

MALCOLM DRILLING COMPANY, INC. TOEING THE LINE IN THE CROWN OF MAINE

# FOUNDATION

MAY/JUNE  
2022

# DRILLING



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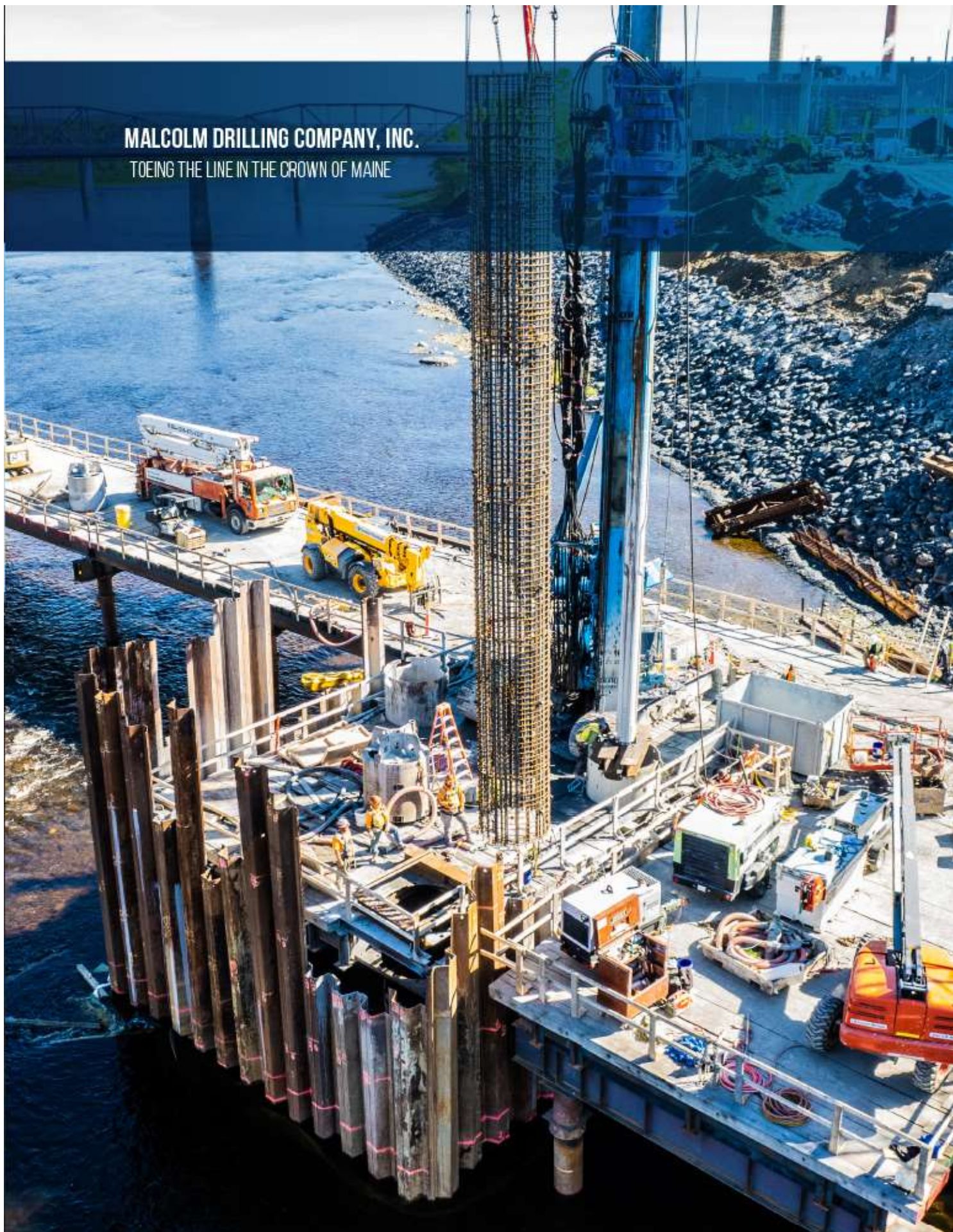
**PHOENIX FOUNDATION**  
GOIN' DEEP AT FENWAY PARK

**IRBY CONSTRUCTION COMPANY**  
HOW MID-PROGRAM  
QUALITY MANAGEMENT ADJUSTMENTS  
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**MALCOLM DRILLING COMPANY, INC.**  
TOEING THE LINE IN THE CROWN OF MAINE





COVER FEATURE: MALCOLM DRILLING

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# TOEING THE LINE IN THE CROWN OF MAINE

BY JIM GLIDER, PROJECT MANAGER, MALCOLM DRILLING FOUNDATION DRILLING





REED & REED ASSISTING MALCOLM DRILLING BY LIFTING AND SETTING THE PERMANENT CASING SECTION FOR MALCOLM'S BG40 TO INSTALL.  
(PHOTO COURTESY OF AROOSTOOK UNMANNED AERIAL PHOTOGRAPHY)

Approximately a seven-and-a-half-hour drive northeast of Boston gets you to a quiet little border town in Maine called Madawaska. Unless you are an avid moose hunter, snow mobile enthusiast, or ploye aficionado, this part of the United States is likely unfamiliar to you. However, if you have ever been lucky enough to visit one of the last great untouched frontiers in the northeast part of the US, you would know why the word Aroostook (the name of the County Madawaska is in) means "beautiful river" in Native American. The incredible scenery, wildlife, and the beautiful St. John's River make the 'Crown of Maine' an incredibly astonishing place to visit... AND WORK!

The story of why Madawaska, Maine, is donning the pages of your ADSC magazine all starts around a MaineDOT bid back in February of 2021. The bid was joint effort between MaineDOT, the New Brunswick Department of Transportation and Infrastructure (NBDTI), and the US General Services Administration (GSA) to replace the outdated border crossing between the US

and Canada. The crossing itself, the Madawaska/Edmundston International

Bridge, consisted of a 100-year-old 4-span steel truss structure that was well past its useful service life. With a current weight rating of only 5 tons, a new structure was needed to support the international trade and commerce of that corner of the United States.

With a low bid just north of \$86 million, Reed & Reed, Inc., of Woolwich, Maine, was awarded the multi-year, complex project of replacing this critical infrastructure. The new structure will consist of an 1,828-foot-long steel girder bridge that crosses the St. John's River at a 45-degree angle. The bridge consists of seven concrete substructure units supported by driven piles and micropiles on both shorelines, and all in-water piers are supported by 6-foot diameter drilled shafts with rock sockets. Reed and Reed selected ADSC Contractor Member, Malcolm Drilling Company, Inc., to install the permanently cased shafts for the in-water piers.

Malcolm Drilling, the San Francisco-born specialty drilling contractor, decided to pack up a Bauer BG40 and ship it almost 1,900 miles from its Miami, Florida, yard to drill up in Madawaska, Maine. As part of its efforts to bolster its presence in the Northeast, this project had everything that is right in the Malcolm wheel-house: difficult trestle access... check, overburden and rock sockets requiring a little extra blue muscle... check, international project complexities that require half the work being done in the United States and half in Canada... check, a worldwide pandemic that completely shuts down the US/Canada border for the duration of the project... (there wasn't a box to check for this one!).

What are the challenges for US-based contractors utilizing US equipment and US materials to perform work in a country with strict entry restrictions? You then take into consideration the fact that the only ready-mix supplier capable of delivering a wet, tremie-placed drilled shaft concrete mix to the project was located in Canada (remember that "mostly" US materials part), and you have yourself a real challenge on your hands.

With the support of the three local government agencies, Reed and Reed, and

their primary Canadian subcontractor (Greenfield Construction), those

extraordinary project conditions turned into a remarkable success. Part of that success was the shaft installation work being completed prior to the onset of winter of 2021 – winter in this part of the country can start as early as September/October and does not cease until well into the traditional spring season for the rest of the country. That success, as only achieved by a united effort of all involved, did not come without its learning curves and hiccups along the way.

## **THE GEOLOGY**

Before we can understand the drilled shafts and the challenges associated with this project, let's quickly review the conditions we had to contend with up in northern Maine.

The new bridge span is supported by a total of three driven pile-supported abutments/piers and four drilled shaft-supported piers. The piers on the ends of the span are located on embankments that reach up 40 feet to ridgelines above the St. John River Valley. The three midspan piers are located within the St. John River. Although not encountered in shaft construction, both sides of the valley are overlaid by sandy urban fill which covers sandy alluvium. The only overburden encountered during drilling was glacial till which is a very dense sand with some gravel and silt and was 20 to 30 feet thick at the pier locations. Bedrock is a hard, fresh, aphanitic blue/grey slate with a moderately sloping surface. The primary bedrock joints were extremely closely to moderately spaced, and the unconfined compressive strength of the rock ranged from 1,000 to 11,000 psi. Local groundwater level is dictated by the river level and rises steeply to follow the embankments on either side of the valley.





MALCOLM DRILLING INSTALLING DRILLED SHAFTS VIA WORK TRESTLE ON THE ST. JOHN RIVER IN MADAWAKSA, MAINE.

*(PHOTO COURTESY OF AROOSTOOK UNMANNED AERIAL PHOTOGRAPHY)*

## **THE SHAFTS**

As mentioned, the in-water foundations for this project consisted of 6-foot diameter drilled shafts, permanently cased through the overburden, seated into the bedrock, with a rock socket extending 15 feet below into the bedrock. The Sonic Caliper method was used to measure final shaft verticality and a SQUID device was used to verify base cleanliness prior to concrete placement. TIP wires and CSL tubes were installed in all the shaft rebar cages to perform non-destructive testing following concrete placement and initial cure.

The drilling itself was completed using conventional tooling. The seating of the casing into the fractured slate layers present at the top of the bedrock formation proved to be the biggest challenge on the project. The minimum specified seat of the casing into the bedrock (6 inches) proved to not provide a positive seal against inflowing groundwater. As a result, Malcolm utilized a two-tiered approach to achieve a positive seal. The first step was to advance the casing deeper than required into more competent bedrock below. The second essential change was placing a sacrificial concrete seal at the bottom of the seated casing prior to bedrock drilling.

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All that effort would seem rather rudimentary if not for the two major hurdles that the project team had to overcome: difficult access and working on an international border during a border closing pandemic.

**"The slopes of the St. John River tend to be exceedingly high and very steep in the Madawaska area. Along the south shoreline, the embankment was as much as 40 feet above the drilling platform elevation."**

## **ACCESS**

The slopes of the St. John River tend to be exceedingly high and very steep in the Madawaska area. Along the south shoreline, the embankment was as much as 40 feet above the drilling platform elevation. This required a massive earth moving effort to build a ramp parallel to the river and large enough to allow all construction equipment and materials to safely traverse the grade change for the entirety of the bridge project.

Once down on at the trestle elevation, space to store materials and install the work was at an extreme premium. Driven pile bents extending from the main trestle over the cofferdam were the only access means for the drill rig to get to the shaft locations. When drilling at the pier locations, travel from one side of the trestle was cut off. The heavy skew of the trestle led to some interesting trucking maneuvers to get the casing and the rebar cages onto the trestle platform from up in the laydown yards on top of the slope.



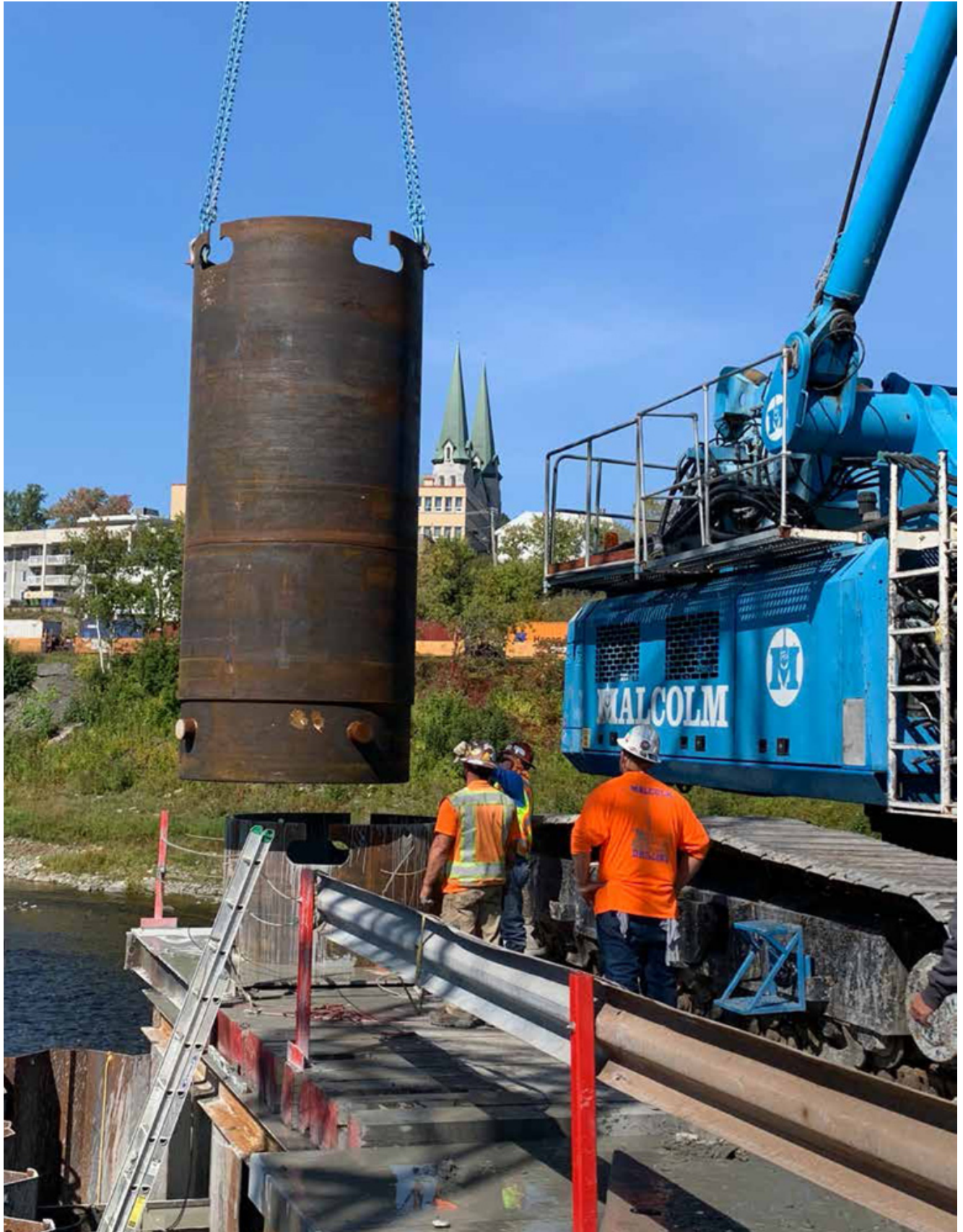


SETTING UP ON THE SHAFT LOCATION. (PHOTO COURTESY OF AROOSTOOK UNMANNED AERIAL PHOTOGRAPHY)



DRILLING SLATE ON THE TRESTLE WORK PLATFORM.





INSTALLING A PERMANENT CASING EXTENSION.

Overall, the access constraints of the project were not insurmountable. A couple of early mornings of hopscotching cranes, drill rigs, and pile hammers around the trestle was nothing compared to the logistical issues of dealing with a closed Canadian border.

## **INTERNATIONAL WORK DURING A PANDEMIC**

The COVID-19 pandemic affected each of us in some varying extent across the global landscape. The heavy civil industry saw minimal-to-no shutdowns of its inprogress work sites as we were all considered “critical infrastructure” when the sweeping national shutdowns took place. While many of us had to adapt to some new jobsite safety practices, we were fortunate to not see a screeching halt to all work. The pandemic fueled changes on this project, however, were far greater than a N-95 mask and a little social distancing.

Having worked on the Gordie Howe Bridge, Malcolm is familiar with the complications that come with working on foreign border crossing projects. Often you are dealing with the rules and regulations of multiple government agencies, different units of measurement, and a more complex set of rules over importation/taxation of goods, equipment, and workforce. Those complications are typically alleviated by the fact that you can at least enter and exit both while working on that project. However, due to COVID-19, US workers had to follow extremely strict quarantining and testing protocols just to get into Canada. This meant that Malcolm employees wanting to enter and work on the Canadian side of the river, even just for a couple hours, had to go sit through a 14-day quarantine upon entering the country with a negative COVID test.

**"Malcolm employees wanting to enter and work on the Canadian side of the river, even just for a couple hours, had to go sit through a 14-day quarantine upon entering the country with a negative COVID test."**





DRILLING OVERBURDEN ON THE TRESTLE WORK PLATFORM. (PHOTO COURTESY OF AROOSTOOK UNMANNED AERIAL PHOTOGRAPHY)

With two piers, totaling eight drilled shafts, needing to be installed on the Canadian side of the border, Malcolm and the contracting team had to get creative with access and scheduling. Malcolm's inability to pass onto Canadian soil proved to be a logistical challenge during drilling operations, as well as pre-construction. Nearly all of Malcolm's hands-on pre-planning had to be completed vicariously through a Canadian teammate via phone conversations or video conferencing. Brushing up on the French language became a priority while working together with French-Canadian subcontractors.

The fact that Malcolm's ready-mix concrete supplier and pump truck subcontractor were also located exclusively on Canadian soil proved to be even more problematic. During the pre-construction phase. Malcolm was unable to trial

more problematic. During the pre-construction phase, Malcolm was unable to grab a batch and visually inspect the ready-mix. Observing the mix through photos and videos was the closest that the operation and quality control teams got to seeing it prior to drilling. After drilling began, it was impossible to make changes to the mix and get it approved on time.

The one that thing that proved to be the most crucial piece to the success of the project was the fact that the elevated work trestle spanned from the US shoreline to the south, all the way to the northernmost pier on the Canadian shoreline, thus encompassing all four of the in-water piers. This access schedule allowed Malcolm to drill Canadian dirt and rock on the eight Canadian drilled shafts, while never actually stepping foot on Canadian soil. Without this trestle set up, all Malcolm crew and equipment would have had to passed through Canadian customs and would have been subject to quarantine regulations.

The downfall for a full-length trestle with a single point of access is that two-way traffic isn't going to take place for 20- to 30-foot-wide construction equipment. With spoils from eight US shafts heading back to US shores; casing, rebar, equipment, labor, and fuel being brought from the US shore; spoils from eight Canadian shafts heading to the Canada shore; ready-mix, and concrete pumps coming from the Canadian shore... let us just say the Madawaska Waltz was in full effect. With a specification tolerance for drilling adjacent to freshly placed concrete and a schedule push to complete the work before the winter season (which, again, pretty much started on September 30th), Malcolm and the construction team were not afforded the ability to work continuously from one end to the other.

## **CONCLUSION**

To really put this whole project and its true uniqueness into perspective, did you know that there is a North American time zone that is ahead of Eastern Standard Time? Unbeknownst to the project team, the Canadian side of this project was operating on Atlantic Standard Time! That was a new one, and it was just another example of just how unique this project really was. Paying for concrete in Canadian Dollars but getting paid for it in US Dollars; placing concrete by the cubic yard but ordering it by the cubic meter; putting a concrete order in for 2:00



cubic yard but ordering it by the cubic meter, putting a concrete order in for 2:00 PM, but concrete placement time was actually at 1:00 PM – all of these

eccentricities added up to the need for an experienced project management staff with a high degree of flexibility and ability to adapt.

### **"Did you know that there is a North American time zone that is ahead of Eastern Standard Time?"**

The project, through its first construction season, has been a remarkable success. It is a prime example of the combined effort of what multiple government agencies, a grouping of forward-thinking contractors, and the persistent effort of competent engineering and craft work can truly accomplish. Despite the effects of a global pandemic, the jurisdictional borders between two countries, and the remoteness of a place as beautiful as the Crown of Maine; there is no challenge that can't be overcome with sound engineering, impeccable communications, and little good old-fashioned teamwork! LOOK TO THE BLUE. ▲

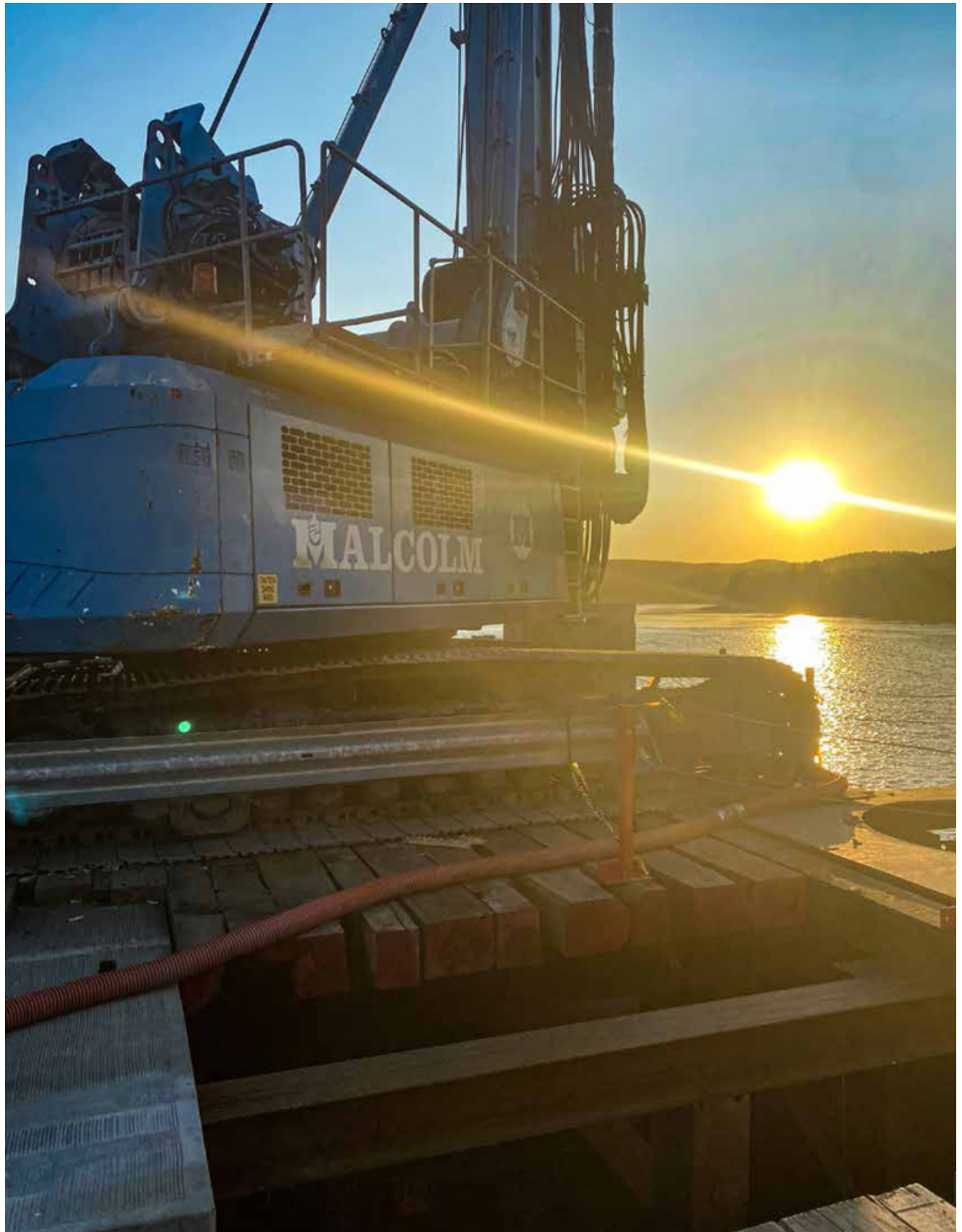
### **SPECIAL THANKS**

- Maine Department of Transportation
- Reed & Reed (General Contractor)



INSTALLING THE REBAR CAGE PRIOR TO CONCRETE PLACEMENT.  
(PHOTO COURTESY OF AROOSTOOK UNMANNED AERIAL PHOTOGRAPHY)





MALCOLM DRILLING CREWS ENJOYING THE PICTURESQUE SUNSET ON THE US-CANADIAN BORDER IN NORTHERN MAINE.

**"Malcolm was unable to trial batch and visually inspect the ready-mix. Observing the mix through photos and videos was the closest that the operation and quality control teams got to seeing it prior to drilling."**