

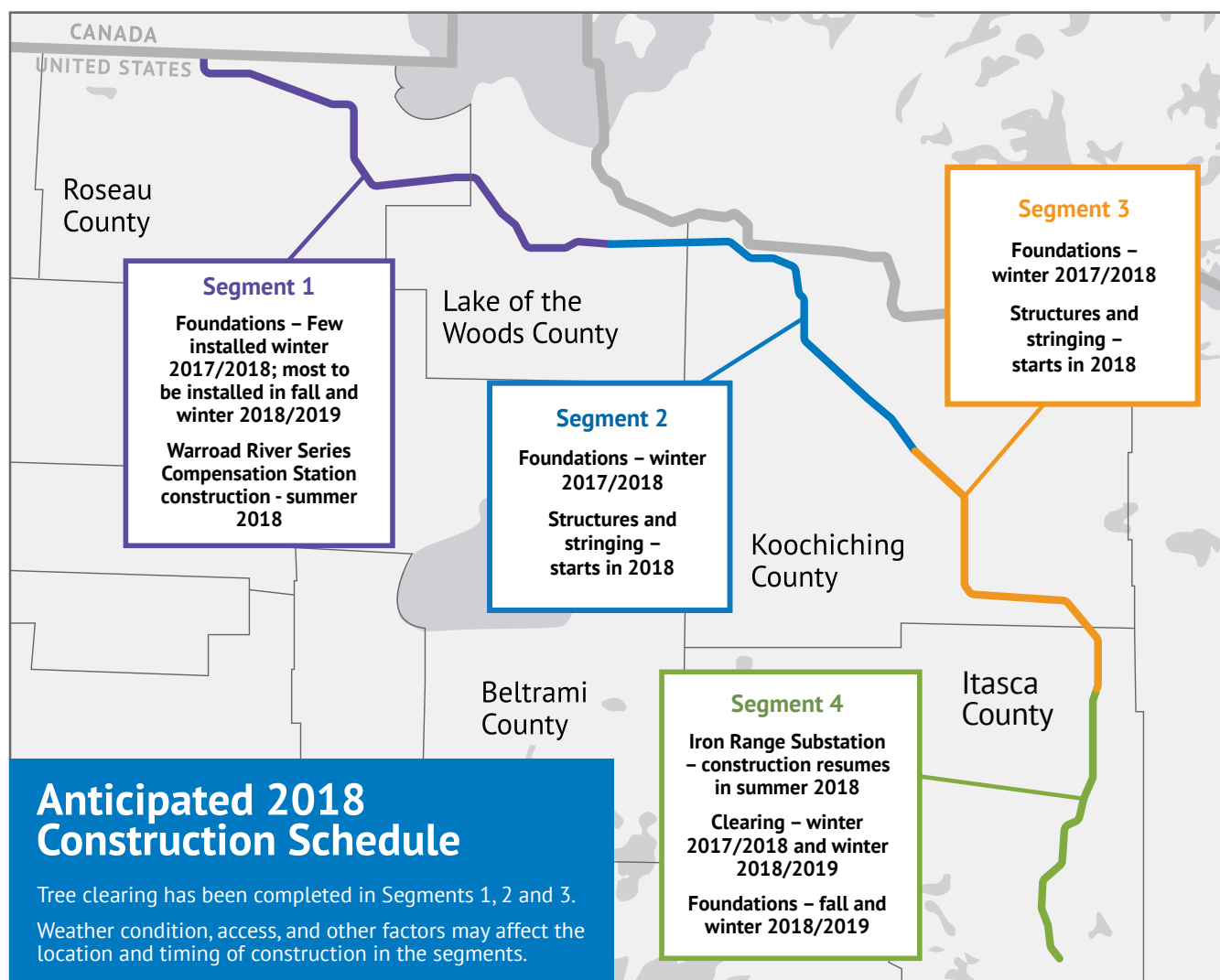
A Word from Minnesota Power

Cold weather is great for construction when working in wetlands and peatlands as it allows the Project Team to create thick ice roads, which can better support heavy equipment. This winter, the Construction Team made progress in all four segments of the Project. Tree clearing is complete in Segments 1, 2 and 3. Clearing in Segment 4 began and will be completed next winter. Foundation installation began in Segments 1, 2 and 3. The Project anticipates completing foundations in Segments 2 and 3 this winter. The map below outlines the Project's schedule by segment.

This spring and summer, you can expect to see helicopters carrying structures in Segments 2 and 3 and work will resume at the Iron Range Substation in Segment 4. As weather and access allows, foundations will be installed in Segment 1 and clearing will continue in Segment 4.

Thank you for your ongoing collaboration on this important project for Minnesota Power and our region. We always welcome suggestions for topics to include in future newsletters. Please use the Project contact information to reach out if you have any questions.

- Jim Atkinson Environmental & Real Estate Manager



Foundation Types

This year, the Project Team will primarily focus on foundation installation in Segments 2 and 3, although a few foundations were installed in Segment 1. There are three types of foundations used on the Project – helical piles, micropiles, and drilled piers. The foundation type is based on the structure type, span length, and soil conditions. The majority of the foundations will be helical piles.

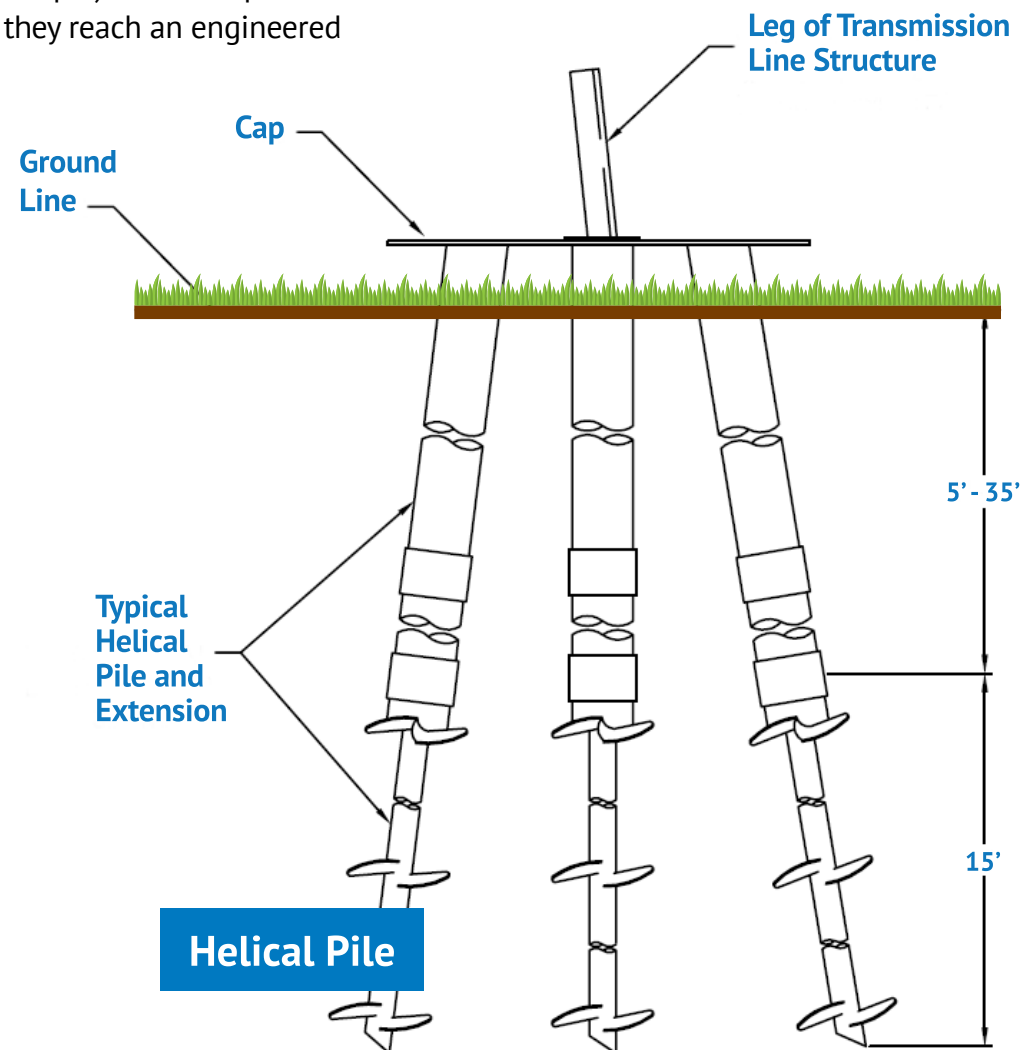


Screwing the helical pile into the ground

What are Helical Piles?

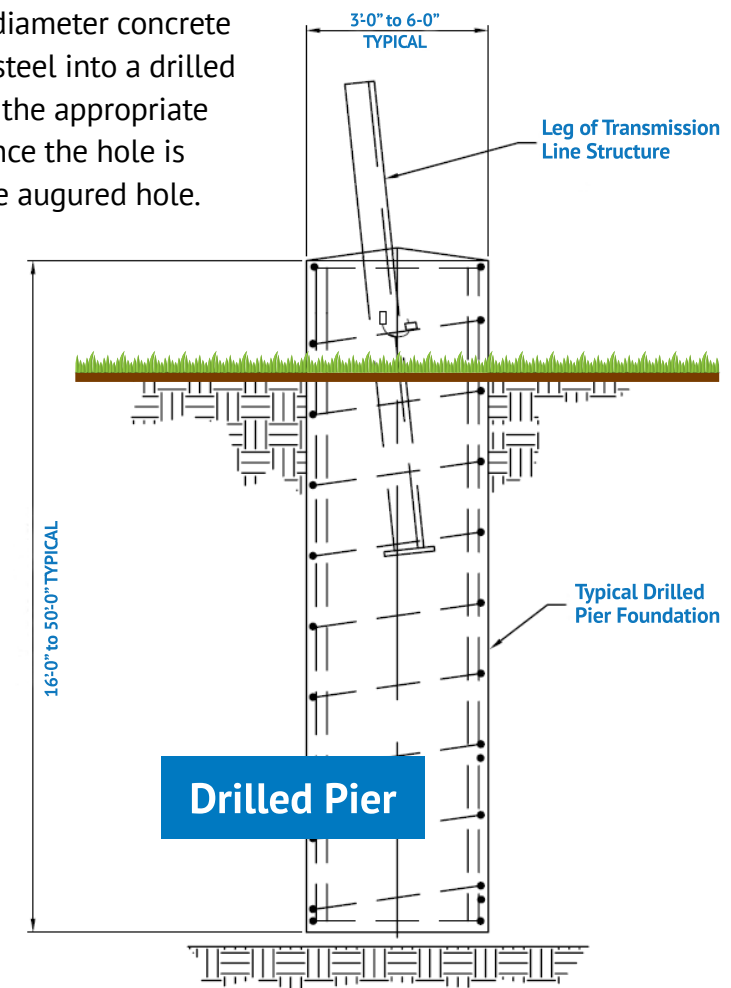
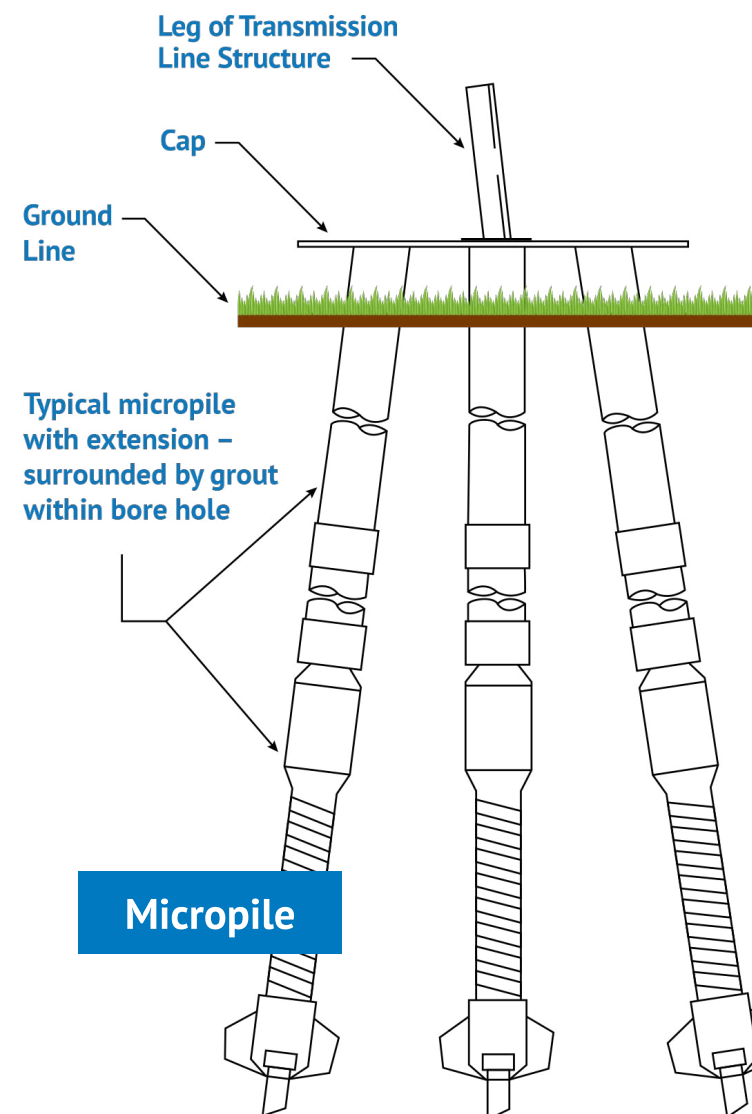
Helical piles are long steel shaft foundations that are turned deep into the soil to hold up the foundation cap. The helical pile foundation uses a series (or multiple) of helical piles that are screwed into the ground until they reach an engineered specified depth or torque value indicating they are sufficiently embedded into the ground.

Once the series of piles reach bearing depth, the piles are cut to the desired elevation, and a cap (concrete or steel) is fitted to the top of the helical piles, tying all piles together to distribute the tower weight and load. A steel pile cap may require field welding and cutting to adapt the prefabricated cap to the piles. A concrete pile cap is also an option for the helical pile supported foundations, but would require a concrete pour.



What are Drilled Piers?

A drilled pier is a deep foundation system that is a large diameter concrete cylinder constructed by placing concrete and reinforcing steel into a drilled shaft. Construction starts with auguring a circular hole of the appropriate diameter and depth where the foundations will be set. Once the hole is complete, a rebar cage and anchor bolt cage are set in the augured hole. The rebar cage provides strength and support for the concrete foundation. The anchor bolt cage is the attachment point for the structure. Concrete is then poured in the hole and allowed to cure for up to 30 days (weather dependent). Once the concrete is cured, the structures are lifted and bolted to the foundation.



What are Micropiles?

Micropiles are long steel shaft foundations that are drilled and grouted into the soil to support the structure foundation. On this Project, these foundations tend to be used in areas where soil conditions prevent the effective use of helical piles, such as shallow bedrock or very rocky soils.

Similar to the helical pile, micropiles use a series of piles (steel shafts in the ground) at each foundation, then a cap is welded to the series of piles to support the structure.



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GREATNORTHERNnews

Project Highlight: Protecting Cultural Resources

If a cultural resource is discovered within the Right-of-Way, steps are taken to protect it.

- Activity is stopped within 100 feet in any direction from the resource
- Construction management and the Minnesota Power team is notified
- The resource is not moved, destroyed or covered

What is a cultural resource? A cultural resource is the physical evidence or a place where past human activity occurred. It can be a site, object, landscape, or an object or natural feature of significance to a group of people traditionally associated with it.

