

5. DESCRIPTION OF THE PROJECT

5.1 Route Selection Process

The Project was reviewed during the planning process by a team of right-of-way, environmental and engineering personnel. The team reviewed the general project area for significant routing/siting issues that may arise. Route alternatives were identified using the process described below and ultimately one route was selected for this Route Permit application in accordance with Minn. Rules 4400.2100.

5.1.1 Route Selection Criteria

The siting team analyzed the project area using various geographic data (aerial photos, topographic maps, etc.), public input and field investigations. Preliminary route options were then identified based on opportunities to:

- share rights-of-way with existing transmission lines by double circuiting where practical or paralleling an existing line;
- minimize impacts to reliability (i.e., consider if existing lines can be taken out of service for re-construction);
- parallel utility rights-of-way, roads and trails to help decrease the amount of new right-of-way required;
- parallel field lines and property lines, where access is adequate and the transmission line would cause minimal conflicts; and
- minimize the length of the transmission line to reduce the impact area and costs for the proposed Project.

The routes were further refined by avoiding, to the extent possible, areas where an HVTL could create significant impacts. These areas include:

- existing and planned high density residential areas;
- cultivated agricultural areas;
- areas where clearances are limited because of airports and commercial/industrial structures; and
- environmentally sensitive sites, such as wetlands, archaeologically significant sites, areas with threatened, endangered and species of special concern, areas of significant biological or cultural significance, and federal lands.

Routes following existing corridors are generally preferred to new cross-country routes. However, roads may not provide optimal transmission line route

opportunities if populated with homes. Native and planted tree screens between the homes and the road or highway would require removal for construction and safe operation of the transmission line.

For new cross-country routes, the preference is to follow survey or property lines provided the Project termini are oriented in a north to south or east to west alignment.

5.2 Substation/Switching Station Selection Process

5.2.1 Substation/Switching Station Siting Criteria

General substation siting criteria for the Tower Substation and Embarrass Switching Station were used. These criteria include:

- Locate near load-serving areas to minimize construction/length of distribution lines. The preferred Tower Substation site is located near the existing distribution lines that serve Tower and the adjacent Lake Vermilion area.
- Locate near existing high side (transmission – 115 kV) and low side (feeder lines – 46 kV) lines to reduce impacts associated with line construction. The Tower Substation site is located adjacent to the proposed transmission line route and is located less than a mile from the existing 46 kV line serving the area. The Embarrass Switching Station site is located adjacent to the two 115 kV transmission lines (Line #34 and Line #34 tap) that will be connected to the new switching station.
- Avoid sensitive areas such as low areas, wetlands, waterways and wildlife areas. Locating facilities in these areas increases the likelihood of conflicts with environmental resources and poses problems both for construction and operation of a substation (i.e., poor soil conditions). The sites under consideration are not located in low areas, wetlands or wildlife areas, and are not adjacent to waterways.
- Evaluate opportunities for screening the stations from points of view such as trails, roads and homes. The Proposed Tower Substation site is located near Highway 135; however, a vegetative screen of mature trees will remain between the road and the substation. The Embarrass Switching Station site is located in a forested area totally screened from the nearest road (CSAH 138). No homes are in close proximity to either the Tower or Embarrass sites.
- Locate near an access road(s) to minimize length and to make entrance to the substation convenient for security and outage purposes. The proposed Tower Substation site is located adjacent to Highway 135 and the

Embarrass site can be accessed from CSAH 138 (Giant's Ridge Road) via an existing gravel road. This gravel road and bridge over the Embarrass River would need to be upgraded to allow safe entrance of construction vehicles and substation materials.

- Locate away from residences. A primary impact associated with substations is noise. The Proposed Tower Substation site is located approximately 1,300 feet from the nearest residence and is situated in an area zoned Forest Agricultural Management-3. The Proposed Embarrass site is located more than 1/2 mile from any residence and is zoned Multiple Use Non-Shoreland-2.
- Ability to secure a suitably-sized parcel. A sufficiently-sized parcel to construct the substation, provide for future expansion (if necessary), provide for a buffer from residences, and allow access to a mobile substation is necessary. The sites under consideration are large enough to meet the Project's needs.
- Locate on marginally productive land to minimize impact to high-yield agricultural and/or forested lands. The proposed Tower site is a grass field adjacent to a periodically used gravel pit. The site meets this requirement, as there is no crop or forested land at the site. The Embarrass site is located in a forested area, adjacent to two cleared transmission line rights-of-way.

5.3 Proposed Project

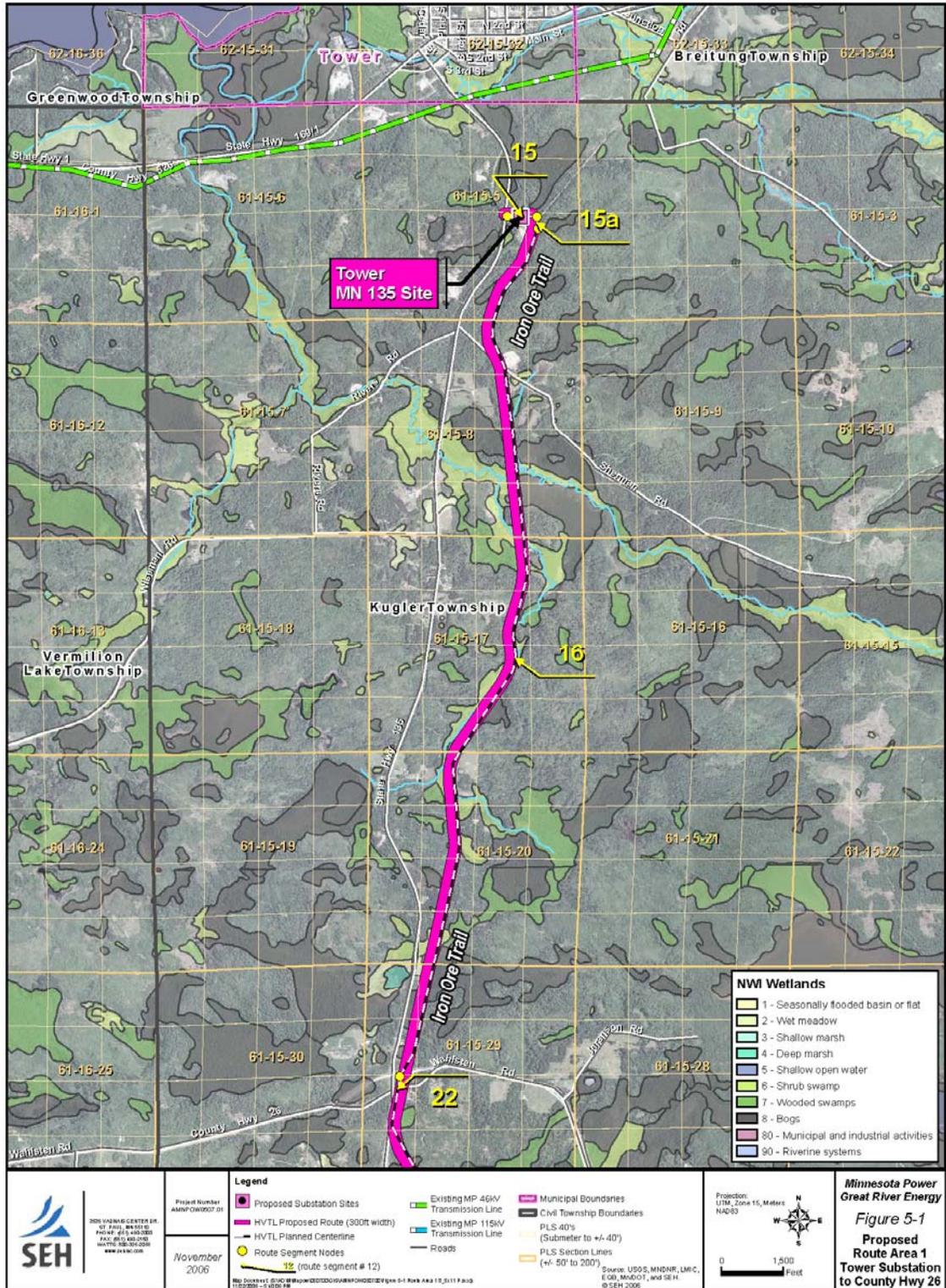
5.3.1 Proposed Tower Substation Site (Highway 135 Site)

The Tower Substation would be owned by Minnesota Power. The proposed site is located 0.6 miles south of Tower and east of Highway 135 (Figure 5-1). The site is privately owned and located in the northeast corner of the NW/SE, Section 5, Township 61 North, Range 15 West. Access to the site would be from an existing gravel access off of Highway 135. The site is fairly level and adjacent to an active gravel pit located to the south.

The new 115 kV transmission line from the Embarrass Switching Station would enter the Tower Substation from the south, and the two new 46 kV lines would exit to the north to interconnect with the existing 46 kV Line #32. The native tree screen along Highway 135 would remain and effectively reduce the visibility of the substation from the highway. There are no homes located on the parcel and the nearest home is located 1,300 feet to the northwest on the west side of Highway 135. The 200' x 200' substation footprint would be located 50 feet from the north and east property lines to maintain zoning setback requirements and to allow adequate room for site preparation and erosion prevention measures. Soil boring information revealed bedrock at a depth of 35' at one location.

The substation layout would be developed to accommodate additional substation expansion plans in the future to accommodate a 69 kV exit to the northwest for GRE's planned reinforcement of the existing 69 kV system and addition of distribution facilities to serve the Tower area load. The entire substation site (200' x 200') would be graded and fenced. Major equipment within and adjacent to the substation would include a 115/46 kV transformer, circuit breakers, line termination structures, and a control house.

Figure 5-1 Proposed Tower Substation Site and Proposed Route for Route Area 1



An improved access road off of Highway 135 and a small parking lot would also need to be constructed. A photo (Figure 5-2) and a site plan (Figure 5-3) provide additional detail on the Proposed Tower Substation (Highway 135) site.

Reasons to propose—The site is adequately sized, fairly level and trees have been removed from the footprint area. There is site preparation material available in the adjacent gravel pit. Access to the site for site preparation vehicles and installation of the large substation equipment (circuit breakers, transformers) is satisfactory. Costs for improvement and extension of the present access road would be minimal. The area is sparsely populated with a commercial/industrial history (gravel extraction area). A screen of trees along Highway 135 could remain to reduce visibility of the substation. The location would optimize the length of the proposed 115 kV transmission line and the two 46 kV circuit extensions to the existing 46 kV Line #32.

The landowner is willing to sell an adequately-sized portion of the 33.6-acre parcel for the Tower Substation. The utilities are pursuing an option agreement with the landowner, which would be contingent upon Commission approval of the proposed Tower Substation site.

Figure 5-2 Photo of Proposed Tower Substation Site



5.3.2 Proposed Route for Route Area 1 – Tower Substation to County Highway 26

The Proposed Route for Route Area 1 is shown on Figure 5-1.

Route Segments 15a and 16

The Proposed Route follows the former Duluth Missabe & Iron Range Railroad (DM&IR) grade, now called the Iron Ore Trail, for 4.2 miles. The intended centerline follows the east side of the grade from the proposed Tower Substation site south to County Highway 26. At that point, the intended centerline crosses to the west side to avoid removing a planted tree screen between the Iron Ore Trail and a home located east of the trail.

The Iron Ore Trail provides a practical corridor-sharing opportunity through a rural, wooded area with interspersed wetlands. The area is generally inaccessible and consequently there are no homes located within or adjacent to the Proposed Route. The existing corridor would need to be widened to allow safe, reliable operation of the transmission line, which would be located within a 100 foot wide right-of-way. Dependent upon the ground survey, transmission line engineering, and landowner easement negotiations, the final right-of-way locations may provide the opportunity to reduce the amount of tree vegetation within the right-of-way due to sharing the Iron Ore Trail corridor.

Reasons to propose—The route segments follow an unpopulated existing corridor. One of only two existing north to south corridors within the project area, the Iron Ore Trail would minimize impact to homeowners in the area without creating a new cross-country corridor. The Iron Ore Trail includes several long tangent (straight, in-line) sections, thus minimizing the need for angle structures and minimizing cost. There are only three stream crossings, which can be crossed near the existing bridges of the Iron Ore Trail.

5.3.3 Proposed Route for Route Area 2 – County Highway 26 to East Taylor Road

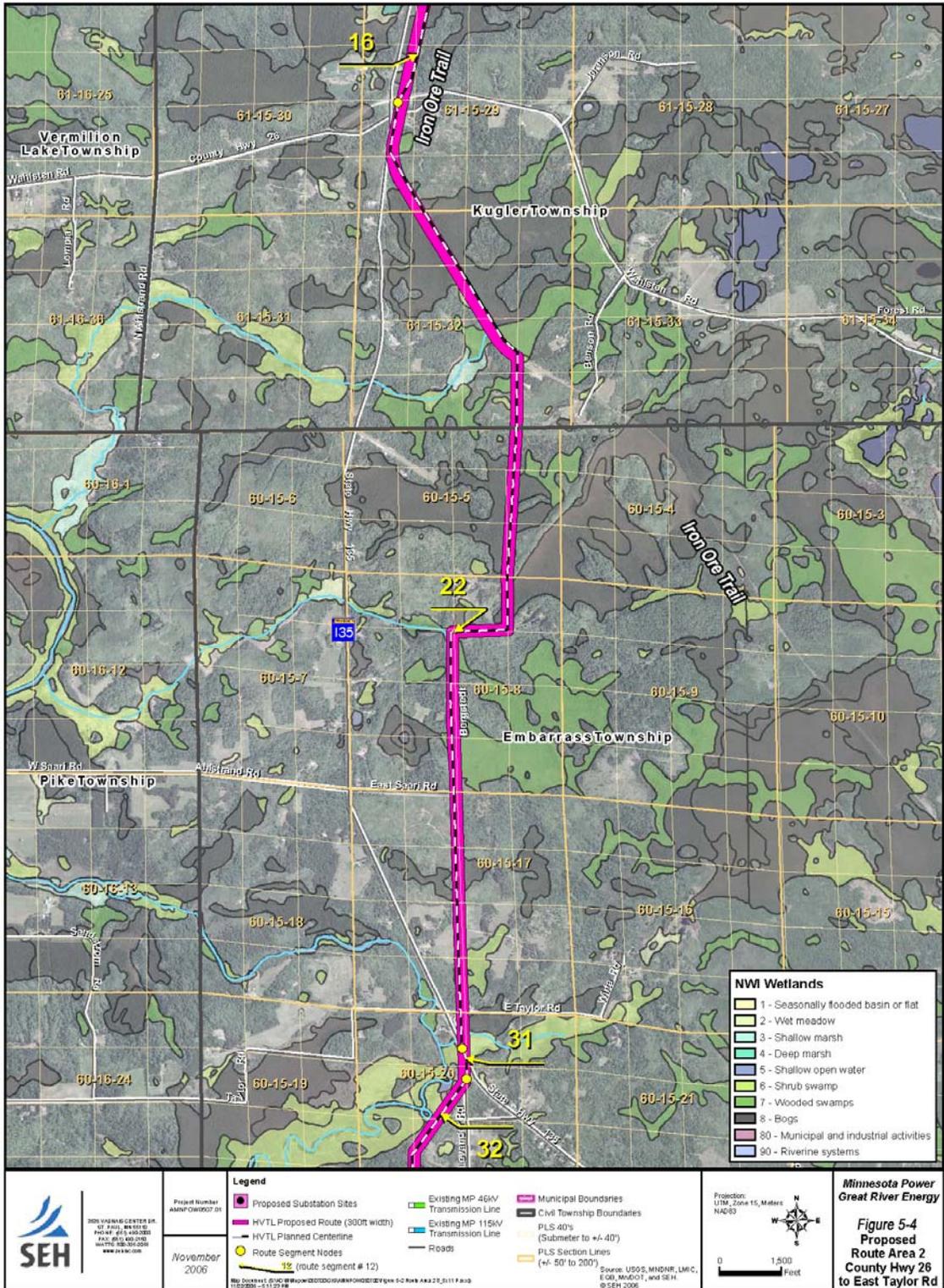
The Proposed Route for Route Area 2 is shown on Figure 5-4.

Route Segment 22

The Proposed Route follows the Iron Ore Trail for approximately 1.3 miles, follows a survey line for approximately 1.3 miles, and follows gravel roads for 2.2 miles (total distance of 4.8 miles). There would be 3.5 miles of existing corridor and 1.3 miles of new corridor. The intended centerline follows the west side of the Iron Ore Trail immediately south of County Highway 26 and crosses and remains on the northeast side of the trail until departing the trail and heading south to follow a survey line in Section 32 (T61N, R15W). The intended centerline for planning purposes follows the west side of the survey/property line. The intended centerline creates a near 90 degree angle to follow the single

phase distribution line located on the north side of the east-west gravel road extending from County Road 364 (Bergstedt Road).

Figure 5-4 Proposed Route for Route Area 2 – County Highway 26 to East Taylor Road



The intent is to remove and underground the single phase distribution line and utilize the cleared right-of-way for a portion of the proposed transmission line right-of-way. The Proposed Route angles 90 degrees to the south, with the intended right-of-way located on the west side of Bergstedt Road to the East Taylor Road. The intent is to remove and underground the single phase distribution and use the existing cleared right-of-way for a portion of the proposed transmission line right-of-way. At East Taylor Road the intended centerline would move to the east to afford an increased separation between the proposed transmission line and the existing three-phase distribution line and the church.

There are three homes and a church located within the 300' wide Proposed Route. Two homes are located nearly opposite each other on the Bergstedt Road, making it impractical to avoid both homes by switching back and forth across the road with the intended centerline. The home on the west side and nearest the intended centerline is presently unoccupied. See Appendix E – Exhibit 1 for an aerial view of the Proposed Route, planned right-of-way centerline, and the two homes.

At the church, the determination of the final right-of-way location would incorporate the interests of the church and the practical design, construction and operational alternatives of the existing distribution line and the proposed transmission line. See Appendix E – Exhibit 2 for an aerial view of the Proposed Route, preliminary right-of-way centerline, and the church.

The Proposed Route crosses two streams: one in a common corridor with the Iron Ore Trail and the other with the three phase distribution line south of East Taylor Road. The Proposed Route passes through a varying landscape predominated by wooded uplands, wetlands and interspersed open pasture areas.

Reasons to propose—The Proposed Route follows two sparsely populated existing corridors (Iron Ore Trail and Bergstedt Road). Two homes and a church are within the Proposed Route and two additional homes (on County Highway 26 and on East Taylor Road) are adjacent to the east side of the Proposed Route. The new cross-country section follows the survey/property line, interconnecting the two existing corridors. The primary alternative, the Highway 135 alternative, is an existing corridor; however, there are 35 homes located within or adjacent to the route alternative, which would have great impact on homeowners in the project area. The Proposed Route includes several long tangent sections, which minimizes angle structures and reduces Project costs.

The Proposed Route is located to provide a safe distance from the end of the private grass landing strip located in Section 5 (T60N, R15W). The Highway 135 alternative would require purchase and retirement of the landing strip.

5.3.4 Proposed Route for Route Area 3 – East Taylor Road to County Highway 21

The Proposed Route for Route Area 3 is shown on Figure 5-5.

Route Segment 31

This short north/south segment crosses Highway 135 and connects RS 22 and 32. An angle structure would be required at the interface with RS 32 near the intersection of Highway 135 and the Levander Road.

Route Segment 32

This route segment is a new cross-country route that includes a 0.3 mile diagonal and a 1.2 mile section that parallels a survey/property line. The intended centerline is located on the west side of the survey/property line.

Reasons to propose—There are no homes within or adjacent to the Proposed Route in this route area. The route would cross only one stream. The landscape is predominated by several wetlands and interspersed with wooded uplands. Although the Proposed Route would create a new right-of-way, the alignment is superior to an alignment through the front yards of the 13 homes located along Levander Road.

5.3.5 Proposed Route for Route Area 4 – County Highway 21 to Embarrass Switching Station

The Proposed Route for Route Area 4 and the proposed Embarrass Switching Station site are shown on Figure 5-6.

Route Segment 42

This 1.3 mile route segment would be a new cross-country path located on the survey/property line in Sections 29 and 30 (T60N, R15W). The intended centerline is located on the west side of the 1/16 line. The landscape is primarily wetland interspersed with wooded upland. The 40-acre parcels east of the Proposed Route in Section 32 are privately owned and the parcels crossed by the Proposed Route are tax forfeit property. Landowners at public meetings voiced their strong preference to construct the transmission line on the tax forfeit property rather than across their mixed pasture and upland forest land to the east of the Proposed Route.

Route Segment 44a

This 1.8 mile long route segment continues through the large wetland area in White Township. The intended centerline is located on the west side of the 1/16 line in Sections 5 and 8 following the survey/property line. The intended centerline continues on the south side of the existing MP 115 kV transmission line for 0.25 miles. Section 5 is tax forfeit and corporate (RGGGS) ownership and

Section 8 is in private ownership. There is no established access to this area, so there is low potential for future development.

Figure 5-5 Proposed Route for Route Area 3 – East Taylor Road To County Highway 21

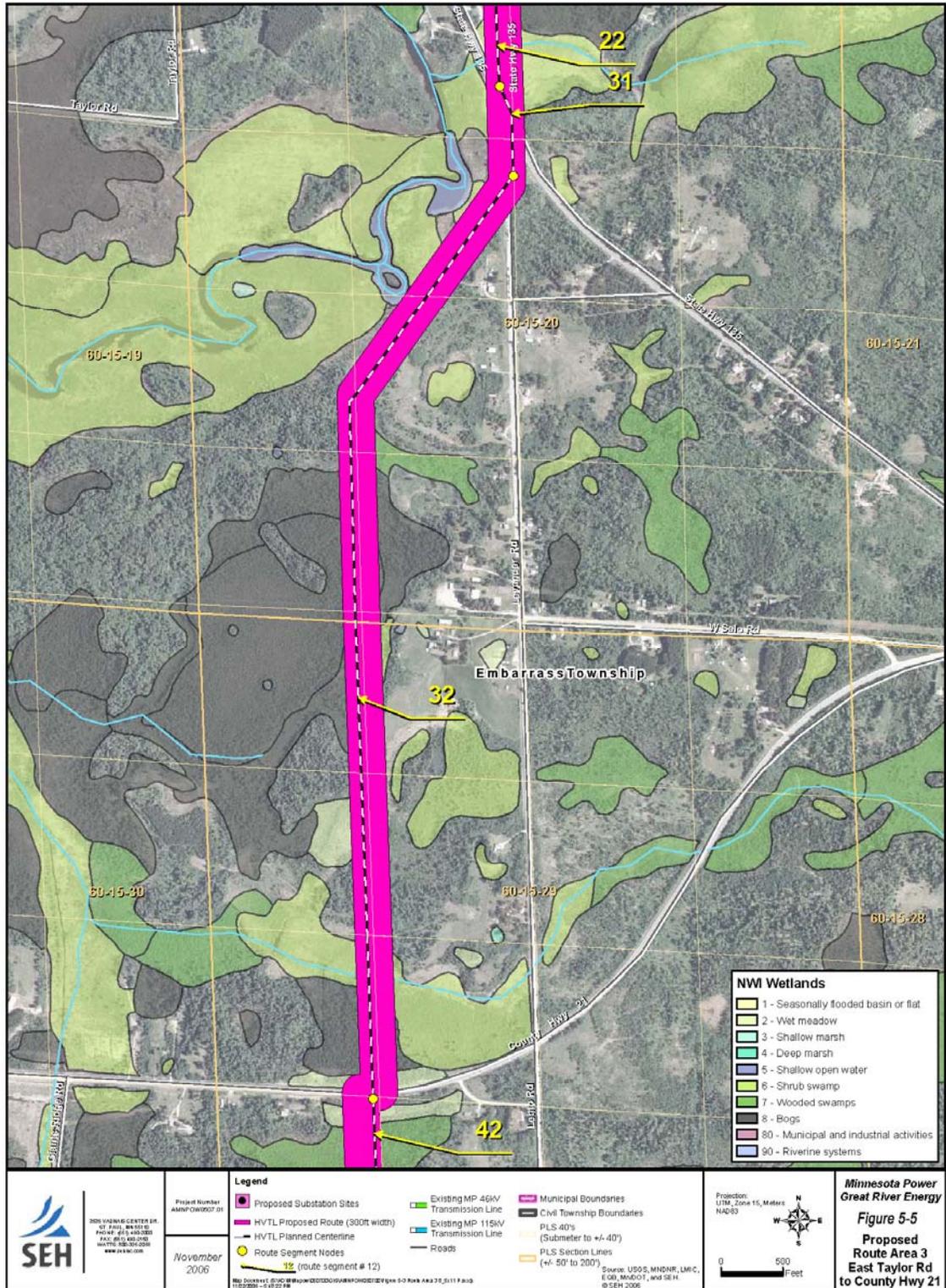
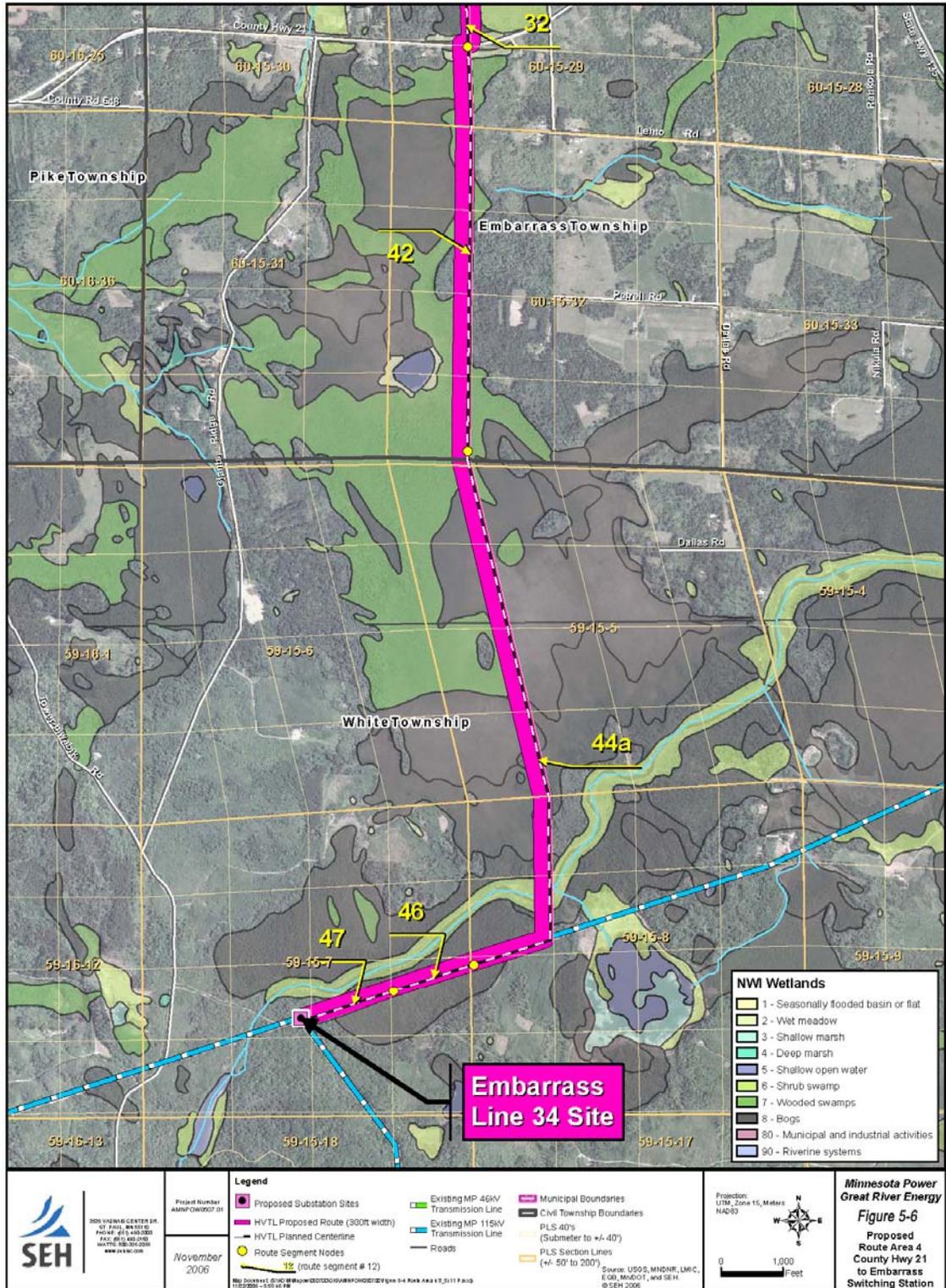


Figure 5-6 Proposed Route for Route Area 4 – County Highway 21 to Embarrass Switching Station



Route Segments 46 and 47

These two route segments total 0.6 miles in length and follow the MP 115 kV transmission line on the south side through a predominantly wetland landscape. RS 47 travels through a wooded upland area for 0.15 miles and terminates at the proposed Embarrass Switching Station site in Section 7. The existing 115 kV right-of-way would need to be widened by approximately 60 feet to provide for safe and reliable construction and operation of the proposed transmission line.

Reason to propose—The Proposed Route was analyzed and compared to the two main route alternatives; the Giant’s Ridge Road alternative (RS 45 and 49a or 45, 48, and 49) and the central route alternatives (RS 43 or 44; 43a common to both).

The Giant’s Ridge Road alternative follows a gravel road for most of the distance from its common point with the Proposed Route to the Embarrass Switching Station site (4.0 miles). The Proposed Route would not affect any existing homes, whereas the Giant’s Ridge Road alternative includes 12 homes within the route. Single pole construction would minimize vegetation removal to expand on the roadway clearing; however, tree screens would be reduced or eliminated between the road and the 12 homes. Landowners expressed a strong preference to locate the transmission line on public land east of the Giant’s Ridge Road. Additionally, the Proposed Route is 3.6 miles long; 0.4 miles shorter than the Giant’s Ridge Road alternative.

The two central route alternatives would alleviate the concerns of landowners along the Giant’s Ridge Road; however, both (RS 43 and 44) options would cross the “Height of Land Portage,” which is a listed property in the National Register of Historic Places (NRHP). RS 44a (the Proposed Route) was developed to avoid any impact to the “portage.”

5.3.6 Proposed Embarrass Switching Station

The new switching station would be constructed at the location of the existing 115 kV Line tap off of 115 kV Line #34 (Virginia to Laskin). The proposed 115 kV line would enter from the northeast, creating an interconnection point of four 115 kV transmission lines. The switching station would look similar to a 115 kV substation, except there would be no transformers. The entire switching station site (approximately 180' x 180') would be graded and fenced. Major equipment within and adjacent to the switching station would include four 115 kV circuit breakers, line termination structures, and a control house. An improved access road and a small parking lot would also need to be constructed.

A photo (Figure 5-7) and a site plan (Figure 5-8) provide additional detail on the proposed Embarrass Switching Station site.

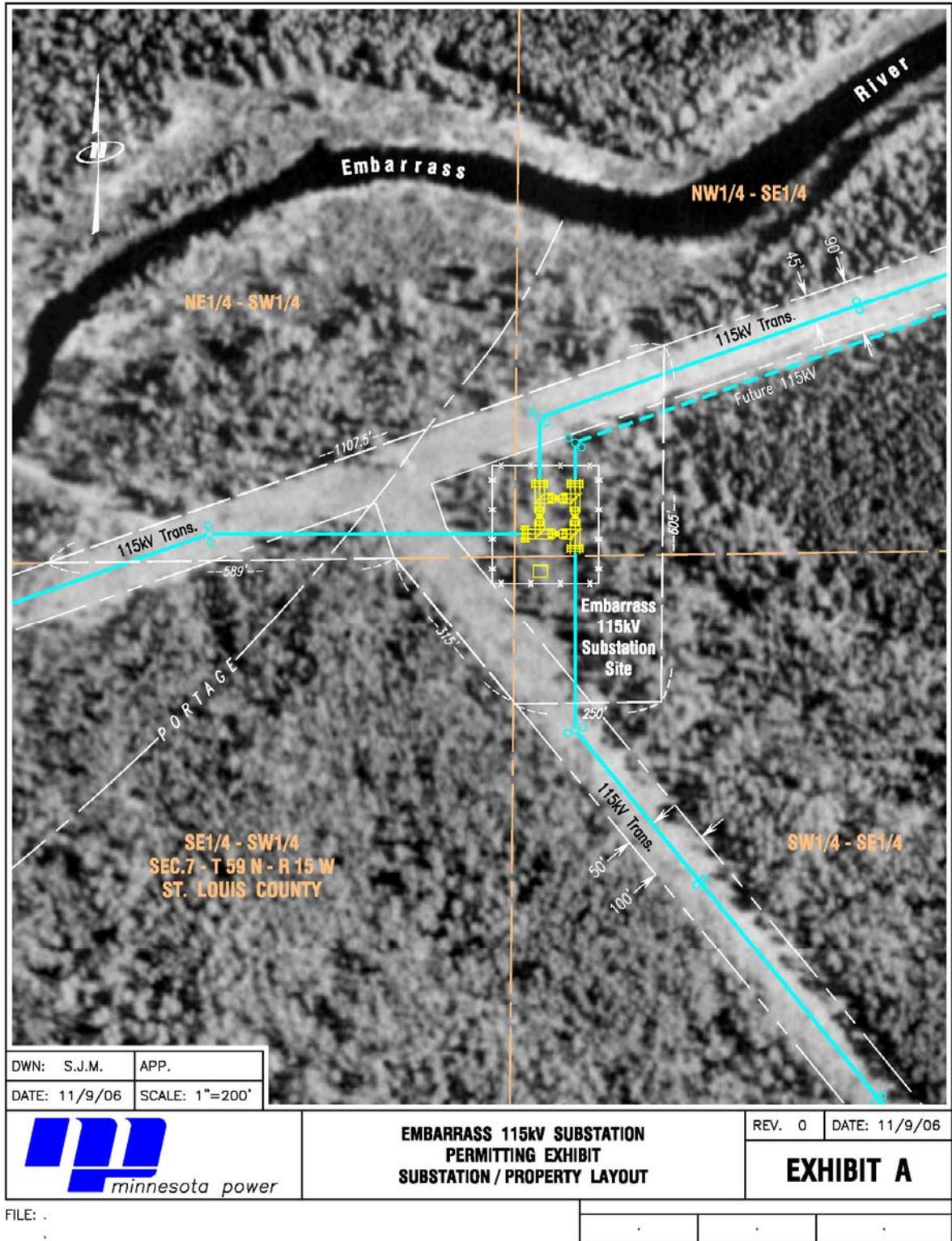
Reasons to propose— The site is adequately sized, fairly level, and optimally located at the intersection of the two 115 kV transmission lines that are required

to interconnect with the Embarrass Switching Station. The site location will minimize additional 115 kV transmission line construction cost and environmental impact. The area around the site is sparsely populated and it has been previously disturbed by the construction of the adjacent transmission lines and metal lattice switch structure. An existing gravel road and bridge across the Embarrass River provide adequate access to the site from CSAH 138 (Giant's Ridge Road). The access road would require blading and graveling and the bridge may require enhancement. The distance from CSAH 138 (2,000') and abundant trees around the site would eliminate visual impact to travelers on CSAH 138. Trees would be retained on the site, outside of the switching station footprint, to minimize visual impact to any future development in the immediate area. A Phase 1 archaeology field survey conducted fall 2006 determined that there were no archaeological/cultural artifacts present within or adjacent to the Embarrass Switching Station footprint.

Figure 5-7 Photo of Proposed Embarrass Switching Station Site



Figure 5-8 Embarrass Switching Station Location and Layout



5.4 Description of Design Options to Accommodate Future Expansion of the HVTL and Tower Substation to Meet Forecast Load Growth

Load flow analysis was used to estimate the length of time the Project will provide adequate support to the region. Based on forecast load growth rates, MP and GRE do not anticipate a need to expand the proposed Tower 115 kV line through 2025, nor are MP or GRE aware of any other utility plans to expand the 115 kV line. The design plans are therefore based on the current Project and do not include any future expansion of the HVTL.

GRE does have plans to expand the Tower Substation by adding a 115/69 kV transformer and construct a 69 kV line exiting the substation to the northwest to fulfill an expected need for additional support in the west Vermilion Lake and Cook area. LCP has experienced extensive growth in electrical demand in the area between the existing distribution substations at Cook and Vermilion. This continuing growth in electrical demand will require that a new 69 kV delivery point be located between these two substations.

Eventually a new 69 kV line (approximately 25 miles) will be necessary between the Tower Substation and a new distribution substation near Frazer Bay on Lake Vermilion and then extending to the Ainsworth Board Plant near Cook, Minnesota. This would provide a much needed third 69 kV source into the load center of the 69 kV system that would serve existing load and new load development along Lake Vermilion. Because this is a 69 kV project, neither a Certificate of Need nor a Route Permit would be required from the Commission.

MP distribution engineering anticipates a need to upgrade the distribution system serving the town of Tower due to age, condition and load growth. To address this need, the Tower 115/46 kV Substation will be designed to accommodate the future addition of distribution transformers, feeder exits and associated equipment.