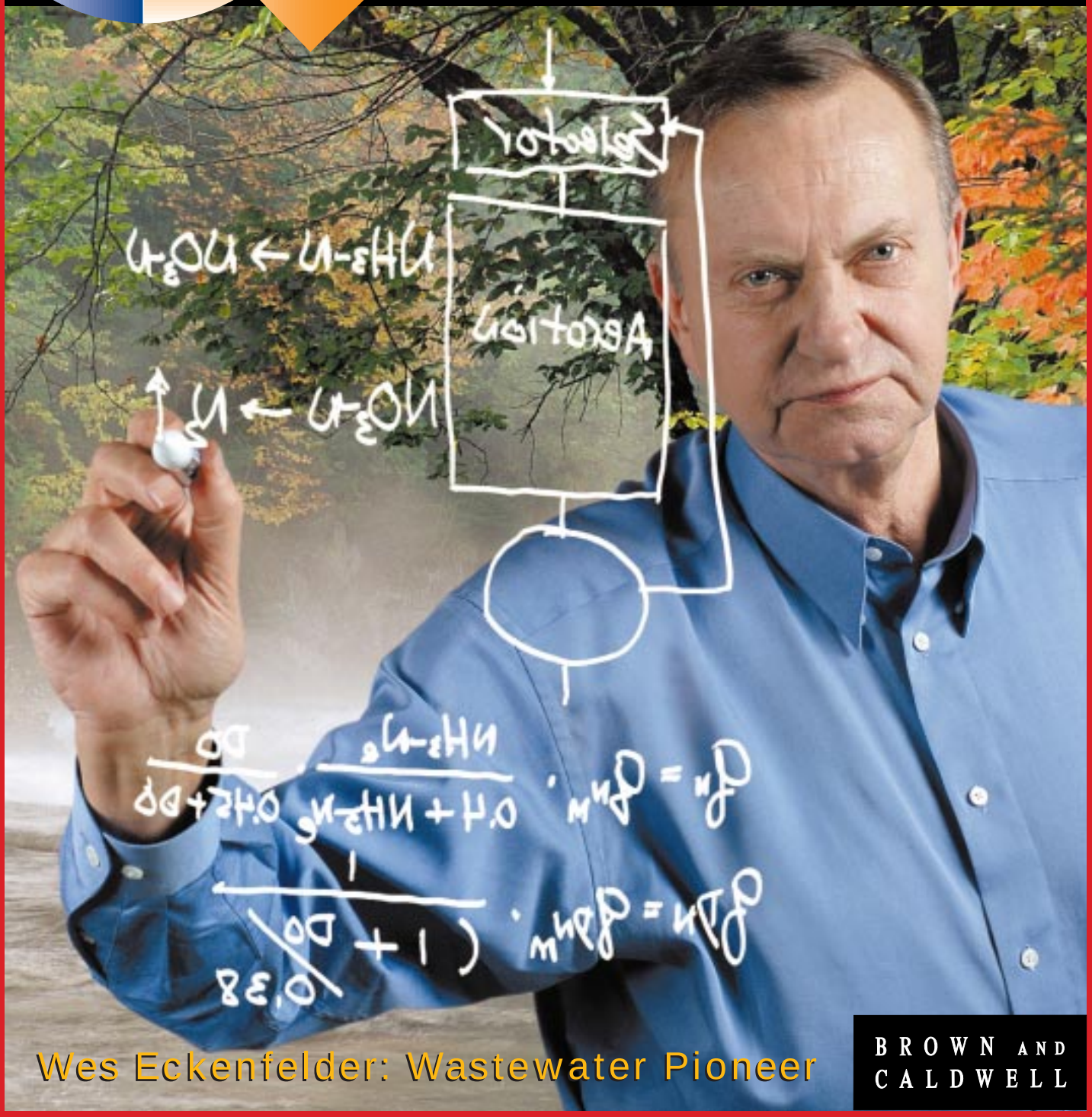
Winter 2000, Volume 29, Number 1

QUARTERLY



Wes Eckenfelder: Wastewater Pioneer

BROWN AND CALDWELL

Wes Eckenfelder, one of the three people recently named 20th-Century Pollution Control Pioneers by "Environmental Protection" magazine.

PHOTO BY JEFF ALEXANDER

QUARTERLY

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To speak with a Brown and Caldwell representative, call us at (800) 727-2224 or visit our web site at www.brownandcaldwell.com.

Brown and Caldwell provides environmental engineering and consulting services to public agencies, the federal government, and industry.

Quarterly is published by Brown and Caldwell, P.O. Box 8045, Walnut Creek, CA 94596-1220; tel. (925) 937-9010. Subscriptions are free.

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Wesley Eckenfelder: PERSISTENT Pioneer

This issue honors Dr. W. Wesley Eckenfelder, one of the three people named 20th-Century Pollution Control Pioneers by "Environmental Protection" magazine this past December. Along with recognizing Wes, that magazine honored J. J. Thomson and Arthur J. Dempster, early developers of the mass spectrometer, and Rachel Carson, author of "Silent Spring," the book credited with beginning the modern American environmental movement.

Wes is a trailblazer in the wastewater industry. He has personally trained thousands of graduate-level students and practicing professionals in the science and art of industrial wastewater treatment, and his textbooks are standards worldwide. He started his first environmental consulting business in 1949; has consulted with more than 150 industrial companies; developed several biological treatment systems specifically for industrial applications; authored or edited 27 books; is the recipient of 26 national and international honors; and co-founded the International Association for Water Pollution Research and Control (IAWPRC) in 1962.

Today, as a senior technical director for Brown and Caldwell, Wes continues to educate, innovate, and develop practical solutions. In the nearly two years since Brown and Caldwell acquired Eckenfelder Inc., we've found that the firm's 30-year track record in serving top industrial companies perfectly complements Brown and Caldwell's environmental practice. A shared value has propelled our ongoing combination: a pioneering spirit.

When Wes and I sat down to talk for *Quarterly* in late December, he started by telling me of a new idea for improving biological-nutrient removal in a low-dissolved-oxygen environment. He described field measurements planned at a local plant to test the process modification, a low-cost treatment solution to comply with pending state regulations. That this was first on his agenda says it all: Rather than discussing his 50-year career and the recent honor from "Environmental Protection," this internationally acclaimed pioneer was more interested in doing just that—pioneering.

You can reach Wes at weckenfelder@brwncald.com.

— *CRAIG GOEHRING, P.E., CEO*

Craig Goehring: **In the mid-1950s, who were your peers in teaching and advancing environmental or sanitary engineering?**
Wes Eckenfelder: Back then, probably Ross McKinney, a major researcher with the University of Kansas. There weren't many people in the '50s who were doing process design for industrial wastewater. On the international scene, there was Wuhrman in Switzerland, Downing in England, and Von der Emde in Germany. I organized the first international conference at Manhattan College in 1955 and got the world's primary movers to come and give a paper or two. We published the proceedings in 1956.

CG: **Did the conference have a particular focus?**
WE: We had roughly 100 people, with all of the major leaders from England, Germany, Switzerland, and Japan. It was principally focused on biological factors. We held a second conference in '57 and another in '60. There was no international association in those days. It was the first time equations and formulations were discussed, and it was probably the thing that propelled me to publish "Biological Waste Treatment" in 1960. That was the first book on biological waste treatment and the first time all these equations appeared.

CG: **Any thoughts on your early impact on the industry?**
WE: I designed one of the first activated sludge plants for the pulp and paper industry in 1953. Prior to that, it was primary treatment and then into the river. We ran pilot studies for about eight months because there was no information around at that time. The plant was designed by Gibbs and Hill; I did the process design. The plant went on line in 1955 or 1956. Interestingly, not only is it still operating, but it's treating triple the load for which it was originally designed.

CG: **You started with pilot tests to get reaction rates. Were you using process equations?**
WE: They were really crude at that point. Then around 1955 or '56, we were the first to come up with an aerated lagoon design. In fact, Donald O'Connor from Manhattan College and I published a paper that included equations which were the forerunner of the kind of mathematics that we're using now.

CG: **So you were looking for repeatability, ways to expand the process. Was there a chemical engineering first-rate reaction equation that you were building from?**
WE: I got to know a biochem professor at Columbia who was in the process of developing equations for the fermentation industry. I figured, this is the same kind of thing we do in

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Industry/Municipality Cooperation Leads to Win-Win Solution for Kentucky Wastewater Treatment

An acute wastewater treatment problem is resolved when a food processing facility installs a pretreatment system in just four months and a city is persuaded to take a second look at its treatment plant capacity.

A food processing plant, the City of Murray, Ky., and Brown and Caldwell recently proved again that industry and municipalities can meet wastewater treatment targets more quickly and inexpensively when they collaborate in their search for solutions.

The solution in this case hinged on conducting a comprehensive assessment of the municipal treatment plant capacity, and the design and installation of a pretreatment system at the food processing facility that reduced its biochemical oxygen demand (BOD) load on the City by more than 50 percent.

"Cooperative problem-solving between industry and municipalities about discharge compliance makes sense," comments Jeff Pintenich, the project principal in charge. "The municipality has a large investment in facilities and is considered the expert in treatment. Industry is the expert on producing its products. When both look at pretreatment and capacity options together, they can maximize existing capital investments and minimize new ones. That saves money for private industry *and* the city."

A problem with City effluent sends up a red flag

Satisfactory wastewater treatment at the publicly owned, Murray, Ky., facility was defined largely according to "Recommended Standards for Wastewater Facilities," known as the Ten State Standards, which had been embraced by the Kentucky Division of Water. In 1994, the City facility was rated to treat an annual average BOD load of 10,328 pounds per day (lb/day), at a wastewater flow of 4 million gallons per day (mgd). Actually, the plant treated an annual average BOD load of 12,300 lb/day. The food processor's share of that load was approximately 5,000 lb/day (roughly 40 percent), at an average flow of 0.2 mgd.

Because the City treatment plant's operating load was more than 90 percent of its rated capacity, the Division of Water had threatened the City with a moratorium on new sewer connections. The City had responded by assigning its consultant to evaluate possible plant upgrades that would meet the Division of Water's published design values.

Then an acute noncompliance event occurred in the City's only—and effluent-dominated—creek, prompting the Division of Water and other agencies to get involved.

The most likely cause of the event was a sludge blanket carryover from the treatment plant's secondary clarifier, which in turn was caused by two factors. One was inadequate sludge wastage due to the City's inability to land-apply the sludge over a prolonged wet-weather period (the City wasn't prepared to dispose of the sludge in a landfill). The second factor was the poor sludge settleability that plagued the City plant.

Nevertheless—because it generated 40 percent of the City treatment plant's annual average BOD load—the food processor was implicated as the instigator of the plant upset. The City ordered the food processor to install a pretreatment system that would reduce its BOD load by 70 percent. Estimated cost: $3.5 million.

Quickly installing industry pretreatment

"The food processing plant called on Brown and Caldwell to design and build the pretreatment system and negotiate the pretreatment permit with the City and state," explains Project Manager Houston Flippin. "We were able to negotiate a 45 percent reduction in BOD load within six months—and a delay of the 70 percent reduction requirement until we could comprehensively evaluate the actual treatment capacity of the City's facility."

Meanwhile, Brown and Caldwell evaluated design alternatives for the pretreatment system and performed bench-scale testing. An aerated equalization tank was selected for design, which began in October 1998. Only four months later, the pretreatment system started up. It consisted of on-line

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The former aerobic digesters of the Murray, Ky., municipal wastewater treatment plant. As part of minor modifications recommended by Brown and Caldwell, these digesters were converted to sludge thickeners to promote more effective use of a newer aerobic digester. This and other modifications stemmed from Brown and Caldwell's six-week program to re-evaluate the City plant's capacity, which was thereby increased by 25 percent *(PHOTOS BY JASON MULLEN).*

Two workers inside the new 570,000-gallon aerated equalization tank at a food processing plant in Murray, Ky. The tank is part of a wastewater pretreatment system—designed and built by Brown and Caldwell in just four months—that reduced the food processor's biochemical oxygen demand load by more than 50 percent.

Win-Win, Continued from Page 2

waste-load monitoring through turbidity analysis, a lift station, a force main, and a 570,000-gallon aerated equalization tank with jet aeration, defoamer addition, nutrient addition, and process-control systems. The interim pretreatment limits were met immediately. Later, they were exceeded, with more than 50 percent of the BOD load reduced by the new system. Installed cost: $1.8 million.

Already-improved City capacity further unmasked by evaluation

The food processing plant's new pretreatment system allowed the City's facility to achieve good sludge settleability, since pretreatment mitigated dissolved oxygen and nutrient deficiencies at the City plant. Previously, this could be achieved only with chlorination of return activated sludge, because the City plant was already operating all of its aeration equipment and had no facilities for nutrient addition.

With some of the City's technical problems already resolved, Brown and Caldwell embarked on the capacity re-evaluation, putting together a team of engineers: Scott Hall of Charlotte, N.C.; Steve Batiste, Pintenich, Flippin, and others of Nashville, Tenn.; Henryk Melcer and Patricia Tam of Seattle; John Bratby of Denver; Dave Kinnear of Salt Lake City; and Marc Pritchard of Pleasant Hill, Calif. They performed a six-week program involving full-scale stress testing of clarifiers and the belt press, dirty-water oxygen transfer testing, determination of nitrification rates, determination of influent total suspended solids degradability, full-scale plant monitoring, and a review of existing data.

Using the Division of Water design values, the City's consultant had proposed a $2.5 million upgrade to treat an annual average BOD load of 15,000 lb/day. But Brown and Caldwell's results showed that the City facility could be upgraded to treat the same waste load simply by adding aeration equipment and making other minor modifications, at an installed cost of $500,000.

The City—and its consultant—agreed with Brown and Caldwell's findings. The food processing plant and the City co-petitioned the state to rerate the publicly owned treatment plant for the greater waste load with aeration upgrades and minor modifications alone, and to allow the food processor higher pretreatment limits on BOD. That way, both the food processor and the City could depend on the available capacity for a 25 percent increase in waste load.

The upgrade and its terms are expected to be approved shortly by the Division of Water. "Everyone was a winner," says Flippin. "The food processing plant saved $1.7 million by not having to provide additional treatment. And the City saved $2 million by implementing a site-specific solution."

Contact Mike Roeder or Houston Flippin in Nashville, at (615) 255-2288, or Paul Klopping in Corvallis, Ore., at (541) 754-7677, for more information on this project, design-build pretreatment systems for industry, and capacity rerating for municipal treatment plants.

With two months to close escrow, RMC Nevada sought an accurate analysis of a site's mineable resource—along with Phase I ESAs and a review of operating permits—to assess whether it should finalize the acquisition deal.

Phillip Bonnell, president of RMC Nevada, had roughly 60 days until the close of escrow on two quarry sites his company had agreed to purchase. The seller claimed that one of the sites—an 858-acre property east of Reno—contained approximately 1 billion tons of mineable material.

The site's value would vary by millions of dollars according to the veracity of the seller's claim. Bonnell needed an accurate analysis of its resources, and he needed it quickly. In addition, he had to get a thorough assessment of existing operations and mining permits to evaluate whether RMC could continue mining at the site, which had been operating since 1988. Finally, so RMC would qualify for the innocent landowner defense under the Comprehensive Environmental Response and Liability Act (CERCLA), Phase I environmental site assessments (ESAs) of the two parcels were needed before the sale could proceed.

"On July 16, 1999, we first got a call from Phil," recalls Kevin Hebert, Brown and Caldwell's client service manager for RMC Nevada. "He realized we had our work cut out for us to complete all the due-diligence activities before close of escrow. But I assured him that by the time we propose our scope of work to a client, we've already scheduled most of the subcontractors. When we receive authorization to proceed, our team is off and running."

The team quickly mobilizes

On July 27, Hebert flew from the Phoenix office to Reno, where the sellers gave him and Bonnell a preliminary tour of the site. By August 13, RMC had authorized the proposed work plan, which included aerial mapping, quarry and pit mapping, completion of an exploration program, permit review, data compilation and modeling, and a draft report documenting all results and conclusions, to be submitted within six weeks, one full week before the close of escrow.

This schedule gave RMC enough time to iron out with the sellers any issues that Brown and Caldwell uncovered, or, if necessary, to renegotiate the sale price.

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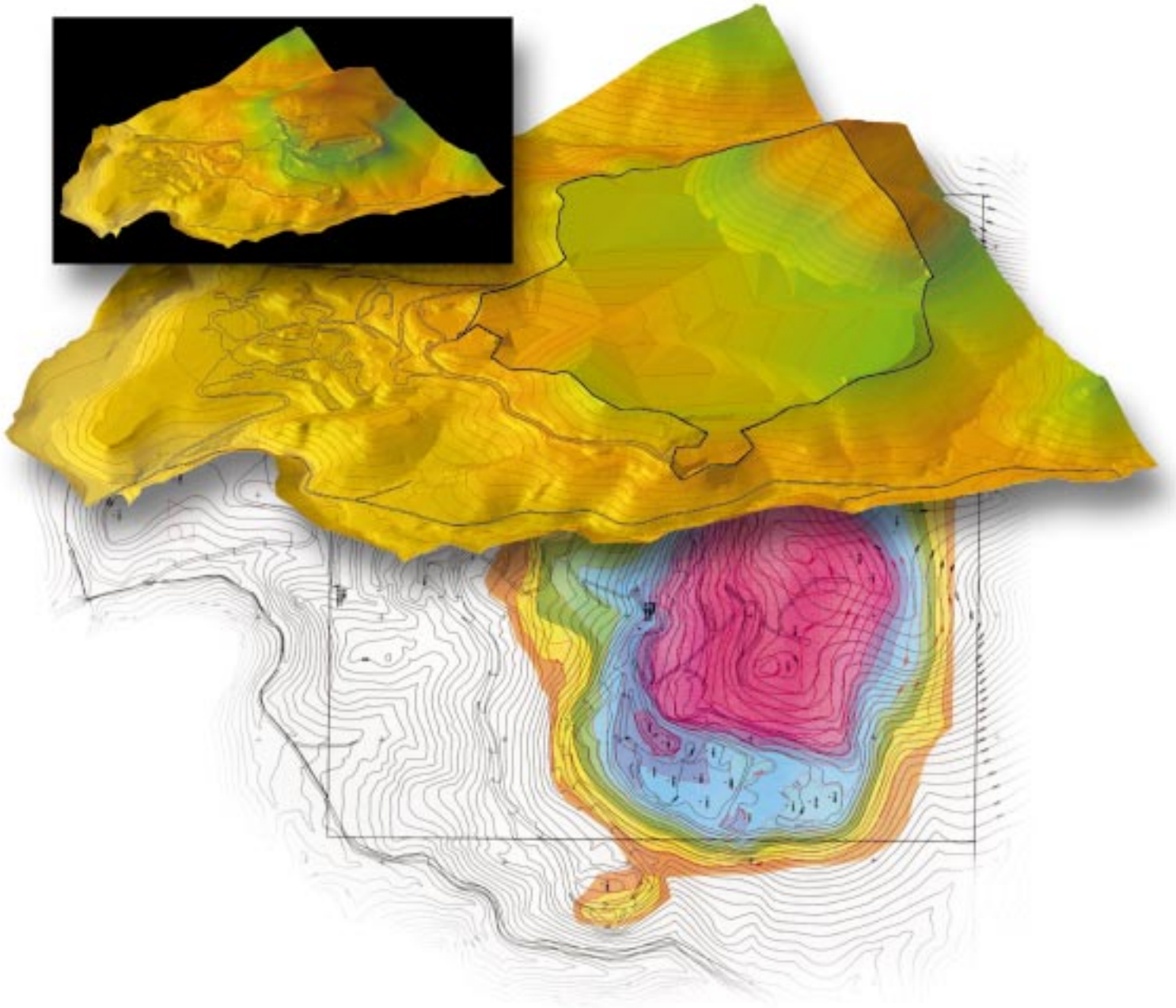
Against the Clock, Due Diligence Digs Deep for Possible Quarry Purchase



To calculate the volume of a quarry site's mineable resource over time for its possible purchase, Brown and Caldwell used topographic images (bottom) to help develop three-dimensional topographic models (top) and conceptual pit designs (middle). The pit designs incorporate five different constraining surfaces, property boundaries, geologic data, assumptions regarding pit slopes, and other site information. The design illustrated here depicts a 2 horizontal:1 vertical pit slope.

Against the Clock, Continued from Page 4

Meanwhile, nearby forest fires were producing smoke and haze that threatened to indefinitely delay aerial surveying, which was needed to gain essential topographic data.

As the fires kept burning, Hebert and Project Manager Rob Matter assembled the team: from the Phoenix office, Jim Robison, senior mining engineer, Janice Petticrew, environmental scientist, and Bill Simmons, senior design engineer; from the Boise, Idaho, office, Geologist Rob Mullener; and from the Carson City, Nev., office, Geologists Brad Hart and John Bennett. Each team member would contribute expertise—gained from environmental assessments, mining projects, and geologic mapping—that would yield a whole view greater than the sum of its parts.

3D resource modeling new to industry

While three-dimensional modeling has been employed for years in the mining industry to evaluate base and precious metals, the construction materials industry only recently began to reap the fruits of this technology. Brown and Caldwell employs the modeling programs Surpac 2000™ and SurvCADD™ to develop conceptual pit designs that incorporate topographic data and geologic models.

"Using this software, we can render surface details, add a pit outline, and overlay it with an aerial photograph," explains Geologist Rob Mullener, a former Surpac technical specialist who recently joined Brown and Caldwell. "And we can generate a moving image as if we were flying over the property. This allows visualization of the property layout before, during, and after mining."

From field data to modeling to accurate prediction

Matter, Hebert, Hart, and Petticrew arrived on site August 25 to begin Phase I-related inspections and to develop an understanding of the site's geology and the operation's physical layout and constraints—specifically, its mineable resource, the Washington Hill rhyolite. The rhyolite is crushed, processed, and used to produce concrete and asphalt.

Field mapping, exploratory drilling, and detailed site examination proceeded through September. A sub-meter-accuracy global positioning system (GPS) instrument was used to locate the drill holes and to identify geologic structures that could hinder complete extraction of the rhyolite. And finally, on August 30, the smoke subsided enough for North American Mapping to complete its subcontracted aerial photogrammetric survey.

> *"With three-dimensional modeling software, we can render surface details, add a pit outline, and overlay it with an aerial photograph."*

During the next three weeks, from offices in three states, the team amassed and interpreted multiple data sets to provide an in-depth picture of the proposed acquisition's resources. First, they prepared a geologic model. This incorporated information from many sources: the U.S. Geological Survey, aerial topographic survey, legal documents, exploration boreholes, and GPS survey. The geologic model allowed Brown and Caldwell to estimate the shape, vertical and horizontal extent, and variability of rhyolite on the 858-acre site.

Next, the team developed mining scenarios, harnessing Surpac 2000 and SurvCADD to prepare conceptual pit designs for the identified extraction scenarios. The pit designs accounted for a number of variables: five different constraining surfaces, a 200-foot offset inside the property line, the rhyolite contact with an underlying andesite rock body, the encroaching highwall pit slopes, the assumed structure of the andesite, the existing topography, wash loss, and material quality, the latter partly determined by laboratory analysis of drill cuttings. A discrepancy in information about the property boundary also was accounted for.

Then, as Petticrew was completing the Phase I ESAs and Hebert was reviewing the site operating permits, the rest of the team employed the volumetric modeling programs to merge the geologic model with the conceptual pit designs to determine the total tonnage of extractable rhyolite at the site.

At the finish line

"If a buyer doesn't quantify a site's resources before purchase, he or she is taking on a huge risk," explains Brian Anderson, who spearheads Brown and Caldwell's construction materials practice. "Many acquisitions are based on an economic model that's linked to the facility's mine life, and thus ultimately tied to the total resource quantity. But the buyer may not know if this model is accurate. An analysis like the one we did for RMC finds out. We provide a credible third-party

bargaining chip."

The bargaining chip was delivered to RMC on September 24, not two months from the preliminary site inspection, in the form of the promised draft report.

It showed that the recoverable resources of the 858-acre parcel were much more limited than the the seller had asserted. Instead of 1 billion tons of mineable rhyolite, approximately 136 million tons of product was recoverable using a 2 horizontal:1 vertical pit slope, and approximately 117 million tons of product was recoverable using a 3 horizontal:1 vertical pit slope, according to the due-diligence team's estimate. Assuming the current production rate of 1 million tons per year, the team determined the site's mine life to be approximately 100 years.

ESAs for both sites uncovered no significant environmental problems present that would prevent the deal from closing. Also, the permit review showed that conditions for continued operation of the site were acceptable to RMC.

Although Brown and Caldwell's estimated volume of recoverable rhyolite was far lower than the seller's claim, RMC had previously drawn its own line in the sand: 100 million tons of rhyolite to be extracted with reasonable confidence. Brown and Caldwell's analysis reassured Bonnell that the minimum could be mined. And the team's other findings added the final pieces to the puzzle of what the two parcels really offered.

"RMC Nevada is very pleased that Brown and Caldwell met our timeline," says Bonnell. "The team's efforts helped us support our position and our purchase price. The transaction closed successfully."

Contact Brian Anderson in the Boise, Idaho, office at (208) 336-1340 for more information on construction materials services.

QUARTERNOTES

Guidebook Navigates Texas' New Rules on Environmental Risk Assessment

The Lone Star State has finalized new rules for risk assessment of contaminated sites and cleanup using natural attenuation. And a new guidebook is available from Brown and Caldwell to help industry users understand and apply the wide-ranging regulations.

In development since 1996, the Texas Risk Reduction Program (TRRP) Rules reflect the state's reputation for doing things in a big way. "They are the most comprehensive rules for risk-based corrective action promulgated by a state so far," says Austin Cooley, P.E., Houston-based environmental program manager for Brown and Caldwell. "And in the past, many states have followed Texas' lead in this area."

Brown and Caldwell helped develop the new program, participating in all meetings of the Texas Natural Resource Conservation Commission's TRRP working group and providing extensive written comments on the rules. The company also trained Commission staff in risk assessment and natural attenuation evaluation methods.

Brown and Caldwell's 30-page "Texas Risk Reduction Program Guidebook" summarizes the regulations in a comprehensible way, addresses their framework, and discusses their most important elements. A section on "Frequently Asked Questions" is included. For a copy, send $5 to Kelly Ansley, Brown and Caldwell, 1415 Louisiana, Suite 2500, Houston, Texas 77002, or call (713) 646-1134.

Salo Elected to WEF Board of Directors

John Salo, senior vice president in Brown and Caldwell's Atlanta office, was elected to the Water Environment Federation (WEF) Board of Directors at the Annual Conference in New Orleans in October 1999. One of two directors from Georgia, he will serve a three-year term.

In 1998, Salo received WEF's Arthur Sidney Bedell Award, the most prestigious award that can be given to honor an individual member, "in acknowledgement of extraordinary personal service."

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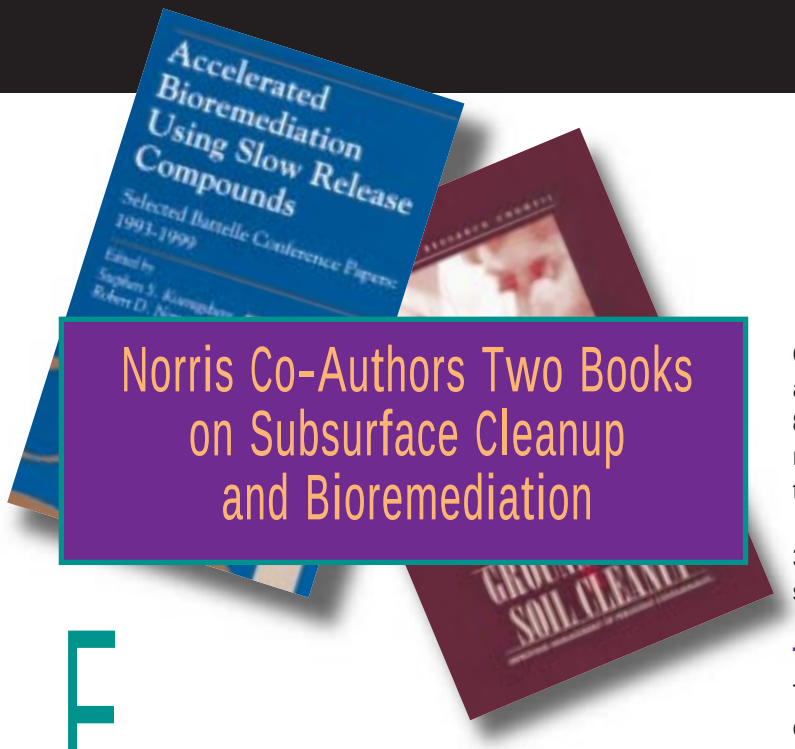

Norris Co-Authors Two Books on Subsurface Cleanup and Bioremediation

Focusing on the Department of Energy's (DOE's) environmental practices and technologies, a new publication from the National Research Council examines current issues in subsurface remediation. "Groundwater and Soil Cleanup: Improving Management of Persistent Contaminants" is co-authored by Robert D. Norris, Ph.D., Brown and Caldwell's Nashville-based technical director of in-situ remediation.

The Council formed a committee in 1997 to review how the DOE develops technologies to characterize, remediate, and contain contaminants on its sites, evaluate the technologies, and critique the DOE's management of their technology development program. The resulting book details the department's groundwater and soil problems and the changing regulatory environment. It then examines DOE responses to dense, non-aqueous-phase liquids (DNAPLs), metals, and radionuclides and recommends technical approaches.

Norris' efforts on another National Research Council committee helped lead to the influential book "In Situ Bioremediation—When Does It Work?" That volume introduced the term "intrinsic remediation" and served as the basis for the U.S. EPA's monitored natural attenuation protocols.

Also co-authored by Norris is "Accelerated Bioremediation Using Slow Release Compounds," recently published by Battelle Press. The book presents selected papers from a conference series on bioremediation technologies sponsored by Battelle—a Columbus, Ohio-based non-profit technology organization—from 1993 to 1999. Norris and co-editor Steve Koenigsberg, Ph.D., highlight the key issues involved in the use of slow-release oxygen and hydrogen compounds to clean up various contaminants.

Contact the National Academy Press at www.nap.edu or (888) 624-8373 to order "Groundwater and Soil Cleanup." To obtain "Accelerated Bioremediation Using Slow Release Compounds," contact Norris at (615) 255-2288 or bnorris@brwncald.com.

Choosing the Best Way to Comply with (Gasp!) GASB 34

Governmental Accounting Standards Board Statement 34 (GASB) isn't a problem waiting somewhere in the distant future. It's here. Roughly 84,000 agencies will need to comply with the new rules for financial reporting—many of them in the fiscal year beginning July 1, 2001, and the rest over the following two years, depending on their revenues.

Forward-thinking agencies are starting now to prepare for GASB 34. But choosing the best way to comply may not be easy: Compliance strategies will have effects reverberating well beyond the CFO's office.

Two approaches to accounting for fixed assets

The new rules require public agencies to identify all their fixed assets, establish each asset's value, and determine its service life. Agencies then must calculate and report the depreciation of these assets—or report activities and expenditures to maintain assets—as part of the cost of doing business.

Many agencies will find this difficult because of incomplete fixed asset records, poor knowledge of historical costs, or unknown asset service lives.

Once depreciation is reported as a utility cost, current rates may not appear to be in line with the cost of providing service. For instance, if payments on debt principal, rather than depreciation, have been the basis for current rates, the sudden substitution of depreciation will skew the apparent gain or loss from operations, perhaps dramatically.

Offering an alternative to reporting depreciation, GASB sets out a "modified approach"—which it encourages infrastructure agencies to adopt—requiring that agencies periodically assess the condition of their fixed assets and report activities and expenditures to maintain the assets. This rigorous approach to GASB 34 compliance is not strictly required, but bond rating agencies will probably favor it for two reasons: It avoids the distorting effects of reporting depreciation based on historical costs; and it demonstrates good stewardship of assets in a way that simply reporting depreciation does not.

Many infrastructure agencies will choose to adopt programs to periodically assess and report asset conditions in accord with GASB 34's modified approach. These agencies will need to develop scales to rate asset condition, methodologies to document asset condition, and a GASB 34-compliant asset management system. Of course, they also

will have to inventory their assets and conduct the periodic condition assessments. None of this will be easy, although the effort may well prove valuable in the long run.

Different agencies will have different objectives

Dealing effectively with GASB 34 requires establishing compliance goals and objectives, which may include the following:

- Formulate an initiative to fully comply with GASB 34 in a way that maximizes financial health and promotes good bond ratings
- Create, or change, the agency's asset management system to meet the new financial reporting needs
- Integrate this asset management system with other asset-based systems such as geographic information systems (GIS), maintenance management, work order systems, and replacement planning
- Set policies to maintain infrastructure assets to a standard of excellence
- Minimize rate disruption

Different utilities and public agencies will adopt different approaches to meeting the new GASB standards. To help an agency develop an optimal compliance strategy, Brown and Caldwell typically takes some or all of the following steps:

- Review fixed asset and historical cost records, and recommend how these records can be completed and brought up to date according to GASB 34 guidelines
- Interview staff throughout the organization to document existing and needed asset-based applications (GIS, maintenance management, master planning, replacement planning, etc.)
- Interview the agency's auditors to determine their standards for a GASB 34-compliant fixed asset system, and which compliance approaches are preferred versus those likely to generate unfavorable footnotes to the financial statements—or even a qualified audit opinion
- Help chart an overall compliance strategy that meets identified needs and compliance objectives while considering other existing or planned systems that may depend on a comprehensive fixed-asset database

After a strategy has been formulated, Brown and Caldwell may help implement it, working with agencies as program or project managers in several key areas:

- Developing asset condition scales and asset inventory and condition assessment methodologies
- Conducting asset inventories, valuations, and condition assessments
- Developing procedures to keep the asset database up-to-date
- Developing or helping to implement related asset-based systems
- Integrating GASB 34 compliance efforts with other asset-based management systems and regulatory compliance programs, such as those specified in the Clean Water Act and proposed under the EPA's draft sewer overflow prevention program
- Integrating fragmented asset databases so that all agency users can be served from a consistent and up-to-date database

If agencies can get ahead of GASB 34's looming requirements, they may discover compliance choices that benefit them in the long run. For more information, contact me at (949) 260-6152, or kharlow@brwncald.com.

—KEN HARLOW

Salo, Continued from Page 7

Salo served as Chair of the Georgia WEF Section in 1997-98 and Chair of the Section's Legislative Committee, which he organized, from 1992-94. He has been an officer of the Georgia Section since 1994. WEF, an international, not-for-profit educational and technical organization of more than 40,000 members, focuses on activities that preserve and enhance the global water environment.

Unique Collaborative Process to Convert Former Refinery Site

Using a federal court-ordered collaborative process never before applied to a RCRA refinery site closure, BP Amoco, the Wyoming Department of Environmental Quality, a Joint Powers Board formed by the City of Casper and Natrona County, and Brown and Caldwell together are working towards beneficial reuse of a former refinery and its associated properties.

Their aim to rapidly return the unique Casper, Wyo., site to recreational,

Continued on Next Page

Unique Collaborative Process

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wildlife, and commercial use contrasts with conventional RCRA closures, which typically take 15 to 20 years. The former Amoco refinery project is on track to achieve a final remedial decision in three years.

The Joint Powers Board (JPB), which includes both elected officials and appointed citizens, needed an unbiased ally to represent its interests in the technically complex process and to help maintain the project's aggressive schedule. "Drawing on their knowledge and experience in environmental remediation, Brown and Caldwell is giving the JPB an objective voice in the process," explains Dave Engels, the board's executive director. "They're helping us make sure that whatever is proposed protects human health and the environment."

The refinery operated for nearly a century before being closed approximately eight years ago. With almost 10,000 feet of frontage on the North Platte River and proximity to downtown Casper, the desirable site of the now-demolished refinery offers a number of possible uses. The draft reuse plan for the site, proposed by the JPB and a citizen committee, envisions a golf course, office park, and large areas of open space reserved for recreation and wildlife. An offsite property, Soda Lake, also offers valuable new uses: Where refinery wastewater was disposed of, now migratory waterfowl, antelope, and other wildlife have established themselves in a habitat of unusual diversity for a semi-arid region. Characterization activities and corrective-measure studies for the lake are scheduled for later this year.

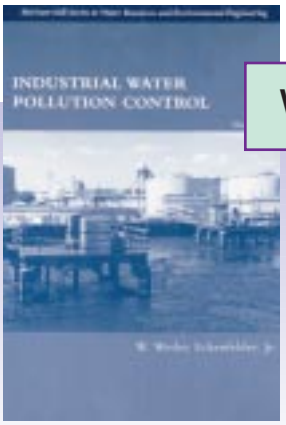
One of the Casper project's toughest challenges is resolution of complex technical issues in a collaborative process that requires agreement via consensus by all the parties. "We've been able to achieve breakthroughs by emphasizing the range of knowledge that everyone in this process has to contribute," comments Steve Haverl, Brown and Caldwell's principal in charge of the project and senior vice president of environmental services, "and by focusing on problem-solving using scientific methods."

A sheet-pile barrier wall is being constructed along the North Platte River to help contain releases from a former refinery site in Casper, Wyo. The site is being restored to support recreational and commercial uses. Brown and Caldwell is part of a court-ordered collaborative process to address site characterization and remediation.

In early 1999, for example, the involved parties began considering the issue of non-aqueous phase liquids (NAPLs) underlying the former refinery and the length of a sheet-pile wall that would help contain it. Initially, it had been agreed that the wall would be constructed along a particular stretch of the North Platte River. Then considerable contention arose, with some arguing that the wall should extend the whole length of the river or even surround the entire property.

Recognizing the stalemate, Brown and Caldwell recommended convening an expert panel composed of members invited by each participant in the process. The JPB was represented by Brown and Caldwell's Robert Mutch, of Mahwah, N.J., and Ron Burt, of Nashville, Tenn. "The panel produced a report describing the migration of NAPLs—oil—and dissolved-phase groundwater contaminants at the site," says Mutch. "With that technical basis, the panel recommended that the sheet-pile wall span the length of the North Platte River on the refinery side, but not encircle the property." Breaking through the stalemate, the expert panel also established a precedent on how to resolve any future collaborative stalls.

The high-profile project involves media coverage of all key meetings. Linda Henry, Ron Zurlinden, and Cindy Paulson round out the company's team, providing assessments of ecologic and human health risks and making public educational presentations in addition to offering expertise on site characterization, remediation, and water quality.



Wes Eckenfelder's "Industrial Water Pollution Control"

McGraw-Hill recently published the third edition of "Industrial Water Pollution Control" by W. Wesley Eckenfelder, Jr., D.Sc., P.E., senior technical director for Brown and Caldwell (see the interview this issue). The 1989 and 1967 editions also were authored by Eckenfelder.

The new edition features case histories, problems from the field, and increased emphasis on the application of theories and state-of-the-art technology. The contents reflect changes demanded over the past few years by higher water-quality standards.

For an examination copy, email mark_johnson@mcgraw-hill.com with your mailing address, request, and the book's ISBN (0-07-039364-8), or call the publisher at (800) 338-3987.

Kaolin Industry Aims to Shape MACT Regulations

The kaolin industry is helping to shape new federal standards for maximum achievable control technology (MACT) to limit air pollution. The clay products MACT, which includes kaolin, is due to be promulgated by May 15, 2002.

"The economic impact of this regulation on the kaolin manufacturing industry could be enormous, as much as eight or nine figures," says Craig Smith, Ph.D., a Brown and Caldwell air regulations expert based in Atlanta. "We hope to reduce that impact by supporting the development of regulations that fit this industry, not the other way around."

Smith leads the strategic response of the China Clay Producers Association (CCPA), which consists of five companies that produce 60 percent of the world's kaolin. A type of clay used in high-grade paper, paints, additives, and pharmaceuticals, kaolin deposits in North America are concentrated in Georgia. The clay processing industry also includes alumina, bentonite, fuller's earth, and ball clay.

"Brown and Caldwell is the quarterback, running the plays to get the CCPA through a myriad of regulatory issues," explains Smith. "A big part of our work is facilitating meetings by a group which is bound by a common goal, but made up of ardent competitors. This group continues to develop honesty and openness among themselves—which is critical to achieving consensus on strategic issues."

An outgrowth of the 1990 amendments to the Clean Air Act, and administered by the U.S. Environmental Protection Agency (EPA), MACT regulations will eventually cover more than 174 industrial categories. To date, 43 standards have been promulgated for 78 categories of emission sources. Over the next three years, 66 standards covering 96 source categories are to be issued. If federal MACT standards aren't issued on time, states can put forth equivalent air emissions regulations.

MACT standards have raised considerable concern among private industry because so far, their limits have required capital-intensive emissions controls. Emissions may be reduced through elimination, process modifications and substitutions, new operating procedures, and/or "end-of-the-pipe" controls. Costs for the latter have run into the millions of dollars.

Smith is drawing on his work with other industries that have responded to MACT standards development, including gasoline storage and organic liquid distribution companies. In particular, he has analyzed the efforts of others to influence MACT regulations development, including the portland cement, phosphate fertilizer, and lime industries. This has involved examining the EPA's approach to various air pollutants as well as indicators, emissions levels, required monitoring, final compliance requirements, and industry costs.

Smith cites the outcome that befell the portland cement industry as one the kaolin industry wants to avoid: Two manufacturer associations are suing the EPA, disputing its prescribed monitoring technology and its ability to regulate certain pollutants, while the Sierra Club is suing the EPA as well, alleging that it has not gone far enough in reducing hazardous air pollutants. Meanwhile, the EPA estimates that the portland cement MACT standard will lead to industry compliance costs of $240 million per year.

For the kaolin industry, Brown and Caldwell formulated a decision analysis process that wouldn't predetermine the course of action. A more typical approach would be linear (collecting information and then responding to the EPA) rather than global (looking at the problem as a whole, weighing the risks and rewards of different technical issues, and then developing strategic paths). The company's team includes specialists in mining, testing, permitting and compliance, health and risk assessment, decision and strategic analysis, modeling, economic analysis, and process engineering.

DOE Commends Clarke for Pit 9 Drilling Safety Review

In an unusual recognition of timely and high-quality work, the Department of Energy gave a Corporate Award to James Clarke, Ph.D., of Brown and Caldwell, and his fellow team members from four other firms, for their independent technical review of proposed sonic drilling in Pit 9 at the Idaho National Engineering and Environmental Laboratory.

The Department had received conflicting advice about whether sonic drilling into the pit's buried waste–which contains potassium and sodium nitrates and petroleum hydrocarbon oils–could result in explosion or fire. The 1-acre pit also contains barrels, boots, rags, and debris contaminated with plutonium and other hazardous chemicals generated during nuclear weapons production at the Rocky Flats site in Colorado and dumped in the late 1960s. The Department planned to sample it via sonic drilling as part of a cleanup project that had been plagued by technical and legal delays.

The independent panel concluded in November 1999 that the potential for explosion or fire from sonic drilling is "beyond extremely unlikely" if the panel's recommendations are followed. Recently, 20 subsurface probes were installed using sonic drilling throughout the full depth of Pit 9, without incident.

Academic Institutions Learning Hard Lessons

Through EPA Enforcement

Sounding a clarion bell heard across the United States, the U.S. Environmental Protection Agency (EPA) announced last fall that it had fined the University of Hawaii more than $115,000 for its shortcomings in environmental compliance.

No longer, the EPA seemed to be saying, would the nation's colleges or universities sidestep its enforcement hammer. Since then the buzz among trade associations serving thousands of top campus administrators has been about a crackdown. The threat is perceived as an amorphous one, and concern is high.

Traditionally less regulated by environmental agencies, colleges and universities can avoid fines, demonstrate leadership, improve public relations, and reduce operating costs through compliance efforts.

Significant work already being done for some of the nation's leading universities in advance of this latest wave of enforcement illustrates how academic institutions can take action to allay their concerns.

By successfully implementing an environmental program, these institutions will not only improve compliance and reduce the chances of an unpleasant six-figure fine—they will also demonstrate their leadership, turning compliance measures into an example of environmental stewardship, with accompanying public relations rewards. Just as important, they can significantly reduce operating costs, allowing them to redirect savings to improve academic programs.

Leaders of academic institutions should start with a frank and honest assessment. Do you handle environmental issues only after the regulators and notices of violation show up? Does your staff have the depth of experience to properly support and negotiate your case with a regulatory agency?

In one recent case, a consultant's ability to develop a plan for handling hazardous materials within an allowed 30-day period prevented the site from being included on the state Superfund list. By clearly understanding the regulatory environment, encouraging the university to respond quickly and appropriately, and, above all, keeping the university's best interests in mind, the consultant helped it turn a negative into a positive.

Do you have an automated, systematic program for notification about compliance deadlines and requirements? One major Southeastern university began its environmental stewardship with a top-to-bottom review of environmental health and safety (EHS) practices. The university, already a leader in handling environmental issues up front, requested a comprehensive third-party review of its EHS program, focusing on management systems, hazardous waste management, asbestos, radiation, biosafety, tank management, solid waste management, air/wastewater treatment and permitting, steam plant operations, and vehicle maintenance operations. The final report summarized regulatory compliance and management issues and gave more than 200 recommendations on improving operations.

Here's another example of how to turn a potential public relations disaster into environmental "solutioneering." A university discovered an undetermined number of buried drums of the pesticide DDT. Facing liability under state Superfund laws, the university turned to its consultant for information about its regulatory responsibilities. The response they planned and enacted included not only traditional engineering services to confirm the extent of contamination, but also community outreach efforts and ongoing communication with the media—yielding good press and public respect.

An effective environmental management program these days can mean a lot more than proactive compliance. For example, with increasing threats of bioterrorism, one university has put together an emergency operations plan for its entire campus of more than 300 buildings. It developed a core response plan with specific facility information, and a training program covering fire safety, chemical storage, and utilities identification. To expedite information-gathering and enhance response capabilities for the local emergency response teams, the university compiled all of this information into one document, accessible via a web-based browser (with password). The user-friendly electronic format allows the document to be continuously upgraded.

As part of their environmental efforts, some universities are reaping financial rewards through improved management of energy systems. As with their environmental compliance efforts, universities often begin with an audit to analyze system performance, costs, and efficiency. Next, a report might identify potential cost-savings items, such as increased centralization, each with an estimated payback period. A consulting firm with a full palette of HVAC, mechanical, and electrical engineering skills can work with a client to identify methods to implement system improvements in a phased approach to accommodate budgeting cycles. These improvements often lead to immediate and significant reductions in operating costs.

As today's business sense, bottom-line mentality penetrates university administrations, it is crucial to avoid surprises—be it a massive capital expense after an energy system shutdown, or a major fine for failure to properly manage environmental compliance. Be honest, assess your environmental needs, staff capabilities, and potential liabilities, and then develop a plan. Ask experts to share what they have already learned. As times continue to change, you will find yourself ready for the tests ahead.

—JIM CLAFFEY, PH.D.

For more information on environmental management strategies tailored to institutions of higher learning, contact Claffey in Atlanta at (770) 673-3663.

Eckenfelder

CONTINUED FROM PAGE 1

activated sludge, so I literally picked up all of his material and reworked it for activated sludge.

CG: **What constituted a pilot study in the '50s?**
WE: At the West Vaco Mill in Covington, Va., we had steel tanks. The aeration tank was roughly 7 feet wide and 14 feet deep, and we had a clarifier. We simply compared the detention time—sludge age wasn't really used at that time. We used a mixed liquor of 2,500 milligrams per liter or somewhere thereabouts. Four hours, six hours detention time. Not highly sophisticated, but it worked.

CG: **What was the objective of secondary treatment then?**
WE: 85 percent removal of BOD. At that point, industry was considered the same as municipal.

CG: **And with primary treatment, you weren't getting that.**
WE: Right. Something around 20 percent.

CG: **What were the early arguments against secondary treatment?**
WE: Cost. They claimed either that it was going to put them out of business or that there really wasn't a problem out there. Unless there was a fish kill, industry wasn't being squeezed.

CG: **Thinking through the advancements in technology over the span of your career, what hasn't changed and what has?**
WE: Interesting you'd ask that. A few weeks ago I was looking through my 1960 book and thought to myself, "Things sure haven't changed much since I wrote that!" Of course, things are still being fine-tuned, but basic concepts . . .Well, the bugs haven't changed in thousands of years. They're still doing the same things. Today, I'd say that membranes—biomembranes in particular—is certainly new technology that will become a milestone.

CG: **What about the move toward statistical modeling to anticipate problems?**
WE: Certainly in the municipal area, we're already there. Not so in industrial. If you take domestic sewage with no industrial input, it has a reasonably predictable cycle over 24 hours that can be programmed. But for industry, with changes in production, batch processing, you have no predictable model. It's a different game. But we'll eventually come up with something.

CG: **As predictable as the municipal waste stream looks, the operations philosophy is still very reactive.**
WE: It's a mindset. People are convinced that there is so much variability that their charter is just to react to what they get every day.

CG: **So what we see with Eric Wahlberg's work on this whole concept is that operators need a higher level of confidence in statistical process control.**
WE: Education, attitudes, understanding—that's what's important. Science is already there.

Most coveted honor:
"The Imhoff-Koch Medal from the International Water Association. I received it in Kyoto in 1990, and I was especially honored because an international panel made the selection."

First job out of college:
"Paint inspector for the City of New York, 1946. Prompted me to go to graduate school."

Motivation for becoming a professor:
"I needed a job that paid, but I was also determined to overcome my speech impediment—my way."

Biggest personal achievement:
"Becoming an educator, as well as knowing that my books are published in many languages and in use all over the world."

Biggest technology bust:
"Physical-chemical treatment of municipal wastewater."

An anecdote:
"I was keynote speaker at the Purdue Industrial Waste Conference in 1965. Unfortunately, I got caught up in the festivities the night before and ended up losing my car. I opened my remarks the next morning by asking if anyone had seen it."

Most harrowing experience:
"Attending the 1968 IAWPRC Conference in Prague the day Soviet tanks rolled into the city. They cancelled the conference that year, but managed to put it back on in Prague the following year."

The Short Course on Pulp and Paper Activated Sludge

The new Short Course on Pulp and Paper Activated Sludge targets sludge settling problems, both filamentous and non-filamentous. Structured for experienced operators and managers of activated sludge plants, this fast-paced, hands-on workshop covers tools and techniques to efficiently troubleshoot and correct secondary clarifier problems.

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- Learn a powerful new technique for measuring sludge settling characteristics
- Understand statistical process control and the use of selectors and biological modeling to improve operations reliability

The Short Course on Pulp and Paper Activated Sludge is presented by Paul Klopping, senior vice president for Industrial Water Quality at Brown and Caldwell. Klopping helped develop TAPPI's Activated Sludge Plant Operations Short Course and was awarded "finest faculty" status by TAPPI each year from 1994 through 1999.

Course components:

Overview of Biological Treatment
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Controlling Waste Sludge Flow
Controlling Aeration
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