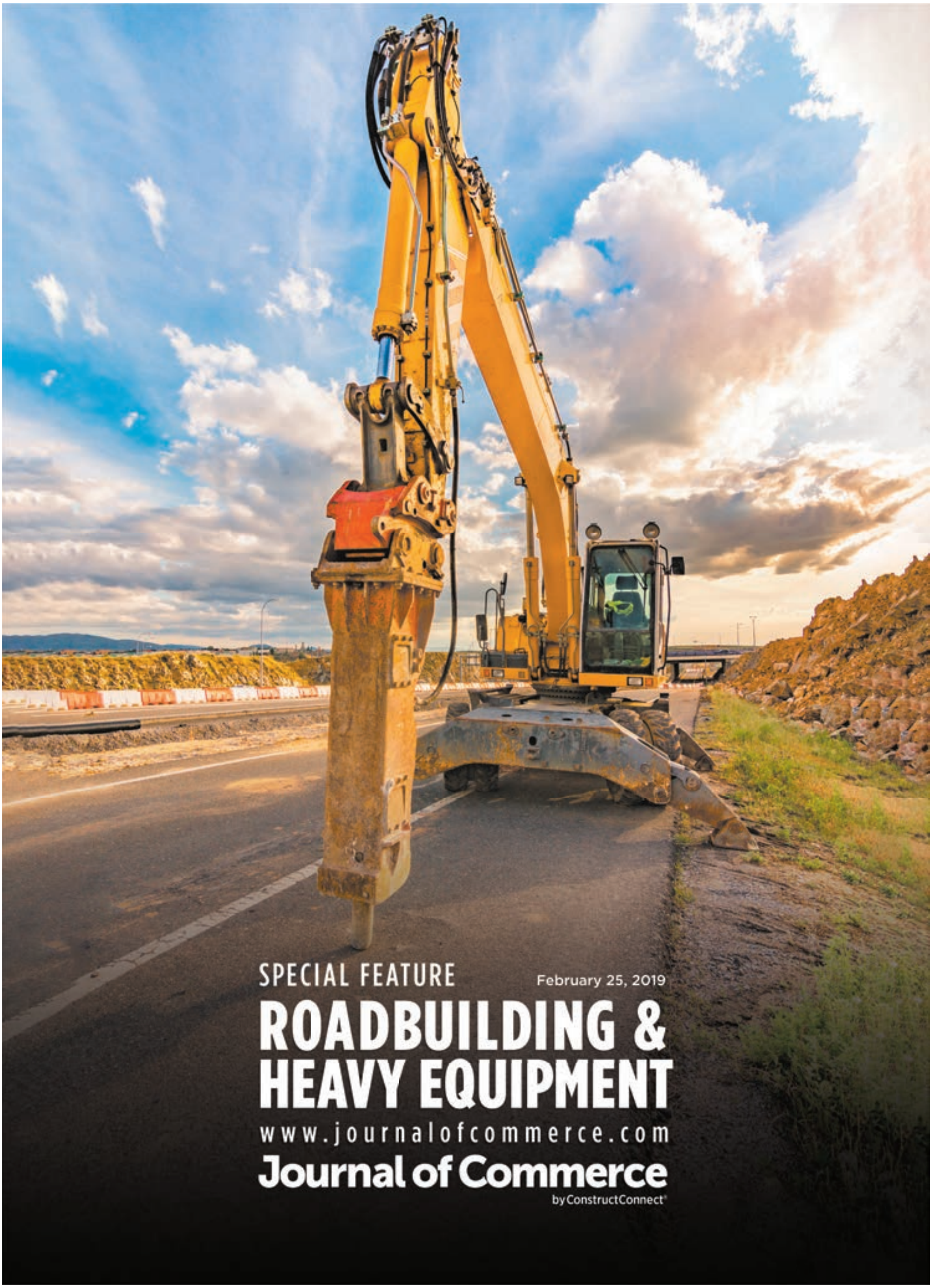

SPECIAL FEATURE

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Cold planers key to asphalt milling projects

NATHAN MEDCALF
CORRESPONDENT

Asphalt milling is a cost-effective means for addressing asphalt deficiencies on roads, highways and parking lots. When asphalt reveals cracks and potholes that aren't deep — and the base and sub-base are intact, scraping away just the asphalt is both cost-effective and quick compared to replacing the entire road.

"Milling of pavement surfaces can be for several different reasons. Main reasons are for removal of worn or degraded asphalt layers, to improve ride-ability, re-shape the road or improve traction/grip," says Matt White, North American Sales Manager-Milling & Recycling/Stabilizing, Bomag Americas.

"Preparation of the milling machine as well as the job site are crucial pieces to the milling process. Preparation of trucking (how many trucks are needed, how long turn-around times are and logistics) is crucial," says White. "Communication between crew onsite and milling operators is key as well."

Asphalt milling is achieved through the use of a cold planer. Also known as a planer, asphalt grinder, asphalt milling machine, cold milling machine, a cold planer cuts the asphalt with a rotating drum equipped with teeth and then vacuums the milled pieces and places them on a conveyor, which transports the pieces to a truck positioned immediately in front of the planer.

WIRTGEN GROUP

Automatic leveling system technology, such as Wirtgen's Level Pro that is integrated into cold milling machines, permit on-the-fly adjustment of milling depth and correction of grade and slope of milled surface prior to overlay.

The grinded asphalt is known as reclaimed asphalt pavement (RAP); it is processed into engineered aggregates and then gets used in asphalt mixes.

"Asphalt 'cold' milling with self-propelled cold mills prepares a road driving course for an asphalt overlay or pavement preservation surface treatment," says Tom Chastain, Applications Specialist, Wirtgen America.

"By removing an aged, oxidized driving surface in advance of paving, cracks that may reflect from existing surface up through a fresh asphalt surface are eliminated; existing crown and slope are restored or altered; low clearance under bridges due to multiple overlays is corrected; and curbs are revealed that were covered up by multiple overlays."

Chastain continues: "Asphalt milling is not to be confused with cold in-place or hot in-place recycling, in which a single machine or an equipment train removes, recycles and replaces the surface in one pass. Nor should it be confused with full-depth recycling or reclamation, in which a failed pavement is pulverized in-place and mixed with the layers below and compacted as the base for a new asphalt overlay."

Machine control has been part of a cold planer's DNA for a long time. For nearly two decades, these machines have come equipped with grade control, which senses the height of the material to be cut and automatically makes drum height changes according to the specifications input into the machine by the operator.

"Proper setup of grade controls, combined with drum maintenance and machine maintenance will ensure the machine is capable of producing at 100 per cent," says White.

Then, manufacturers developed slope control, which senses the side-to-side angle of the machine and automatically makes adjustments according to specification.

More recently, manufacturers have developed a way to change the drum speed from the operator's station; instead of getting under the machine to change a belt, an operator simply pushes a button on the control panel.

A cold planer operator has to maintain two speeds — the speed of the drum's rotation and the forward speed of the machine. The drum's rotation speed has to correspond to the machine's forward speed, otherwise you can end up with choppy asphalt and damaged cutting teeth.

"Milling speed is critical. Typically, a steady, consistent speed will produce better results and less wear/tear on a machine, than running as fast as possible," says White.

Another important feature of a cold planer is its ability for quick and easy drum changes.

Finally, an efficient dust suppression system (water) on a cold planer protects the operator and workers from inhaling it, as well as cools down the drum. This is called "water on the fly", because the water is used while the machine continues to work.

NATHAN MEDCALF

A Bomag BM 1200/35 cold planer milling the parking lot of a logistics company. Asphalt surfaces get milled and paved over regular, long intervals, of a decade or two, depending on their intensity of use.

Climate change floods leading to bridge, culvert and road upgrades

JEAN SORENSEN
CORRESPONDENT

Hundreds of millions of dollars in culvert, roads and bridges construction are needed in B.C. to fix rural flood damage and help municipalities to flood proof as climate change brings rising water levels.

The work is preparing for what a new B.C. government report on severe event flooding and wildfires is calling the "new normal". Addressing the New Normal: 21st Century Disaster Management in British Columbia sets out the problems facing communities and makes wide ranging recommendations including the need for better infrastructure and new technologies.

In flood-struck areas such as Grand Forks, Peace River, and the Okanagan, work has already started. Contracts are not billion dollar deals, but smaller contracts, as governments look at replacing bridges, culverts, and roads to accommodate increased water flows.

In the Peace River, the Ministry of Transportation and Infrastructure (MoTi) has embarked upon a multi-year plan to replace culverts and constructing new bridges following the 2016 flood. To date, $82 million has been spent, a MoTi email said. Thirteen new structures have been either built, are in construction, or planned. Construction companies working on projects include: Brocor Corporation Ltd. (Rolla Road bridge), Surespan Construction ($12.4 million for Tippy Corner, Willow Flats and Stone Creek bridges) and Formula Contractors ($7.1 million Bowlder Creek bridge). Bridges are constructed to a 200-year flood level.

Five more projects will be constructed over the next two years. They include the $25 million 8th Street Bridge in Dawson Creek being designed by Associated Engineering. The project, according to MoTi information, is expected to go to tender in the spring 2019 and will take two years to complete as it replaces culverts.

Other projects are the Fur Thief Bridge (construction starting in summer 2019 with Parsons Engineering acting as consultants); Parnell Road bridge (construction starting in summer 2019 with Klohn Crippen Berger as the engineering consultants); Gladys Bridge (construction starting in late 2019 or early 2020 with Parsons Engineering as consults); and the Gibbons multi-plate structure (construction slated for late 2019 or early 2020 with Parsons Engineering acting as consultant).

The Boundary Flood Recovery (BFR) team, which includes hard-hit Grand Forks, is looking for flood recovery funds to begin its flood upgrade. In May 2018, parts of the Granby, West Kettle and Kettle River exceeded the 200-year flow level causing $38 million in damages to agricultural operations and buildings ranging from residential to industrial.

Grand Forks has a five-year $60 million flood recovery plan in place and is seeking funding from different levels of government. In January, the city applied to Infrastructure Canada, through the BFR, for $49.9 million in funding for flood mitigation projects that will pay for re-establishing wetlands, building dikes, raising roads, installing pumps for storm water drainage, and bank stabilization. The total time to implement all stages of the proposed plan is five years after receiving funding approval. Funds are also being sought under the National Disaster Mitigation Program for further works.

B.C. MINISTRY OF TRANSPORTATION FLICKR

High levels of rainfall caused widespread flooding in areas of B.C. in June 2016. Flooding and washouts severely impacted roads. Seen here, crews worked on Highway 29 South repairs.

> "Some of the infrastructure is very old and designed at a time when we didn't have a lot of water and flow data,"
>
> Des Goold
> Northwest Hydraulic Consultants

In the Okanagan where flooding has occurred for the past two years, Don Dobson P.Eng. of Dobson Engineering, has already issued an alert for the South Okanagan area it has reached saturation levels of groundwater "creating an increased potential for flooding during freshet in 2019".

The Regional District of Central Okanagan, one of three regional districts, has recently completed mop-up damage from the 2017 flood in six of its regional parks where bridge, trail, parking lot or boat launch damage was incurred by flooding and contracts let to repair damages ranged from $100,000 to $500,000. Kelowna is looking to repair damaged culverts and a longer range plan, pending ministry approval, is replace the culverts with a larger open bottom arch culvert. The project is in the design state.

The shift to upgrade grass-roots infrastructure is tied to increased level of precipitation more often.

"Climate change has always happened," said Dobson, "But, what we are seeing is that things are changing more rapidly."

There are also more extreme events occurring. He said that engineers have used the best available data when designing dykes, roads, bridge and culverts. Culverts have a 50-100 year life while bridges up to 75-100 years. Engineers have in the past designed to a 50, 100 or 200 year extreme occurrence but as the Grand Fork's flood demonstrated, it surpassed the level anticipated for a 200 year event.

Within the past decade, increased rainfall and warmer temperatures have resulted in data spikes showing higher lake and river levels rise, he said. Engineers now have to eye data more critically when retrofitting a bridge or culvert or building new structures.

"How has that data changed? And, does that change mean we have to re-visit and re-size the bridge or culvert?" he said.

Northwest Hydraulic Consultants engineer Des Goold, P.Eng., said all the replacements happening of culverts and bridges cannot be blamed entirely on climate change flooding. In some cases, the structures were undersized from the beginning based on limited flow information.

"With respect to the flooding in the Peace and Okanagan, some of the infrastructure is very old and designed at a time when we didn't have a lot of water and flow data," he said.

Engineers may have had only 20 to 30 years of data to aid them in designing culverts or smaller bridges. "It was more of a guessing game," he said.

Today, there is a longer history of recording such information. Generally, he said, there is a shift towards upsizing culverts or replacing culverts with bridges. But, that move is also dependent on other design factors such as providing bridges with clear spans so midstream piers do not trap debris, or providing larger sized culverts with debris deflects to avoid clogs.

The B.C. government, the Engineers and Geoscientists BC, the Association of Consulting Engineering Companies B.C. plus other organizations have produced guidelines or best practices for accommodating climate change in structures. "Generally, the design of bridges haven't changed a lot," Goold said, aside from the piers may be dug deeper, larger-sized riprap used to stave off scouring or erosion, and structures may be more elevated.

But, preventative design solutions are being explored. The BC MoTi in rural areas, many of which service access roads needed forest access or fighting fires, are dealing with rock and timber from debris flows or landslides leading to blockages and road washouts.

At Grizzly Creek, near Chetwyn, in northern B.C. a 900 mm culvert was overwhelmed creating flooding and washing out parts of Highway 97 in 2016. McElhanney Consulting Services Ltd. reviewed crossing replacement options and with Atlantic Industries Ltd. selected to build a bolt-a-plate horizontal ellipse structure.

Northwest Hydraulic Consultants Ltd. (NHC) recommended additional armouring of the culvert invert plates to better withstand abrasion from gravel and rocks. (The armouring plates are attached on the bottom half to further prevent scouring and are easier to replace than the metal lining inside the concrete culvert).

As a further deterrent for debris, NHC also recommended and provided preliminary design of a V-shaped steel trash rack which deflects debris to the sides of the culvert and prevents jams. McElhanney completed the detailed design of the trash rack.

Mark Woods, community services manager for the Regional District of Okanagan-Similkameen said the regional districts within the Okanagan area have all banded together to provide gain greater flood mitigation solutions and determine what needs to be done to infrastructure.

See LIDAR, Pg. R-4

B.C. MINISTRY OF TRANSPORTATION FLICKR

Crews work on Mason-Semple Road in June 2016 after rainfall caused road damage.

Calculating accurate spot elevations critical for estimators

DON PROCTER
CORRESPONDENT

Identifying and accurately calculating spot elevations — high or low areas on an excavation site — on earthworks drawings can be tricky work for an estimator.

"There is so much going on with a set of drawings that to only find the spot elevations actually means training it (software) to disregard all of the irrelevant stuff on a set of plans," says Jeff Graham, CEO of Construction AI, a young tech company which is planning to launch software soon that will solve the problem.

It is important information for estimators, particularly on extensive excavation sites such as subdivisions, schools, commercial and industrial malls, pipelines and road projects, says Graham who co-founded Construction AI with Max Klein and Jason Heard.

Calling an estimator's time "unbelievably precious", Graham says the software allows them to prepare a bid quickly and accurately.

Filtering out irrelevant information is the trick, he says, noting that to accurately calculate spot elevations includes determining the cost of fill removal and the type and quantity of replacement materials.

While optical character recognition software has been used by some companies to scan drawings, it does not focus on spot elevations, says Graham whose company is based in Mosquodoboit Harbour, N.S. and Alberta.

"Estimators need to figure out the areas of new asphalt, concrete, storm, sanitary, water. It's complicated."

Construction AI's software has been in development since the company was founded about three years ago.

"It's been a brutally hard problem to solve," he says, noting that his is not the first company to take a stab at developing the software.

Graham says the software "frees up" estimators to do other tasks. Securing the closest dump sites to keep trucking costs down and managing subcontractor relationships are examples of those tasks.

"I think those are ultimately the things that can win or lose a job."

Graham says the software will be launched once a "channel marketing" deal has been arranged. That will be "a revenue-sharing deal" with an established earthworks software player which has a global-reaching customer base.

The goal is to form a partnership with "with a construction company or two in Canada."

Graham says the software is not suitable to every project.

"Our use case is where the engineer does a site model in CAD and then renders it in a PDF drawing and posts it on a tender site" for bidding earthworks contractors. "Each one of those contractors turns that PDF back into their own 3D model or they calculate it by hand using cross sections."

He says Construction AI can process the PDF quickly to get the information to contractors to accurately bid the job.

"The problem we are solving is in the tendering process where the engineer doesn't share the CAD file, which in my experience is most of the time."

The idea of developing the software came to Graham while he was working for his father's excavating business. Describing the estimating work as "drudgery," he says it involved entering spot elevations, identifying buildings and other data entry tasks from drawings to exact the quantities for a bid submission.

Construction AI was a recent winner of the Innovacorp Sprint Competition for early stage software-based technology companies in Nova Scotia. The company received $25,000 and guidance from seasoned business professionals to help get the product to market.

Graham says in the near future the software will do more than accurately estimate contours (spot elevations). "We're very confident we will be able to do roadworks, sidewalks…"

Over the longer term, Graham says the goal is to provide software to do repetitive tasks for other construction trades as well.

Manitoba to replace 100-year-old Crescent Lake bridge with causeway

MYRON LOVE
CORRESPONDENT

The tendering documents are ready and the new Crescent Lake Causeway in Portage La Prairie in south central Manitoba is definitely a go.

The $7-million project is intended to replace a 100-year-old bridge spanning scenic Crescent Lake on the southwest side of the city of about 13,000.

The lake encloses Island Park, a recreation area that includes a multiplex, tennis courts, picnic sites, horse racing track, an 18-hole golf course, outdoor water park, a playground area, bandshell, outdoor walking paths, natural habitat, , arboretum and strawberry farms.

"We considered a number of different options," says Jocelyn Lequier-Jobin, Portage's Manager of Engineering. "We consulted extensively with the public and different stakeholders. Based on price and other factors, we determined that a causeway offered the best value and would also be esthetically appealing."

The plan proposes a three-lane, low level, causeway with three arched culverts, roundabouts at the north and south intersections, and an active transportation pathway.

The design includes provision for passage of snowmobiles, skiers, pedestrians, and portages over the causeway.

The roundabouts have been designed to accommodate truck movements.

Lequier-Jobin reports that the demolition of the bridge is scheduled to begin this summer — with a temporary causeway modified to accommodate two lanes of traffic and a pedestrian walkway. The project will require one year of consolidation and settlement of road sub-grade material before the pavement and curbing can be built. The overall construction duration is estimated to be 1.5 years, with the roadway work being completed in 2020.

CITY OF PORTAGE LA PRAIRIE

This rendering depicts what the new Crescent Lake Causeway is anticipated to look like. A 100-year-old bridge currently in place will be replaced in the $7-million project.

LIDAR being used to strengthen engineering decisions

Continued from Pg. R-3

Currently, LIDAR technology is being used. LIDAR is an aircraft born radar system that maps elevations.

"We are trying to determine where the water will flow when there is a substantial run-off and where the low-lying areas are and how that changes the landscape," he said. That information can translate into information which can form wetlands, how to engineer roads, bridges, culverts and residential areas within the regional districts.

"There is no doubt that we are looking at new standards and new concepts of how we do things and we need the consulting engineers to read the latest article and design accordingly," he said.

One recent study has come from Korea. 'Flood fragility analysis for bridges with multiple failure modes' is currently one of the few studies looking at bridge failures caused by floods rather than seismic failure. The study by researchers at the Ulsan National Institute of Science and Technology uses a new method to calculate the potential risk to a bridge in rapid flowing flood waters on pier or pile ductility, pier rebar rapture, pile rupture, and deck loss.

Bringing together all the information on new solutions, historical flow data, potential for debris flows, climate change impact on rising oceans, and the impact on surrounding forest cover and wildfires is not without challenges.

"It is an enormous task," said Grand Forks mayor Brian Taylor when he speaks about redesigning a city infrastructure to become flood-proof in the changing environment and trying to do it with the best information possible and in a way the public can understand.

Taylor said the city enacted new bylaws that raised buildings higher and that saved some buildings, but many still remain in flood plains, areas now restricted from new construction. No bridges were washed away but a rising river carrying a tree stump dented a utility pipe carried by a bridge. As well, the city's public works yard was cut off from downtown when the connecting road flooded and a dyke road had to be constructed.

Taylor said that cities hire the best professional to provide guidelines, based upon the best available data but, despite all these measures, there is still an element of uncertainty facing many B.C. rural cities.

Over-harvesting is occurring in many parts of B.C. as the province attempts to remove salvageable mountain pine beetle-killed trees, which leaves less living forest with roots to absorb ground moisture and hold the ground intact. The growing prevalence of wildfires has also caused rural cities to remove forest cover around them.

"There is a confluence of factors that lead into this," he said as the issue goes beyond high snow-packs and rainfall.

Grand Forks, he said, is taking the lead in devising a plan to mitigate flood damage in the future and is fortunate to have the support of the provincial government to help both with funding and planning. He doesn't believe Grand Forks will be the only community that will need to upgrade and change as water levels rise.

"We are really writing the floor plan for disaster areas in the future," he said.