

2022 INFRASTRUCTURE REPORT

ROADWORK PROJECTS

FORGING PATH AHEAD



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ROADWORKS WORK FOR THE ECONOMY

As inflation rises, and with it, economic uncertainty, here are five projects to watch as construction continues across Canada.

BY SAUL CHERNOS

When Doug Ford's Conservative government was re-elected in Ontario this past June, that province's on-again, off-again plan to build Highway 413, a new route across the north end of the Greater Toronto Area, received a significant boost; or so it seemed.

Over the years the 59-kilometre corridor has had its ups and downs. It has been touted for its potential to ease gridlock yet derided for the environmental footprint it would leave across a sensitive greenbelt that successive governments have pledged to protect.

During the month-long campaign, pundits billed the vote as a referendum about the highway, which would skirt around Brampton and Vaughan. However, with information about species at risk living along the proposed route coming to light after the election, the project remains on precarious ground.

Still, despite a range of environmental, economic and geopolitical pressures, many road, bridge and tunnel projects remain ongoing and look to keep road crews busy

across Canada over the next few years. While not an exhaustive list, the following spotlights and profiles in five regions across the country help highlight some of the ongoing prospects for roadbuilding that will be happening in the coming years.

BRITISH COLUMBIA: HIGHWAY 1

Construction of the Highway 99 Tunnel, rebuilding flood-damaged highways, and multiple side-road projects are keeping B.C. roadbuilders busy, but Highway 1 continues to lead the way as a multi-year road improvement endeavour.

The details vary by segment, but the overall goal is to improve safety and expand one lane in each direction to two while building barriers and landscaped medians to support a 100 kph speed limit. Much of the work also includes expanding brake check areas, adding acceleration and deceleration lanes, improving passing opportunities to accommodate increased traffic, and enhancing active transportation.

Work is being completed in phases and has been underway for nearly a decade. Segments immediately east of Kamloops

are long done, and a two-kilometre stretch east of Revelstoke at Illecillewaet was finished in November 2021. Construction is also progressing on new four-laning segments in Chase and Salmon Arm.

Three phases of work through Kicking Horse Canyon have similarly widened 21 kilometres of narrow, winding two-lane highway across some of Canada's most mountainous terrain, and a \$440.6-million design and build contract has been awarded to Kicking Horse Canyon Constructors for a fourth 4.8-km section. The consortium for this segment includes Aecon Group, Parsons and Emil Anderson Construction. Work is slated for substantial completion in winter 2023-24.

PHOTO: © SCOTT / ADOBE STOCK

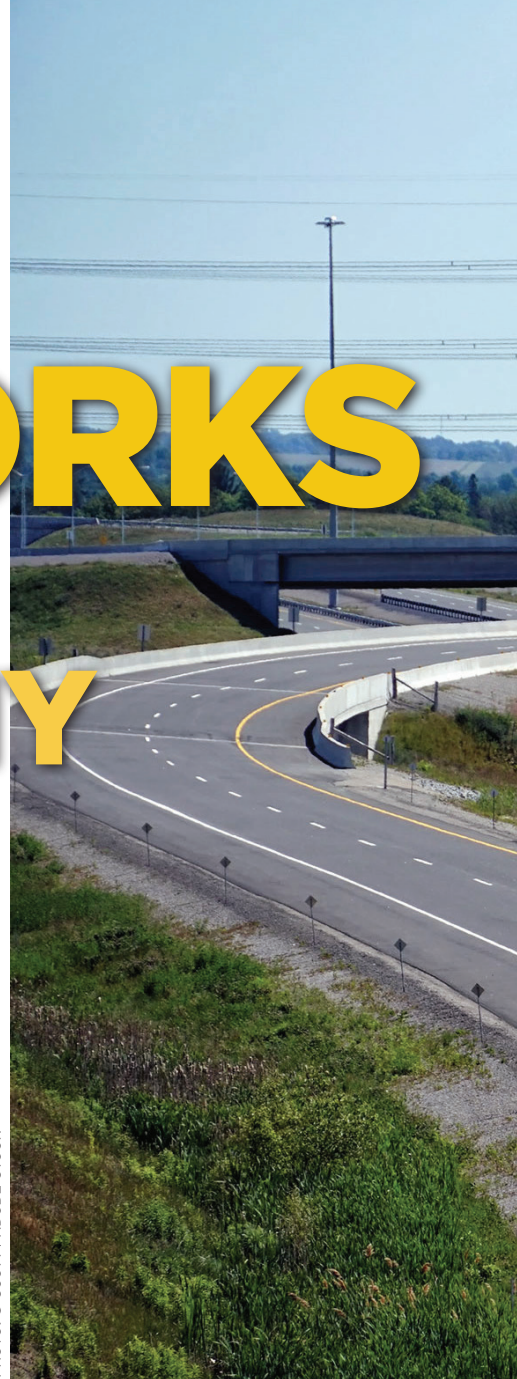




PHOTO: COURTESY OF B.C. MINISTRY OF TRANSPORTATION AND INFRASTRUCTURE

Also on tap are a 4.3-km, \$243 million stretch from Ford Road to Tappen Valley Road, which will see the Tappen Overhead Bridge replaced and widened; construction of the new \$123.7 million four-lane Quartz Creek Bridge; and the projected \$224.5 million replacement of the R.W. Bruhn Bridge. Contractors for currently active projects include: Dawson Civil (Chase Creek Road to Chase West), CIF Construction (Chase West to Chase Creek Bridge), Springline Construction Services (Salmon Arm West), and Pennecon Heavy Civil (Quartz Creek Bridge).

BC Road Builders and Heavy Construction Association president Kelly Scott calls the entire billion-dollar-plus

package a significant investment that stands to enhance safety and efficiency.

“The work continues to bolster the western trade corridor we keep talking about,” he says. “This is a critical artery. All communities will benefit from the improved, efficient, safe road system, with better access to health care, education and supplies.”

MANITOBA: WINNIPEG PERIMETER HIGHWAY

In announcing a three-year, \$1.5 billion plan for Manitoba’s network of highways, Manitoba’s Transportation and Infrastructure Minister Doyle Piwniuk emphasized the importance of the routes to trade and commerce.

While ongoing work on the north-south Highway 75 corridor is designed to improve access to and from U.S. markets via North Dakota, the Winnipeg Perimeter Highway is a key project for which investment is expected to ring in at more than \$346 million.

“Our government recognizes targeted investments in roadways and bridges are foundational to our economic growth and the quality of life for all Manitobans,” Piwniuk said in an April budget announcement. “Advancing our highway network will enable market access for international, interprovincial and regional movement of goods, and will position our province to become a national transportation hub.”

Chris Lorenc, president of the Manitoba Heavy Construction Association, says the multi-year capital program for highways recognizes the critical role transportation infrastructure plays in economic growth.

“Manitoba’s economy relies on trade for about 54 per cent of its GDP, and the Perimeter Highway and Highway 75 are two of the key trade gateways and corridors in the province,” says Lorenc. “The fact that the province has identified, or is in the process of identifying, trade as an economic-enabling instrument is important, and we’re glad that the Perimeter is getting this kind of attention.”

With a new interchange at St. Mary’s Road underway, and another at McGillivray



PHOTO: COURTESY OF THE CITY OF MONTREAL.

Boulevard set to go, Lorenc anticipates improvements to overall traffic flow.

“These are all factors that are required to ensure you’re not start-stop, start-stop, start-stop. They will improve safety as well as the general comfort and ease with which product can be moved around.”

Lorenc says Canada needs a sustainable, predictable, incremental national plan that can be coupled with concurrent provincial investment strategies focusing on efficient and cost-effective trade gateways and corridors.

“The federal government has allocated \$640 million to enhance trade gateways and corridors over the next five years, which is a drop in the bucket,” Lorenc says. “There’s no national plan recognizing that 66 per cent of Canada’s GDP is generated by trade.”

QUEBEC: JACQUES-BIZARD BRIDGE

The Ile-aux-Tourtes bridge in Montreal and Ile d’Orleans bridge near Quebec City stand to keep work crews busy for the next few years. Of particular note, however, is a new bridge being built to replace the aging Jacques-Bizard Bridge, which dates to 1965 and is the lone road link between Montreal and Ile Bizard.

The \$85 million structure, first approved in 2015 and slated to open in 2023, with landscaping and finishing work to carry into 2024, is to be located next

to the existing bridge and is intended to address increased congestion by enabling 30,000 vehicles to cross the Riviere des Prairies on a daily basis while facilitating active travel with a two-way bike path and a widened sidewalk.

The lead contractor on the project, EBC Inc., started work this past spring. The project will see approaches to adjacent intersections redesigned and a fourth vehicular lane added to end the need to continually change the directionality of a middle lane.

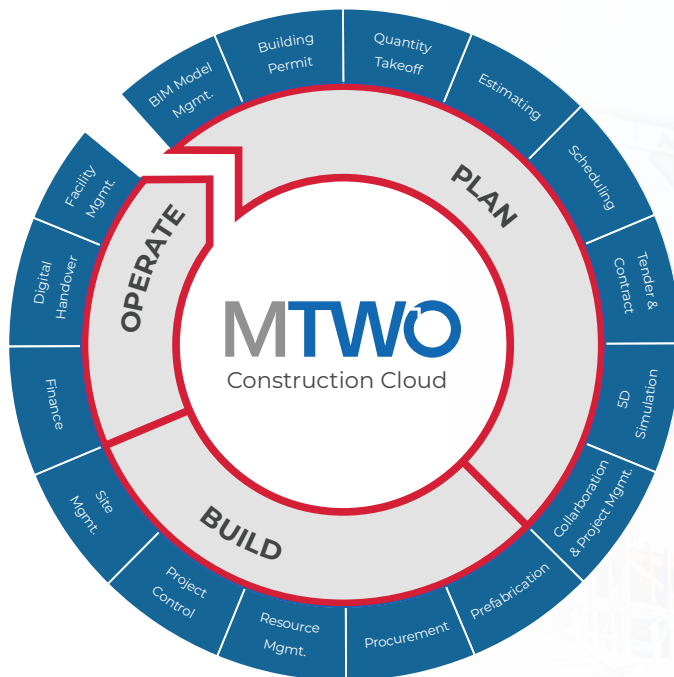
Electrical networks and cabling and sewer and water lines are also being installed and renewed to improve services on the island. The new bridge will also include a lookout, which is being installed in the middle of the bridge, and the adjacent Parc Denis-Benjamin-Viger is being redeveloped. Urban furniture will feature throughout the structure.

To attain the bridge’s projected 100-year life span, engineers proscribed galvanized reinforcing steel, high performance coating and improved drainage systems to add reinforcement and cope with de-icing salt and freeze-thaw cycles.

“This project is a fine example of efficient economic stimulation,” says Gisele Bourque, CEO of the Quebec Road Builders and Heavy Construction Association. “These are structuring projects that put several types of jobs and businesses

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PHOTO: COURTESY OF YUKON.CA.



to work. Starting with general contractors and their subcontractors, this type of project involves several specialties ... and also requires the involvement of many suppliers.”

Bourque points to a clear link between public infrastructure investments and long-term economic performance.

“Investments in public infrastructure are necessary for a healthy economy, not only in times of crisis but also in times of economic growth,” she says, noting that the construction industry is a major economic force in the province. As a whole, it represents 14 per cent of Quebec’s GDP.

YUKON: NISUTLIN BAY BRIDGE

When blasting started earlier this summer, the Yukon government heralded the \$160-million replacement of the Nisutlin Bay Bridge as critical to the local community, territory, country and continent.

The bridge, billed by the government as the largest capital project in Yukon history, crosses Teslin Lake north of the Yukon-B.C. border and keeps traffic flowing along the Alaska Highway, a major artery for travel, goods and essential services.

The original bridge, built in 1953, was aging, and the government wanted a modern-day structure to accommodate increased traffic volumes, including trucks bringing goods and services to the rest of the territory and into Alaska.

The new concrete and asphalt bridge was designed in collaboration with the Teslin Tlingit Council, which signed a project charter with the territory to formalize plans to minimize disruptions from construction and maximize local economic benefits.

The new bridge will be 483 metres long, nearly 13.5 metres wide to accommodate heavier truck traffic, and will include two lanes of traffic, a widened shoulder for cyclists, and a sidewalk that’s lit and separated from traffic. A walkway will also be built underneath the bridge so pedestrians and snowmobiles can cross safely.

Project spokesperson Krysten Johnson, from the Government of Yukon’s Department of Highways and Public Works, says local employment is key to the project and Graham Infrastructure, the lead constructor, has committed to prioritizing hiring Teslin-based businesses, contractors and tradespeople.

“This specific project will ensure a number of local opportunities and community development opportunities including involvement in environmental monitoring, gravel pit development, and the design and installation of artwork to be installed on or near the new bridge,” Johnson said.

Project completion is slated for early 2026, and the current bridge, in service 20 metres away, will be demolished when that happens.

ONTARIO: BRADFORD BYPASS

Highway 413 may be facing uncertainty, but road signs along Highways 400 and 404 declaring “The future site of the Bradford Bypass” suggest shovels may soon be on their way to the Greater Toronto Area’s northern reaches. While still at the planning stage, this 16.2-kilometre route linking the two north-south highways enjoys relative support with far less opposition than what Highway 413 has faced.

Plans call for a 100-metre-wide right-of-way with four lanes and a mix of grass medians and concrete barriers.

The Ontario Ministry of Transportation (MTO) has retained AECOM Canada to coordinate work on the preliminary design, including a provincial environmental assessment. And, with no federal assessment expected, provincial projections call for design completion by early 2023.

Andrew Hurd, director of policy and stakeholder relations with the Ontario Road Builders’ Association, says the bypass was included in this past spring’s provincial budget and, while the post-election budget had yet to be reintroduced at press time, the government looks poised to reintroduce largely the same document.

“Government projections indicate that commuters using the highway will save up to 35 minutes and that construction will support an estimated 2,600 jobs per year during construction and generate an estimated \$274 million in annual GDP,” Hurd says.

Hurd considers projects like this good news for Ontario’s economy. “Anytime there’s a substantial amount of work in a given area it supports local economies in addition to the provincial GDP.”

With population growth projected to continue across southern Ontario, Hurd also pointed to ongoing work to widen Highway 401 and improve Highway 7 between Guelph and Kitchener, coupled with work on rail and other public transit systems, as vital to supporting trade and other economic activity. □

Saul Chernos is a freelance writer and regular contributor to On-Site.



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Located at Lake Ontario, Ashbridges Bay Treatment Plant is serving more than 1.5 million residents of Toronto, and is one of Canada's largest and oldest wastewater treatment plants.

PHOTOS: COURTESY OF HATCH.

GOING DIGITAL FOR WASTEWATER PLANS

Toronto's Ashbridges Bay Treatment Plant outfall project uses 3-D modelling to deliver results on time and within budget.

BY DENISE DEVEAU

Toronto's Ashbridges Bay Treatment Plant is one of Canada's largest and oldest wastewater treatment plants, servicing approximately 1.6 million residents. The century-old facility discharges treated effluent into Lake Ontario through an existing one-kilometre-long outfall that dates back to 1947. With that tunnel reaching the end of its service life and having limited hydraulic capacity, work on a replacement is underway.

The city turned to Hatch, an engineering and construction consultancy firm with a global team members, to design the new tunneled outfall. The design process started in 2015; construction began in 2019; and the target is a completion date in 2024. Throughout the process Hatch has relied on a suite of Bentley's 3-D modelling appli-

cations to ensure deliverables would be on time and within budget.

DESIGNING FOR SUCCESS

Hatch and the city of Toronto evaluated numerous alternative outfall design concepts for the shaft, tunnel(s) and risers, including various construction methods such as tunnelling and in-lake dredging. The decision was made to proceed with a single large-diameter tunnel.

"The preferred outfall alternative was assessed to have the lowest life cycle costs with the least environmental impact during construction," says Kevin Waher, senior project manager, tunnels at Hatch. "It also allows treated effluent to flow by gravity from the plant, through the effluent conduits, into the shaft, along the tunnel,

and be dispersed into the lake via risers from tunnel crown to the lakebed along the last 1,000 metres. Ports are installed on the top of each riser to enhance treated effluent dispersion into Lake Ontario."

The design involved, among other elements, sinking a shaft adjacent to the shoreline and then mining a tunnel through rock beneath the lakebed below Lake Ontario.

"To be clear, this is not any typical tunnel," says Waher. "We're effectively building a shaft, which is a football-field deep into the ground, a tunnel that is approximately three times the length of the Golden Gate Bridge, and a tunnel diameter [that is] the size of an average two-storey house."

The most challenging construction

sequencing constraint was to have all risers installed, grouted, and tested for leaks before tunnelling below with a tunnel boring machine (TBM), explains Waher.

“Without this constraint, the risk of over-drilling a riser into a completed tunnel would result in significant worker safety, property damage, schedule, and financial impacts to the outfall project.”

Another constraint involved probing ahead of the TBM to assess the potential for water inflows and to implement pre-excavation grouting to improve rock quality and limit water ingress into the tunnel, as required.

Project: Ashbridges Bay Treatment Plant Outfall

Owner/Client: City of Toronto (Toronto Water)

Location: Toronto, Ontario

Consultant (Organization): Hatch

Digital Solutions: Bentley Systems

LEVERAGING THE POWER OF DIGITIZATION

The location, complexity and scale of the project required an integrated approach leveraging computer-aided design with engineering analysis, while considering the underwater soil and environmental features. The team used Bentley’s 3-D modelling software during the project’s design phase for all major design elements, including the effluent conduits, shaft support of excavation and final lining, tunnel liner, riser-to-tunnel connections, risers, ports, and port protection.

The software allowed engineers to create surfaces from borehole logs, including the lake’s water level and the anticipated tunnel invert. This enabled the prediction of geological boundary conditions below the lake to make significant design decisions.

“This is an important design approach to mitigate potential risks of tunnel inundation from the above lake,” says Waher. “Generating the lakebed surface profile using 3-D tools also enabled us to locate the diffuser risers as far as possible from the shoreline, to improve dispersion and minimize environmental impacts within Lake Ontario, and prior to the local underwater

feature called the ‘Toronto Scarp.’”

3-D modelling also assisted in the development of each segment of the precast concrete tunnel lining (PCTL), he adds. “It allowed us to design a complete tunnel PCTL ring and then determine the ‘clocking’ or rotation of each ring, as well as predict possible tunnel-to-riser connection issues and generate bid design drawings.”

The software was key in expediting delivery, reducing costs and delivering the detailed design on time and within budget. Hatch estimates that the digital tools saved roughly 2,000 hours of staff labour, with digital collaboration and the use of 3-D models for technical peer and constructability review workshops adding to the savings as well.

“The outfall project design phase was completed to the city’s satisfaction, on time and under budget, which is commendable,” says Justyna Teper, senior engineer with the City of Toronto, and the outfall project manager.

THE ROAD TO COMPLETION

Construction commenced in 2019 and is expected to be completed in 2024.

“With the risers installed and the tunnel now complete, we’re approximately two-thirds of the way there,” says Waher. “The next challenge involves placement of grout within the rock above the tunnel crown to mitigate potential groundwater inflows, install rock bolts to support the precast concrete tunnel lining segments, and then strategically remove specific segments to excavate and support the final one to two metres of rock between the tunnel crown and each riser.”

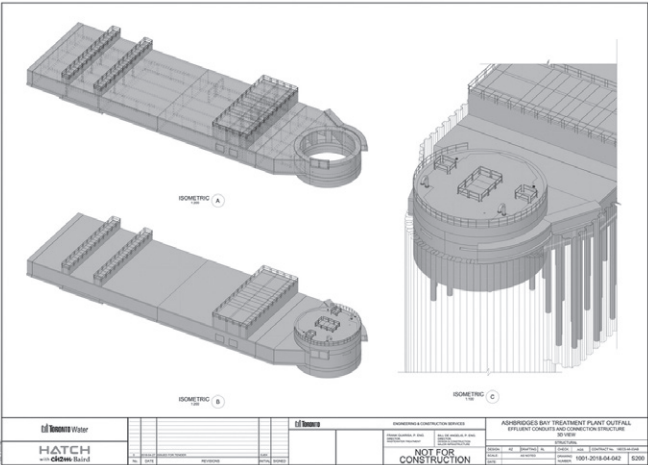
Subsequent work will include final lining installation in the shaft, effluent conduit construction, tunnel flooding, and then the final ports and port protection installation over the next few years, adds Waher.

“When all 50 riser-to-tunnel connections are complete, we will demobilize from the tunnel and place concrete within the starter tunnel and shaft final lining up to the ground surface before making the final connection between the shaft and the effluent conduits. The tunnel will then be flooded before ports are installed on the top of each riser.”

When completed, the Ashbridges Bay Treatment Plant outfall will be the largest in Canada and one of the largest outfalls in North America. “We believe this project will act as a blueprint for future outfall and intake projects locally and across the world,” says Waher.

“This is a mega project in the water industry,” confirms Sandra DiMatteo, Bentley’s director of industry marketing for water. “It compares to the prominent Tuas deep tunnel sewerage system in Singapore where digitalization and technological advancements play a key role in the development project. That’s the way progress is made, one project at a time, advancing digitalization, advancing engineering, and advancing infrastructure together towards quality of life for our communities.”

Adds Waher, “Our exceptional and diverse team continues to successfully collaborate and innovate to solve construction challenges on this project. We are all looking forward to the day we can celebrate the outfall as commissioned and ready to receive flows from the Ashbridges Bay Treatment Plant.” □



The design of the system was accomplished using digital models and structural analysis, conserving resource hours and allowing the the detailed design to be completed on time and within budget.



The construction credit crunch: A perfect storm

Availability of capital, credit and cashflow is dropping at a shocking pace.

The construction sector, for the most part, has very thin margins, especially when viewed in the context of the risks taken via contract over the past decade. Of concern is the rapid rise in risk over the past three years as events such as the COVID-19 pandemic and geopolitical instability created by war in eastern Europe have added uncertainty into the marketplace.

Construction stakeholders need to be laser focused in the coming five to 10 years as the impacts of these risk-fuelling events continue to manifest within the global construction economy. The construction sector has already begun a journey down the road of a massive credit crunch and the availability of capital, credit and cashflow is beginning to drop at a shocking pace.

As forward-minded companies, there are some solutions that warrant consideration to help mitigate credit crunch impacts.

SUPPLY CHAIN DISRUPTION

The supply chain was, and continues to be, dramatically disrupted, resulting in many knock-on impacts. This disruption wasn't just about paying higher prices to get what you needed, it was whether you could even get what you needed, regardless of price. Many best practices and solutions have been suggested to help deal with the impact, including:

- Conducting detailed assessments of materials and supply chain feasibility with the owner and specifier.
- Purchasing and storing materials in advance of needs.
- More intense monitoring of vendors in your supply chain.
- The use of technology to monitor the supply chain.
- Calls for more use of domestically manufactured materials.

INFLATION

The inevitable next step after a supply chain disruption is an increase in prices for materials in short supply. We have seen massive increases prices for key materials like timber, steel, concrete, fuel, road building materials, copper, and virtually every other construction material. To combat the impact of inflation:

- Qualify bids to consider rapid price increases.
- Use escalation clauses in contracts.
- Educate your customers around inflation (show hard evidence).
- Use technology to track the supply chain and price increases.
- Press for government support.
- Consider paying a premium for greater certainty in pricing.

INCREASING INTEREST RATES AND PROJECT CANCELLATIONS

As inflation and prices go up, so too will interest rates. We have already seen massive increases in prime lending rates by central banks globally to fight inflation. This has led many projects to

undergo a feasibility review as costs related to supply chain inflation and costs related to interest rate increases combine to put many public and private projects on hold. Expect to see more projects being "mothballed" or cancelled in coming months and years.

To minimize your company's exposures to project cancellations:

- Increase due diligence around the projects you pursue.
- Do a deep dive over the various sectors of the economy to determine which are likely to suffer cancellations.
- Assess the financial strength of the companies you work with.
- Consider proof-of-financing in bid security instruments.

ACCESS TO SURETY AND BANK CREDIT

As inflation, unpredictable supply chains, interest rate increases and construction project cancellations make their way through the global economy, the financial health of construction stakeholders will continue to face challenges.

Those supplying credit to the construction sector are already beginning to take notice. One can expect we will be entering a phase of tight surety and bank credit. Construction stakeholders should invest in strengthening relationships with their surety and bank credit providers. Sit down with your trusted advisors and ensure you have the right credit partners to weather the future tight credit storm. It is time to strengthen your credit relationships.

ACCESS TO LABOUR

Supply of materials isn't the only area of weakness. The supply of labour is going from bad to worse. There is already price pressure on labour due to lack of supply. This will only increase as inflation starts being raised as grounds for seeking new employment.

Take all precautions within your organization to ensure you are assessing current talent needs, benchmarking cost of talent, and have tools to ideally allocate talent across your organization. It is also wise to adopt best practices to attract and retain top talent.

The past few years, and the coming several years, will be very challenging when it comes to financial health and access to credit. Be mindful of the various impact areas driving these turbulent times and harness the power of tools and best practices to ensure each of these disruptive areas do not have a material impact on your organization.

Once the storm has been weathered you want to be in a strong financial position to take advantages of the post-credit crunch marketplace. □

David Bowcott is Global Director – Growth, Innovation & Insight, Global Construction and Infrastructure Group at Aon Risk Solutions. Please send comments to editor@on-sitemag.com.



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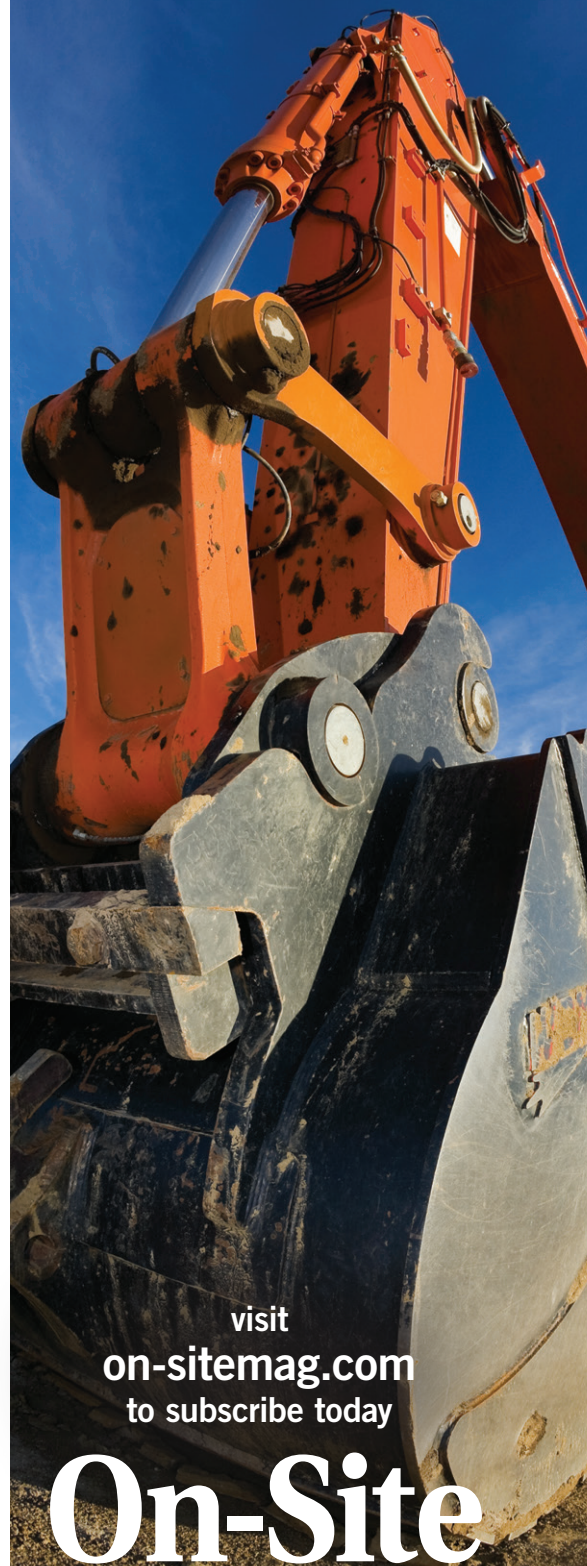
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