AQUATIC RESOURCES REPORT

Bylin Dam Rehabilitation, Walsh County

Prepared for:

Walsh County Water Resource District

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I hereby certify that this report was prepared by me or under my direct supervision.

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Date: 2022-05-10

HEI project no. 7135-0037

HOUSTON ENGINEERING INC.

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1 EXECUTIVE SUMMARY

Staff from Houston Engineering, Inc. (Houston Engineering) completed a field investigation of the survey area to identify and delineate aquatic resources for a project on behalf of the Natural Resource Conservation Service. The survey area is located in Vesta Township (T 157N, R 57W, S 31,32, 33), Norton Township (T 156N, R 57W, S 5,6), Latona Township (T156N, R58, S1), and Adams Township (T157, R58W, S 23, 25, 26, 36) near Adams, ND, in Walsh County, North Dakota. The delineation was conducted in accordance with the 1987 Corps of Engineers Wetland Delineation Manual (USACE 1987), and the Great Plains Regional Supplement (USACE 2010), and guidelines for other waters determinations (USACE 2020). Results of the field delineations indicate there are 37 wetland areas (total 35.35 acres) and 49 potential other waters (total 80.07 acres, 45,730.82 linear feet) located in the 950-acre survey area. Most of the aquatic resources within the survey area are potential other waters made up of intermittent or perennial streams, drainage features, and lacustrine fringe wetlands. Most of the wetlands are natural (58 %), but many have developed from construction of roads and the dam, and from the artificial hydrology of the reservoir (total 42 % artificial, 38 % are lacustrine fringe). There are three major bodies of water, the North Branch Forest River, Dougherty Dam reservoir, and the Bylin Dam reservoir, within the project.

For the Future Without Federal Investment (FWOFI) alternative (Alternative 1) there are anticipated to be 7.44 acres of permanent impacts to artificial wetlands and no permanent impacts to natural wetlands. There will also be 104.9 feet of permanent impacts to the river channel and elimination of the reservoir. Mitigation requirements, depending upon the decisions of the US Army Corps of Engineers 404 permitting, could result in purchase of replacement acres at a 1:1 ratio at a cost of $446,400.

For the structural alternative (Alternative 1) there are anticipated to be no of permanent and 0.44 acres of temporary impacts to natural wetlands and 0.065 acres of permanent and 8.02 acres of temporary impacts to artificial wetlands . There will also be 43.0 acres of temporary impacts to the reservoir. Mitigation requirements, depending upon the decisions of the US Army Corps of Engineers 404 permitting, could result in purchase of replacement acres at a 1:1 ratio at a cost of $4,200.

2 INTRODUCTION

The purpose of this report is to identify and describe aquatic resources to document boundary determinations for review by regulatory authorities and to aid engineers avoiding impacts to aquatic resources during the design process. The project consists of correcting dam performance, design, and safety standards while maintaining the current flood protection and recreational opportunities.

3 LOCATION

The project is located in Vesta Township (T 157N, R 57W, S 31,32, 33), Norton Township (T 156N, R 57W, S 5,6), Latona Township (T156N, R58, S1), and Adams Township (T157, R58W, S 23, 25, 26, 36) near Adams, ND, in Walsh County, North Dakota; general latitude: 48.370366, longitude: -98.035542; **Exhibit**

D-9-1: Project Location Map). The project extends from the dam upstream following the river and the river catchment area. Most of the catchment is pastureland and prairie with some portions extending into adjacent agricultural land. The project is two miles south of Adams, ND (driving directions: from USACE office in Bismarck, head east on I-94 going east.; follow I-94 E and ND-1 to 51st NE in Clara.; Continue on 51st St. NE until ND-35 to 121st Ave NE in Vesta)(**Appendix D-9-A : Google Map Directions**). The project area extends approximately four miles west of the Bylin Dam for a total survey area of 950 acres.

4 METHODS

The field aquatic resource delineation was conducted in accordance with the 1987 Corps of Engineers Wetlands Delineation Manual and the appropriate Regional Supplement: Great Plains (USACE 2010). Aquatic resource boundaries within the project boundary were determined by paired test holes observing the presence of hydric soil, vegetation, and hydrology, and were recorded on USACE Wetland Determination Data Forms. Wetland types followed “Cowardin” nomenclature in Federal Geographic Data Committee (2013). Determination of drainages and delineation of streams and rivers followed guidance from USACE (2020). The delineation report was written following the requirements of USACE (2019).

The following procedures were used to determine wetland ecosystems:

- Review of the available background resource information of this site as a part of the aquatic resource delineation activities. Aquatic resource maps were developed using aerial photography from 2019 in combination with the United States Fish and Wildlife Service National Wetlands Inventory (NWI) layer (USFWS 2019), United States Geological Survey (USGS) Topography Map; and Natural Resources Conservation Service Soil Survey (maps and soil unit characteristics USDA-NRCS 2010), and historical aerial photography from 2003, 2009, 2012, 2015, 2017, and 2019 (**Appendix D-9-D: Historical Aerial Photography**).
- Field survey of vegetation to determine the proportion of the dominant plant species classified as either obligate wetland, facultative wetland, or facultative plants; according to the National Wetland Plant List: 2020 wetland ratings (USACE 2018); or if other indicators of wetland vegetation were present. Nomenclature followed the PLANTS Database (USDA-NRCS 2020a).
- Field sampling of soil using a soil probe to identify soil morphology, redoximorphic features, and soil texture. We determined the hydric soil indicators according to Field Indicators of Hydric Soils in the United States; Guide for Identifying and Delineating Hydric Soils, Version 7.0 (USDA-NRCS 2016).
- Hydrology by observation of on-site primary and secondary indicators (USACE 2010). We also used aerial photography to assist hydrologic assessment. To describe the climatic conditions at the time of sampling, we accessed antecedent and recent rainfall data before going in the field (NDAWN 2010. To determine if the dry season water Table D-9-hydrology indicator applies, we obtained the typical water balance for the site at the date of sampling (Matsuura et al. 2003).

The following procedures were used to determine all potential other waters (OW):

- This guidance follows USACE (2020). All occurrences of blue lines on the USGS Topo Maps and stream and riverine data from the North Dakota GIS Database were identified prior to the field visit, as were areas of deepwater habitat (lakes). Historical aerial photographs and topographic data were used to identify potential drainage features. All lakes and larger drainage channels were described and mapped in the field. All potential drainage features were observed, or, where there were too many for feasible ground-truthing or inaccessible, several representative features were visually observed and then their characteristics were extrapolated to the remainder in the survey area.

The survey area is the portion of land defined as the Upstream Assessment Area. The survey area includes the reservoir and the upstream floodplain of the Forest River Valley. The survey area is approximately 950 acres, entirely within Walsh County. The area includes the dam, the reservoir, a zone downstream, and the floodplain upstream of the dam. For the downstream area, this extended approximately 1000 feet downstream and included land that may be affected if the dam is decommissioned. For the upstream extent, the area of potential effect was estimated by including land in an approximate flood zone using the elevation of the dam plus an additional ten feet.

Staff from Houston Engineering (Kaleb Haley) and a Registered Professional Soil Classifier (Mike Ulmer, Prairie Soil Consulting, LLC) performed fieldwork on July 17th, 2020. Donna Jacob and Mark D. Aanenson (both of Houston Engineering) performed fieldwork on September 22nd and 23rd, 2020. The wetland and other waters boundaries and sample locations were marked using a Trimble Geo 7X GPS unit for those representative plant communities present along the wetland boundaries. We also used additional, undocumented sample points throughout the delineation to verify vegetation, hydric soils, and hydrology. We recorded our observations using geolocated photographs and data forms. Once the correlation between hydrology, hydric soils, and hydrophytic vegetation was established for each wetland, the boundary of the wetland was determined by mapping the visible indicators (vegetation and hydrology) and verifying the presence of hydric soils when necessary. All wetlands were surveyed, but for many of the ephemeral drainages we used photos or visual observation only, and then interpreted these to be similar to field-verified sites.

A judgement was made regarding the natural or artificial state of the wetlands upon request of the NRCS. This judgement was based upon GIS and field observations. The lacustrine fringe was considered to be artificial based upon the presence of hydrology existing from the construction of the dams and filling of the reservoirs (artificial hydrologic condition). The artificial hydrology was assessed by using Lidar to map the elevation of the 2-year 24-hour flood event inundation. This flooding frequency was considered to be enough to sustain hydrophytic vegetation. Other wetlands were formed from the construction of the dam, access roads, or gravel pits.

The survey area was fully evaluated. The site was examined using remote tools (LiDAR, topographic maps, soil maps, NWI, and many years of aerial photography including wet years). The ground-truthing involved covering much of the site on foot, however, the terrain and dense vegetation restricted access and visibility in some areas. Upon guidance from the NRCS, extra attention was paid during the survey to

locating and recognizing fen communities. If soil units and/or slopes favorable to the formation of fens were identified (see fen description below), extra effort was made to survey those areas thoroughly. Over the whole site, extra attention was given to looking for organic soil layers in wetlands.

Fens are a relatively uncommon wetland type and are vulnerable to disturbance through small changes in their hydrology. Fens are predominantly groundwater-fed systems, so the soil is continually saturated. This condition supports the formation of peat soils by slowing the process of organic matter decomposition. Fens are indicated as having soils described as histosol (40 cm organic soil) or histic epipedon (20 cm or mor of organic soil) (US Army Corps of Engineers 2010). Sloping fens form at the base of hills where groundwater discharges to the surface or on hillslopes where groundwater discharges from glacial moraines and bedrock aquifers. In North Dakota, fens would typically be classified by the HGM (hydrogeomorphic) classification as the "SLOPE" type (USDA-NRCS 2008). Slopes can be steep or gentle. If the groundwater discharge is sufficient, these slope wetlands can be found on landscapes that are nearly flat. Typically, water flows slowly over the fen surface during most or all of the summer, maintaining a constant soil saturation. Basin fens form from gradual filling of lakes or ponds with partially decomposed plant remains. These fens are flat and located near the margin of open water. The dominant species growing in fens are sedges, and there are other species depending upon the pH of the water and the availability of nutrients (cations) (MN DNR 2016, USFS 2021). Poor fens, with slightly acidic waters (pH of 4.5 to 5.5), include also evergreen shrubs and mosses (including *Sphagnum* spp.). Rich fens, being circumneutral (pH, 5.5-6.9), also support other wetland plants and mosses (including *Sphagnum* spp.). Calcareous fens, with alkaline waters (pH above 6.9) and a thicker peat layer, are known to foster mosses other than *Sphagnum* and a suite of distinctive and rare (declining) wetland plants (e.g., MN DNR 2016).

5 RESULTS

5.1 LANDSCAPE SETTING:

The survey area is located in the Northern Glaciated Plains Ecological Province, Drift Plains Subsection (USEPA 2020). This region consists of glacial features including gently rolling hills many of which are connected on the surface by natural streams and rivers or artificial drainage. This area includes of a mix of vegetation types including forest, prairie, and wetland plant communities. Pre-settlement vegetation was dominated by tallgrass prairies and shortgrass prairie but now much of the area is farmland. The current local land use proximate to the project consists of hay production pastures and cultivated agriculture.

The total survey area was within the foreseeable impacts of the future dam rehabilitation. The circumstances were normal, but the vegetation (heavily grazed, mowed) and the hydrology (road and ditch construction) were significantly disturbed in some areas.

5.2 CLIMATIC CONDITIONS:

The weather conditions during both field visits were good. During the first field visit in July the climatic conditions in the area were normal due to precipitation totals in the three months before the survey (**Table D-9-1a**, WETS data, USDA-NRCS 2020b). The survey area received 0.54 inches of rain the seven days prior to the July 17th, 2020 fieldwork (NDAWN 2020). During the field visit in September, the climatic conditions in the area were drier than normal due to decreased precipitation in the three months before (**Table D-9-1b**, WETS data, USDA-NRCS 2020b). The survey area received no rain during the seven days prior to the September 22nd, 2020 fieldwork (NDAWN 2020).

Table D-9-1a: WETS data (May through July), historical precipitation data compared to recent precipitation data from a 48-year dataset (1971-2020) recorded at a nearby weather station (USDA-NRCS 2020b).

		Long-term rainfall records (1971-2019)							
WETS Station Langdon, ND	**Month**	**<30%**	**Mean**	**>30%**	**Actual**	**Condition**	**Condition Value**	**Month Weight Value**	**Condition Value X Month Weight**
3rd Prior Month	April	0.46	0.99	1.15	**0.61**	Normal	2	1	2
2nd Prior Month	May	1.44	2.34	2.84	**0.89**	Dry	1	2	2
1st Prior Month	June	2.37	3.33	3.94	**3.96**	Wet	3	3	9
								Sum:	**13**
								Conditions Onsite:	**Normal**

If sum is:	
6 to 9	then prior period has been drier than normal
10 to 14	then prior period has been normal
15 to 18	then prior period has been wetter than normal

Condition Values:
(1) Dry
(2) Normal
(3) Wet

Table D-9-1b: WETS data (July through September), historical precipitation data compared to recent precipitation data from a 48-year dataset (1971-2020) recorded at a nearby weather station (USDA-NRCS 2020b).

		Long-term rainfall records (1971-2019)							
WETS Station Langdon, ND	**Month**	**<30%**	**Mean**	**>30%**	**Actual**	**Condition**	**Condition Value**	**Month Weight Value**	**Condition Value X Month Weight**
3rd Prior Month	July	2.04	3.19	3.84	**4.06**	Wet	3	1	3
2nd Prior Month	August	1.57	2.73	3.31	**0.96**	Dry	1	2	2
1st Prior Month	September	1.13	1.68	2.01	**0.50**	Dry	1	3	3
								Sum:	**8**
								Conditions Onsite:	**Dry**

If sum is:	
6 to 9	then prior period has been drier than normal
10 to 14	then prior period has been normal
15 to 18	then prior period has been wetter than normal

Condition Values:
(1) Dry
(2) Normal
(3) Wet

5.3 OVERALL AQUATIC RESOURCE DESCRIPTIONS

Results of the field wetland delineation indicate there are 37 wetland areas (total 35.35 acres) and 49 potential other waters (total 80.07 acres, 45,730.82 linear feet) located in the 950-acre survey area (**Exhibit D-9-2: Aquatic Resources Maps**).

Wetlands: Some of the wetlands are listed in the NWI (**Table D-9-2**). Wetland types include natural swales (riverine wetlands), lacustrine fringe wetlands (with hydrology supplied by the presence of the

artificial reservoirs), and several basin or impoundment wetlands formed from the construction of the dam or other features (see **Appendix D-9-B: Site Photographs**). The potential other waters within the survey area include the reservoirs, the North Branch Forest River, and its tributaries. The North Branch Forest River is listed by the NWI as R5UBH (riverine, unknown perennial, unconsolidated bottom, permanently flooded) type. There are many tributaries that are classified by the NWI as a R4SBC (riverine, intermittent, streambed, seasonally flooded) type, but the majority of the potential other waters are ephemeral streams and drainages.

5.3.1 OVERALL VEGETATION DESCRIPTIONS

The wetland plant communities in the survey area are wet-mesic prairie and shallow marsh. Dominant species in the wetland areas within the project area (**Appendix D-9-C: Plant List**) represent herbaceous, shrub, and tree strata. The tree stratum is predominantly represented by *Acer negundo* (boxelder). The shrub species included *Amorpha canescens* (lead plant), *Artemisia absinthium* (absinthium), *Salix interior* (sandbar willow), *Shepherdia argentea* (silver buffaloberry), *Symphoricarpos albus* (snowberry), and *Symphoricarpos occidentalis* (buck brush). There are a variety of wetland herbs, the more frequent species include *Alopecurus pratensis* (meadow foxtail), *Bromus inermis* (smooth brome), *Carex atherodes* (slough sedge), *Eleocharis palustris* (common spikerush), *Hordeum jubatum* (foxtail barley), *Juncus arcticus* (arctic rush), *Panicum virgatum* (switchgrass), *Persicaria amphibia* (swamp smartweed), *Phalaris arundinacea* (reed canary grass), *Scirpus pallidus* (pale bulrush), *Spartina pectinata* (prairie cordgrass), and *Urtica dioica* (stinging nettle).

5.3.2 OVERALL SOIL DESCRIPTIONS

The NRCS Web Soil Survey identified areas of mapped hydric soils within the survey area. Please refer to **Exhibit D-9-3: USDA Soils Map**. The majority of the wetlands are included in map units that are predominately non-hydric (0 to 32%). Dominant soils within the project site areas are excessively drained and are formed in glacio-fluvial deposits (USDA-NRCS 2010). The survey area is composed of a variety of soil types with slopes ranging between zero and seventy-five percent. The dominant soils include Kloten-Walsh-Edgeley loam complex (hydric rating: 0 %) and Barnes-Svea loam complex (hydric rating: 4 %).

5.3.3 OVERALL HYDROLOGY DESCRIPTION

The survey area is located in the Walsh Rural Water District and the North Branch Forest River watershed. The North Branch Forest River watershed drains approximately 157 square miles of land, made up primarily of agricultural and pasture fields. The topography throughout the survey area consists of gently rolling hills and many of the wetlands receive runoff from agricultural fields. Other wetlands form a fringe along the edge of the reservoirs (**Exhibit D-9-4: LiDAR Maps**). There three major bodies of water within the survey area, the North Branch Forest River, Dougherty Dam reservoir, and Bylin Dam reservoir. The USGS topographic map was examined for indications of wetland conditions within the project corridor. No wetlands are indicated as marsh on the map within or near the survey

area. Historical aerial photography shows evidence of drainages, saturation, and wet signatures throughout the survey area (**Appendix D-9-D: Historical Aerial Photographs**).

5.4 INDIVIDUAL SITE DESCRIPTIONS

See **Table D-9-2** for wetland information and **Table D-9-3** for potential other waters information. Data recorded for each wetland are shown Wetland Determination Data Forms (data available upon request from ND NRCS). Potential other waters are also documented on data forms (data available upon request from ND NRCS).

5.4.1 WETLANDS

5.4.1.1 RIVERINE/DRAINAGEWAY WETLANDS: 1a, 1b, 1c, 3, 4, 5, 7, 8, 10, 18, 22, 24, 37

These are natural wetlands formed in flow pathways, either of the mainstem North Branch Forest River or its tributaries. The NWI listings include none, PEMA, PEM1C, and R4SBC. Dominant species include *Alopecurus pratensis* (meadow foxtail- FACW), *Carex atherodes* (wheat sedge-OBL), *Carex lacustris* (lake sedge-OBL), *Juncus arcticus* (Baltic rush-FACW), *Persicaria amphibia* (water smartweed-OBL), *Phalaris arundinacea* (reed canary grass- FACW), *Scirpus pallidus* (pale bulrush- OBL), *Solidago canadensis* (Canada goldenrod – FACU), *Spartina pectinata* (prairie cordgrass -FACW), *Typha x glauca* (hybrid cattail -OBL), and *Urtica dioica* (stinging nettle- FAC). Soils include loams, clay-loams, and silty clay-loams with indicators including A11- Depleted Below Dark Surface, F3- Depleted Matrix, and F6- Redox Dark Surface. Hydrology indicators documented for these wetlands include A1- Surface Water, A2- High Water Table, A3- Saturation, B13-Aquatic Invertebrates, C9- Saturation Visible on Aerial Imagery, D2- Geomorphic Position, and D5- FAC Neutral Test. Wetland functions include wildlife habitat, water purification, carbon storage, water storage, and biofiltration of nutrients from runoff. Water sources are comprised of surface runoff from various drainages, surrounding fields, and grazed pastures.

5.4.1.2 LACUSTRINE FRINGE WETLANDS: 9, 11, 12, 13, 14, 15, 16, 17, 19, 20, 21, 23, 25, 26, 27, 28, 30, 32, 33

These are wetlands formed along the shore of the reservoir, supported entirely or in part by the artificial hydrology of the lake. Some of these wetlands are a combination of drainageways (natural hydrologic conditions) and lacustrine fringe (9, 11, 12, 14, 15, 23, 28). The NWI listings include none, PEM1A, and PEM1C. Dominant species include *Alopecurus pratensis* (meadow foxtail- FACW), *Eleocharis palustris* (common spikerush-OBL),*Hordeum jubatum* (foxtail barley-FACW), *Phalaris arundinacea* (reed canary grass- FACW), *Poa pratensis* (Kentucky blue grass-FACU), *Scirpus pallidus* (pale bulrush- OBL), *Spartina pectinata* (prairie cordgrass -FACW), and *Typha x glauca* (hybrid cattail -OBL). Wetland functions include wildlife habitat, water purification, carbon storage, water storage, and biofiltration of nutrients from runoff. Water sources are comprised of surface runoff from various drainages, the reservoir, surrounding fields, and grazed pastures.

5.4.1.3 DEPRESSIONAL WETLANDS: 2, 6, 29, 31, 34, 35, 36

Wetland 2 is an excavated pond and is classified by the NWI as PABFx. Field observations confirm this classification. The vegetation consists of *Typha x glauca* (hybrid cattail -OBL). The hydrology indicators documented for this wetland include A1 Surface Water, A2- High Water Table, A3- Saturation, C9- Saturation Visible on Aerial Imagery, D2- Geomorphic Position and D5- FAC Neutral Test. The soils of this wetland is clay loam and meets the following hydric soil indicator: A11- Depleted Below Dark Surface and F2-Depleted Matrix. Wetland functions include wildlife habitat, water purification, carbon storage, water storage, and biofiltration of nutrients from runoff. Water sources are comprised of surface runoff from the adjacent roadways, road ditch, and fields.

Wetland 6: This wetland appears to have formed from the construction of the road and placement of a culvert. It is classified by the NWI as PEM1C. The vegetation within this wetland includes *Phalaris arundinacea* (reed canary grass -FACW), *Typha x glauca* (hybrid cattail -OBL), and *Persicaria amphibia* (water smartweed-OBL). The hydrology indicators documented for this wetland include A2- High Water Table, A3- Saturation, C9- Saturation Visible on Aerial Imagery, D2- Geomorphic Position and D5- FAC Neutral Test, and B-13 Aquatic Invertebrates. The soils of these wetlands are dominated by loamy textured soils and meet the following hydric soil indicator: F6- Redox Dark Surface. Wetland functions include wildlife habitat, water purification, carbon storage, water storage, and biofiltration of nutrients from runoff. Water sources are comprised of surface runoff from OW-16 and surrounding fields.

Wetland 29 is a natural wetland not classified by the NWI. Field observations classify it as PEM1A. Wetland 29 is dominated by *Alopecurus pratensis* (meadow foxtail- FACW), *Phalaris arundinacea* (reed canary grass- FACW), *Persicaria amphibia* (water smartweed-OBL), *Spartina pectinata* (prairie cordgrass- FACW), *Scirpus pallidus* (pale bulrush- OBL), and *Panicum virgatum* (witchgrass-FAC). Hydrology indicators documented for this wetland include A2- High Water Table, A3- Saturation, C9- Saturation Visible on Aerial Imagery, D2- Geomorphic Position, D5- FAC Neutral Test. This wetland has clay loam textured soils with redoximorphic features in the upper part of the soil profile. The soils met the following hydric soil indicator: F6- Redox Dark Surface. Wetland functions include wildlife habitat, water purification, carbon storage, water storage, and biofiltration of nutrients from runoff. Water sources are comprised of surface runoff from the adjacent roadways, road ditch, and fields.

Wetland 31 appears to have developed as a result of the construction of the original road and is not classified by the NWI. Field observations classify this wetland as PEM1A. Wetland 32 is a fringe wetland that is hydrologically connected to the reservoir. The vegetation within this wetland consists of *Phalaris arundinacea* (reed canary grass- FACW) and *Urtica dioica* (stinging nettle- FAC). The clay loam soils met the following hydric soil indicators: A12- Thick Dark Surface and F6- Redox Dark Surface. Hydrology indicators documented for these wetlands include A3- Saturation, C9- Saturation Visible on Aerial Imagery, D2- Geomorphic Position, and D5- FAC Neutral Test. Wetland functions include wildlife habitat, water purification, carbon storage, water storage, and biofiltration of nutrients from runoff. Water sources are comprised of surface runoff from the adjacent roadways, road ditch, and fields.

Wetland 34 appears to be a drainageway that has been impounded by the toeslope of the dam and is not classified by the NWI. Field observations classify this wetland as PEM1A. Wetland 34 is dominated by *Phalaris arundinacea* (reed canary grass- FACW). . This wetland area has clay loam textured soils with redoximorphic features in the upper part of the soil profile. The soil met the following hydric soil indicator: F6- Redox Dark Surface. Hydrology indicators documented for this wetland include A2- High Water Table, A3- Saturation, C9- Saturation Visible on Aerial Imagery, D2- Geomorphic Position, D5- FAC Neutral Test. Wetland functions include carbon storage, water storage, and biofiltration of nutrients from runoff. Water sources are comprised of surface runoff from the fields.

Wetland 35 appears to have developed from the construction of the road and is not classified by the NWI. Field observations classify this wetland as PEM1A-mosaic (more than 50% wetland). Wetland 35 is dominated by *Alopecurus arundinaceus* (creeping meadow foxtail – FACW) and *Typha X glauca* (hybrid cattail - OBL). The soil met the following hydric soil indicator: F6 – Redox Dark Surface. Hydrology indicators documented for this wetland include D2- Geomorphic Position and D5- FAC Neutral Test. This wetland area has silty loam textured soils with redoximorphic features in the upper part of the soil profile. Wetland functions include water purification, carbon storage, and biofiltration of nutrients from runoff. Water sources are comprised of surface runoff from the adjacent roadway and fields.

Wetland 36 appears to have developed after the excavation of the auxiliary spillway and is not classified by the NWI. Field observations classify this wetland as PEM1A. Wetland 36 is dominated by *Alopecurus pratensis* (meadow foxtail- FACW). This wetland area has clay loam textured soils with redoximorphic features in the upper part of the soil profile. The soil met the following hydric soil indicator: F6- Redox Dark Surface. Hydrology indicators documented for this wetland include A2- High Water Table, A3- Saturation, C9- Saturation Visible on Aerial Imagery, D2- Geomorphic Position, D5- FAC Neutral Test, and D7-Frost-Heave Hummocks. Wetland functions include wildlife habitat, water purification, carbon storage, water storage, and biofiltration of nutrients from runoff. Water sources are comprised of surface runoff from the adjacent roadways, road ditch, and fields.

Table D-9-2: Delineated Wetlands and their characteristics (data limited to project boundary only).

Wetland Number	NWI Listing	Field Observation	Natural or Artificial (* lacustrine fringe)	Wetland area (acres)	Latitude (center)	Longitude (center)
1a	PEM1A/PEM1C	PEM1A	Natural	6.36	48.400734	-98.0834807
1b	PEM1C	PEM1C	Natural	1.61	48.3976685	-98.0802181
1c	PEM1C	PEM1C	Natural	2.29	48.3963826	-98.0767175
2	PABFx	PABFx	Artificial	0.14	48.3972016	-98.0772232
3	PEM1C	PEM1C	Natural	0.71	48.3816115	-98.0565263
4	Not Listed	PEM1A	Natural	0.03	48.380939	-98.0575507
5	Not Listed	PEM1A	Natural	0.03	48.3797357	-98.0572325
6	PEM1C	PEM1C	Artificial	0.04	48.3793884	-98.0577024
7	Not Listed	PEM1A	Natural	0.51	48.3786403	-98.0568705
8	Not Listed	PEM1A	Natural	0.19	48.3779556	-98.0579961

Table D-9-2: continued

Wetland Number	NWI Listing	Field Observation	Natural or Artificial (* lacustrine fringe)	Wetland area (acres)	Latitude (center)	Longitude (center)
9	PEM1C/R5UBH/R4SBC/L1UBGh	PEM1A/PEM1C/PABF	Natural	1.65	48.3764222	-98.0525885
			Artificial*	4.49		
10	PUBC	PUBC	Natural	0.24	48.3723986	-98.0492442
11	Not Listed	PEM1A	Natural	0.11	48.3734605	-98.0480253
			Artificial*	0.22		
12	Not Listed	PEM1A	Natural	0.44	48.3738031	-98.0456742
			Artificial*	0.1		
13	Not Listed	PEM1A	Artificial*	0.22	48.3722268	-98.0443914
14	PEM1A/R4SBC/R5UBH	PEM1A/PABF	Natural	1.0	48.3762501	-98.0432191
			Artificial*	0.44		
15	Not Listed	PEM1A	Natural	0.19	48.3731878	-98.0389072
			Artificial*	0.16		
16	Not Listed	PEM1A	Artificial*	0.06	48.3722009	-98.0408668
17	R5UBH/L1UBGh	PABF	Artificial*	0.49	48.369243	-98.0398226
18	R4SBC	PEM1C	Natural	0.10	48.3724145	-98.0396535
19	Not Listed	PEM1A	Artificial*	0.02	48.3720246	-98.0388999
20	Not Listed	PEM1A	Artificial*	0.02	48.3718535	-98.0382356
21	Not Listed	PEM1A	Artificial*	0.06	48.3715074	-98.0373945
22	PEM1C	PEM1C	Natural	0.25	48.370648	-98.0366951
23	Not Listed	PEM1A	Natural	1.08	48.371518	-98.0370827
			Artificial*	2.6		
24	PEM1A/R4SBC	PEM1A	Natural	1.80	48.3670833	-98.0281666
25	L1UBGh	PABF	Artificial*	1.11	48.3702113	-98.0217943
26	Not Listed	PEM1A	Artificial*	2.30	48.3688131	-98.0174002
27	L1UBGh	PABF	Artificial*	0.05	48.3651371	-98.0157956
28	Not Listed	PEM1A	Natural	0.17	48.3675591	-98.0181864
			Artificial*	0.71		
29	Not Listed	PEM1A	Natural	0.53	48.364591	-98.015821
30	Not Listed	PEM1A	Artificial*	0.19	48.3683651	-98.0137199
31	Not Listed	PEM1A	Artificial	0.12	48.3689533	-98.0118318
32	Not Listed	PEM1A	Artificial*	0.02	48.3679715	-98.0116826
33	Not Listed	PEM1A	Artificial*	0.02	48.3672342	-98.0112445
34	Not Listed	PEM1A	Artificial	0.06	48.3665777	-98.0120906
35	Not Listed	PEM1A	Artificial	0.02	48.3659128	-98.0104267
36	Not Listed	PEM1A	Artificial	0.85	48.3658075	-98.0102238
37	Not Listed	PEM1A	Natural	1.07	48.3726093	-98.0101871
Total acres of wetlands within project boundary				**34.87**		
Total acres natural wetland				20.36		
Total acres artificial wetland				14.51		
Total acres artificial lacustrine fringe				13.28		

5.4.2 POTENTIAL OTHER WATERS

Table D-9-3 shows the potential other waters in the survey area.

OW 1 (Bylin Dam and Dougherty Dam Reservoirs)

The Bylin Dam Reservoir is an artificial lake that was created with the construction of the Bylin Dam. An original structure, Dougherty Dam, is part of the Bylin reservoir when the water is high. The Bylin reservoir part is approximately 59.62 acres, and the Dougherty reservoir is approximately 20.57 acres. Both are classified as L1UBHh by the NWI. Field observations confirm this classification.

OW-2 (North Branch Forest River) and 4-10, 15-18, 22, 28, 49 (Tributaries)

The North Branch Forest River flows southeast through the survey area and drains into the Bylin Dam reservoir. The mainstem is classified by the NWI as R2UBF while the majority of the potential tributaries are classified as R4SBC/PEM1C. Field observations confirm these classifications. The North Branch Forest River converges with the Forest River approximately 14.5 miles southeast of Bylin Dam near Fordville, North Dakota and is a tributary to the Red River of the North. The dominant vegetation within the low-flow channel includes *Spartina pectinata* (prairie cordgrass), *Schoenoplectus tabernaemontani* (soft-stem bulrush), *Phalaris arundinacea* (reed canary grass), and *Symphyotrichum ericoides* (heath aster). The dominant vegetation along the active floodplain boundary includes *Phalaris arundinacea* (reed canary grass), *Bromus inermis* (smooth brome), *Poa pratensis* (Kentucky blue grass), *Solidago canadensis* (Canada goldenrod), *Cirsium arvense* (Canada thistle), *Sonchus arvensis* (perennial sow thistle), and *Euphorbia esula* (leafy spurge). The width of the channel is approximately five feet near the reservoir and becomes narrower further upstream (1-3 feet wide). The river has a slightly meandering course in some places and flows through wetland areas in other places. The river flows into the reservoir pool and continues its course downstream upon exiting the reservoir at the outlet point.

OW 3, 11-14, 19-21, 23-27, 29-48 (Drainage features)

These are potential OW-drainages observed within the project area. These drainage features are indicated on the map because of their relatively low position on the landscape, which creates the potential for concentrated flows toward the Bylin Dam Reservoir. No indicators of ordinary high-water marks were observed during the field visits and no active floodplains were observed/associated with these features. These are likely ephemeral features which lack sufficient wetland indicators, and the presence of flow is a response to precipitation and/or flood events. The dominant vegetation within the low-flow channel include *Spartina pectinata* (prairie cordgrass), *Phalaris arundinacea* (reed canary grass), *Symphyotrichum ericoides* (heath aster), and many *Carex spp.* (sedges). The dominant vegetation along the active floodplain boundary includes *Bromus inermis* (smooth brome), *Poa pratensis* (Kentucky bluegrass), *Solidago canadensis* (Canada goldenrod), *Cirsium arvense* (Canada thistle), *Sonchus arvensis* (perennial sow thistle), *Artemisia campestris* (field sagewort), and *Euphorbia esula* (leafy spurge). The width of the channel is approximately 1-2’ wide with many of the drainages being concave within the landscape.

Table D-9-3: Potential other waters and their characteristics (data limited to project boundary only).

Resource ID	NWI Listing	Field Observation	OW length (linear feet)	OW Area (acres)	Latitude (center)	Longitude (center)
1	L1UBGh	L1UBGh	-	Bylin 59.62 Dougherty 20.57	48.37418937	-98.0500918
2	PEM1C/R4SBC	PEM1C/R4SBC	11947.98	-	48.3861541	-98.06380865
3	Not Listed	R4SBC	506.50	-	48.39593139	-98.07651883
4	R4SBC	R4SBC	1650.72	-	48.39039582	-98.06958883
5	Not Listed	PEM1A/C	435.38	-	48.38997816	-98.06944293
6	R4SBC	R4SBC	1828.93	-	48.39034452	-98.06329951
7	R4SBC	R4SBC	767.54	-	48.38908278	-98.06272857
8	Not Listed	PEM1A/C	515.39	-	48.38871426	-98.06743087
9	Not Listed	PEM1A/C	1032.65	-	48.3868835	-98.06607107
10	Not Listed	PEM1A/C	282.39	-	48.3866013	-98.06579086
11	Not Listed	N/A	671.1	-	48.38399025	-98.06368157
12	Not Listed	N/A	696.48	-	48.38383288	-98.06371023
13	Not Listed	N/A	369.64	-	48.38397449	-98.06155893
14	Not Listed	N/A	363.25	-	48.38389648	-98.06154558
15	Not Listed	PEM1A/C	421.76	-	48.38232767	-98.06227018
16	R4SBC	R4SBC	2567.4	-	48.37962046	-98.06016367
17	Not Listed	PEM1A/C	49.24	-	48.38078816	-98.0578232
18	Not Listed	PEM1A/C	136.39	-	48.38029261	-98.05727238
19	Not Listed	PEM1A/C	934.98	-	48.3789427	-98.05755968
20	Not Listed	PEM1A/C	310.55	-	48.37809283	-98.05739628
21	Not Listed	PEM1A/C	831.64	-	48.3736473	-98.05602823
22	R4SBC	R4SBC	1353.34	-	48.37164199	-98.05640022
23	Not Listed	PEM1A/C	1134.72	-	48.37072001	-98.05059669
24	Not Listed	PEM1A/C	617.64	-	48.37770645	-98.04561115
25	Not Listed	PEM1A/C	510.66	-	48.37417847	-98.04681527
26	Not Listed	PEM1A/C	512.57	-	48.37154661	-98.04639572
27	Not Listed	PEM1A/C	611.88	-	48.37075955	-98.04555402
28	R4SBC/R5UBH	R4SBC	2320.39	-	48.37020278	-98.04169564
29	Not Listed	PEM1A/C	185.03	-	48.37430567	-98.04117799
30	Not Listed	PEM1A/C	211.57	-	48.37386654	-98.0392182
31	Not Listed	R4SBC	252.32	-	48.37369782	-98.03826661
32	Not Listed	PEM1A/C	245.84	-	48.37295228	-98.0360694
33	Not Listed	R4SBC	688.36	-	48.36983638	-98.0373087
34	Not Listed	R4SBC	906.48	-	48.36959294	-98.03425613

Table D-9-3: continued

Resource ID	NWI Listing	Field Observation	OW length (linear feet)	OW Area (acres)	Latitude (center)	Longitude (center)
35	Not Listed	PEM1/SS1F	327.95	-	48.37015783	-98.03169083
36	Not Listed	PEM1/SS1F	356.07	-	48.37121148	-98.02807968
37	Not Listed	PEM1/SS1F	449.34	-	48.37025415	-98.02536485
38	Not Listed	PEM1/SS1F	186.24	-	48.36972286	-98.02342729
39	Not Listed	PEM1A/C	450.94	-	48.36589121	-98.02788796
40	Not Listed	PEM1A/C	950.14	-	48.36646638	-98.02651285
41	Not Listed	R4SBC	389.82	-	48.36675589	-98.02517995
42	Not Listed	PEM1/SS1F	416.85	-	48.37026949	-98.02040891
43	Not Listed	PEM1/SS1F	440.6	-	48.37130434	-98.02119588
44	Not Listed	PEM1/SS1F	1030.69	-	48.37281562	-98.02217214
45	Not Listed	PEM1/SS1F	2262.27	-	48.37327558	-98.02482634
46	Not Listed	PEM1A/C	433.68	-	48.36706007	-98.01859512
47	Not Listed	R4SBC	310.7	-	48.36526212	-98.01743754
48	Not Listed	PEM1A/C	1403.3	-	48.37002179	-98.01546874
49	Not Listed	PEM1/SS1F	451.52	-	48.37084064	-98.00841955
Totals within project boundary			**45,730.82**	**80.19**		

5.5 COMMERCE

There are no evident commerce activities associated with these wetlands. There are no irrigation features associated with these wetlands. The dam reservoir offers boating and fishing activities that are open to the public. A public boat access is located at the eastern side of the reservoir.

5.6 IMPACTS TO AQUATIC RESOURCES

The two proposed project alternatives include impacts to aquatic resources. The sections below briefly describe the alternatives, the potential impacts, and avoidance measures that were incorporated into the alternative designs, an estimate of the mitigation requirements, and proposed mitigation methods. All aquatic resources are assumed to be under the jurisdiction of the USACE for the purposes of this estimate and it is assumed both natural and artificial wetlands may require mitigation. These estimates are provisional upon USACE determination once a 404-permit application has been submitted.

5.6.1 ALTERNATIVE NO. 1 –FUTURE WITHOUT FEDERAL INVESTMENT (FWOFI)

Alternative No. 1 would involve a breach of the existing dam and removal of the outlet works associated with the dam. Riprap and sheet and sheet piling would be used to minimize sediment transport downstream. The road over Bylin Dam would be realigned to its original location (prior to the construction of Bylin Dam, 122nd Ave NE) west of the dam embankment, and a 90-inch diameter culvert would be installed to pass flows through the road crossing with the North Branch Forest River.

Impacts to aquatic resources include elimination of the Bylin reservoir and subsequent loss of lacustrine fringe wetlands, fill into wetlands where the roadbed would be constructed, and excavation into the current plunge pool and a stretch of the downstream channel. Impacts are shown on **Exhibit D-9-5** and in **Table D-9-4**).

Table D-9-4: Impacts to aquatic resources with Alternative 1.

Resource ID	Resource Description	Feature Condition	Impact Type and Description	Impact (acres unless noted)	Proposed Mitigation
Wetland 23	Lacustrine fringe	Artificial (hydrology)	Permanent, water source eliminated	2.58	Mitigation credit purchase or redevelopment of floodplain wetlands
	Riverine wetland	Natural	No impact	n/a	n/a
Wetland 25	Lacustrine fringe	Artificial (hydrology)	Permanent, water source eliminated	1.1	Mitigation credit purchase or redevelopment of floodplain wetlands
	Riverine wetland	Natural	No impact	n/a	n/a
Wetland 26	Lacustrine fringe	Artificial (hydrology)	Permanent, water source eliminated	2.3	Mitigation credit purchase or redevelopment of floodplain wetlands
			Permanent, fill with road construction	n/a	n/a, wetland already eliminated by reservoir removal
	Riverine wetland	Natural	No impact	n/a	n/a
Wetland 27	Lacustrine fringe	Artificial (hydrology)	Permanent, water source eliminated	0.49	Mitigation credit purchase or redevelopment of floodplain wetlands
Wetland 28	Lacustrine fringe	Artificial (hydrology)	Permanent, water source eliminated	0.71	Mitigation credit purchase or redevelopment of floodplain wetlands
	Riverine wetland	Natural	No impact	n/a	n/a
Wetland 30	Lacustrine fringe	Artificial (hydrology)	Permanent, water source eliminated	0.19	Mitigation credit purchase or redevelopment of floodplain wetlands
			Permanent, fill with road construction	n/a	n/a, wetland already eliminated by reservoir removal

Table D-9-4: continued.

Resource ID	Resource Description	Feature Condition	Impact Type and Description	Impact (acres unless noted)	Proposed Mitigation
Wetland 31	Impoundment	Artificial (drainageway obstructed by road construction)	Permanent, fill with road construction	0.026	Mitigation credit purchase
Wetland 32	Lacustrine fringe	Artificial (hydrology)	Permanent, water source eliminated	0.02	Mitigation credit purchase or redevelopment of floodplain wetlands
			Permanent, fill with road construction	n/a	n/a, wetland already eliminated by reservoir removal
Wetland 33	Lacustrine fringe	Artificial (hydrology)	Permanent, water source eliminated	0.018	Mitigation credit purchase or redevelopment of floodplain wetlands
			Permanent, fill with road construction	n/a	n/a, wetland already eliminated by reservoir removal
OW-1	Bylin Reservoir – open water	Artificial (hydrology)	Permanent, open water areas eliminated	59.62	n/a
OW-2	Stream	Natural	Excavation	104.9	n/a

5.6.2 ALTERNATIVE NO. 2 – STRUCTURAL REHABILITATION TO HIGH-HAZARD DESIGNATION (STRUCTURAL REHABILITATION)

The structural rehabilitation involves raising the dam embankment, modifying the existing auxiliary spillway profile, armoring the auxiliary spillway with ACB, implementing a new principal spillway structure, modifying the downstream embankment of the dam, and adjusting the plunge pool and channel location.

Impacts to aquatic resources include permanent excavation, permanent fill, temporary equipment parking, temporary inundation of wetlands, temporary drawdown of the reservoir (approximately September to June), and fill in the downstream channel. Impacts are shown on **Exhibit D-9-6** and in **Table D-9-5**).

Table D-9-5: Impacts to aquatic resources with Alternative 2.

Resource ID	Resource Description (lacustrine fringe, basin, stream, other)	Feature Condition (artificial, natural)	Impact Type and description	Impact (acres unless noted)	Proposed Mitigation
Wetland 1	Riverine wetland	Natural	Temporary, inundation	0.0012	n/a
Wetland 3	Riverine wetland	Natural	Temporary, inundation	0.086	n/a
Wetland 8	Riverine wetland	Natural	Temporary, inundation	0.02	n/a
Wetland 9	Riverine wetland	Natural	Temporary, inundation	0.044	n/a
Wetland 12	Riverine wetland	Natural	Temporary, inundation	0.049	n/a
Wetland 14	Riverine wetland	Natural	Temporary, inundation	0.038	n/a
Wetland 18	Riverine wetland	Natural	Temporary, inundation	0.061	n/a
Wetland 23	Riverine wetland	Natural	Temporary, inundation	0.028	n/a
	Lacustrine fringe	Artificial (hydrology)	Temporary, reservoir drawdown	2.6	n/a
Wetland 24	Riverine wetland	Natural	Temporary, inundation	0.11	n/a
Wetland 25	Lacustrine fringe	Artificial (hydrology)	Temporary, reservoir drawdown	1.1	n/a
Wetland 26	Lacustrine fringe	Artificial (hydrology)	Permanent, excavation	0.057	Mitigation credit purchase or n/a
			Temporary, reservoir drawdown	2.3	n/a
Wetland 27	Lacustrine fringe	Artificial (hydrology)	Temporary, reservoir drawdown	0.049	n/a
Wetland 28	Lacustrine fringe	Artificial (hydrology)	Temporary, reservoir drawdown	0.71	n/a
Wetland 30	Lacustrine fringe	Artificial (hydrology)	Temporary, reservoir drawdown	0.19	n/a

Table D-9-5: continued.

Resource ID	Resource Description (lacustrine fringe, basin, stream, other)	Feature Condition (artificial, natural)	Impact Type and description	Impact (acres unless noted)	Proposed Mitigation
Wetland 32	Lacustrine fringe	Artificial (hydrology)	Temporary, reservoir drawdown	0.2	n/a
Wetland 33	Lacustrine fringe	Artificial (hydrology)	Temporary, reservoir drawdown	0.018	n/a
Wetland 34	Impoundment	Artificial (drainageway obstructed by dam toeslope)	Permanent, fill	0.0079	Mitigation credit purchase
Wetland 36	Basin wetland	Artificial (formed from spillway construction)	Temporary, equipment staging (fill)	0.85	n/a
OW-1	Bylin Reservoir – open water	Artificial (formed from dam construction)	Temporary, coffer dams and drawdown for construction	43	n/a
OW-2	Channel	Natural	Channel course adjustment – permanent fill	251.53 feet	n/a, replaced with new channel

5.7 IMPACTS SUMMARY

Tables D-9-6 and **D-9-7** show the summarized impacts and potential mitigation acres.

Table D-9-6: Summary of impacts to aquatic resources with Alternative 1-Future Without Federal Investment.

Impact Duration	Wetland / OW Type	Impact Type	Impact Quantity	Mitigation Credit Purchase if USACE 404 decision and if 1:1 ratio
Permanent	Natural	Excavation	104.90 feet stream	n/a
	Artificial	Fill	0.03 acres wetlands	0.03 credits
		Drawdown	59.62 acres lake 7.41 acres wetlands	n/a 7.41 credits
Total Wetland Impact			**7.44**	**-**
Total Permanent Wetland Impact			**7.44**	**Up to 7.44 credits**

Table D-9-7: Summary of impacts to aquatic resources with Alternative 2 – Structural Alternative.

Impact Duration	Wetland / OW Type	Impact Type	Impact Quantity	Mitigation Credit Purchase if USACE 404 decision and if 1:1 ratio
Permanent	Natural	Fill	251.53 river feet	n/a
	Artificial	Fill	0.008 wetland acres	0.008 credits
		Excavation	0.057 wetland acres	0.057 credits
Temporary	Natural	Inundation	0.44 wetland acres	n/a
	Artificial	Fill	0.85 wetland acres	n/a
		Drawdown	7.17 wetland acres 43.0 lake acres	n/a
Total Wetland Impact			**8.52 acres**	**-**
Total Permanent Wetland Impact			**0.065 acres**	**Up to 0.07 credits**

5.8 AVOIDANCE, MINIMIZATION, AND MITIGATION MEASURES

Avoidance measures incorporated into the designs included keeping the Alternative 2 drawdown to a minimum depth difference and duration, minimizing the size of equipment staging areas, repairing damage in wetlands due to equipment, and minimizing the downstream channel construction extent; and replacing the road in Alternative 1 on the smallest footprint possible while meeting safety standards.

Mitigation methods may consist of purchasing credits in the Red River Basin Service Area from Ducks Unlimited ($60,000 per credit as of April 15, 2022). For Alternative 1, if the USACE determines jurisdiction on all wetlands and determines all impacts (on natural and artificial wetlands) require a 1:1 replacement ratio, this could amount to $446,400. For Alternative 2, the mitigation credits could amount to $4,200.

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7 DELINEATOR CREDENTIALS

Name: Mike Ulmer, Soil Scientist, Prairie Soil Consulting, LLC

Education: North Dakota State School of Science, Wahpeton ND – AS Civil Engineering Technology, North Dakota State University, Fargo, ND – BS and MS Soil Science

Professional Memberships: Professional Soil Classifiers Association of North Dakota, Soil Science Society of America, Soil and Water Conservation Society, North Dakota Geological Society, North Dakota Academy of Science

National Association of Soil Conservation Districts, Phi Kappa Phi Honor Society

Training: SOIL Wetland identification (1978, 1995), SOIL Wetland training (1999), SOIL Reg. IV (1991), SOIL Hydric Soils (1995), SOIL Advanced Hydric Soils (2005)

Name: Mark D. Aanenson, Senior Environmental Scientist

Education: Minnesota State University Moorhead – BS Biology

Professional Membership: MN Wetland Professionals Association

Certifications/Licenses: Minnesota Wetland Professional Certification (no. 1001)

Training: More than 30 years of experience in wetland delineation, permitting, and other wetland-related work. Board of Water and Soil Resources – Jurisdictional Delineation of Wetlands in Minnesota; Advanced Delineation Practicum; Hydrologic Monitoring; Minnesota Routine Assessment Method; Wetland Plant Identification; University of Minnesota St. Paul – Soils 5555 – Wetland Soils, Dr. Jay Bell; NRCS – Engineering Properties of Soils; Minnesota DNR Native Plant Community Field Guide Training; Minnesota DNR Native Plant Community Field Plant Identification, Sedges of Minnesota Laboratory and Field Identification, 25+ years of fieldwork experience in the Northern Plains, UMN Approved Self-study course: Grasses of the Northern Plains

Name: Dr. Donna Jacob, Senior Scientist

Education: Beloit College – BS Environmental Biology, University College Dublin – MSc Botany, University College Dublin – PhD Botany (wetland biogeochemistry)

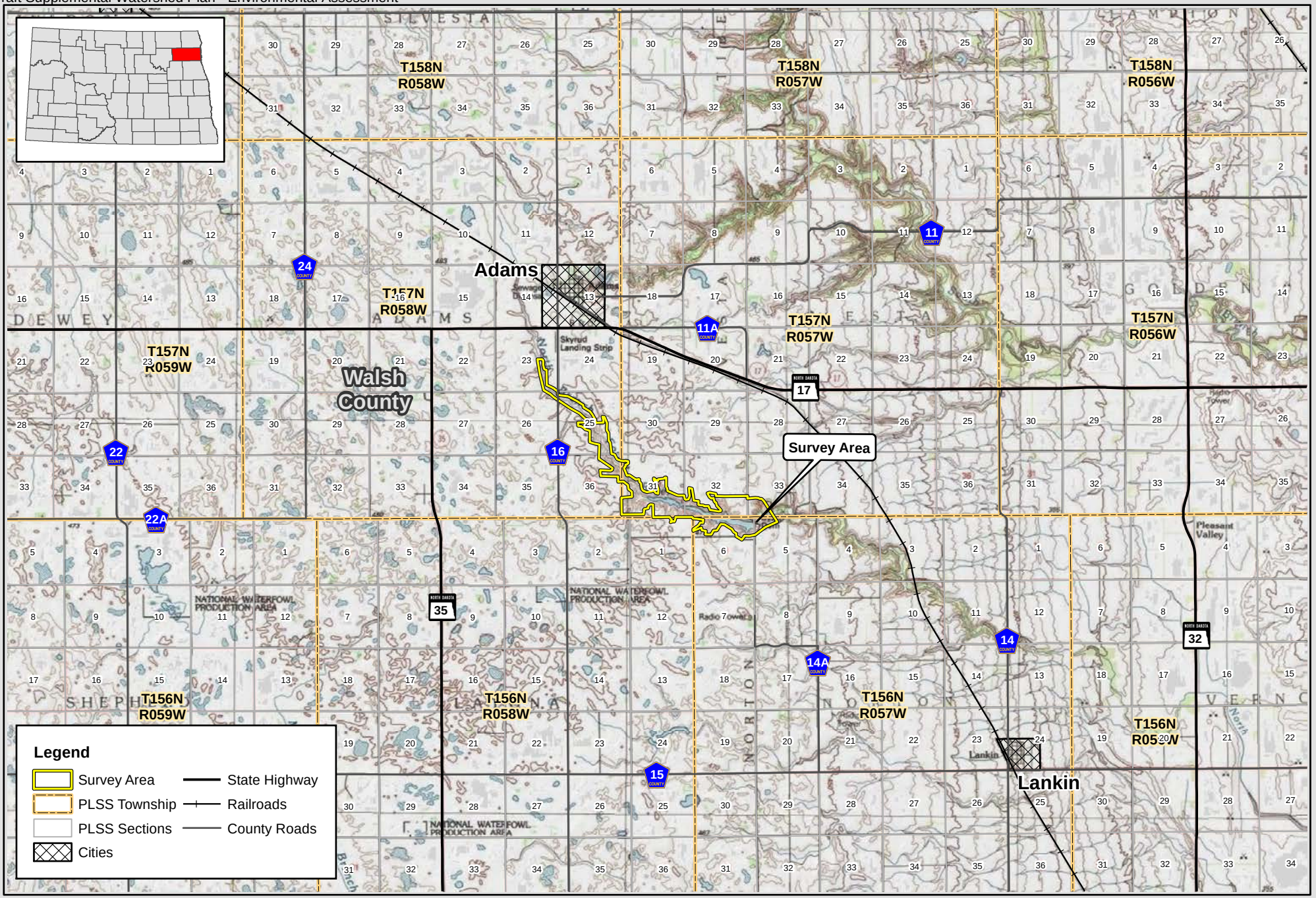
Professional Membership: Society of Wetland Scientists, American Association for the Advancement of Science, Research Associate Professor Affiliate at North Dakota State University, elected to Minnesota School Board Association

Certifications/Licenses: Professional Wetland Scientist (no. 2672), Minnesota Wetland Professional Certification (no. 1267)

Training: More than 25 years of experience including applied science and basic research in ecology and wetlands (most recently Research Associate Professor, North Dakota State University, 30+ peer-review publications); vegetation and biological inventories; wetland bank application preparation, preparing applications for 404 permitting; wetland delineations and fieldwork in the Northern Plains, MO, CO, NE, WI and other regions (Europe, Central Asia); Minnesota Wetland Professional Wetland Delineator Course, Minnesota DNR Native Plant Community Field Guide Training; Minnesota DNR Native Plant Community Field Plant Identification, Sedges of Minnesota Laboratory and Field Identification, UMN Approved Self-study course: Grasses of the Northern Plains

REPORT AUTHORS

Kaleb Haley, Benjamin Hengel, and Donna Jacob wrote the report. Jake Larson completed the GIS work and maps. Jacob, Aanenson, Haley, and Mike Ulmer (Prairie Soil Consulting, LLC) performed the fieldwork.



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HOUSTON engineering, inc.

Exhibit D-9-1: Project Location Map

North Branch Forest River Dam No. 1 (Bylin Dam)
Aquatic Resources Delineation Report
Natural Resource Conservation Service (NRCS)

0 1 2 4 Miles

1 in = 2 miles

N W E S

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AS SHOWN	JHL	DJ	7135-0037	5/5/2022	1 of 1

HOUSTON engineering, inc.

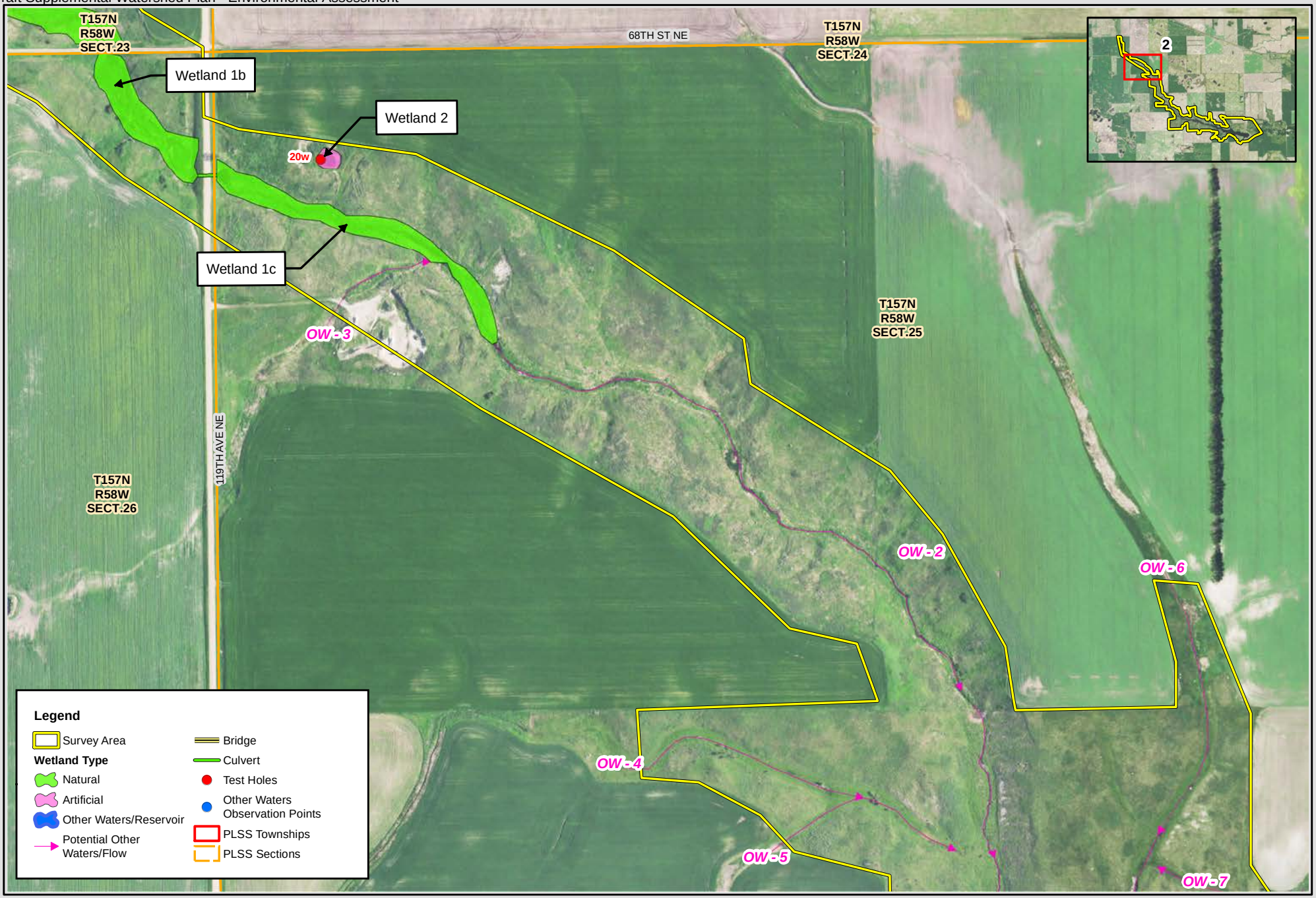
Exhibit D-9-2 Aquatic Resources Map

North Branch Forest River Dam No. 1 (Bylin Dam)
Natural Resource Conservation Service (NRCS)

0 250 500 1,000 Feet

1 inch = 500 feet

N W E S



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HOUSTON engineering, inc.

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North Branch Forest River Dam No. 1 (Bylin Dam)
Natural Resource Conservation Service (NRCS)

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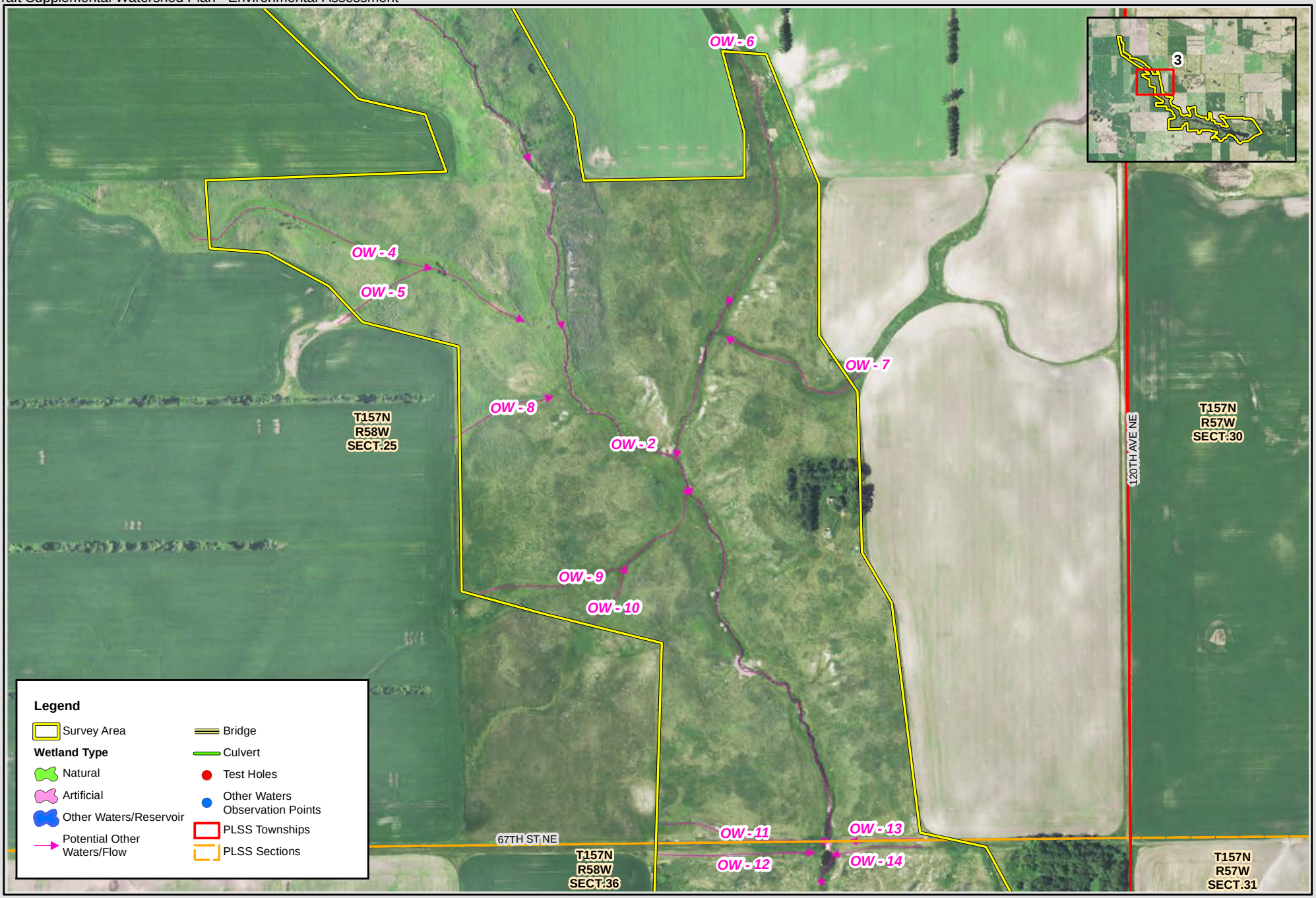

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HOUSTON engineering, inc.

Exhibit D-9-2 Aquatic Resources Map

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Natural Resource Conservation Service (NRCS)

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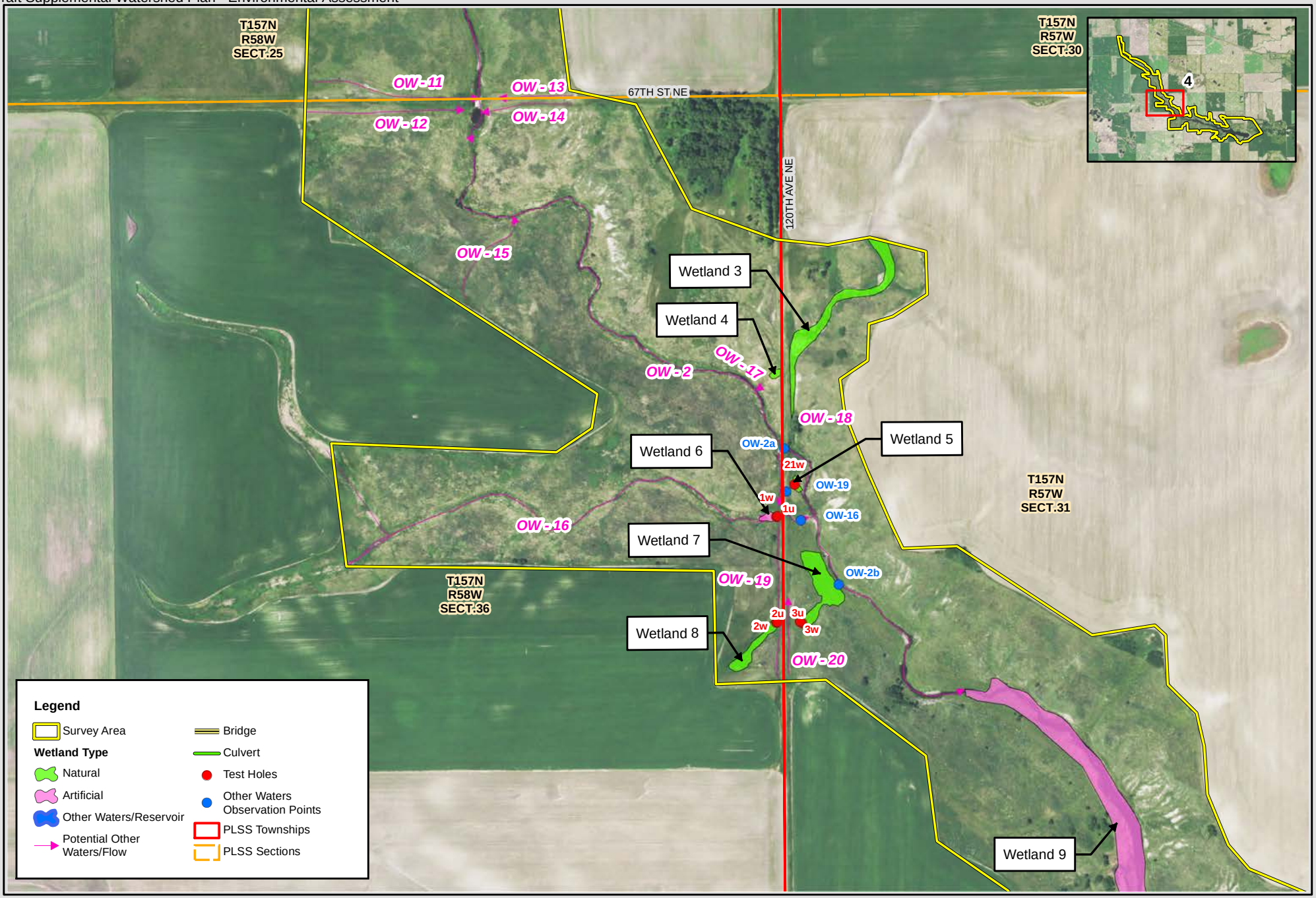

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HOUSTON engineering, inc.

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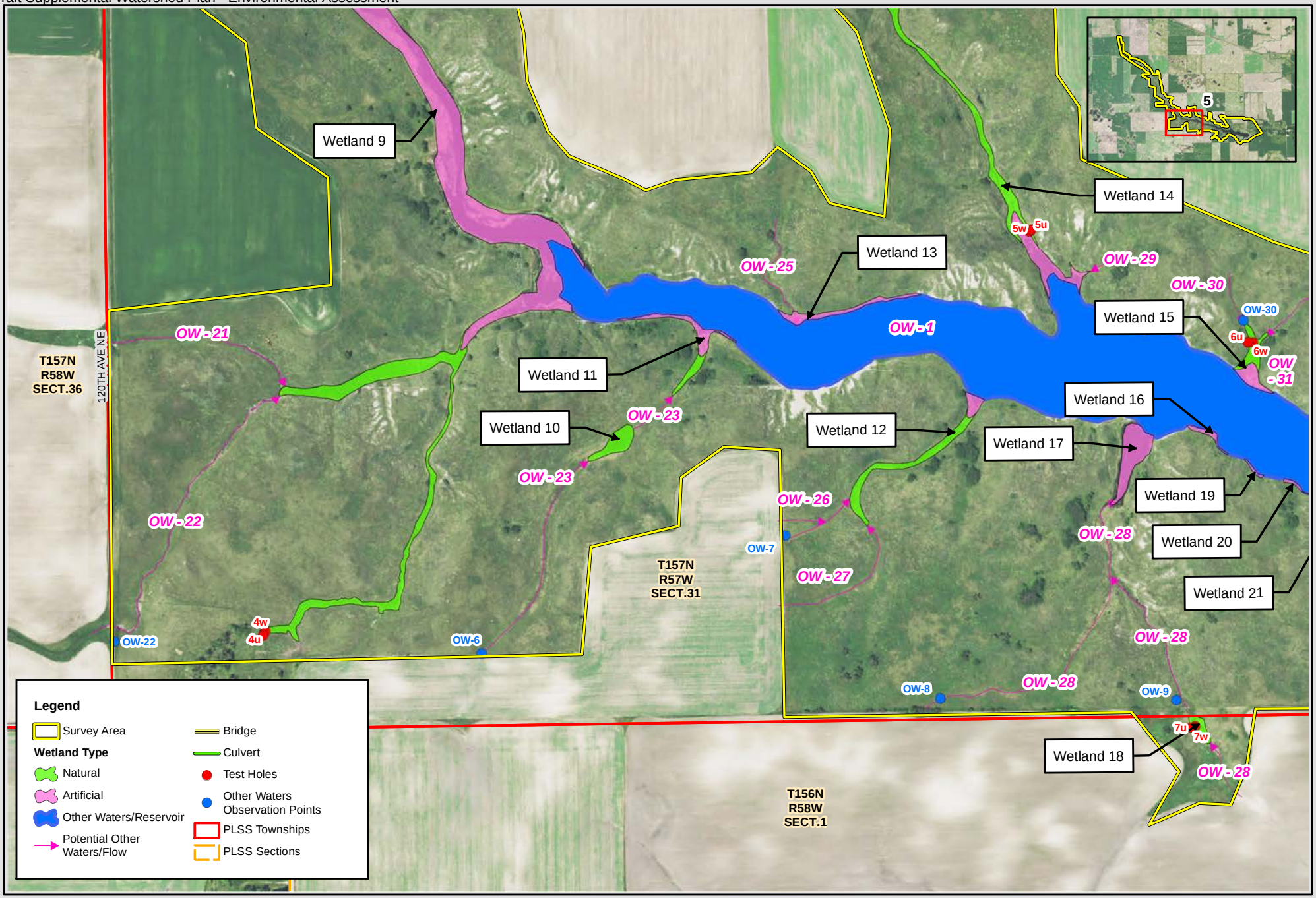

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HOUSTON engineering, inc.

Exhibit D-9-2 Aquatic Resources Map

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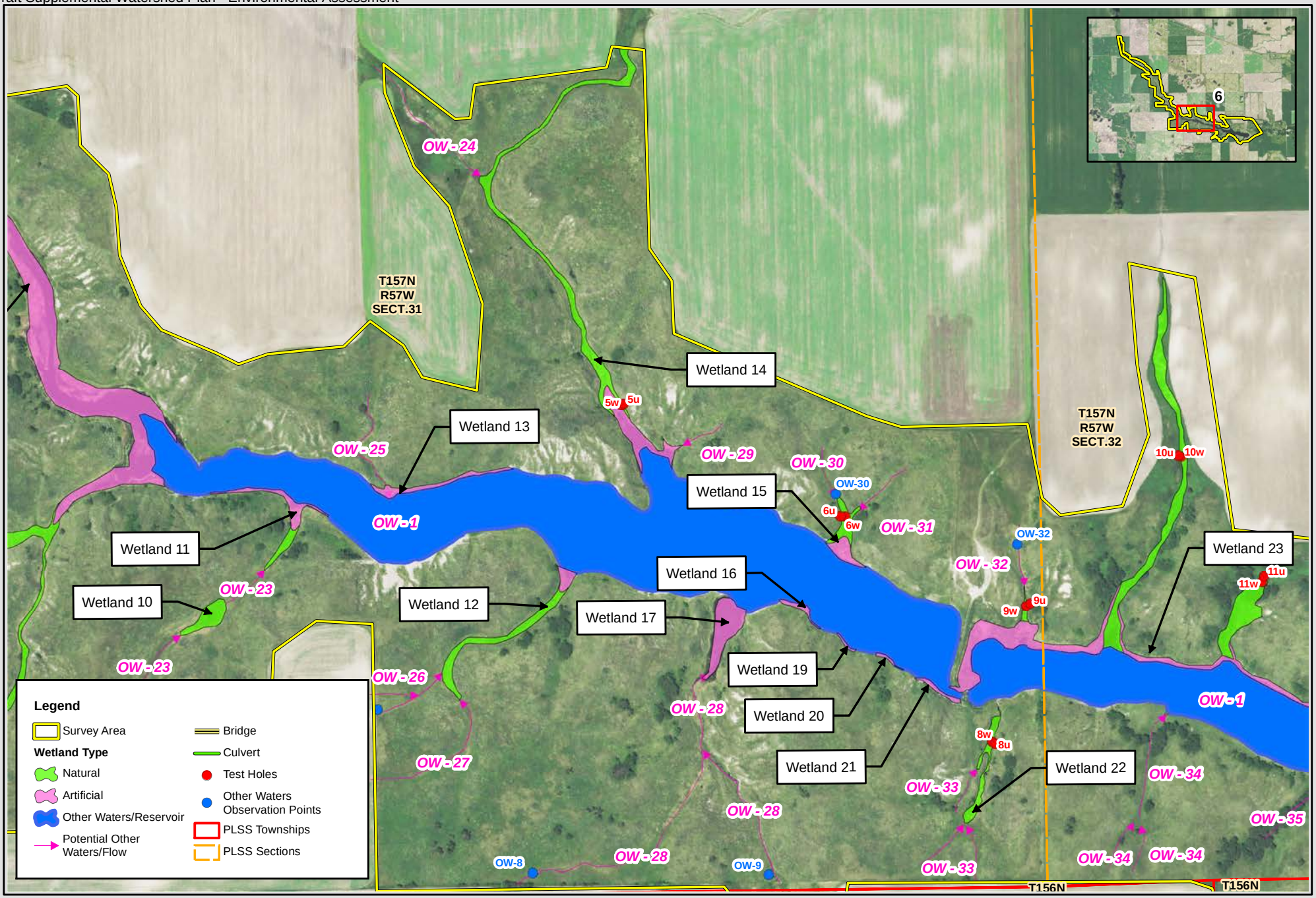

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HOUSTON engineering, inc.

Exhibit D-9-2 Aquatic Resources Map

North Branch Forest River Dam No. 1 (Bylin Dam)
Natural Resource Conservation Service (NRCS)

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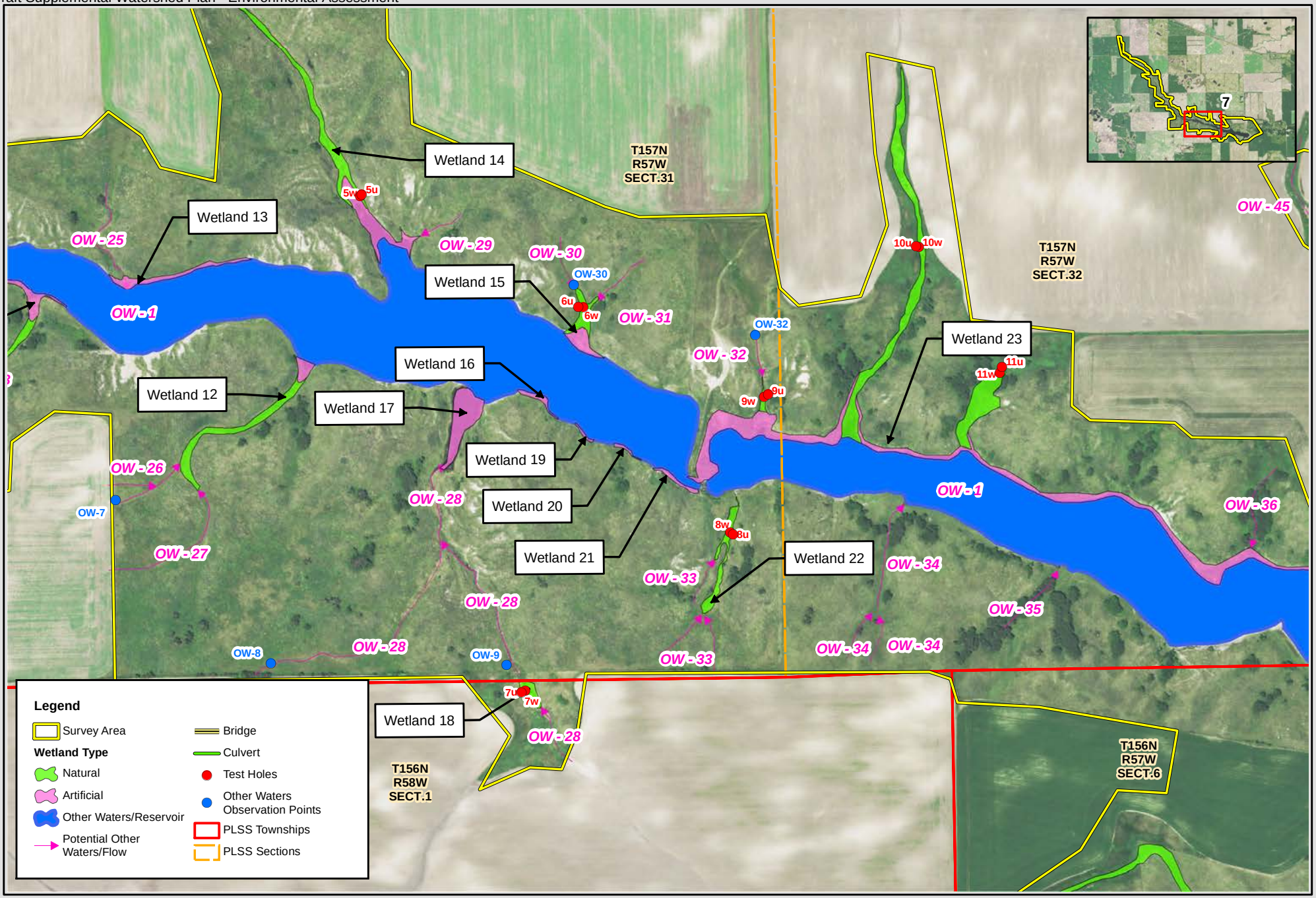

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HOUSTON engineering, inc.

Exhibit D-9-2 Aquatic Resources Map

North Branch Forest River Dam No. 1 (Bylin Dam)
Natural Resource Conservation Service (NRCS)

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1 inch = 500 feet

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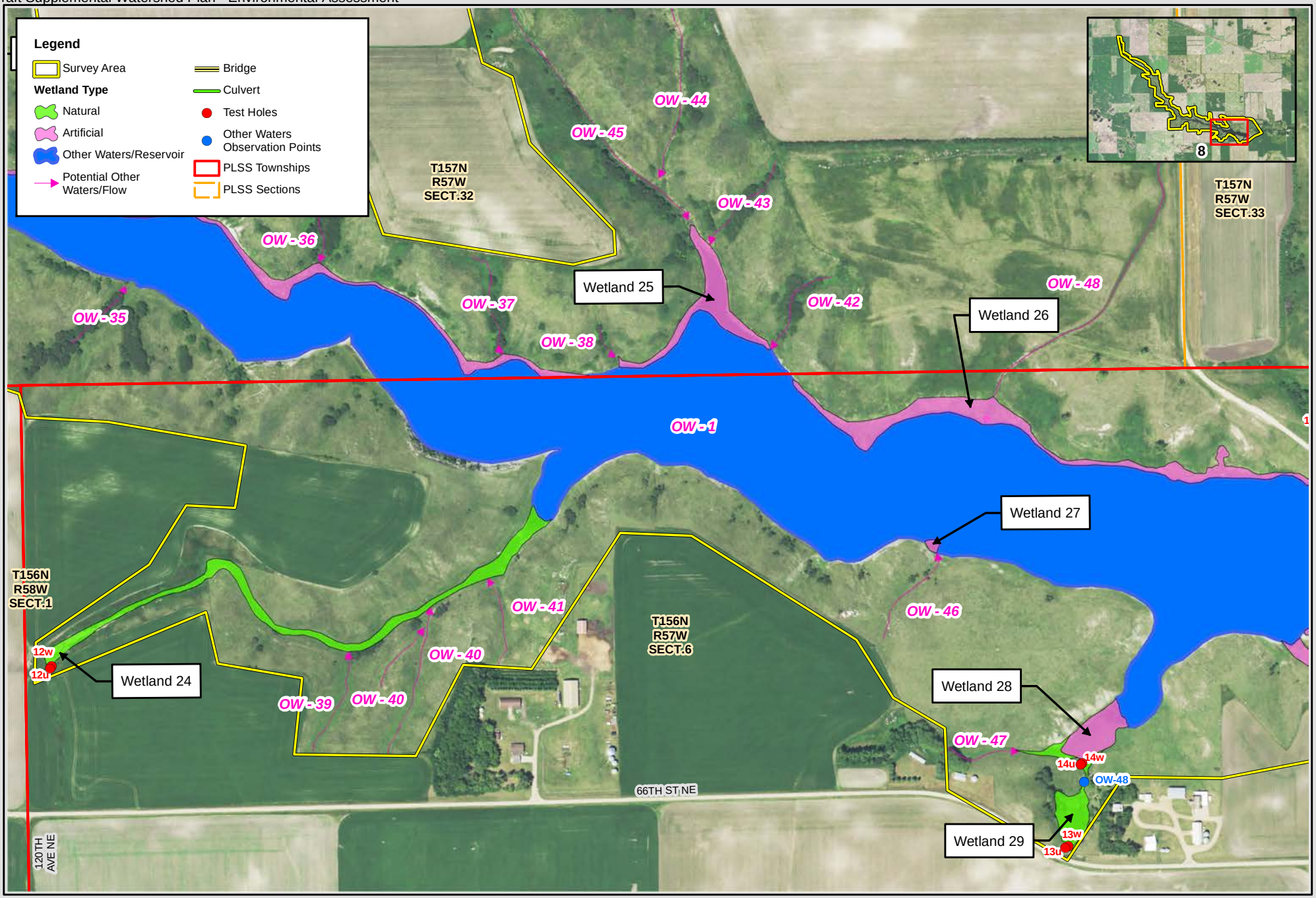

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HOUSTON engineering, inc.

Exhibit D-9-2 Aquatic Resources Map

North Branch Forest River Dam No. 1 (Bylin Dam)
Natural Resource Conservation Service (NRCS)

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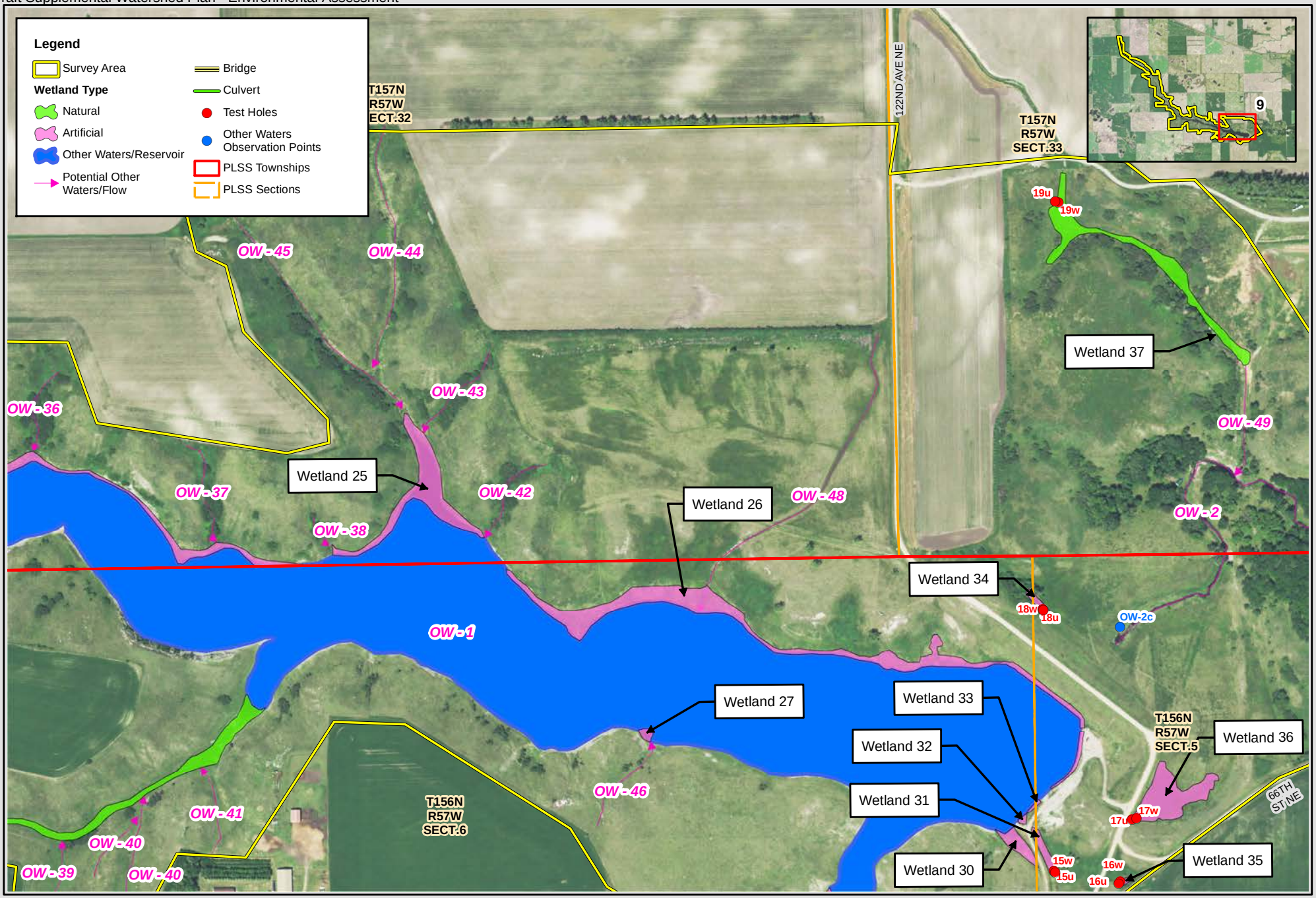

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HOUSTON engineering, inc.

Exhibit D-9-2 Aquatic Resources Map

North Branch Forest River Dam No. 1 (Bylin Dam)
Natural Resource Conservation Service (NRCS)

0 250 500 1,000 Feet

1 inch = 500 feet

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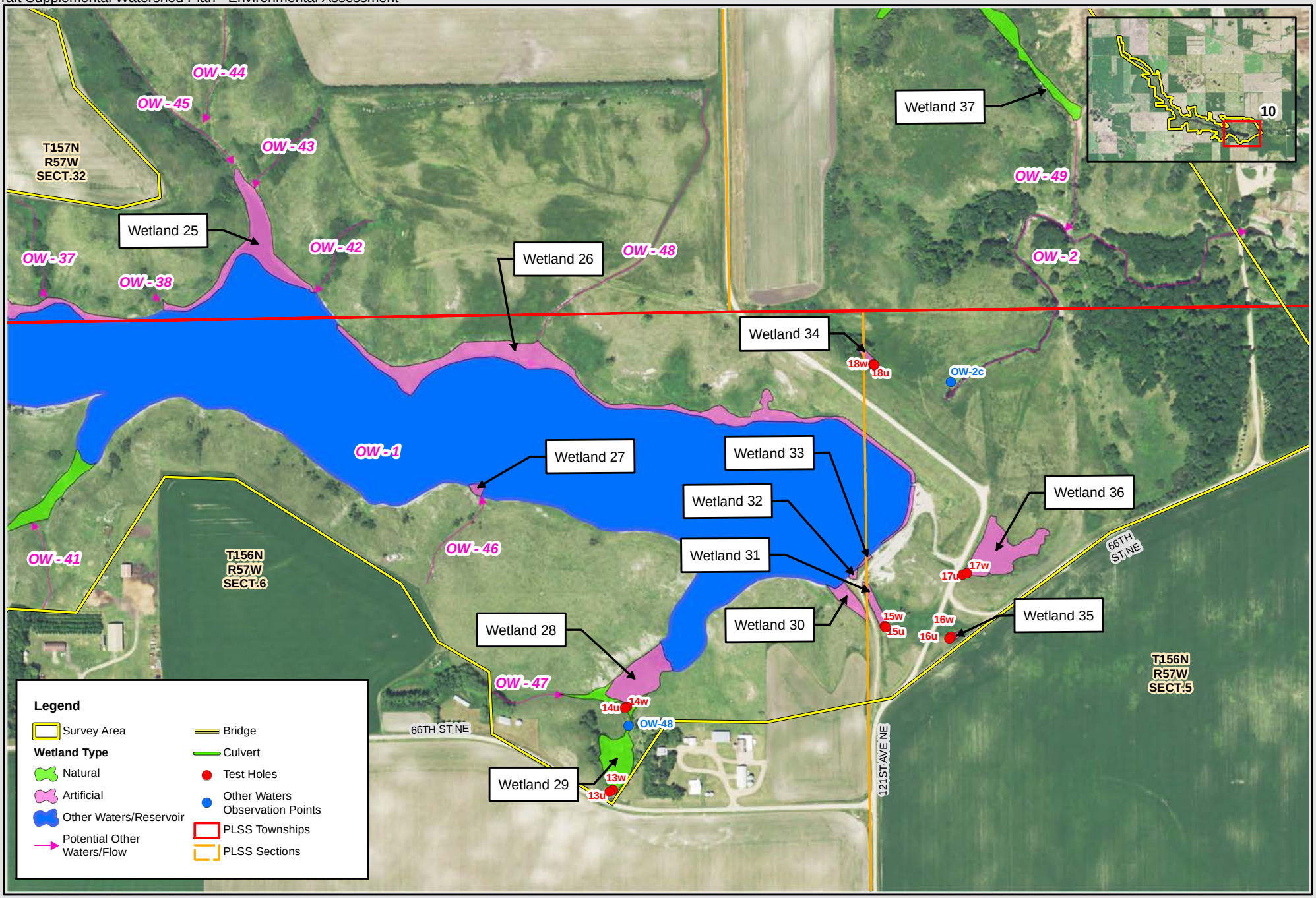

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HOUSTON engineering, inc.

Exhibit D-9-2 Aquatic Resources Map

North Branch Forest River Dam No. 1 (Bylin Dam)
Natural Resource Conservation Service (NRCS)

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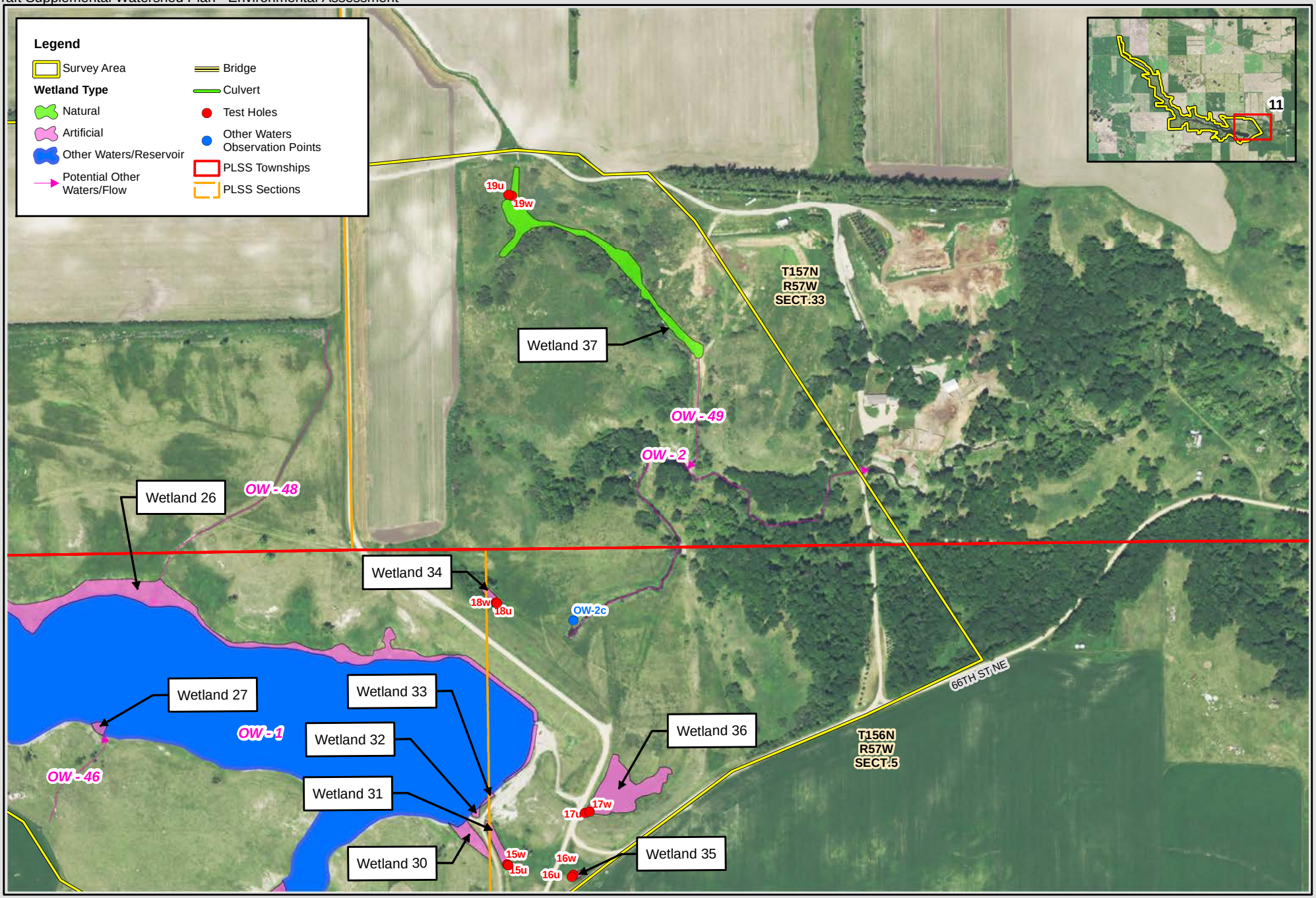

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HOUSTON engineering, inc.

Exhibit D-9-2 Aquatic Resources Map

North Branch Forest River Dam No. 1 (Bylin Dam)
Natural Resource Conservation Service (NRCS)

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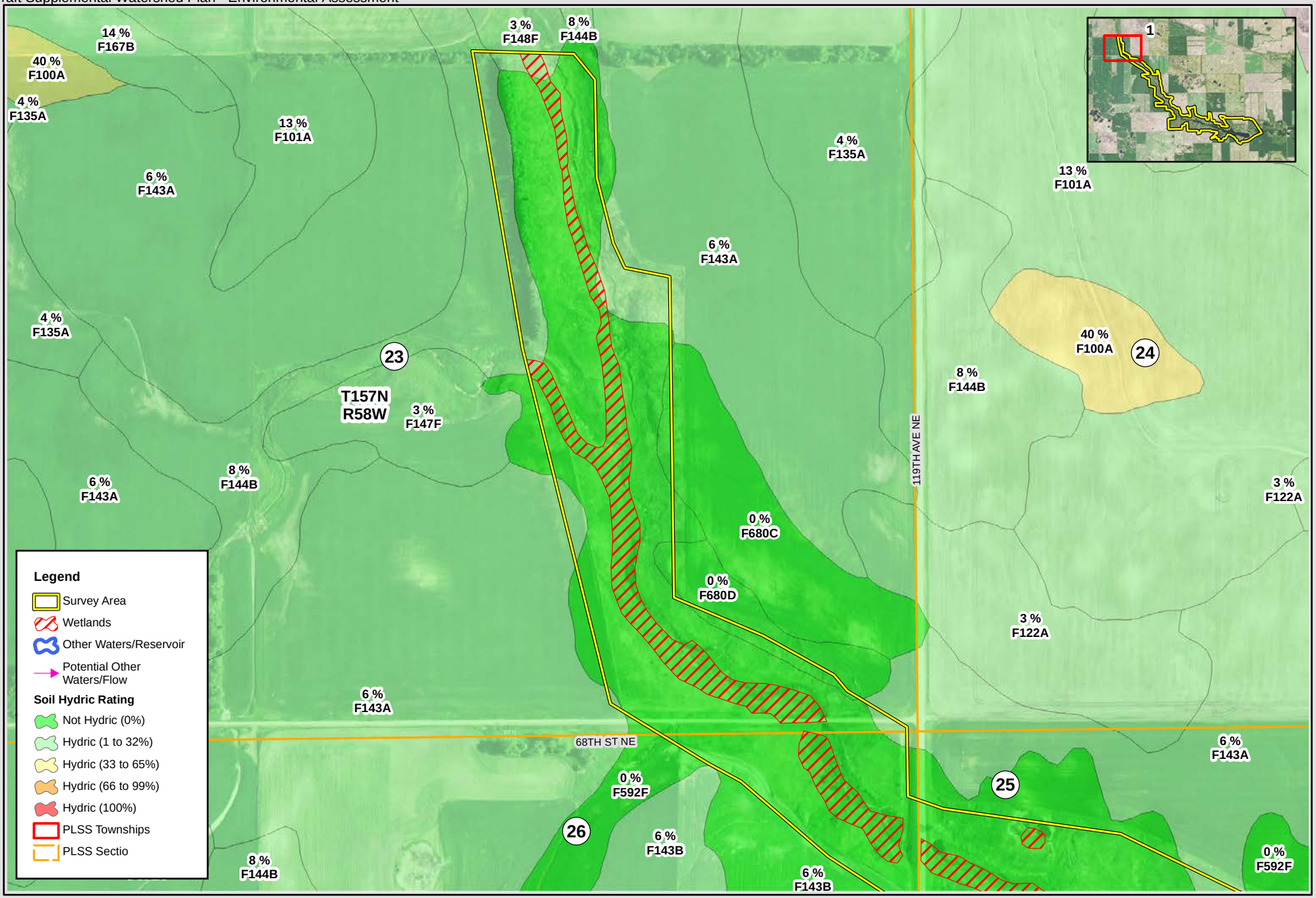

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HOUSTON engineering, inc.

Exhibit D-9-3: USDA Soils Map

North Branch Forest River Dam No. 1 (Bylin Dam)
Aquatic Resources Delineation Report
Natural Resource Conservation Service (NRCS)

0 250 500 1,000 Feet

1 inch = 500 feet

N W E S

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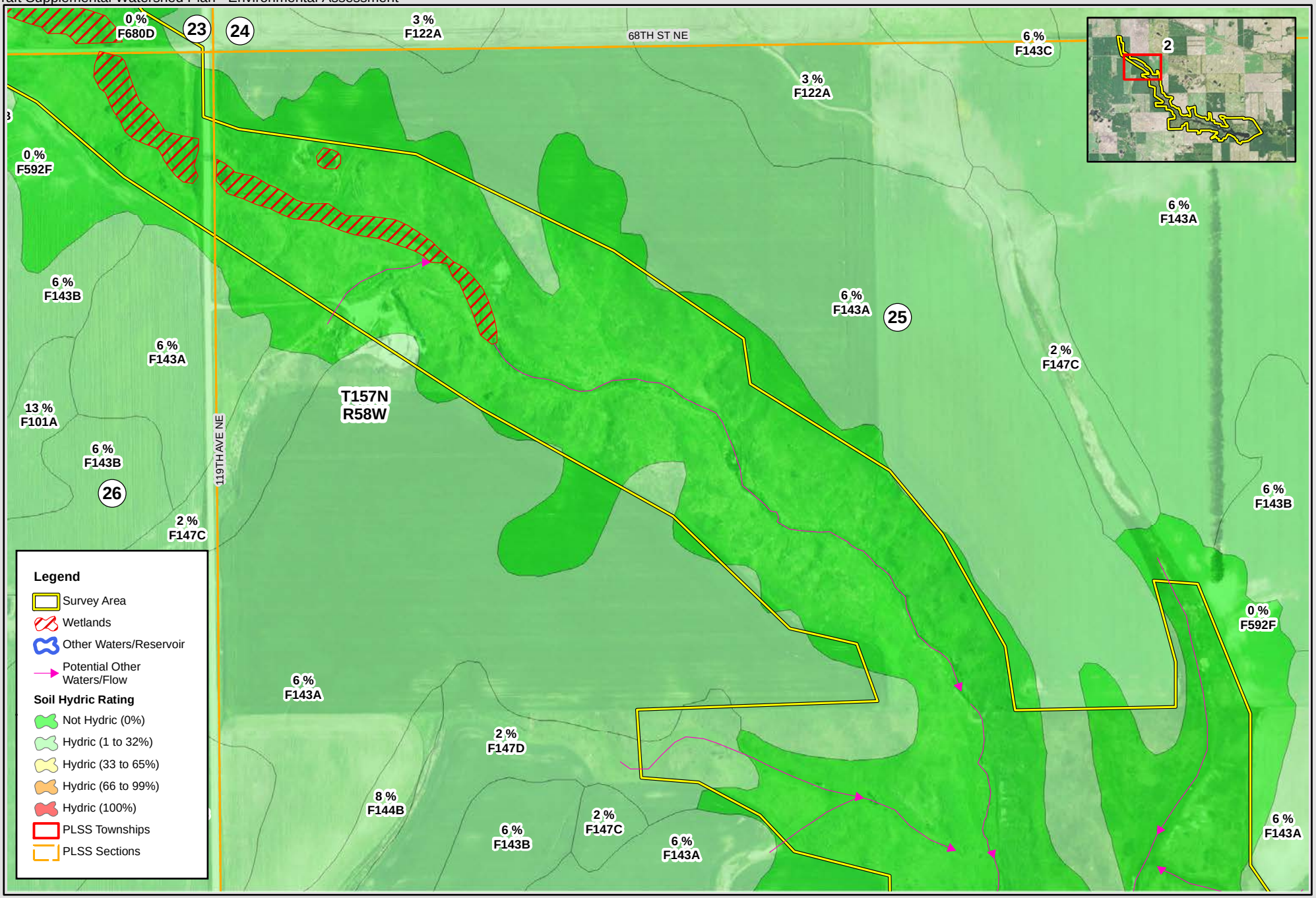

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HOUSTON engineering, inc.

Exhibit D-9-3: USDA Soils Map

North Branch Forest River Dam No. 1 (Bylin Dam)
Aquatic Resources Delineation Report
Natural Resource Conservation Service (NRCS)

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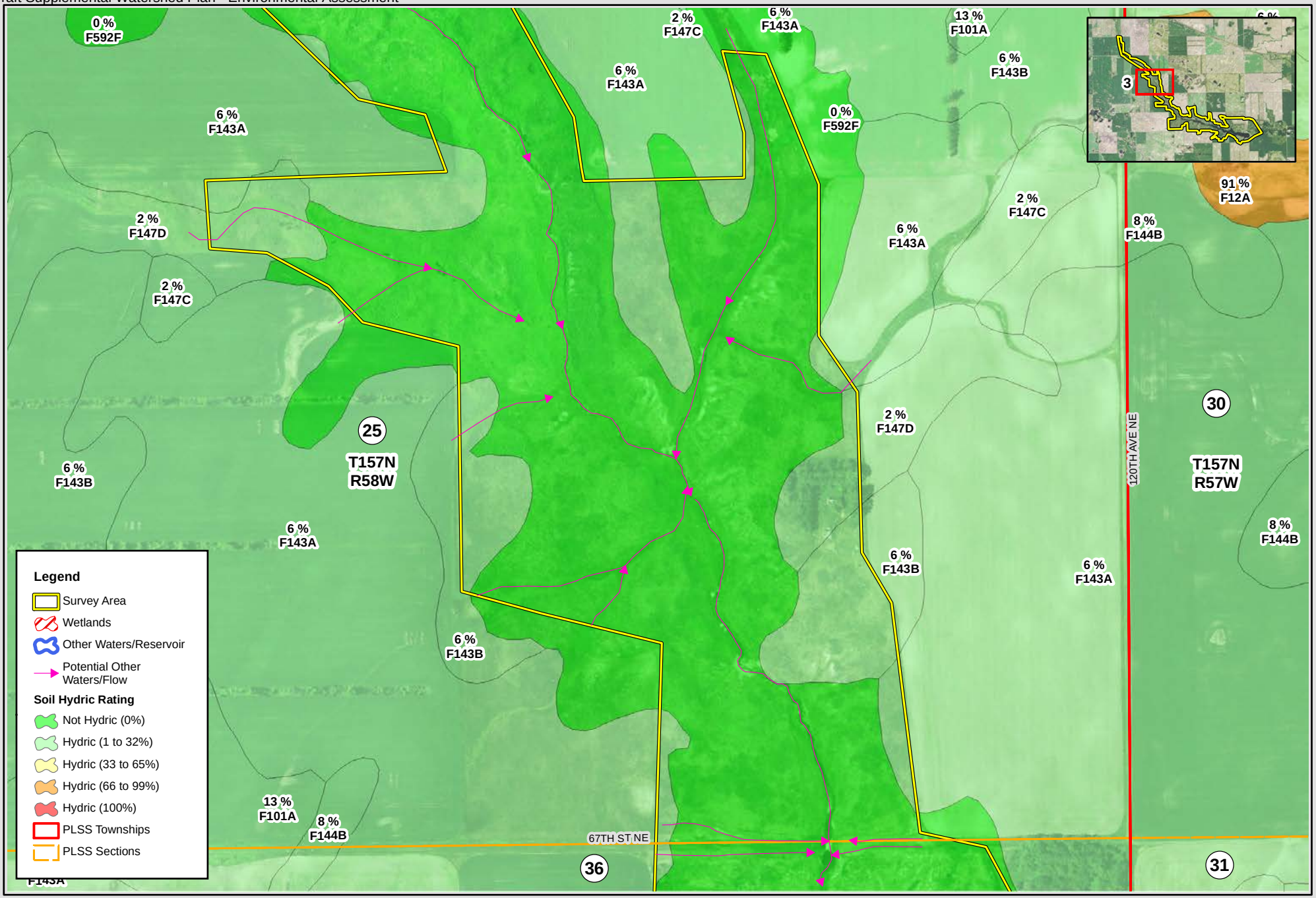

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HOUSTON engineering, inc.

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North Branch Forest River Dam No. 1 (Bylin Dam)
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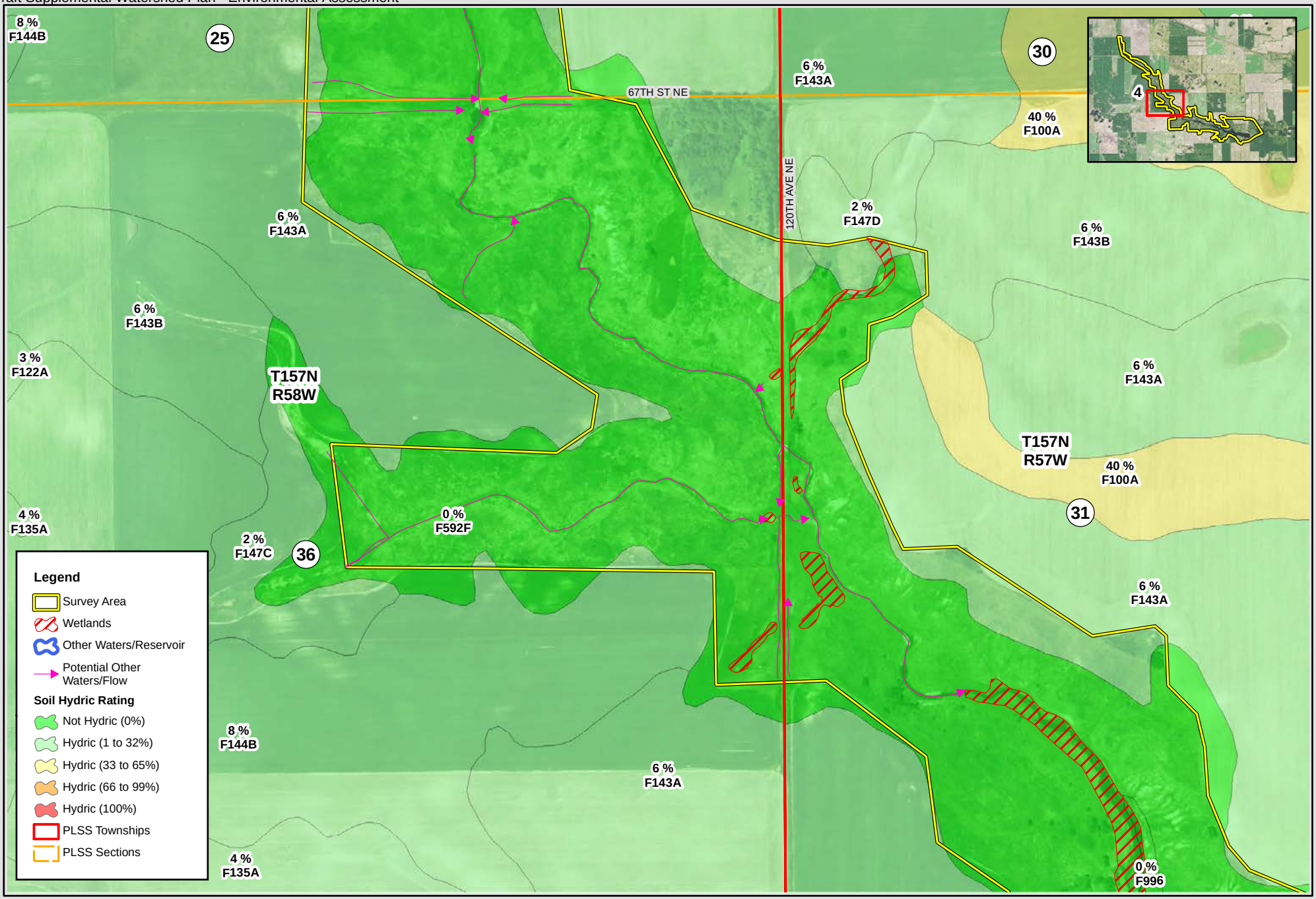

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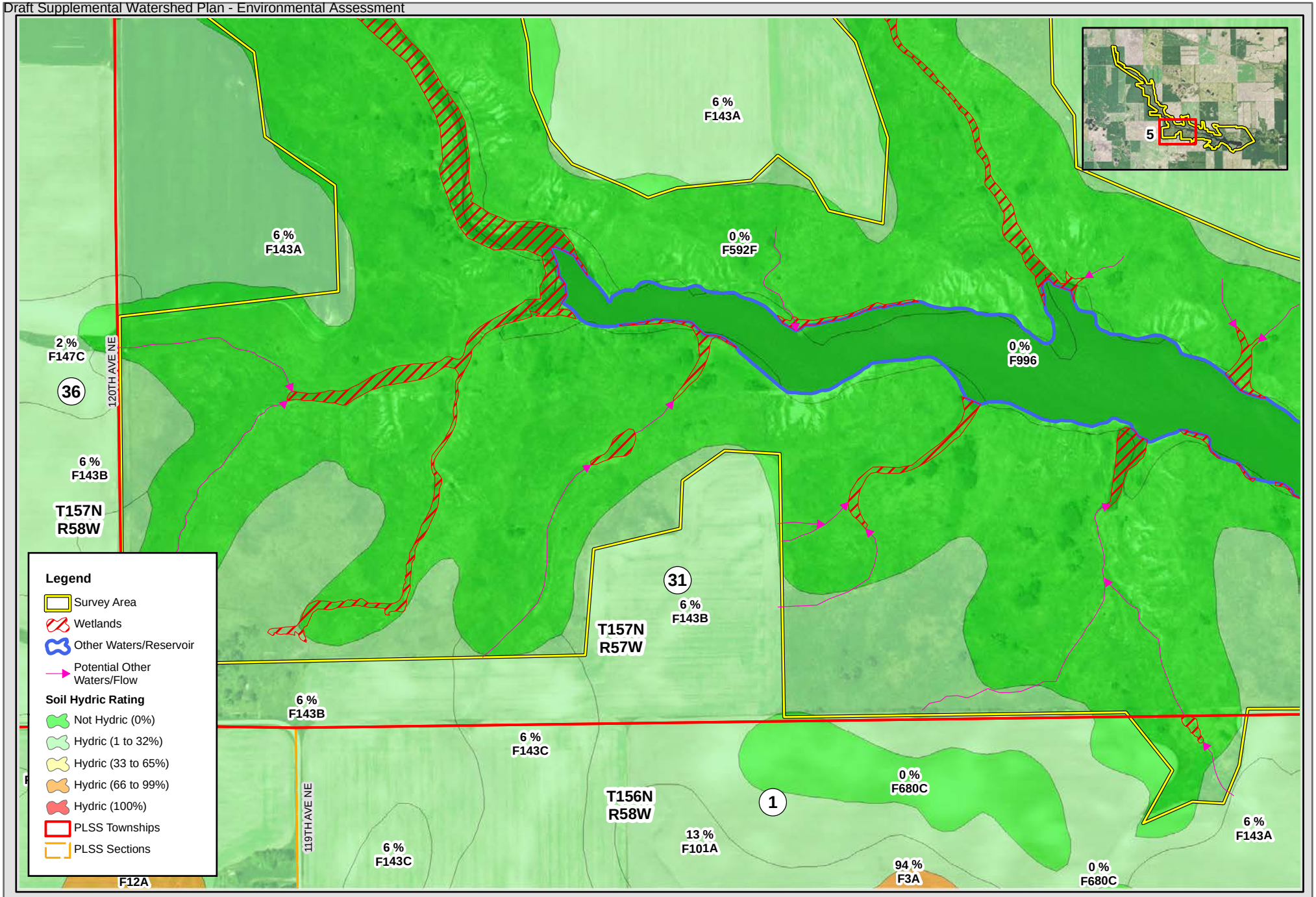

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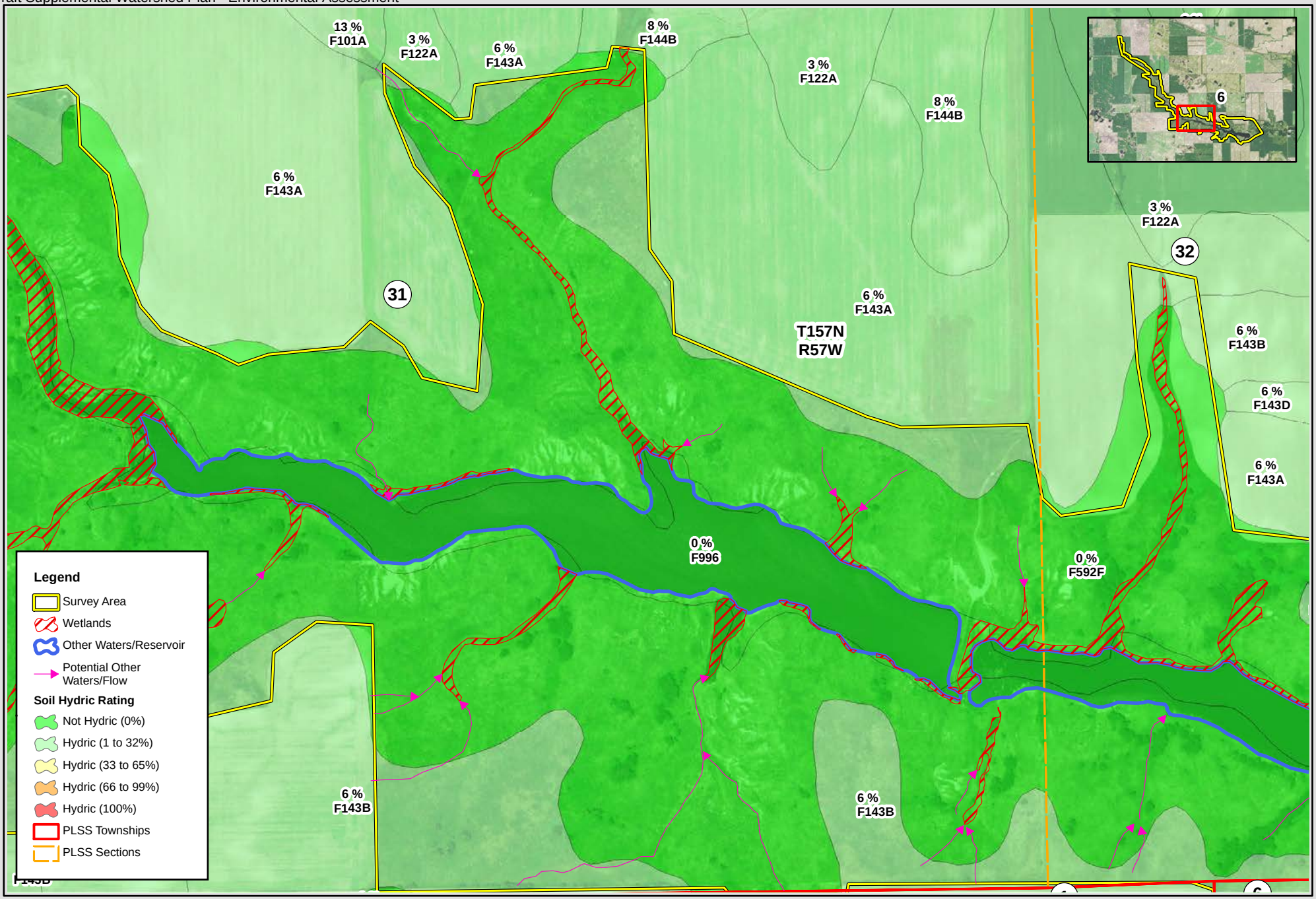

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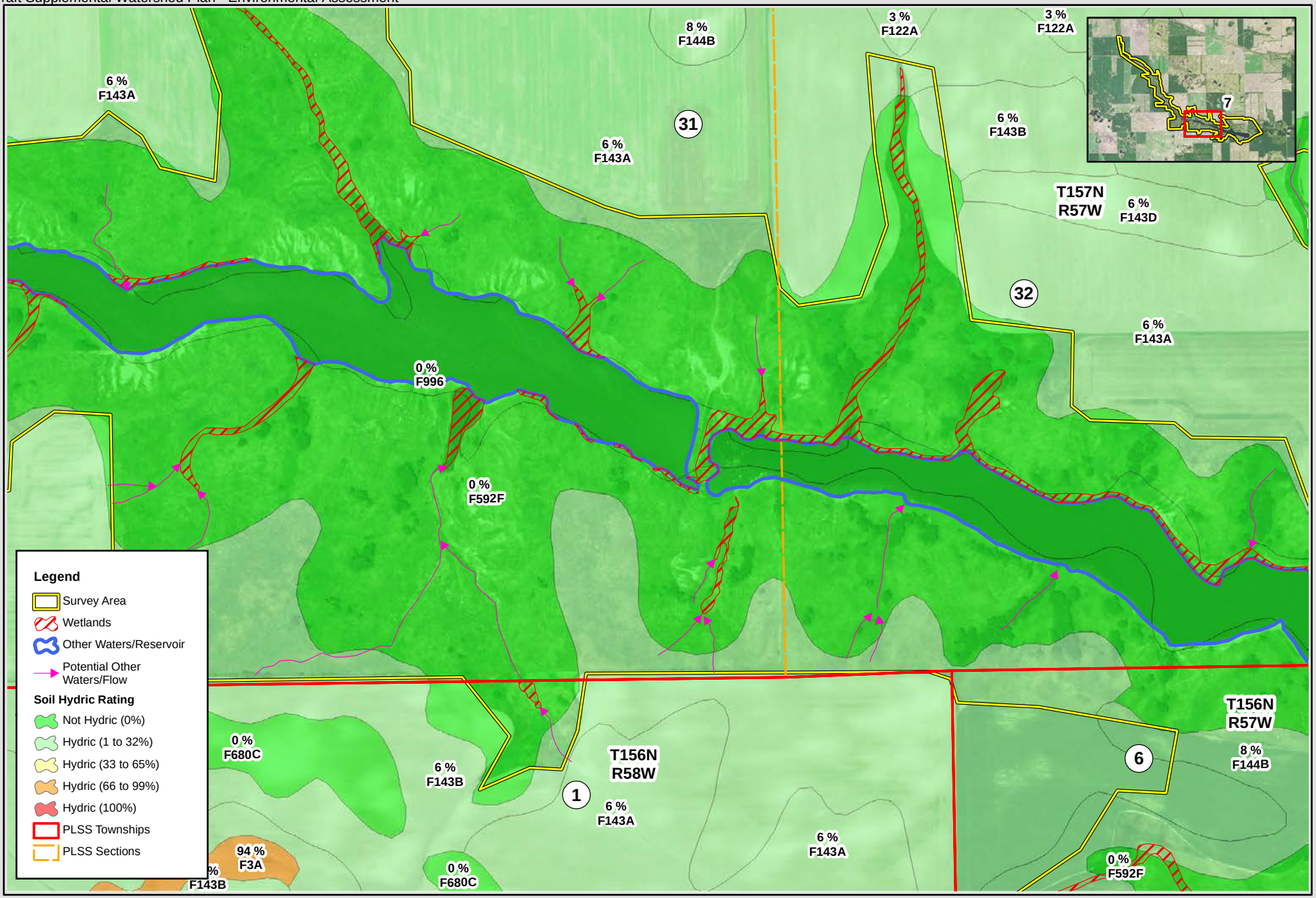

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HOUSTON engineering, inc.

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North Branch Forest River Dam No. 1 (Bylin Dam)
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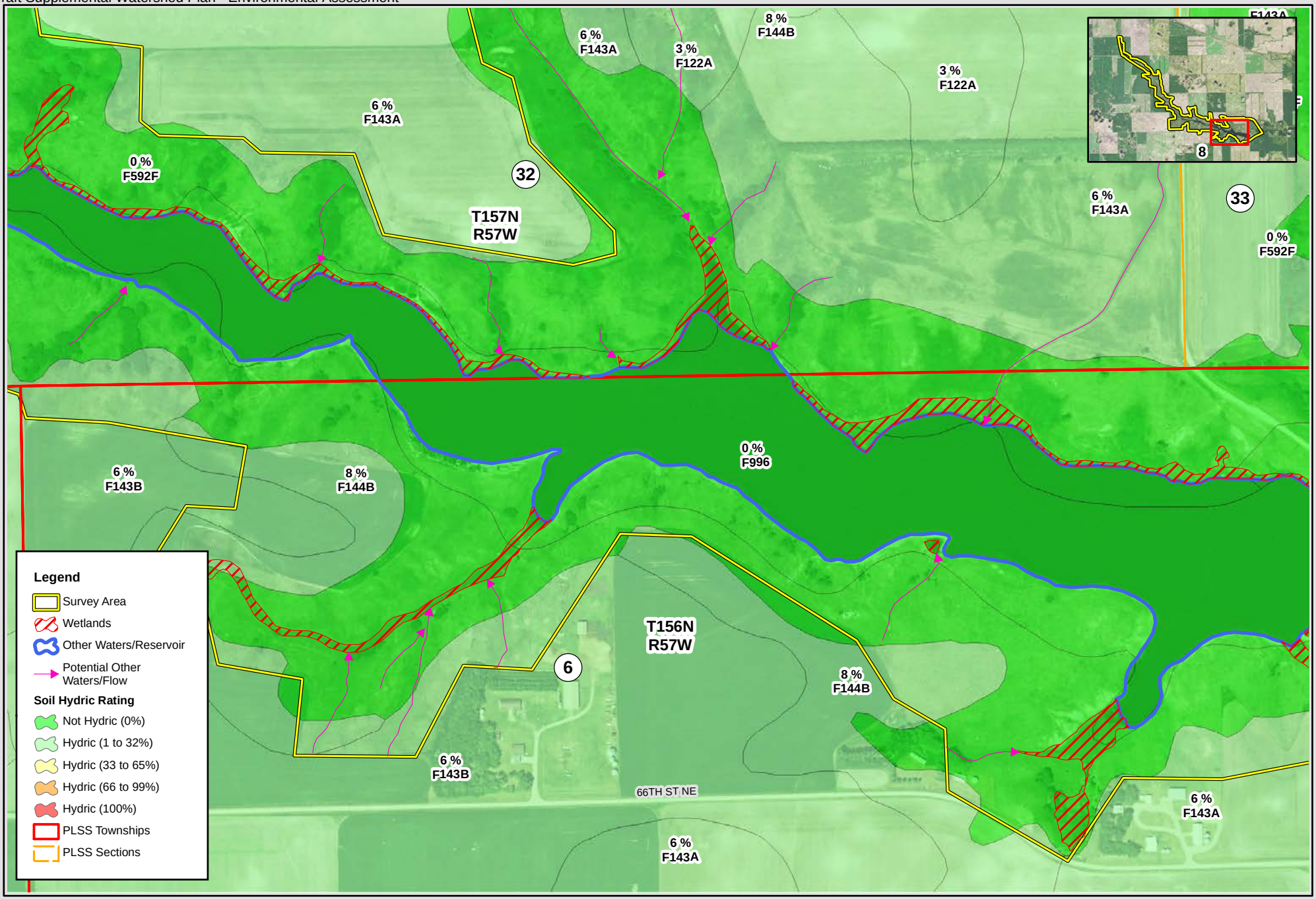

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HOUSTON engineering, inc.

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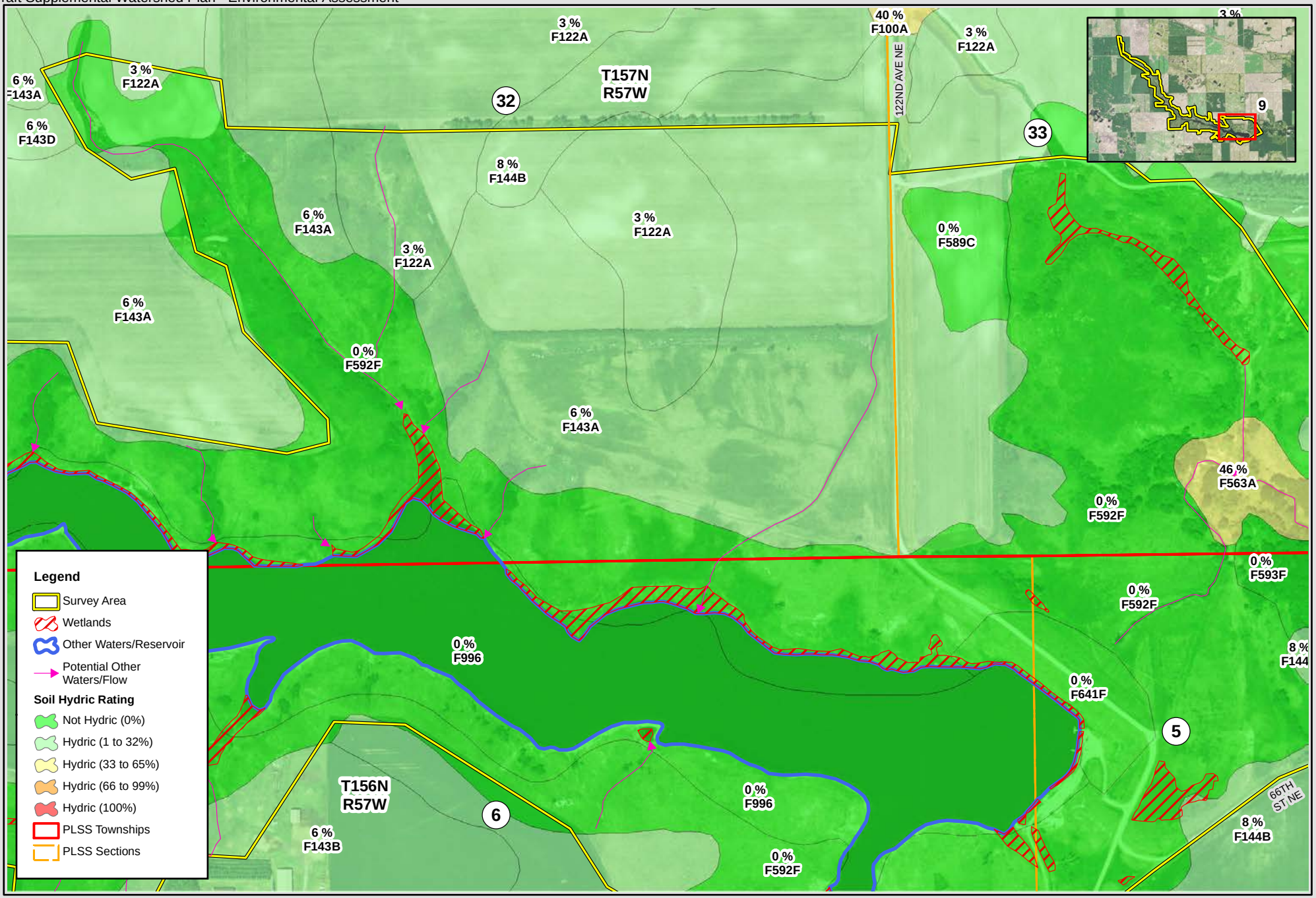

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HOUSTON engineering, inc.

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North Branch Forest River Dam No. 1 (Bylin Dam)
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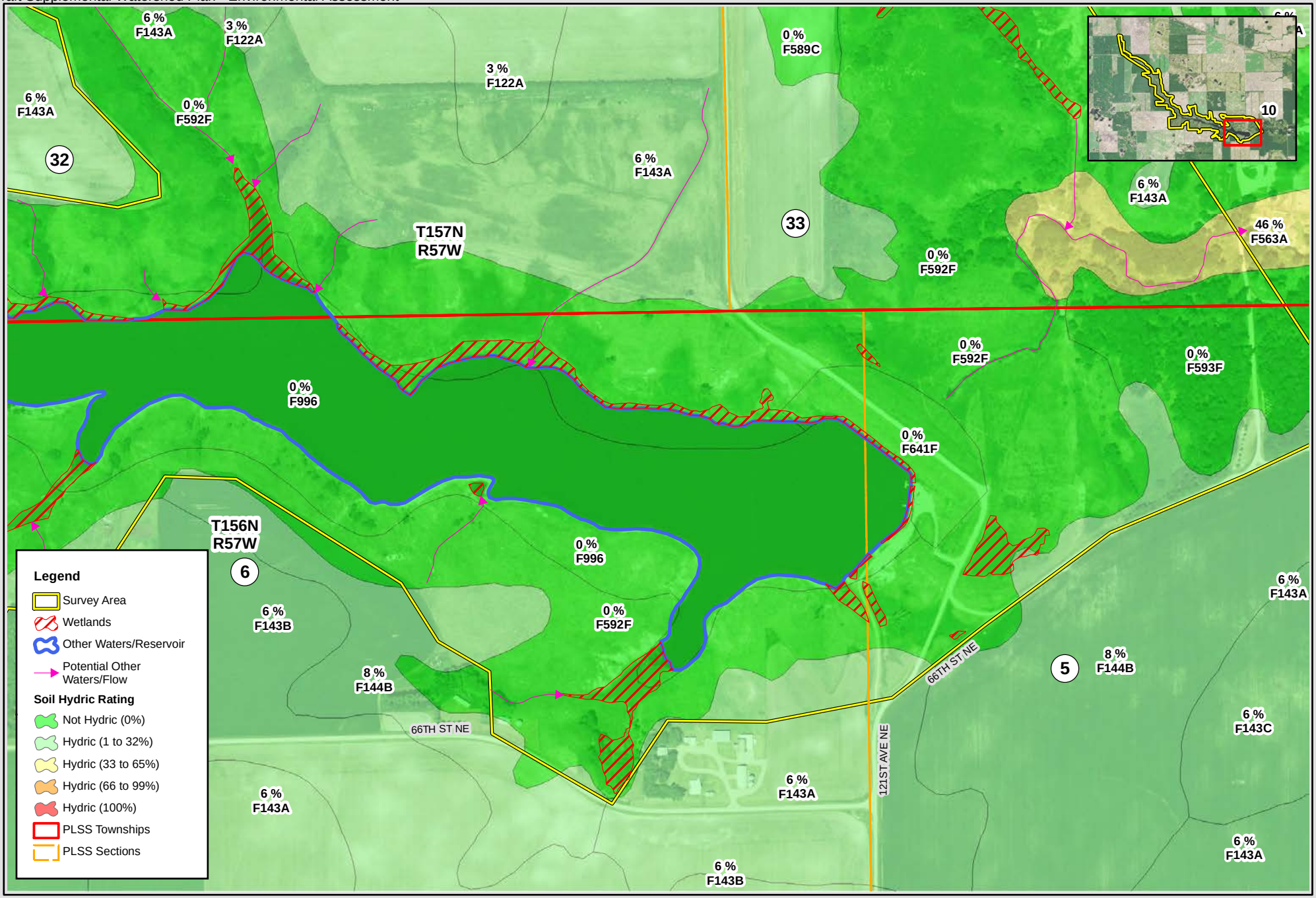

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HOUSTON engineering, inc.

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Aquatic Resources Delineation Report
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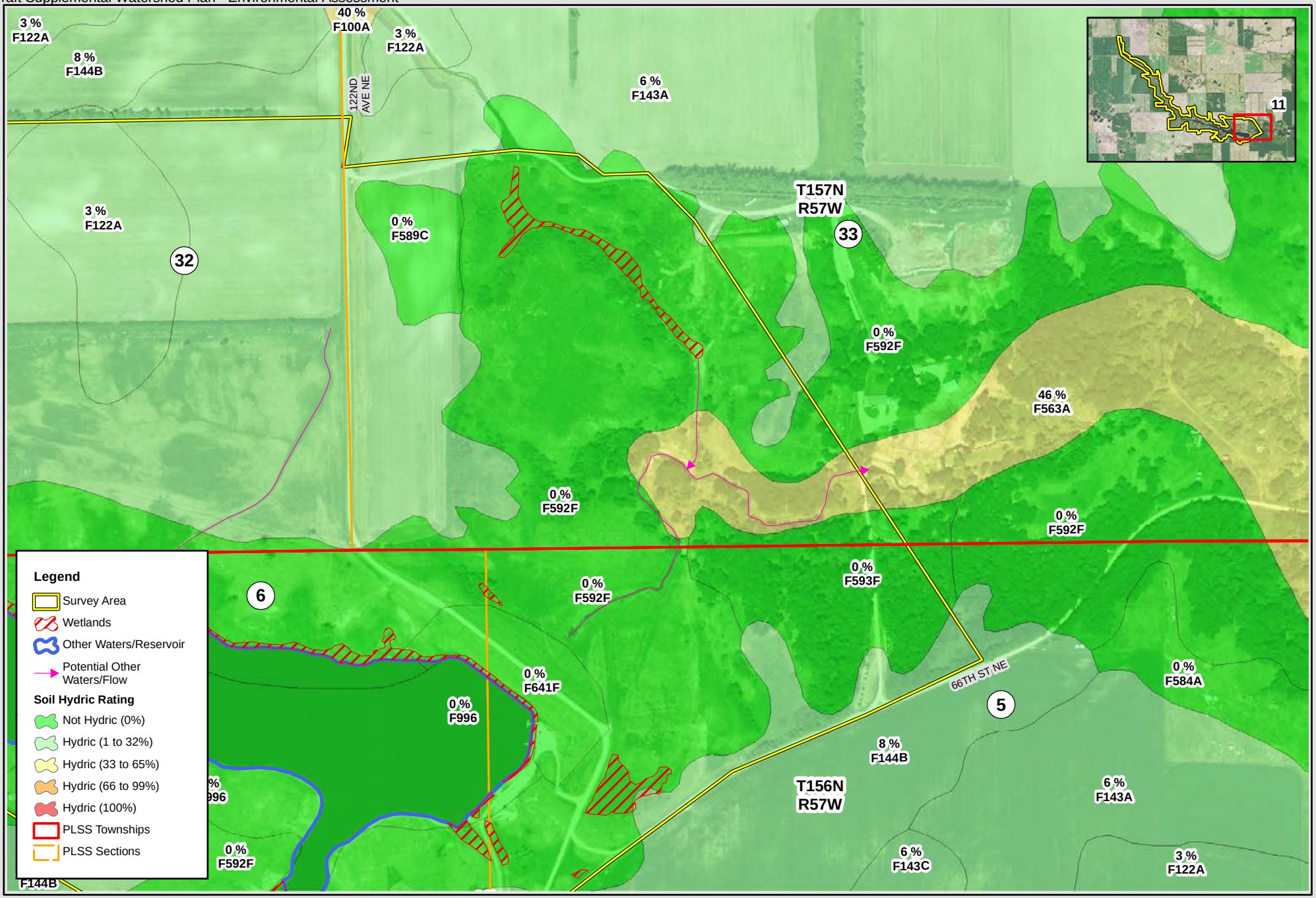

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HOUSTON engineering, inc.

Exhibit D-9-3: USDA Soils Map

North Branch Forest River Dam No. 1 (Bylin Dam)
Aquatic Resources Delineation Report
Natural Resource Conservation Service (NRCS)

0 250 500 1,000 Feet

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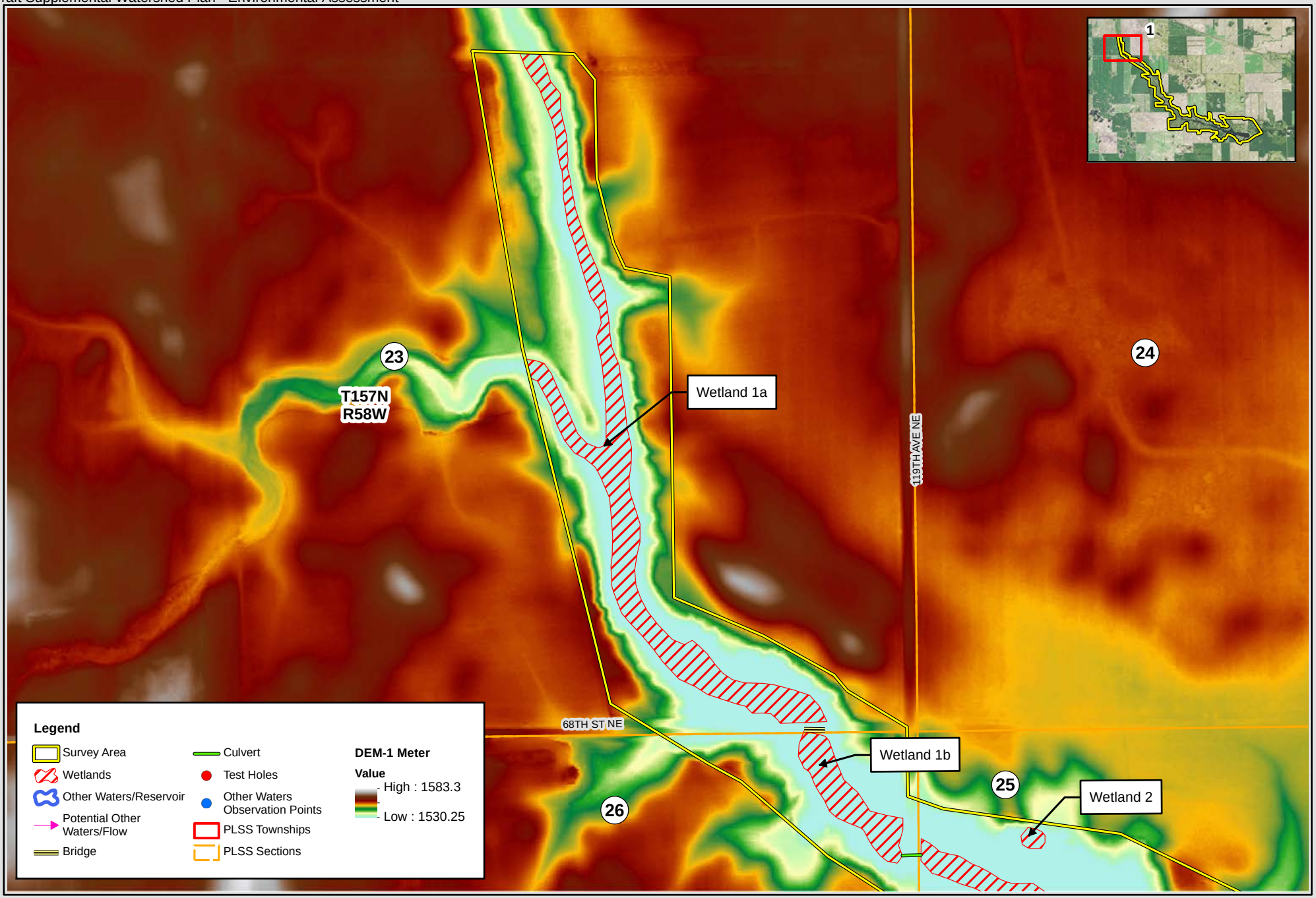
N W E S

Hydric Rating by Map Unit

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
F122A	Svea-Cresbard loams, 0 to 3 percent slopes	3	19.0	2.0%
F143A	Barnes-Svea loams, 0 to 3 percent slopes	6	108.9	11.4%
F143B	Barnes-Svea loams, 3 to 6 percent slopes	6	58.6	6.1%
F143C	Barnes-Buse-Langhei loams, 6 to 9 percent slopes	6	0.4	0.0%
F143D	Barnes-Buse-Langhei loams, 9 to 15 percent slopes	6	0.0	0.0%
F144B	Barnes-Buse loams, 3 to 6 percent slopes	8	24.6	2.6%
F147C	Buse-Barnes-Darnen loams, 3 to 9 percent slopes	2	0.7	0.1%
F147D	Buse-Barnes-Darnen loams, 6 to 15 percent slopes	2	6.5	0.7%
F148F	Buse-Barnes-La Prairie, occasionally flooded loams, 6 to 35 percent slopes	3	0.5	0.0%
F563A	Fluvaquents, channeled-Fairdale complex, 0 to 2 percent slopes, frequently flooded	46	6.1	0.6%
F589C	Edgeley-Kloten loams, 6 to 9 percent slopes	0	4.0	0.4%
F592F	Kloten-Walsh-Edgeley loams, 6 to 35 percent slopes	0	621.6	65.2%
F641F	Udarents loamy, earthen dam, 1 to 75 percent slopes	0	5.5	0.6%
F680C	Barnes-Sioux complex, 3 to 9 percent slopes	0	0.5	0.1%
F680D	Barnes-Sioux complex, 6 to 15 percent slopes	0	0.9	0.1%
F996	Water	0	96.4	10.1%
Totals for Area of Interest			**954.0**	**100.0%**



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HOUSTON engineering, inc.

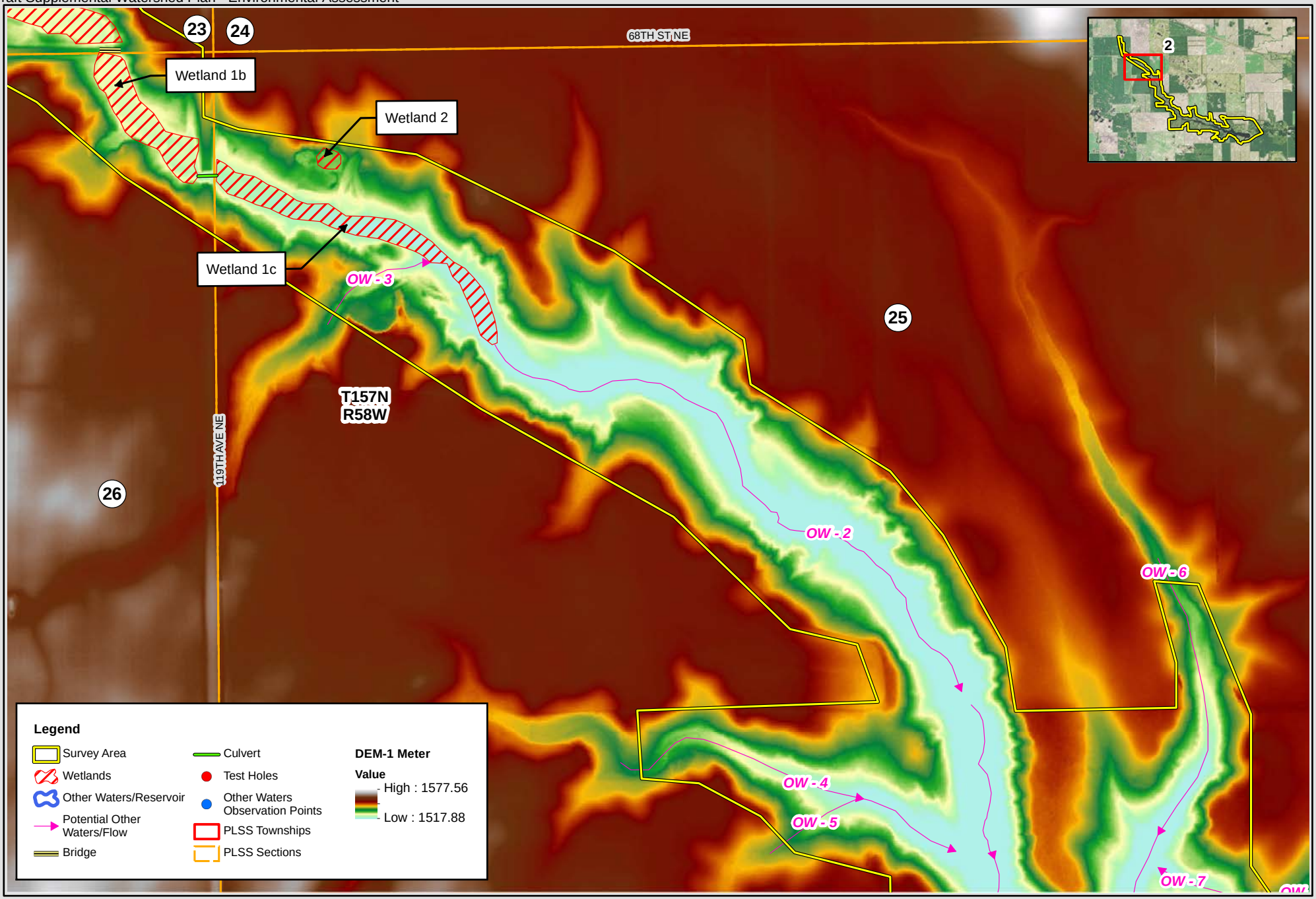
Exhibit D-9-4: Lidar Map

North Branch Forest River Dam No. 1 (Bylin Dam)
Aquatic Resources Delineation Report
Natural Resource Conservation Service (NRCS)

0 250 500 1,000 Feet

1 inch = 500 feet

N W E S



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HOUSTON engineering, inc.

Exhibit D-9-4: Lidar Map

North Branch Forest River Dam No. 1 (Bylin Dam)
Aquatic Resources Delineation Report
Natural Resource Conservation Service (NRCS)

0 250 500 1,000 Feet

1 inch = 500 feet

N W E S

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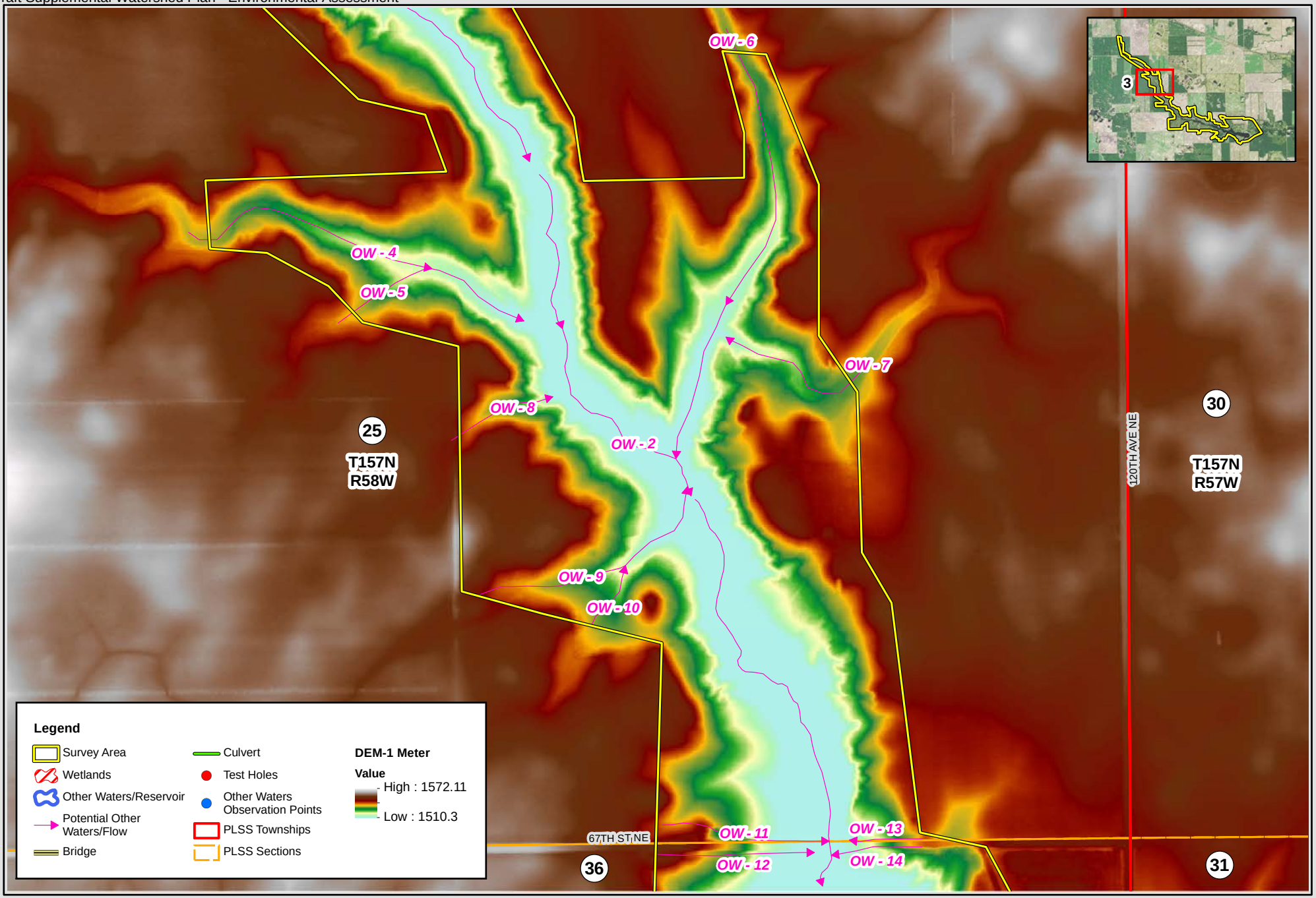

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HOUSTON engineering, inc.

Exhibit D-9-4: Lidar Map

North Branch Forest River Dam No. 1 (Bylin Dam)
Aquatic Resources Delineation Report
Natural Resource Conservation Service (NRCS)

0 250 500 1,000 Feet

1 inch = 500 feet

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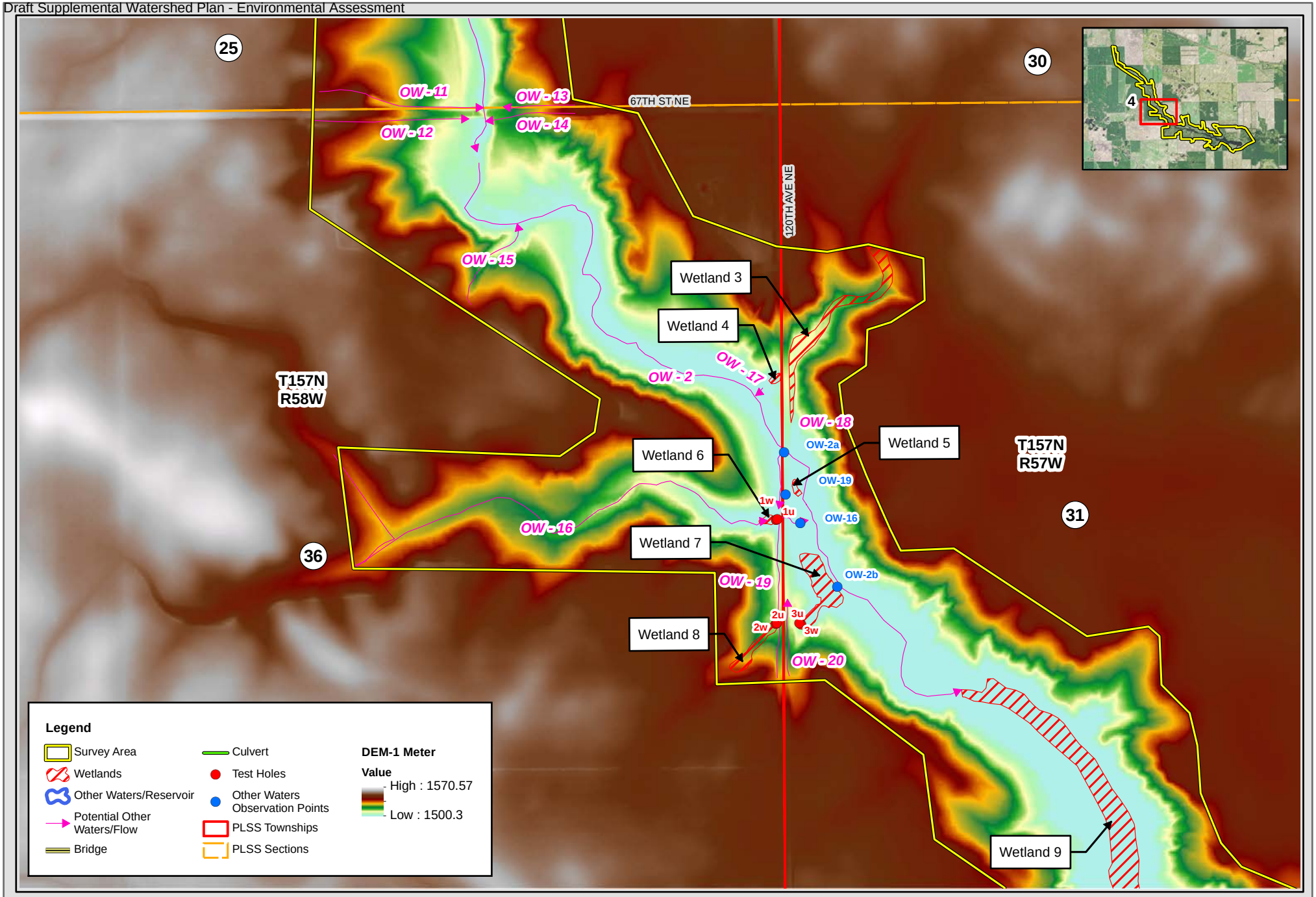

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HOUSTON engineering, inc.

Exhibit D-9-4: Lidar Map

North Branch Forest River Dam No. 1 (Bylin Dam)
Aquatic Resources Delineation Report
Natural Resource Conservation Service (NRCS)

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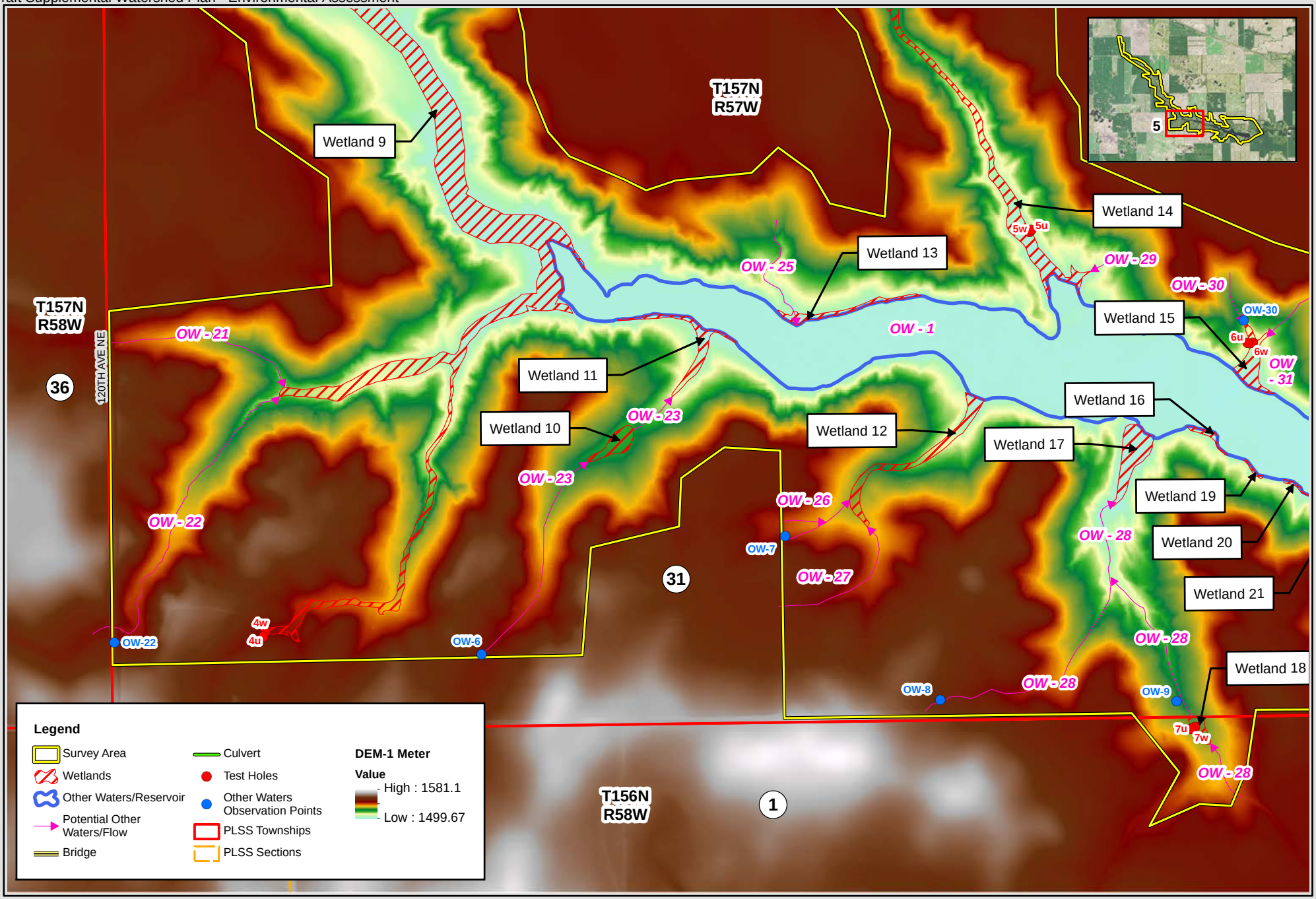

Scale: AS SHOWN | Drawn by: JHL | Checked by: DJ | Project No.: 7135-0037 | Date: 12/10/2020 | Sheet: 1 of 1

HOUSTON engineering, inc.

Exhibit D-9-4: Lidar Map

North Branch Forest River Dam No. 1 (Bylin Dam)
Aquatic Resources Delineation Report
Natural Resource Conservation Service (NRCS)

0 250 500 1,000 Feet

1 inch = 500 feet

N W E S

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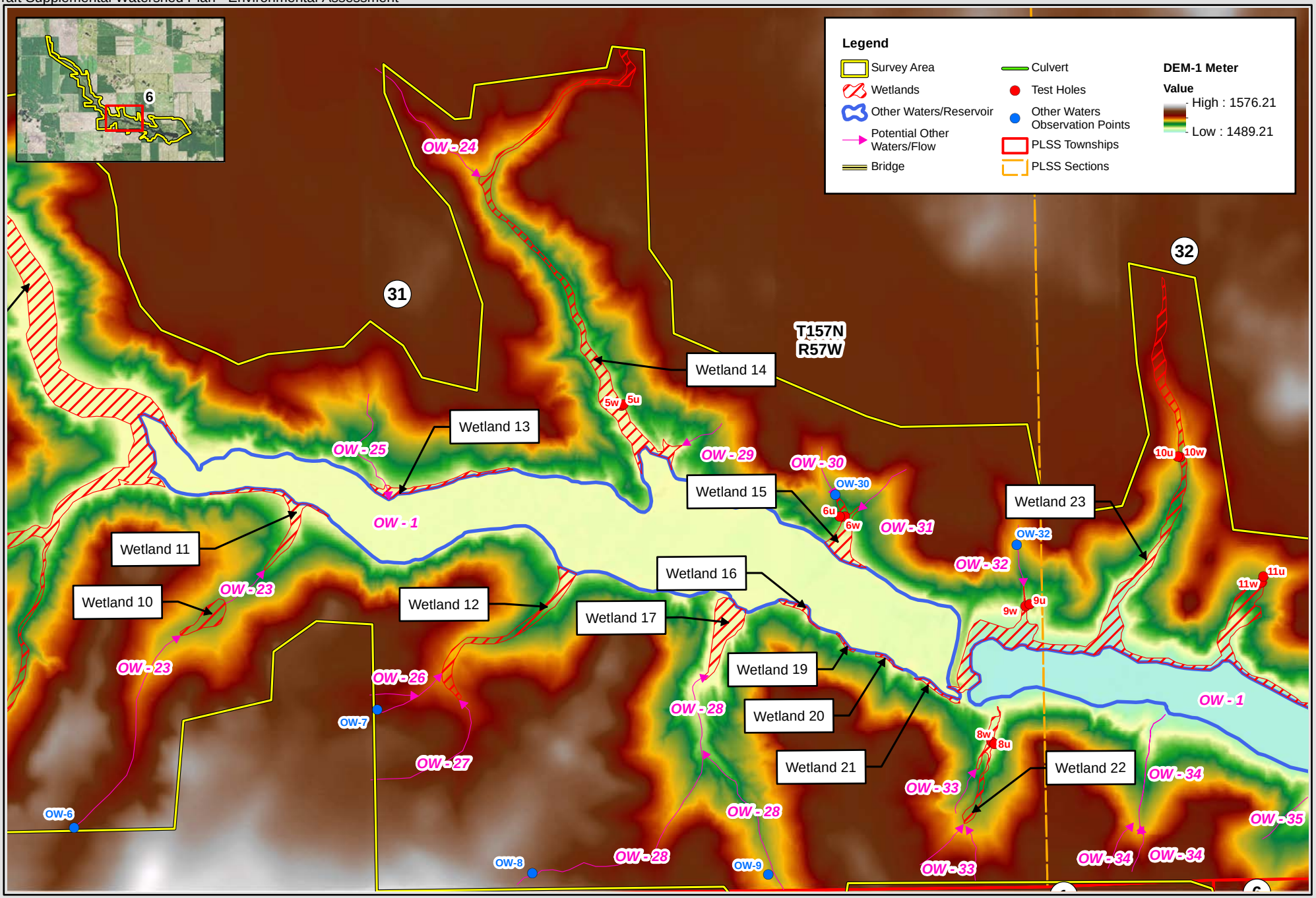

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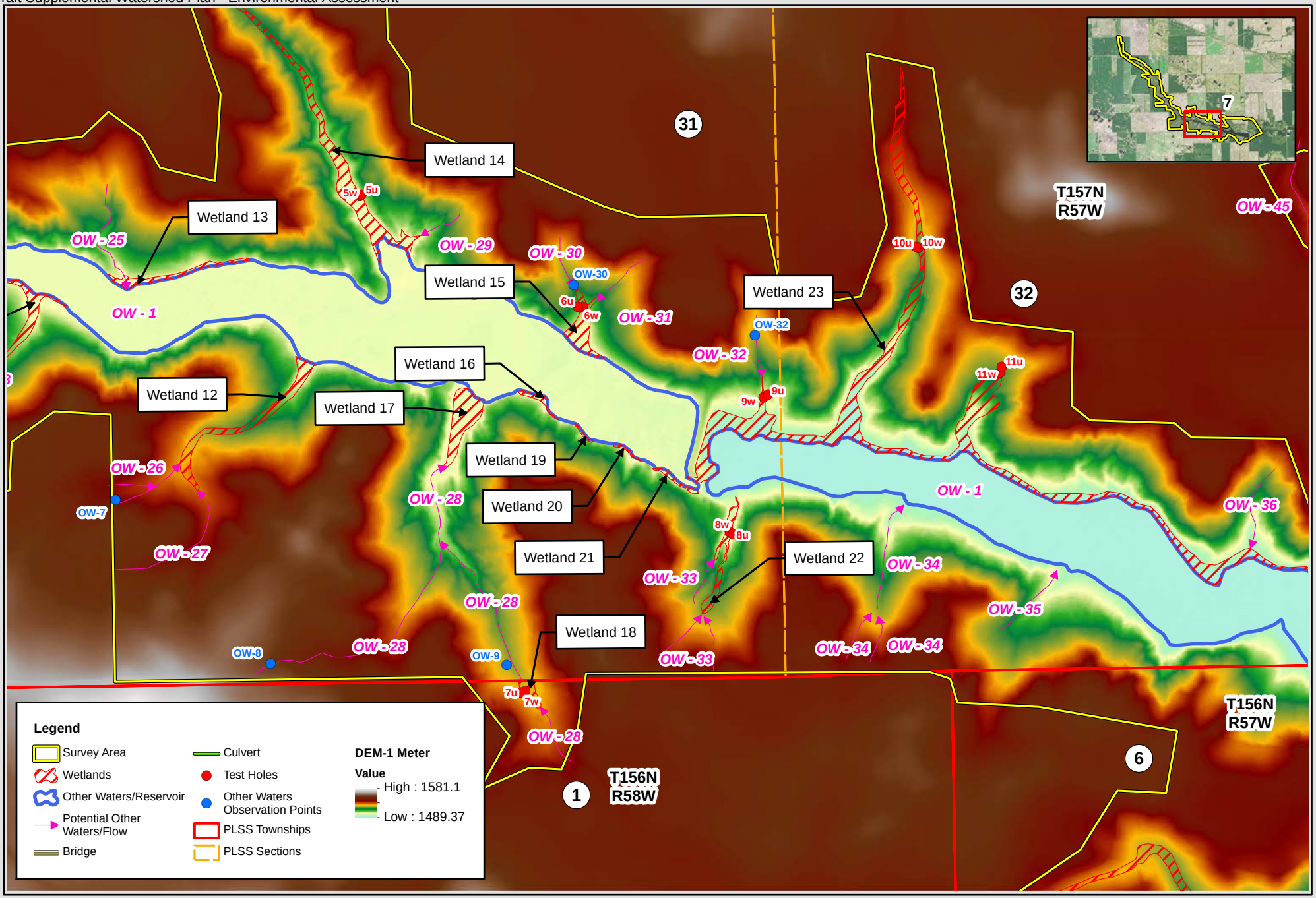

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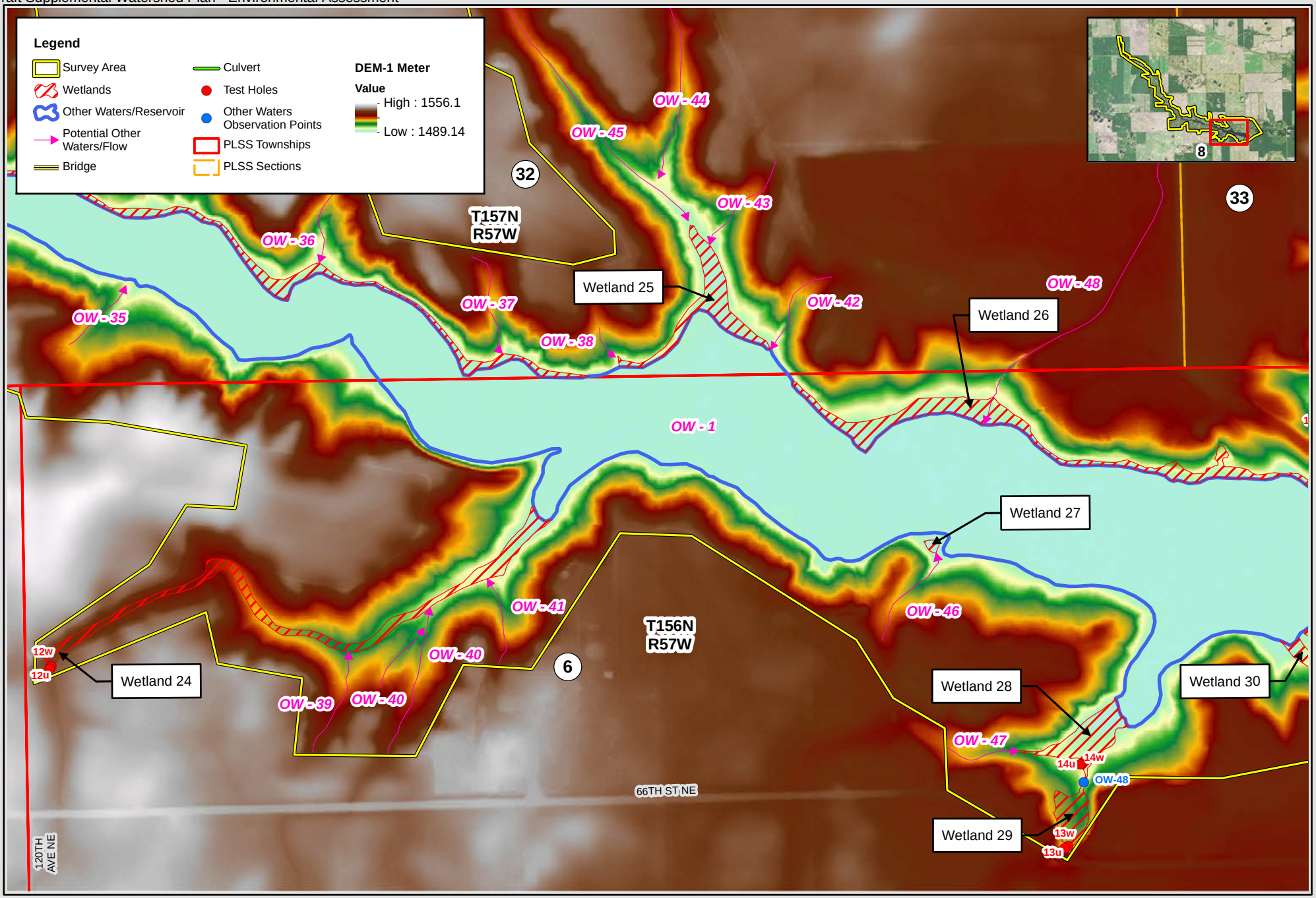

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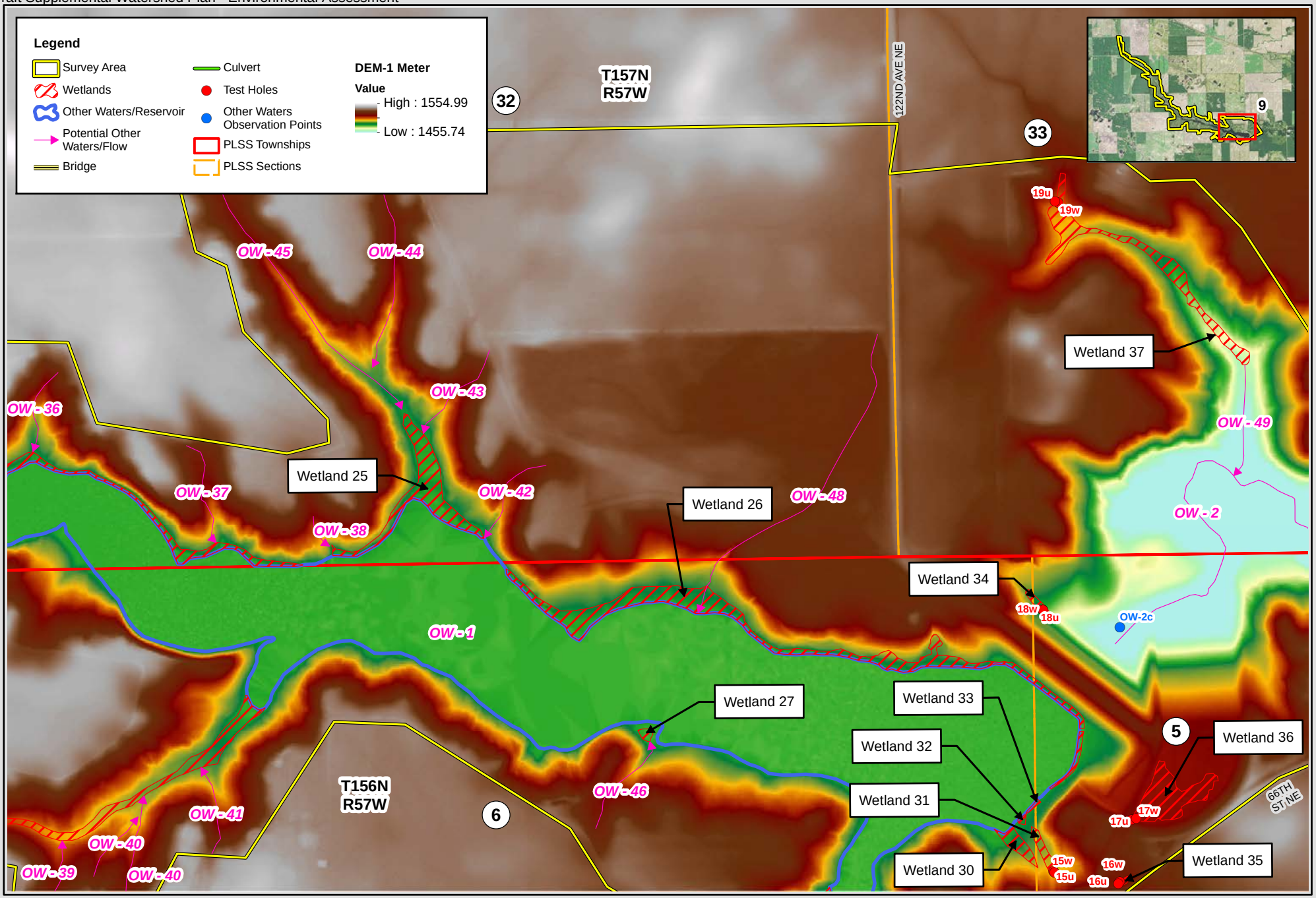

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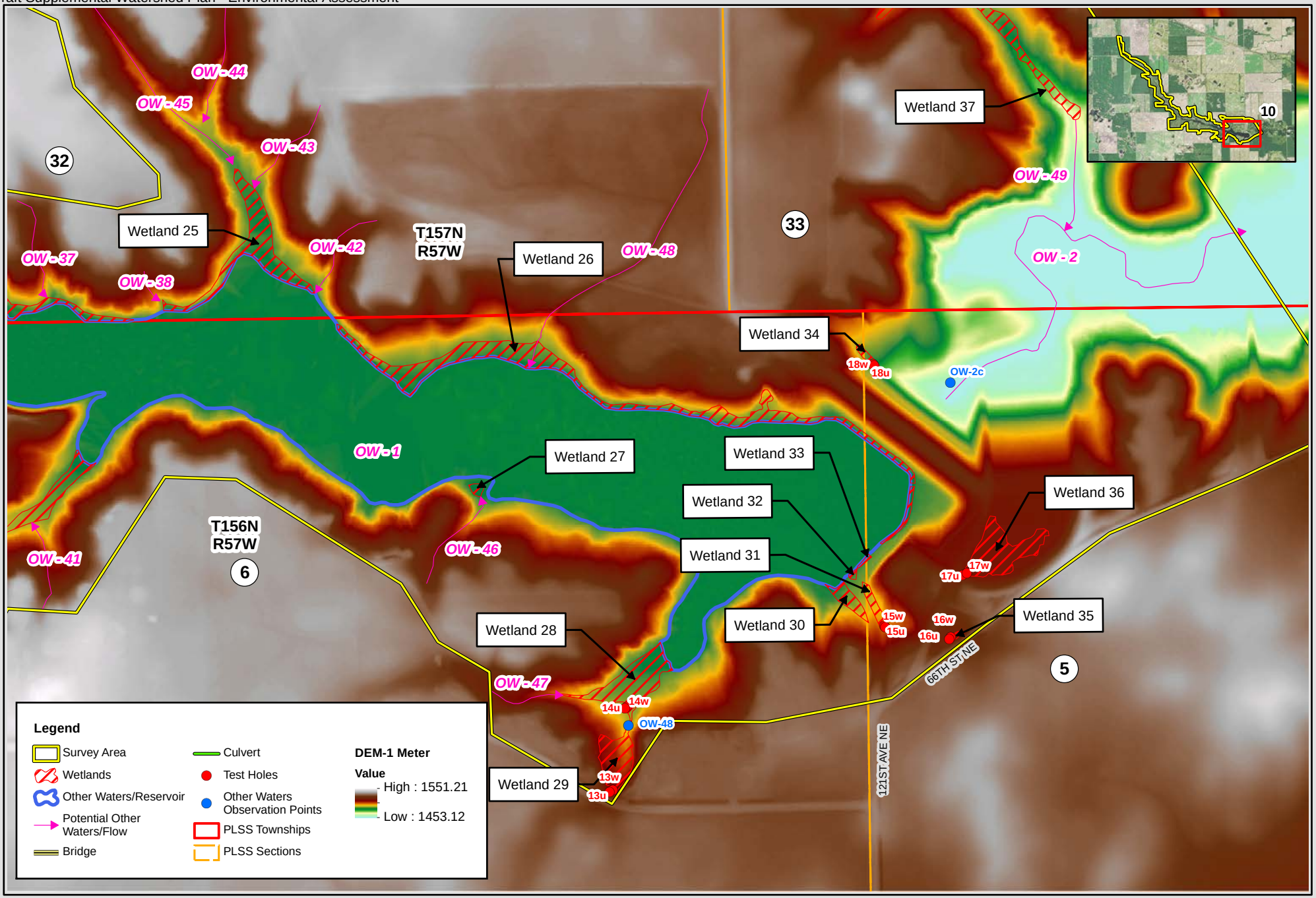

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HOUSTON engineering, inc.

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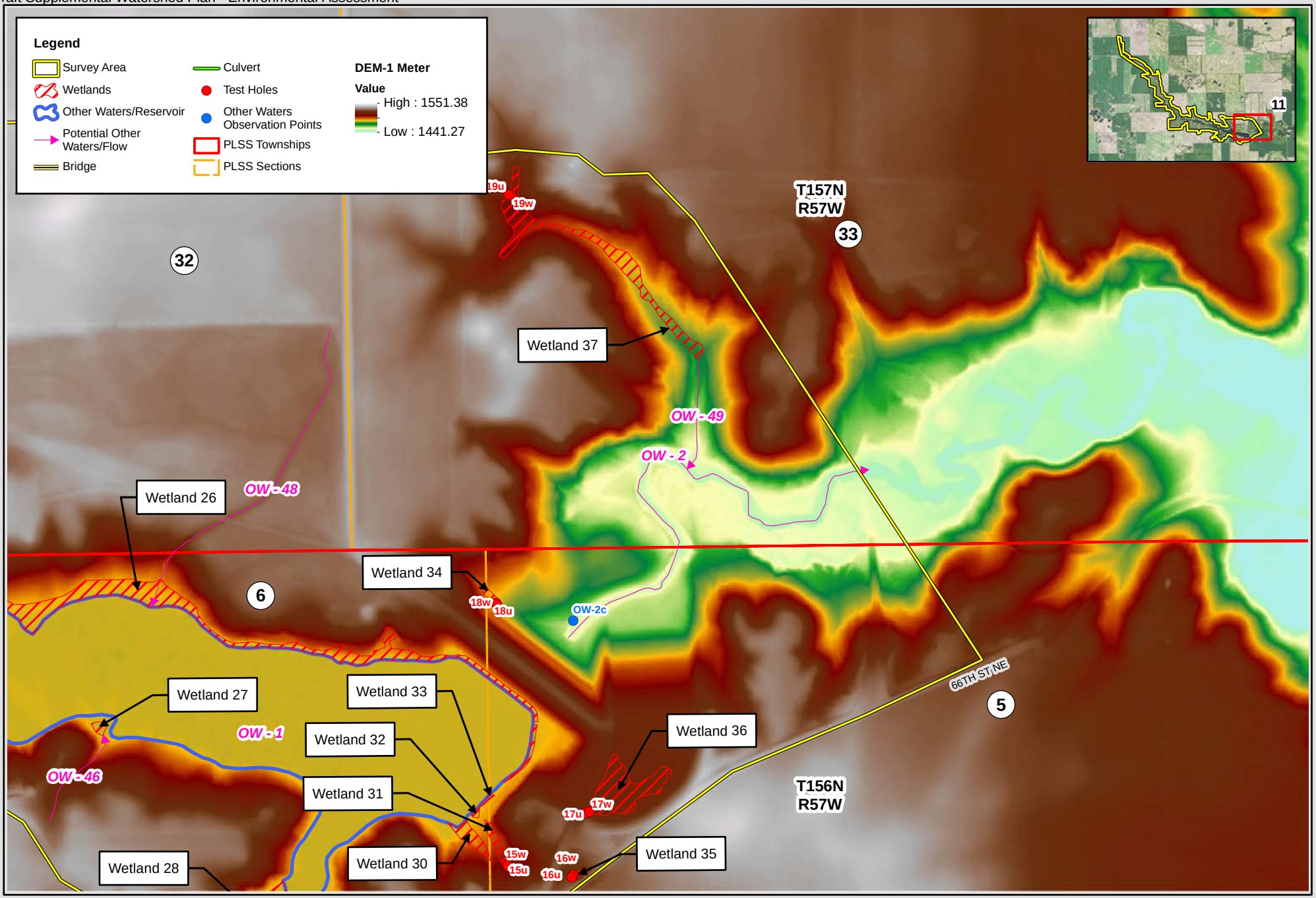

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HOUSTON engineering, inc.

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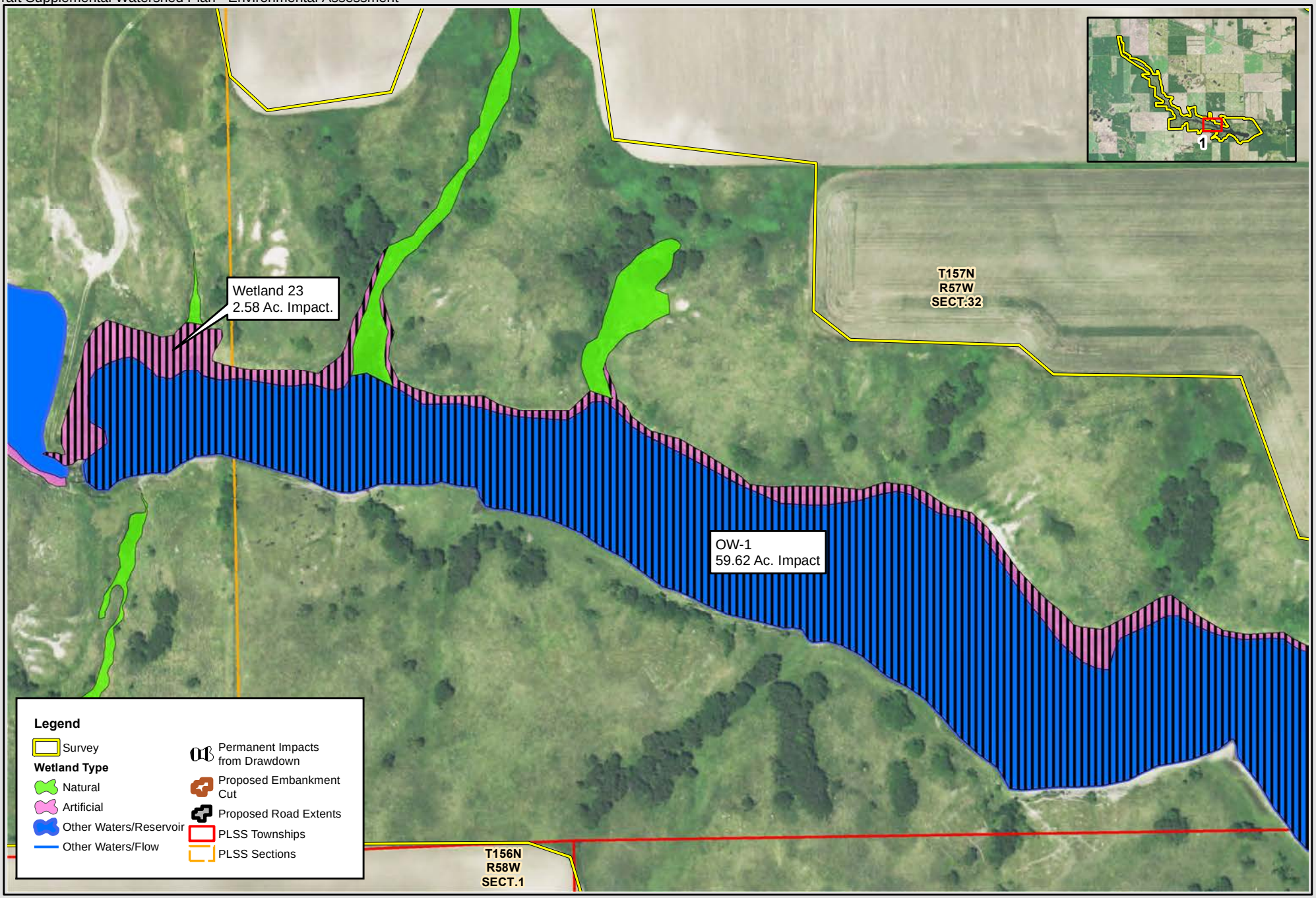

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HOUSTON engineering, inc.

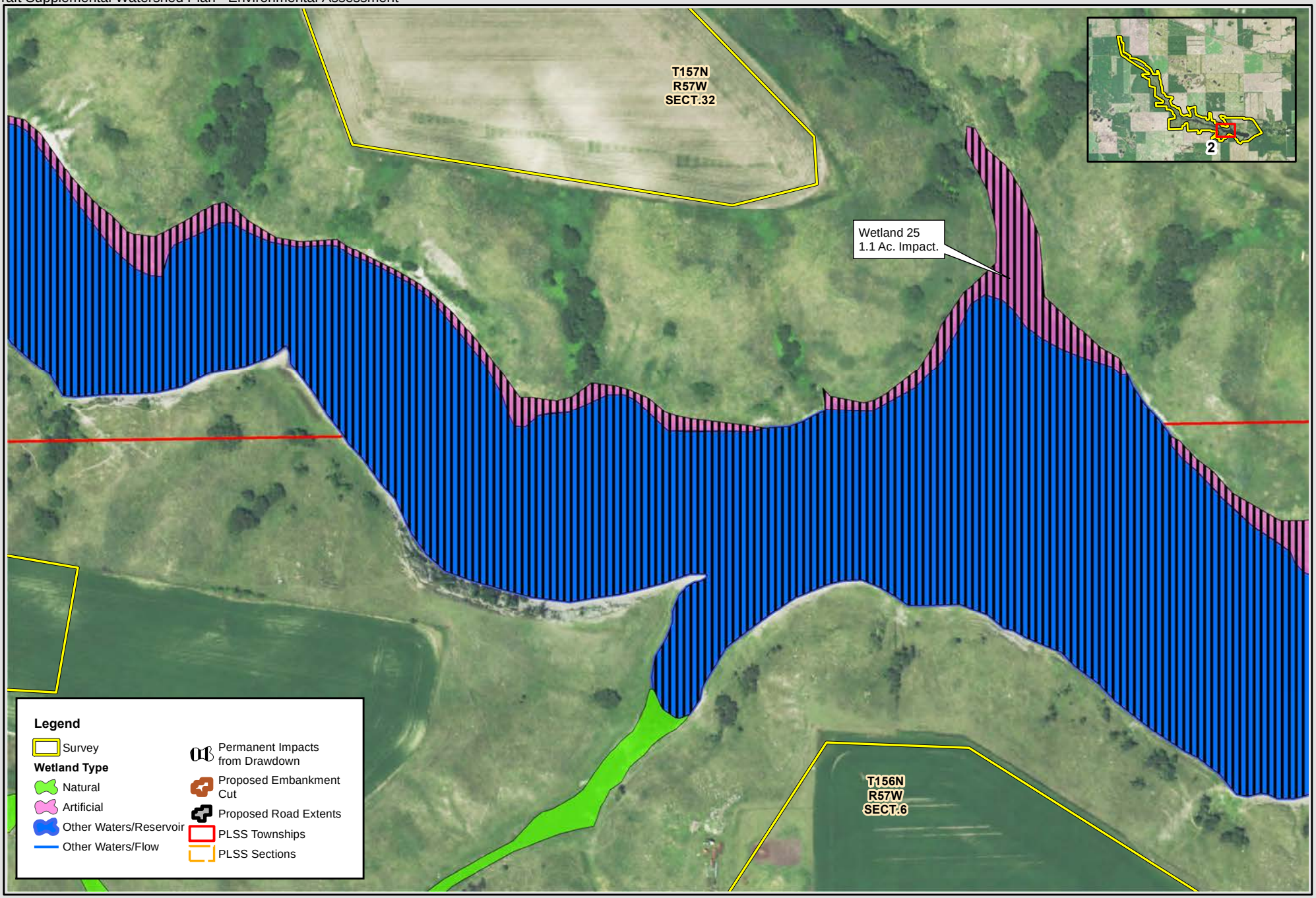
Exhibit D-9-5 – Alternative 1 Impacts Map

North Branch Forest River Dam No. 1 (Bylin Dam)
Natural Resource Conservation Service (NRCS)

0 125 250 500 Feet

1 inch = 250 feet

N W E S



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HOUSTON engineering, inc.

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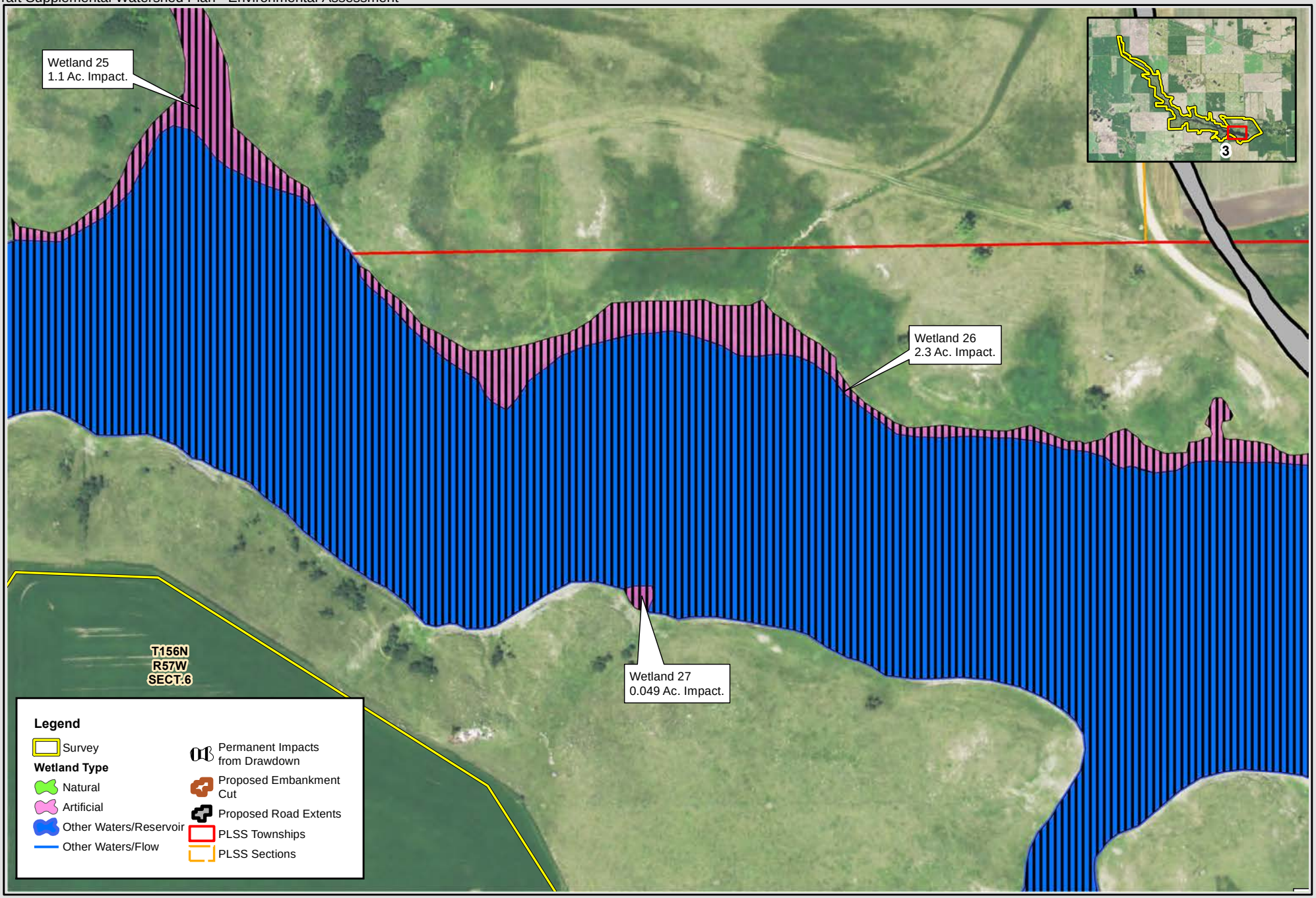
N W E S



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HOUSTON engineering, inc.

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N W E S

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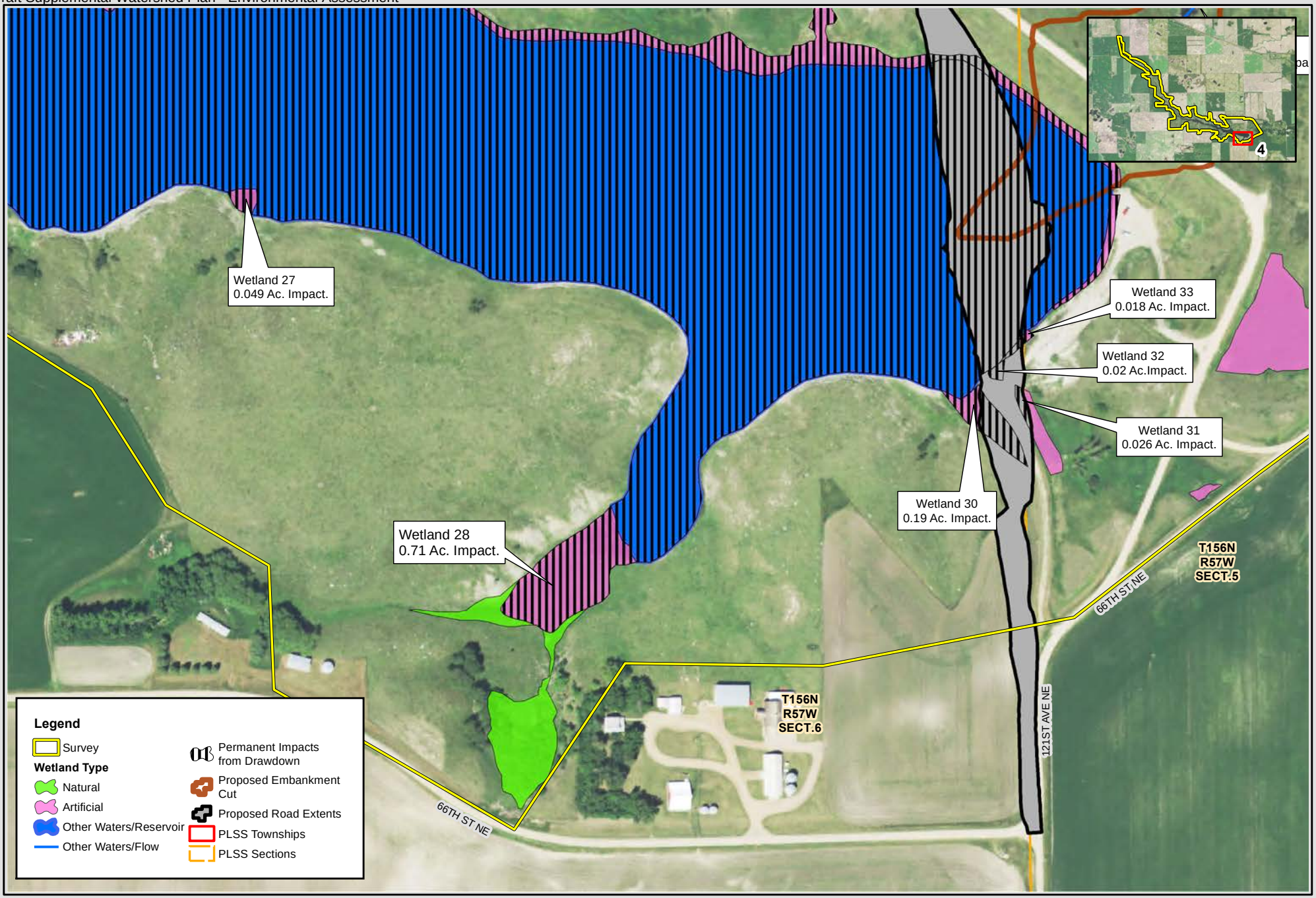

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HOUSTON engineering, inc.

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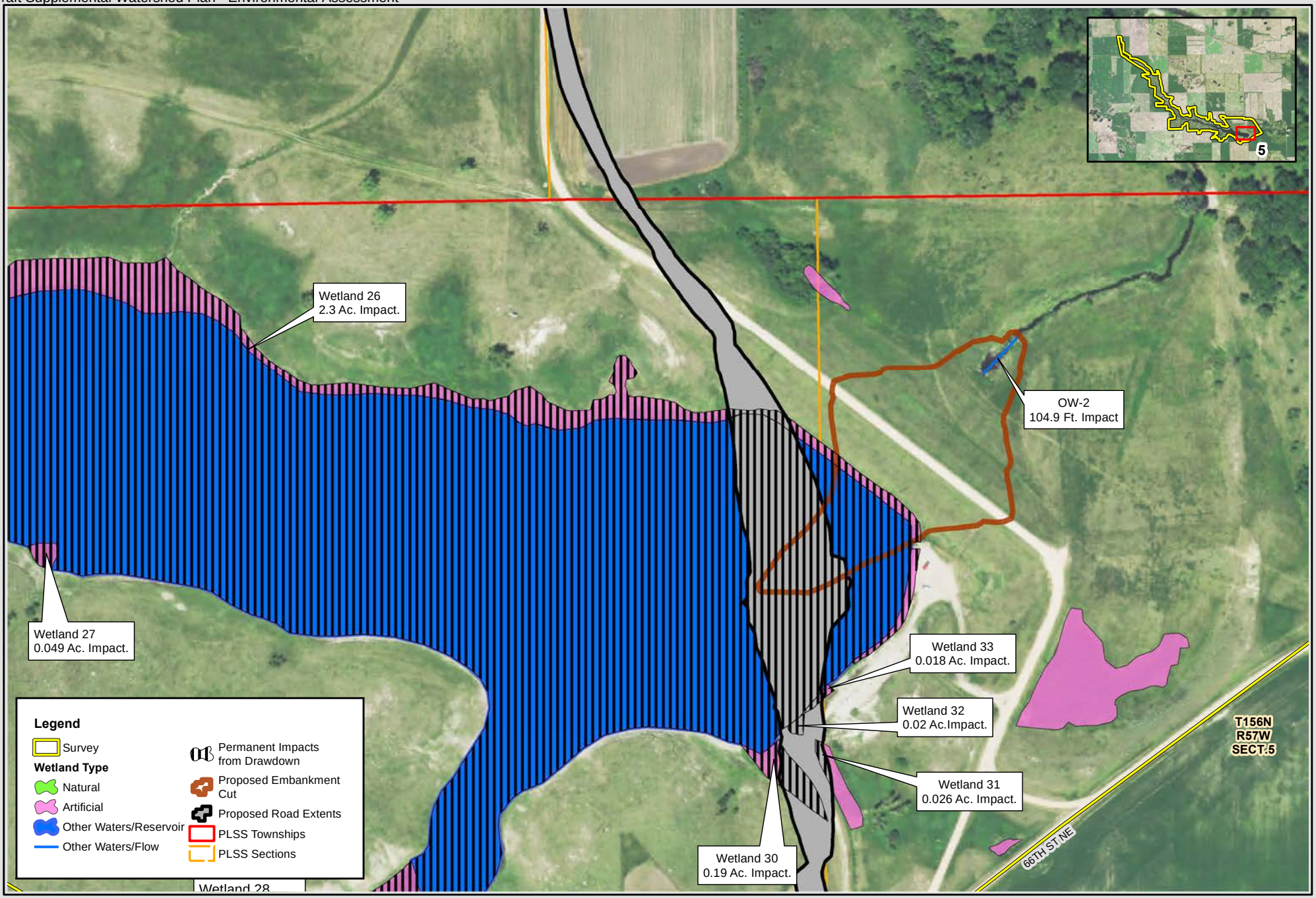

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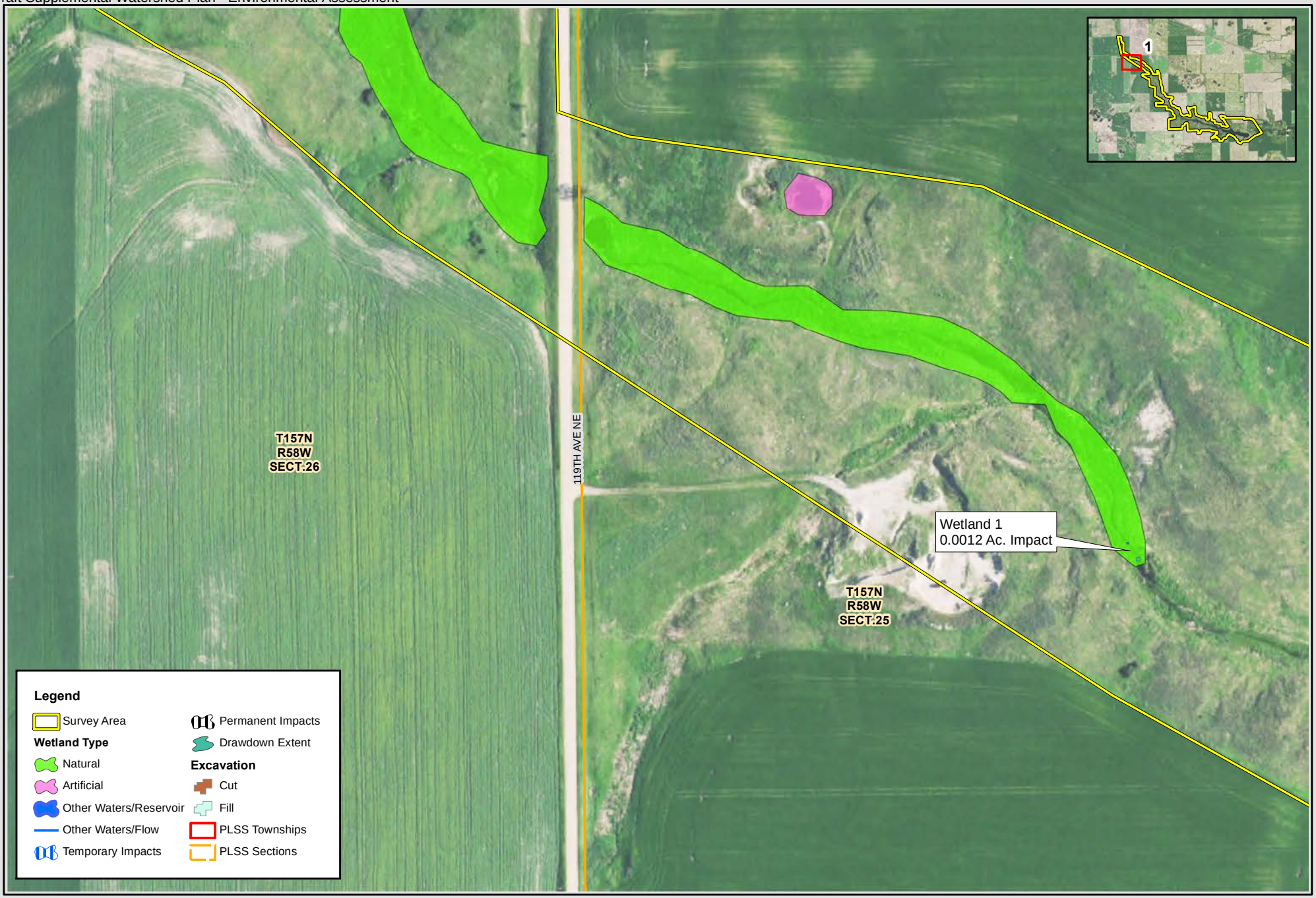

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AS SHOWN	JHL	DJ	7135-0037	5/9/2022	1 of 1

HOUSTON engineering, inc.

Exhibit D-9-6 – Alternative 2 Impacts Map

North Branch Forest River Dam No. 1 (Bylin Dam)
Natural Resource Conservation Service (NRCS)

0 125 250 500 Feet

1 inch = 250 feet

N W E S

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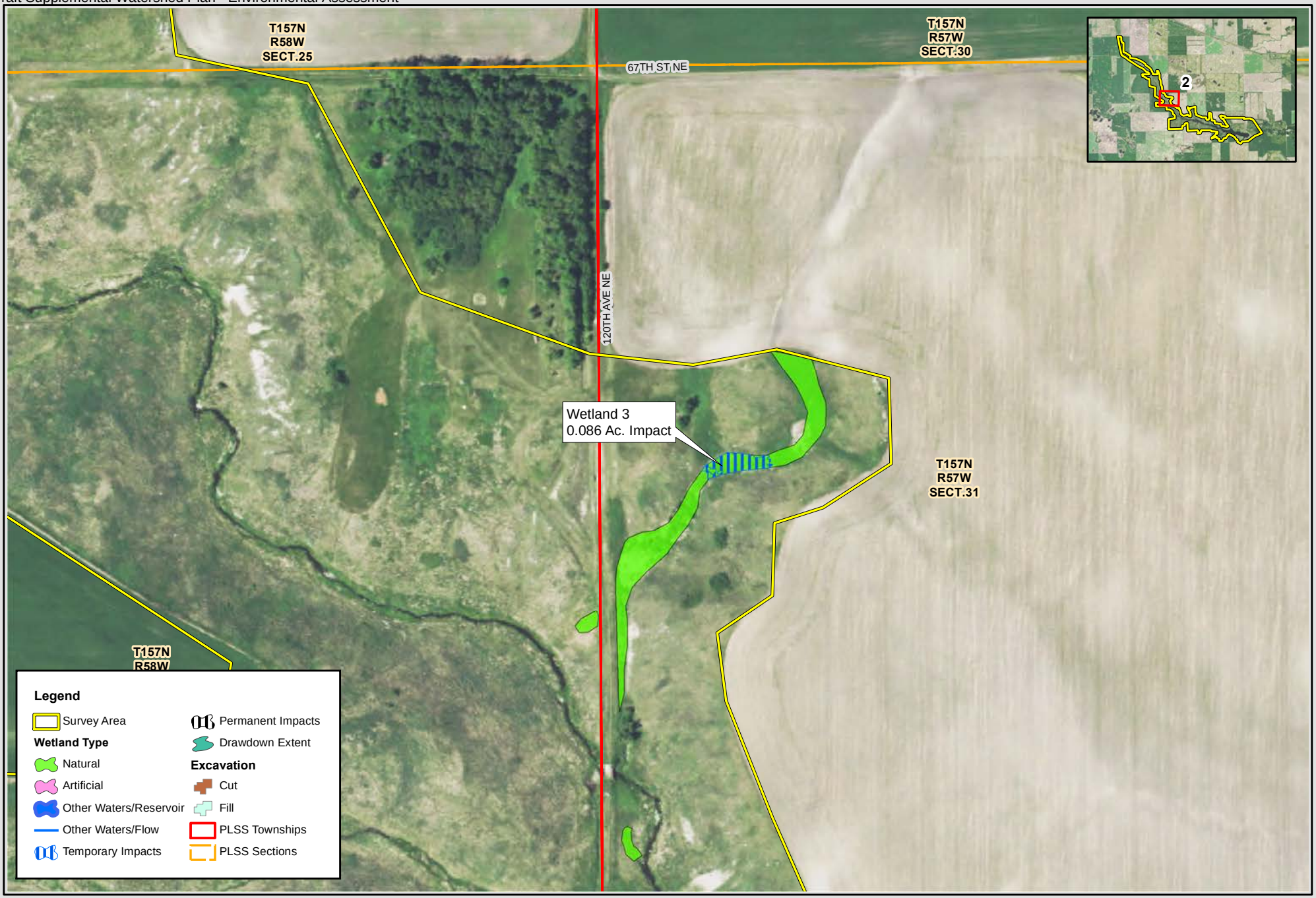

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HOUSTON engineering, inc.

Exhibit D-9-6 – Alternative 2 Impacts Map

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Natural Resource Conservation Service (NRCS)

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1 inch = 250 feet

N W E S

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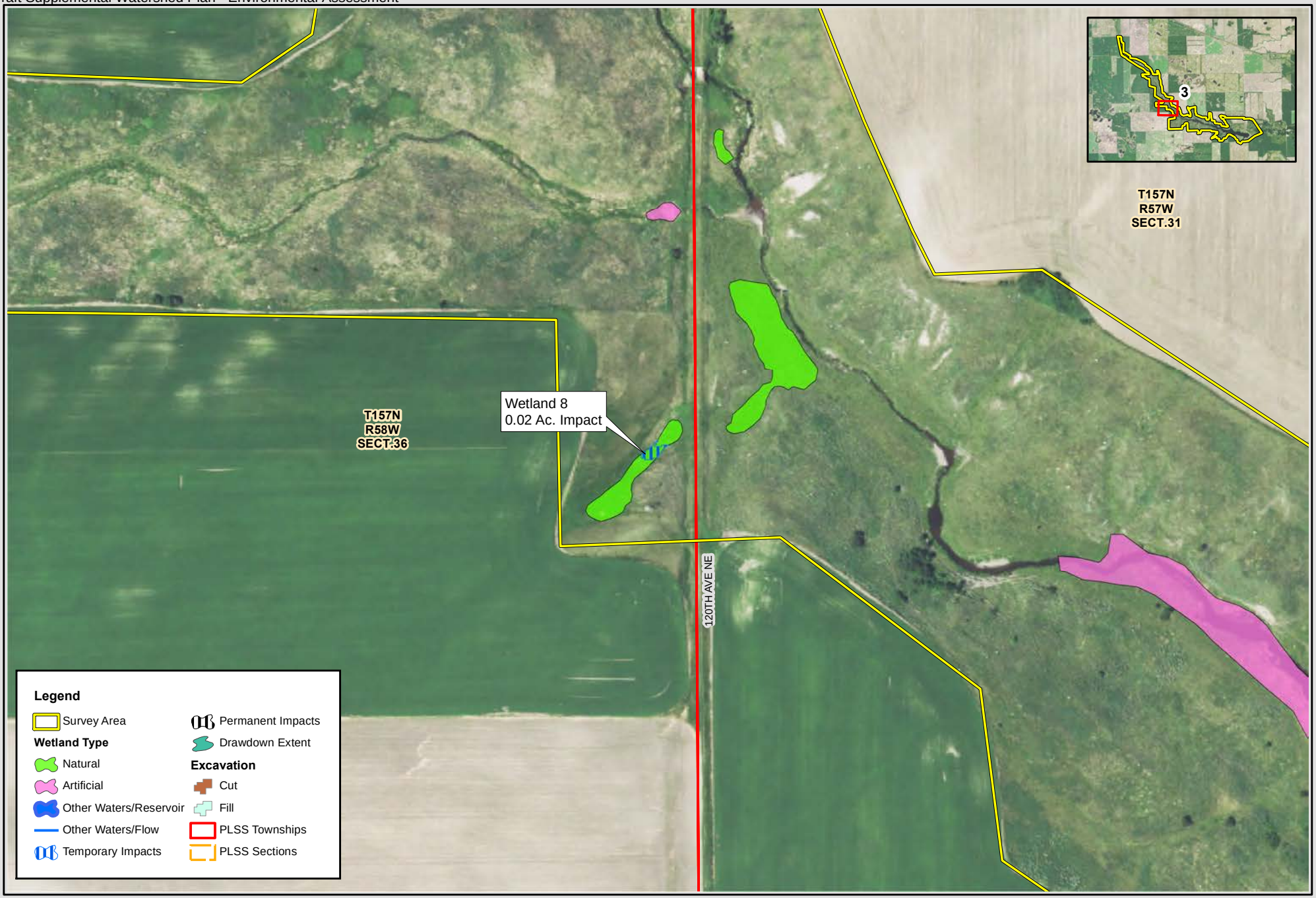

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HOUSTON engineering, inc.

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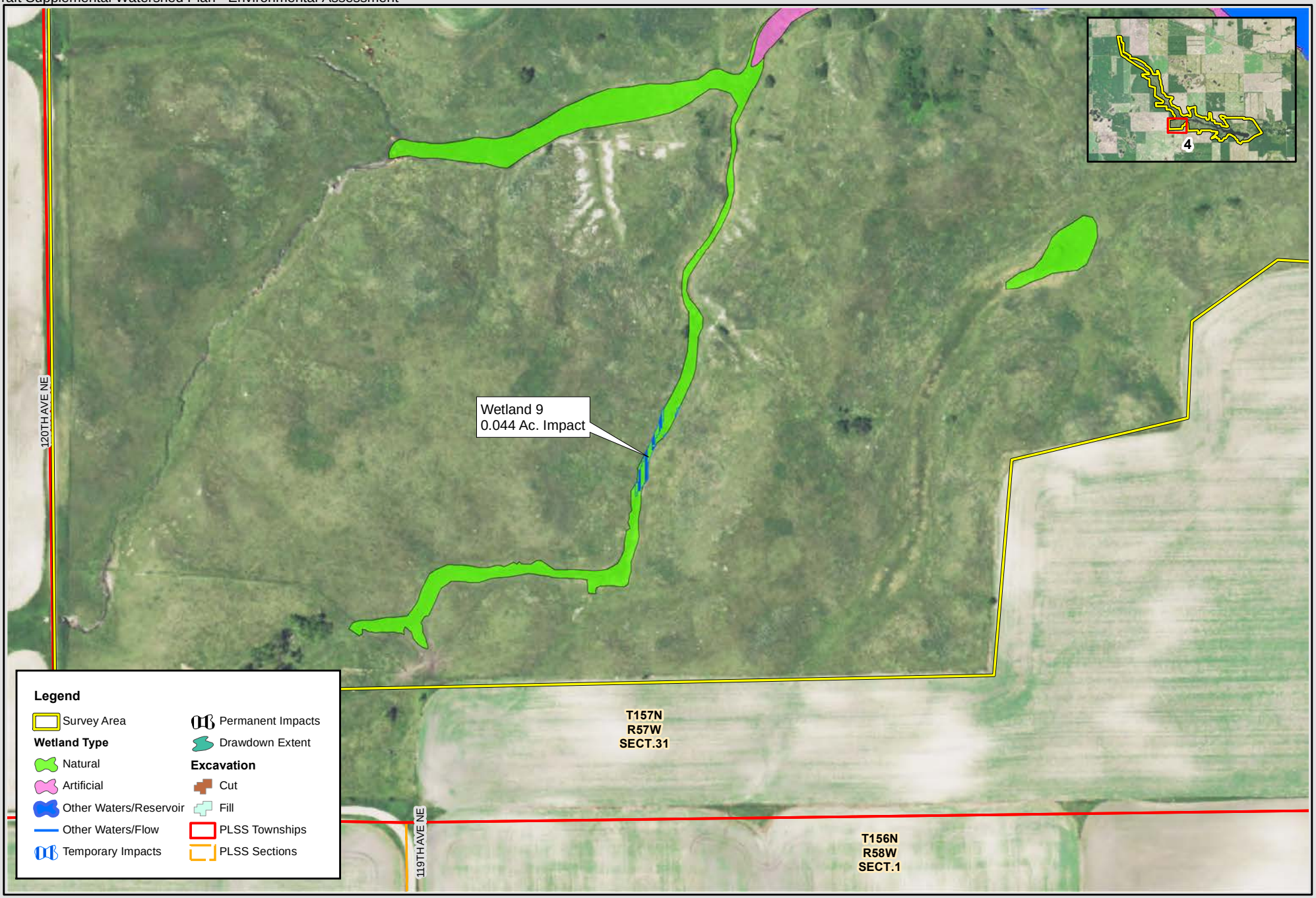

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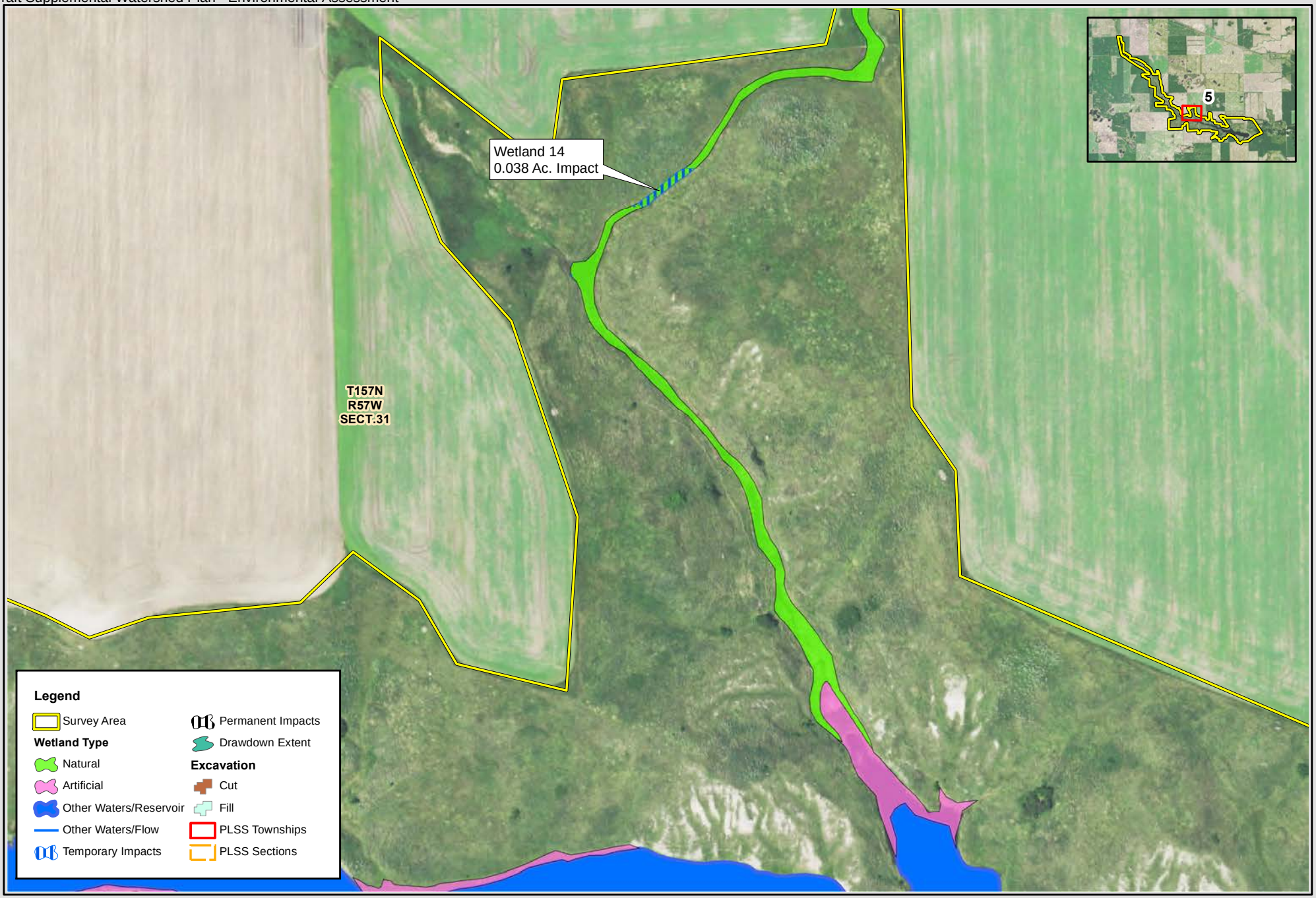

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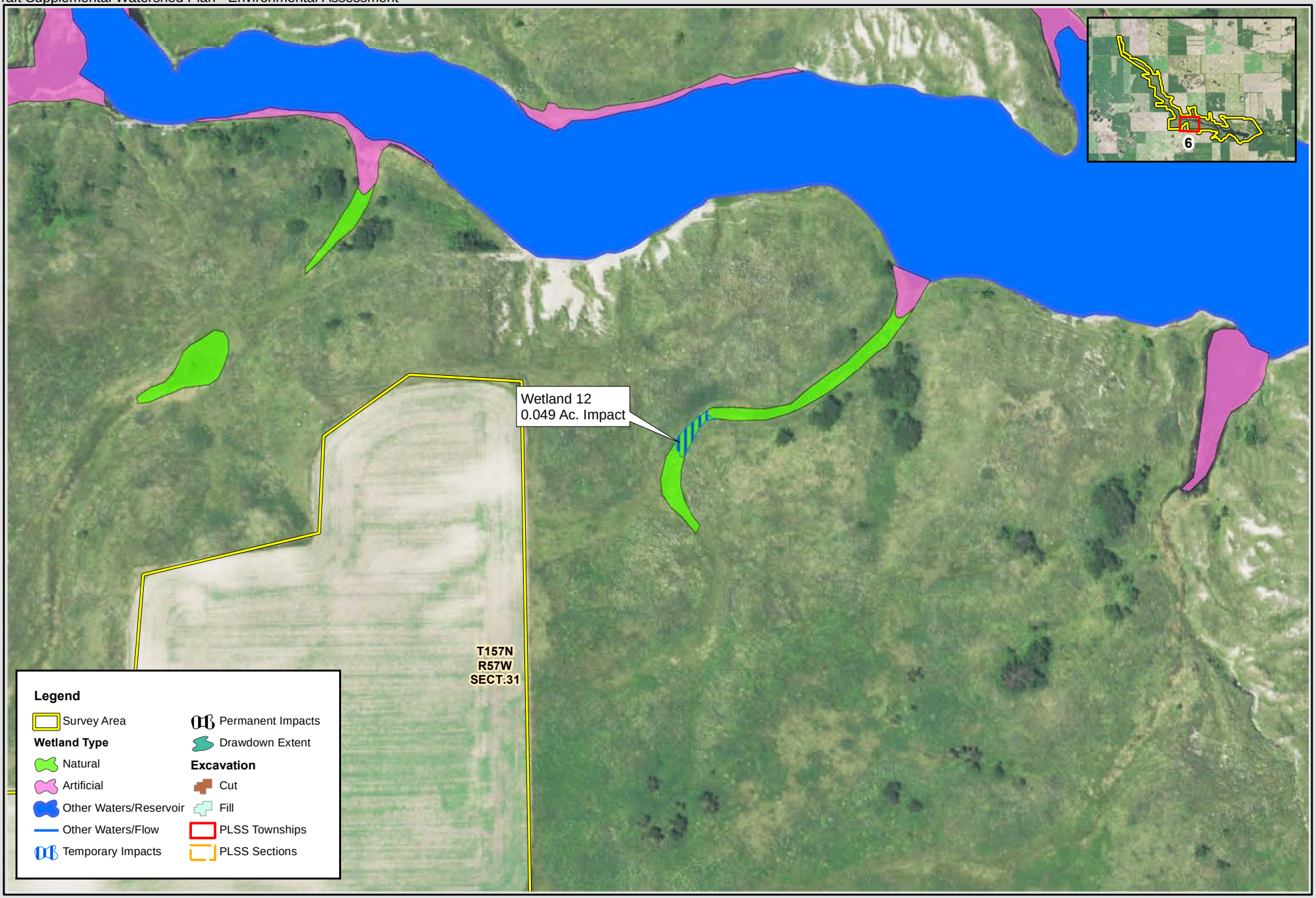

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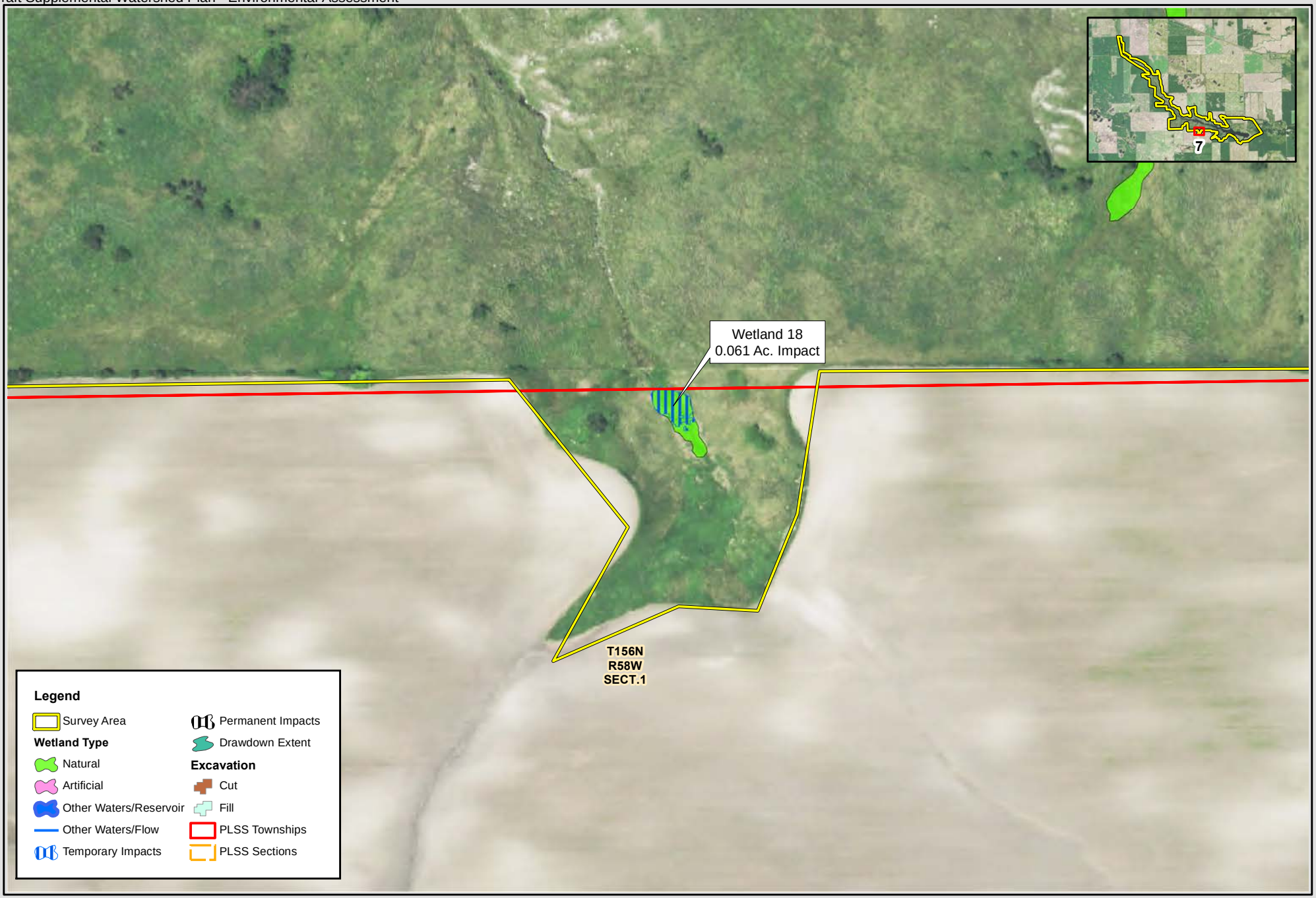

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AS SHOWN	JHL	DJ	7135-0037	5/9/2022	1 of 1

HOUSTON engineering, inc.

Exhibit D-9-6 – Alternative 2 Impacts Map

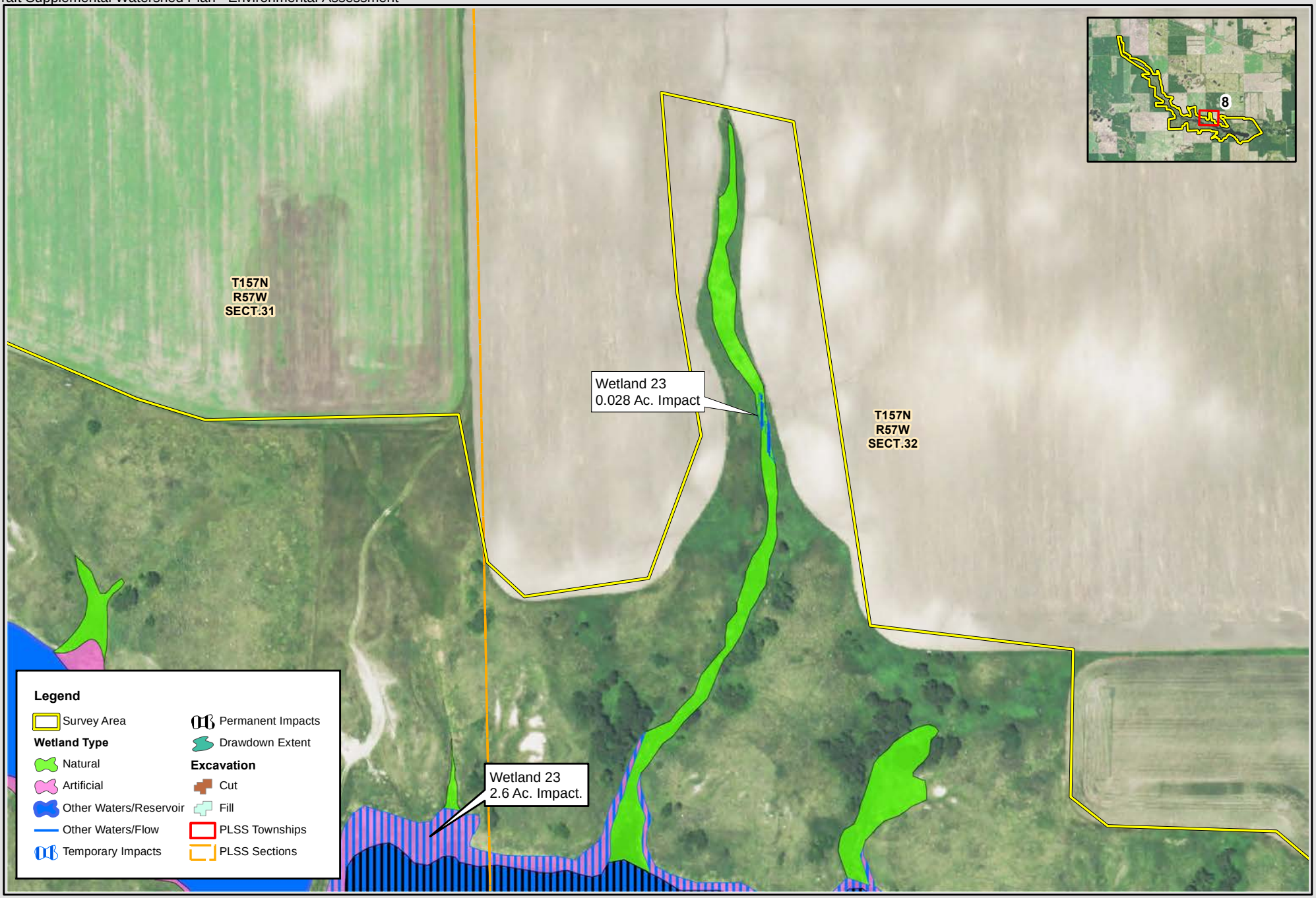
North Branch Forest River Dam No. 1 (Bylin Dam)
Natural Resource Conservation Service (NRCS)

0 100 200 400 Feet

1 inch = 200 feet

N W E S

Document Path: H:\JBN\7100\7135\7135_0037\GIS\WorkingBylin_JHL.mxd



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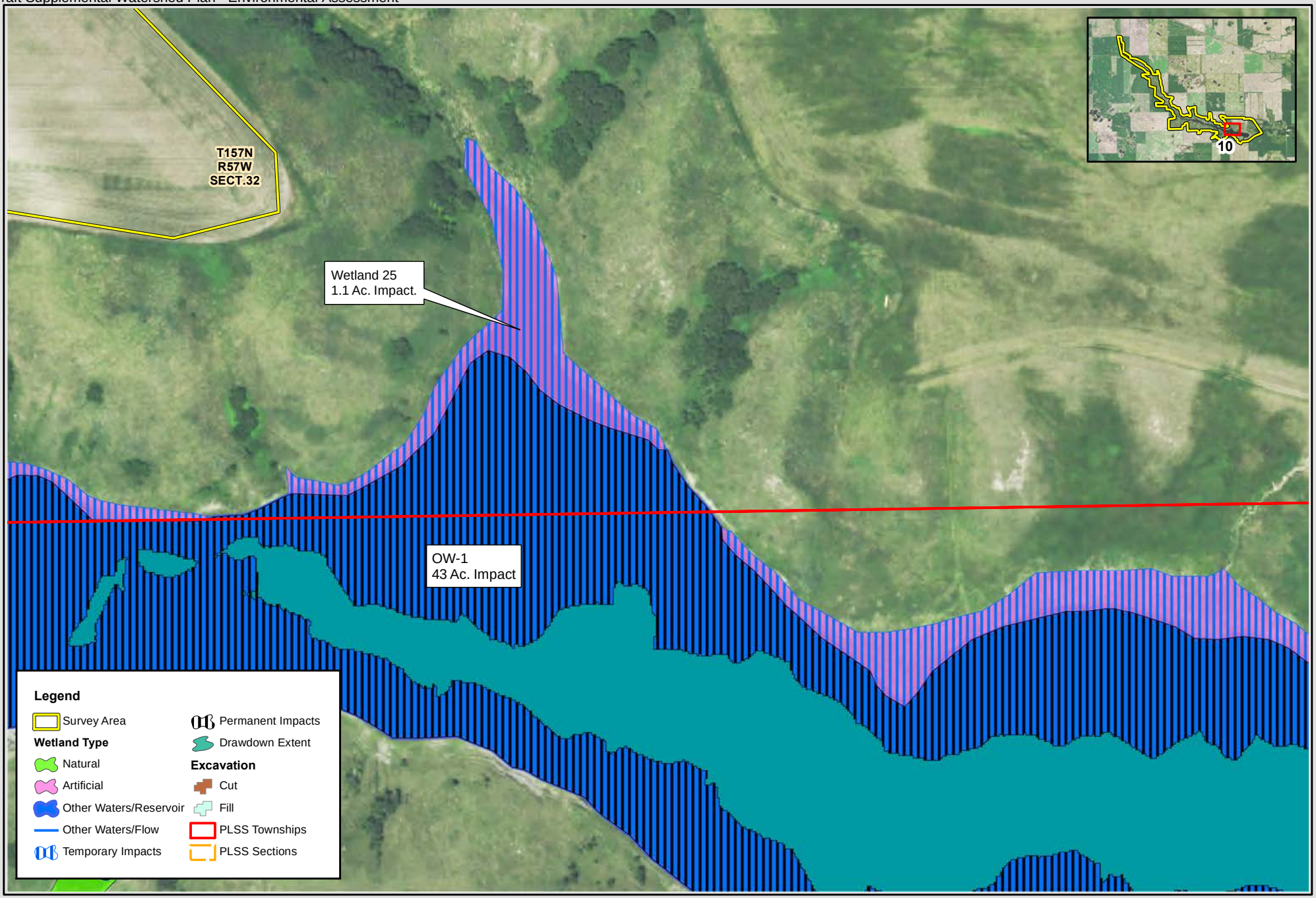

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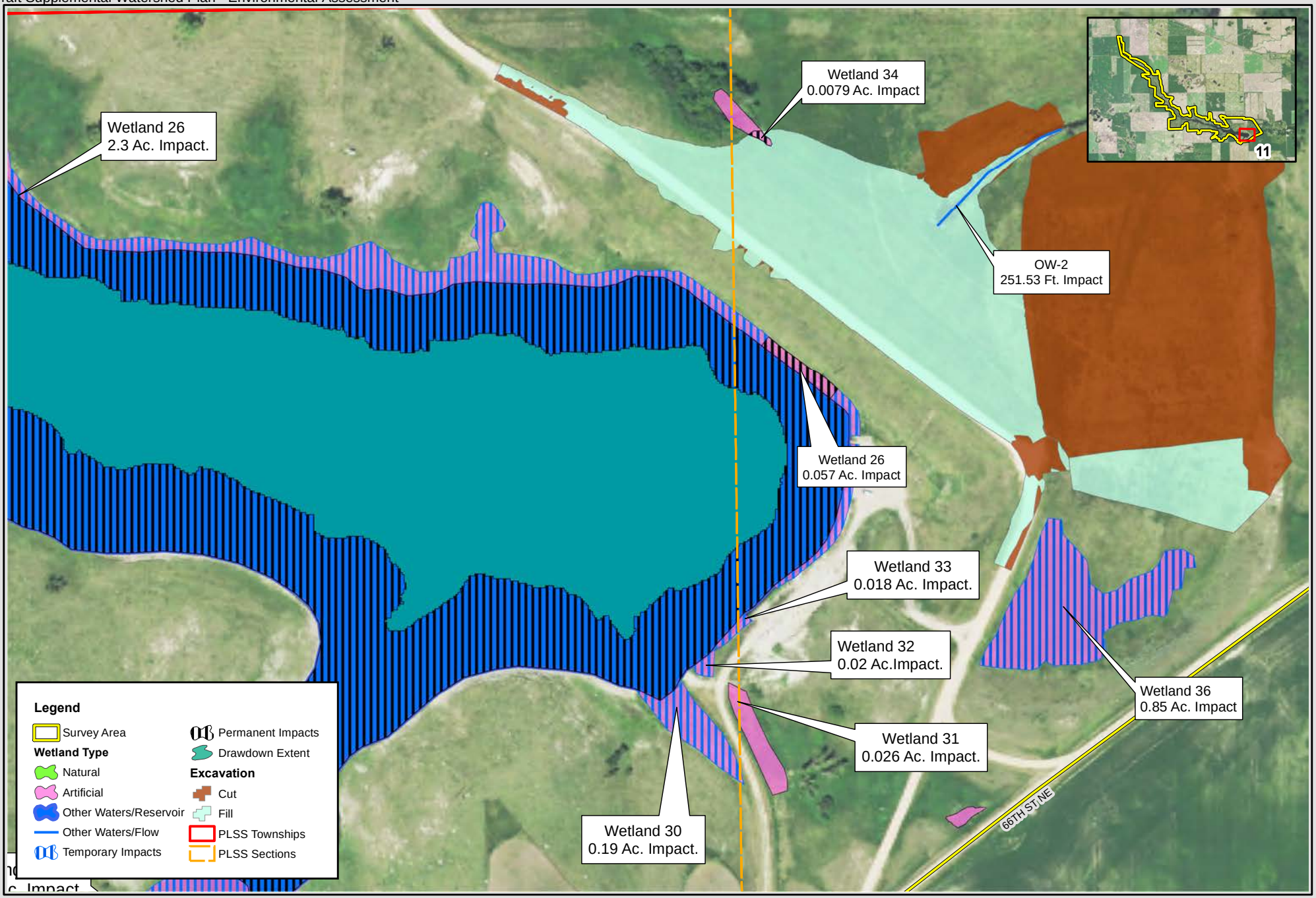

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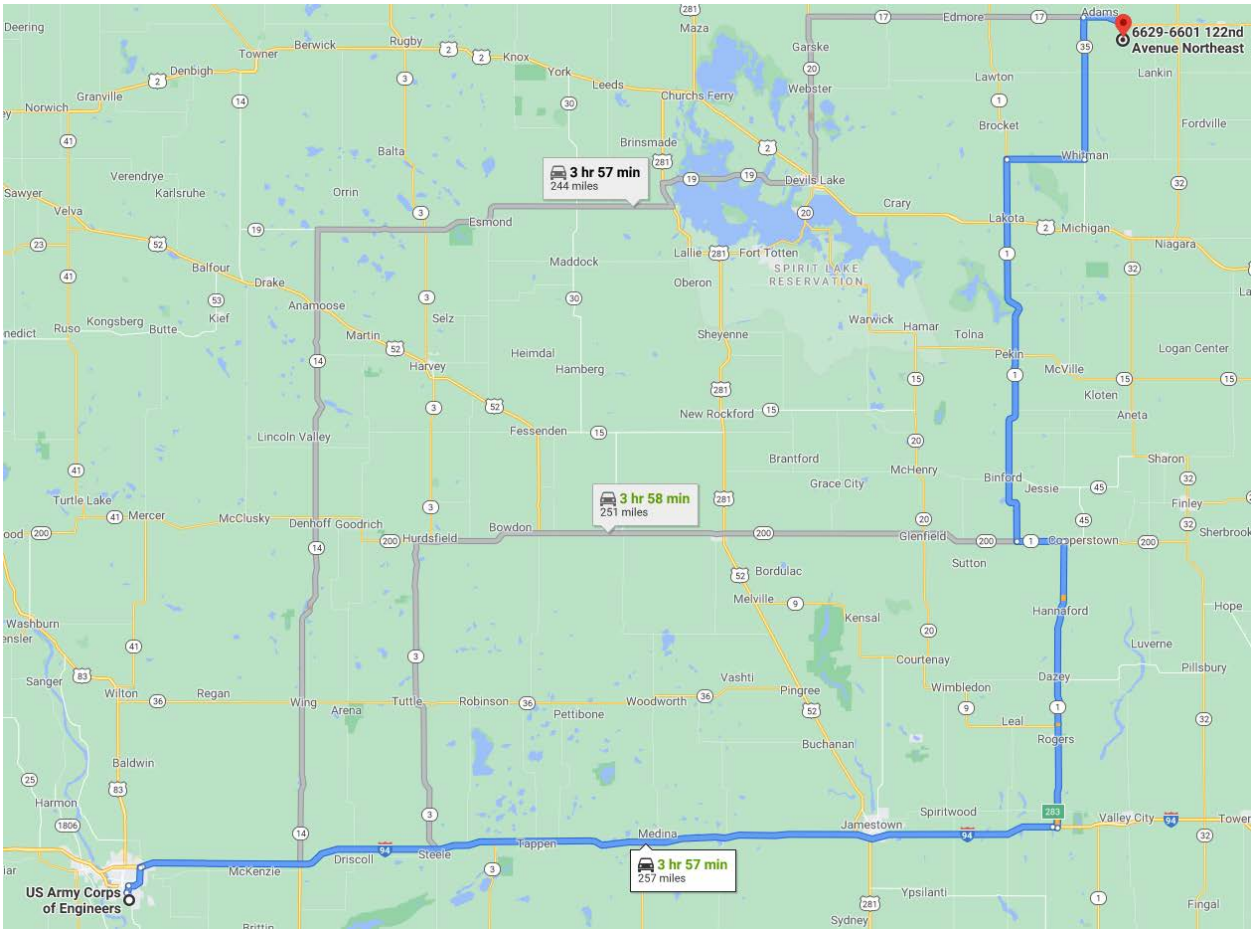
N W E S

Document Path: \\houston\hei\JBN\7100\7135\7135_0037\GIS\WorkingBylin_JHL.mxd

APPENDIX D-9-A

Google Maps Directions

From US Army Corps of Engineers to Bylin Dam- **257 Miles, 3 hrs and 27min**



US Army Corps of Engineers

3319 University Dr, Bismarck, ND 58504

Get on I-94 E/US-83 S from E Bismarck Expy

10 min (5.8 mi)

Head north on ND-1804 N/Airport Expy/University Dr toward Sisseton St

1.0 mi

Turn right onto Airport Rd

0.9 mi

Turn right onto E Bismarck Expy

3.6 mi

Turn right to merge onto I-94 E/US-83 S toward Fargo

0.3 mi

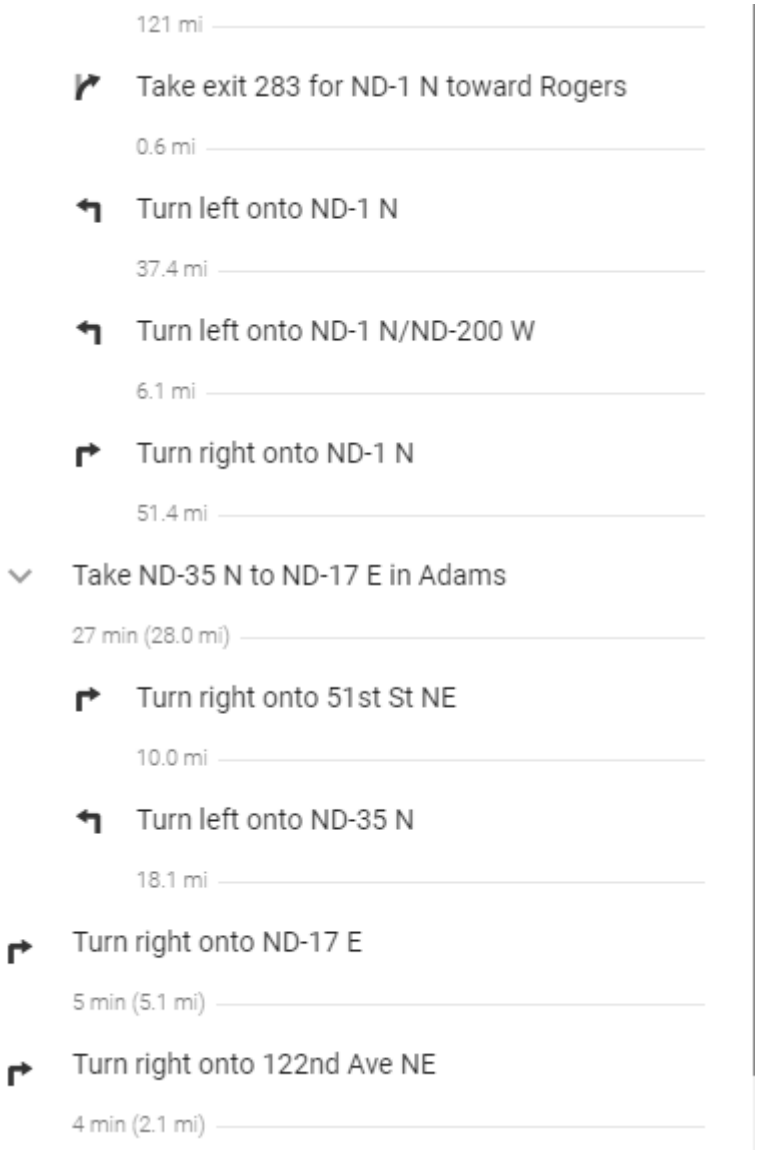
Follow I-94 E and ND-1 N to 51st St NE in Clara

3 hr 11 min (216 mi)

Merge onto I-94 E/US-83 S

Continue to follow I-94 E

121 mi


121 mi
Take exit 283 for ND-1 N toward Rogers
0.6 mi
Turn left onto ND-1 N
37.4 mi
Turn left onto ND-1 N/ND-200 W
6.1 mi
Turn right onto ND-1 N
51.4 mi
Take ND-35 N to ND-17 E in Adams
27 min (28.0 mi)
Turn right onto 51st St NE
10.0 mi
Turn left onto ND-35 N
18.1 mi
Turn right onto ND-17 E
5 min (5.1 mi)
Turn right onto 122nd Ave NE
4 min (2.1 mi)

APPENDIX D-9-B

Selected Site Photographs

Wetland #6- INFORMATION SUMMARY		
	**Location**	Lat: 48.37938842 Long: -98.05770244
	Dominant Vegetation	*Typha X glauca, Persicaria amphibia*
	Soils	Loam
	Hydrology	High Water Table, Saturation, Aquatic Invertebrates, Saturation Visible on Aerial Imagery, Geomorphic Position, and FAC-Neutral Test
	Rationale for Delineation	This area met all wetland delineation criteria

Wetland #7- INFORMATION SUMMARY		
	**Location**	Lat: 48.378244, Long: -98.057174
	Dominant Vegetation	*Spartina pectinata*, *Juncus articus*, and *Scirpus pallidus*
	Soils	Loam
	Hydrology	High Water Table, Saturation, Aquatic Invertebrates, Saturation Visible on Aerial Imagery, Geomorphic Position, and FAC-Neutral Test
	Rationale for Delineation	This area met all wetland delineation criteria

Wetland #8- INFORMATION SUMMARY		
	**Location**	Lat: 48.378245, Long: -98.057593
	Dominant Vegetation	*Phalaris arundinacea* and *Urtica dioica*
	Soils	Loam
	Hydrology	Depleted Below Dark Surface, Depleted Matrix
	Rationale for Delineation	This area met all wetland delineation criteria

Wetland #9- INFORMATION SUMMARY		
	**Location**	Lat: 48.370411, Long: -98.054978
	Dominant Vegetation	*Scirpus pallidus*, *Eleocharis palustris*, *Poa pratensis*, *Hordeum jubatum*
	Soils	Clay Loam
	Hydrology	Saturation visible on aerial imagery, Geomorphic Position, and FAC-Neutral Test
	Rationale for Delineation	This area met all wetland delineation criteria

Wetland #14- INFORMATION SUMMARY		
	**Location**	Lat: 48.374637, Long: -98.042491
	Dominant Vegetation	*Spartina pectinata*
	Soils	Clay Loam and Loam
	Hydrology	FAC-Neutral Test and Geomorphic Position
	Rationale for Delineation	This area met all wetland delineation criteria

Wetland #15- INFORMATION SUMMARY		
	**Location**	Lat: 48.373402, Long: -98.038884
	Dominant Vegetation	*Spartina pectinata*
	Soils	Silty Loam and Clay sand
	Hydrology	Saturation, Geomorphic Position, and FAC-Neutral Test
	Rationale for Delineation	This area met all wetland delineation criteria

Wetland #18- INFORMATION SUMMARY		
	**Location**	Lat: 48.37241453 Long: -98.0396535
	Dominant Vegetation	*Typha X glauca and Carex lacustris*
	Soils	Loam and Silty Loam
	Hydrology	Geomorphic Position and FAC-Neutral Test
	Rationale for Delineation	This area met all wetland delineation criteria

Wetland #22- INFORMATION SUMMARY		
	**Location**	Lat: 48.37064801 Long: -98.03669514
	Dominant Vegetation	*Carex atherodes*
	Soils	Clay Loam
	Hydrology	Geomorphic Position and FAC-Neutral Test
	Rationale for Delineation	This area met all wetland delineation criteria

Wetland #23- INFORMATION SUMMARY		
	**Location**	Lat: 48.37213494 Long: -98.03598026
	Dominant Vegetation	*Phalaris arundinacea*
	Soils	Loam
	Hydrology	Geomorphic Position and FAC-Neutral Test
	Rationale for Delineation	This area met all wetland delineation criteria

Wetland #23- INFORMATION SUMMARY		
	**Location**	Lat: 48.37347474 Long: -98.03399531
	Dominant Vegetation	*Phalaris arundinacea*
	Soils	Loam
	Hydrology	Surface Water, Geomorphic Position, and FAC-Neutral Test
	Rationale for Delineation	This area met all wetland delineation criteria

Wetland #23- INFORMATION SUMMARY		
	**Location**	Lat: 48.372635, Long: -98.032131
	Dominant Vegetation	*Phalaris arundinacea*
	Soils	Loam
	Hydrology	Surface Water, Geomorphic Position, and FAC-Neutral Test
	Rationale for Delineation	This area met all wetland delineation criteria

Wetland #24- INFORMATION SUMMARY		
	**Location**	Lat: 48.366373, Long: -98.032521
	Dominant Vegetation	*Typha X. glauca*
	Soils	Clay Loam
	Hydrology	High Water Table, Saturation, Saturation Visible on Aerial Imagery, and FAC-Neutral Test
	Rationale for Delineation	This area met all wetland delineation criteria

Wetland #30- INFORMATION SUMMARY		
	**Location**	Lat: 48.366023, Long: -98.011597
	Dominant Vegetation	*Phalaris arundinacea* and *Urtica dioica*
	Soils	Clay Loam
	Hydrology	High Water Table, Saturation, Saturation Visible on Aerial Imagery, and FAC-Neutral Test
	Rationale for Delineation	This area met all wetland delineation criteria

Wetland #33- INFORMATION SUMMARY		
	**Location**	Lat: 48.175054, Long: -97.758172
	Dominant Vegetation	*Salix interior*, *Acer negundo*, *Alopecurus pratensis,* and *Solidago canadensis*
	Soils	Sandy Loam and Sandy Clay Loam
	Hydrology	Saturation Visible on Aerial Imagery, and Geomorphic Position
	Rationale for Delineation	This area met all wetland delineation criteria

Wetland #34- INFORMATION SUMMARY		
	**Location**	Lat: 48.36591277 Long: -98.01042665
	Dominant Vegetation	*Phalaris arundinacea*
	Soils	Clay Loam
	Hydrology	High Water Table, Saturation, Saturation Visible on Aerial Imagery, Geomorphic Position, and FAC-Neutral Test
	Rationale for Delineation	This area met all wetland delineation criteria

Wetland #36- INFORMATION SUMMARY		
	**Location**	Lat: 48.181611, Long: -97.756883
	Dominant Vegetation	*Alopecurus pratensis*
	Soils	Clay Loam
	Hydrology	High Water Table, Saturation, Saturation Visible on Aerial Imagery, Geomorphic Position, FAC-Neutral Test, and Frost Heave Hummocks
	Rationale for Delineation	This area met all wetland delineation criteria

Other Water #2a - INFORMATION SUMMARY		
	**Location**	Lat: 48.380135, Long: -98.057446
	Dominant Vegetation	*Spartina pectinata* and *Symphyotrichum ericoides*
	Soils	Clay Loam
	Hydrology	Natural drainage that has hydrology most years
	Rationale for Delineation	Potential other water indicators are present

Other Water #2b - INFORMATION SUMMARY		
	**Location**	Lat: 48.378664, Long: -98.056586
	Dominant Vegetation	*Phalaris arundinacea*
	Soils	Clay Loam
	Hydrology	Natural drainage that has hydrology most years
	Rationale for Delineation	Potential other water indicators are present

Other Water #2c - INFORMATION SUMMARY		
	**Location**	Lat: 48.368650, Long: -98.010467
	Dominant Vegetation	*Schoenoplectus tabernaemontani* and *Phalaris arundinacea*
	Soils	Clay Loam
	Hydrology	Natural drainage that has hydrology most years; incised stream channel
	Rationale for Delineation	Potential other water indicators are present

Other Water #13 - INFORMATION SUMMARY		
	**Location**	Lat: 48.365781, Long: -98.015382
	Dominant Vegetation	*Typha X glauca, Spartina pectinate, Salix interior*, and *Sagittaria latifolia*
	Soils	Clay Loam
	Hydrology	Dam reservoir pool with hydrology year round
	Rationale for Delineation	Potential other water indicators are present

Other Water #14 - INFORMATION SUMMARY		
	**Location**	Lat: 48.398373, Long: -98.080766
	Dominant Vegetation	*Typha X glauca*
	Soils	Clay Loam
	Hydrology	Natural depressional drainage that has hydrology year round
	Rationale for Delineation	Potential other water indicators are present

Other Water #16 - INFORMATION SUMMARY		
	**Location**	Lat: 48.379365, Long: -98.057203
	Dominant Vegetation	-
	Soils	Clay Loam
	Hydrology	Natural drainage that has hydrology most years; incised stream channel
	Rationale for Delineation	Potential other water indicators are present

Other Water #22 - INFORMATION SUMMARY		
	**Location**	Lat: 48.370324, Long: -98.057455
	Dominant Vegetation	-
	Soils	Clay Loam
	Hydrology	Natural drainage that has hydrology most years
	Rationale for Delineation	Potential other water indicators are present

Other Water #30 - INFORMATION SUMMARY		
	**Location**	Lat: 48.373619, Long: -98.038981
	Dominant Vegetation	*Typha X glauca and Spartina pectinata*
	Soils	Clay Loam
	Hydrology	Natural drainage that has hydrology for part of the growing season
	Rationale for Delineation	Potential other water indicators are present

Other Water #32 - INFORMATION SUMMARY		
	**Location**	Lat: 48.373079, Long: -98.036102
	Dominant Vegetation	*Spartina Pectinata, Poa pratensis, and Sonchus arvensis*
	Soils	Clay Loam
	Hydrology	Depressional drainage that has hydrology for part of the growing season
	Rationale for Delineation	Potential other water indicators are present

Other Water #48 - INFORMATION SUMMARY		
	**Location**	Lat: 48.364994, Long: -98.015794
	Dominant Vegetation	*Phalaris arundinacea*
	Soils	Clay Loam
	Hydrology	Natural drainage that has hydrology most years
	Rationale for Delineation	Potential other water indicators are present

APPENDIX D-9-C

Plant List

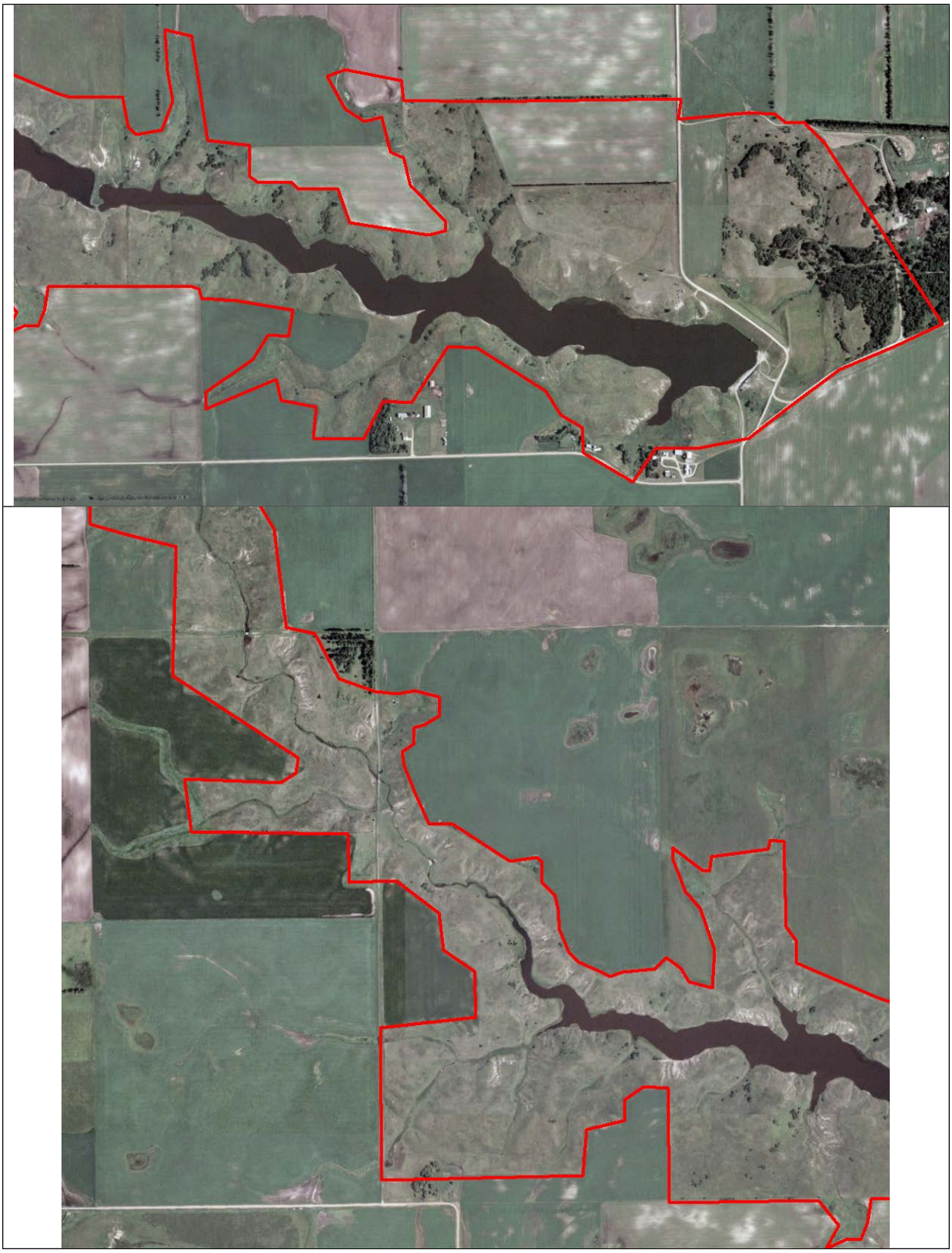
Appendix D-9-C: Plant List (species names from Lichvar et al. 2016; noxious weed lists from ND Department of Agriculture 2020).

Genus/Species	Common Name	Indicator Status Great Plains region	Dominant Wetland plants	Dominant Upland Plants	Stratum	Native status/noxious weeds
Acer negundo	boxelder	FAC	x		tree	native
Achillea millefolium	common yarrow	FACU			herb	native
Alopecurus pratensis	meadow foxtail	FACW	x		herb	exotic
Amorpha canescens	lead plant	not listed			shrub	native
Artemisia absinthium	absinth wormwood	not listed			herb	Invasive/noxious
Artemisia biennis	biennial wormwood	FACU			shrub	invasive
Bromus inermis	smooth brome	UPL	x	x	herb	invasive
Calamagrostis canadensis	Canada bluejoint	FACW			herb	native
Carex atherodes	slough sedge	OBL	x		herb	native
Cirsium arvense	Canada thistle	FACU		x	herb	Invasive/noxious
Eleocharis palustris	common spikerush	OBL	x		herb	native
Elymus repens	quackgrass	FACU		x	herb	invasive
Euphorbia esula	leafy spurge	not listed		x	herb	Invasive/noxious
Glycyrrhiza lepidota	wild licorice	FACU			herb	native
Grindelia squarrosa	gumweed	UPL			herb	native
Hordeum jubatum	foxtail barley	FACW	x		herb	native
Juncus arcticus	arctic rush	FACW	x		herb	native
Lycopus americanus	American water horehound	OBL			herb	native
Medicago lupulina	black medick	FACU			herb	invasive
Panicum virgatum	switchgrass	FAC	x		herb	native
Persicaria amphibia	swamp smartweed	OBL	x		herb	native
Phalaris arundinacea	reed canary grass	FACW	x		herb	native
Poa palustris	fowl bluegrass	FACW			herb	native
Poa pratensis	Kentucky blue grass	FACU		x	herb	exotic
Potentilla anserina	silver cinquefoil	FACW			herb	native
Salix interior	sandbar willow	FACW	x		Tree/shrub	native
Scirpus atrovirens	green bulrush	OBL			herb	native
Scirpus pallidus	pale bulrush	OBL	x		herb	native
Shepherdia argentea	silver buffaloberry	UPL		x	shrub	native
Sium suave	water parsnip	OBL			herb	native

Solidago canadensis	Canada goldenrod	FACU			herb	native
Sonchus arvensis	perennial sow thistle	FAC			herb	exotic
Spartina pectinata	prairie cordgrass	FACW	x		herb	native
Symphoricarpos albus	snowberry	UPL		x	shrub	native
Symphoricarpos occidentalis	buck brush	UPL		x	shrub	native
Symphyotrichum ericoides	heath aster	FACU			herb	native
Symphyotrichum lanceolatum	panicled aster	FACW			herb	native
Symphyotrichum laeve	smooth blue aster	FACU			herb	native
Taraxacum officinale	common dandelion	FACU		x	herb	introduced/invasive
Trifolium repens	white clover	FACU		x	herb	exotic
Typha X glauca	hybrid cattail	OBL	x		herb	native
Urtica dioica	stinging nettle	FAC	x		herb	native

APPENDIX D-9-D

Historical Aerial Photographs



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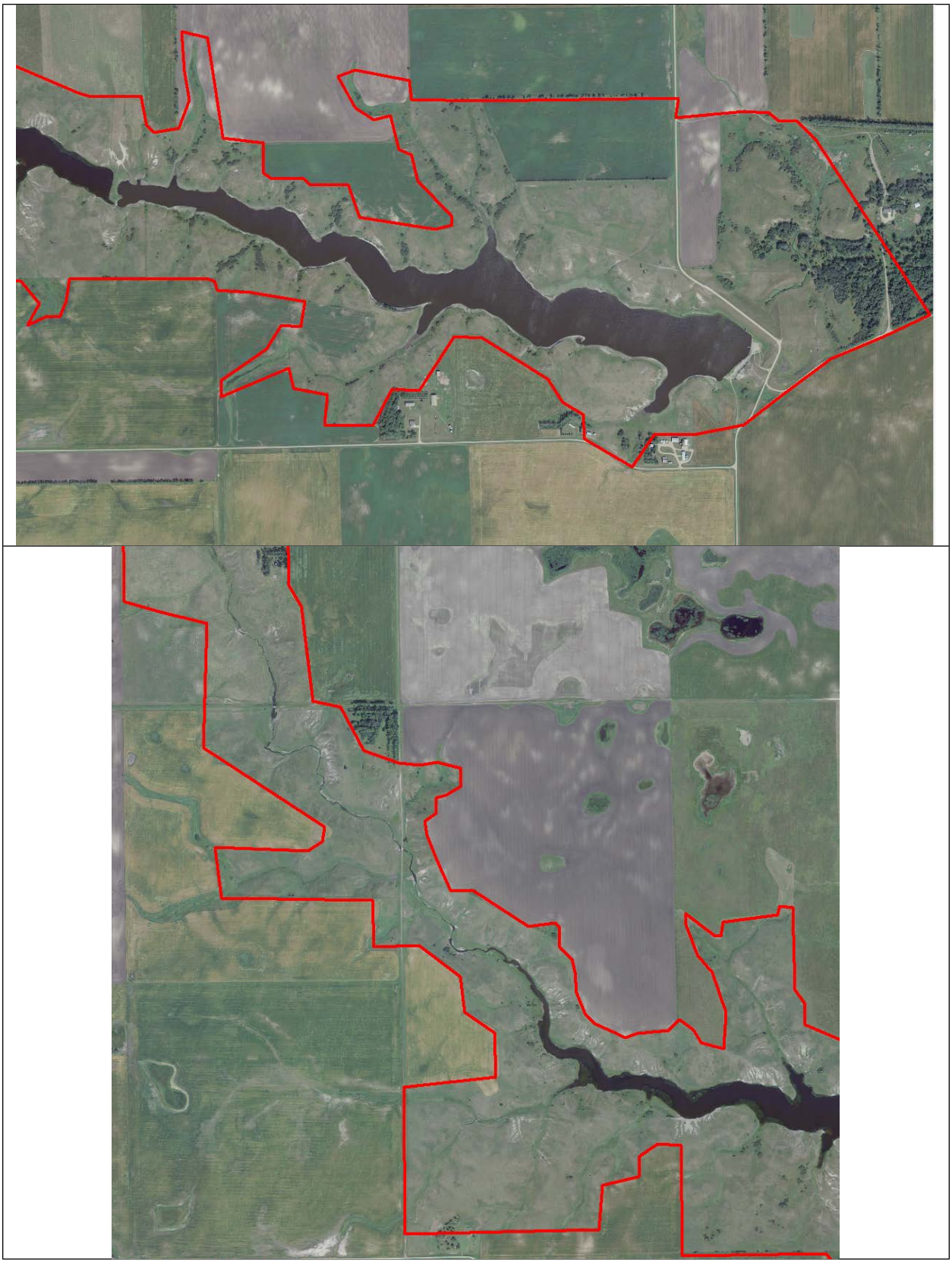

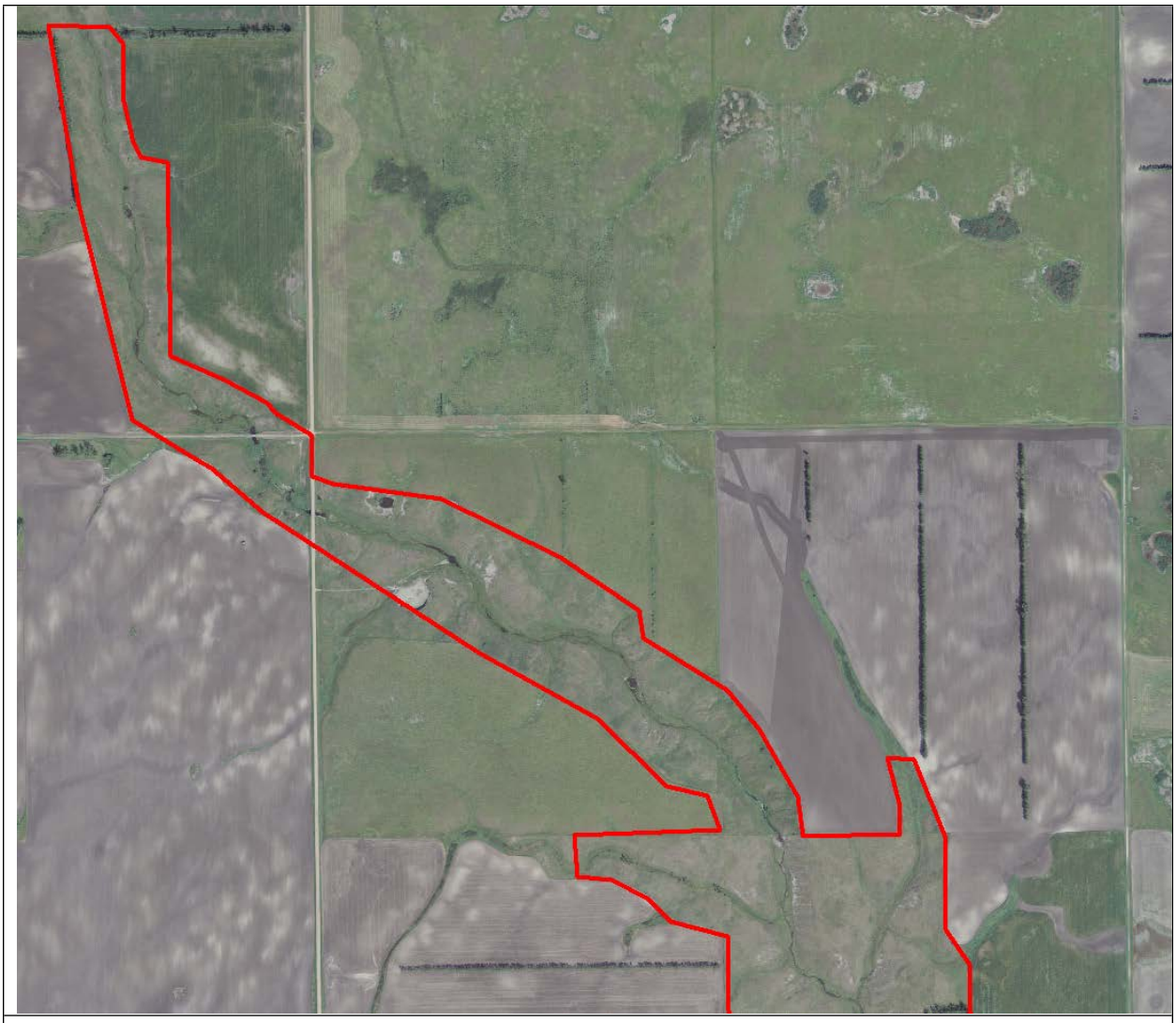

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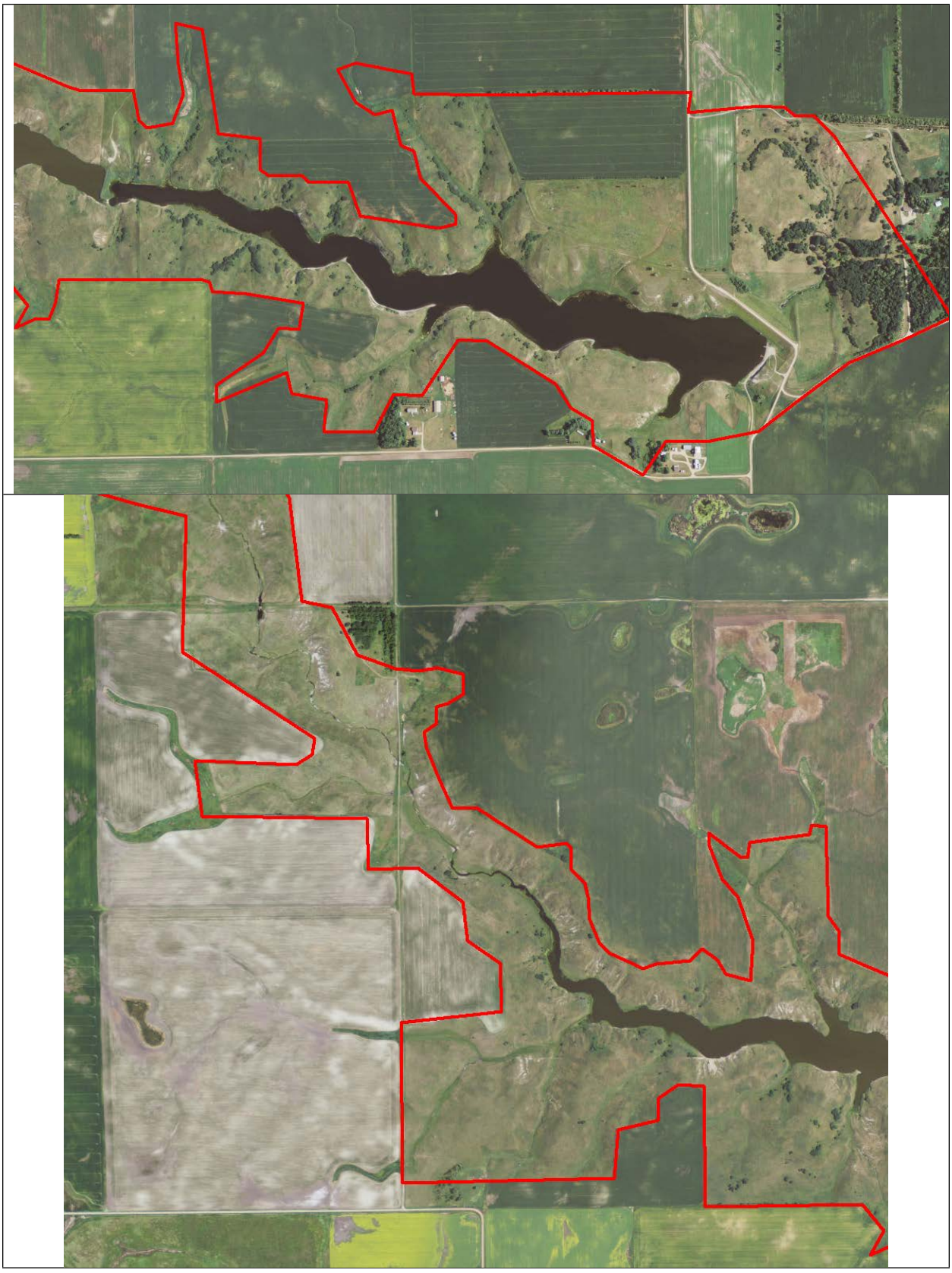

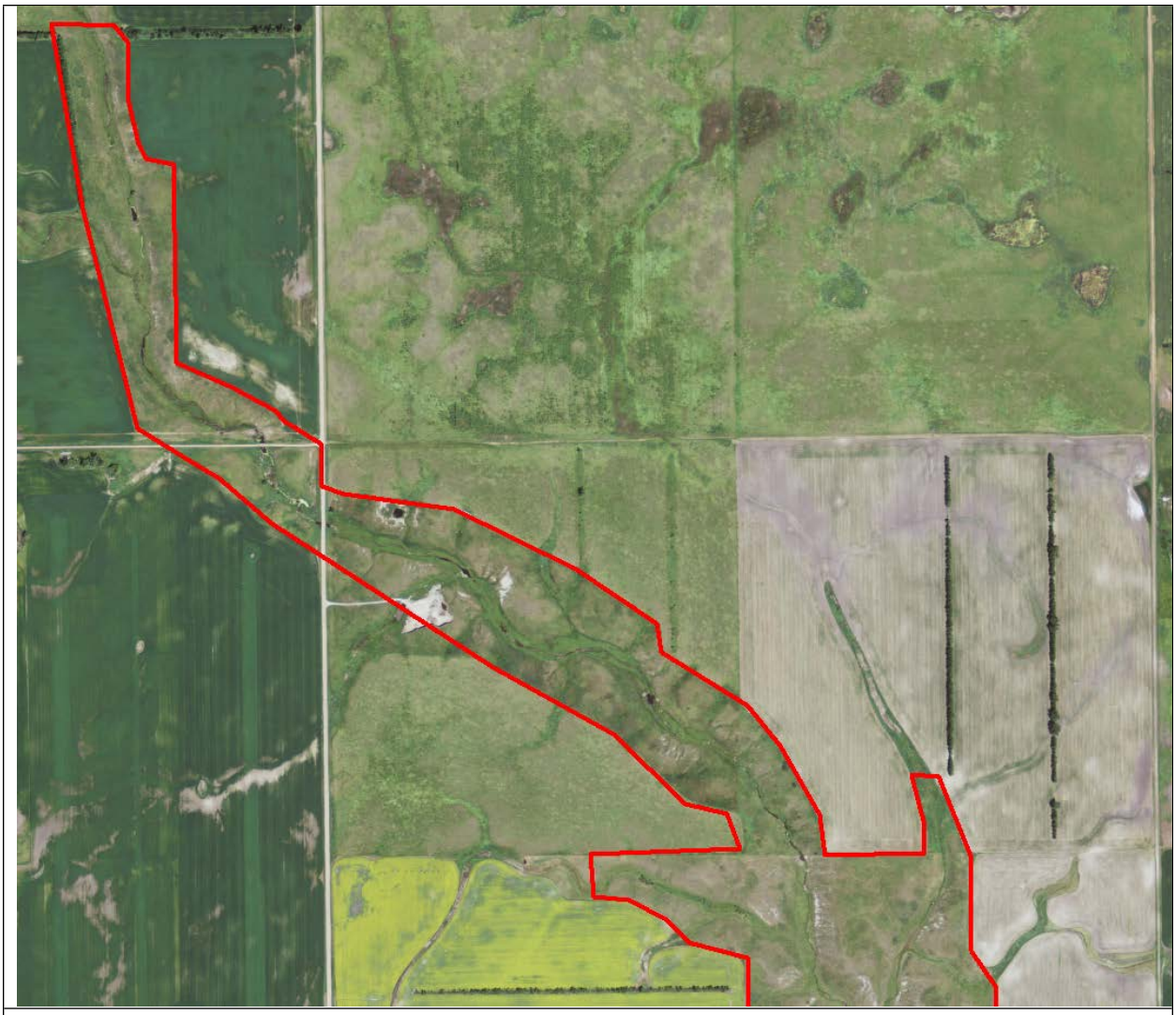

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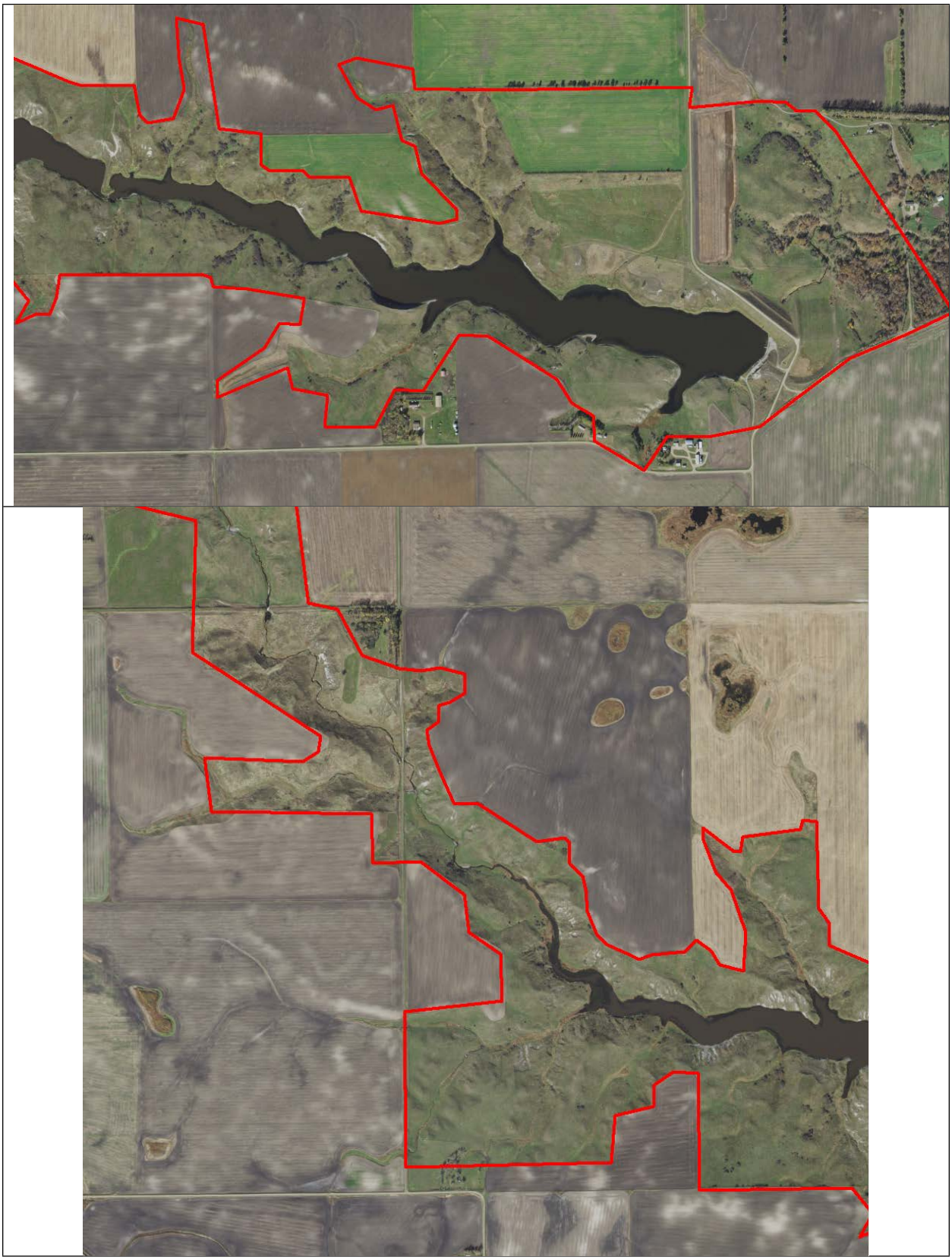

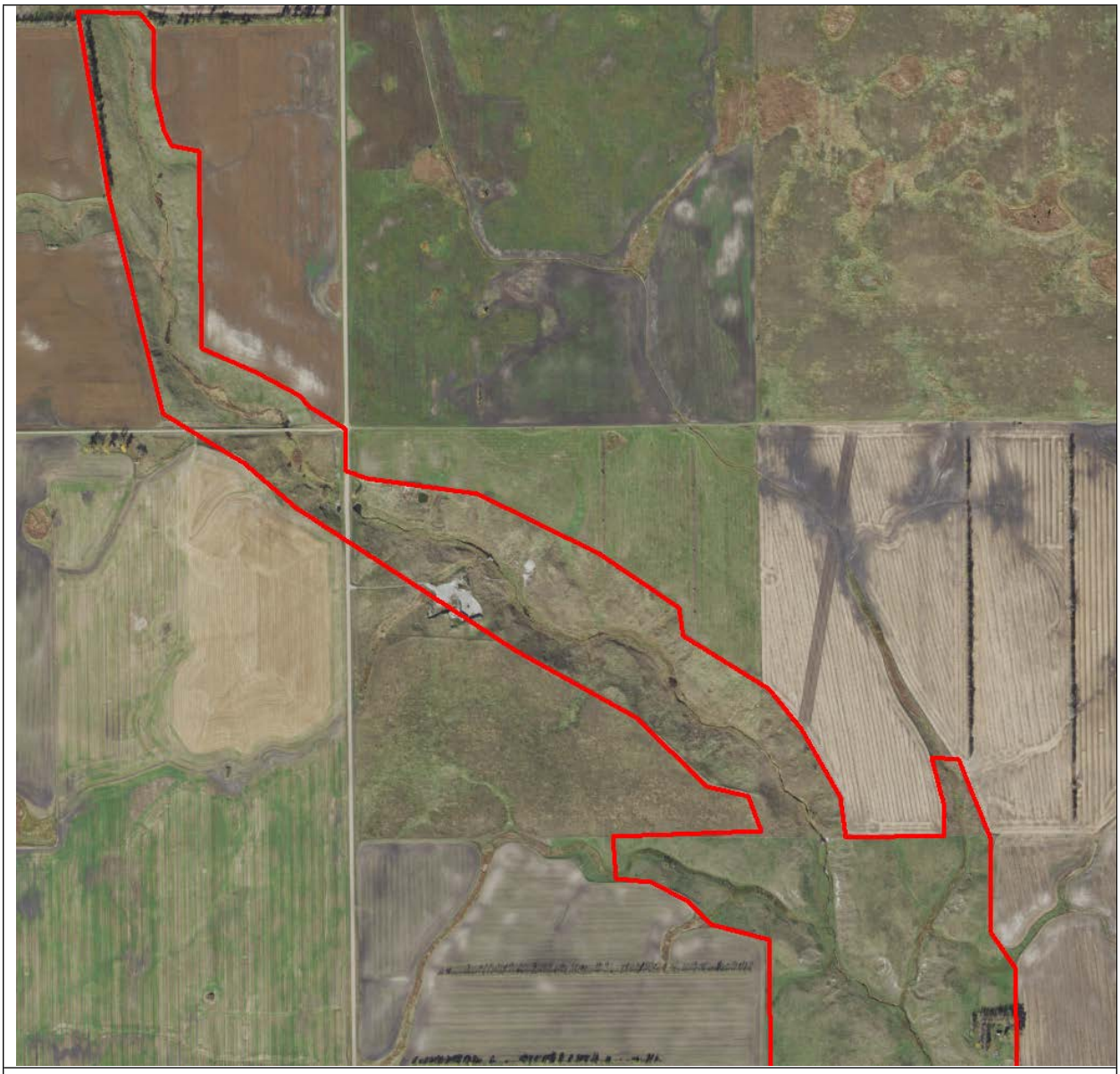

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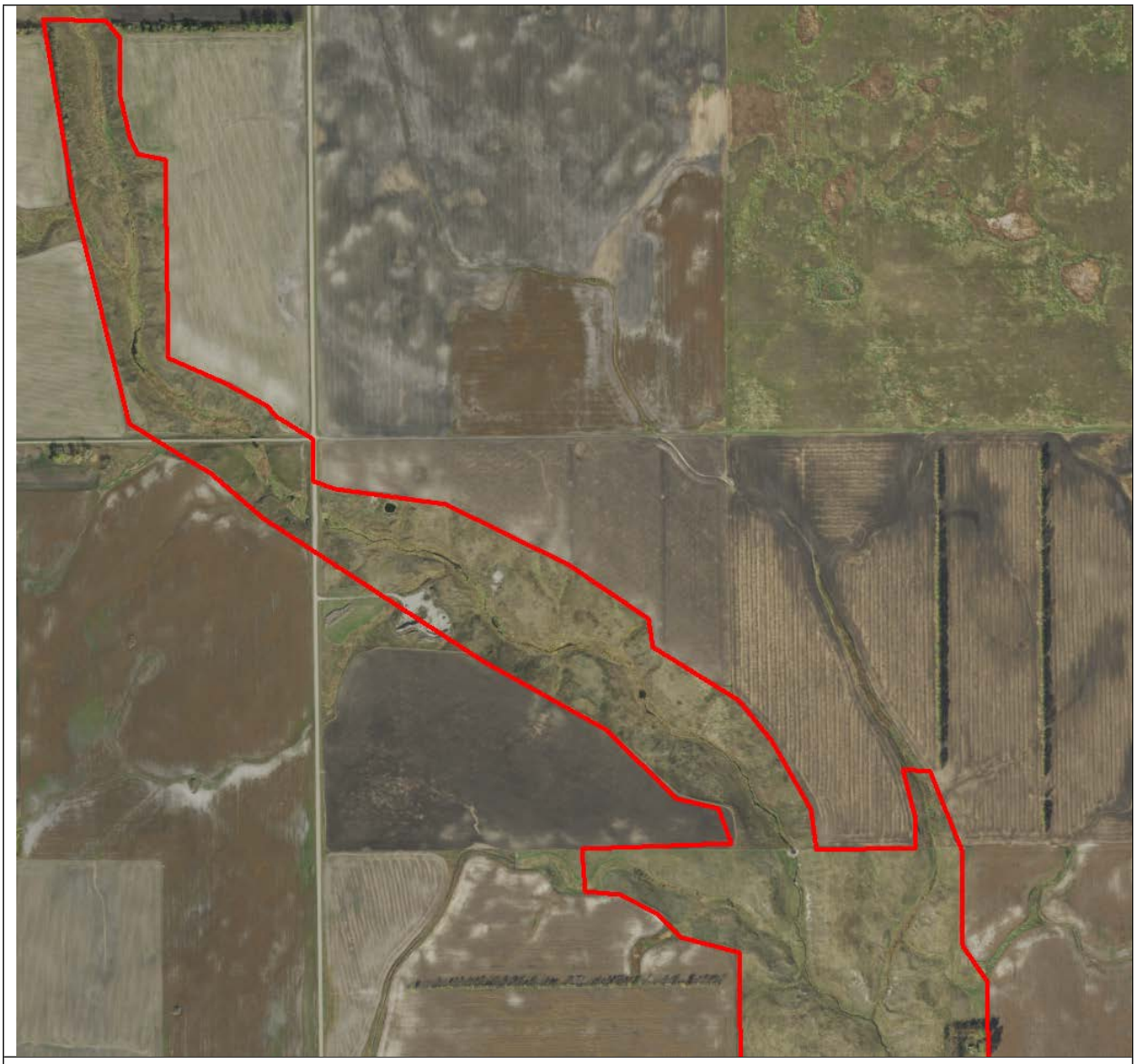

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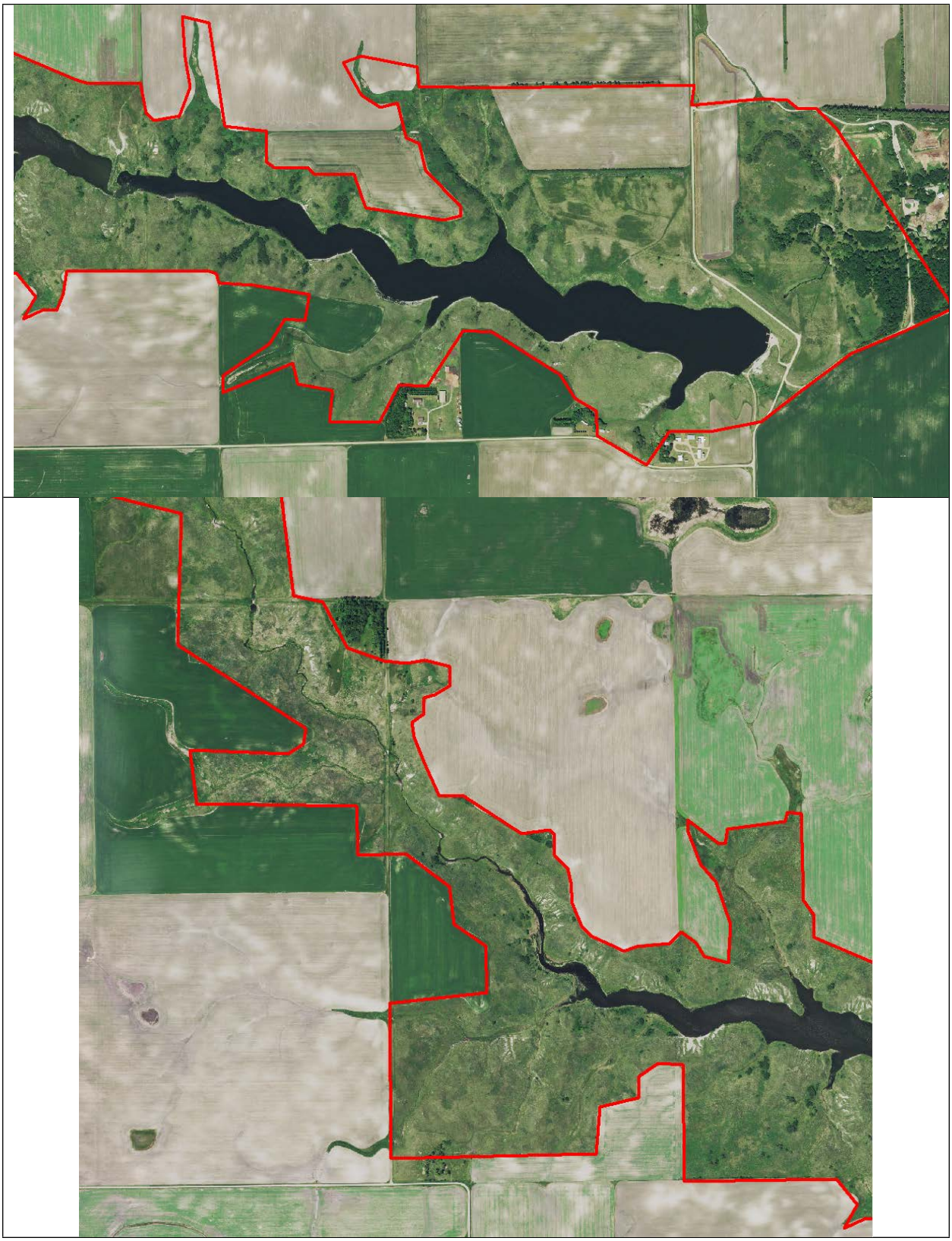

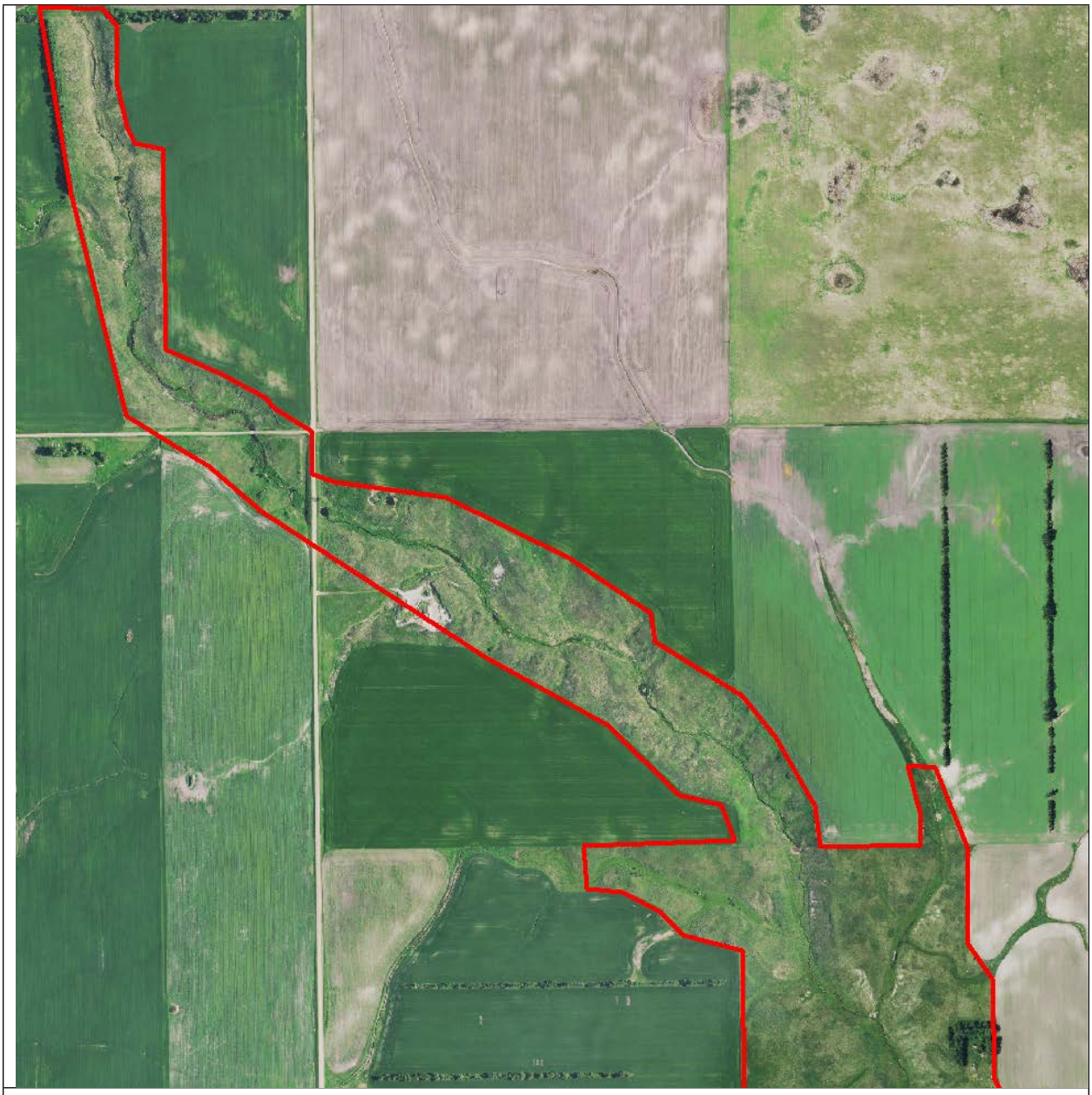

2019