

**Aquatic Resources Inventory
Badger Wind Energy Project
McIntosh County, North Dakota**



Prepared for:

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TABLE OF CONTENTS

INTRODUCTION 1
STUDY AREA 1
METHODS 3
RESULTS 4
 Wetlands 4
 Waterbodies 7
CONCLUSIONS 8
REFERENCES 8

LIST OF TABLES

Table 1. Summary of all field delineated wetlands in the Badger Wind Energy Project Area, McIntosh County, North Dakota **Error! Bookmark not defined.**
Table 2. Summary of all field delineated waterbodies in the Badger Wind Energy Project Area, McIntosh County, North Dakota **Error! Bookmark not defined.**

LIST OF FIGURES

Figure 1. Location of the Badger Wind Energy Project in Logan and McIntosh counties, North Dakota 2
Figure 2. Results of the National Wetland Inventory and National Hydrography Dataset review for the Badger Wind Energy Project in Logan and McIntosh counties, North Dakota 5

LIST OF APPENDICES

- Appendix A. Field Delineated Wetland Maps
- Appendix B. US Army Corps of Engineers Great Plains Region Datasheets and Photographs
- Appendix C. Waterbody Photographs

INTRODUCTION

Badger Wind, LLC is proposing the development of a 52,305-acre (ac; 21,167 hectares [ha]) wind energy facility called the Badger Wind Energy Project (Project), in Logan and McIntosh counties, North Dakota. The Project is located approximately two miles (mi; 3.2 kilometers [km]) west of Wishek, North Dakota (Figure 1). To support development of the Project, Badger Wind, LLC contracted Western EcoSystems Technology, Inc. (WEST) to conduct an aquatic resources inventory (ARI) for the portion of the Project occurring within McIntosh County (WEST Survey Area: Figure 1). The objective of the ARI was to identify and delineate locations of wetlands and waterbodies within this portion of the Project.

STUDY AREA

The Project lies within the Northwestern Glaciated Plains Level III Ecoregion, an ecoregion dominated by mixed-grass prairie (USEPA 2013). The majority of land within the Project has been converted to crop (e.g., soy, sunflower) and pasture for livestock grazing. The Project will be sited entirely on private lands. Topography within the Project ranges from relatively flat to rolling hills and elevations range from 2,020 to 2,120 feet (ft; 615 to 646 meters [m]). Overall, the Project drains to the southwest and to the north, into South Branch Beaver Creek and Beaver Creek, tributaries to the Missouri River. The Project contains numerous unnamed drainages, a couple of which may have intermittent or perennial flow regimes. Primary land uses in the Project include agriculture and livestock grazing.

Badger Wind Energy Project Aquatic Resources Inventory Report

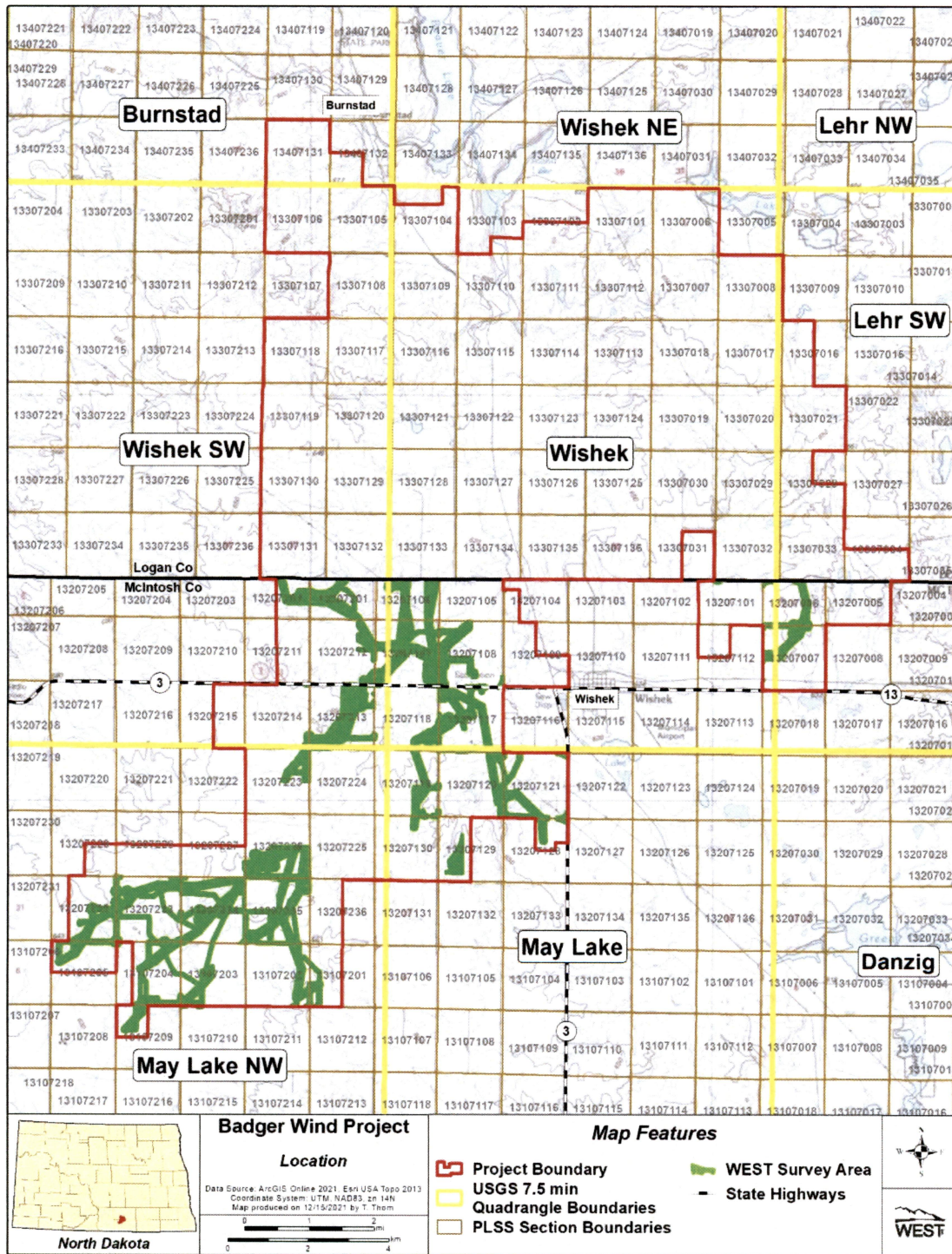


Figure 1. Location of the Badger Wind Energy Project in Logan and McIntosh counties, North Dakota.

METHODS

Prior to conducting fieldwork WEST completed a desktop review of US Geological Survey (USGS) topographic maps, soil survey information from the Natural Resource Conservation Service (NRCS), US Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) maps, and the US Geological Survey (USGS) National Hydrography Dataset (NHD; USGS NHD 2017). Based on this review, all areas identified as potentially being wetlands or waters of the US (WOTUS) were targeted for field verification.

Wetlands were delineated in accordance with the 1987 *Corps of Engineers Wetlands Delineation Manual* (US Army Corps of Engineers [USACE] 1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Great Plains (Version 2.0)* (USACE 2010). The 1987 manual outlines a three parameter approach for an area to be considered a wetland, in which all three parameters must be met. Hydrophytic plants must be the dominant vegetative cover, hydric soils must be present, and wetland hydrology must be present. Wetland plant indicator status was determined using the USACE National Wetland Plant List (USACE 2020). The delineated wetlands were classified according to methodologies set forth in *Wetlands and Deepwater Habitats of the United States* (Cowardin et al. 1979). Paired sample plots (wetland and upland) were evaluated and USACE regional datasheets were completed for each wetland encountered. Plots were located in areas that best represented the vegetation, soils, and hydrology of the site. Photographs were recorded for all wetlands identified within the Project area. Wetland limits and sample points were surveyed using a Trimble Geo 7x global positioning system (GPS) with sub-foot accuracy. Each mapped wetland was assigned a unique ID, starting with “w”, followed by the delineator’s initials, and then the feature number (e.g., w-kf-001). The wetland sample point was identified by a “_w” at the end of the wetland ID and the upland point by a “_u” (e.g., w-kf-001_w).

All drainage features and other waterbodies (e.g., stock ponds) within the Project area, including those identified in the NWI and NHD datasets, were examined for inclusion as potential WOTUS. The field review was focused on the presence of a definable bed and bank, ordinary high water mark (OHWM), downstream surface connection to WOTUS, evidence of flow, and/or presence of areas that meet the USACE criteria for wetlands. If present, the OHWM of each of these features was recorded with GPS. These features were delineated and documented in a similar manner as wetlands. Each waterbody feature possessing an OHWM was assigned its own unique ID: linear drainages were assigned an “s”, followed by delineator’s initials and then a feature number (e.g., s-kf-001); open water/stock ponds were assigned an “o”, followed by delineator’s initials and then a feature number (e.g., o-kf-001). All NWI polygons or NHD blue lines that intersected the Project but clearly did not meet the definition of a wetland or WOTUS were photo documented and a non-WOTUS point was collected. Such points were identified with a “no” followed by the delineator’s initials and then a feature number (e.g., no-kf-001).

Field surveys were conducted in October 2021 by WEST wetland ecologists Alex Brazeal and Kurt Flaig. The survey corridors for the proposed infrastructure were provided as shapefiles on October 6, 2021. The survey area (Figure 1 – WEST Survey Area) comprised 3,462 ac (1,401 ha) and consisted of the following Project infrastructure and associated buffers:

- 300-foot radius centered around turbines
- 200-foot wide corridor for turbine access roads
- 100-foot wide corridor for crane walk paths
- 150-foot wide corridor for all underground collection lines

Shapefiles depicting these corridors were loaded onto handheld GPS units and used in the field to ensure survey area boundaries were accurately identified and included in the survey. NWI polygons and NHD blue lines were also loaded onto GPS for accurate field-verification.

RESULTS

Wetlands

Seventy-four wetlands, totaling 80.2 ac (32.5 ha), were identified and delineated during the field investigation (Table 1, Appendix A). Detailed maps of wetland locations are provided in Appendix A. Table 1 provides a summary of wetland classifications and acreages. All of the 74 wetlands were classified as Palustrine Emergent (PEM) wetlands. Fifty-eight of the wetlands occurred along drainages and 16 in depressions/ponds. Fifty-five of the drainage wetlands and nine of the depressional wetlands appeared to have a downstream connection to WOTUS. All other wetlands had no apparent outlets. Wetland determination data forms and photographs of wetlands are provided in Appendix B.

Vegetation

The most common wetland species encountered in the 74 wetlands delineated within the Project area were prairie cordgrass (*Spartina pectinata*; FACW), creeping spikerush (*Eleocharis palustris*; OBL), foxtail barley (*Hordeum jubatum*; FACW), reed canary-grass (*Phalaris arundinacea*; FACW), pale smartweed (*Persicaria lapathifolia*; OBL), and Northwest territory sedge (*Carex utriculata*; OBL). Dominant vegetation recorded in upland sample plots included smooth brome (*Bromus inermis*; UPL), Kentucky bluegrass (*Poa pratensis*; FACU), annual bluegrass (*Poa annua*; FACU), Canada thistle (*Cirsium arvense*; FACU), and wheat (*Triticum aestivum*; UPL).

Hydrology

All, or a combination of saturation, high water table, and surface water were the primary hydrologic indicators for wetlands. Other hydrology indicators noted during the field investigation were geomorphic position and FAC-neutral test.

Soils

Soil colors were predominantly dark (e.g., 10 YR 2/1) and included redox concentrations. The primary field hydric soil indicator used was redox dark surface. The majority of the soils were silt loams, loams, and clay loams. In addition to a transition from wetland to upland vegetation, the primary characteristic used to distinguish wetland/upland boundaries, and soils, was the presence/absence of redox concentrations, as upland sample points often featured low chromas.

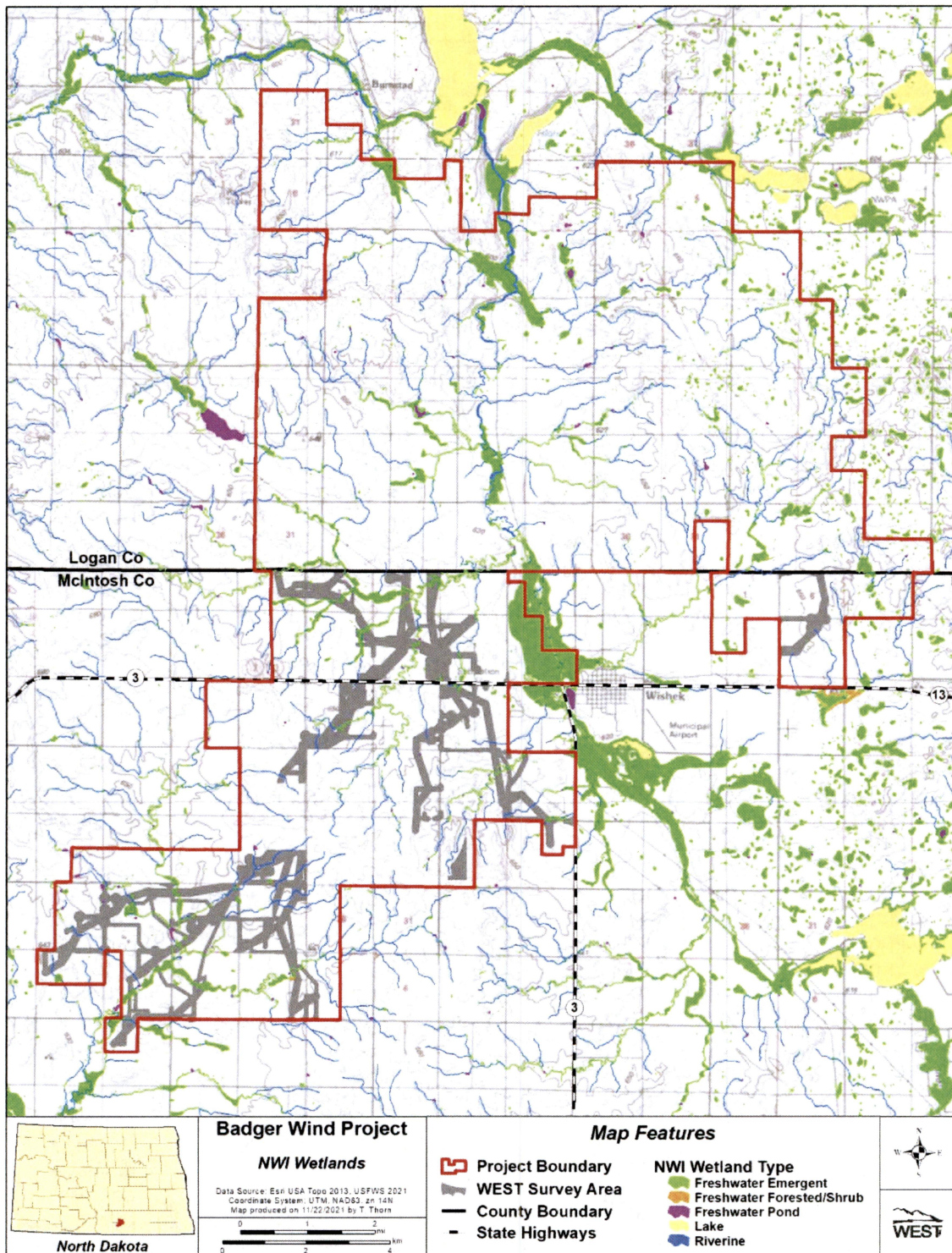


Figure 2. Results of the National Wetland Inventory and National Hydrography Dataset review for the Badger Wind Energy Project in Logan and McIntosh counties, North Dakota.

Badger Wind Energy Project Aquatic Resources Inventory Report

Table 1. Summary of all field delineated wetlands in the Badger Wind Energy Project Area, McIntosh County, North Dakota.

Aquatic Feature ID	Acres	Cowardin Classification	Lat/Long	Landform
w-kf-001a	1.02	PEM	46.186502/-99.701728	drainage
w-kf-001b	0.20	PEM	46.187257/-99.704235	drainage
w-kf-002	0.17	PEM	46.187273/-99.689287	depression
w-kf-003a	0.32	PEM	46.198478/-99.650036	drainage
w-kf-003b	0.65	PEM	46.198464/-99.652515	drainage
w-kf-003c	1.70	PEM	46.196627/-99.652454	drainage
w-kf-004	2.16	PEM	46.212857/-99.657487	drainage
w-kf-005	0.12	PEM	46.216700/-99.660199	depression
w-kf-006	0.17	PEM	46.219863/-99.650156	drainage
w-kf-007a	0.29	PEM	46.220059/-99.662332	drainage
w-kf-007b	1.50	PEM	46.218390/-99.665150	drainage
w-kf-007c	0.04	PEM	46.219359/-99.663551	drainage
w-kf-007d	1.33	PEM	46.219908/-99.664496	drainage
w-kf-007e	0.13	PEM	46.218169/-99.670039	drainage
w-kf-007f	1.11	PEM	46.216596/-99.667799	drainage
w-kf-008	0.92	PEM	46.212869/-99.669954	depression
w-kf-009a	1.21	PEM	46.215263/-99.670899	drainage
w-kf-009b	0.50	PEM	46.208798/-99.673650	drainage
w-kf-009c	0.08	PEM	46.209344/-99.674806	drainage
w-kf-009d	0.43	PEM	46.211414/-99.678719	drainage
w-kf-009e	0.13	PEM	46.209852/-99.669876	drainage
w-kf-010	0.17	PEM	46.200814/-99.680486	drainage
w-kf-011	3.53	PEM	46.194825/-99.682290	drainage
w-kf-012	0.03	PEM	46.187416/-99.704931	depression
w-kf-014a	0.14	PEM	46.192419/-99.703007	drainage
w-kf-014b	0.18	PEM	46.193165/-99.702253	drainage
w-kf-014c	0.38	PEM	46.197680/-99.694066	drainage
w-kf-015	0.02	PEM	46.212266/-99.711265	depression
w-kf-016	0.29	PEM	46.215208/-99.711634	depression
w-kf-017	0.07	PEM	46.215109/-99.711030	drainage
w-kf-018a	1.32	PEM	46.213259/-99.702418	depression
w-kf-018b	1.03	PEM	46.213806/-99.701298	depression
w-kf-018c	0.36	PEM	46.211848/-99.702344	depression
w-kf-019	0.35	PEM	46.209931/-99.696108	drainage
w-kf-020a	0.13	PEM	46.216075/-99.688580	drainage
w-kf-020b	4.00	PEM	46.213841/-99.689249	drainage
w-kf-020c	0.89	PEM	46.212567/-99.688388	drainage
w-kf-021a	0.40	PEM	46.207687/-99.688047	drainage
w-kf-021b	0.39	PEM	46.208142/-99.688159	drainage
w-kf-021c	0.64	PEM	46.203100/-99.688177	drainage
w-kf-021d	0.63	PEM	46.202993/-99.686962	drainage
w-kf-021e	1.13	PEM	46.206265/-99.689829	drainage
w-kf-021f	0.29	PEM	46.207003/-99.691507	drainage
w-kf-022	0.18	PEM	46.204782/-99.685965	depression
w-kf-023a	0.51	PEM	46.249700/-99.641230	drainage
w-kf-023b	1.43	PEM	46.249717/-99.638501	drainage
w-kf-024a	1.00	PEM	46.267498/-99.615096	drainage
w-kf-024b	0.07	PEM	46.267433/-99.615679	drainage
w-kf-024c	0.21	PEM	46.267113/-99.616890	drainage
w-kf-025	0.21	PEM	46.265303/-99.602051	drainage
w-ab-001	0.05	PEM	46.259954/-99.607607	depression

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Table 1. Summary of all field delineated wetlands in the Badger Wind Energy Project Area, McIntosh County, North Dakota.

Aquatic Feature ID	Acres	Cowardin Classification	Lat/Long	Landform
w-ab-002	0.71	PEM	46.259647/-99.608002	depression
w-ab-003	5.93	PEM	46.281252/-99.610054	drainage
w-ab-004	6.15	PEM	46.282417/-99.658718	drainage
w-ab-005	0.15	PEM	46.244117/-99.614070	depression
w-ab-006	1.44	PEM	46.246689/-99.591617	drainage
w-ab-007	2.27	PEM	46.244168/-99.566757	depression
w-ab-008	0.11	PEM	46.230061/-99.568352	depression
w-ab-009	0.04	PEM	46.231629/-99.566225	drainage
w-ab-010	1.56	PEM	46.230563/-99.574234	drainage
w-ab-010a	0.65	PEM	46.229909/-99.574851	drainage
w-ab-011	4.12	PEM	46.233429/-99.578893	drainage
w-ab-012	0.94	PEM	46.230969/-99.576517	depression
w-ab-013	0.70	PEM	46.244212/-99.581712	drainage
w-ab-014	1.02	PEM	46.267346/-99.632490	drainage
w-ab-014a	6.68	PEM	46.269694/-99.632577	drainage
w-ab-015	0.88	PEM	46.241517/-99.586945	drainage
w-ab-015a	1.74	PEM	46.240596/-99.589374	drainage
w-ab-015b	1.16	PEM	46.241198/-99.590174	drainage
w-ab-016	3.48	PEM	46.276267/-99.619254	drainage
w-ab-016a	1.44	PEM	46.279325/-99.618500	drainage
w-ab-017	3.57	PEM	46.276653/-99.640700	drainage
w-ab-017a	0.50	PEM	46.279055/-99.635435	drainage
w-ab-018	0.77	PEM	46.282601/-99.637819	drainage

Waterbodies

Seven waterbodies were delineated in the Project area during the field investigation (Table 2, Appendix A). Three of the waterbodies represented a single drainage that was documented in three different locations (s-kf-001a, s-kf-001b, s-kf-001c). An OHWM was present at the three locations and the drainage had an apparent downstream connection to WOTUS. The OHWM was identified by the break in slope along the outer boundary of the active channel. The remaining four waterbody features were depressions/ponds with no outlets.

Numerous (35) drainage features identified in the NWI/NHD review as blue line streams were evaluated in the field and determined to be lacking characteristics of WOTUS. Specifically, these drainages did not possess an OHWM and were composed of upland vegetation. Such drainages were recorded with GPS as non-WOTUS (“no”) points and were photo documented. Detailed maps of waterbody locations are provided in Appendix A; waterbody photographs are provided in Appendix C.

Table 2. Summary of all field delineated waterbodies in the Badger Wind Energy Project Area, McIntosh County, North Dakota.

Aquatic Feature ID	Acres	Linear Feet	Type	Lat/Long	Regime
s-kf-001a	0.18	222	stream	46.191195/-99.702343	perennial
s-kf-001b	0.07	206	stream	46.192292/-99.703131	perennial
s-kf-001c	0.27	600	stream	46.197929/-99.694481	perennial

Table 2. Summary of all field delineated waterbodies in the Badger Wind Energy Project Area, McIntosh County, North Dakota.

Aquatic Feature ID	Acres	Linear Feet	Type	Lat/Long	Regime
o-kf-001	0.12	n/a	depression	46.212188/-99.711427	n/a
o-kf-002	0.01	n/a	depression	46.206356/-99.722226	n/a
o-kf-003	0.18	n/a	depression	46.213637/-99.700285	n/a
o-ab-001	0.12	n/a	depression	46.268719/-99.495109	n/a

CONCLUSIONS

Based on the field delineation results, 74 wetlands and seven waterbodies occur within the Project area. The majority of these features appeared to have a downstream connection to a WOTUS. Thirty-five drainage features were determined to lack an OHWM and apparent downstream connection to a WOTUS. Final jurisdictional status of wetlands and waterbodies occurring in the Project area is the sole responsibility of the USACE.

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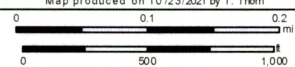
Appendix A. Field Delineated Wetland Maps



Badger Wind Project

**Water Features
Survey Results**

Data Source: NAIP 2020
 Coordinate System: UTM, NAD83, zone 14N
 Map produced on 10/23/2021 by T. Thorn

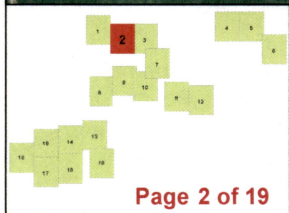
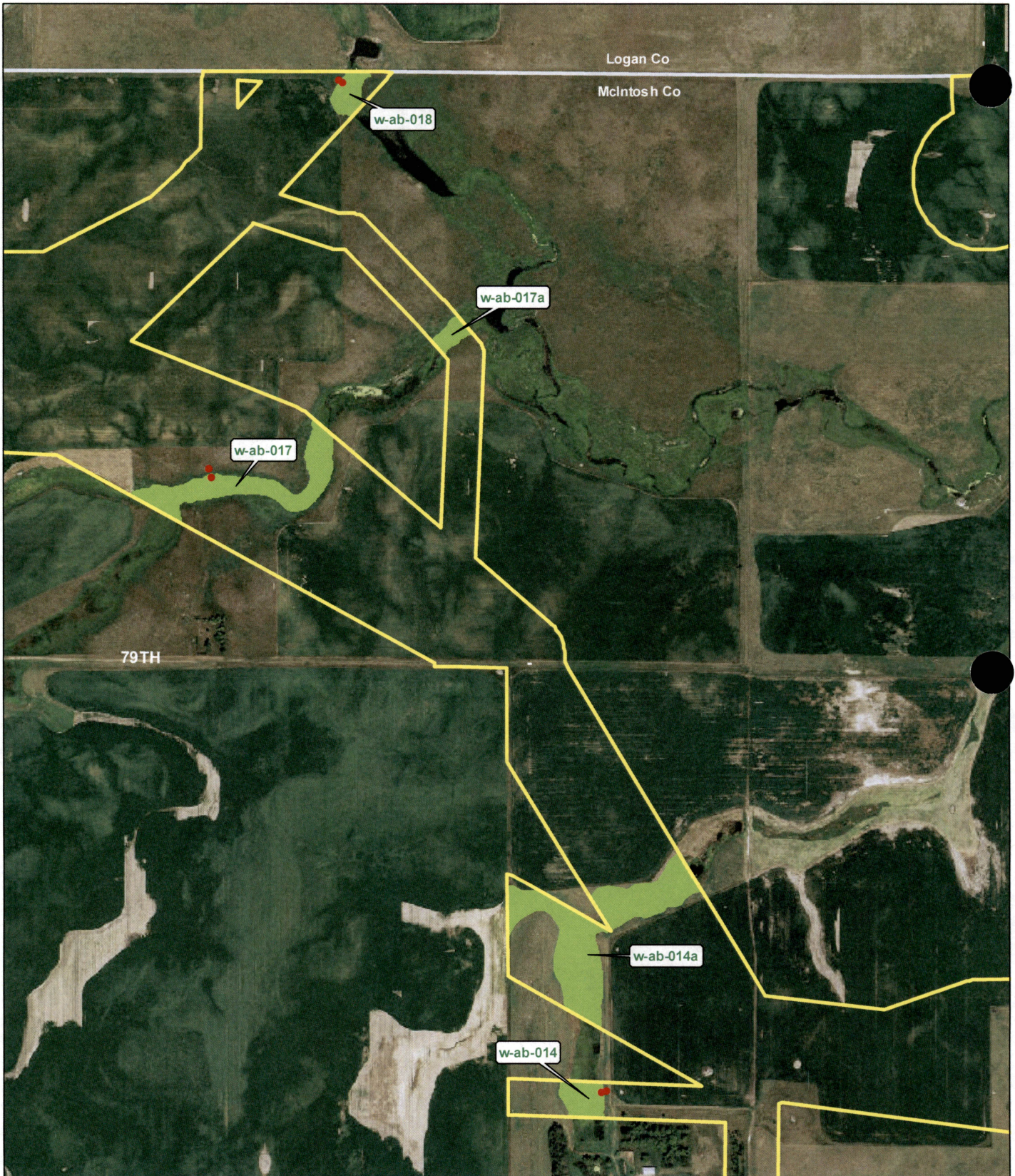


- WEST Delineated
Wetlands/Water Features**
- Survey Area
 - Wetlands
 - Other Water Features

Map Features

- Wetland/Upland Sample Points
- Non WOTUS Points
- County Boundary
- State Highway



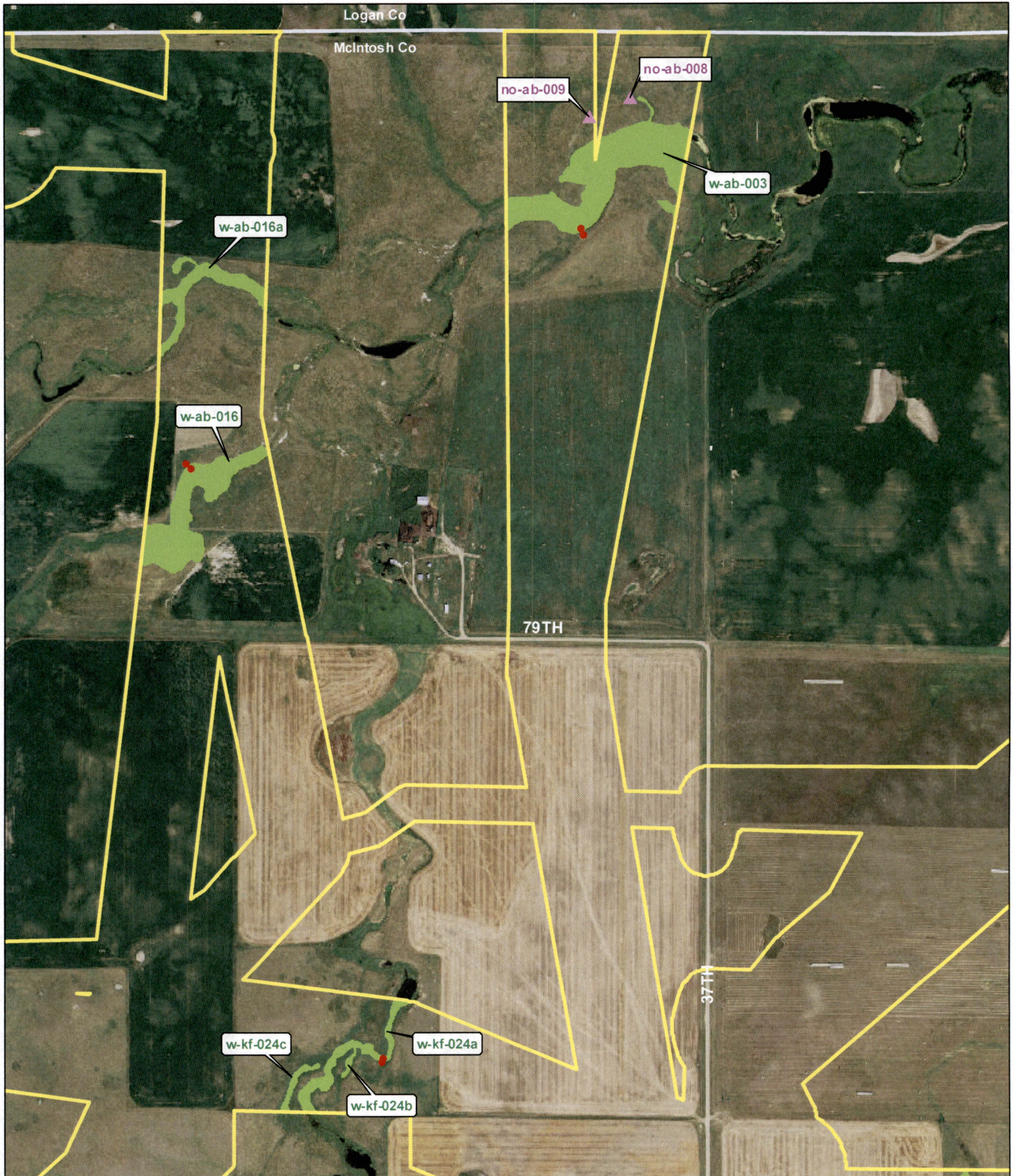


Badger Wind Project
Water Features
Survey Results

Data Source: NAIP 2020
 Coordinate System: UTM, NAD83, zn 14N
 Map produced on 10/23/2021 by T. Thom

Map Features

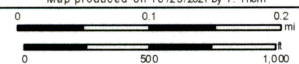
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Badger Wind Project

**Water Features
Survey Results**

Data Source: NAIP 2020
 Coordinate System: UTM, NAD83, 2n 14N
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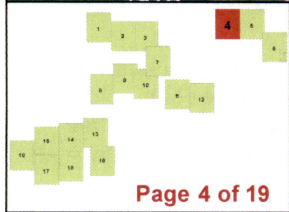


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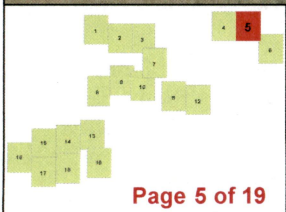


Badger Wind Project
Water Features
Survey Results

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Map Features

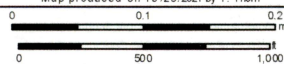
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Badger Wind Project

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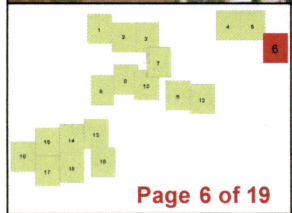
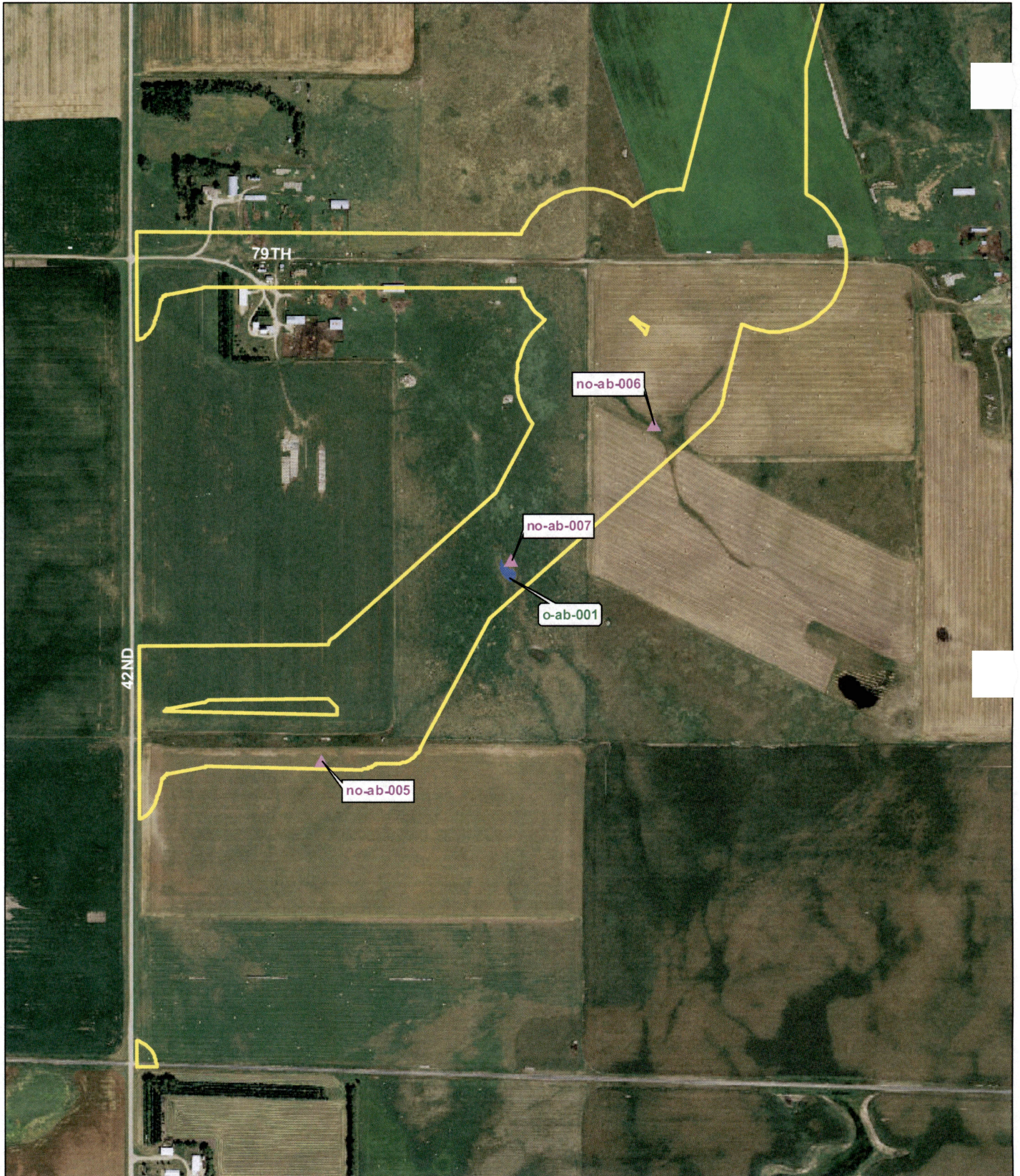


- WEST Delineated
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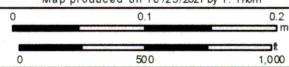




Badger Wind Project

**Water Features
Survey Results**

Data Source: NAIP 2020
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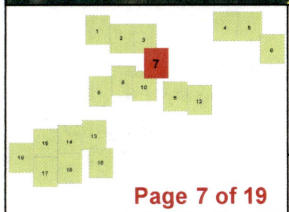
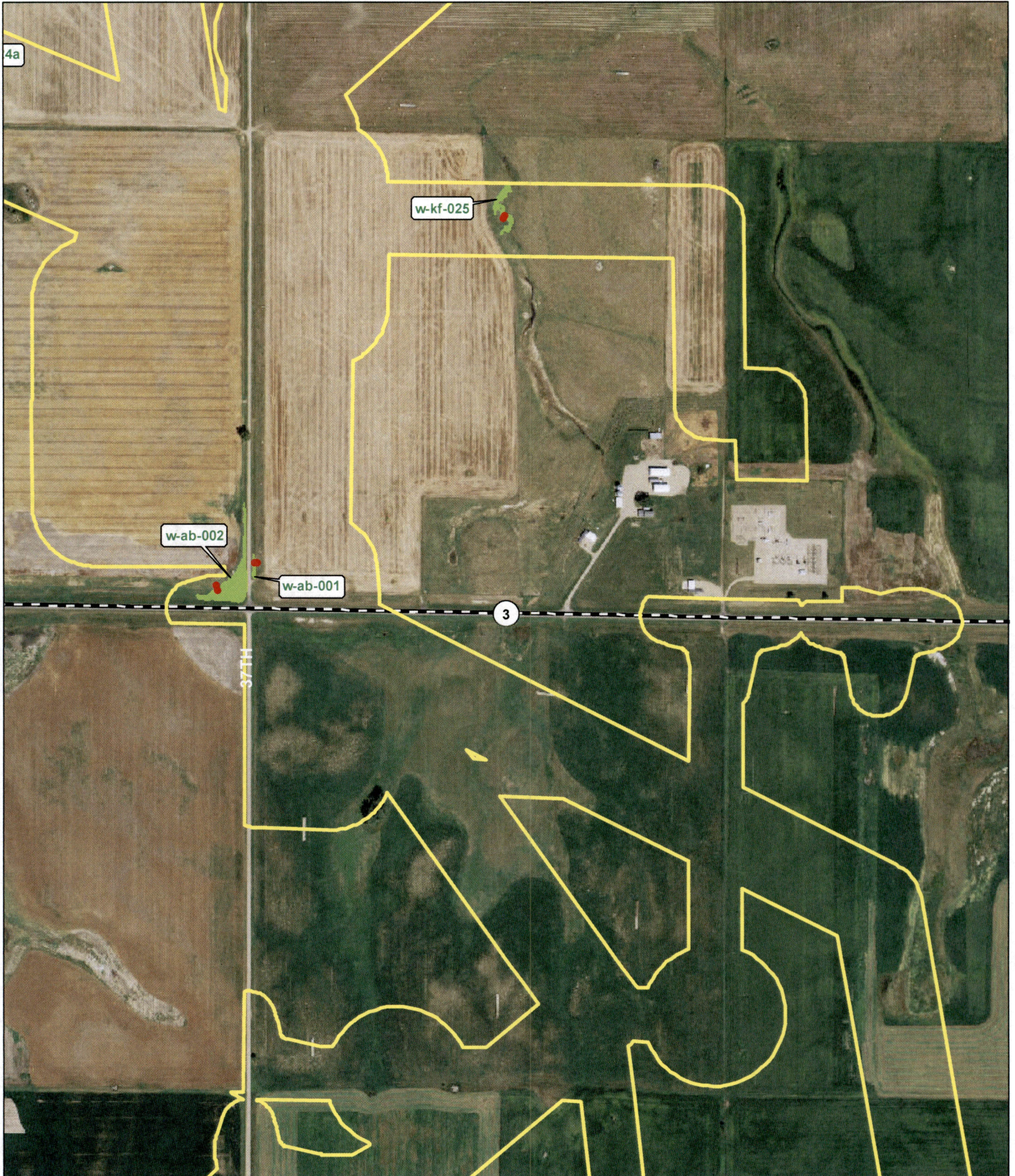


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- Non WOTUS Points
- County Boundary
- State Highway

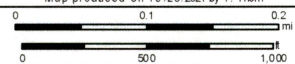




Badger Wind Project

**Water Features
Survey Results**

Data Source: NAIP 2020
 Coordinate System: UTM, NAD83, ZN 14N
 Map produced on 10/23/2021 by T. Thom

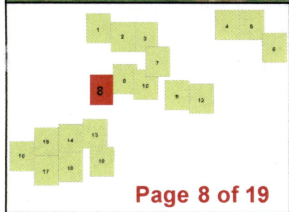
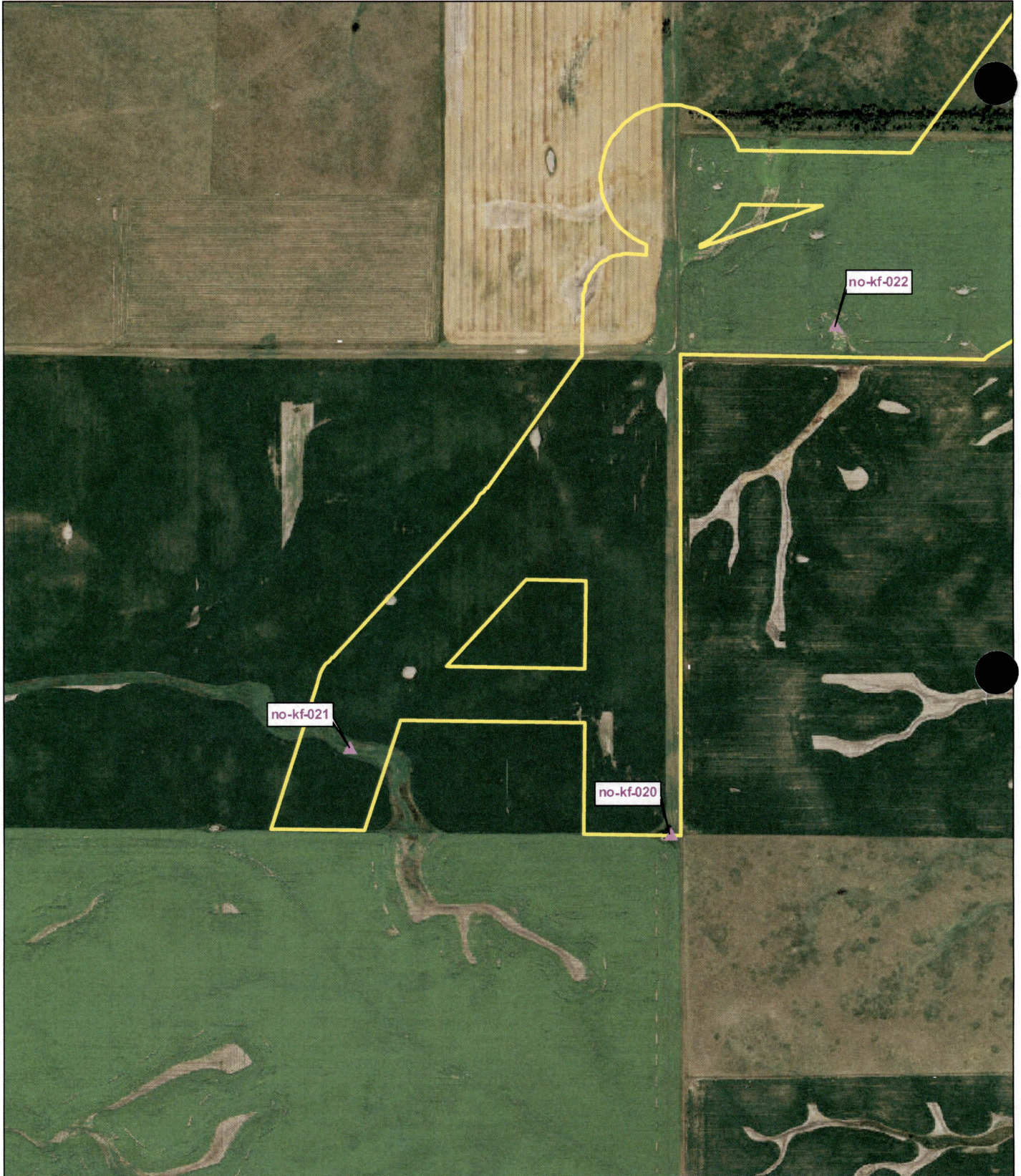


- WEST Delineated
Wetlands/Water Features**
- Survey Area
 - Wetlands
 - Other Water Features

Map Features

- Wetland/Upland Sample Points
- Non WOTUS Points
- County Boundary
- State Highway

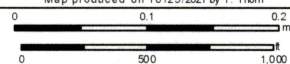




Badger Wind Project

**Water Features
Survey Results**

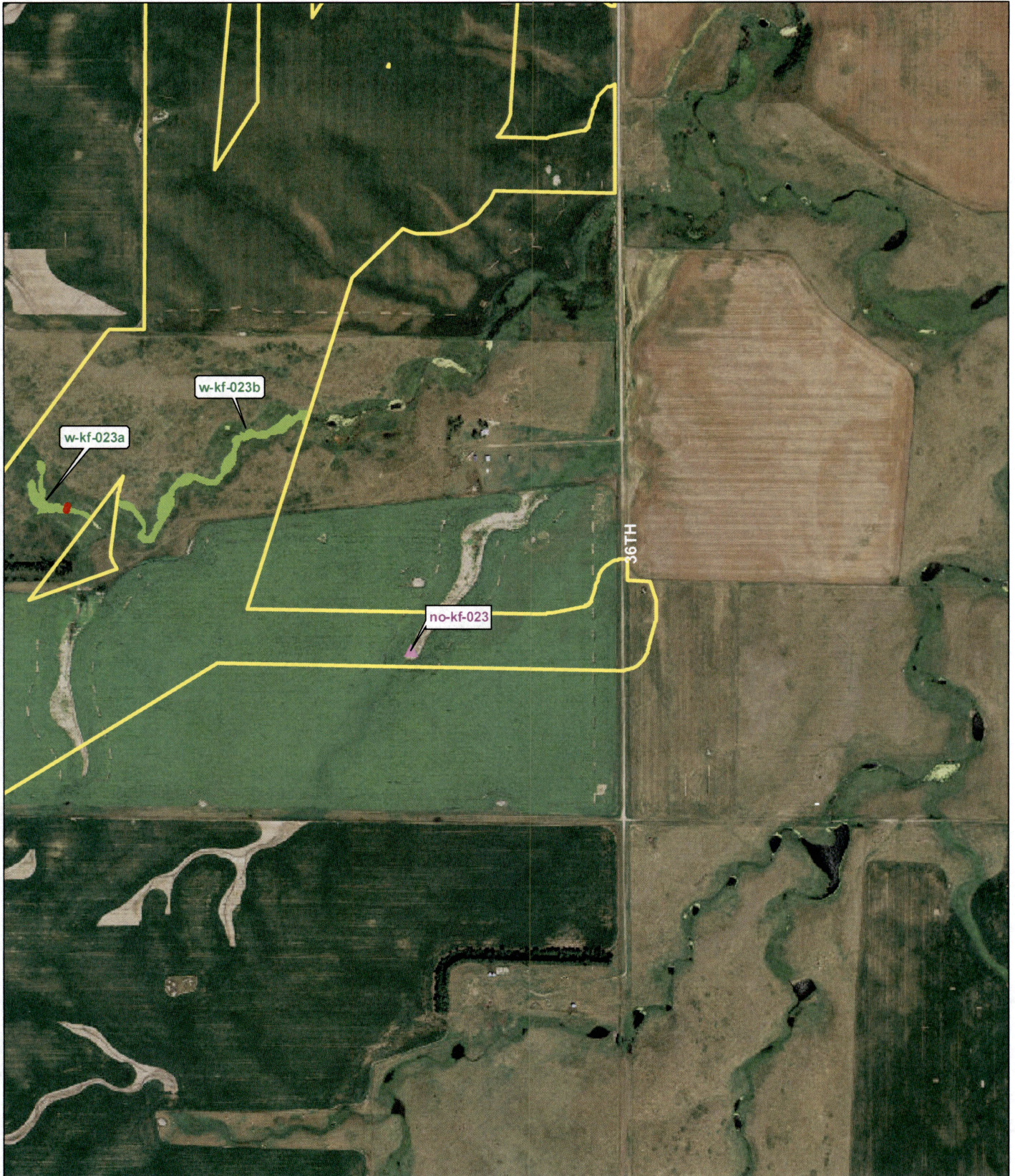
Data Source: NAIP 2020
 Coordinate System: UTM, NAD83, zn 14N
 Map produced on 10/23/2021 by T. Thom



- Map Features**
- Survey Area
 - WEST Delineated Wetlands/Water Features**
 - Wetlands
 - Other Water Features

- Wetland/Upland Sample Points
- Non WOTUS Points
- County Boundary
- State Highway

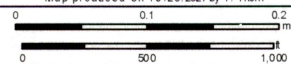




Badger Wind Project

**Water Features
Survey Results**

Data Source: NAIP 2020
 Coordinate System: UTM, NAD83, zn 14N
 Map produced on 10/23/2021 by T. Thom

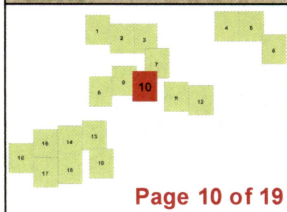
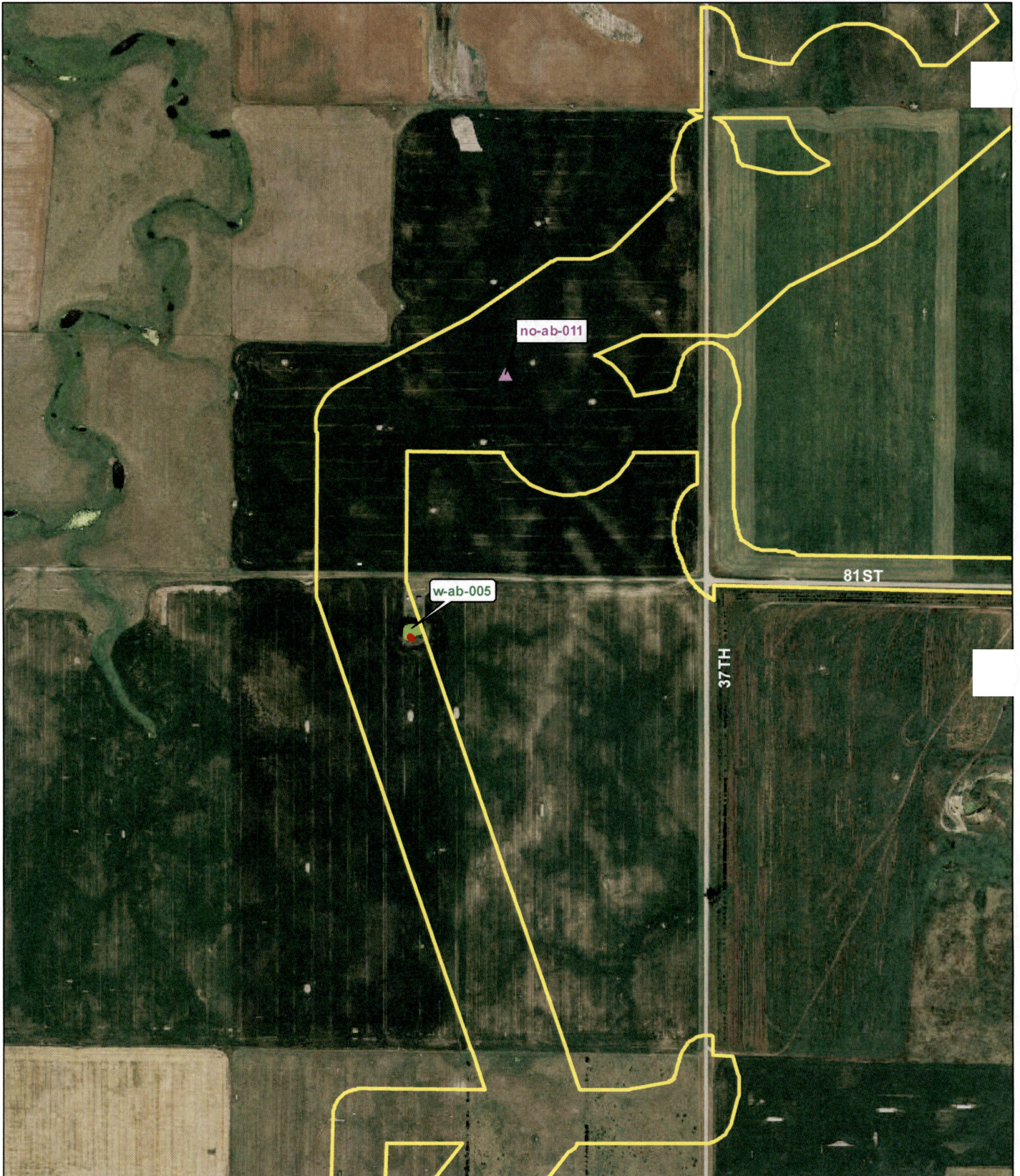


- Survey Area
- WEST Delineated**
- Wetlands/Water Features
- Wetlands
- Other Water Features

Map Features

- Wetland/Upland Sample Points
- Non WOTUS Points
- County Boundary
- State Highway

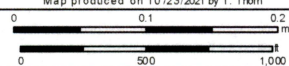




Badger Wind Project

**Water Features
Survey Results**

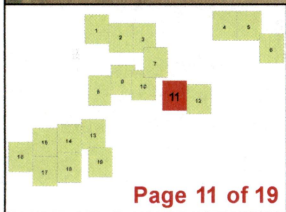
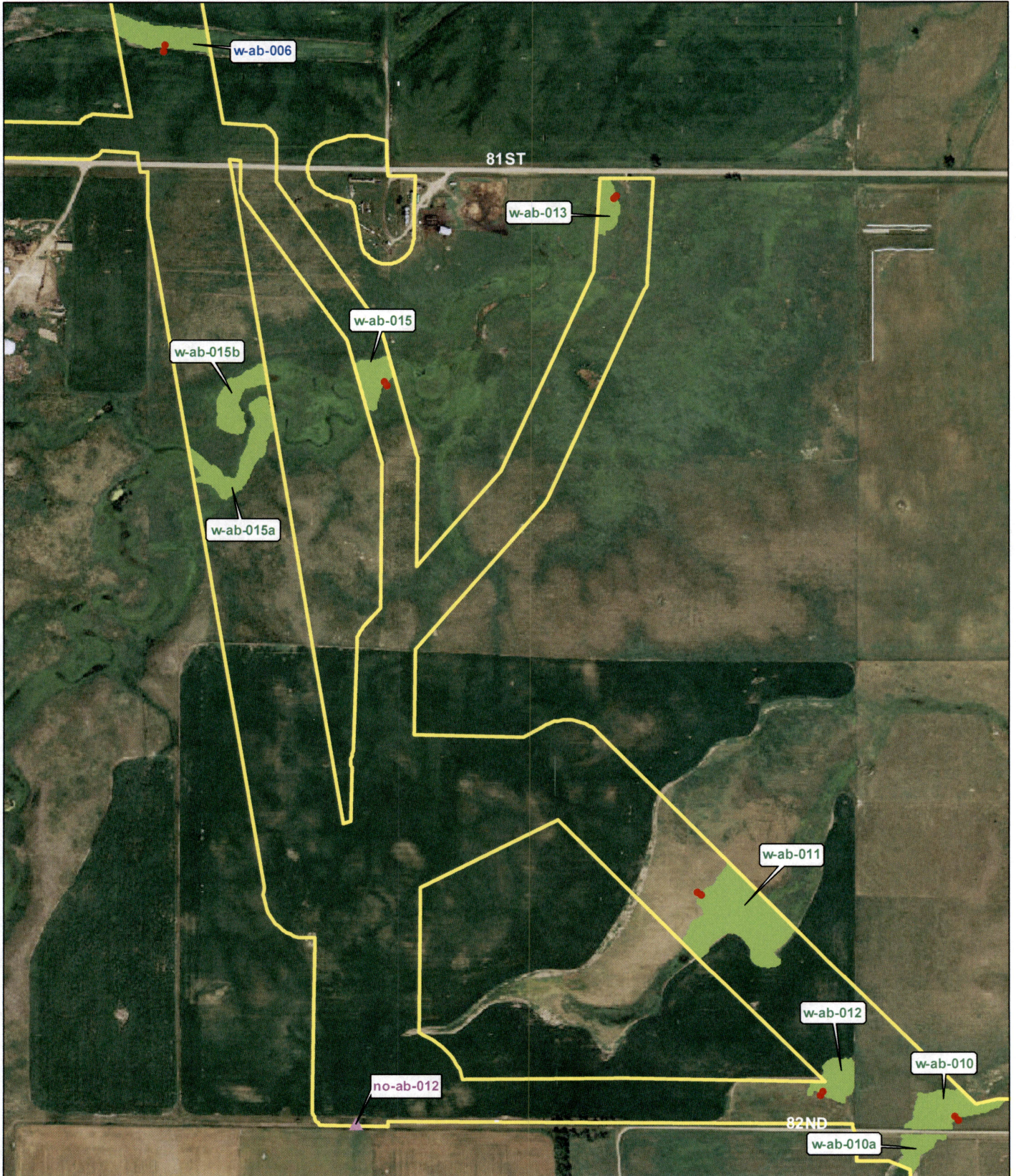
Data Source: NAIP 2020
 Coordinate System: UTM, NAD83, zn 14N
 Map produced on 10/23/2021 by T. Thom



- Map Features**
- Survey Area
 - WEST Delineated**
 - Wetlands
 - Other Water Features

- Wetland/Upland Sample Points
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- County Boundary
- State Highway

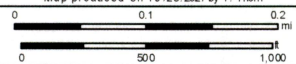




Badger Wind Project

**Water Features
Survey Results**

Data Source: NAIP 2020
 Coordinate System: UTM, NAD83, 2n 14N
 Map produced on 10/23/2021 by T. Thom



- Map Features**
- Survey Area
 - WEST Delineated Wetlands/Water Features**
 - Wetlands
 - Other Water Features

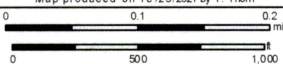
- Wetland/Upland Sample Points
- Non WOTUS Points
- County Boundary
- State Highway





Badger Wind Project
Water Features
Survey Results

Data Source: NAIP 2020
 Coordinate System: UTM, NAD83, zn 14N
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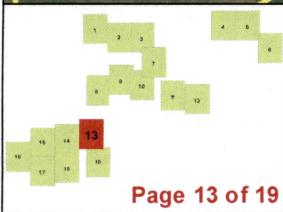
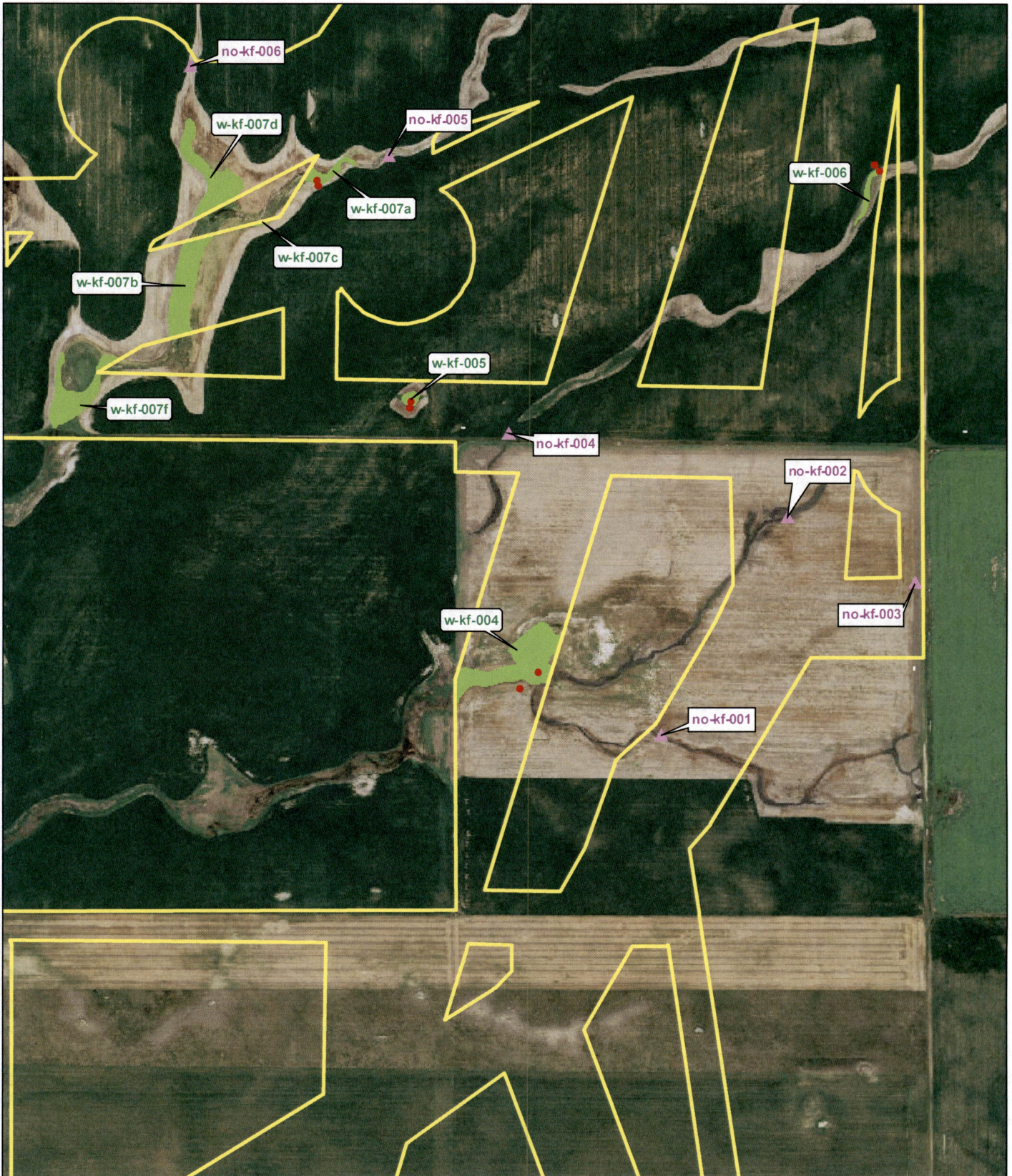


- Survey Area
- WEST Delineated**
- Wetlands/Water Features**
- Wetlands
- Other Water Features

Map Features

- Wetland/Upland Sample Points
- Non WOTUS Points
- County Boundary
- State Highway

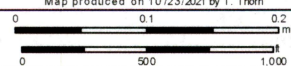




Badger Wind Project

**Water Features
Survey Results**

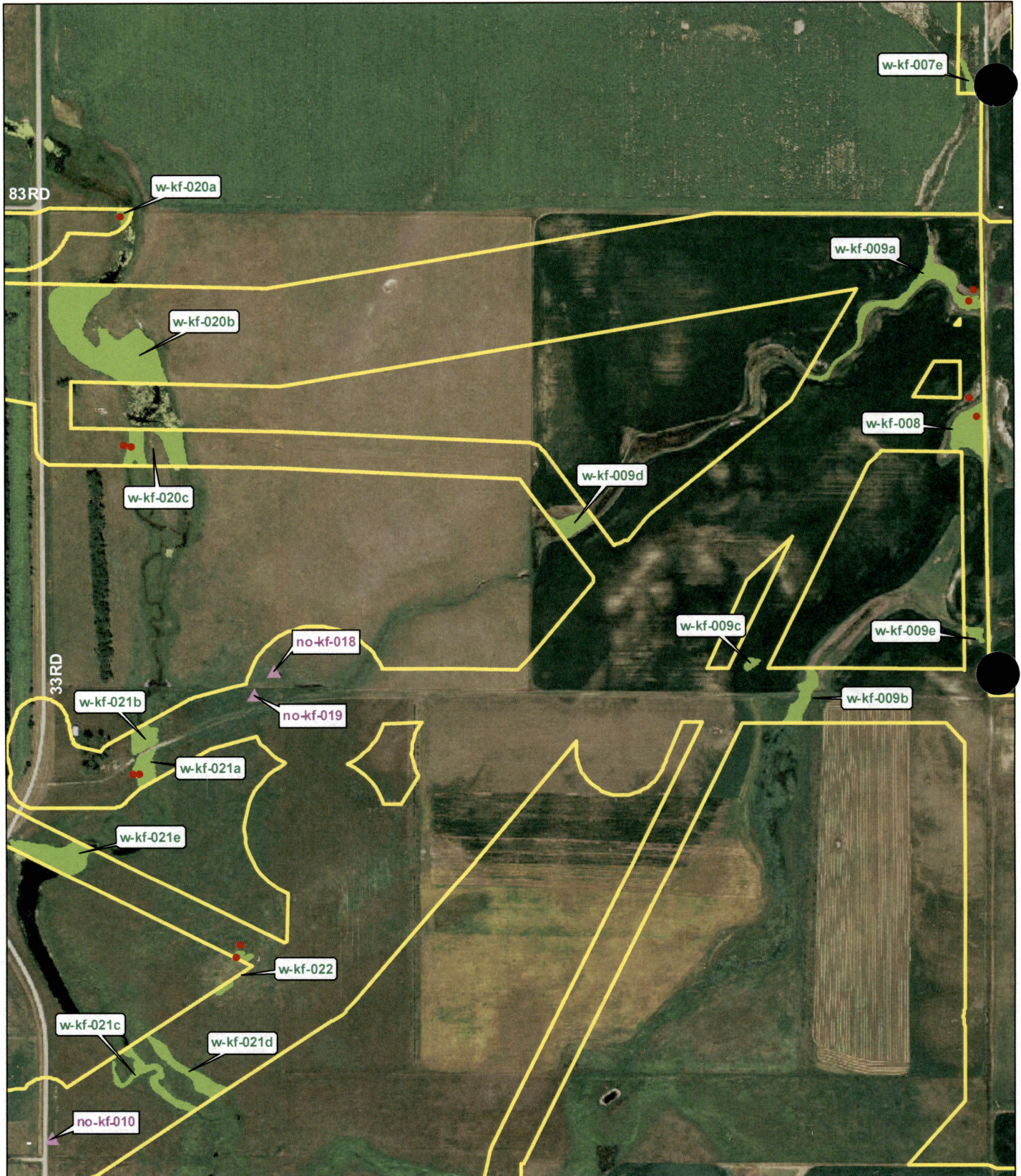
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 Coordinate System: UTM, NAD83, zn 14N
 Map produced on 10/23/2021 by T. Thom



- Map Features**
- Survey Area
 - WEST Delineated Wetlands/Water Features**
 - Wetlands
 - Other Water Features

- Wetland/Upland Sample Points
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- County Boundary
- State Highway

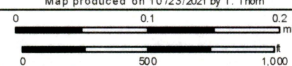




Badger Wind Project

**Water Features
Survey Results**

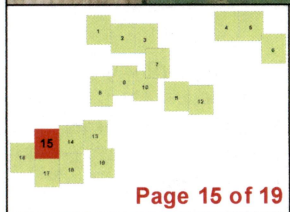
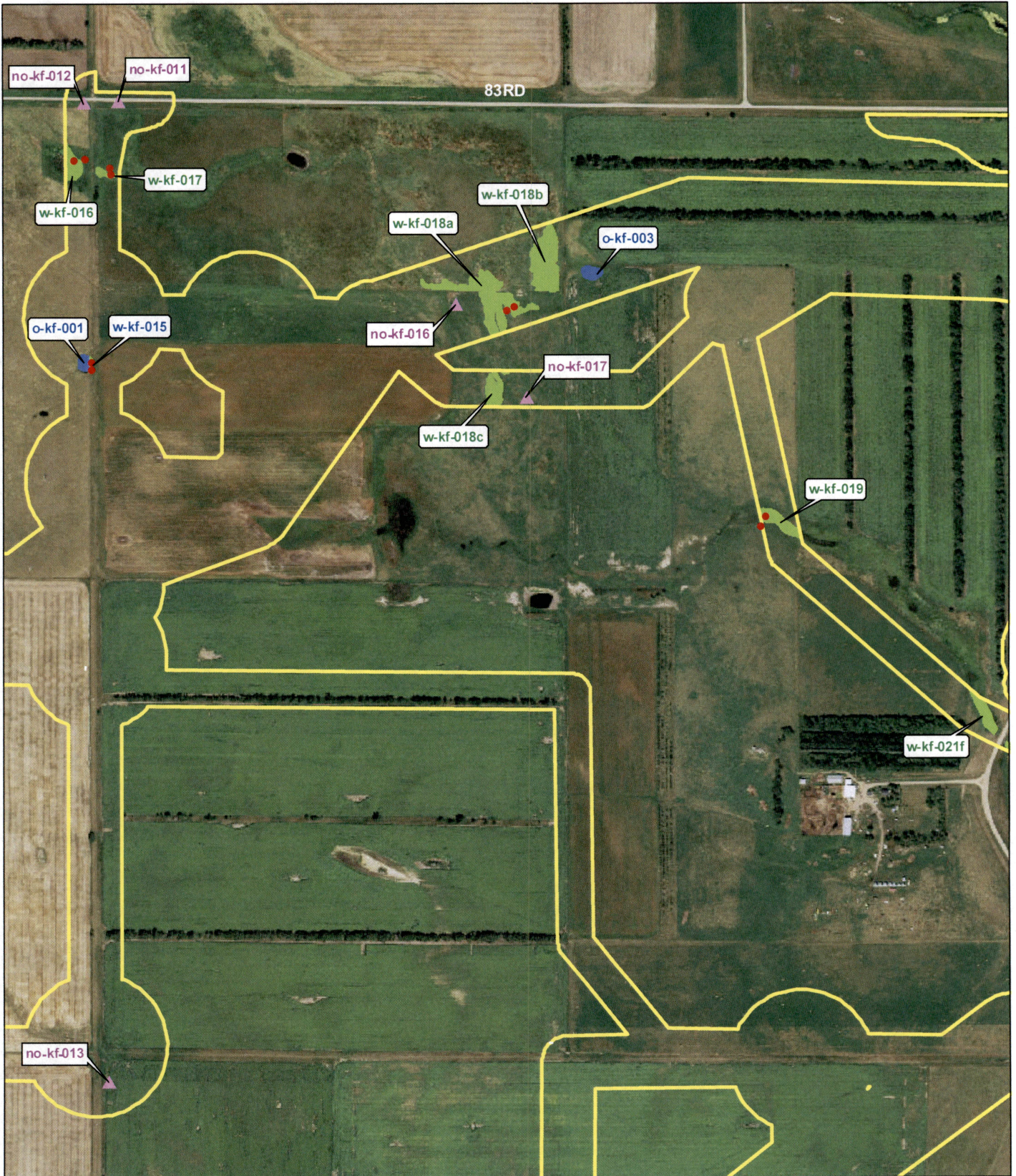
Data Source: NAIP 2020
 Coordinate System: UTM, NAD83, 2n 14N
 Map produced on 10/23/2021 by T. Thom



- Map Features**
- Survey Area
 - WEST Delineated Wetlands/Water Features**
 - Wetlands
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- Wetland/Upland Sample Points
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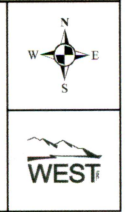


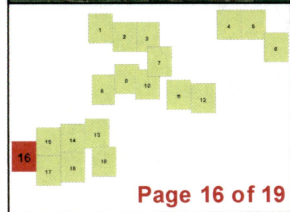
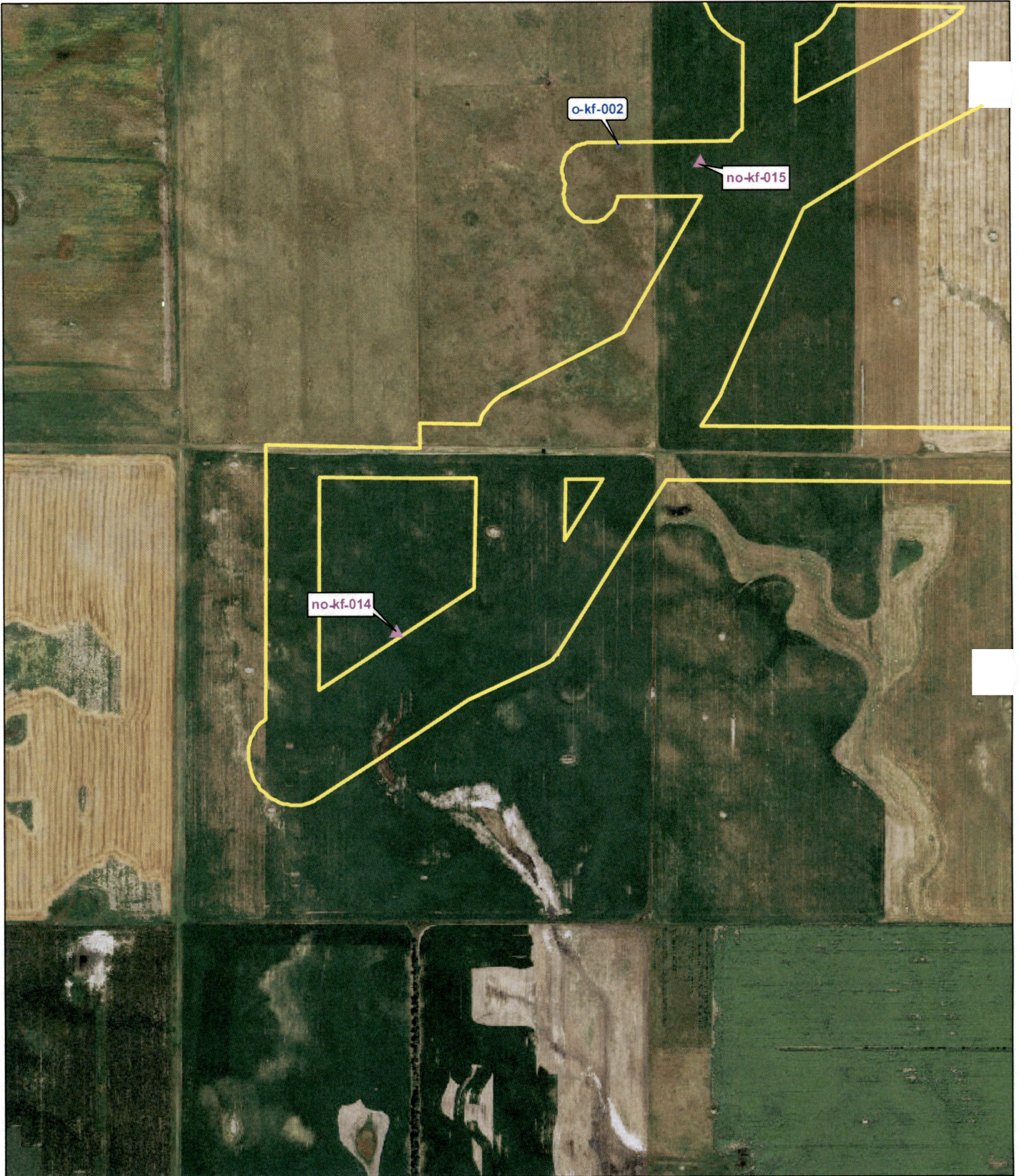


Badger Wind Project
Water Features
Survey Results

Data Source: NAIP 2020
 Coordinate System: UTM, NAD83, 2n 14N
 Map produced on 10/23/2021 by T. Thom

Map Features	
Survey Area	Wetland/Upland Sample Points
WEST Delineated Wetlands/Water Features	Non WOTUS Points
Wetlands	County Boundary
Other Water Features	State Highway

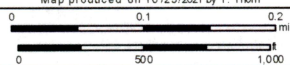




Badger Wind Project

**Water Features
Survey Results**

Data Source: NAIP 2020
Coordinate System: UTM, NAD83, zn 14N
Map produced on 10/23/2021 by T. Thom

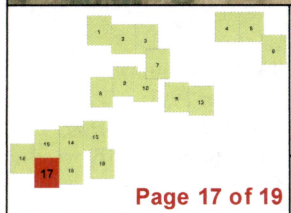
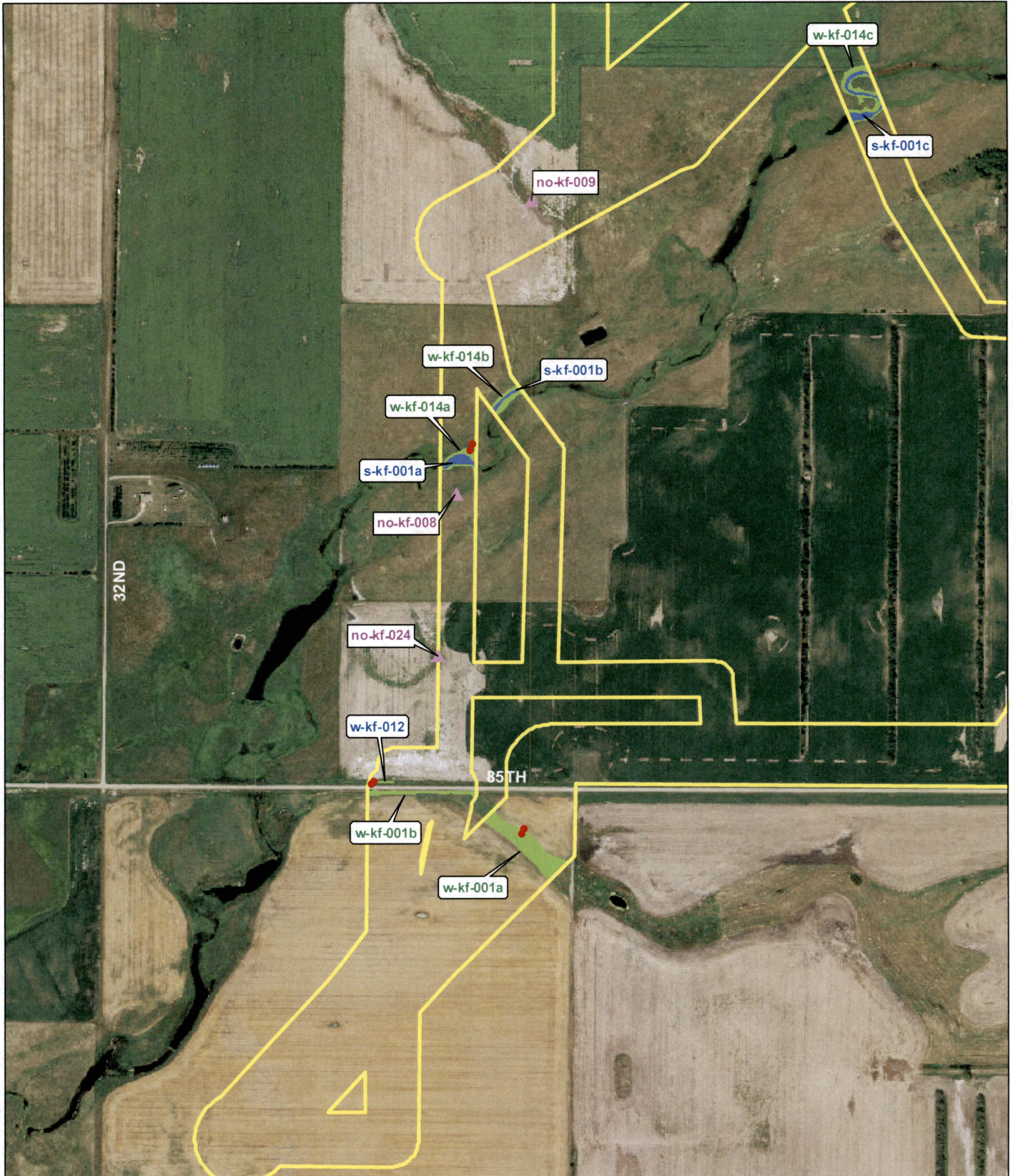


- Survey Area
- WEST Delineated Wetlands/Water Features**
- Wetlands
- Other Water Features

Map Features

- Wetland/Upland Sample Points
- Non WOTUS Points
- County Boundary
- State Highway

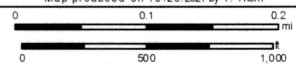




Badger Wind Project

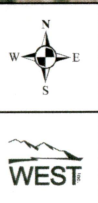
**Water Features
Survey Results**

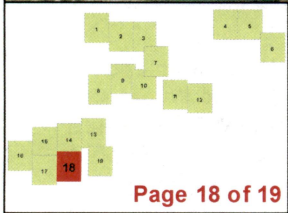
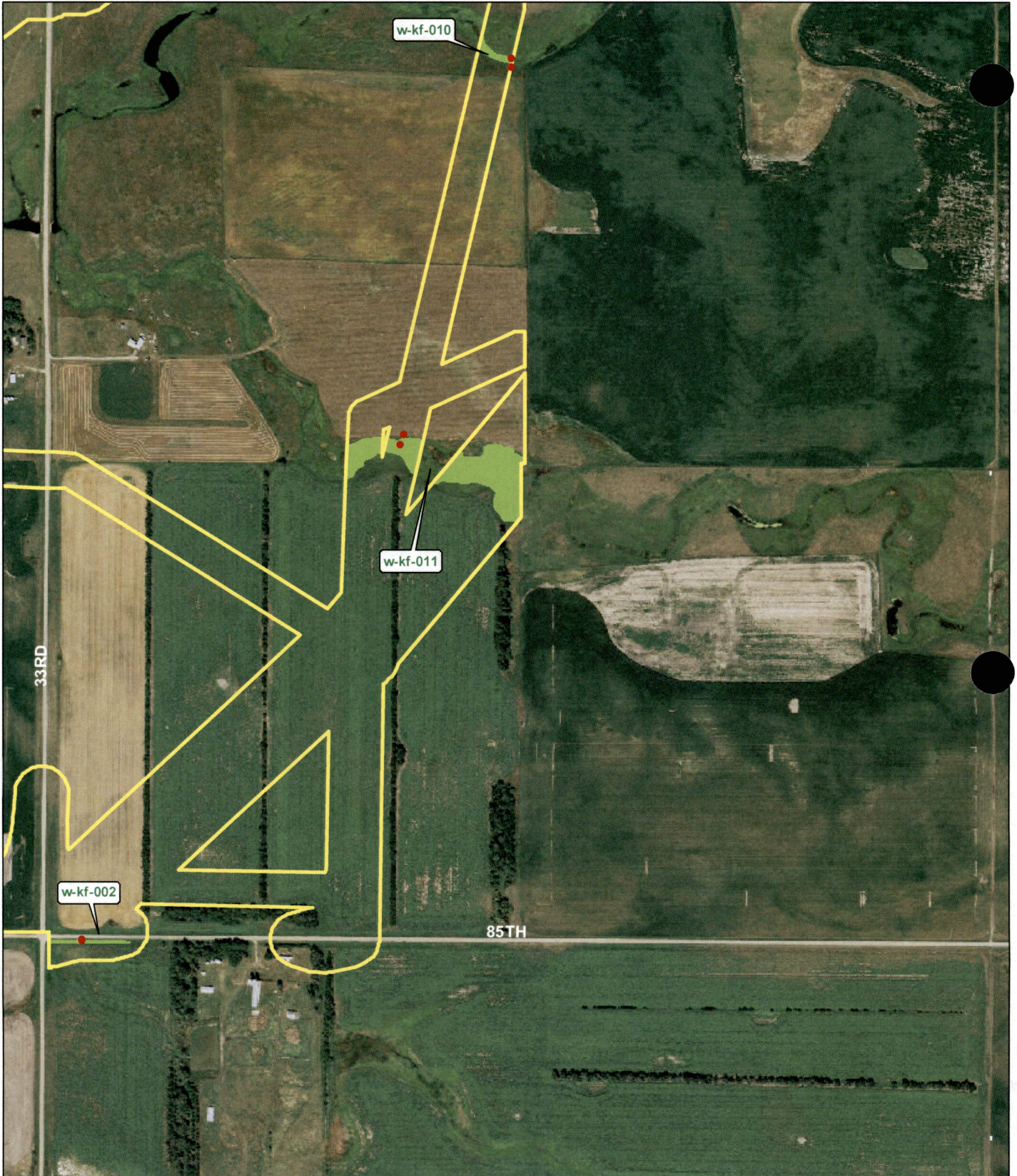
Data Source: NAIP 2020
 Coordinate System: UTM, NAD83, 2n 14N
 Map produced on 10/23/2021 by T. Thom



- Map Features**
- Survey Area
 - WEST Delineated Wetlands/Water Features**
 - Wetlands
 - Other Water Features

- Wetland/Upland Sample Points
- Non WOTUS Points
- County Boundary
- State Highway

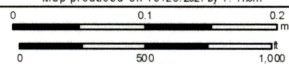




Badger Wind Project

**Water Features
Survey Results**

Data Source: NAIP 2020
 Coordinate System: UTM, NAD83, 2n 14N
 Map produced on 10/23/2021 by T. Thom

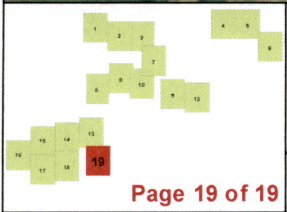
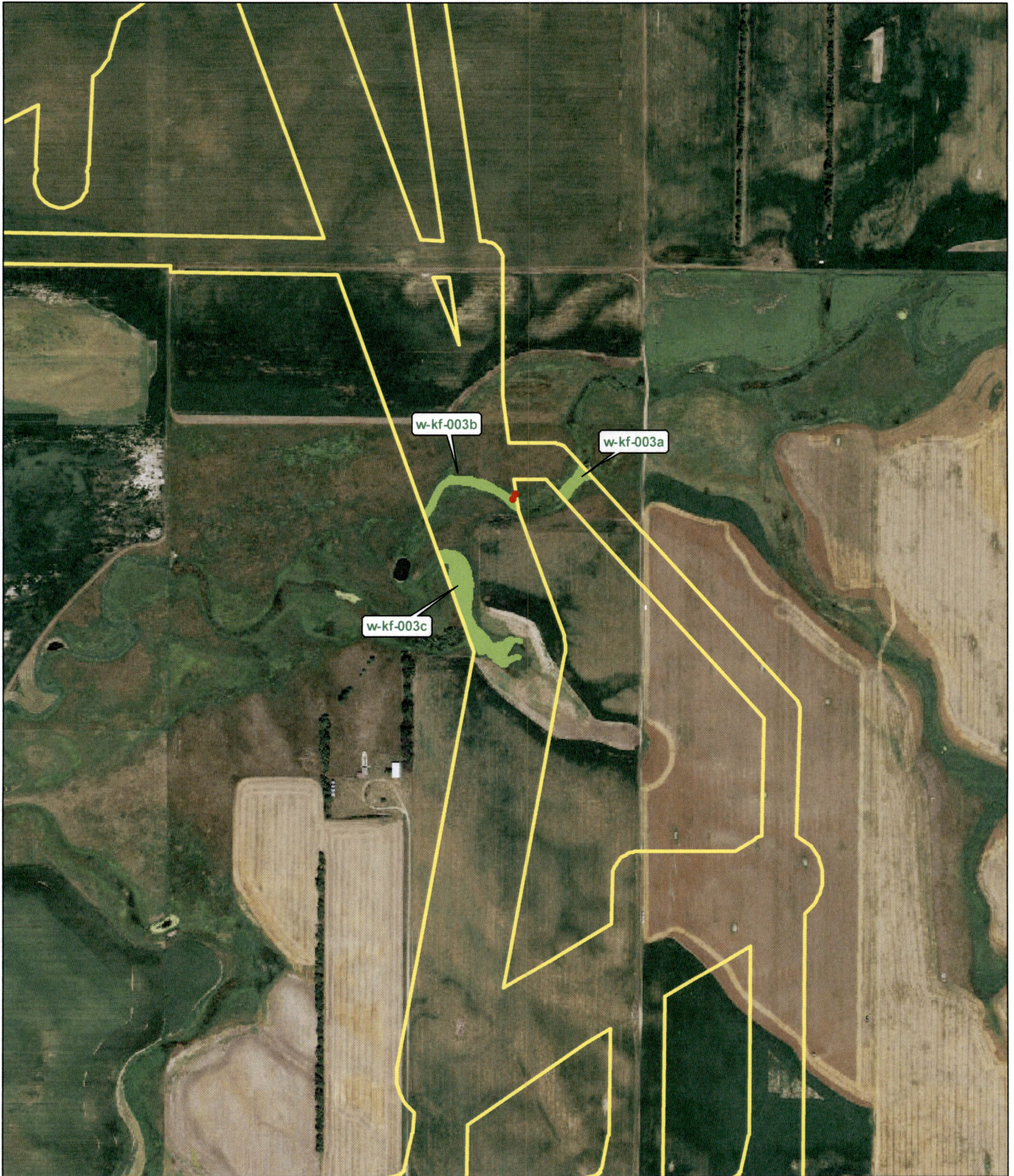


- Survey Area
- WEST Delineated
Wetlands/Water Features**
- Wetlands
- Other Water Features

Map Features

- Wetland/Upland
Sample Points
- Non WOTUS Points
- County Boundary
- State Highway

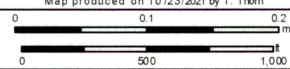




Badger Wind Project

**Water Features
Survey Results**

Data Source: NAIP 2020
 Coordinate System: UTM, NAD83, zone 14N
 Map produced on 10/23/2021 by T. Thom



- Map Features**
- Survey Area
 - WEST Delineated Wetlands/Water Features**
 - Wetlands
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- Wetland/Upland Sample Points
- Non WOTUS Points
- County Boundary
- State Highway



**Appendix B. US Army Corps of Engineers Great Plains Region Datasheets and
Photographs**

[Omitted]

Appendix C. Waterbody Photographs



Appendix C1. s-kf-001a.



Appendix C2. s-kf-001b.



Appendix C3. s-kf-001c.



Appendix C4. o-kf-001.



Appendix C5. o-kf-002.



Appendix C6. o-kf-003.



Appendix C7. o-ab-001.