking, innovative experts and leaders who perform at their best to deliver value for clients in a safe, innovative, and sustainable manner.

Conclusion

As questions for the distinguished guests continued on the afternoon of November 6, 2003, the employees had the opportunity to see a part of the firm's history and legacy before them. In introducing them, Peterson reminded the audience how important these guests were to the ongoing work of CH2M HILL. He told the employees that they were, to borrow a phrase, "standing on the shoulders of giants"—the founders and leaders of earlier generations of employees.

The tasks CH2M HILL was grappling with on that particular day in November were in many ways different from and more complex than those the Oregon State engineering professor, his three students, and the Redding entrepreneur faced in the mid- to late 1940s. The advent of the computer age, the sheer number of employees to be led and managed, the move toward globalization, and the advent of becoming a full-service firm—these were just a few examples beyond the imagination or comprehension of the founders and early generations of leaders.

Those in the audience that afternoon heard messages not about what was different but, rather, about what had remained constant in the fabric of the firm throughout its six decades of growth and development:

- The value system needed to guide decisions, built on a foundation of honesty and integrity
- The passion to serve clients with innovative and cost-effective solutions to their problems
- The belief that teamwork and consensus building would triumph over self-serving individualism
- The knowledge that technology could help CH2M HILL's clients build a better world

The audience also learned about the people who could make it all happen. It was people who knew and relied on each other who built the firm, and it would be the people at the Denver campus and hundreds of locations around the globe who would secure the future of CH2M HILL.

What began with a simple question—"Did you ever imagine…"—had a profound answer beyond what Howland said that day. Cornell, Howland, Hayes, Merryfield, Hill, and thousands of CH2M HILL employees after them could not have imagined the CH2M HILL of the twenty-first century. But they built it, grew it, developed it, nurtured it, and gave it a unique place in the consulting, design, and construction industry.

Epilogue

Reflections of Two CEOs

Harlan Moyer and Ralph Peterson were in a reflective mood one Saturday afternoon in autumn 2004. It was in CH2M HILL's Denver office where the two CEOs talked privately about the history of the firm, the kinds of changes they had seen, and the challenges they had faced over the years. Typical of the CH2M HILL culture in which they had both spent their entire careers, neither of them talked about their individual accomplishments, despite having been collectively at the helm of the company for a quarter century. They talked instead about how they had been given what was an almost sacred trust: to carry on the legacy that the founders of the firm had created.

Known for his succinct and sometimes brutal honesty, Peterson laughed and said: "As CEOs, our biggest job was to do exactly what the firm had been doing well before we came along and not mess it up."

Those who had been entrusted with the leadership of CH2M HILL—not just these two CEOs, but the founders, the past board members, the senior leaders of the firm over the years—had made decisions based on the best interests of the company and its employee-owners, but those decisions were dependent on adhering to the core values of the company, which "must last forever," Peterson said to Moyer.

Telling CH2M HILL's history was a way to document their belief that the core values and principles that guided their decisions were unchanged from those that had governed the firm and their predecessors.

Moyer, who spent many years trying to pull together a written history of the firm, had always believed that there was a purpose to his quest. He wanted people—primarily the past, present, and future employees of CH2M HILL—to understand how CH2M HILL came to be and what made it a different place to work:

> *Writing our history was never about "selling" CH2M HILL to clients, and certainly not to the general public. I came to work for Clair Hill in 1952 and celebrated 57 years of working for CH2M HILL in 2009.*
>
> *I have dealt with hundreds of companies in my career—including partners, competitors, suppliers, and subcontractors, and of course our clients. I know I'm biased, but I don't know of any other company like this one. I wanted people to get a feel for this firm, but not through an egotistical biography or a stale business book nobody reads or a coffee table book that collects dust. I just wanted to collect in one place some of the events that got us to where we are today.*

We can't predict CH2M HILL's future, but I know that our future success is contingent on the same values and principles Fred, Clair, Holly, Jim, and Burke lived by when they started their two companies.

Words from Jim Howland's *Little Yellow Book*, still fresh after all these years, articulate those values and demonstrate that they remain a vital link between the company's past and its future.

Honesty and integrity. Whether faced with a grilling cross-examination by a congressional committee or analyzing the impacts of corporate malfeasance, the leaders of CH2M HILL are charged with making the "right" decision, even if it means sacrificing short-term profitability. Howland said: "A good test to determine if a contemplated action is ethical is to ask, 'Would I want to see it in the headlines tomorrow morning?'"

Empowering people. Those who have worked for CH2M HILL talk almost reverently about decentralized decision making, having "room to run" when making business development decisions, and the faith and trust on the company's part that people at all levels can make the right decisions if given the opportunities. There is a belief that the best decisions come from those closest to the ground.

In Howland's words: "The person closest to the action has the best chance of making the right decision—if the person is properly informed of the firmwide implications."

IDC and OMI, for example, were created when entrepreneurial employees saw business opportunities and were given the latitude to pursue them. And delving into program management and nuclear-waste cleanup at a time when they were well beyond anything CH2M HILL had done before, individuals like Tom Gibbs, Jim Ferris, and Bob Card seized the moment and surprised the industry.

Be open to possibilities. Businesses are not stagnant; they must grow and thrive, or decline. Throughout its history, CH2M HILL demonstrated a willingness to expand both its geography and its business portfolio. This openness has often involved taking risks of varying magnitudes, but the firm's leaders have embraced the notion of finding new clients and serving them in different ways.

In the early days of the firm, the founders reached beyond the narrow geographies of Corvallis and Redding, merged to become CH2M HILL, and became a West Coast company. In the 1970s and 1980s, the success of the Lake Tahoe program led to an East Coast presence and eventually to

international growth. And in the early 2000s, CH2M HILL boldly acquired Lockwood Greene and a few years later VECO, expanding the company's reach into power, biopharmaceuticals, construction, and oil and gas.

Underlying this constant search for helping clients build a better world are Howland's words: "Let us be flamboyant when it comes to dreaming and thinking; conservative in our personal habits while doing interesting, innovative things inside and outside the firm."

Employee ownership. A hallmark of CH2M HILL and one of its critical differentiators within its industry is its unique approach to ownership. The success of this business model is founded not just on the idea of people sharing the annual profits, but also on them having a stake in the company's success. Peterson was often quoted as having to respond to a "multi-thousand person board of directors," and he meant it as a compliment, not a burden he had to carry.

From a client's perspective, CH2M HILL's ownership structure, in and of itself, may not be significant. In theory, a client can get the same service from a publicly held company. But when every employee can assert, "I am a CH2M HILL owner," it tells the client that they will stand behind their work, deliver the best team, and ensure the client's satisfaction. Their success is the client's success, and it contributes to both the company's bottom line and their own personal financial growth.

Clients and projects. CH2M HILL is in the business of delivering projects for clients. Few products, no mass marketing, not very flashy, conservative in its outlook. Just making sure that each and every client is given the attention needed to solve its problems.

At its annual retreat in 2003, CH2M HILL's board of directors reviewed data that showed that the "80-20" rule governed the firm's revenues: The vast majority of CH2M HILL's revenues came from a handful of clients, while more than three-fourths of the clients produced the remaining revenues. Even as a $2 billion firm at the time, CH2M HILL's average project size was only about $75,000.

Yet, when it was suggested that CH2M HILL could no longer effectively serve "smaller clients," there was an uproar. To even think of abandoning these smaller clients was a rejection of the founders' legacy. The point was clear: Every client should be given the proper attention to make it successful. The *Little Yellow Book* captured both of these concepts.

On clients:

> *The client is king…or queen. Each one is important. An extra phone call or meeting him/her at the airport are the kinds of things which, in addition to outstanding work on their behalf, can keep clients in our camp.*

And on projects:

> *There is a fine line between failure and success both in getting a project and doing a project. Little things like getting the report in a day early, taking special care to keep the client informed, and going back once more on our own time to check on something or with somebody can be the critical ingredients.*

Final Words

Moyer and Peterson concluded their discussion, as they were often wont to do, asking about their respective spouses and families, telling a story or two about grandchildren, and promising to get together again soon. Their central topic had been how to complete the history project, but they had inadvertently accomplished something more. Through their reflections, they had reached a simple but profound conclusion: CH2M HILL's business success was built on core values, having the right people, and doing good projects for a wide variety of clients.

The homespun wisdom of Howland is, like the man who penned the *Little Yellow Book*, pretty simple. As one reads the sixteen-page pamphlet, there is no "aha!" moment among the thirty-five "truths" it contains. What it does for CH2M HILL's employees, operating in hundreds of offices in dozens of countries around the world, is to give them a touchstone to their roots, a link to past, present, and future employees of the firm.

Every day, on every project, employees of CH2M HILL can begin their workdays reminded of the humble origins of an engineering professor and his three students at Oregon State University and an enterprising entrepreneur in Redding. They carry on that legacy, with a proud history and a promising future. All they have to do is follow Howland's advice:

"Do good work. Make a profit. Enjoy life."

CH2MHILL®

Building a Better World

TRANSFORMATIONAL MILESTONES

1946 to 2009

There is no bigger fan of CH2M HILL and its employees than former CEO Harlan Moyer, and that is why he wanted to share this story. His passion for the company and the dedication of employees who have made it a success are exemplified throughout this book.

"I wanted people to get a feel for this firm, but not through an egotistical biography or a stale business book nobody reads or a coffee table book that collects dust. I just wanted to collect in one place some of the events that got us to where we are . . . ."

Today, CH2M HILL employs thousands of professionals who are delivering challenging projects around the world. How it got to where it is today is based on forward, innovative thinking and holding true to values that were established decades ago, values that are expressed on these pages and held dear by employees far and wide, then and now. This book is for them and those who follow in the years to come.

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