

Tree and Shrub Inventory Report

Merricourt Wind Farm to Ellendale

230 kV Transmission Line

March 2011

Prepared for:

Montana-Dakota Utilities Co.



A Division of MDU Resources Group, Inc.

In the Community to Serve®

Prepared by:

HDR Engineering, Inc.



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1.0 INTRODUCTION

Montana-Dakota Utilities, Co. (Montana-Dakota) has proposed to construct, own, and operate an approximately 30-mile-long, 230 kilovolt (kV) transmission line from the upgraded Ellendale Substation in Dickey County to the proposed Merricourt Wind Farm Substation in McIntosh County. This project is referred to as the Merricourt Wind Farm to Ellendale Project (Project).

The Project would consist of three major components: (1) 230 kV transmission line, (2) Ellendale Junction Substation upgrades, and (3) new Merricourt Wind Farm Substation. The Project does not include the development of the Merricourt Wind Farm.

Table 1 lists the counties, townships, and sections crossed by the Project. The full alignment and section numbers are shown in Figure 1, at the end of this report.

Table 1
Counties, Townships, and Sections within the proposed ROW

Township Name	Township	Range	Sections
Dickey County			
Ellendale	129	63	3-4; 6-10
Elm		64	1-3; 6-12
Lorraine		65	1-6; 8-12
Albertha		66	1-3
Spring Valley	130	66	4-6; 9; 16; 21; 27-28; 34
McIntosh County			
Unorganized	130	67	1-3

2.0 PURPOSE

As part of the tree and shrub mitigation specifications for regulated utility projects, the North Dakota Public Service Commission (NDPSC) typically requests an inventory of trees and shrubs that are anticipated to be cleared as a result of the project. For past projects the NDPSC has requested tree and shrub mitigation at a 2 to 1 basis. A copy of the NDPSC's typical inventory and mitigation specifications are attached as Appendix A.

Additionally, this tree and shrub inventory may be used to identify avoidance and minimization opportunities for native and planted areas.

3.0 METHODS

Trees and shrubs, including those considered invasive species, were inventoried within the 120-foot-wide right-of-way (ROW) easement. The inventory includes site location, species present, and number of trees and shrubs at each location. The inventory was conducted in accordance with paragraphs 1 to 4 of the Tree and Shrub Specifications attached as Appendix A.

Tree and shrubs were individually counted by stems. Multi-stemmed shrubs (e.g., lilac, chokecherry, redosier dogwood, hawthorn) were counted by clumps where readily distinguishable. In most cases clumps consisted of four to six stems.

Diameter at breast height (DBH) was collected according to the following categories:

- (1) less than 1 inch;
- (2) 1 inch to 2 inches; and,
- (3) greater than 2 inches.

The inventory recorded whether the tree or shrub was part of a native growth area or a planted area. Species classification as a tree or shrub was established according to the categories defined in *Trees and Shrubs of North Dakota* (Herman et al., 2003). Since the aforementioned publication does not categorize specific willow species, sandbar willow (*Salix interior*) was assumed to be a shrub based on its short, multi-stemmed growth form within the Project area.

Tree and shrub locations within the ROW were collected with a sub-meter GPS unit and assigned a site ID according to preliminary pole numbering data. Sites were established by collecting a GPS boundary around groupings of trees and/or shrubs. Site locations are shown on Figures 2-1 to 2-20 and are summarized in Appendix C.

Potential impact avoidance opportunities were also identified for each site according to its perceived interference with transmission line construction, operation, or maintenance. For example, it is possible that impacts may not occur at the fringes of the ROW and at areas of steep terrain that will likely be spanned by the transmission line. Representative photographs were collected at the sites and are included as Appendix B.

The scope of this inventory is based upon the December 7, 2010, proposed transmission line ROW.

4.0 SITE DESCRIPTION

The Project is located in southeastern North Dakota and crosses western Dickey County and eastern McIntosh County. The Project area consists mostly of tilled agricultural lands and prairie rangeland. Grasslands tend to be concentrated in the west half of the Project area where the terrain is rolling and relatively rocky (Figure 1). Trees are sporadic throughout the Project area and are primarily present as wooded draws, riparian areas, and windrows (See Appendix B for representative photos).

Trees and shrubs within the Project area are generally distributed according to ecological region (see Figure 1 for ecoregions). Inventoried trees and shrubs within the Drift Plains (the east Project area) are, in nearly all cases, arranged as windrows that have been planted with non-native and/or invasive species. Inventoried trees and shrubs within the Missouri Coteau (the west Project area) are frequently native growth areas dominated by species such as hawthorn and chokecherry. Native growth in the Project area is most common near the edge of the Missouri Coteau, which is located to the east of the U.S. Fish and Wildlife Service (USFWS) LSB Waterfowl Production Area (Figure 2-11).

5.0 RESULTS

Trees and shrubs were inventoried at 79 sites within the ROW. Within these sites, 18 species of trees and shrubs were identified representing a total of 2,993 inventoried trees and shrubs, of which 2,584 are categorized as shrubs and 409 as trees. If sandbar willow—a dense colonial species—is excluded there are only 1,154 shrubs within the ROW.

Table 2 summarizes the inventory by species. Appendix B provides representative photos of the sites.

Appendix C provides detailed information of the inventoried sites that are shown on Figures 2-1 to 2-20.

Table 2
Summary Count of Tree and Shrub Inventory

Area	Common Name	Species	Tree or Shrub	Number of Site Locations	Number and Size (DBH)			Total Number
					<1 in	1 to 2 in	>2 in	
native	ash, green	<i>Fraxinus pennsylvanica</i>	tree	5		1	31	32
	chokecherry	<i>Prunus virginica</i>	shrub	14	79	300	55	434
	cottonwood, eastern	<i>Populus deltoides</i>	tree	3			6	6
	hawthorn species	<i>Crataegus sp.</i>	shrub	34		418	274	692
	willow, black	<i>Salix nigra</i>	tree	8			25	25
	willow, sandbar	<i>Salix exigua</i>	shrub	2	1,430			1,430
<i>Native Growth Area</i>				--	1,509	719	391	2,619
planted	apple species	<i>Malus sp.</i>	tree	1		1		1
	boxelder	<i>Acer negundo</i>	tree	10			58	58
	dogwood, redosier	<i>Cornus sericea</i>	shrub	2	6			6
	elm, Siberian	<i>Ulmus pumila</i>	tree	14		1	149	150
	honeysuckle, Tatarian	<i>Lonicera tatarica</i>	shrub	2		20		20
	lilac, common	<i>Syringa vulgaris</i>	shrub	1		2		2
	olive, Russian	<i>Elaeagnus angustifolia</i>	tree	5			125	125
	poplar, Lombardy	<i>Populus nigra</i>	tree	1			4	4
	redcedar, eastern	<i>Juniperus virginiana</i>	tree	1			1	1
	spruce, blue	<i>Picea pungens</i>	tree	1			1	1
	spruce, white	<i>Picea glauca</i>	tree	1		1		1
	willow, laurel	<i>Salix pentandra</i>	tree	1			5	5
<i>Planted Area Subtotal</i>				--	6	25	343	374
<i>Trees Subtotal</i>				--	0	4	405	409
<i>Shrubs Subtotal</i>				--	1,515	740	329	2,584
<i>Shrubs Subtotal, excluding sandbar willow</i>				--	85	740	329	1,154
Total Number				79^a	1,515	744	734	2,993

^a Total is less than sum of species more than one species may be present per site.

5.1 Planted Areas

As noted in Section 3.0, planted areas were most common in the east half of the Project. Siberian elm, boxelder, and Russian olive were the most frequent species inventoried in planted tree rows (see appendix photos B-1 and B-2). Planted trees tended to be larger than the trees inventoried in native growth areas. Tree size in planted tree rows typically consisted of trees with a DBH of 4 to 12 inches and heights from 15 to 25 feet. Nearly all tree rows were orientated in cardinal directions (i.e., north-south or east-west). Most trees were planted in single rows, although double and triple rows of trees were also inventoried. Many of the tree rows were planted with non-native invasive species such as Russian olive and Siberian elm.

5.2 Native Growth Areas

Hawthorn and chokecherry were there most frequently encountered species in native growth areas. Shrub sizes were typically less than 3-inch DBH with heights of 6 to 12 feet. Both hawthorn and chokecherry tended to display multi-stemmed growth forms of approximately four to six stems per plant (See appendix photos B-4 and B-5).

Sandbar willow was documented at only two sites (sites 270 and 274; Figure 2-18; appendix photo B-5). However, sandbar willow represents a disproportionately large number of the counted shrubs (55 percent) due to the dense colonial nature of this species. Typical inventoried sandbar willows were multi-stemmed clumps of four to six stems per plant that were 3 to 6 feet tall with a DBH of approximately 0.5 inches.

6.0 RECOMMENDATIONS

HDR offers the following recommendations regarding mitigation:

- **Planted Areas**
 - Invasive Species. Trees and shrubs that are generally considered invasive species should be replaced with non-invasive native species of a comparable height and canopy suitable for the mitigation area. Invasive species documented as part of the inventory include: Siberian elm, Tatarian honeysuckle, and Russian olive.
 - Clear cuts through windbreaks and shelterbelts. Keep clear cuts as narrow as feasible to promote safe construction, operation, and maintenance of the transmission line. PSC guidelines recommend that clear cuts maintain a width of 50 feet or less (Appendix A, Section 8). Appendix C includes information about possible opportunities to avoid impacts at specific sites.
- **Native Growth Areas**
 - Ravines. Low growing native growth such as hawthorn and chokecherry should be left intact in areas where trees and shrubs are not expected to interfere with construction, operation, and/or maintenance. (e.g., within steep ravines, adjacent to riparian areas). Appendix C includes information about possible opportunities to avoid impacts at specific sites.

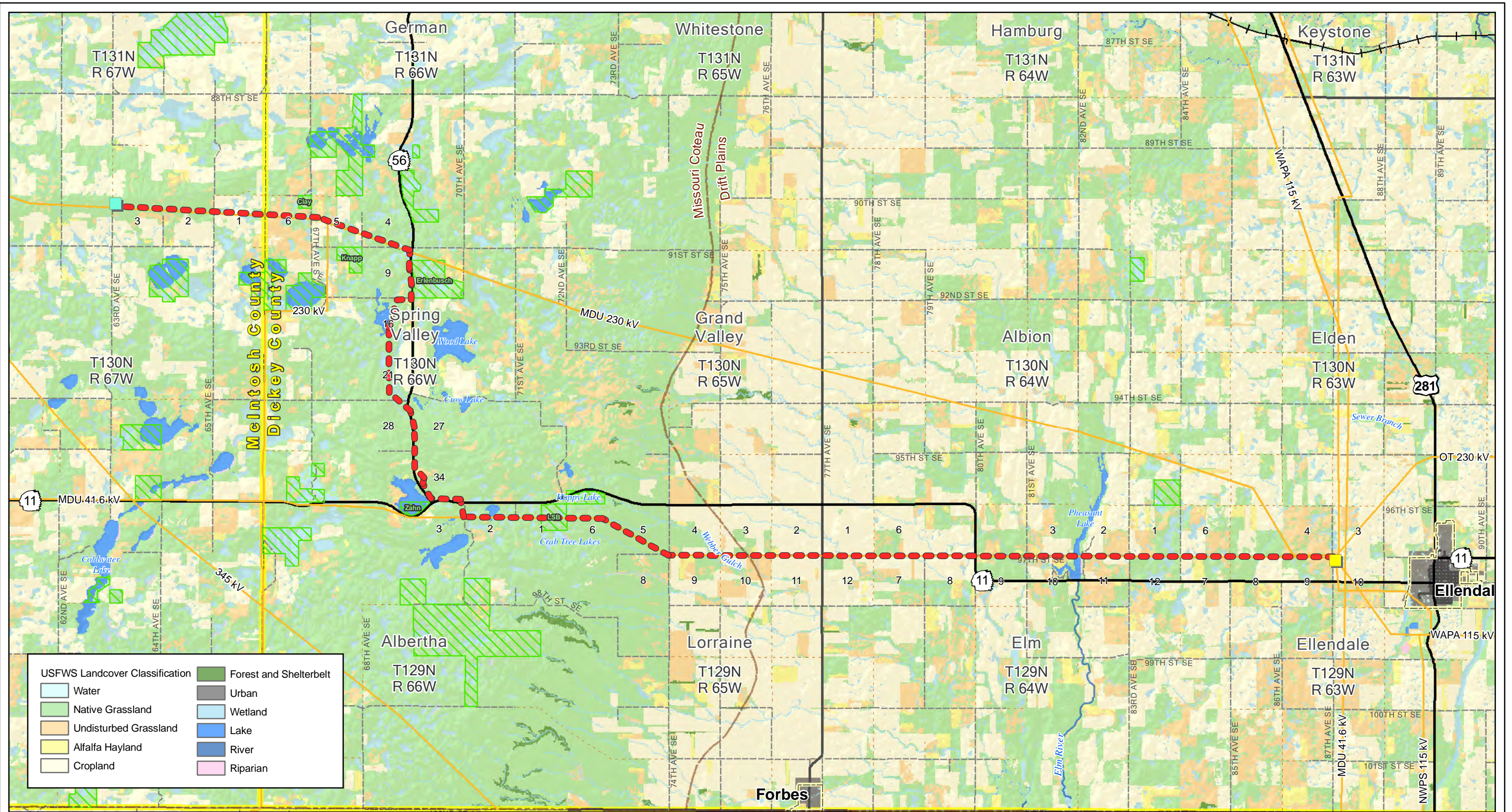
- Sandbar willow. Sandbar willow is resilient to disturbance and may be cut flush to the ground where necessary to accommodate construction. Cut areas will regenerate naturally (Stevens et al. 2005). No replacement or mitigation is recommended for sandbar willow.

7.0 REFERENCES

- Bryce, S.A., Omernik, J.M., Pater, D.A., Ulmer, M., Schaar, J., Freeouf, J., Johnson, R., Kuck, P., and Azevedo, S.H., 1996, *Ecoregions of North Dakota and South Dakota*, Reston, Virginia, U.S. Geological Survey . http://www.epa.gov/wed/pages/ecoregions/ndsd_eco.htm. Accessed December 17, 2010.
- Herman, D. and Chaput, L. 2003. *Trees and Shrubs of North Dakota*. North Dakota State University Extension Service. 36p. <http://www.ag.ndsu.edu/pubs/plantsci/trees/eb38.pdf>. Accessed January 11, 2010.
- North Dakota Public Service Commission. *Exhibit C1 North Dakota Public Service Commission Findings of Fact, Conclusion of Law and Order*. Tree and Shrub Mitigation Specifications 3p.
- Stevens, M. Fenchel, G. and Hoag, C. 2005. *Salix exigua Fact Sheet*. Contributed by: USDA NRCS National Plant Data Center, New Mexico Plant Materials Center, & Idaho Plant Materials Center. 10p. http://plants.usda.gov/plantguide/pdf/cs_saex.pdf. Accessed January 11, 2010

Figures

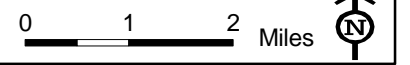
Figure 1
Project Location Map and Landcover Types



USFWS Landcover Classification	
	Water
	Native Grassland
	Undisturbed Grassland
	Alfalfa Hayland
	Cropland
	Forest and Shelterbelt
	Urban
	Wetland
	Lake
	River
	Riparian

- Proposed T-Line Centerline ver. 12-7-2010
- County Boundary
- EPA Level IV Ecoregion
- Proposed MDU Merricourt Wind Farm Substation
- Paved
- USFWS Waterfowl Production Area
- Existing MDU Ellendale Jct. Substation
- Graded/Drained/Gravel
- Intermittent Watercourse
- Existing Transmission Line
- Trail/Unimproved
- Perennial Stream

Figure 1
 Overview and USFWS Landcover Classification
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Figures 2-1 to 2-20
Detailed Inventory Site Location

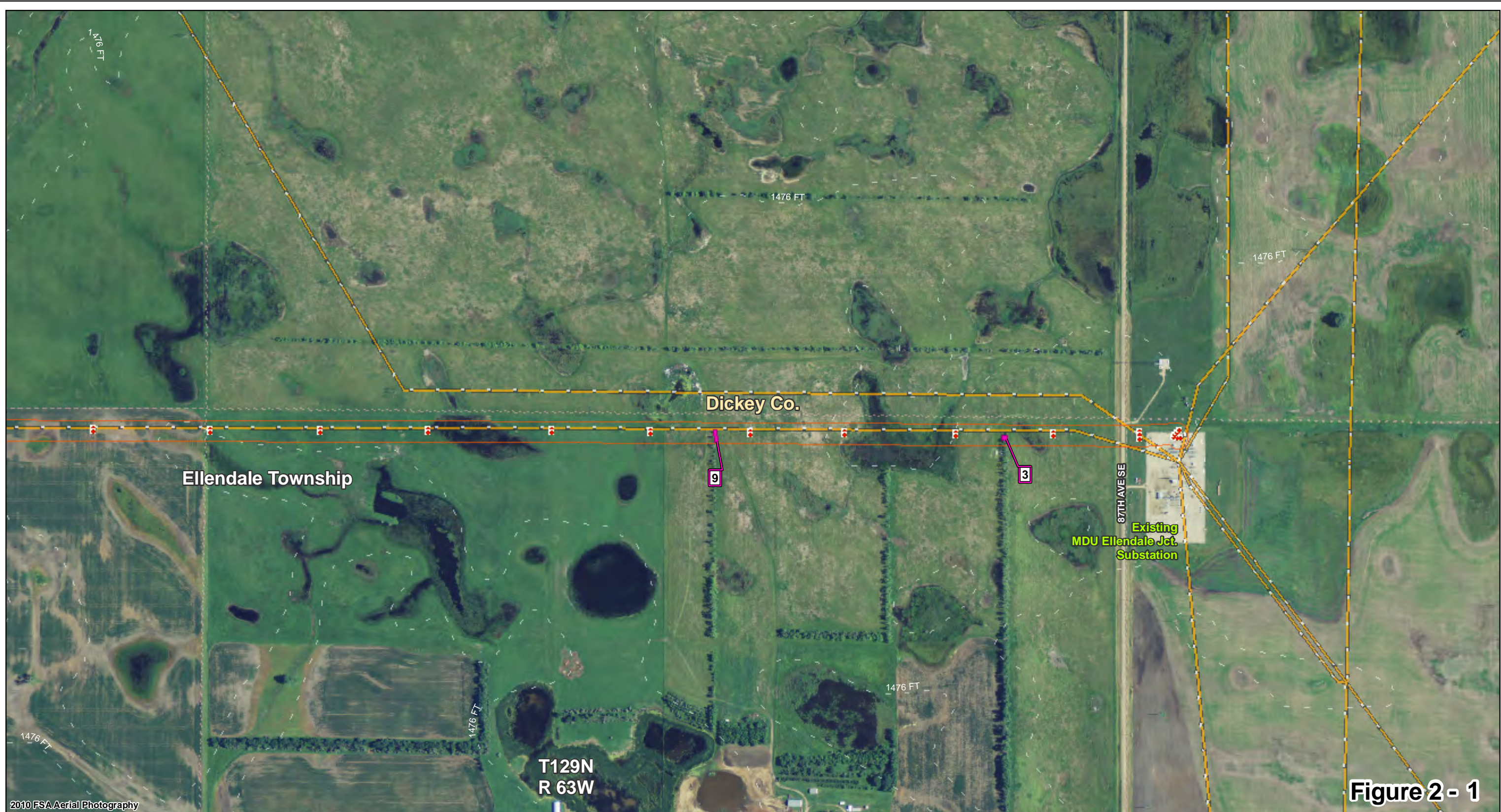
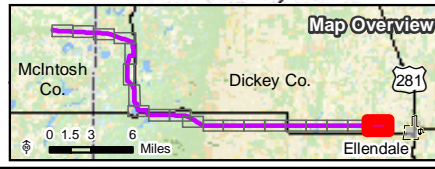


Figure 2 - 1

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- | | | |
|------------------------------|---------------------|-----------------------------------|
| • Proposed Pole Locations | Inventory Area Type | ▭ USFWS Waterfowl Production Area |
| ▭ Proposed 120 Foot ROW | 🌸 Planted | ▭ County Boundary |
| ▭ Proposed Substation | 🌿 Native Growth | ▭ Township Boundary |
| 📶 Existing Transmission Line | | |

Tree and Shrub Inventory
 Montana-Dakota Utilities Co.
 Merricourt Wind Farm to
 Ellendale Project



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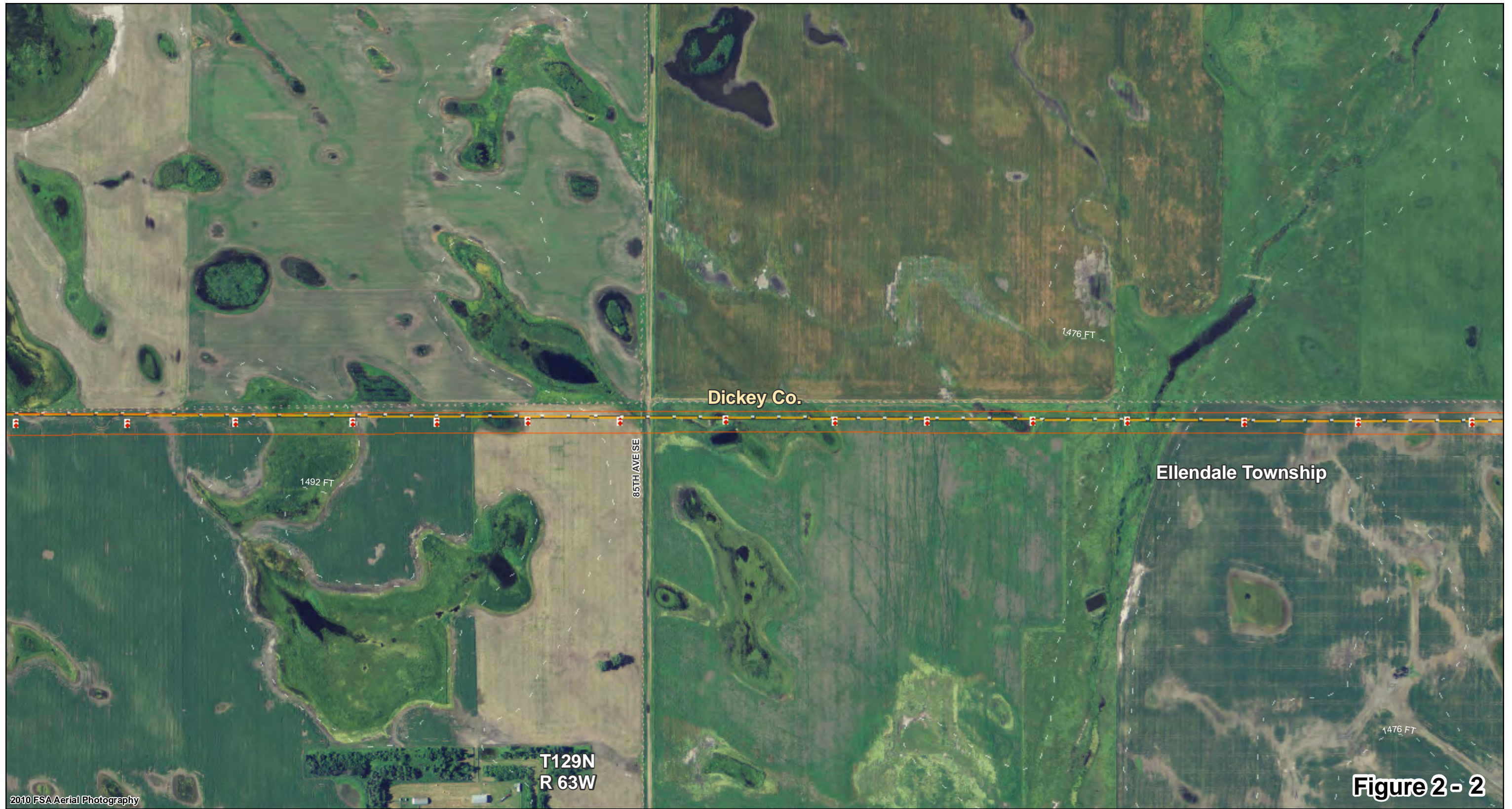
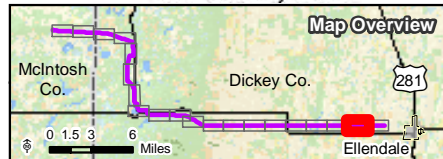


Figure 2- 2

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| • Proposed Pole Locations | Inventory Area Type | USFS Waterfowl Production Area |
| Proposed 120 Foot ROW | Planted | County Boundary |
| Proposed Substation | Native Growth | Township Boundary |
| Existing Transmission Line | | |

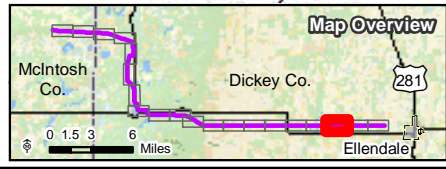
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Figure 2 - 3

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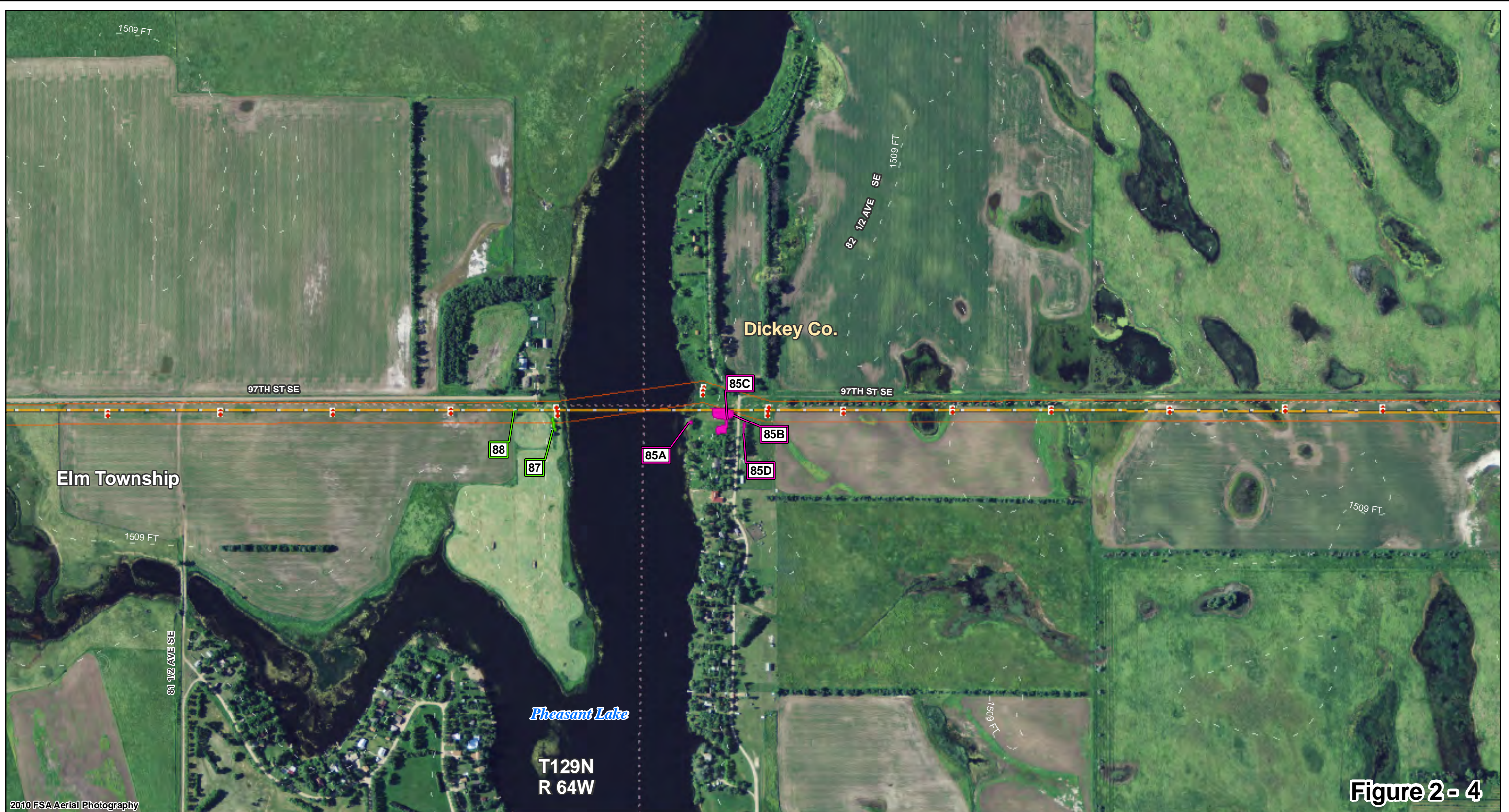


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| • Proposed Pole Locations | Inventory Area Type | USFS Waterfowl Production Area |
| ○ Proposed 120 Foot ROW | Planted | County Boundary |
| ▭ Proposed Substation | Native Growth | Township Boundary |
| — Existing Transmission Line | | |

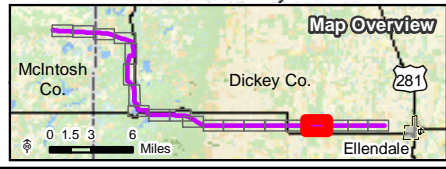


Tree and Shrub Inventory
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| • Proposed Pole Locations | Inventory Area Type | ▭ USFWS Waterfowl Production Area |
| ▭ Proposed 120 Foot ROW | 🌸 Planted | ▭ County Boundary |
| ▭ Proposed Substation | 🌿 Native Growth | ▭ Township Boundary |
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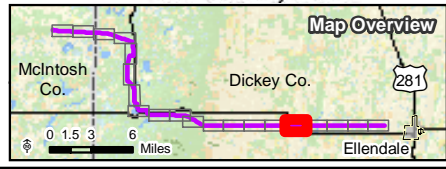


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Figure 2 - 5

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| • Proposed Pole Locations | Inventory Area Type | ▭ USFWS Waterfowl Production Area |
| ▭ Proposed 120 Foot ROW | 🌳 Planted | ▭ County Boundary |
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Tree and Shrub Inventory
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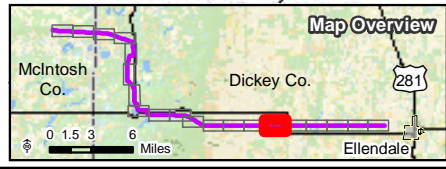


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Figure 2- 6

2010 FSA Aerial Photography
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| • Proposed Pole Locations | Inventory Area Type | ▭ USFWS Waterfowl Production Area |
| ▭ Proposed 120 Foot ROW | 🌳 Planted | ▭ County Boundary |
| ▭ Proposed Substation | 🌳 Native Growth | ▭ Township Boundary |
| 📡 Existing Transmission Line | | |

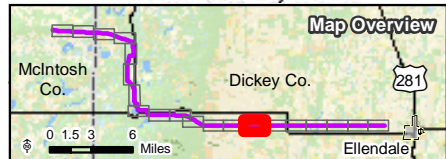


Tree and Shrub Inventory
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2010 FSA Aerial Photography



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| ▭ Proposed Substation | 🌿 Native Growth | ▭ Township Boundary |
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Tree and Shrub Inventory
 Montana-Dakota Utilities Co.
 Merricourt Wind Farm to
 Ellendale Project



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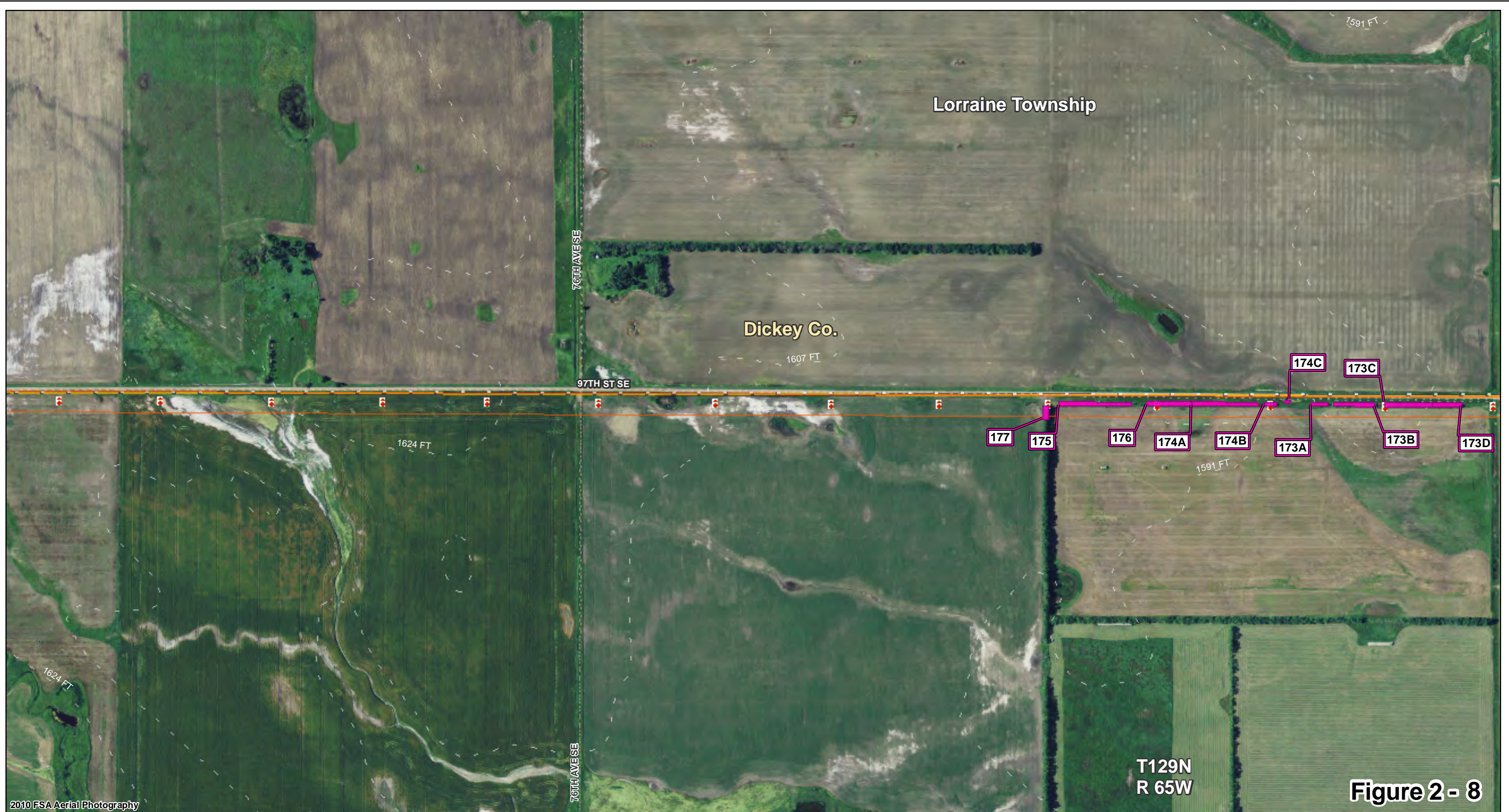


Figure 2 - 8

2010 FSA Aerial Photography

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Map Overview

McIntosh Co. Dickey Co. Ellendale

0 1.5 3 6 Miles

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|----------------------------|---------------------|---------------------------------|
| • Proposed Pole Locations | Inventory Area Type | USFWS Waterfowl Production Area |
| Proposed 120 Foot ROW | Planted | County Boundary |
| Proposed Substation | Native Growth | Township Boundary |
| Existing Transmission Line | | |

Tree and Shrub Inventory
Montana-Dakota Utilities Co.
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0 500 1,000 Feet

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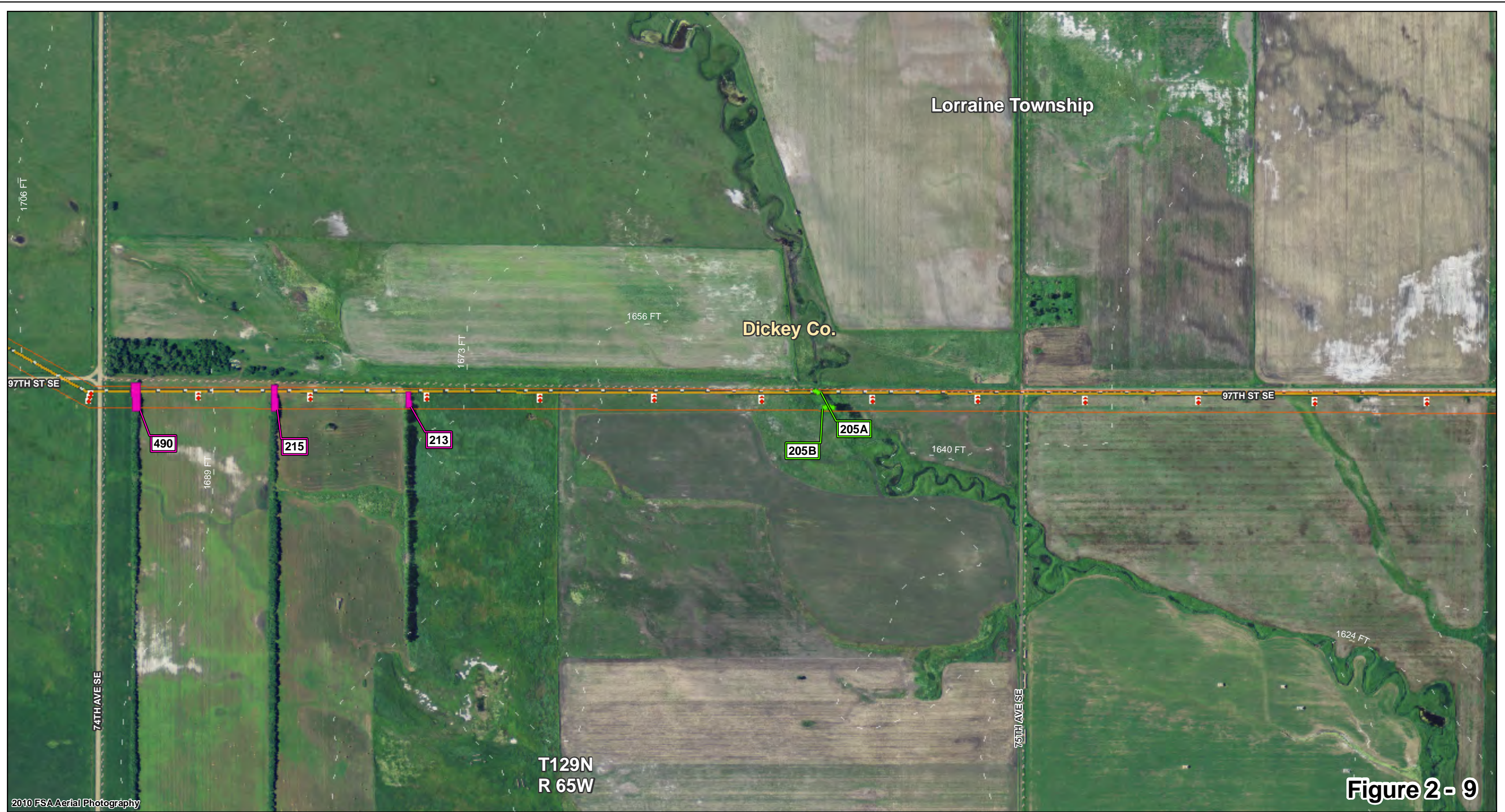
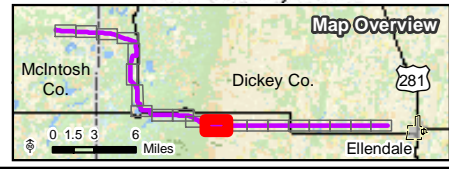


Figure 2- 9

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| • Proposed Pole Locations | Inventory Area Type | ▭ USFWS Waterfowl Production Area |
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Tree and Shrub Inventory
 Montana-Dakota Utilities Co.
 Merricourt Wind Farm to
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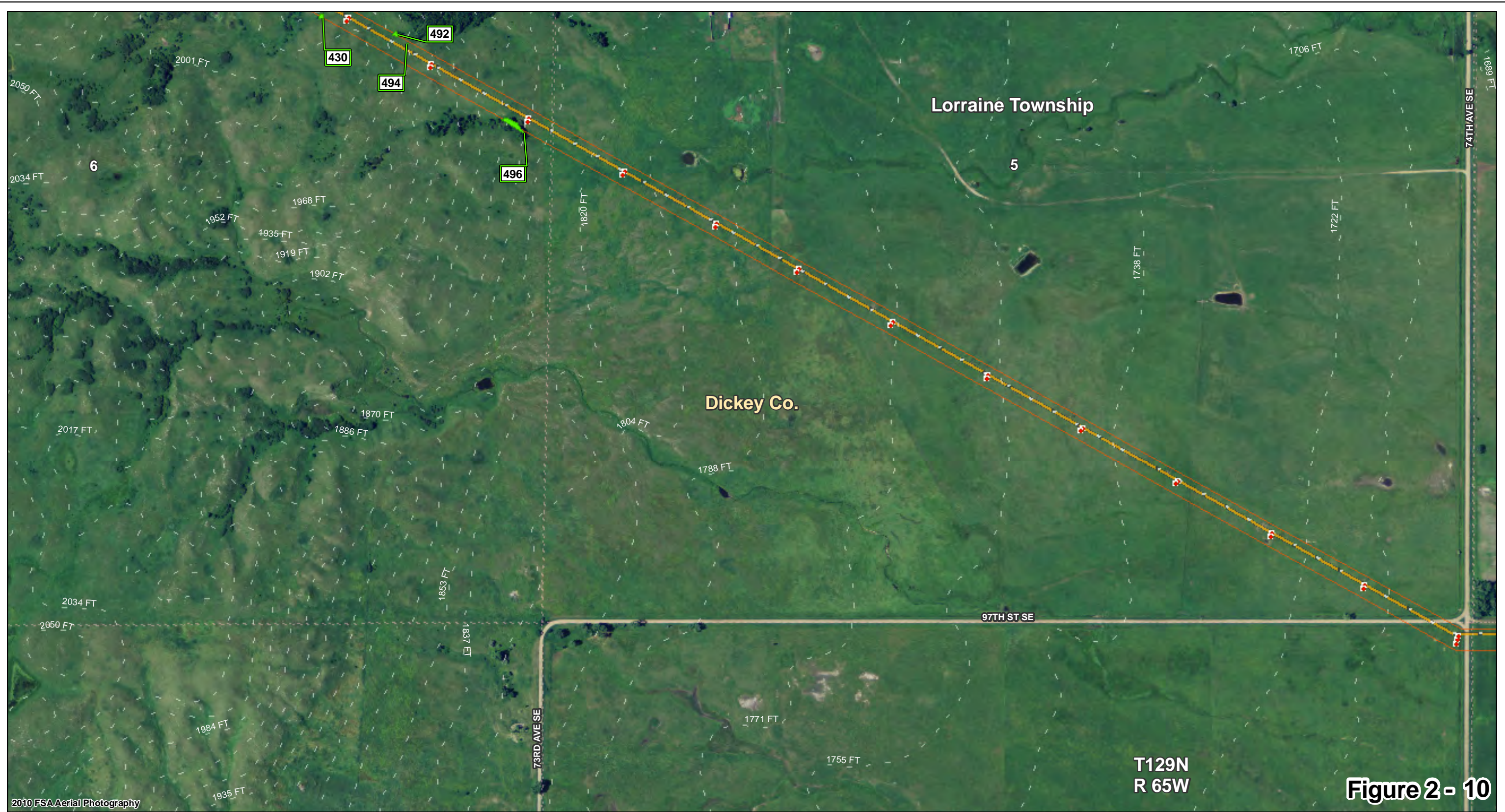


Figure 2- 10

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| • Proposed Pole Locations | Inventory Area Type | ▭ USFWS Waterfowl Production Area |
| ▭ Proposed 120 Foot ROW | 🌸 Planted | ▭ County Boundary |
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| 📏 Existing Transmission Line | | |

Tree and Shrub Inventory
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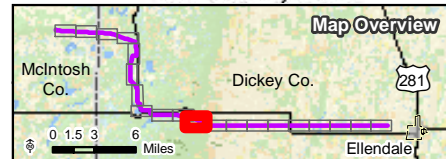
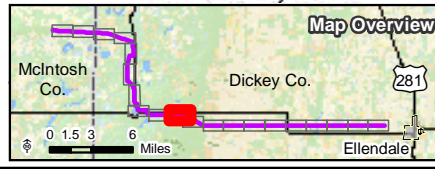




Figure 2- 11

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- Proposed Pole Locations
- ▭ Proposed 120 Foot ROW
- ▭ Proposed Substation
- ⚡ Existing Transmission Line
- Inventory Area Type
- 🌳 Planted
- 🌿 Native Growth
- ▭ USFWS Waterfowl Production Area
- ▭ County Boundary
- ▭ Township Boundary

Tree and Shrub Inventory
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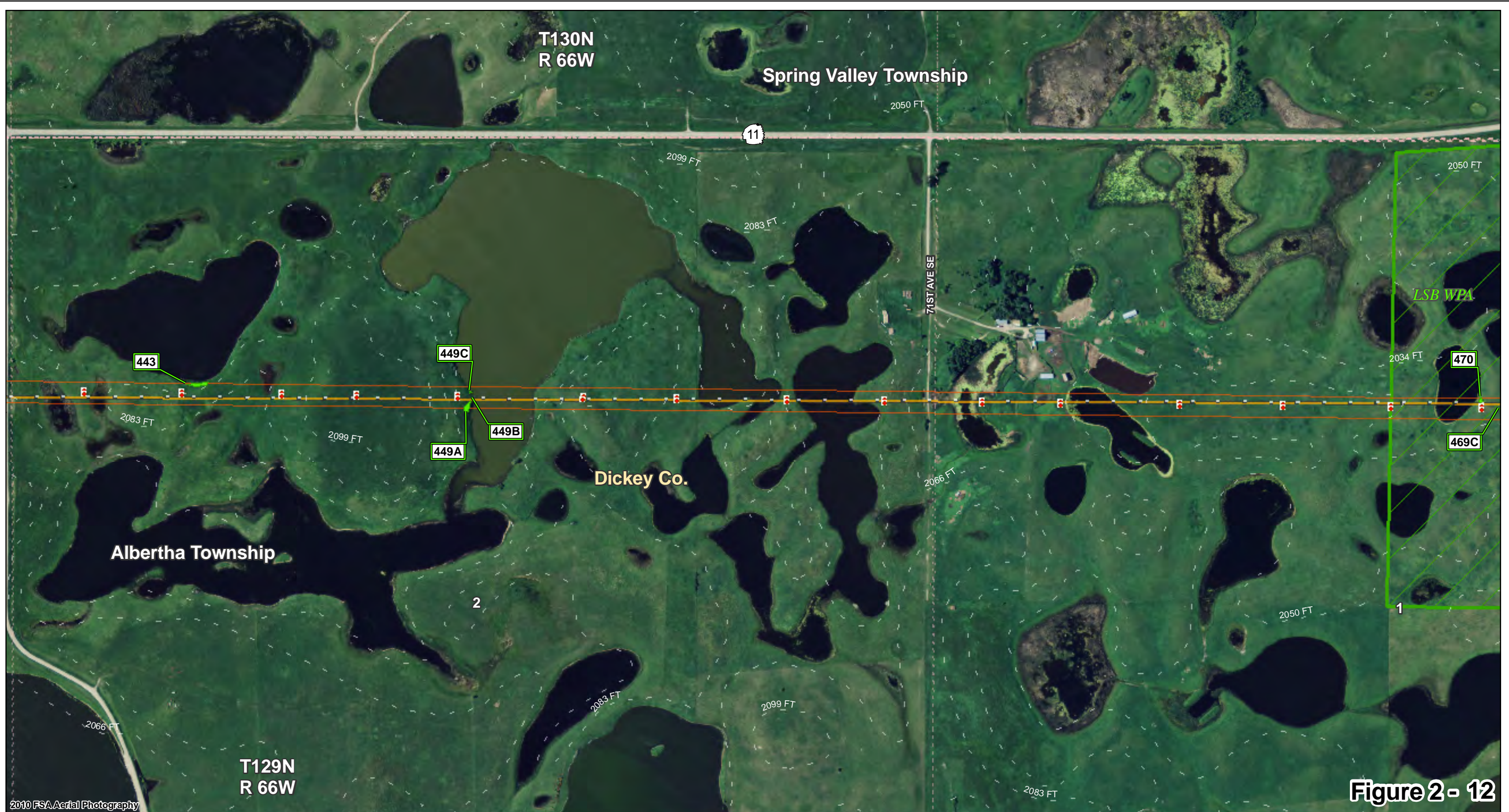


Figure 2- 12

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2010 FSA Aerial Photography

Map Overview

McIntosh Co. Dickey Co. Ellendale

0 1.5 3 6 Miles

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|------------------------------|---------------------|-----------------------------------|
| • Proposed Pole Locations | Inventory Area Type | ▭ USFWS Waterfowl Production Area |
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Tree and Shrub Inventory
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Figure 2- 13

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Map Overview

- | | | |
|----------------------------|---------------------|--------------------------------|
| • Proposed Pole Locations | Inventory Area Type | USFS Waterfowl Production Area |
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Tree and Shrub Inventory
Montana-Dakota Utilities Co.
Merricourt Wind Farm to
Ellendale Project

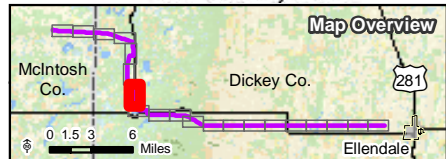


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Figure 2- 14

MONTANA-DAKOTA
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- | | | |
|------------------------------|---------------------|-----------------------------------|
| • Proposed Pole Locations | Inventory Area Type | ▭ USFWS Waterfowl Production Area |
| ▭ Proposed 120 Foot ROW | 🌱 Planted | ▭ County Boundary |
| ▭ Proposed Substation | 🌿 Native Growth | ▭ Township Boundary |
| 📡 Existing Transmission Line | | |

Tree and Shrub Inventory
 Montana-Dakota Utilities Co.
 Merricourt Wind Farm to
 Ellendale Project

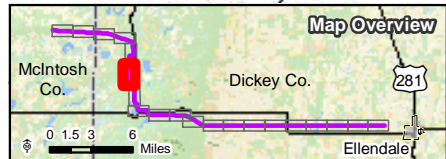


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Figure 2- 15

2010 FSA Aerial Photography
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|------------------------------|---------------------|-----------------------------------|
| • Proposed Pole Locations | Inventory Area Type | ▭ USFWS Waterfowl Production Area |
| ▭ Proposed 120 Foot ROW | 🌸 Planted | ▭ County Boundary |
| ▭ Proposed Substation | 🌿 Native Growth | ▭ Township Boundary |
| 📏 Existing Transmission Line | | |

Tree and Shrub Inventory
 Montana-Dakota Utilities Co.
 Merricourt Wind Farm to
 Ellendale Project





Figure 2- 16

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2010 FSA Aerial Photography

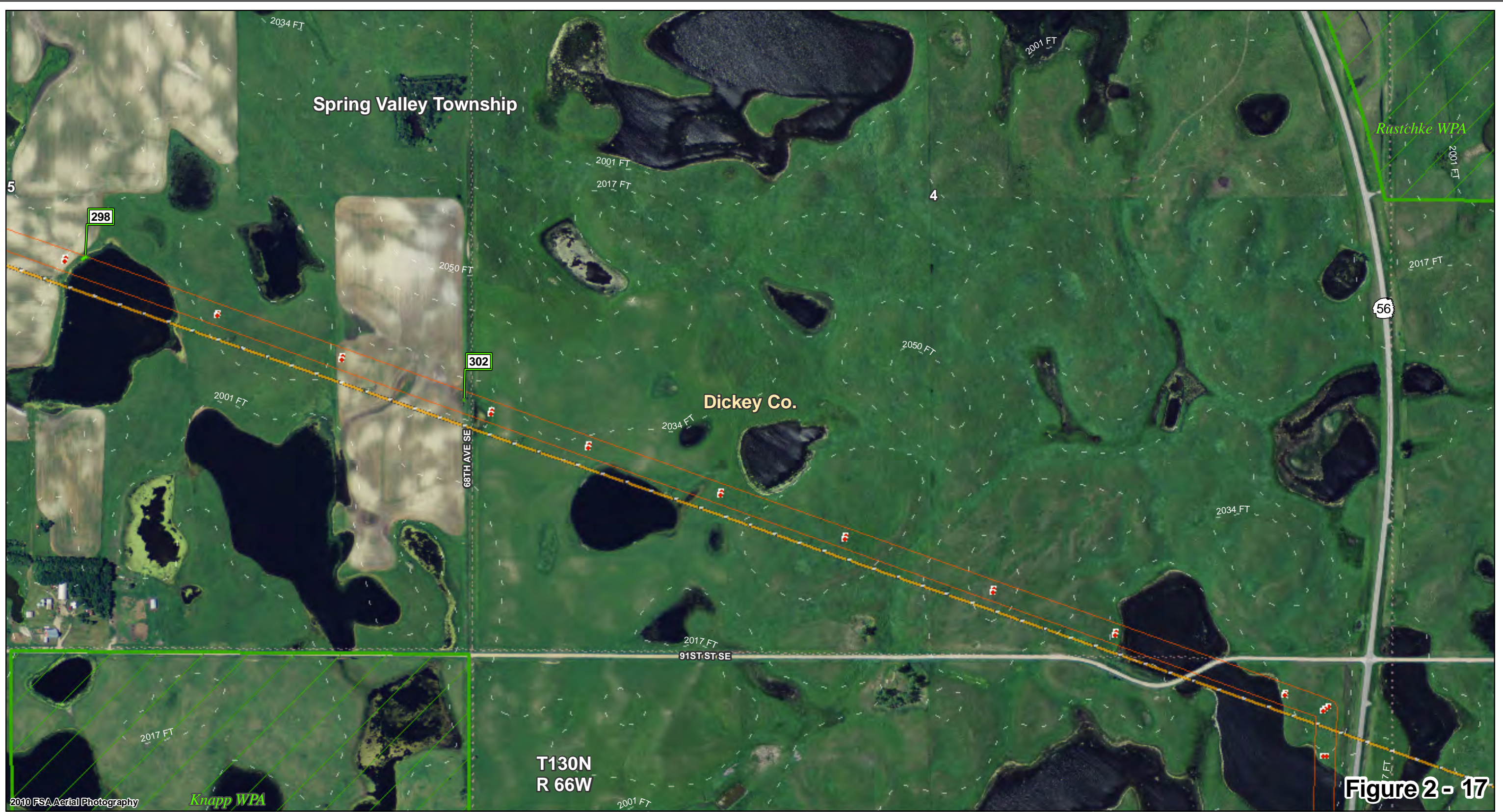
Map Overview

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|------------------------------|---------------------|-----------------------------------|
| • Proposed Pole Locations | Inventory Area Type | ▭ USFWS Waterfowl Production Area |
| ▭ Proposed 120 Foot ROW | 🌳 Planted | ▭ County Boundary |
| ▭ Proposed Substation | 🌳 Native Growth | ▭ Township Boundary |
| 📶 Existing Transmission Line | | |

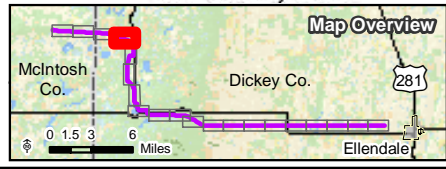
Tree and Shrub Inventory
 Montana-Dakota Utilities Co.
 Merricourt Wind Farm to
 Ellendale Project

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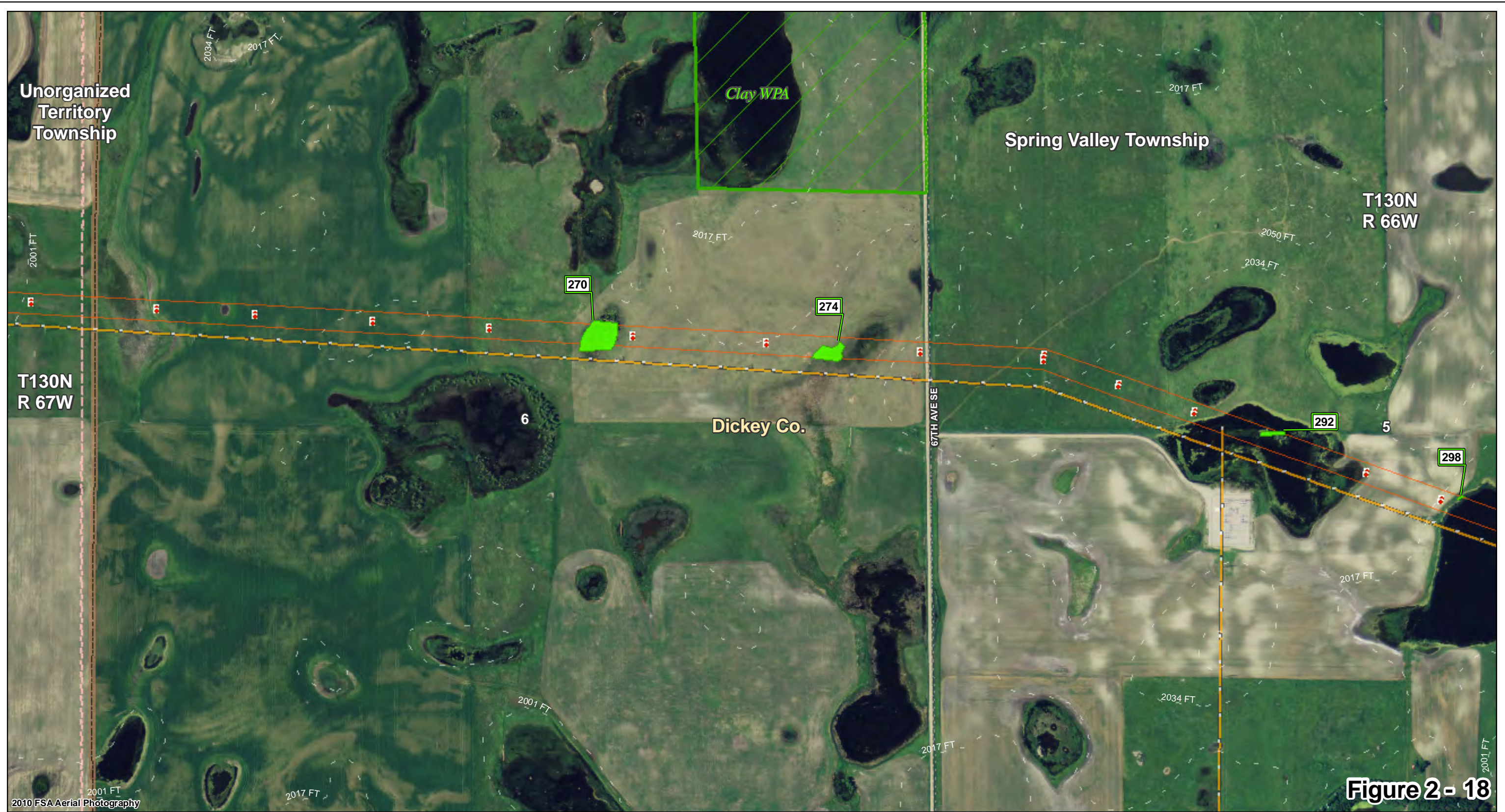
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|----------------------------|---------------------|---------------------------------|
| • Proposed Pole Locations | Inventory Area Type | USFWS Waterfowl Production Area |
| Proposed 120 Foot ROW | Planted | County Boundary |
| Proposed Substation | Native Growth | Township Boundary |
| Existing Transmission Line | | |



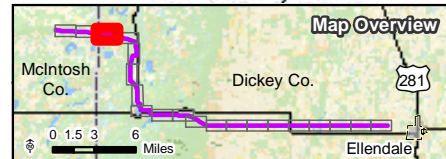
Tree and Shrub Inventory
 Montana-Dakota Utilities Co.
 Merricourt Wind Farm to
 Ellendale Project

Figure 2-17

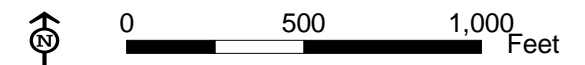
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|------------------------------|---------------------|---------------------------------|
| • Proposed Pole Locations | Inventory Area Type | USFWS Waterfowl Production Area |
| ○ Proposed 120 Foot ROW | Planted | County Boundary |
| ▭ Proposed Substation | Native Growth | Township Boundary |
| — Existing Transmission Line | | |



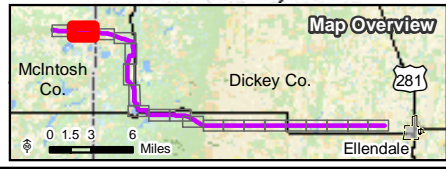
Tree and Shrub Inventory
 Montana-Dakota Utilities Co.
 Merricourt Wind Farm to
 Ellendale Project

Figure 2-18



Figure 2 - 19

2010 FSA Aerial Photography
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|------------------------------|---------------------|-----------------------------------|
| • Proposed Pole Locations | Inventory Area Type | ▭ USFWS Waterfowl Production Area |
| ▭ Proposed 120 Foot ROW | 🌸 Planted | ▭ County Boundary |
| ▭ Proposed Substation | 🌿 Native Growth | ▭ Township Boundary |
| 📡 Existing Transmission Line | | |

Tree and Shrub Inventory
 Montana-Dakota Utilities Co.
 Merricourt Wind Farm to
 Ellendale Project



Map Document: (\\mapge-gis-file\GISProj\MDU\140114\map_docs\Tree_Report\Fig2_MWFE_DetailedTrees.mxd) 9/9/2011 3:45:37 PM

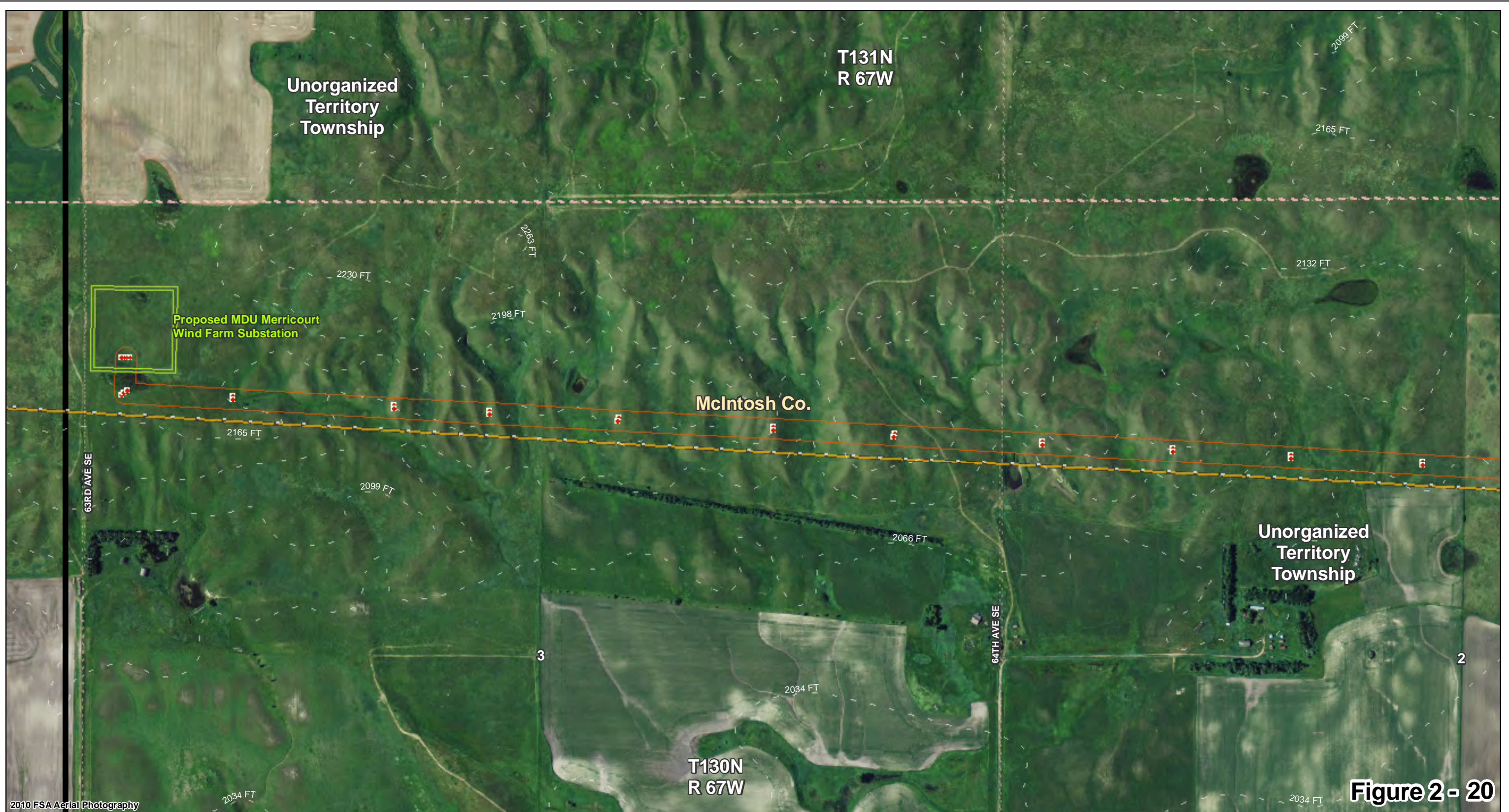
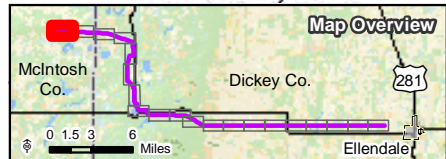


Figure 2 - 20

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|----------------------------|---------------------|---------------------------------|
| • Proposed Pole Locations | Inventory Area Type | USFWS Waterfowl Production Area |
| Proposed 120 Foot ROW | Planted | County Boundary |
| Proposed Substation | Native Growth | Township Boundary |
| Existing Transmission Line | | |

Tree and Shrub Inventory
 Montana-Dakota Utilities Co.
 Merricourt Wind Farm to
 Ellendale Project



Map Document: (\\mapge-gis-file\GISProj\MDU\140114\map_docs\Tree_Report\Fig2_MWFE_DetailedTrees.mxd) 9/20/11 3:45:37 PM

Appendix A
PSC Mitigation Specifications

Tree and Shrub Mitigation Specifications

Inventory

1. Trees and shrubs anticipated to be cleared, including those that are considered invasive species or noxious weeds (*e.g.*, *Caragana arborescens*, *Elaeagnus angustifolia*, *Rhamnus cathartica*, *Tamarix chinensis*, *T. parviflora*, *T. ramosissima*, *Ulmus pumila*), shall be inventoried before cutting. The inventory shall record the location, number, and species of trees and shrubs.
2. In windbreaks, shelterbelts and other planted areas, trees or shrubs anticipated to be cleared, regardless of size, shall be inventoried for replacement.
3. In native growth areas, trees anticipated to be cleared that are 1 inch diameter at breast height ("dbh") or greater shall be inventoried for replacement.
4. In native growth areas, shrubs anticipated to be cleared in the permanent right-of-way shall be inventoried for replacement.
5. In native growth areas outside the permanent right-of-way, shrubs shall be cut flush with the surface of the ground, taking care to leave the naturally occurring seed bank and root stock intact. If soil disturbance is necessary, the native topsoil shall be preserved and replaced after construction. Shrubs shall be allowed to regenerate naturally where native topsoil is preserved and replaced. Where native topsoil is not preserved and replaced, shrubs anticipated to be cleared shall be inventoried for replacement.
6. In native growth areas, trees and shrubs may be inventoried by actual count or by sampling method that will properly represent the woody vegetation population. A sampling plan developed by the company, filed with the North Dakota Public Service Commission (NDPSC) and approved prior to the start of construction shall define the sampling method to be used for trees, for tall shrubs and for low shrubs. The data from the sample plots shall be extrapolated to the total acreage of the wooded area to be cleared to determine the species and quantity of trees and shrubs to be replaced.

Clearing for Construction

7. Trees and shrubs shall be selectively cleared, leaving mature trees and shrubs intact where practical.
8. The width of clear cuts through windbreaks, shelterbelts and all other wooded areas shall be limited to 50 feet or less unless otherwise approved by the NDPSC.
9. If the area of trees or shrubs actually cleared differs from the area inventoried, the difference in number of trees and shrubs to be replaced shall be noted on the inventory.

Replacement

10. Prior to tree/shrub replacement, documentation identifying the number and variety of trees removed as well as the mitigation plan for the proposed number, variety, type, location and date of replacement plantings shall be filed with the NSPSC for approval.
11. Tree replacement shall be on a 2 to 1 basis with 2-year-old saplings. Shrub replacement shall be on a 2 to 1 basis with stem cuttings.
12. Trees and shrubs shall be replaced by the same species or similar species suitable for North Dakota growing conditions as recommended by the North Dakota Forest Service.
13. Tree and shrub replacement shall not be conducted within a 20 to 30 foot wide path over the pipeline to facilitate visual inspections of the right-of-way in accordance with U.S. Department of Transportation safety regulations.
14. Landowners shall be given the option of having replacement trees/shrubs planted off the right-of-way on the landowner's property or waiving that requirement in writing and allowing those replacement trees/shrubs to be planted at alternative locations.
15. At the conclusion of the project, documentation identifying the actual number, variety, type, location and date of the replacement plantings shall be filed with the NDPSC.
16. Tree/shrub replacements shall be inspected once a year for three years, on about the anniversary of the plantings, and, on or shortly before October 1 of each year, a report shall be submitted to the NDPSC documenting the condition of replacement planting and any woodlands work completed. If after three years from the anniversary of the plantings the survival rate is less than 75%, the NDPSC may order additional planting(s).

Appendix B
Representative Site Photos



Site 159B: looking east at planted Siberian elm



Site 175: looking east at planted Russian olive



Site 340: looking east at planted redosier dogwood and native boxelder



Site 85B: looking northwest at east of side of Pheasant Lake



Site 292: looking south at cottonwood and black willow



Site 261A: looking southeast at green ash



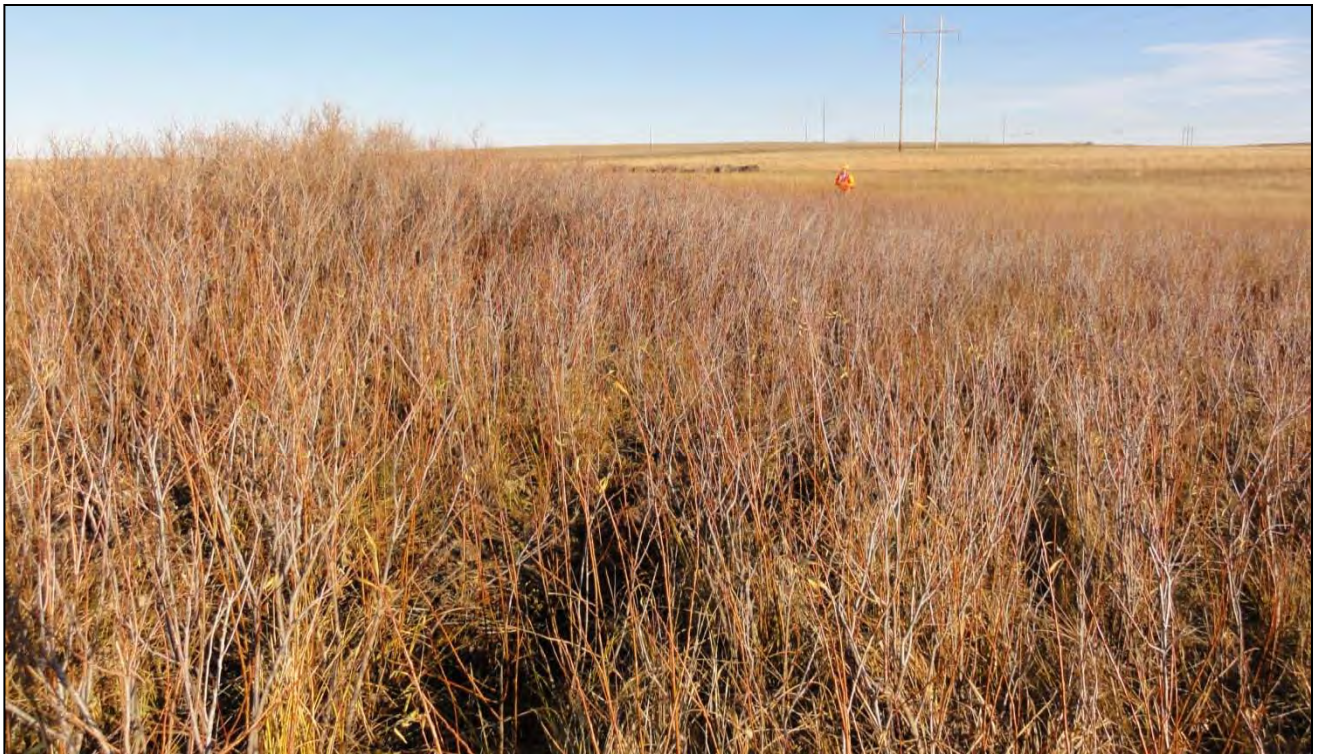
Site 431: looking northwest at native growth area



Site 161B: looking west at native growth area



Site 482: looking east at native growth area



Site 274: looking east as sandbar willow

Appendix C
Tree and Shrub Inventory Site Locations and Summary

Figure 2 - Index	Location				Species	Total Number	Growth Type		Size		Possibly Avoidable	Comments
	Site ID	Sec.	T.	R.			Planted	Native	Typical DBH (in)	Typical Height (ft)		
1	3	9	129	63	<i>Ulmus pumila</i>	7	yes	no	6 to 14	12 to 30	maybe	North end of single row of planted trees spaced 3 to 5 ft apart.
1	9	9	129	63	<i>Ulmus pumila</i>	3	yes	no	3, 8, 12	10 to 25	no	North end of single row of planted trees. Trees dying.
4	87	10	129	64	<i>Acer negundo</i>	2	no	yes	6, 10	20	no	Growing between two grain bins. Near west side of Pheasant Lake.
4	88	10	129	64	<i>Acer negundo</i>	1	no	yes	8	15	no	Growing near shed near west side of Pheasant Lake.
4	85A	11	129	64	<i>Cornus sericea</i>	1	yes	yes	<1	6	maybe	Multi-stemmed shrub.
					<i>Salix nigra</i>	4	no	yes	20	30	maybe	Some trees multi-stemmed. Along Pheasant Lake shoreline.
4	85B	11	129	64	<i>Juniperus virginiana</i>	1	yes	yes	4	15	no	Single tree in empty lot on Pheasant Lake.
					<i>Picea pungens</i>	1	yes	no	4	20	no	Single tree row in empty lot on Pheasant Lake.
					<i>Ulmus pumila</i>	28	yes	no	6 to 16	20 to 25	no	Tree row along NE side of empty lot on Pheasant Lake. 4 ft spacing.
4	85C	11	129	64	<i>Malus sp.</i>	1	yes	no	2	10	maybe	Single tree on empty lot on Pheasant Lake.
					<i>Ulmus pumila</i>	12	yes	no	8 to 12	20	maybe	Single E-W oriented row on east side of empty lot on Pheasant Lake.
4	85D	11	129	64	<i>Ulmus pumila</i>	8	yes	no	4 to 14	20	maybe	N-S oriented single tree row east of local road along Pheasant Lake.

Figure 2 - Index	Location				Species	Total Number	Growth Type		Size		Possibly Avoidable	Comments
	Site ID	Sec.	T.	R.			Planted	Native	Typical DBH (in)	Typical Height (ft)		
5	91A	10	129	64	<i>Acer negundo</i>	1	yes	yes	8	15	no	Abandoned farmstead.
					<i>Ulmus pumila</i>	3	yes	no	5	12	no	Abandoned farmstead.
5	91B	10	129	64	<i>Acer negundo</i>	32	yes	yes	8 to 16	25	no	Abandoned farmstead. Part of N-S oriented tree row 4 rows deep. Some multi-stemmed trees to 40 in DBH.
					<i>Syringa vulgaris</i>	2	yes	no	2	12	no	Abandoned farmstead. Part of N-S oriented tree row 4 rows deep. Multi-stemmed.
					<i>Ulmus pumila</i>	3	yes	no	5	15	no	Abandoned farmstead. Part of N-S oriented tree row 4 rows deep.
7	160	12	129	65	<i>Acer negundo</i>	1	no	yes	6	20	maybe	Adjacent to wetland.
					<i>Crataegus sp.</i>	7	no	yes	1 to 2	4 to 7	maybe	Adjacent to wetland.
7	159A	12	129	65	<i>Ulmus pumila</i>	7	yes	no	3 to 6	15	no	E-W oriented tree row planted 4 ft apart.
7	159B	12	129	65	<i>Ulmus pumila</i>	14	yes	no	6 to 10	20	maybe	N-S oriented double tree row on S side of section line; trees 4 ft apart.
7	161A	12	129	65	<i>Crataegus sp.</i>	64	no	yes	1 to 2	5 to 8	yes	Dense multi-stemmed shrubby trees growing on S slope of intermittent drainage.
7	161B	12	129	65	<i>Crataegus sp.</i>	24	no	yes	1 to 2	5 to 8	yes	Dense multi-stemmed shrubby trees growing on S slope of intermittent drainage.
8	175	11	129	65	<i>Elaeagnus angustifolia</i>	43	yes	no	4 to 6	15	no	E-W oriented tree row planted 6 to 10 ft apart. Located under existing 41 kV t-line.

Figure 2 - Index	Location				Species	Total Number	Growth Type		Size		Possibly Avoidable	Comments
	Site ID	Sec.	T.	R.			Planted	Native	Typical DBH (in)	Typical Height (ft)		
8	176	11	129	65	<i>Elaeagnus angustifolia</i>	27	yes	no	4 to 6	15	no	E-W oriented tree row planted 6 to 10 ft apart. Located under existing 41 kV t-line.
8	177	11	129	65	<i>Prunus virginica</i>	7	yes	yes	1 to 2	5 to 8	maybe	N-S oriented tree row. Multi-stemmed.
					<i>Ulmus pumila</i>	21	yes	no	8 to 12	20 to 25	maybe	N-S oriented tree row. Some trees multi-stemmed. 3 ft spacing.
8	173A	11	129	65	<i>Prunus virginica</i>	20	yes	yes	2 to 3	15	no	8 to 20 stems per tree.
8	173B	11	129	65	<i>Elaeagnus angustifolia</i>	28	yes	no	6 to 8	20 to 25	no	Planted 6 to 10 feet apart. 2 to 3 stems per tree.
8	173C	11	129	65	<i>Elaeagnus angustifolia</i>	24	yes	no	6 to 8	20 to 25	no	Planted 6 to 10 feet apart. 2 to 3 stems per tree.
8	173D	11	129	65	<i>Prunus virginica</i>	29	yes	yes	2 to 4	15	no	Multi-stemmed tree.
					<i>Prunus virginica</i>	25	yes	yes	<1	6 to 10	no	Multi-stemmed shrub.
8	174A	11	129	65	<i>Prunus virginica</i>	62	yes	yes	1 to 3	12	no	E-W oriented tree row. Located under existing 41 kV t-line. Multi-stemmed, 8 to 20 stems per tree.
8	174B	11	129	65	<i>Prunus virginica</i>	12	yes	yes	1 to 3	12	no	E-W oriented tree row. Located under existing 41 kV t-line. Multi-stemmed, 8 to 20 stems per tree.
8	174C	11	129	65	<i>Salix nigra</i>	1	yes	yes	14	15	no	5 stems. Located near existing 41 kV t-line.

Merricourt Wind Farm to Ellendale 230 kV Transmission Line

Figure 2 - Index	Location				Species	Total Number	Growth Type		Size		Possibly Avoidable	Comments
	Site ID	Sec.	T.	R.			Planted	Native	Typical DBH (in)	Typical Height (ft)		
9	213	9	129	65	<i>Ulmus pumila</i>	7	yes	no	4 to 12	20	no	N-S oriented single tree row with a few multi-stemmed trees. Planted 6 to 10 ft apart.
9	215	9	129	65	<i>Ulmus pumila</i>	21	yes	no	6 to 20	20 to 25	no	N-S oriented single tree row with a few multi-stemmed trees.
9	490	9	129	65	<i>Prunus virginica</i>	148	yes	yes	<1 to 2	5 to 8	no	N-S oriented shrubs growing under a row of planted <i>Ulmus pumila</i> . Multi-stemmed, typically 2 to 3 stems per shrub.
					<i>Ulmus pumila</i>	15	yes	no	3 to 20, most 14	20 to 25	no	N-S oriented single tree row passing under existing 41 kV line.
9	205A	9	129	65	<i>Salix nigra</i>	2	no	yes	14	20	no	Located at edge of drainage near section line road. Multi-stemmed trees are 60 in DBH. Trees 10 ft apart.
9	205B	9	129	65	<i>Populus deltoides</i>	4	no	yes	24 to 30	50	maybe	Located at edge of drainage near section line road. Trees area about 15 ft apart.
10	496	6	129	65	<i>Crataegus sp.</i>	2	no	yes	1 to 2	8	yes	Multi-stemmed 3 to 6 stems per plant. Native wooded ravine adjacent to ROW.
					<i>Fraxinus pennsylvanica</i>	3	no	yes	10 to 16	25 to 30	yes	Native wooded ravine adjacent to ROW.
11	430	6	129	65	<i>Crataegus sp.</i>	25	no	yes	2	4 to 7	maybe	Two small clumps of multi-stemmed hawthorn.

Figure 2 - Index	Location				Species	Total Number	Growth Type		Size		Possibly Avoidable	Comments
	Site ID	Sec.	T.	R.			Planted	Native	Typical DBH (in)	Typical Height (ft)		
11	431	6	129	65	<i>Acer negundo</i>	1	no	yes	5	20	yes	Tree growing in steep ravine.
					<i>Crataegus sp.</i>	97	no	yes	1 to 3	3 to 7	yes	Multi-stemmed shrubs growing on both slopes of a steep ravine.
					<i>Prunus virginica</i>	3	no	yes	2	10	yes	Shrubs growing within steep ravine.
11	470	1	129	66	<i>Crataegus sp.</i>	21	no	yes	1 to 3	4 to 7	maybe	In clump adjacent to east side of a wetland within LSB WPA. Multi-stemmed, 2 to 4 stems per plant.
11	471	1	129	66	<i>Crataegus sp.</i>	22	no	yes	2 to 3	8 to 10	no	In clump adjacent to wetland within LSB WPA. 1 to 2 stems per plant.
11	475	1	129	66	<i>Crataegus sp.</i>	5	no	yes	2	6	maybe	Multi-stemmed shrubs. 2 to 3 stems per plant. Within LSB WPA.
11	478	1	129	66	<i>Crataegus sp.</i>	1	no	yes	2	6	maybe	In heavily grazed pastured prairie.
11	479	6	129	65	<i>Crataegus sp.</i>	5	no	yes	1	4 to 5	yes	Clump of shrubs in pastured prairie.
11	482	6	129	65	<i>Crataegus sp.</i>	79	no	yes	1 to 3	5 to 9	no	Clump of trees under existing t-line in pastured prairie.
					<i>Prunus virginica</i>	33	no	yes	<1	3 to 4	no	Clump of trees under existing t-line in pastured prairie. Single stemmed.
11	492	6	129	65	<i>Crataegus sp.</i>	45	no	yes	1 to 2	5 to 7	yes	Clump at top of Coteau.
					<i>Fraxinus pennsylvanica</i>	3	no	yes	4 to 10	20	yes	Clump at top of Coteau.

Figure 2 - Index	Location				Species	Total Number	Growth Type		Size		Possibly Avoidable	Comments
	Site ID	Sec.	T.	R.			Planted	Native	Typical DBH (in)	Typical Height (ft)		
11	494	6	129	65	<i>Crataegus sp.</i>	1	no	yes	2	7	maybe	Single shrub at top of Coteau.
11	469A	1	129	66	<i>Crataegus sp.</i>	3	no	yes	1 to3	5 to 6	maybe	Patches in moderate quality prairie in LSB WPA.
11	469B	1	129	66	<i>Crataegus sp.</i>	1	no	yes	2	5	yes	Patches in moderate quality prairie in LSB WPA.
11	469C	1	129	66	<i>Crataegus sp.</i>	1	no	yes	2	5	no	Patches in moderate quality prairie in LSB WPA.
11	473A	1	129	66	<i>Crataegus sp.</i>	1	no	yes	1	4	no	Multi-stemmed shrubs. 2 to 3 stems per plant. Within LSB WPA in moderate quality prairie.
11	473B	1	129	66	<i>Crataegus sp.</i>	50	no	yes	1 to 3	6 to 10	no	Multi-stemmed shrubs. 2 to 3 stems per plant. Within LSB WPA in moderate quality prairie.
11	473C	1	129	66	<i>Crataegus sp.</i>	6	no	yes	2 to 3	4 to 8	maybe	Multi-stemmed shrubs. 2 to 3 stems per plant. Within LSB WPA in moderate quality prairie.
11	473D	1	129	66	<i>Crataegus sp.</i>	32	no	yes	2 to 3	7 to 12	no	Multi-stemmed shrubs. 2 to 3 stems per plant. Within LSB WPA in moderate quality prairie.
11	477A	6	129	65	<i>Crataegus sp.</i>	2	no	yes	2	6	yes	In heavily grazed pastured prairie.
11	477B	6	129	65	<i>Crataegus sp.</i>	1	no	yes	3	6	yes	In heavily grazed pastured prairie.

Figure 2 - Index	Location				Species	Total Number	Growth Type		Size		Possibly Avoidable	Comments
	Site ID	Sec.	T.	R.			Planted	Native	Typical DBH (in)	Typical Height (ft)		
11	481A	6	129	65	<i>Crataegus sp.</i>	24	no	yes	1 to 3	4 to 9	no	Clumps growing is heavily grazed prairie pasture.
11	481B	6	129	65	<i>Crataegus sp.</i>	1	no	yes	2	6	no	Clumps growing is heavily grazed prairie pasture.
11	481C	6	129	65	<i>Crataegus sp.</i>	1	no	yes	2	6	maybe	Clumps growing is heavily grazed prairie pasture.
11	483A	6	129	65	<i>Crataegus sp.</i>	11	no	yes	2 to 3	7 to 9	yes	Clumps growing is heavily grazed prairie pasture.
11	483B	6	129	65	<i>Crataegus sp.</i>	22	no	yes	1 to 2	4 to 8	no	Clumps growing is heavily grazed prairie pasture.
11	483C	6	129	65	<i>Crataegus sp.</i>	85	no	yes	1 to 3	4 to 10	no	Clumps growing is heavily grazed prairie pasture.
11	483D	6	129	65	<i>Crataegus sp.</i>	2	no	yes	2	6	maybe	Clumps growing is heavily grazed prairie pasture.
12	443	2	129	66	<i>Crataegus sp.</i>	16	no	yes	1 to 2	4 to 7	yes	Line of shrubs along south wetland slope.
12	449A	2	129	66	<i>Crataegus sp.</i>	31	no	yes	1 to 3	4 to 8	yes	Growing along steep wetland slopes. Multi-stemmed, 2 to 4 stems per plant.
12	449B	2	129	66	<i>Crataegus sp.</i>	3	no	yes	2	4 to 6	yes	Growing along steep wetland slopes.
12	449C	2	129	66	<i>Salix nigra</i>	1	no	yes	3	10	yes	Growing along steep wetland slopes.
14	389	27	130	66	<i>Acer negundo</i>	11	no	yes	8 to 10	15 to 25	no	Scattered spacing.
					<i>Prunus virginica</i>	20	no	yes	<1 to 2	8	no	Multi-stemmed clumps.
					<i>Salix pentandra</i>	5	yes	no	12 to 24	25	no	Some multi-stemmed trees to 60 in.

Merricourt Wind Farm to Ellendale 230 kV Transmission Line

Figure 2 - Index	Location				Species	Total Number	Growth Type		Size		Possibly Avoidable	Comments
	Site ID	Sec.	T.	R.			Planted	Native	Typical DBH (in)	Typical Height (ft)		
14	402	28	130	66	<i>Crataegus sp.</i>	1	no	yes	4	10	yes	Lone multi-stemmed tree in field.
15	359	21	130	66	<i>Prunus virginica</i>	21	no	yes	<1	4	yes	Multi-stemmed clumps along steep wetland slope.
16	339	16	130	66	<i>Acer negundo</i>	1	yes	yes	3	12	no	Part of N-S oriented tree row.
					<i>Lonicera tatarica</i>	13	yes	no	1	7 to 8	no	N-S oriented shrub row with multi-stemmed shrubs. 8 to 12 stems per shrub.
16	340	16	130	66	<i>Acer negundo</i>	4	yes	yes	3 to 5	12 to 15	maybe	Planted shrub row.
					<i>Cornus sericea</i>	5	yes	yes	<1	7	maybe	30 to 40 stems per shrub. Planted 4 ft apart.
16	348	16	130	66	<i>Prunus virginica</i>	22	no	yes	<1 to 2	5	maybe	Multi-stemmed clumps of 3 to 8. Adjacent to a lake.
16	337A	16	130	66	<i>Populus nigra</i>	4	yes	no	4	15	yes	E-W planted single tree row. 10 ft apart.
16	337B	16	130	66	<i>Fraxinus pennsylvanica</i>	1	yes	yes	1	8	yes	E-W planted single tree row.
					<i>Picea glauca</i>	1	yes	no	2	5	yes	E-W planted single tree row.
16	337C	16	130	66	<i>Elaeagnus angustifolia</i>	3	yes	no	2 to 3	8 to 12	no	E-W planted about 15 feet apart.
16	337D	16	130	66	<i>Lonicera tatarica</i>	7	yes	no	1	6	no	E-W planted multi-stem shrubs about 4 ft apart.
17	298	5	130	66	<i>Salix nigra</i>	1	no	yes	12	12	maybe	Single tree leaning over wetland.
17	302	5	130	66	<i>Salix nigra</i>	1	no	yes	12	20	no	Single 2-stemmed tree in wetland.

Figure 2 - Index	Location				Species	Total Number	Growth Type		Size		Possibly Avoidable	Comments
	Site ID	Sec.	T.	R.			Planted	Native	Typical DBH (in)	Typical Height (ft)		
18	270	6	130	66	<i>Salix exigua</i>	530	no	yes	<1	5 to 8	no	Broad area of multi-stemmed shrubs. 6 to 12 stems per plant. Area about 20 ft wide surrounding most of wetland.
					<i>Salix nigra</i>	12	no	yes	10 to 12	20 to 25	no	PFO wetland with <i>Salix nigra</i> and dead cottonwood trucks. 20 wide <i>Salix exigua</i> fringe
18	274	6	130	66	<i>Salix exigua</i>	900	no	yes	<1	3 to 6	no	Broad area of multi-stemmed shrubs. 4 to 8 stems per plant. Located on fringe of PEMB wetland.
18	292	5	130	66	<i>Populus deltoides</i>	1	no	yes	20	40	no	Trees in middle of wetland due to recent increase in wetland depth. Tree likely hydrologically stressed.
					<i>Salix nigra</i>	3	no	yes	10	15 to 20	no	Trees in middle of wetland due to recent increase in wetland depth.
19	254	1	130	67	<i>Acer negundo</i>	4	no	yes	3 and 14	12 and 20	maybe	Adjacent to open water wetland. Three 3 in DBH trees and one 14 in DBH.
					<i>Prunus virginica</i>	6	no	yes	3	10	maybe	Single clump adjacent to open water wetland.
					<i>Prunus virginica</i>	26	no	yes	1	4 to 6	maybe	Multi-stem clumps of 3 to 5 stems adjacent to open water wetland.
					<i>Ulmus pumila</i>	1	no	no	1	8	maybe	Adjacent to open water wetland.

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Figure 2 - Index	Location				Species	Total Number	Growth Type		Size		Possibly Avoidable	Comments
	Site ID	Sec.	T.	R.			Planted	Native	Typical DBH (in)	Typical Height (ft)		
19	261A	1	130	67	<i>Fraxinus pennsylvanica</i>	24	yes	yes	5 to 18	25 to 30	maybe	Scattered tree rows. Most trees in 6 to 8 in DBH range.
					<i>Populus deltoides</i>	1	yes	yes	38	50	maybe	Single large cottonwood within planted green ash tree rows.
19	261B	1	130	67	<i>Fraxinus pennsylvanica</i>	1	yes	yes	5	20	no	Stubby single tree.