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Chapter 7
Route Segment Alternatives

Chapter 7 compares individual route segment alternatives (RSAs) with the segment of the Applicant's preferred route they would replace. Commenters proposed RSAs during the scoping process to mitigate impacts on localized resources. Most are relatively short deviations; however, two are over 50 miles long. This chapter also describes RSA-53, a stand-alone RSA that connects to RSA-21, making it possible for RA-06, RA-07, or RA-08 to avoid the Fond du Lac Indian Reservation. Table 4.3-5 describes the location of each RSA, as well as its intended purpose. Figure 7-1 shows the location of the RSAs.

7.1 BACKGROUND

The discussion that follows identifies differences between individual RSAs and the segment of the Applicant's preferred route they replace by comparing common resources and factors. Each RSA is briefly described and discussed; meaningful variations between the RSA and the segment of the Applicant's preferred route it replaces are highlighted; affected resources are shown in a table; and the RSA is identified on a map. Note that the purpose of this chapter is to identify differences between the routing options—that is, the variation between the RSA and the segment of the Applicant's preferred route it replaces. As such, this chapter does not discuss impacts that are similar regardless of their intensity level.

The analysis used geographic information system (GIS) software to identify resources affected by the pipeline based upon the commenter's proposed alignment. In certain instances, re-aligning the pipeline within the route width might avoid specific resources. A centerline modification within a non-homogenous route segment might change the resources affected. This analysis does not account for these changes because without detailed engineering surveys and consideration of design constraints or restrictions associated with other resources within the route segment, it is difficult to accurately determine if re-alignment is possible and, if it is possible, where the pipeline would ultimately be located. Instead, in these instances the analysis relies on generic assessments, for example: "Re-aligning the pipeline within the route width would avoid this structure; re-alignment would likely increase the number of forested acres within the construction work area."

7.2 ASSUMPTIONS

Existing conditions along individual RSAs at the landscape scale are similar to those described in Chapter 6. Construction and operation practices are identical to those described in Chapter 2, including Applicant-proposed measures to avoid and minimize environmental impacts. Mitigation measures discussed throughout Chapters 2, 5, and 6 apply to any RSA selected. This analysis assumes coordination with local, state, federal, and tribal agencies would occur to determine appropriate design, construction, and operation techniques.

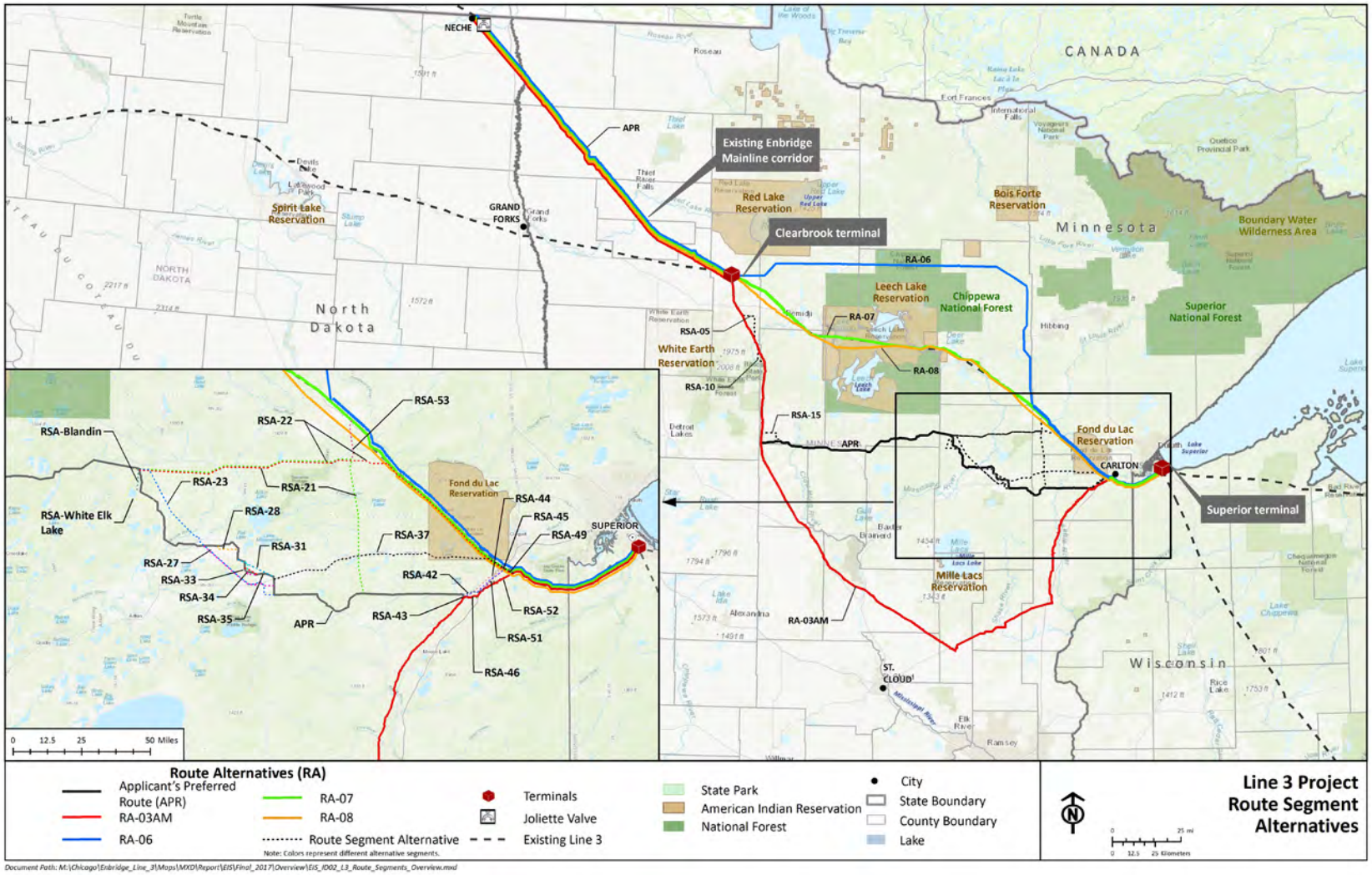

Figure 7-1. Location of Route Segment Alternatives

If the Minnesota Public Utilities Commission (Commission) selects RSA-21, RSA-22, RSA-23, or RSA-37, a new pump station might be required. A pump station would require approximately 8 acres of land. Additional mainline valves (MLV) could be required for RSA-05, RSA-21, RSA-22, RSA-23, RSA-27, and RSA-37 because of their length or proximity to sensitive resources. Specific footprints of these facilities are not evaluated in this analysis because pump station or MLV locations have not been identified. Facilities would be sited as part of final design, if a given RSA is selected by the Commission for the permitted route.

The analysis in Section 7.3 highlights meaningful variations between routing options. To reduce redundancy, potential impacts are described once below. Impacts are organized by routing factor. The analysis of meaningful variations between routing options in Section 7.3 pulls from these descriptions.

(A) Human Settlement

Aesthetics: Aesthetic impacts are subjective and relate to an individual's perceived sense of beauty. They are influenced by many factors. Commonly, people consider a harmonious viewshed to be aesthetically pleasing.

In general, the duration of visual impacts during construction in all but areas of woody vegetation, including forested wetlands, would persist until vegetation has reestablished in the construction work area. Operational impacts would be associated mainly with aboveground facilities and permanent clearing of woody vegetation within the 50-foot-wide permanent right-of-way. These impacts would be strongest where they are in the immediate foreground of sensitive observation points.

Noise: Project-related noise impacts generally fall into two categories: temporary impacts resulting from the use of construction equipment and activities and permanent impacts resulting from pump station facility operations. Because Chapter 7 does not discuss facilities, permanent noise impacts are not discussed.

Construction-related noise associated with heavy equipment can range from 80 to 90 decibels (specifically A-weighted decibels or dBA) at full power. Heavy equipment usually runs at full power 50 percent of the time. Point source sounds decrease 6 dBA per doubling of distance. This means an 80 dBA sound at 50 feet is perceived as a 56 dBA sound at 800 feet. A 90 dBA sound is perceived as 66 dBA. As such, construction-related noises are anticipated to be greatest within 1,250 feet of the centerline of the pipeline permanent right-of-way.

Transportation: Pipeline companies cross roads and other features by a variety of methods: open trench, bore, or directional drill. These methods affect traffic patterns differently. For example, the open trench method will result in road closures, whereas a bore or directional drill method might occur while traffic utilizes the road. The Applicant is proposing to cross paved roads and railroads by boring or horizontal directional drill (HDD), which would prevent road closures.

Displacement: Displacement is the forced removal of a residence or business to accommodate the routing of the pipeline. Often displacement can be avoided by re-aligning the pipeline within the route width.

Environmental Justice: Environmental justice refers to the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income. In general, environmental justice is

addressed to ensure equal protection from environmental and health hazards, as well as equal access to the environmental decision-making process.

Minority or low-income communities are often concentrated in small geographical areas within the larger area of study. Identifying these areas enables an analysis of whether these communities might experience disproportionate impacts from a project. This allows analysts and decision-makers to identify and understand what portion of the total impacts may be borne by minority or low-income communities, to assess whether they are disproportionately high and adverse and to develop alternatives and mitigation measures if necessary.

(B) Natural Environment

Vegetation: Vegetation is an assemblage of plants with similar structure that are categorized into types of ground cover. This analysis is based on existing cover types and site-specific impacts.

Vegetation would be removed or disturbed during construction. Short-term impacts are the result of grading and other physical disturbances. Woody species are not permitted to regenerate in the permanent right-of-way. This alters the composition and structure of the vegetation by converting it to herbaceous cover types. These impacts are permanent. Clearing vegetation increases potential for the introduction of invasive species; however, for the purposes of Chapter 7, potential impacts from invasive species are assumed to be similar for all routing options.

Native Plant Communities: Native plant communities are a group of native plants that interact with each other and with their environment in ways not greatly altered by modern human activity or by introduced organisms. Impacts on these communities are considered greater than impacts on other areas (e.g., non-native plant communities, heavily disturbed areas).

Wildlife Habitat: As a result of vegetation clearing, the underlying wildlife habitat would be altered—in some instances, permanently. Habitat loss has a consistent negative effect on biodiversity and can adversely affect species richness and population growth rates, among other measures. Habitat loss results from the creation of new corridors (called greenfield crossings) or the expansion of an existing corridor. Greenfield crossings create new habitat fragmentation, or the breaking apart of habitat, and new “edge” effects, or the creation of an artificial habitat boundary. While expansion of existing corridors further emphasizes existing habitat fragmentation and edge effects on one side of the right-of-way, potential impacts are less than those created by greenfield crossings.

Designated trout stream corridors are permanent easements that encompass 66 feet of land and water on either side of the centerline of the stream. Easements permit angler access, provide corridor protection, and allow the Minnesota DNR to conduct habitat improvement activities if needed. Impacts on these areas are considered greater due to the public investment of funds to secure the easement and the habitat they protect.

Wildlife: Wildlife that inhabit the route are anticipated to relocate during Project construction. The majority would return; however, some might be permanently displaced—especially species that rely upon woody vegetation or unfragmented habitats. Some individuals might be struck or killed, but population-level impacts are not anticipated.

Unique Natural Resources: Rare/protected wildlife species that inhabit the route are anticipated to temporarily relocate during Project construction. However, injury or loss of rare/protected individuals or communities could occur during construction. Population-level impacts are not anticipated.

Public Lands: Potential impacts on public lands—lands identified and protected because of their value to the state—would affect all Minnesotans. Given the importance of state lands to wildlife, recreation, and tourism, potential impacts would be regional. Impacts on private lands generally only affect those specific landowners and communities, and remain local. While both impacts may be significant, this analysis assumes, that on whole, potential impacts on public lands are greater.

(C) Cultural Resources

Potential direct impacts to cultural resources (including archaeological and historic resources) may occur during construction, when ground disturbing and right-of-way clearing activities are being conducted. Direct impacts may include the physical destruction of a resource (due to ground penetration or disruption of the stratigraphy of an archaeological site), limitations on access, or vandalism or looting, if the resource is significant. Indirect impacts include dust, vibration, and visual intrusions related to construction equipment and activities, as well as construction-related noise.

Operations related direct impacts largely would occur if a previously undiscovered resource is found during maintenance activities, or if a spill were to occur. Indirect impacts would primarily consist of the presence of MLVs, pump stations, and maintenance crews and equipment, resulting in dust, vibration, and visual and auditory intrusions.

For the purposes of this analysis, all information provided is based on data obtained from State Historic Preservation Office (SHPO) databases. Since all RSAs are located within Minnesota, this includes data obtained from the Minnesota Historical Society (MHS) in 2016. In this manner, archaeological and historic resources that are considered important to American Indian tribes may not be captured, unless the resource was recorded and included in one of these databases. In this manner, the potential number of resources to be impacted may be underestimated.

(D) Economics

Agriculture: Impacts on agriculture occur during pipeline construction. Impacts can include soil erosion, interference with and damage to agricultural surface and subsurface drainage and irrigation systems, mixing or loss of fertile topsoil and subsoil, and soil compaction. During construction, the production of crops on agricultural land would typically be prevented for one growing season, resulting in temporary minor losses to land currently being used for agricultural production. Additionally, timber production can be disrupted also resulting in crop losses. For the purposes of this analysis, impacts on peat lands are assumed to be permanent.

Recreation and Tourism: Impacts on recreation can be positive or negative. Potential impacts might be negative if they change the aesthetics of a recreational destination. Conversely, right-of-way clearing might increase opportunities for wildlife viewing or hunting. Impacts on recreation affect tourism if the impact increases or decreases visitor use in such areas as state owned lands. Since the majority of the land crossed by the route does not include developed recreational areas such as facilities and trails, potential impacts are likely to be temporary and localized, and limited to recreational users who live in and around the area.

(G) Natural Resources

Water Resources: Pipelines can affect surface waters, generally through indirect impacts from vegetation removal during right-of-way clearing. These impacts can include changes in water flow patterns or increased sedimentation. The potential for surface water impacts increases at stream/river crossings and in proximity to surface waters, such as rivers, lakes, and ponds. Direct impacts on groundwater can occur when a pipeline trench affects shallow water tables or underground pathways to aquifers. Potential for impacts is assumed to correlate with vulnerable water table distance crossed. Indirect impacts on groundwater can result from direct impacts on surface water.

Wetlands: Potential impacts to wetlands generally occur during construction. Impacts to wetlands are usually short-term and temporary because there is no permanent filling of wetland areas. Impacts on the hydrology of a wetland can significantly impair its function. Conversion of forested or woody wetlands will not reduce the overall wetland acreage, but will permanently convert the wetland to a different vegetation community and wetland type. Like surface waters, wetlands are affected in large part from changes in water flow patterns or increased sedimentation. The potential for impacts increases in proximity to the wetland.

7.3 ANALYSIS

Section 7.3 analyses 24 RSAs.

7.3.1 Route Segment Alternative RSA-05

RSA-05 is located in Clearwater County. It is 13.0 miles long and replaces a 9.8-mile segment of the Applicant's preferred route between Milepost (MP) 154.1 and MP 164.0 (Figure 7.3-1). RSA-05 traverses an area of mixed active farmland and forested land. It departs from the Minnesota Pipeline Company, LLC (MPL) pipeline corridor along which the Applicant's preferred route is co-located, creating a new greenfield corridor. RSA-05 was proposed by Enbridge in its May 26, 2016 Project scoping comments to avoid crossing lands within the boundaries of the Eastern Wild Rice Watershed. Enbridge proposed the alternative to address concerns raised by the White Earth Band of Ojibwe regarding impacts to Lower Rice Lake, an important wild rice lake for tribal members located within the watershed. Table 7.3-1 highlights the differences between RSA-05 and the Applicant's preferred route.

RSA-05 moves the pipeline out of the Eastern Wild Rice watershed. However, it shifts the resources at risk from an accidental release of oil to the Clearwater River watershed and Mississippi River – Headwaters watershed. These two watersheds are otherwise affected by the Applicant's preferred route in the immediate area; the Eastern Wild Rice watershed is not.

The Wild Rice River flows from Upper Rice Lake and meanders through Lower Rice Lake and the Eastern Wild Rice watershed until it reaches the Red River. The Applicant's preferred route is 0.7 mile from Upper Rice Lake at its closest point. Due to this distance, impacts on this waterbody from construction and normal operation are not anticipated. Mud Lake is approximately 1.3 miles north of Upper Rice Lake. Satellite imagery and topographic maps suggest that Mud Lake also drains to the Wild Rice River. The Applicant's preferred route passes approximately 500 feet northeast of this waterbody through a freshwater emergent wetland. It appears that, should this wetland be saturated, a hydrological connection between the Applicant's preferred route and the Wild Rice River might exist.

RSA-05 increases the minimum separation between these lakes and the pipeline to approximately 2.5 miles and moves the pipeline out of the Eastern Wild Rice watershed. However, RSA-05 crosses Walker Brook, which is a tributary to the Clearwater River. In addition, RSA-05 crosses an unnamed, intermittent stream at three locations as well as two other unnamed intermittent streams. These streams flow through Duncan, Berg, and Moose lakes prior to joining the Little Mississippi River.

Meaningful Variation Exists Between Routing Options

RSA-05 and the Applicant's preferred route are different in the following criteria: (A) Human Settlement; (B) Natural Environment; (F) Co-Location; and (G) Natural Resources.

(A) Human Settlement

Aesthetics: Both routing options expand or create new openings on the landscape; however, RSA-05 requires greenfield crossings, while the Applicant's preferred route does not. Therefore, RSA-05 is anticipated to increase aesthetic impacts.

Noise: The centerline of RSA-05 is within 1,250 feet of 14 additional sensitive noise receptors. This increases potential construction-related noise impacts at those noise sensitive receptors.

Transportation: RSA-05 and the Applicant's preferred route cross the same number of roads. This does not necessarily mean the impact will be the same between the two routes as traffic volumes and flow patterns differ among roads. Impacts may or may not affect traffic patterns during Project construction depending upon the construction method used to cross all affected roadways.

(B) Natural Environment

Vegetation: RSA-05 would require clearing of an additional 29 acres of forested cover types. This could lead to greater stormwater run-off and permanent loss of forest vegetation. Neither the RSA or APR cross any MBS survey areas where sensitive vegetation may be found.

Wildlife Habitat: RSA-05 would affect 29 additional acres of woodland habitat, but 5 fewer acres of wetland habitat for those wildlife species that depend on these habitat types. Conversely, wildlife species that tend to prefer edge habitat would be positively impacted post-restoration.

RSA-05 requires greenfield crossings; the Applicant's preferred route does not. Because of this, impacts from habitat fragmentation and edge effects would be greater along RSA-05.

Unique Natural Resources: RSA-05 and the Applicant's preferred route both cross in the vicinity of one occurrence of a Minnesota state species of special concern (mussel species) at the same location. Therefore, impacts are expected to be similar between the two routes.

(F) Co-Location

RSA-05 is co-located with existing corridors for approximately 71 percent less of its length than the Applicant's preferred route.

(G) Natural Resources

Water Resources: RSA-05 increases potential for surface water impacts because it requires four additional stream crossings. RSA-05 also crosses an additional 0.8 mile of vulnerable water table aquifers compared with the Applicant's preferred route which may affect groundwater.

Wetlands: RSA-05 would affect half as many wetland acres and reduce conversion of forested wetlands, reducing potential impacts to wetlands overall. Although the overall acreage loss would not change, conversion of forested wetlands to emergent wetlands is a quantifiable loss of habitat functionality.

Table 7.3-1. Localized Differences between Route Segment Alternative RSA-05 and the Applicant's Preferred Route

Resource or Factor	Route Segment Alternative	Replaced Segment of Route	Change
Acres of construction work area	189.20	128.79	**+ 60.41**
Percentage co-located with existing corridors[a]	28.4%	100%	**– 71.6%**
Number of sensitive noise receptors[b]	32	18	**+ 14**
Number of road crossings[c]	11	11	**No change**
Number of NHD stream/river crossings [c]	6	2	**+ 4**
NHD Artificial Path	0	0	**No change**
NHD Canal/Ditch	0	0	**No change**
NHD Connector	0	0	**No change**
NHD Steam/River Intermittent	5	2	**+ 3**
NHD Stream/River Perennial	1	0	**+ 1**
Number of designated trout stream crossings	--	--	**No change**
Acres of native plant community crossings (construction work area)	--	--	**No change**
Acres of forested land crossings (construction work area)	89.15	59.80	**+ 29.35**
Acres of wetland crossings (construction work area)	16.91	22.81	**– 5.9**
Miles of vulnerable water table crossings[f]	2.3	1.5	**+ 0.8**
Number of Minnesota rare/protected species occurrences[g]	1	1	**No change**
Number of public water wells within 1250ft. of the centerline	4	5	**- 1**
Public water basins crossed by centerline	0	1	**- 1**
Miles of State Lands crossed by centerline	0.0	0.0	**No change**
Miles of timber parcels crossed by centerline	0.0	0.0	**No change**
Number of archaeological resources	1	0	**+1**
Number of historic resources	0	1	**-1**

Table 7.3-1. Localized Differences between Route Segment Alternative RSA-05 and the Applicant's Preferred Route

Land Cover – Permanent Right-of-Way[h]					
Route Segment	**Agricultural**	**Developed**	**Forest**	**Water/Wetlands**	**Other**
RSA	41%	2%	48%	4%	6%
Replaced segment	32%	3%	45%	8%	11%
Change	**+ 9%**	**– 1%**	**+ 3%**	**– 4%**	**– 5%**
Wetlands – Permanent Right-of Way[i]					
Route Segment	**Emergent**	**Forested/Shrub**	**Freshwater Pond**	**Lake**	**Riverine**
RSA	3.42	3.71	--	--	--
Replaced segment	4.76	6.82	0.23	--	--
Change	**– 1.34**	**– 3.11**	**– 0.23**	**No change**	**No change**

[a] Existing corridors used by RSA-05 would consist of transmission line and road rights-of-way.

[b] Sensitive noise receptors within 1,250 feet of the centerline of the pipeline permanent right-of-way.

[c] Crossings by proposed centerline.

[d] Minnesota Biological Survey, sensitive plant communities

[e] Minnesota Biological Survey, lakes with aquatic vegetation 1250ft. of the centerline.

[f] Provided by Minnesota Department of Natural Resources.

[g] Occurrences of state rare/protected species within 1,250 feet of the centerline of the pipeline permanent right-of-way. In order to protect their exact location, an "occurrence" represents the location of the record plus a species-specific buffer distance. Data provided by State of Minnesota, Department of Natural Resources (MN-DNR 2016). State data does not include occurrence information for Canada lynx or gray wolf.

[h] National Land Cover Database (Homer et al. 2015). Percentage of permanent right-of-way in acres.

[i] National Wetlands Inventory (USFWS n. d.). Permanent right-of-way in acres.

RSA = route segment alternative, "--" = Not applicable

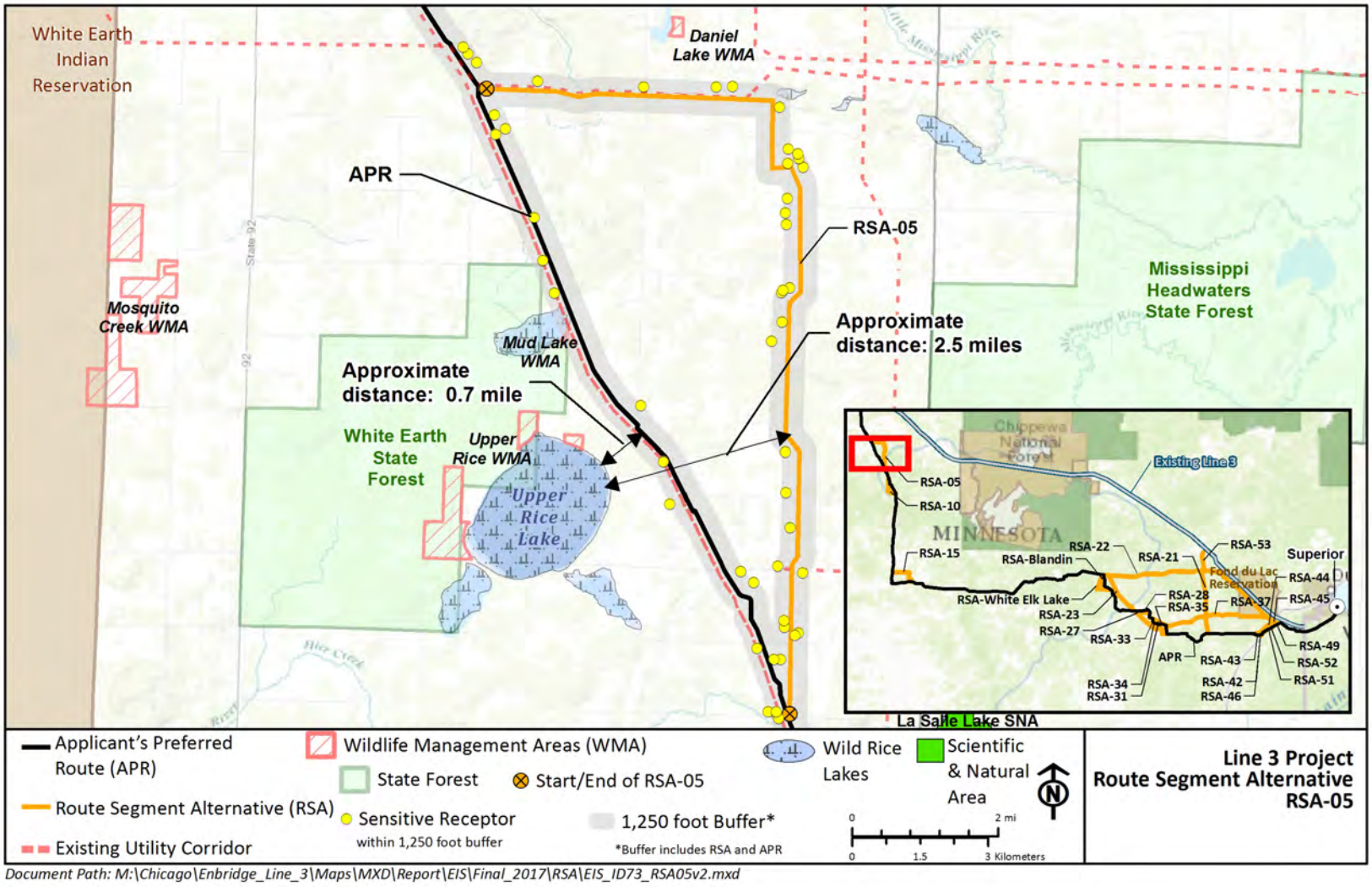

Figure 7.3-1. Route Segment Alternative RSA-05

7.3.2 Route Segment Alternative RSA-10

RSA-10 is located in Clearwater and Hubbard counties. It is approximately 6.8 miles long and replaces a 5.6-mile segment of the Applicant's preferred route between MP 167.4 and MP 173.1 (Figure 7.3-2). RSA-10 is located adjacent to road rights-of-way and crosses forested areas intermixed with farmland. The purpose of RSA-10 is to move the crossing at LaSalle Creek to a more accessible location for emergency response. LaSalle Creek is a tributary to the Mississippi River. It flows south-to-north through various wetland types and Big LaSalle Lake, Middle LaSalle Lake, and LaSalle Lake before joining the Mississippi River. Table 7.3-2 highlights the differences between RSA-10 and the Applicant's preferred route.

RSA-10 locates the LaSalle Creek crossing in a more accessible location. The Applicant's preferred route positions the LaSalle Creek crossing approximately 0.5 mile upstream from Big LaSalle Lake, about 0.8 miles from Itasca Township Road 187, and 1.6 miles from 105th Avenue. The Applicant's preferred route crossing would be accessible via maintenance roads along new or existing oil pipelines. RSA-10 increases the distance of the crossing from Big LaSalle Lake to approximately 3.0 miles. It crosses LaSalle Creek along County Road 96, effectively eliminating separation from road access.

Cumulative Impacts Influence Route Segment Alternative RSA-10

Minnkota Power Cooperative proposes to construct a 115-kilovolt (kV) high-voltage transmission line to serve the industrial load for a new pumping station to be constructed and operated by MPL. The project is referred to as the Minnesota Pipeline – Laporte 115-kV Transmission Line Project (MPL-Laporte Project). RSA-10 follows the preferred transmission line route. Should the Commission ultimately select the preferred transmission line route, it would necessitate shifting the RSA-10 centerline for a portion of its length to provide adequate spacing between it and the transmission line.

The Environmental Assessment (EA) for the MPL-Laporte Project included an alternative that co-located the transmission line along the existing MPL pipeline corridor (Collocate Alternative Route). During development of the Collocate Alternative Route, MPL requested that a separation distance of 100 feet be maintained between the existing pipeline corridor and the new 115-kV transmission line, resulting in a 25-foot gap between the existing pipeline right-of-way and the transmission line right-of-way.

In the Relative Merits analysis contained in the EA, staff determined the Collocate Alternative Route had greater potential for negative impacts than the preferred route because of the separation between rights-of-way. This separation would create a new corridor, causing greater aesthetic impacts and increased habitat fragmentation and edge effects.

In the MPL-Laporte Project EA, staff indicated that the preferred transmission line route has the least potential for negative impacts. Should the Commission ultimately select this route, it would likely necessitate shifting the RSA-10 centerline 150 feet farther from 281st Avenue to provide adequate spacing between it and the transmission line—much like the Collocate Alternative Route discussed above—leaving a 75-foot gap between the pipeline and transmission line rights-of-way. This area may or may not be cleared of vegetation. This spacing is not necessary between pipelines. Therefore, should the Applicant's preferred route be selected instead of RSA-10, a separation distance would not be necessary, and the impacts discussed above (greater aesthetic impacts, increased habitat fragmentation, and new edge effects) would not occur.

Meaningful Variation Exists Between Routing Options

RSA-10 and the Applicant's preferred route are different in the following criteria: (A) Human Settlement; (B) Natural Environment; (C) Cultural Resources; (D) Economics, and (G) Natural Resources.

(A) Human Settlement

Aesthetics: RSA-10 follows existing roadway corridors for nearly its entire length. This would result in greater visual disturbance during construction than the Applicant's preferred route but create fewer long-term aesthetic impacts by not creating as many new openings in the landscape. Long-term aesthetic impacts may or may not be noticeable to the casual observer.

Noise: The centerline of RSA-10 is within 1,250 feet of six additional sensitive noise receptors, increasing potential noise impacts related to construction.

(B) Natural Environment

Vegetation: As currently routed, RSA-10 would affect approximately 25 forested acres; however, should the preferred route of the MPL-Laporte Project be selected, this would necessitate the pipeline being shifted from its current location. This would likely increase impacts on forested lands along the RSA and, as a result, would make impacts on forested cover types similar between routing options.

RSA-10 would affect approximately half as many acres within a native plant community compared with the Applicant's preferred route.

Wildlife Habitat: RSA-10 would affect 24 fewer acres of woodland habitat, but 5 more acres of wetland habitat for those wildlife species that depend on these habitat types.

RSA-10 requires virtually no greenfield crossings. Because of this, impacts from habitat fragmentation and edge effects would be less along RSA-10. Conversely, wildlife species that tend to prefer edge habitat would be more positively impacted by the Applicant's preferred route post-restoration.

RSA-10 would cross a designated trout stream (LaSalle Creek) in a less sensitive location (existing road crossing), reducing impacts on this resource.

(C) Cultural Resources

RSA-10 contains one more archaeological resource, as compared to the route segment it would replace. However, it would contain one less historic resource. None of the resources are listed on the State Register or the NRHP.

(D) Economics

State Lands: RSA-10 borders Itasca State Park for a portion of its length; the Applicant's preferred route does not. This would decrease accessibility to a portion of this State Park during construction as construction workspaces would be off-limits.

(G) Natural Resources

Water Resources: The LaSalle Creek crossing along RSA-10 is approximately 3.0 miles from Big LaSalle Lake—a 2.5-mile increase over the Applicant's preferred route—potentially reducing impacts on Big LaSalle Lake from an accidental release of oil. There is no change in the overall number of stream crossing between the two alternatives.

RSA-10 crosses 0.7 fewer miles of vulnerable water table aquifers and two more public water wells.

Wetlands: RSA-10 would convert approximately 2.5 acres of forested wetlands to emergent wetlands; the Applicant's preferred route would convert less than 0.1 acre. Overall, RSA-10 crosses more acres of forested wetlands, increasing potential impacts resulting from the functionality loss due to forested wetland conversion to emergent wetlands.

Table 7.3-2. Localized Differences between Route Segment Alternative RSA-10 and the Applicant's Preferred Route

Resource or Factor	Route Segment Alternative	Replaced Segment of Route	Change
Acres of permanent right-of-way	99.25	78.12	**+ 21.13**
Percentage co-located with existing corridors[a]	99%	70%	**+ 29%**
Number of sensitive noise receptors[b]	16	9	**+ 7**
Number of road crossings[c]	9	6	**+ 3**
Number of NHD stream/river crossings	2	2	**No change**
NHD Artificial Path	0	0	**No change**
NHD Canal/Ditch	0	0	**No change**
NHD Connector	0	0	**No change**
NHD Steam/River Intermittent	1	1	**No change**
NHD Stream/River Perennial	1	1	**No change**
Number of designated trout stream crossings	1	1	**No change**
Acres of native plant community crossings (construction work area)	4.73	8.19	**– 3.46**
Acres of forested land crossings (construction work area)	44.97	69.01	**– 24.04**
Acres of wetland crossings (construction work area)	5.70	1.82	**+ 3.88**
Miles of vulnerable water table crossings[f]	0.2	0.9	**– 0.7**
Number of Minnesota rare/protected species occurrences[g]	6	5	**+1**
Number of public water wells within 1250ft. of the centerline	2	0	**+ 2**
Public water basins crossed by centerline	0	0	**No Change**
Miles of State Lands crossed by centerline	1.0	0.0	**+ 1.0**
Miles of timber parcels crossed by centerline	0.0	0.0	**No Change**
Number of archaeological resources	1	0	**+1**
Number of historic resources	0	1	**-1**

Table 7.3-2. Localized Differences between Route Segment Alternative RSA-10 and the Applicant's Preferred Route

Land Cover[h]					
Route Segment	**Agricultural**	**Developed**	**Forest**	**Water/Wetlands**	**Other**
RSA	14%	33%	45%	2%	7%
Replaced segment	6%	2%	87%	1%	5%
Change	**+ 8%**	**+ 31%**	**– 42%**	**+ 1%**	**– 2%**
Wetlands[i]					
Route Segment	**Emergent**	**Forested/Shrub**	**Freshwater Pond**	**Lake**	**Riverine**
RSA	0.20	2.40	--	--	--
Replaced segment	0.76	0.08	--	--	--
Change	**– 0.56**	**+ 2.32**	**No change**	**No change**	**No change**

[a] Existing corridors used by RSA-05 would consist of transmission line and road rights-of-way.

[b] Sensitive noise receptors within 1,250 feet of the centerline of the pipeline permanent right-of-way.

[c] Crossings by proposed centerline.

[d] Minnesota Biological Survey, sensitive plant communities

[e] Minnesota Biological Survey, lakes with aquatic vegetation 1250ft. of the centerline.

[f] Provided by Minnesota Department of Natural Resources.

[g] Occurrences of state rare/protected species within 1,250 feet of the centerline of the pipeline permanent right-of-way. In order to protect their exact location, an "occurrence" represents the location of the record plus a species-specific buffer distance. Data provided by State of Minnesota, Department of Natural Resources (MN-DNR 2016). State data does not include occurrence information for Canada lynx or gray wolf.

[h] National Land Cover Database (Homer et al. 2015). Percentage of permanent right-of-way in acres.

[i] National Wetlands Inventory (USFWS n. d.). Permanent right-of-way in acres.

RSA = route segment alternative, "--" = Not applicable

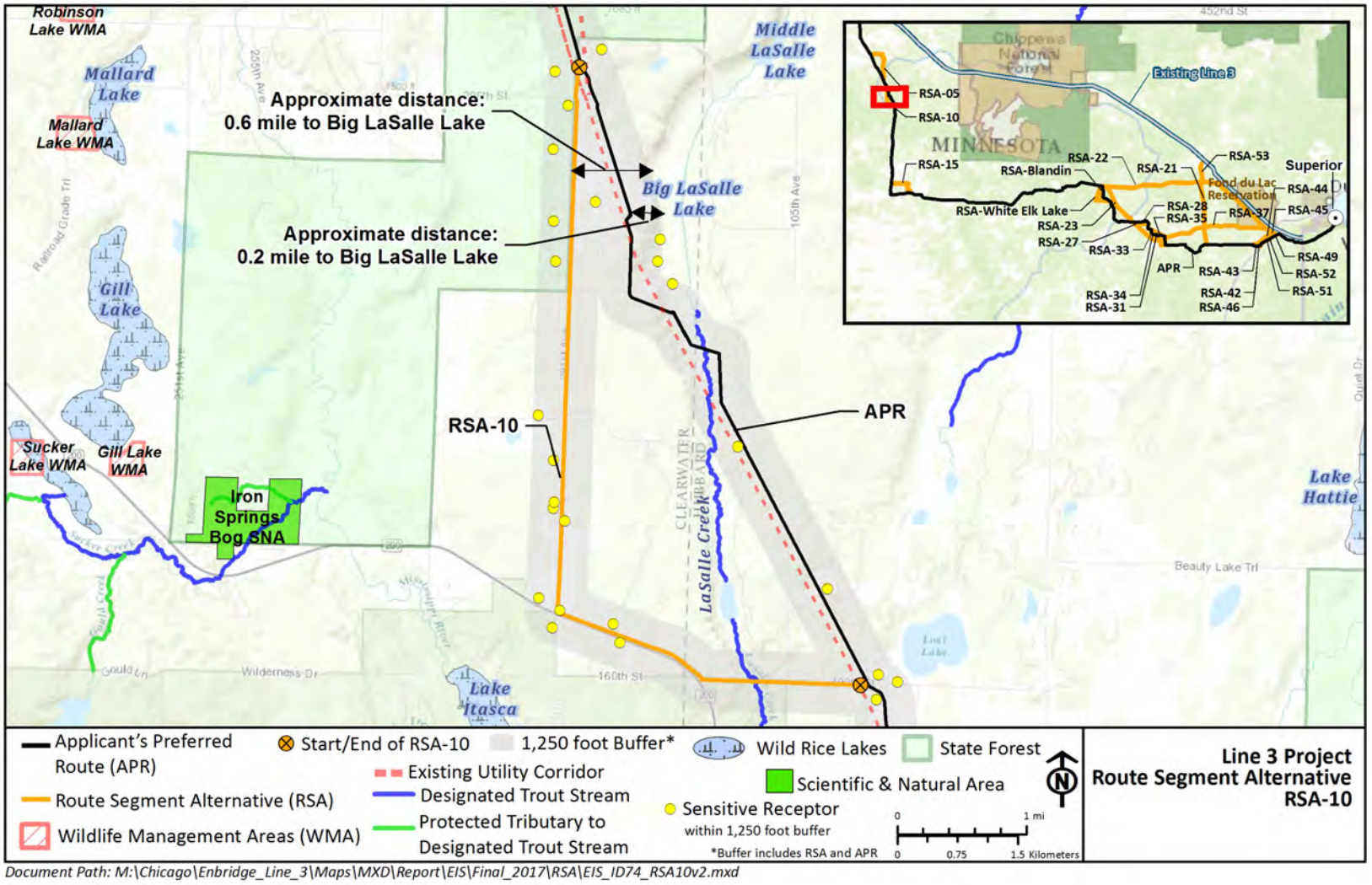

Figure 7.3-2. Route Segment Alternative RSA-10

7.3.3 Route Segment Alternative RSA-15

RSA-15 is located in Hubbard County. It is approximately 9.5 miles long and replaces a 10.4-mile segment of the Applicant's preferred route between MP 199.7 and MP 210.1 (Figure 7.3-3). RSA-15 is co-located with existing corridors for its entire length, and passes through farmland, forest, and wetland areas. The purpose of RSA-15 is to provide better access near Twin Lakes and Shell River for emergency response. Table 7.3-3 highlights the differences between RSA-15 and the Applicant's preferred route.

RSA-15 does not cross the Shell River, but rather the Fishhook River about 1,300 feet upstream of the Shell River and 1.7 miles from Upper Twin Lake. The crossing is approximately 900 feet from Arbor Road. The Applicant's preferred route crosses the Shell River at three locations, one of which is approximately 0.5 mile from Upper Twin Lake. The crossing is 0.6 mile from County Road 6. There is no road access between the Applicant's preferred route and Upper Twin Lake, whereas along RSA-15 the Shell River passes beneath Arbor Road approximately 1.4 miles upstream of Upper Twin Lake.

Meaningful Variation Exists Between Routing Options

RSA-15 and the Applicant's preferred route are different in the following criteria: (A) Human Settlement; (B) Natural Environment; (C) Cultural Resources; (D) Economics; and (G) Natural Resources.

(A) Human Settlement

Noise: The centerline of RSA-15 is within 1,250 feet of nine more sensitive noise receptors, thereby increasing potential overall noise impacts related to construction.

Displacement: As currently proposed, RSA-15 displaces several residences. The homes could be avoided by re-aligning the pipeline within the route width. This would likely increase impacts on agricultural and forested cover types.

(B) Natural Environment

Vegetation: RSA-15 would affect approximately 13 more acres of native plant communities, but 28 fewer acres of forested cover types potentially resulting in lessened stormwater run-off potential.

Wildlife Habitat: RSA-15 would affect 28 fewer acres of woodland habitat, but 18 more acres of wetland habitat for those wildlife species that depend on these habitat types.

RSA-15 would cross five fewer designated trout streams. This is a significant decrease in potential impacts to trout production waters when compared to the Applicant's preferred route.

Unique Natural Resources: RSA-15 and the Applicant's preferred route both cross in the vicinity of two occurrences. Therefore, impacts are expected to be similar between the two routes. Occurrences within RSA-15 include mussel species.

(C) Cultural Resources

RSA-15 contains one more archaeological resource, as compared to the route segment it would replace. However, it would contain four less historic resources. None of the resources are listed on the State Register or the NRHP.

(D) Economics

RSA-15 does not cross any designated timber parcels while the Applicant's preferred route crossed approximately 1.8 miles of timber parcels. Thus, RSA-15 would have less of an impact to timber activities.

(G) Natural Resources

Water Resources: RSA-15 reduces the number of stream crossings by five when compared to the Applicant's preferred route. This reduction creates less potential for run-off, sedimentation, and turbidity to affect the area waterway network.

RSA-15 crosses 2.8 fewer miles of vulnerable water table aquifers but 29 more public water wells.

Wetlands: RSA-15 would increase potential impacts to wetlands by almost tripling the acreage of forested wetland conversion to emergent wetland.

Table 7.3-3. Localized Differences between Route Segment Alternative RSA-15 and the Applicant's Preferred Route

Resource or Factor	Route Segment Alternative	Replaced Segment of Route	Change
Acres of construction work area	137.77	133.30	**+ 4.47**
Percentage co-located with existing corridors[a]	100%	100%	**No change**
Number of sensitive noise receptors[b]	32	23	**+ 9**
Number of road crossings[c]	14	11	**+ 3**
Number of NHD stream/river crossings	1	6	**– 5**
NHD Artificial Path	0	3	**– 3**
NHD Canal/Ditch	0	0	**No Change**
NHD Connector	0	0	**No Change**
NHD Steam/River Intermittent	0	0	**No Change**
NHD Stream/River Perennial	1	3	**– 2**
Number of designated trout stream crossings	1	6	**– 5**
Acres of native plant community crossings (construction work area)	30.01	16.70	**+ 13.31**
Acres of forested land crossings (construction work area)	52.38	80.02	**– 27.64**
Acres of wetland crossings (construction work area)	30.38	11.93	**+ 18.45**
Miles of vulnerable water table crossings[f]	6.9	9.7	**– 2.8**

Table 7.3-3. Localized Differences between Route Segment Alternative RSA-15 and the Applicant's Preferred Route

Resource or Factor	Route Segment Alternative	Replaced Segment of Route	Change
Number of Minnesota rare/protected species occurrences[g]	2	2	**No change**
Number of public water wells within 1250ft. of the centerline	52	23	**+ 29**
Public water basins crossed by centerline	0	0	**No Change**
Miles of State Lands crossed by centerline	1.0	1.0	**No Change**
Miles of timber parcels crossed by centerline	0.0	1.8	**– 1.8**
Number of archaeological resources	1	0	**+1**
Number of historic resources	0	4	**-4**

Land Cover – Permanent Right-of-Way[h]					
Route Segment	**Agricultural**	**Developed**	**Forest**	**Water/Wetlands**	**Other**
RSA	26%	26%	36%	6%	5%
Replaced segment	20%	3%	57%	13%	7%
Change	**+ 6%**	**+ 23%**	**– 21%**	**– 7%**	**– 2%**

Wetlands – Permanent Right-of-Way[i]					
Route Segment	**Emergent**	**Forested/Shrub**	**Freshwater Pond**	**Lake**	**Riverine**
RSA	4.24	8.25	--	--	--
Replaced segment	3.62	5.80	0.15	--	0.26
Change	**+ 0.62**	**+ 2.45**	**– 0.15**	**No change**	**– 0.26**

[a] Existing corridors used by RSA-05 would consist of transmission line and road rights-of-way.

[b] Sensitive noise receptors within 1,250 feet of the centerline of the pipeline permanent right-of-way.

[c] Crossings by proposed centerline.

[d] Minnesota Biological Survey, sensitive plant communities

[e] Minnesota Biological Survey, lakes with aquatic vegetation 1250ft. of the centerline.

[f] Provided by Minnesota Department of Natural Resources.

[g] Occurrences of state rare/protected species within 1,250 feet of the centerline of the pipeline permanent right-of-way. In order to protect their exact location, an "occurrence" represents the location of the record plus a species-specific buffer distance. Data provided by State of Minnesota, Department of Natural Resources (MN-DNR 2016). State data does not include occurrence information for Canada lynx or gray wolf.

[h] National Land Cover Database (Homer et al. 2015). Percentage of permanent right-of-way in acres.

[i] National Wetlands Inventory (USFWS n. d.). Permanent right-of-way in acres.

RSA = route segment alternative, "--" = Not applicable

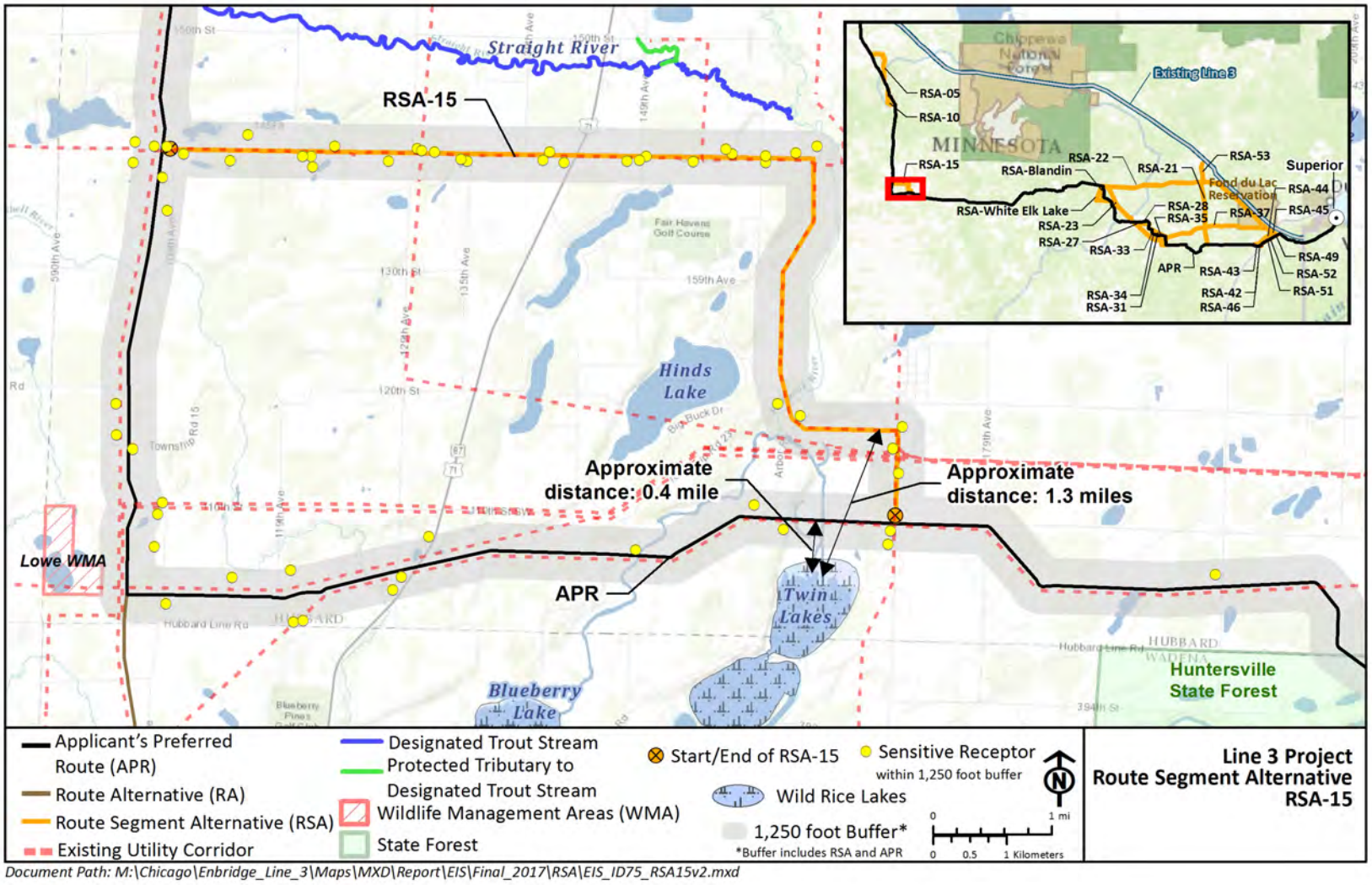

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Figure 7.3-3. Route Segment Alternative RSA-15

7.3.4 Route Segment Alternative RSA-Blandin

RSA-Blandin is located in Aitkin County. It is approximately 3.9 miles in length and replaces a 3.9-mile segment of the Applicant's preferred route between MP 278.3 and MP 282.2 (Figure 7.3-4). RSA-Blandin is a greenfield route that crosses mainly forested areas and some wetlands. Its purpose is to avoid a Minnesota DNR Forest Legacy Easement, which contains a provision restricting disturbance from a pipeline. RSA-Blandin avoids the Forest Legacy Easement. Minnesota DNR commented that uncertainty associated with these restrictions necessitates additional routing options in this area. Table 7.3-4 highlights the differences between RSA-Blandin and the Applicant's preferred route.

Meaningful Variation Exists Between Routing Options

RSA-Blandin and the Applicant's preferred route are different in the following criteria: (A) Human Settlement; (B) Natural Environment; (D) Economics; (F) Co-Location; and (G) Natural Resources.

(A) Human Settlement

Aesthetics: Both routing options create new openings within Hill River State Forest that would create visual impacts; however, 15 percent of the Applicant's preferred route is co-located with existing road corridor, reducing this effect.

Noise: The centerline of RSA-Blandin is within 1,250 feet of one less sensitive noise receptor, thereby decreasing overall potential noise impacts related to construction

(B) Natural Environment

Vegetation: RSA-Blandin would affect 20 additional forested acres than the Applicant's preferred route potentially resulting in lessened stormwater run-off potential.

Wildlife Habitat: RSA-Blandin would affect 20 more acres of woodland habitat, but 6 less acres of wetland habitat for those wildlife species that depend on these habitat types. Overall, both routing options reduce wildlife habitat in an MBS site, specifically forest and wetland habitats; however, the Applicant's preferred route would have less habitat fragmentation and lower edge effects because a greater percentage is co-located with existing infrastructure.

RSA-Blandin requires 100% greenfield crossings. Because of this, negative impacts from habitat fragmentation and edge effects would be a factor to species affected by such habitat.

Unique Natural Resources: RSA-Blandin would cross in the vicinity of one more occurrence than the Applicant's preferred route, increasing potential impacts. Occurrences within RSA-Blandin include amphibian and bat species.

(D) Economics

Public Lands: The Applicant's preferred route would cross more mileage of state lands than this RSA and a state conservation easement.

(F) Co-Location

The Applicant's preferred route is co-located for 15 percent of its length. RSA-Blandin is a greenfield route.

(G) Natural Resources

Water Resources: RSA-Blandin requires neither river crossings nor vulnerable water table crossings which reduces the potential impact to these water resources when compared to the Applicant's preferred route.

Wetlands: RSA-Blandin would affect 6 fewer acres of wetlands and about half as many forested wetlands as the Applicant's preferred route.

Table 7.3-4. Localized Differences between Route Segment Alternative RSA-Blandin and the Applicant's Preferred Route

Resource or Factor	Route Segment Alternative	Replaced Segment of Route	Change
Acres of construction work area	56.84	50.67	**+ 6.17**
Percentage co-located with existing corridors[a]	0%	15.8%	**– 15.8%**
Number of sensitive noise receptors[b]	2	3	**– 1**
Number of road crossings[c]	1	1	**No change**
Number of NHD stream/river crossings	0	1	**– 1**
NHD Artificial Path	0	0	**No change**
NHD Canal/Ditch	0	0	**No change**
NHD Connector	0	0	**No change**
NHD Steam/River Intermittent	0	1	**– 1**
NHD Stream/River Perennial	0	0	**No change**
Number of designated trout stream crossings	0	0	**No change**
Acres of native plant community crossings (construction work area)	0	0	**No change**
Acres of forested land crossings (construction work area)	48.52	28.50	**+ 20.02**
Acres of wetland crossings (construction work area)	3.34	9.40	**– 6.06**
Miles of vulnerable water table crossings[f]	0	0.5	**– 0.5**
Number of Minnesota rare/protected species occurrences[g]	4	3	**+1**
Number of public water wells within 1250ft. of the centerline	1	2	**– 1**
Public water basins crossed by centerline	0	0	**No Change**
Miles of State Lands crossed by centerline	2.9	3.5	**– 0.6**
Miles of timber parcels crossed by centerline	0.0	0.0	**No Change**
Number of archaeological resources	0	0	No Change
Number of historic resources	0	0	No Change

Table 7.3-4. Localized Differences between Route Segment Alternative RSA-Blandin and the Applicant's Preferred Route

Land Cover – Permanent Right-of-Way[d]					
Route Segment	**Agricultural**	**Developed**	**Forest**	**Water/Wetlands**	**Other**
RSA	--	2%	86%	7%	5%
Replaced segment	--	16%	55%	20%	9%
Change	**No change**	**– 14%**	**+ 31%**	**– 13%**	**– 4%**
Wetlands – Permanent Right-of-Way[e]					
Route Segment	**Emergent**	**Forested/Shrub**	**Freshwater Pond**	**Lake**	**Riverine**
RSA	0.29	1.17	--	--	--
Replaced segment	0.96	3.85	--	--	--
Change	**– 0.67**	**– 2.68**	**No change**	**No change**	**No change**

[a] Existing corridors used by RSA-05 would consist of transmission line and road rights-of-way.

[b] Sensitive noise receptors within 1,250 feet of the centerline of the pipeline permanent right-of-way.

[c] Crossings by proposed centerline.

[d] Minnesota Biological Survey, sensitive plant communities

[e] Minnesota Biological Survey, lakes with aquatic vegetation 1250ft. of the centerline.

[f] Provided by Minnesota Department of Natural Resources.

[g] Occurrences of state rare/protected species within 1,250 feet of the centerline of the pipeline permanent right-of-way. In order to protect their exact location, an "occurrence" represents the location of the record plus a species-specific buffer distance. Data provided by State of Minnesota, Department of Natural Resources (MN-DNR 2016). State data does not include occurrence information for Canada lynx or gray wolf.

[h] National Land Cover Database (Homer et al. 2015). Percentage of permanent right-of-way in acres.

[i] National Wetlands Inventory (USFWS n. d.). Permanent right-of-way in acres.

RSA = route segment alternative, "--" = Not applicable

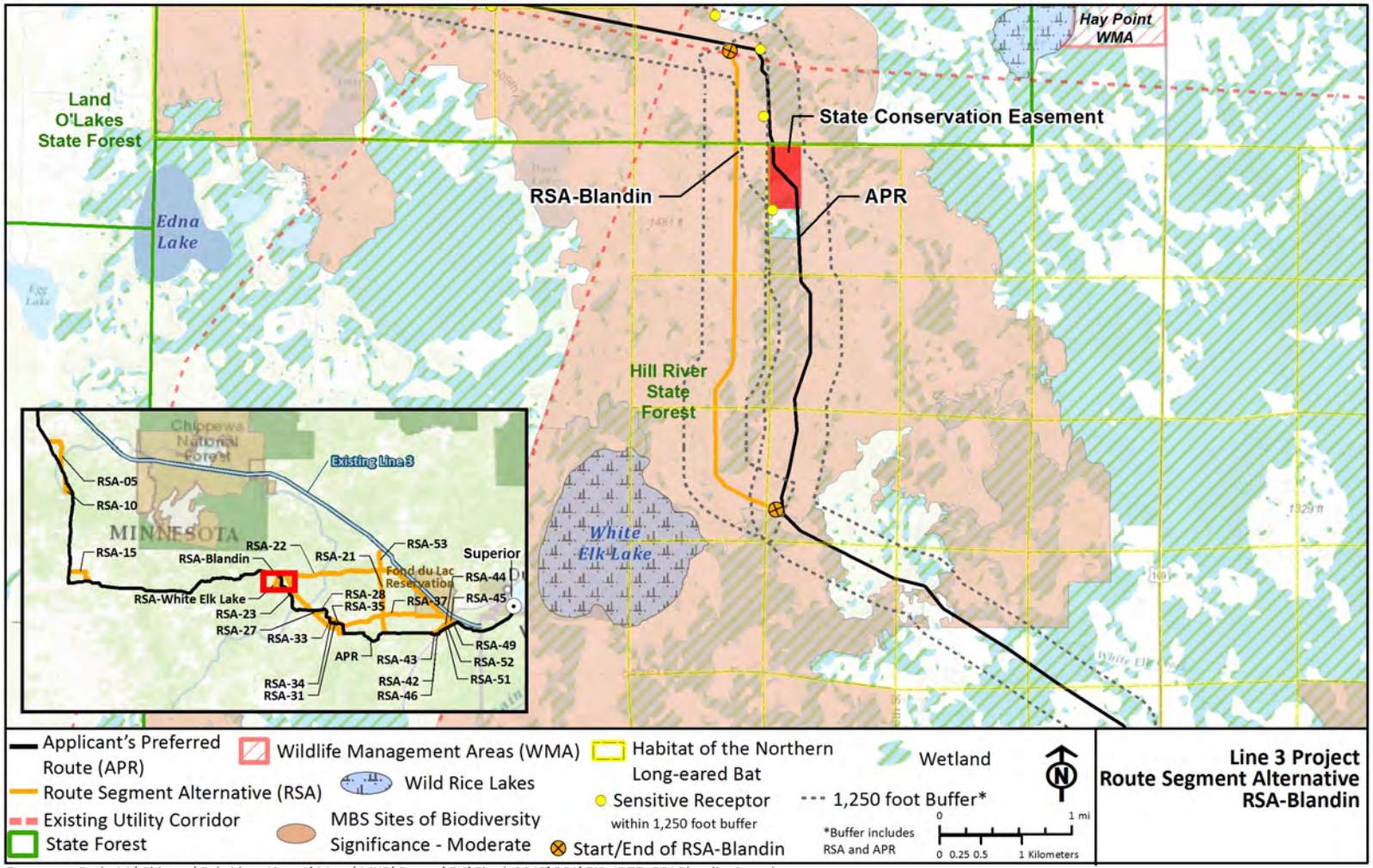

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Figure 7.3-4. Route Segment Alternative RSA-Blandin

7.3.5 Route Segment Alternative RSA-White Elk Lake

RSA-White Elk Lake is located in Aitkin County. It is approximately 9.7 miles long and would replace a 6.8-mile segment of the Applicant's preferred route between MP 277.9 and MP 284.7 (Figure 7.3-5). RSA-White Elk is co-located with existing infrastructure, and runs through primarily forest and wetlands areas. The purposes of RSA-White Elk Lake are to avoid a conservation easement held by the MDNR on land owned by the Blandin Paper Company as part of the Minnesota Forest Legacy Program and fragmentation of an MBS Site. Minnesota DNR commented that uncertainty associated with Forest Legacy Easement which contains a provision restricting disturbance from a pipeline, necessitates additional routing options in this area. Table 7.3-5 highlights the differences between RSA-White Elk Lake and the Applicant's preferred route.

RSA-White Elk Lake avoids the Forest Legacy Easement. This is the same easement avoided by RSA-Blandin. RSA-White Elk Lake is co-located with existing roadway and transmission line corridors for its entire length; therefore, while it crosses an MBS Site, it does not create new habitat fragmentation, specifically new edge effects.

Meaningful Variation Exists Between Routing Options

RSA-White Elk Lake and the Applicant's preferred route are different in the following criteria: (A) Human Settlement; (B) Natural Environment; and (G) Natural Resources.

(A) Human Settlement

Aesthetics: RSA-White Elk Lake follows existing infrastructure rights-of-way for the greater portion of its length, reducing potential for visual impacts by not creating as many new landscape openings.

Noise: The centerline of RSA-White Elk Lake is within 1,250 feet of twice as many sensitive noise receptors as the Applicant's preferred route, thereby increasing potential noise impacts related to construction.

(B) Natural Environment

Wildlife: RSA-White Elk Lake avoids documented maternity roost trees for the northern long-eared bat along the Applicant's preferred route; however, considering the proximity of the two routing options, the species likely uses portions of RSA- White Elk Lake as well.

Wildlife Habitat: Both routing options would have reduced wildlife habitat in an MBS Site, specifically forest and wetland habitats; however, RSA-White Elk Lake would have reduced habitat fragmentation and edge effects because a greater percentage is co-located with existing infrastructure—that is, the MBS Site is already fragmented along RSA-White Elk Lake.

Unique Natural Resources: RSA-White Elk Lake would cross in the vicinity of four fewer rare species occurrences than the Applicant's preferred route, decreasing potential impacts. There are no occurrences within RSA-White Elk Lake.

(G) Natural Resources

Wetlands: RSA-White Elk Lake is significantly longer than the Applicant's preferred route. For this reason, it doubles potential impacts to wetlands. The RSA passes through a wetland that might hydrologically connect two wild rice lakes.

Table 7.3-5. Localized Differences between Route Segment Alternative RSA-White Elk Lake and the Applicant's Preferred Route

Resource or Factor	Route Segment Alternative	Replaced Segment of Route	Change
Acres of construction work area	140.79	86.95	**+ 53.84**
Percentage co-located with existing corridors[a]	68.0%	8.8%	**+ 60.0%**
Number of sensitive noise receptors[b]	8	4	**+ 4**
Number of road crossings[c]	8	1	**+ 7**
Number of NHD stream/river crossings	2	2	**No change**
NHD Artificial Path	0	0	**No change**
NHD Canal/Ditch	0	0	**No change**
NHD Connector	0	0	**No change**
NHD Steam/River Intermittent	1	1	**No change**
NHD Stream/River Perennial	1	1	**No change**
Number of designated trout stream crossings	0	0	**No change**
Acres of native plant community crossings (construction work area)	0	0	**No change**
Acres of forested land crossings (construction work area)	42.92	47.59	**– 4.67**
Acres of wetland crossings (construction work area)	36.54	18.23	**+ 18.31**
Miles of vulnerable water table crossings[f]	--	0.5	**– 0.5**
Number of Minnesota rare/protected species occurrences[g]	0	4	**-4**
Number of public water wells within 1250ft. of the centerline	6	3	**+ 3**
Public water basins crossed by centerline	0	0	**No Change**
Miles of State Lands crossed by centerline	5.4	6.0	**– 0.6**
Miles of timber parcels crossed by centerline	0.0	0.0	**No Change**
Number of archaeological resources	0	0	No Change
Number of historic resources	0	0	No Change

Land Cover – Permanent Right-of-Way[h]					
Route Segment	**Agricultural**	**Developed**	**Forest**	**Water/Wetlands**	**Other**
RSA	10%	5%	30%	30%	25%
Replaced segment	1%	9%	53%	28%	9%
Change	**+ 9%**	**– 4%**	**– 23%**	**+ 2%**	**+ 14%**

Table 7.3-5. Localized Differences between Route Segment Alternative RSA-White Elk Lake and the Applicant's Preferred Route

Wetlands – Permanent Right-of-Way[i]					
Route Segment	**Emergent**	**Forested/Shrub**	**Freshwater Pond**	**Lake**	**Riverine**
RSA	7.84	7.34	--	--	--
Replaced segment	4.95	4.45	--	--	--
Change	**+ 2.89**	**+ 2.89**	**No change**	**No change**	**No change**

[a] Existing corridors used by RSA-05 would consist of transmission line and road rights-of-way.

[b] Sensitive noise receptors within 1,250 feet of the centerline of the pipeline permanent right-of-way.

[c] Crossings by proposed centerline.

[d] Minnesota Biological Survey, sensitive plant communities

[e] Minnesota Biological Survey, lakes with aquatic vegetation 1250ft. of the centerline.

[f] Provided by Minnesota Department of Natural Resources.

[g] Occurrences of state rare/protected species within 1,250 feet of the centerline of the pipeline permanent right-of-way. In order to protect their exact location, an "occurrence" represents the location of the record plus a species-specific buffer distance. Data provided by State of Minnesota, Department of Natural Resources (MN-DNR 2016). State data does not include occurrence information for Canada lynx or gray wolf.

[h] National Land Cover Database (Homer et al. 2015). Percentage of permanent right-of-way in acres.

[i] National Wetlands Inventory (USFWS n. d.). Permanent right-of-way in acres.

RSA = route segment alternative, "--" = Not applicable

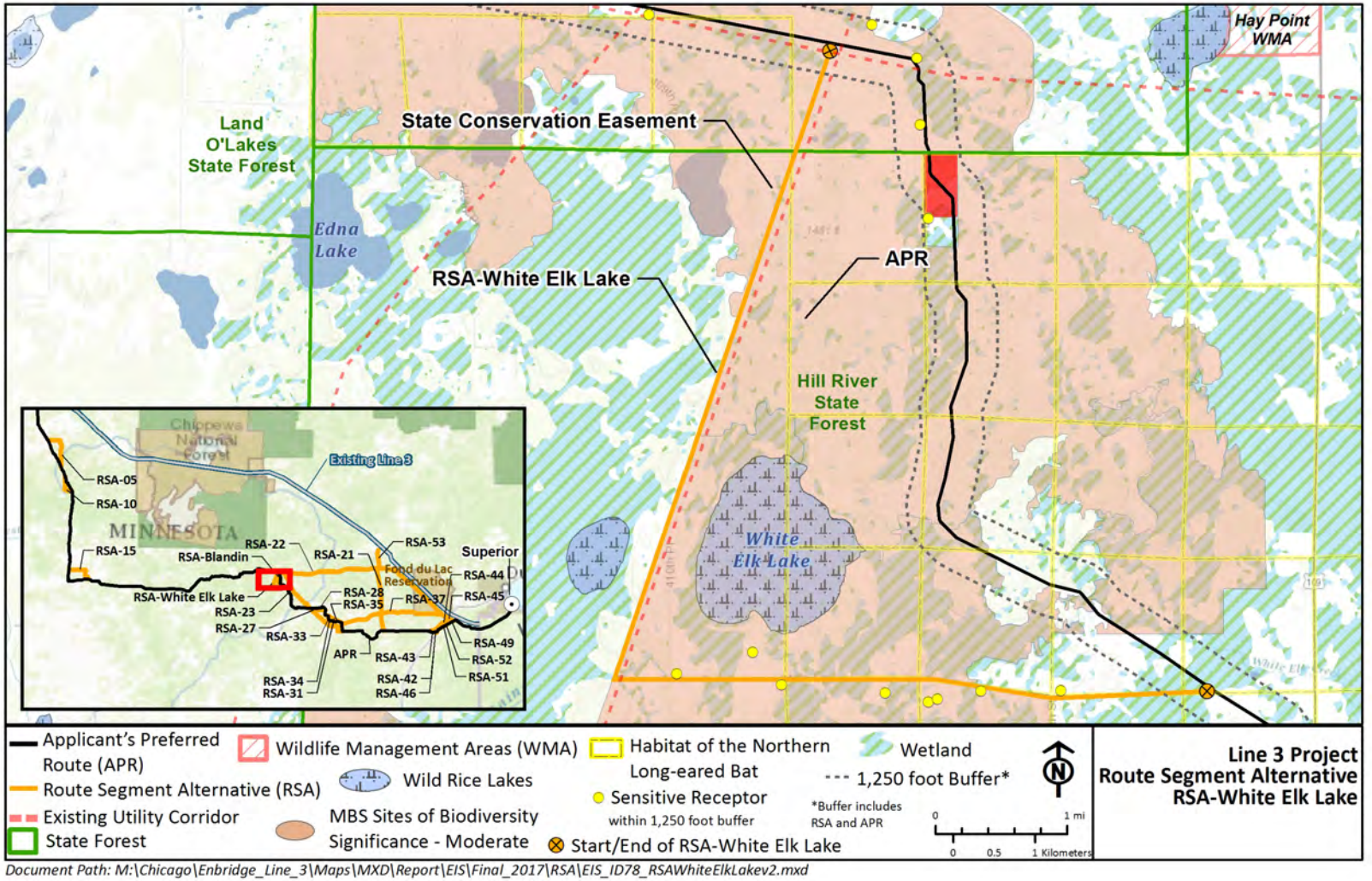

Figure 7.3-5. Route Segment Alternative RSA-White Elk Lake

7.3.6 Route Segment Alternative RSA-21

RSA-21 is located in Aitkin County. It is approximately 53.9 miles long and would replace a 53.5-mile segment of the Applicant's preferred route between MP 278.5 and MP 331.9 (Figure 7.3-6). RSA-21 crosses primarily wetland cover types, but forested cover types are also crossed. The purpose of RSA-21 is to avoid impacts on the Sandy River, an ecologically and economically significant fisheries resource, especially downstream resources, such as wild rice and trout streams in the Big Sandy Lake watershed. Table 7.3-6 highlights differences between RSA-21 and the Applicant's preferred route.

RSA-21 eliminates crossings of, and increases separation between, the pipeline and the Sandy River. It does not eliminate impacts on wild rice waters, and it crosses an additional designated trout stream.

RSA-21 avoids crossing the Sandy River; however, it crosses the West Savanna River, Prairie River, and Tamarack River, all of which flow to Big Sandy Lake. The RSA also crosses a wetland that, based on desktop analysis, is hydrologically connected to the Little Tamarack River, which flows to the Tamarack River and into Big Sandy Lake. Therefore, while RSA-21 might eliminate potential impacts on the Sandy River from an accidental release of oil, it does not necessary avoid potential impacts on Big Sandy Lake.

RSA-21 passes adjacent to Moose Lake, an identified wild rice water. It crosses the Tamarack River approximately 0.5 mile upstream of Tamarack Lake, a wild rice water. Additionally, the RSA crosses West Savanna River, Prairie River, and Tamarack River, all of which flow to Big Sandy Lake.

Meaningful Variation Exists Between Routing Options

RSA-21 and the Applicant's preferred route are different in the following criteria: (A) Human Settlement; (B) Natural Environment; (C) Cultural Resources; (D) Economics; (F) Co-Location; and (G) Natural Resources.

(A) Human Settlement

Aesthetics: RSA-21 would have reduced visual impacts compared with the Applicant's preferred route due to its distance from population centers and co-location with existing corridors.

Noise: The centerline of RSA-21 is within 1,250 feet of 57 fewer sensitive noise receptors, thereby decreasing potential noise impacts to human settlement related to construction.

(B) Natural Environment

Vegetation: RSA-21 would reduce impacts on forested areas by approximately 60 acres. It would increase impacts on native plant communities by approximately the same acreage, including two high conservation value forests—Savanna Hardwoods and Floodwood Bog—within the Savanna State Forest. These forest types are managed in accordance with Forest Stewardship Council forest certification for high biodiversity value.

Unique Natural Resources: RSA-21 would cross in the vicinity of 36 fewer occurrences than the Applicant's preferred route, decreasing potential impacts. Occurrences within RSA-21 include bat, bird, and plant species.

(C) Cultural Resources

RSA-21 contains three less archaeological resources, as compared to the route segment it would replace. It also contains two less historic resources. However, none of the resources are listed on the State Register or the NRHP.

(D) Economics

Agriculture: RSA-21 does not cross any agricultural areas while the Applicant's preferred route would cross approximately 133 acres.

Public Lands: RSA-21 would increase separation or avoid several Wildlife Management Areas (WMAs)—Grayling Marsh and Lawler—near the Applicant's preferred route. It approaches Hay Point WMA to the north. Overall, RSA-21 increases separation between the pipeline and WMAs. A greater portion of RSA-21 crosses state forests. RSA-21 borders the Savanna Portage State Park for a portion of its length.

(F) Co-Location

RSA-21 is co-located with existing transmission line rights-of-way for its entire length; the Applicant's preferred route is co-located for approximately one-quarter of its length.

(G) Natural Resources

Water Resources: RSA-21 has two more waterbody crossings overall compared with the Applicant's preferred route and four more perennial stream crossings, one of which is a designated trout stream tributary. The Applicant's preferred route does not cross a trout stream.

Wetlands: RSA-21 crosses approximately two-thirds more wetland acres: 403 acres compared to 164 acres. It would convert twice as many forested wetlands (154 acres) to a less functional emergent wetland type.

Table 7.3-6. Localized Differences between Route Segment Alternative RSA-21 and the Applicant's Preferred Route

Resource or Factor	Route Segment Alternative	Replaced Segment of Route	Change
Acres of construction work area	784.49	667.86	**+ 116.63**
Percentage co-located with existing corridors[a]	100%	26.3%	**+ 73.7%**
Number of sensitive noise receptors[b]	6	63	**– 57**
Number of road crossings[c]	20	25	**– 5**
Number of NHD stream/river crossings	25	23	**+ 2**
NHD Artificial Path	2	2	**No Change**
NHD Canal/Ditch	12	7	**+ 5**
NHD Connector	0	0	**No Change**
NHD Steam/River Intermittent	3	10	**– 7**

Table 7.3-6. Localized Differences between Route Segment Alternative RSA-21 and the Applicant's Preferred Route

Resource or Factor	Route Segment Alternative	Replaced Segment of Route	Change
NHD Stream/River Perennial	8	4	**+ 4**
Number of designated trout stream crossings	1	--	**+ 1**
Acres of native plant community crossings (construction work area)	76.12	9.70	**+ 66.42**
Acres of forested land crossings (construction work area)	169.37	232.65	**– 63.28**
Acres of wetland crossings (construction work area)	403.25	164.83	**+ 238.42**
Miles of vulnerable water table crossings[f]	6.0	1.9	**+ 4.1**
Number of Minnesota rare/protected species occurrences[g]	10	46	**-36**
Number of public water wells within 1250ft. of the centerline	5	53	**– 48**
Public water basins crossed by centerline	1	0	**+ 1**
Miles of State Lands crossed by centerline	12.1	13.4	**– 1.3**
Miles of timber parcels crossed by centerline	0.3	0.0	**+ 0.3**
Number of archaeological resources	0	3	-3
Number of historic resources	0	2	-2

Land Cover – Permanent Right-of-Way[h]					
Route Segment	**Agricultural**	**Developed**	**Forest**	**Water/Wetlands**	**Other**
RSA	--	1%	21%	61%	16%
Replaced segment	20%	5%	33%	36%	5%
Change	**– 20%**	**– 4%**	**– 12%**	**+ 25%**	**+ 11%**

Wetlands – Permanent Right-of-Way[i]					
Route Segment	**Emergent**	**Forested/Shrub**	**Freshwater Pond**	**Lake**	**Riverine**
RSA	12.70	154.27	0.97	0.13	0.24
Replaced segment	20.37	65.19	0.48	--	0.50
Change	**– 7.67**	**+ 89.08**	**+ 0.49**	**+ 0.13**	**– 0.26**

[a] Existing corridors used by RSA-05 would consist of transmission line and road rights-of-way.

[b] Sensitive noise receptors within 1,250 feet of the centerline of the pipeline permanent right-of-way.

[c] Crossings by proposed centerline.

[d] Minnesota Biological Survey, sensitive plant communities

[e] Minnesota Biological Survey, lakes with aquatic vegetation 1250ft. of the centerline.

[f] Provided by Minnesota Department of Natural Resources.

[g] Occurrences of state rare/protected species within 1,250 feet of the centerline of the pipeline permanent right-of-way. In order to protect their exact location, an "occurrence" represents the location of the record plus a species-specific buffer distance. Data provided by State of Minnesota, Department of Natural Resources (MN-DNR 2016). State data does not include occurrence information for Canada lynx or gray wolf.

[h] National Land Cover Database (Homer et al. 2015). Percentage of permanent right-of-way in acres.

[i] National Wetlands Inventory (USFWS n. d.). Permanent right-of-way in acres.

RSA = route segment alternative, "--" = Not applicable

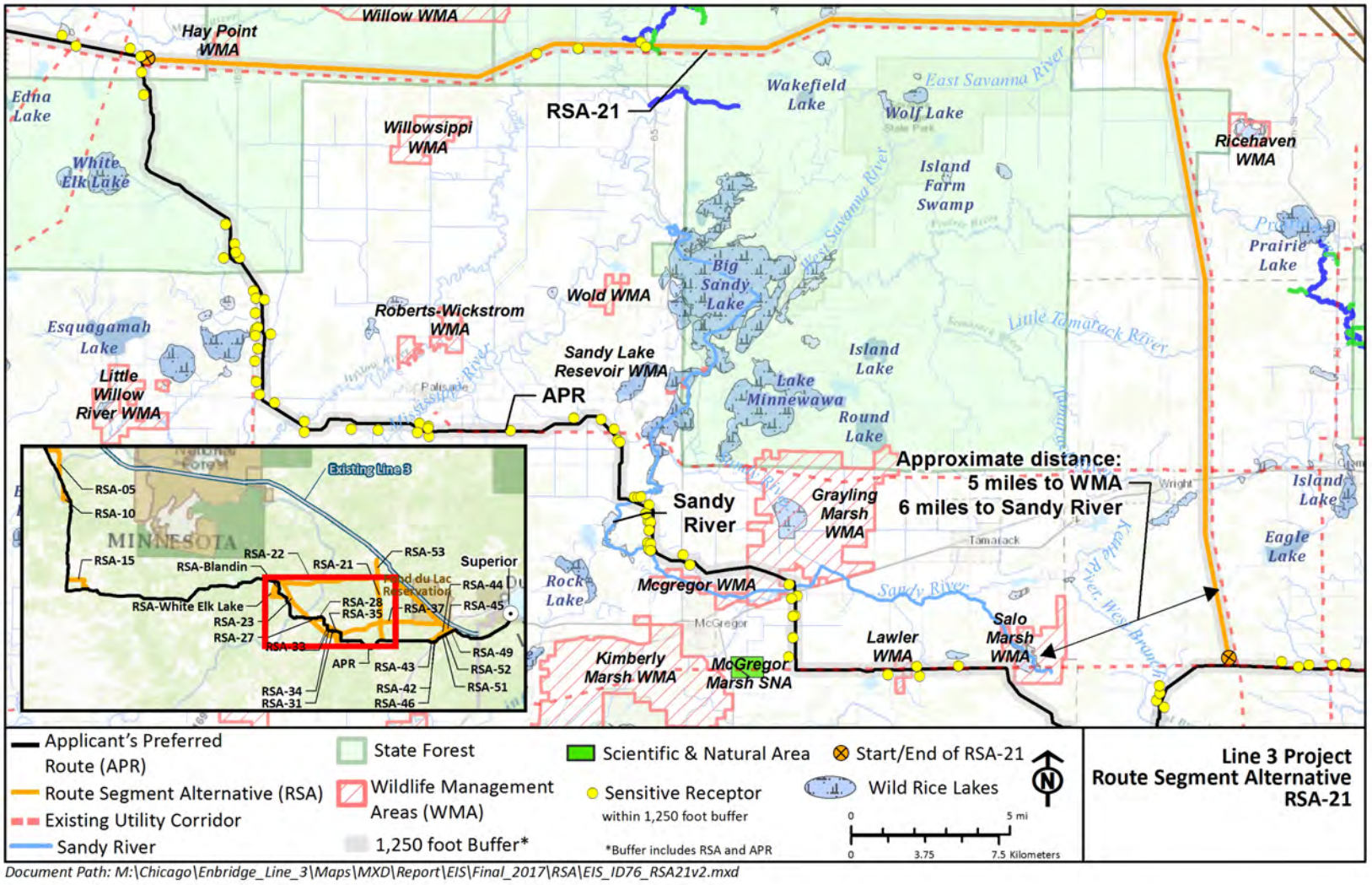

Figure 7.3-6. Route Segment Alternative RSA-21

7.3.7 Route Segment Alternative RSA-22

RSA-22 is located in Aitkin, St. Louis, and Carlton counties. It is approximately 64.7 miles long and replaces a 73.8-mile segment of the Applicant's preferred route between MP 278.5 and MP 356.7 (Figure 7.3-7). RSA-22 is predominately wetland and forested cover types; however, some farming does occur in this area. The purpose of this RSA is to avoid important habitat in the Big Sandy Lake watershed as well as Grayling Marsh WMA, and Lawler WMA. Table 7.3-7 highlights the differences between RSA-22 and the Applicant's preferred route.

RSA-22 avoids crossing the Sandy River; however, it crosses the West Savanna River, which flows to Big Sandy Lake. Therefore, it would have reduced potential impacts on the Sandy River from an accidental release of oil, but does not necessarily avoid potential impacts on the Big Sandy Lake watershed or the 13 other perennial streams it would cross.

RSA-22 increases separation or avoids several WMAs—Grayling Marsh and Lawler—near the Applicant's preferred route. It approaches Hay Point WMA to the north. Overall, this RSA increases separation between the pipeline and WMAs.

Meaningful Variation Exists Between Routing Options

RSA-22 and the Applicant's preferred route are different in the following criteria: (A) Human Settlement; (B) Natural Environment; (C) Cultural Resources; (D) Economics; (F) Co-Location; and (G) Natural Resources.

(A) Human Settlement

Aesthetics: The RSA would reduce visual impacts due to its distance from population centers and co-location with existing corridors.

Noise: The centerline of RSA-22 is within 1,250 feet of 47 fewer sensitive noise receptors, thereby decreasing potential noise impacts related to construction.

Environmental Justice: RSA-22 passes through the Fond du Lac Indian Reservation, whereas the Applicant's preferred route does not.

(B) Natural Environment

Vegetation: RSA-22 crosses 130 fewer forested acres, but an additional 40 acres of native plant communities, including two high conservation value forests—Savanna Hardwoods and Floodwood Bog—within the Savanna State Forest. These forest types are managed in accordance with Forest Stewardship Council forest certification for high biodiversity value. RSA-22 increases separation or avoids several WMAs, including Grayling Marsh and Lawler WMAs, near the Applicant's preferred route.

Wildlife Habitat: RSA-22 would affect 130 fewer acres of woodland habitat, but 145 more acres of wetland habitat for those wildlife species that depend on these habitat types.

RSA-22 would cross eleven fewer streams, with one less designated trout stream when compared to the Applicant's preferred route. This would represent a decrease in potential impacts to trout production waters when compared to the Applicant's preferred route.

Unique Natural Resources: RSA-22 would cross in the vicinity of 57 fewer occurrences than the Applicant's preferred route, decreasing potential impacts. Occurrences within RSA-22 include bat, bird, and plant species.

(C) Cultural Resources

RSA-22 contains five less archaeological resources, as compared to the route segment it would replace. It also contains one less historic resource. However, none of the resources are listed on the State Register or the NRHP.

(D) Economics

Public Lands: RSA-22 approaches Hay Point WMA to the north. Overall, RSA-22 increases separation between WMAs; however, the RSA is routed through significantly more State Forest—Savanna and Fond du Lac State Forests—and borders Savanna Portage State Park for a portion of its length. However, overall impacts to state lands are greater under the Applicant's preferred route.

(F) Co-Location

RSA-22 is co-located with existing transmission line, refined product pipeline, oil pipeline, or natural gas pipeline rights-of-way for its entire length; the Applicant's preferred route is co-located for 44 percent of its length.

(G) Natural Resources

Water Resources: RSA-22 crosses eleven fewer streams and rivers, one less designated trout stream tributary, and a wild rice lake compared with Applicant's preferred route.

Wetlands: RSA-22 crosses twice as many acres of wetland habitat, including an additional 90 acres of forested wetlands, as the Applicant's preferred route. It crosses twice as many miles of vulnerable water tables.

Table 7.3-7. Localized Differences between Route Segment Alternative RSA-22 and the Applicant's Preferred Route

Resource or Factor	Route Segment Alternative	Replaced Segment of Route	Change
Acres of construction work area	940.81	985.84	**– 45.03**
Percentage co-located with existing corridors[a]	100%	44.3%	**+ 55.7%**
Number of sensitive noise receptors[b]	75	122	**– 47**
Number of road crossings[c]	39	42	**– 3**
Number of NHD stream/river crossings	30	41	**– 11**
NHD Artificial Path	2	2	**No change**
NHD Canal/Ditch	11	9	**+ 2**
NHD Connector	0	1	**– 1**
NHD Steam/River Intermittent	3	18	**– 15**
NHD Stream/River Perennial	14	11	**+ 3**
Number of designated trout stream crossings	2	3	**– 1**
Acres of native plant community crossings (construction work area)	68.99	27.49	**+ 41.50**
Acres of forested land crossings (construction work area)	217.38	348.96	**– 131.58**
Acres of wetland crossings (construction work area)	418.44	273.07	**+ 145.37**
Miles of vulnerable water table crossings[f]	12.0	6.2	**+ 5.8**
Number of Minnesota rare/protected species occurrences[g]	17	74	**-57**
Number of public water wells within 1250ft. of the centerline	42	92	**– 50**
Public water basins crossed by centerline	1	0	**+ 1**
Miles of State Lands crossed by centerline	10.5	14.2	**– 3.7**
Miles of timber parcels crossed by centerline	0.0	0.0	**No Change**
Number of archaeological resources	0	5	-5
Number of historic resources	2	3	-1

Land Cover – Permanent Right-of-Way[h]					
Route Segment	**Agricultural**	**Developed**	**Forest**	**Water/Wetlands**	**Other**
RSA	4%	2%	23%	52%	20%
Replaced segment	16%	4%	33%	39%	7%
Change	**– 12%**	**– 2%**	**– 10%**	**+ 13%**	**+ 13%**

Table 7.3-7. Localized Differences between Route Segment Alternative RSA-22 and the Applicant's Preferred Route

Wetlands – Permanent Right-of-Way[i]					
Route Segment	**Emergent**	**Forested/Shrub**	**Freshwater Pond**	**Lake**	**Riverine**
RSA	19.51	152.79	2.11	0.13	0.23
Replaced segment	32.79	106.84	0.83	--	0.50
Change	**– 13.28**	**+ 45.95**	**+ 1.28**	**+ 0.13**	**– 0.27**

[a] Existing corridors used by RSA-05 would consist of transmission line and road rights-of-way.

[b] Sensitive noise receptors within 1,250 feet of the centerline of the pipeline permanent right-of-way.

[c] Crossings by proposed centerline.

[d] Minnesota Biological Survey, sensitive plant communities

[e] Minnesota Biological Survey, lakes with aquatic vegetation 1250ft. of the centerline.

[f] Provided by Minnesota Department of Natural Resources.

[g] Occurrences of state rare/protected species within 1,250 feet of the centerline of the pipeline permanent right-of-way. In order to protect their exact location, an "occurrence" represents the location of the record plus a species-specific buffer distance. Data provided by State of Minnesota, Department of Natural Resources (MN-DNR 2016). State data does not include occurrence information for Canada lynx or gray wolf.

[h] National Land Cover Database (Homer et al. 2015). Percentage of permanent right-of-way in acres.

[i] National Wetlands Inventory (USFWS n. d.). Permanent right-of-way in acres.

RSA = route segment alternative, "--" = Not applicable

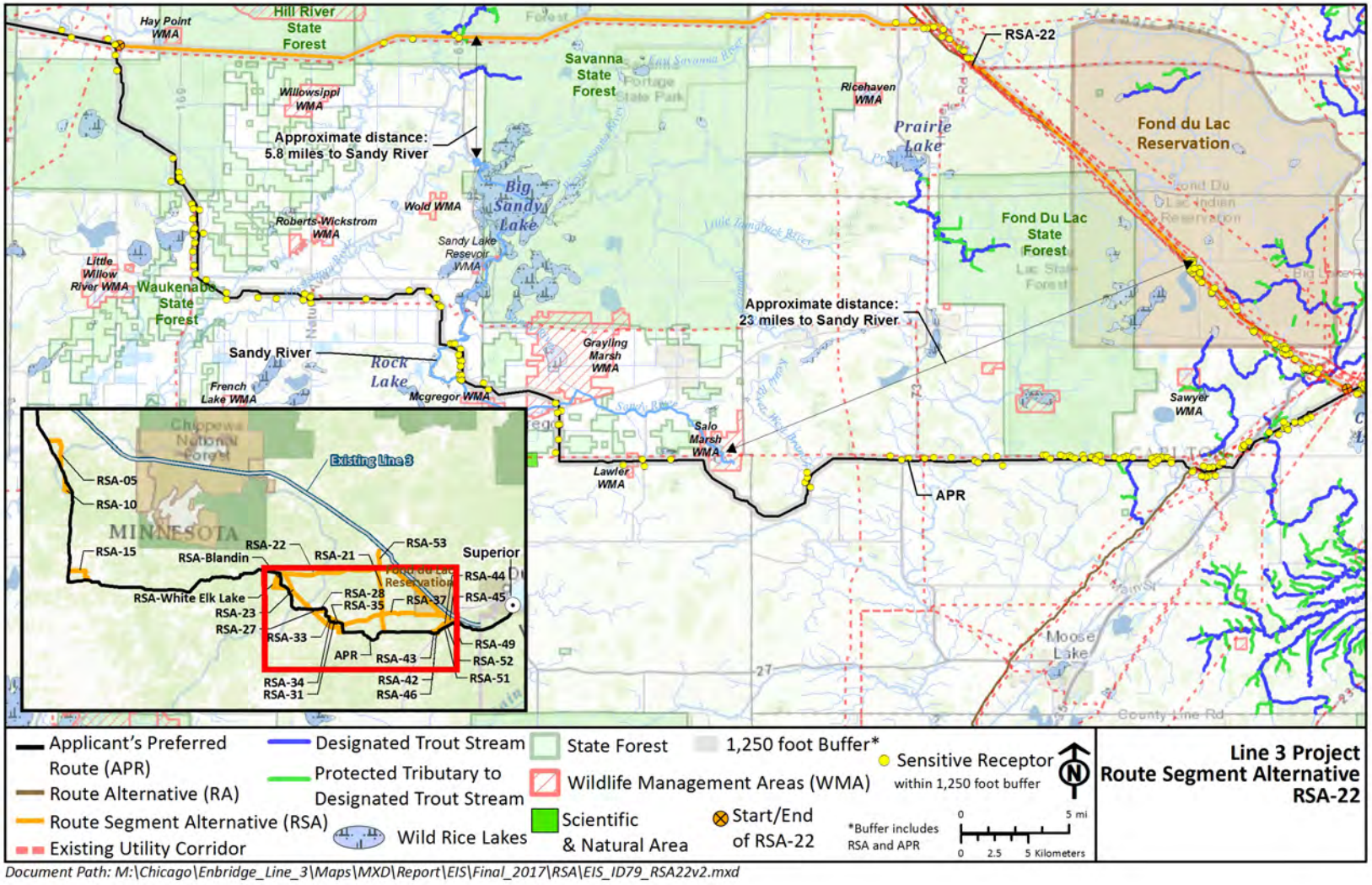

Figure 7.3-7. Route Segment Alternative RSA-22

7.3.8 Route Segment Alternative RSA-23

RSA-23 is located in Aitkin County. It is approximately 31.2 miles long and replaces a 37.0-mile segment of the Applicant's preferred route between MP 278.5 and MP 315.5 (Figure 7.3-8). RSA-23 co-locates the pipeline route with the Soo Line North Trail, a recreational off-highway vehicle trail, for the majority of its length. Wetlands dominate RSA-23; forested areas also exist. The Applicant had originally considered this routing option, but ultimately did not include it in their preferred route. Though no specific environmental reasons were given, multiple commenters requested the RSA be assessed in the Environmental Impact Statement (EIS). Table 7.3-8 highlights the differences between RSA-23 and the Applicant's preferred route.

Route Segment Alternative Crosses a Prohibited Area

RSA-23 crosses the McGregor Marsh Scientific and Natural Area (SNA) following an existing corridor. McGregor SNA is a sensitive area. It is an extensive marsh in the bed of Glacial Lake Aitkin that contains very specific habitat requirements for two rare birds.

Minnesota Statutes 86A.05, Subdivision 5(c), states that "[*p*]*hysical development shall be limited to the facilities absolutely necessary for protection, research, and educational projects, and, where appropriate, for interpretive services*." Minnesota Rule 6135.1100 [Utility Crossings], Subpart 5, indicates that unless no feasible alternative exists, Minnesota DNR must avoid permitting utility crossings across SNAs. Minnesota DNR has indicated it will not permit this crossing. For this reason, no discussion comparing RSA-23 with the Applicant's preferred route was completed.

Table 7.3-8. Localized Differences between Route Segment Alternative RSA-23 and the Applicant's Preferred Route

Resource or Factor	Route Segment Alternative	Replaced Segment of Route	Change
Acres of construction work area	453.24	449.61	**+ 3.63**
Percentage co-located with existing corridors[a]	15.8%	7.3%	**+ 8.5%**
Number of sensitive noise receptors[b]	96	54	**+ 42**
Number of road crossings[c]	18	21	**– 3**
Number of NHD stream/river crossings	17	20	**– 3**
NHD Artificial Path	1	2	**– 1**
NHD Canal/Ditch	8	7	**+ 1**
NHD Connector	0	0	**No Change**
NHD Steam/River Intermittent	3	9	**– 6**
NHD Stream/River Perennial	5	2	**+ 3**
Number of designated trout stream crossings	--	--	**No change**
Acres of native plant community crossings (construction work area)	28.22	--	**+ 28.22**
Acres of forested land crossings (construction work area)	83.86	118.83	**– 34.97**
Acres of wetland crossings (construction work area)	283.70	129.28	**+ 154.42**

Table 7.3-8. Localized Differences between Route Segment Alternative RSA-23 and the Applicant's Preferred Route

Resource or Factor	Route Segment Alternative	Replaced Segment of Route	Change
Miles of vulnerable water table crossings[f]	6.2	1.9	**+ 4.3**
Number of Minnesota rare/protected species occurrences[g]	21	31	**-10**
Number of public water wells within 1250ft. of the centerline	41	49	**– 8**
Public water basins crossed by centerline	1	0	**+ 1**
Miles of State Lands crossed by centerline	12.7	12.0	**+ 0.7**
Miles of timber parcels crossed by centerline	0.0	0.0	**No Change**
Number of archaeological resources	10	3	+7
Number of historic resources	1	2	-1

Land Cover – Permanent Right-of-Way[h]					
Route Segment	**Agricultural**	**Developed**	**Forest**	**Water/Wetlands**	**Other**
RSA	4%	3%	18%	69%	5%
Replaced segment	22%	7%	26%	41%	4%
Change	**– 18%**	**– 4%**	**– 8%**	**+ 28%**	**+ 1%**

Wetlands – Permanent Right-of-Way[i]					
Route Segment	**Emergent**	**Forested/Shrub**	**Freshwater Pond**	**Lake**	**Riverine**
RSA	34.28	85.02	--	--	0.22
Replaced segment	15.68	51.51	0.48	--	0.50
Change	**+ 18.60**	**+ 33.51**	**– 0.48**	**No change**	**– 0.23**

[a] Existing corridors used by RSA-05 would consist of transmission line and road rights-of-way.

[b] Sensitive noise receptors within 1,250 feet of the centerline of the pipeline permanent right-of-way.

[c] Crossings by proposed centerline.

[d] Minnesota Biological Survey, sensitive plant communities

[e] Minnesota Biological Survey, lakes with aquatic vegetation 1250ft. of the centerline.

[f] Provided by Minnesota Department of Natural Resources.

[g] Occurrences of state rare/protected species within 1,250 feet of the centerline of the pipeline permanent right-of-way. In order to protect their exact location, an "occurrence" represents the location of the record plus a species-specific buffer distance. Data provided by State of Minnesota, Department of Natural Resources (MN-DNR 2016). State data does not include occurrence information for Canada lynx or gray wolf.

[h] National Land Cover Database (Homer et al. 2015). Percentage of permanent right-of-way in acres.

[i] National Wetlands Inventory (USFWS n. d.). Permanent right-of-way in acres.

RSA = route segment alternative, "--" = Not applicable

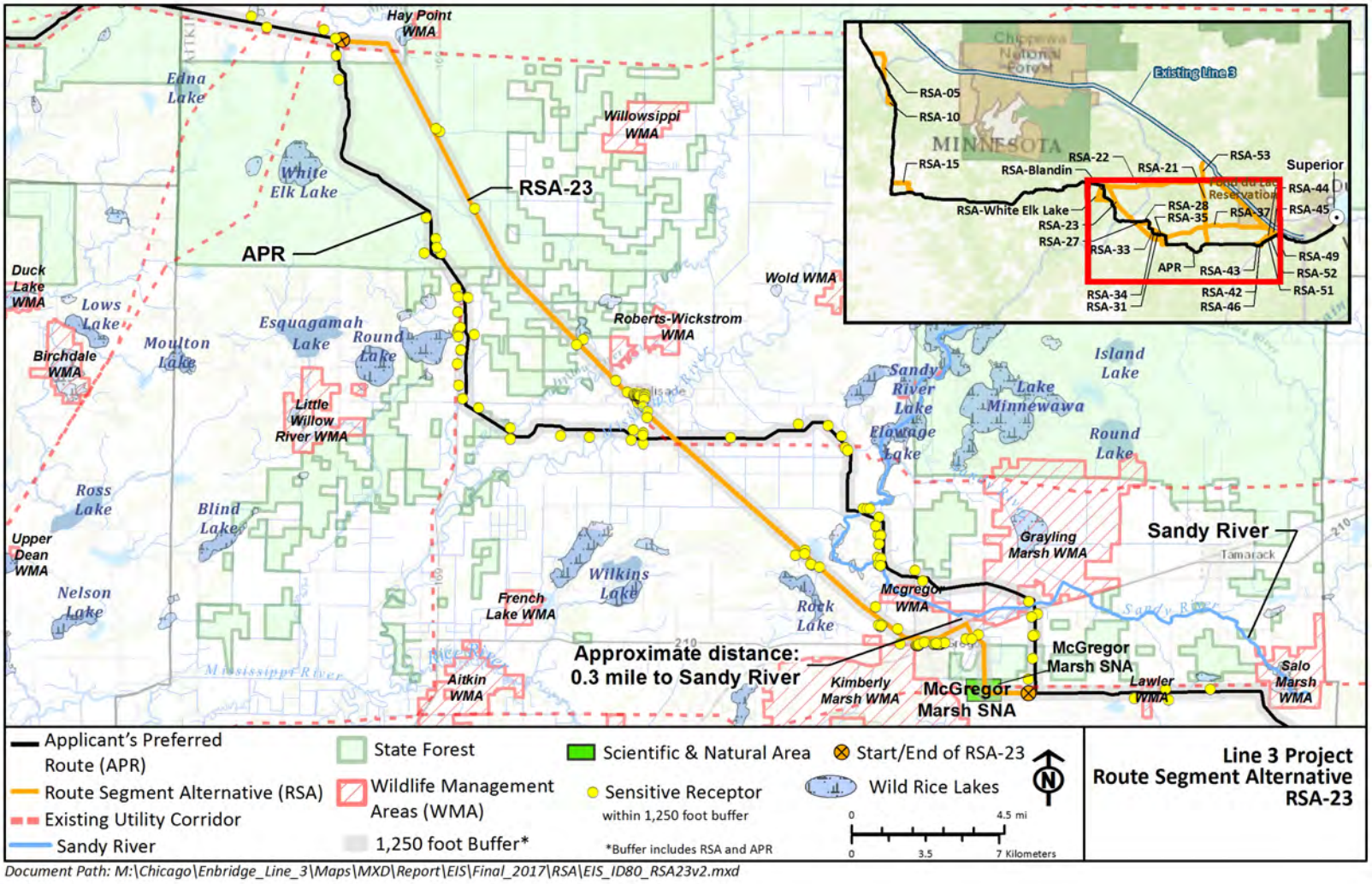

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Figure 7.3-8. Route Segment Alternative RSA-23

7.3.9 Route Segment Alternative RSA-27

RSA-27 is located Aitkin, St. Louis, and Carlton counties. It is approximately 13.2 miles long and replaces a 16.0-mile segment of the Applicant's preferred route between MP 298.1 and MP 314.0 (Figure 7.3-9). It follows the Soo Line North Trail, a recreational off-highway vehicle trail, for a significant portion of its length. RSA-27 is primarily dominated by wetlands, and crosses forested cover types to a lesser extent. Its purpose is to avoid the McGregor Marsh SNA and the Sandy River watershed. Table 7.3-9 highlights the differences between RSA-27 and the Applicant's preferred route.

RSA-27 avoids the McGregor Marsh SNA. The Applicant's preferred route also avoids the SNA. RSA-27 avoids crossing the Sandy River, but does not eliminate potential impacts on the Sandy River watershed. RSA-27 crosses an unnamed stream that connects Rock Lake to Round Lake to Davis Lake. As currently routed, the proposed pipeline would run adjacent to Round Lake. The Sandy River flows through Davis Lake. Overall, the RSA decreases the number of Sandy River crossings, reducing potential impacts on the Sandy River watershed.

Meaningful Variation Exists Between Routing Options

RSA-27 and the Applicant's preferred route are different in the following criteria: (A) Human Settlement; (B) Natural Environment; (C) Cultural Resources; (D) Economics; (F) Co-Location; and (G) Natural Resources.

(A) Human Settlement

Aesthetics: The RSA would increase visual impacts due to its proximity to the city of McGregor and the Soo Line North Trail although neither alternative would make substantial use of existing rights-of-way.

Noise: The centerline of RSA-27 is within 1,250 feet of 10 additional sensitive noise receptors, thereby increasing potential noise impacts related to construction.

(B) Natural Environment

Vegetation: RSA-27 crosses 16 acres of native plant communities; the replaced segment of the Applicant's preferred route does not.

Unique Natural Resources: RSA-27 would cross in the vicinity of 15 fewer occurrences than the Applicant's preferred route, decreasing potential impacts. Occurrences within RSA-27 include bird and plant species.

(C) Cultural Resources

RSA-27 contains the same number of archaeological resources, as compared to the route segment it would replace. However, it would contain one more historic resource. None of the resources are listed on the State Register or the NRHP.

(D) Economics

Recreation and Tourism: RSA-27 parallels the Soo Line North Trail for a portion of its length. Construction of the pipeline would affect recreational users. Permanent impacts would result from the

conversion of forest and forested wetland cover types near the trail. These impacts (cleared right-of-way) would be perceptible to trail users after restoration of the pipeline in select locations; however, the trail parallels or crosses existing utility corridors and roadways in different locations along its length. Once constructed, impacts on recreation or tourism are not expected.

Agriculture: RSA-27 crosses less agricultural land as a percentage of its length than the Applicant's preferred route, decreasing short-term agricultural impacts.

Public Lands: RSA-27 avoids crossing the Grayling Marsh WMA. It crosses the McGregor WMA, but the pipeline alignment could avoid this WMA through re-alignment of the centerline within the route width. RSA-27 approaches Kimberly Marsh WMA. Overall, the RSA reduces impacts on WMAs.

(F) Co-Location

RSA-27 utilizes existing rights-of-way for approximately 16 percent of its length while the Applicant's preferred route utilizes 7 percent.

(G) Natural Resources

Wetlands: RSA-27 crosses an additional 100 acres of wetlands than the Applicant's preferred route, including 30 acres of forested wetlands.

Water Resources: The RSA crosses 2.7 additional miles of vulnerable water tables and a single public watershed basin.

Table 7.3-9. Localized Differences between Route Segment Alternative RSA-27 and the Applicant's Preferred Route

Resource or Factor	Route Segment Alternative	Replaced Segment of Route	Change
Acres of construction work area	192.50	190.34	**+ 2.16**
Percentage co-located with existing corridors[a]	15.8%	7.3%	**+ 8.5%**
Number of sensitive noise receptors[b]	35	25	**+ 10**
Number of road crossings[c]	10	10	**No change**
Number of NHD stream/river crossings	9	11	**- 2**
NHD Artificial Path	0	1	**- 1**
NHD Canal/Ditch	6	6	**No change**
NHD Connector	0	0	**No Change**
NHD Steam/River Intermittent	2	4	**- 2**
NHD Stream/River Perennial	1	0	**+ 1**
Number of designated trout stream crossings	0	0	**No change**
Acres of native plant community crossings (construction work area)	16.49	0	**+ 16.49**
Acres of forested land crossings (construction work area)	32.03	40.60	**– 8.57**

Table 7.3-9. Localized Differences between Route Segment Alternative RSA-27 and the Applicant's Preferred Route

Resource or Factor	Route Segment Alternative	Replaced Segment of Route	Change
Acres of wetland crossings (construction work area)	139.07	40.88	**+ 98.19**
Miles of vulnerable water table crossings[f]	3.8	1.1	**+ 2.7**
Number of Minnesota rare/protected species occurrences[g]	9	24	**-15**
Number of public water wells within 1250ft. of the centerline	25	21	**+ 4**
Public water basins crossed by centerline	1	0	**+ 1**
Miles of State Lands crossed by centerline	1.1	1.1	**No Change**
Miles of timber parcels crossed by centerline	0.0	0.0	**No Change**
Number of archaeological resources	1	1	No change
Number of historic resources	1	0	+1

Land Cover – Permanent Right-of-Way[h]					
Route Segment	**Agricultural**	**Developed**	**Forest**	**Water/Wetlands**	**Other**
RSA	1%	2%	17%	79%	1%
Replaced segment	33%	9%	21%	34%	3%
Change	**– 32%**	**– 7%**	**– 4%**	**+ 45%**	**– 2%**

Wetlands – Permanent Right-of-Way[i]					
Route Segment	**Emergent**	**Forested/Shrub**	**Freshwater Pond**	**Lake**	**Riverine**
RSA	15.18	42.85	--	--	--
Replaced segment	8.58	13.11	0.48	--	0.24
Change	**+ 6.60**	**+ 29.74**	**– 0.48**	**No change**	**– 0.24**

[a] Existing corridors used by RSA-05 would consist of transmission line and road rights-of-way.

[b] Sensitive noise receptors within 1,250 feet of the centerline of the pipeline permanent right-of-way.

[c] Crossings by proposed centerline.

[d] Minnesota Biological Survey, sensitive plant communities

[e] Minnesota Biological Survey, lakes with aquatic vegetation 1250ft. of the centerline.

[f] Provided by Minnesota Department of Natural Resources.

[g] Occurrences of state rare/protected species within 1,250 feet of the centerline of the pipeline permanent right-of-way. In order to protect their exact location, an "occurrence" represents the location of the record plus a species-specific buffer distance. Data provided by State of Minnesota, Department of Natural Resources (MN-DNR 2016). State data does not include occurrence information for Canada lynx or gray wolf.

[h] National Land Cover Database (Homer et al. 2015). Percentage of permanent right-of-way in acres.

[i] National Wetlands Inventory (USFWS n. d.). Permanent right-of-way in acres.

RSA = route segment alternative, "--" = Not applicable

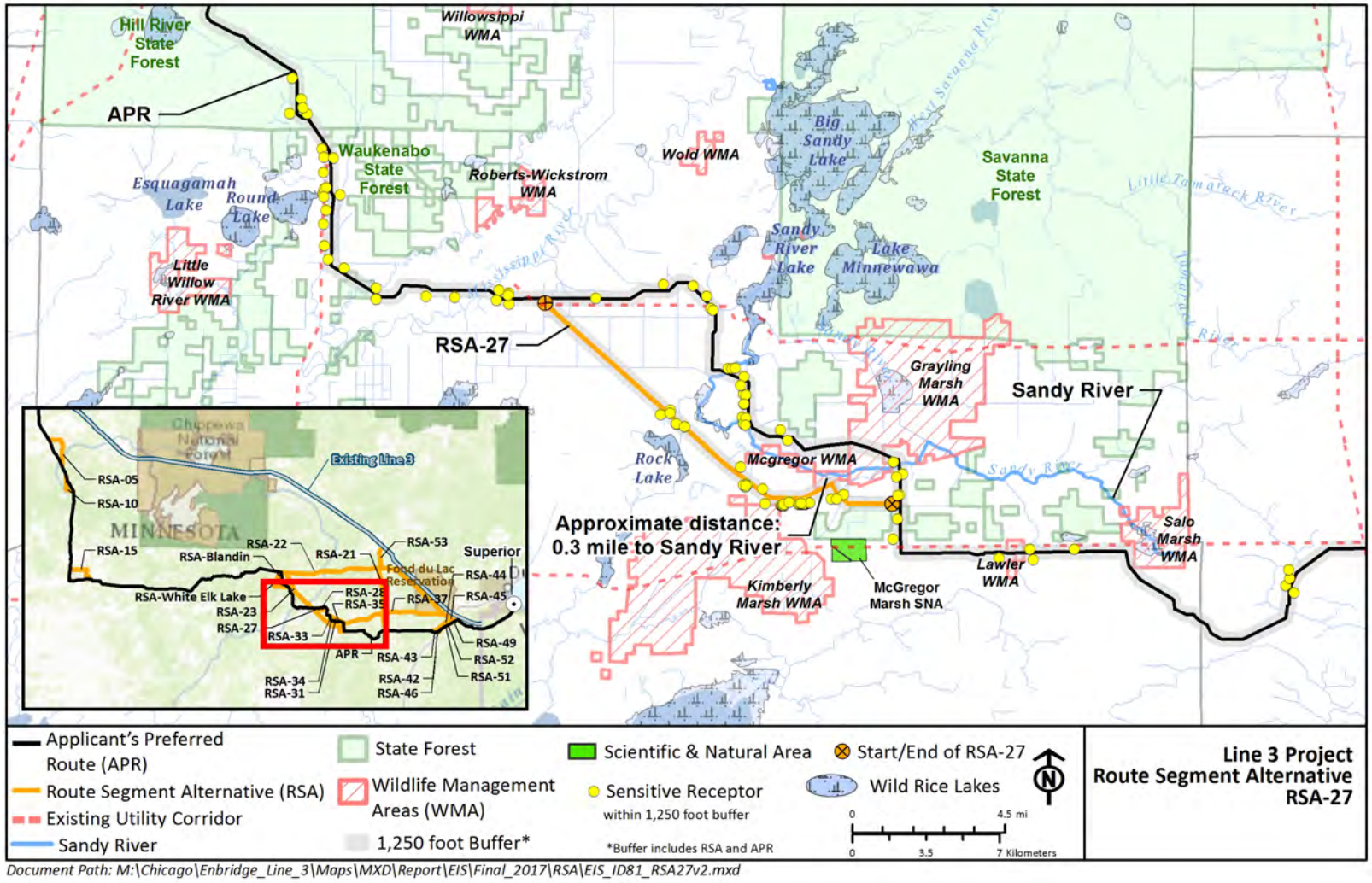

Figure 7.3-9. Route Segment Alternative RSA-27

7.3.10 Route Segment Alternative RSA-28

RSA-28 is located in Aitkin County. It is approximately 3.6 miles long and replaces a 3.8-mile segment of the Applicant's preferred route from MP 300.2 to MP 303.9. RSA-28 is located primarily in an agricultural area. It was submitted as a map with no comment attached; therefore, its purpose is unknown. The RSA avoids multiple diagonal crossings of rural properties and a few noise sensitive receptors. However, it passes through land recorded by U.S. Steel (Keetac) as a compensatory wetland mitigation bank easement. Therefore, RSA-28 is not a viable routing option and no further analysis is provided. As proposed, this RSA is unworkable.

7.3.11 Route Segment Alternative RSA-31

RSA-31 is located in Aitkin County. It is approximately 6.1 miles long and replaces a 7.2-mile segment of the Applicant's preferred route from MP 305.5 to MP 312.7 (Figure 7.3-10). RSA-31 is a greenfield crossing across developed farmland, wetlands, and forests. Its purpose is to straighten and shorten the pipeline route. RSA-31 was proposed to reduce the distance between the pipeline and a specific residence. Table 7.3-10 highlights the differences between RSA-31 and the Applicant's preferred route.

RSA-31 shortens and straightens the pipeline route. It increases the distance between the pipeline and many of the receptors along the replaced segment of the Applicant's preferred route; however, it decreases the distance between the pipeline and two receptors.

Meaningful Variation Exists Between Routing Options

RSA-31 and the Applicant's preferred route are different in the following criteria: (A) Human Settlement; (B) Natural Environment; (C) Cultural Resources; (D) Economics; and (G) Natural Resources.

(A) Human Settlement

Noise: RSA-31 decreases the number of sensitive noise receptors within 1,250 feet of the pipeline centerline by 11, reducing construction-related noise impacts.

(B) Natural Environment

Vegetation: RSA-31 crosses approximately 12 fewer forested acres than the Applicant's preferred route.

Unique Natural Resources: RSA-31 would cross in the vicinity of 13 fewer protected species occurrences than the Applicant's preferred route, decreasing potential impacts. Occurrences within RSA-31 include bat, bird, butterfly, and plant species.

(C) Cultural Resources

RSA-31 contains one less archaeological resource, as compared to the route segment it would replace. However, neither RSA-31 nor the segment it would replace contain historic structures.

(D) Economics

Agriculture: The RSA bisects an active peat farm near Savanna State Forest which is a permanent impact. Both alternatives would impact similar overall acreages of agriculture land but with the RSA impacting a peat farm the negative economic impact would be greater.

Public Lands: The RSA crosses Savanna State Forest; the replaced segment of the Applicant's preferred route does not.

(G) Natural Resources

Water Resources: RSA-31 crosses 1 less mile of vulnerable water tables, and would require two fewer waterbody crossings reducing the potential for run-off into area waterways. .

Wetlands: RSA-31 would affect approximately 22 additional acres of wetlands, and would convert twice as many acres of forested wetlands to a different wetland type.

Table 7.3-10. Localized Differences between Route Segment Alternative RSA-31 and the Applicant's Preferred Route

Resource or Factor	Route Segment Alternative	Replaced Segment of Route	Change
Acres of construction work area	88.68	87.03	**+ 1.65**
Percentage co-located with existing corridors[a]	0	0	**No change**
Number of sensitive noise receptors[b]	4	15	**– 11**
Number of road crossings[c]	3	3	**No change**
Number of NHD stream/river crossings	3	5	**– 2**
NHD Artificial Path	1	1	**No change**
NHD Canal/Ditch	0	0	**No change**
NHD Connector	0	0	**No change**
NHD Steam/River Intermittent	2	4	**– 2**
NHD Stream/River Perennial	0	0	**No change**
Number of designated trout stream crossings	--	--	**No change**
Acres of native plant community crossings (construction work area)	--	--	**No change**
Acres of forested land crossings (construction work area)	16.97	28.99	**– 12.02**
Acres of wetland crossings (construction work area)	36.89	14.31	**+ 22.58**
Miles of vulnerable water table crossings[f]	0.1	1.1	**– 1.0**
Number of Minnesota rare/protected species occurrences[g]	8	21	**-13**
Number of public water wells within 1250ft. of the centerline	3	16	**– 13**
Public water basins crossed by centerline	0	0	**No Change**
Miles of State Lands crossed by centerline	1.1	0.0	**+ 1.1**
Miles of timber parcels crossed by centerline	0.0	0.0	**No Change**
Number of archaeological resources	0	1	-1
Number of historic resources	0	0	No Change

Table 7.3-10. Localized Differences between Route Segment Alternative RSA-31 and the Applicant's Preferred Route

Resource or Factor	Route Segment Alternative	Replaced Segment of Route	Change

Land Cover – Permanent Right-of-Way[h]					
Route Segment	**Agricultural**	**Developed**	**Forest**	**Water/Wetlands**	**Other**
RSA	25%	1%	20%	47%	7%
Replaced segment	28%	1%	33%	33%	4%
Change	**– 3%**	**No change**	**– 13%**	**+ 14%**	**+ 3%**

Wetlands – Permanent Right-of-Way[i]					
Route Segment	**Emergent**	**Forested/Shrub**	**Freshwater Pond**	**Lake**	**Riverine**
RSA	1.81	13.11	--	--	0.47
Replaced segment	1.13	6.46	--	--	0.24
Change	**+ 0.68**	**+ 6.65**	**No change**	**No change**	**+ 0.23**

[a] Existing corridors used by RSA-05 would consist of transmission line and road rights-of-way.

[b] Sensitive noise receptors within 1,250 feet of the centerline of the pipeline permanent right-of-way.

[c] Crossings by proposed centerline.

[d] Minnesota Biological Survey, sensitive plant communities

[e] Minnesota Biological Survey, lakes with aquatic vegetation 1250ft. of the centerline.

[f] Provided by Minnesota Department of Natural Resources.

[g] Occurrences of state rare/protected species within 1,250 feet of the centerline of the pipeline permanent right-of-way. In order to protect their exact location, an "occurrence" represents the location of the record plus a species-specific buffer distance. Data provided by State of Minnesota, Department of Natural Resources (MN-DNR 2016). State data does not include occurrence information for Canada lynx or gray wolf.

[h] National Land Cover Database (Homer et al. 2015). Percentage of permanent right-of-way in acres.

[i] National Wetlands Inventory (USFWS n. d.). Permanent right-of-way in acres.

RSA = route segment alternative, "--" = Not applicable

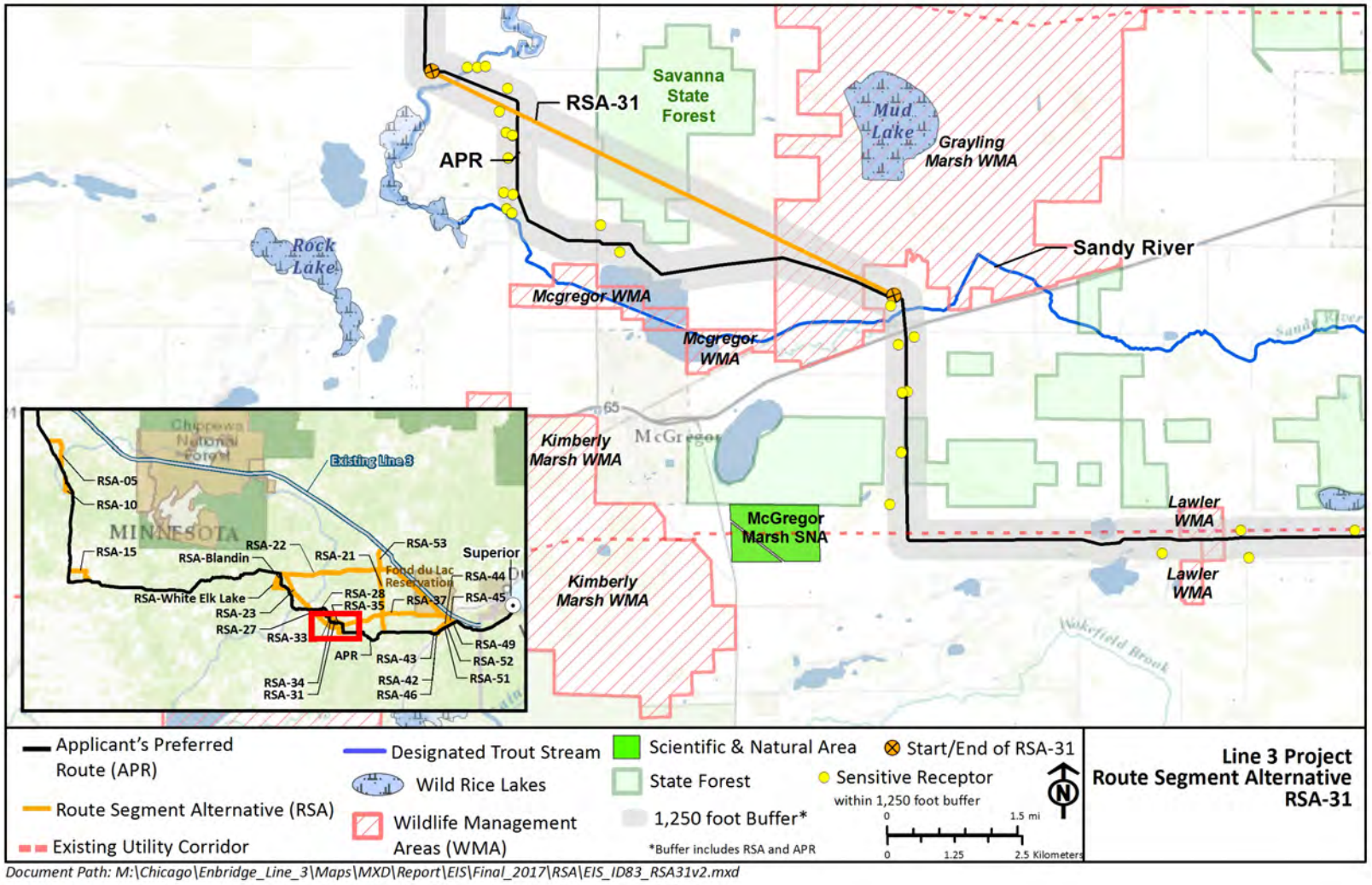

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Figure 7.3-10. Route Segment Alternative RSA-31

7.3.12 Route Segment Alternative RSA-33

RSA-33 is located in Aitkin County. It is approximately 1.8 miles long and replaces a 1.7-mile segment of the Applicant's preferred route between MP 306.7 and MP 308.4 (Figure 7.3-11). RSA-33 is located on primarily forest and wetland cover types. This RSA moves the pipeline to a different portion of the commenter's property, where it is adjacent to a peat plant. It relocates the pipeline further from residences, and does not shift these impacts to other residences. Table 7.3-11 highlights the differences between RSA-33 and the Applicant's preferred route.

Meaningful Variation Exists Between Routing Options

RSA-33 and the Applicant's preferred route are different in the following criteria: (A) Human Settlement; (B) Natural Environment; and (G) Natural Resources.

(A) Human Settlement

Noise: RSA-33 eliminates sensitive noise receptors within 1,250 feet of the pipeline centerline, avoiding construction-related noise impacts.

(B) Natural Environment

Unique Natural Resources: RSA-33 would cross in the vicinity of two more protected species occurrences than the Applicant's preferred route, increasing potential impacts. Occurrences within RSA-33 include bat and butterfly species.

(G) Natural Resources

Wetlands: RSA-33 would affect approximately 8 acres of wetlands, half of which are forested wetlands, increasing conversion of forested wetlands to another wetland type by 3 acres.

Table 7.3-11. Localized Differences between Route Segment Alternative RSA-33 and the Applicant's Preferred Route

Resource or Factor	Route Segment Alternative	Replaced Segment of Route	Change
Acres of construction work area	26.47	20.99	**+ 5.48**
Percentage co-located with existing corridors[a]	0	0	**No change**
Number of sensitive noise receptors[b]	0	8	**– 8**
Number of road crossings[c]	0	0	**No Change**
Number of designated trout stream crossings	0	0	**No change**
Number of NHD stream/river crossings	3	2	**+ 1**
NHD Artificial Path	0	0	**No change**
NHD Canal/Ditch	0	0	**No change**
NHD Connector	0	0	**No change**
NHD Steam/River Intermittent	3	2	**+ 1**

Table 7.3-11. Localized Differences between Route Segment Alternative RSA-33 and the Applicant's Preferred Route

Resource or Factor	Route Segment Alternative	Replaced Segment of Route	Change
NHD Stream/River Perennial	0	0	**No change**
Acres of native plant community crossings (construction work area)	0	0	**No change**
Acres of forested land crossings (construction work area)	8.66	5.93	**+ 2.73**
Acres of wetland crossings (construction work area)	11.20	2.57	**+ 8.63**
Miles of vulnerable water table crossings[f]	0.5	0.4	**+ 0.1**
Number of Minnesota rare/protected species occurrences[g]	10	8	**+2**
Number of public water wells within 1250ft. of the centerline	0	9	**+ 9**
Public water basins crossed by centerline	0	0	**No Change**
Miles of State Lands crossed by centerline	0.0	0.0	**No Change**
Miles of timber parcels crossed by centerline	0.0	0.0	**No Change**
Number of archaeological resources	0	0	No Change
Number of historic resources	0	0	No Change

Land Cover – Permanent Right-of-Way[h]					
Route Segment	**Agricultural**	**Developed**	**Forest**	**Water/Wetlands**	**Other**
RSA	11%	--	33%	46%	9%
Replaced segment	22%	--	29%	47%	2%
Change	**– 11%**	**No change**	**+ 4%**	**– 1%**	**+ 7%**

Wetlands – Permanent Right-of-Way[i]					
Route Segment	**Emergent**	**Forested/Shrub**	**Freshwater Pond**	**Lake**	**Riverine**
RSA	--	4.64	--	--	--
Replaced segment	--	1.35	--	--	--
Change	**No change**	**+ 3.29**	**No change**	**No change**	**No change**

[a] Existing corridors used by RSA-05 would consist of transmission line and road rights-of-way.

[b] Sensitive noise receptors within 1,250 feet of the centerline of the pipeline permanent right-of-way.

[c] Crossings by proposed centerline.

[d] Minnesota Biological Survey, sensitive plant communities

[e] Minnesota Biological Survey, lakes with aquatic vegetation 1250ft. of the centerline.

[f] Provided by Minnesota Department of Natural Resources.

[g] Occurrences of state rare/protected species within 1,250 feet of the centerline of the pipeline permanent right-of-way. In order to protect their exact location, an "occurrence" represents the location of the record plus a species-specific buffer distance. Data provided by State of Minnesota, Department of Natural Resources (MN-DNR 2016). State data does not include occurrence information for Canada lynx or gray wolf.

[h] National Land Cover Database (Homer et al. 2015). Percentage of permanent right-of-way in acres.

[i] National Wetlands Inventory (USFWS n. d.). Permanent right-of-way in acres.

RSA = route segment alternative, "--" = Not applicable

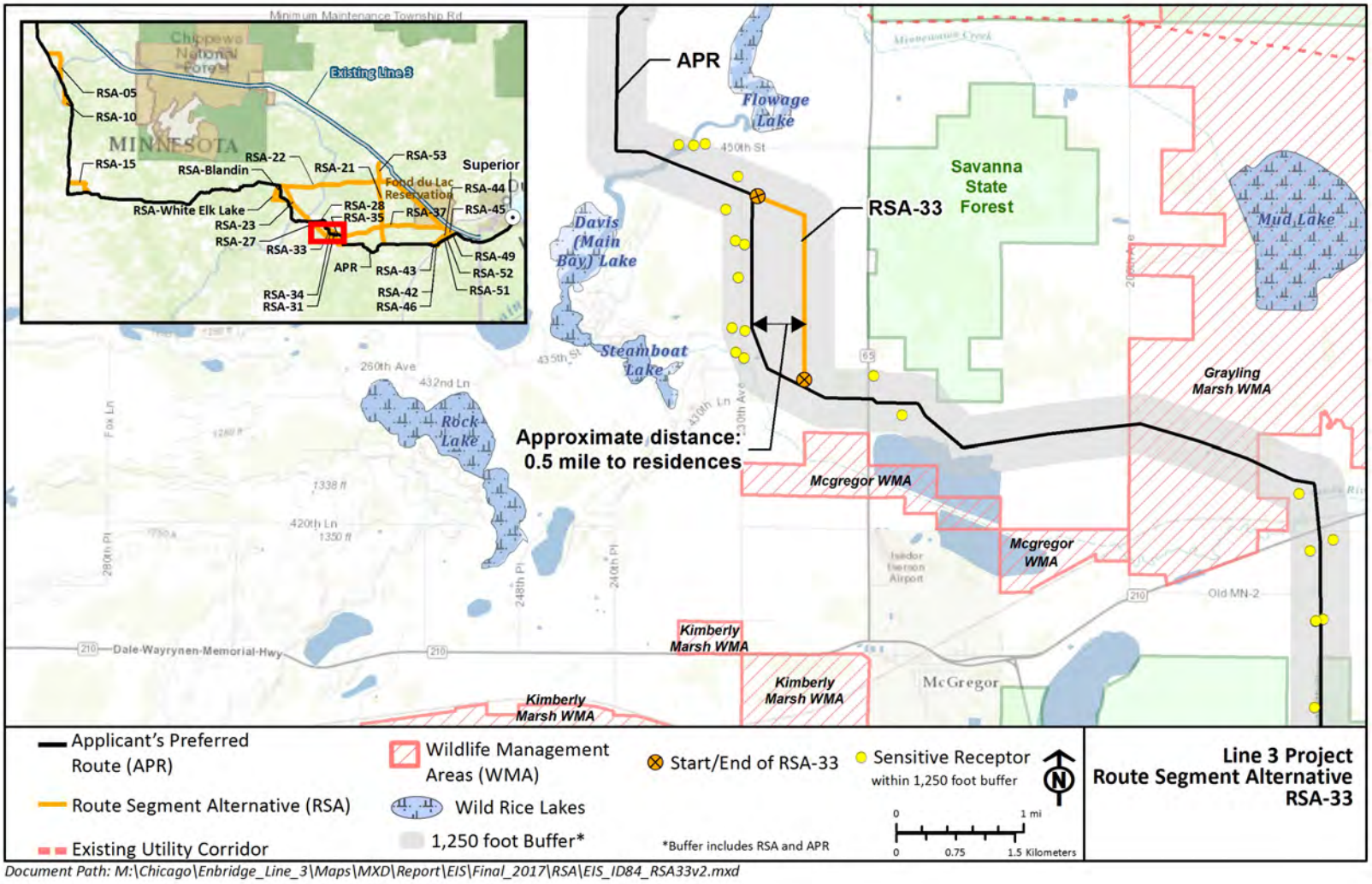

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Figure 7.3-11. Route Segment Alternative RSA-33

7.3.13 Route Segment Alternative RSA-34

RSA-34 is located in Aitkin County. It is approximately 2.2 miles long and replaces a 2.5-mile segment of the Applicant's preferred route between MP 307.6 and MP 310.1 (Figure 7.3-12). It is primarily wetland, forest, and agricultural cover types. RSA-34 was proposed to increase the distance from a specific residence. It reduces the number of sensitive noise receptors within 1,250 feet of the pipeline centerline; however, it shifts impacts to an active peat mining facility, crossing its storage and processing facility. Table 7.3-12 highlights the differences between RSA-34 and the replaced segment of the Applicant's preferred route.

Meaningful Variation Exists Between Routing Options

RSA-34 and the Applicant's preferred route are different in the following criteria: (A) Human Settlement; (B) Natural Environment; (D) Economics; and (G) Natural Resources.

(A) Human Settlement

Noise: RSA-34 reduces the number of sensitive noise receptors within 1,250 feet of the pipeline centerline by half, avoiding construction-related noise impacts.

(B) Natural Environment

Vegetation: The RSA passes through approximately half as many acres of forested cover types as the Applicant's preferred route.

RSA-34 and the corresponding Applicant's preferred route require all greenfield crossings. Because of this, negative impacts from habitat fragmentation and edge effects would be a factor with both alternatives. However, fragmentation would likely be a greater factor in the Applicant's preferred route because it crossed approximately 8 more acres of forested lands.

Unique Natural Resources: RSA-34 would cross in the vicinity of four fewer occurrences than the Applicant's preferred route, decreasing potential impacts. Occurrences within RSA-34 include bat and butterfly species.

(D) Economics

Agriculture: The RSA crosses through an active peat processing and storage facility. Based on satellite imagery, should RSA-34 be selected it would likely necessitate re-routing the pipeline route to avoid this business. This would increase impacts on forested cover types. Re-routing within the route width may or may not be possible within the route width.

(G) Natural Resources

Wetlands: RSA-34 would affect approximately 10 additional wetland acres, increasing conversion of forested wetlands to another wetland type by approximately 5 acres.

Table 7.3-12. Localized Differences between Route Segment Alternative RSA-34 and the Applicant's Preferred Route

Resource or Factor	Route Segment Alternative	Replaced Segment of Route	Change
Acres of construction work area	32.23	31.37	**+ 0.86**
Percentage co-located with existing corridors[a]	0	0	**No change**
Number of sensitive noise receptors[b]	3	6	**– 3**
Number of road crossings[c]	1	1	**No change**
Number of NHD stream/river crossings	3	3	**No change**
NHD Artificial Path	0	0	**No change**
NHD Canal/Ditch	0	0	**No change**
NHD Connector	0	0	**No change**
NHD Steam/River Intermittent	3	3	**No change**
NHD Stream/River Perennial	0	0	**No change**
Number of designated trout stream crossings	0	0	**No change**
Acres of native plant community crossings (construction work area)	0	0	**No change**
Acres of forested land crossings (construction work area)	11.65	19.39	**– 7.74**
Acres of wetland crossings (construction work area)	14.93	4.77	**+ 10.16**
Miles of vulnerable water table crossings[f]	1.0	1.1	**– 0.1**
Number of Minnesota rare/protected species occurrences[g]	10	14	**-4**
Number of public water wells within 1250ft. of the centerline	4	8	**– 4**
Public water basins crossed by centerline	0	0	**No Change**
Miles of State Lands crossed by centerline	0.0	0.0	**No Change**
Miles of timber parcels crossed by centerline	0.0	0.0	**No Change**
Number of archaeological resources	1	1	**No Change**
Number of historic resources	0	0	**No Change**

Land Cover – Permanent Right-of-Way[h]					
Route Segment	**Agricultural**	**Developed**	**Forest**	**Water/Wetlands**	**Other**
RSA	16%	2%	37%	45%	1%
Replaced segment	5%	1%	62%	30%	1%
Change	**+ 11%**	**+ 1%**	**– 25%**	**+ 15%**	**No change**

Table 7.3-12. Localized Differences between Route Segment Alternative RSA-34 and the Applicant's Preferred Route

Wetlands – Permanent Right-of-Way[i]					
Route Segment	**Emergent**	**Forested/Shrub**	**Freshwater Pond**	**Lake**	**Riverine**
RSA	0.35	5.87	--	--	--
Replaced segment	0.57	1.92	--	--	--
Change	**– 0.22**	**+ 3.95**	**No change**	**No change**	**No change**

[a] Existing corridors used by RSA-05 would consist of transmission line and road rights-of-way.

[b] Sensitive noise receptors within 1,250 feet of the centerline of the pipeline permanent right-of-way.

[c] Crossings by proposed centerline.

[d] Minnesota Biological Survey, sensitive plant communities

[e] Minnesota Biological Survey, lakes with aquatic vegetation 1250ft. of the centerline.

[f] Provided by Minnesota Department of Natural Resources.

[g] Occurrences of state rare/protected species within 1,250 feet of the centerline of the pipeline permanent right-of-way. In order to protect their exact location, an "occurrence" represents the location of the record plus a species-specific buffer distance. Data provided by State of Minnesota, Department of Natural Resources (MN-DNR 2016). State data does not include occurrence information for Canada lynx or gray wolf.

[h] National Land Cover Database (Homer et al. 2015). Percentage of permanent right-of-way in acres.

[i] National Wetlands Inventory (USFWS n. d.). Permanent right-of-way in acres.

RSA = route segment alternative, "--" = Not applicable

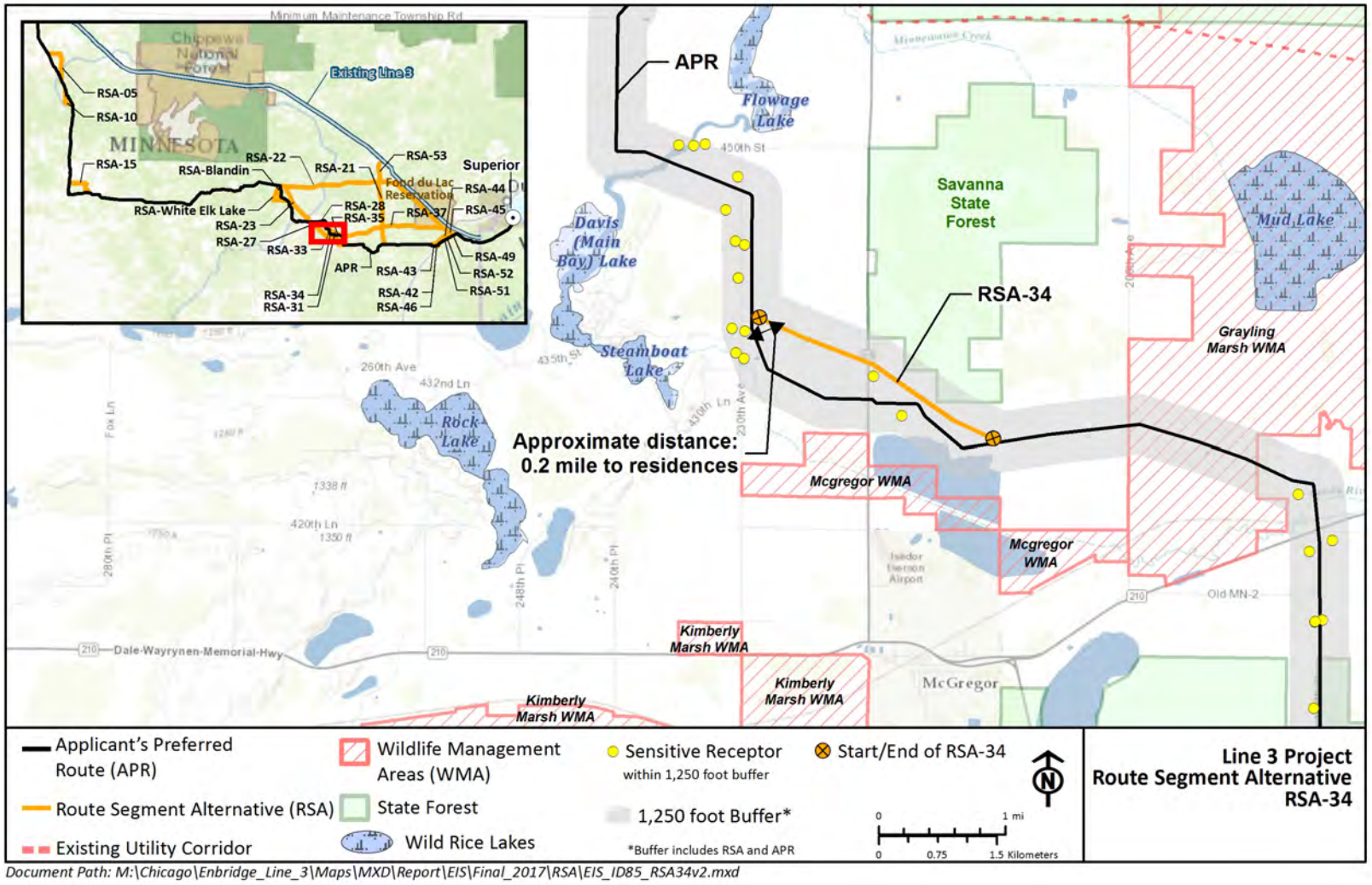

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Figure 7.3-12. Route Segment Alternative RSA-34

7.3.14 Route Segment Alternative RSA-35

RSA-35 is located in Aitkin County. It is approximately 1.6 miles long and replaces a 1.4-mile segment of the Applicant's preferred route from MP 308.4 to MP 309.8 (Figure 7.3-13). The RSA crosses primarily forested and wetland cover types. These National Land Cover Database (Homer et al. 2015) identified wetlands are likely peat fields that may or may not be active. The RSA was proposed to increase the distance between the pipeline and a specific residence. RSA-35 does not change the number of sensitive noise receptors within 1,250 feet of the pipeline centerline. It simply shifts impacts from one residence to another. Table 7.3-13 highlights the differences between RSA-35 and the Applicant's preferred route.

Meaningful Variation Exists Between Routing Options

RSA-35 and the Applicant's preferred route are different in the following criteria: (A) Human Settlement; (B) Natural Environment; (C) Cultural Resources; (D) Economics, and (G) Natural Resources.

(A) Human Settlement

Displacement: The current alignment of RSA-35 would displace a residence; as such, it would need to be re-routed within the route width. This would likely increase impacts on wetland cover types.

(B) Natural Environment

Vegetation: The RSA passes through approximately half as many acres of forested cover types as the Applicant's preferred route.

Unique Natural Resources: RSA-35 would cross in the vicinity of one more occurrence than the Applicant's preferred route, increasing potential impacts. Occurrences within RSA-35 include bat and butterfly species.

(C) Cultural Resources

RSA-35 contains one less archaeological resource, as compared to the route segment it would replace. Neither RSA-35 nor the segment it would replace contain historic resources. None of the resources are listed on the State Register or the NRHP.

(D) Economics

Agriculture: While both RSA-35 and the Applicant's preferred route cross peat lands, the RSA is located within peat lands for a greater portion of its length.

Public Lands: RSA-35 crosses the McGregor WMA for approximately 0.5 mile of its length. The Applicant's preferred route does not cross state lands.

(G) Natural Resources

Wetlands: RSA-35 would affect approximately 11 additional wetland acres, increasing conversion of forested wetlands to emergent wetland.

Table 7.3-13. Localized Differences between Route Segment Alternative RSA-35 and the Applicant's Preferred Route

Resource or Factor	Route Segment Alternative	Replaced Segment of Route	Change
Acres of construction work area	23.68	17.93	**+ 5.75**
Percentage co-located with existing corridors[a]	0	0	**No change**
Number of sensitive noise receptors[b]	2	2	**No change**
Number of road crossings[c]	1	1	**No Change**
Number of NHD stream/river crossings	1	1	**No change**
NHD Artificial Path	0	0	**No change**
NHD Canal/Ditch	0	0	**No change**
NHD Connector	0	0	**No change**
NHD Steam/River Intermittent	1	0	**+ 1**
NHD Stream/River Perennial	0	1	**- 1**
Number of designated trout stream crossings	0	0	**No change**
Acres of native plant community crossings (construction work area)	0	0	**No change**
Acres of forested land crossings (construction work area)	7.73	12.21	**– 4.48**
Acres of wetland crossings (construction work area)	14.53	2.93	**+ 11.60**
Miles of vulnerable water table crossings[f]	0.5	0.7	**– 0.2**
Number of Minnesota rare/protected species occurrences[g]	10	9	**+1**
Number of public water wells within 1250ft. of the centerline	0	3	**– 3**
Public water basins crossed by centerline	0	0	**No Change**
Miles of State Lands crossed by centerline	0.5	0.0	**+ 0.5**
Miles of timber parcels crossed by centerline	0.0	0.0	**No Change**
Number of archaeological resources	0	1	-1
Number of historic resources	0	0	No Change

Land Cover – Permanent Right-of-Way[h]					
Route Segment	**Agricultural**	**Developed**	**Forest**	**Water/Wetlands**	**Other**
RSA	--	2%	34%	64%	--
Replaced segment	--	3%	66%	28%	3%
Change	**No change**	**– 1%**	**– 32%**	**+ 36%**	**– 3%**

Table 7.3-13. Localized Differences between Route Segment Alternative RSA-35 and the Applicant's Preferred Route

Wetlands – Permanent Right-of-Way[i]					
Route Segment	**Emergent**	**Forested/Shrub**	**Freshwater Pond**	**Lake**	**Riverine**
RSA	5.42	0.66	--	--	--
Replaced segment	0.29	1.23	--	--	--
Change	**+ 5.13**	**– 0.57**	**No change**	**No change**	**No change**

[a] Existing corridors used by RSA-05 would consist of transmission line and road rights-of-way.

[b] Sensitive noise receptors within 1,250 feet of the centerline of the pipeline permanent right-of-way.

[c] Crossings by proposed centerline.

[d] Minnesota Biological Survey, sensitive plant communities

[e] Minnesota Biological Survey, lakes with aquatic vegetation 1250ft. of the centerline.

[f] Provided by Minnesota Department of Natural Resources.

[g] Occurrences of state rare/protected species within 1,250 feet of the centerline of the pipeline permanent right-of-way. In order to protect their exact location, an "occurrence" represents the location of the record plus a species-specific buffer distance. Data provided by State of Minnesota, Department of Natural Resources (MN-DNR 2016). State data does not include occurrence information for Canada lynx or gray wolf.

[h] National Land Cover Database (Homer et al. 2015). Percentage of permanent right-of-way in acres.

[i] National Wetlands Inventory (USFWS n. d.). Permanent right-of-way in acres.

RSA = route segment alternative, "--" = Not applicable

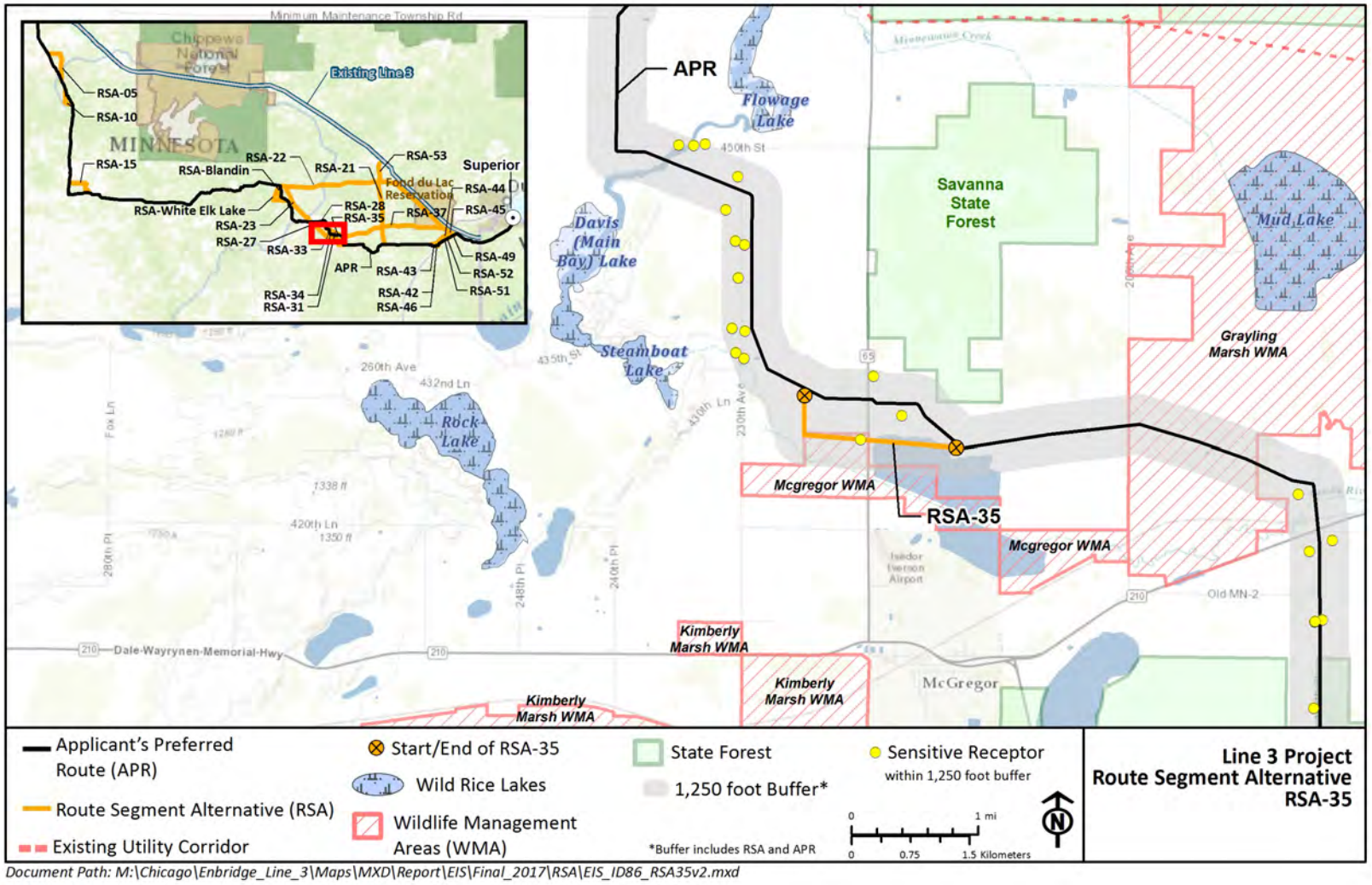

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Figure 7.3-13. Route Segment Alternative RSA-35

7.3.15 Route Segment Alternative RSA-37

RSA-37 is located in Aitkin and Carlton counties. It is approximately 38.7 miles long and replaces a 43.7-mile segment of the Applicant's preferred route between MP 313.1 and MP 356.8 (Figure 7.3-14). The RSA was proposed to avoid Salo Marsh WMA and Lawler WMA.

RSA-37 is not a viable routing option; therefore, no further analysis is provided. As proposed, this RSA is unworkable. It passes beneath multiple structures, most notably beneath Cromwell High School. The school and its grounds cannot be avoided within the route width. Table 7.3-14 nonetheless highlights the differences between RSA-37 and the Applicant's preferred route.

Table 7.3-14. Localized Differences between Route Segment Alternative RSA-37 and the Applicant's Preferred Route

Resource or Factor	Route Segment Alternative	Replaced Segment of Route	Change
Acres of construction work area	562.17	564.91	**– 2.74**
Percentage co-located with existing corridors[a]	11.4%	68.9%	**– 57.5%**
Number of sensitive noise receptors[b]	190	97	**+ 93**
Number of road crossings[c]	38	21	**+ 17**
Number of NHD stream/river crossings	20	22	**– 2**
NHD Artificial Path	3	0	**_+ 3**
NHD Canal/Ditch	5	3	**+ 2**
NHD Connector	0	1	**– 1**
NHD Steam/River Intermittent	5	9	**– 4**
NHD Stream/River Perennial	7	9	**– 2**
Number of designated trout stream crossings	2	3	**– 1**
Acres of native plant community crossings (construction work area)	21.82	27.49	**– 5.67**
MBS, Plant Occurrences[d]	327	0	**+ 327**
MBS, Lake Points[e]	6	0	**+ 6**
Acres of forested land crossings (construction work area)	94.92	236.31	**– 141.39**
Acres of wetland crossings (construction work area)	235.96	154.98	**+ 80.98**
Miles of vulnerable water table crossings[f]	6.6	4.4	**+ 2.2**
Number of Minnesota rare/protected species occurrences[g]	7	44	**-37**
Number of public water wells within 1250ft. of the centerline	88	44	**+ 44**
Public water basins crossed by centerline	1	0	**+ 1**
Miles of State Lands crossed by centerline	0.8	3.0	**– 2.2**
Miles of timber parcels crossed by centerline	0.0	0.0	**No Change**
Number of archaeological resources	17	2	+15
Number of historic resources	1	1	No Change

Table 7.3-14. Localized Differences between Route Segment Alternative RSA-37 and the Applicant's Preferred Route

Land Cover – Permanent Right-of-Way[h]					
Route Segment	**Agricultural**	**Developed**	**Forest**	**Water/Wetlands**	**Other**
RSA	17%	4%	17%	52%	10%
Replaced segment	10%	4%	39%	39%	9%
Change	**+ 7%**	**No change**	**– 22%**	**+ 13%**	**+ 1%**
Wetlands – Permanent Right-of-Way[i]					
Route Segment	**Emergent**	**Forested/Shrub**	**Freshwater Pond**	**Lake**	**Riverine**
RSA	28.63	67.02	1.49	1.76	--
Replaced segment	18.17	60.14	0.35	--	--
Change	**+ 10.46**	**+ 6.88**	**+ 1.14**	**+ 1.76**	**No change**

[a] Existing corridors used by RSA-05 would consist of transmission line and road rights-of-way.

[b] Sensitive noise receptors within 1,250 feet of the centerline of the pipeline permanent right-of-way.

[c] Crossings by proposed centerline.

[d] Minnesota Biological Survey, sensitive plant communities

[e] Minnesota Biological Survey, lakes with aquatic vegetation 1250ft. of the centerline.

[f] Provided by Minnesota Department of Natural Resources.

[g] Occurrences of state rare/protected species within 1,250 feet of the centerline of the pipeline permanent right-of-way. In order to protect their exact location, an "occurrence" represents the location of the record plus a species-specific buffer distance. Data provided by State of Minnesota, Department of Natural Resources (MN-DNR 2016). State data does not include occurrence information for Canada lynx or gray wolf.

[h] National Land Cover Database (Homer et al. 2015). Percentage of permanent right-of-way in acres.

[i] National Wetlands Inventory (USFWS n. d.). Permanent right-of-way in acres.

RSA = route segment alternative, "--" = Not applicable

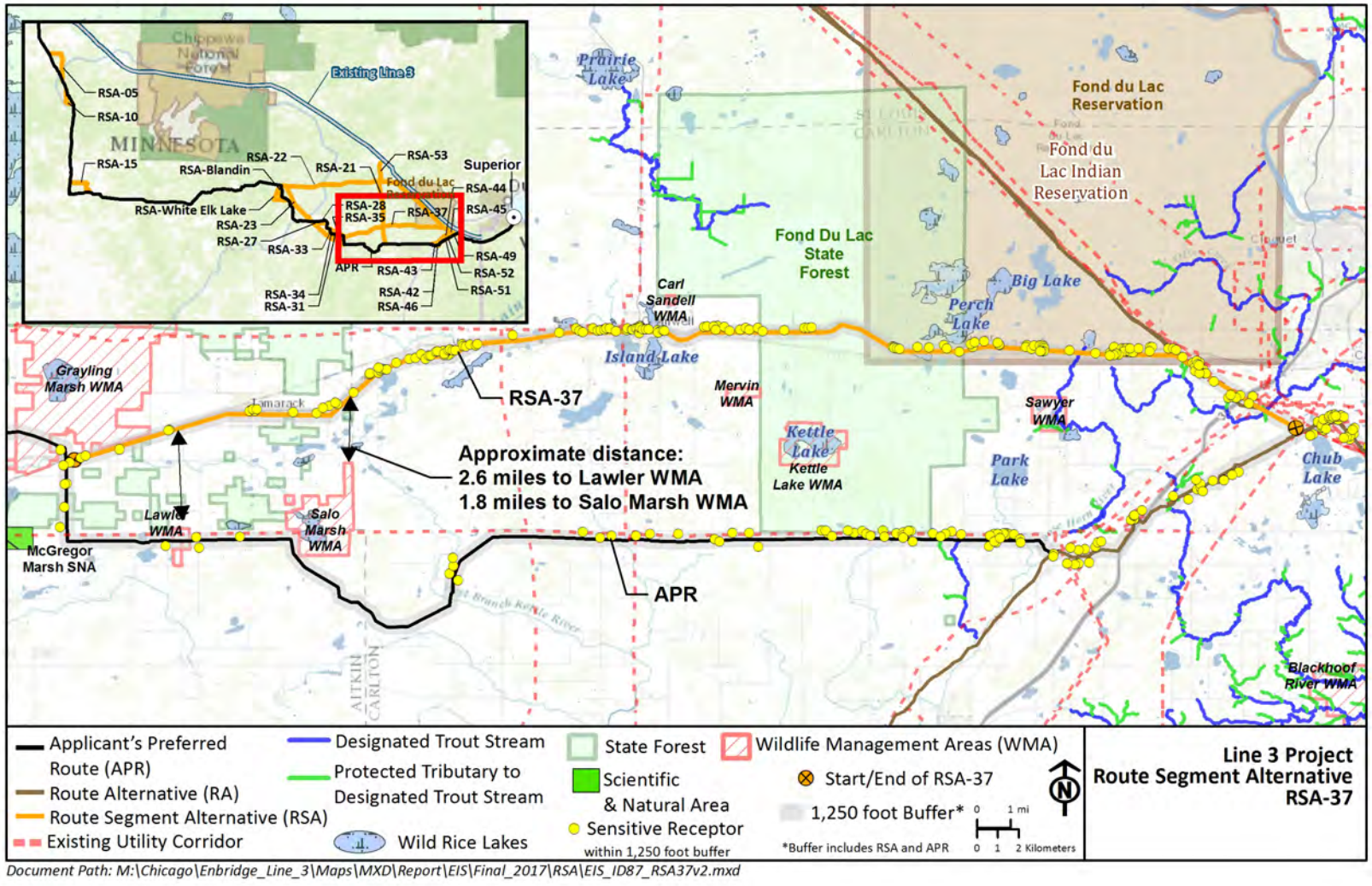

Figure 7.3-14. Route Segment Alternative RSA-37

7.3.16 Route Segment Alternative RSA-42

RSA-42 is located in Carlton County. It is approximately 3.5 miles long and replaces a 4.3-mile segment of the Applicant's preferred route between MP 347.1 and MP 351.4 (Figure 7.3-15). The RSA crosses primarily wetland cover types and to a lesser extent forested and agricultural cover types as well. The purpose of the RSA is to co-locate the pipeline with an existing transmission line corridor. Table 7.3-15 highlights the differences between RSA-42 and the Applicant's preferred route.

Meaningful Variation Exists Between Routing Options

RSA-42 and the Applicant's preferred route are different in the following criteria: (A) Human Settlement; (B) Natural Environment; (F) Co-Location; and (G) Natural Resources.

(A) Human Settlement

Aesthetics: RSA-42 reduces aesthetic impacts because it is co-located with existing corridors for its entire length whereas the Applicant's preferred route is entirely greenfield. RSA-42 would avoid creating new openings in the landscape reducing aesthetic impacts.

(B) Natural Environment

Vegetation: The RSA passes through approximately 16 less acres of forested cover types as the Applicant's preferred route. This would reduce impact to species that rely on forested communities.

RSA-42 utilizes co-location of existing rights-of-way for 100 percent of its route. Because of this, negative impacts from habitat fragmentation and edge effects are reduced when compared with the Applicant's preferred route.

Wildlife Habitat: RSA-42 crosses two designated trout streams; the Applicant's preferred route does not. This would create potential stresses to trout production waters in the immediate area. RSA-42 would affect more acres of wetland habitat.

Unique Natural Resources: RSA-42 would cross in the vicinity of three more protected species occurrences than the Applicant's preferred route, increasing potential impacts. Occurrences within RSA-42 include bat species.

(F) Co-Location

RSA-42 is co-located for its entire length; the Applicant's preferred route is not co-located with existing corridors.

(G) Natural Resources

Water Resources: The RSA is routed within 500 feet of several designated trout waters for approximately 10,000 feet of its length, which increases potential impacts on floodplain hydrology and water quality for these streams as much of the pipeline crosses the floodplain wetlands immediately adjacent to these streams.

Wetlands: RSA-42 would affect approximately twice as many wetland acres as the Applicant's preferred route.

Table 7.3-15. Localized Differences between Route Segment Alternative RSA-42 and the Applicant's Preferred Route

Resource or Factor	Route Segment Alternative	Replaced Segment of Route	Change
Acres of construction work area	50.91	56.59	**– 5.68**
Percentage co-located with existing corridors[a]	100%	0	**+ 100%**
Number of sensitive noise receptors[b]	19	18	**+ 1**
Number of road crossings[c]	4	4	**No Change**
Number of NHD stream/river crossings	3	2	**+ 1**
NHD Artificial Path	0	0	**No Change**
NHD Canal/Ditch	0	0	**No Change**
NHD Connector	2	0	**+ 2**
NHD Steam/River Intermittent	0	1	**– 1**
NHD Stream/River Perennial	1	1	**No Change**
Number of designated trout stream crossings	2	0	**+ 2**
Acres of native plant community crossings (construction work area)	-	-	**No change**
Acres of forested land crossings (construction work area)	8.49	25.14	**– 16.65**
Acres of wetland crossings (construction work area)	32.71	16.29	**+ 16.42**
Miles of vulnerable water table crossings[f]	-	-	**No change**
Number of Minnesota rare/protected species occurrences[g]	5	2	**+3**
Number of public water wells within 1250ft. of the centerline	11	12	**– 1**
Public water basins crossed by centerline	0	0	**No Change**
Miles of State Lands crossed by centerline	0.0	0.0	**No Change**
Miles of timber parcels crossed by centerline	0.0	0.0	**No Change**
Number of archaeological resources	0	0	No Change
Number of historic resources	0	0	No Change

Land Cover – Permanent Right-of-Way[h]					
Route Segment	**Agricultural**	**Developed**	**Forest**	**Water/Wetlands**	**Other**
RSA	10%	8%	17%	66%	1%
Replaced Segment	14%	4%	44%	31%	7%
Change	**– 4%**	**+ 4%**	**– 27%**	**+ 35%**	**– 6%**

Table 7.3-15. Localized Differences between Route Segment Alternative RSA-42 and the Applicant's Preferred Route

Wetlands – Permanent Right-of-Way[i]					
Route Segment	**Emergent**	**Forested/Shrub**	**Freshwater Pond**	**Lake**	**Riverine**
RSA	4.23	9.36	-	-	-
Replaced Segment	-	7.66	-	-	-
Change	**+ 4.23**	**+ 1.70**	**No change**	**No change**	**No change**

[a] Existing corridors used by RSA-05 would consist of transmission line and road rights-of-way.

[b] Sensitive noise receptors within 1,250 feet of the centerline of the pipeline permanent right-of-way.

[c] Crossings by proposed centerline.

[d] Minnesota Biological Survey, sensitive plant communities

[e] Minnesota Biological Survey, lakes with aquatic vegetation 1250ft. of the centerline.

[f] Provided by Minnesota Department of Natural Resources.

[g] Occurrences of state rare/protected species within 1,250 feet of the centerline of the pipeline permanent right-of-way. In order to protect their exact location, an "occurrence" represents the location of the record plus a species-specific buffer distance. Data provided by State of Minnesota, Department of Natural Resources (MN-DNR 2016). State data does not include occurrence information for Canada lynx or gray wolf.

[h] National Land Cover Database (Homer et al. 2015). Percentage of permanent right-of-way in acres.

[i] National Wetlands Inventory (USFWS n. d.). Permanent right-of-way in acres.

RSA = route segment alternative, "--" = Not applicable

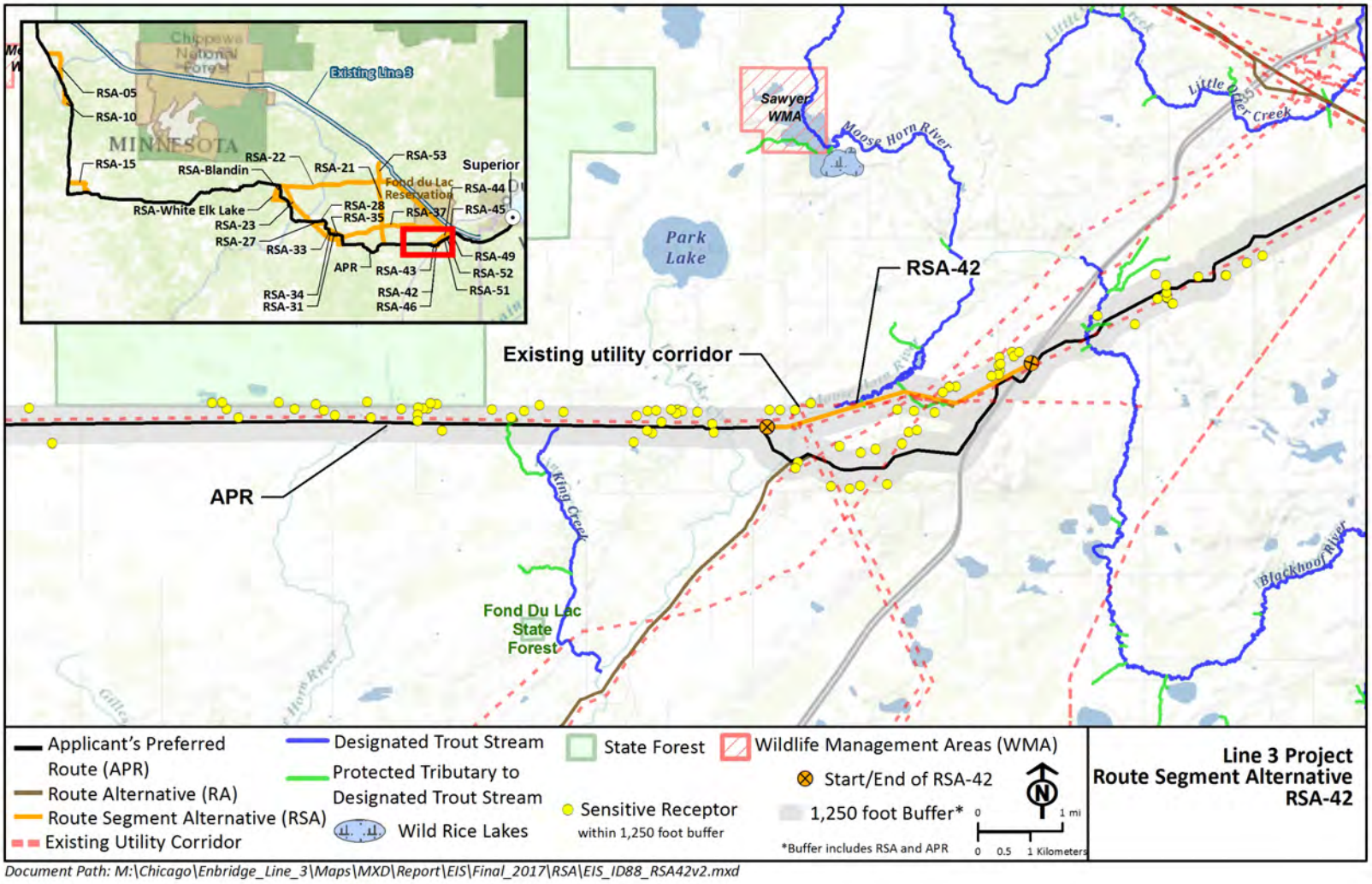

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Figure 7.3-15. Route Segment Alternative RSA-42

7.3.17 Route Segment Alternative RSA-43

RSA-43 is located in Carlton County. It is approximately 3.1 miles long and replaces a 3.5-mile segment of the Applicant's preferred route between MP 347.9 and 351.4 (Figure 7.3-16). RSA-43 crosses primarily forested and wetland cover types. Its purpose is to co-locate the pipeline with existing corridors. The RSA is co-located for its entire length. Table 7.3-16 highlights the differences between RSA-43 and the Applicant's preferred route.

Meaningful Variation Exists Between Routing Options

RSA-43 and the Applicant's preferred route are different in the following criteria: (A) Human Settlement; (B) Natural Environment; and (F) Co-Location.

(A) Human Settlement

Aesthetics: RSA-43 reduces aesthetic impacts because it is co-located with existing corridors for its entire length while the Applicant's preferred route is not co-located with existing corridors.

(B) Natural Environment

Wildlife Habitat: RSA-43 crosses a designated trout stream; the Applicant's preferred route does not.

Unique Natural Resources: RSA-43 would cross in the vicinity of four more occurrences than the Applicant's preferred route, increasing potential impacts. Occurrences within RSA-43 bat species.

(F) Co-Location

RSA-43 is co-located with existing corridors for its entire length; the Applicant's preferred route is not.

Table 7.3-16. Localized Differences between Route Segment Alternative RSA-43 and the Applicant's Preferred Route

Resource or Factor	Route Segment Alternative	Replaced Segment of Route	Change
Acres of construction work area	44.85	46.84	**– 1.99**
Percentage co-located with existing corridors[a]	100%	0	**+ 100%**
Number of sensitive noise receptors[b]	22	16	**+ 6**
Number of road crossings[c]	3	3	**No Change**
Number of NHD stream/river crossings	2	1	**+ 1**
NHD Artificial Path	0	0	**No change**
NHD Canal/Ditch	0	0	**No change**
NHD Connector	1	0	**+ 1**
NHD Steam/River Intermittent	1	1	**No change**
NHD Stream/River Perennial	0	0	**No change**
Number of designated trout stream crossings	1	0	**+ 1**

Table 7.3-16. Localized Differences between Route Segment Alternative RSA-43 and the Applicant's Preferred Route

Resource or Factor	Route Segment Alternative	Replaced Segment of Route	Change
Acres of native plant community crossings (construction work area)	0	0	**No change**
Acres of forested land crossings (construction work area)	17.70	21.45	**– 3.75**
Acres of wetland crossings (construction work area)	13.59	11.71	**+ 1.88**
Miles of vulnerable water table crossings[f]	0	0	**No change**
Number of Minnesota rare/protected species occurrences[g]	6	2	**+4**
Number of public water wells within 1250ft. of the centerline	11	9	**+ 2**
Public water basins crossed by centerline	0	0	**No Change**
Miles of State Lands crossed by centerline	0.0	0.0	**No Change**
Miles of timber parcels crossed by centerline	0.0	0.0	**No Change**
Number of archaeological resources	0	0	No Change
Number of historic resources	0	0	No Change

Land Cover[h]					
Route Segment	**Agricultural**	**Developed**	**Forest**	**Water/Wetlands**	**Other**
RSA	11%	8%	41%	37%	3%
Replaced segment	17%	4%	45%	25%	8%
Change	**– 6%**	**+ 4%**	**– 4%**	**+ 12%**	**– 5%**

Wetlands[i]					
Route Segment	**Emergent**	**Forested/Shrub**	**Freshwater Pond**	**Lake**	**Riverine**
RSA	--	5.71	--	--	--
Replaced segment	--	5.43	--	--	--
Change	**No change**	**+ 0.28**	**No change**	**No change**	**No change**

[a] Existing corridors used by RSA-05 would consist of transmission line and road rights-of-way.

[b] Sensitive noise receptors within 1,250 feet of the centerline of the pipeline permanent right-of-way.

[c] Crossings by proposed centerline.

[d] Minnesota Biological Survey, sensitive plant communities

[e] Minnesota Biological Survey, lakes with aquatic vegetation 1250ft. of the centerline.

[f] Provided by Minnesota Department of Natural Resources.

[g] Occurrences of state rare/protected species within 1,250 feet of the centerline of the pipeline permanent right-of-way. In order to protect their exact location, an "occurrence" represents the location of the record plus a species-specific buffer distance. Data provided by State of Minnesota, Department of Natural Resources (MN-DNR 2016). State data does not include occurrence information for Canada lynx or gray wolf.

[h] National Land Cover Database (Homer et al. 2015). Percentage of permanent right-of-way in acres.

[i] National Wetlands Inventory (USFWS n. d.). Permanent right-of-way in acres.

RSA = route segment alternative, "--" = Not applicable

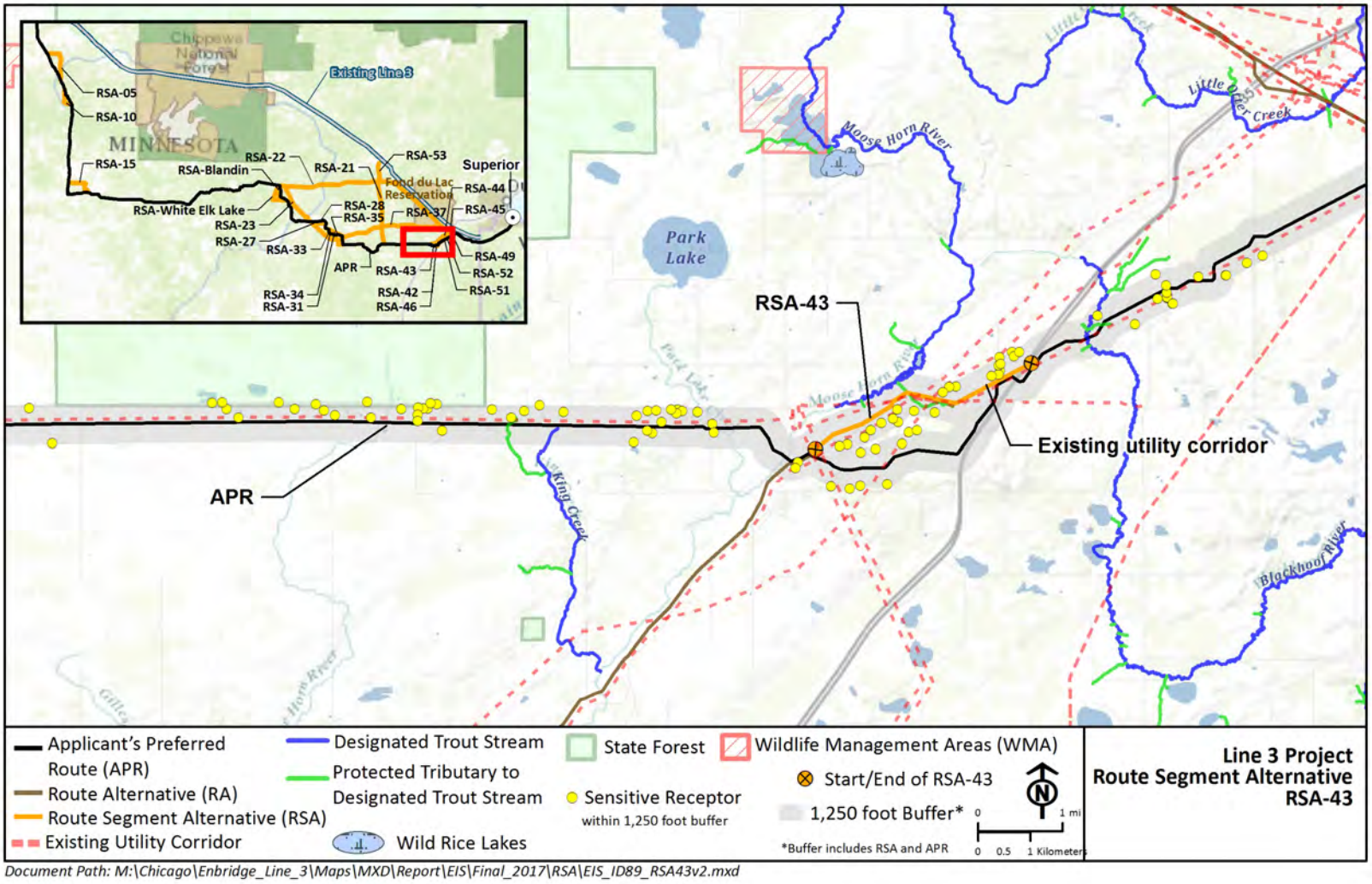

Figure 7.3-16. Route Segment Alternative RSA-43

7.3.18 Route Segment Alternative RSA-44

RSA-44 is located in Carlton County. It is approximately 9.1 miles long and replaces an 8.9-mile segment of the Applicant's preferred route between MP 347.9 and MP 356.8 (Figure 7.3-17). The RSA was proposed to avoid the Blackhoof River watershed and potential impacts from groundwater flow around the watershed.

RSA-44 is not a viable routing option; therefore, no further analysis is provided. As proposed, this RSA is unworkable. The RSA passes beneath multiple structures, most notably the cluster of structures south of Omar's Sand & Gravel. These buildings cannot be avoided within the route width. Table 7.3-17 nonetheless highlights the differences between RSA-44 and the Applicant's preferred route.

Table 7.3-17. Localized Differences between Route Segment Alternative RSA-44 and the Applicant's Preferred Route

Resource or Factor	Route Segment Alternative	Replaced Segment of Route	Change
Acres of construction work area	131.60	116.85	**+ 14.75**
Percentage co-located with existing corridors[a]	19.9%	60.2%	**– 57.5%**
Number of sensitive noise receptors[b]	42	28	**+ 14**
Number of road crossings[c]	7	6	**+ 1**
Number of NHD stream/river crossings	7	5	**+ 2**
NHD Artificial Path	0	0	**No change**
NHD Canal/Ditch	0	0	**No change**
NHD Connector	1	1	**No change**
NHD Steam/River Intermittent	2	2	**No change**
NHD Stream/River Perennial	4	2	**+ 2**
Number of designated trout stream crossings	3	2	**+ 1**
Acres of native plant community crossings (construction work area)	0	0	**No change**
Acres of forested land crossings (construction work area)	39.88	45.56	**– 5.68**
Acres of wetland crossings (construction work area)	51.42	35.33	**+ 16.09**
Miles of vulnerable water table crossings[f]	0	0	**No change**
Number of Minnesota rare/protected species occurrences[g]	11	12	**-1**
Number of public water wells within 1250ft. of the centerline	21	15	**+ 6**
Public water basins crossed by centerline	0	0	**No Change**
Miles of State Lands crossed by centerline	0.7	0.3	**+ 0.4**
Miles of timber parcels crossed by centerline	0.0	0.0	**No Change**
Number of archaeological resources	3	0	+3
Number of historic resources	0	0	No Change

Table 7.3-17. Localized Differences between Route Segment Alternative RSA-44 and the Applicant's Preferred Route

Land Cover – Permanent Right-of-Way[h]					
Route Segment	**Agricultural**	**Developed**	**Forest**	**Water/Wetlands**	**Other**
RSA	13%	3%	31%	41%	12%
Replaced segment	10%	5%	37%	39%	9%
Change	**+ 3%**	**– 2%**	**– 6%**	**+ 2%**	**+ 3%**
Wetlands – Permanent Right-of-Way[i]					
Route Segment	**Emergent**	**Forested/Shrub**	**Freshwater Pond**	**Lake**	**Riverine**
RSA	0.34	21.12	--	--	--
Replaced segment	--	17.28	0.35	--	--
Change	**+ 0.34**	**+ 3.84**	**– 0.35**	**No change**	**No change**

Notes:

[a] Existing corridors used by RSA-05 would consist of transmission line and road rights-of-way.

[b] Sensitive noise receptors within 1,250 feet of the centerline of the pipeline permanent right-of-way.

[c] Crossings by proposed centerline.

[d] Minnesota Biological Survey, sensitive plant communities

[e] Minnesota Biological Survey, lakes with aquatic vegetation 1250ft. of the centerline.

[f] Provided by Minnesota Department of Natural Resources.

[g] Occurrences of state rare/protected species within 1,250 feet of the centerline of the pipeline permanent right-of-way. In order to protect their exact location, an "occurrence" represents the location of the record plus a species-specific buffer distance. Data provided by State of Minnesota, Department of Natural Resources (MN-DNR 2016). State data does not include occurrence information for Canada lynx or gray wolf.

[h] National Land Cover Database (Homer et al. 2015). Percentage of permanent right-of-way in acres.

[i] National Wetlands Inventory (USFWS n. d.). Permanent right-of-way in acres.

RSA = route segment alternative, "--" = Not applicable

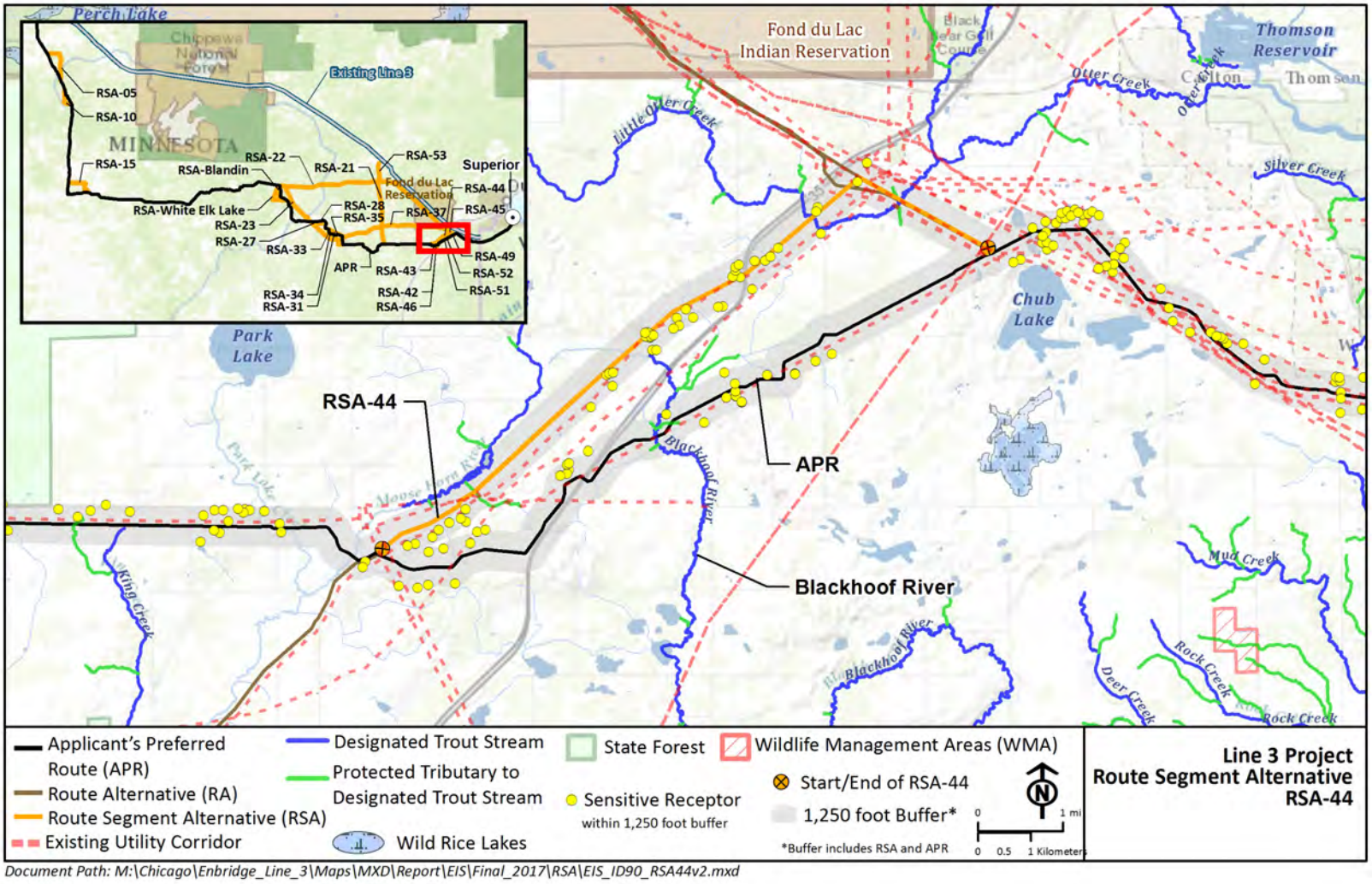

Figure 7.3-17. Route Segment Alternative RSA-44

7.3.19 Route Segment Alternative RSA-45

RSA-45 is located in Carlton County. It is approximately 9.1 miles long and replaces an 8.8-mile segment of the Applicant's preferred route between MP 347.9 and 356.8 (Figure 7.3-18). The RSA crosses primarily forest and wetland cover types. It makes new greenfield crossings in an area heavily affected by habitat fragmentation. A commenter suggested following an existing utility corridor on the north side of State Highway 61 to avoid the Blackhoof River watershed and potential impacts from groundwater flow around the watershed. RSA-45 crosses the Blackhoof River and three other perennial streams. The Blackhoof River meets with the Nemadji River and eventually flows to Lake Superior. Table 7.3-18 highlights the differences between RSA-45 and the Applicant's preferred route.

Meaningful Variation Exists Between Routing Options

RSA-45 and the Applicant's preferred route are different in the following criteria: (A) Human Settlement; (B) Natural Environment; (D) Economics; (F) Co-Location; and (G) Natural Resources.

(A) Human Settlement

Noise: RSA-45 increases the number of sensitive noise receptors within 1,250 feet of the pipeline centerline by 13, increasing potential noise impacts.

(B) Natural Environment

Wildlife Habitat: RSA-45 would further fragment an area already heavily affected by habitat fragmentation. It would affect approximately 14 additional acres of wetland habitat. RSA-45 would require two additional designated trout stream crossings (Little Otter Creek).

(D) Economics

Agriculture: 6 percent of the land RSA-45 crosses is considered agricultural land while the Applicant's preferred route is 10 percent.

Public Lands: RSA-45 crosses 0.2 less miles of state owned public lands compared with the Applicant's preferred route. This would create a lessened impact for the public visiting state lands.

(F) Co-Location

RSA-45 is co-located with existing infrastructure for 16 percent of its length; the Applicant's preferred route is co-located for 60 percent of its length.

(G) Natural Resources

Water Resources: RSA-45 crosses 1.2 fewer miles of vulnerable water tables compared with the Applicant's preferred route. It makes two additional river crossings.

Wetlands: RSA-45 would affect approximately 14 additional acres of wetlands.

Table 7.3-18. Localized Differences between Route Segment Alternative RSA-45 and the Applicant's Preferred Route

Resource or Factor	Route Segment Alternative	Replaced Segment of Route	Change
Acres of construction work area	131.53	116.85	**+ 14.68**
Percentage co-located with existing corridors[a]	16.60	60.20	**– 43.6%**
Number of sensitive noise receptors[b]	41	28	**+ 13**
Number of road crossings[c]	7	6	**+ 1**
Number of NHD stream/river crossings	7	5	**+ 2**
NHD Artificial Path	0	0	**No change**
NHD Canal/Ditch	0	0	**No change**
NHD Connector	1	1	**No change**
NHD Steam/River Intermittent	2	2	**No change**
NHD Stream/River Perennial	4	2	**+ 2**
Number of designated trout stream crossings	4	2	**+ 2**
Acres of native plant community crossings (construction work area)	--	--	**No change**
MBS, Plant Occurrences[d]	0	0	**No Change**
MBS, Lake Points[e]	0	0	**No Change**
Acres of forested land crossings (construction work area)	42.91	45.56	**– 2.65**
Acres of wetland crossings (construction work area)	49.03	35.33	**+ 13.70**
Miles of vulnerable water table crossings[f]	0.5	1.7	**– 1.2**
Number of Minnesota rare/protected species occurrences[g]	14	12	**+ 2**
Number of public water wells within 1250ft. of the centerline	25	15	**+ 10**
Public water basins crossed by centerline	0	0	**No Change**
Miles of State Lands crossed by centerline	0.1	0.3	**– 0.2**
Miles of timber parcels crossed by centerline	0.0	0.0	**No Change**
Number of archaeological resources	0	0	No Change
Number of historic resources	0	0	No Change

Land Cover – Permanent Right-of-Way[h]					
Route Segment	**Agricultural**	**Developed**	**Forest**	**Water/Wetlands**	**Other**
RSA	6%	5%	33%	46%	9%
Replaced Segment	10%	5%	37%	39%	9%
Change	**– 4%**	**No change**	**– 4%**	**+ 7%**	**No change**

Table 7.3-18. Localized Differences between Route Segment Alternative RSA-45 and the Applicant's Preferred Route

Wetlands – Permanent Right-of-Way[i]					
Route Segment	**Emergent**	**Forested/Shrub**	**Freshwater Pond**	**Lake**	**Riverine**
RSA	1.96	18.50	--	--	--
Replaced Segment	--	17.28	0.35	--	--
Change	**+ 1.96**	**+ 1.22**	**– 0.35**	**No change**	**No change**

[a] Existing corridors used by RSA-05 would consist of transmission line and road rights-of-way.

[b] Sensitive noise receptors within 1,250 feet of the centerline of the pipeline permanent right-of-way.

[c] Crossings by proposed centerline.

[d] Minnesota Biological Survey, sensitive plant communities

[e] Minnesota Biological Survey, lakes with aquatic vegetation 1250ft. of the centerline.

[f] Provided by Minnesota Department of Natural Resources.

[g] Occurrences of state rare/protected species within 1,250 feet of the centerline of the pipeline permanent right-of-way. In order to protect their exact location, an "occurrence" represents the location of the record plus a species-specific buffer distance. Data provided by State of Minnesota, Department of Natural Resources (MN-DNR 2016). State data does not include occurrence information for Canada lynx or gray wolf.

[h] National Land Cover Database (Homer et al. 2015). Percentage of permanent right-of-way in acres.

[i] National Wetlands Inventory (USFWS n. d.). Permanent right-of-way in acres.

RSA = route segment alternative, "--" = Not applicable

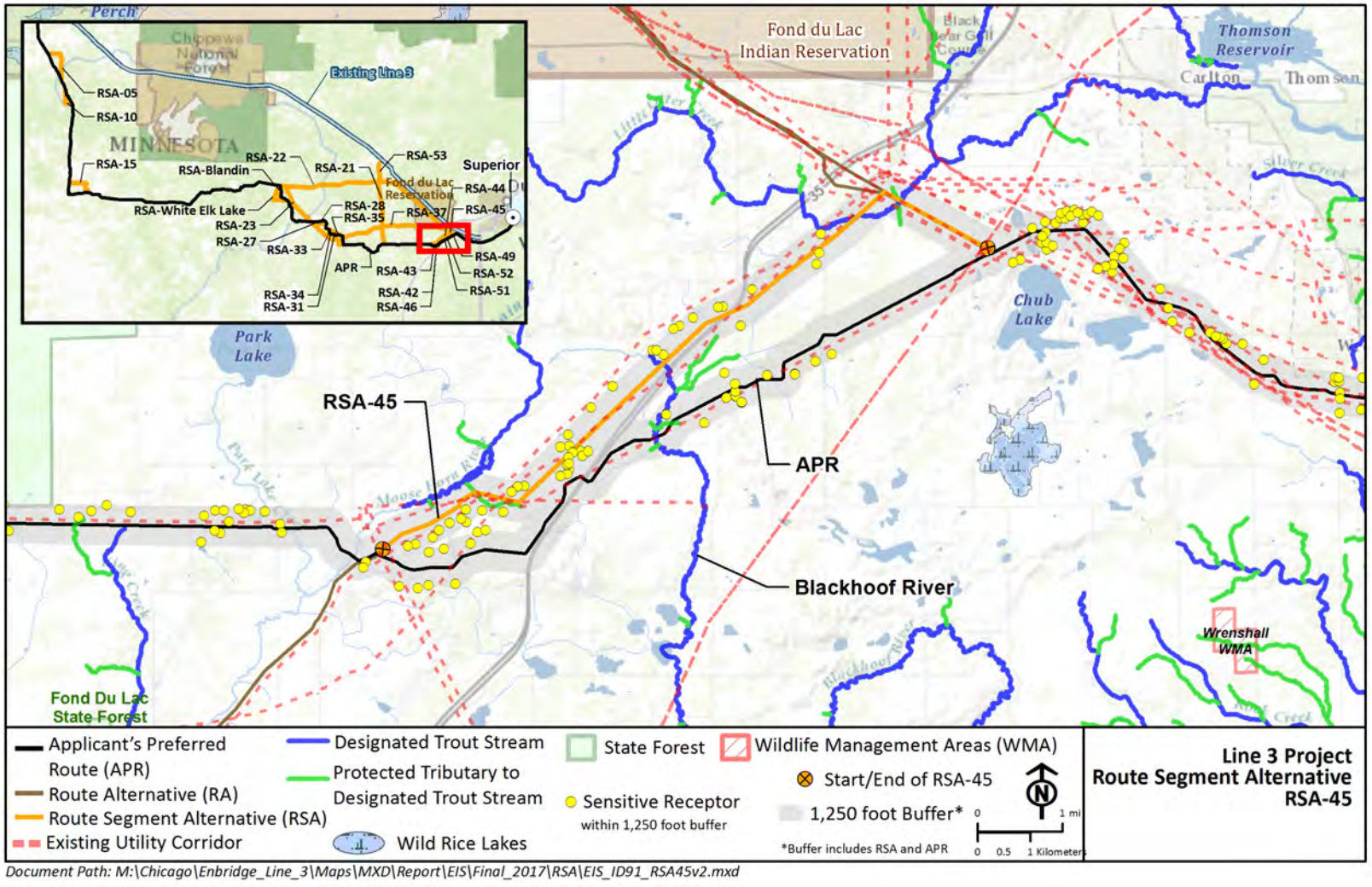

Figure 7.3-18. Route Segment Alternative RSA-45

7.3.20 Route Segment Alternative RSA-46

RSA-46 is located in Carlton County. It is approximately 1.0 mile long and replaces a 0.9-mile segment of the Applicant's preferred route between MP 348.9 and MP 349.8 (Figure 7.3-19). RSA-46 is located primarily through wetland and forest cover types. It avoids an area of active farmland. Table 7.3-19 highlights the differences between RSA-46 and the Applicant's preferred route.

Meaningful Variation Exists Between Routing Options

RSA-46 and the Applicant's preferred route are different in the following criteria: (A) Human Settlement; (B) Natural Environment; (D) Economics; and (G) Natural Resources.

(A) Human Settlement

Noise: RSA-45 has two less number of sensitive noise receptors within 1,250 feet of the pipeline centerline. This would decrease the potential of negative impacts to nearby NSA's.

(B) Natural Environment

Vegetation: RSA-46 crosses an additional 2.75 acres of forested cover types compared with the Applicant's preferred route.

(D) Economics

Agriculture: RSA-46 would not impact any agricultural land nor timber production areas. The Applicant's preferred route would impact approximately 4 acres of land used in agriculture.

(G) Natural Resources

Wetlands: The RSA would affect approximately 2.5 additional wetland acres and approximately twice as many forested wetlands as the Applicant's preferred route.

Table 7.3-19. Localized Differences between Route Segment Alternative RSA-46 and the Applicant's Preferred Route

Resource or Factor	Route Segment Alternative	Replaced Segment of Route	Change
Acres of construction work area	14.47	13.01	**+ 1.46**
Percentage co-located with existing corridors[a]	0	0	**No change**
Number of sensitive noise receptors[b]	3	5	**– 2**
Number of road crossings[c]	0	0	**No Change**
Number of NHD stream/river crossings	0	1	**– 1**
NHD Artificial Path	0	0	**No change**
NHD Canal/Ditch	0	0	**No change**
NHD Connector	0	0	**No change**
NHD Steam/River Intermittent	0	1	**– 1**

Table 7.3-19. Localized Differences between Route Segment Alternative RSA-46 and the Applicant's Preferred Route

Resource or Factor	Route Segment Alternative	Replaced Segment of Route	Change
NHD Stream/River Perennial	0	0	**No change**
Number of designated trout stream crossings	0	0	**No change**
Acres of native plant community crossings (construction work area)	0	0	**No change**
Acres of forested land crossings (construction work area)	6.91	4.16	**+ 2.75**
Acres of wetland crossings (construction work area)	5.47	3.02	**+ 2.45**
Miles of vulnerable water table crossings[f]	0	0	**No change**
Number of Minnesota rare/protected species occurrences[g]	1	1	**No change**
Number of public water wells within 1250ft. of the centerline	1	4	**– 3**
Public water basins crossed by centerline	0	0	**No Change**
Miles of State Lands crossed by centerline	0.0	0.0	**No Change**
Miles of timber parcels crossed by centerline	0.0	0.0	**No Change**
Number of archaeological resources	0	0	No Change
Number of historic resources	0	0	No Change

Land Cover – Permanent Right-of-Way[h]					
Route Segment	**Agricultural**	**Developed**	**Forest**	**Water/Wetlands**	**Other**
RSA	--	--	46%	46%	7%
Replaced segment	36%	--	31%	26%	6%
Change	**– 36%**	**No change**	**+ 15%**	**+ 20%**	**+ 1%**

Wetlands – Permanent Right-of-Way[i]					
Route Segment	**Emergent**	**Forested/Shrub**	**Freshwater Pond**	**Lake**	**Riverine**
RSA	--	2.30	--	--	--
Replaced segment	--	1.44	--	--	--
Change	**No change**	**+ 0.86**	**No change**	**No change**	**No change**

[a] Existing corridors used by RSA-05 would consist of transmission line and road rights-of-way.

[b] Sensitive noise receptors within 1,250 feet of the centerline of the pipeline permanent right-of-way.

[c] Crossings by proposed centerline.

[d] Minnesota Biological Survey, sensitive plant communities

[e] Minnesota Biological Survey, lakes with aquatic vegetation 1250ft. of the centerline.

[f] Provided by Minnesota Department of Natural Resources.

[g] Occurrences of state rare/protected species within 1,250 feet of the centerline of the pipeline permanent right-of-way. In order to protect their exact location, an "occurrence" represents the location of the record plus a species-specific buffer distance. Data provided by State of Minnesota, Department of Natural Resources (MN-DNR 2016). State data does not include occurrence information for Canada lynx or gray wolf.

[h] National Land Cover Database (Homer et al. 2015). Percentage of permanent right-of-way in acres.

[i] National Wetlands Inventory (USFWS n. d.). Permanent right-of-way in acres.

RSA = route segment alternative, "--" = Not applicable

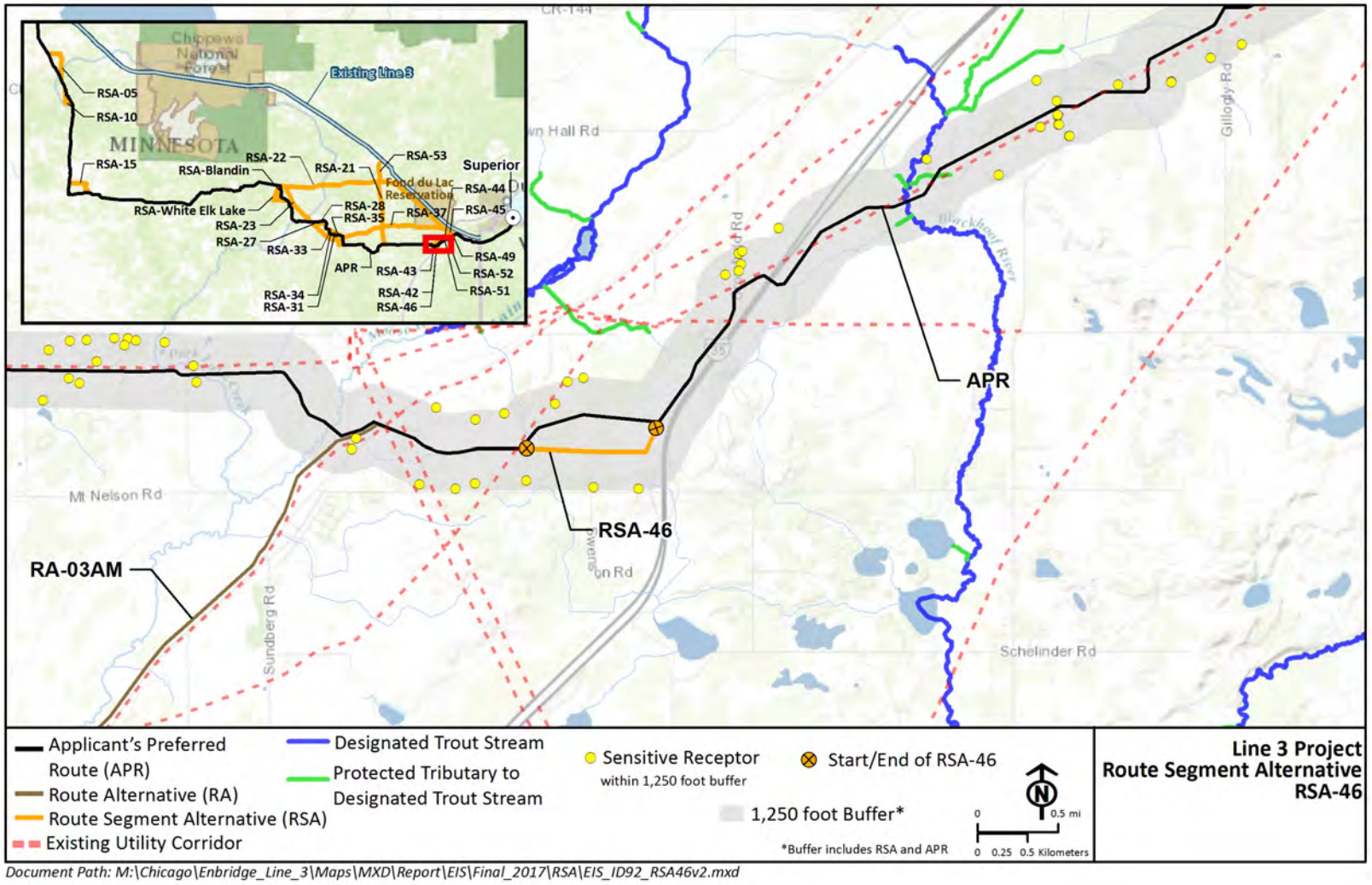

Figure 7.3-19. Route Segment Alternative RSA-46

7.3.21 Route Segment Alternative RSA-49

RSA-49 is located in Carlton County. It is approximately 6.0 miles long and replaces a 5.4-mile segment between MP 351.4 and 356.8 (Figure 7.3-20). RSA-49 is dominated by wetland and forested cover types. A commenter requested following the south sides of Interstate 35 and State Highway 61 to distance the pipeline from multiple properties. The RSA accomplishes this purpose. Table 7.3-20 highlights the differences between RSA-49 and the Applicant's preferred route.

Meaningful Variation Exists Between Routing Options

RSA-49 and the Applicant's preferred route are different in the following criteria: (A) Human Settlement; (B) Natural Environment; (F) Co-Location; and (G) Natural Resources.

(A) Human Settlement

Aesthetics: RSA-49 would utilize less existing rights-of-way than the Applicant's preferred route. Each route would create new openings in the landscape but RSA-49 would be constructed near I-35 which may increase visual impacts.

Noise: RSA-49 reduces the number of sensitive noise receptors within 1,250 feet of the pipeline centerline by four, decreasing potential noise impacts.

(B) Natural Environment

Wildlife Habitat: RSA-49 would further fragment an area already heavily affected by habitat fragmentation. It would affect approximately 30 additional acres of wetland habitat. RSA-49 would cross two additional designated trout streams and be routed adjacent to tributary S-001-003-030-001 for approximately 3,000 feet, increasing potential for impacts on riparian vegetation and shading. These impacts might be avoidable by re-aligning the pipeline within the route width. Re-alignment would likely result in impacts on similar cover types.

Unique Natural Resources: RSA-49 would cross in the vicinity of two more occurrences than the Applicant's preferred route, increasing potential impacts. Occurrences within RSA-49 include bat species.

(F) Co-Location

RSA-49 is co-located with existing infrastructure for 25 percent of its length; the Applicant's preferred route is co-located for 80 percent of its length.

(G) Natural Resources

Water Resources: RSA-49 crosses 1.2 fewer miles of vulnerable water tables. It makes three additional river crossings, two of which are designated as trout streams.

Fewer public water wells would potentially be impacted by RSA-49 because this route moves away from an areas off Highway 5 where houses are located.

Wetlands: RSA-49 would affect approximately 30 additional acres of wetlands, converting those acres to less functional emergent wetlands.

Table 7.3-20. Localized Differences between Route Segment Alternative RSA-49 and the Applicant's Preferred Route

Resource or Factor	Route Segment Alternative	Replaced Segment of Route	Change
Acres of construction work area	86.53	69.11	**+ 17.42**
Percentage co-located with existing corridors[a]	25.4%	80.7%	**– 55.3%**
Number of sensitive noise receptors[b]	8	12	**– 4**
Number of road crossings[c]	2	3	**– 1**
Number of NHD stream/river crossings	7	4	**+ 3**
NHD Artificial Path	0	0	**No change**
NHD Canal/Ditch	0	0	**No change**
NHD Connector	1	1	**No change**
NHD Steam/River Intermittent	0	1	**– 1**
NHD Stream/River Perennial	6	2	**+ 4**
Number of designated trout stream crossings	4	2	**+ 2**
Acres of native plant community crossings (construction work area)	--	--	**No change**
Acres of forested land crossings (construction work area)	15.38	24.11	**– 8.73**
Acres of wetland crossings (construction work area)	53.84	22.93	**+ 30.91**
Miles of vulnerable water table crossings[f]	0.5	1.7	**– 1.2**
Number of Minnesota rare/protected species occurrences[g]	11	9	**+ 2**
Number of public water wells within 1250ft. of the centerline	4	6	**– 2**
Public water basins crossed by centerline	0	0	**No Change**
Miles of State Lands crossed by centerline	0.3	0.3	**No Change**
Miles of timber parcels crossed by centerline	0	0	**No Change**
Number of archaeological resources	0	0	No Change
Number of historic resources	0	0	No Change

Land Cover – Permanent Right-of-Way[h]					
Route Segment	**Agricultural**	**Developed**	**Forest**	**Water/Wetlands**	**Other**
RSA	1%	1%	19%	68%	11%
Replaced segment	6%	6%	31%	46%	10%
Change	**– 5%**	**– 5%**	**– 12%**	**+ 22%**	**+ 1%**

Table 7.3-20. Localized Differences between Route Segment Alternative RSA-49 and the Applicant's Preferred Route

Wetlands – Permanent Right-of-Way[i]					
Route Segment	**Emergent**	**Forested/Shrub**	**Freshwater Pond**	**Lake**	**Riverine**
RSA	0.88	21.48	--	--	--
Replaced segment	--	11.51	0.35	--	--
Change	**+ 0.88**	**+ 9.97**	**– 0.35**	**No change**	**No change**

[a] Existing corridors used by RSA-05 would consist of transmission line and road rights-of-way.

[b] Sensitive noise receptors within 1,250 feet of the centerline of the pipeline permanent right-of-way.

[c] Crossings by proposed centerline.

[d] Minnesota Biological Survey, sensitive plant communities

[e] Minnesota Biological Survey, lakes with aquatic vegetation 1250ft. of the centerline.

[f] Provided by Minnesota Department of Natural Resources.

[g] Occurrences of state rare/protected species within 1,250 feet of the centerline of the pipeline permanent right-of-way. In order to protect their exact location, an "occurrence" represents the location of the record plus a species-specific buffer distance. Data provided by State of Minnesota, Department of Natural Resources (MN-DNR 2016). State data does not include occurrence information for Canada lynx or gray wolf.

[h] National Land Cover Database (Homer et al. 2015). Percentage of permanent right-of-way in acres.

[i] National Wetlands Inventory (USFWS n. d.). Permanent right-of-way in acres.

RSA = route segment alternative, "--" = Not applicable

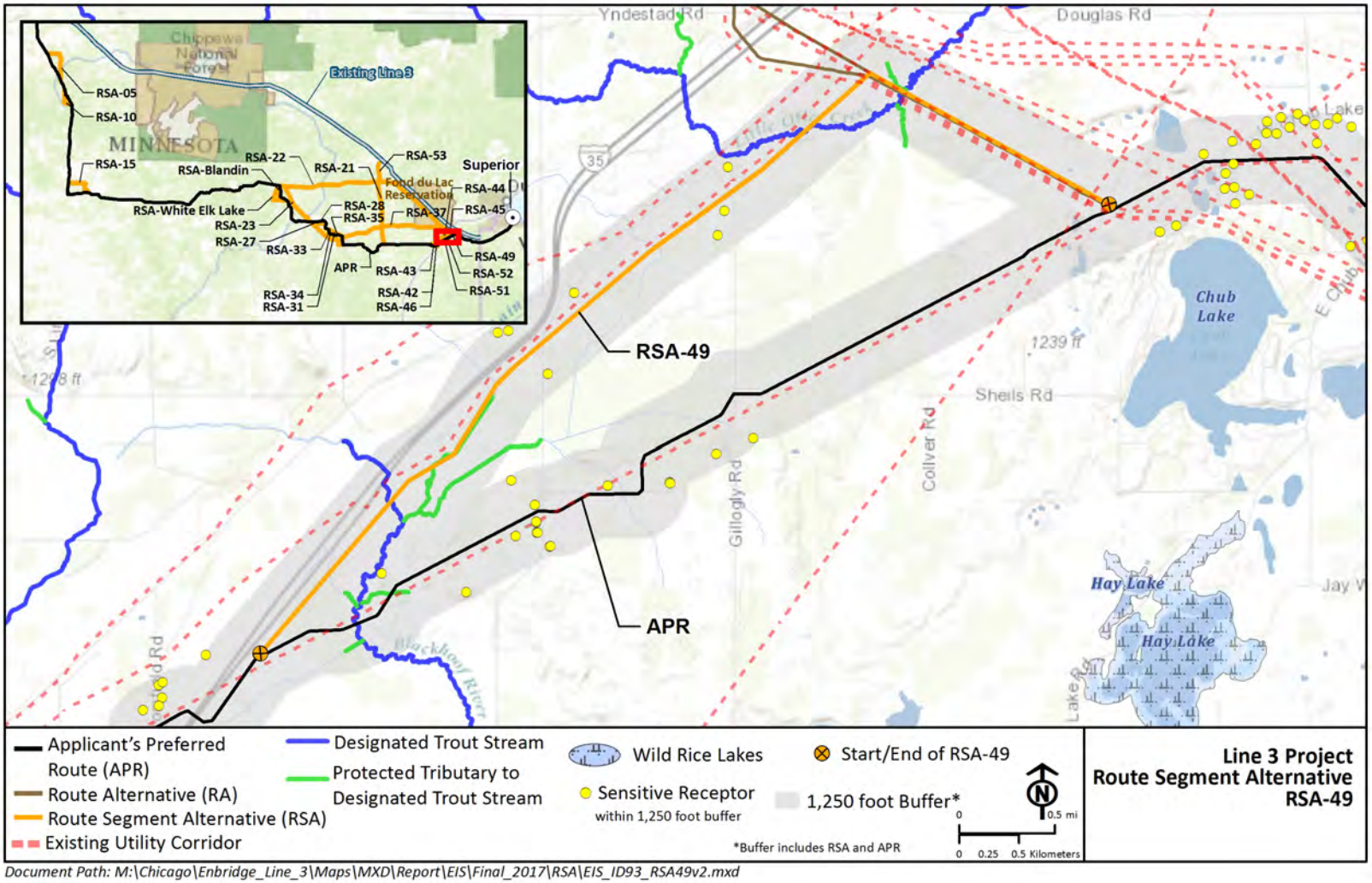

Figure 7.3-20. Route Segment Alternative RSA-49

7.3.22 Route Segment Alternative RSA-51

RSA-51 is located in Carlton County. It is approximately 1.4 miles long and replaces a 1.3-mile segment of the Applicant's preferred route between MP 352.8 and MP 354.1 (Figure 7.3-21). Forest and wetland cover types dominate this RSA. A commenter proposed shifting the pipeline north to follow the tree line to create distance between the pipeline and nearby homesteads. Table 7.3-21 highlights the differences between RSA-51 and the Applicant's preferred route.

RSA-51 reduces the number of sensitive noise receptors within 1,250 feet of the pipeline centerline; it does not shift impacts to other residences.

Meaningful Variation Exists Between Routing Options

RSA-51 and the Applicant's preferred route are different in the following criteria: (A) Human Settlement; (B) Natural Environment; and (G) Natural Resources.

(A) Human Settlement

Noise: RSA-51 reduces the number of sensitive noise receptors within 1,250 feet of the pipeline centerline by half. The RSA avoids the nearby homes that are found along the Applicant's preferred route.

(B) Natural Environment

Vegetation: RSA-51 is a greenfield route which would create forest fragmentation and promote edge and open space species. The Applicant's preferred route would widen the existing rights-of-way it utilizes.

Unique Natural Resources: RSA-51 would cross in the vicinity of three more occurrences than the Applicant's preferred route, increasing potential impacts. Occurrences within RSA-51 include bat species.

(G) Natural Resources

Water Resources: The RSA makes two additional river crossings of a tributary to the Blackhoof River. This stream crossing is a trout designated stream and it is not crossed by the Applicant's preferred route.

Wetlands: RSA-51 crosses 9 acres of wetlands and 4 acres of forested wetlands. The Applicant's preferred route does not cross wetlands.

Table 7.3-21. Localized Differences between Route Segment Alternative RSA-51 and the Applicant's Preferred Route

Resource or Factor	Route Segment Alternative	Replaced Segment of Route	Change
Acres of construction work area	20.56	18.62	**+ 1.94**
Percentage co-located with existing corridors[a]	0	43.3%	**– 43.3%**
Number of sensitive noise receptors[b]	4	8	**– 4**
Number of road crossings[c]	1	2	**– 1**
Number of NHD stream/river crossings	2	1	**+ 1**
NHD Artificial Path	0	0	**No change**
NHD Canal/Ditch	0	0	**No change**
NHD Connector	0	0	**No change**
NHD Steam/River Intermittent	0	1	**– 1**
NHD Stream/River Perennial	2	0	**+ 2**
Number of designated trout stream crossings	1	0	**+ 1**
Acres of native plant community crossings (construction work area)	0	0	**No change**
Acres of forested land crossings (construction work area)	9.39	8.14	**+ 1.25**
Acres of wetland crossings (construction work area)	9.26	0	**+ 9.26**
Miles of vulnerable water table crossings[f]	0.5	1.3	**– 0.8**
Number of Minnesota rare/protected species occurrences[g]	5	2	**+3**
Number of public water wells within 1250ft. of the centerline	1	3	**– 2**
Public water basins crossed by centerline	0	0	**No Change**
Miles of State Lands crossed by centerline	0.0	0.0	**No Change**
Miles of timber parcels crossed by centerline	0	0	**No Change**
Number of archaeological resources	0	0	No Change
Number of historic resources	0	0	No Change

Land Cover – Permanent Right-of-Way[h]					
Route Segment	**Agricultural**	**Developed**	**Forest**	**Water/Wetlands**	**Other**
RSA	--	1%	45%	50%	3%
Replaced segment	16%	24%	43%	8%	10%
Change	**– 16%**	**– 23%**	**+ 2%**	**+ 42%**	**– 7%**

Table 7.3-21. Localized Differences between Route Segment Alternative RSA-51 and the Applicant's Preferred Route

Wetlands – Permanent Right-of-Way[i]					
Route Segment	**Emergent**	**Forested/Shrub**	**Freshwater Pond**	**Lake**	**Riverine**
RSA	--	3.97	--	--	--
Replaced segment	--	--	--	--	--
Change	**No change**	**+ 3.97**	**No change**	**No change**	**No change**

[a] Existing corridors used by RSA-05 would consist of transmission line and road rights-of-way.

[b] Sensitive noise receptors within 1,250 feet of the centerline of the pipeline permanent right-of-way.

[c] Crossings by proposed centerline.

[d] Minnesota Biological Survey, sensitive plant communities

[e] Minnesota Biological Survey, lakes with aquatic vegetation 1250ft. of the centerline.

[f] Provided by Minnesota Department of Natural Resources.

[g] Occurrences of state rare/protected species within 1,250 feet of the centerline of the pipeline permanent right-of-way. In order to protect their exact location, an "occurrence" represents the location of the record plus a species-specific buffer distance. Data provided by State of Minnesota, Department of Natural Resources (MN-DNR 2016). State data does not include occurrence information for Canada lynx or gray wolf.

[h] National Land Cover Database (Homer et al. 2015). Percentage of permanent right-of-way in acres.

[i] National Wetlands Inventory (USFWS n. d.). Permanent right-of-way in acres.

RSA = route segment alternative, "--" = Not applicable

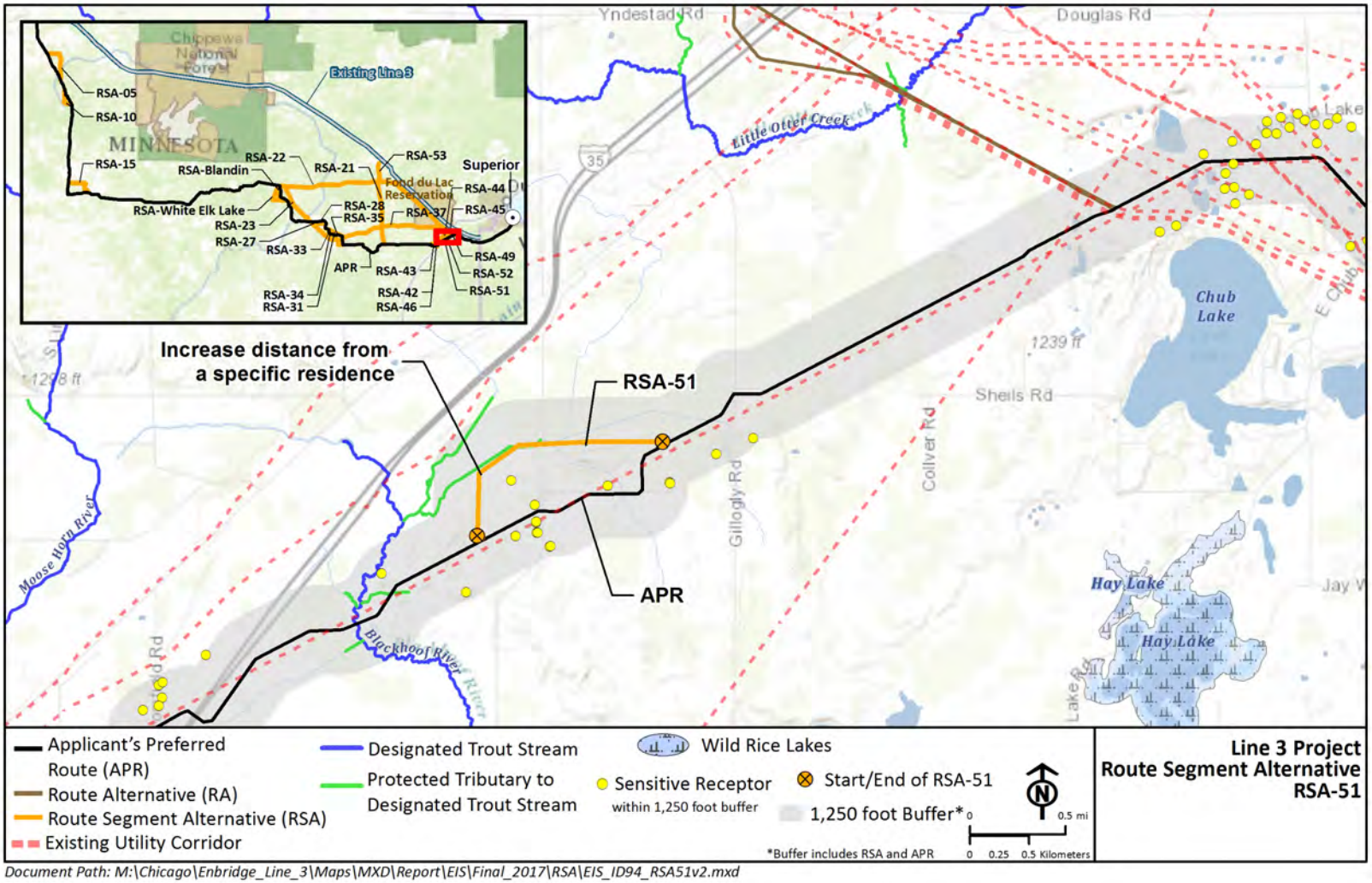

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Figure 7.3-21. Route Segment Alternative RSA-51

7.3.23 Route Segment Alternative RSA-52

RSA-52 is located in Carlton County. It is approximately 1.0 mile long and replaces a 0.9-mile segment of the Applicant's preferred route between MP 353.2 and MP 354.1 (Figure 7.3-22). Forest and wetland cover types dominate this RSA. A commenter proposed shifting the pipeline north to follow the tree line to increase separation between the pipeline and homesteads. Table 7.3-22 highlights the differences between RSA-52 and the Applicant's preferred route.

RSA-52 reduces the number of sensitive noise receptors within 1,250 feet of the pipeline centerline by one. It borders one homestead on two sides.

Meaningful Variation Exists Between Routing Options

RSA-52 and the Applicant's preferred route are different in the following criteria: (A) Human Settlement; (B) Natural Environment; (F) Co-location; and (G) Natural Resources.

(A) Human Settlement

Noise: RSA-52 reduces the number of sensitive noise receptors within 1,250 feet of the pipeline centerline by one. It borders one homestead on two sides.

(B) Natural Environment

Vegetation: RSA-52 doubles the number of forested acres crossed. This along with being a greenfield route would increase impacts to tree species and wildlife habitat that utilize the forest for cover.

Unique Natural Resources: RSA-52 would cross in the vicinity of two more occurrences than the Applicant's preferred route, increasing potential impacts. Occurrences within RSA-52 include bat species.

(F) Co-Location

RSA-52 is co-located with existing road right-of-way for approximately 25 percent of its length; the Applicant's preferred route is co-located for 43 percent of its length.

(G) Natural Resources

Wetlands: The RSA would affect approximately 2.5 additional wetland acres, of which 2 acres are forested wetlands. The Applicant's preferred route would not affect wetlands.

Table 7.3-22. Localized Differences between Route Segment Alternative RSA-52 and the Applicant's Preferred Route

Resource or Factor	Route Segment Alternative	Replaced Segment of Route	Change
Acres of construction work area	14.20	13.22	**+ 0.98**
Percentage co-located with existing corridors[a]	~25%	43.3%	**– ~18.3%**
Number of sensitive noise receptors[b]	4	5	**– 1**
Number of road crossings[c]	1	2	**– 1**
Number of NHD stream/river crossings	1	1	**No change**
NHD Artificial Path	0	0	**No change**
NHD Canal/Ditch	0	0	**No change**
NHD Connector	0	0	**No change**
NHD Steam/River Intermittent	0	1	**– 1**
NHD Stream/River Perennial	1	0	**+ 1**
Number of designated trout stream crossings	0	0	**No change**
Acres of native plant community crossings (construction work area)	0	0	**No change**
Acres of forested land crossings (construction work area)	8.51	3.53	**+ 4.98**
Acres of wetland crossings (construction work area)	4.07	0	**+ 4.07**
Miles of vulnerable water table crossings[f]	0.7	1.1	**– 0.4**
Number of Minnesota rare/protected species occurrences[g]	3	1	**+2**
Number of public water wells within 1250ft. of the centerline	1	2	**– 1**
Public water basins crossed by centerline	0	0	**No Change**
Miles of State Lands crossed by centerline	0.0	0.0	**No Change**
Miles of timber parcels crossed by centerline	0	0	**No Change**
Number of archaeological resources	0	0	**No Change**
Number of historic resources	0	0	**No Change**

Land Cover – Permanent Right-of-Way[h]					
Route Segment	**Agricultural**	**Developed**	**Forest**	**Water/Wetlands**	**Other**
RSA	--	2%	60%	35%	2%
Replaced segment	22%	34%	23%	11%	10%
Change	**– 22%**	**– 32%**	**+ 37%**	**+ 24%**	**– 8%**

Table 7.3-22. Localized Differences between Route Segment Alternative RSA-52 and the Applicant's Preferred Route

Wetlands – Permanent Right-of-Way[i]					
Route Segment	**Emergent**	**Forested/Shrub**	**Freshwater Pond**	**Lake**	**Riverine**
RSA	--	1.76	--	--	--
Replaced segment	--	--	--	--	--
Change	**No change**	**+ 1.76**	**No change**	**No change**	**No change**

[a] Existing corridors used by RSA-05 would consist of transmission line and road rights-of-way.

[b] Sensitive noise receptors within 1,250 feet of the centerline of the pipeline permanent right-of-way.

[c] Crossings by proposed centerline.

[d] Minnesota Biological Survey, sensitive plant communities

[e] Minnesota Biological Survey, lakes with aquatic vegetation 1250ft. of the centerline.

[f] Provided by Minnesota Department of Natural Resources.

[g] Occurrences of state rare/protected species within 1,250 feet of the centerline of the pipeline permanent right-of-way. In order to protect their exact location, an "occurrence" represents the location of the record plus a species-specific buffer distance. Data provided by State of Minnesota, Department of Natural Resources (MN-DNR 2016). State data does not include occurrence information for Canada lynx or gray wolf.

[h] National Land Cover Database (Homer et al. 2015). Percentage of permanent right-of-way in acres.

[i] National Wetlands Inventory (USFWS n. d.). Permanent right-of-way in acres.

RSA = route segment alternative, "--" = Not applicable

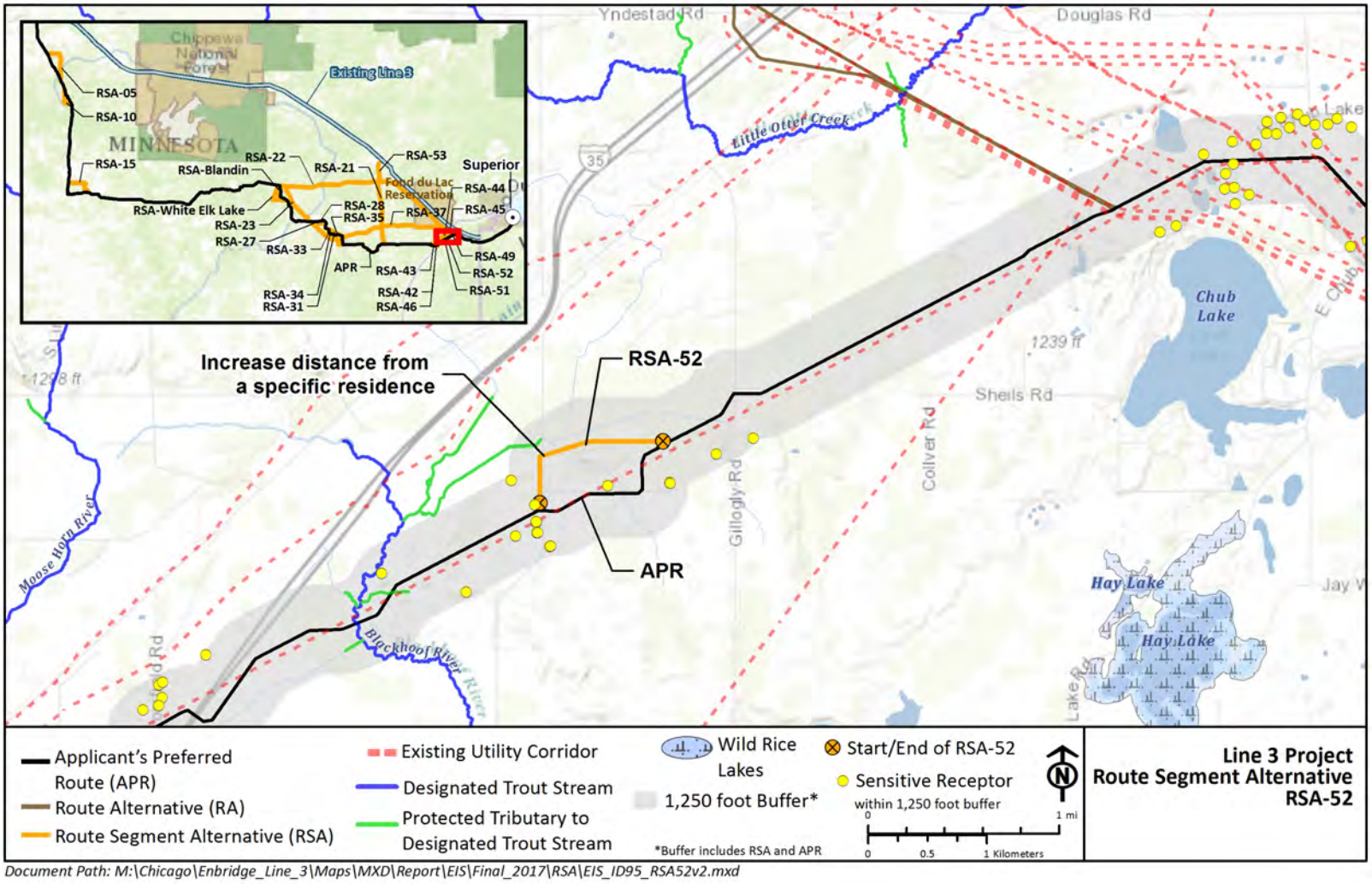

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Figure 7.3-22. Route Segment Alternative RSA-52

7.3.24 Route Segment Alternative RSA-53

RSA-53 is in St. Louis County. It is approximately 6.15 miles long and begins at MP 270.4 along RA-07 (Figure 7.3-23). It is dominated by wetland cover types and is co-located with existing transmission infrastructure for its entire length. RSA-53 would convert approximately 30 acres of forested wetlands to a different wetland type. The RSA was proposed to connect RA-07 with RSA-22, allowing a connection between the northern route alternatives (RA-06, RA-07, and RA-08) and the Applicant's preferred route to avoid crossing the Fond du Lac Indian Reservation. Table 7.3-23 highlights the impacts that would be associated with RSA-53.

Table 7.3-23. Route Segment Alternative RSA-53 Resources and Factors

Resource or Factor	Route Segment Alternative
Acres of construction work area	89.5
Percentage co-located with existing corridors[a]	100%
Number of sensitive noise receptors[b]	1
Number of road crossings[c]	3
Number of NHD stream/river crossings	3
NHD Artificial Path	0
NHD Canal/Ditch	3
NHD Connector	0
NHD Steam/River Intermittent	0
NHD Stream/River Perennial	0
Number of designated trout stream crossings	--
Acres of native plant community crossings (construction work area)	--
MBS, Plant Occurrences[d]	0
MBS, Lake Points[e]	0
Acres of forested land crossings (construction work area)	3.75
Acres of wetland crossings (construction work area)	76.68
Miles of vulnerable water table crossings[f]	0
Number of Minnesota rare/protected species occurrences[g]	0
Number of public water wells within 1250ft. of the centerline	0
Miles of public water basins crossed by centerline	0.0
Miles of State Lands crossed by centerline	0.0
Miles of timber parcels crossed by centerline	0
Number of archaeological resources	0
Number of historic resources	0

Table 7.3-23. Route Segment Alternative RSA-53 Resources and Factors

Land Cover – Permanent Right-of-Way[h]					
Route Segment	**Agricultural**	**Developed**	**Forest**	**Water/Wetlands**	**Other**
RSA	3%	2%	4%	88%	3%
Wetlands – Permanent Right-of-Way[i]					
Route Segment	**Emergent**	**Forested/Shrub**	**Freshwater Pond**	**Lake**	**Riverine**
RSA	0.60	30.75	0.18	-	-

[a] Existing corridors used by RSA-05 would consist of transmission line and road rights-of-way.

[b] Sensitive noise receptors within 1,250 feet of the centerline of the pipeline permanent right-of-way.

[c] Crossings by proposed centerline.

[d] Minnesota Biological Survey, sensitive plant communities

[e] Minnesota Biological Survey, lakes with aquatic vegetation 1250ft. of the centerline.

[f] Provided by Minnesota Department of Natural Resources.

[g] Occurrences of state rare/protected species within 1,250 feet of the centerline of the pipeline permanent right-of-way. In order to protect their exact location, an "occurrence" represents the location of the record plus a species-specific buffer distance. Data provided by State of Minnesota, Department of Natural Resources (MN-DNR 2016). State data does not include occurrence information for Canada lynx or gray wolf.

[h] National Land Cover Database (Homer et al. 2015). Percentage of permanent right-of-way in acres.

[i] National Wetlands Inventory (USFWS n. d.). Permanent right-of-way in acres.

RSA = route segment alternative, "--" = Not applicable

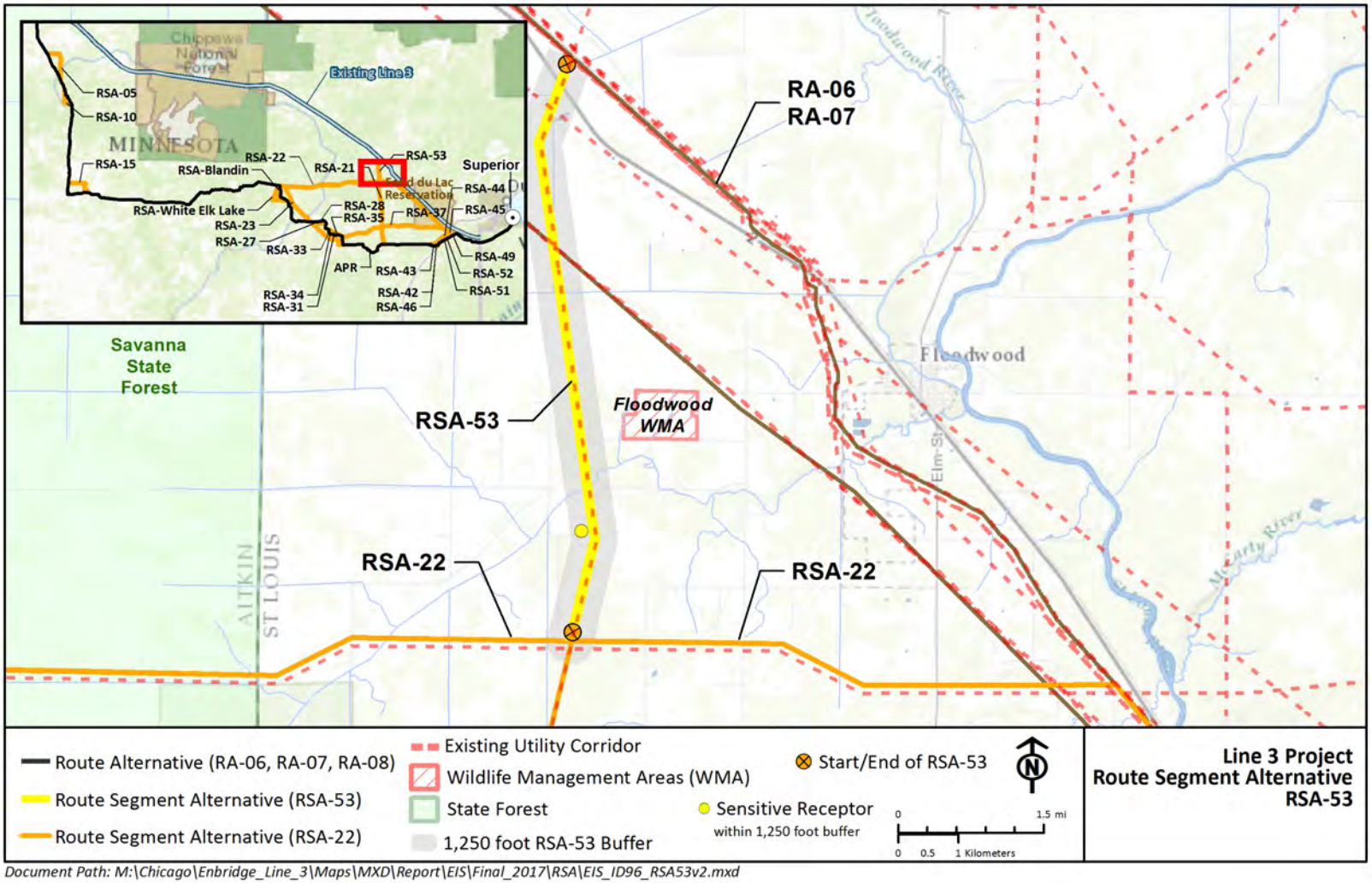

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Figure 7.3-23. Route Segment Alternative RSA-53

7.4 REFERENCES

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U. S. Fish and Wildlife Service (USFWS). (n.d.). National Wetlands Inventory website. U.S. Department of the Interior, Fish and Wildlife Service, Washington, D. C. http://www.fws.gov/wetlands/. Accessed April 22, 2016.