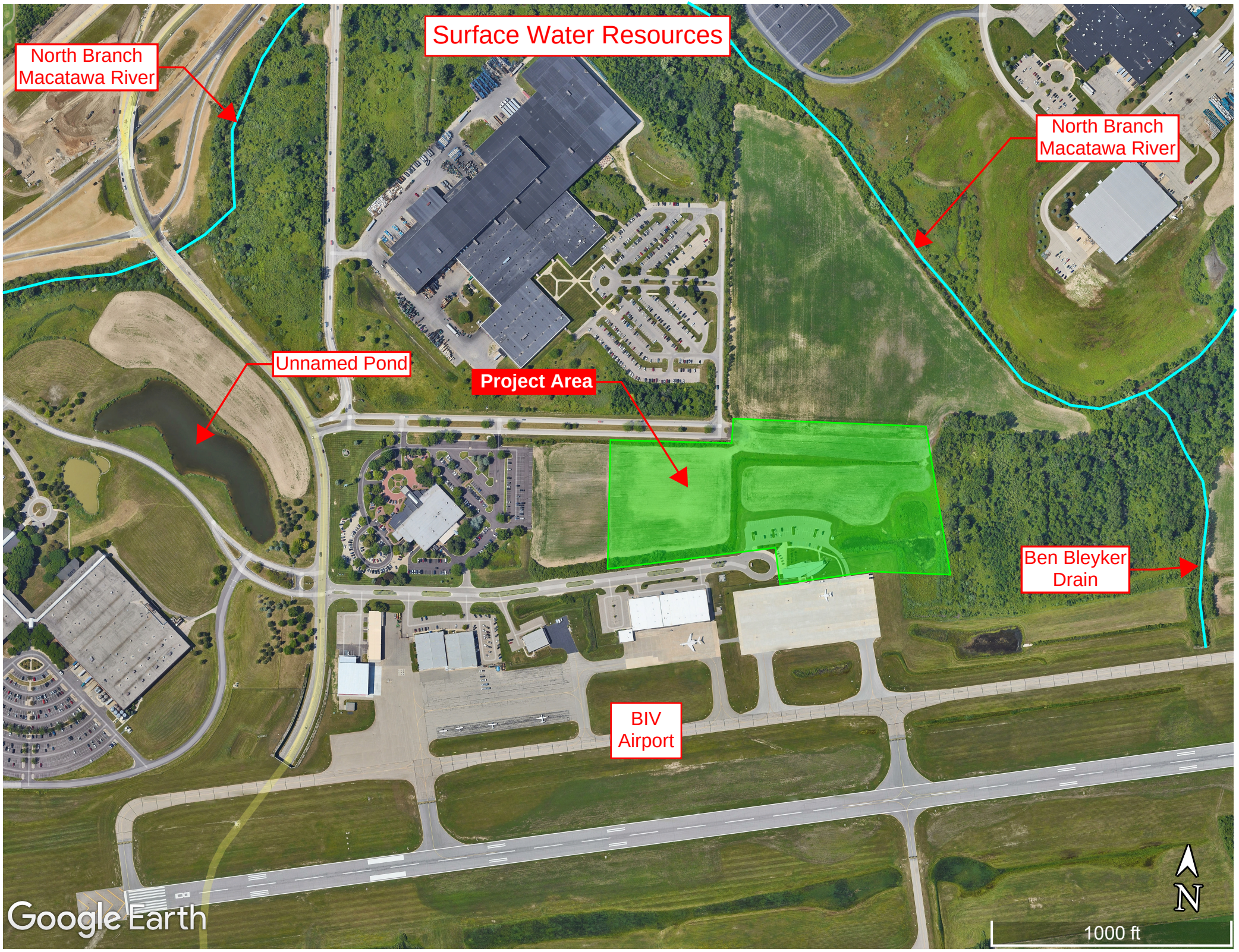
Appendix K – Water Resources


Surface Water Resources
North Branch Macatawa River
North Branch Macatawa River
Unnamed Pond
Project Area
Ben Bleyker Drain
BIV Airport
N
1000 ft
Google Earth

PREPARED BY

Mead & Hunt

WETLAND DELINEATION REPORT

SHORT FORM ENVIRONMENTAL ASSESSMENT FOR NORTH HANGAR AREA TAXILANE

WEST MICHIGAN REGIONAL AIRPORT (BIV)
HOLLAND, MI

PROJECT NUMBER 0819900-211654.02

February 2023

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1. Executive Summary

West Michigan Regional Airport (BIV or Airport) is a public use general aviation airport serving the Allegan and Ottawa Counties region of Michigan. BIV is within the city limits of Holland, Michigan in Allegan County, which is located in southwest Michigan along the eastern shore of Lake Michigan.

North of the existing fixed base operator (FBO) terminal building at BIV is a 15-acre area that currently is not served by aviation infrastructure. To meet the needs of existing and future users of the Airport, BIV is planning to construct the necessary infrastructure to provide access to this area. BIV proposes to sufficiently develop the project area including taxilanes, apron expansion, construction grading, lighting, fencing, utilities, and site restoration which will allow private and corporate hangar development in the future with minimum additional site improvements.

In support of environmental documentation for this project, a wetland delineation was conducted by Mead & Hunt, Inc. (Mead & Hunt) within an Area of Interest (AOI) on September 27, 2022. The AOI is in Section 8, Township 4 North, Range 15 West in the City of Holland, Allegan County, Michigan. The AOI covers approximately 17.1 acres.

A total of three (3) wetlands were delineated within the AOI, one of which is a detention area. Wetlands consist of three types: Scrub-shrub/Emergent (PSS/PEM), Emergent/Forested (PEM/PFO), and Unconsolidated Bottom, excavated (PUBGx). Wetland 1 is a roadside ditch along Regent Blvd on the northern extent of the Project AOI. Wetland 2 is a constructed stormwater drainage ditch that drains from west to east and continues beyond the Project AOI on both the west and east ends. A portion of the drainage ditch was realigned in 2016 as part of the FBO building and parking area project. Wetland 3 is a drainage detention area originally constructed about 2012 and later expanded with the construction of the FBO building and parking area in 2016.

2. Introduction

West Michigan Regional Airport (BIV or Airport) is a public use general aviation airport serving the Allegan and Ottawa Counties region of Michigan. Owned and operated by the West Michigan Airport Authority (WMAA)[1], the Federal Aviation Administration (FAA) classifies BIV as a general aviation airport in the National Plan of Integrated Airport Systems (NPIAS). BIV is defined as a Tier I airport, the highest classification, within the 2017 Michigan Aviation System Plan (MASP), further demonstrating the importance of the Airport to the aviation transportation system within the state of Michigan.

BIV is within the city limits of Holland, Michigan in Allegan County, which is located in southwest Michigan along the eastern shore of Lake Michigan, approximately 68 miles north of the Michigan-Indiana border. Interstate 196 (I-196), which links Benton Harbor, South Haven, Holland, and Grand Rapids, is located just south of the southern boundary of the Airport.

Communities neighboring the City of Holland are the City of Zeeland, the community of Beechwood, Fillmore and Laketown Townships in Allegan County, and Park and Holland Charter Townships in Ottawa County. The Airport is approximately 432 acres in size and sits to the east of the convergence of I-196 and U.S. Route 31/Business Loop I-196. Other surrounding roads are Washington Avenue on the western side of the Airport, Lincoln Avenue on the eastern side, 48th Street to the north, and 64th Street to the south. The Airport and Project AOI are shown on the Project Location Map provided in Appendix A.

The Airport has one runway, Runway 8/26, which measures 6,002 feet in length and 100 feet in width. A full parallel taxiway (50 feet wide) intersecting five connector taxiways is located north of Runway 8/26 with a holding pad at the approach end of Runway 26.

North of the existing terminal building at BIV is a 15-acre area that currently is not served by aviation infrastructure. To meet the needs of existing and future users of the Airport, BIV is planning to construct the necessary infrastructure to provide access to this area. Proposed development includes private and corporate hangars, taxilanes, apron expansion, construction grading, lighting, fencing, utilities, and site restoration.

The Airport is not proposing to construct a full build-out scenario of the 15-acre project area. Rather BIV will sufficiently develop the project area to allow private and corporate hangar development in the future with minimum additional site improvements. Future hangars, aprons, and apron approach work will be funded privately by individual developers as demand increases.

In support of environmental documentation for this project, a wetland delineation was conducted by Mead & Hunt, Inc. (Mead & Hunt) within an AOI on September 27, 2022. The AOI is in Section 8, Township 4 North, Range 15 West in the City of Holland, Allegan County, Michigan. The AOI covers approximately 17.1 acres.

[1] The WMAA is comprised of representatives from the City of Holland, Park Township, and the City of Zeeland.

This report summarizes the results of the wetland delineation. Delineator qualifications are provided in Appendix H. 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; 20 years wetland delineation practice.

3. Methods

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

- Climate Data and Summary Reports from AgACIS, WETS Climate Tables for 1981-2010 for Holland WTP, MI. Accessed at http://agacis.rcc-acis.org/.

- LiDAR Elevation Data for Allegan County (2015) collected as part of the Michigan Statewide Authoritative Imagery & LiDAR Program (MiSAIL). DEM data was accessed from The National Map download application (TNM Download v2.0) at https://apps.nationalmap.gov/downloader/. Two-foot contours were generated from the DEM using GIS software.

- Mapped Michigan wetlands accessed at the Michigan Department of Environment, Great Lakes, and Energy (EGLE) Michigan Wetland Map viewer. Accessed at https://www.mcgi.state.mi.us/wetlands/.

- U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory mapping accessed at https://fwsprimary.wim.usgs.gov/wetlands/apps/wetlands-mapper/.

- *2020 National Wetland Plant List* (U.S. Army Corps of Engineers 2020, National Wetland Plant List, version 3.5).

- *Field Indicators of Hydric Soils in the United States: A Guide for Identifying and Delineating Hydric Soils*, Version 8.2, 2018.

- U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) soil survey. Accessed at Web Soil Survey at http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx.

- Aerial photography from USDA Farm Service Agency (USDA-FSA) National Agriculture Imagery Program (NAIP) from NAIP Imagery Map Service (WMS). Accessed at https://gis.apfo.usda.gov/arcgis/rest/services/.

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 and Northeast Region* (Version 2.0) (U.S. Army Corps of Engineers, 2011). Soil characteristics were examined by digging pits with a 16-inch tile spade, and in cases where thick A horizons were encountered, an Eijkelkamp Edelman soil auger for combination soils with a 3-inch diameter by 6-inch-long barrel was employed to sample at depth. This soil auger was used to periodically test soils on both the upland and wetland sides of the boundary line. 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. Hydrologic indicators were visually assessed.

Vegetation was documented on Northcentral/Northeast Regional automated data forms provided by the USACE. 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 *2020 National Wetland Plant List* (USACE, 2020) 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 (U.S. Army Corps of Engineers, 2016). Precipitation data three months prior to fieldwork was compared to 30-year precipitation averages (1981-2010) 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 8 data points—four in uplands and four 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 R1 GPS receiver capable of sub-meter accuracy and mapped using Geographic Information System (GIS) software.

4. Results and Discussion

A. Site Description

(1) Airport History and Facilities

The airport began operations in 1942 when Gradus Geurink, a Holland aviator, created a small grass runway for private planes amidst a north Allegan County cornfield. The runway was first paved in 1962, with much of the airport's growth coming during the remainder of the 1960s and into the 1970s. The airport was privately owned until 1986, when the City of Holland acquired the airport, known at the time as Tulip City Airport and at that point it became a public airport. The City of Holland owned the airport until 2008, when the West Michigan Airport Authority (WMAA), a regional collaboration of the City of Holland, City of Zeeland, and Park Township, took ownership.

The Airport currently has one runway, Runway 8/26 and a full parallel taxiway with a holding pad at the approach end of Runway 26. Private hangars, a terminal/fixed base operator (FBO) building, maintenance facilities, and tiedown space on approximately 520,500 square feet of aircraft parking area are available for users of the airport. The FBO building and associated automobile parking were constructed in 2016 at the east end of Geurink Blvd on the north side of the airport. At that time, the detention area was expanded and a drainage ditch that formerly ran parallel to Geurink Blvd was re-aligned to flow northward before heading east off Airport property.

(2) Area of Interest Description

The AOI covers approximately 17.1 acres and is located north of the FBO building and parking area. Undeveloped lands within the AOI are in agricultural production. The re-aligned ditch splits the farmed area into two sections and at the time of field work, both fields were in soybeans. The Airport property line forms the northern extent of the AOI. The southeastern corner of the AOI consists of a stormwater detention area. This area was expanded to the north during construction of the FBO building. A water control structure on the east berm of the detention area controls water levels and outgoing flows.

Drainage generally flows to the east, either to the detention area via piped conveyances or through the re-aligned drainage ditch. Just to the east of the AOI boundary, an undeveloped forested area with mapped wetlands (see discussion below) receives detention pond overflow or ditch drainage which ultimately flows to the North Branch of the Macatawa River.

Topography within the AOI is relatively flat with topographic highs around 676 ft (NAVD 1988) on the western end, gradually sloping to the east where the forested edge of the AOI sits at about 668 ft. Topographic mapping from LiDAR Elevation Data for Allegan County (2015) is provided in Appendix B. These data are reflective of site conditions prior to the construction of the new FBO building and parking area.

(3) Soils Mapping

A majority of the AOI (93.1%) is covered by a soil complex rated as predominantly non-hydric. The majority of the Capac-Wixom complex (21B) consists of fine sandy loam (Capac) and loamy

sands (Wixom) found on moraines and knolls or lake plains. Minor components of this complex are found within depressions.

A small portion of the AOI is covered by soils mapped as Brookston silt loam (17) found in drainageways and depressions. This soils unit is rated as predominantly hydric. Both soil units are rated as prime farmland if drained.

Soils present within the AOI are summarized in Table 1. Soils rated as predominantly hydric or hydric are in bold. Soils mapping for the AOI is presented in Appendix B.

TABLE 1. SUMMARY OF SOILS IN THE AOI

Map Unit Symbol	Map Unit Name	Percent of AOI	Primary Landform	Hydric Rating (percent)
17	**Brookston silt loam, 0 to 2 percent slopes**	**6.9%**	**Drainageways and Depressions on till plains and moraines**	**Predominantly Hydric (95)**
21B	Capac-Wixom complex, 1 to 4 percent slopes	93.1%	Moraines, knolls, Lake plains, Depressions	Predominantly Non-Hydric (10)

(4) Aquatic Resources

Aquatic resources including mapped streams and water bodies, wetlands and Federal Emergency Management Agency (FEMA) floodplains are shown on the maps provided in Appendix C.

(a). Wetlands

Two previous delineations within Airport property were completed in 2009 (JFNew, 2009) and 2018 (Mikles, 2018). In the 2009 report, wetlands were delineated over the existing property boundary at the time. Of direct relevance to the current project, a wetland delineated directly east of the current project AOI was described as part of a group of wetlands designated as an emergent/ scrub-shrub wetland. This grouping of wetlands was dominated by sandbar willow (*Salix interior*: OBL [now FACW]), cattail (*Typha angustifolia*: OBL), purple loosestrife (*Lythrum salicaria*: OBL), lance-leaved aster (*Aster lanceolatus*: FACW [now *Symphyotrichum lanceolatum*: FACW]), yellow nutsedge (*Cyperus strigosus*: FACW [now FACW]), among others.

Ten wetlands were reported by Mikles (2018) on three parcels located on the south side of the runway and east of the perimeter road (Lincoln Avenue). These were classified as either emergent, forested or shrub wetlands; however, due to their location they are not directly relevant to the current project. Both wetland boundary maps are included in Appendix C for reference.

No wetlands are mapped within the AOI on the National Wetland Inventory (NWI). One forested wetland (PFO1) is mapped adjacent to the east side of the AOI. Other forested wetlands are mapped within a larger forested area adjacent to the North Branch of the Macatawa River. This forested area was previously delineated by JFNew (2009).

The Michigan Wetlands Mapper includes NWI mapped wetlands and others identified on the Michigan Resource Inventory System (MIRIS). There are no MIRIS wetlands identified on this mapping that are relevant for the project area.

(b). Streams

The AOI is located in the North Branch Macatawa River watershed (HUC14: 4050002050060). The North Branch of this river (also known as the Tulip Intercounty Drain) flows roughly west-to-east just north of the project AOI. Within Airport property, the Ben Bleyker Drain is carried under the runway and taxiway and flows northward to this branch of the Macatawa River outside of the project area. There are no mapped streams or drains within the project AOI.

(c). Floodplains

No FEMA floodplains are mapped within or adjacent to the project AOI.

(5) Antecedent Climatic Conditions

An assessment of antecedent climatic conditions was made using precipitation data for the three months prior to the site visit. This analysis indicated that climatic conditions were within normal range for the late September field visit (see Appendix D). Prior to the site visit, approximately 0.6 inches of precipitation fell over two days as recorded at the Airport station (Holland Tulip City AP).

(6) Atypical Conditions Analysis

The runway was first paved in 1962, with much of the airport's growth coming during the remainder of the 1960s and into the 1970s. Within the AOI, construction activities associated with the FBO building and parking area in 2016 and regular agricultural activities have affected areas on the landscape. Area within the AOI has 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 patterns.
- Regular mowing in landscaped areas around parking and building areas.
- Regular soil disturbance and compaction due to operation of agricultural machinery.
- Alteration of drainage patterns and hydrological function due to the realignment of the drainage ditch in 2016 and substitution of pipe drainage for natural sheet flow in some areas.

Much of the area within the AOI has been in agricultural production for decades. These areas have experienced regular plowing and soil compaction, and it is possible the fields have been tiled to improve drainage. Normal circumstances in these farmed areas were considered not to be present.

Normal circumstances were considered to be present in non-agricultural areas due to the relatively long period of time since initial construction and that regular vegetation maintenance is largely confined to upland areas. Vegetative growth in maintained areas was sufficient to make plant identification reliable.

B. Findings

(1) Wetlands

A total of three (3) wetlands were delineated within the AOI, one of which is a detention area. Wetlands consist of three types: Scrub-shrub/Emergent (PSS/PEM), Emergent/Forested (PEM/PFO), and Unconsolidated Bottom, excavated (PUBGx) which are discussed below. Wetlands delineated within the AOI are summarized in Table 2.

Wetland boundary maps with sampling point locations and field photograph locations are presented in Appendix E followed by data sheets and field photographs in Appendices F and G. The delineated wetlands are described in more detail in the **Wetland Site Descriptions** section below.

TABLE 2. SUMMARY OF DELINEATED WETLANDS WITHIN THE AOI

Wetland ID	Comment	Cowardin Type	Dominant Vegetation	Total Area within AOI (acres)	Total Area within AOI (sq. ft.)
1	Roadside ditch	PSS/PEM1	*Populus deltoides* (FAC), *Salix interior* (FACW), *Juncus dudleyi* (FACW), *Lythrum salicaria* (OBL)	0.096	4,180.63
2	Drainage conveyance	PEM/PFO	*Salix amygdaloides (*FACW)*, S. discolor* (FACW), *Lythrum salicaria* (OBL), *Carex vulpinoidea* (OBL), *Juncus dudleyi* (FACW); *Salix petiolaris* (FACW), *Fraxinus pennsylvanica* (FACW), *Solidago gigantea* (FACW), *Vitis riparia* (FAC)	0.905	39,442.70
3	Detention area	PUBGx	*Salix discolor* (FACW), *Typha angustifolia* (OBL), *Carex vulpinoidea* (OBL), *Lythrum salicaria (*OBL), *Juncus dudleyi* (FACW)	1.237	53,865.32
			Total	**2.238**	**97,488.65**

(a). Wetland Site Descriptions

Wetland 1*	
Site Information	
Sampling Date	9/27/2022
Cowardin Type	PSS/PEM1
Wetland Description	Wetland 1 is a roadside ditch along Regent Blvd on the northern extent of the Project AOI. The ditch varies from 12 to 15 feet in width and 2 to 3 feet deep. It drains the farm field to the south and receives road runoff from the north; it appears to drain to the north through a culvert at the eastern end. No standing water was observed in the ditch. Wetland 1 is dominated by small cottonwoods, sandbar willow, purple loosestrife and Dudley's rush. The wetland continues beyond the Project AOI.
Mapped NWI Type	N/A
Mapped Soil Type/ Hydric Rating	Brookston loam, 0 to 2 percent slopes (17) (Predominantly Hydric); Capac-Wixom complex, 1 to 4 percent slopes (21B) (Predominantly Non-hydric)
Photo Numbers**	Photos 1 - 5
Associated Data Pts***	DPs 1 - 2
Comments	Ditch wetland
Wetland Criteria	
Dominant Vegetation	Populus deltoides (FAC), Salix interior (FACW), Juncus dudleyi (FACW), Lythrum salicaria (OBL)
Hydric Soil Indicators	Depleted Below Dark Surface (A11), Loamy Gleyed Matrix (F2)
Hydrology Indicators	Geomorphic Position (D2), FAC-Neutral Test (D5)
Boundary Determination	
Description	The boundary was determined by transition to upland vegetation, a lack of wetland hydrology, and an absence of hydric soils indicators. Distinct topographic changes along the ditch profile were observed in transition to uplands. The wetland boundary continues beyond the Project AOI.

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

Wetland 2*	
Site Information	
Sampling Date	9/27/2022
Cowardin Type	PEM/PFO
Wetland Description	Wetland 2 is a constructed stormwater ditch that drains from west to east and continues beyond the Project AOI on both the west and east ends. A portion of the ditch was realigned in 2016 as part of the FBO building and parking area project. It drains farm fields on either side of the ditch and receives drainage flows from the west along Geurink Blvd. The western section along Geurink Blvd is forested, covered by a mix of small trees consisting of green ash, sandbar willow, cottonwoods, and crack willow. The northern and eastern portions of the ditch are covered by mostly herbaceous vegetation dominated by purple loosestrife, fox sedge, Dudley's rush, cattails, and phragmites with scattered stands of meadow willow. Water-stained leaves were observed throughout the ditch but standing water was only observed in the northern segment of the ditch. The ditch varies in width from 15 - 20 feet and narrows at the eastern end; bank sides were quite steep.
Mapped NWI Type	N/A
Mapped Soil Type/ Hydric Rating	Capac-Wixom complex, 1 to 4 percent slopes (21B) (Predominantly Non-hydric)
Photo Numbers**	Photos 6 - 16, 19
Associated Data Pts***	DPs 3 - 6
Comments	Drainage conveyance
Wetland Criteria	
Dominant Vegetation	Salix amygdaloides (FACW), S. discolor (FACW), Lythrum salicaria (OBL), Carex vulpinoidea (OBL), Juncus dudleyi (FACW), Salix petiolaris (FACW), Fraxinus pennsylvanica (FACW), Solidago gigantea (FACW), Vitis riparia (FAC)
Hydric Soil Indicators	Depleted Matrix (F3); Depleted Below Dark Surface (A11)
Hydrology Indicators	Water-Stained Leaves (B9), Geomorphic Position (D2), FAC-Neutral Test (D5), Saturation (A3), Sparsely Vegetated Concave Surface (B8), Dry-Season Water Table (C2), Geomorphic Position (D2), FAC-Neutral Test (D5)
Boundary Determination	
Description	The boundary was determined by transition to upland vegetation, a lack of wetland hydrology, and an absence of hydric soils indicators. Distinct topographic changes along the ditch profile were observed in transition to uplands. The wetland boundary continues beyond the Project AOI.

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

Wetland 3*	
Site Information	
Sampling Date	9/27/2022
Cowardin Type	PUBGx
Wetland Description	Wetland 3 is a detention area originally constructed about 2012 and later expanded with the construction of the FBO building and parking area in 2016. A control structure regulates water levels in the basin with flows exiting on the eastern side of the basin. Berms on the eastern and northern sides of the basin are between 6 and 8 feet high. Within the AOI, one culvert empties into the basin at the western end. Standing water was present in the basin and vegetation was dominated by cattails, purple loosestrife, and willow.
Mapped NWI Type	N/A
Mapped Soil Type/ Hydric Rating	Capac-Wixom complex, 1 to 4 percent slopes (21B) (Predominantly Non-hydric)
Photo Numbers**	Photos 17 - 26
Associated Data Pts***	DPs 7 - 8
Comments	Detention area
Wetland Criteria	
Dominant Vegetation	Salix discolor (FACW), Typha angustifolia (OBL), Carex vulpinoidea (OBL), Lythrum salicaria (OBL), Juncus dudleyi (FACW)
Hydric Soil Indicators	Depleted Below Dark Surface (A11), Redox Dark Surface (F6)
Hydrology Indicators	Surface Water (A1), High Water Table (A2), Saturation (A3), Saturation Visible on Aerial Imagery (C9), Geomorphic Position (D2), FAC-Neutral Test (D5)
Boundary Determination	
Description	The boundary was determined by transition to upland vegetation, a lack of wetland hydrology, and an absence of hydric soils indicators. Distinct topographic changes along the berm were observed in transition to uplands. The wetland boundary continues beyond the Project AOI.

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

(2) Uplands

Uplands within the AOI consist of a mixture of developed areas and agricultural lands. Managed areas are covered by a mixture of turf grasses and forbs.

Dominant herbaceous vegetation found at upland sampling points within the AOI included creeping wild rye, Kentucky blue grass, Canada goldenrod, Canadian thistle, English plantain, white clover, Oldfield American-Aster, and wild strawberry. Honeysuckle and autumn olive were found in the shrub layer while the tree and vine strata contained no dominant species at upland sampling points.

Transition to uplands was marked by distinct topographic changes along ditch or berm profiles, a lack of wetland hydrology and hydrophytic vegetation, and an absence of hydric soils. Table 3 lists the dominant species found at upland sampling points and others observed while on site.

TABLE 3. UPLAND SPECIES OBSERVED WITHIN THE AOI

Scientific Name	Common Name	Wetland Indicator Status
Cirsium arvense	Canada thistle	FACU
Daucus carota	Queen Anne's lace	FACU
Elaeagnus umbellata	Autumn olive	UPL
Elymus repens	Creeping wild rye	FACU
Fragaria virginiana	Wild strawberry	FACU
Leucanthemum vulgare	Ox-Eye Daisy	UPL
Lotus corniculatus	Bird's-foot trefoil	FACU
Lonicera x bella	Honeysuckle	FACU
Plantago lanceolata	English plantain	FACU
Poa pratensis	Kentucky blue grass	FACU
Solidago canadensis	Canada goldenrod	FACU
Taraxacum officinale	Common dandelion	FACU
Trifolium repens	White clover	FACU
Symphyotrichum pilosum	White Oldfield American-Aster	FACU

(3) Summary

In summary, three (3) wetlands were identified within the AOI and are documented by eight sampling points. Two are constructed stormwater drainage features and one is a roadside ditch. The AOI is dominated (93.1%) by soils mapped from the Capac-Wixom complex of fine sandy loam (Capac) and loamy sands (Wixom) rated as Predominantly Non-Hydric. The Project AOI is covered by level to slightly sloped soils with slopes varying from 1 to 4 percent.

The wetland boundary was determined by the observation of multiple indicators of wetland hydrology associated with wetland vegetation on soils satisfying the Depleted Below Dark Surface (A11), Loamy Gleyed Matrix (F2), Depleted Matrix (F3), and Redox Dark Surface (F6) hydric soils indicators in wetlands. Wetland hydrology was directly observed as Surface Water (A1), High Water Table (A2), and Saturation (A3) within Wetland 3. Other primary hydrology

indicators observed in wetlands included Sparsely Vegetated Concave Surface (B8) and Water-Stained Leaves (B9). Secondary hydrology indicators of Geomorphic Position (D2) and a positive FAC-Neutral Test (D5) were satisfied at all sampling points. Other secondary hydrology indicators observed in other wetlands included Dry-Season Water Table (C2) and Saturation Visible on Aerial Imagery (C9).

The boundary determinations primarily relied on the lack of hydrophytic vegetation and wetland hydrology indicators, and on an absence of hydric soils indicators. Topographic changes related to berm or ditch slopes, sometimes on steep gradients, also aided the boundary determination.

5. Conclusions

A total of three (3) separate wetland boundaries enclosing 2.238 acres were delineated within the Project AOI. 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 impacts from activities within 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 AOI 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.

6. 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: Northcentral and Northeast Region* (USACE, 2011).

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 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: February 2023

7. References

Climate Data and Summary Reports from AgACIS, WETS Climate Tables for 1981-2010. Holland WTP, MI. Data accessed at http://agacis.rcc-acis.org/. Accessed September 2022.

EGLE, 2022. Michigan EGLE Wetlands Map Viewer available online at https://www.mcgi.state.mi.us/wetlands/mcgiMap.html. Accessed September 2022.

JFNew, 2009. *Regulatory Wetland Delineation Report, Tulip City Airport Site, Allegan County, Michigan*. Report prepared by JFNew, West Olive, Michigan. Report prepared for Mead & Hunt, Inc., Lansing, Michigan. September, 9, 2009.

Mikles, Len, 2018. *Wetland Delineation Report for the West Michigan Regional Airport Parcel H, Area North of Parcel H, and Parcel K in Holland, Allegan County, Michigan*. Report prepared by ASC Group, Inc., Columbus, OH. Report prepared for Mead & Hunt, Inc., Lansing, Michigan. June 12, 2018.

Soils Survey of Allegan 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. Accessed September 2022.

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. Wakely, 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.

U.S. Army Corps of Engineers, 2016. *Guidance for Offsite Hydrology/Wetland Determinations*. U.S. Army Corps of Engineers, St. Paul District and Minnesota Board of Water and Soil Resources. Accessed at https://bwsr.state.mn.us/delineation-guidance-resources.

U.S. Army Corps of Engineers, 2020. *National Wetland Plant List*, version 3.5. Accessed at http://wetland-plants.usace.army.mil/. U.S. Army Corps of Engineers, Engineer Research and Development Center, Cold Regions Research and Engineering Laboratory, Hanover, NH.

U.S. Department of Agriculture, Natural Resource Conservation Service (USDA, NRCS), 2018. *Field Indicators of Hydric Soils in the United States*, Version 8.2, ed. L.M. Vasilas and J.F. Berkowitz. USDA, NRCS in cooperation with the National Technical Committee for Hydric Soils.

U.S. Fish and Wildlife Service, 2022. *Wetlands Mapper*. National Wetlands Inventory mapping available online at https://fwsprimary.wim.usgs.gov/wetlands/apps/wetlands-mapper/. Accessed December 2022.

8. List of Preparers/Contributors

The preparer of this document is:

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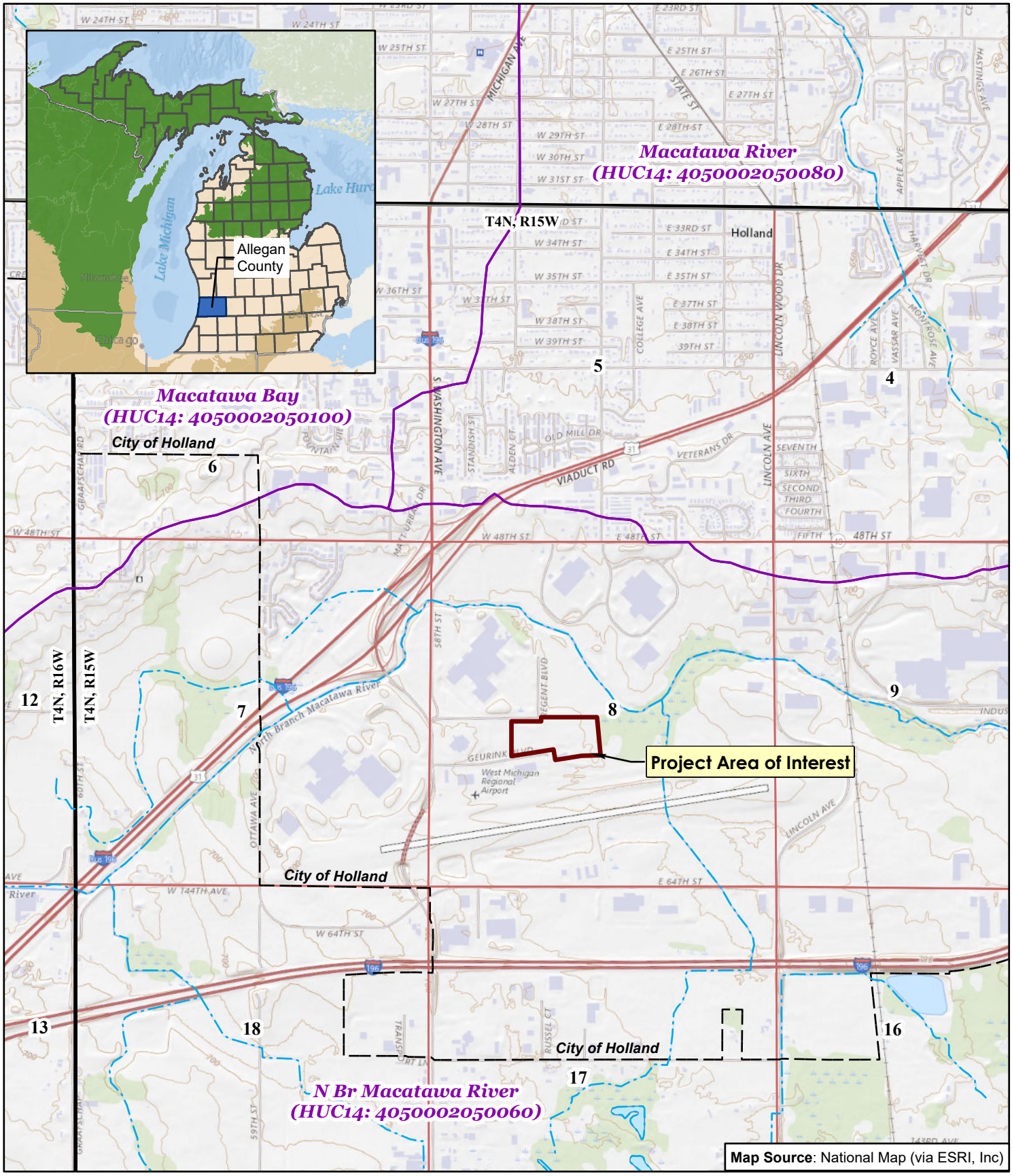
2440 Deming Road, Middleton, WI 53562
Mead & Hunt, Inc.

APPENDIX A Project Location Map



Project Location Map

West Michigan Regional Airport (BIV)
North Hangar Development Project

0 500 1,000 2,000 Feet

N

Legend

- Project AOI
- PLSS Township Line
- PLSS Section Line
- County Line
- Stream
- Lake/Pond
- Major Watershed
- Municipal Boundary

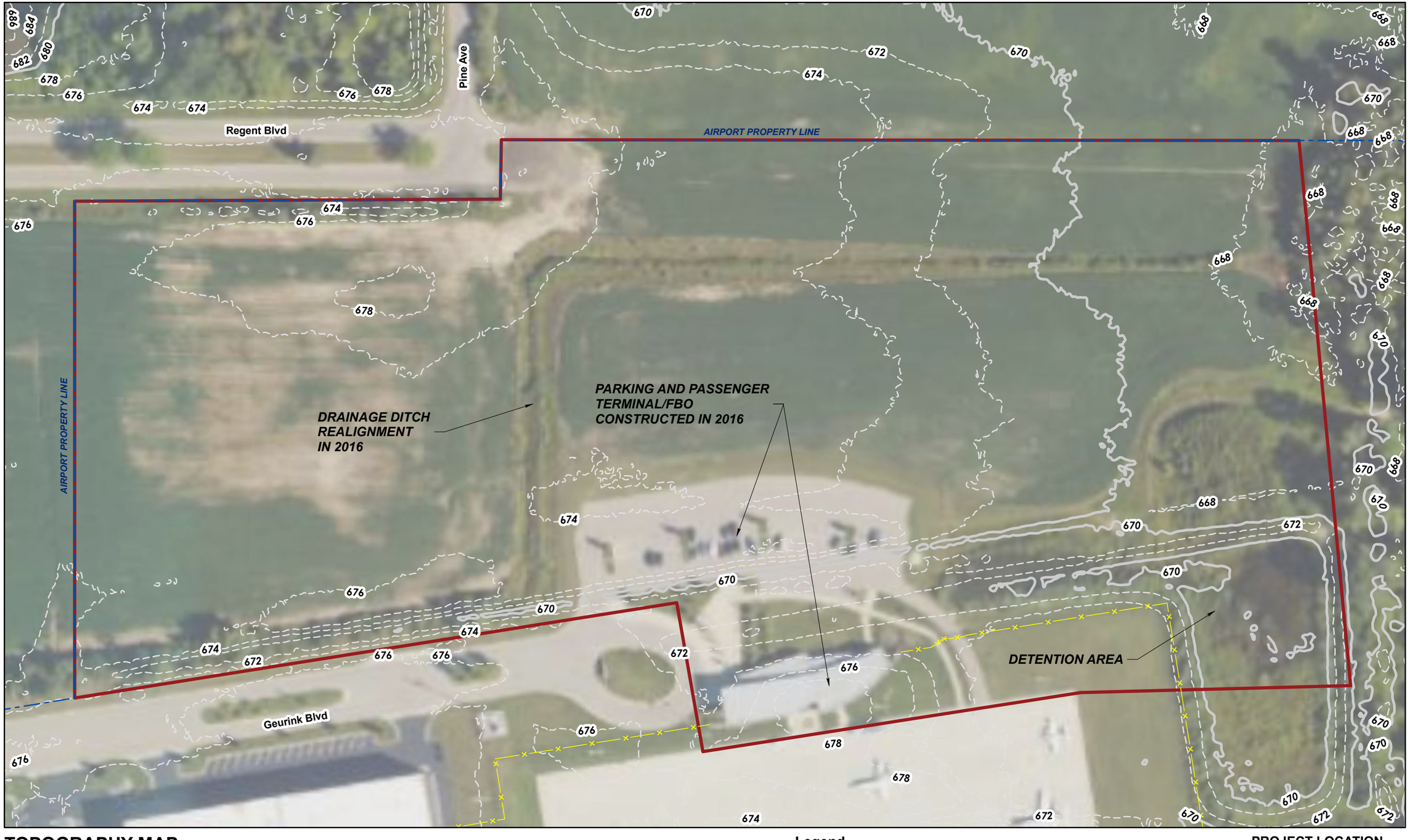
LAND RESOURCE REGION

- K
- L
- M

Project Location

T4N, R15W Section 8
City of Holland
Allegan County, MI
LRR Subregion: L
USACE Regional Supplement: NC/NE
Area of Interest: 17.1 acres
USGS Quads: Hamilton West
Field work conducted: Sept. 27, 2022

APPENDIX B Topography and NRCS Soils Mapping



TOPOGRAPHY MAP

West Michigan Regional Airport (BIV)
North Hangar Development Project

0 20 40 80 120 160 Feet

N

Legend

- Project AOI
- Airport Property Line
- Existing Fence

Contour Type

- Index
- Intermediate

Data Sources
1. Contours, Allegan County, 2-foot contour interval generated from 2015 USGS DEM acquired by MiSAIL. Data obtained from USGS National Map (https://apps.nationalmap.gov/downloader/)
2. Image Source: NAIP image service (https://gis.apfo.usda.gov/arcgis/services), 2022

PROJECT LOCATION

T4N, R15W Section 8
City of Holland
Allegan County, MI
LRR Subregion: L
USACE Regional Supplement: NC/NE
Area of Interest: 17.1 acres
USGS Quads: Hamilton West
Field work conducted: Sept. 27, 2022

Hydric Rating by Map Unit—Allegan County, Michigan
(Holland (BIV) North Hangar Development)

Map Scale: 1:2,300 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 30 60 120 180

Feet
0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84

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.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

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: Allegan County, Michigan
Survey Area Data: Version 19, Sep 2, 2021

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

Date(s) aerial images were photographed: Aug 12, 2020—Nov 3, 2020

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
17	Brookston loam, 0 to 2 percent slopes	95	1.2	6.9%
21B	Capac-Wixom complex, 1 to 4 percent slopes	10	15.9	93.1%
Totals for Area of Interest			**17.1**	**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.

Federal Register. Doc. 2012-4733 Filed 2-28-12. February, 28, 2012. Hydric soils of 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. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service.

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–MI005-Allegan County, Michigan					
Map symbol and map unit name	**Component/Local Phase**	**Comp. pct.**	**Landform**	**Hydric status**	**Hydric criteria met (code)**
17: Brookston loam, 0 to 2 percent slopes	Brookston	85-100	Drainageways on till plains,depressions on till plains,drainageways on moraines,depressions on moraines	Yes	2,3
	Conover	0-7	Till plains,moraines	No	—
	Belleville	0-5	Drainageways on till plains,drainageways on moraines,depressions on till plains,depressions on moraines	Yes	2,3
	Corunna	0-2	Depressions on till plains,depressions on moraines,drainageways on till plains,drainageways on moraines	Yes	2
	Linwood	0-1	Depressions on till plains,depressions on moraines	Yes	1,3
21B: Capac-Wixom complex, 1 to 4 percent slopes	Capac	50-60	Moraines,knolls	No	—
	Wixom	25-35	Lake plains	No	—
	Corunna	2-6	Depressions	Yes	2,3
	Pipestone	2-7	—	No	—
	Brookston	1-7	Depressions	Yes	2,3

Data Source Information

Soil Survey Area: Allegan County, Michigan
Survey Area Data: Version 19, Sep 2, 2021

APPENDIX C Previous Wetland and FEMA Floodplain Mapping

U.S. Fish and Wildlife Service
National Wetlands Inventory

North Hangar Development (BIV)

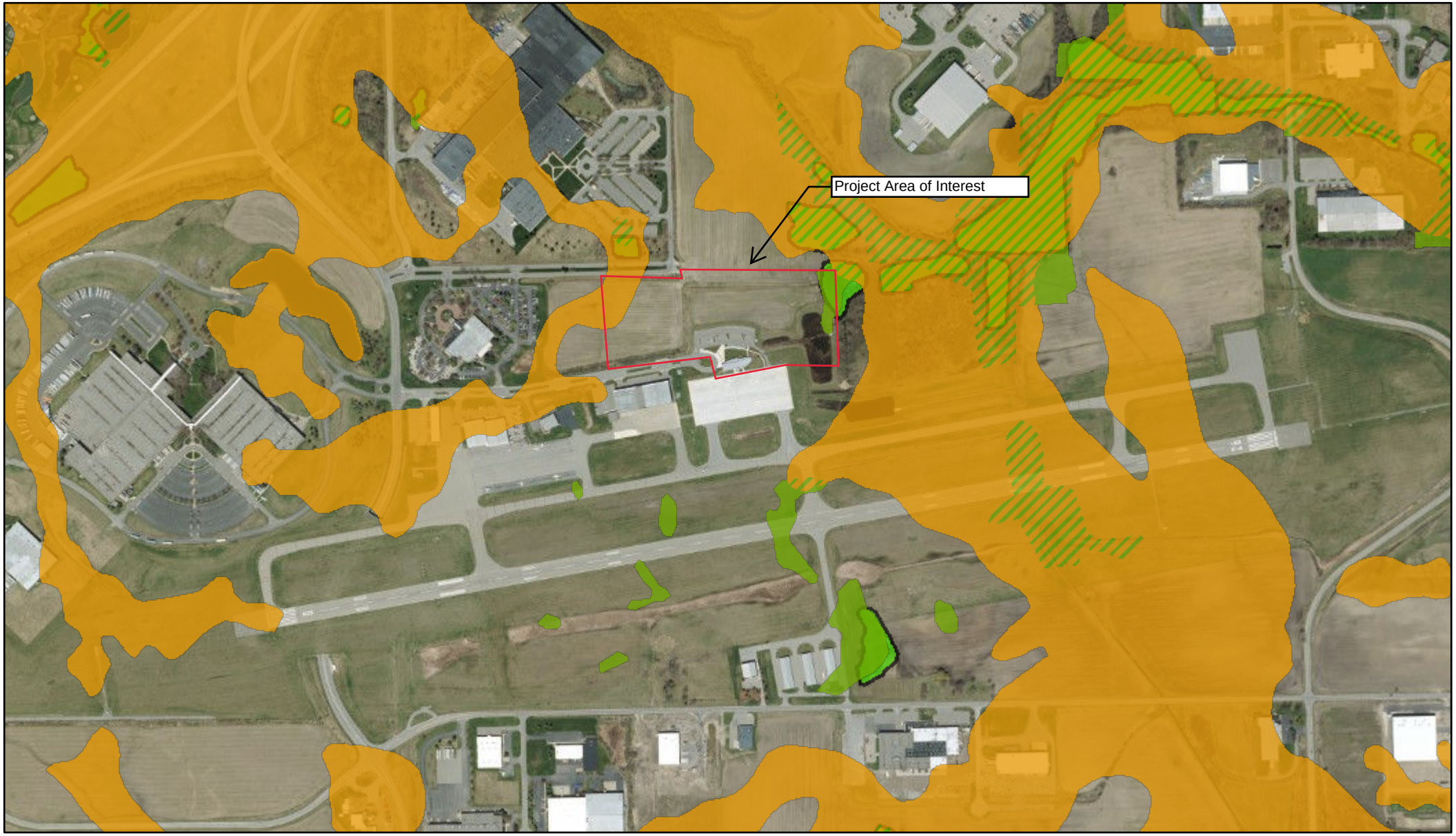
December 28, 2022

Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

Wetlands Map Viewer



September 13, 2022

Part 303 Final Wetlands Inventory

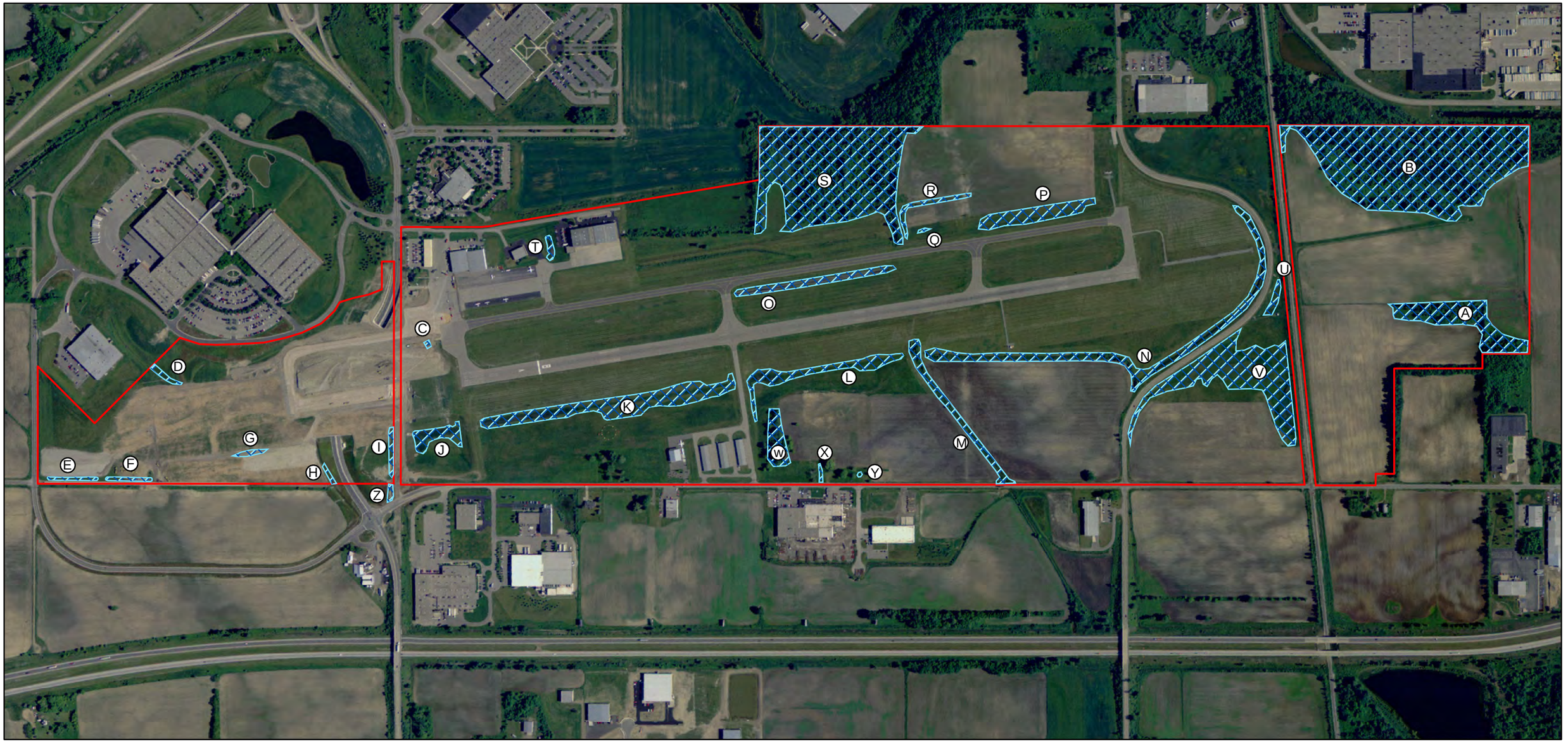
- Wetlands as identified on NWI and MIRIS maps
- Soil areas which include wetland soils
- Wetlands as identified on NWI and MIRIS maps and soil areas which include wetland soils

1:9,301

0 0.07 0.15 0.3 mi

0 0.13 0.25 0.5 km

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community



Legend

Approximate Property Boundaries

Approximate Wetland Locations

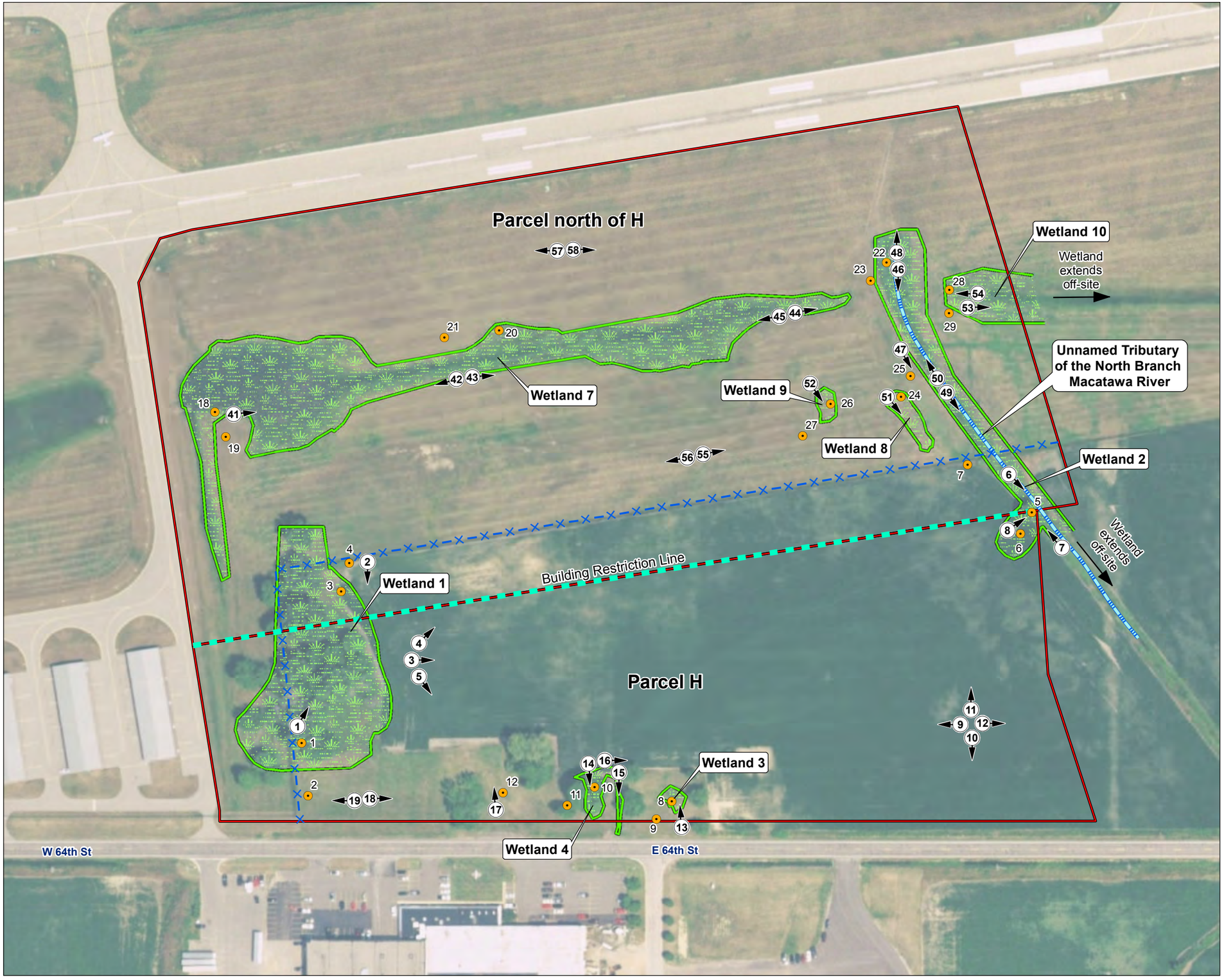
JFNew, 2009

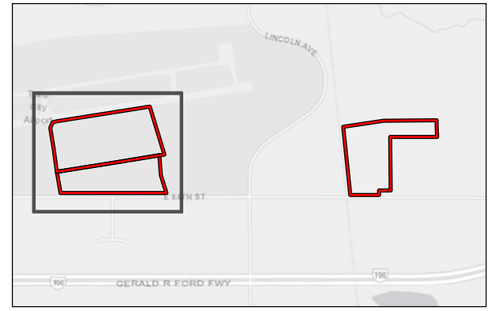
Figure 1: Wetland Location Map
Tulip City Airport
Wetland Map
Mead & Hunt, Inc.
Allegan County, Michigan

September, 2009
JFN File No. 0908016.00

350 0 350 700
Feet

11181 Marwill Avenue, West Olive, MI 49460
Phone 616-847-1680 / Fax 616-847-9970
www.jfnew.com





- Study area boundary
- Stream
- Wetland
- Sample point
- Fence
- Building Restriction Line
- Photograph location

Base: USDA FSA
Aerial photograph 2016

N

0 20 40 60 80 100 Meters

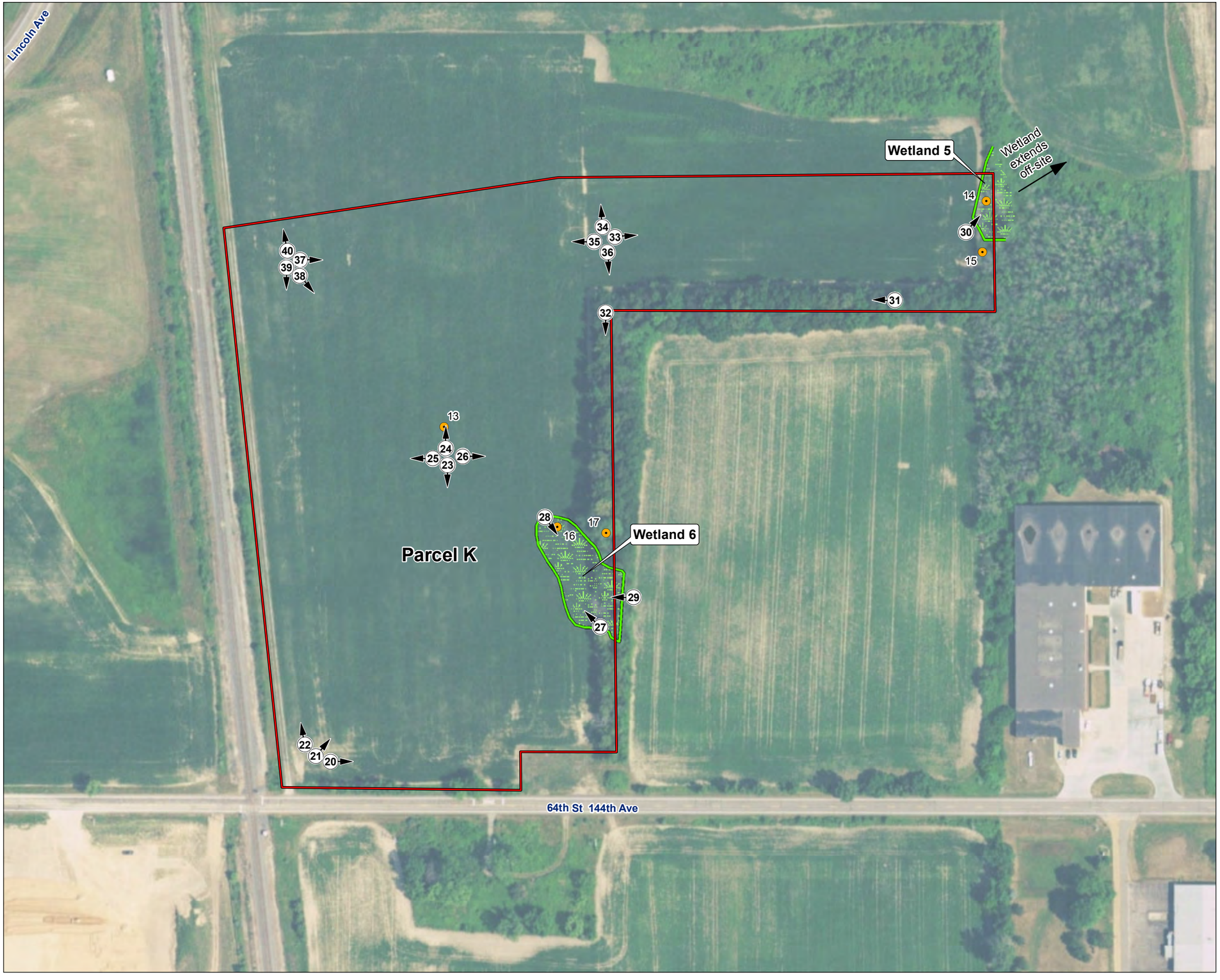
0 60 120 180 240 300 Feet

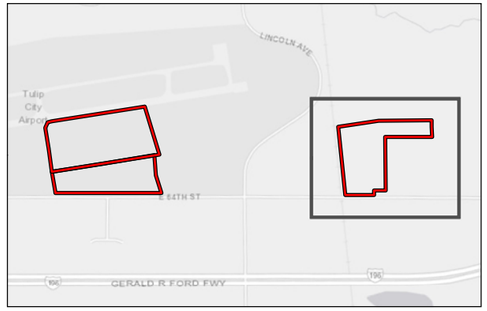
MIKLES, 2018.

Figure 6 **Sheet 1 of 2**

Aerial photograph showing streams, wetlands, sample point locations, and photograph locations for the West Michigan Regional Airport study areas. (2 Sheets)

Created by JVT; last saved: 6/7/2018 8:31:06 AM





Study area boundary

Stream

Wetland

Sample point

Building Restriction Line

Photograph location

Base: USDA FSA
Aerial photograph 2016

N

0 20 40 60 80 100 Meters

0 60 120 180 240 300 Feet

MIKLES, 2018.

Figure 6 **Sheet 2 of 2**

Aerial photograph showing streams, wetlands, sample point locations, and photograph locations for the West Michigan Regional Airport study areas. (2 Sheets)

Created by: JVT; last saved: 6/7/2018 8:31:06 AM

National Flood Hazard Layer FIRMette

86°6'49"W 42°44'54"N

86°6'12"W 42°44'27"N

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

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

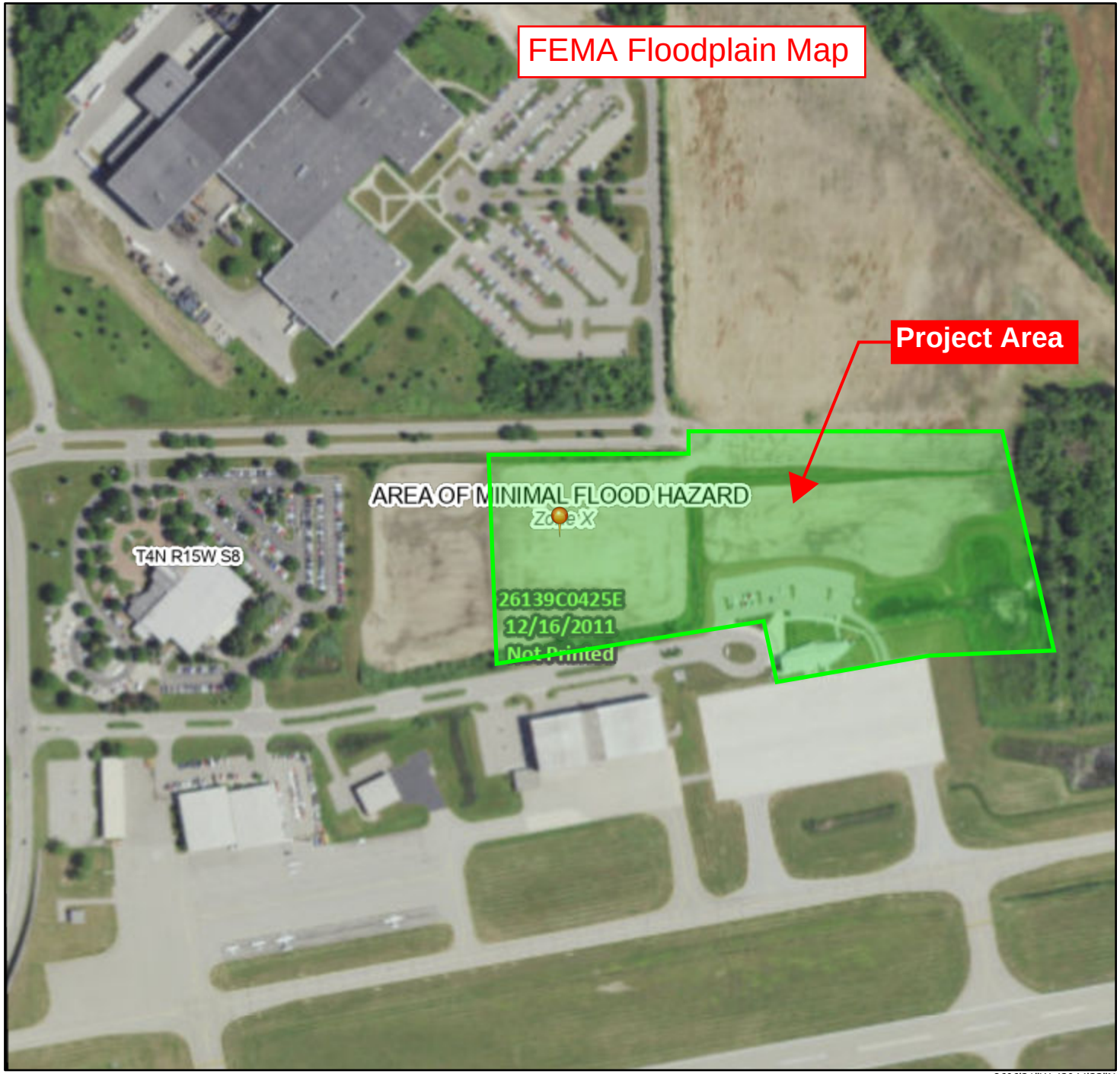
This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 12/28/2022 at 10:46 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

National Flood Hazard Layer FIRMette

86°6'58"W 42°45'N



86°6'21"W 42°44'33"N

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

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 9/8/2022 at 3:35 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

APPENDIX D Antecedent Precipitation Analysis

WETS Analysis Worksheet

Project Name: **Holland - West Michigan Regional Airport**
Period Of Interest: June - August
Station: **Holland WTP, MI**
County: Holland, MI
Normals Period: 1981-2010
Site Visit: **9/27/2022**

Long-term rainfall records

	Month	30% chance <	Normal	30% chance >
1st month prior:	August	2.19	3.47	4.19
2nd month prior:	July	1.93	3.40	4.14
3rd month prior:	June	1.84	3.50	4.27
		Sum =	**10.37**	

Site Determination*

Site Rainfall (in)	Condition (Dry/Normal*/Wet)	Condition** Value	Month Weight	Product
3.22	Normal	2	3	6
4.51	Wet	3	2	6
1.72	Dry	1	1	1
Sum = **9.45**			Sum***=	**13**

* HOLLAND TULIP CITY AP, MI

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

Determination:

	Wet
	Dry
X	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: HOLLAND WTP, MI								
Requested years: 1971 - 2010								
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	32.1	18.1	25.1	1.98	1.18	2.41	5	23.6
Feb	35.1	19.4	27.3	1.57	0.79	1.91	4	13.6
Mar	45.2	26.6	35.9	2.17	1.23	2.64	5	5.4
Apr	58.6	36.7	47.6	3.03	2.24	3.56	6	1.0
May	69.7	46.5	58.1	3.68	2.30	4.45	7	0.0
Jun	79.0	55.7	67.4	3.50	1.84	4.27	6	0.0
Jul	83.1	60.4	71.8	3.40	1.93	4.14	5	0.0
Aug	81.6	59.4	70.5	3.47	2.19	4.19	6	0.0
Sep	74.1	52.0	63.0	3.68	2.14	4.45	7	0.0
Oct	61.3	41.7	51.5	3.17	2.00	3.82	7	0.3
Nov	48.7	33.0	40.9	3.63	2.45	4.34	7	4.1
Dec	36.5	23.2	29.8	2.97	2.07	3.52	7	18.6
Annual:					33.96	38.98		
Average	58.8	39.4	49.1	-	-	-	-	-
Total	-	-	-	36.25			73	66.6

GROWING SEASON DATES			
Years with missing data:	24 deg = 8	28 deg = 5	32 deg = 4
Years with no occurrence:	24 deg = 0	28 deg = 0	32 deg = 0
Data years used:	24 deg = 32	28 deg = 35	32 deg = 36
Probability	24 F or higher	28 F or higher	32 F or higher
50 percent *	4/8 to 11/10: 216 days	4/22 to 10/27: 188 days	5/7 to 10/13: 159 days
70 percent *	4/3 to 11/15: 226 days	4/16 to 11/3: 201 days	5/2 to 10/18: 169 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
1905						M0.33	3.17	4.64	3.62	5.77	2.64	1.94	22.11
1906	3.12	3.06	2.26	1.87	3.79	1.97	2.15	1.49	6.75		2.95	1.78	31.19
1907	4.91	1.10	1.86	2.72	2.34	2.89	4.71	3.15	4.68	1.99	3.03	3.77	37.15
1908	1.60	3.35	3.05	4.34	4.14	1.14	2.57			0.84	4.02	3.74	28.79
1909	2.43	3.62	2.12	10.70	1.51	5.58	0.65	3.09	1.79	1.41	3.62	5.98	42.50
1910	2.48	2.18	0.14	3.19	4.43	0.79	2.09	3.22	2.21	3.73	1.93	1.57	27.96
1911	2.47	2.36	M0.59	5.41	3.74	M4.53	1.21	1.79	5.47	6.44	4.36	2.26	40.63
1912	2.99	2.27	1.34	2.83	4.90	1.28	5.55	2.78	2.84	3.68	2.69	1.46	34.61

1913	1.75	1.29	2.62	2.13	2.46	1.77	1.63	0.39	2.25	3.05	2.15	0.53	22.02
1914	M2.74	2.23	2.27	2.23	3.78	M6.73	0.88	3.20	3.64	1.64	1.96	2.26	33.56
1915	1.14	2.27	M1.15	0.82	3.39	M1.97	M2.56	2.55	7.92	1.34	1.37	M1.96	28.44
1916	3.77	0.86	2.92	2.19	4.00	5.03	0.13	4.25	6.04	3.34	2.33	3.47	38.33
1917	1.16	1.39	2.11	3.74	3.78	3.64	3.21	0.39	5.19	4.73	0.93	1.42	31.69
1918	M0.44	2.59	1.42	2.02	3.64	0.53	3.62	1.05	1.80	4.86	3.35	3.05	28.37
1919	0.68	1.93	5.02	3.29	4.40	1.59	0.64	1.71	4.14	4.72	2.46	1.15	31.73
1920	1.52	1.37	3.73	3.26	1.73	2.34	1.67	1.09	2.41	1.87	2.15	3.11	26.25
1921	0.79	0.77	4.36	4.15	2.04	1.47	1.02	5.23	5.08	5.20	2.98	3.36	36.45
1922	0.81	1.55	3.08	3.32	2.59	1.86	4.66	2.05	6.04	2.24	3.01	1.14	32.35
1923	1.03	1.62	2.59	M1.72	3.17	1.63	2.38	2.29	5.39	3.98	1.30	2.19	29.29
1924	2.48	1.92	M2.42	4.02	3.89	M4.09	2.73	4.42	3.36	0.46	1.72	1.69	33.20
1925	0.40	1.34	1.33	2.41	1.36	1.18	7.03	2.18	5.65	3.43	1.87	1.86	30.04
1926	2.60	2.77	2.29	1.73	3.07	3.36	1.92	2.49	7.09	3.34	M4.28	M1.25	36.19
1927	M1.84	1.42	1.72	3.38	4.96	2.55	1.69	0.90	4.91	3.13	5.10	2.49	34.09
1928	1.84	1.48	1.99	2.64	1.75	7.02	0.74	2.66	3.79	6.53	3.95	2.59	36.98
1929	3.70	0.53	1.99	5.34	5.65	3.05	0.80	0.41	M1.46	3.41	1.22	1.96	29.52
1930	2.79	1.03	1.21	2.45	1.75	1.34	0.77	0.91	1.20	2.12	2.47	1.32	19.36
1931	0.84	0.57	2.50	1.52	2.81	2.87	1.88	1.30	4.10	3.20	3.29	2.15	27.03
1932	2.96	0.93	2.23	0.98	3.70	0.92	5.84	1.56	0.91	4.81	1.42	2.55	28.81
1933	0.74	1.59	2.01	3.12	6.31	3.14	2.33	1.62	2.21	6.30	2.41	1.28	33.06
1934	1.17	0.74	1.18	1.50	2.49	2.30	0.61	3.05	5.20	2.23	4.02	2.16	26.65
1935	2.02	1.63	2.18	2.63	4.89	3.79	1.77	5.64	2.96	1.15	5.40	2.63	36.69
1936	2.77	2.37	0.56	1.94	0.98	2.39	0.33	5.25	6.87	2.62	0.60	2.97	29.65
1937	1.34	1.29	1.65	4.40	3.46	1.71	2.13	5.01	2.58	2.67	3.28	2.42	31.94
1938	2.68	4.89	2.93	0.88	4.82	3.92	4.28	3.50	3.36	1.25	1.51	1.88	35.90
1939	2.65	2.57	1.16	3.70	1.20	4.49	0.71	3.31	2.98	2.81	0.81	1.35	27.74
1940	2.71	0.63	1.82	1.60	5.19	3.45	2.17	11.27	2.05	3.53	3.67	1.97	40.06
1941	2.46	1.53	5.70	1.56	2.58	1.62	0.77	2.30	5.80	6.09	4.43	1.43	36.27
1942	1.80	0.83	2.97	0.39	5.20	4.10	4.30	4.05	6.82	3.92	4.70	3.61	42.69
1943	2.40	1.96	3.06	2.02	5.58	2.18	2.87	2.49	2.16	1.28	2.30	1.05	29.35
1944	1.64	1.75	3.25	2.55	1.70	4.77	3.80	2.03	4.56	0.62	1.97	1.91	30.55
1945	1.04	1.90	1.55	4.14	5.92	3.30	2.46	1.90	6.74	2.58	3.11	1.75	36.39
1946	1.89	2.06	2.41	1.30	3.67	2.70	0.66	1.92	1.97	2.10	3.59	2.70	26.97

1947	2.80	1.87	2.06	7.06	5.14	3.59	2.41	1.19	6.61	0.58	3.04	2.53	38.88
1948	2.24	1.70	6.06	4.83	4.35	2.40	3.62	0.38	2.10	1.34	1.89	M2.69	33.60
1949	3.32	2.21	2.89	1.99	0.87	1.99	7.92	1.23	3.26	1.91	2.37	4.86	34.82
1950	4.19	3.00	2.24	6.56	0.65	3.57	4.23	1.47	3.42	1.33	3.29	4.05	38.00
1951	2.22	2.18	2.17	4.45	2.54	7.61	1.88	3.34	5.00	2.94	3.98	3.52	41.83
1952	2.36	0.73	2.71	2.45	3.93	2.61	5.26	4.45	2.99	0.82	3.56	2.72	34.59
1953	1.49	1.87	1.76	2.41	2.93	4.81	2.62	3.61	2.94	1.66	1.47	2.03	29.60
1954	2.28	2.60	4.18	4.05	1.19	6.73	4.09	1.93	2.35	9.60	1.88	2.59	43.47
1955	2.01	2.00	2.36	1.76	2.04	2.10	4.37	4.30	1.82	4.50	3.79	1.29	32.34
1956	0.41	1.93	2.87	4.41	M5.39	0.54	3.38	3.49	0.52	0.50	1.78	1.45	26.67
1957	2.03	2.12	2.09	3.07	5.54	3.54	2.68	2.05	1.81	3.82	4.16	2.36	35.27
1958	1.70	1.56	0.49	2.27	0.88	2.68	2.66	1.27	3.12	3.16	3.15	1.28	24.22
1959	2.30	2.44	3.25	4.57	2.75	1.29	1.80	1.85	1.78	7.81	3.87	3.32	37.03
1960	4.45	3.57	1.52	3.83	3.79	2.40	4.54	3.34	1.50	1.96	3.93	1.48	36.31
1961	1.19	1.29	3.21	3.97	1.16	1.19	2.24	2.18	9.23	2.58	2.24	1.60	32.08
1962	3.47	1.30	1.35	1.98	1.56	0.95	2.25	2.65	3.08	3.23	1.04	4.75	27.61
1963	2.04	1.28	4.09	4.97	2.31	2.05	2.80	3.26	1.50	1.86	4.31	5.19	35.66
1964	1.10	0.74	2.52	4.18	3.74	2.98	2.01	4.63	3.54	2.15	3.68	2.04	33.31
1965	4.48	2.28	2.67	2.59	0.99	3.06	2.10	5.13	5.69	3.23	2.32	5.16	39.70
1966	1.30	1.14	3.78	5.84	2.93	3.53	2.49	2.85	2.10	3.16	5.33	3.38	37.83
1967	4.13	0.86	1.38	7.13	1.29	10.66	4.12	2.05	2.64	5.16	4.74	5.11	49.27
1968	1.55	1.01	0.89	3.19	2.20	5.43	3.13	3.38	4.19	3.12	3.77	4.26	36.12
1969	2.93	0.34	0.78	4.72	4.10	5.75	4.90	1.17	1.80	5.66	2.62	0.75	35.52
1970	1.65	0.33	2.06	3.56	3.95	3.08	5.17	1.87	6.27	2.95	2.95	2.82	36.66
1971	0.62	0.87	0.75	1.62	1.01	1.67	4.81	1.62	4.47	1.39	1.72	4.25	24.80
1972	1.35	0.59	2.09	3.13	1.88	8.40	5.62	7.21	5.22	2.72	2.13	3.58	43.92
1973	0.91	1.06	2.33	3.90	4.20	2.91	1.96	4.70	5.98	2.00	4.77	4.12	38.84
1974	3.72	3.44	3.75	2.80	4.48	4.11	0.87	1.62	2.69	2.28	3.24	2.47	35.47
1975	4.03	2.24	1.90	4.16	2.12	5.49	2.10	8.46	1.22	1.17	4.06	3.48	40.43
1976	1.93	1.47	6.25	4.57	6.93	M1.52	1.89	1.08	1.94	1.54	2.13	2.43	33.68
1977	2.07	0.78	3.80	2.44	1.17	2.43	3.96	4.58	4.12	2.96	2.84	3.97	35.12
1978	2.94	0.50	1.57	2.89	3.00	5.35	3.32	2.96	7.95	3.48	2.76	2.82	39.54
1979	4.27	0.74	3.84	2.88	1.37	6.53	1.98	5.30	T	3.90	3.70	3.11	37.62
1980	1.47	1.01	1.08	4.03	2.68	5.82	4.02	3.33	4.35	2.48	1.87	M3.39	35.53

1981	1.09	2.37	1.14	4.96	5.90	4.89	2.29	2.31	4.21	2.68	1.98	1.44	35.26
1982	2.90	0.65	1.25	1.73	4.10	2.09	M9.92	5.03	2.07	1.61	3.65	3.47	38.47
1983	0.66	1.07	2.45	3.72	4.37	2.11	3.58	2.26	4.64	2.75	2.69	3.16	33.46
1984	M0.76	0.43	M2.08	1.87	5.06	0.65	2.91	1.62	3.55	2.58	3.10	3.60	28.21
1985	3.61		4.43	2.40	M1.98	1.40	1.46	3.96	3.03	4.38	5.39	M4.77	36.81
1986	M1.09	2.93	1.47	M1.80	3.01	4.52	M6.33	3.37	10.89	3.20	0.89	M0.95	40.45
1987	2.14	0.04	1.84	2.69	M1.00	1.11	2.32		4.58	3.69	2.67	3.93	26.01
1988	1.86	1.69	2.04	3.60	0.58	0.60	1.85	2.20	5.84	4.90	5.53	2.96	33.65
1989	0.81	1.15	1.66	1.31	5.65	3.80	2.32	4.76	4.20	1.53	2.45	M1.65	31.29
1990	1.41	2.52	1.75	M2.94	5.55	3.37	3.15	4.02	3.07	6.01	7.05	1.93	42.77
1991	M1.01	0.29	2.09	5.19	2.90	1.28	5.65	1.73	3.21	7.50	3.89	2.06	36.80
1992	1.36	1.17	2.03	M2.58	1.39	2.56	M4.89	2.25	4.87	M2.05	6.37	M2.53	34.05
1993	3.72	M1.36	1.61	5.20	3.17	5.34	3.76	6.76	7.45	2.58	1.84	1.22	44.01
1994	3.23	1.73	0.73	M2.59	2.32	5.71	4.62	4.85	2.71	2.34	5.94	1.36	38.13
1995	M2.34	M0.99	1.20	3.41	1.90	2.33	5.12	1.38	2.14	3.82	M4.07	M1.02	29.72
1996	M4.40	M0.90	M3.49	M2.74	5.69	10.90	M5.24	1.34	3.17	M3.11	M2.07	M2.17	45.22
1997	M4.06	M3.23	M0.50	M2.66	3.60	7.47	M3.58	M4.45	3.65	3.18	M3.07	M4.72	44.17
1998	M3.94	2.43	M2.58	4.31	2.69	1.99	3.10	5.30	1.18	3.05	2.03	M2.72	35.32
1999	M4.70	M1.10	M0.20	3.22	4.55	M4.75	M1.20	1.05	0.70	M0.75	M1.76	M3.56	27.54
2000	M0.16	M0.32		M2.92	9.52	M1.00	4.93	M2.76	6.99	M1.91	M3.88	M3.40	37.79
2001	M0.13	M0.90	M1.85	1.11	8.34	M7.81	M0.64	8.05	5.42	9.24	2.28	M7.71	53.48
2002	M2.50	M3.38	M7.81	3.48	4.83	4.09	M0.05	4.60	2.10	4.22	M2.86	M0.90	40.82
2003	MT	M4.75	M0.86	3.03	4.67	1.22	1.36	2.81	2.71	3.24	M11.42	M0.95	37.02
2004	M0.12	M0.40	M2.73	0.50	6.03	3.01	3.00	3.65	0.08	6.79	M2.10	M3.84	32.25
2005	M2.18	M0.75	M1.10	M1.47	1.72	0.93	4.40	0.90	2.62	0.17	M8.27	M0.22	24.73
2006	M1.63	M0.21	M1.70	M4.89	M5.01	M0.18	M1.65	M0.95	M2.31	M2.87	M1.06	M3.30	25.76
2007	M1.12		M2.59	M0.68	M0.90	M1.38	M2.78	M4.78	0.87	M2.14	M0.61	M0.95	18.80
2008	M2.62	M0.00	M0.25	M1.95	M1.73	M3.81	M3.19	MT	M7.95	M3.84	M5.67	M0.30	31.31
2009	M0.25	M1.80	M0.85	M4.58	M3.52	M10.13	M0.47	M3.59	M1.88	M2.67	M0.44	M2.10	32.28
2010	MT	M4.50	M0.00	M1.85	M4.86	M6.44	M8.36	M1.64	M3.00	2.18	2.21	M5.77	40.81
2011	M14.88	M0.00	M1.57	M7.65	M2.05	M1.39	M4.46	7.19	4.08	1.59	M3.22	M2.21	50.29
2012	M2.54	M1.35	M2.87	M1.61	M2.33	M0.39	M1.87	M3.01	M1.80	M8.63	M0.53	M2.47	29.40
2013	M3.81	3.56	M1.18	M10.81	M3.00	M2.16	M2.01	1.96	M0.92	2.42	3.81	M1.41	37.05
2014	M4.22	M1.74	M1.25	M3.00	M2.49	M3.90	M2.72	4.14	2.20	M3.93	M3.47	M0.81	33.87

2015	1.11	M2.01	M0.63	M1.56	M1.92	M2.28	M1.05	M2.25	M0.80	M1.31	M1.50	M3.90	20.32
2016	M0.90	M1.47	M2.37	M2.79	M2.75	M2.33	M4.39	M5.89	M1.85	M2.62	M1.70	M1.11	30.17
2017	M1.97	M0.14	M0.79	M3.95	M1.35	M3.40	M1.80	M1.50	M0.62	M6.98	M2.76	M1.18	26.44
2018	M2.52	M3.07	M0.66	M0.74	M4.19	M2.36	M1.17	M4.56	M1.69	M6.67	M1.54	M1.14	30.31
2019	M3.12	M2.13	M2.99	M2.63	M4.42	M1.93	M0.73	M1.71	M3.75	M1.98	M1.06	M1.77	28.22
2020	M1.12	M0.11	M2.35	M1.01	M4.57	M2.09	M2.41	M1.17	M0.61	M3.20	M1.08	M2.16	21.88
2021	M0.74	M0.76	M0.95	M1.29	M1.40	M7.34	M1.13	M2.78	M1.15	M3.40	M1.83	M1.59	24.36
2022	1.92	M3.56	M3.09	M4.41	M2.63	M1.46	M4.86	M2.59	M1.20				25.72
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: 2022-09-13													

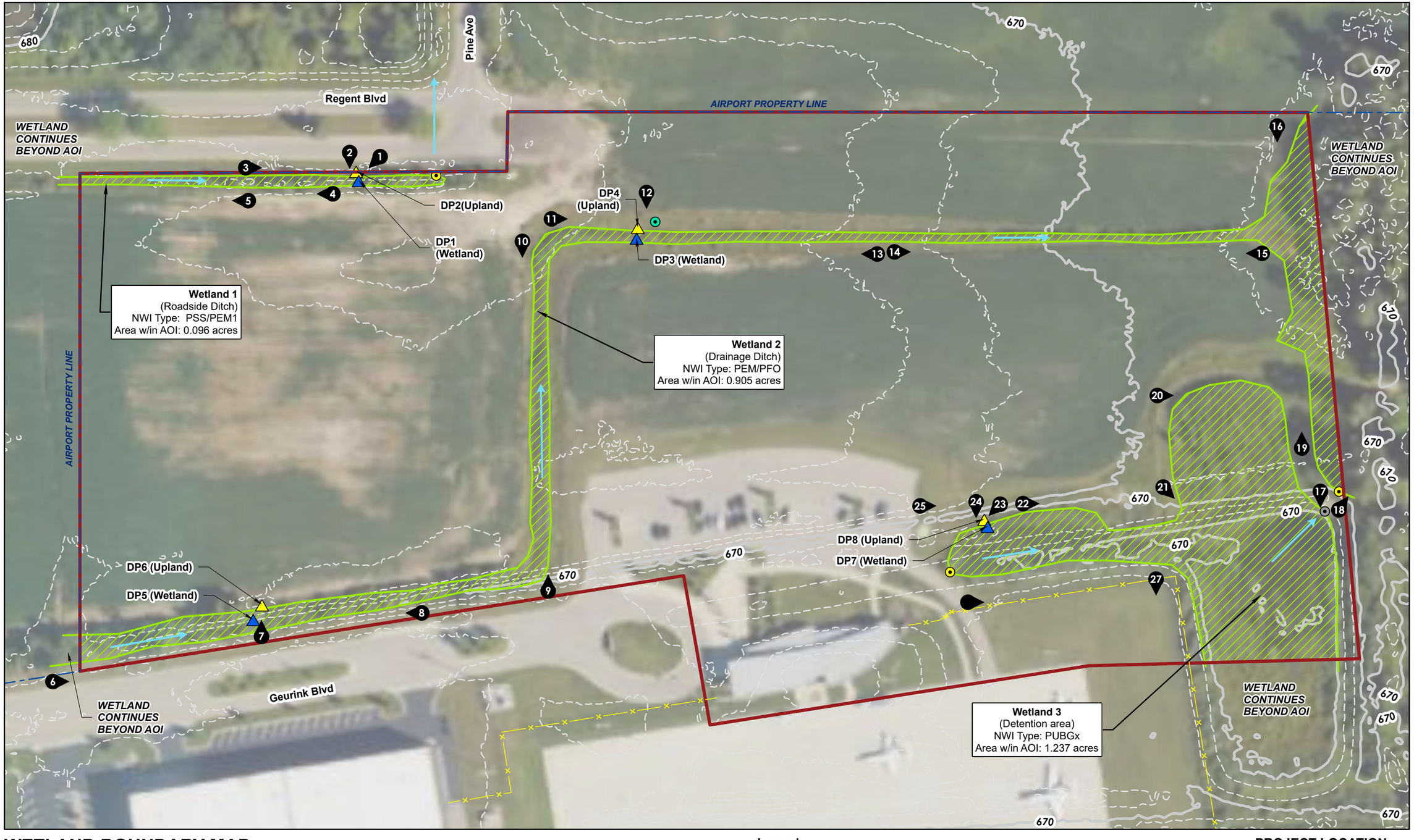
Monthly Total Precipitation for HOLLAND TULIP CITY AP, MI

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2022	1.39	2.85	3.41	5.06	3.44	1.72	4.51	3.22	M	M	M	M	M
Mean	1.39	2.85	3.41	5.06	3.44	1.72	4.51	3.22	M	M	M	M	M

Climatological Data for HOLLAND TULIP CITY AP, MI - September 2022

Date	Max Temperature	Min Temperature	Avg Temperature	GDD Base 40	GDD Base 50	Precipitation	Snowfall	Snow Depth
2022-09-01	85	62	73.5	34	24	0.00	M	M
2022-09-02	84	66	75.0	35	25	0.00	M	M
2022-09-03	82	62	72.0	32	22	0.00	M	M
2022-09-04	69	61	65.0	25	15	0.00	M	M
2022-09-05	72	60	66.0	26	16	0.00	M	M
2022-09-06	78	62	70.0	30	20	0.00	M	M
2022-09-07	78	56	67.0	27	17	0.00	M	M
2022-09-08	78	54	66.0	26	16	0.00	M	M
2022-09-09	82	56	69.0	29	19	0.00	M	M
2022-09-10	81	60	70.5	31	21	0.00	M	M
2022-09-11	69	61	65.0	25	15	1.31	M	M
2022-09-12	65	55	60.0	20	10	T	M	M
2022-09-13	73	52	62.5	23	13	0.00	M	M
2022-09-14	75	54	64.5	25	15	0.00	M	M
2022-09-15	77	54	65.5	26	16	0.00	M	M
2022-09-16	79	59	69.0	29	19	0.00	M	M
2022-09-17	82	62	72.0	32	22	T	M	M
2022-09-18	80	66	73.0	33	23	0.39	M	M
2022-09-19	76	57	66.5	27	17	0.00	M	M
2022-09-20	78	52	65.0	25	15	0.11	M	M
2022-09-21	77	65	71.0	31	21	0.00	M	M
2022-09-22	65	50	57.5	18	8	0.00	M	M
2022-09-23	63	39	51.0	11	1	0.00	M	M
2022-09-24	63	52	57.5	18	8	0.02	M	M
2022-09-25	65	54	59.5	20	10	0.32	M	M
2022-09-26	59	51	55.0	15	5	0.32	M	M
2022-09-27	57	47	52.0	12	2	T	M	M
2022-09-28	56	47	51.5	12	2	0.00	M	M
2022-09-29	62	40	51.0	11	1	0.00	M	M
2022-09-30	66	40	53.0	13	3	0.00	M	M
Average|Sum	72.5	55.2	63.9	721	421	2.47	M	M

APPENDIX E Wetland Boundary Map



WETLAND BOUNDARY MAP

West Michigan Regional Airport (BIV)
North Hangar Development Project

0 20 40 80 120 160 Feet

N

Legend

- Project AOI
- Delineated Wetland
- Photo Location and Direction
- Flow Direction
- Airport Property Line
- Existing Fence
- Culvert
- Drain
- Outlet Structure

Data Point Type
- Upland
- Wetland

Contour Type
- Index
- Intermediate

Data Sources
1. Contours, Allegan County, 2-foot contour interval generated from 2015 USGS DEM acquired by MiSAIL. Data obtained from USGS National Map (https://apps.nationalmap.gov/downloader/)
2. Image Source: NAIP Image Server (https://gis.apfo.usda.gov/arcgis/services/ NAIP/ USDA_CONUS_PRIME/ImageServer), 2022

PROJECT LOCATION

T4N, R15W Section 8
City of Holland
Allegan County, MI
LRR Subregion: L
USACE Regional Supplement: NC/NE
Area of Interest: 17.1 acres
USGS Quads: Hamilton West
Field work conducted: Sept. 27, 2022

APPENDIX F Data Sheets

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Northcentral and Northeast Region
See ERDC/EL TR-12-1; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp: 11/30/2024
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: WEST MICHIGAN REGIONAL AIRPORT (BIV) City/County: Holland/Allegan Sampling Date: 9/27/2022

Applicant/Owner: West Michigan Airport Authority State: MI Sampling Point: DP1

Investigator(s): Brauna Hartzell, Mead & Hunt, Inc. Section, Township, Range: Section 8, T4N, R15W

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

Subregion (LRR or MLRA): LRR L, MLRA 97 Lat: 42.746826 Long: -86.110457 Datum: WGS84

Soil Map Unit Name: Capac-Wixom complex, 1 to 4 percent slopes (21B) (Predominantly Non-hydric) NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (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: 1
Wetland Hydrology Present?	Yes X	No ____	

Remarks: (Explain alternative procedures here or in a separate report.)
An analysis of antecedent precipitation indicates that environmental conditions were within normal range. Soils disturbed due to ditch construction.

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 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 indicated. Rainstorms over the prior 2 days totalling about 0.6 inches. Soils saturated at surface. No standing water or water table observed.

VEGETATION – Use scientific names of plants. Sampling Point: DP1

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Populus deltoides*	15	Yes	FAC
2.			
3.			
4.			
5.			
6.			
7.			
	15	=Total Cover	
Sapling/Shrub Stratum (Plot size: 15 ft)			
1. *Salix interior*	60	Yes	FACW
2. *Populus deltoides*	10	No	FAC
3.			
4.			
5.			
6.			
7.			
	70	=Total Cover	
Herb Stratum (Plot size: 5 ft)			
1. *Juncus dudleyi*	40	Yes	FACW
2. *Lythrum salicaria*	20	Yes	OBL
3. *Carex scoparia*	15	No	FACW
4. *Calamagrostis canadensis*	10	No	OBL
5. *Poa pratensis*	5	No	FACU
6. *Euthamia graminifolia*	5	No	FAC
7. *Symphyotrichum lateriflorum*	5	No	FAC
8.			
9.			
10.			
11.			
12.			
	100	=Total Cover	
Woody Vine Stratum (Plot size: 15 ft)			
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	30	x 1 =	30
FACW species	115	x 2 =	230
FAC species	35	x 3 =	105
FACU species	5	x 4 =	20
UPL species	0	x 5 =	0
Column Totals:	185 (A)		385 (B)

Prevalence Index = B/A = 2.08

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.

SOIL

Sampling Point DP1

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR 3/1	100					Loamy/Clayey	
5-18	N 6/	95	10YR 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)
- ___ Mesic Spodic (A17) **(MLRA 144A, 145, 149B)**
- ___ 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**)
- X 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)
- ___ 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 Loamy Gleyed Matrix (F2) are satisfied.

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U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Northcentral and Northeast Region
See ERDC/EL TR-12-1; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp: 11/30/2024
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: WEST MICHIGAN REGIONAL AIRPORT (BIV) City/County: Holland/Allegan Sampling Date: 9/27/2022

Applicant/Owner: West Michigan Airport Authority State: MI Sampling Point: DP2

Investigator(s): Brauna Hartzell, Mead & Hunt, Inc. Section, Township, Range: Section 8, T4N, R15W

Landform (hillside, terrace, etc.): midslope Local relief (concave, convex, none): convex Slope %: 3-5%

Subregion (LRR or MLRA): LRR L, MLRA 97 Lat: 42.746853 Long: -86.110469 Datum: WGS84

Soil Map Unit Name: Capac-Wixom complex, 1 to 4 percent slopes (21B) (Predominantly Non-hydric) NWI classification: N/A

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

Are Vegetation X, 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 within a Wetland?** **Yes** ____ **No** X
Hydric Soil Present?	Yes ____	No X	If yes, optional Wetland Site ID: ____
Wetland Hydrology Present?	Yes ____	No X	

Remarks: (Explain alternative procedures here or in a separate report.)
An analysis of antecedent precipitation indicates that environmental conditions were within normal range. Data point taken along road fillslope; soils likely disturbed due to road construction. Area is mown frequently.

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. Rainstorms over the prior 2 days totalling about 0.6 inches. About 8-9 ft separates this sampling point from its paired wetland sampling point (DP1) with about 2 ft change in elevation.

VEGETATION – Use scientific names of plants.

Sampling Point: DP2

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
Sapling/Shrub Stratum (Plot size: 15 ft)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
Herb Stratum (Plot size: 5 ft)			
1. *Poa pratensis*	35	Yes	FACU
2. *Trifolium repens*	20	Yes	FACU
3. *Plantago lanceolata*	20	Yes	FACU
4. *Daucus carota*	15	No	UPL
5. *Symphyotrichum pilosum*	5	No	FACU
6. *Leucanthemum vulgare*	5	No	UPL
7.			
8.			
9.			
10.			
11.			
12.			
	100 =Total Cover		
Woody Vine Stratum (Plot size: 15 ft)			
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: 3 (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	80	x 4 =	320
UPL species	20	x 5 =	100
Column Totals:	100 (A)		420 (B)

Prevalence Index = B/A = 4.20

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 DP2

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 3/2	100					Loamy/Clayey	
6-18	10YR 4/6	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)
- ___ Mesic Spodic (A17) **(MLRA 144A, 145, 149B)**
- ___ 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)
- ___ 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-12-1; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp: 11/30/2024
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: WEST MICHIGAN REGIONAL AIRPORT (BIV) City/County: Holland/Allegan Sampling Date: 9/27/2022

Applicant/Owner: West Michigan Airport Authority State: MI Sampling Point: DP3

Investigator(s): Brauna Hartzell, Mead & Hunt, Inc. Section, Township, Range: Section 8, T4N, R15W

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

Subregion (LRR or MLRA): LRR L, MLRA 97 Lat: 42.746674 Long: -86.109348 Datum: WGS84

Soil Map Unit Name: Capac-Wixom complex, 1 to 4 percent slopes (21B) (Predominantly Non-hydric) NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (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: 2
Wetland Hydrology Present?	Yes X	No ____	

Remarks: (Explain alternative procedures here or in a separate report.)
An analysis of antecedent precipitation indicates that environmental conditions were within normal range. Soils disturbed due to ditch construction.

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)
- 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)
- 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): ____

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

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

Remarks:
Wetland hydrology is indicated. Rainstorms over the prior 2 days totalling about 0.6 inches. Surface saturation only, no standing water or water table observed.

VEGETATION – Use scientific names of plants.

Sampling Point: DP3

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
Sapling/Shrub Stratum (Plot size: 15 ft)			
1. *Salix amygdaloides*	20	Yes	FACW
2. *Salix discolor*	5	Yes	FACW
3.			
4.			
5.			
6.			
7.			
	25 =Total Cover		
Herb Stratum (Plot size: 5 ft)			
1. *Lythrum salicaria*	30	Yes	OBL
2. *Carex vulpinoidea*	20	Yes	OBL
3. *Juncus dudleyi*	15	Yes	FACW
4. *Phragmites australis*	15	Yes	FACW
5. *Typha angustifolia*	10	No	OBL
6. *Juncus effusus*	10	No	OBL
7.			
8.			
9.			
10.			
11.			
12.			
	100 =Total Cover		
Woody Vine Stratum (Plot size: 15 ft)			
1.			
2.			
3.			
4.			
	=Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 6 (A)

Total Number of Dominant Species Across All Strata: 6 (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	70	x 1 =	70
FACW species	55	x 2 =	110
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	125 (A)		180 (B)

Prevalence Index = B/A = 1.44

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.

SOIL

Sampling Point DP3

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	10YR 4/1	100					Loamy/Clayey	No redox observed
8-17	10YR 5/1	97	10YR 4/6	3	C	M	Loamy/Clayey	Prominent redox concentrations
17-20	7.5YR 4/4	100						

[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)
- ___ Mesic Spodic (A17) **(MLRA 144A, 145, 149B)**
- ___ 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)
- ___ 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 Depleted Matrix (F3) is satisfied. At depth, soils very compacted and dry.

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U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Northcentral and Northeast Region
See ERDC/EL TR-12-1; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp: 11/30/2024
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: WEST MICHIGAN REGIONAL AIRPORT (BIV) City/County: Holland/Allegan Sampling Date: 9/27/2022

Applicant/Owner: West Michigan Airport Authority State: MI Sampling Point: DP4

Investigator(s): Brauna Hartzell, Mead & Hunt, Inc. Section, Township, Range: Section 8, T4N, R15W

Landform (hillside, terrace, etc.): midslope Local relief (concave, convex, none): convex Slope %: 3-5%

Subregion (LRR or MLRA): LRR L, MLRA 97 Lat: 42.746706 Long: -86.109344 Datum: WGS84

Soil Map Unit Name: Capac-Wixom complex, 1 to 4 percent slopes (21B) (Predominantly Non-hydric) NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (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.)
An analysis of antecedent precipitation indicates that environmental conditions were within normal range. Data point taken along fillslope of farm field. Field is tilled and drains to the 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. Rainstorms over the prior 2 days totalling about 0.6 inches. About 10ft separates this sampling point from its paired wetland sampling point (DP3) with about 2 ft change in elevation.

VEGETATION – Use scientific names of plants. Sampling Point: DP4

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
Sapling/Shrub Stratum (Plot size: 15 ft)			
1. *Elaeagnus umbellata*	5	Yes	UPL
2.			
3.			
4.			
5.			
6.			
7.			
	5 =Total Cover		
Herb Stratum (Plot size: 5 ft)			
1. *Poa pratensis*	27	Yes	FACU
2. *Elymus repens*	25	Yes	FACU
3. *Symphyotrichum pilosum*	20	Yes	FACU
4. *Plantago lanceolata*	15	No	FACU
5. *Daucus carota*	5	No	UPL
6. *Leucanthemum vulgare*	5	No	UPL
7. *Cirsium vulgare*	3	No	FACU
8.			
9.			
10.			
11.			
12.			
	100 =Total Cover		
Woody Vine Stratum (Plot size: 15 ft)			
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: 4 (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	90	x 4 =	360
UPL species	15	x 5 =	75
Column Totals:	105 (A)		435 (B)

Prevalence Index = B/A = 4.14

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. Also observed, Melilotus officinalis and Solidago canadensis along ditch profile.

SOIL

Sampling Point DP4

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR 3/2	100					Loamy/Clayey	
8-12	10YR 5/1	95	10YR 4/6	5	C	M	Loamy/Clayey	Prominent redox concentrations
12-18	10YR 5/2	98	10YR 4/6	2	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)
- ___ Mesic Spodic (A17) **(MLRA 144A, 145, 149B)**
- ___ 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)
- ___ 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-12-1; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp: 11/30/2024
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: WEST MICHIGAN REGIONAL AIRPORT (BIV) City/County: Holland/Allegan Sampling Date: 9/27/2022

Applicant/Owner: West Michigan Airport Authority State: MI Sampling Point: DP5

Investigator(s): Brauna Hartzell, Mead & Hunt, Inc. Section, Township, Range: Section 8, T4N, R15W

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

Subregion (LRR or MLRA): LRR L, MLRA 97 Lat: 42.745533 Long: -86.110841 Datum: WGS84

Soil Map Unit Name: Capac-Wixom complex, 1 to 4 percent slopes (21B) (Predominantly Non-hydric) NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (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: 2
Wetland Hydrology Present?	Yes X	No ____	

Remarks: (Explain alternative procedures here or in a separate report.)
An analysis of antecedent precipitation indicates that environmental conditions were within normal range. Data point taken near toeslope of ditch. Soils likely disturbed due to ditch construction.

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)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- X 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)
- X 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 X	No ____	Depth (inches): 15
Saturation Present? (includes capillary fringe)	Yes X	No ____	Depth (inches): 4

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. Rainstorms over the prior 2 days totalling about 0.6 inches. Late September in normal dry season with water table observed at 15 inches. Rainfall and site runoff at this end of the ditch could also be responsible for presence of water table.

VEGETATION – Use scientific names of plants.

Sampling Point: DP5

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Salix petiolaris*	25	Yes	FACW
2. *Fraxinus pennsylvanica*	10	Yes	FACW
3.			
4.			
5.			
6.			
7.			
	35	=Total Cover	
Sapling/Shrub Stratum (Plot size: 15 ft)			
1. *Salix petiolaris*	80	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
	80	=Total Cover	
Herb Stratum (Plot size: 5 ft)			
1. *Solidago gigantea*	10	Yes	FACW
2. *Equisetum arvense*	3	No	FAC
3. *Geum aleppicum*	3	No	FAC
4. *Symphyotrichum lateriflorum*	2	No	FAC
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	18	=Total Cover	
Woody Vine Stratum (Plot size: 15 ft)			
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: 5 (A)

Total Number of Dominant Species Across All Strata: 5 (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	125	x 2 =	250
FAC species	18	x 3 =	54
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	143 (A)		304 (B)

Prevalence Index = B/A = 2.13

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. Little herbaceous vegetation is present on ditch bottom.

SOIL

Sampling Point DP5

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	
4-18	10YR 5/2	98	10YR 4/6	2	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)
- ___ Mesic Spodic (A17) **(MLRA 144A, 145, 149B)**
- ___ 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)
- ___ 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-12-1; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp: 11/30/2024
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: WEST MICHIGAN REGIONAL AIRPORT (BIV) City/County: Holland/Allegan Sampling Date: 9/27/2022

Applicant/Owner: West Michigan Airport Authority State: MI Sampling Point: DP6

Investigator(s): Brauna Hartzell, Mead & Hunt, Inc. Section, Township, Range: Section 8, T4N, R15W

Landform (hillside, terrace, etc.): shoulder Local relief (concave, convex, none): convex Slope %: 20%

Subregion (LRR or MLRA): LRR L, MLRA 97 Lat: 42.745577 Long: -86.110807 Datum: WGS84

Soil Map Unit Name: Capac-Wixom complex, 1 to 4 percent slopes (21B) (Predominantly Non-hydric) NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (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 ____	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.)
An analysis of antecedent precipitation indicates that environmental conditions were within normal range. Data point taken below farm field; some erosion and alluvial deposition; very dry.

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. Rainstorms over the prior 2 days totalling about 0.6 inches. About 12ft separates this sampling point from its paired wetland sampling point (DP5) with about 4 ft change in elevation.

VEGETATION – Use scientific names of plants.

Sampling Point: DP6

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
Sapling/Shrub Stratum (Plot size: 15 ft)			
1. *Lonicera X bella*	90	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
	90 =Total Cover		
Herb Stratum (Plot size: 5 ft)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	=Total Cover		
Woody Vine Stratum (Plot size: 15 ft)			
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	0	x 3 =	0
FACU species	90	x 4 =	360
UPL species	0	x 5 =	0
Column Totals:	90 (A)		360 (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. Little herbaceous cover present; no trees present.

SOIL

Sampling Point DP6

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	10YR 4/3	100					Loamy/Clayey	very dry

[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)
- ___ Mesic Spodic (A17) **(MLRA 144A, 145, 149B)**
- ___ 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)
- ___ 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. Soils very dry and compacted.

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U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Northcentral and Northeast Region
See ERDC/EL TR-12-1; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp: 11/30/2024
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: WEST MICHIGAN REGIONAL AIRPORT (BIV) City/County: Holland/Allegan Sampling Date: 9/27/2022

Applicant/Owner: West Michigan Airport Authority State: MI Sampling Point: DP7

Investigator(s): Brauna Hartzell, Mead & Hunt, Inc. Section, Township, Range: Section 8, T4N, R15W

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

Subregion (LRR or MLRA): LRR L, MLRA 97 Lat: 42.74585 Long: -86.107929 Datum: WGS84

Soil Map Unit Name: Capac-Wixom complex, 1 to 4 percent slopes (21B) (Predominantly Non-hydric) NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (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: 3
Wetland Hydrology Present?	Yes X	No ____	

Remarks: (Explain alternative procedures here or in a separate report.)
An analysis of antecedent precipitation indicates that environmental conditions were within normal range. Area has been bermed for detention; data point taken at edge of standing water within detention area.

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): 3
Water Table Present?	Yes X	No ____	Depth (inches): 10
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:
Saturation observed on aerial imagery from 6/2022 and 4/2020

Remarks:
Wetland hydrology is present and indicated. Rainstorms over the prior 2 days totalling about 0.6 inches. Standing water in most of sampling plot. Data point taken at edge of berm.

VEGETATION – Use scientific names of plants.

Sampling Point: DP7

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
Sapling/Shrub Stratum (Plot size: 15 ft)			
1. *Salix discolor*	30	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
	30 =Total Cover		
Herb Stratum (Plot size: 5 ft)			
1. *Typha angustifolia*	20	Yes	OBL
2. *Carex vulpinoidea*	20	Yes	OBL
3. *Lythrum salicaria*	15	Yes	OBL
4. *Juncus dudleyi*	15	Yes	FACW
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	70 =Total Cover		
Woody Vine Stratum (Plot size: 15 ft)			
1.			
2.			
3.			
4.			
	=Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 5 (A)

Total Number of Dominant Species Across All Strata: 5 (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	55	x 1 =	55
FACW species	45	x 2 =	90
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	100 (A)		145 (B)

Prevalence Index = B/A = 1.45

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. Interior of wetland dominated by cattails. Standing water in most of the sampling plot.

SOIL

Sampling Point DP7

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
0-12	10YR 3/2	95	7.5YR 4/4	5	C	M	Loamy/Clayey	Distinct redox concentrations
12-18	10YR 5/2	97	10YR 5/6	3	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)
- ___ Mesic Spodic (A17) **(MLRA 144A, 145, 149B)**
- ___ 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)
- ___ 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 Redox Dark Surface (F6) are satisfied.

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U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Northcentral and Northeast Region
See ERDC/EL TR-12-1; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp: 11/30/2024
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: WEST MICHIGAN REGIONAL AIRPORT (BIV) City/County: Holland/Allegan Sampling Date: 9/27/2022

Applicant/Owner: West Michigan Airport Authority State: MI Sampling Point: DP8

Investigator(s): Brauna Hartzell, Mead & Hunt, Inc. Section, Township, Range: Section 8, T4N, R15W

Landform (hillside, terrace, etc.): shoulder Local relief (concave, convex, none): convex Slope %: 3-5%

Subregion (LRR or MLRA): LRR L, MLRA 97 Lat: 42.745871 Long: -86.107943 Datum: WGS84

Soil Map Unit Name: Capac-Wixom complex, 1 to 4 percent slopes (21B) (Predominantly Non-hydric) NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (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 ____	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.)
An analysis of antecedent precipitation indicates that environmental conditions were within normal range. Data point taken on berm; some mixed soils observed.

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. Rainstorms over the prior 2 days totalling about 0.6 inches. About 9 ft separates this sampling point from its paired wetland sampling point (DP7) with 1 - 2 ft change in elevation.

VEGETATION – Use scientific names of plants. Sampling Point: DP8

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
Sapling/Shrub Stratum (Plot size: 15 ft)			
1. *Elaeagnus umbellata*	5	Yes	UPL
2.			
3.			
4.			
5.			
6.			
7.			
	5 =Total Cover		
Herb Stratum (Plot size: 5 ft)			
1. *Elymus repens*	40	Yes	FACU
2. *Solidago canadensis*	20	Yes	FACU
3. *Symphyotrichum pilosum*	20	Yes	FACU
4. *Poa pratensis*	10	No	FACU
5. *Lotus corniculatus*	5	No	FACU
6. *Euthamia graminifolia*	5	No	FAC
7. *Fragaria virginiana*	5	No	FACU
8. *Phalaris arundinacea*	2	No	FACW
9.			
10.			
11.			
12.			
	107 =Total Cover		
Woody Vine Stratum (Plot size: 15 ft)			
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: 4 (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	5	x 3 =	15
FACU species	100	x 4 =	400
UPL species	5	x 5 =	25
Column Totals:	112 (A)		444 (B)

Prevalence Index = B/A = 3.96

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

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	
5-7	10YR 4/6	100					Loamy/Clayey	Mixed
7-18	10YR 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)
- ___ Mesic Spodic (A17) **(MLRA 144A, 145, 149B)**
- ___ 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)
- ___ 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. Some mixing of soils was observed.

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APPENDIX G Site Photographs

Photo 1. Wetland 1, Data points 1 and 2. View to the southwest.

Photo 2. Wetland 1, Data points 1 and 2. View to the south.

Photo 3. Wetland 1, general site. View to the east.

Photo 4. Farm field at edge of Wetland 1. View to the west.

Photo 5. Farm field at edge of Wetland 1. View to the west.

Photo 6. Wetland 2, general site. View to the east.

Photo 7. Wetland 2, Data points 5 and 6. View to the north.

Photo 8. Wetland 2, general site. View to the west.

Photo 9. Wetland 2, general site. View to the north.

Photo 10. Wetland 2, general site. View to the south.

Photo 11. Wetland 2, general site. View to the east.

Photo 12. Wetland 2, Data points 3 and 4. View to the south.

Photo 13. Wetland 2 along farm field. View to the west.

Photo 14. Wetland 2 along farm field. View to the east.

Photo 15. Wetland 2 along farm field. View to the west.

Photo 16. Drowned out area of farm field in Wetland 2. View to the south.

Photo 17. Overflow structure at Wetland 3. View to the south.

Photo 18. Weir at Wetland 3. View to the northeast.

Photo 19. Wetlands 2 & 3 along berm. View to the north.

Photo 20. Wetland 3, general site. View to the east.

Photo 21. Wetland 3, general site. View to the southeast.

Photo 22. Wetland 3, general site. View to the east.

Photo 23. Wetland 3, Data points 7 and 8. View to the southwest.

Photo 24. Wetland 3, Data points 7 and 8. View to the south.

Photo 25. Wetland 3, general site. View to the east.

Photo 26. Wetland 3, general site. View to the east.

Photo 27. Infield area. View to the south.

APPENDIX H Delineator Qualifications

BRAUNA HARTZELL, GISP, PWS
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 twenty 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) guidance including the Midwest and Northcentral and Northeast Regional Supplements 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 Wisconsin, Minnesota, and Michigan since 2002. Work included conducting the delineation, documenting field investigations and site conditions, creating wetland boundary maps, and report writing. 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
- Wetland delineation and permitting

Education

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

Certificates

- Ecological Restoration Certificate (5-3.0 CEU classes), Restoring Minnesota Ecological Restoration Training Cooperative program, 2020

Registration/Certification

- Certified GIS Professional (GISP), GIS Certification Institute
- Professional Wetland Scientist (PWS), Society of Wetland Scientists Professional Certification Program (SWSPCP)

Training and Seminars

- Critical Methods in Delineation, University of Wisconsin-LaCrosse, 2007, 2008, 2009, 2017, 2018, 2019, 2020, 2021, 2022
- Conservation Biology, University of Wisconsin-Madison, Spring 2021
- Grasses, Sedges, and Rushes Workshop, University of Wisconsin–LaCrosse, 2017
- Wildlife Inventory and Monitoring Workshop, University of Wisconsin – Milwaukee, 2015
- Advanced Wetland Delineation Workshop, University of Wisconsin – LaCrosse, 2007
- Basic Hydric Soil Identification Workshop, University of Wisconsin – LaCrosse, 2005
- Wetlands Ecology, University of Wisconsin – Madison, Spring 2003
- Vascular Flora of Wisconsin, University of Wisconsin – Madison, Spring 2002

RELATED PROJECTS (WETLANDS)

Wetland Delineation, Airlake Airport Dakota County, 2022
Metropolitan Airports Commission
Lakeville, Minnesota
Lead Wetland Delineator. Brauna served as lead wetland delineator in support of an environmental assessment for proposed airfield improvements at the Airport that include modifying the location of the runway ends to increase the existing declared distances, reconstructing the existing runway, and extending the runway and associated taxiways. The area of interest is approximately 164 acres is size and resulted in the delineation of twelve wetlands. An ordinary high water mark determination was completed for a previously re-aligned segment of tributary on the airfield. Wetland types encountered include emergent seasonally-flooded basins, fresh (wet) meadows, and shallow marsh. An off-site hydrology assessment using historic aerial photographs supported field assessment of farm fields within the study area. Brauna also completed NEPA documentation for wetlands.

Wetland Delineation, Chippewa Valley Regional Airport, 2022
Wisconsin Bureau of Aeronautics
Eau Claire, Wisconsin
Lead Wetland Delineator. Brauna served as lead wetland delineator in support of environmental documentation for a proposed wildlife perimeter fence replacement/extension and selective clearing project on Airport owned lands in the city of Eau Claire. The existing perimeter fence will be replaced with USDA-APHIS-WS/FAA recommended 10-foot chain link wildlife exclusion fencing. The Airport will also clear several areas of brush and stumps to establish turf vegetation to more easily maintain the area and to enhance wildlife control. The proposed fence corridor was surveyed for wetlands and streams and areas proposed for clearing were examined. Twelve wetlands were identified within the project AOI. Wetland types encountered include forested, fresh wet meadow and shrub-scrub wetlands.

Conservation Easement Baseline Biological Survey, 2021
Houghton County Airport
Calumet, Michigan
Lead Environmental Scientist. To mitigate for wetland impacts relating to a clearing project at the Airport, the Houghton County Memorial Airport will create a conservation easement for a 40-acre parcel owned by Houghton County**.** Brauna was lead environmental scientist responsible for overseeing and assisting with field work by a botanist and report and map creation. A Floristic Quality Assessment was performed by conducting a meander survey and collecting species cover data at eight permanent quadrat locations. The baseline report detailed field work to assess and document the 40-acre parcel as a high-quality Wooded Dune and Swale complex for creation of a conservation easement. Brauna coordinated with the Michigan Office of Environment, Great Lakes, and Energy (EGLE) to complete all necessary field requirements for the preservation of this rare plant community type.

Wetland Delineation, STH 162 Vernon and La Crosse Counties, 2021
Wisconsin Department of Transportation
Madison, Wisconsin
Lead Wetland Delineator. Brauna was lead wetland delineator in support of culvert, beam guard, and surface upgrades for a 5.6 mile stretch of State Trunk Highway (STH) 162 in Vernon and LaCrosse Counties. The project corridor extended from Coon Valley to STH 33. The area of interest consisted of the full length of the project corridor and selected areas requiring culvert and beam guard upgrades. The delineation resulted in the delineation of four wetlands. Stream assessments and Ordinary High Water Mark (OHWM) determinations were completed at two bridges within the Coon Valley municipal limits. Wetland types

- Grasses: Identification and Ecology Workshop, University of Wisconsin – Milwaukee workshop, 2002
- Basic Wetland Delineation Workshop, University of Wisconsin–LaCrosse, 2002

Training and Seminars

- GPS Field Collection Techniques Training Workshop for Trimble GeoXH, Seiler Instruments

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

encountered include fresh wet meadow and shrub-scrub wetlands delineated in association with stream crossings or adjacent floodplains.

Wetland Delineation, STH 162 Vernon County, 2021
Wisconsin Department of Transportation
Madison, Wisconsin

Lead Wetland Delineator. Brauna was lead wetland delineator in support of culvert, beam guard, and surface upgrades for a 6.9 mile stretch of State Trunk Highway (STH) 162 in Vernon County. The project corridor extended from Stoddard to Chaseburg. The area of interest consisted of the full length of the project corridor and selected areas requiring culvert and beam guard upgrades. The delineation resulted in the delineation of nine wetlands. Stream assessments for five streams were completed. Wetland types encountered include fresh wet meadow wetlands delineated in association with stream crossings or adjacent floodplains.

Wetland Delineation, STH 29 Clark County, 2021
Wisconsin Department of Transportation
Madison, Wisconsin

Lead Wetland Delineator. Brauna was lead wetland delineator in support of proposed culvert and beam guard upgrades for a 15.1 mile stretch of State Trunk Highway (STH) 29 in Clark County. The area of interest consisted of separate investigation areas at selected culvert and beam guard locations and all local road intersections which resulted in the delineation of 104 wetlands. Wetland types encountered include fresh wet meadows, forested wetlands, and riparian wetlands associated with four major stream crossings.

Wetland Delineation, 2020
Rochester International Airport
Rochester, Minnesota

Brauna served as lead wetland delineator in support of an environmental assessment for a proposed extension of Runway 2/20 and associated Taxiway A, along with other connected actions including the realignment of navigational equipment. The area of interest is approximately 712 acres is size and resulted in the delineation of thirty-eight wetlands. Wetland types encountered include emergent seasonally-flooded basins, and forested and fresh (wet) meadows. An off-site hydrology assessment using historic aerial photographs supported field assessment of farm fields within the study area. Agricultural areas were examined resulting in the delineation of two farmed wetlands. Brauna also completed NEPA documentation for wetlands and lead wetland permitting efforts.

Wetland Delineation, W.K. Kellogg Airport, 2020
W.K. Kellogg Airport
Battle Creek, Michigan

Brauna served as lead wetland delineator in support of an environmental documentation for a proposed road realignment to facilitate hangar development and other support services at the airport. The area of interest is approximately 52 acres is size and resulted in the delineation of six wetlands. Wetland types encountered include emergent seasonally-flooded basins and one emergent/forested wetland.

Joint Individual Permit – USACE Approval, 2019
Reconstruction and Extension of Runway 7L/25R and Taxiway A
Kenosha Regional Airport
Kenosha, Wisconsin

The proposed project includes the reconstruction and extension of Runway 7L/25R and Taxiway A at the Airport. Other actions proposed include improving the approach minimums to Runway 25R, bringing the geometries of these pavements into conformance with current standards, acquiring land and performing obstruction removal to provide clear approach and departure operations, and relocating navigational instruments and edge lighting / signage to correspond with the proposed pavement limits. Approximately 2.5 acres of wetland fill are necessary to achieve project needs. Brauna served as the lead preparer of the individual permit application which included a Practicable Alternatives Analysis.

Wetland Delineation and Biological Resources Survey, 2019
Ann Arbor Municipal Airport
Ann Arbor, Michigan

Brauna served as lead wetland delineator in support of an environmental assessment for a proposed extension of Runway 6/24 and associated Taxiway A, along with other connected actions including the removal of decommissioned navigational equipment. The area of interest is approximately 82 acres is size and resulted in the delineation of three wetlands and one stream. Habitat for identified threatened and endangered species was assessed during field work. Wetland types encountered include emergent seasonally-flooded basins and one stream approximately 300 ft long within the project area of interest.

Wetland Delineation and Biological Resources Survey, 2019
Kalamazoo-Battle Creek International Airport
Kalamazoo, Michigan

Brauna served as lead wetland delineator in support of an environmental assessment for a proposed extension of Runway 17/35 and improvement of airfield movement by correcting geometry deficiencies associated with the intersection of Taxiway C and Runway 17. The area of interest is approximately 246 acres is size and resulted in the delineation of seven wetlands. Habitat for identified threatened and endangered species was assessed during field work. Wetland types encountered include emergent seasonally-flooded basins and a large complex with multiple community types within the project area of interest.

Wetland Delineation and Biological Resources Survey, 2019
Ontonagon County Airport
Ontonagon, Michigan

Brauna served as lead wetland delineator in support of an environmental assessment for a proposed obstruction clearing for Runway 17/35. The area of interest is approximately 127 acres is size and resulted in the delineation of thirty-one new wetlands and re-examination of seven previously delineated wetlands. Habitat for identified threatened and endangered species was assessed during field work. Wetland types encountered include emergent seasonally-flooded basins, forested and scrub-shrub wetlands within the project area of interest.

Wetland Delineation and Biological Resources Survey, 2019
Houghton County Airport
Calumet, Michigan

Brauna served as lead wetland delineator in support of an environmental assessment for obstruction clearing for the Runway 25 approach and RPZ, removal of an existing farm pond, and reestablishment of a regulated stream. The parcel was recently acquired by the Airport. The area of interest is approximately 23 acres is size and resulted in the delineation of four wetlands, one stream, and one small pond. Habitat for identified threatened and endangered species was assessed during field work. Wetland types encountered include an emergent seasonally-flooded basin, three forested wetlands, and a 1-acre pond with multiple community types within the project area of interest.

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 miti-gation 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.

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 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.