Designing a defense against erosion

Inside
AEC Technology Strategies Conference
A clear view on project management
Advances in barrier geosynthetics
The SmartDitch® System will stop your erosion problems before they start.
Where Can it Work for You?

12” Depth SmartDitch
12” Trapezoidal SmartDitch® eliminated stormwater flooding in this residential community in Colorado.

24” Depth SmartDitch
24” Trapezoidal SmartDitch® stabilized this steep slope below a highway drainage outfall, after several attempts to repair it with riprap failed.

24” Semi-Circular SmartDitch
24” Semi-circular SmartDitch® provided a much needed water diversion system for a landowner in California.

Expandable MegaDitch
The new MegaDitch™ expandable ditch liner is the perfect solution to this large scale Canadian mine stormwater flow channel.

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Made in the USA
on the cover

A soft armor anchored reinforced vegetation system and hard armor concrete articulated block mats were combined to protect West City Ditch in Kissimmee, Fla., from erosion. — story on page 50.

Photo: Geotextile System by Propex

www.cenews.com May 2011 CE NEWS 3

contents
May 2011

exclusive

20 2011 Top Civil Firms

Civil engineering firms with $100 million or more in revenue forge ahead by branching out and making changes.

BY LYNN PETRAK

features

34 A clear view ahead

Eliminating project delays and cost overruns with virtual environments

BY GARRETT HARLEY

38 Technology is the future

The 2011 AEC Technology Strategies Conference offers IT sessions for industry professionals.

BY STEPHANIE HILDEBRANDT

40 Advances in barrier geosynthetics

Trends and opportunities for geomembrane and geosynthetic clay liner design

BY CHRIS KELSEY

projects

46 Refined engineering for reliable remediation

Advanced wetland designs offer decades of durable, low-cost wastewater treatment at hydrocarbon and chemical-contaminated sites.

BY SCOTT D. WALLACE, P.E.

48 Wastewater reclamation connection

Construction Manager At-Risk delivery method cuts months from pipeline schedule.

BY DANIEL C. BROWN

Exclusively at cenews.com

- Vinyl sheet piling for seawall replacement
- Retaining walls support Utah rail system
- Soil stabilization treatment prevents clay swelling
departments

6  From the Publisher
8  Comment
10  Letters
12  News and Events
18  CE News Online
19  Association News
56  Marketplace
57  Reader Resource

columns

26  Project Management Insights
   Five ways to communicate better
   BY CHRISTINE BRACK, PMP

28  Leadership
   KM and TL
   BY ED FRIEDRICH

30  Mergers & Acquisitions
   Be a dealmaker in mergers and acquisitions.
   BY JEFF CLARK

31  Building Value
   Firm owners: You could be your own worst enemy
   BY TRACEY JEFFERS, MBA, CBA, CMEA

32  Professional Practice
   Facts of civil-engineering life
   BY JOHN P. BACHNER

44  Leveraging Technology
   CAD as a business-development tool
   BY MARK J. SCACCO, P.E.

58  Beyond Words
   Creating a balanced regulatory environment
   BY STEVEN ECKLER

products

50  Engineered Solutions
   Designing a defense against erosion
   BY BOB DRAKE

55  New & Noteworthy
   Software, laser scanner, water quality, and stormwater

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Why is Hank so happy?

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April was a big month for me. Besides working on the continuing integration of CE News and sister publication Structural Engineering & Design, April also brought the birth of my fourth daughter, Hazel Zweig.

As I thought about the world she was being born into and what her life could be, I realized what a wonderful age we live in. While it is easy to complain or worry about one thing or another, we are making tremendous strides in terms of increasing the standard of living for billions of people in all corners of the planet.

As you undoubtedly know, civil engineers play a huge role in creating our future on planet Earth. I am thankful for all you do to give us clean water, reliable transportation, fresh air, and so, so much more. Every day, almost every single thing we do has been touched (and improved) in some way by civil engineers. Take pride in who you are and what you do. It is indeed a noble profession!

Meanwhile, the May issue of CE News brings with it our annual look at the top civil engineering firms in this business. Many are familiar. ZweigWhite has either been a consultant to, sold books to, or had people at our events from nearly every one of them.

One thing is completely clear: The recession in the construction industry overall has certainly not affected every firm in our business equally. There are still some companies that are doing incredibly well. The big firms keep getting bigger and into more things — more new service lines, project types, and clients. Obviously, companies dependent on land development were hardest hit while those focusing on the federal government and certain other infrastructure sectors such as water and wastewater, power, highways and bridges, higher education, and airports, for the most part, fared best.

You’ll see some new columns in this issue as we deliver on our promise of more content related to “the business of civil engineering.” I hope you find our new columnists both enjoyable and helpful to you.

We’ve also had a tremendous response from readers telling me how much they love CE News and offering up suggestions on how to make it better. Keep those calls, e-mails, and letters coming, please! We value your feedback greatly and really appreciate hearing from you.
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Leading by example

In the run up to Earth Day (April 22), the U.S. Environmental Protection Agency (EPA) released its fiscal year 2010 scorecard on sustainability and energy performance. According to the agency, it is meeting or exceeding all federal goals to decrease energy use per square foot, reduce potable water use per square foot, lessen fleet petroleum use, establish inventories of direct and indirect greenhouse gas emissions, incorporate sustainable building practices, and increase renewable energy use.

EPA’s Sustainability and Energy Scorecard (http://epa.gov/aboutepa/ombscorecard.html) indicates that it has decreased energy consumption by 22.8 percent since 2003, decreased water use by 18.7 percent compared with 2007, and cut petroleum use in the agency’s vehicle fleet by 24.9 percent compared with 2005. Additionally, EPA purchases 100 percent green power for all of its electric power needs and 7.69 percent of its buildings are considered sustainable green buildings (the target is 15 percent by 2015).

In addition to saving taxpayer money, the EPA is by all appearances taking seriously its environmental mission and “leading by example.” Which raises a question for the civil engineering industry: For all of the discussion about sustainable design, green projects, low-impact development, and LEED certification, are firms applying internally the professional advice they so ably provide to their clients?

With a quick look at the websites of the first 10 firms — the leaders in the industry, at least in terms of annual revenue — on the Top Civil Firms 2011 list (see page 20), I discovered that more than half of the companies prominently tout their in-house efforts with a link from either the home page or from an “About us” page to a sustainability or social responsibility page.

Internal sustainability efforts typically focus on decreasing paper use, increasing use of recycled products, decreasing energy and water use, and reducing the firm’s total carbon footprint. These are low- or no-cost and generally simple steps that civil engineering firms of any size can take. Additionally, some firms are building or moving into environmentally friendly offices. For example, Bechtel’s Washington, D.C., office was LEED-Platinum certified by the U.S. Green Building Council, the company said.

Measuring and reporting progress requires a greater, and more costly, effort. Nevertheless, at least half of the top 10 firms offer easy-to-find, downloadable sustainability reports — some annually; others less frequent. Several firms use the Global Reporting Initiative (GRI; www.globalreporting.org) Reporting Framework, which, according to GRI, establishes “principles and performance indicators that organizations can use to measure and report their economic, environmental, and social performance.” The GRI also offers Sustainability Reporting Guidelines, Sector Supplements (unique indicators for industry sectors), and National Annexes (unique country-level information).

So, how is your firm leading by example when it comes to sustainability? We would welcome brief accounts of your successful efforts, great ideas, lessons learned, long-term goals, and benefits realized. You don’t have to be a Top Civil Firm to be an industry leader.

Bob Drake, bdrake@zweigwhite.com
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High-speed rail

I read your editorial (“Fiscal prudence or petty politics”) in the [March 2011] issue of CE News regarding the decisions being made by several governors regarding cutting funding to several high-speed rail projects. While I agree that we need to invest in our infrastructure, I am skeptical of investing large sums of federal tax dollars into programs like high-speed rail that have had a poor track record of fiscal performance in the United States. One only needs to look to Amtrak to prove this point.

Facing a $14 trillion national debt, I think that the governors were courageous in rejecting the federal funding. There is nothing petty about the funds needed to build these types of high-speed rail systems and recurring annual operations and maintenance expenses they will require. Our federal tax dollars would be much better spent on maintaining and upgrading our already existing and aging interstate highway system and the many thousands of deteriorating and functionally obsolete bridges and roads throughout our nation.

William F. Sauers, P.E.

I agree with Gov. Scott in Florida and Gov. Kasich in Ohio. It is fiscal prudence in my opinion. High-speed rail from Cleveland to Orlando, Fl., makes sense. The problem with high-speed rail from Tampa to Orlando or Cleveland to Cincinnati is that when I look at the overall trip time, I can get there much faster driving. If I drive a car that gets 20 mpg and gas is $5 per gallon, it will cost me about $40 to drive from Tampa to Orlando and back. The train ticket will probably be that much if it isn’t subsidized by tax dollars.

Instead of trying to build short-run high-speed rail lines that make no economic sense and will have to be subsidized by the taxpayers forever, let’s look at interstate high-speed rail that might make some sense or spend our tax dollars more efficiently and economically somewhere else. We are not Europe, Japan, or China. Our country developed around automotivetranportation and that isn’t going to change. If gasoline prices get too high, people will buy more fuel-efficient cars and still utilize the automobile for convenience.

Donald L. Feller, P.E.

I realize in your capacity as editor you’re working to support the engineering profession, particularly [civil engineers]. However, I was dismayed over your editorial in the March 2011 issue when you referred to Florida Gov. Scott’s decision to end their light-rail project as, potentially, “petty politics.” As a technical magazine editor, should you be playing politics?

As an engineer that has been the recipient of both private and government-funded work, I’ve been very grateful for what has come my way. However, I always remember that I am first an American, second a professional engineer. And being an American, I must act responsibly in my civil (no pun intended) activities. Just because a project was created doesn’t mean that it is right and just — and being a New Yorker, I have absolutely no idea whether the Florida light rail is good or bad for the people there. As a taxpayer though, I can only support or argue against projects, and in the end use my vote in the ballot box to make my case.

While I love my profession and the people in it, I must first be honest with myself and ask, as an American: Is this project right or wrong? After everyone makes their case and the elected politicians make their decisions, we fall in line — at least till the next election. If that means we as engineers get or lose work, so be it. Heck, there are so many deteriorating bridges, buildings, and highways, there’s got to be more than enough work for all in the next 20 years.

As Americans, it should continue to be our duty to formulate opinions as to where our hard-earned tax dollars are being spent, but when wearing our engineer hats, we should only assess technical data and formulate technical recommendations — one of which could very well be that a light-rail system in Florida would be a more efficient way to travel in Florida than the alternatives. However, we must stop ourselves from venturing beyond the engineering analysis by fomenting clearly political statements, since once we ventured down that path, why should anyone believe what we say in the future since it will always be perceived as trying to save our own butts?

Thomas J. Petracca, P.E.

Project management

I was happy to see [Christine Brack’s] article (“Isn’t it ironic,” CE News, April 2011, page 28) on project management in the A/E field. I am a civil engineer with PMP certification for eight years. I am always amazed at whom managers and directors appoint to project manager positions simply because they have been assigned the engineer for the project. Most times these individuals have little training in project management and simply do what has been done in the past. The end result is obvious: a project that does not meet schedule or budget with many change orders in the design and construction of the project. The blame lies not in the individuals, who are well meaning, but in the managers and directors who do not understand what project management is. As pointed out in the article, very little training is offered to these individuals because it is not seen as necessary. However, it is also true that not everyone can be a project manager. Project management requires various skill sets, especially communication, which is lost in the process of selecting project managers.

Gene Estrada, P.E., PMP
Overcoming Our Infrastructure Deficits

Innovations in Planning and Design

Solving the problems facing our roads, water, energy, and other vital infrastructure today requires new ways of executing projects. With limited fiscal and human resources, it is critical for project stakeholders to leverage innovations in processes and technologies to more efficiently deliver infrastructure projects. This series of webcasts will discuss these challenges and offer solutions, including how information modeling can impact infrastructure throughout its lifecycle—from planning to design, construction, and maintenance.

Better Planning with Information Modeling
MAY 11, 2011 / 1 pm ET, 12 pm CT, 10 am PT

Building Information Modeling (BIM) is creating a cultural shift in infrastructure planning and design workforces. Increasingly, geospatial professionals working on transportation, utility, and other infrastructure projects are being asked to integrate BIM models with GIS data to more directly represent the as-built structure and better leverage "GIS ready" design data. This session will present how design and GIS professionals can take advantage of data aggregation, integration and automation to create more accurate drawings, designs and maps; make better design decisions by evaluating existing conditions more effectively; distribute and exchange information in different ways; and more.

COMING UP...
Roads & Highways: Planning Ahead
JUNE 2, 2011 / 1 pm ET, 12 pm CT, 10 am PT

Habitat Development: Planning for Sustainability
JUNE 23, 2011 / 1 pm ET, 12 pm CT, 1 am PT

Roads & Highways: Optimizing Designs through Visualization
JULY 28, 2011 / 1 pm ET, 12 pm CT, 10 am PT

Roads & Highways: From Design to Construction Coordination
AUGUST 11, 2011 / 1 pm ET, 12 pm CT, 10 am PT

Better Infrastructure Management with Information Modeling
SEPTEMBER 22, 2011 / 1 pm ET, 12 pm CT, 10 am PT

VIEW THE ARCHIVE
The Infrastructure Lifecycle: Challenges and Solutions
AIRED ON: MARCH 31, 2011

This virtual tour of a series of presentations that elaborate on the challenges public and private infrastructure project managers face and how they can design, manage, and execute projects in a different way than ever before. Attendees will see how market-based solutions and design tools play a key role in supporting these new approaches to reduce costs, risks, and timelines.

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Water withdrawal project wins ACEC National Grand Award

DENVER — CH2M HILL’s Pelton Round Butte Selective Water Withdrawal Project won the American Council of Engineering Companies’ (ACEC) national Grand Award. The Pelton Round Butte Hydroelectric Project is co-owned by Portland General Electric (PGE) and the Confederated Tribes of the Warm Springs Reservation of Oregon. The award was accepted by PGE and CH2M HILL, which provided design and construction oversight for the project.

Located near Madras, Ore., on Lake Billy Chinook, the original Round Butte dam, built in the early 1960s, affected water flow and temperature so greatly that native salmon and other fish could not find their way out of the reservoir, and natural migration ceased. In 2004, in an agreement with the Confederated Tribes of Warm Springs of Oregon, PGE hired CH2M HILL to complete a fish collection and bypass system at the three-dam, 465-MW Pelton Round Butte Hydroelectric Project in order to restore the anadromous fish runs to their natural habitat.

CH2M HILL designed and helped construct the Pelton Round Butte Selective Water Withdrawal Project, which, completed in 2009, is the only known floating surface fish collection facility coupled with power generation in the world, according to the firm. As a result of the selective water withdrawal project, the Pelton Round Butte Hydroelectric project has been certified by the Low Impact Hydropower Institute as a source of green power.

The project was designed to modify the surface current directions to improve guidance of the migrating fish into the fish collection structure, provide fish sorting and handling system, exclude all fish from passing through the turbines, and ensure the water passing through the turbines complies with the state and tribal water quality standards in order to restore water quality to improve the fish habitat.

For the first time in 40 years, Chinook, sockeye, and steelhead salmon are able to complete their lifecycles as the juvenile fish are passed downstream to the Deschutes River basin and then are able to return as adults to spawn naturally upstream of Round Butte Dam.

More than 100,000 fish were captured and transferred downstream in 2010, its first full year of operation.

The design of the 270-foot-tall and concrete structure was significantly influenced by complex construction challenges and site-staging limitations, and 3D modeling was integral in developing the engineering data and material quantities. The largest construction challenge was when it came to assembling, lowering, and attaching the equivalent of a six-story building to the face of the existing powerhouse that was submerged 270 feet in water. With virtually no room on the crest of the dam, a pontoon barge with central moon pool was used for assembly, and the structure was designed so that remotely operated submerged vehicles could perform nearly all of the underwater work.

Other challenges included excavating nearly 200 cubic yards of rock under water without blasting; drilling 11, 30-inch-diameter rock sockets each about 30 feet deep; installing 1,100 feet of 24-inch-diameter steel pipe piles; and placing nearly 200 cubic yards of high-strength underwater grout. All work activities were completed with minimal impact to power generation.

ACEC’s annual Engineering Excellence Awards competition recognizes engineering firms for projects that...
demonstrate a high degree of innovation, achievement, and value, and are chosen by a panel of judges possessing a vast array of industry expertise. Hundreds of projects from around the world are submitted and only 24 are selected as top award winners — 16 Honor Awards and 8 Grand Awards; one Grand Award winner is selected for the Grand Conceptor Award.

SSR to design Audubon-certified road

GERMANTOWN, TENN. — Smith Seckman Reid Inc. (SSR) is providing construction engineering and inspection services for the city of Germantown’s Wolf River Boulevard. This $25 million project is part of the Audubon International Silver Signature Sanctuary green certification program. It will be the first silver-certified road in Tennessee, and the first Audubon-certified road in the United States.

The Audubon International Silver Signature Sanctuary program focuses on combining areas of environmental protection, including wildlife conservation and water use efficiency, with human use. According to Audubon’s website (http://signature.auduboninternational.org): “The Audubon Signature Program provides comprehensive environmental planning assistance to new developments. The program helps landowners and developers design for the environment so that both economic and environmental objectives are achieved. Once construction is complete, involvement in an Audubon Signature Program ensures that managers apply sustainable resource management practices in the long-term stewardship of the property.”

Design features for the Wolf River Boulevard project include four, 12-foot traffic lanes; 12-foot shoulders with bike lanes; 14-foot medians with native plants; and bridges with bike and pedestrian crossings. The reconstruction of this roadway will create a natural parkway for residents and visitors to

The Wolf River Boulevard in Germantown, Tenn., is part of the Audubon International Silver Signature Sanctuary green certification program. It is expected to be the first silver-certified road in Tennessee, and the first Audubon-certified road in the United States.

Smith Seckman Reid Inc.

www.redi-rock.com

REDI-ROCK DELIVERS WALL SOLUTION ON A TIGHT DEADLINE

"They needed this done before we even started," a project manager for this Vermontmentation explained. Engineers were tasked with finding a wall solution that would create enough space for the new cantilever while accommodating infrastructure already in place. Redi-Rock was chosen for the project because:

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walk, pedal, and drive, while providing a sanctuary for plants and wildlife and filtering clean stormwater.

The project broke ground at the end of March, and construction is scheduled to be completed by July 2013.

EPA solicits comments on stormwater permit
WASHINGTON, D.C. — On April 15, the U.S. Environmental Protection Agency (EPA) released for public comment a draft permit that it said will help improve the nation’s waterways by regulating the discharge of stormwater from construction sites. The proposed Construction General Permit (CGP) includes enhanced provisions to protect impaired and sensitive waters. Some of the significant proposed permit modifications include new requirements for:
- eligibility for emergency-related construction;
- required use of the electronic notice of intent process;
- sediment and erosion controls;
- natural buffers or alternative controls;
- soil stabilization;
- pollution prevention;
- site inspections;
- stormwater pollution prevention plans; and
- permit termination.

Many of the new permit requirements implement new effluent limitations guidelines and new source performance standards for the construction and development industry that became effective on Feb. 1, 2010. These requirements include a suite of erosion and sediment controls and pollution prevention measures that apply to all permitted construction sites.

The permit will be effective in areas where the EPA is the permitting authority, including Idaho, Massachusetts, New Hampshire, New Mexico, most territories, most Indian country lands, and Washington, D.C.

The public has until mid-June to comment on the draft permit. EPA anticipates that it will issue the final CGP by Jan. 31, 2012. The current permit is scheduled to expire on June 30, 2011; however, EPA is proposing to extend the current permit until Jan. 31, 2012, to provide sufficient time to finalize the new permit.

PBSJ Corporation is renamed Atkins

TAMPA, FLA. — The PBSJ Corporation and its PBS&J subsidiary company have been renamed Atkins. PBSJ operates as a national business of Atkins in North America following its acquisition in October 2010. Atkins is the world’s 11th largest design firm.

“The Atkins name is well known and highly respected through the United Kingdom and Europe, the Middle East, Asia, and the Pacific and in key sectors such as energy,” said Robert J. Paulsen, former chairman and president of The PBSJ Corporation and now president and regional managing director of Atkins in North America.

Holders of more than 97 percent of The PBSJ Corporation’s capital stock voted to approve the corporation’s acquisition by Atkins last October. Atkins has about 18,000 employees, including more than 3,700 (full- and part-time) in North America.

Golder Associates acquires Marston

CALGARY, ALBERTA — Golder Associates acquired the Marston group of companies, a full-service mining consultancy that specializes in mine planning and geologic services for open pit and underground coal, metals, oil sands, and industrial mineral mines.

The acquisition boosts Golder’s global capabilities in mining by expanding its mine planning and resource evaluation capabilities in energy minerals, particularly coal and the Alberta oil sands. It also expands opportunities

In an exclusive Distance Learning Update, CE News provides a convenient guide to many of the online programs that offer civil engineers an opportunity to earn advanced degrees while working.

PLUS — Readers provide input for the 13th annual salary survey that tracks salary and benefits received by civil engineers across the country.
submit services — including geotechnical engineering, mine waste management, environmental services and permitting, and reclamation and closure — to new clients in the world’s major coal-producing regions.

“The combined services of Golder Associates and Marston provide tremendous advantages to all our mining clients by creating one of the largest and most distinguished groups of geology and mine planning professionals in the business,” said Brian Conlin, president and CEO of Golder Associates Corp.

The acquisition also will allow employees of Marston, which was founded as a family business in 1977 and grew to 84 employees in three countries, to participate in Golder’s employee ownership model. Marston will join the existing Golder offices in Denver and Calgary, Alberta, while also retaining its existing locations in St. Louis; San Antonio; and Newcastle, NSW, Australia.

URS acquires BP Barber
SAN FRANCISCO — URS Corp. acquired Columbia, S.C.-based BP Barber, a privately held civil engineering firm specializing in water and wastewater infrastructure. The financial terms of the transaction were not disclosed. According to URS, the addition of BP Barber expands URS’ presence in South Carolina, particularly in the attractive water/wastewater market, and provides immediate opportunities for URS to broaden services to existing BP Barber customers.

With a staff of approximately 150 professionals working from six offices located in South Carolina, North Carolina, and Georgia, BP Barber provides engineering services to state and local government agencies and private-sector companies in the Southeast. The company primarily serves the water/wastewater market. It also provides environmental, urban development, surveying, and geographic information system services.

Researcher tests steel fiber-reinforced concrete pipe
ARLINGTON, TEXAS — Researchers at The University of Texas (UT) at Arlington are partnering with a Belgian company to test new construction methods for reinforcing concrete pipes with steel fibers to build stronger, more durable pipes at a lower cost. UT Arlington civil engineering professor Ali Abolmaali was awarded a $155,000 grant through Bekaert, a
global producer of drawn steel wire products, for the project. The grant calls for the American Association of State Highway and Transportation Officials and the American Society for Testing and Materials to review design specifications based on UT Arlington’s findings. The work is expected to lead to new design and construction standards in the United States. Abolmaali said similar construction standards calling for mixing steel fibers in concrete pipes already have been adopted in Europe.

The pipes, which range from 1 foot to 6 feet in diameter, are cast for infrastructure use such as bridge supports, water transport, and sewer conveyance, among other things.

“Steel fiber-reinforced concrete pipe is the norm in the rest of the world so it is critical that we have the same superior quality concrete pipe for U.S. infrastructure needs,” said Bekart company spokesman T.R. Kunesh. “This cutting-edge testing program at UT Arlington will open doors to many other transportation applications including bridges, drainage, and utility structures.”

Abolmaali said the anticipated new construction standards would eliminate the need for steel-mesh cages placed inside concrete pipe forms, making the pipe manufacturing process less expensive and less labor intensive.

More testing and evaluation will be required once the new standards are adopted, Abolmaali said. Pipe producers including Hansen Pipe, Rinker Materials, Northern Concrete Pipe, and Sherman-Dixie Industries are conducting pipe manufacturing for the grant for free, he said.

“With the technology available to us today through improved mix designs and the use of steel fiber reinforcement,” said Pete DeLay, CEO for Sherman-Dixie, “we believe that we can develop new standards and design characteristics for concrete pipe that will provide phenomenal long-term performance at a lower cost.”

Corrections

The Solid Waste Association of North America (www.swana.org) was omitted from the directory of industry associations in the March issue of CE News. SWANA is located at 1100 Wayne Ave., Ste. 700, Silver Spring, MD 20910; phone: 800-467-9262.

In the April issue of CE News, CREW was incorrectly identified as Citizens for Responsibility and Ethics in Washington. The correct organization is Commercial Real Estate Women Network. This error appeared in Judith Nitsch’s section of “The Power List.”
Vinyl sheet piling for seawall replacement

Collier Canal is the primary stormwater detention area for more than 50 percent of the city of Sebastian along the east coast of Florida. During the last decade, many of the bulkhead sections along the 2.1-mile stretch of Collier Canal had failed and literally fallen into the canal. Silt had filled in the canal, reducing water storage capacity and compromising the water quality.

The city of Sebastian concluded that it needed to dredge and dispose of 30,000 cubic yards of silt and stabilize the canal bank. The city selected a design/build vinyl sheet pile seawall solution for its aesthetic appearance, long lifespan, fast installation, and economical traits. To read the full article, visit www.cenews.com.

Rail plan gives Utah citizens first class public transportation

The FrontRunner South Commuter Rail Line runs from Salt Lake City south 45 miles to Provo. It has 300,000 square feet of retaining walls. Numerous factors contributed to the success, cost savings, and function of these Keystone Compac retaining walls, including single-phase construction, slip joint construction, locally manufactured products, high productivity installation, wick drain installation, lightweight backfill, and low maintenance. To read the full article, visit www.cenews.com.

Soil stabilization treatment prevents clay swelling

When moisture gets into clay, it can swell up and lift a building off its foundation, or heave up parking lots, roadways, or runways. Perma-Pier, which specializes in repairing foundations and underpavements that have been damaged by swelling clay throughout the Texas prairie lands, recommends that developers and builders pre-treat soil containing problematic clay so that the damage doesn’t occur in the first place. If it’s too late for this advice, however, the company suggests using an “electromechanical” soil-stabilizing compound that produces ions with a charge from opposite those in the clay.

Once the ions in the clay have been neutralized, the clay no longer attracts water. The moisture already present in the soil will likely evaporate in warm weather. Or, the water can be “squeezed” out of the soil by compaction, which removes the water passageways in the clay. To read the full article, visit www.cenews.com.
ASFE elects David Gaboury president

SILVER SPRING, MD. — David R. Gaboury, P.E., is the new president of ASFE/The Geoprofessional Business Association, a not-for-profit association of geoprofessional firms that employ 150,000 individuals worldwide. Gaboury is the 41st individual to serve as ASFE’s president and chair of the group’s board of directors. For more information, visit www.asfe.org.

New website launched about PVC pipe

DALLAS — The Uni-Bell PVC Pipe Association launched a new website to inform the public and stakeholders about its industry and showcase the sustainability, cost-effectiveness, and versatility of its products. The new site, www.uni-bell.org, offers several sections designed to cover all aspects of PVC pipe, from a breakdown of its uses in a wide range of applications, to detailed fact sheets on its manufacture, testing, and specifications, to blogs addressing recent developments and technical questions regarding the industry. Interested parties also will find information in the site’s resource library, including technical documents, issue briefs, and information on “sustainable cities” that use PVC pipe.

CMAA publishes update of construction management review

MCLEAN, VA. — The Construction Management Association of America (CMAA) published an updated edition of its “State by State Review of Licensing Requirements Affecting Construction Managers,” a key reference for any organization or individual practicing construction management in multiple states. The review summarizes the state laws governing the practice of construction management, with references to the relevant statutes. It also provides contact information for the government agencies that regulate licensing of architects, engineers, and contractors. To purchase the review, visit www.cmaanet.org/cmaa-bookstore.

Stormwater newsletter debuts

ALEXANDRIA, VA. — The Water Environment Federation (WEF) recently launched a publication designed to keep water quality professionals informed about activities and developments related to the topic of stormwater. The Stormwater Report will publish monthly free of charge and cover advanced practices, cutting-edge research, policy updates, and current events pertaining to stormwater.
2011 Top Civil Firms

Civil engineering firms with $100 million or more in revenue forge ahead by branching out and making changes. By Lynn Petrak

On the bridge to the future of civil engineering, care ful design, constant maintenance, and structural integrity have never been so important. Indeed, just as some bridges in this nation’s infrastructure are being totally reconstructed to suit modern traffic needs and others are tended to with limited means, today’s civil engineering firms are moving forward to the next point in the road as best as they can. The 2011 CE News list of the nation’s leading civil engineering firms, ranked by revenue, shows that overcoming gaps isn’t always easy, but can be managed.

For one thing, as the nation and world’s financial outlook remains shaky, civil engineering firms have become more versatile. Dayton, Ohio-based Woolpert is marking its 100th year in 2011 and continues to evolve as it has in the past. “In an industry reliant on backlog and hit hard by the economic downturn, architecture, engineering, and geospatial firms have been diligently searching for ways to recover,” said Michael Flannery, CEO. “There is no question that staying on the leading edge of technology is often critical to providing innovative solutions. And there is, without a doubt, much value in following lending markets, creating public-private partnerships, and understanding economic development drivers.” Sustainability is another avenue to growth, Flannery noted.

Being versatile and keeping a steady commitment to future goals while working on current projects is underscored by Scott Gallaher, P.G., principal-in-charge for all CEI/CIM/CM contracts for Lowell, Mass.-based TRC. Gallaher noted that shortfalls in federal funding have hampered new projects and often create a certain “backlog bubble,” but said that firms can take heart in a better outlook in the private sector. “This industry may change down the road and I think there will be some revenue streams that are different from what we are accustomed to, with more privatization. We really are at a crossroads,” Gallaher said, adding that TRC is adapting accordingly. “Our game plan is to diversify ourselves.”

For many civil engineering firms, part of such diversification efforts have involved mergers and acquisitions. Woolpert, for example, recently acquired the Dallas operations of Bohannan Huston, a spatial data, mapping, civil engineering, and advanced engineering technology services firm headquartered in New Mexico — the firm’s fourth acquisition in three years.

Another example is Michael Baker Corp., which acquired The LPA Group Inc. last year after selling its energy business. Florida-based PBS&J, on the CE News list last year, joined Atkins — the world’s 11th largest design firm, headquartered in the United Kingdom — in the fall and now operates as a national business of Atkins in the United States. KBR acquired Roberts & Schaefer Company, a Chicago firm that provides services and processing infrastructure to mining and minerals, power, industrial, refining, aggregates, precious and base metals industries. Wilbur Smith Associates, included in this year’s list, was acquired in February 2011 and now is part of CDM. To be sure, there are many other examples of newly forged alliances and reorganizations.

Lynn Petrak is a freelance writer and researcher based in LaGrange, Ill. She can be contacted at lynnpetrak@sbcglobal.net.
The strongest and most durable natural fiber blankets in the market.

Made with bristle coir fiber, the longer and stronger coconut (coir) fiber.

When selecting and specifying woven coir mats, designers should not only consider the unit weight, but also the wet tensile strengths, coir type, open area as well as machine direction and cross direction twine counts.

Advantages

* 100% natural and biodegradable.
* Last 4 - 6 years.
* Completely wildlife friendly.
* Hold moisture and support seed germination and growth.
* Open weave supports reseeding, if necessary.
* Open weave allows planting through the mat without cutting the mat.
* Easy to install and walk on the mat.
* Provide aesthetically pleasing applications.
* Upon biodegradation, blanket becomes mulch that improves soil.

Woven coir mats support vegetation establishment better than synthetic mats.

RoLanka also offers CoirMat made of mattress coir fiber.

Available in Portland, OR and Stockbridge, GA

Easy planting through BioD-Mat
<table>
<thead>
<tr>
<th>Firm</th>
<th>2010 Revenue</th>
<th>No. of employees</th>
<th>Leadership</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bechtel Group Inc.</td>
<td>$30.8 billion</td>
<td>52,700</td>
<td>Riley P. Bechtel, chairman and CEO</td>
<td><a href="http://www.bechtel.com">www.bechtel.com</a></td>
</tr>
<tr>
<td>* Fluor Corp.</td>
<td>$20.8 billion</td>
<td>42,000</td>
<td>David T. Seaton, CEO and director</td>
<td><a href="http://www.fluor.com">www.fluor.com</a></td>
</tr>
<tr>
<td>* KBR</td>
<td>$12 billion</td>
<td>35,000</td>
<td>William P. Utt, chairman, president, and CEO</td>
<td><a href="http://www.kbr.com">www.kbr.com</a></td>
</tr>
<tr>
<td>* Jacobs Engineering Group Inc.</td>
<td>$9.9 billion</td>
<td>50,000</td>
<td>Craig L. Martin, president and CEO</td>
<td><a href="http://www.jacobs.com">www.jacobs.com</a></td>
</tr>
<tr>
<td>* URS Corporation</td>
<td>$9.18 billion</td>
<td>47,000</td>
<td>Martin Koffel, chairman, president, and CEO</td>
<td><a href="http://www.urscorp.com">www.urscorp.com</a></td>
</tr>
<tr>
<td>* AECOM</td>
<td>$7.0 billion</td>
<td>45,000</td>
<td>Richard Newman, chairman;</td>
<td><a href="http://www.aecom.com">www.aecom.com</a></td>
</tr>
<tr>
<td>* The Shaw Group</td>
<td>$7.0 billion</td>
<td>27,000</td>
<td>James Bernhard, chairman, president, and CEO</td>
<td><a href="http://www.shawgrp.com">www.shawgrp.com</a></td>
</tr>
<tr>
<td>CH2M HILL Inc.</td>
<td>$6.3 billion</td>
<td>23,500</td>
<td>Lee McIntire, chairman and CEO</td>
<td><a href="http://www.ch2m.com">www.ch2m.com</a></td>
</tr>
<tr>
<td>WorleyParsons</td>
<td>$5.06 billion</td>
<td>30,000</td>
<td>John Grill, CEO</td>
<td><a href="http://www.worleyparsons.com">www.worleyparsons.com</a></td>
</tr>
<tr>
<td>AMEC</td>
<td>$3.9 billion</td>
<td>23,000</td>
<td>Samir Brikho, chief executive</td>
<td><a href="http://www.amec.com">www.amec.com</a></td>
</tr>
<tr>
<td>ARCADIS U.S. Inc.</td>
<td>$2.86 billion</td>
<td>15,905</td>
<td>Steven Blake, chairman and CEO</td>
<td><a href="http://www.arcadis-us.com">www.arcadis-us.com</a></td>
</tr>
<tr>
<td>Black &amp; Veatch</td>
<td>$2.7 billion</td>
<td>8,600</td>
<td>Len C. Rodman, chairman, president, and CEO</td>
<td><a href="http://www.bv.com">www.bv.com</a></td>
</tr>
<tr>
<td>Parsons Corporation</td>
<td>$2.7 billion</td>
<td>10,600</td>
<td>Charles Harrington, chairman and CEO</td>
<td><a href="http://www.parsons.com">www.parsons.com</a></td>
</tr>
<tr>
<td>Parsons Brinckerhoff</td>
<td>$2.3 billion</td>
<td>14,000</td>
<td>George J. Pierson, CEO</td>
<td><a href="http://www.pbworld.com">www.pbworld.com</a></td>
</tr>
<tr>
<td>* Tetra Tech Inc.</td>
<td>$2.2 billion</td>
<td>12,000</td>
<td>Dan L. Batrack, chairman, CEO, and president</td>
<td><a href="http://www.tetratech.com">www.tetratech.com</a></td>
</tr>
<tr>
<td>* Stantec Inc.</td>
<td>$1.51 billion</td>
<td>10,700</td>
<td>Bob Gomes, CEO, president and director</td>
<td><a href="http://www.stantec.com">www.stantec.com</a></td>
</tr>
<tr>
<td>HDR Inc.</td>
<td>$1.5 billion</td>
<td>7,800</td>
<td>Richard Bell, chairman and CEO</td>
<td><a href="http://www.hdrinc.com">www.hdrinc.com</a></td>
</tr>
<tr>
<td>MWH Global Inc.</td>
<td>$1.3 billion</td>
<td>7,000</td>
<td>Robert B. Uhler, chairman and CEO</td>
<td><a href="http://www.mwghglobal.com">www.mwghglobal.com</a></td>
</tr>
<tr>
<td>Willbros Group Inc.</td>
<td>$1.2 billion</td>
<td>4,750</td>
<td>Randy Harl, president and CEO</td>
<td><a href="http://www.willbros.com">www.willbros.com</a></td>
</tr>
<tr>
<td>Burns &amp; McDonnell</td>
<td>$1.1 billion</td>
<td>3,000</td>
<td>Greg Graves, CEO</td>
<td><a href="http://www.burnsmcd.com">www.burnsmcd.com</a></td>
</tr>
<tr>
<td>* Golder Associates</td>
<td>$1 billion</td>
<td>7,000</td>
<td>Brian H. Conlin, president</td>
<td><a href="http://www.golder.com">www.golder.com</a></td>
</tr>
<tr>
<td>HNTB</td>
<td>$1 billion</td>
<td>3,666</td>
<td>Ken Graham, CEO (HNTB Infrastructure)</td>
<td><a href="http://www.hntb.com">www.hntb.com</a></td>
</tr>
</tbody>
</table>

* Firms also recognized on The Zwieg Letter Hot Firm 2010 List
<table>
<thead>
<tr>
<th>Firm</th>
<th>2010 Revenue</th>
<th>No. of employees</th>
<th>Leadership</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>Halcrow</td>
<td>$820 million</td>
<td>6,000</td>
<td>Peter Gammie, chief executive</td>
<td><a href="http://www.halcrow.com">www.halcrow.com</a></td>
</tr>
<tr>
<td>CDM</td>
<td>$720 million</td>
<td>6,000</td>
<td>Richard Fox, chairman and CEO</td>
<td><a href="http://www.cdm.com">www.cdm.com</a></td>
</tr>
<tr>
<td>The Louis Berger Group</td>
<td>$694 million</td>
<td>5,000</td>
<td>Nicholas J. Masucci, CEO and president</td>
<td><a href="http://www.louisberger.com">www.louisberger.com</a></td>
</tr>
<tr>
<td>Atkins North America Inc.</td>
<td>$684 million</td>
<td>2,590</td>
<td>Robert J. Paulsen, CEO</td>
<td><a href="http://www.atkinsglobal.com">www.atkinsglobal.com</a></td>
</tr>
<tr>
<td>S&amp;B Engineering and Constructors</td>
<td>$674 million</td>
<td>4,000</td>
<td>James G. Slaughter, Jr., CEO</td>
<td><a href="http://www.sbec.com">www.sbec.com</a></td>
</tr>
<tr>
<td>ERM Group Inc.</td>
<td>$600 million</td>
<td>3,600</td>
<td>John Alexander, CEO</td>
<td><a href="http://www.erm.com">www.erm.com</a></td>
</tr>
<tr>
<td>* Michael Baker Corp.</td>
<td>$499.4 million</td>
<td>2,900</td>
<td>Bradley L. Mallory, president and CEO</td>
<td><a href="http://www.mbakercorp.com">www.mbakercorp.com</a></td>
</tr>
<tr>
<td>MACTEC Inc.</td>
<td>$440 million</td>
<td>3,000</td>
<td>Ann E. Massey, president and CEO</td>
<td><a href="http://www.mactec.com">www.mactec.com</a></td>
</tr>
<tr>
<td>STV Group</td>
<td>$350 million</td>
<td>1,700</td>
<td>Dominick Servedio, chairman and CEO</td>
<td><a href="http://www.stvinc.com">www.stvinc.com</a></td>
</tr>
<tr>
<td>Hatch Mott MacDonald</td>
<td>$347.6 million</td>
<td>2,000</td>
<td>Nicholas M. DeNichilo, CEO</td>
<td><a href="http://www.hatchmott.com">www.hatchmott.com</a></td>
</tr>
<tr>
<td>* M. Baker Corp.</td>
<td>$329 million</td>
<td>2,400</td>
<td>Christopher Vincze, chairman and CEO</td>
<td><a href="http://www.trcsolutions.com">www.trcsolutions.com</a></td>
</tr>
<tr>
<td>Terracon Consultants</td>
<td>$329 million</td>
<td>2,700</td>
<td>David Gaboury, president and CEO</td>
<td><a href="http://www.terracon.com">www.terracon.com</a></td>
</tr>
<tr>
<td>Dewberry</td>
<td>$320 million</td>
<td>1,800</td>
<td>Donald E. Stone, Jr., CEO</td>
<td><a href="http://www.dewberry.com">www.dewberry.com</a></td>
</tr>
<tr>
<td>Kimley-Horn &amp; Associates Inc.</td>
<td>$319 million</td>
<td>1,575</td>
<td>John Atz, president; and Mark Wilson, CEO</td>
<td><a href="http://www.kimley-horn.com">www.kimley-horn.com</a></td>
</tr>
<tr>
<td>Kleinfelder Group</td>
<td>$305.5 million</td>
<td>1,700</td>
<td>William Siegel, president and CEO</td>
<td><a href="http://www.kleinfelder.com">www.kleinfelder.com</a></td>
</tr>
<tr>
<td>Gannett Fleming Inc.</td>
<td>$296.7 million</td>
<td>2,100</td>
<td>William Stout, chairman and CEO</td>
<td><a href="http://www.gannettfleming.com">www.gannettfleming.com</a></td>
</tr>
<tr>
<td>Brown &amp; Caldwell</td>
<td>$294 million (E)</td>
<td>1,500</td>
<td>Craig Goehringer, CEO</td>
<td></td>
</tr>
<tr>
<td>Professional Service Industries Inc.</td>
<td>$240 million (E)</td>
<td>2,500</td>
<td>Murry Savage, CEO</td>
<td><a href="http://www.psiusa.com">www.psiusa.com</a></td>
</tr>
<tr>
<td>T.Y. Lin International</td>
<td>$229.3 million</td>
<td>2,138</td>
<td>Alvaro J. Piedrahita, president and CEO</td>
<td><a href="http://www.tylin.com">www.tylin.com</a></td>
</tr>
<tr>
<td>TranSystems</td>
<td>$204.6 million</td>
<td>1,000</td>
<td>Brian G. Larson, CEO</td>
<td><a href="http://www.transystems.com">www.transystems.com</a></td>
</tr>
<tr>
<td>Mustang Engineering Inc.</td>
<td>$191 million (E)</td>
<td>7,000</td>
<td>William Higgs and Paul Redmon</td>
<td></td>
</tr>
</tbody>
</table>

* Firms also recognized on The Zwieg Letter Hot Firm 2010 List
<table>
<thead>
<tr>
<th>Firm</th>
<th>North American headquarters</th>
<th>2010 Revenue</th>
<th>No. of employees</th>
<th>Leadership</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stanley Consultants</td>
<td>Muscatine, IA</td>
<td>$189.8 million</td>
<td>1,500</td>
<td>Gregs Thomopulos, chairman and CEO</td>
<td><a href="http://www.stanleyconsultants.com">www.stanleyconsultants.com</a></td>
</tr>
<tr>
<td>Enercon Services Inc.</td>
<td>Tulsa, OK</td>
<td>$186 million</td>
<td>1,200</td>
<td>John Richardson, president</td>
<td><a href="http://www.enercon.com">www.enercon.com</a></td>
</tr>
<tr>
<td>Wilbur Smith Associates</td>
<td>Columbia, SC</td>
<td>$182.4 million</td>
<td>1,000</td>
<td>Stevenson Smith, chairman and CEO</td>
<td><a href="http://www.wilbursmith.com">www.wilbursmith.com</a></td>
</tr>
<tr>
<td>* Greenman Pederson</td>
<td>Babylon, NY</td>
<td>$171.7 million</td>
<td>1,052</td>
<td>Steve Greenman, CEO</td>
<td><a href="http://www.gpinet.com">www.gpinet.com</a></td>
</tr>
<tr>
<td>Hazen &amp; Sawyer</td>
<td>New York, NY</td>
<td>$165 million</td>
<td>800</td>
<td>James W. Fagan, president</td>
<td><a href="http://www.hazenandsawyer.com">www.hazenandsawyer.com</a></td>
</tr>
<tr>
<td>Carollo Engineers Inc.</td>
<td>Walnut Creek, CA</td>
<td>$147 million</td>
<td>631</td>
<td>Gary Deis, CEO</td>
<td><a href="http://www.carollo.com">www.carollo.com</a></td>
</tr>
<tr>
<td>Reynolds, Smith and Hills Inc.</td>
<td>Jacksonville, FL</td>
<td>$143 million</td>
<td>776</td>
<td>Leerie T. Jenkins, CEO and chairman</td>
<td><a href="http://www.rsandh.com">www.rsandh.com</a></td>
</tr>
<tr>
<td>VHB</td>
<td>Watertown, MA</td>
<td>$142.5 million</td>
<td>900</td>
<td>Robert Brustlin, president and CEO</td>
<td><a href="http://www.vhb.com">www.vhb.com</a></td>
</tr>
<tr>
<td>* KCI Technologies</td>
<td>Sparks, MD</td>
<td>$131 million</td>
<td>850</td>
<td>Terry Neimeyer, chairman and CEO</td>
<td><a href="http://www.kci.com">www.kci.com</a></td>
</tr>
<tr>
<td>Psomas</td>
<td>Los Angeles, CA</td>
<td>$130 million</td>
<td>500</td>
<td>Blake Murillo, CEO</td>
<td><a href="http://www.pomas.com">www.pomas.com</a></td>
</tr>
<tr>
<td>ATC Associates</td>
<td>Marietta, GA</td>
<td>$126 million</td>
<td>1,800</td>
<td>Robert Toups, CEO</td>
<td><a href="http://www.atcassociates.com">www.atcassociates.com</a></td>
</tr>
<tr>
<td>SCS Engineers</td>
<td>Reston, VA</td>
<td>$125 million</td>
<td>670</td>
<td>Jim Walsh, president and CEO</td>
<td><a href="http://www.langan.com">www.langan.com</a></td>
</tr>
<tr>
<td>David Evans and Associates</td>
<td>Portland, OR</td>
<td>$123 million</td>
<td>650</td>
<td>Al Barkouli, president and CEO</td>
<td><a href="http://www.deainc.com">www.deainc.com</a></td>
</tr>
<tr>
<td>* CHA</td>
<td>Albany, NY</td>
<td>$122.3 million</td>
<td>775</td>
<td>Raymond J. Kinley, Jr. president and CEO</td>
<td><a href="http://www.chacompanies.com">www.chacompanies.com</a></td>
</tr>
<tr>
<td>Woolpert Inc.</td>
<td>Dayton, OH</td>
<td>$119 million</td>
<td>650</td>
<td>Michael Flannery, CEO</td>
<td><a href="http://www.woolpert.com">www.woolpert.com</a></td>
</tr>
<tr>
<td>* Pennoni Associates Inc.</td>
<td>Philadelphia, PA</td>
<td>$117.9 million</td>
<td>950</td>
<td>Anthony S. Bartolomeo, president and CEO</td>
<td><a href="http://www.pennoni.com">www.pennoni.com</a></td>
</tr>
<tr>
<td>KPFF Inc.</td>
<td>Seattle, WA</td>
<td>$117.8 million</td>
<td>900</td>
<td>Jefferson Asher, president</td>
<td></td>
</tr>
<tr>
<td>Moffatt &amp; Nichol</td>
<td>Long Beach, CA</td>
<td>$116 million</td>
<td>500</td>
<td>Eric Nichol, president</td>
<td><a href="http://www.moffattnichol.com">www.moffattnichol.com</a></td>
</tr>
<tr>
<td>RBF Consulting</td>
<td>Irvine, CA</td>
<td>$115 million</td>
<td>600</td>
<td>James E. McDonald, co-CEOs</td>
<td></td>
</tr>
<tr>
<td>Foth</td>
<td>Green Bay, WI</td>
<td>$114 million</td>
<td>675</td>
<td>Tim Weyenberg, CEO</td>
<td><a href="http://www.foth.com">www.foth.com</a></td>
</tr>
<tr>
<td>Rummel, Klepper and Kahl LLP</td>
<td>Baltimore, MD</td>
<td>$102 million</td>
<td>740</td>
<td>Stephen G. Zentz, partner</td>
<td></td>
</tr>
<tr>
<td>Langan Engineering</td>
<td>Elmwood Park, NJ</td>
<td>$100 million</td>
<td>500</td>
<td>David T. Gockel, CEO</td>
<td><a href="http://www.langan.com">www.langan.com</a></td>
</tr>
</tbody>
</table>

* Firms also recognized on The Zwieg Letter Hot Firm 2010 List
TRIMBLE TSC3

We’ve added a lot more capability. Without taking anything away from its simplicity.

THE NEW AND IMPROVED TRIMBLE TSC3 CONTROLLER

The problem with new and improved is that too often it means unfamiliar and different. That’s not the case with the new Trimble TSC3 controller.

Optimized for Trimble Access, this new field solution delivers more capable data collection, computing and connectivity than ever before, without sacrificing the familiar functions that have made our surveying systems famous.

COLLECT SHARE AND DELIVER:

A larger, full-color screen means more function from the map screen and more direct access to the features you need to complete the job. And keep the data flowing with integrated Bluetooth, WiFi and cellular modem.

Trimble Access field software allows you to bring data from the internal GPS, compass and camera into your workflow. In a single step you can automatically add images as attribute information to any point you are measuring.

Easier and more effective? Yes. More complicated? Not at all. The new Trimble TSC3 controller. It does amazingly complex things—all designed to make doing your job easier.

To learn more about the new Trimble TSC3, visit: trimble.com/TSC3

SUCCESS FOUND HERE
Everything I’ve read about project management suggests that a project manager should spend 90 percent of his or her time communicating. That may seem like too many hours devoted to one activity, but consider what communication really encompasses — it’s significantly more than just talking. Project communication is all the ways we distribute information, report data, and manage stakeholders.

Communication is the phone calls we make. It’s the e-mails, memos, letters, transmittals, and documents we send out to the team. It’s all the meetings we attend. Communication is reporting on the project status, archiving information, and sharing lessons learned. It’s handling stakeholder issues and concerns. This is plenty of stuff, so something can be misunderstood easily and we can become a bit sloppy over time.

So, if we are allocating 90 percent of our time to communication, and we’re blending several people into the mix, and one of them is the customer, shouldn’t we be getting better at it if we can? Here are some approaches to focus on:

1) Establish a communication plan. Without a plan, information flow gets unwieldy and teams can be overwhelmed. A plan helps us decide what is critical and what is not. It identifies who needs various kinds of information, how it’s published, and who’s responsible. This plan also should contain the guidelines and ground rules for project meetings, e-mail protocol, status updates, and backup contacts when the main recipient is away. This also is referred to as a RACI diagram; it designates who is Responsible, Accountable, Consulted, and Informed on a project team.

2) Createmeeting agendas. Anyone leading a meeting should have an agenda prepared in advance. Everyone loathes meetings that seem to go on forever, so prioritize the items that need to be discussed and set the length of time for discussion. If one of the team members has a quick issue but doesn’t need to attend the entire session, address that first so he or she can leave. Be respectful of everyone’s time — and of your own time — and rein it in when things start to drift. Distribute minutes consistently and, if you are not the author, make sure you check those minutes for accuracy.

3) Document, verify, archive, and share. Good project managers collect a lot of information. The project environment is a busy one and, despite our best attempts, we — or our clients — are going to forget things. E-mails, memos, letters, and sketches are important project documents that tell the story of what was said and what was decided. Taking the time to confirm a conversation is worth the extra minutes in our day. These records only benefit our firm if they’re easily available and archived in a sensible manner. Project managers also have an obligation to share lessons learned — especially if it helps the team achieve greater future success.

4) Develop skills. Though we all communicate every day, it’s still a skill that can be developed. For example, we can become better listeners by paying closer attention and improving our recall. And we can become better writers: After all, if most of what we want to express will be expressed in e-mails or memos, using good grammar and a positive tone is an essential job skill. We have a lot of technology at our disposal, but that doesn’t mean we should hide behind it. As a general rule, if an e-mail has exceeded three exchanges between all the recipients, it’s time to pick up the phone or meet to resolve the issue.

5) Understand your responsibility. Just sending an e-mail or making an announcement doesn’t guarantee that communication has been achieved. If we’re the ones distributing information, we’re responsible for ensuring that our transmission is clear and complete. Also, we need to confirm that this information has been understood properly. Simple validation, follow-ups, and check-ins should do the trick.

Christine Brack, PMP, is a principal with ZweigWhite specializing in business planning and project management best practices. She can be contacted at cbrack@zweigwhite.com.

“The single biggest problem in communication is the illusion that it has taken place.”
— George Bernard Shaw

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So, what is this all about? Knowledge management (KM) means developing a firm’s body of expert knowledge and making it accessible to the entire firm. Thought leadership (TL) means developing new and innovative ideas through research and application, then sharing these ideas in a way that improves the profession and the industries we serve. Thus, KM and TL probably is the most important background work that should be taking place in any design firm. So, after reading the first few responses when a KA Connect (www.ka-connect.com) blog posed the question, “How would you make a compelling case for KM and TL to an A/E/C organization CEO?”, I felt compelled to enter the dialogue.

The discussion revolved around a concern that fee pressures and survival instincts were combining in firms to discourage or stop investment in KM and TL. “It’s all about billable hours,” one person responded. “Who has time to invest in KM and TL? How can we convince our CEO to resume funding for this sort of thing and continuing education as well?” I was concerned about what I was hearing because I believe that successful firms create and sustain a culture of KM and TL despite economic conditions. In fact, KM and TL never work if directed or assigned.

Knowledge comes as a result of passions. You search out deep knowledge about something because you’re passionate about it. You connect yourself with others who share your passion. The proliferation of knowledge in a firm and access to it comes as a result of a culture in which people share their passions. When passions are broadly known in a firm, you know who to ask about what, with whom to talk to gain knowledge about your problem, and who will answer your question in context.

Knowledge assets are not assembled. It’s not enough to build and rely on an elaborate electronic database of knowledge. What yields results is having the will and taking the time to build a culture that will use the electronic compilation to connect with the person who has the knowledge to facilitate (no, lubricate) that connectivity. The important thing is not spending the money, it’s building a culture of rich networks that share and collaborate.

Likewise, TL is the outcome of a passionate commitment to a subject. People become thought leaders because they constantly are gathering knowledge about a subject that fascinates them so much that they never stop gathering data and talking to people who also are deeply engaged. It’s not a matter of diverting effort from otherwise billable time. These are people who invent time to pursue their passions. Thought leaders just can’t help themselves. If someone thinks they have to ask for permission to spend time on something, they’re either not passionate enough or you have a very oppressive culture in your organization. Your culture, not your billable time policy, is what supports people’s passions, encouraging them and creating a platform (print, speaking engagements, membership in related organizations) for them to expose their thought leadership.

If you have to pitch your CEO to resume your focus on KM and TL, why aren’t you the CEO? He or she has clearly lost his or her way. I don’t care how tough the market or the economy are, the CEO’s role, through thick and thin, good times and bad, remains the same:

- Lead client relationships — for sales, referrals, and satisfaction.
- Create an atmosphere where people want to work collaboratively with you and each other to do work that makes your clients successful.
- Contract for services and manage their delivery in a way that generates profits.
- Create a collaborative atmosphere with all stakeholders (contractors, subcontractors, suppliers, manufacturers, building officials, lenders, everyone) to bring the best and brightest resources and work effort to bear on your clients’ matters.
- Lead innovation through KM and TL.

Based on the number of people responding to my blog post who shared painful stories and concerns about their firms, there are some terribly repressed people and oppressive cultures out there right now. It reflects how deeply affecting this recession has been. At the same time, I’m working with companies and individuals who have held their course — CEOs who continue to pursue and support passions. I hope yours is or moves quickly toward being one of them.

Ed Friedrichs is chairman of ZweigWhite. He previously was president of Gensler, Architecture Design and Planning Worldwide. During his tenure at Gensler, he established the firm’s successful practice areas in entertainment, transportation, urban and master planning, and strategic facility consulting. He can be contacted at info@zweigwhite.com.
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any firm owners are afraid to market their firms for fear that once the word is out that they are for sale, their perceived value will go down and their staff will leave. This is not the case, and all principals should be prepared to sell at any time to truly maximize the value of their firms. Be prepared to sell yourself, your people, and your firm at any moment. You never know when the right buyer might present themselves.

Promote your firm so you can be viewed as a desirable buyer and suitor as well. Every owner is a buyer or a seller, depending on what day of the week you talk to them. Think: “closing a deal with a desirable firm,” and don’t worry about what side of the table you might be perceived to be on. This mindset allows you to think and grow rich in today’s mergers and acquisitions (M&A) landscape, where consolidation is dominant.

Watching Donald Trump the other day, I was reminded how brilliant a salesman he is by constantly promoting all of his assets, and even his liabilities. Tacky, gaudy, and obnoxious at times, yes, but incredibly talented in creating value through his persona and brand.

He plans to run for president in 2012. Recently, he was the target of a Celebrity Roast on Comedy Central. He loved it. Any mud that could be slung at him was thrown his way — but it was done in an environment that was controlled by him. He is the consummate dealmaker. You always will find him selling his assortment of baubles and wares — from buildings to mainstream media shows — his confident grin letting everyone know that if he doesn’t get what he wants at that particular moment, he will eventually. It’s just a matter of time. Even if you dislike him, it would be hard to deny his skill as a dealmaker.

Napoleon Hill is another great salesman from the last century. His beliefs and books have helped millions become more successful. He learned from studying many of the masters of industry during his generation — Edison, Ford, Morgan, Carnegie, and Schwab, to name a few. These men knew how to make a deal.

Morgan, Carnegie, and Schwab did what many today would view as the quintessential industry roll-up when they formed U.S. Steel. They all made out like bandits! Morgan and his buying syndicate made hundreds of millions, more than doubling the value of the previously separate entities before the deal, while Carnegie, as the largest seller, made his fortune as well. This was a transactional success for both the buyer and seller of such monumental proportions that it is a cornerstone to my belief that this deal — or any deal — requires at least one knowledgeable industry expert to champion and pitch the arrangement. Charles Schwab was that person in the U.S. Steel story. He negotiated the buyout of Carnegie assets that led to the formation of U.S. Steel. According to the company’s website, when founded in 1901, U.S. Steel Corp. was the largest business enterprise ever launched, with an authorized capitalization of $1.4 billion.

Following are my key points as to why it is so important to be a dealmaker in today’s A/E market for M&A:

- If you’re not active in M&A discussions, you’re not a player, but rather a pawn threatened to be knocked off the game board at any time.
- Your firm intelligence and overall industry IQ increases dramatically by looking at acquisition targets as a buyer or at possible suitors as a seller.
- Growth through acquisitions versus organic growth is simply faster — but not always better. When you do acquire or merge successfully with another firm, the opportunities are numerous and extremely advantageous, from cost-cutting and shared services to cross-selling and leveraging client relationships, not to mention how many items can be written off as a cost of the transaction.
- You can make the world a better place through better M&A. Architects and engineers long have been seen as civic leaders. Do you really want the real estate developers and the Donald Trumps of the world to have all of the power deciding what gets built and what doesn’t? Empower yourself and your firm and become a dealmaker.

There is no doubt that one can grow rich through M&A and give back to the community in return. You also can lose your shirt. Be smart about those you align with in building your M&A team. Hire the right advisors, attend the best industry events, and don’t be afraid to try and fail at this game, provided you know how to mitigate the risks. The consolidation trend can be your friend. Be a dealmaker and control your firm’s destiny with successful M&A.

Jeff Clark is managing director and principal of the M&A team for ZweigWhite. He can be reached at 919-931-9936 or jeffc@zweigwhite.com.
Firm owners: You could be your own worst enemy

There is a four-letter word that likely is the first formed in the mind of an investor when determining whether or not an investment may be worthwhile: Risk. Anyone with a pile of money looking to invest does not generally do so without first assessing the riskiness of an investment, the likelihood of receiving a return on that investment, and the level of risk present to determine how much return will be required.

People usually think of big, publicly traded companies when investing and do not put as much emphasis on returns when dealing with private companies. In many cases, people investing in closely held firms tend to look at it more from the perspective of lifestyle than a formal investment; the “returns” are more along the lines of independence. When it comes to valuing private company shares, the valuation exercise requires development of rates of return, and firm owners should expect not just a return of investment, but a return on investment.

Most private company valuations, including architectural, engineering, and environmental consulting firms, are performed under the premise of fair market value as defined in IRS Revenue Ruling 59-60, the ruling most commonly prescribed as a guide for the valuation of closely held companies and their securities. This ruling enumerates several factors for consideration, including the earning capacity of the business. Enter the Income Approach.

The Income Approach uses a financial return stream to develop an indication of value for the subject interest. In doing so, the appraiser must develop a discount rate that is the proxy required return for the hypothetical buyer. There is more than one technique for developing a discount rate, but the build-up methodology demonstrates how the risk level present in a closely held company can impact value.

In the build-up methodology, the discount rate is “built-up” from empirical financial risk components derived from the public markets. In today’s economy, that rate is in the neighborhood of 15 to 17 percent, or slightly higher if the appraiser determines that a size premium rate from the smallest of the small companies is warranted. One additional component is necessary to account for the fact that your closely held firm likely is much different than a company traded on an exchange. This last component is called the company-specific risk premium because it is specific to the subject business being valued. The specific company risk premium is of primary importance to you as a firm owner or principal because this is where the rubber meets the road in terms of driving firm value up or down. Take a minute to run down this list and ask yourself where you think you might stand:

- Financial condition — When was the last time any financial analysis was done in your firm to determine performance levels such as liquidity, receivables collection, working capital, debt burden, et cetera?
- Asset risk — Engineering, architectural, and environmental consulting firms have a significant amount of value wrapped up in intangible assets, such as reputation and client base, that can erode quickly unless consistently nurtured. What are you doing to ensure and sustain a strong value for your firm’s goodwill?
- Competition — What are your strengths and weaknesses when compared with the competition?
- Management quality and depth — Do you have depth on your bench or do you rely heavily on a few top players?
- Diversification — Are you diversified in size, geography, and customer base? If your AEC firm relies on a handful of clients to make up a majority of revenue, the upward impact on risk is substantial.

To demonstrate the influence that a rate of return has on value, assume that a firm has net cash flow to equity of $500,000. That is the cash flow available to the shareholders that is free of working capital requirements and expenditures. Also assume that the rate is inclusive of the company-specific risk premium and long-term growth has been accounted for.

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Based on the concluded rates, the spread in value indications is $500,000, or an entire year of cash flow! No one likes “leaving money on the table.” Spending some time understanding your firm’s risk drivers and addressing those on the high end of the scale could be time wisely spent.

Tracey D. Jeffers, MBA, CBA, CMEA, is the principal of Valuation Consulting for ZweigWhite. Contact her at tjeffers@zweigwhite.com or 479-582-5700.
It's important for all civil engineers to know some important facts of civil-engineering life. The more of these facts you're aware of, the less risk you have to deal with, which is why, in well-run firms, the following facts are “old news” to every professional on staff:

Fact — The people who decide what you should or should not have done on a project, and whether or not you performed negligently, seldom know anything about civil engineering.

Fact — You do not have to be licensed or certified to be sued for professional negligence.

Fact — As a professional, you are personally liable for your own professional acts and the professional acts of those you supervise. “Professional acts” include writing and speaking.

Fact — Your personal liability can outlast your firm’s liability — your firm’s going out of existence does not relieve you of personal liability.

Fact — Many corporate entities, especially limited liability companies (LLCs), dissolve themselves out of existence once a project is complete. As such, when a problem is discovered, civil engineers may be among the only parties left to sue because of their personal liability.

Fact — As a professional, you owe a duty of care to every party that foreseeably could be injured or damaged by your negligent acts. For example, if you do the civil engineering for a housing development, you owe a duty of care to every homeowner.

Fact — Your personal liability may outlast you! (Your estate can be sued for your alleged negligence.)

Fact — Although your employer may have professional liability insurance (PLI) in place, the cost of defense and judgments could exceed the limits of the PLI policy. If your employer does not have the resources to cover all claims expenses stemming from your alleged negligence, you feasibly might have to cover some on your own.

Fact — When you moonlight, you become 100-percent liable for all your independent professional acts. If you moonlight without having your own PLI in place, you could be taking a huge risk. The volunteered services you provide in your professional capacity — be they on behalf of a religious group, community organization serving the homeless, an animal shelter, or some other worthwhile cause — all are considered moonlighting, unless you are performing on behalf of the organization that employs you.

Fact — Even a community organization you provide civil engineering services for at no fee may have to sue you to retain its own insurance protection. For the same reason, you might have to sue the community organization.

Fact — A written agreement in which your client agrees not to sue you even if you are negligent is generally of no help at all.

Fact — All projects you perform are governed by a contract. If you have not committed the contract to writing, a judge or jury will tell you exactly what it says.

Fact — Providing flawless instruments of professional service is not the best defense against claims. (What is and what are you doing about it?)

Fact — In most states, parties other than your client (i.e., third parties such as contractors when your client is the owner) cannot file a professional negligence claim against you for purely economic damages (damages unrelated to personal injury or property damage). Nonetheless, third parties in many states can sue you for negligent misrepresentation (negligently misrepresenting that the instruments of professional service you developed incorporated no negligent errors).

Fact — Although most civil engineers do not like to write, they are more liable for what they write than most other professionals. You need to know why “certify” and related words can create far more risk than alternatives, and why the additional risk usually is uninsurable. You also need to know why those who claim that their firms offer “full service” or adhere to the “highest standards” are creating needless risks for themselves.

Fact — Although most civil engineers provide a wide array of deliverables as written documents, the vast majority do not know how to proofread.

If you already knew all this, great; chances are you’re applying your knowledge and running a better business as a result. If you didn’t already know all this and want to learn more, you should take advantage of the copious programs and materials available (www.asfe.org is one place to start). And if you didn’t already know all this and even if you don’t care to learn more, you still will — the hard way.

John P. Bachner is the executive vice president of ASFE/The Geoprofessional Business Association, a not-for-profit association of geoprofessional firms — firms that provide geotechnical, geologic, environmental, construction materials engineering and testing (CoMET), and related professional services. He can be contacted at john@asfe.org.
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<th>BEST PRACTICES</th>
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In the architecture, engineering, and construction (AEC) world, project delays and cost overruns seem to be the norm instead of the exception. We have all heard of diverse, high-profile projects that have failed spectacularly with massive budget overruns and delays. But any high-profile examples you can think of are only indicative of an industry that wastes more than $120 billion annually in the United States alone because of out-of-control delays, cost overruns, and other inefficiencies, according to author Barry B. LePatner in his book, “Broken Buildings, Busted Budgets.”

LePatner placed some of the blame for these gross disparities on the lack of technology in the industry. Construction ranks the lowest among U.S. industries in the amount of money invested annually in technology, he wrote. This is shocking when you consider that technology could create a collaborative environment that provides transparency between all the stakeholders in a project and improve efficiencies at all levels.

Making matters worse, today’s construction and engineering industry faces new challenges. Capital spending is down, regulatory requirements are up, and all stakeholders involved in projects are looking for better ways to improve efficiencies and save money. The industry must optimize the use of limited capital to meet increasingly rigorous stakeholder demands.

At the same time, the one constant in construction is change. At any moment, a smooth-running project can be slowed by differing site conditions, design conflicts, supply chain problems, or inspection delays. It’s simply impossible to sit back and assume that you will have the data that’s needed to meet regulatory reporting requirements on time. It requires a forward-thinking view to anticipate and react quickly to these unexpected changes.

**Virtual visibility**

Enterprise project portfolio management (EPPM) solutions can help solve these issues. By providing a standardized approach for creating visibility and transparency into all projects, they enable groups of people representing different disciplines — from project managers, contract managers, and division managers to subcontractors, architects, engineers, suppliers, and owners — to collaborate on many issues and changes in a virtual environment. This in turn enables teams to juggle multiple documents and contracts, allowing greater agility for managing project changes while...
facilitating better strategic planning, management, efficiencies, and cost savings.

Without that kind of technology, it is difficult to get all of the stakeholders who are involved in the delivery on the same page, especially when they are often based in different locations. Each construction project involves an intricate web of relationships between owners, contractors, designers, engineers, and subcontractors — each with their own relationships, methods, and technologies. Yet, many best practices, best resources, cost-saving efficiencies, and information for regulatory reporting are not shared because the information is contained in “silos.” Each new project starts again from scratch.

That disconnect costs all stakeholders time and money. The lack of transparency and visibility prevents stakeholders from making factual, metrics-based project decisions.

For example, status updates and regulatory reporting requirements, whether health and safety related, Sarbanes-Oxley (or equivalent) mandated, public funding required, or simply owner-required reporting, traditionally involve a lot of paperwork and scrounging for data. Often, those in charge of producing these reports cobble together spreadsheets from many sources in various formats.

At the project level, managers often lack a system of accountability and team coordination. What’s more, they don’t have the ability to manage changes to the project proactively and plan for changes in resources.

AEC firm executives want to maximize project and program profitability, but often they can’t get a clear view across all projects when it comes to resource allocation, cross-project efficiency gains, or looming project problems.

Owners and executives also face stringent timeframe-to-market requirements and must make progress payments, but they lack one clear version of the truth from all contractors, designers, engineers, and other stakeholders about the progress of the project. At the end of the day, these stakeholders want to know what a project will cost, when a project will be done, and have that information summed up for all of their projects.

If they were able to create a virtual environment that could bring all of the constituents in a project together, they would be able to create a clear view of project performance from the project level to the executive suite. That kind of transparency and visibility is critical for better business management and strategic planning within an organization, as well as across project stakeholders where appropriate.

With EPPM in place, project managers can quickly capture and disseminate project information — such as cost to date, projected cost at completion, and project delivery dates — and easily maintain full accountability across the project team through easy status updates.

Managers have real-time access to all relevant project information and statuses, including requests for information (RFIs), submittals, change order requests, and schedule updates. They can focus on managing projects rather than chasing down paperwork.

For owners and executives, EPPM provides one version of the truth with real-time data across all projects and rolled up to divisions or groups, with clean and relevant reports. It enables them to maintain accountability across all stakeholders to mitigate and avoid claims. By providing a framework to standardize and codify business processes and project best practices, EPPM enables owners to reduce overhead and drive productivity.

Stakeholders know exactly where projects stand and can assess proactive measures quickly to ensure capital projects meet time-to-market requirements. What’s more, EPPM gives easy visibility into real-time contractor performance across time and projects to optimize long-term supply chain relationships.

Project benefits

With such clear benefits, many firms in the AEC world now are leveraging EPPM technologies to help prevent project delays and cost overruns. One example is Cannon Design, an international architectural, engineering, and planning firm. The firm used EPPM tools to manage the architectural and engineering work for the Richmond Olympic Oval, the site for the 2010 Olympic and Paralympic Winter Games and centerpiece of a major new urban waterfront development in Richmond, British Columbia.

To manage a project of that scale and complexity within a restricted timeframe, Cannon Design took advantage of its “single-firm, multi-office” structure to share best practices and streamline processes across the many offices involved with the project. Additionally, to complete the project within a restricted timeframe, Cannon Design needed to ensure timely responses to thousands of RFIs and submittals, the process by which a contractor seeks architectural approval for specific products.

Leveraging its EPPM system, Cannon Design enabled a large team of architects, engineers, and construction managers in multiple offices across North America to coordinate with owners and contractors around RFIs, submittals, change orders, project finances, and more — regardless of their physical location — in a collaborative, virtual work environment.

The enhanced collaboration has helped Cannon Design successfully manage hundreds of projects and coordinate thousands of documents, avoiding delays and liabilities and resulting in an average 20- to 35-percent reduction in turn-around time for RFIs and submittals.

The EPPM system also ensured that the project was compliant with internal best practices and industry standards by providing analytical data that the Cannon Design team lever-
aged continually to refine and improve the review process and performance during the entire project lifecycle.

As the centerpiece of a major new urban waterfront neighborhood and an international destination and meeting place for diverse indoor and outdoor recreational activities, shopping, and services, it was imperative that the Richmond Olympic Oval incorporated cutting-edge sustainable design.

According to Gustavo Lima, principal and director of construction administration at Cannon Design, there are many components in the construction of a sustainable structure of this magnitude, each of which needs to be analyzed against strict parameters established by the Green Building Council.

By allowing Cannon Design to maximize productivity and reduce risk throughout a 20-month construction phase of the Richmond Olympic Oval, its EPPM system ensured that a cutting-edge, sustainable design was completed on schedule and within budget. By using an EPPM solution, Cannon Design also was able to meet the rigid demands of the LEED Silver certification. The Richmond Oval is a multi-international, award-winning facility and a model for sports and wellness facilities worldwide.

As examples like this show, having a clear view ahead — through transparency and visibility — no longer is just an option for navigating the changing dynamics of project delivery in the engineering and construction industry. While the industry cannot predict every mishap, supply chain delay, or economic downturn that may affect a project, it can adopt the tools that enable it to look forward into projects, proactively plan for potential problems, and have scenarios in place that let it react quickly to setbacks.

An EPPM solution does this and more, enabling engineering/construction organizations to gain efficiency by standardizing operations in an automated format while providing a collaborative, virtual environment that delivers visibility and accountability across projects, programs, and the enterprise. ■

Garrett Harley is engineering and construction industry strategist for Oracle’s Primavera Project Portfolio Management group.

For more information on project management, go to www.aectechstrategies.com/project-management.html.
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Whether the economy picks up or not, professionals in any industry must look to the future. One way to do so is through technology. When it comes to the architecture, engineering, and construction (AEC) industry, the AEC Technology Strategies Conference is a great way to strengthen this knowledge.

The 2011 AEC Technology Strategies Conference, in its 12th consecutive year, provides information technology (IT) sessions, exhibits, and networking opportunities to forward-thinking business and IT leaders in the AEC industry. Professionals holding such positions as chief information officer, vice president of technology, IT director, president, CEO, principal, human resources director, market analyst, consultant, and software and service solution providers all will be present at the event. This year, it will be hosted at the Hilton La Jolla Torrey Pines in La Jolla, Calif., from June 9-10.

The 2011 conference host will be Chris Pinckney, chief information officer at Psomas. Each day will feature concurrent breakout sessions, general sessions, and solution showcase sessions (where vendors will be able to describe their products and how they will help IT managers). The following abstracts offer a taste of these thought-provoking sessions:

- **Models as Wikis: Source control, model servers, and cloud systems for open 3D concurrent design** — Dennis Shelden and Andrew Witt, Gehry Technologies: Learn how distributed group authorships transforming 3D design and creating new opportunities, innovations, and competitive pressures.
- **Managing technological change** — Gerri King, Ph.D., Human Dynamics Associates Inc.: This session addresses the challenges of dealing with changes in technology while offering techniques for facilitating transitions.
- **Legal ramifications related to the use of technology by design professionals** — Ted Levin, P.E., and D. Creighton Sebra, Esq., Morris Polich & Purdy LLP: This session exposes the legal issues and the potential for liability related to the use of technology in the design and construction phases of the building process.
- **Technology frameworks for project teams** — Jim Forester, P.E., Newforma Inc.: This talk explores technology in regards to the growing demands for transparency, accountability, complexity, and communication in the context of Newforma customers who have implemented a project information management (PIM) strategy in their firms using Newforma Project Center.
- **Thought leadership 2.0: How social media tools will impact the way you develop and market your firm’s expertise** — Christopher Parsons, Knowledge Architecture: Learn how Knowledge Architecture has helped architects and engineers apply traditional and emerging social media and web 2.0 tools to create, market, and leverage knowledge.
- **Integrating your virtual world** — Wes Peper, Coffman Engineers Inc.: This session will revolve around a case study of the methods used to create a virtual environment along with some of the inexpensive tools used to protect the firm environment.
- **iCoexist: Integrating Macs and Apple products in your PC environment** — Michael Rinken, FRCH Design Worldwide: This session will focus on some of the specific technologies and practices that have allowed FRCH to provide service and support for its Mac users.
- **Rich opportunity for IT and business through the use of unified communication** — Pejman Saifi, BSc. PMP ITMCP PMCP, Halcrow: This session will demonstrate how Halcrow, through the use of Microsoft Lync and Cisco Unified Communication platforms, will empower its global skills and people in more than 100 global offices to deliver high-quality, valued services to its customers.

Early bird registration pricing for the event is $995, and $895 for additional attendees from the same firm, before May 9. After May 9, registration is $1,095 for the first attendee and $995 for additional attendees from the same firm. ZweigWhite has reserved a block of rooms at the Hilton La Jolla Torrey Pines for a discounted rate of $149 per night. To receive this special rate, attendees must reserve their rooms before May 18. For more information, visit www.aectechstrategies.com/welcome.html.
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During the recent Geo-Frontiers 2011 event in Dallas (March 2011), barrier geosynthetics were high on the discussion list. A special panel session addressed the differences between geomembrane installation practices in North America and Europe. Another session focused on liner integrity (leak location) surveys. And the Geosynthetic Institute’s GRI-24 symposium focused on sustainability issues, such as the staggering statistic that it takes 150 truckloads of clay (for compacted clay layers) to equal the performance of a single truckload of geosynthetic clay liners (GCLs).

In addition to these matters, three other barrier issues stood out: the forthcoming direct shear results guide from ASTM Committee D35 on Geosynthetics; the important role ethylene vinyl alcohol (EVOH) can play in gas barrier performance; and the new utilization of trenchless, anchored, exposed geomembrane caps.

Guide for evaluating direct shear

ASTM Committee D35 soon will publish a much-needed guide for evaluating direct shear results involving geosynthetics. Some projects have been rejected because of misinterpretation of interface shear strength results regarding GCLs, geomembranes, or other geosynthetics.

“On a slope, those types of interfaces can be the critical slip plane,” said Chris Athanassopoulos of CETCO Lining Technologies. Athanassopoulos took the lead on compiling D7702.

“You need to look at everything in terms of shear strength and not just friction angle and adhesion.”

Both note that D7702 will greatly help ease the process of updating specifications, the wide range and differing quality of which have helped bring this guide into existence.

The D7702 guide does not say explicitly how things must be done, but it does provide ample evidence for the designer to know just how conservative his design might be. Ultimately, the guide is intended to assist designers and users of geosynthetics. It is not intended to replace education or experience and should only be used in conjunction with professional judgment.

Athanassopoulos and his industry colleagues have assembled around 40 reference documents in D7702. “For people who don’t work with these materials every day, they will be able to go to one location to help them evaluate their direct shear test results,” Athanassopoulos said.

Arrival of EVOH

The plastic snack cups of peaches and pudding you see in the grocery store have inspired what may be the next big option in geotechnical and architectural barrier membranes: heightened gas barrier performance. Food packaging may seem simple, but those little plastic cups and bags can be five-, seven-, or even nine-layer structures, incorporating resins designed to optimize moisture and gas barrier performance. These constructions protect the freshness of food and extend shelf life from days to months and even years. Soon, these materials may be part of many protection designs for basements, brownfields, and groundwater.

Geomembranes and GCLs perform exceptionally well in liquid containment applications, but gas barrier performance still can be improved. Volatile organic compounds (VOCs) can diffuse through barrier geosynthetics. The rate is low, but the incorporation of EVOH into select geosynthetics in lab and field tests shows that the diffusion rate can be much lower (see Table 1).

The immediate potential for EVOH seems to be in vapor retarders for commercial/residential construction and brownfields on the more traditional geotechnical side of things.

Raven Industries is the first manufacturer to utilize EVOH in its geomembranes. “Geomembranes were not our first tar-
get,” said Raven’s Gary Kolbasuk. “We asked where else we could use this kind of technology. One idea was in agriculture for things like broadcast fumigation film, mulch film, silage film, things of that nature. For construction, there’s underslab vapor retarders for radon and VOC control.”

EVOH is part of the polyethylene family (in that it consists of ethylene and an ethylene molecule with an OH group on it), and it’s easily co-extruded with materials such as linear low-density polyethylene (LLDPE), high-density polyethylene (HDPE), and polypropylene. EVOH is a polar molecule, making it a strong barrier to non-polar contaminants such as VOCs. Polyethylene (PE) is a great barrier to water. The incorporation of EVOH with PE leads to some wonderful performance properties in a geosynthetic composite.

For larger-scale membrane production, one challenge is that EVOH and PE don’t bond to one another. A third polymer, or tie layer, is needed on either side of the EVOH. The tie layer is a modified PE (typically with maleic anhydride) that bonds physically and chemically the EVOH and the primary geomembrane polymer. These products must have at least five layers (primary polymer, tie layer, EVOH, tie layer, primary polymer). While this structure is common to food packaging, most geomembrane manufacturers do not have the dies necessary for this type of production.

“For geomembranes, it’s going to take some investment in co-extrusion,” said Robert Armstrong of Kuraray Americas. The company’s EVAL unit produces EVOH. “We’ve investigated a lot of ideas on how to incorporate an EVOH barrier liner and cover systems … For example, in addition to producing unreinforced and reinforced co-extruded 40- to 60-mil geomembranes with EVOH, it would be perfectly possible to sandwich a GCL with a thin EVOH co-extruded barrier film that could be made on existing co-extrusion equipment. That would be another way of getting the EVOH barrier into a project’s system.”

Such a solution may be applicable to brownfield capping fairly soon. As for geomembranes, it may be only a handful of months before thicker membranes with EVOH are available. Raven currently is installing a line that will have the capacity for 60- and 80-mil LLDPE and HDPE geomembranes with EVOH. That line is expected to be operational later in 2011.

If there is anything that designers may need to do in order to transition to this option, however, it may be in the need for new seam-testing specifications.

“You may see some separation between the EVOH and a high-density layer,” Armstrong said. “You might not get complete cohesive failure, but perhaps some delamination in seam testing.”

“The bond between the various layers is not as strong as, say, the internal strength of polyethylene,” Kolbasuk said. He likens it to reinforced membranes, which have similar seam-testing issues. “What you start doing is a ply-adhesion test, peeling the layers apart as you continue the seam test. That’s perfectly normal for a reinforced geomembrane … With EVOH, you’re going to see the same kind of phenomena; so people really need to think of the EVOH as a reinforcement layer when seam testing. You’ll see this delamination in the peel test.”

Will EVOH incorporation affect the performance of these membranes? The EVOH is a thin layer, so even though it is a highly crystalline component, a higher modulus material, its impact on barrier flexibility is negligible. It will alter ultimate elongation values in non-reinforced membranes, but it won’t alter material use. For example, pre-fabrication of flexible membranes with EVOH will not be limited. And no problems have been found in welding these materials.

Furthermore, research conducted by Rebecca McWatters and R. Kerry Rowe, Ph.D., at Queen’s University in Canada has shown that the VOC barrier properties of even monolayer EVOH film submitted to 100 percent relative humidity — an absolute worst-case condition — remain several orders of magnitude higher than normal high-density polyethylene. From this we can assume that even at the edges of a panel of EVOH-enhanced material, there will not be limited performance or any elevated design risk involved.

Both Kolbasuk and Armstrong expect to see EVOH in barrier materials at landfills, brownfields, and secondary containment sites soon. Kolbasuk
ments a small project example from Sioux Falls, S.D. The city wanted to convert a brownfields site into a farmers market. “There was VOC contamination,” he said, “so they put an EVOH membrane down before the concrete.”

It’s a fairly simple solution, and there are plenty of opportunities, such as in the beneficial conversion of areas contaminated by former dry cleaners, gas stations, military operations, etc.; anywhere common to VOC contamination and, perhaps, heightened environmental rules.

Also, there is the possibility of EVOH being incorporated into HDPE pipe, which would allow a level of diffusion protection that PVC pipe cannot offer (EVOH and PVC are not really compatible). This could allow for pipe running through contaminated soils or new solutions in oil and gas exploration applications.

No more trenches?

Exposed geomembrane covers are not new solutions for landfill cell closure, but they have not always been welcomed by local officials. Often, this has had to do with aesthetic reasons, but a number of new approaches to the exposed cover have revived this design option. The addition of thin-film photovoltaic cells to the surface of exposed membranes has garnered great interest. The availability of green-tinted membranes also is helping. And synthetic grass installed atop an exposed membrane, such as with the ClosureTurf system, has entered the market.

American Environmental Group Ltd. (AEGL) now is offering a system that highlights the cost reduction and time-saving qualities of exposed membrane capping systems. In cooperation with Platipus Anchors Inc., AEGL has developed a trenchless, anchored, exposed membrane system.

“Trenching increases the scheduling length and overall project costs substantially,” said AEGL’s Chris Eichelberger. This new anchor system is faster and more cost-effective.

Trench construction is necessary for traditional coversystems, whether they use exposed or soil-covered membranes. However, trenching is a source of significant cost increase. Even a small 5-acre footprint can require 10,000 linear feet of trench. Since liner can be installed much faster than trenches can be dug, liner installation teams often are made to wait; but they have to be onsite as the trench work occurs. Trenches cannot be left open overnight due to odor concerns; they must be utilized as soon as possible.

“Backfilling becomes an issue too,” Eichelberger said. “Typically, the engineer will specify a certain density of soil weight that is required as ballast. So an earthwork contractor is trying to backfill and compact soil on a section of waste mass.”

Another issue is that in digging a trench, you inevitably encounter waste. It’s often old and produces odor. It must be collected and reburied elsewhere, adding to the site work. Also, hitting the waste changes the geometry of a trench; it often widens the trench.

Perhaps the most notable problem with trenches is that they eat up a good deal of liner as the liner is anchored in them. On that small 5-acre footprint example, Eichelberger noted that between 7 and 9 acres of material may be needed to complete the installation. This material wastage adds cost.

“It really just comes down to the trenching,” he said. “Ballast trenching is necessary, but can extend the schedule and add substantial cost to the project.”

The trenchless system, which has been installed on a few sites already, utilizes percussion-based anchor installation. These anchors were known to work well in clay, sand, and gravel, but not a lot of data was available on how they would perform in solid waste. AEGL conducted preliminary tests with the anchors on a landfill site and used that data to ensure they could provide the amount of resistance engineers required in the design.

Currently, this system’s anchors have a maximum rating of 2,000 pounds, which has been more than sufficient. No problems to date have been found on these installations, and two of the exposed covers have been quite large and have used a 40-mil HDPE geomembrane.

“The anchors aren’t going to be the determining factor,” Eichelberger said. “It’s really whether exposed geomembrane closure systems continue to gain momentum and acceptance across the industry. The anchoring system is a tremendous addition to the concept. Application areas may include gas, odor, and leachate management.”

Three uses for a system like this seem relevant for designers and site owners:

- Lower cost, lower regulatory end to shed leachate for one to five years. A less-expensivemembrane is perhaps a possibility here.
- Mid-range to shed leachate and control odors or erosion (e.g., cover 15 to 20 acres on short notice). These exposed cap designs target five to 10 years.
- Large-scale — When thermoplastic polyolefin or 60-mil HDPE are approved for long-term use in an exposed cover design, these designs serve 15- to 20-year cover plans.

Exposed caps offer many benefits. They aren’t subject to the stability concerns which come with soil covers. Hydraulic heads are easier to manage on an exposed cap, any need for repair is far easier to spot and handle, the construction window is much shorter, and the airspace available for waste burial is greater (meaning a longer service life).

The economics are certainly on the side of exposed caps, but designer and regulatory familiarity with these options must increase.
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Firm Success.
If you are like most principals at engineering firms around the country, you probably are sitting on a money-making tool your organization already has paid for, but severely underutilizes. Chances are you are not fully aware of the power of the tool, or only are tangentially aware of its capabilities. Organizations across the country continue to pay for this powerful business development tool each year, but fail to reap the return on investment that rightfully is theirs.

Would it make any sense to purchase a robotic total station and not use the "robotic" functionality? Would you invest in the latest 64-bit computer hardware and install an antiquated 32-bit operating system that cannot even access the hardware benefits? And yet, year in and year out, this is precisely what most firms do with their CAD and modeling software. Most organizations figure out how to make the new software do what the old software did, barely scratching the surface of the power they just purchased.

Why do otherwise intelligent people running successful businesses or departments make such a decision? In my experience, the reason is that principals and others responsible for business development simply do not know what the software can do or the relative ease with which it can be done. Even more troubling for these key decision makers, they don’t know what they don’t know. Since its release decades ago, CAD and modeling software have been the domain of IT personnel, CAD managers, designers, and drafters.

With almost absolute delegation to one of the aforementioned, principals remove themselves from the process of research, evaluation, testing, RFP letting and review, and quotegathering. These tasks seldom benefit from the input of the business development team or the owners’ unique point of view. Usually, the only “input” the principals provide is the one related to the price of the software. This almost always results in final decisions being based on cost and not value.

Over time, this delegation can become detrimental to the health of the organization. Working in what they feel is the best interest of their bosses, those making the decisions about CAD and modeling software often end up shielding owners and principals from money-making opportunities.

Most business owners, principals, and business development managers keep themselves well informed of current market conditions that impact their businesses. They read trade journals like this one, attend association meetings, and read the paper and discuss the economic landscape with their colleagues. Almost without exception, as they go about this information-gathering and assessment process, they have a good understanding of the design resources available at their organizations. For example, principals know if they have the ability to perform an environmental assessment or watershed analysis, or to design a dam. Further, if the expertise does not exist on staff, they have a pretty good idea of what is needed and where to get it. Unfortunately, this same type of knowledge regarding their firm’s CAD and modeling expertise is not at the principal’s fingertips. Not only are they unsure of what personnel expertise is required, they also lack knowledge of their organization’s software capabilities.

However, not all firms are neglecting the power of CAD as a business development tool. Whether as an act of foresight of the looming recession or in a move to ensure the survival and future prosperity of their firms in the face of the recession, some organizations have taken a closer look at not only how to find new opportunities, but also how to create them. Following are a few examples:

• Building information modeling (BIM) now is a requirement on all U.S. General Services Administration contracts. Architects involved in these projects are looking for civil engineers with the ability to provide site models that interoperate with their BIM deliverables.
• Automated machine control has quickly become a common practice for earthwork operations. Detailed digital terrain models of the site are required and civil engineering firms are working with contractors to create these models.
• Visualization and simulation used to be a luxury performed by specialists after design was completed. Your modeling software now lets you create stunning visualizations that are integrated into the design process. This allows engineers to prepare better designs and convey design intent, and gives them an edge when competing for clients.

Please send me an e-mail and let me know what your firm is doing to develop new business and leverage its technology investments.

Mark J. Scacco, P.E., is the president and founder of Engineered Efficiency Inc., a nationwide BIM and CAD training and consulting firm. He appreciates your feedback at mark.scacco@eng-eff.com.

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Improvements in the engineering of wetlands for wastewater treatment during the last decade have helped increase the reliability of these natural systems. Engineers have borrowed the biology, chemistry, and hydraulics principles of the wastewater industry and are employing them successfully to create remediation systems that perform like conventional sewage plants but look like, well, just “plants.”

Inclusion of aeration in subsurface wetlands has greatly advanced the ability of the systems to degrade contaminants such as hydrocarbons and ammonia aerobically. This is critical for the design of wetland systems in applications such as produced water treatment or for nitrifying ammonia found in tailings ponds for gold mines. And by using hydraulic and thermodynamic principles, designers are creating wetland “reactors” that are stable and efficient.

As the design approach has advanced, the engineering of the systems also has been refined — from biological empiricism to chemical reactor design. This trend is particularly apparent for pump-and-treat remediation systems where engineered wetlands are proving successful and durable.

Wetland systems are larger than mechanical systems; however, there is a trade-off between the mechanical complexity and land utilization. Lagoons and wetlands don’t need as much attention or maintenance as their mechanical counterparts; they are big, simple, and low maintenance. With minimal moving parts, natural systems can be operated for decades without the need for overhaul or equipment replacement. The bottom line asset here is low lifecycle cost. The more that we exploit bacteria and other natural mechanisms, the less mechanical effort we need to use to get the job done (and ultimately, the lower the cost).

In addition, for site managers faced with the liability of contamination plumes affecting their neighbors’ groundwater, the liability is long term — decades not days. When pump-and-treat systems are used, the “treat” part must do the job for the long term as well. Treatment wetland systems have been selected for a number of high-profile remediation projects. They work and have low, or in some cases no, operation costs aside from routine yard maintenance.

Through a unique combination of natural processes, wetland systems are being used to remediate petroleum hydrocarbons found in groundwater. Treatment of a wide range of compounds including benzene, toluene, ethylbenzene, and xylene (BTEX) occurs through volatilization and aerobic biodegradation. Microbial communities in wetlands are known to break down...
many of these and other volatile organic compounds. Engineering a system that provides a consistent environment to allow such microbial communities to flourish during the extended life of the system is the challenge.

Remediation wetlands in action

Wellsville, N.Y. — Such a system is in operation at a former refinery in Wellsville, N.Y. The former site of an oil refinery from 1901 to 1958 is located next to the Genesee River. The long-term closure plan for the site includes a barrier wall to prevent migration of contaminated groundwater to other river. Groundwater extraction pumps deliver water to a treatment wetland constructed on site. The system consists of a cascade aerator, sedimentation pond, surface flow wetland, and vertical flow wetland and provides treatment for 650 cubic meters per day (m$^3$/d) of groundwater. The influent has elevated levels of iron, manganese, and petroleum hydrocarbons (including aniline and nitrobenzene).

The cascade aerator provides passive aeration of the influent flow, permitting the iron and manganese to be oxidized. The oxidized metals generate precipitates that are allowed to fall out in the downstream sedimentation pond. After the sedimentation pond, the flow enters a surface flow wetland, which is lined and operates at water depths between 0.3 meters and 0.6 meters. There are four cells in parallel (each 0.6 acres) designed to expedite the biodegradation of petroleum hydrocarbons in the water. Flow then is introduced into a vertical flow wetland comprised of limestone aggregate. The limestone beds are used to buffer the pH depression related to the upstream iron precipitation.

Casper, Wyo. — British Petroleum (BP) in Casper, Wyo., also constructed a petroleum hydrocarbon remediation system. The site includes an office park, river-front trails, and a whitewater-kayak course. The Casper system provides treatment of as much as 11,400 m$^3$/d of gasoline-contaminated groundwater. It is anticipated to operate effectively for more than 100 years.

This award-winning wetland project is one of the largest petroleum remediation wetlands in North America, and one of the first wetland treatment systems designed specifically for cold-weather hydrocarbon removal. The design of the wetland was integrated into the golf course and many of the water features have dual uses for treatment and golf course play.

This project design includes a cascade aeration system for iron oxidation and air stripping, a soil-matrix biofilter for gas-phase benzene removal, surface flow wetland cells for removal of ferric hydroxide precipitates, stormwater retention wetlands, and radial subsurface flow insulated wetland cells for BTEX removal. Support of the design required conducting a pilot to determine site-specific rate constants.

Refinery site, Midwest region — Groundwater extracted from a former refinery site contains diesel range organics and gasoline range organics along with other conventional parameters. A treatment system based on constructed wetlands was selected to provide treatment of the groundwater because it could be constructed within the existing pond infrastructure on site and designed to have low, long-term power requirements.

The system includes a cascade aerator, mineral settling basin, and a three-stage wetland system: 1) a reducing stage, 2) an oxidizing stage, and 3) a polishing stage. The reducing stage is designed to facilitate the reductive dehalogenation of chlorinated organics such as trichloroethane and vinyl chloride, while the oxidizing stage is designed for aerobic degradation of benzene, gasoline range organics, and diesel range organics. Stage 1 (reducing wetland) employs a vertical, downflow configuration and stage 2 (oxidizing wetland) uses a conventional free surface wetland interspersed with aerobic zones. The polishing stage wetland is designed similar to the stage 2 oxidizing wetland but without aeration.

Wurtsmith Air Force Base, Oscoda, Mich. — A wetland treatment system is planned for construction at Wurtsmith Air Force Base. The pump-and-treat system is designed for a flow of 0.63 million gallons per day and treatment of trichloroethylene and other chlorinated hydrocarbons. The need for hydrocarbon remediation here results from a landfill onsite that was used during World War II and the Cold War. The system employs a cascade aerator for oxidation of metals. From the cascade aerator, the flow travels through a sedimentation pond where precipitates are allowed to settle. Following the sedimentation pond, flow continues through a free watersurface wetland and a subsurface wetland before final disposal by soil infiltration.

There are no motors or other mechanical components following the pumps that deliver the groundwater to the cascade aerators; operation and maintenance is limited to routine visual monitoring and grounds keeping. The subsurface wetland will be constructed with aeration lines in place as a contingency measure, but the manifold for the lines is not expected to be connected to an aeration unless needed. Ongoing operations costs will be limited primarily to the cost of operating the groundwater extraction pumps.

Looking good at 30

Treatment wetlands designed on proven science and common engineering practices are proving financially viable over the long haul. The good news is that the systems in the ground now will be around for many years to come and are expected to be working long past 30 years of age.
Any time you set out to build a large-diameter wastewater pipeline that is nearly 5 miles long and as deep as 20 feet, you are bound to face some challenges. But at the $41.2 million Plant Interconnect project in Pima County, Ariz., the design and construction team met those challenges and completed the big gravity-flow pipeline with no major problems.

Pima County’s wastewater reclamation system serves the greater Tucson area, with a population of more than 1 million, and covers approximately 2,000 square miles. A portion of that area — 473 square miles — is served by two wastewater reclamation facilities (WRF). One of them, the Ina Road WRF, stands 4.6 miles north of the Roger Road WRF.

The Plant Interconnect pipeline consists of 17,600 feet of 72-inch-diameter pipe and 6,600 feet of 60-inch-diameter pipe. The pipeline will carry an excess flow averaging 36 mgd (peak 81 mgd) from the new Roger Road facility north to the Ina Road plant.

The county chose Hobas pipe — a centrifugally cast, fiberglass reinforced polymer mortar — for the project. The Plant Interconnect project brings the total number of installations in the Tucson area in recent years to nine with this product.

“We briefly explored PVC pipe, but they don’t make it that big,” said Jaime Rivera, project manager for the Pima County Regional Wastewater Reclamation Department. “So that narrowed our search to two choices: a PVC liner for concrete pipe or Hobas. We had some issues with constructability of the PVC liner, so it was less risky to use Hobas. It is corrosion resistant with no added-on lining.”

Time-saving project delivery

By using the Construction Manager At-Risk (CMAR) delivery method, the county was able to slash four to six months from the time it takes to go from design to construction. With the CMAR process, Pima County selected the engineer — Brown and Caldwell — at the same time it chose a construction manager, the Sundt-Kiewit joint venture. Sundt-Kiewit subcontracted the pipeline construction to Don Kelly Construction, Bozeman, Mont.

Rivera said the conventional design-bid-build process takes four to six months just to advertise the project for bids, select the low bidder, get the low
That structure exceeded the county’s budget in order to protect the pipeline. The construction manager set $25.7 million as its guaranteed maximum construction cost — and, in fact, completed the project for less than that amount. (The $41.2 million cited earlier includes non-construction costs such as right-of-way, design costs, and program management.)

During the design stage, Hobas engineering staff assisted in preparation of lay drawings to identify the locations for fittings and deflected pipe joints to maintain the designed alignment, said Rene Garcia, EIT, senior engineering associate at Hobas. “We also provided input to the proposed installation method, and suggested trench details that would be easily constructible and provide the needed support for the pipe,” Garcia said.

Design was completed in January 2009, and the construction Notice to Proceed was given that April. Construction began shortly thereafter, and reached substantial completion by December 2010.

The project presented challenges in the form of two washes — river beds that are dry most of the time but flood occasionally and erode away the channel over time. The big pipeline had to cross under the washes with sufficient cover that floods would not reach the pipe’s crown. James Nichols, project engineer for Brown and Caldwell, said the county had two choices for building the wash crossings.

For one, it is possible to build an expensive grade-control structure directly over the pipeline. This structure would hold sediment upstream of the pipeline and would only allow channel degradation downstream of the structure in order to protect the pipeline. That structure exceeded the county’s budget. Therefore, it was decided to use two siphons to carry wastewater under the washes.

When a siphon is installed to go beneath an obstruction or river channel, Nichols said the flow goes from a gravity flow with the pipe partially full to a pressurized flow with the pipe completely full. The velocity of the wastewater needs to be high enough to move solids up the slope on the downstream leg. The siphons — constructed to depths of about 35 feet — consisted of dual 42-inch steel pipelines with welded joints and special linings and coatings for corrosion protection.

Gravity flow carries the wastewater from south to north. “At the very northerly end, we connected to a pipe elevation that was fixed,” Nichols said. “So we could not go any deeper at that point. We had to connect into that starting point since the county did not want to consider installing a pump station.

“In order to go beneath the washes with a total gravity system, we had to use a very flat slope on the pipe going back toward the beginning point on the south end,” he added. “When you have a very flat slope, the pipe has to be larger to carry the same amount of flow. The required pipe diameter was about 84-inches for the gravity system. We were able to get under the two washes, but with only a few feet of cover.

Ease of installation

Don Kelly Construction began construction at the northern end, and used two crews to work southward, digging the trench and burying the pipe.

Kelly used 28-foot-long trench boxes stacked as necessary for the depth. Production in the sandy silt soil averaged about 250 feet per day per crew over the length of the project. “There were days when we worked the shallower reaches where a crew would average 400 feet per day,” said Jeff Hagen, Kelly’s general superintendent for the project.

The Hobas pipe fit together well, Hagen said. “We generally lowered pipe into the ditch with a strap. Depending on the situation, you can pull it home with that strap to make the joint, or you can push on the end of the pipe with the excavator to join them together. It takes a bit of force because you want to make sure you get a good seal. The 60-inch pipe takes about 6,000 pounds of force to join the two pipes together,” Hagen said.

The larger Hobas pipe was tested for deflection by using a wooden cross to measure any deflections. Smaller pipe could be tested with a mandrel. All pipe passed a 5-percent deflection test. And finally, due to the tight grade requirements, the county ran a closed-circuit television camera down the pipe, following some water poured into it, to measure dips and peaks. “We have to make sure there are no excessive dips in the line,” Rivera said. “Our standard is 1.75 inches and all pipe passed that test as well.”

The pipe was bedded in 6 inches of imported sand and backfilled with sand as much as 1 foot over the crown. Kelly compacted the sand backfill alongside the pipe with a tamping compactor to provide side support. “The sand works well to get compaction so that those pipes will not deflect when you finish backfilling over the top of them,” Hagen said. “As long as you have side support, the Hobas pipe will not be over-deflect on you.”

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Engineered Solutions

Designing a defense against erosion
Projects highlight strategic use of hard, soft, and organic technologies.

By Bob Drake

Hard armor, soft armor, and vegetation are all important defensive weapons in the battle against erosion and its consequent impacts on landscapes, infrastructure, and stormwater quality. And as in war, victories depend on effective and strategic use of a varied arsenal as situations “on the ground” — literally — dictate. The following applications of a range of erosion control technologies in transportation and drainage projects highlight strategies that civil engineers and erosion control professionals can consider when designing such a defense.

Airport Drive, Charlotte, N.C.
Sanders Utility Construction of Charlotte, N.C., recently installed 19,000 feet of steel water supply pipe along Airport Drive, adjacent to the Charlotte-Douglas International Airport. Airport Drive had a severe dip in it where it crossed a watercourse and the project designer, Camp, Dresser and McKee, saw an opportunity to eliminate the severe dip as part of the utility installation. Fill was imported and the road was elevated, thereby eliminating the severe dip. However, steep side slopes, with slope gradients exceeding 2:1, resulted from the fill placement. The project designer specified a triple-net coconut turf reinforcement mat (TRM) to protect the side slopes from erosion and to facilitate establishment of vegetation. East Coast Erosion Blanket ECC-3, a triple-net TRM with a coconut matrix, was installed after the side slopes were graded and seeded. The ECC-3 protected the slopes from raindrop splash erosion and provided a permanent mat that allowed the vegetation to grow into and through it. The TRM now provides a strong base that is incorporated with the plants to protect the slope.

East Coast Erosion Blanket’s ECC-3 triple-net coconut TRMs are designed to provide permanent slope protection. The TRMs are manufactured with a top and bottom, medium-weight 8# PMSF, UV-stabilized polypropylene net and a middle heavyweight 24# PMSF, UV-stabilized net. All three nets are UV stabilized to resist the effects of natural ultraviolet radiation. The coconut fiber matrix is 100 percent organic and will slowly degrade as it is exposed to the forces of nature and as the vegetation penetrates through the netting.

The 100-square-yard TRM rolls were easy to install. The product was anchored at the top of the slope and allowed to unroll down the slope. The TRM was stapled to the slope with 6-inch, 11-gauge steel staples. Vegetation quickly became established.

State Highway 385 overpass, Memphis, Tenn.
The Tennessee Department of Transportation (TDOT), like many state transportation departments, has traditionally used rock rip rap as its primary erosion control solution for bridge drain applications. But in the case of the extreme water flows from one of its overpasses, located at U.S. Highway 72 and State Highway 385 just southeast of Memphis, rip rap wasn’t the appropriate remedy.

This bridge had a drainage channel with a 3:1 slope. Combined with the stress of concentrated water flows, gravity easily dislodged and displaced the rock, resulting in erosion at the overpass and a continued headache for the TDOT maintenance team.

The site also became a safety hazard.
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for motorists because of sediment running onto the roadway. TDOT incurred continuing costs from the frequent need to remove sediment and repair the rip rap after each major storm event.

ScourStop transition mats were presented to TDOT as a solution to deal with the steep slopes and extreme water velocities. Approximately 1,000 square feet of ScourStop mats were used with a combination of sod and TRMs to replace the rip rap at the bridge drain. The ScourStop solution addressed the erosion issues and stabilized the drainage system. TDOT no longer has to return to repair or replace the dislodged rip rap and the sediment is no longer being carried onto the roadway.

Scour Stop transition mats — 4 feet by 4 feet by 1/2-inch-thick polymer — are installed easily on steep slopes without requiring heavy equipment, and are a no-maintenance, vegetated, NPDES-compliant alternative to hard armor solutions. Hard armor has long been the standard remedy for abating the effects of extreme hydraulic conditions. But with the combination of stress from concentrated water flows and gravity, loose-placed rip rap frequently moves, requiring repeated maintenance and replacement to ensure the integrity of the engineered drainage system.

In steep drainage designs, ScourStop manages the stresses more effectively through its combination of deep-seated anchoring and lower profile. In addition, the ScourStop system allows the incorporation of vegetation into the steep drainage channel, which in turn decreases the velocity of the flows, cleans the runoff water, and enables infiltration into the soil.

Information provided by Landmark Earth Solutions Inc.

The Interstate 385 renovation project in South Carolina began in January 2010. Led by the South Carolina Department of Transportation, the $60 million rehabilitation and widening of a 15-mile stretch of roadway included a massive erosion control assignment.

More than 300 acres of steep slopes needed vegetation established quickly to keep soil from eroding in an area of the state dissected by two dozen streams. Further complicating matters, the work had to take place during the winter and spring seasons that saw heavy rains and cool temperatures throughout construction—not exactly an ideal scenario for such a large erosion control application.

The state of South Carolina mandated that the project be fast-tracked because the revamped stretch of interstate was so well traveled—about 21,900 vehicles each day. The condensed construction schedule saved the state more than $34 million.

However, that required the project, which would typically take two years to complete, to follow a tight eight-month timeframe. The interstate was closed to one direction of traffic to hasten construction—the first time
an entire direction of traffic had been closed on an interstate in the state’s history. Consequently, the erosion control products selected had to work on first application to prevent the project from incurring fines for liquidated damages. The contractor, McCarthy Improvement Co., would be fined $50,000 for each day the roadway remained closed to traffic past its mid-August deadline.

The project’s numerous erosion control challenges were solved with Profile Products LLC’s Flexterra High Performance-Flexible Growth Medium (HP-FGM).

Flexterra HP-FGM stood out to officials because it is applied hydraulically and designed to bond immediately to soil, even under wet conditions. In independent testing, Flexterra HP-FGM was shown to be 99-percent effective. Vegetative establishment was documented to grow eight times faster than bare soil and twice as fast as rolled erosion control blankets. It’s also faster and less expensive to use than blankets because no fine grading is required to smooth the slopes before application. Patented HP-FGM is non-toxic, 100-percent biodegradable, and manufactured from 100-percent recycled wood fibers and naturally derived biopolymers.

A two-step application technique was required. Seed, fertilizer, and agronomic amendments with a small amount of HP-FGM were applied first. After the first pass, McCarthy applied the remaining HP-FGM in opposing directions to cover and protect the previously applied layer of seed and amendments to achieve the specified application rate.

Information provided by Profile Products LLC

West City Ditch, Kissimmee, Fla.

The city of Kissimmee, Fla., experienced extensive flooding on July 11, 2009, from a flash flood where unofficial recordings of 7 inches of rain in two hours were reported. The nearest city rain gauge reported 4.35 inches in two hours. The flash flood was caused by two colliding fronts that converged over a 1,200-acre area of the city. The subsequent runoff severely eroded a major conveyance ditch, named the West City Ditch, which drains half of the city’s stormwater into Lake Tohopekaliga. The ditch is designed to convey 1,500 cubic feet per second for a 100-year storm event; however, the flash flood was equivalent to a 500-year storm event and the resulting overtopping flow eroded the ditch banks by more than 2 feet along certain reaches of the canal and flowed over three collector roads crossing the ditch.

Because of the severe damage caused by the flash flood and the desire to prevent this type of damage in the future, the city applied for an Emergency Watershed Restoration Grant with the U.S. Department of Agriculture – Natural Resource Conservation Service (NRCS). The city was awarded the grant to make the necessary repairs to restore the ditch banks and install erosion protection measures. Initially, the parties desired a cost-effective and green solution instead of using traditional methods such as rip rap. Having several positive experiences with engineered solutions and services supplied by CONTECH Construction Products Inc. and Propex for stream bank stabilization, the NRCS recommended the city use a combination of ArmorMax (soft armor) permanent erosion solutions and ArmorFlex (hard armor) to restore the eroded stream banks and to provide erosion protection measures for the future.

The ArmorMax anchored reinforced vegetation system, manufactured by Propex and supplied by CONTECH for this project, is composed of a high-
performance TRM (HPTRM) and earth percussion anchors. ArmorMax is an engineered solution and provides additional factors of safety against erosion and scour. It also can be engineered to failures when needed. The ArmorMax system initially was used on the West City Ditch to prevent surface erosion, but upon further investigation, it was determined that the ditch embankments were unstable. Therefore, a structural ArmorMax system was needed to prevent erosion caused by surficial slope failures. Propex provided the necessary engineering/slope stability analysis needed to complete the design, and 6-foot, 9-foot, and 12-foot anchors were used to stabilize the slopes, while the HPTRM component of the system provided permanent surface erosion protection.

ArmorMax anchored reinforced vegetation system — soft armor (background) — and CONTECH ArmorFlex concrete articulated block mats (foreground) were combined to protect West City Ditch in Kissimmee, Fla., from erosion.

ArmorFlex concrete articulated block mats, manufactured by CONTECH, make a flexible matrix of concrete blocks with uniform size, shape, and weight. ArmorFlex blocks are designed to have specific hydraulic capacities and are laced longitudinally with cables to ease handling and installation. The blocks come in an open-cell or closed-cell configuration, depending on the aesthetic and vegetation needs. The blocks were designed to withstand the hydraulic forces that would be anticipated in the next severe storm event and multiple block sizes and thicknesses were used on the project, ranging from 4 inches to 6 inches and using both open- and closed-cell configurations.

Information provided by Propex Inc.

Mary Creek, Archbold Biological Reserve, Fla.

Mary Creek, which drains approximately 1,000 acres of preserve and wetland ground in Archbold Biological Reserve, Fla., was experiencing erosion caused by high flows from storm conditions. The naturally meandering creek had straightened due to erosion and the force of the stormwater. For purposes of wetland restoration, it was desired to realign Mary Creek to its former meandering state. When the first round of dirt work to realign the creek failed after a major storm event, it was decided that the creek would need to be armored to prevent major erosion.

The initial thought was to hard armor the creek with articulated concrete block or rock Reno mattresses. However, with the wildlife consideration of the site, soft armor designs ultimately were desired. To provide permanent soil protection, Tensar’s North American Green’s P500 Turf/Earth Reinforcement Mat (TERM) was selected. After grading and channel realignment were completed, the P500 TERM was installed. Two sections of Mary Creek were protected — one upstream and one downstream of a newly constructed bridge. The upstream section was realigned to the natural meandering form of the creek with its many tight curves, while the downstream section was a straight shot that extended beyond the new bridge.

The P500 TERM was selected because of its long-term erosion control and vegetation reinforcement capabilities facilitated by excellent UV stability and high tensile strength. As with any TRM, the P500 TERM is designed to protect the soil temporarily and permanently aid in the reinforcement of the vegetation roots and stems as the site develops and matures. A series of fasteners including earth anchors and 24-inch pins were used to provide permanent deep strata anchoring and to ensure intimate mat-to-soil contact. Sod was installed on top of the P500 TERM in lieu of pre-seeding. Minimal irrigation was needed on-site, and the sod was installed on the channel sideslopes, leaving the continually wet bottom of the channel to vegetate naturally. As the sod established, the strength of the complete system continued to increase. With minimal installation costs, and material costs lower than hard- armored systems, the P500 TERM resulted in a high-strength, low-cost, and natural alternative.

Information provided by Tensar International Corp.

The complete Mary Creek drainage channel was protected with a system including Tensar’s North American Green P500 Turf/Earth Reinforcement Mat and earth anchors.
Software, laser scanner, water quality, and stormwater

AutoCAD WS mobile app for Android
Autodesk Inc’s free AutoCAD WS mobile application now is available on the Android platform. AutoCAD WS uses cloud computing technology to enable Autodesk software users to view, edit, and share their designs through Web browsers and mobile devices. Features unique to the Android version of AutoCAD WS include the text annotation tool, which supports integrated voice commands available on devices running Android 2.2 (Froyo) or above; Plot to PDF (Web app only); and Anywhere Storage (Web and mobile apps).

Autodesk Inc. — www.autodesk.com

Desktop GIS software for infrastructure
Bentley Systems Inc. released Bentley Map V8i (SELECTseries 2) desktop GIS software for infrastructure that is intrinsically 3D. Bentley Map serves as a fully featured, universal GIS platform supporting the creation, persistence, maintenance, analysis, and sharing of 2D and 3D geospatial information. The V8i (SELECTSeries 2) release provides new functionality that further reduces costs and risks of geospatial data sharing across infrastructure projects and enterprises. It’s available in three editions to meet the needs of different users: Bentley Map PowerView, Bentley Map, and Bentley Map Enterprise.

Bentley Systems Inc. — www.bentley.com

Retaining wall engineering app
Daystar Software announced the availability of Daystar iStructural.com, a fully cross-platform, cloud-based structural engineering application that works on Windows, Macintosh, and Linux. Daystar iStructural.com is available in both free and paid versions. Current modules include cantilevered/restrained concrete and masonry retaining walls; tapered cantilevered/restrained concrete retaining walls; allowable stress and strength/slender wall design; pinned-pinned, fixed-pinned, fixed-only analysis; and wall and parapet design.

Daystar Software — www.istructural.com

High-speed, phase-based laser scanner
Leica Geosystems introduced the HDS7000, a new phase-based laser scanner that lets users take advantage of ultra-high-speed scanning for more scanning applications on more sites. The HDS7000 features key enhancements compared with its predecessor, thanks to its design, environmental specs, and low-noise data. It features a longer range at which vertical surfaces can be detected; a new, graphical user interface; reduced range noise at longer ranges; and class 1 laser for sites that require this classification.

Leica Geosystems — www.leica-geosystems.us/en

Oil bioremediation system
Non-invasive treatment of oil-polluted waste, water, and soil is available with the automatic OilClean bioremediation system, a joint venture between Pro-Act Biotech and EcoSolutions LLC. The self-powered system optimizes treatment using on-site and remote system management capabilities to monitor water quality in the treatment zone and to balance nutrients and dissolved oxygen. Effective for pre-treatment of oil-polluted waste, OilClean also is ideal for treatment in sensitive marsh and wetland environments and for groundwater and soil remediation challenges.

Pro-Act Biotech Inc. — www.proactbiotech.com
EcoSolutions LLC — www.ecosoldesigns.com

THM removal system
The new trihalomethane (THM) Removal System from SolarBee Inc. combines the latest mixing and air-stripping technologies to effectively remove all four types of regulated THMs. The SolarBee THM Removal System is modular and scalable to fit any tank size or THM concentration, and it installs with little or no infrastructure change. NSF-approved materials are used throughout and include floating air diffusers that offer extended use with little or no maintenance, according to the company. Shallow diffuser depth allows use of a low-energy turbine blower.

SolarBee Inc. — www.solarbee.com

Stormwater chamber
Advanced Drainage Systems Inc. (ADS) launched the StormTech MC-4500 chamber to contain and control stormwater runoff in an underground system. The chamber is designed in accordance with American Association of State Highway and Transportation Officials and American Society for Testing and Materials design standards, making it a qualified choice for use in commercial and municipal projects. It is rated by ADS for a 100-year service life and able to handle large stormwater flow volumes.

Advanced Drainage Systems Inc. — www.ads-pipe.com
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<td>51</td>
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<td>27</td>
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<td>59</td>
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<td>21</td>
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<td>53</td>
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When it comes to our regulatory environment, we are out of balance. Job-creating initiatives often are stalled by procedural delays that may not benefit our economy or environment. Regulatory efforts need to shift from an emphasis on procedures to one on substance, while acknowledging that balancing protection of the environment is not against enhancing the future of sustainable economic development.

With changes in attitudes and implementation, rather than statutes and litigation, our regulatory framework can become a tool rather than an obstacle to having a natural environment enjoyed by an employed public.

Consider four suggestions for creating a balanced regulatory environment:

1) Promoting a balanced approach mindset. Based on the idea that economic freedom is the foundation for individual success and prosperity, Congress enacted the Regulatory Flexibility Act in 1980, which required agencies to consider the economic impact of rulemaking on small businesses and jurisdictions. In a time of economic uncertainty, we need to promote a broader regulatory flexibility act; one that considers economic development interests and the impacts of rulemaking on businesses regardless of size.

2) Enabling “street-level” discretionary authority. Reform cannot be legislated if everyday decision making continues to be held back by insufficient or uninterested human resources. We must motivate our regulatory foot-soldiers to achieve the desired balance — one founded on broader statutory intent, rather than redundant, inconsistent, or overlapping regulations. We are, however, a litigious society, and reform at the ground level will weaken if fears of adjudication overcome our sensibilities. Our street-level decision makers should be empowered to be flexible and innovative, with discretionary authority to make balanced, logical determinations.

3) Enacting economic justice. The original connotation of “shovel ready” was born out of the site development industry’s recognition that permitting delays often were the discriminating factor among competing sites. In today’s global market, delays associated with permit acquisition can result in a community’s loss of significant jobs and taxes. The federal government and several states have enacted environmental justice programs to ensure the fair treatment and meaningful involvement of people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Ironically, whereas environmental justice protects populations that historically endured a disproportionate share of environmental harms and risks, according to the U.S. Environmental Protection Agency (EPA), the burden of rigid regulations often are a disincentive to the attraction of sustainable job-creating, public benefit investment these communities desire. A balanced regulatory environment also requires economic justice. Economic justice will facilitate consideration of economic factors, as well as community objectives during the review process. As public interest decisions, no permit should be issued or denied without coordination with local stakeholders — the most suited to represent that interest. Moreover, we need to remove the implication that permitting needs hinder economic growth. A balanced regulatory environment would allow for pre-permitting sites to facilitate attraction of sustainable, job-creating development that meets specific environmental and community criteria.

4) Guaranteeing review timeframes. Developers understand that informed decision making is based on absolutes — what is known at the time questions are asked. In a competitive market, unanswerable questions are undesirable and the impetus for site selectors and developers to bypass otherwise acceptable sites and communities. For site sponsors, the undefined time to obtain a permit is a critical limiting factor. Moreover, the lack of enforceable timeframes often is the impetus for delays becoming de facto permit denials. Discretion should be in the decision, not in the procedure. In a balanced regulatory environment, review timeframes will be reasonable, well-established, and enforced. An expanded use of alternative permitting mechanisms, such as letters-of-permission and activity-based general permits, could shorten timeframes. Many states promote guaranteed review periods to attract development; this should be the rule in the competitive global economy.

Steven Eckler is a senior managing scientist at O’Brien & Gere. He has more than 22 years of professional experience in a career that has focused on local, state, and federal right-to-build requirements; environmental regulations and permitting; site assessments; and environmental compliance issues. He can be contacted at info@obg.com.
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