Appendices

Appendix A – Runway Length Needs Determination
Appendix B – 30th Street North Realignment Alternatives Review
Appendix C – Wetland Delineation, Functional Assessment, and Associated Correspondence
Appendix D – Section 106 Documentation & Correspondence
Appendix E – U.S. Fish & Wildlife Section 7 Consultation Correspondence
Appendix F – Minnesota DNR Natural Heritage Information System (NHIS) Materials
Appendix G – USDA NRCS Farmland Conversion Impact Rating Form AD-1006
Appendix H – Phase I Environmental Site Assessment Report
Appendix I – Wildlife Hazard Site Visit Documentation & USDA-APHIS Correspondence
Appendix J – Aircraft Noise Analysis Report
Appendix K – Agency Scoping Documentation & Correspondence
Appendix L – Public Involvement
Appendix M – Public Comments and Responses
Appendix N – Municipal/Agency Comments and Responses

Appendix A – Runway Length Needs Determination

Content	Page
Runway Length Needs Documentation Report	A-1 thru A-27

Runway Length Needs Documentation

This appendix substantiates and documents the need for primary and crosswind runway lengths that meet user needs at Lake Elmo Airport, using the LTCP runway length analysis as a starting point. The following subsections present aircraft operations data and the associated runway length analysis:

- Existing and Forecasted Aircraft Activity Estimates
  - LTCP Base Year (2012) Aircraft Operations Estimate
  - Revised Base Year (2016) Aircraft Operations Estimate
  - LTCP Aircraft Operations Forecast (2012 to 2035)
  - Revised Aircraft Operations Forecast (2016 to 2035)
- Runway Length Analysis
  - Role and Classification of the Airport
  - FAA Runway Length Guidance
  - Takeoff Operations
  - Landing Operations
  - Crosswind Runway Length
  - Stage Length Considerations
  - Runway Length Conclusions
- Summary of Recommendations

1. Existing and Forecasted Aircraft Activity Estimates

Aircraft activity estimates for Lake Elmo Airport provide the basis for identifying the critical aircraft for which the runways at the Airport should be designed. According to FAA Advisory Circular (AC) 150/5000-17, *Critical Aircraft and Regular Use Determination*, “the critical aircraft is the most demanding aircraft type, or grouping of aircraft with similar characteristics, that make regular use of the airport. Regular use is 500 annual operations, including both itinerant and local operations but excluding touch-and-go operations. An operation is either a takeoff or a landing.”

Aircraft activity estimates also provide the basis for developing several operational inputs used to generate existing and future noise exposure maps with the FAA Aviation Environmental Design Tool (AEDT), such as the number of aircraft operations and the types of aircraft (fleet mix). This report presents the method used to estimate aircraft activity for the Lake Elmo Airport EA/ EAW. These estimates were used to substantiate the purpose and need for proposed airfield improvements and to develop noise exposure contour maps for the no-action and reasonable alternatives.

Aircraft activity at Lake Elmo Airport is analyzed in the following sections:

- LTCP Base Year (2012) Aircraft Operations Estimate
- Revised Base Year (2016) Aircraft Operations Estimate
- LTCP Aircraft Operations Forecast (2012 to 2035)
- Revised Aircraft Operations Forecast (2016 to 2035)

1.1 LTCP Base Year (2012) Aircraft Operations Estimate

This section summarizes the criteria and assumptions used by the LTCP to identify base year aircraft operations and fleet mix at Lake Elmo Airport.

There is no Air Traffic Control Tower (ATCT) at Lake Elmo Airport, so there is no “official” count of aircraft operations. The existing (2014) level of aircraft operations at the Airport (25,727 annual operations, or approximately 70 operations per day) was calculated for the LTCP as follows:

- The MAC Noise and Operations Monitoring System (MACNOMS) flight tracking system recorded 17,705 flight tracks for aircraft arriving to or departing from Lake Elmo Airport during 2014.
- The MACNOMS capture rate at all MAC-owned towered reliever airports (MACNOMS tracks compared to the official FAA Tower Count) for 2014 was 66.5%. The Anoka County-Blaine Airport (ANE) capture rate is 68.82%, and was used to adjust the Lake Elmo data set to account for missing flight tracks in MACNOMS.
- The MACNOMS capture rate adjustment for Lake Elmo is as follows: 17,705 MACNOMS recorded tracks / 68.82% ANE capture rate = 25,727 annual operations.

This estimate is consistent with on-site observations conducted at the Airport during a two-week period in December 2011 and a one-week period in August 2012.

- Average daily aircraft operations were 52 in December 2011 and 87 in August 2012.
- Monthly operations estimates for December 2011 and August 2012 were extrapolated using data from the towered reliever airports.
- A ratio of December and August operations as a percentage of the entire year was established using data from the towered reliever airports.
- This ratio was applied to the monthly estimates at Lake Elmo to estimate total 2012 operations (26,709).

The LTCP used the 2012 base year estimate of 26,709 aircraft operations to prepare forecasts for the years 2015, 2020, 2025, 2030, and 2035. The LTCP estimated operational fleet mix in 2012 by aircraft categories as follows:

- 26,088 (97.7%) single-engine piston operations (including experimental and light sport),
- 112 (0.4%) multi-engine piston operations,
- 56 (0.2%) turboprop operations,
- 4 (<0.1%) jet operations, and
- 449 (1.7%) helicopter operations.

According to the *Minneapolis-St. Paul Reliever Airports Activity Forecasts Technical Report* (revised October 2014), the percentage shares of base year operations per aircraft type were estimated based on MAC radar data and observations collected during the December 2011 and August 2012 on-site counts. These aircraft type shares assume that the annual shares of single-engine piston, multi-engine piston, and helicopter operations for the entire 2012 calendar year were consistent with observations from the on-site counts, and that MAC radar identified all operations by turboprop and jet aircraft that occurred at Lake Elmo Airport in 2012.

A-2

The LTCP used the 2012 annual operations estimates by aircraft category described above as a critical input in deriving the composition of the operational fleet by specific aircraft make and model, for conducting a base case (existing conditions) noise analysis. The process used to derive operations by specific aircraft make and model was as follows:

- MACNOMS data was gathered for the 12-month period ending October 2014, which included 1,187 flight tracks for which the aircraft make and model was known.
- The composition of aircraft types for the 1,187 flight tracks in this dataset for which the aircraft make and model was known was quantified on a per aircraft basis.
- The summary 2012 base year operations numbers described above served as the targets for scaling the MACNOMS fleet mix to equal total annual aircraft operations by operations type (i.e. arrival, departure, touch-and-go) and aircraft category (i.e. single-engine piston, multi-engine piston, turboprop, etc.). **Table 1** illustrates the adjustments made to scale the MACNOMS counts to match the 2012 forecast base year operations estimates.
- In cases where there were no MACNOMS flight tracks for which the aircraft make and model was known, flight tracks for similar types of operations by similar aircraft types were substituted. For example, there were no flight tracks for helicopter arrivals or touch-and-goes in the dataset, but there were flight tracks for helicopter departures. Therefore, the helicopter arrivals and touch-and-goes were modeled based on helicopter departure data.

Table 1: LTCP Base Year Fleet Mix Adjustments

Operation Type	**Aircraft Group**	**MACNOMS Count**	**Forecast Target**	**Adjustment Factor**	**Adjusted Totals**
Arrivals	Single Engine Piston + Other	501	11,436	22.826	11,436
	Multi-Engine Piston	60	46	0.767	46
	Turboprop	26	28	1.077	28
	Jets	0	2	2	2
	Helicopter	0	162	162	162
	Arrival Total	**587**	**11,674**		11,674
Departures	Single Engine Piston + Other	531	11,436	21.537	11,436
	Multi-Engine Piston	39	46	1.179	46
	Turboprop	24	28	1.167	28
	Jets	0	2	2	2
	Helicopter	2	162	81	162
	Departure Total	**596**	**11,674**		11,674
Touch and Go	Single Engine Piston + Other	4	1,608	402	1,608
	Multi-Engine Piston	0	10	10	10
	Turboprop	0	0	0	0
	Jets	0	0	0	0
	Helicopter	0	62.5	62.5	62.5
	Touch and Go Total	**4**	**1,680.5**		**1,680.5**
	Grand Total	**1,187**	**25,028.5**		**25,028.5**

Note: Two military operations identified by MACNOMS are not counted in table above.

1.2 Revised Base Year (2016) Aircraft Operations Estimate

This section describes the approach Mead & Hunt used to develop its own independent aircraft operations estimates for the most recent full calendar year (2016), and explains the rationale for recommending modification of the operational fleet mix estimates developed for and presented in the LTCP. To make these estimates, Mead & Hunt conducted detailed analysis of Airport-specific operations data available from both the FAA Traffic Flow Management System Counts (TFMSC) and the MACNOMS databases. The purpose, data collection methods, and limitations of these databases are summarized below.

The TFMSC is a nationwide database designed to provide information on traffic counts by airport or by city pair. It includes data for flights that fly under Instrument Flight Rules (IFR) and are captured by the FAA's enroute computers. Most Visual Flight Rules (VFR) and some non-enroute IFR traffic is excluded from these counts. The source data are created when pilots file flight plans and/or when flights are detected by the surveillance system in the National Airspace System (NAS), usually via RADAR. This data source provides an incomplete record of operations at Lake Elmo Airport, because most of its users operate in VFR conditions without an IFR flight plan. However, this data provides valuable information regarding the operational fleet at the Airport because it includes the aircraft make and model associated with each flight it captures.

The MACNOMS is a MAC-owned and operated database designed primarily to help MAC staff analyze aircraft noise impacts, assess noise abatement procedures, and provide public access to flight tracking and detailed aircraft noise data. Deployed in 1992, the system correlates information from a state-of-the-art flight tracking data feed with noise data collected at 39 Remote Monitoring Towers (RMTs) located around Minneapolis-St. Paul International Airport. The flight tracking data feed draws on information provided by FAA enroute radar systems, terminal secondary surveillance systems, Airport Surface Detection Equipment (ASDE-X) systems, Wide Area Multilateration (WAM) systems, and the nationwide Automatic Dependent Surveillance-Broadcast (ADS-B) system. For MACNOMS flights tracks at Lake Elmo, aircraft make and model information is available if the pilot filed an IFR flight plan, or the aircraft has the required cockpit transponder equipment to communicate with the data feed source system.

There were 19,757 total aircraft flight tracks captured by MACNOMS at Lake Elmo Airport in 2016. Based on MAC staff analysis of flight track beginning and end points, Mead & Hunt estimates that 1,215 of the 19,757 tracks (6.1%) were conducted by aircraft flying near but not taking off and landing at the Airport, resulting in an estimated 18,542 total flight tracks associated with actual takeoff and landing operations at Lake Elmo Airport. **Table 2** on the next page summarizes these flight tracks based on origin/destination and aircraft engine type information included in the MACNOMS data.

Table 2: Lake Elmo Airport 2016 MACNOMS Flight Tracks by Aircraft Engine and Operation Types					
	Operation Type				
		Itinerant			
Aircraft Engine Type	**Local**	**Other Twin Cities Airport**	**Outside Twin Cities**	**Origin / Destination Unknown**	**Total**
Single-Engine Piston	396	233	333	836	**1,798**
Single-Engine Turboprop	0	4	11	15	**30**
Multi-Engine Piston	2	8	17	42	**69**
Multi-Engine Turboprop	0	1	2	0	**3**
Jet	0	1	0	0	**1**
Helicopter	0	117	0	2	**119**
Unknown	10,482	1,779	0	4,261	**16,522**
Total Flight Tracks	**10,880**	**2,143**	**363**	**5,156**	**18,542**

Sources: MACNOMS, Mead & Hunt.
Notes: Flight tracks by unknown aircraft types were adjusted to eliminate those conducted by aircraft flying near but not taking off and landing at Lake Elmo Airport, assuming this percentage was the same as among similar flight tracks for which the aircraft type is known. Local operations are defined by FAA as takeoffs and landings conducted by aircraft operating in the traffic pattern or within sight of the tower, or aircraft known to be departing or arriving from flight in local practice areas, or aircraft executing practice instrument approaches at the airport. Itinerant operations are defined as all aircraft operations other than local operations, and essentially represent takeoffs and landings of aircraft going from one airport to another.

1.2.1 Turboprop and Jet Aircraft Flight Tracks

Turboprop and jet aircraft are generally more expensive to own and operate than single-engine piston, multi-engine piston, and helicopter aircraft. To protect their investment and comply with insurance requirements, pilots of these aircraft are more likely to file IFR flight plans and the aircraft are more likely to have state-of-the-art avionics in the cockpit. For these reasons, it is reasonable to assume that MACNOMS captured most turboprop and jet aircraft operations that occurred at Lake Elmo Airport in 2016. Mead & Hunt normalized the turboprop and jet aircraft flight track counts so that for every arrival operation, there was a corresponding departure. The adjusted flight track totals are shown in **Table 3** below.

Table 3: 2016 Turboprop and Jet Aircraft Flight Track Estimates				
		Itinerant		
Aircraft Engine Type	**Local**	**Other Twin Cities Airport**	**Outside Twin Cities**	**Total**
Single-Engine Turboprop	0	6	34	**40**
Multi-Engine Turboprop	0	2	4	**6**
Jet	0	2	0	**2**

Sources: MACNOMS, Mead & Hunt

1.2.2 Single-Engine Piston, Multi-Engine Piston, and Helicopter Flight Tracks

As shown in Table 3, Mead & Hunt estimates that a minimum of 48 flight tracks in the 2016 MACNOMS data set were conducted by turboprop and jet aircraft. To assign the remaining flight tracks to aircraft type categories, Mead & Hunt assumed that these flight tracks were conducted by single-engine piston, multi-engine piston, and helicopter aircraft. The following narrative explains how Mead & Hunt assigned the flight tracks to these three aircraft categories.

Mead & Hunt concluded that both the aircraft make/model and origin/destination airport are known when 1) the pilot filed an IFR flight plan, or 2) the pilot did not file an IFR flight plan, but the aircraft make/model was captured because it had an ADS-B transponder and the origin/destination airport was captured because it was within the Twin Cities metropolitan area. Mead & Hunt further concluded that only the aircraft make/model is known when the pilot did not file a flight plan and the origin/destination airport was outside the Twin Cities metro area, but the aircraft had an ADS-B transponder. Finally, Mead & Hunt concluded that flight tracks for which the aircraft make/model is unknown represent VFR operations by aircraft without an ADS-B transponder.

Mead & Hunt reviewed ADS-B equipage statistics for various aircraft types to determine appropriate assumptions regarding the fleet mix of flight tracks for which the aircraft make/model is unknown. The FAA has mandated that aircraft operating in most controlled airspace install ADS-B transponders by January 1, 2020. Based on available FAA statistics, Mead & Hunt estimates that only 8.1% of the national GA and air taxi fleet was equipped with functioning ADS-B equipment as of September 1, 2016. Multi-engine piston, turboprop, and jet aircraft were more likely to have ADS-B transponders than other types of aircraft, as shown in **Table 4**.

Table 4: Nationwide ADS-B Equipage Rates by Aircraft Type (Non-Air Carrier)

Aircraft Type	ADS-B Equipped (Good Install)	Active GA & Air Taxi Fleet	Estimated Percentage Equipped
Single-Engine Piston	11,508	162,775	7.1%
Rotorcraft	814	10,700	7.6%
Multi-Engine Piston, Turboprop, & Jet	4,704	36,430	12.9%
Total	**17,026**	**209,905**	**8.1%**

Sources: FAA Aerospace Forecasts, FAA ADS-B Performance Monitor, Mead & Hunt

Notes: ADS-B equipage by aircraft type derived from FAA statistics as of September 1, 2016. Active GA & Air Taxi Fleet are 2016 domestic fleet estimates from *FAA Aerospace Forecast FY2017-2021*. Single-engine piston includes experimental, light sport, and other aircraft.

Mead & Hunt also quantified MACNOMS flight tracks conducted by based aircraft, to determine whether an adjustment factor should be applied to account for the higher likelihood that multi-engine piston aircraft are ADS-B equipped, and therefore over-represented among the flight tracks for which the aircraft type is known. This analysis determined that 37 of the 194 (19.0%) airplanes based at Lake Elmo are represented among these flight tracks. Of these, 36 are single-engine piston aircraft, while one is a multi-engine piston aircraft. In other words, 19.3% of the 187 based single-engine piston aircraft are represented among the flight tracks for which the aircraft type is known, while 20.0% of the five based multi-engine aircraft are represented. Because based single-engine piston aircraft were just as likely to be represented among these flight tracks as based multi-engine piston aircraft, Mead & Hunt concluded that an adjustment factor to account for ADS-B equipage is not appropriate for multi-engine piston aircraft at Lake Elmo Airport.

Local Operations

There were 10,880 MACNOMS flight tracks in 2016, or 58.6% of total flight tracks, which represent local operations at Lake Elmo Airport. This is consistent with the January 2017 FAA Terminal Area Forecast, which estimates that approximately 61.2% of aircraft activity at Lake Elmo Airport consists of local operations. The aircraft type is known for 398 of the 10,880 local flight tracks captured by MACNOMS, 99.5% of which were conducted by single-engine piston aircraft and 0.5% were conducted by multi-engine piston aircraft. This aircraft type split is relatively consistent with the based fleet mix at Lake Elmo Airport, which is 96.4% single-engine piston, 2.6% multi-engine piston, and 1.0% helicopters, which is appropriate because local operations at an airport are typically conducted by aircraft based at that airport.

To allocate the local flight tracks to aircraft type categories, the type shares for which the aircraft type is known were applied to the 10,482 local operations for which the aircraft type is unknown, as shown in **Table 5**.

Table 5: 2016 Aircraft Type Estimates for Local Piston & Helicopter Flight Tracks by Unknown Aircraft Type

Aircraft Engine Type	Share Among Flight Tracks for Which Aircraft Type is Known	Estimated Flight Tracks
Single-Engine Piston	99.5%	10,433
Multi-Engine Piston	0.5%	49
Helicopter	0.0%	0
	Total Flight Tracks	**10,482**

Sources: MACNOMS, Mead & Hunt

Itinerant Operations

There were 2,506 MACNOMS flight tracks in 2016, or 13.5% of total flight tracks, which represent itinerant operations at Lake Elmo Airport for which the origin/destination airport is known. The aircraft type is known for 727 of these 2,506 itinerant operations. Of these 727 operations, 19 were associated with turboprop or jet aircraft. The fleet mix for the remaining 708 operations varied depending on whether the origin/destination airport was within or outside the Twin Cities metro area, as shown in **Table 6** on the next page.

Table 6: 2016 MACNOMS Itinerant Piston & Helicopter Flight Tracks by Known Aircraft Types				
	Origin/Destination at Another Twin Cities Airport		**Origin/Destination at Airport Outside Twin Cities**	
Aircraft Type	**Operations**	**Share**	**Operations**	**Share**
Single-Engine Piston	233	65.1%	333	95.1%
Multi-Engine Piston	8	2.2%	17	4.9%
Helicopter	117	32.7%	0	0.0%
Total	**358**	**100.0%**	**350**	**100.0%**

Sources: MACNOMS, Mead & Hunt

The remaining 1,779 itinerant MACNOMS flight tracks, for which the origin/destination airport is known but the aircraft type is not known, were for flights occurring between Lake Elmo Airport and other airports in the Twin Cities metro area. Of these, four are assumed to have been completed by turboprop and jet aircraft as assigned in Section 1.2.1. The Twin Cities itinerant flight track type shares shown in Table 6 for which the aircraft type is known were applied to the 1,775 Twin Cities itinerant flight tracks for which the aircraft type is unknown, as shown in **Table 7**.

Table 7: 2016 Aircraft Type Estimates for Twin Cities Itinerant Piston & Helicopter Flight Tracks by Unknown Aircraft Type		
Aircraft Engine Type	**Share Among Flight Tracks for Which Aircraft Type is Known**	**Estimated Flight Tracks**
Single-Engine Piston	65.1%	1,155
Multi-Engine Piston	2.2%	40
Helicopter	32.7%	580
	Total Flight Tracks	**1,775**

Sources: MACNOMS, Mead & Hunt

The origin/destination airport of the remaining 5,156 flight tracks is unknown. The aircraft type is known for 895 of these flight tracks, but unknown for the remaining 4,261 flight tracks. Of these 895 flight tracks, 15 were associated with turboprop aircraft. The fleet mix for the remaining 880 flight tracks for which the aircraft type is known but origin/destination airport is unknown is compared to that for the 350 non-metro itinerant piston and helicopter flight tracks for which the aircraft type is known in **Table 8** on the next page.

Table 8: 2016 Non-Metro Itinerant Piston & Helicopter Operations and Operations with Unknown Origin/Destination by Known Aircraft Types				
	Origin/Destination at Airport Outside Twin Cities		**Unknown Origin/Destination Airport**	
Aircraft Type	**Operations**	**Share**	**Operations**	**Share**
Single-Engine Piston	333	95.1%	836	95.0%
Multi-Engine Piston	17	4.9%	42	4.8%
Helicopter	0	0.0%	2	0.2%
Total	**350**	**100%**	**880**	**100%**

Sources: MACNOMS, Mead & Hunt

The similarity of the aircraft type shares for these two flight track categories strongly suggests that the flight tracks for which the origin/destination is unknown represent flight tracks to or from airports outside the Twin Cities metro area. This is also supported by the fact that MACNOMS captures flight tracks at all Twin Cities metro area airports, and therefore the origin and destination for both local flight tracks and flight tracks between Twin Cities metro area airports should already be captured. For these reasons, Mead & Hunt concluded that the 5,156 operations for which the origin/destination airport is unknown represent flights between Lake Elmo and airports outside the Twin Cities metro area. Of these, 25 are assumed to have been completed by turboprop and jet aircraft as assigned in Section 1.2.1, and 880 were conducted by known aircraft types as shown in Table 8. To allocate the remaining 4,251 non-metro itinerant flight tracks to aircraft type categories, the type shares for which the aircraft type is known were applied as shown in **Table 9**.

Table 9: Aircraft Type Estimates for Non-Metro Itinerant Piston & Helicopter Flight Tracks by Unknown Aircraft Type		
Aircraft Engine Type	**Share Among Flight Tracks for Which Aircraft Type is Known**	**Estimated Flight Tracks**
Single-Engine Piston	95.0%	4,038
Multi-Engine Piston	4.8%	203
Helicopter	0.2%	10
	Total Flight Tracks	**4,251**

Sources: MACNOMS, Mead & Hunt

1.2.3 Aircraft Activity Estimate Summary

The 2016 MACNOMS flight tracks for Lake Elmo Airport are summarized in **Table 10** on the next page according to the aircraft type assignments described above. The flight track totals in Table 10 were then adjusted using the 72.44% MACNOMS capture rate reported to the state legislature in 2016, to account for missing flight tracks in MACNOMS. After making this adjustment, Mead & Hunt estimates there were 25,596 total aircraft operations at Lake Elmo Airport in 2016, as summarized in **Table 11** on the next page.

Table 10: Lake Elmo 2016 MACNOMS Flight Tracks by Aircraft and Operation Types							
	Operation Type						
	Local		**Itinerant**				**Total Flight Tracks**
			Other Twin Cities Airport		**Outside Twin Cities**		
Aircraft Type	**Aircraft Type Known**	**Aircraft Type Assigned by Mead & Hunt**	**Aircraft Type Known**	**Aircraft Type Assigned by Mead & Hunt**	**Aircraft Type Known**	**Aircraft Type Assigned by Mead & Hunt**	
Single-Engine Piston	396	10,433	233	1,155	1,169	4,038	17,424
Single-Engine Turboprop	0	0	4	2	26	8	40
Multi-Engine Piston	2	49	8	40	59	203	361
Multi-Engine Turboprop	0	0	1	1	2	2	6
Jet	0	0	1	1	0	0	2
Helicopter	0	0	117	580	2	10	709
Total Flight Tracks	**398**	**10,482**	**364**	**1,780**	**1,257**	**4,261**	**18,542**

Sources: MACNOMS, Mead & Hunt

Table 11: Lake Elmo 2016 Operations Estimate by Aircraft and Operation Types				
	Operation Type			
		Itinerant		
Engine Type	**Local**	**Other Twin Cities Airport**	**Outside Twin Cities**	**Total Operations**
Single-Engine Piston	14,949	1,916	7,188	**24,053**
Single-Engine Turboprop	0	8	47	**55**
Multi-Engine Piston	70	66	362	**498**
Multi-Engine Turboprop	0	2	6	**8**
Jet	0	3	0	**3**
Helicopter	0	962	17	**979**
Total	**15,019**	**2,960**	**7,617**	**25,596**

Sources: MACNOMS, Mead & Hunt

This 2016 operations estimate is slightly less than the 2012 and 2014 estimates generated for the LTCP, which were 26,709 and 25,727 operations, respectively. This 2016 estimate indicates that the LTCP may underestimate current operations by multi-engine piston and helicopter aircraft. The Mead & Hunt 2016 estimates are compared to the LTCP 2012 estimates in **Table 12** on the next page.

A-10

Table 12: Base Year Operations Estimate Comparison		
Engine Type	**LTCP Estimate (2012)**	**Mead & Hunt Estimate (2016)**
Single-Engine Piston	26,088	24,053
Multi-Engine Piston	112	498
Turboprop	56	63
Jet	4	3
Helicopter	449	979
Total	**26,709**	**25,596**

1.2.4 Aircraft Activity Estimate by Aircraft Make/Model

Mead & Hunt analyzed the prevalence of specific aircraft makes and models at Lake Elmo Airport, to derive aircraft-specific fleet mix estimates for developing a noise analysis and for determining the design family of aircraft for a runway length analysis. Because the makes and models operating at a specific airport vary from year to year, the 2016 MACNOMS information was compared to TFMSC information for the years 2012 to 2016, to verify the aircraft types are using the Airport on a consistent basis. This comparison is shown in **Table 13** on the next page. The 2016 MACNOMS percentages shown in Table 12 were then used to categorize the operations summarized in Table 11 by specific aircraft make/model, as shown in **Table 14** on the following page. The fleet estimates confirm the design aircraft family at Lake Elmo Airport remains the small, propeller-driven aircraft weighing less than 12,500 pounds and with fewer than 10 passenger seats – which accounted for 24,614 estimated operations in 2016.

A-11

Table 13: Lake Elmo Airport - Available Usage Information by Aircraft Type (Jets & Helicopters Excluded)					
Aircraft Make & Model	**TFMSC Operations (2012 - 2016)**	**Share of Operations in Category**	**MACNOMS Flight Tracks (2016)**	**Share of Flight Tracks in Category**	**Maximum Seats**
Single-Engine Piston Aircraft					
Piper PA-28/32 Cherokee/Warrior/Dakota/Arrow	822	21.8%	544	30.3%	4
Van's RV-6/7/8/9/10/12	87	2.3%	369	20.5%	4
Cessna 140/150/152/170/172/177/180/182/185	921	24.4%	256	14.2%	4
Cirrus SR20/SR22/SR22-Turbo	744	19.7%	216	12.0%	5
Beech Bonanza 33/34/35/36	568	15.0%	140	7.8%	6
Other Single-Engine Piston	50	1.3%	103	5.7%	4
Cessna 205/206/210	289	7.7%	66	3.7%	6
Mooney M-20 (various models)	132	3.5%	50	2.8%	4
Lancair LC-41 Columbia 300/400	48	1.3%	30	1.7%	4
Rockwell Commander 112	68	1.8%	12	0.7%	4
Piper PA-24 Comanche	37	1.0%	9	0.5%	6
Piper PA-46 Malibu	10	0.3%	3	0.2%	6
Single-Engine Piston Total	***3,776***		***1,798***		
Single-Engine Turboprop Aircraft					
Socata TBM-700/850	120	71.9%	23	76.7%	6
Piper PA-46T Malibu Meridian	12	7.2%	3	10.0%	6
Pilatus PC-12	35	21.0%	2	6.7%	9
Cessna 208 Caravan	0	0.0%	2	6.7%	9
Single-Engine Turboprop Total	***167***		***30***		
Multi-Engine Piston Aircraft					
Cessna 335/337/340	167	58.6%	31	44.9%	5
Beech Baron 55/58	37	13.0%	19	27.5%	6
Cessna 414/421	2	0.8%	7	10.1%	8
Diamond Twin Star DA50	21	7.4%	3	4.3%	4
Piper PA-31 Navajo / Chieftain	24	8.4%	2	2.9%	7
Piper PA-34 Seneca	8	2.8%	2	2.9%	6
Cessna 310	5	1.8%	2	2.9%	6
Piper PA-44 Seminole	11	3.9%	1	1.4%	4
Piper PA-23 Apache/Aztec	3	1.1%	1	1.4%	6
P-68 Observer	0	0.0%	1	1.4%	6
Piper PA-30 Twin Comanche	5	1.8%	0	0.0%	6
Beech 95 Travel Air	2	0.7%	0	0.0%	5
Multi-Engine Piston Total	***285***		***69***		
Multi-Engine Turboprop Aircraft					
Swearingen Merlin III	1	10.0%	1	33.3%	9
Cessna Conquest 441	0	0.0%	1	33.3%	9
Beech Super King Air 90/200/300/350	7	70.0%	1	33.3%	9
Rockwell Aero Commander 690	2	20.0%	0	0.0%	6
Multi-Engine Turboprop Total	***10***		***3***		

Sources: TFMSC, MACNOMS, Mead & Hunt. Note: Aircraft highlighted in orange were selected for primary runway length analysis; aircraft highlighted in blue were selected for crosswind runway length analysis.

Table 14: 2016 Operational Fleet Mix Estimates by Aircraft Make/Model		
Aircraft Make & Model	**Share of Flight Tracks in Category**	**Estimated Operations**
Single-Engine Piston Aircraft		
Piper PA-28/32 Cherokee/Warrior/Dakota/Arrow	30.3%	7,277.44
Van's RV-6/7/8/9/10/12	20.5%	4,936.35
Cessna 140/150/152/170/172/177/180/182/185	14.2%	3,424.68
Cirrus SR20/SR22/SR22-Turbo	12.0%	2,889.57
Beech Bonanza 33/34/35/36	7.8%	1,872.87
Other Single-Engine Piston	5.7%	1,377.90
Cessna 205/206/210	3.7%	882.92
Mooney M-20 (various models)	2.8%	668.88
Lancair LC-41 Columbia 300/400	1.7%	401.33
Rockwell Commander 112	0.7%	160.53
Piper PA-24 Comanche	0.5%	120.40
Piper PA-46 Malibu	0.2%	40.13
Single-Engine Turboprop Aircraft		
Socata TBM-700/850	76.7%	42.17
Piper PA-46T Malibu Meridian	10.0%	5.50
Pilatus PC-12	6.7%	3.67
Cessna 208 Caravan	6.7%	3.67
Multi-Engine Piston Aircraft		
Cessna 335/337/340	27.2%	133.88
Beech Baron 55/58	16.6%	82.06
Piper PA-30 Twin Comanche[1]	16.2%	80.00
Piper PA-31 Navajo / Chieftain[1]	9.9%	48.64
Piper PA-23 Apache/Aztec[1]	9.0%	44.32
Cessna T-50 Bobcat[1]	8.1%	40.00
Cessna Chancellor 414	3.0%	15.12
Cessna Golden Eagle 421	3.0%	15.12
Diamond Twin Star DA50	2.6%	12.96
Piper PA-34 Seneca	1.8%	8.64
Cessna 310	1.8%	8.64
Piper PA-44 Seminole	0.9%	4.32
P-68 Observer	0.9%	4.32
Multi-Engine Turboprop		
Beech King Air 200	33.3%	2.67
Cessna Conquest 441	33.3%	2.67
Swearingen Merlin III	33.3%	2.67
Jet Aircraft		
Cessna Citation Jet 560XLS	100.0%	3.00
Helicopters		
Robinson R44	100.0%	979.00
	Total	**25,596.00**

Sources: TFMSC, MACNOMS, Mead & Hunt
[1]Multi-engine piston aircraft percentages adjusted to account for operations by these based aircraft types. Based on discussion with Airport staff and tenants, as well as analysis of typical operations by other based aircraft, Mead & Hunt estimates 40 annual operations by each based multi-engine piston aircraft.

A-13

1.3 LTCP Aircraft Operations Forecast Overview (2012 to 2035)

This section provides an overview of the methodology used to generate the preferred LTCP aircraft operations forecasts.

For each aircraft type category, the LTCP assumed that aircraft operations would increase proportional to the rate of hours flown per based aircraft. For this reason, aircraft operations were anticipated to grow slightly from 2012 to 2035, even though based aircraft were expected to decline. The Base Case LTCP aircraft operations forecast, which does not consider potential increases in operations due to provision of additional runway length, is shown below in **Table 15**.

Table 15: LTCP Aircraft Operations Forecast – Base Case

Year	Single Engine Piston	Multi-Engine Piston	Turboprop	Microjets	Other Jets	Helicopter	Other*	Total
2015	21,664	110	58	2	2	441	3,176	25,454
2020	20,092	109	59	3	3	662	3,304	24,232
2025	19,802	100	58	4	4	664	3,276	23,908
2030	20,946	132	57	5	5	668	3,388	25,200
2035	21,823	125	56	5	5	672	3,450	26,138

Source: Minneapolis-St. Paul Reliever Airports Activity Forecasts – Technical Report July 2013 (Revised October 2014)
Notes: * Includes Experimental and Light Sport Aircraft

The LTCP also considered the proposed primary runway extension and developed a forecast for this scenario, which found that a runway extension would result in a slight increase in total aircraft operations as it would allow aircraft to use the Airport more often. However, the increase would be limited to turboprop and jet aircraft because the existing runway length is generally sufficient for smaller aircraft. The Extended Runway scenario forecast is shown below in **Table 16**.

Table 16: LTCP Aircraft Operations Forecast – Extended Runway Scenario

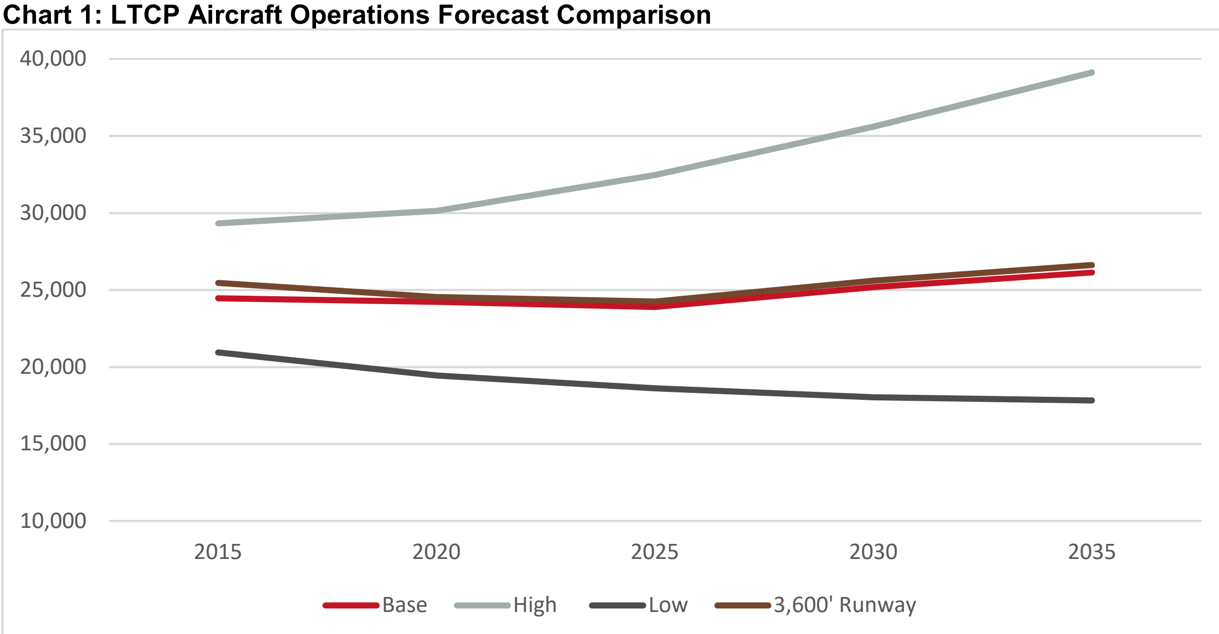
Year	Single Engine Piston	Multi-Engine Piston	Turboprop	Microjets	Other Jets	Helicopter	Other*	Total
2015	21,664	110	58	2	2	441	3,176	25,454
2020	20,092	109	323	33	16	662	3,304	24,539
2025	19,802	100	335	56	28	664	3,276	24,261
2030	20,946	132	346	90	45	668	3,388	25,615
2035	21,823	125	358	128	64	672	3,450	26,620

Source: Minneapolis-St. Paul Reliever Airports Activity Forecasts – Technical Report July 2013 (Revised October 2014)
Notes: * Includes Experimental and Light Sport Aircraft

1.4 Revised Aircraft Operations Forecast (2016 to 2035)

The estimated total of 25,596 operations at Lake Elmo Airport in 2016 is consistent with the Base Case LTCP forecast, which projected between 25,000 and 26,000 operations for 2016. The LTCP included High Range and Low Range forecasts, with the Base Case and Extended Runway scenario forecasts falling in between as shown in **Chart 1**. Because the 2016 operations estimate presented in Section 2 is consistent with the overall LTCP operations forecasts, Mead & Hunt used the overall operation estimates from the LTCP Base Case and Extended Runway scenario forecasts to study future Airport use and associated aircraft noise in the EA/EAW.

Chart 1: LTCP Aircraft Operations Forecast Comparison



Source: Lake Elmo Airport 2035 LTCP

However, as discussed in Section 2, Mead & Hunt's review of TFMSC and MACNOMS data suggests that the LTCP base year operational fleet mix estimates may have underestimated operations by multi-engine and helicopter aircraft. Based on consideration of the increased utility of an extended primary runway relative to each aircraft category, Mead & Hunt developed percentage estimates of expected future operations given an extended primary runway, which are presented in **Table 17** on the next page. These estimates anticipate increases in the share of multi-engine piston, turboprop, and jet aircraft operations because of the additional available runway length. This equates to approximately 3 additional multi-engine piston, 4 additional turboprop, and 0.5 additional jet aircraft operations per week when compared to the base year condition.

Table 17: Existing and Forecast Fleet Mix Percentage Estimates		
Aircraft Type	**2016 Base Year Operations**	**Future Operations with Extended Primary Runway**
Single Engine Piston	93.97%	93.00%
Multi-Engine Piston	1.95%	2.50%
Turboprop	0.25%	1.00%
Jets	0.01%	0.10%
Helicopter	3.82%	3.40%

The percentages shown in Table 17 were applied to the total annual operations from the LTCP extended runway operations forecast scenario to produce the revised operations forecast presented in **Table 18**. Compared to the LTCP extended runway scenario, the revised forecast operations are higher in single-engine piston, multi-engine piston and helicopters and lower in turboprop and jet aircraft.

Table 18: Revised Aircraft Operations Forecast - Extended Runway Scenario						
Year	**Single Engine Piston**	**Multi-Engine Piston**	**Turboprop**	**Jet**	**Helicopter**	**Total**
2016*	24,053	498	63	3	979	**25,596**
2020	22,821	613	245	25	834	**24,539**
2025	22,563	607	243	24	825	**24,261**
2030	23,822	640	256	26	871	**25,615**
2035	24,757	666	266	27	905	**26,620**

Source: Lake Elmo Airport 2035 LTCP, MACNOMS, Mead & Hunt
Note: Single-engine piston operations include experimental and light sport aircraft. The 2016 operations represent an estimate of actual activity during that year. The 2016 operations estimate was used as the base case for purposes of studying existing conditions in the EA/EAW.

2. Runway Length Analysis

2.1 Role and Classification of the Airport

The primary role of the Lake Elmo Airport is to serve personal, recreational, and some business aviation users in Washington County and the eastern portion of the Minneapolis-St. Paul metropolitan area. Example business services include flight training and aircraft maintenance. The role of the Airport is not expected to change during the 20-year planning window analyzed in the 2035 LTCP.

The critical aircraft to be accommodated at the Lake Elmo Airport are small, propeller-driven aircraft weighing less than 12,500 pounds with fewer than 10 passenger seats. A wide variety of single and multi-engine aircraft are included within this category. **Table 19** outlines a representative mix of aircraft selected for individual evaluation. The aircraft were selected because they are the most demanding aircraft using the Airport consistent with the operations forecasts presented in the previous section.

Table 19 - Representative Family of Aircraft - Lake Elmo Airport
Small Airplanes with Maximum Certified Takeoff Weight of 12,500 lbs or less

Aircraft Model	Engine Type	Wingspan (ft)	Maximum Takeoff Weight (lbs)	Operating Empty Weight (lbs)	Maximum Useful Load (lbs)	Passenger Seat Range
Beechcraft King Air 200	Multi - Turboprop	54.5	12,500	8,750	3,750	7-9
Pilatus PC-12	Single - Turboprop	53.3	9,921	5,468	4,453	7-9
Cessna 421C	Multi - Piston	41.1	7,450	4,501	2,949	6-8
Socata TBM 700	Single - Turboprop	41.6	7,394	6,032	1,362	4-6
Piper PA 31P-350 Chieftain	Multi - Turboprop	44.5	7,000	4,319	2,681	5-7
Cessna 414A	Multi - Piston	44.1	6,750	4,365	2,385	6-8
Cessna 340	Multi - Piston	38.1	6,000	3,921	2,079	4-5
Cessna 310R	Multi - Piston	36.9	5,500	3,260	2,240	5-6
Beechcraft Baron G58	Multi - Piston	37.8	5,500	4,030	1,470	4-6
Piper PA-30 Twin Comanche	Multi - Piston	36.0	3,600	2,160	1,440	4-6

Source: Aircraft Manufacturers

This report utilizes both the general runway length guidance provided in FAA Advisory Circular (AC) 150/5325-4B, *Runway Length Recommendations for Airport Design*, for this representative aircraft family, as well as the aircraft manuals for the specific aircraft shown in **Table 19**, to determine individual runway length requirements for both takeoff and landing operations.

Federal, state, regional and local agencies each have their own classification systems for airports. While different in name, there are often similar infrastructure characteristics. The various classifications for the Lake Elmo Airport are described briefly below. These classifications are consistent with the representative family of aircraft identified in Table 19.

Federal Aviation Administration (FAA): The Lake Elmo Airport is included in the FAA's National Plan of Integrated Airport Systems (NPIAS)[1] as a Regional General Aviation (GA) Airport. Airports of this category are in metropolitan areas and serve relatively large populations. They support regional economies with interstate and some long-distance flying, and have high levels of activity, including some jets and multiengine propeller aircraft. The NPIAS also identifies Lake Elmo as a Reliever to the Minneapolis-St. Paul International Airport.

Metropolitan Airports Commission (MAC): Within its system of airports, the MAC further classifies its reliever airports as being either "primary" or "complimentary" facilities. The MAC classifies Lake Elmo Airport as a complimentary reliever airport, designed to accommodate the smaller end of the GA traffic spectrum, such as the family of small propeller-driven airplanes with fewer than 10 passenger seats as described above. By the MAC's definition, the "primary reliever" airports are those better equipped to serve business jets and corporate aircraft in addition to small GA aircraft.

[1] Additional information available at: https://www.faa.gov/airports/planning_capacity/npias/

Minnesota Department of Transportation (MnDOT): The Minnesota State Aviation System Plan (SASP)[2] classifies Lake Elmo as an Intermediate Airport. Airports of this type have a paved and lighted primary runway that is less than 5,000 feet in length. These airports can accommodate all single-engine aircraft, some multi-engine aircraft (including turboprops), and some business jets. Intermediate Airports serve as landing facilities for flight training, aircraft maintenance, and GA aircraft up to the smaller business jet size.

Metropolitan Council: The Metropolitan Council develops regional transportation policy, including the Regional Aviation System Plan, which classifies Lake Elmo as a Minor Airport. Facilities within this definition have a primary runway length between 2,500 and 5,000 feet, with either a precision or non-precision instrument approach. These airports can accommodate personal use and recreational aircraft, business GA, air taxi traffic, and flight training.

2.2 FAA Runway Length Design Guidance

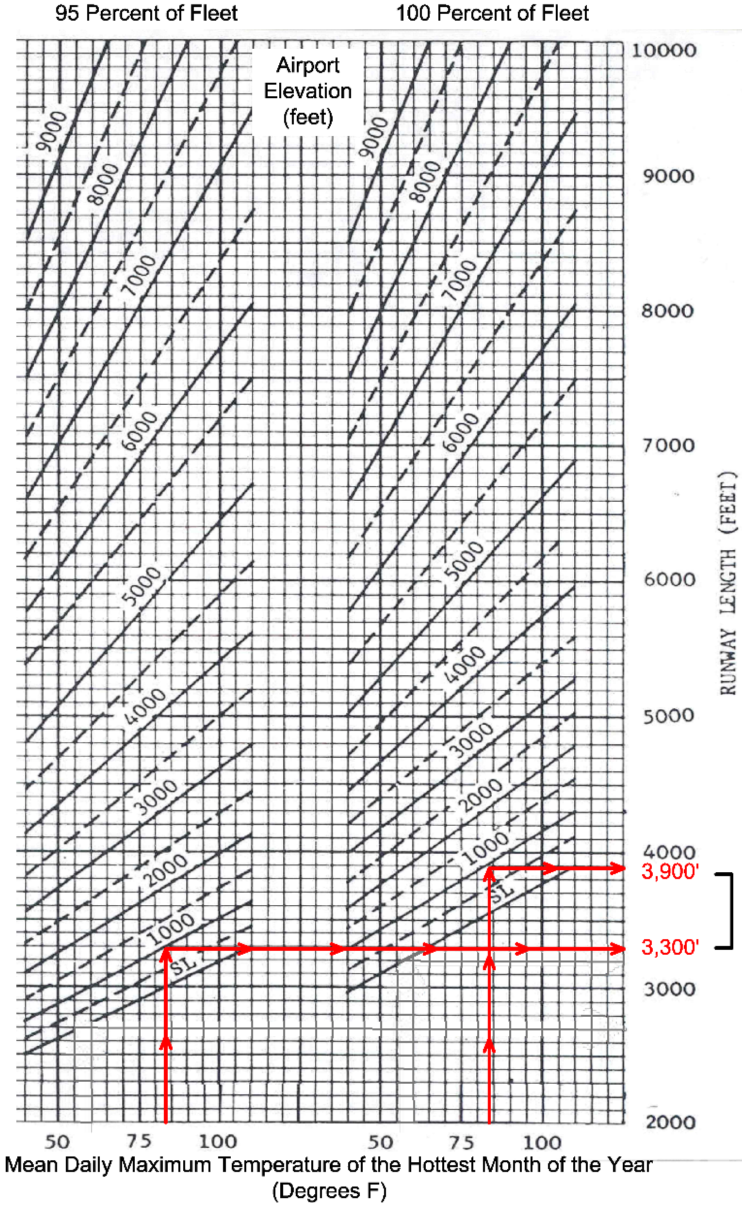
Primary Runway 14-32 at Lake Elmo Airport (21D) is currently 2,849 feet long. To determine the adequacy of the existing runway length, the LTCP documented specific runway length requirements based upon guidance from FAA AC 150/5325-4B *Runway Length Requirements for Airport Design*. The following summarizes some of the important concepts from AC 150/5325-4B regarding regular use and recommended runway length:

- The goal is to construct an available runway length for new runways or extensions to existing runways that is suitable for the critical design airplanes.
- The critical design airplanes (or single airplane) are the aircraft that result in the longest recommended runway length.
- The design objective for the primary runway is to provide a runway length for all airplanes that will regularly use it without causing operational weight restrictions.

The recommended runway length is determined according to a family grouping of airplanes having similar performance characteristics and operating weights. The 2035 LTCP states that the critical aircraft at 21D remain small, propeller-driven airplanes, weighing less than 12,500 pounds and with fewer than 10 passenger seats. FAA AC 150/5325-4B divides the fewer than 10 passenger seat category into two fleet subcategories, namely, "95 percent of fleet" or "100 percent of fleet". The 95 percent of fleet category applies to airports that are primarily intended to serve medium size population communities with a diversity of usage and a greater potential for increased aviation activities. Also included in this category are those airports that are primarily intended to serve low-activity locations, small population communities, and remote recreational areas. The 100 percent of fleet category applies to airports primarily intended to serve communities located on the fringe of a metropolitan area or a relatively large population remote from a metropolitan area. Based on these definitions, the 100 percent of fleet subcategory is most applicable at Lake Elmo Airport. AC 150/5325-4B provides runway length curves for each of these fleet categories as illustrated below in **Chart 2**.

[2] Additional information available at: http://www.dot.state.mn.us/aero/planning/sasp.html

Chart 2: Runway Length Requirements for Small Airplanes with Fewer than 10 Passenger Seats



Source: FAA AC 150/5325-4B, Runway Length Recommendations for Airport Design

Using the airport elevation of 932 feet above mean sea level (MSL), and a mean daily maximum temperature of 83 degrees Fahrenheit, **Chart 2** recommends a primary runway length of 3,300 feet for the 95 percent of fleet subcategory and a primary runway length of 3,900 feet for the 100 percent of fleet subcategory, AC 150/5325-4B further states that an appropriate runway length can also be determined from airplane flight manuals for the aircraft types to be accommodated. To more precisely define a recommended primary runway length for Lake Elmo Airport, the following sections analyze runway length requirements for the representative aircraft family shown in Table 19 above.

2.3 Takeoff Operations

In evaluating takeoff operations, two conditions were evaluated. First, takeoff length requirements were determined for operating weights ranging from the maximum gross takeoff weight of each aircraft (100% useful load) down to a 60% useful load. Useful load is the difference between the maximum allowable structural gross weight and the operational empty weight of an aircraft; in other words, useful load consists of passengers, cargo, and fuel. These takeoff lengths are summarized in **Table 20** and assume the following airfield conditions:

- Mean daily maximum hot month temperature: 30° Celsius (86° Fahrenheit)
- Airport Elevation: 932' MSL
- Headwind: 0 knots[3]
- Flaps: Typical[4]
- Slope of Runway: Uphill[5]

Table 20 - Runway Length Requirements - Takeoff Operations
Representative Family of Aircraft - Lake Elmo Airport (21D)

Aircraft Model	Takeoff Length Requirements for % Useful Load (ft)			
	@ 100% UL	@ 90% UL	@ 75% UL	@ 60% UL
Beechcraft King Air 200	3,300	3,150	2,750	2,600
Pilatus PC-12	3,300	3,000	2,600	2,100
Cessna 421C	3,000	2,700	2,320	1,820
Socata TBM 700	3,290	2,950	2,590	2,090
Piper PA 31P-350 Chieftain	3,100	2,900	2,700	2,550
Cessna 414A	3,150	2,900	2,560	2,060
Cessna 340	2,740	2,600	2,500	2,400
Cessna 310R	2,000	1,870	1,700	1,580
Beechcraft Baron G58	2,850	2,700	2,600	2,500
Piper PA-30 Twin Comanche	2,600	2,420	2,210	2,000
Average:	**2,933**	**2,719**	**2,453**	**2,170**
Median:	**3,050**	**2,800**	**2,575**	**2,095**

Source: Aircraft manuals

[3] While the LTCP used a 5-knot headwind, this analysis takes into account that users often must operate with a tailwind to take off from the more favorable runway end. Use of zero wind is consistent with FAA guidance in AC 150/5325-4B, Section 206.

[4] Use of typical flaps is based on recommendations found in the individual airplane flight manuals and use of these manuals to establish the needs of the design aircraft is allowable per AC 150/5325-4B, Section 202.

[5] If provided by the performance chart in question, the actual Runway 14/32 gradient was used. The evaluation of runway gradient considers FAA guidance. AC 150/5325-4B, Section 206, states that runway gradient and "other factors" are "accounted for in the runway length curves by increasing the takeoff and landing distance (whichever is longer) of the group's most demanding airplane by 10 percent for the various combinations of elevation and temperature."

Second, the length of runway required for an aborted takeoff operation was evaluated, which is referred to as the accelerate-stop distance. The runway lengths required to satisfy these distances are summarized in **Table 21** for the same range of useful load percentages, and assume the same airfield conditions.

Table 21 - Runway Length Requirements - Accelerate Stop Distance
Representative Family of Aircraft - Lake Elmo Airport (21D)

Aircraft Model	Accelerate Stop Distances for % Useful Load (ft)			
	@ 100% UL	@ 90% UL	@ 75% UL	@ 60% UL
Beechcraft King Air 200	3,600	3,500	3,400	3,250
Pilatus PC-12	3,800	3,500	3,150	2,800
Cessna 421C	4,200	3,800	3,400	2,750
Socata TBM 700	3,750	3,650	3,500	3,400
Piper PA 31P-350 Chieftain	4,000	3,800	3,550	3,400
Cessna 414A	4,644	4,279	3,738	3,232
Cessna 340	3,400	3,300	3,200	3,100
Cessna 310R	4,000	3,900	3,600	3,000
Beechcraft Baron G58	3,400	3,300	3,270	3,200
Piper PA-30 Twin Comanche	3,600	3,500	3,300	3,000
Average:	**3,839**	**3,653**	**3,411**	**3,113**
Median:	**3,775**	**3,575**	**3,400**	**3,150**

Source: Aircraft manuals

In comparing the runway lengths outlined in **Tables 20** and **21**, the accelerate-stop distance is the more demanding runway length requirement when considering takeoff operations. As this length provides a factor of safety in the event of an aborted takeoff, it is consistent with the Airport's key objective for enhancing safety and operational capabilities. The individual runway lengths shown in **Table 21** were obtained independently from operating handbooks of these representative aircraft, and align closely to those lengths presented in the 2035 LTCP.

When considering the range of runway lengths for various useful load percentages, a runway length of 3,500 to 3,600 feet would accommodate most aircraft and loading conditions for aborted takeoff operations from 21D, and would accommodate all takeoff length requirements. Although the AC 150/5325-4B method identifies a recommended runway length of 3,900 feet, a runway length of 3,500 to 3,600 feet would accommodate user in most scenarios and would provide a substantial safety and operational improvement over the current primary runway length of 2,849 feet. The method used to establish the recommended runway length is based on applying FAA's guidance taking into account the natural and built environment in the vicinity of the Airport to: 1) provide runway protection zones (RPZs) that are clear of incompatible land uses; 2) allow realignment of 30th Street North such that the existing four-way intersection of 30th Street and Neal Avenue can be maintained; and 3) maximize the distance of the proposed runway ends from adjacent private properties. In all cases, the pilot is in command of his or her aircraft and must make the final determination on whether his or her aircraft may be safely operated within the available runway length.

2.4 Landing Operations

The runway length required for takeoffs is generally greater than that required for landing operations as the aircraft is usually heavier and must accelerate from a stopped position. However, during periods when the runway is wet and slippery from snow cover or ice, these “contaminated” surface conditions decrease the effectiveness of braking and thereby increase the length of runway needed for landing.

Table 22 illustrates the landing length requirements for the representative family of aircraft under various useful load factors, and assumes the following airfield conditions:

- Dry and uncontaminated runway pavement surface
- Mean daily maximum hot month temperature: 30° Celsius (86° Fahrenheit)
- Airport Elevation: 932’ MSL
- Headwind: 0 knots
- Flaps: Typical
- Slope of Runway: Downhill

Table 22 - Runway Length Requirements - Landing Distance
Representative Family of Aircraft - Lake Elmo Airport (21D)

Aircraft Model	Landing Length Requirements for % Useful Load (ft)			
	@ 100% UL	@ 90% UL	@ 75% UL	@ 60% UL
Beechcraft King Air 200	2,500	2,325	2,200	2,150
Pilatus PC-12	2,400	2,320	2,220	2,120
Cessna 421C	2,360	2,300	2,230	2,100
Socata TBM 700	2,660	2,560	2,420	2,300
Piper PA 31P-350 Chieftain	1,950	1,800	1,700	1,600
Cessna 414A	2,490	2,400	2,300	2,160
Cessna 340	1,959	1,890	1,820	1,750
Cessna 310R	1,620	1,520	1,400	1,300
Beechcraft Baron G58	2,750	2,650	2,525	2,400
Piper PA-30 Twin Comanche	2,210	2,150	2,075	2,000
Average:	**2,290**	**2,192**	**2,089**	**1,988**
Median:	**2,380**	**2,310**	**2,210**	**2,110**

Source: Aircraft manuals

Users of the Lake Elmo Airport were contacted during the LTCP process concerning their runway length requirements. In addition to identifying longer takeoff lengths in the hot summer months because of payload and density-altitude factors, the users also commented on the need for additional landing length during the winter months for slippery conditions when longer landing rolls were required.

The landing length requirements shown in **Table 22** are shorter than the takeoff and accelerate-stop distances presented in Section 2.3, but do not include any factors for wet or slippery surface conditions. In referencing the pilot operating handbooks, many identify a 30% increase to be added to the required landing length for slippery conditions or similar surface contamination. Requirements for commuter and on-demand (i.e. charter) operators of turboprop aircraft also have landing limitations that are specified within Part 135 code of federal regulations.[6] These regulations specify the need for operators to be able to conduct a full stop landing within 60% of the available runway length at the destination airport, or within 70% of the available runway length at an alternate airport destination. While these regulations generally pertain to turboprop operators only, they do provide a frame of reference for suitable safety factors to be applied when considering winter landing length requirements.

As shown in **Table 22**, a 2,200-foot runway length would accommodate most landing operations for the family of aircraft shown during dry and uncontaminated conditions. **Table 23** illustrates the adjusted landing length requirements when accounting for the various contamination and safety factors discussed above.

Table 23 - Adjusted Average Landing Length Requirements

Considering factors for contamination and safety - Lake Elmo Airport (21D)

Adjusted Average Landing Length	Landing Length Requirements for % Useful Load (ft)			
	@ 100% UL	@ 90% UL	@ 75% UL	@ 60% UL
Landing Length in Dry and Uncontaminated Conditions (ft):	2,290	2,192	2,089	1,988
Landing Length with 30% Increase for Wet and Slippery (ft):	2,977	2,850	2,716	2,584
Landing within 70% of Available Runway Length (ft):	3,271	3,131	2,984	2,840
Landing within 60% of Available Runway Length (ft):	3,817	3,653	3,482	3,313

In considering the adjusted landing lengths presented in **Table 23**, and the accelerate-stop distances presented in **Table 21**, a primary runway length of 3,500 to 3,600 feet would provide suitable operational distance. This length accounts for the safety factors associated with an aborted operation during takeoff and contaminated surface conditions during landings. Although the AC 150/5325-4B method identifies a recommended runway length of 3,900 feet, a runway length of 3,500 to 3,600 feet would accommodate user needs in most scenarios and would provide a substantial safety and operational improvement over the current primary runway length of 2,849 feet. The method used to establish the recommended runway length is based on applying FAA's guidance taking into account the natural and built environment in the vicinity of the Airport to: 1) provide runway protection zones (RPZs) that are clear of incompatible land uses; 2) allow realignment of 30th Street North such that the existing four-way intersection of 30th Street and Neal Avenue can be maintained; and 3) maximize the distance of the proposed runway ends from adjacent private properties. In all cases, the pilot is in command of his or her aircraft and must make the final determination on whether his or her aircraft may be safely operated within the available runway length.

2.5 Crosswind Runway Length

AC 150/5325-4B also provides guidance for determining appropriate crosswind runway length. The runway length for crosswind runways is based on the recommended length for lower crosswind capable airplanes using the primary runway. At Lake Elmo, these consist of light, single-engine aircraft. For this analysis, a grouping of aircraft of this category and type, weighing less than 5,000 pounds, was selected from IFR operational databases maintained by FAA and the MACNOMS database described in Section

[6] Electronic code of federal regulations, Part 135.385 pertains to landing limitations. Additional information is available at: https://www.ecfr.gov/cgi-bin/text-idx?SID=f6264ba184562097b414fe34a507ebbe&node=14:3.0.1.1.11.9.3.14&rgn=div8

1.2.4. **Table 24** on the next page summarizes the grouping of the light, single-engine aircraft that make regular use of the Lake Elmo Airport, and the takeoff runway length requirements of these aircraft. Based on the analysis of 2016 MACNOMS data presented in Section 1, approximately 97% of operations on Runway 04/22 are conducted by single-engine piston aircraft, nearly all of which weigh less than 5,000 pounds. Furthermore, the 2016 MACNOMS data indicate that approximately 25% of total aircraft operations at Lake Elmo Airport take place on Runway 04/22. Given the estimated total of 25,596 annual aircraft operations, approximately 6,399 operations were conducted on Runway 04/22 in 2016.

The existing crosswind Runway 04/22 is currently 2,496 feet long. According to user input received during development of the Airport's LTCP, the current crosswind runway length can be uncomfortably short during certain wind conditions. In consideration of user feedback, and the recommended takeoff lengths of the smaller and lighter aircraft identified in **Table 24**, a runway length of 2,700 to 2,800 feet would most appropriately accommodate crosswind operations at Lake Elmo. This length would accommodate the average takeoff requirements of the smaller and lighter airplanes operating at Lake Elmo Airport on a regular basis. Landing length requirements were not considered by this analysis, as they are generally shorter than the takeoff length requirements for these types of aircraft.

Table 24 - Representative Aircraft for Crosswind Analysis - Lake Elmo Airport
Smaller Airplanes with Maximum Certified Takeoff Weight of 5,000 lbs or less

Aircraft Model	Wingspan (ft)	Maximum Takeoff Weight (lbs)	Takeoff Runway Length Requirements[1] (ft)
Piper PA-34 Seneca	38.9	4,570	3,000
Piper PA-46 Malibu	43.0	4,340	2,800
Lancair IV	35.5	3,850	2,800
Piper PA-30 Twin Comanche	36.0	3,600	3,600
Cirrus SR22	38.2	3,600	3,300
Beechcraft Bonanza 33	33.5	3,400	2,750
Mooney M20TN	36.5	3,368	2,450
Piper PA-28 Cherokee	35.0	2,550	2,300
Cessna 172	36.0	2,300	1,750
		Average:	**2,750**

[1] Takeoff Length based on: Airport Elevation of 932 MSL, 30° Celsius, 10 knot headwind. Use of a headwind is appropriate for crosswind runway length analysis because the runway is intended for use during periods of crosswinds with respect to the primary runway, which translates to headwinds on the crosswind runway.
Source: Aircraft manuals

2.6 Stage Length Considerations

In addition to safety, one of the key objectives of the LTCP was to increase the operational capabilities of the design aircraft family. As part of outreach efforts to assess the needs of Airport users, business operators noted the convenience that the Lake Elmo Airport provides to their operations by accommodating direct access to outlying areas in which they conduct business that are not otherwise serviced by major carriers. Users identified the frequent use of the Airport for business operations to a variety of locations throughout the Midwest, but additionally commented on restrictions due to the short runways and lack of instrument approaches.

Flight plans filed for instrument (IFR) operations to and from the Lake Elmo Airport were obtained for the past five years to identify the range of stage lengths that are currently accommodated. While IFR operations represent a small fraction of overall operations, business operators and those conducting longer cross country flights are more likely to file this type of flight plan. **Table 25** on the next page illustrates the various ranges of IFR operations (in nautical miles) filed to and from the Lake Elmo Airport from 2012 to 2016.

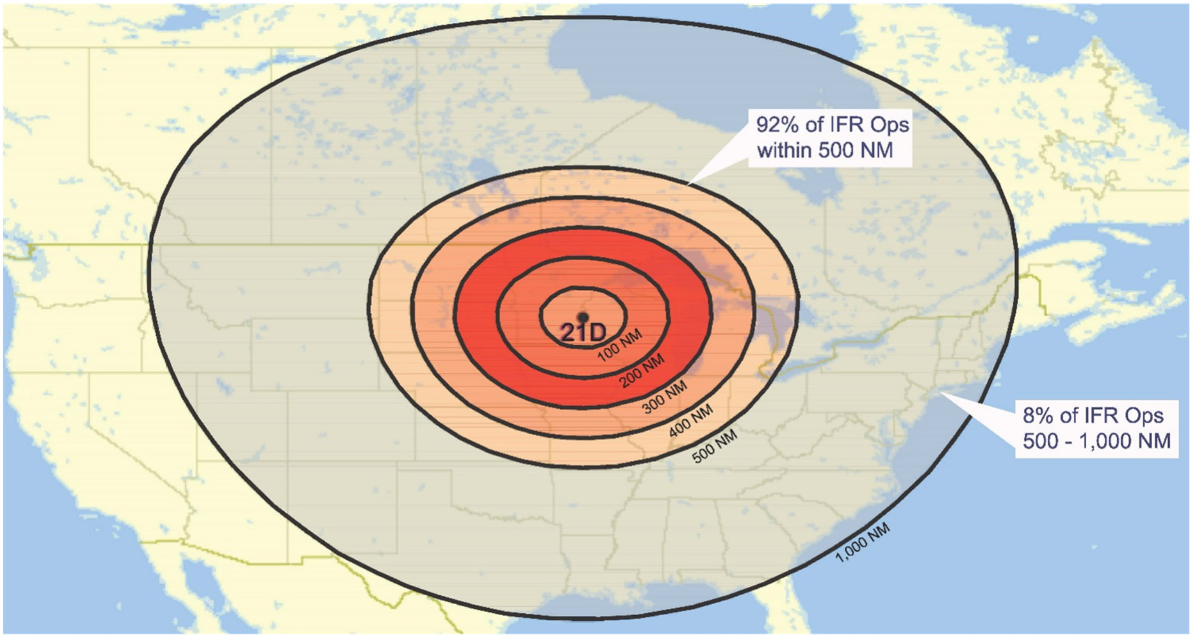
Table 25 - Stage Length of IFR Operations to/from Lake Elmo Airport
Years 2012 -2016

Stage Length Range (NM)			IFR Departures	IFR Arrivals	Total IFR Operations	Cumulative IFR Operations	Cumulative Percentage of Operations
0	*to*	100	433	316	749	749	*20%*
100	*to*	200	570	538	1108	1857	*50%*
200	*to*	300	437	573	1010	2867	*77%*
300	*to*	400	151	171	322	3189	*86%*
400	*to*	500	117	109	226	3415	*92%*
500	*to*	600	48	41	89	3504	*94%*
600	*to*	700	50	35	85	3589	*96%*
700	*to*	800	26	30	56	3645	*98%*
800	*to*	900	15	17	32	3677	*99%*
900	*to*	1000 and greater	9	41	50	3727	*100%*
Totals (2012 - 2016):			**1,856**	**1,871**	**3,727**		

Source: FAA Traffic Flow Management System Counts (TFMSC) Database - City Pair for Calendar Years 2012 - 2016

Table 25 shows that approximately 92% of IFR operations at Lake Elmo were conducted to or from other airports within 500 nautical miles (NM). This affirms the FAA's NPIAS classification of the Airport as a Regional GA facility. The range of IFR operations is depicted graphically in the map provided in **Chart 3**.

Chart 3: Range of Stage Length Operations to/from Lake Elmo Airport (2012-2016)



While most operations to and from the Lake Elmo Airport are anticipated to remain concentrated locally within the upper Midwest region, the IFR data shows that longer stage length operations are also conducted to distances that can stretch as far as the east coast, northern Florida and the western Rocky Mountains. In considering the objective to improve facilities for the family of aircraft using the Lake Elmo Airport, the runway lengths identified within the earlier sections will make longer trips to and from Lake Elmo Airport more feasible, and help operators reach a greater service area.

2.7 Runway Length Conclusions

Primary runway length needs were first evaluated utilizing FAA guidance provided in AC 150/5325-4B *Runway Length Requirements for Airport Design* for small, propeller-driven aircraft weighing less than 12,500 pounds and with fewer than 10 passenger seats. The AC identifies a recommended primary runway length of 3,300 feet for the 95 percent of fleet subcategory and a recommended primary runway length of 3,900 feet for the 100 percent of fleet subcategory. To more precisely identify an appropriate runway length within that range, individual takeoff and landing length requirements for a grouping of representative aircraft were then evaluated. In considering the individual operational requirements, the accelerate-stop distance was found to be the most demanding length, resulting in a recommended primary runway length of 3,500 to 3,600 feet. This length provides sufficient safety to accommodate aborted takeoffs, as well as longer roll out lengths required for landings when the runway surface conditions are wet and slippery, and braking is less effective.

Crosswind runway length needs were determined by evaluating smaller, single-engine aircraft with maximum takeoff weights of less than 5,000 pounds. A grouping of aircraft of this size and type were selected from those making the most regular use of Lake Elmo Airport, and represent airplanes less capable of operating against a crosswind component on the primary runway. Runway length requirements were evaluated from performance charts for these aircraft, and a 2,700 to 2,800-foot runway length for crosswind operations was found to be the most appropriate for Lake Elmo Airport.

Feedback from the Airport users, and an analysis of trip lengths to and from the Lake Elmo Airport were also considered in evaluating the appropriate runway length conditions. The recommended lengths for each runway are summarized in **Table 26**.

Table 26 - Recommended Runway Lengths *Primary and Crosswind Runways - Lake Elmo Airport (21D)*	
Recommended Runway Length	
Primary Runway 14-32:	**3,500 feet**
Crosswind Runway 04-22:	**2,750 feet**

The runway lengths identified in **Table 26** are consistent with the findings of the 2035 LTCP completed for the Lake Elmo Airport, and will serve to meet the key objectives of improving the safety and operational capabilities for the users at the Lake Elmo Airport.

3. Summary of Recommendations

The following is a summary of recommendations identified in this appendix:

- **Aircraft Activity.** The share of existing operations by multi-engine piston aircraft may have been underestimated by the LTCP; however, these aircraft are within the critical aircraft family and therefore re-allocation of operations to these aircraft should not change the project as proposed. The revised extended runway operations forecast shown in Table 18 was used to inform the Purpose & Need, Alternatives Analysis, and Environmental Consequences chapters of the EA/EAW.
- **Runway Length.** The required runway lengths identified in the LTCP are consistent with the needs of the representative family of aircraft with the most demanding performance characteristics that operate on either runway.

A-27

Appendix B – 30th Street North Realignment Alternatives Review

30th Street North Realignment Alternatives Review

Lake Elmo Airport
Environmental Assessment

Report prepared by

Mead & Hunt

Table of Contents

Appendices

Tables

Exhibits

1. Introduction

A. Study Purpose

In September of 2016, the Metropolitan Airports Commission (MAC) adopted the 2035 Long-Term Comprehensive Plan (LTCP) for the Lake Elmo Airport. The study's final preferred alternative recommended the construction of a new 3,500-foot Runway 14-32 adjacent to the existing runway, which will be converted into a taxiway for the new runway. The existing 30th Street N is in direct conflict with the proposed new runway.

Three alternatives were presented and analyzed in the LTCP for realigning 30th Street N. This report provides an overview of the road realignment alternatives considered by the LTCP, and presents two additional alternatives to consider during the National Environmental Policy Act (NEPA) process that seek to respond to public concerns while also meeting the project objectives. The purpose of this report is to summarize alternatives considered by the Environmental Assessment (EA), in addition to the preferred alternative alignment identified in the LTCP.

B. Location of Study

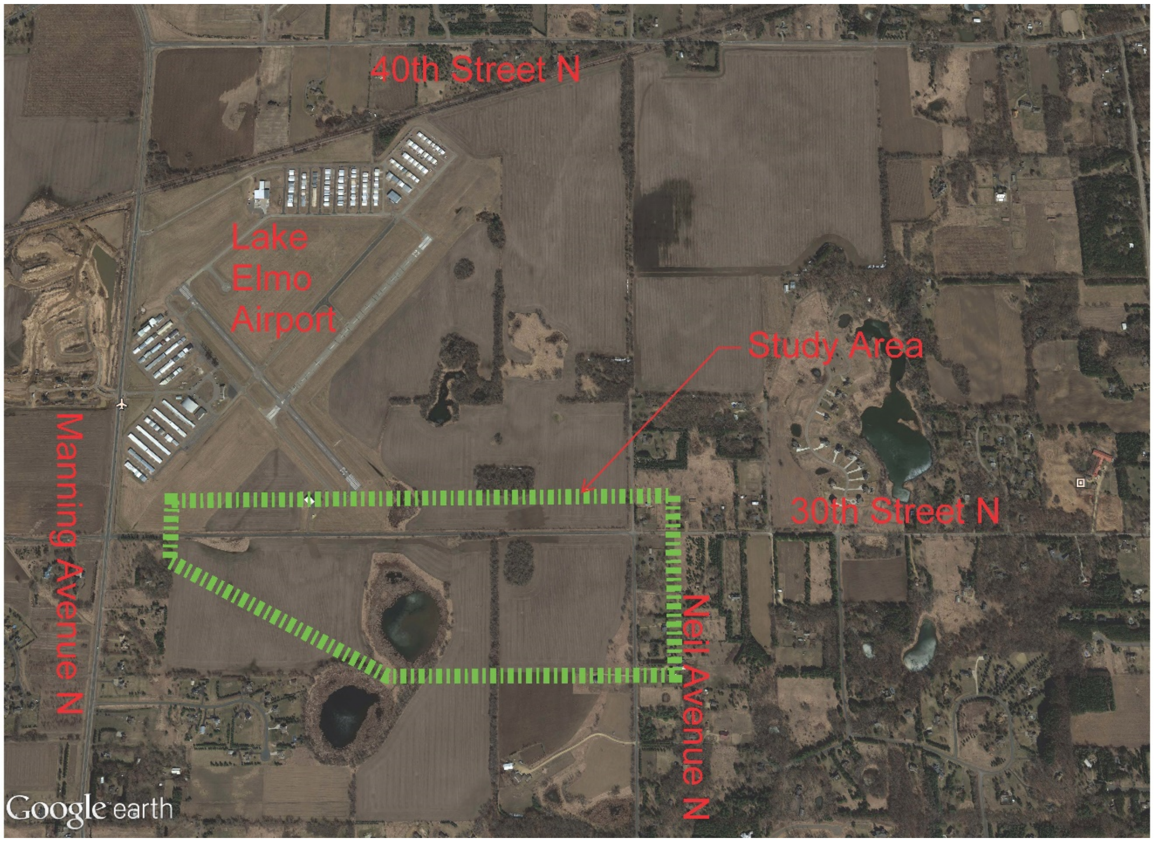
The airport is located approximately 12 miles northeast of downtown St. Paul and one mile east of downtown Lake Elmo, within Baytown and West Lakeland Townships. The focal point of the study is 30th Street N (located along the southern edge of Lake Elmo Airport), Neal Avenue North, and the intersection of these two roadways. As shown in **Exhibit 1** on the next page, the analysis area is bound by CSAH 14 (40th Street N) to the north, CSAH 65 (Oakgreen Avenue North) to the east, CSAH 10 (10th Street North) to the south, and CSAH 15 (Manning Avenue N) to the west.

2. Existing Site Conditions

Existing land uses within the study area consists of a mix of agricultural, residential, and public (Lake Elmo Airport), however, the land use around the proposed realignment area is primarily agricultural with large lot rural residential property located east of Neal Avenue N and south of the airport. The terrain within the analysis area is classified as level.

Soils maps available from National Resources Conversation Service (NRCS) show the soils in the area generally consist of Antigo Silt Loam, Campia Silt Loam, and Crystal Lake Silt Loam. These soils generally have an A-4 rating under the AASHTO Group Classification, which categorizes this soil type as fair to poor for use as a roadway subgrade material.

EXHIBIT 1: PROJECT LOCATION



3. Alternative Descriptions

Three build alternatives for 30th Street N were presented in the 2035 LTCP. This report reviews these alternatives and develops two additional alternative layouts, which are introduced in the following section and are shown in Appendix A. An Alternative Evaluation Matrix summarizing the impacts of the two new alternatives compared to the preferred alignment from the LTCP (Alternative 3) can be found on Table 6 in Section 6.

Based on public input received during the LTCP and EA processes, 30th Street North is an important local traffic corridor that must be maintained. Therefore, closing 30th Street North was discarded as an alternative and was not considered in detail by the LTCP or EA.

A. Previous Build Alternatives 1-3 from the 2035 LTCP

Alternatives 1-3 as described in the 2035 LTCP are presented below and shown on **Exhibit 2**.

(1) Realignment Alternative 1

This alternative realigns 30th Street N to the southeast of the relocated Runway 32 RPZ so that it intersects with Neal Avenue approximately ¼-mile south of the existing intersection. The design speed for the relocated roadway is 45 miles per hour. With this alignment option, through traffic on 30th Street N would experience two additional turning movements in each direction and an increase in total travel distance (about 1,800 feet). Also, 30th Street N through traffic would be introduced onto the segment of Neal Avenue between the intersections. Conversely, local traffic flowing between Manning Avenue and residential developments to the south of the new intersection would be removed from this segment of Neal Avenue and benefit from a reduced travel distance. For the reasons identified above, this alternative was discarded.

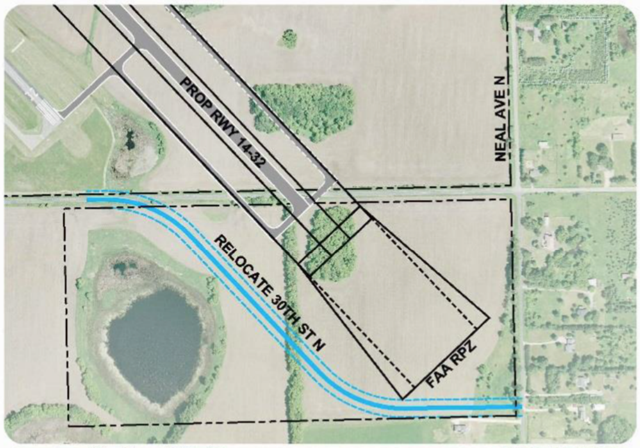
(2) Realignment Alternative 2

This alternative realigns 30th Street N around the end of the relocated Runway 32 RPZ but continues the curve to the north so that the roadway reconnects at the existing Neal Avenue alignment and intersection. Access to existing Neal Avenue south of the realigned area would be maintained through construction of a new “T” intersection. The design speed for the relocated roadway is 45 miles per hour. With this alignment option, through traffic on 30th Street N would experience one additional turning movement in each direction and an increase in total travel distance (about 1,500 feet). Compared to Realignment Alternative 1, 30th Street N traffic would be introduced onto a shorter segment of the existing Neal Avenue alignment. Impacts to local traffic flowing between Manning Avenue and residential developments to the south of the new intersection are like those in Alternative 1. For the reasons identified above, this alternative was discarded.

(3) Realignment Alternative 3

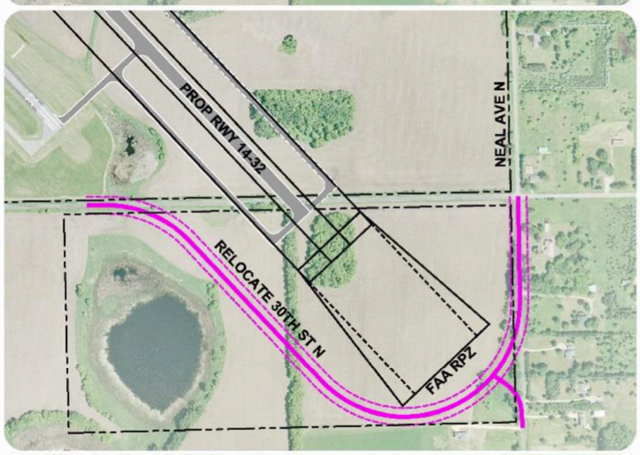
This alternative maintains the existing four-way intersection at 30th Street N and Neal Avenue; the realigned roadway curves around the relocated Runway 32 RPZ. Due to the tighter curves, the design speed for the relocated roadway is reduced to 30 miles per hour. With this alignment option, there are no new intersections or turning movements for thru traffic on 30th Street N and no new traffic is introduced onto Neal Avenue. However, this alignment does not allow for the relocated Runway 14/32 to be extended to its recommended length of 3,600 feet as originally proposed and was designed specifically for a shortened 3,500-foot runway, however this layout does intersect the corners of the MnDOT Clear Zone. This alternative was selected as the Final LTCP Preferred Alternative and will be compared to the two new realignment concepts in Sections 4, 5, and 6 of this report.

EXHIBIT 2: 2035 LTCP 30TH STREET N RELOCATION ALIGNMENT ALTERNATIVES



ALTERNATIVE 1

-SPEED LIMIT: 45 mph
-COMPATIBLE WITH AIRFIELD ALTERNATIVE B (3,600')
-COMPATIBLE WITH AIRFIELD ALTERNATIVE C (3,900')
-ADDS 30TH ST N TRAFFIC TO A PORTION OF NEAL AVE N
-REQUIRES CONSTRUCTION OF ADDITIONAL INTERSECTION



ALTERNATIVE 2

-SPEED LIMIT: 45 mph
-COMPATIBLE WITH AIRFIELD ALTERNATIVE B (3,600')
-COMPATIBLE WITH AIRFIELD ALTERNATIVE C (3,900')
-ADDS 30TH ST N TRAFFIC TO A PORTION OF NEAL AVE N
-REQUIRES CONSTRUCTION OF ADDITIONAL INTERSECTION

ALTERNATIVE 3

-SPEED LIMIT: 30 mph
-RESTRICTS AIRFIELD ALT. B RUNWAY LENGTH TO 3,150'
-RESTRICTS AIRFIELD ALT. C RUNWAY LENGTH TO 3,760'
-NO ADDITIONAL INTERSECTION REQUIRED

B. Realignment Alternatives 4A and 4B – Realigned 30th Street / Neal Ave

The roadway alignment shown in the Alternative 4A and 4B layouts are modified hybrid versions of Alternatives 2 and 3. Assuming a Runway 14/32 length of 3,500 feet and reduced runway protection zone (RPZ) size as identified by the LTCP Final Preferred Development Alternative, these alternatives shift the road alignment to the northwest, introducing a longer straight section to incorporate an intersection treatment. The Alternate Layouts in Appendix A show the two intersection treatment options. Alternative 4A includes a roundabout at the intersection of realigned 30th Street N and Neal Avenue N, while Alternative 4B shows a tee intersection option.

These alternatives realign 30th Street N to the southeast of the proposed Runway 32 RPZ and intersects realigned portions of Neal Avenue N at a proposed intersection 600 feet southwest of the existing intersection. This layout intersects the corners of the MnDOT Clear Zone to minimize impacts to adjacent residential properties along Neal Avenue N.

The proposed design speed for 30th Street N west of the proposed intersection is 60 MPH transitioning to 35 MPH prior to entering the intersection. Realigned 30th Street N to the east of the intersection and Neal Avenue N to the south of the intersection would have design speeds of 35 MPH. See Section 5.C for more information regarding existing and proposed posted speed limits and design speeds. An access road is proposed on the southeast leg of the intersection to connect to the existing Neal Avenue N to provide access to the adjacent property owners and has a design speed of 25 MPH. Both alternatives effectively move the four-way stop controlled intersection to the southwest and increase the total travel distance on 30th Street N by approximately 985 feet compared to the existing condition.

Both alternatives would also move through traffic further away from the residential properties located on Neal Avenue North, creating a larger buffer between traffic and existing residential properties.

The following intersection types were evaluated on this alignment alternative:

(1) Alternative 4A - Realigned 30th Street / Neal Ave with a Roundabout

Alternative 4A constructs a single lane roundabout at the proposed intersection of 30th Street N and Neal Avenue N. This alternative provides the following considerations:

- Reduced travel delays at the intersection.
- Several state DOTs and the Insurance Institute for Highway Safety have found roundabouts reduce severe crashes, especially at right angles.
- Does not prioritize traffic on one entering roadway over another.
- Provides traffic calming along 30th Street N between curves with different speed zones along the proposed realignment.
- Roundabout provides options for landscape and creation of a gateway into the adjacent residential areas.
- More expensive construction and right-of-way costs than the tee intersection option.

(2) Alternative 4B - Realigned 30th Street / Neal Ave with a Tee Intersection

Alternative 4B constructs a tee intersection that provides a left turn with a through bypass for the 30th Street N westbound traffic and a right-turn lane onto Neal Ave N from eastbound 30th Street N. Along Neal Avenue N, northbound traffic will be required to stop at the intersection and wait for gaps in the 30th Street N traffic. This alternative provides the following considerations:

- Increased travel delays along Neal Avenue N at the intersection for the stop condition.
- Decreased travel delays along 30th Street N.
- Prioritize traffic on 30th Street N over traffic on Neal Avenue N.
- Intersection is located within a speed change zone along 30th Street N between the two curves.
- Intersection sight distance from Neal Avenue N requires driver to look more than 90 degrees to the right for vehicles while turning left onto 30th Street N due to curvature of the roadway.
- Less expensive construction and right-of-way costs than the roundabout option.

4. Traffic

Traffic in the area was evaluated along 30th Street N and Neal Avenue N based on count data available from Washington County count stations located west of CSAH 15 and east of CSAH 65.

A. Existing Traffic Volumes

Existing traffic volumes were collected by Washington County at the following count stations:

TABLE 1: 2016 TRAFFIC COUNT DATA

Roadway	Location	Date of Count	Volume from count
30th St. N	East of CSAH 15	Monday July 18 – Wednesday July 20, 2016	1478
30th St. N	East of CSAH 65	Tuesday May 24 – Thursday May 26, 2016	1024

The volume signifies a daily total and is the total number of vehicles for both directions of travel. An hourly breakdown of data from these counts can be found in Appendix B.

B. Proposed Traffic Volumes

Traffic forecasts were based off the Manning Avenue corridor study prepared for Washington County in 2014. The report can be found at: https://www.co.washington.mn.us/DocumentCenter/View/7426. Based on growth factors in the area, the projected average daily traffic (ADT) for 30th Street N is anticipated to be 2,000 vehicles per day by 2030.

C. Intersection Operations

Various intersection alternatives including roundabouts and tee intersections are proposed as part of this study. Based on the proposed traffic volumes above, hourly volumes were developed and a capacity analysis of the proposed layouts was run using Highway Capacity Software (HCS). The results of this analysis can be found in Appendix B. Based the capacity analysis, the proposed intersection alternatives for 30th Street N with Neal Avenue N are anticipated to provide a minimum Level-of-Service (LOS) of A, which signifies minimal delays are anticipated during the peak hour of travel.

D. Emergency Response Times

Comments received during public review of the 2035 LTCP identified potential increases in emergency response times as a concern of residents. An initial review of the travel times for each new alternative is shown and compared to Alternative 3 below in Table 2. The travel time differences were determined by computing the travel time along the proposed alternative beginning at the existing intersection of 30th Street N / Manning Avenue N and traveling eastbound to 30th Street N / Neal Avenue N, and comparing them to the base travel time along the existing roadway. The travel times are computed based on the difference in length of proposed roadway compared to the existing length, the anticipated posted speed limit along the roadway, and delay associated with the proposed intersection type. The delay at the intersection is the approach delay which includes stopped-time delay and the time loss due to deceleration from the approach speed to a stop and the time loss due to re-acceleration back to the desired speed. This delay is computed utilizing Highway Capacity Software (HCS) based on estimated peak hour volumes. It should be noted that emergency response times could be higher or lower since the first responder's vehicles travel speed may differ from the anticipated posted speed limit. In addition, changes to travel time differ under each alternative based on whether the destination is east or south of the study area.

TABLE 2: ANTICIPATED CHANGES TO TRAVEL TIME COMPARED TO EXISTING CONDITION

FROM MANNING AVENUE N TO EAST OF NEAL AVENUE N ALONG 30TH STREET N	
Alternative	Anticipated Changes to Travel Time (seconds)
3	+46.1
4A	+28.5
4B	+26.8
FROM MANNING AVENUE N TO NEAL AVENUE N SOUTH OF 30TH STREET N	
Alternative	Anticipated Changes to Travel Time (seconds)
3	+46.1
4A	+10.8
4B	+6.8

Notes:

- Alternative 3 did not include approach delay since the existing and proposed alternatives ends at the all-way stop controlled intersection and the approach delay would be the same for both conditions. Alternative travel time change is based solely on the increased length and the decrease in the anticipated posted speed.
- Alternatives 4A and 4B existing condition includes an additional approach delay of 8.9 seconds for the existing all-way stop control intersection of 30th Street N with Neal Avenue N per the highway capacity manual. The proposed alternatives do not have approach delay at this location since the existing all-way stop is anticipated to be removed.
- Alternative 4A includes an approach delay of 3.1 sec. on the approach of each leg of the roundabout per the results of the Highway Capacity Software
- Alternative 4B does not includes a deceleration/acceleration delay for vehicles traveling eastbound on 30th Avenue N since no stop control is present and includes a deceleration/acceleration delay only for vehicles turning right onto Neal Avenue N.

The Airport and adjacent areas in Bayport and West Lakeland Townships to the immediate north, south, and east are within the Bayport Fire Department (BFD) service area, while adjacent areas to the immediate west are within the City of Lake Elmo Fire Department service area. Because it is located outside the City of Lake Elmo, the proposed realignment of 30th Street N would not affect primary emergency response west of the Airport. The realigned segment of 30th Street N is located entirely within the BFD service area. The BFD headquarters building is located approximately four and a half miles northeast of and is an approximate seven-minute drive from the Airport.

The project team met with BFD staff during the EA process to assess potential impacts to emergency response associated with the realignment of 30th Street N. The realignment of 30th Street N is not anticipated to be a detriment to initial emergency response times from BFD to any locations within its service area. This conclusion is based on information provided by BFD that indicates the affected segment of 30th Street N would not be used during its initial response to emergencies at any location within its service area. The primary use of 30th Street N with respect to emergency response would be for shuttling municipal water from hydrants in the City of Lake Elmo to replenish water capacity when fighting fires in areas east of the airport that do not have water service. The BFD fleet has a combined water tank capacity of over 4,000 gallons, and is supported by mutual aid responders from Stillwater, Lower St. Croix, Lake Elmo, and Hudson with a combined fleet capacity of over 10,000 gallons. Based on fleet capacity and planned extension of water services to new residential areas immediately west of the airport, the project team does not believe that the changes in travel times shown in Table 2 represent an adverse effect to water shuttles that cannot be mitigated by available means.

5. Alternative Review

This section provides a detailed review, analysis, and comparison of Alternatives 3, 4A, and 4B. The 30th Street N roadway east of Manning Avenue N is functionally classified as a major collector based on the Functional Classification System prepared by the Metropolitan Council in September of 2014 (http://giswebsite.metc.state.mn.us/mapgallery/pdfs/large_reference_fun_class.pdf). According the 2030 Washington County transportation plan, "collector roadways serve shorter trips and allow more direct access from local streets and driveways. These roadways collect and distribute traffic to the arterial system from neighborhoods as well as commercial and industrial areas." Neal Avenue to the immediate south of 30th Street N is functionally classified as a local road, which "connect blocks within residential neighborhoods as well as commercial and industrial areas." These classifications define a roadway's purpose and use, and are important in determining which roadway, shoulder, and right-of-way widths would be applied to each segment of roadway based on the town standards.

A. Typical Sections

A rural typical section was assumed for the build alternatives due to the existing location and characteristics of the project setting. The project is in an undeveloped area and characterized by relatively higher / rural speed limits. The assumed typical section is based on Baytown and West Lakeland

Township street design standards, which call for the following minimum pavement widths for a collector roadway:

- Minimum Roadway Width 24 feet
- Shoulder Width 8 feet

Note: The difference between the West Lakeland and Baytown Township street design standards is that the West Lakeland standard requires a 4-foot shoulder width for a collector roadway, whereas the Baytown standard requires an 8-foot shoulder width. Furthermore, the Baytown Township standards require an 8-foot shoulder width for collector roads and a 4-foot shoulder width for local roads. For this study, an 8-foot shoulder width was utilized for both 30th Street N and Neal Avenue N to determine the costs and impact of the proposed alternatives.

B. Design Vehicles

For the design of horizontal alignment, super elevations, and roundabout design in Alternative 4A, the WB-19 (WB-62) semi tractor-trailer combination design vehicle was utilized. For the design of turning movements and sight lines at the tee and all-way stop intersections in Alternative 3 and 4B, the SU (single unit) design vehicle was utilized.

As noted previously, the project team met with the Baytown Fire Department during the EA process to discuss the alternative layouts presented in this report. Following the meeting, the design and turning movements within the cul de sacs in Alternatives 4A and 4B were checked against the following vehicles utilized by the fire department:

- 2001 Pierce Dash
- 2007 Pierce Velocity
- 2014 Rosenbauer Commander
- 2001 Kenworth tandem

The turning movements evaluated for the fire department included the ability of the engines to turn around and maneuver within the cul de sac and the ability of water tenders to circulate between a water source and a drop tank located on the cul de sac. All turning movements were checked utilizing AutoTurn design software.

C. Posted Speed Limits and Design Speed

Posted speed limits are relatively high in the project area. The following posted speed limits were observed within the project area:

- 30th Street N (between Manning Ave N and Neal Ave N) 55 MPH
- 30th Street N (east of Neal Ave N) 45 MPH
- Neal Street North (south of 30th Street N) 45 MPH
- Neal Street North (north of 30th Street N) Unposted

Design speed is the speed used to determine the various geometric design features of a roadway. The design speeds for each alternative vary for each roadway, are shown on the Alternative Layouts, and are anticipated to be 5 miles per hour higher than the posted speed limits. This assumption is based on industry best practice, as well as the MnDOT Road Design Manual, which states that "it is typically desirable to choose a design speed that equals or exceeds the anticipated posted speed, and complements the highway type, setting, functional classification, traffic volume, and terrain." The design speeds are described in the alternative description section based on guidance provided in MnDOT Road Design Manual for rural highways and are super-elevated based on a maximum rate of 6% slope across the roadway.

D. Roadway Characteristics

The roadway geometric design characteristics for Alternatives 3, 4A, and 4B are presented below in Table 3.

TABLE 3: ALTERNATIVE GEOMETRIC DESIGN CHARACTERISTICS

<table>
<tr><th colspan="2">Criterion</th><th>Alternative 3</th><th>Alternative 4A</th><th>Alternative 4B</th></tr>
<tr><td colspan="2"></td><td>Final LTCP Alternative</td><td>Modified Hybrid with New Roundabout</td><td>Modified Hybrid with New T-Intersection</td></tr>
<tr><td colspan="2">Design Speed</td><td>30-mph</td><td>60-mph transitioning to 35-mph</td><td>60-mph transitioning to 35-mph</td></tr>
<tr><td rowspan="3">Curve Radius</td><td>Radius #1</td><td>R = 675'
Length = 544.18
SE% = 5.7%</td><td colspan="2">R = 1,273'
Length = 1,035.50
SE% = 6.0%</td></tr>
<tr><td>Radius #2</td><td>R = 500'
Length = 1,157.85
SE% = 6.0%</td><td colspan="2">R = 498'
Length = 981.32
SE% = 3.5%</td></tr>
<tr><td>Radius #3</td><td>R = 215'
Length = 295.96'
SE% = 6.0%</td><td colspan="2">R = 315'
Length = 376.90
SE% = 6.0%</td></tr>
<tr><td colspan="2">Intersection Type</td><td>All-way stop</td><td>Roundabout</td><td>Tee Intersection</td></tr>
<tr><td colspan="2">No. of Conflict Points</td><td>32</td><td>6</td><td>9</td></tr>
<tr><td colspan="2">Required Field of Vision</td><td>213º</td><td>133º</td><td>173º</td></tr>
<tr><td colspan="2">Typical Section</td><td colspan="3">12' Travel Lanes with 8' gravel shoulders</td></tr>
<tr><td colspan="2">Cross Slope</td><td colspan="3">2% Typical</td></tr>
<tr><td colspan="2">Paved Surface</td><td colspan="3">Assumed Asphalt Paved with Gravel Base</td></tr>
</table>

Notes:
- Radius are presented starting on the west end on the proposed alternative and proceeding easterly.
- The 60-mph design speed for Alternatives 4A and 4B applies west of the southernmost curve of the proposed realigned road.

Key characteristics to highlight for this review include the curve radius, vehicle conflict points, and field of vision or sight distance.

(1) Horizontal Curve Radius

The horizontal curve radius of the layout is directly related to the design speed. A shorter, smaller radius curve will generally be associated with lower design speeds than a larger, longer radius. This is also demonstrated in the travel time changes presented in Table 2. Alternative 3 generally has smaller curve radii along the entire alignment than Alternatives 4A/4B. This results in a speed change from 55 mph to 30 mph occurring prior to entering the project area for Alternative 3, whereas Alternative 4A/4B uses a larger radius on the west end of the project area, allowing the 55 mph speed limit to continue into the project area before requiring a speed reduction to 30 mph.

(2) Vehicular Conflict Points

A vehicular conflict point is the point at which the paths of two through or turning highway users (motorist, pedestrian, bicyclist) diverge, merge, or cross. An increased number of conflict points is generally associated with increased levels of roadway accidents, so reducing the number of conflicts points is an approach to improve safety along the road corridor.

(3) Field of Vision

Field of vision and sight distance are critical components of the intersection operation and safety. How sight lines affect the intersection differ based on the type of traffic control that is in place. This is described in more detail in the next section.

E. Intersection Characteristics

Three different intersection treatments are presented in the alternatives. Below is a brief description of the intersection control types and the advantages and disadvantages of each alternative.

(1) Minor road stop control (one-way) for Alternative 4B

This treatment was applied to the new intersection proposed by Alternative 4B. It includes a stop sign on the south approach along Neal Avenue N and no stop sign for traffic on 30th Street N. This is the most common type of intersection installed on rural roadway systems that are determined to need minimal traffic control.

Advantages

- Low installation costs
- Low maintenance costs
- Reduced number of vehicular conflict points (total of 9)
- Continuous traffic flow for major approaches.

Cons:

- Higher stop control delay during peak periods for minor approach.

- Requires longer sight lines be maintained for visibility and safety for stopped vehicle to gauge, react, and enter traffic stream safely.
- Risk for severe crashes as traffic increases.

(2) All-way, stop-controlled for Alternative 3

This intersection treatment was applied to Alternative 3 and maintains the existing all-way stop control at the intersection of 30th Street N and Neal Avenue N. All-way, stop control can be useful as a safety measure at intersections if certain traffic volume and safety conditions exist. Safety concerns typically associated with all-way stops include pedestrians, bicyclists, and all road users expecting other road users to stop, inability to provide adequate sight distance, or where the volume of traffic on the intersecting roads is approximately equal and when traffic conditions are met in accordance to the Manual of Uniform Traffic Control Devices (MUTCD).

Advantages

- Provides for orderly flow of traffic
- Reduce the severity and frequency of right angle and left turn crashes over minor road stop control
- Relatively inexpensive and quick to implement
- Does not require extensive sight lines like the minor road stop control intersection, but sight distance is required for vehicles to react in case one vehicle is non-compliant with the traffic sign (i.e. failure to stop).

Disadvantages

- Some types of crashes may increase (i.e. rear end)
- Highest number of vehicular conflict points (total of 32)
- Limited to lower volume intersections
- Increases delay to all legs of the intersection
- Total intersection capacity is limited
- Providing for U turns can be difficult and may be prohibited

(3) Single lane roundabout for Alternative 4A

This treatment was applied to the new intersection proposed by Alternative 4A and consists of a three-way roundabout with yield signs along all three approaches. Roundabouts are circular intersections with specific design and traffic control features. These features include yield control of all entering traffic, channelized approaches, and appropriate geometric curvature to ensure that travel speeds on the circulatory roadway are typically less than 30 miles per hour (mph). Also, traffic movement is possible only in a counter-clockwise direction within the roundabout. Roundabout intersections eliminate several vehicle conflict points typically associated with traditional intersections. A four-legged, single lane roundabout has 75 percent fewer vehicle conflict points than a traditional stop-controlled intersection. Roundabouts also enhance safety by reducing vehicle speeds both in and through the intersection.

Advantages

- Provides for orderly flow of traffic
- Lowest number of vehicular conflict points (total of 6)
- Minimizes the severity and frequency of most crash types (89 percent decrease in fatal crashes, a 74 percent decrease in life-altering injury crashes, and a 39 percent decrease in all crashes)
- Provides traffic calming by reducing vehicular speeds on all approaches
- U turns can be executed safely and easily
- Less delay than other types of intersection control (reduced fuel consumption, better air quality)
- Does not require extensive sight lines like the minor road stop control intersection, but sight distance is required for vehicles to see next approach and vehicle within circulatory roadway and react.

Disadvantages

- Highest installation costs
- May need additional right of way at intersection
- Typically requires additional features such as landscaping, lighting, and truck aprons
- Typically requires more initial design effort than other intersection types
- Works best with single lane approaches

F. Right-of-Way (ROW) and Access Management

Right-of-way (ROW) impacts were estimated assuming a 50-foot offset from the centerline of the proposed pavement for both the 30th Street North and Neal Avenue North roadways. This assumption coincides with the minimum ROW width of 100 feet for a collector roadway as required in the Baytown and West Lakeland Township street design standards. Although the standard 60-foot ROW width for a local road is narrower, a 100-foot ROW was used for Neal Avenue N to account for uneven terrain in some areas which may require a wider ROW to accommodate the proposed design. This assumption also allows for a standard ditch section. Existing and proposed ROW is shown on the Alternative layouts. Proposed modifications to existing property access points in also shown on the Alternative Layouts in Appendix A.

The following table breaks down the right-of-way needed for each alternative into right-of-way required within airport property, right-of-way required outside of airport property, and total right-of-way required:

TABLE 4: ANTICIPATED RIGHT-OF-WAY NEEDS

Alternative	ROW within Airport Property (Acres)	ROW outside of Airport Property (Acres)	Total ROW Required (Acres)
3	7.24	0.00	7.24
4A	9.51	0.00	9.51
4B	9.29	0.00	9.29

The right-of-way needs for each alternative are shown on the Alternate Layouts in Appendix A.

G. Constructability and Construction Sequencing

The proposed roadways are on new alignments, south of the existing 30th Street N roadway. It is anticipated the existing roadway will remain open to traffic while the new roadway and associated intersections are constructed. Short term closures of 30th Street N and Neal Street N would be required to construct the connections to the existing roadway. These closures would be non-concurrent to maintain access to residents along these routes.

H. Environmental Impacts

Based on the National Historic Preservation Act Section 106 investigation completed for the EA, there are no historical or archeological sites affected by Alternatives 3, 4A, or 4B. The primary known environmental impacts are the need for additional right-of-way required Airport property currently being used for agricultural purposes and encroachments to wetlands located adjacent to 30th Street N. The right-of-way need from agricultural properties and wetland encroachments for each new alternative are estimated and compared to Alternative 3 in Table 5 and on the Alternative Layout in Appendix A.

TABLE 5: ESTIMATED AGRICULTURAL AND WETLAND IMPACTS

Alternative	Agricultural ROW Required (Acres)	Anticipated Wetland Impact within ROW (Acres)
3	7.24	0.124
4A	9.51	0.115
4B	9.29	0.115

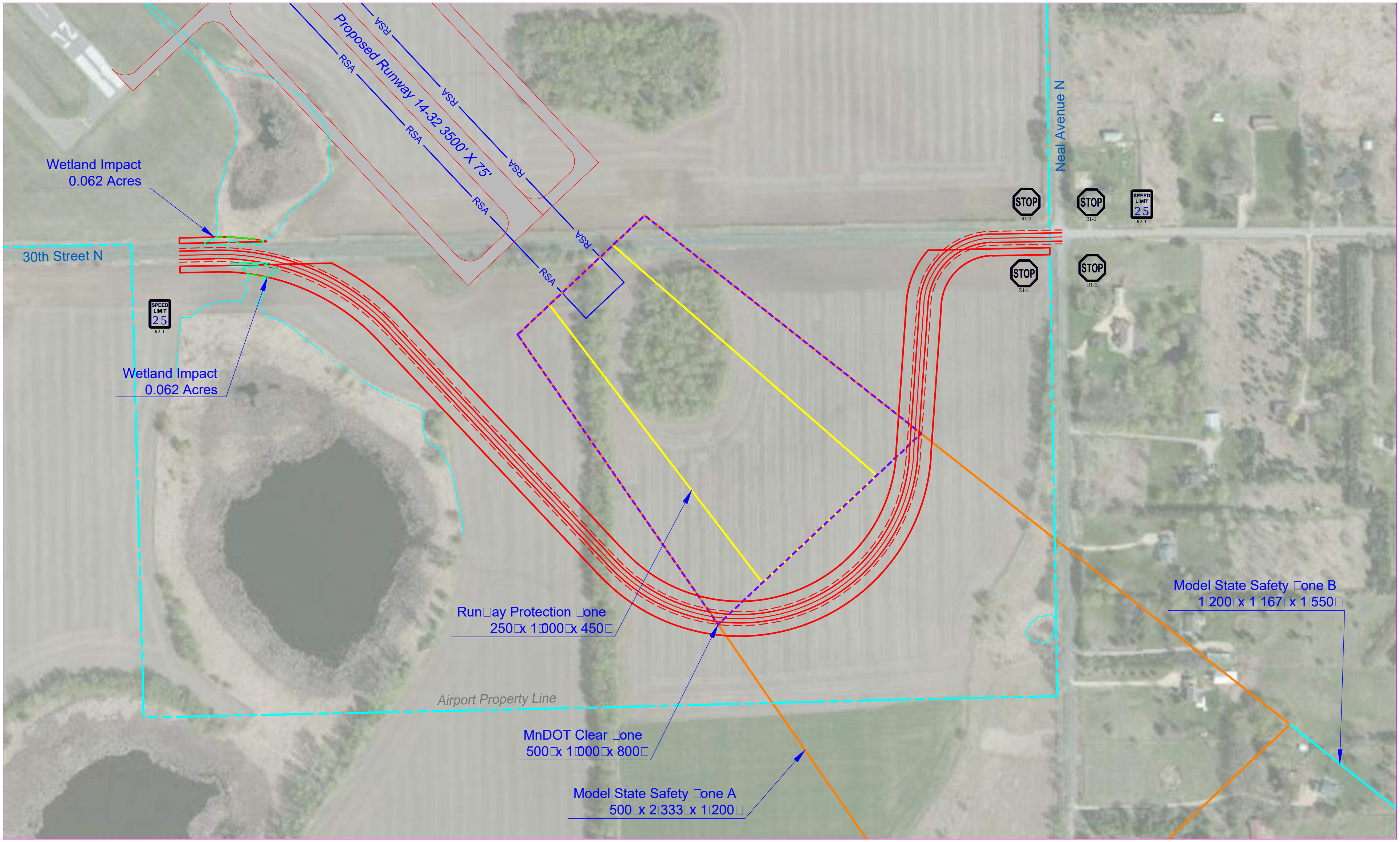
6. Summary

Several parameters were used to review the three build alternatives presented in this study. Table 6 summarizes the outcome of alternative review. Design characteristics and travel time increases associated with Alternatives 4A and 4B are preferable to those associated with Alternative 3. However, these new alternatives would be more costly to implement.

TABLE 6: ALTERNATIVE REVIEW MATRIX

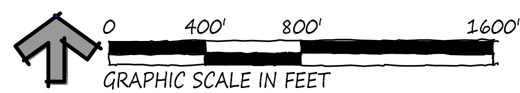
		Alternative 3 **Final LTCP Alternative**	**Alternative 4A** **Modified Hybrid with New Roundabout**	**Alternative 4B** **Modified Hybrid with New T-Intersection**
Cost		\$1.0 million	\$1.5 million	\$1.4 million
Design Characteristics	Vehicle Points of Conflict at Intersection	32	6	9
	Required Field of Vision at Intersection	213º	133º	173º
	Radius of Easternmost Curve	200 feet	315 feet	315 feet
Travel Time	Travel Time Increase from Manning Avenue to East of Existing 30th/Neal Intersection	+ 46.1 seconds	+ 28.5 seconds	+ 26.8 seconds
	Travel Time Increase from Manning Avenue to South of Existing 30th/Neal Intersection	+ 46.1 seconds	+ 10.8 seconds	+ 6.8 seconds
Environmental Factors	Wetland Fill Area (approx.)	0.12 acres	0.12 acres	0.12 acres

Appendix A: Alternative Layouts



Proposed Realignment

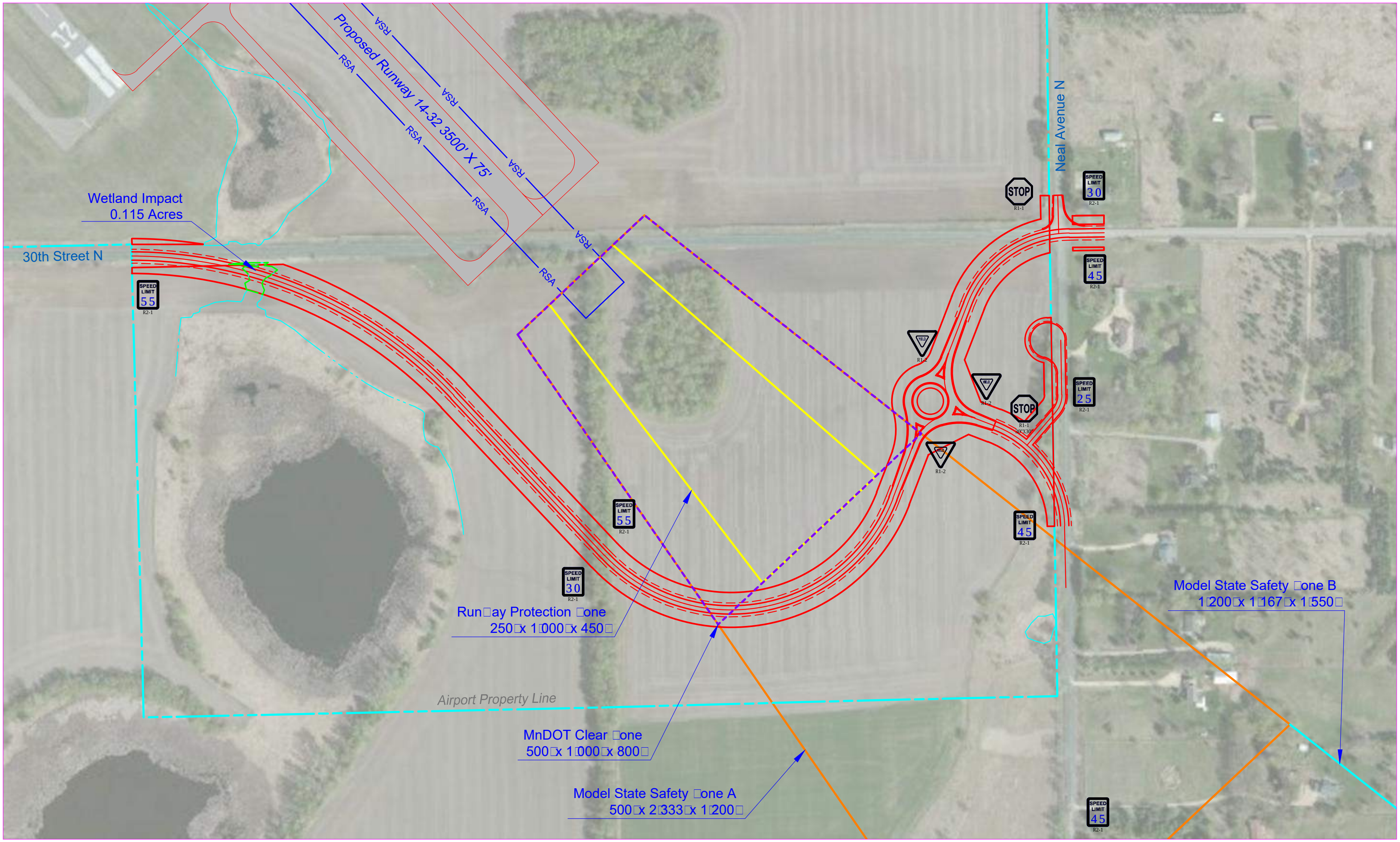
Approximate Wetland Areas



□a□□ □□□ □ □□r□□r□

30□□ □□□nu□ R□a□□n□ □n□

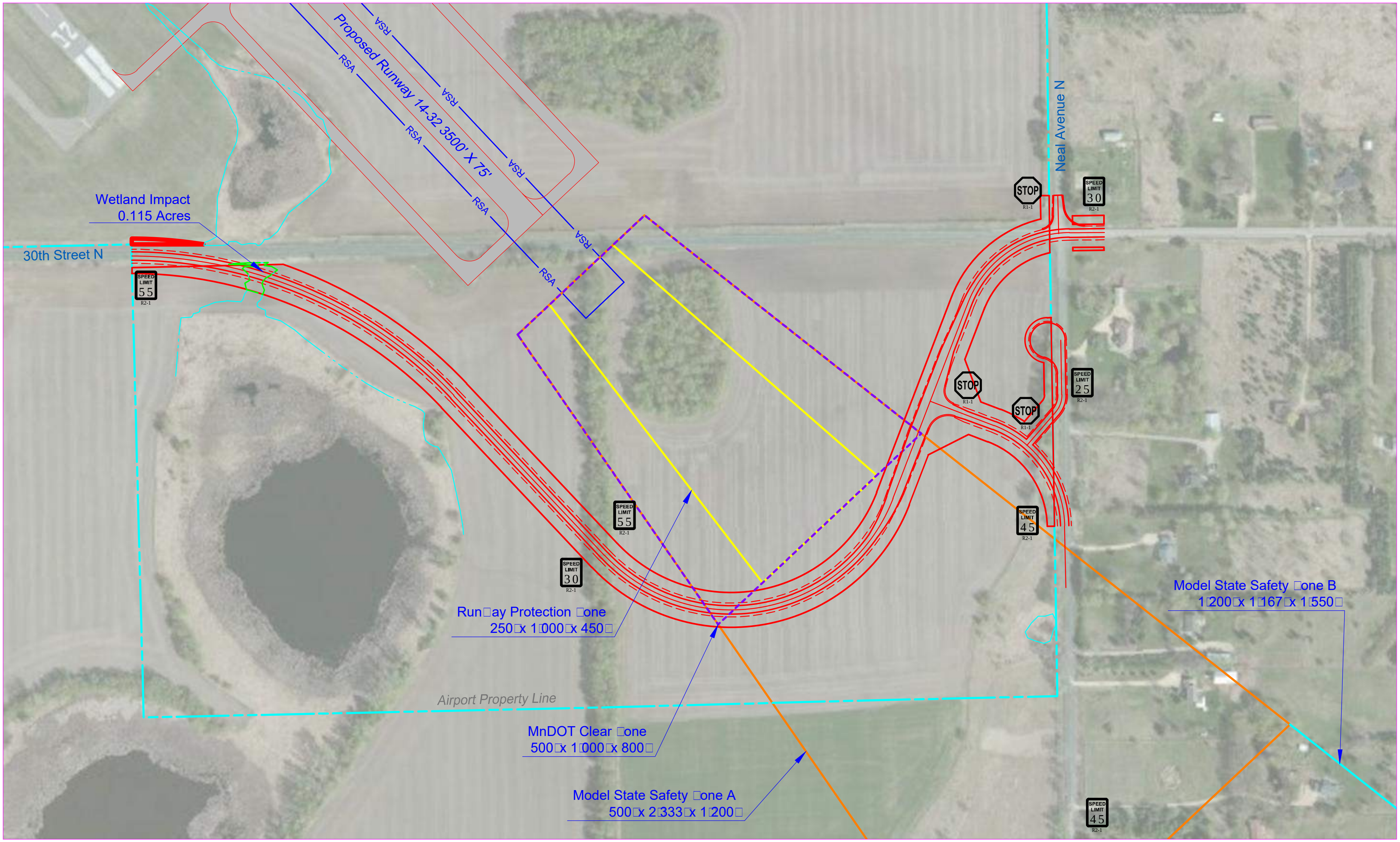
□ □□rna□□□□ 3



Proposed Realignment

Approximate Wetland Areas

0 200' 400' 800'
GRAPHIC SCALE IN FEET



Proposed Realignment

Approximate Wetland Areas

0 200' 400' 800'

GRAPHIC SCALE IN FEET

□a□□ □□□ □ □□r□□r□

30□□ □□□nu□ R□a□□n□ □n□

□ □□rna□□□ 4□

Appendix B: Traffic Data

Traffic Count Data				
68841 - 30th St E of CR 65				
Counter 14				
	5/24/2016	5/25/2016	5/26/2016	Average
00:00 - 00:59		4	3	4
01:00 - 01:59		1	0	1
02:00 - 02:59		0	2	1
03:00 - 03:59		2	1	2
04:00 - 04:59		8	6	7
05:00 - 05:59		11	9	10
06:00 - 06:59		45	35	40
07:00 - 07:59		95	88	92
08:00 - 08:59		63	62	63
09:00 - 09:59		74	50	62
10:00 - 10:59		65	40	53
11:00 - 11:59		53	38	46
12:00 - 12:59		46		46
13:00 - 13:59		58		58
14:00 - 14:59		75		75
15:00 - 15:59	68	48		58
16:00 - 16:59	91	88		90
17:00 - 17:59	78	82		80
18:00 - 18:59	89	71		80
19:00 - 19:59	57	58		58
20:00 - 20:59	43	49		46
21:00 - 21:59	34	30		32
22:00 - 22:59	12	13		13
23:00 - 23:59	4	9		7
			Total	1024

Traffic Count Data				
30th St N E of CSAH 15				
Counter 1				
	7/18/2016	7/19/2016	7/20/2016	Average
00:00 - 00:59		3	3	3
01:00 - 01:59		1	3	2
02:00 - 02:59		2	2	2
03:00 - 03:59		2	1	2
04:00 - 04:59		5	7	6
05:00 - 05:59		20	18	19
06:00 - 06:59		41	38	40
07:00 - 07:59		92		92
08:00 - 08:59	96	93		95
09:00 - 09:59	117	97		107
10:00 - 10:59	78	74		76
11:00 - 11:59	123	122		123
12:00 - 12:59	98	80		89
13:00 - 13:59	95	113		104
14:00 - 14:59	81	89		85
15:00 - 15:59	125	135		130
16:00 - 16:59	97	106		102
17:00 - 17:59	94	115		105
18:00 - 18:59	86	86		86
19:00 - 19:59	63	79		71
20:00 - 20:59	49	67		58
21:00 - 21:59	43	40		42
22:00 - 22:59	18	31		25
23:00 - 23:59	14	13		14
			Total	1478

HCS7 Roundabouts Report

General Information		Site Information	
Analyst	DLW	Intersection	30th Street & Neil Avenue
Agency or Co.	Mead & Hunt	E/W Street Name	30th Street
Date Performed	4/21/2017	N/S Street Name	Neil Avenue
Analysis Year	Design	Analysis Time Period (hrs)	0.25
Time Analyzed	Peak Hour Alternate 1	Peak Hour Factor	0.92
Project Description	Lake Elmo Airport	Jurisdiction	

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment			LTR				LTR				LTR				LTR	
Volume (V), veh/h	0	20	1	15	0	1	2	1	0	15	10	1	0	50	10	1
Percent Heavy Vehicles, %	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Flow Rate (v_{PCE}), pc/h	0	22	1	16	0	1	2	1	0	16	11	1	0	55	11	1
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.9763			4.9763			4.9763			4.9763	
Follow-Up Headway (s)		2.6087			2.6087			2.6087			2.6087	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		39			4			28			67	
Entry Volume veh/h		39			4			28			66	
Circulating Flow (v_c), pc/h	67			49			78			19		
Exiting Flow (v_{ex}), pc/h	57			19			34			28		
Capacity (c_{pce}), pc/h		1289			1313			1274			1354	
Capacity (c), veh/h		1276			1300			1262			1340	
v/c Ratio (x)		0.03			0.00			0.02			0.05	

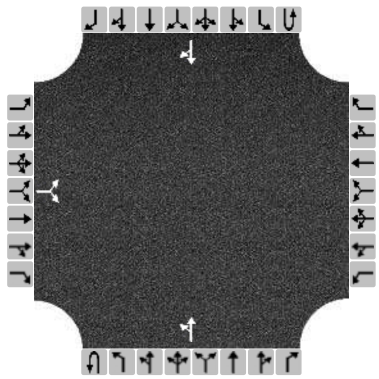
Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		3.1			2.8			3.0			3.1	
Lane LOS		A			A			A			A	
95% Queue, veh		0.1			0.0			0.1			0.2	
Approach Delay, s/veh	3.1			2.8			3.0			3.1		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh | LOS	3.1						A					

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	DLW	Intersection	Neil Avenue & 30thStreet
Agency/Co.	Mead & Hunt	Jurisdiction	
Date Performed	4/21/2017	East/West Street	Neil Avenue
Analysis Year		North/South Street	30th Street
Time Analyzed	Design Peak Hour Alt 2	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	Lake Elmo Airport		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	1	0	0	0	1	0
Configuration			LR							LT						TR
Volume, V (veh/h)		20		15						15	10				10	50
Percent Heavy Vehicles (%)		1		1						1						
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

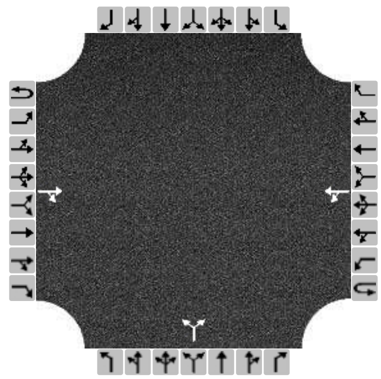
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			38							16						
Capacity, c (veh/h)			962							1543						
v/c Ratio			0.04							0.01						
95% Queue Length, Q_{95} (veh)			0.1							0.0						
Control Delay (s/veh)			8.9							7.4						
Level of Service, LOS			A							A						
Approach Delay (s/veh)	8.9								4.4							
Approach LOS	A															

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	DLW	Intersection	30thStreet & Neil Avenue
Agency/Co.	Mead & Hunt	Jurisdiction	
Date Performed	4/21/2017	East/West Street	30th Street
Analysis Year		North/South Street	Neil Avenue
Time Analyzed	Design Peak Hour Alt 3	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Lake Elmo Airport		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume, V (veh/h)			20	15		10	50			15		10				
Percent Heavy Vehicles (%)						1				1		1				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						11					27					
Capacity, c (veh/h)						1578					946					
v/c Ratio						0.01					0.03					
95% Queue Length, Q_{95} (veh)						0.0					0.1					
Control Delay (s/veh)						7.3					8.9					
Level of Service, LOS						A					A					
Approach Delay (s/veh)					1.3				8.9							
Approach LOS									A							

Appendix C: Cost Estimate Summaries

PRELIMINARY COST ESTIMATE
30th STREET NORTH REALIGNMENT ALTERNATE 3

ITEM	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL COST (ROUNDED)
1	**REMOVAL**				
	Obliterate Old Roadway	STA	26	$550.00	$14,300.00
2	**NEW PAVEMENT**				
	HMA Asphalt Pavement	TON	2375	$75.00	$178,200.00
	Concrete Curb and Gutter	LF	0	$15.00	$0.00
	Base Aggregate Dense 1 1/4-Inch	Tons	8200	$20.00	$164,000.00
3	**EARTHWORK**				
	Common	YD^3	15000	$6.00	$90,000.00
	Borrow	YD^3	0	$0.00	$0.00
				Subtotal Roadway Costs (Items 1-3)	$446,500.00
4	**DRAINAGE**	L.S.	7.5 % of Items 1-3	N/A	$33,500.00
5	**EROSION CONTROL**	L.S.	2 % of Items 1-3	N/A	$9,000.00
6	**TRAFFIC CONTROL**	L.S.	5 % of Items 1-3	N/A	$22,400.00
7	**LIGHTING**	L.S.	4 % of Items 1-3	N/A	$17,900.00
8	**SIGNING/MARKINGS**	L.S.	3 % of Items 1-3	N/A	$13,400.00
9	**OVERHEAD SIGN STRUCTURES**	EACH	0		$0.00
10	**TRAFFIC SIGNALS**	EACH	0	$150,000	$0.00
11	**MOBILIZATION**	L.S.	7 % of Items 1-10 & 13		$27,200.00
12	**ROADWAY INCIDENTALS**	L.S.	30 % of Items 1-3		$171,000.00
				TOTAL ROADWAY COSTS (Items 1-12)	**$740,900.00**
13	**STRUCTURES**				
	Box Culverts				
					$0.00
				Box Culvert Subtotal	**$0.00**
	Retaining Walls				
				Retaining Wall Subtotal	**$0.00**
	Structural Incidentals	L.S.	10 % of Structures		$0.00
				TOTAL STRUCTURE COSTS (Item 13)	**$0.00**
				Subtotal Construction Costs (Items 1-13)	$740,900.00
14	**CONSTRUCTION DELIVERY**	L.S.	15 % of Items 1-13	N/A	$111,135.00
				TOTAL CONSTRUCTION COSTS (Items 1-14)	**$852,035.00**
15	**ROW ACQUISITION**	AC	0.00	$7,500.00	$0.00
16	**REAL ESTATE INCIDENTALS**	L.S.	20 % of Item 16	N/A	$0.00
17	**REAL ESTATE DELIVERY**	L.S.	25 % of Item 16	N/A	$0.00
				TOTAL ROW COSTS (Items 16-18)	**$0.00**
18	**CONTINGENCY**	L.S.	15 % of Items 1-18	N/A	$127,900.00
	GRAND TOTAL PROJECT COST				**$979,935.00**

PRELIMINARY COST ESTIMATE
30th STREET NORTH REALIGNMENT ALTERNATE 4A

ITEM	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL COST (ROUNDED)
1	**REMOVAL**				
	Obliterate Old Roadway	STA	33	$550.00	$18,150.00
2	**NEW PAVEMENT**				
	HMA Asphalt Pavement	TON	3650	$75.00	$273,800.00
	Concrete Curb and Gutter	LF	2305	$15.00	$34,600.00
	Base Aggregate Dense 1 1/4-Inch	Tons	12500	$20.00	$250,000.00
3	**EARTHWORK**				
	Common	YD^3	15000	$6.00	$90,000.00
	Borrow	YD^3	0	$0.00	$0.00
				Subtotal Roadway Costs (Items 1-3)	$666,550.00
4	**DRAINAGE**	L.S.	7.5 % of Items 1-3	N/A	$50,000.00
5	**EROSION CONTROL**	L.S.	2 % of Items 1-3	N/A	$13,400.00
6	**TRAFFIC CONTROL**	L.S.	5 % of Items 1-3	N/A	$33,400.00
7	**LIGHTING**	L.S.	4 % of Items 1-3	N/A	$26,700.00
8	**SIGNING/MARKINGS**	L.S.	3 % of Items 1-3	N/A	$20,000.00
9	**OVERHEAD SIGN STRUCTURES**	EACH	0		$0.00
10	**TRAFFIC SIGNALS**	EACH	0	$150,000	$0.00
11	**MOBILIZATION**	L.S.	5 % of Items 1-10 & 13		$40,600.00
12	**ROADWAY INCIDENTALS**	L.S.	30 % of Items 1-3		$255,200.00
				TOTAL ROADWAY COSTS (Items 1-12)	**$1,105,850.00**
13	**STRUCTURES**				
	Box Culverts				
					$0.00
				Box Culvert Subtotal	**$0.00**
	Retaining Walls				
				Retaining Wall Subtotal	**$0.00**
	Structural Incidentals	L.S.	10 % of Structures		$0.00
				TOTAL STRUCTURE COSTS (Item 13)	**$0.00**
				Subtotal Construction Costs (Items 1-13)	$1,105,850.00
14	**CONSTRUCTION DELIVERY**	L.S.	15 % of Items 1-13	N/A	$165,877.50
				TOTAL CONSTRUCTION COSTS (Items 1-14)	**$1,271,727.50**
15	**ROW ACQUISITION**	AC	0.00	$7,500.00	$0.00
16	**REAL ESTATE INCIDENTALS**	L.S.	20 % of Item 16	N/A	$0.00
17	**REAL ESTATE DELIVERY**	L.S.	25 % of Item 16	N/A	$0.00
				TOTAL ROW COSTS (Items 16-18)	**$0.00**
18	**CONTINGENCY**	L.S.	15 % of Items 1-18	N/A	$190,800.00
	GRAND TOTAL PROJECT COST				**$1,462,527.50**

PRELIMINARY COST ESTIMATE
30th STREET NORTH REALIGNMENT ALTERNATE 4B

ITEM	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL COST (ROUNDED)
1	**REMOVAL**				
	Obliterate Old Roadway	STA	33	$550.00	$18,150.00
2	**NEW PAVEMENT**				
	HMA Asphalt Pavement	TON	3670	$75.00	$275,300.00
	Concrete Curb and Gutter	LF	200	$15.00	$3,000.00
	Base Aggregate Dense 1 1/4-Inch	Tons	12600	$20.00	$252,000.00
3	**EARTHWORK**				
	Common	YD^3	15000	$6.00	$90,000.00
	Borrow	YD^3	0	$0.00	$0.00
				Subtotal Roadway Costs (Items 1-3)	$638,450.00
4	**DRAINAGE**	L.S.	7.5 % of Items 1-3	N/A	$47,900.00
5	**EROSION CONTROL**	L.S.	2 % of Items 1-3	N/A	$12,800.00
6	**TRAFFIC CONTROL**	L.S.	5 % of Items 1-3	N/A	$32,000.00
7	**LIGHTING**	L.S.	0 % of Items 1-3	N/A	$0.00
8	**SIGNING/MARKINGS**	L.S.	3 % of Items 1-3	N/A	$19,200.00
9	**OVERHEAD SIGN STRUCTURES**	EACH	0		$0.00
10	**TRAFFIC SIGNALS**	EACH	0	$150,000	$0.00
11	**MOBILIZATION**	L.S.	5 % of Items 1-10 & 13		$37,600.00
12	**ROADWAY INCIDENTALS**	L.S.	30 % of Items 1-3		$236,400.00
				TOTAL ROADWAY COSTS (Items 1-12)	**$1,024,350.00**
13	**STRUCTURES**				
	Box Culverts				
					$0.00
				Box Culvert Subtotal	**$0.00**
	Retaining Walls				
				Retaining Wall Subtotal	**$0.00**
	Structural Incidentals	L.S.	10 % of Structures		$0.00
				TOTAL STRUCTURE COSTS (Item 13)	**$0.00**
				Subtotal Construction Costs (Items 1-13)	$1,024,350.00
14	**CONSTRUCTION DELIVERY**	L.S.	15 % of Items 1-13	N/A	$153,652.50
				TOTAL CONSTRUCTION COSTS (Items 1-14)	**$1,178,002.50**
15	**ROW ACQUISITION**	AC	0.00	$7,500.00	$0.00
16	**REAL ESTATE INCIDENTALS**	L.S.	20 % of Item 16	N/A	$0.00
17	**REAL ESTATE DELIVERY**	L.S.	25 % of Item 16	N/A	$0.00
				TOTAL ROW COSTS (Items 16-18)	**$0.00**
18	**CONTINGENCY**	L.S.	15 % of Items 1-18	N/A	$176,800.00
	GRAND TOTAL PROJECT COST				**$1,354,802.50**

Appendix C – Wetland Delineation, Functional Assessment, and Associated Correspondence

Minnesota Wetland Conservation Act
Notice of Decision

Local Government Unit (LGU)	Address
Valley Branch Watershed District (VBWD)	**P.O. Box 838** **Lake Elmo, MN 55042**

1. PROJECT INFORMATION

Applicant Name	Project Name	Date of Application	Application Number
Chad Leqve, Metropolitan Airports Commission	**Lake Elmo Airport**	**7/11/2018**	

☒ Attach site locator map.

Type of Decision:

☒ Wetland Boundary or Type ☐ No-Loss ☐ Exemption ☐ Sequencing

☐ Replacement Plan ☐ Banking Plan

Technical Evaluation Panel (TEP) Findings and Recommendation (if any):

☐ Approve ☐ Approve with conditions ☐ Deny

Summary (or attach): **No TEP Findings Report. See below for TEP involvement.**

2. LOCAL GOVERNMENT UNIT DECISION

Date of Decision: **8/23/2018**

☒ Approved ☐ Approved with conditions (include below) ☐ Denied

LGU Findings and Conclusions (attach additional sheets as necessary):

On behalf of the Metropolitan Airports Commission, Mead & Hunt. submitted an addendum wetland delineation report and request for wetland boundary and type concurrence for an additional area associated with the Lake Elmo Airport Runway Relocation and Improvements project in Lake Elmo, Minnesota (Sec. 18 and 19, T29N, R20W) within Washington County.

In 2017, wetland boundaries and types were approved for the majority of the project area. This addendum covers an extended project area not previously evaluated.

Two wetlands were delineated within the extended evaluation with the following type designations:

Wetland	Wetland Type	Circular 39 Type	Dominant Vegetation	Area (Sq. Ft)	Area (Acres)
5	Fresh (wet) Meadow/ Shrub Carr/ Floodplain Forest	Type 2/ Type 6/ Type 1	Reed canary grass, box elder, buckthorn, stinging nettle, green ash	43,382.57	0.996
10	Floodplain Forest	Type 1	Box elder, American elm, buckthorn	9,424.66	0.216

The wetland delineation report and Notice of Application were provided to the TEP on 7/18/2018.

A site review was conducted on 8/2/2018. Those present at the site review were Jay Riggs, Washington Conservation District and Karen Wold, Barr Engineering Co. for the VBWD.

The comment period ended on 8/10/2018, and no comments were received.

The wetland boundaries and types are accurate based on the requirements of the *1987 U.S. Army Corps of Engineers Wetland Delineation Manual*, the *2012 Northcentral and Northeast Regional Supplement*, and the *2015 Guidance for Submittal of Delineation Reports to the USACE and WCA LGU in Minnesota, Version 2.0*.

For Replacement Plans using credits from the State Wetland Bank:

Bank Account #	Bank Service Area	County	Credits Approved for Withdrawal (sq. ft. or nearest .01 acre)

Replacement Plan Approval Conditions. In addition to any conditions specified by the LGU, the approval of a Wetland Replacement Plan is conditional upon the following:

☐ **Financial Assurance:** For project-specific replacement that is not in-advance, a financial assurance specified by the LGU must be submitted to the LGU in accordance with MN Rule 8420.0522, Subp. 9 (List amount and type in LGU Findings).

☐ **Deed Recording:** For project-specific replacement, evidence must be provided to the LGU that the BWSR "Declaration of Restrictions and Covenants" and "Consent to Replacement Wetland" forms have been filed with the county recorder's office in which the replacement wetland is located.

☐ **Credit Withdrawal:** For replacement consisting of wetland bank credits, confirmation that BWSR has withdrawn the credits from the state wetland bank as specified in the approved replacement plan.

Wetlands may not be impacted until all applicable conditions have been met!

LGU Authorized Signature:

Signing and mailing of this completed form to the appropriate recipients in accordance with 8420.0255, Subp. 5 provides notice that a decision was made by the LGU under the Wetland Conservation Act as specified above. If additional details on the decision exist, they have been provided to the landowner and are available from the LGU upon request.

Name	Title	
Karen Wold	**Senior Environmental Scientist, Barr Engineering Co. – Engineers for the VBWD**	
Signature	Date	Phone Number and E-mail
Karen Wold	**8/23/2018**	**952-832-2707** **kwold@barr.com**

THIS DECISION ONLY APPLIES TO THE MINNESOTA WETLAND CONSERVATION ACT. Additional approvals or permits from local, state, and federal agencies may be required. Check with all appropriate authorities before commencing work in or near wetlands.

Applicants proceed at their own risk if work authorized by this decision is started before the time period for appeal (30 days) has expired. If this decision is reversed or revised under appeal, the applicant may be responsible for restoring or replacing all wetland impacts.

This decision is valid for five years from the date of decision unless a longer period is advised by the TEP and specified in this notice of decision.

3. APPEAL OF THIS DECISION

Pursuant to MN Rule 8420.0905, any appeal of this decision can only be commenced by mailing a petition for appeal, including applicable fee, within thirty (30) calendar days of the date of the mailing of this Notice to the following as indicated:

Check one:

☐ Appeal of an LGU staff decision. Send petition and $_____ fee (if applicable) to:	☒ Appeal of LGU governing body decision. Send petition and $500 filing fee to: Executive Director Minnesota Board of Water and Soil Resources 520 Lafayette Road North St. Paul, MN 55155

4. LIST OF ADDRESSEES

☒ SWCD TEP member: **Jay Riggs - Washington Conservation District**
☒ BWSR TEP member: **Ben Meyer**
☒ DNR TEP member: **Becky Horton**
☒ WD or WMO (if applicable): **John Hanson**
☒ Applicant (notice only) and Landowner (if different): **Chad Leqve (Metropolitan Airports Commission), Evan Barrett and Brauna Hartzell (Mead & Hunt, Inc.)**
☒ Corps of Engineers Project Manager: **Tom Hingsberger**
☐ BWSR Wetland Bank Coordinator (wetland bank plan decisions only)

5. MAILING INFORMATION

- For a list of BWSR TEP representatives: www.bwsr.state.mn.us/aboutbwsr/workareas/WCA_areas.pdf
- For a list of DNR TEP representatives: www.bwsr.state.mn.us/wetlands/wca/DNR_TEP_contacts.pdf
- Department of Natural Resources Regional Offices:

NW Region: Reg. Env. Assess. Ecol. Div. Ecol. Resources 2115 Birchmont Beach Rd. NE Bemidji, MN 56601	NE Region: Reg. Env. Assess. Ecol. Div. Ecol. Resources 1201 E. Hwy. 2 Grand Rapids, MN 55744	Central Region: Reg. Env. Assess. Ecol. Div. Ecol. Resources 1200 Warner Road St. Paul, MN 55106	Southern Region: Reg. Env. Assess. Ecol. Div. Ecol. Resources 261 Hwy. 15 South New Ulm, MN 56073

For a map of DNR Administrative Regions, see: http://files.dnr.state.mn.us/aboutdnr/dnr_regions.pdf

- For a list of Corps of Project Managers: www.mvp.usace.army.mil/regulatory/default.asp?pageid=687 or send to:

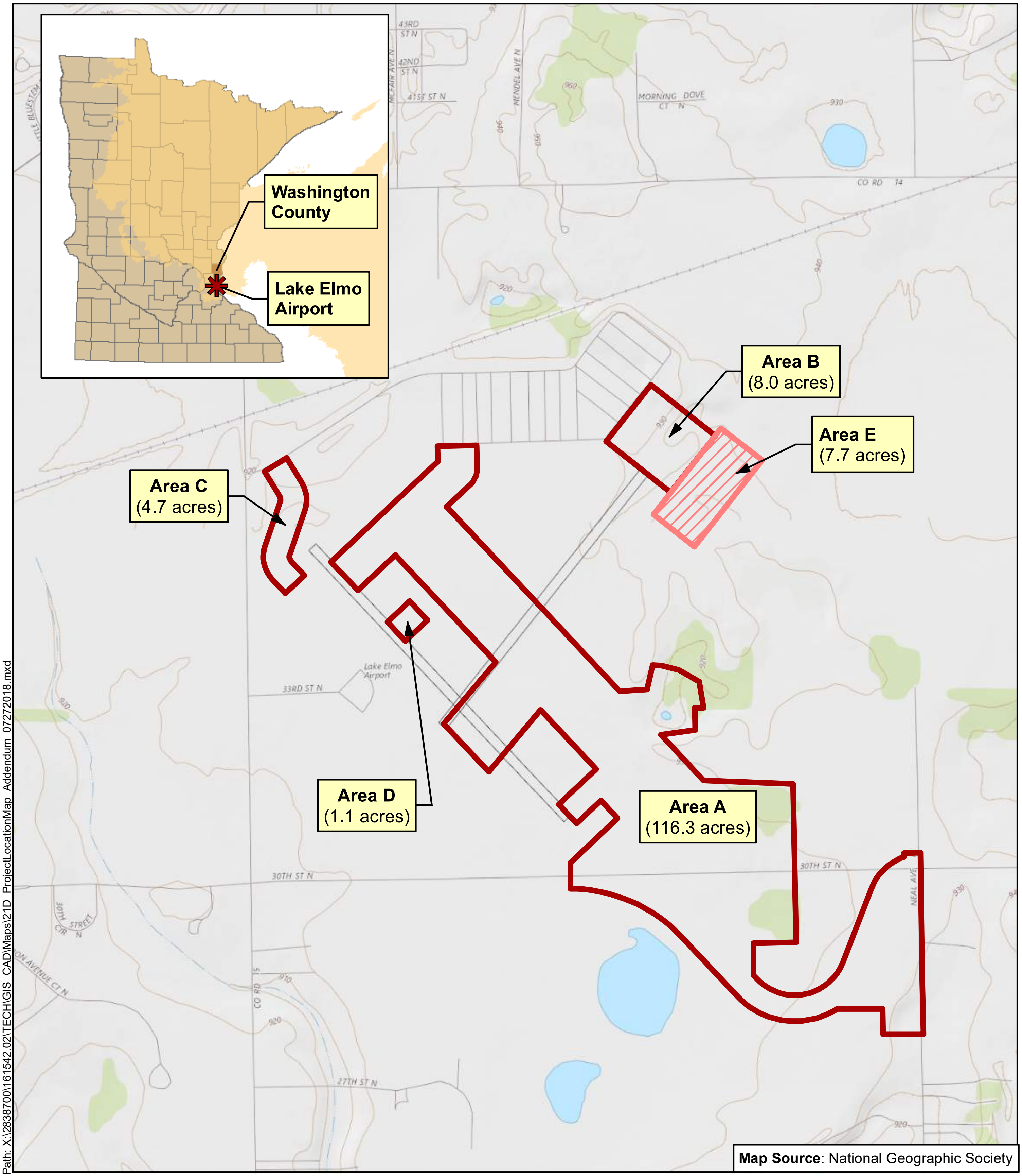
  US Army Corps of Engineers
  St. Paul District, ATTN: OP-R
  180 Fifth St. East, Suite 700
  St. Paul, MN 55101-1678

- For Wetland Bank Plan applications, also send a copy of the application to:

  Minnesota Board of Water and Soil Resources
  Wetland Bank Coordinator
  520 Lafayette Road North
  St. Paul, MN 55155

6. ATTACHMENTS

In addition to the site locator map, list any other attachments:
☒ **wetland delineation map**



Path: X:\2838700\161542.02\TECH\GIS_CAD\Maps\21D_ProjectLocationMap_Addendum_07272018.mxd

Project Location and Topography

LAKE ELMO AIRPORT

Proposed Runway 14/32 Relocation and Associated Improvements

Legend

2017 Area of Interest

2018 Area of Interest

LRR Subregion: K

0 1,000 2,000 Feet

N

Project Location

T29N, R20W, S18 and S19
Baytown and West Lakeland Townships
Washington County, MN
LRR Subregion: K
USACE Regional Supplement: NC/NE
Area = 130.1 acres

Aquatic Resources Map

National Wetlands Inventory (NWI),
Minnesota Public Waters, and
National Hydrography Dataset

LAKE ELMO AIRPORT

Proposed Runway 14-32 Runway Shift

Legend

- Area of Interest (2017)
- Area of Interest (2018)
- Airport Property Boundary
- MN Public Waters Basins
- Intermittent Stream (NHD)

WETLAND TYPE*

- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond

* Labeled with NWI classificaiton and Circular 39 Type

N

0 150 300 600 900 1,200 1,500 1,800 Feet

Project Information

T29N, R20W, S18 and S19
City of Lake Elmo
Washington County, MN
Area of Interest = 130.1 acres
Field work conducted:
June 5 - 9, 2017

Mead & Hunt

Wetland Data: National Wetland Inventory Update for Minnesota, East-Central (2010-2011)

Mn Public Waters Data: Public Waters (PW) Basin and Watercourse Delineations, Washington County, MN Geospatial Commons

Stream Data: National Hydrography Dataset (NHD), USGS

Image Source: MnGEO WMS Image Service, Washington County (2016 color 7-county)

Path: X:\2838700\161542.02\TECH\GIS_CAD\Maps\21D_LakeElmoNWIMap.mxd

Wetland Delineation Report Addendum

Lake Elmo (21D) Airport

Runway 14/32 Relocation and Associated Improvements

Report prepared for

Metropolitan Airports Commission

Minneapolis, Minnesota

Report prepared by

Mead & Hunt

www.meadhunt.com

June 2018

Table of Contents

Appendices

Tables — Page

1. Introduction

Lake Elmo Airport (21D or the Airport) is a general aviation reliever airport owned and operated by the Metropolitan Airports Commission (MAC). The airport is located just east of St. Paul, Minnesota. The Airport is bordered by Manning Avenue N. (MN 15) to the west, a Union Pacific Railroad line on the north, and 30th Street N. to the south. Airport property covers approximately 640 acres over three parcels. The central parcel includes the main airfield and associated facilities, roads, and hangar areas. Additional parcels of land extend ownership to the north along Manning Avenue to 40th Street N. (Minnesota Trunk Highway 14), encompassing about 40 acres, and to the south of 30th Street N. for an additional 80 acres. To the south and east, the Airport is bordered by rolling farmland and woodlands with scattered residences, and lies within the Downs Lake subwatershed of the St. Croix River - Stillwater watershed. Areas west of the Airport consist primarily of single-family residential development. A project location map is presented in Appendix A.

The airfield at 21D consists of two runways, two supporting taxiways, and numerous privately owned hangars. Runway 14/32 is the primary runway and is 2,850 feet long and 75 feet wide. The crosswind runway (Runway 4/22) is 2,497 feet long and 75 feet wide. There are two non-precision instrument approaches to the Airport, which has no control tower. Fueling, flight training, and aircraft maintenance services are available from a fixed-base operator. The primary role of the airport is to serve personal, recreational, and business aviation users. The Airport provides business services including flight training and aircraft maintenance.

A previous wetland delineation and functional assessment, completed in October 2017, documented nine wetlands within an Area of Interest on Airport property. The October delineation supported an alternatives analysis that explores how to meet planning goals related to runway and safety improvements at the Airport, which was included in a draft federal environmental assessment (EA) / state environmental assessment worksheet (EAW) published by the MAC on February 26, 2018.

In November 2017, Mead & Hunt, Inc. (Mead & Hunt) determined that approximately 0.6 acres of on-Airport tree clearing would need to occur in two wetland areas that were not delineated by the 2017 wetland boundary survey. These areas are located near the Runway 22 end and are identified by the U.S. Fish & Wildlife Service (USFWS) National Wetland Inventory (NWI) database as Type 1 seasonally flooded basins. Visual observations made by Mead & Hunt staff during the 2017 wetland boundary survey indicated that Type 1 is the appropriate classification, and that the wetlands will remain Type 1 following removal of any trees. Based on consultation with the Federal Aviation Administration (FAA) and the Valley Branch Watershed District (VBWD), Mead & Hunt determined that these wetland areas should be delineated to confirm the wetland boundaries and types, because tree removal in wetlands which results in a change in wetland type may be considered a regulated activity under the Minnesota Wetland Conservation Act (WCA). However, seasonal considerations dictated that this additional delineation work be completed in the spring of 2018, following publication of the Draft EA/EAW. The Draft EA/EAW included a commitment to complete the delineation work prior to publication of the Final EA/EAW document.

Mead & Hunt conducted a wetland delineation within an Area of Interest (AOI) on April 27 and 29, 2018. The Area of Interest, identified as Area E in this report, lies adjacent to Area B in the October 2017 delineation. The 2017 delineation identified the portion of Wetland 5 that is located within Area B as identified in **Appendix A**. This expanded 2018 delineation investigated the remainder of Wetland 5, as well as another small isolated area identified as Wetland 10, as shown in **Appendix D**.

The AOI comprises 7.7 acres located in Section 18, Township 29 North, Range 20 West, Washington County, Minnesota. Two wetlands were identified within the AOI. The information contained in this report confirms that tree removal within these wetlands will not change the Circular 39 wetland type, as stated by the Draft EA/EAW. Therefore, this report does not change the conclusions of the Draft EA/EAW.

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

- Brauna Hartzell, BS Biological Science, Florida State University, 1982; MS Environmental Monitoring, University of Wisconsin-Madison, 1994; 15 years wetland delineation practice.

2. Methods

Available resources used to provide context and background information and to assist in the field assessment for the wetland determination included:

- U.S. Geological Survey (USGS) topographic maps and 2-foot elevation contours provided by Minnesota Geospatial Commons, Minnesota Elevation Mapping Project, 2011.
- U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) soil survey, Web Soil Survey at http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx
- U.S. Fish and Wildlife National Wetland Inventory (NWI) mapping with update for East-Central Minnesota at https://www.fws.gov/wetlands/data/mapper.html
- 2016 National Wetland Plant List (Lichvar, R.W., D. L. Banks, W. N. Kirchner, and N. C. Melvin, 2016)
- Climatic norms at Minneapolis/St. Paul Airport, MN from USDA WETS tables at https://www.wcc.nrcs.usda.gov/climate/navigate_wets.html
- Gridded precipitation data provided by Minnesota State Climatology Office at http://climateapps.dnr.state.mn.us/gridded_data/precip/monthly/monthly_gridded_precip.asp
- Aerial photography (MnGEO WMS Image Service)

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* (USACE, 2011). Soil characteristics were examined by digging pits with a 16-inch tile spade and hydrologic indicators were visually assessed. Soil pits remained open for a minimum of 15 minutes to adequately assess the water table. Use of Munsell Soil Color charts determined the hue, value, and chroma for the matrix and any redoximorphic features in each soil layer.

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

Antecedent precipitation was assessed following procedures developed by the NRCS. Precipitation data three months prior to fieldwork were 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 four data points—two in uplands and two in wetlands—were established to characterize the range of soil, vegetation, and hydrologic conditions. Wire pin flags placed approximately 25-50 feet apart indicated wetland boundary points. These sampling points and wetland boundary flags were surveyed with a Trimble Geo7X capable of sub-meter accuracy and mapped using Geographic Information System (GIS) software.

The following appendices are included with this report:

- Appendix A – Project Location and Topography Map
- Appendix B – Detailed Topography Map, Aquatic Resources Map, and NRCS Soils Map
- Appendix C – WETS Analysis and Climatic Data
- Appendix D – Wetland Boundary Map
- Appendix E – Data Sheets with Field Photographs
- Appendix F – Delineator Qualifications

3. Results and Discussion

A. Site Description

The AOI covers approximately 7.7 acres near the Runway 22 end. A project location map is presented in Appendix A.

Most of the AOI is under row-crop cultivation east of Runway 4/22. Two areas of wooded wetlands appear in this area. Each is located at topographic lows surrounded by agricultural fields. Natural sheet flow from the surrounding terrain moves towards these depressional basins over gradients varying from 2.5 percent to 15 percent. See Appendix B for a detailed Topographic Map.

At the time of field work, the agricultural fields had not been planted and vegetation was absent. Isolated woodlands and depressional areas appeared undisturbed.

(1) Soils Mapping

Most of the AOI is covered by three soils: well drained Antigo silt loams (0 to 2 percent slopes), well drained Santiago silt loam (2 to 6 percent slopes), and moderately well drained Freeon silt loam (2 to 6 percent slopes). Typical soil profiles for Antigo silt loams (49) show a dark grayish brown (10YR 4/2) silt loam over a brown (10YR 5/3) silt loam. Santiago silt loam (153B) shows a dark brown (10YR 3/3) silt loam in the A horizon; underlying this is a brown (10YR 5/3) silt loam with remnants of dark yellowish brown (10YR 4/4) silt loam. Soil profiles for the Freeon soil series (264) describe a very dark grayish brown (10YR 3/2) silt loam underlain by a brown (10YR 5/3) silt loam with remnants of dark yellowish brown (10YR 4/4) silt loam and strong brown (7.5YR 4/6) masses of iron accumulation.

Antigo and Santiago silt loams and their minor components are non-hydric while Freeon silt loam contains a minor component, Capitola muck at 5 percent, which is hydric.

Depressional areas within the AOI generally are covered by soils from the well-drained Freeon series. An area of Auburndale silt loam (0 to 2 percent slopes) covers the northern corner of the AOI and corresponds to an area previously mapped as wetland in the NWI and the October 2017 delineation. A very dark grayish brown (10YR 3/2) silt loam covers a grayish brown (10YR 5/2) silt loam with many medium prominent strong brown (7.5YR 5/8) masses of iron accumulation in a typical soil profile for the poorly drained Auburndale series.

Soils present within the AOI are summarized in Table 1. Soils mapping is presented in Appendix B.

Table 1. Summary of Soils in Area of Interest

Map unit symbol	Map unit name	Soil Unit Component Percentage	Landform	Hydric Status
49	Antigo silt loam, 0 to 2 percent slopes	Antigo/ minor comp. 80/20	Terraces, flats	No
49B	Antigo silt loam, 2 to 6 percent slopes	Antigo/ minor comp. 80/20	Terraces, flats, hillslopes	No
153B	Santiago silt loam, 2 to 6 percent slopes	Santiago/ minor comp. 90/10	Moraines	No
155B	Chetek sandy loam, 0 to 6 percent slopes	Chetek/ minor comp. 90/10	Outwash plains	No
155C	Chetek sandy loam, 6 to 12 percent slopes	Chetek/ minor comp. 90/10	Pitted outwash plains	No
189	Auburndale silt loam, 0 to 2 percent slopes	Auburndale/ minor comp. 85/15	Depressions and drainageways on ground moraines	Yes
264	Freeon silt loam, 2 to 6 percent slopes	Freeon/ minor comp. 95/5	Ground moraines	No

(2) Aquatic Resources

The NWI indicates two areas of mapped wetlands within the AOI: one area mapped as a combination of seasonally flooded emergent (PEM1A) and forested wetland (PFO1) and another area, a small pocket of forested wetland (PFO1A), is mapped in the southern portion of the AOI.

Both wetlands within the AOI are classified as Circular 39 Type 1. No Minnesota Public Waters are mapped in the AOI. See Appendix B for aquatic resources mapping.

(3) Antecedent Climatic Conditions

A precipitation worksheet using the gridded method from the Minnesota State Climatology Office was calculated for the Airport. Climatic normals covered the period 1981 – 2010. On-site precipitation data was accessed from the Minnesota State Climatology Office and used to analyze climatic conditions for three months prior to field work. As the delineation occurred on April 27, the month of April was included in the analysis. This analysis indicated climatic conditions within normal range based on precipitation.

Within the early season timeframe of this delineation, average precipitation as rain is low. In the three months prior to delineation (April, March, and February), precipitation falls mainly as snow. Snowfall data from the Woodbury, Minnesota, station was used for comparing on-site conditions to long-term snowfall normals from the Minneapolis-St. Paul International Airport. The Lake Elmo station does not collect snow data.

Table 2 summarizes snowfall amounts compared to normal long-term data. April's snowfall exceeded normal by more than 22 inches; one event, experienced over two days on April 15 and 16, accounted for 14.4 inches of snow. At the time of field work (April 27), no snow accumulation was observed. On-site conditions, however, were very wet.

Table 2. Summary of Snowfall for Three Months Prior to Field Work

Month	Average Monthly Snowfall[1]	On-site Monthly Snowfall[2]	Amount above Normal
February	8.5	15.8	+7.3
March	10.5	11.2	+0.7
April	3.0	25.7	+22.7

[1] Minneapolis/St Paul Airport

[2] Woodbury 1.7 N, MN

The amount of water in snow, or snow water equivalent (SWE), depends on the density of the snow and the temperature during which the snowfall occurred. SWE is calculated as the inches of snow multiplied by the density of the snow. Using a typical snow density of 10 percent for temperatures between 28˚F and 34˚F, 25.7 inches of snow would yield an additional 2.57 inches of water for the month of April.

Based on precipitation data and an estimate of the SWE for April, climatic conditions were considered wetter than normal.

A WETS analysis worksheet and supporting precipitation and snowfall data appear in Appendix C along with precipitation and snowfall data.

(4) Growing Season

Climatic normal data from the Minneapolis-St. Paul International Airport indicate the start of the growing season with 50 percent probability of 28˚F or higher to be April 13 (See Appendix C). Conditions encountered during field work on April 27 showed the start of vegetative growth of herbaceous vegetation; however, bare ground conditions were observed within forested areas. Hydrophytic vegetation determinations in these areas were made based on the tree and shrub strata.

B. Findings

(1) Wetlands

A total of two wetlands were delineated within the AOI. A wetland boundary map with sampling point locations is presented in Appendix D followed by data sheets and field photographs in Appendix E. Table 3 summarizes the delineated wetlands described in detail below.

Table 3. Summary of Delineated Wetlands within the Area of Interest

Wetland	Wetland Type	Circular 39 Type	Dominant Vegetation	Area (Sq. Ft)	Area (Acres)
5	Fresh (wet) Meadow/ Shrub Carr/ Floodplain Forest	Type 2/ Type 6/ Type 1	Reed canary grass, box elder, buckthorn, stinging nettle, green ash	43,382.57	0.996
10	Floodplain Forest	Type 1	Box elder, American elm, buckthorn	9,424.66	0.216

(a) Wetland 5 (PEMB/Type 2, PSS1/Type 6, PFO1/Type 1)

Wetland 5 (W5) is a shallow closed basin located near the end of Runway 22. The wetland consists of three plant communities: a dense emergent fringe dominated by reed canary grass on the western edge of the wetland, transitioning to a shrub-carr component and a forested floodplain community on the eastern end. The basin is at the base of knolls on all sides with slopes as steep as 15 percent. Within the wetland, drainage flows from the basin to the southeast through the shrub-carr complex then through a shallow swale to the forest community at its southern extent. The swale hydrologically connects the two lobes of the wetland. The wetland appears to have no outlets.

The 2017 delineation identified the portion of Wetland 5 that was located within Area B. The current delineation completes the delineation of Wetland 5 in Area E.

The NWI mapping indicates this area as a temporary flooded emergent/shrub (PEM1A/PFO1A) wetland. See Appendix B for NWI mapping.

Two data points (DP20 and DP21) were sampled at the northern side of the wetland boundary within the shrub-carr complex. No vegetation disturbance due to management activities was noted. The locations of these points are shown on the Wetland Boundary Map provided in Appendix D; data sheets along with field photographs are presented in Appendix E.

Vegetation

Early season growing conditions were evident at the time of field work. Herbaceous vegetation was beginning to show signs of vegetative growth; however, much of the ground was bare in wetland areas, leading to a hydrophytic vegetation determination primarily made based on shrub and tree strata.

At DP21 (wetland), the dominant vegetation was box elder (*Acer negundo*: FAC), buckthorn (*Rhamnus cathartica*: FAC), and stinging nettle (*Urtica dioica*: FAC). Other tree and shrub components observed were willow (*Salix* sp.) and red osier dogwood (*Cornus alba*: FACW). Reed canary grass (*Phalaris arundinacea*: FACW) was present along the wetland fringe in open, non-forested areas. The hydrophytic vegetation criterion was satisfied at this sampling point.

Hydrology

The western end of the wetland is a steep-sided basin on three sides, approximately five feet deep, situated at the base of two knolls on the north and west sides. The topography flattens to the east, allowing water to flow eastward through a shrub-carr complex and into a forested community. The eastern part of the wetland also receives natural sheet flows from the surrounding higher areas.

At the time of the June 2017 field work, the western end of the wetland held no surface water in the steep-sided basin; conditions during the April 2018 field work revealed a basin completely filled with surface water. Surface water was present within the forested area at the eastern end of the wetland and other areas of the wetland exhibited saturated ground conditions.

At DP21, wetland hydrology was present and indicated by a High Water Table (A2) at nine inches in depth, Saturation (A3) at the surface and secondary indicators of Geomorphic Position (D2) and a positive FAC-Neutral Test (D5). Surface Water (A1) to a depth of 3 inches also was observed within 10 feet of the sampling point. These four primary and secondary indicators meet the wetland hydrology criterion at DP21.

Soils

The area is mapped as poorly drained Auburndale silt loam, a soil unit rated as hydric. At DP 21 (Wetland), a matrix of black (10YR2/1) silt loam overlaid a black (10YR2/1) sandy loam with reddish-brown (5YR4/4) redox concentrations, satisfying hydric soils indicator Redox Dark Surface (F6).

Wetland Boundary

The wetland boundary was determined by differences in vegetation, hydrology, soils, and at various points, a significant change in elevation. In transition to uplands, upland vegetation including white pine (*Pinus strobus*: FACU), Siberian elm (*Ulmus pumila*: FACU), and Kentucky blue grass (*Poa pratensis*: FACU) dominated, even as reed canary grass crossed the boundary at upland sampling point DP20. Elderberry (*Sambucus racemosa*: FACU) was present along the boundary within the eastern forested portion of the wetland. The lack of hydric soils and wetland hydrology indicators also determined the boundary.

A sharp topographic rise of about 4-5 feet accompanied the transition to uplands around the rim of the basin at the western end. Less significant topographic breaks were observed in other areas of the wetland.

(b) Wetland 10 (PFO1/Type 1)

Wetland 10 (W10) is a shallow basin populated with a forested community consisting of box elder, elm, and buckthorn. This closed basin receives sheet flow from the surrounding agricultural fields and has no outlets.

Topography varies little over the breadth of the wetland, which is largely enclosed by the 928-foot contour. Areas in the surrounding farm fields are just a few feet higher in elevation.

This area is mapped on the NWI as forested wetland (PFO1/Type 1). See Appendix B for NWI mapping.

Two data points (DP22 and DP23) were sampled on the north side of the wetland boundary. No vegetation disturbance due to management activities was noted. The locations of these points are shown on the Wetland Boundary Map provided in Appendix D; data sheets along with field photographs are presented in Appendix E.

Vegetation

Box elder and buckthorn, both facultative species, were co-dominants at wetland sampling point DP23. The herbaceous layer was not sampled due to lack of early season growth. Several dead standing elms were present within the central area of the wetland. The dominant species within the wetland are hydrophytic and meet the hydrophytic vegetation criterion.

Hydrology

Standing water was present within the central core of the wetland at the time of field work. Wetland hydrology was strongly present and indicated within W10. Primary indicators were Surface Water (A1) to a depth of 3 inches, High Water Table (A2) to a depth of 4 inches, and Saturation (A3) at the soil surface. Secondary indicators of wetland hydrology consisted of Geomorphic Position (D2) and a positive FAC-Neutral Test (D5). These five indicators satisfied the wetland hydrology criterion and sampling point DP23.

Soils

Soils mapping shows this forested area mapped on Freeon silt loam (2 to 6 percent slopes) and Santiago silt loam (2 to 6 percent slopes). Neither soil is rated as hydric. At wetland sampling point (DP23), a soil profile of black (10YR2/1) loam underlain by a depleted matrix of gray (10YR5/1) clay loam with strong brown (7.5YR4/6) redoximorphic features satisfied the Depleted Below Dark Surface (A11) and the Thick Dark Surface (A12) field indicators. The hydric soils criterion was satisfied with these indicators.

Wetland Boundary

The wetland boundary was determined by a transition to upland vegetation, a lack of hydric soils indicators, and a lack of wetland hydrology. At upland sampling point DP22, the hydrophytic vegetation crossed the boundary with box elder, buckthorn, and black cherry (*Prunus serotina*: FACU) dominating the tree and shrub layers. This assemblage of species, though, failed the Prevalence Index at 3.18. The herbaceous layer was not sampled due to early season growing conditions.

This sampling point was approximately 1-2 feet higher in elevation and this topographic difference was also a determinant of the boundary. Hydric soils indicators were absent at upland sampling point DP22 as were wetland hydrology indicators.

C. Uplands

Uplands within the AOI consisted primarily of cultivated fields in corn-soybean rotation. Dominant upland vegetation included Kentucky blue grass, white pine, Siberian elm, and black cherry. Transition to upland was marked by a lack of wetland hydrology and absence of hydric soils in many cases. Often, topographic breaks of 2-3 feet were associated with upland areas.

D. Summary

In summary, the AOI is primarily covered by silt loam and sandy loam soils, with several areas in agricultural production or in managed landscapes. Two wetlands were identified within the AOI: an extension to previously-identified Wetland 5 and Wetland 10, a new wetland investigated in this delineation. These wetlands are documented by four sampling points. The wetland boundary was determined by the observation of multiple indicators of wetland hydrology associated with wetland vegetation on soils exhibiting Depleted Below Dark Surface (A11), Thick Dark Surface (A12), and Redox Dark Surface (F6), in isolated depressional basins. Wetland hydrology was directly observed as Saturation (A3), High Water Table (A2), and/or Surface Water (A1) in both wetlands. The boundary determinations primarily relied on the absence of all three wetland criteria - lack of hydrophytic vegetation, wetland hydrology indicators, and hydric soils – as well as topographic breaks.

(1) Other waters

This AOI does not include any intermittent or perennial streams or navigable waters. No other water bodies were identified during the delineation.

4. Conclusion

A total of two separate wetland boundaries enclosing 1.212 acres were delineated within the AOI near the Runway 22 end at Lake Elmo Airport. The boundary and type information in this report supplements, and should be considered an addendum to, the previous delineation and functional assessment report completed in October 2017.

The information contained in this report confirms that tree removal within these wetlands will not change the Circular 39 wetland type, as stated by the Draft EA/EAW. Therefore, this report does not change the conclusions of the Draft EA/EAW.

On November 9, 2017, the local government unit (LGU) under the Minnesota Wetland Conservation Act (WCA), Valley Branch Watershed District (VBWD), issued a Notice of Decision concurring with the wetland boundaries and types identified in the October 2017 report. The MAC will request an update to this decision that incorporates the additional boundary and type information described in this report addendum for wetlands near the Runway 22 end.

5. Certification 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* (U.S. Army Corps of Engineers, 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

Brauna Hartzell
Wetland Ecologist & GIS Analyst

Date: June 2018

6. References

The following data sources were examined prior to fieldwork:

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

- MnGEO Geospatial Image Service. Minnesota Geospatial Information Office, Saint Paul, Minnesota. Accessed at http://geoint.lmic.state.mn.us/cgi-bin/wms.

- Minnesota State Climatology Office. Accessed at http://climateapps.dnr.state.mn.us/gridded_data/precip/monthly/monthly_gridded_precip.asp

- National Wetlands Inventory (with Minnesota Update) from the U.S. Fish and Wildlife Service at https://www.fws.gov/wetlands/data/mapper.html

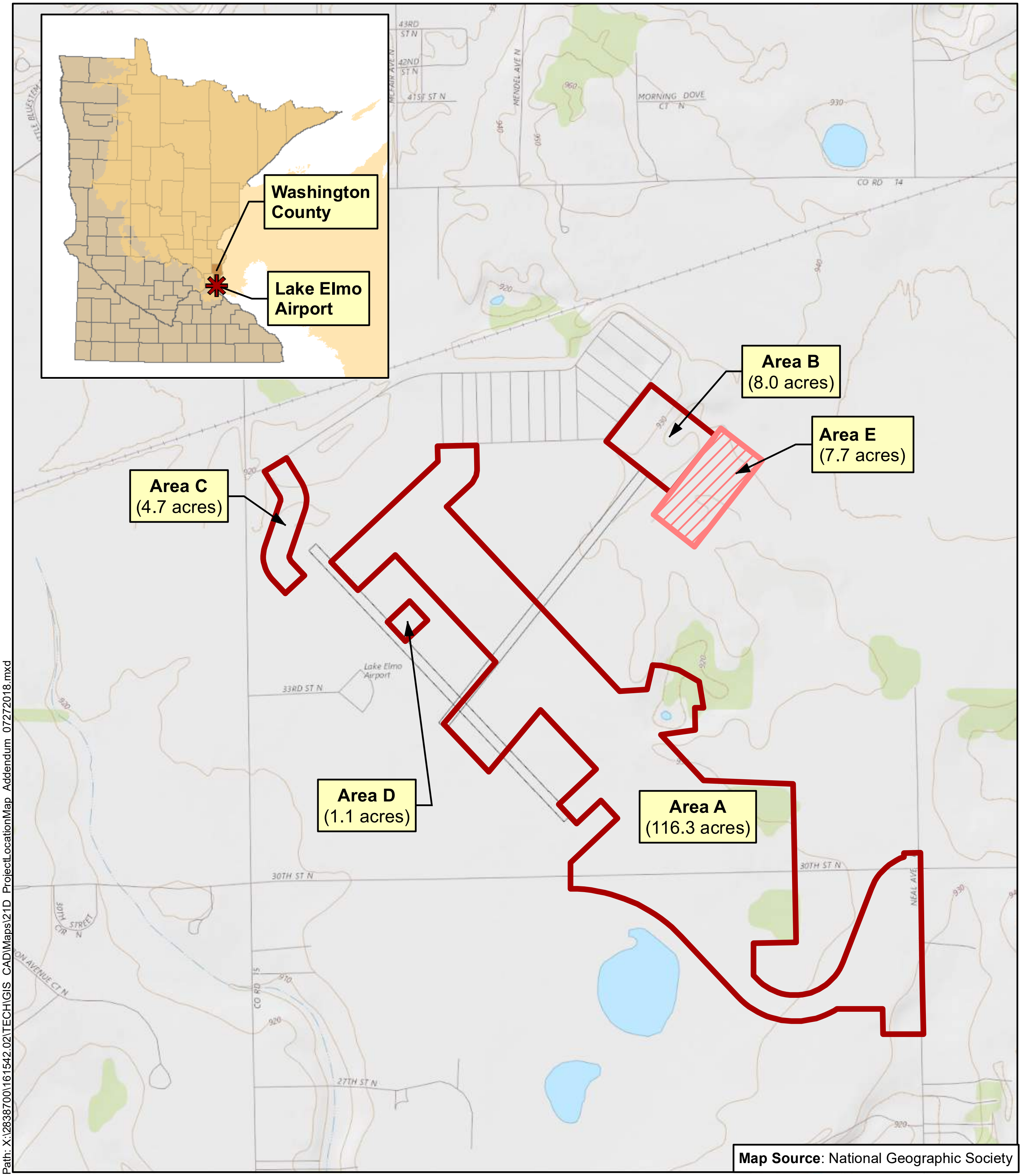
- Soils Survey of Washington County, MN, 2003. U.S. Department of Agriculture (USDA), Natural Resources Conservation Service, Web Soil Survey available online at http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx.

- U.S. Army Corps of Engineers, 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*. USACE, St. Paul District and Minnesota Board of Water and Soil Resources. Minneapolis, MN.

- U.S. Department of Agriculture (USDA), NRCS, 2016. *Field Indicators of Hydric Soils in the United States*, Version 8.0, ed. L.M. Vasilas, G.W. Hurt, and J.F. Berkowitz. USDA, NRCS in cooperation with the National Technical Committee for Hydric Soils.

Appendix A. Project Location and Topography Map



Path: X:\2838700\161542.02\TECH\GIS_CAD\Maps\21D_ProjectLocationMap_Addendum_07272018.mxd

Project Location and Topography

LAKE ELMO AIRPORT

Proposed Runway 14/32 Relocation
and Associated Improvements

Legend

2017 Area of Interest
2018 Area of Interest
LRR Subregion: K

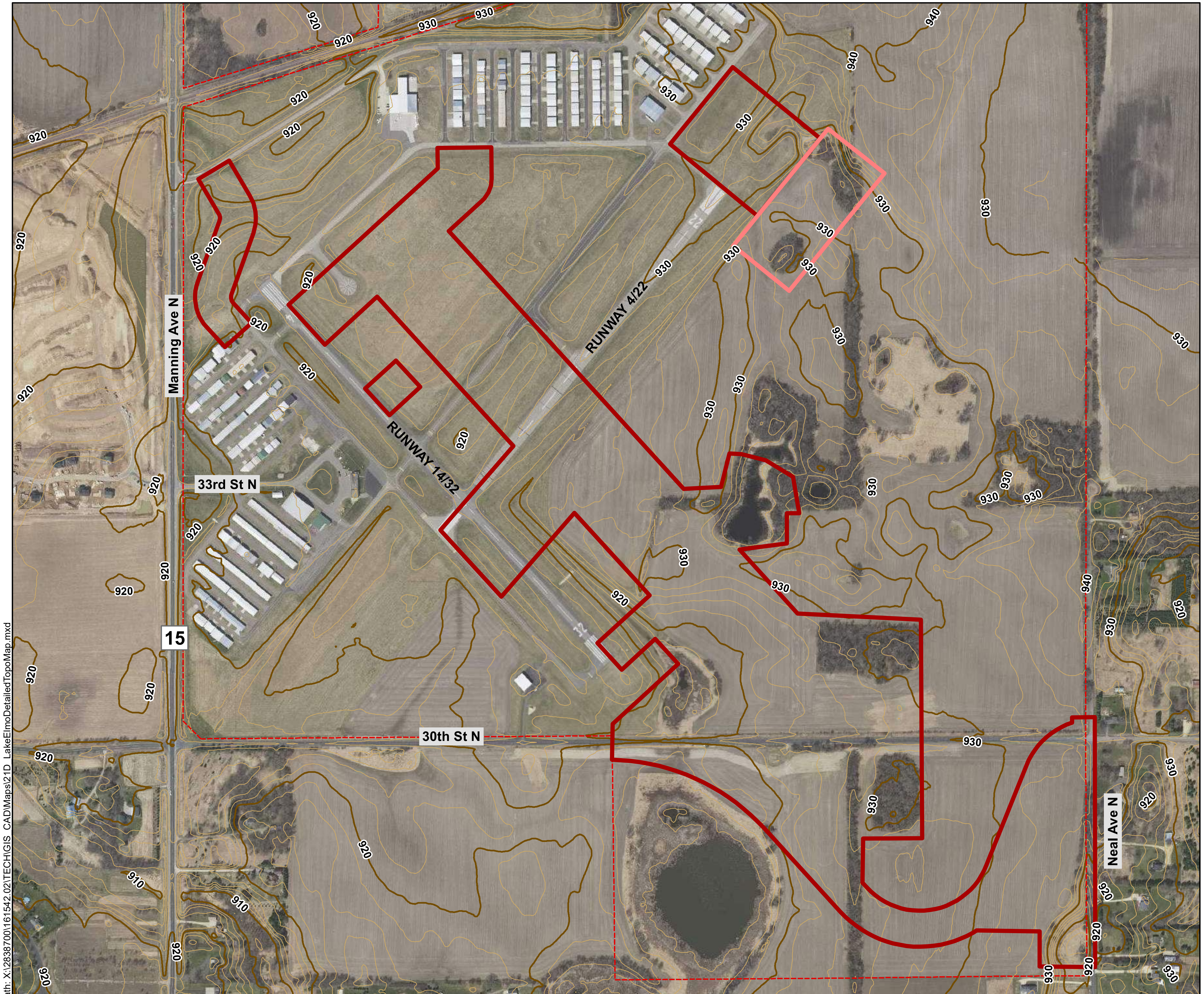
0 1,000 2,000 Feet

N

Project Location

T29N, R20W, S18 and S19
Baytown and West Lakeland Townships
Washington County, MN
LRR Subregion: K
USACE Regional Supplement: NC/NE
Area = 130.1 acres

Appendix B. Detailed Topographic Map, Aquatic Resources Map, and NRCS Soils Map



Detailed Topography Map

LAKE ELMO AIRPORT

Proposed Runway 14-32 Runway Shift

Legend

- Area of Interest (2017)
- Area of Interest (2018)
- Airport Property Boundary

Contour Elevation

- Index Contour
- Intermediate Contour

N

0 150 300 600 900 1,200 Feet

Note: Contour interval is 2 feet.

Project Information

T29N, R20W, S18 and S19
City of Lake Elmo
Washington County, MN
Area of Interest = 130.1 acres
Field work conducted:
June 5 - 9, 2017

Image Source: MnGEO WMS Image Service, Washington County (2016 color 7-county)

Contour Source:
Minnesota Geospatial Commons,
Minnesota Elevation Mapping Project
Twin Cities Metro Region 2011

Mead & Hunt

Path: X:\2838700\161542.02\TECH\GIS_CAD\Maps\21D_LakeElmoDetailedTopoMap.mxd

Path: X:\2838700\161542.02\TECH\GIS_CAD\Maps\21D_LakeElmoNWIMap.mxd

Aquatic Resources Map

National Wetlands Inventory (NWI),
Minnesota Public Waters, and
National Hydrography Dataset

LAKE ELMO AIRPORT

Proposed Runway 14-32 Runway Shift

Legend

- Area of Interest (2017)
- Area of Interest (2018)
- Airport Property Boundary
- MN Public Waters Basins
- Intermittent Stream (NHD)

WETLAND TYPE*

- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond

* Labeled with NWI classificaiton and Circular 39 Type

N

0 150 300 600 900 1,200 1,500 1,800 Feet

Project Information

T29N, R20W, S18 and S19
City of Lake Elmo
Washington County, MN
Area of Interest = 130.1 acres
Field work conducted:
June 5 - 9, 2017

Mead & Hunt

Wetland Data: National Wetland Inventory
Update for Minnesota, East-Central (2010-2011)

Mn Public Waters Data: Public Waters (PW) Basin
and Watercourse Delineations, Washington County,
MN Geospatial Commons

Stream Data: National Hydrography Dataset (NHD), USGS

Image Source: MnGEO WMS Image Service,
Washington County (2016 color 7-county)

Hydric Rating by Map Unit—Washington County, Minnesota
(Lake Elmo Airport Hydric Soils Rating)

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: Washington County, Minnesota
Survey Area Data: Version 12, Oct 4, 2017

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

Date(s) aerial images were photographed: Jul 1, 2013—Sep 13, 2016

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
49	Antigo silt loam, 0 to 2 percent slopes	0	2.0	20.2%
49B	Antigo silt loam, 2 to 6 percent slopes	0	0.6	5.8%
153B	Santiago silt loam, 2 to 6 percent slopes	0	1.9	19.2%
155B	Chetek sandy loam, 0 to 6 percent slopes	0	0.1	0.8%
155C	Chetek sandy loam, 6 to 12 percent slopes	0	1.3	13.0%
189	Auburndale silt loam, 0 to 2 percent slopes	95	0.7	7.1%
264	Freeon silt loam, 2 to 6 percent slopes	3	3.3	33.9%
Totals for Area of Interest			**9.9**	**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–MN163-Washington County, Minnesota					
Map symbol and map unit name	**Component/Local Phase**	**Comp. pct.**	**Landform**	**Hydric status**	**Hydric criteria met (code)**
49: Antigo silt loam, 0 to 2 percent slopes	Antigo	70-100	Terraces,flats	No	—
	Billyboy	0-15	Terraces,flats	No	—
	Sconsin	0-10	Terraces,flats	No	—
	Rosholt	0-10	Terraces,flats	No	—
	Ossmer	0-5	Terraces,flats	No	—
	Brill	0-5	Terraces,flats	No	—
49B: Antigo silt loam, 2 to 6 percent slopes	Antigo	70-100	Terraces,flats,hillslopes	No	—
	Rosholt	0-10	Terraces,flats,hillslopes	No	—
	Billyboy	0-10	Terraces,flats,hillslopes	No	—
	Sconsin	0-10	Terraces,flats,hillslopes	No	—
	Brill	0-5	Terraces,flats,hillslopes	No	—
	Ossmer	0-5	Terraces,flats,hillslopes	No	—
153B: Santiago silt loam, 2 to 6 percent slopes	Santiago	90	Moraines	No	—
	Freeon	5	—	No	—
	Kingsley	5	—	No	—
155B: Chetek sandy loam, 0 to 6 percent slopes	Chetek	90	Outwash plains	No	—
	Kingsley	5	—	No	—
	Poskin	5	—	No	—
155C: Chetek sandy loam, 6 to 12 percent slopes	Chetek	90	Pitted outwash plains	No	—
	Poskin	5	—	No	—
	Kingsley	5	—	No	—
189: Auburndale silt loam, 0 to 2 percent slopes	Auburndale	70-100	Depressions on ground moraines,drainageways on ground moraines	Yes	2,3
	Almena	0-10	Ground moraines	No	—

Hydric Soil List - All Components–MN163-Washington County, Minnesota					
Map symbol and map unit name	**Component/Local Phase**	**Comp. pct.**	**Landform**	**Hydric status**	**Hydric criteria met (code)**
	Capitola	0-10	Depressions on ground moraines,drainage ways on ground moraines	Yes	2,3
	Cathro	0-5	Depressions on ground moraines	Yes	1,3
	Auburndale-Briefly flooded	0-5	Drainageways on ground moraines	Yes	2
264: Freeon silt loam, 2 to 6 percent slopes	Freeon	75-95	Ground moraines,moraines	No	—
	Magnor	5-15	Ground moraines,moraines	No	—
	Santiago	0-5	Ground moraines,moraines	No	—
	Capitola	0-5	Depressions on ground moraines,drainage ways on ground moraines	Yes	2,3
	Haugen	0-5	Moraines	No	—
	Freeon-Very stony	0-5	Ground moraines,moraines	No	—

Data Source Information

Soil Survey Area: Washington County, Minnesota
Survey Area Data: Version 12, Oct 4, 2017

Appendix C. WETS Analysis and Climatic Data

WETS Analysis Worksheet

Project Name: **Lake Elmo Airport (21D) Runway 14/32 Relocation**
Period Of Interest: January - March
Station: **LAKE ELMO, MN (Gridded)**
County: Washington, MN
Normals Period: 1981 - 2010

Long-term rainfall records (MN State Climatology Office)

	Month	30% chance <	Normal	30% chance >
1st month prior:	April	2.10	2.81	3.23
2nd month prior:	March	1.48	1.85	2.08
3rd month prior:	February	0.49	0.80	0.94
		Sum =	**5.46**	

Site Determination†

Site Rainfall (in)	Condition (Dry/Normal*/Wet)	Condition** Value	Month Weight	Product
2.72	Normal	2	3	6
1.22	Dry	1	2	2
1.73	Wet	3	1	3
Sum = **5.67**			Sum***=	**11**

† MN State Climatology Office

* 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://www.ncdc.noaa.gov/cdo-web/datatools
Minnesota State Climatology Office (http://climateapps.dnr.state.mn.us/gridded_data/precip/wetland/wetland.asp)

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.

Precipitation data for target wetland location:

county: **Washington** township number: **29N**
township name: **Baytown** range number: **20W**
nearest community: **Lake Elmo** section number: **18**

Source: Minnesota State Climatology Office (http://climateapps.dnr.state.mn.us/gridded_data/precip/monthly/monthly_gridded_precip.asp)

precipitation totals are in inches

color key:
total is in lowest 30th percentile of the period-of-record distribution
total is => 30th and <= 70th percentile
total is in highest 30th percentile of the period-of-record distribution

multi-month totals:
WARM = warm season (May thru September)
ANN = calendar year (January thru December)
WAT = water year (Oct. previous year thru Sep. present year)

A 'R' following a monthly total indicates a provisional value derived from radar-based estimates.

Period-of-Record Summary Statistics															
	Jan	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*	*WARM*	*ANN*	*WAT*
30%	0.49	0.47	1.04	1.57	2.75	3.38	2.61	2.73	2.16	1.38	0.76	0.57	16.87	26.64	26.55
70%	1.10	1.11	2.06	2.92	4.21	5.49	4.50	4.80	4.27	2.91	1.85	1.37	21.53	32.69	33.06
mean	0.87	0.85	1.61	2.45	3.68	4.58	3.77	3.79	3.30	2.40	1.54	1.05	19.11	29.86	29.89
1981-2010 Summary Statistics															
	Jan	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*	*WARM*	*ANN*	*WAT*
30%	0.53	0.49	1.48	2.10	3.26	3.74	2.67	3.32	2.46	1.77	1.04	0.72	18.86	30.85	29.00
70%	1.18	0.94	2.08	3.23	4.05	5.73	4.67	5.45	4.39	3.95	2.25	1.50	21.95	35.12	36.02
mean	0.95	0.80	1.85	2.81	3.89	4.54	4.02	4.59	3.56	2.99	1.90	1.20	20.59	33.09	32.88
Year-to-Year Data															
Year	*Jan*	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*	*WARM*	*ANN*	*WAT*
2018	1.35														
2017	1.57	0.73	0.89	3.51	6.42	3.38	2.59	5.56	1.35	4.29	0.49	0.89	19.30	31.67	34.11
2016	0.42	0.88	2.17	2.80	2.87	4.59	5.57	9.03	6.12	3.31	2.29	2.51	28.18	42.56	46.10
2015	0.42	0.37	0.68	2.23	4.36	5.24	7.71	3.38	5.56	3.14	5.27	3.24	26.25	41.60	33.90
2014	1.28	1.41	0.93	7.01	4.82	11.46	2.55	3.68	2.31	1.66	1.23	1.06	24.82	39.40	41.64
2013	0.98	1.31	2.29	5.29	5.65	8.32	1.50	0.78	1.61	3.87	0.62	1.70	17.86	33.92	31.90
2012	0.66	1.68	1.65	3.49	6.77	3.38	5.29	1.47	0.56	1.33	0.80	2.04	17.47	29.12	27.38
2011	1.03	1.29	2.30	3.31	3.98	5.04	7.13	5.18	0.90	0.98	0.49	0.96	22.23	32.59	37.81
2010	0.61	0.86	0.65	2.07	3.80	5.76	5.06	5.84	6.28	2.22	2.47	2.96	26.74	38.58	40.22
2009	0.49	1.12	1.28	1.54	0.77	4.17	2.59	6.96	0.63	6.84	0.39	2.06	15.12	28.84	24.66
2008	0.23	0.56	2.12	4.41	3.23	4.35	2.85	3.99	2.49	2.32	1.31	1.48	16.91	29.34	30.63
2007	0.72	1.15	3.24	1.50	3.76	1.36	1.54	6.40	5.19	4.51	0.08	1.81	18.25	31.26	28.24
2006	1.10	0.27	2.07	3.71	3.15	2.22	1.89	8.51	3.60	0.65	0.98	1.75	19.37	29.90	35.52
2005	1.37	1.15	1.61	2.32	3.66	5.97	3.13	5.39	4.89	6.32	1.31	1.37	23.04	38.49	34.47
2004	0.47	1.58	2.05	2.42	5.98	3.76	2.61	1.94	3.69	3.22	1.25	0.51	17.98	29.48	27.56
2003	0.21	0.87	1.72	2.11	7.23	5.72	2.70	0.72	2.65	1.08	1.09	0.89	19.02	26.99	29.09
2002	0.55	0.72	2.49	3.84	3.70	8.96	5.78	6.03	4.32	4.87	0.03	0.26	28.79	41.55	40.81
2001	1.26	1.35	0.96	7.45	3.92	5.88	1.80	3.29	3.61	1.36	2.51	0.55	18.50	33.94	37.23
2000	1.02	1.28	1.23	1.52	5.88	4.51	3.96	5.20	2.38	2.05	4.29	1.37	21.93	34.69	29.28
1999	1.87	0.60	1.56	3.81	5.96	4.84	3.44	5.58	2.16	0.90	0.88	0.52	21.98	32.12	35.47
	Jan	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*	*WARM*	*ANN*	*WAT*
1998	1.94	0.90	3.73	2.74	4.18	6.71	2.18	5.10	1.45	3.22	1.75	0.68	19.62	34.58	32.73
1997	1.75	0.19	1.50	0.82	1.93	4.52	8.23	3.97	3.00	2.37	1.06	0.37	21.65	29.71	37.19
1996	2.45	0.28	1.96	0.80	3.71	4.50	3.15	1.77	2.04	4.27	5.21	1.80	15.17	31.94	28.60
1995	0.45	0.25	2.71	2.77	3.72	4.78	5.29	6.80	1.18	6.03	0.87	1.04	21.77	35.89	35.62

1994	1.37	0.82	0.44	4.62	1.99	3.17	4.64	4.75	4.55	5.18	1.92	0.57	19.10	34.02	30.42
1993	1.52	0.32	1.07	3.11	3.94	7.26	4.28	9.64	2.56	1.28	2.01	0.78	27.68	37.77	40.05
1992	1.15	0.51	1.83	2.49	1.06	4.04	6.87	3.02	5.19	2.48	2.63	1.24	20.18	32.51	33.99
1991	0.36	0.88	3.13	2.88	8.16	3.70	4.37	4.04	6.59	1.84	5.20	0.79	26.86	41.94	37.35
1990	0.20	0.63	3.67	4.22	4.40	8.88	4.75	2.54	2.36	1.61	0.58	1.05	22.93	34.89	34.39
1989	0.60	0.69	1.94	2.65	3.67	3.03	5.27	2.93	2.93	0.86	1.45	0.43	17.83	26.45	28.33
1988	1.05	0.24	1.51	0.98	3.28	0.45	1.51	4.16	4.87	0.95	2.90	0.77	14.27	22.67	23.16
1987	0.32	0.01	0.37	0.19	2.08	2.12	11.08	3.19	1.47	1.41	2.16	1.54	19.94	25.94	24.37
1986	0.70	0.70	1.59	5.85	3.99	6.14	5.13	3.76	7.69	2.22	1.01	0.31	26.71	39.09	42.92
1985	0.68	0.43	2.49	2.45	5.26	3.45	2.43	5.32	6.37	3.91	1.93	1.53	22.83	36.25	37.20
1984	0.80	1.52	1.44	2.93	2.97	6.38	3.19	3.72	3.11	5.68	0.67	1.97	19.37	34.38	35.22
1983	0.61	1.05	2.64	3.04	3.45	4.03	4.29	3.33	4.04	3.01	4.71	1.44	19.14	35.64	36.94
1982	2.33	0.31	1.70	1.67	4.55	1.65	2.00	3.26	3.34	4.03	2.97	3.46	14.80	31.27	25.97
1981	0.23	2.68	0.67	3.52	3.17	4.02	4.52	6.61	2.02	3.10	1.32	0.74	20.34	32.60	28.78
1980	1.16	0.65	1.13	1.23	2.61	7.33	2.53	6.20	5.41	0.84	0.24	0.26	24.08	29.59	33.10
1979	1.20	1.46	3.43	0.90	4.42	6.81	3.71	7.06	2.65	2.89	1.60	0.36	24.65	36.49	34.58
	Jan	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*	*WARM*	*ANN*	*WAT*
1978	0.33	0.20	0.53	3.82	4.24	5.69	8.41	5.65	2.62	0.29	1.70	0.95	26.61	34.43	36.90
1977	0.63	1.00	3.40	2.42	3.20	5.19	4.24	7.14	5.39	2.83	1.38	1.20	25.16	38.02	33.62
1976	0.86	0.63	3.31	1.10	0.55	3.31	2.33	1.31	1.86	0.57	0.08	0.36	9.36	16.27	21.69
1975	2.86	0.52	1.37	6.58	4.89	9.20	3.58	6.15	1.29	0.51	4.80	1.12	25.11	42.87	39.95
1974	0.20	1.02	0.69	2.30	2.65	3.85	1.42	4.47	1.13	1.61	1.43	0.47	13.52	21.24	22.76
1973	0.82	0.65	1.38	2.10	6.06	3.75	3.06	5.41	3.54	2.32	1.53	1.18	21.82	31.80	32.57
1972	0.97	0.47	0.80	1.93	1.73	2.80	6.59	5.34	3.54	3.05	1.32	1.43	20.00	29.97	32.77
1971	0.86	1.39	0.60	0.76	3.82	4.17	3.68	2.17	3.93	5.74	2.15	0.71	17.77	29.98	32.24
1970	0.42	0.11	2.05	2.99	4.47	2.89	2.94	2.85	4.96	6.24	3.97	0.65	18.11	34.54	29.19
1969	2.26	0.31	0.79	1.18	1.71	3.30	3.17	0.72	0.85	2.85	0.82	1.84	9.75	19.80	23.11
1968	0.70	0.12	1.45	3.42	3.59	7.05	4.48	1.63	5.97	5.50	0.77	2.55	22.72	37.23	30.70
1967	2.84	1.10	0.92	2.92	1.61	9.03	2.16	2.77	1.04	1.80	0.14	0.35	16.61	26.68	28.51
1966	0.70	1.19	2.77	1.02	1.44	3.29	2.86	3.57	2.31	3.04	0.31	0.77	13.47	23.27	24.44
1965	0.40	1.62	3.18	3.61	3.97	8.41	5.46	2.63	5.03	1.18	2.36	1.75	25.50	39.60	36.40
1964	0.58	0.03	1.25	3.28	3.79	1.69	1.96	5.84	4.77	0.59	0.73	0.77	18.05	25.28	25.66
1963	0.51	0.42	1.26	2.41	3.91	3.04	2.74	1.86	4.02	0.97	0.67	0.83	15.57	22.64	23.11
1962	0.58	1.66	1.85	1.45	6.18	3.61	5.65	4.39	3.30	2.09	0.49	0.36	23.13	31.61	34.85
1961	0.10	0.90	2.83	3.11	4.00	2.46	3.57	1.86	2.91	3.15	1.57	1.46	14.80	27.92	24.75
1960	0.47	0.22	0.53	2.84	4.20	4.06	1.50	4.97	3.44	1.02	1.22	0.77	18.17	25.24	27.02
1959	0.06	0.44	0.41	1.02	5.55	1.87	2.54	6.52	2.83	2.63	0.52	1.64	19.31	26.03	24.79
	Jan	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*	*WARM*	*ANN*	*WAT*
1958	0.25	0.03	0.37	2.84	1.27	2.50	4.86	3.43	1.46	2.46	0.96	0.13	13.52	20.56	20.43
1957	0.24	0.59	1.19	1.54	4.20	7.69	6.44	5.04	2.14	1.30	1.83	0.29	25.51	32.49	33.01
1956	0.45	0.22	1.82	0.73	2.82	7.51	4.52	5.83	0.85	2.27	1.54	0.13	21.53	28.69	29.46
1955	0.46	1.36	0.51	1.15	1.65	4.47	5.66	4.55	0.82	2.70	0.94	1.07	17.15	25.34	23.53
1954	0.31	0.44	2.23	4.35	5.42	5.14	2.72	3.63	4.50	1.67	0.71	0.52	21.41	31.64	32.59
1953	0.64	1.76	2.15	2.34	2.35	6.24	4.49	3.15	0.92	0.06	2.07	1.72	17.15	27.89	25.53
1952	1.03	1.20	2.50	1.48	3.20	4.88	3.37	3.89	0.42	0.03	1.00	0.46	15.76	23.46	27.15
1951	0.48	1.38	3.00	2.52	3.68	6.64	5.62	3.64	7.73	1.62	2.17	1.39	27.31	39.87	38.75
1950	1.65	0.86	2.91	2.69	3.24	1.98	3.71	2.73	1.73	1.77	0.71	1.58	13.39	25.56	25.41
1949	1.86	0.22	3.17	2.02	1.78	3.61	5.94	1.72	3.02	1.94	0.57	1.40	16.07	27.25	27.52
1948	0.20	1.84	1.05	2.16	1.17	2.76	5.33	3.32	0.73	0.61	2.59	0.98	13.31	22.74	22.21

1947	0.61	0.29	0.55	3.36	2.22	4.85	1.24	2.94	2.55	0.79	2.16	0.70	13.80	22.26	24.10
1946	1.19	1.14	1.41	0.90	2.54	7.47	2.80	0.74	6.15	3.22	1.40	0.87	19.70	29.83	27.45
1945	0.62	1.88	3.00	3.76	3.07	6.71	4.70	3.80	2.39	0.36	1.29	1.46	20.67	33.04	32.63
1944	0.52	1.04	1.30	2.06	5.98	6.19	2.99	3.08	1.02	0.29	2.16	0.25	19.26	26.88	27.06
1943	1.20	0.47	1.20	1.35	5.00	4.67	3.80	2.22	2.24	1.45	1.43	0.00	17.93	25.03	24.69
1942	0.13	0.28	1.94	3.15	7.79	3.99	5.24	2.72	8.81	0.95	0.49	1.10	28.55	36.59	41.48
1941	0.96	0.97	1.20	1.48	4.11	3.56	2.76	3.51	4.30	5.37	1.05	1.01	18.24	30.28	30.14
1940	0.32	1.11	2.66	1.70	2.26	7.02	3.50	4.97	0.33	1.88	4.04	1.37	18.08	31.16	27.07
1939	1.22	1.48	0.67	2.07	3.31	5.23	3.01	4.68	3.38	2.06	0.09	1.05	19.61	28.25	28.66
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	WARM	ANN	WAT
1938	0.79	0.46	2.06	3.67	10.20	4.81	3.71	3.88	4.91	1.09	1.76	0.76	27.51	38.10	37.44
1937	1.06	0.59	0.59	2.22	4.86	2.59	2.07	4.37	2.61	1.51	0.80	0.64	16.50	23.91	24.04
1936	0.70	1.27	2.23	1.14	2.51	1.71	0.03	2.92	1.33	0.56	0.76	1.76	8.50	16.92	19.15
1935	1.38	0.14	1.23	2.38	3.34	3.89	3.34	3.35	1.87	3.42	1.09	0.80	15.79	26.23	28.17
1934	0.83	0.19	0.57	2.04	0.44	2.45	2.13	1.96	5.54	3.87	1.71	1.67	12.52	23.40	18.86
1933	1.10	0.74	1.88	1.57	5.81	1.90	2.41	1.03	4.70	1.37	0.72	0.62	15.85	23.85	26.07
1932	1.67	0.83	1.23	2.61	2.32	2.62	2.88	3.31	1.05	0.95	2.45	1.53	12.18	23.45	25.11
1931	0.14	0.80	1.44	1.57	1.34	3.72	0.72	3.70	3.22	2.47	3.45	0.67	12.70	23.24	21.19
1930	0.98	1.86	0.58	0.69	3.96	6.20	2.89	0.63	3.73	1.91	2.48	0.15	17.41	26.06	24.27
1929	1.49	0.86	1.00	2.11	2.14	3.09	3.65	2.26	3.86	1.87	0.44	0.44	15.00	23.21	24.84
1928	0.34	1.24	0.61	2.72	2.24	3.53	4.00	6.33	2.48	3.56	0.36	0.46	18.58	27.87	29.29
1927	0.49	0.28	2.24	2.20	4.15	5.39	2.46	2.21	4.34	2.16	1.60	2.04	18.55	29.56	29.09
1926	0.64	0.68	1.48	0.72	1.10	3.80	3.16	3.91	5.85	2.16	2.05	1.12	17.82	26.67	23.55
1925	0.44	0.50	0.46	1.33	1.85	5.85	3.82	0.19	3.82	0.80	0.63	0.78	15.53	20.47	21.29
1924	0.51	0.74	1.12	3.53	1.44	5.52	2.42	6.65	3.65	1.29	0.69	1.05	19.68	28.61	27.68
1923	1.07	0.40	0.88	1.78	2.78	4.83	2.48	2.05	2.41	1.10	0.43	0.57	14.55	20.78	23.28
1922	0.69	2.30	1.57	2.03	2.99	5.48	2.55	1.62	2.13	0.91	3.59	0.10	14.77	25.96	23.72
1921	0.43	0.37	1.71	2.18	3.47	3.71	4.22	2.02	4.82	0.58	1.45	0.33	18.24	25.29	27.44
1920	1.67	0.46	2.46	2.14	3.14	8.40	1.49	1.55	2.57	2.46	1.35	0.70	17.15	28.39	29.38
1919	0.38	1.77	1.00	3.46	1.93	4.13	6.26	2.34	2.07	2.38	2.58	0.54	16.73	28.84	30.70
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	WARM	ANN	WAT
1918	0.54	0.63	0.59	0.94	5.01	2.65	4.09	4.06	1.58	2.31	3.36	1.69	17.39	27.45	22.76
1917	1.64	0.65	2.46	1.93	3.59	3.75	4.26	2.45	2.05	2.15	0.06	0.46	16.10	25.45	25.95
1916	2.41	0.52	1.05	3.32	6.15	5.04	0.73	2.05	2.76	1.58	0.76	0.83	16.73	27.20	30.42
1915	1.00	1.98	0.80	1.39	3.62	5.31	4.89	3.56	2.91	2.61	3.28	0.50	20.29	31.85	28.02
1914	0.78	0.40	1.07	3.34	1.80	8.89	1.73	6.31	2.88	1.87	0.34	0.35	21.61	29.76	31.19
1913	0.41	0.65	1.84	2.07	3.38	2.48	7.19	1.48	4.26	3.19	0.76	0.04	18.79	27.75	27.16
1912	0.42	0.26	0.34	2.47	5.52	1.02	5.25	5.82	2.17	1.44	0.26	1.70	19.78	26.67	33.51
1911	0.83	0.82	1.12	2.26	3.67	5.96	4.53	3.66	5.51	7.12	1.33	1.79	23.33	38.60	30.43
1910	0.88	0.46	0.04	0.68	1.56	1.49	1.64	1.89	2.08	1.02	0.55	0.50	8.66	12.79	17.95
1909	1.15	1.63	0.55	2.20	3.37	3.72	4.30	2.28	4.66	2.06	3.40	1.77	18.33	31.09	28.53
1908	0.37	0.96	1.81	3.77	7.44	7.22	2.14	0.86	3.87	2.62	1.00	1.05	21.53	33.11	31.02
1907	1.20	0.87	0.79	1.18	1.82	3.74	3.58	5.65	5.30	1.04	0.97	0.57	20.09	26.71	30.14
1906	1.72	0.30	1.34	2.34	9.12	3.37	2.86	3.19	4.55	2.30	2.63	1.08	23.09	34.80	34.60
1905	0.66	0.65	0.99	0.62	4.47	7.02	3.46	5.85	4.90	2.72	2.79	0.30	25.70	34.43	35.16
1904	0.38	0.69	1.43	1.45	3.38	4.42	4.47	4.92	4.03	5.62	0.10	0.82	21.22	31.71	29.61
1903	0.28	0.72	1.77	3.10	5.85	0.87	6.41	4.78	9.08	3.47	0.35	0.62	26.99	37.30	39.62
1902	0.53	0.53	0.50	2.62	4.57	2.17	6.77	4.90	3.86	1.99	2.62	2.15	22.27	33.21	29.16
1901	0.51	0.34	2.30	1.29	1.31	5.97	2.17	2.81	4.65	1.38	0.81	0.52	16.91	24.06	27.23

1900	0.77	1.08	1.57	1.81	0.33	2.26	7.27	6.08	6.60	4.44	0.84	0.60	22.54	33.65	33.61
1899	1.27	1.93	2.72	0.90	3.73	5.20	1.71	4.07	1.79	3.79	0.67	1.38	16.50	29.16	30.45
	Jan	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*	*WARM*	*ANN*	*WAT*
1898	0.19	1.51	2.13	1.27	4.24	3.07	2.74	2.68	0.76	5.26	1.83	0.04	13.49	25.72	22.39
1897	1.80	1.20	3.07	1.26	1.95	7.10	5.01	2.45	2.92	2.52	1.13	0.15	19.43	30.56	34.60
1896	0.83	0.17	2.44	5.00	3.93	3.05	1.53	2.80	2.71	3.52	3.54	0.78	14.02	30.30	23.93
1895	1.16	0.57	0.41	1.75	3.56	3.52	4.04	1.85	4.39	0.10	1.02	0.35	17.36	22.72	27.61
1894	1.11	0.21	2.42	3.95	4.64	1.83	0.15	0.57	1.85	4.69	0.54	1.13	9.04	23.09	22.53
1893	0.98	2.01	2.15	4.41	2.44	1.68	2.03	4.17	2.72	1.87	1.04	2.89	13.04	28.39	24.58
1892	0.12	1.68	1.00	1.24	6.01	7.15	9.64	3.70	1.92	0.68	0.60	0.71	28.42	34.45	38.63
1891	1.26	1.71	1.82	2.33	1.34	4.19	2.80	3.12	1.77	1.58	0.86	3.73	13.22	26.51	

Minnesota State Climatology Office

State Climatology Office - DNR Division of Ecological and Water Resources University of Minnesota

Nearest Station Precipitation Data Retrieval

Minnesota's precipitation data archive is searched for data closest to a selected target location for each month. Values from the site closest to the target location are returned below after clicking the ***retrieve monthly data*** or ***retrieve daily data*** buttons. The precipitation data are made up of measured rainfall and the measured liquid content of snowfall.

Temperature, **snowfall**, and **snow depth** data from National Weather Service reporting stations are no longer retrieved from this application. To obtain those data, see our newest data retrieval tool (May 2014). National Weather Service precipitation data continue to be available from this application.

Obtaining data for legal purposes
Guide for column headers in the data table

target location: Washington-Baytown-Lake Elmo 29N 20W S18 (latitude: 44.99844 longitude: 92.85172)

click to select target location

years: 2018 ▼ to 2018 ▼

number of **missing days** allowed per month: 3

retrieve monthly data retrieve daily data

results:

```
    Target: T29 R20 S18
mon year  cc tttN rrW ss nnnn oooooooo  pre (inches)                          dis
Jan 2018  82  29N 20W 29 SWCD          1.52                                 2 mi.
Feb 2018  82  29N 20W 29 SWCD          1.73                                 2 mi.
Mar 2018  82  29N 20W 29 SWCD          1.22                                 2 mi.
Apr 2018  82  29N 20W 29 SWCD          2.72                                 2 mi.
May 2018  82  29N 20W 29 SWCD          3.13                                 2 mi.
Jun 2018                    m                           999 mi.
Jul 2018                    m                           999 mi.
Aug 2018                    m                           999 mi.
Sep 2018                    m                           999 mi.
Oct 2018                    m                           999 mi.
Nov 2018                    m                           999 mi.
Dec 2018                    m                           999 mi.
```

Where indicated: Missing values are shown as 'm'. Days on which precip accumulated in the gage are shown as '-'. 'TTTT RR SS' is the 'public land survey(PLS)' or 'legal' location of the observed data. Section values greater 36 are SECTIC 'TIC' locations plus 100. 'NWS ID' the National Weather Service Cooperative station number. Note that the 'PLS' will always be correct for precipitation data while the 'NWS ID' will always be correct for the temperature data. If no PLS info is supplied the the 'NWS ID' number applies to all shown data.

State Climatology Office - MnDNR - Ecological and Water Resources

WETS Station: MINNEAPOLIS/ ST PAUL AP, MN

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	22.3	5.6	14.0	0.92	0.51	1.12	3	11.8
Feb	28.0	11.6	19.8	0.79	0.50	0.95	3	8.5
Mar	40.5	23.7	32.1	1.82	1.23	2.18	5	10.5
Apr	57.4	36.9	47.2	2.51	1.51	3.04	6	3.0
May	69.6	48.6	59.1	3.23	2.26	3.83	7	0.0
Jun	78.9	58.4	68.6	4.34	2.87	5.20	8	0.0
Jul	83.6	63.8	73.7	3.72	2.26	4.51	6	0.0
Aug	80.5	61.3	70.9	4.26	2.93	5.08	6	0.0
Sep	71.5	51.7	61.6	2.88	1.89	3.46	6	0.0
Oct	58.1	39.4	48.8	2.26	1.18	2.76	4	0.6
Nov	41.1	25.9	33.5	1.72	0.80	2.10	4	8.5
Dec	26.7	11.8	19.3	1.06	0.61	1.28	3	11.7
Annual:					26.12	32.31		
Average	54.9	36.6	45.7	-	-	-	-	-
Total	-	-	-	29.50			61	54.5

GROWING SEASON DATES

Years with missing data:	24 deg = 0	28 deg = 0	32 deg = 0
Years with no occurrence:	24 deg = 0	28 deg = 0	32 deg = 0
Data years used:	24 deg = 40	28 deg = 40	32 deg = 40
Probability	24 F or higher	28 F or higher	32 F or higher
50 percent *	4/5 to 11/4: 213 days	4/13 to 10/19: 189 days	4/28 to 10/8: 163 days
70 percent *	4/1 to 11/9: 222 days	4/8 to 10/24: 199 days	4/24 to 10/12: 171 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
1938				3.27	6.97	2.96	3.36	3.45	3.24	0.84	1.29	0.77	26.15
1939	1.06	0.88	0.61	2.19	3.55	4.95	2.75	3.65	2.31	1.56	0.02	0.97	24.50
1940	0.37	0.91	2.16	1.21	1.64	7.10	2.46	4.54	0.41	1.57	5.15	1.02	28.54
1941	0.74	0.89	0.77	1.87	2.91	3.29	1.98	3.66	3.47	5.52	1.05	0.85	27.00
1942	0.15	0.45	1.74	3.41	6.78	2.69	3.80	2.11	7.53	0.78	0.27	0.85	30.56
1943	0.91	0.57	0.81	0.98	4.27	4.23	3.78	1.75	2.47	1.30	1.64	T	22.71
1944	0.24	1.10	1.20	2.24	6.15	6.69	4.39	3.65	0.97	0.26	2.10	0.09	29.08
1945	0.63	1.84	1.95	2.95	3.09	5.57	4.13	2.27	2.13	0.30	0.92	1.41	27.19
1946	0.94	1.15	1.20	0.66	3.04	7.80	2.76	0.43	6.	2.	1.	0.	28.

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Global Summary of the Month for 2018

Generated on 05/31/2018

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Current Location: Elev: 980 ft. Lat: 44.9305° N Lon: -92.9249° W
Station: **WOODBURY 1.7 N, MN US US1MNWG0016**

Date	Temperature (F)													Precipitation (Inches)								
Elem ->	TAVG	TMAX	TMIN	HTDD	CLDD	EMXT		EMNT		DX90	DX32	DT32	DT00	PRCP	EMXP		SNOW	EMSD		DP01	DP10	DP1X
										Number of Days					Greatest Observed		Snow, Sleet			Number of Days		
Month	Mean	Mean Max.	Mean Min	Heating Degree Days	Cooling Degree Days	Highest	High Date	Lowest	Low Date	Max >= 90	Max <= 32	Min <= 32	Min <= 0	Total	Amount	Date	Total Fall	Max Depth	Max Date	>=.01	>=.10	>=1.0
Jan														1.27	0.99	23	18.6			4	3	0
Feb														1.69	0.59	25	15.8			7	4	0
Mar														1.58	0.63	06	11.2			8	5	0
Apr														3.13	1.21	15	25.7			8	5	1

Notes

(Blank) Data element not reported or missing.

\+ Occurred on one or more previous dates during the month. The date in the Date field is the last day of occurrence.

A Accumulated amount.

X Monthly means or totals based on incomplete time series.

T Trace Amount.

ESTIMATING THE WATER EQUIVALENT OF SNOW

When the water equivalent of snow cannot be accurately measured by melting, weighing, or core sampling; the observer shall estimate the water equivalent to the nearest 0.01 inch. Use Figure 11-8, New Snowfall to Estimated Meltwater Conversion Table, only as a guide in estimating the water equivalency of newly fallen snow.

New Snowfall to Estimated Meltwater Conversion Table

MELT WATER EQUIVALENT (INCHES)	**NEW SNOWFALL** (INCHES)						
	Temperature (°F)						
	34 to 28	27 to 20	19 to 15	14 to 10	9 to 0	-1 to -20	-21 to -40
trace	trace	0.1	0.2	0.3	0.4	0.5	1.0
.01	0.1	0.2	0.2	0.3	0.4	0.5	1.0
.02	0.2	0.3	0.4	0.6	0.8	1.0	2.0
.03	0.3	0.5	0.6	0.9	1.2	1.5	3.0
.04	0.4	0.6	0.8	1.2	1.6	2.0	4.0
.05	0.5	0.8	1.0	1.5	2.0	2.5	5.0
.06	0.6	0.9	1.2	1.8	2.4	3.0	6.0
.07	0.7	1.1	1.4	2.1	2.8	3.5	7.0
.08	0.8	1.2	1.6	2.4	3.2	4.0	8.0
.09	0.9	1.4	1.8	2.7	3.6	4.5	9.0
.10	1.0	1.5	2.0	3.0	4.0	5.0	10.0
.11	1.1	1.7	2.2	3.3	4.4	5.5	11.0
.12	1.2	1.8	2.4	3.6	4.8	6.0	12.0
.13	1.3	2.0	2.6	3.9	5.2	6.5	13.0

.14	1.4	2.1	2.8	4.2	5.6	7.0	14.0
.15	1.5	2.3	3.0	4.5	6.0	7.5	15.0
.16	1.6	2.4	3.2	4.8	6.4	8.0	16.0
.17	1.7	2.6	3.4	5.1	6.8	8.5	17.0
.18	1.8	2.7	3.6	5.4	7.2	9.0	18.0
.19	1.9	2.9	3.8	5.7	7.6	9.5	19.0
.20	2.0	3.0	4.0	6.0	8.0	10.0	20.0
.21	2.1	3.1	4.2	6.3	8.4	10.5	21.0
.22	2.2	3.3	4.4	6.6	8.8	11.0	22.0
.23	2.3	3.4	4.6	6.9	9.2	11.5	23.0
.24	2.4	3.6	4.8	7.2	9.6	12.0	24.0
.25	2.5	3.8	5.0	7.5	10.0	12.5	25.0
.30	3.0	4.5	6.0	9.0	12.0	15.0	30.0
.35	3.5	5.3	7.0	10.5	14.0	17.5	35.0
.40	4.0	6.0	8.0	12.0	16.0	20.0	40.0
.45	4.5	6.8	9.0	13.5	18.0	22.5	45.0
.50	5.0	7.5	10.0	15.0	20.0	25.0	50.0
.60	6.0	9.0	12.0	18.0	24.0	30.0	60.0
.70	7.0	10.5	14.0	21.0	28.0	35.0	70.0

.80	8.0	12.0	16.0	24.0	32.0	40.0	80.0
.90	9.0	13.5	18.0	27.0	36.0	45.0	90.0
1.00	10.0	15.0	20.0	30.0	40.0	50.0	100.0
2.00	20.0	30.0	40.0	60.0	80.0	100.0	200.0
3.00	30.0	45.0	60.0	90.0	120.0	150.0	300.0

This figure can only be used in determining amounts of newly fallen snow. It cannot be used for determining the water equivalency (933RRR) of "old" snow. Packing and melting/refreezing have substantial effects on the density of the snow pack and are not accounted for by this figure.

Appendix D. Wetland Boundary Map

Wetland Boundary Map Addendum

LAKE ELMO AIRPORT

Proposed Runway 14-32 Runway Shift

Legend

- Photo Location (2018)
- Data Point Location (2018)
- Wetland Boundary (2018)
- 2017 Area of Interest
- 2018 Area of Interest
- Photo Location (2017)
- Data Point Location (2017)
- Wetland Boundary (2017)
- Wetland within AOI
- Wetland outside AOI
- Culvert End Location
- Flow Direction
- Ditch/Swale Flow
- Airport Property Boundary

N

0 50 100 200 300 Feet

Elevation contour interval is 2 feet

Project Information

T29N, R20W, S18 and S19
City of Lake Elmo
Washington County, MN
Area of Interest = 130.1 acres
Field work conducted:
June 5 - 9, 2017;
April 27 and 29, 2018

Mead &Hunt

Image Source: MnGEO WMS Image Service, Washington County (2016 color 7-county)
Contour Source: Minnesota Geospatial Commons, Minnesota Elevation Mapping Project Twin Cities Metro Region 2011

Path: X:\2838700\161542.02\TECH\GIS_CAD\Maps\21D_LakeElmoWetlandBoundaryMaps1500_Addendum_04272018.mxd

Appendix E. Data Sheets with Field Photographs

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Lake Elmo airport (21D) Runway 14/32 Relocation City/County: Washington Sampling Date: 04/27/2018
Applicant/Owner: Metropolitan Airports Commission State: Minnesota Sample Point: DP 20
Investigator(s): Brauna Hartzell, Mead & Hunt, Inc. Section, Township, Range: Section 18, T29N, R20W
Landform (hillslope, terrace, etc.): backslope Local relief (concave, convex, none): convex Slope (%): < 1%
Subregion (LRR or MLRA): K/153 Lat: 45.001641 Long: -92.848589 Datum: NAD 83
Soil Map Unit Name: Auburndale silt loam, 0 – 2 percent slopes (189) NWI classification: ______
Are climatic hydrologic conditions on the site typical for this time of year? Yes ☐ No ☒ (If no, explain in Remarks.)
Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? **Yes** ☒ **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 ☒
Hydric Soil Present?	Yes ☐	No ☒
Wetland Hydrology Present?	Yes ☐	No ☒

Is the Sampled Area within a Wetland? **Yes** ☐ **No** ☒
If yes, optional Wetland Side ID: _____

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

VEGETATION - Use scientific names of plants

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Pinus strobus	10	X	FACU
2. Ulmus pumila	3	X	FACU
3.			
4.			
5.			
	13	= Total Cover	
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
Herb Stratum (Plot size: 5')			
1. Phalaris arundinacea	45	X	FACW
2. Helianthus annuus	10		FACU
3. Poa pratensis	45	X	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	100	= Total Cover	
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
		= Total Cover	

Remarks: (Include photo numbers here or on a separate sheet.) Hydrophytic vegetation is not present. Herbaceous vegetative growth limited due to early season conditions. DP20 (upland) is about 2 feet higher in elevation than paired wetland sampling point (DP21). About 25 feet separates the two points.

50/20 Thresholds	20%	50%
Tree Stratum	2.6	6.5
Sapling/Shrub Stratum	_____	_____
Herb Stratum	_____	_____
Woody Vine Stratum	_____	_____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)
Total Number of Dominant Species Across All Strata: 4 (B)
Percent of Dominant Species That Are OBI, FACW, or FAC: 25 (A/B)

Prevalence Index worksheet:

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

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

- ☐ Rapid Test for Hydrophytic Vegetation
- ☐ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations' (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation' (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 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 ☒

SOIL

Sampling Point: DP20

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
0-20	10YR3/2						Sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ☐ Polyvalue Below Surface (S8) **(LRR R, MLRA 149 B)**
- ☐ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ☐ 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)

Indicators for Problematic Hydric

- ☐ 2 cm Muck - (A10) **(LRR K, L, MLRA 149B)**
- ☐ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ☐ 5 cm Peat or Mucky Peat (S3) **(LRR K, L, R)**
- ☐ Dark Surface (S7) **(LRR K, L)**
- ☐ Polyvalue Below Surface (S8) **(LRR K, L)**
- ☐ Thin Dark Surface (S9) **(LRR K, L)**
- ☐ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ☐ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]1ndicators 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 ☒

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

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)
- ☐ FAC-Neutral Test (D5)
- ☐ Microtopographic Relief (D4)

Field Observations:

Surface Water Present?	Yes ☐	No ☒	Depth (inches): < 20
Water Table Present?	Yes ☐	No ☒	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes ☐	No ☒	Depth (inches): _____

Indicators of Wetland Hydrology Present?
Yes ☐ No ☒

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

Remarks: Wetland hydrology is neither present nor indicated.

Photo: See general site **Photos 29 – 34**.

Data Points 20 and 21

Photo 32. View to the southwest.

Photo 31. General Site. View to the southwest.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Lake Elmo airport (21D) Runway 14/32 Relocation   City/County: Washington   Sampling Date: 04/27/2018

Applicant/Owner: Metropolitan Airports Commission   State: Minnesota   Sample Point: DP 21

Investigator(s): Brauna Hartzell, Mead & Hunt, Inc.   Section, Township, Range: Section 18, T29N, R20W

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

Subregion (LRR or MLRA): K/153   Lat: 45.001638   Long: -92.848691   Datum: NAD 83

Soil Map Unit Name: Auburndale silt loam, 0 to 2 percent slopes   NWI classification: PSS

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

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed?   Are "Normal Circumstances" present? **Yes** ☒ **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 ☐
Hydric Soil Present?	Yes ☒	No ☐
Wetland Hydrology Present?	Yes ☒	No ☐

Is the Sampled Area within a Wetland? **Yes** ☒ **No** ☐

If yes, optional Wetland Side ID: 5

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

VEGETATION - Use scientific names of plants

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer negundo	70	X	FAC
2. Rhamnus cathartica	20	X	FAC
3.			
4.			
5.			
	90	= Total Cover	
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
Herb Stratum (Plot size: 5')			
1. Acer negundo	5	X	FAC
2. Urtica dioica	5	X	FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	10	= Total Cover	
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
		= Total Cover	

Remarks: (Include photo numbers here or on a separate sheet.) Hydrophytic vegetation is present. Herbaceous vegetative growth limited due to early season conditions. DP21 (wetland) is about 2 feet lower in elevation than paired upland sampling point (DP20). About 25 feet separates the two points.

50/20 Thresholds	20%	50%
Tree Stratum	18	45
Sapling/Shrub Stratum		
Herb Stratum	2	5
Woody Vine Stratum		

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 OBI, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

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

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

- ☐ Rapid Test for Hydrophytic Vegetation
- ☒ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations' (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation' (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 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 ☐

SOIL

Sampling Point: DP21

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	10YR2/1	100					Silt loam	
6-20	10YR2/1	96	5YR4/4	4	C	M	Sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ☐ Polyvalue Below Surface (S8) **(LRR R, MLRA 149 B)**
- ☐ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ☐ 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)

[3]1ndicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Indicators for Problematic Hydric

- ☐ 2 cm Muck - (A10) **(LRR K, L, MLRA 149B)**
- ☐ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ☐ 5 cm Peat or Mucky Peat (S3) **(LRR K, L, R)**
- ☐ Dark Surface (S7) **(LRR K, L)**
- ☐ Polyvalue Below Surface (S8) **(LRR K, L)**
- ☐ Thin Dark Surface (S9) **(LRR K, L)**
- ☐ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ☐ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** ☒ **No** ☐

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

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)
- ☐ FAC-Neutral Test (D5)
- ☐ Microtopographic Relief (D4)

Field Observations:

Surface Water Present?	Yes ☒	No ☐	Depth (inches): 3
Water Table Present?	Yes ☒	No ☐	Depth (inches): 9
Saturation Present? (includes capillary fringe)	Yes ☒	No ☐	Depth (inches): 0

Indicators of Wetland Hydrology Present? **Yes** ☒ **No** ☐

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

Remarks: Wetland hydrology is present and indicated. Surface water to about 3 inches in depth about 10 feet to the south within the basin. Water is 4-5 feet deep in parts of the basin due to drainage of melting heavy early spring snowfall.

Photo: See general site **Photos 29 – 34**.

Data Points 20 and 21

Photo 32. View to the southwest.

Photo 31. General Site. View to the southwest.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Lake Elmo airport (21D) Runway 14/32 Relocation City/County: Washington Sampling Date: 04/27/2018

Applicant/Owner: Metropolitan Airports Commission State: Minnesota Sample Point: DP22

Investigator(s): Brauna Hartzell, Mead & Hunt, Inc. Section, Township, Range: Section 18, T29N, R20W

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

Subregion (LRR or MLRA): K/153 Lat: 45.000207 Long: -92.849608 Datum: NAD 83

Soil Map Unit Name: Santiago silt loam, 2 to 6 percent slopes (153B) NWI classification:

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

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? **Yes** ☒ **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 ☒
Hydric Soil Present?	Yes ☐	No ☒
Wetland Hydrology Present?	Yes ☐	No ☒

Is the Sampled Area within a Wetland? **Yes** ☐ **No** ☒

If yes, optional Wetland Side ID: _____

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

VEGETATION - Use scientific names of plants

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer negundo	45	X	FAC
2. Prunus serotina	25	X	FACU
3. Ulmus americana	15		FACW
4. Quercus rubra	15		FACU
5.			
	13	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15')			
1. Rhamnus cathartica	25	X	FAC
2. Ribes hirtellum	2		FACW
3.			
4.			
5.			
	27	= Total Cover	
Herb Stratum (Plot size: 5'			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	100	= Total Cover	
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
		= Total Cover	

Remarks: (Include photo numbers here or on a separate sheet.) Hydrophytic vegetation is not present. Fails the Prevalence Index at 3.18. Herbaceous vegetative growth limited due to early season conditions. DP22 (upland) is about 2 feet higher in elevation than paired wetland sampling point (DP23). About 25 feet separates the two points.

50/20 Thresholds	20%	50%
Tree Stratum	20	50
Sapling/Shrub Stratum	5	13.5
Herb Stratum		
Woody Vine Stratum		

Dominance Test worksheet:

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

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

Percent of Dominant Species That Are OBI, FACW, or FAC: 66 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species	17	x 2 = 34
FAC species	70	x 3 = 210
FACU species	40	x 4 = 160
UPL species		x 5 =
Column Totals:	127 (A)	404 (B)

Prevalence Index = B/A = 3.18

Hydrophytic Vegetation Indicators:

- ☐ Rapid Test for Hydrophytic Vegetation
- ☒ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations' (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation' (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 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 ☒

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
0-20	10YR2/2						Silt Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ☐ Polyvalue Below Surface (S8) **(LRR R, MLRA 149 B)**
- ☐ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ☐ 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)

[3]1ndicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Indicators for Problematic Hydric

- ☐ 2 cm Muck - (A10) **(LRR K, L, MLRA 149B)**
- ☐ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ☐ 5 cm Peat or Mucky Peat (S3) **(LRR K, L, R)**
- ☐ Dark Surface (S7) **(LRR K, L)**
- ☐ Polyvalue Below Surface (S8) **(LRR K, L)**
- ☐ Thin Dark Surface (S9) **(LRR K, L)**
- ☐ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ☐ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** ☐ **No** ☒

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

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)
- ☐ FAC-Neutral Test (D5)
- ☐ Microtopographic Relief (D4)

Field Observations:

Surface Water Present?	Yes ☐	No ☒	Depth (inches): < 20
Water Table Present?	Yes ☐	No ☒	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes ☐	No ☒	Depth (inches): _____

Indicators of Wetland Hydrology Present? **Yes** ☐ **No** ☒

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

Remarks: Wetland hydrology is neither present nor indicated.

Photo: See **Photos 35 and 36**.

Data Points 22 and 23

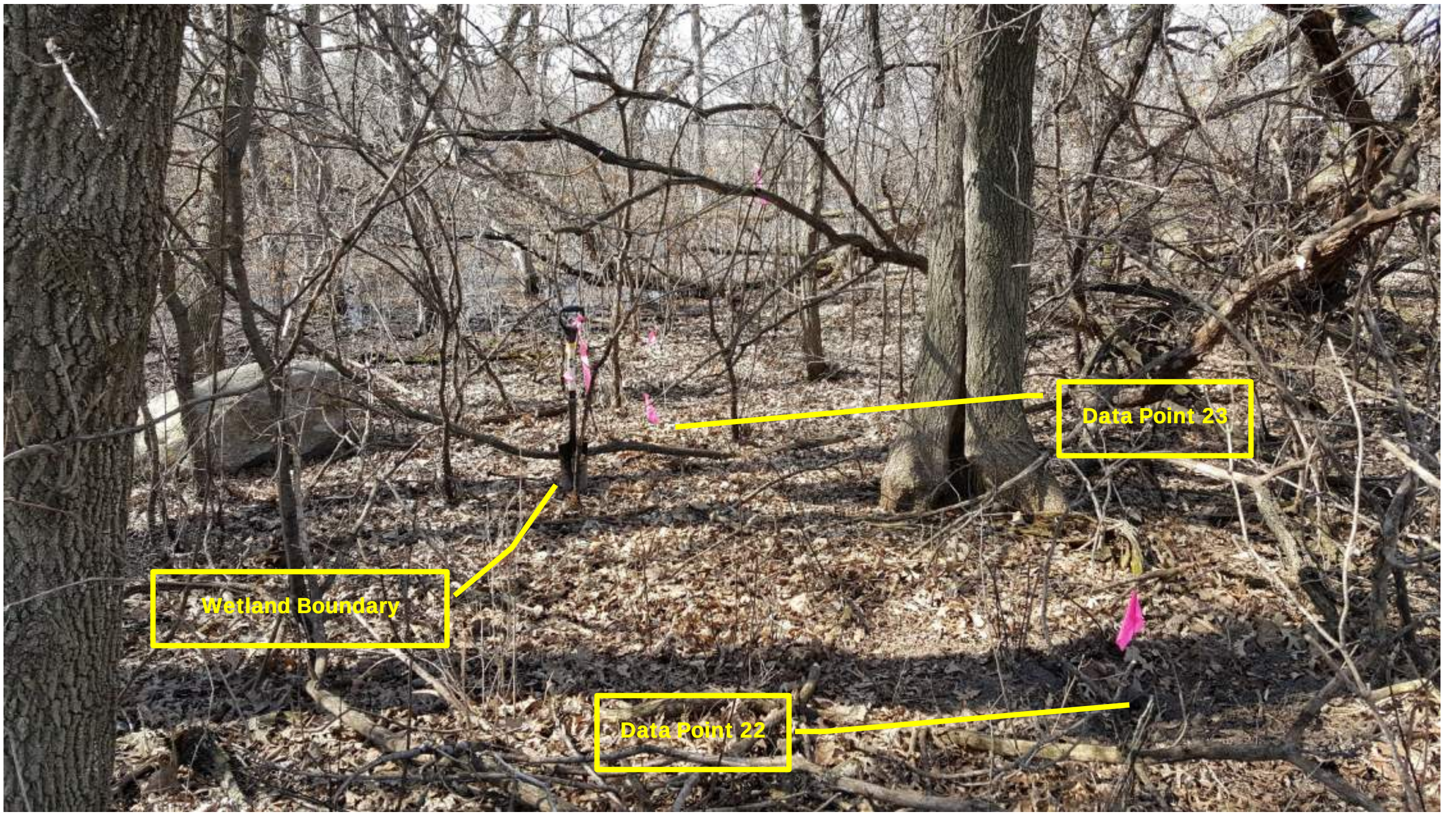


Photo 35. View to the south.

Photo 36. General Site. View to the southeast.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Lake Elmo airport (21D) Runway 14/32 Relocation City/County: Washington Sampling Date: 04/27/2018

Applicant/Owner: Metropolitan Airports Commission State: Minnesota Sample Point: DP23

Investigator(s): Brauna Hartzell, Mead & Hunt, Inc. Section, Township, Range: Section 18, T29N, R20W

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

Subregion (LRR or MLRA): K/153 Lat: 45.000131 Long: -92.849617 Datum: NAD 83

Soil Map Unit Name: Freeon silt loam, 1 to 4 percent slopes (264) NWI classification: PFO

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

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? **Yes** ☒ **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 ☐	**Is the Sampled Area within a Wetland?** **Yes** ☒ **No** ☐
Hydric Soil Present?	Yes ☒	No ☐	
Wetland Hydrology Present?	Yes ☒	No ☐	If yes, optional Wetland Side ID: 10

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

VEGETATION - Use scientific names of plants

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer negundo	40	X	FAC
2. Rhamnus cathartica	10	X	FAC
3.			
4.			
5.			
	50	= Total Cover	
Sapling/Shrub Stratum (Plot size: ____)			
1. Rhamnus cathartica	75	X	FAC
2.			
3.			
4.			
5.			
	75	= Total Cover	
Herb Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
		= Total Cover	
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
		= Total Cover	

Remarks: (Include photo numbers here or on a separate sheet.) Hydrophytic vegetation is present. Herbaceous vegetative growth limited due to early season conditions. Several dead elms (*Ulmus americana*) in standing water nearby.

50/20 Thresholds	20%	50%
Tree Stratum	10	25
Sapling/Shrub Stratum	15	37.5
Herb Stratum		
Woody Vine Stratum		

Dominance Test worksheet:

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

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

Percent of Dominant Species That Are OBI, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species	125	x 3 = 375
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	125 (A)	375 (B)

Prevalence Index = B/A = 3.0

Hydrophytic Vegetation Indicators:

- ☐ Rapid Test for Hydrophytic Vegetation
- ☒ Dominance Test is >50%
- ☒ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations' (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation' (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 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 ☐

SOIL

Sampling Point: DP23

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	10YR2/1	100					Silt loam	
12 - 20	10YR5/1	97	7.5YR4/6	3	C	M	Clay loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☒ Depleted Below Dark Surface (A11)
- ☒ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ☐ Polyvalue Below Surface (S8) **(LRR R, MLRA 149 B)**
- ☐ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ☐ 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)

Indicators for Problematic Hydric

- ☐ 2 cm Muck - (A10) **(LRR K, L, MLRA 149B)**
- ☐ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ☐ 5 cm Peat or Mucky Peat (S3) **(LRR K, L, R)**
- ☐ Dark Surface (S7) **(LRR K, L)**
- ☐ Polyvalue Below Surface (S8) **(LRR K, L)**
- ☐ Thin Dark Surface (S9) **(LRR K, L)**
- ☐ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ☐ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]1ndicators 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 ☐

Remarks: Hydric soils are present. Hydric soils indicators Depleted Below Dark Surface (A11) and Thick Dark Surface (A12) are satisfied.

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)
- ☐ FAC-Neutral Test (D5)
- ☐ Microtopographic Relief (D4)

Field Observations:

Surface Water Present?	Yes ☒	No ☐	Depth (inches): 3
Water Table Present?	Yes ☒	No ☐	Depth (inches): 4
Saturation Present? (includes capillary fringe)	Yes ☒	No ☐	Depth (inches): 0

Indicators of Wetland Hydrology Present?
Yes ☒ No ☐

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

Remarks: Wetland hydrology is present and indicated. Closed shallow basin with standing water present.

Photo:

Data Points 22 and 23

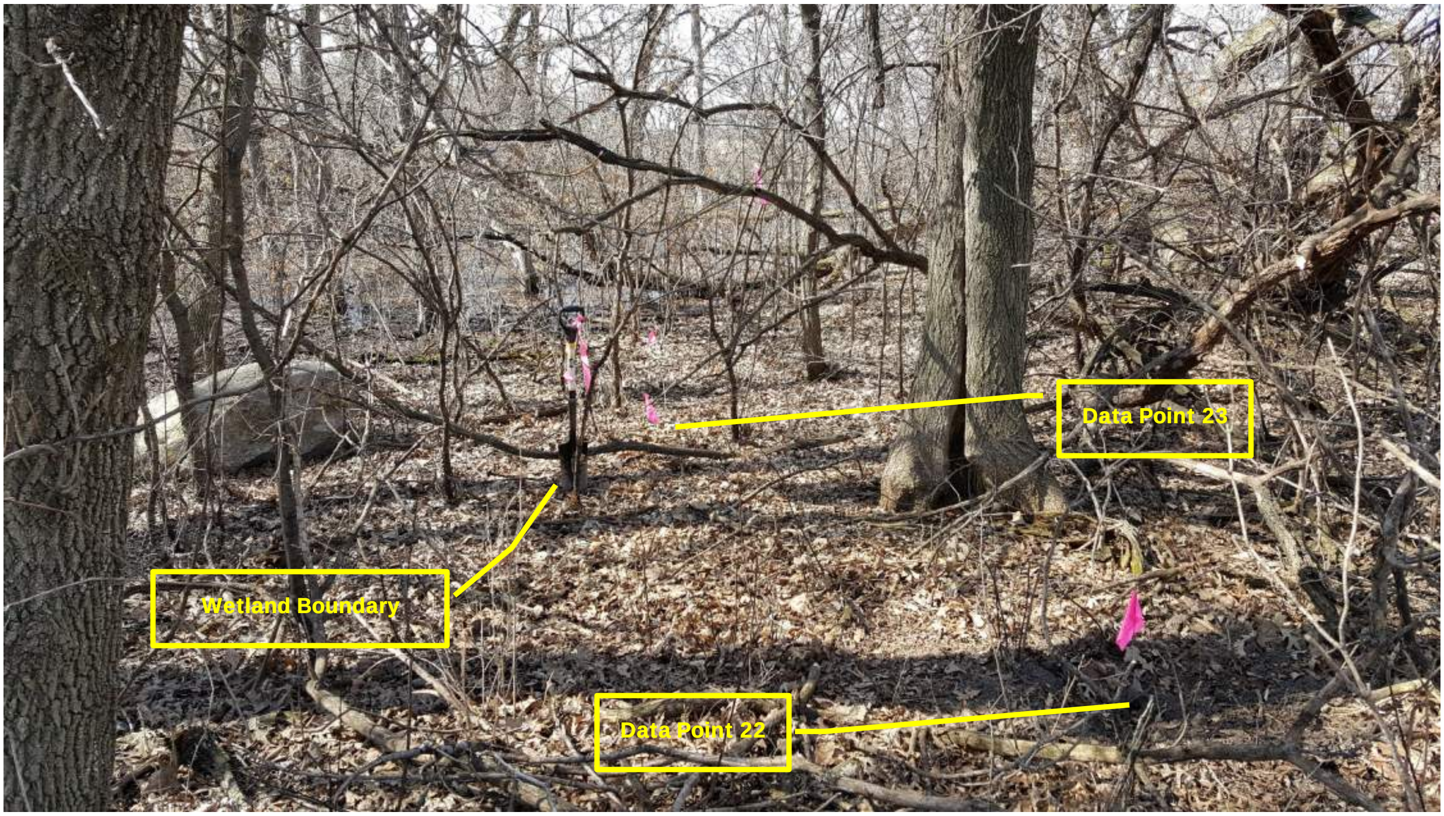


Photo 35. View to the south.

Photo 36. General Site. View to the southeast.

Photo 29. Wetland 5, View to the north.

Photo 30. Wetland 5, View to the south.

Photo 31. Wetland 5, View to the southwest.

Photo 32. Wetland 5, Data Points 20 and 21, View to the south.

Photo 33. Wetland 5, Eastern Lobe, View to the south.

Photo 34. Wetland 5, Eastern Lobe, View to the southwest.

Photo 35. Wetland 10, Data points 22 and 23. View to the south.

Photo 36. Wetland 10. View to the southth.

Appendix F. Delineator Qualifications

BRAUNA HARTZELL, GISP
GEOGRAPHIC INFORMATION SYSTEM (GIS)/IMAGE PROCESSING ANALYST

EXPERIENCE (GIS)

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

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

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

EXPERIENCE (WETLAND/ENVIRONMENTAL)

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

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

Areas of Expertise

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

Education

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

Registration/Certification

- Certified GIS Professional (GISP), GIS Certification Institute

Training and Seminars

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

RELATED PROJECTS (WETLANDS)

Wetland Delineations
Various Clients
Midwest USA

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

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

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

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

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.

BRAUNA HARTZELL, GISP (CONTINUED)

Wetland Delineation, Ontonagon County Airport, 2016
Michigan Bureau of Aeronautics
Ontonagon County, Michigan

Brauna served as the lead wetland delineator in support of permitting and on-site mitigation activities related to proposed wetland disturbance in another area of the airport. The area of interest is approximately 19.4 acres in size and resulted in the delineation of 11 wetlands in areas previously in agricultural production. Brauna also performed groundwater well monitoring and data analysis in support of mitigation site design.

Wetland Delineation, Central Wisconsin Airport, 2016
Wisconsin Bureau of Aeronautics
Mosinee, Marathon County, Wisconsin

Brauna served as the lead wetland delineator in support of master planning activities related to determining the viability of shifting Runway 17/35 to the south. The area of interest is approximately 70 acres in size and resulted in the delineation of three large wetlands on airport property and two off-site. The three on-site wetlands experience regular mowing and other maintenance activities as well as show evidence of groundwater contact on a sloping terrain with a seasonal high-water table; off-site wetlands consisted of an alder and a hardwood swamp.

Little Rock Lake Wetland Survey, 2016
National Ecological Observatory Network (NEON), Boulder, CO
Vilas County, Wisconsin

Brauna served as the lead wetland scientist in support of site equipment layout investigations for long-term ecological monitoring. A total of four wetlands were delineated within the area of interest at this mesotrophic seepage lake covering about 39 acres. Each proposed equipment installation site was surveyed and wetlands delineated in close proximity to any proposed location.

Interstate Highway (IH) 90/94 Corridor Study, 2013-2017
Wisconsin Department of Transportation (WisDOT) Southwest Region
Portage, Juneau, Sauk, and Columbia Counties, Wisconsin

Mead & Hunt is leading a team that is conducting a corridor study of IH 90/94 from US12/WIS 16 to IH39. The project consists of evaluating operational and safety issues, review of the interchanges and ramps within the corridor, and evaluating possible expansion. Environmental studies are being conducted and include; cultural resources surveys, endangered species surveys, contaminated material investigations, noise analysis and wetland delineations. Brauna is a wetland scientist assisting in the delineation, wetland field data collection and mapping. Cost: $210 million

STH 67 Resurfacing Design and Environmental Documentation, 2011
Wisconsin Department of Transportation (WisDOT) Northeast Region
Fond du Lac County, Wisconsin

Mead & Hunt lead redesign of this 20 mile corridor of STH 67 spanning Fond du Lac County through both rural and developed sections. In support of environmental documentation, a wetland delineation was performed within the right-of-way for the 20 mile corridor. Wetland types encountered include: shallow marsh, fresh wet meadows, shrub swamps, and riparian wetlands. In total, 69 wetlands were delineated. Brauna assisted with wetland delineation and survey, mapping and data management.

BRAUNA HARTZELL, GISP (CONTINUED)

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.

DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, CORPS OF ENGINEERS
180 FIFTH STREET EAST, SUITE 700
ST. PAUL, MN 55101-1678

REPLY TO ATTENTION OF
REGULATORY BRANCH

Regulatory File No. MVP-2017-04274-TJH

March 19, 2018

Metropolitan Airports Commission
c/o Chad Leqve
6040 28th Avenue South
Minneapolis, Minnesota 55450

Dear Mr. Leqve:

This letter is in response to your request for an approved jurisdictional determination for the nine wetlands delineated in the Wetland Delineation and Functional Assessment Report for the Lake Elmo Airport - Runway 14/32 Relocation and Associated Improvements. The review area for our jurisdictional determination is identified on the enclosed figures, labeled MVP-2017-04274-TJH, Pages 1 through 8. The project site is in Sections 18 and 19, Township 29 North, Range 20 West, Washington County, Minnesota.

The review area contains no waters of the United States subject to Corps of Engineers jurisdiction. Therefore, you are not required to obtain Department of the Army authorization to discharge dredged or fill material within this area. The rationale for this determination is provided in the attached Approved Jurisdictional Determination form. This determination is only valid for the review area shown on the enclosed figures.

If you object to this approved jurisdictional determination, you may request an administrative appeal under Corps regulations at 33 CFR 331. Enclosed you will find a Notification of Appeal Process (NAP) fact sheet and Request for Appeal (RFA) form. If you request to appeal this determination, you must submit a completed RFA form to the Mississippi Valley Division Office at the address shown on the form.

In order for an RFA to be accepted by the Corps, the Corps must determine that it is complete, that it meets the criteria for appeal under 33 CFR 331.5, and that it has been received by the Division Office within 60 days of the date of the enclosed NAP. It is not necessary to submit an RFA form to the division office if you do not object to the determination in this letter

This approved jurisdictional determination may be relied upon for five years from the date of this letter. However, the Corps reserves the right to review and revise the boundary in response to changing site conditions, information that was not considered during our initial review, or off-site activities that could indirectly alter the extent of wetlands and other resources on-site. This determination may be renewed at the end of the five year period provided you submit a written request and our staff are able to verify that the limits established during the original determination are still accurate.

If you have any questions, please contact me in our St. Paul office at (651) 290-5367 or Thomas.J.Hingsberger@usace.army.mil. In any correspondence or inquiries, please refer to the Regulatory file number shown above.

Sincerely,

Thomas Hingsberger

Tom Hingsberger
Project Manager

Enclosures

cc:
Evan Barrett (Mead & Hunt)
Ben Meyer (BWSR)
Karen Wold (Barr Engineering)
Jay Riggs (WCD)
Jennifer Sorenson (MnDNR)
Becky Horton (MnDNR)

APPROVED JURISDICTIONAL DETERMINATION FORM
U.S. Army Corps of Engineers

This form should be completed by following the instructions provided in Section IV of the JD Form Instructional Guidebook.

SECTION I: BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION (JD): February 27, 2018

B. ST PAUL, MN DISTRICT OFFICE, FILE NAME, AND NUMBER:
MVP-2017-04274-TJH Lake Elmo Airport

C. PROJECT LOCATION AND BACKGROUND INFORMATION:
State: Minnesota County/parish/borough: Washington City: Lake Elmo
Center coordinates of site (lat/long in degree decimal format): Lat. 44.997526° **N**, Long. -92.851647° **W**.
Universal Transverse Mercator:
Name of nearest waterbody: St. Croix River
Name of watershed or Hydrologic Unit Code (HUC): 07030005 Upper Mississippi Region
☒ Check if map/diagram of review area and/or potential jurisdictional areas is/are available upon request.
☐ Check if other sites (e.g., offsite mitigation sites, disposal sites, etc…) are associated with this action and are recorded on a different JD form.

D. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):
☒ Office (Desk) Determination. Date: January 24, 2018
☐ Field Determination. Date(s):

SECTION II: SUMMARY OF FINDINGS

A. RHA SECTION 10 DETERMINATION OF JURISDICTION.

There are no "*navigable waters of the U.S.*" within Rivers and Harbors Act (RHA) jurisdiction (as defined by 33 CFR part 329) in the review area.

B. CWA SECTION 404 DETERMINATION OF JURISDICTION.

There are no"*waters of the U.S.*" within Clean Water Act (CWA) jurisdiction (as defined by 33 CFR part 328) in the review area.

1. **Waters of the U.S.:** N/A

2. **Non-regulated waters/wetlands (check if applicable):**[1]
☒ Potentially jurisdictional waters and/or wetlands were assessed within the review area and determined to be not jurisdictional.
Explain: **There are 9 wetlands within the review area shown on the enclosed figures labeled MVP-2017-04274-TJH Page 1 of 2 through 2 of 2. These wetlands do not have a surface or shallow subsurface hydrologic connection to any navigable waters or their tributaries, as confirmed in the Wetland Delineation Report for the Lake Elmo (21D) Airport Runway 14/32 Relocation and Associated Improvements project dated October 2017. Each of the 9 wetland basins are surrounded by uplands and have no swales, pipes or other means to connect them to waters of the U.S. (WOUS). We have determined that these wetlands are isolated depressions and not waters of the U.S.**

The 9 wetlands delineated in the review area do not support a link to interstate or foreign commerce because they are not known to be used by interstate or foreign travelers for recreation or other purposes; do not produce fish or shellfish that could be taken and sold in interstate or foreign commerce; and are not known to be used for industrial purposes by industries in interstate or foreign commerce. These wetlands do not have an ecological connection to other waters within the review area. Furthermore, even though the offsite portion of Wetland 1 was not delineated, based on the aerial photography and LiDAR contours it appears unlikely that the wetland would have a connection to another waterbody. The offsite portion of Wetland 1 is adjacent to residential housing and upland agricultural fields, and it does not appear to drain into any culverts, rivers, ditches, or storm water systems. The waterbodies within the review area were determined to not be jurisdictional under the CWA.

SECTION III: CWA ANALYSIS

A. TNWs AND WETLANDS ADJACENT TO TNWs: N/A

B. CHARACTERISTICS OF TRIBUTARY (THAT IS NOT A TNW) AND ITS ADJACENT WETLANDS (IF ANY): N/A

[1] Supporting documentation is presented in Section III.F.

C. SIGNIFICANT NEXUS DETERMINATION: N/A

D. DETERMINATIONS OF JURISDICTIONAL FINDINGS. THE SUBJECT WATERS/WETLANDS ARE (CHECK ALL THAT APPLY): N/A

E. ISOLATED [INTERSTATE OR INTRA-STATE] WATERS, INCLUDING ISOLATED WETLANDS, THE USE, DEGRADATION OR DESTRUCTION OF WHICH COULD AFFECT INTERSTATE COMMERCE, INCLUDING ANY SUCH WATERS (CHECK ALL THAT APPLY): N/A

F. NON-JURISDICTIONAL WATERS, INCLUDING WETLANDS (CHECK ALL THAT APPLY):

☐ If potential wetlands were assessed within the review area, these areas did not meet the criteria in the 1987 Corps of Engineers Wetland Delineation Manual and/or appropriate Regional Supplements.
☒ Review area included isolated waters with no substantial nexus to interstate (or foreign) commerce.
  ☒ Prior to the Jan 2001 Supreme Court decision in "*SWANCC*," the review area would have been regulated based solely on the "Migratory Bird Rule" (MBR).
☐ Waters do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction. Explain:
☐ Other (explain, if not covered above):

Provide acreage estimates for non-jurisdictional waters in the review area, where the sole potential basis of jurisdiction is the MBR factors (i.e., presence of migratory birds, presence of endangered species, use of water for irrigated agriculture), using best professional judgment (check all that apply):

☐ Non-wetland waters (i.e., rivers, streams): linear feet width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☒ Wetlands: Wetland 1 = 0.187, Wetland 2 = 0.117, Wetland 3 = 0.110, Wetland 4 = 0.167, Wetland 5 = 0.094, Wetland 6 = 0.009, Wetland 7 = 0.013, Wetland 8 = 3.766, Wetland 9 = 2.858 acres.

Provide acreage estimates for non-jurisdictional waters in the review area that do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction (check all that apply):

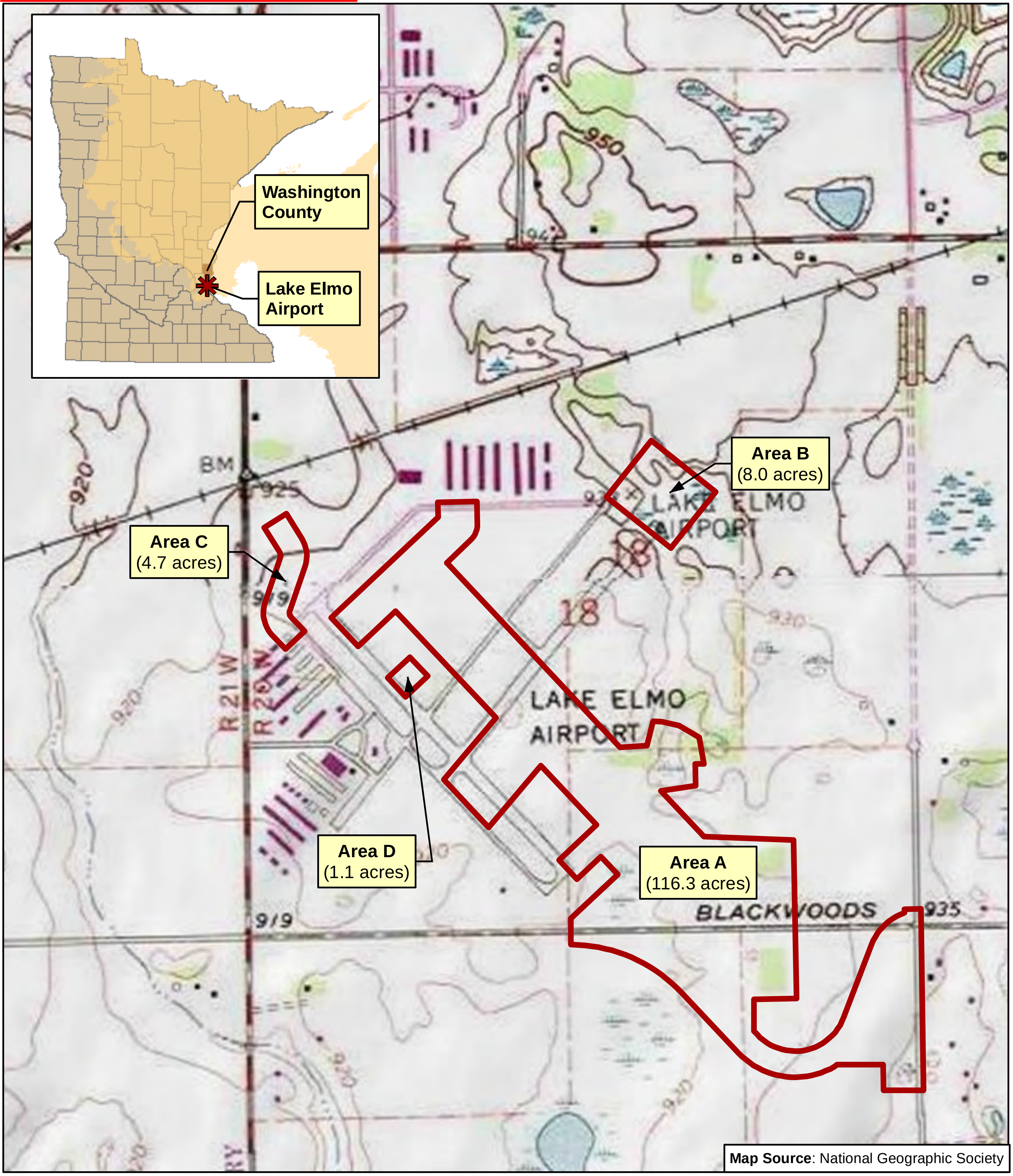
☐ Non-wetland waters (i.e., rivers, streams): linear feet, width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

SECTION IV: DATA SOURCES.

A. SUPPORTING DATA. Data reviewed for JD (check all that apply - checked items shall be included in case file and, where checked and requested, appropriately reference sources below):

☒ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: Mead and Hunt
☒ Data sheets prepared/submitted by or on behalf of the applicant/consultant.
  ☒ Office concurs with data sheets/delineation report.
  ☐ Office does not concur with data sheets/delineation report.
☐ Data sheets prepared by the Corps:
☐ Corps navigable waters' study:
☐ U.S. Geological Survey Hydrologic Atlas:
  ☐ USGS NHD data.
  ☐ USGS 8 and 12 digit HUC maps.
☒ U.S. Geological Survey map(s). Cite scale & quad name:1:24K MN-Stillwater
☒ USDA Natural Resources Conservation Service Soil Survey. Citation: NRCS Web Soil Survey Washington Co.
☒ National wetlands inventory map(s). Cite name:USFWS NWI
☐ State/Local wetland inventory map(s):
☐ FEMA/FIRM maps:
☐ 100-year Floodplain Elevation is: (National Geodectic Vertical Datum of 1929)
☐ Photographs: ☐ Aerial (Name & Date):
  or ☐ Other (Name & Date):
☐ Previous determination(s). File no. and date of response letter:
☐ Applicable/supporting case law:
☐ Applicable/supporting scientific literature:
☐ Other information (please specify):

B. ADDITIONAL COMMENTS TO SUPPORT JD:



Project Location and Topography

LAKE ELMO AIRPORT

Proposed Runway 14/32 Relocation
and Associated Improvements

Legend

Area of Interest (AOI)

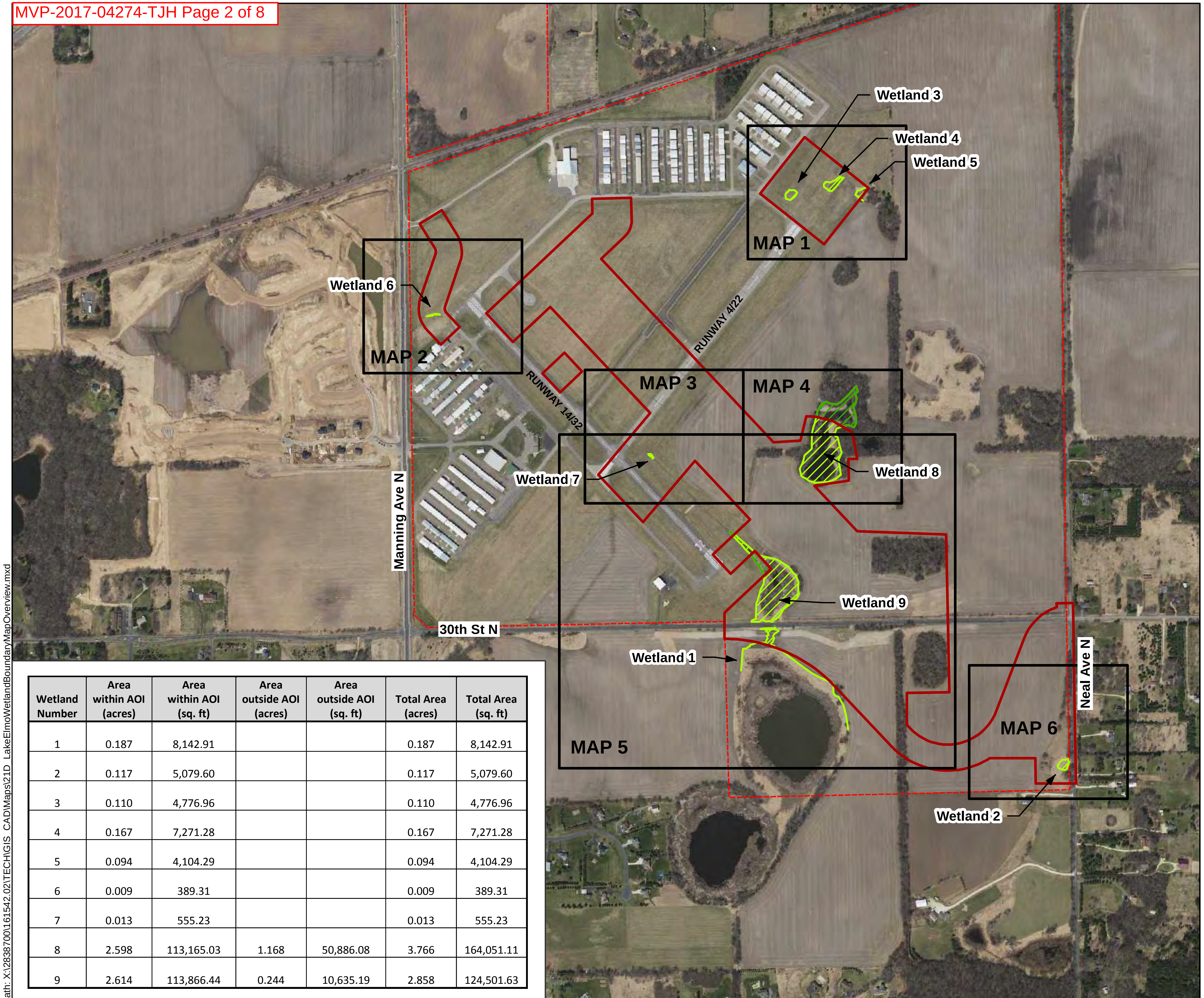
LRR Subregion: K

0 1,000 2,000 Feet

N

Project Location

T29N, R20W, S18 and S19
Baytown and West Lakeland Townships
Washington County, MN
LRR Subregion: K
USACE Regional Supplement: NC/NE
Area = 130.1 acres



Wetland Number	Area within AOI (acres)	Area within AOI (sq. ft)	Area outside AOI (acres)	Area outside AOI (sq. ft)	Total Area (acres)	Total Area (sq. ft)
1	0.187	8,142.91			0.187	8,142.91
2	0.117	5,079.60			0.117	5,079.60
3	0.110	4,776.96			0.110	4,776.96
4	0.167	7,271.28			0.167	7,271.28
5	0.094	4,104.29			0.094	4,104.29
6	0.009	389.31			0.009	389.31
7	0.013	555.23			0.013	555.23
8	2.598	113,165.03	1.168	50,886.08	3.766	164,051.11
9	2.614	113,866.44	0.244	10,635.19	2.858	124,501.63

Path: X:\2838700\161542.02\TECH\GIS_CAD\Maps\21D_LakeElmoWetlandBoundaryMapOverview.mxd

Wetland Boundary Map Sheet Key

LAKE ELMO AIRPORT

Proposed Runway 14-32 Runway Shift

Legend

- Map Sheet
- Wetland Boundary
- Wetland within AOI
- Outside AOI
- Area of Interest
- Airport Property Boundary

Wetland Number	Description	Circular 39 Type
1	Seasonally Flooded Basin	Type 1
2	Fresh (wet) Meadow	Type 2
3	Fresh (wet) Meadow	Type 2
4	Fresh (wet) Meadow	Type 2
5	Fresh (wet) Meadow	Type 2
6	Fresh (wet) Meadow (Ditch Wetland)	Type 2
7	Fresh (wet) Meadow (Ditch Wetland)	Type 2
8	Fresh (wet) Meadow /Deep Marsh	Type 2/ Type 4
9	Fresh (wet) Meadow /Shallow Marsh	Type 2/ Type 3

N

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

Project Information

T29N, R20W, S18 and S19
City of Lake Elmo
Washington County, MN
Area of Interest = 130.1 acres
Field work conducted:
June 5 - 9, 2017

Mead & Hunt

Image Source: MnGEO WMS Image Service, Washington County (2016 color 7-county)

Wetland Boundary Map

LAKE ELMO AIRPORT

Proposed Runway 14-32 Runway Shift

Legend

- Photo Location
- Data Point Location
- Wetland Boundary
- Wetland within AOI
- Wetland outside AOI
- Culvert End Location
- Flow Direction
- Ditch/Swale Flow
- Area of Interest
- Airport Property Boundary

N

0 50 100 200 300 Feet

Elevation contour interval is 2 feet

Project Information

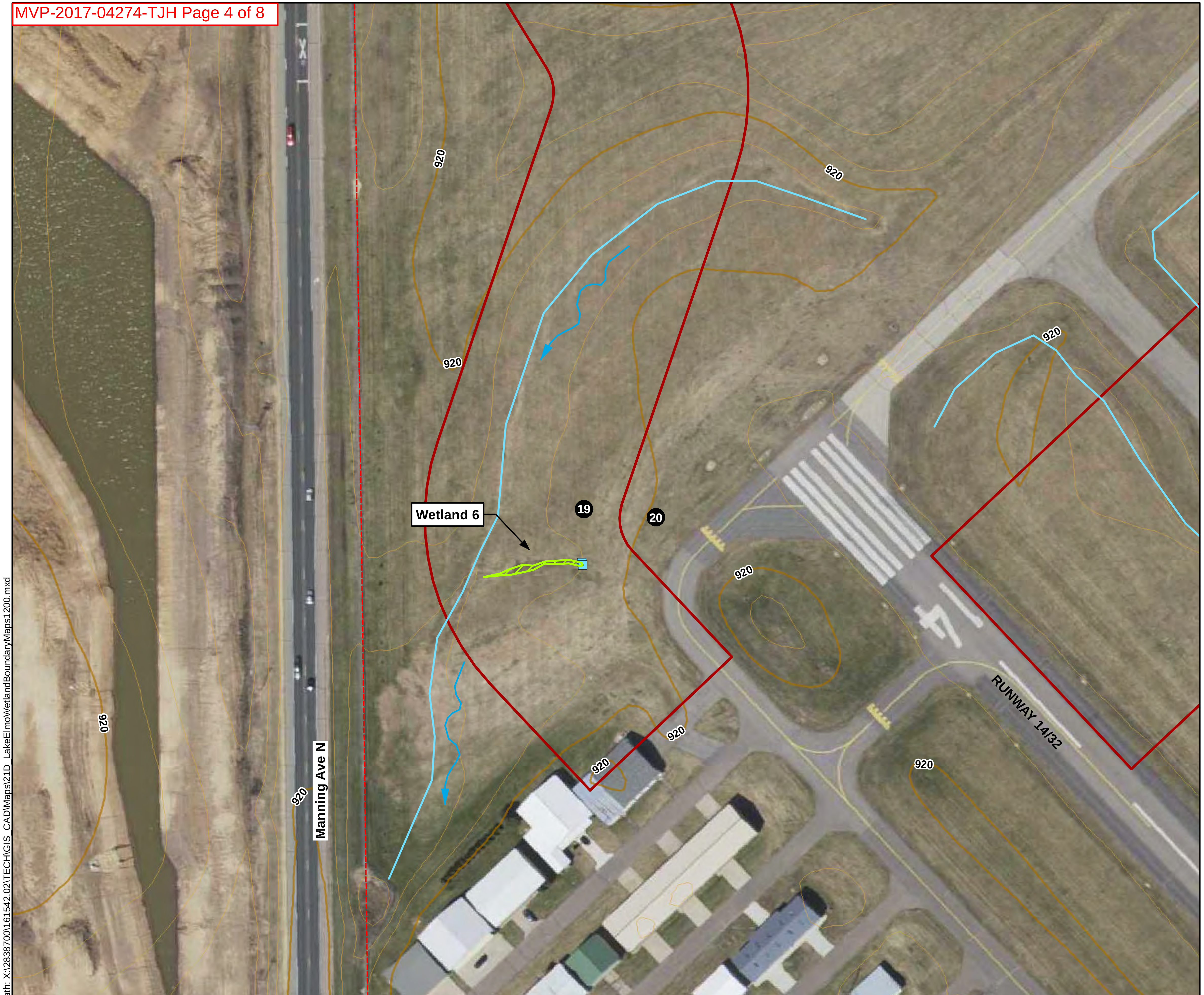
T29N, R20W, S18 and S19
City of Lake Elmo
Washington County, MN
Area of Interest = 130.1 acres
Field work conducted:
June 5 - 9, 2017

Mead & Hunt

Image Source: MnGEO WMS Image Service, Washington County (2016 color 7-county)
Contour Source:
Minnesota Geospatial Commons,
Minnesota Elevation Mapping Project
Twin Cities Metro Region 2011

Map 1 of 6

Path: X:\2838700\161542.02\TECH\GIS_CAD\Maps\21D_LakeElmoWetlandBoundaryMaps1200.mxd



Wetland Boundary Map

LAKE ELMO AIRPORT

Proposed Runway 14-32 Runway Shift

Legend

- Photo Location
- Data Point Location
- Wetland Boundary
- Wetland within AOI
- Wetland outside AOI
- Culvert End Location
- Flow Direction
- Ditch/Swale Flow
- Area of Interest
- Airport Property Boundary

N

0 50 100 200 300 Feet

Elevation contour interval is 2 feet

Project Information

T29N, R20W, S18 and S19
City of Lake Elmo
Washington County, MN
Area of Interest = 130.1 acres
Field work conducted:
June 5 - 9, 2017

Mead & Hunt

Image Source: MnGEO WMS Image Service, Washington County (2016 color 7-county)
Contour Source:
Minnesota Geospatial Commons,
Minnesota Elevation Mapping Project
Twin Cities Metro Region 2011

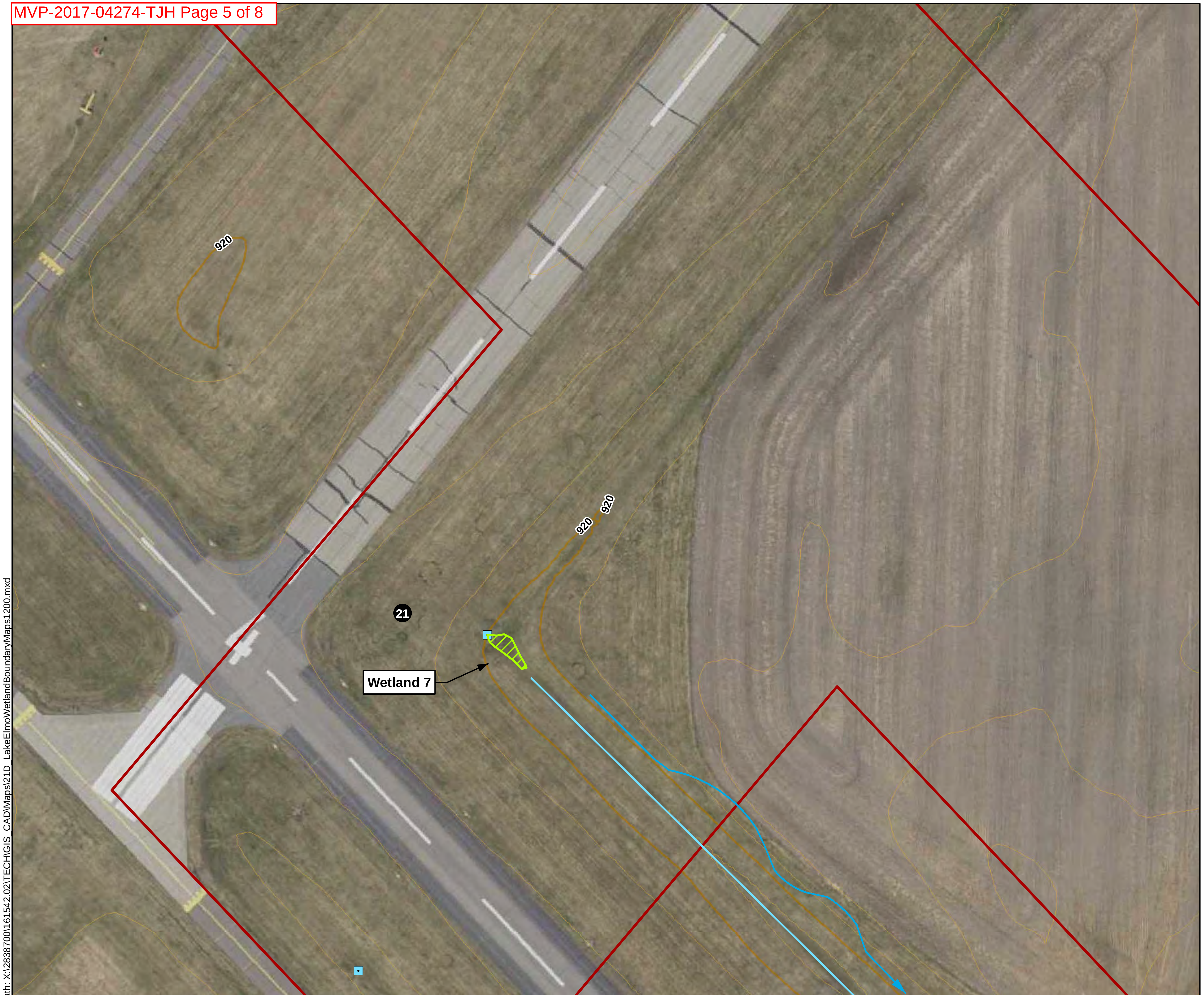
Map 2 of 6

Path: X:\2838700\161542.02\TECH\GIS_CAD\Maps\21D_LakeElmoWetlandBoundaryMaps1200.mxd

Wetland Boundary Map

LAKE ELMO AIRPORT

Proposed Runway 14-32 Runway Shift



Legend

- Photo Location
- Data Point Location
- Wetland Boundary
- Wetland within AOI
- Wetland outside AOI
- Culvert End Location
- Flow Direction
- Ditch/Swale Flow
- Area of Interest
- Airport Property Boundary

N

0 50 100 200 300 Feet

Elevation contour interval is 2 feet

Project Information

T29N, R20W, S18 and S19
City of Lake Elmo
Washington County, MN
Area of Interest = 130.1 acres
Field work conducted:
June 5 - 9, 2017

Mead & Hunt

Image Source: MnGEO WMS Image Service, Washington County (2016 color 7-county)
Contour Source: Minnesota Geospatial Commons, Minnesota Elevation Mapping Project Twin Cities Metro Region 2011

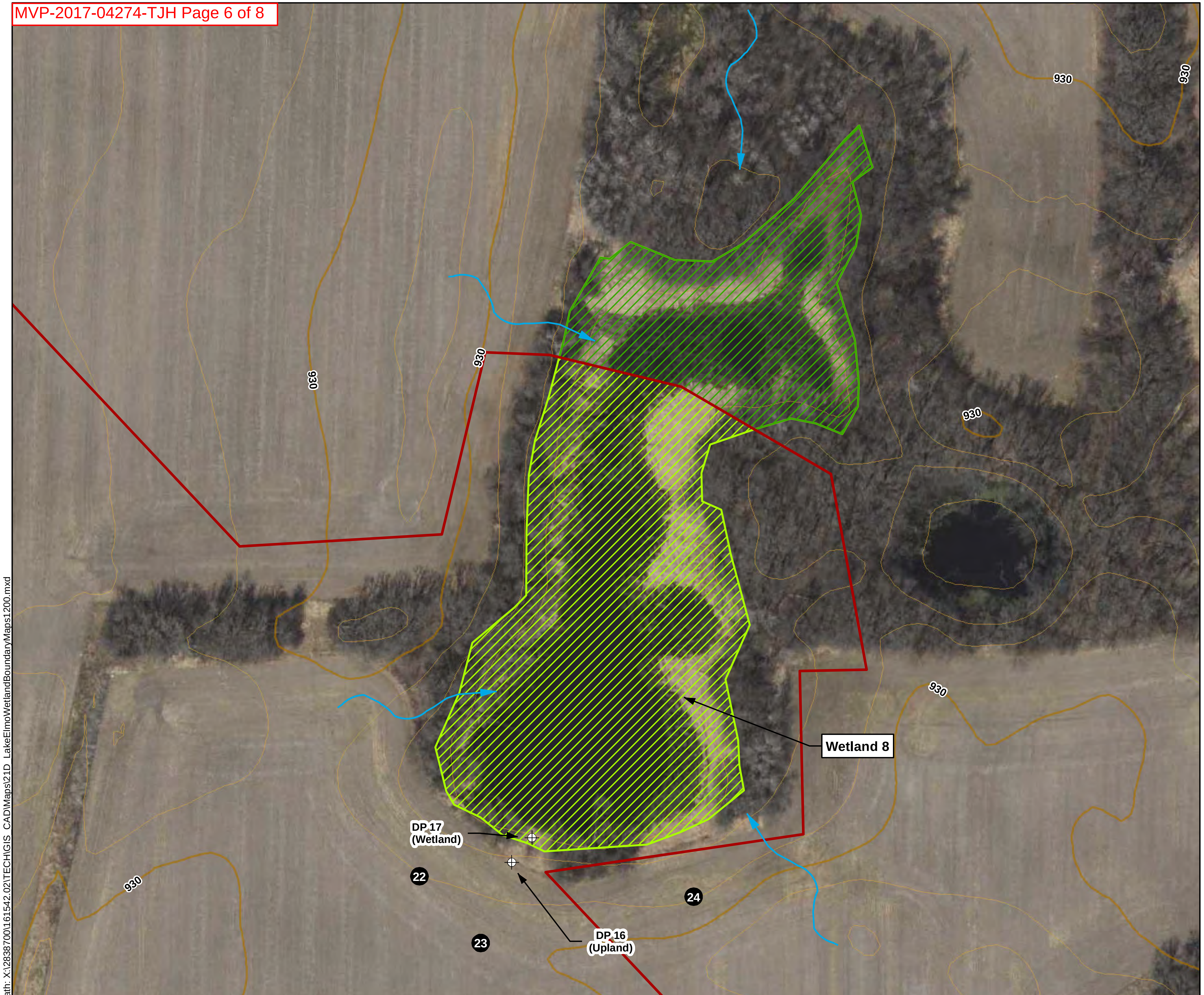
Map 3 of 6

Path: X:\283870\161542.02\TECH\GIS_CAD\Maps\21D_LakeElmoWetlandBoundaryMaps1200.mxd

Wetland Boundary Map

LAKE ELMO AIRPORT

Proposed Runway 14-32 Runway Shift



Legend

- Photo Location
- Data Point Location
- Wetland Boundary
- Wetland within AOI
- Wetland outside AOI
- Culvert End Location
- Flow Direction
- Ditch/Swale Flow
- Area of Interest
- Airport Property Boundary

N

0 50 100 200 300 Feet

Elevation contour interval is 2 feet

Project Information

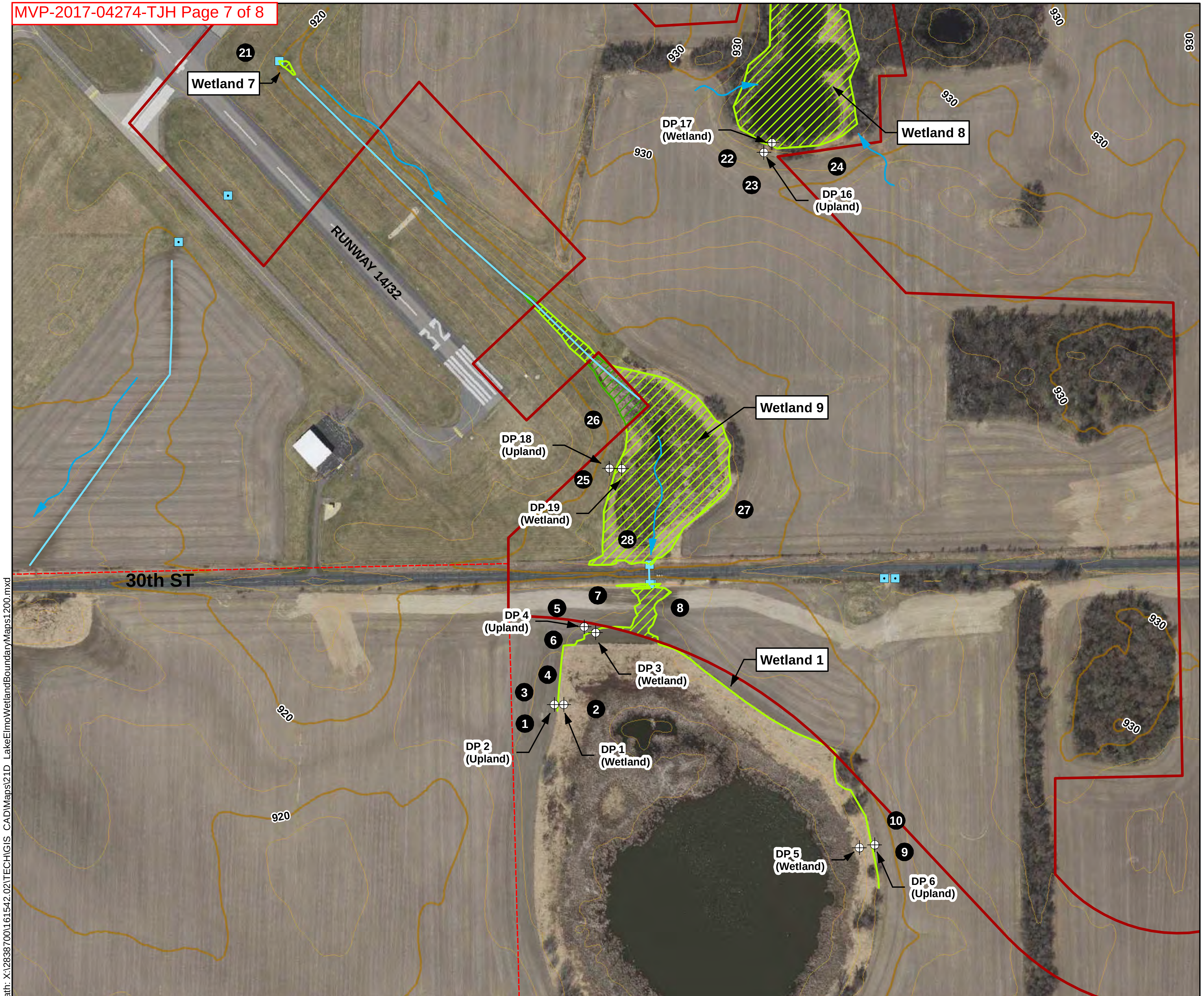
T29N, R20W, S18 and S19
City of Lake Elmo
Washington County, MN
Area of Interest = 130.1 acres
Field work conducted:
June 5 - 9, 2017

Mead & Hunt

Image Source: MnGEO WMS Image Service, Washington County (2016 color 7-county)
Contour Source:
Minnesota Geospatial Commons,
Minnesota Elevation Mapping Project
Twin Cities Metro Region 2011

Map 4 of 6

Path: X:\2838700\161542.02\TECH\GIS_CAD\Maps\21D_LakeElmoWetlandBoundaryMaps1200.mxd



Wetland Boundary Map

LAKE ELMO AIRPORT

Proposed Runway 14-32 Runway Shift

Legend

- Photo Location
- Data Point Location
- Wetland Boundary
- Wetland within AOI
- Wetland outside AOI
- Culvert End Location
- Flow Direction
- Ditch/Swale Flow
- Area of Interest
- Airport Property Boundary

N

0 50 100 200 300 400 500 600 700 Feet

Elevation contour interval is 2 feet

Project Information

T29N, R20W, S18 and S19
City of Lake Elmo
Washington County, MN
Area of Interest = 130.1 acres
Field work conducted:
June 5 - 9, 2017

Mead & Hunt

Image Source: MnGEO WMS Image Service, Washington County (2016 color 7-county)
Contour Source: Minnesota Geospatial Commons, Minnesota Elevation Mapping Project Twin Cities Metro Region 2011

Map 5 of 6

Path: X:\2838700\161542.02\TECH\GIS_CAD\Maps\21D_LakeElmoWetlandBoundaryMaps1200.mxd

Wetland Boundary Map

LAKE ELMO AIRPORT

Proposed Runway 14-32 Runway Shift

Legend

- Photo Location
- Data Point Location
- Wetland Boundary
- Wetland within AOI
- Wetland outside AOI
- Culvert End Location
- Flow Direction
- Ditch/Swale Flow
- Area of Interest
- Airport Property Boundary

N

0 50 100 200 300 Feet

Elevation contour interval is 2 feet

Project Information

T29N, R20W, S18 and S19
City of Lake Elmo
Washington County, MN
Area of Interest = 130.1 acres
Field work conducted:
June 5 - 9, 2017

Mead & Hunt

Image Source: MnGEO WMS Image Service, Washington County (2016 color 7-county)
Contour Source:
Minnesota Geospatial Commons,
Minnesota Elevation Mapping Project
Twin Cities Metro Region 2011

Map 6 of 6

Path: X:\2838700\161542.02\TECH\GIS_CAD\Maps\21D_LakeElmoWetlandBoundaryMaps1200.mxd

NOTIFICATION OF ADMINISTRATIVE APPEAL OPTIONS AND PROCESS AND REQUEST FOR APPEAL		
Applicant: Metropolitan Airports Commission c/o Chad Leqve	**File No.:MVP-2017-04274-TJH**	**Date:**

Attached is:		See Section below
	INITIAL PROFFERED PERMIT (Standard Permit or Letter of permission)	A
	PROFFERED PERMIT (Standard Permit or Letter of permission)	B
	PERMIT DENIAL	C
X	APPROVED JURISDICTIONAL DETERMINATION	D
	PRELIMINARY JURISDICTIONAL DETERMINATION	E

SECTION I - The following identifies your rights and options regarding an administrative appeal of the above decision. Additional information may be found at http://usace.army.mil/inet/functions/cw/cecwo/reg or Corps regulations at 33 CFR Part 331.

A: INITIAL PROFFERED PERMIT: You may accept or object to the permit.

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- OBJECT: If you object to the permit (Standard or LOP) because of certain terms and conditions therein, you may request that the permit be modified accordingly. You must complete Section II of this form and return the form to the district engineer. Your objections must be received by the district engineer within 60 days of the date of this notice, or you will forfeit your right to appeal the permit in the future. Upon receipt of your letter, the district engineer will evaluate your objections and may: (a) modify the permit to address all of your concerns, (b) modify the permit to address some of your objections, or (c) not modify the permit having determined that the permit should be issued as previously written. After evaluating your objections, the district engineer will send you a proffered permit for your reconsideration, as indicated in Section B below.

B: PROFFERED PERMIT: You may accept or appeal the permit

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- APPEAL: If you choose to decline the proffered permit (Standard or LOP) because of certain terms and conditions therein, you may appeal the declined permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

C: PERMIT DENIAL: You may appeal the denial of a permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

D: APPROVED JURISDICTIONAL DETERMINATION: You may accept or appeal the approved JD or provide new information.

- ACCEPT: You do not need to notify the Corps to accept an approved JD. Failure to notify the Corps within 60 days of the date of this notice, means that you accept the approved JD in its entirety, and waive all rights to appeal the approved JD.
- APPEAL: If you disagree with the approved JD, you may appeal the approved JD under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

E: PRELIMINARY JURISDICTIONAL DETERMINATION: You do not need to respond to the Corps regarding the preliminary JD. The Preliminary JD is not appealable. If you wish, you may request an approved JD (which may be appealed), by contacting the Corps district for further instruction. Also you may provide new information for further consideration by the Corps to reevaluate the JD.

SECTION II - REQUEST FOR APPEAL or OBJECTIONS TO AN INITIAL PROFFERED PERMIT		
REASONS FOR APPEAL OR OBJECTIONS: (Describe your reasons for appealing the decision or your objections to an initial proffered permit in clear concise statements. You may attach additional information to this form to clarify where your reasons or objections are addressed in the administrative record.)		
ADDITIONAL INFORMATION: The appeal is limited to a review of the administrative record, the Corps memorandum for the record of the appeal conference or meeting, and any supplemental information that the review officer has determined is needed to clarify the administrative record. Neither the appellant nor the Corps may add new information or analyses to the record. However, you may provide additional information to clarify the location of information that is already in the administrative record.		
POINT OF CONTACT FOR QUESTIONS OR INFORMATION:		
If you have questions regarding this decision and/or the appeal process you may contact: U.S. Army Corps of Engineers Attention: Tom Hingsberger 180 East 5th Street, Suite 700 Saint Paul, Minnesota 55101 Telephone: (651) 290-5367	If you only have questions regarding the appeal process you may also contact the Division Engineer through: Administrative Appeals Review Officer Mississippi Valley Division P.O. Box 80 (1400 Walnut Street) Vicksburg, MS 39181-0080 601-634-5820 FAX: 601-634-5816	
RIGHT OF ENTRY: Your signature below grants the right of entry to Corps of Engineers personnel, and any government consultants, to conduct investigations of the project site during the course of the appeal process. You will be provided a 15 day notice of any site investigation, and will have the opportunity to participate in all site investigations.		
_______________________________ Signature of appellant or agent.	Date:	Telephone number:

Minnesota Wetland Conservation Act
Notice of Decision

Local Government Unit (LGU) **Valley Branch Watershed District (VBWD)**	Address **P.O. Box 838** **Lake Elmo, MN 55042**

1. PROJECT INFORMATION

Applicant Name **Chad Leqve, Metropolitan Airports Commission**	Project Name **Lake Elmo Airport**	Date of Application **9/25/2017**	Application Number
☒ Attach site locator map.			

Type of Decision:

☒ Wetland Boundary or Type ☐ No-Loss ☐ Exemption ☐ Sequencing
☐ Replacement Plan ☐ Banking Plan

Technical Evaluation Panel (TEP) Findings and Recommendation (if any):

☐ Approve ☐ Approve with conditions ☐ Deny

Summary (or attach): **No TEP Findings Report**

2. LOCAL GOVERNMENT UNIT DECISION

Date of Decision: **11/9/2017**

☒ Approved ☐ Approved with conditions (include below) ☐ Denied

LGU Findings and Conclusions (attach additional sheets as necessary):

On behalf of the Metropolitan Airports Commission, Mead & Hunt submitted a wetland delineation report and request for wetland boundary and type concurrence associated with the Lake Elmo Airport Runway Relocation and Improvements project in Lake Elmo, Minnesota (Sec. 18 and 19, T29N, R20W) within Washington County.

The wetland delineation report and Notice of Application were provided to the TEP on 10/3/2017.

A site review was conducted on 10/17/2017. Those present at the site review were Jay Riggs, Washington Conservation District; Ben Meyer, Board of Water and Soil Resources; Karen Wold, Barr Engineering Co. for the VBWD; and Brauna Hartzell, Mead & Hunt. During the site review, several changes were made to the wetland types. Mead & Hunt revised the wetland delineation report to reflect these changes and reference consistent wetland types throughout the report. The revised wetland delineation report was provided to TEP members. The comment period ended on 10/30/2017, and no other comments were received.

The revised wetland types are as follows:

Wetland	Wetland Type	Circular 39 Type	Cowardin Type
1	Seasonally Flooded Basin1	Type 1	PEMA
2	Fresh (wet) Meadow	Type 2	PEMB
3	Fresh (wet) Meadow	Type 2	PEMB

4	Fresh (wet) Meadow	Type 2	PEMB
5	Fresh (wet) Meadow	Type 2	PEMB
6	Fresh (wet) Meadow	Type 2	PEMB
7	Fresh (wet) Meadow	Type 2	PEMB
8	Fresh (wet) Meadow /Deep Marsh	Type 2/ Type 4	PEMB/ABF
9	Fresh (wet) Meadow /Shallow Marsh	Type 2/ Type 3	PEMB/C

1 Wetland 1 continues beyond the AOI boundary; delineated boundary within the AOI consists of farmed fields and wetland fringe.

The wetland boundaries and revised types within the evaluation area are accurate based on the requirements of the *1987 U.S. Army Corps of Engineers Wetland Delineation Manual*, the *2012 Northcentral and Northeast Regional Supplement*, and the *2015 Guidance for Submittal of Delineation Reports to the USACE and WCA LGU in Minnesota, Version 2.0.*

The VBWD approves the wetland boundaries and types within the evaluation area.

For Replacement Plans using credits from the State Wetland Bank:

Bank Account #	Bank Service Area	County	Credits Approved for Withdrawal (sq. ft. or nearest .01 acre)

Replacement Plan Approval Conditions. In addition to any conditions specified by the LGU, the approval of a Wetland Replacement Plan is conditional upon the following:

☐ **Financial Assurance:** For project-specific replacement that is not in-advance, a financial assurance specified by the LGU must be submitted to the LGU in accordance with MN Rule 8420.0522, Subp. 9 (List amount and type in LGU Findings).

☐ **Deed Recording:** For project-specific replacement, evidence must be provided to the LGU that the BWSR "Declaration of Restrictions and Covenants" and "Consent to Replacement Wetland" forms have been filed with the county recorder's office in which the replacement wetland is located.

☐ **Credit Withdrawal:** For replacement consisting of wetland bank credits, confirmation that BWSR has withdrawn the credits from the state wetland bank as specified in the approved replacement plan.

Wetlands may not be impacted until all applicable conditions have been met!

LGU Authorized Signature:

<table>
<tr><td colspan="3">Signing and mailing of this completed form to the appropriate recipients in accordance with 8420.0255, Subp. 5 provides notice that a decision was made by the LGU under the Wetland Conservation Act as specified above. If additional details on the decision exist, they have been provided to the landowner and are available from the LGU upon request.</td></tr>
<tr><td>Name
David J. Bucheck</td><td colspan="2">Title
Valley Branch WD Board President</td></tr>
<tr><td>Signature
DJ Bucheck</td><td>Date
11/9/2017</td><td>Phone Number and E-mail
651-770-1730
djbucheck@yahoo.com</td></tr>
</table>

THIS DECISION ONLY APPLIES TO THE MINNESOTA WETLAND CONSERVATION ACT. Additional approvals or permits from local, state, and federal agencies may be required. Check with all appropriate authorities before commencing work in or near wetlands.

Applicants proceed at their own risk if work authorized by this decision is started before the time period for appeal (30 days) has expired. If this decision is reversed or revised under appeal, the applicant may be responsible for restoring or replacing all wetland impacts.

This decision is valid for five years from the date of decision unless a longer period is advised by the TEP and specified in this notice of decision.

3. APPEAL OF THIS DECISION

Pursuant to MN Rule 8420.0905, any appeal of this decision can only be commenced by mailing a petition for appeal, including applicable fee, within thirty (30) calendar days of the date of the mailing of this Notice to the following as indicated:

Check one:

☐ Appeal of an LGU staff decision. Send petition and $_____ fee (if applicable) to:	☒ Appeal of LGU governing body decision. Send petition and $500 filing fee to: Executive Director Minnesota Board of Water and Soil Resources 520 Lafayette Road North St. Paul, MN 55155

4. LIST OF ADDRESSEES

☒ SWCD TEP member: **Jay Riggs - Washington Conservation District**
☒ BWSR TEP member: **Ben Meyer**
☒ DNR TEP member: **Becky Horton and Jenifer Sorensen**
☒ WD or WMO (if applicable): **John Hanson**
☒ Applicant (notice only) and Landowner (if different): **Chad Leqve (Metropolitan Airports Commission), Brauna Hartzell and Evan Barrett (Mead & Hunt, Inc.)**
☒ Corps of Engineers Project Manager: **Tom Hingsberger**
☐ BWSR Wetland Bank Coordinator (wetland bank plan decisions only)

5. MAILING INFORMATION

➢For a list of BWSR TEP representatives: www.bwsr.state.mn.us/aboutbwsr/workareas/WCA_areas.pdf

➢For a list of DNR TEP representatives: www.bwsr.state.mn.us/wetlands/wca/DNR_TEP_contacts.pdf

➢Department of Natural Resources Regional Offices:

NW Region:	NE Region:	Central Region:	Southern Region:
Reg. Env. Assess. Ecol. Div. Ecol. Resources 2115 Birchmont Beach Rd. NE Bemidji, MN 56601	Reg. Env. Assess. Ecol. Div. Ecol. Resources 1201 E. Hwy. 2 Grand Rapids, MN 55744	Reg. Env. Assess. Ecol. Div. Ecol. Resources 1200 Warner Road St. Paul, MN 55106	Reg. Env. Assess. Ecol. Div. Ecol. Resources 261 Hwy. 15 South New Ulm, MN 56073

For a map of DNR Administrative Regions, see: http://files.dnr.state.mn.us/aboutdnr/dnr_regions.pdf

➢For a list of Corps of Project Managers: www.mvp.usace.army.mil/regulatory/default.asp?pageid=687 or send to:

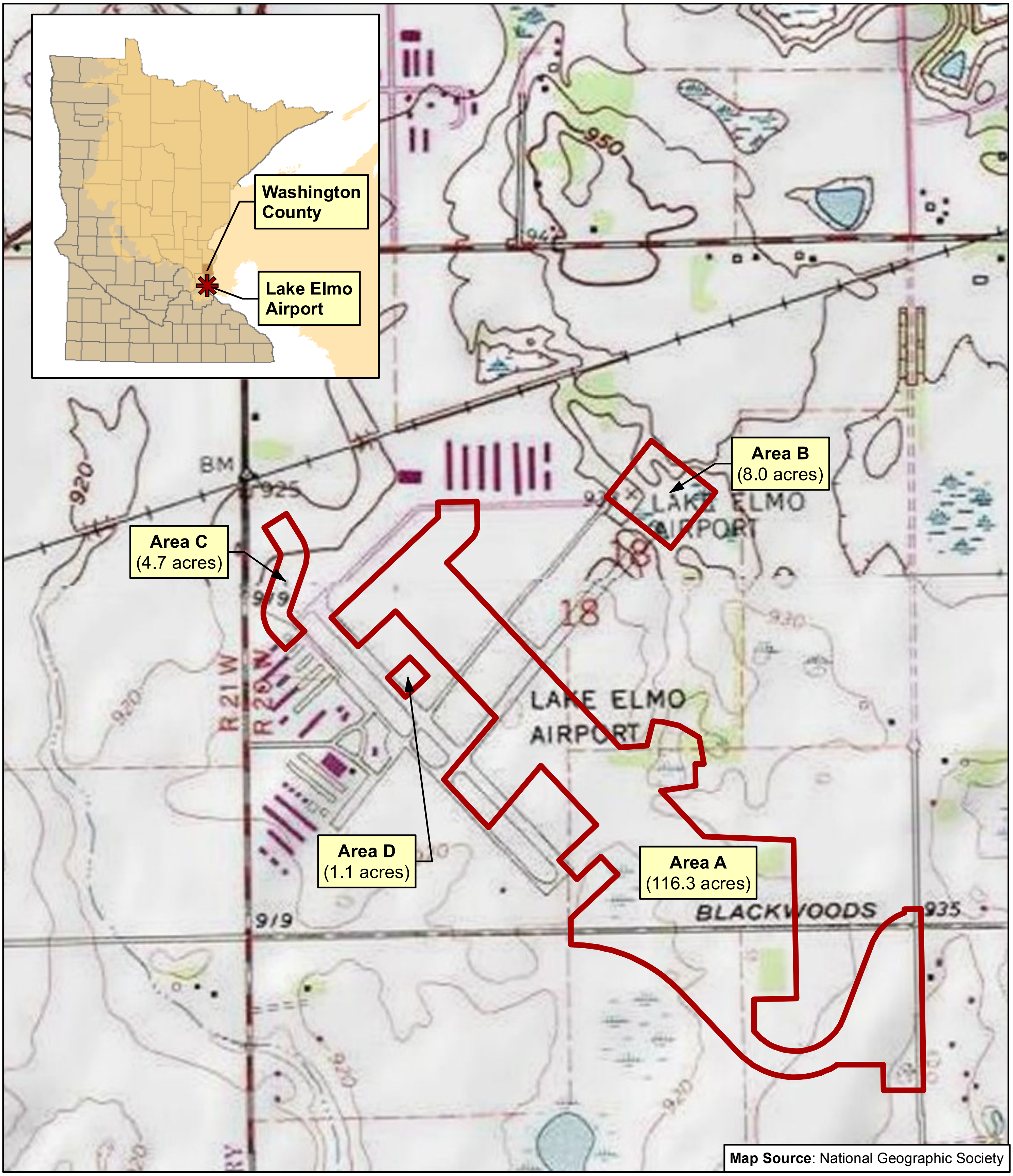
US Army Corps of Engineers
St. Paul District, ATTN: OP-R
180 Fifth St. East, Suite 700
St. Paul, MN 55101-1678

➢For Wetland Bank Plan applications, also send a copy of the application to:

Minnesota Board of Water and Soil Resources
Wetland Bank Coordinator
520 Lafayette Road North
St. Paul, MN 55155

6. ATTACHMENTS

In addition to the site locator map, list any other attachments: ☒ **wetland delineation map**



Project Location and Topography

LAKE ELMO AIRPORT

Proposed Runway 14/32 Relocation and Associated Improvements

Legend

Area of Interest (AOI)

LRR Subregion: K

0 1,000 2,000 Feet

N

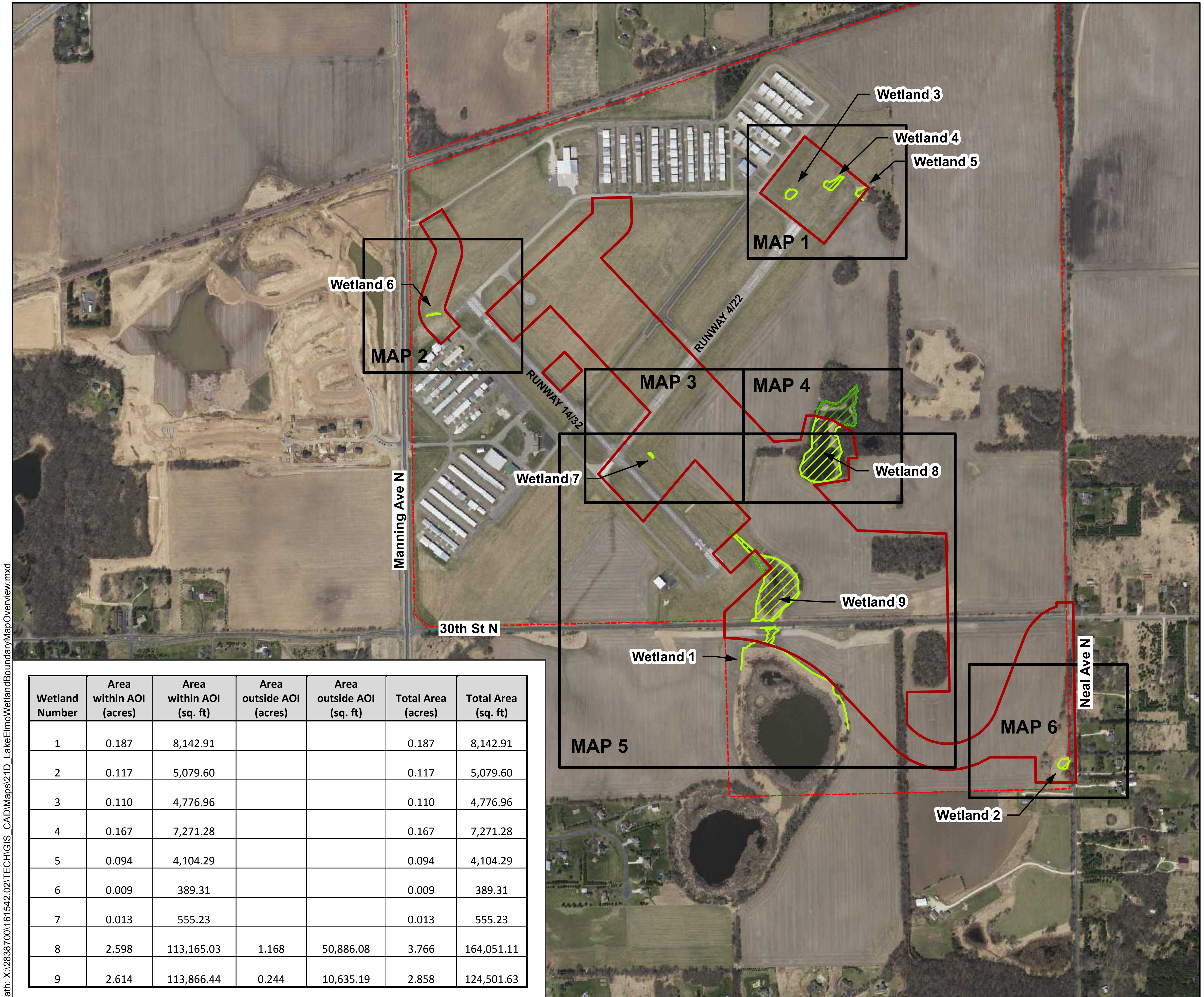
Project Location

T29N, R20W, S18 and S19
Baytown and West Lakeland Townships
Washington County, MN
LRR Subregion: K
USACE Regional Supplement: NC/NE
Area = 130.1 acres

Wetland Boundary Map Sheet Key

LAKE ELMO AIRPORT

Proposed Runway 14-32 Runway Shift



Wetland Number	Area within AOI (acres)	Area within AOI (sq. ft)	Area outside AOI (acres)	Area outside AOI (sq. ft)	Total Area (acres)	Total Area (sq. ft)
1	0.187	8,142.91			0.187	8,142.91
2	0.117	5,079.60			0.117	5,079.60
3	0.110	4,776.96			0.110	4,776.96
4	0.167	7,271.28			0.167	7,271.28
5	0.094	4,104.29			0.094	4,104.29
6	0.009	389.31			0.009	389.31
7	0.013	555.23			0.013	555.23
8	2.598	113,165.03	1.168	50,886.08	3.766	164,051.11
9	2.614	113,866.44	0.244	10,635.19	2.858	124,501.63

Legend

- Map Sheet
- Wetland Boundary
- Wetland within AOI
- Outside AOI
- Area of Interest
- Airport Property Boundary

Wetland Number	Description	Circular 39 Type
1	Seasonally Flooded Basin	Type 1
2	Fresh (wet) Meadow	Type 2
3	Fresh (wet) Meadow	Type 2
4	Fresh (wet) Meadow	Type 2
5	Fresh (wet) Meadow	Type 2
6	Fresh (wet) Meadow (Ditch Wetland)	Type 2
7	Fresh (wet) Meadow (Ditch Wetland)	Type 2
8	Fresh (wet) Meadow /Deep Marsh	Type 2/ Type 4
9	Fresh (wet) Meadow /Shallow Marsh	Type 2/ Type 3

N

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

Project Information

T29N, R20W, S18 and S19
City of Lake Elmo
Washington County, MN
Area of Interest = 130.1 acres
Field work conducted:
June 5 - 9, 2017

Mead & Hunt

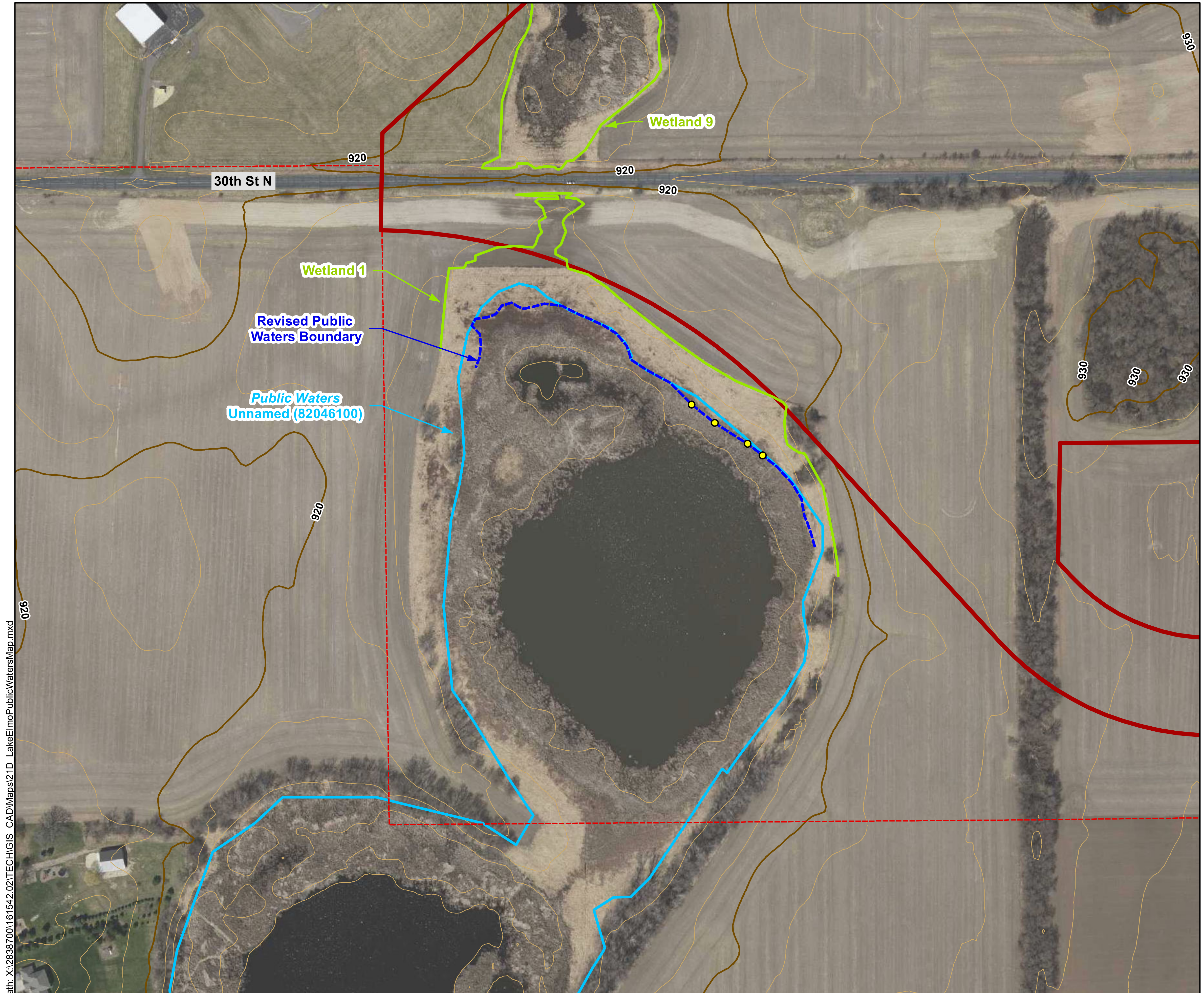
Image Source: MnGEO WMS Image Service, Washington County (2016 color 7-county)

Path: X:\2838700\161542.02\TECH\GIS_CAD\Maps\21D_LakeElmoWetlandBoundaryMapOverview.mxd

MN Public Waters Map

LAKE ELMO AIRPORT

Proposed Runway 14-32 Runway Shift



Legend

- MN Public Waters Basins *
- Public Waters Revised **
- Delineated Wetland Boundary ***
- Public Waters Boundary Point (GPS)
- Area of Interest
- Airport Property Boundary

Contour Elevation

- Index Contour
- Intermediate Contour

N

0 150 300 Feet

Project Information

T29N, R20W, S18 and S19
City of Lake Elmo
Washington County, MN
Area of Interest = 130.1 acres
Field work conducted:
June 5 - 9, 2017

Mead & Hunt

*** Mn Public Waters Data:** Public Waters (PW) Basin and Watercourse Delineations, Washington County, MN Geospatial Commons

**** Mn Public Waters Revised:** Based on field-collected GPS points, aerial photography, and LiDAR topographic data

***** Delineated Wetland Boundary:** Field work conducted June 5 - 9, 2017

Contour Source: Minnesota Geospatial Commons, Minnesota Elevation Mapping Project, Twin Cities Metro Region 2011

Image Source: MnGEO WMS Image Service, Washington County (2016 color 7-county)

Minnesota Wetland Conservation Act
Notice of Decision

Local Government Unit (LGU) **Valley Branch Watershed District (VBWD)**	Address **P.O. Box 838** **Lake Elmo, MN 55042**

1. PROJECT INFORMATION

Applicant Name	Project Name	Date of Application	Application Number
Chad Leqve, Metropolitan Airports Commission	**Lake Elmo Airport**	**12/4/2017** **12/21/2017 additional information**	

☒ Attach site locator map.

Type of Decision:

☐ Wetland Boundary or Type ☒ No-Loss ☐ Exemption ☐ Sequencing
☐ Replacement Plan ☐ Banking Plan

Technical Evaluation Panel (TEP) Findings and Recommendation (if any):

☐ Approve ☐ Approve with conditions ☐ Deny

Summary (or attach): **No TEP Findings Report**

2. LOCAL GOVERNMENT UNIT DECISION

Date of Decision: **01/25/2018**

☒ Approved ☐ Approved with conditions (include below) ☐ Denied

LGU Findings and Conclusions (attach additional sheets as necessary):

On behalf of the Metropolitan Airports Commission, Mead & Hunt, Inc. submitted a request for a WCA no-loss incidental wetland determination associated with the Lake Elmo Airport Runway Relocation and Improvements project in Lake Elmo, Minnesota (Sec. 18 and 19, T29N, R20W), within Washington County.

The wetland boundaries and types were previously approved by the VBWD on 11/09/2017.

The incidental wetland request submittal provides documentation that Wetlands 3, 6, and 7 are incidental wetlands, according to MN Rule 8420.0105 Subp. 2 D, and not regulated within the scope of the WCA.

The submittal was provided to TEP members for review and comment. TEP members Ben Meyer, from the Minnesota Board of Water and Soil Resources; Jay Riggs, from the Washington Conservation District; and Karen Wold, with Barr Engineering Co. for the VBWD, all agree that the soil mapping and historical imagery for these three areas do not show a wetland prior to the runway construction. Therefore, these are wetland areas created in non-wetland areas solely by actions. Because it was not the purpose of these actions to create the wetland, the areas meet the definition of incidental wetlands.

The VBWD approves the incidental wetland determination for Wetlands 3, 6, and 7 according to MN Rule 8420.0105 Subp. 2 D and any project work within these areas as WCA no-loss activity

under MN Rule 8420.0415 A.

For Replacement Plans using credits from the State Wetland Bank:

Bank Account #	Bank Service Area	County	Credits Approved for Withdrawal (sq. ft. or nearest .01 acre)

Replacement Plan Approval Conditions. In addition to any conditions specified by the LGU, the approval of a Wetland Replacement Plan is conditional upon the following:

☐ **Financial Assurance:** For project-specific replacement that is not in-advance, a financial assurance specified by the LGU must be submitted to the LGU in accordance with MN Rule 8420.0522, Subp. 9 (List amount and type in LGU Findings).

☐ **Deed Recording:** For project-specific replacement, evidence must be provided to the LGU that the BWSR "Declaration of Restrictions and Covenants" and "Consent to Replacement Wetland" forms have been filed with the county recorder's office in which the replacement wetland is located.

☐ **Credit Withdrawal:** For replacement consisting of wetland bank credits, confirmation that BWSR has withdrawn the credits from the state wetland bank as specified in the approved replacement plan.

Wetlands may not be impacted until all applicable conditions have been met!

LGU Authorized Signature:

<table>
<tr><td colspan="3">Signing and mailing of this completed form to the appropriate recipients in accordance with 8420.0255, Subp. 5 provides notice that a decision was made by the LGU under the Wetland Conservation Act as specified above. If additional details on the decision exist, they have been provided to the landowner and are available from the LGU upon request.</td></tr>
<tr><td>Name
Jill Lucas</td><td colspan="2">Title
Valley Branch WD Board President</td></tr>
<tr><td>Signature
John S Hanson for</td><td>Date
1/25/2018</td><td>Phone Number and E-mail
612-860-0551
Jill.m.lucas@gmail.com</td></tr>
</table>

THIS DECISION ONLY APPLIES TO THE MINNESOTA WETLAND CONSERVATION ACT. Additional approvals or permits from local, state, and federal agencies may be required. Check with all appropriate authorities before commencing work in or near wetlands.

Applicants proceed at their own risk if work authorized by this decision is started before the time period for appeal (30 days) has expired. If this decision is reversed or revised under appeal, the applicant may be responsible for restoring or replacing all wetland impacts.

This decision is valid for five years from the date of decision unless a longer period is advised by the TEP and specified in this notice of decision.

3. APPEAL OF THIS DECISION

Pursuant to MN Rule 8420.0905, any appeal of this decision can only be commenced by mailing a petition for appeal, including applicable fee, within thirty (30) calendar days of the date of the mailing of this Notice to the following as indicated:

Check one:

☐ Appeal of an LGU staff decision. Send petition and $_____ fee (if applicable) to:	☒ Appeal of LGU governing body decision. Send petition and $500 filing fee to: Executive Director Minnesota Board of Water and Soil Resources 520 Lafayette Road North St. Paul, MN 55155

4. LIST OF ADDRESSEES

☒ SWCD TEP member: **Jay Riggs - Washington Conservation District**
☒ BWSR TEP member: **Ben Meyer**
☒ DNR TEP member: **Becky Horton and Jenifer Sorensen**
☒ WD or WMO (if applicable): **John Hanson**
☒ Applicant (notice only) and Landowner (if different): **Chad Leqve (Metropolitan Airports Commission), Brauna Hartzell and Evan Barrett (Mead & Hunt, Inc.)**
☒ Corps of Engineers Project Manager: **Tom Hingsberger**
☐ BWSR Wetland Bank Coordinator (wetland bank plan decisions only)

5. MAILING INFORMATION

➢For a list of BWSR TEP representatives: www.bwsr.state.mn.us/aboutbwsr/workareas/WCA_areas.pdf

➢For a list of DNR TEP representatives: www.bwsr.state.mn.us/wetlands/wca/DNR_TEP_contacts.pdf

➢Department of Natural Resources Regional Offices:

NW Region:	NE Region:	Central Region:	Southern Region:
Reg. Env. Assess. Ecol. Div. Ecol. Resources 2115 Birchmont Beach Rd. NE Bemidji, MN 56601	Reg. Env. Assess. Ecol. Div. Ecol. Resources 1201 E. Hwy. 2 Grand Rapids, MN 55744	Reg. Env. Assess. Ecol. Div. Ecol. Resources 1200 Warner Road St. Paul, MN 55106	Reg. Env. Assess. Ecol. Div. Ecol. Resources 261 Hwy. 15 South New Ulm, MN 56073

For a map of DNR Administrative Regions, see: http://files.dnr.state.mn.us/aboutdnr/dnr_regions.pdf

➢For a list of Corps of Project Managers: www.mvp.usace.army.mil/regulatory/default.asp?pageid=687
or send to:

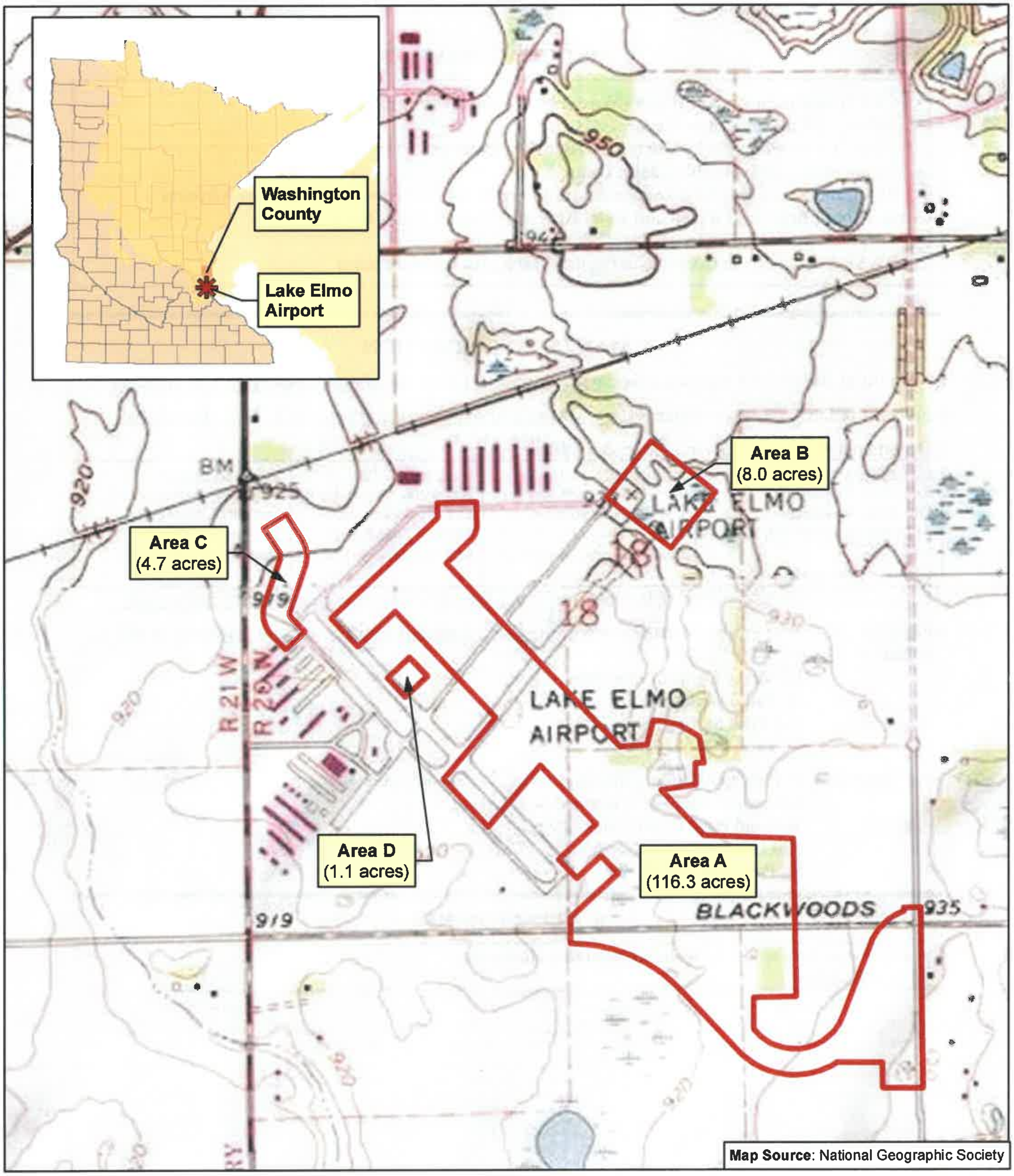
US Army Corps of Engineers
St. Paul District, ATTN: OP-R
180 Fifth St. East, Suite 700
St. Paul, MN 55101-1678

➢For Wetland Bank Plan applications, also send a copy of the application to:

Minnesota Board of Water and Soil Resources
Wetland Bank Coordinator
520 Lafayette Road North
St. Paul, MN 55155

6. ATTACHMENTS

In addition to the site locator map, list any other attachments:
☒ **application**



Project Location and Topography

LAKE ELMO AIRPORT

Proposed Runway 14/32 Relocation and Associated Improvements

Legend

Area of Interest (AOI)

LRR Subregion: K

0 1,000 2,000 Feet

N

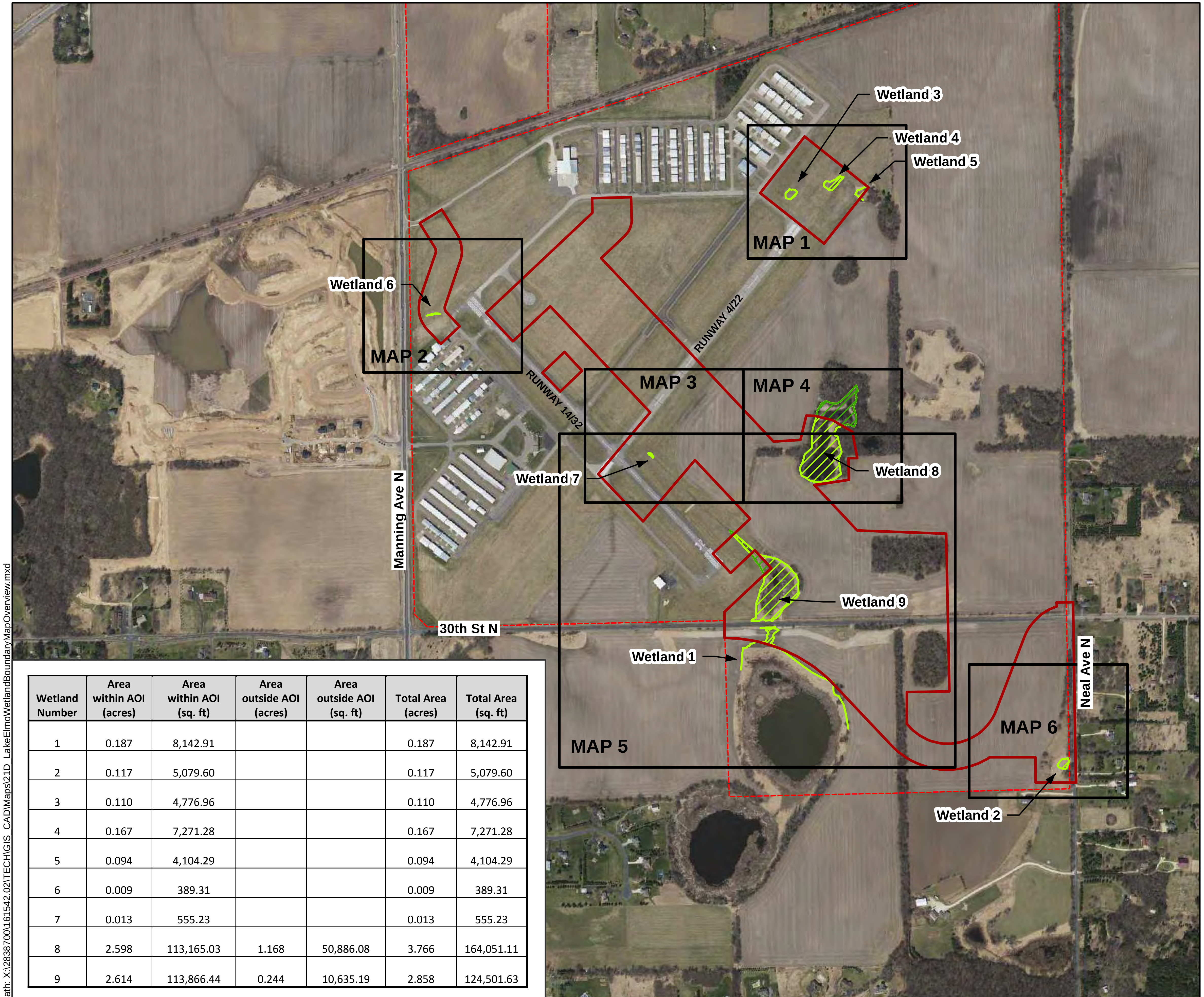
Project Location

T29N, R20W, S18 and S19
Baytown and West Lakeland Townships
Washington County, MN
LRR Subregion: K
USACE Regional Supplement: NC/NE
Area = 130.1 acres

Wetland Boundary Map Sheet Key

LAKE ELMO AIRPORT

Proposed Runway 14-32 Runway Shift



Wetland Number	Area within AOI (acres)	Area within AOI (sq. ft)	Area outside AOI (acres)	Area outside AOI (sq. ft)	Total Area (acres)	Total Area (sq. ft)
1	0.187	8,142.91			0.187	8,142.91
2	0.117	5,079.60			0.117	5,079.60
3	0.110	4,776.96			0.110	4,776.96
4	0.167	7,271.28			0.167	7,271.28
5	0.094	4,104.29			0.094	4,104.29
6	0.009	389.31			0.009	389.31
7	0.013	555.23			0.013	555.23
8	2.598	113,165.03	1.168	50,886.08	3.766	164,051.11
9	2.614	113,866.44	0.244	10,635.19	2.858	124,501.63

Path: X:\283870\161542.02\TECH\GIS_CADMaps\21D_LakeElmoWetlandBoundaryMapOverview.mxd

Legend

- Map Sheet
- Wetland Boundary
- Wetland within AOI
- Outside AOI
- Area of Interest
- Airport Property Boundary

Wetland Number	Description	Circular 39 Type
1	Seasonally Flooded Basin	Type 1
2	Fresh (wet) Meadow	Type 2
3	Fresh (wet) Meadow	Type 2
4	Fresh (wet) Meadow	Type 2
5	Fresh (wet) Meadow	Type 2
6	Fresh (wet) Meadow (Ditch Wetland)	Type 2
7	Fresh (wet) Meadow (Ditch Wetland)	Type 2
8	Fresh (wet) Meadow /Deep Marsh	Type 2/ Type 4
9	Fresh (wet) Meadow /Shallow Marsh	Type 2/ Type 3

N

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

Project Information

T29N, R20W, S18 and S19
City of Lake Elmo
Washington County, MN
Area of Interest = 130.1 acres
Field work conducted:
June 5 - 9, 2017

Mead & Hunt

Image Source: MnGEO WMS Image Service, Washington County (2016 color 7-county)

Mead&Hunt

Transmittal

7900 W 78th Street, Suite 370, Minneapolis, MN 55439

PROJECT:	MAC 21D Lake Elmo Environmental Services 2838700-161542.02	DATE:	12/4/2017
SUBJECT:	Lake Elmo Airport Wetland Determination Requests	TRANSMITTAL ID:	00013
PURPOSE:	For your approval	VIA:	Info Exchange

FROM

NAME	COMPANY	EMAIL	PHONE
Evan Barrett 7900 W 78th Street, Suite 370 Minneapolis MN 55439 United States	Mead & Hunt, Inc.	Evan.Barrett@meadhunt.com	952-641-8820

TO

NAME	COMPANY	EMAIL	PHONE
kwold@barr.com		kwold@barr.com	
thomas.j.hingsberger@usace.army.mil		thomas.j.hingsberger@usace.army.mil	

REMARKS:

Good morning Ms. Wold & Mr. Hingsberger,
On behalf of the Metropolitan Airports Commission, I would like to request the following with respect to our wetland delineation at Lake Elmo Airport. Below are links to a technical memorandum and related documentation that provide supporting documentation for these requests.

- From the Valley Branch Watershed District and Technical Evaluation Panel, we would like to request an incidental wetland review of Wetlands 3, 6, and 7.
- From the U.S. Army Corps of Engineers, we would like to request an approved jurisdictional determination for all nine wetlands identified in the wetland delineation report.

Please provide an approximate time frame we should expect for responses to these requests, and let Brauna Hartzell and I know if you have any questions or concerns.

Thank you!

R. Evan Barrett, AICP | Planner, Aviation Services
Mead & Hunt, Inc | 7900 West 78th Street, Suite 370 | Minneapolis, MN 55439
Main: 952-941-5619 | Mobile: 612-597-4262 | Direct: 952-641-8820
evan.barrett@meadhunt.com | www.meadhunt.com

Transmittal

DATE: 12/4/2017
TRANSMITTAL ID: 00013

DESCRIPTION OF CONTENTS

QTY	DATED	TITLE	NOTES
1	12/4/2017	WetlandTechnicalMemo_12.04.2017.pdf	
1	10/26/2017	AppendixF_WetlandBoundaryMaps.pdf	
1	11/15/2017	AppendixB4_washingtoncountypublicwaters_2011may20.pdf	
1	8/18/2017	AppendixC_AerialPhotoReview.pdf	
1	11/15/2017	AppendixB2_20170801_16551604684_12_Hydric_Rating_by_Map_Unit.pdf	
1	8/18/2017	AppendixB3_21D_LakeElmoNWIMap.pdf	
1	8/18/2017	AppendixB1_21D_LakeElmoDetailedTopoMap.pdf	

COPIES:

Brauna Hartzell (Mead & Hunt, Inc.)

Technical Report

To: U.S. Army Corps of Engineers, St. Paul District
Valley Branch Watershed District

From: Mead & Hunt, Inc.

Date: December 4, 2017

Subject: **Lake Elmo Airport (21D)**
Runway 14/32 Relocation and Associated Improvements
Request for U.S. Army Corps of Engineers Approved Jurisdictional Determination and MN Wetland Conservation Act Incidental Wetland Determination

1. Determination Requests

Mead & Hunt, as agent for the Metropolitan Airports Commission (MAC), is requesting an approved jurisdictional determination from the USCOE to determine which, if any, of the nine wetlands delineated at Lake Elmo Airport are jurisdictional waters of the United States and therefore fall under the jurisdiction of Section 404 of the Clean Water Act (CWA). We understand that this review will take approximately 60 days to complete.

Preliminary jurisdictional determinations are advisory in nature and are not appealable while approved jurisdictional determinations document whether a wetland and/or waterbody is subject to regulatory jurisdiction under Section 404 of the CWA. Proposed activities that result in dredge or fill material being discharged into jurisdictional wetlands are regulated through a permit review process. Compensatory mitigation will be required for unavoidable impacts to regulated wetlands.

Wetlands in Minnesota are also regulated under the Minnesota Wetland Conservation Act (WCA). Unavoidable impacts to regulated wetlands require a replacement plan. However, certain types of wetlands created within non-wetland areas due to drainage practices, impoundments, and the like, are not regulated by the WCA. Impacts to wetlands of this type do not require a replacement plan under the WCA. Therefore, Mead & Hunt is requesting an incidental wetland review of Wetlands 3, 6, and 7 from the local government unit (LGU) under WCA, Valley Branch Watershed District. These wetlands appear to have been created in association with drainage ditches and/or adverse construction grading and may be determined incidental.

The overlapping but separate frameworks regulating wetlands in Minnesota at the federal and state levels are complex. The purpose of these determination requests is to clarify the status of delineated wetlands under both federal and state regulation at Lake Elmo. This information will be crucial in evaluating required mitigation for potential wetland impacts associated with proposed actions at the Airport.

A wetland boundary map is included with this memo which shows the locations and types of these specific wetlands. Documentation is provided as part of this memo for both determination requests.

Included as supplemental information to this memo for use in these determinations are materials included in the *Wetland Delineation and Functional Assessment Report*[1] previously submitted to the USCOE and the LGU. More detailed site history and background can also be found in the delineation report as well as site photos and a wetland functional assessment. Supplemental materials provided here include:

- A detailed topographic map generated from LiDAR data collected by the Minnesota Elevation Mapping Project (2011)
- NRCS Hydric Soils Mapping
- Aquatic Resources Map showing National Wetland Inventory mapping, MN Public Waters, and Stream data from the National Hydrography Dataset
- Washington County, MN Public Waters Map (with Lake Elmo Airport Area highlighted)
- Historic Aerial Photo Review
- Wetland Boundary Maps (with detailed topographic information included)

2. Background

Lake Elmo Airport (21D) is a general aviation reliever airport owned and operated by the Metropolitan Airports Commission (MAC). The airport is located approximately 20 miles east of downtown St. Paul, Minnesota. The airfield at 21D consists of two runways, supporting taxiways, and numerous privately owned hangars. Runway 14/32 is the primary runway and is 2,849 feet long and 75 feet wide. The crosswind runway (Runway 4/22) is 2,496 feet long and 75 feet wide. There are two non-precision instrument approaches to the Airport, which has no control tower. Fueling, flight training, and aircraft maintenance services are available from a fixed-base operator. The primary role of the airport is to serve personal, recreational, and business aviation users.

MAC has prepared a number of Long-Term Comprehensive Plans (LTCP) for the Airport, beginning in 1966 with updates in 1976, 1992, 2008, and 2016. The LTCP identifies future facility needs, delineates the future footprint of the Airport, and aims to bring the Airport into alignment with Federal Aviation Administration (FAA) guidance and standards.

A joint federal Environmental Assessment (EA) / State Environmental Assessment Worksheet (EAW) is being completed to identify and evaluate environmental impacts associated with proposed actions to address future facility needs and various deficiencies identified at the Airport. In support of this effort, a wetland delineation and functional assessment was performed by Mead & Hunt, Inc. (Mead & Hunt) in 2017.

A Technical Evaluation Panel (TEP) field review meeting was held at the Airport on October 17, 2017 and a Minnesota Wetland Conservation Act (WCA) Notice of Decision was approved by the Valley Branch Watershed District (VBWD), the LGU, on November 9, 2017. The wetland boundaries and types were approved by this Decision.

---

[1] *Wetland Delineation and Functional Assessment Report, Lake Elmo (21D) Airport, Runway 14/32 Runway Relocation and Associated Improvements.* Report prepared for the Metropolitan Airports Commission, Minneapolis, MN. Report prepared by Mead & Hunt, Inc., Middleton, WI. October 2017.

Nine wetlands were delineated at the Airport and consist primarily of Fresh (wet) Meadow (Type 2) wetlands. Table 1 lists the delineated wetlands and types.

Table 1: Summary of Delineated Wetlands at Lake Elmo Airport			
Wetland	**Wetland Type**	**Circular 39 Type**	**Cowardin Type**
1	Seasonally Flooded Basin[1]	Type 1	PEMA
2	Fresh (wet) Meadow	Type 2	PEMB
3	Fresh (wet) Meadow	Type 2	PEMB
4	Fresh (wet) Meadow	Type 2	PEMB
5	Fresh (wet) Meadow	Type 2	PEMB
6	Fresh (wet) Meadow	Type 2	PEMB
7	Fresh (wet) Meadow	Type 2	PEMB
8	Fresh (wet) Meadow /Deep Marsh	Type 2/ Type 4	PEMB/F
9	Fresh (wet) Meadow/ Shallow Marsh	Type 2/ Type 3	PEMB/C

3. Regulatory Agencies

Wetlands and other waters are regulated by a variety of agencies, including those at the federal, state, and local level. Overlapping jurisdictional responsibilities can sometimes cover the same wetland, as described below.

A. Federal

The U.S. Army Corps of Engineers (USCOE) and the U.S. Environmental Protection Agency (EPA), under Section 404 of the Clean Water Act (CWA), regulate discharge of dredged or fill materials to Waters of the U.S., including wetlands, as well as work within the channel of navigable waters as defined by Section 10 of the Rivers and Harbors Act. The current regulatory definition of "Waters of the U.S." is complex and is under review. Operationally, the definition has reverted to the 1986/1988 definition.

To determine which wetlands may be regulated under Section 404, jurisdictional determinations are performed by the USCOE. A preliminary jurisdictional determination (JD) by the USCOE requires less time to complete, is advisory in nature, and may not be appealed. An approved jurisdictional determination by the USCOE results in documentation of the presence or absence of Waters of the U.S. and therefore whether a wetland and/or waterbody is subject to regulatory jurisdiction under Section 404 of the CWA. Approved JDs are valid for a period of five years from issuance.

Section 404 requires a permit before dredge or fill material may be discharged into Waters of the U.S. Prior to applying for a 404 permit, steps must be taken to avoid impacts to wetlands, minimize potential impacts, and to provide compensatory mitigation for all remaining unavoidable impacts.

B. State

At the State level, the Minnesota Department of Natural Resources (DNR) regulates areas listed as Public Waters – those areas below the Ordinary High Water of wetlands and waters. *Public waters wetlands* are a subset of the broader category of “public waters” regulated by the DNR, which includes most lakes and larger streams and rivers. Public waters wetlands are defined in Minn. Stat. § 103G.005, subd. 15a, as follows:

> "Public waters wetlands" means all types 3, 4, and 5 wetlands, as defined in United States Fish and Wildlife Service Circular No. 39 (1971 edition), not included within the definition of public waters, that are ten or more acres in size in unincorporated areas or 2-1/2 or more acres in incorporated areas.[2]

MN Public Water 82046100 lies in close proximity to the project area of interest and is associated with Wetland 1.

C. Local

Under the Wetland Conservation Act of 1991, the State of Minnesota regulates wetlands not protected under the DNR’s public waters permit program. Wetlands regulated under the WCA are defined in Minn. Stat. § 103G.005, subd. 19:

> “Wetlands" means lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. For purposes of this definition, wetlands must have the following three attributes: (1) have a predominance of hydric soils; (2) be inundated or saturated by surface water or ground water at a frequency and duration sufficient to support a prevalence of hydrophytic vegetation typically adapted for life in saturated soil conditions; and (3) under normal circumstances support a prevalence of hydrophytic vegetation.[2]

Under the WCA, responsibility for administration is shared by both local and state government. A local government unit (LGU), typically a city, county, watershed district or soil and water conservation district, has responsibility for administering provisions under the WCA at the local level. On state lands, the state agency with administrative responsibility for the land is also responsible for administering the WCA.

The WCA, however, does not regulate “incidental wetlands” as given in Chapter 8420 of the Minnesota Administrative Rules under Part 8420.0105, subp. 2D:

> “Incidental wetlands" are wetland areas that the landowner can demonstrate, to the satisfaction of the local government unit, were created in nonwetland areas solely by actions, the purpose of which was not to create the wetland. Incidental wetlands include drainage ditches,

[2] “WETLANDS REGULATION IN MINNESOTA”, Minnesota Board of Water and Soil Resources, May 2003 (Accessed on-line at http://www.bwsr.state.mn.us/wetlands/publications)

impoundments, or excavations constructed in nonwetlands solely for the purpose of effluent treatment, containment of waste material, storm water retention or detention, drainage, soil and water conservation practices, and water quality improvements and not as part of a wetland replacement process that may, over time, take on wetland characteristics. "

A replacement plan is required for unavoidable impacts to wetlands covered under WCA; a replacement plan, therefore, is not required for impacts to wetlands determined to be incidental.

4. Discussion of Subject Wetlands 3, 6, and 7

The airport was constructed around 1951-1952 (located in the southwest quarter of Section 18, T29N, R20W) on lands consistently in agricultural production since at least 1938 (the first available aerial photo). As can be seen in the series of aerial photos covering from 1938 to 2016, lands surrounding the airfield within Section 18 have been in agricultural production from completion of airport construction to today. Lands within the infield area are hayed or mown regularly and other areas outside of the airfield, but on Airport property, are in row crop production. Wet signatures, except those associated with isolated wetlands consistently seen in the series of aerial photos, appear to be absent in areas on Airport property under cultivation.

Soils in this part of the Section 18 are covered primarily by Crystal Lake silt Loam, 1 to 3 percent slopes (449) with a hydric rating of just 3 percent and non-hydric Antigo silt loam, 2 to 6 percent slopes (49B). These fertile well-drained soils support the nearly continuous agricultural production observed. See Soils mapping provided for coverage of these soil series.

Delineated Wetlands 1, 2, 5, 8, and 9 are consistent with previously mapped National Wetland Inventory (NWI) wetlands shown on the Aquatic Resources Map. However, Wetlands 3, 6, and 7 are not identified on the NWI. Wetlands 6 and 7 (See Wetland Boundary Maps 2 and 3, respectively) are ditch wetlands associated with culvert outlets designed to drain infield areas at the Airport. Wetland 6 is located at the base of a culvert near the end of Runway 14 and directs drainage to the west. Wetland 7 is located near the intersection of the two runways and drains from a large culvert into a wide swale that connects to Wetland 9. Both of these wetlands have developed as a result of the consistent hydrological support that the culvert drainage provides. These wetlands occur in moderately well-drained Crystal Lake silt loam and likely are incidental to the construction of the drainage system for the airport.

Wetland 3 is located near the Runway 22 end (See Wetland Boundary Map 1). Grading at a topographic high of 930 feet above sea level extends beyond the end of the runway for approximately 200 feet. Wetland 3 is located on the west side at the base of the slope associated with this runway safety area grading. The fillslope associated with the connecting taxiway bounds the southern side of the wetland. A swale, running parallel to the hangar area taxilane, drains areas to the north and likely some of the associated hangar development to the west. Wetland 3, though, does not appear to connect hydrologically to the swale or the culvert draining to the south under the connector taxiway. Surface run-off from slopes on the east and south likely collects in this isolated low spot and supports this Fresh (wet) Meadow Type 2 wetland.

Wetland 3 occurs on soils mapped as well-drained non-hydric Antigo silt loam, 2 to 6 percent slopes (49B). From the aerial photo review, it appears that the area at the end of the runway was consistently in agricultural production until the runway was constructed and that grading for fill slopes and the runway safety area contributed to the formation of this wetland in non-wetland soils. Therefore, Wetland 3 is incidental to the construction of the runway and its drainage system.

5. Summary

This memorandum and its attachments support a request for jurisdictional determinations by the USCOE and the VBWD. Mead & Hunt is requesting an approved jurisdictional determination by the USCOE for all nine wetlands delineated at the Airport and an incidental wetland determination from the VBWD for Wetland 3, 6, and 7.

PART ONE: Applicant Information

If applicant is an entity (company, government entity, partnership, etc.), an authorized contact person must be identified. If the applicant is using an agent (consultant, lawyer, or other third party) and has authorized them to act on their behalf, the agent's contact information must also be provided.

Applicant/Landowner Name: Chad Leqve (Metropolitan Airports Commission)
Mailing Address: 6040 28TH AVE S, MINNEAPOLIS MN 55450
Phone: 612-725-6326
E-mail Address: Chad.leqve@mspmac.org

Authorized Contact (do not complete if same as above):
Mailing Address:
Phone:
E-mail Address:

Agent Name: Evan Barrett (Mead & Hunt, Inc.)
Mailing Address: 7900 West 78th Street, Suite 370, Minneapolis, MN 55439
Phone: 952-641-8820
E-mail Address: evan.barrett@meadhunt.com

PART TWO: Site Location Information

County: Washington
City/Township: Lake Elmo (Baytown/West Lakeland Townships)
Parcel ID and/or Address: 3275 MANNING AVE N
Legal Description (Section, Township, Range): Section 18 and 19, T29N, R20W
Lat/Long (decimal degrees): 44.997089N, 92.857562W
Attach a map showing the location of the site in relation to local streets, roads, highways. (See Appendix A of delineation report)
Approximate size of site (acres) or if a linear project, length (feet): 130 acres

If you know that your proposal will require an individual Permit from the U.S. Army Corps of Engineers, you must provide the names and addresses of all property owners adjacent to the project site. This information may be provided by attaching a list to your application or by using block 25 of the Application for Department of the Army permit which can be obtained at:

http://www.mvp.usace.army.mil/Portals/57/docs/regulatory/RegulatoryDocs/engform_4345_2012oct.pdf

PART THREE: General Project/Site Information

If this application is related to a delineation approval, exemption determination, jurisdictional determination, or other correspondence submitted ***prior to*** this application then describe that here and provide the Corps of Engineers project number.

Describe the project that is being proposed, the project purpose and need, and schedule for implementation and completion. The project description must fully describe the nature and scope of the proposed activity including a description of all project elements that effect aquatic resources (wetland, lake, tributary, etc.) and must also include plans and cross section or profile drawings showing the location, character, and dimensions of all proposed activities and aquatic resource impacts.

Lake Elmo Airport Federal EA/State EAW
Project Name and/or Number:

PART FOUR: Aquatic Resource Impact[1] Summary

If your proposed project involves a direct or indirect impact to an aquatic resource (wetland, lake, tributary, etc.) identify each impact in the table below. Include all anticipated impacts, including those expected to be temporary. Attach an overhead view map, aerial photo, and/or drawing showing all of the aquatic resources in the project area and the location(s) of the proposed impacts. Label each aquatic resource on the map with a reference number or letter and identify the impacts in the following table.

Aquatic Resource ID (as noted on overhead view)	**Aquatic Resource Type** (wetland, lake, tributary etc.)	**Type of Impact** (fill, excavate, drain, or remove vegetation)	**Duration of Impact** Permanent (P) or Temporary (T)[1]	**Size of Impact**[2]	**Overall Size of Aquatic Resource** [3]	**Existing Plant Community Type(s)** in Impact Area[4]	**County, Major Watershed #, and Bank Service Area #** of Impact Area[5]

[1]If impacts are temporary; enter the duration of the impacts in days next to the "T". For example, a project with a temporary access fill that would be removed after 220 days would be entered "T (220)".
[2]Impacts less than 0.01 acre should be reported in square feet. Impacts 0.01 acre or greater should be reported as acres and rounded to the nearest 0.01 acre. Tributary impacts must be reported in linear feet of impact and an area of impact by indicating first the linear feet of impact along the flowline of the stream followed by the area impact in parentheses). For example, a project that impacts 50 feet of a stream that is 6 feet wide would be reported as 50 ft (300 square feet).
[3]This is generally only applicable if you are applying for a de minimis exemption under MN Rules 8420.0420 Subp. 8, otherwise enter "N/A".
[4]Use *Wetland Plants and Plant Community Types of Minnesota and Wisconsin* 3rd Ed. as modified in MN Rules 8420.0405 Subp. 2.
[5]Refer to Major Watershed and Bank Service Area maps in MN Rules 8420.0522 Subp. 7.

If any of the above identified impacts have already occurred, identify which impacts they are and the circumstances associated with each:

PART FIVE: Applicant Signature

☒ Check here if you are requesting a pre-application consultation with the Corps and LGU based on the information you have provided. Regulatory entities will not initiate a formal application review if this box is checked.

By signature below, I attest that the information in this application is complete and accurate. I further attest that I possess the authority to undertake the work described herein.

Signature: ______________________ Date: 9/25/2017

I hereby authorize Evan Barrett Mead and Hunt to act on my behalf as my agent in the processing of this application and to furnish, upon request, supplemental information in support of this application.

____

[1] The term "impact" as used in this joint application form is a generic term used for disclosure purposes to identify activities that may require approval from one or more regulatory agencies. For purposes of this form it is not meant to indicate whether or not those activities may require mitigation/replacement.

Attachment B
Supporting Information for Applications Involving Exemptions, No Loss Determinations, and Activities Not Requiring Mitigation

Complete this part ***if*** you maintain that the identified aquatic resource impacts in Part Four do not require wetland replacement/compensatory mitigation OR ***if*** you are seeking verification that the proposed water resource impacts are either exempt from replacement or are not under CWA/WCA jurisdiction.

Identify the specific exemption or no-loss provision for which you believe your project or site qualifies:

We are seeking verification that wetlands 3, 6, and 7 (identified in a previously submitted wetland delineation report for Lake Elmo Airport) are incidental and therefore do not fall under CWA/WCA jurisdiction.

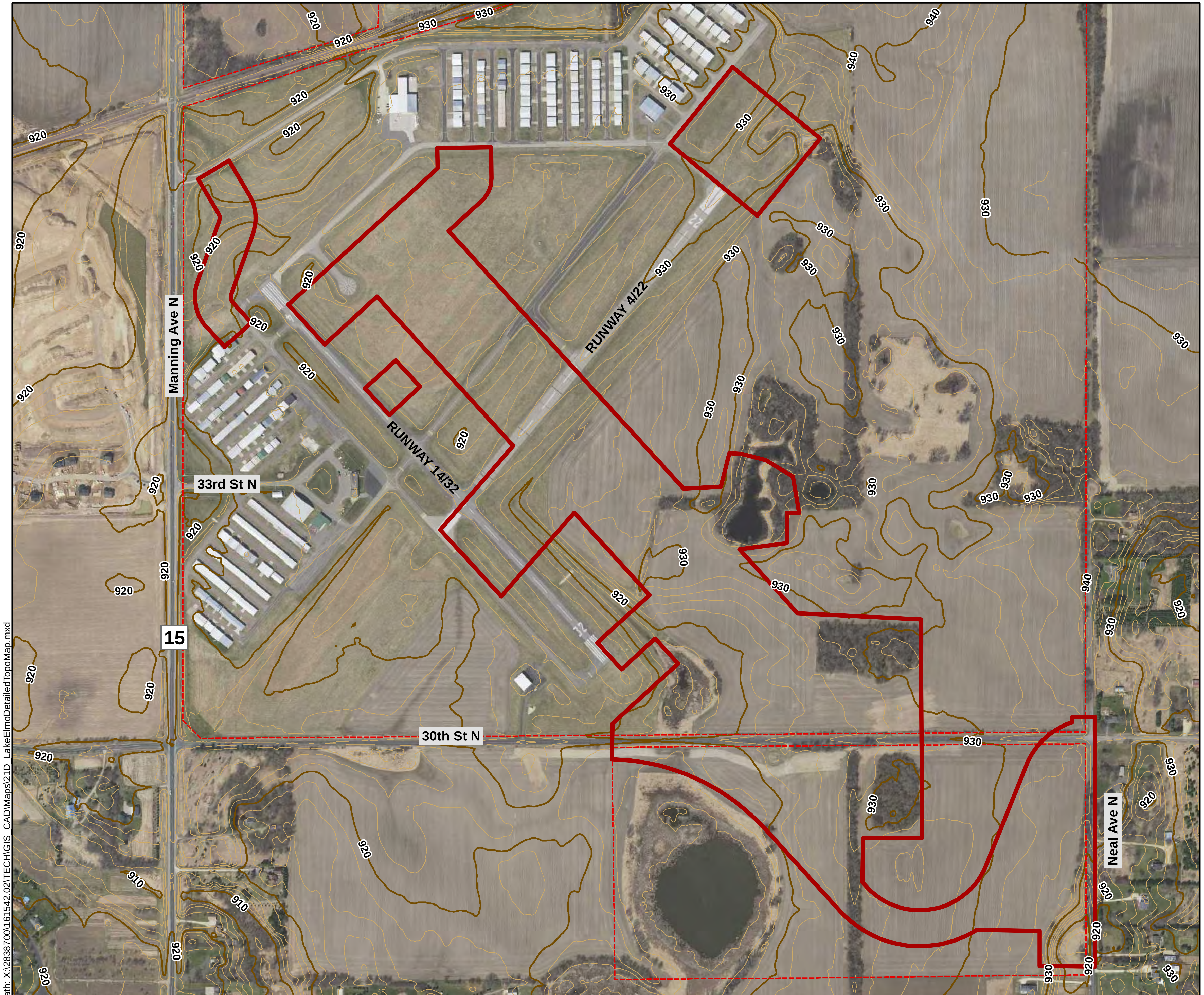
Provide a detailed explanation of how your project or site qualifies for the above. Be specific and provide and refer to attachments and exhibits that support your contention. Applicants should refer to rules (e.g. WCA rules), guidance documents (e.g. BWSR guidance, Corps guidance letters/public notices), and permit conditions (e.g. Corps General Permit conditions) to determine the necessary information to support the application. Applicants are strongly encouraged to contact the WCA LGU and Corps Project Manager prior to submitting an application if they are unsure of what type of information to provide:

A detailed technical memo with supporting documentation (historic aerial photography, soils, and delineated wetland boundary maps) was submitted to the US Army Corps of Engineers, St. Paul District and the Valley Branch Watershed District (VBWD) on December 4, 2017. Additional information and clarification was requested by the VBWD on December 21, 2017. This Attachment B is also included as part of the supplemental information submittal. Information submitted as part of this additional info request includes historical aerial photos zoomed in to focus on the three wetlands in this review.

Detailed Topography Map

LAKE ELMO AIRPORT

Proposed Runway 14-32 Runway Shift



Legend

- Area of Interest
- Airport Property Boundary

Contour Elevation

- Index Contour
- Intermediate Contour

N

0 150 300 600 900 1,200 Feet

Note: Contour interval is 2 feet.

Project Information

T29N, R20W, S18 and S19
City of Lake Elmo
Washington County, MN
Area of Interest = 130.1 acres
Field work conducted:
June 5 - 9, 2017

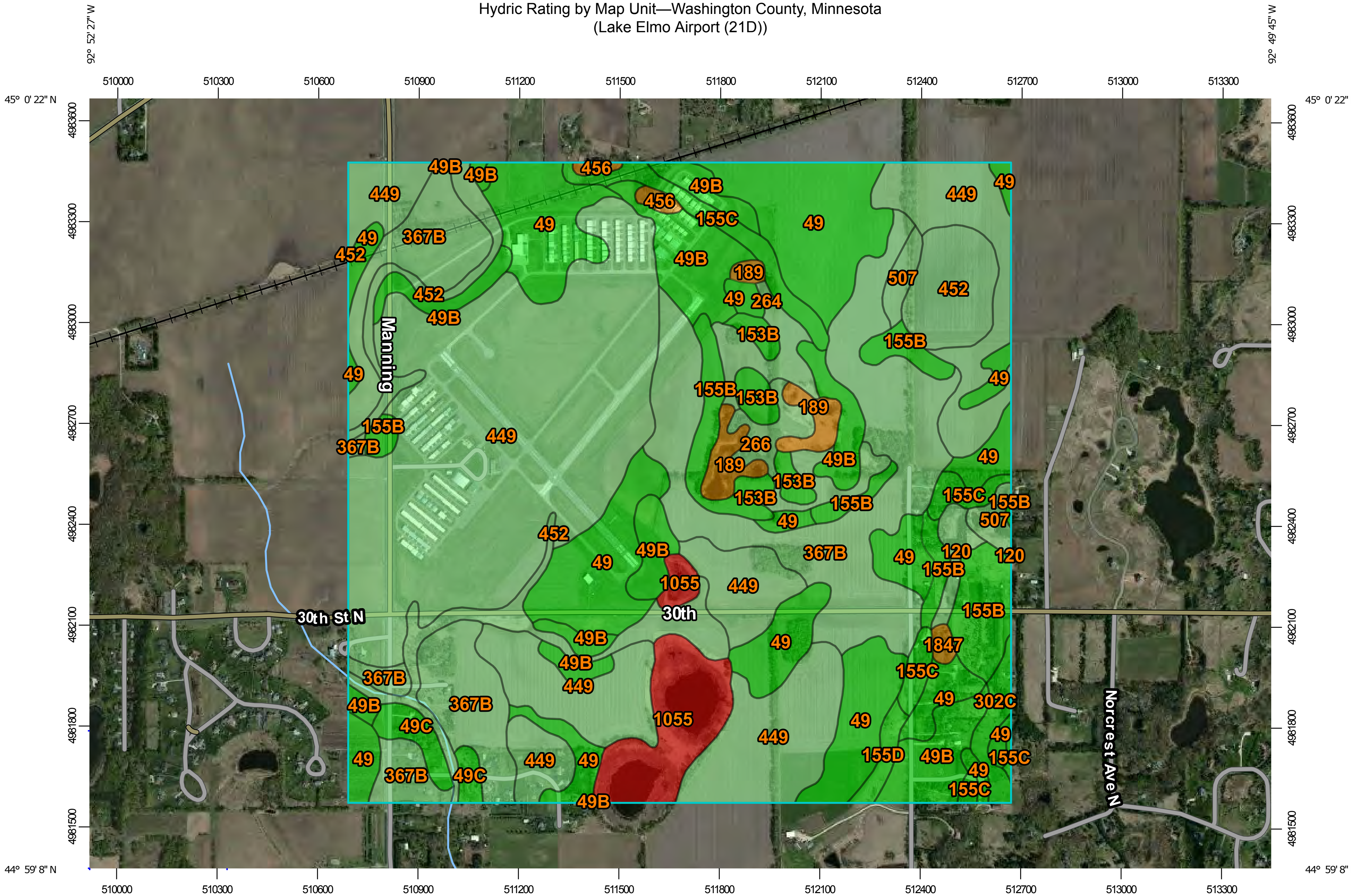
Image Source: MnGEO WMS Image Service, Washington County (2016 color 7-county)

Contour Source:
Minnesota Geospatial Commons,
Minnesota Elevation Mapping Project
Twin Cities Metro Region 2011

Mead & Hunt

Path: X:\2838700\161542.02\TECH\GIS_CAD\Maps\21D_LakeElmoDetailedTopoMap.mxd

Hydric Rating by Map Unit—Washington County, Minnesota
(Lake Elmo Airport (21D))



Map Scale: 1:16,100 if printed on A landscape (11" x 8.5") sheet.

N

0 200 400 800 1200 Meters

0 500 1000 2000 3000 Feet

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 15N 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.

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: Washington County, Minnesota
Survey Area Data: Version 11, Sep 19, 2016

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

Date(s) aerial images were photographed: Mar 16, 2012—Apr 26, 2012

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

Hydric Rating by Map Unit— Summary by Map Unit — Washington County, Minnesota (MN163)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
49	Antigo silt loam, 0 to 2 percent slopes	0	166.4	17.8%
49B	Antigo silt loam, 2 to 6 percent slopes	0	68.2	7.3%
49C	Antigo silt loam, 6 to 15 percent slopes	0	8.9	1.0%
120	Brill silt loam	5	5.4	0.6%
153B	Santiago silt loam, 2 to 6 percent slopes	0	11.3	1.2%
155B	Chetek sandy loam, 0 to 6 percent slopes	0	39.3	4.2%
155C	Chetek sandy loam, 6 to 12 percent slopes	0	21.7	2.3%
155D	Chetek sandy loam, 12 to 25 percent slopes	0	4.2	0.5%
189	Auburndale silt loam, 0 to 2 percent slopes	95	12.5	1.3%
264	Freeon silt loam, 2 to 6 percent slopes	3	11.0	1.2%
266	Freer silt loam	5	14.2	1.5%
302C	Rosholt sandy loam, 6 to 15 percent slopes	0	6.6	0.7%
367B	Campia silt loam, 0 to 8 percent slopes	2	147.0	15.7%
449	Crystal Lake silt loam, 1 to 3 percent slopes	3	320.6	34.3%
452	Comstock silt loam	4	53.9	5.8%
456	Barronett silt loam	92	2.8	0.3%
507	Poskin silt loam	3	8.3	0.9%
1055	Aquolls and Histosols, ponded	100	31.4	3.4%
1847	Barronett silt loam, sandy substratum	90	1.7	0.2%
Totals for Area of Interest			**935.5**	**100.0%**

Description

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

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

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

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

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

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

References:

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

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

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

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

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

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

Rating Options

Aggregation Method: Percent Present

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Aquatic Resources Map

National Wetlands Inventory (NWI),
Minnesota Public Waters, and
National Hydrography Dataset

LAKE ELMO AIRPORT

Proposed Runway 14-32 Runway Shift

Legend

- Area of Interest
- Airport Property Boundary
- MN Public Waters Basins
- Intermittent Stream (NHD)

WETLAND TYPE*

- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond

* Labeled with NWI classificaiton and Circular 39 Type

N

0 150 300 600 900 1,200 1,500 1,800 Feet

Project Information

T29N, R20W, S18 and S19
City of Lake Elmo
Washington County, MN
Area of Interest = 130.1 acres
Field work conducted:
June 5 - 9, 2017

Mead & Hunt

Wetland Data: National Wetland Inventory Update for Minnesota, East-Central (2010-2011)

Mn Public Waters Data: Public Waters (PW) Basin and Watercourse Delineations, Washington County, MN Geospatial Commons

Stream Data: National Hydrography Dataset (NHD), USGS

Image Source: MnGEO WMS Image Service, Washington County (2016 color 7-county)

Path: X:\283870\161542.02\TECH\GIS_CAD\Maps\21D_LakeElmoNWIMap.mxd

Public Waters

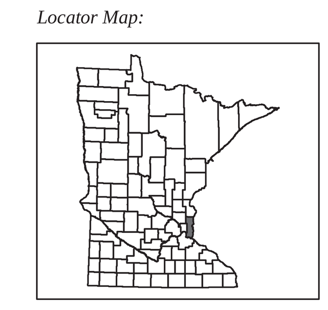
Washington County Minnesota

Public Waters are defined in *Minnesota Statutes*, section 103G.005. The boundaries of public waters shown on this map are approximate. A public water boundary coincides with the ordinary high water level as defined in *Minnesota Statutes*, section 103G.005 and is determined through DNR field inspection or survey. Public waters are subject to regulation as per *Minnesota Statutes*, section 103G.245. Current designated trout streams are listed in *Minnesota Rules*, part 6264.0050. Shaded Public Land Survey sections may contain designated trout stream tributaries (see *Minnesota Rules*, part 6264.0050) subject to permit requirements. Additional public watercourses may exist within these sections, subject to field determination. It is incumbent upon a person contemplating work in a public watercourse to investigate whether said watercourse is a designated trout stream regardless of whether said public watercourse is depicted on this map. **Note:** As stated in *Minnesota Statutes*, section 103G.205, the designation of waters of this state as public waters ***does not*** affect state law forbidding trespass on private lands. Contact the DNR office in your area for further information or visit http://mndnr.gov.

Legend

- Public Water Basin or Wetland
- Public Water Watercourse
- Public Ditch/Altered Natural Watercourse
- Other Watercourse, Not a Public Watercourse
- Interstate Highway
- Federal Trunk Highway
- State Trunk Highway
- City Streets & Township Roads
- PLS40 Section Line
- PLS40 Township Line
- Municipal Boundaries
- *Public Land Survey Sections Containing Designated Trout Stream Tributaries*
- Washington County
- Adjacent Counties

Locator Map:



Scale: Convert map units to miles

0 0.5 1 2 3 4

Miles

The DNR Information Center
Twin Cities: (651) 296-6157
Minnesota toll free: 1-888-646-6367
Telecommunication device for the hearing impaired (TDD): (651) 296-5484
TDD Minnesota toll free: 1-800-657-3929
DNR web site: http://mndnr.gov

This information is available in alternative format on request.
Equal opportunity to participate in and benefit from programs of the Minnesota Department of Natural Resources is available regardless of race, color, national origin, sex, sexual orientation, marital status, status with regard to public assistance, age, or disability. Discrimination inquiries should be sent to Minnesota DNR, 500 Lafayette Road, St. Paul, MN 55155-4031, or the Equal Opportunity Office, Department of the Interior, Washington, DC 20240.

This map was prepared from publicly available information only. Every reasonable effort has been made to ensure the accuracy of the factual data on which this map interpretation is based. However, the Department of Natural Resources does not warrant the accuracy, completeness, or any implied uses of these data. Users may wish to verify critical information; sources include both the references here and information on file in the offices of the Minnesota Department of Natural Resources. This map should not be used to establish legal title, boundaries, or locations of improvements. This map was compiled and generated using geographic information systems (GIS) technology. Digital data products are available from DNR Ecological and Water Resources at http://mndnr.gov/waters and at http://deli.dnr.state.mn.us.

The Adobe PDF file represents a map created at a size of 34 inches by 44 inches (ANSI E). The data were compiled at a scale of 1:60,000 using the Universal Transverse Mercator Projection, gridzone 15, 1983 North American Datum. This map was created on: 20 May 2011.

Image Date: 7/28/1938

Image Source: Minnesota Historical Aerial Photographs, U of MN

Image Date: 5/8/1947

Image Source: Minnesota Historical Aerial Photographs, U of MN

Historic Aerial Imagery

LAKE ELMO AIRPORT

Proposed Runway 14-32 Runway Shift

N

Project Information

T29N, R20W, S18 and S19
City of Lake Elmo
Washington County, MN
Area of Interest = 130.1 acres
Field work conducted:
June 5 - 9, 2017

Mead & Hunt

Images are not to scale

Image Date: 10/28/1953

Image Source: Minnesota Historical Aerial Photographs, U of MN

Image Date: 11/28/1966

Image Source: USGS

Historic Aerial Imagery

LAKE ELMO AIRPORT

Proposed Runway 14-32 Runway Shift

Images are not to scale

N

Project Information

T29N, R20W, S18 and S19
City of Lake Elmo
Washington County, MN
Area of Interest = 130.1 acres
Field work conducted:
June 5 - 9, 2017

Mead & Hunt

Image Date: 10/16/1972

Image Source: USGS

Image Date: 5/1/1980

Image Source: USGS

Historic Aerial Imagery

LAKE ELMO AIRPORT

Proposed Runway 14-32 Runway Shift

N

Project Information

T29N, R20W, S18 and S19
City of Lake Elmo
Washington County, MN
Area of Interest = 130.1 acres
Field work conducted:
June 5 - 9, 2017

Mead & Hunt

Images are not to scale

Image Date: 10/16/1994

Image Source: MnDNR Forestry Aerial Photography

Image Date: 1997

Image Source: MnGEO Aerial Photography (7-county BW)

Historic Aerial Imagery

LAKE ELMO AIRPORT

Proposed Runway 14-32 Runway Shift

Legend

Airport Property Boundary

0 300 600 1,200 1,800 2,400 Feet

N

Project Information

T29N, R20W, S18 and S19
City of Lake Elmo
Washington County, MN
Area of Interest = 130.1 acres
Field work conducted:
June 5 - 9, 2017

Mead & Hunt

Image Date: 2000

Image Source: MnGEO Aerial Photography (7-county BW)

Image Date: 2010

Image Source: MnGEO Aerial Photography (2010 color FSA)

Historic Aerial Imagery

LAKE ELMO AIRPORT

Proposed Runway 14-32 Runway Shift

Legend

Airport Property Boundary

0 300 600 1,200 1,800 2,400 Feet

N

Project Information

T29N, R20W, S18 and S19
City of Lake Elmo
Washington County, MN
Area of Interest = 130.1 acres
Field work conducted:
June 5 - 9, 2017

Mead & Hunt

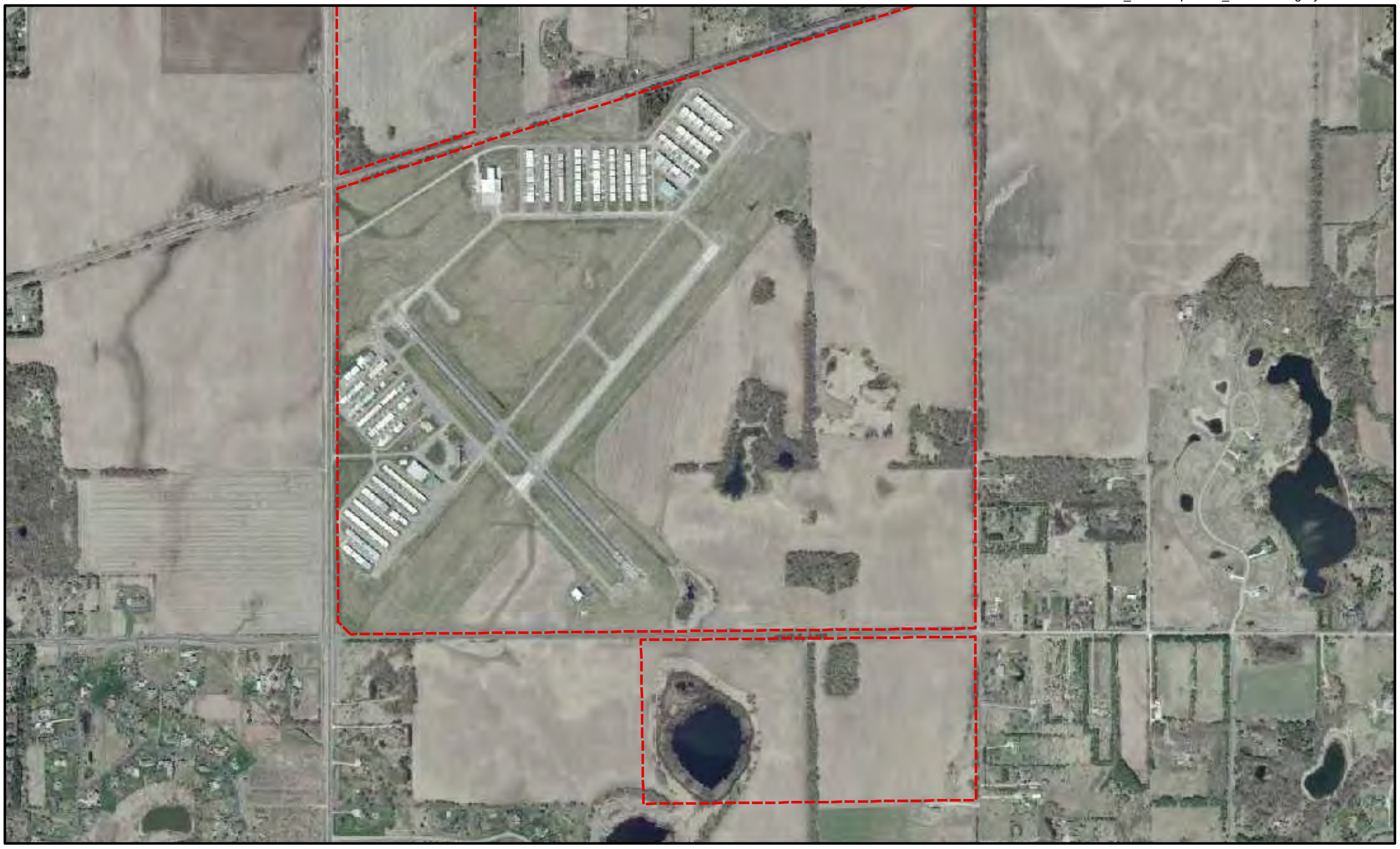


Image Date: 2013

Image Source: MnGEO Aerial Photography (2013 Washington)

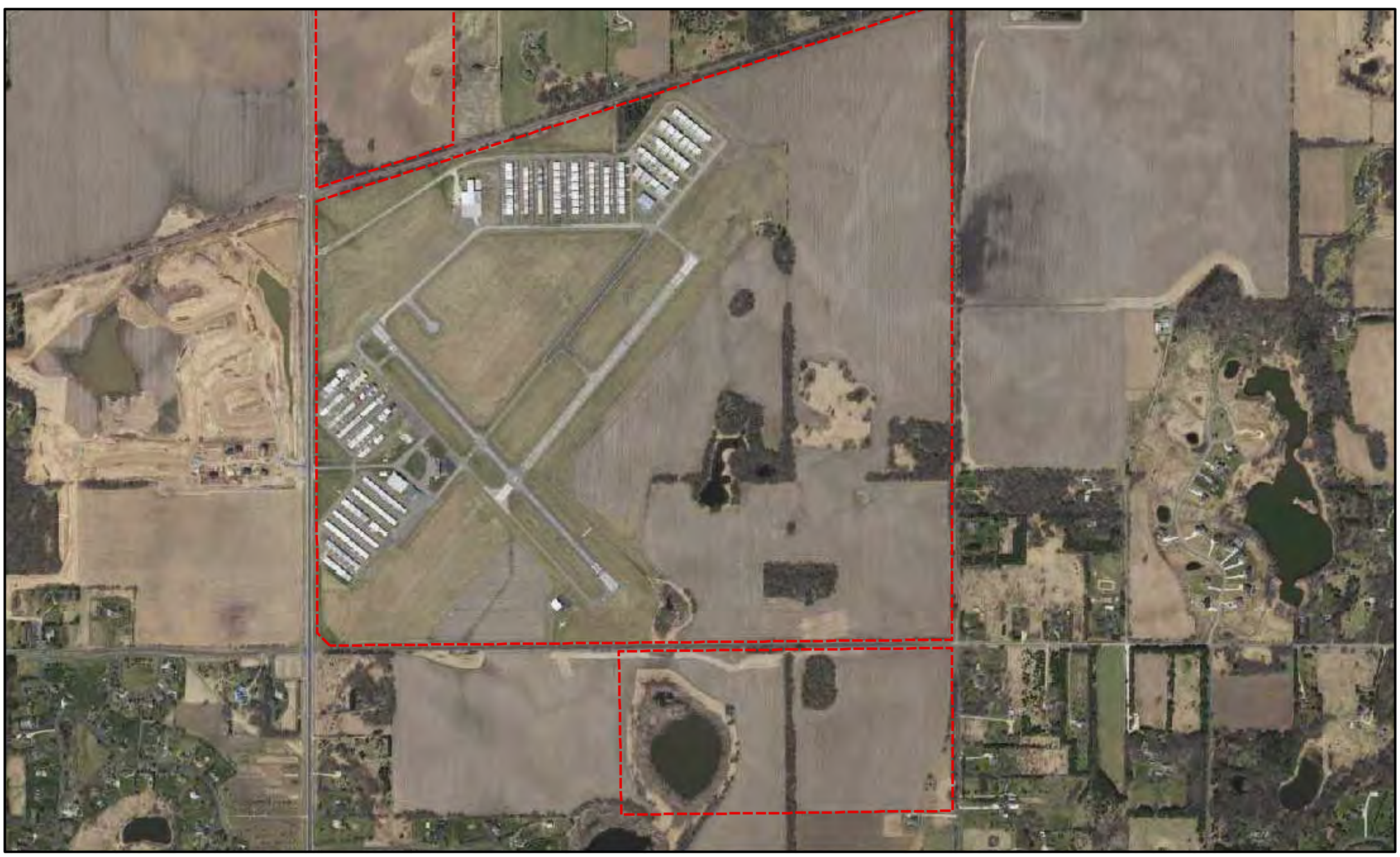


Image Date: 2016

Image Source: MnGEO Aerial Photography (2016 color 7-county)

Historic Aerial Imagery

LAKE ELMO AIRPORT

Proposed Runway 14-32 Runway Shift

Legend

Airport Property Boundary

0 300 600 1,200 1,800 2,400 Feet

N

Project Information

T29N, R20W, S18 and S19
City of Lake Elmo
Washington County, MN
Area of Interest = 130.1 acres
Field work conducted:
June 5 - 9, 2017

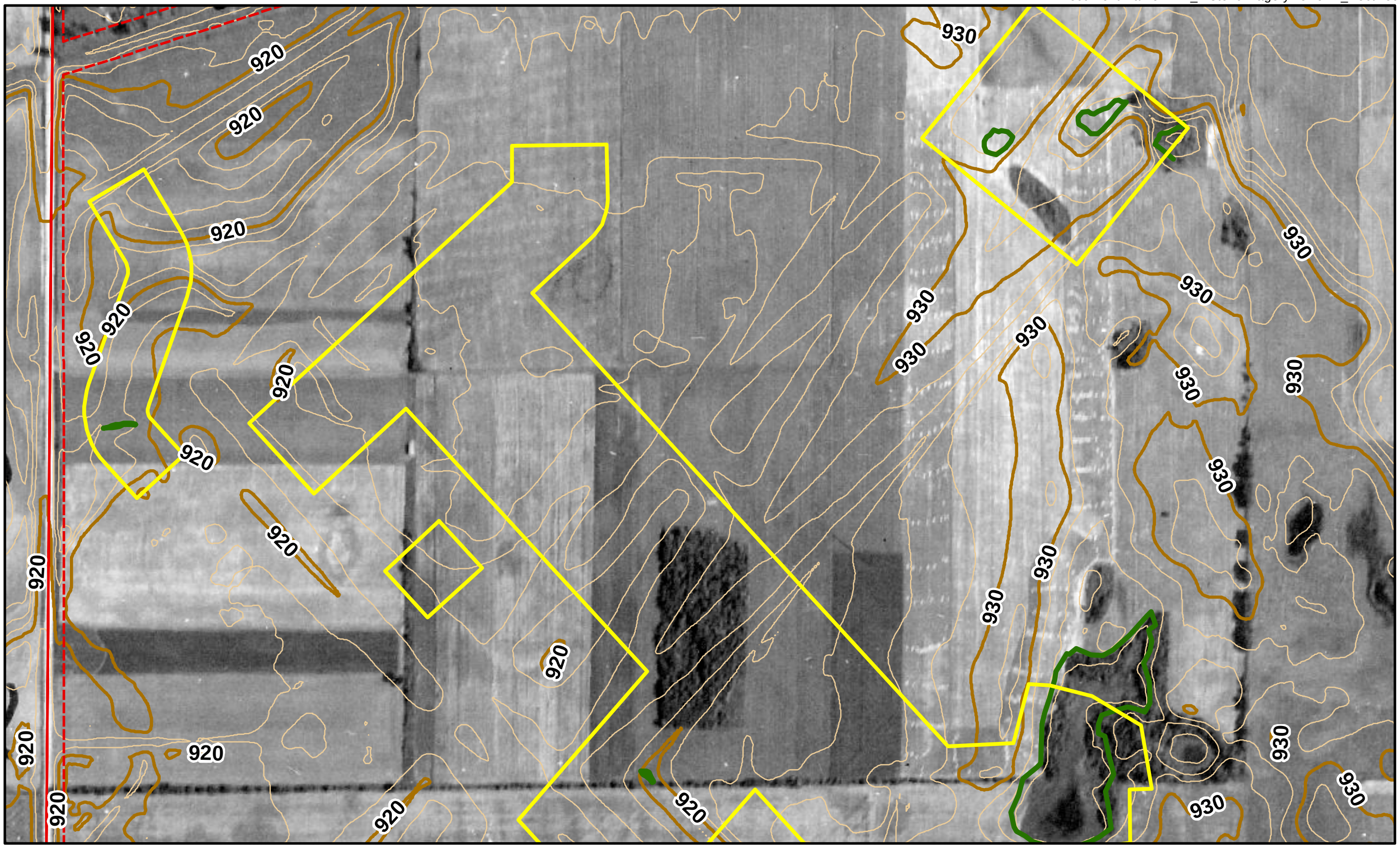


Image Date: 7/28/1938

Image Source: Minnesota Historical Aerial Photographs, U of MN

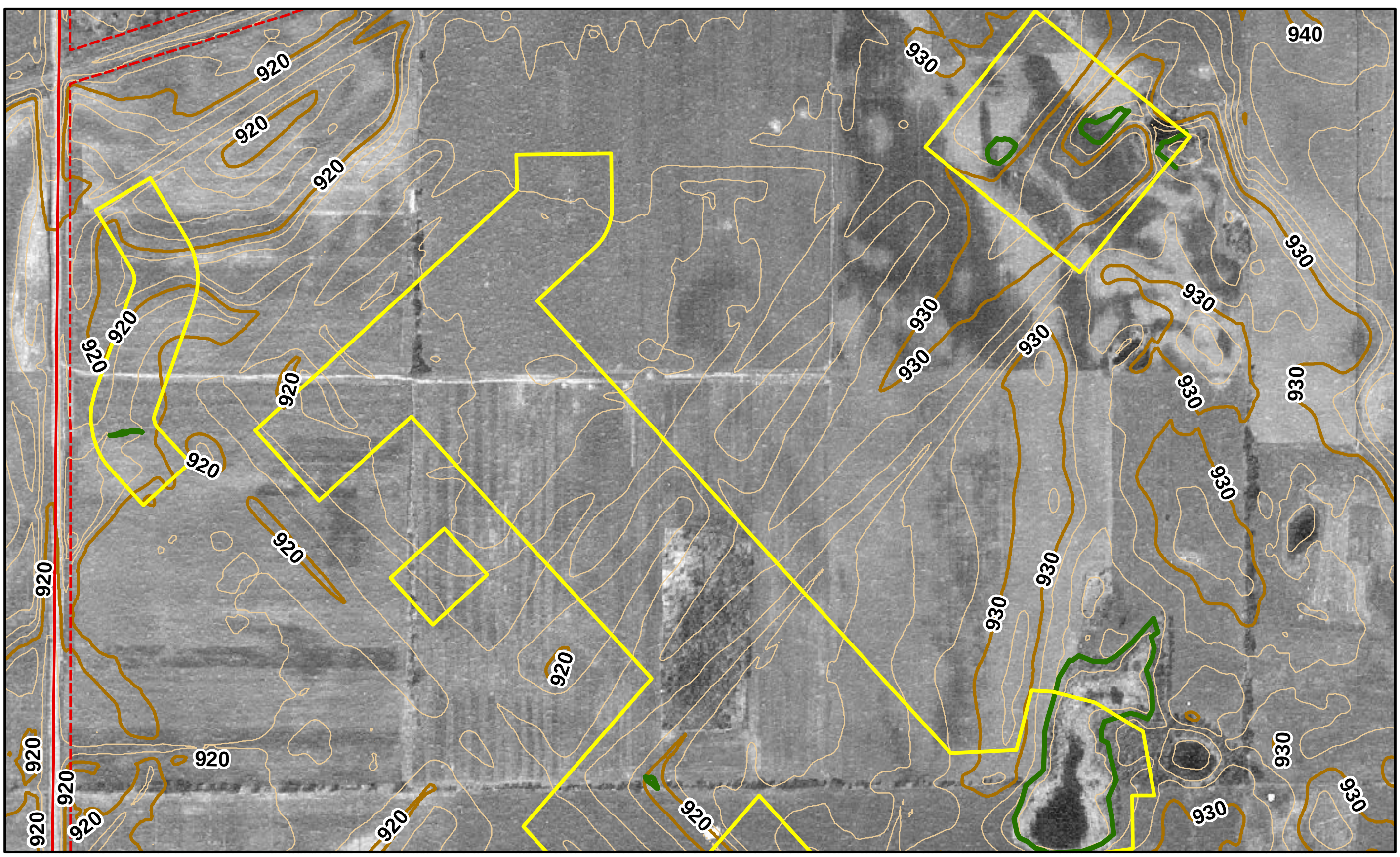


Image Date: 5/8/1947

Image Source: Minnesota Historical Aerial Photographs, U of MN
Contour Source: Minnesota Geospatial Commons, Minnesota Elevation Mapping Project, Twin Cities Metro Region 2011

Historic Aerial Imagery

LAKE ELMO AIRPORT
Proposed Runway 14-32 Runway Shift

0 150 300 600 900 Feet

N

Legend

- Project AOI
- Delineated Wetland Boundary
- PLSS Section Line
- Airport Property Boundary
- Index Contour
- Intermediate Contour (Contour interval is 2 feet)

Project Information

T29N, R20W, S18 and S19
City of Lake Elmo
Washington County, MN
Area of Interest = 130.1 acres
Field work conducted:
June 5 - 9, 2017

Mead & Hunt

Document Name: 21D_HistoricImageryReview4_Rectified_1957_1964

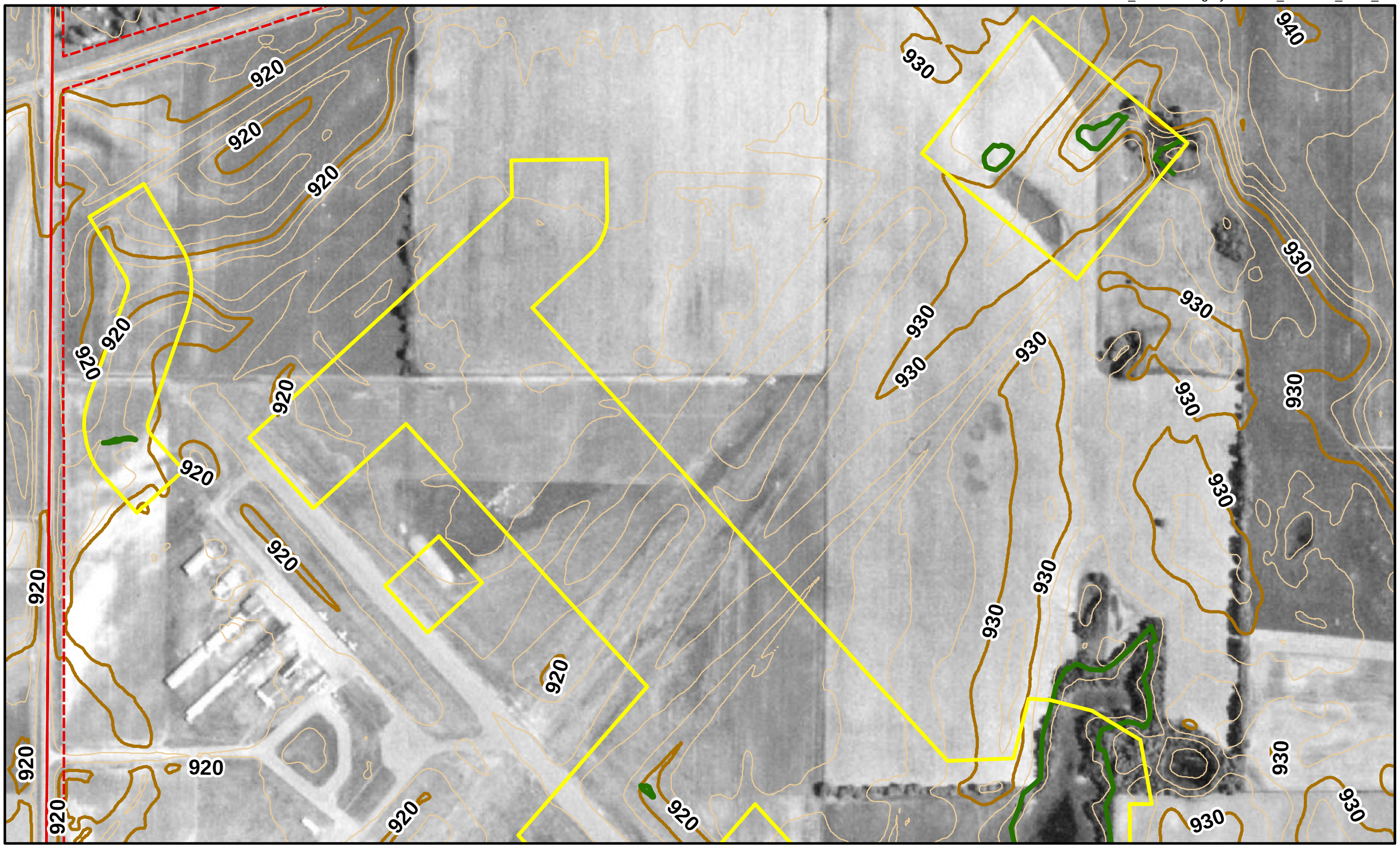


Image Date: 5/30/1957

Image Source: Minnesota Historical Aerial Photographs, U of MN

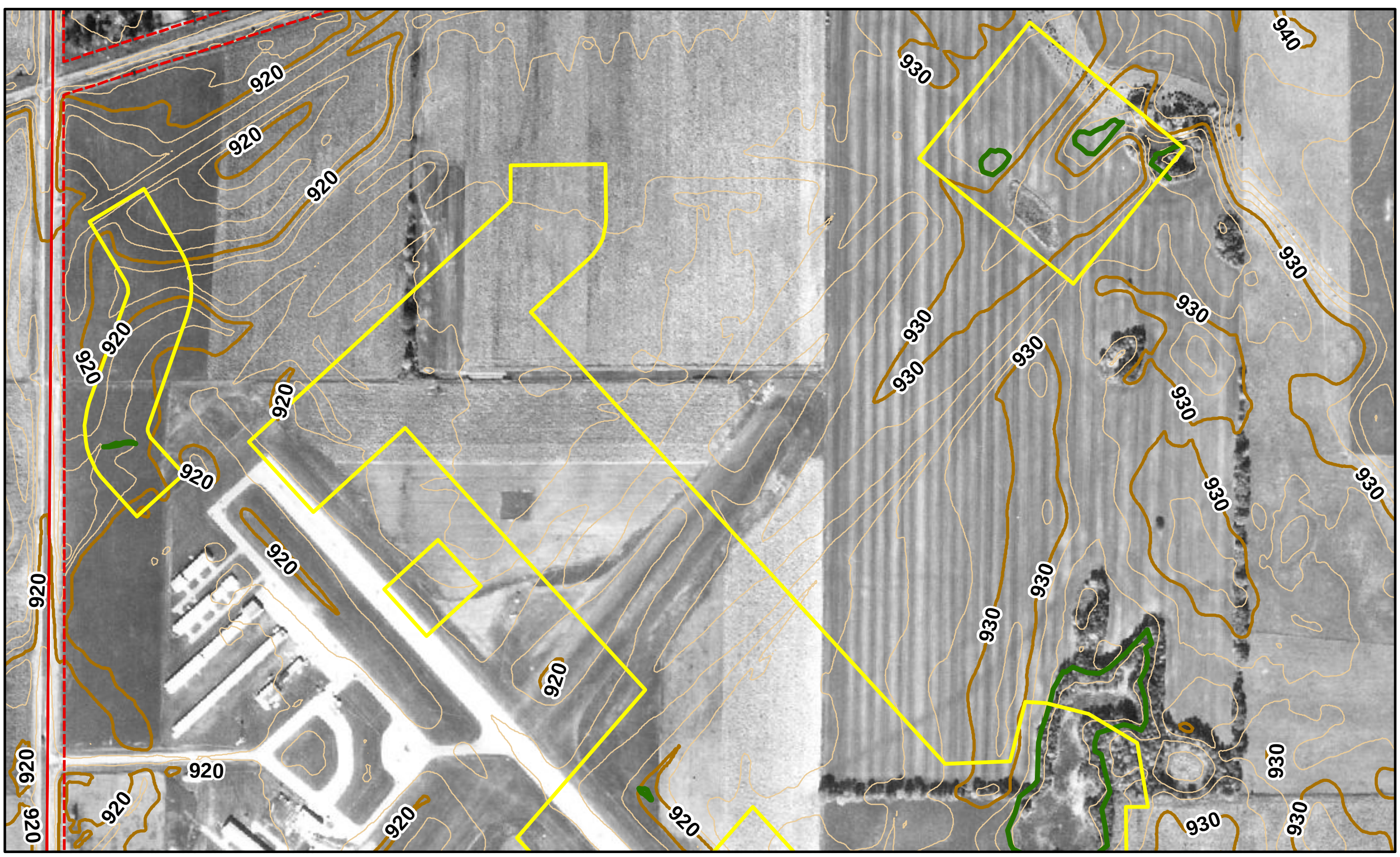


Image Date: 10/2/1964

Image Source: Minnesota Historical Aerial Photographs, U of MN
Contour Source: Minnesota Geospatial Commons, Minnesota Elevation Mapping Project, Twin Cities Metro Region 2011

Historic Aerial Imagery

LAKE ELMO AIRPORT
Proposed Runway 14-32 Runway Shift

0 150 300 600 900 Feet

N

Legend

- Project AOI
- Delineated Wetland Boundary
- PLSS Section Line
- Airport Property Boundary
- Index Contour
- Intermediate Contour (Contour interval is 2 feet)

Project Information

T29N, R20W, S18 and S19
City of Lake Elmo
Washington County, MN
Area of Interest = 130.1 acres
Field work conducted:
June 5 - 9, 2017

Mead & Hunt

Document Name: 21D_HistoricImageryReview2_Rectified

Image Date: 10/28/1953

Image Source: Minnesota Historical Aerial Photographs, U of MN

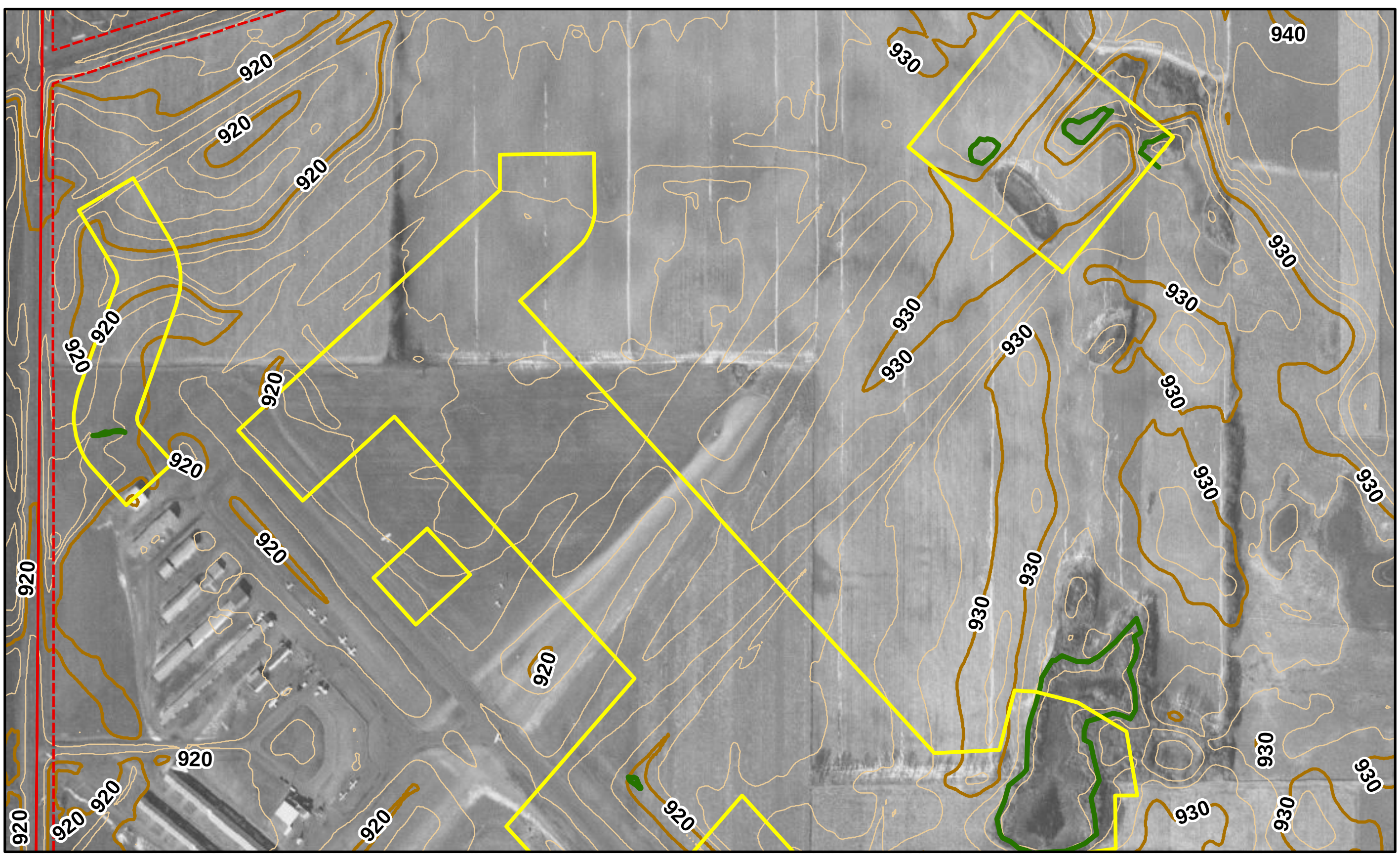


Image Date: 11/28/1966

Image Source: USGS

Contour Source: Minnesota Geospatial Commons, Minnesota Elevation Mapping Project, Twin Cities Metro Region 2011

Historic Aerial Imagery

LAKE ELMO AIRPORT

Proposed Runway 14-32 Runway Shift

0 150 300 600 900 Feet

N

Legend

- Project AOI
- Delineated Wetland Boundary
- PLSS Section Line
- Airport Property Boundary
- Index Contour
- Intermediate Contour (Contour interval is 2 feet)

Project Information

T29N, R20W, S18 and S19
City of Lake Elmo
Washington County, MN
Area of Interest = 130.1 acres
Field work conducted:
June 5 - 9, 2017

Mead & Hunt

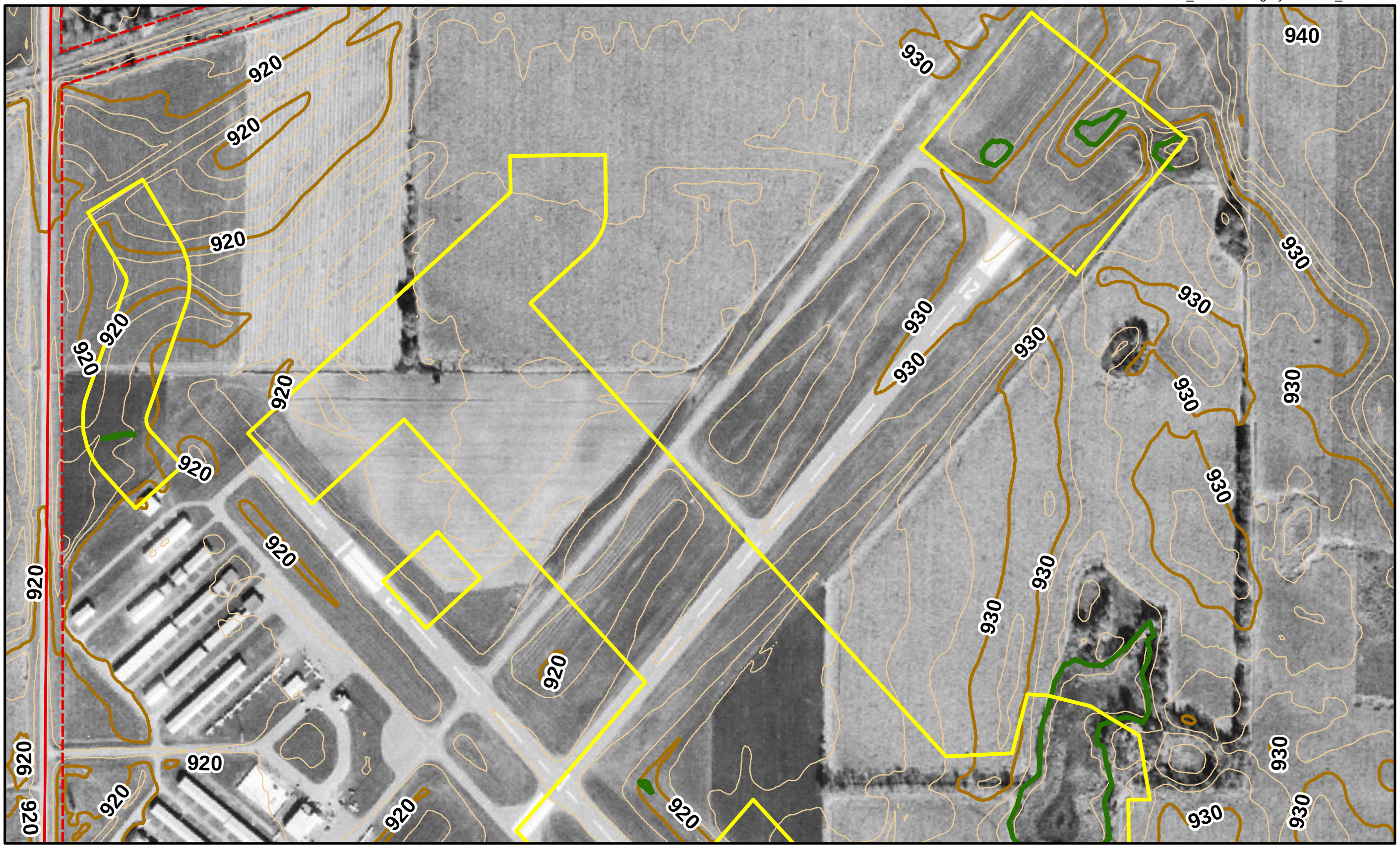


Image Date: 10/16/1972

Image Source: USGS

Image Date: 5/1/1980

Image Source: USGS

Contour Source: Minnesota Geospatial Commons, Minnesota Elevation Mapping Project, Twin Cities Metro Region 2011

Historic Aerial Imagery

LAKE ELMO AIRPORT

Proposed Runway 14-32 Runway Shift

0 150 300 600 900 Feet

N

Legend

- Project AOI
- Delineated Wetland Boundary
- PLSS Section Line
- Airport Property Boundary
- Index Contour
- Intermediate Contour (Contour interval is 2 feet)

Project Information

T29N, R20W, S18 and S19
City of Lake Elmo
Washington County, MN
Area of Interest = 130.1 acres
Field work conducted:
June 5 - 9, 2017

Mead & Hunt

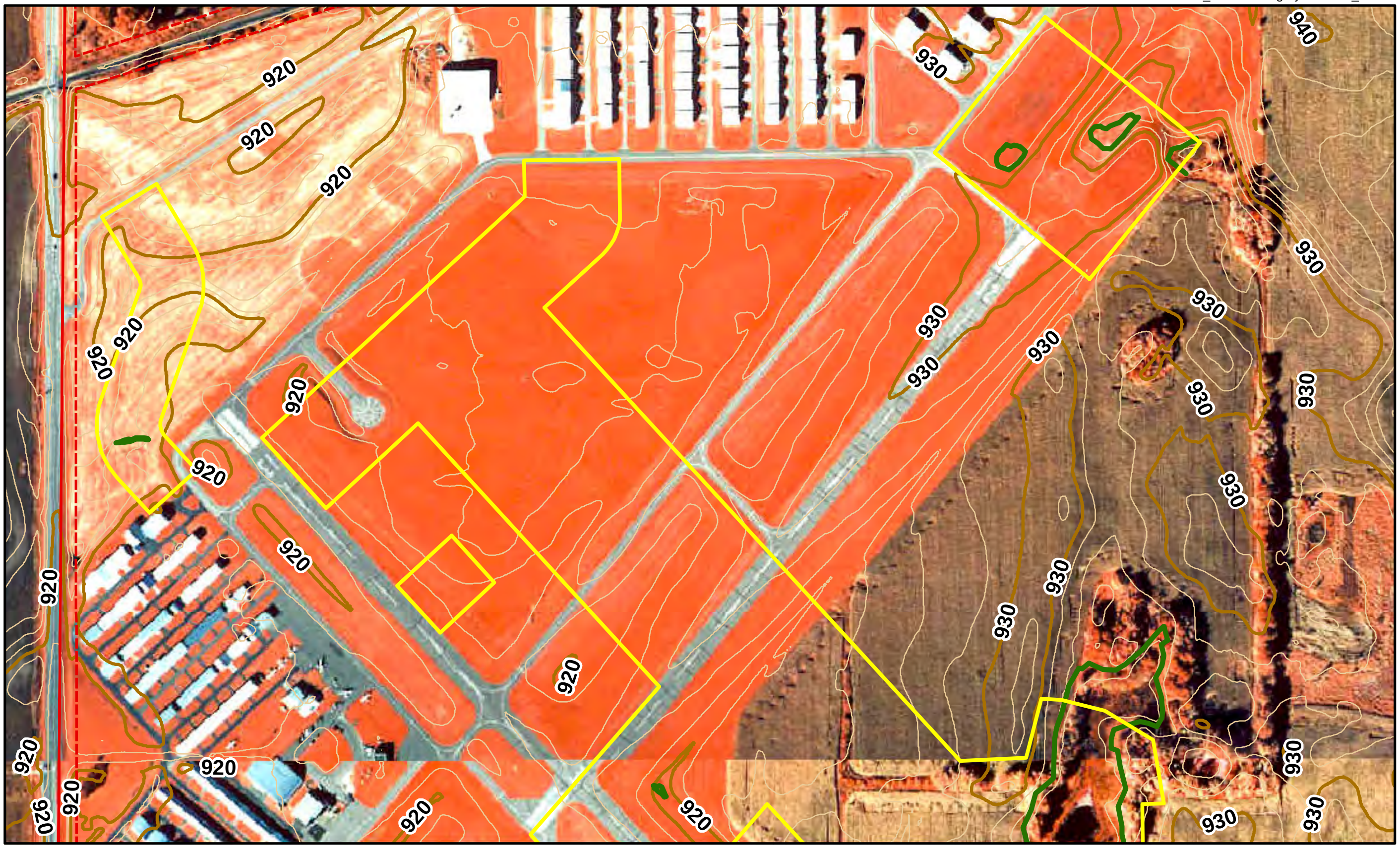


Image Date: 10/16/1994

Image Source: MnDNR Forestry Aerial Photography

Image Date: 1997

Image Source: MnGEO Aerial Photography (7-county BW)
Contour Source: Minnesota Geospatial Commons, Minnesota Elevation Mapping Project, Twin Cities Metro Region 2011

Historic Aerial Imagery

LAKE ELMO AIRPORT

Proposed Runway 14-32 Runway Shift

0 150 300 600 900 Feet

N

Legend

- Project AOI
- Delineated Wetland Boundary
- PLSS Section Line
- Airport Property Boundary
- Index Contour
- Intermediate Contour (Contour interval is 2 feet)

Project Information

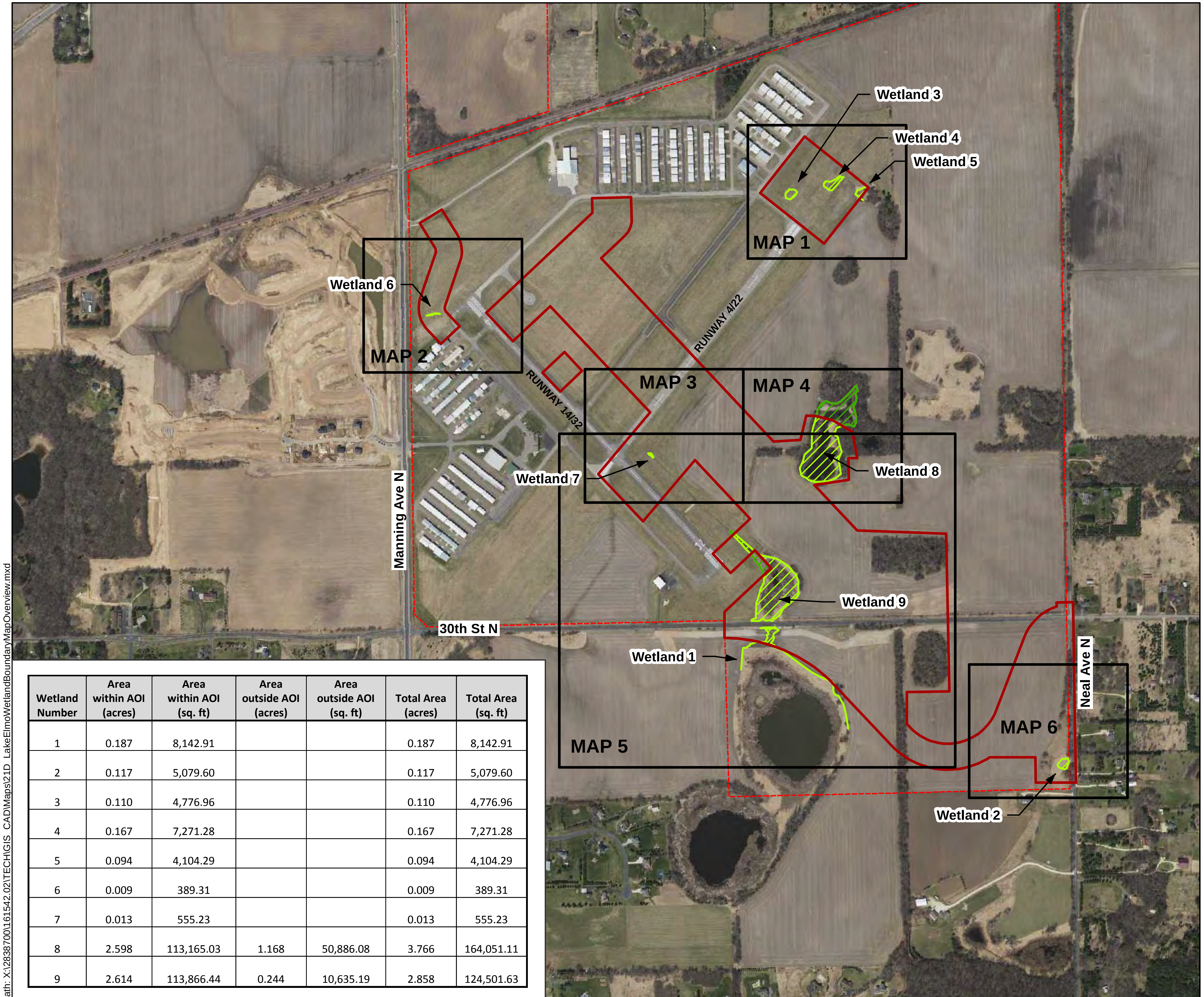
T29N, R20W, S18 and S19
City of Lake Elmo
Washington County, MN
Area of Interest = 130.1 acres
Field work conducted:
June 5 - 9, 2017

Mead & Hunt

Wetland Boundary Map Sheet Key

LAKE ELMO AIRPORT

Proposed Runway 14-32 Runway Shift



Wetland Number	Area within AOI (acres)	Area within AOI (sq. ft)	Area outside AOI (acres)	Area outside AOI (sq. ft)	Total Area (acres)	Total Area (sq. ft)
1	0.187	8,142.91			0.187	8,142.91
2	0.117	5,079.60			0.117	5,079.60
3	0.110	4,776.96			0.110	4,776.96
4	0.167	7,271.28			0.167	7,271.28
5	0.094	4,104.29			0.094	4,104.29
6	0.009	389.31			0.009	389.31
7	0.013	555.23			0.013	555.23
8	2.598	113,165.03	1.168	50,886.08	3.766	164,051.11
9	2.614	113,866.44	0.244	10,635.19	2.858	124,501.63

Legend

- Map Sheet
- Wetland Boundary
- Wetland within AOI
- Outside AOI
- Area of Interest
- Airport Property Boundary

Wetland Number	Description	Circular 39 Type
1	Seasonally Flooded Basin	Type 1
2	Fresh (wet) Meadow	Type 2
3	Fresh (wet) Meadow	Type 2
4	Fresh (wet) Meadow	Type 2
5	Fresh (wet) Meadow	Type 2
6	Fresh (wet) Meadow (Ditch Wetland)	Type 2
7	Fresh (wet) Meadow (Ditch Wetland)	Type 2
8	Fresh (wet) Meadow /Deep Marsh	Type 2/ Type 4
9	Fresh (wet) Meadow /Shallow Marsh	Type 2/ Type 3

N

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

Project Information

T29N, R20W, S18 and S19
City of Lake Elmo
Washington County, MN
Area of Interest = 130.1 acres
Field work conducted:
June 5 - 9, 2017

Mead & Hunt

Image Source: MnGEO WMS Image Service, Washington County (2016 color 7-county)

Path: X:\28387001\61542.02\TECH\GIS_CADMaps\21D_LakeElmoWetlandBoundaryMapOverview.mxd

Wetland Boundary Map

LAKE ELMO AIRPORT

Proposed Runway 14-32 Runway Shift

Legend

- Photo Location
- Data Point Location
- Wetland Boundary
- Wetland within AOI
- Wetland outside AOI
- Culvert End Location
- Flow Direction
- Ditch/Swale Flow
- Area of Interest
- Airport Property Boundary

N

0 50 100 200 300 Feet

Elevation contour interval is 2 feet

Project Information

T29N, R20W, S18 and S19
City of Lake Elmo
Washington County, MN
Area of Interest = 130.1 acres
Field work conducted:
June 5 - 9, 2017

Mead & Hunt

Image Source: MnGEO WMS Image Service, Washington County (2016 color 7-county)
Contour Source:
Minnesota Geospatial Commons,
Minnesota Elevation Mapping Project
Twin Cities Metro Region 2011

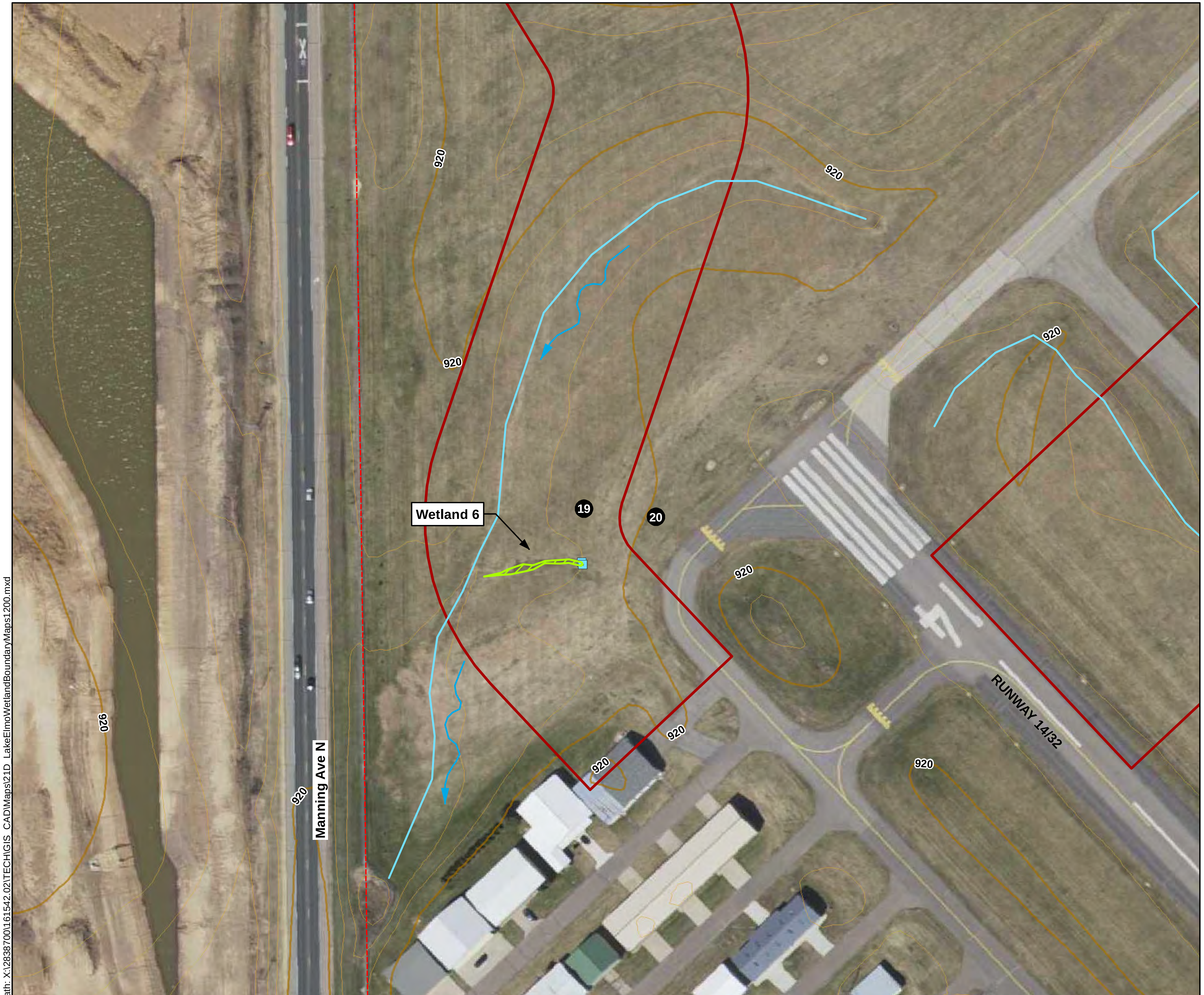
Map 1 of 6

Path: X:\283870001\61542.02\TECH\GIS_CAD\Maps\21D_LakeElmoWetlandBoundaryMaps1200.mxd

Wetland Boundary Map

LAKE ELMO AIRPORT

Proposed Runway 14-32 Runway Shift



Legend

- Photo Location
- Data Point Location
- Wetland Boundary
- Wetland within AOI
- Wetland outside AOI
- Culvert End Location
- Flow Direction
- Ditch/Swale Flow
- Area of Interest
- Airport Property Boundary

N

0 50 100 200 300 Feet

Elevation contour interval is 2 feet

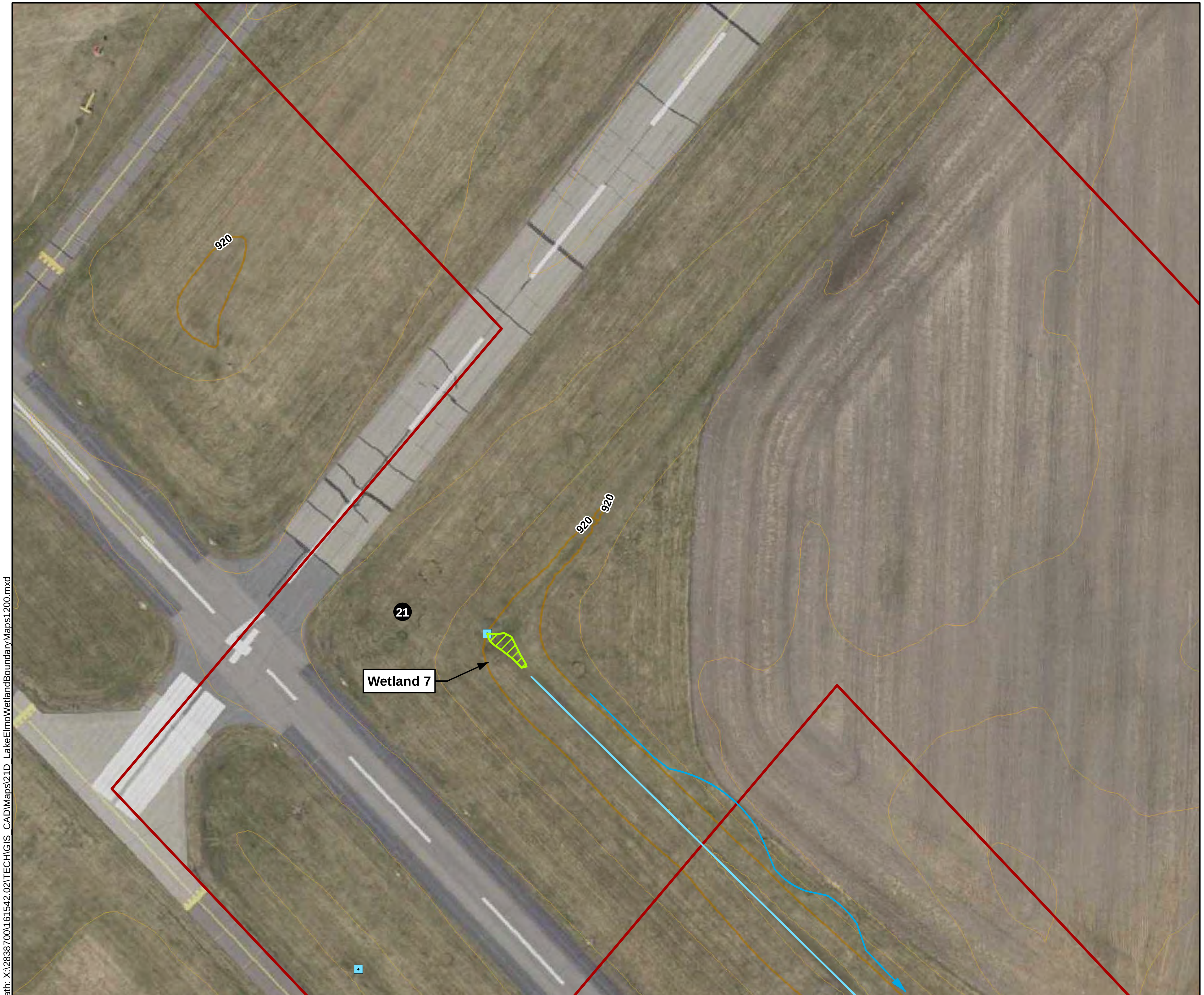
Project Information

T29N, R20W, S18 and S19
City of Lake Elmo
Washington County, MN
Area of Interest = 130.1 acres
Field work conducted:
June 5 - 9, 2017

Mead & Hunt

Image Source: MnGEO WMS Image Service, Washington County (2016 color 7-county)
Contour Source: Minnesota Geospatial Commons, Minnesota Elevation Mapping Project Twin Cities Metro Region 2011

Map 2 of 6



Wetland Boundary Map

LAKE ELMO AIRPORT

Proposed Runway 14-32 Runway Shift

Legend

- Photo Location
- Data Point Location
- Wetland Boundary
- Wetland within AOI
- Wetland outside AOI
- Culvert End Location
- Flow Direction
- Ditch/Swale Flow
- Area of Interest
- Airport Property Boundary

N

0 50 100 200 300 Feet

Elevation contour interval is 2 feet

Project Information

T29N, R20W, S18 and S19
City of Lake Elmo
Washington County, MN
Area of Interest = 130.1 acres
Field work conducted:
June 5 - 9, 2017

Mead & Hunt

Image Source: MnGEO WMS Image Service, Washington County (2016 color 7-county)
Contour Source:
Minnesota Geospatial Commons,
Minnesota Elevation Mapping Project
Twin Cities Metro Region 2011

Map 3 of 6

Wetland Boundary Map

LAKE ELMO AIRPORT

Proposed Runway 14-32 Runway Shift

Legend

- Photo Location
- Data Point Location
- Wetland Boundary
- Wetland within AOI
- Wetland outside AOI
- Culvert End Location
- Flow Direction
- Ditch/Swale Flow
- Area of Interest
- Airport Property Boundary

N

0 50 100 200 300 Feet

Elevation contour interval is 2 feet

Project Information

T29N, R20W, S18 and S19
City of Lake Elmo
Washington County, MN
Area of Interest = 130.1 acres
Field work conducted:
June 5 - 9, 2017

Mead & Hunt

Image Source: MnGEO WMS Image Service, Washington County (2016 color 7-county)
Contour Source: Minnesota Geospatial Commons, Minnesota Elevation Mapping Project Twin Cities Metro Region 2011

Map 4 of 6

Path: X:\2838700\161542.02\TECH\GIS_CAD\Maps\21D_LakeElmoWetlandBoundaryMaps1200.mxd

Wetland Boundary Map

LAKE ELMO AIRPORT

Proposed Runway 14-32 Runway Shift

Legend

- Photo Location
- Data Point Location
- Wetland Boundary
- Wetland within AOI
- Wetland outside AOI
- Culvert End Location
- Flow Direction
- Ditch/Swale Flow
- Area of Interest
- Airport Property Boundary

N

0 50 100 200 300 400 500 600 700 Feet

Elevation contour interval is 2 feet

Project Information

T29N, R20W, S18 and S19
City of Lake Elmo
Washington County, MN
Area of Interest = 130.1 acres
Field work conducted:
June 5 - 9, 2017

Mead & Hunt

Image Source: MnGEO WMS Image Service, Washington County (2016 color 7-county)
Contour Source:
Minnesota Geospatial Commons,
Minnesota Elevation Mapping Project
Twin Cities Metro Region 2011

Map 5 of 6

Path: X:\2838700\161542.02\TECH\GIS_CAD\Maps\21D_LakeElmoWetlandBoundaryMaps1200.mxd

Wetland Boundary Map

LAKE ELMO AIRPORT

Proposed Runway 14-32 Runway Shift

Legend

- Photo Location
- Data Point Location
- Wetland Boundary
- Wetland within AOI
- Wetland outside AOI
- Culvert End Location
- Flow Direction
- Ditch/Swale Flow
- Area of Interest
- Airport Property Boundary

N

0 50 100 200 300 Feet

Elevation contour interval is 2 feet

Project Information

T29N, R20W, S18 and S19
City of Lake Elmo
Washington County, MN
Area of Interest = 130.1 acres
Field work conducted:
June 5 - 9, 2017

Mead & Hunt

Image Source: MnGEO WMS Image Service, Washington County (2016 color 7-county)
Contour Source:
Minnesota Geospatial Commons,
Minnesota Elevation Mapping Project
Twin Cities Metro Region 2011

Map 6 of 6

Path: X:\283870\161542.02\TECH\GIS_CAD\Maps\21D_LakeElmoWetlandBoundaryMaps1200.mxd

Wetland Delineation and Function Assessment Report

(final)

Lake Elmo (21D) Airport

Runway 14/32 Relocation and Associated Improvements

Report prepared for

Metropolitan Airports Commission

Minneapolis, Minnesota

Report prepared by

Mead & Hunt

www.meadhunt.com

October 2017

Table of Contents

Appendices

Tables **Page**

1. Introduction

Lake Elmo Airport (21D) is a general aviation reliever airport owned and operated by the Metropolitan Airports Commission (MAC). The airport is located just east of St. Paul, Minnesota. The Airport is bordered by Manning Avenue N. (MN 15) to the west, a Union Pacific Railroad line on the north, and 30th Street N. to the south. Airport property covers approximately 640 acres over three parcels. The central parcel includes the main airfield and associated facilities, roads, and hangar areas. Additional parcels of land extend ownership to the north along Manning Avenue to 40th Street N. (Minnesota Trunk Highway 14), encompassing about 40 acres, and to the south of 30th Street N. for an additional 80 acres. To the south and east, the Airport is bordered by rolling farmland and woodlands with scattered residences, and lies within the Downs Lake subwatershed of the St. Croix River - Stillwater watershed. Areas west of the Airport consist primarily of single-family residential development. A project location map is presented in Appendix A.

The airfield at 21D consists of two runways, two supporting taxiways, and numerous privately owned hangars. Runway 14/32 is the primary runway and is 2,850 feet long and 75 feet wide. The crosswind runway (Runway 4/22) is 2,497 feet long and 75 feet wide. There are two non-precision instrument approaches to the Airport, which has no control tower. Fueling, flight training, and aircraft maintenance services are available from a fixed-base operator. The primary role of the airport is to serve personal, recreational, and business aviation users. The Airport provides business services including flight training and aircraft maintenance.

MAC has prepared a number of Long-Term Comprehensive Plans (LTCP) for the Airport, beginning in 1966 with updates in 1976, 1992, and 2008. The draft 2035 LTCP identifies future facility needs, delineates the future footprint of the Airport, and aims to bring the Airport into safety compliance with Federal Aviation Administration (FAA) guidelines.

The purpose of the proposed action at 21D is to pursue the following three general infrastructure goals for the Airport:

1) Address failing, end-of-life infrastructure;

2) Enhance safety for Airport users and neighbors; and

3) Improve facilities for the family of aircraft using and expected to use the Airport.

The need for the proposed action is based on the following four deficiencies at the existing facility:

1) The existing runway and taxiway pavements are deteriorating and need to be replaced.

2) Runway 14/32 has several incompatible land uses within its runway protection zones (RPZs), including a railroad and two public roads.

3) The existing lengths of Runway 14/32 and 4/22 do not meet the needs of current Airport operators and their aircraft.

4) The existing instrument approach procedures do not utilize the latest available navigational technology.

The proposed action will address these deficiencies by achieving the following four specific objectives:

1) Improve the runway and taxiway pavement condition;

2) Minimize incompatible land uses in the RPZs;

3) Meet runway length needs for existing users; and

4) Upgrade the instrument approach procedures.

In support of an alternatives analysis that explores meeting these goals, a wetland delineation and functional assessment was conducted by Mead & Hunt, Inc. (Mead & Hunt) within an Area of Interest (AOI) on June 5-9, 2017. The AOI comprises 130.1 acres spread over four separate areas and is located in Sections 18 and 19, Township 29 North, Range 20 West, Washington County, Minnesota. A total of nine wetlands were identified within the AOI.

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

- Brauna Hartzell, BS Biological Science, Florida State University, 1982; MS Environmental Monitoring, University of Wisconsin-Madison, 1994; 15 years wetland delineation practice.

- Kim Shannon, BS Biology, Oklahoma State University, 1994; MS Applied and Natural Science (Botany), Oklahoma State University, 1997; 10 years wetland delineation practice.

2. Methods

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

- U.S. Geological Survey (USGS) topographic maps and 2-foot elevation contours provided by Minnesota Geospatial Commons, Minnesota Elevation Mapping Project, 2011.
- U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) soil survey, Web Soil Survey at http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx
- U.S. Fish and Wildlife National Wetland Inventory (NWI) mapping with update for East-Central Minnesota at https://www.fws.gov/wetlands/data/mapper.html
- 2016 National Wetland Plant List (Lichvar, R.W., D. L. Banks, W. N. Kirchner, and N. C. Melvin, 2016)
- Climatic norms at Minneapolis/St. Paul Airport, MN from USDA WETS tables at https://www.wcc.nrcs.usda.gov/climate/navigate_wets.html
- Minnesota Climatology Working group, Wetland Delineation Precipitation Data Retrieval from Gridded database at http://climate.umn.edu/mapClim2007/MNlocApp.asp
- Minnesota Wetland Functional Assessment (MNRAM) data provided by the Valley Branch Watershed District Engineer (via email dated 3/3/2017).
- Aerial photography (MnGEO WMS Image Service, MnDNR Department of Forestry, US Geological Survey, GoogleEarth)

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* (U.S. Army Corps of Engineers, 2011). Soil characteristics were examined by digging pits with a 16-inch tile spade and hydrologic indicators were visually assessed. Soil pits were left open for a minimum of 15 minutes to adequately assess the water table. Munsell Soil Color charts were used to determine the hue, value, and chroma for the matrix and any redoximorphic features in each soil layer.

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

Antecedent precipitation was assessed following procedures developed by the NRCS. Precipitation data three months prior to fieldwork were compared to 30-year precipitation averages (1981-2010) to determine if hydrologic conditions were normal, wetter, or drier than normal for the area.

An offsite hydrology investigation per guidance established by the St. Paul District (USACE, 2016) was performed to assess areas in agricultural production for saturated soil or standing water. Each area identified was investigated in the field and documented.

All area within the AOI was examined. A total of 19 data points—ten in uplands and nine in wetlands—were established to characterize the range of soil, vegetation, and hydrologic conditions. Wetland boundary points were indicated by wire pin flags placed approximately 25-50 feet apart. These sampling points and wetland boundary flags were surveyed with a Trimble Geo7X capable of sub-meter accuracy and mapped using Geographic Information System (GIS) software.

The following appendices are included with this report:

- Appendix A – Project Location and Topography Map
- Appendix B – Detailed Topographic Map, NRCS Soils Map, and Aquatic Resources Map
- Appendix C – Historical Aerial Photography
- Appendix D – Offsite Hydrology Evaluation
- Appendix E – WETS Analysis and Climatic Data
- Appendix F – Wetland Boundary Maps
- Appendix G – Data Sheets with Field Photographs
- Appendix H – MNRAM Functional Assessment Forms
- Appendix I – Delineator Qualifications

3. Results and Discussion

A. Site Description

The AOI covers approximately 130 acres split across four separate areas. The largest section of the AOI, approximately 116 acres in size, extends across areas of the airfield, crossing over 30th Street to include most of the airport parcel south of 30th Street. Smaller sections of the AOI cover the safety area north of Runway 22 end (8.0 acres), an area on the western edge of the Airport along Manning Avenue (4.7 acres), and a small area adjacent to Runway 14/32 and northeast of the main hanger complex just over 1 acre in size. A project location map is presented in Appendix A.

Portions of the AOI are under row-crop cultivation east of Runway 4/22. Scattered woodlands and wetlands appear in this area. Undeveloped infield areas to the west of Runway 4/22 consist of grasses and forbs mown or hayed on a regular basis. The airfield is generally flat with little elevation change; the eastern side is somewhat higher at approximately 930 feet (NAVD 1988), gently sloping to the west and south to about 920 feet at the Airport entrance on Manning Avenue. See Appendix B for a detailed Topographic Map.

Drainage flows generally from northeast to southwest as it moves under 30th Street and Manning Avenue via numerous culverts. Within Airport property, the main southerly drainage conveys flows to a depressional shallow marsh and seasonally flooded basin near the Runway 32 end north of 30th Street. This wetland is connected hydrologically to a larger depressional shallow marsh south of 30th Street via a culvert. Area south of 30th Street is cultivated, although prior to construction of the road these two wetlands were likely physically connected.

Airport lands not in agricultural production are actively managed by regular mowing or periodic haying. At the time of field work, the west side (uncultivated areas) of the Airport had not been mown for some time, making vegetation readily identifiable. Most of these uncultivated areas were dominated by a mix of grasses and forbs consisting of Kentucky blue grass, orchard grass, red clover, common yarrow, milkweed, and Canada thistle. Farm fields on the east side of Runway 4/22 and south of 30th Street were under cultivation. Isolated woodlands and depressional areas appeared undisturbed.

(1) Soils Mapping

Most of the AOI is covered by three soils: well drained Antigo silt loams (0 to 2 percent slopes and 2 to 6 percent slopes) and moderately well drained Crystal Lake silt loam (1 to 3 percent slopes). Typical soil profiles for Antigo silt loams (49 and 49B) show a dark grayish brown (10YR 4/2) silt loam over a brown (10YR 5/3) silt loam. Crystal Lake silt loam (449) also shows a dark grayish brown (10YR 4/2) silt loam in the A horizon; however, underlying this is a light brownish gray (10YR 6/2) silt loam with few fine prominent yellowish red (5YR 4/6) masses of iron accumulation. Antigo silt loams and their minor components are non-hydric while Crystal Lake silt loam contains a minor component, Barronett silt loam at 3%, which is hydric.

Depressional areas within the AOI generally are covered by hydric soils from the poorly drained Auburndale series and by ponded, very poorly drained Aquolls and Histosols. A very dark grayish brown (10YR 3/2) silt loam covers a grayish brown (10YR 5/2) silt loam with many medium prominent strong brown (7.5YR 5/8) masses of iron accumulation in a typical soil profile for the Auburndale series. Areas mapped as Aquolls and Histosols are rated as hydric.

Soils present within the AOI are summarized in Table 1. Soils mapping for the AOI is presented in Appendix B.

Table 1. Summary of Soils in Area of Interest

Map unit symbol	Map unit name	Soil Unit Component Percentage	Landform	Hydric Status
49	Antigo silt loam, 0 to 2 percent slopes	Antigo/ minor comp. 80/20	Terraces, flats	No
49B	Antigo silt loam, 2 to 6 percent slopes	Antigo/ minor comp. 80/20	Terraces, flats, hillslopes	No
153B	Santiago silt loam, 2 to 6 percent slopes	Santiago/ minor comp. 90/10	Moraines	No
155B	Chetek sandy loam, 0 to 6 percent slopes	Chetek/ minor comp. 90/10	Outwash plains	No
155C	Chetek sandy loam, 6 to 12 percent slopes	Chetek/ minor comp. 90/10	Pitted outwash plains	No
155D	Chetek sandy loam, 12 to 25 percent slopes	Chetek/ minor comp. 90/10	Pitted outwash plains	No
189	Auburndale silt loam, 0 to 2 percent slopes	Auburndale/ minor comp. 85/15	Ground moraines	Yes
266	Freer silt loam	Freer/ minor comp. 90/10	Moraines	No
367B	Campia silt loam, 0 to 8 percent slopes	Campia/ minor comp. 90/10	Lake plains	No
449	Crystal Lake silt loam, 1 to 3 percent slopes	Crystal Lake/ minor comp. 90/10	Lake plains	No
452	Comstock silt loam	Comstock/ minor comp. 90/10	Lake plains	No
1055	Aquolls and Histosols, ponded	Histosols/Aquolls 50/50	Depressions on moraines	Yes

(2) Aquatic Resources

The National Wetland Inventory (NWI) indicates several areas of mapped wetlands within the AOI: two areas mapped as seasonally flooded emergent (PEM1C) with a fringe of temporary-flooded emergent (PEM1A), both within the eastern portion of the AOI. A small pocket of forested wetland (PFO1A) is mapped adjacent to an emergent wetland (PEM1A) just northeast of the Runway 22 end. A small emergent seasonally flooded wetland, mapped as PEM1A, lies at the very eastern edge of the AOI, just west of Neal Avenue.

Just outside of the AOI, south of 30th Street is a large open-water cattail swamp ringed by emergent vegetation and mapped as PEM1A, PEM1C, and PABG. The northern edge of this wetland was investigated because of its close proximity to the AOI and its likely connection to the wetland complex north of 30th Street. This wetland is identified as an unnamed MN Public Water (82-461W) and appears to be an isolated wetland with no downstream connections.

An unnamed intermittent stream flows southerly through the western half of Section 19 to Downs Lake. This lake is located west of Manning Avenue and south of the airport. The stream does not flow through the AOI.

Wetlands within the AOI are classified as Circular 39 Types 1 and 3. See Appendix B for aquatic resources mapping.

(3) Historic Aerial Photograph Review

Aerial photographs from 1938, 1947, 1953, 1966, 1972, 1980, 1994, 1997, 2000, 2002, 2004, 2008, 2010, and 2012-2016 were reviewed to assess areas within the AOI that have been and continue to be in agricultural production. A representative sample of these photos is presented in Appendix C. The earliest photograph of the area, taken in 1938, shows the general vicinity of the AOI mostly under cultivation with Manning Avenue, 30th Street, and the rail line in their current configuration. Two farmsteads are located within Sections 18 and 19, one at the southeast corner of Section 18 and one in the northeast corner of Section 19, situated across from each other on 30th Street. Four areas of isolated wetlands are seen much as they are today: the large swamp complex south of 30th Street, a similar smaller swamp area just north of 30th Street, an isolated depressional wooded wetland in the southeast quarter of Section 18, and a grouping of four smaller wooded areas just south of the rail line.

Land use remained the same over the next 10 years with little if any change seen in the 1947 photo. The airport was constructed around 1951-1952 and, with the exception of the airfield area (located in the southwest quarter of Section 18), the surrounding lands remained largely in agricultural production in 1953. By 1966, hangars were being developed on the west side of the airport with further hangar development seen in 1972, at which point the current configuration of runways and taxiways was set. It appears that the farmstead south of 30th Street may have been abandoned, noting the lack of driveway access and the growth of tree canopy.

The north side hangar development was well under way by the early 1990s and largely built out by 2000. The farmstead north of 30th Street was abandoned by 1994 and reversion to forest had nearly closed the canopy.

A small saturated area can be seen in a number of photos starting in 1994 located north of the Runway 22 end. Over the course of numerous photos (1994, 1997, 2004, 2010, 2013, and 2016), this area consistently shows saturated wet signatures; two years a wet signature did not appear. This location was investigated during field work and is documented as Wetland 4 in the Findings section below.

The pattern of agricultural use, both row cropping and forage production, in areas east of the airfield and south of 30th Street within Airport property, observed since the Airport's construction, continues to the present and reflects conditions encountered at the time of field work in 2017. Isolated depressional wetlands appear to be intact and little disturbance was observed in these aerial photos.

No other wet signatures were observed in the farmed fields within the AOI with the exception of area just south of 30th Street situated between the two swamp complexes. This area has been farmed for many years and will be addressed separately as it relates to delineated wetlands, discussed in the following section under Wetland 1. An evaluation of this area using the methodology and guidelines described by the USACE for Offsite Hydrology and Wetland Determinations (USACE, 2016) is presented in Appendix D.

(4) Antecedent Climatic Conditions

A precipitation worksheet using the gridded method from the Minnesota Climatology Working Group was calculated for the three months prior to field work. This analysis indicated that climatic conditions were wetter than normal. Additionally, a WETS analysis using long-term climatic normal data from Minneapolis/St Paul Airport and rain data from the Woodbury, Minnesota, precipitation gage shows a total of 11.8 inches as compared to the long-term average of 7.56 inches. Based on the WETS analysis, hydrologic conditions were wetter than normal (see Appendix E).

B. Findings

(1) Wetlands

A total of nine wetlands were delineated within the AOI. Wetland boundary maps with sampling point locations are presented in Appendix F followed by data sheets and field photographs in Appendix G. Table 2 summarizes the delineated wetlands which are described in detail below.

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

Wetland	Wetland Type	Circular 39 Type	Dominant Vegetation	Area within AOI (Sq. Ft)	Area within AOI (Acres)
1	Seasonally Flooded Basin[1]	Type 1	Agricultural Field	8,142.91	0.187
2	Fresh (wet) Meadow	Type 2	Reed canary grass	5,079.60	0.117
3	Fresh (wet) Meadow	Type 2	Tall buttercup, horsetail, and broom sedge	4,776.96	0.110
4	Fresh (wet) Meadow	Type 2	Path rush, American manna grass	7,271.28	0.167
5	Fresh (wet) Meadow	Type 2/	Reed canary grass	4,104.29	0.094
6	Fresh (wet) Meadow (Ditch Wetland)	Type 2	American manna grass, reed canary grass	389.31	0.009
7	Fresh (wet) Meadow (Ditch Wetland)	Type 2	Reed canary grass	555.23	0.013
8	Fresh (wet) Meadow /Deep Marsh	Type 2/ Type 4	Reed canary grass, black willow, box elder	113,165.03	2.598
9	Fresh (wet) Meadow /Shallow Marsh	Type 2/ Type 3	Reed canary grass, sensitive fern	113,866.44	2.614

[1] *Wetland 1 continues beyond the AOI boundary; delineated boundary within the AOI consists of farmed fields and wetland fringe.*

(a) Wetland 1 (PEMA/Type 1)

Wetland 1 (W1) is a shallow basin located south of 30th Street with two central cores of open water populated with cattails and surrounded by a wide dense fringe dominated by reed canary grass. NWI mapping shows the central open water cores mapped as aquatic bed (PABG) with an inner ring mapped as seasonally-flooded emergent (PEM1C), and an outer ring of temporary flooded emergent (PEM1A). Only the northern extent of this wetland was investigated due to its proximity to the AOI boundary. Lands between 30th Street and the north end of the wetland have been in agricultural production for many years.

An offsite hydrology analysis of the agricultural area using 18 historic aerial photographs is provided in Appendix D. This analysis shows that 66% of the photographs taken with normal antecedent precipitation exhibit wet signatures. These signatures include both soil wetness and crop stress signatures, supporting observations taken in the field at sampling data point (DP) 3 and DP4.

Slopes around the basin vary from a 1% to 3% grade. The basin receives runoff from the surrounding fields and a 24 inch culvert under 30th Street contributes drainage from the north. It is likely that, prior to the construction of 30th Street, these two wetlands were physically connected. Currently, they appear to be connected hydrologically.

Data points 1 through 6 were taken in W1. DPs 1, 2, 5, and 6 are indicative of the wetland fringe while DPs 3 and 4 were taken in the farmed area south of 30th Street. The locations of these sampling points are found on the Wetland Boundary Maps in Appendix F. Data sheets along with field photographs are presented in Appendix G.

Vegetation

At both wetland data points DP1 and DP5, the vegetation is dominated by reed canary grass in the herb layer. Other minor components of the herb stratum included stinging nettle (*Urtica dioica*: FAC) and water smartweed (*Persicaria amphibia*: OBL). The dominant species at wetland sampling points DP1 and DP5 are hydrophytic (FACW or FAC) and meet the wetland vegetation criterion.

At DP3 (wetland) within the farmed field, no identifiable vegetation was present and the sampling area was mostly bare. This appeared to be the result of inundation which caused soy bean seedling drown-out at this data point.

Hydrology

While evidence of surface water, a high water table, or saturation was not observed at either DP1 or DP5, oxidized rhizospheres were observed on living roots which met the C3 (Oxidized Rhizospheres on Living Roots) primary indicator of wetland hydrology at both these wetland sampling points. Secondary indicators Geomorphic Position (D2) and a positive FAC-Neutral Test (D5) were also present.

Wetland hydrology at DP3 (wetland) in the farm field was indicated by multiple primary indicators Drift Deposits (B3), Sparsely Vegetated Concave Surface (B8), and Water-Stained Leaves (B9). Secondary hydrology indicators included Surface Soil Cracks (B6) and Stunted or Stressed Plants (D1). The previous year's corn debris had drifted and accumulated against the standing vegetation of the wetland fringe to the south of DP3. Water-staining was present on many of the old stalks. The soil surface at DP3 was devoid of planted soy beans, indicating crop drown-out conditions and plants under stress. Re-growth of weedy vegetation was noted; however, the shoots were too small to identify. Cracked soils were seen in overflow areas near the culvert exit under 30th Street, approximately 150 feet to the north of DP3. Standing water was present at the base of the culvert.

Offsite hydrology analysis using 18 historic aerial photographs showed that 66% of the photographs taken with normal antecedent precipitation exhibited wet signatures. Therefore, secondary indicator Saturation Visible on Aerial Imagery (C9) was also met at DP3.

In meeting multiple primary and secondary indicators of wetland hydrology, the hydrology criterion is satisfied.

Soils

Three mapped soils cover this area: Crystal Lake silt loam (1 to 3 percent slopes) at DP1, DP2, DP5, and DP6; Comstock silt loam at DP3 and DP4; and Aquolls and Histosols (ponded) within the basin itself.

The hydric soils criterion was satisfied at five of the six sample points taken in W1 which included two upland data points (DP2 and DP4). At DPs 1 through 5, the Depleted below Dark Surface (A11) was met. DP1 and DP2, on the west side of the wetland, also met Redox Dark Surface (F6). The Depleted Matrix (F3) indicator was also met at DP 5, located on the east side of the wetland.

The soil profiles at these five data points were all silt loams with very dark brown to very dark grayish brown matrix colors (10YR2/2 and 10YR3/2) and prominent redoximorphic features in strong brown colors (7.5YR4/6 and 7.5YR5/6). A depleted matrix was encountered at DP5 with a dark gray (10YR4/1) silt loam with strong brown (7.5YR4/6) redox features starting at 4 inches deep. With numerous hydric soils indicators being met, the hydric soils criterion is satisfied.

The upland data point (DP6) did not satisfy any hydric soils indicator with a dark brown (10YR3/3) silt loam and no redox features.

Wetland Boundary

The wetland boundary was based on distinct differences in vegetation, hydrology, and topography. All upland data points (DP2, DP4, and DP6) were taken in surrounding agricultural fields where soy beans had recently been planted after light discing. In transition to uplands, bean sprouts were vigorous and not stressed, and indicators of wetland hydrology were lacking. Hydric soils were present at most of the data points so this wetland criterion was not a factor in determining the boundary except on the east side of the wetland. Wetland hydrology was absent at all three upland data points.

Topography changes were more pronounced on the east side of the wetland as compared to the more subtle slopes on the west. The nearly flat field south of 30th Street exhibited many indicators of wetland hydrology and the loss of vegetation due to drown-out together determined the boundary in this area.

(b) Wetland 2 (PEMB/Type 2)

Wetland 2 (W2) is a depressional emergent wetland community located at the base of a steep hillslope on its northern and western sides and is bounded by the road fill slope of Neal Avenue on the east. Surface runoff from the surrounding hill slope flows over a 12-13% grade to this area and exits over a more gradual gradient to the south. W2 consists almost entirely of reed canary grass (*Phalaris arundinacea: FACW*) with a few isolated willow (*Salix* sp.) on the fringes. A few elm (*Ulmus americana: FACW*) and box elders (*Acer negundo: FAC*) appeared higher on the slope on the western side and a pocket of aspen (*Populus tremuloides: FAC*) and buckthorn (*Rhamnus cathartica: FAC)* was observed in the southeast corner of the area.

This area is mapped on the National Wetland Inventory map as emergent temporary flooded (PEM1A). See Appendix B for NWI mapping.

DPs 7, 8, and 9 were taken in W2. The locations of these sampling points are found on the Wetland Boundary Maps in Appendix F. Data sheets along with field photographs are presented in Appendix G.

Vegetation

Reed canary grass (FACW) was dominant within W2 and the hydrophytic vegetation criterion was satisfied at all three sampling points including the two upland data points (DP8 and DP9). A few isolated willows and a dead standing tree was observed on the wetland fringe and documented at DP7 (wetland).

Hydrology

Primary indicators of wetland hydrology present within W2 were High Water Table (A2) and Saturation (A3) observed at wetland sampling point DP7. Saturation (A3) was found at DP 8, an upland sampling point. Secondary indicators included Geomorphic Position (D2) and a positive FAC-Neutral Test (D5) for data points 7 and 8 and Stunted or Stressed Plants (D1) at DP 7 only. The numerous primary and secondary indicators satisfied the wetland hydrology criterion.

Soils

Chetek sandy loam (12 to 25 percent slopes) and Antigo silt loam (0 to 2 percent slopes) are mapped over Wetland 2. A very dark gray loam (7.5YR3/1) with distinct dark brown (7.5YR3/3) redoximorphic features met the Redox Dark Surface (F6) hydric soils criterion at DP7; however, a similar profile at DP8 did not meet hydric soils criteria due to depth and insufficient redoximorphic features. DP9 (upland) did not meet any hydric soils indicators due to high chroma soils.

Wetland Boundary

The wetland boundary in W2 was primarily determined by transitions to upland conditions in soils and hydrology field parameters along with topographic changes. Wetland vegetation crossed the boundary and was present at both upland sampling points (DP8 and DP9) but the lack of hydrology and hydric soils indicators determined the boundary over this sampling transect. In transition to upland, the boundary was primarily associated with changes in elevation of two to four feet on the north and west sides along the base of the hill slope and along the road fill slope on the east. On the southern end of the wetland, less abrupt topographic changes determined the boundary.

(c) Wetland 3 (PEMB/Type 2)

Wetland 3 (W3) is an emergent wetland community located north of Runway 22 end at the base of a narrow knoll on the east (likely related to construction of the runway), the fill slope of the connector taxiway, and a shallow swale on the west. This swale drains from northeast to southwest along a hangar access road and is drained by a culvert at the southern end. There does not appear to be a connection between W3 and the swale as a slight topographic rise between the two areas separates them.

This small basin collects surface runoff from the east and south and was relatively undisturbed at the time of field work. The area is mown frequently; however, regrowth was sufficient for identification at the time of field work. Some mower tracks were observed within the wetland, some of which were bare; others contained some iron staining. W3 does not appear on NWI mapping.

Sampling points DP10 (wetland) and DP11 (upland) were taken. The locations of these points are shown on the Wetland Boundary Maps provided in Appendix F; data sheets along with field photographs are presented in Appendix G.

Vegetation
The diverse mix of vegetation within W3 was dominated by tall buttercup (*Ranunculus acris*: FAC), field horsetail (*Equisetum arvense*: FAC), and broom sedge (*Carex scoparia*: FACW). Other species including selfheal (*Prunella vulgaris*: FAC), path rush (*Juncus tenuis*: FAC), Kentucky blue grass (*Poa pratensis*: FACU) and grass-leaf starwort (*Stellaria graminea*: UPL) completed the assemblage. The dominant species within W3 are hydrophytic (FAC and FACW) and meet the hydrophytic vegetation criterion.

Hydrology
Wetland hydrology was present and indicated. At data point DP10 (wetland), the soils were saturated at the surface and met primary indicator Saturation (A3). Geomorphic Position (D2), a secondary indicator of wetland hydrology, was also met. Runoff from slopes to the east and south appear to collect in this shallow basin with no apparent outlet before infiltrating into the subsoil. Primary and secondary hydrology indicators were satisfied at DP10 and wetland hydrology is present.

Soils
Antigo silt loam (2 to 6 percent slopes) is mapped underlying Wetland 3. While this series and several of its minor components are primarily mapped with silt loam profiles, one of the components (Rosholt) contains a sandy loam profile. At wetland sampling point DP10, a layer of very dark gray (5YR3/1) sandy loam with yellowish red (5YR4/6) redoximorphic features covering a dark reddish gray (5YR4/2) sand with yellowish red (5YR4/6) redoximorphic features was documented. This profile met hydric soils indicators Sandy Redox (S5) and Redox Dark Surface (F6) and therefore hydric soils are present.

Wetland Boundary
The wetland boundary was determined by a transition to a plant community dominated by upland species with minor wetland components, an absence of hydric soils indicators, and a lack of wetland hydrology indicators. A topographic transition of about 2-3 feet to uplands was also noted along the southern side due to the taxiway fill slope and due to a topographic rise on the eastern side. On the northern and western sides, vegetation changes and more minor topographic changes determined the boundary.

In uplands, the vegetation shifted to one dominated by Kentucky blue grass and grass-leaf starwort at upland sampling point DP11. Other species observed as minor components included white and red clover (*Trifolium repens*: FACU and *Trifolium pratense*: FACU), oxeye-daisy (*Leucanthemum vulgare*: UPL) as tall buttercup and common selfheal (both FAC) crossed the boundary. Hydric soils and wetland hydrology indicators were absent at DP11.

(d) Wetland 4 (PEMB/Type 2)

Wetland 4 (W4) is an emergent wetland community located north of the Runway 22 end, a flat area situated between two knolls with slopes rising six to eight feet on three sides. Surface runoff is collected at this low spot between these converging landforms. The wetland also receives drainage from the north over a more gradual gradient before exiting on the eastern side where a narrow neck appears to carry flow from this wetland to Wetland 5 (discussed below); however, at the time of field work, evidence of a wetland connection was not observed. A slight topographic rise serves to separate these wetland areas under most circumstances and hydric soils indicators were not observed in test soil pits dug in the rise.

While W4 does not appear on NWI mapping, this area consistently shows saturated wet signatures in numerous aerial photos (1994, 1997, 2004, 2010, 2013, 2015, and 2016).

Several areas of rutting due to mowing operations were observed at the time of field investigation although the area had not been mown recently. Two data points (DP12 and DP13) were sampled in an undisturbed area on the eastern side.

The locations of these points are shown on the Wetland Boundary Maps provided in Appendix F; data sheets along with field photographs are presented in Appendix G. The complex topography is shown on the detailed topography map in Appendix B.

Vegetation

The plant community at DP13 (wetland) was dominated by path rush (FAC) and American manna grass (*Glyceria grandis*: OBL), both hydrophytic wetland plants. Other minor components of the wetland plant assemblage were wooly-fruit sedge (*Carex lasiocarpa*: OBL), horsetail, reed canary grass, and broom sedge. A large area of matted vegetation was observed to the west of the data point locations. Hydrophytic vegetation dominated at DP13 and therefore meets the hydrophytic vegetation criterion.

Hydrology

Wetland hydrology is present and indicated at DP13 (wetland). One primary indicator of wetland hydrology was present with Saturation (A3) to a depth of 6 inches as well as secondary indicators of Geomorphic Position (D2), a positive FAC-Neutral Test (D5), and Saturation Visible on Aerial Imagery (C9). These four indicators of wetland hydrology satisfied the hydrology criterion.

Soils

As with Wetland 3, Antigo silt loam (2 to 6 percent slopes) is mapped underlying this wetland. A similar sandy soil profile was seen at DP13 as with DP 10 in W3. While soil disturbance was noted here, the profile appeared to be intact. Two thin sandy layers overlaid a depleted matrix of dark gray (5YR4/1) sandy loam with yellowish red (5YR4/6) redoximorphic features starting at 6 inches deep which met field indicator Depleted Matrix (F3). The hydric soils criterion was satisfied.

Wetland Boundary
The wetland boundary was determined by a transition to a plant community dominated by upland species, a lack of hydric soils and wetland hydrology indicators, and changes in elevation. In uplands, the plant community shifted to one dominated by Kentucky blue grass and grass-leaf starwort as seen at upland sampling point DP12. Both white and red clover and dandelion (*Taraxacum officinale*: FACU) entered the plant community as minor components.

A topographic rise of about two feet along the east and south sides of the wetland aided in boundary determination. Along the western and northern sides, transition to upland vegetation determined the boundary. Hydric soils indicators and wetland hydrology indicators were absent at DP12.

(e) Wetland 5 (PEMB/Type 2)
Wetland 5 (W5) is a shallow closed basin with a dense fringe dominated by reed canary grass located at the northeastern corner of the AOI, near the end of Runway 22. The basin is at the base of knolls on the north, west, and east sides with slopes as steep as 15%. Drainage flows to the southeast through a shrub-carr complex just outside of the AOI. Within the AOI, the wetland is comprised of emergent vegetation only.

The NWI mapping indicates this area as a temporary flooded emergent/shrub (PEM1A/PFO1A) wetland. See Appendix B for NWI mapping.

Two data points (DP14 and DP15) were sampled at the northern side of the wetland boundary. No vegetation disturbance due to management activities was noted. The locations of these points are shown on the Wetland Boundary Maps provided in Appendix F; data sheets along with field photographs are presented in Appendix G.

Vegetation
At DP15 (wetland), the dominant vegetation was reed canary grass with a minor component of water smartweed (*Persicaria amphibia*: OBL). Stinging nettle (*Urtica dioica*: FAC) appeared in the assemblage along the boundary. Within the AOI, vegetation was confined to the herb stratum; outside of the AOI to the east, tree and shrub components were observed consisting of box elder, willow (*Salix* sp.), and red osier dogwood. The hydrophytic vegetation criterion was satisfied at this sampling point.

Hydrology
Wetland hydrology was present and indicated by a High Water Table (A2) to three inches in depth, Saturation (A3) at the surface and secondary indicators of Geomorphic Position (D2) and a

positive FAC-Neutral Test (D5). These four primary and secondary indicators meet the wetland hydrology criterion at DP15.

Soils

The area is mapped as poorly drained Auburndale silt loam, a soil unit rated as hydric. At DP 15, a depleted matrix of dark gray (10YR4/1) silt loam with reddish-brown (5YR4/4) redox concentrations overlaid a black (7.5YR2.5/1) silt loam. Two field indicators of hydric soils were observed including Depleted Matrix (F3) and Redox Depressions (F8). In satisfying these indicators, the hydric soils criterion was met.

Wetland Boundary

The wetland boundary was determined by differences in vegetation, hydrology, soils, and a significant change in elevation. In transition to uplands, reed canary grass was still dominant, crossing the boundary; however, Canada thistle became a major component of the limited plant assemblage, failing the Prevalence Index at 3.2 at the upland sampling point DP14. The lack of hydric soils and wetland hydrology indicators also determined the boundary.

A sharp topographic rise of about 4-5 feet accompanied the transition to uplands around the rim of the basin within the AOI.

(f) Wetlands 6 and 7 (PEMB/Type 2)

Wetlands 6 and 7 are small isolated ditch wetlands located at the base of culverts within the infield. Sampling points were not taken in these two wetlands. Photos of both wetlands are presented in Appendix G (Additional Photos). Neither of these wetlands was identified on the NWI mapping. Each wetland is discussed below.

Wetland 6 (W6), at just 389.31 square feet in size, is situated near the end of Runway 14 at the base of a fill slope for the connector taxiway. An 18-inch culvert directs drainage from the infield into this area which continues along a shallow swale which drains to the south before exiting under Manning Avenue.

Vegetation at W6 was dominated by American manna grass (*Glyceria grandis*: OBL), reed canary grass, and water smartweed. Some areas of bare soils were noted and the ditch and surrounding areas are mowed on a regular basis. Test pits visually confirmed the presence of hydric soils indicators. Wetland 6 is covered by Crystal Lake silt loam (1 to 3 percent slopes). Saturation was present within the ditch. Wetland hydrology is also confirmed by the domination by obligate vegetation.

The boundary was determined by a lack of hydric indicators in the soil, a change in vegetation and a lack of hydrology indicators. In transition to uplands, turf grasses dominated by Kentucky blue grass became dominant.

Wetland 7 (W7) is located just to the east of the runway intersection and is a small isolated ditch wetland at 555.23 square feet in size. This wetland is fed by a 30-inch culvert which drains to a wide shallow swale flowing east. Reed canary grass dominated the hydrophytic vegetation and soils were visually assessed for hydric soils criteria. Standing water was present at the base of the culvert and much of the surface of the wetland was saturated. Soils within this wetland are mapped as Crystal Lake silt loam (1 to 3 percent slopes).

The wetland boundary was determined by a transition to upland vegetation, a lack of hydric soils indicators, and a lack of wetland hydrology. Upland vegetation was dominated by Kentucky blue grass, dandelion, and English plantain (*Plantago lanceolata*: FACU).

(g) Wetland 8 (PEMB/Type 2 and PABF/Type 4)

Wetland 8 (W8) is an isolated basin located to the east of Runway 4/22 and surrounded by farm fields. A large expanse of open water typified the interior of the wetland. The wetland fringe consists of a mixture of mature tree cover and emergent vegetation. Drainage from topographically-higher farm fields and wooded areas collects in this low spot with no apparent outlet. The boundary of W8 continues to the north outside the AOI.

This area is mapped on the NWI as temporary flooded emergent (PEM1A/Type1) and seasonally flooded emergent (PEM1C/Type 3). See Appendix B for NWI mapping. The wetland area is present in the 1938 aerial photo and appears largely undisturbed in subsequent photos (see Appendix C).

Two data points (DP16 and DP17) were sampled at the southern end of the wetland boundary. No vegetation disturbance due to management activities was noted. The locations of these points are shown on the Wetland Boundary Maps provided in Appendix F; data sheets along with field photographs are presented in Appendix G.

Vegetation

At wetland sampling point DP17, reed canary grass was dominant in the herb stratum while black willow (*Salix nigra*: OBL) and box elder (*Acer negundo*: FAC) were co-dominants in the tree layer. Other trees observed in the wetland included swamp white oak (*Quercus bicolor*: FACW), quaking aspen (*Populus deltoides*: FAC), American elm (*Ulmus americana*: FACW), and buckthorn (*Rhamnus cathartica*: FAC). Herbaceous cover throughout the wetland, especially on the wetland fringe, was dominated by reed canary grass. The dominant vegetation seen at the sampling point was either FAC, FACW, or OBL and met the hydrophytic vegetation criterion.

Hydrology

Wetland hydrology was strongly present and indicated within W8. Primary indicators were Surface Water (A1) to a depth of 2 inches, High Water Table (A2) to a depth of 8 inches, and Saturation (A3) at the soil surface. Oxidized Rhizospheres on Living Roots (C3) were are also observed within the top foot of the soil profile. Secondary indicators of wetland hydrology consisted of Geomorphic Position (D2) and a positive FAC-Neutral Test (D5). These six indicators satisfied the wetland hydrology criterion.

Soils

Soils within the wetland are mapped as poorly drained Auburndale silt loam. The soil profile showed a deep layer of black (5YR2.5/1) loam with dark red (2.5YR3/6) redoximorphic features which satisfied the Redox Dark Surface (F6) field indicator. Due to the closed depressional landform within which the wetland is located, the Redox Depressions (F8) field indicator was also met. With these two indicators, the hydric soils criterion was satisfied.

Wetland Boundary

The wetland boundary was determined by a transition to upland vegetation, a lack of hydric soils indicators, and a lack of wetland hydrology. Upland sampling point (DP16) was taken in the farm field just to the south of the wetland. In the largely bare soil, upland herbaceous vegetation was dominated by Canada goldenrod (*Solidago canadensis*: FACU) and burdock (*Arctium minus*: FACU). Upland tree species noted along the boundary included northern pin oak (*Quercus ellipsoidalis*: UPL), white ash (*Fraxinus americana*: FACU), black cherry (*Prunus serotina*: FACU).

A well-defined change in elevation of about 3-4 feet accompanied the transition to uplands surrounding the wetland. Hydric soils indicators were absent in the high chroma soil profile at DP 16 (upland) and no wetland hydrology was observed or indicated.

(h) Wetland 9 (PEMB/Type 2 and PEMC/Type 3)

Wetland 9 (W9) is a shallow basin with a central core of open water populated with cattails and surrounded by a wide dense fringe dominated by reed canary grass. It is located north of 30th Street and east of the Runway 32 end. Drainage flows from the west via a wide grassy swale north of Runway 14/32, from turf grass areas at the end of the runway, and runoff from surrounding farm fields on the north and east sides. The wetland is drained by one 24-inch culvert under 30th Street, which forms the southern boundary of the wetland.

Topography varies little over the breadth of the wetland which is largely enclosed by the 918-foot contour. Areas in the surrounding farm fields and grassy infield areas are just a few feet higher in elevation.

The wetland area is present in the 1938 aerial photo and appears largely undisturbed by farming operations in all subsequent photos (Appendix C). At the time of 1938 aerial, 30th Street had been constructed, which appears to have cut off this wetland from the larger wetland complex south of 30th Street.

This area is mapped on the NWI as temporary flooded emergent (PEM1A/Type 2) and seasonally flooded emergent (PEM1C/Type 3). See Appendix B for NWI mapping.

Two data points (DP18 and DP19) were sampled on the west side of the wetland boundary. No vegetation disturbance due to management activities was noted. Turf grass areas west of the wetland had been mown. The locations of these points are shown on the Wetland Boundary Maps provided in Appendix F; data sheets along with field photographs are presented in Appendix G.

Vegetation
Reed canary grass and sensitive fern (*Onoclea sensibilis*: FACW) were co-dominants at wetland sampling point DP19. Water smartweed was a minor component of the plant assemblage. In open water areas, cattail (*Typha angustifolia*: OBL) dominated with isolated willow (*Salix* sp.) and box elders on the fringe. North of the sampling point locations, the boundary includes areas extending into the western drainage swale which contained spike rush (*Eleocharis* sp.) and sedges (*Carex* sp.). The dominant species within the wetland are mostly hydrophytic and meet the hydrophytic vegetation criterion.

Hydrology
Wetland hydrology was strongly present and indicated within W9. Primary indicators were Surface Water (A1) to a depth of 4 inches, High Water Table (A2) to a depth of 8 inches, and Saturation (A3) at the soil surface. Secondary indicators of wetland hydrology consisted of Geomorphic Position (D2) and a positive FAC-Neutral Test (D5). These five indicators satisfied the wetland hydrology criterion.

Soils
Soils mapping shows this as an area of ponded Aquolls and Histosols. At wetland sampling point (DP19), a soil profile of very dark gray (5YR3/1) loam with yellowish red (5YR4/6) redoximorphic features satisfied the Redox Dark Surface (F6) indicator. The hydric soils criterion was satisfied with this field indicator.

Wetland Boundary
The wetland boundary was determined by a transition to upland vegetation, a lack of hydric soils indicators, and a lack of wetland hydrology. At upland sampling point DP18, the vegetation shifted to one dominated by Kentucky blue grass with a diverse array of upland species as minor components: plantain (*Plantago major*: FACU), grass-leaf starwort (UPL) and common chickweed (*Stellaria media*: FACU), dandelion, red clover, and bird’s foot trefoil (*Lotus corniculata*: FACU).

This sampling point was approximately 1-2 feet higher in elevation and this topographic difference was also a determinant of the boundary. Hydric soils indicators were absent at DP18 as were wetland hydrology indicators.

C. Uplands

Upland within the AOI consisted primarily of cultivated fields in corn-soybean rotation and mown infield areas with a mixture of grasses and forbs. Dominant upland vegetation included Kentucky blue grass, grass-leaf starwort, Canada thistle, burdock, and Canada goldenrod. A variety of species were also observed as minor components of the upland plant community including ox-eye daisy, white and red clover, and plantain. Transition to upland was marked a lack of wetland hydrology and absence of hydric soils in many cases. Often, topographic breaks of 2-3 feet were associated with upland areas.

D. Functional Assessment

A functional assessment of the delineated wetlands was performed using the Minnesota Routine Assessment Method (MNRAM). The scoring for the MNRAM assessment was done after completion of the wetland delineation using soils, plant community, hydrology information, and field observations collected as part of that effort. The rankings for each of the 72 questions were entered into the MNRAM database (version 3.4 beta) to arrive at the functional assessment.

Functional assessment information for wetlands in Section 18 and 19 previously identified was provided by the Valley Branch Watershed District (VBWD). This data was combined with field observations to assist with making rankings for wetlands within the AOI. Wetland IDs were assigned as part of the assessments. The numbering scheme provided by VBWD was kept for the current assessments, using a letter modifier to indicate an update record. If a new wetland was identified, a new ID number was assigned with a sequential number. Table 3 provides the Location ID numbers assigned to each wetland.

The assessments were completed for the AOI only. Two wetlands (1 and 5) continue beyond the boundary of the AOI. Wetland 1 is a seasonally-flooded farm field that receives drainage from a culvert under 30th Street at the northern end of the boundary, which flows to the dense fringe of reed canary grass forming the perennial northern extent of the wetland. The assessment record for this wetland is considered an addition, rather than an update. Wetlands 4 and 5 correspond to one previously assessed wetland. A connection between these two wetlands was not observed at the time of field work and thus are treated as two wetlands in this assessment. In addition, the assessment for Wetland 5 included only the emergent plant community within the AOI; the Shrub component previously assessed continued beyond the AOI boundary and was not evaluated.

Three new wetlands were delineated: an isolated depressional basin and two ditch wetlands (Wetlands 3, 6, and 7, respectively). These were assigned new location ID numbers and a new assessment completed. Site Response Forms and Assessment Summary reports are provided in Appendix H.

Table 3. Wetland and Functional Assessment IDs

Wetland	Location	Record Status
Wetland 1	82-029-20-19-007-B	Additional Area
Wetland 2	82-029-20-19-005-B	Update
Wetland 3	82-029-20-18-011-A	New
Wetland 4	82-029-20-18-008-B	VBWD Wetland split
Wetland 5	82-029-20-18-008-C	VBWD Wetland split
Wetland 6	82-029-20-18-012-A	New
Wetland 7	82-029-20-18-013-A	New
Wetland 8	82-029-20-18-003-B	Update
Wetland 9	82-029-20-18-002-B	Update

E. Summary

In summary, the AOI is primarily covered by silt loam and sandy loam soils, with several areas in agricultural production or in managed landscapes. Nine wetland were identified within the AOI and are documented by 19 sampling points. The wetland boundary was determined by the observation of multiple indicators of wetland hydrology associated with wetland vegetation on soils exhibiting Depleted Below Dark Surface (A11), Depleted Matrix (F3), Redox Dark Surface (F6), and Redox Depressions (F8) in isolated depressional basins. Wetland hydrology was directly observed as Saturation (A3), High Water Table (A2), and/or Surface Water (A1) at all wetlands except Wetland 1 (farm field). The boundary determinations primarily relied on the absence of all three wetland criteria: lack of hydrophytic vegetation, wetland hydrology indicators, and hydric soils.

(1) Other waters

This AOI does not include any intermittent or perennial streams or navigable waters. No other water bodies were identified during the delineation.

4. Conclusion

A total of nine separate wetland boundaries enclosing 5.909 acres were delineated within the AOI at Lake Elmo Airport. A jurisdictional determination for these wetlands will be needed from the U.S. Corps of Engineers (USACE) as they may be considered isolated water bodies. A Section 404 wetland fill permit from the USACE will be needed for any construction activities within the jurisdictional wetland boundaries. A Section 401 water quality certification of the 404 permit will also be required by the Minnesota Pollution Control Agency, and additional permits may be required from the Local Government Unit (LGU) under the Minnesota Wetland Conservation Act. Independent review by local land use authorities may also be required. Final authority over the project rests with the above federal, state, and local agencies.

5. Certification 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* (U.S. Army Corps of Engineers, 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

Brauna Hartzell
Wetland Ecologist & GIS Analyst

The undersigned does hereby certify and state he is a Professional Wetland Scientist (PWS); that work described herein was reviewed for conformance to best accepted professional practices; and that this delineation has been 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* (U.S. Army Corps of Engineers, 2011).

MEAD & HUNT, Inc.

Perry Rossa

Perry Rossa
PWS Cert. No. 2382

Date: August 2017

6. References

The following data sources were examined prior to fieldwork:

- Google Earth. Historical Aerial Images, Google Inc.

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

- MnGEO Geospatial Image Service. Minnesota Geospatial Information Office, Saint Paul, Minnesota. Accessed at http://geoint.lmic.state.mn.us/cgi-bin/wms.

- Minnesota Department of Natural Resources (MnDNR), Division of Forestry. Forestry Resource Assessment, 1994. Fall color-infrared Aerial Photography. Accessed at http://dnr.state.mn.us/airphotos/index.html

- National Wetlands Inventory (with Minnesota Update) from the U.S. Fish and Wildlife Service at https://www.fws.gov/wetlands/data/mapper.html

- Soils Survey of Washington County, MN, 2003. U.S. Department of Agriculture (USDA), Natural Resources Conservation Service, Web Soil Survey available online at http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx.

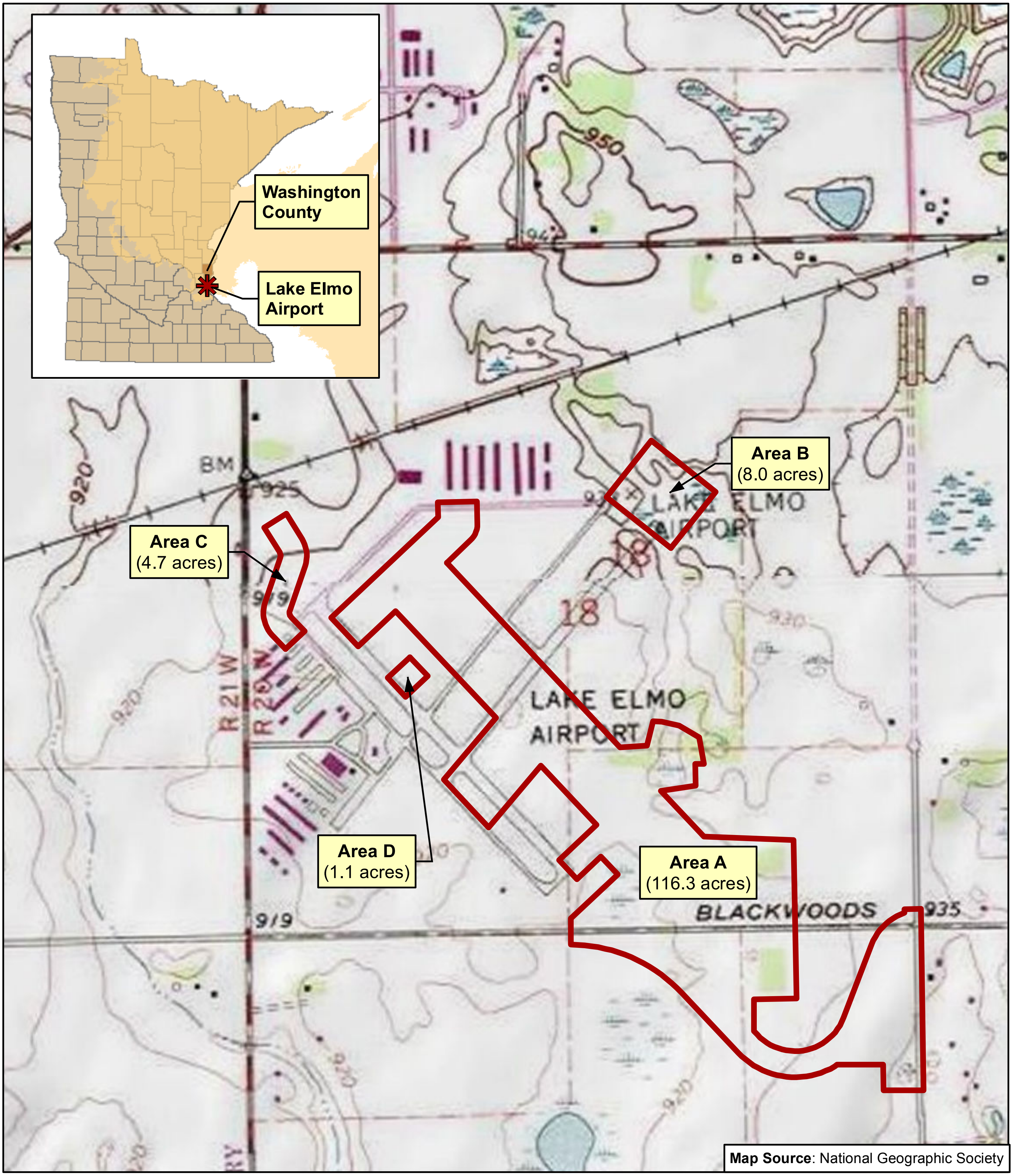
- U.S. Army Corps of Engineers, 2011. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (Version 2.0),* ed. J.S. Wakely, R.W. Lichvar, C.V. Noble, and J. F. Berkowitz. ERDC/EL TR-12-1. Vicksburg, MS: U.S. Army Engineer Research and Development Center.

- U.S. Army Corps of Engineers, 2016. *Guidance for Offsite Hydrology/Wetland Determinations*. USACE, St. Paul District and Minnesota Board of Water and Soil Resources. Minneapolis, MN.

- U.S. Department of Agriculture, Natural Resource Conservation Service (USDA, NRCS), 2016. *Field Indicators of Hydric Soils in the United States*, Version 8.0, ed. L.M. Vasilas, G.W. Hurt, and J.F. Berkowitz. USDA, NRCS in cooperation with the National Technical Committee for Hydric Soils.

- US Geological Survey (USGS), Earth Resources Observation and Science (EROS) Center. Aerial images accessed at https://earthexplorer.usgs.gov/.

Appendix A. Project Location and Topography Map



Project Location and Topography

LAKE ELMO AIRPORT

Proposed Runway 14/32 Relocation and Associated Improvements

Legend

Area of Interest (AOI)

LRR Subregion: K

0 1,000 2,000 Feet

N

Project Location

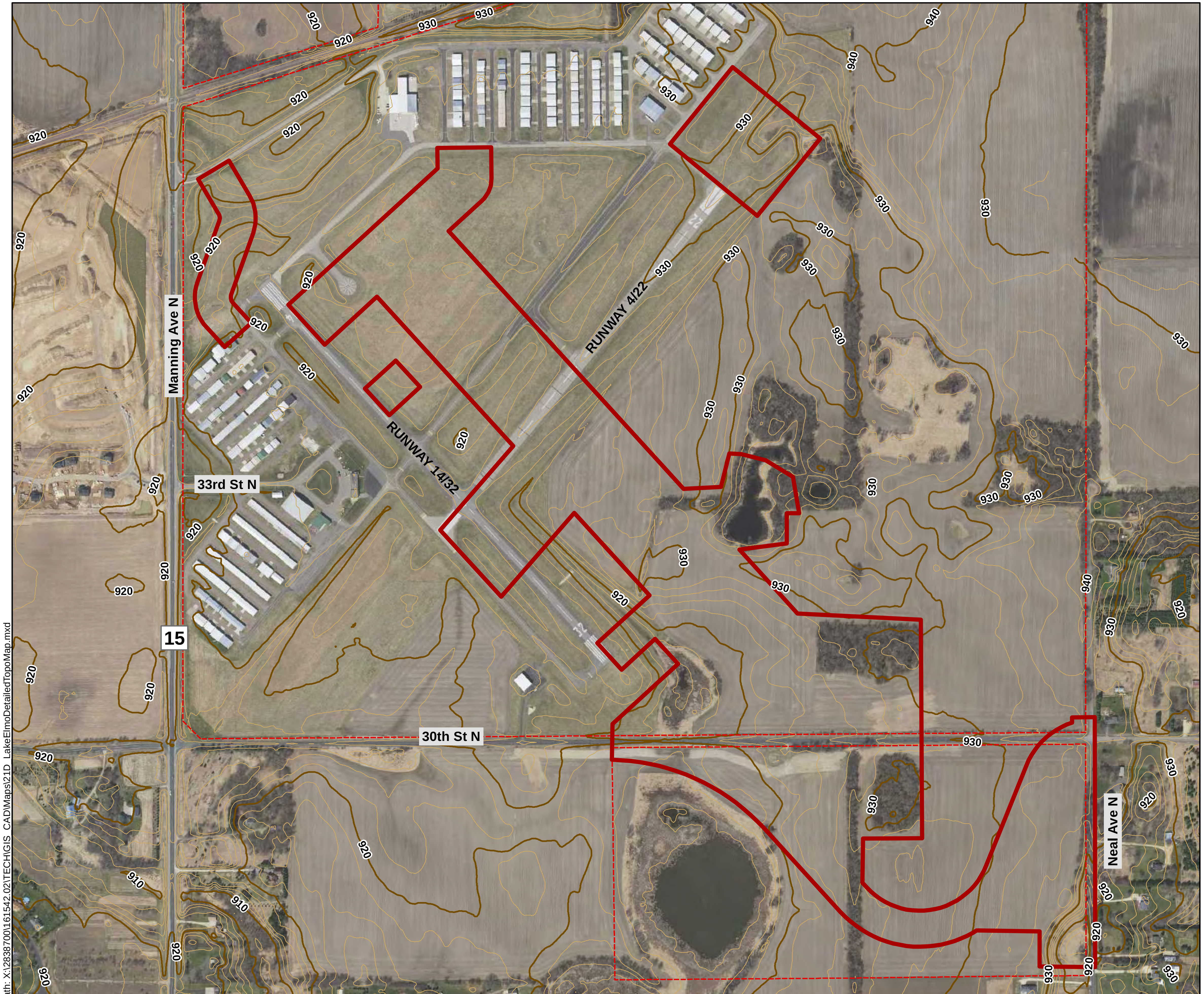
T29N, R20W, S18 and S19
Baytown and West Lakeland Townships
Washington County, MN
LRR Subregion: K
USACE Regional Supplement: NC/NE
Area = 130.1 acres

Appendix B. Detailed Topographic Map, NRCS Soils Map, and Aquatic Resources Map

Detailed Topography Map

LAKE ELMO AIRPORT

Proposed Runway 14-32 Runway Shift



Legend

Area of Interest

Airport Property Boundary

Contour Elevation

Index Contour

Intermediate Contour

N

0 150 300 600 900 1,200 Feet

Note: Contour interval is 2 feet.

Project Information

T29N, R20W, S18 and S19
City of Lake Elmo
Washington County, MN
Area of Interest = 130.1 acres
Field work conducted:
June 5 - 9, 2017

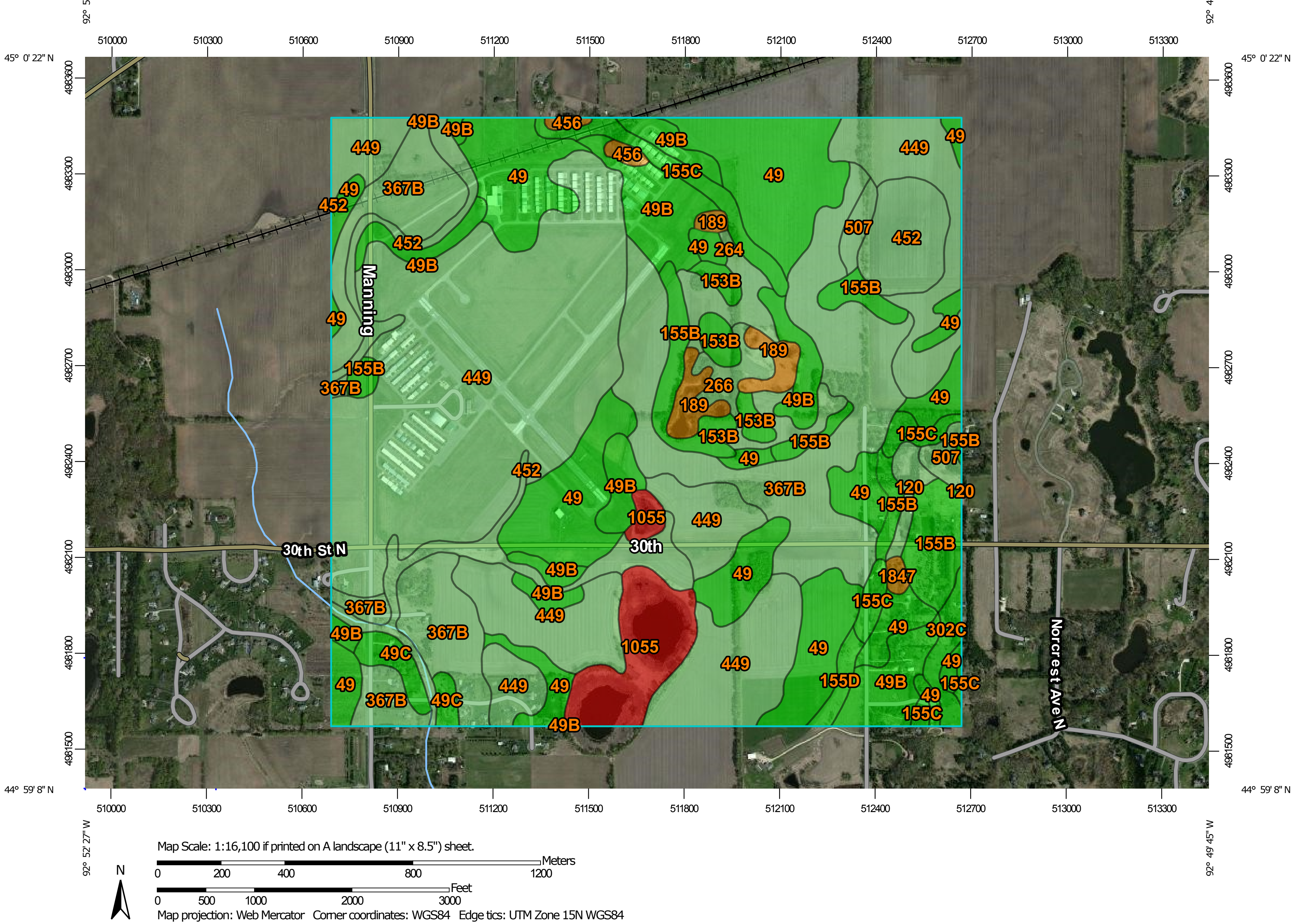
Image Source: MnGEO WMS Image Service, Washington County (2016 color 7-county)

Contour Source:
Minnesota Geospatial Commons,
Minnesota Elevation Mapping Project
Twin Cities Metro Region 2011

Mead & Hunt

Path: X:\28387001\161542.02\TECH\GIS_CAD\Maps\21D_LakeElmoDetailedTopoMap.mxd

Hydric Rating by Map Unit—Washington County, Minnesota
(Lake Elmo Airport (21D))



MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

Hydric (100%)

Hydric (66 to 99%)

Hydric (33 to 65%)

Hydric (1 to 32%)

Not Hydric (0%)

Not rated or not available

Soil Rating Lines

Hydric (100%)

Hydric (66 to 99%)

Hydric (33 to 65%)

Hydric (1 to 32%)

Not Hydric (0%)

Not rated or not available

Soil Rating Points

Hydric (100%)

Hydric (66 to 99%)

Hydric (33 to 65%)

Hydric (1 to 32%)

Not Hydric (0%)

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

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

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

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

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

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

Soil Survey Area: Washington County, Minnesota
Survey Area Data: Version 11, Sep 19, 2016

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

Date(s) aerial images were photographed: Mar 16, 2012—Apr 26, 2012

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

Hydric Rating by Map Unit— Summary by Map Unit — Washington County, Minnesota (MN163)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
49	Antigo silt loam, 0 to 2 percent slopes	0	166.4	17.8%
49B	Antigo silt loam, 2 to 6 percent slopes	0	68.2	7.3%
49C	Antigo silt loam, 6 to 15 percent slopes	0	8.9	1.0%
120	Brill silt loam	5	5.4	0.6%
153B	Santiago silt loam, 2 to 6 percent slopes	0	11.3	1.2%
155B	Chetek sandy loam, 0 to 6 percent slopes	0	39.3	4.2%
155C	Chetek sandy loam, 6 to 12 percent slopes	0	21.7	2.3%
155D	Chetek sandy loam, 12 to 25 percent slopes	0	4.2	0.5%
189	Auburndale silt loam, 0 to 2 percent slopes	95	12.5	1.3%
264	Freeon silt loam, 2 to 6 percent slopes	3	11.0	1.2%
266	Freer silt loam	5	14.2	1.5%
302C	Rosholt sandy loam, 6 to 15 percent slopes	0	6.6	0.7%
367B	Campia silt loam, 0 to 8 percent slopes	2	147.0	15.7%
449	Crystal Lake silt loam, 1 to 3 percent slopes	3	320.6	34.3%
452	Comstock silt loam	4	53.9	5.8%
456	Barronett silt loam	92	2.8	0.3%
507	Poskin silt loam	3	8.3	0.9%
1055	Aquolls and Histosols, ponded	100	31.4	3.4%
1847	Barronett silt loam, sandy substratum	90	1.7	0.2%
Totals for Area of Interest			**935.5**	**100.0%**

Description

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

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

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

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

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

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

References:

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

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

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

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

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

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

Rating Options

Aggregation Method: Percent Present

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Aquatic Resources Map

National Wetlands Inventory (NWI),
Minnesota Public Waters, and
National Hydrography Dataset

LAKE ELMO AIRPORT

Proposed Runway 14-32 Runway Shift

Legend

- Area of Interest
- Airport Property Boundary
- MN Public Waters Basins
- Intermittent Stream (NHD)

WETLAND TYPE*

- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond

* Labeled with NWI classificaiton and Circular 39 Type

Project Information

T29N, R20W, S18 and S19
City of Lake Elmo
Washington County, MN
Area of Interest = 130.1 acres
Field work conducted:
June 5 - 9, 2017

Mead & Hunt

Wetland Data: National Wetland Inventory Update for Minnesota, East-Central (2010-2011)

Mn Public Waters Data: Public Waters (PW) Basin and Watercourse Delineations, Washington County, MN Geospatial Commons

Stream Data: National Hydrography Dataset (NHD), USGS

Image Source: MnGEO WMS Image Service, Washington County (2016 color 7-county)

Path: X:\28387\00\161542.02\TECH\GIS_CADMaps\21D_LakeElmoNWIMap.mxd

Public Waters

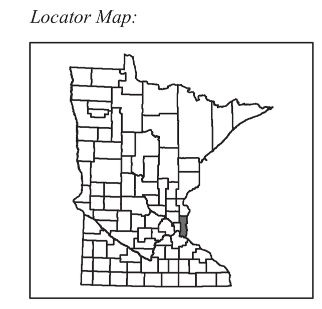
Washington County Minnesota

Public Waters are defined in *Minnesota Statutes,* section 103G.005. The boundaries of public waters shown on this map are approximate. A public water boundary coincides with the ordinary high water level as defined in *Minnesota Statutes,* section 103G.005 and is determined through DNR field inspection or survey. Public waters are subject to regulation as per *Minnesota Statutes*, section 103G.245. Current designated trout streams are listed in *Minnesota Rules,* part 6264.0050. Shaded Public Land Survey sections may contain designated trout stream tributaries (see *Minnesota Rules,* part 6264.0050) subject to permit requirements. Additional public watercourses may exist within these sections, subject to field determination. It is incumbent upon a person contemplating work in a public watercourse to investigate whether said watercourse is a designated trout stream regardless of whether said public watercourse is depicted on this map. **Note:** As stated in *Minnesota Statutes,* section 103G.205, the designation of waters of this state as public waters ***does not*** affect state law forbidding trespass on private lands. Contact the DNR office in your area for further information or visit http://mndnr.gov.

Legend

- Public Water Basin or Wetland
- Public Water Watercourse
- Public Ditch/Altered Natural Watercourse
- Other Watercourse, Not a Public Watercourse
- Interstate Highway
- Federal Trunk Highway
- State Trunk Highway
- City Streets & Township Roads
- PLS40 Section Line
- PLS40 Township Line
- Municipal Boundaries
- *Public Land Survey Sections Containing Designated Trout Stream Tributaries*
- Washington County
- Adjacent Counties

Locator Map:



Scale: Convert map units to miles

0 0.5 1 2 3 4
Miles

The DNR Information Center
Twin Cities: (651) 296-6157
Minnesota toll free: 1-888-646-6367
Telecommunication device for the hearing impaired (TDD): (651) 296-5484
TDD Minnesota toll free: 1-800-657-3929
DNR web site: http://mndnr.gov

This information is available in alternative format on request.
Equal opportunity to participate in and benefit from programs of the Minnesota Department of Natural Resources is available regardless of race, color, national origin, sex, sexual orientation, marital status, status with regard to public assistance, age, or disability. Discrimination inquiries should be sent to Minnesota DNR, 500 Lafayette Road, St. Paul, MN 55155-4031, or the Equal Opportunity Office, Department of the Interior, Washington, DC 20240.

This map was prepared from publicly available information only. Every reasonable effort has been made to ensure the accuracy of the factual data on which this map interpretation is based. However, the Department of Natural Resources does not warrant the accuracy, completeness, or any implied uses of these data. Users may wish to verify critical information; sources include both the references here and information on file in the offices of the Minnesota Department of Natural Resources. This map should not be used to establish legal title, boundaries, or locations of improvements. This map was compiled and generated using geographic information systems (GIS) technology. Digital data products are available from DNR Ecological and Water Resources at http://mndnr.gov/waters and at http://deli.dnr.state.mn.us.

The Adobe PDF file represents a map created at a size of 34 inches by 44 inches (ANSI E). The data were compiled at a scale of 1:60,000 using the Universal Transverse Mercator Projection, gridzone 15, 1983 North American Datum. This map was created on: 20 May 2011.

Appendix C. Historic Aerial Photography

Image Date: 7/28/1938

Image Source: Minnesota Historical Aerial Photographs, U of MN

Image Date: 5/8/1947

Image Source: Minnesota Historical Aerial Photographs, U of MN

Historic Aerial Imagery

LAKE ELMO AIRPORT

Proposed Runway 14-32 Runway Shift

N

Project Information

T29N, R20W, S18 and S19
City of Lake Elmo
Washington County, MN
Area of Interest = 130.1 acres
Field work conducted:
June 5 - 9, 2017

Mead &Hunt

Images are not to scale

Image Date: 10/28/1953

Image Source: Minnesota Historical Aerial Photographs, U of MN

Image Date: 11/28/1966

Image Source: USGS

Historic Aerial Imagery

LAKE ELMO AIRPORT

Proposed Runway 14-32 Runway Shift

N

Project Information

T29N, R20W, S18 and S19
City of Lake Elmo
Washington County, MN
Area of Interest = 130.1 acres
Field work conducted:
June 5 - 9, 2017

Mead & Hunt

Images are not to scale

Image Date: 10/16/1972

Image Source: USGS

Image Date: 5/1/1980

Image Source: USGS

Historic Aerial Imagery

LAKE ELMO AIRPORT

Proposed Runway 14-32 Runway Shift

N

Project Information

T29N, R20W, S18 and S19
City of Lake Elmo
Washington County, MN
Area of Interest = 130.1 acres
Field work conducted:
June 5 - 9, 2017

Images are not to scale

Image Date: 10/16/1994

Image Source: MnDNR Forestry Aerial Photography

Image Date: 1997

Image Source: MnGEO Aerial Photography (7-county BW)

Historic Aerial Imagery

LAKE ELMO AIRPORT

Proposed Runway 14-32 Runway Shift

Legend

Airport Property Boundary

0 300 600 1,200 1,800 2,400 Feet

N

Project Information

T29N, R20W, S18 and S19
City of Lake Elmo
Washington County, MN
Area of Interest = 130.1 acres
Field work conducted:
June 5 - 9, 2017

Mead & Hunt

Image Date: 2000

Image Source: MnGEO Aerial Photography (7-county BW)

Image Date: 2010

Image Source: MnGEO Aerial Photography (2010 color FSA)

Historic Aerial Imagery

LAKE ELMO AIRPORT

Proposed Runway 14-32 Runway Shift

Legend

Airport Property Boundary

0 300 600 1,200 1,800 2,400 Feet

N

Project Information

T29N, R20W, S18 and S19
City of Lake Elmo
Washington County, MN
Area of Interest = 130.1 acres
Field work conducted:
June 5 - 9, 2017

Mead & Hunt

Path: X:\2838700\161542.02\TECH\GIS_CAD\Maps\21D_HistoricImageryReview6.mxd

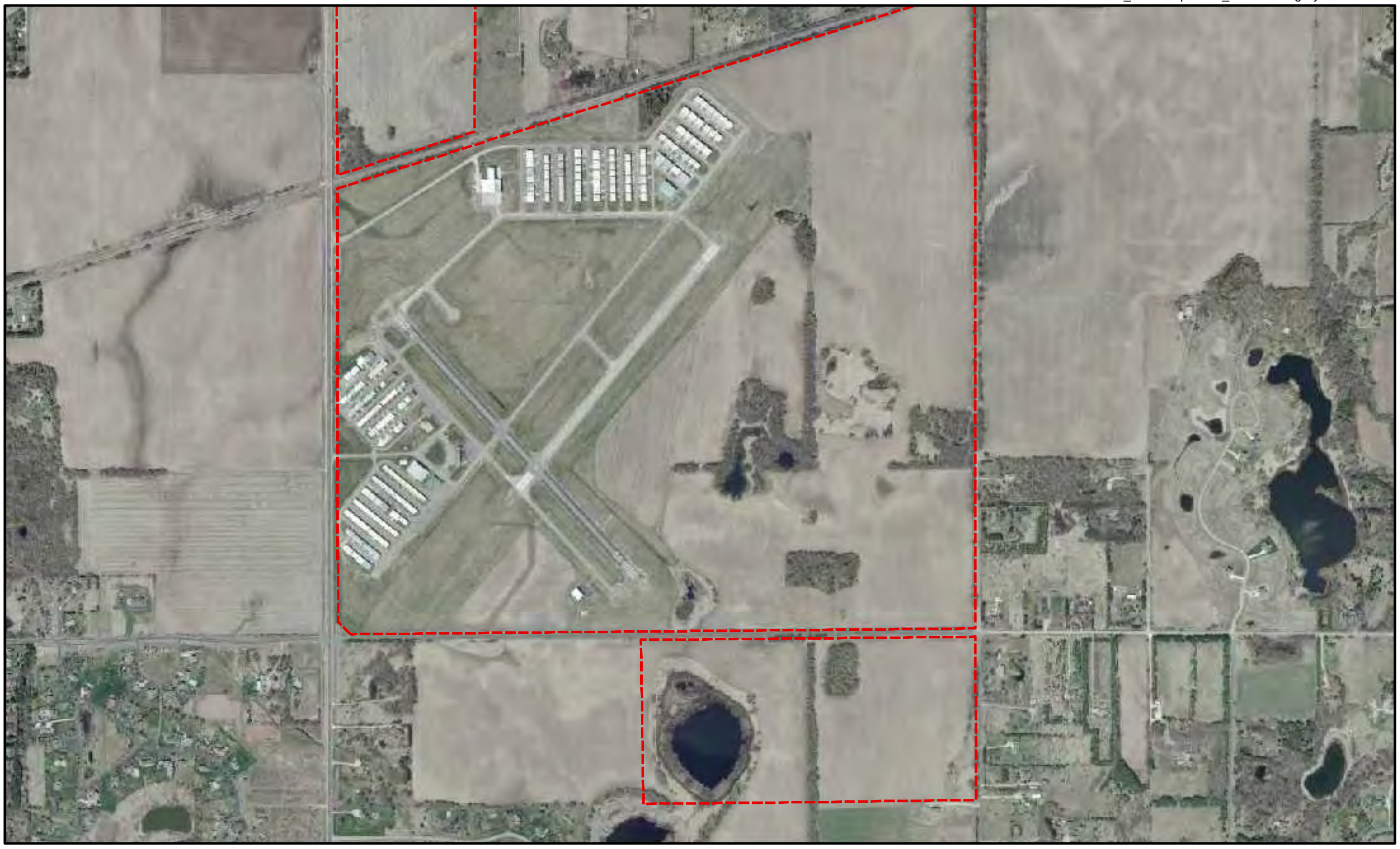


Image Date: 2013

Image Source: MnGEO Aerial Photography (2013 Washington)

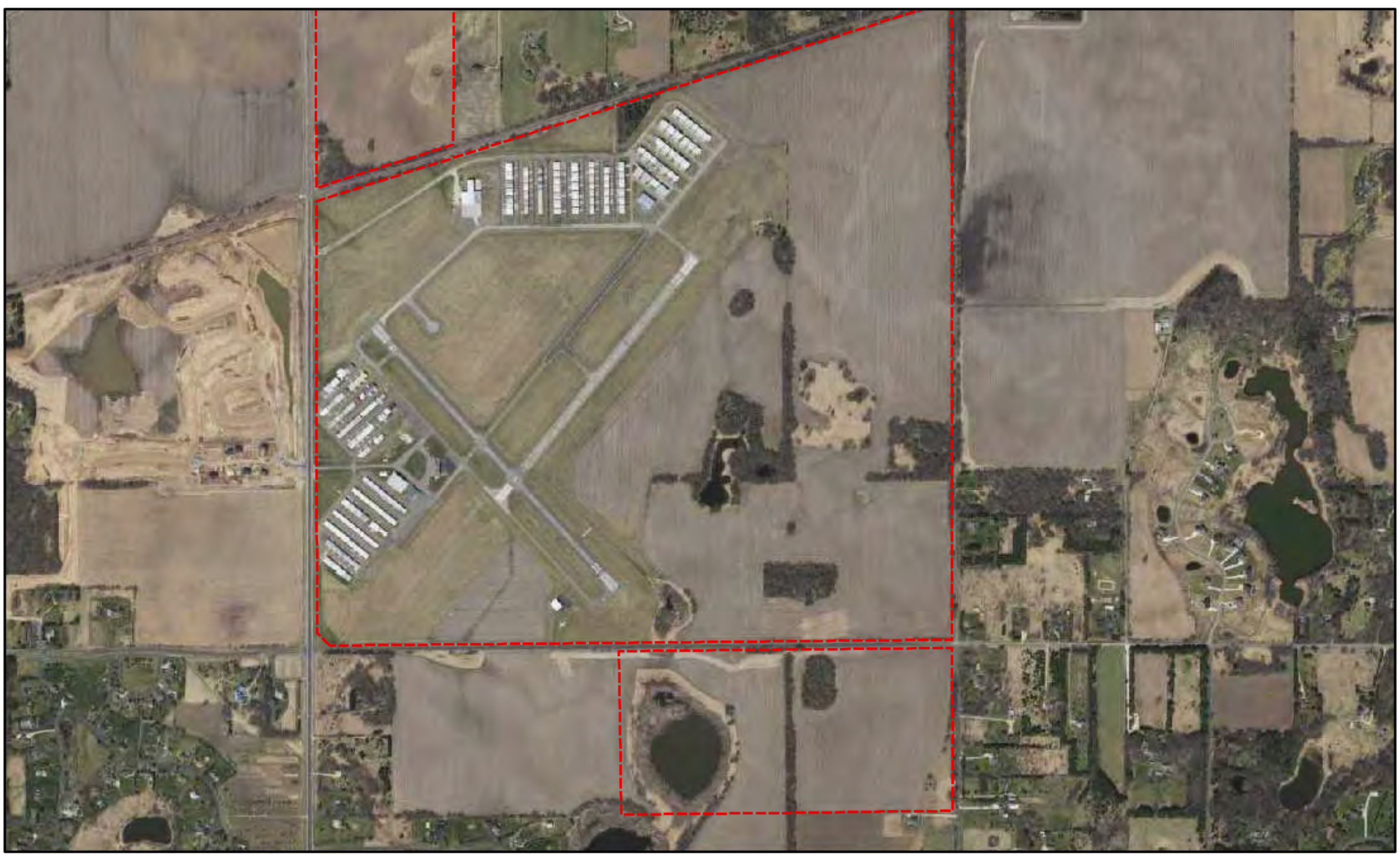


Image Date: 2016

Image Source: MnGEO Aerial Photography (2016 color 7-county)

Historic Aerial Imagery

LAKE ELMO AIRPORT

Proposed Runway 14-32 Runway Shift

Legend

Airport Property Boundary

0 300 600 1,200 1,800 2,400 Feet

N

Project Information

T29N, R20W, S18 and S19
City of Lake Elmo
Washington County, MN
Area of Interest = 130.1 acres
Field work conducted:
June 5 - 9, 2017

Mead & Hunt

Appendix D. Offsite Hydrology Evaluation

Exhibit 1 Field data sheet reference (if applicable): ___________

Wetland Hydrology from Aerial Imagery – Recording Form

Project Name: Lake Elmo Airport (21D) Date: 08/04/2017 County: Washington

Investigator: Brauna Hartzell Legal Description (T, R, S): T29N, R20W, S18,19

Summary Table

Date Image Taken (M-D-Y)	Image Source	Climate Condition (wet, dry, normal)[i]	Image Interpretation(s)			
			Area: **A**	Area:	Area:	Area:
04/15/2016	MnGEO	**Normal**	**SS**			
09/27/2015	NAIP	**Normal**	**CS**			
10/11/2014	GoogleEarth	Dry	CS			
05/15/2013	MnGEO	Wet	SS			
07/18/2013	NAIP	Wet	CS			
09/15/2013	GoogleEarth	Dry	CS			
09/07/2012	GoogleEarth	**Normal**	**CS**			
09/13/2010	NAIP	Wet	NV			
04/2010	MnGEO	Dry	SS			
08/18/2009	NAIP	Dry	NV			
07/08/2008	NAIP	**Normal**	**NC**			
07/15/2006	NAIP	Dry	NC			
04/24/2004	MnGEO	**Normal**	**NV**			
07/18/2003	NAIP	Wet	DO			
09/2002	USGS	Wet	CS			
05/01/2000	MnGEO	Dry	NV			
04/14/1997	MnGEO	**Normal**	**NV**			
10/10/1994	MnDNR	Wet	NC			
Normal Climate Condition			Area:	Area:	Area:	Area:
Number			6			
Number with wet signatures			4			
Percent with wet signatures			66%			

KEY		
WS - wetland signature	SS - soil wetness signature	CS - crop stress
NC - not cropped	AP - altered pattern	NV - normal vegetative cover
DO - drowned out	SW - standing water	NSS – no soil wetness signature
Other labels or comments:		

- Use above key to label image interpretations. It is imperative that the reviewer read and understand the guidance associated with the use of these labels. If alternate labels are used, indicate in box above.
- If less than five (5) images taken during normal climate conditions are available, use an equal number of images taken during wet and dry climate conditions and use as many images as you have available. Describe the results using this methodology in your report.

---

[i] Use MN State Climatology website to determine climate condition when image was taken.

Exhibit 2 Field data sheet reference (if applicable): ___________

Wetland Determination from Aerial Imagery – Recording Form

Project Name: Lake Elmo Airport (21D) Date: 08/04/2017 County: Washington

Investigator: Brauna Hartzell Legal Description (T, R, S): T29N, R20W, S18,19

Use the Decision Matrix below to complete Table 1.

Hydric Soils present[1]	Identified on NWI or other wetland map[2]	Percent with wet signatures from Exhibit 1	Field verification required[3]	Wetland?
Yes	Yes	>50%	No	Yes
Yes	Yes	30-50%	No	Yes
Yes	Yes	<30%	Yes	Yes, if other hydrology indicators present
Yes	No	>50%	No	Yes
Yes	No	30-50%	Yes	Yes, if other hydrology indicators present
Yes	No	<30%	No	No
No	Yes	>50%	No	Yes
No	Yes	30-50%	No	Yes
No	Yes	<30%	No	No
No	No	>50%	Yes	Yes, if other hydrology indicators present
No	No	30-50%	Yes	Yes, if other hydrology indicators present
No	No	<30%	No	No

[1] The presence of hydric soils can be determined from the "Hydric Rating by Map Unit Feature" under "Land Classifications" from the Web Soil Survey. "Not Hydric" is the only category considered to not have hydric soils. Field sampling for the presence/absence of hydric soil indicators can be used in lieu of the hydric rating if appropriately documented by providing completed field data sheets.

[2] At minimum, the most updated NWI data available for the area must be reviewed for this step. Any and all other local or regional wetland maps that are publically available should be reviewed.

[3] Area should be reviewed in the field for the presence/absence of wetland hydrology indicators per the applicable 87 Manual Regional Supplement, including the D2 indicator (geomorphic position).

Table 1.

Area	Hydric Soils Present	Identified on NWI or other wetland map	Percent with wet signatures from Exhibit 1	Other hydrology indicators present[1]	Wetland?
A	Yes (per field)	No	66%	Yes (per field)	Yes

[1] Answer "N/A" if field verification is not required and was not conducted.

Historic Aerial Imagery
LAKE ELMO AIRPORT
Proposed Runway 14-32 Runway Shift


Image Date: 4/2016 — Image Source: MnGeo Aerial Photography


Image Date: 9/27/2015 — Image Source: USDA FSA NAIP Orthoimagery


Image Date: 10/11/2014 — Image Source: GoogleEarth


Image Date: 5/2013 — Image Source: MnGeo Aerial Photography

Legend
Airport Property Boundary

N

0 150 300 600 Feet

MAP 1

Project Information

T29N, R20W, S18 and S19
City of Lake Elmo
Washington County, MN
Area of Interest = 130.1 acres
Field work conducted:
June 5 - 9, 2017

Mead & Hunt

Path: X:\2838700\161542.02\TECH\GIS_CAD\Maps\21D_HistoricImagery1.mxd

Image Date: 7/18/2013 Image Source: USDA FSA NAIP Orthoimagery

Image Date: 9/15/2013 Image Source: GoogleEarth

Image Date: 09/7/2012 Image Source: GoogleEarth

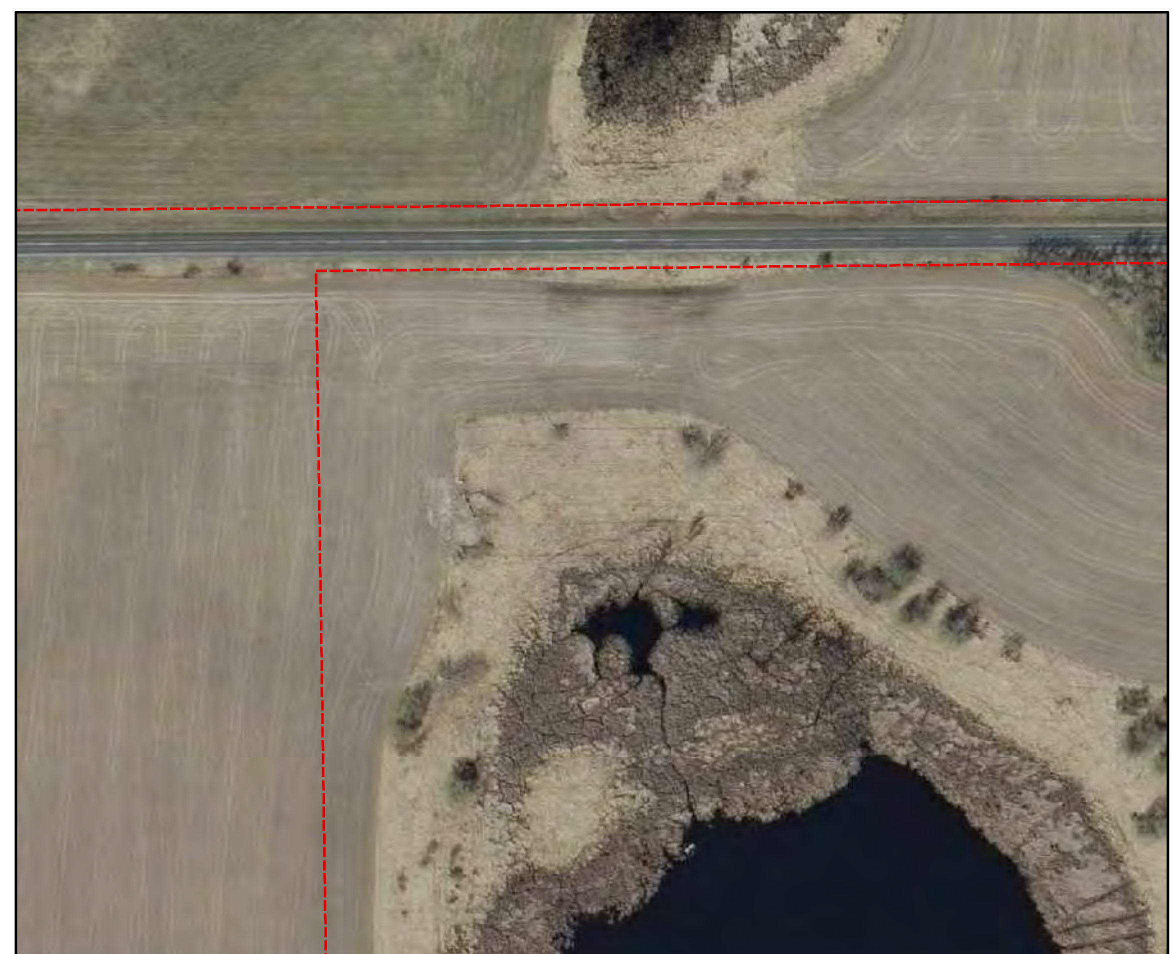


Image Date: 4/2010 Image Source: MnGEO Aerial Photography

Historic Aerial Imagery

LAKE ELMO AIRPORT

Proposed Runway 14-32 Runway Shift

Legend

Airport Property Boundary

N

0 75 150 300 450 600 Feet

MAP 2

Project Information

T29N, R20W, S18 and S19
City of Lake Elmo
Washington County, MN
Area of Interest = 130.1 acres
Field work conducted:
June 5 - 9, 2017

Mead & Hunt

Path: X:\2838700\161542.02\TECH\GIS_CAD\Maps\21D_HistoricImagery2A.mxd

Historic Aerial Imagery

LAKE ELMO AIRPORT

Proposed Runway 14-32 Runway Shift

Image Date: 9/13/2010 Image Source: USDA FSA NAIP Orthoimagery

Image Date: 8/18/2009 Image Source: USDA FSA NAIP Orthoimagery

Image Date: 07/08/2008 Image Source: USDA FS NAIP Orthoimagery

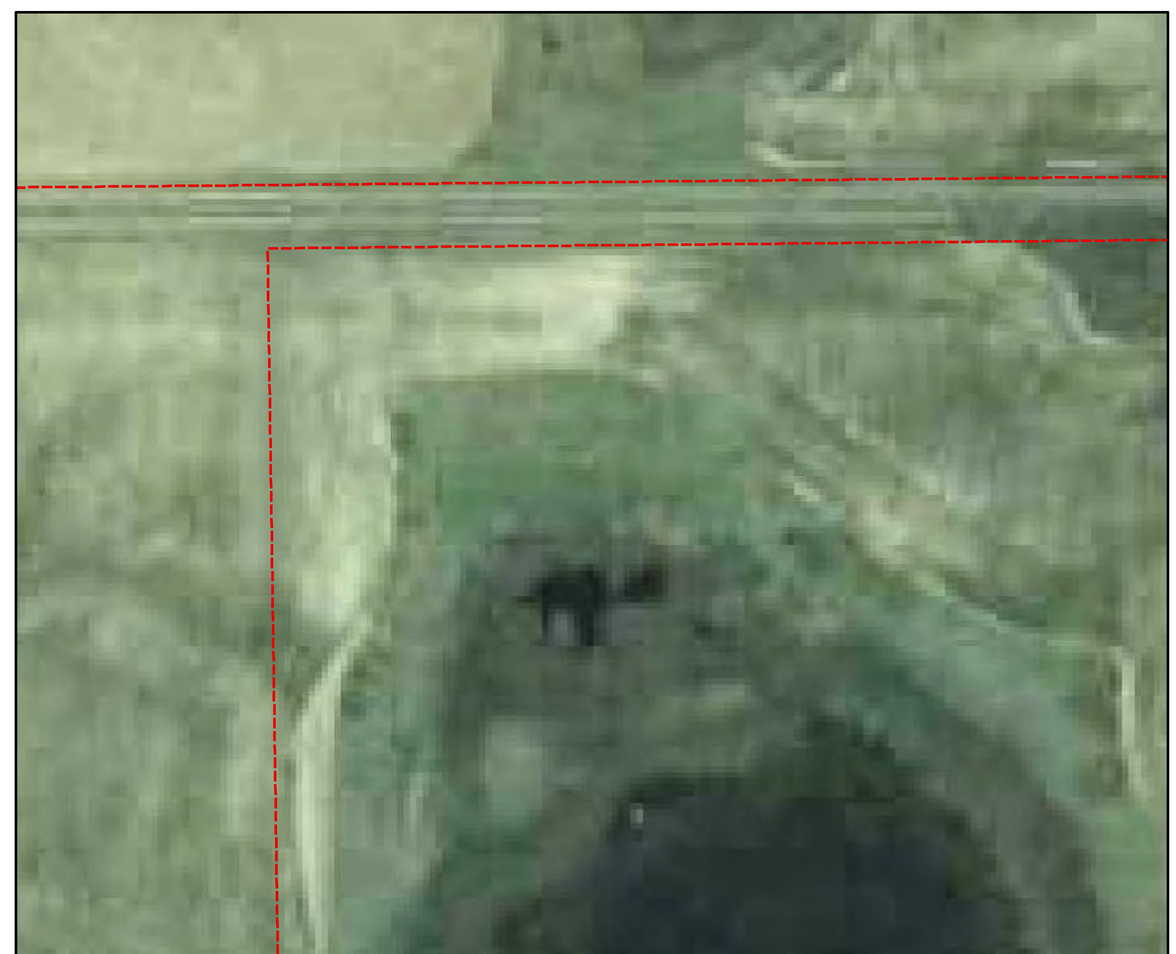


Image Date: 7/15/2006 Image Source: USDA FSA NAIP Orthoimagery

Legend

Airport Property Boundary

N

0 75 150 300 450 600 Feet

MAP 3

Project Information

T29N, R20W, S18 and S19
City of Lake Elmo
Washington County, MN
Area of Interest = 130.1 acres
Field work conducted:
June 5 - 9, 2017

Mead & Hunt

Path: X:\2838700\161542.02\TECH\GIS_CADMaps\21D_HistoricImagery3.mxd

Historic Aerial Imagery

LAKE ELMO AIRPORT

Proposed Runway 14-32 Runway Shift

Image Date: 04/24/2004

Image Source: MnGEO Aerial Photography

Image Date: 7/18/2003

Image Source: USDA FSA NAIP Orthoimagery

Image Date: 09/2002

Image Source: USGS Orthoimagery

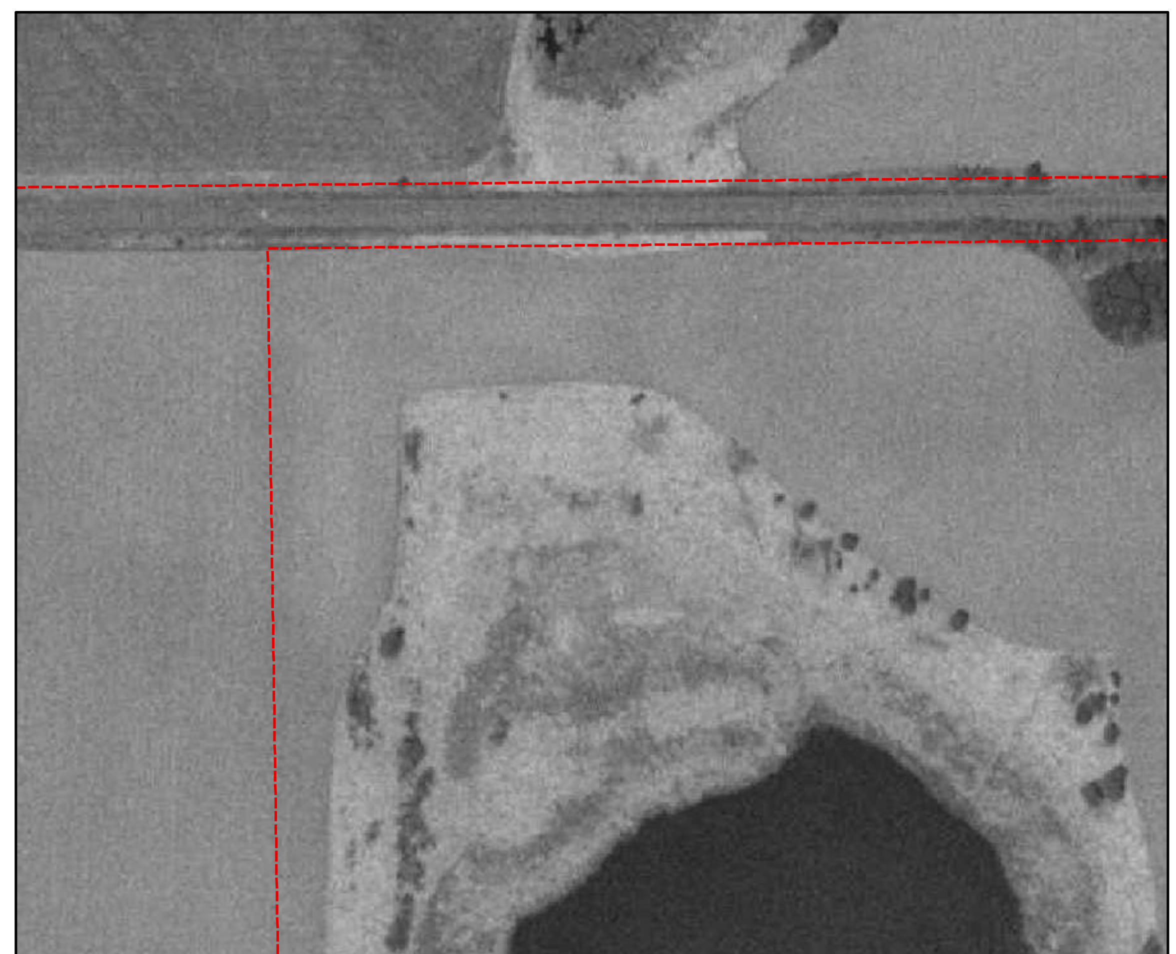


Image Date: 5/1/2000

Image Source: MnGEO Aerial Imagery

Legend

Airport Property Boundary

N

0 75 150 300 450 600 Feet

MAP 4

Project Information

T29N, R20W, S18 and S19
City of Lake Elmo
Washington County, MN
Area of Interest = 130.1 acres
Field work conducted:
June 5 - 9, 2017

Mead & Hunt

Path: X:\2838700\161542.02\TECH\GIS_CAD\Maps\21D_HistoricImagery4.mxd

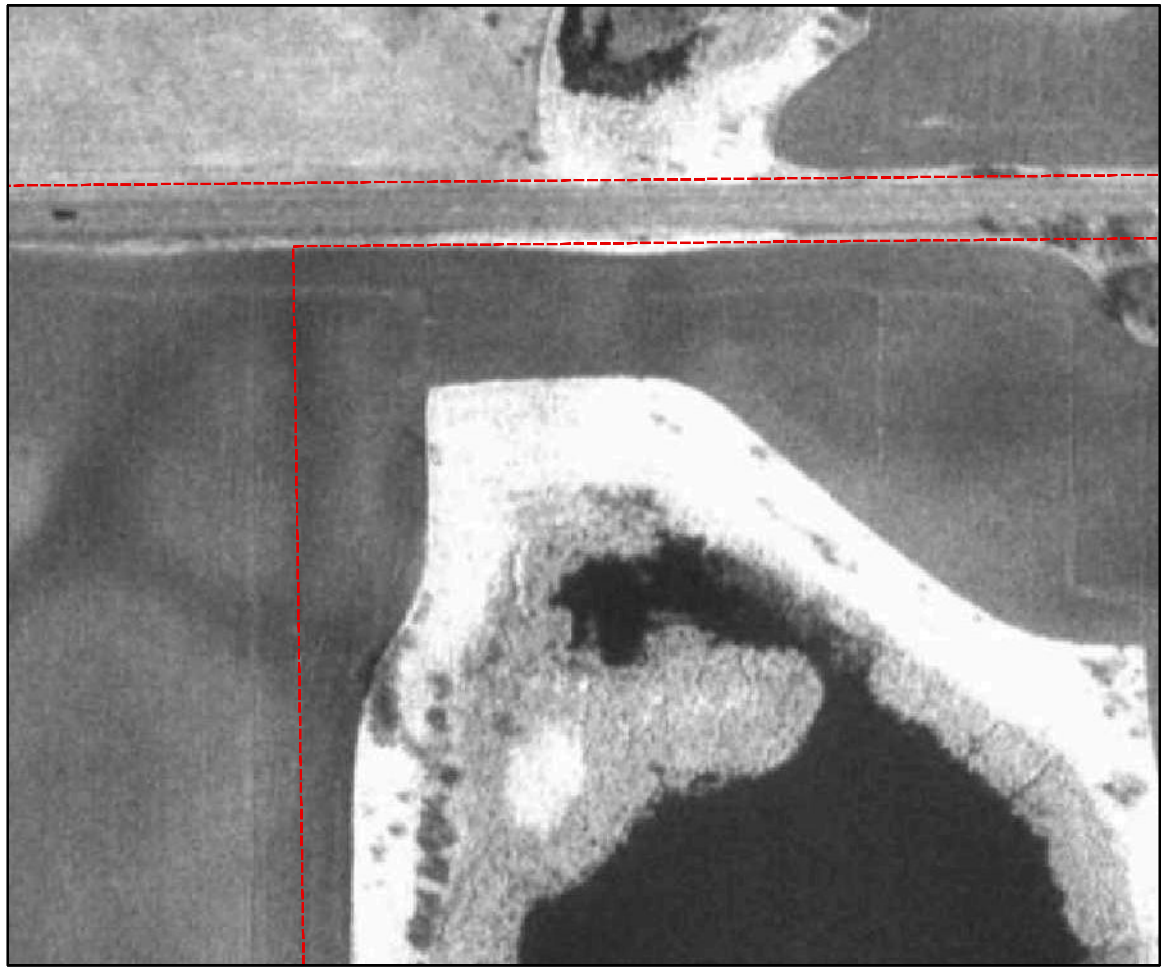


Image Date: 04/14/1997 Image Source: MnGEO Aerial Photography

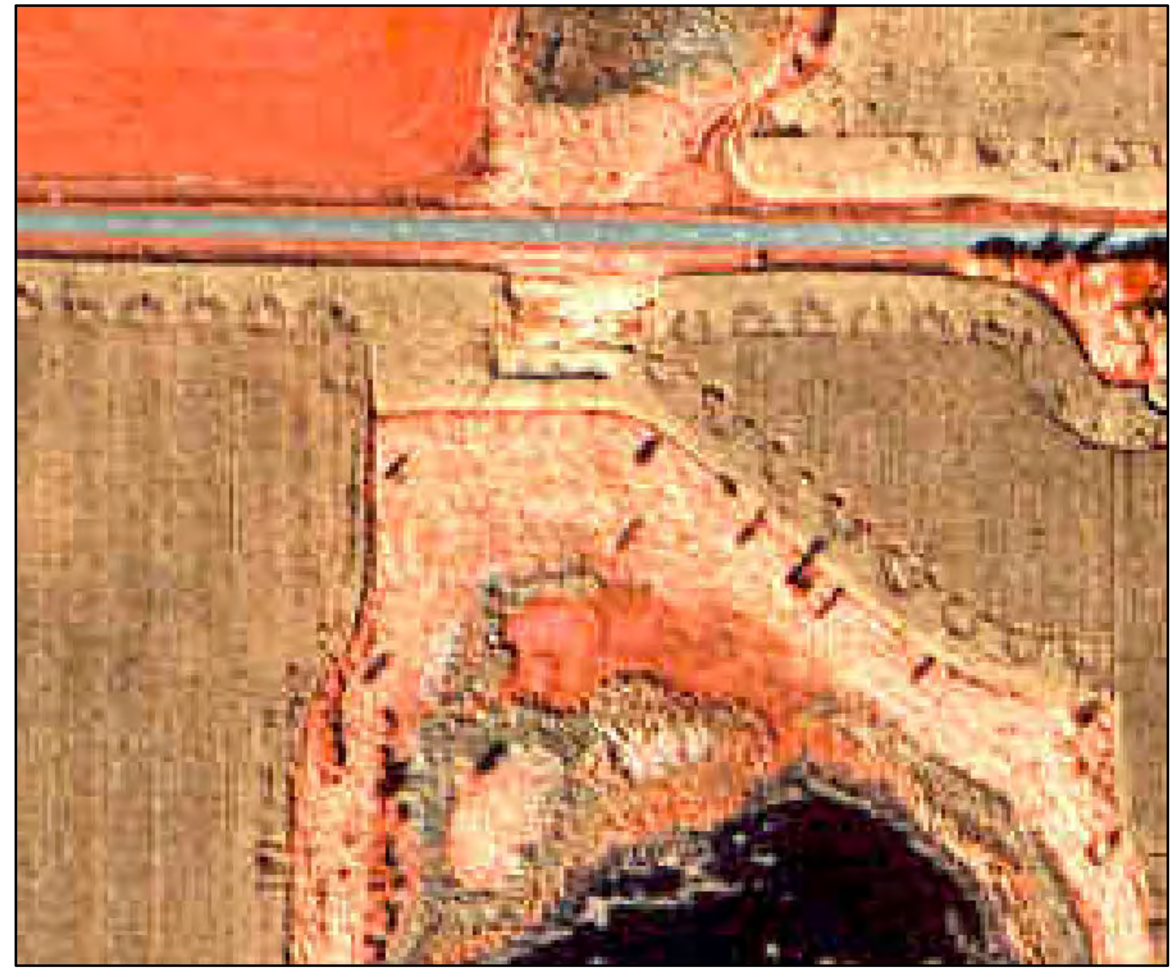


Image Date: 10/10/1994 Image Source: MnDNR Aerial Imagery

Historic Aerial Imagery

LAKE ELMO AIRPORT

Proposed Runway 14-32 Runway Shift

Legend

Airport Property Boundary

N

0 75 150 300 450 600 Feet

MAP 5

Project Information

T29N, R20W, S18 and S19
City of Lake Elmo
Washington County, MN
Area of Interest = 130.1 acres
Field work conducted:
June 5 - 9, 2017

Mead & Hunt

Path: X:\2838700\161542.02\TECH\GIS_CAD\Maps\21D_HistoricImagery5.mxd

Minnesota Climatology Working Group

State Climatology Office - DNR Division of Ecological and Water Resources University of Minnesota

Precipitation Worksheet Using Gridded Database

Precipitation data for target wetland location:

county: **Washington**
township name: **unnamed**
nearest community: **Lake Elmo**
township number: **29N**
range number: **21W**
section number: **24**

Aerial photograph or site visit date:
Friday, April 15, 2016

Score using 1981-2010 normal period

values are in inches A 'R' following a monthly total indicates a provisional value derived from radar-based estimates.	first prior month: **March 2016**	second prior month: **February 2016**	third prior month: **January 2016**
estimated precipitation total for this location:	**2.22**	**0.87**	**0.44**
there is a 30% chance this location will have less than:	1.48	0.51	0.54
there is a 30% chance this location will have more than:	2.13	0.99	1.24
type of month: dry normal wet	**wet**	**normal**	**dry**
monthly score	**3 * 3 = 9**	**2 * 2 = 4**	**1 * 1 = 1**
multi-month score: 6 to 9 (dry) 10 to 14 (normal) 15 to 18 (wet)	**14 (Normal)**		

Other Resources:

- retrieve daily precipitation data
- view radar-based precipitation estimates
- view weekly precipitation maps
- *Evaluating Antecedent Precipitation Conditions* (BWSR)

Minnesota Climatology Working Group

State Climatology Office - DNR Division of Ecological and Water Resources University of Minnesota

home | current conditions | journal | past data | summaries | agriculture | other sites | contact us | search |

Precipitation Worksheet Using Gridded Database

Precipitation data for target wetland location:

county: **Washington** township number: **29N**
township name: **Baytown** range number: **20W**
nearest community: **Lake Elmo** section number: **19**

Aerial photograph or site visit date:
Sunday, September 27, 2015

Score using 1981-2010 normal period

values are in inches A 'R' following a monthly total indicates a provisional value derived from radar-based estimates.	first prior month: **August 2015**	second prior month: **July 2015**	third prior month: **June 2015**
estimated precipitation total for this location:	**3.30**	**7.79**	**5.24**
there is a 30% chance this location will have less than:	3.32	2.65	3.68
there is a 30% chance this location will have more than:	5.39	4.73	5.74
type of month: dry normal wet	**dry**	**wet**	**normal**
monthly score	**3 * 1 = 3**	**2 * 3 = 6**	**1 * 2 = 2**
multi-month score: 6 to 9 (dry) 10 to 14 (normal) 15 to 18 (wet)	**11 (Normal)**		

Other Resources:

- retrieve daily precipitation data
- view radar-based precipitation estimates
- view weekly precipitation maps
- *Evaluating Antecedent Precipitation Conditions* (BWSR)

Minnesota Climatology Working Group

State Climatology Office - DNR Division of Ecological and Water Resources University of Minnesota

Precipitation Worksheet Using Gridded Database

Precipitation data for target wetland location:

county: **Washington**
township name: **Baytown**
nearest community: **Lake Elmo**
township number: **29N**
range number: **20W**
section number: **19**

Aerial photograph or site visit date:
Saturday, October 11, 2014

Score using 1981-2010 normal period

values are in inches A 'R' following a monthly total indicates a provisional value derived from radar-based estimates.	first prior month: **September 2014**	second prior month: **August 2014**	third prior month: **July 2014**
estimated precipitation total for this location:	**2.31**	**3.65**	**2.59**
there is a 30% chance this location will have less than:	2.45	3.32	2.65
there is a 30% chance this location will have more than:	4.36	5.39	4.73
type of month: dry normal wet	**dry**	**normal**	**dry**
monthly score	**3 * 1 = 3**	**2 * 2 = 4**	**1 * 1 = 1**
multi-month score: 6 to 9 (dry) 10 to 14 (normal) 15 to 18 (wet)	**8 (Dry)**		

Other Resources:

- retrieve daily precipitation data
- view radar-based precipitation estimates
- view weekly precipitation maps
- *Evaluating Antecedent Precipitation Conditions* (BWSR)

Minnesota Climatology Working Group

State Climatology Office - DNR Division of Ecological and Water Resources University of Minnesota

Precipitation Worksheet Using Gridded Database

Precipitation data for target wetland location:

county: **Washington** township number: **29N**
township name: **Baytown** range number: **20W**
nearest community: **Lake Elmo** section number: **19**

Aerial photograph or site visit date:
Wednesday, May 15, 2013

Score using 1981-2010 normal period

values are in inches A 'R' following a monthly total indicates a provisional value derived from radar-based estimates.	first prior month: **April 2013**	second prior month: **March 2013**	third prior month: **February 2013**
estimated precipitation total for this location:	**5.42**	**2.28**	**1.32**
there is a 30% chance this location will have less than:	2.06	1.47	0.50
there is a 30% chance this location will have more than:	3.19	2.10	0.95
type of month: dry normal wet	**wet**	**wet**	**wet**
monthly score	**3 * 3 = 9**	**2 * 3 = 6**	**1 * 3 = 3**
multi-month score: 6 to 9 (dry) 10 to 14 (normal) 15 to 18 (wet)	**18 (Wet)**		

Other Resources:

- retrieve daily precipitation data
- view radar-based precipitation estimates
- view weekly precipitation maps
- *Evaluating Antecedent Precipitation Conditions* (BWSR)

Minnesota Climatology Working Group

State Climatology Office - DNR Division of Ecological and Water Resources University of Minnesota

Precipitation Worksheet Using Gridded Database

Precipitation data for target wetland location:

county: **Washington** township number: **29N**
township name: **Baytown** range number: **20W**
nearest community: **Lake Elmo** section number: **19**

Aerial photograph or site visit date:
Thursday, July 18, 2013

Score using 1981-2010 normal period

values are in inches A 'R' following a monthly total indicates a provisional value derived from radar-based estimates.	first prior month: **June 2013**	second prior month: **May 2013**	third prior month: **April 2013**
estimated precipitation total for this location:	**8.31**	**5.66**	**5.42**
there is a 30% chance this location will have less than:	3.68	3.28	2.06
there is a 30% chance this location will have more than:	5.74	3.99	3.19
type of month: dry normal wet	**wet**	**wet**	**wet**
monthly score	**3 * 3 = 9**	**2 * 3 = 6**	**1 * 3 = 3**
multi-month score: 6 to 9 (dry) 10 to 14 (normal) 15 to 18 (wet)	**18 (Wet)**		

Other Resources:

- retrieve daily precipitation data
- view radar-based precipitation estimates
- view weekly precipitation maps
- *Evaluating Antecedent Precipitation Conditions* (BWSR)

Minnesota Climatology Working Group

State Climatology Office - DNR Division of Ecological and Water Resources University of Minnesota

Precipitation Worksheet Using Gridded Database

Precipitation data for target wetland location:

county: **Washington** township number: **29N**
township name: **Baytown** range number: **20W**
nearest community: **Lake Elmo** section number: **19**

Aerial photograph or site visit date:
Sunday, September 15, 2013

Score using 1981-2010 normal period

values are in inches A 'R' following a monthly total indicates a provisional value derived from radar-based estimates.	first prior month: **August 2013**	second prior month: **July 2013**	third prior month: **June 2013**
estimated precipitation total for this location:	**0.80**	**1.50**	**8.30**
there is a 30% chance this location will have less than:	3.32	2.65	3.68
there is a 30% chance this location will have more than:	5.39	4.73	5.75
type of month: dry normal wet	**dry**	**dry**	**wet**
monthly score	**3 * 1 = 3**	**2 * 1 = 2**	**1 * 3 = 3**
multi-month score: 6 to 9 (dry) 10 to 14 (normal) 15 to 18 (wet)	**8 (Dry)**		

Other Resources:

- retrieve daily precipitation data
- view radar-based precipitation estimates
- view weekly precipitation maps
- *Evaluating Antecedent Precipitation Conditions* (BWSR)

Minnesota Climatology Working Group

State Climatology Office - DNR Division of Ecological and Water Resources   University of Minnesota

Precipitation Worksheet Using Gridded Database

Precipitation data for target wetland location:
county: **Washington** township number: **29N**
township name: **Baytown** range number: **20W**
nearest community: **Lake Elmo** section number: **19**

Aerial photograph or site visit date:
Friday, September 07, 2012

Score using 1981-2010 normal period

values are in inches A 'R' following a monthly total indicates a provisional value derived from radar-based estimates.	first prior month: **August 2012**	second prior month: **July 2012**	third prior month: **June 2012**
estimated precipitation total for this location:	**1.47**	**5.18**	**3.31**
there is a 30% chance this location will have less than:	3.32	2.65	3.68
there is a 30% chance this location will have more than:	5.39	4.73	5.75
type of month: dry normal wet	**dry**	**wet**	**dry**
monthly score	**3 * 1 = 3**	**2 * 3 = 6**	**1 * 1 = 1**
multi-month score: 6 to 9 (dry) 10 to 14 (normal) 15 to 18 (wet)	**10 (Normal)**		

Other Resources:

- retrieve daily precipitation data
- view radar-based precipitation estimates
- view weekly precipitation maps
- *Evaluating Antecedent Precipitation Conditions* (BWSR)

Minnesota Climatology Working Group

State Climatology Office - DNR Division of Ecological and Water Resources University of Minnesota

Precipitation Worksheet Using Gridded Database

Precipitation data for target wetland location:
county: **Washington** township number: **29N**
township name: **Baytown** range number: **20W**
nearest community: **Lake Elmo** section number: **19**

Aerial photograph or site visit date:
Monday, September 13, 2010

Score using 1981-2010 normal period

values are in inches A 'R' following a monthly total indicates a provisional value derived from radar-based estimates.	first prior month: **August 2010**	second prior month: **July 2010**	third prior month: **June 2010**
estimated precipitation total for this location:	**5.92**	**5.26**	**5.73**
there is a 30% chance this location will have less than:	3.33	2.66	3.69
there is a 30% chance this location will have more than:	5.38	4.74	5.76
type of month: dry normal wet	**wet**	**wet**	**normal**
monthly score	**3 * 3 = 9**	**2 * 3 = 6**	**1 * 2 = 2**
multi-month score: 6 to 9 (dry) 10 to 14 (normal) 15 to 18 (wet)	**17 (Wet)**		

Other Resources:

- retrieve daily precipitation data
- view radar-based precipitation estimates
- view weekly precipitation maps
- *Evaluating Antecedent Precipitation Conditions* (BWSR)

Minnesota Climatology Working Group

State Climatology Office - DNR Division of Ecological and Water Resources University of Minnesota

Precipitation Worksheet Using Gridded Database

Precipitation data for target wetland location:

county: **Washington**
township name: **Baytown**
nearest community: **Lake Elmo**
township number: **29N**
range number: **20W**
section number: **19**

Aerial photograph or site visit date:
Thursday, April 15, 2010

Score using 1981-2010 normal period

values are in inches A 'R' following a monthly total indicates a provisional value derived from radar-based estimates.	first prior month: **March 2010**	second prior month: **February 2010**	third prior month: **January 2010**
estimated precipitation total for this location:	**0.62**	**0.88**	**0.63**
there is a 30% chance this location will have less than:	1.47	0.50	0.54
there is a 30% chance this location will have more than:	2.10	0.95	1.20
type of month: dry normal wet	**dry**	**normal**	**normal**
monthly score	**3 * 1 = 3**	**2 * 2 = 4**	**1 * 2 = 2**
multi-month score: 6 to 9 (dry) 10 to 14 (normal) 15 to 18 (wet)	**9 (Dry)**		

Other Resources:

- retrieve daily precipitation data
- view radar-based precipitation estimates
- view weekly precipitation maps
- *Evaluating Antecedent Precipitation Conditions* (BWSR)

Minnesota Climatology Working Group

State Climatology Office - DNR Division of Ecological and Water Resources University of Minnesota

Precipitation Worksheet Using Gridded Database

Precipitation data for target wetland location:

county: **Washington**
township name: **Baytown**
nearest community: **Lake Elmo**
township number: **29N**
range number: **20W**
section number: **19**

Aerial photograph or site visit date:
Tuesday, August 18, 2009

Score using 1981-2010 normal period

values are in inches A 'R' following a monthly total indicates a provisional value derived from radar-based estimates.	first prior month: **July 2009**	second prior month: **June 2009**	third prior month: **May 2009**
estimated precipitation total for this location:	**2.59**	**4.19**	**0.80**
there is a 30% chance this location will have less than:	2.65	3.68	3.28
there is a 30% chance this location will have more than:	4.73	5.74	3.99
type of month: dry normal wet	**dry**	**normal**	**dry**
monthly score	**3 * 1 = 3**	**2 * 2 = 4**	**1 * 1 = 1**
multi-month score: 6 to 9 (dry) 10 to 14 (normal) 15 to 18 (wet)	**8 (Dry)**		

Other Resources:

- retrieve daily precipitation data
- view radar-based precipitation estimates
- view weekly precipitation maps
- *Evaluating Antecedent Precipitation Conditions* (BWSR)

Minnesota Climatology Working Group

State Climatology Office - DNR Division of Ecological and Water Resources University of Minnesota

Precipitation Worksheet Using Gridded Database

Precipitation data for target wetland location:

county: **Washington**
township name: **Baytown**
nearest community: **Lake Elmo**
township number: **29N**
range number: **20W**
section number: **19**

Aerial photograph or site visit date:
Tuesday, July 08, 2008

Score using 1981-2010 normal period

values are in inches A 'R' following a monthly total indicates a provisional value derived from radar-based estimates.	first prior month: **June 2008**	second prior month: **May 2008**	third prior month: **April 2008**
estimated precipitation total for this location:	**4.36**	**3.18**	**4.39**
there is a 30% chance this location will have less than:	3.68	3.28	2.06
there is a 30% chance this location will have more than:	5.74	3.99	3.19
type of month: dry normal wet	**normal**	**dry**	**wet**
monthly score	**3 * 2 = 6**	**2 * 1 = 2**	**1 * 3 = 3**
multi-month score: 6 to 9 (dry) 10 to 14 (normal) 15 to 18 (wet)	**11 (Normal)**		

Other Resources:

- retrieve daily precipitation data
- view radar-based precipitation estimates
- view weekly precipitation maps
- *Evaluating Antecedent Precipitation Conditions* (BWSR)

Minnesota Climatology Working Group

State Climatology Office - DNR Division of Ecological and Water Resources University of Minnesota

Precipitation Worksheet Using Gridded Database

Precipitation data for target wetland location:
county: **Washington** township number: **29N**
township name: **Baytown** range number: **20W**
nearest community: **Lake Elmo** section number: **19**

Aerial photograph or site visit date:
Saturday, July 15, 2006

Score using 1981-2010 normal period

values are in inches A 'R' following a monthly total indicates a provisional value derived from radar-based estimates.	first prior month: **June 2006**	second prior month: **May 2006**	third prior month: **April 2006**
estimated precipitation total for this location:	**2.26**	**3.20**	**3.55**
there is a 30% chance this location will have less than:	3.68	3.28	2.06
there is a 30% chance this location will have more than:	5.74	3.99	3.19
type of month: dry normal wet	**dry**	**dry**	**wet**
monthly score	**3 * 1 = 3**	**2 * 1 = 2**	**1 * 3 = 3**
multi-month score: 6 to 9 (dry) 10 to 14 (normal) 15 to 18 (wet)	**8 (Dry)**		

Other Resources:

- retrieve daily precipitation data
- view radar-based precipitation estimates
- view weekly precipitation maps
- *Evaluating Antecedent Precipitation Conditions* (BWSR)

Minnesota Climatology Working Group

State Climatology Office - DNR Division of Ecological and Water Resources University of Minnesota

Precipitation Worksheet Using Gridded Database

Precipitation data for target wetland location:
county: **Washington**
township name: **Baytown**
nearest community: **Lake Elmo**
township number: **29N**
range number: **20W**
section number: **19**

Aerial photograph or site visit date:
Saturday, April 24, 2004

Score using 1981-2010 normal period

values are in inches A 'R' following a monthly total indicates a provisional value derived from radar-based estimates.	first prior month: **March 2004**	second prior month: **February 2004**	third prior month: **January 2004**
estimated precipitation total for this location:	**2.07**	**1.59**	**0.48**
there is a 30% chance this location will have less than:	1.47	0.50	0.54
there is a 30% chance this location will have more than:	2.10	0.95	1.20
type of month: dry normal wet	**normal**	**wet**	**dry**
monthly score	**3 * 2 = 6**	**2 * 3 = 6**	**1 * 1 = 1**
multi-month score: 6 to 9 (dry) 10 to 14 (normal) 15 to 18 (wet)	**13 (Normal)**		

Other Resources:

- retrieve daily precipitation data
- view radar-based precipitation estimates
- view weekly precipitation maps
- *Evaluating Antecedent Precipitation Conditions* (BWSR)

Minnesota Climatology Working Group

State Climatology Office - DNR Division of Ecological and Water Resources University of Minnesota

Precipitation Worksheet Using Gridded Database

Precipitation data for target wetland location:

county: **Washington**
township number: **29N**
township name: **Baytown**
range number: **20W**
nearest community: **Lake Elmo**
section number: **19**

Aerial photograph or site visit date:
Friday, July 18, 2003

Score using 1981-2010 normal period

values are in inches A 'R' following a monthly total indicates a provisional value derived from radar-based estimates.	first prior month: **June 2003**	second prior month: **May 2003**	third prior month: **April 2003**
estimated precipitation total for this location:	**5.80**	**7.20**	**2.04**
there is a 30% chance this location will have less than:	3.68	3.28	2.06
there is a 30% chance this location will have more than:	5.74	3.99	3.19
type of month: **dry** **normal** **wet**	**wet**	**wet**	**dry**
monthly score	**3 * 3 = 9**	**2 * 3 = 6**	**1 * 1 = 1**
multi-month score: 6 to 9 (dry) 10 to 14 (normal) 15 to 18 (wet)	**16 (Wet)**		

Other Resources:

- retrieve daily precipitation data
- view radar-based precipitation estimates
- view weekly precipitation maps
- *Evaluating Antecedent Precipitation Conditions* (BWSR)

Minnesota Climatology Working Group

State Climatology Office - DNR Division of Ecological and Water Resources University of Minnesota

Precipitation Worksheet Using Gridded Database

Precipitation data for target wetland location:

county: **Washington**
township name: **Baytown**
nearest community: **Lake Elmo**
township number: **29N**
range number: **20W**
section number: **19**

Aerial photograph or site visit date:
Sunday, September 15, 2002

Score using 1981-2010 normal period

values are in inches A 'R' following a monthly total indicates a provisional value derived from radar-based estimates.	first prior month: **August 2002**	second prior month: **July 2002**	third prior month: **June 2002**
estimated precipitation total for this location:	**6.03**	**5.71**	**8.98**
there is a 30% chance this location will have less than:	3.32	2.65	3.68
there is a 30% chance this location will have more than:	5.39	4.73	5.74
type of month: dry normal wet	**wet**	**wet**	**wet**
monthly score	**3 * 3 = 9**	**2 * 3 = 6**	**1 * 3 = 3**
multi-month score: 6 to 9 (dry) 10 to 14 (normal) 15 to 18 (wet)	**18 (Wet)**		

Other Resources:

- retrieve daily precipitation data
- view radar-based precipitation estimates
- view weekly precipitation maps
- *Evaluating Antecedent Precipitation Conditions* (BWSR)

Minnesota Climatology Working Group

State Climatology Office - DNR Division of Ecological and Water Resources University of Minnesota

Precipitation Worksheet Using Gridded Database

Precipitation data for target wetland location:

county: **Washington**
township name: **Baytown**
nearest community: **Lake Elmo**
township number: **29N**
range number: **20W**
section number: **19**

Aerial photograph or site visit date:
Tuesday, May 02, 2000

Score using 1981-2010 normal period

values are in inches A 'R' following a monthly total indicates a provisional value derived from radar-based estimates.	first prior month: **April 2000**	second prior month: **March 2000**	third prior month: **February 2000**
estimated precipitation total for this location:	**1.48**	**1.24**	**1.27**
there is a 30% chance this location will have less than:	2.06	1.47	0.50
there is a 30% chance this location will have more than:	3.19	2.10	0.95
type of month: dry normal wet	**dry**	**dry**	**wet**
monthly score	**3 * 1 = 3**	**2 * 1 = 2**	**1 * 3 = 3**
multi-month score: 6 to 9 (dry) 10 to 14 (normal) 15 to 18 (wet)	**8 (Dry)**		

Other Resources:

- retrieve daily precipitation data
- view radar-based precipitation estimates
- view weekly precipitation maps
- *Evaluating Antecedent Precipitation Conditions* (BWSR)

Minnesota Climatology Working Group

State Climatology Office - DNR Division of Ecological and Water Resources University of Minnesota

Precipitation Worksheet Using Gridded Database

Precipitation data for target wetland location:

county: **Washington** township number: **29N**
township name: **Baytown** range number: **20W**
nearest community: **Lake Elmo** section number: **19**

Aerial photograph or site visit date:
Monday, April 14, 1997

Score using 1981-2010 normal period

values are in inches A 'R' following a monthly total indicates a provisional value derived from radar-based estimates.	first prior month: **March 1997**	second prior month: **February 1997**	third prior month: **January 1997**
estimated precipitation total for this location:	**1.48**	**0.19**	**1.76**
there is a 30% chance this location will have less than:	1.47	0.50	0.54
there is a 30% chance this location will have more than:	2.10	0.95	1.20
type of month: dry normal wet	**normal**	**dry**	**wet**
monthly score	**3 * 2 = 6**	**2 * 1 = 2**	**1 * 3 = 3**
multi-month score: 6 to 9 (dry) 10 to 14 (normal) 15 to 18 (wet)	**11 (Normal)**		

Other Resources:

- retrieve daily precipitation data
- view radar-based precipitation estimates
- view weekly precipitation maps
- *Evaluating Antecedent Precipitation Conditions* (BWSR)

Minnesota Climatology Working Group

State Climatology Office - DNR Division of Ecological and Water Resources   University of Minnesota

Precipitation Worksheet Using Gridded Database

Precipitation data for target wetland location:

county: **Washington**   township number: **29N**
township name: **Baytown**   range number: **20W**
nearest community: **Lake Elmo**   section number: **19**

Aerial photograph or site visit date:
Monday, October 10, 1994

Score using 1981-2010 normal period

values are in inches A 'R' following a monthly total indicates a provisional value derived from radar-based estimates.	first prior month: **September 1994**	second prior month: **August 1994**	third prior month: **July 1994**
estimated precipitation total for this location:	**4.53**	**4.80**	**4.74**
there is a 30% chance this location will have less than:	2.45	3.32	2.65
there is a 30% chance this location will have more than:	4.36	5.38	4.73
type of month: dry normal wet	**wet**	**normal**	**wet**
monthly score	**3 * 3 = 9**	**2 * 2 = 4**	**1 * 3 = 3**
multi-month score: 6 to 9 (dry) 10 to 14 (normal) 15 to 18 (wet)	**16 (Wet)**		

Other Resources:

- retrieve daily precipitation data
- view radar-based precipitation estimates
- view weekly precipitation maps
- *Evaluating Antecedent Precipitation Conditions* (BWSR)

Appendix E. WETS Analysis and Climatic Data

Minnesota Climatology Working Group

State Climatology Office - DNR Division of Ecological and Water Resources University of Minnesota

Precipitation Worksheet Using Gridded Database

Precipitation data for target wetland location:

county: **Washington**
township name: **Baytown**
nearest community: **Lake Elmo**
township number: **29N**
range number: **20W**
section number: **18**

Aerial photograph or site visit date:
Monday, June 05, 2017

Score using 1981-2010 normal period

values are in inches A 'R' following a monthly total indicates a provisional value derived from radar-based estimates.	first prior month: **May 2017**	second prior month: **April 2017**	third prior month: **March 2017**
estimated precipitation total for this location:	**5.51R**	**3.55**	**0.88**
there is a 30% chance this location will have less than:	3.25	2.09	1.45
there is a 30% chance this location will have more than:	4.05	3.19	2.09
type of month: dry normal wet	**wet**	**wet**	**dry**
monthly score	**3 * 3 = 9**	**2 * 3 = 6**	**1 * 1 = 1**
multi-month score: 6 to 9 (dry) 10 to 14 (normal) 15 to 18 (wet)	**16 (Wet)**		

Other Resources:

- retrieve daily precipitation data
- view radar-based precipitation estimates
- view weekly precipitation maps
- *Evaluating Antecedent Precipitation Conditions* (BWSR)

WETS Analysis Worksheet

Project Name: **Lake Elmo Airport (21D) Runway 14/32 Relocation**
Period Of Interest: March - May
Station: **MINNEAPOLIS/ST PAUL AP, MN**
County: Washington, MN

Long-term rainfall records (from WETS table)

	Month	30% chance <	Normal	30% chance >
1st month prior:	May	2.26	3.23	3.83
2nd month prior:	April	1.51	2.51	3.04
3rd month prior:	March	1.23	1.82	2.18
		Sum =	**7.56**	

Site Determination*

Site Rainfall (in)	Condition (Dry/Normal*/Wet)	Condition** Value	Month Weight	Product
7.03	Wet	3	3	9
3.94	Wet	3	2	6
0.83	Dry	1	1	1
Sum = **11.8**			Sum***=	**16**

* Woodbury 1.7N, MN GHCND:US1MNWG0016

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

Determination: X Wet
Dry
Normal

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

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

Precipitation data source:
http://www.ncdc.noaa.gov/cdo-web/datatools

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 Station: MINNEAPOLIS/ ST PAUL AP, MN

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	22.3	5.6	14.0	0.92	0.51	1.12	3	11.8
Feb	28.0	11.6	19.8	0.79	0.50	0.95	3	8.5
Mar	40.5	23.7	32.1	1.82	1.23	2.18	5	10.5
Apr	57.4	36.9	47.2	2.51	1.51	3.04	6	3.0
May	69.6	48.6	59.1	3.23	2.26	3.83	7	0.0
Jun	78.9	58.4	68.6	4.34	2.87	5.20	8	0.0
Jul	83.6	63.8	73.7	3.72	2.26	4.51	6	0.0
Aug	80.5	61.3	70.9	4.26	2.93	5.08	6	0.0
Sep	71.5	51.7	61.6	2.88	1.89	3.46	6	0.0
Oct	58.1	39.4	48.8	2.26	1.18	2.76	4	0.6
Nov	41.1	25.9	33.5	1.72	0.80	2.10	4	8.5
Dec	26.7	11.8	19.3	1.06	0.61	1.28	3	11.7
Annual:					26.12	32.31		
Average	54.9	36.6	45.7	-	-	-	-	-
Total	-	-	-	29.50			61	54.5

GROWING SEASON DATES

Years with missing data:	24 deg = 0	28 deg = 0	32 deg = 0
Years with no occurrence:	24 deg = 0	28 deg = 0	32 deg = 0
Data years used:	24 deg = 40	28 deg = 40	32 deg = 40
Probability	24 F or higher	28 F or higher	32 F or higher
50 percent *	4/5 to 11/4: 213 days	4/13 to 10/19: 189 days	4/28 to 10/8: 163 days
70 percent *	4/1 to 11/9: 222 days	4/8 to 10/24: 199 days	4/24 to 10/12: 171 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
1938				3.27	6.97	2.96	3.36	3.45	3.24	0.84	1.29	0.77	26.15
1939	1.06	0.88	0.61	2.19	3.55	4.95	2.75	3.65	2.31	1.56	0.02	0.97	24.50
1940	0.37	0.91	2.16	1.21	1.64	7.10	2.46	4.54	0.41	1.57	5.15	1.02	28.54
1941	0.74	0.89	0.77	1.87	2.91	3.29	1.98	3.66	3.47	5.52	1.05	0.85	27.00
1942	0.15	0.45	1.74	3.41	6.78	2.69	3.80	2.11	7.53	0.78	0.27	0.85	30.56
1943	0.91	0.57	0.81	0.98	4.27	4.23	3.78	1.75	2.47	1.30	1.64	T	22.71
1944	0.24	1.10	1.20	2.24	6.15	6.69	4.39	3.65	0.97	0.26	2.10	0.09	29.08
1945	0.63	1.84	1.95	2.95	3.09	5.57	4.13	2.27	2.13	0.30	0.92	1.41	27.19
1946	0.94	1.15	1.20	0.66	3.04	7.80	2.76	0.43	6.	2.	1.	0.	28.

									58	51	22	68	97
1947	0.71	0.20	0.47	2.44	2.56	5.30	0.96	2.41	1.48	1.10	2.85	0.60	21.08
1948	0.15	1.37	1.43	1.77	0.74	2.58	1.34	3.37	1.04	0.60	1.89	0.67	16.95
1949	1.65	0.14	3.37	1.89	0.90	2.74	6.01	2.64	2.67	1.72	0.42	0.99	25.14
1950	1.27	0.68	2.20	2.19	2.87	1.26	3.74	1.84	1.46	1.22	0.89	1.99	21.61
1951	0.44	1.71	3.00	1.86	4.14	5.50	5.44	1.94	5.80	1.44	2.12	1.21	34.60
1952	1.05	1.20	3.09	0.59	2.86	3.98	4.56	4.18	0.42	0.01	1.28	0.45	23.67
1953	0.55	1.23	1.51	2.04	1.92	7.10	6.81	2.75	0.55	0.15	1.54	1.76	27.91
1954	0.25	0.32	2.10	3.53	2.54	4.71	1.33	3.08	3.65	1.23	0.61	0.33	23.68
1955	0.47	1.54	0.52	0.92	0.69	1.53	7.10	2.84	0.99	2.21	1.04	1.26	21.11
1956	0.48	0.20	1.62	0.67	1.96	6.58	5.18	5.22	0.79	1.95	1.35	0.20	26.20
1957	0.32	0.83	1.31	1.23	3.13	4.12	6.31	5.75	1.65	1.40	1.56	0.24	27.85
1958	0.21	0.24	0.32	1.99	1.39	2.01	3.15	3.03	1.09	1.55	1.01	0.21	16.20
1959	0.11	0.61	0.59	0.64	5.03	4.07	2.60	6.60	2.29	2.43	0.63	1.28	26.88
1960	0.68	0.22	0.81	2.04	3.19	3.08	1.93	3.99	3.79	0.31	0.87	0.55	21.46
1961	0.28	0.89	2.81	2.39	3.48	1.87	2.94	2.38	3.01	3.03	1.06	1.60	25.74
1962	0.55	2.07	1.87	1.31	8.03	1.48	5.12	3.47	2.46	1.69	0.52	0.26	28.83
1963	0.46	0.41	1.18	2.07	5.06	1.91	1.53	1.55	3.47	0.81	0.52	0.60	19.57
1964	0.47	0.06	1.35	2.98	3.44	2.18	2.02	5.42	5.21	0.57	1.19	1.08	25.97
1965	0.47	1.59	4.75	3.52	7.86	4.01	4.69	4.04	4.90	0.90	1.98	1.23	39.94
1966	0.95	1.55	2.48	0.89	1.46	3.51	2.47	4.40	1.69	3.53	0.39	1.02	24.34
1967	3.63	1.59	0.96	4.07	0.61	7.53	1.36	2.79	0.63	1.73	0.09	0.45	25.44
1968	0.71	0.13	1.89	2.94	3.74	6.78	6.46	0.75	6.16	5.62	0.54	2.21	37.93
1969	2.05	0.31	0.90	1.55	1.98	2.93	2.95	0.99	0.49	2.53	0.55	2.06	19.29
1970	0.47	0.16	2.05	3.55	4.77	1.27	3.66	2.19	3.19	4.97	3.82	0.43	30.53
1971	1.22	1.74	1.21	1.11	3.14	3.52	3.94	1.78	2.73	5.68	2.67	0.70	29.44
1972	0.84	0.49	1.25	1.69	2.18	3.31	5.12	2.48	1.96	1.77	1.11	1.57	23.77
1973	0.92	0.84	1.12	2.32	2.48	1.06	2.90	3.05	2.08	1.29	1.97	1.10	21.13
1974	0.17	1.06	1.00	2.42	2.08	5.21	1.14	2.75	0.58	1.69	0.66	0.35	19.11
1975	2.82	0.79	1.67	5.40	3.81	7.99	0.58	4.92	1.31	0.27	4.80	0.79	35.15
1976	0.87	0.59	2.83	0.80	1.13	3.86	2.45	1.39	1.42	0.49	0.16	0.51	16.50
1977	0.65	0.93	2.66	1.84	2.86	3.57	3.72	9.31	4.43	2.34	1.42	1.15	34.88
1978	0.38	0.24	0.79	3.63	3.79	7.09	3.19	5.77	2.47	0.19	1.84	0.88	30.26
1979	1.09	1.39	2.55	0.66	4.55	4.78	2.34	7.04	2.20	3.16	0.98	0.33	31.07
1980	0.94	0.67	1.12	0.83	2.29	5.52	2.30	3.26	3.	0.	0.	0.	21.

									68	66	26	24	77
1981	0.30	2.14	0.71	2.17	2.18	4.42	4.09	4.73	1.46	2.69	2.16	0.92	27.97
1982	2.45	0.43	2.09	1.62	4.99	1.44	0.92	3.80	1.50	3.45	3.27	4.27	30.23
1983	0.67	1.19	3.22	3.97	6.20	5.22	3.07	3.12	3.34	2.61	4.93	1.53	39.07
1984	0.88	1.64	1.47	3.86	2.29	7.95	3.03	5.15	2.65	5.48	0.31	2.24	36.95
1985	0.87	0.50	4.48	1.81	3.65	2.18	2.20	5.02	4.37	3.66	1.72	1.20	31.66
1986	0.90	0.84	2.03	5.88	3.48	5.34	4.11	4.44	6.90	1.77	0.62	0.31	36.62
1987	0.63	0.13	0.64	0.16	1.88	1.95	17.90	3.67	1.28	0.60	2.07	1.25	32.16
1988	1.37	0.30	1.33	1.58	1.70	0.22	1.17	4.29	2.79	0.80	2.86	0.67	19.08
1989	0.52	1.04	2.19	2.66	3.38	3.50	3.50	2.92	1.28	0.53	1.38	0.42	23.32
1990	0.10	0.77	3.66	3.80	3.36	9.82	5.06	1.71	1.88	1.23	0.65	1.01	33.05
1991	0.49	1.03	2.29	3.58	6.35	2.57	2.95	3.14	5.43	2.52	5.29	1.05	36.69
1992	0.66	0.57	1.56	1.99	1.15	3.68	5.21	4.54	5.20	2.11	1.95	1.05	29.67
1993	1.25	0.39	1.25	1.99	4.02	6.28	5.58	6.50	2.04	0.79	1.57	0.55	32.21
1994	1.17	0.78	0.32	3.77	2.21	3.09	4.12	2.90	4.74	4.65	1.39	0.53	29.67
1995	0.36	0.25	2.11	1.90	2.43	3.38	2.72	4.59	2.21	3.68	0.88	1.15	25.66
1996	1.87	0.24	1.39	0.76	2.37	4.76	2.09	1.43	1.30	3.01	5.08	1.75	26.05
1997	1.71	0.30	1.18	1.01	1.70	3.70	12.60	6.01	3.19	2.03	0.69	0.31	34.43
1998	1.64	0.80	4.56	1.56	4.40	6.52	2.63	5.99	1.32	2.19	1.32	0.46	33.39
1999	2.67	0.40	1.86	3.43	6.56	3.68	4.55	2.64	2.73	0.92	0.77	0.33	30.54
2000	0.90	1.08	1.12	1.12	4.56	4.56	6.10	3.19	2.15	1.09	3.38	1.23	30.48
2001	1.21	1.33	1.09	7.00	4.53	6.35	2.12	2.31	3.50	1.28	2.77	0.74	34.23
2002	0.46	0.41	1.38	3.15	2.83	8.30	5.19	8.30	3.90	4.18	0.09	0.22	38.41
2003	0.22	0.54	1.44	2.40	6.14	4.66	2.05	1.12	2.20	0.62	0.71	0.62	22.72
2004	0.23	1.09	2.11	2.06	6.39	3.06	3.36	1.19	4.21	2.32	0.93	0.44	27.39
2005	1.21	0.96	1.37	2.30	2.78	4.24	2.94	5.22	4.44	5.45	1.53	0.97	33.41
2006	0.71	0.32	2.01	5.97	1.66	2.81	1.29	6.90	2.44	0.41	0.92	2.13	27.57
2007	0.31	1.37	3.64	1.11	1.99	2.05	3.29	9.32	6.04	3.63	0.09	1.48	34.32
2008	0.15	0.40	1.97	3.12	2.53	2.70	2.13	3.35	1.78	1.96	1.14	1.15	22.38
2009	0.57	0.93	1.50	1.57	0.53	2.86	2.17	6.43	0.46	5.57	0.38	1.83	24.80
2010	0.45	0.75	0.69	2.32	2.50	6.25	3.03	4.91	5.52	1.61	2.07	2.79	32.89
2011	1.00	1.12	2.06	2.80	4.04	5.28	5.23	3.03	0.36	0.70	0.30	0.99	26.91
2012	0.36	1.71	1.40	3.04	9.34	3.59	4.90	1.38	0.30	1.30	0.63	1.64	29.59
2013	0.86	1.33	2.04	5.22	6.24	5.17	3.51	2.07	1.35	3.00	0.52	1.46	32.77
2014	1.42	1.41	0.82	6.27	4.55	11.36	2.27	2.90	0.	1.	0.	0.	35.

									92	75	87	86	40
2015	0.34	0.35	0.67	2.42	3.55	4.40	7.32	2.99	4.65	2.61	4.52	2.32	36.14
2016	0.31	1.09	2.26	2.84	2.42	4.49	5.09	7.82	5.47	3.41	2.98	2.14	40.32
2017	0.98	0.64	0.68	4.45	M4.80								11.55
Notes: Data missing in any month have an "M" flag. A "T" indicates a trace of precipitation.													
Data missing for all days in a month or year is blank.													
Creation date: 2016-07-22													

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Record of Climatological Observations

These data are quality controlled and may not be identical to the original observations.

Generated on 06/01/2017

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Elev: 980 ft. Lat: 44.930° N Lon: 92.925° W

Station: **WOODBURY 1.7 N, MN US GHCND:US1MNWG0016**

Observation Time Temperature: Unknown Observation Time Precipitation: Unknown

Preliminary	Year	Month	Day	Temperature (F) 24 hrs. ending at observation time Max.	Temperature (F) 24 hrs. ending at observation time Min.	Temperature (F) at Observation	Precipitation 24 Hour Amounts ending at observation time Rain, melted snow, etc. (in)	Flag	Snow, ice pellets, hail (in)	Flag	At Obs Time Snow, ice pellets, hail, ice on ground (in)	Evaporation 24 Hour Wind Movement (mi)	Evaporation Amount of Evap. (in)	Soil Temperature (F) 4 in depth Ground Cover (see *)	4 in depth Max.	4 in depth Min.	8 in depth Ground Cover (see *)	8 in depth Max.	8 in depth Min.
	2017	3	1				0.10		1.2		1.2								
	2017	3	2				0.01		0.2										
	2017	3	3				0.00		0.0										
	2017	3	4				T		0.1										
	2017	3	5				0.00		0.0										
	2017	3	6				T		0.0		0.0								
	2017	3	7				0.21		T		T								
	2017	3	8				0.00		0.0										
	2017	3	9				0.00		0.0										
	2017	3	10				0.00		0.0										
	2017	3	11				0.00		0.0										
	2017	3	12				0.00		0.0										
	2017	3	13				0.29		3.2		3.2								
	2017	3	14				T		0.0										
	2017	3	15				0.00		0.0										
	2017	3	16				0.00		0.0										
	2017	3	17				0.02		0.0		0.0								
	2017	3	18				T		0.0										
	2017	3	19				0.00		0.0										
	2017	3	20				0.00		0.0		0.0								
	2017	3	21				0.00		0.0										
	2017	3	22				0.00		0.0										
	2017	3	23				0.00		0.0										
	2017	3	24				0.11		0.0										
	2017	3	25				0.01		0.0										
	2017	3	26				0.05		0.0										
	2017	3	27				0.02		0.0		0.0								
	2017	3	28				0.00		0.0										
	2017	3	29				0.00		0.0										
	2017	3	30				0.01		0.0										
	2017	3	31				0.00		0.0										
			Summary				0.83		4.7										

The '*' flags in Preliminary indicate the data have not completed processing and qualitycontrol and may not be identical to the original observation
Empty, or blank, cells indicate that a data observation was not reported.
***Ground Cover: 1=Grass; 2=Fallow; 3=Bare Ground; 4=Brome grass; 5=Sod; 6=Straw mulch; 7=Grass muck; 8=Bare muck; 0=Unknown**
"s" This data value failed one of NCDC's quality control tests.
"T" values in the Precipitation category above indicate a TRACE value was recorded.
"A" values in the Precipitation Flag or the Snow Flag column indicate a multiday total, accumulated since last measurement, is being used.
Data value inconsistency may be present due to rounding calculations during the conversion process from SI metric units to standard imperial units.

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Record of Climatological Observations

These data are quality controlled and may not be identical to the original observations.
Generated on 06/01/2017

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Elev: 980 ft. Lat: 44.930° N Lon: 92.925° W

Station: **WOODBURY 1.7 N, MN US GHCND:US1MNWG0016**

Observation Time Temperature: Unknown Observation Time Precipitation: Unknown

Preliminary	Year	Month	Day	Temperature (F)			Precipitation					Evaporation		Soil Temperature (F)					
				24 hrs. ending at observation time		at Observation	24 Hour Amounts ending at observation time				At Obs Time			4 in depth			8 in depth		
				Max.	Min.		Rain, melted snow, etc. (in)	Flag	Snow, ice pellets, hail (in)	Flag	Snow, ice pellets, hail, ice on ground (in)	24 Hour Wind Movement (mi)	Amount of Evap. (in)	Ground Cover (see *)	Max.	Min.	Ground Cover (see *)	Max.	Min.
	2017	4	1				0.00		0.0										
	2017	4	2				0.00		0.0										
	2017	4	3				T		0.0		0.0								
	2017	4	4				0.14		0.0										
	2017	4	5				0.00		0.0										
	2017	4	6				0.00		0.0										
	2017	4	7				0.00		0.0										
	2017	4	8				0.00		0.0										
	2017	4	9				0.00		0.0										
	2017	4	10				0.08		0.0		0.0								
	2017	4	11				0.08		0.0										
	2017	4	12				0.00		0.0										
	2017	4	13				0.21		0.0										
	2017	4	14				0.00		0.0										
	2017	4	15				0.72		0.0										
	2017	4	16				0.45		0.0										
	2017	4	17				0.00		0.0										
	2017	4	18				0.00		0.0										
	2017	4	19				0.20												
	2017	4	20				1.01												
	2017	4	21				T												
	2017	4	22				0.00		0.0										
	2017	4	23				0.00		0.0										
	2017	4	24				0.00		0.0										
	2017	4	25				0.02												
	2017	4	26				0.93												
	2017	4	27				0.07		T										
	2017	4	28				0.03		T		0.0								
	2017	4	29				0.00		0.0										
	2017	4	30				0.00		0.0										
			Summary				3.94		0.0										

The '*' flags in Preliminary indicate the data have not completed processing and qualitycontrol and may not be identical to the original observation
Empty, or blank, cells indicate that a data observation was not reported.
***Ground Cover: 1=Grass; 2=Fallow; 3=Bare Ground; 4=Brome grass; 5=Sod; 6=Straw mulch; 7=Grass muck; 8=Bare muck; 0=Unknown**
"s" This data value failed one of NCDC's quality control tests.
"T" values in the Precipitation category above indicate a TRACE value was recorded.
"A" values in the Precipitation Flag or the Snow Flag column indicate a multiday total, accumulated since last measurement, is being used.
Data value inconsistency may be present due to rounding calculations during the conversion process from SI metric units to standard imperial units.

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Record of Climatological Observations

These data are quality controlled and may not be identical to the original observations.
Generated on 06/12/2017

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Elev: 980 ft. Lat: 44.930° N Lon: 92.925° W

Station: **WOODBURY 1.7 N, MN US GHCND:US1MNWG0016**

Observation Time Temperature: Unknown Observation Time Precipitation: Unknown

				Temperature (F)			Precipitation					Evaporation		Soil Temperature (F)					
				24 hrs. ending at observation time		at Observation	24 Hour Amounts ending at observation time				At Obs Time			4 in depth			8 in depth		
Preliminary	Year	Month	Day	Max.	Min.		Rain, melted snow, etc. (in)	Flag	Snow, ice pellets, hail (in)	Flag	Snow, ice pellets, hail, ice on ground (in)	24 Hour Wind Movement (mi)	Amount of Evap. (in)	Ground Cover (see *)	Max.	Min.	Ground Cover (see *)	Max.	Min.
	2017	5	1				0.93		0.0		0.0								
	2017	5	2				0.41		T		0.0								
	2017	5	3				0.00		0.0										
	2017	5	4				0.00		0.0										
	2017	5	5				0.00		0.0										
	2017	5	6				0.00		0.0										
	2017	5	7				0.00		0.0										
	2017	5	8				0.00		0.0										
	2017	5	9				0.35												
	2017	5	10				0.03												
	2017	5	11				0.00		0.0										
	2017	5	12																
	2017	5	13																
	2017	5	14																
	2017	5	15																
	2017	5	16																
	2017	5	17				1.45												
	2017	5	18				2.16												
	2017	5	19				0.03												
	2017	5	20				0.01												
	2017	5	21				1.46												
	2017	5	22				0.04												
	2017	5	23				0.11												
	2017	5	24				0.01												
	2017	5	25				0.00		0.0										
	2017	5	26				0.01												
	2017	5	27				0.00		0.0										
	2017	5	28				0.00		0.0										
	2017	5	29				0.02												
	2017	5	30				0.01												
	2017	5	31				0.00		0.0										
			Summary				7.03		0.0										

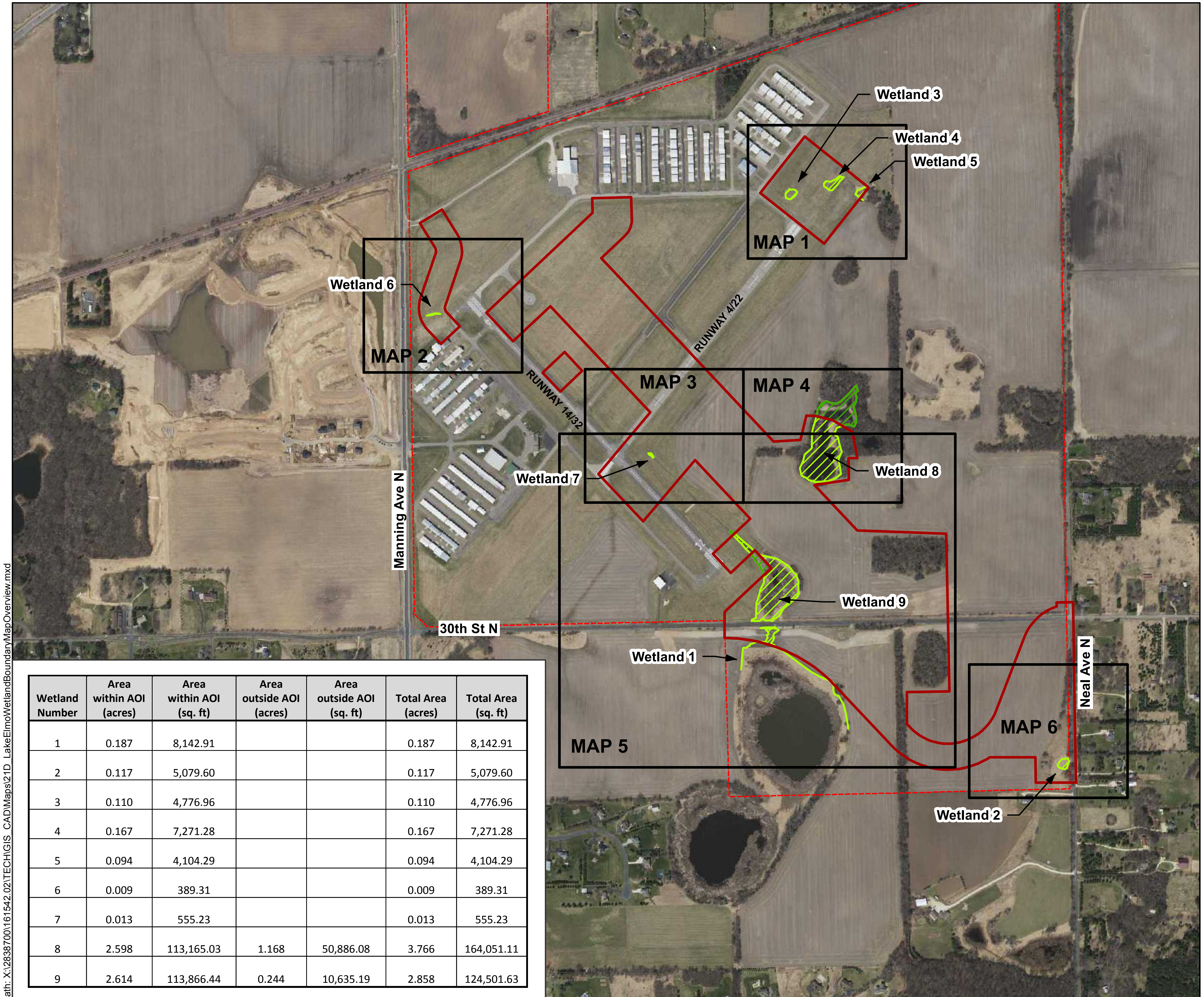
The '*' flags in Preliminary indicate the data have not completed processing and qualitycontrol and may not be identical to the original observation
Empty, or blank, cells indicate that a data observation was not reported.
***Ground Cover: 1=Grass; 2=Fallow; 3=Bare Ground; 4=Brome grass; 5=Sod; 6=Straw mulch; 7=Grass muck; 8=Bare muck; 0=Unknown**
"s" This data value failed one of NCDC's quality control tests.
"T" values in the Precipitation category above indicate a TRACE value was recorded.
"A" values in the Precipitation Flag or the Snow Flag column indicate a multiday total, accumulated since last measurement, is being used.
Data value inconsistency may be present due to rounding calculations during the conversion process from SI metric units to standard imperial units.

Appendix F. Wetland Boundary Maps

Wetland Boundary Map Sheet Key

LAKE ELMO AIRPORT

Proposed Runway 14-32 Runway Shift



Legend

- Map Sheet
- Wetland Boundary
- Wetland within AOI
- Outside AOI
- Area of Interest
- Airport Property Boundary

Wetland Number	Area within AOI (acres)	Area within AOI (sq. ft)	Area outside AOI (acres)	Area outside AOI (sq. ft)	Total Area (acres)	Total Area (sq. ft)
1	0.187	8,142.91			0.187	8,142.91
2	0.117	5,079.60			0.117	5,079.60
3	0.110	4,776.96			0.110	4,776.96
4	0.167	7,271.28			0.167	7,271.28
5	0.094	4,104.29			0.094	4,104.29
6	0.009	389.31			0.009	389.31
7	0.013	555.23			0.013	555.23
8	2.598	113,165.03	1.168	50,886.08	3.766	164,051.11
9	2.614	113,866.44	0.244	10,635.19	2.858	124,501.63

Wetland Number	Description	Circular 39 Type
1	Seasonally Flooded Basin	Type 1
2	Fresh (wet) Meadow	Type 2
3	Fresh (wet) Meadow	Type 2
4	Fresh (wet) Meadow	Type 2
5	Fresh (wet) Meadow	Type 2
6	Fresh (wet) Meadow (Ditch Wetland)	Type 2
7	Fresh (wet) Meadow (Ditch Wetland)	Type 2
8	Fresh (wet) Meadow /Deep Marsh	Type 2/ Type 4
9	Fresh (wet) Meadow /Shallow Marsh	Type 2/ Type 3

N

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

Project Information

T29N, R20W, S18 and S19
City of Lake Elmo
Washington County, MN
Area of Interest = 130.1 acres
Field work conducted:
June 5 - 9, 2017

Mead & Hunt

Image Source: MnGEO WMS Image Service, Washington County (2016 color 7-county)

Path: X:\2838700\161542.02\TECH\GIS_CAD\Maps\21D_LakeElmoWetlandBoundaryMapOverview.mxd

Wetland Boundary Map

LAKE ELMO AIRPORT

Proposed Runway 14-32 Runway Shift

Legend

- Photo Location
- Data Point Location
- Wetland Boundary
- Wetland within AOI
- Wetland outside AOI
- Culvert End Location
- Flow Direction
- Ditch/Swale Flow
- Area of Interest
- Airport Property Boundary

N

0 50 100 200 300 Feet

Elevation contour interval is 2 feet

Project Information

T29N, R20W, S18 and S19
City of Lake Elmo
Washington County, MN
Area of Interest = 130.1 acres
Field work conducted:
June 5 - 9, 2017

Image Source: MnGEO WMS Image Service, Washington County (2016 color 7-county)
Contour Source: Minnesota Geospatial Commons, Minnesota Elevation Mapping Project Twin Cities Metro Region 2011

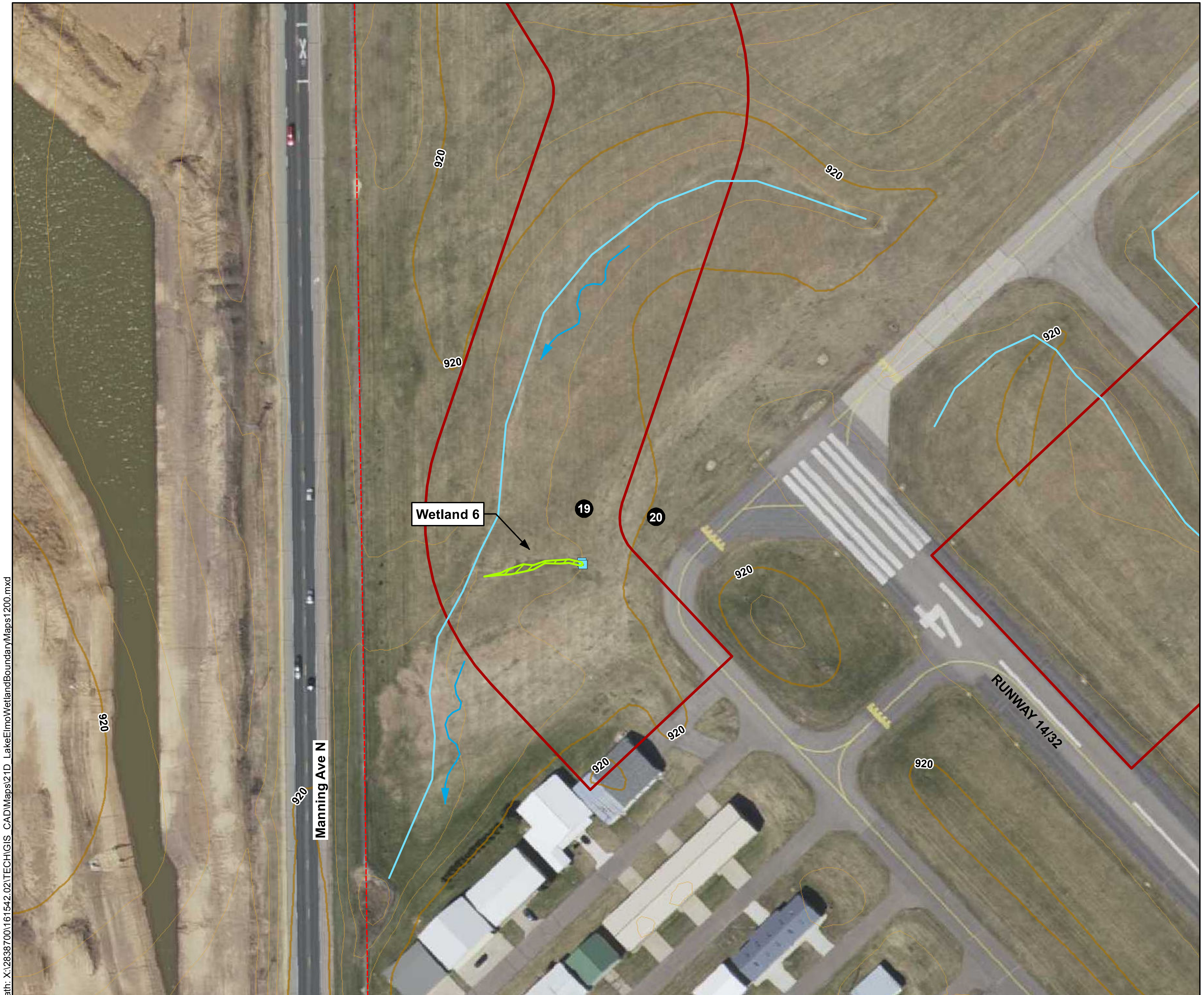
Map 1 of 6

Path: X:\283870\161542.02\TECH\GIS_CAD\Maps\21D_LakeElmoWetlandBoundaryMaps1200.mxd

Wetland Boundary Map

LAKE ELMO AIRPORT

Proposed Runway 14-32 Runway Shift



Legend

- Photo Location
- Data Point Location
- Wetland Boundary
- Wetland within AOI
- Wetland outside AOI
- Culvert End Location
- Flow Direction
- Ditch/Swale Flow
- Area of Interest
- Airport Property Boundary

N

0 50 100 200 300 Feet

Elevation contour interval is 2 feet

Project Information

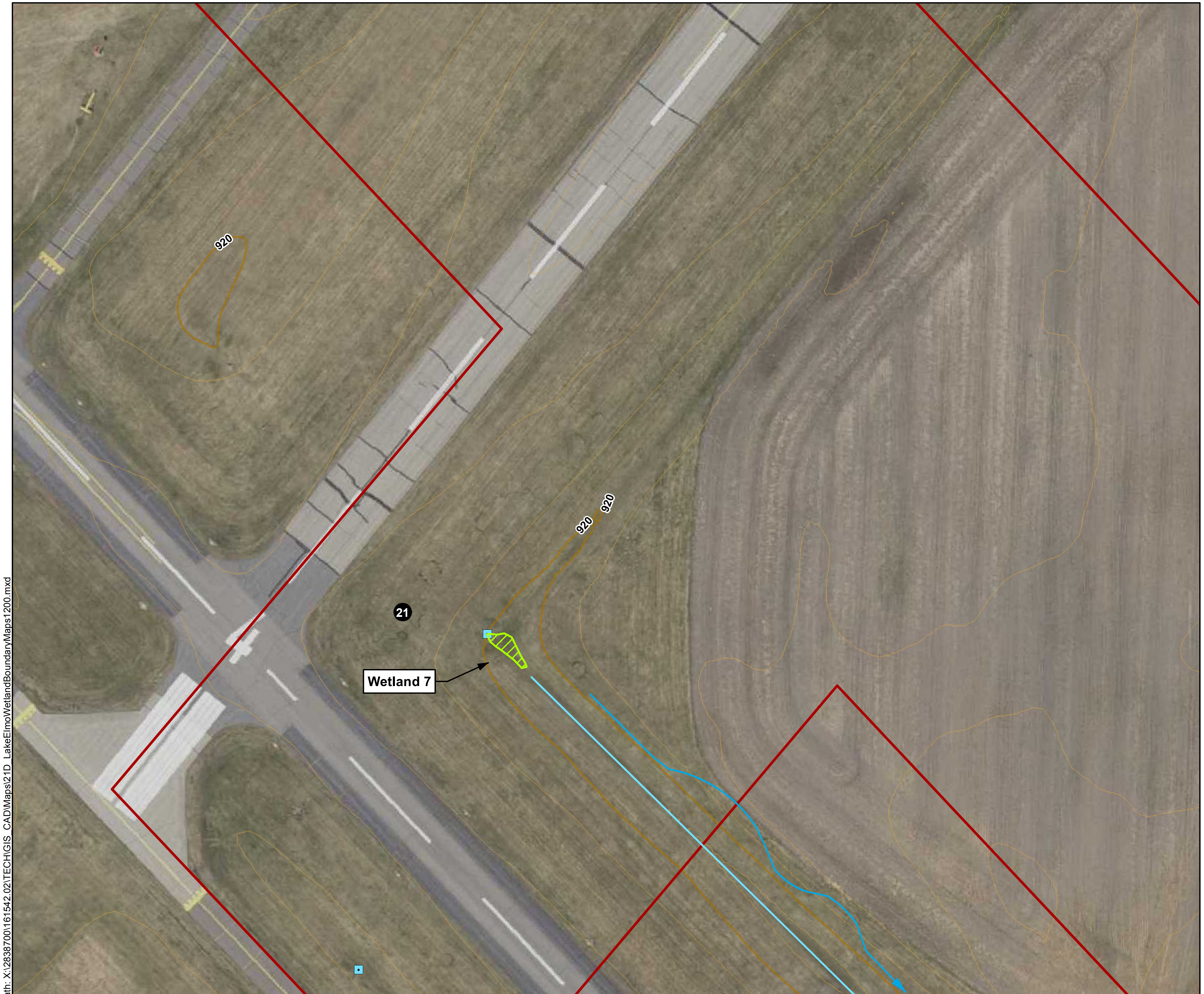
T29N, R20W, S18 and S19
City of Lake Elmo
Washington County, MN
Area of Interest = 130.1 acres
Field work conducted:
June 5 - 9, 2017

Mead & Hunt

Image Source: MnGEO WMS Image Service, Washington County (2016 color 7-county)
Contour Source:
Minnesota Geospatial Commons,
Minnesota Elevation Mapping Project
Twin Cities Metro Region 2011

Map 2 of 6

Path: X:\283870\161542.02\TECH\GIS_CAD\Maps\21D_LakeElmoWetlandBoundaryMaps1200.mxd



Wetland Boundary Map

LAKE ELMO AIRPORT

Proposed Runway 14-32 Runway Shift

Legend

- Photo Location
- Data Point Location
- Wetland Boundary
- Wetland within AOI
- Wetland outside AOI
- Culvert End Location
- Flow Direction
- Ditch/Swale Flow
- Area of Interest
- Airport Property Boundary

N

0 50 100 200 300 Feet

Elevation contour interval is 2 feet

Project Information

T29N, R20W, S18 and S19
City of Lake Elmo
Washington County, MN
Area of Interest = 130.1 acres
Field work conducted:
June 5 - 9, 2017

Mead & Hunt

Image Source: MnGEO WMS Image Service, Washington County (2016 color 7-county)
Contour Source: Minnesota Geospatial Commons, Minnesota Elevation Mapping Project Twin Cities Metro Region 2011

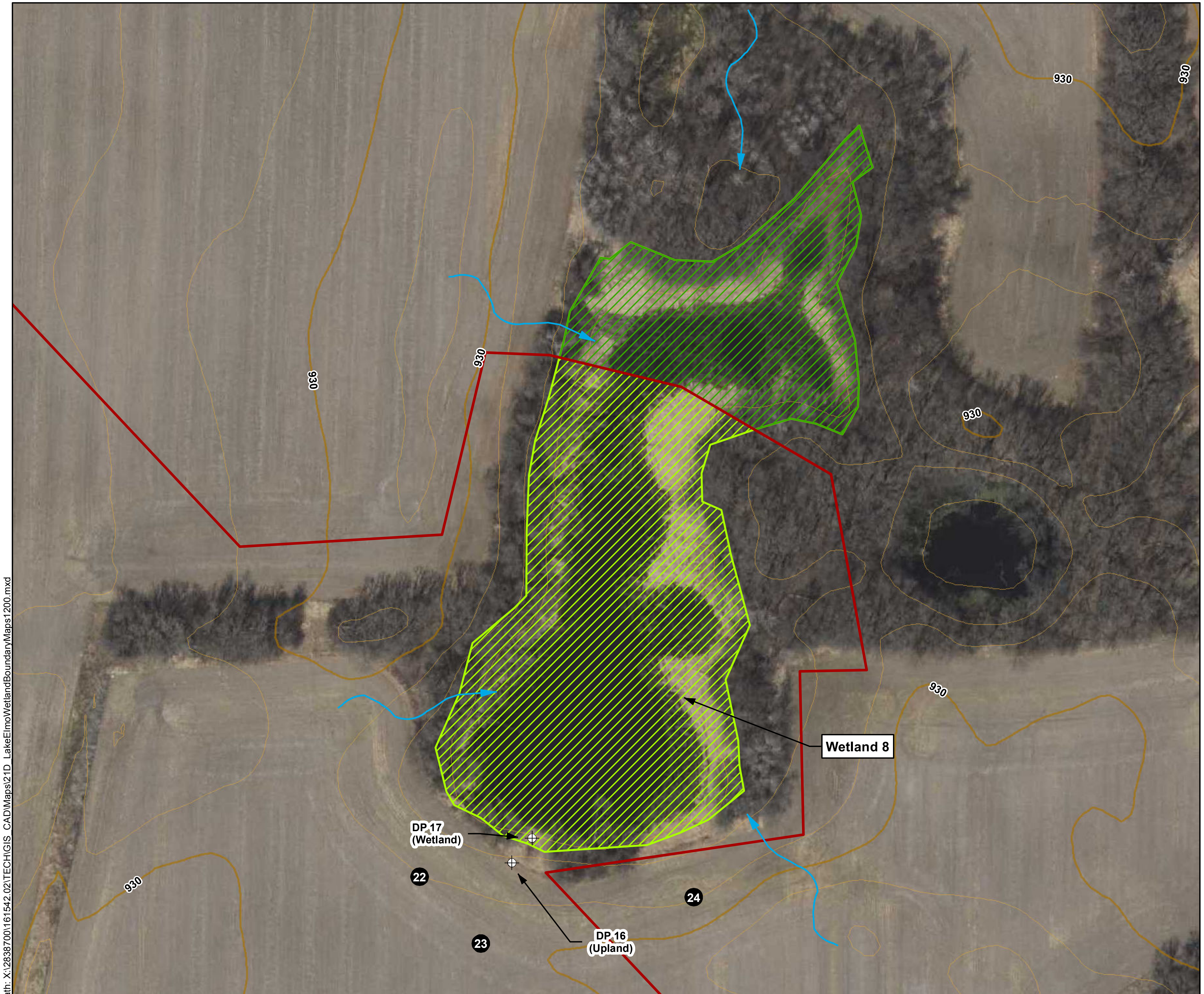
Map 3 of 6

Path: X:\2838700\161542.02\TECH\GIS_CAD\Maps\21D_LakeElmoWetlandBoundaryMaps1200.mxd

Wetland Boundary Map

LAKE ELMO AIRPORT

Proposed Runway 14-32 Runway Shift



Legend

- Photo Location
- Data Point Location
- Wetland Boundary
- Wetland within AOI
- Wetland outside AOI
- Culvert End Location
- Flow Direction
- Ditch/Swale Flow
- Area of Interest
- Airport Property Boundary

N

0 50 100 200 300 Feet

Elevation contour interval is 2 feet

Project Information

T29N, R20W, S18 and S19
City of Lake Elmo
Washington County, MN
Area of Interest = 130.1 acres
Field work conducted:
June 5 - 9, 2017

Mead & Hunt

Image Source: MnGEO WMS Image Service, Washington County (2016 color 7-county)
Contour Source: Minnesota Geospatial Commons, Minnesota Elevation Mapping Project Twin Cities Metro Region 2011

Map 4 of 6

Path: X:\283870\161542.02\TECH\GIS_CADMaps\21D_LakeElmoWetlandBoundaryMaps1200.mxd

Wetland Boundary Map

LAKE ELMO AIRPORT

Proposed Runway 14-32 Runway Shift

Path: X:\283870\161542.02\TECH\GIS_CAD\Maps\21D_LakeElmoWetlandBoundaryMaps1200.mxd

Legend

- Photo Location
- Data Point Location
- Wetland Boundary
- Wetland within AOI
- Wetland outside AOI
- Culvert End Location
- Flow Direction
- Ditch/Swale Flow
- Area of Interest
- Airport Property Boundary

N

0 50 100 200 300 400 500 600 700 Feet

Elevation contour interval is 2 feet

Project Information

T29N, R20W, S18 and S19
City of Lake Elmo
Washington County, MN
Area of Interest = 130.1 acres
Field work conducted:
June 5 - 9, 2017

Mead & Hunt

Image Source: MnGEO WMS Image Service, Washington County (2016 color 7-county)
Contour Source: Minnesota Geospatial Commons, Minnesota Elevation Mapping Project Twin Cities Metro Region 2011

Map 5 of 6

Wetland Boundary Map

LAKE ELMO AIRPORT

Proposed Runway 14-32 Runway Shift

Legend

- Photo Location
- Data Point Location
- Wetland Boundary
- Wetland within AOI
- Wetland outside AOI
- Culvert End Location
- Flow Direction
- Ditch/Swale Flow
- Area of Interest
- Airport Property Boundary

N

0 50 100 200 300 Feet

Elevation contour interval is 2 feet

Project Information

T29N, R20W, S18 and S19
City of Lake Elmo
Washington County, MN
Area of Interest = 130.1 acres
Field work conducted:
June 5 - 9, 2017

Mead & Hunt

Image Source: MnGEO WMS Image Service, Washington County (2016 color 7-county)
Contour Source:
Minnesota Geospatial Commons,
Minnesota Elevation Mapping Project
Twin Cities Metro Region 2011

Map 6 of 6

Appendix G. Data Sheets with Field Photographs

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Lake Elmo airport (21D) Runway 14/32 Relocation City/County: Washington Sampling Date: 6/5/2017
Applicant/Owner: Metropolitan Airports Commission State: Minnesota Sample Point: DP1
Investigator(s): Brauna Hartzell and Kim Shannon, Mead & Hunt, Inc. Section, Township, Range: Section 19, T29N, R20W
Landform (hillslope, terrace, etc.): Depression Local relief (concave, convex, none): Concave Slope (%): <1%
Subregion (LRR or MLRA): K/153 Lat: 44.9916 ° N Long: 92.8528 ° W Datum: WGS 84
Soil Map Unit Name: Crystal Lake silt loam, 1 to 3 percent slopes NWI classification: PEMA
Are climatic hydrologic conditions on the site typical for this time of year? Yes ☐ No ☒ (If no, explain in Remarks.)
Are Vegetation ☒, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? **Yes** ☒ **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 ☐	**Is the Sampled Area within a Wetland?** **Yes** ☒ **No** ☐
Hydric Soil Present?	Yes ☒	No ☐	
Wetland Hydrology Present?	Yes ☒	No ☐	If yes, optional Wetland Side ID: 1

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

VEGETATION - Use scientific names of plants

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
Herb Stratum (Plot size: 5 ft)			
1. *Phalaris arundinacea*	96	X	FACW
2. *Urtica dioica*	3		FAC
3. *Cirsium arvense*	1		FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	100	= Total Cover	
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
		= Total Cover	

Remarks: (Include photo numbers here or on a separate sheet.) Hydrophytic vegetation is present. Data point is located within the wetland fringe at about same elevation as Data Point 2 (upland) and about 20 feet to the east.

50/20 Thresholds	20%	50%
Tree Stratum		
Sapling/Shrub Stratum		
Herb Stratum	20	50
Woody Vine Stratum		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)
Total Number of Dominant Species Across All Strata: 1 (B)
Percent of Dominant Species That Are OBI, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species	96	x 2 = 192
FAC species	3	x 3 = 9
FACU species	1	x 4 = 4
UPL species		x 5 =
Column Totals:	100 (A)	205 (B)

Prevalence Index = B/A = 2.05

Hydrophytic Vegetation Indicators:

☒ Rapid Test for Hydrophytic Vegetation
☒ Dominance Test is >50%
☒ Prevalence Index is ≤3.0[1]
☐ Morphological Adaptations' (Provide supporting data in Remarks or on a separate sheet)
☐ Problematic Hydrophytic Vegetation' (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 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 ☐

SOIL

Sampling Point: 1

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
0-11	10YR 2/2	95	2.5YR 4/6	5	C	PL	Silt loam	PL = oxidized rhizospheres
11-18	10YR 4/1	96	7.5YR 4/6	4	C	C, PL	Silt loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☒ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ☐ Polyvalue Below Surface (S8) **(LRR R, MLRA 149 B)**
- ☐ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ☐ 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)

[3]1Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Indicators for Problematic Hydric

- ☐ 2 cm Muck - (A10) **(LRR K, L, MLRA 149B)**
- ☐ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ☐ 5 cm Peat or Mucky Peat (S3) **(LRR K, L, R)**
- ☐ Dark Surface (S7) **(LRR K, L)**
- ☐ Polyvalue Below Surface (S8) **(LRR K, L)**
- ☐ Thin Dark Surface (S9) **(LRR K, L)**
- ☐ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ☐ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ☒ No ☐

Remarks: Hydric soils are present. Meets hydric soils criteria Depleted Below Dark Surface (A11) and Redox Dark Surface (F6).

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)
- ☐ FAC-Neutral Test (D5)
- ☐ Microtopographic Relief (D4)

Field Observations:

Surface Water Present?	Yes ☐	No ☒	Depth (inches): _____
Water Table Present?	Yes ☐	No ☒	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes ☐	No ☒	Depth (inches): _____

Indicators of Wetland Hydrology Present? Yes ☒ No ☐

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

Remarks: Wetland hydrology is present. Data point in a concave surface within wetland fringe vegetation of a shallow marsh.

Photo:

Data Point 1

Photo 1. View to the east.

Photo 2. General site, view to the east.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Lake Elmo airport (21D) Runway 14/32 Relocation City/County: Washington Sampling Date: 6/5/2017

Applicant/Owner: Metropolitan Airports Commission State: Minnesota Sample Point: DP2

Investigator(s): Brauna Hartzell and Kim Shannon, Mead & Hunt, Inc. Section, Township, Range: Section 19, T29N, R20W

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

Subregion (LRR or MLRA): K/153 Lat: 44.9917° N Long: 92.8529° W Datum: WGS 84

Soil Map Unit Name: Crystal Lake silt loam, 1 to 3 percent slopes NWI classification: ______

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

Are Vegetation ☒, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? **Yes** ☐ **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 ☒	**Is the Sampled Area within a Wetland?** **Yes** ☐ **No** ☒
Hydric Soil Present?	Yes ☒	No ☐	If yes, optional Wetland Side ID: _____
Wetland Hydrology Present?	Yes ☐	No ☒	

Remarks: (Explain alternative procedures here or in a separate report.) A WETS analysis of the antecedent precipitation indicates the hydrologic conditions on the site were wetter than normal range at the time of investigation. Data point located in a plowed, recently planted field with beans.

VEGETATION - Use scientific names of plants

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
Herb Stratum (Plot size: 5 ft)			
1. *Glycine max*	5	X	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	5	= Total Cover	
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
		= Total Cover	

Remarks: (Include photo numbers here or on a separate sheet.) Hydrophytic vegetation is not present. Data Point located at edge of farm field recently planted with soy beans; at about same elevation as Data Point 1 (wetland) and about 20 feet to the west. Soil mostly unvegetated (95%).

50/20 Thresholds	20%	50%
Tree Stratum	_____	_____
Sapling/Shrub Stratum	_____	_____
Herb Stratum	_____	_____
Woody Vine Stratum	_____	_____

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 OBI, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

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

Prevalence Index = B/A = 4.0

Hydrophytic Vegetation Indicators:

☐ Rapid Test for Hydrophytic Vegetation

☐ Dominance Test is >50%

☐ Prevalence Index is ≤3.0[1]

☐ Morphological Adaptations' (Provide supporting data in Remarks or on a separate sheet)

☐ Problematic Hydrophytic Vegetation' (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 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 ☒

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
0-4	10YR 3/2	99	7.5YR 4/6	1	C	M	Silt loam	
4-10	10YR 3/2	90	7.5YR 4/6	10	C	M	Silt loam	
11-16	10YR 5/2	94	7.5YR 4/6	6	C	M	Silt loam	
16-20	10YR 4/4	100					Silt loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☒ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ☐ Polyvalue Below Surface (S8) **(LRR R, MLRA 149 B)**
- ☐ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ☐ 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)

[3]1Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Indicators for Problematic Hydric

- ☐ 2 cm Muck - (A10) **(LRR K, L, MLRA 149B)**
- ☐ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ☐ 5 cm Peat or Mucky Peat (S3) **(LRR K, L, R)**
- ☐ Dark Surface (S7) **(LRR K, L)**
- ☐ Polyvalue Below Surface (S8) **(LRR K, L)**
- ☐ Thin Dark Surface (S9) **(LRR K, L)**
- ☐ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ☐ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ☒ No ☐

Remarks: Hydric soils are present. Meets hydric soils criteria Depleted Below Dark Surface (A11) and Redox Dark Surface (F6).

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)
- ☐ FAC-Neutral Test (D5)
- ☐ Microtopographic Relief (D4)

Field Observations:

Surface Water Present?	Yes ☐	No ☒	Depth (inches): _____
Water Table Present?	Yes ☐	No ☒	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes ☐	No ☒	Depth (inches): _____

Indicators of Wetland Hydrology Present? Yes ☐ No ☒

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

Remarks: Wetland hydrology is neither present nor indicated. Some collection of corn cobs and stalks adjacent to wetland vegetation but random nature indicates not a result of water flow, perhaps more a result of wind.

Photo:

Data Point 2

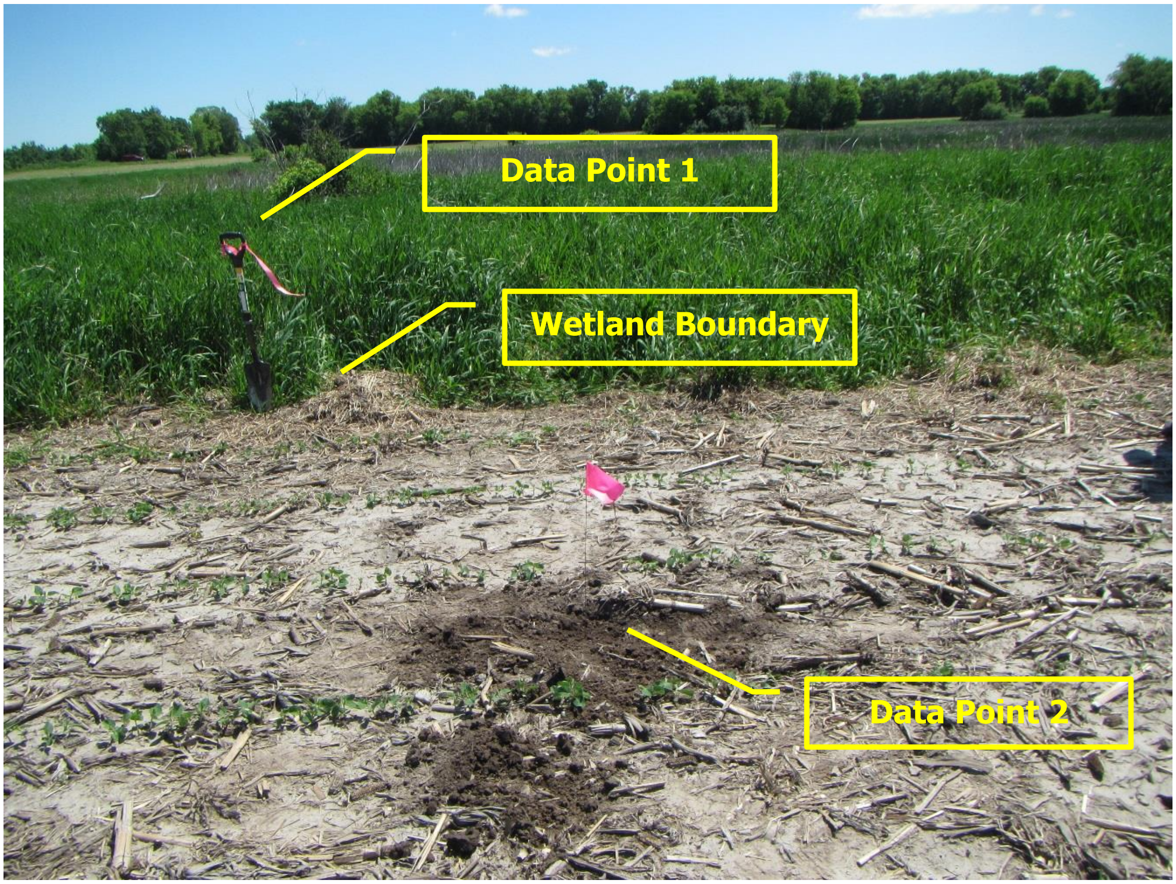


Photo 3. View to the east.

Photo 4. Wetland 1, view to the north.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Lake Elmo airport (21D) Runway 14/32 Relocation City/County: Washington Sampling Date: 6/5/2017

Applicant/Owner: Metropolitan Airports Commission State: Minnesota Sample Point: DP3

Investigator(s): Brauna Hartzell and Kim Shannon, Mead & Hunt, Inc. Section, Township, Range: Section 19, T29N, R20W

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

Subregion (LRR or MLRA): K/153 Lat: 44.9922° N Long: 92.8525° W Datum: WGS 84

Soil Map Unit Name: Comstock silt loam NWI classification: PEM1A

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

Are Vegetation ☒, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? **Yes** ☐ **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 ☐	**Is the Sampled Area within a Wetland?** **Yes** ☒ **No** ☐
Hydric Soil Present?	Yes ☒	No ☐	
Wetland Hydrology Present?	Yes ☒	No ☐	If yes, optional Wetland Side ID: 1

Remarks: (Explain alternative procedures here or in a separate report.) A WETS analysis of the antecedent precipitation indicates the hydrologic conditions on the site were wetter than normal range at the time of investigation. Absence of vegetation due to inundation/ponding and long-term cultivation. Farm field recently planted to soy beans.

VEGETATION - Use scientific names of plants

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
Herb Stratum (Plot size: 5ft)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
		= Total Cover	
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
		= Total Cover	

Remarks: (Include photo numbers here or on a separate sheet.) Bare concave surface, unidentifiable grass shoots, cracked soils, drift lines 25ft to south; About 30 ft separates data point and paired upland point (DP4) with very slight elevation change between. Hydrophytic vegetation would be supported as evidenced by wet signatures on historical aerial photography in 60% of images and close proximity of wetland vegetation (see DP1 and 5). Indicators of hydric soil and wetland hydrology are present.

50/20 Thresholds	20%	50%
Tree Stratum		
Sapling/Shrub Stratum		
Herb Stratum		
Woody Vine Stratum		

Dominance Test worksheet:

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

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

Percent of Dominant Species That Are OBI, FACW, or FAC: ____ (A/B)

Prevalence Index worksheet:

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

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

- ☐ Rapid Test for Hydrophytic Vegetation
- ☐ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations' (Provide supporting data in Remarks or on a separate sheet)
- ☒ Problematic Hydrophytic Vegetation' (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 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 ☐

SOIL

Sampling Point: DP3

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

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-10	10YR 3/2	96	7.5YR 5/6	4	C	M	Silt loam	
10-16	10YR 5/2	65	7.5YR 5/6	34	C	M	Silt loam	
			7.5YR 2.5/1	1	C	PL	Silt loam	
16-18	10YR 4/4	50					Silt loam	
	10YR 5/8	50					Silt loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☒ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ☐ Polyvalue Below Surface (S8) **(LRR R, MLRA 149 B)**
- ☐ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ☐ 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)

[3]1Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Indicators for Problematic Hydric

- ☐ 2 cm Muck - (A10) **(LRR K, L, MLRA 149B)**
- ☐ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ☐ 5 cm Peat or Mucky Peat (S3) **(LRR K, L, R)**
- ☐ Dark Surface (S7) **(LRR K, L)**
- ☐ Polyvalue Below Surface (S8) **(LRR K, L)**
- ☐ Thin Dark Surface (S9) **(LRR K, L)**
- ☐ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ☐ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ☒ No ☐

Remarks: Hydric soils are present. Meets hydric soils criterion Depleted Below Dark Surface (A11).

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)
- ☐ FAC-Neutral Test (D5)
- ☐ Microtopographic Relief (D4)

Field Observations:

Surface Water Present?	Yes ☐	No ☒	Depth (inches): _____
Water Table Present?	Yes ☐	No ☒	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes ☐	No ☒	Depth (inches): _____

Indicators of Wetland Hydrology Present? Yes ☒ No ☐

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

Remarks: Wetland hydrology is indicated. Dry, cracked soil surface; old corn stalks water stained; drifting corn debris pushed against wetland fringe vegetation; planted soy beans dead or stressed within boundary; soil sparsely vegetated; wet signatures on historical aerial photography in 60% of images.

Photo:

Data Points 3 and 4

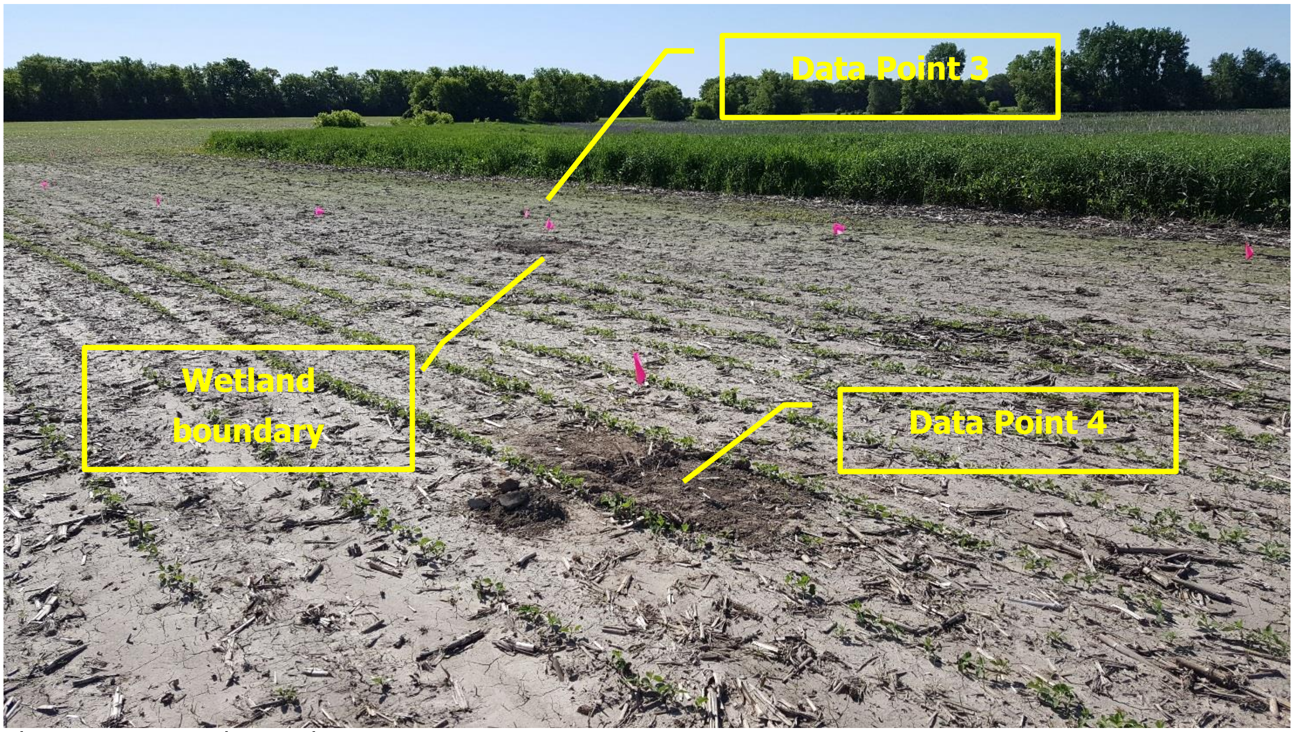


Photo 5. View to the southeast.

Photo 6. Drift deposits near Data Point 3. View to the east.

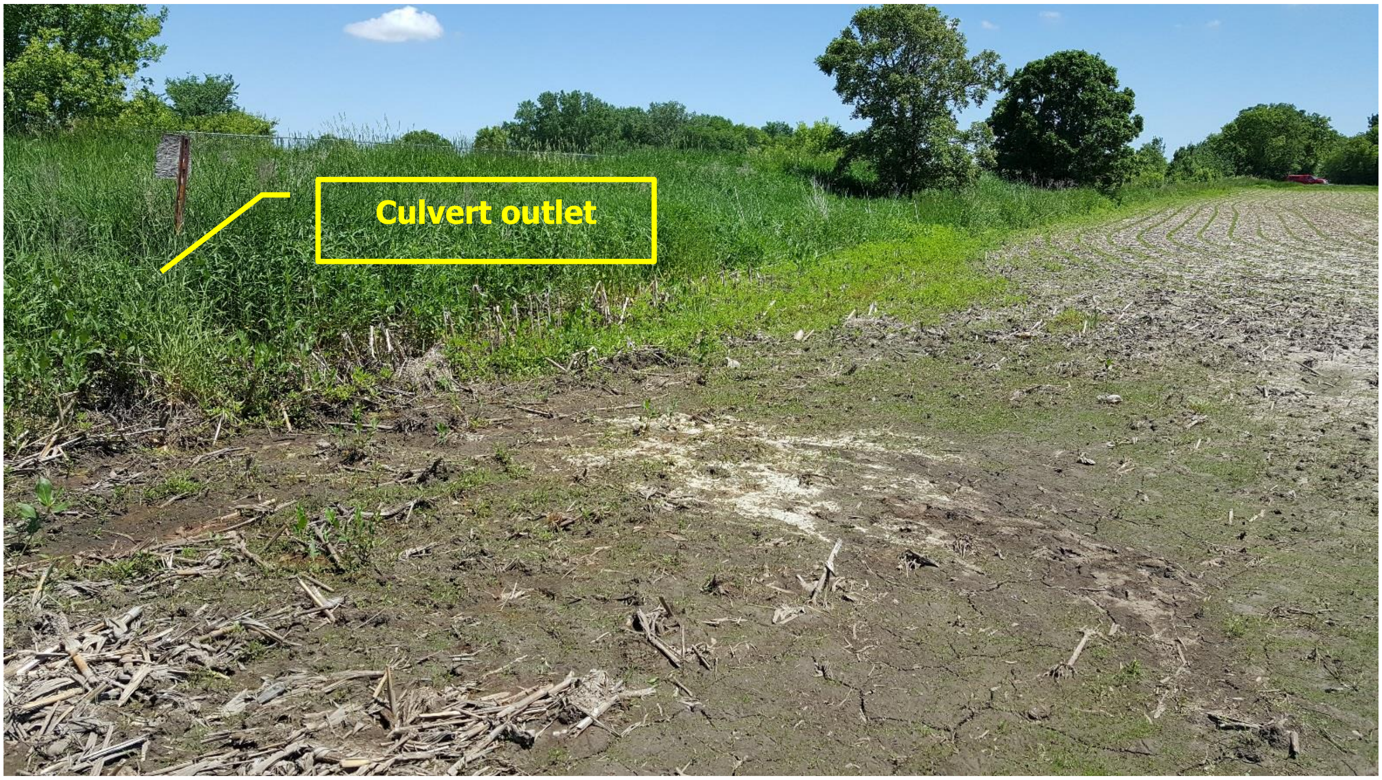


Photo 7. Bare and cracked soils near culvert outlet under 30th Street. View to the east.

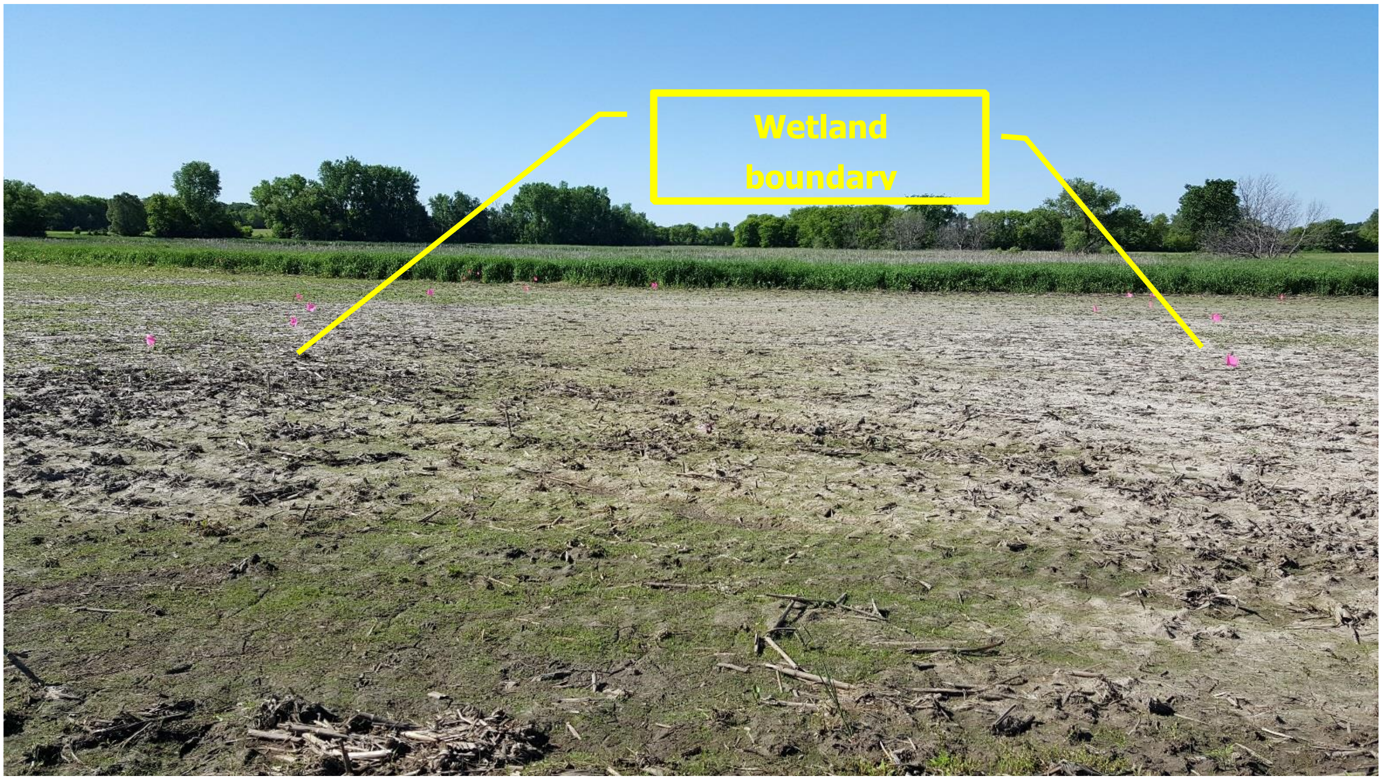


Photo 8. Wetland 1, view to the south. View taken within wetland boundary.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Lake Elmo Airport (21D) Runway 14/32 Relocation City/County: Washington Sampling Date: 6/5/2017
Applicant/Owner: Metropolitan Airports Commission State: Minnesota Sample Point: DP4
Investigator(s): Brauna Hartzell and Kim Shannon, Mead & Hunt, Inc. Section, Township, Range: Section 19, T29N, R20W
Landform (hillslope, terrace, etc.): footslope Local relief (concave, convex, none): none Slope (%): <1%
Subregion (LRR or MLRA): K/153 Lat: 44.9922° N Long: 92.8526° W Datum: WGS 84
Soil Map Unit Name: Comstock silt loam NWI classification: ____
Are climatic hydrologic conditions on the site typical for this time of year? Yes ☐ No ☒ (If no, explain in Remarks.)
Are Vegetation ☒, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? **Yes** ☐ **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 ☒	**Is the Sampled Area within a Wetland?** Yes ☐ No ☒
Hydric Soil Present?	Yes ☒	No ☐	
Wetland Hydrology Present?	Yes ☐	No ☒	If yes, optional Wetland Side ID: ____

Remarks: (Explain alternative procedures here or in a separate report.) A WETS analysis of the antecedent precipitation indicates the hydrologic conditions on the site were wetter than normal range at the time of investigation. Vegetation disturbed due to long-term cultivation; farm field planted to soy beans.

VEGETATION - Use scientific names of plants

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
Herb Stratum (Plot size: 5ft)			
1. *Glycine max*	6	X	UPL
2. *Persicaria amphibia*	2	X	OBL
3. *Ambrosia trifida*	1		FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	9	= Total Cover	
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
		= Total Cover	

Remarks: (Include photo numbers here or on a separate sheet.) Farmed field; no stressed vegetation; no cracking soil; no drift lines; soy beans present. About 30 feet separates data point from paired wetland data point (DP 3) with very slight elevation change between; Fails Prevalence Index at 3.89.

50/20 Thresholds	20%	50%
Tree Stratum		
Sapling/Shrub Stratum		
Herb Stratum	2	4.5
Woody Vine Stratum		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)
Total Number of Dominant Species Across All Strata: 2 (B)
Percent of Dominant Species That Are OBI, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	2	x 1 = 2
FACW species		x 2 =
FAC species	1	x 3 = 3
FACU species		x 4 =
UPL species	6	x 5 = 30
Column Totals:	9 (A)	35 (B)

Prevalence Index = B/A = 3.89

Hydrophytic Vegetation Indicators:

- ☐ Rapid Test for Hydrophytic Vegetation
- ☐ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations' (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation' (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 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 ☒

SOIL

Sampling Point: DP4

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
0-10	10YR 3/2	96	7.5YR 4/6	4	C	M	Silt loam	
10-16	10YR 5/2	90	7.5YR 4/6	4	C	M	Silt loam	
			7.5YR 4/1	6	C	M	Silt loam	
16-18	10YR 4/4	100					Silt loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☒ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ☐ Polyvalue Below Surface (S8) **(LRR R, MLRA 149 B)**
- ☐ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ☐ 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)

Indicators for Problematic Hydric

- ☐ 2 cm Muck - (A10) **(LRR K, L, MLRA 149B)**
- ☐ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ☐ 5 cm Peat or Mucky Peat (S3) **(LRR K, L, R)**
- ☐ Dark Surface (S7) **(LRR K, L)**
- ☐ Polyvalue Below Surface (S8) **(LRR K, L)**
- ☐ Thin Dark Surface (S9) **(LRR K, L)**
- ☐ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ☐ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]1Indicators 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** ☐

Remarks: Hydric soils are present. Meets hydric soils criterion Depleted Below Dark Surface (A11).

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)
- ☐ FAC-Neutral Test (D5)
- ☐ Microtopographic Relief (D4)

Field Observations:

Surface Water Present?	Yes ☐	No ☒	Depth (inches): _____
Water Table Present?	Yes ☐	No ☒	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes ☐	No ☒	Depth (inches): _____

Indicators of Wetland Hydrology Present? Yes ☐ **No** ☒

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

Remarks: Wetland hydrology is neither present nor indicated.

Photo:

Data Points 3 and 4

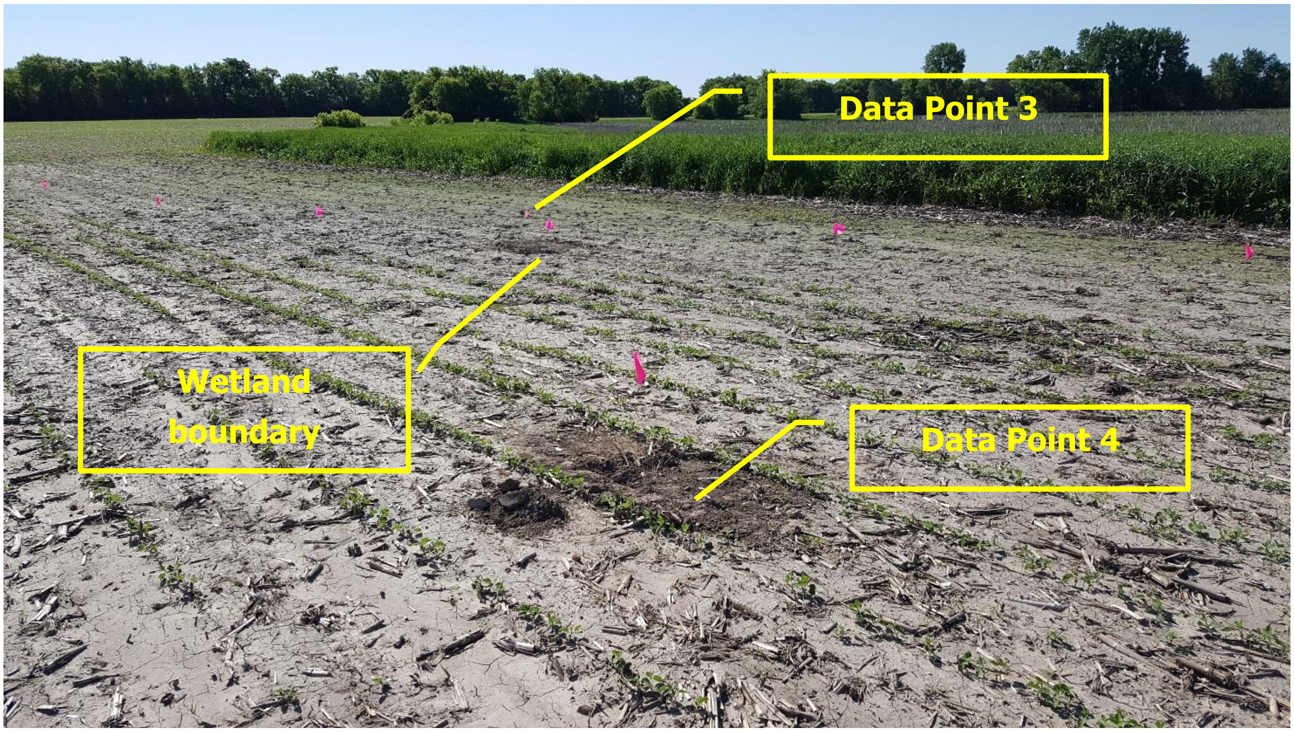


Photo 5. View to the southeast.

See additional photos on Data Point 3.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Lake Elmo airport (21D) Runway 14/32 Relocation City/County: Washington Sampling Date: 6/5/2017
Applicant/Owner: Metropolitan Airports Commission State: Minnesota Sample Point: DP5
Investigator(s): Brauna Hartzell and Kim Shannon, Mead & Hunt, Inc. Section, Township, Range: Section 19, T29N, R20W
Landform (hillslope, terrace, etc.): depression Local relief (concave, convex, none): concave Slope (%): 1%
Subregion (LRR or MLRA): K/153 Lat: 44.9906° N Long: 92.8499° W Datum: WGS 84
Soil Map Unit Name: Aquolls and Histosols, ponded NWI classification: PEMA
Are climatic hydrologic conditions on the site typical for this time of year? Yes ☐ No ☒ (If no, explain in Remarks.)
Are Vegetation ☒, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? **Yes** ☒ **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 ☐	**Is the Sampled Area within a Wetland?** **Yes** ☒ **No** ☐
Hydric Soil Present?	Yes ☒	No ☐	
Wetland Hydrology Present?	Yes ☒	No ☐	If yes, optional Wetland Side ID: 1

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

VEGETATION - Use scientific names of plants

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
Herb Stratum (Plot size: 5ft)			
1. *Phalaris arundinacea*	95	X	FACW
2. *Persicaria amphibia*	2		OBL
3. *Cirsium arvense*	1		FACU
4. *Urtica dioica*	2		FAC
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	100	= Total Cover	
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
		= Total Cover	

Remarks: (Include photo numbers here or on a separate sheet.) Hydrophytic vegetation is present. Data Point in fringe vegetation of shallow marsh; also *Typha angustifolia* present 15 ft to west. About 40 feet separates this data point and its paired upland point (DP 6) and is about 3 feet lower in elevation.

50/20 Thresholds	20%	50%
Tree Stratum	____	____
Sapling/Shrub Stratum	____	____
Herb Stratum	20	50
Woody Vine Stratum	____	____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)
Total Number of Dominant Species Across All Strata: 1 (B)
Percent of Dominant Species That Are OBI, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	2	x 1 = 2
FACW species	95	x 2 = 190
FAC species	2	x 3 = 6
FACU species	1	x 4 = 4
UPL species	____	x 5 = ____
Column Totals:	100 (A)	202 (B)

Prevalence Index = B/A = 2.02

Hydrophytic Vegetation Indicators:

- ☒ Rapid Test for Hydrophytic Vegetation
- ☒ Dominance Test is >50%
- ☒ Prevalence Index is $\leq$3.0[1]
- ☐ Morphological Adaptations' (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation' (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 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 ☐

SOIL

Sampling Point: DP5

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

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 3/2	100					Silt loam	
4-12	10YR 4/1	95	7.5YR 4/6	5	C	PL	Silt loam	PL = oxidized rhizospheres
12-16	10YR 5/1	70	5YR 4/6	30	C	M	Silt loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☒ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ☐ Polyvalue Below Surface (S8) **(LRR R, MLRA 149 B)**
- ☐ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ☐ 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)

Indicators for Problematic Hydric

- ☐ 2 cm Muck - (A10) **(LRR K, L, MLRA 149B)**
- ☐ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ☐ 5 cm Peat or Mucky Peat (S3) **(LRR K, L, R)**
- ☐ Dark Surface (S7) **(LRR K, L)**
- ☐ Polyvalue Below Surface (S8) **(LRR K, L)**
- ☐ Thin Dark Surface (S9) **(LRR K, L)**
- ☐ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ☐ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]1Indicators 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** ☐

Remarks: Hydric soils are present. Meets hydric soils criteria Depleted Below Dark Surface (A11) and Depleted Matrix (F3)

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)
- ☒ FAC-Neutral Test (D5)
- ☐ Microtopographic Relief (D4)

Field Observations:

Surface Water Present?	Yes ☐	No ☒	Depth (inches): _____
Water Table Present?	Yes ☐	No ☒	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes ☐	No ☒	Depth (inches): _____

Indicators of Wetland Hydrology Present?
Yes ☒ **No** ☐

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

Remarks: Wetland hydrology is indicated. Data point in wetland fringe of depressional shallow marsh.

Photo:

Data Point 5

Photo 9. View to the west.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Lake Elmo Airport (21D) Runway 14/32 Relocation City/County: Washington Sampling Date: 6/5/2017
Applicant/Owner: Metropolitan Airports Commission State: Minnesota Sample Point: DP6
Investigator(s): Brauna Hartzell and Kim Shannon, Mead & Hunt, Inc. Section, Township, Range: Section 19, T29N, R20W
Landform (hillslope, terrace, etc.): shoulder Local relief (concave, convex, none): none Slope (%): <1%
Subregion (LRR or MLRA): K/153 Lat: 44.9907° N Long: 92.8497° W Datum: WGS 84
Soil Map Unit Name: Crystal Lake silt loam, 1 to 3 percent slopes NWI classification: ____
Are climatic hydrologic conditions on the site typical for this time of year? Yes ☐ No ☒ (If no, explain in Remarks.)
Are Vegetation ☒, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? **Yes** ☐ **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 ☒	**Is the Sampled Area within a Wetland?** **Yes** ☐ **No** ☒
Hydric Soil Present?	Yes ☐	No ☒	
Wetland Hydrology Present?	Yes ☐	No ☒	If yes, optional Wetland Side ID: _____

Remarks: (Explain alternative procedures here or in a separate report.) A WETS analysis of the antecedent precipitation indicates the hydrologic conditions on the site were wetter than normal range at the time of investigation. Vegetation disturbed due to long-term cultivation. Farm field planted to soy beans.

VEGETATION - Use scientific names of plants

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
Herb Stratum (Plot size: 5ft)			
1. *Glycine max*	8	X	UPL
2. *Acer negundo*	2	X	FACW
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	10	= Total Cover	
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
		= Total Cover	

Remarks: Hydrophytic vegetation is not present. Also immature milkweed (*Ascelpias syrica*) is present just outside of sampling area. About 40 feet separates this data point and its paired wetland point (DP 5); data point 6 is about 3 feet higher in elevation.

50/20 Thresholds	20%	50%
Tree Stratum		
Sapling/Shrub Stratum		
Herb Stratum	2	5
Woody Vine Stratum		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)
Total Number of Dominant Species Across All Strata: 2 (B)
Percent of Dominant Species That Are OBI, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	_____	x 1 = _____
FACW species	2	x 2 = 4
FAC species	_____	x 3 = _____
FACU species	_____	x 4 = _____
UPL species	8	x 5 = 40
Column Totals:	10 (A)	44 (B)

Prevalence Index = B/A = 4.4

Hydrophytic Vegetation Indicators:

- ☐ Rapid Test for Hydrophytic Vegetation
- ☐ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations' (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation' (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 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 ☒

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
0-16	10YR 3/3	100					Silt loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

☐ Histosol (A1)
☐ Histic Epipedon (A2)
☐ Black Histic (A3)
☐ Hydrogen Sulfide (A4)
☐ Stratified Layers (A5)
☐ Depleted Below Dark Surface (A11)
☐ Thick Dark Surface (A12)
☐ Sandy Mucky Mineral (S1)
☐ Sandy Gleyed Matrix (S4)
☐ Sandy Redox (S5)
☐ Stripped Matrix (S6)
☐ Dark Surface (S7) **(LRR R, MLRA 149B)**
☐ Polyvalue Below Surface (S8) **(LRR R, MLRA 149 B)**
☐ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
☐ 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)

Indicators for Problematic Hydric

☐ 2 cm Muck - (A10) **(LRR K, L, MLRA 149B)**
☐ Coast Prairie Redox (A16) **(LRR K, L, R)**
☐ 5 cm Peat or Mucky Peat (S3) **(LRR K, L, R)**
☐ Dark Surface (S7) **(LRR K, L)**
☐ Polyvalue Below Surface (S8) **(LRR K, L)**
☐ Thin Dark Surface (S9) **(LRR K, L)**
☐ Iron-Manganese Masses (F12) **(LRR K, L, R)**
☐ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
☐ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
☐ Red Parent Material (F21)
☐ Very Shallow Dark Surface (TF12)
☐ Other (Explain in Remarks)

[3]1Indicators 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** ☒

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

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)
☐ FAC-Neutral Test (D5)
☐ Microtopographic Relief (D4)

Field Observations:

Surface Water Present?	Yes ☐	No ☒	Depth (inches): _____
Water Table Present?	Yes ☐	No ☒	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes ☐	No ☒	Depth (inches): _____

Indicators of Wetland Hydrology Present? **Yes** ☐ **No** ☒

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

Remarks: Wetland hydrology is neither present nor indicated.

Photo:

Data Point 6

Photo 10. Soils at data point 6.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Lake Elmo airport (21D) Runway 14/32 Relocation City/County: Washington Sampling Date: 6/6/2017

Applicant/Owner: Metropolitan Airports Commission State: Minnesota Sample Point: DP7

Investigator(s): Brauna Hartzell and Kim Shannon, Mead & Hunt, Inc. Section, Township, Range: Section 19, T29N, R20W

Landform (hillslope, terrace, etc.): basin/depression Local relief (concave, convex, none): concave Slope (%): <1%

Subregion (LRR or MLRA): K/153 Lat: 44.9895° N Long: 92.8433° W Datum: WGS 84

Soil Map Unit Name: Chetek sandy loam, 12 to 25 percent slopes NWI classification: PEMB

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

Are Vegetation ☒, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? **Yes** ☒ **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 ☐	**Is the Sampled Area within a Wetland?** **Yes** ☒ **No** ☐
Hydric Soil Present?	Yes ☒	No ☐	
Wetland Hydrology Present?	Yes ☒	No ☐	If yes, optional Wetland Side ID: 2

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

VEGETATION - Use scientific names of plants

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
Herb Stratum (Plot size: 5ft)			
1. *Phalaris arundinacea*	100	X	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	100	= Total Cover	
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
		= Total Cover	

Remarks: (Include photo numbers here or on a separate sheet.) Hydrophytic vegetation is present. Data point located in shallow basin, dominated by reed canary grass. Saturation at surface at a number of test pits. Dead standing tree 15ft away; some stressed *Salix sp.* at edge of wetland. Data point located about 25 feet from paired upland data point and about 1 foot lower in elevation.

50/20 Thresholds

	20%	50%
Tree Stratum		
Sapling/Shrub Stratum		
Herb Stratum	20	50
Woody Vine Stratum		

Dominance Test worksheet:

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

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

Percent of Dominant Species That Are OBI, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species	100	x 2 = 200
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	100 (A)	200 (B)

Prevalence Index = B/A = 2.0

Hydrophytic Vegetation Indicators:

- ☒ Rapid Test for Hydrophytic Vegetation
- ☒ Dominance Test is >50%
- ☒ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations' (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation' (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 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 ☐

SOIL

Sampling Point: DP7

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

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	7.5YR 3/1	100					loam	
6-16	7.5YR 3/1	98	7.5YR 3/3	2	C	M	Loam	
16-22	10YR 4/3	100					Loam	With small gravel present

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ☐ Polyvalue Below Surface (S8) **(LRR R, MLRA 149 B)**
- ☐ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ☐ 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)

Indicators for Problematic Hydric

- ☐ 2 cm Muck - (A10) **(LRR K, L, MLRA 149B)**
- ☐ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ☐ 5 cm Peat or Mucky Peat (S3) **(LRR K, L, R)**
- ☐ Dark Surface (S7) **(LRR K, L)**
- ☐ Polyvalue Below Surface (S8) **(LRR K, L)**
- ☐ Thin Dark Surface (S9) **(LRR K, L)**
- ☐ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ☐ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]1Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed): at F6

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** ☒ **No** ☐

Remarks: Hydric soils are present. Meets hydric soils criterion Redox Dark Surface (F6).

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)
- ☒ FAC-Neutral Test (D5)
- ☐ Microtopographic Relief (D4)

Field Observations:

Surface Water Present?	Yes ☐	No ☒	Depth (inches): _____
Water Table Present?	Yes ☒	No ☐	Depth (inches): 10
Saturation Present? (includes capillary fringe)	Yes ☒	No ☐	Depth (inches): 2

Indicators of Wetland Hydrology Present? **Yes** ☒ **No** ☐

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

Remarks: Wetland hydrology is present and indicated. Dead standing tree about 15ft away indicates vegetative stress. Data point located in shallow depressional basin.

Photo:

Data Point 7

Photo 11. View to the south.

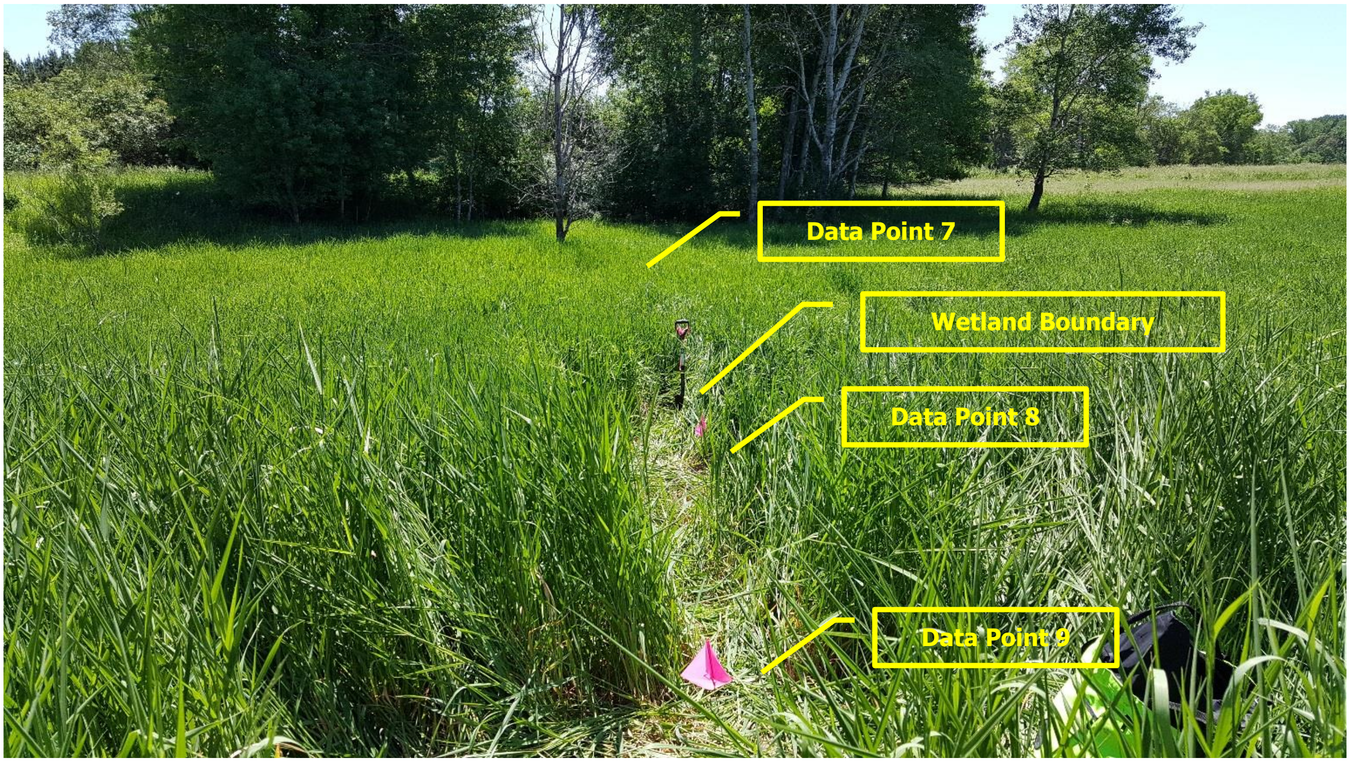


Photo 12. Data Points 7, 8 and 9. View to the south.

General Site

Photo 13. View to the south.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Lake Elmo airport (21D) Runway 14/32 Relocation City/County: Washington Sampling Date: 6/6/2017

Applicant/Owner: Metropolitan Airports Commission State: Minnesota Sample Point: DP8

Investigator(s): Brauna Hartzell and Kim Shannon, Mead & Hunt, Inc. Section, Township, Range: Section 19, T29N, R20W

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

Subregion (LRR or MLRA): K/153 Lat: 44.9896° N Long: 92.8434° W Datum: WGS 84

Soil Map Unit Name: Chetek sandy loam, 12 to 25 percent slopes NWI classification: ______

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

Are Vegetation ☒, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? **Yes** ☒ **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 ☐	**Is the Sampled Area within a Wetland?** **Yes** ☐ **No** ☒
Hydric Soil Present?	Yes ☐	No ☒	
Wetland Hydrology Present?	Yes ☒	No ☐	If yes, optional Wetland Side ID: _____

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

VEGETATION - Use scientific names of plants

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
Herb Stratum (Plot size: 5ft)			
1. *Phalaris arundinacea*	100	X	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	100	= Total Cover	
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
		= Total Cover	

Remarks: (Include photo numbers here or on a separate sheet.) Hydrophytic vegetation is present, dominated by reed canary grass cover; about 25-30 feet from paired wetland data point (DP7) but slightly higher, about 1 ft higher in elevation.

50/20 Thresholds	20%	50%
Tree Stratum		
Sapling/Shrub Stratum		
Herb Stratum	20	50
Woody Vine Stratum		

Dominance Test worksheet:

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

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

Percent of Dominant Species That Are OBI, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species	100	x 2 = 200
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	100 (A)	200 (B)

Prevalence Index = B/A = 2.0

Hydrophytic Vegetation Indicators:

- ☒ Rapid Test for Hydrophytic Vegetation
- ☒ Dominance Test is >50%
- ☒ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations' (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation' (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 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 ☐

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
0-10	7.5YR 3/1	100					loam	
10-20	7.5YR 3/1	99	7.5YR 3/3	1			loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ☐ Polyvalue Below Surface (S8) **(LRR R, MLRA 149 B)**
- ☐ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ☐ 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)

Indicators for Problematic Hydric

- ☐ 2 cm Muck - (A10) **(LRR K, L, MLRA 149B)**
- ☐ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ☐ 5 cm Peat or Mucky Peat (S3) **(LRR K, L, R)**
- ☐ Dark Surface (S7) **(LRR K, L)**
- ☐ Polyvalue Below Surface (S8) **(LRR K, L)**
- ☐ Thin Dark Surface (S9) **(LRR K, L)**
- ☐ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ☐ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]1Indicators 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 ☒

Remarks: Does not meet hydric soils criteria

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)
- ☒ FAC-Neutral Test (D5)
- ☐ Microtopographic Relief (D4)

Field Observations:

Surface Water Present?	Yes ☐	No ☒	Depth (inches): _____
Water Table Present?	Yes ☐	No ☒	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes ☒	No ☐	Depth (inches): 8

Indicators of Wetland Hydrology Present? **Yes ☒ No ☐**

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

Remarks: Wetland hydrology is present. Soil saturated to 8 inches in depth but no water table present.

Photo: See photos on data sheet for data point 7 (wetland).

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Lake Elmo airport (21D) Runway 14/32 Relocation City/County: Washington Sampling Date: 6/6/2017

Applicant/Owner: Metropolitan Airports Commission State: Minnesota Sample Point: DP9

Investigator(s): Brauna Hartzell and Kim Shannon, Mead & Hunt, Inc. Section, Township, Range: Section 19, T29N, R20W

Landform (hillslope, terrace, etc.): basin slope Local relief (concave, convex, none): convex Slope (%): 3%

Subregion (LRR or MLRA): K/153 Lat: 44.9897° N Long: 92.8435° W Datum: WGS 84

Soil Map Unit Name: Chetek sandy loam, 12 to 25 percent slopes NWI classification: ____

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

Are Vegetation ☒, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? **Yes** ☒ **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 ☐	**Is the Sampled Area within a Wetland?** **Yes** ☐ **No** ☒
Hydric Soil Present?	Yes ☐	No ☒	
Wetland Hydrology Present?	Yes ☐	No ☒	If yes, optional Wetland Side ID: ____

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

VEGETATION - Use scientific names of plants

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
Herb Stratum (Plot size: 5ft)			
1. *Phalaris arundinacea*	98	X	FACW
2. *Bromus inermis*	1		UPL
3. *Poa pratensis*	1		FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	100	= Total Cover	
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
		= Total Cover	

Remarks: (Include photo numbers here or on a separate sheet.) Hydrophytic vegetation is present. DP9 is about 3 feet higher than upland data point (DP8) and about 15ft away. Topographic break between data points 8 and 9.

50/20 Thresholds	20%	50%
Tree Stratum	____	____
Sapling/Shrub Stratum	____	____
Herb Stratum	20	50
Woody Vine Stratum	____	____

Dominance Test worksheet:

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

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

Percent of Dominant Species That Are OBI, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	98	x 2 = 196
FAC species	____	x 3 = ____
FACU species	1	x 4 = 4
UPL species	1	x 5 = 5
Column Totals:	100 (A)	205 (B)

Prevalence Index = B/A = 2.05

Hydrophytic Vegetation Indicators:

- ☒ Rapid Test for Hydrophytic Vegetation
- ☒ Dominance Test is >50%
- ☒ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations' (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation' (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 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 ☐

SOIL

Sampling Point: DP9

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

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 3/4	100					loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

☐ Histosol (A1)
☐ Histic Epipedon (A2)
☐ Black Histic (A3)
☐ Hydrogen Sulfide (A4)
☐ Stratified Layers (A5)
☐ Depleted Below Dark Surface (A11)
☐ Thick Dark Surface (A12)
☐ Sandy Mucky Mineral (S1)
☐ Sandy Gleyed Matrix (S4)
☐ Sandy Redox (S5)
☐ Stripped Matrix (S6)
☐ Dark Surface (S7) **(LRR R, MLRA 149B)**
☐ Polyvalue Below Surface (S8) **(LRR R, MLRA 149 B)**
☐ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
☐ 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)

Indicators for Problematic Hydric

☐ 2 cm Muck - (A10) **(LRR K, L, MLRA 149B)**
☐ Coast Prairie Redox (A16) **(LRR K, L, R)**
☐ 5 cm Peat or Mucky Peat (S3) **(LRR K, L, R)**
☐ Dark Surface (S7) **(LRR K, L)**
☐ Polyvalue Below Surface (S8) **(LRR K, L)**
☐ Thin Dark Surface (S9) **(LRR K, L)**
☐ Iron-Manganese Masses (F12) **(LRR K, L, R)**
☐ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
☐ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
☐ Red Parent Material (F21)
☐ Very Shallow Dark Surface (TF12)
☐ Other (Explain in Remarks)

[3]1Indicators 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** ☒

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

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)
☐ FAC-Neutral Test (D5)
☐ Microtopographic Relief (D4)

Field Observations:

Surface Water Present?	Yes ☐	No ☒	Depth (inches): _____
Water Table Present?	Yes ☐	No ☒	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes ☐	No ☒	Depth (inches): _____

Indicators of Wetland Hydrology Present? **Yes** ☐ **No** ☒

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

Remarks: Wetland hydrology is not present.

Photo: See photos on data sheet for data point 7 (wetland).

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Lake Elmo airport (21D) Runway 14/32 Relocation City/County: Washington Sampling Date: 6/7/2017

Applicant/Owner: Metropolitan Airports Commission State: Minnesota Sample Point: DP10

Investigator(s): Brauna Hartzell and Kim Shannon, Mead & Hunt, Inc. Section, Township, Range: Section 18, T29N, R20W

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

Subregion (LRR or MLRA): K/153 Lat: 45.00164° N Long: 92.85113° W Datum: WGS 84

Soil Map Unit Name: Antigo silt loam, 2 to 6 percent slopes NWI classification: PEMB

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

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? **Yes** ☒ **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 ☐	**Is the Sampled Area within a Wetland?** **Yes** ☒ **No** ☐
Hydric Soil Present?	Yes ☒	No ☐	
Wetland Hydrology Present?	Yes ☒	No ☐	If yes, optional Wetland Side ID: 3

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

VEGETATION - Use scientific names of plants

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
Herb Stratum (Plot size: 5ft)			
1. *Ranunculus acris*	35	X	FAC
2. *Equisetum arvense*	60	X	FAC
3. *Carex scoparia*	30	X	FACW
4. *Prunella vulgaris*	5		FAC
5. *Juncus tenuis*	3		FAC
6. *Poa pratensis*	2		FACU
7. *Stellaria graminea*	1		UPL
8.			
9.			
10.			
11.			
12.			
	136	= Total Cover	
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
		= Total Cover	

Remarks: (Include photo numbers here or on a separate sheet.) Data point in shallow basin as base of hill. A few old tracks present with bare spots; iron staining in some. Disturbance is minimal. *Carex lanuginosa, C. vulpinoidea, Eleocharis* sp., and sphagnum moss also present.

50/20 Thresholds	20%	50%
Tree Stratum		
Sapling/Shrub Stratum		
Herb Stratum	27	68
Woody Vine Stratum		

Dominance Test worksheet:

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

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

Percent of Dominant Species That Are OBI, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species	30	x 2 = 60
FAC species	103	x 3 = 309
FACU species	2	x 4 = 8
UPL species	1	x 5 = 5
Column Totals:	136 (A)	382 (B)

Prevalence Index = B/A = 2.80

Hydrophytic Vegetation Indicators:

- ☐ Rapid Test for Hydrophytic Vegetation
- ☒ Dominance Test is >50%
- ☒ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations' (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation' (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 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 ☐

SOIL

Sampling Point: DP10

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

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-4	5YR 3/1	97	5YR 4/6	3	C	PL	Sandy loam	
4-16	5YR 4/2	96	5YR 4/6	4	C	M	Sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☒ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ☐ Polyvalue Below Surface (S8) **(LRR R, MLRA 149 B)**
- ☐ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ☐ 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)

[3]1ndicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Indicators for Problematic Hydric

- ☐ 2 cm Muck - (A10) **(LRR K, L, MLRA 149B)**
- ☐ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ☐ 5 cm Peat or Mucky Peat (S3) **(LRR K, L, R)**
- ☐ Dark Surface (S7) **(LRR K, L)**
- ☐ Polyvalue Below Surface (S8) **(LRR K, L)**
- ☐ Thin Dark Surface (S9) **(LRR K, L)**
- ☐ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ☐ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ☒ No ☐

Remarks: Hydric soils are present. Meets hydric soils criteria Sandy Redox (S5) and Redox Dark Surface (F6)

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)
- ☐ FAC-Neutral Test (D5)
- ☐ Microtopographic Relief (D4)

Field Observations:

Surface Water Present?	Yes ☐	No ☒	Depth (inches): _____
Water Table Present?	Yes ☐	No ☒	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes ☒	No ☐	Depth (inches): 0

Indicators of Wetland Hydrology Present? Yes ☒ No ☐

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

Remarks: Wetland hydrology is present and indicated. Data point located in depressional area at base of slope.

Photo:

Data Points 10 and 11

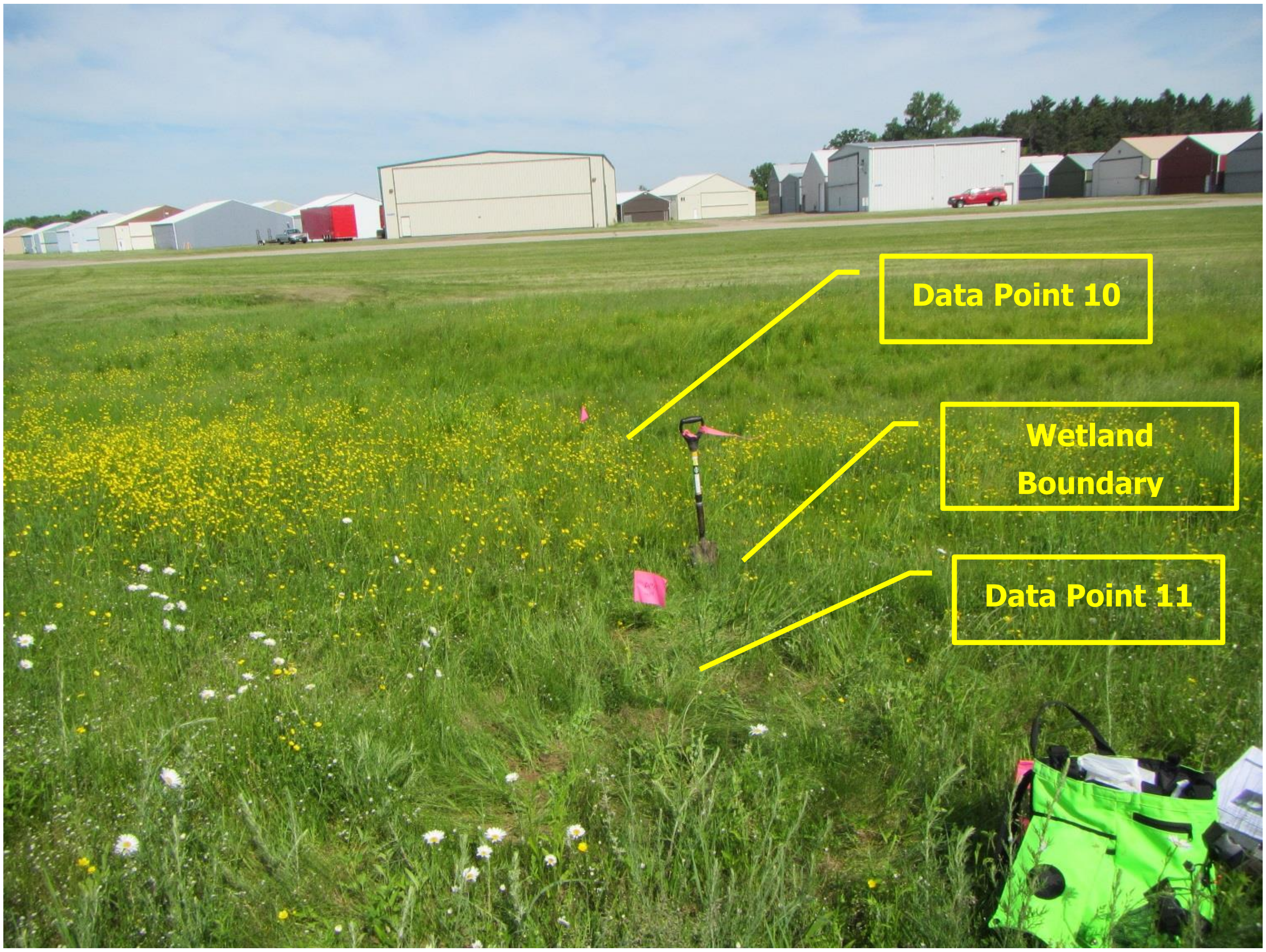


Photo 14. View to the west.

Photo 15. Wetland 3, view to the north.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Lake Elmo airport (21D) Runway 14/32 Relocation City/County: Washington Sampling Date: 6/7/2017
Applicant/Owner: Metropolitan Airports Commission State: Minnesota Sample Point: DP11
Investigator(s): Brauna Hartzell and Kim Shannon, Mead & Hunt, Inc. Section, Township, Range: Section 18, T29N, R20W
Landform (hillslope, terrace, etc.): footslope Local relief (concave, convex, none): none Slope (%): ~ 10%
Subregion (LRR or MLRA): K/153 Lat: 45.0016° N Long: 92.8511° W Datum: WGS 84
Soil Map Unit Name: Antigo silt loam, 2 to 6 percent slopes NWI classification: ______
Are climatic hydrologic conditions on the site typical for this time of year? Yes ☐ No ☒ (If no, explain in Remarks.)
Are Vegetation ☒, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? **Yes** ☒ **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 ☒
Hydric Soil Present?	Yes ☐	No ☒
Wetland Hydrology Present?	Yes ☐	No ☒

Is the Sampled Area within a Wetland? **Yes** ☐ **No** ☒
If yes, optional Wetland Side ID: _____

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

VEGETATION - Use scientific names of plants

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
Herb Stratum (Plot size: 5ft)			
1. *Poa pratensis*	60	X	FACU
2. *Stellaria graminea*	25	X	UPL
3. *Trifolium repens*	12		FACU
4. *Ranunculus acris*	10		FAC
5. *Leucanthemum vulgare*	8		UPL
6. *Prunella vulgaris*	5		FAC
7. *Trifolium pratense*	3		FACU
8. *Plantago lanceolata*	2		FACU
9.			
10.			
11.			
12.			
	125	= Total Cover	
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
		= Total Cover	

Remarks: (Include photo numbers here or on a separate sheet.) Hydrophytic vegetation is not present. DP11 is about 2 to 3 feet higher upslope than its paired wetland data point (DP 10) and about 15-18 feet to the east.

50/20 Thresholds	20%	50%
Tree Stratum	_____	_____
Sapling/Shrub Stratum	_____	_____
Herb Stratum	25	62
Woody Vine Stratum	_____	_____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)
Total Number of Dominant Species Across All Strata: 2 (B)
Percent of Dominant Species That Are OBI, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	_____	x 1 = _____
FACW species	_____	x 2 = _____
FAC species	15	x 3 = 45
FACU species	77	x 4 = 308
UPL species	33	x 5 = 165
Column Totals:	125 (A)	518 (B)

Prevalence Index = B/A = 4.14

Hydrophytic Vegetation Indicators:

- ☐ Rapid Test for Hydrophytic Vegetation
- ☐ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations' (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation' (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 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 ☒

SOIL

Sampling Point: DP11

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	5YR 2.5/2	100					Sandy loam	
4-6	5YR 2.5/2	94	5YR 4/4	5	C	M	Sandy loam	Small pebbles present
			10YR 2/1	1	C	M		
6-16	5YR 4/4	100					sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

☐ Histosol (A1)
☐ Histic Epipedon (A2)
☐ Black Histic (A3)
☐ Hydrogen Sulfide (A4)
☐ Stratified Layers (A5)
☐ Depleted Below Dark Surface (A11)
☐ Thick Dark Surface (A12)
☐ Sandy Mucky Mineral (S1)
☐ Sandy Gleyed Matrix (S4)
☐ Sandy Redox (S5)
☐ Stripped Matrix (S6)
☐ Dark Surface (S7) **(LRR R, MLRA 149B)**
☐ Polyvalue Below Surface (S8) **(LRR R, MLRA 149 B)**
☐ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
☐ 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)

Indicators for Problematic Hydric

☐ 2 cm Muck - (A10) **(LRR K, L, MLRA 149B)**
☐ Coast Prairie Redox (A16) **(LRR K, L, R)**
☐ 5 cm Peat or Mucky Peat (S3) **(LRR K, L, R)**
☐ Dark Surface (S7) **(LRR K, L)**
☐ Polyvalue Below Surface (S8) **(LRR K, L)**
☐ Thin Dark Surface (S9) **(LRR K, L)**
☐ Iron-Manganese Masses (F12) **(LRR K, L, R)**
☐ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
☐ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
☐ Red Parent Material (F21)
☐ Very Shallow Dark Surface (TF12)
☐ Other (Explain in Remarks)

[3]1Indicators 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** ☒

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

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)
☐ FAC-Neutral Test (D5)
☐ Microtopographic Relief (D4)

Field Observations:

Surface Water Present?	Yes ☐	No ☒	Depth (inches): _____
Water Table Present?	Yes ☐	No ☒	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes ☐	No ☒	Depth (inches): _____

Indicators of Wetland Hydrology Present?
Yes ☐ **No** ☒

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

Remarks: Wetland hydrology is neither present nor indicated. Appears to be an isolated basin receiving upslope runoff from south and east. Culvert to the west does not appear to connect.

Photo:

Data Points 10 and 11

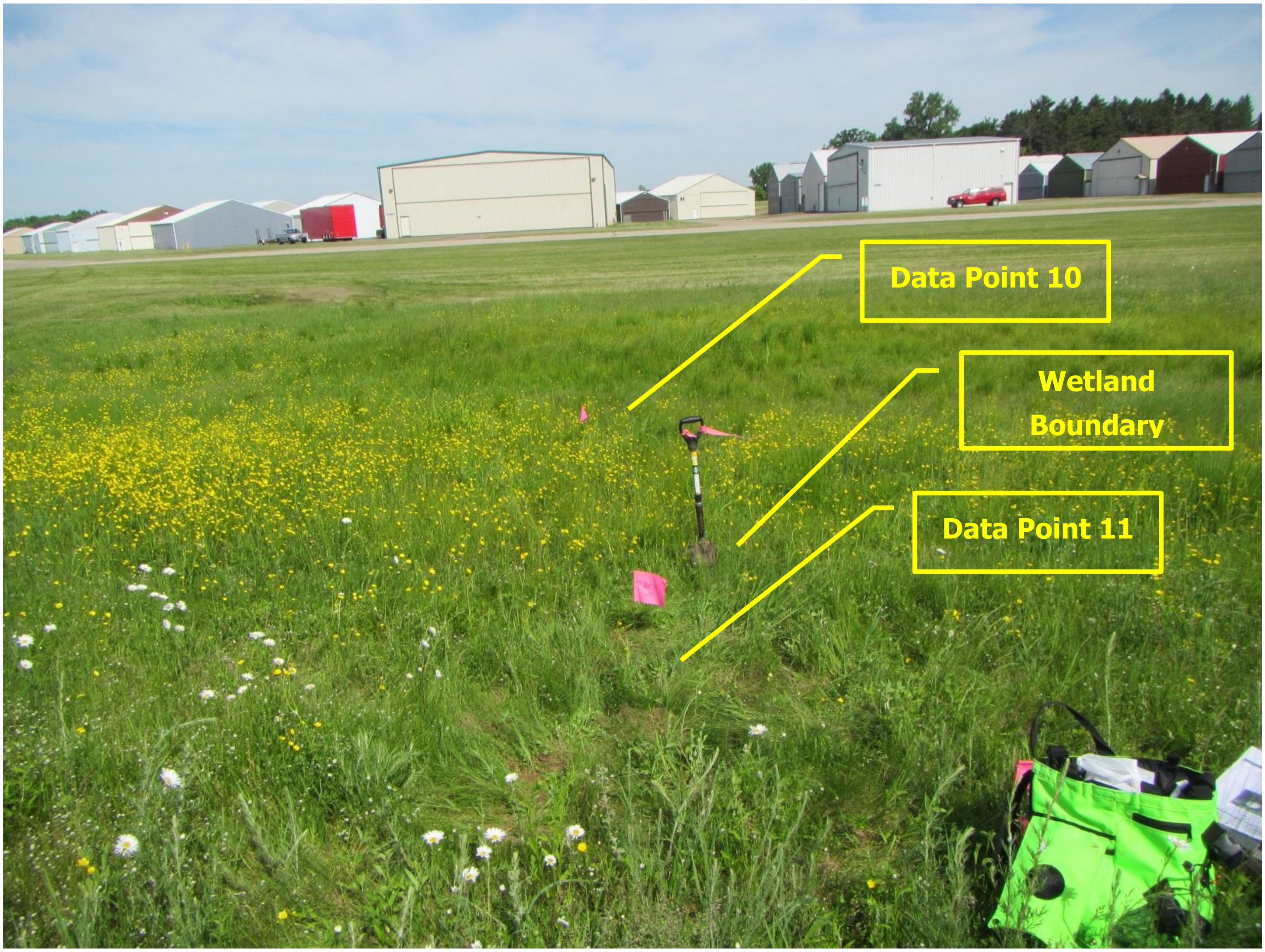


Photo 14. View to the west.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Lake Elmo airport (21D) Runway 14/32 Relocation City/County: Washington Sampling Date: 6/7/2017

Applicant/Owner: Metropolitan Airports Commission State: Minnesota Sample Point: DP12

Investigator(s): Brauna Hartzell and Kim Shannon, Mead & Hunt, Inc. Section, Township, Range: Section 18, T29N, R20W

Landform (hillslope, terrace, etc.): toeslope Local relief (concave, convex, none): convex Slope (%): 1-3%

Subregion (LRR or MLRA): K/153 Lat: 45.00177° N Long: 92.84989° W Datum: WGS 84

Soil Map Unit Name: Antigo silt loam, 2 to 6 percent slopes NWI classification:

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

Are Vegetation ☒, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? **Yes** ☒ **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 ☒
Hydric Soil Present?	Yes ☐	No ☒
Wetland Hydrology Present?	Yes ☐	No ☒

Is the Sampled Area within a Wetland? **Yes** ☐ **No** ☒

If yes, optional Wetland Side ID: _____

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

VEGETATION - Use scientific names of plants

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
Herb Stratum (Plot size: 5ft)			
1. *Poa pratensis*	45	X	FACU
2. *Stellaria graminea*	35	X	UPL
3. *Trifolium repens*	10		FACU
4. *Taraxacum officinale*	5		FACU
5. *Trifolium pratense*	5		FACU
6. *Glechoma hederacea*	2		FACU
7. *Equisetum arvense*	1		FAC
8.			
9.			
10.			
11.			
12.			
	103	= Total Cover	
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
		= Total Cover	

Remarks: (Include photo numbers here or on a separate sheet.) Hydrophytic vegetation is not present. Data point located at base of hillslope, 10 feet to the east from paired wetland data point (DP13) and about 1 foot higher in elevation than DP13.

50/20 Thresholds	20%	50%
Tree Stratum	_____	_____
Sapling/Shrub Stratum	_____	_____
Herb Stratum	21	52
Woody Vine Stratum	_____	_____

Dominance Test worksheet:

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

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

Percent of Dominant Species That Are OBI, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	_____	x 1 = _____
FACW species	_____	x 2 = _____
FAC species	1	x 3 = 3
FACU species	67	x 4 = 268
UPL species	35	x 5 = 175
Column Totals:	103 (A)	546 (B)

Prevalence Index = B/A = 5.15

Hydrophytic Vegetation Indicators:

- ☐ Rapid Test for Hydrophytic Vegetation
- ☐ Dominance Test is >50%
- ☐ Prevalence Index is $\leq$3.0[1]
- ☐ Morphological Adaptations' (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation' (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 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 ☒

SOIL

Sampling Point: DP12

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

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-3	5YR 4/2	100					Sandy loam	
3-12	5YR 4/4	100					Sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ☐ Polyvalue Below Surface (S8) **(LRR R, MLRA 149 B)**
- ☐ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ☐ 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)

Indicators for Problematic Hydric

- ☐ 2 cm Muck - (A10) **(LRR K, L, MLRA 149B)**
- ☐ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ☐ 5 cm Peat or Mucky Peat (S3) **(LRR K, L, R)**
- ☐ Dark Surface (S7) **(LRR K, L)**
- ☐ Polyvalue Below Surface (S8) **(LRR K, L)**
- ☐ Thin Dark Surface (S9) **(LRR K, L)**
- ☐ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ☐ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]1Indicators 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** ☒

Remarks: Hydric soils are not present. Does not meet hydric soils criteria. Soils very hard and dry; dug to refusal.

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)
- ☐ FAC-Neutral Test (D5)
- ☐ Microtopographic Relief (D4)

Field Observations:

Surface Water Present?	Yes ☐	No ☒	Depth (inches): _____
Water Table Present?	Yes ☐	No ☒	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes ☐	No ☒	Depth (inches): _____

Indicators of Wetland Hydrology Present?
Yes ☐ **No** ☒

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

Remarks: Wetland hydrology is not present nor indicated. Ground very hard and dry.

Photo:

Data points 12 and 13

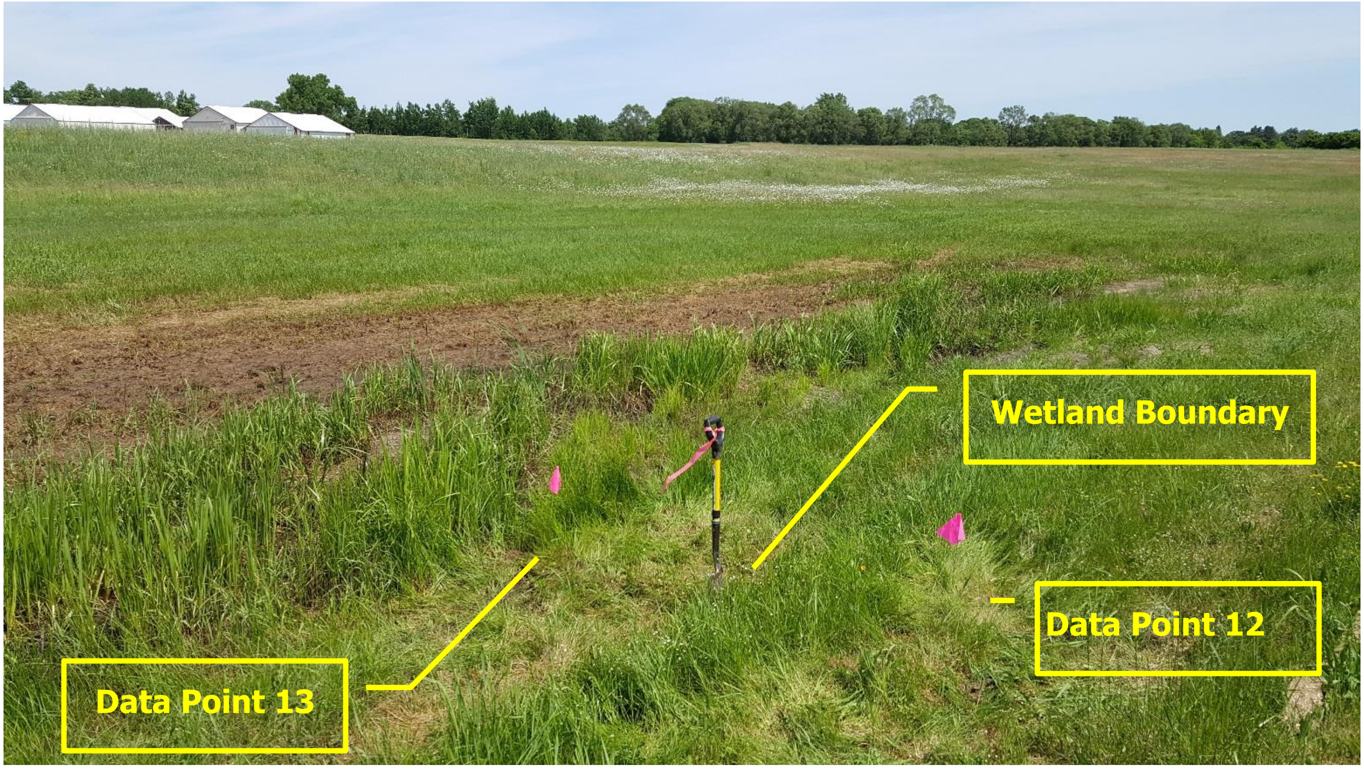


Photo 16. View to the north.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Lake Elmo airport (21D) Runway 14/32 Relocation City/County: Washington Sampling Date: 6/7/2017

Applicant/Owner: Metropolitan Airports Commission State: Minnesota Sample Point: DP13

Investigator(s): Brauna Hartzell and Kim Shannon, Mead & Hunt, Inc. Section, Township, Range: Section 18, T29N, R20W

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

Subregion (LRR or MLRA): K/153 Lat: 45.0018° N Long: 92.8499° W Datum: WGS 84

Soil Map Unit Name: Antigo silt loam, 2 to 6 percent slopes NWI classification: PEMB

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

Are Vegetation ☒, Soil ☒, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? **Yes** ☐ **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 ☐	**Is the Sampled Area within a Wetland?** **Yes** ☒ **No** ☐
Hydric Soil Present?	Yes ☒	No ☐	
Wetland Hydrology Present?	Yes ☒	No ☐	If yes, optional Wetland Side ID: 4

Remarks: (Explain alternative procedures here or in a separate report.) A WETS analysis of the antecedent precipitation indicates the hydrologic conditions on the site were wetter than normal range at the time of investigation. Soils and vegetation significantly disturbed due to rutting from tractor mower; soil profile overturned.

VEGETATION - Use scientific names of plants

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
Herb Stratum (Plot size: 5ft)			
1. *Juncus tenuis*	40	X	FAC
2. *Glyceria grandis*	25	X	OBL
3. *Carex lasiocarpa*	10		OBL
4. *Rumex crispus*	2		FAC
5. *Equisetum arvense*	3		FAC
6. *Phalaris arundinacea*	3		FACW
7. *Trifolium repens*	1		FACU
8. *Carex scoparia*	1		FACW
9.			
10.			
11.			
12.			
	85	= Total Cover	
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
		= Total Cover	

Remarks: (Include photo numbers here or on a separate sheet.) Hydrophytic vegetation is present. Large area of matted vegetation due to inundation and some mowing on west side. Low area situated between two hills; probably remnant surface before runway construction/grading. Cattails (*Typha* sp.) present just outside 5ft sample area.

50/20 Thresholds	20%	50%
Tree Stratum		
Sapling/Shrub Stratum		
Herb Stratum	17	42
Woody Vine Stratum		

Dominance Test worksheet:

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

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

Percent of Dominant Species That Are OBI, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	35	x 1 = 35
FACW species	4	x 2 = 8
FAC species	45	x 3 = 135
FACU species	1	x 4 = 4
UPL species		x 5 =
Column Totals:	85 (A)	182 (B)

Prevalence Index = B/A = 2.14

Hydrophytic Vegetation Indicators:

- ☐ Rapid Test for Hydrophytic Vegetation
- ☒ Dominance Test is >50%
- ☒ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations' (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation' (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 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 ☐

SOIL

Sampling Point: DP13

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
0-2	5YR 3/2	100					Sand	With organic material
2-6	5YR 4/4	100					Sand	
6-12	5YR 4/1	97	5YR 4/6	3			Sandy loam	
12-18	5YR 3/1	90	5YR 5/6	10			Sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ☐ Polyvalue Below Surface (S8) **(LRR R, MLRA 149 B)**
- ☐ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ☐ 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)

Indicators for Problematic Hydric

- ☐ 2 cm Muck - (A10) **(LRR K, L, MLRA 149B)**
- ☐ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ☐ 5 cm Peat or Mucky Peat (S3) **(LRR K, L, R)**
- ☐ Dark Surface (S7) **(LRR K, L)**
- ☐ Polyvalue Below Surface (S8) **(LRR K, L)**
- ☐ Thin Dark Surface (S9) **(LRR K, L)**
- ☐ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ☐ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]1ndicators 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 ☐

Remarks: Hydric soils are present. Meets hydric soil criterion Depleted Matrix (F3). Despite nearby soil profile disturbance from rutting, profile appears intact here.

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)
- ☒ FAC-Neutral Test (D5)
- ☐ Microtopographic Relief (D4)

Field Observations:

Surface Water Present?	Yes ☐	No ☒	Depth (inches): _____
Water Table Present?	Yes ☐	No ☒	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes ☒	No ☐	Depth (inches): 6

Indicators of Wetland Hydrology Present? Yes ☒ No ☐

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

Remarks: Wetland hydrology is present and indicated. Data point in low area situated between knolls. An aerial photo review indicated saturation was visible on a number of photos. See report for discussion.

Photo:

Data points 12 and 13

Photo 16. View to the north.

Photo 17. Soil disturbance north of data point locations.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Lake Elmo airport (21D) Runway 14/32 Relocation City/County: Washington Sampling Date: 6/7/2017
Applicant/Owner: Metropolitan Airports Commission State: Minnesota Sample Point: DP14
Investigator(s): Brauna Hartzell and Kim Shannon, Mead & Hunt, Inc. Section, Township, Range: Section 18, T29N, R20W
Landform (hillslope, terrace, etc.): bench Local relief (concave, convex, none): none Slope (%): <1%
Subregion (LRR or MLRA): K/153 Lat: 45.001802° N Long: 92.84905° W Datum: WGS 84
Soil Map Unit Name: Auburndale silt loam NWI classification:
Are climatic hydrologic conditions on the site typical for this time of year? Yes ☐ No ☒ (If no, explain in Remarks.)
Are Vegetation ☒, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? **Yes** ☒ **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 ☒
Hydric Soil Present?	Yes ☐	No ☒
Wetland Hydrology Present?	Yes ☐	No ☒

Is the Sampled Area within a Wetland? **Yes** ☐ **No** ☒
If yes, optional Wetland Side ID: ____

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

VEGETATION - Use scientific names of plants

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
Herb Stratum (Plot size: 5ft)			
1. *Phalaris arundinacea*	40	X	FACW
2. *Cirsium arvense*	60	X	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	100	= Total Cover	
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
		= Total Cover	

Remarks: (Include photo numbers here or on a separate sheet.) Hydrophytic vegetation is not present. Does not pass prevalence index; data point 14 about 4-5 feet higher and about 20 feet north of paired wetland point (DP 15).

50/20 Thresholds	20%	50%
Tree Stratum		
Sapling/Shrub Stratum		
Herb Stratum	20	50
Woody Vine Stratum		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)
Total Number of Dominant Species Across All Strata: 2 (B)
Percent of Dominant Species That Are OBI, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of.		Multiply by:
OBL species		x 1 =
FACW species	40	x 2 = 80
FAC species		x 3 =
FACU species	60	x 4 = 240
UPL species		x 5 =
Column Totals:	100 (A)	320 (B)

Prevalence Index = B/A = 3.2

Hydrophytic Vegetation Indicators:

☐ Rapid Test for Hydrophytic Vegetation
☐ Dominance Test is >50%
☐ Prevalence Index is ≤3.0[1]
☐ Morphological Adaptations' (Provide supporting data in Remarks or on a separate sheet)
☐ Problematic Hydrophytic Vegetation' (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 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 ☒

SOIL

Sampling Point: DP14

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

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16	5YR 3/2	50					loam	
	5YR 4/4	50					loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ☐ Polyvalue Below Surface (S8) **(LRR R, MLRA 149 B)**
- ☐ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ☐ 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)

Indicators for Problematic Hydric

- ☐ 2 cm Muck - (A10) **(LRR K, L, MLRA 149B)**
- ☐ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ☐ 5 cm Peat or Mucky Peat (S3) **(LRR K, L, R)**
- ☐ Dark Surface (S7) **(LRR K, L)**
- ☐ Polyvalue Below Surface (S8) **(LRR K, L)**
- ☐ Thin Dark Surface (S9) **(LRR K, L)**
- ☐ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ☐ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]1Indicators 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** ☒

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

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)
- ☐ FAC-Neutral Test (D5)
- ☐ Microtopographic Relief (D4)

Field Observations:

Surface Water Present?	Yes ☐	No ☒	Depth (inches): _____
Water Table Present?	Yes ☐	No ☒	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes ☐	No ☒	Depth (inches): _____

Indicators of Wetland Hydrology Present? **Yes** ☐ **No** ☒

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

Remarks: Wetland hydrology is neither present nor indicated.

Photo:

Data points 14 and 15

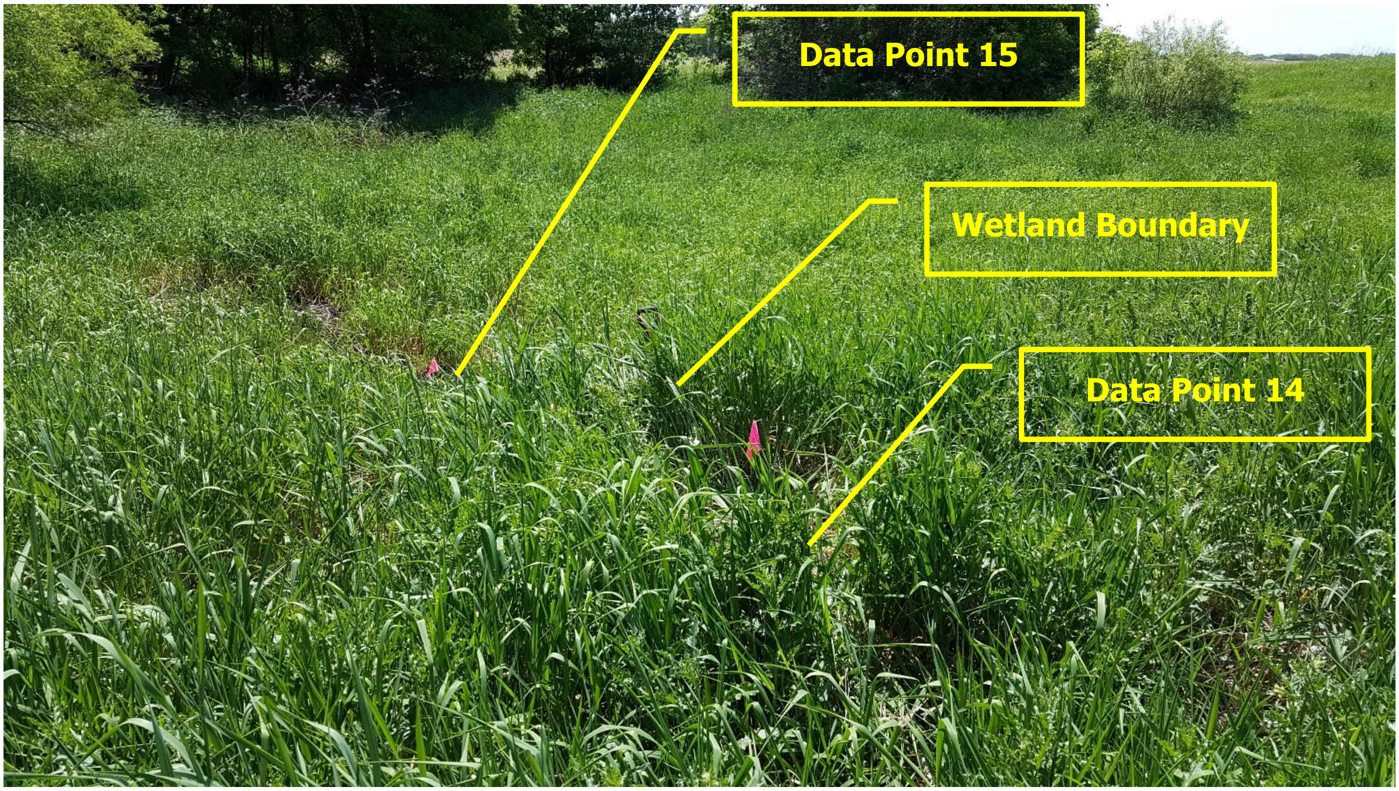


Photo 18. View to the south.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Lake Elmo airport (21D) Runway 14/32 Relocation City/County: Washington Sampling Date: 6/7/2017
Applicant/Owner: Metropolitan Airports Commission State: Minnesota Sample Point: DP15
Investigator(s): Brauna Hartzell and Kim Shannon, Mead & Hunt, Inc. Section, Township, Range: Section 18, T29N, R20W
Landform (hillslope, terrace, etc.): basin Local relief (concave, convex, none): concave Slope (%): <1%
Subregion (LRR or MLRA): K/153 Lat: 45.00175° N Long: 92.849016° W Datum: WGS 84
Soil Map Unit Name: Auburndale silt loam NWI classification: PEMB
Are climatic hydrologic conditions on the site typical for this time of year? Yes ☐ No ☒ (If no, explain in Remarks.)
Are Vegetation ☒, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? **Yes** ☒ **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 ☐	**Is the Sampled Area within a Wetland?** **Yes** ☒ **No** ☐
Hydric Soil Present?	Yes ☒	No ☐	
Wetland Hydrology Present?	Yes ☒	No ☐	If yes, optional Wetland Side ID: 5

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

VEGETATION - Use scientific names of plants

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
Herb Stratum (Plot size: 5ft)			
1. *Phalaris arundinacea*	85	X	FACW
2. *Persicaria amphibia*	5		OBL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	90	= Total Cover	
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
		= Total Cover	

Remarks: (Include photo numbers here or on a separate sheet.) Hydrophytic vegetation is present. Dead, matted *Persicaria* stalks from previous year inhibiting Reed canary grass growth. Data point located in closed depressional basin about 4-5 feet lower than paired upland point (DP 14) and about 20 feet to the south.

50/20 Thresholds	20%	50%
Tree Stratum		
Sapling/Shrub Stratum		
Herb Stratum	18	45
Woody Vine Stratum		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)
Total Number of Dominant Species Across All Strata: 1 (B)
Percent of Dominant Species That Are OBI, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	5	x 1 = 5
FACW species	85	x 2 = 170
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	90 (A)	175 (B)

Prevalence Index = B/A = 1.94

Hydrophytic Vegetation Indicators:

- ☒ Rapid Test for Hydrophytic Vegetation
- ☒ Dominance Test is >50%
- ☒ Prevalence Index is $\leq$3.0[1]
- ☐ Morphological Adaptations' (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation' (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 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 ☐

SOIL

Sampling Point: DP15

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 4/1	100					Silt loam	
4-8	10YR 4/1	90	5YR 4/4	10	C	M	Silt loam	
8-12	7.5YR 2.5/1	100					Silt loam	Very crumbly
12-16	10YR 4/1	100					Silt loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ☐ Polyvalue Below Surface (S8) **(LRR R, MLRA 149 B)**
- ☐ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ☐ 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)

Indicators for Problematic Hydric

- ☐ 2 cm Muck - (A10) **(LRR K, L, MLRA 149B)**
- ☐ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ☐ 5 cm Peat or Mucky Peat (S3) **(LRR K, L, R)**
- ☐ Dark Surface (S7) **(LRR K, L)**
- ☐ Polyvalue Below Surface (S8) **(LRR K, L)**
- ☐ Thin Dark Surface (S9) **(LRR K, L)**
- ☐ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ☐ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]1Indicators 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** ☐

Remarks: Hydric soils are present. Meets hydric soil criteria Depleted Matrix (F3) and Redox Depressions (F8).

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)
- ☒ FAC-Neutral Test (D5)
- ☐ Microtopographic Relief (D4)

Field Observations:

Surface Water Present?	Yes ☐	No ☒	Depth (inches): _____
Water Table Present?	Yes ☒	No ☐	Depth (inches): 3
Saturation Present? (includes capillary fringe)	Yes ☒	No ☐	Depth (inches): 0

Indicators of Wetland Hydrology Present?
Yes ☒ **No** ☐

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

Remarks: Wetland hydrology is present and indicated.

Photo:

Data points 14 and 15

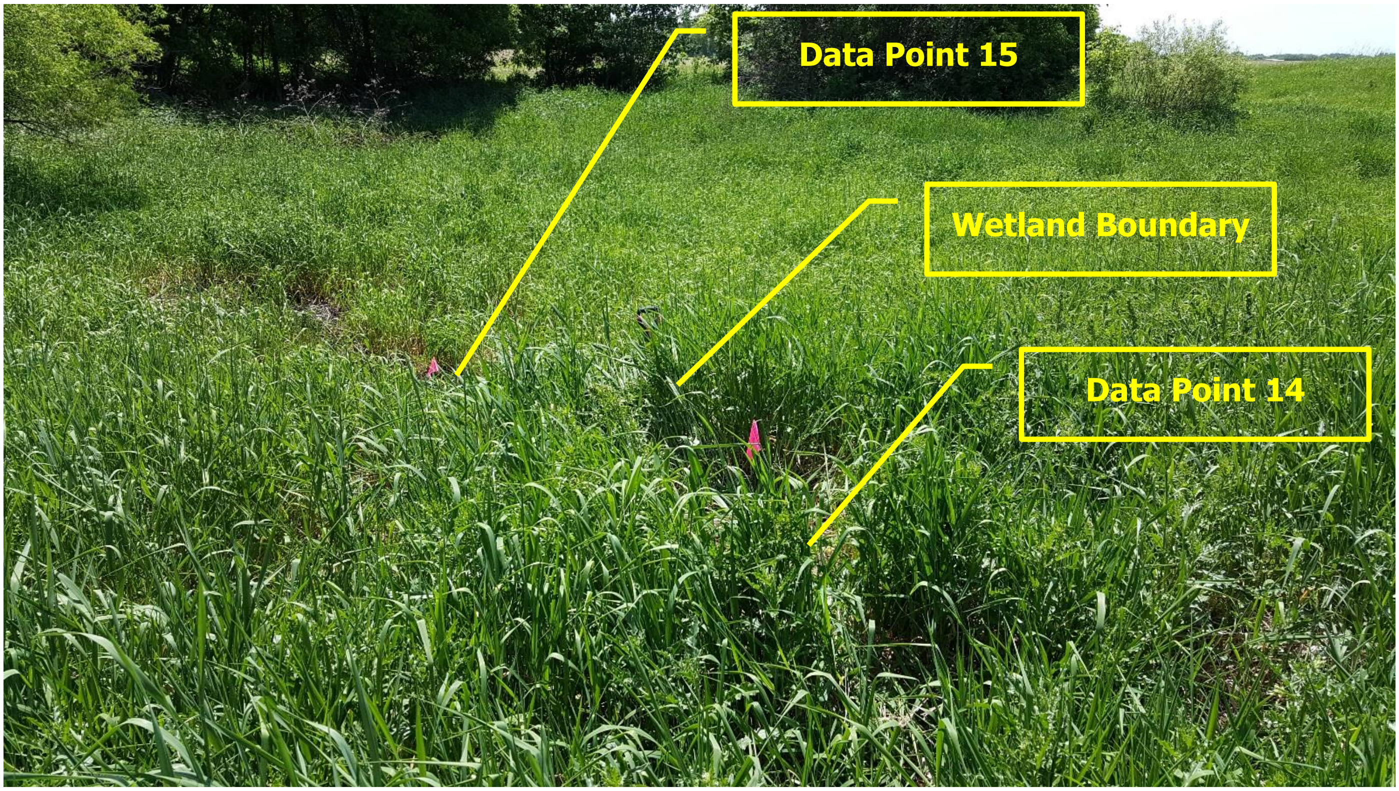


Photo 18. View to the south.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Lake Elmo airport (21D) Runway 14/32 Relocation City/County: Washington Sampling Date: 6/8/2017

Applicant/Owner: Metropolitan Airports Commission State: Minnesota Sample Point: DP16

Investigator(s): Brauna Hartzell and Kim Shannon, Mead & Hunt, Inc. Section, Township, Range: Section 18, T29N, R20W

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

Subregion (LRR or MLRA): K/153 Lat: 44.9955° N Long: 92.85074° W Datum: WGS 84

Soil Map Unit Name: Chetek sandy loam, 0 to 6 percent slopes NWI classification:

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

Are Vegetation ☒, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? **Yes** ☐ **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 ☒	**Is the Sampled Area within a Wetland?** **Yes** ☐ **No** ☒
Hydric Soil Present?	Yes ☐	No ☒	
Wetland Hydrology Present?	Yes ☐	No ☒	If yes, optional Wetland Side ID:

Remarks: (Explain alternative procedures here or in a separate report.) A WETS analysis of the antecedent precipitation indicates the hydrologic conditions on the site were wetter than normal range at the time of investigation. Data point at edge of farmed field planted to soy beans.

VEGETATION - Use scientific names of plants

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
Herb Stratum (Plot size: 5ft)			
1. *Solidago canadensis*	5	X	FACU
2. *Arctium minus*	4	X	FACU
3. *Ambrosia trifida*	3		FAC
4. *Asclepias syrica*	3		FACU
5. *Glycine max*	3		UPL
6. *Chenopodium album*	1		FACU
7.			
8.			
9.			
10.			
11.			
12.			
	19	= Total Cover	
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
		= Total Cover	

Remarks: (Include photo numbers here or on a separate sheet.) Hydrophytic vegetation not present; at edge of farm field surrounding wetland. Data point 16 located about 30 south of paired wetland data point (DP17) and about 4 feet higher in elevation. Topo break at wetland boundary.

50/20 Thresholds	20%	50%
Tree Stratum		
Sapling/Shrub Stratum		
Herb Stratum	4	10
Woody Vine Stratum		

Dominance Test worksheet:

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

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

Percent of Dominant Species That Are OBI, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species	3	x 3 = 9
FACU species	13	x 4 = 52
UPL species	3	x 5 = 15
Column Totals:	19 (A)	76 (B)

Prevalence Index = B/A = 4.0

Hydrophytic Vegetation Indicators:

- ☐ Rapid Test for Hydrophytic Vegetation
- ☐ Dominance Test is >50%
- ☐ Prevalence Index is <3.0[1]
- ☐ Morphological Adaptations' (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation' (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 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 ☒

SOIL

Sampling Point: DP16

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

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16	5YR 3/3	100					Sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ☐ Polyvalue Below Surface (S8) **(LRR R, MLRA 149 B)**
- ☐ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ☐ 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)

Indicators for Problematic Hydric

- ☐ 2 cm Muck - (A10) **(LRR K, L, MLRA 149B)**
- ☐ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ☐ 5 cm Peat or Mucky Peat (S3) **(LRR K, L, R)**
- ☐ Dark Surface (S7) **(LRR K, L)**
- ☐ Polyvalue Below Surface (S8) **(LRR K, L)**
- ☐ Thin Dark Surface (S9) **(LRR K, L)**
- ☐ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ☐ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]1Indicators 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** ☒

Remarks: Hydric soils are not present. Does not meet hydric soil criteria.

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)
- ☐ FAC-Neutral Test (D5)
- ☐ Microtopographic Relief (D4)

Field Observations:

Surface Water Present?	Yes ☐	No ☒	Depth (inches): _____
Water Table Present?	Yes ☐	No ☒	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes ☐	No ☒	Depth (inches): _____

Indicators of Wetland Hydrology Present? **Yes** ☐ **No** ☒

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

Remarks: Wetland hydrology is neither present nor indicated.

Photo:

Data point 16

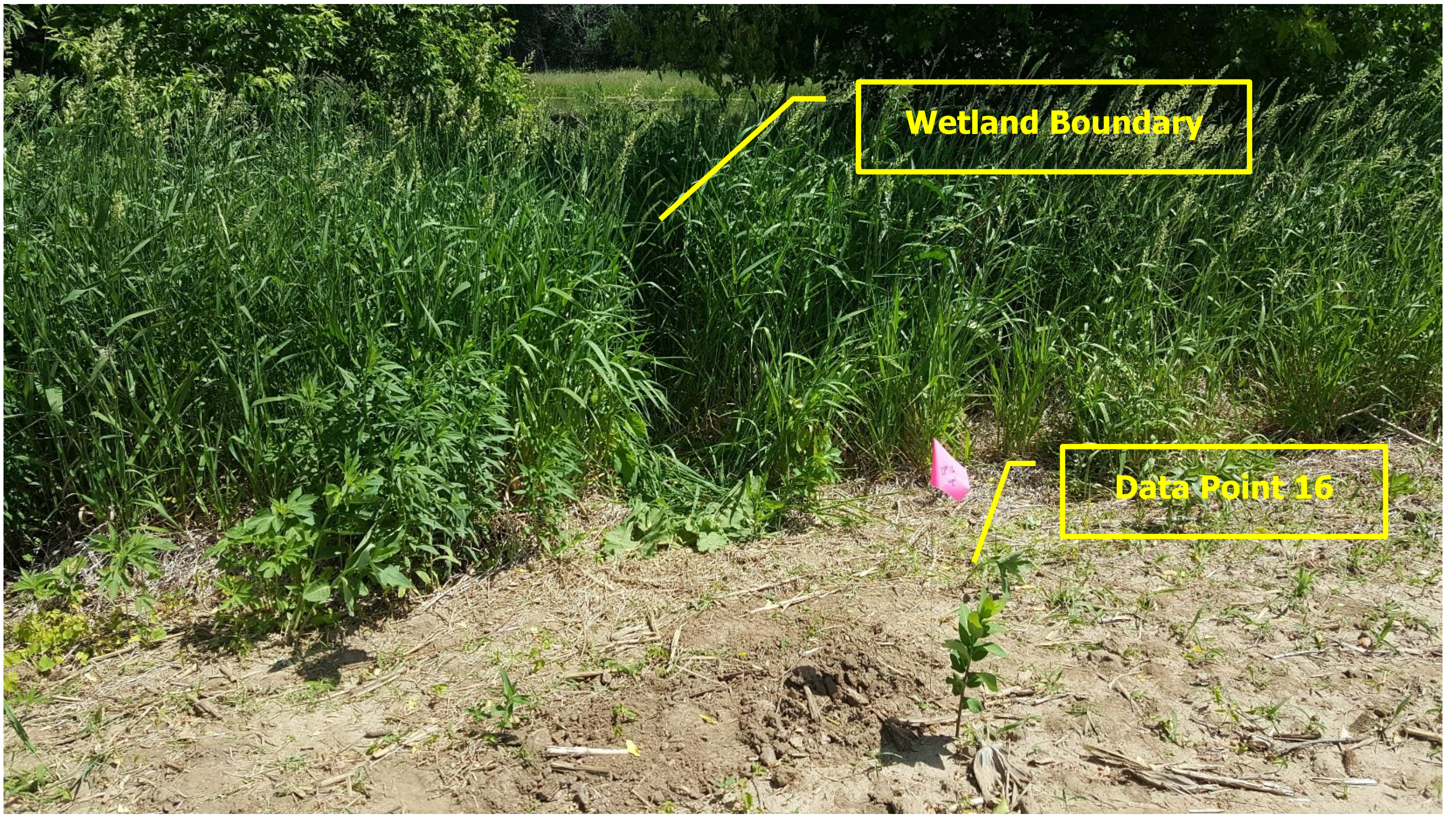


Photo 22. View to the north.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Lake Elmo airport (21D) Runway 14/32 Relocation City/County: Washington Sampling Date: 6/8/2017
Applicant/Owner: Metropolitan Airports Commission State: Minnesota Sample Point: DP17
Investigator(s): Brauna Hartzell and Kim Shannon, Mead & Hunt, Inc. Section, Township, Range: Section 18, T29N, R20W
Landform (hillslope, terrace, etc.): basin Local relief (concave, convex, none): concave Slope (%): <1%
Subregion (LRR or MLRA): K/153 Lat: 44.9956° N Long: 92.85066° W Datum: WGS 84
Soil Map Unit Name: Auburndale silt loam NWI classification: PEMB
Are climatic hydrologic conditions on the site typical for this time of year? Yes ☐ No ☒ (If no, explain in Remarks.)
Are Vegetation ☒, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? **Yes** ☒ **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 ☐
Hydric Soil Present?	Yes ☒	No ☐
Wetland Hydrology Present?	Yes ☒	No ☐

Is the Sampled Area within a Wetland? **Yes** ☒ **No** ☐
If yes, optional Wetland Side ID: 8

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

VEGETATION - Use scientific names of plants

Tree Stratum (Plot size: 30ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Salix nigra*	20	X	OBL
2. *Acer negundo*	35	X	FAC
3. *Rhamnus cathartica*	5		FAC
4.			
5.			
	60	= Total Cover	
Sapling/Shrub Stratum (Plot size: ___)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
Herb Stratum (Plot size: 5ft)			
1. *Phalaris arundinacea*	98	X	FACW
2. *Urtica dioica*	2		FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	100	= Total Cover	
Woody Vine Stratum (Plot size: ___)			
1.			
2.			
		= Total Cover	

Remarks: (Include photo numbers here or on a separate sheet.) Hydrophytic vegetation is present. Data point at edge of closed depressional pond. Reed canary grass rings entire pond. Topo break at edge. Thirty feet separates the paired data points with DP 17 (wetland) 4ft lower. Also present, swamp white oak, *Ulmus americana* and *Populus tremuloides* in wetlands; topo breaks and understory changes to upland; burdock and

50/20 Thresholds

	20%	50%
Tree Stratum	12	30
Sapling/Shrub Stratum		
Herb Stratum	20	50
Woody Vine Stratum		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)
Total Number of Dominant Species Across All Strata: 3 (B)
Percent of Dominant Species That Are OBI, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	20	x 1 = 20
FACW species	98	x 2 = 196
FAC species	42	x 3 = 126
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	160 (A)	342 (B)

Prevalence Index = B/A = 2.14

Hydrophytic Vegetation Indicators:

- ☐ Rapid Test for Hydrophytic Vegetation
- ☒ Dominance Test is >50%
- ☒ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations' (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation' (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 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 ☐

SOIL

Sampling Point: DP17

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	5YR 2.5/2	90	2.5YR 3/6	10	C	PL	Loam	PL= oxidized rhizospheres

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ☐ Polyvalue Below Surface (S8) **(LRR R, MLRA 149 B)**
- ☐ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ☐ 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)

[3]1Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Indicators for Problematic Hydric

- ☐ 2 cm Muck - (A10) **(LRR K, L, MLRA 149B)**
- ☐ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ☐ 5 cm Peat or Mucky Peat (S3) **(LRR K, L, R)**
- ☐ Dark Surface (S7) **(LRR K, L)**
- ☐ Polyvalue Below Surface (S8) **(LRR K, L)**
- ☐ Thin Dark Surface (S9) **(LRR K, L)**
- ☐ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ☐ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ☒ No ☐

Remarks: Hydric soils are present. Meets hydric soils criteria Redox Dark Surface (F6) and Redox Depressions (F8)

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)
- ☒ FAC-Neutral Test (D5)
- ☐ Microtopographic Relief (D4)

Field Observations:

Surface Water Present?	Yes ☒	No ☐	Depth (inches): 2
Water Table Present?	Yes ☒	No ☐	Depth (inches): 8
Saturation Present? (includes capillary fringe)	Yes ☒	No ☐	Depth (inches): 0

Indicators of Wetland Hydrology Present? Yes ☒ No ☐

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

Remarks: Wetland hydrology is present and indicated; surface water 3 ft to the north. Data point at edge of closed depressional pond. Historic aerial imagery shows this area to be consistently inundated.

Photo:

Data Point 17

Photo 23. Soil pit.

Photo 24. Wetland 8, view to the north.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Lake Elmo airport (21D) Runway 14/32 Relocation City/County: Washington Sampling Date: 6/8/2017
Applicant/Owner: Metropolitan Airports Commission State: Minnesota Sample Point: DP18
Investigator(s): Brauna Hartzell and Kim Shannon, Mead & Hunt, Inc. Section, Township, Range: Section 18, T29N, R20W
Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): none Slope (%): 1%
Subregion (LRR or MLRA): K/153 Lat: 44.99334° N Long: 92.8523° W Datum: WGS 84
Soil Map Unit Name: Antigo silt loam, 2 to 6 percent slopes NWI classification: ______
Are climatic hydrologic conditions on the site typical for this time of year? Yes ☐ No ☒ (If no, explain in Remarks.)
Are Vegetation ☒, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? **Yes** ☒ **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 ☒	**Is the Sampled Area within a Wetland?** **Yes** ☐ **No** ☒
Hydric Soil Present?	Yes ☐	No ☒	If yes, optional Wetland Side ID: _____
Wetland Hydrology Present?	Yes ☐	No ☒	

Remarks: (Explain alternative procedures here or in a separate report.) A WETS analysis of the antecedent precipitation indicates the hydrologic conditions on the site were wetter than normal range at the time of investigation. In an area mowed infrequently but data point at edge of unmown.

VEGETATION - Use scientific names of plants

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
Herb Stratum (Plot size: 5ft)			
1. *Poa pratensis*	70	X	FACU
2. *Plantago major*	20		FACU
3. *Stellaria graminea*	2		UPL
4. *Stellaria media*	2		FACU
5. *Taraxacum officinale*	7		FACU
6. *Trifolium pretense*	3		FACU
7. *Persicaria amphibian*	2		OBL
8. *Lotus corniculatus*	2		FACU
9.			
10.			
11.			
12.			
	108	= Total Cover	
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
		= Total Cover	

Remarks: (Include photo numbers here or on a separate sheet.) Hydrophytic vegetation not present. *Persicaria amphibia* appears to be spreading rhizomatously. DP18 is separated from its paired wetland data point (DP 19) by about 30 feet and is about 1-2 feet higher in elevation.

50/20 Thresholds

	20%	50%
Tree Stratum	____	____
Sapling/Shrub Stratum	____	____
Herb Stratum	21	54
Woody Vine Stratum	____	____

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 OBI, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of.		Multiply by:
OBL species	2	x 1 = 2
FACW species	_____	x 2 = _____
FAC species	_____	x 3 = _____
FACU species	104	x 4 = 416
UPL species	2	x 5 = 10
Column Totals:	108 (A)	428 (B)

Prevalence Index = B/A = 3.96

Hydrophytic Vegetation Indicators:

- ☐ Rapid Test for Hydrophytic Vegetation
- ☐ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations' (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation' (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 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 ☒

SOIL

Sampling Point: DP18

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 %	Type[1]	Loc[2]	Texture	Remarks
0-8	5YR 4/2	99	5YR 4/4	1	C	M	loam	
8-16	5YR 5/6	100					Loamy sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ☐ Polyvalue Below Surface (S8) **(LRR R, MLRA 149 B)**
- ☐ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ☐ 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)

Indicators for Problematic Hydric

- ☐ 2 cm Muck - (A10) **(LRR K, L, MLRA 149B)**
- ☐ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ☐ 5 cm Peat or Mucky Peat (S3) **(LRR K, L, R)**
- ☐ Dark Surface (S7) **(LRR K, L)**
- ☐ Polyvalue Below Surface (S8) **(LRR K, L)**
- ☐ Thin Dark Surface (S9) **(LRR K, L)**
- ☐ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ☐ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]1Indicators 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** ☒

Remarks: Hydric soils are not present. Does not meet hydric soil criteria.

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)
- ☐ FAC-Neutral Test (D5)
- ☐ Microtopographic Relief (D4)

Field Observations:

Surface Water Present?	Yes ☐	No ☒	Depth (inches): _____
Water Table Present?	Yes ☐	No ☒	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes ☐	No ☒	Depth (inches): _____

Indicators of Wetland Hydrology Present? **Yes** ☐ **No** ☒

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

Remarks: Wetland hydrology is not present nor indicated.

Photo:

Data points 18 and 19

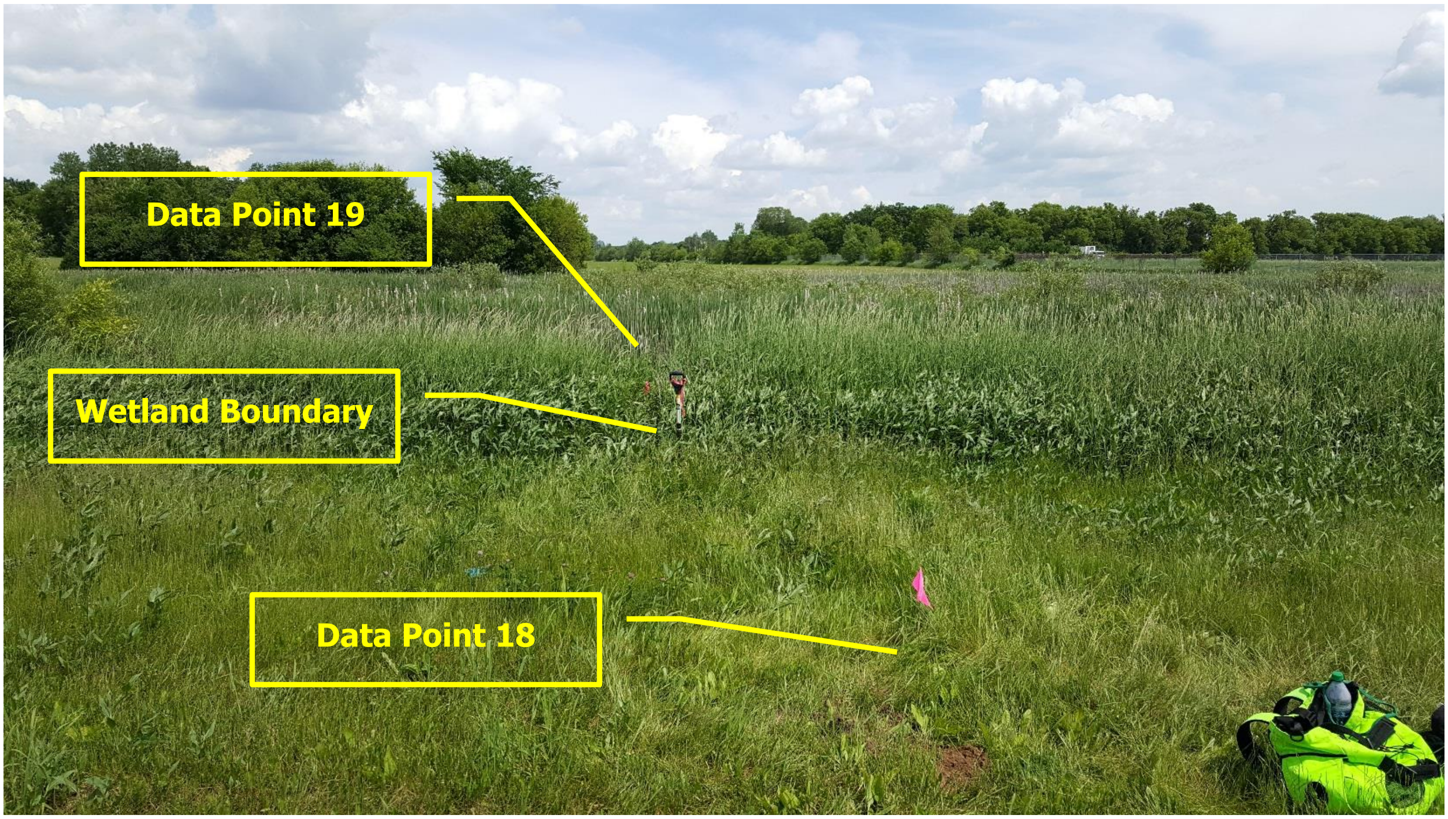


Photo 25. View to the east.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Lake Elmo airport (21D) Runway 14/32 Relocation City/County: Washington Sampling Date: 6/8/2017
Applicant/Owner: Metropolitan Airports Commission State: Minnesota Sample Point: DP19
Investigator(s): Brauna Hartzell and Kim Shannon, Mead & Hunt, Inc. Section, Township, Range: Section 18, T29N, R20W
Landform (hillslope, terrace, etc.): basin Local relief (concave, convex, none): concave Slope (%): <1%
Subregion (LRR or MLRA): K/153 Lat: 44.99334° N Long: 92.8522° W Datum: WGS 84
Soil Map Unit Name: Aquolls and Histosols, ponded NWI classification: PEMB
Are climatic hydrologic conditions on the site typical for this time of year? Yes ☐ No ☒ (If no, explain in Remarks.)
Are Vegetation ☒, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? **Yes** ☒ **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 ☐
Hydric Soil Present?	Yes ☒	No ☐
Wetland Hydrology Present?	Yes ☒	No ☐

Is the Sampled Area within a Wetland? **Yes** ☒ **No** ☐
If yes, optional Wetland Side ID: 9

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

VEGETATION - Use scientific names of plants

Tree Stratum (Plot size: ______)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
Sapling/Shrub Stratum (Plot size: ______)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
Herb Stratum (Plot size: 5ft)			
1. *Phalaris arundinacea*	80	X	FACW
2. *Onoclea sensibilis*	25	X	FACW
3. *Persicaria amphibia*	10		OBL
4. *Parthenocissus quinquefolia*	1		FACU
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	116	= Total Cover	
Woody Vine Stratum (Plot size: ______)			
1.			
2.			
		= Total Cover	

Remarks: (Include photo numbers here or on a separate sheet.) Hydrophytic vegetation is present. About 30 feet separates DP19 from paired upland data point (DP18); about 1-2 feet lower in elevation. Data point located within depressional basin. Large stand of cattails to east in standing water. Standing water nearly completely covered by *Typha sp.*

50/20 Thresholds	20%	50%
Tree Stratum		
Sapling/Shrub Stratum		
Herb Stratum	23	58
Woody Vine Stratum		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)
Total Number of Dominant Species Across All Strata: 2 (B)
Percent of Dominant Species That Are OBI, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	10	x 1 = 10
FACW species	105	x 2 = 210
FAC species		x 3 =
FACU species	1	x 4 = 4
UPL species		x 5 =
Column Totals:	116 (A)	234 (B)

Prevalence Index = B/A = 2.02

Hydrophytic Vegetation Indicators:

- ☒ Rapid Test for Hydrophytic Vegetation
- ☒ Dominance Test is >50%
- ☒ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations' (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation' (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 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 ☐

SOIL

Sampling Point: DP19

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

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16	5YR 3/1	92	5YR 4/6	8	C	M, PL	loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ☐ Polyvalue Below Surface (S8) **(LRR R, MLRA 149 B)**
- ☐ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ☐ 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)

Indicators for Problematic Hydric

- ☐ 2 cm Muck - (A10) **(LRR K, L, MLRA 149B)**
- ☐ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ☐ 5 cm Peat or Mucky Peat (S3) **(LRR K, L, R)**
- ☐ Dark Surface (S7) **(LRR K, L)**
- ☐ Polyvalue Below Surface (S8) **(LRR K, L)**
- ☐ Thin Dark Surface (S9) **(LRR K, L)**
- ☐ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ☐ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☒ Other (Explain in Remarks)

[3]1Indicators 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 ☐

Remarks: Hydric soils are present. Meets hydric soils criteria Redox Dark Surface (F6). Also, meets NYCHS criteria 3 (long-duration flooding or saturation) as below.

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)
- ☒ FAC-Neutral Test (D5)
- ☐ Microtopographic Relief (D4)

Field Observations:

Surface Water Present?	Yes ☒	No ☐	Depth (inches): 4
Water Table Present?	Yes ☒	No ☐	Depth (inches): 8
Saturation Present? (includes capillary fringe)	Yes ☒	No ☐	Depth (inches): 0

Indicators of Wetland Hydrology Present? Yes ☒ No ☐

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

Remarks: Wetland hydrology is present and indicated. Standing water 6-8 feet to east. Data point located in closed depressional basin. Historic aerial imagery shows this area to be consistently inundated. Also, area experiences long-duration flooding or saturation.

Photo:

Data points 18 and 19

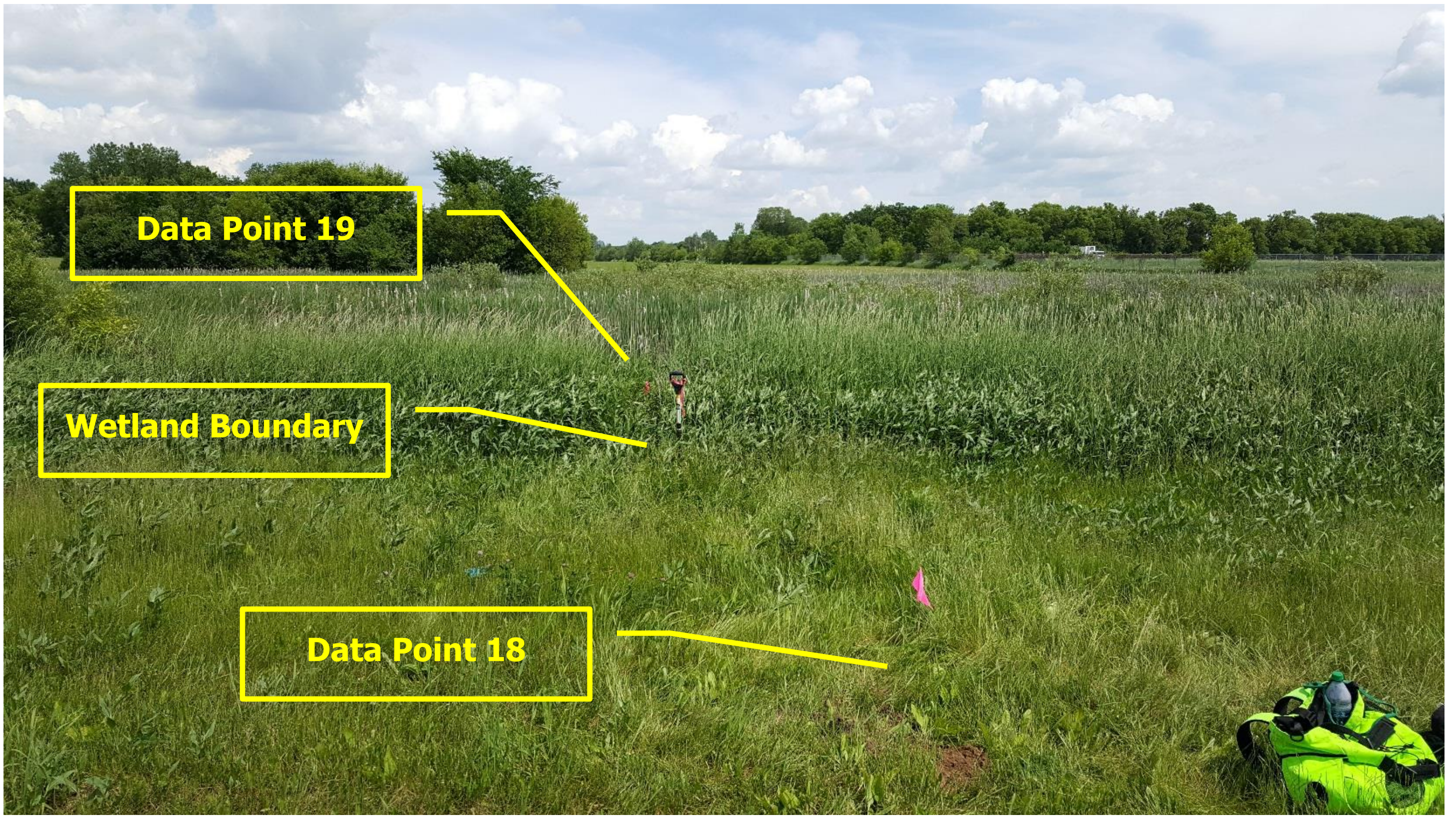


Photo 25. View to the east.

Photo 26. Wetland 9 from the west side, view to the east.


Photo 27. Wetland 9 from east side, view to the west.

Photo 28. Wetland 9 from the south, view to the north.

Additional Photos

Photo 19. Wetland 6. Ditch, view to the west.

Photo 20. Wetland 6. At Culvert, view to the west.

Photo 21. Wetland 7. Ditch, view to the east.

Appendix H. MNRAM Functional Assessment Forms

Wetland Functional Assessment Summary
21D - Lake Elmo Airport

Wetland Name	WS	SA	Location	Hydrogeomorphology	Maint. of Hydrologic Regime	Flood/ Stormwater/ Attenuation	Downstream Water Quality	Maint. of Wetland Water Quality	Shoreline Protection
Wetland 1	37	6	82-029-20-19-007-B	Depressional/Flow-through (apparent inlet and outlet), Depressional/Flow-through (apparent inlet and outlet)	Moderate	Moderate	Moderate	Moderate	Not Applicable
Wetland 2	37	6	82-029-20-19-005-B	Depressional/Isolated (no discernable inlets or outlets)	High	High	Moderate	Moderate	Not Applicable
Wetland 3	37	6	82-029-20-18-011-A	Depressional/Isolated (no discernable inlets or outlets)	Moderate	Moderate	Moderate	Moderate	Not Applicable
Wetland 4	37	6	82-029-20-18-008-B	Depressional/Isolated (no discernable inlets or outlets)	Moderate	Moderate	Moderate	Moderate	Not Applicable
Wetland 5	37	6	82-029-20-18-008-C	Depressional/Isolated (no discernable inlets or outlets)	Moderate	Moderate	Moderate	Moderate	Not Applicable
Wetland 6	37	6	82-029-20-18-012-A	Depressional/Flow-through (apparent inlet and outlet), Depressional/Flow-through (apparent inlet and outlet)	Moderate	Moderate	Moderate	Moderate	Not Applicable
Wetland 7	37	6	82-029-20-18-013-A	Depressional/Flow-through (apparent inlet and outlet), Depressional/Flow-through (apparent inlet and outlet)	Moderate	Moderate	Moderate	Moderate	Not Applicable
Wetland 8	37	6	82-029-20-18-003-B	Depressional/Isolated (no discernable inlets or outlets)	High	High	High	Moderate	Not Applicable
Wetland 9	37	6	82-029-20-18-002-B	Depressional/Flow-through (apparent inlet and outlet), Depressional/Flow-through (apparent inlet and outlet)	Moderate	Moderate	Moderate	Moderate	Not Applicable

Wetland Functional Assessment Summary
21D - Lake Elmo Airport

Wetland Name	Location	Maint. of Char. of Wildlife Habitat	Maint.of Char. Fish Habitat	Maint. of Char. Amphibian Habitat	Aesthetics/ Recreation/ Education/ Cultural	Commercial Uses	Ground-Water Interaction	Additional Information: Wetland Restoration Potential	Additional Information: Additional Stormwater Treatment Needs	Additional Information: Wetland Sensitivity to Stormwater and Urban Develop.
Wetland 1	82-029-20-19-007-B	Moderate	Not Applicable	Not Applicab	Moderate	Low	Combination Discharge, Recharge	Not Applicable	Moderate	Exceptional
Wetland 2	82-029-20-19-005-B	Moderate	Not Applicable	Not Applicab	Moderate	Not Applicable	Combination Discharge, Recharge	Not Applicable	Moderate	Moderate
Wetland 3	82-029-20-18-011-A	Moderate	Not Applicable	Low	Moderate	Not Applicable	Combination Discharge, Recharge	Not Applicable	Moderate	Moderate
Wetland 4	82-029-20-18-008-B	Moderate	Not Applicable	Not Applicab	Moderate	Not Applicable	Combination Discharge, Recharge	Not Applicable	Moderate	Moderate
Wetland 5	82-029-20-18-008-C	Moderate	Low	Low	Moderate	Not Applicable	Combination Discharge, Recharge	Not Applicable	Moderate	Moderate
Wetland 6	82-029-20-18-012-A	Moderate	Not Applicable	Not Applicab	Moderate	Not Applicable	Combination Discharge, Recharge	Not Applicable	Moderate	Moderate
Wetland 7	82-029-20-18-013-A	Moderate	Not Applicable	Not Applicab	Moderate	Not Applicable	Combination Discharge, Recharge	Not Applicable	Moderate	Moderate
Wetland 8	82-029-20-18-003-B	Moderate	Moderate	Moderate	Moderate	Not Applicable	Combination Discharge, Recharge	Not Applicable	Moderate	Moderate
Wetland 9	82-029-20-18-002-B	Low	Moderate	Low	Moderate	Not Applicable	Discharge	Not Applicable	Moderate	Moderate

MnRAM: Site Response Record

For Wetland: Wetland 1

Location: 82-029-20-19-007-B

21D - Lake Elmo Airport

Plant Community: Seasonally Flooded Ba

Cowardin Classification: PEM1A

Circular 39: Type 1

4	*Listed, rare, special species?*	No
5	*Rare community or habitat?*	No
6	*Pre-European-settlement condition?*	No

Hydrogeomorphology / topography:

7 Depressional/FlowThru

8-1	*Maximum water depth*	0 inches
8-2	*% inundated*	0%
9	*Immediate drainage--local WS*	178.5 acr
10	*Esimated size/existing site:*	*(see #66)*

11-Upland Soil Crystal Lake silt loam, 1 to 3 percent

11-Wetland Soil Comstock silt loam

12	*Outlet for flood control*	B
13	*Outlet for hydro regime*	A
14	*Dominant upland land use*	B
15	*Wetland soil condition*	C
16	*Vegetation (% cover)*	0%
17	*Emerg. veg flood resistance*	C
18	*Sediment delivery*	B
19	*Upland soils (soil group)*	B
20	*Stormwater runoff*	B
21	*Subwatershed wetland density*	A
22	*Channels/sheet flow*	B
23	*Adjacent buffer width*	50 feet

Adjacent area management

24-A	*Full*	30%
24-B	*Manicured*	0%
24-C	*Bare*	70%

Adjacent area diversity/structure

25-A	*Native*	10%
25-B	*Mixed*	80%
25-C	*Sparse*	10%

Adjacent area slope

26-A	*Gentle*	60%
26-B	*Moderate*	40%
26-C	*Steep*	0%
27	*Downstream sens./WQ protect.*	B
28	*Nutrient loading*	B
29	*Shoreline wetland?*	No

Shoreline Wetland

30	*Rooted veg., % cover*	0%
31	*Wetland in-water width*	0 feet
32	*Emerg. veg. erosion resistance*	
33	*Erosion potential of site*	
34	*Upslope veg./bank protection*	
35	*Rare wildlife?*	No
36	*Scare/Rare/S1/S2 community*	No
37	*Vegetative cover*	NA
38	*Veg. community interspersion*	NA
39	*Wetland detritus*	C
40	*Interspersion on landscape*	B
41	*Wildlife barriers*	B

Amphibian-breeding potential

42	*Hydroperiod adequacy*	Inadequate
43	*Fish presence*	B
44	*Overwintering habitat*	
45	*Wildlife species (list)*	
46	*Fish habitat quality*	NA
47	*Fish species (list)*	
48	*Unique/rare opportunity*	No
49	*Wetland visibility*	B
50	*Proximity to population*	Yes
51	*Public ownership*	A
52	*Public access*	B
53	*Human influence on wetland*	B
54	*Human influence on viewshed*	C
55	*Spatial buffer*	B
56	*Recreational activity potential*	C
57	*Commercial crop--hydro impact*	C

Groundwater-specific questions

58	*Wetland soils*	Recharge
59	*Subwatershed land use*	Discharge
60	*Wetland size/soil group*	Discharge
61	*Wetland hydroperiod*	Recharge
62	*Inlet/Outlet configuration*	Recharge
63	*Upland topo relief*	Discharge

Additional information

64	*Restoration potential*	No
65	*LO affected by restoration*	
66	*Existing size*	0.187
	Restorable size	0
	Potential new wetland	0
67	*Average width of pot. buffer*	0 feet
68	*Ease of potential restoration*	
69	*Hydrologic alterations*	0
70	*Potential wetland type*	0
71	*Stormwater sensitivity*	C
72	*Additional treatment needs*	B

Watershed St. Croix (Stillwater)

WS# 37 Service Area: 6

For functional ratings, please run the Summary tab report.

This report printed on: 10/26/2017

Wetland Functional Assessment Summary

Wetland Name	Hydrogeomorphology	Maintenance of Hydrologic Regime	Flood/ Stormwater/ Attenuation	Downstream Water Quality	Maintenance of Wetland Water Quality	Shoreline Protection
Wetland 1	Depressional/Flow-through (apparent inlet and outlet), Depressional/Flow-through (apparent inlet and outlet)	0.52	0.46	0.45	0.37	0.00
		Moderate	Moderate	Moderate	Moderate	Not Applicable

						Additional Information		
Wetland Name	Maintenance of Characteristic Wildlife Habitat Structure	Maintenance of Characteristic Fish Habitat	Maintenance of Characteristic Amphibian Habitat	Aesthetics/ Recreation/ Education/ Cultural	Commercial Uses	Ground-Water Interaction	Wetland Restoration Potential	Wetland Sensitivity to Stormwater and Urban Development	Additional Stormwater Treatment Needs
Wetland 1	0.39	0.00	0.00	0.52	0.10	Combination Discharge, Recharge	0.00	0.10	0.37
	Moderate	Not Applicable	Not Applicable	Moderate	Low		Not Applicable	Exceptional	Moderate

Wetland Community Summary

		Vegetative Diversity/Integrity								
		Community								
Wetland Name	Location	Cowardin Classification	Circular 39	Plant Community	Wetland Proportion	Individual Community Rating	Highest Wetland Rating	Average Wetland Rating	Weighted Average Wetland Rating	
Wetland 1	82-029-20-19-007-B	PEM1A	Type 1	Seasonally Flooded Basin	20	0.1	0.10	0.10	0.02	
							Low	Low	Low	
					20		0.10	0.10	0.02	☐

☑ ***Denotes incomplete calculation data.***

MnRAM: Site Response Record

For Wetland: Wetland 2

Location: 82-029-20-19-005-B

21D - Lake Elmo Airport

Plant Community: Fresh (Wet) Meadow

Cowardin Classification: PEM1B

Circular 39: Type 2

4	*Listed, rare, special species?*	No
5	*Rare community or habitat?*	No
6	*Pre-European-settlement condition?*	No

Hydrogeomorphology / topography:

7		Depressional/Isolated
8-1	*Maximum water depth*	0 inches
8-2	*% inundated*	0%
9	*Immediate drainage--local WS*	7.3 acres
10	*Esimated size/existing site:*	*(see #66)*
11-Upland Soil		Chetek sandy loam, 12 to 25 percent slopes
11-Wetland Soil		Antigo silt loam, 0 to 2 percent slopes

12	*Outlet for flood control*	A
13	*Outlet for hydro regime*	A
14	*Dominant upland land use*	B
15	*Wetland soil condition*	A
16	*Vegetation (% cover)*	100%
17	*Emerg. veg flood resistance*	B
18	*Sediment delivery*	B
19	*Upland soils (soil group)*	B
20	*Stormwater runoff*	C
21	*Subwatershed wetland density*	A
22	*Channels/sheet flow*	B
23	*Adjacent buffer width*	30 feet

Adjacent area management

24-A	*Full*	90%
24-B	*Manicured*	0%
24-C	*Bare*	10%

Adjacent area diversity/structure

25-A	*Native*	0%
25-B	*Mixed*	90%
25-C	*Sparse*	10%

Adjacent area slope

26-A	*Gentle*	35%
26-B	*Moderate*	60%
26-C	*Steep*	5%
27	*Downstream sens./WQ protect.*	B
28	*Nutrient loading*	B
29	*Shoreline wetland?*	No

Shoreline Wetland

30	*Rooted veg., % cover*	0%
31	*Wetland in-water width*	0 feet
32	*Emerg. veg. erosion resistance*	
33	*Erosion potential of site*	
34	*Upslope veg./bank protection*	
35	*Rare wildlife?*	No
36	*Scare/Rare/S1/S2 community*	No
37	*Vegetative cover*	NA
38	*Veg. community interspersion*	NA
39	*Wetland detritus*	B
40	*Interspersion on landscape*	B
41	*Wildlife barriers*	B

Amphibian-breeding potential

42	*Hydroperiod adequacy*	Inadequate
43	*Fish presence*	A
44	*Overwintering habitat*	
45	*Wildlife species (list)*	
46	*Fish habitat quality*	NA
47	*Fish species (list)*	
48	*Unique/rare opportunity*	No
49	*Wetland visibility*	B
50	*Proximity to population*	Yes
51	*Public ownership*	A
52	*Public access*	C
53	*Human influence on wetland*	B
54	*Human influence on viewshed*	C
55	*Spatial buffer*	B
56	*Recreational activity potential*	C
57	*Commercial crop--hydro impact*	NA

Groundwater-specific questions

58	*Wetland soils*	Recharge
59	*Subwatershed land use*	Discharge
60	*Wetland size/soil group*	Discharge
61	*Wetland hydroperiod*	Recharge
62	*Inlet/Outlet configuration*	Recharge
63	*Upland topo relief*	Discharge

Additional information

64	*Restoration potential*	No
65	*LO affected by restoration*	
66	*Existing size*	0.117
	Restorable size	0
	Potential new wetland	0
67	*Average width of pot. buffer*	0 feet
68	*Ease of potential restoration*	
69	*Hydrologic alterations*	0
70	*Potential wetland type*	0
71	*Stormwater sensitivity*	B
72	*Additional treatment needs*	A

Watershed St. Croix (Stillwater)

WS# 37 Service Area: 6

For functional ratings, please run the Summary tab report.

This report printed on: 10/26/2017

Wetland Functional Assessment Summary

Wetland Name	Hydrogeomorphology	Maintenance of Hydrologic Regime	Flood/ Stormwater/ Attenuation	Downstream Water Quality	Maintenance of Wetland Water Quality	Shoreline Protection
Wetland 2	Depressional/Isolated (no discernable inlets or outlets)	0.88	0.69	0.58	0.48	0.00
		High	High	Moderate	Moderate	Not Applicable

Wetland Name	Maintenance of Characteristic Wildlife Habitat Structure	Maintenance of Characteristic Fish Habitat	Maintenance of Characteristic Amphibian Habitat	Aesthetics/ Recreation/ Education/ Cultural	Commercial Uses	Ground-Water Interaction	Additional Information: Wetland Restoration Potential	Additional Information: Wetland Sensitivity to Stormwater and Urban Development	Additional Information: Additional Stormwater Treatment Needs
Wetland 2	0.52	0.00	0.00	0.47	0.00	Combination Discharge, Recharge	0.00	0.10	0.48
	Moderate	Not Applicable	Not Applicable	Moderate	Not Applicable		Not Applicable	Moderate	Moderate

Wetland Community Summary

		Vegetative Diversity/Integrity								
		Community								
Wetland Name	Location	Cowardin Classification	Circular 39	Plant Community	Wetland Proportion	Individual Community Rating	Highest Wetland Rating	Average Wetland Rating	Weighted Average Wetland Rating	
Wetland 2	82-029-20-19-005-B	PEM1B	Type 2	Fresh (Wet) Meadow	100	0.1	0.10	0.10	0.10	
							Low	Low	Low	
					100		0.10	0.10	0.10	☐

☑ ***Denotes incomplete calculation data.***

MnRAM: Site Response Record

For Wetland: Wetland 3

Location: 82-029-20-18-011-A

21D - Lake Elmo Airport

Plant Community: Fresh (Wet) Meadow

Cowardin Classification: PEMB

Circular 39: Type 2

4	*Listed, rare, special species?*	No
5	*Rare community or habitat?*	No
6	*Pre-European-settlement condition?*	No

Hydrogeomorphology / topography:

7		Depressional/Isolated
8-1	*Maximum water depth*	0 inches
8-2	*% inundated*	0%
9	*Immediate drainage--local WS*	102 acres
10	*Esimated size/existing site:*	*(see #66)*
11-Upland Soil		Antigo silt loam, 2 to 6 percent slopes
11-Wetland Soil		Antigo silt loam, 2 to 6 percent slopes

12	*Outlet for flood control*	A
13	*Outlet for hydro regime*	A
14	*Dominant upland land use*	B
15	*Wetland soil condition*	B
16	*Vegetation (% cover)*	95%
17	*Emerg. veg flood resistance*	C
18	*Sediment delivery*	B
19	*Upland soils (soil group)*	B
20	*Stormwater runoff*	B
21	*Subwatershed wetland density*	A
22	*Channels/sheet flow*	B
23	*Adjacent buffer width*	25 feet

Adjacent area management

24-A	*Full*	50%
24-B	*Manicured*	50%
24-C	*Bare*	0%

Adjacent area diversity/structure

25-A	*Native*	0%
25-B	*Mixed*	90%
25-C	*Sparse*	10%

Adjacent area slope

26-A	*Gentle*	80%
26-B	*Moderate*	20%
26-C	*Steep*	0%
27	*Downstream sens./WQ protect.*	B
28	*Nutrient loading*	A
29	*Shoreline wetland?*	No

Shoreline Wetland

30	*Rooted veg., % cover*	0%
31	*Wetland in-water width*	0 feet
32	*Emerg. veg. erosion resistance*	
33	*Erosion potential of site*	
34	*Upslope veg./bank protection*	
35	*Rare wildlife?*	No
36	*Scare/Rare/S1/S2 community*	No
37	*Vegetative cover*	NA
38	*Veg. community interspersion*	NA
39	*Wetland detritus*	B
40	*Interspersion on landscape*	B
41	*Wildlife barriers*	B

Amphibian-breeding potential

42	*Hydroperiod adequacy*	Adequate
43	*Fish presence*	A
44	*Overwintering habitat*	
45	*Wildlife species (list)*	
46	*Fish habitat quality*	NA
47	*Fish species (list)*	
48	*Unique/rare opportunity*	No
49	*Wetland visibility*	B
50	*Proximity to population*	Yes
51	*Public ownership*	A
52	*Public access*	C
53	*Human influence on wetland*	B
54	*Human influence on viewshed*	B
55	*Spatial buffer*	B
56	*Recreational activity potential*	C
57	*Commercial crop--hydro impact*	NA

Groundwater-specific questions

58	*Wetland soils*	Recharge
59	*Subwatershed land use*	Discharge
60	*Wetland size/soil group*	Discharge
61	*Wetland hydroperiod*	Recharge
62	*Inlet/Outlet configuration*	Recharge
63	*Upland topo relief*	Discharge

Additional information

64	*Restoration potential*	No
65	*LO affected by restoration*	
66	*Existing size*	0.11
	Restorable size	0
	Potential new wetland	0
67	*Average width of pot. buffer*	0 feet
68	*Ease of potential restoration*	
69	*Hydrologic alterations*	0
70	*Potential wetland type*	0
71	*Stormwater sensitivity*	A
72	*Additional treatment needs*	B

Watershed St. Croix (Stillwater)

WS# 37 Service Area: 6

For functional ratings, please run the Summary tab report.

This report printed on: 10/26/2017

Wetland Functional Assessment Summary

Wetland Name	Hydrogeomorphology	Maintenance of Hydrologic Regime	Flood/ Stormwater/ Attenuation	Downstream Water Quality	Maintenance of Wetland Water Quality	Shoreline Protection
Wetland 3	Depressional/Isolated (no discernable inlets or outlets)	0.63	0.66	0.61	0.60	0.00
		Moderate	Moderate	Moderate	Moderate	Not Applicable

Wetland Name	Maintenance of Characteristic Wildlife Habitat Structure	Maintenance of Characteristic Fish Habitat	Maintenance of Characteristic Amphibian Habitat	Aesthetics/ Recreation/ Education/ Cultural	Commercial Uses	Ground-Water Interaction	Additional Information: Wetland Restoration Potential	Additional Information: Wetland Sensitivity to Stormwater and Urban Development	Additional Information: Additional Stormwater Treatment Needs
Wetland 3	0.55	0.00	0.28	0.52	0.00	Combination Discharge, Recharge	0.00	0.50	0.60
	Moderate	Not Applicable	Low	Moderate	Not Applicable		Not Applicable	Moderate	Moderate

Wetland Community Summary

Wetland Name	Location	Vegetative Diversity/Integrity: Community: Cowardin Classification	Circular 39	Plant Community	Wetland Proportion	Individual Community Rating	Highest Wetland Rating	Average Wetland Rating	Weighted Average Wetland Rating
Wetland 3	82-029-20-18-011-A	PEMB	Type 2	Fresh (Wet) Meadow	100	0.5	0.50	0.50	0.50
							Moderate	Moderate	Moderate
					100		0.50	0.50	0.50

☐

☑ ***Denotes incomplete calculation data.***

MnRAM: Site Response Record

For Wetland: Wetland 4

Location: 82-029-20-18-008-B

21D - Lake Elmo Airport

Plant Community: Fresh (Wet) Meadow

Cowardin Classification: PEMB

Circular 39: Type 2

4 *Listed, rare, special species?* No

5 *Rare community or habitat?* No

6 *Pre-European-settlement condition?* No

Hydrogeomorphology / topography:

7 Depressional/Isolated

8-1 *Maximum water depth* 1 inches

8-2 *% inundated* 10%

9 *Immediate drainage--local WS* 102 acres

10 *Esimated size/existing site:* *(see #66)*

11-Upland Soil: Antigo silt loam, 2 to 6 percent slopes

11-Wetland Soil: Antigo silt loam, 2 to 6 percent slopes

12 *Outlet for flood control* A

13 *Outlet for hydro regime* A

14 *Dominant upland land use* B

15 *Wetland soil condition* C

16 *Vegetation (% cover)* 80%

17 *Emerg. veg flood resistance* C

18 *Sediment delivery* B

19 *Upland soils (soil group)* B

20 *Stormwater runoff* B

21 *Subwatershed wetland density* A

22 *Channels/sheet flow* B

23 *Adjacent buffer width* 50 feet

Adjacent area management

24-A *Full* 80%

24-B *Manicured* 0%

24-C *Bare* 20%

Adjacent area diversity/structure

25-A *Native* 0%

25-B *Mixed* 90%

25-C *Sparse* 10%

Adjacent area slope

26-A *Gentle* 60%

26-B *Moderate* 40%

26-C *Steep* 0%

27 *Downstream sens./WQ protect.* B

28 *Nutrient loading* B

29 *Shoreline wetland?* No

Shoreline Wetland

30 *Rooted veg., % cover* 0%

31 *Wetland in-water width* 0 feet

32 *Emerg. veg. erosion resistance*

33 *Erosion potential of site*

34 *Upslope veg./bank protection*

35 *Rare wildlife?* No

36 *Scare/Rare/S1/S2 community* No

37 *Vegetative cover* NA

38 *Veg. community interspersion* NA

39 *Wetland detritus* NA

40 *Interspersion on landscape* B

41 *Wildlife barriers* B

Amphibian-breeding potential

42 *Hydroperiod adequacy* Inadequate

43 *Fish presence* A

44 *Overwintering habitat*

45 *Wildlife species (list)*

46 *Fish habitat quality* NA

47 *Fish species (list)*

48 *Unique/rare opportunity* No

49 *Wetland visibility* C

50 *Proximity to population* Yes

51 *Public ownership* A

52 *Public access* C

53 *Human influence on wetland* B

54 *Human influence on viewshed* C

55 *Spatial buffer* B

56 *Recreational activity potential* C

57 *Commercial crop--hydro impact* NA

Groundwater-specific questions

58 *Wetland soils* Recharge

59 *Subwatershed land use* Discharge

60 *Wetland size/soil group* Discharge

61 *Wetland hydroperiod* Recharge

62 *Inlet/Outlet configuration* Recharge

63 *Upland topo relief* Discharge

Additional information

64 *Restoration potential* No

65 *LO affected by restoration*

66 *Existing size* 0.167

Restorable size 0

Potential new wetland 0

67 *Average width of pot. buffer* 0 feet

68 *Ease of potential restoration*

69 *Hydrologic alterations* 0

70 *Potential wetland type* 0

71 *Stormwater sensitivity* B

72 *Additional treatment needs* B

Watershed: St. Croix (Stillwater)

WS#: 37 Service Area: 6

For functional ratings, please run the Summary tab report.

This report printed on: 10/26/2017

Wetland Functional Assessment Summary

Wetland Name	Hydrogeomorphology	Maintenance of Hydrologic Regime	Flood/ Stormwater/ Attenuation	Downstream Water Quality	Maintenance of Wetland Water Quality	Shoreline Protection
Wetland 4	Depressional/Isolated (no discernable inlets or outlets)	0.52	0.62	0.61	0.53	0.00
		Moderate	Moderate	Moderate	Moderate	Not Applicable

Wetland Name	Maintenance of Characteristic Wildlife Habitat Structure	Maintenance of Characteristic Fish Habitat	Maintenance of Characteristic Amphibian Habitat	Aesthetics/ Recreation/ Education/ Cultural	Commercial Uses	Ground-Water Interaction	Additional Information: Wetland Restoration Potential	Additional Information: Wetland Sensitivity to Stormwater and Urban Development	Additional Information: Additional Stormwater Treatment Needs
Wetland 4	0.58	0.00	0.00	0.42	0.00	Combination Discharge, Recharge	0.00	0.50	0.53
	Moderate	Not Applicable	Not Applicable	Moderate	Not Applicable		Not Applicable	Moderate	Moderate

Wetland Community Summary

		Vegetative Diversity/Integrity							
		Community							
Wetland Name	Location	Cowardin Classification	Circular 39	Plant Community	Wetland Proportion	Individual Community Rating	Highest Wetland Rating	Average Wetland Rating	Weighted Average Wetland Rating
Wetland 4	82-029-20-18-008-B	PEMB	Type 2	Fresh (Wet) Meadow	100	0.5	0.50	0.50	0.50
							Moderate	Moderate	Moderate
					100		0.50	0.50	0.50

☑ ***Denotes incomplete calculation data.***

MnRAM: Site Response Record

For Wetland: Wetland 5

Location: 82-029-20-18-008-C

21D - Lake Elmo Airport

Plant Community: Fresh (Wet) Meadow

Cowardin Classification: PEMB

Circular 39: Type 2

4	*Listed, rare, special species?*	No
5	*Rare community or habitat?*	No
6	*Pre-European-settlement condition?*	No

Hydrogeomorphology / topography:

7		Depressional/Isolated
8-1	*Maximum water depth*	3 inches
8-2	*% inundated*	20%
9	*Immediate drainage--local WS*	102 acres
10	*Esimated size/existing site:*	*(see #66)*
11-Upland Soil		Antigo silt loam, 2 to 6 percent slopes
11-Wetland Soil		Auburndale silt loam

12	*Outlet for flood control*	A
13	*Outlet for hydro regime*	A
14	*Dominant upland land use*	B
15	*Wetland soil condition*	B
16	*Vegetation (% cover)*	100%
17	*Emerg. veg flood resistance*	C
18	*Sediment delivery*	B
19	*Upland soils (soil group)*	B
20	*Stormwater runoff*	B
21	*Subwatershed wetland density*	A
22	*Channels/sheet flow*	B
23	*Adjacent buffer width*	10 feet

Adjacent area management

24-A	*Full*	20%
24-B	*Manicured*	0%
24-C	*Bare*	80%

Adjacent area diversity/structure

25-A	*Native*	0%
25-B	*Mixed*	20%
25-C	*Sparse*	80%

Adjacent area slope

26-A	*Gentle*	40%
26-B	*Moderate*	60%
26-C	*Steep*	0%
27	*Downstream sens./WQ protect.*	B
28	*Nutrient loading*	B
29	*Shoreline wetland?*	No

Shoreline Wetland

30	*Rooted veg., % cover*	0%
31	*Wetland in-water width*	0 feet
32	*Emerg. veg. erosion resistance*	
33	*Erosion potential of site*	
34	*Upslope veg./bank protection*	
35	*Rare wildlife?*	No
36	*Scare/Rare/S1/S2 community*	No
37	*Vegetative cover*	NA
38	*Veg. community interspersion*	NA
39	*Wetland detritus*	B
40	*Interspersion on landscape*	B
41	*Wildlife barriers*	B

Amphibian-breeding potential

42	*Hydroperiod adequacy*	Adequate
43	*Fish presence*	A
44	*Overwintering habitat*	C
45	*Wildlife species (list)*	
46	*Fish habitat quality*	C
47	*Fish species (list)*	
48	*Unique/rare opportunity*	No
49	*Wetland visibility*	C
50	*Proximity to population*	Yes
51	*Public ownership*	A
52	*Public access*	C
53	*Human influence on wetland*	B
54	*Human influence on viewshed*	C
55	*Spatial buffer*	B
56	*Recreational activity potential*	C
57	*Commercial crop--hydro impact*	NA

Groundwater-specific questions

58	*Wetland soils*	Recharge
59	*Subwatershed land use*	Discharge
60	*Wetland size/soil group*	Discharge
61	*Wetland hydroperiod*	Recharge
62	*Inlet/Outlet configuration*	Recharge
63	*Upland topo relief*	Discharge

Additional information

64	*Restoration potential*	No
65	*LO affected by restoration*	
66	*Existing size*	0.094
	Restorable size	0
	Potential new wetland	0
67	*Average width of pot. buffer*	0 feet
68	*Ease of potential restoration*	
69	*Hydrologic alterations*	0
70	*Potential wetland type*	0
71	*Stormwater sensitivity*	B
72	*Additional treatment needs*	B

Watershed St. Croix (Stillwater)

WS# 37 Service Area: 6

For functional ratings, please run the Summary tab report.

This report printed on: 10/26/2017

Wetland Functional Assessment Summary

Wetland Name	Hydrogeomorphology	Maintenance of Hydrologic Regime	Flood/ Stormwater/ Attenuation	Downstream Water Quality	Maintenance of Wetland Water Quality	Shoreline Protection
Wetland 5	Depressional/Isolated (no discernable inlets or outlets)	0.63	0.66	0.56	0.37	0.00
		Moderate	Moderate	Moderate	Moderate	Not Applicable

Wetland Name	Maintenance of Characteristic Wildlife Habitat Structure	Maintenance of Characteristic Fish Habitat	Maintenance of Characteristic Amphibian Habitat	Aesthetics/ Recreation/ Education/ Cultural	Commercial Uses	Ground-Water Interaction	Additional Information: Wetland Restoration Potential	Additional Information: Wetland Sensitivity to Stormwater and Urban Development	Additional Information: Additional Stormwater Treatment Needs
Wetland 5	0.42	0.33	0.30	0.42	0.00	Combination Discharge, Recharge	0.00	0.10	0.37
	Moderate	Low	Low	Moderate	Not Applicable		Not Applicable	Moderate	Moderate

Wetland Community Summary

		Vegetative Diversity/Integrity								
		Community								
Wetland Name	Location	Cowardin Classification	Circular 39	Plant Community	Wetland Proportion	Individual Community Rating	Highest Wetland Rating	Average Wetland Rating	Weighted Average Wetland Rating	
Wetland 5	82-029-20-18-008-C	PEMB	Type 2	Fresh (Wet) Meadow	100	0.1	0.10	0.10	0.10	
							Low	Low	Low	
					100		0.10	0.10	0.10	☐

☑ ***Denotes incomplete calculation data.***

MnRAM: Site Response Record

For Wetland: Wetland 6

Location: 82-029-20-18-012-A

21D - Lake Elmo Airport

Plant Community: Fresh (Wet) Meadow

Cowardin Classification: PEMB

Circular 39: Type 2

4	*Listed, rare, special species?*	No
5	*Rare community or habitat?*	No
6	*Pre-European-settlement condition?*	No

Hydrogeomorphology / topography:

7		Depressional/FlowThru
8-1	*Maximum water depth*	0 inches
8-2	*% inundated*	0%
9	*Immediate drainage--local WS*	71 acres
10	*Esimated size/existing site:*	*(see #66)*
11-Upland Soil		Crystal Lake silt loam, 1 to 3 percent slopes
11-Wetland Soil		Crystal Lake silt loam, 1 to 3 percent slopes

12	*Outlet for flood control*	B
13	*Outlet for hydro regime*	A
14	*Dominant upland land use*	B
15	*Wetland soil condition*	A
16	*Vegetation (% cover)*	80%
17	*Emerg. veg flood resistance*	C
18	*Sediment delivery*	B
19	*Upland soils (soil group)*	B
20	*Stormwater runoff*	A
21	*Subwatershed wetland density*	A
22	*Channels/sheet flow*	B
23	*Adjacent buffer width*	10 feet

Adjacent area management

24-A	*Full*	0%
24-B	*Manicured*	100%
24-C	*Bare*	0%

Adjacent area diversity/structure

25-A	*Native*	0%
25-B	*Mixed*	95%
25-C	*Sparse*	5%

Adjacent area slope

26-A	*Gentle*	100%
26-B	*Moderate*	0%
26-C	*Steep*	0%
27	*Downstream sens./WQ protect.*	B
28	*Nutrient loading*	B
29	*Shoreline wetland?*	No

Shoreline Wetland

30	*Rooted veg., % cover*	0%
31	*Wetland in-water width*	0 feet
32	*Emerg. veg. erosion resistance*	
33	*Erosion potential of site*	
34	*Upslope veg./bank protection*	
35	*Rare wildlife?*	No
36	*Scare/Rare/S1/S2 community*	No
37	*Vegetative cover*	NA
38	*Veg. community interspersion*	NA
39	*Wetland detritus*	B
40	*Interspersion on landscape*	B
41	*Wildlife barriers*	B

Amphibian-breeding potential

42	*Hydroperiod adequacy*	Inadequate
43	*Fish presence*	A
44	*Overwintering habitat*	
45	*Wildlife species (list)*	
46	*Fish habitat quality*	NA
47	*Fish species (list)*	
48	*Unique/rare opportunity*	No
49	*Wetland visibility*	B
50	*Proximity to population*	Yes
51	*Public ownership*	A
52	*Public access*	C
53	*Human influence on wetland*	B
54	*Human influence on viewshed*	C
55	*Spatial buffer*	B
56	*Recreational activity potential*	C
57	*Commercial crop--hydro impact*	NA

Groundwater-specific questions

58	*Wetland soils*	Recharge
59	*Subwatershed land use*	Discharge
60	*Wetland size/soil group*	Discharge
61	*Wetland hydroperiod*	Recharge
62	*Inlet/Outlet configuration*	Recharge
63	*Upland topo relief*	Recharge

Additional information

64	*Restoration potential*	No
65	*LO affected by restoration*	
66	*Existing size*	0.009
	Restorable size	0
	Potential new wetland	0
67	*Average width of pot. buffer*	0 feet
68	*Ease of potential restoration*	
69	*Hydrologic alterations*	0
70	*Potential wetland type*	0
71	*Stormwater sensitivity*	B
72	*Additional treatment needs*	A

Watershed St. Croix (Stillwater)

WS# 37 Service Area: 6

For functional ratings, please run the Summary tab report.

This report printed on: 10/26/2017

Wetland Functional Assessment Summary

Wetland Name	Hydrogeomorphology	Maintenance of Hydrologic Regime	Flood/ Stormwater/ Attenuation	Downstream Water Quality	Maintenance of Wetland Water Quality	Shoreline Protection
Wetland 6	Depressional/Flow-through (apparent inlet and outlet), Depressional/Flow-through (apparent inlet and outlet)	0.65	0.66	0.58	0.33	0.00
		Moderate	Moderate	Moderate	Moderate	Not Applicable

Wetland Name	Maintenance of Characteristic Wildlife Habitat Structure	Maintenance of Characteristic Fish Habitat	Maintenance of Characteristic Amphibian Habitat	Aesthetics/ Recreation/ Education/ Cultural	Commercial Uses	Ground-Water Interaction	Additional Information: Wetland Restoration Potential	Additional Information: Wetland Sensitivity to Stormwater and Urban Development	Additional Information: Additional Stormwater Treatment Needs
Wetland 6	0.39	0.00	0.00	0.47	0.00	Combination Discharge, Recharge	0.00	0.10	0.33
	Moderate	Not Applicable	Not Applicable	Moderate	Not Applicable		Not Applicable	Moderate	Moderate

Wetland Community Summary

Wetland Name	Location	Vegetative Diversity/Integrity: Community: Cowardin Classification	Circular 39	Plant Community	Wetland Proportion	Individual Community Rating	Highest Wetland Rating	Average Wetland Rating	Weighted Average Wetland Rating
Wetland 6	82-029-20-18-012-A	PEMB	Type 2	Fresh (Wet) Meadow	100	0.1	0.10	0.10	0.10
							Low	Low	Low
					100		0.10	0.10	0.10

☐

☑ ***Denotes incomplete calculation data.***

MnRAM: Site Response Record

For Wetland: Wetland 7

Location: 82-029-20-18-013-A

21D - Lake Elmo Airport

Plant Community: Fresh (Wet) Meadow

Cowardin Classification: PEMB

Circular 39: Type 2

4	*Listed, rare, special species?*	No
5	*Rare community or habitat?*	No
6	*Pre-European-settlement condition?*	No

Hydrogeomorphology / topography:

7		Depressional/FlowThru
8-1	*Maximum water depth*	0 inches
8-2	*% inundated*	0%
9	*Immediate drainage--local WS*	30 acres
10	*Esimated size/existing site:*	*(see #66)*
11-Upland Soil		Crystal Lake silt loam, 1 to 3 percent slopes
11-Wetland Soil		Crystal Lake silt loam, 1 to 3 percent slopes

12	*Outlet for flood control*	B
13	*Outlet for hydro regime*	A
14	*Dominant upland land use*	B
15	*Wetland soil condition*	A
16	*Vegetation (% cover)*	90%
17	*Emerg. veg flood resistance*	C
18	*Sediment delivery*	B
19	*Upland soils (soil group)*	B
20	*Stormwater runoff*	A
21	*Subwatershed wetland density*	A
22	*Channels/sheet flow*	B
23	*Adjacent buffer width*	10 feet

Adjacent area management

24-A	*Full*	0%
24-B	*Manicured*	100%
24-C	*Bare*	0%

Adjacent area diversity/structure

25-A	*Native*	0%
25-B	*Mixed*	95%
25-C	*Sparse*	5%

Adjacent area slope

26-A	*Gentle*	100%
26-B	*Moderate*	0%
26-C	*Steep*	0%
27	*Downstream sens./WQ protect.*	B
28	*Nutrient loading*	B
29	*Shoreline wetland?*	No

Shoreline Wetland

30	*Rooted veg., % cover*	0%
31	*Wetland in-water width*	0 feet
32	*Emerg. veg. erosion resistance*	
33	*Erosion potential of site*	
34	*Upslope veg./bank protection*	
35	*Rare wildlife?*	No
36	*Scare/Rare/S1/S2 community*	No
37	*Vegetative cover*	NA
38	*Veg. community interspersion*	NA
39	*Wetland detritus*	B
40	*Interspersion on landscape*	B
41	*Wildlife barriers*	B

Amphibian-breeding potential

42	*Hydroperiod adequacy*	Inadequate
43	*Fish presence*	A
44	*Overwintering habitat*	
45	*Wildlife species (list)*	
46	*Fish habitat quality*	NA
47	*Fish species (list)*	
48	*Unique/rare opportunity*	No
49	*Wetland visibility*	C
50	*Proximity to population*	Yes
51	*Public ownership*	A
52	*Public access*	C
53	*Human influence on wetland*	B
54	*Human influence on viewshed*	B
55	*Spatial buffer*	B
56	*Recreational activity potential*	C
57	*Commercial crop--hydro impact*	NA

Groundwater-specific questions

58	*Wetland soils*	Recharge
59	*Subwatershed land use*	Discharge
60	*Wetland size/soil group*	Discharge
61	*Wetland hydroperiod*	Recharge
62	*Inlet/Outlet configuration*	Recharge
63	*Upland topo relief*	Recharge

Additional information

64	*Restoration potential*	No
65	*LO affected by restoration*	
66	*Existing size*	0.013
	Restorable size	0
	Potential new wetland	0
67	*Average width of pot. buffer*	0 feet
68	*Ease of potential restoration*	
69	*Hydrologic alterations*	0
70	*Potential wetland type*	0
71	*Stormwater sensitivity*	B
72	*Additional treatment needs*	A

Watershed St. Croix (Stillwater)

WS# 37 Service Area: 6

For functional ratings, please run the Summary tab report.

This report printed on: 10/26/2017

Wetland Functional Assessment Summary

Wetland Name	Hydrogeomorphology	Maintenance of Hydrologic Regime	Flood/ Stormwater/ Attenuation	Downstream Water Quality	Maintenance of Wetland Water Quality	Shoreline Protection
Wetland 7	Depressional/Flow-through (apparent inlet and outlet), Depressional/Flow-through (apparent inlet and outlet)	0.65	0.66	0.58	0.33	0.00
		Moderate	Moderate	Moderate	Moderate	Not Applicable

							Additional Information		
Wetland Name	Maintenance of Characteristic Wildlife Habitat Structure	Maintenance of Characteristic Fish Habitat	Maintenance of Characteristic Amphibian Habitat	Aesthetics/ Recreation/ Education/ Cultural	Commercial Uses	Ground-Water Interaction	Wetland Restoration Potential	Wetland Sensitivity to Stormwater and Urban Development	Additional Stormwater Treatment Needs
Wetland 7	0.39	0.00	0.00	0.47	0.00	Combination Discharge, Recharge	0.00	0.10	0.33
	Moderate	Not Applicable	Not Applicable	Moderate	Not Applicable		Not Applicable	Moderate	Moderate

Wetland Community Summary

		Vegetative Diversity/Integrity							
		Community							
Wetland Name	Location	Cowardin Classification	Circular 39	Plant Community	Wetland Proportion	Individual Community Rating	Highest Wetland Rating	Average Wetland Rating	Weighted Average Wetland Rating
Wetland 7	82-029-20-18-013-A	PEMB	Type 2	Fresh (Wet) Meadow	100	0.1	0.10	0.10	0.10
							Low	Low	Low
					100		0.10	0.10	0.10

☑ ***Denotes incomplete calculation data.***

MnRAM: Site Response Record

For Wetland: Wetland 8

Location: 82-029-20-18-003-B

21D - Lake Elmo Airport

Plant Community: Fresh (Wet) Meadow

Cowardin Classification: PEMB — Circular 39: Type 2

Plant Community: Deep Marsh

Cowardin Classification: PAB2F — Circular 39: Type 4

4	*Listed, rare, special species?*	No
5	*Rare community or habitat?*	No
6	*Pre-European-settlement condition?*	No

Hydrogeomorphology / topography:

7		Depressional/Isolated
8-1	*Maximum water depth*	24 inche
8-2	*% inundated*	40%
9	*Immediate drainage--local WS*	102 acres
10	*Esimated size/existing site:*	*(see #66)*
11-Upland Soil		Chetek sandy loam, 0 to 6 percent slopes
11-Wetland Soil		Auburndale silt loam

12	*Outlet for flood control*	A
13	*Outlet for hydro regime*	A
14	*Dominant upland land use*	B
15	*Wetland soil condition*	A
16	*Vegetation (% cover)*	90%
17	*Emerg. veg flood resistance*	A
18	*Sediment delivery*	B
19	*Upland soils (soil group)*	B
20	*Stormwater runoff*	B
21	*Subwatershed wetland density*	A
22	*Channels/sheet flow*	B
23	*Adjacent buffer width*	50 feet

Adjacent area management

24-A	*Full*	90%
24-B	*Manicured*	0%
24-C	*Bare*	10%

Adjacent area diversity/structure

25-A	*Native*	0%
25-B	*Mixed*	90%
25-C	*Sparse*	10%

Adjacent area slope

26-A	*Gentle*	90%
26-B	*Moderate*	10%
26-C	*Steep*	0%

27	*Downstream sens./WQ protect.*	B
28	*Nutrient loading*	B
29	*Shoreline wetland?*	No

Shoreline Wetland

30	*Rooted veg., % cover*	0%
31	*Wetland in-water width*	0 feet
32	*Emerg. veg. erosion resistance*	
33	*Erosion potential of site*	
34	*Upslope veg./bank protection*	
35	*Rare wildlife?*	No
36	*Scare/Rare/S1/S2 community*	No
37	*Vegetative cover*	B
38	*Veg. community interspersion*	C
39	*Wetland detritus*	B
40	*Interspersion on landscape*	B
41	*Wildlife barriers*	A

Amphibian-breeding potential

42	*Hydroperiod adequacy*	Adequate
43	*Fish presence*	A
44	*Overwintering habitat*	C
45	*Wildlife species (list)*	
46	*Fish habitat quality*	C
47	*Fish species (list)*	
48	*Unique/rare opportunity*	No
49	*Wetland visibility*	C
50	*Proximity to population*	Yes
51	*Public ownership*	A
52	*Public access*	C
53	*Human influence on wetland*	B
54	*Human influence on viewshed*	C
55	*Spatial buffer*	A
56	*Recreational activity potential*	C
57	*Commercial crop--hydro impact*	NA

Groundwater-specific questions

58	*Wetland soils*	Recharge
59	*Subwatershed land use*	Discharge
60	*Wetland size/soil group*	Discharge
61	*Wetland hydroperiod*	Discharge
62	*Inlet/Outlet configuration*	Recharge
63	*Upland topo relief*	Discharge

Additional information

64	*Restoration potential*	No
65	*LO affected by restoration*	
66	*Existing size*	2.598
	Restorable size	0
	Potential new wetland	0
67	*Average width of pot. buffer*	0 feet
68	*Ease of potential restoration*	
69	*Hydrologic alterations*	0
70	*Potential wetland type*	0
71	*Stormwater sensitivity*	B
72	*Additional treatment needs*	B

Watershed St. Croix (Stillwater)

WS# 37 Service Area: 6

For functional ratings, please run the Summary tab report.

This report printed on: 10/26/2017

Wetland Functional Assessment Summary

Wetland Name	Hydrogeomorphology	Maintenance of Hydrologic Regime	Flood/ Stormwater/ Attenuation	Downstream Water Quality	Maintenance of Wetland Water Quality	Shoreline Protection
Wetland 8	Depressional/Isolated (no discernable inlets or outlets)	0.75	0.77	0.68	0.53	0.00
		High	High	High	Moderate	Not Applicable

Wetland Name	Maintenance of Characteristic Wildlife Habitat Structure	Maintenance of Characteristic Fish Habitat	Maintenance of Characteristic Amphibian Habitat	Aesthetics/ Recreation/ Education/ Cultural	Commercial Uses	Ground-Water Interaction	Additional Information: Wetland Restoration Potential	Additional Information: Wetland Sensitivity to Stormwater and Urban Development	Additional Information: Additional Stormwater Treatment Needs
Wetland 8	0.56	0.44	0.52	0.49	0.00	Combination Discharge, Recharge	0.00	1.00	0.53
	Moderate	Moderate	Moderate	Moderate	Not Applicable		Not Applicable	Moderate	Moderate

Wetland Community Summary

Wetland Name	Location	Vegetative Diversity/Integrity: Community: Cowardin Classification	Circular 39	Plant Community	Wetland Proportion	Individual Community Rating	Highest Wetland Rating	Average Wetland Rating	Weighted Average Wetland Rating
Wetland 8	82-029-20-18-003-B	PEMB	Type 2	Fresh (Wet) Meadow	60	0.1	1.00	0.55	0.46
							High	Moderate	Moderate
		PAB2F	Type 4	Deep Marsh	40	1	1.00	0.55	0.46
							High	Moderate	Moderate
					100		1.00	0.55	0.46

☑ *Denotes incomplete calculation data.*

MnRAM: Site Response Record

For Wetland: Wetland 9

Location: 82-029-20-18-002-B

21D - Lake Elmo Airport

Plant Community: Fresh (Wet) Meadow

Cowardin Classification: PEMB — Circular 39: Type 2

Plant Community: Shallow Marsh

Cowardin Classification: PEMC — Circular 39: Type 3

4	*Listed, rare, special species?*	No
5	*Rare community or habitat?*	No
6	*Pre-European-settlement condition?*	No

Hydrogeomorphology / topography:

7		Depressional/FlowThru
8-1	*Maximum water depth*	12 inche
8-2	*% inundated*	10%
9	*Immediate drainage--local WS*	108.8 acr
10	*Esimated size/existing site:*	(see #66)
11-Upland Soil		Antigo silt loam, 2 to 6 percent slopes
11-Wetland Soil		Aquolls and Histosols, ponded

12	*Outlet for flood control*	B
13	*Outlet for hydro regime*	B
14	*Dominant upland land use*	B
15	*Wetland soil condition*	A
16	*Vegetation (% cover)*	80%
17	*Emerg. veg flood resistance*	C
18	*Sediment delivery*	B
19	*Upland soils (soil group)*	B
20	*Stormwater runoff*	B
21	*Subwatershed wetland density*	A
22	*Channels/sheet flow*	B
23	*Adjacent buffer width*	10 feet

Adjacent area management

24-A	*Full*	10%
24-B	*Manicured*	0%
24-C	*Bare*	90%

Adjacent area diversity/structure

25-A	*Native*	0%
25-B	*Mixed*	10%
25-C	*Sparse*	90%

Adjacent area slope

26-A	*Gentle*	80%
26-B	*Moderate*	20%
26-C	*Steep*	0%

27	*Downstream sens./WQ protect.*	B
28	*Nutrient loading*	B
29	*Shoreline wetland?*	No

Shoreline Wetland

30	*Rooted veg., % cover*	0%
31	*Wetland in-water width*	0 feet
32	*Emerg. veg. erosion resistance*	
33	*Erosion potential of site*	
34	*Upslope veg./bank protection*	
35	*Rare wildlife?*	No
36	*Scare/Rare/S1/S2 community*	No
37	*Vegetative cover*	C
38	*Veg. community interspersion*	C
39	*Wetland detritus*	B
40	*Interspersion on landscape*	B
41	*Wildlife barriers*	B

Amphibian-breeding potential

42	*Hydroperiod adequacy*	Adequate
43	*Fish presence*	B
44	*Overwintering habitat*	C
45	*Wildlife species (list)*	
46	*Fish habitat quality*	B
47	*Fish species (list)*	
48	*Unique/rare opportunity*	No
49	*Wetland visibility*	B
50	*Proximity to population*	Yes
51	*Public ownership*	A
52	*Public access*	C
53	*Human influence on wetland*	B
54	*Human influence on viewshed*	C
55	*Spatial buffer*	B
56	*Recreational activity potential*	C
57	*Commercial crop--hydro impact*	NA

Groundwater-specific questions

58	*Wetland soils*	Discharge
59	*Subwatershed land use*	Discharge
60	*Wetland size/soil group*	Discharge
61	*Wetland hydroperiod*	Discharge
62	*Inlet/Outlet configuration*	Recharge
63	*Upland topo relief*	Discharge

Additional information

64	*Restoration potential*	No
65	*LO affected by restoration*	
66	*Existing size*	2.614
	Restorable size	0
	Potential new wetland	0
67	*Average width of pot. buffer*	0 feet
68	*Ease of potential restoration*	
69	*Hydrologic alterations*	0
70	*Potential wetland type*	0
71	*Stormwater sensitivity*	B
72	*Additional treatment needs*	B

Watershed St. Croix (Stillwater)

WS# 37 Service Area: 6

For functional ratings, please run the Summary tab report.

This report printed on: 10/26/2017

Wetland Functional Assessment Summary

Wetland Name	Hydrogeomorphology	Maintenance of Hydrologic Regime	Flood/ Stormwater/ Attenuation	Downstream Water Quality	Maintenance of Wetland Water Quality	Shoreline Protection
Wetland 9	Depressional/Flow-through (apparent inlet and outlet), Depressional/Flow-through (apparent inlet and outlet)	0.63	0.61	0.49	0.37	0.00
		Moderate	Moderate	Moderate	Moderate	Not Applicable

Wetland Name	Maintenance of Characteristic Wildlife Habitat Structure	Maintenance of Characteristic Fish Habitat	Maintenance of Characteristic Amphibian Habitat	Aesthetics/ Recreation/ Education/ Cultural	Commercial Uses	Ground-Water Interaction	Additional Information: Wetland Restoration Potential	Additional Information: Wetland Sensitivity to Stormwater and Urban Development	Additional Information: Additional Stormwater Treatment Needs
Wetland 9	0.30	0.45	0.15	0.47	0.00	Discharge	0.00	0.10	0.37
	Low	Moderate	Low	Moderate	Not Applicable		Not Applicable	Moderate	Moderate

Wetland Community Summary

Wetland Name	Location	Community: Cowardin Classification	Community: Circular 39	Community: Plant Community	Vegetative Diversity/Integrity: Wetland Proportion	Individual Community Rating	Highest Wetland Rating	Average Wetland Rating	Weighted Average Wetland Rating
Wetland 9	82-029-20-18-002-B	PEMB	Type 2	Fresh (Wet) Meadow	65	0.1	0.10	0.10	0.10
							Low	Low	Low
		PEMC	Type 3	Shallow Marsh	35	0.1	0.10	0.10	0.10
							Low	Low	Low
					100		0.10	0.10	0.10

☑ *Denotes incomplete calculation data.*

Appendix I. Delineator Qualifications

BRAUNA HARTZELL, GISP
GEOGRAPHIC INFORMATION SYSTEM (GIS)/IMAGE PROCESSING ANALYST

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

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

Areas of Expertise

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

Education

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

Registration/Certification

- Certified GIS Professional (GISP), GIS Certification Institute

Training and Seminars

- Building Web Applications Using the ArcGIS API for Flex, ESRI
- Geodatabase Design Concepts, ESRI
- Vascular Flora of Wisconsin, University of Wisconsin – Madison, Spring 2002
- Wetlands Ecology, University of Wisconsin – Madison, Spring 2003
- Grasses: Identification and Ecology Workshop, University of Wisconsin – Milwaukee workshop, 2002
- GPS Field Collection Techniques Training Workshop for Trimble GeoXH, Seiler Instruments
- Basic Wetland Delineation Workshop, University of Wisconsin–LaCrosse, 2002
- Basic Hydric Soil Identification Workshop, University of Wisconsin – LaCrosse, 2005
- Advanced Wetland Delineation Workshop, University of Wisconsin – LaCrosse, 2007
- Critical Methods in Delineation, University of Wisconsin-LaCrosse, 2007, 2008, and 2009
- Wildlife Inventory and Monitoring, University of Wisconsin – Milwaukee workshop, 2015

RELATED PROJECTS (WETLANDS)

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

- Pellet Subdivision – Middleton, Wisconsin, 2002
- Potter's Creek Subdivision – Green Bay, Wisconsin, 2003
- Oak Street Bridge Design – La Crosse, Wisconsin, 2003
- Winona Municipal Airport – Winona, Minnesota, 2003 & 2009
- State Trunk Highway (STH) 29 – Marathon County, Wisconsin, 2003
- Hampton Heights Subdivision – Ledgeview, Wisconsin, 2004
- County Trunk Highway (CTH) W – Oconto County, Wisconsin, 2004
- Town of Rockland Preliminary Plat – Brown County, Wisconsin, 2004
- Mourning Dove Subdivision – Oconto County, Wisconsin, 2004
- Cinnamon Ridge Subdivision – Suamico, Oconto County, Wisconsin, 2004
- Kenosha Regional Airport – Kenosha, Wisconsin, 2005
- County Trunk Highway (CTH) A – Lincoln County, Wisconsin
- CTH D – Vernon County, Wisconsin, 2006
- Burton Street – Beloit, Wisconsin, 2006
- Central Wisconsin Airport – Mosinee, Marathon County, Wisconsin, 2008
- State Trunk Highway (STH) 67, Fond du Lac County, Wisconsin, 2011
- Interstate Highway 90/94 Corridor Study, 2014 & 2015
- Ontonagon County Airport, Ontonagon County, Michigan, 2016
- Central Wisconsin Airport – Mosinee, Marathon County, Wisconsin, 2016
- Little Rock Lake, Vilas County, Wisconsin, 2016

Ontonagon County Airport, 2016
Michigan Bureau of Aeronautics
Ontonagon County, Michigan
Brauna served as the lead wetland delineator in support of permitting and on-site mitigation activities related to proposed wetland disturbance in another area of the airport. The area of interest is approximately 19.4 acres in size and resulted in the delineation of 11 wetlands in areas previously in agricultural production. Brauna also performed groundwater well monitoring and data analysis in support of mitigation site design.

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

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

groundwater contact on a sloping terrain with a seasonal high-water table; off-site wetlands consisted of an alder and a hardwood swamp.

Little Rock Lake Wetland Survey, 2016
National Ecological Observatory Network (NEON), Boulder, CO
Vilas County, Wisconsin

Brauna served as the lead wetland scientist in support of site equipment layout investigations for long-term ecological monitoring. A total of four wetlands were delineated within the area of interest at this mesotrophic seepage lake covering about 39 acres. Each proposed equipment installation site was surveyed and wetlands delineated in close proximity to any proposed location.

Interstate Highway (IH) 90/94 Corridor Study, 2013-2017
Wisconsin Department of Transportation (WisDOT) Southwest Region
Portage, Juneau, Sauk, and Columbia Counties, Wisconsin

Mead & Hunt is leading a team that is conducting a corridor study of IH 90/94 from US12/WIS 16 to IH39. The project consists of evaluating operational and safety issues, review of the interchanges and ramps within the corridor, and evaluating possible expansion. Environmental studies are being conducted and include; cultural resources surveys, endangered species surveys, contaminated material investigations, noise analysis and wetland delineations. Brauna is a wetland scientist assisting in the delineation, wetland field data collection and mapping. Cost: $210 million

STH 67 Resurfacing Design and Environmental Documentation, 2011
Wisconsin Department of Transportation (WisDOT) Northeast Region
Fond du Lac County, Wisconsin

Mead & Hunt lead redesign of this 20 mile corridor of STH 67 spanning Fond du Lac County through both rural and developed sections. In support of environmental documentation, a wetland delineation was performed within the right-of-way for the 20 mile corridor. Wetland types encountered include: shallow marsh, fresh wet meadows, shrub swamps, and riparian wetlands. In total, 69 wetlands were delineated. Brauna assisted with wetland delineation and survey, mapping and data management.

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.

Wetland Permit Application, 2003-2008
Tulip City Airport
Holland, Michigan

The purpose of the project was to increase the capacity of the main runway and correct unsafe conditions in the approaches to the airport. Four project alternatives were addressed in the permit application, as well as wetland avoidance and impact minimization. Special considerations included the minimization of wildlife habitat potential for airport safety reasons and the location of the mitigation site "offsite" within three miles of the airport. In 2003, Brauna designed a riparian wetland mitigation site in the City of Holland. The project included construction plans and sections, an examination of existing site conditions, vegetative reestablishment and expected hydrology, and a monitoring protocol including performance stands. Monitoring in 2008 showed that site has achieved full performance in terms of wetland function and area.

Voges Road, Road Reconstruction Permit Application
City of Madison
Madison, Wisconsin

The proposed reconstruction of Voges Road, a vital corridor connection between Madison and McFarland, necessitated the submission of a Section 404 permit application. The proposed improvements included widening the road and upgrading to an urban curb-and-gutter section to accommodate increased traffic volumes and improve drainage along the road.

KIMBERLY SHANNON
ENVIRONMENTAL SCIENTIST

Kimberly Shannon is an environmental scientist with over a decade of experience. Over the years she has gained professional experience in coordinating and completing a variety of project types including oil and gas, electric transmission, nuclear, transportation, commercial development, and local government. She has honed her regulatory and technical skills while providing excellent service to diverse clients. Her technical expertise and strongest skills as a consultant include the identification, mapping, and delineation of streams and wetlands; 404 permitting and compensatory mitigation; United States Army Corps of Engineers (USACE) coordination, and assisting various clients through the 404 permitting process. Kimberly also has professional experience in the preparation and coordination of environmental assessment and categorical exclusion documents in support of the National Environmental Policy Act (NEPA) process, habitat evaluation for threatened and endangered species, proposal writing and pricing, technical writing and editing, training junior staff, and working with project managers, colleagues and clients to achieve project goals and objectives in a timely and cost effective manner. She coordinates with subcontractors and science/environmental staff in offices across the country to complete field work, reports, permits, and data deliverables.

RELATED PROJECTS

Mitigation Coordination for Oklahoma Department of Transportation (ODOT) with Multiple Agencies, EC 1660, 2015-present
ODOT
Statewide, Oklahoma
Kimberly is assisting ODOT with the coordination of various mitigation projects across Oklahoma. As part of this contract she is working directly with the USACE, other consultants, and the Oklahoma Chapter of The Nature Conservancy, a key mitigation partner for ODOT. Assisting TNC with production of a mitigation master plan for TNC's Oka' Yanahli Preserve in Pontotoc County, OK.

Kimberly's years of various environmental project experience includes:

- Waters re-evaluations and mitigation plans – ODOT
- Mitigation plan for Durant Bypass – ODOT
- Local government contract for statewide county road and bridge projects – ODOT
- BNSF Railroad separation EA – ODOT
- Delineations, 404 permitting, and mitigation planning in Texas and Oklahoma – QuikTrip
- Natural gas liquids trunk line right of way assessments, reports and 404 permitting in OK, KS, TX, CO included over 400 miles and 1,000 waterbodies assessed – DCP Midstream, LLC
- Wetland delineations and site spot checks in Uintah Basin, Utah; Senior delineator for site-specific survey on Ute and Ouray Reservation – Constellation Energy Partners (CEP)
- Section 7 consultation and biological assessment (BA) for the American Burying Beetle in Tulsa, OK – Tulsa Botanic Garden

Areas of Expertise

- Permitting and licensing
- NEPA
- Public involvement
- Regulatory compliance
- Environmental Assessments
- Environmental Reports
- Stream and wetland delineation

LinkedIn url

- https://www.linkedin.com/pub/kimberly-shannon/29/412/a38

Education

- MS, Applied and Natural Science, Oklahoma State University, 1997
- BS, Biology, Oklahoma State University, 1994
- Certificate, GIS, Tulsa Community College, 2010

Training and Seminars

- "Permitting and Training," Federal Energy Regulatory Commission (FERC), 2013
- "Advanced Problems in Hydric Soil Evaluation," North Carolina State University, 2010
- "Contractor Orientation Safety Course," Burlington Northern Santa Fe Railroad (BNSF), Union Pacific Railroad (UPRR), 2009
- "Regional Supplement Seminar," Wetland Training Institute, 2008

Presentations

- NEPA Updates for Oklahoma, Wallace Engineering, 2009
- Panel Presentation: Careers in the Frontier of the Environment, Women in Science Conference, 2008
- Panel Presentation: Landowner Relationships, Natural Areas Associations Conference, 2004

Past Employment

- Delineations, habitat assessments, vegetation mapping, aquatic ecology surveys, and NRC site audits in support of COL application and ER Luminant Generation Company – Comanche Peak Nuclear Power Plant, Glen Rose, TX
- Coordinated staff for weeks of biological monitoring of seismic drilling and receiver line crews at Tishomingo – NWR Chesapeake Energy

Ontonagon County Airport, 2016
Michigan Bureau of Aeronautics
Ontonagon County, Michigan
Kim served as a wetland delineator in support of permitting and on-site mitigation activities related to a proposed wetland disturbance in another area of the airport. The area of interest spans approximately 19.4 acres and resulted in the delineation of 11 wetlands in areas previously in agricultural production. Kim also assisted groundwater well monitoring in support of mitigation site design.

Waters Re-Evaluations and Mitigation, 2009-January 2010
Oklahoma Department of Transportation (ODOT)
Statewide, Oklahoma
Kimberly assisted with multiple re-evaluations of potentially jurisdictional waterbodies related to bridge replacement projects across Oklahoma. Delineation reports, 404 permits, and mitigation plans were prepared for the ODOT. *This project was completed while Kimberly was employed with another firm.*

Mitigation Projects, 2009-2015
Oklahoma Department of Transportation (ODOT)
Statewide, Oklahoma
Kimberly prepared compensatory mitigation plans for 404 Permit Applications in support of ODOT road and bridge improvement projects across Oklahoma. She conducted and coordinated site assessments, site selection, landowner correspondence and coordination, site planning, agency coordination, and monitoring plans for multiple mitigation projects.

Mitigation Plan, Durant Bypass, May 2010-2015
Oklahoma Department of Transportation (ODOT)
Durant, Oklahoma
Kimberly prepared a compensatory mitigation plan for a 404 permit in support of the ODOT's bypass loop around US70 in Durant, Oklahoma. She coordinated with the United States Army Corps of Engineers (USACE), ODOT, subcontractors, and the City of Durant during the project.

Delineation, Reporting, and 404 Permitting, November 2011-April 2012
QuikTrip
Dallas/Fort Worth Metroplex, Texas
Kimberly led and completed multiple delineations, protected species habitat evaluations, reporting efforts, and 404 permitting (NWP39) including mitigation bank and agency coordination for the client. *This project was completed while Kimberly was employed with another firm.*

- Kleinfelder
- Enercon Services
- George M. Sutton Avian Research Center
- Oklahoma Biological Survey
- Tulsa Community College
- Oklahoma Chapter of the Nature Conservancy

No. of Years With Mead & Hunt

- Hired 05/04/2015

No. of Years With Other Firms

- 10

Delineation, Reporting, and 404 Permitting for 72-TC, May 2014-September 2014
QuikTrip Corporation
Muskogee, Oklahoma

Kimberly coordinated and completed the delineation, protected species habitat evaluations, reporting efforts, and 404 permitting (NWP39) including mitigation plan preparation and agency coordination for the client. *This project was completed while Kimberly was employed with another firm.*

Local Government Contract for Statewide County Road and Bridge Projects
Oklahoma Department of Transportation (ODOT)
Statewide Oklahoma

These similar county-level projects included the delineation of potentially jurisdictional waterbodies, assessment of potential habitat for federally protected species, reporting efforts, the completion of project specific National Environmental Policy Act (NEPA) clearance documents, tribal coordination, and coordination with Oklahoma Department of Transportation (ODOT) contacts and county commissioners. Kimberly assisted with the coordination and completion of field assessments and related reports in support of the Categorical Exclusion (CE) documents. She also coordinated report review with ODOT and preparation of the CE report. *This project was completed while Kimberly was employed with another firm.*

Southern Hills Natural Gas Liquids Trunk Line ROW Assessments, Reports and 404 Permitting, December 2011-July 2012
DCP Midstream, LLC
Meade County, Kansas and Beaver, Harper, Woodward, Major, Blaine, Kingfisher, Logan, Oklahoma, Lincoln, and Pottawatomie Counties, Oklahoma

Kimberly reviewed and classified over 500 waterbodies along approximately 260 miles of pipeline right-of-way. She reviewed all right-of-way feature maps and coordinated field data for the presence of potentially jurisdictional waters and potential threatened and endangered species habitat for a large trunk line pipeline in Oklahoma. Kimberly classified and coordinated mapping efforts with GIS professionals and the client to assist with horizontal directional drilling (HDD) boring locations in order to avoid or minimize impacts to jurisdictional waterbodies. These data were used to complete delineation reports, 404 permitting (NWP12) and to prepare engineering alignment sheets. As appropriate, Kimberly coordinated directly with the Tulsa and Fort Worth District Regulatory Branch of the United States Army Corps of Engineers for the timely completion and issuance of NWP12. She worked directly with the client's environmental project manager to assist with reroutes and attended alignment sheet review meetings. *This project was completed while Kimberly was employed with another firm.*

Southern Hills Natural Gas Liquids Lateral Lines Right-of-Way Assessments, Reports and 404 Permitting, March-August 2012
DCP Midstream, LLC
Woodward, Woods, Major, Logan, and Lincoln Counties, Oklahoma

Kimberly classified over 300 waterbodies along approximately 88 miles of pipeline right-of-way. She reviewed all right-of-way feature maps and coordinated field data for the presence of potentially jurisdictional waters and potential threatened and endangered species habitat for multiple lateral pipelines in Oklahoma. Kimberly classified and coordinated mapping efforts with GIS professionals and the client to assist with horizontal directional drilling (HDD) boring locations in order to avoid or minimize impacts to jurisdictional waterbodies. These data were used to complete delineation reports, 404 permitting (NWP12) and to prepare engineering alignment sheets. As appropriate, Kimberly coordinated directly with the Tulsa and Fort Worth District Regulatory Branch of the United States Army Corps of Engineers for the timely completion and issuance of NWP12. She worked directly with the client's environmental project manager to assist with reroutes and attended alignment sheet review meetings. *This project was completed while Kimberly was employed with another firm.*

Chitwood/Sholem Lateral Pipeline Right-of-Way Assessments, Reports and 404 Permitting, April-August 2012
DCP Midstream, LLC
Jefferson County, Oklahoma and Clay and Jack Counties, Texas
Kimberly classified over 189 waterbodies along approximately 31.5 miles of pipeline right-of-way. She reviewed all right-of-way feature maps and coordinated field data for the presence of potentially jurisdictional waters and potential threatened and endangered species habitat for multiple pipelines in Oklahoma and Texas. Kimberly classified and coordinated mapping efforts with GIS professionals and the client to assist with horizontal directional drilling (HDD) boring locations in order to avoid or minimize impacts to jurisdictional waterbodies. These data were used to complete delineation reports, 404 permitting (NWP12) and to prepare engineering alignment sheets. As appropriate, Kimberly coordinated directly with the Tulsa and Fort Worth District Regulatory Branch of the United States Army Corps of Engineers for the timely completion and issuance of NWP12. She worked directly with the client's environmental project manager to assist with reroutes and attended alignment sheet review meetings. *This project was completed while Kimberly was employed with another firm.*

Wetland Delineations and Site Spot Checks, May-September 2014
Constellation Energy Partners (CEP)
Uintah Basin, Utah
Kimberly worked in the Uintah Basin in northeast Utah on multiple occasions to assist as a Senior Delineator for site-specific waters and wetlands delineations, section block (square mile) surveys, and site spot checks for waterbodies on the Ute and Ouray Reservation. *This project was completed while Kimberly was employed with another firm.*

Biological Assessment (BA) for the American Burying Beetle, 2007-2008
Tulsa Botanic Garden
Tulsa, Oklahoma
In response to a federal nexus via a nationwide permit application for the construction of a dam at the Oklahoma Centennial Botanical Gardens, Kimberly prepared a biological assessment in response to Formal Section 7 Consultation with United States Fish and Wildlife Service for the American Burying Beetle. *This project was completed while Kimberly was employed with another firm.*

Wetland Inventory, 2006-2007
Camp Gruber Maneuver Training Center
Muskogee County, Oklahoma
As directed by EO 11990, Kimberly was part of a team that assessed the Camp Gruber site for new wetlands and verification of previously identified wetlands, included delineation of waterbodies subject to the jurisdiction of the United States Army Corps of Engineers (USACE). *This project was completed while Kimberly was employed with another firm.*■

Appendix D – Section 106 Documentation & Correspondence

MINNESOTA HISTORICAL SOCIETY

Using the Power of History to Transform Lives
PRESERVING › SHARING › CONNECTING

STATE HISTORIC PRESERVATION OFFICE

December 28, 2017

Mr. Josh Fitzpatrick
Environmental Protection Specialist
Federal Aviation Administration
Dakota – Minnesota Airports District Office
6020 28th Avenue South, Room 102
Minneapolis, MN 55450

RE: Lake Elmo Airport Improvement Project
Baytown Twp & West Lakeland Twp, Washington County, MN
SHPO Number: 2018-0345

Dear Mr. Fitzpatrick:

Thank you for the opportunity to comment on the above project. Information received in our office on 1 December 2017 has been reviewed pursuant to the responsibilities given the State Historic Preservation Officer by Section 106 of the National Historic Preservation Act of 1966 and implementing federal regulations at 36 CFR 800.

We have reviewed the documentation included with your November 21, 2017 cover letter, a submittal which included the following reports: *Phase I Archaeological Identification Survey of Proposed Changes to Portions of the Lake Elmo Airport, Washington County, Minnesota* (August 2017, Mississippi Valley Archaeology Center); and *Phase I Reconnaissance Survey Report, Lake Elmo Airport* (November 2017, Mead & Hunt) with associated inventory forms. Our comments are provided below.

Area of Potential Effects

We have completed our review of your correspondence along with the documentation provided in regards to your agency's determination of the area of potential effect (APE) for the Federal undertaking. We agree that this APE determination is generally appropriate to take into account the potential direct and indirect effects of the proposed undertaking as we currently understand it. As the project's scope of work is further defined, or if it is significantly altered from the current scope, additional consultation with our office may be necessary in order to revise the current APE.

Identification of Historic Properties

Archaeology

As a result of the investigations, two archaeological sites were identified within the APE for this project, 21WA0119 and 21WA0120. These sites have not been evaluated to determine their eligibility for listing in the National Register of Historic Places (NRHP). As long as the trees and vegetation are hand-cut within the site areas, and there is no ground disturbance and no use of heavy machinery in the site areas, this project should have no effect on archaeological resources. If impacts to these sites cannot be avoided, Phase II evaluation will be needed.

History/Architecture Properties

Thirteen history/architecture properties were identified within the APE for this project. We agree with your agency's determination that the following twelve properties are **not eligible** for listing in the NRHP: Edward Flynn House (WA-BYT-004), house at 3245 Neal Ave. N (WA-BYT-008), house at 3101 Neal Ave. N (WA-BYT-009), house at 13030 30th St. N (WA-BYT-010), house at 13100 30th St. N (WA-BYT-011), house at 12905 40th St. N (WA-BYT-012), house at 12805 40th St. N (WA-BYT-013), house at 12689 40th St. N (WA-BYT-014), house at 12657 40th St. N (WA-BYT-015), Lake Elmo Airport (WA-BYT-016), house at 2925 Neal Ave. N (WA-WLK-006), and house at 2933 Manning Ave. N (WA-WLK-007). We agree that the remaining property, the St. Paul, Stillwater and Taylor's Falls Railroad Corridor (XX-RRD-044), needs further evaluation to determine its eligibility for listing in the NRHP.

Assessment of Effects

Provided that impacts to sites 21WA0119 and 21WA0120 are avoided as stated, and that all project activities occur outside the boundaries of the St. Paul, Stillwater and Taylor's Falls Railroad Corridor Historic District, we concur with your agency's determination that **no historic properties will be affected** by this project.

Implementation of the undertaking in accordance with this finding, as documented, fulfills the agency's responsibilities under Section 106. If the project is not constructed as proposed, including, but not limited to, a situation where engineering/design changes to the currently proposed project diverts substantially from what was presented at the time of this review, or engineering/design changes involving undisturbed new rights-of-way or easements are made for the undertaking following completion of this review, the agency will need to reopen Section 106 consultation with our office.

Please contact Kelly Gragg-Johnson, Review and Compliance Specialist, at (651) 259-3455 if you have any questions regarding our review of this project.

Sincerely,

Sarah J. Beimers

Sarah J. Beimers, Manager
Government Programs and Compliance

FEDERAL AVIATION ADMINISTRATION
DOCUMENTATION OF SECTION 106 FINDING OF
NO HISTORIC PROPERTIES AFFECTED
SUBMITTED TO THE MINNESOTA STATE HISTORIC PRESERVATION OFFICER (SHPO), LOWER SIOUX INDIAN COMMUNITY TRIBAL HISTORIC PRESERVATION OFFICER (THPO), UPPER SIOUX INDIAN COMMUNITY THPO, PRAIRIE ISLAND INDIAN COMMUNITY THPO, MILLE LACS BAND OF OJIBWE THPO, and the SHAKOPEE MDEWAKANTON SIOUX COMMUNITY
PURSUANT TO 36 CFR Section 800.4(d)(1) for the
LAKE ELMO AIRPORT IMPROVEMENT PROJECT

1. DESCRIPTION OF THE UNDERTAKING

The Lake Elmo Airport (Airport) has undertaken an environmental assessment (EA) with the Federal Aviation Administration (FAA) for Airport improvements including:

1. Relocate Runway 14/32 to the northeast and extend to the southeast, including all necessary grading, clearing, and runway lighting.
2. Construct cross-field taxiway to serve new Runway 14 end.
3. Convert existing Runway 14/32 to a partial parallel taxiway and construct other taxiways as needed to support the relocated runway, including taxiway lighting and/or reflectors.
4. Extend Runway 04/22 to the northeast and add necessary lighting and taxiway connectors.
5. Realign 30th Street North around the new Runway 14/32 runway protection zone to reconnect with Neal Avenue North.
6. Construct a connector road.
7. Establish non-precision instrument approach procedures to all four runway ends.
8. Remove approximately 20 acres of trees.

A map identifying project features can be found in Appendix A.

2. AREA OF POTENTIAL EFFECT

The Area of Potential Effect (APE) is the area within which an undertaking may affect an historic property or cultural resource, either directly or indirectly. The APE for this project encompasses all areas proposed for disturbance and the view shed (the area which the project may visually impact) of the project (Appendix B).

3. EFFORTS TO IDENTIFY HISTORIC PROPERTIES

Qualified historians from Mead & Hunt worked with the FAA to delineate the Area of Potential Effect (APE), which was defined to include the Lake Elmo Airport and first-tier properties, those that are directly adjacent to airport property, with structures that are 45 years in age or older. Where project activities are more extensive and have additional direct and indirect effects, such as at the southeast end of Runway 32 and proposed 30th Street realignment areas, the APE was expanded to include second tier properties, those adjacent to first tier properties. The APE takes into account direct and indirect effects to resources based on the proposed project activities. A map of the APE is included in Appendix B.

Prior to fieldwork, the project team conducted a literature review at the Minnesota State Historic Preservation Office (SHPO) to identify any previously surveyed architecture/history properties within the APE. One property within the APE, the Edward Flynn House (WA-BYT-004), was previously identified.

Mead & Hunt historians conducted Phase I fieldwork on May 30, 2017 (Appendix C). In addition to the previously identified Edward Flynn House, historians identified 12 historic-age resources, which are defined as constructed in or before 1972. Of the 13 surveyed properties, 12 are recommended not eligible for listing in the National Register of Historic Places (NRHP) and no further work is required.

The remaining property, the Union Pacific Railway—historically the St. Paul, Stillwater, & Taylor's Falls (StPS&TF) Railroad—is recommended for further study if future actions were to impact the line. The line may have significance under the *Railroads in Minnesota, 1862-1956 Multiple Property Documentation Form* (MPD), applying NRHP *Criterion A: Transportation* as an early connection between the manufacturing/commerce nodes of Stillwater and the Twin Cities, and as an important component of Minnesota's railroad network that provided an early link between the Twin Cities, Stillwater, and wider markets.

Project activities, however, are located on airport property, outside the railroad right-of-way and potential historic boundary (as outlined in the MPD, the historic boundary will be the historic right-of-way of the company that built the line) and have a minimal potential for impact to the railroad corridor. Project related tree removal, will not alter any character-defining features of the potential StPS&TF Railroad Corridor Historic District or diminish its potential significance. Furthermore, the tree removal will have a limited impact on the overall setting and visual appearance from the railroad corridor itself. The loss of a relatively small number of trees along the entire rail corridor (which currently extends from St. Paul to Stillwater) will not drastically change the railroad's overall visual appearance, setting, or feeling.

In addition, there is no potential for indirect visual effects to the railroad corridor as changes to the runways, lighting, and navigational aids proposed adjacent to the railroad will not drastically alter current views from along the corridor. Similarly, there are no anticipated noise impacts to the railroad. Aircraft size and type will not change from what is currently landed on the runways adjacent to the railroad corridor. There will be no discernable change to noise levels experienced on railroad property. As such, it was determined that no further work is required for this property at this time. Should project activities change to potentially impact the railroad, then a reexamination of their effects on the StPS&TF Railroad would be completed.

The Mississippi Valley Archaeology Center (MVAC) conducted a Phase I archaeological survey (Appendix D) for the proposed Lake Elmo Airport in Washington County, Minnesota on June 1, and July 12, and 13, 2017.

A total of approximately 126 acres was surveyed. Survey methods included pedestrian survey in plowed fields with excellent surface visibility, and shovel testing within portions of the current airport grounds and wooded areas within and adjacent to the plowed fields with no surface visibility.

Two new historic sites were identified. 21WA0119 consists of historic foundations with one structure consisting of a limestone foundation with a concrete addition, and a second foundation made of concrete and cinderblock. There are also some concrete slabs of unknown use. Based on historical documentation, these structures were erected sometime between 1874 and 1901, and were present until possibly the early 1980's. 21WA0120 consists of two historic foundations made of concrete. Based on historical research, the structures were erected sometime between 1874 and 1901, and were present until at the least the mid to late 1960's.

Historical maps and deed research indicate that from 1933 to 1946, the foundations associated with both of these sites, and the land surrounding them, were owned by the Jacob Schmidt Brewing Company. It is unknown if the buildings at these two sites were used in any of the manufacturing or storage for the brewery which during the 1930's and 1940's, was the seventh largest in the nation. The intact foundations indicate integrity, and the relationship to the Jacob Schmidt Brewing Company could indicate significance. These two sites may be potentially eligible for listing on the NRHP under Criteria D, as they could yield important information about the past. However, since ultimately ground disturbing activities will be able to avoid these sites, the sites were not formally evaluated for eligibility for the NRHP. The only action in the site areas is the groves of trees they are located in will be clear cut.

No other cultural material was identified within the project area, therefore no further work is recommended for the remainder of the project. However, if in the future ground disturbing activities are planned in the locations of WA0119 and WA0120, the SHPO will be consulted to see if further evaluations are necessary.

4. BASIS FOR FINDING

The FAA has therefore determined that a finding of *No Historic Properties Affected* is appropriate for the project. The FAA respectfully requests that the Lower Sioux Indian Community THPO, Upper Sioux Indian Community THPO, Prairie Island Indian Community THPO, Mille Lacs Band of Ojibwe THPO, the Shakopee Mdewakanton Sioux Community, and SHPO provide written concurrence with this Section 106 finding within 30 days of receipt.

ATTACHMENTS

Appendix A Project Exhibit

Appendix B APE & Phase I Reconnaissance Survey Sites

Appendix C Phase I Reconnaissance Survey

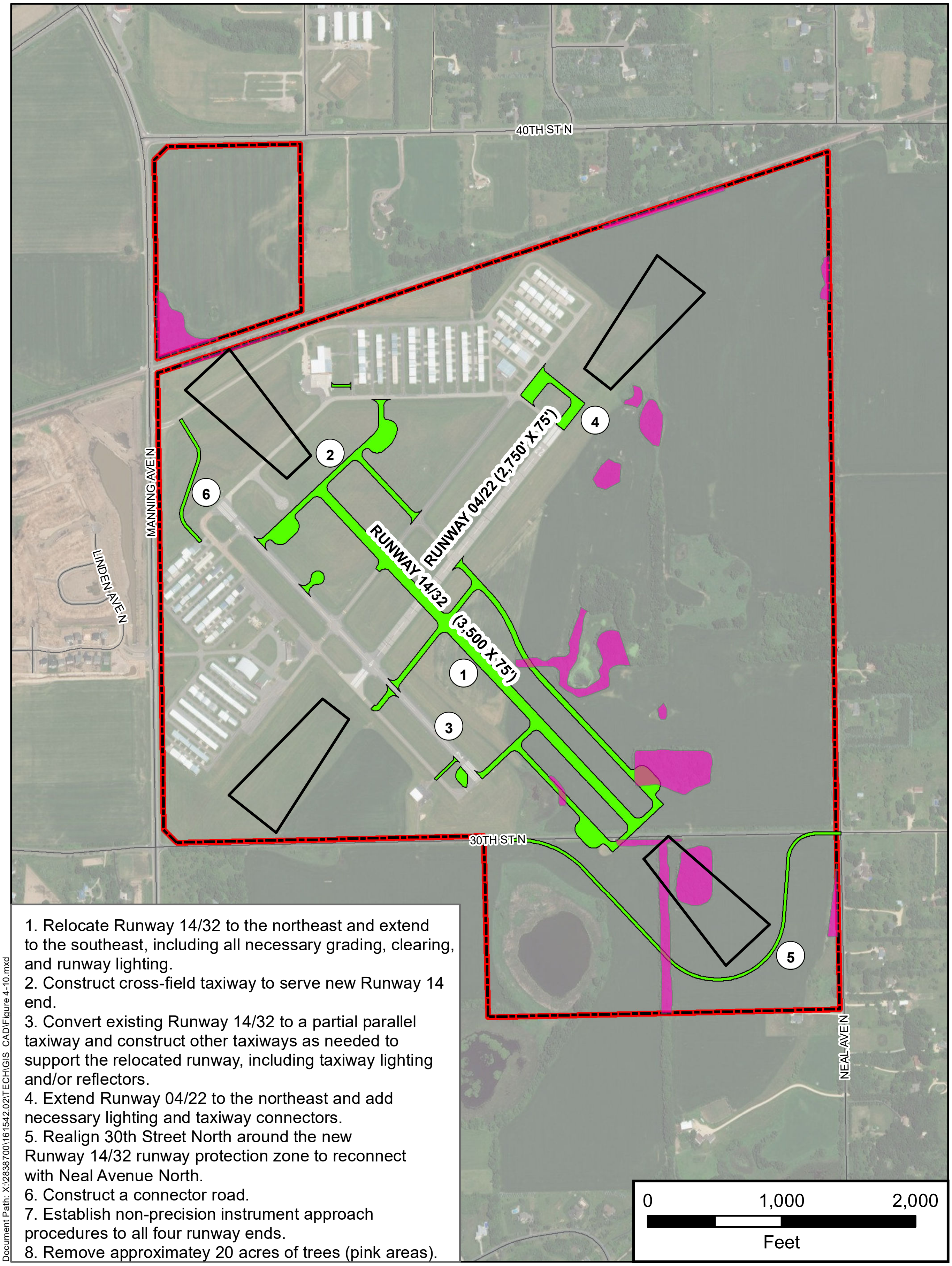
Appendix D Phase I Archeological Survey

Josh Fitzpatrick
Environmental Protection Specialist
Federal Aviation Administration
Dakota-Minnesota Airport District Office

20-October 2017

Date

Attachment A



Washington County, MN - GIS Data Downloads at http://maps.co.washington.mn.us/arcgis/services/Public/Public_Parcels

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Project Summary
Lake Elmo Airport
Environmental Assessment

Attachment B


WA-LEC-021
WA-LEC-022
WA-LEC-020
WA-BYT-004
WA-LEC-023
XX-RRD-044
WA-LEC-024
COUNTY RD 14 (40TH ST N)
UNION PACIFIC RAILROAD
SERVICE RD
FAA RPZ
254' EXTENSION
ULT RWY 4-22 2750' X 75'
EX RWY 4-22 2496' X 75'
RSA
ROFA
CONNECTOR RD
CONVERT RWY 14-32 TO TWY
RECONSTRUCT
CONSTRUCT PROP RWY 14-32 3500' X 75'
WA-LEC-024
COUNTY RD 15 (MANNING AVE N)
WA-BYT-007
WA-BYT-008
WA-BYT-010
WA-BYT-009
NEAL AVE N
30TH ST N
RELOCATE 30TH ST N
WA-LEC-025
WA-WLK-006
500 250 0 500 Feet
Legend
Airport Boundary
Area of Potential Effect

Evan Barrett

From: Joshua.Fitzpatrick@faa.gov
Sent: Friday, October 20, 2017 10:55 AM
To: Evan Barrett
Subject: FW: Section 106 Determination of Effect for the Lake Elmo Airport Improvement Project

---

From: Fitzpatrick, Joshua (FAA)
Sent: Friday, October 20, 2017 10:33 AM
To: Cheyanne St. John <cheyanne.stjohn@lowersioux.com>
Subject: Section 106 Determination of Effect for the Lake Elmo Airport Improvement Project

Dear Ms. St. John:

The Federal Aviation Administration (FAA) determined that a Section 106 finding of a No Historic Properties Affected is applicable for the Lake Elmo Airport Improvement Project. The FAA respectfully requests the Lower Sioux THPO to provide written concurrence with the Section 106 determination of No Historic Properties Affected within 30 days of receipt.

I have placed a hard copy in the mail to President Pendleton as well. Do you want me to continue to do that?

If you have any comments, questions, or concerns regarding the analyses and conclusions used to determine the potential effects of the proposed project on historic, cultural, and archaeological resources, or have any questions regarding the project, please do not hesitate to contact me.

Sincerely,

Josh Fitzpatrick
Environmental Protection Specialist
FAA Dakota-Minnesota Airport District Office
Joshua.Fitzpatrick@faa.gov
(612) 253-4639

Evan Barrett

From: Joshua.Fitzpatrick@faa.gov
Sent: Friday, October 20, 2017 10:56 AM
To: Evan Barrett
Subject: FW: Section 106 Determination of Effect for the Lake Elmo Airport Improvement Project

---

From: Fitzpatrick, Joshua (FAA)
Sent: Friday, October 20, 2017 10:53 AM
To: Natalie Weyaus <Natalie.Weyaus@millelacsband.com>; 'John Reynolds' <John.Reynolds@millelacsband.com>
Subject: Section 106 Determination of Effect for the Lake Elmo Airport Improvement Project

Dear Ms. Weyaus:

The Federal Aviation Administration (FAA) determined that a Section 106 finding of a No Historic Properties Affected is applicable for the Lake Elmo Airport Improvement Project. The FAA respectfully requests the Mille Lacs Band of Ojibwe THPO to provide written concurrence with the Section 106 determination of No Historic Properties Affected within 30 days of receipt.

If you have any comments, questions, or concerns regarding the analyses and conclusions used to determine the potential effects of the proposed project on historic, cultural, and archaeological resources, or have any questions regarding the project, please do not hesitate to contact me.

Sincerely,

Josh Fitzpatrick
Environmental Protection Specialist
FAA Dakota-Minnesota Airport District Office
Joshua.Fitzpatrick@faa.gov
(612) 253-4639

Evan Barrett

From:	Joshua.Fitzpatrick@faa.gov
Sent:	Friday, October 20, 2017 10:56 AM
To:	Evan Barrett
Subject:	FW: Section 106 Determination of Effect for the Lake Elmo Airport Improvement Project

---

From: Fitzpatrick, Joshua (FAA)
Sent: Friday, October 20, 2017 10:51 AM
To: noah.white@piic.org
Subject: Section 106 Determination of Effect for the Lake Elmo Airport Improvement Project

Dear Mr. White:

The Federal Aviation Administration (FAA) determined that a Section 106 finding of a No Historic Properties Affected is applicable for the Lake Elmo Airport Improvement Project. The FAA respectfully requests the Prairie Island Indian Community THPO to provide written concurrence with the Section 106 determination of No Historic Properties Affected within 30 days of receipt.

If you have any comments, questions, or concerns regarding the analyses and conclusions used to determine the potential effects of the proposed project on historic, cultural, and archaeological resources, or have any questions regarding the project, please do not hesitate to contact me.

Sincerely,

Josh Fitzpatrick
Environmental Protection Specialist
FAA Dakota-Minnesota Airport District Office
Joshua.Fitzpatrick@faa.gov
(612) 253-4639

Evan Barrett

From:	Joshua.Fitzpatrick@faa.gov
Sent:	Friday, October 20, 2017 10:56 AM
To:	Evan Barrett
Subject:	FW: Section 106 Determination of Effect for the Lake Elmo Airport Improvement Project

---

From: Fitzpatrick, Joshua (FAA)
Sent: Friday, October 20, 2017 10:46 AM
To: Leonard Wabasha <leonard.wabasha@shakopeedakota.org>
Subject: Section 106 Determination of Effect for the Lake Elmo Airport Improvement Project

Dear Mr. Wabasha:

The Federal Aviation Administration (FAA) determined that a Section 106 finding of a No Historic Properties Affected is applicable for the Lake Elmo Airport Improvement Project. The FAA respectfully requests the Shakopee Mdewakanton Sioux Community to provide written concurrence with the Section 106 determination of No Historic Properties Affected within 30 days of receipt.

If you have any comments, questions, or concerns regarding the analyses and conclusions used to determine the potential effects of the proposed project on historic, cultural, and archaeological resources, or have any questions regarding the project, please do not hesitate to contact me.

Sincerely,

Josh Fitzpatrick
Environmental Protection Specialist
FAA Dakota-Minnesota Airport District Office
Joshua.Fitzpatrick@faa.gov
(612) 253-4639

Evan Barrett

From: Joshua.Fitzpatrick@faa.gov
Sent: Friday, October 20, 2017 10:55 AM
To: Evan Barrett
Subject: FW: Section 106 Determination of Effect for the Lake Elmo Airport Improvement Project

---

From: Fitzpatrick, Joshua (FAA)
Sent: Friday, October 20, 2017 10:24 AM
To: Samantha Odegard <samanthao@uppersiouxcommunity-nsn.gov>
Subject: Section 106 Determination of Effect for the Lake Elmo Airport Improvement Project

Dear Ms. Odegard:

The Federal Aviation Administration (FAA) determined that a Section 106 finding of a No Historic Properties Affected is applicable for the Lake Elmo Airport Improvement Project. The FAA respectfully requests the Upper Sioux THPO to provide written concurrence with the Section 106 determination of No Historic Properties Affected within 30 days of receipt.

I have placed a hard copy in the mail to your Chairman as well. Do you want me to continue to do that?

If you have any comments, questions, or concerns regarding the analyses and conclusions used to determine the potential effects of the proposed project on historic, cultural, and archaeological resources, or have any questions regarding the project, please do not hesitate to contact me.

Sincerely,

Josh Fitzpatrick
Environmental Protection Specialist
FAA Dakota-Minnesota Airport District Office
Joshua.Fitzpatrick@faa.gov
(612) 253-4639

Phase I (Reconnaissance Survey) Report

Lake Elmo Airport

Prepared for

Metropolitan Airports Commission

Prepared by

Mead & Hunt

www.meadhunt.com

Co-principal investigators Katherine Haun Schuring and Kathryn Ohland

Project Managers Emily Pettis and Evan Barrett

November 2017

Table of Contents

Appendices

Tables

Executive Summary

The Metropolitan Airports Commission (MAC) recently completed a Long-Term Comprehensive Plan (LTCP) for the Lake Elmo Airport, which was approved by the MAC Board in September 2016. The key planning objectives of the LTCP include: addressing failing end-of-life infrastructure, enhancing safety, and improving operational capacity for design aircraft family. To meet these objectives, the MAC, owner of the Lake Elmo Airport, retained Mead & Hunt, Inc. (Mead & Hunt) to develop plans for a proposed airport update project. The overall project activities include:

- Relocating Runway 14/32 to the northeast and extending it to the southeast, including all necessary grading, clearing, and runway lighting.
- Constructing a new cross-field taxiway to serve the new Runway 14 end, including taxiway lighting and/or reflectors.
- Converting the existing Runway 14/32 to a partial parallel taxiway and constructing other taxiways as needed to support the relocated runway, including taxiway lighting and/or reflectors.
- Establishing a new non-precision approach to the Runway 14 end.
- Extending Runway 4/22 to the northeast and adding necessary lighting and taxiway connectors.
- Upgrading existing Runway 4 approach to RNAV (GPS).
- Realigning 30th Street N. around the new Runway 14/32 Runway Protection Zone to reconnect with Neal Avenue.

The project will use Federal Aviation Administration (FAA) funding and therefore must comply with Section 106 of the National Historic Preservation Act of 1966 (Section 106), as amended, and its implementing regulations, 36 CFR 800.

Qualified historians from Mead & Hunt worked with the FAA to delineate the Area of Potential Effects (APE), which was defined to include the Lake Elmo Airport and first-tier properties, those that are directly adjacent to airport property, with structures that are 45 years in age or older. Where project activities are more extensive and have additional direct and indirect effects, such as at the southeast end of Runway 32 and proposed 30th Street realignment areas, the APE was expanded to include second tier properties, those adjacent to first tier properties. The APE takes into account direct and indirect effects to resources based on the proposed project activities. A map of the APE is included in Appendix A.

Prior to fieldwork, the project team conducted a literature review at the Minnesota State Historic Preservation Office (SHPO) to identify any previously surveyed architecture/history properties within the APE. One property within the APE, the Edward Flynn House (WA-BYT-004), was previously identified.

Mead & Hunt historians Katherine Haun-Schuring and Kathryn Ohland conducted Phase I fieldwork on May 30, 2017. In addition to the previously identified Edward Flynn House, historians identified 12 historic-age resources, which are defined as constructed in or before 1972. A survey map identifying all surveyed properties and Minnesota Architecture/History Inventory Forms are included in Appendix B. Of the 13 surveyed properties, 12 are recommended not eligible for listing in the National Register of Historic Places (National Register) and no further work is required. The remaining property, the Union Pacific Railway—historically the St. Paul, Stillwater, & Taylor's Falls (StPS&TF) Railroad—is recommended for further study. The line may have significance under the *Railroads in Minnesota, 1862-1956 Multiple Property Documentation Form* (MPD), applying National Register *Criterion A: Transportation* as an early connection between the manufacturing/commerce nodes of Stillwater and the Twin Cities, and as an important component of Minnesota's railroad network that provided an early link between the Twin Cities, Stillwater, and wider markets.[1] Project activities, however, are located on airport property, outside the railroad right-of-way and potential historic boundary (as outlined in the MPD, the historic boundary will be the historic right-of-way of the company that built the line) and have a minimal potential for impact to the railroad corridor. As such, it was determined, in consultation with the FAA, that no further work is required for this property at this time. Should project activities change, a reexamination of their effects on the StPS&TF Railroad should be completed.

[1] National Register of Historic Places, Multiple Property, "Railroads in Minnesota, 1862-1956," Statewide, Minnesota, F195-196.

1. Introduction

A. Location and purpose of project

The Metropolitan Airports Commission (MAC) proposes substantial updates to the Lake Elmo Airport in order to adhere to the Long Term Comprehensive Plan (LTCP), developed and approved by the MAC in September 2016, and to meet current FAA safety requirements. A description of project activities is included in Section 1.B. The approximately 630-acre airport is located on multiple parcels within both Baytown and West Lakeland Townships and is roughly bounded by Manning Avenue on the west; the Union Pacific Railway, historically the St. Paul, Stillwater & Taylor's Falls (StPS&TF) Railroad, on the north; Neal Avenue on the east; and 30th Street on the south (see Figure 1).[2] The land around the airport is a mixture of rural and suburban, with farmsteads dating to the late nineteenth century, residences from the early and mid-twentieth century, and modern development present.

The project will receive Federal Aviation Administration (FAA) funding; therefore, it must comply with Section 106 of the National Historic Preservation Act of 1966 (Section 106), as amended, and its implementing regulations, 36 CFR 800. In March 2017 Mead & Hunt, Inc. (Mead & Hunt) was retained by the MAC to complete Phase I survey in order to identify properties that may be eligible for listing in the National Register of Historic Places (National Register) and to facilitate compliance with Section 106 review.

[2] For the purposes of this report, the historic name of the railroad will be used throughout.

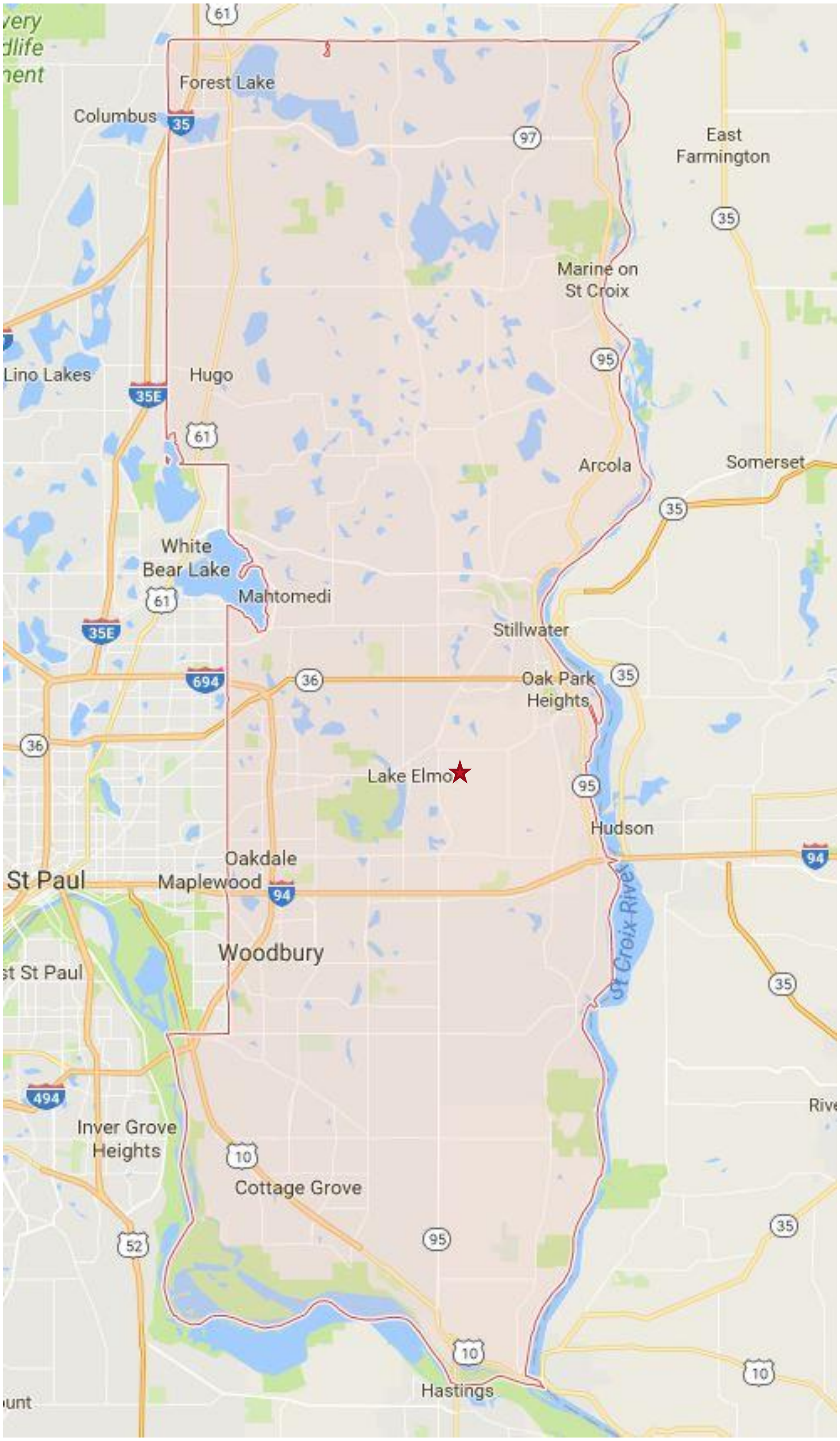


Figure 1. Map showing the project location. The star indicates the approximate location of the Lake Elmo Airport within Washington County, highlighted within the red boundary.

B. Project description

The proposed project will relocate the primary runway (Runway 14/32) 615 feet to the northeast and increase the runway length from 2,850 feet to 3,500 feet to the southeast. The existing Runway 14/32 will be converted to a partial parallel taxiway; additional taxiways are proposed as needed to support the relocated runway. To accommodate the runway relocation and provide necessary safety clearances within the Runway Projection Zones (RPZ), groves of trees on airport property will be removed, including along the StPS&TF Railroad corridor and adjacent to the relocated Runway 14/32. Additionally, the crosswind runway (Runway 4/22) will be extended 254 feet to an overall length of 2,750 feet. Taxiways, lighting, and navigational aids for both runways will also be added or upgraded throughout the airport. To accommodate the Runway 14/32 RPZ, 30th Street N. is proposed for realignment. Beginning at the intersection with Neal Avenue N., a portion of the roadway will be curved to the south on existing airport property around the new runway before meeting with the existing alignment. An overview map of the project activities is presented in Figure 2.

.

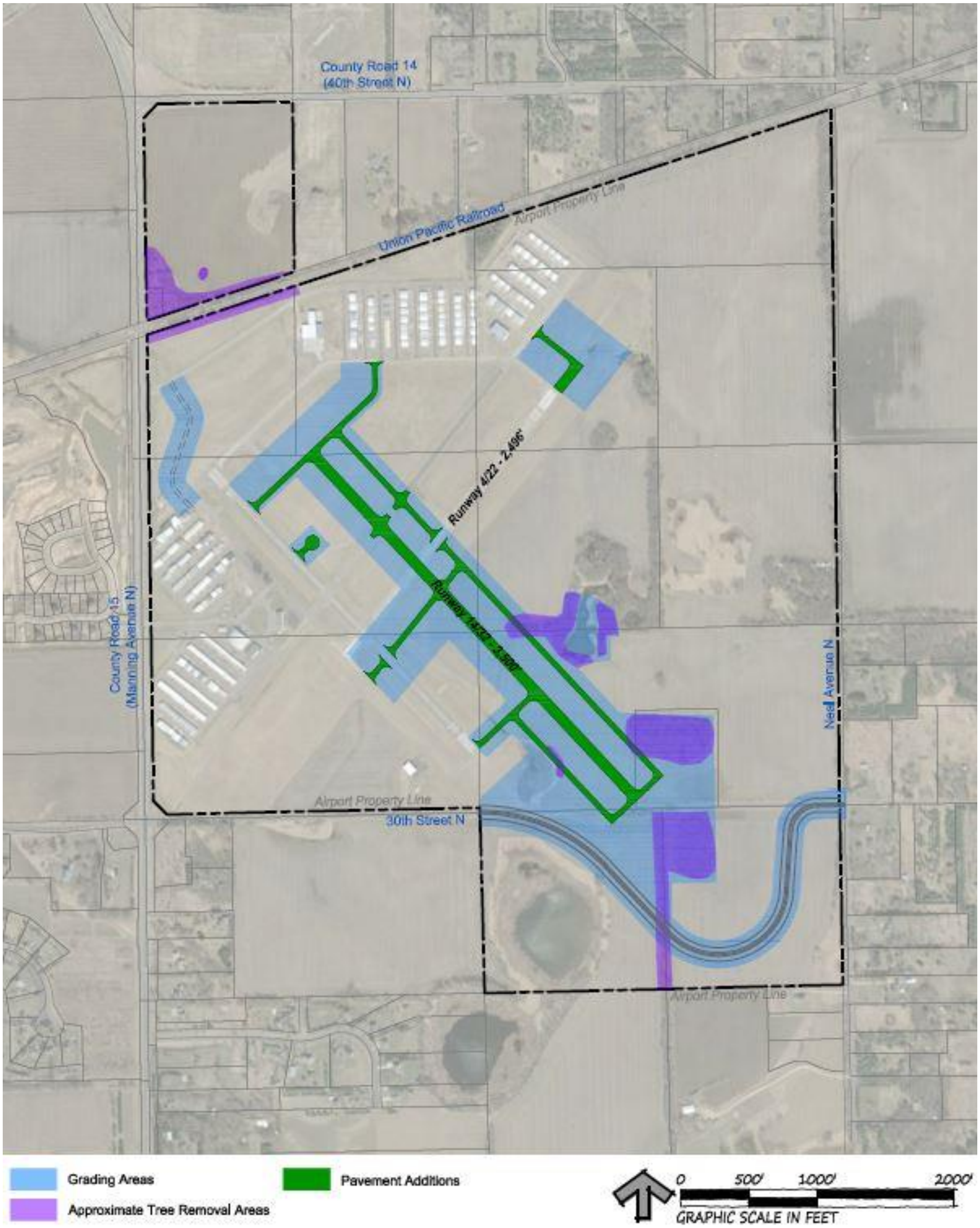


Figure 2. Map of proposed project activities.

C. Area of Potential Effects

In consultation with the FAA, the Area of Potential Effects (APE) for architecture/history was defined to include the Lake Elmo Airport and adjacent first-tier properties. Where project activities are more extensive and have additional direct and indirect effects, such as at the southeast end of Runway 32 and proposed 30th Street realignment areas, the APE was expanded to include second-tier properties. The APE encompasses direct effects, such as those areas affected by ground disturbance activities for runway, taxiway, and road construction and tree removals. Additionally, the APE takes into consideration indirect visual and noise impacts. The APE is illustrated on the map in Appendix A.

2. Survey Methodology and Research Design

The objective of the architectural history survey was to identify historic-age properties, defined as 45 years or older, in the APE that meet the National Register Criteria for Evaluation. Prior to fieldwork, the project team conducted a literature review at the Minnesota State Historic Preservation Office (SHPO) to identify any previously surveyed architecture/history properties in the APE. One property, the Edward Flynn House (WA-BYT-004) at 13131 40th Street N., was previously identified as part of a 1980 county-wide survey; the property was not formally evaluated at that time.

Professional historians from Mead & Hunt, who exceed the Secretary of the Interior's Professional Qualification Standards for history and/or architectural history, as outlined in 36 CFR Part 61, conducted the Phase I fieldwork on May 30, 2017. The field investigation was limited to historic-age resources identified from the public right-of-way in West Lakeland and Baytown Townships, as well as the Lake Elmo Airport. Mead & Hunt assessed the significance and historic integrity of these properties to make a recommendation for listing in the National Register (see Section 4 for recommendations).

Based on properties identified in the APE, project research focused on the themes of agricultural development and transportation within Washington County. Surveyed properties directly relate to the statewide historic thematic context *Historic Context Study of Minnesota Farms (1820-1960)* and the *Railroads in Minnesota, 1862-1956 Multiple Property Documentation Form* (MPD), which provides contextual information and National Register registration requirements for railroads within the state. Repositories consulted to obtain historical information include:

- Minnesota Historical Society
- Washington County Historical Society
- Lake Elmo Airport
- Metropolitan Airport Commission
- Stillwater Public Library

Primary and secondary sources include:

- SHPO inventory forms
- County and city histories
- County assessment records
- Plat maps and aerial images
- Stillwater Public Library subject files
- MAC Lake Elmo files
- Online resources
- Personal communication with property owner

3. Historic Overview

The purpose of this historic overview is to provide a context in which to identify important historic themes and to evaluate historic-age properties in the APE.

A. Washington County

Located in eastern Minnesota, Washington County is bordered by the St. Croix and Mississippi Rivers on the east and south, respectively; Ramsey and Anoka Counties on the west; and Chisago County on the north.[3] Historically, Washington County contained prairie lands with timber stands growing along rivers, creeks, and lakes. It possessed abundant fur, timber, and mineral resources that became the source of the county's earliest industries.[4] Due to its proximity to rivers, the county was also well-suited for early agricultural development.

Though the earliest European explorers traveled through the area in 1680, permanent settlement began in the late 1830s. Washington County was established on October 27, 1849, as one of the nine original counties in Minnesota Territory. The county remained largely rural with the majority of its land cultivated for crops or used for livestock production until the mid-twentieth century, when suburban development changed the landscape.

While a rural atmosphere is retained in large portions of the county, certain areas are decidedly suburban, such as those nearest St. Paul and Stillwater. Within Baytown and West Lakeland Townships, suburban residential development began in the mid-to-late twentieth century, with Ranch, Split-level, and Rambler houses constructed on large lots. More recently, housing subdivisions are under development to the immediate west of the airport.

B. Agriculture

Agriculture has been a primary industry within the county since its initial Euro-American settlement. The number of farms rose continuously during the ensuing decades, with 85 percent of Washington County land utilized for farming by 1900. During this period the primary crops were wheat, corn, oats, barley, rye, hay, and potatoes.[5] During the latter decades of the nineteenth century advancements in cultivation machinery and farm diversification revolutionized agriculture and allowed for increased yields, particularly in oats and corn. County exports also increased with the construction of multiple railroad lines in the late nineteenth century, which provided access to new markets.[6] Dairying was also a popular industry, with 52 percent of farms producing milk, butter, and cheese by 1910.[7] Examples of late-nineteenth-century

---

[3] Carol Zellie Landscape Research, *Washington County Historic Contexts* (prepared for Washington County Land Management, 1999), 8; Washington County, "County History," 2017, https://www.co.washington.mn.us/102/County-History.

[4] Zellie, *Washington County Historic Contexts*, 8.

[5] Zellie, *Washington County Historic Contexts*, 164–66.

[6] Zellie, *Washington County Historic Contexts*, 166.

[7] Zellie, *Washington County Historic Contexts*, 166–67; Robert Goodman, *A History of Washington County: Gateway to Minnesota History* (Stillwater, Minn.: Washington County Historical Society, 2008), 98–99.

farms can be found in Lake Elmo and Baytown and West Lakeland Townships, including the c.1880 Edward Flynn Farm, which is located adjacent to the Lake Elmo Airport.

Washington County remained predominantly rural well into the twentieth century. Fruit growers and nurseries joined established crop farms during the post-World War II (postwar) period, though 80 percent of the land was still farmed with corn and soybeans. Although farming remained prominent during the 1960s and continues today as evidenced by the cultivated farm fields adjacent to the airport, farms are slowly being replaced by suburban residential development.[8] Currently, the county's agricultural products include tree and fruit nurseries, sod farms, and corn, with sheep, goats, and horses as the prevalent livestock.[9]

C. Transportation

The early Washington County transportation network consisted of Indian trails, steamboats on the St. Croix and Mississippi Rivers, and territorial and military roads. Beginning in the late 1860s railroads surpassed all previous modes of transportation in use and importance. The St. Paul & Chicago (later Chicago, Milwaukee, & St. Paul) Railroad, constructed in 1869, served as the first line through the county. Soon after, additional railroad companies established several lines, ultimately creating freight and passenger connections to Minneapolis, St. Paul, Duluth, and wider markets.[10] The StPS&TF (currently the Union Pacific Railway) was constructed through the county in 1872. It provided freight and passenger transportation between the Twin Cities and Chicago to the southeast and Omaha, Nebraska, to the southwest. The railroad corridor currently serves as the northern border of the Lake Elmo Airport property.[11]

At the turn of the twentieth century emphasis shifted from the railroad to roads, catalyzed by the Good Roads Movement. Early vehicular roads through the county were primitive, but road improvements, including paving, started in earnest in the 1920s following the creation of the Trunk Highway System. Over the following decades travel by rail declined significantly as more Minnesotans chose the automobile as their primary mode of transportation. By the 1960s most rail passenger service within Washington County ended. [12]

D. Aviation in Washington County

During the twentieth century air travel became another noteworthy mode of transportation within Washington County, with numerous airfields developed on converted farmland. Early airfields within the county included the Luchsinger farm in Lakeland and the Northport airstrip in Grant Township (both nonextant).[13] During World War II the U.S. Army and Navy actively used these and other airfields in Washington County to train pilots. Notably, the Northport airstrip, formally established as an airport

---

[8] Zellie, *Washington County Historic Contexts*, 167.

[9] Goodman, *A History of Washington County: Gateway to Minnesota History*, 209.

[10] Goodman, *A History of Washington County: Gateway to Minnesota History*, 83, 89–91.

[11] Goodman, *A History of Washington County: Gateway to Minnesota History*, 19.

[12] Zellie, *Washington County Historic Contexts*, 133.

[13] Nancy Goodman, "Historic Airports in Washington County," *Historical Whisperings* 39, no. 1 (April 2012): 1.

c.1939, served as the chief training field for the government-sponsored War Training Service (formerly the Civilian Pilot Training program).[14] In order to support training activities, the Army Air Corps leased several farm fields, including the Edward Flynn Farm, where glider pilots could land.[15]

Recognizing the future importance of air transportation in the state and with the hope of making the Twin Cities a leader in aviation within the upper Midwest, the Minnesota State Legislature created the MAC in 1943. The MAC was designed to take a regional approach to air service, discourage competition between Minneapolis and St. Paul, and promote air transportation and commerce in the seven-county Twin Cities metro area. To meet these goals, the MAC established a system of airports, with the primary airport being Wold-Chamberlain Field (which became Minneapolis-St. Paul International Airport in 1948) and six reliever airports to accommodate smaller aircraft traffic.[16]

In 1949 the MAC decided that one of the six reliever airports would be located within the eastern suburbs of St. Paul. It purchased 160 acres of farmland near the community of Lake Elmo in Baytown Township for development as the Lake Elmo Airport. In 1951 the airport officially opened and featured two runways and a small number of privately owned hangars. Over the coming decades, the MAC expanded the airport property and constructed support buildings, including a maintenance building. Private development continued with the construction of Fixed Base Operators (FBOs) and hangars. Today the airport encompasses more than 600 acres and features more than 150 buildings supporting and housing 189 aircraft as of October 2016. It is currently used by local businesses and private pilots, as well as the Civil Air Patrol.[17]

Currently there are two airports, Lake Elmo Airport and Daniel A. DePonti Memorial Airport, and a handful of private airfields within Washington County. The DePonti Airport (originally called the Journey's End Airport) was privately developed during the 1950s but was sold to the City of Forest Lake in 1998 for continued use as an airport.[18] All of the other previously established airfields, such as Northport, are nonextant, with the land reused for development.[19]

[14] Goodman, "Historic Airports in Washington County," 1, 6; Goodman, *A History of Washington County: Gateway to Minnesota History*, 206.

[15] Goodman, "Historic Airports in Washington County," 6.

[16] Metropolitan Airports Commission, "Metropolitan Airports Commission," 2015, https://metroairports.org/Airport-Authority/Metropolitan-Airports-Commission/Administration/Administration.aspx.

[17] Goodman, "Historic Airports in Washington County," 8.

[18] Goodman, "Historic Airports in Washington County," 7–8.

[19] Goodman, "Historic Airports in Washington County"; Goodman, *A History of Washington County: Gateway to Minnesota History*.

4. Results and Recommendations

Historians identified and documented 13 historic-age properties within the APE, including the previously identified Edward Flynn House (see Table 1). Twelve properties are recommended not eligible for listing in the National Register as they do not appear to possess a significant association with an important historic theme or person, and do not possess architectural significance. No further work is recommended for these properties. New or updated inventory forms have been prepared for these resources and are included in Appendix B.

Table 1. Surveyed properties within the APE

Inventory No.	Name	Address	Recommendation
WA-WLK-006	House	2925 Neal Avenue N.	Not Eligible
WA-BYT-004	Edward Flynn House	13131 40th Street N.	Not Eligible
WA-BYT-008	House	3245 Neal Avenue N.	Not Eligible
WA-BYT-009	House	3101 Neal Avenue N.	Not Eligible
WA-BYT-010	House	13030 30th Street N.	Not Eligible
WA-BYT-011	House	13100 30th Street N.	Not Eligible
WA-BYT-012	House	12905 40th Street N.	Not Eligible
WA-BYT-013	House	12805 40th Street N.	Not Eligible
WA-BYT-014	House	12689 40th Street N.	Not Eligible
WA-BYT-015	House	12657 40th Street N.	Not Eligible
WA-BYT-016	Lake Elmo Airport	3275 Manning Avenue N.	Not Eligible
WA-WLK-007	House	2933 Manning Avenue N	Not Eligible
XX-RRD-044	StPS&TF Railroad	N/A	Further study recommended

The final property, the StPS&TF Railroad (XX-RRD-044), is recommended for further study for its association with railroad transportation in Minnesota and Washington County. Completed in 1872, the StPS&TF Railroad connected St. Paul with Stillwater. The line was largely used to transport lumber and was a major carrier of passengers and freight in and out of the Twin Cities to wider markets, such as

Chicago.[20] Per the *Railroads in Minnesota, 1862-1956 Multiple Property Documentation Form* (MPD), the railroad may have significance under National Register *Criterion A* as a Railroad Corridor Historic District under Significance Requirement 2 as it provided a connection between the manufacturing/commerce nodes at Stillwater and the Twin Cities, and/or Significance Requirement 3 as an important component of Minnesota's railroad network that provided an important early link between the Twin Cities, Stillwater, and wider markets.[21]

Based on a review of the proposed project activities, there are limited potential impacts to the railroad corridor. All ground disturbance associated with the relocation and extension of the runways and construction of taxiways will be located on airport property, outside the railroad right-of-way and potential historic boundary (see Figure 2; as outlined in the MPD, the historic boundary will be the historic right-of-way of the company that built the line). Additionally, to accommodate the relocated Runway 14/32 RPZ and meet current FAA safety regulations, groups of trees located in the northwestern quadrant of the airport property, adjacent to the railroad corridor boundary, will be removed. However, the tree removal, will not alter any character-defining features of the potential StPS&TF Railroad Corridor Historic District or diminish its potential significance. Furthermore, the tree removal will have a limited impact on the overall setting and visual appearance from the railroad corridor itself. The loss of a relatively small number of trees along the entire rail corridor (which currently extends from St. Paul to Stillwater) will not drastically change the railroad's overall visual appearance, setting, or feeling (see Figure 3 and 4).

[20] National Register of Historic Places, Multiple Property, "Railroads in Minnesota, 1862-1956," E37–40; Miranda Van Fleet, "Casey Jones State Trail -St. Paul & Sioux City Railroad/Chicago, St. Paul, Minneapolis & Omaha Railway/Chicago & North Western Railway - [XX-RRD-041]," n.d., Minnesota Historic Buildings Inventory, Minnesota State Historic Preservation Office; Richard S. Prosser, *Rails to the North Star: A Minnesota Railroad Atlas* (Minneapolis: University of Minnesota Press, 2007), 19–20, 85, 120–21, 126, 161, 163.

[21] National Register of Historic Places, Multiple Property, "Railroads in Minnesota, 1862-1956," F195-196.

Figure 3. Tree removal areas adjacent to the StPS&TF Railroad.

Figure 4. Tree removal area along StPS&TF Railroad corridor near Manning Avenue. Trees nearest the road are subject to removal.

In addition, there is no potential for indirect visual effects to the railroad corridor as changes to the runways, lighting, and navigational aids proposed adjacent to the railroad will not drastically alter current views from along the corridor. Similarly, there are no anticipated noise impacts to the railroad. Aircraft size and type will not change from what is currently landed on the runways adjacent to the railroad corridor. As such, there will be no discernable change to noise levels experienced on railroad property.

As project activities have a limited potential for impact on the railroad property, an intensive-level review of the corridor is not warranted at this time and compliance with Section 106 is complete. Should project activities change, a reexamination of the project and its effects on railroad property should be completed.

Bibliography

Goodman, Nancy. "Historic Airports in Washington County." *Historical Whisperings* 39, no. 1 (April 2012): 1, 6–8.

Goodman, Robert. *A History of Washington County: Gateway to Minnesota History*. Stillwater, Minn.: Washington County Historical Society, 2008.

Metropolitan Airports Commission. "Metropolitan Airports Commission," 2015. https://metroairports.org/Airport-Authority/Metropolitan-Airports-Commission/Administration/Administration.aspx.

National Register of Historic Places, Multiple Property. "Railroads in Minnesota, 1862-1956." Statewide, Minnesota.

Prosser, Richard S. *Rails to the North Star: A Minnesota Railroad Atlas*. Minneapolis: University of Minnesota Press, 2007.

Van Fleet, Miranda. "Casey Jones State Trail -St. Paul & Sioux City Railroad/Chicago, St. Paul, Minneapolis & Omaha Railway/Chicago & North Western Railway - [XX-RRD-041]," n.d. Minnesota Historic Buildings Inventory. Minnesota State Historic Preservation Office.

Washington County. "County History," 2017. https://www.co.washington.mn.us/102/County-History.

Zellie, Carol, Landscape Research. *Washington County Historic Contexts*. Prepared for Washington County Land Management, 1999.

Appendix A. Area of Potential Effects Map

Appendix A: APE Map

Appendix B. Result Map and Inventory Forms

Legend
Airport Boundary
Area of Potential Effect
500 250 0 500 Feet
N
WA-BYT-013
WA-BYT-014
WA-BYT-012
WA-BYT-004
WA-BYT-015
XX-RRD-044
WA-BYT-016
COUNTY RD 14 (40TH ST N)
UNION PACIFIC RAILROAD
SERVICE RD
FAA RPZ
CONNECTOR RD
CONVERT RWY 14-32 TO TWY
ULT RWY 4-22 2750' X 75'
EX RWY 4-22 2496' X 75'
RSA
ROFA
254' EXTENSION
RECONSTRUCT
CONSTRUCT PROP RWY 14-32 3500' X 75'
WA-BYT-016
COUNTY RD 15 (MANNING AVE N)
NEAL AVE N
WA-BYT-008
WA-BYT-009
WA-BYT-011
WA-BYT-010
30TH ST N
RELOCATE 30TH ST N
WA-WLK-007
WA-WLK-006

Identification	
Historic Name	House
Current Name	House
Address	2925 Neal Avenue N.
City/Twp	West Lakeland Twp.
County	Washington
PIN	2002920220002

SHPO Inventory No. WA-WLK-006

Review and Compliance No.

Project No.

Survey No. FN1

Previous National Register Status
__ NRHP __ CEF __ SEF __ DOE __ Locally Des.

Location of Property Centroid					
Legal Desc.	**Sec** 20	**Twp**	29	**Rng**	20
USGS Quad	Hudson **QQ**	NW-NW			
UTM ZONE	15T	NAD83			
Easting	512480	**Northing**	4981925		

Description	
Resource Type	Building
Style	Vernacular
Construction Date	1914
Date Source	Assessor Data
Current Use	Domestic – single dwelling
Historical Context	Urban Centers 1870-1940

Description, including alterations

The buildings on this property are largely obscured by vegetation. The following description is based on limited field review and aerial imagery. The one-and-one-half-story vernacular house with a rectangular footprint was constructed in 1914. It is clad in horizontal wood siding and has an asphalt-shingled, front-gable roof with an eave overhang. An interior brick chimney is located at the roof ridgeline. The front (north) facade is largely covered by a one-story, flat-roof addition. Grouped replacement windows are located on the west elevation. Windows are replacement, one-over-one, double-hung sash with metal storms.

A modern pole building is located north of the house.

Historical Narrative

N/A

Significance

The property was evaluated under *Criterion C: Architecture*. Research and field survey identified no evidence of distinctive characteristics of a type, method, or period of construction; the work of a master; high artistic value; or the collective representation of a significant and distinguishable entity related to a trend of history. Therefore, the property lacks significance under *Criterion C*. Based on the results of the literature review, the property does not appear to be significant to any trend of local, state, or national history. Thus, the property is not eligible under *Criterion A: History*. The property does not appear to qualify under *Criterion B: Significant Person.* It is recommended not eligible for the National Register. No further work is recommended.

Area of Significance

N/A

Period of Significance

N/A

Integrity

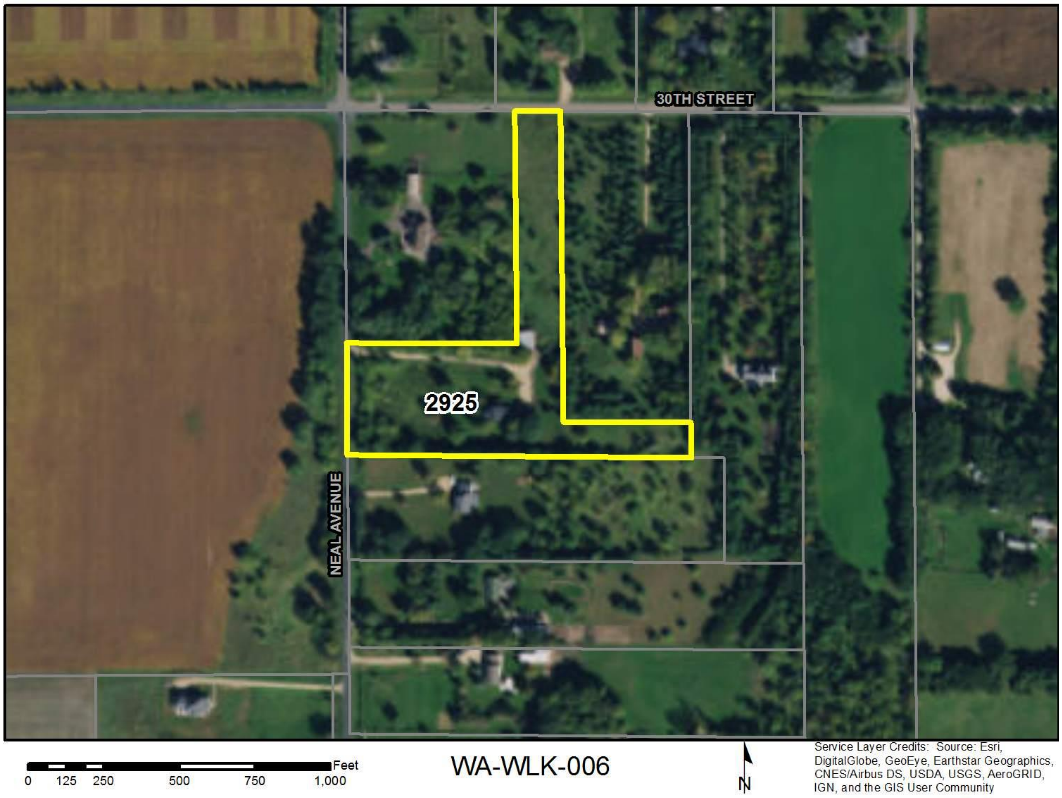
N/A

National Register Eligibility Recommendation

Not Eligible

2925 Neal Avenue N.

2925 Neal Avenue N.


30TH STREET
NEAL AVENUE
2925
0 125 250 500 750 1,000 Feet
N
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

WA-WLK-006

THIS PAGE INTENTIONALLY LEFT BLANK

Identification	
Historic Name	House
Current Name	House
Address	3245 Neal Avenue N.
City/Twp	Baytown Twp.
County	Washington
PIN	1702920330004

SHPO Inventory No. WA-BYT-008

Review and Compliance No.

Project No.

Survey No. FN2

Previous National Register Status
__ NRHP __ CEF __ SEF __ DOE __ Locally Des.

Location of Property Centroid					
Legal Desc. Sec	17	**Twp**	29	**Rng**	20
USGS Quad	Hudson	**QQ**	SW-SW		
UTM ZONE	15		NAD83		
Easting	512443		**Northing**	4982522	

Description	
Resource Type	Building
Style	Vernacular
Construction Date	1901
Date Source	Assessor Data
Original Use	Domestic – single dwelling
Current Use	Domestic – single dwelling
Historical Context	Urban Centers 1870-1940

Description, including alterations

The buildings on this property are largely obscured by vegetation. The following description is based on limited field review and aerial imagery. This one-and-one-half-story vernacular house with a rectangular footprint was constructed in 1901. It is clad in vinyl siding and has an asphalt-shingled, front-gable roof. The front (south) facade features a modern wood deck and a bay window with replacement, one-over-one, double-hung sash. A second bay window with replacement, one-over-one, double-hung sash is located on the side (west) elevation. Windows are replacement, one-over-one, double-hung sash.

Three modern outbuildings are located on the property, including a detached garage and two sheds. The detached, two-stall garage is located southeast of the house. One shed is located east of the house and the other to the south.

Historical Narrative

N/A

Significance

The property was evaluated under *Criterion C: Architecture*. Research and field survey identified no evidence of distinctive characteristics of a type, method, or period of construction; the work of a master; high artistic value; or the collective representation of a significant and distinguishable entity related to a trend of history. Therefore, the property lacks significance under *Criterion C*. Based on the results of the literature review, the property does not appear to be significant to any trend of local, state, or national history. Thus, the property is not eligible under *Criterion A: History*. The property does not appear to qualify under *Criterion B: Significant Person.* It is recommended not eligible for the National Register. No further work is recommended.

Area of Significance

N/A

Period of Significance

N/A

Integrity

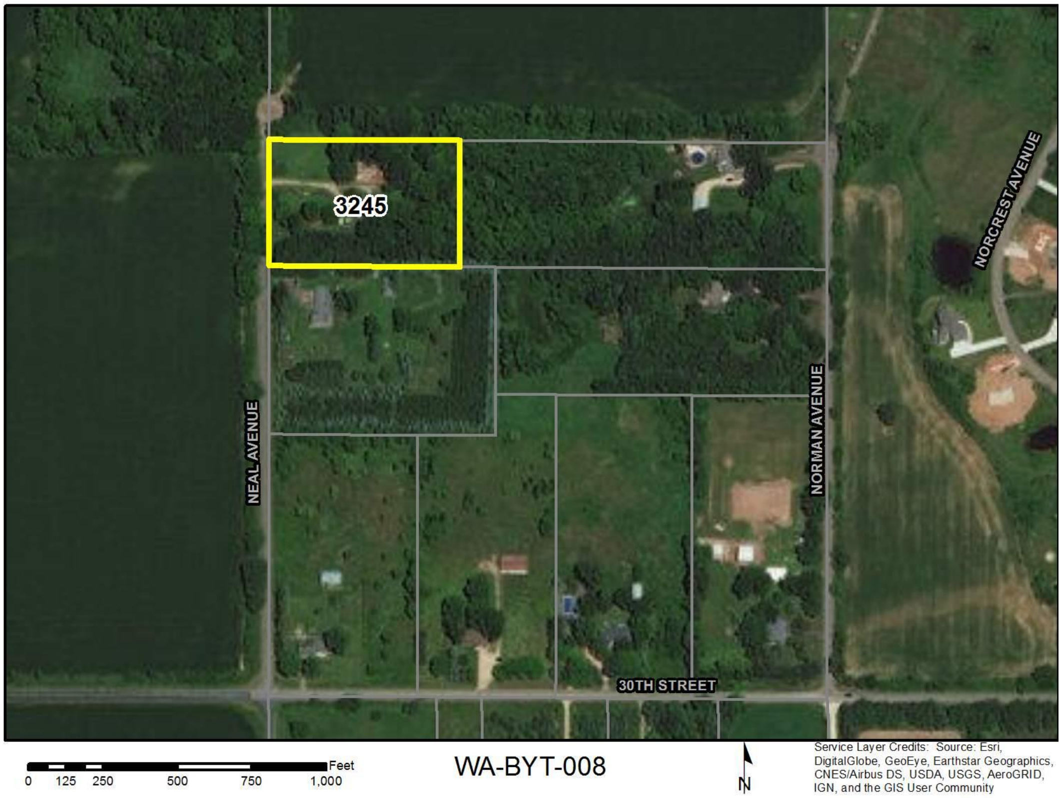
N/A

National Register Eligibility Recommendation

Not Eligible

3245 Neal Avenue N.

3245 Neal Avenue N.


3245
NEAL AVENUE
NORMAN AVENUE
NORCREST AVENUE
30TH STREET
Feet
0 125 250 500 750 1,000
N
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

WA-BYT-008

THIS PAGE INTENTIONALLY LEFT BLANK

Identification	
Historic Name	House
Current Name	House
Address	3101 Neal Avenue N.
City/Twp	Baytown Twp.
County	Washington
PIN	1702920330005

SHPO Inventory No. WA-BYT-009

Review and Compliance No.

Project No.

Survey No. FN3

Previous National Register Status
__ NRHP __ CEF __ SEF __ DOE __ Locally Des.

Location of Property Centroid					
Legal Desc. Sec	17	**Twp**	29	**Rng**	20
USGS Quad	Hudson	**QQ**	SW-SW		
UTM ZONE	15		NAD83		
Easting	512408	**Northing**	4982422		

Description	
Resource Type	Building
Style	Ranch
Construction Date	1971
Date Source	Assessor Data
Original Use	Domestic- single dwelling
Current Use	Domestic- single dwelling
Historical Context	Urban Centers 1870-1940

Description, including alterations

This one-story Ranch house with a rectangular footprint was constructed in 1971. It rests on a concrete block foundation, is clad in brick veneer and vertical wood siding, and has an asphalt-shingled, side gable roof with an eave overhang. The front (west) facade features a front gable projection, recessed porch supported by square columns, brick planter, and integral two-stall garage. An interior brick chimney is located at the roof ridgeline. Windows are replacement, vinyl casements; sliding; and one-over-one, double-hung sash.

There are three outbuildings located on the property. Two sheds are located at the north end of the property and the third outbuilding is located east of the house in the rear yard. All three are clad in vertical wood siding and have asphalt-shingled gable roofs.

Historical Narrative

N/A

Significance

The property was evaluated under *Criterion C: Architecture*. Research and field survey identified no evidence of distinctive characteristics of a type, method, or period of construction; the work of a master; high artistic value; or the collective representation of a significant and distinguishable entity related to a trend of history. Therefore, the property lacks significance under *Criterion C*. Based on the results of the literature review, the property does not appear to be significant to any trend of local, state, or national history. Thus, the property is not eligible under *Criterion A: History*. The property does not appear to qualify under *Criterion B: Significant Person.* It is recommended not eligible for the National Register. No further work is recommended.

Area of Significance

N/A

Period of Significance

N/A

Integrity

N/A

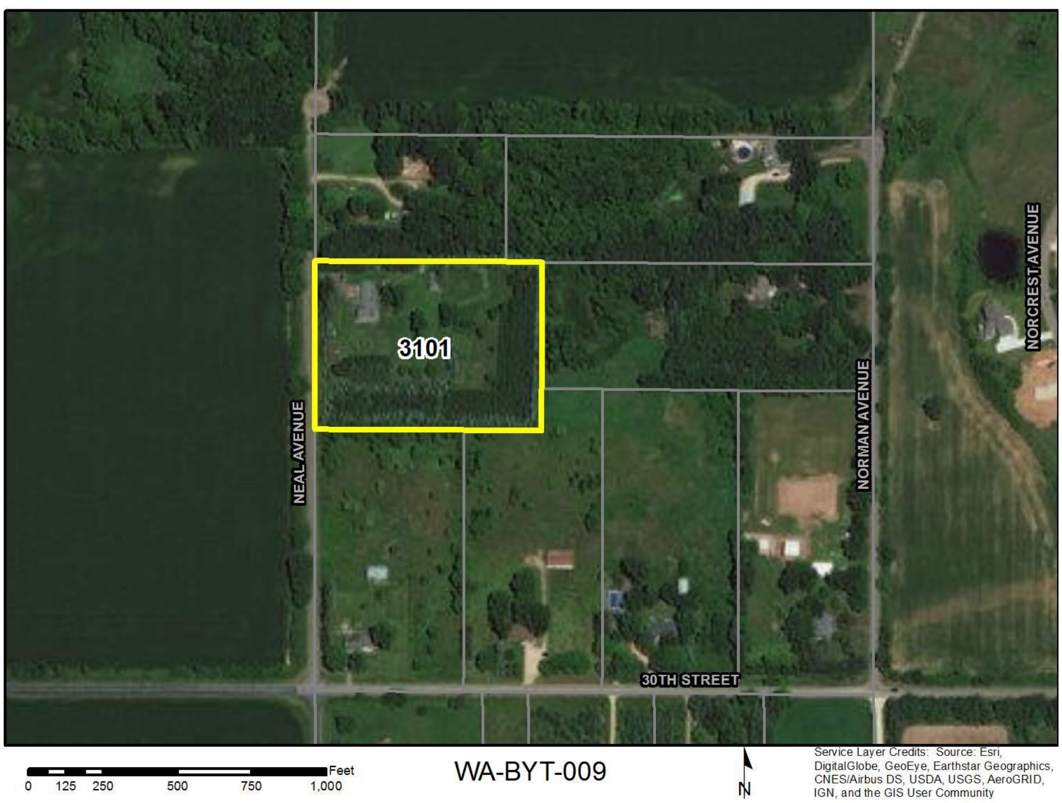
National Register Eligibility Recommendation

Not Eligible

3101 Neal Avenue N.

3101 Neal Avenue N.

3101 Neal Avenue N.



THIS PAGE INTENTIONALLY LEFT BLANK

Identification	
Historic Name	House
Current Name	House
Address	13030 30th Street N.
City/Twp	Baytown Twp.
County	Washington
PIN	1702920330001

SHPO Inventory No. WA-BYT-010

Review and Compliance No.

Project No.

Survey No. FN4

Previous National Register Status
__ NRHP __ CEF __ SEF __ DOE __ Locally Des.

Location of Property Centroid					
Legal Desc. Sec	17	**Twp**	29	**Rng**	20
USGS Quad	Hudson	**QQ**	SW-SW		
UTM ZONE	15		NAD83		
Easting	512405		**Northing**	4982177	

Description	
Resource Type	Building
Style	Split-level
Construction Date	1971
Date Source	Assessor Data
Original Use	Domestic – single dwelling
Current Use	Domestic – single dwelling
Historical Context	Urban Centers 1870-1940

Description, including alterations

This Split-level house with a rectangular footprint was constructed in 1971. It rests on an elevated concrete block foundation, is clad in replacement aluminum siding, and has an asphalt-shingled, front-gable roof. The front (south) facade features an upper-story overhang, a one-story wing with an entrance and simple concrete stoop, and a slightly projecting, two-stall garage on the west end. An exterior brick chimney is located on the side (east) elevation. A three-season porch with an exterior brick chimney is located on the rear (north) elevation. Windows are original sliding, casements, and one-over-one, double-hung sash.

A modern pole building is located north of the house in the rear yard. It is clad in metal and has a side gable metal roof. It features a sliding metal door and original sliding windows on the front (south) facade.

Historical Narrative

N/A

Significance

The property was evaluated under *Criterion C: Architecture*. Research and field survey identified no evidence of distinctive characteristics of a type, method, or period of construction; the work of a master; high artistic value; or the collective representation of a significant and distinguishable entity related to a trend of history. Therefore, the property lacks significance under *Criterion C*. Based on the results of the literature review, the property does not appear to be significant to any trend of local, state, or national history. Thus, the property is not eligible under *Criterion A: History*. The property does not appear to qualify under *Criterion B: Significant Person.* It is recommended not eligible for the National Register. No further work is recommended.

Area of Significance

N/A

Period of Significance

N/A

Integrity

N/A

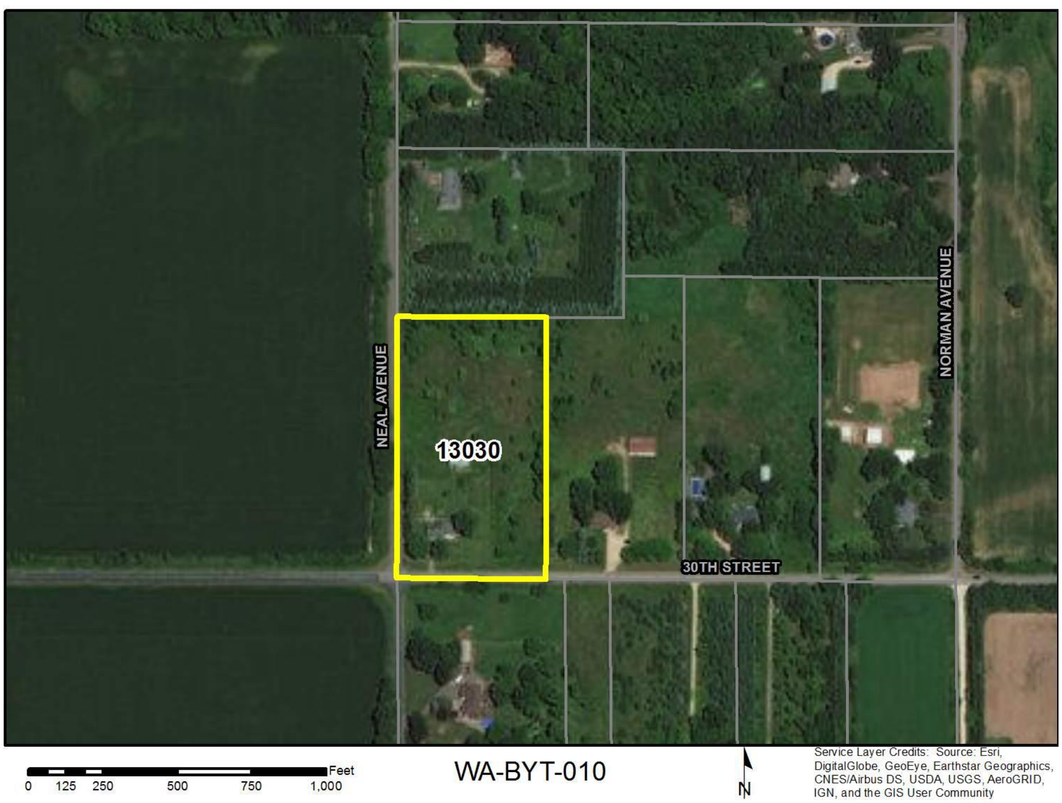
National Register Eligibility Recommendation

Not Eligible

13030 30th Street N.

13030 30th Street N.

13030 30th Street N.



THIS PAGE INTENTIONALLY LEFT BLANK

Identification	
Historic Name	House
Current Name	House
Address	13100 30th Street N
City/Twp	Baytown Twp.
County	Washington
PIN	1702920330006

SHPO Inventory No. WA-BYT-011

Review and Compliance No.

Project No.

Survey No. FN5

Previous National Register Status
__ NRHP __ CEF __ SEF __ DOE __ Locally Des.

Location of Property Centroid					
Legal Desc. Sec	17	**Twp**	29	**Rng**	20
USGS Quad	Hudson	**QQ**	SW-SW		
UTM ZONE	15		NAD83		
Easting	512520		**Northing**	4982183	

Description	
Resource Type	Building
Style	Ranch
Construction Date	1972
Date Source	Assessor Data
Original Use	Domestic – single dwelling
Current Use	Domestic – single dwelling
Historical Context	Urban Centers 1870-1940

Description, including alterations

This one-story Ranch house with a rectangular footprint was constructed in 1972. It is clad in replacement vinyl siding and has an asphalt-shingled, side-gable roof with an eave overhang. The front (south) facade features grouped original casement windows, brick veneer under the water table, and a projecting front-gable, two-stall garage on the east end. The entrance on the front facade has a simple concrete stoop that is covered by an extension of the front gable roof and is supported by a wrought iron support. A second entrance with a concrete stoop is located on the side (east) elevation. An interior brick chimney is located at the roof ridge line. Windows are replacement sliding, original casements, and original fixed-over-awning.

A pole building is located north of the house in the rear yard.

Historical Narrative

N/A

Significance

The property was evaluated under *Criterion C: Architecture*. Research and field survey identified no evidence of distinctive characteristics of a type, method, or period of construction; the work of a master; high artistic value; or the collective representation of a significant and distinguishable entity related to a trend of history. Therefore, the property lacks significance under *Criterion C*. Based on the results of the literature review, the property does not appear to be significant to any trend of local, state, or national history. Thus, the property is not eligible under *Criterion A: History*. The property does not appear to qualify under *Criterion B: Significant Person.* It is recommended not eligible for the National Register. No further work is recommended.

Area of Significance

N/A

Period of Significance

N/A

Integrity

N/A

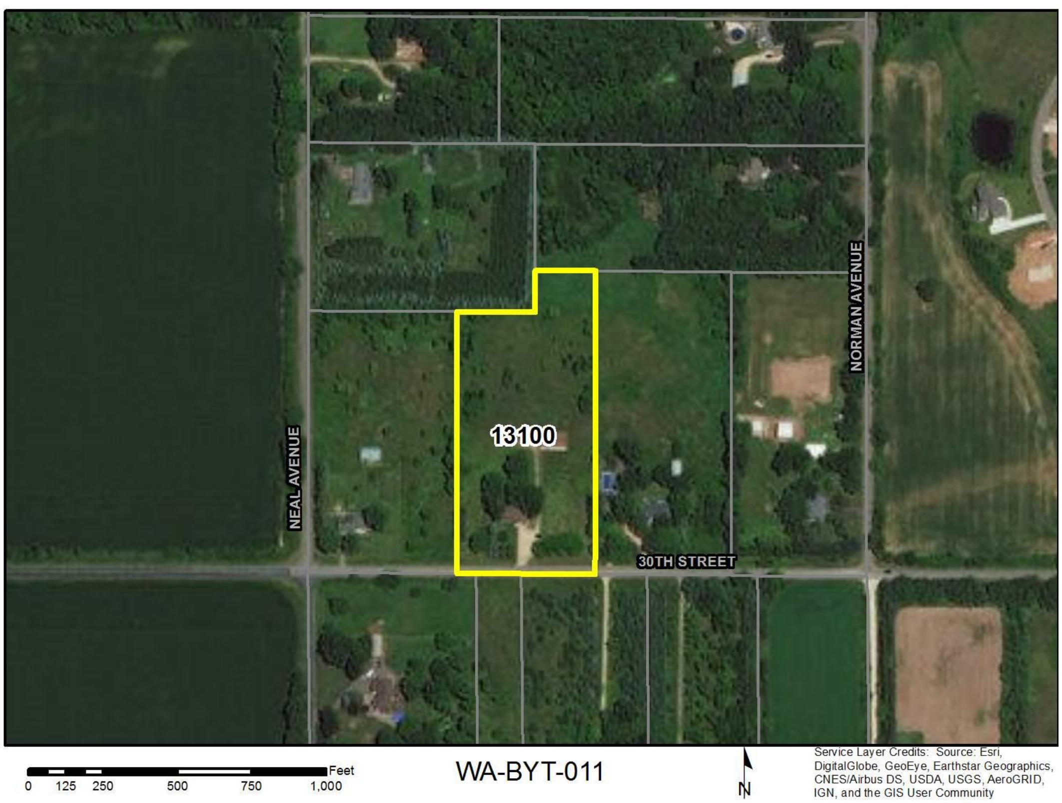
National Register Eligibility Recommendation

Not Eligible

13100 30th Street N.

13100 30th Street N.

13100 30th Street N.



THIS PAGE INTENTIONALLY LEFT BLANK

Identification	
Historic Name	Edward Flynn House
Current Name	Edward Flynn House
Address	13131 40th Street N.
City/Twp	Baytown Twp.
County	Washington
PIN	1702920220001

SHPO Inventory No. WA-BYT-004-**UPDATE**

Review and Compliance No.

Project No.

Survey No. FN6

Previous National Register Status
__ NRHP __ CEF __ SEF __ DOE __ Locally Des.

Location of Property Centroid					
Legal Desc. Sec	17	**Twp**	29	**Rng**	20
USGS Quad	Stillwater **QQ** NW-NW				
UTM ZONE	15		NAD83		
Easting	512579		**Northing**		4983713

Description	
Resource Type	Building
Style	Vernacular
Construction Date	c.1880
Date Source	Field Review
Original Use	Domestic – single dwelling
Current Use	Domestic – single dwelling
Historical Context	Urban Centers 1870-1940

Description, including alterations

There are five buildings on this property: a c.1880 house, c.1960 side-gable house, c.1945 concrete block outbuilding, c.1955 Quonset, and c.1930 outbuilding. Some buildings on this property are largely obscured by vegetation. The following descriptions are based on limited field review and aerial imagery.

The two-story vernacular house with a rectangular footprint was constructed c.1880. It is composed of two blocks: a two-story hip roof main block, and a one-and-one-half-story side-gable wing. This house is clad in brick and features two-over-two, double-hung windows with segmental arches and stone sills. The front (south) facade of the main block features a large multi-light, replacement, picture window with five-light sidelights and an entrance with an arched transom and simple concrete stoop. The c.1895 wing features gable wall dormers and a second entrance with an arched lintel and simple stoop. A one-story porch is located on the south (rear) elevation. Windows are replacement, two-over-two, double-hung and fixed sash. The front porch has been removed.

A c.1960, one-story, side-gable house with a rectangular footprint is located to the west of the c.1880 house. It rests on a concrete block foundation, is clad in wood siding, and has an asphalt-shingled, side gable roof. The front (west) facade features a large, multi-light, fixed window and central entrance with a simple wood stoop. An interior brick chimney is located at the roof ridgeline and vertical wood siding is located in the gable ends. Windows are original, one-over-one, double-hung sash.

A c.1945 concrete block outbuilding is located between the two houses. The building has an asphalt-shingled, front-gable roof with wood siding in the gable end. The front (north) elevation features a double-leaf sliding wood door. Windows are fixed sash.

A c.1955 Quonset is located south of the house in the rear yard. It has an arched metal roof.

A c.1930 outbuilding is located south of the c.1880 house and c.1955 Quonset. It has a side-gable roof.

Historical Narrative

Irish immigrants Edward and Patrick Flynn purchased this parcel of land in Washington County in 1861 to establish a farm. Edward Flynn, who retained ownership of the property throughout the ensuing years, built the farmhouse's two-story main block c.1880 and, according to the current homeowner, the one-and-one-half-story wing in 1895. Veronica Flynn, one of Edward's five children, obtained ownership of the property after her father's death in 1898. Although Veronica owned the property for many years, she did not farm and moved to Lake Elmo in the 1930s, while retaining ownership of the family farmstead. According to the current owner, the front porch was removed sometime in the early twentieth century, during Veronica's ownership. During World War II the farmhouse and adjacent farm fields were used by the Military's War Training Service in conjunction with the Northport airport for pilot training. Officers involved with the program resided in the Flynn farmhouse.

In 1940, just prior to her death, Veronica gave the farmstead to her youngest brother. He sold it to George Kern in 1944. During his approximately 25-year ownership, Kern converted the land into a sod farm and added the picture window to the farmhouse facade. He also constructed the c.1945 outbuilding and c.1960 side-gable house on the west end side of the property for use by a hired worker. The Quonset was also added to the property. Following Kern, the property was owned by the Kirby family, who made no significant alterations. Ownership then passed to the current resident, Kenneth Hannah, in the mid-1980s. According to Mr. Hannah, the barn on the property was recently removed and transported to North Carolina for reuse as a church. Currently, the c.1945 outbuilding and c.1960 side-gable house are located on a different parcel but remain associated with the larger farmstead.[1]

Significance

The property was evaluated under *Criterion C: Architecture*. Research and field survey identified no evidence of distinctive characteristics of a type, method, or period of construction; the work of a master; high artistic value; or the collective representation of a significant and distinguishable entity related to a trend of history. The house also has diminished integrity due to the loss of the front porch and replacement of original windows, most notably the addition of a large picture window on the facade. Therefore, the property lacks significance under *Criterion C*. Based on available research the property does not appear to be significant to any trend of local, state, or national history. The property does not appear to have been significant in the context of Washington County agriculture. Although the property was used temporarily by the military to train pilots, it was not significant within the context of overall military operations or the war effort in Washington County and Minnesota. Therefore, the property lacks significance within the context of Washington County or Minnesota aviation. Thus, the property is not eligible under *Criterion A: History*. The early owners of the property, Edward and Veronica Flynn, do not appear to have been significant in the history of Washington County, nor do any of the subsequent owners. As such, the property does not appear to qualify under *Criterion B: Significant Person.* The property is recommended not eligible for the National Register. No further work is recommended.

Area of Significance

N/A

Period of Significance

N/A

Integrity

N/A

National Register Eligibility Recommendation

Not Eligible

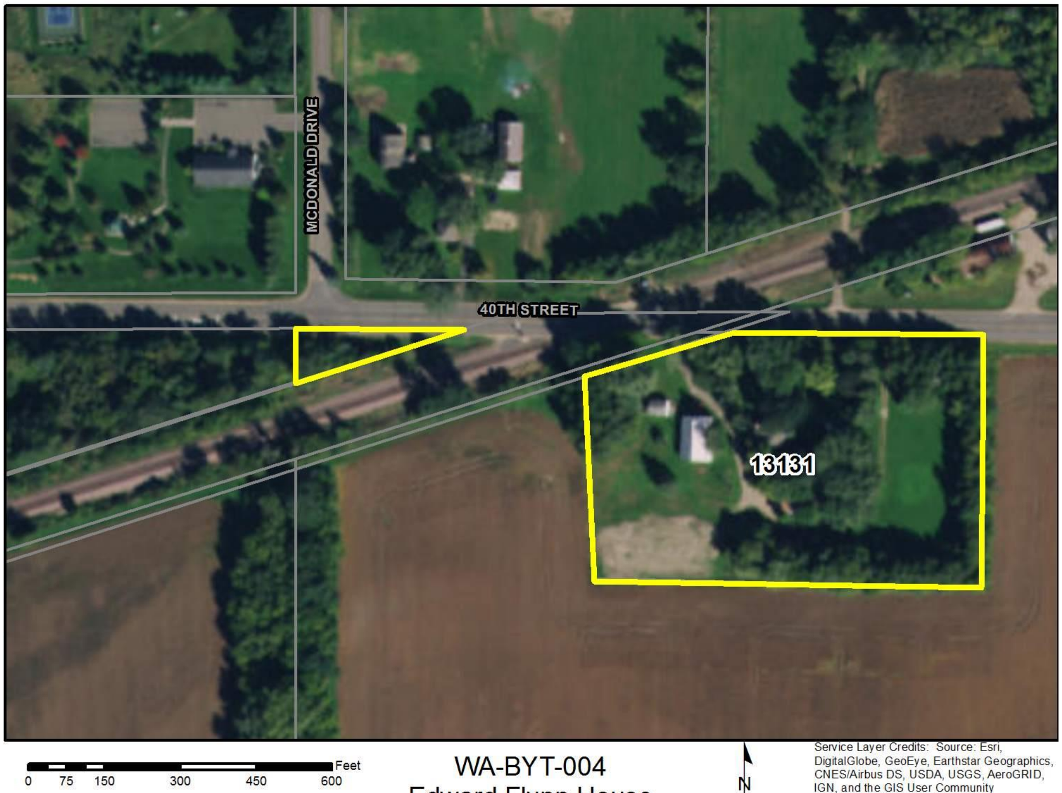
[1] Kenneth Hannah, interview with Mead & Hunt, Inc., June 30, 2016; "Stillwater Daily Gazette," June 8, 1942, 6; Nancy Goodman, "Historic Airports in Washington County," *Historical Whisperings* 39, no. 1 (April 2012): 8.

13131 40th Street N.

13131 40th Street N.

13131 40th Street N.

13131 40th Street N. Aerial images for this property are not current; the red X denotes the barn that was recently removed from the property.



WA-BYT-004
Edward Flynn House

THIS PAGE INTENTIONALLY LEFT BLANK

Identification	
Historic Name	St. Paul Stillwater and Taylor's Falls Railroad/ Chicago, St. Paul, Minneapolis & Omaha Railway/Chicago & North Western Railway
Current Name	Union Pacific Railway
Address	N/A
City/Twp	Lake Elmo
County	Washington
PIN	

SHPO Inventory No. XX-RRD-044

Review and Compliance No.

Project No.

Survey No. FN7

Previous National Register Status
__ NRHP __ CEF __ SEF __ DOE __ Locally Des.

Location of Property Centroid					
Legal Desc. Sec	18	**Twp**	29	**Rng**	20
USGS Quad	Stillwater **QQ** N				
UTM ZONE	15	NAD83			
Easting	511651	**Northing**	4983482		

Description	
Resource Type	Structure
Style	No Style
Construction Date	1872
Original Use	Transportation – rail-related
Current Use	Transportation – rail-related
Historical Context	Railroad Development in Minnesota, 1862-1956

Description, including alterations

The St. Paul, Stillwater & Taylor's Falls Railroad/Chicago, St. Paul, Minneapolis & Omaha Railway/ Chicago & North Western Railway/Union Pacific Railway (referred to by its original moniker throughout: StPS&TF) extends on a southwest to northeast axis at the northern edge of the Lake Elmo Airport. It enters the project area just east of the corridor's intersection with Manning Avenue and travels approximately 1.11 miles before exiting the project area at its intersection with 40th Street N. The corridor's single track with wood rail ties rests on a raised ballast bed. Grassy areas line the railroad bed on both sides, with groves of deciduous trees largely located at the edge of the grassy area. A guarded at-grade crossing is located at the intersection with 40th Street N. and Manning Avenue. No other rail features are located along the corridor in the Area of Potential Effect (APE).

Historical Narrative

The StPS&TF Railroad was incorporated in 1869 by officers of the St. Paul & Sioux City Railroad Company. They intended to build a railroad from St. Paul to Taylor's Falls via Stillwater with a branch connecting to Hudson, Wisconsin. The line was completed from St. Paul to Stillwater, passing through Lake Elmo, in 1872. In 1880 the company consolidated with others to form the Chicago, St. Paul, Minneapolis & Omaha Railway Company (CStPM&O), which was commonly known as the "Omaha." In 1882 the Chicago & North Western Railway acquired control of the CStPM&O but the line continued to operate as the "Omaha." The StPS&TF line was largely used to transport lumber and was a major carrier of passengers and freight in an out of the Twin Cities.[1] The line is currently owned and operated by Union Pacific Railway.

Significance

The StPS&TF may have significance for its association with railroad transportation in Minnesota and Washington County.

[1] National Register of Historic Places, Multiple Property, "Railroads in Minnesota, 1862-1956," Statewide, Minnesota, E37–E40; Miranda Van Fleet, "Casey Jones State Trail -St. Paul & Sioux City Railroad/Chicago, St. Paul, Minneapolis & Omaha Railway/Chicago & North Western Railway - [XX-RRD-041]," n.d., Minnesota Historic Buildings Inventory, Minnesota State Historic Preservation Office; Richard S. Prosser, *Rails to the North Star: A Minnesota Railroad Atlas* (Minneapolis, Minn.: University of Minnesota Press, 2007), 19–20, 85, 120–121, 126, 161, 163.

The StPS&TF Railroad may have significance for its association with railroad transportation in Minnesota and Washington County. Completed in 1872, the railroad was an early connection between St. Paul and Stillwater that was used to transport timber as well as passengers and freight in and out of the Twin Cities to wider markets, such as Chicago.[2] Per the *Railroads in Minnesota, 1862-1956 Multiple Property Documentation Form,* the railroad may have significance applying *Criterion A* under significance requirement 2, as it provided a connection between the manufacturing/commerce nodes at Stillwater and the Twin Cities, and/or requirement 3, as an important component of Minnesota's railroad network that provided an important early link between the Twin Cities, Stillwater, and wider markets.[3] For the purpose of the project, however, further evaluation of the corridor is not recommended at this time as proposed project activities are limited to tree clearing outside the railroad right-of-way, resulting in limited potential for impact on the corridor. See *Phase I (Reconnaissance Survey) Report: Lake Elmo Airport* on file at SHPO for further details regarding project activities.

Area of Significance
Transportation

Period of Significance
Further study required

Integrity
N/A

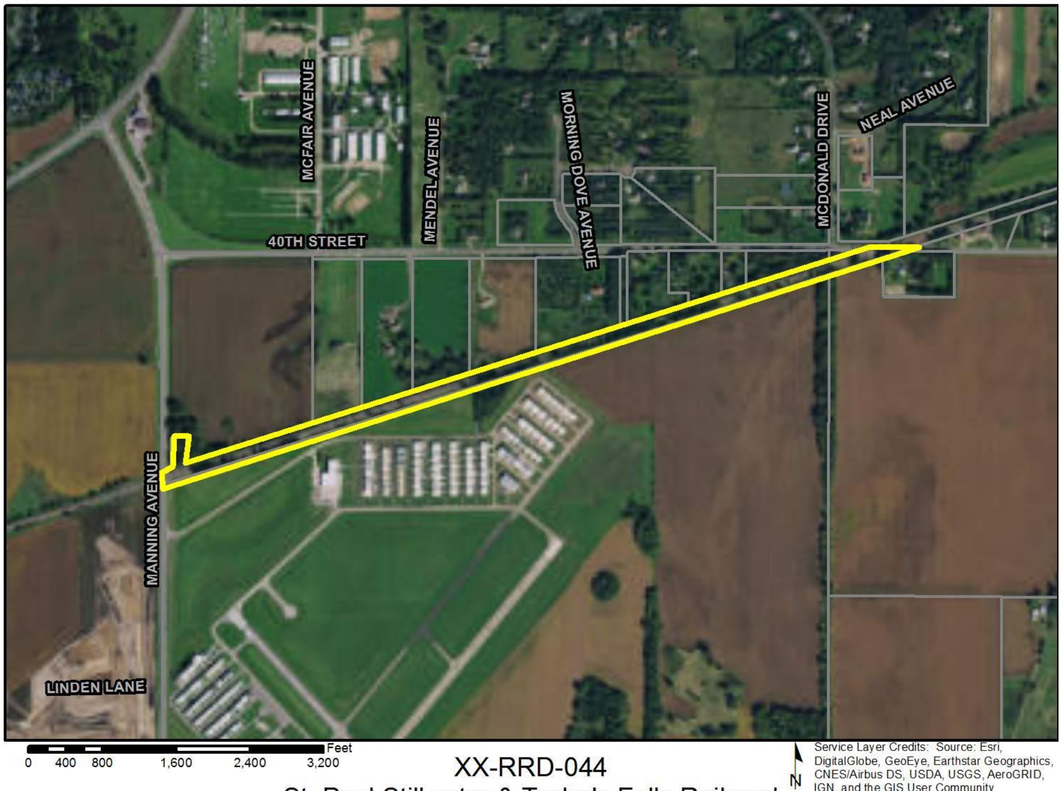
National Register Eligibility Recommendation
Further study required

[2] National Register of Historic Places, Multiple Property, "Railroads in Minnesota, 1862-1956," Statewide, Minnesota, E37–E40; Miranda Van Fleet, "Casey Jones State Trail -St. Paul & Sioux City Railroad/Chicago, St. Paul, Minneapolis & Omaha Railway/Chicago & North Western Railway - [XX-RRD-041}," n.d., Minnesota Historic Buildings Inventory, Minnesota State Historic Preservation Office; Richard S. Prosser, *Rails to the North Star: A Minnesota Railroad Atlas* (Minneapolis, Minn.: University of Minnesota Press, 2007), 19–20, 85, 120–121, 126, 161, 163.

[3] National Register of Historic Places, Multiple Property, "Railroads in Minnesota, 1862-1956," Statewide, Minnesota, F195–196.

St. Paul, Stillwater & Taylor's Falls Railroad at intersection with Manning Avenue N.

St. Paul, Stillwater & Taylor's Falls Railroad at intersection with 40th Street N.



XX-RRD-044
St. Paul Stillwater & Taylor's Falls Railroad

Identification	
Historic Name	House
Current Name	House
Address	12905 40th Street N.
City/Twp	Baytown Twp.
County	Washington
PIN	1802920110003

SHPO Inventory No. WA-BYT-012

Review and Compliance No.

Project No.

Survey No. FN8

Previous National Register Status
__ NRHP __ CEF __ SEF __ DOE __ Locally Des.

Location of Property Centroid					
Legal Desc. Sec	18	**Twp**	29	**Rng**	20
USGS Quad	Stillwater **QQ** NE-NE				
UTM ZONE	15	NAD83			
Easting	512208	**Northing**	4983707		

Description	
Resource Type	Building
Style	Split-level
Construction Date	c.1970
Date Source	Field Review
Original Use	Domestic- single dwelling
Current Use	Domestic- single dwelling
Historical Context	Urban Centers 1870-1940

Description, including alterations

This Split-level house with rectangular footprint was constructed c.1970. It rests on a raised concrete foundation, is clad in original wide-lap wood siding, and has an asphalt-shingled, side gable roof. The front (north) facade features a central entrance with a simple wood stoop and grouped, replacement, one-over-one, double-hung and sliding windows.

A c.1970 garage is located west of the house. It is clad in original wide-lap wood siding and has an asphalt-shingled, front-gable roof.

Historical Narrative

N/A

Significance

The property was evaluated under *Criterion C: Architecture*. Research and field survey identified no evidence of distinctive characteristics of a type, method, or period of construction; the work of a master; high artistic value; or the collective representation of a significant and distinguishable entity related to a trend of history. Therefore, the property lacks significance under *Criterion C*. Based on the results of the literature review, the property does not appear to be significant to any trend of local, state, or national history. Thus, the property is not eligible under *Criterion A: History*. The property does not appear to qualify under *Criterion B: Significant Person.* It is recommended not eligible for the National Register. No further work is recommended.

Area of Significance

N/A

Period of Significance

N/A

Integrity

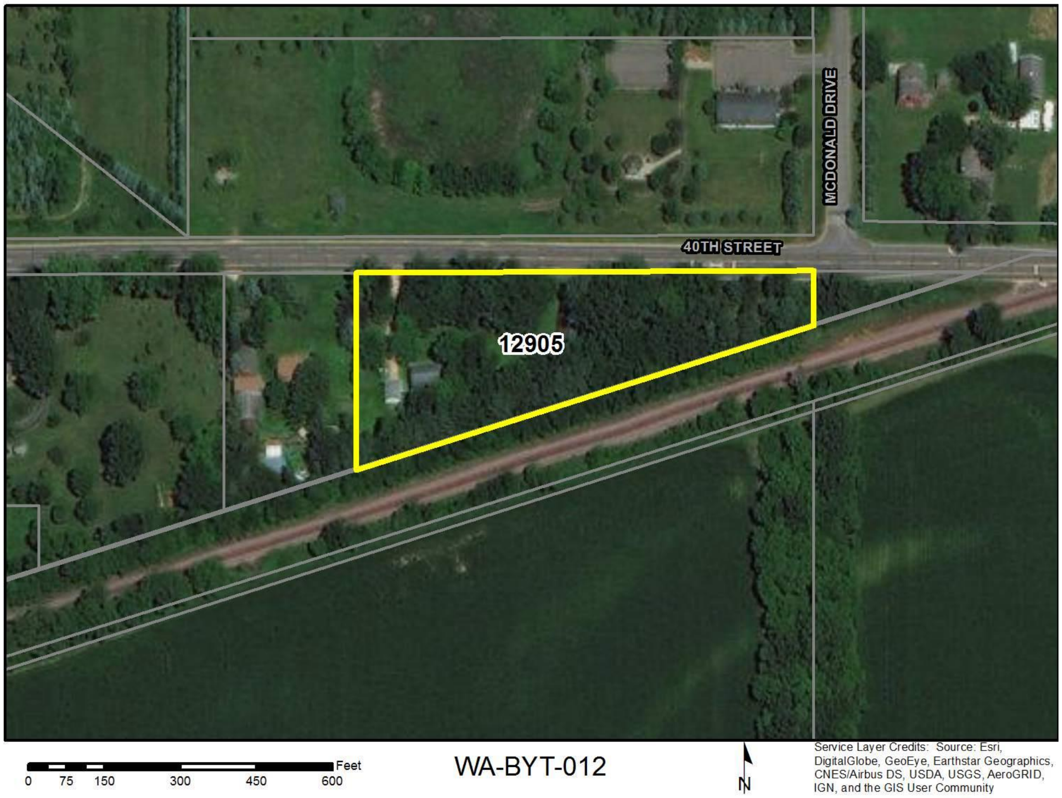
N/A

National Register Eligibility Recommendation

Not Eligible

12905 40th Street N.

12905 40th Street N.


MCDONALD DRIVE
40TH STREET
12905
Feet
0 75 150 300 450 600
WA-BYT-012
N
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

THIS PAGE INTENTIONALLY LEFT BLANK

Identification	
Historic Name	House
Current Name	House
Address	12805 40th Street N.
City/Twp	Baytown Twp.
County	Washington
PIN	1802920110004

SHPO Inventory No. WA-BYT-013

Review and Compliance No.

Project No.

Survey No. FN9

Previous National Register Status
__ NRHP __ CEF __ SEF __ DOE __ Locally Des.

Location of Property Centroid					
Legal Desc. Sec	18	**Twp**	29	**Rng**	20
USGS Quad	Stillwater **QQ** NE-NE				
UTM ZONE	15	NAD83			
Easting	512132	**Northing**	4983702		

Description	
Resource Type	Building
Style	Split-level
Construction Date	1965
Date Source	Assessor Data
Original Use	Domestic- single dwelling
Current Use	Domestic- single dwelling
Historical Context	Urban Centers 1870-1940

Description, including alterations

This Split-level house with a rectangular footprint was constructed in 1965. It rests on an elevated concrete block foundation, is clad in vertical wood siding, and has an asphalt-shingled, side-gable roof with a wide eave overhang. The front (north) facade features a central entrance with transom and side light, a group of fixed-over-awning windows, and a partial upper-story overhang over the elevated basement. An interior brick chimney is located at the roof ridgeline. Windows are the original casements and fixed-over-awning sash.

A large, two-stall detached garage with vertical wood siding and asphalt-shingled, shed roof are located east of the house. The garage features an interior brick chimney at the roof ridgeline and a large addition on the rear (south) elevation.

Historical Narrative

N/A

Significance

The property was evaluated under *Criterion C: Architecture*. Research and field survey identified no evidence of distinctive characteristics of a type, method, or period of construction; the work of a master; high artistic value; or the collective representation of a significant and distinguishable entity related to a trend of history. Therefore, the property lacks significance under *Criterion C*. Based on the results of the literature review, the property does not appear to be significant to any trend of local, state, or national history. Thus, the property is not eligible under *Criterion A: History*. The property does not appear to qualify under *Criterion B: Significant Person.* It is recommended not eligible for the National Register. No further work is recommended.

Area of Significance

N/A

Period of Significance

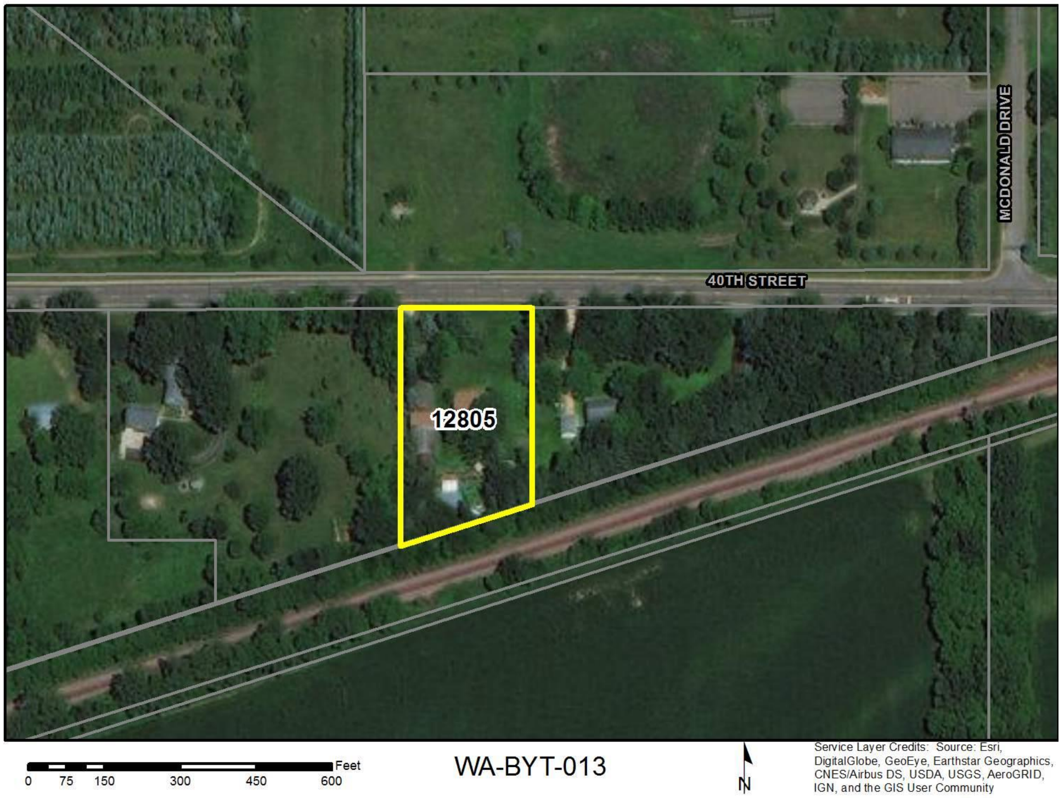
N/A

Integrity
N/A

National Register Eligibility Recommendation
Not Eligible

12805 40th Street N.

12805 40th Street N.


MCDONALD DRIVE
40TH STREET
12805
Feet
0 75 150 300 450 600
N
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

WA-BYT-013

THIS PAGE INTENTIONALLY LEFT BLANK

Identification	
Historic Name	House
Current Name	House
Address	12689 40th Street N.
City/Twp	Baytown Twp.
County	Washington
PIN	1802920110002

SHPO Inventory No. WA-BYT-014

Review and Compliance No.

Project No.

Survey No. FN10

Previous National Register Status
__ NRHP __ CEF __ SEF __ DOE __ Locally Des.

Location of Property Centroid					
Legal Desc. Sec	18	**Twp**	29	**Rng**	20
USGS Quad	Stillwater **QQ** NE-NE				
UTM ZONE	15	NAD83			
Easting	512025	**Northing**	4983712		

Description	
Resource Type	Building
Style	Queen Anne
Construction Date	c.1880
Date Source	Field Review
Original Use	Domestic- single dwelling
Current Use	Domestic- single dwelling
Historical Context	Urban Centers 1870-1940

Description, including alterations

There are four buildings on this property: a c.1880 house, modern barn, modern pole building, and modern gazebo. This two-story Queen Anne house with an irregular footprint was constructed c.1880. It is clad in wood siding and has an asphalt-shingled, irregular roof. The front (west) facade features a two-story, projecting front-gable bay with a fixed window and replacement fish-scale shingles in the gable end. A second two-story projecting bay with replacement decorative shingles is located on the side (east) elevation. The entrance is located on the side (west) elevation and is covered by a portico supported by brackets. Windows are replacement, one-over-one, double-hung and fixed sash.

A c.1985 barn is located southwest of the house. It is clad in wood siding and has a front-gable roof. The side (north) elevation features two gable wall dormers. Windows are replacement, one-over-one, double-hung and sliding sash.

A modern pole building is located southwest of the house and a modern gazebo is located to the south in the rear yard.

Historical Narrative

N/A

Significance

The property was evaluated under *Criterion C: Architecture*. Research and field survey identified no evidence of distinctive characteristics of a type, method, or period of construction; the work of a master; high artistic value; or the collective representation of a significant and distinguishable entity related to a trend of history. Therefore, the property lacks significance under *Criterion C*. Based on the results of the literature review, the property does not appear to be significant to any trend of local, state, or national history. Thus, the property is not eligible under *Criterion A: History*. The property does not appear to qualify under *Criterion B: Significant Person.* It is recommended not eligible for the National Register. No further work is recommended.

Area of Significance

N/A

Period of Significance

N/A

Integrity
N/A

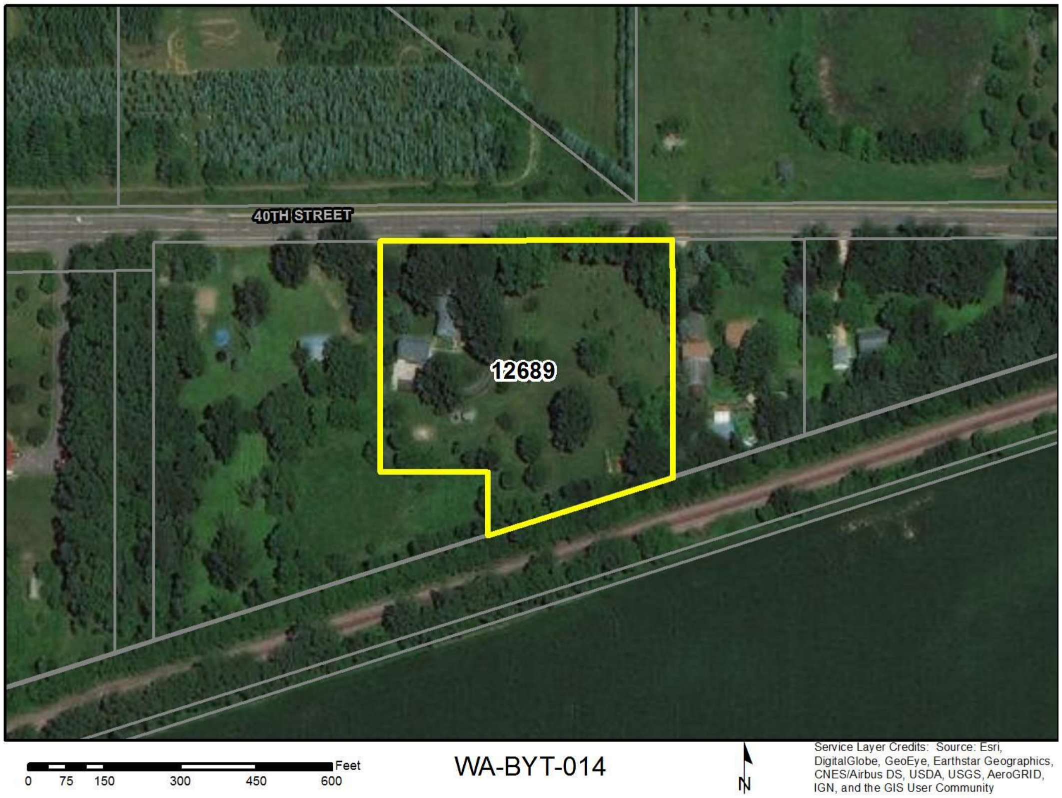
National Register Eligibility Recommendation
Not Eligible

12689 40th Street N.

12689 40th Street N.

12689 40th Street N.

12689 40th Street N.


40TH STREET
12689
0 75 150 300 450 600 Feet
WA-BYT-014
N
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Identification	
Historic Name	House
Current Name	House
Address	12657 40th Street N.
City/Twp	Baytown Twp.
County	Washington
PIN	1802920120002

SHPO Inventory No. WA-BYT-015

Review and Compliance No.

Project No.

Survey No. FN11

Previous National Register Status
__ NRHP __ CEF __ SEF __ DOE __ Locally Des.

Location of Property Centroid					
Legal Desc. Sec	18	**Twp**	29	**Rng**	20
USGS Quad	Stillwater	**QQ**	NE-NE		
UTM ZONE	15		NAD83		
Easting	511921	**Northing**	4983725		

Description	
Resource Type	Building
Style	Ranch
Construction Date	1968
Date Source	Assessor Data
Original Use	Domestic- single dwelling
Current Use	Domestic- single dwelling
Historical Context	Urban Centers 1870-1940

Description, including alterations

This one-story Ranch house with a rectangular footprint was constructed in 1968. It rests on a concrete block foundation, is clad in replacement vinyl siding, and has an asphalt-shingled, side-gable roof with an eave overhang. The front (north) facade features a simple concrete stoop, slightly projecting bay on the west end, and a bay window with replacement fixed and one-over-one, double-hung sash. An interior brick chimney is located at the roof ridgeline. Windows are original, one-over-one, double-hung and replacement sliding sash. An original attached garage may have been incorporated into the massing at an unknown time.

A modern two-stall detached garage with wide-lap wood siding and an asphalt-shingled, side-gable roof is located south of the house.

Historical Narrative

N/A

Significance

The property was evaluated under *Criterion C: Architecture*. Research and field survey identified no evidence of distinctive characteristics of a type, method, or period of construction; the work of a master; high artistic value; or the collective representation of a significant and distinguishable entity related to a trend of history. Therefore, the property lacks significance under *Criterion C*. Based on the results of the literature review, the property does not appear to be significant to any trend of local, state, or national history. Thus, the property is not eligible under *Criterion A: History*. The property does not appear to qualify under *Criterion B: Significant Person.* It is recommended not eligible for the National Register. No further work is recommended.

Area of Significance

N/A

Period of Significance

N/A

Integrity

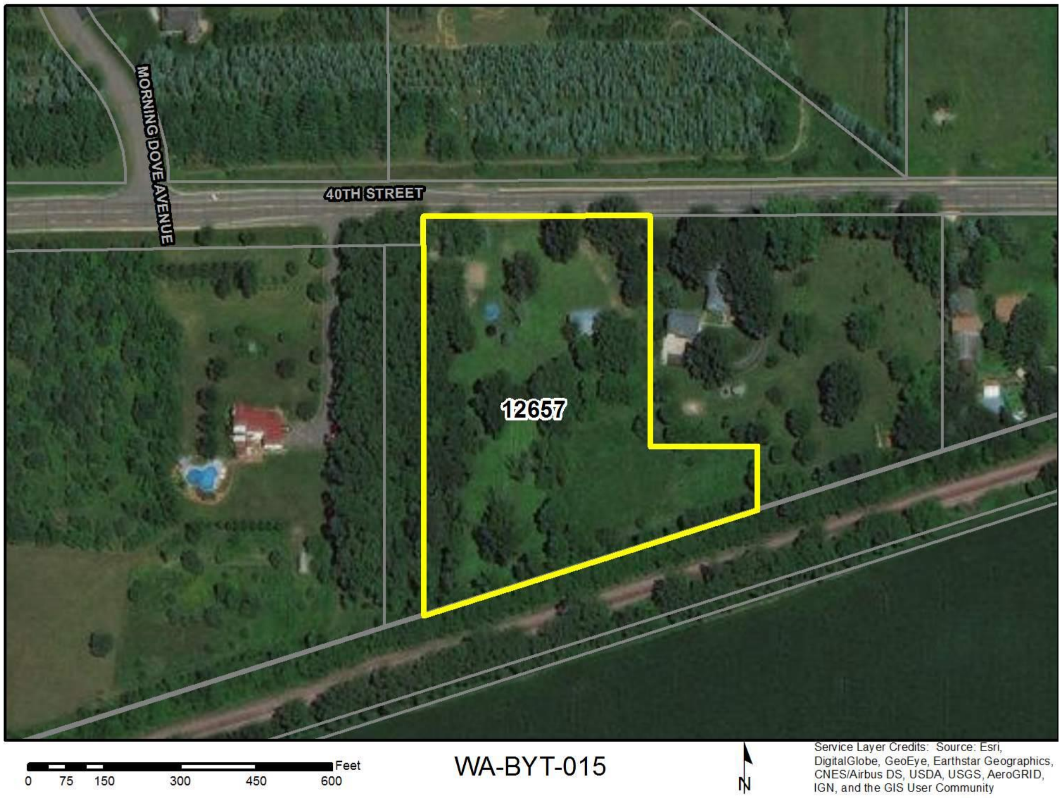
N/A

National Register Eligibility Recommendation

Not Eligible

12657 40th Street N.

12657 40th Street N.


MORNING DOVE AVENUE
40TH STREET
12657
Feet
0 75 150 300 450 600
N
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

WA-BYT-015

THIS PAGE INTENTIONALLY LEFT BLANK

Identification	
Historic Name	Lake Elmo Airport
Current Name	Lake Elmo Airport
Address	3275 Manning Avenue N.
City/Twp	Baytown Twp.
County	Washington
PIN	

SHPO Inventory No. WA-BYT-016

Review and Compliance No.

Project No.

Survey No. FN12

Previous National Register Status
__ NRHP __ CEF __ SEF __ DOE __ Locally Des.

Location of Property Centroid			
Legal Desc. Sec	18 **Twp** 29	**Rng**	20
USGS Quad	Hudson and Stillwater	**QQ**	entire section
UTM ZONE	15	**NAD**83	
Easting	511219	**Northing**	4982749

Description	
Resource Type	Building
Style	No Style
Construction Date	1951
Date Source	Assessor Data
Original Use	Transportation- air-related
Current Use	Transportation- air-related
Historical Context	Urban Centers 1870-1940

Description, including alterations

The approximately 630-acre Lake Elmo Airport is located on multiple parcels within Baytown and West Lakeland Townships and is roughly bounded by Manning Avenue on the west, the Union Pacific (historically the St. Paul, Stillwater, & Taylor's Falls Railroad) on the north, Neal Avenue on the east, and 30th Street on the south. Residences, dating from the late nineteenth century to the 2000s, are adjacent to the airport along with a handful of late-nineteenth-century farmsteads. Three access roads provide entry to the airport: two off of Manning Avenue and the third off of 30th Street. The main access road is located off of Manning Avenue and is signed as 33rd Avenue N., in the approximate center of the airport property.

The airport features two runways: a primary runway (Runway 14-32) extending in a northwest-southeast orientation and a cross wind runway (Runway 4-22) extending in a northeast-southwest orientation. Taxiways, lights, and navigational aids are located along both runways. There are three groups of hangars on the airport, identified as Hangar Areas 1-3 in Figure 1. Hangar Areas 1 and 2, which consist of historic-age and modern hangars, are located adjacent to Manning Avenue and are separated by 33rd Avenue N. Hangar Area 3 consists of modern hangars, constructed from 1990 to the present, and is located in the northwest quadrant adjacent to the Union Pacific rail line.

Figure 1. Current aerial of Lake Elmo Airport.

The airport features several modern and historic-age aviation support buildings called out in Figure 2. The following brief building descriptions are organized by support buildings and Hangar Areas 1-3.

Figure 2. Location of support buildings and hangars.

Located at the north end of the property near the railroad corridor, Valters Aviation serves as the airport's fixed-base operator (FBO) (see Figure 3). The c.1990, one-story building rests on a concrete block foundation, is clad in standing-seam metal siding, and has a shallow, front-gable, standing-seam metal roof. It features a large, vertical, bi-fold door on the south elevation and metal, fixed sash windows. A c.2000, one-story, shed-roof addition is located on the north elevation.

Figure 3. Valters Aviation Building, view facing northeast.

The c.1980, one-story Lake Elmo Metropolitan Airports Commission (MAC) maintenance building is located at the east end of the airport's main access road (see Figure 4). The concrete block building rests on a poured concrete foundation and has a flat roof with metal coping and metal fixed sash windows. It features seven bays, each with an overhead door, on the front (west) facade. The southern two bays are slightly higher than the remainder of the building. A one-story, c.2000 addition wraps around the side (north) and rear (east) elevation and features a band of fixed frame windows.

Figure 4. c.1980 Lake Elmo MAC maintenance building, view facing southeast.

A c.1960, irregularly shaped, one-story building, possibly a former FBO building, is located southwest of the maintenance building (see Figure 5). It rests on a poured-concrete foundation, is clad in vertical metal siding, and has flat metal roof. The front (north) facade features an overhead door, casement windows, and polygonal projecting bay on the southeast end. A large vertical bi-fold door is located on side (southeast) elevation.

Figure 5. c.1960 building, possibly a former FBO building, view facing west.

A c.1970, one-story maintenance building is located near the southern end of the property and is accessed via 30th Street (see Figure 6). It rests on a poured-concrete foundation, is clad in standing-seam metal siding, and has a shallow front-gable roof that is covered in standing-seam metal. The front (northeast) facade features a large overhead metal door. Windows are three-part sliding sash.

Figure 6. c.1970 south maintenance building, view facing southwest.

The airport has approximately 128 hangars constructed from the 1950s to the present. The historic-age hangars, dating to the 1950s and 1960s, are located in Hangar Areas 1 and 2. These hangars consist of a mixture of box and T-hangars and Quonsets (see Figures 7-10). They vary in type and size; feature alterations, including replacement siding, windows, and doors; and do not appear to be planned as a cohesive group. The historic-age box and T-hangars commonly rest on poured-concrete foundations, are clad in metal, and have front- or side-gable roofs. They feature sliding or vertical bi-fold doors and some have sliding or fixed windows. The Quonsets rest on poured-concrete foundations, are clad in metal siding, and have arched metal roofs. They also feature sliding or vertical bi-fold metal doors. Modern box hangars are interspersed with historic-age hangars in Hangar Areas 1 and 2.

Figure 7. Historic-age T-hangar, view facing south.

Figure 8. Historic-age Box and Quonset hangars, view facing south.

Figure 9. Historic-age Quonset hangars, view facing southwest.

Figure 10. Large c.1970 Quonset Hangar, view facing north.

Modern box hangars, constructed from c.1990 to the present, are located in Hangar Area 3 (see Figures 11 and 12). They rest on poured-concrete foundations, are clad in vertical metal siding, and have metal front- or side-gable roofs. The hangars feature a large vertical bi-fold door often with an adjacent single-leaf entry door. Some have sliding or fixed windows.

Figure 11. Modern box hangars, view facing southeast.

Figure 12. Modern box hangar, view facing southwest.

Historical Narrative

During World War II the Minnesota State Legislature recognized the future importance of air transportation in the state. With the hope of making the Twin Cities a leader in aviation within the upper Midwest, the legislature created the Metropolitan Airports Commission (MAC) in 1943 with the aim of promoting air transportation and commerce in the seven-county Twin Cities metro area. The MAC was designed to take a regional approach to air service and discourage competition between Minneapolis and St. Paul. As a result, the MAC established a system of airports with the primary airport being Wold-Chamberlain Field (which became Minneapolis-St. Paul International Airport in 1948) and six reliever airports to accommodate smaller aircraft traffic.[1] The organization decided that one reliever airport would

[1] Metropolitan Airports Commission, “Metropolitan Airports Commission,” 2015, https://metroairports.org/Airport-Authority/Metropolitan-Airports-Commission/Administration/Administration.aspx.

be located within the eastern suburbs of St. Paul. As such, in 1949 it purchased 160 acres of farmland near the community of Lake Elmo in Baytown Township for development as the Lake Elmo Airport. At its officially opening in 1951, the Lake Elmo Airport had two runways: a northwest-southeast 2,300-foot-long paved runway (Runway 13-31) and a northeast-southwest 2,400-foot-long sod runway (Runway 3-21).[2]

Not long after its construction, private individuals and small companies began developing hangars and support buildings on-site (see Figure 13). Hangars, including the nine original T-hangars, were constructed in Hangar Area 1, off of Manning Avenue (see Figure 2). The first FBO at the airport, operated by A.R. Metzger, opened in 1951.[3]

Figure 13. 1953 aerial photograph of Lake Elmo Airport.[4]

[2] The runway numbers were changed in 1999 to 14-32 and 04-22, respectively.

[3] Metropolitan Airports Commission, "Lake Elmo Airport File," n.d., available at the Metropolitan Airports Commission, Minneapolis, Minnesota; Metropolitan Airports Commission, "Lake Elmo Airport 2035 Long Term Comprehensive Plan," 2016, 1–3; Nancy Goodman, "Historic Airports in Washington County," *Historical Whisperings* 39, no. 1 (April 2012): 8.

[4] "Historical Aerial Photograph, Washington County," 1953, available in the Borchert Map Library, University of Minnesota.

In 1966 the MAC expanded the Lake Elmo Airport by purchasing an additional 470 acres of farmland in Baytown and West Lakeland Townships. In the following year it lengthened Runway 13-31 to 2,600 feet and relocated, extended, and paved Runway 3-21 to 2,500 feet.[5] In the coming decade MAC constructed support buildings, including a maintenance facility and navigational aids. Private hangar and FBO development continued on the west side of the airport (see Figures 14 and 15). Throughout the 1970s and 1980s the airport supported two FBOs, Elmo Aero and Mayer Aviation, which replaced the original Metzger FBO. A third FBO, Lake Elmo Flight Services, also operated for a time and constructed a combined hangar and office facility near the northern edge in 1990.

Figure 14. 1957 aerial photograph Lake Elmo Airport.[6]

[5] Metropolitan Airports Commission, "Lake Elmo Airport 2035 Long Term Comprehensive Plan," 1–4.

[6] "Historical Aerial Photograph, Washington County," 1957, available in the Borchert Map Library, University of Minnesota.

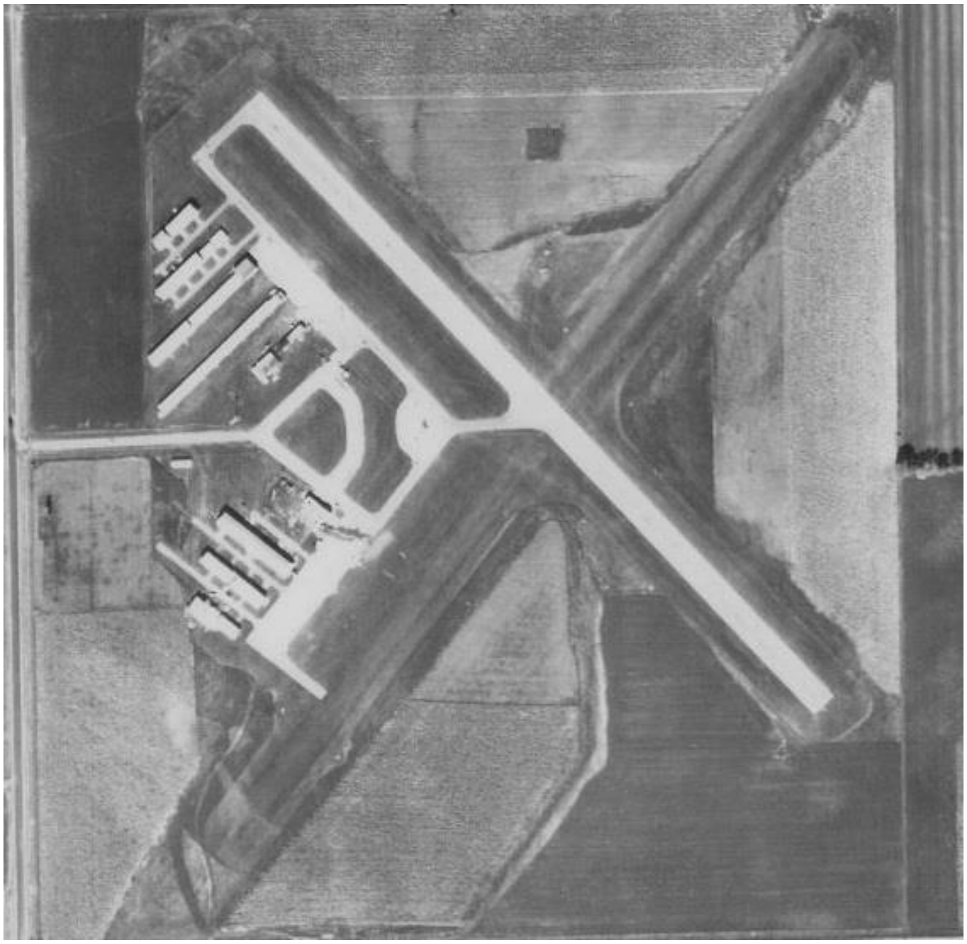


Figure 15. 1964 aerial photograph of Lake Elmo Airport.[7]

By the 1990s development shifted to the northern quadrant of the airport (Hangar Area 3). Several modern box hangars were built in this area at that time to accommodate growing demand for aircraft storage. Former FBOs dissolved, leaving Mayer Aviation as the sole FBO. The company was subsequently replaced by the current FBO, Valters Aviation, in 2003. The most recent MAC-initiated airport improvements came in in the early 1990s when it extended Runway 13-31 to its current length of 2849 feet.

Today, the Lake Elmo Airport is one of two airports within Washington County, the other being the Daniel A. DePonti Memorial Airport.[8] It is over 600 acres in size; remains under MAC ownership; is used by local businesses, private pilots, and the Civil Air Patrol; supports 150 buildings; and houses 189 aircraft as of October 2016.[9]

[7] "Historical Aerial Photograph, Washington County," 1964, available in the Borchert Map Library, University of Minnesota.

[8] Goodman, "Historic Airports in Washington County," 8; Metropolitan Airports Commission, "Lake Elmo Airport 2035 Long Term Comprehensive Plan," 1–3–1–4; Metropolitan Airports Commission, "Lake Elmo Airport File."

[9] Goodman, "Historic Airports in Washington County," 8.

Significance
The Lake Elmo Airport, including its collection of support buildings and hangars, was evaluated under *Criteria A, B,* and *C. Criterion D,* which deals with potential information sources, was evaluated by the Mississippi Valley Archaeology Center under another cover. The archaeology report will be on file at SHPO.

Research and field survey identified no evidence of distinctive characteristics of a type, method, or period of construction; the work of a master; high artistic value; or the collective representation of a significant and distinguishable entity related to a trend of history within *Criterion C* in the areas of Architecture or Engineering. Based on a review of aerial photography, airport histories, and expansion studies, the Lake Elmo Airport does not exhibit a planned development pattern. It was constructed over the course of 40 years and represents a mix of MAC- and privately constructed support buildings and hangars, which are typical box, T-, and Quonset hangar types found in regional airports statewide and do not represent a significant method of construction, nor do they represent a significant or cohesive collection of a building type. Additionally, many of the support buildings and historic-age hangars have been altered to varying degrees through replacement siding, windows, and doors. Therefore, the property lacks significance under *Criterion C*.

Based on the results of the literature review, the Lake Elmo Airport does not appear to be significant to any trend of local, state, or national history. While it is a reliever airport within the MAC system, the airport is not significant within the history or development of that system. It is not distinct or extraordinary in comparison to the other reliever airport within the MAC system or regionally, nor is it important within the overall history of aviation in Minnesota or Washington County. Thus, the property is not eligible under *Criterion A: History*.

Research did not reveal any notable individuals associated with MAC, the airport or its operations, regional aviation, or aviation activities within the state. As such, the property does not appear to qualify under *Criterion B: Significant Person.*

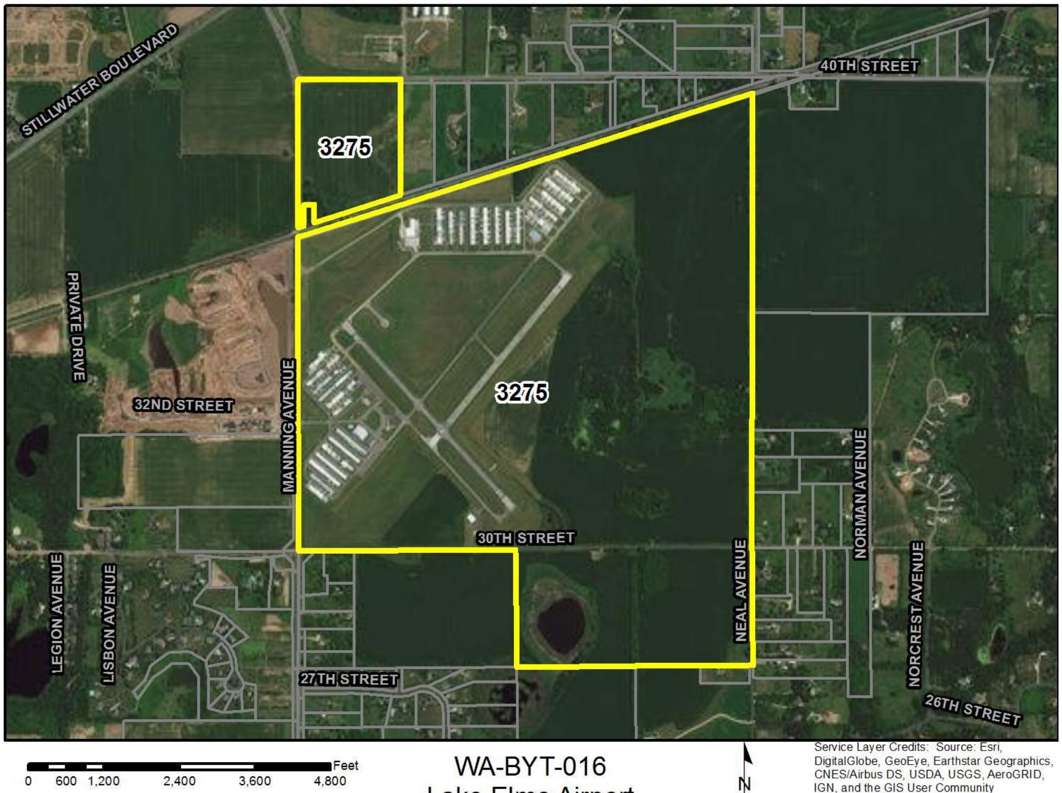
The Lake Elmo Airport is recommended not eligible for the National Register. No further work is recommended.

Area of Significance
N/A

Period of Significance
N/A

Integrity
N/A

National Register Eligibility Recommendation
Not Eligible



WA-BYT-016
Lake Elmo Airport

THIS PAGE INTENTIONALLY LEFT BLANK

Identification	
Historic Name	House
Current Name	House
Address	2933 Manning Avenue N.
City/Twp	West Lakeland Twp.
County	Washington
PIN	1902920220010

SHPO Inventory No. WA-WLK-007

Review and Compliance No.

Project No.

Survey No. FN13

Previous National Register Status
__ NRHP __ CEF __ SEF __ DOE __ Locally Des.

Location of Property Centroid					
Legal Desc. Sec	19	**Twp**	29	**Rng**	20
USGS Quad	Hudson	**QQ**	NW-NW		
UTM ZONE	15	**NAD**	83		
Easting	510942	**Northing**	4981997		

Description	
Resource Type	Building
Style	Vernacular
Construction Date	1901
Date Source	Assessor Data
Original Use	Domestic- single dwelling
Current Use	Domestic- single dwelling
Historical Context	Urban Centers 1870-1940

Description, including alterations

The buildings on this property are not visible from the public right-of-way. Aerial images indicate that the property has three buildings that are largely surrounded by mature trees. The primary structure is a gable-ell house that appears to feature a bay window on the front (south) facade. County Assessor records indicate it was constructed in 1901. Two gable-roof outbuildings are located to the west of the house. Both appear to be modern.

Historical Narrative

N/A

Significance

The property was evaluated under *Criterion C: Architecture*. Research and field survey identified no evidence of distinctive characteristics of a type, method, or period of construction; the work of a master; high artistic value; or the collective representation of a significant and distinguishable entity related to a trend of history. Therefore, the property lacks significance under *Criterion C*. Based on the results of the literature review, the property does not appear to be significant to any trend of local, state, or national history. Thus, the property is not eligible under *Criterion A: History*. The property does not appear to qualify under *Criterion B: Significant Person.* It is recommended not eligible for the National Register. No further work is recommended.

Area of Significance

N/A

Period of Significance

N/A

Integrity

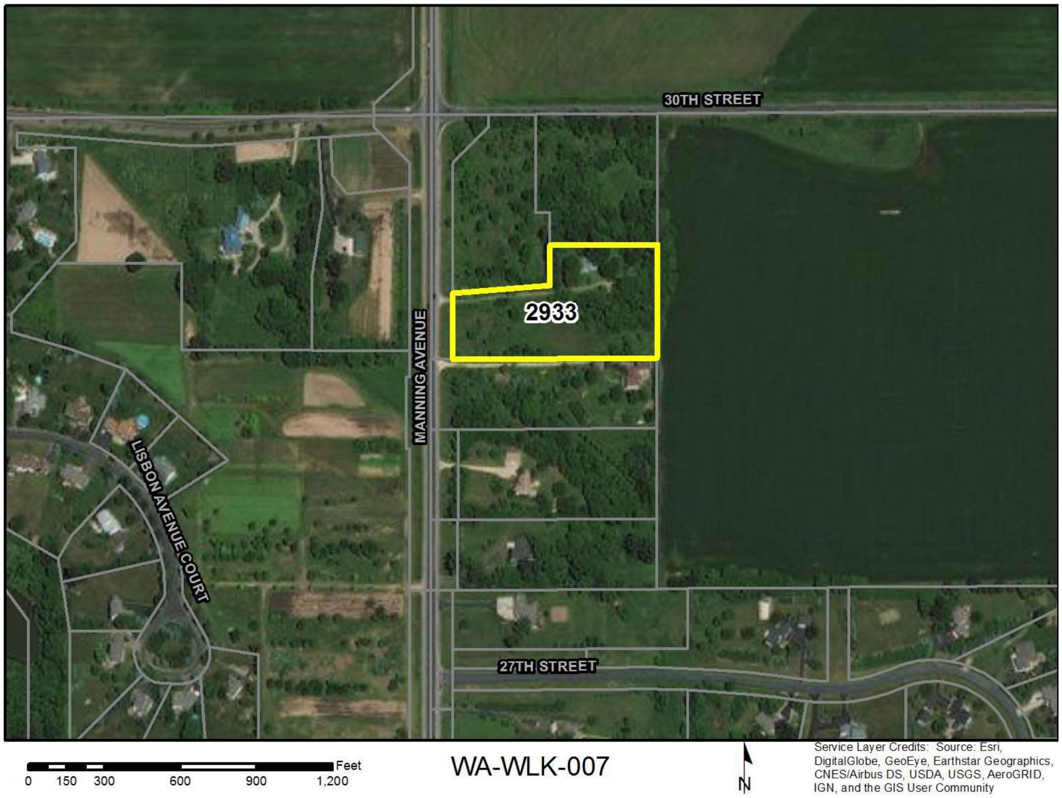
N/A

National Register Eligibility Recommendation

Not Eligible

2933 Manning Avenue N.

2933 Manning Avenue N.


30TH STREET
MANNING AVENUE
2933
LISBON AVENUE COURT
27TH STREET
0 150 300 600 900 1,200 Feet
WA-WLK-007
N
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

THIS PAGE INTENTIONALLY LEFT BLANK

Phase I Archaeological Identification Survey of Proposed Changes to Portions of the Lake Elmo Airport, Washington County, Minnesota

Prepared for:
Mead and Hunt
7900 West 78th Street
Suite 370
Minneapolis, MN 55439-2572

Principal Investigator and Report Prepared by:
Vicki L. Twinde-Javner

Mississippi Valley Archaeology Center
University of Wisconsin-La Crosse

Reports of Investigations No. 1113

August 2017

ABSTRACT/MANAGEMENT SUMMARY

At the request of Mead and Hunt, on June 1, and July 12 and 13, 2017, personnel from the Mississippi Valley Archaeology Center (MVAC) led by the Principal Investigator conducted a Phase I archaeological survey for a proposed expansion to the Lake Elmo Airport in Washington County, Minnesota. The project is within Sections 18 and 19 of Township 29 North, Range 20 West in Baytown and West Lakeland Townships in Minnesota Archaeological Region 4e. This work was done for the Metropolitan Airports Commission to be in compliance with the National Environmental Policy Act (NEPA) and Council on Environmental Quality (CEQ) as part of the Federal Aviation Administration (FAA) policies and procedures as detailed in FAA Order 1050.IF.

A total of approximately 126 acres was surveyed. Survey methods included pedestrian survey in plowed fields with excellent surface visibility, and shovel testing within portions of the current airport grounds and wooded areas within and adjacent to the plowed fields with no surface visibility.

Two new historic sites were identified. 21WA0119 consists of historic foundations with one structure consisting of a limestone foundation with a concrete addition, and a second foundation made of concrete and cinderblock. There is also some concrete slabs of unknown use. Based on historical documentation, these structures were erected sometime between 1874 and 1901, and were present until possibly the early 1980's. 21WA0120 consists of two historic foundations made of concrete. Based on historical research, the structures were erected sometime between 1874 and 1901, and were present until at the least the mid to late 1960's.

Historical maps and deed research indicate that from 1933 to 1946, the foundations associated with both of these sites, and the land surrounding them, were owned by the Jacob Schmidt Brewing Company. It is unknown if the buildings at these two sites were used in any of the manufacturing or storage for the brewery which during the 1930's and 1940's, was the seventh largest in the nation. The intact foundations indicate integrity, and the relationship to the Jacob Schmidt Brewing Company could indicate significance. These two sites may be potentially eligible for listing on the National Register of Historic Places (NRHP) under Criteria D, as they could yield important information about the past. However, since ultimately ground disturbing activities will be able to avoid these sites, the sites were not formally evaluated for eligibility for the NRHP. The only action in the site areas is the groves of trees they are located in will be clear cut.

No other cultural material was identified within the project area, therefore no further work is recommended for the remainder of the project. However, if in the future, ground disturbing activities are planned in the locations of WA0119 and WA0120, the State Historic Preservation Office should be consulted to see if further evaluations are necessary.

TABLE OF CONTENTS

List of Figures

List of Tables

INTRODUCTION AND PROJECT DESCRIPTION

In June and July 2017, personnel from the Mississippi Valley Archaeology Center (MVAC) led by the Principal Investigator performed a Phase I archaeological identification survey for a proposed expansion to the Lake Elmo Airport in Washington County, Minnesota (Figure 1). This work was done at the request of the Metropolitan Airports Commission (MAC) for compliance with the National Environmental Policy Act (NEPA) and Council on Environmental Quality (CEQ) as part of the Federal Aviation Administration (FAA) policies and procedures as detailed in FAA Order 1050.IF. The MAC has developed a number of previous planning studies, and prepared the first long-term comprehensive plan for the Lake Elmo Airport in 1966 with updates in 1976, 1992, 2008, and 2016. The current proposed expansion is one part of this plan to update existing infrastructure and improve safety and provide appropriate facilities for the types of aircraft currently using this airport (Airport Development and Environment Departments 2016: 1-1). The MAC, owner of the Lake Elmo Airport, is proposing to:

- Build a new 3,500 foot replacement runway for the existing 2,850 foot primary runway, Runway 14/32. This will include shifting the runway 615 feet to the northeast and will include all necessary grading, clearing, and runway lighting.
- Realign 30th Street North along the new Runway 32 Runway Protection Zone (RPZ) and reconnect to the existing intersection with Neal Avenue.
- Construct a new cross field taxiway to serve the new Runway 14 end, including taxiway lighting and/or reflectors.
- Convert existing Runway 14/32 to a partial parallel taxiway and construct with other taxiways as needed to support the relocated runway, including taxiway lighting and/or reflectors.
- Reconstruct Runway 4/22 and extend to 2,750 feet, including necessary lighting and taxiway connectors.
- Establish a new non-precision approach to new Runway 14 and upgrade existing Runway 4 approach to RNAV (GPS).
- Add a new connector road from the existing service road for better access to the hangars north of the main entrance driveway to the airport.
- Add an additional compass point east of Runway 14/32.

The Area of Potential Effect (APE) for the project will include any proposed areas of ground disturbance related to the actions described above. The project consisted of survey of approximately 126 acres of both agricultural land, wooded areas, and portions of the existing airfield. Since the project area has not been previously surveyed, and no known sites were in the project area, the purpose of the survey was to identify any cultural resources in the APE.

The project is within Sections 18 and 19 of Township 29 North, Range 20 West in Baytown and West Lakeland Townships (Figures 2 and 3). The survey outline is an amorphous shape and representative UTM coordinates for this project can be found in Figure 2.

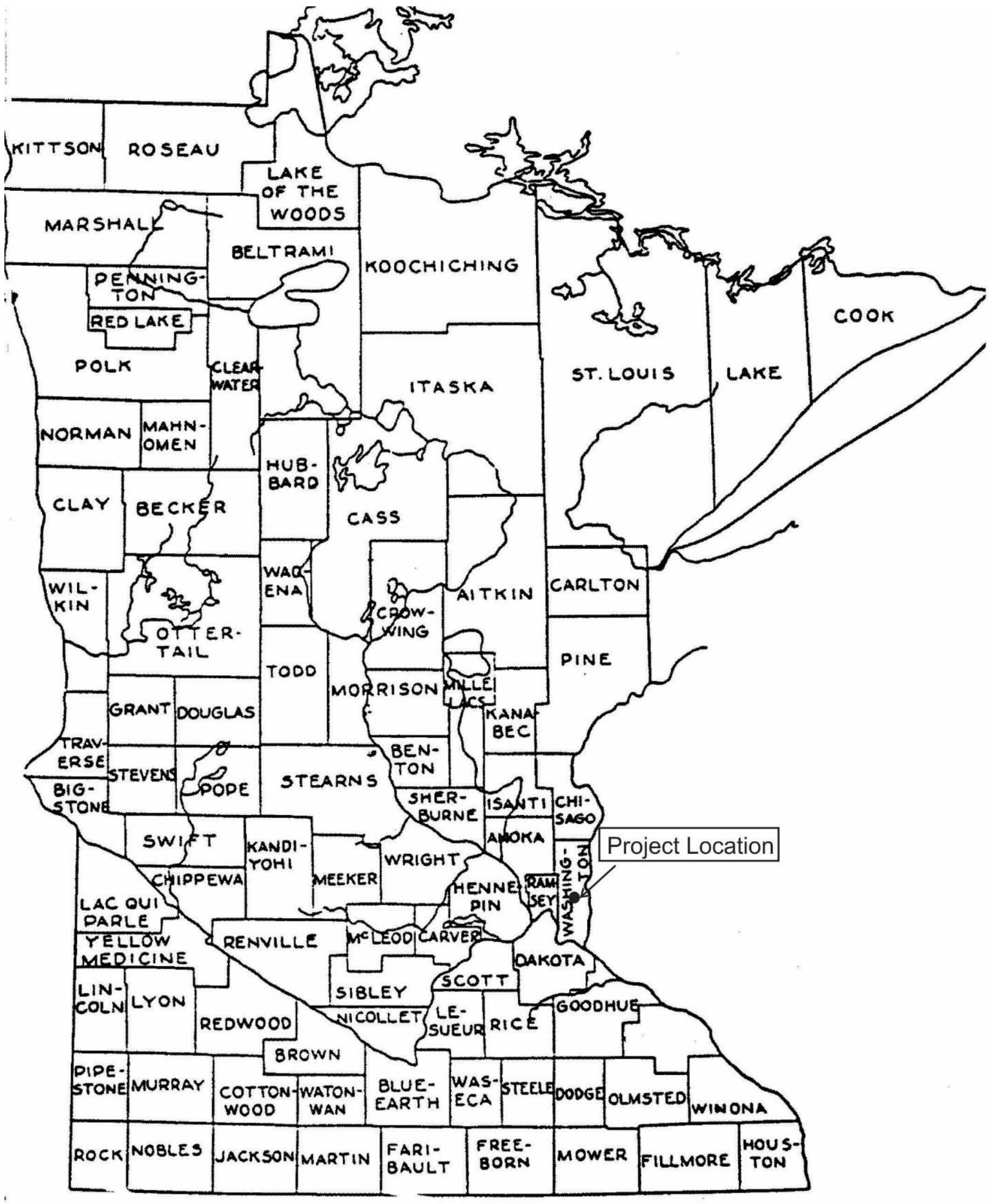
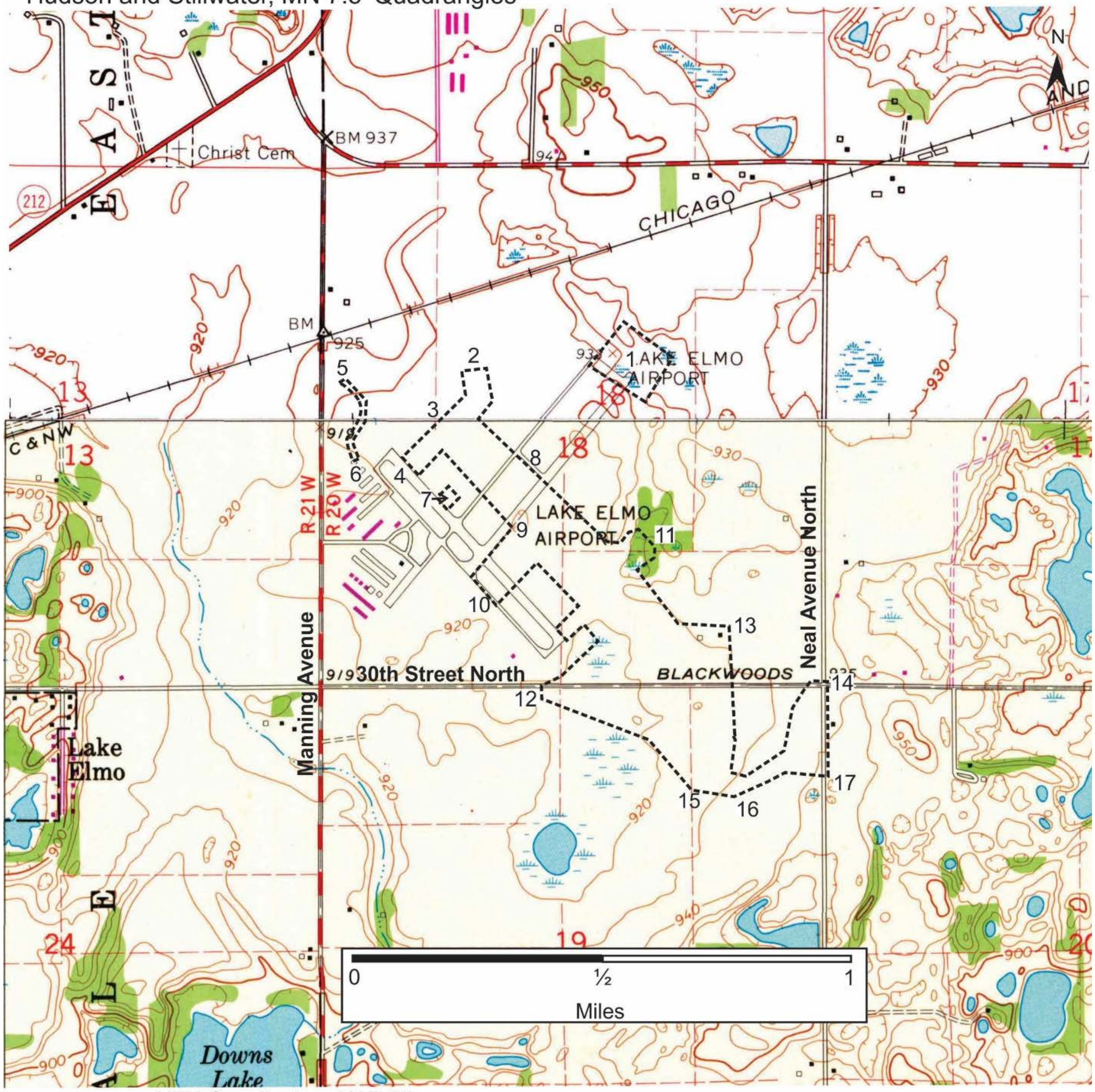


Figure 1. Approximate location of project area in Minnesota.

Hudson and Stillwater, MN 7.5' Quadrangles



UTM Coordinates - NAD 27

1 = 511777, 4982945	7 = 511191, 4982557	13 = 512086, 4982119
2 = 511318, 4982925	8 = 511492, 4982573	14 = 512393, 4981952
3 = 511204, 4982770	9 = 511404, 4982435	15 = 511989, 4981607
4 = 511087, 4982601	10 = 511352, 4982207	16 = 512162, 4981596
5 = 510900, 4982867	11 = 511864, 4982396	17 = 512402, 4981652
6 = 510925, 4982607	12 = 511608, 4981898	

Figure 2. Approximate location of project area shown with UTM coordinates.

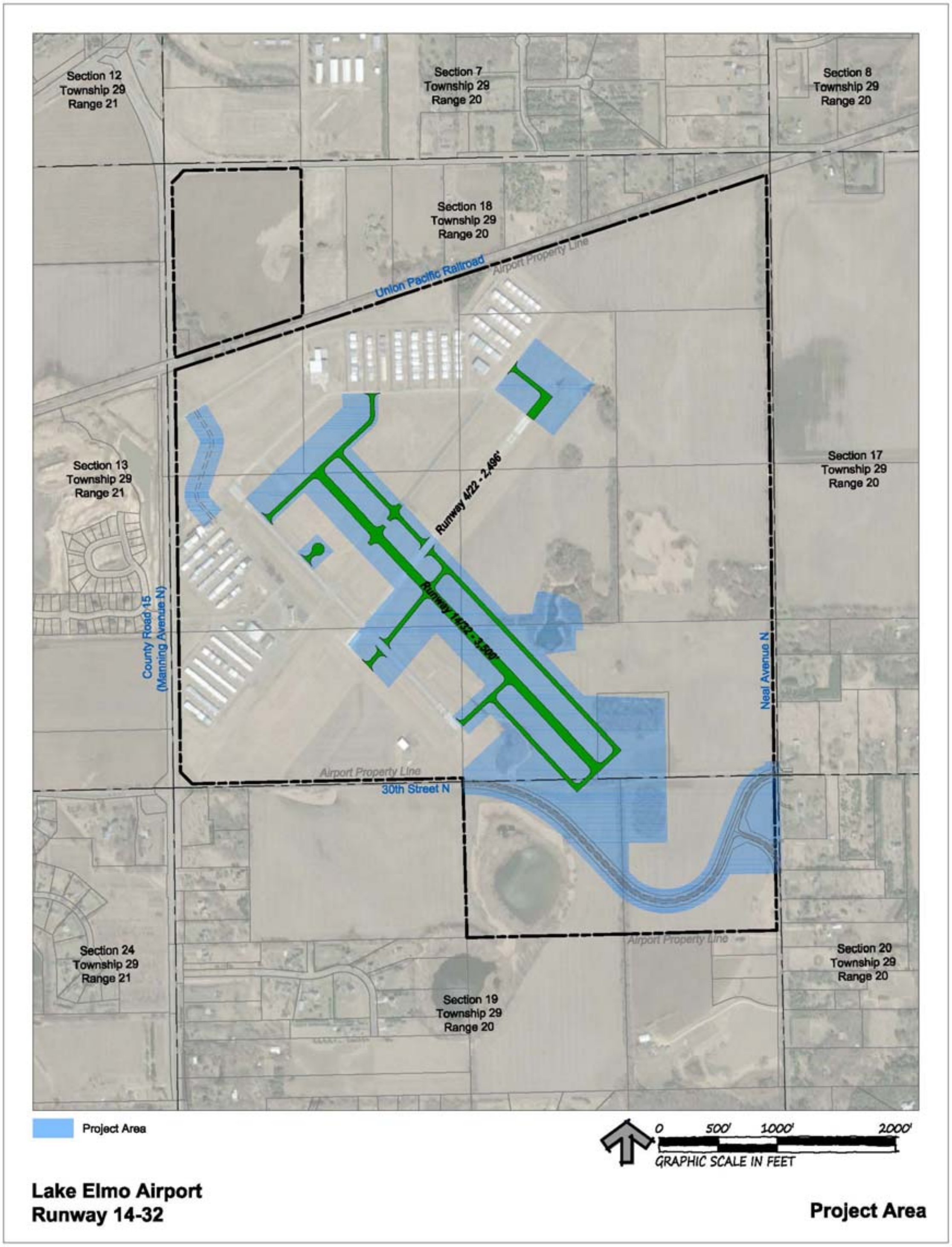


Figure 3. Aerial view of project area provided by Mead and Hunt.

RESEARCH DESIGN

The research design for the airport expansion project sought to identify cultural resources that might be impacted by planned construction activities. Methods involved: pre-field investigation to identify known sites; review of historic aerial photos and plat maps; and survey of areas that may be affected by the proposed changes to the airport and realignment of a portion of 30th Street North. Since no previous surveys have taken place in the project area, and the area is closer to water sources indicating a higher probability of cultural resources, the entire project area was surveyed. The survey included both pedestrian survey and shovel testing. The extent of the APE included all proposed area of potential ground disturbance. Any cultural resources identified during the survey were to be mapped, GPS coordinates recorded, and site forms filled out for the Minnesota Historical Society as applicable.

LITERATURE SEARCH

ENVIRONMENTAL SETTING

The APE includes: the current grounds of the Lake Elmo Airport facility which is east of Manning Avenue, north of 30th Street North, and west of Neal Avenue North; new runway areas south of the existing airport grounds encompassing portions of existing farm fields north and south of 30th Street North; realignment of 30th Street North encompassing plowed fields south of 30th Street North; and, some minor improvements along Neal Avenue North as a result of the realignment of 30th Street North.

The project lies in the Central Lake Deciduous Region. The topography of this region includes moraines, till plans and outwash plains. Numerous lakes are found throughout the region and the Mississippi River flows through the regions eastern and central part. In early historic times, the vegetation in the southern and western parts of the region would have been dominated by Big Woods species with numerous large inclusions of prairie and wood oak (Anfinson 1990: 147-148). The original vegetation cover of the project area would have consisted of brushland (oak openings and barrens with scatter trees and groves of oaks of scrubby form with some brush and thickets and occasionally with pines (Marschner 1930). The project area is within what is considered the Eastern Broadleaf Forest Province. This province covers nearly 12 million acres of the central and southeastern portion of Minnesota, and serves as a transition between semiarid portions of the state that were historically prairie and semi-humid mixed conifer-deciduous forests to the northeast (Minnesota DNR 2017).

The bedrock geology of the project area is part of the Mille Lacs-Highland Moraine Association with glacial end deposits (Hobbs and Goebel 1982). The soils within this region generally have medium to coarse textures with prairie soils in the south and west, and forest soils in the north and east. Outcrops of bedrock are limited to occasional granitic rock exposures in the region’s center and eastern edge (Anfinson 1990: 148). Due to the size of the project area, it contains various types of soils (Table 1) (Natural Resource Conservation Service 2017).

Table 1. Soil types in project area.

Antigo silt loam, 0 to 6 percent slopes
Antigo silt loam, 2 to 6 percent slopes
Campia silt loam, 0 to 8 percent slopes
Chetek sandy loam, 0 to 6 percent slopes
Chetek sandy loam, 6 to 12 percent slopes
Comstock silt loam
Crystal Lake silt loam, 1 to 3 percent slopes
Freer silt loam
Santiago silt loam, 2 to 6 percent slopes

REGIONAL CULTURAL CONTEXT

Prehistoric

The project lies in what has been classified as the Central Lake Deciduous Region. The prehistory of this area has been divided into three periods: Early, Middle, and Late Prehistoric. Technology and cultural changes interpreted in the archaeological record are used to define these periods. Within these periods, Johnson (1988) has identified Paleoindian, Eastern Archaic, Woodland and Mississippian cultural traditions.

Early Prehistoric Period (before 6000 B.C. - 1000 B.C.): Paleoindians maintained a hunting-gathering subsistence, traveling in small bands. Large Pleistocene mammals such as the woolly mammoth and mastodon were supported by a vast Boreal conifer forest (Wright 1974). Clovis and Folsum fluted points of the Early Prehistoric Period are representative of this period and have been recovered in southern and southwestern Minnesota (Anfinson 1997). During the latter phases of the Paleoindian tradition, it appears that human populations began spreading throughout the state based on projectile point finds (Johnson 1988: 6-9).

Eastern Archaic people (6000 - 800 B.C.) continued hunting and gathering, and the appearance of groundstone technology suggests a shift to greater use of plant resources (Wright 1974). Early Archaic peoples focused on bison hunting, and later on deer and elk. In the latter half of the Eastern Archaic Period copper became an important resource material in the production of utilitarian items. Stemmed points became popular during this time period and chipped stone scrapers, knives, punches, and drills were utilized. During this time period, techniques for making ground and pecked stone tools was established (Johnson 1988: 10-14).

Middle Prehistoric Period (800 B.C. - A.D. 900): The beginning of the Middle Prehistoric Period is marked by the appearance of pottery and burial mound construction, mainly identified as the Woodland tradition. Woodland pottery contained grit, a crushed rock or sand, which was used to temper the clay during firing. The thin-walled pottery often displayed decorated impressions. Conical and linear mounds were mainly utilized for burial mounds, as very few effigy mounds along the Wisconsin border from the Twin Cities southward Woodland peoples still relied on seasonal hunting and gathering, but developed a more sedentary lifestyle. Projectile points varied in form with side and corner notched points becoming popular. The use of copper lessens during this time, but it continues to be used for awls or piercing tools and ornaments. Ground stone tools, including the popular grooved maul, were utilized (Johnson 1988: 15-19). Increasing population growth, intensification of regional identity and local groups, increasing efficient use of local raw materials and food sources, and intrusion of ideas, materials, and technology from other regions are major trends identified in Minnesota during this time period (Benchley et al. 1997a: 124).

Late Prehistoric Period (A.D. 900-1650): In southern Minnesota this period is identified with the appearance of the Mississippian culture and the introduction of corn horticulture. Mississippian culture was based upon intensive agriculture including the cultivation of maize or corn, beans, squash, sunflowers and tobacco. Although intensive agriculture was important, hunting and fishing remained essential, with Bison an important food staple. Large semi-permanent villages were maintained. Chipped stone technology continued including side-notched and unnotched triangular points, double pointed knives, trapezoidal forms of hide scrapers, along with drills and punches. Ground stone tools also were continued to be used, along with bone tools. Eastern Minnesota pottery was tempered with crushed shell and included wide or narrow incised geometric decoration. The use of burial mounds continued in some areas, and in the southern part of Minnesota, some of the mounds are more distinctive than their Woodland counterparts in that the exterior was covered in limestone slabs (Johnson 1988: 24-27).

Historic

With the coming of the Europeans to the area, European items and disease came into Minnesota from the east and south. Eastern tribes began to push to the west, displacing the original habitants. At the beginning of the contact period, the largest and possibly most widespread group was the Eastern Dakota, who occupied most of the Lake-forest biome of the central and northern Minnesota. They were displaced from the Lake-forest biome into the prairies, mainly by the Ojibway during the Chippewa (Ojibway)-Dakota wars, which lasted from the 1730's until 1854. Other Native groups were present in Minnesota during the early historic time period, including the Iowa, Oto, and possibly the Assiniboine (Benchley et al. 1997b: 203-207).

The construction of Fort Snelling on the west side of the Mississippi River brought Euro-American civilization to Minnesota (Anfinson 1989: 20). Washington County was established on October 27, 1849. This was one of the nine original counties into which Minnesota was divided in 1849, although it is smaller than originally mapped. The county was named after George

Washington (Upham 2001: 615). Baytown Township was organized in May of 1858 (Upham 2001: 616). Lakeland Township (which West Lakeland Township was part of originally), was settled in 1839 and organized on October 20, 1858. West Lakeland Township was named as such in 1951 when Lakeland Township incorporated (Upham 2001: 607, 620).

PREVIOUS SITES AND SURVEYS

This project is located in SHPO region 4e. A literature review request was submitted to the Minnesota Historical Society (MHS) for the Township, Range, and Sections that the project area passes through and the Sections that would be within one mile of the existing project area. The Principal Investigator also visited the State Historic Preservation Office (SHPO) on May 10, 2017, to look through the maps, and previous site and survey files housed at that facility.

According to information provided by and researched at the Minnesota SHPO, one previously recorded site is within one mile of the project area. 21Waa, called Bass Lake Station, is located in Township 29 North, Range 21 West, Section 13. This site is a historic depression. The topographic maps at the SHPO office did not have this site mapped, but according to a list of sites provided by the SHPO office, the site is located in the southwest quarter of Section 13, which would put it at least a half mile to the west of the project area. Additionally, there is one historic cemetery located a quarter to a half mile northwest of the project along Stillwater Boulevard North. No previous recorded sites overlap the current project area.

Based on the list of reports for Washington County provided by the SHPO, and a review of reports in the Washington County drawer at the SHPO during the May 2017 visit, there has been no previous field surveys in the project area. A cultural resource assessment for the Lake Elmo Village area, which included the area just west of Manning Avenue opposite the airport grounds, was completed in 2007. However, this assessment included a literature review, background information, and recommendations for future work in the area, but did not include field survey (Boden and Mathis 2007).

LAND USE HISTORY

Various maps and atlases were researched to establish a general pattern of development along the project area and land use history. Online resources were used along with maps and atlases found at the MHS library. Mead and Hunt assisted MVAC with some of this research. Minnesota Historic Contexts applicable to this project include Early Agriculture and River Settlement (1840-1870).

According to the General Land Office (GLO) Records map from the Bureau of Land Management for this area, a 1854 original survey map (actual field survey dates to 1847) does not have any indications of cultural features, mounds, old roads or trails within either Sections 18 or 19 of Township 29 North, Range 20 West. The map and associated notes do not have any information regarding potential archaeological sites in these sections (Bureau of Land Management 2017, Field Notes Volume 130).

Historic maps of the area including plat maps and topographic maps were reviewed. Andreas' (1874) map of the area does not exhibit any structures or cultural features within the project area. One structure is noted near the very northwest corner of the current airport property near the railroad tracks. Since there is no scale on the map, it is unclear if this structure is within the project area. The only project action in this part of the airport is for a new access road. A structure is noted in the center of Section 19, but is it is out of the project area (Figure 4).

The 1901 plat map of the area does show two structures in the project area, both north and south of 30th Street North (Blackwoods Avenue) (Northwest Publishing Company 1901) (Figure 5). The 1916 plat map of the area does not exhibit structures in the project area, but this map does very few structures within the two townships and appears to be more of a map showing property ownership boundaries (Hixson 1916). The case is similar with the 1938 plat map (Hudson Map Company 1938) of the area.

Based on historic aerial photos, the land where the current facility is located and the proposed expansion area was plowed fields back until at least 1938. Two clusters of structures are noted both north and south of 30th Street North on the 1938 through 1964 aerial photos (Regents of the University of Minnesota 2017) which are currently in groves of trees that were shovel tested as part of this project. These locations match the approximate locations of the structures on the historic plat maps. The 1938 aerial photo also shows that there were a few other ponds or what appear to be water sources in the northeast portion of the project area that are no longer apparent. See Results section of this report for historic aerial photos and further discussion.

The Lake Elmo Airport was opened in 1951. The first airfield near the current facility was opened in 1939 between the cities of White Bear Lake and Stillwater, and was known as Northport. During World War II, the Army used Northport to train pilots under the Civilian Piolet Training Program. The Army also leased the Flynn Farm to the east of the current airport and established a landing area to train glider pilots. After the war, the Flynn Farm airfield was closed and the land was once again used for agricultural purposes. After World War II, the MAC saw a need for an airport east of the Twin Cities, and in 1949, approximately 160 acres of land was purchased and the Lake Elmo Airport opened in 1951. At this time, draining, grading, and surfacing began for the single 75 foot wide by 2300 foot long paved runway that runs northwest-southeast. Since 1951, the runway was extended to 2850 feet with a full lighting system, and a second 2400 foot paved runway was added that runs northeast-southwest. The airport has a full taxiway system, an automated weather station, and two areas for instrument approach procedures. In 1966, an additional 470 acres was purchased for expansion of the airport, which includes all of the current project area except the area immediately east of Neal Avenue (Airport Development and Environment Departments 2016: 1-3, and Foster 2013: 3).

Figure 4. Andreas (1874) map of project area.

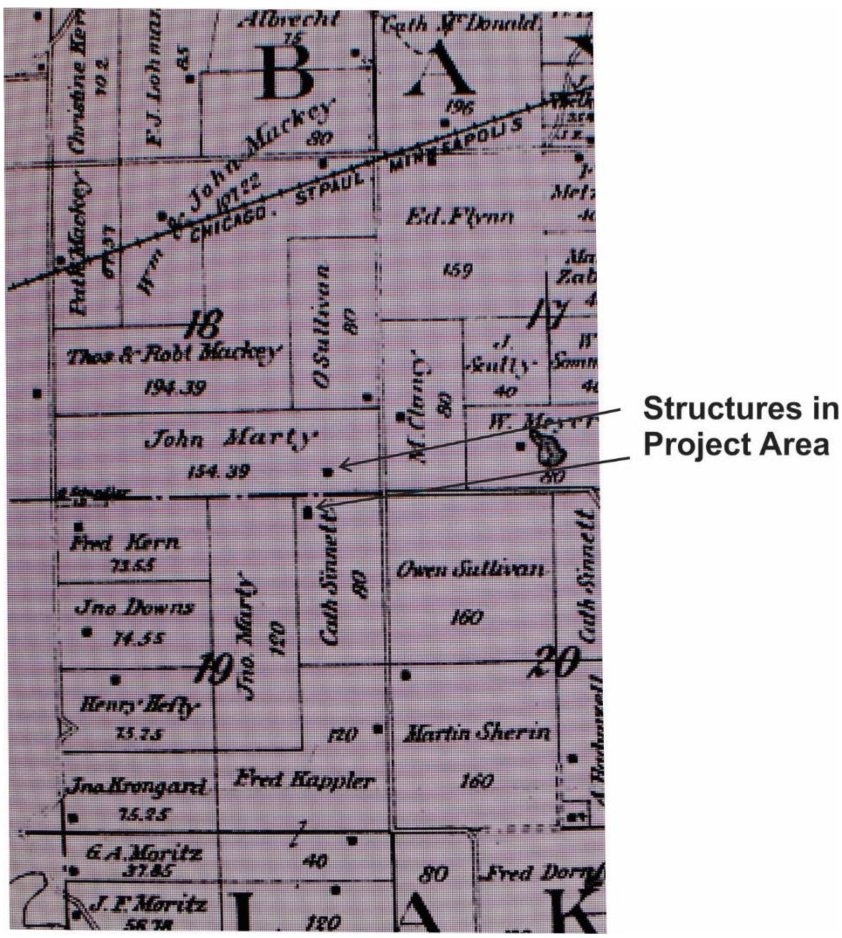


Figure 5. Northwest Publishing Company (1901) map of project area.

METHODOLOGY/WORK SUMMARY

On June 1, and July 12 and 13th, 2017, an MVAC field crew led by the Principal Investigator conducted a Phase I archaeological investigative survey of the proposed project area in Minnesota Archaeological Region 4e. The APE for the project included all areas of proposed ground disturbance which included portions in the existing airport facility north of 30th Street North and east of Manning Avenue, plowed fields and a small amount of wooded areas north of 30th Street North between Manning Avenue and Neal Avenue North, plowed fields and a small amount of wooded area south of 30th Street between Manning Avenue and Neal Avenue North, and approximately 840 feet north to south on the east side of Neal Avenue North, approximately 50 feet from the centerline of the road. There were no previously recorded sites within the project area, so the objective of the Phase I survey was to look for new sites.

The portions of the project north and south of 30th Street North, outside of the existing airport facility grounds, mainly consisted of plowed fields with a few wooded areas. At the time of the June 1 survey, the plowed fields contained soybeans that were 4 to 6 inches in height. Although there was some remnant corn stalks from previous harvests in the fields, the surface visibility was, in general, excellent with most areas in the plowed fields exceeding 95 percent surface visibility. The fields were walked on a warm sunny day which made the visibility optimal. To include various alternatives for the realignment of 30th Street North, some additional area was pedestrian surveyed south of 30th Street North in July when the soybeans had grown to more than a foot in height, but the surface visibility between the rows was still excellent. Pedestrian survey was carried out within the plowed fields in 12 to 15 meter intervals (Figures 6 and 7).

The proposed realignment of a portion of 30th Street North would possibly impact a small portion of Neal Ave, and the survey parameters were indicated to be 50 feet from centerline along the road for approximately 840 feet to cover any potential work. Once Gopher One marked the utilities along Neal Avenue, the east side of the road was shown to be saturated with utilities, therefore was not surveyed (Figure 8). The west side of the road had utilities near the road edge, and then was sloped up to the end of the plowed field that was pedestrian surveyed by MVAC. Therefore, this grassy area on the west side of Neal Avenue was not surveyed. Since the plowed fields on either side of the portion of 30th Street North that is to be impacted were very close to the road edge, with only a small amount of grass and slope/ditch between the road and the plowed fields, no shovel testing was undertaken along 30th Street North since the pedestrian survey of the immediately adjacent plowed fields should have given adequate coverage.

Historic aerial photos and historic maps were reviewed prior to the survey. Historic aerial images from 1953 and 1964 show the runways, but since these aerials are in black and white, although some grading was apparent, it was hard to estimate the actual grading limits within the current airport facility verses what was plowed field at that time, therefore the entire APE was considered in the survey. Within the airport facility, shovel tests were placed in 15 meter

Figure 6. Example of field conditions in plowed fields south of 30th Street North. View facing north.

Figure 7. Example of field conditions in plowed fields north of 30th Street North. View facing north.

Figure 8. Example of utility disturbance east of Neal Avenue North. View facing south.

intervals in all areas that were not obviously disturbed by ditch or grading. One area between existing Runway 14/32 and the taxiway was not shovel tested due to the fact there was graded slope on both edges with a ditch line running down the center. An area just east of Runway 14/32 at its southeastern end was obviously graded with some steep slope. A small area at the northeastern end of the facility that had some wetland, ditch, and slope. MVAC made a reasonable and good faith effort to shovel test any of the other areas that could not be ruled out as obviously disturbed on the surface. This included most of the rest of the project area except areas of steep slope or wetland. Some of the shovel tests along the access driveway for the northernmost set of airplane hangars showed obvious disturbance within a few inches of the ground surface by previous grading. The area southwest of Runway 14/32 exhibited obvious disturbance by previous grading with a few inches of the surface. The portion of the open area north of the taxiway for Runway 4/22 exhibited some disturbance, while other shovel tests appeared to show developed soil for the area (Figures 9 through 12).

There were a few wooded areas north and south of 30th Street North in and immediately adjacent to the plowed fields, and shovel testing was undertaken in 15 meter intervals. A few small areas of wetland were located north of 30th Street North, and were not shovel tested.

All shovel tests were excavated into sterile subsoil, and all soil was screened through 1/4 inch mesh. In general, shovel tests ranged from 48 to 50 centimeters below the current ground surface, depending on location and terrain. Areas that were wetland, steep slope, had obvious disturbance by road construction, or obvious grading or ditching from airport construction were not surveyed. Examples of shovel test profiles are below:

Example Soil Profiles
0-32 cm, 10YR 2/2 Very Dark Brown Silt
32-49 cm, 10YR 6/8 Brownish Yellow Silty Clay

0-37 cm, 10YR 3/1 Very Dark Grey Silt
37-52 cm, 10YR 6/6 Brownish Yellow Silty Clay

0-27 cm, 10YR Very Dark Brown Silt
27-34 cm, 10YR 4/4 Dark Yellowish Brown Silt
34 – 55 cm, 10YR 6/8, Brownish Yellow Silt

All sites were mapped and GPS points were taken to establish UTM coordinates. Sketch maps were drawn of each site, and general notes were taken on the surrounding terrain and other pertinent information. Historic debris found at the two historic sites identified during this survey were photographed as appropriate and were noted in the general field notes. However, due to the more recent nature of the historic debris at the sites, no material was collected. All field notes, photographs, and other documentation will be stored at MVAC.

Figure 9. Example of field conditions in existing airfield north of taxiway for Runway 4/22. View facing southwest.

Figure 10. Example of field conditions in existing airfield south of Runway 4/22. View facing northeast.

Figure 11. Example of field conditions in new compass point north of Runway 14/32. View facing northwest.

Figure 12. Example of field conditions northeast of Runway 4/22. View facing southeast.

RESULTS

Two new historic sites, 21WA0119 and 21WA0120, were identified while shovel testing in two groves of trees north and south of 30th Street North (Figure 13). These sites coincide with the foundations noted on the 1938 through 1960 aerial photos, and the 1901 and later plat maps.

21WA0119 - Lake Elmo Air Foundations 1

21WA0119, called Lake Elmo Air Foundations 1, is in the SW/14 of the SW1/4 of the SE1/4 of Section 18 in Township 29 North, Range 20 West in Baytown Township (see Figure 13). This site was found while shovel testing in a grove of trees north of 30th Street North, southeast of the existing Lake Elmo Airport facility. This site consists of foundations associated with two buildings and some concrete slabs of unknown origin. The first foundation was found approximately 420 feet north of 30th Street North, and had a limestone portion measuring 26 feet by 15 feet, with a later concrete block addition at its northwest corner measuring approximately 19 feet by 18 feet (Figures 14 and 15). The concrete addition had a metal waterspout, a copper pipe with electrical wire, and electrical plugins apparent. The area where these foundations were located was extremely overgrown and it was apparent that the foundations had been affected by downed and uprooted trees in the area. The depth of the foundations was approximately three feet.

Since this whole wooded area was extremely overgrown, it was hard to get accurate measurements between the foundations. However, measurements were estimated using GPS data. Approximately 113 feet to the west of the first foundation, a large concrete slab measuring approximately 50 feet long by 14.5 feet wide was identified. The purpose of this slab is unknown. Approximately 53 feet southwest of this concrete slab was the remnant of another concrete building. This building was approximately 77 feet long by 17 feet wide. The outsides of this foundation was made of concrete block/cinder block and there were 7 foot “rooms” or entrance areas made of cinderblock at the northern and eastern ends of the building (Figure 16). The interior of this building had three separate concrete slabs inside at different levels in height. The highest was at the northern end, with the second level approximately 12 inches lower in the middle, and then another transition sloping down approximately 4 inches at the southern end. This may have been some type of barn. To the west of this area, some concrete rubble was also noted in the thick undergrowth, but the purpose of it was unknown. Review of Lidar Imagery for the site did not appear to show further foundations to the west in the grove of trees (Minnesota Department of Natural Resources and MNGeo 2017).

No cultural material was found in any of the shovel tests in and surrounding the site area. Some historic debris noted on the surface in and around the foundations included mostly 1960/1970 debris including terracotta pots, plastic materials, a lawn chair, scrap metal, nails, container glass fragments, ceramic crockery, and metal pails. Notes were taken about the

Hudson and Stillwater, MN 7.5' Quadrangles

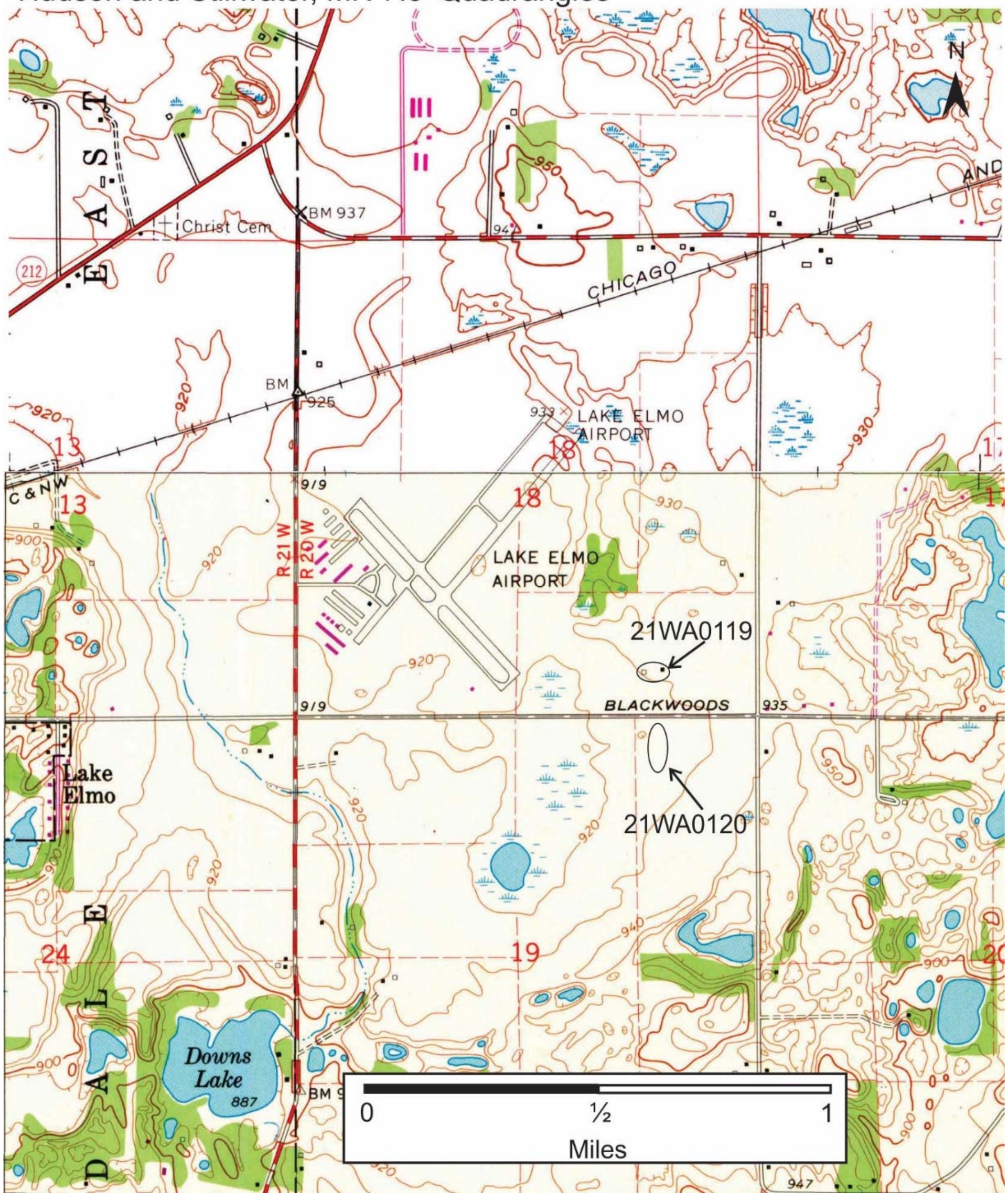


Figure 13. Approximate locations of 21WA0119 and 21WA0120.

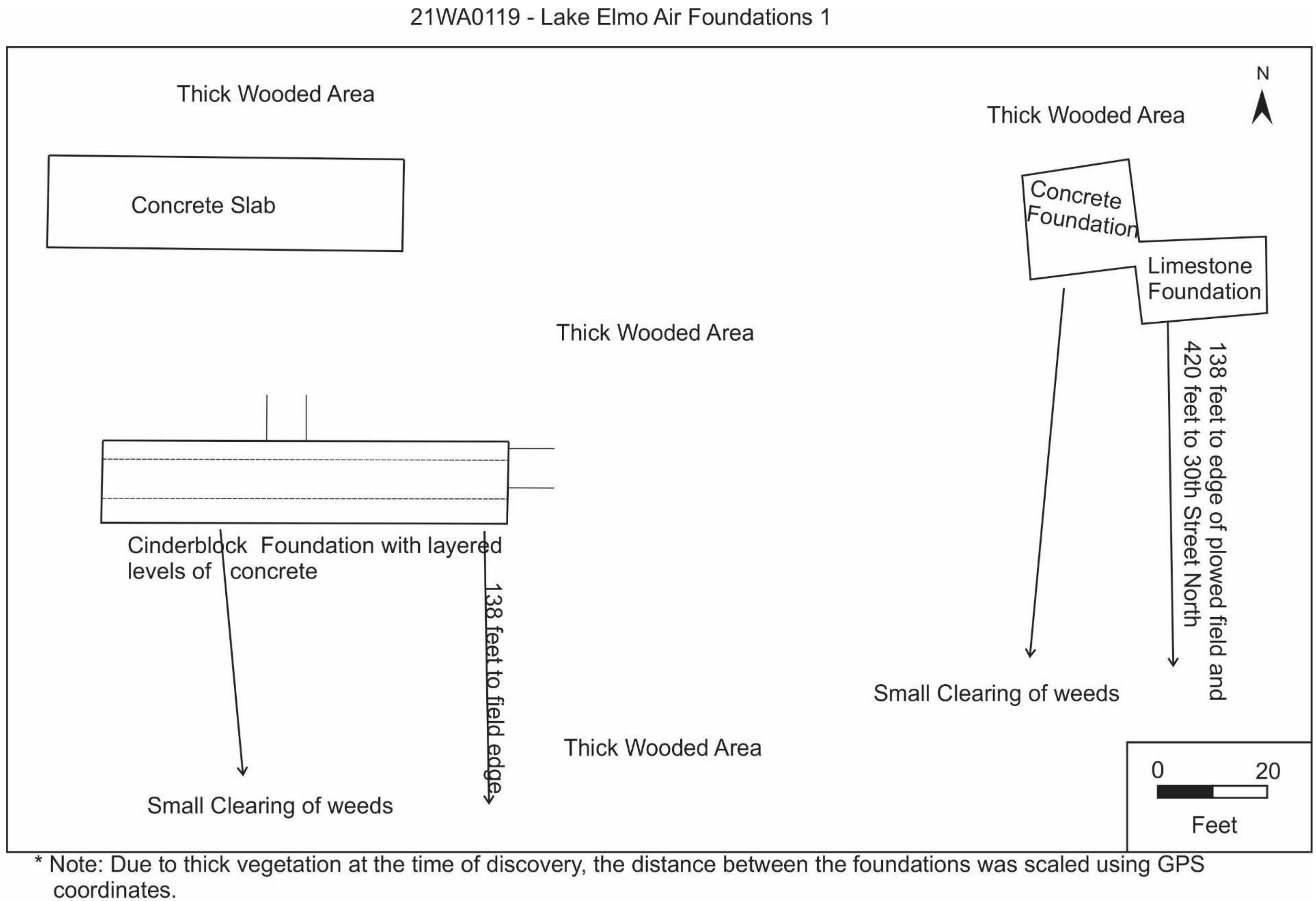


Figure 14. Sketch map of 21WA0119.

Figure 15. View of limestone foundation at 21WA0119.

Figure 16. View of cinderblock foundation at 21WA0119.

debris and it was photographed as appropriate, but due to the more recent nature of the material, it was not collected.

Although the grove of trees was extremely overgrown, there were two areas at the southern end that were more "clear" with less trees than the rest of the area. It appears that this may have been the original yard or entrance areas to the two buildings. The 1938 aerial photo shows that the driveway for this site used to enter from 30th Street North (formerly Blackwoods Avenue) and go into area just west of the eastern most foundation (the one containing the limestone foundation) (Figure 17). There are more buildings on the western edge of the site in 1938 than the amount of foundations found by MVAC in 2017, but the 1947 aerial photo shows that some of these buildings (likely outbuildings) were gone (Figure 18). The 1953 and 1964 aerial photos (Figures 19 and 20) show only possibly three buildings at the site, and the structures that appeared to be on the western side of the site were no longer there. There appears to be a line of planted trees to the west of the foundations.

The 1874 plat does not exhibit structures in this area (Andreas 1874), but the 1901 plat map of the area does (Northwest Publishing Company 1901) (See Figures 4 and 5). The limestone foundation portion of this site would suggest a pre-1900 use for that portion of the site, so the limestone foundation was likely constructed post 1874 since it was not on the Andreas map. The 1964 aerial photos still shows structures in this location and a 1967 topographic map still has a structure symbol in this location. A structure is shown in this location up until the 1982-1983 plat maps, so it was likely razed after that time.

Of interest to the history of this site is that the 1938 plat map indicates that the land the site is on and the land surrounding it was owned by the Jacob Schmidt Brewing Company (Figure 21). The Jacob Schmidt Brewing Company building was located at 882 West Seventh Street in downtown St. Paul. Jacob Schmidt first worked and established the North Star Brewing Company on the later 1800's. With a partnership with Adolph and Otto Bremer, Schmidt worked to establish the North Star Brand into the late 1800's. After a fire destroyed that brewery in 1900, Adolf Bremmer and Schmidt bought a brewery that was in financial trouble and reopened in 1901 as the Jacob Schmidt Brewing Company. Otto Bremer continued helping with the business, but his first interest was banking. In 1911, Schmidt died, but Adolph and Otto Bremer continued working together. The company continued to grow until 1919 when the 18th Amendment passed and breweries stopped brewing beer. During this time, the company produced a soft drink line that met with poor success until they started producing Schmidt's Select, a non-alcoholic but "beery" flavored malt drink. By 1933, when beer was legalized again, Schmidts' beer became popular again. The company continued to grow and Schmidt Beer became so popular that the brewery ranked seventh largest in the United States. After the death of the last of the original owners, by 1955 the company changed hands although still operating under the Jacob Schmidt brand name, until it was purchased by the G. Heileman Brewing Company in 1972 (Jacob Schmidt Brewing Company 1950 and 1972).

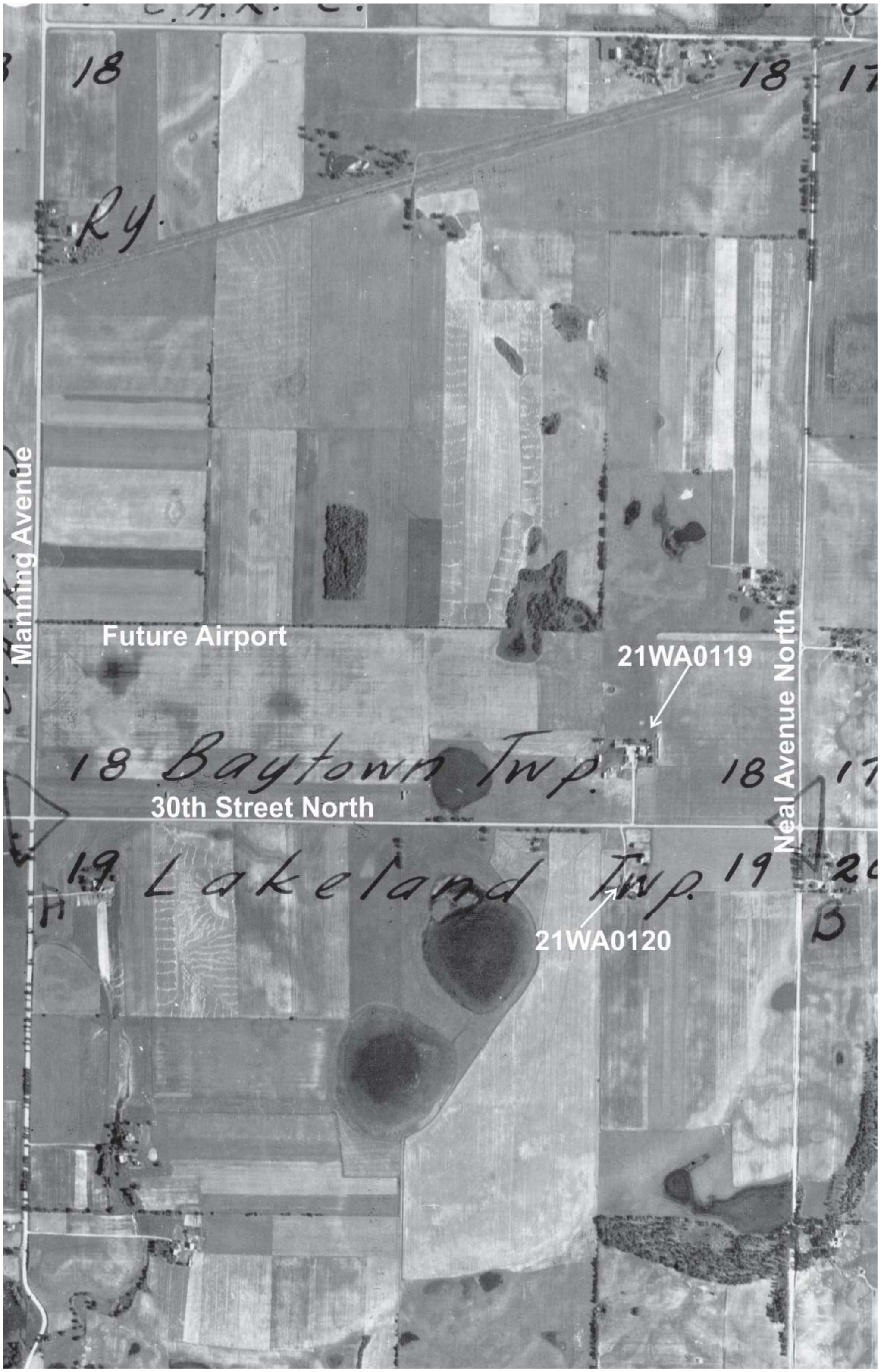


Figure 17. 1938 aerial photo of general project area and locations of 21WA0119 and 21WA0120 (Regents of the University of Minnesota 2017).

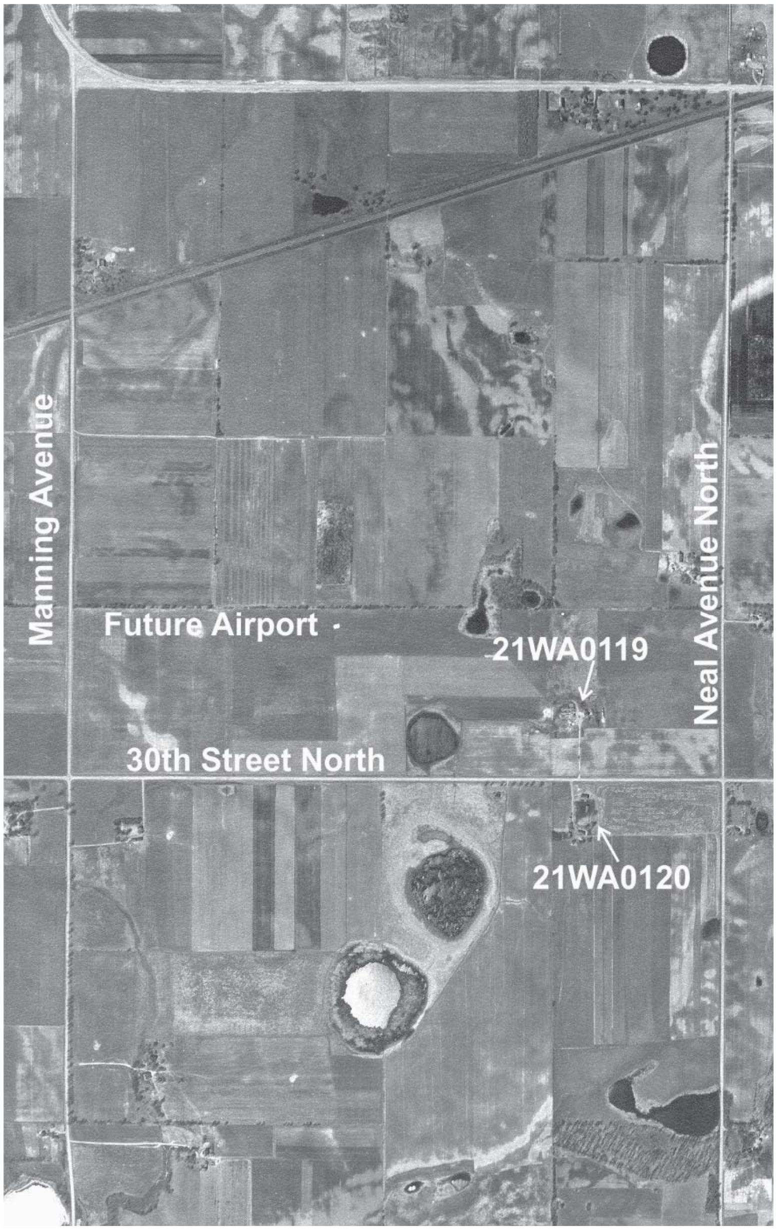


Figure 18. 1947 aerial photo of general project area and locations of 21WA0119 and 21WA0120 (Regents of the University of Minnesota 2017).

Figure 19. 1953 aerial photo of general project area and locations of 21WA0119 and 21WA0120 (Regents of the University of Minnesota 2017).

Figure 20. 1964 aerial photo of general project area and locations of 21WA0119 and 21WA0120 (Regents of the University of Minnesota 2017).

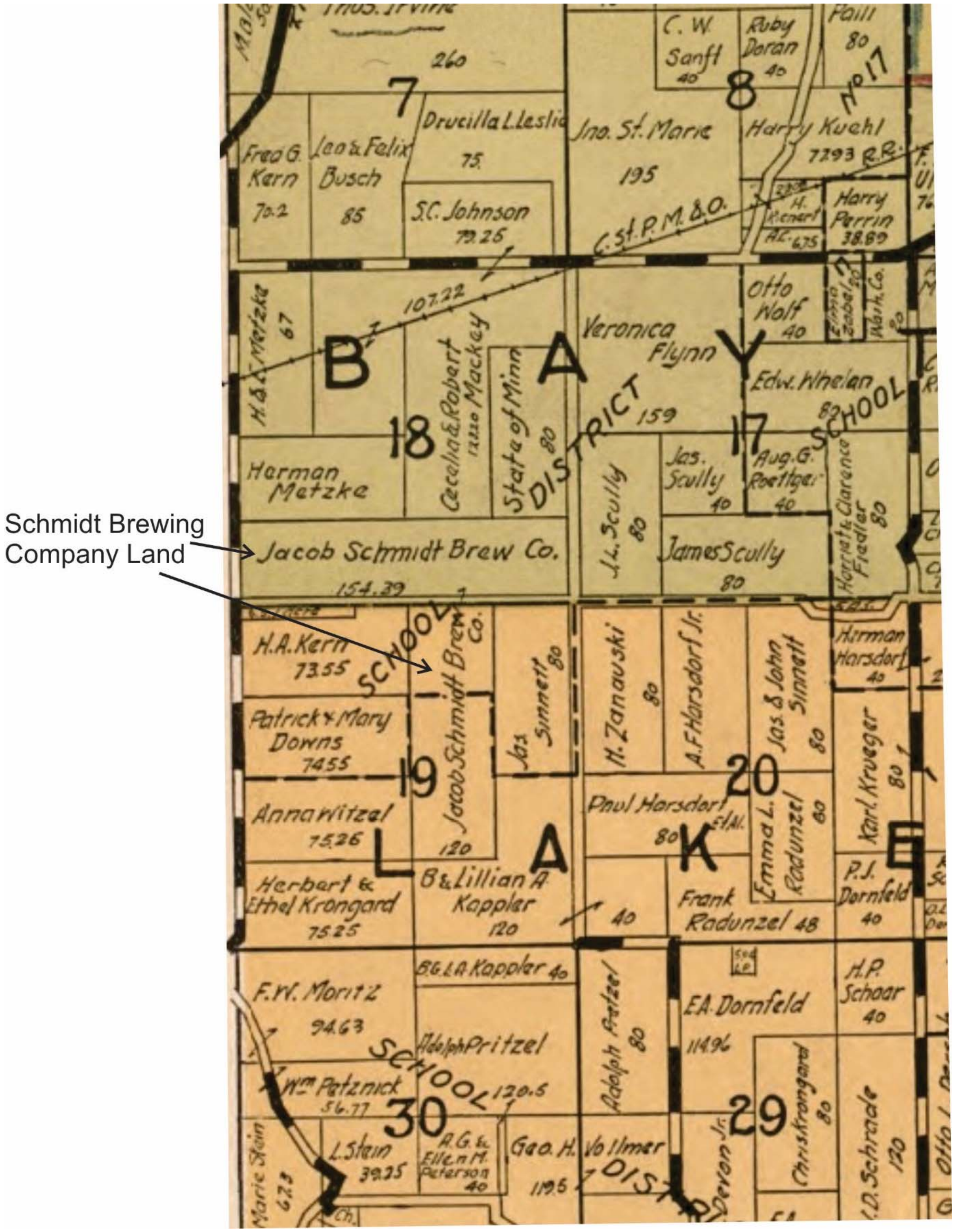


Figure 21. Plat map dating to 1938 showing Jacob Schmidt Brewing Company ownership of portions of project area and locations of sites 21WA0119 and 21WA0120 (Hudson Map Company 1938).

Mead and Hunt assisted MVAC with deed research for this site, and this research found that Otto Bremer purchased this land in 1928, and the land was officially deeded over to the Jacob Schmidt Brewing Company in 1933. The brewing company owned the property until 1946, and then sold it to George H. Halpin and Richard P. Carlton, copartners as Countryside Farms.

The Jacob Schmidt Brewing Company was significant to the brewing industry of the Twin Cities area during its time as one of the top ten brewing companies in the nation. Otto Bremer purchased the land surrounding the site in 1928 during prohibition, but when the brewing company was manufacturing various types of soda. The land was officially sold to the Jacob Schmidt Brewing Company in 1933, the year prohibition ended. Unfortunately, no information could be found in the company histories of why this land was purchased. Perhaps it was to harvest barley and hops for the brewery operation downtown at a time when the end of prohibition allowed for the manufacture of alcoholic beverages again. Perhaps the land was rented out. This is conjecture at this point, but the most relevant issue to 21WA0119 is what was the brewing company's relationship to the structures identified at the site, if any? If the structures were used for company storage or in a process that aided in the brewing process for one of the ten top breweries in the nation, it could suggest a level of significance for the site. The 1938 plat map did not show the Schmidt Brewing Company owning any additional land in Baytown and West Lakeland Township, or in the Oakland Township to the west.

This site dates from circa pre-1901 to the early 1980's. The limestone foundation component of the site indicates likely an early construction date with later concrete additions. The foundations show on plat maps up until the early 1980's. The intact foundations indicate integrity, and the relationship to the Jacob Schmidt Brewery for thirteen years from the 1930's to the 1940's could suggest a level of significance. This site may be potentially eligible for listing on the National Register of Historic Places (NRHP) under Criteria D, as it could yield important information about the past. However, since ultimately ground disturbing activities will be able to avoid this site, it was not formally evaluated for eligibility for the NRHP. The only project action that will take place within the site area is that the grove of trees surrounding the site will be clear cut.

<u>21WA0120 – Lake Elmo Air Foundations 2</u>

21WA0120, called Lake Elmo Air Foundations 2, is in the NW/14 of the NE1/4 of the NE1/4 of Section 19 in Township 29 North, Range 20 West in West Lakeland Township (See Figure 13). This site was found while shovel testing in a grove of trees south of 30th Street North, southeast of the existing Lake Elmo Airport facility. This site consists of concrete foundations associated with two buildings spaced approximately 377 feet apart (Figure 22). The first foundation was approximately 20 feet inside the tree line in the northeast corner of the grove of trees, and 120 feet south of 30th Street North. This foundation measured 20 feet north to south

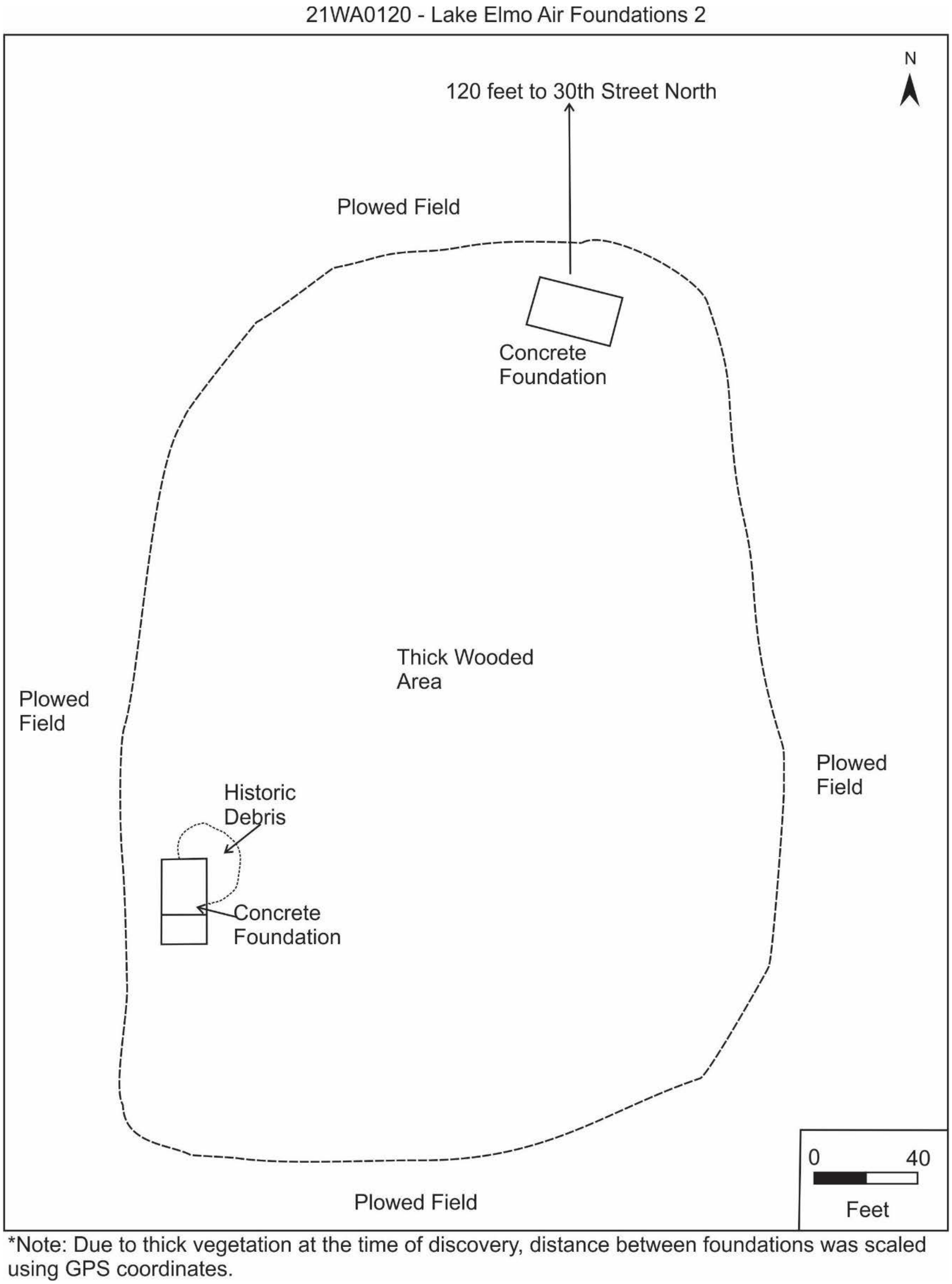


Figure 22. Sketch map of 21WA0120.

and 29 feet east to west. A few pieces of historic debris were noted on the surface including an old broom, some broken post 1950's bottles, and some metal fencing material. The broken bottles did not have enough present to be diagnostic.

This grove of trees was extremely overgrown and it was hard to measure the distance between the two buildings with a tape measure, but based on GPS coordinates, the second foundation is approximately 377 feet to the southwest. The second concrete foundation was located near the southwest corner of the grove of trees, close to the edge of the adjacent plowed field. This foundation measured 32 feet north to south and 18.5 feet east to west (See Figure 22 and 23). This foundation was divided into two rooms by a foundation piece 12 feet from the southern end of the building. Within a 50 to 60 foot radius of this foundation, there was a significant amount of discarded post 1950 debris and even more recent historic debris including bed or couch cushion springs, scrap metal and fencing material, several metal cans and buckets, plastic material, glass bottles, and a wood stove (Figure 24). Portions of a metal toy rifle were also present. Notes were taken about the debris and it was photographed as appropriate, but due to the more recent nature of the material, it was not collected. Only one small fragmentary piece of crockery was found in a shovel tests in this grove of trees, and it was not collected.

Based on the 1938 aerial photos of the area, it appears that the driveway for this property went from 30th Street North (Blackwoods Avenue) to the structure found at the southwest grove of trees, while the foundation found closest to 30th Street North appears to be an outbuilding. The 1938 aerial shows that there may have been another building south of the one closest to 30th Street North, but since no foundation relating to this was found by MVAC in 2017, this building may have not had a foundation, and it may have been some other type of temporary or portable structure. The 1947 aerial shows both structures, and it is not clear on the 1953 aerial photo if both structures are present. The 1964 aerial does not show the building closest to 30th Street North, so it is presumed to have been razed between 1953 and 1964. The 1964 aerial photo does show the structure furthest from 30th Street North (at the southwest corner of the grove of trees) (see Figures 17 through 20). A 1966 plat map shows a structure in this area (Rockford Map Publisher 1966), but the 1967 topographic map of the area does not have a structure shown in this area by the time, so it likely that both structures were razed prior to 1967. Lidar imagery reviewed for the site do no show additional structures in the grove of trees (Minnesota Department of Natural Resources and MNGeo 2017). There was a circular item east of the southern foundation noted on the Lidar map, but no cultural feature relating to it was identified by MVAC in the field in 2017.

Historic plat maps indicate that structures were not in this area in 1874 (Andreas 1874), but were in this area by 1901 (Northwest Publishing Company 1901). Historic map research and deed research for the site indicates that the foundations at 21WA0120 and the land surrounding them were also owned by Otto Bremer beginning in 1927, and the Jacob Schmidt Brewing Company from 1933 to 1946 (see Figure 19), and the land was then deeded over the Countryside Farms like the area north of 30th Street North. The same type of question applies to this site as at

Figure 23. View of southern most foundations at 21WA0120.

Figure 24. Example of historic debris near southern foundation at 21WA0120.

21WA0119. What was the relationship to these foundation to one of the top brewing companies in the nation right after prohibition?

This site dates from circa pre-1901 to the mid/late 1960's. Although maps show a structure in this area in 1901, this would be a little early for concrete foundations, so there may have been some other type of limestone structure here originally that was razed or built over. MVAC did not find evidence of an earlier structure during the survey. The intact foundations indicate integrity, and the relationship to the Jacob Schmidt Brewery Company for thirteen years from the 1930's to the 1940's could suggest a level of significance. This site may be potentially eligible for listing on the National Register of Historic Places (NRHP) under Criteria D, as it could yield important information about the past. However, since ultimately ground disturbing activities will be able to avoid this site, it was not formally evaluated for eligibility for the NRHP. The only project action that will take place within the site area is that grove of trees will be clear cut.

RECOMMENDATIONS

Although from historical resource it is known that the Jacob Schmidt Brewery Company, at one point one of the top ten brewing companies in the nation, owned the land surrounding and including the foundations found at both 21WA0119 and 21WA0120, the relationship of the foundations to the brewery and its operations, if any, is unknown at this time. Company histories and deed research did not provide any details of why the company would have owned land at least twelve miles from the brewery. Due to their age, intact foundation material, and some type of relationship to the Jacob Schmidt Brewing Company, the two sites may be potentially eligible for listing the NRHP under Criteria D as they may provide important information about the past. However, since ground disturbing activities will be able to avoid the foundations, the sites were not formally evaluated for eligibility for the NRHP. The groves of trees surrounding the sites will be clear cut, and to avoid any inadvertent disturbance to the foundations, it is recommended that the trees in and immediately around the foundations be hand cut, and no heavy equipment drive near the foundations. If, in the future, ground disturbance is planned in the areas of the site locations, the SHPO should be consulted to see if further evaluation of the sites are necessary.

Aside from the 21WA0119 and 21WA0120, no other cultural material was identified during the survey. Therefore no further work is recommended for the remainder of the project area.

REFERENCES CITED

Airport Development and Environment Departments

2016 *Lake Elmo Airport 2035 Long-Term Comprehensive Plan (LTCP).* Minneapolis Saint Paul Metropolitan Airports Commission. Minneapolis, Minnesota.

Andreas, A. T.

1874 *An Illustrated Historical Atlas of the State of Minnesota*. A. T. Andreas, Chicago, Illinois.

Anfinson, Scott

1989 Archaeology of the Central Minneapolis Riverfront Part 1: Historical Overview and Archaeological Potentials (1990). *The Minnesota Archaeologist* 48 (1-2).

1990 Archaeological Regions in Minnesota and the Woodland Period. In *The Woodland Tradition in the Western Great Lakes: Papers Presented to Elden Johnson,* edited by Guy E. Gibbon, pp. 135-166. University of Minnesota Publications in Anthropology No. 4 University of Minnesota, Minneapolis.

1997 *Southwestern Minnesota Archaeology: 12,000 Years in the Prairie Lake Region*. Minnesota Historical Society Press, St. Paul.

Benchley, Elizabeth, Blane Nansel, and Clark Dobbs

1997a The Woodland Period. In *Archeology and Bioarcheology of the Northern Woodlands,* edited by Elizabeth Benchley, Blane Nansel, Clark Dobbs, Susan Thurston Myster, and Barbara O'Connell, pp. 59-70. Arkansas Archeological Survey Research Series No. 52.

1997b Historic Period. In *Archeology and Bioarcheology of the Northern Woodlands,* edited by Elizabeth Benchley, Blane Nansel, Clark Dobbs, Susan Thurston Myster, and Barbara O'Connell, pp. 180-214. Arkansas Archeological Survey Research Series No. 52.

Boden, Peggy J., and Craig Mathis

2007 *Cultural Resource Assessment for the Lake Elmo Village Area Alternative Urban Areawide Review (AUAR), Washington County, Minnesota*. Project No. 07-23, The 106 Group Ltd., St. Paul, Minnesota.

Bureau of Land Management

2017 *General Land Office Records*. Electronic document, http://www.glorecords.blm.gov/details/survey/default.aspx?dm_id=237014&sid=vitgpbm1.x4v&surveyDetailsTabIndex=1, accessed May 2017.

Foster, Tom
2013 *Lake Elmo Airport*. Minnesota Flyer. Franklin Newspapers, Sandstone, Minnesota.

Hixson, W. W. & Company
1916 *Plat Book of the State of Minnesota*. W. W. Hixson & Co., Rockford, Illinois.

Hobbs, Howard C., and Joseph E. Goebel
1982 *Geologic Map of Minnesota, Quarternary Geology*. Minnesota Geological Survey. University of Minnesota.

Hudson Map Company
1938 *Plat Book of Washington County, Minnesota*. Hudson Map Company, Minneapolis, Minnesota.

Jacob Schmidt Brewing Company
1950 *Your Visit to the Jacob Schmidt Brewing Company*. Jacob Schmidt Brewing Company, St. Paul, Minnesota.

1972 *Our History*. Jacob Schmidt Brewing Company, St. Paul, Minnesota.

Johnson, Elden
1988 *The Prehistoric Peoples of Minnesota*. Minnesota Historical Society Press, St. Paul, Minnesota.

Marschner, Francis
1930 *The Original Vegetation of Minnesota: compiled from United States General Land Office Survey Notes*. North Central Forest Experiment Station, Forest Service, United States Department of Agriculture, St. Paul. Reprinted 1978.

Minnesota DNR
2017 Ecological Classification Systems of Minnesota. Minnesota Department of Natural Resources. Electronic Document, http://files.dnr.state.mn.us/natural_resources/ecs/province.pdf, accessed June 2017.

Minnesota Department of Natural Resources and MNGeo.
2017 *MnTOPO*. Electronic Document, http://arcgis.dnr.state.mn.us/maps/mntopo/, accessed May 2017.

Natural Resource Conservation Service 2017
2017 *Web Soil Survey*. Electronic Document, http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx, accessed April 2017.

Northwest Publishing Company
1901 *Plat Book of Washington County, Minnesota*. Northwest Publishing Company, Minneapolis, Minnesota.

Regents of the University of Minnesota
2017 *Minnesota Historical Aerial Photographs Online*. Electronic Document, https://www.lib.umn.edu/apps/mhapo/, accessed May 2017.

Rockford Map Publishers
1966 *Tri-Annual Atlas and Plat Book, Washington County, Minnesota*. Rockford Map Publishers, Rockford, Illinois.

Upham, Warren
2001 *Minnesota Place Names.* Minnesota Historical Society Press, S. Paul, Minnesota.

Wright, H. E. Jr.
1974 The Environment of Early Man in the Great Lakes Region. In *Aspects of Upper Great Lakes Anthropology: Papers in Honor of Lloyd A. Wilford*, edited by Elden Johnson, pp. 8-14. Minnesota Historical Society, St. Paul.

Appendix 1: Literature Review from MN SHPO.

Archaeological Site Locations

Site Number	Site Name	Twp.	Range	Sec.	Quarter Sections	Acres	Phase	Site Description	Tradition	Context	Reports	NR	CEF	DOE
County:	**Washington**													
21WAaa	Bass Lake Station	29	21	13	SW	0		HD						