## Appendix G – Archaeology Report

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July 24, 2018

Josh Fitzpatrick
Environmental Protection Specialist
Federal Aviation Administration
Dakota - Minnesota Airports District Office
6020 28th Avenue South, Room 102
Minneapolis, MN  55450

RE:  Crystal Airport Improvement Project
      Crystal, Hennepin County
      SHPO Number: 2018-2015

Dear Mr. Fitzpatrick:

Thank you for continuing consultation on the above project. Information received in our office on 25 June 2018 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.

As you are aware, we previously commented on this project in a letter dated June 18, 2018 agreeing with your agency’s determination of the area of potential effects for this project, as well as your agency’s determination that the Crystal Airport is not eligible for listing in the National Register of Historic Places. You have now submitted a letter report titled Phase I Archaeological Survey of the Crystal Airport, Hennepin County, Minnesota prepared by Mississippi Valley Archaeology Center (June 12, 2018). We have reviewed this letter report and based on information that is available to us at this time, we concur with your agency’s determination that no historic properties will be affected by the proposed project.

Implementation of the undertaking in accordance with this finding, as documented, fulfills your agency’s responsibilities under Section 106. If the project is not constructed as proposed, including, but not limited to, a situation where design changes to the currently proposed project diverts substantially from what was presented at the time of this review, or design changes involving undisturbed ground are made for the undertaking following completion of this review, then your agency will need to reopen Section 106 consultation with our office pursuant to 36 CFR 800.5(d)(1).

Please feel free to contact Kelly Gragg-Johnson, Environmental Review Program Specialist, at (651) 201-3285 or kelly.graggjohnson@state.mn.us if you have any questions regarding our review of this project.

Sincerely,

Sarah J. Beimers
Environmental Review Program Manager
June 21, 2018

Ms. Sarah Beimers  
State Historic Preservation Office  
50 Sherburne Avenue  
Suite 203  
St. Paul, MN 55155

Re: Determination of Effect for the Crystal Airport Improvement Project (SHPO Number: 2018-2015)

Dear Ms. Beimers:

On May 7, 2018, the Federal Aviation Administration (FAA) determined that a Section 106 finding of a No Historic Properties Affected was applicable for the Crystal Airport Improvement Project. Previous SHPO concurrence was received for the No Historic Properties Affected finding on June 18, 2018 related to a review of potentially historic age properties at the Airport.

The previous Section 106 finding did not contain an archeology survey of the Airport. On May 31, 2018, the Mississippi Valley Archaeology Center conducted a field survey of the site. Shovel testing throughout the project area yielded no cultural materials other than modern asphalt, nails, glass, and shreds of fabric. No precontact cultural materials were discovered as a result of survey. Therefore, the FAA has made a determination that No Historic Properties Affected is still appropriate and seeks your concurrence 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 Airports District Office  
612-253-4639

Enclosure: Phase I Archaeological Survey of the Crystal Airport
June 12, 2018

To: Evan Barrett,
Mead and Hunt, Inc.
7900 West 78th Street
Suite 370
Minneapolis, MN 55439

From: Constance Arzigian, Mississippi Valley Archaeology Center (MVAC),
University of Wisconsin-La Crosse

Re: Phase I Archaeological Survey of the Crystal Airport, Hennepin County, Minnesota.
Principal Investigator: Constance Arzigian
Report Prepared by: Cynthia Kocik, Constance Arzigian, and Vicki L. Twinde-Javner
MVAC SR 2018-27

This short report describes Phase I archaeological investigations of 31 acres of planned new construction at the Crystal Airport in Crystal and Brooklyn Park, Hennepin County, Minnesota, on May 31, 2018. Constance Arzigian, Principal Investigator and Senior Research Associate, and research interns and archaeological technicians Cynthia Kocik, Brett Meyer, Sarah Schultz, Jacob Stone, and Kyle Willoughby from the Mississippi Valley Archaeology Center at the University of Wisconsin-La Crosse performed the work for Mead and Hunt. Shovel testing recovered no cultural material, and identified all project areas as having been previously disturbed or consisting of wetland soils with a low probability of containing cultural material. No further archaeological investigations are recommended.

Project Description: The project area covers 31 acres of new disturbance across three proposed perimeter roads, an apron expansion, a segment of non-aeronautical development, two new taxiways, and reconfiguration at the ends of the northwest and southeast runway/taxiways at the Crystal Airport in Hennepin County, Minnesota (Figure 1). The project area is located in Section 4 and the NE and SE ¼ of Section 5, Township 118N, Range 21W; and the SE ¼ of Section 33, Township 119N, Range 21W. A small creek runs just 160 feet outside the project area at the northeast corner of the airport. The creek flows southeast to Upper Twin Lake, with Middle Twin Lake and Twin Lake immediately south, slightly over 0.5 miles to the east and southeast of the project location. Palmer Lake lies nearly 3 miles to the northeast. The Mississippi River flows south approximately 4.25 miles east of the project area. Figures 2 and 3 highlight the project plans on aerial and topographic maps.
Figure 1. Location of the project area within Hennepin County, Minnesota.
Figure 2. Aerial view of the areas of planned construction on the Crystal Airport property. A zone of specially manicured lawn with two lines of white cubes that was omitted from survey in the area of non-aeronautical development is outlined in dark blue. (Provided by Mead and Hunt.)
Figure 3. The project area displayed on a topographic map. (Generated in ArcGIS.)
Previously Reported Sites: According to records on file with the Minnesota Office of the State Archaeologist, no previously reported sites exist within the project area. Two previously reported sites lie in a section adjacent to the project area near Palmer Lake: Palmer Lake Mounds (21HE-0075), a Woodland mound group, and Palmer Lake Park (21HE-0151), a Middle to Late Woodland site (Table 1).

Table 1. Previously reported sites nearest the project area.

<table>
<thead>
<tr>
<th>Site Number</th>
<th>Site Name</th>
<th>Description</th>
<th>Tradition</th>
<th>Township</th>
<th>Range</th>
<th>Section</th>
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<td>21HE0075</td>
<td>Palmer Lake Mounds</td>
<td>EW</td>
<td>W-2</td>
<td>119</td>
<td>21</td>
<td>34</td>
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<td>21HE0151</td>
<td>Palmer Lake Park</td>
<td>AS</td>
<td>W-1</td>
<td>119</td>
<td>21</td>
<td>34</td>
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Environmental Setting: The project area falls within the Eastern Broadleaf Forest Province, Minnesota and Northeast Iowa Morainal section, Anoka Sand Plain subsection in the Minnesota Ecological Classification System (Minnesota Department of Natural Resources 2018). The bedrock geology of the project area consists of outwash (Hobb and Goebel 1982). A number of generally deep soils comprise the project area (United States Department of Agriculture, Natural Resources Conservation Service [USDA-NRCS] 2018b; Figure 4):

- Duelm loamy sand (D17A in Figure 4): 0 to 2 percent slopes, moderately well drained
- Forada sandy loam (D10A): 0 to 2 percent slopes, poorly drained and very poorly drained
- Hubbard loamy sand (D67B): 1 to 6 percent slopes, excessively drained
- Seelyeville and Markey soils, depressional (D30A): 0 to 1 percent slopes, very poorly drained
- Udorthents (cut and fill land) (U3B): 0 to 6 percent slopes, well drained
- Udorthents, wet substratum (U2A): 0 to 2 percent slopes, well drained
- Urban land-Duelm complex (D31A): 0 to 2 percent slopes, moderately well drained
- Urban land-Hubbard complex (D64B): 0 to 8 percent slopes, excessively drained
- Urban land-Udipsamments (cut and fill land) complex (U4A): 0 to 2 percent slopes, somewhat excessively drained.

The section of non-aeronautical development at the north end of the project area, south of 63rd Avenue North and straddling an entrance gate and roadway, consists mainly of Forada sandy loam. Small patches of depressional Seelyeville and Markey soils, urban land-Duelm complex, cut and fill land Udorthents, and urban-land Hubbard complex cover the rest of this area.

The footprint for the runway/taxiway reconfiguration at the northwest end of runways 14L and 14R lies largely in Udorthents cut and fill land and smaller patches of Forada sandy loam and Hubbard loamy sand. The new northwest taxiway area, extending southwest from runway 14R, contains a combination of Forada sandy loam and urban land-Duelm complex soils. The new southeast taxiway, extending southwest from runway 32L, includes Hubbard loamy sand with a slight segment of urban land-Duelm complex at its southern corner. The area of new disturbance for the runway/taxiway reconfiguration at the southeast end of runways 32L and 32R is composed mainly of Udorthents with wet substratum and Duelm loamy sand, as well as smaller segments of Forada sandy loam and Seelyeville and Markey, depressional soils.
Figure 4. Soil types within the project area.
The perimeter road at the northwest corner of the project area, extending north-south east of Douglas Drive North and curving at its north end to connect to an existing paved road, crosses urban land-Hubbard complex, Udorthents cut and fill land, and Forada sandy loam. The soils in the perimeter road and apron expansion east-northeast of Lakeland Avenue North at the southwest corner of the project area comprise moderately well to excessively drained soils, mostly urban land-Udipsamments (cut and fill) complex and Hubbard loamy sand with smaller portions of urban land-Duelm complex and Duelm loamy sand. The perimeter road in the southeast corner of the project area, beginning west of the southeast runway and stretching southeast and then east to end north of and parallel to 56th Avenue North, includes a patchwork of urban land-Hubbard complex, Duelm loamy sand, Udorthents with wet substratum, and Seelyeville and Markey soils (USDA-NRCS 2018b).

The cut-and-fill and urban land soils, present to some extent in most areas of new disturbance, suggest previous disturbance, such as construction, in these segments. The poorly drained Forada sandy loam and Seelyeville and Markey soils indicate areas of prior wetlands. The probability of discovering intact archaeological sites in either disturbed or wetland soils is low. Areas with well drained Duelm loamy sand would have been drier and more conducive to habitation and other activities in the past, making them more likely to contain archaeological sites.

The Forada soil series, the most widespread wet soil in the project area, usually exhibits the following profile:

Ap--0 to 9 inches [0 to 23 cm]; black (10YR 2/1) loam; dark gray (10YR 4/1) dry; weak very fine granular structure; friable; neutral; abrupt smooth boundary.

A--9 to 16 inches [23 to 41 cm]; very dark gray (10YR 3/1) loam; gray (10YR 5/1) dry; weak medium subangular blocky structure; friable; neutral; clear wavy boundary. (Combined thickness of A horizons is 10 to 24 inches [25 to 61 cm].)

Bg1--16 to 20 inches [41 to 51 cm]; dark grayish brown (2.5Y 4/2) sandy loam; many fine distinct dark gray (10YR 4/1) Fe depletions and few fine prominent yellowish brown (10YR 5/6) Fe concentrations; weak fine subangular blocky structure; friable; about 5 percent gravel; neutral; clear wavy boundary.

Bg2--20 to 28 inches [41 to 71 cm]; grayish brown (2.5Y 5/2) loam; few fine prominent dark yellowish brown (10YR 4/4) Fe concentrations; weak fine subangular blocky structure; friable; about 2 percent gravel; slightly acid; abrupt wavy boundary. (Combined thickness of Bg horizons is 5 to 25 inches.)

2Cg1--28 to 33 inches [71 to 84 cm]; light brownish gray (2.5Y 6/2) coarse sand; many medium prominent yellowish brown (10YR 5/6) Fe concentrations; single grain; loose; about 5 percent gravel; neutral; clear wavy boundary.

2Cg2--33 to 60 inches [84 to 152 cm]; dark grayish brown (2.5Y 4/2) coarse sand; single grain; loose; about 5 percent gravel; slightly effervescent; moderately alkaline [USDA-NRCS 2018a].
A typical profile of Duelm is:

Ap--0 to 25 cm; black (10YR 2/1) loamy sand, dark grayish brown (10YR 4/2) dry; weak fine and medium subangular blocky structure; very friable...about 1 percent gravel; neutral; abrupt smooth boundary. (20 to 30 cm thick)

AB--25 to 41 cm; dark brown (10YR 3/3) loamy sand, grayish brown (10YR 5/2) dry; weak very fine subangular blocky structure; very friable; neutral; common fine distinct brown (7.5YR 4/4) Fe concentrations; gradual wavy boundary. (0 to 20 cm thick)

Bw1--41 to 51 cm; dark yellowish brown (10YR 4/4) coarse sand; single grain; loose; many fine prominent reddish brown (5YR 4/4) Fe concentrations; slightly acid; clear wavy boundary.

Bw2--51 to 76 cm; brown (10YR 4/3) coarse sand; single grain; loose; about 3 percent gravel; many medium distinct brown (7.5YR 4/4) Fe concentrations and few fine distinct grayish brown (2.5Y 5/2) Fe depletions; slightly acid; gradual smooth boundary. (Combined thickness of Bw horizon is 8 to 38 cm)

C1--76 to 94 cm grayish brown (10YR 5/2) coarse sand; single grain; loose; about 1 percent gravel; common fine distinct yellowish brown (10YR 5/4) Fe concentrations; slightly acid; gradual wavy boundary.

C2--94 to 203 cm; brown (10YR 4/3) coarse sand; single grain; loose; common fine faint dark grayish brown (10YR 4/2) Fe depletions and few fine prominent dark reddish brown (5YR 3/4) Fe concentrations; neutral [USDA-NRCS 2018a].

The original vegetation cover of the project area would have consisted of brushland (oak openings and barrens with scattered trees and groves of oaks of scrubby form, with some brush and thickets and occasionally with pines) (Marschner 1930). The relatively wet, poorly drained soils that compose much of the project area, such as Forada sandy loam, would have supported marsh vegetation and trees (USDA-NRCS 2018a). Native tall prairie grasses and deciduous trees could have grown in the deep and better drained soils, such as Duelm loamy sand (USDA-NRCS 2018a). In accordance with the abovementioned soil types, General Land Office (GLO) plat maps of the project area from ca. 1856 document a marsh overlapping what are now the southeastern portion of the non-aeronautical development area and the southeast new taxiway and a prairie in the planned apron expansion and perimeter road in the southwest corner of the airport (Minnesota IT Services Geospatial Information Office [MnGeo] 2018; Figure 5).
Aerial photos from 1937 and 1945 show cropland covering much of what would become the Crystal Airport, along with scattered stands of trees (University of Minnesota 2015:WN 3-271, A-19-068; Figures 6 and 7). Wetland areas and ponds stretch from what is now the airport’s northeast corner, along its east side, and down to its southeast corner. Aerial photos from 1956, 1967, and 1971 portray the runways and the southern triangular block of taxiways, roadways, and buildings in the same general configuration as the present, with increased construction and expansion of paved and unpaved runways, roads, and buildings through time (University of Minnesota 2015:HHJ-241, BDR-3-230, clk-1-891; Figures 8-10).

The modern vegetation in the project area comprises mostly mown grass. Two fairly narrow stands of trees run north-south on the west side of the north gate and east-west on the east side of the gate, and a thicker stand in a horseshoe pattern grows on the far west end of the non-aeronautical development area. The narrow stands are observable as two straight, perpendicular rows of trees forming an “L” in the 1967 and 1971 aerial photos (Figures 8 and 9), suggesting that those areas were disturbed historically to create the tree lines.
Figure 6. 1937 aerial photo depicting wetlands in what would become the east side of the Crystal Airport. Upper Twin Lake is in the lower right. (University of Minnesota – Minnesota Historical Aerial Photographs Online WN 3-271).

Figure 7. 1945 aerial photo taken prior to the airport’s construction. (University of Minnesota – Minnesota Historical Aerial Photographs Online A-19-068.)
Figure 8. 1956 aerial photo showing early runways in a formation similar to the present. (University of Minnesota – Minnesota Historical Aerial Photographs Online HHJ-241).

Figure 9. 1967 aerial photo with wetland areas visible in darker patches around a creek in the upper right corner and in the lower left. (University of Minnesota – Minnesota Historical Aerial Photographs Online BDR-3-230.)
Field Investigations and Results: Cynthia Kocik, Brett Meyer, Sarah Schultz, Jacob Stone, and Kyle Willoughby, archaeological technicians and research interns with the Mississippi Valley Archaeology Center (MVAC), conducted field survey on May 31, 2018, under the direction of Constance Arzigian, Principal Investigator and Senior Research Associate with MVAC. Survey included all areas of proposed new disturbance and was guided in the field by GPS units uploaded with the extents of these areas as indicated by Mead and Hunt. It proceeded from north to south along the two runway/taxiway reconfigurations and the two new taxiways, to the southeast new perimeter road, then to the apron expansion and perimeter road near the fueling station, then north to the perimeter road northwest of the northern runway/taxiway reconfiguration and the non-aeronautical development area. Airport personnel escorted the field crew across all survey areas except the segment of non-aeronautical development.

Because grass and, to a lesser extent, trees cover the unpaved segments of the project area so that there is no surface visibility, shovel tests approximately 30 cm in diameter were dug at 30-meter intervals where soils had likely been disturbed by past construction and at 15-meter intervals in areas in which intact soils were encountered to detect evidence of archaeological sites. Noticeably graded areas and ditches, a swath of lawn abutting the fueling station in the apron expansion, and a segment of lawn with a rectangular arrangement of large, white boxes in the area of non-aeronautical development (outlined in dark blue in Figures 3 and 11) were not tested. All soil was screened through ¼ inch mesh to facilitate the recovery of artifacts. The field crew recorded the locations of select shovel tests representative of the areas surveyed to an accuracy of approximately 3 meters using DeLorme Earthmate PN-60w GPS units (Figures 11-13). They also documented soil profiles for these shovel tests to track changes across the project area and took photographs of the general topography in each section surveyed (Figures 14-31).
Figure 11. GPS waypoints for select shovel tests in the northern half of the airport. Labelled shovel tests are discussed specifically in the text. (Generated in ArcGIS.)
Figure 12. GPS waypoints for shovel tests in the southeast new taxiway, runway/taxiway reconfiguration, and perimeter road. (Generated in ArcGIS).
Figure 13. GPS waypoints for shovel tests in the planned apron expansion and west perimeter road. (Generated in ArcGIS).

Shovel testing at 30-meter intervals in the northwest runway/taxiway reconfiguration encountered cut and fill land with topsoil generally of dark brown loamy sand running from approximately 8 to 45 cm deep, usually around 20 cm (Figure 14). A sharp boundary delineated the topsoil from the loose sand below (Figure 15). Shovel tests in the western portion of this
section, where Forada sandy loam was expected to occur, tended to be deeper than those northeast of the existing runway. Pieces of asphalt in a number of shovel tests, mainly near the existing runway where the land had been disturbed previously (Figure 2), also attested to past disturbance.

Each of the northwest and southeast new taxiways between the two runway/taxiway reconfigurations were investigated with five shovel tests in two rows spaced at 30 meters (Figures 11 and 12). The topsoil was dark brown and 15 to 20 cm in depth, overlying grey, wet (hydric) soil, in the northwest taxiway (Figures 16 and 17). Hydric soils are present in wetlands (anticipated in the project area based on the USDA-NRCS Web Soil Survey, GLO maps, and aerial photos [MnGeo 2018; University of Minnesota 2015; USDA-NRCS 2018b]) and have a low probability of containing archaeological sites. Shovel tests in the southeast taxiway encountered 20 to 30 cm of dark brown topsoil with light brown subsoil (Figures 18 and 19). This area was once marsh and should yield Hubbard loamy sand (Figure 5; MnGeo 2018; USDA-NRCS 2018b), but construction of the runway and apron to the immediate northeast and southwest, respectively, likely already impacted much of this area, as well as the other new taxiway.

Shovel testing in the southeast runway/taxiway reconfiguration revealed hydric soils, in some instances with orange streaks from the oxidation of iron in the wet soil, underneath dark brown to nearly black topsoil 15 to 30 cm deep (Figures 20 and 21). Bottle glass, a nail, and pieces of fabric attributable to modern disturbance and filling activity were discovered in shovel test D345. Likewise, the perimeter road running southwest to south of the existing runway was disturbed, as evinced by fill including pieces of asphalt and nails (Figures 22 and 23).

In the apron expansion, shovel tests were placed 30 meters apart outside a maximum 50-meter buffer between the westernmost row of shovel tests and the edge of the pavement for the fueling station to avoid striking any buried pipes, tanks, or equipment (Figures 12 and 24). These tests produced fill, consistent with the urban land-Udipsamments cut and fill recorded for this portion of the project area (USDA-NRCS 2018b). Shovel tests on the perimeter road just north of the apron expansion encountered fill and hydric subsoil similar to that in other sections of the project area, which varied from the better drained Hubbard loamy sand and Duelm loamy sand expected (Figure 25). The topsoil tended to be dark brown and approximately 30 cm deep (Figure 26).

The soil for the southern 280 meters of the planned perimeter road in the northwest corner of the airport grounds was disturbed, with a topsoil depth of around 30 cm (Figure 27). The topsoil at the east end of the hook of the perimeter road, just before it joins the existing roadway, consisted of a shallower dark brown to dark grey sandy loam around 10 cm deep, with a sharp transition down to a band of much lighter yellowish brown sandy loam to loamy sand overlying slightly lighter loose sand (Figure 28). The disturbed soil observed in most of the shovel tests along the perimeter road, including pieces of asphalt in D348 (Figures 11 and 28), corroborates the Udorthents cut and fill designation for much of the footprint for the new road. Between the south and east sections, the topsoil became deeper, with dark soil (10YR 2.5/1) at a depth of 50 cm in shovel test A025, where the planned road begins to curve east (Figure 29). The testing interval was tightened to 15 meters around this shovel test due to the possible presence of additional undisturbed soils with a higher likelihood of artifacts and intact archaeological features. Further exploration of shovel test A025 with a handheld bucket auger revealed gleyed, grey sand (10YR 6/1) at the auger’s maximum depth of 94 cm. This area of deep soil does
correspond to the wet Forada sandy loam expected from the USDA-NRCS Web Soil Survey (USDA-NRCS 2018b).

The 10 acres of non-aeronautical development on the north side of the airport included mowed areas with grass that were shovel tested at regular 30-meter intervals. Ditched, wooded areas on either side of the north gate and roadway were not shovel tested at regular intervals, and a closely mowed patch of lawn with six large, white cubes in a three-by-two arrangement in the southeast corner was not shovel tested to avoid damaging any special facilities or utilities within the patch (Figure 30). Testing in the southwest corner of the east end of the span of non-aeronautical development yielded graded soil and light brown subsoil indicative of the well drained cut and fill land Udorthents anticipated in that area (Figure 31). The topsoil was shallow, 8 to 14 cm, usually with hydric subsoil, consistent with the Forada sandy loam expected in much of this area, the marsh recorded in the GLO maps, and the historical aerial photos (MnGeo 2018; University of Minnesota 2015; USDA-NRCS 2018b). Shovel test A030 on the north side of the stand of trees east of the north gate (Figure 10), revealed topsoil approximately 40 cm deep. However, the immediate vicinity appeared graded, fitting with the historic formation of the tree lines in the area prior to the 1967 aerial photo (University of Minnesota 2015:BDR-3-230).

Shovel testing throughout the project area yielded no cultural materials other than modern asphalt, nails, glass, and shreds of fabric. No precontact cultural materials were discovered as a result of survey.

**Recommendations:** No cultural resources will be adversely affected by the project. Much of the project area consisted of disturbed and wetland soils, making the presence of surviving cultural materials unlikely. No further archaeological investigation is recommended.

However, it is always possible that deeply buried materials, including human remains, may be encountered during the course of construction. If human remains are discovered all work must cease immediately in that area, and the Minnesota Office of the State Archaeologist must be contacted promptly.

**References Cited:**
Hobbs, Howard C., and Joseph E. Goebel

Marschner, Francis

Minnesota Department of Natural Resources
Minnesota IT Services Geospatial Information Office

United States Department of Agriculture, Natural Resources Conservation Service

University of Minnesota

Figures 14-31:

Figure 14. View to the northwest of shovel testing in the area northeast of the northwest end of the existing runway in the northwest runway/taxiway reconfiguration.
Figure 15. Shovel test at GPS waypoint A002 (Figure 11) in the northwest runway/taxiway reconfiguration, typical for this area of the project. Note the sharp boundary between upper Zones A (10YR 3/2) and B (10YR 2/2), disturbed, and Zone C (10YR 3/6). This particular hole contains a band of black fill (Zone B) under the dark greyish brown topsoil (Zone A).

Figure 16. Survey covering the northwest new taxiway, viewed from the north. A slight dip and rise in the lawn up to the pavement in the background on the right indicate previous disturbance.
Figure 17. Shovel test A006 (Figure 11), in the footprint for the northwest new taxiway, exhibiting hydric soil in Zone B below the topsoil (Zone A).

Figure 18. View from the south of the southeast new taxiway.
Figure 19. Shovel test A008 (Figure 12), with 15 cm of dark brown topsoil over a light brown subsoil, in the planned southeast new taxiway.

Figure 20. The west side of the area of planned disturbance for the southeast runway/taxiway reconfiguration, as seen from the northwest.
Figure 21. Shovel test at waypoint A014 (Figure 12), illustrative of the hydric soils, seen here in the grey Zone B (10YR 5/1), in the southeast runway/taxiway reconfiguration.

Figure 22. Shovel testing along the planned perimeter road in the southeast corner of the airport, as viewed from the north.
Figure 23. Disturbed soil, as indicated by a sharp boundary between Zones A (20 cm deep) and B and the mottling of the soil, in shovel test G007 (Figure 12) along the southeast perimeter road. A similar soil profile dominated throughout the footprint for the perimeter road.

Figure 24. Southeast side of the proposed apron expansion as viewed from the northwest, with the fueling station and a tanker truck on the left in the background.
Figure 25. View from the southeast of survey in the footprints for the northwest corner of the apron expansion and the west perimeter road to its north.

Figure 26. Shovel test at waypoint G015 (Figure 13) in the planned west perimeter road. The fairly abrupt though mottled boundary into greyish brown Zone B occurs at nearly 30 cm below the surface.
Figure 27. Shovel testing along the southern portion of the northwest perimeter road, as seen from the north.

Figure 28. The soil encountered along the northwest perimeter road was mostly cut and fill, as shown in shovel test D348 (Figure 11). It contained shallow topsoil (Zone A, 10YR 3/1) with pieces of asphalt over sand (Zone B, 10YR 4/4).
Figure 29. Shovel test at waypoint A025 (Figure 11) in the footprint for the northwest perimeter road. The dark, deep soil, characteristic of the Forada sandy loam anticipated in this segment of the northwest perimeter road, suggested an expanse of intact soil.

Figure 30. The stand of trees running east-west on the east side of the north entrance gate, with the lawn on the west side of the road leading south from the gate in the foreground.
Figure 31. At the north edge of Udorthents cut and fill land where it borders Forada sandy loam, as classified by the USDA-NRCS Web Soil Survey (USDA-NRCS 2018b), shovel test A027 (Figure 11) exemplifies the graded soil in the southwest corner of the non-aeronautical development area. Shovel tests farther east more consistently revealed hydric subsoil.