Appendix N – Water Resources

Wetland Delineation Report

Kalamazoo-Battle Creek Airport

Runway 17/35 Extension and Taxiway Improvements

Report prepared for

Kalamazoo County, Michigan

Report prepared by

Mead & Hunt

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Table of Contents

Page

Appendices

Tables

1. Introduction

The Kalamazoo/Battle Creek International Airport (AZO or Airport) is classified by the Federal Aviation Administration (FAA) as a non-hub, commercial service airport that serves the areas of Kalamazoo and Battle Creek and surrounding communities in southwest Michigan. Kalamazoo County owns and operates the Airport covering approximately 806 acres. The Airport is located within the city limits of Kalamazoo in Kalamazoo County, although the boundary between the City of Kalamazoo and the City of Portage runs adjacent to its southern and western borders.

The Airport is at the intersection of Interstate 94 and East Kilgore Road. The northern half of the Airport is surrounded by single-family residences and a mix of commercial and general industrial land uses. On the south, the Airport is bordered by primarily general industrial and commercial uses consisting of Pfizer Pharmaceutical directly south, Mann+Hummel on the southeast, and the Air Zoo Aviation Museum on the west. The southwest portion of Airport property holds several open fields and just outside of Airport property on the southeast is a County-owned parcel of undeveloped land. The Airport property spans two watersheds: the Portage Creek subwatershed (HUC 12: 040500030604) and the Davis Creek-Kalamazoo River subwatershed (HUC 12: 040500030606), both parts of the Spring Brook-Kalamazoo River Watershed. A project location map is presented in Appendix A.

The airfield at AZO consists of three runways and supporting taxiways. Runway 17/35 is oriented in a north-south direction, is 6,502 feet long and 150 feet wide, and is the primary runway. Runway 5/23 is 3,438 feet long and 100 feet wide, oriented in a northeast-southwest direction, and is the primary crosswind runway. Runway 9/27 is 2,800 feet long and 60 feet wide, oriented in an east-west direction, and serves as a secondary crosswind runway.

In addition to the three runways, the Airport has many airside and landside assets that include parallel taxiways, connector taxiways, aprons, navigational aids (NAVAIDs), hangars, a passenger terminal building, an air traffic control tower (ATCT), and four fixed based operators (FBOs). FBOs provide fueling, aircraft maintenance, and other important ground services.

As identified in previous planning documents (2013 Master Plan Update and the 2017 Runway Incursion Mitigation (RIM) Study), the Airport has a demonstrated need for a longer primary runway to meet current and future user demand and to also correct taxiway geometric deficiencies. Major development items include the following:

- Meet the operational demands of existing and projected aircraft by providing additional runway length that meets FAA design standards

- Improve airfield movement by correcting geometry deficiencies associated with the intersection of Taxiway C and Runway 17

In support of an environmental assessment for the extension of Runway 17/35, a wetland delineation was conducted by Mead & Hunt, Inc. (Mead & Hunt) within an Area of Interest (AOI) covering three separate areas over two field visits on June 6-7, 2019 and August 19-21, 2019. The AOI comprises

246.4 acres located in Sections 1, 2, 11, and 12, Township 3 South, Range 11 West and Section 35, Township 2 South, Range 11 West, Kalamazoo County, Michigan. A total of seven wetlands were identified within the AOI.

This report summarizes the results of the wetland delineation. Delineator qualifications are provided in Appendix I. Mead & Hunt staff who performed the wetland delineation are:

- Brauna Hartzell, BS Biological Science, Florida State University, 1982; MS Environmental Monitoring, University of Wisconsin-Madison, 1994; 17 years wetland delineation practice.

2. Methods

The wetland determination made use of available resources to provide context and background information and to assist in the field assessment including:

- Kalamazoo County 2-foot elevation contour data obtained from Kalamazoo County GIS web site accessed at https://www.arcgis.com/apps/webappviewer/index.html?id=659542cd5d0c47ce9b8ad8c623499b81.
- U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) soil survey, Web Soil Survey. Accessed at http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx.
- U.S. Fish and Wildlife National Wetland Inventory (NWI) Wetlands Mapper. Accessed at https://www.fws.gov/wetlands/data/mapper.html.
- Michigan Department of Environment, Great Lakes, and Energy (EGLE), Wetlands Map Viewer. Accessed at https://www.mcgi.state.mi.us/wetlands/mcgiMap.html#.
- 2016 National Wetland Plant List (Lichvar, R.W., D. L. Banks, W. N. Kirchner, and N. C. Melvin, 2016).
- Aerial photography from the following sources:
    - Kalamazoo County Parcel Viewer, City of Kalamazoo and City of Portage mapping sites. Accessed at https://www.kalcounty.com/planning/gis.htm
    - USDA-FSA National Agriculture Imagery Program (NAIP). Accessed as a GIS map service at https://gis.apfo.usda.gov/arcgis/rest/services
    - Google Earth

The field methods used conform to the Routine Onsite Method of the *1987 U.S. Army Corps of Engineers' (USACE) Wetland Delineation Manual*, as enhanced by the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral/Northeast Region* (U.S. Army Corps of Engineers, 2012). Soil characteristics were examined by digging pits with a 16-inch tile spade and hydrologic indicators were visually assessed. Soil pits were left open for a minimum of 15 minutes to adequately assess the water table. Munsell Soil Color charts were used to determine the hue, value, and chroma for the matrix and any redoximorphic features in each soil layer.

Vegetation was documented on Northcentral/Northeast Regional data forms. Percent cover of each species in each stratum was estimated. The herbaceous stratum was sampled within a 5-foot radius plot; a 15-foot radius plot for the shrub/sapling stratum; and a 30-foot radius plot for the tree and woody vine stratum. The 2016 National Wetland Plant List (Lichvar, R.W., et al. 2016) was used to determine the wetland indicator status for each species and the 50/20 rule was applied to determine dominance.

Antecedent precipitation was assessed following procedures developed by the NRCS. Precipitation data three months prior to fieldwork was compared to 20-year precipitation averages (1999-2019) to determine if hydrologic conditions were normal, wetter, or drier than normal for the area.

All area within the AOI was examined. A total of 12 data points— six in uplands and six in wetlands— were established to characterize the range of soil, vegetation, and hydrologic conditions. Wetland boundary points were indicated by wire pin flags placed approximately 25-50 feet apart. These sampling points and wetland boundary flags were surveyed with a Trimble Geo7X capable of sub-meter accuracy and mapped using Geographic Information System (GIS) software. The wire pin flags were removed from active airfield areas after survey so that mowing operations would not be impacted.

The following appendices are included with this report:

- Appendix A – Project Location and Topography Map
- Appendix B – Detailed Topographic Map, FEMA Floodplain, and NRCS Soils Map
- Appendix C – Previous Wetland Mapping
- Appendix D – WETS Analysis and Climatic Data
- Appendix E – Historic Aerial Imagery
- Appendix F – Wetland Boundary Maps
- Appendix G – Data Sheets
- Appendix H – Field Photographs
- Appendix I – Delineator Qualifications

3. Results and Discussion

A. Site Description

The AOI covers approximately 246.4 acres on Airport property. The AOI is split into three sections. Area A comprises about 12 acres north of East Kilgore Road. Areas B and C are situated at the runway ends: approximately 104.1 acres at the Runway 17 end and 130.34 acres at the Runway 35 end.

A watershed divide occurs along the western side of the Airport with most of the airport property falling within the Davis Creek-Kalamazoo River subwatershed. A small portion of the western side of the Airport falls within the Portage Creek subwatershed. Drainage from the northern end of the Airport is directed to the east toward the Davis-Olmstead Drain. See Appendix A for the Project Location Map.

The airfield is relatively flat with little elevation change over the active airside areas. Topography within the active airfield varies from a high of about 870 ft (NAVD 1988) near the terminal and associated parking lot to about 840 ft at the eastern boundary of Airport property. From south to north along primary Runway 17/35, the topography remains constant at about 854 ft. Topographic mapping (contour interval 2-foot) from Kalamazoo County is presented in Appendix B.

North of Kilgore Road is an Airport-owned triangular-shaped parcel (Area A) underlying the Runway 17 Runway Protection Zone (RPZ). A large berm parallels East Kilgore Road, the southern boundary of this parcel, and rises 15-20 feet from the surrounding flatter areas on either side. The berm is dominated by mature box elder. Areas north of the berm contain scattered copses of trees intermixed with old field vegetation.

Nearly all infield areas consist of grasses and forbs and are mown on a regular basis. At the time of field work adequate regrowth was observed, making upland vegetation identifiable in most cases. Upland areas at the Runway 17 end (Area B) were dominated by a mix of introduced grasses and common forbs consisting of Kentucky blue grass, orchard grass, white and red clover, English plantain, Bird’s-foot trefoil, chickweed, dandelion, Canada thistle, and yarrow. The dominant upland species found at the Runway 35 end (Area C) included a similar grass and forb assemblage: orchard grass, Kentucky blue grass, spotted knapweed, dandelion, white and red clover, Canada thistle, Bird’s-foot trefoil, and English plantain.

A north-south oriented railroad forms the eastern boundary of the airfield. Area C extends to the east of the railroad in the southeast corner of the airfield and contains parts of three parcels: a large vacant County-owned parcel covered by old field vegetation, the Mann+Hummel south commercial property containing a large warehouse and parking area, and a vacant parcel owned by the City of Portage. The County-owned parcel is fairly flat and is a former tree plantation consisting of scattered spruce and white pine. The western half of the City of Portage parcel is tree-covered while the eastern half is vacant and covered by old field vegetation. To the north of the City of Portage parcel is another parcel owned by Mann+Hummel. An access road spans the City of Portage parcel and connects the two Mann+Hummel properties, splitting the City of Portage parcel in half.

(1) Soils Mapping

The majority of land within the AOI (88.5%) is covered by three non-hydric soil units – two units of Kalamazoo loam (KaA and KaB), and Urban land-Kalamazoo complex (UkB). The Kalamazoo series consists of very deep, well drained soils formed in loess-influenced loamy outwash overlying sand, loamy sand, or sand and gravel outwash on outwash plains, terraces, valley trains, and low-lying moraines. Typical soil profiles of the Kalamazoo series consist of dark grayish brown (10YR 4/2) loam over dark yellowish brown (10YR 4/4) loam to 16 inches in depth. These soil units are rated as non-hydric.

Soils mapped as a complex of urban land and Kalamazoo loam make up the largest component (77.5%) of the soils within the AOI. A typical profile is unavailable for this map unit. This soil unit is rated as non-hydric.

Two areas of Adrian muck are mapped with the AOI, a small area within Area B and a larger mapped unit within Area C. The Adrian series consists of very deep, very poorly drained soils formed in herbaceous organic materials over sandy deposits on outwash plains, lake plains, lake terraces, floodplains, moraines, and till plains. The Adrian series soil profile is typified by black (N 2.5/), very dark brown (10YR 2/2) or black (10YR 2/1) rubbed muck (sapric materials) to 27 inches in depth on slopes of 0 to 1 percent. This soil unit is rated as hydric.

Soils present within the AOI are summarized in Table 1. Soils rated as hydric are bolded in the table below. Soils mapping for the AOI is presented in Appendix B.

Table 1. Summary of Soils in Area of Interest

Map unit symbol	Map unit name	Percent of AOI	Primary Landform	Hydric Rating (Percent)
Ad	**Adrian muck, 0 to 1 percent slopes**	**11.5**	**Depressions on outwash plains, depressions on moraines on outwash plains, Glacial drainage channels, Outwash plains, nearshore zones (relict)**	**Yes (100)**
KaA	Kalamazoo loam, 0 to 2 percent slopes	5.5	Outwash plains, outwash terraces	No (0)
KaB	Kalamazoo loam, 2 to 6 percent slopes	5.5	Outwash plains, outwash terraces	No (0)
UkB	Urban land-Kalamazoo complex, 0 to 6 percent slopes	77.5	Outwash plains, outwash terraces	No (0)

(2) FEMA Floodplains

The airport property is mapped entirely within Zone X (Area of Minimal Flood Hazard). To the west of the Airport, the Portage Creek floodplain flows to the south. To the east, the floodplain of the Davis-Olmsted drain is shown as an area of Zone A. This drain receives drainage flows from the Airport via culverts under the railroad. FEMA floodplain mapping is presented in Appendix B.

(3) Aquatic Resources

The National Wetland Inventory (NWI) indicates two areas of mapped wetlands within the AOI. A complex of wetlands to the west of the Davis-Olmsted Drain mapped as emergent, seasonally flooded, and partially drained/ditched (PEM1Cd) or emergent, semi-permanently flooded (PEM1F). Another area of emergent, seasonally flooded (PEM1C) wetland is mapped within Area C to the east of the railroad. No wetlands are mapped for the north portion of the AOI (Area A).

The Michigan Department of Environment, Great Lakes, and Energy (EGLE) Wetlands Map Viewer also shows mapped wetlands in similar areas with the extension of wetland mapping to the west across the railroad track near the south end of Airport property. Previous wetland mapping is presented in Appendix C.

(4) Antecedent Climatic Conditions

An assessment of antecedent climatic conditions was made using precipitation data for the three months prior to field work on both site visits. This analysis indicated that climatic conditions were wetter than normal range for both the June and August 2019 field visits (see Appendix D).

August of 2019 was a dry month with a total of 1.73 inches of rain for the month in comparison to a normal of 3.70 inches. The day before the August site visit, approximately 0.3 inches of rain fell on site. One day prior to the June 2019 site visit, approximately 0.43 inches of rain fell on site. Precipitation data for June and August are presented in Appendix D.

(5) Historic Aerial Photograph Review

Aerial photographs from 1938, 1950, 1960, 1964, 1974, 1981, 1989, 1997, 2000, 2002, 2004, 2006, 2007, 2009, 2013, 2016, 2017, and 2018 were reviewed to assess areas within the AOI for wet signatures. These photos were accessed from the City of Portage GIS Mapping site at https://www.portagemi.gov/177/GIS-City-Maps and are presented in Appendix E. These images cover Areas B and C of the AOI. Google Earth images from 1999, 2003, 2006, and 2011 covering Area A supplement images available from the City of Portage's web site, and are also presented in Appendix E.

Area A

The earliest image that covers the whole of Area A comes from 1999. This image shows the berm along East Kilgore Road in place with some tree coverage and a line of trees running along the I-94 right-of-way. The rest of the field appears to be fallow with some isolated trees present. These conditions appear little changed until 2009 when this line of trees along I-94 has been removed.

Since 2009 isolated trees and small copses have begun to fill in the fallow field as well as along the berm. The 2011 image shows a circular-shaped copse of trees in the northwest corner of Area A, the berm covered by trees, and scattered trees throughout the field. In the most recent image from 2018, the eastern end of the berm has been cleared of trees, directly in line with the Runway 17 end, likely for the purposes of removing obstructions to the approach.

Area B

The area at the north end of the Airport was primarily in agricultural use in 1938 and by 1950, Runway 5/23 was constructed. In both photos from these years, three small depressional wetlands are visible in the southeast corner of the Area B boundary. By 1960, the runway safety area has been graded but surrounding lands are still being farmed. The initial construction of Runway 17/35 has been completed by 1964 which was extended to its current configuration by 1981, and surrounding lands have been taken out of agricultural production. The depressional wetlands and surrounding area in the southeast corner of Area B remains stable with consistent ponded or saturated conditions seen in photos taken in 1964, 1974, 1981, and 1989. In the 1989 photo, it appears the culverts now are transporting flows to the wetland area in the southeast corner of Area B.

By 1997, an apron has been constructed next to the taxiway at the end of Runway 17 along with a ditch that skirts the edge of the concrete. Drainage from this ditch flows northeast around the end of the runway and then appears to be directed back to the southeast. By 2004, the Runway 17 RSA has been graded and a portion of the drainage ditch has been piped under the RSA. Wetland area in the southeast corner shows isolated trees but by 2007 only the Central drainage of this area has a concentration of woody vegetation, conditions which continue to the present.

Area C

Area C was primarily in agricultural uses in 1938, the earliest photo is this series. A large expanse of low-lying area apparently covered by herbaceous vegetation straddles a north-south oriented road passing through the area which later was converted to a railroad corridor. Several small copses of trees are also present at this time. In 1950 a similar pattern of land use is seen but by 1960 woody species are encroaching on the edges of the low-lying area to the west of the railroad as well as in the central portion on the east side.

Between 1960 and 1964, Runway 17/35 was constructed, and the approach lighting system installed with an associated access road extending to the south. The railroad has replaced the former north-south road and provides access to developing commercial parcels to the south. Woody encroachment is seen across the whole low-lying area in 1964. By 1974, the western side of the depressional area within the airfield has been cleared of woody vegetation while the eastern side remains unaffected.

By 1974, a small storage building has been constructed just west of Sprinkle Road. The 1981 aerial shows further expansion of this building complex while fields to the north and south are being cropped. The depressional area is now smaller in size and covered by woody vegetation to the east of the railroad; the west side on the airfield is showing signs of regrowth of woody vegetation. It is unknown whether the field to the east of the depression was tiled to support agricultural activities.

By 1997, a tree farm has been planted in the field to the south of the Mann+Hummel property whose facilities have expanded again to include two large warehouses. The depressional area to the east of the railroad appears covered by trees while the on-airfield portion has been cleared.

By 2002, the farm field to the north of the Mann+Hummel property appears to have been left fallow and remains in pasture-type vegetation to the present time. Clearing of the east side of the depression appears to have occurred between 2002 and 2004 with a few trees left on the east boundary of Area C. The west side on the airfield shows signs of grading and filling.

Between 2004 and 2006, Runway 17/35 was extended with further filling and grading at this end of the airfield. The east side of the depression appears to be covered with herbaceous vegetation.

The railroad spur connecting the Mann+Hummel property to the railroad has been constructed by 2013 along with a small detention area just north of the spur. Trees have once again begun to overtake the depressional area and by 2016 an access road between the two Mann+Hummel properties skirts the edge of the depression through the fallow lot.

(6) Atypical Conditions Analysis

The Airport has a long history within the City and County of Kalamazoo, serving the community since 1928. Commercial airline service was begun in 1944 and increased passenger demand over the years has led to runway extensions, instrument upgrades, and terminal expansions. Within airport property, construction over the Airport's history has affected many areas on the landscape which have experienced some or all of the following disturbances:

- Grading, filling, mixing, transportation, and compaction of native soils.
- Introduction of cool-season turf grasses.
- Changes to topography and drainage.
- Substitution of pipe drainage for natural sheet flow in some areas.
- Regular mowing of most airport property, which encourages the growth of grass species over forbs.

Within the AOI, though, normal circumstances were considered to be present due to the long period of time since construction and that regular vegetation maintenance is largely confined to upland areas. Soils were found to be intact at sampling points and vegetation regrowth at the time of field work was sufficient at most sampling points to make plant identification reliable.

B. Findings

(1) Wetlands

A total of seven wetlands were delineated within the overall AOI. No wetlands were delineated in Area A north of East Kilgore Road. Within Area B of the AOI, Wetlands 1A, 1B, and 2 are associated with drainage features and are located on the north part of the airfield near the Runway 17 end.

Wetlands 3 and 6 are located on the eastern side of Area B southeast of the Runway 23 end. Several National Wetland Inventory (NWI) wetlands are mapped within this complex (see Appendix C). This wetland complex is fed by four culverts and consists of three drainages: the South, Central, and North drainages as shown on Wetland maps presented in Appendix F. No culvert exiting to the

Central drainage was located at the western end during field work. Standing water was present throughout the wetland complex. Drainage from the complex is presumed to exit Airport property under the perimeter road and the railroad at the eastern end of the South drainage.

Wetland 3 is a diverse mix of trees, shrubs, and herbaceous vegetation. The Central drainage is dominated by a woody assemblage of black willow, box elder, cottonwood, red osier dogwood, peach-leaf, and sandbar willow. The herbaceous vegetation of the South drainage is dominated by sedges (*Carex hystericina*, *C. vulpinoidea*, *C. crinita*, *C. scoparia*), woolgrass and dark-green bulrush, purple loosestrife, cattail, vervain, soft-stem bulrush, soft rush, buttonbush, and elderberry. The North drainage was dominated by herbaceous vegetation with a few black willow trees at the eastern end. Vegetation consisted of woolgrass, dark-green bulrush, soft rush, reed canary grass, common spike-rush, straw-colored flat sedge, and cattail.

Wetland 6, also shown as an area of mapped NWI wetland, is further west of the South drainage of Wetland 3 and is at the bottom of a depressional landform. Wetland 6 receives flows from a culvert approximately 10 feet higher in elevation to the west; these flows eventually drain to the west end of Wetland 3's South drainage. These two wetlands are separated by an area of upland lacking hydrophytic vegetation.

Wetlands 4 and 5 are found within Area C of the AOI and are located on the eastern side of the railroad. Wetland 4 is directly behind the Mann+Hummel facility and is a detention area receiving flows from a culvert on the southeast side of the depression as well as runoff from the surrounding slopes. The topography transitions over steep grades to the embankments of the railroad grade on the west and a railroad spur on the south and east.

Wetland 5 is a small depression found within an area previously mapped on the NWI as an emergent wetland (PEM1C). The larger area between the railroad and a connecting road between the two Mann+Hummel facilities within which Wetland 5 is located is covered by an even-age stand of primarily sweet and black cherry trees (*Prunus avium:* FACU and *P. serotina:* FACU). The understory is dominated by pokeweed (*Phytolacca americana*: FACU), burnweed (*Senecio hieraciifolius*: FACU), greenbrier (*Smilax rotundifolia*: FAC), three-seeded mercury (*Acalypha rhomboidea*: FACU), and jumpseed (*Persicaria virginiana*: FAC). Soils mapping shows this area mapped as Adrian muck, a hydric soil unit. Field observations including numerous 20 – 22-inch-deep test pits throughout the area found no presence of or primary indicators of wetland hydrology in the black (N 2.5/ or 10YR2/1) dry crumbly soils.

The depressional area surrounding Wetland 5 has had a long history (see Historic Aerial Review in ***Section 3.A.5*** above for discussion) of modification beginning with the construction of a road splitting this area in two sometime before 1938 which later became the bed for the railroad. Later construction of buildings and associated grading, conversion to agriculture, woody encroachment, filling and grading on the west side due to runway extensions, and construction of an access road on the east side have resulted in significant hydrological alterations to this area. Vegetation is now dominated by facultative upland tree species. No evidence of culvert inputs was found during field

work, leaving surface runoff and precipitation as the only sources of hydrology to the area which presently does not support hydrophytic vegetation.

Wetland boundary maps with sampling point locations are presented in Appendix F followed by data sheets and field photographs in Appendices G and H, respectively. Table 2 summarizes the delineated wetlands which are described in the **Site Descriptions** sections below.

Table 2. Summary of Delineated Wetlands within the Area of Interest

Wetland	NWI Type	Dominant Vegetation	Total Area within AOI (Acres)	Total Area within AOI (Sq. Ft)
1A	PEM	*Phalaris arundinacea* (FACW), *Solidago gigantea* (FACW)	0.214	9,309.243
1B	PEM	*Phalaris arundinacea* (FACW), *Symphotrichum puniceum* (OBL), *Solanum dulcamara* (FAC)	0.009	406.521
2	PEM	*Carex vulpinoidea* (OBL), *Solidago gigantea* (FACW), *Acer negundo* (saplings) (FAC)	0.030	1,299.337
3	PEM/PSS	*Salix nigra* (OBL), *Eleocharis palustris* (OBL); *Salix x fragilis* (FAC), *Cornus alba* (FACW), *Phalaris arundinacea* (FACW), *Symphotrichum lanceolatum* (FACW), *Geum aleppicum* (FAC), *Vitis riparia* (FAC)	3.470	151,147.974
4	PEM	*Typha angustifolia* (OBL), *Eleocharis palustris* (OBL), *Salix interior* (FACW)	0.171	7,468.824
5	PEM	*Persicaria maculosa* (FAC)	0.056	2,423.705
6	PEM	*Phalaris arundinacea* (FACW), *Persicaria maculosa* (FAC), *Cyperus strigosus* (FACW)	0.056	2,455.372
Total			4.006	174,510.975

(a) Site Descriptions

Wetland 1A	
Site Information	
Sampling Date	6/7/2019
Delineated Type	PEM
Wetland Description	Wetland 1A is a long swale adjacent to a section of closed pavement near the Runway 17 end. Two culverts drain to this swale - a temporary 12 inch culvert on the south end draining northward and one large 36 inch culvert carrying flows from the west. The swale runs eastward along the north edge of the pavement then northward to a large culvert that drains eastward under the RSA, connecting to Wetland 1B. Standing water was present at the western end of Wetland 1A. Saturation and drift deposits were noted at the wetland sampling point while a 1-2 foot change in elevation is seen along the length of the swale in transition to uplands. The swale bottom is rip-rapped at the north end. The swale topography continues further north to a vacated culvert. This area was dry and appeared to be inactive.
Mapped NWI Type	Not mapped
Mapped Soil Type/ Hydric Rating	Urban land-Kalamazoo complex, 0 to 6 percent slopes (UkB) (Non-Hydric)
Map Reference*	Map 1
Photo Numbers**	Photos 3 - 8
Associated Data Pts***	DPs 1 - 2
Wetland Criteria	
Dominant Vegetation	Phalaris arundinacea (FACW), Solidago gigantea (FACW)
Hydric Soil Indicators	Redox Dark Surface (F6)
Hydrology Indicators	Saturation (A3), Drift Deposits (B3), Saturation Visible on Aerial Imagery (C9), Geomorphic Position (D2), FAC-Neutral (D5)
Boundary Determination	
Description	The boundary was determined by changes in topography, a transition to upland vegetation dominated by Kentucky blue grass and orchard grass, and a lack of wetland hydrology and hydric soils indicators.

* See Appendix F for Wetland Mapping
** See Appendix H for Photos
*** See Appendix G for Wetland Data Sheets

Wetland 1B	
Site Information	
Sampling Date	6/7/2019
Delineated Type	PEM
Wetland Description	Wetland 1B appears to be connected to Wetland 1A via a culvert that runs under the Runway 17 RSA. The end of the culvert is rip-rapped and dominated by reed canary grass and purple-stem aster.
Mapped NWI Type	Not mapped
Mapped Soil Type/ Hydric Rating	Urban land-Kalamazoo complex, 0 to 6 percent slopes (UkB) (Non-Hydric)
Map Reference*	Map 1
Photo Numbers**	Photo 9
Associated Data Pts***	N/A
Wetland Criteria	
Dominant Vegetation	Phalaris arundinacea (FACW), Symphotrichum puniceum (OBL), Solanum dulcamara (FAC)
Hydric Soil Indicators	
Hydrology Indicators	N/A
Boundary Determination	
Description	The boundary was determined by changes in topography and a transition to upland vegetation dominated by Kentucky blue grass.

* See Appendix F for Wetland Mapping
** See Appendix H for Photos
*** See Appendix G for Wetland Data Sheets

Wetland 2	
Site Information	
Sampling Date	6/7/2019
Delineated Type	PEM
Wetland Description	Wetland 2 is a narrow steep-sided (3-4 feet deep) ditch with culverts at either end. The double 24-inch culverts on the west side drain under the taxilane; the eastern culvert probably connects to the culvert draining to the North drainage area of Wetland 3. Hydric soils were verified and saturation was present at the surface.
Mapped NWI Type	Not mapped
Mapped Soil Type/ Hydric Rating	Urban land-Kalamazoo complex, 0 to 6 percent slopes (UkB) (Non-Hydric)
Map Reference*	Map 3
Photo Numbers**	Photos 15 - 17
Associated Data Pts***	N/A
Wetland Criteria	
Dominant Vegetation	Carex vulpinoidea (OBL), Solidago gigantea (FACW), Acer negundo (saplings) (FAC)
Hydric Soil Indicators	
Hydrology Indicators	N/A
Boundary Determination	
Description	The boundary was determined by changes in topography and a transition to upland vegetation dominated by Kentucky blue grass, timothy, common milkweed, and Bird's-foot trefoil.

* See Appendix F for Wetland Mapping
** See Appendix H for Photos
*** See Appendix G for Wetland Data Sheets

Wetland 3	
Site Information	
Sampling Date	8/19/2019
Delineated Type	PEM/PSS
Wetland Description	Wetland 3 is a large wetland complex with multiple drainageways carrying flows from the airfield under the perimeter road and off Airport property to the east. Standing water was observed throughout the wetland. The North drainage was dominated by blunt spike rush and woolgrass. A significant topographic break was seen at sampling points 3 and 4 in transition to uplands dominated by Kentucky blue grass. The larger Central drainage was covered by shrubs and black willow trees with some mature cottonwoods. Standing water was seen through this part of the wetland. The Southern drainage is a fairly narrow swale fed by a large culvert at the western end that contained standing water throughout and a diverse mix of herbaceous wetland vegetation. Parts of this wetland were previously mapped on the NWI as PEM1Cd and PEM1F.
Mapped NWI Type	PEM1Cd, PEM1F
Mapped Soil Type/ Hydric Rating	Urban land-Kalamazoo complex, 0 to 6 percent slopes (UkB) (Non-Hydric); Adrian muck, 0 to 1 percent slopes (Ad) (Hydric)
Map Reference*	Map 3
Photo Numbers**	Photos 18 - 31
Associated Data Pts***	DPs 3 - 6
Wetland Criteria	
Dominant Vegetation	Salix nigra (OBL), Eleocharis palustris (OBL), Salix nigra, Salix x fragilis (FAC), Cornus alba (FACW), Phalaris arundinacea (FACW), Symphyotrichum lanceolatum (FACW), Geum aleppicum (FAC), Vitis riparia (FAC)
Hydric Soil Indicators	Depleted Below Dark Surface (A11), Depleted Matrix (F3), Redox Dark Surface (F6)
Hydrology Indicators	Surface Water (A1), High Water Table (A2), Saturation (A3), Visible on Aerial Imagery (C9), Geomorphic Position (D2), FAC-Neutral (D5)
Boundary Determination	
Description	The boundary was determined by changes in topography and a transition to upland vegetation dominated by Kentucky blue grass, wild rye, and English plantain. In places, there were sharp topographic breaks which aided boundary determination while in others the topography was flatter and changes in vegetation and a lack of wetland hydrology indicators determined the boundary.

* See Appendix F for Wetland Mapping
** See Appendix H for Photos
*** See Appendix G for Wetland Data Sheets

Wetland 4	
Site Information	
Sampling Date	8/19/2019
Delineated Type	PEM
Wetland Description	Wetland 4 is a detention area located west of the Mann+Hummel building. A culvert feeds this area from the southeast. Slopes were quite steep on grades as much as 30% on the east, south, and west sides. The north side was somewhat flatter. Vegetation was dominated by cattails, common spike rush, and sandbar willow. Standing water was seen throughout the wetland.
Mapped NWI Type	Not mapped
Mapped Soil Type/ Hydric Rating	Kalamazoo loam, 2 to 6 percent slopes (KaB) (Non-hydric)
Map Reference*	Map 4
Photo Numbers**	Photos 40 - 44
Associated Data Pts***	DPs 7 - 8
Wetland Criteria	
Dominant Vegetation	Typha angustifolia (OBL), Eleocharis palustris (OBL), Salix interior (FACW)
Hydric Soil Indicators	Depleted Below Dark Surface (A11), Sandy Redox (S5), Depleted Matrix (F3)
Hydrology Indicators	Surface Water (A1), High Water Table (A2), Saturation (A3), Saturation Visible on Aerial Imagery (C9), Geomorphic Position (D2), FAC-Neutral (D5)
Boundary Determination	
Description	The boundary was determined by changes in topography and a transition to upland vegetation dominated by Kentucky blue grass and spotted knapweed. Distinct topographic changes were seen on the surrounding steep slopes as well as a lack of wetland hydrology indicators.

* See Appendix F for Wetland Mapping
** See Appendix H for Photos
*** See Appendix G for Wetland Data Sheets

Wetland 5	
Site Information	
Sampling Date	8/19/2019
Delineated Type	PEM
Wetland Description	Wetland 5 is a small depression within a large wooded expanse located between the railroad and the Mann+Hummel building. This area was previously mapped as PEM1C on soils mapped as hydric (Adrian muck). The area is now covered by cherry (Prunus avium and P. serotina), pokeweed, and burnweed. Within Wetland 5, dead and stressed cherry trees were observed. Test pits taken throughout the wetland showed black (2.5/N) heavily organic, dry crumbly soils to depth. No evidence of hydrological inputs from culverts was found and no wetland hydrology was observed or indicated in other parts of the wetland.
Mapped NWI Type	PEM1C
Mapped Soil Type/ Hydric Rating	Adrian muck, 0 to 1 percent slopes (Ad) (Hydric)
Map Reference*	Map 5
Photo Numbers**	Photos 46 - 47
Associated Data Pts***	DPs 9 - 10
Wetland Criteria	
Dominant Vegetation	Persicaria maculosa (FAC)
Hydric Soil Indicators	Redox Dark Surface (F6), Redox Depressions (F8)
Hydrology Indicators	Stunted or Stressed Plants (D1), and Geomorphic Position (D2)
Boundary Determination	
Description	The boundary was determined by slight changes in topography within the depressional area and a transition to upland vegetation dominated by sweet cherry, black cherry, and pokeweed. A lack of wetland hydrology indicators also aided the boundary determination.

* See Appendix F for Wetland Mapping
** See Appendix H for Photos
*** See Appendix G for Wetland Data Sheets

Wetland 6	
Site Information	
Sampling Date	8/19/2019
Delineated Type	PEM
Wetland Description	Wetland 6 is a shallow swale in the lowest topographic area of a depressional landform just east of a culvert exiting from the airfield. No hydrological connection to this culvert was observed due to the fairly steep topography. Flows from the culvert eventually reach the South drainage of Wetland 3. This area also collects surface runoff from the surrounding landform. The wetland vegetation was dominated by reed canary grass, spotted lady's-thumb, and straw-color flat sedge. This area is regularly mowed.
Mapped NWI Type	PEM1F
Mapped Soil Type/ Hydric Rating	Urban land-Kalamazoo complex, 0 to 6 percent slopes (UkB) (Non-Hydric)
Map Reference*	Map 3
Photo Numbers**	Photos 32 - 35
Associated Data Pts***	DPs 11 - 12
Wetland Criteria	
Dominant Vegetation	Phalaris arundinacea (FACW), Persicaria maculosa (FAC), Cyperus strigosus (FACW)
Hydric Soil Indicators	Redox Dark Surface (F6)
Hydrology Indicators	Geomorphic Position (D2), FAC-Neutral (D5)
Boundary Determination	
Description	The boundary was determined by slight changes in topography, a transition to upland vegetation dominated by Kentucky blue grass and Virginia strawberry, and a lack of wetland hydrology indicators.

* See Appendix F for Wetland Mapping
** See Appendix H for Photos
*** See Appendix G for Wetland Data Sheets

(2) Other Waters

No other water bodies were identified during the delineation.

C. Uplands

(1) Area A

Area A, located north of airfield, is marked by a large berm paralleling East Kilgore Road dominated by box elder. North of the berm is a plant assemblage consistent with old field vegetation: yarrow, Canada goldenrod, ox-eye daisy, Kentucky blue grass, riverbank grape, hawkweed (yellow and orange), whorled milkweed, sheep sorrel, Indian hemp, wild strawberry, and blackberry. Scattered trees consist of hawthorn, autumn olive, European white birch, black locust, honey locust, sumac, and red maple. No wetlands were delineated in this area. A list of species found in this area is provided in Table 3.

Table 3. Plant Species found in uplands within Area A

Common Name	Species Name (wetland indicator)	Common Name	Species Name (wetland indicator)
Yarrow	*Achillea millefolium* (FACU)	Hawthorn	*Crataegus crus-galli* (FAC)
Canada goldenrod	*Solidago canadensis* (FACU)	Autumn olive	*Elaeagnus umbellata* (FACU)
Ox-eye daisy	*Leucanthemum vulgare* (UPL)	European white birch	*Betula pendula* (FACU)
Kentucky blue grass	*Poa pratensis* (FACU)	Black locust	*Robinia pseudoacacia* (FACU)
Orange hawkweed	*Hieracium aurantiacum* (UPL)	Honey locust	*Gleditsia triacanthos* (FAC)
Yellow hawkweed	*Hieracium caespitosum* (UPL)	Sumac	*Rhus typhina* (UPL)
Whorled milkweed	*Asclepias verticillata* (UPL)	Red Maple	*Acer rubrum* (FAC)
Sheep sorrel	*Rumex acetosella* (FACU)	Box elder	*Acer negundo* (FAC)
Indian hemp	*Apocynum cannabinum* (FAC)		
Wild strawberry	*Fragaria virginiana* (FACU)		
Blackberry	*Rubus allegheniensis* (FACU)		
Riverbank grape	*Vitis riparia* (FAC)		

(2) Area B

Located entirely within the airfield at the north end, uplands in Area B were dominated by a mix of grasses and forbs consisting of Kentucky blue grass, orchard grass, white and red clover, English plantain, Bird's-foot trefoil, chickweed, dandelion, Canada thistle, and yarrow. Most of the acreage within Area B with the exception of lower-lying wetland areas is regularly mowed.

(3) Area C

A similar mix of grasses and forbs covers the Runway 35 end and south to the Airport property line. Grading and filling due to extensions of Runway 35 and construction of the approach lighting system and associated access roads have resulted in much of the area formerly mapped as wetland on Adrian muck soils being covered by the same mix of grasses and forbs. A low area just to the southeast of the Runway 35 pavement was examined and test soil pits did not reveal hydric soils.

East of the railroad at the intersection of Romence Road and Sprinkle Road, a large parcel was covered by old field vegetation along with remnants of a tree farm. Rows of spruce and white pine were interspersed with open areas of old field. Herbaceous vegetation is presented in Table 4.

Table 4. Plant species found at intersection of Romence and Sprinkle Roads

Common Name	**Species Name (wetland indicator)**
Yarrow	*Achillea millefolium* (FACU)
Canada goldenrod	*Solidago canadensis* (FACU)
Daisy fleabane	*Erigeron annus* (FACU)
Kentucky blue grass	*Poa pratensis* (FACU)
Smooth brome	B*romus inermis* (UPL)
Quack grass	*Elymus repens* (FACU)
Common milkweed	*Asclepias syriaca* (UPL)
Canada thistle	*Cirsium arvense* (FACU)
Bull thistle	*Cirsium vulgare* (FACU)
Hoary alyssum	*Berteroa incana* (UPL)
Queen Anne's lace	*Daucus carota* (FACU)
Common St. John's-wort	*Hypericum perforatum* (UPL)
English plantain	*Plantago lanceolata* (FACU)
Spotted knapweed	*Centaurea stoebe* (UPL)
Mullein	*Verbascum thapsus* (UPL)
White pine	*Pinus strobus* (FACU)
Spruce	*Picea sp.*

D. Summary

In summary, the majority of land within the AOI (88.5%) is covered by three non-hydric soil units – two units of Kalamazoo loam (KaA and KaB) and Urban land-Kalamazoo complex (UkB). The balance of the AOI is made up of two areas of Adrian muck soils (11.5%) rated as hydric. Seven wetlands were identified within the AOI under normal circumstances enclosing 4.006 acres. Twelve (12) sampling points document conditions within the AOI. Environmental conditions were wetter than normal range for both the June and August 2019 field visits. The wetland boundary was determined by the observation of multiple indicators of wetland hydrology associated with wetland vegetation on soils exhibiting Depleted Below Dark Surface (A11), Depleted Matrix (F3), Redox Dark Surface (F6), Sandy Redox (S5), and Redox Depressions (F8) in depressional basins and swales. Wetland hydrology was indicated by primary and secondary indicators observed as Surface Water (A1), High Water Table (A2), Saturation (A3), Saturation Visible on Aerial Imagery (C9), Geomorphic Position (D2), and Positive FAC-Neutral (D5). The boundary determinations primarily relied on the absence of one or more wetland criteria: lack of hydrophytic vegetation, wetland hydrology indicators, and hydric soils. Distinct topographic breaks often found along the depression edges also aided the boundary determination.

4. Conclusions

A total of seven separate wetland boundaries enclosing 4.006 acres were delineated within the AOI at the Kalamazoo-Battle Creek International Airport. A jurisdictional determination for these wetlands may be needed from the EGLE. A Part 303, PA451 wetland fill permit from the EGLE may be needed for any wetland mitigation activities within the jurisdictional wetland boundaries. Independent review by local land use authorities and adoption of the wetland boundaries under shoreland/wetland zoning ordinances may also be required. Final authority over the project rests with the above federal, state, and local agencies.

The wetland and water boundaries established by this work are valid only for the subject project and any use or interpretation of its findings for areas outside the project area of interest is not supported. The user of this wetland boundary report is advised that changing environmental conditions may affect the future validity of the wetland boundaries so established.

5. Certifications and Limitations

The undersigned does hereby certify and state that she is an employee of Mead & Hunt, Inc., that she has been designated as being in responsible charge of the delineation of wetlands described herein; and that this delineation was performed in accordance with the USACE 1987 *Wetland Delineation Manual* as enhanced by the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Midwest* (U.S. Army Corps of Engineers, 2010).

This wetland delineation report documents vegetation, soils, and hydrology conditions on the above-referenced parcel according to these standard accepted practices, and the wetland boundary so established is valid only for the designated area. No uses or interpretations of wetland conditions or boundaries outside of the work area are supported by this work.

The mapped waters and wetland boundaries are valid under the environmental conditions existing at the time of delineation. The user of this information is hereby notified that changing environmental conditions may affect the future validity of the wetland boundary.

MEAD & HUNT, Inc.

Brauna Hartzell
Wetland Ecologist & GIS Analyst

Date: June 2020

6. References

The following data sources were examined prior to fieldwork:

Google Earth. Historical Aerial Images, Google Inc.

Lichvar, R.W., D. L. Banks, W. N. Kirchner, and N. C. Melvin, 2016. *State of Michigan 2016 Wetland Plant List.* The National Wetland Plant List: 2016 wetland ratings, version 3.3. Phytoneuron 2016-30:1-17. Published 28 April 2016. http://wetland_plants.usace.army.mil/.

Michigan Department of Environment, Great Lakes, and Energy (EGLE), Wetlands Map Viewer. Accessed at https://www.mcgi.state.mi.us/wetlands/mcgiMap.html#.

National Wetlands Inventory from the U.S. Fish and Wildlife Service Wetlands Mapper. Accessed at https://www.fws.gov/wetlands/data/mapper.html.

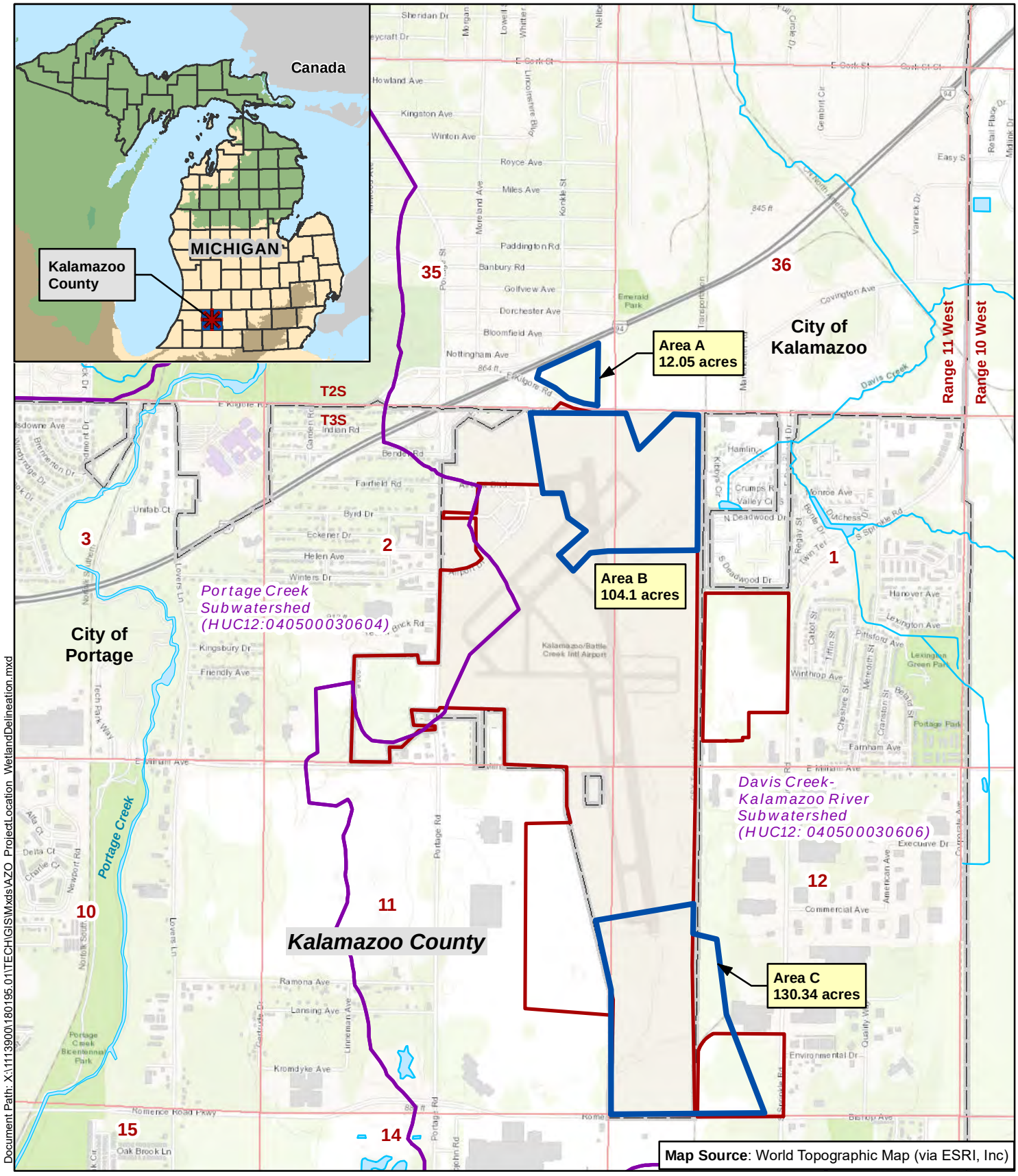
Soils Survey of Kalamazoo County, MI. U.S. Department of Agriculture (USDA), Natural Resources Conservation Service, Web Soil Survey available online at http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx.

U.S. Army Corps of Engineers, 2012. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral/Northeast Region (Version 2.0),* ed. J.S. Wakely, R.W. Lichvar, and C.V. Noble. ERDC/EL TR-11-1. Vicksburg, MS: U.S. Army Engineer Research and Development Center.

U.S. Department of Agriculture, Natural Resource Conservation Service (USDA, NRCS), 2017. *Field Indicators of Hydric Soils in the United States*, Version 8.1, ed. L.M. Vasilas, G.W. Hurt, and J.F. Berkowitz. USDA, NRCS in cooperation with the National Technical Committee for Hydric Soils.

USDA-FSA National Agriculture Imagery Program (NAIP). Accessed as a GIS map service at https://gis.apfo.usda.gov/arcgis/rest/services.

Appendix A. Project Location and Topography Map



Project Location

Kalamazoo/Battle Creek International Airport

0 500 1,000 2,000 Feet

N

Legend

- Area of Interest (AOI)
- Approximate Airport Property Boundary
- HUC 12 Watershed
- Section Line
- City Boundary

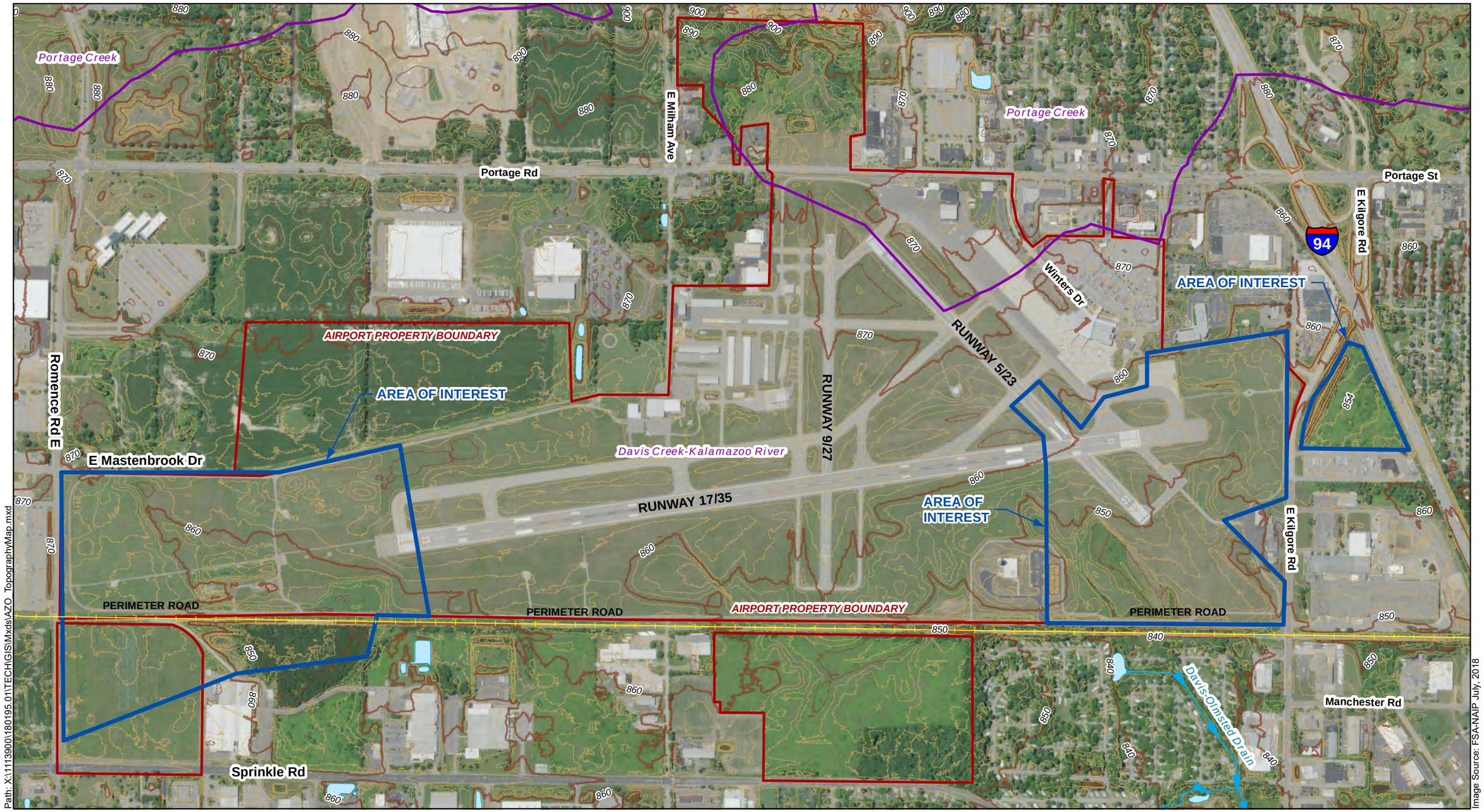
LRR SUBREGION

- K
- L
- M

Project Information

T3S, R11W, Sections 1, 2, 11, and 12
T2S, R11W, Section 35
City of Kalamazoo
Kalamazoo County, MI
LRR subregion: L
USACE Regional Supplement: NC/NE
Area of Interest = 246.4 acres
Field work conducted: June 6 - 7, 2019 and August 19 - 21, 2019

Appendix B. Detailed Topographic, FEMA Floodplain, and NRCS Soils Maps



Topography Map

Kalamazoo/Battle Creek International Airport

Data Sources:
Airport Property Boundary: AZO Airport Layout Plan
Contours: 2-foot elevation contours created by Remote Sensing & GIS Research and Outreach Services, Michigan State University, 2015. Obtained from Kalamazoo County GIS.
County Drains: Obtained from Kalamazoo County GIS

Legend

- Approximate Airport Property Boundary
- Area of Interest (AOI)
- HUC 12 Watershed
- Pond/Lake
- County Drain
- Railroads

Contour Type

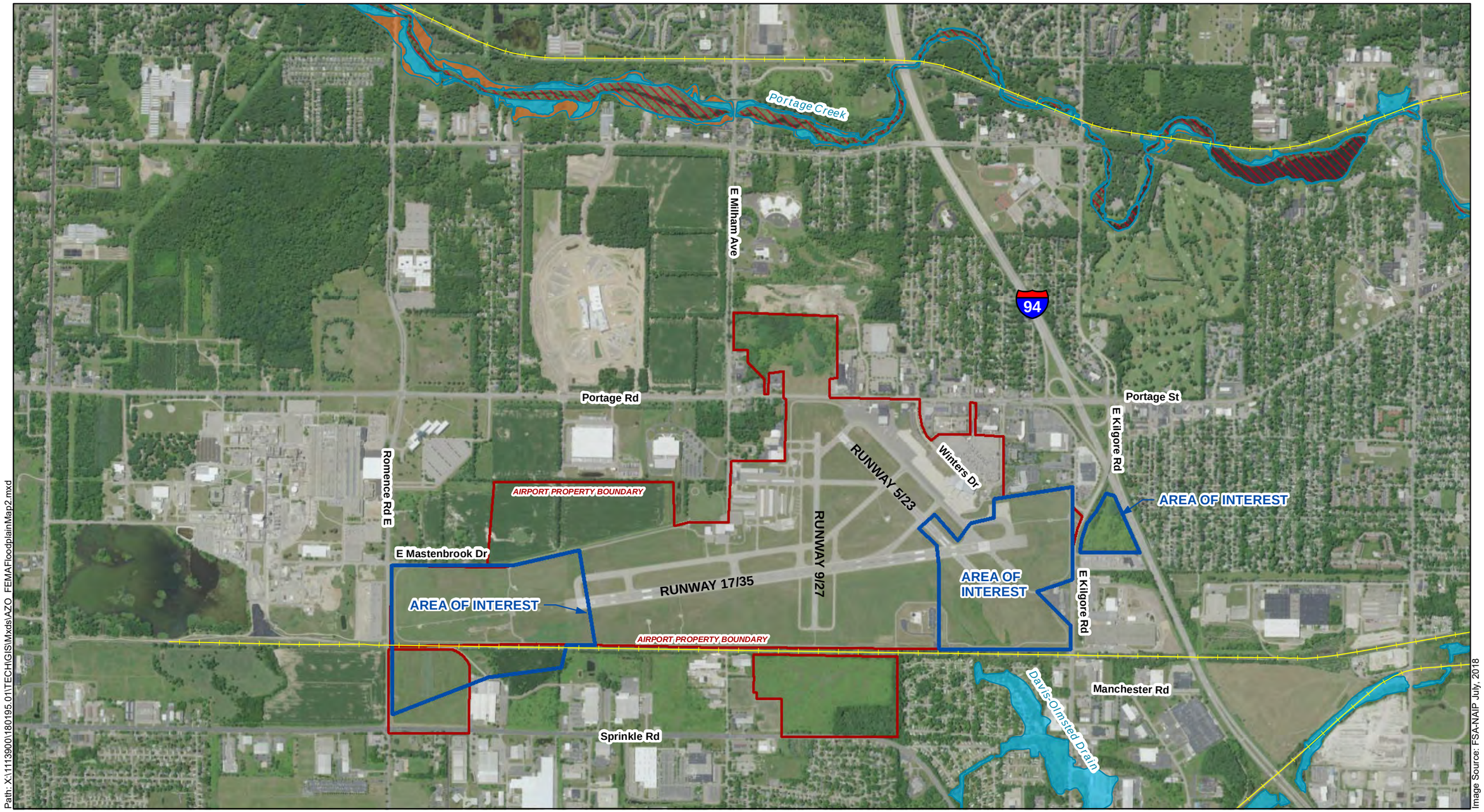
- Index
- Index_Depression
- Intermediate
- Intermediate_Depression

N

0 250 500 1,000 1,500 Feet

Project Location

T3S, R11W, Sections 1, 2, 11, and 12
T2S, R11W, Section 35
Kalamazoo/Battle Creek Intl Airport
City of Kalamazoo
Kalamazoo County, MI
LRR subregion: L
USACE Regional Supplement: NC/NE
Area of Interest = 246.4 acres
Field work conducted: June 6 - 7, 2019
and August 19 - 21, 2019



FEMA Floodplain Map

Kalamazoo/Battle Creek International Airport

Data Sources:

Airport Property Boundary: AZO Airport Layout Plan
Flood Hazard: FEMA National Flood Hazard Layer, Kalamazoo County, MI

Legend

- Approximate Airport Property Boundary
- Area of Interest (AOI)
- Railroads

Flood Hazard

- 1% Annual Chance Flood Hazard
- Regulatory Floodway
- 0.2% Annual Chance Flood Hazard

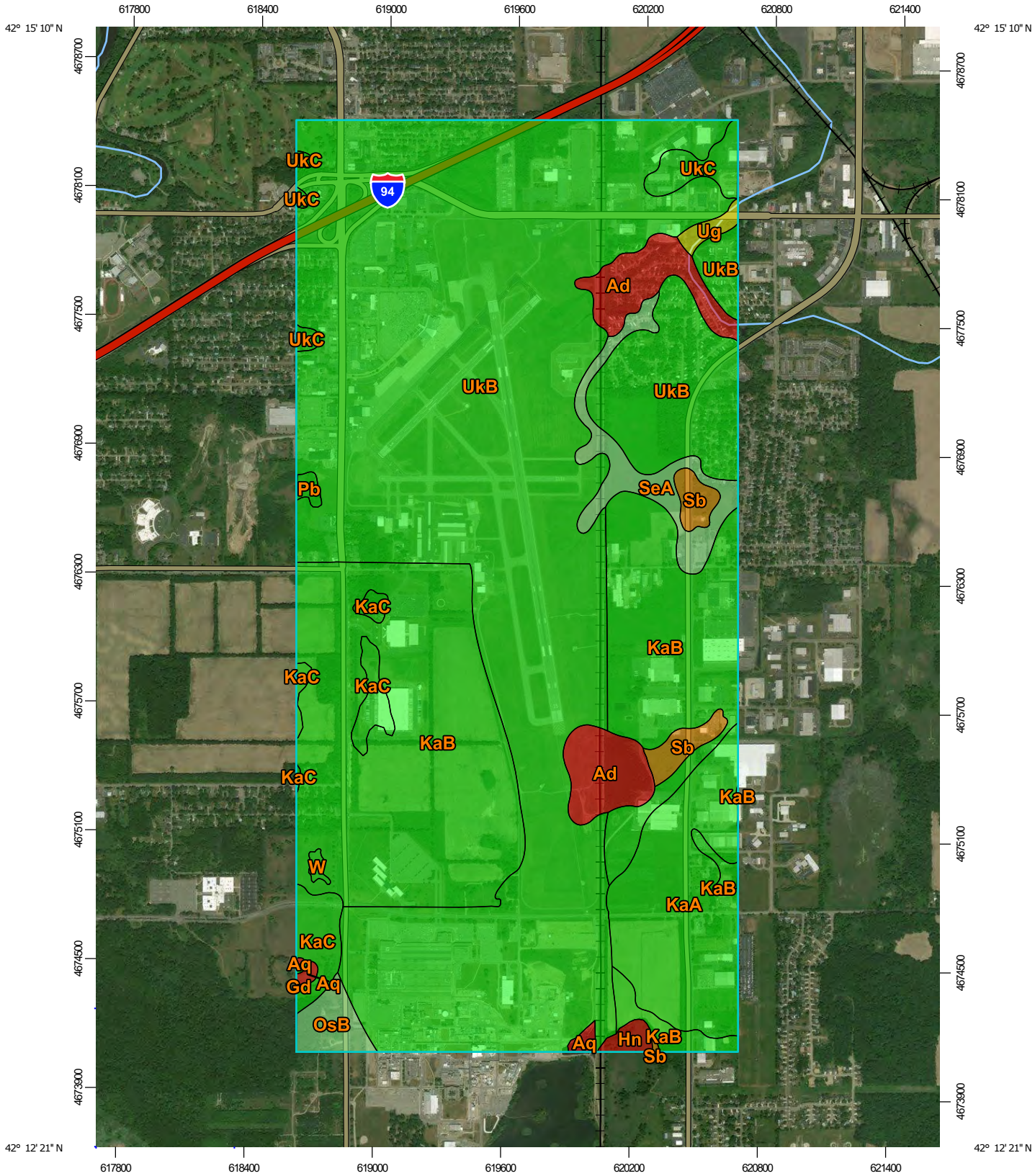
N

0 500 1,000 2,000 3,000 Feet

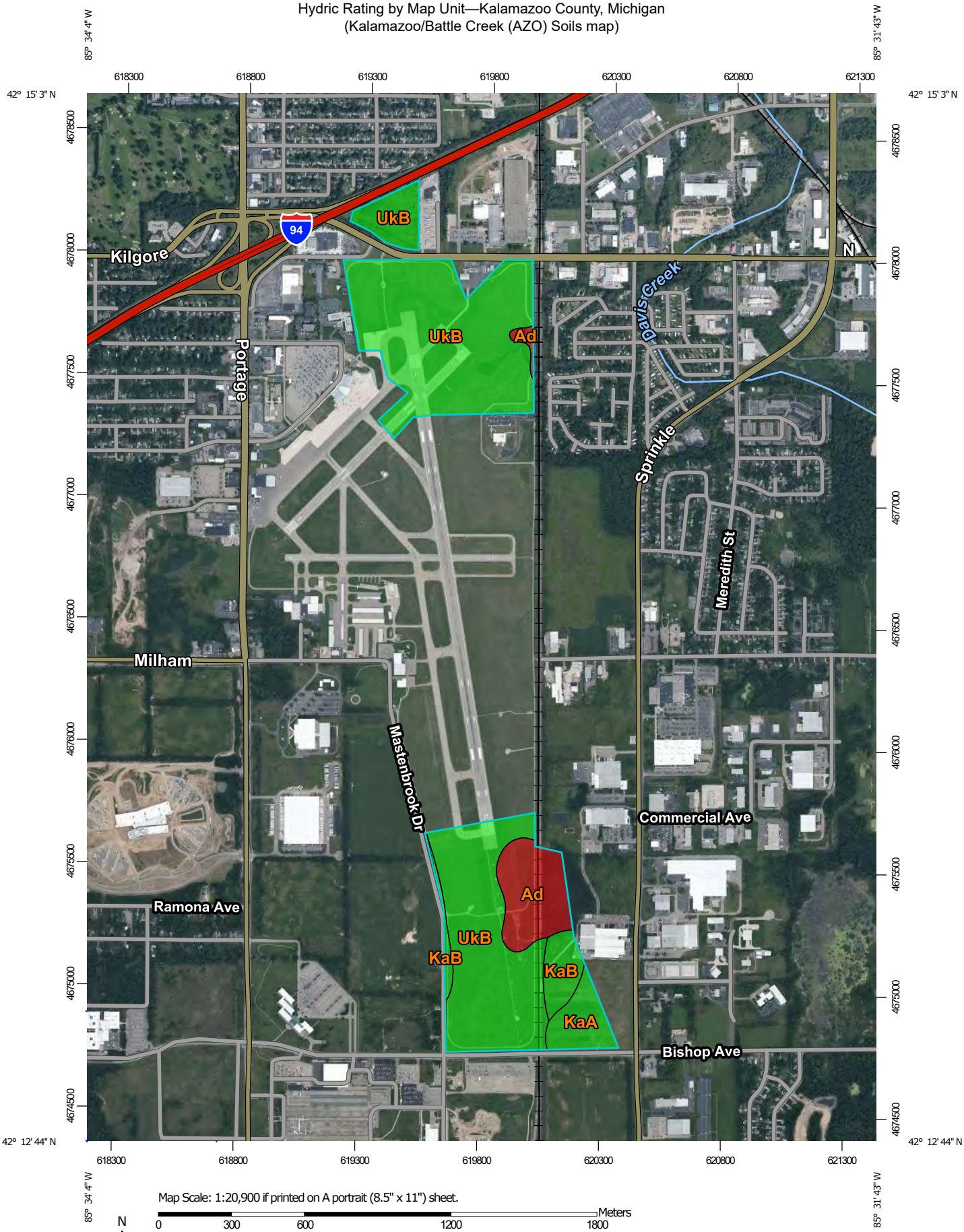
Project Location

T3S, R11W, Sections 1, 2, 11, and 12
T2S, R11W, Section 35
Kalamazoo/Battle Creek Intl Airport
City of Kalamazoo
Kalamazoo County, MI
LRR subregion: L
USACE Regional Supplement: NC/NE
Area of Interest = 246.4 acres
Field work conducted: June 6 - 7, 2019 and August 19 - 21, 2019

Hydric Rating by Map Unit—Kalamazoo County, Michigan
(Kalamazoo/Battle Creek Airport (AZO))



Hydric Rating by Map Unit—Kalamazoo County, Michigan
(Kalamazoo/Battle Creek (AZO) Soils map)



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- Hydric (100%)
- Hydric (66 to 99%)
- Hydric (33 to 65%)
- Hydric (1 to 32%)
- Not Hydric (0%)
- Not rated or not available

Soil Rating Lines
- Hydric (100%)
- Hydric (66 to 99%)
- Hydric (33 to 65%)
- Hydric (1 to 32%)
- Not Hydric (0%)
- Not rated or not available

Soil Rating Points
- Hydric (100%)
- Hydric (66 to 99%)
- Hydric (33 to 65%)
- Hydric (1 to 32%)
- Not Hydric (0%)
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Kalamazoo County, Michigan
Survey Area Data: Version 14, Sep 16, 2019

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 5, 2018—Sep 4, 2018

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydric Rating by Map Unit

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
Ad	Adrian muck, 0 to 1 percent slopes	100	28.3	11.5%
KaA	Kalamazoo loam, 0 to 2 percent slopes	0	13.6	5.5%
KaB	Kalamazoo loam, 2 to 6 percent slopes	0	13.6	5.5%
UkB	Urban land-Kalamazoo complex, 0 to 6 percent slopes	0	191.0	77.5%
Totals for Area of Interest			**246.5**	**100.0%**

Description

This rating indicates the percentage of map units that meets the criteria for hydric soils. Map units are composed of one or more map unit components or soil types, each of which is rated as hydric soil or not hydric. Map units that are made up dominantly of hydric soils may have small areas of minor nonhydric components in the higher positions on the landform, and map units that are made up dominantly of nonhydric soils may have small areas of minor hydric components in the lower positions on the landform. Each map unit is rated based on its respective components and the percentage of each component within the map unit.

The thematic map is color coded based on the composition of hydric components. The five color classes are separated as 100 percent hydric components, 66 to 99 percent hydric components, 33 to 65 percent hydric components, 1 to 32 percent hydric components, and less than one percent hydric components.

In Web Soil Survey, the Summary by Map Unit table that is displayed below the map pane contains a column named 'Rating'. In this column the percentage of each map unit that is classified as hydric is displayed.

Hydric soils are defined by the National Technical Committee for Hydric Soils (NTCHS) as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (Federal Register, 1994). Under natural conditions, these soils are either saturated or inundated long enough during the growing season to support the growth and reproduction of hydrophytic vegetation.

The NTCHS definition identifies general soil properties that are associated with wetness. In order to determine whether a specific soil is a hydric soil or nonhydric soil, however, more specific information, such as information about the depth and duration of the water table, is needed. Thus, criteria that identify those estimated soil properties unique to hydric soils have been established (Federal Register, 2002). These criteria are used to identify map unit components that normally are associated with wetlands. The criteria used are selected estimated soil properties that are described in "Soil Taxonomy" (Soil Survey Staff, 1999) and "Keys to Soil Taxonomy" (Soil Survey Staff, 2006) and in the "Soil Survey Manual" (Soil Survey Division Staff, 1993).

If soils are wet enough for a long enough period of time to be considered hydric, they should exhibit certain properties that can be easily observed in the field. These visible properties are indicators of hydric soils. The indicators used to make onsite determinations of hydric soils are specified in "Field Indicators of Hydric Soils in the United States" (Hurt and Vasilas, 2006).

References:

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18.

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service. U.S. Department of Agriculture Handbook 436.

Soil Survey Staff. 2006. Keys to soil taxonomy. 10th edition. U.S. Department of Agriculture, Natural Resources Conservation Service.

Rating Options

Aggregation Method: Percent Present

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Hydric Soil List - All Components

This table lists the map unit components and their hydric status in the survey area. This list can help in planning land uses; however, onsite investigation is recommended to determine the hydric soils on a specific site (National Research Council, 1995; Hurt and others, 2002).

The three essential characteristics of wetlands are hydrophytic vegetation, hydric soils, and wetland hydrology (Cowardin and others, 1979; U.S. Army Corps of Engineers, 1987; National Research Council, 1995; Tiner, 1985). Criteria for all of the characteristics must be met for areas to be identified as wetlands. Undrained hydric soils that have natural vegetation should support a dominant population of ecological wetland plant species. Hydric soils that have been converted to other uses should be capable of being restored to wetlands.

Hydric soils are defined by the National Technical Committee for Hydric Soils (NTCHS) as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (Federal Register, 1994). These soils, under natural conditions, are either saturated or inundated long enough during the growing season to support the growth and reproduction of hydrophytic vegetation.

The NTCHS definition identifies general soil properties that are associated with wetness. In order to determine whether a specific soil is a hydric soil or nonhydric soil, however, more specific information, such as information about the depth and duration of the water table, is needed. Thus, criteria that identify those estimated soil properties unique to hydric soils have been established (Federal Register, 2002). These criteria are used to identify map unit components that normally are associated with wetlands. The criteria used are selected estimated soil properties that are described in "Soil Taxonomy" (Soil Survey Staff, 1999) and "Keys to Soil Taxonomy" (Soil Survey Staff, 2006) and in the "Soil Survey Manual" (Soil Survey Division Staff, 1993).

If soils are wet enough for a long enough period of time to be considered hydric, they should exhibit certain properties that can be easily observed in the field. These visible properties are indicators of hydric soils. The indicators used to make onsite determinations of hydric soils are specified in "Field Indicators of Hydric Soils in the United States" (Hurt and Vasilas, 2006).

Hydric soils are identified by examining and describing the soil to a depth of about 20 inches. This depth may be greater if determination of an appropriate indicator so requires. It is always recommended that soils be excavated and described to the depth necessary for an understanding of the redoximorphic processes. Then, using the completed soil descriptions, soil scientists can compare the soil features required by each indicator and specify which indicators have been matched with the conditions observed in the soil. The soil can be identified as a hydric soil if at least one of the approved indicators is present.

Map units that are dominantly made up of hydric soils may have small areas, or inclusions, of nonhydric soils in the higher positions on the landform, and map units dominantly made up of nonhydric soils may have inclusions of hydric soils in the lower positions on the landform.

The criteria for hydric soils are represented by codes in the table (for example, 2). Definitions for the codes are as follows:

1. All Histels except for Folistels, and Histosols except for Folists.
2. Soils in Aquic suborders, great groups, or subgroups, Albolls suborder, Historthels great group, Histoturbels great group, Pachic subgroups, or Cumulic subgroups that:
   A. Based on the range of characteristics for the soil series, will at least in part meet one or more Field Indicators of Hydric Soils in the United States, or
   B. Show evidence that the soil meets the definition of a hydric soil;
3. Soils that are frequently ponded for long or very long duration during the growing season.
   A. Based on the range of characteristics for the soil series, will at least in part meet one or more Field Indicators of Hydric Soils in the United States, or
   B. Show evidence that the soil meets the definition of a hydric soil;
4. Map unit components that are frequently flooded for long duration or very long duration during the growing season that:
   A. Based on the range of characteristics for the soil series, will at least in part meet one or more Field Indicators of Hydric Soils in the United States, or
   B. Show evidence that the soil meets the definition of a hydric soil;

Hydric Condition: Food Security Act information regarding the ability to grow a commodity crop without removing woody vegetation or manipulating hydrology.

References:

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

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Vasilas, L.M., G.W. Hurt, and C.V. Noble, editors. Version 7.0, 2010. Field indicators of hydric soils in the United States.

Report—Hydric Soil List - All Components

Hydric Soil List - All Components–MI077-Kalamazoo County, Michigan					
Map symbol and map unit name	**Component/Local Phase**	**Comp. pct.**	**Landform**	**Hydric status**	**Hydric criteria met (code)**
Ad: Adrian muck, 0 to 1 percent slopes	Adrian	85-100	Depressions on outwash plains,depressions on moraines on outwash plains	Yes	1,3
	Kingsville	0-10	Outwash plains,nearshore zones (relict)	Yes	2,3
	Edwards	0-12	Depressions on outwash plains,depressions on moraines on outwash plains	Yes	1,3
	Houghton	0-10	Depressions on moraines on outwash plains,depressions on outwash plains	Yes	1,3
	Gilford-Gravelly subsoil	0-7	Glacial drainage channels,glacial drainage channels	Yes	2,3
KaA: Kalamazoo loam, 0 to 2 percent slopes	Kalamazoo	85-100	Outwash plains,outwash terraces	No	—
	Spinks	0-10	Outwash terraces,outwash plains	No	—
	Bronson	0-5	Outwash plains,outwash terraces	No	—
	Sleeth	0-5	Outwash plains,outwash terraces	No	—
KaB: Kalamazoo loam, 2 to 6 percent slopes	Kalamazoo	85-100	Outwash terraces,outwash plains	No	—
	Spinks	0-10	Outwash terraces,outwash plains	No	—
	Sleeth	0-5	Outwash plains,outwash terraces	No	—
	Bronson	0-5	Outwash plains,outwash terraces	No	—

Hydric Soil List - All Components–MI077-Kalamazoo County, Michigan					
Map symbol and map unit name	**Component/Local Phase**	**Comp. pct.**	**Landform**	**Hydric status**	**Hydric criteria met (code)**
UkB: Urban land-Kalamazoo complex, 0 to 6 percent slopes	Urban land	55-75	—	No	—
	Kalamazoo	25-40	Outwash terraces,outwash plains	No	—
	Spinks	0-8	Outwash plains,outwash terraces	No	—
	Bronson	0-7	Outwash plains,outwash terraces	No	—
	Sleeth	0-3	Outwash plains,outwash terraces	No	—

Data Source Information

Soil Survey Area: Kalamazoo County, Michigan
Survey Area Data: Version 14, Sep 16, 2019

Appendix C. Previous Wetland Mapping

Previous Wetland Mapping

Kalamazoo/Battle Creek International Airport

Data Sources:

Airport Property Boundary: AZO Airport Layout Plan
NWI: National Wetlands Inventory (2005) MI EGLE Wetlands Map Viewer
Soils: USDA Web Soil Survey
County Drains: Obtained from Kalamazoo County GIS

Legend

- Approximate Airport Property Boundary
- Area of Interest (AOI)
- Pond/Lake
- County Drain
- National Wetland Inventory (2005)
- Hydric or Predominantly Hydric Soils Units
- Railroads

N

0 250 500 1,000 1,500 Feet

Project Location

T3S, R11W, Sections 1, 2, 11, and 12
T2S, R11W, Section 35
Kalamazoo/Battle Creek Intl Airport
City of Kalamazoo
Kalamazoo County, MI
LRR subregion: L
USACE Regional Supplement: NC/NE
Area of Interest = 246.4 acres
Field work conducted: June 6 - 7, 2019 and August 19 - 21, 2019

Path: X:\1113900\180195.01\TECH\GIS\Mxds\AZO_MichiganWetlandMap.mxd

Image Source: FSA-NAIP July, 2018

Appendix D. WETS Analysis and Climatic Data

WETS Analysis Worksheet

Project Name: **Kalamazoo Runway 17/35 Extension EA**
Period Of Interest: March - May, 2019
Station: **KALAMAZOO - BATTLE CREEK INTL AP, MI**
County: Kalamazoo, MI
Normals Period: 1999 - 2019

Long-term rainfall records

	Month	30% chance <	Normal	30% chance >
1st month prior:	May	2.93	4.26	5.07
2nd month prior:	April	2.05	3.09	3.70
3rd month prior:	March	1.23	1.97	2.37
		Sum =	**9.32**	

Site Determination

Site Rainfall (in)	Condition (Dry/Normal*/Wet)	Condition** Value	Month Weight	Product
5.75	Wet	3	3	9
3.90	Wet	3	2	6
2.62	Wet	3	1	3
Sum = **12.27**			Sum***=	**18**

* Normal precipitation with 30% to 70% probability of occurrence

Determination:
X Wet
_____ Dry
_____ Normal

**Condition value:
Dry = 1
Normal = 2
Wet = 3

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

Precipitation data source:
http://agacis.rcc-acis.org/

Reference:

Donald E.Woodward, ed. 1997. *Hydrology Tools for Wetland Determination* , Chapter 19. Engineering Field Handbook. U.S. Department of Agriculture, Natural Resources Conservation Service, Fort Worth, TX.

WETS Analysis Worksheet

Project Name: **Kalamazoo Runway 17/35 Extension EA**
Period Of Interest: May - July, 2019
Station: **KALAMAZOO - BATTLE CREEK INTL AP, MI**
County: Kalamazoo, MI
Normals Period: 1999 - 2019

Long-term rainfall records

	Month	30% chance <	Normal	30% chance >
1st month prior:	July	2.21	3.34	4.01
2nd month prior:	June	2.22	3.24	3.87
3rd month prior:	May	2.93	4.26	5.07
		Sum =	**10.84**	

Site Determination

Site Rainfall (in)	Condition (Dry/Normal*/Wet)	Condition** Value	Month Weight	Product
2.65	Normal	2	3	6
5.79	Wet	3	2	6
5.75	Wet	3	1	3
Sum = **14.19**			Sum***=	**15**

* Normal precipitation with 30% to 70% probability of occurrence

Determination:
X Wet
_____ Dry
_____ Normal

**Condition value:
Dry = 1
Normal = 2
Wet = 3

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

Precipitation data source:
http://agacis.rcc-acis.org/

Reference:

Donald E.Woodward, ed. 1997. *Hydrology Tools for Wetland Determination* , Chapter 19. Engineering Field Handbook. U.S. Department of Agriculture, Natural Resources Conservation Service, Fort Worth, TX.

WETS Table

WETS Station: KALAMAZOO BATTLE CREEK INTL AP, MI

Requested years: 1999 - 2019

Month	Avg Max Temp	Avg Min Temp	Avg Mean Temp	Avg Precip	30% chance precip less than	30% chance precip more than	Avg number days precip 0.10 or more	Avg Snowfall
Jan	31.4	17.6	24.5	1.66	0.87	2.02	4	-
Feb	34.3	18.9	26.6	1.53	0.97	1.85	4	-
Mar	46.1	27.1	36.6	1.97	1.23	2.37	5	-
Apr	60.0	38.1	49.1	3.09	2.05	3.70	7	-
May	70.7	48.9	59.8	4.26	2.93	5.07	9	-
Jun	79.5	58.4	69.0	3.24	2.22	3.87	6	-
Jul	83.7	62.0	72.8	3.34	2.21	4.01	6	-
Aug	81.4	60.4	70.9	3.70	2.55	4.41	6	-
Sep	75.2	53.2	64.2	3.14	2.10	3.76	6	-
Oct	61.5	42.2	51.8	3.91	2.41	4.72	7	-
Nov	48.3	32.7	40.5	2.38	1.58	2.85	6	-
Dec	36.2	23.7	29.9	1.75	1.38	2.02	5	-
Annual:					31.24	36.36		
Average	59.0	40.3	49.6	-	-	-	-	-
Total	-	-	-	33.97			70	-

GROWING SEASON DATES

Years with missing data:	24 deg = 0	28 deg = 0	32 deg = 0
Years with no occurrence:	24 deg = 0	28 deg = 0	32 deg = 0
Data years used:	24 deg = 21	28 deg = 21	32 deg = 21
Probability	24 F or higher	28 F or higher	32 F or higher
50 percent *	4/3 to 11/13: 224 days	4/18 to 10/29: 194 days	4/30 to 10/16: 169 days
70 percent *	3/31 to 11/17: 231 days	4/14 to 11/3: 203 days	4/26 to 10/20: 177 days

* Percent chance of the growing season occurring between the Beginning and Ending dates.

STATS TABLE - total precipitation (inches)

Yr	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annl
1998				3.67	0.84	3.35	3.85	2.42	2.42	2.81	1.62	1.17	22.15
1999	2.54	1.43	0.97	6.94	1.75	2.33	3.83	2.74	1.89	0.78	1.50	2.47	29.17
2000	0.97	1.12	1.42	3.25	7.04	3.78	3.91	3.07	3.80	M3.12	3.45	1.47	36.40
2001	0.48	3.13	0.48	2.88	5.28	4.08	2.44	6.38	3.84	6.70	2.62	M1.33	39.64
2002	1.28	1.31	2.15	2.81	3.57	1.37	1.75	4.33	1.06	1.80	1.61	1.53	24.57
2003	0.37	0.63	1.78	3.06	4.14	1.79	2.63	3.48	4.26	2.97	6.26	1.35	32.72
2004	0.59	0.83	4.02	0.85	9.11	3.90	3.56	3.15	1.58	3.87	4.05	1.94	37.45
2005	4.25	2.05	1.09	0.42	2.04	4.85	6.09	2.03	2.46	0.78	2.38	1.15	29.59
2006	3.23	0.99	2.93	1.66	4.76	1.98	4.04	4.79	3.	3.	2.	2.82	37.

									46	98	94		58
2007	2.74	0.55	1.79	2.74	2.42	1.96	0.70	8.01	1.50	4.67	1.82	1.75	30.65
2008	3.47	2.37	1.87	2.05	2.01	3.93	3.58	1.29	11.28	2.34	1.08	2.51	37.78
2009	0.82	2.23	3.53	4.47	1.86	2.99	0.39	5.45	1.32	5.51	0.80	1.58	30.95
2010	0.45	0.74	0.89	2.47	5.70	5.64	2.58	2.07	2.95	1.19	2.24	1.06	27.98
2011	0.22	0.63	2.07	5.34	5.94	1.60	5.44	3.53	3.42	3.22	3.28	1.84	36.53
2012	2.13	M1.97	2.67	3.56	1.36	0.86	2.52	2.74	2.72	4.79	0.36	1.60	27.28
2013	3.40	1.26	0.68	6.25	3.47	6.29	3.54	4.20	1.73	4.66	2.49	1.46	39.43
2014	1.12	1.41	1.25	2.02	2.62	3.87	2.95	1.55	2.82	4.89	2.57	M1.06	28.13
2015	0.96	M0.57	M0.33	2.03	5.82	3.91	4.11	2.94	4.45	2.04	1.90	3.19	32.25
2016	0.88	0.68	2.96	3.13	3.33	1.90	7.46	7.38	3.33	3.36	2.08	1.42	37.91
2017	2.69	2.03	4.17	2.62	3.64	1.24	3.19	1.45	1.81	12.41	3.31	0.71	39.27
2018	1.02	4.81	1.60	2.43	7.78	4.01	2.85	5.49	2.24	4.17	1.94	1.86	40.20
2019	1.16	1.45	2.62	3.90	5.75	5.79	2.65	1.73	4.11	4.77	1.24	2.69	37.86
2020	3.39	M0.34											3.73

Notes: Data missing in any month have an "M" flag. A "T" indicates a trace of precipitation.

Data missing for all days in a month or year is blank.

Creation date: 2016-07-22

Climatological Data for KALAMAZOO BATTLE CREEK INTL AP, MI - June 2019

Date	Max Temperature	Min Temperature	Avg Temperature	GDD Base 40	GDD Base 50	Precipitation	Snowfall	Snow Depth
2019-06-01	79	58	68.5	29	19	0.08	M	M
2019-06-02	70	51	60.5	21	11	0.00	M	M
2019-06-03	69	44	56.5	17	7	0.00	M	M
2019-06-04	74	48	61.0	21	11	T	M	M
2019-06-05	80	63	71.5	32	22	0.43	M	M
2019-06-06	79	60	69.5	30	20	0.00	M	M
2019-06-07	84	57	70.5	31	21	0.00	M	M
2019-06-08	84	56	70.0	30	20	0.00	M	M
2019-06-09	72	65	68.5	29	19	0.34	M	M
2019-06-10	69	51	60.0	20	10	0.24	M	M
2019-06-11	79	47	63.0	23	13	0.00	M	M
2019-06-12	78	56	67.0	27	17	0.03	M	M
2019-06-13	60	48	54.0	14	4	1.14	M	M
2019-06-14	77	46	61.5	22	12	0.00	M	M
2019-06-15	72	61	66.5	27	17	0.02	M	M
2019-06-16	67	58	62.5	23	13	0.12	M	M
2019-06-17	71	60	65.5	26	16	0.00	M	0
2019-06-18	81	59	70.0	30	20	0.00	M	M
2019-06-19	82	61	71.5	32	22	1.19	M	M
2019-06-20	67	60	63.5	24	14	1.89	M	M
2019-06-21	79	56	67.5	28	18	0.00	M	M
2019-06-22	80	59	69.5	30	20	0.00	M	M
2019-06-23	84	60	72.0	32	22	0.02	M	M
2019-06-24	80	64	72.0	32	22	0.25	M	M
2019-06-25	85	63	74.0	34	24	0.04	M	M
2019-06-26	86	65	75.5	36	26	0.00	M	M
2019-06-27	87	64	75.5	36	26	T	M	M
2019-06-28	88	69	78.5	39	29	T	M	M
2019-06-29	89	69	79.0	39	29	0.00	M	M
2019-06-30	89	65	77.0	37	27	0.00	M	M
Average|Sum	78.0	58.1	68.1	851	551	5.79	M	0.0

Climatological Data for KALAMAZOO BATTLE CREEK INTL AP, MI - August 2019

Date	Max Temperature	Min Temperature	Avg Temperature	GDD Base 40	GDD Base 50	Precipitation	Snowfall	Snow Depth
2019-08-01	84	56	70.0	30	20	0.00	M	M
2019-08-02	85	55	70.0	30	20	0.00	M	M
2019-08-03	88	57	72.5	33	23	0.00	M	M
2019-08-04	88	63	75.5	36	26	0.37	M	M
2019-08-05	88	61	74.5	35	25	T	M	M
2019-08-06	82	66	74.0	34	24	0.15	M	M
2019-08-07	86	62	74.0	34	24	0.00	M	M
2019-08-08	82	61	71.5	32	22	0.12	M	M
2019-08-09	80	58	69.0	29	19	0.00	M	M
2019-08-10	84	56	70.0	30	20	0.00	M	M
2019-08-11	86	59	72.5	33	23	T	M	M
2019-08-12	84	69	76.5	37	27	0.02	M	M
2019-08-13	87	68	77.5	38	28	0.00	M	M
2019-08-14	85	64	74.5	35	25	0.06	M	M
2019-08-15	76	60	68.0	28	18	0.00	M	M
2019-08-16	83	55	69.0	29	19	0.23	M	M
2019-08-17	82	64	73.0	33	23	T	M	M
2019-08-18	84	68	76.0	36	26	0.32	M	M
2019-08-19	87	65	76.0	36	26	0.00	M	M
2019-08-20	86	70	78.0	38	28	T	M	M
2019-08-21	87	65	76.0	36	26	0.01	M	M
2019-08-22	79	58	68.5	29	19	0.00	M	M
2019-08-23	78	51	64.5	25	15	0.00	M	M
2019-08-24	78	49	63.5	24	14	0.00	M	M
2019-08-25	81	51	66.0	26	16	0.00	M	M
2019-08-26	72	61	66.5	27	17	0.42	M	M
2019-08-27	82	67	74.5	35	25	0.00	M	M
2019-08-28	76	58	67.0	27	17	0.00	M	M
2019-08-29	85	54	69.5	30	20	0.03	M	M
2019-08-30	76	53	64.5	25	15	0.00	M	M
2019-08-31	77	49	63.0	23	13	0.00	M	0
Average|Sum	82.5	59.8	71.1	973	663	1.73	M	0.0

Appendix E. Historic Aerial Imagery

Area of Interest

Area A

Area A

Google Earth 1999

Area A

Google Earth 2003

Bloomfield Ave

Morland St

Somerset Ave

Nottingham Ave

94

Kilgore Service Rd

E Kilgore Rd

Google Earth

Image U.S. Geological Survey

700 ft

Area A

Google Earth 2006

Bloomfield Ave

Moreland St

Somerset Ave

Nottingham Ave

94

Kilgore Service Rd

E Kilgore Rd

Google Earth

Image U.S. Geological Survey

700 ft

PORTAGE
A Natural Place to Move

Portage GIS

Area A

powered by FetchGIS

100m
300ft

Map Publication:
05/14/2020 11:18 AM

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PORTAGE
A Natural Place to Move

Portage GIS

Area A

powered by FetchGIS

100m
300ft

Map Publication:
05/14/2020 11:19 AM

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Area A

Google Earth 2011

Bloomfield Ave

Moreland St

Somerset Ave

Nottingham Ave

94

Kilgore Service Rd

E Kilgore Rd

Google Earth

Image U.S. Geological Survey

700 ft

PORTAGE
A Natural Place to Move

Portage GIS

Area A

powered by FetchGIS

100m
300ft

Map Publication:
05/14/2020 11:19 AM

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Portage GIS

Area A

powered by FetchGIS

100m
300ft

Map Publication:
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Area A

powered by FetchGIS

100m
300ft

Map Publication:
05/14/2020 11:21 AM

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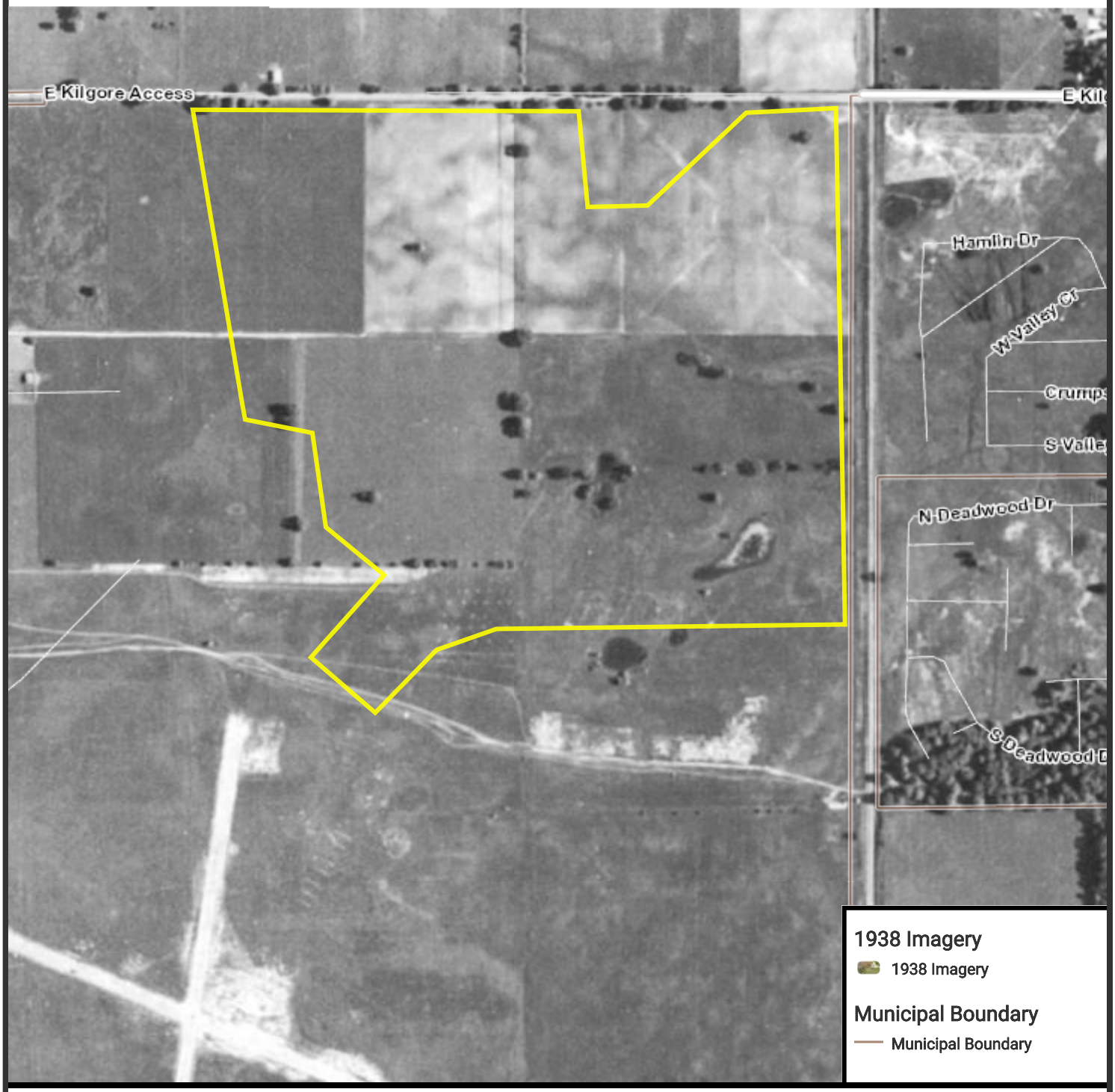
Area of Interest

Area B



PORTAGE
A Natural Place to Move

Portage GIS

Area B

powered by FetchGIS

200m
600ft

Map Publication:
05/13/2020 2:04 PM

PORTAGE
A Natural Place to Move

Portage GIS

Area B

powered by FetchGIS

200m
600ft

Map Publication:
05/13/2020 2:05 PM

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Portage GIS

Area B

powered by FetchGIS

200m
600ft

Map Publication:
05/13/2020 2:06 PM

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Portage GIS

Area B

powered by FetchGIS

200m
600ft

Map Publication:
05/13/2020 2:07 PM

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PORTAGE
A Natural Place to Move

Portage GIS

Area B

powered by FetchGIS

200m
600ft

Map Publication:
05/13/2020 2:08 PM

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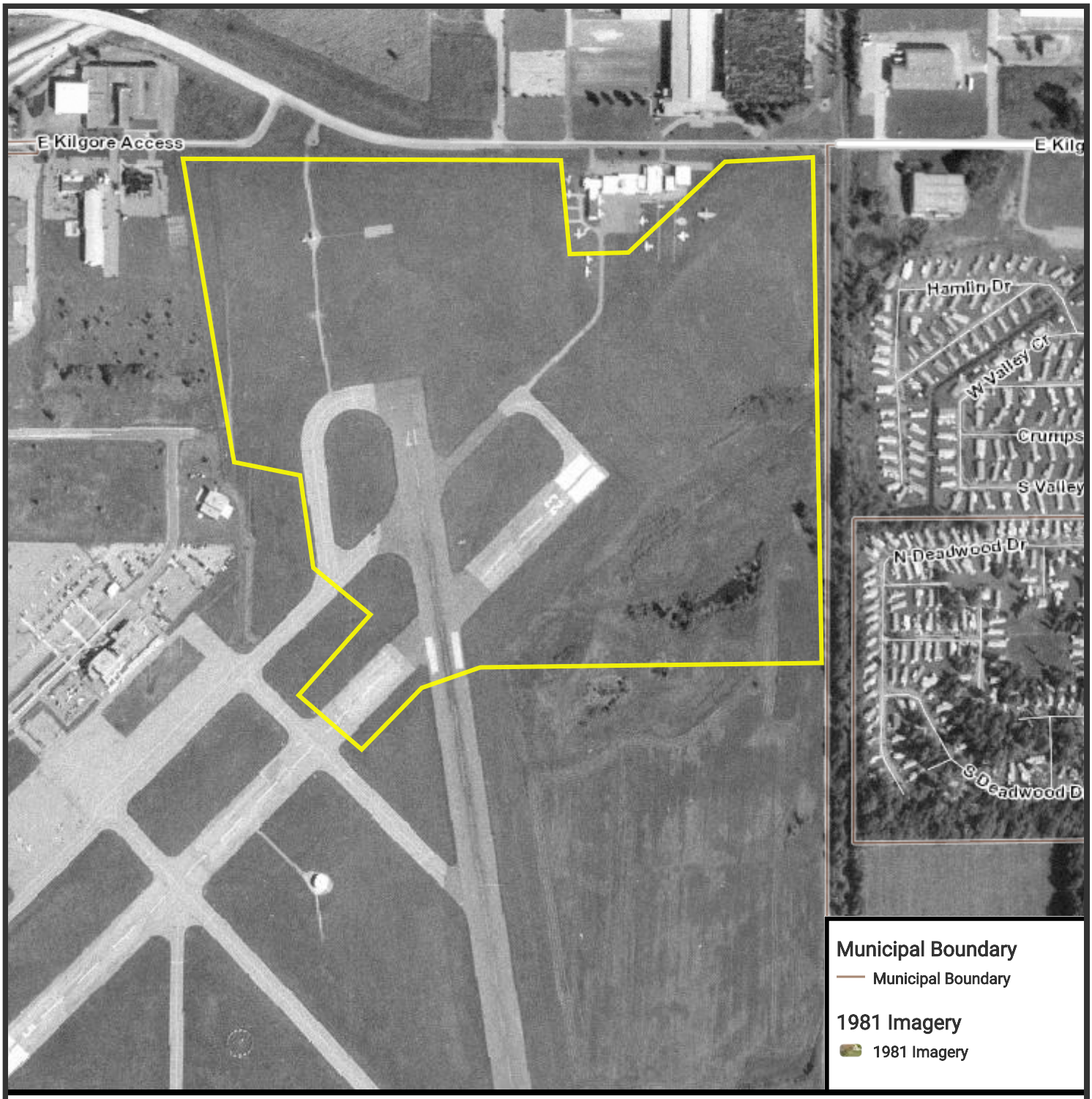

Municipal Boundary

Municipal Boundary

1981 Imagery

1981 Imagery

PORTAGE
A Natural Place to Move

Portage GIS

Area B

powered by FetchGIS

200m
600ft

Map Publication:
05/13/2020 2:08 PM

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PORTAGE
A Natural Place to Move

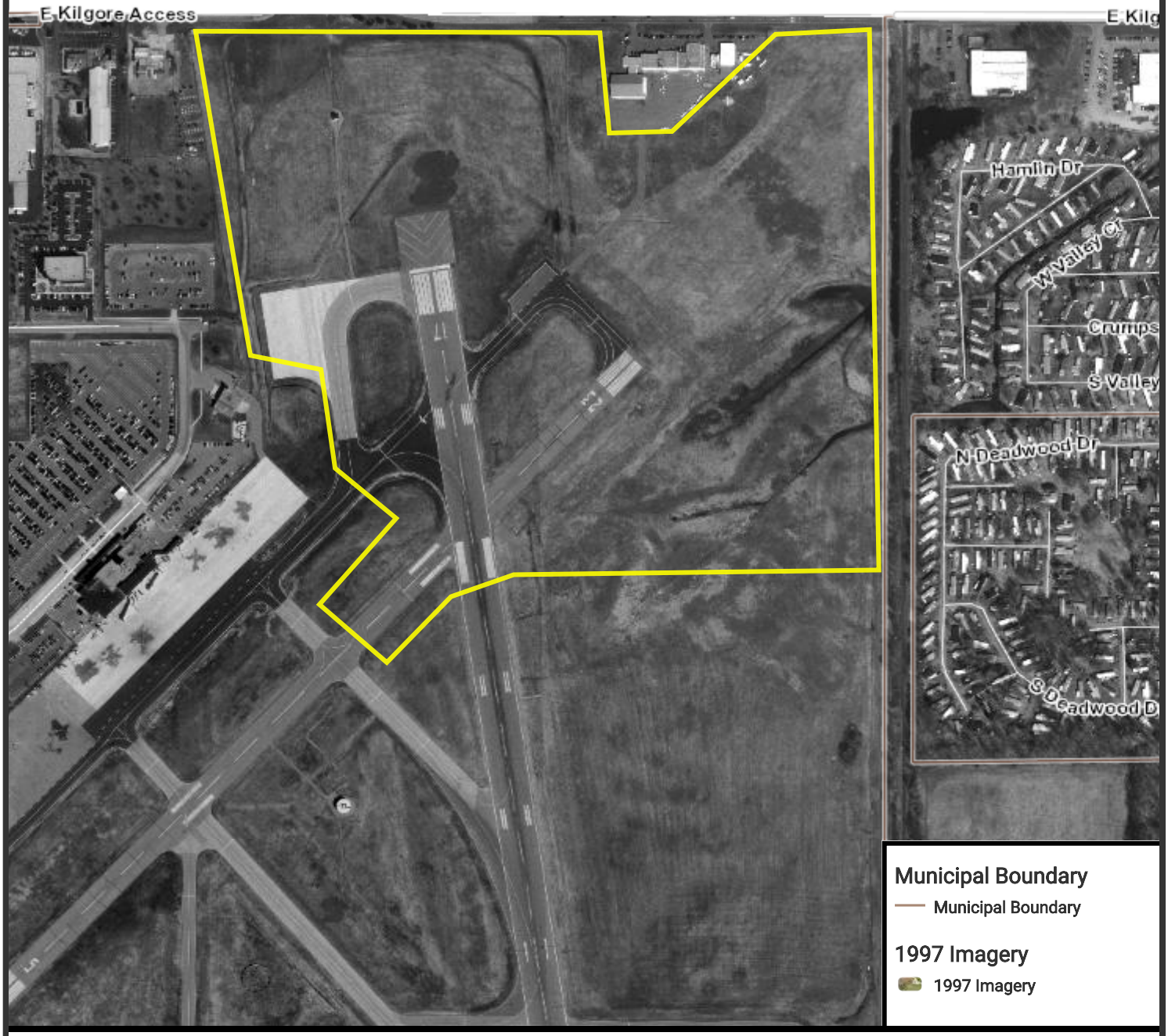
Portage GIS

Area B

powered by FetchGIS

200m
600ft

Map Publication:
05/13/2020 2:09 PM



PORTAGE
A Natural Place to Move

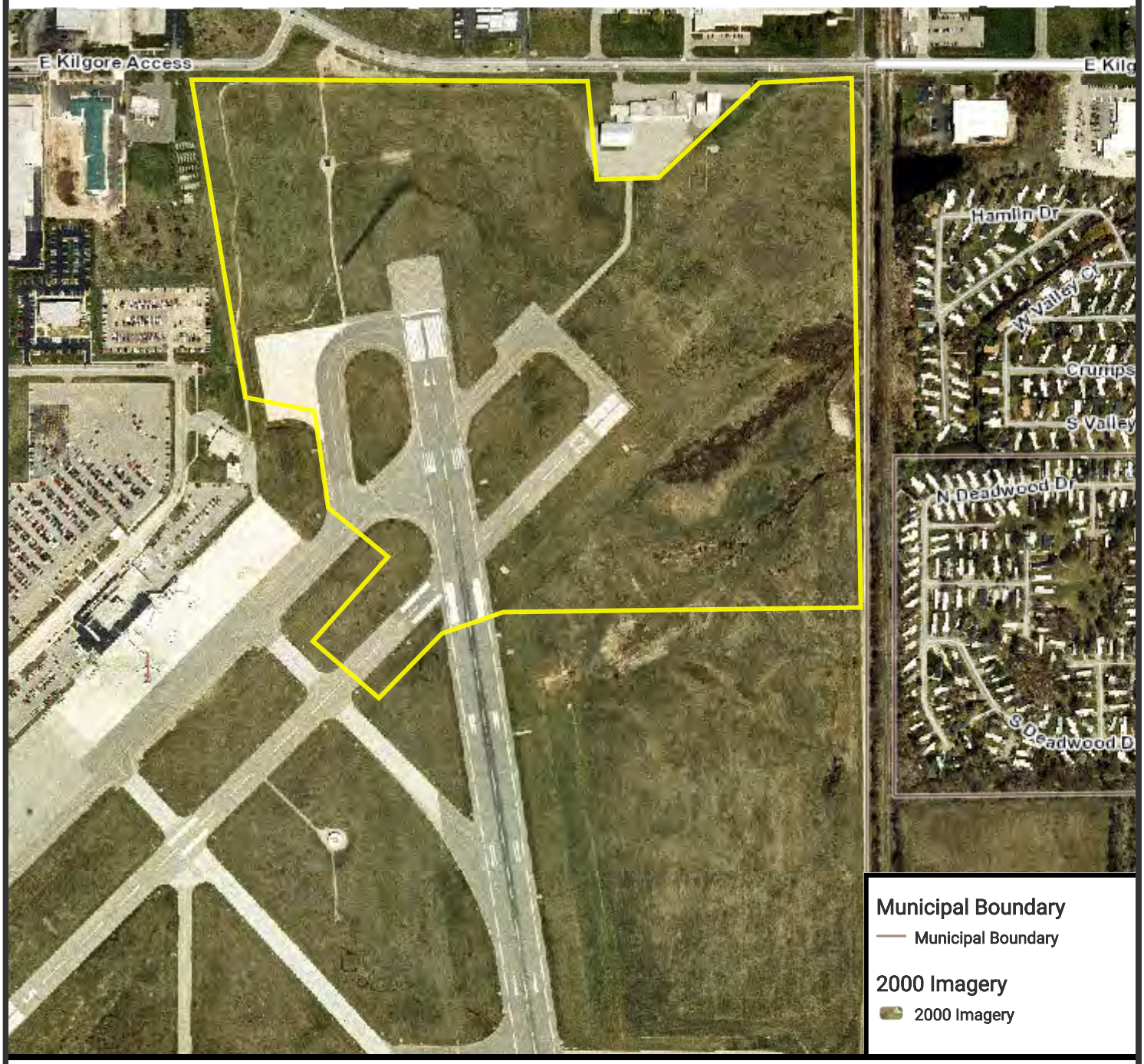
Portage GIS

Area B

powered by FetchGIS

200m
600ft

Map Publication:
05/13/2020 2:10 PM



Municipal Boundary

Municipal Boundary

2000 Imagery

2000 Imagery

PORTAGE
A Natural Place to Move

Portage GIS

Area B

powered by FetchGIS

200m
600ft

Map Publication:
05/13/2020 2:10 PM

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PORTAGE
A Natural Place to Move

Portage GIS

Area B

powered by FetchGIS

200m
600ft

Map Publication:
05/13/2020 2:11 PM

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PORTAGE
A Natural Place to Move

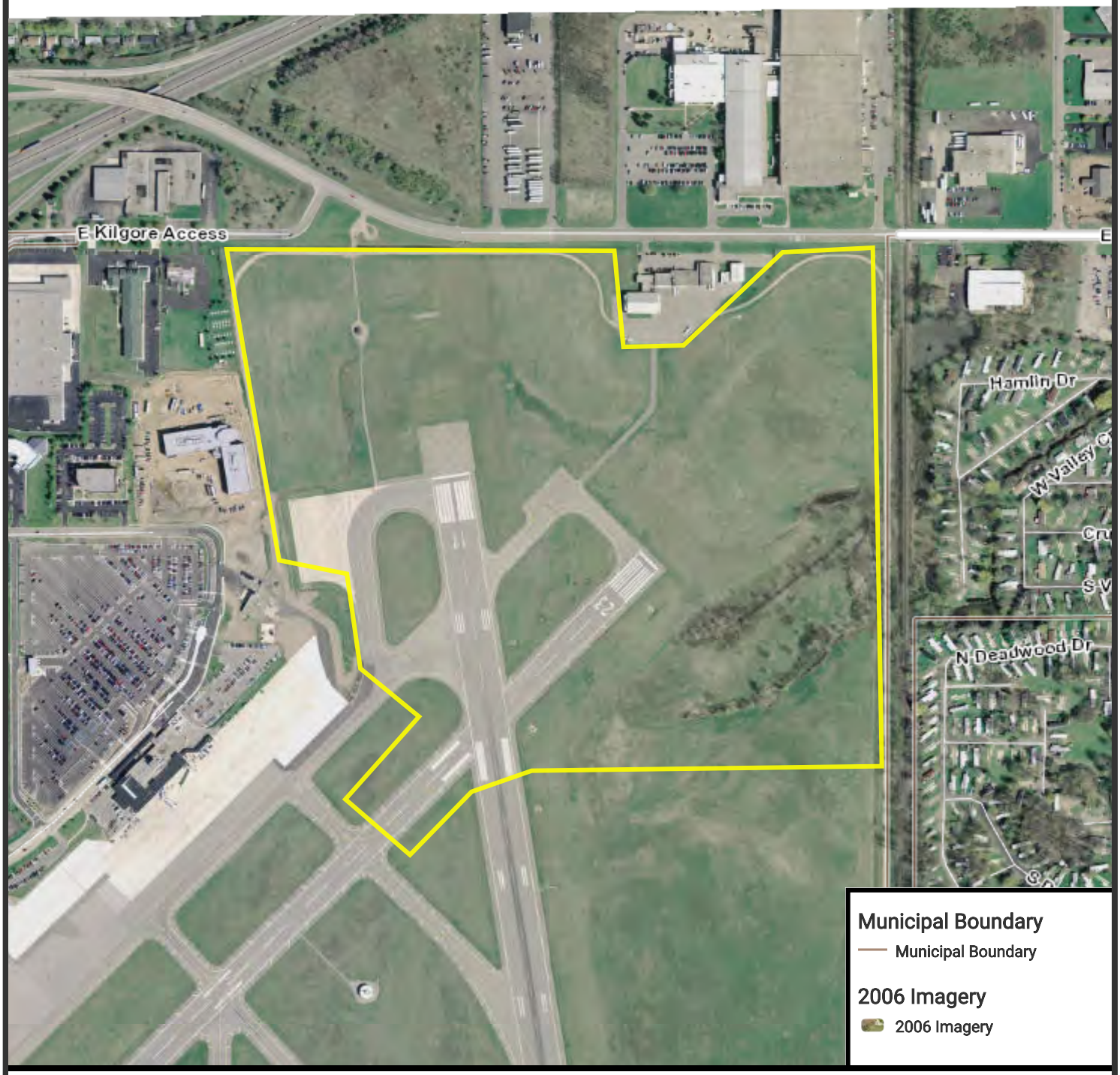
Portage GIS

Area B

powered by FetchGIS

200m
600ft

Map Publication:
05/13/2020 2:12 PM



PORTAGE
A Natural Place to Move

Portage GIS

Area B

powered by FetchGIS

200m
600ft

Map Publication:
05/13/2020 2:13 PM

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PORTAGE
A Natural Place to Move

Portage GIS

Area B

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200m
600ft

Map Publication:
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PORTAGE
A Natural Place to Move

Portage GIS

Area B

powered by FetchGIS

200m
600ft

Map Publication:
05/13/2020 2:14 PM

PORTAGE
A Natural Place to Move

Portage GIS

Area B

powered by FetchGIS

200m
600ft

Map Publication:
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A Natural Place to Move

Portage GIS

Area B

powered by FetchGIS

200m
600ft

Map Publication:
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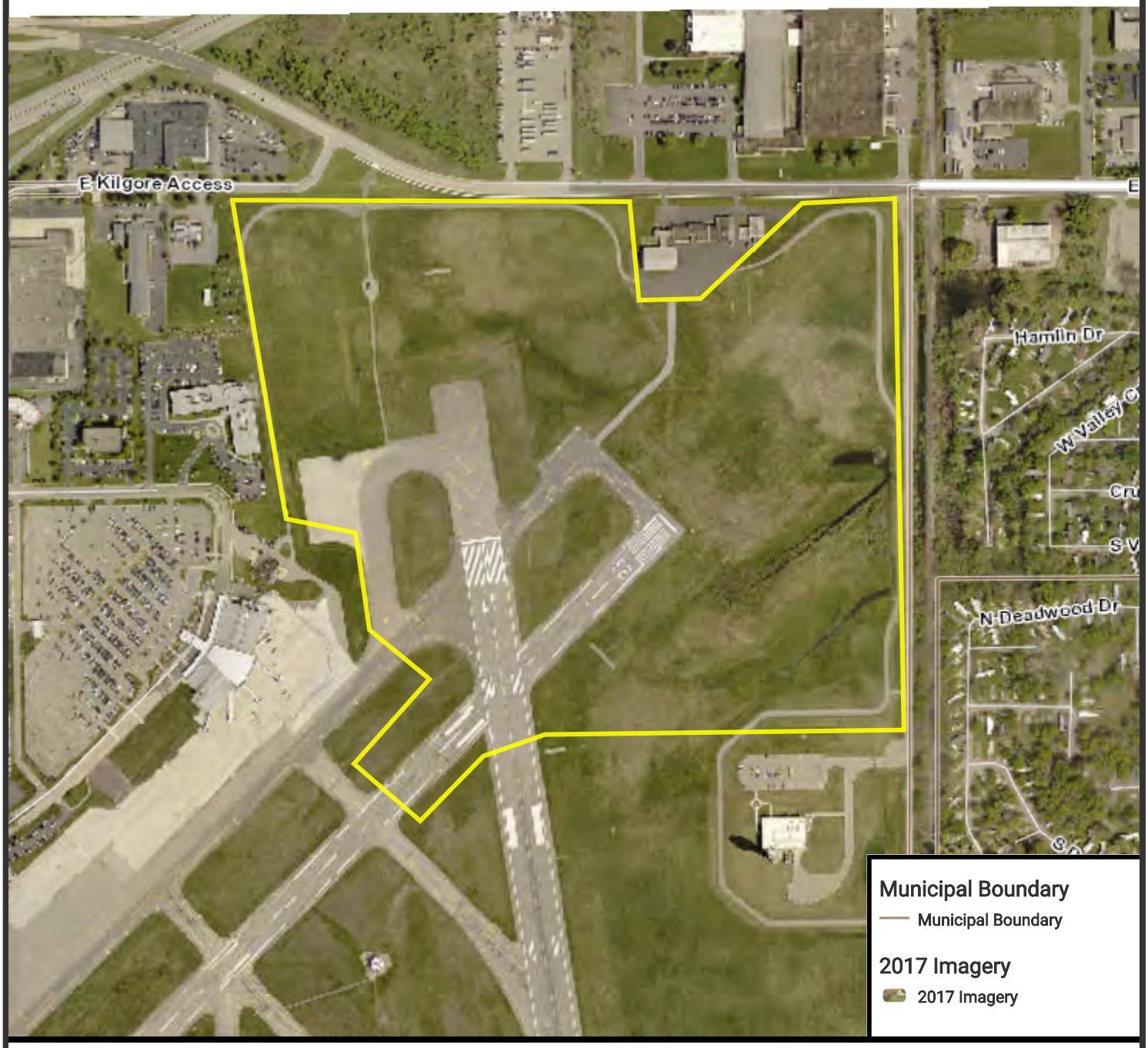

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A Natural Place to Move

Portage GIS

Area B

powered by FetchGIS

200m
600ft

Map Publication:
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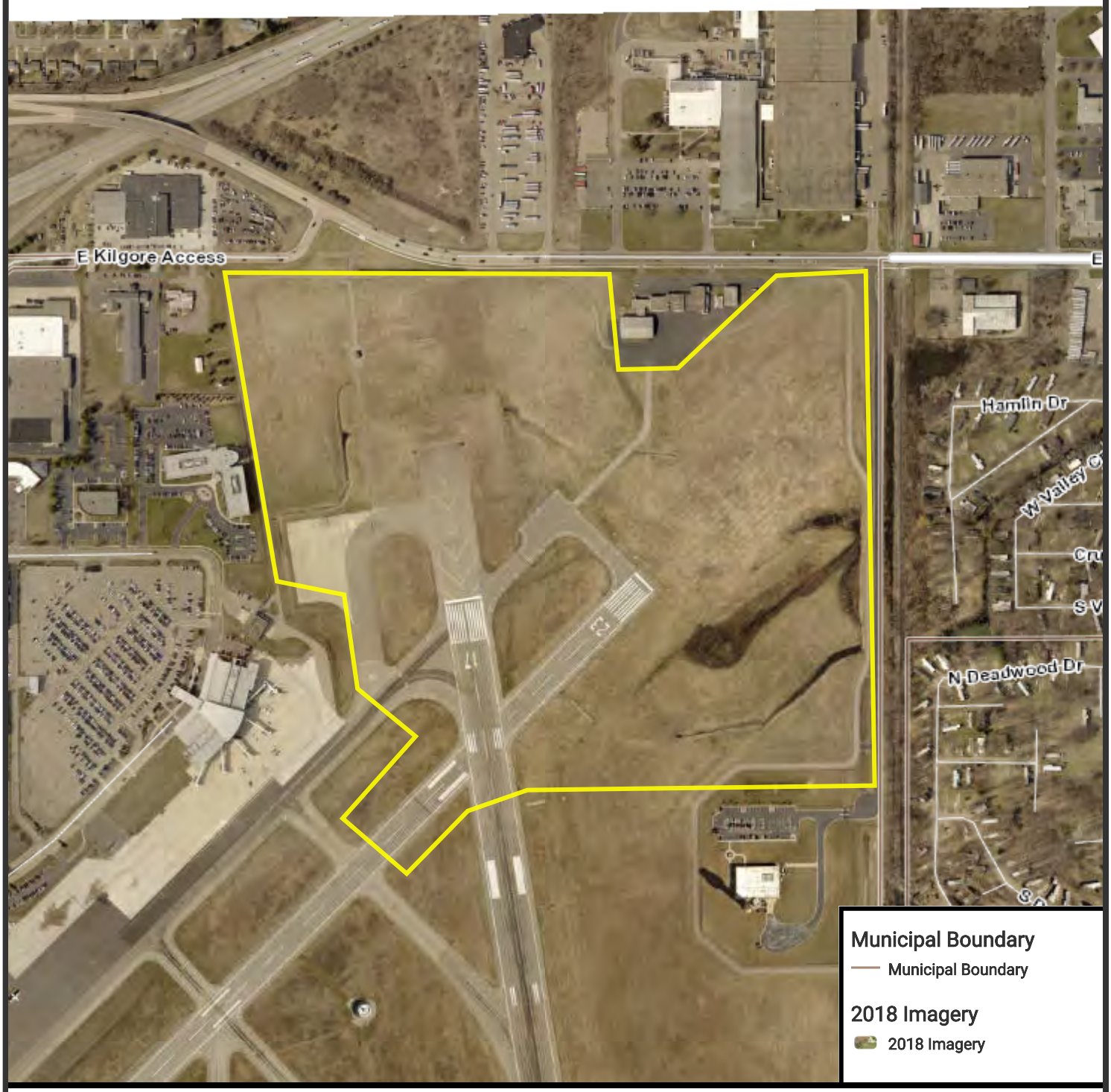

PORTAGE
A Natural Place to Move

Portage GIS

Area B

powered by FetchGIS

200m
600ft

Map Publication:
05/13/2020 2:19 PM

Area of Interest

Area C

PORTAGE
A Natural Place to Move

Portage GIS

powered by FetchGIS

200m
600ft

Map Publication:
05/13/2020 10:36 AM

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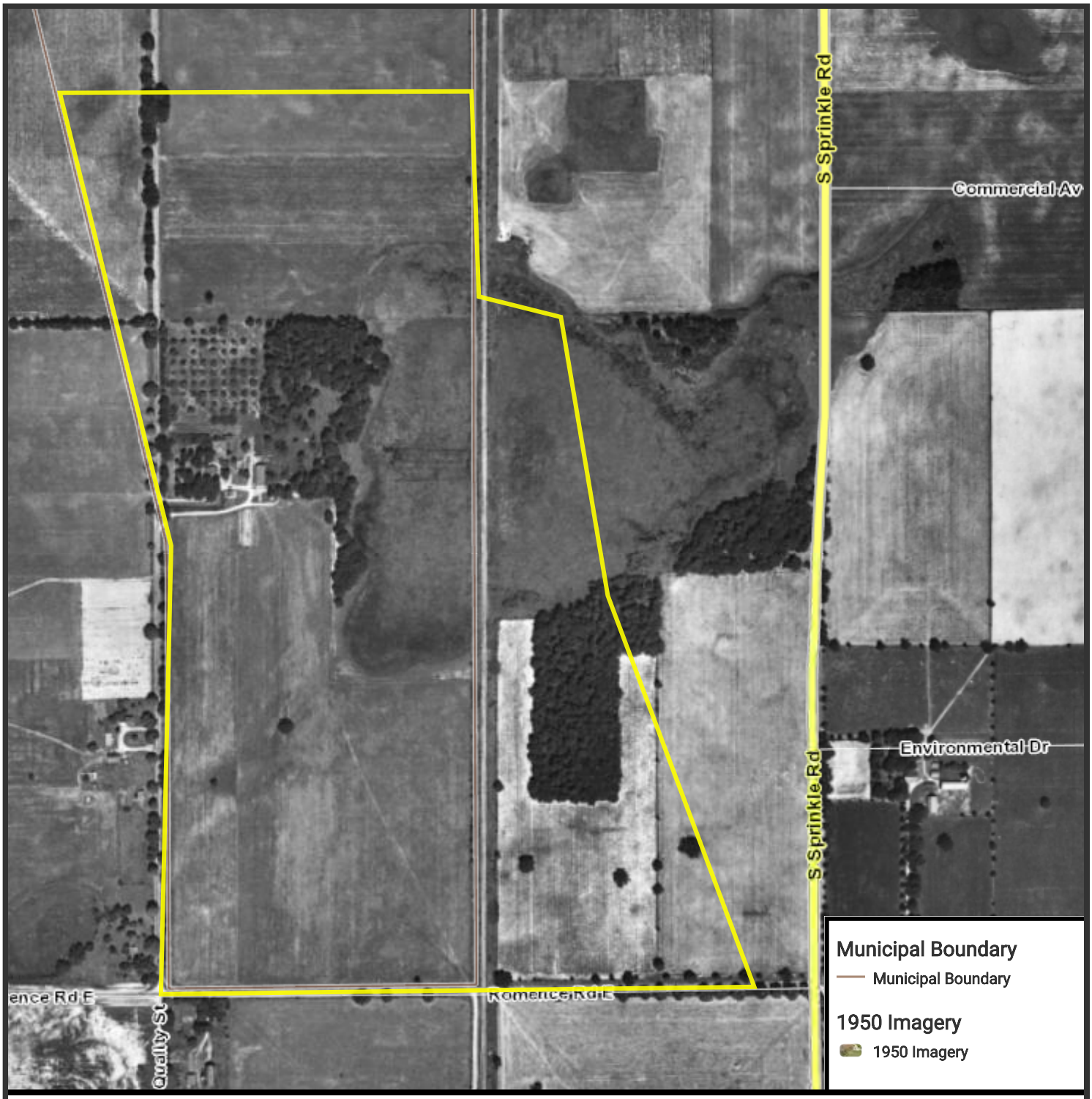

PORTAGE
A Natural Place to Move

Portage GIS

powered by FetchGIS

200m
600ft

Map Publication:
05/13/2020 10:38 AM

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PORTAGE
A Natural Place to Move

Portage GIS

powered by FetchGIS

200m
600ft

Map Publication:
05/13/2020 10:39 AM

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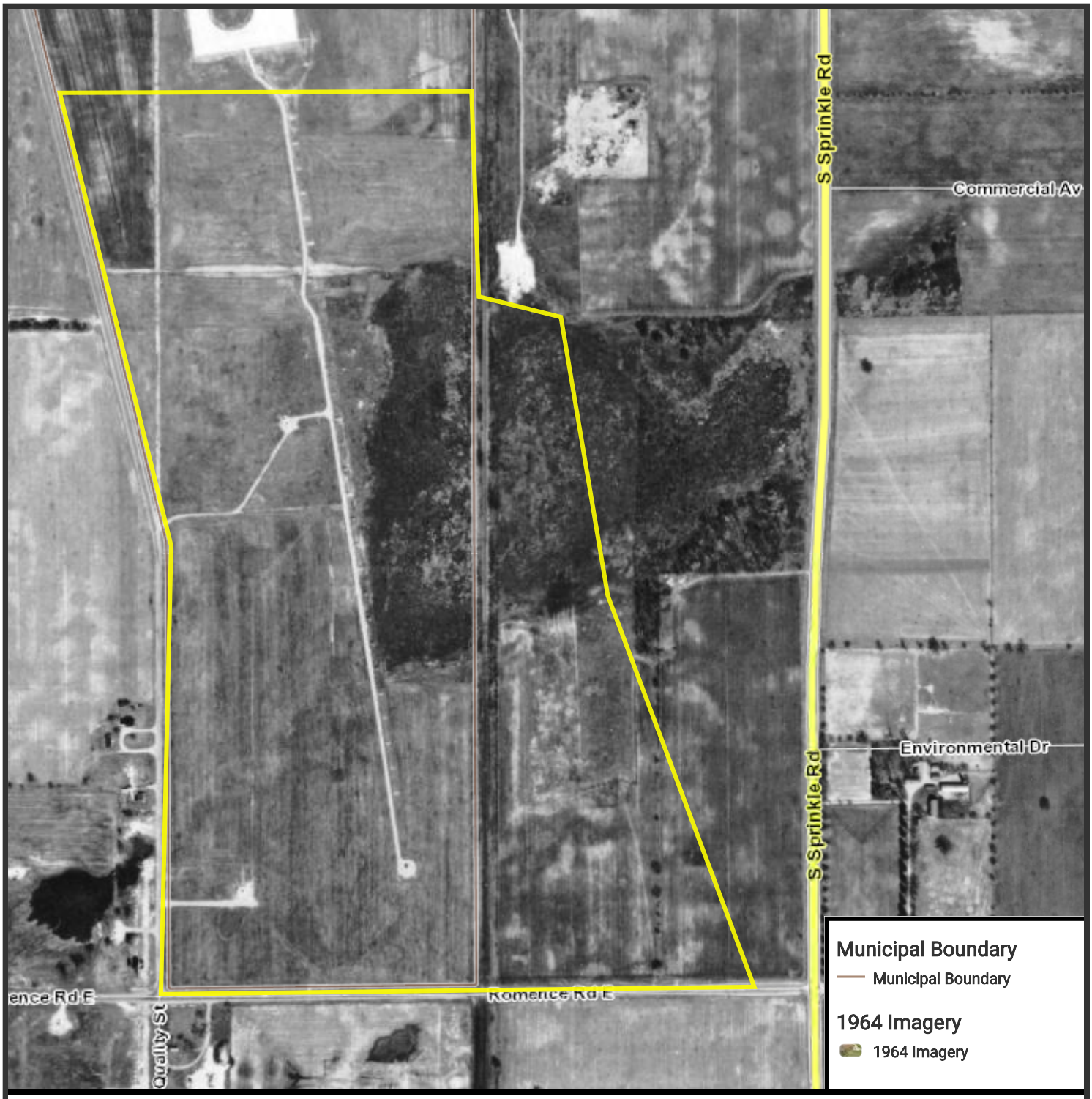

PORTAGE
A Natural Place to Move

Portage GIS

powered by FetchGIS

200m
600ft

Map Publication:
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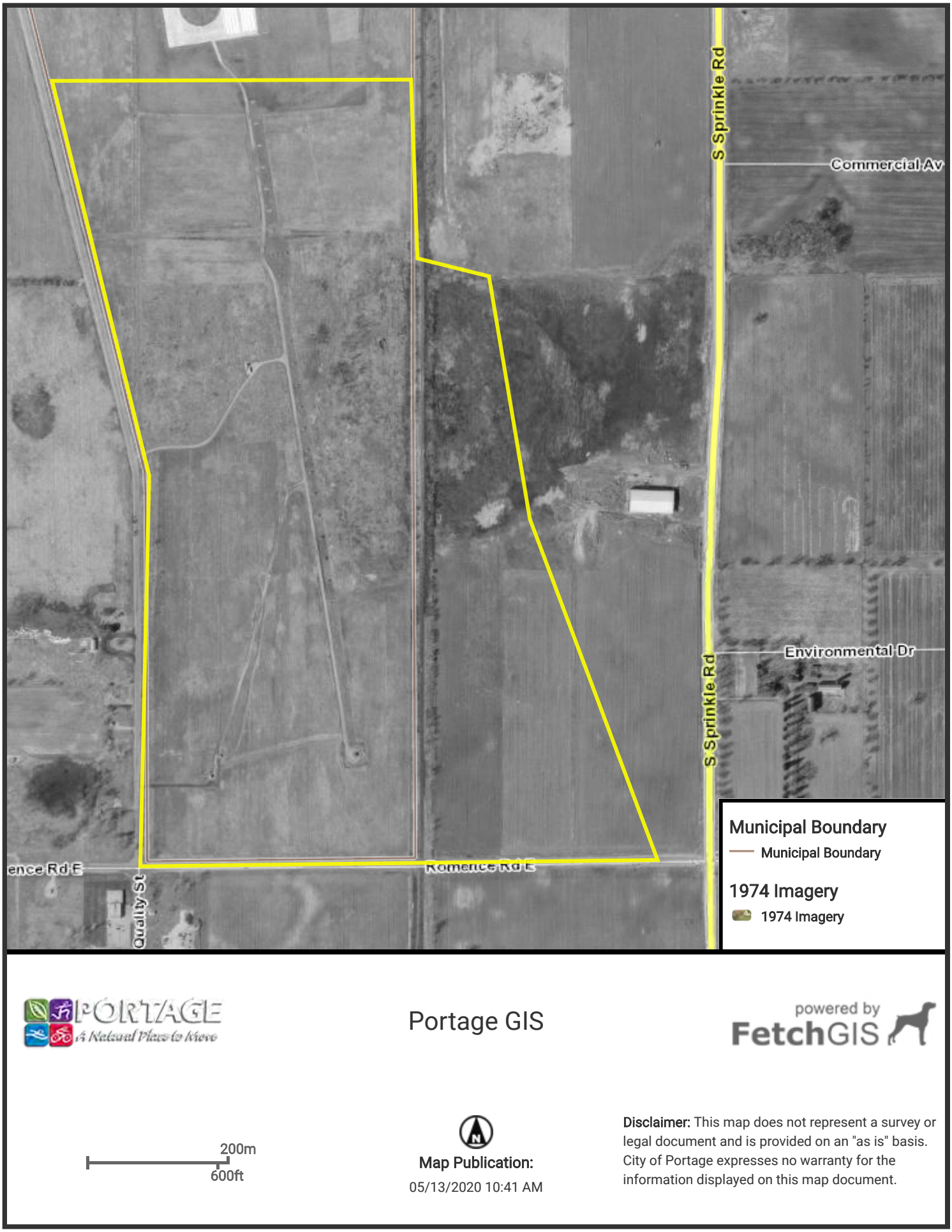

PORTAGE
A Natural Place to Move

Portage GIS

powered by FetchGIS

200m
600ft

Map Publication:
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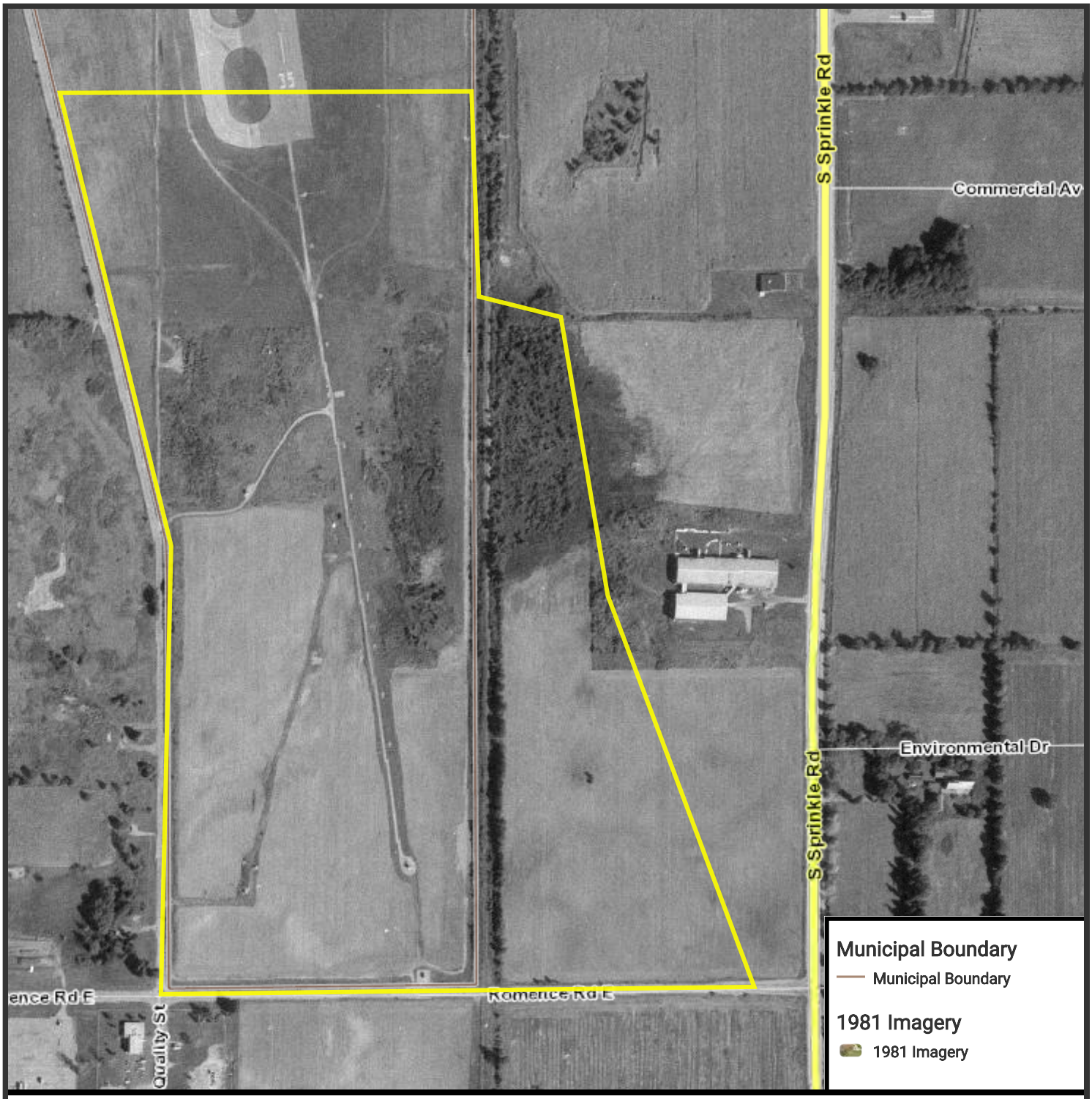

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A Natural Place to Move

Portage GIS

powered by FetchGIS

200m
600ft

Map Publication:
05/13/2020 10:42 AM

PORTAGE
A Natural Place to Move

Portage GIS

powered by FetchGIS

200m
600ft

Map Publication:
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PORTAGE
A Natural Place to Move

Portage GIS

powered by FetchGIS

200m
600ft

Map Publication:
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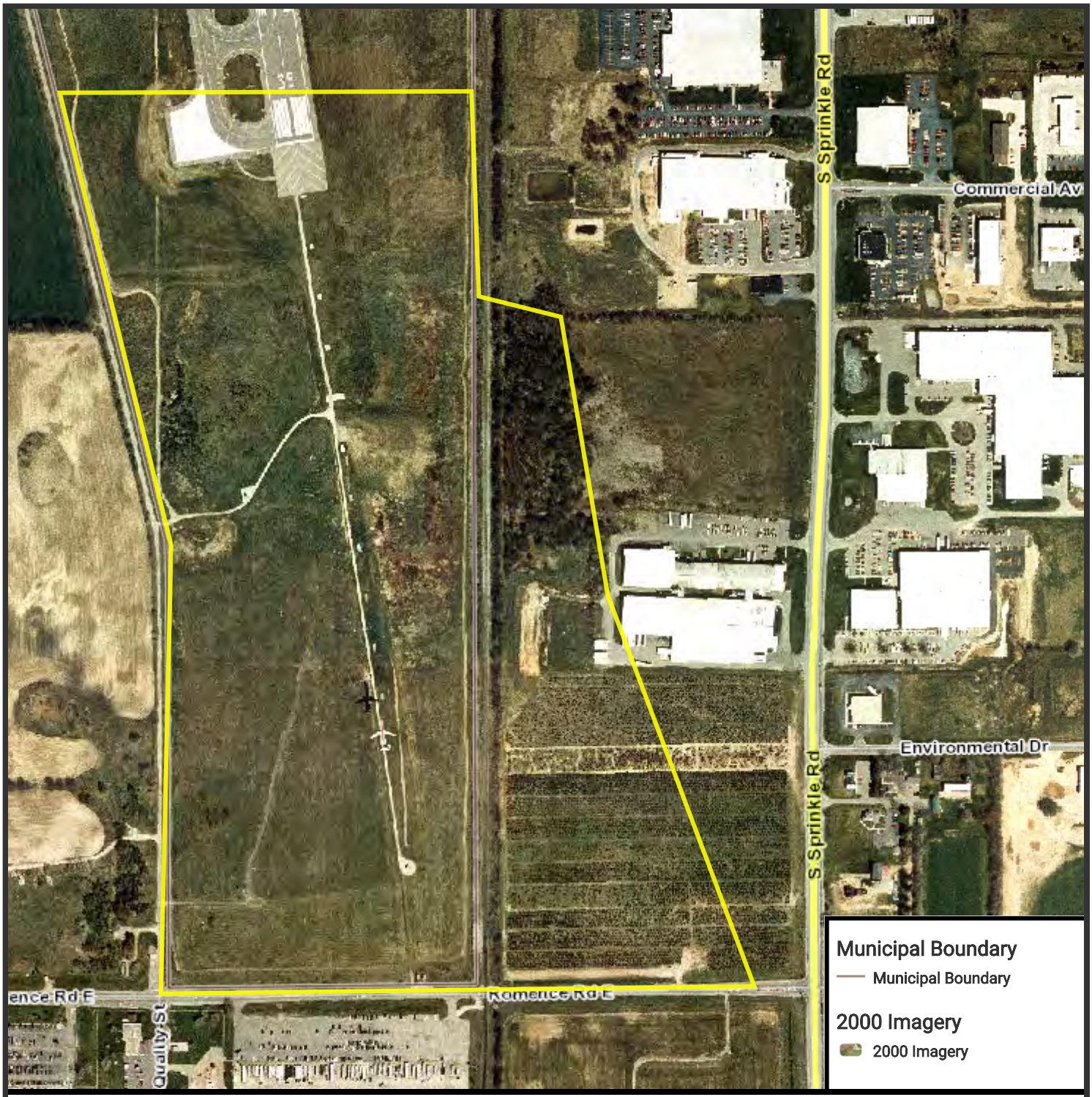

PORTAGE
A Natural Place to Move

Portage GIS

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200m
600ft

Map Publication:
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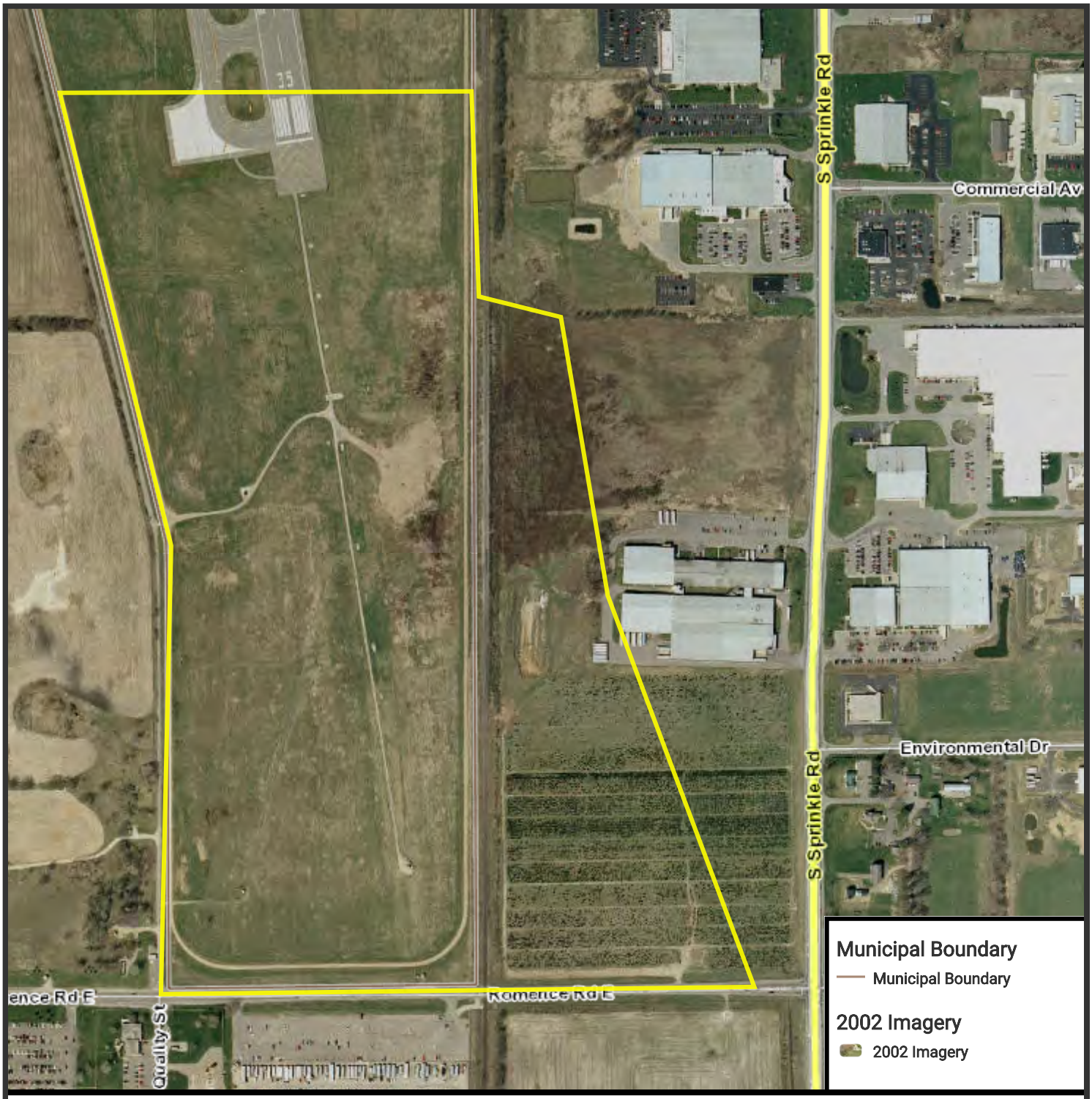

PORTAGE
A Natural Place to Move

Portage GIS

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200m
600ft

Map Publication:
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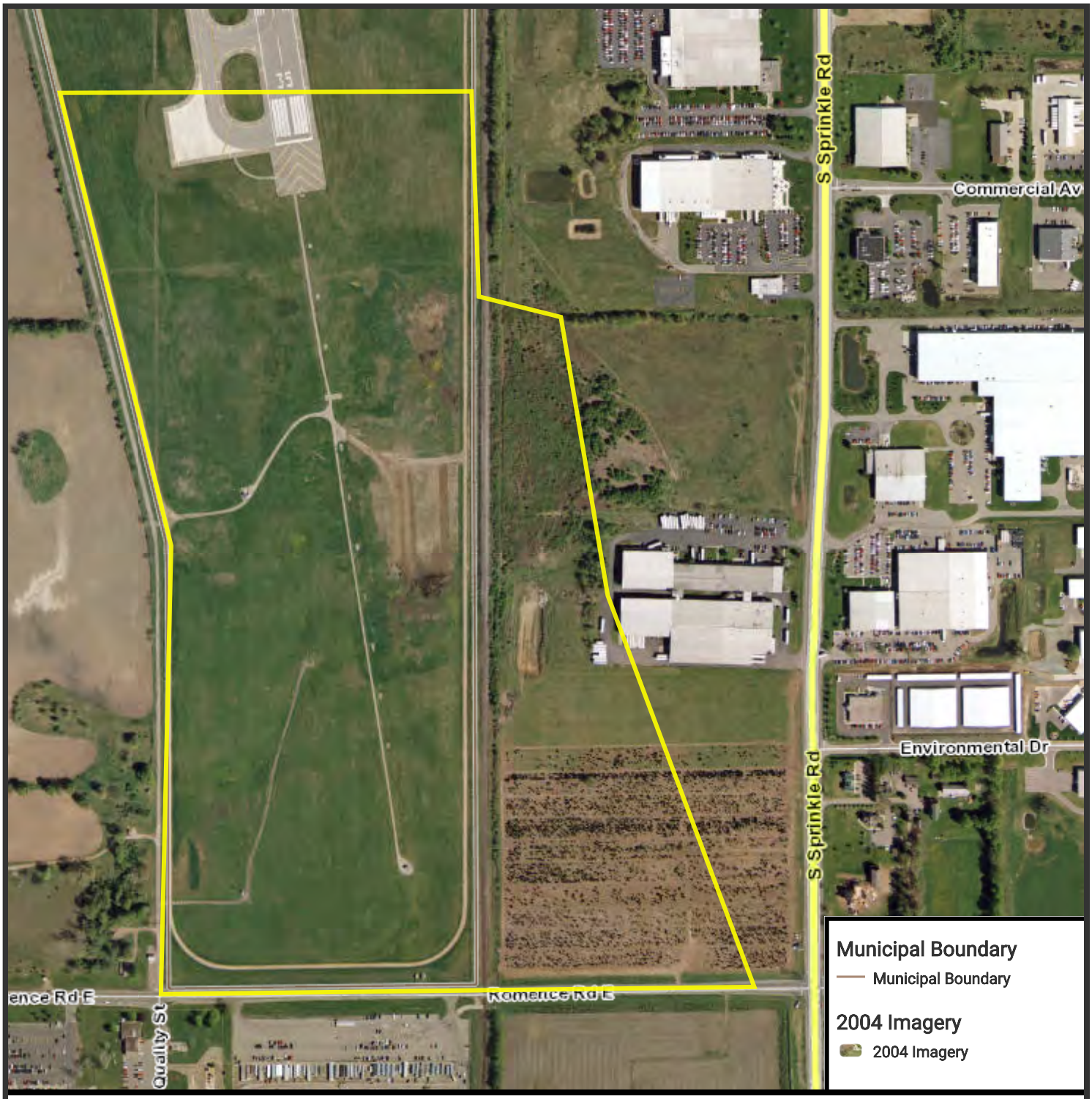

PORTAGE
A Natural Place to Move

Portage GIS

powered by FetchGIS

200m
600ft

Map Publication:
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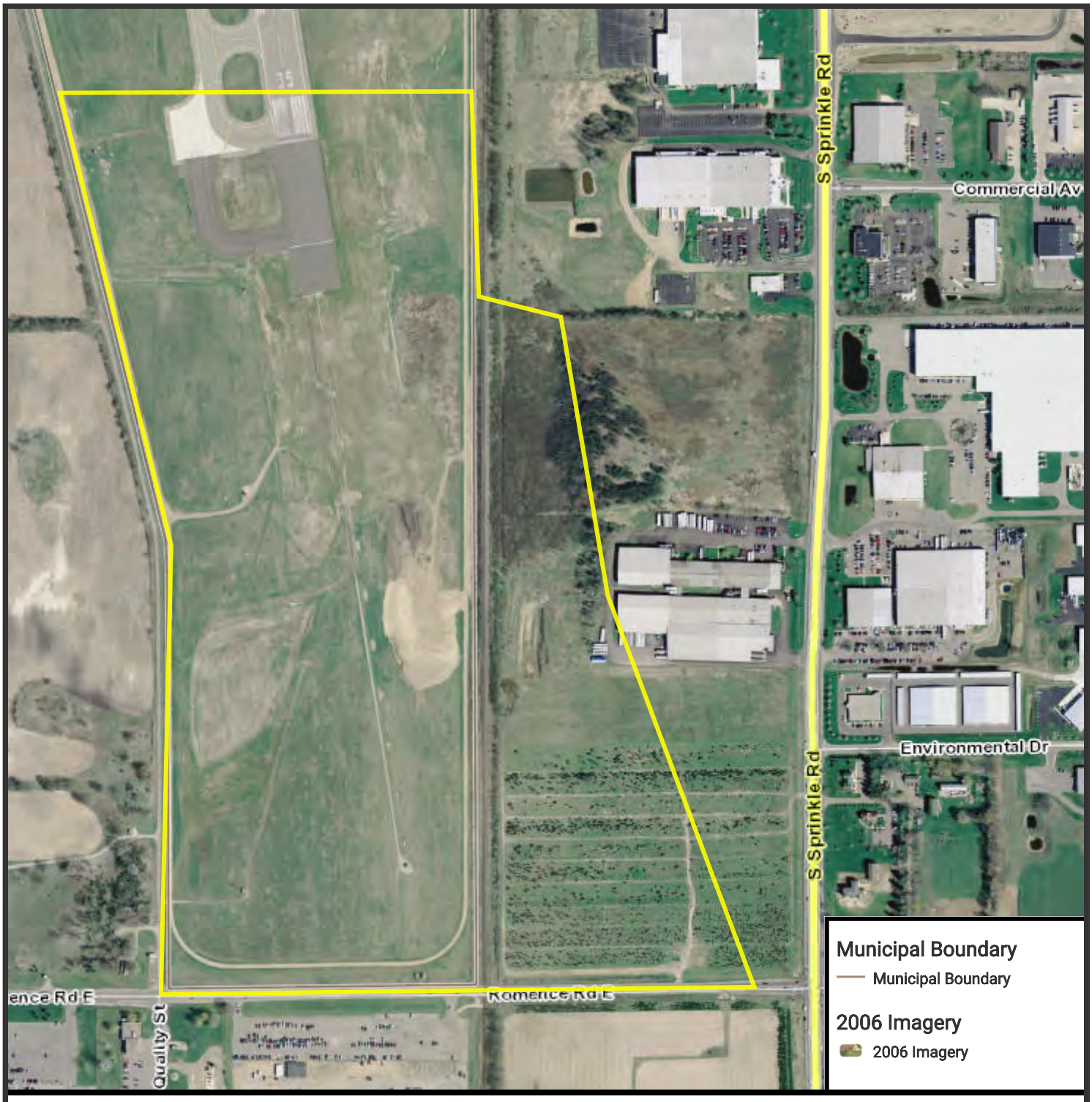
Disclaimer: This map does not represent a survey or legal document and is provided on an "as is" basis. City of Portage expresses no warranty for the information displayed on this map document.



PORTAGE
A Natural Place to Move

Portage GIS

powered by FetchGIS

200m
600ft

Map Publication:
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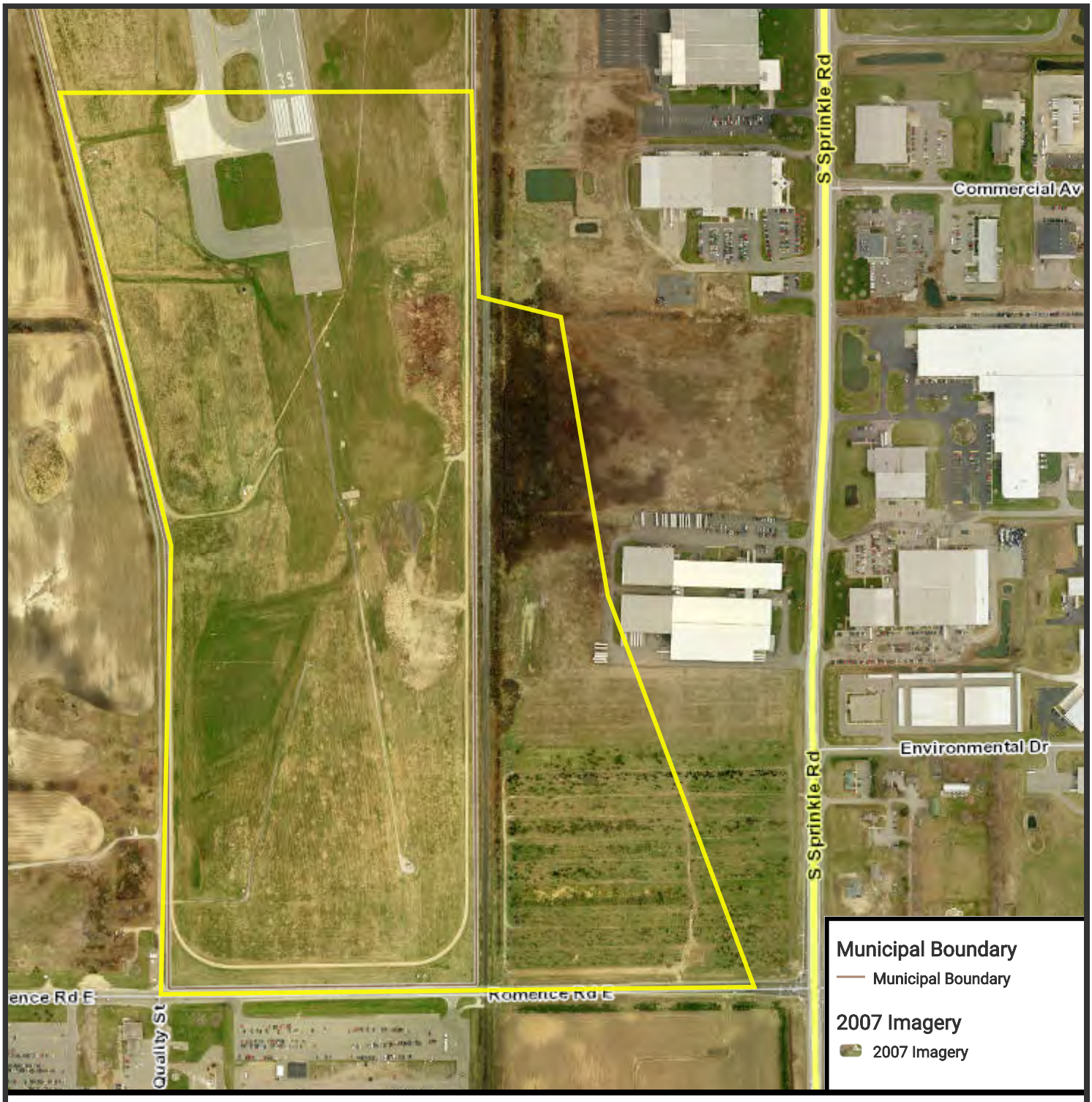

PORTAGE
A Natural Place to Move

Portage GIS

powered by FetchGIS

200m
600ft

Map Publication:
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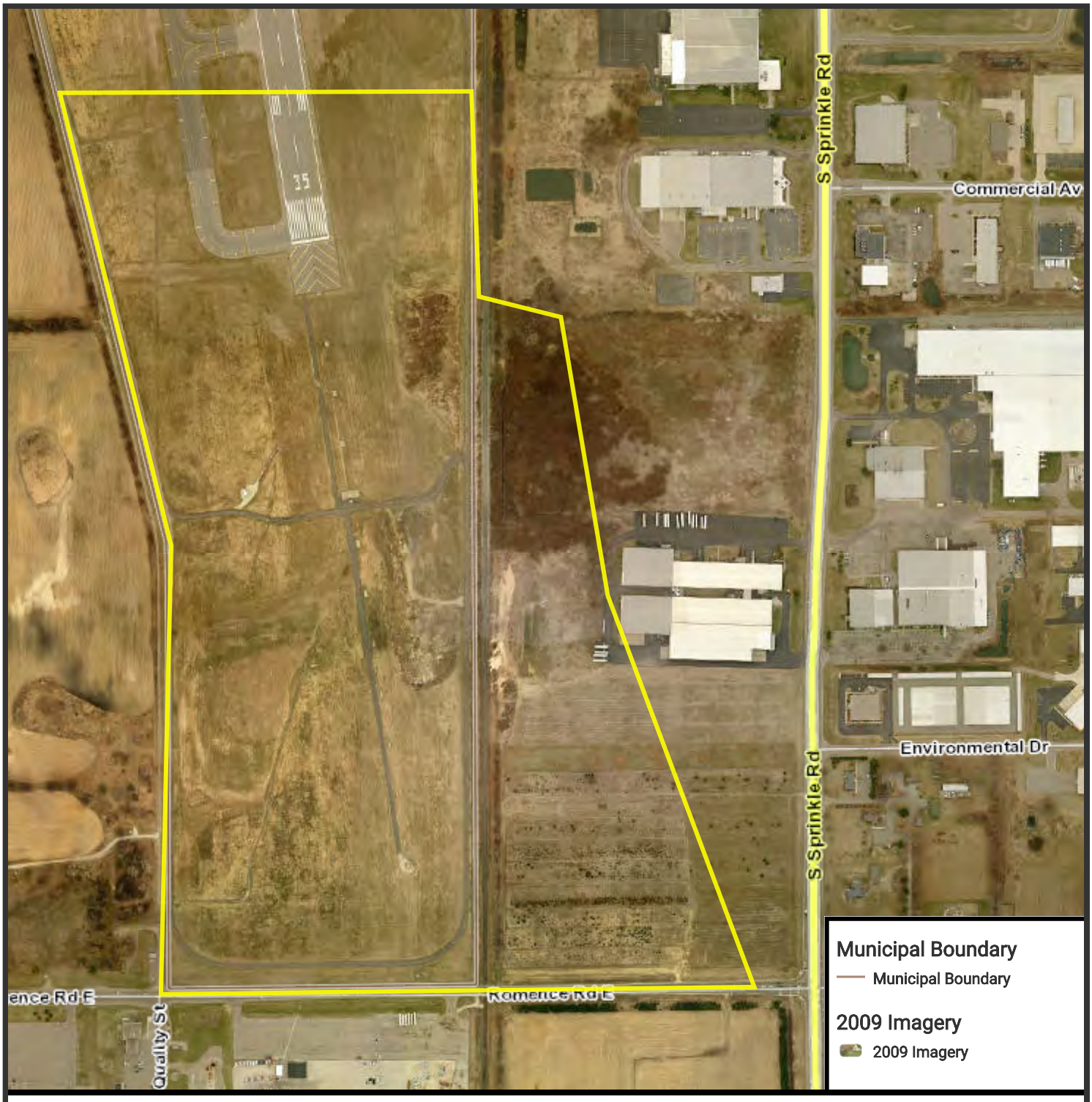

PORTAGE
A Natural Place to Move

Portage GIS

powered by FetchGIS

200m
600ft

Map Publication:
05/13/2020 10:49 AM

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PORTAGE
A Natural Place to Move

Portage GIS

powered by FetchGIS

200m
600ft

Map Publication:
05/13/2020 10:50 AM

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PORTAGE
A Natural Place to Move

Portage GIS

powered by FetchGIS

200m
600ft

Map Publication:
05/13/2020 10:51 AM

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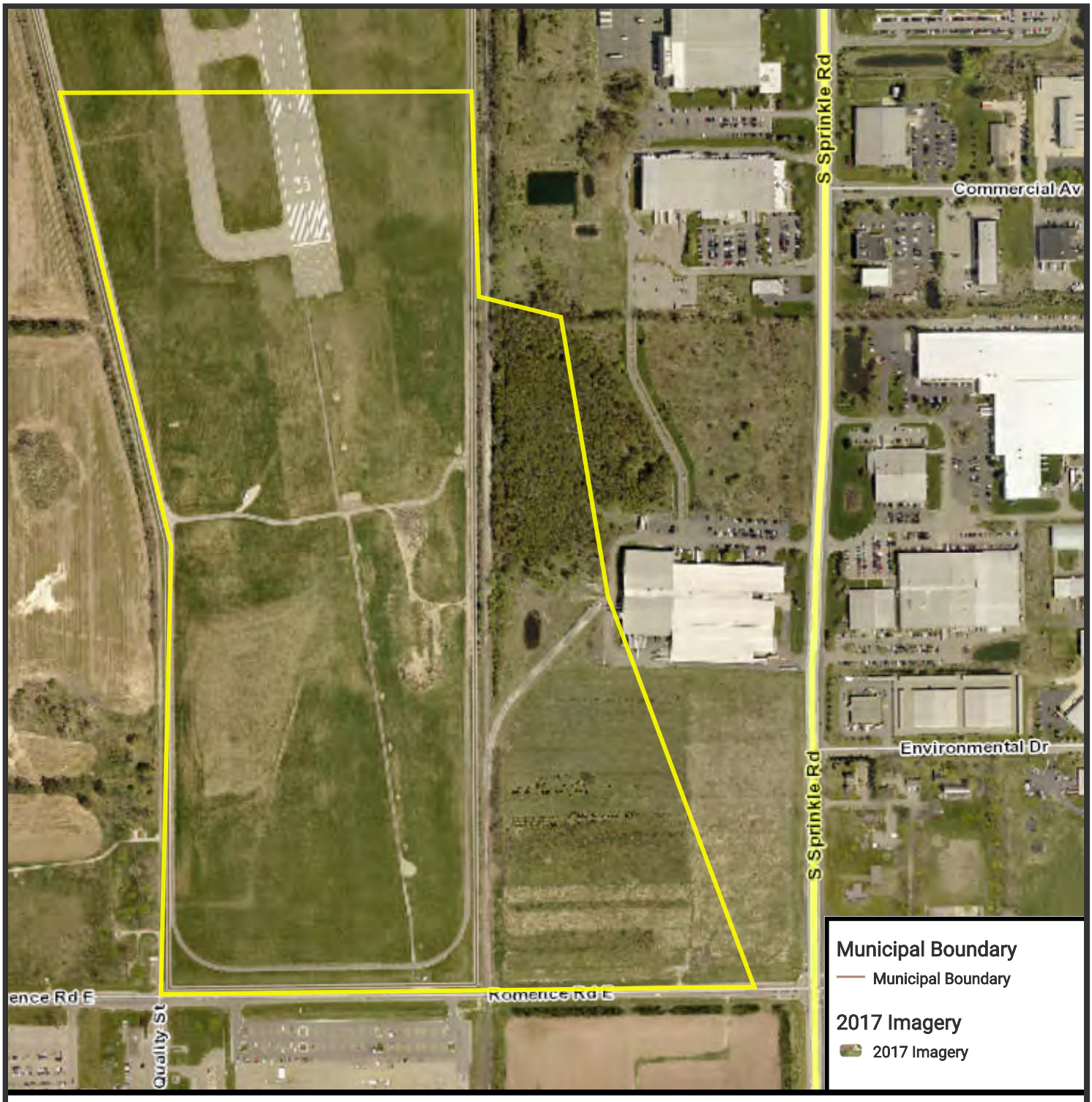

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Portage GIS

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200m
600ft

Map Publication:
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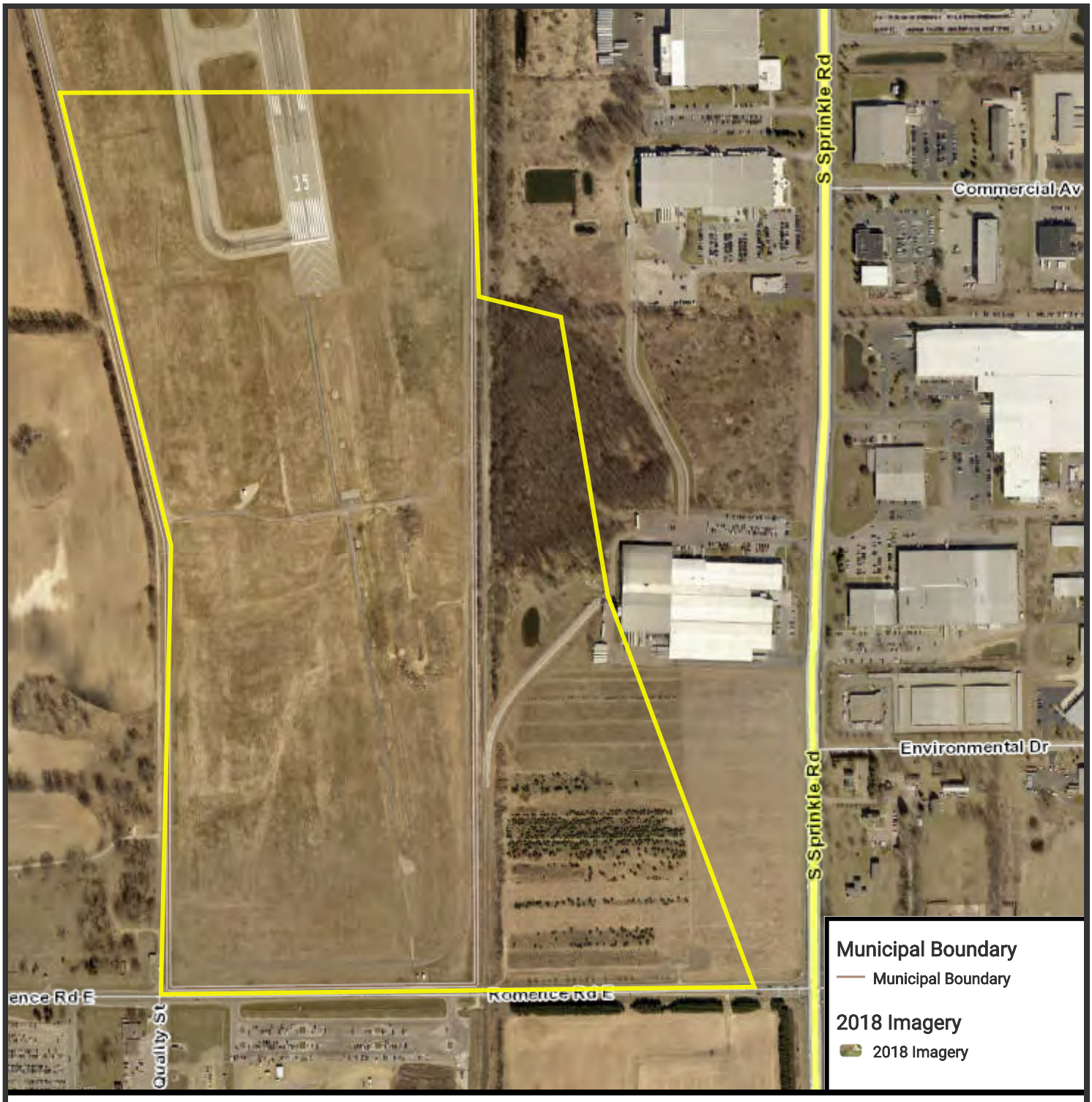

PORTAGE
A Natural Place to Move

Portage GIS

powered by FetchGIS

200m
600ft

Map Publication:
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Appendix F. Wetland Boundary Maps

Wetland Summary Table			
Wetland No.	Wetland Type	Area (acres)	Area (sq. ft.)
1A	PEM	0.214	9,309.243
1B	PEM	0.009	406.521
2	PEM	0.030	1,299.337
3	PEM/PSS	3.470	151,147.974
4	PEM	0.171	7,468.824
5	PEM	0.056	2,423.705
6	PEM	0.056	2,455.372

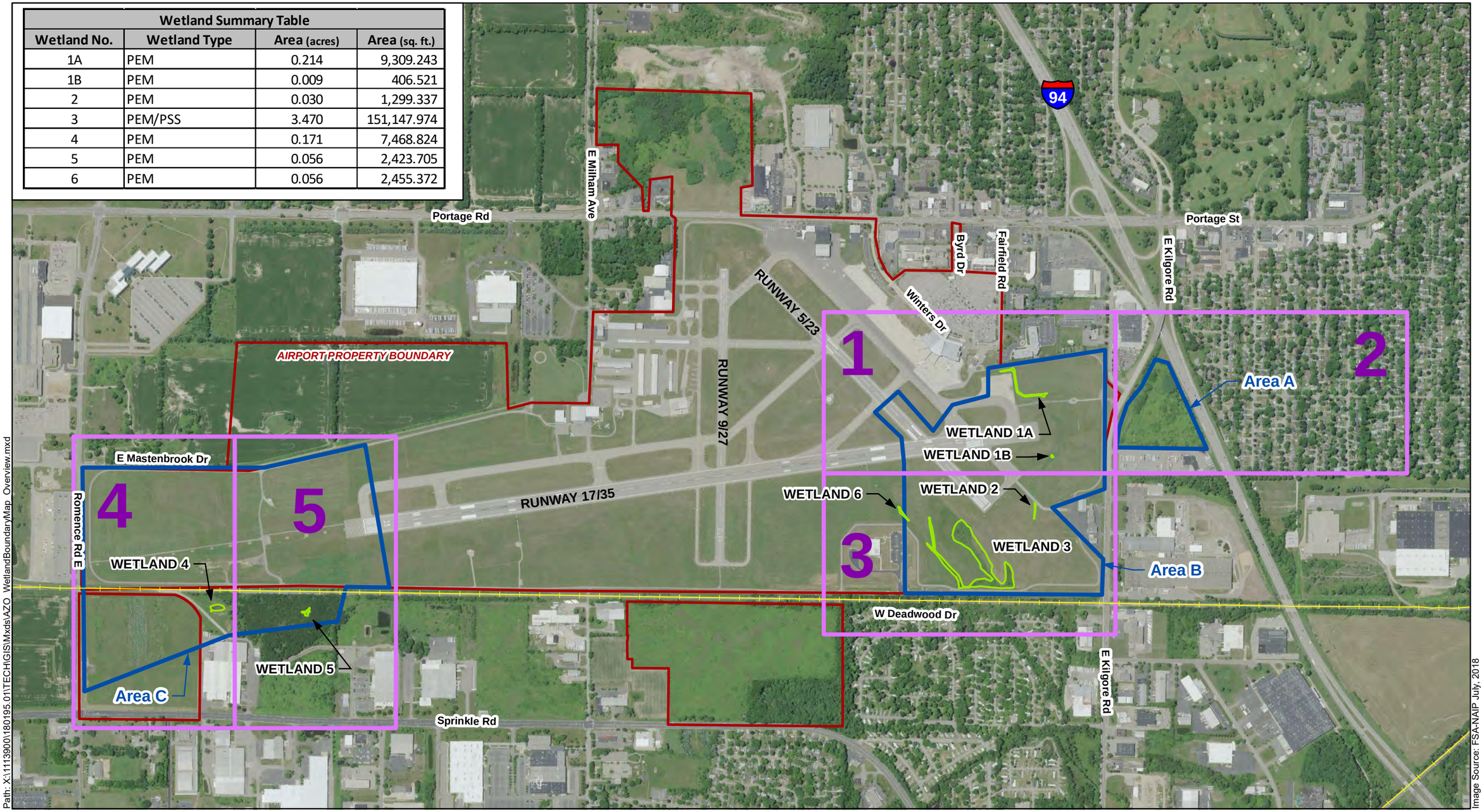

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Image Source: FSA-NAIP July, 2018

Wetland Boundary Overview Map

Kalamazoo/Battle Creek International Airport

Data Sources:

Airport Property Boundary: AZO Airport Layout Plan

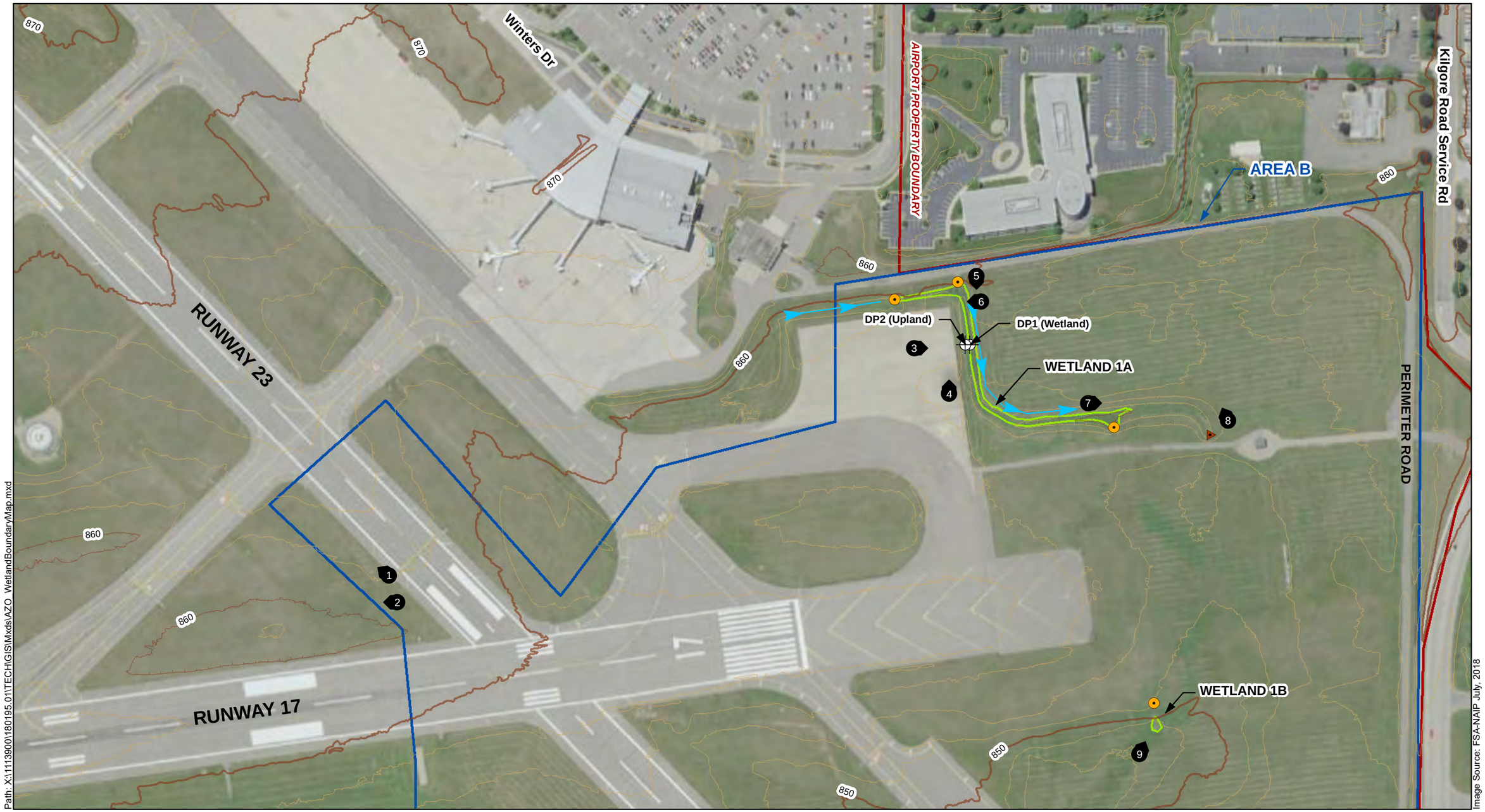
Legend

- Delineated Wetland
- Area of Interest (AOI)
- Railroads
- Approximate Airport Property Boundary
- Map Sheet

0 250 500 1,000 1,500 2,000 Feet

Project Location

T3S, R11W, Sections 1, 2, 11, and 12
T2S, R11W, Section 35
Kalamazoo/Battle Creek Intl Airport
City of Kalamazoo
Kalamazoo County, MI
LRR subregion: L
USACE Regional Supplement: NC/NE
Area of Interest = 246.4 acres
Field work conducted: June 6 - 7, 2019 and August 19 - 21, 2019



Path: X:\1113900\180195.01\TECH\GIS\Mxds\AZO_WetlandBoundaryMap.mxd

Image Source: FSA-NAIP July, 2018

Wetland Boundary Map

Kalamazoo/Battle Creek International Airport

Data Sources:

Airport Property Boundary: AZO Airport Layout Plan
Contours: 2-foot elevation contours created by Remote Sensing & GIS Research and Outreach Services, Michigan State University, 2015. Obtained from Kalamazoo County GIS.
Lakes: Obtained from Kalamazoo County GIS

Legend

- Delineated Wetland
- Data Point Location
- Photo Location with Number**
- Culvert
- Road Drain
- Vacated
- Area of Interest
- Area of Interest (Obscured)
- Approximate Airport Property Boundary
- Flow Direction
- Lake/Pond
- Railroads

Contour Type*

- Index
- Index Depression
- Intermediate
- Intermediate Depression

* Contour interval is 2 feet
** See Appendix H for Field Photographs

Map 1 of 5

N

0 50 100 200 300 400 Feet

Project Location

T3S, R11W, Sections 1, 2, 11, and 12
T2S, R11W, Section 35
Kalamazoo/Battle Creek Intl Airport
City of Kalamazoo
Kalamazoo County, MI
LRR subregion: L
USACE Regional Supplement: NC/NE
Area of Interest = 246.4 acres
Field work conducted: June 6 - 7, 2019 and August 19 - 21, 2019

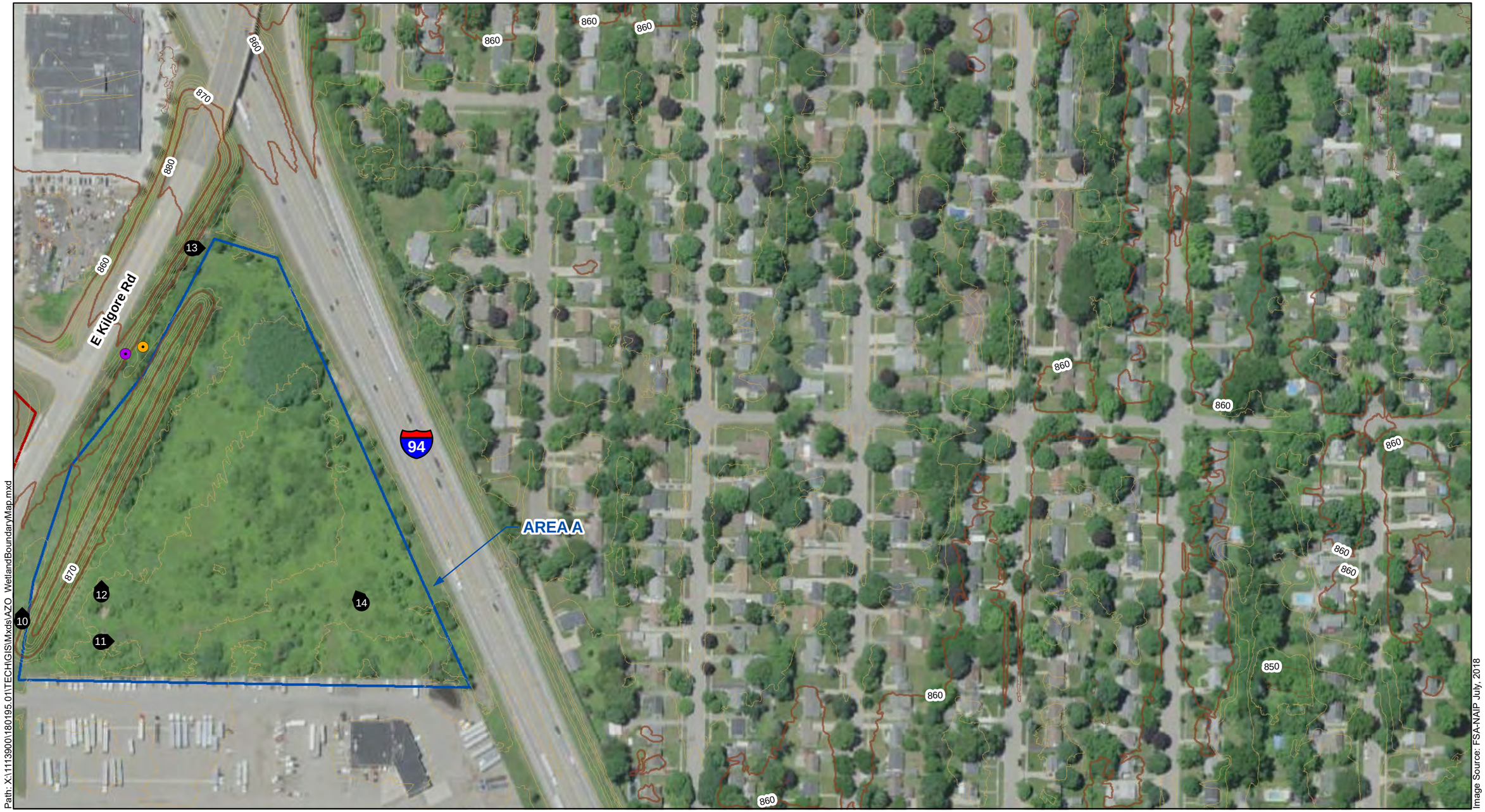


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Image Source: FSA-NAIP July, 2018

Wetland Boundary Map

Kalamazoo/Battle Creek International Airport

Data Sources:

Airport Property Boundary: AZO Airport Layout Plan
Contours: 2-foot elevation contours created by Remote Sensing & GIS Research and Outreach Services, Michigan State University, 2015. Obtained from Kalamazoo County GIS.
Lakes: Obtained from Kalamazoo County GIS

Legend

- Delineated Wetland
- Data Point Location
- Photo Location with Number**
- Culvert
- Road Drain
- Vacated
- Area of Interest
- Area of Interest (Obscured)
- Approximate Airport Property Boundary
- Flow Direction
- Lake/Pond
- Railroads

Contour Type*

- Index
- Index Depression
- Intermediate
- Intermediate Depression

* Contour interval is 2 feet
** See Appendix H for Field Photographs

Map 2 of 5

N

0 50 100 200 300 400 Feet

Project Location

T3S, R11W, Sections 1, 2, 11, and 12
T2S, R11W, Section 35
Kalamazoo/Battle Creek Intl Airport
City of Kalamazoo
Kalamazoo County, MI
LRR subregion: L
USACE Regional Supplement: NC/NE
Area of Interest = 246.4 acres
Field work conducted: June 6 - 7, 2019 and August 19 - 21, 2019

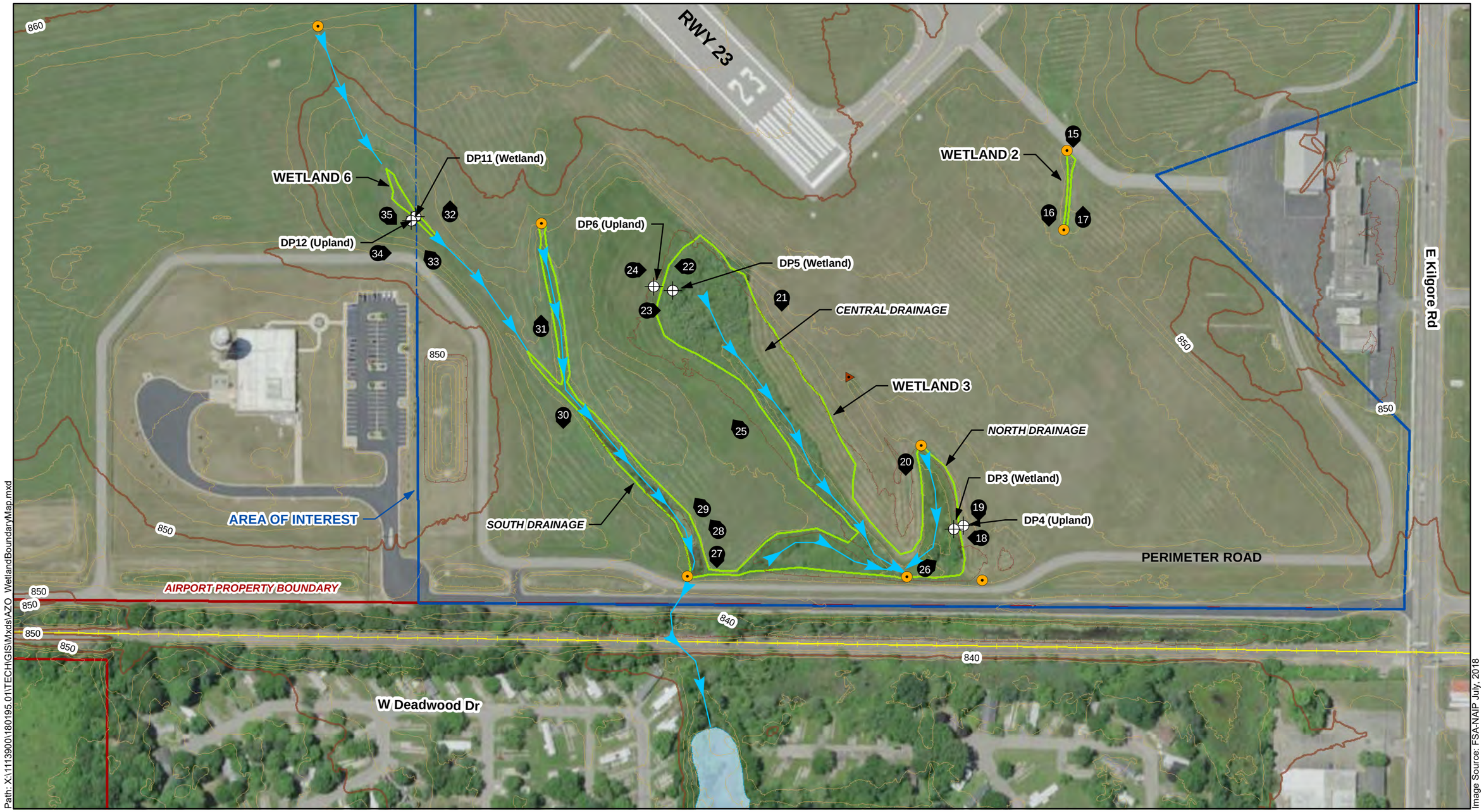

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Image Source: FSA-NAIP July, 2018

Wetland Boundary Map

Kalamazoo/Battle Creek International Airport

Data Sources:

Airport Property Boundary: AZO Airport Layout Plan
Contours: 2-foot elevation contours created by Remote Sensing & GIS Research and Outreach Services, Michigan State University, 2015. Obtained from Kalamazoo County GIS.
Lakes: Obtained from Kalamazoo County GIS

Legend

- Delineated Wetland
- Data Point Location
- Photo Location with Number**
- Culvert
- Road Drain
- Vacated
- Area of Interest
- Area of Interest (Obscured)
- Approximate Airport Property Boundary
- Flow Direction
- Lake/Pond
- Railroads

Contour Type*

- Index
- Index Depression
- Intermediate
- Intermediate Depression

* Contour interval is 2 feet
** See Appendix H for Field Photographs

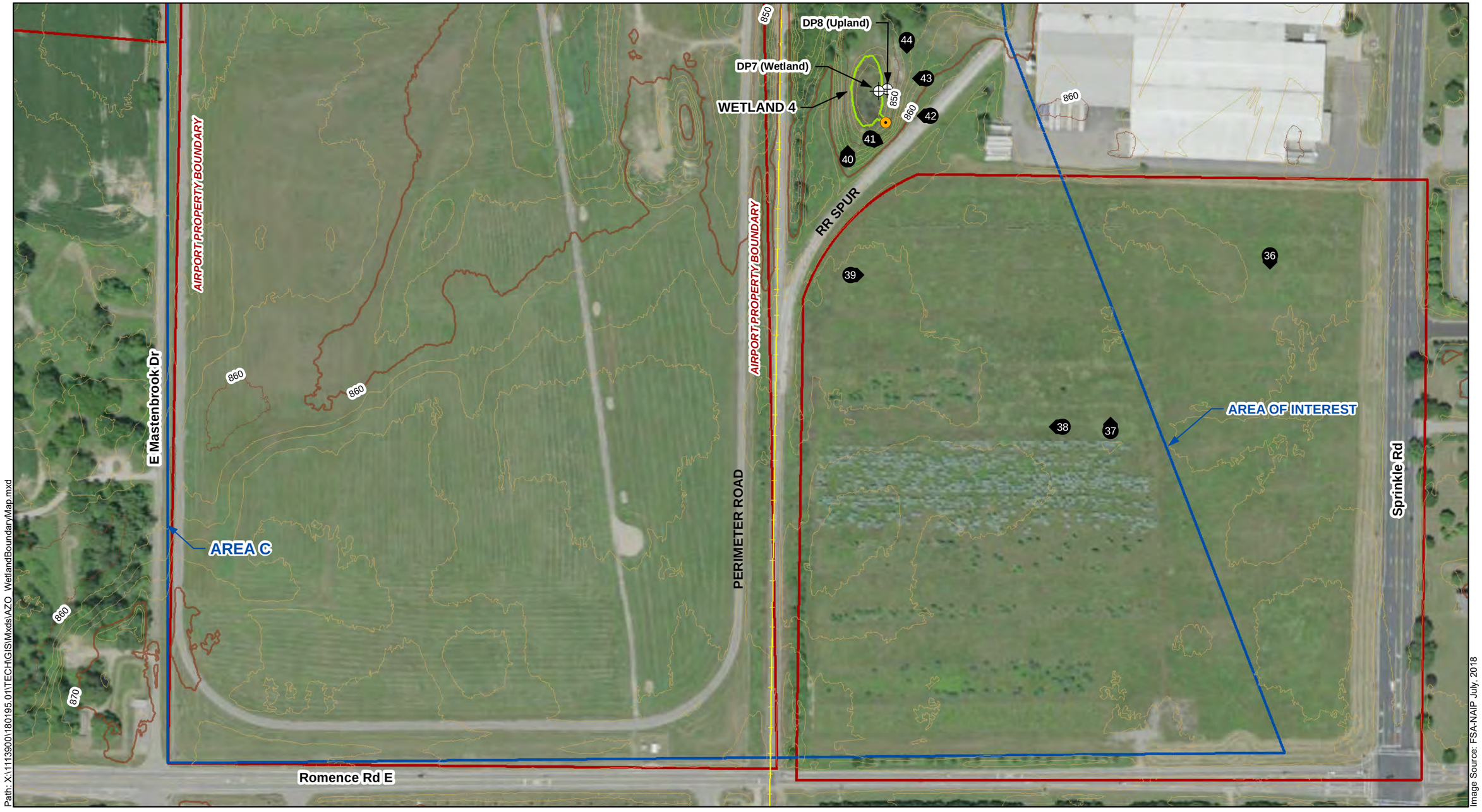
Map 3 of 5

N

0 50 100 200 300 400 Feet

Project Location

T3S, R11W, Sections 1, 2, 11, and 12
T2S, R11W, Section 35
Kalamazoo/Battle Creek Intl Airport
City of Kalamazoo
Kalamazoo County, MI
LRR subregion: L
USACE Regional Supplement: NC/NE
Area of Interest = 246.4 acres
Field work conducted: June 6 - 7, 2019 and August 19 - 21, 2019



Path: X:\1113900\180195.01\TECH\GIS\Mxds\AZO_WetlandBoundaryMap.mxd

Image Source: FSA-NAIP July, 2018

Wetland Boundary Map

Kalamazoo/Battle Creek International Airport

Data Sources:

Airport Property Boundary: AZO Airport Layout Plan
Contours: 2-foot elevation contours created by Remote Sensing & GIS Research and Outreach Services, Michigan State University, 2015. Obtained from Kalamazoo County GIS.
Lakes: Obtained from Kalamazoo County GIS

Legend

- Delineated Wetland
- Data Point Location
- Photo Location with Number**
- Culvert
- Road Drain
- Vacated
- Area of Interest
- Area of Interest (Obscured)
- Approximate Airport Property Boundary
- Flow Direction
- Lake/Pond
- Railroads

Contour Type*

- Index
- Index Depression
- Intermediate
- Intermediate Depression

* Contour interval is 2 feet
** See Appendix H for Field Photographs

Map 4 of 5

N

0 50 100 200 300 400 Feet

Project Location

T3S, R11W, Sections 1, 2, 11, and 12
T2S, R11W, Section 35
Kalamazoo/Battle Creek Intl Airport
City of Kalamazoo
Kalamazoo County, MI
LRR subregion: L
USACE Regional Supplement: NC/NE
Area of Interest = 246.4 acres
Field work conducted: June 6 - 7, 2019 and August 19 - 21, 2019

Path: X:\1113900\180195.01\TECH\GIS\Mxds\AZO_WetlandBoundaryMap.mxd

Image Source: FSA-NAIP July, 2018

Wetland Boundary Map

Kalamazoo/Battle Creek International Airport

Data Sources:

Airport Property Boundary: AZO Airport Layout Plan
Contours: 2-foot elevation contours created by Remote Sensing & GIS Research and Outreach Services, Michigan State University, 2015. Obtained from Kalamazoo County GIS.
Lakes: Obtained from Kalamazoo County GIS

Legend

- Delineated Wetland
- Data Point Location
- Photo Location with Number**
- Culvert
- Road Drain
- Vacated
- Area of Interest
- Area of Interest (Obscured)
- Approximate Airport Property Boundary
- Flow Direction
- Lake/Pond
- Railroads

Contour Type*

- Index
- Index Depression
- Intermediate
- Intermediate Depression

* Contour interval is 2 feet
** See Appendix H for Field Photographs

Map 5 of 5

N

0 50 100 200 300 400 Feet

Project Location

T3S, R11W, Sections 1, 2, 11, and 12
T2S, R11W, Section 35
Kalamazoo/Battle Creek Intl Airport
City of Kalamazoo
Kalamazoo County, MI
LRR subregion: L
USACE Regional Supplement: NC/NE
Area of Interest = 246.4 acres
Field work conducted: June 6 - 7, 2019 and August 19 - 21, 2019

Appendix G. Data Sheets

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Northcentral and Northeast Region
See ERDC/EL TR-07-24; the proponent agency is CECW-CO-R

Requirement Control Symbol EXEMPT (Authority: AR 335-15, paragraph 5-2a)

Project/Site: Kalamazoo Runway 17/35 Extension EA City/County: Kalamazoo Sampling Date: 06/07/2019

Applicant/Owner: Kalamazoo County State: MI Sampling Point: DP1 WET

Investigator(s): Brauna Hartzell & Tom Ward, Mead & Hunt, Inc. Section, Township, Range: Section 2, T3S, R11W

Landform (hillside, terrace, etc.): Ditch Bottom Local relief (concave, convex, none): Concave Slope %: <1%

Subregion (LRR or MLRA): LRR L, MLRA 98 Lat: 42.242305 Long: -85.553985 Datum: WGS84

Soil Map Unit Name: Urban land-Kalamazoo complex, 0 to 6 % slopes (UkB) (Non-hydric) NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation ____, Soil X, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** **Yes** X **No** ____
Hydric Soil Present?	Yes X	No ____	If yes, optional Wetland Site ID: 1
Wetland Hydrology Present?	Yes X	No ____	

Remarks: (Explain alternative procedures here or in a separate report.)
A WETS analysis of the antecedent precipitation indicates the hydrologic conditions on the site were wetter than normal range at the time of investigation. Datapoint was taken within a ditch constructed circa 2002.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- x Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- x Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- x Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- x Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- x FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No x	Depth (inches): ____
Water Table Present?	Yes ____	No x	Depth (inches): ____
Saturation Present? (includes capillary fringe)	Yes x	No ____	Depth (inches): 2

Wetland Hydrology Present? **Yes** X **No** ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Wetland hydrology is present and indicated. Saturation (A3) within sampling plot and seen on aerial photos taken in 2017 (Google Earth). Standing water within 15'.

VEGETATION – Use scientific names of plants.

Sampling Point: DP1 WET

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
Sapling/Shrub Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
Herb Stratum (Plot size: 5')			
1. *Phalaris arundinacea*	45	Yes	FACW
2. *Solidago gigantea*	30	Yes	FACW
3. *Carex vulpinoidea*	10	No	OBL
4. *Lyconus americanus*	10	No	OBL
5. *Cirsium arvense*	5	No	FACU
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	100 =Total Cover		
Woody Vine Stratum (Plot size: 30')			
1.			
2.			
3.			
4.			
	=Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	20	x 1 =	20
FACW species	75	x 2 =	150
FAC species	0	x 3 =	0
FACU species	5	x 4 =	20
UPL species	0	x 5 =	0
Column Totals:	100 (A)		190 (B)

Prevalence Index = B/A = 1.90

Hydrophytic Vegetation Indicators:

X 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)
Hydrophytic vegetation is present. Also present is Schoenoplectus tabernaemontani and Scirpus cyperinus. Approximately 10' separates the paired data points (DP2 upland) with about 1' change in elevation.

SOIL

Sampling Point DP1 WET

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 3/1	100					Loamy/Clayey	
6-12	10YR 3/1	95	7.5YR 4/4	5	C	M	Loamy/Clayey	Prominent redox concentrations
12-18	7.5YR 3/2	100					Loamy/Clayey	With small pebbles (fill?)

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ High Chroma Sands (S11) (**LRR K, L)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- x Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) (**LRR K, L**)
- ___ Red Parent Material (F21) **(MLRA 145)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Red Parent Material (F21) **(outside MLRA 145)**
- ___ Very Shallow Dark Surface (F22)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** ___

Remarks:

Hydric soils are present. Constructed ditch. Hydric soils indicator Redox Dark Surface (F6) is satisfied.

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U.S. Army Corps of Engineers **WETLAND DETERMINATION DATA SHEET – Northcentral and Northeast Region** See ERDC/EL TR-07-24; the proponent agency is CECW-CO-R	***Requirement Control Symbol EXEMPT (Authority: AR 335-15, paragraph 5-2a)***

Project/Site: Kalamazoo Runway 17/35 Extension EA City/County: Kalamazoo Sampling Date: 06/07/2019

Applicant/Owner: Kalamazoo County State: MI Sampling Point: DP2 UPL

Investigator(s): Brauna Hartzell & Tom Ward, Mead & Hunt, Inc. Section, Township, Range: Section 2, T3S, R11W

Landform (hillside, terrace, etc.): Midslope Local relief (concave, convex, none): Convex Slope %: < 1%

Subregion (LRR or MLRA): LRR L, MLRA 98 Lat: 42.242280 Long: -85.553986 Datum: WGS84

Soil Map Unit Name: Urban land-Kalamazoo complex, 0 to 6 percent slopes (UkB) (Non-hydric) NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation X, Soil X, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ____ No X

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	**Is the Sampled Area**
Hydric Soil Present?	Yes ____	No X	**within a Wetland?** **Yes** ____ **No** X
Wetland Hydrology Present?	Yes ____	No X	If yes, optional Wetland Site ID:

Remarks: (Explain alternative procedures here or in a separate report.)
A WETS analysis of the antecedent precipitation indicates the hydrologic conditions on the site were wetter than normal range at the time of investigation. Area mown regularly; 3' deep mown constructed ditch. Datapoint taken between ramp and constructed ditch.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): ____
Water Table Present?	Yes ____	No X	Depth (inches): ____
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): ____

Wetland Hydrology Present? **Yes** ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Wetland hydrology is neither present nor indicated.

VEGETATION – Use scientific names of plants.

Sampling Point: DP2 UPL

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
Sapling/Shrub Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
Herb Stratum (Plot size: 5')			
1. *Poa pratensis*	60	Yes	FACU
2. *Dactylis glomerata*	20	Yes	FACU
3. *Taraxacum officinale*	10	No	FACU
4. *Achillea millefolium*	10	No	FACU
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	100 =Total Cover		
Woody Vine Stratum (Plot size: 30')			
1.			
2.			
3.			
4.			
	=Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	100	x 4 =	400
UPL species	0	x 5 =	0
Column Totals:	100 (A)		400 (B)

Prevalence Index = B/A = 4.00

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ___ **No** X

Remarks: (Include photo numbers here or on a separate sheet.)
Hydrophytic vegetation is not present. Area mown regularly.

SOIL

Sampling Point DP2 UPL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-7	10YR 3/1	100					Loamy/Clayey	
7-16	7.5YR 3/2	100					Loamy/Clayey	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ High Chroma Sands (S11) (**LRR K, L)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) (**LRR K, L**)
- ___ Red Parent Material (F21) **(MLRA 145)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Red Parent Material (F21) **(outside MLRA 145)**
- ___ Very Shallow Dark Surface (F22)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** ___ **No** X

Remarks:

Hydric soils are not present. Does not meet hydric soils criteria.

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U.S. Army Corps of Engineers **WETLAND DETERMINATION DATA SHEET – Northcentral and Northeast Region** See ERDC/EL TR-07-24; the proponent agency is CECW-CO-R	***Requirement Control Symbol EXEMPT (Authority: AR 335-15, paragraph 5-2a)***

Project/Site: Kalamazoo Runway 17/35 Extension EA City/County: Kalamazoo Sampling Date: 08/19/2019

Applicant/Owner: Kalamazoo County State: MI Sampling Point: DP3 WET

Investigator(s): Brauna Hartzell, Mead & Hunt, Inc. Section, Township, Range: Section 1, T3S, R11W

Landform (hillside, terrace, etc.): Basin Local relief (concave, convex, none): Concave Slope %: <1%

Subregion (LRR or MLRA): LRR L, MLRA 98 Lat: 42.242298 Long: -85.546358 Datum: WGS84

Soil Map Unit Name: Adrian muck, 0 to 1 percent slopes (Ad) (Hydric) NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** **Yes** X **No** ____
Hydric Soil Present?	Yes X	No ____	If yes, optional Wetland Site ID: 3
Wetland Hydrology Present?	Yes X	No ____	

Remarks: (Explain alternative procedures here or in a separate report.)
A WETS analysis of the antecedent precipitation indicates the hydrologic conditions on the site were wetter than normal range at the time of investigation. Rain storm occurred the night before.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- x Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- x Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- x Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- x FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No ____	Depth (inches): 2
Water Table Present?	Yes ____	No X	Depth (inches): 20
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): ____

Wetland Hydrology Present? **Yes** X **No** ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Wetland hydrology is present and indicated. Rainstorm occurred the night before. Surface water is present within sampling area but water table is greater than 20 inches in depth and no saturation noted in the soil pit at depth. Saturation is visible on aerial imagery (C9) taken in 2017 (Google Earth).

VEGETATION – Use scientific names of plants.

Sampling Point: DP3 WET

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. *Salix nigra*	30	Yes	OBL
2.			
3.			
4.			
5.			
6.			
7.			
	30	=Total Cover	
Sapling/Shrub Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
		=Total Cover	
Herb Stratum (Plot size: 5')			
1. *Eleocharis palustris*	60	Yes	OBL
2. *Scirpus cyperinus*	10	No	OBL
3. *Cyperus strigosus*	10	No	FACW
4. *Juncus effusus*	10	No	OBL
5. *Persicaria hydropiper*	5	No	OBL
6. *Phalaris arundinacea*	5	No	FACW
7.			
8.			
9.			
10.			
11.			
12.			
	100	=Total Cover	
Woody Vine Stratum (Plot size: 30')			
1.			
2.			
3.			
4.			
		=Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	115	x 1 =	115
FACW species	15	x 2 =	30
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	130 (A)		145 (B)

Prevalence Index = B/A = 1.12

Hydrophytic Vegetation Indicators:

X 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)
Hydrophytic vegetation is present. Also present are Lythrum salicaria, Typha spp., Apocynum cannabinum, Carex vulpinoidea, Carex scoparia, and Lycopus americanus.

SOIL

Sampling Point DP3 WET

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR 3/1	100					Loamy/Clayey	
5-8	10YR 3/1	90	7.5YR 4/6	10	C	M	Loamy/Clayey	Prominent redox concentrations
8-20	7.5YR 4/2	75	7.5YR 4/6	20	C	M	Loamy/Clayey	Prominent redox concentrations
			7.5YR 5/1	5	D	M		Faint redox concentrations

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- x Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ High Chroma Sands (S11) (**LRR K, L)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- x Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) (**LRR K, L**)
- ___ Red Parent Material (F21) **(MLRA 145)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Red Parent Material (F21) **(outside MLRA 145)**
- ___ Very Shallow Dark Surface (F22)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** ___

Remarks:

Hydric soils are present. Hydric soils indicators Depleted Below Dark Surface (A11) and Depleted Matrix (F3) are satisfied.

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U.S. Army Corps of Engineers **WETLAND DETERMINATION DATA SHEET – Northcentral and Northeast Region** See ERDC/EL TR-07-24; the proponent agency is CECW-CO-R	***Requirement Control Symbol EXEMPT (Authority: AR 335-15, paragraph 5-2a)***

Project/Site: Kalamazoo Runway 17/35 Extension EA City/County: Kalamazoo Sampling Date: 08/19/2019

Applicant/Owner: Kalamazoo County State: MI Sampling Point: DP4 UPL

Investigator(s): Brauna Hartzell, Mead & Hunt, Inc. Section, Township, Range: Section 1, T3S, R11W

Landform (hillside, terrace, etc.): Terrace Local relief (concave, convex, none): Convex Slope %: 3%

Subregion (LRR or MLRA): LRR L, MLRA 98 Lat: 42.242352 Long: -85.546384 Datum: WGS84

Soil Map Unit Name: Adrian muck, 0 to 1 percent slopes (Ad) (Hydric) NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation X, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	**Is the Sampled Area**
Hydric Soil Present?	Yes ____	No X	**within a Wetland?** **Yes** ____ **No** X
Wetland Hydrology Present?	Yes ____	No X	If yes, optional Wetland Site ID: ____

Remarks: (Explain alternative procedures here or in a separate report.)
A WETS analysis of the antecedent precipitation indicates the hydrologic conditions on the site were wetter than normal range at the time of investigation. Area is mown regularly.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): ____
Water Table Present?	Yes ____	No X	Depth (inches): ____
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): ____

Wetland Hydrology Present? **Yes** ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Wetland hydrology is neither present nor indicated.

VEGETATION – Use scientific names of plants.

Sampling Point: DP4 UPL

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
Sapling/Shrub Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
Herb Stratum (Plot size: 5')			
1. *Poa pratensis*	85	Yes	FACU
2. *Elymus repens*	10	No	FACU
3. *Prunella vulgaris*	5	No	FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	100 =Total Cover		
Woody Vine Stratum (Plot size: 30')			
1.			
2.			
3.			
4.			
	=Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	5	x 3 =	15
FACU species	95	x 4 =	380
UPL species	0	x 5 =	0
Column Totals:	100 (A)		395 (B)

Prevalence Index = B/A = 3.95

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ___ **No** X

Remarks: (Include photo numbers here or on a separate sheet.)
Hydrophytic vegetation is not present. Approximately 25' separate, with ~4' in elevation. Significant topographic change of ~3' at boundary.

SOIL

Sampling Point DP4 UPL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 3/3	100					Loamy/Clayey	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ High Chroma Sands (S11) (**LRR K, L)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) (**LRR K, L**)
- ___ Red Parent Material (F21) **(MLRA 145)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Red Parent Material (F21) **(outside MLRA 145)**
- ___ Very Shallow Dark Surface (F22)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** ___ **No** X

Remarks:

Hydric soils are not present. Does not meet hydric soils criteria.

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U.S. Army Corps of Engineers **WETLAND DETERMINATION DATA SHEET – Northcentral and Northeast Region** See ERDC/EL TR-07-24; the proponent agency is CECW-CO-R	***Requirement Control Symbol EXEMPT (Authority: AR 335-15, paragraph 5-2a)***

Project/Site: Kalamazoo Runway 17/35 Extension EA City/County: Kalamazoo Sampling Date: 08/19/2019

Applicant/Owner: Kalamazoo County State: MI Sampling Point: DP 5 WET

Investigator(s): Brauna Hartzell, Mead & Hunt, Inc. Section, Township, Range: Section 1, T3S, R11W

Landform (hillside, terrace, etc.): Basin Local relief (concave, convex, none): Concave Slope %: < 1%

Subregion (LRR or MLRA): LRR L, MLRA 98 Lat: 42.240669 Long: -85.548164 Datum: WGS84

Soil Map Unit Name: Urban land-Kalamazoo complex, 0 to 6 percent slopes (UkB) (Non-hydric) NWI classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** **Yes** X **No** ____
Hydric Soil Present?	Yes X	No ____	If yes, optional Wetland Site ID: 3
Wetland Hydrology Present?	Yes X	No ____	

Remarks: (Explain alternative procedures here or in a separate report.)
A WETS analysis of the antecedent precipitation indicates the hydrologic conditions on the site were wetter than normal range at the time of investigation.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

___ Surface Water (A1)	___ Water-Stained Leaves (B9)	___ Surface Soil Cracks (B6)
x High Water Table (A2)	___ Aquatic Fauna (B13)	___ Drainage Patterns (B10)
x Saturation (A3)	___ Marl Deposits (B15)	___ Moss Trim Lines (B16)
___ Water Marks (B1)	___ Hydrogen Sulfide Odor (C1)	___ Dry-Season Water Table (C2)
___ Sediment Deposits (B2)	___ Oxidized Rhizospheres on Living Roots (C3)	x Saturation Visible on Aerial Imagery (C9)
___ Drift Deposits (B3)	___ Presence of Reduced Iron (C4)	___ Stunted or Stressed Plants (D1)
___ Algal Mat or Crust (B4)	___ Recent Iron Reduction in Tilled Soils (C6)	x Geomorphic Position (D2)
___ Iron Deposits (B5)	___ Thin Muck Surface (C7)	___ Shallow Aquitard (D3)
___ Inundation Visible on Aerial Imagery (B7)	___ Other (Explain in Remarks)	___ Microtopographic Relief (D4)
___ Sparsely Vegetated Concave Surface (B8)		x FAC-Neutral Test (D5)

Secondary Indicators (minimum of two required)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): ____
Water Table Present?	Yes X	No ____	Depth (inches): 10
Saturation Present? (includes capillary fringe)	Yes X	No ____	Depth (inches): 6

Wetland Hydrology Present? **Yes** X **No** ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Wetland hydrology is present and indicated. Saturation (A3) within sampling plot and seen on aerial photos taken in 2017 (Google Earth).

VEGETATION – Use scientific names of plants.

Sampling Point: DP 5 WET

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. ***Salix nigra***	25	Yes	OBL
2. ***Salix X fragilis***	25	Yes	FAC
3.			
4.			
5.			
6.			
7.			
	50	=Total Cover	
Sapling/Shrub Stratum (Plot size: 15')			
1. ***Salix nigra***	40	Yes	OBL
2. ***Cornus alba***	25	Yes	FACW
3.			
4.			
5.			
6.			
7.			
	65	=Total Cover	
Herb Stratum (Plot size: 5')			
1. ***Phalaris arundinacea***	40	Yes	FACW
2. ***Symphotrichum lanceolatum***	25	Yes	FACW
3. ***Geum aleppicum***	20	Yes	FAC
4. ***Carex stipata***	5	No	OBL
5. ***Scirpus cyperinus***	5	No	OBL
6. ***Carex vulpinoidea***	5	No	OBL
7.			
8.			
9.			
10.			
11.			
12.			
	100	=Total Cover	
Woody Vine Stratum (Plot size: 30')			
1. ***Vitis riparia***	10	Yes	FAC
2.			
3.			
4.			
	10	=Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 8 (A)

Total Number of Dominant Species Across All Strata: 8 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	80	x 1 =	80
FACW species	90	x 2 =	180
FAC species	55	x 3 =	165
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	225 (A)		425 (B)

Prevalence Index = B/A = 1.89

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)
Hydrophytic vegetation is present. Also present is Typha angustifolia.

SOIL

Sampling Point: DP 5 WET

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 3/2	100					Loamy/Clayey	Some gravel
4-16	10YR 3/2	95	7.5YR 4/6	5	C	M	Loamy/Clayey	Prominent redox concentrations

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ High Chroma Sands (S11) (**LRR K, L)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- x Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) (**LRR K, L**)
- ___ Red Parent Material (F21) **(MLRA 145)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Red Parent Material (F21) **(outside MLRA 145)**
- ___ Very Shallow Dark Surface (F22)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** ___

Remarks:

Hydric soils are present. Hydric soils indicator Redox Dark Surface (F6) is satisfied.

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U.S. Army Corps of Engineers **WETLAND DETERMINATION DATA SHEET – Northcentral and Northeast Region** See ERDC/EL TR-07-24; the proponent agency is CECW-CO-R	***Requirement Control Symbol EXEMPT (Authority: AR 335-15, paragraph 5-2a)***

Project/Site: Kalamazoo Runway 17/35 Extension EA City/County: Kalamazoo Sampling Date: 08/19/2019

Applicant/Owner: Kalamazoo County State: MI Sampling Point: DP6 UPL

Investigator(s): Brauna Hartzell, Mead & Hunt, Inc. Section, Township, Range: Section 1, T3S, R11W

Landform (hillside, terrace, etc.): Flat Local relief (concave, convex, none): Convex Slope %: < 1%

Subregion (LRR or MLRA): LRR L, MLRA 98 Lat: 42.240561 Long: -85.548194 Datum: WGS84

Soil Map Unit Name: Urban land-Kalamazoo complex, 0 to 6 percent slopes (UkB) (Non-hydric) NWI classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation X, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	**Is the Sampled Area**
Hydric Soil Present?	Yes X	No ____	**within a Wetland?** **Yes** ____ **No** X
Wetland Hydrology Present?	Yes ____	No X	If yes, optional Wetland Site ID: ____

Remarks: (Explain alternative procedures here or in a separate report.)
A WETS analysis of the antecedent precipitation indicates the hydrologic conditions on the site were wetter than normal range at the time of investigation. Area is mown regularly.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): ____
Water Table Present?	Yes ____	No X	Depth (inches): ____
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): ____

Wetland Hydrology Present? **Yes** ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Wetland hydrology is neither present nor indicated. Rain storm occurred previous night.

VEGETATION – Use scientific names of plants.

Sampling Point: DP6 UPL

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
Sapling/Shrub Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
Herb Stratum (Plot size: 5')			
1. *Poa pratensis*	60	Yes	FACU
2. *Elymus repens*	20	Yes	FACU
3. *Plantago lanceolata*	10	No	FACU
4. *Taraxacum officinale*	5	No	FACU
5. *Trifolium repens*	5	No	FACU
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	100 =Total Cover		
Woody Vine Stratum (Plot size: 30')			
1.			
2.			
3.			
4.			
	=Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	100	x 4 =	400
UPL species	0	x 5 =	0
Column Totals:	100 (A)		400 (B)

Prevalence Index = B/A = 4.00

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ___ **No** X

Remarks: (Include photo numbers here or on a separate sheet.)
Hydrophytic vegetation is not present. Fairly flat area sloping towards shrub line. Approximately 30' separates and ~1' is in elevation.

SOIL

Sampling Point DP6 UPL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR 3/2	100					Loamy/Clayey	With small pebbles/gravel
5-10	10YR 3/2	95	7.5YR 4/6	5	C	M	Loamy/Clayey	Prominent redox concentrations
10-18	10YR 3/2	90	7.5YR 4/6	10	C	M	Loamy/Clayey	Prominent redox concentrations

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ High Chroma Sands (S11) (**LRR K, L)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- x Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) (**LRR K, L**)
- ___ Red Parent Material (F21) **(MLRA 145)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Red Parent Material (F21) **(outside MLRA 145)**
- ___ Very Shallow Dark Surface (F22)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** ___

Remarks:

Hydric soils are present. Hydric soils indicator Redox Dark surface (F6) is satisfied.

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U.S. Army Corps of Engineers **WETLAND DETERMINATION DATA SHEET – Northcentral and Northeast Region** See ERDC/EL TR-07-24; the proponent agency is CECW-CO-R	***Requirement Control Symbol EXEMPT (Authority: AR 335-15, paragraph 5-2a)***

Project/Site: Kalamazoo Runway 17/35 Extension EA City/County: Kalamazoo Sampling Date: 08/20/2019

Applicant/Owner: Kalamazoo County State: MI Sampling Point: DP 7 WET

Investigator(s): Brauna Hartzell, Mead & Hunt, Inc. Section, Township, Range: Section 12, T3S, R11W

Landform (hillside, terrace, etc.): Basin Local relief (concave, convex, none): Concave Slope %: <1%

Subregion (LRR or MLRA): LRR L, MLRA 98 Lat: 42.219578 Long: -85.544716 Datum: WGS84

Soil Map Unit Name: Kalamazoo loam, 2 to 6 percent slopes (KaB) (Non-hydric) NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation ____, Soil X, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** **Yes** X **No** ____
Hydric Soil Present?	Yes X	No ____	If yes, optional Wetland Site ID: 4
Wetland Hydrology Present?	Yes X	No ____	

Remarks: (Explain alternative procedures here or in a separate report.)
A WETS analysis of the antecedent precipitation indicates the hydrologic conditions on the site were wetter than normal range at the time of investigation. Likely a constructed storm basin with culvert inflow from southeast.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- x Surface Water (A1)
- x High Water Table (A2)
- x Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- x Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- x Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- x FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No ____	Depth (inches): 2
Water Table Present?	Yes X	No ____	Depth (inches): 2
Saturation Present? (includes capillary fringe)	Yes X	No ____	Depth (inches): 0

Wetland Hydrology Present? **Yes** X **No** ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Wetland hydrology is present and indicated. Saturation (A3) within sampling plot and seen on aerial photos taken in 2017 (Google Earth).

VEGETATION – Use scientific names of plants.

Sampling Point: DP 7 WET

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
Sapling/Shrub Stratum (Plot size: 15')			
1. *Salix interior*	20	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
	20 =Total Cover		
Herb Stratum (Plot size: 5')			
1. *Typha angustifolia*	42	Yes	OBL
2. *Eleocharis palustris*	30	Yes	OBL
3. *Salix interior*	15	No	FACW
4. *Phalaris arundinacea*	2	No	OBL
5. *Rhynchospora capitellata*	1	No	FAC
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	90 =Total Cover		
Woody Vine Stratum (Plot size: 30')			
1.			
2.			
3.			
4.			
	=Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	74	x 1 =	74
FACW species	35	x 2 =	70
FAC species	1	x 3 =	3
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	110 (A)		147 (B)

Prevalence Index = B/A = 1.34

Hydrophytic Vegetation Indicators:

X 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)
Hydrophytic vegetation is present. Also present are Schoenoplectus tabernaemontani, Scirpus cyperinus, Carex hystericina, and some algal growth.

SOIL

Sampling Point DP 7 WET

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-3	10YR 3/1	100					Loamy/Clayey	
3-8	10YR 4/2	97	10YR 5/6	3	C	M	Sandy	Prominent redox concentrations
8-18	10YR 5/2	95	10YR 5/6	2	C	M	Sandy	Prominent redox concentrations
			5YR 4/6	3	C	M		Prominent redox concentrations

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- x Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- x Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ High Chroma Sands (S11) (**LRR K, L)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- x Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) (**LRR K, L**)
- ___ Red Parent Material (F21) **(MLRA 145)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Red Parent Material (F21) **(outside MLRA 145)**
- ___ Very Shallow Dark Surface (F22)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** ___

Remarks:

Hydric soils are present. Hydric soils indicators Depleted Below Dark Surface (A11), Sandy Redox (S5), and Depleted Matrix (F3) are satisfied.

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U.S. Army Corps of Engineers **WETLAND DETERMINATION DATA SHEET – Northcentral and Northeast Region** See ERDC/EL TR-07-24; the proponent agency is CECW-CO-R	***Requirement Control Symbol*** ***EXEMPT*** ***(Authority: AR 335-15, paragraph 5-2a)***

Project/Site: Kalamazoo Runway 17/35 Extension EA City/County: Kalamazoo Sampling Date: 08/20/2019

Applicant/Owner: Kalamazoo County State: MI Sampling Point: DP8 UPL

Investigator(s): Brauna Hartzell, Mead & Hunt, Inc. Section, Township, Range: Section 12, T3S, R11W

Landform (hillside, terrace, etc.): Midslope Local relief (concave, convex, none): Convex Slope %: 30%

Subregion (LRR or MLRA): LRR L, MLRA 98 Lat: 42.219592 Long: -85.544649 Datum: WGS84

Soil Map Unit Name: Kalamazoo loam, 2 to 6 percent slopes (KaB) (Non-hydric) NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation ____, Soil X, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	**Is the Sampled Area**
Hydric Soil Present?	Yes X	No ____	**within a Wetland?** **Yes** ____ **No** X
Wetland Hydrology Present?	Yes ____	No X	If yes, optional Wetland Site ID: ____

Remarks: (Explain alternative procedures here or in a separate report.)
A WETS analysis of the antecedent precipitation indicates the hydrologic conditions on the site were wetter than normal range at the time of investigation. Likely impacted by construction of detention area.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): ____
Water Table Present?	Yes ____	No X	Depth (inches): ____
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): ____

Wetland Hydrology Present? **Yes** ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Wetland hydrology is neither present nor indicated. Datapoint is approximately 5' higher in elevation than paired wetland point (DP7) and approximately 20' separates the two points.

VEGETATION – Use scientific names of plants.

Sampling Point: DP8 UPL

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
Sapling/Shrub Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
Herb Stratum (Plot size: 5')			
1. *Poa pratensis*	30	Yes	FACU
2. *Centaurea maculosa*	20	Yes	UPL
3. *Achillea millefolium*	10	Yes	FACU
4. *Elymus repens*	10	Yes	FACU
5. *Medicago lupulina*	10	Yes	FACU
6. *Solidago canadensis*	5	No	FACU
7. *Bromus inermis*	5	No	UPL
8. *Daucus carota*	5	No	UPL
9. *Plantago lanceolata*	5	No	FACU
10.			
11.			
12.			
	100 =Total Cover		
Woody Vine Stratum (Plot size: 30')			
1.			
2.			
3.			
4.			
	=Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	70	x 4 =	280
UPL species	30	x 5 =	150
Column Totals:	100 (A)		430 (B)

Prevalence Index = B/A = 4.30

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ___ **No** X

Remarks: (Include photo numbers here or on a separate sheet.)
Hydrophytic vegetation is not present.

SOIL

Sampling Point DP8 UPL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-3	10YR 3/1	100					Loamy/Clayey	
3-6	10YR 3/2	95	10YR 4/6	5	C	M	Sandy	Prominent redox concentrations
6-11	10YR 3/2	95	5YR 4/6	5	C	M	Sandy	Prominent redox concentrations
11-18	10YR 5/4	100					Sandy	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- x Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ High Chroma Sands (S11) (**LRR K, L)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) (**LRR K, L**)
- ___ Red Parent Material (F21) **(MLRA 145)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Red Parent Material (F21) **(outside MLRA 145)**
- ___ Very Shallow Dark Surface (F22)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ___

Depth (inches): ___

Hydric Soil Present? **Yes** X **No** ___

Remarks:

Hydric soils are present. Hydric soils indicator Sandy Redox (S5) is satisfied.

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U.S. Army Corps of Engineers **WETLAND DETERMINATION DATA SHEET – Northcentral and Northeast Region** See ERDC/EL TR-07-24; the proponent agency is CECW-CO-R	***Requirement Control Symbol EXEMPT (Authority: AR 335-15, paragraph 5-2a)***

Project/Site: Kalamazoo Runway 17/35 Extension EA City/County: Kalamazoo Sampling Date: 08/20/2019

Applicant/Owner: Kalamazoo County State: MI Sampling Point: DP9 WET

Investigator(s): Brauna Hartzell, Mead & Hunt, Inc. Section, Township, Range: Section 12, T3S, R11W

Landform (hillside, terrace, etc.): Basin Local relief (concave, convex, none): Concave Slope %: <1%

Subregion (LRR or MLRA): LRR L, MLRA 98 Lat: 42.222163 Long: -85.544724 Datum: WGS84

Soil Map Unit Name: Adrian muck, 0 to 1 percent slopes (Ad) (Hydric) NWI classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** **Yes** X **No** ____
Hydric Soil Present?	Yes X	No ____	If yes, optional Wetland Site ID: 5
Wetland Hydrology Present?	Yes X	No ____	

Remarks: (Explain alternative procedures here or in a separate report.)
A WETS analysis of the antecedent precipitation indicates the hydrologic conditions on the site were wetter than normal range at the time of investigation.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- x Stunted or Stressed Plants (D1)
- x Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): ____
Water Table Present?	Yes ____	No X	Depth (inches): ____
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): ____

Wetland Hydrology Present? **Yes** X **No** ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Wetland hydrology is indicated; likely remnant of former wooded wetland. Dead standing cherry trees within basin. Data point taken in shallow basin.

VEGETATION – Use scientific names of plants.

Sampling Point: DP9 WET

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
Sapling/Shrub Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
Herb Stratum (Plot size: 5')			
1. ***Persicaria maculosa***	80	Yes	FAC
2. ***Phytolacca americana***	15	No	FACU
3. ***Frangula alnus***	5	No	FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	100 =Total Cover		
Woody Vine Stratum (Plot size: 30')			
1.			
2.			
3.			
4.			
	=Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	85	x 3 =	255
FACU species	15	x 4 =	60
UPL species	0	x 5 =	0
Column Totals:	100 (A)		315 (B)

Prevalence Index = B/A = 3.15

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

_X_ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)
Hydrophytic vegetation is present. Dead standing cherry trees (Prunus serotina).

SOIL

Sampling Point DP9 WET

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	N 2.5/	100					Loamy/Clayey	
4-20	N 2.5/	95	2.5YR 3/4	5	C	M	Loamy/Clayey	Prominent redox concentrations

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ High Chroma Sands (S11) (**LRR K, L)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- x Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- x Redox Depressions (F8)
- ___ Marl (F10) (**LRR K, L**)
- ___ Red Parent Material (F21) **(MLRA 145)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Red Parent Material (F21) **(outside MLRA 145)**
- ___ Very Shallow Dark Surface (F22)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** ___

Remarks:

Hydric soils are present. Hydric soils indicators Redox Dark surface (F6) and Redox Depressions (F8) are satisfied. Soils are very dry and crumbly. Data point taken in a shallow closed basin.

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U.S. Army Corps of Engineers **WETLAND DETERMINATION DATA SHEET – Northcentral and Northeast Region** See ERDC/EL TR-07-24; the proponent agency is CECW-CO-R	***Requirement Control Symbol EXEMPT (Authority: AR 335-15, paragraph 5-2a)***

Project/Site: Kalamazoo Runway 17/35 Extension EA City/County: Kalamazoo Sampling Date: 08/20/2019

Applicant/Owner: Kalamazoo County State: MI Sampling Point: DP10 UPL

Investigator(s): Brauna Hartzell, Mead & Hunt, Inc. Section, Township, Range: Section 12, T3S, R11W

Landform (hillside, terrace, etc.): Terrace Local relief (concave, convex, none): None Slope %: <1%

Subregion (LRR or MLRA): LRR L, MLRA 98 Lat: 42.222129 Long: -85.544810 Datum: WGS84

Soil Map Unit Name: Adrian muck, 0 to 1 percent slopes (Ad) (Hydric) NWI classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	**Is the Sampled Area**
Hydric Soil Present?	Yes X	No ____	**within a Wetland?** **Yes** ____ **No** X
Wetland Hydrology Present?	Yes ____	No X	If yes, optional Wetland Site ID: ____

Remarks: (Explain alternative procedures here or in a separate report.)
A WETS analysis of the antecedent precipitation indicates the hydrologic conditions on the site were wetter than normal range at the time of investigation. Water sources cut off by railroad and commercial construction to the east?

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): ____
Water Table Present?	Yes ____	No X	Depth (inches): ____
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): ____

Wetland Hydrology Present? **Yes** ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Wetland hydrology is neither present nor indicated. Datapoint approximately 2' higher in elevation than paired wetland point (DP9).

VEGETATION – Use scientific names of plants.

Sampling Point: DP10 UPL

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. *Prunus avium*	50	Yes	FACU
2. *Prunus serotina*	10	No	FACU
3.			
4.			
5.			
6.			
7.			
	60	=Total Cover	
Sapling/Shrub Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
		=Total Cover	
Herb Stratum (Plot size: 5')			
1. *Phytolacca americana*	75	Yes	FACU
2. *Persicaria macuolsa*	5	No	FAC
3. *Setaria faberi*	5	No	FACU
4. *Frangula alnus*	3	No	FAC
5. *Pilea pumila*	2	No	FACW
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	90	=Total Cover	
Woody Vine Stratum (Plot size: 30')			
1.			
2.			
3.			
4.			
		=Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	2	x 2 =	4
FAC species	8	x 3 =	24
FACU species	140	x 4 =	560
UPL species	0	x 5 =	0
Column Totals:	150 (A)		588 (B)

Prevalence Index = B/A = 3.92

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ___ **No** X

Remarks: (Include photo numbers here or on a separate sheet.)
Hydrophytic vegetation is not present. Some bare soil due to shading.

SOIL

Sampling Point DP10 UPL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	N 2.5/	100					Loamy/Clayey	humus
6-18	N 2.5/	95	2.5YR 3/4	5	C	PL/M	Loamy/Clayey	Prominent redox concentrations

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ High Chroma Sands (S11) (**LRR K, L)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- x Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) (**LRR K, L**)
- ___ Red Parent Material (F21) **(MLRA 145)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Red Parent Material (F21) **(outside MLRA 145)**
- ___ Very Shallow Dark Surface (F22)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** ___

Remarks:

Hydric soils are present. Hydric soils indicator Redox Dark surface (F6) is satisfied. Very dry and crumbly soil. Redox features in pore linings not on living roots. High organic content soil.

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U.S. Army Corps of Engineers **WETLAND DETERMINATION DATA SHEET – Northcentral and Northeast Region** See ERDC/EL TR-07-24; the proponent agency is CECW-CO-R	***Requirement Control Symbol EXEMPT (Authority: AR 335-15, paragraph 5-2a)***

Project/Site: Kalamazoo Runway 17/35 Extension EA City/County: Kalamazoo Sampling Date: 08/21/2019

Applicant/Owner: Kalamazoo County State: MI Sampling Point: DP 11 WET

Investigator(s): Brauna Hartzell, Mead & Hunt, Inc. Section, Township, Range: Section 1, T3S, R11W

Landform (hillside, terrace, etc.): Shallow basin/swale Local relief (concave, convex, none): Concave Slope %: <1%

Subregion (LRR or MLRA): LRR L, MLRA 98 Lat: 42.239190 Long: -85.548707 Datum: WGS84

Soil Map Unit Name: Urban land-Kalamazoo complex, 0 to 6 percent slopes (UkB) (Non-hydric) NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation X, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** **Yes** X **No** ____
Hydric Soil Present?	Yes X	No ____	If yes, optional Wetland Site ID: 6
Wetland Hydrology Present?	Yes X	No ____	

Remarks: (Explain alternative procedures here or in a separate report.)
A WETS analysis of the antecedent precipitation indicates the hydrologic conditions on the site were wetter than normal range at the time of investigation. Area is mown regularly.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- x Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- x FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): ____
Water Table Present?	Yes ____	No X	Depth (inches): ____
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): ____

Wetland Hydrology Present? **Yes** X **No** ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Wetland hydrology is indicated. At previous field visit in June, standing water was observed in this swale.

VEGETATION – Use scientific names of plants.

Sampling Point: DP 11 WET

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
Sapling/Shrub Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
Herb Stratum (Plot size: 5')			
1. *Phalaris arundinacea*	43	Yes	FACW
2. *Persicaria maculosa*	20	Yes	FAC
3. *Cyperus strigosus*	20	Yes	FACW
4. *Symphyotrichum lateriflorum*	15	No	FAC
5. *Asclepias syriaca*	2	No	UPL
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	100 =Total Cover		
Woody Vine Stratum (Plot size: 30')			
1.			
2.			
3.			
4.			
	=Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	63	x 2 =	126
FAC species	35	x 3 =	105
FACU species	0	x 4 =	0
UPL species	2	x 5 =	10
Column Totals:	100 (A)		241 (B)

Prevalence Index = B/A = 2.41

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)
Hydrophytic vegetation is present. Also present are Juncus effusus and Rumex crispus. Due to height of vegetation, difficult to identifiy all species. Datapoint is taken in shallow swale that drains a culvert further west.

SOIL

Sampling Point DP 11 WET

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR 3/2	100					Loamy/Clayey	
5-14	10YR 3/1	95	5YR 3/4	5	C	M	Loamy/Clayey	Prominent redox concentrations
14-18	10YR 3/1	100					Loamy/Clayey	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ High Chroma Sands (S11) (**LRR K, L)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- x Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) (**LRR K, L**)
- ___ Red Parent Material (F21) **(MLRA 145)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Red Parent Material (F21) **(outside MLRA 145)**
- ___ Very Shallow Dark Surface (F22)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** ___

Remarks:

Hydric soils are present. Hydric soils indicator Redox Dark surface (F6) is satisfied.

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U.S. Army Corps of Engineers **WETLAND DETERMINATION DATA SHEET – Northcentral and Northeast Region** See ERDC/EL TR-07-24; the proponent agency is CECW-CO-R	***Requirement Control Symbol EXEMPT (Authority: AR 335-15, paragraph 5-2a)***

Project/Site: Kalamazoo Runway 17/35 Extension EA City/County: Kalamazoo Sampling Date: 08/21/2019

Applicant/Owner: Kalamazoo County State: MI Sampling Point: DP 12 UPL

Investigator(s): Brauna Hartzell, Mead & Hunt, Inc. Section, Township, Range: Section 1, T3S, R11W

Landform (hillside, terrace, etc.): Terrace Local relief (concave, convex, none): Flat Slope %: <1%

Subregion (LRR or MLRA): LRR L, MLRA 98 Lat: 42.239167 Long: -85.548677 Datum: WGS84

Soil Map Unit Name: Urban land-Kalamazoo complex, 0 to 6 percent slopes (UkB) (Non-hydric) NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation X, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	**Is the Sampled Area**
Hydric Soil Present?	Yes X	No ____	**within a Wetland?** **Yes** ____ **No** X
Wetland Hydrology Present?	Yes ____	No X	If yes, optional Wetland Site ID: ____

Remarks: (Explain alternative procedures here or in a separate report.)
A WETS analysis of the antecedent precipitation indicates the hydrologic conditions on the site were wetter than normal range at the time of investigation. Area is mown regularly.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): ____
Water Table Present?	Yes ____	No X	Depth (inches): ____
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): ____

Wetland Hydrology Present? **Yes** ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Wetland hydrology is neither present nor indicated. Approximately 1' higher than paired wetland point.

VEGETATION – Use scientific names of plants.

Sampling Point: DP 12 UPL

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
Sapling/Shrub Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
Herb Stratum (Plot size: 5')			
1. *Poa pratensis*	50	Yes	FACU
2. *Fragaria virginiana*	25	Yes	FACU
3. *Plantago lanceolata*	10	No	FACU
4. *Taraxacum officinale*	5	No	FACU
5. *Trifolium pratense*	5	No	FACU
6. *Trifolium repens*	5	No	FACU
7.			
8.			
9.			
10.			
11.			
12.			
	100 =Total Cover		
Woody Vine Stratum (Plot size: 30')			
1.			
2.			
3.			
4.			
	=Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	100	x 4 =	400
UPL species	0	x 5 =	0
Column Totals:	100 (A)		400 (B)

Prevalence Index = B/A = 4.00

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ___ **No** X

Remarks: (Include photo numbers here or on a separate sheet.)
Hydrophytic vegetation is not present. Approximately 10' separates the points with about 1' in elevation change. Vegetation difficult to identify.

SOIL

Sampling Point DP 12 UPL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 3/2	100					Loamy/Clayey	
4-10	10YR 3/2	95	7.5YR 4/6	5	C	M	Loamy/Clayey	Prominent redox concentrations
10-16	7.5YR 4/1	95	7.5YR 4/6	5	C	M	Loamy/Clayey	Prominent redox concentrations

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- x Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ High Chroma Sands (S11) (**LRR K, L)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- x Depleted Matrix (F3)
- x Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) (**LRR K, L**)
- ___ Red Parent Material (F21) **(MLRA 145)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Red Parent Material (F21) **(outside MLRA 145)**
- ___ Very Shallow Dark Surface (F22)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** ___

Remarks:

Hydric soils are present. Hydric soils indicators Depleted Below Dark Surface (A11), Depleted Matrix (F3), and Redox Dark Surface (F6) are satisfied.

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Appendix H. Field Photographs

Photo 1. General infield area. View to the southwest. (Aug 19, 2019).

Photo 2. General infield area. View to the south. (Aug 19, 2019).

Photo 3. Wetland 1A, Data points 1 and 2. View to the north. (June 07, 2019).

Photo 4. Wetland 1A, Data points 1 and 2. View to the west (June 07, 2019).

Photo 5. Wetland 1A, General site. View to the east. (June 07, 2019).

Photo 6. Wetland 1A, General site. View to the south. (June 07, 2019).

Photo 7. Wetland 1A, General site. View to the north. (June 07, 2019).

Photo 8. General infield area. View to the west. (June 07, 2019).

Photo 9. Wetland 1B, General site. View to the northwest. (June 07, 2019).

Photo 10. General site. View to the west. (June 06, 2019).

Photo 11. General site. View to the north. (June 06, 2019).

Photo 12. General site. View to the west. (June 06, 2019).

Photo 13. General site. View to the north. (June 06, 2019).

Photo 14. General site. View to the southwest. (June 06, 2019).

Photo 15. Wetland 2, General site. View to the east. (June 07, 2019).

Photo 16. Wetland 2, Culvert headwall.. View to the east. (June 07, 2019).

Photo 17. Wetland 2, General site. View to the west. (June 07, 2019).

Photo 18. Wetland 3, Data points 3 and 4. View to the south. (Aug 19, 2019).

Photo 19. Wetland 3, Data points 3 and 4. View to the east. (Aug 19, 2019).

Photo 20. Wetland 3, North drainage, General site. View to the east. (Aug 19, 2019).

Photo 21. Wetland 3, Central drainage, General site. View to the east. (Aug 19, 2019).

Photo 22. Wetland 3, Data point 5. View to the south. (Aug 19, 2019).

Photo 23. Wetland 3, Wetland boundary and data point 5. View to the north. (Aug 19, 2019).

Photo 24. Wetland 3, Wetland boundary and data point 6. View to the north. (Aug 19, 2019).

Photo 25. Wetland 3, Central drainage, General site. View to the west. (Aug 19, 2019).

Photo 26. Wetland 3, North drainage, General site. View to the northwest. (Aug 19, 2019).

Photo 27. Wetland 3, South drainage, General site. View to the east. (Aug 19, 2019).

Photo 28. Wetland 3, South drainage, General site. View to the west. (Aug 19, 2019).

Photo 29. Wetland 3, South drainage, General site. View to the west. (June 07, 2019).

Photo 30. Wetland 3, South drainage, General site. View to the east. (Aug 19, 2019).

Photo 31. Wetland 3, South drainage, General site. View to the west. (Aug 19, 2019).

Photo 32. Wetland 6, General site. View to the west. (Aug 21, 2019).

Photo 33. Wetland 6, Data points 11 and 12. View to the west. (Aug 21, 2019).

Photo 34. Wetland 6, Data points 11 and 12. View to the north. (Aug 21, 2019).

Photo 35. Wetland 6, General site. View to the west. (Aug 21, 2019).

Photo 36. Mann-Hummel Parcel, south field. View to the south. (Aug 20, 2019).

Photo 37. Mann-Hummel Parcel, south field. View to the north. (Aug 20, 2019).

Photo 38. Mann-Hummel Parcel, south field. View to the west. (Aug 20, 2019).

Photo 39. Mann-Hummel Parcel, south field. View to the east. (Aug 20, 2019).

Photo 40. Wetland 4, General site. View to the north. (Aug 20, 2019).

Photo 41. Wetland 4, Culvert. View to the southeast. (Aug 20, 2019).

Photo 42. Wetland 4, General site. View to the west. (Aug 20, 2019).

Photo 43. Wetland 4, Data points 7 and 8. View to the west. (Aug 20, 2019).

Photo 44. Wetland 4, Data points 7 and 8. View to the south. (Aug 20, 2019).

Photo 45. General site along railroad. View to the north. (Aug 20, 2019).

Photo 46. Wetland 5, Data point 9. View to the east. (Aug 20, 2019).

Photo 47. Wetland 5, Data points 9 and 10. View to the southwest. (Aug 20, 2019).

Photo 48. General site, wooded area. View to the southeast. (Aug 20, 2019).

Appendix I. Delineator Qualifications

BRAUNA HARTZELL, GISP
GEOGRAPHIC INFORMATION SYSTEM (GIS) ANALYST/ WETLANDS SCIENTIST

EXPERIENCE (GIS)

Brauna Hartzell has more than 20 years of experience applying GIS software and database design techniques to support wetlands and water resources, historic preservation, community planning, transportation, aviation and military planning, and municipal infrastructure and storm water management. She has worked extensively with GIS and mapping software including ArcGIS desktop and ARC/INFO workstation and has specialized experience with 3D Analyst, Network Analyst and Spatial Analyst. She also collects environmental field data using hand-held GPS units and post-processes information for inclusion in databases and use in spatial analyses. Brauna collaborates with personnel from multiple disciplines to solve complex spatial problems through scripting and spatial analysis to deliver results and data for project-specific needs. She utilizes geoprocessing models, Python, and VBA to meet analytical needs of projects.

Brauna is experienced with GIS-related data submittal requirements associated with the Federal Energy Regulatory Commission (FERC) and the Federal Aviation Administration (FAA) data standardization initiatives. She has extensive experience developing Geodatabases with the Spatial Data Standards for Facility, Infrastructure, and Environment (SDSFIE) standard and creating Federal Geographic Data Committee (FGDC)-compliant metadata.

Brauna has specialized experience with using 3D data formats for spatial analysis, contour generation and manipulation, and geospatial modeling. She is adept in the use of LiDAR-derived data and DTMs in support of hydrology and hydraulic analyses. Additionally, she has extensive experience with SSURGO databases and the National Hydrography Dataset.

EXPERIENCE (WETLAND/ENVIRONMENTAL)

Brauna Hartzell has more than fifteen years of experience in wetland delineation, wetland permitting, and restoration projects. She performs wetland and field delineations conforming to current United States Army Corps of Engineers (USACE) including the Northcentral and Northeast Regional Supplement and State standards, designs custom field data collection applications, collects field data using hand-held Global Positioning Systems (GPS) data collectors and tablets, and prepares National Environmental Policy Act (NEPA) documentation. Brauna has successfully guided numerous projects through the Section 404 permitting process.

Brauna has performed numerous wetland delineations in the Upper Midwest. She conducts wetland mitigation site monitoring according to established site-specific assessment protocols, performs vegetation surveys, and analyzes and presents field collected data in graphical and tabular form. She also assists in mitigation site design and construction specifications development.

Areas of Expertise

- Geographic Information Systems (GIS)
- Remote-sensing image processing
- Digital mapping
- Database design
- Programming
- Wetland delineation and permitting

Education

- MS, Environmental Monitoring, 1994, University of Wisconsin, Madison
- BS, Biological Science, 1982, Florida State University, Tallahassee, Florida

Registration/Certification

- Certified GIS Professional (GISP), GIS Certification Institute

Training and Seminars

- Geodatabase Design Concepts, ESRI
- Grasses, Sedges, and Rushes Workshop, University of Wisconsin–LaCrosse, 2017
- Vascular Flora of Wisconsin, University of Wisconsin – Madison, Spring 2002
- Wetlands Ecology, University of Wisconsin – Madison, Spring 2003
- Grasses: Identification and Ecology Workshop, University of Wisconsin – Milwaukee workshop, 2002
- GPS Field Collection Techniques Training Workshop for Trimble GeoXH, Seiler Instruments
- Basic Wetland Delineation Workshop, University of Wisconsin–LaCrosse, 2002
- Basic Hydric Soil Identification Workshop, University of Wisconsin – LaCrosse, 2005
- Advanced Wetland Delineation Workshop, University of Wisconsin – LaCrosse, 2007
- Critical Methods in Delineation, University of Wisconsin-LaCrosse, 2007, 2008, 2009, 2017, 2018, 2019, 2020
- Wildlife Inventory and Monitoring, University of Wisconsin – Milwaukee workshop, 2015

RELATED PROJECTS (WETLANDS)

Wetland Delineations
Various Clients
Midwest USA

Brauna performed wetland delineations in accordance with the Routine On-Site Method of 1987 United States Army Corps of Engineers (USACE) wetland delineation manual at various sites in Wisconsin and Minnesota. Work included conducting the delineation, documenting field investigations and site conditions, creating wetland boundary maps, and report writing. Delineations were performed for the following projects:

- Pellet Subdivision – Middleton, Wisconsin, 2002
- Potter's Creek Subdivision – Green Bay, Wisconsin, 2003
- Oak Street Bridge Design – La Crosse, Wisconsin, 2003
- Winona Municipal Airport – Winona, Minnesota, 2003 & 2009
- State Trunk Highway (STH) 29 – Marathon County, Wisconsin, 2003
- Hampton Heights Subdivision – Ledgeview, Wisconsin, 2004
- County Trunk Highway (CTH) W – Oconto County, Wisconsin, 2004
- Town of Rockland Preliminary Plat – Brown County, Wisconsin, 2004
- Mourning Dove Subdivision – Oconto County, Wisconsin, 2004
- Cinnamon Ridge Subdivision – Suamico, Oconto County, Wisconsin, 2004
- Kenosha Regional Airport – Kenosha, Wisconsin, 2005
- County Trunk Highway (CTH) A – Lincoln County, Wisconsin
- CTH D – Vernon County, Wisconsin, 2006
- Burton Street – Beloit, Wisconsin, 2006
- Central Wisconsin Airport – Mosinee, Marathon County, Wisconsin, 2008
- State Trunk Highway (STH) 67, Fond du Lac County, Wisconsin, 2011
- Interstate Highway 90/94 Corridor Study, 2014 & 2015
- Ontonagon County Airport, Ontonagon County, Michigan, 2016
- Central Wisconsin Airport – Mosinee, Marathon County, Wisconsin, 2016
- Little Rock Lake, Vilas County, Wisconsin, 2016
- Green Bay-Austin Straubel International Airport, 2017
- Lake Elmo Airport, Lake Elmo, Minnesota, 2017
- STH 48/US 53 Interchange, Rice Lake, Wisconsin, 2017
- Waukesha County Airport, Waukesha, Wisconsin, 2017
- I-43 Ozaukee/Milwaukee counties, Wisconsin, 2017
- Crystal Airport, Brooklyn Center, Minnesota, 2018
- STH 164, Waukesha County, Wisconsin, 2018
- STH 173, Juneau and Monroe counties, Wisconsin, 2018
- W. K. Kellogg Airport, Battle Creek, Michigan, 2018
- Ann Arbor Municipal Airport, Ann Arbor, Michigan, 2019
- Kalamazoo Battle Creek International Airport, Kalamazoo, Michigan, 2019
- Ontonagon County Airport, Ontonagon County, Michigan, 2019
- Houghton County Airport, Calumet, Michigan, 2019

Past Employment

- Information Management Systems, Inc.
- Adult Communities Total Services, Inc.
- Archeological Assessments, Inc.
- University of Wisconsin – Madison

No. of Years With Mead & Hunt

- Hired 08/28/1992

No. of Years With Other Firms

- Four

Joint Individual Permit – USACE Approval, 2018
Construction of Production and Logistics Facility
Haribo of America
Pleasant Prairie, Wisconsin
The proposed project includes construction of a production and logistics facility with visitor and employee parking, warehousing capability, and other amenities. 0.6 acres of wetland fill will be necessary to achieve project needs. Brauna served as the lead preparer of the individual permit application which included a Practicable Alternatives Analysis.

Wetland Delineation, W.K. Kellogg Airport, 2018
W.K. Kellogg Airport
Battle Creek, Michigan
Brauna served as lead wetland delineator in support of an environmental assessment for proposed grading and site improvements to facilitate hangar development and other support services at the airport. The area of interest is approximately 180 acres is size and resulted in the delineation of six wetlands. Wetland types encountered include emergent seasonally-flooded basins and aquatic bed wetlands.

Wetland Delineation, Crystal Airport, 2018
Metropolitan Airports Commission
Brooklyn Center, Minnesota
Brauna served as lead wetland delineator in support of alternatives analysis for an environmental assessment for proposed airfield improvements. The area of interest is approximately 50 acres is size spread over eight areas and resulted in the delineation of seven wetlands. Wetland delineated consisted of emergent Type 1 seasonally-flooded basins.

Wetland Delineation, STH 73, Juneau and Monroe counties, 2018
Wisconsin Department of Transportation
Madison, Wisconsin
Brauna served as lead wetland delineator in support of bridge replacements and beam guard upgrades along a 19.4 mile stretch of State Trunk Highway (STH) 173 slated for roadway resurfacing improvements in Juneau and Monroe counties. Wetlands were delineated in association with bridge crossings at three stream crossings and areas of beam guard upgrades. Wetland types encountered include: fresh wet meadows and hardwood and shrub swamps.

Wetland Delineation, STH 164 Waukesha County, 2018
Wisconsin Department of Transportation
Madison, Wisconsin
Brauna served as lead wetland delineator managing two delineator teams in support of resurfacing and intersection upgrade alternatives analysis for a 4.6 mile stretch of State Trunk Highway (STH) 164 in Waukesha County. The area of interest is approximately 133 acres is size and resulted in the delineation of 22 wetlands. Wetland types encountered include: fresh wet meadows, hardwood and shrub swamps, and riparian wetlands associated with six major and minor stream crossings.

Joint Section 404 – WCA Permit and Compensatory Mitigation Plan, 2017
Detroit Lakes-Becker County Airport
Detroit Lakes, MN
The proposed project at the Airport includes a relocation of the Runway 13 threshold 1,000 feet to the southeast to provide a 5,200-foot long runway which accommodates an instrument approach with CAT-I minimums. Additionally, a full-length taxiway will be constructed. In total, the proposed project will address airfield design deficiencies,

improve runway pavement condition, and meet runway length requirements. Approximately 14 acres of wetland fill will be necessary to achieve project needs. A compensatory mitigation plan is included in the permit application. Brauna served as the lead preparer of the permit application.

Wetland Delineation, I-43 Ozaukee/Milwaukee counties, 2017
Wisconsin Department of Transportation
Madison, Wisconsin
Brauna served as lead wetland delineator in support of roadway design alternatives analysis for a 1.4 mile stretch of Interstate highway in Ozaukee and Milwaukee counties. The area of interest is approximately 92 acres is size and resulted in the delineation of 61 wetlands. Wetland types encountered include: fresh wet meadows, and hardwood and shrub swamps.

Wetland Delineation and Re-certification, Waukesha County, 2017
Waukesha County Airport
Waukesha, WI
Brauna served as the lead wetland delineator to update and re-certify previously delineated wetland boundaries more than 5 years old. Airfield projects spanning more than 8 years necessitated multiple delineations. Permitting for the current Runway Safety Area (RSA) improvement project required a reassessment of previous wetland boundaries. The boundaries of 12 previous identified wetlands were investigated during field work using hand-held GPS equipment. Three boundaries were updated based on changed environmental conditions and one new wetland was identified in an area not previously investigated. Sampling points and photographs combined to provide documentation of the re-certification.

Wetland Delineation, Lake Elmo Airport, 2017
Metropolitan Airports Commission
Lake Elmo, Minnesota
Brauna served as lead wetland delineator in support of alternatives analysis for an environmental assessment for a proposed runway relocation and associated improvements. The area of interest is approximately 130 acres is size and resulted in the delineation of nine wetlands, one of which was in agricultural production. Wetland types encountered include: shallow marsh, fresh wet meadows, and shrub swamps. A functional assessment was performed using the MN Rapid Assessment Method (MNRAM), updating existing information and assessing newly delineated wetlands.

Wetland Delineation, Green Bay-Austin Straubel International Airport, 2017
Wisconsin Bureau of Aeronautics
Brown County, Wisconsin
Brauna served as lead wetland delineator in support of an environmental assessment for a proposed expansion to the East General Aviation apron and regrading associated with Runway 6/24. The area of interest is approximately 65 acres is size, covering airport infield areas, which resulted in the delineation of 23 emergent wet-meadow wetlands.

Wetland Delineation, STH 48/US 53 Interchange Improvements, 2017
Wisconsin Department of Transportation
Rice Lake, Wisconsin
Brauna served as the lead wetland delineator in support of permitting for interchange improvements to address safety, geometric and operational deficiencies, and improve facilities for non-motorized traffic. The area of interest is approximately 17.5 acres in size and resulted in the delineation of nine wetlands. Wetland types encountered include: fresh wet meadows and ditch wetlands.

Wetland Delineation, Ontonagon County Airport, 2016
Michigan Bureau of Aeronautics
Ontonagon County, Michigan
Brauna served as the lead wetland delineator in support of permitting and on-site mitigation activities related to proposed wetland disturbance in another area of the airport. The area of interest is approximately 19.4 acres in size and resulted in the delineation of 11 wetlands in areas previously in agricultural production. Brauna also performed groundwater well monitoring and data analysis in support of mitigation site design.

Wetland Delineation, Central Wisconsin Airport, 2016
Wisconsin Bureau of Aeronautics
Mosinee, Marathon County, Wisconsin
Brauna served as the lead wetland delineator in support of master planning activities related to determining the viability of shifting Runway 17/35 to the south. The area of interest is approximately 70 acres in size and resulted in the delineation of three large wetlands on airport property and two off-site. The three on-site wetlands experience regular mowing and other maintenance activities as well as show evidence of groundwater contact on a sloping terrain with a seasonal high-water table; off-site wetlands consisted of an alder and a hardwood swamp.

Little Rock Lake Wetland Survey, 2016
National Ecological Observatory Network (NEON), Boulder, CO
Vilas County, Wisconsin
Brauna served as the lead wetland scientist in support of site equipment layout investigations for long-term ecological monitoring. A total of four wetlands were delineated within the area of interest at this mesotrophic seepage lake covering about 39 acres. Each proposed equipment installation site was surveyed and wetlands delineated in close proximity to any proposed location.

Interstate Highway (IH) 90/94 Corridor Study, 2013-2017
Wisconsin Department of Transportation (WisDOT) Southwest Region
Portage, Juneau, Sauk, and Columbia Counties, Wisconsin
Mead & Hunt is leading a team that is conducting a corridor study of IH 90/94 from US12/WIS 16 to IH39. The project consists of evaluating operational and safety issues, review of the interchanges and ramps within the corridor, and evaluating possible expansion. Environmental studies are being conducted and include; cultural resources surveys, endangered species surveys, contaminated material investigations, noise analysis and wetland delineations. Brauna is a wetland scientist assisting in the delineation, wetland field data collection and mapping. Cost: $210 million

Wetland Mitigation, Runway 14/32 Safety Area, 2004-2011
WisDOT Bureau of Aeronautics
Madison, Wisconsin
Brauna served as project scientist for this reconstruction of a runway safety area and railroad within a state natural area. 140 acres of fen and sedge meadow were restored and enhanced, and 6,000 feet of Starkweather creek was restored with an annually flooded riparian corridor. The project also included restoration of ten acres of swamp forest and 35 acres of upland buffer, plus negotiation of annual management and monitoring to enhance rare plant habitats within Cherokee Fen. The mitigation cost was more than $1.5 million, with a total project construction cost of $25 million. Brauna assisted with wetland monitoring and collection of botanical and hydrologic data for compliance. She also monitored for invasive species.

October 10, 2019 Project No. 18105133

Electronic version submitted via e-mail

Pfizer, Inc.
7000 Portage Road
Portage, MI 49001
Attn: Mr. Joshua Slater

RE: WETLAND DELINEATION AND REGULATORY STATUS REVIEW REPORT
PFIZER PROPERTY – RUNWAY 17/35 EXTENSION AND TAXIWAY C REALIGNMENT
SECTION 13, PORTAGE TOWNSHIP
KALAMAZOO COUNTY, MICHIGAN

Dear Mr. Slater:

Golder Associates Inc. (Golder) respectfully submits this report to Pfizer Inc. (Pfizer) summarizing the results of a wetland assessment and delineation of the Pfizer property proposed as part of the Kalamazoo/Battle Creek International Airport (Airport) runway extension and taxiway realignment project (Project).

1.0 INTRODUCTION

Golder was retained by Pfizer to delineate wetlands on the Pfizer property that may be regulated under Part 303: Wetlands Protection of Michigan's Natural Resources and Environmental Protection Act (NREPA), 1994 PA 451, as amended (Part 303) and provide an opinion of their regulatory status under Part 303. The wetlands assessment and delineation is required by Mead & Hunt to complete an Environmental Assessment (EA) for the Project. Mead & Hunt is working with the Airport and the Federal Aviation Administration (FAA) to extend a runway approximately 1,150 feet (ft.) which includes the installation of FAA light extensions and the abandonment and relocation of an existing rail line. Elements of the Project (FAA light extensions and the abandonment and relocation of an existing rail line) will extend onto property owned by Pfizer, hereinafter referred to as the Area of Potential Effects (APE). The approximate location of the Project and key elements in relation to the Pfizer property are shown on the Proposed Property map provide by Mead and Hunt (Attachment A). The APE consists of about 76.98 acres of a larger Pfizer parcel comprising a 300 foot buffer around the margin of the proposed Project. The APE excludes the railroad right-of-way (ROW) currently controlled and used by Penn Central Railroad. The area comprised by the railroad ROW was not included in Golder's scope.

2.0 METHODS

2.1 Desktop Information Review

Golder reviewed readily-available public information from the following sources to assess current and recent past conditions on the APE and prepare for the APE visit:

- United States Geological Survey (USGS) topographic map (Figure 1)
- Readily-available aerial imagery (Figures 2 through 7, and viewed online)
- Natural Resources Conservation Service (NRCS) Soil Survey Map (Figure 3)
- National Wetlands Inventory (NWI) Map (Figure 4)

Golder Associates Inc.
4775 Two Mile Road, Suite A Bay City, Michigan, USA 48706 T: +1 989 439-1070 F: 1+ 989 439-1074

- Michigan Department of Environment, Great Lakes, and Energy (EGLE) Wetland Inventory (Figure 5)
- Federal Emergency Management Agency (FEMA) 100-Year Floodplain Map (Figure 6)

2.2 Field Assessment

Mr. Brian Huebner (Professional Wetland Scientist #2882) of Golder visited the APE and performed the assessment and delineation on April 15, 2019. Field methods followed criteria provided in the 1987 US Army Corps of Engineers (USACE) Wetland Delineation Manual and Regional Supplement: Northcentral and Northeast Region (USACE 1987, USACE 2011). The assessment was conducted during the onset of the growing season as evidenced by newly emerging herbaceous plant growth and buds bursting on trees and shrubs. The assessment was conducted during a period of time characterized by the seasonal high water table. Golder is of the opinion that conditions on the APE were conducive to performing the scope of work for its intended purpose.

Average precipitation for the preceding three-month period near the APE was determined using the NRCS method [*NRCS Engineering Field Handbook Chapter 19, Tools for Wetland Determinations and WETS Table and Rainfall Documentation Worksheet* (Attachment B)]. Using the Rainfall Documentation Worksheet analysis, Golder determined that the field investigation was preceded by a period of normal precipitation.

The wetland delineation was performed by walking over the APE and evaluating prominent land cover, habitat types, and potential wetland areas. Golder established sampling locations within select habitat types and in potential wetland areas. At each sampling location, Golder performed an assessment of vegetation, soil type/characteristics, and surface/subsurface hydrologic indicators to determine the presence and status of wetland-determining characteristics at that location and identify the dominant vegetation types in both the uplands and wetlands across the APE. In accordance with the USACE delineation criteria, an area must have a predominance of hydrophytic vegetation, the presence of hydric soil, and adequate hydrology to be considered a wetland.

Vegetation was identified by flowers, leaves, and/or persistent remains from the previous growing season such as bark, twigs, stems, and reproductive structures. The wetland indicator status for vegetation noted during the evaluation was obtained from the USACE *Northcentral and Northeast 2016 Regional Wetland Plant List*. Soil was evaluated by digging test pits up to 24 inches deep or using a probe manually pushed into the ground to depths of approximately 18 to 24 inches. Soil conditions were evaluated using criteria established by the NRCS (*Field Indicators of Hydric Soils in the United States*), and soil colors were evaluated using a Munsell® Color Chart. Hydrology was evaluated through direct observation of standing water and/or saturated soil and/or indirectly through observation of other primary and/or secondary visual indications.

Areas identified as potential wetlands on the APE were delineated and flagged with high-visibility pink flagging and alpha-numerically coded. Geographic coordinates of delineated boundaries were collected using a Trimble GeoXT global positioning system (GPS) unit with sub-meter accuracy.

3.0 RESULTS

3.1 Information Review

The USGS topographic map (Figure 1) indicated that the ground elevation in the vicinity of the APE ranges between 860 - 870 feet above mean sea level (MSL), with the highest elevations located on the northern end. Surface water drainage on and near the APE has been modified by surrounding development. Upjohn Pond is located on and adjoins the southwest part of the APE. The USGS map indicated the presence of wetlands (marsh symbols) on the south part of the APE.

Aerial imagery from the National Agriculture Imagery Program (Figure 2) and viewed online indicated that in 1950, the north part of the APE was used as farmed land, the central part was used as part of the railroad access to a large industrial facility, and the south part was relatively low-lying, undeveloped meadow and scrub-shrub, and forested habitat. Upjohn Pond did not appear to have been present in 1950. The railroad was present through the middle part of the APE. Sometime between 1950 and 1960, the area of Upjohn Pond appeared to have been dammed and/or excavated to form a lake. Land use on the north part of the APE remained relatively unchanged until sometime between 1989 and 1997, during which time a parking lot had been established on the northwest part of the APE. Land use on the APE remained similar from about 1997 through the present. It appeared there were areas of standing water or saturated soils on the APE in the aerial imagery. Areas of standing water and saturated soils typically appear as relatively darkened areas or areas characterized by differing vegetation types on the aerial photos, while areas of stressed vegetation may appear as contrasting shades of green.

The NRCS soil survey map (Figure 3) indicated five soil map units on the APE. Map units are composed of one or more components or soil types. Table 1 presents a summary of soil map units on the APE and the NRCS hydric rating, which indicates the percentage of a representative map unit that is expected to meet the criteria for hydric soils as determined by the National Technical Committee on Hydric Soils (NTCHS). A hydric soil is defined as a soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (typically wetland soils).

Table 1: NRCS Soil Types Mapped on the APE

Soil Series Map Unit	Soil Series Map Unit Symbol	Hydric Rating (%)
Aquents and Histosols, ponded	Aq	100
Houghton muck, 0 to 1 percent slopes	Hn	100
Kalamazoo loam, 0 to 2 percent slopes	KaA	0
Kalamazoo loam, 2 to 6 percent slopes	KaB	0
Urban land-Kalamazoo complex	UKB	0

The presence of these soil types on the APE was generally verified during the APE visit (Section 2.2). Based on visual observation of fill material, abrupt changes in topography, and apparent development history of the APE, Golder is of the opinion that surface and near-surface soils in some areas have been modified by historic filling and grading. NRCS soil surveys are compiled using information at coarse spatial scales, including sources typically based on remote sensing techniques. It is not unusual for the results of fieldwork to differ from conditions depicted by NRCS soil survey, particularly in areas of historic development.

Both the NWI map (Figure 4) and EGLE wetland map (Figure 5) indicated the presence of mapped wetlands on the APE. The extent of wetlands shown on the NWI map was generally consistent with observations during the APE visit (Section 2.2) while the extent of wetlands on the EGLE wetland maps appeared greater than the extents based on field assessment, particularly near the central part of the APE. The NWI and EGLE wetland maps were compiled using information at coarse spatial scales from sources typically based on remote sensing techniques. It is not unusual for the results of fieldwork to identify areas with conditions different from those depicted by the EGLE and NWI maps, particularly in areas of historic development.

The FEMA floodplain map (Figure 6) indicated that the APE is not located within a designated 100-year floodplain.

3.2 Field Assessment

The APE consisted of paved parking areas and developed access roads (northwest and west parts), actively farmed land (northeast part), and undeveloped but historically disturbed meadow and forested habitat (southeast part). There was some fill and miscellaneous debris located on parts of the APE, particularly on the south parts adjacent to Upjohn Pond and along the railroad ROW. The ground surface on the APE was nearly level to undulating with distinct ridges and swales in some areas, particularly adjacent to Upjohn Pond and the railroad ROW. Parts of the APE consisted of relatively low-lying habitat with areas of seasonally ponded surface water evident.

Golder identified three distinct wetland areas on the APE that were characterized by a predominance of wetland plant species, hydric soil indicators, and visible indications of wetland hydrology. These areas were designated as Wetlands A, C, and D. The approximate location of the delineated wetland boundaries in relation to the APE limits are depicted on the attached Wetland Map (Figure 7). Delineated wetland areas on the APE are summarized in Table 2.

Table 2: Delineated Wetland Areas on the APE (Excluding the Railroad ROW)

Wetland Identification	Area within APE Limits (Acres)	Wetland Type(s)[1]	Likely Regulatory Status[2]	
			Federal	State
Wetland A	0.049	PEM/SS	Regulated	Regulated
Wetland C	0.004	PEM	Regulated	Regulated
Wetland D	6.510	PEM	Regulated	Regulated
Total	6.563	-		

[1] Cowardin Classification: PFO = Forested, PSS = Scrub-Shrub, PEM = Emergent
[2] Final jurisdictional determination is made by the USACE and EGLE. See Section 4.2 for a discussion of likely regulatory status.

Golder observed two apparent wetlands within parts of the railroad ROW. The wetlands were formed in trackside drainage features and their general locations are shown for general reference on the Wetland Map (Figure 7). The limits of wetlands shown within the railroad ROW are for general reference and planning purposes. They were not delineated nor are they included in Table 2 or discussion below.

Typical conditions noted in wetlands on the APE are described below. The scientific names and wetland indicator status of vegetation noted during the delineation follow the common name the first time each plant species is referenced. Photographs depicting typical conditions at the APE during the visit are included as Attachment C. Photographs were taken by Pfizer staff during the APE visit and provided to Golder at a subsequent date. Information regarding conditions in specific upland and wetland sample locations is included on the Wetland Data Forms included as Attachment D.

Wetland A consisted of seasonally inundated and saturated emergent (wet meadow) and scrub-shrub habitat along the edge of Upjohn Lake. Vegetation was characterized by black willow (*Salix nigra*; OBL), sandbar willow (*Salix interior*; OBL), and other willows (*Salix* sp.; assumed FACW to OBL), common reed (*Phalaris arundinaceae*; FACW), blue joint grass (*Calamagrostis canadensis*; OBL), and sedges (*Carex* sp.; assumed FACW to OBL). Soil in the wetland typically consisted of about nine to 12 inches of black to very dark brown gravelly sand with few (less than

two percent) to common (two to 20 percent) yellowish red to strong brown mottles underlain by grayish brown to brown gravelly fill. Soil in the wetland was saturated to the surface with a water table present at about 3 to 6 inches below the ground surface (bgs). Other indications of wetland hydrology included water stained leaves and geomorphic position. Wetland A receives surface water runoff from adjacent uplands and overflow from Upjohn Pond during periods of high water. Excess water from Wetland A flows into Upjohn Pond when water levels in the pond are lower than the wetland.

Wetland C consisted of seasonally saturated, emergent habitat formed in a small basin in historically filled ground. There was no appreciable vegetation in the wetland (a small, sparsely vegetated concave surface). Soil in the wetland typically consisted of about six to nine inches of very dark grayish brown sandy loam with few to common strong brown mottles underlain by gravelly fill. Soil in the wetland was saturated to the surface or inundated with up to about six inches of water. Other indicators of wetland hydrology included water stained leaves, sparsely vegetated concave surface, and geomorphic position in conjunction with a shallow aquitard. Wetland C receives surface water runoff from adjacent uplands. There was no readily apparent location from which surface water flows out of Wetland C, although it appeared that excess surface water from Wetland C would flow into Upjohn Pond during periods of unusually heavy rainfall.

Wetland D consisted of seasonally inundated and saturated emergent (wet meadow) habitat with some trees and shrubs along the edges. Vegetation was characterized by willows and common reed. Soil in the wetland consisted of more than 12 inches of reddish black to black muck or mucky peat. Soil in the wetland was saturated to the surface or inundated with one or more inches of water. Some parts of the wetland were inundated with 12 or more inches of water. Other indications of wetland hydrology included water stained leaves, algae in some areas, and geomorphic position. Wetland D receives surface water runoff from adjacent uplands and Upjohn Pond, as evidenced by a culvert and sluice gate near the south end of the APE. Based on visual observations, it appeared that the water level in Upjohn Pond is higher than the water level in Wetland D and that the sluice gate is periodically opened to flood parts of Wetland D with one or more feet of water. There was no readily apparent location from which surface water flows out of Wetland D. Wetland D is part of a larger wetland complex greater than five acres in size (historically part of Upjohn Pond and adjacent wetlands) that extends beyond the APE limits. Wetland areas that are separated by man-made features, such as roads, railroads, dikes, and levees are considered part of the same wetland complex when determining overall wetland size and connectivity.

Uplands adjacent to Wetlands A and C consisted of forested and meadow habitat formed on historically filled and graded land, as evidenced by abrupt changes in topography and the presence of foreign materials in the soil such as brick, concrete, and metal fragments. Vegetation in these filled areas was characterized by cottonwood (*Populus deltoides,* FAC), dead and dying green ash (*Fraxinus pennsylvanica*; FACW), common buckthorn (*Rhamnus cathartica*; FAC), honeysuckle (*Lonicera tartarica*; FACU), riverbank grape (*Vitis riparia*; FACW), yellow avens (*Geum aleppicum*; FAC), motherwort (*Leonurus cardiaca*; UPL), yarrow (*Achillea millefolium*; FACU), Queen-Anne's-lace (*Daucus carota*; FACU), smooth brome (*Bromus inermis*; FACU), bluegrass (*Poa pratensis*; FACU), and switchgrass (*Panicum virgatum*; FAC). Soil in the filled upland area consisted of mixed very dark brown to brown sandy material with foreign materials present such as brick, concrete, clay pipe and metal fragments. Soil in the upland was not saturated within 24 inches of the surface and there were no other primary or secondary indicators of wetland hydrology.

Uplands adjacent to Wetland D consisted of forested, scrub-shrub, and meadow habitat. The upland area along the west side of Wetland D (between flags D1 through D13) consisted of habitat formed on historically filled land, as evidenced by abrupt changes in topography and observations of adjacent historic excavation. Vegetation in uplands adjacent to Wetland D was characterized by black cherry (*Prunus serotina*; FACU), pin oak (*Quercus palustris*; FACW), red maple (*Acer rubrum*; FAC), cottonwood, box elder (*Acer negundo*; FACW), white birch (*Betula papyrifera*; FACU), willows, blackberry (*Rubus allegheniensis*; FACU), blue joint grass, common reed, and little blue stem (*Schizachyrium scoparium*; FACU). Soil in the filled upland area consisted of 18 to 24 or more inches of black

to dark reddish brown mucky peat or muck. Soil in the upland was not saturated within 24 inches of the surface and there were no other primary or secondary indicators of wetland hydrology. Based on visual observations of historic excavation and grading as well as strongly buttresses roots in areas where the organic soil has subsided, it appeared that Wetland D has been affected by historic drainage activities and that surface water elevations have been lowered from pre-disturbed conditions.

4.0 REGULATORY STATUS REVIEW AND GUIDANCE

4.1 Floodplains

Floodplains are regulated under NREPA, Part 31: Water Resources Protection Floodplain Regulatory Authority. The APE is not located near a mapped floodplain and no permit is required under Part 31 for work on the APE.

4.2 Wetlands

Since 1984, the federal government has authorized the State of Michigan to administer the Clean Water Act (CWA) Section 404 program within its borders, regulating impacts to wetlands and waters of the US (WOUS). Because the program is administered by the State of Michigan, applicants for most wetland permits are required only to apply to the EGLE for approval under Part 303. The following exceptions are areas where the federal government, specifically the USACE, maintains jurisdiction within the state. In these areas, a separate permit must be received from both the USACE and the EGLE. USACE jurisdiction over these waters is maintained under Section 10 of the federal Rivers and Harbors Act of 1899:

- Traditionally navigable waters
  - Great Lake
  - Connecting channels
  - Waters connected to the Great Lake where navigational conditions are maintained
- Wetlands directly adjacent to these waters

None of the wetlands on the APE appear located in or adjacent to a Great Lake or connecting water to the Great Lakes.

The State of Michigan regulates wetlands based on their location and surface connectivity to inland lakes, ponds, streams, and rivers. Per EGLE Rule R 281.921, inland lakes, ponds, streams, and rivers are defined as:

> "(i) A river or stream which has definite banks, a bed, and visible evidence of a continued flow or continued occurrence of water.
>
> (ii) A natural or permanent artificial inland lake or impoundment that has definite banks, a bed, visible evidence of a continued occurrence of water, and a surface area of water that is more than five acres. This does not include lakes constructed by excavating or diking dry land and maintained for the sole purpose of cooling or storing water and does not include lagoons used for treating polluted water.
>
> (iii) A natural or permanent artificial pond that has permanent open water with a surface area that is more than one acre, but less than five acres. This does not include ponds constructed

> by excavating or diking dry land and maintained for the sole purpose of cooling or storing water and does not include lagoons used for treating polluted water."

Wetlands are regulated under Part 303 if they have a direct surface water connection to or are within 500 feet of a lake, pond, stream, or river as defined above, or are within 1,000 feet of the Great Lakes or Lake St. Clair. Wetlands are also regulated under Part 303 if they do not meet the above guidelines but are greater than five acres in size, have been documented to support state or federal endangered or threatened species, or are rare or imperiled as defined by the state. Wetland areas that are separated by man-made features, such as roads, railroads, dikes, and levees are considered part of the same wetland complex when determining overall wetland size and connectivity.

All of the wetlands noted on the APE are located within 500 feet of Upjohn Lake, which is greater than one acre in size. In addition, Wetland D is part of a larger wetland complex greater than five acres in size.

Based on current provisions of Part 303 and conditions observed during the APE visit and delineation, Golder is of the opinion that all wetlands on the APE are regulated under Part 303. A permit is required from the EGLE to place fill in, excavate soil from, or otherwise modify the soil and/or hydrology of regulated wetlands.

4.3 Inland Lakes and Streams

The State of Michigan regulates inland lakes and streams under NREPA, Part 301 Inland Lakes and Streams (see Section 3.2 for the definition of inland lakes, ponds, streams, and rivers). Based on the current provisions of Part 301, Golder is of the opinion that Upjohn Pond is regulated under Part 301. **A permit is required from the EGLE to place fill in, excavate soil from, or otherwise modify areas below the ordinary high watermark (OHWM) of Upjohn Lake.**

The above regulatory guidance is to be used for general planning purposes only. The EGLE has final discretion regarding the delineation and regulatory status of wetlands and water resources on the APE. If confirmation of the delineated wetland boundaries and regulatory status of wetlands and waterbodies on the APE is desired, Golder can coordinate with the EGLE to conduct a Level 3 Wetland Identification through the EGLE Wetland Identification Program (WIP). This process will produce an agency confirmation of wetland regulatory status, location, size, and type that can aid subsequent agency review of related permit applications (if required). The above opinion applies only to the regulatory status and need for permits specific to the issue of wetlands and water resources regulated under the CWA and NREPA. Other permits and approvals may be required for various APE development, improvement, or modification activities.

5.0 CLOSING

Golder's evaluation was performed in accordance with generally accepted procedures for conducting wetland evaluations. Golder makes no representation for a period of time over which this evaluation will remain valid, though a wetland determination or delineation performed or confirmed by the EGLE is typically valid for a period of three years. Golder's conclusion reflects our professional opinion based on conditions present at the time of the evaluation. Discrepancies may arise between current and future evaluation of wetlands on the APE due to changes in land use, vegetation, and/or hydrology. No warranties, implied or expressed, are made. It is expressly understood that Golder assumes no responsibility for reporting to federal, state, or local authority or private parties, information disclosed by this or future phases of work performed at this APE.

Golder is pleased to be of continued service to Pfizer. If you have questions or should you require additional information, please contact Brian Huebner at (989) 439-1070, ext. 13 or bhuebner@golder.com.

Sincerely,

Golder Associates Inc.

Brian Huebner, PWS
Senior Ecologist

BJH/lms/jbm

Figures:
Figure 1. APE Location Map (USGS Topographic Map)
Figure 2. APE Location Map (Aerial Image)
Figure 3. NRCS Soil Survey Map
Figure 4. EGLE Wetland Map
Figure 5. NWI Map
Figure 6. FEMA Floodplain Map
Figure 7. Wetland Map

Attachments:
Attachment A. Mead and Hunt Proposed Property Map
Attachment B. WETS Table and Rainfall Documentation Worksheet
Attachment C. APE Photographs
Attachment D. Wetland Data Forms

6.0 REFERENCES

Environmental Laboratory. (1987). "Corps of Engineers Wetlands Delineation Manual," Technical Report Y-87-1, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

U.S. Army Corps of Engineers. 2011. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (Version 2.0), ed. J. S. Wakeley, R. W. Lichvar, C. V. Noble, and J. F. Berkowitz. ERDC/EL TR-12-1. Vicksburg, MS: U.S. Army Engineer Research and Development Center.

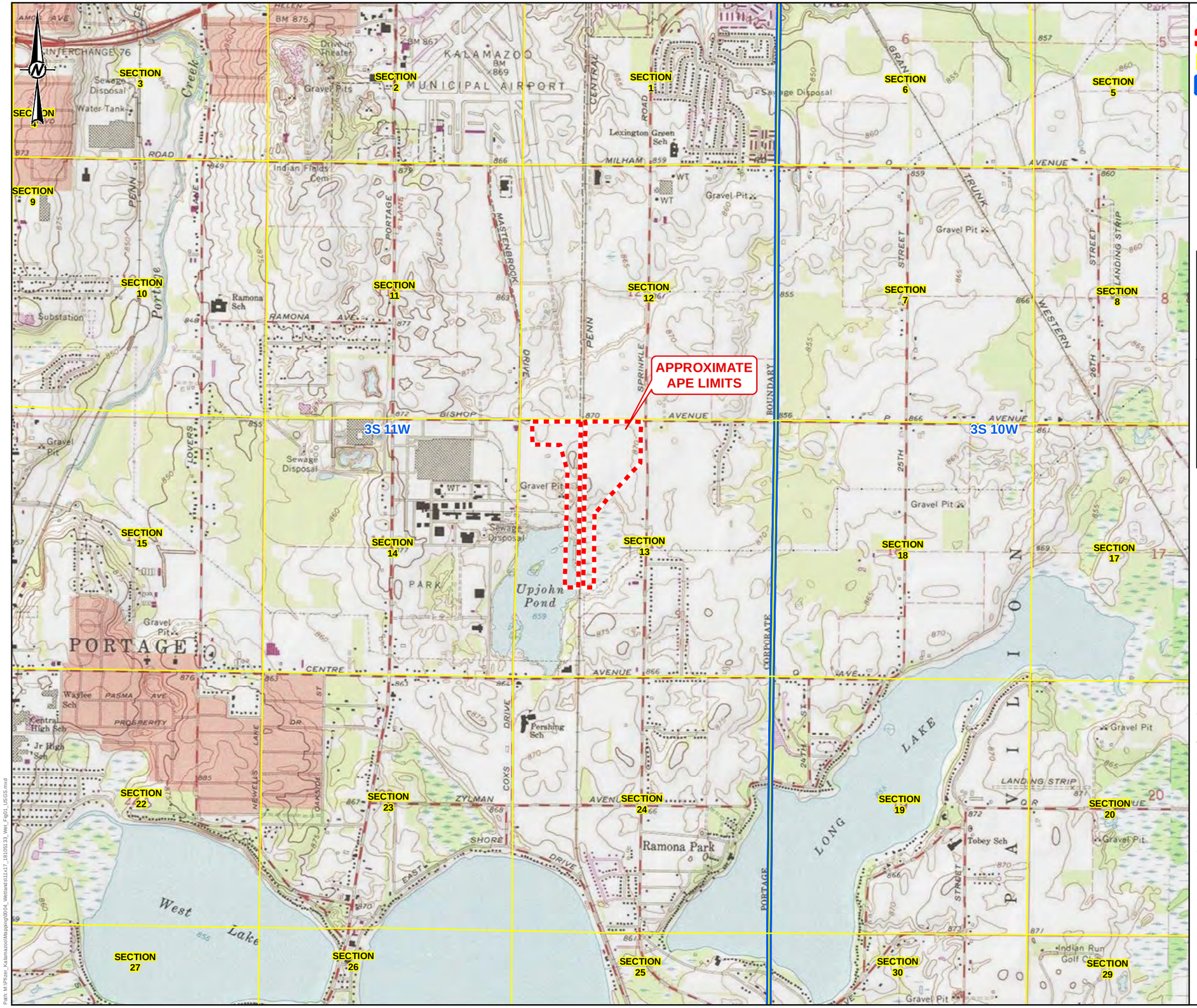
USDA-NRCS. 2010. “Field Indicators of Hydric Soils in the United States (version 7.0).”

https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_053171.pdf

NRCS. 1997. Engineering Field Handbook. Chapter 19, “Hydrology Tools for Wetland Determination.”

https://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17556.wba

Figures



LEGEND

- APPROXIMATE APE LIMITS
- SECTION
- TOWNSHIP/RANGE

KEY MAP

Feet
0 1,000 2,000 4,000

REFERENCE

1. TOPOGRAPHIC BACKGROUND: ESRI BASEMAP SERVICES. USGS 1:24,000 TOPOGRAPHIC QUADRANGLE SHOWN: "PORTAGE, MI".

CLIENT
PFIZER INC.

PROJECT
KALAMAZOO AIRPORT EXPANSION
PORTAGE TOWNSHIP, KALAMAZOO COUNTY, MICHIGAN

TITLE
APE LOCATION MAP
USGS TOPOGRAPHIC MAP

CONSULTANT
GOLDER

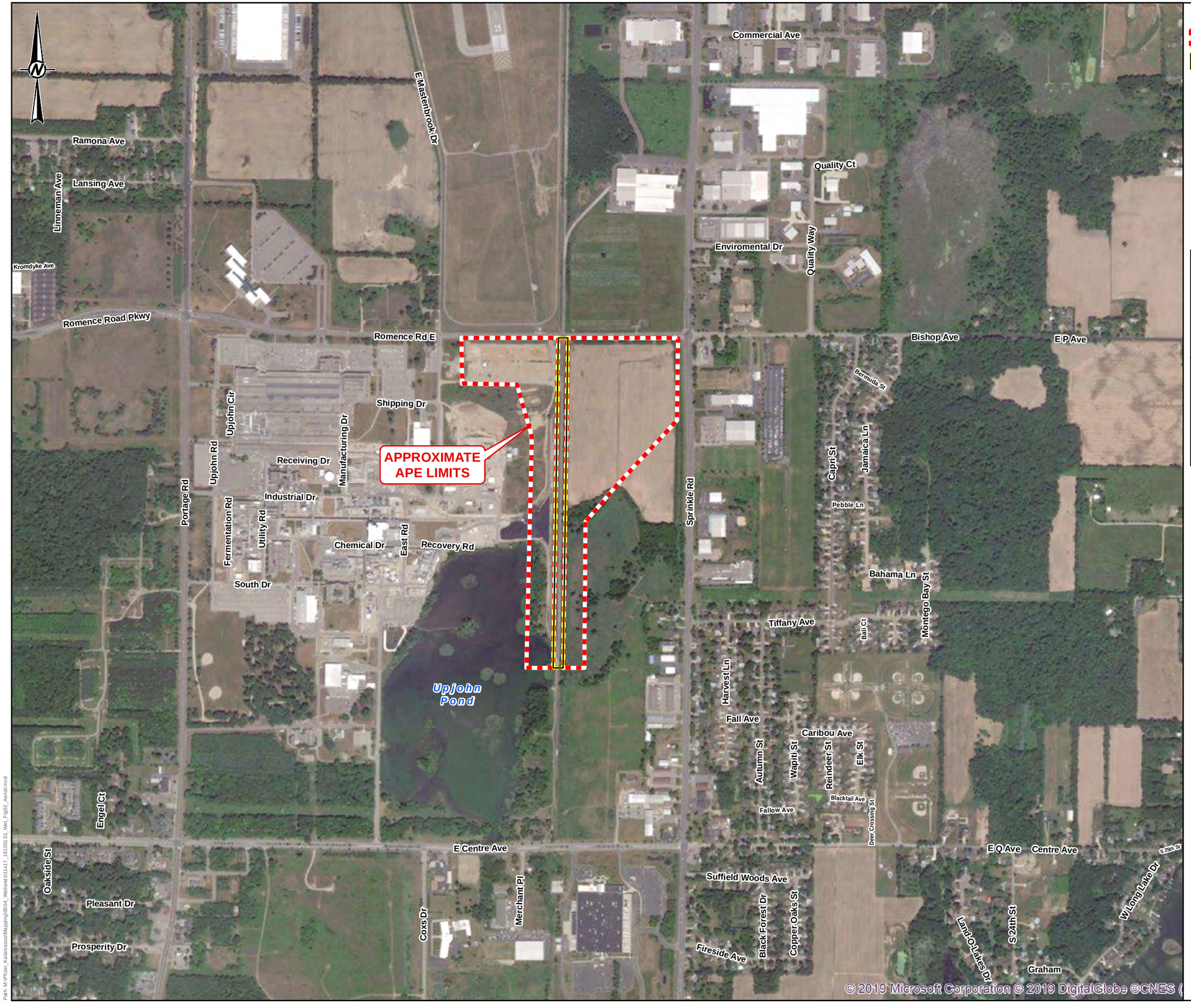
YYYY-MM-DD	2019-07-21
PREPARED	KJC
DESIGN	KJC
REVIEW	JBM
APPROVED	BJH

PROJECT No.
18105133

FIGURE
1

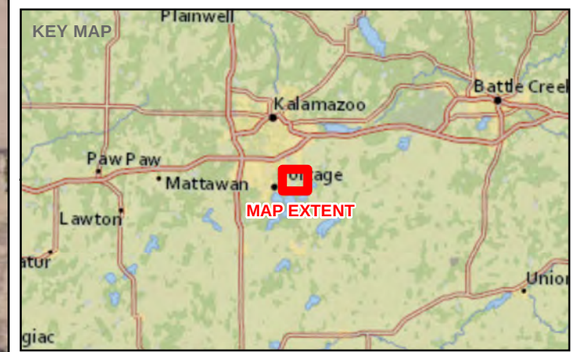
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM:
1in
0

Path: M:\Pfizer, Kalamazoo\Mapping\800a_Wetland\s11x17_18105133_Wet_Fig01_USGS.mxd



LEGEND

- APPROXIMATE APE LIMITS
- APPROXIMATE RAILROAD ROW



0 500 1,000 2,000 Feet

REFERENCE

1. AERIAL IMAGERY: ESRI, DIGITAL GLOBE, MICROSOFT, BING MAPS. IMAGERY FLOWN 2016.

CLIENT
PFIZER INC.

PROJECT
KALAMAZOO AIRPORT EXPANSION
PORTAGE TOWNSHIP, KALAMAZOO COUNTY, MICHIGAN

TITLE
APE LOCATION MAP
AERIAL IMAGERY

CONSULTANT
GOLDER

YYYY-MM-DD	2019-07-21
PREPARED	KJC
DESIGN	KJC
REVIEW	JBM
APPROVED	BJH

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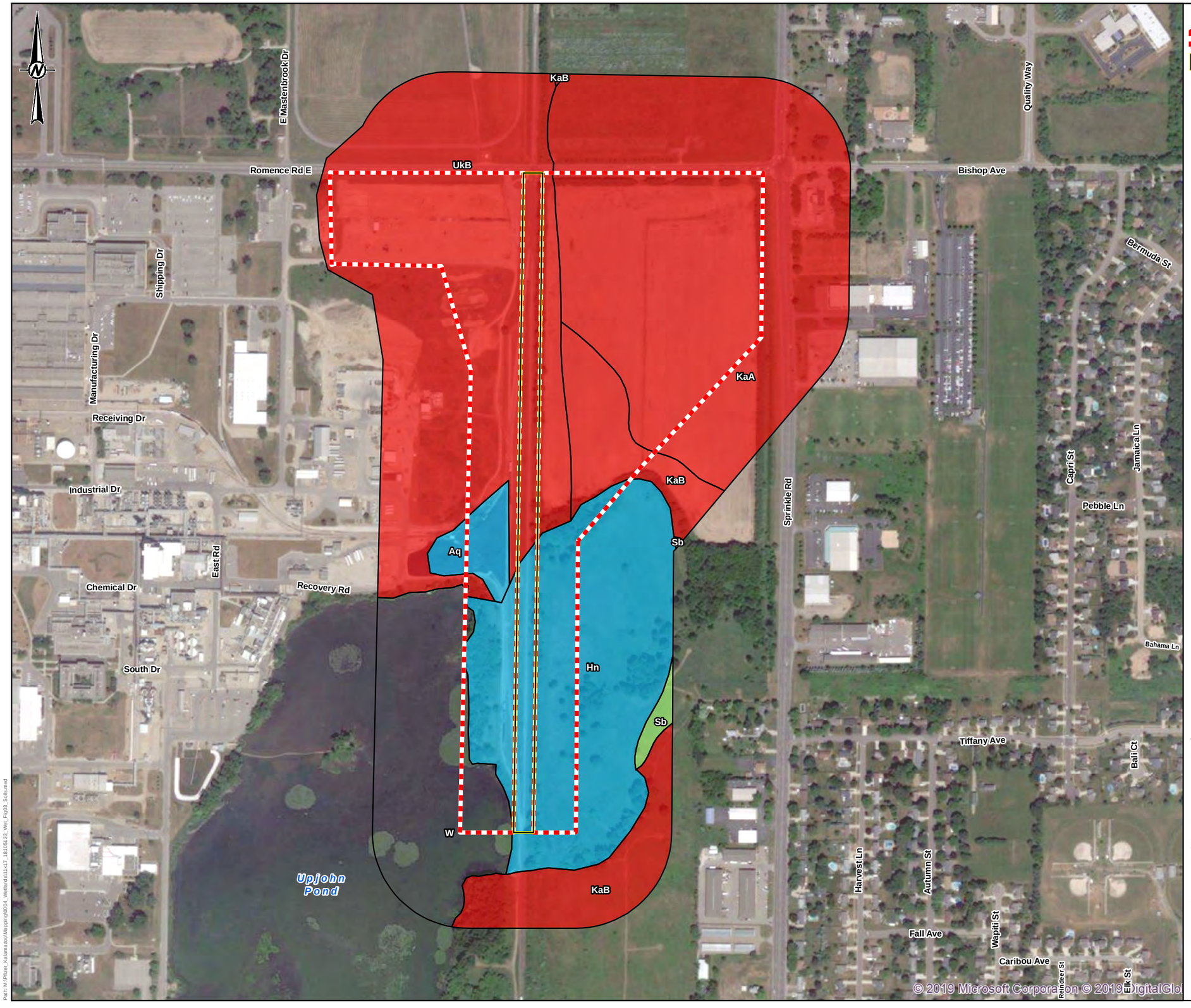
18105133

FIGURE
2

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM:
1in
0

Path: M:\Pfizer, Kalamazoo\Mapping\00\04_Wetland\s11x17_18105133_Wet_Fig02_Aerial.mxd



LEGEND

APPROXIMATE APE LIMITS

APPROXIMATE RAILROAD ROW

NRCS SOIL SURVEY

NOT HYDRIC (0%)

HYDRIC (1 TO 32%)

HYDRIC (66 TO 99%)

HYDRIC (100%)

SOIL TYPE (WITH HYDRIC RATING)

AQ - AQUENTS AND HISTOSOLS PONDED (100%)

HN - HOUGHTON MUCK, 0 TO 1 PERCENT SLOPES (100%)

KAA - KALAMAZOO LOAM, 0 TO 2 PERCENT SLOPES (0%)

KAB - KALAMAZOO LOAM, 2 TO 6 PERCENT SLOPES (0%)

SB - SEBEWA LOAM, 0 TO 2 PERCENT SLOPES (95%)

UKB - URBAN LAND-KALAMAZOO COMPLEX (0%)

W - WATER

0 250 500 1,000 Feet

REFERENCE

1. AERIAL IMAGERY: ESRI, DIGITAL GLOBE, MICROSOFT, BING MAPS. IMAGERY FLOWN 2016.
2. SOILS DATASET: USDA-NRCS SOIL SURVEY GEOGRAPHIC (SSURGO),

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PROJECT
KALAMAZOO AIRPORT EXPANSION
PORTAGE TOWNSHIP, KALAMAZOO COUNTY, MICHIGAN

TITLE
NRCS SOIL SURVEY MAP

CONSULTANT
GOLDER

YYYY-MM-DD	2019-07-21
PREPARED	KJC
DESIGN	KJC
REVIEW	JBM
APPROVED	BJH

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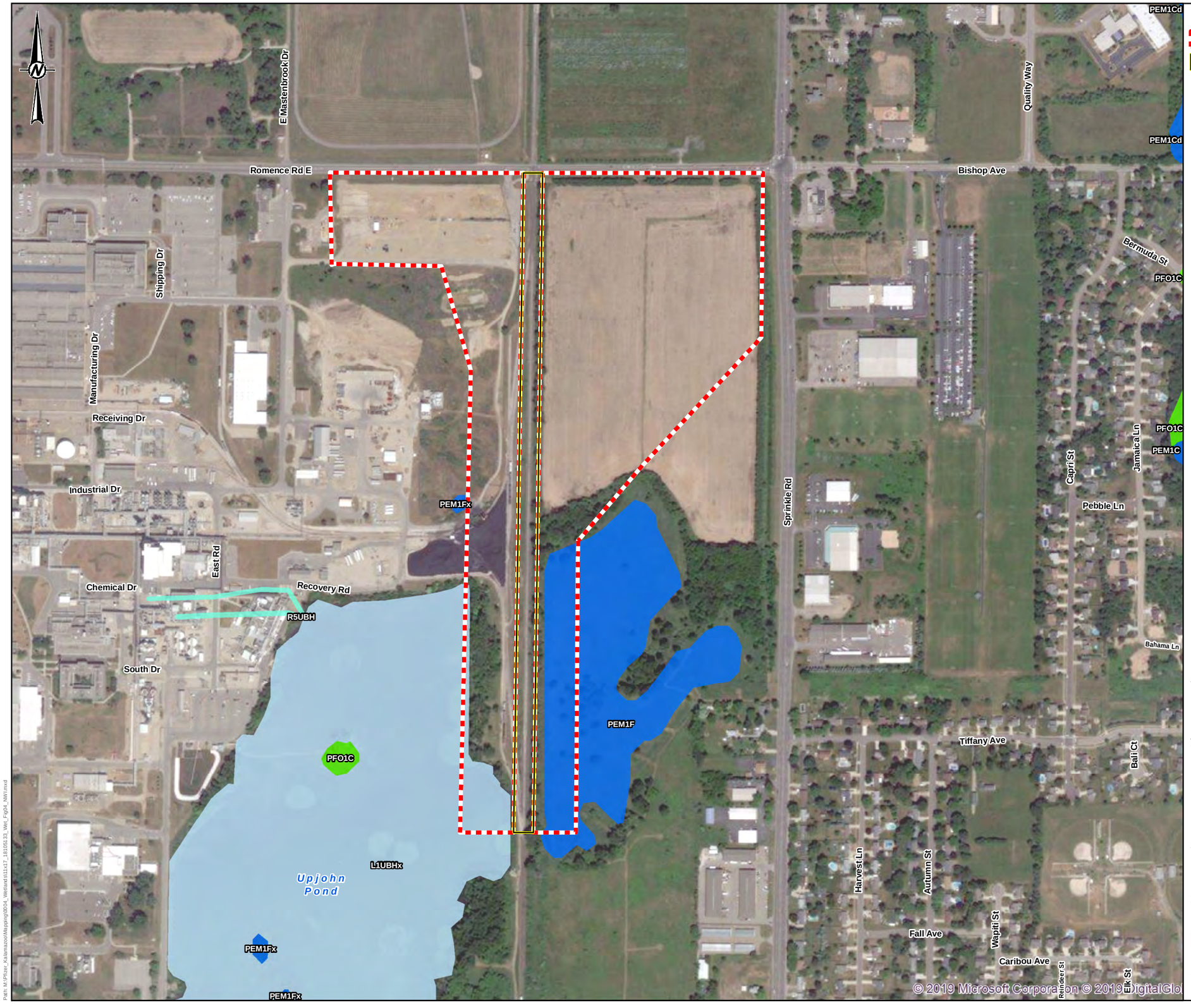
18105133

FIGURE
3

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: 11in

Path: M:\Pfizer, Kalamazoo\Mapping\00\04_Wetland\11x17_18105133_Wet_Fig03_Soils.mxd



LEGEND

- APPROXIMATE APE LIMITS
- APPROXIMATE RAILROAD ROW

NWI WETLAND TYPE

- LAKE
- FRESHWATER EMERGENT WETLAND
- FRESHWATER FORESTED/SHRUB WETLAND
- RIVERINE

0 250 500 1,000 Feet

REFERENCE

1. AERIAL IMAGERY: ESRI, DIGITAL GLOBE, MICROSOFT, BING MAPS. IMAGERY FLOWN 2016.
2. WETLANDS DATASET: NATIONAL WETLANDS INVENTORY (NWI), US FISH AND WILDLIFE SERVICE, 2017.

CLIENT
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PROJECT
KALAMAZOO AIRPORT EXPANSION
PORTAGE TOWNSHIP, KALAMAZOO COUNTY, MICHIGAN

TITLE
NWI MAP

CONSULTANT
GOLDER

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PREPARED	KJC
DESIGN	KJC
REVIEW	JBM
APPROVED	BJH

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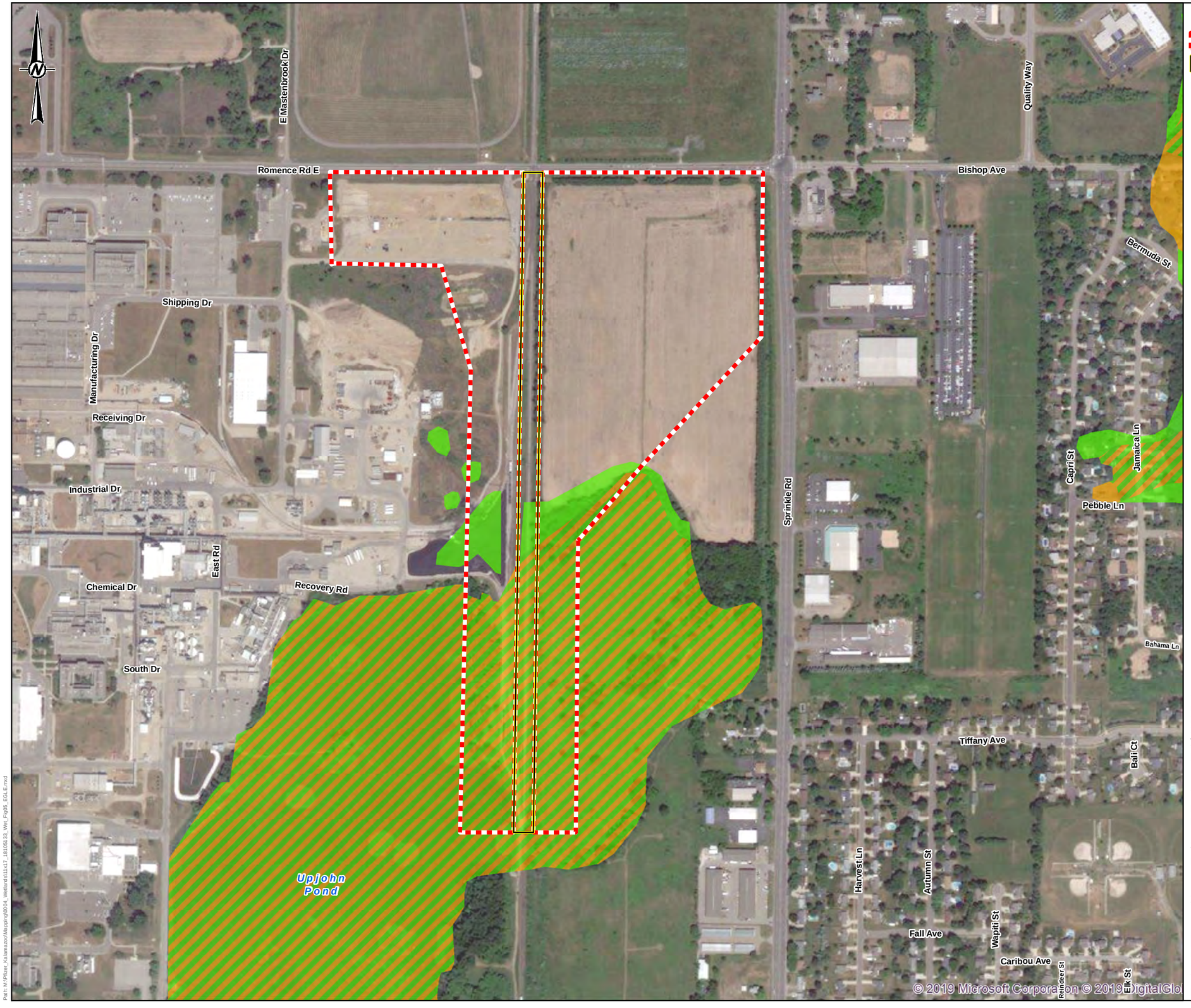
18105133

FIGURE
4

Path: M:\Pfizer_KalamazooMapping\00\04_Wetland\s11x17_18105133_Wet_Fig04_NWI.mxd

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM:
0 1 in



LEGEND

APPROXIMATE APE LIMITS

APPROXIMATE RAILROAD ROW

EGLE WETLANDS

SOIL AREAS WHICH INCLUDE WETLAND SOILS

WETLANDS AS IDENTIFIED ON NWI AND/OR MIRIS MAPS

WETLANDS AS IDENTIFIED ON NWI AND/OR MIRIS MAPS AND SOIL AREAS WHICH INCLUDE WETLAND SOILS

0 250 500 1,000 Feet

REFERENCE

1. AERIAL IMAGERY: ESRI, DIGITAL GLOBE, MICROSOFT, BING MAPS. IMAGERY FLOWN 2016.
2. WETLANDS DATASET: MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY.

CLIENT
PFIZER INC.

PROJECT
KALAMAZOO AIRPORT EXPANSION
PORTAGE TOWNSHIP, KALAMAZOO COUNTY, MICHIGAN

TITLE
EGLE WETLAND MAP

CONSULTANT
GOLDER

YYYY-MM-DD	2019-07-21
PREPARED	KJC
DESIGN	KJC
REVIEW	JBM
APPROVED	BJH

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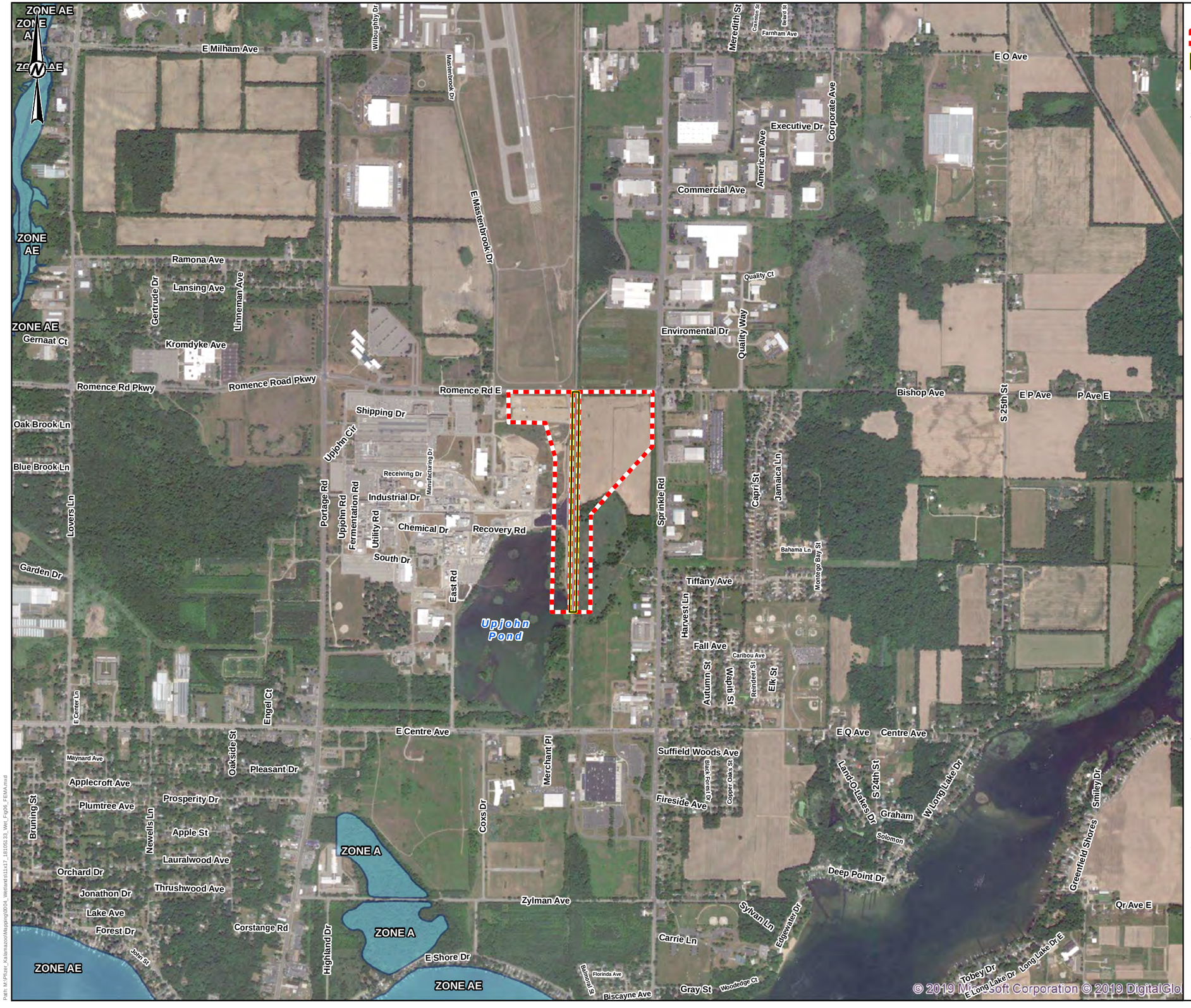
18105133

FIGURE
5

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: 0 1in

Path: M:\Pfizer_KalamazooMapping\09004_Wetland\s11x17_18105133_Wet_Fig05_EGLE.mxd



LEGEND

- APPROXIMATE APE LIMITS
- APPROXIMATE RAILROAD ROW
- FEMA 100-YEAR FLOODPLAIN

ZONE AE = AN AREA INUNDATED BY 1% ANNUAL CHANCE FLOODING, FOR WHICH BFES HAVE BEEN DETERMINED.

ZONE A = AN AREA INUNDATED BY 1% ANNUAL CHANCE FLOODING, FOR WHICH NO BASE FLOOD ELEVATIONS HAVE BEEN DETERMINED.

0 750 1,500 3,000 Feet

REFERENCE

1. AERIAL IMAGERY: ESRI, DIGITAL GLOBE, MICROSOFT, BING MAPS. IMAGERY FLOWN 2016.
2. FLOODPLAIN DATASET: FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA).

CLIENT
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PROJECT
KALAMAZOO AIRPORT EXPANSION
PORTAGE TOWNSHIP, KALAMAZOO COUNTY, MICHIGAN

TITLE
FEMA
100-YR FLOODPLAIN MAP

CONSULTANT
GOLDER

YYYY-MM-DD	2019-07-21
PREPARED	KJC
DESIGN	KJC
REVIEW	JBM
APPROVED	BJH

PROJECT No.
18105133

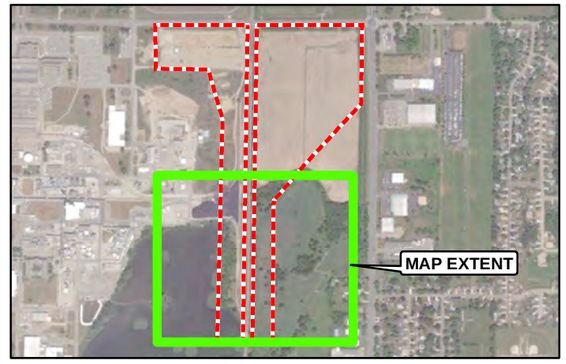
FIGURE
6

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: 1 in 0

Path: M:\Pfizer_Kalamazoo\Mapping\0004_Wetland\s11x17_18105133_WH_Fig06_FEMA.mxd

LEGEND

- APPROXIMATE APE LIMITS
- WETLANDS (AREA WITHIN APE LIMITS)
- APPROXIMATE WETLAND LOCATION (NOT VERIFIED BY DELINEATION OR SURVEY)
- WETLAND CONTINUES BEYOND APE LIMITS
- APPROXIMATE LIMITS OF ORDINARY HIGH WATER MARK



0 87.5 175 350 Feet

REFERENCE

1. AERIAL IMAGERY: ESRI, DIGITAL GLOBE, MICROSOFT, BING MAPS. IMAGERY FLOWN 2016.
2. WETLAND BOUNDARIES BASED ON FIELD DELINEATION CONDUCTED BY GOLDER ON APRIL 15, 2019.

CLIENT
PFIZER INC.

PROJECT
KALAMAZOO AIRPORT EXPANSION
PORTAGE TOWNSHIP, KALAMAZOO COUNTY, MICHIGAN

TITLE
WETLAND MAP

CONSULTANT
GOLDER

YYYY-MM-DD	2019-07-21
PREPARED	KJC
DESIGN	KJC
REVIEW	JBM
APPROVED	BJH

PROJECT No.
18105133

FIGURE
7

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: 1in 0

Path: M:\Pfizer_KalamazooMapping\00\04_Wetland\911\47_18105133_Wet_Fig\07_Wetlands.mxd

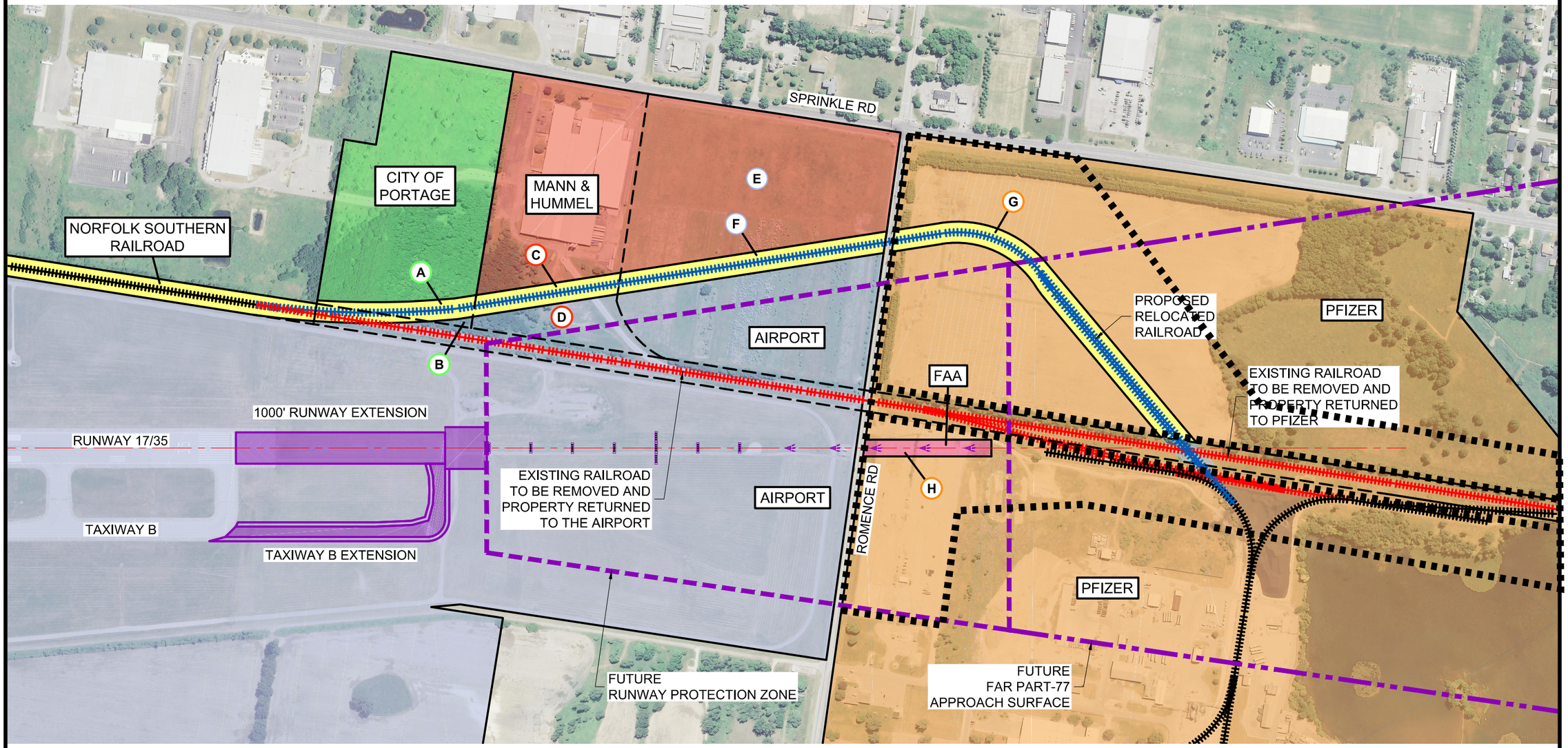
ATTACHMENT B

Mead and Hunt Proposed Property Map

PROPOSED PROPERTY

WITH PROPOSED RAILROAD

APPROXIMATE APE LIMITS (PFIZER PROPERTY)



NOTE: CITY OF PORTAGE, MANN & HUMMEL, AND PFIZER PARCEL BOUNDARIES HAVE BEEN ESTIMATED USING DATA FROM THE KALAMAZOO COUNTY GIS SYSTEM.

CITY OF PORTAGE

- A: AREA DEEDED TO NORFOLK SOUTHERN RAILROAD
- B: AREA DEEDED TO THE AIRPORT

MANN & HUMMEL

- C: AREA DEEDED TO NORFOLK SOUTHERN RAILROAD
- D: AREA DEEDED TO THE AIRPORT

AIRPORT

- E: AREA DEEDED TO MANN & HUMMEL
- F: AREA DEEDED TO NORFOLK SOUTHERN RAILROAD

PFIZER

- G: AREA DEEDED (TO BE DETERMINED)
- H: AREA DEEDED TO FAA FOR MALSR CRITICAL AREA*
  *ACTUAL TYPE OF ACQUISTION TO BE DETERMINED

Mead & Hunt

Mead and Hunt, Inc.
2440 Deming Way
Middleton, WI 53562
phone: 608-273-6380
meadhunt.com

KALAMAZOO/BATTLE CREEK INTERNATIONAL AIRPORT RUNWAY 17/35 RIM, EXTENSION AND RAILROAD RELOCATION

KALAMAZOO, MICHIGAN

ISSUED

M&H NO.:	1113900-141424.01
DATE:	4/23/18
DESIGNED BY:	AEF
DRAWN BY:	AEF
CHECKED BY:	SADW

DO NOT SCALE DRAWINGS

SHEET CONTENTS

PROPERTY INVOLVED IN RAILROAD RELOCATION

SHEET NO.

2 OF 2

4/23/2018 9:31:10 AM

ATTACHMENT B

WETS Table and Rainfall Documentation Worksheet

WETS Table

WETS Station: GULL LAKE BIOLOGICAL STATION, MI

Requested years: 1988 - 2019

Month	Avg Max Temp	Avg Min Temp	Avg Mean Temp	Avg Precip	30% chance precip less than	30% chance precip more than	Avg number days precip 0.10 or more	Avg Snowfall
Jan	33.7	18.5	26.1	2.51	1.78	2.97	7	15.1
Feb	36.3	18.5	27.4	2.02	1.32	2.42	5	10.8
Mar	48.3	27.6	37.9	2.44	1.39	2.97	6	4.3
Apr	61.8	37.7	49.7	3.64	2.63	4.29	7	0.3
May	73.0	48.3	60.6	4.31	2.63	5.21	8	0.0
Jun	82.4	57.8	70.1	3.94	2.72	4.70	7	0.0
Jul	85.7	61.3	73.5	3.81	2.41	4.60	6	0.0
Aug	83.0	60.1	71.6	4.39	3.18	5.18	7	0.0
Sep	76.1	52.3	64.2	3.91	2.36	4.74	6	0.0
Oct	63.7	42.4	53.1	3.93	2.65	4.70	7	0.5
Nov	49.4	33.3	41.3	3.38	2.29	4.04	7	4.1
Dec	36.6	22.3	29.4	2.40	1.76	2.82	7	13.4
Annual:					-	-		
Average	60.8	40.0	50.4	-	-	-	-	-
Total	-	-	-	40.68			81	48.4

GROWING SEASON DATES

Years with missing data:	24 deg = 11	28 deg = 10	32 deg = 9
Years with no occurrence:	24 deg = 0	28 deg = 0	32 deg = 0
Data years used:	24 deg = 21	28 deg = 22	32 deg = 23
Probability	24 F or higher	28 F or higher	32 F or higher
50 percent *	4/5 to 11/12: 221 days	4/20 to 10/30: 193 days	5/4 to 10/12: 161 days
70 percent *	4/3 to 11/15: 226 days	4/13 to 11/6: 207 days	4/29 to 10/18: 172 days

* Percent chance of the growing season occurring between the Beginning and Ending dates.

STATS TABLE - total precipitation (inches)

Yr	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annl
1929				M3.31	4.12	2.53	2.63	0.71	1.69	4.43	1.88	M1.51	22.81
1930	1.49	M0.45	M2.97	M1.29	3.38	2.65	1.22	1.50	0.76	0.96	2.10	0.77	19.54
1931	1.18	M0.99	2.50	1.13	2.14	3.68	0.70	2.05	2.46	1.78	4.00	M2.08	24.69
1932	3.84	1.95	1.53	1.45	M5.04	3.98	4.11	2.58	2.16	5.58	2.01	3.10	37.33
1933	1.56	1.34	1.76	3.19	4.62	4.15	2.61	3.59	M4.54	6.81	2.59	2.14	38.90
1934	1.03	0.40	1.65	2.72	1.78	0.94	0.92	2.20	4.33	1.98	3.50	1.37	22.82
1935	2.30	1.38	3.28	1.55	4.66	4.86	2.72	7.42	3.11	1.25	6.10	1.08	39.71
1936	1.41	1.18	0.62	3.11	0.99	3.76	0.78	3.06	6.06	4.87	1.37	2.79	30.00
1937	2.63	1.57	0.95	5.23	3.31	6.67	2.11	5.24	1.	M1.	1.45	2.29	35.

									89	90			24
1938	1.70	4.38	3.68	1.85	5.50	M3.62	4.26	3.90	2.77	0.23	1.79	2.23	35.91
1939	2.38	4.59	1.71	4.27	1.29	5.45	1.90	9.13	1.88	4.15	0.99	1.52	39.26
1940	1.96	0.40	1.40	1.82	4.85	7.31	2.22	9.87	1.11	4.02	2.47	2.13	39.56
1941	M2.11	M0.85	1.37	M2.11	M2.96	M3.78	M3.22	M1.54	M3.75	M9.80	M3.32	M1.56	36.37
1942	1.92	M0.88	M5.08	M0.90	M4.03	M5.48	5.38	M5.66	M3.38	M3.98	M3.18	M2.97	42.84
1943	M2.13	M2.08	M3.28	3.12	8.76	3.13	5.30	1.86	4.97	1.70	2.94	0.33	39.60
1944	1.35	2.38	4.47	3.40	3.71	3.53	0.83	3.87	3.09	1.56	2.41	0.99	31.59
1945	0.61	1.23	2.54	3.15	7.69	3.70	2.14	2.06	5.49	2.18	2.61	M1.67	35.07
1946	1.77	1.65	3.19	1.27	4.92	1.59	0.25	1.62	4.45	3.53	3.16	2.96	30.36
1947	2.87	1.09	2.01	7.71	4.79	3.83	2.53	4.94	4.91	1.23	2.77	1.76	40.44
1948	M1.34	2.30	5.09	3.97	5.79	M2.41	2.67	1.22	3.20	0.51	2.85	2.89	34.24
1949	3.61	2.71	3.39	2.32	2.69	4.12	2.61	3.58	2.83	2.73	1.87	2.77	35.23
1950	4.02	3.52	3.28	7.93	0.92	4.90	4.70	1.57	5.90	0.66	2.29	2.55	42.24
1951	2.61	1.64	1.92	3.83	2.89	4.02	3.14	4.01	3.67	4.60	3.25	2.54	38.12
1952	5.38	M1.36	1.61	M3.23	5.51	2.26	4.76	3.04	1.23	0.22	2.95	1.79	33.34
1953	1.53	0.75	2.14	M2.57	3.20	4.39	2.79	2.90	1.38	1.89	1.46	1.07	26.07
1954	1.66	M2.18	2.65	3.38	0.94	M7.69	2.70	3.31	2.98	8.67	M2.49	1.73	40.38
1955	1.37	1.65	1.72	2.81	1.91	4.75	3.48	3.28	M1.14	M5.00	M2.49	0.44	30.04
1956	1.10	1.63	1.90	4.63	3.75	3.67	2.43	1.87	0.62	0.24	1.13	0.81	23.78
1957	2.39	1.23	1.59	4.66	4.29	3.01	4.62	3.05	1.82	4.42	2.87	1.56	35.51
1958	1.13	1.18	0.56	2.03	1.39	6.26	3.28	4.29	2.44	1.75	M2.40	0.43	27.14
1959	2.31	2.08	1.49	2.52	2.53	4.38	3.88	4.39	3.10	4.62	1.86	1.68	34.84
1960	2.94	1.98	0.56	2.88	5.12	4.78	3.19	2.57	1.58	1.23	1.65	0.72	29.20
1961	0.28	0.51	1.88	3.73	1.73	3.27	2.50	5.15	6.24	2.45	1.37	0.76	29.87
1962	2.35	0.43	0.77	1.77	3.19	3.79	2.79	1.26	3.54	2.70	0.39	1.51	24.49
1963	0.82	0.37	M1.37	2.28	4.25	1.54	4.05	1.81	1.02	0.84	1.20	0.48	20.03
1964	0.50	0.32	2.01	3.69	2.44	2.13	2.61	4.93	4.72	1.19	2.74	1.43	28.71
1965	2.05	1.35	1.94	1.89	1.97	3.21	2.21	5.21	5.18	2.26	2.04	4.53	33.84
1966	0.93	1.51	3.25	4.48	3.53	2.22	2.16	5.13	1.73	1.03	6.56	3.92	36.45
1967	2.73	1.61	1.12	4.73	2.34	6.03	2.88	1.90	3.08	5.13	3.08	5.01	39.64
1968	1.66	2.65	0.73	2.95	3.25	6.59	5.37	3.44	3.17	3.49	4.49	3.51	41.30
1969	M1.68	0.28	1.83	4.95	2.79	5.60	4.47	1.56	0.43	5.56	3.12	0.72	32.99
1970	0.82	0.75	M2.30	3.49	4.09	3.62	6.03	1.63	3.24	4.40	M3.02	1.55	34.94
1971	1.09	2.92	M0.90	1.14	2.33	1.63	5.64	1.86	4.	3.	3.10	4.60	33.

									53	51			25
1972	1.58	1.09	2.34	3.39	3.79	2.70	4.94	6.27	6.15	3.10	2.31	4.63	42.29
1973	1.33	1.48	3.61	3.71	6.06	3.63	3.77	1.95	4.57	3.04	3.68	2.70	39.53
1974	2.36	3.10	3.91	4.95	3.44	3.63	1.36	2.92	3.43	1.55	2.92	1.26	34.83
1975	M1.08	2.40	2.09	6.48	6.02	2.74	M0.13	10.43	1.80	0.99	3.06	4.52	41.74
1976	2.02	1.97	M2.47	4.33	3.25	2.86	3.93	0.45	2.18	2.72	M1.39	1.38	28.95
1977	2.35	0.53	2.15	3.99	1.06	4.08	1.84	5.51	4.52	2.02	3.34	2.14	33.53
1978	4.11	0.34	1.17	2.82	2.95	6.53	2.44	1.70	5.84	3.27	2.65	5.39	39.21
1979	M2.05	1.57	2.95	4.80	2.37	9.28	2.28	4.99	T	2.70	5.54	M2.38	40.91
1980	0.76	1.92	2.69	3.13	2.44	5.18	5.21	5.71	3.67	2.00	1.25	M2.72	36.68
1981	0.54	M2.24	1.02	6.28	3.44	4.27	1.69	3.67	6.87	3.22	1.36	1.27	35.87
1982	2.79	M1.10	4.67	1.87	4.01	4.15	4.26	2.17	1.39	1.16	5.26	5.28	38.11
1983	0.98	1.26	3.25	5.00	5.44	1.91	2.86	2.88	4.33	2.24	3.71	2.93	36.79
1984	M0.61	1.17	3.04	3.09	4.55	0.27	3.34	1.05	6.17	3.53	2.52	5.84	35.18
1985	M2.70	M3.72	5.08	3.68	4.33	1.76	4.62	4.21	2.21	5.06	6.13	M2.31	45.81
1986	0.78	M3.33	1.78	4.42	3.60		M7.27	4.60	9.99	3.77	0.49	1.51	41.54
1987	1.16	0.09	1.52	2.36	1.33	2.01	M2.56	6.94	5.19	2.53	2.41	5.09	33.19
1988		1.46	2.35	3.03	1.41	1.44	4.17	4.99	6.41	5.33	5.42	M2.15	38.16
1989	1.77	1.37	2.68	M1.98	6.00	5.38	2.86	4.32	6.85	1.30	4.14	1.16	39.81
1990	2.14	3.11	2.80	3.01	4.71	4.58	2.50	3.47	3.35	6.59	7.61	M2.93	46.80
1991	1.27	0.58	5.73	5.37	3.39	2.82	5.87	6.21	2.23	7.37	M2.70	4.95	48.49
1992	M1.36	1.05	2.67	2.86	0.98	1.21	6.03	3.37	5.48	2.87	4.42	M3.03	35.33
1993	M3.52	M0.90	M2.25	4.71	1.71	7.16	2.61	3.36	5.31	3.70	1.14	1.16	37.53
1994	M2.59	M1.36	1.44	3.50	0.86	5.76	6.60	5.64	M1.02	2.28	5.40	1.46	37.91
1995	2.58	0.86	1.65	M3.33	3.76	2.96	5.30	5.05	M4.72	2.84	M5.00	M1.17	39.22
1996	M1.37	1.35	0.75	3.70	3.70	6.21	1.39	1.61	3.05	3.98	M2.42	M3.73	33.26
1997	M2.93	4.41	M2.33	1.52	4.59	4.46	1.70	M3.65	5.67	2.47	1.85	M1.99	37.57
1998	M4.22	1.97	M3.48	5.29	1.94	2.67	4.12	2.33	2.10	3.67	2.10	M1.40	35.29
1999	M4.11	1.43	1.39	6.31	2.36	4.29	3.24	1.97	2.93	1.41	0.95	M3.48	33.87
2000	3.24	1.67	M2.10	4.49	9.14	4.01	4.84	4.63	5.26	2.66	M4.68	3.88	50.60
2001	1.07	M3.84	0.91	3.09	7.67	5.28	2.01	5.82	4.93	7.71	2.05	2.80	47.18
2002	M2.30	2.01	2.18	3.25	4.49	2.04	4.29	5.75	1.71	4.47	M2.05	M2.38	36.92
2003	M0.92	M1.12	1.87	M3.04	6.24	2.47	2.92	3.88	5.29	2.49	6.81	2.51	39.56
2004	1.82	1.34	4.61	0.44	9.93	3.85	3.16	M6.66	1.72	3.36	4.29	2.68	43.86
2005	M4.87	M1.69	M0.24	M0.66	M1.76	M4.50	M1.89	M0.49	M0.	M0.	M2.	M1.	21.

									36	14	87	86	33
2006	M3.08	M0.47	M2.14	M2.27	M6.06	M0.43	M4.17	M6.15	M3.22	M4.61	M3.27	M1.21	37.08
2007	3.86	M1.22	2.66	3.33	2.54	1.68	0.75					M0.60	16.64
2008	M4.24	M3.28	1.96	2.47	1.87	5.90	6.82	0.82	14.04	3.53	M1.48	3.73	50.14
2009	2.93	M3.07	3.88	5.57	2.49	M6.02	0.51	7.82			0.98	1.67	34.94
2010	0.86	1.72	1.08	2.87	1.18	M8.08	M5.58		3.71	1.78	1.82	1.13	29.81
2011	M0.93	1.39		M0.00	6.77	2.26	9.15	M3.84	M2.98	3.53	4.09	3.81	38.75
2012	3.26	2.69	4.11	4.23		1.56	1.53	M3.04	M2.53	M1.64	M0.13	M2.19	26.91
2013	M3.25		M0.66	8.44	M4.44	M4.02	M4.62	5.36	M0.96	M2.57	M3.64	M2.40	40.36
2014	M3.50	2.77	M1.85	3.60	M4.11	M6.10	M3.68	M3.15	M2.36	4.04	M3.59	M1.37	40.12
2015	M1.18	M0.60	M0.03	M2.74	M7.30		5.85	5.80	M2.00	M1.48	M2.69	M2.85	32.52
2016	M1.83	M0.66	M3.65	3.58	M4.35	1.53	M5.86	M7.57	M1.40	M3.37	2.49	M2.67	38.96
2017	M4.00	M1.48	5.14	M3.38	3.70	2.19	2.50	2.47	1.08	12.15	M4.29	M1.57	43.95
2018	M1.65	5.05	1.87	2.68	8.93	4.47	1.83	6.06	5.20	5.26	3.19	M1.11	47.30
2019	M2.06	M1.85	M2.66	M0.00									6.57
Notes: Data missing in any month have an "M" flag. A "T" indicates a trace of precipitation.													
Data missing for all days in a month or year is blank.													
Creation date: 2016-07-22													

NRCS method - Rainfall Documentation Worksheet Hydrology Tools for Wetland Determination
NRCS Engineering Field Handbook Chapter 19

Date	Insert Date	**Landowner/Project**	Pfizer
Weather Station	Gull Lake Biological Station, MI	**State**	MI
County	Kalamazoo	**Growing Season**	4/13 to 11/6 (28 deg/70%)
Photo/obs Date	April 15, 2019	**Soil Name**	See wetland report

Long-term rainfall statistics (from WETS table or State Climatology Office)

	Month	30% chance <	30% chance >	Precip	Condition Dry, Wet, Normal	Condition Value	Month Weight Value	Product of Previous 2 Columns
1st Prior Month*	March	1.39	2.97	2.66	N	2	3	6
2nd Prior Month*	February	1.32	2.42	1.85	N	2	2	4
3rd Prior Month*	January	1.78	2.97	2.06	N	2	1	2
							Sum	**12**

*compared to photo/observation date

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

Condition value:
Dry =1
Normal =2
Wet =3

Conclusions: **prior period has been normal**

ATTACHMENT C

APE Photographs

PFIZER – RUNWAY 17/35 EXTENSION AND TAXIWAY C REALIGNMENT
WETLAND DELINEATION
KALAMAZOO COUNTY, MICHIGAN

PHOTO 1 **Photo taken on by Pfizer staff on April 15, 2019 depicting typical conditions in Wetland A (near flag A9 facing south).**	
PHOTO 2 **Photo taken on by Pfizer staff on April 15, 2019 depicting typical conditions in Wetland C (near flag C9 facing west).**	

PHOTO 3 **Photo taken on by Pfizer staff on April 15, 2019 depicting typical conditions in Wetland D (near flag D4 facing northeast).**	
PHOTO 4 **Photo taken on by Pfizer staff on April 15, 2019 depicting typical conditions in Wetland D (SP-D1).**	

PHOTO 5 **Photo taken on by Pfizer staff on April 15, 2019 depicting typical conditions in wetlands along the railroad tracks (cattails in trackside drainage feature northeast of Wetland A).**	
PHOTO 6 **Photo taken on by Pfizer staff on April 15, 2019 depicting typical conditions in wetlands along the railroad tracks (wet meadow in trackside drainage feature west of Wetland D). Wetland D evident in left side of photo, upland ridge in center, and trackside wetlands in right side.**	

ATTACHMENT D

Wetland Data Forms

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Pfizer Property City/County: Portage Twp., Kalamazoo Co. Sampling Date: 4/15/2019

Applicant/Owner: Pfizer State: MI Sampling Point: SP-A1

Investigator(s): Brian Huebner, PWS #2882 Section, Township, Range: Sect 13, T 3 S, R 11W

Landform (hillside, terrace, etc.): lacustrine fringe Local relief (concave, convex, none): nearly level Slope %: 0-1

Subregion (LRR or MLRA): LRR L, MLRA 98 Lat: see maps Long: Datum:

Soil Map Unit Name: Houghton muck, 0-1 percent slopes (Hn) NWI classification: PEM (mapped L1UBHX)

Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No (If no, explain in Remarks.)

Are Vegetation , Soil , or Hydrology significantly disturbed? Are "Normal Circumstances" present? Yes x No

Are Vegetation , Soil , or Hydrology naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No	**Is the Sampled Area**
Hydric Soil Present?	Yes X	No	**within a Wetland?** **Yes** X **No**
Wetland Hydrology Present?	Yes X	No	If yes, optional Wetland Site ID: Wetland A

Remarks: (Explain alternative procedures here or in a separate report.)
See wetland report for a descripton of site conditions at the time of the delineation.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- Water Marks (B1)
- Sediment Deposits (B2)
- Drift Deposits (B3)
- Algal Mat or Crust (B4)
- Iron Deposits (B5)
- Inundation Visible on Aerial Imagery (B7)
- Sparsely Vegetated Concave Surface (B8)
- x Water-Stained Leaves (B9)
- Aquatic Fauna (B13)
- Marl Deposits (B15)
- Hydrogen Sulfide Odor (C1)
- Oxidized Rhizospheres on Living Roots (C3)
- Presence of Reduced Iron (C4)
- Recent Iron Reduction in Tilled Soils (C6)
- Thin Muck Surface (C7)
- Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- Surface Soil Cracks (B6)
- Drainage Patterns (B10)
- Moss Trim Lines (B16)
- Dry-Season Water Table (C2)
- Crayfish Burrows (C8)
- Saturation Visible on Aerial Imagery (C9)
- Stunted or Stressed Plants (D1)
- Geomorphic Position (D2)
- Shallow Aquitard (D3)
- Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes	No x	Depth (inches):
Water Table Present?	Yes x	No	Depth (inches): 3
Saturation Present? (includes capillary fringe)	Yes x	No	Depth (inches): 0

Wetland Hydrology Present? **Yes** X **No**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
The wetland delneation was conducted during a period of time characterized by the seasonal high water table. Rainfall for the three-month period preceding the delineation was normal. See NRCS WETS table and rainfall documentaton worksheet in wetland delineation report.

VEGETATION – Use scientific names of plants. Sampling Point: SP-A1

Tree Stratum (Plot size: 30'R)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Salix nigra*	20	Yes	OBL
2.			
3.			
4.			
5.			
6.			
7.			
	20	=Total Cover	
Sapling/Shrub Stratum (Plot size: 15'R)			
1. *Salix interior*	20	Yes	FACW
2. *Salix sp. (cut, assumed FACW)*	20	Yes	FACW
3.			
4.			
5.			
6.			
7.			
	40	=Total Cover	
Herb Stratum (Plot size: 5'R)			
1. *Phalaris arundinacea*	90	Yes	FACW
2. *Carex sp. (assumed FACW)*	20	No	FACW
3. *Apocynum cannabinum*	2	No	FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	112	=Total Cover	
Woody Vine Stratum (Plot size: 30'R)			
1.			
2.			
3.			
4.			
		=Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	20	x 1 =	20
FACW species	150	x 2 =	300
FAC species	2	x 3 =	6
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	172 (A)		326 (B)

Prevalence Index = B/A = 1.90

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)
Wetland delineation conducted at the onset of the growing season as evidenced by newly emerging herbaceous vegetation (violets, lake sedge, and others) and developing buds on trees and shrubs. See wetland delineation report for photographs depicting typical conditions in wetlands on the site.

SOIL

Sampling Point SP-A1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	7.5YR 2.5/1	95	5YR 4/6	5	C	M	Sandy	Prominent redox concentrations
6-9	10YR 3/2	100					Sandy	sandy, gravelly FILL

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- X Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- x Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ High Chroma Sands (S11) (**LRR K, L)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) (**LRR K, L**)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ? Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** ___

Remarks:

This data form is revised from Northcentral and Northeast Regional Supplement Version 2.0 to include the NRCS Field Indicators of Hydric Soils, Version 7.0, 2015 Errata. (http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_051293.docx). Area has been historically filled as evidenced by abrupt topography and presence of foreign debris in soil (brick, concret, metal fragments).

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Pfizer Property City/County: Portage Twp., Kalamazoo Co. Sampling Date: 4/15/2019

Applicant/Owner: Pfizer State: MI Sampling Point: SP-UA1

Investigator(s): Brian Huebner, PWS #2882 Section, Township, Range: Sect 13, T 3 S, R 11W

Landform (hillside, terrace, etc.): backslope near shoulder Local relief (concave, convex, none): convex Slope %: 2-4

Subregion (LRR or MLRA): LRR L, MLRA 98 Lat: see maps Long: Datum:

Soil Map Unit Name: Houghton muck, 0-1 percent slopes (Hn) NWI classification: NA

Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No (If no, explain in Remarks.)

Are Vegetation , Soil , or Hydrology significantly disturbed? Are "Normal Circumstances" present? Yes x No

Are Vegetation , Soil , or Hydrology naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No	**Is the Sampled Area**
Hydric Soil Present?	Yes	No X	**within a Wetland?** **Yes** **No** X
Wetland Hydrology Present?	Yes	No X	If yes, optional Wetland Site ID:

Remarks: (Explain alternative procedures here or in a separate report.)
See wetland report for a descripton of site conditions at the time of the delineation.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- Surface Water (A1)
- High Water Table (A2)
- Saturation (A3)
- Water Marks (B1)
- Sediment Deposits (B2)
- Drift Deposits (B3)
- Algal Mat or Crust (B4)
- Iron Deposits (B5)
- Inundation Visible on Aerial Imagery (B7)
- Sparsely Vegetated Concave Surface (B8)
- Water-Stained Leaves (B9)
- Aquatic Fauna (B13)
- Marl Deposits (B15)
- Hydrogen Sulfide Odor (C1)
- Oxidized Rhizospheres on Living Roots (C3)
- Presence of Reduced Iron (C4)
- Recent Iron Reduction in Tilled Soils (C6)
- Thin Muck Surface (C7)
- Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- Surface Soil Cracks (B6)
- Drainage Patterns (B10)
- Moss Trim Lines (B16)
- Dry-Season Water Table (C2)
- Crayfish Burrows (C8)
- Saturation Visible on Aerial Imagery (C9)
- Stunted or Stressed Plants (D1)
- Geomorphic Position (D2)
- Shallow Aquitard (D3)
- Microtopographic Relief (D4)
- FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes	No x	Depth (inches):
Water Table Present?	Yes	No x	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes	No x	Depth (inches):

Wetland Hydrology Present? **Yes** **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
The wetland delneation was conducted during a period of time characterized by the seasonal high water table. Rainfall for the three-month period preceding the delineation was normal. See NRCS WETS table and rainfall documentaton worksheet in wetland delineation report.

VEGETATION – Use scientific names of plants. Sampling Point: SP-UA1

Tree Stratum (Plot size: 30'R)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
Sapling/Shrub Stratum (Plot size: 15'R)			
1. *Salix interior*	10	Yes	FACW
2. *Salix sp. (cut, assumed FACW)*	5	Yes	FACW
3.			
4.			
5.			
6.			
7.			
	15 =Total Cover		
Herb Stratum (Plot size: 5'R)			
1. *Asclepias syriaca*	10	Yes	UPL
2. *Panicum virgatum*	10	Yes	FAC
3. *Poa pratensis*	10	Yes	FACU
4. *Achillea millefolium*	5	No	FACU
5. *Verbascum thapsus*	5	No	UPL
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	40 =Total Cover		
Woody Vine Stratum (Plot size: 30'R)			
1.			
2.			
3.			
4.			
	=Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 60.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	15	x 2 =	30
FAC species	10	x 3 =	30
FACU species	15	x 4 =	60
UPL species	15	x 5 =	75
Column Totals:	55 (A)		195 (B)

Prevalence Index = B/A = 3.55

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

Wetland delineation conducted at the onset of the growing season as evidenced by newly emerging herbaceous vegetation (violets, lake sedge, and others) and developing buds on trees and shrubs. See wetland delineation report for photographs depicting typical conditions in wetlands on the site. Although vegetation dominated by FAC or wetter species (50/20 rule), prevalence index >3 indicates strong presence of upland species. Wetland vegetation is based on presence of willow, which can be invasive and grow well in disturbed upland areas (particularly sandbar willow/S. interior).

SOIL

Sampling Point SP-UA1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8	7.5YR 2.5/2	95	7.5YR 4/6	5	C	M	Sandy	Prominent redox concentrations
8-12	10YR 4/3	100					Sandy	sandy, gravelly FILL

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ High Chroma Sands (S11) (**LRR K, L)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) (**LRR K, L**)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** ___ **No** X

Remarks:

This data form is revised from Northcentral and Northeast Regional Supplement Version 2.0 to include the NRCS Field Indicators of Hydric Soils, Version 7.0, 2015 Errata. (http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_051293.docx). Soil in area is fill as evidenced by abrupt chnages in topography and presence of foreign material in soil (brick and concrete fragments). Sample location in distinctly elevated area compared to adjacent wetlands.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Pfizer Property City/County: Portage Twp., Kalamazoo Co. Sampling Date: 4/15/2019

Applicant/Owner: Pfizer State: MI Sampling Point: SP-D1

Investigator(s): Brian Huebner, PWS #2882 Section, Township, Range: Sect 13, T 3 S, R 11W

Landform (hillside, terrace, etc.): footslope Local relief (concave, convex, none): convex Slope %: 1-2

Subregion (LRR or MLRA): LRR L, MLRA 98 Lat: see maps Long: Datum:

Soil Map Unit Name: Houghton muck, 0-1 percent slopes (Hn) NWI classification: PEM (mapped on NWI)

Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No (If no, explain in Remarks.)

Are Vegetation , Soil , or Hydrology significantly disturbed? Are "Normal Circumstances" present? Yes x No

Are Vegetation , Soil , or Hydrology naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No	**Is the Sampled Area**
Hydric Soil Present?	Yes x	No	**within a Wetland?** **Yes** X **No**
Wetland Hydrology Present?	Yes X	No	If yes, optional Wetland Site ID: Wetland D

Remarks: (Explain alternative procedures here or in a separate report.)
See wetland report for a descripton of site conditions at the time of the delineation.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes	No x	Depth (inches):
Water Table Present?	Yes x	No	Depth (inches): 1
Saturation Present? (includes capillary fringe)	Yes x	No	Depth (inches): 0

Wetland Hydrology Present? **Yes** X **No**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
The wetland delneation was conducted during a period of time characterized by the seasonal high water table. Rainfall for the three-month period preceding the delineation was normal. See NRCS WETS table and rainfall documentaton worksheet in wetland delineation report.

VEGETATION – Use scientific names of plants. Sampling Point: SP-D1

Tree Stratum (Plot size: 30'R)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
		=Total Cover	
Sapling/Shrub Stratum (Plot size: 15'R)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
		=Total Cover	
Herb Stratum (Plot size: 5'R)			
1. *Phalaris arundinacea*	100	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	100	=Total Cover	
Woody Vine Stratum (Plot size: 30'R)			
1.			
2.			
3.			
4.			
		=Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	100	x 2 =	200
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	100 (A)		200 (B)

Prevalence Index = B/A = 2.00

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)
Wetland delineation conducted at the onset of the growing season as evidenced by newly emerging herbaceous vegetation (violets, lake sedge, and others) and developing buds on trees and shrubs. See wetland delineation report for photographs depicting typical conditions in wetlands on the site.

SOIL

Sampling Point SP-D1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-18	2.5YR 2.5/1	100					Muck	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- x Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ High Chroma Sands (S11) (**LRR K, L)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) (**LRR K, L**)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** x **No** ___

Remarks:

This data form is revised from Northcentral and Northeast Regional Supplement Version 2.0 to include the NRCS Field Indicators of Hydric Soils, Version 7.0, 2015 Errata. (http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_051293.docx)

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Pfizer Property City/County: Portage Twp., Kalamazoo Co. Sampling Date: 4/15/2019

Applicant/Owner: Pfizer State: MI Sampling Point: SP-UD1

Investigator(s): Brian Huebner, PWS #2882 Section, Township, Range: Sect 13, T 3 S, R 11W

Landform (hillside, terrace, etc.): hillside/summit (fill) Local relief (concave, convex, none): convex Slope %: 1-3

Subregion (LRR or MLRA): LRR L, MLRA 98 Lat: see maps Long: Datum:

Soil Map Unit Name: Houghton muck, 0-1 percent slopes (Hn) NWI classification: NA (mapped as PEM1F)

Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No (If no, explain in Remarks.)

Are Vegetation , Soil , or Hydrology significantly disturbed? Are "Normal Circumstances" present? Yes x No

Are Vegetation , Soil , or Hydrology naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No	**Is the Sampled Area**
Hydric Soil Present?	Yes	No X	**within a Wetland?** **Yes** **No** X
Wetland Hydrology Present?	Yes	No X	If yes, optional Wetland Site ID:

Remarks: (Explain alternative procedures here or in a separate report.)
See wetland report for a descripton of site conditions at the time of the delineation.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- Surface Water (A1)
- High Water Table (A2)
- Saturation (A3)
- Water Marks (B1)
- Sediment Deposits (B2)
- Drift Deposits (B3)
- Algal Mat or Crust (B4)
- Iron Deposits (B5)
- Inundation Visible on Aerial Imagery (B7)
- Sparsely Vegetated Concave Surface (B8)
- Water-Stained Leaves (B9)
- Aquatic Fauna (B13)
- Marl Deposits (B15)
- Hydrogen Sulfide Odor (C1)
- Oxidized Rhizospheres on Living Roots (C3)
- Presence of Reduced Iron (C4)
- Recent Iron Reduction in Tilled Soils (C6)
- Thin Muck Surface (C7)
- Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- Surface Soil Cracks (B6)
- Drainage Patterns (B10)
- Moss Trim Lines (B16)
- Dry-Season Water Table (C2)
- Crayfish Burrows (C8)
- Saturation Visible on Aerial Imagery (C9)
- Stunted or Stressed Plants (D1)
- Geomorphic Position (D2)
- Shallow Aquitard (D3)
- Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes	No x	Depth (inches):
Water Table Present?	Yes	No x	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes	No x	Depth (inches):

Wetland Hydrology Present? **Yes** **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
The wetland delneation was conducted during a period of time characterized by the seasonal high water table. Rainfall for the three-month period preceding the delineation was normal. See NRCS WETS table and rainfall documentaton worksheet in wetland delineation report.

VEGETATION – Use scientific names of plants. Sampling Point: SP-UD1

Tree Stratum (Plot size: 30'R)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Prunus serotina*	20	Yes	FACU
2. *Acer rubrum*	30	Yes	FAC
3. *Quercus palustris*	15	Yes	FACW
4.			
5.			
6.			
7.			
	65	=Total Cover	
Sapling/Shrub Stratum (Plot size: 15'R)			
1. *Amelanchier arborea (dead/dying)*	10	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
	10	=Total Cover	
Herb Stratum (Plot size: 5'R)			
1. *Phalaris arundinacea*	30	Yes	FACW
2. Unidentified grass (assumed FAC)	20	Yes	FAC
3. *Viola sororia*	2	No	FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	52	=Total Cover	
Woody Vine Stratum (Plot size: 30'R)			
1.			
2.			
3.			
4.			
		=Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 66.7% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	45	x 2 =	90
FAC species	52	x 3 =	156
FACU species	30	x 4 =	120
UPL species	0	x 5 =	0
Column Totals:	127 (A)		366 (B)

Prevalence Index = B/A = 2.88

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

Wetland delineation conducted at the onset of the growing season as evidenced by newly emerging herbaceous vegetation (violets, lake sedge, and others) and developing buds on trees and shrubs. See wetland delineation report for photographs depicting typical conditions in wetlands on the site. Herbaceous vegetation dominated by "weedy" species (reed canary grass). Area is clearly upland based on topography (sample location on narrow ridge 4 or more feet above the elevation of the adjacent wetlands.

SOIL

Sampling Point SP-UD1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-24	5YR 2.5/2	100					Mucky Peat	Area is historic fill built up with organic soil from adjacent wetland.

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ High Chroma Sands (S11) (**LRR K, L)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) (**LRR K, L**)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** ___ **No** X

Remarks:

This data form is revised from Northcentral and Northeast Regional Supplement Version 2.0 to include the NRCS Field Indicators of Hydric Soils, Version 7.0, 2015 Errata. (http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_051293.docx). Upland is formed on a prominant, narrow ridge of fill comprised or organic soil presumably excavated from the adjacent wetlands.