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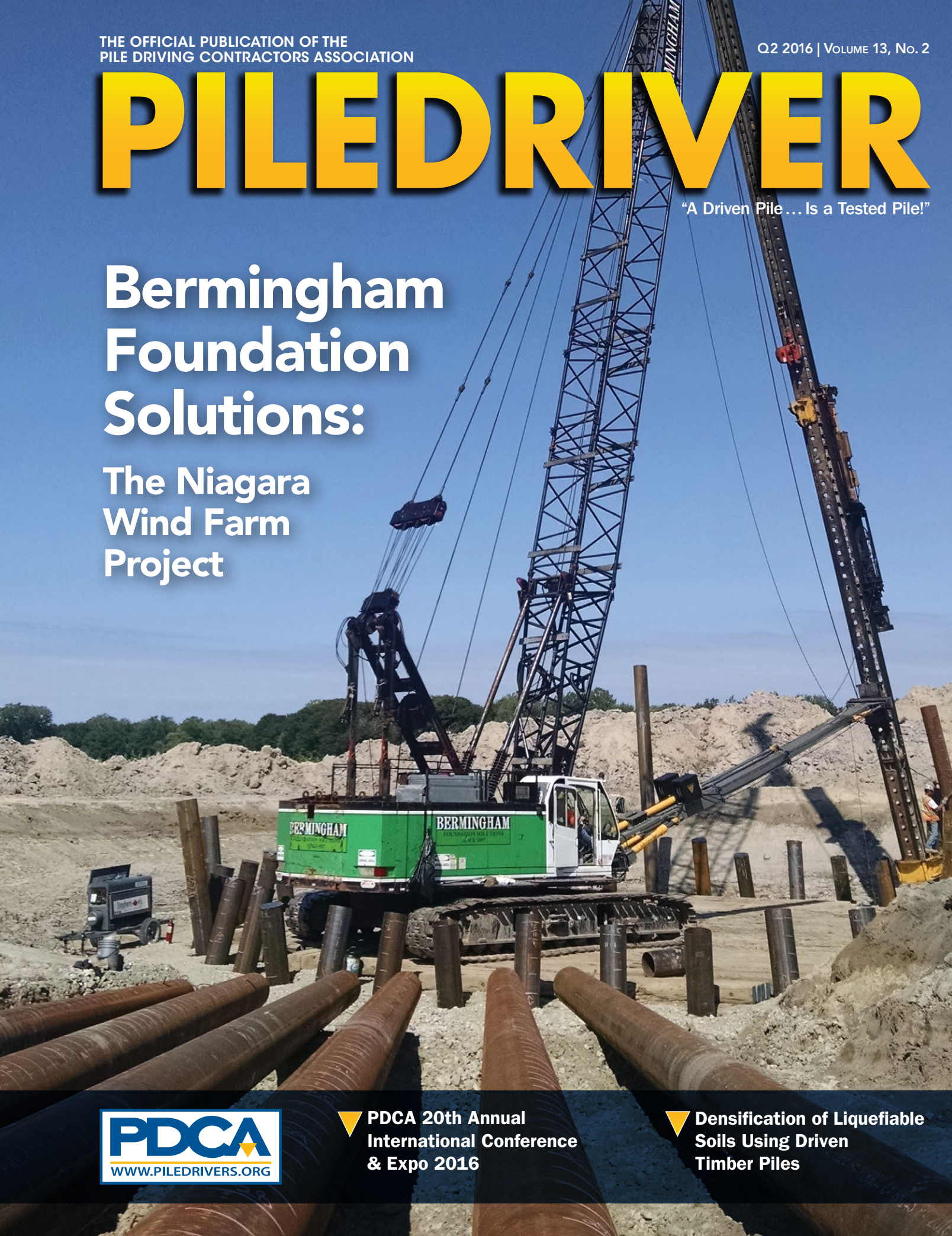
PILEDRIVER

"A Driven Pile… Is a Tested Pile!"



Bermingham Foundation Solutions:

The Niagara Wind Farm Project

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NIAGARA WIND FARM: A WIN-WIN FOR ALL

This $1-billion project will have the largest turbines in North America when completed and create clean wind energy that will promote healthy communities for thousands of homes in Ontario

By Lisa Kopochinski

It was in late 2014 that the Ontario government gave the green light for a huge wind energy project in Niagara and Haldimand County that would provide thousands of homes with clean emission and pollution-free energy. At the same time, this $1-billion project will create employment opportunities in the region and support local economic development – a true win-win for all involved.

Once completed, the project will see 77 3.0 MV wind turbines built in small clusters on a wind farm within the township of West Lincoln and Wainfleet, and the town of Lincoln in the region of Niagara and Haldimont County.

Known as the Niagara Wind Farm, Bob Daniels, vice president of the Niagara Region Wind Corporation (now called FWRN LP), says the corporation's mission is "to develop clean wind energy that promotes economic development, healthy communities and environmental responsibility in Ontario."

With more than three decades of experience in wind power and real estate development, FWRN

LP says the ability to maintain sustainable communities is largely dependent on economic growth.

As a result, this project – which requires a strong collaboration with multiple teams and partners, consideration of government policy, local community stakeholders, infrastructure and supply chains – is expected to create 700 new jobs during project development and 100 new long-term jobs during the operating life of the wind power project. More than $80 million in land lease payments to the residents of the Niagara region and Haldimand County is also expected during the operating life of the project.

Pile driving

Bermingham Foundation Solutions Ltd. was tasked with providing pile foundations on 27 of the 77 turbines. The Hamilton-based

Numerous Conditions Required

Before construction could begin on the $1-billion Niagara Wind Farm, numerous conditions had to be met for Niagara Region Wind Corporation (now called FWRN LP) to move forward. As a result of comments received by the municipality and local residents, NRWC was required to do the following:

- Not construct or operate more than 77 out of the 80 wind turbine generators identified in the approval
- Comply with the Ministry's noise emission limits at all times
- Carry out an acoustic emission audit of the sound levels produced by the operation of the equipment at five receptors
- Carry out an acoustic emission audit of the acoustic emissions produced by the operation of two of the wind turbine generators
- Manage stormwater, and control sediment and erosion during and post construction
- Develop and implement a pre- and post-construction groundwater monitoring program
- Carry out specific items if foundation dewatering or water takings by tanker exceed 50,000 L/day
- Apply the Department of Fisheries and Oceans Operational Statement, if during construction, waterbodies that were previously not identified are discovered
- Design, construct and operate a spill containment facility for each of the transformer substations
- Implement the pre- and post-construction Natural Heritage monitoring program, which includes bird and bat monitoring
- Undertake the supplementary monitoring program discussed with Environment Canada and determine next steps as part of the program including the implementation of mitigation measures in response to any potential unanticipated adverse effects
- Ensure that activities requiring authorizations under the Endangered Species Act are not commenced until authorizations are in place
- Create a Community Liaison Committee with members of the public and applicant
- Undertake ongoing Aboriginal consultation and fulfill all commitments made by it
- Prepare a Traffic Management Plan to be provided to the upper and lower tier municipalities
- Notify the ministry of complaints received alleging adverse effect caused by the construction, installation, operation, use or retirement of the facility

company began work in April 2015 on pile foundations in the area between Dunnville, Lowbanks, Wainfleet and Mt. Carmel.

Andy Morrisey, project manager at Bermingham, said the piles were 16-inch diameter pipe piles, closed ended and supplied in lengths up to 110 feet each.

"The lengths installed were up to 155 feet after splicing during installation," said Morrisey. "Piles were filled with concrete and had rebar cages running the entire length."

Berminghammer B32, B4505 and B5505 hammers were used on vertical travel lead systems that were up to 130 feet long.

Continued on page 96

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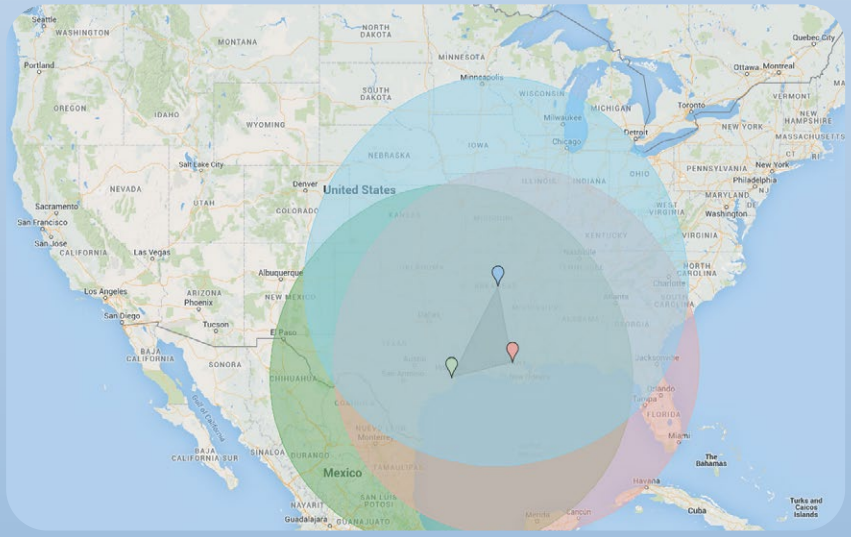

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"At the peak of the project, six cranes were on site driving piles, ranging from 100-ton to 165-ton capacities," he said. "Up to eight additional crews set rebar cages and concrete on double shifts. Each turbine had 48 piles, with a total of 1,296 piles installed."

The piles were supplied by Atlas Tube, in lengths up to 110 feet (5,590 tons total). Lafarge supplied the concrete (5,300 cubical metres total).

Challenges

"The very aggressive schedule was a major challenge, and one of the reasons Bermingham was selected," said Morrisey. "Key personnel to coordinate the large workforce were used. We partnered with Anchor Shoring and Caissons to provide additional labor and equipment support."

Other challenges existed, as well. For instance, pile tip elevations varied drastically in some locations, and were not consistent with contract expected depths.

"Strong working relationships with suppliers allowed us to get additional required material – as needed – on very short notice without any downtime," said Morrisey.

"Placing rebar cages the full length of the pile in such long and narrow piles was another challenge," he said. "We developed a rapid in-place splicing technique to insert cages efficiently and a customizable tremie system to place concrete in wet conditions with piles varying in length by 50 feet at a single turbine."

Following the installation of piles, massive concrete bases were poured and buried, on which precast tower sections were erected.

Morrisey says from a pile driving standpoint, the project was unique "because each of the narrow pipe piles contained a reinforcing cage that ran the full length of the pile. This posed a major challenge for cage installation and concrete placement, which we had to overcome."

And overcome this challenge and others is exactly what the Bermingham team did. In fact, he adds that what the team liked best about this project was the fact it was so fast-paced.

"Once again, we proved the capabilities of ourselves and our equipment to drive long steel piles." ▼

Photos courtesy of Bermingham Foundation Solutions