

# ELEMENTS



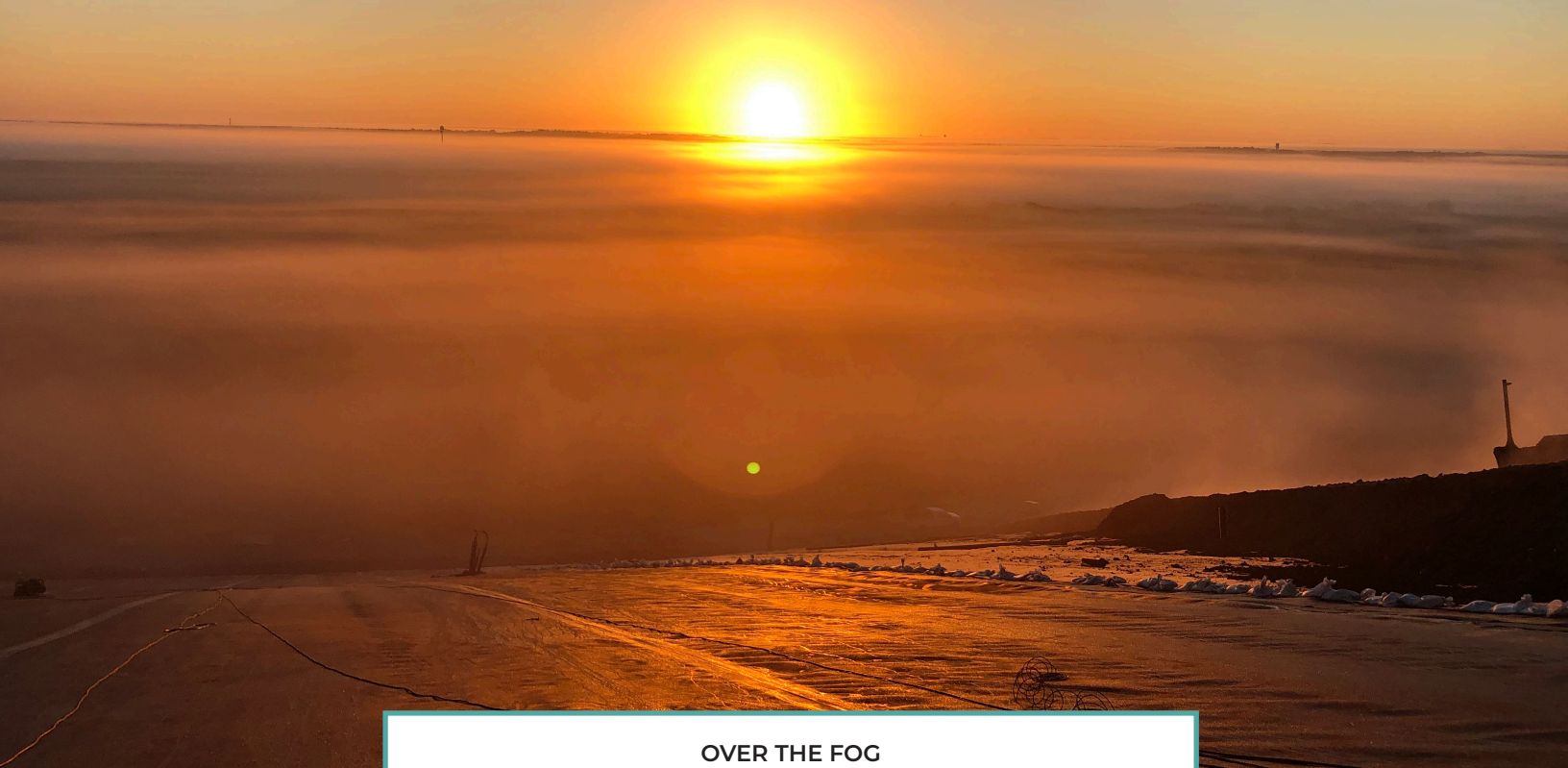
## WIDE WORLD OF WASTE

**INSIDE:** Innovative solutions, landfill gas operations & maintenance, leachate treatment options, and new experts leading the way

2021 Vol. 2







### OVER THE FOG

Photo Credit: Christopher Joachim, Staff Consultant, Boston office

CEC was performing construction quality assurance for a landfill cap system. On the day the photo was taken, the contractor was preparing to make patches to the liner and deploy geocomposite.

# WELCOME

Most people are neither interested nor concerned about what happens to the waste they generate after those wastes leave their homes or places of business. They expect those wastes are managed in a manner that is safe to both the public and the environment. Further, most people do not understand how the management of wastes has evolved over the last 50 years, from wastes being placed in the local dump or burn pile to now being disposed of in secure landfills with sophisticated systems to prevent releases to the environment.

Then again, there are people who make the proper management of waste the focus of their professional lives. And a large number of those people work for CEC, providing services to

our waste management clients. In fact, about 20% of CEC's annual revenues are obtained by providing services to our waste management clients. In this edition of Elements, we spotlight two of our newer employees who have that focus. We will introduce you to Michael Yacyshyn, who takes over the leadership of our Waste Management practice, and Darrell Thompson, who joined us recently to help expand our services to our waste management clients in California and other western states.

In this edition, we also spotlight some of the evolving services we are providing to help our waste management clients respond to their operational challenges. You can read about how CEC has helped address chemicals of concern and slope stability issues associated with landfill liquids (leachate). In this edition, you can

also read about how CEC helps those same clients manage their landfill gas, and how we help them also treat their leachate. Those were not the concerns of the organizations that operated the local dumps and burn piles.

As we approach the end of another year, we continue to be grateful for our loyal clients and the opportunities they provide us to be of service to them. We are also grateful to the CEC team that makes servicing our clients their ongoing mission. We hope that you all have an enjoyable holiday season and a safe and happy start to 2022.

Ken Miller, President & CEO

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CEC sponsors a photo-of-the-month contest encouraging employees to submit photos from their work sites. Winning photos are published on CEC's internal website and social media pages. One is selected for Elements.

Elements is published by Civil & Environmental Consultants, Inc. for clients, business partners, and other associates.

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ON THE COVER: A view of scenic Western Pennsylvania from Vogel Holding, Inc.'s Seneca Landfill.

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Civil & Environmental Consultants, Inc.

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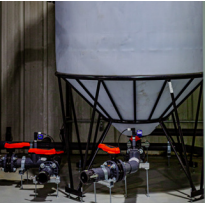
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# INNOVATIVE SOLUTIONS FOR GROWING CONCERNS

■ CEC experts have conceptualized and implemented new technology and methods to help landfill owners and operators manage PFAS and landfill stability.

**W**ith the effects of both per- and polyfluoroalkyl substances (PFAS) and leachate dominating the current state of the solid waste industry, CEC's experts found new, innovative ways to help our clients navigate regulatory concerns and the slope stability of their landfills.

Five of CEC's waste management professionals developed new technology and methods to help our clients manage PFAS and evaluate the stability of their landfills, leading to lower costs and increased peace of mind about their facilities.

For their efforts in helping our solid waste clients and advancing CEC's capabilities, Ivan Cooper and Bruce Reilly of CEC Charlotte, Jon Kitchen of CEC Boston, and Tim Mitchell and Dave Spang of CEC Monroeville were winners of CEC's Innovation Award. Here's a look at their innovations and how they're helping.

## SIMPLIFIED PFAS REMOVAL TECHNOLOGY

Known as "forever chemicals" because of their resistance to breaking down, PFAS are manufactured chemicals that are found in many consumer products, such as cookware, packaging materials, and firefighting foams.

Ivan, Bruce, and Jon helped one of CEC's landfill clients navigate expensive and limited options for the treatment and disposal of leachate liquid generated from a landfill that contained PFAS.

"There have been a lot of efforts to develop advanced biological treatment for these chemicals, and they've had some success, but it's not easy to implement or cost-effective," Bruce says. "Liquids containing PFAS must be treated and disposed of off site, usually through a Publicly Owned Treatment Works (POTW), or on site through a National Pollutant Discharge

Elimination System (NPDES) permit or direct discharge. The U.S. Environmental Protection Agency (EPA) recently mandated that NPDES permit holders must monitor and report PFAS concentrations that are leaving the POTW in the form of treated wastewater. This includes the POTW and landfills that have direct discharge permits."

Public worry about PFAS is ever-increasing, with concern about the prevalence of PFAS compounds in POTW discharges and their impact on rivers, bays, and estuaries. The group developed a simplified treatment process that reduced the concentration of PFAS, allowing the client to treat their leachate at a POTW. Doing so lowered their cost when compared to other options and still met permit requirements.

As most landfills will be required to remove PFAS from landfill liquids over the next several years, owners and operators will seek options that help them meet regulatory requirements without breaking the bank or dedicating significant manpower to maintain.

"The EPA is in a monitoring and reporting mode, collecting this data so they can establish treatment standards or discharge criteria for this material," Bruce says.

CEC's technology is non-complex and could be scaled to reach clients nationwide, providing a cheaper, easier-to-maintain treatment and disposal option.

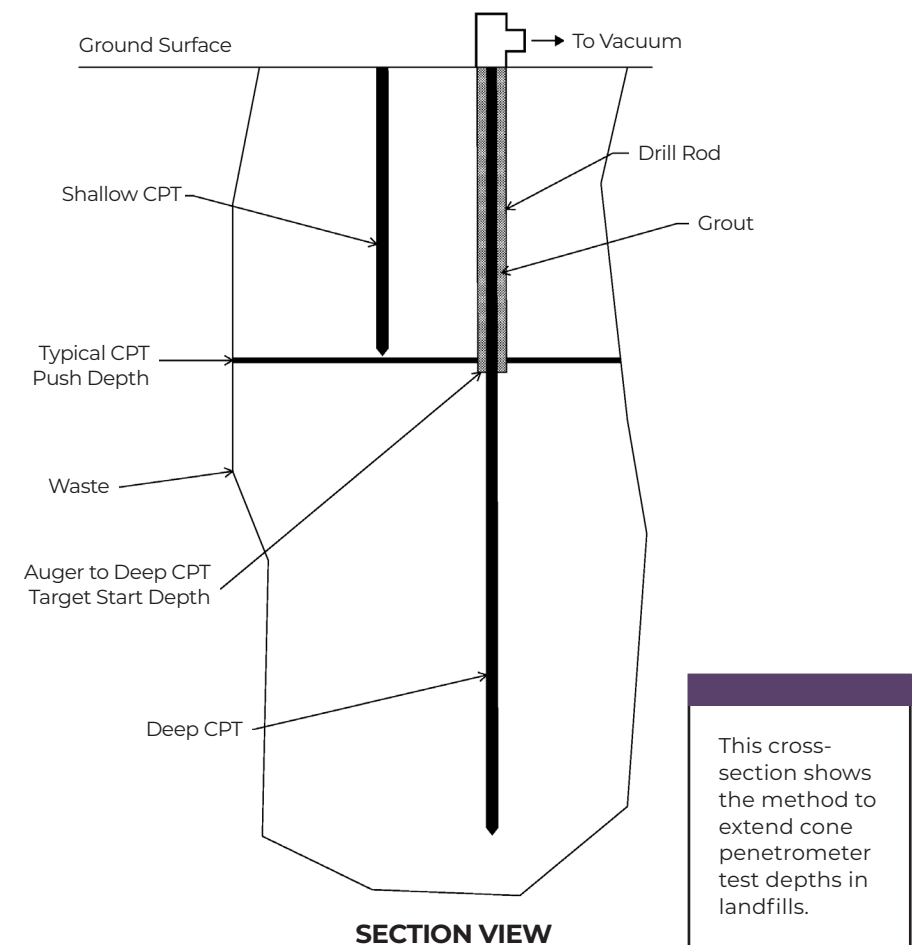
## METHOD TO EXTEND CONE PENETROMETER TEST (CPT) DEPTHS IN LANDFILLS

As waste streams continue to evolve, there is now a greater need for landfill slope stability evaluations, subsurface investigations, and slope remediation

designs. Many landfill owners and operators have had to seek new sources of revenue because of the changing waste landscape, including waste diversion, waste minimization, and recycling efforts. As such, they have accepted special waste types that had not been accepted in large quantities in the past, including liquids and sludges. Accepting those waste types affects the overall slope stability of the waste mass, and in some cases, this

is compounding slope stability issues at sites that already have high liquid levels.

Cone Penetrometer Tests (CPTs) are performed to evaluate subsurface liquid conditions and provide detailed information on the strength of the waste materials. A shortcoming of this test is that it typically has a limiting depth of 75 feet. However, Tim developed a procedure to extend the depth of the test to 150 feet.



## Tim Mitchell, P.E., Named to Waste360's "40 Under 40" List for 2021

A rising star in the Solid Waste industry, CEC Monroeville's Tim Mitchell, P.E., was named to Waste360's "40 Under 40" list for 2021. Tim's efforts are helping to enhance CEC's capabilities in serving our clients while also getting increasingly and widely recognized in the solid waste world. Tim has been instrumental in developing CEC's abilities to characterize non-traditional waste streams and their impact on landfill stability. "It is in the client's best interest to get a good understanding and better handle on what the conditions are regarding liquids in the waste mass," Tim says. "Many sites we work on have existed for more than 20 years and had a history of poor leachate management, so we're helping get them on the right track to continue operations seamlessly."

Scan the QR code to learn more about Tim on our blog.







Left to right: Jonathan Kitchen, Ivan Cooper, and Bruce Reilly

On the site that prompted him to try to increase the depths, Tim says he and the CEC team had made conservative assumptions about the deeper portions of the waste slopes at a landfill with a waste column about 300 feet deep. In making those assumptions, the site would have required extensive site improvements to enhance the stability of the slope to an acceptable level. However, Tim’s innovation allowed the team to analyze deeper into the waste mass and refine their assumptions based on data retrieved from the CPTs, while also addressing landfill gas safety concerns.

“This resulted in a significant cost savings to our client because they no longer had to perform the extensive site improvements originally required for the site,” Tim says. “There was a distinct difference in waste materials that were shallower compared to the deeper portions, giving us a better understanding of what the material properties were and the necessary actions to address with the client.”

After extensive coordination among CEC, the client, landfill gas consultants for the site, the landfill gas driller, an auger drill, and the CPT contractor, six deep CPTs were performed. The maximum CPT depth achieved was about 140 feet BGS, nearly double the previous maximum depth for the site.

SLOPE MONITORING DATA EVALUATION

When CEC recommends slope monitoring, it generally is for relatively severe cases of landfill slope

movement. Because of the urgency required, Dave sought to streamline the process to reduce the amount of time it takes to analyze slope monitoring data. Slope monitoring has three goals: provide a leading indicator of potential large-scale slope movement, delineate the limits of the at-risk areas, and quantify the magnitude and direction of the slope movement.

“Obviously slope movement presents significant safety hazards to personnel at the site. Nobody wants to put personnel at risk by having employees work in a potentially unsafe area, but nobody wants to spend unnecessary money by possibly relocating infrastructure or operations if it’s not necessary, so what we’re trying to do with slope monitoring is assess the severity of a situation,” Dave says.

Operations at high-hazard landfills — those with steep/tall slopes — require multiple data monitoring points to provide important information about potential slope movements. In this case, client expectations for this project site included timely analysis of data from more than 70 locations and recommendations for landfill operational action to limit the potential for slope failures.

Dave developed a method that allowed the capture and analysis of data from the 70 locations, producing 400 graphs and calculations about potential slope movement within 15 minutes and presenting the information in graphical form. This innovation allowed for



Tim Mitchell



Dave Spang

additional time for checking and analysis, and it improved deliverables for client communications.

CEC is currently utilizing similar methods to estimate and monitor pore pressures within the waste mass based on liquid-level measurements from piezometers and landfill gas extraction wells. CEC can now relay slope stability information within a day. Before, it could take a few hours to let clients know whether there was a problem, and up to a week to relay that information in an easy-to-understand way.

These innovations will be instrumental in ensuring landfill owners and operators are meeting all regulations and permitting requirements. These tools also will provide advanced insight into how they can safely operate and maintain their facilities now and in the future. ■

WASTE MANAGEMENT PRACTICE

NEW EXPERT AT THE HELM

Michael Yacyshyn takes the lead of CEC's Waste Management practice at a time when landfill clients are facing regulatory, permitting, and operational challenges.

For more than 30 years, CEC has consistently prided itself on its small-firm environment and providing a fun, fulfilling workplace for its employee owners. Even as the firm has grown from coast to coast with more than 1,100 employees, the firm remains highly invested in its professionals and their technical expertise.

The focus on employees and the overall culture attracted Michael Yacyshyn to the firm in November 2020 after he had spent more than 40 years with consulting firms in California. Michael now serves as CEC’s corporate Waste Management practice lead, taking over the role from Tim Nytra, who will continue to focus on client projects and growing the practice.

“CEC reminds me of the really good consulting firms I worked for when I started in consulting in the late 1970s; very collaborative, collegial, and employee-focused, which isn’t necessarily the norm anymore,” Michael says. “As some firms get larger and consolidate with or are acquired by other firms, in many cases, the people are sometimes forgotten. Because our people are our No. 1 resource and are employee-owners, our business is not subject to short-term pressures typical in publicly traded consulting firms.

“At CEC, people are invested and rewarded for their efforts because we know our clients’ success is all of our success. You know you’re part of the team, not just making money for the ownership. That investment pays off in our commitment to our clients.”

PRESSING ISSUES

Michael takes over the Waste Management practice at a time when CEC’s landfill clients are facing regulatory, permitting, and operational challenges. One such challenge is managing the slope stability issues that have become increasingly prevalent. If not mitigated, those slope stability issues can lead to landslides that significantly

We have a unique opportunity at CEC to leverage our breadth of waste management services because our technical experts are put in position to be the business developers and bring in work.

MICHAEL YACYSHYN
CEC Waste Management Practice Lead

disrupt landfill operations and can cost millions of dollars to repair.

He says that years of owners and operators perhaps not giving liquids in landfills the attention they deserved has led to stability concerns at some sites. That has manifested in major waste companies having to invest more money right now, burdened by the need to drain landfills and come up with systems during design and construction that will facilitate the removal of liquids.

“These are things that you just didn’t do 20 years ago, even 10 years ago,”



Michael says. “We’re learning more and more. Each landfill is a living organism, and they’re all slightly different. We have a number of sites we’re trying to understand past waste acceptance practices and the percentage of liquids and other low-strength wastes that were taken over time. That all affects the stability.”

Michael is currently working as part of a CEC team to analyze the stability of a landfill in the southeast that’s seeing issues related to liquids accumulation and old cells that employed a smooth geomembrane base liner system. This very low-strength interface at the bottom of the landfill is presenting slope stability concerns.

“You rarely see smooth geomembrane at the bottom of landfills anymore, if at all, and the very low-strength interface and resulting lower factors of safety against sliding is the reason why,” he explains.

Utilizing CPTs, CEC assessed subsurface strength and liquid conditions at the site to gather detailed information about liquid levels and the strength of the waste materials. CEC also installed vibrating wire piezometers (VWP) adjacent to each CPT location in the landfill to further evaluate liquid levels.



The information at this site is gathered by cloud-based remote-sensing devices that pull liquid-level data from each of the VWP locations around the landfill in real time. That system provides real-time updates that enable CEC to adjust input parameters for slope stability analysis that, in turn, can help clients make informed decisions. In this case, the client was seeking to expand laterally, but because of delays, they've been forced to place waste in areas they didn't necessarily want to, which can lead to reduced factors of safety. These analyses will help them assess the most cost-effective way of dealing with potential slope instability and how to proceed with expansion.

"If you're truly trying to help your client, you're going to innovate when you can. You want to do things within regulations but maybe take a different

approach and help save the client money, and I think that's key to being an effective consultant," Michael says. "If you look at companies on paper, we all have people with advanced degrees. So how do you differentiate yourself? Our innovations go a long way to making us stand out among our competitors."

**PLANNING AHEAD**

Michael will aim to enhance quality and risk management guidelines as the practice lead so clients seeking waste management services are receiving the top-notch service they expect. He also will aim to leverage the variety of experts throughout the practice to ensure clients understand the full scope of services CEC provides.

With professionals who have expertise in industrial waste, liquid waste, hazardous waste, coal

combustion residue waste, and numerous others, CEC can provide services that benefit clients across all of the market sectors the firm serves, not just solid waste.

The solid waste market and waste management practice often go hand in hand, but Michael hopes the practice can also facilitate opportunities outside of the solid waste world and capitalize on the versatility of CEC's waste experts to further expand the firm's client base.

"We have a unique opportunity at CEC to leverage our breadth of waste management services because our technical experts are put in position to be the business developers and bring in work," he says. "Ensuring we're doing that, managing risk, and developing technical guidelines for certain aspects of our practice will be my major focuses in this role." ■





# LISTEN AND SUBSCRIBE!

The CEC podcast series is designed to inform and entertain the engineering crowd and layperson alike — whether you want to take a deep dive with CEC Explains, or you just want a quick hit on a trending topic with CEC Chats. Every episode offers insights and analysis from our dynamic team.

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# In case you missed it ...

## A look back at regulatory and government-related updates

We're always monitoring the regulatory landscape so we can keep you up to speed on important changes and their effects. A change in the presidential administration and increased funding for projects across the United States has led to no shortage of opportunities, questions, and concerns.

Here is a collection of recent posts from our blog, in which we update you on some of the more pertinent topics from the regulatory world. We also show some of the work CEC is doing as clients utilize federal, state, and local funding for new projects.

[cecinc.com/blog](https://cecinc.com/blog)



OHIO EPA'S REVISIONS TO EMISSION CONTROL RULE COULD PRESENT PERMITTING AND COMPLIANCE CHALLENGES



JUST ISSUED: PENNSYLVANIA STATE PROGRAMMATIC GENERAL PERMIT-6 (PASPGP-6)



2021 ALTA/NSPS STANDARDS CHANGES MAY AFFECT HOW SURVEYS ARE CONDUCTED



BREAKING DOWN NEW JERSEY'S SOLAR INCENTIVE PROGRAM



CEC'S REDEVELOPMENT PLANS WILL HELP REVITALIZE FORMER STEEL TOWN



NEW STATE BUDGET PROVIDES BIG BOON FOR BROWNFIELDS FUNDING IN OHIO



THE REGULATORY ROLLER COASTER OF WATERS OF THE UNITED STATES



AMERICAN RESCUE PLAN ACT OF 2021 PRESENTS UNPRECEDENTED OPPORTUNITY



### CEC now offers Liquid Release Testing

Landfills are accepting increasingly diverse types of waste. More industrial-type wastes, which are often wet and of low strength, are being disposed. These wastes can reduce the stability of a landfill, and in some cases have created slope failures that are extremely costly to repair, not to mention being safety and environmental hazards. To address these concerns, CEC now offers liquid release testing to landfill operators and waste generators so they may gain important information and insights about accurate disposal fees and how a particular type of waste may affect the stability of their landfill.

Scan the QR code to learn more.



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ELEMENTS



# DARRELL THOMPSON

## CALIFORNIA OPERATIONS LEAD

On its own, California is the fifth-largest economy in the world. The most populous state in our country is home to the operations of some of our biggest clients, and CEC did not have an established base to serve California clients — until now.

CEC has officially expanded its footprint from coast to coast with the addition of California operations and California lead Darrell Thompson.

Darrell is an environmental consultant and solid waste engineer specializing in landfill gas engineering, operations, and compliance. He has 28 years of experience, including 24 years of project work and

building client relationships in California, where he will leverage those relationships to help CEC grow its client base and solidify the firm's nationwide coverage.

"California is a huge territory with no shortage of chances to quickly tap into the tremendous client base," Darrell says. "Throughout the company, we have a deep bench of technical professionals and experts from the wide array of industries we serve, so the timing is right and our clients are receptive. California has the need, key clients, and opportunities to bring CEC's multidisciplinary expertise to the West Coast, where companies are ready for some new faces."

### How much of a game-changer is it for CEC to have established operations in California?

California generates more than 40 million tons of waste annually and has some of the most stringent environmental regulations in the United States, particularly regulations geared toward combating climate change. It's a huge market for all types of engineering and consulting services. By having an office and resources in California, we can leverage relationships our employees, who were former leaders in the industry, have with major waste management companies here. The combination of a deep technical bench and decades of industry experience formulates innovative, sensible, and cost-effective solutions where our competitors fall short.

### Are there impending environmental regulatory concerns waste companies should be aware of?

PFAS continues to be a prevailing concern in the waste industry, and we are anticipating regulatory actions in response to recent data that has been collected in California. We are seeing examples of increased costs in raw leachate disposal and, in some cases, limitations on or rejection of leachate disposal altogether at treatment facilities. This is driving our clients to seek out costly disposal options, including on-site treatment.

### Is there a trend in California that could offer new opportunities?

California's aggressive emissions reductions goals are driving opportunities in renewable energy tied to the solid waste industry. The low carbon fuel standard and California's cap and trade market have attractive financial incentives for the production and sale of Renewable Natural Gas (RNG) due to the value of credits associated with fuels derived from renewable sources such as dairy waste, biosolids, food waste, landfill gas, and solar. Major players in the renewable energy market have committed to dozens of projects in California and nationally, so there are more chances to help companies reach their goals as they take advantage of these financial incentives and credits.

### Describe a unique project you've worked on.

One of the most unique projects I've worked on was the assessment and control of an aluminum dross reaction at a landfill in the Midwest. Elevated temperatures at landfills and the result of the reaction of one waste with another can result in unexpected landfill conditions, such as excess gas pressures, rapid settlement, generation of addition liquid waste, damage to landfill infrastructure, odors, and personnel safety issues.

Over the years, landfill owners have gained an appreciation for the importance of understanding the potential side effects of receiving certain wastes and how they react under certain environmental conditions.

Seeing firsthand what can happen underground gave me a deep appreciation for what various waste decomposition processes can do, the chemistry of the processes, the risk owners and operators take versus reward, and the importance of safety for crews working on landfills. In these situations, solutions often require out-of-the-box thinking and the lessons learned are incredibly valuable.



### What are some hot-button topics clients in California should be aware of?

Beginning January 1, 2022, under Senate Bill 1383 (SB 1383), all jurisdictions in California are required to provide collection and now enforce separation of organic waste at residences and businesses, with few exceptions. Collection of organic wastes and compliance with this mandate will be accomplished by amending hauling contracts, providing labeled bins, conducting routine waste audits of haul routes, distributing educational materials, and issuing citations for non-compliance.

This is a significant hot button for jurisdictions and our clients for the following reasons. In California, "organics" are defined as food waste, green waste, landscape and pruning waste, applicable textiles and carpets, wood, lumber, fiber, manure, biosolids, digestate, and sludges. This represents roughly two-thirds of the total waste landfilled in California. As part of the state's climate change initiatives, California has a goal to reduce the disposal of organic waste by 75% by 2025 and increase food waste recovery by 20% by 2025.

These are aggressive goals driving tremendous need for additional infrastructure and technology, which is why CEC's experts in organics management are so vital to our operations in California. Our professionals understand the operational challenges presented by fluctuations in waste streams, and we can assist our clients in complying with SB 1383 and addressing its impacts on the industry.

California recognizes the deficiency in the infrastructure and has created tens of millions of dollars in grant money available for qualified organics facility projects. We have relationships with organics industry leaders helping municipalities fund new infrastructure, and we are positioning ourselves alongside top waste companies to offer sensible, cost-effective solutions to handling the expected influx of organics on the market. For example, we recently were awarded a compost facility design and permitting project with a major California waste company, and we look forward to helping other companies meet the requirements of SB 1383. ■





## LANDFILL GAS OPERATIONS & MAINTENANCE

# COMPLIANCE WITH DOWNSTREAM BENEFITS

■ CEC's Landfill Gas Operations & Maintenance team has expanded across the country as the regulatory environment continues to evolve.

A series of environmental laws and statutes passed decades ago continue to rear their heads among landfill owners and operators. All these years later, EPA continues to create and adjust regulations that put those laws into practice, focusing strictly on how to keep waste from getting into the air, water, and soil.

Those in the solid waste business soon realized that if their landfill reached a new source performance standard, they would need to install a landfill gas collection system or risk fines from the EPA over fugitive emissions — leaks, or other irregular releases of gas or vapors — that cause compliance issues and potentially pose public hazards.

With these EPA regulations in place, the landfill gas system design, construction, and operations and maintenance job fields were born.



Landfill gas collection and control systems can continue to operate even decades after a landfill closes.

### CEC'S O&M TEAM

Although the implementation of landfill gas systems is not new, the recognition of just how much time and energy needs to be spent in ensuring their proper operation and maintenance continues to be at the forefront of owners' and operators' minds.

CEC recently broke out a team dedicated solely to landfill gas operations & maintenance, with experts nationwide ensuring the proper implementation and continued use of these systems during the landfill's life cycle.

"Creating this team greatly expanded our market share and position in the landfill gas O&M space," says Harold Barber, office lead for CEC Houston and CEC's landfill gas O&M team. "When we created this team, it made us a player from coast to coast. It's quite beneficial to our clients because there are not many companies that do this for a living."

CEC's professionals throughout offices in Boston, Charlotte, Chicago, Cleveland, and Houston provide services for non-routine landfill gas management, contaminated liquid management and extraction, pumping system maintenance, and other services that enable facilities to maintain normal disposal operations while remaining in environmental compliance.

The industry has seen a shift over time as regulations became more stringent and owners and operators became more diligent in adhering to them, explains Greg Komperda, CEC's landfill gas O&M expert in Chicago.

"The industry has changed for the better," says Greg, who has more than 19 years of experience working in landfill gas. "Nowadays, our work is geared more toward preventing issues, rather than reacting to them. We are now better suited to anticipate changes in landfills and plan to expand our systems accordingly."

### REUSE, POST-CLOSURE WORK, AND DATA

Seamless operations of these systems is vital not only for landfill owners and operators, but also for energy suppliers



who might use the collected gas for power supply.

Having a team dedicated to ensuring the proper operation and maintenance of these systems opens up opportunities with landfill gas energy developers who have their own wells and their own needs at these sites.

Among those needs is making sure a well field is being tuned properly, which helps the energy developers meet their needs to sell electricity.

"Without us physically at the site and making sure it's operating and being maintained, they can't make the money they need for a payback, and they won't qualify for the environmental credit that goes along with it," Harold says. "Our services go downstream."

When a landfill closes, the work of CEC's landfill gas O&M team is not complete — not by a long shot.

The landfill might not be accepting new waste, but the work to ensure it stays within compliance and regulations can continue for decades as the waste mass continues to emit gas.

That's why it's critical for landfill gas systems to be consistently monitored and for the experts who can make

adjustments and ensure proper operation to be readily available, both for those landfill owners and operators and for the companies who rely on the landfill gas for renewable energy.

"Post-closure care from a landfill gas perspective becomes especially important in high-population areas, where the detection of odors might be more likely," Greg says. "Clients rely on us to do everything we can to make that landfill invisible to the public."

CEC has the latest technology and instrumentation to collect data from the well fields and present it to clients in an easy-to-comprehend way. It's a well-rounded system where CEC's professionals are constantly crunching numbers to ensure owners and operators are hitting their marks and effectively mitigating their gas concerns.

"The data tells the tale for the well field," Harold says. "From that data, you can determine gas quality, whether you can increase the vacuum in the well field at certain points, or make sure there isn't a subsurface oxidation event occurring. The last thing anyone wants is a regulator who's identified a problem knocking on the door. That's why our team is so vital." ■



# CROSSING THAT BRIDGE WHEN THEY GOT TO IT



CEC's design for a bridge crossing Hurricane Creek allowed Republic Services to expand operations in Arlington, Texas.

■ A longtime CEC solid waste client needed a structural engineer to design a bridge that would support the expansion of a landfill they operate. They quickly realized they didn't need to look any further than CEC.

Republic Services has a longstanding relationship with CEC, which provides solid waste consulting and engineering services for Republic sites across the country. So when a Republic-operated landfill in Arlington, Texas, was reaching capacity on a waste unit and was ready to begin construction and operations on another waste unit located across a major creek, they needed a way to get to the other side — a high-capacity bridge.

Capitalizing on the existing relationship, CEC Principal Adam Mehevec informed Republic that CEC had the structural engineering and bridge

design experts who could design the bridge in addition to the experts in Texas who could handle the local permitting. With bridge experts in Bridgeport, West Virginia, and assistance from professionals in Austin, Houston, and Knoxville, CEC was well-equipped to help Republic cross this bridge when they got to it.

“Other engineering firms that bid on the project indicated they thought they could repurpose another civil engineer to tackle the bridge project, versus CEC who had dedicated bridge staff, which instilled confidence,” says Adam Hart, Republic Services Environmental Manager.



CEC's design integrated and embedded a carrier pipe for a landfill gas pipeline.

## SIZING IT UP

In terms of size and capacity, this bridge was the largest that CEC's bridge professionals, a group that continues to grow in size and levels of expertise, have worked on — and it was completed without a hitch.

The bridge gives access to 40 years of landfill capacity on the other side of Hurricane Creek. It also opened up the opportunity to relocate that same creek in the future and add more airspace capacity, says Dave Hildreth, Republic's Division Manager for the landfill.

“Knowing CEC and the qualifications of the team we normally work with, along with their far-reaching expertise in other offices' capabilities to draw on, I'd say was a major contributing factor in their selection.”

CEC team members from the Austin, Bridgeport, Houston, and Knoxville

offices joined forces to coordinate permitting, survey, structural design, geotechnical investigations, and utility relocation, as well as to provide construction quality assurance.

The techniques used to design the bridge differed from what might normally occur because of the size and weight of the vehicles the bridge was designed for. With articulated vehicles that could weigh up to 180,000 pounds, the bridge required an extreme weight capacity.

“All bridges are designed to periodically allow for a heavy-load vehicle to use the bridge, but they are not always designed with that type of vehicle as the primary traffic,” says Greg Linder, a principal at CEC Bridgeport who was the project manager at this site.

CEC Bridgeport civil engineering consultant Hannah Costello says that among the challenges at this site was



**Other engineering firms that bid on the project indicated they thought they could repurpose another civil engineer to tackle the bridge project, versus CEC who had dedicated bridge staff, which instilled confidence.**

ADAM HART  
Republic Services





integrating and embedding a carrier pipe for a landfill gas pipeline. “That was definitely the most unique part of it,” Hannah says. “You’re sticking a 4-foot diameter pipe through the abutment wall and trying to get the proper spacing for your rebar reinforcement in the abutment to make it work, and also account for expansion and contraction.”

Providing bridge design services for a solid waste client is a shining example of how CEC’s diverse group of experts in offices nationwide can use their skills to help clients meet their goals, even when projects include different services than what CEC has normally provided.

“We definitely have shown them there’s a lot of stuff we can do that we haven’t done for them before,” Adam Mehevec says. “Having CEC be able to provide these services gave Republic peace of mind that this integral portion of their operation would be completed in an efficient, cost-effective manner.”

**COORDINATION AND COMMUNICATION**

Although the bulk of the bridge work came from CEC offices outside of Texas, that didn’t prevent CEC’s professionals from maintaining high levels of communication to ensure Republic’s needs were properly met.



“I had a reasonable amount of high-level information on what it would take to build the bridge due to prior coordination with the floodplain administrator and hydraulic modeling, which narrowed down the design,” Adam Hart said. “There was a high level of communication with CEC’s professionals in the details of what was needed and why.”

CEC’s professionals maintained excellent communication with each other, with their clients, and with the contractors to ensure seamless

completion of this project in the summer of 2021 to meet Republic’s needs.

“We made it a point to make a trip down there for the project kickoff, so they knew who was designing the bridge and that we were clear on the site,” Hannah says. “We made a second trip during construction to strengthen the relationship with the client and contractor. It matters to have a familiar face on site, and we hope that helps open further opportunities for collaboration with everyone involved in this project.” ■

**MANAGING LEACHATE**

# LANDFILLS AND BEYOND

■ Leachate challenges the owners and operators who need to manage it — and the engineers tasked with designing effective treatment options.

Leachate and other landfill-generated liquids (gas condensate and dewatering liquids) can be one of the biggest and most expensive challenges for landfill operators, and among the most challenging industrial wastewaters to manage and treat from a technical standpoint.

The landfill system generates highly variable leachate characteristics due to waste source changes, seasonal precipitation, cell expansion, and closure phasing — not to mention the natural biological and physical process reactions of waste degradation.

The result is variable influent flow rates and constituent concentrations that must be effectively treated to comply with receiving stream or POTW limits. Typical landfill leachate includes high concentrations of organics and ammonia, but it also contains other non-biodegradable and persistent compounds such as PFAS or even color and odor that may need to be treated or mitigated for discharge compliance or process inhibition concerns.

Nutrient-loading impacts to receiving water bodies may also force landfill owners to reduce nutrient levels, which could further require advanced forms of treatment.

These complex liquids present challenges for clients who must determine how to properly treat them. They also present a challenge for engineers who are evaluating and determining the most effective treatment options. As recycling and other waste programs have been implemented, landfill owners and operators are seeking new ways to bring in revenue,



CEC offered numerous services for a major upgrade of this existing on-site leachate treatment plant in the mid-Atlantic, including Light Detection and Ranging (LiDAR) and terrestrial survey services. That technology helped create a model of the existing site and everything inside of it from scratch.





accepting types of waste they might otherwise have ignored in the past. In many instances, wastes other than municipal solid waste comprise as much as 25% of the waste stream. “We’re on the receiving end of that,” says Greg Werner, a Principal in CEC’s Charlotte office who manages the firm’s wastewater treatment subpractice. “What’s going into a landfill is changing and the amount that’s going into a landfill is changing. While you’re designing something or while it’s being built, the landfill might change what they’re taking in or their processes might change. There are a lot of uncontrollable factors inside a landfill.” So how do landfills manage their leachate concerns, both at the landfill and beyond? Here is a look at some of the technology being utilized by CEC’s professionals.

**TREATMENT TECHNOLOGIES**

Leachate treatment commonly requires biological systems be employed as primary or secondary treatment. Biological treatment includes a variety of process options including aerobic, anaerobic, and anoxic processes aimed at removing ammonia,

carbonaceous organics, and nutrients such as phosphorous and nitrogen. Typical biological treatment methods include: conventional Activated Sludge Process (ASP), Sequencing Batch Reactor (SBR), Integrated Fixed-Film Activated Sludge (IFAS), and Membrane Bioreactor (MBR). Each of these methods has its own advantages at meeting the landfill’s treatment objectives. “One concern of treating leachate using a biological process is high solids generation, or sludge waste,” Greg says. “Solids separation and dewatering are integral to the biological process and need to be carefully considered to optimize treatment performance and operating cost.” Primary treatment prior to biological treatment may be required to remove metals or other compounds that may inhibit the biological process. These methods can involve chemical processes aimed at precipitating dissolved metals out of the leachate, or converting compounds like odor-causing sulfur to less harmful forms. They also can involve physical processes like air stripping that transfer volatile compounds or ammonia from one phase to another. Finally, tertiary treatment is required to meet specific limits for

non-biodegradable and persistent compounds after the majority of pollutants have been removed. Tertiary treatment can be used for dissolved ions like chlorides, boron, PFAS, bacteria, odor, color, and residual ammonia and nitrogen. “These compounds are often not very concentrated in the waste stream at this point in the treatment process, but they have limited options for removal or destruction,” Greg says.

**VARYING SERVICES AND OPTIONS**

CEC’s work on leachate projects across the country has involved all of the aforementioned compounds and treatment technologies in some form or another. It also has involved professionals with a wide array of expertise to ensure landfill owners and operators are getting exactly what they need, including providing construction management and support services and construction quality assurance. At a site in the mid-Atlantic, CEC’s breadth of services was on full display for a major upgrade of an existing on-site leachate treatment plant. CEC utilized Light Detection and Ranging (LiDAR) and terrestrial survey

“**Although landfill leachate has some general characteristics, no leachate is created the same or can be treated the same. Having as many experts as we have nationwide with diverse expertise ensures our clients are getting the specialized services their leachate concerns call for.**

**GREG WERNER**  
CEC Principal,  
Wastewater Treatment Expert

services for an existing plant that was lacking plans. That technology helped create a model of the existing site and everything inside of it from scratch, which laid the foundation for CEC’s engineers to determine the next steps. CEC’s experts were instrumental in ensuring the landfill was in compliance and ensured the design and upgrades were consistent with the National Pollutant Discharge Elimination System permit, which called for new discharge limits that required significant modifications to the site’s existing biological system. Professionals from CEC offices nationwide and in numerous practice areas, including air quality, survey/geospatial, civil engineering, water resources, environmental, and waste management, pitched in on this nearly \$18 million project. At another landfill site in the mid-Atlantic, CEC provided a municipal solid waste client with a multi-disciplined team of wastewater, process, mechanical, structural, and electrical engineers to develop a leachate treatment plant on site. The owner had been transporting leachate off site, but that was increasingly difficult and expensive as outlets became limited. Developing an on-site treatment plant would reduce the operational costs and eliminated the risk that having nearly 2,000 off-site truck trips per year would bring. CEC worked with a reverse



osmosis vendor to streamline the design and solve a costly problem for the owner. In an alternative treatment option, CEC assisted a landfill client in the Southeast by developing a system that would pretreat the leachate for discharge to the city sewer system for final treatment and disposal at the city’s POTW. The leachate at this site was much stronger than “typical” leachate, with high ammonia concentrations and high total dissolved solids as a result of large volumes of aluminum dross and municipal wastewater sludges disposed over the years. CEC’s design for the leachate pretreatment system consisted of adding an additional 185,000-gallon storage tank, two 450,000-gallon bioreactor tanks, and two submerged ultrafiltration membrane tanks. As the leachate quantity and strength continued to increase, CEC was able to provide several upgrades to the plant, as well as provide staff who were responsible for daily operations for nearly a decade.

**SPECIALIZED SOLUTIONS**

Landfill leachate is complex, and the appropriate treatment train must be evaluated carefully based on regulatory requirements, the life of the landfill, the capital investment, and operating costs and manpower required to maintain compliance. Leachate projects might have some commonalities, which means the approach to treating it may be similar. But while the overarching issues for many landfills might be similar, there is no template for how to treat leachates. “Although landfill leachate has some general characteristics, no leachate is created the same or can be treated the same,” Greg says. “From permitting to regulatory negotiation early in the process, to the design and construction, and, beyond that, monitoring and modifying as necessary, no two leachate treatment projects are similar. Having as many experts as we have nationwide with diverse expertise ensures our clients are getting the specialized services their leachate concerns call for.” ■





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CEC WILL HAVE A NEW HOME FOR ITS CORPORATE HEADQUARTERS IN 2022.  
LOOK FOR MORE INFORMATION IN THE COMING MONTHS!