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Appendices

Appendix A – Minnesota DNR Natural Heritage Information System (NHIS) Materials

Minnesota Department of Natural Resources
Division of Ecological & Water Resources
500 Lafayette Road, Box 25
St. Paul, MN 55155-4025

March 29, 2018
Correspondence # ERDB 20180275

Ms. Sarah Emmel
Mead & Hunt, Inc.
7900 West 78th Street, Suite 370
Minneapolis, MN 55439

RE: Natural Heritage Review of the proposed Crystal Airport Airfield and Associates Improvements, T118N/119N R21W/21W Sections 4 & 5/32 & 33

Dear Ms. Emmel,

As requested, the Minnesota Natural Heritage Information System has been queried to determine if any rare species or other significant natural features are known to occur within an approximate one-mile radius of the proposed project. Based on this query, rare features have been documented within the search area (for details, please visit the Rare Species Guide Website for more information on the biology, habitat use, and conservation measures of these rare species). Please note that the following rare features may be adversely affected by the proposed project:

Federally Protected Species

- The rusty patched bumble bee (*Bombus affinis*), a federally-listed endangered species, was documented in the vicinity of the proposed project. The rusty patched bumble bee typically occurs in grasslands and urban gardens with flowering plants from April through October. This species nests underground in abandoned rodent cavities or in clumps of grasses. Please reference the guidance at the USFWS rusty patched bumble bee website to determine if the project has the potential to impact this protected species.

Environmental Review and Permitting

- Please include a copy of this letter in any state or local license or permit application. Please note that measures to avoid or minimize disturbance to the above rare features may be included as restrictions or conditions in any required permits or licenses.

The Natural Heritage Information System (NHIS), a collection of databases that contains information about Minnesota's rare natural features, is maintained by the Division of Ecological and Water Resources, Department of Natural Resources. The NHIS is continually updated as new information becomes available, and is the most complete source of data on Minnesota's rare or otherwise significant species, native plant communities, and other

natural features. However, the NHIS is not an exhaustive inventory and thus does not represent all of the occurrences of rare features within the state. Therefore, ecologically significant features for which we have no records may exist within the project area. If additional information becomes available regarding rare features in the vicinity of the project, further review may be necessary.

For environmental review purposes, the results of this Natural Heritage Review are valid for one year; the results are only valid for the project location (noted above) and the project description provided on the NHIS Data Request Form. Please contact me if project details change or for an updated review if construction has not occurred within one year.

The Natural Heritage Review does not constitute review or approval by the Department of Natural Resources as a whole. Instead, it identifies issues regarding known occurrences of rare features and potential effects to these rare features. If needed, please contact your DNR Regional Environmental Assessment Ecologist to determine whether there are other natural resource concerns associated with the proposed project. Please be aware that additional site assessments or review may be required.

Thank you for consulting us on this matter, and for your interest in preserving Minnesota's rare natural resources. An invoice will be mailed to you under separate cover.

Sincerely,

Samantha Bump
Natural Heritage Review Specialist
Samantha.Bump@state.mn.us

Enc. Rusty Patched Bumble Bee Fact Sheet

Links: USFWS Rusty Patched Bumble Bee
https://www.fws.gov/midwest/endangered/insects/rpbb/guidance.html
Rare Species Guide
http://www.dnr.state.mn.us/rsg/index.html
DNR Regional Environmental Assessment Ecologist Contact Info
http://www.dnr.state.mn.us/eco/ereview/erp_regioncontacts.html

Cc: Becky Horton

Rusty Patched Bumble Bee
Bombus affinis

The U.S. Fish and Wildlife Service listed the rusty patched bumble bee as endangered under the Endangered Species Act. Endangered species are animals and plants that are in danger of becoming extinct. Identifying, protecting and recovering endangered species is a primary objective of the U.S. Fish and Wildlife Service's endangered species program.

What is a rusty patched bumble bee?

Appearance: Rusty patched bumble bees live in colonies that include a single queen and female workers. The colony produces males and new queens in late summer. Queens are the largest bees in the colony, and workers are the smallest. All rusty patched bumble bees have entirely black heads, but only workers and males have a rusty reddish patch centrally located on the back.

Habitat: Rusty patched bumble bees once occupied grasslands and tallgrass prairies of the Upper Midwest and Northeast, but most grasslands and prairies have been lost, degraded, or fragmented by conversion to other uses. Bumble bees need areas that provide nectar and pollen from flowers, nesting sites (underground and abandoned rodent cavities or clumps of grasses), and overwintering sites for hibernating queens (undisturbed soil).

Illustrations of a rusty patched bumble bee queen (left), worker (center), and male (right) by Elaine Evans, The Xerces Society.

Photo courtesy of Christy Stewart

Reproduction: Rusty patched bumble bee colonies have an annual cycle. In spring, solitary queens emerge and find nest sites, collect nectar and pollen from flowers and begin laying eggs, which are fertilized by sperm stored since mating the previous fall. Workers hatch from these first eggs and colonies grow as workers collect food, defend the colony, and care for young. Queens remain within the nests and continue laying eggs. In late summer, new queens and males also hatch from eggs. Males disperse to mate with new queens from other colonies. In fall, founding queens, workers and males die. Only new queens go into diapause (a form of hibernation) over winter - and the cycle begins again in spring.

Feeding Habits: Bumble bees gather pollen and nectar from a variety of flowering plants. The rusty patched emerges early in spring and is one of the last species to go into hibernation.

Why conserve rusty patched bumble bees?

As pollinators, rusty patched bumble bees contribute to our food security and the healthy functioning of our ecosystems. Bumble bees are keystone species in most ecosystems, necessary not only for native wildflower reproduction, but also for creating seeds and fruits that feed wildlife as diverse as songbirds and grizzly bears.

Bumble bees are among the most important pollinators of crops such as blueberries, cranberries, and clover and almost the only insect pollinators of tomatoes. Bumble bees are more effective pollinators than honey bees for some crops because of their ability to "buzz pollinate." The economic value of pollination services provided by native insects (mostly bees) is estimated at $3 billion per year in the United States.

It needs a constant supply and diversity of flowers blooming throughout the colony's long life, April through September.

Range: Historically, the rusty patched bumble bee was broadly distributed across the eastern United States and Upper Midwest, from Maine in the U.S. and southern Quebec and Ontario in Canada, south to the northeast corner of Georgia, reaching west to the eastern edges of North and South Dakota. Its range included 28 states, the District of Columbia and 2 provinces in Canada. Since 2000, this bumble bee has been reported from only 13 states and 1 province: Illinois, Indiana, Iowa, Maine, Maryland, Massachusetts, Minnesota, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, Wisconsin – and Ontario, Canada.

Why is the rusty patched bumble bee declining?

Habitat loss and degradation: Most prairies and grasslands of the Upper Midwest and Northeast have been converted to monoculture farms or developed areas, such as cities and roads. Grasslands that remain tend to be small and isolated.

Intensive farming: Increases in farm size and technology advances improved the operating efficiency of farms but have led to practices that harm bumble bees: increased use of pesticides, loss of crop diversity resulting in flowering crops being available for only a short time, loss of hedgerows with flowering plants, and loss of legume pastures.

Disease: Pathogens and parasites may pose a threat, although their prevalence and effects in North American bumble bees are not well understood.

Pesticides: The rusty patched bumble bee may be vulnerable to pesticides. Pesticides are used widely on farms and in cities and have both lethal and sublethal toxic effects. Bumble bees can absorb toxins directly through their exoskeleton and through contaminated nectar and pollen. Rusty patched bumble bees nest in the ground and may be susceptible to pesticides that persist in agricultural soils, lawns and turf.

Global climate change: Climate changes that may harm bumble bees include increased temperature and precipitation extremes, increased drought, early snow melt and late frost events. These changes may lead to more exposure to or susceptibility to disease, fewer flowering plants, fewer places for queens to hibernate and nest, less time for foraging due to high temperatures, and asynchronous flowering plant and bumble bee spring emergence.

What is being done to conserve rusty patched bumble bees?

U.S. Fish and Wildlife Service: Several Service programs work to assess, protect, and restore pollinators and their habitats. Also, the Service works with partners to recover endangered and threatened pollinators and pollinator-dependent plants. Concern about pollinator declines prompted formation of the North American Pollinator Protection Campaign, a collaboration of people dedicated to pollinator conservation and education. The Service has a Memorandum of Understanding with the Pollinator Partnership to work together on those goals. The Service is a natural collaborator because our mission is to work with others to conserve, fish, wildlife, and plants and their habitats.

Other Efforts: Trusts, conservancies, restoration groups and partnerships are supporting pollinator initiatives and incorporating native plants that support bees and other pollinators into their current activities. For example, the USDA Natural Resource Conservation Service is working with landowners in Michigan, Minnesota, Montana, North Dakota, South Dakota, and Wisconsin to make bee-friendly conservation improvements to their land. Improvements include the practices of planting cover crops, wildflowers, or native grasses and improved management on grazing lands.

Research: Researchers are studying and monitoring the impacts of GMO crops and certain pesticides on pollinators. Efforts by citizen scientists and researchers to determine the status of declining bee species are underway throughout the United States.

What can I do to help conserve the rusty patched bumble bee?

Garden: Grow a garden or add a flowering tree or shrub to your yard. Even small areas or containers on patios can provide nectar and pollen for native bees.

Native plants: Use native plants in your yard such as lupines, asters, bee balm, native prairie plants and spring ephemerals. Don't forget spring blooming shrubs like ninebark and pussy willow! Avoid invasive non-native plants and remove them if they invade your yard. For more information on attracting native pollinators, visit www.fws.gov/pollinators/pdfs/PollinatorBookletFinalrevWeb.pdf.

Natural landscapes: Provide natural areas - many bumble bees build nests in undisturbed soil, abandoned rodent burrows or grasss clumps. Keep some unmowed, brushy areas and tolerate bumble bee nests if you find them. Reduce tilling soil and mowing where bumble bees might nest. Support natural areas in your community, county and state.

Minimize: Limit the use of pesticides and chemical fertilizer whenever possible or avoid them entirely. Pesticides cause lethal and sublethal effects to bees and other pollinators.

Appendix B – United States Fish and Wildlife Service Consultation Materials

From: Joshua.Fitzpatrick@faa.gov <Joshua.Fitzpatrick@faa.gov>
Sent: Friday, March 15, 2019 4:16 PM
To: Evan Barrett <Evan.Barrett@meadhunt.com>
Cc: Neil.Ralston@mspmac.org
Subject: FW: [EXTERNAL] FW: Crystal Airport ESA Determination

Hi Evan,

Per below, please reference the USFWS concurrence in the affected environment/environmental consequences section of the EA/EAW and include in the appropriate appendix.

Thanks,

Josh Fitzpatrick
Environmental Protection Specialist
FAA Dakota-Minnesota Airport District Office
Joshua.Fitzpatrick@faa.gov
(612) 253-4639

From: Horton, Andrew <andrew_horton@fws.gov>
Sent: Friday, March 15, 2019 3:52 PM
To: Fitzpatrick, Joshua (FAA) <Joshua.Fitzpatrick@faa.gov>
Subject: Re: [EXTERNAL] FW: Crystal Airport ESA Determination

Josh,

We agree with the determinations you have made and are supportive of the proposed conservation measures. In regard to the northern long-eared bat, tree removal will not take place during a period when the species would be present in the action area. Therefore, we do not expect any direct effects to the species as a result of the action.

- Andrew

Andrew Horton
U.S. Fish and Wildlife Service
Minnesota-Wisconsin Field Office
4101 American Blvd East
Bloomington, MN 55425-1665
(952) 252-0092, ext. 208

From: Fitzpatrick, Joshua (FAA)
Sent: Thursday, February 07, 2019 12:16 PM
To: Andrew_Horton@fws.gov
Subject: Crystal Airport ESA Determination

Dear Mr. Horton:

Per the attached Project Exhibit, the Federal Aviation Administration (FAA) is working with the Metropolitan Airports Commission (MAC) on a large airport development project at the Crystal Airport.

The proposed action will require the removal of trees on Airport property to accommodate future non-aeronautical development along 63rd Avenue North, as well as removal or trimming of several off-Airport trees to clear the applicable runway approach threshold siting surfaces (TSS). An obstruction analysis conducted for the recent Airport Layout Plan (ALP) update identified several trees in the approach and departure areas. The MAC proposes to remove or trim any on- or off-Airport trees currently penetrating the applicable approach TSS prescribed by FAA Advisory Circular (AC) 150/5300-13A, Airport Design, Draft Change 2, as well as any additional trees that should be removed or trimmed to provide a clear approach TSS for a reasonable period beyond project implementation. The timeframe analyzed in this EA/EAW is eight years, which includes time for the environmental review and design phases and provides a forecast for approximately five years from project implementation. The MAC also proposes to remove or trim any on-Airport trees that penetrate the departure surface defined by FAA Order 8260.3D, U.S. Standard for Terminal Instrument Procedures (TERPS). Off-Airport trees penetrating the departure surface will remain, as these trees may be avoided through use of notes published in instrument departure procedures. The MAC will continue to monitor tree growth and request that FAA publish obstacle notes in the flight procedures, as needed.

The attached Tree Mitigation and Growth Analysis report was completed in May 2018 compared tree heights from 2013 Airports Geographic Information System (AGIS) data to a December 2017 spot survey, and incorporated growth rates observed by a certified arborist in May 2018 (see attached study). This study established appropriate growth rates to determine if trees are likely to penetrate the approach TSS within five years of project implementation. The study also considered the growth rate of 2.5 feet per year suggested by the FAA in Engineering Brief 91, Management of Vegetation in the Airport Environment.

Some trees near the Airport will require removal under the no-action alternative. Monitoring tree heights and removing or trimming potential obstructions is an ongoing maintenance measure. An obstruction analysis conducted in 2018 identified approximately eight existing off-Airport points currently penetrating the approach TSS for Runways 14L/32R and 6L/24R, which slopes upward one vertical foot for every 20 horizontal feet starting 200 feet from the runway threshold (the beginning of the runway available for landing). The obstruction analysis identified several additional areas with trees forecasted to penetrate the TSS within five years of project implementation. These areas are shown in the attached exhibits. The areas include up to 38 trees found on private properties and up to three trees in public rights-of-way in the approaches to Runways 14L/32R and 6L/24R. While some of these trees will need to be trimmed or removed for the no-action alternative, there is an increase in the number of projected tree obstructions with the preferred alternative. The projected removals also include approximately 32 trees within a city park in the Runway 14 approach. I have included the park analysis as an attachment as well.

Along with regular growth, the increase in tree penetrations is partially because of the shift of the TSS aligned with the 115-foot shift of Runway 14L/32R to the northwest, which introduces lower elevation limits for trees off the Runway 14L end. However, the preferred alternative also reduces the total area of the TSS that must be kept clear due to the closure of Runway 14R/32L. Any removals will be carefully targeted individual trees and will not involve clear-cutting stands of trees. Identification of specific trees to be removed or trimmed will be determined during the detailed project design phase.

The off-Airport trees to be removed include the species cottonwood, birch, white poplar, Siberian elm, red maple, Douglas fir, ash, box elder, and spruce. Although targeted tree removal is expected to occur off-Airport, such removal is not expected to result in adverse impacts to special status species, or loss, degradation, or fragmentation of native species' habitats. Off-Airport tree removal will not target stands or large groupings of trees that will significantly disrupt habitats. In addition, the environment around the off-Airport tree removals is already fully urbanized and developed.

There are no acreages identified as tree removal, only individual trees based on the analyses provided above.

As of February 7, 2019, there were four federally-listed species with habitat in Hennepin County, including the Rusty Patched Bumble Bee (RPBB) and the Northern Long Eared Bat (NLEB), which is listed as threatened in the area. Two of these species are freshwater mussels with habitat in the Mississippi River and are not found within the project area. The FAA made a no effect determination for the Higgins eye pealymussel and snuffbox.

The NLEB is listed as threatened throughout its extensive range, including all of Minnesota, 36 other states, and multiple southeastern Canadian provinces. During summer, the NLEB typically roosts singly or in colonies under bark, in cavities, or in crevices of living and dead trees. Males and non-reproductive females may also roost in caves and mines during the summer. Most hibernate during winter in caves and mines with constant temperatures, high humidity, and no air currents.

The April 1, 2018, MDNR list of Hennepin County townships with documented NLEB maternity roost trees or hibernacula entrances did not include the Crystal Airport or any adjoining townships. Because the proposed project is within a mostly developed area and does not include documented suitable or designated critical habitat, the proposed action will likely have no effect on the NLEB.

The MAC proposes the following mitigation measures or Avoidance and Minimization Measures (AMMs) for tree removal from the Range-Wide Biological Assessment for Transportation Projects for Indiana Bat and Northern Long-Eared Bat (USFWS/USDOT, April 2015) to protect the NLEB:

Tree Removal AMM 2 - To avoid and minimize impacts to the NLEB, tree removal will be completed between October 1 and April 30, which is the dormant season for the bat at this latitude.

Tree Removal AMM 3 - Tree removal will be limited to that specified in project plans. Tree removal limits will be clearly indicated in the field by bright orange flagging/fencing prior to any tree clearing to ensure contractors stay within clearing limits. Tree clearing limitations will be discussed with contractors at the pre-construction meeting to ensure that they understand clearing limits and how they are marked in the field.

Based on the avoidance measures above and utilizing the attached streamlined consultation form, the FAA has made a may affect, not likely to adversely affect determination for the NLEB.

The RPBB live in colonies that have an annual cycle. The bees gather pollen and nectar from a variety of flowering plants and prefer tallgrass prairie habitat. No critical habitat has been designated for the RPBB. According to the USFWS website, the Airport is in a low potential habitat zone for the RPBB. There are no areas of tallgrass prairie within the study area, and areas dominated by grasses are mowed on a regular basis. Therefore, the proposed action does not affect vegetation types that provide habitat for the RPBB. The USFWS IPaC tool does not identify the RPBB as present within the limits of ground disturbance. Because the proposed project is within a developed area, in a low potential habitat zone for the RPBB, and does not affect any prairie habitat, the proposed project will have no effect on the RPBB or its habitat. As a result, no avoidance or mitigation measures are necessary for the RPBB. The FAA has issued a no effect determination for the RPBB.

Migratory Birds and Bald Eagles

Seven of the bird species protected by the MBTA found near the Airport have nesting seasons that fall between May and October. According to the IPaC species list, these species have been documented by USFWS survey sources during these months within approximately six miles of the Airport within the past ten years. These species include the black-billed cuckoo, the eastern whip-poor-will, the golden-winged warbler, the least bittern, the red-headed woodpecker, the willow flycatcher, and the wood thrush. The breeding season for the bald eagle extends from December to August, however eagles typically nest near bodies of water and away from developed areas. The other listed birds nest elsewhere in their range or have not been observed in the project area during nesting season. Many of the birds are typically found in densely wooded or wetland habitats, and while they are not likely to be affected by the proposed project where ground disturbances will primarily be limited to regularly mowed airfield areas, off-Airport tree removal has the potential to disturb some wooded wetland habitat. Prior to any construction activity during the nesting season, an MBTA nesting bird survey will be completed. Tree removal will occur outside of nesting months for birds observed in the area during their nesting season.

Please let me know if you have any questions and reply back with your agency's decision.

Thank you,

Josh Fitzpatrick

Environmental Protection Specialist

FAA Dakota-Minnesota Airport District Office

Joshua.Fitzpatrick@faa.gov

(612) 253-4639

Northern Long-Eared Bat 4(d) Rule Streamlined Consultation Form

Federal agencies should use this form for the optional streamlined consultation framework for the northern long-eared bat (NLEB). This framework allows federal agencies to rely upon the U.S. Fish and Wildlife Service's (USFWS) January 5, 2016, intra-Service Programmatic Biological Opinion (BO) on the final 4(d) rule for the NLEB for section 7(a)(2) compliance by: (1) notifying the USFWS that an action agency will use the streamlined framework; (2) describing the project with sufficient detail to support the required determination; and (3) enabling the USFWS to track effects and determine if reinitiation of consultation is required per 50 CFR 402.16.

This form is not necessary if an agency determines that a proposed action will have no effect to the NLEB or if the USFWS has concurred in writing with an agency's determination that a proposed action may affect, but is not likely to adversely affect the NLEB (i.e., the standard informal consultation process). Actions that may cause prohibited incidental take require separate formal consultation. Providing this information does not address section 7(a)(2) compliance for any other listed species.

Information to Determine 4(d) Rule Compliance:	**YES**	**NO**
1. Does the project occur wholly outside of the WNS Zone[1]?	☐	☒
2. Have you contacted the appropriate agency[2] to determine if your project is near known hibernacula or maternity roost trees?	☒	☐
3. Could the project disturb hibernating NLEBs in a known hibernaculum?	☐	☒
4. Could the project alter the entrance or interior environment of a known hibernaculum?	☐	☒
5. Does the project remove any trees within 0.25 miles of a known hibernaculum at any time of year?	☐	☒
6. Would the project cut or destroy known occupied maternity roost trees, or any other trees within a 150-foot radius from the maternity roost tree from June 1 through July 31.	☐	☒

You are eligible to use this form if you have answered yes to question #1 **or** yes to question #2 **and** no to questions 3, 4, 5 and 6. The remainder of the form will be used by the USFWS to track our assumptions in the BO.

Agency and Applicant[3] (Name, Email, Phone No.): Josh Fitzpatrick, FAA, Joshua.fitzpatrick@faa.gov

Project Name: Crystal Airport Development Project

Project Location (include coordinates if known): Crystal, MN (Airport and surrounding area)

Basic Project Description (provide narrative below or attach additional information):
See attached project exhibit for lengthy description.

[1] http://www.fws.gov/midwest/endangered/mammals/nleb/pdf/WNSZone.pdf
[2] See http://www.fws.gov/midwest/endangered/mammals/nleb/nhisites.html
[3] If applicable - only needed for federal actions with applicants (e.g., for a permit, etc.) who are party to the consultation.

General Project Information	YES	NO
Does the project occur within 0.25 miles of a known hibernaculum?	☐	☒
Does the project occur within 150 feet of a known maternity roost tree?	☐	☒
Does the project include forest conversion[4]? (if yes, report acreage below)	☒	☐
Estimated total acres of forest conversion	< 5 (individual trees removed)	
If known, estimated acres[5] of forest conversion from April 1 to October 31	0	
If known, estimated acres of forest conversion from June 1 to July 31[6]	0	
Does the project include timber harvest? (if yes, report acreage below)	☐	☒
Estimated total acres of timber harvest		
If known, estimated acres of timber harvest from April 1 to October 31		
If known, estimated acres of timber harvest from June 1 to July 31		
Does the project include prescribed fire? (if yes, report acreage below)	☐	☒
Estimated total acres of prescribed fire		
If known, estimated acres of prescribed fire from April 1 to October 31		
If known, estimated acres of prescribed fire from June 1 to July 31		
Does the project install new wind turbines? (if yes, report capacity in MW below)	☐	☒
Estimated wind capacity (MW)		

Agency Determination:

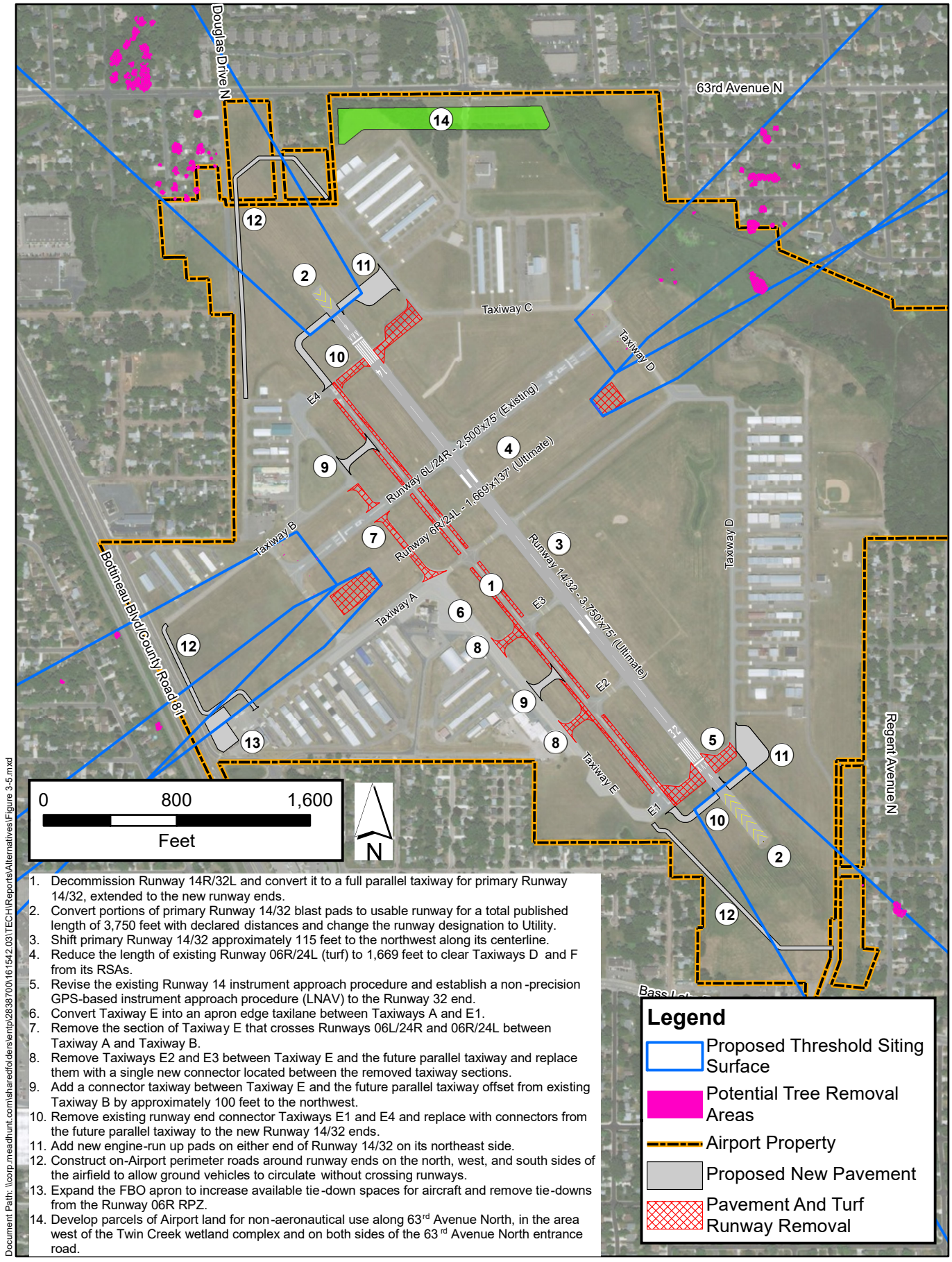
By signing this form, the action agency determines that this project may affect the NLEB, but that any resulting incidental take of the NLEB is not prohibited by the final 4(d) rule.

If the USFWS does not respond within 30 days from submittal of this form, the action agency may presume that its determination is informed by the best available information and that its project responsibilities under 7(a)(2) with respect to the NLEB are fulfilled through the USFWS January 5, 2016, Programmatic BO. The action agency will update this determination annually for multi-year activities.

The action agency understands that the USFWS presumes that all activities are implemented as described herein. The action agency will promptly report any departures from the described activities to the appropriate USFWS Field Office. The action agency will provide the appropriate USFWS Field Office with the results of any surveys conducted for the NLEB. Involved parties will promptly notify the appropriate USFWS Field Office upon finding a dead, injured, or sick NLEB.

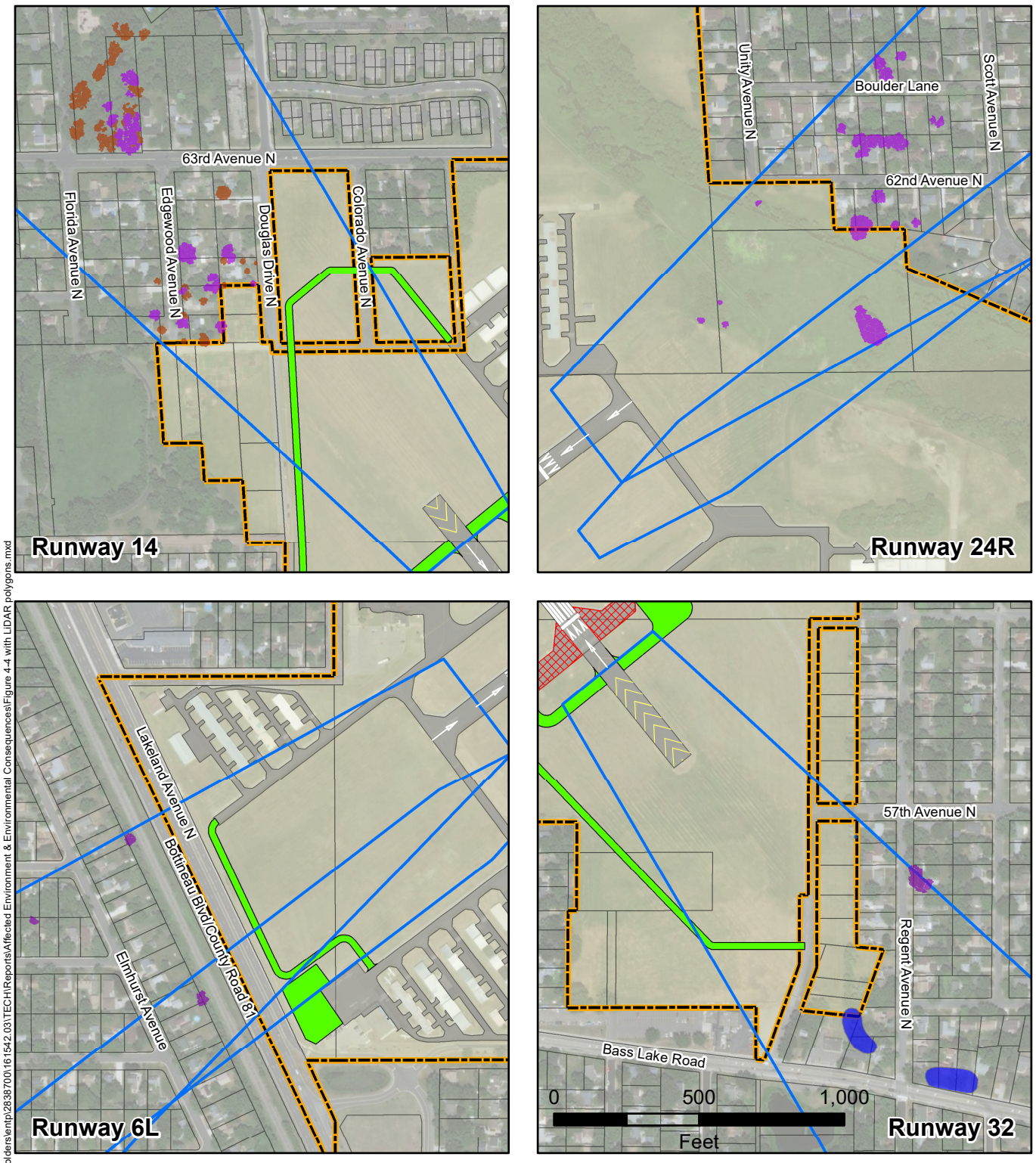
Signature: JOSHUA T FITZPATRICK Digitally signed by JOSHUA T FITZPATRICK Date: 2019.02.07 12:13:20 -06'00' Date Submitted: 2/7/19

[4] Any activity that temporarily or permanently removes suitable forested habitat, including, but not limited to, tree removal from development, energy production and transmission, mining, agriculture, etc. (see page 48 of the BO).
[5] If the project removes less than 10 trees and the acreage is unknown, report the acreage as less than 0.1 acre.
[6] If the activity includes tree clearing in June and July, also include those acreage in April to October.



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

FIGURE 3-5
Preferred Alternative
Crystal Airport
Environmental Assessment



Document Path: \\corp.meadhunt.com\sharedfolders\entp\283870O\161542.03\TECH\Reports\Affected Environment & Environmental Consequences\Figure 4-4 with LiDAR polygons.mxd

Hennepin County, MN - GIS Data Downloads at https://gis-hennepin.opendata.arcgis.com/

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

FIGURE 4-4
Tree Removal Areas
Crystal Airport
Environmental Assessment

Appendix C – Tree Growth Evaluation Study

Tree Growth Evaluation Survey

Crystal Airport

Report prepared by

Mead & Hunt

May 2018

1. Background

Mead & Hunt is currently assisting the Metropolitan Airports Commission (MAC) in developing a joint federal Environmental Assessment (EA) / State Environmental Assessment Worksheet (EAW) for proposed runway projects at Crystal Airport. An updated Airport Layout Plan (ALP) was recently completed for the airport. The ALP identifies numerous off-airport trees in the approach and departure areas for the planned ultimate runway ends. The MAC proposes to remove any off-airport trees currently penetrating the applicable approach threshold siting surfaces (TSS) prescribed by FAA Advisory Circular (AC) 150/5300-13A, Draft Change 2, as well as any additional trees that should be removed to provide a clear approach TSS for a reasonable period (~5 years) beyond project implementation. The purpose of this study is to assist the MAC in determining the appropriate growth rate(s) to apply to current tree elevations to estimate the number of trees that may need to be removed to provide a clear TSS. The FAA has requested that this information be included in the EA/EAW documentation. Identification of specific trees to be trimmed or removed will be determined during the detailed project design phase.

FAA Engineering Brief 91, *Management of Vegetation in the Airport Environment*, states: "When topping trees, the resultant elevation…must provide for at least 5 years of growth below the instrument or visual surface requiring protection. A number of factors affect tree growth on a particular site. Some examples include: species; soil condition (texture, compaction, etc.); soil nutrients; moisture; space; genetics; whether the trees are native or exotic; and the interactions of these variables. Due to these complexities a one-size-fits-all approach is not feasible. Either use an annual normalized growth rate of 2.5 feet per year or determine the growth rate of similar trees near the airport with the assistance of the State Forester or the U.S. Forest Service." Based on consultation with FAA, the opinion of a certified arborist is an acceptable substitute for assistance from these government agencies.

Mead & Hunt assessed the species, health, and growth rates for trees in the approach TSS for both ends of Runways 14L/32R and 6L/24R at Crystal Airport, to determine typical growth rates that can be expected over the next five years. The assessment of growth rates is based on research, field observations, and analysis of a certified arborist, as described below.

2. Survey description and methods

This survey was conducted from public right of ways and the individual trees were not evaluated intensely. All species were identified by their general form, trunk and branch structure. All of the individual trees surveyed were generally evaluated for their health and vigor in their specific setting. However, due to the remote nature of the survey this report should not be used as a key to identify specific species or health of the tree on the properties referred to herein. It should be noted that the field notes often only generally identified the tree species.

The primary observation used to evaluate the growth potential of the trees was the twig elongation from the previous year. This can occasionally be accomplished by direct observation or more often it is necessary to estimate aided by the use of binoculars.

In addition to twig elongation, observations of the tree's appearance including trunk, bark, and branch structure provides many clues to the overall health of the tree. This can be used to predict the vigor of

future growth. When it was not possible to examine the twigs closely these observations were used to help predict future growth.

Most of the trees surveyed are approaching maturity but still produce significant annual twig elongation. The measurement for the total height gain for the trees may be less than the average for twig elongation for two reasons. Most of the trees observed during the survey had large crowns that resulted from growing with plenty of space between the individual trees. This results in multiple stems and many branches in the canopy. The vast majority of the twigs, even those at the top of the tree do not grow straight up, resulting in less addition height. Secondly the twigs at the top of the tree that do add the height are often stressed by direct exposure to the drying effect of the sun and the wind.

Rainfall data from the period between 2014 and 2017 shows slightly above average total annual rainfall for all three growing seasons. The time of year the rainfall occurs has an impact on the total annual growth of the tree, but it is safe to classify the three years before this survey as good growing conditions, so the observed growth is a good representation of future growth. The soils on most of sites consist of sandy loams which are excellent for the growth of the tree species present.

3. General traits of the main species present

The following sections describe the characteristics of three tree species observed with relative frequency throughout the Airport vicinity, as well as other species observed with less frequency.

3.1 Silver Maple (*Acer saccharinum*)

Commonly planted in street and residential settings in the 1950s and 1960s, the silver maple *Acer saccharinum* (referred to as red maple in the field notes as silver maple is often grouped with red maple) is the most commonly occurring species in the survey. It is a highly adaptable species which thrives in most settings. It was widely planted due to its rapid growth. Most of the trees studied in the survey, however, were not next to open water or on a site with a very high water table (the residential development of the area includes drainage improvements). This means that they are not well situated to produce their maximum potential growth rates.

It was determined by the use of binoculars that during the 2017 growing season most of the twigs added between 12 and 24 inches of length. The average length of twig growth was 18 inches or slightly less. The evidence suggests that an average of 18 inches of twig elongation can be expected on the silver maples in the next five years. This will result in 18 inches of additional total height growth annually or slightly less.

Silver maples along Dudley Avenue North (facing east from Hampshire Avenue intersection) in Runway 6L approach area.

3.2 Green Ash (*Fraxinus pennsylvanica*)

Many ash trees were observed during the survey most of which were identified as green ash *Fraxinus pennsylvanica*. Green ash rarely grows to more than 50 feet in height and it does not grow as rapidly as silver maple in most conditions. These characteristics as well as the almost one hundred percent mortality rate from the emerald ash borer mean that the ongoing overall increase in height for these trees can be considered less than one foot per year.

3.3 Cottonwood (*Populus deltoides*)

Cottonwood *Populus deltoides* is the tree which is most likely to cause ongoing approach issues wherever it is present. Several individual cottonwoods were identified during the survey, along with a large stand which is present in the Runway 14L approach area in a public park.

Cottonwood is a tall, fast growing species adapted to wet sites. They are rarely planted in street or residential settings. They seed by wind and will sprout up on any wet site that is not mowed regularly. They sprout vigorously after pruning, producing weak branches, so removal is the only option that should be considered for obstruction mitigation.

A stand of cottonwood trees in a public park north of 63rd Avenue North observed in the Runway 14L approach area

The growth rate on cottonwood is much faster and more variable than any of the other species identified. During very wet years twig elongation exceeding five feet is not uncommon. This rapid growth rate means that including cottonwood with the other species increases the average growth rate for all species markedly.

3.4 Other Tree Species

Several other species were identified during the survey. These can be divided into two groups based on their growth characteristics. This list is not complete but categorizes the majority of the observed species.

The first group consists of austrian pine *Pinus nigra*, blue spruce *Picea pungens*, douglas fir *Pseudotsuga menziesii,* honey locust *Gleditsia triacanthos*, several oak *Quercus* species, sugar maple *Acer saccaharum*, and white spruce *Picea glauca*. This diverse group of tree species all are slower growing than silver maple on most of the sites observed during the survey. The total annual height gain for these species should average about 12 inches.

The second group includes black willow *Salix nigra*, boxelder *Acer negundo*, siberian elm *Ulmus pumila*, white poplar *Populus alba*, and white pine *Pinus strobus*. All of these trees have the potential for greater total annual growth than silver maple. Boxelder and siberian elm do not typically grow to be tall trees, but

many of the individuals observed are still adding height rapidly. White pine has the potential to be very tall and has the most potential to become an obstruction in the future. These species have the potential for an average annual height gain of 24 inches a year. Boxelder and siberian elm will not grow very fast above 70 feet.

3.5 Projected Maximum Height by Species

Tree heights are dependent on many variables. The table below should be used as a guideline only. The average mature height column is a good indicator of the height at which a tree's growth will slow significantly. Any growth projected above this height would be at less than one foot a year.
The average mature height and the maximum height columns are published regional standards. Note that most of the maximum heights are historical old growth records; this column is included for comparison purposes. The maximum height projected for this site incorporates the local conditions.

Table: Mature Tree Height Estimates

Species	Average mature height (feet)*	Maximum height, published (feet)*	Maximum height projected for this site (feet)**
Austrian pine, *Pinus nigra*	80	120	80
Black willow, *Salix nigra*	60	120	85
Blue spruce, *Picea pungens*	100	150	100
Boxelder, *Acer negundo*	50	75	75
Cottonwood, *Populus deltoides*	100	175	120
Douglas fir, *Pseudotsuga menziesii*	130	300	100
Green ash, *Fraxinus pennsylvanica*	60	145	80
Honey locust, *Gleditsia triacanthos*	75	140	80
Oak, most species, *Quercus*	80	150	100
Siberian elm, *Ulmus pumila*	65	80	75
Silver maple, *Acer saccharinum*	80	125	85
Sugar maple, *Acer saccaharum*	80	135	100
White pine, *Pinus strobus*	100	220	120
White poplar, *Populus alba*	50	80	70
White spruce, *Picea glauca*	70	120	80

*Textbook of Dendrology by Harlow, Harrar, Hardin, and White.

**Mead & Hunt Arborist calculation

4. Species and growth rates by runway approach area

The following sections describe tree species observed in each runway approach area and associated predicted rates of growth over the next five years. Specific trees were selected from the ALP inner approach sheets for field observation, based on their relatively tall heights with respect to the approach TSS. Therefore, these observations are representative of trees that would potentially penetrate the TSS within the next five years. Field notes are included in Appendix A.

4.1 Runway 6L Approach

Forty-two trees were observed in the Runway 6L approach area and, of those, 31 were silver maples. Most of the silver maples showed approximately 18 inches of twig elongation. The average twig elongation of all the trees observed is 15.8 inches. There were no cottonwoods observed so the predicted rate of growth is 16 inches in this area.

4.2 Runway 24R Approach

Twenty-nine trees were observed in the Runway 24R approach area and, of those, 11 were silver maples. Once again most of the silver maples showed approximately 18 inches of twig elongation. A variety of other species were present along with one white pine that has the potential for significant growth, but there were no cottonwoods observed. The average twig elongation of all the trees observed is 15.1 inches. The predicted rate of growth is 15 inches in this area.

4.3 Runway 14L Approach

Seventy-five trees were observed in the Runway 14L approach area. The presence of 16 cottonwoods, primarily in the public park north of 63rd Avenue North, makes this area much more prone to rapid height increase than any of the others. Where the cottonwoods are present a growth rate of at least 30 inches is predicted. Aside from the cottonwoods a variety of other species were observed of which red maple and white poplar would be likely to gain height quickly. The average twig elongation of all the trees observed, excluding the cottonwoods is 15.0 inches. Removing the cottonwoods from consideration, the predicted rate of growth is 15 inches in this area.

Species observed in the Runway 14L approach area west of Douglas Drive include boxelder, douglas fir, green ash, Siberian elm, and silver maple.

4.4 Runway 32R Approach

Thirty-three trees were observed in the Runway 32R approach area. The presence of three cottonwoods makes this area a concern. The cottonwoods were younger and very likely to add height quickly in the coming years. Where the cottonwoods are present a growth rate of at least 30 inches is predicted. Aside from the cottonwoods a variety of other species were observed of which red maple is the most common. Several oaks and pines are present, but their current age and condition make them less of a concern than the silver maple. The average twig elongation of all the trees observed, excluding the cottonwoods is 15.8 inches. Removing the cottonwoods from consideration, the predicted rate of growth is 16 inches in this area.

5. Arborist Credentials

The observations and findings described in this report are those of certified arborist Mr. S. Tom Ward. Mr. Ward's experience and credentials are as follows:

- International Society of Arboriculture – Certified Arborist MI-0734A, expires 12/31/19
- Michigan Registered Forester – Registration Number 3301000642, expires 5/31/2020
- Bachelor of Science, majoring in Forest Management at Michigan State University 1993
- Employed as a Consulting Forester by Metropolitan Forestry Consultants from 1993 until 2000.
- Currently employed by Mead & Hunt as a Technician/Certified Arborist starting in May 2000.

Appendix A: Field Observation Log (April 24, 2018)

Note: Species and average growth rates are estimated based on the arborist's visual observation using binoculars. Individual trees were identified from the public right-of-way while referencing printed copies of the ALP approach and departure sheets. Access to the properties was not requested and survey coordinates were not collected; therefore, some trees may not be the actual trees shown on the ALP but are reasonably close to those trees.

ID	YRS TO PEN (2.5' GRWTH)	RW APPCH	VIEWED FROM	SPECIES	ESTIMATED AVERAGE ANNUAL GRWTH (in.)	NOTES
8906	NA	14L	Douglas Dr	Elm	18	This point was identified in the departure surface by Supplemental Flight Procedures Review report dated April 6.
8910	6 to 10	14L	Florida Ave	White Pine	18	
8986	6 to 10	14L	63rd Ave	Cottonwood	>30	
8987	0 to 5	14L	63rd Ave	Cottonwood	>30	
8994	0 to 5	14L	Edgewood Ave	Birch	12	
8996	6 to 10	14L	Edgewood Ave	Red Maple	18	
9040	0 to 5	14L	63rd Ave	Red Maple	18	
9042	0 to 5	14L	63rd Ave	Cottonwood	>30	
9044	6 to 10	14L	Florida Ave	Red Maple	18	
9045	6 to 10	14L	Florida Ave	Red Maple	18	
9046	NOW	14L	Edgewood Ave	White Poplar	24	
9047	0 to 5	14L	Edgewood Ave	Ash	12	
9048	0 to 5	14L	Edgewood Ave	Siberian Elm	12	
9049	0 to 5	14L	Douglas Dr	Red Maple	18	
9050	NOW	14L	Douglas Dr	Douglas Fir	12	
9051	0 to 5	14L	Edgewood Ave	Ash	12	
9084	NOW	14L	Douglas Dr	Ash	12	

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ID	YRS TO PEN (2.5' GRWTH)	RW APPCH	VIEWED FROM	SPECIES	ESTIMATED AVERAGE ANNUAL GRWTH (in.)	NOTES
9085	NOW	14L	Edgewood Ave	White Poplar	24	
9105	NA	14L	63rd Ave	Cottonwood	>30	This point was identified in the departure surface by Supplemental Flight Procedures Review report dated April 6.
9113	0 to 5	14L	63rd Ave	Cottonwood	>30	
9114	0 to 5	14L	63rd Ave	Cottonwood	>30	
9116	6 to 10	14L	63rd Ave	Ash	12	
9116	6 to 10	14L	Edgewood Ave	Austrian Pine	12	
9117	6 to 10	14L	63rd Ave	Elm	12	
9118	6 to 10	14L	63rd Ave	Cottonwood	>30	
9121	6 to 10	14L	Edgewood Ave	Ash	12	
9122	6 to 10	14L	Edgewood Ave	Red Maple	12	
9123	0 to 5	14L	Douglas Dr	Box Elder	18	
9124	NOW	14L	Douglas Dr	White Poplar	24	
9141	6 to 10	14L	63rd Ave	Cottonwood	>30	
9142	6 to 10	14L	63rd Ave	Cottonwood	>30	
9143	0 to 5	14L	Edgewood Ave	Siberian Elm	12	
9144	0 to 5	14L	Edgewood Ave	Spruce	12	
9145	0 to 5	14L	Edgewood Ave	Ash	12	

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ID	YRS TO PEN (2.5' GRWTH)	RW APPCH	VIEWED FROM	SPECIES	ESTIMATED AVERAGE ANNUAL GRWTH (in.)	NOTES
9147	0 to 5	14L	63rd Ave	Red Maple	18	
9148	0 to 5	14L	63rd Ave	Cottonwood	>30	
9149	0 to 5	14L	Edgewood Ave	Ash	12	
9150	6 to 10	14L	Douglas Dr	Box Elder	18	
9151	0 to 5	14L	Florida Ave	Ash	12	
9152	0 to 5	14L	Edgewood Ave	Ash	12	
11440	6 to 10	14L	Edgewood Ave	Ash	12	
11441	6 to 10	14L	Douglas Dr	Ash	12	
11444	6 to 10	14L	Florida Ave	Ash	12	
11445	6 to 10	14L	Florida Ave	Red Maple	18	
11449	6 to 10	14L	Florida Ave	Red Maple	18	
12051	6 to 10	14L	63rd Ave	Cottonwood	>30	
12052	6 to 10	14L	63rd Ave	Cottonwood	>30	
12100	6 to 10	14L	63rd Ave	Cottonwood	>30	
12102	0 to 5	14L	63rd Ave	Cottonwood	>30	
12103	0 to 5	14L	63rd Ave	Cottonwood	>30	
12104	6 to 10	14L	63rd Ave	Cottonwood	>30	

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ID	YRS TO PEN (2.5' GRWTH)	RW APPCH	VIEWED FROM	SPECIES	ESTIMATED AVERAGE ANNUAL GRWTH (in.)	NOTES
12105	6 to 10	14L	Douglas Dr	Norway Maple	12	
12122	6 to 10	14L	Edgewood Ave	NA	NA	Could not find tree in this location
12123	0 to 5	14L	Florida Ave	Sugar Maple	12	
12131	NA	14L	Park	White Pine	18	This point was identified in the departure surface by Supplemental Flight Procedures Review report dated April 6. Cottonwood near same location, avg grwth estimate 36".
12322	6 to 10	14L	Edgewood Ave	Honey Locust	12	
12323	6 to 10	14L	Edgewood Ave	Siberian Elm	18	
12324	6 to 10	14L	Edgewood Ave	Catalapa	18	
12327	6 to 10	14L	Florida Ave	Red Maple	18	
12328	6 to 10	14L	Edgewood Ave	Ash	12	
12329	6 to 10	14L	Edgewood Ave	Ash	12	
12330	6 to 10	14L	Edgewood Ave	Ash	12	
12331	6 to 10	14L	Edgewood Ave	Red Maple	18	
8306	0 to 5	24R	Boulder Ln	Red Maple	18	
8307	0 to 5	24R	Boulder Ln	Ash	12	
8308	6 to 10	24R	63rd Ave	Red Maple	18	
8309	6 to 10	24R	63rd Ave	Elm	12	

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ID	YRS TO PEN (2.5' GRWTH)	RW APPCH	VIEWED FROM	SPECIES	ESTIMATED AVERAGE ANNUAL GRWTH (in.)	NOTES
8310	6 to 10	24R	63rd Ave	Linden		
8322	0 to 5	24R	Boulder Ln	Linden	18	
8323	0 to 5	24R	Boulder Ln	Red Maple	18	
8326	6 to 10	24R	62nd Ave	Red Maple	18	
8327	0 to 5	24R	62nd Ave	Ash		
8328	6 to 10	24R	62nd Ave	Honey Locust	12	
8329	0 to 5	24R	62nd Ave	Ash	12	
8330	0 to 5	24R	Boulder Ln	Honey Locust	12	
8331	0 to 5	24R	62nd Ave	Red Maple	18	
8332	0 to 5	24R	62nd Ave	Red Maple	18	
8333	0 to 5	24R	62nd Ave	Red Maple	18	
8334	0 to 5	24R	62nd Ave	Douglas Fir	12	
8335	0 to 5	24R	62nd Ave	Red Maple	18	
8337	6 to 10	24R	62nd Ave	Norway Maple	12	
8345	NOW	24R	62nd Ave	NA	NA	This tree has been cut down
8346	0 to 5	24R	62nd Ave	Ash	12	
8380	6 to 10	24R	Scott Ave	White Pine	24	

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ID	YRS TO PEN (2.5' GRWTH)	RW APPCH	VIEWED FROM	SPECIES	ESTIMATED AVERAGE ANNUAL GRWTH (in.)	NOTES
8456	6 to 10	24R	62nd Ave	Red Maple	18	
8524	6 to 10	24R	62nd Ave	Honey Locust	12	
8525	0 to 5	24R	62nd Ave	Red Maple	18	
8526	0 to 5	24R	62nd Ave	Spruce	12	
8527	6 to 10	24R	62nd Ave	Ash	12	
8528	0 to 5	24R	62nd Ave	NA	NA	This tree has been cut down
8791	6 to 10	24R	Scott Ave	Honey Locust	12	
8792	6 to 10	24R	Scott Ave	Black Walnut	12	
8794	6 to 10	24R	Scott Ave	Red Maple	18	
8795	6 to 10	24R	Scott Ave	Douglas Fir	12	
8957	6 to 10	32R	Bass Lake Rd	Cottonwood	>30	
8960	6 to 10	32R	Regent Ave	Red Maple	18	
8961	6 to 10	32R	Bass Lake Rd	Red Maple	18	
8962	6 to 10	32R	Bass Lake Rd	Elm	18	
8971	NA	32R	Regent Ave	Red Maple	18	This point was identified in the departure surface by Supplemental Flight Procedures Review report dated April 6.
8972	NOW	32R	Regent Ave	Red Maple	18	
8973	0 to 5	32R	Quail Ave	Red Maple	18	

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ID	YRS TO PEN (2.5' GRWTH)	RW APPCH	VIEWED FROM	SPECIES	ESTIMATED AVERAGE ANNUAL GRWTH (in.)	NOTES
9167	6 to 10	32R	Bass Lake Rd	White Oak	12	
9168		32R	Bass Lake Rd	Cottonwood	>30	Multiple trees of various species and similar height in this location
9169	6 to 10	32R	Bass Lake Rd	Swamp Oak	12	This point was identified in the departure surface by Supplemental Flight Procedures Review report dated April 6.
9170	6 to 10	32R	Bass Lake Rd	Pine	18	
9171	6 to 10	32R	Regent Ave	Honey Locust	12	
9172	0 to 5	32R	Regent Ave	Elm	18	
9173	0 to 5	32R	Regent Ave	NA	NA	No tree in this location, appears to be utility pole
9174	0 to 5	32R	Regent Ave	Elm	18	
9175	6 to 10	32R	Regent Ave	Ash	12	
9176	6 to 10	32R	Regent Ave	Douglas Fir	12	
9177	NOW	32R	Regent Ave	Red Maple	18	
9178	0 to 5	32R	Regent Ave	Ash	12	
9179	6 to 10	32R	Regent Ave	Red Maple	18	
9180	6 to 10	32R	Bass Lake Rd	Red Oak	12	
9184	6 to 10	32R	Regent Ave	Red Maple	18	
9243	0 to 5	32R	Quail Ave	White Poplar	24	

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ID	YRS TO PEN (2.5' GRWTH)	RW APPCH	VIEWED FROM	SPECIES	ESTIMATED AVERAGE ANNUAL GRWTH (in.)	NOTES
9253	0 to 5	32R	Regent Ave	Red Maple	18	
9254	0 to 5	32R	Regent Ave	Siberian Elm	18	
9255	6 to 10	32R	Bass Lake Rd	Ash	12	
9407	0 to 5	32R	Regent Ave	Spruce	12	
9408	0 to 5	32R	Regent Ave	NA	NA	No tree in this location, appears to be utility pole
9409	6 to 10	32R	Regent Ave	NA	NA	No tree in this location, appears to be utility pole
9412	6 to 10	32R	Regent Ave	Elm	18	
18621	6 to 10	32R	Bass Lake Rd	Cottonwood	>30	
18628	6 to 10	32R	Quail Ave	Spruce	12	
18632	6 to 10	32R	Regent Ave	Ash	12	
18633	0 to 5	32R	Regent Ave	NA	NA	Could not find tree in this location
9133	6 to 10	6L	57th Ave	Red Maple	18	
9137	0 to 5	6L	Elmhurst Ave	Red Maple	18	
9195	0 to 5	6L	Elmhurst Ave	Red Maple	18	
9196	6 to 10	6L	Elmhurst Ave	Ash	12	
9197	6 to 10	6L	Elmhurst Ave	Ash	6	
9198	6 to 10	6L	Elmhurst Ave	Ash	6	

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ID	YRS TO PEN (2.5' GRWTH)	RW APPCH	VIEWED FROM	SPECIES	ESTIMATED AVERAGE ANNUAL GRWTH (in.)	NOTES
9199	6 to 10	6L	Elmhurst Ave	Honey Locust	12	Multiple trees of various species and similar height in this location
9200	6 to 10	6L	Elmhurst Ave	Red Maple	12	
9201	6 to 10	6L	Elmhurst Ave	Spruce	12	
9202	0 to 5	6L	Elmhurst Ave	Red Maple	12	
9203	0 to 5	6L	Elmhurst Ave	Red Maple	18	
9204	0 to 5	6L	Elmhurst Ave	Red Maple	24	
9205	6 to 10	6L	Elmhurst Ave	Red Maple	18	
9206	6 to 10	6L	Elmhurst Ave	Red Maple	18	
9207	0 to 5	6L	59th Ave	Red Maple	18	
9208	6 to 10	6L	Dudley Ave	Red Maple	18	
9209	0 to 5	6L	Dudley Ave	Red Maple	18	
9210	0 to 5	6L	Dudley Ave	Red Maple	18	
9211	6 to 10	6L	Dudley Ave	Red Maple	18	
9212	0 to 5	6L	Elmhurst Ave	Black Willow	12	
9213	6 to 10	6L	Dudley Ave	Red Maple	18	
9214	6 to 10	6L	Dudley Ave	Red Maple	18	
9216	0 to 5	6L	Elmhurst Ave	Red Maple	12	

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ID	YRS TO PEN (2.5' GRWTH)	RW APPCH	VIEWED FROM	SPECIES	ESTIMATED AVERAGE ANNUAL GRWTH (in.)	NOTES
9217	6 to 10	6L	Elmhurst Ave	Blue Spruce	6	
9219	0 to 5	6L	Elmhurst Ave	Red Maple	12	
9220	6 to 10	6L	Dudley Ave	Red Maple	18	
9232	6 to 10	6L	Elmhurst Ave	Red Maple	18	
9235	6 to 10	6L	Cloverdale Ave	Red Maple	18	
15035	6 to 10	6L	Elmhurst Ave	Black Willow	12	
15039	6 to 10	6L	Elmhurst Ave	NA	NA	Could not find tree in this location
15041	6 to 10	6L	Elmhurst Ave	Red Maple	18	
15043	6 to 10	6L	Elmhurst Ave	Red Maple	18	
15044	6 to 10	6L	Elmhurst Ave	Willow	18	
15047	6 to 10	6L	Elmhurst Ave	Sugar Maple	12	
15073	6 to 10	6L	Hampshire Ave	Red Maple	18	
15074	6 to 10	6L	Hampshire Ave	Red Maple	18	
16455	6 to 10	6L	Dudley Ave	Red Maple	18	
16456	6 to 10	6L	59th Ave	Red Maple	18	
16656	6 to 10	6L	59th Ave	Red Maple	18	
16660	6 to 10	6L	Elmhurst Ave	Red Maple	18	

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ID	YRS TO PEN (2.5' GRWTH)	RW APPCH	VIEWED FROM	SPECIES	ESTIMATED AVERAGE ANNUAL GRWTH (in.)	NOTES
16661	6 to 10	6L	Elmhurst Ave	Red Maple	18	
16664	6 to 10	6L	Dudley Ave	Red Maple	18	

Appendix D – Section 4(f) and Associated Correspondence

Section 4(f) Evaluation & Preliminary Finding

Responsible Federal Agency: Federal Aviation Administration (FAA)
Proposed Action: Improvements at Crystal Airport
Project Proposer: Metropolitan Airports Commission (MAC)
Section 4(f) Property: Edgewood Park
Section 4(f) Property Owner: City of Brooklyn Park, Minnesota

Report prepared by

Mead & Hunt

February 2019

1. Introduction

Section 4(f) of the U.S. Department of Transportation Act of 1966 protects significant publicly owned parks, recreation areas, wildlife refuges, and historic sites. A Section 4(f) use includes alteration of structures or facilities on the subject property, or constructive uses that do not physically affect the property, but indirectly impairs the resource in some way. The Section 4(f) regulation requires proposed transportation use be avoided, if avoidance is feasible and prudent, before U.S. DOT grants any funding or approvals for the transportation use. Additionally, a full evaluation of measures to minimize harm to that property must be made and documented.

This report evaluates a Section 4(f) property located in Brooklyn Park, Minnesota, that will be affected by a proposed action at Crystal Airport (Federal Aviation Administration (FAA) identifier MIC, or "the Airport"), located in the cities of Crystal, Brooklyn Park, and Brooklyn Center, Minnesota. For this evaluation, the Metropolitan Airports Commission (MAC) is the project proposer, the FAA is the responsible Federal agency, and the City of Brooklyn Park is the owner of, and official with jurisdiction over, the Section 4(f) resource. Coordination between these three entities was undertaken throughout development of this Section 4(f) evaluation, as described in Section 7 of this report.

Subjects covered within this Section 4(f) evaluation report include the following:

- Description of Proposed Action
- Description of Section 4(f) Property
- Description of Use and Impacts on Section 4(f) Property
- Avoidance Alternatives
- Minimization and Mitigation of Harm
- Coordination

2. Description of Proposed Action

Crystal Airport is one of seven airports owned and operated by the Metropolitan Airports Commission (MAC). The Airport is located in Hennepin County, approximately seven miles northwest of downtown Minneapolis. It lies primarily within the City of Crystal, with small portions of airport property extending into the City of Brooklyn Park and the City of Brooklyn Center. The Airport plays an important role in the MAC system of airports by attracting general aviation traffic away from Minneapolis-St. Paul International Airport (MSP) to relieve congestion, which helps reduce operating costs and promotes sustainability. Crystal is the closest MAC airport to downtown Minneapolis. The Airport currently has three paved runways, one turf runway, and two non-precision instrument approaches. Runway 14L/32R is 3,267' x 75'; Runway 14R/32L is 3,266' x 75'; and Runway 6L/24R is 2,500' x 75'. Closed during the winter months, turf Runway 6R/24L is 2,123' x 137'. A fixed-base operator (FBO) is located on site, as is an FAA-operated air traffic control tower, which operates daily in winter from 7 a.m. to 9 p.m. and in summer from 7 a.m. to 10 p.m. In 2017, there were 34,223 landings and takeoffs and 168 based aircraft at Crystal Airport.

Based on the recommendations of a recently completed Long Term Comprehensive Plan (LTCP) for the Airport, the MAC is proposing to make various improvements at the Airport. Based on the nature of the proposed project, the MAC is developing a joint federal Environmental Assessment (EA) / state Environmental Assessment Worksheet (EAW) for the proposed improvements. The federal EA is being developed under FAA policies and procedures detailed in FAA Order 1050.1F (and related documents) for compliance with the National Environmental Policy Act (NEPA) and Council on Environmental Quality (CEQ) regulations implementing NEPA. The state EAW is being developed in compliance with the Minnesota Environmental Policy Act (MEPA) and Minnesota Environmental Quality Board (EQB) rules implementing MEPA.

The purpose of the proposed action at Crystal Airport is to pursue the following three general infrastructure goals for the Airport:

1) Better align airfield infrastructure to match existing and forecasted activity levels;
2) Preserve and improve operational capabilities for design aircraft family; and
3) Enhance safety by simplifying the runway and taxiway layout.

The need of the proposed action is based on achieving the following six objectives that support the project purpose, as defined in the following subsections:

1) Simplify airfield geometry;
2) Provide the required runway length for critical design aircraft[1] needs;
3) Enhance instrument approach capability and mitigate penetrations for both ends of the main primary runway;
4) Improve Airport ground vehicle circulation;
5) Increase aircraft apron parking capacity; and
6) Develop excess Airport property for non-aeronautical use.

The proposed action evaluated by the EA/EAW includes the following, as shown in **Figure 1**:

- Decommission Runway 14R/32L and convert it to a full parallel taxiway for primary Runway 14/32, extended to the new runway ends.
- Convert portions of primary Runway 14/32 blast pads to usable runway for a total published length of 3,750 feet with declared distances and change the runway designation to Utility.
- Shift primary Runway 14/32 approximately 115 feet to the northwest along its centerline.
- Reduce the length of existing Runway 06R/24L (turf) to 1,669 feet to clear Taxiways D & F from its runway safety areas (RSA).
- Revise the existing Runway 14 instrument approach procedure and establish a non-precision GPS-based instrument approach procedure (LNAV) to the Runway 32 end.
- Improve and simplify taxiway system, including:
    - Convert Taxiway E into an apron edge taxilane between Taxiways A and E1.

[1] The critical design aircraft for runway length is defined by FAA Advisory Circular (AC) 150/5000-17, *Critical Aircraft and Regular Use Determination*, as “the single aircraft, or grouping of aircraft with similar operational requirements, that have the longest runway length requirement that makes regular use of the runway.”

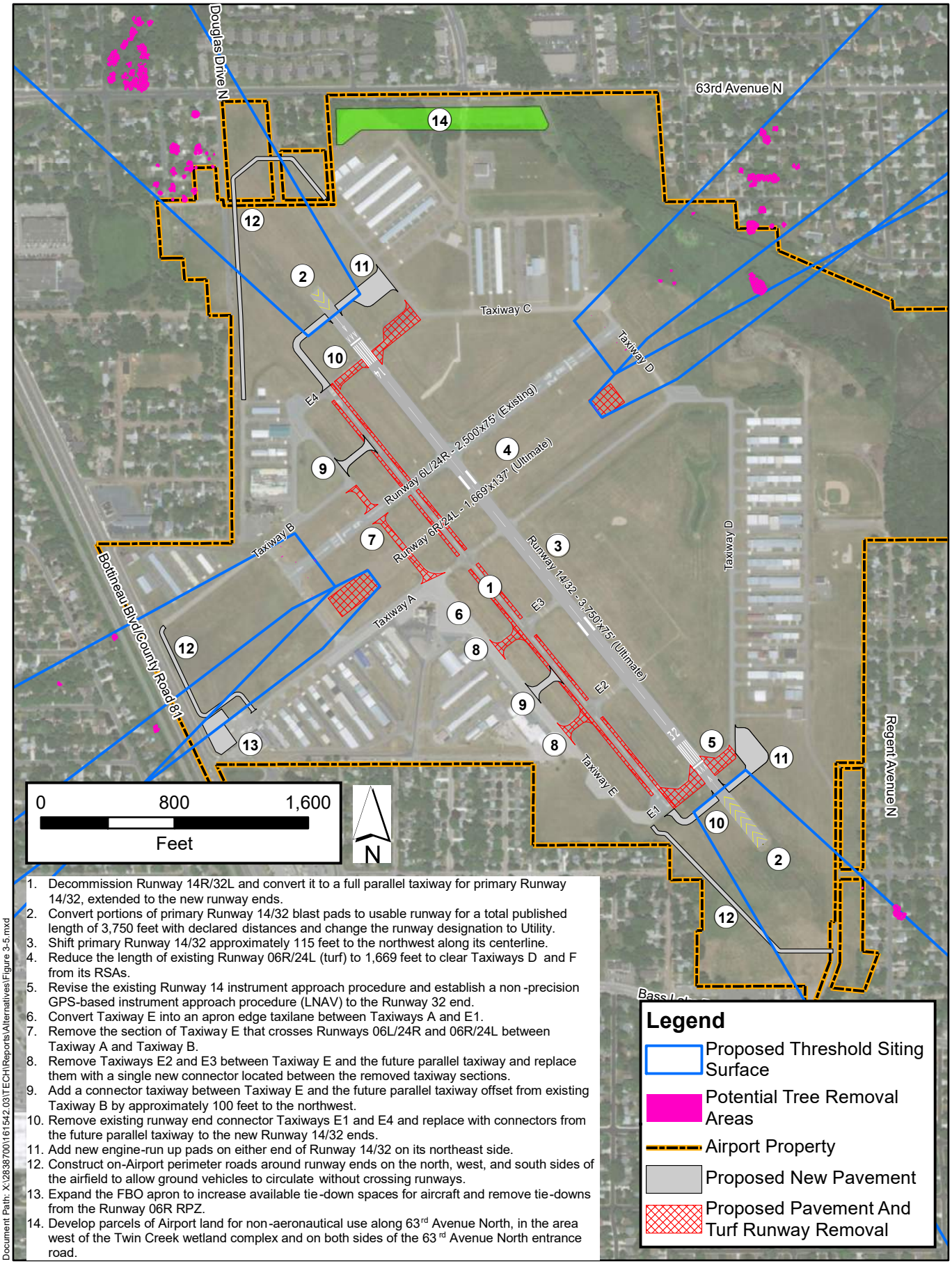

FIGURE 1

Proposed Action
Crystal Airport
Section 4(f) Evaluation

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

    - Remove the section of Taxiway E that crosses Runways 06L/24R and 06R/24L between Taxiway A and Taxiway B.
    - Remove Taxiways E2 and E3 between Taxiway E and the future parallel taxiway and replace them with a single new connector located between the removed taxiway sections.
    - Add a connector taxiway between Taxiway E and the future parallel taxiway offset from existing Taxiway B by approximately 100 feet to the northwest.
    - Remove existing runway end connector Taxiways E1 and E4 and replace with connectors from the future parallel taxiway to the new Runway 14/32 ends.
    - Add new engine-run up pads on either end of Runway 14/32 on its northeast side.
- Construct on-Airport perimeter roads around runway ends on the north, west, and south sides of the airfield to allow ground vehicles to circulate without crossing runways.
- Expand the FBO apron to increase available tie-down spaces for aircraft and remove tie-downs from the Runway 06R runway protection zone (RPZ).
- Develop parcels of Airport land for non-aeronautical use along 63rd Avenue North, in the area west of the Twin Creek wetland complex and on both sides of the 63rd Avenue North entrance road.

The proposed action will require removal of trees in Edgewood Park, which is owned and maintained by the City of Brooklyn Park. Several trees in Edgewood Park are expected to penetrate the proposed Runway 14 approach threshold siting surface (TSS) within five years of project implementation (for more information regarding specific trees see Section 4 of this report). The TSS is designed to protect the use of the runway in both visual and instrument meteorological conditions near the Airport. It has a trapezoidal shape that extends away from the runway along the centerline and at a specific slope. The existing and proposed Runway 14 TSS slopes upward one vertical foot for every 20 horizontal feet starting 200 feet from the Runway 14 landing threshold (the beginning of the runway available for landing). The clearance of the proposed TSS above the ground in the park varies from approximately 82 feet closest to 63rd Avenue North, to approximately 115 feet on the northwest side of the park. The existing TSS is approximately six feet higher than the proposed TSS because the origin of the TSS will shift to the northwest approximately 115 feet with the Runway 14 landing threshold under the proposed action.

3. Description of Section 4(f) Property

Edgewood Park is a neighborhood park in Brooklyn Park, Minnesota. The location of the park with respect to Crystal Airport and other parks in the area, is shown in **Figure 2**. The park property is owned and maintained by the City of Brooklyn Park, its total size is approximately 3.3 acres, and it includes a small playground and a wooded area. The park is not fenced and is open during daylight hours. The north, south, and west sides of the park are bordered by city streets; single-family residential properties border the remaining property boundaries. There is no dedicated vehicle parking for the park, but street parking is available along Florida Avenue to the west and Edgewood Avenue to the north. The playground is situated in the northwest corner of the park, and picnic areas line the northern edge of the wooded area to the south. A wetland complex associated with Twin Creek stretches diagonally across the southern portion of the park from southwest to northeast. There are no marked or clearly maintained walking trails in the wooded area of the park and field observation indicates that the wooded area is rarely used for recreational purposes.

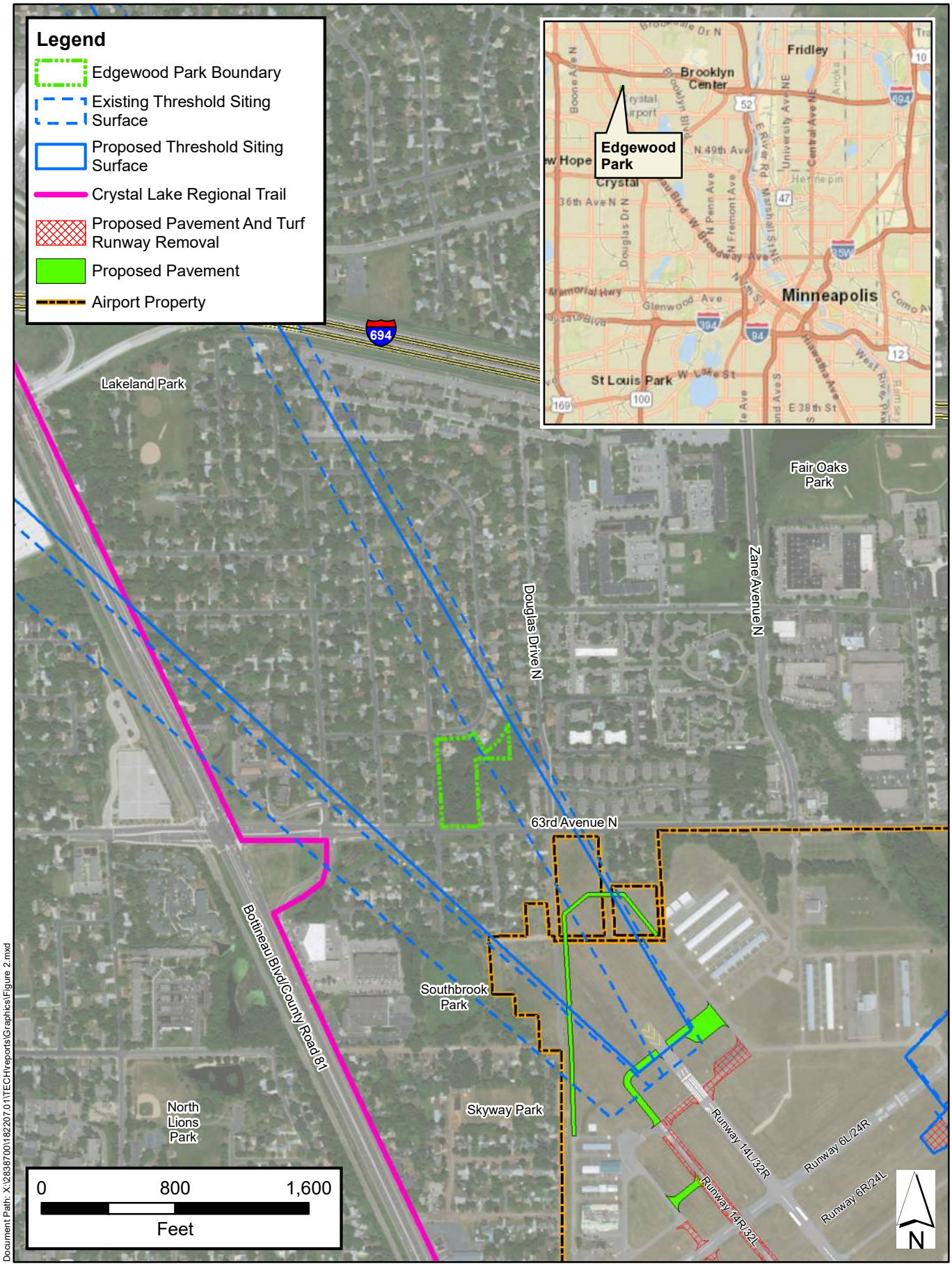

FIGURE 2

Edgewood Park Location Map
Crystal Airport
Section 4(f) Evaluation

Crystal Airport Layout Plan - Prepared by Ricondo, Inc.

Sources: Esri, HERE, DeLorme, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, ©

Clockwise from top: Edgewood Park playground, wooded area south of playground, standing water in wetland at the center of the wooded area.

There are several other City parks nearby, including Southbrook Park one block to the south, Skyway Park three blocks to the south, North Lions Club Park approximately one-half mile to the southwest, Lakeland Park approximately one-half mile to the northwest, and Fair Oaks Park approximately one-half mile to the northeast. Edgewood Park is also approximately two blocks east of the Crystal Lakes Regional Trail, a paved trail for bicycle and pedestrian users that runs through the cities of Crystal and Robbinsdale and connects to the larger Three Rivers trail system to the south. None of these parks or recreational areas will be affected by the proposed action or proposed use of the Section 4(f) property.

Edgewood Park is among 13 of the City's 60 parks that have been identified in the City's Park System Plan as priorities for natural resource management "based on the size and quality of the existing vegetation presently in the park." The Park System Plan also notes that Edgewood Park is within one of the ten census block groups in the city defined as Areas with Majority People of Color and Lower Income (POCLI) and identifies the block group around Edgewood Park as underserved by the parks system.

A property must be a significant resource for Section 4(f) to apply. Resources that meet the 4(f) definition are considered significant unless the official with jurisdiction over the site (in this case, the City of Brooklyn Park) concludes that the entire site is not significant. The City of Brooklyn Park has the authority to determine whether Edgewood Park should be considered a Section 4(f) Resource for the purpose of the Crystal Airport EA/EAW. The FAA may review statements of insignificance.

A certified arborist from Mead & Hunt, Inc., assessed the species, health, and maturity of trees in the park during a field survey on October 3, 2018. The arborist assessed the maturity of the trees based on measurements of trunk diameter and a visual estimate of each tree's height. Location data was mapped for approximately 300 trees representing the larger and more mature trees, while hundreds of smaller trees were observed in the southern portion of the park but were not individually mapped. Light detection and range (LiDAR) information was also collected via airborne remote sensing in September 2018 to provide accurate height information for the tree canopy and specific individual trees in the park.

The wooded area south of playground is not heavily maintained and is dominated by cottonwood (*Populus deltoides*) which constitutes approximately 70 percent of trees in this area. The two other most frequently observed species in the wooded area are boxelder (*Acer negundo*) and Siberian elm (*Ulmus pumila*), each of which constitute approximately 10 percent of trees in this area. The remaining 10 percent of trees in this area consist of various species, including silver maple (*Acer saccharinum*) and hackberry (*Celtis occidentalis).* Some cottonwood and boxelder trees are in an area listed on the National Wetlands Inventory (NWI) mapping tool as a forested/shrub wetland, located at the approximate center of the wooded area.

Trees surrounding the playground north of the wooded area mostly appear to have been planted purposefully and consist of various species including green ash (*Fraxinus pennsylvanica*), silver maple (*Acer saccharinum*), and blue spruce (*Picea pungens*). There is a also an isolated wooded area in the northeast corner of the park that consists primarily of boxelder and Siberian elm.

Approximate tree heights and locations are shown in **Figure 3**, which includes a profile view showing their relationship to the existing and proposed approach TSS for the future Runway 14.

4. Description of Use and Impacts on the Section 4(f) Property

The proposed action will require removal of approximately 32 trees in the southern portion of Edgewood Park, as these trees are expected to become penetrations to the approach TSS for the proposed relocated Runway 14 end. None of these trees currently penetrate the proposed Runway 14 approach TSS, but they all currently reach a height less than 10 feet below the TSS. All trees proposed for removal are cottonwoods, which is the only tree species that is expected to cause ongoing approach issues in the park given their taller than average mature height and their distance approximately 2,000 feet from the proposed Runway 14 end.

Cottonwood is a tall, fast growing species adapted to wet sites. The growth rate of cottonwood trees is much faster and more variable than any of the other species identified. They are rarely purposefully planted in street or residential settings. Their undesirable characteristics are not offset by attractive traits like showy fall color. They seed by wind and will sprout up on any wet site that is not mowed regularly. The seeds they produce are undesirable in residential settings as they regularly clog air conditioners and downspouts. Cottonwoods contribute only minimally to wildlife habitat. They provide some structure for songbirds but produce no edible fruit. They sprout vigorously after pruning, producing weak branches, so removal is the only option that should be considered for obstruction mitigation.

NOTES:
- TREES INDICATED AS "REMOVE" ARE ALL COTTONWOOD TREES WITH HEIGHTS LESS THAN 10 FEET BELOW THE PROPOSED RUNWAY 14 APPROACH TSS.
- TREES INDICATED AS "MONITOR" ARE ALL COTTONWOOD TREES WITH HEIGHTS MORE THAN 10 FEET BELOW THE PROPOSED RUNWAY 14 APPROACH TSS.
- TREES INDICATED AS "KEEP" ARE ALL NON-COTTONWOOD SPECIES WITH HEIGHTS MORE THAN 20 FEET BELOW THE PROPOSED RUNWAY 14 APPROACH TSS.
- HEIGHTS OF TREES GREATER THAN 940 MSL ARE BASED ON TREE CANOPY HEIGHTS IDENTIFIED USING LIDAR DATA COLLECTED IN SEPTEMBER 2018.
- HEIGHTS OF TREES LESS THAN 940 MSL REPRESENT TREES BELOW THE CANOPY AND WERE ESTIMATED BASED ON SPECIES TYPE.

PROPOSED TSS APPROACH SURFACE SLOPE 20:1

EDGEWOOD AVENUE N

PARK BOUNDARY

PLAYGROUND

FLORIDA AVENUE N

WOODED AREA

EXISTING/PROPOSED RUNWAY 14-32 EXTENDED CENTERLINE

63RD AVENUE N

LEGEND

Tree Recommendations:
- Keep
- Monitor
- Remove

AGL Above Ground Level

0 40 80

EDGEWOOD PARK PLAN VIEW

PROFILE SCALE
HORIZONTAL: 1"=80'
VERTICAL: 1"=20'

EXISTING TSS APPROACH SURFACE SLOPE 20:1

PROPOSED TSS APPROACH SURFACE SLOPE 20:1

10'

10'

1000 990 980 970 960 950 940 930 920 910

-27+00 -26+00 -25+00 -24+00 -23+00 -22+00 -21+00 -20+00

CRYSTAL AIRPORT
CRYSTAL, MINNESOTA
EDGEWOOD PARK
SECTION 4(F) EVALUATION

EXISTING TREE PLAN & PROFILE

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12/11/2018

FIGURE 3

1/2/2019 10:31:54 AM
X:\2838700\182207.01\TECH\REPORTS\GRAPHICS\FIGURE 3.DWG

Nearly all cottonwood trees proposed for removal are in the southeast corner of the park. Most of these trees are between 80 and 90 feet tall, with a diameter between 15 and 30 inches. Larger cottonwoods proposed for removal are located further north and west and range from 85 feet tall to a maximum of 97 feet tall, with a diameter between 25 and 50 inches. The shorter cottonwoods proposed for removal are in upland areas with a ground surface elevation of approximately 869 to 870 feet above mean sea level (MSL). The taller cottonwoods are in lower areas between 865 and 868 feet MSL near the wetland area at the center of the wooded portion of the park.

The LiDAR height data indicate that the current maximum height of cottonwood trees in upland areas further from the wetland is about 90 feet, while trees in lower areas near the wetland grow more massive but only marginally taller, with no trees observed with heights greater than 100 feet. According to the *Textbook of Dendrology* by Harlow, Harrar, Hardin, and White, the average mature height for a cottonwood is 100 feet, although they do grow taller in some instances.

The City of Brooklyn Park has requested that several additional cottonwoods along the southern edge of the park be removed at the same time. These additional cottonwoods were not identified as potential penetrations to the approach TSS, but they are in poor health and//or represent a safety hazard to pedestrians.

Approximately 70 additional cottonwood trees were identified that currently reach a height between 10 and 20 feet below the TSS. These trees range in height from 83 to 95 feet tall. If in the future these trees were to grow to the average mature height of 100 feet noted above, none of them will penetrate the TSS given their current distance below the surface. Therefore, the potential future obstruction status of these trees is uncertain, and the MAC proposes to monitor the height of these trees following project implementation rather than remove them as part of the proposed action.

None of the purposefully planted trees surrounding the playground and picnic area in the northern portion of the park are expected to penetrate the proposed TSS, nor will any of the Boxelder or Siberian elm trees located in the isolated wooded area in the northeast corner of the park.

5. Avoidance Alternatives

The no-action alternative is not an acceptable alternative to the proposed action because it does not meet the purpose and need for the project, as it would not provide the required primary runway length for critical design aircraft needs. Under the no-action alternative, the Runway 14 approach TSS would remain in its existing location approximately 115 feet southeast of its proposed location. The existing Runway 14 approach TSS is depicted in profile with relation to the trees in Edgewood Park in Figure 3. As shown, the existing Runway 14 approach TSS is approximately six feet higher over the park than it is under the proposed action. There are approximately 12 trees reaching heights less than 10 feet below the existing Runway 14 approach TSS, compared to approximately 32 trees under the proposed action. There are also approximately 34 trees reaching heights between 10 and 20 feet below the existing Runway 14 approach TSS, compared to approximately 70 trees under the proposed action. Although there are fewer trees within 20 feet of the Runway 14 approach TSS under the no-action alternative, tree removal in the park and/or monitoring of trees for future obstruction status would still be needed.

The only alternatives that would completely avoid the need for tree removal in the park and/or monitoring of trees for future obstruction status are to 1) allow penetrations to the Runway 14 TSS, 2) reduce the length of the primary runway, 3) realign the primary runway, or 4) close the primary runway. The first option is not an acceptable alternative to the proposed action because it does not meet the purpose and need for the project, as it would not enhance instrument approach capability and mitigate penetrations for both ends of the main primary runway. The second and fourth options are also unacceptable because they do not meet the purpose and need for the project, as they would not provide the required primary runway length for critical design aircraft needs. The third option is not acceptable because the current primary runway is centrally located on Airport property and therefore minimizes impacts to both on-Airport and off-Airport land uses. Any rotation or lateral/longitudinal shift of the runway will necessarily result in greater impacts to land uses and environmental resources in the project area and general vicinity. Furthermore, this alternative would be much costlier than the proposed action, which makes efficient use of existing Airport infrastructure, and is likely cost-prohibitive.

Based on the above, there is no acceptable alternative that meets the purpose and need for the project, minimizes impacts to other land uses and environmental resources, and avoids the need for tree removal in Edgewood Park and/or monitoring of trees for future obstruction status.

6. Minimization and Mitigation of Harm

A Section 4(f) evaluation should address all possible measures to minimize harm. For parks, recreation areas, and wildlife and waterfowl refuges, measures to minimize harm may include: design modifications or design goals; replacement of land or facilities of comparable value and function; or monetary compensation to enhance the remaining property or to mitigate the adverse impacts of the project in other ways. All mitigation measures require appropriate documentation and coordination between the responsible federal agency (FAA), project sponsor (the MAC), and the official with jurisdiction (City of Brooklyn Park).

The removal of cottonwood trees and establishment of more desirable species to prevent regrowth of the cottonwoods, or establishing and maintaining turf grasses, are the only cost-effective solutions. Pruning the cottonwoods will be a constant expense with no benefits to the community. Removing the cottonwoods while they are shorter will be less costly than waiting until they become obstructions. They could be replaced with tree species which will be beneficial to the park environment and the community surrounding it. Hackberry (*Celtis occidentalis)* is an example of a species that is currently thriving on the site. This attractive tree will never grow to be an obstruction and the investment made in planting this or other desirable species will improve the public's use of the park. The cottonwoods currently on the site do little to contribute to the park environment. The cottonwood trees make the site look "forested" and provide some shade but represent long-term maintenance and safety problems. The "cotton" seeds can cover the landscape in the spring, but the bigger concern is the high potential to drop large branches as the trees age. Rot at the base of the trunks is also common. The wood is not rot resistant and tall trees can do serious damage when they fall.

All tree removal contract language will include assurances that ANSI A300 standards be followed. Desirable trees which are currently located adjacent to the trees designated for removal will be identified prior to the start of the removal operations. Contract language will provide assurances which protect desirable trees to the extent reasonable and feasible, and to provide replacements if the desirable trees are damaged during removal operations. To avoid and minimize impacts to birds and other animals that may roost or nest in the trees during the summer months, tree removal will be completed between October and April. Tree removal during frozen ground conditions will also decrease rutting and compaction of the soil. Tree removal will be limited to that specified in project plans. Tree removal limits will be clearly indicated in the field by bright orange flagging/fencing prior to any tree clearing to ensure contractors stay within clearing limits. Tree clearing limitations will be discussed with contractors at the pre-construction meeting to ensure that they understand clearing limits and how they are marked in the field. All the wood, foliage, and other material including wood chips will be removed from the site. Where appropriate, stumps will be left in place to control erosion and herbicide will be applied to the stumps to prevent sprouting. Equipment will be cleaned and stored in established staging areas prior to, during, and following tree removal to minimize the spread of invasive plant seeds to off-site areas or other areas on-site. Removal of non-native plant species already established in tree removal areas, such as common buckthorn (*Rhamnus cathartica*), will also be considered.

Tree species selection for replacements will be part of a landscape and/or wildlife management plan developed in concert with the park's owner. Species to be planted in the maintained park area will be selected for characteristics that contribute to the park environment. Hackberry (*Celtis occidentalis),* bitternut hickory (*Carya cordiformis*), red oak (*Quercus rubra*), and bur oak (*Quercus macrocarpa*) are examples of suitable replacement native species. Any tree or shrub species which are identified as contributing to wildlife habitat and do not have the growth potential to be obstructions will be acceptable in the unmaintained areas. Seeding native woodland herbaceous species in canopy openings after cottonwood removal will provide ground cover for erosion control and help prevent establishment of garlic mustard, burdock, and other invasive species. Virginia wildrye (*Elymus virginicus*), bottlebrush grass (*Elymus hystrix*), cut-leaf coneflower (*Rudbeckia laciniata*), and hispid buttercup (*Ranunculus hispidus*) are a few candidates for seeding.

Removal of the cottonwood trees will not substantially change the wooded character of the park or the available habitat types, nor will it change the wetland type or substantially alter its tree cover. Tree removal will be carefully targeted, clear-cutting stands of trees will not be required, all available measures will be taken to minimize impacts to other trees, and the MAC will replace the trees with other shorter and more suitable species for the park environment. For these reasons, the use of Edgewood Park as a neighborhood park and as a natural resource is not expected to be impaired by the proposed action.

According to the FAA's 1050.1F Desk Reference, and the FHWA's July 20, 2012 Section 4(f) policy paper, if the proposed project will not adversely affect the activities, features, or attributes qualifying a park for protection under Section 4(f), the FAA may make a *de minimis* determination about the use of a Section 4(f) property. To make a *de minimis* determination, the NEPA documentation needs to support the finding that there is no adverse effect to the activities, features, and attributes of the resource. This finding can consider mitigation measures.

7. Coordination

During development of this Section 4(f) evaluation, the project proposer (MAC) met on several occasions with the official(s) with jurisdiction over the Section 4(f) property (the City of Brooklyn Park). The MAC also met with responsible federal agency (FAA) staff responsible for this evaluation on several occasions. Coordination included discussion of avoidance alternatives, impacts to the property, and mitigation measures. Coordination with the City of Brooklyn Park also included a discussion of the property's significance and primary use of the property.

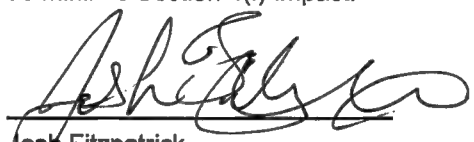
The FAA must provide an opportunity for public review and comment on this Section 4(f) evaluation report. This public review period will be held concurrently with the public comment period for the Draft EA/EAW, which is expected to commence in April 2019 and extend for a period of 45 days. If comments are not received within 15 days of the comment deadline, a lack of objection may be assumed and the process may proceed to a Final Evaluation. After the opportunity for public comment, the City must concur in writing that the project will not adversely affect the activities, features, or attributes that make the property eligible for Section 4(f) protection.

If any agencies raise issues during coordination, Section 4(f) requires follow-up coordination. While the regulation does not stipulate that these issues be resolved successfully, the regulation calls for reasonable efforts and good-faith attention by decision makers to resolve any issues arising during coordination. This evaluation and finding captures discussions and coordination that has taken place between the FAA, MAC representatives, and the City of Brooklyn Park.

After the comment period is complete, the FAA will make a final decision based on the information provided above, any public comments received, and in coordination with the City of Brooklyn Park as to whether the effects of the proposed project on Edgewood Park constitute a *de minimis* Section 4(f) impact.

8. Preliminary Finding

After careful and thorough consideration of the facts contained herein, the undersigned finds that the proposed federal action is consistent with Title 49 USC § 303 and other applicable environmental requirements. The proposed federal action will not significantly affect Edgewood Park and constitutes a *de minimis* Section 4(f) impact.



Josh Fitzpatrick
Environmental Protection Specialist
Federal Aviation Administration
Dakota-Minnesota Airport District Office

11- February 2019
Date

U.S. Department
of Transportation
Federal Aviation Administration

Dakota-Minnesota Airports District Office
Bismarck Office
2301 University Drive, Building 23B
Bismarck, ND 58504

Dakota-Minnesota Airports District Office
Minneapolis Office
6020 28th Avenue South, Suite 102
Minneapolis, MN 55450

February 11, 2019

Ms. Cindy Sherman
Planning Director
Brooklyn Park Community Development Department, City Hall
5200 85th Avenue North
Brooklyn Park Minnesota 55443

Re: Section 4(f) de minimis Finding for a Safety Improvement and Airport Development Project at the Crystal Airport

Dear Ms. Sherman:

The Crystal Airport (MIC), in cooperation with the Federal Aviation Administration (FAA), is proposing to address airfield safety concerns and enhance Airport development opportunities. Because of the frequency of runway incursions at MIC, the FAA included the Airport in its national initiative known as the runway incursion mitigation (RIM) program. Runway incursions occur when an aircraft, vehicle, or person enters the protected area of an airport designated for aircraft landings and takeoffs. The FAA works with airport sponsors included in the RIM program to identify, prioritize, and develop strategies to mitigate risks at airfields with a history of runway incursions. The proposed action will modify the airfield at MIC to reduce the likelihood of future runway incursions.

Section 4(f) of the US Department of Transportation (DOT) Act requires the DOT to make an effort to preserve public park and recreation lands; wildlife and waterfowl refuges, and historic sites. It also prohibits the use of Section 4(f) resources if a feasible and prudent alternative is available. In accordance with the requirements of Section 4(f), the FAA has issued the attached Preliminary Section 4(f) de minimis finding for tree removal impacts to nearby Edgewood Park related to the proposed improvements to the Airport.

The FAA respectfully requests that you review the finding and provide comments or concurrence as appropriate. I have also attached a tree growth study that was utilized to aid in our analyses for impacts to Edgewood Park trees. Please let me know if you have questions or desire further information.

Sincerely,

Joshua Fitzpatrick
Environmental Protection Specialist
FAA – Minneapolis Airport District Office

Cc: Evan Barrett, Mead & Hunt

Brooklyn Park Recreation & Parks

City of Brooklyn Park
Community Activity Center
5600 85th Ave. N.
Brooklyn Park, MN 55443
763-493-8333
www.brooklynpark.org

March 7, 2019

Mr. Joshua Fitzpatrick
Environmental Protection Specialist
FAA-Minneapolis Airport District Office
6020 28th Ave. So. Suite 102
Minneapolis, MN 55450

Re: Section 4(f) de minimis Finding for a Safety Improvement and Airport Development Project at the Crystal Airport.

Dear Mr. Fitzpatrick,

The City of Brooklyn Park has worked closely with MAC and Mead & Hunt representatives to develop a plan for tree removal in Edgewood Park that will provide increased safety for Crystal Airport and not be detrimental to the park.

Staff has reviewed the Section 4(f) Evaluation and Preliminary Finding and are in concurrence with the information, analysis and recommendations in the document as presented.

Please let me know if you require additional information.

Sincerely,

Jody Yungers
Director of Recreation and Parks
City of Brooklyn Park

c. Cindy Sherman, Planning Director
Evan Barrett, Mead & Hunt
Neil Ralston, MAC

Brooklyn Park
Community Development

City of Brooklyn Park
City Hall
5200 85th Ave. N.
Brooklyn Park, MN 55443
763-424-8000
www.brooklynpark.org

July 19, 2019

Mr. Joshua Fitzpatrick
Environmental Protection Specialist
Federal Aviation Administration (FAA)
Minneapolis Airports District Office
6020 28th Avenue South, Suite 102
Minneapolis, MN 55450

Re: Final Section 4(f) *de minimis* finding for Edgewood Park

Dear Mr. Fitzpatrick,

As noted in our letter dated March 7, 2019, the City of Brooklyn Park has worked closely with Metropolitan Airports Commission (MAC) and Mead & Hunt representatives to develop a plan for tree removal in Edgewood Park that will provide increased safety for Crystal Airport and not be detrimental to the park. In that letter, the City concurred with the information, analyses, and recommendations contained in the FAA Preliminary Section 4(f) *de minimis* finding dated February 11, 2019.

We understand that the Preliminary Section 4(f) *de minimis* finding was published for public review and comment on April 22, 2019, and that the opportunity for public comment concluded on June 10, 2019. After reviewing the public comment record compiled during the comment period, the City of Brooklyn Park concurs with the FAA that the proposed action at Crystal Airport will not adversely affect the activities, features, or attributes that make the property eligible for Section 4(f) protection.

Sincerely,

Cindy Sherman

Planning Director
City of Brooklyn Park

Appendix E – Hazardous Materials References

WENCK File #0052-191
December 2014
Updated: June 2018

Spill Prevention, Control & Countermeasure Plan (SPCC)

DRAFT

Prepared for:

Metropolitan Airports Commission
Crystal Airport
Title 40 Code of Federal Regulations Chapter 112
(40 CFR 112)

6220 Zane Avenue North
Crystal, Minnesota 55429

WENCK ASSOCIATES
Responsive partner.
Exceptional outcomes.

Prepared by:

WENCK Associates, Inc.
1802 Wooddale Drive, Suite 100
Woodbury, MN 55125-2937
Phone: (651) 294-4580
Fax: (651)-228-1969

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USEPA SPCC REQUIREMENTS

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Amendment of Spill Prevention, Control, and Countermeasure Plan by Regional Administrator		
4(a)	Facility discharges submit information to the Regional Administrator	Appendix A: SPCC Poster Plan, Table C, Appendix F
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7(a)	Management commitment	Appendix C
7(a)(3)	The physical layout of the facility • Diagrams • Countermeasures for discharge discovery and response • Methods for disposal of recovered materials • Contact list and phone numbers	Site Map Appendix A: SPCC Poster Plan, Table A and Table B, Appendix I
7(b)	Plan a prediction of the direction, rate of flow, and total quantity of oil which could be discharged from the facility as a result of major equipment failure	Appendix A: SPCC Poster Plan, Table E
7(c)	Provide appropriate containment and/or diversionary structures or equipment to prevent a discharge	Appendix A: SPCC Poster Plan, Table D and Table I
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40 CFR 120	Certification of Substantial Harm	Appendix B

***Tables are found in Appendix A.**

1.0 Introduction

1.1 APPLICABILITY STATEMENT

The United States Environmental Protection Agency (USEPA) requires owners of non-transportation-related oil and petroleum products facilities to develop and implement a Spill Prevention, Control and Countermeasure (SPCC) Plan. SPCC Plans must be prepared and implemented if: the capacity of any aboveground storage tank (AST) or the total aboveground aggregate storage capacity is 1,320 gallons or more; and, due to its location, the facility could potentially allow discharge of oil into or upon the navigable waters of the United States.

This SPCC Plan is required of The Metropolitan Airport Commission (MAC) because petroleum products stored at the facility exceed the above referenced threshold; and, due to its location, the facility could potentially allow discharge of oil into or upon the navigable waters of the United States. The purpose of the SPCC Plan is to prevent the occurrence of oil spills by the use of sound engineering and management controls; and prevent discharge of oil into or upon navigable waters of the United States or adjoining shorelines (including discharge of oil via groundwater). In the event a discharge occurs, the Plan identifies control and countermeasures. This SPCC Plan has been prepared in general accordance with Title 40, Code of Federal Regulations (CFR), Part 112. This Plan is prepared for MAC owned and operated facilities and properties associated with Crystal Airport and is not intended for use by users or tenants of the airport.

1.2 PLAN AVAILABILITY

40 CFR 112.3(e)

The SPCC Plan is not required to be filed with USEPA, but a copy must be available for on-site review by the regional administrator during normal working hours. A complete copy of this SPCC Plan will be available in the Maintenance Manager's Office and Environmental Administrators office.

1.3 SITE DESCRIPTION

40 CFR 112.7(a)(3)

Crystal Airport is categorized as an "intermediate" use airport. Crystal Airport accommodates personal, commercial, military, and instructional uses. Airport property is owned by the MAC, and property is leased to tenants involved in the various support, handling, storage, refueling and general transportation activities associated with an intermediate use airport. Crystal Airport operates year-round. The airport location is shown on Figure 1.

Three MAC Maintenance Buildings serve the maintenance needs of the Crystal Airport. The fuel tank on-site is used year-round to fuel airport vehicles. General site conditions are described in Figure 2.

2.0 Certification and Review

2.1 PROFESSIONAL ENGINEER'S CERTIFICATION

40 CFR 112.3(d)

I attest that I am familiar with the requirements of the SPCC Rule; I or my designated agent have visited and examined the facility; the Plan has been prepared in accordance with good engineering practices, including consideration of applicable industry standards and with the requirements of the SPCC Rule; procedures for required inspections and testing have been established and the Plan is adequate for the facility.

Signature/Date:	_____
Name:	Denise Kazmierczak
Registration:	Minnesota Professional Engineer Registration #26594

2.2 PLAN REVIEW AND RECERTIFICATION

40 CFR 112.5

The SPCC Plan shall be amended, within six months, whenever there is a change in the facility's design, construction, operation, or maintenance which materially affects the facility's spill potential for the discharge of oil into or upon the navigable waters of the United States or adjoining shorelines. The Plan must be reviewed at least once every five years, and amended to include more effective prevention and control technology, if: (1) such technology will significantly reduce the likelihood of a spill, and (2) if such technology has been proven in the field. Changes to the Plan must be re-certified by a registered professional engineer.

Due to the site specific details related to individual facility changes, CHS requires that each proposed change be reviewed by corporate engineering to assist in making a determination for professional engineer recertification. Examples of changes that may require amendment of the Plan and certification include but are not limited to:

- Commissioning or decommissioning bulk storage containers (mineral oil or other tank);
- Replacement, reconstruction or movement of bulk storage containers;
- Replacement or installation of piping systems;
- Altering secondary containment structures; or
- Modification of tank inspection guidelines.

Non-technical changes not requiring the exercise of good engineering practice do not require P.E. certification. Such non-technical changes include but are not limited to:

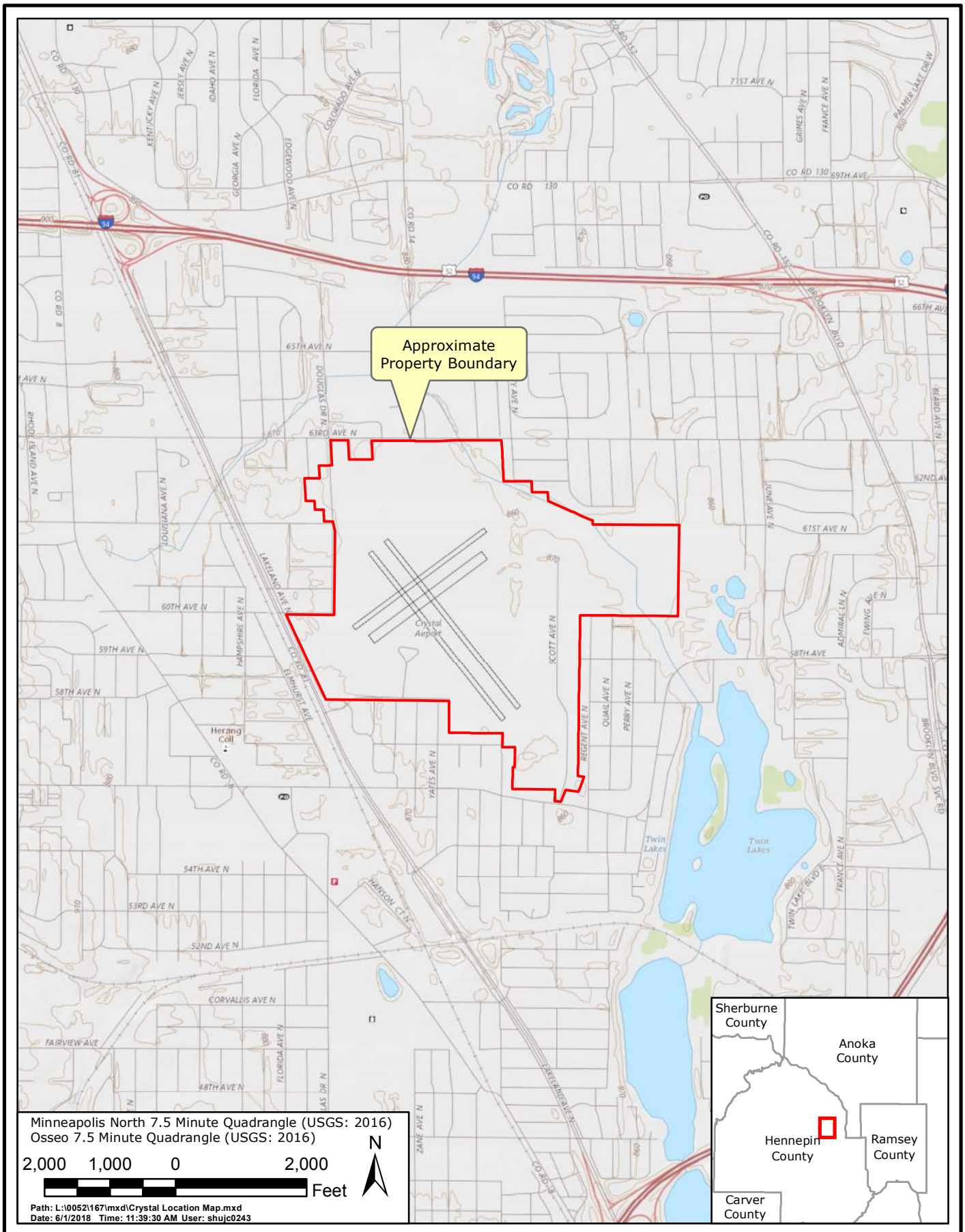
- Changes to the contact list;
- Modifications to transfer procedures;

- Activation / deactivation of existing mineral oil distribution equipment (pumps, piping, etc.) that remains in place (not decommissioned);
- Requirements for storm water discharges; or
- Changes associated with location and handling of 55-gallon drums.

The table below is to be completed following each review, evaluation, and/or amendment.

Review Date	**Review Comments/ Amendments**	**Directed By:**	**PE certification required**
12/1991	Original Plan	Wenck Associates, Inc.	**Y / N**
9/1993	Plan Update	Wenck Associates	**Y / N**
5/1997	Plan Amendments	Wenck Associates	**Y / N**
8/2001	Plan Reviewed with Amendments	Wenck Associates	**Y / N**
8/2003	Reviewed, evaluated, and amended as a result	MAC/Wenck Associates	**Y / N**
1/2009	Reviewed, evaluated, and amended as a result	MAC/Wenck Associates	**Y / N**
12/2014	Reviewed, evaluated, and amended as a result	MAC/Wenck Associates	**Y / N**
6/2018	Added ASTs in Maintenance Building	MAC/Wenck Associates	**Y / N**

Figures



METROPOLITAN AIRPORTS COMMISSION
CRYSTAL AIRPORT
Site Location

WENCK
Responsive partner. Exceptional outcomes.

JUNE 2018

Figure 1

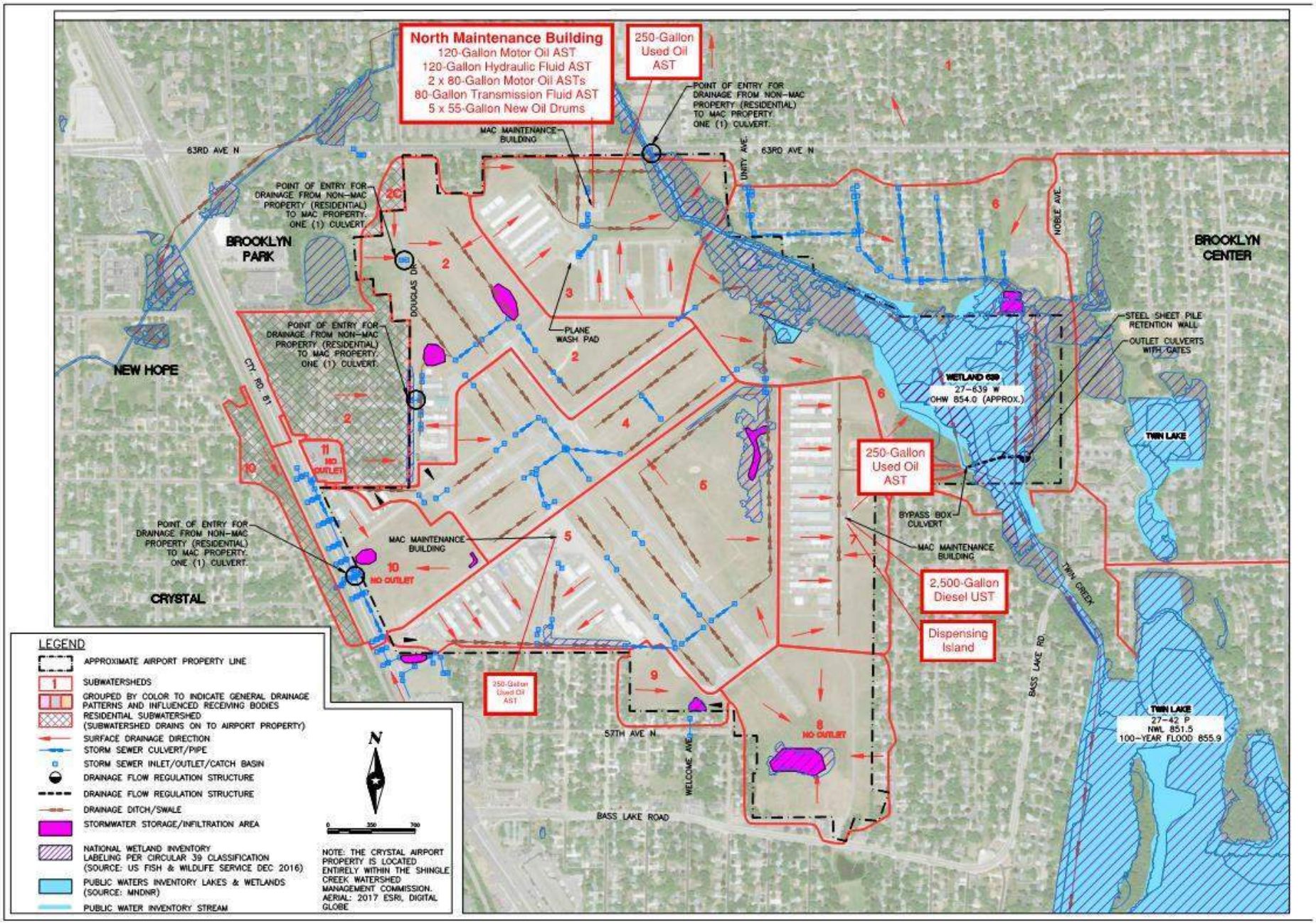


FIGURE 2

APRIL 2015
REVISED MARCH 2018

CRYSTAL AIRPORT (MIC)
AIRFIELD DRAINAGE MAP
CRYSTAL, MN

SEH

MINNEAPOLIS AIRPORTS COMMISSION - CRYSTAL

SITE LAYOUT MAP

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MAY 2018

FIGURE 2

Appendix A

Spill Prevention, Control & Countermeasure Poster Plan

Spill Prevention, Control & Countermeasure Plan

SPCC Plan - 40 CFR 112

Metropolitan Airports Commission
Crystal Airport
6220 Zane Avenue North
Crystal, Minnesota 55429

A—SPILL RESPONSE PROCEDURES

112.7(a)(3)

Spill Occurs

Is the Spill an Emergency? > 5-Gal?

No → **Stop Leak at Source and Contain/ Absorb Spill**

Yes →

Notify Fire Department 911

Notify Duty Officer 800-422-0798

Contact MAC Operations 612-726-5111

Contact Reliever Environmental Admin. 612-725-6429

Spill Remediation Requires Assistance?

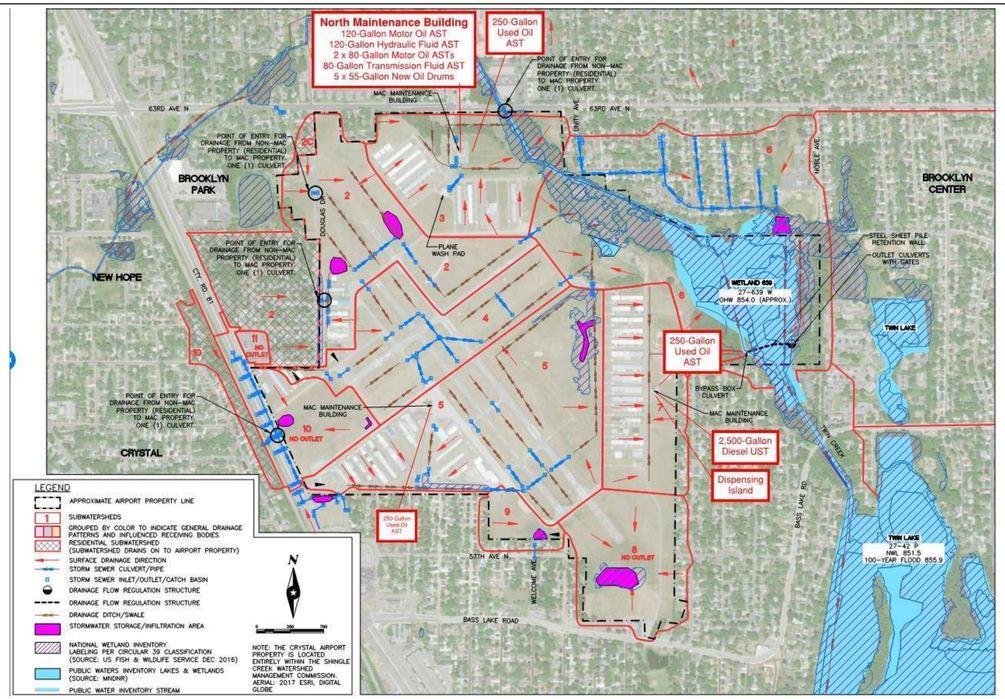
Yes → **Make Necessary Contacts**

Provide Spill Containment/Clean up direction

Prepare Written Report (See Spill Reporting in Appendix F of Bound Copy) → **File Copy with SPCC**

Submit Report to MAC Environmental Administrator

MAC has the primary responsibility for providing the initial response to oil discharge incidents originating from its facility. To accomplish this, MAC has designated the Environmental Administrator as the qualified oil discharge Emergency Coordinator (EC) in the event of an oil discharge.



B—CONTACTS

112.7 (a)(3)

EMERGENCY CONTACTS

(DESIGNATED PERSONNEL RESPONSIBLE FOR OIL SPILL PREVENTION) [112.7(f)(2)]

MAC Contacts

MAC Operations Center 612-726-5111
MAC Env. Admin., Mike Harder 612-725-6429
MAC Director of Relievers, Gary Schmidt 612-726-8135
Crystal MAC Maintenance, Scott Hielscher 612-919-5371

Response Contractors

Wenck Response Services 800-368-8831

AGENCY CONTACTS

National Spill Response Center: 800-424-8802
Minnesota Pollution Control Agency (MPCA): 651-649-5451
Minnesota Duty Officer: 800-422-0798
Met. Council Environmental Services: 651-602-1000

C—PLAN SUBMITTAL AND SPILL REPORTING

112.4

Submit this Plan and written report to the USEPA Region V Reg. Admin. within 60 days, along with other information specified in CFR 112.4 and a written report, if either of the following occurs:

1. The facility discharges more than 1,000 gallons of oil in a single discharge into or upon the navigable waters of the United States or adjoining shorelines in a single event; and/or
2. The facility discharges more than 42 gallons of oil in each of two discharges within any 12-month period

The written report is to contain the following information : (See Spill Reporting Form in Appendix F)

1. Name of the facility;
2. Name(s) of the owner or operator of the facility;
3. Location of the facility;
4. Date and year of initial facility operation;
5. Maximum storage or handling capacity of the facility and normal daily throughput;
6. Description of the facility, including maps, flow diagrams, topographical maps, and other maps;
7. A complete copy of the SPCC Plan with any amendments;
8. The cause(s) of spill(s), including a failure analysis of the system or subsystem in which the failure occurred;
9. The corrective actions and/or countermeasures taken, including an adequate description of equipment repairs and/or
10. Additional preventive measures taken or contemplated to minimize the possibility of recurrence;
11. Such other information as the Regional Administrator may reasonably require pertinent to the plan or spill event.

D—STORAGE AREAS

(see Appendix I)

Tank / Container ID (See Site Map Above)	Contents / Capacity 112.7(a)(3)(i)	Location Description	Reportable Quantity (Minnesota)	Tank Material 112.8(c)(1) & 112.12 (c)	Secondary Containment Type 112.8(c)(2) 112.7(c)	Tank Overfill Prevention 112.8(c)(8)	Tank Inspection Type and Frequency 112.7(e) 112.8(c)(6)
AST-1	Used Oil / 250 gallons	Outside, East Cold Storage Building	>5 gallons	Steel	Concrete Berm	Visual	Visual, Monthly
AST-2	Used Oil / 250 gallons	Outside, North MAC Maintenance Building	>5 gallons	Steel	Concrete Berm	Visual	Visual, Monthly
AST-3	Used Oil / 250 gallons	Outside, Tower Building	>5 gallons	Steel	Concrete Berm	Visual	Visual, Monthly
AST-4	Motor Oil / 120 gallons	Inside, Maintenance Building	>5 gallons	Plastic	Containment Room	Visual	Visual, Monthly
AST-5	Hydraulic Fluid / 120 gallons	Inside, Maintenance Building	>5 gallons	Plastic	Containment Room	Visual	Visual, Monthly
AST-6	Motor Oil / 80 gallons	Inside, Maintenance Building	>5 gallons	Plastic	Containment Room	Visual	Visual, Monthly
AST-7	Transmission Fluid / 80 gallons	Inside, Maintenance Building	>5 gallons	Plastic	Containment Room	Visual	Visual, Monthly
AST-8	Motor Oil / 80 gallons	Inside, Maintenance Building	>5 gallons	Steel	Containment Room	Visual	Visual, Monthly
Drums	New Oil / 55 gallons	Cold Storage, Maintenance, and Tower Buildings	>5 gallons	Steel	Containment Pallets, Concrete Floor	Visual	Visual, Monthly
UST-1	Diesel/ 2,500 gallons	Outside, South of the Cold Storage Building	>5 gallons	Steel	Double Wall UST	Electric Gauge	Elec. Leak Detect

Federal Reportable Quantity: Report spills / releases of any quantity that reach, or have the potential to reach, any natural surface water or the environment (air, soil, storm drain) to the National Response Center.
If a release in any way causes harm or threatens to cause harm to public health and safety, the environment, or property, immediate notification is required.

E - POTENTIAL SPILL SCENARIOS

112.7(b)

POTENTIAL EVENT	SPILL DESCRIPTION	VOLUME RELEASED	SPILL RATE
(ASTs 1-3) 250-Gallon Used Oil AST (outside Cold Storage, Maintenance, and Tower Buildings)			
Complete or partial failure of a full aboveground tank	Release would be contained within the concrete secondary containment system. If the berm also failed, oil would pool within the immediate area where it could be recovered.	1-250 gallons	Gradual to instantaneous
(ASTs 4-8) 80 and 120-Gallon Tanks in the Maintenance Building			
Complete or partial failure of a full aboveground tank	Release would be contained within the concrete basin below the containment room floor grate.	1-250 gallons	Gradual to instantaneous
Various 55-gallon drums (Cold Storage, Maintenance, and Tower Buildings)			
Complete or partial failure of a full drum	Oil would initially be captured in the plastic containment pallet. If the containment failed, oil would pool within the building's flammable trap where it could be recovered.	1-55 gallons	Gradual to instantaneous
(UST 1) 2,500-gallon diesel UST (South of East Cold Storage Building)			
Hose leak during truck loading or dispensing	Oil would be contained within the immediate area using spill response equipment. Oil would likely be contained on-site on the concrete surface surrounding the tank where it would be recovered.	1-2,500 gallons	Gradual to instantaneous

The time for a ruptured tank to completely empty is indeterminate and expected to be brief. For purposes of calculating a maximum spill rate, it is assumed that the ruptured tank would be completely emptied in 2 minutes.

A fuel line leak/rupture or container overflow is the most likely spill scenario. The spill scenario is outlined in Table I.

F—FACILITY DRAINAGE

112.8(b) & 112.12(b)

GENERAL DRAINAGE AND SITE STORMWATER STRUCTURES

MAC oil storage locations (indoor and outdoor) are equipped with one of, or a combination of the following; double walls, containment structures, containment rooms, spill pallets, and spill kits providing secondary containment for the bulk storage containers used for "oil" storage. Therefore, tank failures would not be expected to reach navigable waterways. The most likely potential for a spill event occurrence is due to operational or equipment failure during oil product transfers; however a number of events can cause releases. See Table A of this poster for further information on spill response procedures and Table I for the spill scenario.

Conceptual stormwater flow is shown on Figure 2.

STORMWATER INSPECTION AND DISPOSAL
112.8(b)(1)

Secondary containment structures are not exposed to stormwater at this facility.

G—INSPECTIONS AND RECORDS

112.7(e)

Monthly inspection forms are provided in Appendix E.

Inspection records are area available upon request for a minimum of five years.

112.8(c)(6) & 112.12(c)

The facility deviates from 112.8(c)(6) per 112.7(a)(2) by providing "Equivalent Environmental Protection" in place of integrity testing.

Equivalent Environmental Protection is provided through the following good engineering practices and USEPA criteria for protecting navigable waters:

- Use of shop fabricated tanks (no field erected tanks).
- Tank capacity is less than 30,000 gallons.
- Tanks are elevated so all sides are visible or placed on a barrier (between tank and ground) to ensure leak detection.
- Properly sized secondary containment.
- Monthly visual inspections.

Follow Steel Tank Institute Standard for inspection of ASTs (SP001).

STI Standard for Inspection of ASTs

Shop Fabricated	Category 1 Tanks (0-1100-gallons)	Formal External Inspection	Formal Internal Inspection
ASTs 1-3	250 Gal Used Oil	Not Req'd by STI for this tank	Not Req'd by STI for this tank
ASTs 4-5	120 Gal New Oil	Not Req'd by STI for this tank	Not Req'd by STI for this tank
ASTs 6-8	80 Gal New Oil	Not Req'd by STI for this tank	Not Req'd by STI for this tank
Drums	55 Gal New Oil	Not Req'd by STI for this tank	Not Req'd by STI for this tank

H—TRAINING

112.7(f)

MAC will provide baseline (upon hiring) and annual refresher training to personnel involved in the handling, storage, or use of oil products.

112.7(f)(1) - At a minimum, training will cover operation and maintenance of equipment to prevent discharges, discharge procedure protocols, applicable pollution control laws, rules and regulations, general facility operations and the contents of the SPCC Plan.

112.7(f)(2) - The person(s) accountable for discharge prevention at the facility is/are the MAC Director of Relievers.

(See Table B of this poster)

112.7(f)(3) - Records of training are maintained in Appendix D and/or in the facility office.

I—TANK TRUCK LOADING/UNLOADING

112.7(h)

The facility does not have a transfer rack.

Nighttime oil transfers and transfer during precipitation events will be avoided, if possible.

An employee and/or the truck driver will be present throughout the transfer.

Prior to filling and departure of any tank truck, all outlets of such vehicles will be closely examined for leakage, and if necessary, tightened, adjusted and/or replaced by the transporter to prevent liquid leakage while in transit.

Wheel chocks will be used to prevent premature vehicle departure.

The tank gauge will be checked prior to starting the transfer to determine if the tank has capacity to accept the full transfer from the fuel truck.

The Fuel Inventory Form must be completed for each delivery

SCENARIO

112.7(c)

A diesel transport truck is transferring oil or fuel to the storage tank, with an attendant and/or employee present throughout the operation.

Details:

The truck is loading at a rate of 100 gallons per minute.

The reasonably expected source and cause of a discharge is a ruptured flexible transfer hose.

Transfers are gravity fed and the valve can be manually closed.

An evaluation determines that the discharge will not impede the attendant's access to the shutoff switch and that the attendant can safely shutdown transfer operations within 1 minute of the hose rupture.

Calculations:

The maximum reasonably expected discharge would be calculated to be: [(100 gal/min) x (1 min)]

Conclusion:

Engineered containment volume should be at least 100 gallons. A larger volume for secondary containment would be needed if time required to safely close the shutoff valve takes longer than 1 minute.

J—BULK STORAGE CONTAINERS

112.8(c) & 112.12(c)

General tank information is summarized below. Secondary containment, tank and product information is documented in Table D. The location of the tanks, containers and oil containing equipment are illustrated on Figure 2. All figures and tables are located in the plan binder.

112.8(c)(1) – This facility only uses containers of material and construction that are compatible with the materials stored and the conditions of storage (temperature and pressure).

112.8(c)(2) – Adequate secondary containment is provided for each Bulk Storage Tank. Specific secondary containment information is provided in Table D. Containment calculations are shown in Appendix H.

112.8(c)(3) – This facility does not have diked areas exposed to stormwater that would require draining.

112.8(c)(4) & (5) – There is one completely buried tank on site.

112.8(c)(6) – The SPCC Rule requires that each aboveground container be tested for integrity on a regular schedule including visual inspection with another testing technique. Inspection and integrity testing information is provided in Appendix E and Table G of the Poster Plan.

112.8(c)(7) – There is no internal steam heating coils present on any tanks.

112.8(c)(8) – Overfill prevention is provided for each bulk storage tank in operation at the facility. Methods in use include liquid level gauges, sight tubes and manual checks during product transfers. Specific overfill prevention equipment is identified in Table D.

112.8(c)(9) – The facility does not operate any effluent treatment facilities.

112.8(c)(10) – Oil leaks which result in a loss of oil from tank seams, gaskets, rivets, and bolts are promptly corrected.

112.8(c)(11) – Portable and mobile oil storage containers are positioned inside the facility to prevent a release. Facility containment is described in Table D.

K—TRANSFER OPERATIONS, PUMPING, & IN-PLANT PROCESSES

112.8(d) & 112.12(d)

New petroleum and hazardous materials are received at the facility by truck transport. Diesel and other hazardous materials are gravity fed by hose into the appropriate tanks and containers. Tank filling is continuously monitored to reduce potential overfill or other leakage. Following transfer, pumps, valves, and equipment are turned off and secured. Oil product transfer is performed in accordance with this Plan.

The maximum capacity of oil deliveries to the site would be an 8,000-gallon tanker truck hauling diesel fuel.

112.8(d)(1) - Underground piping associated with oil transfers at the facility are present for the UST. Underground piping runs from the UST through double walled steel piping with CRDM sensors.

112.8(d)(2) - Piping not in service or in standby will be capped or blank-flanged.

112.8(d)(3) - There are no aboveground piping runs at the facility.

112.8(d)(4) - Transfer piping from bulk storage tanks is described below:

i. Diesel UST has an electric pump inside the facility which pumps the product directly into facility equipment.

ii. New oil ASTs in the Maintenance Building are connected to manual nozzles in the main building area by a combination of steel piping and flexible tubing. Pneumatic pumps are located in the containment room. The aboveground piping runs along walls and ceilings.

iii. 55-gallon drums of hydraulic and other oils have hand pumps and are positioned indoors on palletized containment and concrete.

112.8(d)(5) - There is no aboveground oil piping at the facility in danger of damage by vehicle.

L—STATE REGULATIONS

112.7(j)

MN Statute 115.061 states it is the duty of every person to notify the MPCA immediately of the discharge, accidental or otherwise, of any substance or material under its control which, if not recovered, may cause pollution of waters of the state, and the responsible person shall recover as rapidly and as thoroughly as possible such substance or material and take immediately such other action as may be reasonably possible to minimize or abate pollution of waters of the state caused thereby. **Notification is not required for a discharge of five gallons or less of petroleum.**

MN Statute 116.48 requires ASTs greater than or equal to 500 gallons in size to be registered with the MPCA.

M—SECURITY

112.7(g)

112.7(g)(1) - The facility is fenced and access is secured.

112.7(g)(2) - Oil storage tank valves are located on top of the tanks and controlled from the tanks. The valves are locked and secured when not in use.

112.7(g)(3) - The pump for the UST is powered off when not in use. The switch is located inside the locked building.

112.7(g)(4) - The loading/unloading connections of oil pipelines are blank flanged and secured when not in use, as appropriate.

112.7(g)(5) - The facility has adequate lighting with pole-mounted and building-mounted flood lights throughout.

N—SPCC Plan Appendices

See Emergency Coordinator for Complete Plan

O—SPCC Review

PLAN REVIEW 112.5

The SPCC Plan shall be amended within six months of a change in the facility's design, construction, operation, or maintenance which affects the facility's spill potential. The plan must be reviewed at lease once every 5 years and amended as necessary. Annual SPCC Plan Applicability Review Checklist is documented below.

Amendment/Review Log

A plan review log is located in Section 2.2 of the Plan.

P—Certifications

Professional Engineer's Certification

112.3(d)

The Professional Engineer's Certification is located in Section 2.1 of the Plan.

SPCC Management Approval

112.7(a)

Management Approval Certification is located in Appendix C of the Plan.

Certification of Substantial Harm

112.20

MAC Corporation does not pose "substantial harm" and therefore is not subject to this part of the Rule. A copy of the Certification of Substantial Harm Determination Form is included as Appendix B.

Impracticability Determination

112.7(d)

There is no determination of impracticability. Facility management has determined, in accordance with 40 CFR 112.7(d), that use of the containment and diversionary structures or readily available equipment to prevent discharged oil from reaching navigable waters is practical and effective at the facility.

WENCK ASSOCIATES

Responsive partner. Exceptional outcomes.

Appendix B

Certification of Substantial Harm Form

APPENDIX B
CERTIFICATION OF SUBSTANTIAL HARM

Facility Name: Metropolitan Airports Commission - Crystal Airport
6220 Zane Avenue North Crystal, MN 55429

1. Does the facility transfer oil over water to or from vessels and does the facility have a total oil storage capacity greater than or equal to 42,000 gallons?
   Yes _____ No X

2. Does the facility have a total oil storage capacity greater than or equal to 1 million gallons and does the facility lack secondary containment that is sufficiently large to contain the capacity of the largest aboveground oil storage tank plus sufficient freeboard to allow for precipitation within any aboveground storage tank area?
   Yes _____ No X

3. Does the facility have a total oil storage capacity greater than or equal to 1 million gallons and is the facility located at a distance (as calculated using the appropriate formula in Attachment C-III to this appendix or a comparable formula) such that a discharge from the facility could cause injury to fish and wildlife and sensitive environments? For further description of fish and wildlife and sensitive environments, see Appendices I, II, and III to DOC/NOAA's "Guidance for Facility and Vessel Response Plans: Fish and Wildlife and Sensitive Environments" (see Appendix E to this part, Section 10, for availability) and the applicable Area Contingency Plan.
   Yes _____ No X

4. Does the facility have a total oil storage capacity greater than or equal to 1 million gallons and is the facility located at a distance (as calculated using the appropriate formula in Attachment C-III to this appendix or a comparable formula[1]) such that a discharge from the facility would shut down a public drinking water intake?
   Yes _____ No X

5. Does the facility have a total oil storage capacity greater than or equal to 1 million gallons and has the facility experienced a reportable oil spill in an amount greater than or equal to 10,000 gallons within the last 5 years?
   Yes _____ No X

CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document, and that based on my inquiry of those individuals responsible for obtaining this information, I believe that the submitted information is true, accurate, and complete.

_____ _____
Signature Title

_____ _____
Name (please type or print) Date

Appendix C

SPCC Management Approval

SPCC MANAGEMENT APPROVAL

112.7(a)

This SPCC Plan has been reviewed by and is fully approved by the Metropolitan Airports Commission management and the necessary resources have been committed to implement the plan as described.

_____

Signature Date

_____

Name/Title

Certification of Substantial Harm

112.20

Metropolitan Airports Commission does not pose "substantial harm" and therefore is not subject to this part of the Rule. A copy of the Certification of Substantial Harm Determination Form is included as Appendix B.

Impracticability Determination

112.7(d)

There is no determination of impracticability. Facility management has determined, in accordance with 40 CFR 112.7(d), that use of the containment and diversionary structures or readily available equipment to prevent discharged oil from reaching navigable waters is practical and effective at the facility.

Appendix D

Record of Spill Prevention Briefings and Trainings

APPENDIX D
RECORD OF SPILL PREVENTION BRIEFINGS AND TRAININGS

Instructions: Briefings will be scheduled and conducted by the owner or operators for operating personnel at intervals frequent enough to assure adequate understanding of the SPCC plan for this Facility. These briefings should also highlight and describe known spill events or failures, malfunctioning components, and recently developed precautionary measures. Personnel will also be instructed in operation and maintenance of equipment to prevent the discharges of oil and applicable pollution control laws, rules, and regulations. During these briefings there will be an opportunity for Facility operators and other personnel to share recommendations concerning health, safety, and environmental issues encountered during operation of the Facility.

Date: _____

Attendees: _____

_____

_____

_____

_____

_____

_____

Subjects and Issues: _____

_____

_____

Recommendations and Suggestions: _____

_____

Appendix E

SPCC Inspection Guidelines

APPENDIX E
FACILITY INSPECTION GUIDELINES

Instructions: This inspection record will be completed every month. Place an X in the appropriate box for each item. If any response requires elaboration, do so in the Descriptions and Comments space provided. Further descriptions or comments should be attached on a separate sheet of paper if necessary.

	Yes	No	Descriptions and Comments
Tank surfaces show signs of leakage	☐	☐	_____
Tanks are damaged, rusted or deteriorated	☐	☐	_____
Bolts, rivets, or seams are damaged	☐	☐	_____
Tank supports are deteriorated or buckled	☐	☐	_____
Tank foundations have eroded or settled	☐	☐	_____
Level gauges or alarms are inoperative	☐	☐	_____
Vents are obstructed	☐	☐	_____
Valve seals or gaskets are leaking	☐	☐	_____
Pipelines or supports are damaged or deteriorated	☐	☐	_____
Buried pipelines are exposed	☐	☐	_____
Loading/unloading rack is damaged or deteriorated	☐	☐	_____
Connections are not capped or blank-flanged	☐	☐	_____
Secondary containment is damaged or stained	☐	☐	_____
Dike drainage valves are open	☐	☐	_____
Oil/water separator is functioning properly	☐	☐	_____
Oil/water separator effluent has a sheen	☐	☐	_____
Fencing, gates or lighting is non-functional	☐	☐	_____

Remarks: _____

_____

_____

Signature: _____ Date: _____

Appendix F

Spill Reporting Form

Crystal Airport
SPILL REPORTING FORM

Spill Information

Facility Name	Crystal Airport – MAC Maintenance Facilities
Facility Address/Phone Number	6220 Zane Ave N Crystal, MN 55429
Date and Time of Discharge	
Material and Quantity Discharged	
Source of the Discharge	
Description of Affected Media	
Cause of the Discharge	
Injuries or Damages Caused by Discharge	
Actions being used to stop the Discharge	
Was there any Evacuations? (☐ Yes or ☐ No)	
Name of Person Completing Report	
Date Report Completed	

Spill Reporting Information

Did oil discharge reach navigable water? If Yes, contact National Response Center (800) 424-8802.	
Date and Time Contacted	
Officer Reported To	
Incident Number	

Did release cause a "hazardous condition" as defined in Section 3.B? If Yes, contact *Minnesota State Duty Officer (651) 649-5451*	
Date and Time Contacted	
Person Reported To	
Incident Number	

Other Agencies, Individuals, Organizations Contacted

Name	**Date/Time**	**Phone Number**	**Reason for Contact**

Appendix G

Spill Equipment Inventory

SPILL EQUIPMENT INVENTORY
Crystal Airport

Name of Inspector: _____

Date: _____

		Contents (Yes / No)			
ID	**Location**	**Absorbent**	**Pads**	**Boom**	**Other**
SK	East Bldg.				Shovels, Drums, Corn Cob Absorbent
SK	West Bldg.				Shovels, Drums, Corn Cob Absorbent
SK	Maintenance Building				Shovels, Drums, Corn Cob Absorbent

Appendix H

Secondary Containment Calculations

APPENDIX H
SECONDARY CONTAINMENT CALCULATIONS

Tank: 250-Gallon Used Oil Tank

Dike Material: Concrete

Dike Length (ft):	11.75
Dike Width (ft):	6.17
Dike Height (ft):	0.67
Dike Volume (cu. ft.):	48.55
Dike Volume (gal):	363.15

The volume of the containment dikes for the 250-gallon used oil tanks are sufficient to contain the full contents of the respective tanks. The tanks and containment are located under shelters, which prevent accumulation of precipitation.

Appendix I

Oil Inventory

Appendix I
Crystal Airport – MAC Maintenance Facilities
Oil Container Inventory

Tank / Container ID	Contents / Capacity 112.7(a)(3)(i)	Location Description	*Reportable Quantity (Federal)	Reportable Quantity (Minnesota)	Tank Material 112.8(c)(1) & 112.12(c)	Secondary Containment Type 112.8(c)(2) 112.7(c)	Tank Overfill Prevention 112.8(c)(8)	Tank Inspection Type and Frequency 112.7(e) 112.8(c)(6)
AST-1	Used Oil / 250 gallons	Outside, East Cold Storage Building	*See Below	>5 gallons	Steel	Concrete Berm	Visual	Visual, Monthly
AST-2	Used Oil / 250 gallons	Outside, North MAC Maintenance Building	*See Below	>5 gallons	Steel	Concrete Berm	Visual	Visual, Monthly
AST-3	Used Oil / 250 gallons	Outside, Tower Building	*See Below	>5 gallons	Steel	Concrete Berm	Visual	Visual, Monthly
AST-4	Motor Oil / 120 gallons	Inside, MAC Maintenance Building	*See Below	>5 gallons	Plastic	Containment Room	Visual	Visual, Monthly
AST-5	Hydraulic Fluid / 120 gallons	Inside, MAC Maintenance Building	*See Below	>5 gallons	Plastic	Containment Room	Visual	Visual, Monthly
AST-6	Motor Oil / 80 gallons	Inside, MAC Maintenance Building	*See Below	>5 gallons	Plastic	Containment Room	Visual	Visual, Monthly
AST-7	Transmission Fluid / 80 gallons	Inside, MAC Maintenance Building	*See Below	>5 gallons	Plastic	Containment Room	Visual	Visual, Monthly
AST-8`	Motor Oil / 80 gallons	Inside, MAC Maintenance Building	*See Below	>5 gallons	Steel	Containment Room	Visual	Visual, Monthly
Drums (4)	New Oil / 220 gallons (55 gallons each)	Cold Storage, Maintenance, and Tower Buildings	*See Below	>5 gallons	Steel	Poly Containment Pallets, Concrete Floor	Visual	Visual, Monthly
UST-1	Diesel Fuel / 2,500 gallons	Outside, South of Cold Storage Building	*See Below	>5 gallons	Steel	Double Wall UST	Electric Gauge	Elec. Leak Detect
Total Aboveground Storage = 1,450 gallons								

Smaller Tanks/Containers and Drums are not integrity tested: Equivalent Environmental Protection is provided by situating tanks off the ground and a program of thorough visual inspection in accordance with Steel Tank Institute.

*Federal Reportable Quantity: Report spills / releases of any quantity that reach, or have the potential to reach, any natural surface water or the environment (air, soil, storm drain) to the National Response Center.

**If a release in any way causes harm or threatens to cause harm to public health and safety, the environment, or property, immediate notification is required.

Hazardous Materials Sites

Six sites on Airport property and two sites adjacent to the Airport have been previously investigated and remediated for hazardous materials. The majority of these are associated with petroleum leaks and petroleum brownfields. Brownfields are sites where reuse may be complicated by the presence of hazardous substances, such as soils contaminated with petroleum. Seven of the sites are considered remediated or closed, while one off-Airport site (ID 109122) is active. Site closure means that further investigation, monitoring, or corrective action is not necessary to protect resources, even though some petroleum contamination may remain. According to the MPCA, sites are eligible for closure when:

- Proper treatment of excavated soil is completed and documented,
- Free product (if present) has been recovered to the maximum extent practicable,
- The groundwater plume is demonstrably stable, and
- The corrective action goals have been met.

These eight sites are described below, beginning with their MPCA site identifier numbers.

- Site 124282 involved an aviation gas leak associated with a previous FBO. The site was closed in 2008. See page **G-56** for more information.
- Site 37093 included two petroleum leaks associated with Airport tenant activities, both discovered in 1997, including one incident of groundwater contamination. One site was closed in 1997, while the other was closed in 2003. See page **G-60** for more information.
- Site 110667 was associated with an oil storage tank leak and was remediated in 1999. See page **G-54** for more information.
- Site 194881, associated with a previous FBO, was a brownfield remediation completed in 2001. See page **G-52** for more information.
- Site 50093 was an aviation gas leak discovered in 2006 and remediated in 2007. See page **G-40** for more information.
- Site 199961 was the site of a diesel leak discovered in 1991 and remediated in 1992. See page **G-65** for more information.
- Site 101182 is an off-Airport brownfield site associated with County Road 81 reconstruction. See page **G-53** for more information.
- Site 109122 is an off-Airport site associated with multiple gasoline leaks involving groundwater contamination, occurring from 1989 to 2018. This site is adjacent to Twin Creek right before it enters Airport property via a culvert under 63rd Street North. See page **G-67** for more information.

EPA databases documenting brownfield, cleanup, and superfund sites were also consulted. The closest sites in the EPA's database are the Mel-O Honey brownfield site located approximately three-quarters mile southwest of the airport, and the Joslyn Manufacturing & Supply Co Superfund site, approximately three-quarters mile southeast of the airport. See page **G-71** for a map of these sites.

MINNESOTA POLLUTION CONTROL AGENCY

Search...

What's in My Neighborhood

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North of Sixty Flying Inc

Location:	5800 Crystal Airport Rd Crystal, MN 55429-2364 Hennepin County
Watershed:	Mississippi River - Twin Cities (07010206)
Latitude:	45.06021
Longitude:	-93.35508
Coordinate Collection Method:	GPS - Other
Currently Active?	Yes
Institutional controls:	No

Search with a map

Activity Overview

Hazardous Waste

Hazardous Waste - MND981526585 - Very small quantity generator

North of Sixty Flying Inc

Status: Active

Hazardous waste includes substances that are corrosive, explosive, toxic and-or fire hazards. Very Small Quantity Generators produce 220 pounds or less of hazardous waste, and less than 2.2 pounds of acute hazardous waste per month. Businesses in this classification require a license.

Events

Event	Start	End
Notif of Regulated Waste	05/18/2017	

Links to Additional Data Sources

- HW Generator License Application Data - MND981526585

Stormwater

Industrial Stormwater - MNR0537ND

North of Sixty Flying Inc

Status: Inactive

At industrial sites, stormwater may come into contact with harmful pollutants such as toxic metals, oil, grease and de-icing salts. Industrial stormwater permits are designed to limit the contaminants that reach surface and groundwater.

Events

Event	Start	End
Coverage Issuance	12/27/2012	04/05/2015
Coverage Issuance	12/24/1997	04/05/2010

Enforcement Activities

Case Type	Net Penalty	Discovery Date	Action Date	Closure Date
Letter of Warning		05/07/2008	05/07/2008	

Links to Additional Data Sources

- ISW Online Permit Data - MNR0537ND

Industrial Stormwater - MNR053C9G

North of Sixty Flying Inc

Status: Active

At industrial sites, stormwater may come into contact with harmful pollutants such as toxic metals, oil, grease and de-icing salts. Industrial stormwater permits are designed to limit the contaminants that reach surface and groundwater.

Events

Event	Start	End
Administrative Change	04/05/2015	04/05/2020
Coverage Issuance	04/05/2015	02/07/2017

Links to Additional Data Sources

- ISW Online Permit Data - MNR053C9G

Tanks

Underground Tanks - TS0002035

North of Sixty Flying Inc

Status: Active

An underground storage tank site has at least one tank of a certain size on the premises. A tank site may have multiple tanks and these tanks may contain food products, petroleum products or other substances.

Events

Event	Start	End
UST Notif Inst or Status Ch	12/05/2006	
Notice Received	06/21/2006	06/21/2006
Registration Received	06/14/1999	06/14/1999
Registration Received	06/01/1999	06/01/1999
Registration Received	01/07/1999	01/07/1999
Notice Received	09/30/1998	09/30/1998
Registration Received	06/10/1997	06/10/1997
Notice Received	05/15/1997	05/15/1997
Notice Received	01/31/1997	01/31/1997
Registration Received	05/07/1986	05/07/1986
Registration Received	05/06/1986	05/06/1986
Registration Received	10/15/1976	10/15/1976
Registration Received	05/15/1975	05/15/1975

Inspections

Inspection Type	Inspection Date
UT Inspection	10/17/2002
UT Inspection	05/28/1998

Enforcement Activities

Case Type	Net Penalty	Discovery Date	Action Date	Closure Date
Citation Warning		10/17/2002	10/17/2002	

Links to Additional Data Sources

There are no links for this activity. Contact the file manager or program contact to determine if additional information is available.

Underground Tanks - TS0001671

North of Sixty Flying Inc

Status: Active
An underground storage tank site has at least one tank of a certain size on the premises. A tank site may have multiple tanks and these tanks may contain food products, petroleum products or other substances.

Inspections

Inspection Type	Inspection Date
UT Inspection	03/08/2017
UT Inspection	08/21/2012
UT Inspection	05/13/2010
UT Inspection	12/26/2007
UT Inspection	02/06/2003
UT Inspection	10/17/2002
UT Inspection	11/10/1997

Enforcement Activities

Case Type	Net Penalty	Discovery Date	Action Date	Closure Date
Citation Warning		05/13/2010	07/01/2010	04/22/2011
Citation Warning		12/26/2007	12/28/2007	03/07/2008

Links to Additional Data Sources

There are no links for this activity. Contact the file manager or program contact to determine if additional information is available.

Contact

Records managers

Records managers are MPCA staff that will help you to access files relating to this site. To request their help, visit our information request page to learn about the process or simply fill out an information request form.

Program contacts

Contact these MPCA staff if you have more specific questions about these activities.

Contact	Phone	Contact Description
Regina Small	651-757-2382	Hazardous Waste Data Management
Melissa Wenzel	651-757-2816	Ind Stormwater Compliance Staff
Kristin Dennis	651-757-2679	Ind Stormwater Data Management

Alternate Name

Alternate Name or ID	Description
A00002654	Former Preferred ID
MND981526585	Hazardous Waste Preferred ID
MNR0537ND	Industrial Stormwater Preferred ID
MNR053C9G	Industrial Stormwater Preferred ID
4941	MPCA Agency Interest ID
MND981526585	Previous Name
MNR0537ND	Previous Name
TS0001671	Underground Tanks Preferred ID
TS0002035	Underground Tanks Preferred ID

Owners

Owner or Primary Contact:
North of Sixty Flying Inc
Ray Zitzloff

Former Owner or Primary Contact:
Crystal Shamrock Inc/Dan Gilligan
Crystal Skyways Inc
Dan Gilligan
Dave Nelson
North Of Sixty Inc
Northland Aircraft Service

Documents

These files do not necessarily represent the MPCA's full set of public records for this site.

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MINNESOTA POLLUTION CONTROL AGENCY

Search...

What's in My Neighborhood

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Thunderbird Aviation Inc - Crystal

Location:	5800 Crystal Airport Rd Ste 14 Crystal, MN 55429-2365 Hennepin County
Watershed:	Mississippi River - Twin Cities (07010206)
Latitude:	45.06021
Longitude:	-93.35508
Coordinate Collection Method:	GPS - Other
Currently Active?	Yes
Industry Classification:	Other Airport Operations
Institutional controls:	No

Search with a map

Activity Overview

Hazardous Waste

Hazardous Waste - MNS000147579 - Very small quantity generator

Thunderbird Aviation Inc - Crystal

Status: Active

Hazardous waste includes substances that are corrosive, explosive, toxic and-or fire hazards. Very Small Quantity Generators produce 220 pounds or less of hazardous waste, and less than 2.2 pounds of acute hazardous waste per month. Businesses in this classification require a license.

Events

Event	Start	End
Annual Gen License Report	01/25/2018	
Notif of Regulated Waste	05/18/2017	
Application/Notification/Registration Received	04/19/2017	04/19/2017
Annual Gen License Report	05/03/2016	
Annual Gen License Report	12/04/2014	
Annual Gen License Report	12/16/2013	
Annual Gen License Report	01/04/2013	
Annual Gen License Report	12/16/2011	

Links to Additional Data Sources

- HW Generator License Application Data - MNS000147579

Stormwater

Industrial Stormwater - MNR0534ZW

Thunderbird Aviation Inc - Crystal

Status: Inactive

At industrial sites, stormwater may come into contact with harmful pollutants such as toxic metals, oil, grease and de-icing salts. Industrial stormwater permits are designed to limit the contaminants that reach surface and groundwater.

Events

Event	Start	End
Coverage Issuance	08/09/2010	04/05/2015
Coverage Issuance	05/02/2009	04/05/2010

Enforcement Activities

Case Type	Net Penalty	Discovery Date	Action Date	Closure Date
Letter of Warning		05/07/2008	05/07/2008	

Links to Additional Data Sources

- ISW Online Permit Data - MNR0534ZW

Industrial Stormwater - MNR0538BY

Thunderbird Aviation Inc - Crystal

Status: Active

At industrial sites, stormwater may come into contact with harmful pollutants such as toxic metals, oil, grease and de-icing salts. Industrial stormwater permits are designed to limit the contaminants that reach surface and groundwater.

Events

Event	Start	End
Coverage Issuance	04/05/2015	04/05/2020

Links to Additional Data Sources

- ISW Online Permit Data - MNR0538BY

Contact

Records managers

Records managers are MPCA staff that will help you to access files relating to this site. To request their help, visit our information request page to learn about the process or simply fill out an information request form.

Program contacts

Contact these MPCA staff if you have more specific questions about these activities.

Contact	Phone	Contact Description
Regina Small	651-757-2382	Hazardous Waste Data Management
Melissa Wenzel	651-757-2816	Ind Stormwater Compliance Staff
Kristin Dennis	651-757-2679	Ind Stormwater Data Management

Alternate Name

Alternate Name or ID	Description
A00023937	Former Preferred ID
MNS000147579	Hazardous Waste Preferred ID
MNR0534ZW	Industrial Stormwater Preferred ID
MNR0538BY	Industrial Stormwater Preferred ID
131187	MPCA Agency Interest ID

Owners

Owner or Primary Contact:
Nancy Grazzini-Olson
Thunderbird Aviation Inc

Former Owner or Primary Contact:
Thunderbird Aviation Inc

Documents

These files do not necessarily represent the MPCA's full set of public records for this site.

To request more records, visit our information request page to learn about the process or simply fill out an information request form.

MINNESOTA POLLUTION CONTROL AGENCY

Search...

What's in My Neighborhood

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MAC - Crystal Airport

Location:	6220 Zane Ave N Minneapolis, MN 55429 Hennepin County
Watershed:	Mississippi River - Twin Cities (07010206)
Latitude:	45.06021
Longitude:	-93.35508
Coordinate Collection Method:	Address Matching House Number
Currently Active?	Yes
Industry Classification:	Airport Operations
Institutional controls:	No

Search with a map

Activity Overview

Hazardous Waste

Hazardous Waste - MN0000239830 - Very small quantity generator

MAC - Crystal Airport

Status: Active

Hazardous waste includes substances that are corrosive, explosive, toxic and-or fire hazards. Very Small Quantity Generators produce 220 pounds or less of hazardous waste, and less than 2.2 pounds of acute hazardous waste per month. Businesses in this classification require a license.

Events

Event	Start	End
Notif of Regulated Waste	05/18/2017	

Links to Additional Data Sources

- HW Generator License Application Data - MN0000239830

Stormwater

Industrial Stormwater - MNR0539X7

MAC - Crystal Airport

Status: Active

At industrial sites, stormwater may come into contact with harmful pollutants such as toxic metals, oil, grease and de-icing salts. Industrial stormwater permits are designed to limit the contaminants that reach surface and groundwater.

Events

Event	Start	End
Coverage Issuance	04/05/2015	04/05/2020

Links to Additional Data Sources

- ISW Online Permit Data - MNR0539X7

Industrial Stormwater - MNR0534YZ

MAC - Crystal Airport

Status: Inactive

At industrial sites, stormwater may come into contact with harmful pollutants such as toxic metals, oil, grease and de-icing salts. Industrial stormwater permits are designed to limit the contaminants that reach surface and groundwater.

Events

Event	Start	End
Coverage Issuance	08/06/2010	04/05/2015
Coverage Reissuance	05/08/2002	04/05/2010
Coverage Issuance	06/11/1997	04/05/2010

Links to Additional Data Sources

- ISW Online Permit Data - MNR0534YZ

Tanks

Aboveground Tanks - TS0001958

MAC - Crystal Airport

Status: Active

An aboveground storage tank site has at least one tank of a certain size on the premises. A tank site may have multiple tanks and these tanks may contain food products, petroleum products or other substances.

Inspections

Inspection Type	Inspection Date
AT Inspection	11/19/2013
AT Inspection	02/25/2011
AT Inspection	01/02/2008
AT Inspection	02/06/2003

Links to Additional Data Sources

There are no links for this activity. Contact the file manager or program contact to determine if additional information is available.

Aboveground Tanks - TS0055436

MAC - Crystal Airport

Status: Active

An aboveground storage tank site has at least one tank of a certain size on the premises. A tank site may have multiple tanks and these tanks may contain food products, petroleum products or other substances.

Events

Event	Start	End
Registration Received	08/05/1997	08/05/1997
Registration Received	02/08/1993	02/08/1993

Links to Additional Data Sources

There are no links for this activity. Contact the file manager or program contact to determine if additional information is available.

Underground Tanks - TS0001958

MAC - Crystal Airport

Status: Active

An underground storage tank site has at least one tank of a certain size on the premises. A tank site may have multiple tanks and these tanks may contain food products, petroleum products or other substances.

Inspections

Inspection Type	Inspection Date
UT Inspection	11/19/2013
UT Inspection	02/25/2011
UT Inspection	01/02/2008
UT Inspection	02/06/2003

Links to Additional Data Sources

There are no links for this activity. Contact the file manager or program contact to determine if additional information is available.

Underground Tanks - TS0055436

MAC - Crystal Airport

Status: Active

An underground storage tank site has at least one tank of a certain size on the premises. A tank site may have multiple tanks and these tanks may contain food products, petroleum products or other substances.

Events

Event	Start	End
UST Ten-Day Adv Notice	05/04/2000	
Notice Received	10/28/1999	10/28/1999
Registration Received	10/27/1999	10/27/1999
Notice Received	03/31/1999	03/31/1999
Registration Received	02/11/1992	02/11/1992
Registration Received	08/29/1991	08/29/1991
Notice Received	08/22/1991	08/22/1991
Notice Received	07/03/1991	07/03/1991
Registration Received	05/07/1986	05/07/1986

Links to Additional Data Sources

There are no links for this activity. Contact the file manager or program contact to determine if additional information is available.

Contact

Records managers

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Program contacts

Contact these MPCA staff if you have more specific questions about these activities.

Contact	Phone	Contact Description
Regina Small	651-757-2382	Hazardous Waste Data Management
Melissa Wenzel	651-757-2816	Ind Stormwater Compliance Staff
Kristin Dennis	651-757-2679	Ind Stormwater Data Management

Alternate Name

Alternate Name or ID	Description
TS0001958	Aboveground Tanks Preferred ID
TS0055436	Aboveground Tanks Preferred ID
A00000137	Former Preferred ID
MN0000239830	Hazardous Waste Preferred ID
MNR0534YZ	Industrial Stormwater Preferred ID
MNR0539X7	Industrial Stormwater Preferred ID
8035	MPCA Agency Interest ID
1958	Previous Name
TS0001958	Underground Tanks Preferred ID
TS0055436	Underground Tanks Preferred ID

Owners

Owner or Primary Contact:

Met Council Environmental Services
Metropolitan Airports Commission

Former Owner or Primary Contact:

Crystal Airport
Dick Keinz

Documents

These files do not necessarily represent the MPCA's full set of public records for this site.

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MINNESOTA POLLUTION CONTROL AGENCY

Search...

What's in My Neighborhood

Help FAQ WIMN Glossary Feedback New search

North Memorial Air Care - Crystal

Location:	5800 Crystal Airport Rd Ste 5 Crystal, MN 55429 Hennepin County
Watershed:	Mississippi River - Twin Cities (07010206)
Latitude:	45.05856
Longitude:	-93.35610
Coordinate Collection Method:	Address Matching House Number
Currently Active?	Yes
Industry Classification:	Air Traffic Control
Institutional controls:	No

Search with a map

Activity Overview

Hazardous Waste

Hazardous Waste - MNR000058321 - Very small quantity generator

North Memorial Air Care - Crystal

Status: Active

Hazardous waste includes substances that are corrosive, explosive, toxic and-or fire hazards. Very Small Quantity Generators produce 220 pounds or less of hazardous waste, and less than 2.2 pounds of acute hazardous waste per month. Businesses in this classification require a license.

Events

Event	Start	End
Annual Gen License Report	01/25/2018	
Notif of Regulated Waste	05/18/2017	
Application/Notification/Registration Received	04/19/2017	04/19/2017
Annual Gen License Report	05/03/2016	
Annual Gen License Report	12/04/2014	
Annual Gen License Report	12/16/2013	
Annual Gen License Report	01/04/2013	
Annual Gen License Report	12/16/2011	
Annual Gen License Report	04/19/2010	
Annual Gen License Report	05/07/2009	
Annual Gen License Report	06/12/2008	
Annual Gen License Report	01/28/2008	

Links to Additional Data Sources

- HW Generator License Application Data - MNR000058321

Investigation and Cleanup

Petroleum Remediation - LS0016502 - Leak Site

North Memorial Air Care - Crystal

Status: Inactive

Leak sites are locations where a release of petroleum products has occurred from a tank system. Leak sites can occur from aboveground or underground tank systems as well as from spills at tank facilities.

Events

Event	Start	End
Site Closed	08/29/2007	08/29/2007
Remedial Investigation Report Reviewed	08/06/2007	08/29/2007
Site Closed	08/06/2007	08/29/2007
Technical Review of Remedial Investigation Report Completed	08/06/2007	08/21/2007
More Work Requested	07/09/2007	07/09/2007
Limited Site Investigation Reviewed	06/19/2007	07/09/2007
More Work Requested	06/19/2007	07/09/2007
Technical Review of Limited Site Investigation Report Completed	06/19/2007	06/27/2007
Application Completeness Determined	06/19/2007	06/19/2007
File Reviewed No Report Received	03/16/2007	03/16/2007
Wakeup Request Issued	03/16/2007	03/16/2007
Responsible Party Determined	07/19/2006	07/19/2006
Standard Letter Issued	07/19/2006	07/19/2006
Leak Discovered	06/28/2006	06/28/2006
Leak Reported	06/28/2006	06/28/2006

Inspections

Inspection Type	Inspection Date
Field Work Notification	07/20/2007

Links to Additional Data Sources

There are no links for this activity. Contact the file manager or program contact to determine if additional information is available.

Contact

Records managers

Records managers are MPCA staff that will help you to access files relating to this site. To request their help, visit our information request page to learn about the process or simply fill out an information request form.

Program contacts

Contact these MPCA staff if you have more specific questions about these activities.

Contact	Phone	Contact Description
Regina Small	651-757-2382	Hazardous Waste Data Management

Alternate Name

Alternate Name or ID	Description
16502	Former Leak Site Preferred ID
MNR000058321	Hazardous Waste Preferred ID
LS0016502	Leak Site Preferred ID
50093	MPCA Agency Interest ID

Owners

Owner or Primary Contact:
North Memorial Air Care

Former Owner or Primary Contact:
There are no records of former owner or primary contact names.

Documents

These files do not necessarily represent the MPCA's full set of public records for this site.

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MINNESOTA POLLUTION CONTROL AGENCY

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North Memorial Air Care

Location:	5930 Lakeland Ave N Crystal, MN 55428 Hennepin County
Watershed:	Mississippi River - Twin Cities (07010206)
Latitude:	45.06061
Longitude:	-93.36202
Coordinate Collection Method:	Address Matching House Number
Currently Active?	No
Institutional controls:	No

Search with a map

Activity Overview

Hazardous Waste

Hazardous Waste - MNR000028621

North Memorial Air Care

Status: Inactive

Events

Event	Start	End
Notif of Regulated Waste	05/18/2017	

Links to Additional Data Sources

- HW Generator License Application Data - MNR000028621

Contact

Records managers

Records managers are MPCA staff that will help you to access files relating to this site. To request their help, visit our information request page to learn about the process or simply fill out an information request form.

Program contacts

Contact these MPCA staff if you have more specific questions about these activities.

Contact	Phone	Contact Description
Regina Small	651-757-2382	Hazardous Waste Data Management

Alternate Name

Alternate Name or ID	Description
MNR000028621	Hazardous Waste Preferred ID
38771	MPCA Agency Interest ID

Owners

Owner or Primary Contact:

There are no records of owner or primary contact names.

Former Owner or Primary Contact:

North Memorial Air Care

Documents

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MINNESOTA POLLUTION CONTROL AGENCY

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What's in My Neighborhood

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Kurt Manufacturing - Airport Hangar

Location:	5800 Crystal Airport Rd Crystal, MN 55429-2364 Hennepin County
Watershed:	Mississippi River - Twin Cities (07010206)
Latitude:	45.06047
Longitude:	-93.35572
Coordinate Collection Method:	Address Matching House Number
Currently Active?	Yes
Industry Classification:	Nonscheduled Air Transportation
Institutional controls:	No

Search with a map

Activity Overview

Hazardous Waste

Hazardous Waste - MND985681055

Kurt Manufacturing - Airport Hangar

Status: Inactive

Events

Event	Start	End
Application/Notification/Registration Received	01/10/2017	01/10/2017

Links to Additional Data Sources

- HW Generator License Application Data - MND985681055

Contact

Records managers

Records managers are MPCA staff that will help you to access files relating to this site. To request their help, visit our information request page to learn about the process or simply fill out an information request form.

Program contacts

Contact these MPCA staff if you have more specific questions about these activities.

Contact	Phone	Contact Description
Regina Small	651-757-2382	Hazardous Waste Data Management

Alternate Name

Alternate Name or ID	Description
MND985681055	Hazardous Waste Preferred ID
34610	MPCA Agency Interest ID

Owners

Owner or Primary Contact:
Kurt Manufacturing
Kurt Manufacturing Co

Former Owner or Primary Contact:
There are no records of former owner or primary contact names.

Documents

These files do not necessarily represent the MPCA's full set of public records for this site.

To request more records, visit our information request page to learn about the process or simply fill out an information request form.

MINNESOTA POLLUTION CONTROL AGENCY

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Maxwell Aircraft Service

Location:	Crystal Airport Minneapolis, MN 55429 Hennepin County
Watershed:	Mississippi River - Twin Cities (07010206)
Latitude:	45.06381
Longitude:	-93.34221
Coordinate Collection Method:	Public Land Survey-Two Quarter
Currently Active?	Yes
Industry Classification:	Air Traffic Control
Institutional controls:	No

Search with a map

Activity Overview

Hazardous Waste

Hazardous Waste - MND008858128 - Small quantity generator

Maxwell Aircraft Service

Status: Active

Hazardous waste includes substances that are corrosive, explosive, toxic and/or fire hazards. Small Quantity Generators produce between 220 and 2,200 pounds of hazardous waste per month, and less than 2.2 pounds of waste classified as acute hazardous waste. Businesses in this classification require a license.

Events

Event	Start	End
Annual Gen License Report	01/25/2018	
Notif of Regulated Waste	05/18/2017	
Application/Notification/Registration Received	04/19/2017	04/19/2017
Annual Gen License Report	05/03/2016	
Annual Gen License Report	12/04/2014	
Annual Gen License Report	12/16/2013	
Annual Gen License Report	01/04/2013	
Annual Gen License Report	12/16/2011	
Annual Gen License Report	04/19/2010	
Annual Gen License Report	05/07/2009	
Annual Gen License Report	06/12/2008	
Annual Gen License Report	01/28/2008	

Inspections

Inspection Type	Inspection Date
HW Compliance Evaluation Inspection	10/14/2008
HW Compliance Evaluation Inspection	05/10/2008
HW Compliance Evaluation Inspection	04/28/2008

Enforcement Activities

Case Type	Net Penalty	Discovery Date	Action Date	Closure Date
APO - Combination	$10,000	04/28/2008	08/18/2008	10/14/2008

Links to Additional Data Sources

- HW Generator License Application Data - MND008858128

Stormwater

Industrial Stormwater - MNRNE34T7

Maxwell Aircraft Service

Status: Inactive

At industrial sites, stormwater may come into contact with harmful pollutants such as toxic metals, oil, grease and de-icing salts. Industrial stormwater permits are designed to limit the contaminants that reach surface and groundwater.

Events

Event	Start	End
No Exposure Exclusion	07/26/2010	07/13/2018

Enforcement Activities

Case Type	Net Penalty	Discovery Date	Action Date	Closure Date
Letter of Warning		05/07/2008	05/07/2008	

Links to Additional Data Sources

- ISW Online Permit Data - MNRNE34T7

Contact

Records managers

Records managers are MPCA staff that will help you to access files relating to this site. To request their help, visit our information request page to learn about the process or simply fill out an information request form.

Program contacts

Contact these MPCA staff if you have more specific questions about these activities.

Contact	Phone	Contact Description
Regina Small	651-757-2382	Hazardous Waste Data Management
Melissa Wenzel	651-757-2816	Ind Stormwater Compliance Staff
Kristin Dennis	651-757-2679	Ind Stormwater Data Management

Alternate Name

Alternate Name or ID	Description
MND008858128	Hazardous Waste Preferred ID
MNRNE34T7	Industrial Stormwater Preferred ID
18404	MPCA Agency Interest ID

Owners

Owner or Primary Contact:
Maxwell Aircraft Service

Former Owner or Primary Contact:
There are no records of former owner or primary contact names.

Documents

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WENTWORTH AIRCRAFT INC

Location:	6000 Douglas Dr N Minneapolis, MN 55429-2314 Hennepin County
Watershed:	Mississippi River - Twin Cities (07010206)
Latitude:	45.06247
Longitude:	-93.35909
Coordinate Collection Method:	Digitized - MPCA internal mapping application
Currently Active?	Yes
Industry Classification:	Other Support Activities for Air Transportation
Institutional controls:	No

Search with a map

Activity Overview

Hazardous Waste

Hazardous Waste - MND077633584 - Very small quantity generator

WENTWORTH AIRCRAFT INC

Status: Active

Hazardous waste includes substances that are corrosive, explosive, toxic and-or fire hazards. Very Small Quantity Generators produce 220 pounds or less of hazardous waste, and less than 2.2 pounds of acute hazardous waste per month. Businesses in this classification require a license.

Events

Event	Start	End
Application/Notification/Registration Received	03/08/2018	03/08/2018
Annual Gen License Report	03/08/2018	
Application/Notification/Registration Received	11/22/2017	11/22/2017
Notif of Regulated Waste	05/18/2017	
Application/Notification/Registration Received	04/19/2017	04/19/2017
Annual Gen License Report	05/03/2016	

Links to Additional Data Sources

- HW Generator License Application Data - MND077633584

Contact

Records managers

Records managers are MPCA staff that will help you to access files relating to this site. To request their help, visit our information request page to learn about the process or simply fill out an information request form.

Program contacts

Contact these MPCA staff if you have more specific questions about these activities.

Contact	Phone	Contact Description
Regina Small	651-757-2382	Hazardous Waste Data Management

Alternate Name

Alternate Name or ID	Description
MND077633584	Hazardous Waste Preferred ID
33817	MPCA Agency Interest ID

Owners

Owner or Primary Contact:
WENTWORTH AIRCRAFT INC

Former Owner or Primary Contact:
Crystal Shamrock Inc

Documents

These files do not necessarily represent the MPCA's full set of public records for this site.

To request more records, visit our information request page to learn about the process or simply fill out an information request form.

MINNESOTA POLLUTION CONTROL AGENCY

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Helicopter Flight

Location:	5930 Lakeland Ave N Crystal, MN 55428-3465 Hennepin County
Watershed:	Mississippi River - Twin Cities (07010206)
Latitude:	45.06061
Longitude:	-93.36202
Coordinate Collection Method:	Address Matching House Number
Currently Active?	Yes
Industry Classification:	Scenic and Sightseeing Transportation, Other
Institutional controls:	No

Search with a map

Activity Overview

Hazardous Waste

Hazardous Waste - MND052732914 - Minimal quantity generator

Helicopter Flight

Status: Active

Hazardous waste includes substances that are corrosive, explosive, toxic and-or fire hazards. Minimal Quantity Generators generate less than 100 pounds per year, none of which is classified as an acute hazardous waste.

Events

Event	Start	End
Notif of Regulated Waste	05/18/2017	

Links to Additional Data Sources

- HW Generator License Application Data - MND052732914

Stormwater

Industrial Stormwater - A00002201

Helicopter Flight

Status: Inactive

At industrial sites, stormwater may come into contact with harmful pollutants such as toxic metals, oil, grease and de-icing salts. Industrial stormwater permits are designed to limit the contaminants that reach surface and groundwater.

Events

Event	Start	End
Coverage Termination	03/14/1993	03/14/1993

Links to Additional Data Sources

- ISW Online Permit Data - A00002201

Tanks

Underground Tanks - TS0002780

Helicopter Flight

Status: Inactive

An underground storage tank site has at least one tank of a certain size on the premises. A tank site may have multiple tanks and these tanks may contain food products, petroleum products or other substances.

Events

Event	Start	End
Registration Received	06/01/1997	06/01/1997
Registration Received	06/25/1986	06/25/1986

Inspections

Inspection Type	Inspection Date
UT Inspection	05/28/1998

Links to Additional Data Sources

There are no links for this activity. Contact the file manager or program contact to determine if additional information is available.

Contact

Records managers

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Program contacts

Contact these MPCA staff if you have more specific questions about these activities.

Contact	Phone	Contact Description
Regina Small	651-757-2382	Hazardous Waste Data Management
Melissa Wenzel	651-757-2816	Ind Stormwater Compliance Staff
Kristin Dennis	651-757-2679	Ind Stormwater Data Management
Jacob Mueller	651-757-2862	Underground Tanks Compliance Staff

Alternate Name

Alternate Name or ID	Description
MND052732914	Hazardous Waste Preferred ID
A00002201	Industrial Stormwater Preferred ID
38770	MPCA Agency Interest ID
TS0002780	Underground Tanks Preferred ID

Owners

Owner or Primary Contact:
Helicopter Flight
Pro Air Aviation Inc

Former Owner or Primary Contact:
There are no records of former owner or primary contact names.

Documents

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Oasis Markets

Location:	6300 Zane Ave N Brooklyn Park, MN 55429-4102 Hennepin County
Watershed:	Mississippi River - Twin Cities (07010206)
Latitude:	45.06928
Longitude:	-93.35469
Coordinate Collection Method:	Address Matching House Number
Currently Active?	Yes
Institutional controls:	No

Search with a map

Activity Overview

Hazardous Waste

Hazardous Waste - MNR000028779

Oasis Markets

Status: Inactive

Events

Event	Start	End
Notif of Regulated Waste	05/18/2017	
Application/Notification/Registration Received	07/18/2016	07/18/2016

Links to Additional Data Sources

- HW Generator License Application Data - MNR000028779

Contact

Records managers

Records managers are MPCA staff that will help you to access files relating to this site. To request their help, visit our information request page to learn about the process or simply fill out an information request form.

Program contacts

Contact these MPCA staff if you have more specific questions about these activities.

Contact	Phone	Contact Description
Regina Small	651-757-2382	Hazardous Waste Data Management

Alternate Name

Alternate Name or ID	Description
MNR000028779	Hazardous Waste Preferred ID
17834	MPCA Agency Interest ID

Owners

Owner or Primary Contact:

Oasis Markets

Former Owner or Primary Contact:

There are no records of former owner or primary contact names.

Documents

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MINNESOTA POLLUTION CONTROL AGENCY

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Metro Airports Comm Flying Scotchman Inc

Location:	5200 Zane Ave Brooklyn Park, MN 55443 Hennepin County
Watershed:	Mississippi River - Twin Cities (07010206)
Latitude:	45.06937
Longitude:	-93.35452
Coordinate Collection Method:	Address Matching House Number
Currently Active?	Yes
Industry Classification:	Air Traffic Control
Institutional controls:	No

Search with a map

Activity Overview

Hazardous Waste

Hazardous Waste - MND982627176

Metro Airports Comm Flying Scotchman Inc

Status: Inactive

Events

Event	Start	End
Application/Notification/Registration Received	03/28/2018	03/28/2018
Notif of Regulated Waste	05/18/2017	

Links to Additional Data Sources

- HW Generator License Application Data - MND982627176

Stormwater

Industrial Stormwater - A00019220

Metro Airports Comm Flying Scotchman Inc

Status: Inactive

At industrial sites, stormwater may come into contact with harmful pollutants such as toxic metals, oil, grease and de-icing salts. Industrial stormwater permits are designed to limit the contaminants that reach surface and groundwater.

Events

Event	Start	End
No Exposure Exclusion	02/15/2007	04/05/2015

Enforcement Activities

Case Type	Net Penalty	Discovery Date	Action Date	Closure Date
Letter of Warning		05/07/2008	05/07/2008	

Links to Additional Data Sources

- ISW Online Permit Data - A00019220

Tanks

Underground Tanks - TS0001783

Metro Airports Comm Flying Scotchman Inc

Status: Active

An underground storage tank site has at least one tank of a certain size on the premises. A tank site may have multiple tanks and these tanks may contain food products, petroleum products or other substances.

Events

Event	Start	End
Registration Received	10/01/2012	10/01/2012
Notice Received	09/18/2012	09/18/2012
Registration Received	11/04/2011	11/04/2011
UST Notif Inst or Status Ch	03/26/2003	
Registration Received	03/03/2003	03/03/2003
Notice Received	10/21/1999	10/21/1999
Notice Received	11/25/1998	11/25/1998
Registration Received	03/01/1986	03/01/1986

Inspections

Inspection Type	Inspection Date
UT Inspection	09/05/2012
UT Inspection	07/29/2010
UT Inspection	11/20/2007
UT Inspection	02/27/2003
UT Inspection	04/27/1998

Enforcement Activities

Case Type	Net Penalty	Discovery Date	Action Date	Closure Date
Citation Warning		11/20/2007	12/05/2007	12/19/2007
Citation Warning		02/27/2003	02/27/2003	

Links to Additional Data Sources

There are no links for this activity. Contact the file manager or program contact to determine if additional information is available.

Contact

Records managers

Records managers are MPCA staff that will help you to access files relating to this site. To request their help, visit our information request page to learn about the process or simply fill out an information request form.

Program contacts

Contact these MPCA staff if you have more specific questions about these activities.

Contact	Phone	Contact Description
Regina Small	651-757-2382	Hazardous Waste Data Management
Melissa Wenzel	651-757-2816	Ind Stormwater Compliance Staff
Kristin Dennis	651-757-2679	Ind Stormwater Data Management

Alternate Name

Alternate Name or ID	Description
MND982627176	Hazardous Waste Preferred ID
A00019220	Industrial Stormwater Preferred ID
17544	MPCA Agency Interest ID
1783	Previous Name
TS0001783	Underground Tanks Preferred ID

Owners

Owner or Primary Contact:
John Roder

Former Owner or Primary Contact:
Flying Scotchman Inc
Metro Airports Comm Flying Scotchman Inc
Namaste Holdings LLC
Namaste Holdings Llc
Ross Arneson

Documents

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MINNESOTA POLLUTION CONTROL AGENCY

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What's in My Neighborhood

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Flying Scotchman, Inc

Location:	6300 Zane Ave N Brooklyn Park, MN 55429 Hennepin County
Watershed:	Mississippi River - Twin Cities (07010206)
Latitude:	45.06956
Longitude:	-93.35482
Coordinate Collection Method:	Digitized-DRG
Currently Active?	Yes
Institutional controls:	No

Search with a map

Activity Overview

Investigation and Cleanup

Brownfields - VP10910 - Voluntary Investigation and Cleanup

Flying Scotchman, Inc

Status: Inactive

Brownfields are potentially contaminated sites where the MPCA is helping buyers, sellers, developers or local governments to voluntarily investigate and clean up land for sale, financing or redevelopment. Sites may be petroleum brownfields, non-petroleum brownfields, or both. Non-petroleum brownfields are called Voluntary Investigation and Cleanup sites.

Events

Event	Start	End
No Action Letter Issued	01/09/2001	01/09/2001
Site Closed	01/08/2001	01/08/2001
No Action Letter Issued	12/28/2000	12/28/2000
Remedial Investigation Report Reviewed	08/24/2000	12/21/2000
Technical Review of Remedial Investigation Report Completed	08/24/2000	12/21/2000
Phase II Report Reviewed	07/07/2000	07/07/2000
VIC - Phase II Work Plan Approval Letter Issued	07/03/2000	07/03/2000
Technical Review of Work Plan Completed	06/23/2000	06/26/2000
Work Plan Reviewed	06/23/2000	06/26/2000
VIC - Phase I Report Reviewed	04/17/2000	04/17/2000
Other Report Type Not Listed Reviewed	04/10/2000	04/14/2000
Technical Review of Other Report Type Not Listed Completed	04/10/2000	04/14/2000
Comment Letter Prepared	01/31/2000	01/31/2000
VIC - Phase I Report Reviewed	12/13/1999	01/27/2000
VIC - Technical Review of Phase I Report Completed	12/13/1999	01/27/2000
Phase I Report Reviewed	12/01/1999	12/01/1999
Comment Letter Prepared	05/06/1999	05/06/1999
Application Completeness Determined	11/20/1998	11/20/1998
Remedial Investigation Report Reviewed	11/18/1998	05/01/1999
Technical Review of Remedial Investigation Report Completed	11/18/1998	05/01/1999
Application/Notification/Registration Received	11/18/1998	11/18/1998
Phase II Report Reviewed	09/16/1998	09/16/1998

Links to Additional Data Sources

There are no links for this activity. Contact the file manager or program contact to determine if additional information is available.

Contact

Records managers

Records managers are MPCA staff that will help you to access files relating to this site. To request their help, visit our information request page to learn about the process or simply fill out an information request form.

Program contacts

Contact these MPCA staff if you have more specific questions about these activities.

No program contact has been designated for this site.

Alternate Name

Alternate Name or ID	Description
VP10910	Brownfields Preferred ID
VP10910	Former Brownfields VIC Preferred ID
5020	MES Link ID
194881	MPCA Agency Interest ID
VP10910	Previous Name

Owners

Owner or Primary Contact:

Unknown

Former Owner or Primary Contact:

There are no records of former owner or primary contact names.

Documents

These files do not necessarily represent the MPCA's full set of public records for this site.

To request more records, visit our information request page to learn about the process or simply fill out an information request form.

MINNESOTA POLLUTION CONTROL AGENCY

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Highway 81 Crystal Corridor

Location:	Highway 81 from 35th Ave N to 58th Lakeland Ave Crystal, MN 55429 Hennepin County
Watershed:	Mississippi River - Twin Cities (07010206)
Latitude:	45.06381
Longitude:	-93.34221
Coordinate Collection Method:	Public Land Survey-Two Quarter
Currently Active?	Yes
Institutional controls:	No

Search with a map

Activity Overview

Investigation and Cleanup

Brownfields - PB3821 - Petroleum Brownfield

Highway 81 Crystal Corridor

Status: Inactive

Brownfields are potentially contaminated sites where the MPCA is helping buyers, sellers, developers or local governments to voluntarily investigate and clean up land for sale, financing or redevelopment. Sites may be petroleum brownfields, non-petroleum brownfields, or both.

Events

Event	Start	End
Other Report Type Not Listed Reviewed	02/10/2012	02/10/2012
Site Closed	02/10/2012	02/10/2012
Technical Review of Other Report Type Not Listed Completed	02/10/2012	02/10/2012
PBP - Response Action Plan (RAP) Approval Letter Issued	01/28/2010	01/28/2010
PBP - Response Action Plan (RAP) Approval Letter Issued	12/31/2009	01/28/2010
PBP - Response Action Plan (RAP) Reviewed	12/31/2009	01/28/2010
PBP - Technical Review of Response Action Plan (RAP) Completed	12/31/2009	01/26/2010
Application Completeness Determined	12/31/2009	12/31/2009

Links to Additional Data Sources

There are no links for this activity. Contact the file manager or program contact to determine if additional information is available.

Contact

Records managers

Records managers are MPCA staff that will help you to access files relating to this site. To request their help, visit our information request page to learn about the process or simply fill out an information request form.

Program contacts

Contact these MPCA staff if you have more specific questions about these activities.

No program contact has been designated for this site.

Alternate Name

Alternate Name or ID	Description
PB3821	Brownfields Preferred ID
3821	Former Brownfields PBP Preferred ID
185609	MPCA Agency Interest ID

Owners

Owner or Primary Contact:

Hennepin Co Environmental Services

Hennepin County Environmental Services

Former Owner or Primary Contact:

There are no records of former owner or primary contact names.

Documents

These files do not necessarily represent the MPCA's full set of public records for this site.

To request more records, visit our information request page to learn about the process or simply fill out an information request form.

MINNESOTA POLLUTION CONTROL AGENCY

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Faa Crystal Airport Tower Building

Location:	Highway 169 & Bass Lake Rd Crystal, MN 55429 Hennepin County
Watershed:	Mississippi River - Twin Cities (07010206)
Latitude:	45.06381
Longitude:	-93.34221
Coordinate Collection Method:	Public Land Survey-Two Quarter
Currently Active?	No
Institutional controls:	No

Search with a map

Activity Overview

Investigation and Cleanup

Petroleum Remediation - LS0012538 - Leak Site

Faa Crystal Airport Tower Building

Status: Inactive

Leak sites are locations where a release of petroleum products has occurred from a tank system. Leak sites can occur from aboveground or underground tank systems as well as from spills at tank facilities.

Events

Event	Start	End
Limited Site Investigation Reviewed	11/01/1999	12/07/1999
Site Closed	11/01/1999	12/07/1999
Technical Review of Limited Site Investigation Report Completed	11/01/1999	12/01/1999
Excavation Report Reviewed	05/07/1999	07/02/1999
More Work Requested	05/07/1999	07/02/1999
Responsible Party Determined	04/21/1999	04/21/1999
Standard Letter Issued	04/21/1999	04/21/1999
Leak Reported	04/08/1999	04/08/1999
Leak Discovered	04/07/1999	04/07/1999

Links to Additional Data Sources

There are no links for this activity. Contact the file manager or program contact to determine if additional information is available.

Tanks

Underground Tanks - TS0002897

Faa Crystal Airport Tower Building

Status: Inactive

An underground storage tank site has at least one tank of a certain size on the premises. A tank site may have multiple tanks and these tanks may contain food products, petroleum products or other substances.

Events

Event	Start	End
Notice Received	07/24/1995	07/24/1995
Registration Received	09/23/1988	09/23/1988
Registration Received	05/06/1986	05/06/1986

Links to Additional Data Sources

There are no links for this activity. Contact the file manager or program contact to determine if additional information is available.

Contact

Records managers

Records managers are MPCA staff that will help you to access files relating to this site. To request their help, visit our information request page to learn about the process or simply fill out an information request form.

Program contacts

Contact these MPCA staff if you have more specific questions about these activities.

Contact	Phone	Contact Description
Jacob Mueller	651-757-2862	Underground Tanks Compliance Staff

Alternate Name

Alternate Name or ID	Description
12538	Former Leak Site Preferred ID
LS0012538	Leak Site Preferred ID
110667	MPCA Agency Interest ID
TS0002897	Underground Tanks Preferred ID

Owners

Owner or Primary Contact:

Faa Crystal Airport Tower Building

Former Owner or Primary Contact:

There are no records of former owner or primary contact names.

Documents

These files do not necessarily represent the MPCA's full set of public records for this site.

To request more records, visit our information request page to learn about the process or simply fill out an information request form.

MINNESOTA POLLUTION CONTROL AGENCY

What's in My Neighborhood

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Crystal Shamrock

Location:	6000 Douglas Dr N Crystal, MN 55429 Hennepin County
Watershed:	Mississippi River - Twin Cities (07010206)
Latitude:	45.06249
Longitude:	-93.35914
Coordinate Collection Method:	Digitized - MPCA internal mapping application
Currently Active?	Yes
Institutional controls:	No

Search with a map

Activity Overview

Investigation and Cleanup

Petroleum Remediation - LS0017311 - Leak Site

Crystal Shamrock

Status: Inactive

Leak sites are locations where a release of petroleum products has occurred from a tank system. Leak sites can occur from aboveground or underground tank systems as well as from spills at tank facilities.

Events

Event	Start	End
Responsible Party Determined	07/25/2008	07/25/2008
Standard Letter Issued	07/25/2008	07/25/2008
Requested Information/Report Reviewed	07/11/2008	07/29/2008
Site Closed	07/11/2008	07/29/2008
Leak Reported	06/27/2008	06/27/2008
Leak Discovered	06/26/2008	06/26/2008

Links to Additional Data Sources

There are no links for this activity. Contact the file manager or program contact to determine if additional information is available.

Tanks

Underground Tanks - TS0012367

Crystal Shamrock

Status: Active

An underground storage tank site has at least one tank of a certain size on the premises. A tank site may have multiple tanks and these tanks may contain food products, petroleum products or other substances.

Events

Event	Start	End
Registration Received	05/06/2009	05/06/2009
Notice Received	06/23/2008	06/23/2008
Registration Received	02/05/1999	02/05/1999
Notice Received	01/10/1999	01/10/1999
Registration Received	11/11/1993	11/11/1993
Registration Received	06/01/1990	06/01/1990
Registration Received	08/19/1988	08/19/1988
Registration Received	06/02/1978	06/02/1978
Registration Received	01/01/1900	01/01/1900

Inspections

Inspection Type	Inspection Date
UT Inspection	04/24/2009
UT Inspection	06/29/2006
UT Inspection	02/20/2003
UT Inspection	09/29/1997

Enforcement Activities

Case Type	Net Penalty	Discovery Date	Action Date	Closure Date
Citation Warning		02/20/2003	02/20/2003	
Letter of Warning		06/07/1994	06/07/1994	

Links to Additional Data Sources

There are no links for this activity. Contact the file manager or program contact to determine if additional information is available.

Contact

Records managers

Records managers are MPCA staff that will help you to access files relating to this site. To request their help, visit our information request page to learn about the process or simply fill out an information request form.

Program contacts

Contact these MPCA staff if you have more specific questions about these activities.

Contact	Phone	Contact Description
Jacob Mueller	651-757-2862	Underground Tanks Compliance Staff

Alternate Name

Alternate Name or ID	Description
17311	Former Leak Site Preferred ID
LS0017311	Leak Site Preferred ID
124282	MPCA Agency Interest ID
17311	Previous Name
TS0012367	Underground Tanks Preferred ID

Owners

Owner or Primary Contact:

Crystal Shamrock Inc
Wentworth Aircraft

Former Owner or Primary Contact:

There are no records of former owner or primary contact names.

Documents

These files do not necessarily represent the MPCA's full set of public records for this site.

To request more records, visit our information request page to learn about the process or simply fill out an information request form.

MINNESOTA POLLUTION CONTROL AGENCY

What's in My Neighborhood

Help FAQ WIMN Glossary Feedback New search

Runway 5R/23L Reconstruction

Location:	Crystal Airport Crystal, MN 55422 Hennepin County
Watershed:	Mississippi River - Twin Cities (07010206)
Latitude:	45.06271
Longitude:	-93.35222
Coordinate Collection Method:	Address Matching House Number
Currently Active?	Yes
Institutional controls:	No

Search with a map

Activity Overview

Investigation and Cleanup

Petroleum Remediation - LS0009917 - Leak Site

Runway 5R/23L Reconstruction

Status: Inactive

Leak sites are locations where a release of petroleum products has occurred from a tank system. Leak sites can occur from aboveground or underground tank systems as well as from spills at tank facilities.

Events

Event	Start	End
Other Report Type Not Listed Reviewed	04/14/2003	04/16/2003
Site Closed	04/14/2003	04/16/2003
General Information Reviewed	03/28/2003	03/28/2003
More Information Requested	03/28/2003	03/28/2003
File Reviewed No Report Received	01/09/2002	01/11/2002
Wakeup Request Issued	01/09/2002	01/11/2002
File Reviewed No Report Received	05/17/2001	05/17/2001
Wakeup Request Issued	05/17/2001	05/17/2001
More Information Requested	11/07/2000	11/15/2000
Other Report Type Not Listed Reviewed	11/07/2000	11/15/2000
File Reviewed No Report Received	09/08/2000	09/08/2000
More Work Requested	09/08/2000	09/08/2000
General Information Reviewed	12/03/1997	12/03/1997
Other Report Type Not Listed Reviewed	02/05/1997	02/24/1997
Soil Treatment Approved	02/05/1997	02/24/1997
Leak Reported	02/04/1997	02/04/1997
Responsible Party Determined	02/04/1997	02/04/1997
Standard Letter Issued	02/04/1997	02/04/1997
Leak Discovered	02/03/1997	02/03/1997

Links to Additional Data Sources

There are no links for this activity. Contact the file manager or program contact to determine if additional information is available.

Petroleum Remediation - LS0011089 - Leak Site

Runway 5R/23L Reconstruction

Status: Inactive

Leak sites are locations where a release of petroleum products has occurred from a tank system. Leak sites can occur from aboveground or underground tank systems as well as from spills at tank facilities.

Events

Event	Start	End
Responsible Party Determined	02/20/1998	02/20/1998
Standard Letter Issued	02/20/1998	02/20/1998
General Information Reviewed	02/17/1998	02/19/1998
Site Closed	02/17/1998	02/19/1998
Leak Reported	02/02/1998	02/02/1998
Leak Discovered	05/28/1997	05/28/1997

Links to Additional Data Sources

There are no links for this activity. Contact the file manager or program contact to determine if additional information is available.

Stormwater

Construction Stormwater - C00001463

Runway 5R/23L Reconstruction

Status: Inactive

When stormwater drains off a construction site, it can carry sediment and pollutants that harm lakes, streams and wetlands. Stormwater permit requirements are designed to control erosion and limit pollution during and after construction.

Events

Event	Start	End
Coverage Issuance	07/28/1994	12/08/1999
Coverage Termination	07/28/1994	12/08/1999

Links to Additional Data Sources

- CSW Online Permit Data - CSC00001463

Tanks

Underground Tanks - TS0015200

Runway 5R/23L Reconstruction

Status: Active

An underground storage tank site has at least one tank of a certain size on the premises. A tank site may have multiple tanks and these tanks may contain food products, petroleum products or other substances.

Events

Event	Start	End
Notice Received	04/08/1996	04/08/1996
Registration Received	07/02/1991	07/02/1991

Inspections

Inspection Type	Inspection Date
UT Inspection	03/08/2017
UT Inspection	08/21/2012
UT Inspection	05/13/2010
UT Inspection	06/20/2007

Links to Additional Data Sources

There are no links for this activity. Contact the file manager or program contact to determine if additional information is available.

Contact

Records managers

Records managers are MPCA staff that will help you to access files relating to this site. To request their help, visit our information request page to learn about the process or simply fill out an information request form.

Program contacts

Contact these MPCA staff if you have more specific questions about these activities.

Contact	Phone	Contact Description
Rachel Parlin	651-757-2118	Const Stormwater Data Management

Alternate Name

Alternate Name or ID	Description
C00001463	Construction Stormwater Preferred ID
11089	Former Leak Site Preferred ID
9917	Former Leak Site Preferred ID
LS0009917	Leak Site Preferred ID
LS0011089	Leak Site Preferred ID
37093	MPCA Agency Interest ID
TS0015200	Underground Tanks Preferred ID

Owners

Owner or Primary Contact:

Gary Warren
Metropolitan Airports Commission
Thunderbird Aviation Inc

Former Owner or Primary Contact:

There are no records of former owner or primary contact names.

Documents

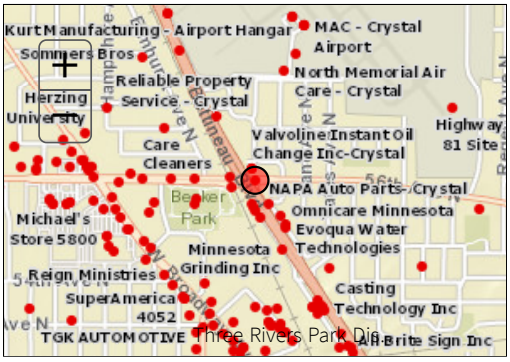
These files do not necessarily represent the MPCA's full set of public records for this site.

To request more records, visit our information request page to learn about the process or simply fill out an information request form.

MINNESOTA POLLUTION CONTROL AGENCY

Crystal Airport-equipment Building

Location:	Highway 81 & Bass Lake Rd Crystal, MN 55429 Hennepin County
Watershed:	Mississippi River - Twin Cities (07010206)
Latitude:	45.05460
Longitude:	-93.35760
Coordinate collection method:	Address Matching Unknown
Currently active?	Yes
Institutional controls:	No



Search with a map

Activity Overview | MPCA Contacts | Alternate Names | Owners | Documents (0)

Investigation and Cleanup

Petroleum Remediation - LS0004782 - Leak Site

Status: Inactive

Leak sites are locations where a release of petroleum products has occurred from a tank system. Leak sites can occur from aboveground or underground tank systems as well as from spills at tank facilities.

Less Detail

Events

Event	Start	End
Remedial Investigation Report Reviewed	10/20/1992	10/28/1992
Site Closed	10/20/1992	10/28/1992
More Information Requested	03/12/1992	04/21/1992
Soil Corrective Action Plan Reviewed	03/12/1992	04/21/1992
Excavation Report Reviewed	03/12/1992	03/12/1992
Responsible Party Determined	11/14/1991	11/14/1991
Standard Letter Issued	11/14/1991	11/14/1991
Leak Reported	10/30/1991	10/30/1991
Leak Discovered	10/29/1991	10/29/1991
Thermal Treatment Soil Batch Approved	01/01/1901	01/01/1901

Links to additional data sources

Leak Data - LS0004782

MINNESOTA POLLUTION CONTROL AGENCY

What's in My Neighborhood

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Zane Mart

Location:	6300 Zane Ave N Brooklyn Park, MN 55429 Hennepin County
Watershed:	Mississippi River - Twin Cities (07010206)
Latitude:	45.06977
Longitude:	-93.35397
Coordinate collection method:	Digitized - MPCA internal mapping application
Currently active?	Yes
Institutional controls:	No

Search with a map

Activity Overview | MPCA Contacts | Alternate Names | Owners | Documents (1)

Investigation and Cleanup

Petroleum Remediation - LS0001722 - Leak Site

Status: Inactive

Leak sites are locations where a release of petroleum products has occurred from a tank system. Leak sites can occur from aboveground or underground tank systems as well as from spills at tank facilities.

Less Detail

Events

Event	Start	End
Monitoring Report Reviewed	11/23/1993	03/24/1994
Site Closed	11/23/1993	03/24/1994
Technical Review of Monitoring Report Completed	11/23/1993	03/24/1994
Monitoring Report Reviewed	08/18/1993	03/24/1994
Technical Review of Monitoring Report Completed	08/18/1993	03/24/1994
Remedial Investigation Report Reviewed	03/11/1993	03/24/1994
Technical Review of Remedial Investigation Report Completed	03/11/1993	03/24/1994
File Reviewed No Report Received	01/27/1993	01/27/1993
Wakeup Request Issued	01/27/1993	01/27/1993
Excavation Report Reviewed	01/29/1990	02/20/1990
Remedial Investigation Requested	01/29/1990	02/20/1990
Responsible Party Determined	11/01/1989	11/01/1989
Standard Letter Issued	11/01/1989	11/01/1989
Leak Discovered	10/11/1989	10/11/1989
Leak Reported	10/11/1989	10/11/1989

Links to additional data sources

Leak Data - LS0001722

Petroleum Remediation - LS0017904 - Leak Site

Status: Inactive

Leak sites are locations where a release of petroleum products has occurred from a tank system. Leak sites can occur from aboveground or underground tank systems as well as from spills at tank facilities.

Less Detail

Events

Event	Start	End
Site Closed	11/21/2017	11/27/2017
Requested Information/Report Reviewed	10/27/2017	11/21/2017
Submittals Due Requested	10/24/2017	10/26/2017
Monitoring Report Reviewed	07/27/2017	10/24/2017
Technical Review of Monitoring Report Completed	07/27/2017	10/24/2017
Submittals Due Requested	07/26/2017	07/26/2017
Commissioner's Site Report Request Processed	10/20/2016	10/21/2016
Commissioner's Site Report Request Processed	10/13/2016	10/13/2016
Commissioner's Site Report Request Processed	10/04/2016	10/12/2016
Wakeup Request Issued	05/19/2016	05/20/2016

More Work Requested	07/06/2015	09/11/2015
Remedial Investigation Report Reviewed	07/06/2015	09/11/2015
Technical Review of Remedial Investigation Report Completed	07/06/2015	09/09/2015
File Reviewed No Report Received	09/12/2014	09/12/2014
Wakeup Request Issued	09/12/2014	09/12/2014
File Reviewed No Report Received	02/11/2013	02/12/2013
Wakeup Request Issued	02/11/2013	02/12/2013
File Reviewed No Report Received	01/16/2013	01/18/2013
Wakeup Request Issued	01/16/2013	01/18/2013
File Reviewed No Report Received	03/08/2012	03/12/2012
Wakeup Request Issued	03/08/2012	03/12/2012
Phase II Report Reviewed	02/09/2012	02/09/2012
Fund Finance Closed	01/10/2012	01/10/2012
Responsible Party Determined	03/24/2011	03/24/2011
Standard Letter Issued	03/24/2011	03/24/2011
Fund Finance Approved	11/24/2010	11/24/2010
File Reviewed No Report Received	06/11/2010	06/11/2010
Referred to Fund Finance Coordinator	06/11/2010	06/11/2010
Closure Request Reviewed	05/12/2010	05/12/2010
Commissioner's Order Issued	05/12/2010	05/12/2010
Leak Discovered	02/23/2010	02/23/2010
Leak Reported	02/23/2010	02/23/2010

Inspections and field work

Type	**Date**
Field Work Notification	08/04/2016
Field Work Notification	03/23/2015
Field Work Notification	05/01/2014
Field Work Notification	04/29/2014

Links to additional data sources

Leak Data - LS0017904

Petroleum Remediation - LS0020702 - Leak Site

Status: Active

Leak sites are locations where a release of petroleum products has occurred from a tank system. Leak sites can occur from aboveground or underground tank systems as well as from spills at tank facilities.

More Detail

Tanks

Underground Tanks - TS0002563

Status: Active

An underground storage tank site has at least one tank of a certain size on the premises. A tank site may have multiple tanks and these tanks may contain food products, petroleum products or other substances.

Less Detail

Events

Event	Start	End
UST Notif Inst or Status Ch	08/06/2015	
Registration Received	12/16/2005	12/16/2005
Registration Received	10/19/1989	10/19/1989
Registration Received	04/30/1986	04/30/1986

Inspections and field work

Type	Date
UT Inspection	09/11/2018
UT Inspection	03/12/2015
UT Inspection	02/03/2012
UT Inspection	08/12/2010
UT Inspection	07/29/2010
UT Inspection	05/05/2010
UT Inspection	04/23/2007

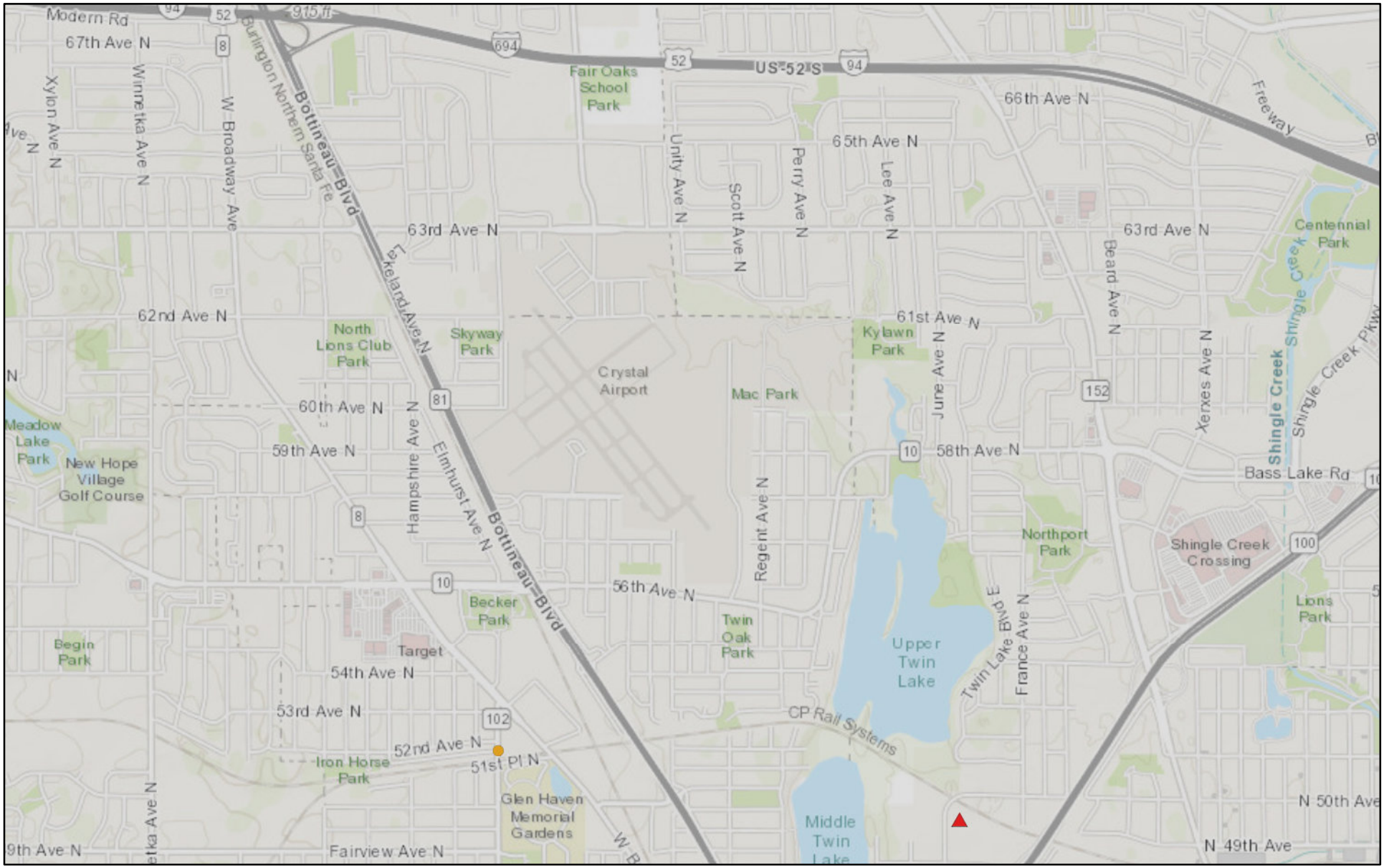
Enforcement Activities

Case Type	Net Penalty	Discovery Date	Action Date	Closure Date
Citation Warning		06/11/2018	06/20/2018	12/05/2018
Red Tag		08/12/2010	08/12/2010	
Citation Warning		04/23/2007	04/23/2007	07/11/2007

Links to additional data sources

Tank Data - TS0002563

EPA identified cleanups



August 9, 2018

polygonLayer

Override 1

1:35,153

0 0.3 0.6 1.2 mi

0 0.475 0.95 1.9 km

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri

E-70

Generated from: Cleanups in My Community: Date above is the date map was printed.
Map showing no EPA identified cleanups in Airport vicinity.

Appendix F – Phase II Historic and Architectural Survey Report

DEPARTMENT OF ADMINISTRATION
STATE HISTORIC PRESERVATION OFFICE

June 18, 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 initiating consultation on the above project. Information received in our office on 21 May 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.

Define Undertaking and Area of Potential Effect
We have reviewed the documentation included with your May 17, 2018 submittal and as we understand it, the proposed Federal undertaking is to make a number of improvements at the Crystal Airport including various runway and taxiway improvements and removals, expanding the FBO apron, and developing a portion of airport land for non-aeronautical use along 63rd Avenue North. We have also completed our review of the documentation provided in regards to your agency's determination of the area of potential effect (APE) for the 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

Historic/Architecture Properties
We have reviewed the Phase II property evaluation submitted for the Crystal Airport (HE-CRC-112) and we concur with your agency's determination that the airport is **not eligible** for listing in the National Register of Historic Places (NRHP). We also concur with the consultant's recommendation that none of the buildings or concentration of buildings within the airport property are individually eligible for listing in the NRHP.

Archaeology
You have indicated that a Phase I archaeological survey is currently underway for this project. We look forward to reviewing the results of this survey as they become available.

We look forward to further consultation regarding this project. 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

U.S. Department
of Transportation
Federal Aviation Administration

Dakota-Minnesota Airports District Office
Bismarck Office
2301 University Drive, Building 23B
Bismarck, ND 58504

Dakota-Minnesota Airports District Office
Minneapolis Office
6020 28th Avenue South, Suite 102
Minneapolis, MN 55450

May 17, 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

Dear Ms. Beimers:

The Federal Aviation Administration (FAA) determined that a Section 106 finding of a No Historic Properties Affected is applicable for the Crystal Airport Improvement Project. The FAA also recommends that the Airport to not be considered eligible for listing under the National Register of Historic Places under Criteria A, B, & C. The FAA respectfully requests the Minnesota State Historic Preservation Office to provide written concurrence with the Section 106 determination of No Historic Properties Affected and for the Airport to not be eligible for listing under Criteria A, B, & C.

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: No Historic Properties Affected Finding

FEDERAL AVIATION ADMINISTRATION (FAA)
DOCUMENTATION OF SECTION 106 FINDING OF
NO HISTORIC PROPERTIES AFFECTED
SUBMITTED TO THE STATE HISTORIC PRESERVATION OFFICE (SHPO)
PURSUANT TO 36 CFR Section 800.4(d)(1) for the
CRYSTAL AIRPORT IMPROVEMENT PROJECT

1. DESCRIPTION OF THE UNDERTAKING

The Metropolitan Airports Commission (MAC), owner of the Crystal Airport (Airport), is proposing to make various improvements to the airfield. The MAC recently completed a Long-Term Comprehensive Plan (LTCP) for the Airport, which was approved by the MAC Board in October 2017. The key planning objectives for the LTCP were to:

- Better align airfield infrastructure to match existing and forecasted activity levels (right-size the airfield);
- Preserve and improve operational capabilities for the current family of aircraft using the facility; and
- Enhance safety by simplifying the runway and taxiway layout.

Project components to be covered as part of the environmental documentation include the following:

- Decommission Runway 14R/32L and convert to parallel taxiway
- Convert portions of Runway 14L/34R blast pads to usable runway
- Reduce length of Runway 06R/24L (turf) to clear Taxiways D & F from the RSA
- Establish LNAV approach to Runway 32R
- Various taxiway improvements and removals
- Expand the FBO apron
- Develop airport land for non-aeronautical use along 63rd Avenue North (work related to this project component will be broken out separately in the fee estimate to allow for a la carte addition or removal) (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 at Mead & Hunt conducted a Phase II Historic and Architectural property inventory of the Crystal Airport to determine whether the Airport is eligible for listing on the National Register of Historic Places (Appendix C). A summary of this inventory is described below.

Crystal Airport was previously evaluated in 2012 as part of the Bottineau (now referred to as Blue Line) Transitway Phase I and II Architectural History Survey. That evaluation determined the following:

> "Although the basic layout of the airport was developed between 1947 and 1971, a substantial number of buildings on the airport grounds were built or replaced from the mid-1960s forward…It was therefore determined that airport does not meet the qualifications for exceptional importance under NRHP Criteria Consideration G. As such, it is recommended that the airport is currently not eligible for the NRHP, and the entire property should be reevaluated for eligibility once the last major development of the airport reaches 50 years of age."

For this reevaluation, the Crystal Airport was evaluated for listing in the National Register under Criteria A, B, and C using the National Register Bulletins *How to Apply the National Register Criteria for Evaluation and Guidelines for Evaluating and Documenting Historic Aviation Properties*. The Crystal Airport was not assessed under National Register Criterion D as part of this evaluation.

Within the MAC system, individual buildings and complexes have been previously evaluated at three of the airports. The Flying Cloud Airport Building Area No. 1 was recommended significant and received SHPO concurrence in 2003 under Criterion A "as an important aspect of the first general aviation airport developed by the Metropolitan Airports Commission in the post-World War II era." The Lake Elmo Airport was determined not eligible in 2017, as it was not found to be significant within the history or development of the MAC system or important within the overall history of aviation history of aviation in Minnesota or Washington County. The Holman Field Administration Building at the St. Paul Airport was evaluated in 1991 and was determined eligible under Criterion A as an example of an important projected completed by the Works Progress Administration (WPA) and the city of St. Paul, and under Criterion C as "one of the most accomplished works of Clarence Wesley Wigington, the first Black architect for the City of St. Paul." These previous evaluations of MAC airports were considered in the evaluation of the Crystal Airport.

Criterion A

In the 2012 evaluation, the Crystal Airport was found to have:

> "…importance in the areas of community planning and development, and transportation, as an integral component of the MAC Reliever System. The airport is the most developed of the reliever airports, having three paved runways and a turf runway, as well as [a] large number of hangars, reflecting the high volume of air traffic that operates out of the airport annually. Additionally, the airport is important as part of the ongoing implementation and operation of the innovative MAC Reliever System."

For this reevaluation, the Crystal Airport was evaluated as a component of the MAC system and for its association with aviation in the Twin Cities metropolitan area. The innovation of the MAC reliever system was also investigated for this reevaluation.

The Crystal Airport is one of five secondary (currently called reliever) airports operated by MAC from the late 1940s to the 1970s that, collectively with the primary airport—Minneapolis-St. Paul International Airport (MSP)—comprise the MAC system. The St. Paul Airport was immediately included in the system as it was part of the impetus to create MAC and stop competition with the then Wold-Chamberlin Field (now MSP). Flying Cloud was the first airport to be purchased and acquired (operated) by MAC in

1948 with Crystal following shortly after in 1949. Lake Elmo and Anoka-Blaine were added to MAC's operations in the early 1950s.

When establishing the system of secondary airports, MAC intended each of the MAC secondary airports for general aviation use, specifically as bases for private planes, as well as for commercial operations like flight schools, charter operators, and commuter services. By diverting smaller aircraft to secondary airports, the MAC could alleviate airport congestion and develop MSP as the major commercial airline hub.

The secondary airports were developed in similar ways during the late 1940s to the early 1970s, focusing on their use for private and small commercial operations. Development of the secondary airports included three to four runways (generally paved), maintenance and FBO facilities, a terminal/administration building and numerous hangars. In addition, both Flying Cloud and Crystal included air traffic control towers built in the early 1960s. Crystal was developed during this time to include four runways (three paved and one turf by 1971), a terminal/administration building with an air traffic control tower addition, hangars for FBOs, flight schools, maintenance facilities, and numerous private hangars. In comparison, Flying Cloud also had three paved runways by 1965, a large number of hangars, a terminal building and air traffic control tower and a number of flight schools. When comparing the use of MAC secondary airports, Flying Cloud was the busiest in the 1950s and 1960s based on flight operations and aircraft. Crystal, with comparable facilities, was the second busiest.

Crystal is one of six airports within the MAC system of secondary airports and serves a similar purpose to the other secondary airports of the system. A portion of the Flying Cloud airport has been recognized as an eligible historic district for its significance as the first general aviation airport within the system. Crystal was the second general aviation airport in the MAC system and there is no evidence that it was more developed than Flying Cloud. There is also no evidence that it developed differently from the other secondary airports or that it influenced the development of later secondary airports such as Lake Elmo or Anoka. Crystal Airport does not appear to have played a significant role in the development of aviation in the Twin Cities or Minnesota. In addition, no important events or trends in aviation were identified as associated with the Crystal Airport that would make it significant under Criterion A.

Investigations were also conducted to understand if the MAC system was innovative within the context of other airport systems in Minnesota or the United States. Although there are claims that the MAC system was pioneering and a model, the sources for these statements do not provide either the historic context and/or evidentiary details to support these statements. Research efforts did not reveal any context or corroboration for MAC being a pioneering system that influenced other airports regionally or nationally. Research did show that nationally, the concept of regional airport systems was discussed in studies in the mid-1920s and 1930s and that airports were being developed elsewhere to separate commercial and general aviation prior to World War II. Regional systems like the airports operated by the Port Authority of New York were implemented by 1947 and MAC's earliest secondary airport (Flying Cloud) was not purchased and acquired until 1948. Therefore, due to a lack of context and lack of evidence of any influence, the MAC system was not found to be either a pioneering system or a model for other systems in Minnesota or the nation. Similarly, the Crystal

Airport itself is not known to have had influence on the development of the MAC system, other MAC airports, or on airport systems outside of the MAC.

The Crystal Airport is recommended not eligible under Criterion A.

Criterion B

Research did not reveal any notable individuals associated with the Crystal Airport or the wider MAC system. Additionally, no individuals associated with the property were found to be important within the aviation history of the region or state. The property is recommended not eligible under Criterion B.

Criterion C

The Crystal Airport was evaluated for its potential significance as an example of a general aviation airport constructed in the post-World War II era and developed through the early 1970s. Operation of the airport by MAC began in 1949 and the airport was largely developed by the early 1970s. This included the four-runway configuration and the construction of a terminal with a control tower attached in 1963, a large number of hangars, and other air service-related hangars and buildings to house services such as Fixed Based Operators (FBOs), flight schools, and maintenance shops. Hangar Area 4 was the only area not fully developed by the early-1970s.

The development and resulting facilities of the Crystal Airport from 1949 through the early 1970s is typical for airports. It is also similar to other MAC secondary airports, which have runways; control towers (Flying Cloud, Crystal and St. Paul); flight schools, maintenance, and FBO facilities; and private hangars. Crystal Airport represents the typical post-war airport development and was not identified to be distinguished in its development within the MAC system or among other general aviation facilities. Its runways and collection of airport buildings are typical of other general aviation airports developed after World War II and therefore do not represent unusual or significant post-World War II airport design. In addition, the Crystal airport developed continuously after the early 1970s, with the construction of many hangars. Buildings constructed after the early 1970s are located throughout the property, including in all four hangar areas, which limits the ability of the overall airport to convey the cohesiveness of a general aviation facility from the postwar era.

Concentrations of buildings and individual buildings within the airport were also evaluated to see if they have significance under Criterion C. In particular, Hangar Areas 1 and 2 retain a higher percentage of buildings constructed before the early-1970s. These areas include a mix of buildings dating from 1951 through ca. 1971, with some infill of hangars built after the early-1970s. Area 1 includes the terminal building with the attached air traffic control tower and maintenance facilities. It is unknown if the tower addition was based on a standard FAA plan. The hangars at the airport are the typical box, T-, and Quonset-style types found at other general aviation airports of this period, including other MAC secondary airports. These hangars do not represent a significant type, period, or method of construction for airport-related buildings, nor are the buildings distinct.

Additionally, many of the hangars built during the evaluation period have been altered with replacement siding and doors and a few additions, altering their historic appearance. These alterations, including the replacement of single-stall T-hangars with ca. 1990s hangars in Hangar Area 1, have affected the integrity of workmanship, materials, design, feeling and association of Hangar Areas 1 and 2.

Building Area No. 1 at Flying Cloud airport was evaluated and received SHPO concurrence for significance under Criterion C "as it contains a collection of small-scale, individual and multi-unit T-hangars that evoke the era of personal aviation after World War II." Although Crystal does contain hangars that date to the late 1940s and 1950s, a similar grouping of hangars was not found that could also represent significance related to personal aviation after World War II.

The Crystal Airport buildings do not represent notable works of a master nor do they have high artistic value. Most buildings are utilitarian in form and design. The few buildings that have stylistic influences, such as the Contemporary terminal building and Crystal Shamrock building, are modest in design and are not distinct examples of their style. In addition, the terminal and administration building has been altered with enclosed windows that remove a key feature of the Contemporary design and the building has been expanded with the addition of an air traffic control tower and maintenance facility additions changing its overall form. The prominent Minnesota architectural firm Magney, Tusler, and Setter, designed the terminal building. However, the building is not identified as one of the firm's significant designs in *Minnesota Architects*, *A Guide to the Architecture of Minnesota*, *A Guide to Minnesota Architecture* or the *AIA Guide to the Twin Cities,* and is a less prominent example of their work. As a result, unlike the Holman Field Administration Building at the St. Paul Airport, which was determined significant and eligible as an important work of architect Clarence Wesley Wigington, the Crystal Airport terminal building was not found to be an important work of Magney, Tusler, and Setter. Additionally, alterations to the building have diminished its integrity, which would preclude its eligibility for listing on the National Register under Criterion C.

Therefore, Crystal Airport as a whole, as well as individual buildings or concentrations of buildings, were not found to possess significance under Criterion C: Architecture and is recommended not eligible.

Integrity

As the Crystal Airport does not have significance, an assessment of its integrity is not warranted.

Recommendation

The Crystal Airport is recommended not eligible for listing in the National Register. In addition, no individual buildings or concentrations of buildings were found to possess significance outside of the overall property.

4. BASIS FOR FINDING

The Airport has been subject to repeated earth moving activities and no cultural resources were discovered. No structures are proposed to be impacted due to the proposed action. If any construction activity results in the advertent discovery of a cultural resource, construction will halt until the SHPO and the Federal Aviation Administration (FAA) are notified.

Completion of the Architectural history review did not identify any impacts to any National Register listed or eligible-for-listing resources due to the proposed project. The FAA recommends that the Crystal Airport is not considered eligible for listing under the National Register for Criteria A, B, &C.

The FAA has therefore determined that a finding of *No Historic Properties Affected* is appropriate for this project. The FAA respectfully requests that the SHPO provide written concurrence within 30 days of receipt of this Section 106 finding of No Historic Properties Affected and that the Airport is not eligible for listing under the National Register for Criteria A, B, & C.

ATTACHMENTS

Appendix A: Project Exhibit

Appendix B: APE Map

Appendix C: Phase II Historic and Architectural Survey

Josh Fitzpatrick
Environmental Protection Specialist
Federal Aviation Administration
Dakota-Minnesota Airport District Office

17-May 2018

Date

Minnesota Multiple Property Inventory Form

Please refer to the *Historic and Architectural Survey Manual* before completing this form.

Must use *Adobe Acrobat Reader* to complete and save this form. *Adobe Acrobat Reader* can be downloaded at: https://get.adobe.com/reader/?promoid=KLXME

General Information

Historic Name: Crystal Airport

Other Names:

Inventory No.: HE-CRC-112

Multiple Property Category: Complex

Multiple Property Category (if other): Airport

New or Updated Form: Updated

Review and Compliance No.: 2011-3773

Extant: Yes

Agency Proj. No.:

Survey Type: Intensive (Phase 2)

Grant No.:

Location Information

Street Address: 5800 Crystal Airport Road

County: Hennepin

City/Twp: Crystal

If Multiple, List All Counties:

If Multiple, List All Cities/Townships:
Brooklyn Park; Brooklyn Center

Total Acres: 436

USGS 7.5 Quad Name(s): Minneapolis North, MN 1993

Township: 118 Range: 21 E/W: W Section: 4

QtrQtrQtr: QtrQtr: N Qtr: NW

Township: 119 Range: 21 E/W: W Section: 33

QtrQtrQtr: QtrQtr: S Qtr: SW

Urban:

Subdivision:

Block(s):

Lot(s):

Property Identification Numbers (PINs): 0411821110001 (primary)

If more space is needed for location information, please submit on a separate sheet.

UTM Coordinates:

Datum: NAD 1983

UTM Zone	Easting	Northing
15M	471637	4990711
15M	472440	4990702
15M	472437	4990504
15M	473255	4990299
15M	473259	4989891
15M	472795	4989885
15M	472716	4989012
15M	472678	4989017
15M	472198	4989479
15M	471600	4989500
15M	471432	4989901
15M	471653	4989892
15M	471520	4990449

Previous Determinations

- ☐ National Register Listed
- ☐ NPS DOE
- ☐ State Register Listed
- ☐ CEF
- ☐ SEF
- ☐ Locally Designated
- ☑ Not Eligible

District Name:

Minnesota Multiple Property Inventory Form

Historic Name: Crystal Airport

Inventory No.: HE-CRC-112

Classification

Number of Resources (Contributing): Buildings: 0 Structures: 0 Sites: 0 Objects: 0

Number of Resources (Noncontributing): Buildings: 144 Structures: 5 Sites: 0 Objects: 0

Associated Properties (Name and Inventory No.): Hangar No. 1 HE-CRC-727; Hangar No. 2 HE-CRC-78; Hangar No. 3/Helicopter Hangar HE-CRC-729; Hangar No. 4 HE-CRC-730; Hangar No. 5 HE-CRC-731; Hangar No. 6 HE-CRC-732; Hangar No. 7 HE-CRC-733; Hangar No. 8 HE-CRC-734; Hangar No. 9 HE-CRC-735

Function or Use

Historic:

Function/Use Category: Transportation

Function/Use Category (if other):

Function/Use Subcategory: Air-Related

Function/Use Subcategory (if other):

Current:

Function/Use Category: Transportation

Function/Use Category (if other):

Function/Use Subcategory: Air-Related

Function/Use Subcategory (if other):

Description

Provide full Narrative Description on Continuation Sheet.

Architectural Style(s): Other

Architectural Style (if other): Multiple

Primary Exterior Material(s): Other

Exterior Material (if other): Multiple

Significance

Provide full Statement of Significance on Continuation Sheet.

Applicable National Register of Historic Places Criteria:

Criterion A: Property is associated with significant events. ☐ Yes ☑ No ☐ More Research Recommended

Criterion B: Property is associated with the lives of significant persons. ☐ Yes ☑ No ☐ More Research Recommended

Criterion C: Property has significant architectural characteristics. ☐ Yes ☑ No ☐ More Research Recommended

Criterion D: Property may yield important information in history/prehistory. ☐ Yes ☑ No ☐ More Research Recommended

Criteria Considerations? ☑ No ☐ Yes *If yes, describe in Statement of Significance on Continuation Sheet.*

Area of Significance:

Additional or Other Area(s) of Significance:

Period(s) of Significance:

Date(s) Constructed: ca. 1950-ca. 2001

Other Significant Construction Dates: *Discuss in Statement of Significance on Continuation Sheet.*

Date Source(s): Historic Aerial Photographs; Newspaper Articles

Architect/Builder/Engineer:

Architect/Builder/Engineer Documentation:

Bibliography

Complete Bibliography on Continuation Sheet.

Additional Documentation

For all properties, the following additional documentation must be submitted with the inventory form. Refer to the *Historic and Architectural Survey Manual* for guidance.

1. Photographs
2. Location Maps

Preparer's Information and Recommendation

Preparer Name and Title: Katie Ohland, Chris Hommerding, and Christina Slattery

Organization/Firm (if applicable): Mead & Hunt, Inc.

Date Inventory Form Prepared: May 8, 2018

Recommended District Evaluation:

- ☐ Eligible for the National Register
- ☑ Not Eligible for the National Register
- ☐ More Information Needed for National Register Evaluation

- ☐ Eligible for Local Designation
- ☐ Not Eligible for Local Designation
- ☐ More Information Needed for Local Designation

Minnesota Historic Preservation Office Comments (MnHPO Use Only)

Initials: _____ Date: _____

Historic District Recommendation (NHRP)

☐ Concur ☐ Does Not Concur ☐ More Information Needed

Comments:

Narrative Description

Located at 5800 Crystal Airport Road, the 436-acre Crystal Airport is comprised of multiple irregularly shaped parcels within Brooklyn Park, Brooklyn Center, and Crystal, Minnesota (see Figure 1).[1] The property is roughly bound by Crystal Airport Road and Bass Lake Road on the south, Lakeland Avenue and Douglas Drive North on the west, 63rd Avenue North on the north, and Regent Avenue North on the east. It is surrounded by mid-twentieth-century residential subdivisions, with additional mid-twentieth-century and modern commercial buildings on Bottineau Boulevard and Lakeland Avenue to the west. A baseball field and the Crystal MAC Wildlife Area (owned by the Metropolitan Airports Commission, or MAC) are located on the northeast side of the property. The airport has four access points with gated entrances: the main access is on Crystal Airport Road, which leads to the air traffic control tower (control tower), while one is on Bass Lake Road, one on 63rd Avenue North, and one on 60th Avenue North. Crystal Airport is a general aviation airport.

An approximately 6-foot-high chain-link perimeter fence topped with barbed wire is located within the boundary and encompasses the secure and active area of the airport. The fence does not enclose the ball field, wildlife area, and parcels west of Douglas Drive that are located within the overall boundary. Along with the Federal Aviation Administration (FAA), MAC considers all parcels within the 436-acre boundary as part of the airport.

[1] This acreage reflects the official acreage of the Crystal Airport reported to the FAA based on the annual inspections.

Figure 1. Crystal Airport location map.

Crystal Airport is comprised of four runways, numerous hangars, and ground service facilities. Of the four runways, three are paved and one is turf. Two of the paved runways (Runways 14L/32R and 14R/32L) extend in a northwest-southeast orientation and are approximately the same length and width, at 3,268'-0'x 75'-0" and 3,267'-0" x 75'-0". The third paved runway and turf runway (Runways 6L/24R and 6R/24L, respectively) are 2,500'-0" x 75'-0" feet and 2,123'-0" x 150'-0", and extend southwest to northeast (see Figures 2 through 4). Paved taxiways extend between the runways and connect to the hangar areas via paved aprons.[2] There are 144 buildings at the airport, clustered in four different groups identified as Hangar Areas 1 through 4 for descriptive purposes in this report (see Figure 5).[3] Tables 1 through 4 at the end of this Narrative Description section list the buildings on the property, of which 131 are hangars.[4] Sixty of the buildings were built between ca. 1953 and ca. 1971 and 84 were built from ca. 1979 to the present.[5] The hangar types are predominately a mixture of multi-unit T-hangars and box hangars, including large arched-roof box hangars and small box hangars. Two Quonset-style hangars, dating to ca. 1953 and ca. 1971, are also present. Additionally, there are several ground service facilities on site, including: a terminal building and control tower, buildings with hangar and office space that house (currently or formerly) fixed-based operators (FBOs) and flight schools, a Civil Air Patrol building, restroom facilities, maintenance and storage buildings, and the Prop-Shop (occupied by Maxwell Aircraft Service, Inc., an aircraft repair and mechanics company).[6] According to MAC there are two active FBOs at the Crystal Airport: Thunderbird Aviation and Northland Aircraft. Other former FBO buildings are located on site but are not active operations.

Each of the hangar areas has a combination of properties dating to the evaluation period (built ca. 1971 and earlier) and post-evaluation period buildings. Hangars are the predominant building type within each area. The ground service facilities are distributed throughout the property. Most ground service facilities dating to the ca. 1971 date or earlier are located in Hangar Areas 1 and 2 and ground service facilities built after the evaluation period are generally sited in Hangar Areas 3 and 4. Hangar Area 1, located off Crystal Airport Road, has the terminal building and control tower from 1951, constructed two years after MAC took over operations, as well as buildings from the 1960s through 1990s. A few private organizations occupy hangars in Hangar Area 1. These include the American Legion, which occupies a multi-unit T-hangar, and North Memorial Hospital, which has a box hangar for helicopter repair. Hangar Area 2, located off Douglas Drive North, has buildings from the 1960s with some 1990s and 2000s hangars. Hangar Area 3, located off 63rd Avenue North, was constructed primarily in the 1970s, with some later development in the 1990s and 2000s. Lastly, Hangar Area 4, located near Regent

[2] The system of taxiways and aprons are counted as one structure on the first page of this inventory form.

[3] Crystal Airport does not have an official naming system for the hangar areas.

[4] The 131 buildings noted here serve only as hangars. Some ground service facilities also incorporate a hangar but are not included in this number.

[5] Building construction dates were assigned from MAC and other sources as available. However, exact building construction dates were not available for a number of buildings, in particular the majority of the hangars. In these cases, building circa (ca.) dates were assigned using available aerial photographs (1947, 1953, 1956, 1957, 1960, 1962, 1966, 1967, 1971, 1972, 1979, 1991, and 2003). The ca. date assigned corresponds to the date that a building first appears on an aerial within the series.

[6] FBOs are private airport tenants that are granted the right to operate and provide airport services such as refueling, de-icing, parking, aircraft rental, aircraft maintenance services, and flight training.

Avenue North, experienced some initial development in the late 1960s and 1970s but was mostly built in the late 1970s through the 1990s (see Figure 6).

Figure 2. Paved Runway 14L/32R, view facing northwest.

Figure 3. Paved Runway 6L-24R, view facing southwest.

Figure 4. Turf Runway 6R/24L, view facing northeast.[7]

[7] The site visit was conducted during winter and some site conditions were obscured by snow, including the turf runway, which is not plowed during winter months.

Figure 5. Crystal Airport hangar areas and runways.

Hangar Area 1

Located at the south end of the airport, Hangar Area 1 has 46 buildings, including ground service facilities and 42 hangars. The service buildings are the terminal building and control tower, two FBOs (Thunderbird Aviation and Northland Aircraft), and the Prop-Shop (see Figure 6).

Figure 6. Current aerial of Hangar Area 1.

Located at the north end of Crystal Airport Road, the irregularly shaped terminal building and control tower consists of four distinct parts: a 1951 terminal and administration building (terminal building), ca. 1956 MAC maintenance building, 1962 control tower, and a ca. 1971 maintenance building addition. Due to the additions, the only visible portions of the original one-story, rectangular-shaped terminal building are the north elevation and a portion the east elevation. This earlier part of the overall building is clad in wood siding and has a shed roof. It has rows of fixed metal windows, one of which is now infilled with wood panels, and a single-leaf door on the east elevation. The ca. 1956 MAC building is attached to the south elevation of the terminal building. The concrete block, one-story, rectangular building rests on a poured-concrete foundation and has a flat roof. The 1962, five-story control tower is attached to the west elevation of the terminal building. A square, three-story block is capped with a set-back, two-story, polygonal tower with large canted windows on each elevation. The tower is clad in enameled metal panels and has one-over-one metal windows on the first three stories. A one-story wing spans the south elevation. A ca. 1971 maintenance building addition was added to the south and west elevations of the MAC building. It has multiple overhead doors on the east elevation and a main entrance on the west elevation (see Figures 7 and 8).

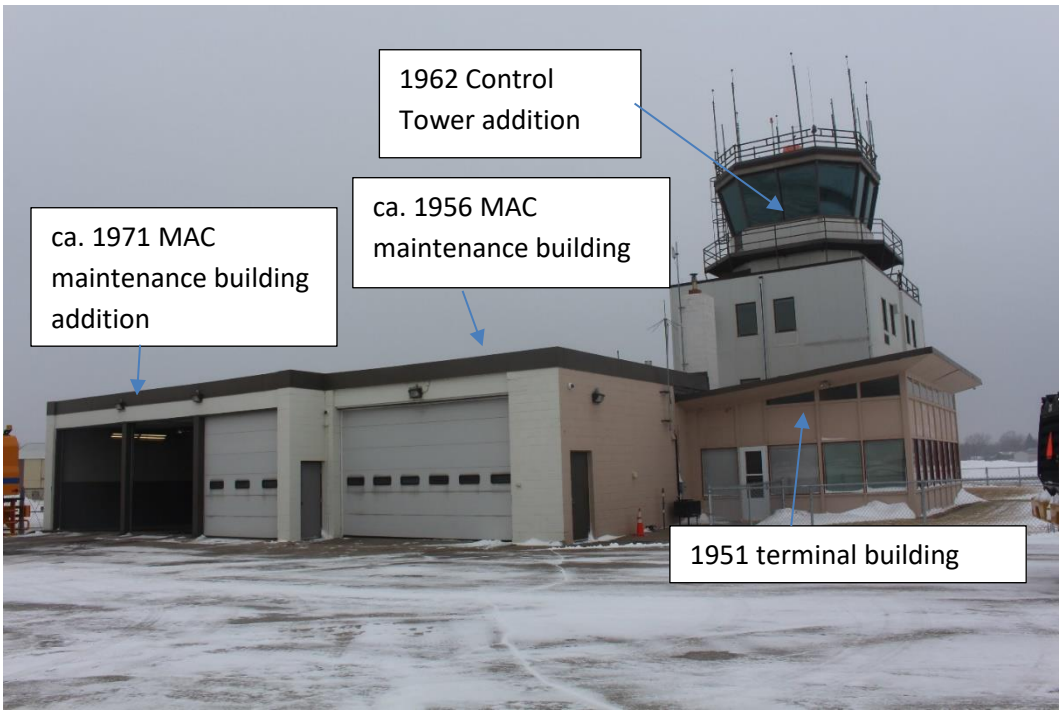


Figure 7. Crystal Airport terminal building and control tower, view facing southwest, showing the four components of the building: the 1951 terminal building, ca. 1956 MAC maintenance building, 1962 control tower, and ca. 1971 MAC maintenance building addition.

Figure 8. Crystal Airport terminal building and control tower, view facing northeast.

The active FBO and flight school, Thunderbird Aviation, is in a ca. 1967 building located at the far western edge of Hangar Area 1. The overall irregularly shaped, concrete block building with a flat roof has two rectangular one-story sections: an office and hangar. The office has brick around the entrance on the front (west) facade that is sheltered by a flat roof awning supported by round posts. Windows are fixed metal sash, and single-leaf doors are also present. The hangar has two vertical bifold doors on the east elevation. Windows are glass block (see Figures 9 and 10).

Figure 9. Thunderbird Aviation, active FBO, view facing southwest.

Figure 10. Thunderbird Aviation, view facing southeast.

Northland Aircraft, the second active FBO on site, is located east of the terminal building and control tower. The FBO is in a ca. 1953, one-story hangar is clad in standing seam metal siding and has an arched metal roof. A vertical bifold door is on the front (northeast) facade, and a one-story, concrete block office with a hip roof is on the side (northwest) elevation (see Figure 11). The hip roof is a ca. 2005 alteration. Located southwest of the main FBO building is a large associated hangar. Built in 1967, the one-story concrete block building has an arched roof (see Figure 12). Gas pumps associated with Northland Aircraft for refueling are northwest of the building.

Figure 11. Ca. 1953 Northland Aircraft hangar and FBO building, view facing south/southwest.

Figure 12. 1967 hangar associated with Northland Aircraft, view facing north.

The Prop-Shop, located southeast of Northland Aircraft, is comprised of five interconnected buildings. It began as a ca. 1953 Quonset hangar and ca. 1953 arched-roof box hangar that are now connected by later additions: a ca. 1979 concrete block box hangar (set back from the apron), ca. 1960 concrete block service building with a single bay, and ca. 1960 concrete block addition with a flat roof. Each building is one story and has a flat or arched roof of varying height. Fenestration also varies on each building. The front (northeast) facade fenestration facing the apron on the Quonset-style hangar consists of three overhead doors. The ca. 1979 building has a vertical bifold door and a single-leaf door on the front (northeast) facade and one-over-one metal windows on the rear (southwest) elevation. The same one-over-one windows are on the ca. 1960 building, as are multi-light metal windows, an overhead door, and a single-leaf door. The ca. 1953 arched-roof box hangar

has a vertical bifold door and multi-light metal windows. Finally, the southernmost ca. 1960 building has one-over-one metal and sliding metal windows and a single-leaf door (see Figures 13 and 14).

Figure 13. Prop-Shop, view facing southwest.

Figure 14. Prop-Shop, view facing southeast.

Within Hangar Area 1, the hangars are arranged in 12 hangar rows and are a mixture of multi-unit T-hangars and box hangars (see Figures 15 and 16). Extending toward the control tower, Crystal Airport Road bisects the area, with eight hangar rows on the west side of the road and four on the east. The eight hangars on the east side of Hangar Area 1 date predominately to the 1950s and 1960s, with one dating to ca. 1971. The west side of Hangar Area 1 has 34 hangars from the 1950s to 1990s. Many of the 1990s hangars are largely concentrated in two rows and replaced the original individual-stall T-Hangars. The hangars commonly rest on poured-concrete foundations, are clad in metal, and have front- or side-gable roofs. Variations include concrete block and fiberboard cladding, and have shed, flat, or arched roofs. The one-story hangars vary in type and size and have sliding or vertical bifold doors (see Figures 17 through 20). Some also have sliding or fixed windows. Several of the hangars have alterations, specifically replacement siding and doors.

Figure 15. Overview of the east side of Hangar Area 1, view facing southeast.

Figure 16. Overview of the west side of Hangar Area 1, view facing south.

Figure 17. Row of 1950s and 1960s hangars on the west side of Hangar Area 1, view facing southwest.

Figure 18. Ca. 1960 T-hangar on the west side of Hangar 1, view facing south southeast.

Figure 19. Ca. 1953 T-hangar, occupied by the American Legion, on the east side of Hangar Area 1, view facing northeast.

Figure 20. Ca. 1991 hangars on the west side of Hangar Area 1, view facing southwest.

Hangar Area 2

Located at the west end of the property, Hangar Area 2 has 14 buildings and both T-hangars and box hangars that were largely developed in the 1960s. Three hangars built in the 1990s and 2000s are present as well as one ground service facility (see Figure 21). The area is roughly L-shaped and has approximately 10 hangar rows, with four along 60th Avenue North and six along Douglas Drive North. Two ca. 1966 buildings along 60th Avenue North were removed ca. 2015.[8] The hangars typically have poured-concrete foundations, are clad in metal, and have front- or side-gable roofs. The one-story hangars are predominately multi-unit and have sliding or vertical bifold doors (see Figure 22). Some also have sliding or fixed windows. The hangars vary in type and size and some have alterations, including replacement siding and doors. The Crystal Shamrock building, a ca. 1966 Contemporary-style building, rests on a poured-concrete foundation, is clad in stucco, and has an irregular roof. It has a stucco pylon with a shamrock cutout on the south elevation, and a flat awning extends out over the main entrance. Windows are fixed metal. The east elevation has a ribbon of large fixed windows that fill up most of the wall space (see Figure 23). The former FBO building and two adjacent associated hangars now serve as an aircraft recovery firm.

Figure 21. Overview of east side of Hangar Area 2, view facing north northeast.

[8] "Aerial Photograph: Crystal, Minnesota," 2003, historicaerials.com.

Figure 22. Ca. 1960 hangar in Hangar Area 2, view facing north.

Figure 23. Ground service facility (former Crystal Shamrock FBO, ca. 1966), view facing west.

Hangar Area 3

Located at the north end of the property, Hangar Area 3 has 14 buildings with seven multi-unit T-hangars constructed in the 1970s, as well as three box and multi-unit T-hangars from the 1990s to 2000s (see Figure 24). The one-story T-hangars have poured-concrete foundations, are clad in metal, and have side-gable roofs. Each are approximately the same size and have vertical bifold doors (see Figure 25). Three hangars located on the westernmost row are two-story box hangars that have a poured-concrete foundation, are clad in metal, and have front-gable roofs (see Figure 26). Some of these hangars have sliding and fixed windows and single-leaf doors. Four ground service facilities are in the area, including a former 1990s FBO building and flight school; two

MAC maintenance and storage buildings built ca. 1994 and ca. 1979, respectively; and a ca. 2001 restroom facility. There is also a ca. 2003 aircraft wash bay apron.

Figure 24. Overview of the west side of Hangar Area 3, view facing northwest.

Figure 25. 1970s T-Hangar, view facing northwest.

Figure 26. 1990s hangars in Hangar Area 3, view facing north.

Hangar Area 4

Located at the east end of the property, Hangar Area 4 has 70 buildings that are mostly single-unit box hangars (see Figure 27). There are also several small, multi-unit T-hangars and a ca. 1971 Quonset-style hangar. The hangars are arranged in 16 rows and were largely constructed in the 1990s, although eight 1960s and ca. 1971 hangars are also present. The hangars have poured-concrete foundations, are clad in metal, and have front-gable roofs, though some have side-gable roofs. The hangars vary in size with vertical bifold doors. Several have single-leaf doors and sliding or fixed windows (see Figures 28 through 31). Support buildings include ca. 1979 and ca. 2003 MAC maintenance buildings and a c.2001 restroom facility. A ca. 1966 FAA radio equipment building is located east of the hangar rows. This simple, rectangular, concrete-block building has a flat roof with a wide eave overhang and a single-leaf door on the east elevation (see Figure 32).

Figure 27. Overview of Hangar Area 4, view facing southeast.

Figure 28. Hangar Area 4, view facing northeast.

Figure 29. Row of 1990s hangars in Hangar Area 4, view facing northeast.

Figure 30. 1960s and 1970s hangars in Hangar Area 4, view facing northeast.

Figure 31. Ca. 1971 Quonset-style hangar, view facing southeast.

Figure 32. Ca. 1966 FAA radio equipment building, view facing east northeast.

Summary/Overview

The Crystal Airport has a collection of buildings that were constructed between 1951 and the 2000s. Forty-two percent date to the evaluation period (built ca. 1971 and earlier). Hangar Areas 1 and 2 have most of the evaluation period-era hangars and ground service facilities, including the terminal building and control tower, FBO buildings, and the Prop-Shop. These two areas, however, have ground service facilities and hangars built after ca. 1971 including nine hangars, many of which replaced earlier, single-unit T-hangars.[9] Changes in Hangar Area 2 since the end of the evaluation period include the addition of three ca. 1991 or ca. 2003 hangars and the loss of two buildings south of 60th Avenue North. Several of the hangars in Hangar Areas 1 and 2 have some degree of alteration, including replacement siding, windows, and doors. The key ground service facilities are also altered. The terminal building and control tower has been altered by enclosed main windows on the terminal and other replacement windows and doors and additions after 1971. Additionally, the Prop-Shop expanded substantially through ca. 1979 and has been modified with some replacement windows and doors. Windows and doors have also been replaced on other key buildings, such as the FBO buildings.

Tables 1 through 4 list the buildings in each hangar area, while Figures 33 through 36 provide maps showing their locations (see Footnote 3 for an explanation of construction dates).

[9] The individual T-hangars were located on the west side of Crystal Lake Road.

Table 1. Crystal Airport Properties, Hangar Area 1

Building # (assigned by MAC)	Building Name	Construction Date	Additions
Tower/Term.	Terminal building and control tower	1951[10]	ca. 1956, 1962[11], ca. 1971
1	FBO Building (Thunderbird Aviation)	ca. 1967	
3-1	T-Hangar	ca. 1960	
3-2A	Hangar	ca. 1957	
3-2B	Hangar	ca. 1991	
3-2C	Hangar	ca. 1966	
3-2D	Hangar	ca. 1966	
5-1A	Hangar	ca. 1957	
5-1B	Hangar	ca. 1957	
5-1C	Hangar	ca. 1957	
5-1D	Hangar	ca. 1957	
5-1E	Hangar	ca. 1962	
5-1G	Hangar	ca. 1957	
5-2A	Hangar	ca. 1956	
5-2B	Hangar	ca. 1956	
5-2C	Hangar	ca. 1956	
5-2D	Hangar	ca. 1960	
5-2E	Hangar	ca. 1956	
5-2F	Hangar	ca. 1956	
5-2G	Hangar	ca. 1956	
5-2H	T-Hangar	ca. 1971	
7-A	Hangar	ca. 1991	
7-D	Hangar	ca. 1953	
7-B1	Hangar	ca. 1991	
7-B	Hangar	ca. 1956	
9-A	Hangar	ca. 1966	
9-B	Hangar	ca. 1991	
9-C	Hangar	ca. 1991	
9-D	Hangar	ca. 1991	
9-E	Hangar	ca. 1991	
9-M	Hangar	ca. 1991	

[10] "Crystal Airport Building," *Minneapolis Tribune*, January 14, 1951.

[11] Aerial photos reveal that the building was under construction in 1962.

Table 1. Crystal Airport Properties, Hangar Area 1

Building # (assigned by MAC)	Building Name	Construction Date	Additions
9-N	Hangar	ca. 1971	
11	Hangar (Civil Air Patrol)	ca. 1953	
13-A	Hangar (formerly Skyways FBO)	ca. 1953	
13-B	Hangar	ca. 1979	
13-C	Hangar	ca. 1956	
15-A	Hangar (Northland Aircraft FBO)	ca. 1953	
15-B	Hangar (Northland Aircraft)	1967[12]	
17	T-Hangar	ca. 1953	
19-A	Aviation Business (hangar)	ca. 1953	
19-B	T-Hangar (American Legion)	ca. 1953	
19-C	Hangar	ca. 1953	
21-A1, 23, and 25	Aviation Business (Prop-Shop)	ca. 1953 (21-A and part of 25)	Two ca. 1960 additions (25 and part of 23), ca. 1979 (23)
21-A2	Hangar (North Memorial Hospital)	ca. 1971	
21-C	Hangar	ca. 1966	
21-B	T-Hangar	ca. 1960	

[12] Aerial photos reveal that the building was under construction in 1967.

Crystal - Buildings
Crystal Airport (MIC)
SHPO Inventory #HE-CRC-112
Crystal, Minnesota

Figure 33. Map of buildings in Hangar Area 1.

Table 2. Crystal Airport Properties, Hangar Area 2

Building #	Building Name	Construction Date	Additions
22	Hangar (MAC use)	ca. 1991	
22-A	Hangar (MAC use)	ca. 1991	
24	T-Hangar	ca. 1966	
28	T-Hangar	ca. 1966	
2	Aviation Business (formerly Crystal Shamrock FBO)	ca. 1966	
4	Aviation Business (formerly Crystal Shamrock hangar)	ca. 1962	
6	Aviation Business (formerly Crystal Shamrock hangar)	ca. 1960	
8-A	Hangar	ca. 1960	
8-B	Hangar	ca. 1960	
8-C	T-Hangar	ca. 1962	
10-A	Hangar	ca. 2003	
10-B	T-Hangar	ca. 1962	
12	T-Hangar	ca. 1962	
14	Hangar	ca. 1966	

Figure 34. Map of buildings in Hangar Area 2.

Table 3. Crystal Airport Properties, Hangar Area 3

Building #	Building Name	Construction Date	Additions
98-A	Hangar	ca. 1991	
98-B	Hangar	ca. 1991	
98-C	Hangar	ca. 2003	
100	T-Hangar	ca. 1979	
102	T-Hangar	ca. 1979	
104	T-Hangar	ca. 1971	
106	T-Hangar	ca. 1971	
112	T-Hangar	ca. 1971	
114	T-Hangar	ca. 1971	
118	Hangar (former FBO and Flight School)	ca. 1991	
122	T-Hangar	ca. 1979	
124	Shed (MAC use)	ca. 1979	
MAC Restroom	Restroom (MAC)	ca. 2001[13]	
MAC Maintenance	Maintenance building (MAC)	ca. 1994[14]*	

[13] SEH, "Crystal Airport Asset Detail Report," 2015, 174, available at Metropolitan Airports Commission.

[14] SEH, "Crystal Airport Asset Detail Report," 168.

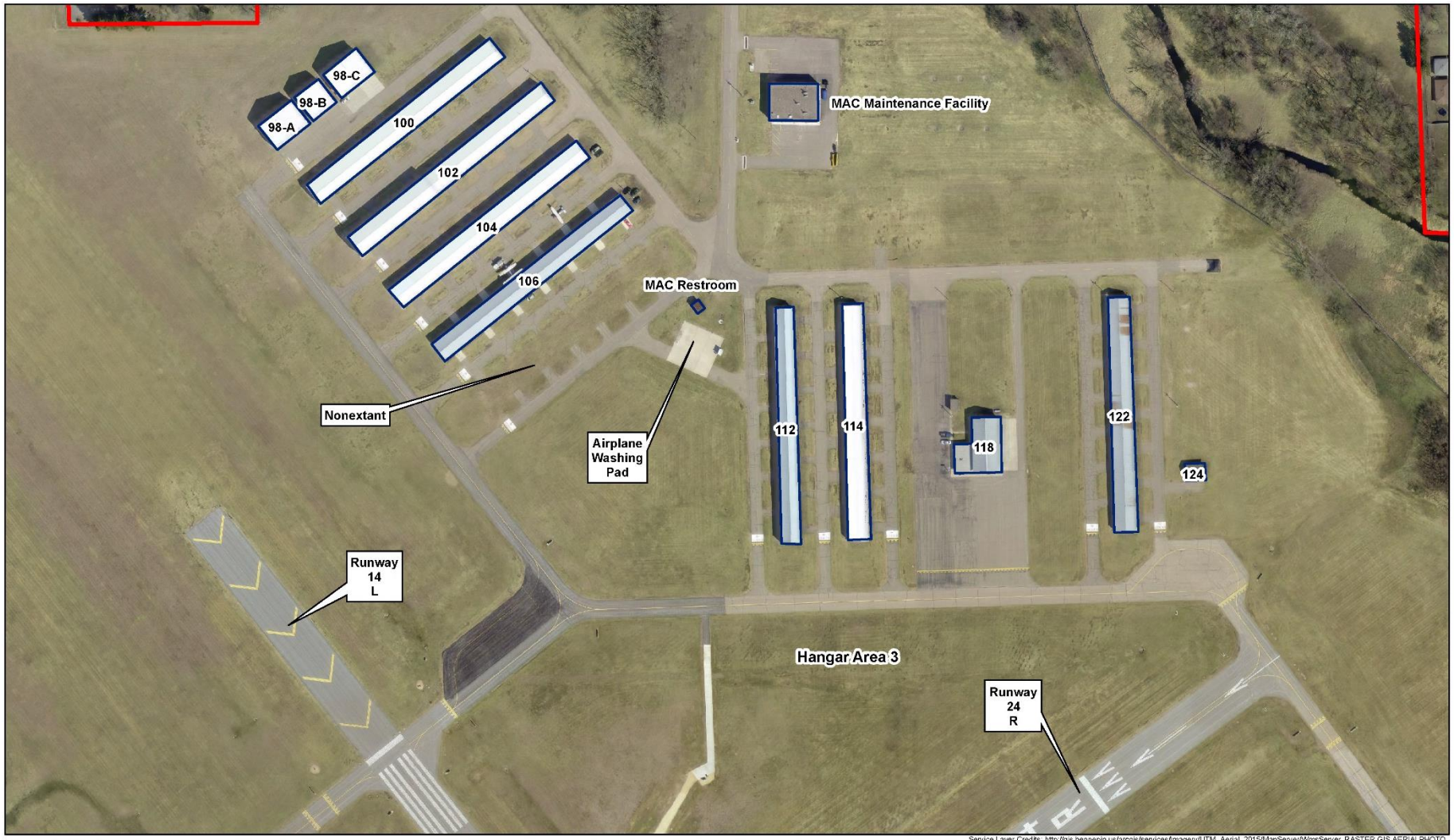


Figure 35. Map of buildings in Hangar Area 3.

Table 4. Crystal Airport Properties, Hangar Area 4

Building #	Building Name	Construction Date	Additions
54-A	Hangar	ca. 1971	
54-B	Hangar	ca. 1991	
54-C	Hangar	ca. 1979	
56-A	T-Hangar	ca. 1979	
56-B	Hangar	ca. 1991	
56-C	Hangar	ca. 1991	
56-D	Hangar	ca. 2003	
58-A	Hangar	ca. 1966	
58-B	Hangar	ca. 1971	
58-C	Hangar	ca. 1971	
58-D	Hangar	ca. 1971	
60-A	T-Hangar	ca. 1966	ca. 1969
60-B	Hangar	ca. 1991	
60-C	Hangar	ca. 1991	
60-D	Hangar	ca. 1991	
62-A	T-Hangar	ca. 1966	
62-B	Hangar	ca. 1971	
62-C	T-Hangar	ca. 1979	
62-D	Hangar	ca. 1991	
64-A	Hangar	ca. 1991	
64-B	Hangar	ca. 1991	
64-C	Hangar	ca. 1991	
64-D	Hangar	ca. 1991	
64-E	Hangar	ca. 1991	
64-F	Hangar	ca. 1991	
66-A	Hangar	ca. 1991	
66-B	Hangar	ca. 1991	
66-C	Hangar	ca. 1991	
68-A	Hangar	ca. 1991	
68-B	Hangar	ca. 1991	
68-C	Hangar	ca. 1991	
68-D	Hangar	ca. 1991	
68-E	Hangar	ca. 1991	
68-F	Hangar	ca. 1991	
70-A	Hangar	ca. 1991	
70-B	Hangar	ca. 1979	

Table 4. Crystal Airport Properties, Hangar Area 4

Building #	Building Name	Construction Date	Additions
70-C	Hangar	ca. 1979	
70-D	Hangar	ca. 1991	
72-A	Hangar	ca. 1979	
72-B	Hangar	ca. 1979	
72-C	Hangar	ca. 1991	
72-D	Hangar	ca. 1991	
74-A	Hangar	ca. 1991	
74-B	Hangar	ca. 2003	
74-C	Hangar	ca. 2003	
74-D	Hangar	ca. 1991	
76-A	Hangar	ca. 1991	
76-B	Hangar	ca. 1991	
76-C	Hangar	ca. 1991	
76-D	Hangar	ca. 1991	
76-E	Hangar	ca. 1991	
78-A	Hangar	ca. 1991	
78-B	Hangar	ca. 2003	
78-C	Hangar	ca. 1991	
78-C1	Hangar	ca. 1991	
78-D	Hangar	ca. 1991	
80-A	Hangar	ca. 1991	
80-B	Hangar	ca. 1991	
80-C	Hangar	ca. 1991	
80-D	Hangar	ca. 2003	
80-E	Hangar	ca. 1991	
82-A	Hangar	ca. 1979	
82-B	Hangar	ca. 1979	
82-C	Hangar	ca. 1991	
82-D	Hangar	ca. 1991	
FAA Radio Building	Shed (FAA)	ca. 1966	
MAC Restroom	Restroom (MAC)	ca. 2001[15]	
MAC Maintenance	Maintenance building (MAC)	ca. 1979	
MAC Maintenance	Maintenance building (MAC)	ca. 2003	
Hangar	Hangar	ca. 2003	

[15] SEH, "Crystal Airport Asset Detail Report," 165.

Figure 36. Map of buildings in Hangar Area 4.

Statement of Significance

Historic Context

Minnesota aviation, 1910-1950

Aviation likely arrived in Minnesota in 1910 with the performance of the first airshow at the State Fairgrounds. In June of that year, pilot Glen Curtiss made seven flights in 40 minutes, sparking interest in the new field of aviation.[16] While airshows continued to entertain spectators throughout the 1910s, interest in aviation got a second important boost in 1917 when the U.S. entered World War I. The number of airplanes, airfields, and pilots increased dramatically during the war, as did the overall attention paid to aviation.[17] For example, that same year, the Minneapolis Aero Club was founded by local aviators and businessmen. The Aero Club was based initially on a farm field in Brooklyn Center ("the Twin Cities' first definable airport"), before moving to a defunct racetrack near Fort Snelling in Minneapolis.[18] After 1920, a federally-funded airmail facility and a U.S. Air Guard Unit joined the Aero Club at the new airfield. New hangars and improved airstrips were added to the site that was variously called Speedway Field, Twin Cities Airport and, after 1923, Wold-Chamberlin Field.[19]

As interest in aviation continued to grow during the 1920s and 1930s, more and more airports developed in the Twin Cities area. Airfields established during this period included Fridley Field in Fridley; the Oxboro, Nicollet, and Cedar Airports in Bloomington; and the Onion, Luxinger's, and Curtiss-Northwest Airports in St. Paul.[20] The majority of these facilities were small, private, turf airstrips, but larger commercial and defense operations required more developed facilities with sizable hangars and paved runways. In 1926, St. Paul built its own municipal airport, known as Holman Field, so St. Paul businesses could have access to a larger airport. By the end of the 1930s, Holman Field featured a new terminal, three large hangars (two municipal hangars and one for Northwest Airlines), and two paved runways.[21] At the same time, a new terminal building was constructed at Wold-Chamberlin Field, and its runways were paved in concrete.[22]

World War II piqued America's interest in aviation. Wartime advances in aircraft and avionics had ushered in new technology, like more powerful engines and lighter-weight fuselages, that made post-World War II

[16] Jerry Sandvick, "Early Airport Development and the Emergence of the Metropolitan Airports Commission," *Hennepin County History* 43, no. 3 (Fall 1984): 3–4.

[17] Anne Milbrooke et al., *National Register Bulletin: Guidelines for Evaluating and Documenting Historic Aviation Properties* (U.S. Department of the Interior, National Park Service, 1998), 8.

[18] Sandvick, "Early Airport Development and the Emergence of the Metropolitan Airports Commission," 4.

[19] Sandvick, "Early Airport Development and the Emergence of the Metropolitan Airports Commission," 4–5.

[20] Noel E. Allard and Gerald N. Sandvick, *Minnesota Aviation History, 1857-1945* (Chaska, Minn.: Mahb Publishing, 1993), 140–46.

[21] Allard and Sandvick, *Minnesota Aviation History, 1857-1945*, 136–37; Sandvick, "Early Airport Development and the Emergence of the Metropolitan Airports Commission," 5.

[22] Sandvick, "Early Airport Development and the Emergence of the Metropolitan Airports Commission," 8.

(postwar) air travel faster, safer, and easier.[23] Additionally, because wartime demanded that the U.S. produce a vast number of aircraft for military purposes, the postwar period saw an excess of airplanes that were readily available and affordable for commercial and private use.[24] Moreover, GIs could take advantage of the GI Bill and register for inexpensive flying lessons.[25] As a result, more Americans were flying not just for personal and business travel, but for recreation as well.

This general trend is seen in the growth of airports (especially general aviation airports) both nationally and in Minnesota during the postwar years. In 1945, for example, the Civil Aeronautics Administration (CAA), the forerunner to the Federal Aviation Administration (FAA), reported the existence of 4,026 airports nationwide, 86 of which were in Minnesota.[26] By 1950, that number had jumped to 6,403 nationally, with 46 percent of these described as "personal type airports." Minnesota had 122, about 80 of which were general aviation airports, defined as predominantly for the use of civil aviation operations.[27]

Creation and early development of the Metropolitan Airports Commission system

During the 1930s, competition between St. Paul's Holman Field and Minneapolis's Wold-Chamberlin Field was fierce. City leaders, legislators, and community members realized that this fevered competition was expensive and unsustainable. In 1943, the state legislature passed a bill creating the Metropolitan Airports Commission (MAC), a public corporation employed to "promote air navigation, insure Minnesota's participation in national and international programs of air commerce, to develop the Twin Cities as an air transportation center and to cooperate with federal and state aviation agencies."[28] Following the passage of this legislation, MAC initiated a study known as the Doell-Shepard report. Completed in 1943, the report outlined the development of an airport system for the Twin Cities metro area.[29] According to this report, MAC's top priority was to stop competition between Wold-Chamberlin and Holman Fields, and limit the Twin Cities to one major airport

[23] Phil Tiemeyer, *Plane Queer: Labor, Sexuality, and AIDS in the History of Male Flight Attendants* (Berkeley: University of California Press, 2013), 52.

[24] Tiemeyer, *Plane Queer: Labor, Sexuality, and AIDS in the History of Male Flight Attendants*, 42.

[25] Milbrooke et al., *National Register Bulletin: Guidelines for Evaluating and Documenting Historic Aviation Properties*, 11.

[26] The Civil Aeronautics Authority was created in 1938 with passage of the Civil Aeronautics Act (discussed below). The early CAA was housed within the Commerce Department and was charged with developing and regulating air transportation "for the improvement of mail service, national defense, and foreign and domestic commerce." In 1940, the Civil Aeronautics Authority became the Civil Aeronautics Administration. The CAA became the FAA in 1958. Acting Secretary of Commerce, *National Airport Plan* (Washington, D.C.: U.S. Government Printing Office, 1945), 68–70; Department of Geography, University of California-Berkeley, "Civil Aeronautics Act (1938)," *Living New Deal*, n.d., https://livingnewdeal.org/glossary/civil-aeronautics-act-1938/.

[27] U.S. Department of Commerce and Civil Aeronautics Administration, *Statistical Handbook of Civil Aviation* (Washington, D.C.: U.S. Government Printing Office, 1950), 6–7, 9, 12.

[28] Sandvick, "Early Airport Development and the Emergence of the Metropolitan Airports Commission," 12–13.

[29]Charles Doell (Chief Engineer of the Minneapolis Park Board) and George Shepard (City Engineer of the City of Saint Paul) presented their findings to the Minnesota Governor and the city councils of Minneapolis and St. Paul in a the following report: Minneapolis-St. Paul Airports Commission, *Survey, Findings of Commission and Plans of Operations* (Honorable E. J. Thye, Governor, State of Minnesota, the City Councils of Minneapolis and Saint Paul, and the Minneapolis Board of Park Commissioners, December 31, 1943), Metropolitan Airports Commission Published Records, Minnesota Historical Society.

facility. After studying both existing and potential airport sites, the report recommended that Wold-Chamberlin Field serve as the primary airport facility for the Twin Cities metro area.[30] MAC adopted this recommendation in 1945, and in 1948, with the arrival of its first international flight, Wold-Chamberlin Field became the Minneapolis-St. Paul International Airport (MSP).

With the new primary airport location decided, MAC turned its attention to developing a system of secondary airports (also referred to as "minor" airports and commonly referred to today as "reliever airports"—it is unknown when the term reliever came into use). At their inception in the late 1940s, these secondary airports were all intended to serve the same purpose: to relieve the primary airport—MSP—of smaller, personal air traffic that would otherwise compete for space with commercial airliners. It was also thought, according to the Doell-Shepard report, that these airports would serve as a base for private plane ownership and operation, flying instruction and schools, charter operators, and even commuter services.[31] MAC studied a number of existing airports and potential airport sites within a 25-mile radius of both the Minneapolis and St. Paul city halls. The goal was to establish an integrated airport system that spread air service equitably throughout the Twin Cities and its suburbs and differentiated air traffic to aid the primary airport, MSP (see Figure 37).[32]

[30] Minneapolis-St. Paul Airports Commission, *Survey, Findings of Commission and Plans of Operations*, 20–21.

[31] Minneapolis-St. Paul Airports Commission, *Survey, Findings of Commission and Plans of Operations*, 27.

[32] Sandvick, "Early Airport Development and the Emergence of the Metropolitan Airports Commission," 13.

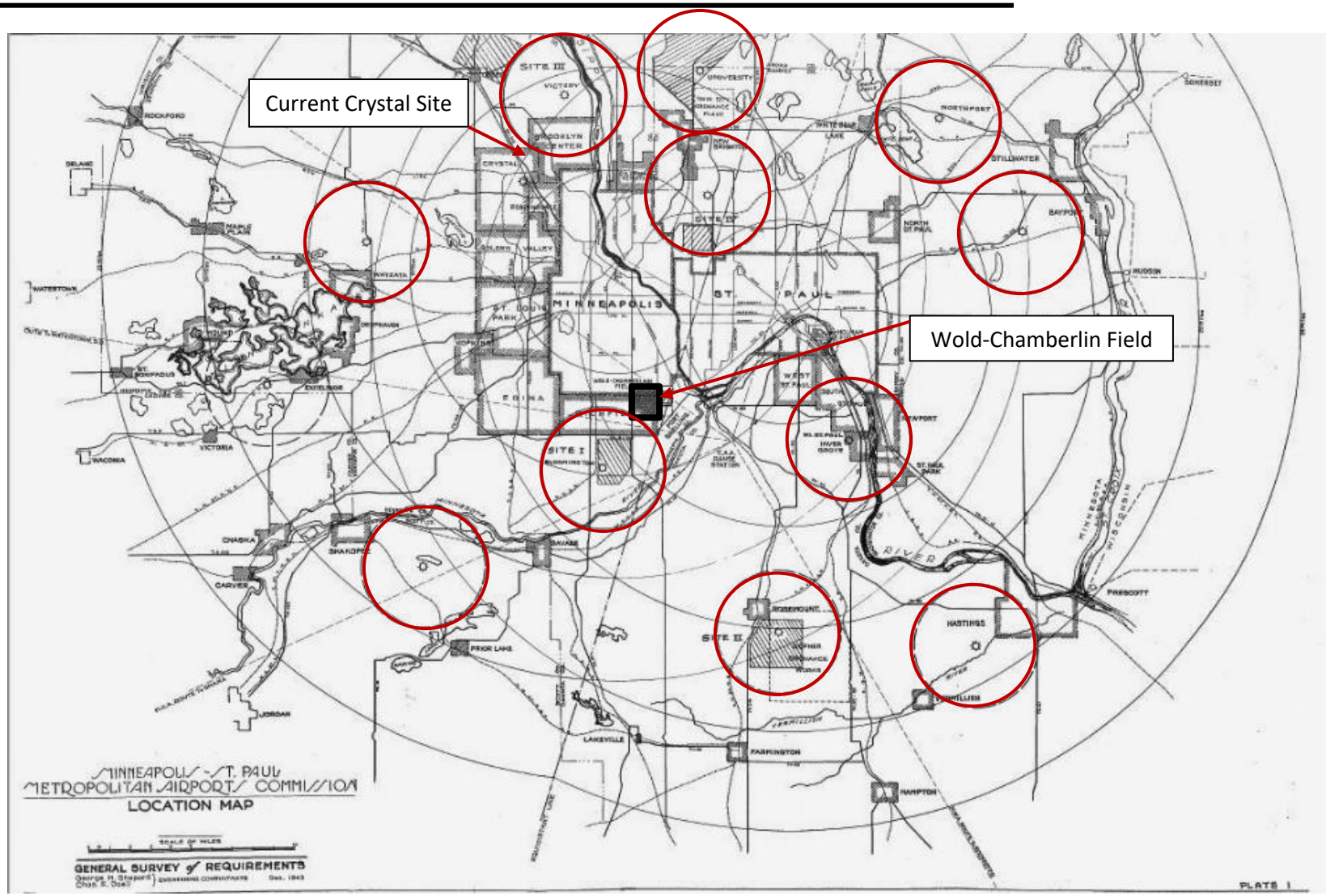


Figure 37. Map from the 1943 Doell-Shepard report showing the potential distribution of airports in the proposed integrated airport system. Wold-Chamberlin Field is the dark box in the middle of the map and potential airports are indicated by the large circles.[33]

[33] Minneapolis-St. Paul Airports Commission, *Survey, Findings of Commission and Plans of Operations*.

Airport construction nationwide received a boost in 1946 when Congress passed the Federal Aid to Airports Act. The act provided matching federal funds for construction of airports built in accordance with the CAA National Airport Plan.[34] The first National Airport plan was completed by the CAA in March 1939, as required by the 1938 Civil Aeronautics Act. The 1939 National Airport Plan concluded that the U.S. needed to develop a planned system of airports and that federal money should be allocated to implement such a system. In 1939, however, federal funding for airport construction was put on hold, as the U.S. began to shift its financial priorities toward national defense and preparations for war.[35] In 1946, with World War II over, federal funding for civilian airports could resume.

In 1947, with federal funding now available, MAC had the ability to begin implementing its secondary airport plan. By then, it had narrowed the list of potential secondary airport locations to three: Flying Cloud (in Eden Prairie), Crystal, and Oakdale.[36] Flying Cloud, an airfield since 1941, became the first secondary airport in the MAC system when it was purchased by MAC in August 1948.[37] MAC officially acquired the airport (took over operation) in September 1948.[38] This gave the MAC system an airport in the southwest metro area. Crystal Airport, in operation for less than a year, was the next secondary airport added to the system. It was purchased in late 1948 and MAC assumed operation officially in early 1949, giving MAC an airport in the northwest metro area.[39] The proposed Oakdale location in the east metro area was scrapped in favor of developing an airport further east in Lake Elmo.[40] MAC purchased 160 acres of farmland in 1949 for this purpose, and opened the Lake Elmo airport in 1951.[41]

The possibility of a MAC airport in the north metro had been discussed since the Doell-Shepard report of 1943. In 1947, however, MAC was exploring the possibility of developing a second major airport for the MAC system in Anoka County.[42] Ultimately, the plan for a second primary airport was abandoned, and the Anoka County site became the fourth secondary airport in the MAC system. Land was purchased for the airport in 1950, and the Anoka County Airport (now the Anoka-Blaine Airport or Janes Field) opened in 1952.[43] With the addition of this

[34] "Airports of the MAC, Volume 2," n.d., 9, Metropolitan Airports Historical Materials, Minnesota Historical Society.

[35] Janet R. Bednarek, *America's Airports: Airfield Development, 1918-1947* (College Station, Tex.: Texas A&M University Press, 2001), 98-99,120-121.

[36] "Airports of the MAC, Volume 2," 10.

[37] Flying Cloud Airport was evaluated in 2003 and the report recommended a portion of the airport as an eligible historic district. Marjorie Pearson, PhD and Penny A. Petersen, Hess, Roise and Company, *Flying Cloud Airport: An Assessment of Significance, HE-2003-4H* (HNTB Corporation, July 2003).

[38] "Airports of the MAC, Volume 2," 28.

[39] "Airports of the MAC, Volume 2," 37.

[40] "Secondary Airports, 1944-1960: Typewritten Manuscript of Actions of Metropolitan Airports Commission," n.d., Metropolitan Airports Commission Published Records, Minnesota Historical Society.

[41] Nancy Goodman, "Historic Airports in Washington County," *Historical Whisperings* 39, no. 1 (April 2012): 8.

[42] "Secondary Airports, 1944-1960: Typewritten Manuscript of Actions of Metropolitan Airports Commission."

[43] "Airports of the MAC: Early Hurdles," n.d., 40–43, Metropolitan Airports Historical Materials, Minnesota Historical Society; Karen Klinkenberg, "Janes Field and the U of MN: A Mission of Teaching, Research and Service" (Blaine County Historical Society, June 2016).

airport, MAC had a complete integrated airport system with one primary airport and five (including Holman Field in St. Paul) secondary airports spread equitably throughout the metro area. Much later, in 1981, a sixth airport, Airlake Airport, was added in the far southern suburb of Lakeville.[44]

Today, Flying Cloud and Anoka (along with St. Paul) are considered by MAC to be primary reliever airports, catering to small business jets and corporate aircraft, as well as other general aviation. By contrast, Crystal, Lake Elmo, and Airlake are classified by MAC as complimentary reliever airports, primarily serving the needs of recreational aircraft operators.[45]

Crystal Airport development

Following the 1943 Doell-Shepard report, MAC considered two possible locations for a new Crystal Airport. One of these sites, called Crystal North, was located north of the current city limits. The other site, called Crystal South, was located at the northern edge of what was the village of Crystal. For a time, MAC also considered acquiring the existing Robbinsdale Airport, located south and west of the current Crystal Airport and north of what is now the Crystal/Robbinsdale border in the area roughly bounded by Douglass Drive North, West Broadway Avenue, and 47th Avenue North (see Figure 38).[46] In 1947, MAC dropped the Robbinsdale Airport from consideration as a potential secondary airport, but continued to debate whether Crystal North or Crystal South would be adequate sites.[47]

[44] Airport Development, Environment, and Reliever Departments, *Airlake Airport: 2035 Long-Term Comprehensive Plan (LTCP) - Final Draft* (Metropolitan Council, November 27, 2017), i.

[45] Metropolitan Airports Commission, *Flying Cloud Airport: Long-Term Comprehensive Plan* (Metropolitan Council, October 2010), 3.

[46] The city of Crystal did not incorporate until 1960, so the Robbinsdale Airport was likely named for the nearest incorporated town, which would have been Robbinsdale.

[47] "Airports of the MAC, Volume 2," 10.

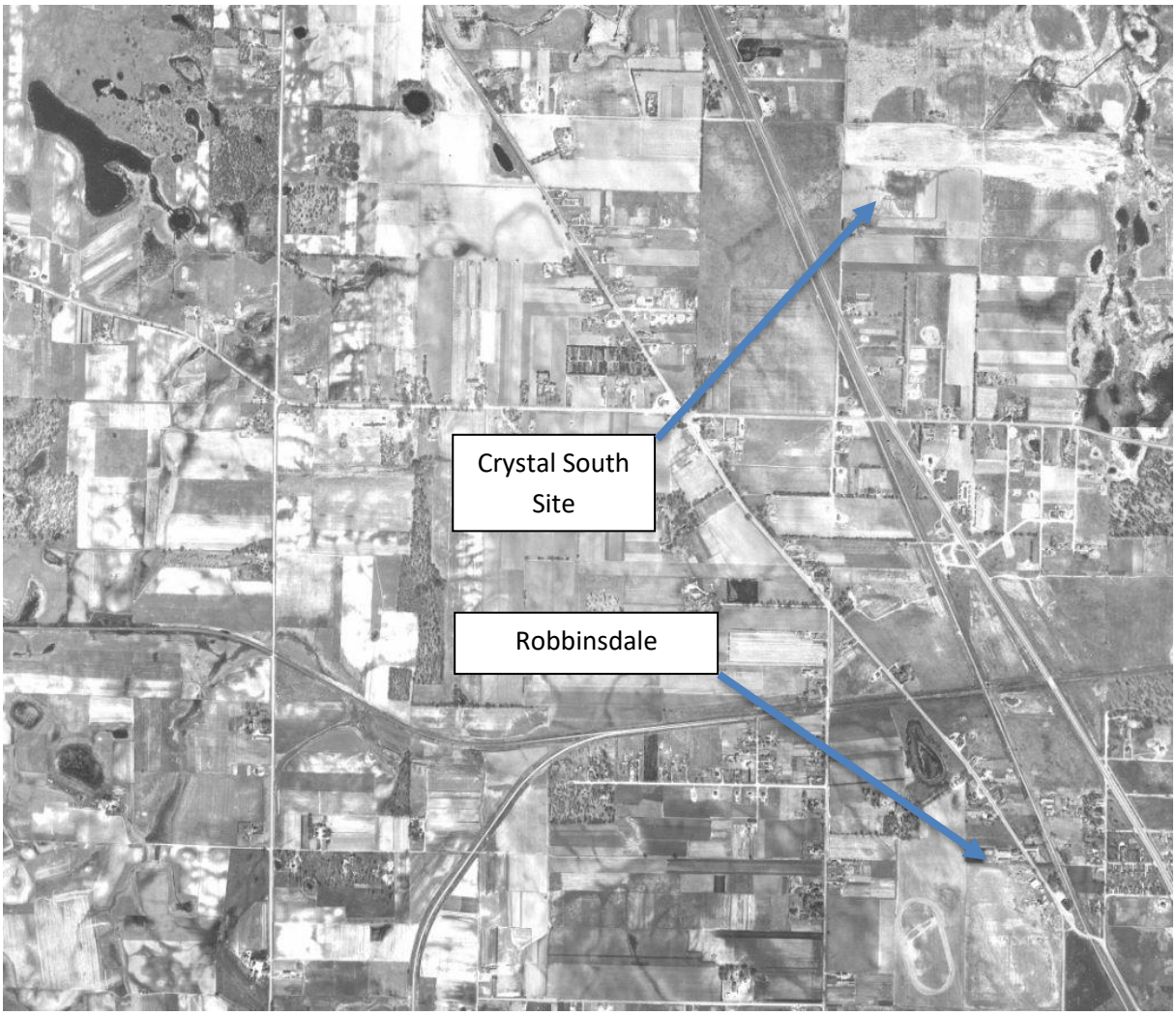


Figure 38. 1947 aerial of Crystal Lake Township showing the Robbinsdale Airport and the proposed Crystal South site. The Crystal North site was located north of the present-day city of Crystal and is not visible on this aerial photograph.[48]

In some ways, MAC's decision on which Crystal site to acquire was forced by States Flying Service, the operators of Robbinsdale Airport. Although Robbinsdale Airport was small, it was also one of the busiest airports in the state in the early 1940s. States Flying Service was concerned about how a new MAC airport in the area would affect its business and its ability to expand.[49] Eager to maintain a stake in the airport business in the area, States Flying Service applied to the State Commissioner of Aeronautics for a license to operate a new airport just over one mile to the north of Robbinsdale Airport, near the proposed Crystal South site.[50] MAC was generally

[48] U.S. Geological Survey, "Aerial Photograph: Crystal, Minnesota Roll-Exp: 3-67," May 8, 1947, Minnesota Historical Aerial Photographs Online, John R. Borchert Map Library, University of Minnesota.

[49] "Ultimatum Given Robbinsdale Airport," *Minneapolis Star*, May 9, 1946, 25.

[50] "Crystal Airport Objections Fade," *Minneapolis Tribune*, October 10, 1946, 18.

focused on the Crystal North site but did not object to the state awarding States Flying Service a license for the new airport, which was granted in 1946.[51]

Because the new airport was located near the Crystal South site, MAC agreed to abandon its plans for Crystal North (which it deemed more valuable as existing truck and chicken farmland) and approved the purchase of the Crystal South site in 1947 (see Figure 39).[52] The purchase of Crystal Airport was not finalized by MAC until September 1948.[53] In the meantime, the owners of States Flying Service had opened Crystal Airport on January 1, 1948, after building three sod runways (each 2,600 feet long and 300 feet wide), a maintenance shop and six hangars.[54] (Because construction dates of buildings are not available, it is not known if these structures are extant.) MAC officially acquired (took over operation) of Crystal in the summer of 1949, and States Flying Service continued to operate at the airport as a FBO.[55] With the development of the Crystal Airport, the Robbinsdale Airport was closed by 1948.[56]

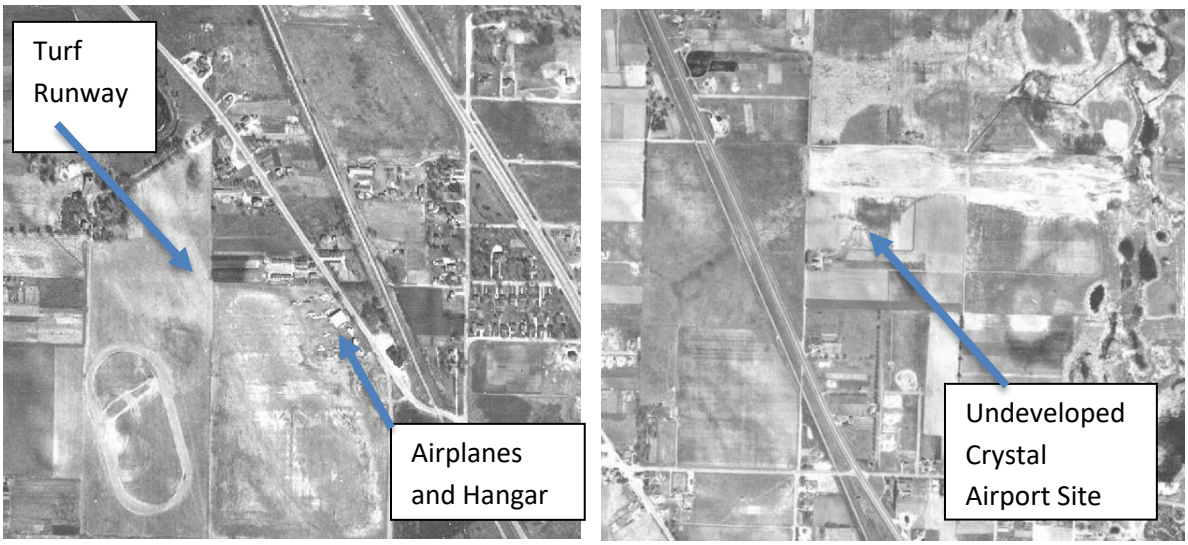


Figure 39. Close-up of 1947 aerial showing Robbinsdale Airport (left) still under operation (note the planes and large hangar to the right of the turf runway) and the undeveloped Crystal Airport site (right).[57]

After acquiring the 118-acre Crystal Airport, MAC spent several years expanding and developing the airport property and runway system. In 1949, for example, MAC approved plans to build a stabilized base for a northwest/southeast runway, apron, and taxiways.[58] This paved runway complemented three turf runways: one

[51] "Airports of the MAC, Volume 2," 14–15, 18; "Airport Goes to Crystal," *Minneapolis Tribune*, October 12, 1946, 9.

[52] "Secondary Airports, 1944-1960: Typewritten Manuscript of Actions of Metropolitan Airports Commission," June 9, 1947.

[53] "Secondary Airports, 1944-1960: Typewritten Manuscript of Actions of Metropolitan Airports Commission," December 6, 1948.

[54] "Airport Opens at Crystal," *Minneapolis Star*, January 1, 1948, 27.

[55] "Secondary Airports, 1944-1960: Typewritten Manuscript of Actions of Metropolitan Airports Commission," June 3, 1949.

[56] "Auto Speedway Opens Sunday at Crystal Village," *Minneapolis Star*, July 16, 1948, 2.

[57] U.S. Geological Survey, "Aerial Photograph: Crystal, Minnesota Roll-Exp: 3-67."

[58] "Airports of the MAC: Early Hurdles," 37.

running northwest/southeast, parallel to the paved runway, and the other two perpendicular, running northeast/southwest.[59] The following year, the airport was provided with sewer and water service, a second apron was added, and contracts were awarded for runway lighting and a terminal building.[60]

The contract for the terminal building was awarded to the prominent Minneapolis architectural firm Magney, Tusler, and Setter. Construction on the terminal building at Crystal Airport began in January 1951, under the St. Paul contractor M.E. Souther Construction Company.[61]

MAC also expanded Crystal Airport by an additional 34 acres in 1951.[62] In 1954, MAC added additional acreage on both the southeast and northeast corners of the property in an effort to protect runway approaches and shield the increased adjacent suburban development from airport noise (see Figures 40 through 42).[63] By 1963, both northwest/southeast runways (paved and turf) had been expanded by 750 feet.[64] By 1965, a second runway was paved so that one northwest/southeast runway and one northeast/southwest runway was paved.[65] With these expansions, the overall configuration of the airport's runways, taxiways, and hangar areas was in place by the late 1960s.[66] A third runway (the second northwest/southeast runway) was paved by 1971.[67]

[59] U.S. Army Map Service, "Aerial Photograph: Crystal, Minnesota, Frame 5397," September 30, 1953.

[60] "Airports of the MAC: Early Hurdles," 38; "Secondary Airports, 1944-1960: Typewritten Manuscript of Actions of Metropolitan Airports Commission," December 3, 1949 and November 16, 1950.

[61] "Crystal Airport Building."

[62] "Secondary Airports, 1944-1960: Typewritten Manuscript of Actions of Metropolitan Airports Commission," June 25, 1951.

[63] "Airports of the MAC: Early Hurdles," 38; "Secondary Airports, 1944-1960: Typewritten Manuscript of Actions of Metropolitan Airports Commission," March 15, 1954.

[64] "MAC Lets Contract for Taxiway Lights," *Minneapolis Tribune*, December 17, 1963, 17.

[65] H. G. Kuitu, "An Analysis of the Minneapolis-St. Paul Integrated Airport System," 1965, Table 1.

[66] Metropolitan Airports Commission, *Crystal Airport: Long-Term Comprehensive Plan* (Metropolitan Council, December 2008), 1.

[67] "Aerial Photograph: Crystal, Minnesota," November 12, 1971, Minnesota Historical Aerial Photographs Online, John R. Borchert Map Library, University of Minnesota.

Figures 40 through 42. 1956 (top left), 1967 (top right), and 1971 (bottom) aerial photographs of Crystal Airport. Note the extension of runways (two of which are paved by 1967) and development of airport land. By 1967, Hangar Areas 1 and 2 were developed and the development of Hangar Areas 3 and 4 was just beginning. By 1971, the current runway configuration of three paved and one turf runway is in place.[68]

The development of Crystal Airport's buildings followed the growth of the airport's acreage and the evolution of its runways. The facility included buildings typical of airports at the time: hangars to provide shelter for aircraft; a control tower to monitor both airside and landside traffic; an administration/terminal building, FBO buildings that included administrative functions and flying schools; and other ground service facilities for fuel, maintenance, and storage.[69] The first area of the airport to be developed was the south hangar area, or Hangar

[68] "Aerial Photograph: Crystal, Minnesota," May 7, 1956, Minnesota Historical Aerial Photographs Online, John R. Borchert Map Library, University of Minnesota; "Aerial Photograph: Crystal, Minnesota," November 18, 1967, Minnesota Historical Aerial Photographs Online, John R. Borchert Map Library, University of Minnesota; "Aerial Photograph: Crystal, Minnesota," November 12, 1971.

[69] Milbrooke et al., *National Register Bulletin: Guidelines for Evaluating and Documenting Historic Aviation Properties*, 22.

Area 1 as defined for this project. Historic aerial photography reveals that this triangular area on the airport's south side included more than one dozen structures by 1953. These included the terminal building (built in 1951, see Figures 43 and 44), two large arched-roof hangar buildings (see Figures 45 and 46), three multi-unit T-hangars, a Quonset-style hangar, and about one-half dozen individual T-hangars (these individual T-hangars were replaced with small box hangars in the 1990s).[70] Three years later, in 1956, the number of structures in Hangar Area 1 had more than doubled to about 30. In addition to the types of structures listed above, by 1956, Hangar Area 1 also included 10 individual box hangars. Around then (ca. 1956) a maintenance bay was added to the terminal building (a second maintenance bay addition followed ca. 1971).[71] A control tower was also added in 1962, greatly expanding the original administration and terminal building.[72] It is unknown if the tower followed a standard plan.

Architect's Drawing by Magney, Tusler & Setter.

Crystal Airport Building A new utility building is under construction at Crystal airport, north of Minneapolis, for the Minneapolis-St. Paul Metropolitan Airports commission. It is scheduled for completion by April 15, 1951, at a cost of $26,950. The structure will house a waiting room, manager's office, information counter, rest rooms, utility room and garage. M. E. Souther Construction Co. of St. Paul is the general contractor.

Figures 43 and 44. Left: Artist's rendering of the 1951 administration and terminal building at Crystal Airport. Right: the original administration and terminal building was expanded with additions of a maintenance facility ca. 1956 and ca. 1971, and the 1962 air traffic control tower.[73] This building is in Hangar Area 1.

[70] U.S. Army Map Service, "Aerial Photograph: Crystal, Minnesota, Frame 5397."

[71] "Aerial Photograph: Crystal, Minnesota," May 7, 1956.

[72] Edward Schafer, "2 Cities Airports Will Install Air Traffic Control Towers," *Minneapolis Star*, September 20, 1961, 8B.

[73] "Crystal Airport Building," 10.


Figures 45 and 46. This ca. 1953, former FBO building and arched-roof hangar belonging to Northland Aircraft were part of the early development of Hangar Area 1, on the south edge of Crystal Airport. 1952 photo (left) courtesy of the Minnesota Historical Society.

By 1960, Hangar Area 1 was almost fully developed, and Crystal Airport moved to developing Hangar Area 2 (west hangar area), beginning in the northern section. By 1962, this area included one multi-unit T-hangar, three box hangars, and a new FBO building (ca. 1966) operated by Crystal Shamrock (see Figure 47).[74] Hangar Area 2 continued to develop into the 1960s, with the addition of more box and multi-unit T-hangars throughout the northern and southern sections. This period also saw an FAA radio tower and storage building (ca. 1966) built on the east side of the property, just east of hangar rows in Hangar Area 4.[75]

Figure 47. The ca. 1966 FBO Crystal Shamrock building located in Hangar Area 2. It is no longer in operation as an FBO.

[74] "Cessna Comes to Crystal," *Minneapolis Star*, January 1, 1960, 23B; "Aerial Photograph: Crystal, Minnesota," April 26, 1962, Minnesota Historical Aerial Photographs Online, John R. Borchert Map Library, University of Minnesota.

[75] "Aerial Photograph: Crystal, Minnesota," November 18, 1967.

By 1967, Hangar Area 2 was mostly developed and Hangar Area 3 (north hangar area) was opened with the construction of a multi-unit T-hangar (nonextant). At the same time, Hangar Area 4 (east hangar area) also had its first structures, including small multi-unit T-hangars and box hangars.[76] A Quonset-style hangar was added ca. 1971.[77] Hangar Area 3 was largely developed with multi-unit T-hangars by the 1970s, but Hangar Area 4 remained mostly undeveloped until the 1990s, when more than 40 box hangars were constructed. This same decade saw the removal and replacement of the collection of individual T-hangars in Hangar Area 1 (multi-unit T-hangars and box hangars from earlier decades remained) and the construction of a small number of hangars in both Hangar Areas 2 and 3.[78] Less than a dozen buildings were constructed at the airport in the 1990s, including box hangars in Hangar Areas 2, 3, and 4, and a MAC maintenance building in Hangar Area 3.[79] Figure 48 illustrates the development of these four hangar areas by decade.

[76] "Aerial Photograph: Crystal, Minnesota," November 18, 1967.

[77] "Aerial Photograph: Crystal, Minnesota," November 12, 1971.

[78] "Aerial Photograph: Crystal, Minnesota," 1979, historicaerials.com; "Aerial Photograph: Crystal, Minnesota," 1991, historicaerials.com.

[79] "Aerial Photograph: Crystal, Minnesota," 2003.

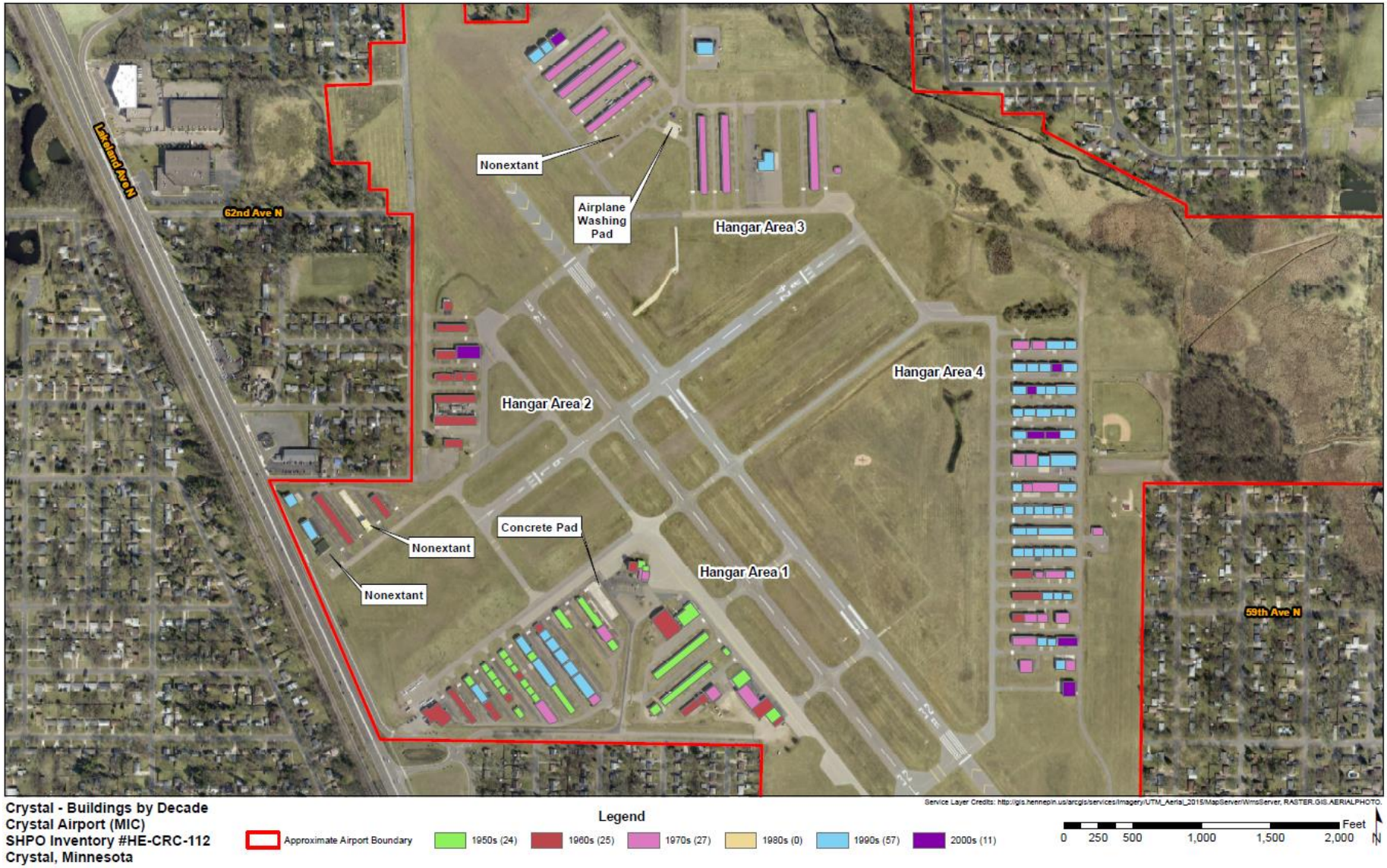


Figure 48. Crystal Airport development by decade.

The growth and development of Crystal Airport was fueled, in large part, by the postwar interest in general aviation. This can be seen in Crystal Airport's use during the 1950s and 1960s. As early as 1950, Crystal Airport based 176 planes and saw up to 100 flight operations an hour. Starting in 1951, the airport was also home to the Prop-Shop (extant), an airplane mechanic business operated by Maxwell Aircraft Service. Like similar airplane repair shops, the Prop-Shop, which still operates today, provided maintenance services for an area that extended beyond state lines.[80] By the mid-1950s, the airport was home to nine "commercial aviation companies," including FBO facilities and five flight schools.[81] Over the years, these FBOs and flight schools included States Flying Service, Hinck Flying Service, Skyways FBO, Crystal Shamrock, Northland Aircraft, Lakeland Flight Service, and Thunderbird Aviation.[82] In 1958, Crystal Airport reported 195 based aircraft.[83] Throughout the 1960s, the airport continued to get busier, seeing 111,585 flight operations (takeoffs and landings) in 1963 and 124,176 in 1964.[84] Flight operation numbers peaked in 1968 with 265,281 takeoffs and landings.[85]

The number of flight operations at Crystal Airport began to decline from this peak. From 1969 to 1970, for instance, flight operations dropped almost 25 percent, from 232,256 to 180,212. Residential development now surrounded the airport and it was unable to expand to accommodate the new, larger business jets and planes of the 1970s on. As a result, Crystal became more focused on recreational flying.[86]

In the 1980s, Crystal experienced a resurgence of activity, as flight operation numbers once again reached 200,000 takeoffs and landings per year.[87] This resurgence is seen in the large number of box hangars built in Hangar Area 4 (east hangar area) during this period. At the same time, Crystal Airport faced increased scrutiny from its neighbors. Residents of neighborhoods that border the airport had been vocal critics of airport operations since the 1950s.[88] A number of plane crashes in the 1980s involving planes taking off or landing at Crystal Airport, revitalized concerns over the airport's location in proximity to residential properties, even though the airport had been present prior to the housing developments.[89] Crystal, however, continued to

[80] *General Information about Minneapolis-St. Paul Airports Commission*, February 26, 1955, Metropolitan Airports Commission Published Records, Minnesota Historical Society; Maxwell Aircraft Service, "About Us," 2018, http://www.maxwellprops.com/about-us.html; Robert Dockry and Phillip Tiedeman, Interview with Mead & Hunt, Inc., Crystal, Minn., January 25, 2018.

[81] "Crystal Air Plaint 'Revs Up' Hearing," *Minneapolis Star*, August 11, 1956, 15A; John Nyburg, "Crystal Airport Learns to Live with Neighbors," *Minneapolis Star*, October 31, 1957, Z2.

[82] Dockry and Tiedeman, Interview with Mead & Hunt, Inc., Crystal, Minn.

[59] Gene Newhall, "Suburban Airports Ease Load on Wold," *Minneapolis Star*, September 18, 1958, 13.

[84] "Company-Owned Planes Keep Things Humming at Area Airports," *Minneapolis Star*, October 15, 1963, 4C; "MAC Reports Income Gains from Concessions," *Minneapolis Star*, January 4, 1965, 1B.

[85] "Understanding and Solving Problems at Crystal Airport," *Minneapolis Star Tribune*, December 15, 1984, 25A.

[86] Metropolitan Airports Commission, *Flying Cloud Airport: Long-Term Comprehensive Plan*, 2; Metropolitan Airports Commission, *Anoka County-Blaine: Long-Term Comprehensive Plan* (Metropolitan Council, June 2010), 3.

[87] Paul Young, "Crash Puts Crystal Airport under Fire," *Minneapolis Star*, April 17, 1980, 34.

[88] Nyburg, "Crystal Airport Learns to Live with Neighbors," Z2.

[89] Young, "Crash Puts Crystal Airport under Fire," 34.

develop with a focus on small planes and private owners during these decades. This can be seen in the hangar development in Hangar Area 4 during the 1980s and the retention of a turf runway.

Crystal Airport experienced a second downward trend in flight operations in the 1990s and 2000s. In the mid-1990s, Anoka County built a new hangar area that attracted pilots away from Crystal. The terrorist attacks of September 11, 2001, which used aircraft, affected aviation greatly. Stricter security measures and increased requirements for pilot licensing resulted in a drop in the number of recreational flyers. At Crystal Airport, the facility was shut down for six months after September 11 because of security concerns and its proximity to downtown Minneapolis. Higher fuel prices and the fact that more and more pilot training was taking place at colleges and universities also had a negative effect on the flight numbers at Crystal Airport.[90] By 2017, the airport had only 158 based aircraft and 42,351 total flight operations.[91]

Development of airport systems

The MAC system was developed as an integrated airport system with a primary airport to serve commercial traffic and secondary airports to provide general aviation services. During research, three sources were found that claimed the MAC system was in some way pioneering and/or a model for other airport systems. A 1951 article in *The Minneapolis Star* cited the MAC system as "one of the unique airport establishments in the country."[92] It listed four reasons for this claim: first, that the system relied on the cooperation of the otherwise competitive cities of Minneapolis and St. Paul; second, that MAC was predicted to soon be profitable; third, that the 1943 law creating the MAC system (and challenges to it) set legal precedent for publicly owned airport systems; and, finally, that the system has proven the case for publicly owned airport systems with specialized traffic. The article, however, does not substantiate the claim that these results make the MAC system unique. No comparative systems are mentioned, nor does the article explore the larger history of the idea of airport systems.

In 1965, the executive director of MAC, H.G. Kuitu, presented a paper to the American Society of Civil Engineers where he noted that "the integrated airport system concept was pioneered by MAC as the most logical means by which air transportation needs of a metropolitan area could be adequately provided." [93] Generally, the presentation was a narrative description of how the MAC system, including the major airport facility (Wold-Chamberlain Field) and the general aviation airports, were developed. Like the 1951 article, Kuitu's presentation did not provide any context on how the MAC system was pioneering in its influence on other airport systems developed in the state or nationally after MAC.

[90] Laurie Blake, "Less Traffic May Mean End for Crystal Airport," *Minneapolis Star Tribune*, June 16, 2007, B3.

[91] U.S. Department of Transportation Federal Aviation Administration, "Crystal Airport Master Record," February 1, 2018, http://www.gcr1.com/5010ReportRouter/MIC.pdf.

[92] "Aviation Age Praises Airports Commission," *The Minneapolis Star*, April 17, 1951, 25.

[93] Kuitu, "An Analysis of the Minneapolis-St. Paul Integrated Airport System," 4; H. G. Kuitu, "An Analysis of the Minneapolis-Saint Paul Integrated Airport System," 1965, 4, http://www.aaaedocs.org/index.cfm?do=openLibPDF&rid=273&doctype=pdf.

Finally, a 1984 article about the development of the MAC system in the magazine *Hennepin County History* cited the Twin Cities airport system as "a model for airport administration throughout the country."[94] This article provides a history of the creation of the MAC system but no context for how the system may have influenced the development of other airport systems. Research did not reveal discussions of how the MAC system influenced the development of other aviation systems. Therefore, the claims that it was pioneering and/or a model for other airport systems in Minnesota or nationally could not be substantiated. Likewise, the concept of MAC as a financial or legal model for other airports was also not supported by research.

Research did reveal that the separation of commercial and general aviation air traffic within a single airport system, with different airports in effect serving specialized traffic, was discussed in planning documents and implemented prior to the system developed by MAC. The concept of an integrated airport system is known to have been around for more than a decade before MAC submitted the Doell-Shepard report to the governor and city councils of Minneapolis and St. Paul in 1943. In 1930, this idea was published in a study by Harvard researchers titled, *Airports: Their Location, Administration and Legal Basis*. The Harvard researchers stated that the most efficient airport plan should include a primary airport located near the central business district of a city and a series of specialized secondary airports in suburban locations.[95] But even before the Harvard study was published, one airport historian notes that a number of U.S. cities produced regional and metropolitan airport plans based on the idea of the integrated airport system in the late 1920s.[96] In 1929, for example, the *Regional Plan for New York and Its Environs* incorporated the idea of an integrated regional airport system with airport specialization (commercial vs. private traffic) into its plans for the region surrounding New York City. In 1930, Philadelphia planners published their study, *Regionally Planned Groundwork: Airways and Airports*, which echoed the Harvard study and called for a hierarchy of airports. While the Philadelphia plan was never realized locally, the New York plan was. [97]

Research also suggests that some of these plans to separate commercial and general aviation within a single system were being executed prior to the construction of the MAC system. The 1944 National Airport Plan, for example, noted that "several large terminal airports" excluded private aircraft before World War II, thus leading to the development of airports servicing private flyers.[98] Although the plan does not specifically mention where this separation of aviation services at airports was occurring, it does provide evidence that it was being done prior to World War II and therefore, MAC did not pioneer airport specialization. Additionally, the New York airport plan mentioned above was implemented in 1947, when the Port Authority of New York took control of then New York Municipal Airport-LaGuardia (later just LaGuardia) and Newark Airports. The next year, it added

[94] Sandvick, "Early Airport Development and the Emergence of the Metropolitan Airports Commission," 16.

[95] Janet R. Daly Bednarek, "City Planning and Municipal Airports, 1927-1930," *Planning Perspectives* 15 (2000): 350, 353.

[96] Bednarek, *America's Airports: Airfield Development, 1918-1947*, 131.

[97] Daly Bednarek, "City Planning and Municipal Airports, 1927-1930," 357–63; Bednarek, *America's Airports: Airfield Development, 1918-1947*, 133–40.

[98] Acting Secretary of Commerce, *National Airport Plan*, 6.

New York International-Idlewild (later John F. Kennedy International) to its system of airports.[99] LaGuardia served the needs of private aircraft, as did Teterboro Airport, which the Port Authority purchased in 1949. Teterboro Airport is currently the Port Authority's general aviation airport.[100]

The Port Authority of New York, first established in 1921, provided a model of interstate cooperation in addressing competing transportation interests. Competition among the states of New York and New Jersey was alleviated by a compact between the two states, an agreement allowed by Congressional approval. The Port Authority is financially independent, receiving no state tax money, but funded instead by revenue generated from facility use (tolls, fares, etc.).[101] Airports became a part of the authority, as noted above, in 1947. Therefore, MAC did not pioneer the idea of a cooperative system of airport operation.

Comparative development of MAC secondary airports

By the mid-1950s, the MAC system consisted of five secondary airports. The St. Paul Airport was an original component of the system as it was part of the impetus to create MAC and stop competition with the then Wold-Chamberlin Field. Flying Cloud and Crystal began operations by MAC in the late 1940s with Lake Elmo and Anoka-Blaine added to their operations in the early 1950s. (Airlake Airport was not added until 1981). When the MAC system was established, the commission envisioned all the secondary airports in the system as general aviation airports having the same function: serving as a base for private plane ownership and operation, whether owned by individuals for recreational flying or by corporations for business travel, flying instruction and schools, charter operations, and even commuter services. For the purposes of comparison, Flying Cloud, Crystal, Anoka-Blaine and Lake Elmo were developed similarly as MAC secondary airports. The St. Paul airport is also a secondary airport but its development is not a direct comparison as it was already well established by the time MAC took over operations.[102]

In the 1950s and 1960s, shortly after becoming part of the MAC system, Flying Cloud and Crystal Airports were the heavy lifters of the MAC secondary airports. Of the two, Flying Cloud Airport was always the busiest, while Crystal Airport was the second busiest in this period. In 1964, Flying Cloud handled 216,475 flight operations with Crystal having 124,064. In contrast, Lake Elmo and Anoka County saw only 120,000 combined (see Figure 49).[103] This flight volume extended into the 1960s when Crystal flight operations peaked in 1968, with 265,281 operations.[104] From 1969 to 1970, both Flying Cloud and Crystal Airports experienced a marked reduction in

[99] The Port Authority of New York & New Jersey, "History of the Port Authority: Aviation History," *The Port Authority of New York & New Jersey*, 2018, https://www.panynj.gov/about/history-aviation.html.

[100] "History of Teterboro Airport," *The Port Authority of New York & New Jersey*, 2018 2001, http://www.panynj.gov/airports/teb-history.html.

[101] The Port Authority of New York & New Jersey, "Overview of Facilities and Services," *The Port Authority of New York & New Jersey*, 2018, http://www.panynj.gov/about/facilities-services.html.

[102] Metropolitan Airports Commission, *St. Paul Downton Airport: Long-Term Comprehensive Plan* (Metropolitan Council, June 2010), 1–2.

[103] Kuitu, "An Analysis of the Minneapolis-St. Paul Integrated Airport System."

[104] "Understanding and Solving Problems at Crystal Airport," 25A.

operations. During this period, Flying Cloud's flight operations dropped from 400,790 to 232,256. Likewise, Crystal's flight operations decreased from 232,256 to 180,212. At the time, these decreases were credited to bad weather and general economic conditions.[105]

	1964 Flight Operations[106]	**2017 Flight Operations**[107]
St. Paul Downtown	122,621	40,489
Flying Cloud	216,475	75,842
Crystal	124,064	42,351
Lake Elmo	30,000	26,498
Anoka County-Blaine	90,000	70,202

Figure 49. Flight operation changes from 1964 to 2017. Note how Crystal Airport drops from second to third highest in flight operations over that period.

Due to the volume of air traffic, these two facilities were the first of the secondary airports to receive air traffic control towers, which were both installed in 1962.[108] Anoka County did not receive a tower until 1996, and Lake Elmo still does not have a tower.[109]

The number of flight operations at each airport corresponded to the number of private hangars built to shelter aircraft based there. A review of aerial photographs shows hangar development at both Crystal and Flying Cloud to be comparable, with each airport containing between 60 and 70 hangars by the mid-1960s.[110] During the same time, Anoka County had approximately 40 hangars and Lake Elmo had 20 hangars.[111] In 1958, Flying Cloud and Crystal combined were home to the majority of the 516 aircraft based at MAC secondary airports.[112] By 1961, Flying Cloud based over 250 aircraft, while Crystal had 190, Anoka had 130 and Lake Elmo had only 45.[113] That number increased for Flying Cloud and Crystal to more than 500 combined in 1965, when the two airports housed well over half the based aircraft at secondary airports (see Figure 50). That rate of based aircraft

[105] "Flying Cloud Field's Flights in Tailspin," *Minneapolis Star*, June 29, 1971, 16.

[106] 1964/65 numbers in this and following charts based on: Kuitu, "An Analysis of the Minneapolis-St. Paul Integrated Airport System."

[107] Metropolitan Airports Commission, *2017 Performance Measures*, Operational Statistics, (2017).

[108] "Contracts Awarded for Two Airport Towers," *Minneapolis Star*, February 22, 1962, 9A.

[109] Metropolitan Airports Commission, *Anoka County-Blaine: Long-Term Comprehensive Plan*, 3; U.S. Department of Transportation Federal Aviation Administration, "Lake Elmo Airport Master Record," February 1, 2018, http://www.gcr1.com/5010ReportRouter/21D.pdf.

[110] "Aerial Photograph: Crystal, Minnesota," November 18, 1967; "Aerial Photograph: Flying Cloud Airport, Minnesota," 1966, historicaerials.com.

[111] "Aerial Photograph: Anoka County-Blaine Airport," 1966, historicaerials.com; "Aerial Photograph: Lake Elmo Airport," 1966, historicaerials.com.

[112] Newhall, "Suburban Airports Ease Load on Wold," 13.

[113] R. Dixon Speas Associates, *State of Minnesota Aviation Plan*, November 1970, 8B, Minnesota Department of Aeronautics Published Records and Reports, Minnesota Historical Society.

continued into 1968, when Flying Cloud and Crystal combined to house 48 percent of the airplanes at MAC secondary airports.[114]

	1961 Based Aircraft[115]	**1965 Based Aircraft**	**2017 Based Aircraft**[116]
St. Paul Downtown	not available	153	87
Flying Cloud	250+	315	373
Crystal	190	203	168
Lake Elmo	45	49	193
Anoka County-Blaine	130	140	377

Figure 50. Change in number of based aircraft from 1961 to 2017. Note how Crystal Airport drops from second to fourth highest in number of based aircraft over that period.

When established, the secondary airports were generally similar size in terms of acreage. When Crystal Airport was first purchased, the property included 118 acres.[117] By comparison, Flying Cloud was 135 acres, and Lake Elmo 160 acres. Anoka was an outlier at 1,200 acres.[118] By 1965, Crystal had grown to 430 acres, while Flying Cloud was 340 acres. Lake Elmo remained at 160 acres and Anoka County contained an expansive 1,900 acres (see Figure 51).[119] Over the next 50 years, Flying Cloud and Lake Elmo both expanded (860 and 640 acres, respectively), while Crystal remained the same size because surrounding residential developments provided no room for expansion.[120] This was a concern beginning in the late 1960s, as Crystal Airport was forecast to exceed capacity by the mid-1970s, leading one report to note that, "there is no reasonable chance of expanding the airport because of the densely developed areas immediately surrounding the property."[121] Although Crystal continued to develop its hangar areas into the 1980s and 1990s, it could not lengthen its runways.

[114] "Flying Cloud Field's Flights in Tailspin," 16.

[115] Schafer, "2 Cities Airports Will Install Air Traffic Control Towers," 8B.

[116] Metropolitan Airports Commission, *2017 Performance Measures*.

[117] "Airports of the MAC, Volume 2," 37.

[118] "Airports of the MAC: Early Hurdles," 40.

[119] An Analysis of the Minneapolis-St. Paul Integrated Airport System."

[120] Unless otherwise noted, 2017 statistics in Figures 50-52 come from the following documents: U.S. Department of Transportation Federal Aviation Administration, "Flying Cloud Airport Master Record," February 1, 2018, http://www.gcr1.com/5010ReportRouter/FCM.pdf; U.S. Department of Transportation Federal Aviation Administration, "Crystal Airport Master Record"; U.S. Department of Transportation Federal Aviation Administration, "Lake Elmo Airport Master Record."

[121] R. Dixon Speas Associates, *State of Minnesota Aviation Plan*.

	Original Acreage	1965 Acreage	2017 Acreage[122]
St. Paul Downtown	not available	540	540
Flying Cloud	135 (1948)	540	860
Crystal	118 (1949)	430	436
Lake Elmo	160 (1949)	160	640
Anoka County-Blaine	1,200 (1950)	1,900	1,860

Figure 51. Increase in airport acreage from original MAC purchase date to 2017.

By 1965, all five airports had between two and four runways, most of which were paved (see Figure 52). Smaller planes with specific types of landing gear and tires require turf runways which is why Crystal has maintained a turf runway to the present.[123] The main difference between the airports in terms of runways was length. Over time, longer and wider runways were needed for larger planes, especially the growing number of turbine-powered executive aircraft that were in use starting in the 1960s.[124]

In the 1970s, several MAC airports began to expand their runways to better accommodate new and larger planes, especially corporate jets and other business aircraft. Crystal was unable to lengthen its runways because of the surrounding residential development. For example, Flying Cloud's longest runway in 1965 at 3,600 feet was expanded to 5,000 feet by 2017 (see Figure 53).[125] Because of its large size, Anoka County has always had a runway at least 5,000 feet long.[126] As a result of the larger runways, by the 1980s and 1990s, Flying Cloud and Anoka County could provide services for the new, larger classes of business aircraft and became the busiest of the MAC secondary, now known as reliever, airports.

	1965 Runways		2017 Runways	
	Number	**Type**	**Number**	**Type**
St. Paul Downtown	3	All paved	3	All paved
Flying Cloud	3	All paved	3	All paved
Crystal	4	2 paved, 2 turf	4	3 paved, 1 turf
Lake Elmo	2	1 paved, 1 turf	2	All paved
Anoka County-Blaine	2	All paved	2	All paved

Figure 52. Runway numbers and types from 1965 to 2017.

[122] 2017 statistics in Figures 50-52 are derived from: U.S. Department of Transportation Federal Aviation Administration, "Anoka County-Blaine Airport Master Record," February 1, 2018, http://www.gcr1.com/5010ReportRouter/ANE.pdf; U.S. Department of Transportation Federal Aviation Administration, "Crystal Airport Master Record"; U.S. Department of Transportation Federal Aviation Administration, "Flying Cloud Airport Master Record"; U.S. Department of Transportation Federal Aviation Administration, "Lake Elmo Airport Master Record"; U.S. Department of Transportation Federal Aviation Administration, "St. Paul Downton Airport Master Record," February 1, 2018, http://www.gcr1.com/5010ReportRouter/STP.pdf; Metropolitan Airports Commission, *2017 Performance Measures*.

[123] Dockry and Tiedeman, Interview with Mead & Hunt, Inc., Crystal, Minn.

[124] Richard A. Leyes II and William A. Fleming, *The History of North American Small Gas Turbine Aircraft Engines* (Reston, Va.: American Institute of Aeronautics and Astronautics, 1999), 763.

[125] U.S. Department of Transportation Federal Aviation Administration, "Flying Cloud Airport Master Record."

[126] U.S. Department of Transportation Federal Aviation Administration, "Anoka County-Blaine Airport Master Record."

	1965 Longest Runway (ft)	2017 Longest Runway (ft)
St. Paul Downton	5,500	6,491
Flying Cloud	3,600	5,000
Crystal	3,250	3,267[127]
Lake Elmo	2,300	2,849
Anoka County-Blaine	5,950	5,000

Figure 53. Change in runway length from 1965 to 2017. Note how Crystal Airport's longest runway did not appreciably change over this period.

The secondary airports within the MAC system were all developed and expanded to serve as general aviation airports. In comparing their development and use during the late 1940s to early 1970s, Crystal developed similarly to the other MAC secondary airports in terms of acreage, runways and use for private aviation during this period. Crystal, along with Flying Cloud, was developed slightly earlier than Lake Elmo and Anoka. There is no evidence that Crystal influenced how these later secondary airports were developed. A portion of Flying Cloud Airport was determined eligible for the National Register as a historic district in 2003. The historic district was found to be "an important aspect of the first general aviation airport developed" by MAC in the postwar era and included hangar types "that evoke[d] the era of personal aviation after World War II."[128]

Architectural Context

General aviation airport property types

The *National Register Bulletin: Guidelines for Documenting and Evaluating Historic Aviation Properties* notes that airports may include the following types of properties: runways, taxiways, passenger terminals, administrative buildings, flying schools, hangars, and ground facilities for fuel, maintenance, and storage.[129] General aviation airports, like the secondary airports of the MAC system, often include these elements but at a more modest scale and number than larger primary airports serving commercial air traffic.

As early as 1929, airport planners were publishing design and construction guides for hangars, terminal and administration buildings and control towers. But they were also quick to note that only the busiest and most developed airports required lots of specialized buildings. As one guide stated, "one central building" was enough "so that various needs can be met without the expense of a group of separate buildings."[130] In 1946, the CAA published its own guide, *Airport Buildings*, which noted that the use of both commercial and private aircraft was predicated to grow quickly in the postwar years. As a result, the CAA guide suggested that postwar airports

[127] Metropolitan Airports Commission, *2017 Performance Measures*.

[128] Marjorie Pearson, PhD and Penny A. Petersen, Hess, Roise and Company, *Flying Cloud Airport: An Assessment of Significance, HE-2003-4H*, 31–32.

[129] Milbrooke et al., *National Register Bulletin: Guidelines for Evaluating and Documenting Historic Aviation Properties*, 22.

[130] Archibald Black, *Civil Airports and Airways* (New York: Simon and Schuster, 1929), 73.

be designed with the future in mind. "Any and all structures at the airport," the CAA said, "must be designed that they can be expanded."[131]

As aviation expanded, especially in the post-World War II era, the number of runways, buildings, and other features at an airport grew substantially. A single runway often became several runways and turf runways were paved. Standardized safety and navigational aids were added. Paved aprons and taxiways made the movement of aircraft to and from runways smoother and easier. Likewise, a handful of multi-purpose buildings evolved into many specialized buildings. At busier general aviation airports, air traffic control towers were built to house controllers that directed the movement of planes both in the air and on the ground.

Runways, aprons, and taxiways

Runways, aprons, and taxiways are the surfaces that aircraft use when traveling on the ground. General aviation airports prior to World War II typically had only a single turf runway. As airports became busier and planes larger after the war, additional runways were added and paved in either concrete or asphalt. Parallel runways allow more than one plane to land or take off at a time. Runways are usually laid out in relation to prevailing winds, so planes can land and takeoff without interference from cross winds. Runways laid out in T-, X, or L-plans take into account shifting winds. Standards for minimum runway widths and lengths have been set by the CAA/FAA since at least the 1950s and are based on the type of aircraft used at a given airport. Standard markings and lighting systems have also been in place since at least this decade and often include: a beacon, wind and traffic indicator, obstruction lights, runway lights, approach lighting, taxiway lighting, and traffic control lights.[132]

Aprons are used primarily for parking and loading or unloading aircraft. At general aviation airports, aprons are found in hangar areas and near FBO buildings. Taxiways are roadways that connect aprons and runways. Taxiways facilitate aircraft traffic on the ground and increase the capacity of an airport. Aprons and taxiways are generally paved with either asphalt or concrete.[133]

Crystal Airport has four runways laid out in an X-plan. Three runways are paved, and one runway is turf. All runways are labeled using the standard FAA system and runway lighting has been in place at Crystal since 1950.[134] Paved aprons are found between hangar rows and taxiways allowing aircraft to move from the hangar areas to the four runways.

Administrative, terminal, and maintenance buildings

Because general aviation airports do not service large commercial airlines, terminal and administration buildings are usually combined. A small waiting room serves as the passenger terminal while the remainder of the building is devoted to office space for airport administrators. The 1946 CAA guide, for example, suggests that

[131] U.S. Department of Commerce and Civil Aeronautics Administration, *Airport Buildings* (Washington, D.C.: U.S. Government Printing Office, 1946), 1.

[132] *Forms and Functions of Twentieth-Century Architecture, Volume IV: Building Types* (New York: Columbia University Press, 1952), 499–502.

[133] *Forms and Functions of Twentieth-Century Architecture, Volume IV: Building Types*, 500–501.

[134] "Secondary Airports, 1944-1960: Typewritten Manuscript of Actions of Metropolitan Airports Commission," November 16, 1950.

despite their smaller size and combined use, general aviation airport terminal and administration buildings should still be built with expansion in mind.[135] In the case of Crystal, the 1951 administration and terminal building was expanded to include the control tower in 1962 and two maintenance bay additions ca. 1956 and ca. 1971.

Airport maintenance buildings can serve a number of functions, including housing maintenance and emergency vehicles, mowing and snowplow equipment, and workshop space. The 1946 CAA guide notes that maintenance buildings should have easy access to both the runway area as well as service roads, which allow vehicular access to the airport property without utilizing taxiways.[136] At Crystal, in addition to the maintenance bays attached to the terminal and administration building, two other maintenance buildings are located in Hangar Areas 3 and 4, respectively. Both of these buildings have easy access to the runway area as well as service roads.

Air traffic control towers

From the cockpit of an airplane, a pilot's visibility is limited, both on the ground and in the air. At busy airports, this limited visibility creates the need for traffic guidance and control to prevent collisions on the ground and facilitate safe landings and takeoffs. Before the advent of radio communication, guidance was provided by an individual on the ground with a pair of flags. Following the introduction of the radio, the former flagperson was moved from the ground to an elevated position atop a hangar or administration building. These elevated positions, or control towers, varied greatly in design as no standards for construction existed before World War II.[137]

Following the war, the CAA began to develop standard designs for airport control towers. These towers were either freestanding or connected to an administration building or hangar. The height of the control tower was determined by the general layout of the airport and the tower's location within that layout. The tower had to be tall enough to provide a 360-degree, unobstructed view of all runways, taxiways, and approaches to the airport. Generally speaking, the design of the control room (on top of the tower) was more important to the tower's function than the tower itself. On average, the control room was approximately 200 square feet and hexagonal in shape. Square control rooms were also used but tended to predate the postwar CAA designs. Large windows surrounded the control room to shelter the air traffic controllers from the elements. Windows were constructed and installed (e.g., using tinted glass or setting the glass at an angle) in an effort to minimize reflection and glare.[138]

The air traffic control towers at both Crystal and Flying Cloud (nonextant) were built starting in 1962 (the tower at Crystal did not open until early 1963.)[139] Research did not indicate if these towers were built using standard

[135] U.S. Department of Commerce and Civil Aeronautics Administration, *Airport Buildings*, 71.

[136] U.S. Department of Commerce and Civil Aeronautics Administration, *Airport Buildings*, 71.

[137] Glen A. Gilbert, *Air Traffic Control* (Chicago: Ziff-Davis Publishing Company, 1945), 101.

[138] Gilbert, *Air Traffic Control*, 103–5.

[139] "Contracts Awarded for Two Airport Towers," 9A; "Control Tower at Crystal Airport to Begin Monday," *Minneapolis Tribune*, March 29, 1963, 7.

plans from either MAC or the FAA (which had taken over for the CAA in 1958).[140] Illustrating the importance of adjusting the height of a control tower to a specific airport, Crystal's tower was built to be 54 feet tall, while Flying Cloud's tower was 64 feet.[141] Both towers were constructed by the Crystal construction firm Petersen and Templin.[142]

Flight schools, aircraft mechanics, and FBOs

Typically private businesses on the airport, flight schools, aircraft mechanics, and FBOs all fulfill different functions, but require a similar mix of aircraft storage, workshop space, and office space. In most instances, this combination can take place under one roof, usually within a large hangar or combination of hangars. Office space is often added as a smaller structure alongside the hangar building or, occasionally, is set off as its own building. FBO facilities usually also include gasoline pumps set off from the buildings, giving airplanes an open space to refuel. FBO and flight school buildings at Crystal include Northland Aircraft, Skyways, and Crystal Shamrock. Thunderbird Aviation is currently the only FBO operating at Crystal Airport. The Prop-Shop is an example of an aircraft mechanic property.

Hangars

Because a general aviation airport is intended primarily for private aircraft, aircraft storage hangars are the most numerous building type at an airport. Airplane hangars at small general aviation airports like Crystal are intended to offer private aircraft owners a safe and secure place to store their aircraft out of the elements. Two main types of hangars are located at Crystal Airport: box hangars and T-hangars.

Box hangars include large, arch-roof hangars and smaller, single- or multi-unit box hangars. These hangars, built of concrete block or metal or wood framing, enclose large open spaces intended to house multiple aircraft, maintenance equipment, and work space (see Figure 54). Because of their size, arched trusses are used to span the open interior. This made the structures expensive, and they tended to be used only by large operators and not individual owners.[143] An additional downside to the large, arched-roof hangar was that multiple aircraft and various equipment would be stored together in the space, leading to the possibility of damaging stored aircraft.[144] Crystal Airport has three large, arched-roof box hangars in Hangar Area 1 (one as part of the Prop-Shop and two associated with Northland Aircraft). The two earliest of these hangars were built ca. 1950. The second arched-roof hangar associated with Northland Aircraft was built in 1967.

A variation of this box style of hangar is the Quonset-style hangar, which has a roof arch that extends to the ground (see Figure 55). Crystal Airport has two Quonset-style hangars: a ca. 1950 hangar in Hangar Area 1 and a ca. 1969 hangar in Hangar Area 4.

[140] "A Brief History of the FAA," January 4, 2017, https://www.faa.gov/about/history/brief_history/.

[141] "Contracts Awarded for Two Airport Towers," 9A.

[142] "Contracts Awarded for Two Airport Towers," 9A.

[143] J. F. Woerner, "T-Type Personal Hangar," *Aero Digest*, September 1946, 44.

[144] "Crystal Airport - HE-CRC-112," n.d., Architecture - History Inventory, Minnesota State Historic Preservation Office.


Figures 54 and 55. Two examples of large, arched-roof hangars found in Hangar Area 1. Left: A 1967 arched-roof hangar used by Northland Aircraft. Right: a ca. 1953 Quonset-style hangar used by the Prop-Shop.

Small box hangars are square or rectangular buildings and can be made of concrete block or framed in wood or iron, in which case they are usually clad in corrugated metal (see Figure 56). Because of their small size, these box hangars do not require arched-roof trusses. Small box hangars generally contain a single bay but can include multiple bays. Most bays can fit one or multiple aircraft. The hangars can have flat, front-gable, or side-gable roofs. Door styles vary but can include sliding doors, cantilevered doors, or bifold doors. Crystal Airport has a variety of box hangars, which are found in all four hangar areas. Some ca. 1956 examples of box hangars are found in Hangar Areas 1 and 2, but the majority of Crystal's box hangars date from the 1980s and 1990s.

Figure 56. A ca. 1956 box hangar in Hangar Area 1. Note the concrete block wall and (likely replacement) bifold door.

T-hangars became popular in the 1940s and are named for their T-shaped stalls, designed in the shape of an airplane and intended to store a single aircraft. T-hangars addressed many of the downsides of large, arched-roof hangars. These stalls could be built singularly, as an individual T-hangar, or combined in a multi-unit T-hangar. The 1946 CAA guide recommended T-hangar stalls be built 42 feet wide, 28 feet deep, and have a door that measured 40 feet by 8 feet. The CAA further recommended that these stalls be combined to form either a square hangar of four units or a rectangular hangar of six units. Figure 57 shows these recommended configurations as well as several options for the placement of multi-unit T-hangars in an airport hangar area.[145]

[145] U.S. Department of Commerce and Civil Aeronautics Administration, *Airport Buildings*, 81.

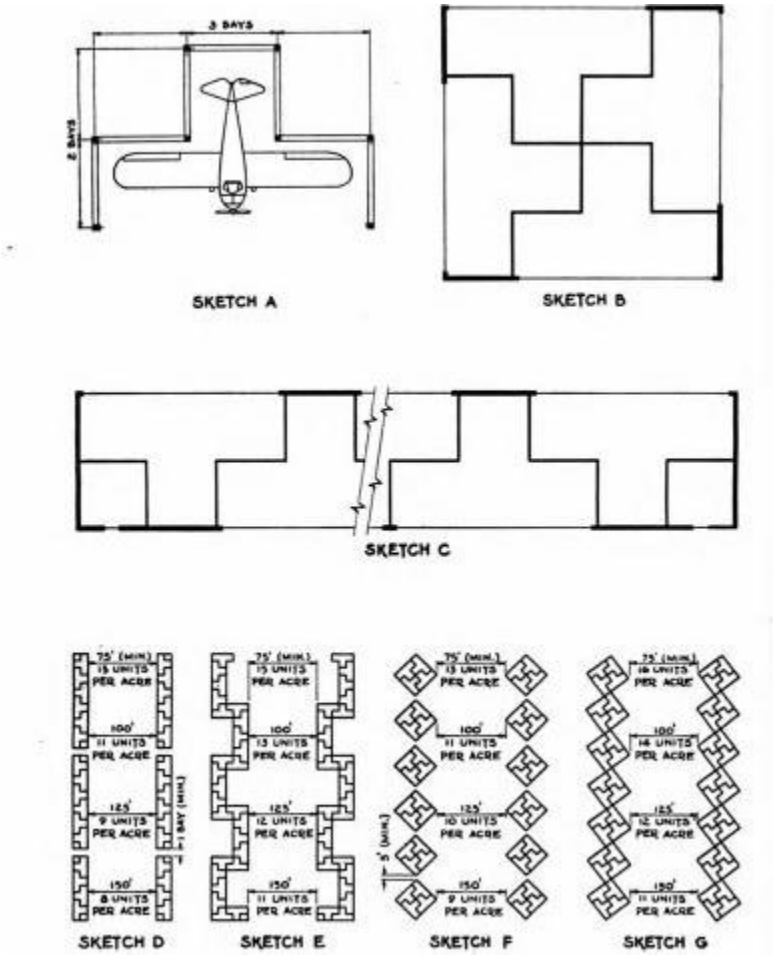


Figure 57. 1946 CAA recommendations for multi-unit T-hangar configurations.[146]

Multi-unit T-hangars have alternating T-stalls with doors on both sides of the hangar building. This pattern maximized the storage space of a hangar building while ensuring the safe storage of individual aircraft. T-hangars are framed in either wood or metal and usually clad in corrugated metal. Both individual and multi-unit T-stalls were inexpensive to build because they required no trusses to span large open spaces.[147] Individual T-stall hangars were present at Crystal Airport, in Hangar Area 1, from ca. 1950 to the 1980s, when they were replaced with box hangars. The airport retains most of its numerous multi-unit hangars (see Figure 58). These multi-unit hangars are present in all four hangar areas and vary in length, with the shortest being three stalls wide and the longest spanning the entire hangar row.

[146] U.S. Department of Commerce and Civil Aeronautics Administration, *Airport Buildings*, 80.

[147] Woerner, "T-Type Personal Hangar," 96.

Figure 58. A ca. 1953, multi-unit T-hangar with five alternating stalls on each side in Hangar Area 1.

As outlined above, the Crystal Airport has a typical collection of buildings, structures, runways and additional infrastructure commonly seen in airports developed from the end of World War II to the present. Overall it is similar in layout, function, and physical characteristics to the other secondary airports within MAC and is characteristic of the airport design guides of the postwar period.

Contemporary Style

The terminal building at Crystal Airport was built in the Contemporary style, which was popular both nationally and in Minnesota from the 1950s to the 1970s, and found in civic, educational, commercial, residential, and religious architecture. The Contemporary style was derived from Moderne and International styles and was a further move away from revival architectural styles that referenced the past. It is characterized by simple forms and a lack of ornamentation, the purpose of which is to highlight the structure and function of the building. Contemporary buildings have low-pitched gable roofs, slanted roofs, or flat roofs. Buildings constructed in this style usually have wide, overhanging eaves often with exposed roof beams. Contemporary style buildings are usually constructed with natural materials like wood, stone, brick, or occasionally concrete. Buildings are often asymmetrical in form with broad expanses of uninterrupted wall space and window openings either in gable ends or just below the roofline in buildings with slanted or flat roofs. The modest terminal building at Crystal airport demonstrated several features of the Contemporary style, including an asymmetrical form, a slanted roof, plywood cladding, and window openings just below the roofline. Many of these features have been altered as a result of the additions described above.[148]

Magney, Tusler and Setter

The prominent Minneapolis firm of Magney, Tusler and Setter designed the terminal building at the Crystal Airport. The firm has a long history of work in Minnesota. Gotlieb Magney (1884-1969) and Wilbur Tusler (1890-1905) became partners in 1917 and designed a number of notable buildings in Minneapolis, including the Chalet at Theodore Wirth Park (1929), and the Young Quinlan store (1928) and the Foshay Tower (1929) in

[148] Virginia McAlester et al., *A Field Guide to American Houses: The Definitive Guide to Identifying and Understanding America's Domestic Architecture*, Revised and expanded edition/second edition (New York: Alfred A. Knopf, 2013), 628–46.

downtown.[149] Donald Setter (1904-1990) joined the firm in 1939, and together Magney, Tusler, and Setter designed buildings like Peik (1954) and Ford (1951) Halls at the University of Minnesota, and the Master Plan (1950s) for new buildings at Gustavus Adolphus College in St. Peter.[150] In 1942, the firm was engaged by Carleton College to design a hangar facility and acted as project manager, overseeing development of the airport facility in Northfield.[151]

The Crystal terminal building was constructed in the Contemporary style, as evoked by its expansive glass windows and deep overhanging roof. This was a style regularly used by Magney, Tusler, and Setter in the 1950s. Peik and Ford Halls and many of the buildings constructed at Gustavus Adolphus College as part of the Master Plan were also designed with elements of Contemporary style. The terminal building at Crystal, however, is a relatively minor design by the firm and is not a notable work of Magney, Tusler, and Setter. Additionally, research did not indicate that the firm served as project manager for development at Crystal as they did at the Carleton College airport.

Significance

Crystal Airport was previously evaluated in 2012 as part of the Bottineau (now referred to as Blue Line) Transitway Phase I and II Architectural History Survey. That evaluation determined the following:

> Although the basic layout of the airport was developed between 1947 and 1971, a substantial number of buildings on the airport grounds were built or replaced from the mid-1960s forward…It was therefore determined that airport does not meet the qualifications for exceptional importance under NRHP Criteria Consideration G. As such, it is recommended that the airport is currently not eligible for the NRHP, and the entire property should be reevaluated for eligibility once the last major development of the airport reaches 50 years of age.[152]

For this reevaluation, the Crystal Airport was evaluated for listing in the National Register under Criteria A, B, and C using the National Register Bulletins *How to Apply the National Register Criteria for Evaluation* and *Guidelines for Evaluating and Documenting Historic Aviation Properties*.[153] The Crystal Airport was not assessed under National Register Criterion D as part of this evaluation.

Within the MAC system, individual buildings and complexes have been previously evaluated at three of the airports. The Flying Cloud Airport Building Area No. 1 was recommended significant and received SHPO

[149] Alan K. Lathrop, *Minnesota Architects: A Biographical Dictionary* (Minneapolis: University of Minnesota Press, 2010), 148–49, 216–17; David Gebhard and Tom Martinson, *A Guide to the Architecture of Minnesota* (Minneapolis: University of Minnestoa Press, 1977), 31–32.

[150] Gebhard and Martinson, *A Guide to the Architecture of Minnesota*, 39, 50–51, 250; Lathrop, *Minnesota Architects: A Biographical Dictionary*, 190–92.

[151] National Register of Historic Places, Carleton Airport, Northfield, Goodhue County, Minnesota, National Register #04000722.

[152] "Crystal Airport - HE-CRC-112."

[153] National Park Service, *How to Apply the National Register Criteria for Evaluation*, National Register Bulletin, 1990, www.nps.gov/Nr/publications/bulletins/nrb15/; Milbrooke et al., *National Register Bulletin: Guidelines for Evaluating and Documenting Historic Aviation Properties*.

concurrence in 2003 under Criterion A "as an important aspect of the first general aviation airport developed by the Metropolitan Airports Commission in the post-World War II era."[154] The Lake Elmo Airport was determined not eligible in 2017 as it was not found to be significant within the history or development of the MAC system or important within the overall history of aviation history of aviation in Minnesota or Washington County. The Holman Field Administration Building at the St. Paul Airport was evaluated in 1991 and was determined eligible under Criterion A as an example of an important projected completed by the Works Progress Administration (WPA) and the city of St. Paul, and under Criterion C as "one of the most accomplished works of Clarence Wesley Wigington, the first Black architect for the City of St. Paul."[155] These previous evaluations of MAC airports and were considered in the evaluation of the Crystal Airport.

Criterion A

In the 2012 evaluation, the Crystal Airport was found to have:

> …importance in the areas of community planning and development, and transportation, as an integral component of the MAC Reliever System. The airport is the most developed of the reliever airports, having three paved runways and a turf runway, as well as [a] large number of hangars, reflecting the high volume of air traffic that operates out of the airport annually. Additionally, the airport is important as part of the ongoing implementation and operation of the innovative MAC Reliever System.[156]

For this reevaluation, the Crystal Airport was evaluated as a component of the MAC system and for its association with aviation in the Twin Cities metropolitan area. The innovation of the MAC reliever system was also investigated for this reevaluation.

The Crystal Airport is one of five secondary (currently called reliever) airports operated by MAC from the late 1940s to the 1970s that, collectively with the primary airport—Minneapolis-St. Paul International Airport (MSP)—comprise the MAC system. The St. Paul Airport was immediately included in the system as it was part of the impetus to create MAC and stop competition with the then Wold-Chamberlin Field (now MSP). Flying Cloud was the first airport to be purchased and acquired (operated) by MAC in 1948 with Crystal following shortly after in 1949. Lake Elmo and Anoka-Blaine were added to MAC's operations in the early 1950s.[157]

When establishing the system of secondary airports, MAC intended each of the MAC secondary airports for general aviation use, specifically as bases for private planes, as well as for commercial operations like flight schools, charter operators, and commuter services. By diverting smaller aircraft to secondary airports, the MAC could alleviate airport congestion and develop MSP as the major commercial airline hub.

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[154] Marjorie Pearson, PhD and Penny A. Petersen, Hess, Roise and Company, *Flying Cloud Airport: An Assessment of Significance, HE-2003-4H*, 31.

[155] National Register of Historic Places, Holman Field Administration Building, St. Paul, Ramsey County, Minnesota, 8–1, National Register #91001004.

[156] "Crystal Airport - HE-CRC-112."

[157] Airlake was not added to the reliever system until 1981 and is therefore outside the period of evaluation.

The secondary airports were developed in similar ways during the late 1940s to the early 1970s, focusing on their use for private and small commercial operations. Development of the secondary airports included three to four runways (generally paved), maintenance and FBO facilities, a terminal/administration building and numerous hangars. In addition, both Flying Cloud and Crystal included air traffic control towers built in the early 1960s. Crystal was developed during this time to include four runways (three paved and one turf by 1971), a terminal/administration building with an air traffic control tower addition, hangars for FBOs, flight schools, maintenance facilities, and numerous private hangars. In comparison, Flying Cloud also had three paved runways by 1965, a large number of hangars, a terminal building and air traffic control tower and a number of flight schools.[158] When comparing the use of MAC secondary airports, Flying Cloud was the busiest in the 1950s and 1960s based on flight operations and aircraft. Crystal, with comparable facilities, was the second busiest.

Crystal is one of six airports within the MAC system of secondary airports and serves a similar purpose to the other secondary airports of the system. A portion of the Flying Cloud airport has been recognized as an eligible historic district for its significance as the first general aviation airport within the system. Crystal was the second general aviation airport in the MAC system and there is no evidence that it was more developed than Flying Cloud. There is also no evidence that it developed differently from the other secondary airports or that it influenced the development of later secondary airports such as Lake Elmo or Anoka. Crystal Airport does not appear to have played a significant role in the development of aviation in the Twin Cities or Minnesota. In addition, no important events or trends in aviation were identified as associated with the Crystal Airport that would make it significant under Criterion A.

Investigations were also conducted to understand if the MAC system was innovative within the context of other airport systems in Minnesota or the United States. Although there are claims that the MAC system was pioneering and a model, the sources for these statements do not provide either the historic context and/or evidentiary details to support these statements. Research efforts did not reveal any context or corroboration for MAC being a pioneering system that influenced other airports regionally or nationally. Research did show that nationally, the concept of regional airport systems was discussed in studies in the mid-1920s and 1930s and that airports were being developed elsewhere to separate commercial and general aviation prior to World War II. Regional systems like the airports operated by the Port Authority of New York were implemented by 1947 and MAC's earliest secondary airport (Flying Cloud) was not purchased and acquired until 1948. Therefore, due to a lack of context and lack of evidence of any influence, the MAC system was not found to be either a pioneering system or a model for other systems in Minnesota or the nation. Similarly, the Crystal Airport itself is not known to have had influence on the development of the MAC system, other MAC airports, or on airport systems outside of the MAC.

The Crystal Airport is recommended not eligible under Criterion A.

[158] Marjorie Pearson, PhD and Penny A. Petersen, Hess, Roise and Company, *Flying Cloud Airport: An Assessment of Significance, HE-2003-4H*, 18–23.

Criterion B
Research did not reveal any notable individuals associated with the Crystal Airport or the wider MAC system. Additionally, no individuals associated with the property were found to be important within the aviation history of the region or state. The property is recommended not eligible under Criterion B.

Criterion C
The Crystal Airport was evaluated for its potential significance as an example of a general aviation airport constructed in the post-World War II era and developed through the early 1970s. Operation of the airport by MAC began in 1949 and the airport was largely developed by the early 1970s. This included the four-runway configuration and the construction of a terminal with a control tower attached in 1963, a large number of hangars, and other air service-related hangars and buildings to house services such as FBOs, flight schools, and maintenance shops. Hangar Area 4 was the only area not fully developed by the early-1970s.

The development and resulting facilities of the Crystal Airport from 1949 through the early 1970s is typical for airports. It is also similar to other MAC secondary airports, which have runways; control towers (Flying Cloud, Crystal and St. Paul); flight schools, maintenance, and FBO facilities; and private hangars. Crystal Airport represents the typical post-war airport development and was not identified to be distinguished in its development within the MAC system or among other general aviation facilities. Its runways and collection of airport buildings are typical of other general aviation airports developed after World War II and therefore do not represent unusual or significant post-World War II airport design. In addition, the Crystal airport developed continuously after the early 1970s, with the construction of many hangars. Buildings constructed after the early 1970s are located throughout the property, including in all four hangar areas, which limits the ability of the overall airport to convey the cohesiveness of a general aviation facility from the postwar era.

Concentrations of buildings and individual buildings within the airport were also evaluated to see if they have significance under Criterion C. In particular, Hangar Areas 1 and 2 retain a higher percentage of buildings constructed before the early-1970s. These areas include a mix of buildings dating from 1951 through ca. 1971, with some infill of hangars built after the early-1970s. Area 1 includes the terminal building with the attached air traffic control tower and maintenance facilities. It is unknown if the tower addition was based on a standard FAA plan. The hangars at the airport are the typical box, T-, and Quonset-style types found at other general aviation airports of this period, including other MAC secondary airports. These hangars do not represent a significant type, period, or method of construction for airport-related buildings, nor are the buildings distinct. Additionally, many of the hangars built during the evaluation period have been altered with replacement siding and doors and a few additions, altering their historic appearance. These alterations, including the replacement of single-stall T-hangars with ca. 1990s hangars in Hangar Area 1, have affected the integrity of workmanship, materials, design, feeling and association of Hangar Areas 1 and 2.

Building Area No. 1 at Flying Cloud airport was evaluated and received SHPO concurrence for significance under Criterion C “as it contains a collection of small-scale, individual and multi-unit T-hangars that evoke the era of

personal aviation after World War II."[159] Although Crystal does contain hangars that date to the late 1940s and 1950s, a similar grouping of hangars was not found that could also represent significance related to personal aviation after World War II.

The Crystal Airport buildings do not represent notable works of a master nor do they have high artistic value. Most buildings are utilitarian in form and design. The few buildings that have stylistic influences, such as the Contemporary terminal building and Crystal Shamrock building, are modest in design and are not distinct examples of their style. In addition, the terminal and administration building has been altered with enclosed windows that remove a key feature of the Contemporary design and the building has been expanded with the addition of an air traffic control tower and maintenance facility additions changing its overall form. The terminal building was designed by the prominent Minnesota architectural firm Magney, Tusler, and Setter. However, the building is not identified as one of the firm's significant designs in *Minnesota Architects*, *A Guide to the Architecture of Minnesota*, *A Guide to Minnesota Architecture* or the *AIA Guide to the Twin Cities,* and is a less prominent example of their work. As a result, unlike the Holman Field Administration Building at the St. Paul Airport, which was determined significant and eligible as an important work of architect Clarence Wesley Wigington, the Crystal Airport terminal building was not found to be an important work of Magney, Tusler, and Setter. Additionally, alterations to the building have diminished its integrity which would preclude its eligibility for listing on the National Register under Criterion C.

Therefore, Crystal Airport as a whole, as well as individual buildings or concentrations of buildings, were not found to possess significance under Criterion C: Architecture and is recommended not eligible.

Integrity

As the Crystal Airport does not have significance, an assessment of its integrity is not warranted.

Recommendation

The Crystal Airport is recommended not eligible for listing in the National Register. In addition, no individual buildings or concentrations of buildings were found to possess significance outside of the overall property.

[159] Marjorie Pearson, PhD and Penny A. Petersen, Hess, Roise and Company, *Flying Cloud Airport: An Assessment of Significance, HE-2003-4H*, 32.

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Maps


Legend
Approximate Airport Boundary
N
0 300 600 1,200 1,800 2,400
Feet
Airport Location
Champlin
Coon Rapids
Blaine
Maple Grove
Brooklyn Park
Mounds View
Minneapolis
Minnetonka
Mendota
100
94
63rd Ave N
Lakeland Ave N
58th Ave N
Bottineau Blvd
56th Ave N

Photographs

Photographs are presented throughout this Multiple Property Inventory Form Continuation Sheet.

Appendix G – Archaeology Report

DEPARTMENT OF ADMINISTRATION
STATE HISTORIC PRESERVATION OFFICE

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

U.S. Department
of Transportation
Federal Aviation Administration

Dakota-Minnesota Airports District Office
Bismarck Office
2301 University Drive, Building 23B
Bismarck, ND 58504

Dakota-Minnesota Airports District Office
Minneapolis Office
6020 28th Avenue South, Suite 102
Minneapolis, MN 55450

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.

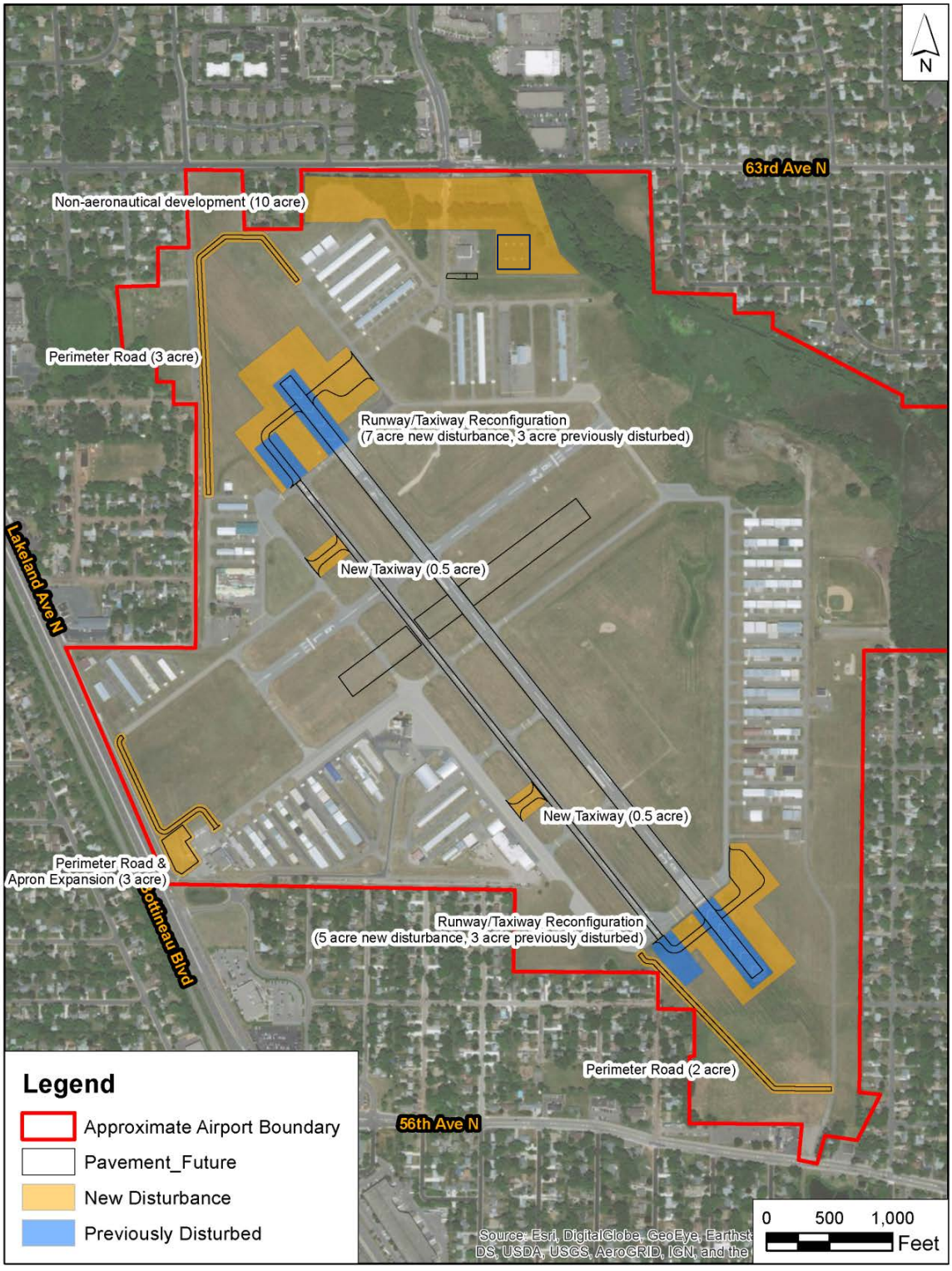

Figure 2. Aerial view of the areas of planned construction on the Crystal Airport property. A zone of specially manicured lawn with two lines of white cubes that was omitted from survey in the area of non-aeronautical development is outlined in dark blue. (Provided by Mead and Hunt.)

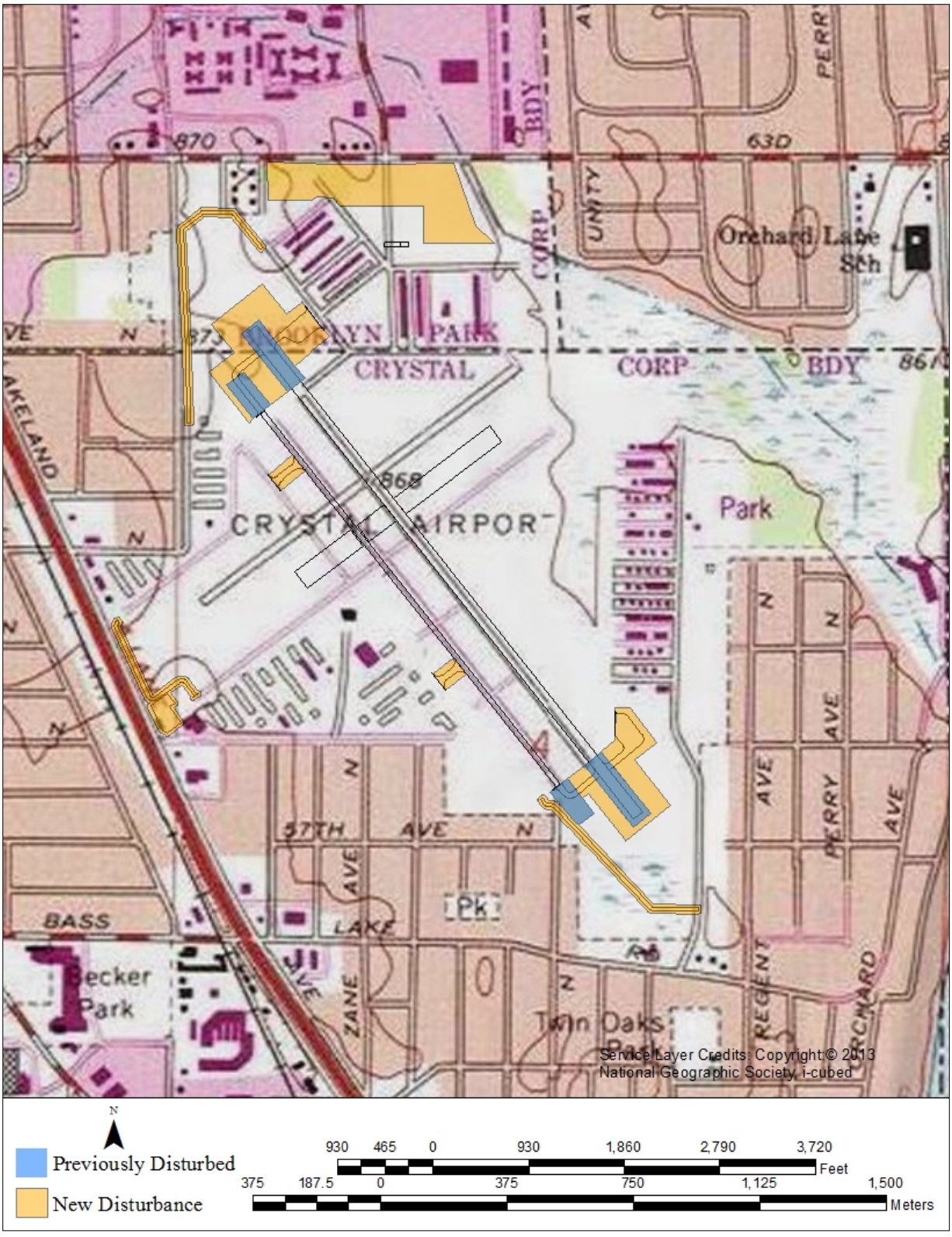

Figure 3. The project area displayed on a topographic map. (Generated in ArcGIS.)

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.

Site Number	Site Name	Description	Tradition	Township	Range	Section
21HE0075	Palmer Lake Mounds	EW	W-2	119	21	34
21HE0151	Palmer Lake Park	AS	W-1	119	21	34

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 (Hobbs 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.

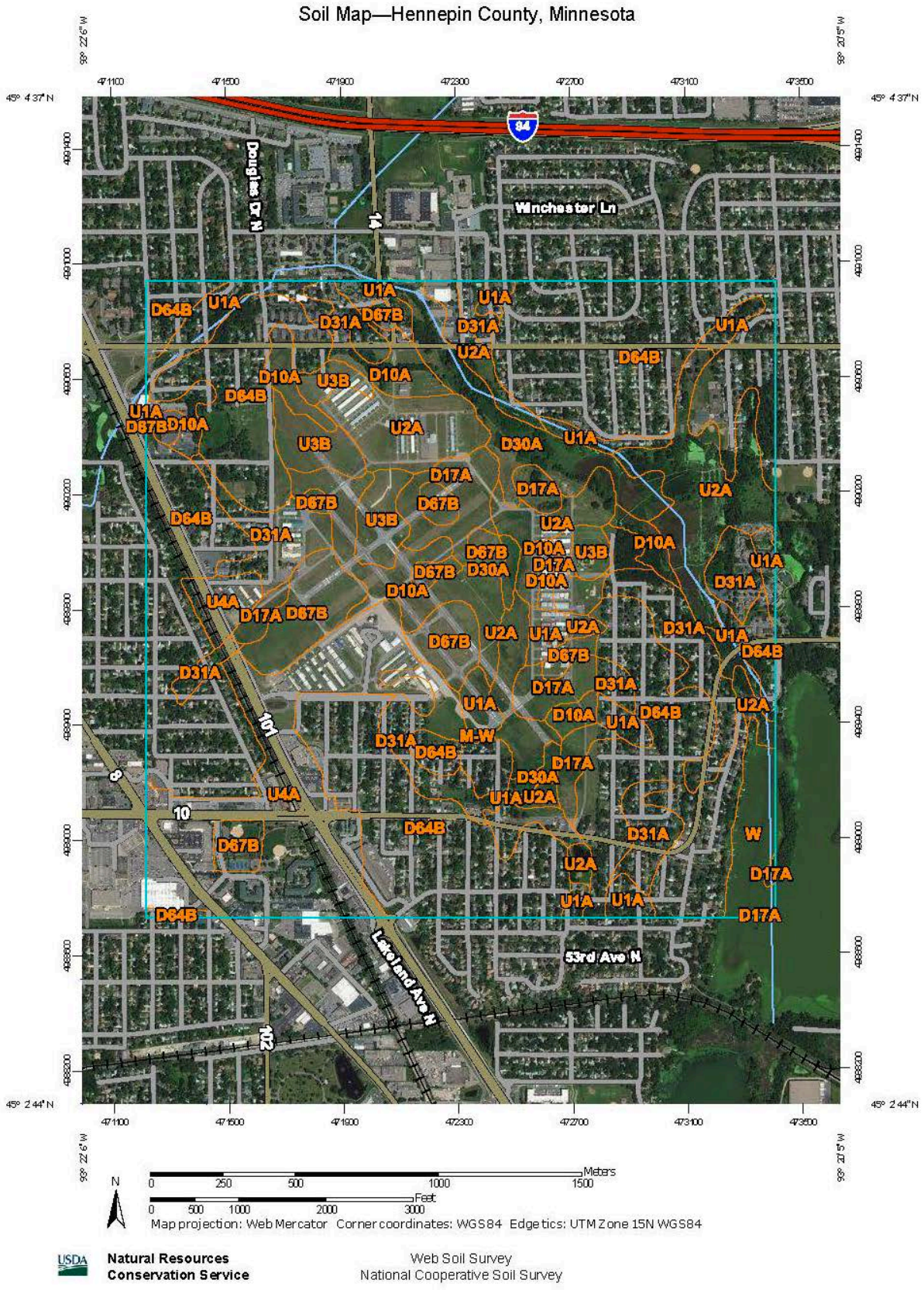

Figure 4. Soil types within the project area.

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).

Figure 5. GLO plat maps showing prairie, within a green border, and marsh, bounded by a border with black interior shading, overlaying a modern aerial image of the Crystal Airport. (Generated through the Minnesota Office of the State Archaeologist web portal.)

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.)

Figure 10. 1971 aerial photo displaying the continued development of the Crystal Airport. (University of Minnesota – Minnesota Historical Aerial Photographs Online clk-1-891.)

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).

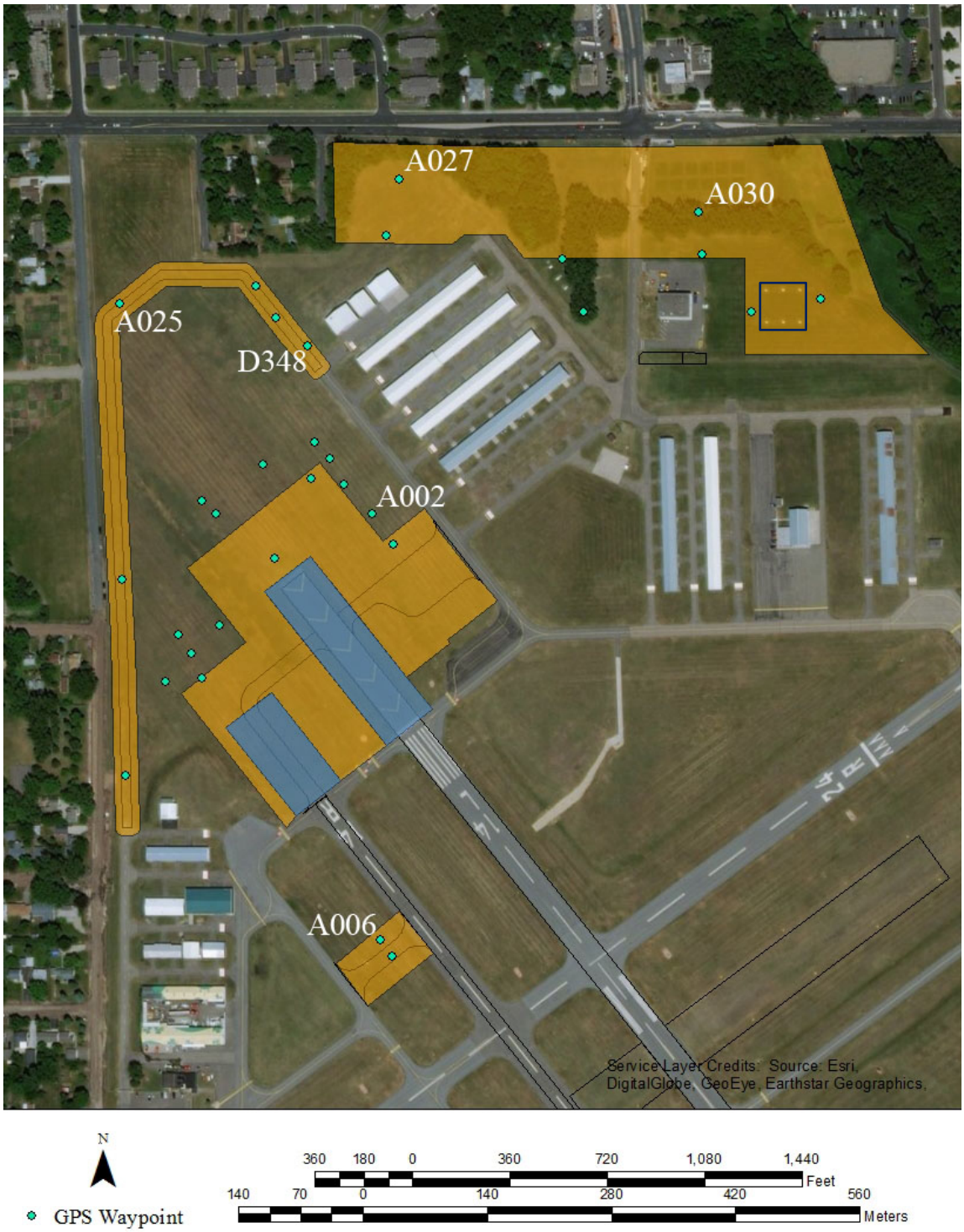

Figure 11. GPS waypoints for select shovel tests in the northern half of the airport. Labelled shovel tests are discussed specifically in the text. (Generated in ArcGIS.)

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 of 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.

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United States Department of Agriculture, Natural Resources Conservation Service
2018a Official Soil Series Descriptions. Electronic file, https://soilseries.sc.egov.usda.gov/, accessed 30 May 2018.
2018b Web Soil Survey. Electronic file, https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx, accessed 30 May 2018.

University of Minnesota
2015 Minnesota Historical Aerial Photographs Online. Electronic file, https://www.lib.umn.edu/apps/mhapo/, accessed 7 June 2018.

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.

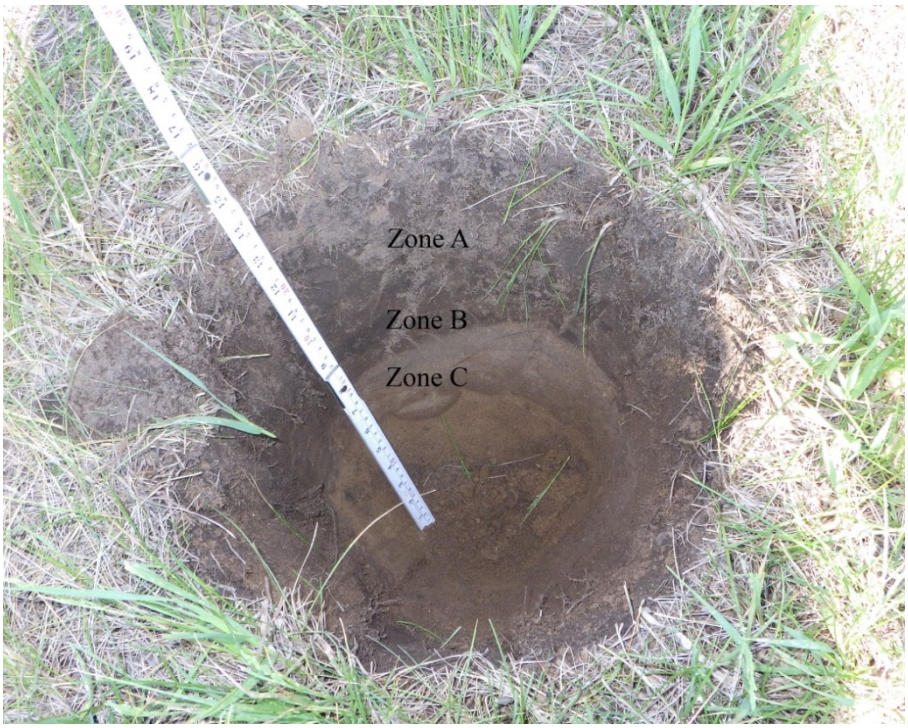


Figure 15. Shovel test at GPS waypoint A002 (Figure 11) in the northwest runway/taxiway reconfiguration, typical for this area of the project. Note the sharp boundary between upper Zones A (10YR 3/2) and B (10YR 2/2), disturbed, and Zone C (10YR 3/6). This particular hole contains a band of black fill (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.

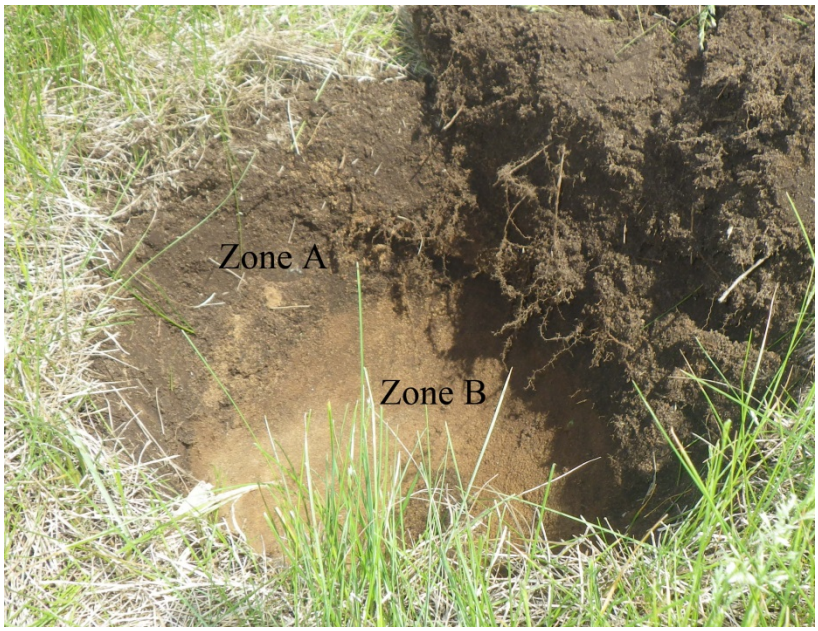


Figure 19. Shovel test A008 (Figure 12), with 15 cm of dark brown topsoil over a light brown subsoil, in the planned southeast new taxiway.


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.

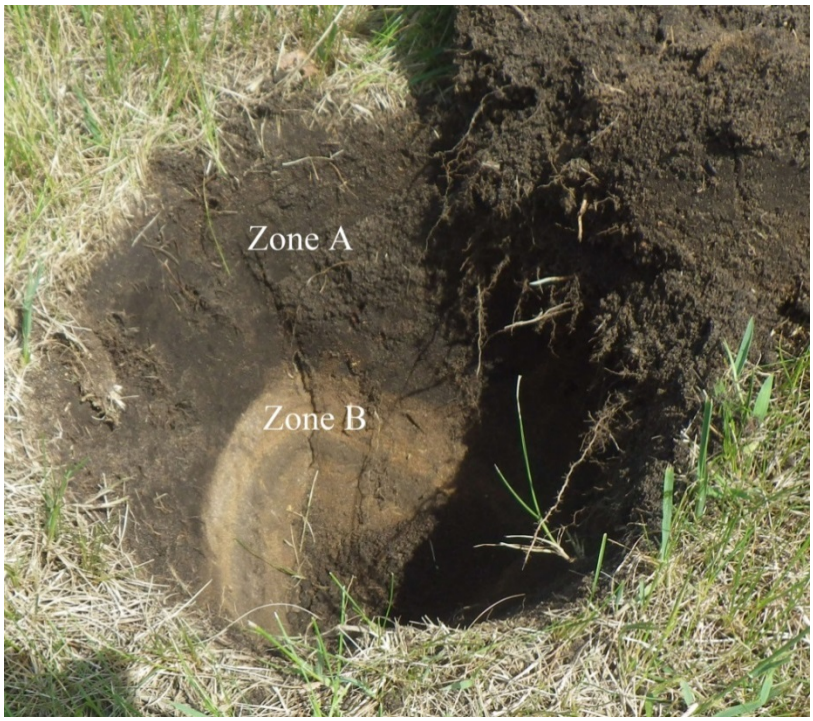


Figure 23. Disturbed soil, as indicated by a sharp boundary between Zones A (20 cm deep) and B and the mottling of the soil, in shovel test G007 (Figure 12) along the southeast perimeter road. A similar soil profile dominated throughout the footprint for the perimeter road.

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.

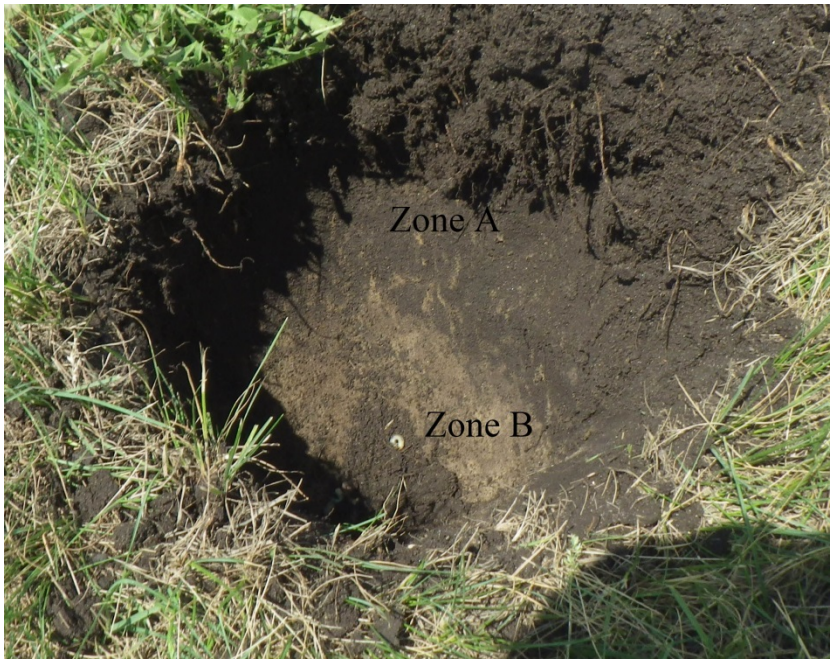


Figure 26. Shovel test at waypoint G015 (Figure 13) in the planned west perimeter road. The fairly abrupt though mottled boundary into greyish brown Zone B occurs at nearly 30 cm below the surface.

Figure 27. Shovel testing along the southern portion of the northwest perimeter road, as seen from the north.

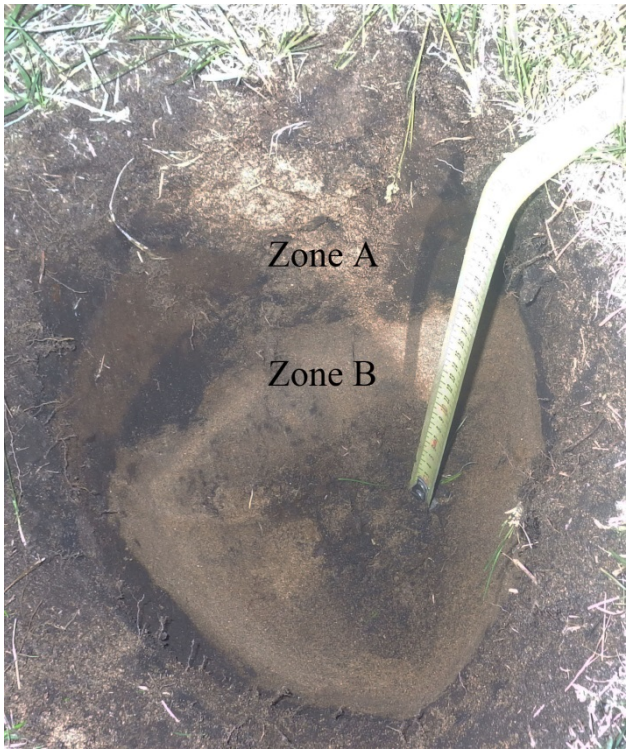


Figure 28. The soil encountered along the northwest perimeter road was mostly cut and fill, as shown in shovel test D348 (Figure 11). It contained shallow topsoil (Zone A, 10YR 3/1) with pieces of asphalt over sand (Zone B, 10YR 4/4).

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.

Appendix H – Runway Protection Zones Alternatives Analysis

U.S. Department
of Transportation
Federal Aviation Administration

Federal Aviation Administration
Dakota-Minnesota Airports District Office
Bismarck Office
2301 University Drive, Building 23B
Bismarck, ND 58504

Federal Aviation Administration
Dakota-Minnesota Airports District Office
Minneapolis Office
6020 28th Avenue South, Suite 102
Minneapolis, MN 55450

May 8, 2018

Mr. Neil Ralston, A.A.E., Airport Planner
Metropolitan Airports Commission
6040 28th Avenue South
Minneapolis, MN 55450

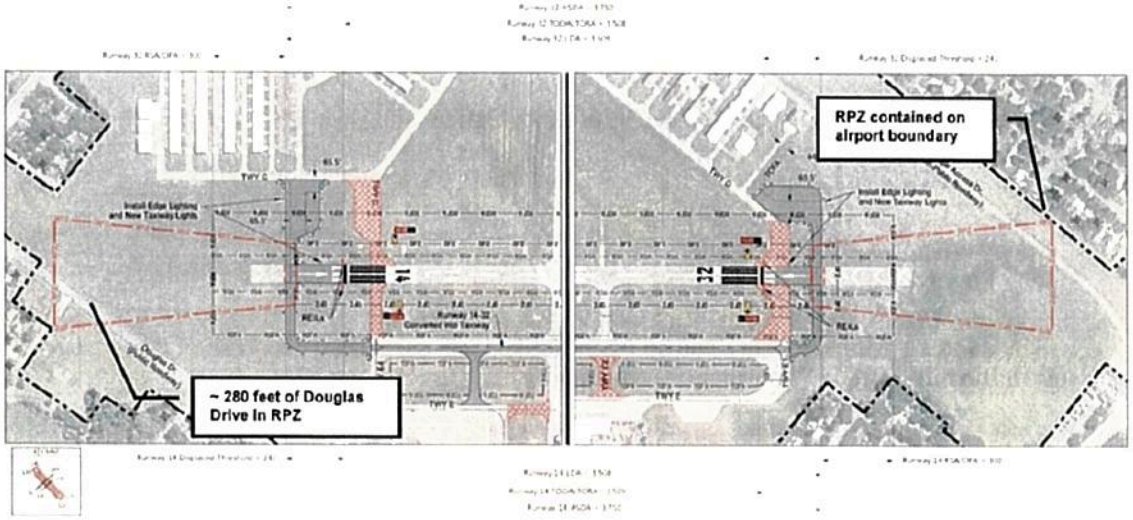
Crystal Airport (MIC) Runway Protection Zone Alternatives Analysis – Douglas Drive & Apron

Mr. Ralston:

The FAA concurs with the revised Crystal Airport Runway Protection Zone Alternatives Analysis (RPZ AA) requested by the Metropolitan Airports Commission (MAC).

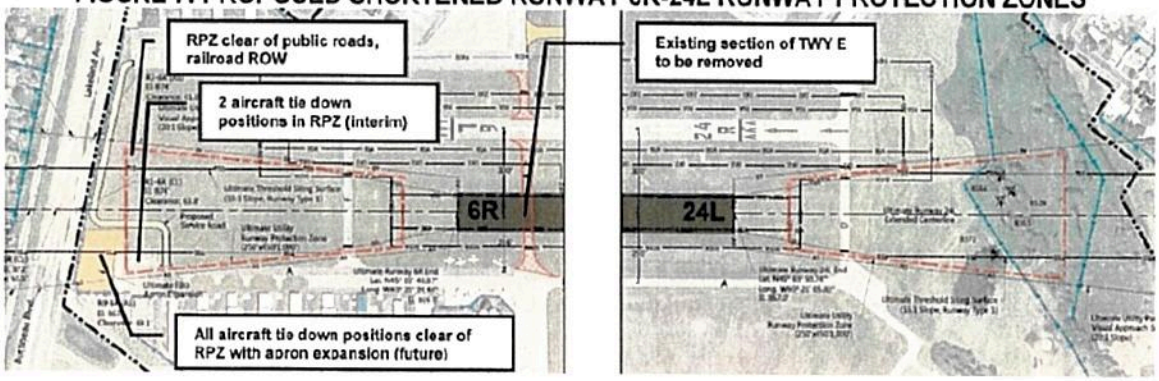
The previously preferred alternative was to convert 500 feet of existing blast pad/overrun pavement on both ends of Runway 14L/32R to stopways. Douglas Drive, a local road, is the Runway 14L RPZ. The current preferred alternative proposes modifications to Runway 14L/32R associated with converting portions of existing paved blast pads to usable runway, including shifting both landing thresholds approximately 115 feet to the northwest. The shift relocates the 32R RPZ entirely onto airport property. The Runway 14L RPZ will continue to be located entirely within airport property.

FIGURE 2: FINAL PREFERRED DEVELOPMENT ALTERNATIVE



Runway 6R/24L is proposed to be shortened to eliminate existing hot spots and remove incompatible land uses (i.e. Douglas Drive, CSAH 81/Bottineau Boulevard, BNSF railroad, and the Blue Line/Bottineau Transitway) from the RPZ. This modification will result in a portion of an existing apron containing three tiedowns to be temporarily located within the 6R RPZ until the apron is expanded and relocated outside of the RPZ.

FIGURE 7: PROPOSED SHORTENED RUNWAY 6R-24L RUNWAY PROTECTION ZONES



The sponsor evaluated alternatives to improve the safety and utility of the airport and mitigate nationally important Runway Incursion Mitigation (RIM) initiatives at MIC. FAA's concurrence of the proposed improvements to Runway 14L/32R is subject to MAC working with the City of Brooklyn Park to consider the installation of "Low Flying Aircraft/No Parking" signage on Douglas Drive at the edges of the RPZ as a mitigation strategy.

If you have any questions or would like to discuss this information further, please feel welcome to contact Gina Mitchell, Community Planner, at (612) 253-4641 or gina.mitchell@faa.gov.

Sincerely,

Andy Peek, Manager
Dakota-Minnesota Airports District Office, Minnesota Office

cc Mike Wilson, MAC, (by email)
Nancy Nistler, FAA (by email)
Josh Fitzpatrick, FAA (by email)
Rylan Juran, MnDOT Aeronautics (by email)
Dan Boerner, MnDOT Aeronautics (by email)
Bob Burrell, MnDOT Aeronautics (by email)

Metropolitan Airports Commission

Airport Development Department

Memo

DATE: **19 March 2018**

TO: **Gina Mitchell, ADO Community Planner**

FROM: **Neil Ralston, MAC Airport Planner**

SUBJECT: **Crystal Airport (MIC)**
Runway Protection Zone Alternatives Analysis (RPZ AA), Revision 2
Submittal for FAA Review

Request: The Metropolitan Airports Commission (MAC) has finalized a Long-Term Comprehensive Plan (LTCP) (i.e. 20-year master planning study) for Crystal Airport (MIC). The initial draft of the LTCP, issued for public review and comment in September 2016, proposed a project to convert approximately 500 feet of existing overrun pavement on both ends of ultimate primary Runway 14-32 (existing primary Runway 14L-32R) to stopways to improve the Accelerate-Stop Distance Available (ASDA).

A local road (Douglas Drive) currently encroaches into the existing Runway 14L RPZ. Considering the low volume of vehicle traffic on this road and the low probability of an aircraft landing on ultimate Runway 14 while a vehicle is traversing the RPZ, MAC sought FAA's approval to keep this section of Douglas Drive within the RPZ via an Alternatives Analysis (AA) document submitted on June 17, 2016. **Figure 1** depicts the layout of this configuration. A copy of the original RPZ Alternatives Analysis memo is included in **Attachment 1**.

FAA concurrence on the RPZ AA was received on July 27, 2016, subject to MAC working with the City of Brooklyn Park to consider the installation of "Low Flying Aircraft/No Parking" signage on Douglas Drive at the edges of the RPZ as a mitigation strategy. FAA's concurrence letter is reproduced in **Attachment 2**.

Based on comments and input received during the LTCP public comment period, MAC refined the preferred alternative to 1] increase the ultimate Runway 14-32 published runway length from 3,267 feet to approximately 3,750 feet in order to not only improve ASDA, but other takeoff and landing distances as well through the use of declared distances, and 2] shorten the existing turf Runway 6R-24L instead of decommissioning it as originally anticipated. The RPZ impacts associated with both of these alternative refinements will be addressed below.

Ultimate Primary Runway 14/32 Preferred Alternative Refinements

The final preferred alternative for ultimate Runway 14-32 involves converting portions of existing paved blast pads on each end to useable runway. The refined concept also proposes to shift the landing thresholds approximately 115 feet to the northwest in order to move the ultimate Runway 32 RPZ fully onto airport property. Based on the current threshold location, the existing Runway 32R RPZ extends beyond the airport boundary onto private residential property. As a result, the ultimate Runway 14 RPZ also shifts 115 feet to the north, but remains on airport property. However, the linear frontage of Douglas Drive within the RPZ increases from approximately 160 feet in the existing condition to approximately 280

feet in the refined alternative condition, an increase of approximately 120 feet. See **Figure 2** for a layout of this configuration, and **Attachment 3** for a copy of the approach plan and profile sheet for ultimate Runway 14-32 from the Draft ALP.

***Action Request #1*:** Based on the rationale as presented in the original RPZ AA (see **Attachment 1**), MAC is seeking FAA's approval to keep an extended section of Douglas Drive within the ultimate Runway 14 RPZ at Crystal Airport, subject to the mitigation strategy outlined in FAA's previous concurrence.

FIGURE 1: ORIGINAL PREFERRED DEVELOPMENT ALTERNATIVE (STOPWAY CONCEPT)

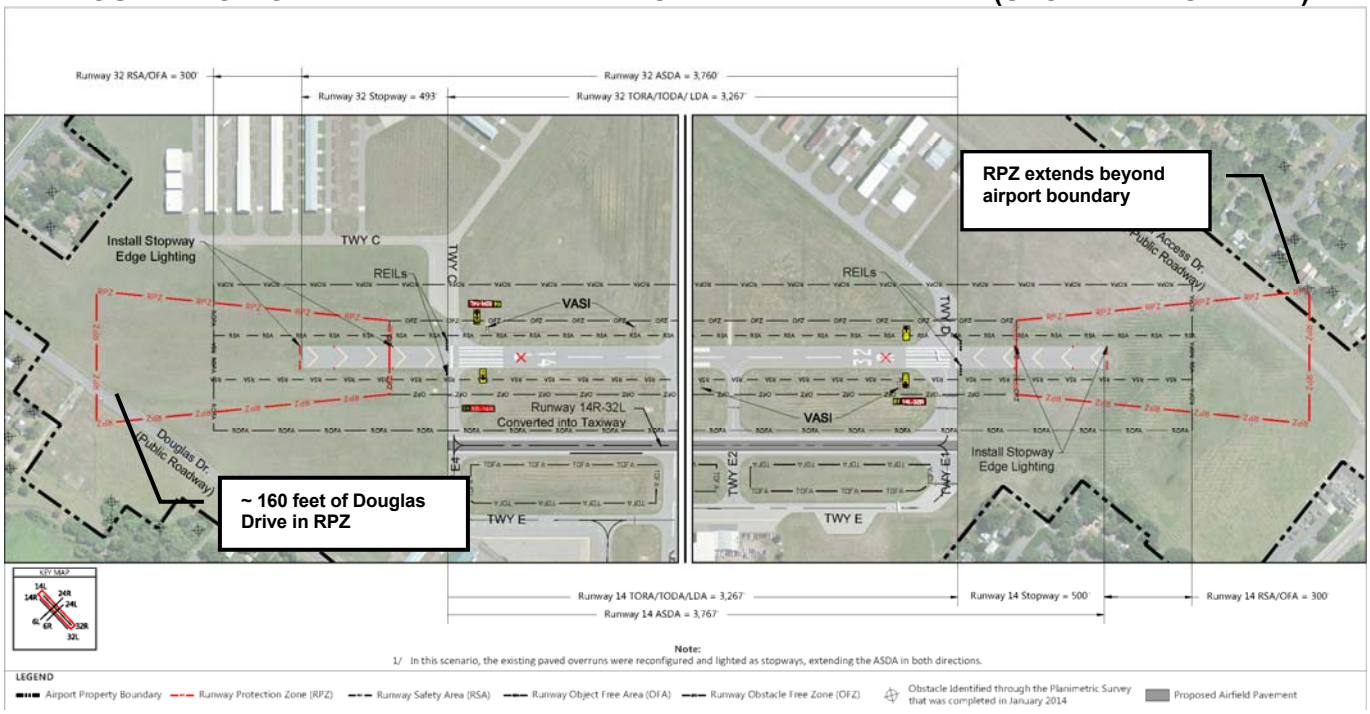
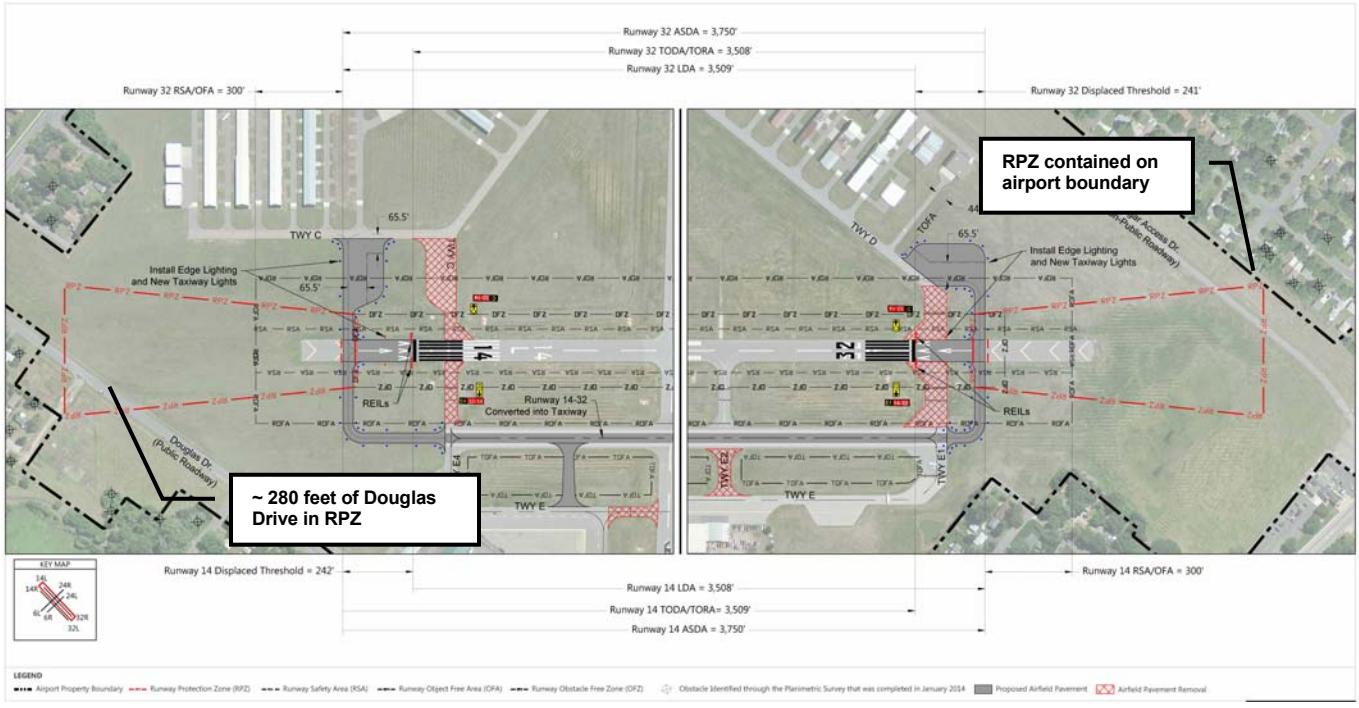


FIGURE 2: FINAL PREFERRED DEVELOPMENT ALTERNATIVE

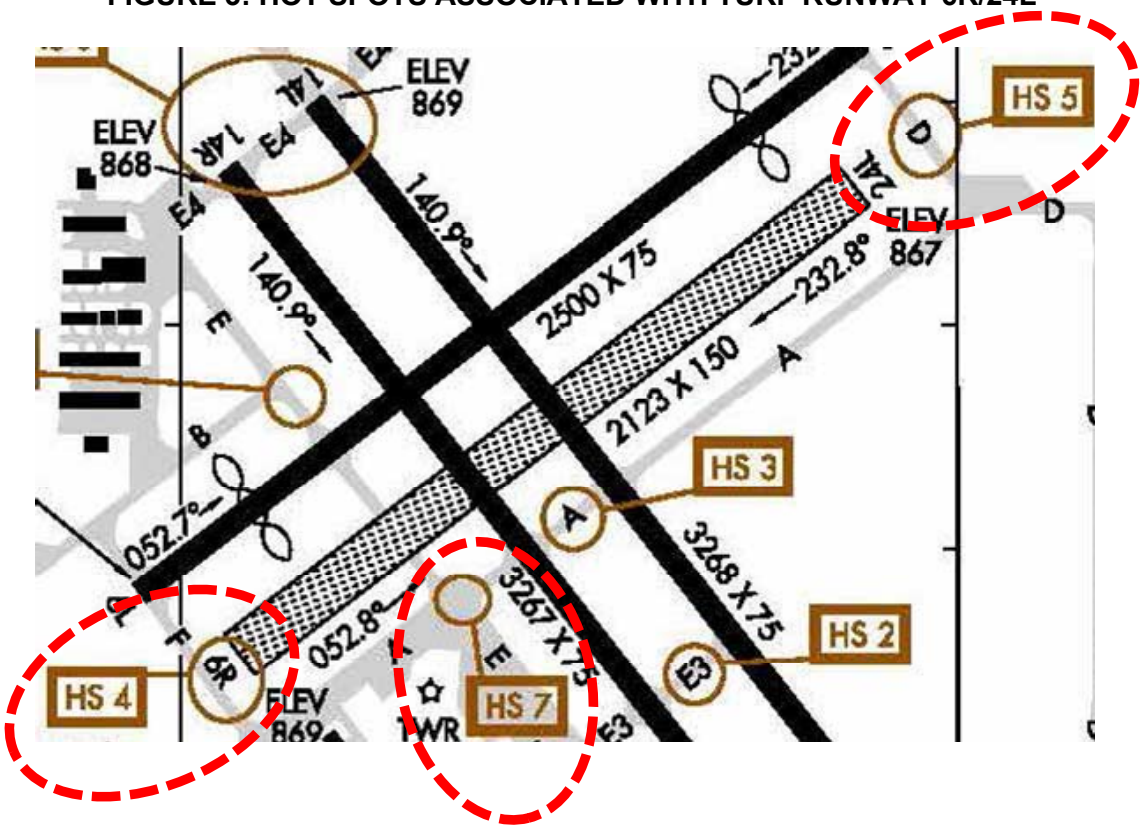


Ultimate Turf Runway 6R/24L Preferred Alternative Refinements

A key objective for airfield improvements at Crystal Airport is to simplify the airfield geometry by reducing the number of designated "hot spots" on the airfield, which represent the areas with the greatest potential for pilot confusion and incursion errors. This is consistent with a nationwide initiative by the Federal Aviation Administration (FAA) to reduce the number of runway incursions and increase airfield safety.

The initial draft of the LTCP, issued for public review and comment in September 2016, proposed to decommission turf Runway 6R-24L as one of several methods to reduce the number of hot spots. As shown in **Figure 3** below, three of the eight Hot Spots at MIC are associated with the turf runway (HS #4, #5, and #7).

FIGURE 3: HOT SPOTS ASSOCIATED WITH TURF RUNWAY 6R/24L

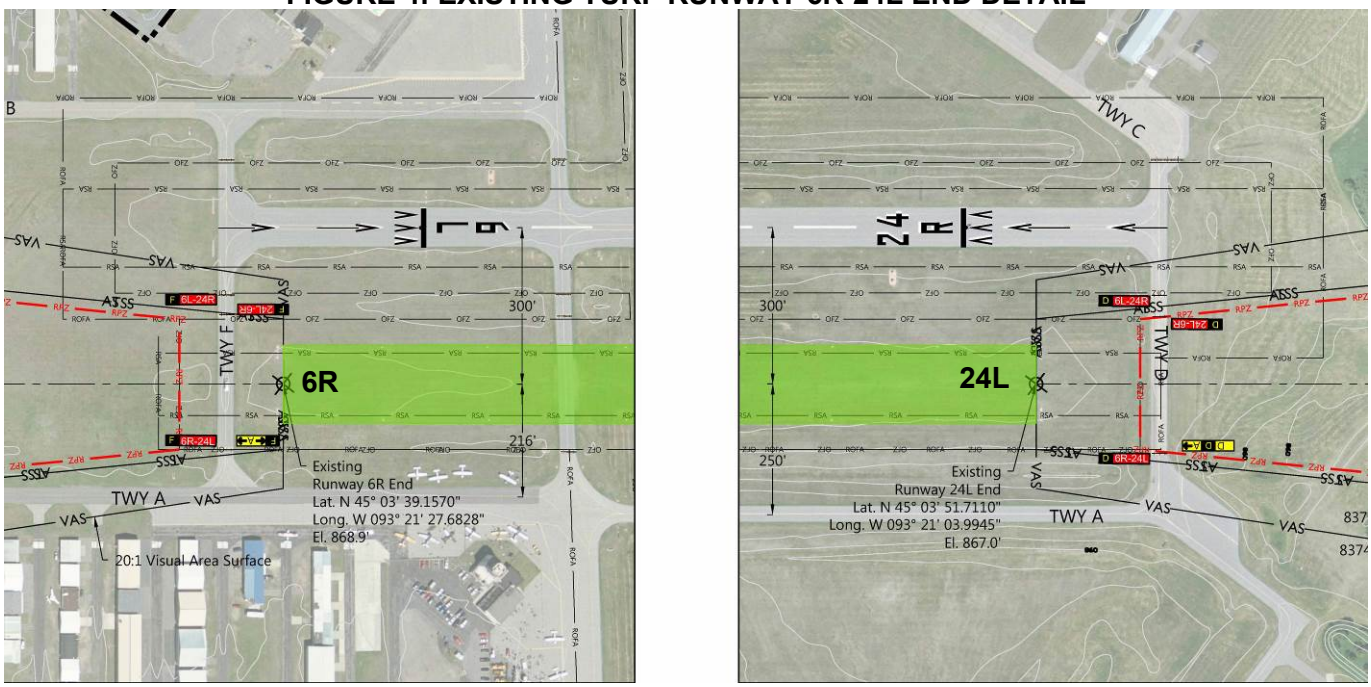


Existing turf Runway 6R-24L is 2,123 feet long and 137 feet wide. As the distance between the edges of Runway 6R-24L and adjacent paved crosswind Runway 6L-24R is less than 200 feet, simultaneous same direction VFR operations are not authorized[1]. The runway is not lit to accommodate night operations. The Runway Design Code (RDC) is A-I-Visual (small aircraft).

As illustrated in **Figure 4**, Taxiways F and D cross through the Runway Safety Area (RSA), Runway Object Free Area (ROFA), and Runway Obstacle Free Zone (ROFZ) of existing Runway 6R-24L. As such, ATCT controllers must hold aircraft and vehicles short of the turf runway (ROFZ) and issue clearance to cross ("mandatory hold"). This holds true even during the winter months when the turf runway is closed and results in a large volume of runway crossings.

[1] JO 7110.65W, Change 1, para. 3-8-3

FIGURE 4: EXISTING TURF RUNWAY 6R-24L END DETAIL



The shortened turf Runway 6R-24 concept proposes the following changes to the existing condition:

- Shift the Runway 6R end to begin 400 feet from the centerline of crossing Taxiway F and the Runway 24L end to begin 400 feet from the centerline of crossing Taxiway D[2]
    - These shifts result in a remaining runway length of 1,669 feet. The existing width will be retained.
    - Based on a review of typical aircraft performance manuals and user feedback, this runway length is adequate to accommodate the fleet mix expected to use the turf runway.
- Employ Threshold Siting Surface (TSS) Type #1 from Table 3-2 of AC 5300-13A, Draft Change 2.
    - This TSS is for the approach end of runways expected to serve small airplanes with approach speeds less than 50 knots (visual runways only, day/night).
    - Based on the known fleet mix of tail wheeled aircraft based at MIC, many existing turf runway operations are conducted by aircraft with an approach speed of less than 50 knots (e.g., Aviat A-1B/C Husky, Cessna 140, Aeronca 7AC Champ, and Piper J-3 Cub).
    - In addition, several models of Light Sport Aircraft (LSA) now on the market have approach speeds of less than 50 knots (e.g., Cessna 162 Skycatcher, and Pipistrel Alpha Trainer).
    - The number of aircraft operating on this runway with an approach speed of greater than 50 knots is not expected to reach 500 annually.
    - With an obstacle clearance slope of 15:1, the TSS will be at a height of approximately 27 feet at the crossing taxiway centerlines.
- Convert the existing "mandatory" runway hold short locations at crossing Taxiways F and D to "holding positions for runway approach area" locations ("approach holds")[3]. This is appropriate as these crossing taxiways will no longer penetrate the RSA, ROFA, or ROFZ.

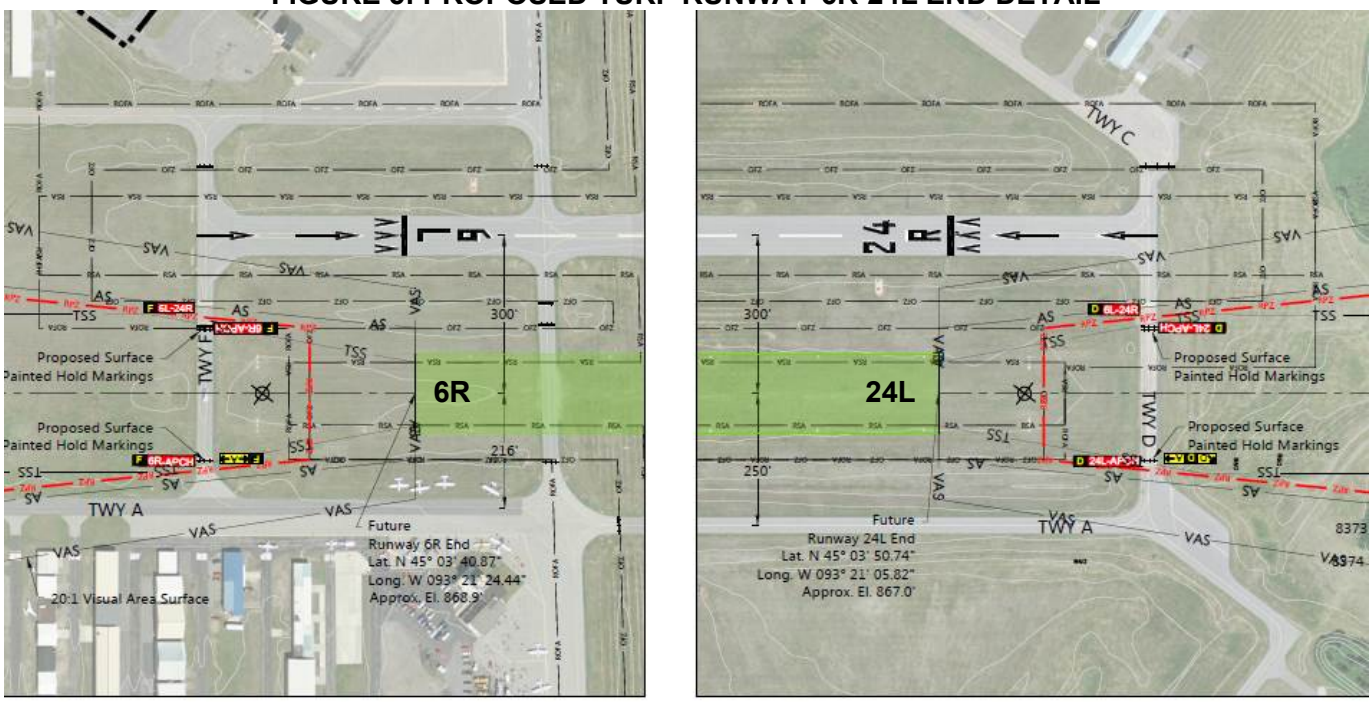
[2] Locations for turf runway access will be identified such that aircraft will not taxi through the approach area onto the runway from Taxiways D or F

[3] AC 150-5340-18F, Chapter 1 para. 5d; AC 150-5340-1L para. 3.3; AIM para. 2-3-5.3 and 2-3-8.2

- The primary operational benefit of employing “approach holds” is that ATCT controllers will only have to hold an aircraft short of the turf runway at crossing taxiways F and D when there is an arrival or departure operation on the turf runway. When no operations are occurring on the turf runway, aircraft are not required to hold short of it. Given the low volume of operations, the number of times that ATCT controllers have to hold an aircraft short of the turf runway will be infrequent. However, when a hold is needed, the appropriate hold short lines and signs will be in place. This will reduce ATCT controller workload and reduce the potential for pilot/vehicle operator confusion and incursions associated with runway hold short instructions at Hot Spots #4 and #5[4].
- The existing hold line locations are proposed to remain in place as they protect the volume of airspace associated with the Type 1 TSS.
- Issue a Form 5010 note and permanent NOTAM stating that the turf runway is closed to operations when the ATCT is closed.

This shortened turf runway concept is shown in **Figure 5**.

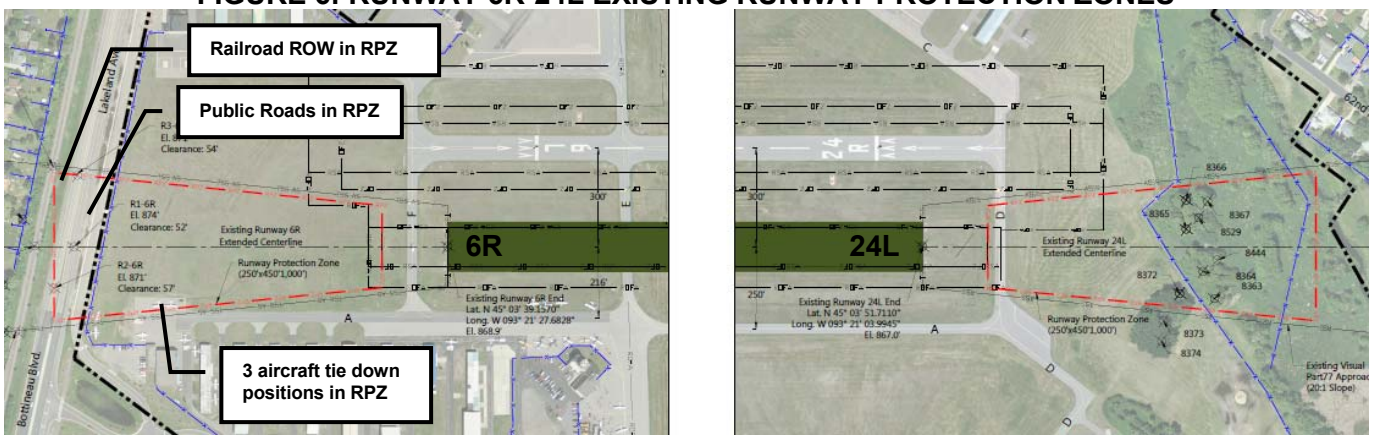
FIGURE 5: PROPOSED TURF RUNWAY 6R-24L END DETAIL



From a Runway Protection Zone (RPZ) perspective, in the existing condition the Runway 6R RPZ extends beyond the airport boundary onto two public roadways: Bottineau Boulevard/County Road 81, which accommodates an estimated 26,500 average daily vehicles, and its frontage road, Lakeland Avenue. The corner of the RPZ also extends into the railroad right-of-way adjacent to Bottineau Boulevard (approximately 0.1 acres). The existing Runway 6R RPZ also encompasses three aircraft parking/tie-down positions on the Fixed Base Operator (FBO) apron. The Runway 24L RPZ in contained on airport property and encompasses compatible land uses. The existing RPZ condition is shown in **Figure 6**.

[4] Hot Spot #7 will also be addressed by removing the section of existing TWY E that crosses the turf runway. See Figure 7.

FIGURE 6: RUNWAY 6R-24L EXISTING RUNWAY PROTECTION ZONES

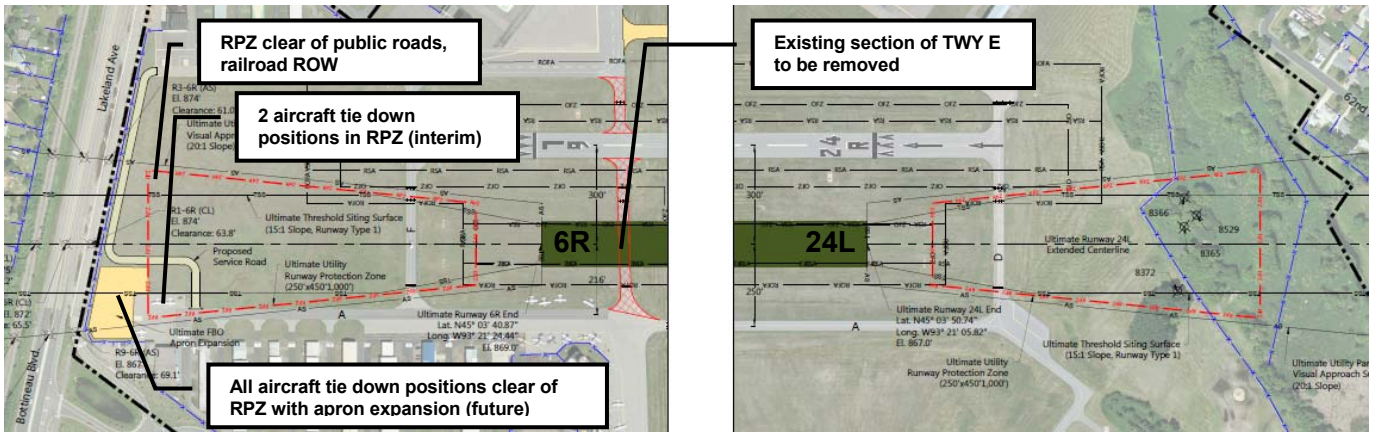


The proposed shortened turf runway concept improves RPZ land use compatibility in the following ways:

- Shifts the Runway 6R RPZ fully onto airport property.
- Removes Bottineau Boulevard, Lakeland Avenue, and the railroad right of way from the Runway 6R RPZ.
- Removes one of the three existing aircraft parking/tie-down locations from the FBO apron from the Runway 6R RPZ. This represents an interim condition until an expansion of the FBO apron is constructed. When the expansion is constructed, all three existing parking/tie-down locations will be converted into taxilane pavement providing access to a new parking/tie-down area that is fully removed from the Runway 6R RPZ. The timing for the FBO apron expansion is currently unknown, but it is feasible that it could occur within a five-year time period.
- A new service road is proposed between Taxiway A and B that will reduce the number of vehicles crossing Runways 6L-24R and 6R-24L.
- The Runway 24L RPZ continues to remain on airport property and encompass compatible land uses.

Figure 7 illustrates the RPZ condition associated with the proposed shortened turf runway concept.

FIGURE 7: PROPOSED SHORTENED RUNWAY 6R-24L RUNWAY PROTECTION ZONES



For further reference, the approach plan and profile sheet from the Draft ALP set for the proposed turf Runway 6R-24L concept is included as **Attachment 4**.

Action Request #2: MAC is requesting FAA concurrence of the proposed turf Runway 6R-24L RPZ condition for the following reasons:

- Crystal has been identified as a RIM priority airport. Approving the land uses within the proposed condition RPZ will advance completion of the ALP and EA/EAW, which are necessary steps to develop a comprehensive project to mitigate nationally important RIM initiatives at MIC.
- The concept is designed to significantly reduce the number of instances where hold short instructions will have to be issued for aircraft and vehicles crossing the ends of the turf runway on Taxiways F and D. This will reduce ATCT controller workload and reduce the potential for pilot/vehicle operator confusion and incursions associated with runway hold short instructions at Hot Spots #4 and #5.
- Retains turf runway operational capabilities at MIC – the last turf runway in the Twin Cities Metropolitan Area System.
- The proposed concept to shorten turf Runway 6R-24L improves upon existing RPZ land use compatibility by shifting the Runway 6R RPZ fully onto airport property and removing both Bottineau Boulevard (26,500 average daily vehicles) and Lakeland Avenue from it.
- In the interim condition with the existing FBO apron, the proposed concept reduces the number of aircraft parking/tie-down positions in the RPZ from three to two. In the ultimate condition with an expanded FBO apron in place, all three existing aircraft parking/tie-down positions will be removed from the RPZ.

We look forward to receiving FAA's written determination on these two action request items. If you have any questions or would like to discuss this information further, please contact me at (612) 726-8129 or neil.ralston@mspmac.org.

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ATTACHMENT 1: ORIGINAL RPZ ALTERNATIVES ANALYSIS MEMO (JUNE 17, 2016)

Metropolitan Airports Commission

Airport Development Department

Memo

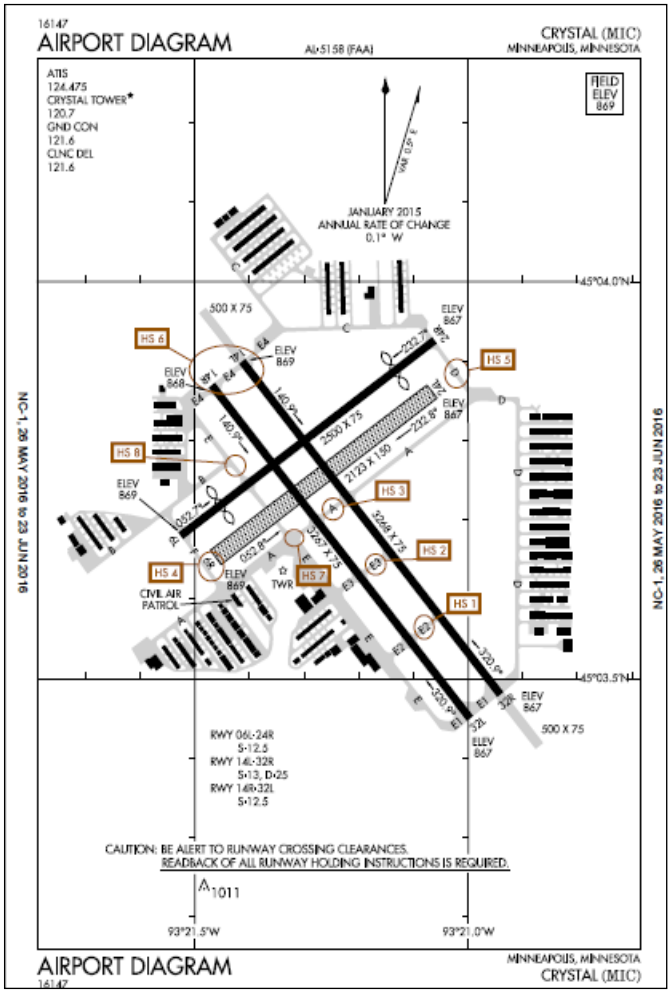
DATE: **17 June 2016**

TO: **Gina Mitchell, ADO Community Planner**

FROM: **Neil Ralston, MAC Airport Planner**

SUBJECT: **Crystal Airport (MIC)**
Runway Protection Zone Alternatives Analysis (RPZ AA)
Submittal for FAA Review

Request: The Metropolitan Airports Commission (MAC) staff is preparing a Long-Term Comprehensive Plan (LTCP) (i.e. 20-year master planning study) for Crystal Airport (MIC) and is proposing a project to convert 500 feet of existing overrun pavement on both ends of Runway 14L/32R (the primary runway) to stopways. This will improve the Accelerate-Stop Distance Available (ASDA). The ADO has determined that the conversion of the overrun pavement to a stopway constitutes an "airfield project" thereby triggering a review of land use compatibility within the RPZ. A local road (Douglas Drive) currently encroaches into the Runway 14L RPZ.



Considering the low volume of vehicle traffic on this road (as documented further below) and the low probability of an aircraft landing on Runway 14L while a vehicle is traversing the RPZ, MAC is seeking FAA's approval to keep this section of Douglas Drive within the RPZ.

Background Information: MIC is one of six reliever airports owned and operated by MAC. It has three paved runways and one turf runway as illustrated on the adjacent airport diagram. It is also served by an Airport Traffic Control Tower (ATCT). MIC has historically had a high number of runway incursions and has been identified as a high priority airport within FAA's Runway Incursion Mitigation (RIM) program.

The previous LTCP, completed in 2008, recommended that runways 14R/32L and 6R/24L be decommissioned in order to better align the size and complexity of the airfield with existing and projected air traffic demand levels. Due to community pressure about land use compatibility within the built up urban area around the airport, MAC has also studied the feasibility of closing the airport. It has been determined that MIC serves an important role in the regional and state airport systems and that its closure is not a viable option.

The Draft 2035 LTCP underway identifies existing and forecasted aircraft operations to remain steady at approximately 40,000 throughout the 20-year planning horizon. The Draft 2035 LTCP carries forward the 2008 vision for closure of runways 14R/32L and 6R/24L, as well as converting 14R/32L into a full-length parallel taxiway. An area of emphasis in the plan is to evaluate airfield modifications to eliminate or minimize all runway incursions at the airport, but particularly at Hot Spot #6 which is identified in the RIM program. Most of the incursions are a result of the close spacing between the runways and confusion over hold instructions (see **Attachment 1**).

It is anticipated that converting 14R/32L into a parallel taxiway would also reduce the potential for runway incursions at Hot Spots #1, #2, and #3, because the short taxi distance and related hold problems between the runways would be eliminated. It is anticipated that closing turf Runway 6R/24L would reduce the potential for runway incursions at Hot Spots #4, #5, and #7 as a result of eliminating related runway crossings.

Concurrently, a project is underway in CY 2016 to remove TERPs 20:1 visual area surface penetrations at the airport. By the end of CY 2016, all known 20:1 visual area surface penetrations to Runways 14L/32R and 6L/24R are expected to be mitigated.

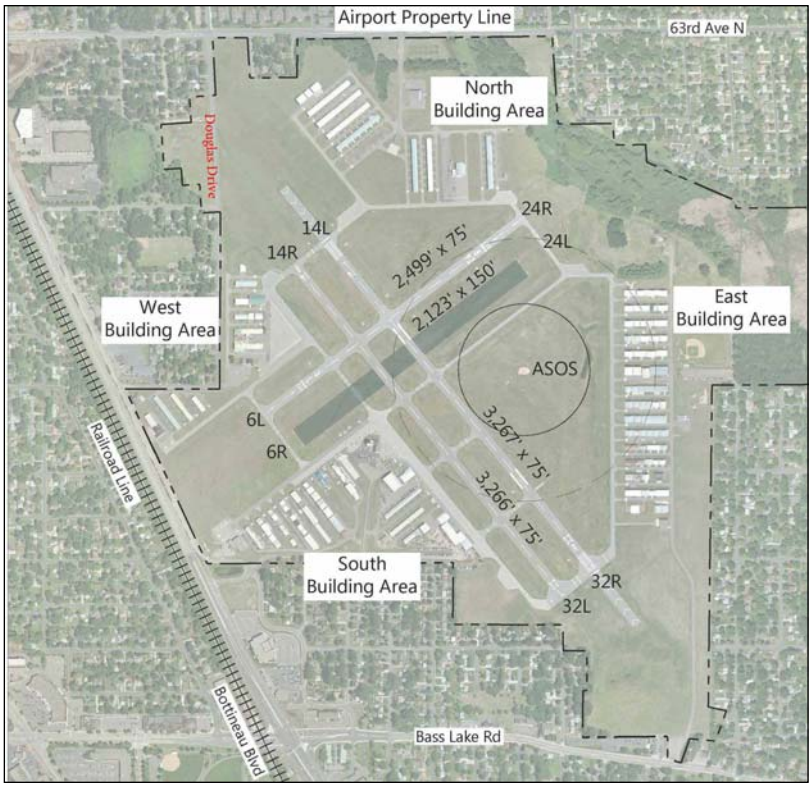
Runway 14L/32R is 3,267 feet long and has one mile approach minimums (Runway 14L end). The airport primarily serves small (B-II) propeller driven aircraft with fewer than 10 passenger seats. The 2008 LTCP and the existing Airport Facility Directory (AFD) publish the Runway 14L/32R certified pavement strength as greater than 12,500 pounds (i.e. 13,000 pounds single-wheel and 25,000 pounds dual-wheel). To improve land use compatibility, however, the Draft 2035 LTCP proposes to update Runway 14L/32R's published maximum takeoff weight as 12,500 pounds or less (Utility Runway designation). As a result, Runway 14L/32R's RPZ size would be 250 feet x 450 feet x 1,000 feet (B-II small aircraft, not lower than 1 mile visibility minimums).

The Draft 2035 LTCP reviewed the FAA's Runway Length Advisory Circular (AC) and identified that an appropriate runway length would be 3,300 feet to accommodate 95% of the fleet or 3,900 feet for 100% of the fleet at maximum payload. Based on existing and projected user needs, the plan recommends enhancing the overall utility of the airport by activing the existing 500-foot paved overruns at each end of Runway 14L/32R as stopways. By activating the stopways, the published runway length to accommodate ASDA requirements would increase to 3,767 feet. Activating the stopways would not change the takeoff run available (TORA), takeoff distance available (TODA), or the landing distance available (LDA). This is appropriate, given that ASDA typically represents the most demanding runway length for the design aircraft family. In addition, it was determined that the improvements needed to increase the TORA, TODA, and LDA would reduce the airport's overall compatibility with adjacent land uses. Activating the stopways would not change the RPZ locations relative to the existing runway thresholds.

The following improvements are needed to activate the stopways as proposed:

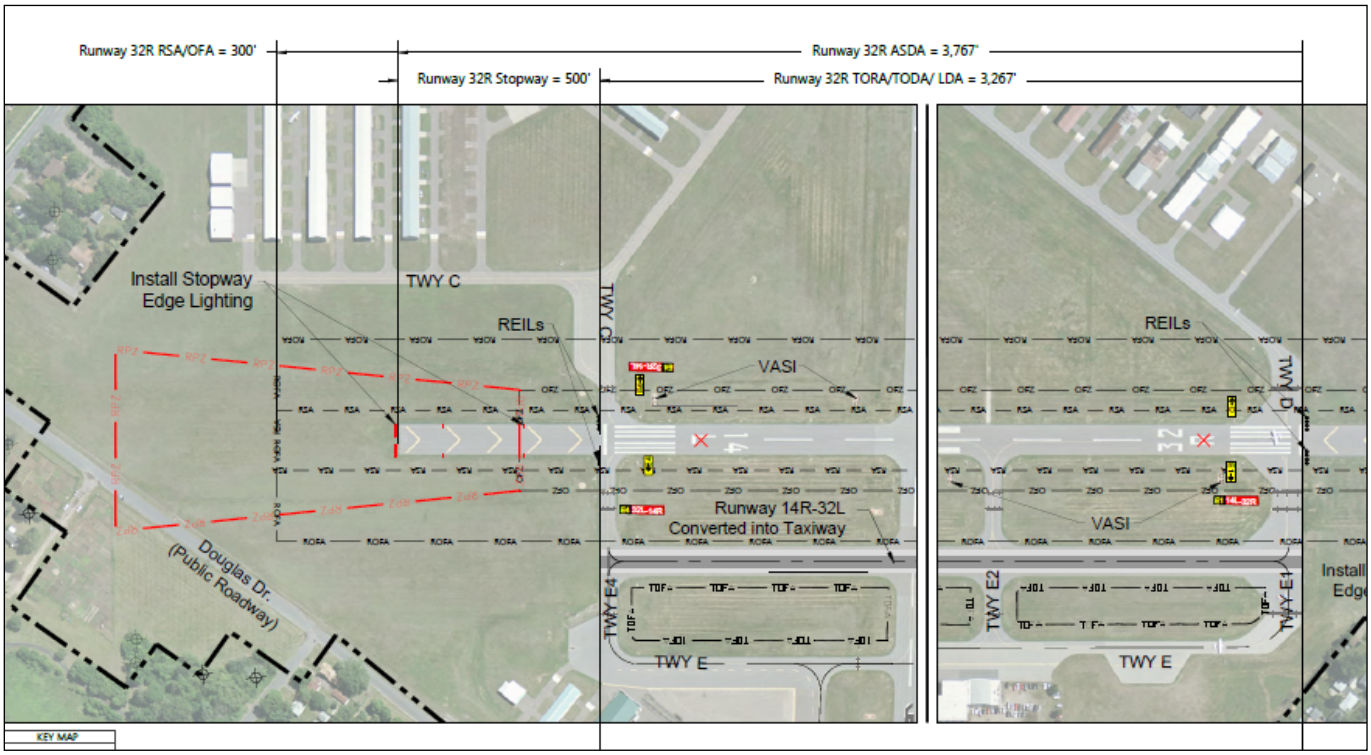
- Relocate existing runway threshold lights in-pavement or outboard
- Install stopway lighting (red) per AC 150/5340-30H, *Design and Installation Details for Airport Visual Aids*
- Complete Runway Safety Area (RSA) grading off stopway ends
- The estimated cost for these airfield improvements at MIC is approximately $200,000

The proposed improvements are shown on **Attachment 2**.



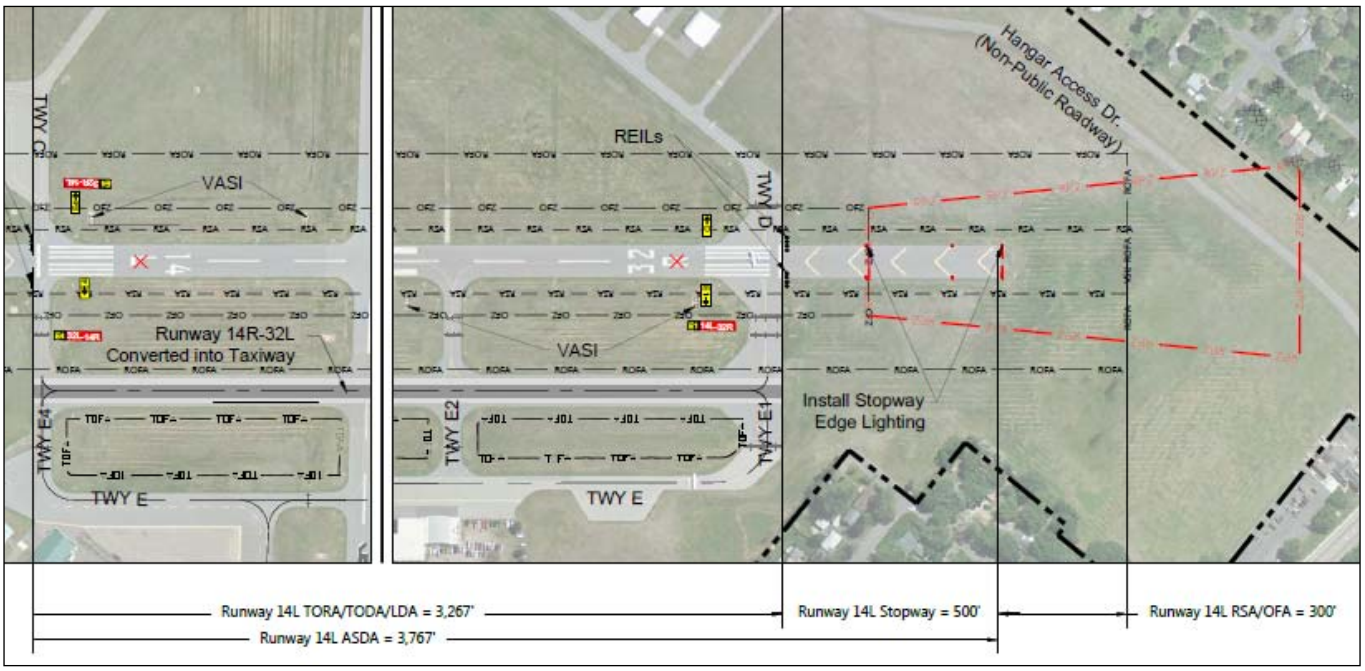
Reducing the RPZ size by reverting to a Utility Runway designation improves land use compatibility. It does not, however, eliminate all incompatible land uses within the RPZs, as further explained below.

Runway 14L RPZ: Douglas Drive is designated as a local road that provides access to the airport and adjacent residential development. By definition, a local roadway serves less than 1,000 vehicles per day. Although no recent traffic study is known to exist for this section of Douglas Drive, vehicle counts taken on other local roadways in the vicinity of the Airport suggest average daily traffic levels in the range of 300 – 500 vehicles. Douglas Drive bisects the outer corner of the RPZ. Relocating Douglas Drive is not feasible due to the existing urban development pattern and adjacent transportation corridors located immediately west of the airport, including Bottineau Boulevard (4-lane arterial roadway), Lakeland Avenue (local frontage road), a freight rail line, and the planned Bottineau/Blue Line Extension Light Rail Transit (LRT)[1]. There are no current plans to increase the capacity of this roadway.



[1] The planned Bottineau Light Rail Transit Line received RPZ AA approval for its location within the Runway 6L and 6R RPZs in 2014

Runway 32R RPZ: The only on-airport land use within this RPZ is an access-controlled hangar access driveway. This driveway only serves airport tenants and is not a public roadway. The small RPZ conforms to FAA RPZ guidance and is owned almost in its entirety by the airport. The small corner of the RPZ that extends beyond the airport boundary does not contain any structures.



In summary, MAC's rationale for not realigning Douglas Drive outside of the RPZ is as follows:

- Crystal has been identified as a RIM priority airport. Approving the existing land uses within the RPZ will advance completion of the 2035 LTCP. This is the necessary first step to proceed into an Environmental Assessment and then develop a project to convert Runway 14R/32L to a parallel taxiway, decommission turf Runway 6R/24L, and mitigate nationally important RIM initiatives at MIC.

- Changing to a Utility runway designation and publishing a maximum pavement strength of 12,500 pounds does not impact users operating at the airport on a regular basis or the airport's role in the regional or state aviation network. The reduction allows a smaller RPZ and minimizes incompatible land uses from the existing condition. This change improves the safety of people and property on the ground.

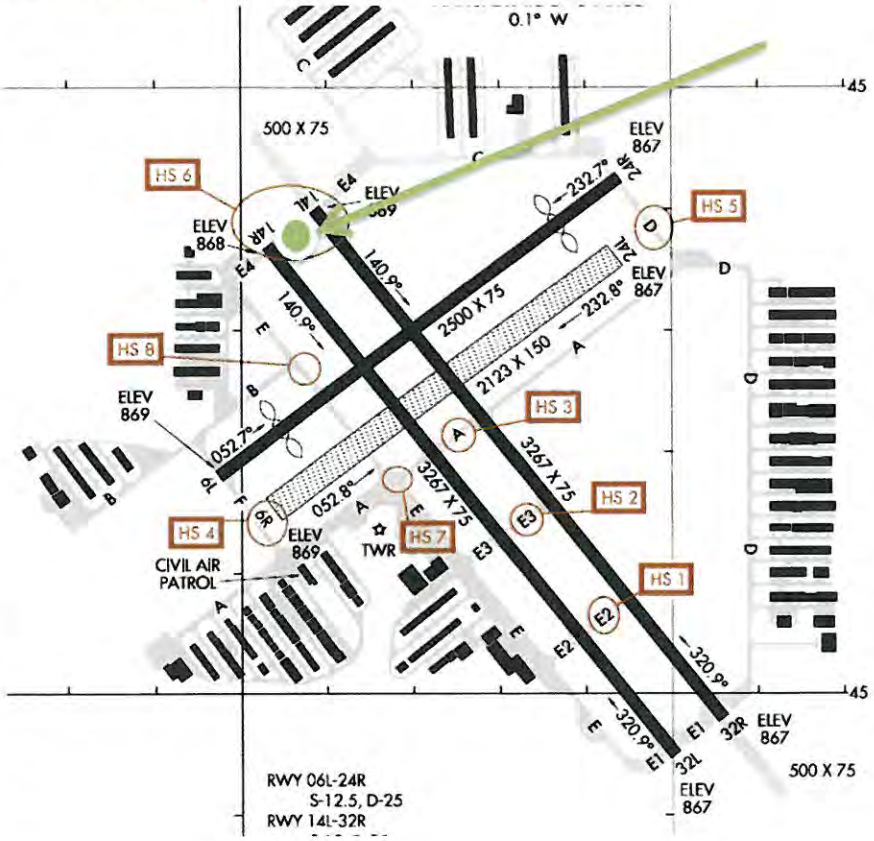
- Douglas Drive is a low volume, local roadway. There is a low risk of an airplane accident within the outer edge of the RPZ where the road is located, when a vehicle is present. Realignment of the road outside of the RPZ is not viable given the location of existing residential development and adjacent transportation corridors immediately west of the airport, including Bottineau Boulevard, Lakeland Avenue, a freight rail line, and the planned Bottineau Light Rail Transit Line. MAC is willing to consider the installation of "Low Flying Aircraft/No Parking" signage on Douglas Drive at the edges of the RPZ as a mitigating strategy, but this will require coordination with and approval from the municipality with roadway jurisdiction (City of Brooklyn Park).

We look forward to receiving FAA's written determination on this matter. If you have any questions or would like to discuss this information further, please contact me at (612) 726-8129 or neil.ralston@mspmac.org.

CRYSTAL AIRPORT (MIC) RIM PROGRAM – TAXIWAY E4 (MIC – HS6)

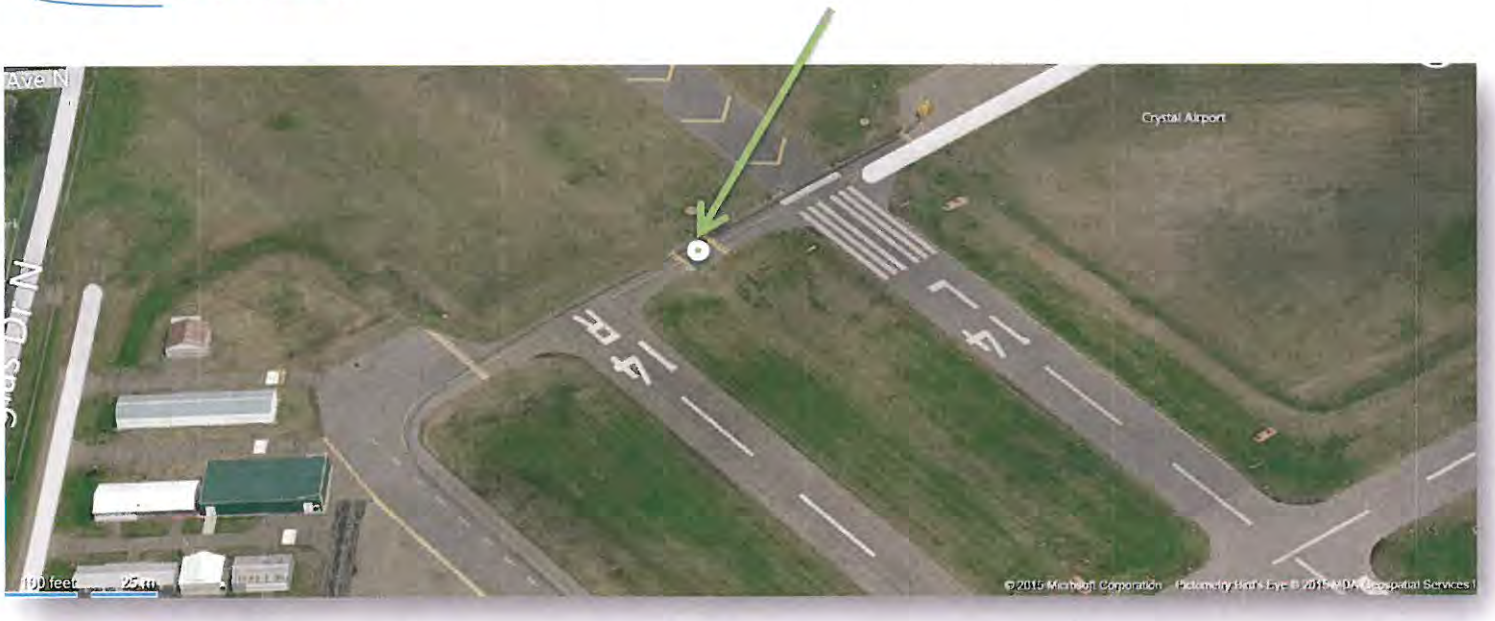
DOCUMENTED RUNWAY INCURSIONS

1. Local Control (LC) observed an unidentified private vehicle driving on Taxiway Echo without an ATC clearance or communications. The vehicle crossed Runway 32R on Taxiway Echo-4 northeast bound. Runway 32R was active at the time of the event. No conflicts. (08/30/2013)
2. Local Control (LC) observed an unidentified private vehicle driving on Taxiway Echo without an ATC clearance or communications. The vehicle then crossed Runway 32L on Taxiway Echo-4 northeast bound at Hot Spot 6. No conflicts reported. (08/30/2013)
3. BE9L received taxi instructions, Runway 14R, via Alpha and Echo, cross Runways 6L and 6R. The BE9L incorrectly read back Runway 14L. GC corrected the pilot and verified he was going to Runway 14R, re-issuing the detailed taxi instructions. The BE9L correctly read back the instructions and runway assignment. Subsequently, the BE9L was observed crossing Runway 14R at the approach end (Echo 4). GC instructed the BE9L to STOP, and the aircraft stopped short of the Hold Lines for Runway 14L on Echo 4. No reported conflict. Area is identified as a Hot Spot. (03/30/2012)
4. PA28A, operated by a student pilot, had been in the pattern doing full stop taxi backs. After the second landing the PA28 called Ground at Taxiway Echo 3 to taxi back to Runway 14R. The controller issued instructions to taxi to Runway 14R via Taxiway Echo, crossing Runways 6R and 6L. The read back was correct. PA28 proceeded across the hold short lines and on to Runway 14R at Taxiway Echo without a clearance. No other vehicles or aircraft were involved so there were no conflicts reported. This even occurred in an area identified as a hot spot. (12/28/2011)
5. A Cessna C172 crossed the hold short line at approach end for Runway 14R without clearance. Local (LC) instructed the pilot to hold position. No conflicts reported. Pilot stated being distracted by a fox near the runway and in error crossed the hold lines. (06/10/2011)
6. A Piper AEST was taxied via Taxiway Echo to Runway 14R which pilot read back. The AEST completed a run-up then entered Runway 14R at approach end without clearance. No conflicts reported. (05/10/2011)
7. A Piper P28A was assigned Runway 14R with instructions to hold short of Runway 14L which was read back correctly the second time. The P28A crossed the hold lines for Runway 14L at approach end without clearance. No conflicts reported. (01/02/2011)
8. A Cessna C172 was issued Runway 14R via Echo for departure and read back Runway 14L. ATCT corrected the pilot and ask to verify they received Runway 14R. The pilot read back Runway 14R. Subsequently the C172 crossed Runway 14R at approach end without clearance. No conflicts



reported. (11/06/2010)

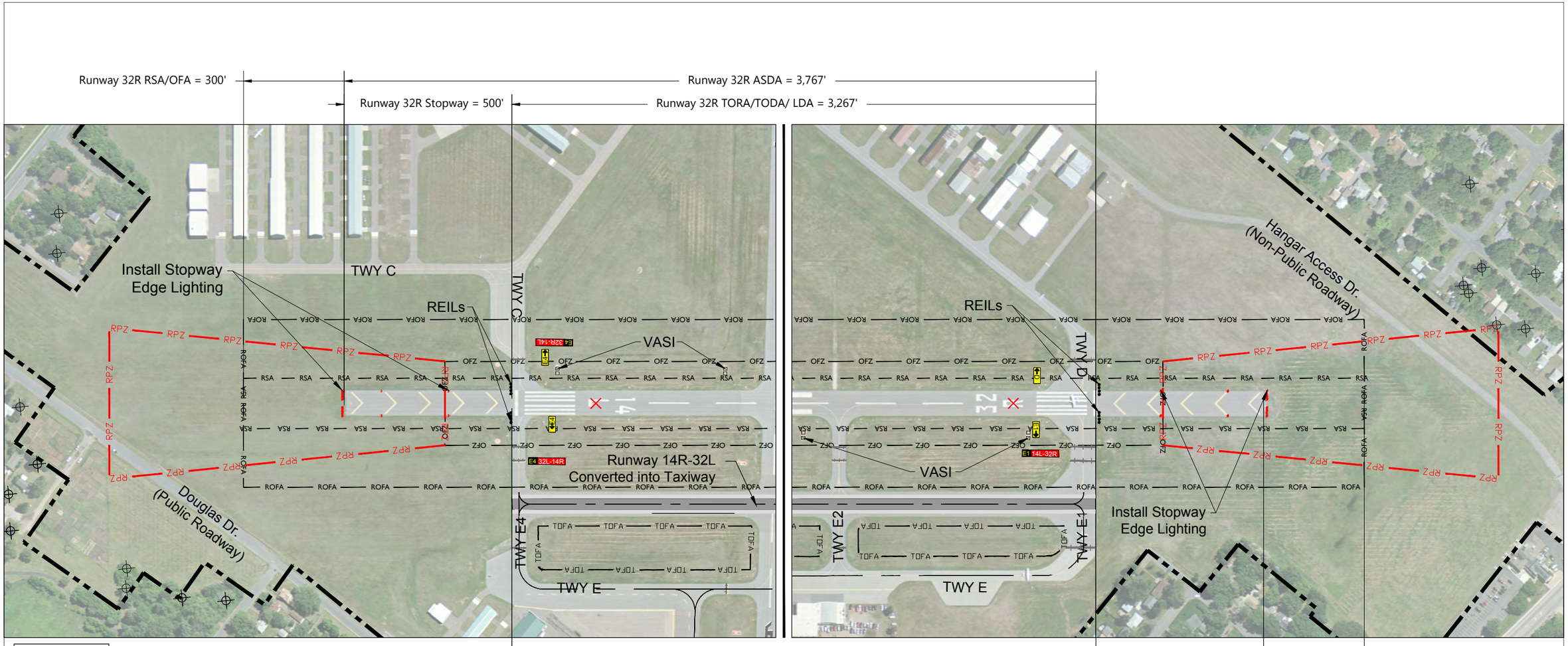
9. An airport taxi crossed Runway 32R (closed for construction) and then Runway 32L at Taxiway E4 (departure end) without authorization. A Piper PA32 was approximately one half (.50) mile final Runway 32L when issued a go around. The vehicle dropped off a passenger on the Shamrock FBO ramp then reversed direction and crossed Runway 32L/R at E 4 onto Taxiway Charlie. The vehicle was intercepted by an airport vehicle near the approach end of Runway 24R at Charlie. In addition, the pedestrian crossed the departure end of Runway 24R without authorization and was also intercepted. (08/01/2008)
10. A Beech BE58 was issued Runway 14R and instructed to cross Runway 6R/L. The pilot read back the instructions to include runway assignment. The BE58 made a right turn from Echo onto Echo 4 and appeared to not be slowing down to hold short of Runway 14R when Ground (GC) instructed the pilot to stop. The BE58 did stop but with tail of aircraft over the hold short line on Echo 4. No conflicts reported. (08/22/2010)
11. Piper PA34 was issued Runway 14R and asked to verify they had ATIS Foxtrot and that they were taxiing to Runway 14R. The pilot responded ?going to 14R and listening to Foxtrot right now?. The PA34 completed run-up in 14R run-up area then crossed Runway 14R without clearance and called ready at Runway 14L. No conflicts reported. (08/19/2010)
12. A POV (Ford F150) was observed by Ground (GC) entering Taxiway Charlie from a non-movement area without authorization. The vehicle proceeded south on Charlie and crossed Runway 14L/R on Echo 4 and entered the non-movement east of Shamrock Aviation. The vehicle then drove south onto Bravo, turned west and crossed Runway 6L/R on Foxtrot, west on Alpha and stopped at Thunderbird Aviation where it was intercepted by a fuel truck driver. No conflicts reported. (08/16/2010)
13. A Cessna C172 taxied from north ramp to Runway 14R via Charlie, E4, and to hold short of Runway 14R. Subsequently the C172 was instructed to cross Runway 14L at E4 and hold short of Runway 14R. The C172 pilot acknowledged then stopped at the Runway 14L hold lines on west side instead of Runway 14R hold lines thus conflicting with N99607, C172, on final Runway 14L. LC issued the C172 a go around but due to a stuck mike from unknown aircraft the C172 could not receive and landed on Runway 14L. The C172 on E4 was clear of the runway stopping approximately 85 feet from Runway 14L runway edge (hold line to runway edge is 95 feet). (08/22/2009)



CITY/AIRPORT	HOT SPOT	DESCRIPTION
TOPEKA		
FORBES FLD (FOE)	HS 1	Southbound tfc on Twy A must remain alert so as to not miss the right turn on Twy A when taxiing to Rwy 03. Twy D continues to an intersection with Rwy 03. Twy A turns to the southwest.
	HS 2	Use caution Twy A becomes Twy E just past access to the apch end of Rwy 03. Twy A turns left, Twy E continues southwest bound to the KS ANG ramp.
	HS 3	Twy E is not visible from the ATCT. Twy E also accesses KS ANG ramp and is not maintained by the Airport Authority.
TOPEKA		
PHILIP BILLARD MUNI (TOP)	HS 1	Twy A and Twy D intersect inside of the Runway Safety Area for Rwy 04–22. Twy A intersects Rwy 04–22 at two different locations.
WICHITA		
WICHITA DWIGHT D EISENHOWER NATIONAL (ICT)	HS 1	Gates 5, 6, 11 and 12 are in close proximity to the movement area boundary. Pushback from these gates enters Twy R.

MINNESOTA

DULUTH		
DULUTH INTL (DLH)	HS 1	Acft/vehicular tfc on Twy E1, Twy E2 and Twy E should be alert. Signage indicates Rwy 27 APCH. Twy E is in the safety area for Rwy 09–27.
	HS 2	Apch end of Rwy 27 located at Twy A5.
	HS 3	Complex intersection. Be alert when taxiing to Rwy 21 via Twy A and Twy C.
MINNEAPOLIS		
CRYSTAL (MIC)	HS 1	Short distance between rwys. Manage your taxi speed.
	HS 2	Short distance between rwys. Manage your taxi speed.
	HS 3	Short distance between rwys. Manage your taxi speed.
	HS 4	Be prepared to hold short of Rwy 06R (sod) on Twy F.
	HS 5	Be prepared to hold short of Rwy 24L (sod) on Twy D.
	HS 6	Multiple vehicle/pedestrian deviations have occurred in this area due to proximity of arpt access points and hangars obscuring twr view.
	HS 7	Close proximity of Rwy 14R and Rwy 06R hold markings at Twy A and Twy E intersection.
	HS 8	Acft taxiing northeast on Twy B for Rwy 24R or Rwy 24L, tend to make a right turn onto Twy E, incurring on the active rwy.
MINNEAPOLIS		
FLYING CLOUD (FCM)	HS 1	Hold position marking/signs for Rwy 10L located 30' south of Twy A.
	HS 2	Hold position marking/signs for Rwy 10L located 30' south of Twy A.
	HS 3	Hold position marking/signs for Rwy 10L located 30' south of Twy A.
	HS 4	Hold position marking/signs for Rwy 10L located 30' south of Twy A.
	HS 5	Hold position marking/signs for Rwy 10L located 30' south of Twy A.
	HS 6	Hold position marking/signs for Rwy 10L located 30' south of Twy A.
	HS 7	Hold position marking/signs for Rwy 10L located 30' south of Twy A.
	HS 8	Hold position marking/signs for Rwy 10L located 30' south of Twy A.
	HS 9	Rwy 18 apch area proximity to adjacent ramps along Twy A.
	HS 10	Close proximity of parallel rwys and holding positions when crossing apch end of Rwy 28L.
	HS 11	Short distance between rwy hold short lines. Be prepared to hold short of each rwy.



Note:
1/ In this scenario, the existing paved overruns were reconfigured and lighted as stopways, extending the ASDA in both directions by 500 feet.

LEGEND

Airport Property Boundary | Runway Protection Zone (RPZ) | Runway Safety Area (RSA) | Runway Object Free Area (OFA) | Runway Obstacle Free Zone (OFZ) | Obstacle Identified through the Planimetric Survey that was completed in January 2014 | Proposed Airfield Pavement

SOURCES: Topography, Planimetric Base Map & Aerial Photo: SEH, Inc., January 2014;Federal Aviation Administration, Advisory Circular 150/5300-13A Change 1, Airport Design, February 2014; Ricondo & Associates, Inc.December 2014.
PREPARED BY: Ricondo & Associates, Inc., December 2014.

NORTH 0 300 ft.

Drawing: M:\MAC\MAC On-Call Planning Services\02 - Crystal Airport ALP Update\CAD\Stopway and Clearway_V4.dwg_Layout: Runway 14L_32R Stopways_May 12, 2016, 9:19am

Runway 14L-32R
Scenario 1 (Application of Stopway Standards)

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ATTACHMENT 2: FAA RPZ AA CONCURRENCE LETTER (JULY 27, 2016)

U.S. Department
of Transportation
Federal Aviation Administration

Federal Aviation Administration
Dakota-Minnesota Airports District Office
Bismarck Office
2301 University Drive, Building 23B
Bismarck, ND 58504

Federal Aviation Administration
Dakota-Minnesota Airports District Office
Minneapolis Office
6020 28th Avenue South, Suite 102
Minneapolis, MN 55450

July 27, 2016

Mr. Neil Ralston, A.A.E., Airport Planner
Metropolitan Airports Commission
6040 28th Avenue South
Minneapolis, MN 55450

Crystal Airport (MIC) Runway Protection Zone Alternatives Analysis – Douglas Drive

Mr. Ralston:

The FAA Dakota-Minnesota Airports District Office (ADO) has obtained FAA Regional and Headquarters concurrence on the Crystal Airport Runway Protection Zone Alternatives Analysis (RPZ AA) requested by the Metropolitan Airports Commission (MAC).

The triggering event for this analysis is the proposed project to convert 500 feet of existing overrun pavement on both ends of Runway 14L/32R to stopways. This will improve the Accelerate-Stop Distance Available. The conversion of the overrun pavement to a stopway constitutes an "airfield project" thereby triggering a review of land use compatibility within the RPZ. A local road (Douglas Drive) currently encroaches into the Runway 14L RPZ.

The sponsor evaluated alternatives to improve the safety and utility of the airport. The sponsor's attached preferred alternative (Scenario 1 illustrated on Attachment 2) is to

- Convert 500 feet of existing overrun pavement on both ends of Runway 14L/32R to stopways.
- Proceed into an Environmental Assessment and then develop a project to convert Runway 14R/32L to a parallel taxiway, decommission turf Runway 6R/24L, and mitigate nationally important Runway Incursion Mitigation (RIM) initiatives at MIC.
- Change to a "utility" runway designation and publish maximum pavement strength of 12,500 pounds to accommodate existing users operating at the airport and maintain the airport's role in the regional or state aviation network. The reduction allows a smaller RPZ and minimizes incompatible land uses from the existing condition.

FAA's concurrence of the conversion of 500 feet of existing overrun pavement on Runway 14L to a stopway is subject to MAC working with the City of Brooklyn Park to consider the installation of "Low Flying Aircraft/No Parking" signage on Douglas Drive at the edges of the RPZ as a mitigation strategy.

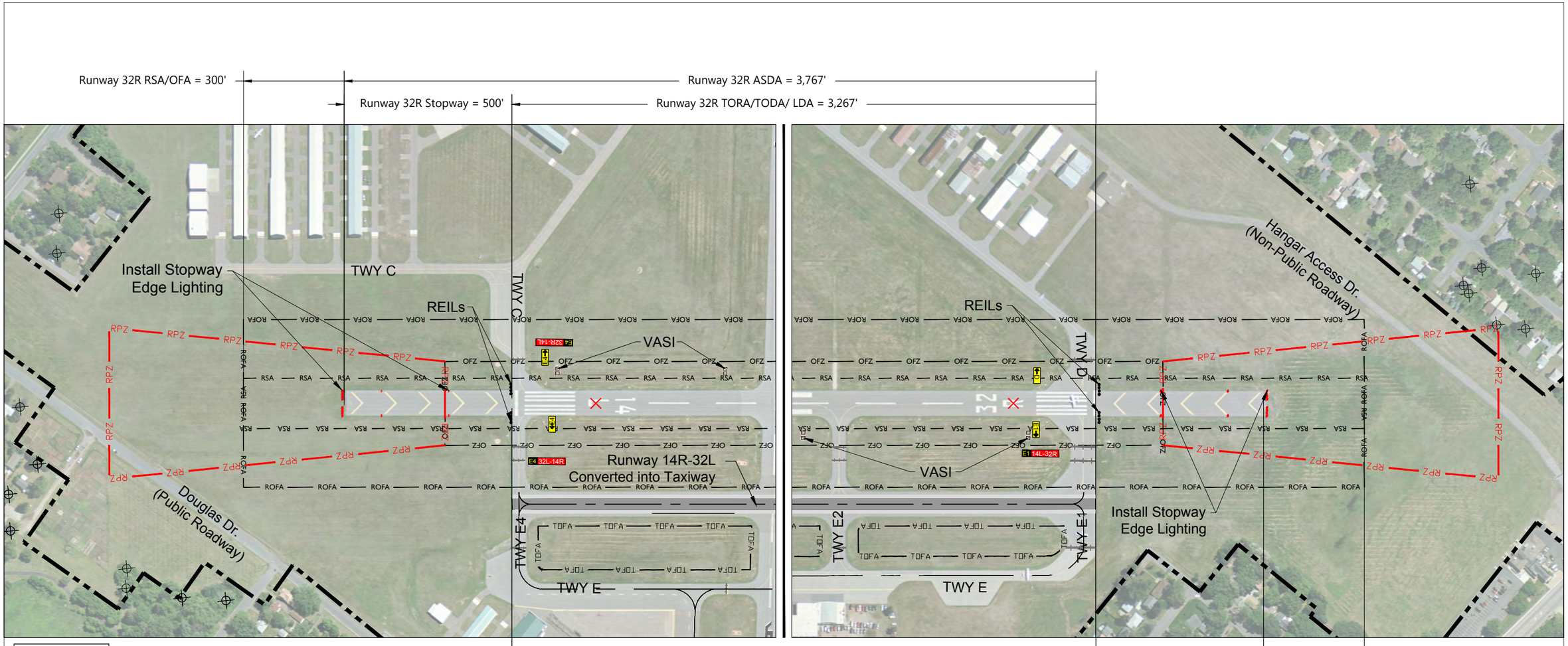
If you have any questions or would like to discuss this information further, please feel welcome to contact Gina Mitchell, Community Planner, at (612) 253-4641 or gina.mitchell@faa.gov.

Sincerely,

Lindsay Butler
Assistant Manager
Dakota-Minnesota Airports District Office, Minnesota Office

enc Preferred Alternative (Scenario 1 illustrated on Attachment 2)

cc Mike Wilson, MAC, (by email)
Nancy Nistler, FAA (by email)
Josh Fitzpatrick, FAA (by email)
Paul Lo, FAA (by email)
Rylan Juran, MnDOT Aeronautics (by email)
Dan Boerner, MnDOT Aeronautics (by email)
Bob Burrell, MnDOT Aeronautics (by email)



Note:
1/ In this scenario, the existing paved overruns were reconfigured and lighted as stopways, extending the ASDA in both directions by 500 feet.

LEGEND

Airport Property Boundary | Runway Protection Zone (RPZ) | Runway Safety Area (RSA) | Runway Object Free Area (OFA) | Runway Obstacle Free Zone (OFZ) | Obstacle Identified through the Planimetric Survey that was completed in January 2014 | Proposed Airfield Pavement

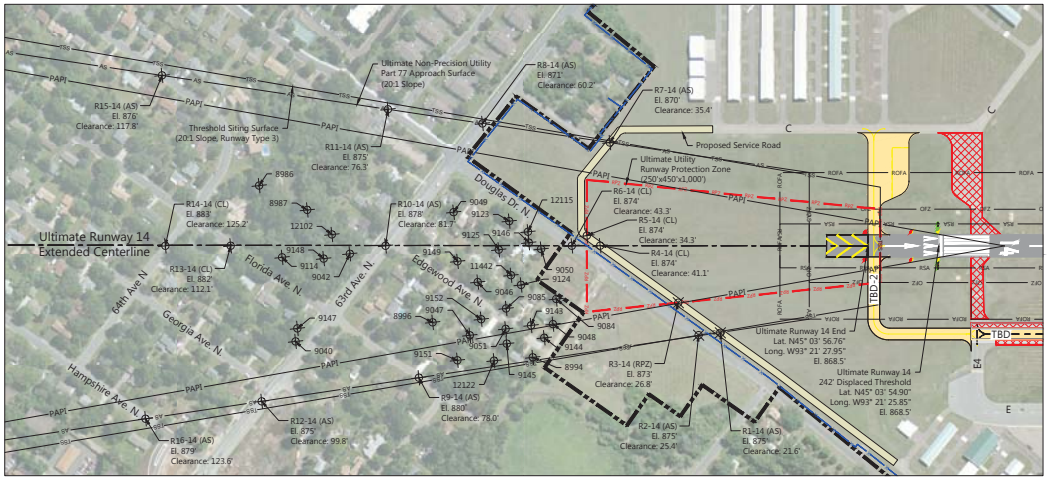
SOURCES: Topography, Planimetric Base Map & Aerial Photo: SEH, Inc., January 2014;Federal Aviation Administration, Advisory Circular 150/5300-13A Change 1, Airport Design, February 2014; Ricondo & Associates, Inc.December 2014.
PREPARED BY: Ricondo & Associates, Inc., December 2014.

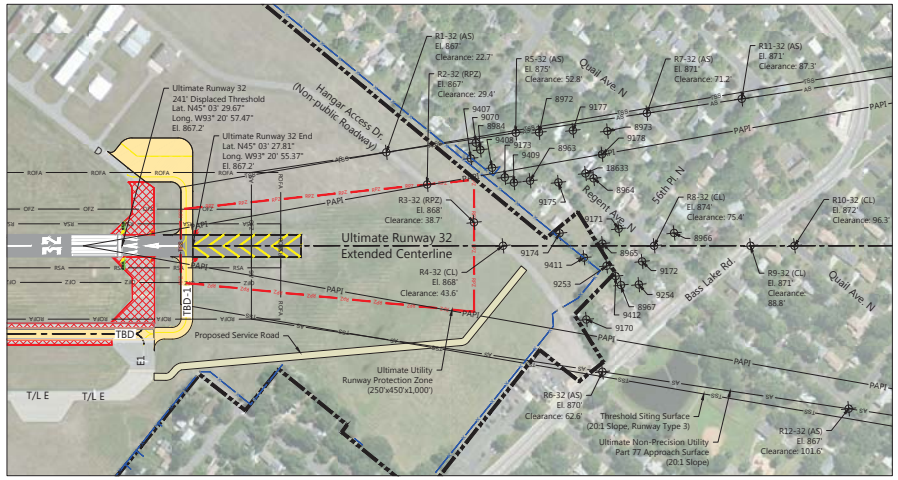
NORTH 0 300 ft.

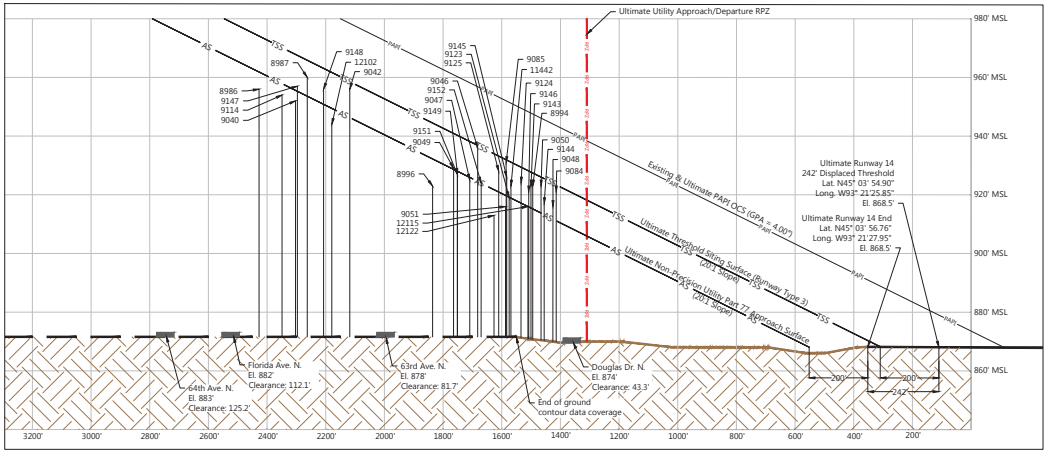
Drawing: M:\MAC\MAC On-Call Planning Services\02 - Crystal Airport ALP Update\CAD\Stopway and Clearway_V4.dwg_Layout: Runway 14L_32R Stopways_May 12, 2016, 9:19am

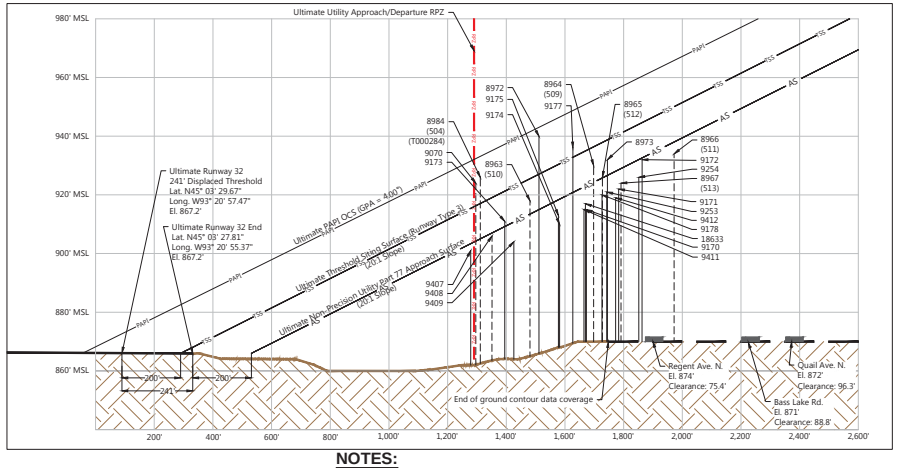
Runway 14L-32R
Scenario 1 (Application of Stopway Standards)

ATTACHMENT 3: ULTIMATE RUNWAY 14-32 APPROACH PLAN AND PROFILE SHEET FROM DRAFT ALP









LEGEND

Object (Structure, Roadway, Tree, Group of Trees)	⊕	Runway Safety Area (RSA)	RSA
Airport Property Boundary		Runway Object Free Area (ROFA)	ROFA
6' AOA Fence	x	Object Free Zone (OFZ)	OFZ
Existing Ground		Runway Protection Zone (RPZ)	RPZ
Tree or Group of Trees Removed (See Note 7)		14 CFR Part 77 Approach Surface (AS)	AS
Proposed Pavement to be Demolished		Threshold Siting Surface (TSS)	TSS
Proposed Airfield Pavement		Precision Approach Path Indicator (PAPI)	PAPI
Proposed Service Road (Non-Public Roadway)			

Source: MIC Aerial Photography, SEH, Inc., January 2014; Metropolitan Airports Commission (MAC), MIC 2035 Long-Term Comprehensive Plan (LTCP), Airfield Concepts, June 2017.

NOTES:

1. All elevations are Mean Sea Level (MSL) (NAVD 88).
2. All coordinates are based on North American Datum 1983 (NAD 83).
3. This document was prepared for planning purposes only. Field surveys should be performed to validate obstacle heights and potential impact to the approach surfaces depicted.
4. Topography and elevation data are based on a planimetric base file provided by SEH in March 2014.
5. Refer to Sheets 25 for the Obstruction Data Tables.
6. Per FAA direction, threshold siting surfaces have been drawn in accordance with Draft FAA AC 150/5300-13A, Change 2.
7. This drawing identifies trees or groups of trees that have been removed as part of the 2016 Tree Mitigation Project (as provided by SEH on October 17, 2016).
8. The elevations of the roads and railroad are actual and do not include Part 77 traverseway adjustment.
9. For reference purposes only, Object ID's in parenthesis correspond to numbers associated with Airport GIS Surface Analysis and Visualization (SAV) Tool.

RICONDO

Crystal Airport

MINNEAPOLIS SAINT PAUL METROPOLITAN AIRPORTS COMMISSION MAC

Inner Portion of the Approach Surface Drawing - Ultimate Runway 14-32

FAA DISCLAIMER:
The contents do not necessarily reflect the official views or policy of the FAA. Acceptance of this plan by the FAA does not in any way constitute a commitment on the part of the United States to participate in any development depicted therein nor does it indicate that the proposed development is environmentally acceptable in accordance with appropriate public laws.

APPROVED BY: Federal Aviation Administration — Date

APPROVED BY: Minnesota Department of Transportation — Date

APPROVED BY AIRPORT SPONSOR: Signature — Director - Airport Development — 10/3/2017 — Date

DRAFT

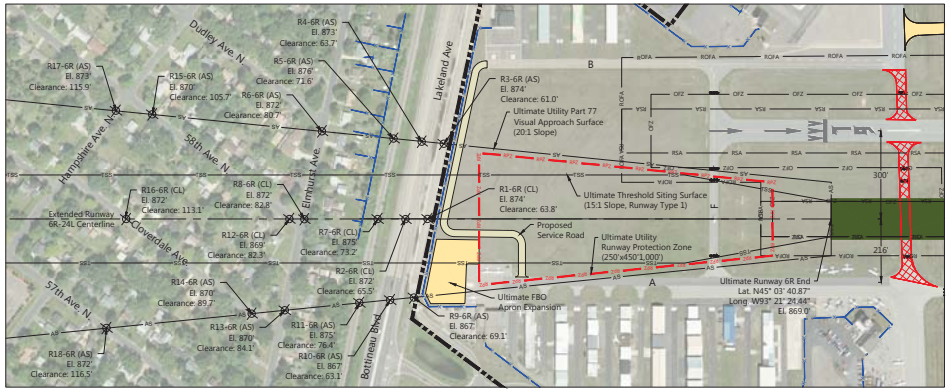
REVISION HISTORY

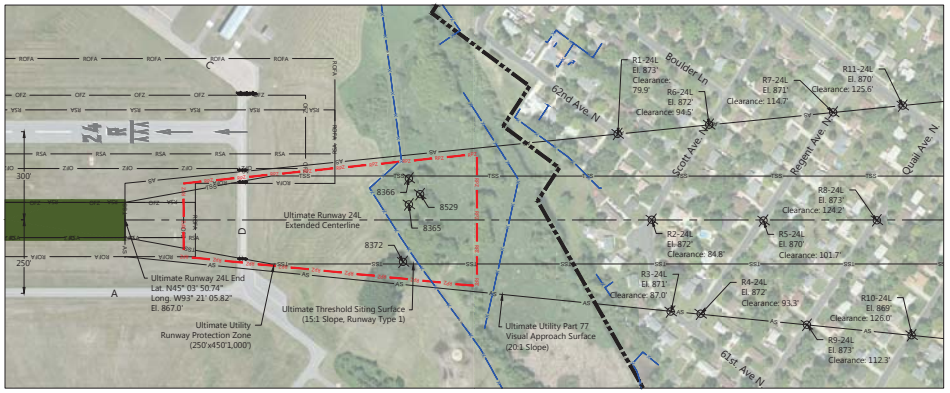
NO.	DATE	DESCRIPTION	APPD.

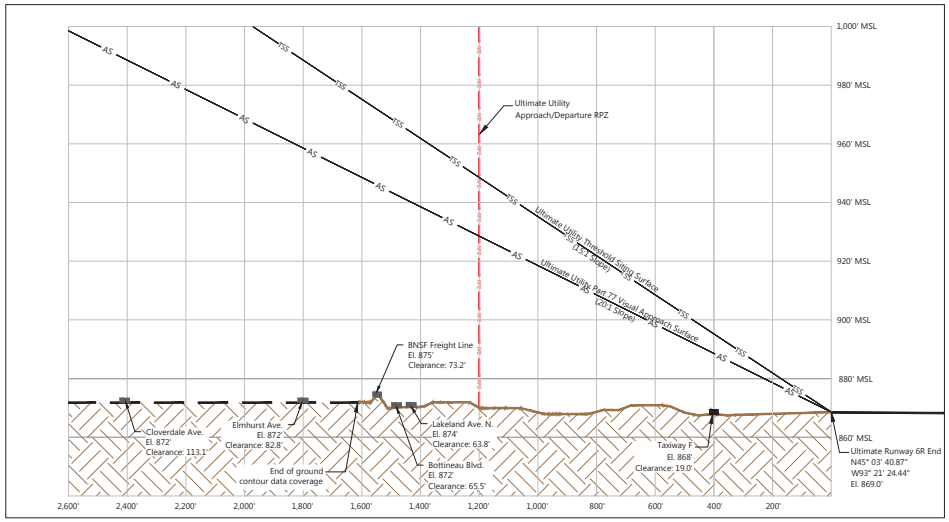
VERTICAL SCALE: 20 10 0
HORIZONTAL SCALE: 100 200
1" = 200'

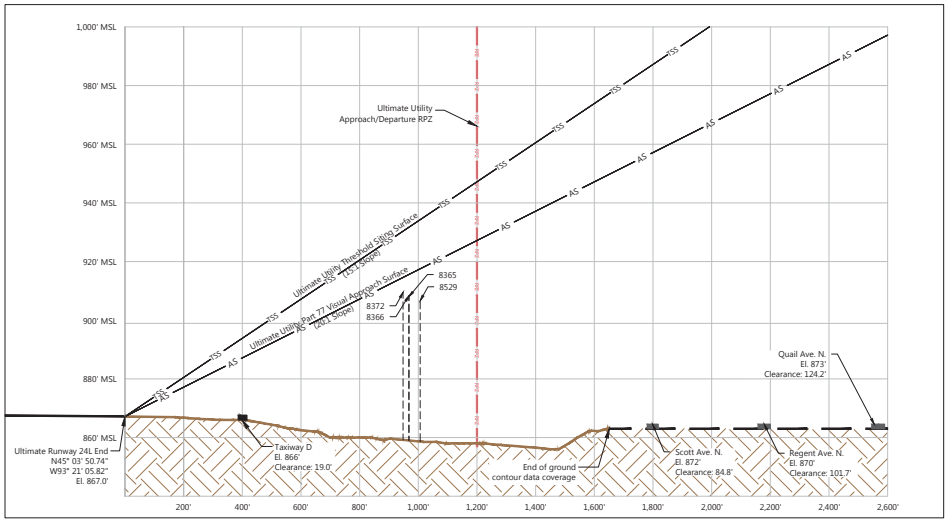
DRAWN BY: JA
CHECKED BY: RL
PREPARED BY: Ricondo, Inc.
DECEMBER 2017
Sheet 22 of 36

ATTACHMENT 4: ULTIMATE RUNWAY 6R-24L APPROACH PLAN AND PROFILE SHEET FROM DRAFT ALP









LEGEND

Object (Structure, Roadway, Tree, Group of Trees)		Approach Runway Protection Zone (RPZ)	RPZ
Airport Property Boundary		Runway Safety Area (RSA)	RSA
6' AOA Fence	x	Runway Object Free Area (ROFA)	ROFA
Tree or Group of Trees Removed (See Note 7)		Runway Object Free Zone (OFZ)	OFZ
Existing Ground		14 CFR Part 77 Approach Surface (AS)	AS
Existing Pavement to be Demolished		Threshold Siting Surface (TSS)	TSS
Proposed Airfield Pavement			
Proposed Service Road (Non-Public Roadway)			

Source: MIC Aerial Photography, SEH, Inc., January 2014; Metropolitan Airports Commission (MAC), MIC 2035 Long-Term Comprehensive Plan (LTCP), Airfield Concepts, June 2017.

NOTES:

1. All elevations are expressed in height above Mean Sea Level (MSL) (NAVD 88).
2. All coordinates are based on North American Datum 1983 (NAD 83).
3. This document was prepared for planning purposes only. Field surveys should be performed to validate obstacle heights and potential impact to the approach surfaces depicted.
4. Topography and elevation data are based on a planimetric base file provided by SEH in March 2014.
5. Refer to Sheet 25 for the obstruction data tables.
6. Per FAA direction, threshold siting surfaces have been drawn in accordance with Draft FAA AC 150/5300-13A Change 2.
7. This drawing identifies trees or group of trees that have been removed as part of the 2016 Tree Mitigation Project (as provided by SEH on October 17, 2017).

RICONDO

Crystal Airport

MAC — Minneapolis Saint Paul Metropolitan Airports Commission

Inner Portion of the Approach Surface Drawing - Ultimate Runway 6R-24L

FAA DISCLAIMER:
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APPROVED BY: Federal Aviation Administration — Date

APPROVED BY: Minnesota Department of Transportation — Date

APPROVED BY AIRPORT SPONSOR: Signature — Director - Airport Development — Date

DRAFT

REVISION HISTORY

NO.	DATE	DESCRIPTION	APPD.

MAGNETIC NORTH DECLINATION - 0° 18' E (AUGUST 2017)
RATE OF CHANGE: 0.0° W PER YEAR
TRUE NORTH
VERTICAL SCALE: 20, 10, 0
HORIZONTAL SCALE: 100, 200
1" = 200'

DRAWN BY: JA
CHECKED BY: RL
PREPARED BY: Ricondo, Inc.
DECEMBER 2017
Sheet 23 of 36

Appendix I – Aircraft Noise Analysis Report

Technical Memorandum

To: *Metropolitan Airports Commission*
From: *Mead & Hunt, Inc.*
Date: *December 14, 2018*
Subject: *Crystal Airport EA/EAW*
AEDT Modeling Inputs and Outputs

This technical memorandum presents the process and modeling inputs used to create the following noise contour scenarios for the Crystal Airport federal Environmental Assessment (EA)/state Environmental Assessment Worksheet (EAW) using the Federal Aviation Administration's (FAA) Aviation Environmental Design Tool (AEDT) Version 2d:

- 2017 Baseline Condition
- 2025 No-Action Alternative
- 2025 Preferred Alternative (with project)

Per applicable FAA guidance, the environmental consequences section of an EA should include analysis of potential noise impacts of the proposed action and alternative(s) for each timeframe evaluated. Timeframes for this analysis were determined in consultation with the FAA Airports District Office in Minneapolis to represent appropriate baseline, no-action, and "with project" operational conditions. For aviation noise analyses, the FAA has determined that the cumulative noise energy exposure of individuals to noise resulting from aviation activities must be established in terms of Yearly Day-Night Average Sound Level (DNL), the FAA's mandated noise metric for evaluating aircraft noise impacts and land use compatibility around US airports. This metric accounts for the noise levels of all individual aircraft events, the number of times those events occur, and the period of day/night in which they occur. The metric logarithmically averages aircraft sound levels at a location over a complete 24-hour period, with a 10-decibel (dB) adjustment added to those noise events occurring from 10:00 p.m. and up to 7:00 a.m. the following morning. This adjustment accounts for increased sensitivity to noise during normal nighttime hours and because ambient sound levels during nighttime are typically about 10 dB lower than during daytime hours.

The AEDT model was initially released in 2015 to replace a series of legacy tools, including the Integrated Noise Model (INM), which was previously used for noise modeling in the recently completed Long Term Comprehensive Plan (LTCP) for Crystal Airport. According to FAA, there is an overlap in functionality and underlying methodologies between AEDT and the legacy tools, however updates were made in AEDT which result in differences when comparing outputs from AEDT and the legacy tools. The updates include smaller flight segments to more accurately model aircraft noise levels for a larger number of aircraft and positions and states along a flight path; a new standard (SAE-ARP-5534) for computing the effects of weather on noise; correcting misidentified aircraft engine mounted locations for three aircraft types; and moving from recursive grids to dynamic grids for noise contour generation.

Noise contours depict an annualized average day of aircraft noise impacts using model inputs, such as aircraft operations (i.e. takeoffs, landings, and touch-and-go's), runway use, flight track use, aircraft fleet mix, aircraft performance and thrust settings, topography information, and atmospheric conditions. Quantifying aircraft-specific noise characteristics in AEDT is accomplished through the use of a comprehensive noise database that has been developed under Federal Aviation Regulation Part 36. As part of the airworthiness certification process, aircraft manufacturers are required to subject aircraft to a battery of noise tests. Through the use of federally adopted and endorsed algorithms, this aircraft-specific noise information is used in the generation of DNL contours. Justification for such an approach is rooted in national standardization of noise quantification at airports.

Airport Operations

In coordination with MAC staff, Mead & Hunt developed 2017 baseline aircraft operations counts, as well as 2025 forecast aircraft operations counts for the no-action and preferred alternative scenarios. The baseline operations counts were established based on data collected in 2017 by the MAC Noise and Operations Monitoring System (MACNOMS). This data was adjusted to reflect MACNOMS capture rates calculated based on the discrepancy between the MACNOMS counts and air traffic control tower counts. The forecast operations counts are based on the total operations forecasted by the recently-completed LTCP for Crystal Airport, with the fleet mix composition adjusted to align with the fleet mix composition observed in the 2017 MACNOMS data. **Table A** below summarizes the aircraft operations for each scenario.

Table A: Airport Operations Summary by Scenario

Aircraft Type	**Baseline (2017)**		**No-Action (2025)**		**Preferred Alternative (2025)**	
Single-Engine Piston	33,272	92.1%	35,562	91.1%	35,470	90.4%
Multi-Engine Piston	1,099	3.0%	1,559	4.0%	1,668	4.2%
Turboprop	105	0.3%	114	0.3%	236	0.6%
Jets	7	0.0%	7	0.0%	79	0.2%
Rotor	1,650	4.6%	1,782	4.6%	1,806	4.6%
Total	**36,134**		**39,025**		**39,258**	

The operations shown in Table A were then assigned to specific aircraft types based on the prevalence of specific aircraft types observed in the MACNOMS data. **Tables 1**, **2**, and **3** attached to this memorandum present the daily baseline and forecast operations counts by aircraft type used to generate the AEDT inputs.

Approval of Non-Standard Aircraft Substitutions

In a letter dated June 26, 2018, the FAA Office of Environment and Energy (AAE) approved use of specific aircraft noise profiles for this study, to represent aircraft types for which AEDT does not identify a standard substitution. These aircraft types and substitution aircraft noise profiles are summarized in a table attached to the June 26 letter, which is attached to this report.

Runway Use

Baseline 2017 runway use and flight track distributions were estimated for aircraft type category based on MACNOMS flight track data for which the aircraft type was known. Runway use distribution was unique for aircraft type and whether the operations were arrivals or departures. The 2017 baseline and 2025 no action alternatives used the same assumptions for runway and track utilization. However, in the 2025 preferred alternative scenario, aircraft will utilize Runway 14L/32R more frequently after Runway 14R/32L is closed. All new jet and turboprop aircraft operations in the 2025 preferred alternative scenario were assigned to Runway 14L/32R. Operations on Runway 14R/32L were redistributed to the remaining open runways under the preferred alternative scenario. **Tables 4** and **5** attached to this memorandum summarize runway use assumptions by aircraft type.

Day/Night Split

MACNOMS data was used to extract time-of-day by aircraft type. The following day/night splits were used for the baseline scenario, no action alternative, and preferred alternative:

Helicopters:	91.1% day – 8.9% night
Business Jet:	100% day – 0.0% night
Single-Engine Piston:	97.4% day – 2.6% night
Twin-Engine Piston:	93.9% day – 6.1% night
Turboprop:	93.9% day – 6.1% night

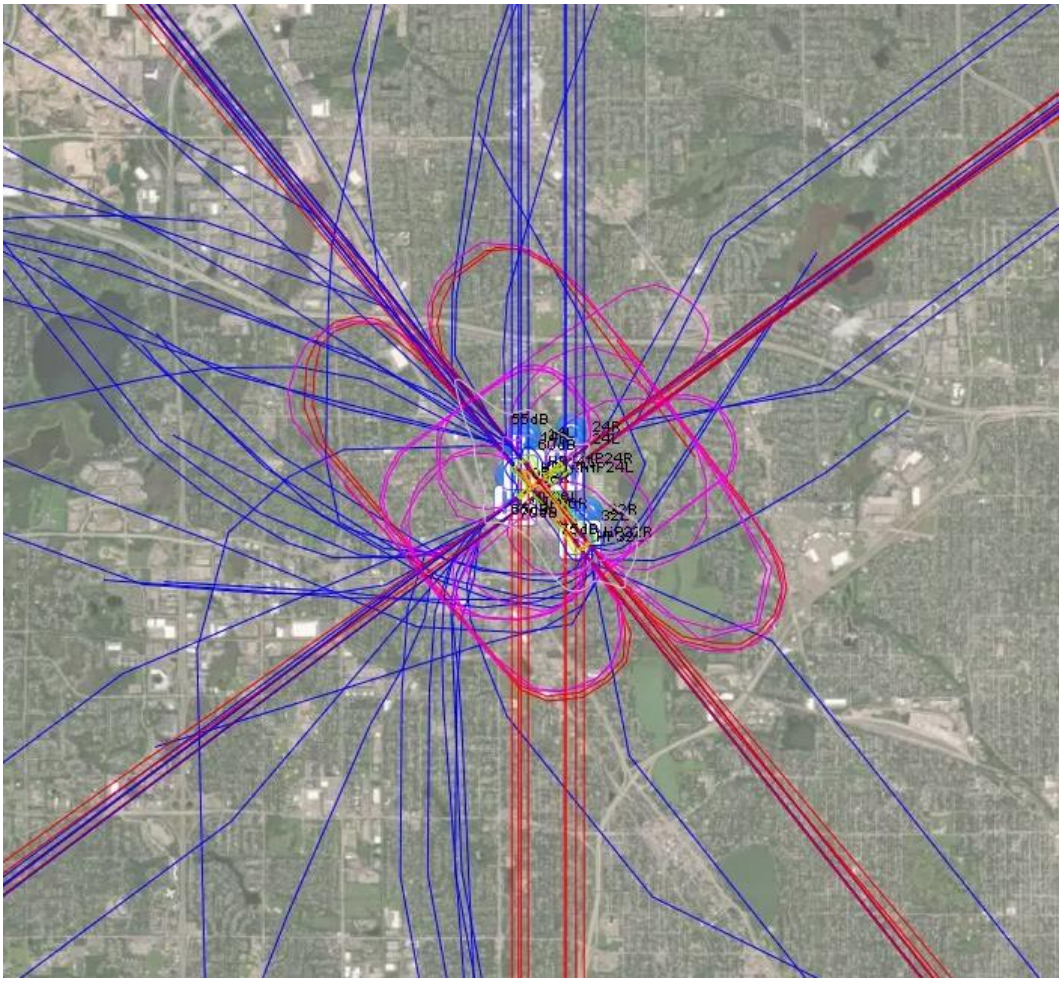
Those operations which occur at night incur the 10-dB nighttime noise sensitivity penalty within the AEDT model.

Flight Tracks

Flight tracks were developed based on MACNOMS flight tracks and are modeled to reflect those used in the recently-completed LTCP. The AEDT study used multiple arrival and departure tracks for each runway end. Some runways had two arrival tracks and three departure tracks, while other runway ends had one arrival track and one departure track. Departure track dispersal was utilized where appropriate to reflect MACNOMS flight track data and the LTCP flight tracks. The image on the next page depicts arrival, departure and touch-and-go tracks as drawn in the AEDT model; red flight tracks represent aircraft arrivals, blue flight tracks represent aircraft departures, and magenta flight tracks represent aircraft touch-and-go's.

Track utilization percentages used in the AEDT study are shown in **Table 6** attached to this memorandum. It is worth noting that the primary drivers of the location and distribution of aircraft noise at this airport are the runway end utilization percentages and aircraft types modeled.

Figure: AEDT Flight Tracks



Weather

The weather data used in the noise study were acquired from the National Oceanic and Atmospheric Administration (NOAA) National Climatic Data Center, which are auto-populated in the AEDT model based on the Airport's location. The following weather inputs were auto-populated within the AEDT model to represent average operating conditions at Crystal Airport:

- Ambient temperature = 45° Fahrenheit
- Sea level pressure = 1015.869995 millibars
- Relative humidity = 68.88%
- Dew point = 36.08° Fahrenheit
- Headwind speed = 7.22 knots

Results

The baseline (2017) noise contours are shown in **Figure 4-9** attached to this report. The contours represent the Federal Aviation Regulations (FAR) Part 150 (14 C.F.R. Part 150) yearly day-night average sound level (DNL) metric, which is measured in decibels (dB). As noted previously, DNL is a cumulative noise metric that represents the average daily noise level, accounting for the added intrusiveness of noise at night compared to during the day. The FAA currently considers the 65 dB DNL contour line as the threshold of significance for noise impact.

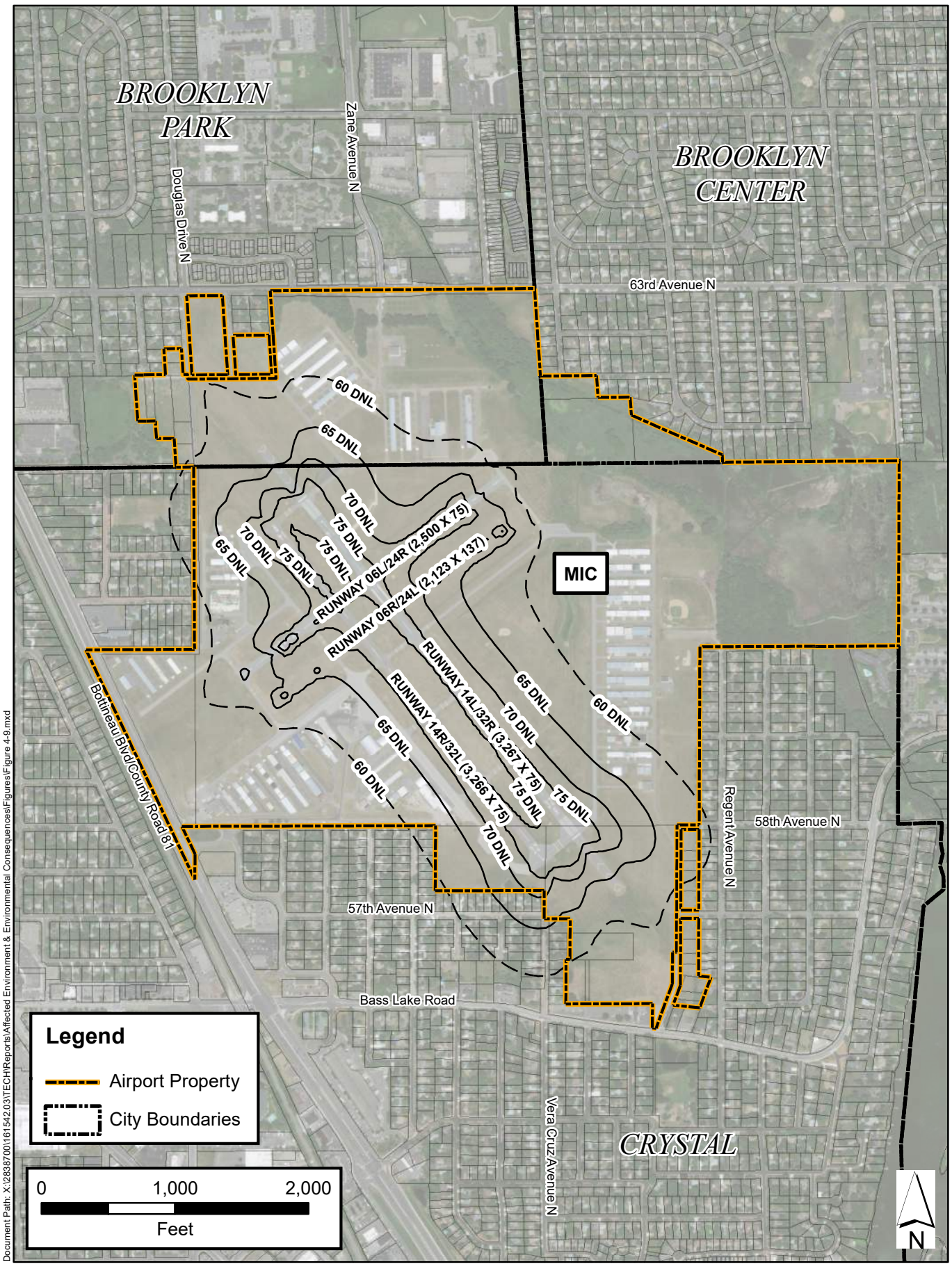
The 65 DNL contour is mostly contained on Airport property in the baseline (2017) scenario, except for a small area south of the Airport off the Runway 32L end. Eleven residential parcels are in or partially within the 65 DNL contour in the baseline scenario. The 70 and 75 DNL contours are contained on the airport property.

Figure 4-10 shows noise contours for the no action and preferred alternative (2025) scenarios. The FAA considers noise impacts to be significant if, “The action would increase noise by DNL 1.5 dB or more for a noise sensitive area that is exposed to noise at or above the DNL 65 dB noise exposure level, or that will be exposed at or above the DNL 65dB level due to a DNL 1.5 dB or greater increase, when compared to the no action alternative for the same timeframe.”

The no action (2025) scenario shows the 65 DNL contour still mostly contained on Airport property, except for 12 residential parcels on the south side of the Airport. This scenario affects one more parcel than the baseline scenario. The 70 and 75 DNL contours are contained on the airport property.

The preferred alternative (2025) scenario shows a reduction in off-Airport noise impacts due to closing Runway 14R/32L. Residential parcels in or partially within the 65 DNL contour are projected to be reduced to four. The 65 DNL and greater contours are all otherwise contained on Airport property. There are no areas within the 65 DNL contour that would experience an increase of 1.5 dB DNL or more; therefore, there will be no significant noise impacts for the preferred alternative. The 70 and 75 DNL contours are contained on the airport property.

According to the FAA’s Land Use Compatibility criteria in 14 CFR Part 150, sensitive land uses (such as residential) are considered incompatible with noise levels of 65 dB DNL or higher. The FAA requires that structures potentially eligible for sound insulation (i.e. within the 65 dB DNL noise contour) be evaluated to determine whether the interior noise levels are high enough to warrant sound insulation treatment. Structures already reducing interior noise exposure to 45 dB or less with windows closed, are ineligible for sound insulation treatment. Following the completion of the EA/EAW, the MAC will test the four residences located in the 65 DNL contours around Crystal Airport in accordance with American Society of the International Association for Testing and Materials (ASTM) standards using a methodology agreed upon by the FAA, MAC and City of Crystal.



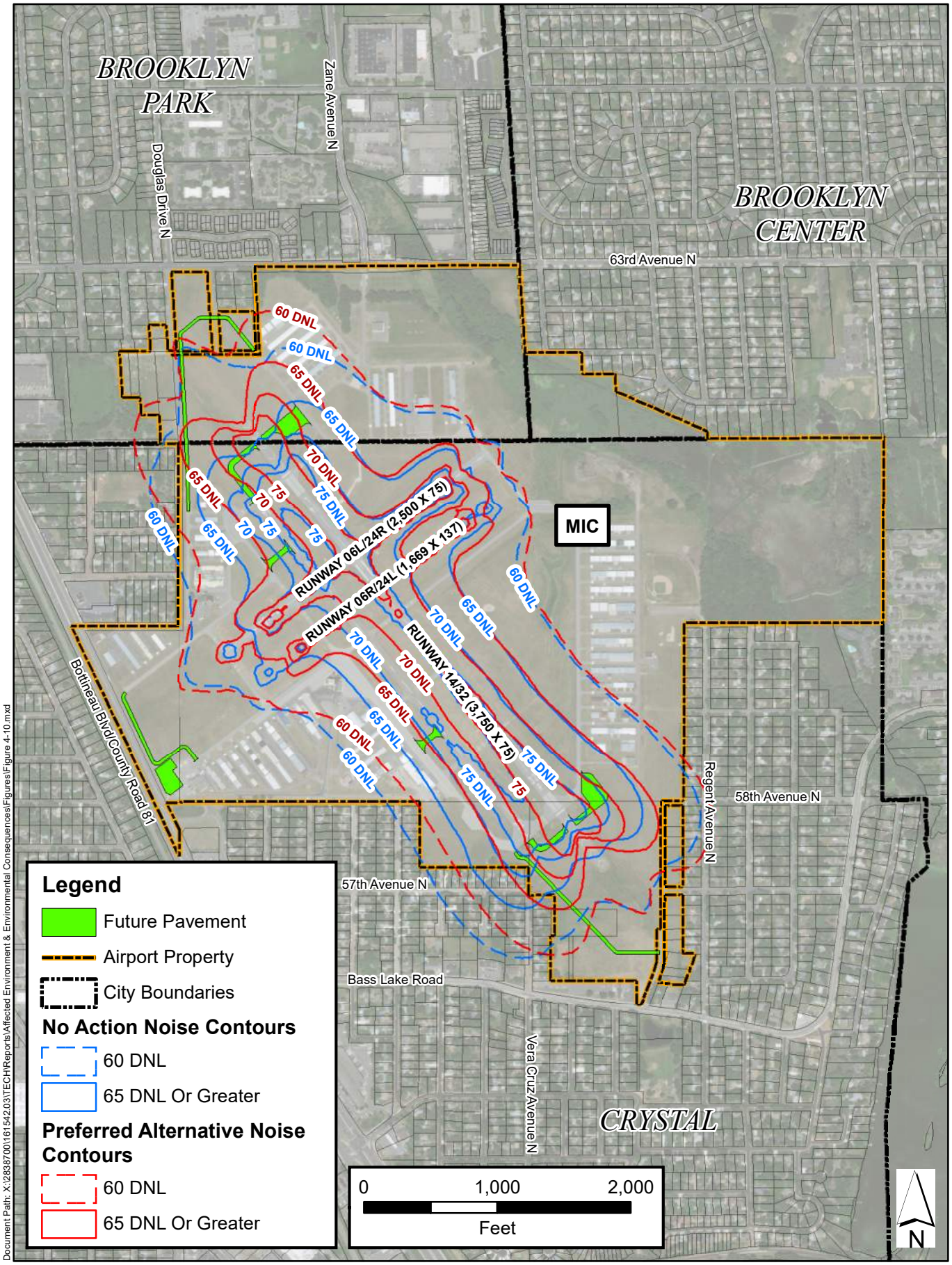
Note: Aircraft noise contour 60 DNL is shown for informational purposes only.

Hennepin County, MN - GIS Data Downloads at https://gis-hennepin.opendata.arcgis.com/

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

FIGURE 4-9

Baseline Noise Contours
Crystal Airport
Environmental Assessment



Note: Aircraft noise contour 60 DNL is shown for informational purposes only.

FIGURE 4-10

No Action and Preferred Alternative Noise Contours
Crystal Airport
Environmental Assessment

Hennepin County, MN - GIS Data Downloads at https://gis-hennepin.opendata.arcgis.com/

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Crystal Airport
Table 1 - Baseline Average Daily Operations

			Departures			Arrivals			Touch and Gos			Total Operations		
Aircraft Type	Model	AEDT Model Used	Day	Night	Total	Day	Night	Total	Day	Night	Total	Day	Night	Total
Helicopter			1.751	0.170	1.922	1.751	0.170	1.922	0.647	0.063	0.710	4.149	0.404	4.553
	Agusta SPA A109	A109	1.674	0.163	1.837	1.674	0.163	1.837	0.619	0.060	0.679	3.967	0.386	4.353
	Bell 407	B407	0.063	0.006	0.069	0.063	0.006	0.069	0.023	0.002	0.026	0.150	0.015	0.164
	EuroCopter 145	B222	0.014	0.001	0.015	0.014	0.001	0.015	0.005	0.001	0.006	0.033	0.003	0.036
Business Jet			0.010	0.000	0.010	0.010	0.000	0.010	0.000	0.000	0.000	0.019	0.000	0.019
	Cessna C501	CNA500	0.002	0.000	0.002	0.002	0.000	0.002	0.000	0.000	0.000	0.005	0.000	0.005
	Cessna Citiation jet 525	CNA500	0.002	0.000	0.002	0.002	0.000	0.002	0.000	0.000	0.000	0.005	0.000	0.005
	Eclipse 500	ECLIPSE500	0.005	0.000	0.005	0.005	0.000	0.005	0.000	0.000	0.000	0.010	0.000	0.010
Single-Engine Piston			31.360	0.830	32.190	31.370	0.831	32.201	26.026	0.690	26.716	88.756	2.351	91.107
	American Champion	CNA172	0.009	0.000	0.009	0.009	0.000	0.009	0.008	0.000	0.008	0.026	0.001	0.027
	Vans RV6	GASEPV	0.332	0.009	0.341	0.333	0.009	0.341	0.276	0.007	0.283	0.941	0.025	0.966
	Vans RV7	GASEPV	0.932	0.025	0.957	0.933	0.025	0.958	0.774	0.021	0.795	2.639	0.070	2.709
	Vans RV8	GASEPV	0.145	0.004	0.148	0.145	0.004	0.149	0.120	0.003	0.123	0.409	0.011	0.420
	Vans RV9	GASEPV	0.018	0.000	0.019	0.018	0.000	0.019	0.015	0.000	0.016	0.052	0.001	0.054
	Vans RV12	GASEPV	0.002	0.000	0.003	0.002	0.000	0.003	0.002	0.000	0.002	0.007	0.000	0.007
	Beech 24 Musketeer	GASEPV	0.034	0.001	0.035	0.034	0.001	0.035	0.028	0.001	0.029	0.096	0.003	0.098
	Beech 35 Bonanza	CNA208	0.797	0.021	0.818	0.798	0.021	0.819	0.662	0.018	0.679	2.256	0.060	2.316
	Beech 36 Bonanza	CNA208	1.458	0.039	1.497	1.460	0.039	1.498	1.211	0.032	1.243	4.129	0.109	4.238
	Beech 77 Skipper	GASEPF	0.009	0.000	0.009	0.009	0.000	0.009	0.008	0.000	0.008	0.026	0.001	0.027
	Beechcraft T-34 Mentor	T34	0.138	0.004	0.142	0.139	0.004	0.142	0.115	0.003	0.118	0.392	0.010	0.402
	Bellanca Viking BL17	GASEPV	0.025	0.001	0.025	0.025	0.001	0.025	0.020	0.001	0.021	0.070	0.002	0.072
	Cessna 140	GASEPF	0.052	0.001	0.054	0.052	0.001	0.054	0.043	0.001	0.045	0.148	0.004	0.152
	Cessna 150	GASEPF	0.052	0.001	0.054	0.052	0.001	0.054	0.043	0.001	0.045	0.148	0.004	0.152
	Cessna 152	GASEPF	0.015	0.000	0.016	0.015	0.000	0.016	0.013	0.000	0.013	0.044	0.001	0.045
	Cessna 172	CNA172	6.678	0.177	6.855	6.684	0.177	6.861	5.546	0.147	5.693	18.908	0.501	19.409
	Cessna 177	CNA172	0.265	0.007	0.272	0.265	0.007	0.272	0.220	0.006	0.226	0.749	0.020	0.769
	Cessna 180	CAN182	0.372	0.010	0.382	0.373	0.010	0.382	0.309	0.008	0.317	1.054	0.028	1.082
	Cessna 182	CAN182	1.621	0.043	1.664	1.621	0.043	1.664	1.345	0.036	1.381	4.587	0.122	4.708
	Cessna 185	CAN182	0.517	0.014	0.531	0.517	0.014	0.531	0.429	0.011	0.441	1.464	0.039	1.503
	Cessna 206	GASEPV	0.188	0.005	0.193	0.188	0.005	0.193	0.156	0.004	0.160	0.532	0.014	0.546
	Cessna 210	GASEPV	0.083	0.002	0.085	0.083	0.002	0.085	0.069	0.002	0.071	0.235	0.006	0.241
	Cessna 182 Turbo	CNA20T	0.758	0.020	0.778	0.758	0.020	0.778	0.628	0.017	0.645	2.144	0.057	2.200
	Cessna 210 Turbo	CNA20T	0.083	0.002	0.085	0.083	0.002	0.085	0.069	0.002	0.071	0.235	0.006	0.241
	Cirrus 20/22	COMSEP	1.694	0.045	1.739	1.694	0.045	1.739	1.405	0.037	1.442	4.792	0.127	4.919
	Cirrus SR22 T	COMSEP	0.040	0.001	0.041	0.040	0.001	0.041	0.033	0.001	0.034	0.113	0.003	0.116
	Diamond DA40	GASEPV	0.028	0.001	0.028	0.028	0.001	0.028	0.023	0.001	0.024	0.078	0.002	0.080
	Experimental (GASEPV)	GASEPV	0.151	0.004	0.155	0.151	0.004	0.155	0.125	0.003	0.129	0.427	0.011	0.438
	Grumman AA5A	GASEPF	0.406	0.011	0.417	0.406	0.011	0.417	0.337	0.009	0.346	1.150	0.030	1.181
	Maule M7	M7235c	0.040	0.001	0.041	0.040	0.001	0.041	0.033	0.001	0.034	0.113	0.003	0.116
	Mooney M20	GASEPV	2.536	0.067	2.603	2.536	0.067	2.603	2.104	0.056	2.160	7.176	0.190	7.366
	Piper J-3 Cub	GASEPF	0.083	0.002	0.085	0.083	0.002	0.085	0.069	0.002	0.071	0.235	0.006	0.241
	PA24	GASEPV	0.102	0.003	0.104	0.102	0.003	0.104	0.084	0.002	0.087	0.288	0.008	0.295
	PA28	GASEPF	10.063	0.266	10.329	10.063	0.267	10.329	8.349	0.221	8.570	28.474	0.754	29.229
	PA32	GASEPV	1.614	0.043	1.656	1.614	0.043	1.656	1.339	0.035	1.374	4.566	0.121	4.687
	Socata TB20 Trinidad	GASEPV	0.018	0.000	0.019	0.018	0.000	0.019	0.015	0.000	0.016	0.052	0.001	0.054
Twin-Engine Piston			1.305	0.084	1.389	1.305	0.084	1.389	0.217	0.014	0.231	2.827	0.182	3.009
	Beech 58	BEC58P	0.264	0.017	0.281	0.264	0.017	0.281	0.044	0.003	0.047	0.572	0.037	0.609
	Beech 65 Queen Air	BEC58P	0.010	0.001	0.011	0.010	0.001	0.011	0.002	0.000	0.002	0.022	0.001	0.024
	Beech 76	BEC58P	0.010	0.001	0.011	0.010	0.001	0.011	0.002	0.000	0.002	0.022	0.001	0.024
	Beech 95	BEC58P	0.067	0.004	0.072	0.067	0.004	0.072	0.011	0.001	0.012	0.146	0.009	0.155
	Beech E-55	BEC58P	0.026	0.002	0.028	0.026	0.002	0.027	0.004	0.000	0.005	0.056	0.004	0.060
	Cessna 310	BEC58P	0.078	0.005	0.083	0.078	0.005	0.083	0.013	0.001	0.014	0.168	0.011	0.179
	Cessna 337	BEC58P	0.300	0.019	0.320	0.300	0.019	0.320	0.050	0.003	0.053	0.651	0.042	0.693
	Cessna 340	BEC58P	0.057	0.004	0.061	0.057	0.004	0.061	0.010	0.001	0.010	0.124	0.008	0.132
	Cessna 414	BEC58P	0.088	0.006	0.094	0.088	0.006	0.094	0.015	0.001	0.016	0.191	0.012	0.203

	Cessna 421	BEC58P	0.010	0.001	0.011	0.010	0.001	0.011	0.002	0.000	0.002	0.022	0.001	0.024
	Diamond Twin Star DA42	PA30	0.026	0.002	0.028	0.026	0.002	0.027	0.004	0.000	0.005	0.056	0.004	0.060
	Piper PA23	BEC58P	0.062	0.004	0.066	0.062	0.004	0.066	0.010	0.001	0.011	0.135	0.009	0.143
	Piper PA30	PA30	0.031	0.002	0.033	0.031	0.002	0.033	0.005	0.000	0.006	0.067	0.004	0.072
	Piper PA31	CNA441	0.067	0.004	0.072	0.067	0.004	0.072	0.011	0.001	0.012	0.146	0.009	0.155
	Piper PA34	BEC58P	0.057	0.004	0.061	0.057	0.004	0.061	0.010	0.001	0.010	0.124	0.008	0.132
	Piper PA44	PA30	0.057	0.004	0.061	0.057	0.004	0.061	0.010	0.001	0.010	0.124	0.008	0.132
	Piper PA46	CNA441	0.093	0.006	0.099	0.093	0.006	0.099	0.016	0.001	0.017	0.202	0.013	0.215
Turbo Prop			0.129	0.008	0.137	0.129	0.008	0.137	0.021	0.001	0.023	0.279	0.018	0.297
	BE20 - Beech 200 Super King	DHC6	0.005	0.000	0.005	0.005	0.000	0.005	0.001	0.000	0.001	0.010	0.001	0.010
	BE30 - Raytheon 300 Super King Air	DHC6	0.003	0.000	0.003	0.003	0.000	0.003	0.001	0.000	0.001	0.007	0.000	0.007
	BE9L - Beech King Air 90	DHC6	0.017	0.001	0.018	0.017	0.001	0.018	0.003	0.000	0.003	0.036	0.002	0.038
	C208 - Cessna 208 Caravan	CNA208	0.023	0.001	0.024	0.023	0.001	0.024	0.004	0.000	0.004	0.049	0.003	0.052
	C425 - Cessna 425 Corsair	CNA441	0.003	0.000	0.003	0.003	0.000	0.003	0.001	0.000	0.001	0.007	0.000	0.007
	C441 - Cessna Conquest	CNA441	0.026	0.002	0.027	0.026	0.002	0.027	0.004	0.000	0.005	0.056	0.004	0.059
	P46T - Piper Malibu Meridian	CNA441	0.023	0.001	0.024	0.023	0.001	0.024	0.004	0.000	0.004	0.049	0.003	0.052
	PC12 - Pilatus PC-12	CNA208	0.018	0.001	0.019	0.018	0.001	0.019	0.003	0.000	0.003	0.039	0.003	0.042
	SW3 - Fairchild Swearingen SA-226T/TB Merlin 3	DHC6	0.003	0.000	0.003	0.003	0.000	0.003	0.001	0.000	0.001	0.007	0.000	0.007
	TBM7 - Socata TBM-7	CNA208	0.006	0.000	0.006	0.006	0.000	0.006	0.001	0.000	0.001	0.013	0.001	0.014
	TBM9 - Socata TBM	CNA208	0.003	0.000	0.003	0.003	0.000	0.003	0.001	0.000	0.001	0.007	0.000	0.007
TOTAL			34.554	1.093	35.647	34.564	1.094	35.658	26.912	0.768	27.681	96.030	2.956	98.986

*Touch-and-go operations in this table were manually doubled to depict 2 operations modeled per touch-and-go
*Totals may not add due to rounding

Crystal Airport
Table 2 - 2025 With Project Average Daily Operations

			Departures			Arrivals			Touch and Gos			Total Operations		
Aircraft Type	Model	AEDT Model Used	Day	Night	Total	Day	Night	Total	Day	Night	Total	Day	Night	Total
Helicopter			1.903	0.185	2.088	1.903	0.185	2.088	0.703	0.068	0.772	4.509	0.439	4.947
	Agusta SPA A109	A109	1.819	0.177	1.996	1.819	0.177	1.996	0.672	0.065	0.738	4.310	0.419	4.729
	Bell 407	B407	0.069	0.007	0.075	0.069	0.007	0.075	0.025	0.002	0.028	0.163	0.016	0.179
	EuroCopter 145	B222	0.015	0.001	0.017	0.015	0.001	0.017	0.006	0.001	0.006	0.036	0.004	0.040
Business Jet			0.108	0.000	0.108	0.108	0.000	0.108	0.000	0.000	0.000	0.216	0.000	0.216
	Cessna C501	CNA500	0.027	0.000	0.027	0.027	0.000	0.027	0.000	0.000	0.000	0.054	0.000	0.054
	Cessna Citiation jet 525	CNA500	0.027	0.000	0.027	0.027	0.000	0.027	0.000	0.000	0.000	0.054	0.000	0.054
	Eclipse 500	ECLIPSE500	0.054	0.000	0.054	0.054	0.000	0.054	0.000	0.000	0.000	0.108	0.000	0.108
Single-Engine Piston			33.463	0.863	34.326	33.490	0.883	34.373	27.785	0.732	28.518	94.739	2.478	97.217
	American Champion	CNA172	0.010	0.000	0.010	0.010	0.000	0.010	0.008	0.000	0.009	0.028	0.001	0.029
	Vans RV6	GASEPV	0.361	0.009	0.370	0.361	0.010	0.371	0.300	0.008	0.308	1.022	0.027	1.049
	Vans RV7	GASEPV	1.013	0.026	1.039	1.014	0.027	1.041	0.841	0.022	0.863	2.868	0.075	2.943
	Vans RV8	GASEPV	0.157	0.004	0.161	0.157	0.004	0.161	0.130	0.003	0.134	0.445	0.012	0.457
	Vans RV9	GASEPV	0.020	0.001	0.021	0.020	0.001	0.021	0.017	0.000	0.017	0.057	0.001	0.058
	Vans RV12	GASEPV	0.003	0.000	0.003	0.003	0.000	0.003	0.002	0.000	0.002	0.008	0.000	0.008
	Beech 24 Musketeer	GASEPV	0.037	0.001	0.038	0.037	0.001	0.038	0.031	0.001	0.031	0.104	0.003	0.107
	Beech 35 Bonanza	CNA208	0.866	0.022	0.888	0.867	0.023	0.889	0.719	0.019	0.738	2.452	0.064	2.516
	Beech 36 Bonanza	CNA208	1.585	0.041	1.626	1.586	0.042	1.628	1.316	0.035	1.351	4.487	0.117	4.604
	Beech 77 Skipper	GASEPF	0.010	0.000	0.010	0.010	0.000	0.010	0.008	0.000	0.009	0.028	0.001	0.029
	Beechcraft T-34 Mentor	T34	0.150	0.004	0.154	0.151	0.004	0.155	0.125	0.003	0.128	0.426	0.011	0.437
	Bellanca Viking BL17	GASEPV	0.027	0.001	0.027	0.027	0.001	0.027	0.022	0.001	0.023	0.076	0.002	0.078
	Cessna 140	GASEPF	0.057	0.001	0.058	0.057	0.001	0.058	0.047	0.001	0.048	0.161	0.004	0.165
	Cessna 150	GASEPF	0.057	0.001	0.058	0.057	0.001	0.058	0.047	0.001	0.048	0.161	0.004	0.165
	Cessna 152	GASEPF	0.017	0.000	0.017	0.017	0.000	0.017	0.014	0.000	0.014	0.047	0.001	0.049
	Cessna 172	CNA172	6.938	0.179	7.117	6.944	0.183	7.127	5.761	0.152	5.913	19.644	0.514	20.158
	Cessna 177	CNA172	0.288	0.007	0.295	0.288	0.008	0.295	0.239	0.006	0.245	0.814	0.021	0.835
	Cessna 180	CAN182	0.405	0.010	0.415	0.405	0.011	0.416	0.336	0.009	0.345	1.145	0.030	1.175
	Cessna 182	CAN182	1.752	0.045	1.797	1.753	0.046	1.800	1.455	0.038	1.493	4.960	0.130	5.090
	Cessna 185	CAN182	0.562	0.014	0.576	0.562	0.015	0.577	0.466	0.012	0.479	1.590	0.042	1.632
	Cessna 206	GASEPV	0.204	0.005	0.209	0.204	0.005	0.209	0.169	0.004	0.174	0.577	0.015	0.593
	Cessna 210	GASEPV	0.090	0.002	0.093	0.090	0.002	0.093	0.075	0.002	0.077	0.256	0.007	0.262
	Cessna 182 Turbo	CNA20T	0.822	0.021	0.844	0.823	0.022	0.845	0.683	0.018	0.701	2.329	0.061	2.389
	Cessna 210 Turbo	CNA20T	0.090	0.002	0.093	0.090	0.002	0.093	0.075	0.002	0.077	0.256	0.007	0.262
	Cirrus 20/22	COMSEP	1.839	0.047	1.886	1.840	0.048	1.889	1.527	0.040	1.567	5.206	0.136	5.342
	Cirrus SR22 T	COMSEP	0.043	0.001	0.045	0.043	0.001	0.045	0.036	0.001	0.037	0.123	0.003	0.126
	Diamond DA40	GASEPV	0.030	0.001	0.031	0.030	0.001	0.031	0.025	0.001	0.026	0.085	0.002	0.087
	Experimental (GASEPV)	GASEPV	0.164	0.004	0.168	0.164	0.004	0.168	0.136	0.004	0.140	0.464	0.012	0.476
	Grumman AA5A	GASEPF	0.441	0.011	0.453	0.442	0.012	0.453	0.366	0.010	0.376	1.249	0.033	1.282
	Maule M7	M7235c	0.043	0.001	0.045	0.043	0.001	0.045	0.036	0.001	0.037	0.123	0.003	0.126
	Mooney M20	GASEPV	2.722	0.070	2.792	2.724	0.072	2.796	2.260	0.060	2.320	7.707	0.202	7.909
	Piper J-3 Cub	GASEPF	0.090	0.002	0.093	0.090	0.002	0.093	0.075	0.002	0.077	0.256	0.007	0.262
	PA24	GASEPV	0.110	0.003	0.113	0.110	0.003	0.113	0.092	0.002	0.094	0.312	0.008	0.321
	PA28	GASEPF	10.687	0.276	10.963	10.696	0.282	10.978	8.874	0.234	9.108	30.256	0.791	31.048
	PA32	GASEPV	1.752	0.045	1.797	1.753	0.046	1.800	1.455	0.038	1.493	4.960	0.130	5.090
	Socata TB20 Trinidad	GASEPV	0.020	0.001	0.021	0.020	0.001	0.021	0.017	0.000	0.017	0.057	0.001	0.058
Twin-Engine Piston			1.942	0.125	2.067	1.981	0.128	2.109	0.330	0.021	0.351	4.253	0.274	4.528
	Beech 58	BEC58P	0.393	0.025	0.418	0.401	0.026	0.427	0.067	0.004	0.071	0.861	0.056	0.916
	Beech 65 Queen Air	BEC58P	0.015	0.001	0.016	0.016	0.001	0.017	0.003	0.000	0.003	0.034	0.002	0.036
	Beech 76	BEC58P	0.015	0.001	0.016	0.016	0.001	0.017	0.003	0.000	0.003	0.034	0.002	0.036
	Beech 95	BEC58P	0.100	0.006	0.107	0.102	0.007	0.109	0.017	0.001	0.018	0.219	0.014	0.234
	Beech E-55	BEC58P	0.038	0.002	0.041	0.039	0.003	0.042	0.007	0.000	0.007	0.084	0.005	0.090
	Cessna 310	BEC58P	0.116	0.007	0.123	0.118	0.008	0.125	0.020	0.001	0.021	0.253	0.016	0.269
	Cessna 337	BEC58P	0.447	0.029	0.476	0.456	0.029	0.486	0.076	0.005	0.081	0.979	0.063	1.042
	Cessna 340	BEC58P	0.085	0.005	0.090	0.087	0.006	0.092	0.014	0.001	0.015	0.186	0.012	0.198
	Cessna 414	BEC58P	0.131	0.008	0.140	0.134	0.009	0.142	0.022	0.001	0.024	0.287	0.019	0.306

	Cessna 421	BEC58P	0.015	0.001	0.016	0.016	0.001	0.017	0.003	0.000	0.003	0.034	0.002	0.036
	Diamond Twin Star DA42	PA30	0.038	0.002	0.041	0.039	0.003	0.042	0.007	0.000	0.007	0.084	0.005	0.090
	Piper PA23	BEC58P	0.092	0.006	0.098	0.094	0.006	0.100	0.016	0.001	0.017	0.202	0.013	0.216
	Piper PA30	PA30	0.046	0.003	0.049	0.047	0.003	0.050	0.008	0.001	0.008	0.101	0.007	0.108
	Piper PA31	CNA441	0.100	0.006	0.107	0.102	0.007	0.109	0.017	0.001	0.018	0.219	0.014	0.234
	Piper PA34	BEC58P	0.085	0.005	0.090	0.087	0.006	0.092	0.014	0.001	0.015	0.186	0.012	0.198
	Piper PA44	PA30	0.085	0.005	0.090	0.087	0.006	0.092	0.014	0.001	0.015	0.186	0.012	0.198
	Piper PA46	CNA441	0.139	0.009	0.148	0.141	0.009	0.151	0.024	0.002	0.025	0.304	0.020	0.323
Turbo Prop			0.275	0.018	0.292	0.280	0.018	0.298	0.047	0.003	0.050	0.602	0.039	0.641
	BE20 - Beech 200 Super King	DHC6	0.010	0.001	0.010	0.010	0.001	0.011	0.002	0.000	0.002	0.021	0.001	0.023
	BE30 - Raytheon 300 Super King Air	DHC6	0.006	0.000	0.007	0.007	0.000	0.007	0.001	0.000	0.001	0.014	0.001	0.015
	BE9L - Beech King Air 90	DHC6	0.036	0.002	0.038	0.036	0.002	0.039	0.006	0.000	0.006	0.078	0.005	0.083
	C208 - Cessna 208 Caravan	CNA208	0.048	0.003	0.052	0.049	0.003	0.053	0.008	0.001	0.009	0.106	0.007	0.113
	C425 - Cessna 425 Corsair	CNA441	0.006	0.000	0.007	0.007	0.000	0.007	0.001	0.000	0.001	0.014	0.001	0.015
	C441 - Cessna Conquest	CNA441	0.055	0.004	0.058	0.056	0.004	0.060	0.009	0.001	0.010	0.120	0.008	0.128
	P46T - Piper Malibu Meridian	CNA441	0.048	0.003	0.052	0.049	0.003	0.053	0.008	0.001	0.009	0.106	0.007	0.113
	PC12 - Pilatus PC-12	CNA208	0.039	0.003	0.041	0.040	0.003	0.042	0.007	0.000	0.007	0.085	0.005	0.090
	SW3 - Fairchild Swearingen SA-226T/TB Merlin 3	DHC6	0.006	0.000	0.007	0.007	0.000	0.007	0.001	0.000	0.001	0.014	0.001	0.015
	TBM7 - Socata TBM-7	CNA208	0.013	0.001	0.014	0.013	0.001	0.014	0.002	0.000	0.002	0.028	0.002	0.030
	TBM9 - Socata TBM	CNA208	0.006	0.000	0.007	0.007	0.000	0.007	0.001	0.000	0.001	0.014	0.001	0.015
TOTAL			37.690	1.192	38.882	37.763	1.214	38.977	28.866	0.825	29.691	104.319	3.230	107.549

*Touch-and-go operations in this table were manually doubled to depict 2 operations modeled per touch-and-go
*Totals may not add due to rounding

Crystal Airport
Table 3 - 2025 No Action Average Daily Operations

Aircraft Type	Model	AEDT Model Used	Departures			Arrivals			Touch and Gos			Total Operations		
			Day	Night	Total	Day	Night	Total	Day	Night	Total	Day	Night	Total
Helicopter			1.876	0.183	2.059	1.877	0.183	2.060	0.694	0.068	0.762	4.448	0.433	4.881
	Agusta SPA A109	A109	1.794	0.175	1.968	1.795	0.175	1.969	0.663	0.065	0.728	4.252	0.414	4.665
	Bell 407	B407	0.068	0.007	0.074	0.068	0.007	0.074	0.025	0.002	0.027	0.161	0.016	0.176
	EuroCopter 145	B222	0.015	0.001	0.016	0.015	0.001	0.016	0.006	0.001	0.006	0.036	0.003	0.039
Business Jet			0.010	0.000	0.010	0.010	0.000	0.010	0.000	0.000	0.000	0.019	0.000	0.019
	Cessna C501	CNA500	0.002	0.000	0.002	0.002	0.000	0.002	0.000	0.000	0.000	0.005	0.000	0.005
	Cessna Citiation jet 525	CNA500	0.002	0.000	0.002	0.002	0.000	0.002	0.000	0.000	0.000	0.005	0.000	0.005
	Eclipse 500	ECLIPSE500	0.005	0.000	0.005	0.005	0.000	0.005	0.000	0.000	0.000	0.010	0.000	0.010
Single-Engine Piston			33.486	0.887	34.373	33.575	0.890	34.465	27.856	0.738	28.594	94.917	2.515	97.432
	American Champion	CNA172	0.010	0.000	0.010	0.010	0.000	0.010	0.008	0.000	0.009	0.028	0.001	0.029
	Vans RV6	GASEPV	0.362	0.010	0.371	0.363	0.010	0.372	0.301	0.008	0.309	1.026	0.027	1.053
	Vans RV7	GASEPV	1.015	0.027	1.042	1.018	0.027	1.045	0.845	0.022	0.867	2.878	0.076	2.954
	Vans RV8	GASEPV	0.157	0.004	0.162	0.158	0.004	0.162	0.131	0.003	0.134	0.446	0.012	0.458
	Vans RV9	GASEPV	0.020	0.001	0.021	0.020	0.001	0.021	0.017	0.000	0.017	0.057	0.002	0.058
	Vans RV12	GASEPV	0.003	0.000	0.003	0.003	0.000	0.003	0.002	0.000	0.002	0.008	0.000	0.008
	Beech 24 Musketeer	GASEPV	0.037	0.001	0.038	0.037	0.001	0.038	0.031	0.001	0.031	0.104	0.003	0.107
	Beech 35 Bonanza	CNA208	0.868	0.023	0.891	0.870	0.023	0.893	0.722	0.019	0.741	2.460	0.065	2.525
	Beech 36 Bonanza	CNA208	1.588	0.042	1.630	1.592	0.042	1.635	1.321	0.035	1.356	4.502	0.119	4.621
	Beech 77 Skipper	GASEPF	0.010	0.000	0.010	0.010	0.000	0.010	0.008	0.000	0.009	0.028	0.001	0.029
	Beechcraft T-34 Mentor	T34	0.151	0.004	0.155	0.151	0.004	0.155	0.125	0.003	0.129	0.427	0.011	0.439
	Bellanca Viking BL17	GASEPV	0.027	0.001	0.028	0.027	0.001	0.028	0.022	0.001	0.023	0.076	0.002	0.078
	Cessna 140	GASEPF	0.057	0.002	0.058	0.057	0.002	0.059	0.047	0.001	0.049	0.161	0.004	0.166
	Cessna 150	GASEPF	0.057	0.002	0.058	0.057	0.002	0.059	0.047	0.001	0.049	0.161	0.004	0.166
	Cessna 152	GASEPF	0.017	0.000	0.017	0.017	0.000	0.017	0.014	0.000	0.014	0.047	0.001	0.049
	Cessna 172	CNA172	6.965	0.184	7.149	6.983	0.185	7.168	5.794	0.154	5.947	19.741	0.523	20.264
	Cessna 177	CNA172	0.288	0.008	0.296	0.289	0.008	0.297	0.240	0.006	0.246	0.817	0.022	0.838
	Cessna 180	CAN182	0.405	0.011	0.416	0.407	0.011	0.417	0.337	0.009	0.346	1.149	0.030	1.180
	Cessna 182	CAN182	1.756	0.046	1.802	1.760	0.047	1.807	1.461	0.039	1.499	4.977	0.132	5.109
	Cessna 185	CAN182	0.563	0.015	0.578	0.564	0.015	0.579	0.468	0.012	0.481	1.596	0.042	1.638
	Cessna 206	GASEPV	0.204	0.005	0.210	0.205	0.005	0.210	0.170	0.005	0.175	0.579	0.015	0.595
	Cessna 210	GASEPV	0.090	0.002	0.093	0.091	0.002	0.093	0.075	0.002	0.077	0.256	0.007	0.263
	Cessna 182 Turbo	CNA20T	0.824	0.022	0.846	0.826	0.022	0.848	0.686	0.018	0.704	2.336	0.062	2.398
	Cessna 210 Turbo	CNA20T	0.090	0.002	0.093	0.091	0.002	0.093	0.075	0.002	0.077	0.256	0.007	0.263
	Cirrus 20/22	COMSEP	1.843	0.049	1.892	1.848	0.049	1.897	1.533	0.041	1.574	5.224	0.138	5.362
	Cirrus SR22 T	COMSEP	0.044	0.001	0.045	0.044	0.001	0.045	0.036	0.001	0.037	0.123	0.003	0.127
	Diamond DA40	GASEPV	0.030	0.001	0.031	0.030	0.001	0.031	0.025	0.001	0.026	0.085	0.002	0.088
	Experimental (GASEPV)	GASEPV	0.164	0.004	0.169	0.165	0.004	0.169	0.137	0.004	0.140	0.465	0.012	0.478
	Grumman AA5A	GASEPF	0.442	0.012	0.454	0.443	0.012	0.455	0.368	0.010	0.378	1.254	0.033	1.287
	Maule M7	M7235c	0.044	0.001	0.045	0.044	0.001	0.045	0.036	0.001	0.037	0.123	0.003	0.127
	Mooney M20	GASEPV	2.728	0.072	2.800	2.735	0.072	2.807	2.269	0.060	2.329	7.731	0.205	7.936
	Piper J-3 Cub	GASEPF	0.090	0.002	0.093	0.091	0.002	0.093	0.075	0.002	0.077	0.256	0.007	0.263
	PA24	GASEPV	0.111	0.003	0.114	0.111	0.003	0.114	0.092	0.002	0.094	0.313	0.008	0.322
	PA28	GASEPF	10.650	0.282	10.932	10.678	0.283	10.961	8.859	0.235	9.094	30.187	0.800	30.987
	PA32	GASEPV	1.756	0.046	1.802	1.760	0.047	1.807	1.461	0.039	1.499	4.977	0.132	5.109
	Socata TB20 Trinidad	GASEPV	0.020	0.001	0.021	0.020	0.001	0.021	0.017	0.000	0.017	0.057	0.002	0.058
Twin-Engine Piston			1.852	0.119	1.971	1.852	0.119	1.971	0.309	0.020	0.328	4.012	0.259	4.271
	Beech 58	BEC58P	0.375	0.024	0.399	0.375	0.024	0.399	0.062	0.004	0.066	0.812	0.052	0.864
	Beech 65 Queen Air	BEC58P	0.015	0.001	0.016	0.015	0.001	0.016	0.002	0.000	0.003	0.032	0.002	0.034
	Beech 76	BEC58P	0.015	0.001	0.016	0.015	0.001	0.016	0.002	0.000	0.003	0.032	0.002	0.034
	Beech 95	BEC58P	0.096	0.006	0.102	0.096	0.006	0.102	0.016	0.001	0.017	0.207	0.013	0.220
	Beech E-55	BEC58P	0.037	0.002	0.039	0.037	0.002	0.039	0.006	0.000	0.007	0.079	0.005	0.085
	Cessna 310	BEC58P	0.110	0.007	0.117	0.110	0.007	0.117	0.018	0.001	0.020	0.239	0.015	0.254
	Cessna 337	BEC58P	0.426	0.028	0.454	0.426	0.028	0.454	0.071	0.005	0.076	0.924	0.060	0.983
	Cessna 340	BEC58P	0.081	0.005	0.086	0.081	0.005	0.086	0.013	0.001	0.014	0.175	0.011	0.187
	Cessna 414	BEC58P	0.125	0.008	0.133	0.125	0.008	0.133	0.021	0.001	0.022	0.271	0.017	0.288
	Cessna 421	BEC58P	0.015	0.001	0.016	0.015	0.001	0.016	0.002	0.000	0.003	0.032	0.002	0.034
	Diamond Twin Star DA42	PA30	0.037	0.002	0.039	0.037	0.002	0.039	0.006	0.000	0.007	0.079	0.005	0.085
	Piper PA23	BEC58P	0.088	0.006	0.094	0.088	0.006	0.094	0.015	0.001	0.016	0.191	0.012	0.203
	Piper PA30	PA30	0.044	0.003	0.047	0.044	0.003	0.047	0.007	0.000	0.008	0.095	0.006	0.102
	Piper PA31	CNA441	0.096	0.006	0.102	0.096	0.006	0.102	0.016	0.001	0.017	0.207	0.013	0.220
	Piper PA34	BEC58P	0.081	0.005	0.086	0.081	0.005	0.086	0.013	0.001	0.014	0.175	0.011	0.187
	Piper PA44	PA30	0.081	0.005	0.086	0.081	0.005	0.086	0.013	0.001	0.014	0.175	0.011	0.187

	Piper PA46	CNA441	0.132	0.009	0.141	0.132	0.009	0.141	0.022	0.001	0.023	0.286	0.018	0.305
Turbo Prop			0.135	0.009	0.144	0.135	0.009	0.144	0.023	0.001	0.024	0.293	0.019	0.312
	BE20 - Beech 200 Super King	DHC6	0.005	0.000	0.005	0.005	0.000	0.005	0.001	0.000	0.001	0.010	0.001	0.011
	BE30 - Raytheon 300 Super King Air	DHC6	0.003	0.000	0.003	0.003	0.000	0.003	0.001	0.000	0.001	0.007	0.000	0.007
	BE9L - Beech King Air 90	DHC6	0.018	0.001	0.019	0.018	0.001	0.019	0.003	0.000	0.003	0.038	0.002	0.040
	C208 - Cessna 208 Caravan	CNA208	0.024	0.002	0.025	0.024	0.002	0.025	0.004	0.000	0.004	0.052	0.003	0.055
	C425 - Cessna 425 Corsair	CNA441	0.003	0.000	0.003	0.003	0.000	0.003	0.001	0.000	0.001	0.007	0.000	0.007
	C441 - Cessna Conquest	CNA441	0.027	0.002	0.029	0.027	0.002	0.029	0.005	0.000	0.005	0.059	0.004	0.062
	P46T - Piper Malibu Meridian	CNA441	0.024	0.002	0.025	0.024	0.002	0.025	0.004	0.000	0.004	0.052	0.003	0.055
	PC12 - Pilatus PC-12	CNA208	0.019	0.001	0.020	0.019	0.001	0.020	0.003	0.000	0.003	0.041	0.003	0.044
	SW3 - Fairchild Swearingen SA-226T/TB Merlin 3	DHC6	0.003	0.000	0.003	0.003	0.000	0.003	0.001	0.000	0.001	0.007	0.000	0.007
	TBM7 - Socata TBM-7	CNA208	0.006	0.000	0.007	0.006	0.000	0.007	0.001	0.000	0.001	0.014	0.001	0.015
	TBM9 - Socata TBM	CNA208	0.003	0.000	0.003	0.003	0.000	0.003	0.001	0.000	0.001	0.007	0.000	0.007
TOTAL			37.360	1.197	38.557	37.449	1.201	38.650	28.881	0.827	29.708	103.690	3.225	106.916

*Touch-and-go operations in this table were manually doubled to depict 2 operations modeled per touch-and-go
*Totals may not add due to rounding

Table 4: Baseline Condition & 2025 No-Action Alternative - Runway Utilizatior

		Arrivals			Departures			Touch and Gos		
Aircraft Group	**Rwy**	**Day**	**Night**	**Total**	**Day**	**Night**	**Total**	**Day**	**Night**	**Total**
Helicopter	14L	27.66%	27.66%	27.66%	26.87%	26.87%	26.87%	27.66%	27.66%	27.66%
	14R	6.38%	6.38%	6.38%	11.98%	11.98%	11.98%	6.38%	6.38%	6.38%
	24L	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	24R	5.67%	5.67%	5.67%	7.02%	7.02%	7.02%	5.67%	5.67%	5.67%
	32L	15.25%	15.25%	15.25%	26.86%	26.86%	26.86%	15.25%	15.25%	15.25%
	32R	39.01%	39.01%	39.01%	22.77%	22.77%	22.77%	39.01%	39.01%	39.01%
	6L	6.03%	6.03%	6.03%	4.50%	4.50%	4.50%	6.03%	6.03%	6.03%
	6R	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Single Piston	14L	38.88%	38.88%	38.88%	31.52%	31.52%	31.52%	38.88%	38.88%	38.88%
	14R	3.86%	3.86%	3.86%	8.41%	8.41%	8.41%	3.86%	3.86%	3.86%
	24L	1.21%	1.21%	1.21%	1.10%	1.10%	1.10%	1.21%	1.21%	1.21%
	24R	8.11%	8.11%	8.11%	5.71%	5.71%	5.71%	8.11%	8.11%	8.11%
	32L	5.53%	5.53%	5.53%	17.36%	17.36%	17.36%	5.53%	5.53%	5.53%
	32R	39.45%	39.45%	39.45%	32.61%	32.61%	32.61%	39.45%	39.45%	39.45%
	6L	2.87%	2.87%	2.87%	2.84%	2.84%	2.84%	2.87%	2.87%	2.87%
	6R	0.25%	0.25%	0.25%	0.45%	0.45%	0.45%	0.25%	0.25%	0.25%
Twin Piston	14L	40.91%	40.91%	40.91%	36.54%	36.54%	36.54%	40.91%	40.91%	40.91%
	14R	7.58%	7.58%	7.58%	3.85%	3.85%	3.85%	7.58%	7.58%	7.58%
	24L	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	24R	9.09%	9.09%	9.09%	0.00%	0.00%	0.00%	9.09%	9.09%	9.09%
	32L	12.12%	12.12%	12.12%	26.92%	26.92%	26.92%	12.12%	12.12%	12.12%
	32R	28.78%	28.78%	28.78%	32.69%	32.69%	32.69%	28.78%	28.78%	28.78%
	6L	1.52%	1.52%	1.52%	0.00%	0.00%	0.00%	1.52%	1.52%	1.52%
	6R	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Turboprop	14L	40.91%	40.91%	40.91%	36.54%	36.54%	36.54%	40.91%	40.91%	40.91%
	14R	7.58%	7.58%	7.58%	3.85%	3.85%	3.85%	7.58%	7.58%	7.58%
	24L	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	24R	9.09%	9.09%	9.09%	0.00%	0.00%	0.00%	9.09%	9.09%	9.09%
	32L	12.12%	12.12%	12.12%	26.92%	26.92%	26.92%	12.12%	12.12%	12.12%
	32R	28.78%	28.78%	28.78%	32.69%	32.69%	32.69%	28.78%	28.78%	28.78%
	6L	1.52%	1.52%	1.52%	0.00%	0.00%	0.00%	1.52%	1.52%	1.52%
	6R	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Jet	14L	42.86%	42.86%	42.86%	50.00%	50.00%	50.00%	42.86%	42.86%	42.86%
	14R	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	24L	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	24R	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	32L	14.29%	14.29%	14.29%	0.00%	0.00%	0.00%	14.29%	14.29%	14.29%
	32R	42.86%	42.86%	42.86%	50.00%	50.00%	50.00%	42.86%	42.86%	42.86%
	6L	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	6R	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Note: Totals may not add to 100% due to rounding.

Source: MAC, Mead & Hunt

Table 5: 2025 With Project Condition - Runway Utilization

		Arrivals			Departures			Touch and Gos		
Aircraft Group	**Rwy**	**Day**	**Night**	**Total**	**Day**	**Night**	**Total**	**Day**	**Night**	**Total**
Helicopter	14L	39.00%	39.00%	39.00%	42.00%	42.00%	42.00%	39.00%	39.00%	39.00%
	14R	RUNWAY CLOSED								
	24L	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	24R	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	32L	RUNWAY CLOSED								
	32R	51.00%	51.00%	51.00%	48.00%	48.00%	48.00%	51.00%	51.00%	51.00%
	6L	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%
	6R	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Single Piston	14L	42.50%	42.50%	42.50%	37.00%	37.00%	37.00%	42.50%	42.50%	42.50%
	14R	RUNWAY CLOSED								
	24L	1.00%	1.00%	1.00%	2.00%	2.00%	2.00%	1.00%	1.00%	1.00%
	24R	9.00%	9.00%	9.00%	8.00%	8.00%	8.00%	9.00%	9.00%	9.00%
	32L	RUNWAY CLOSED								
	32R	44.50%	44.50%	44.50%	48.00%	48.00%	48.00%	44.50%	44.50%	44.50%
	6L	2.00%	2.00%	2.00%	3.00%	3.00%	3.00%	2.00%	2.00%	2.00%
	6R	1.00%	1.00%	1.00%	2.00%	2.00%	2.00%	1.00%	1.00%	1.00%
Twin Piston	14L	57.00%	57.00%	57.00%	51.00%	51.00%	51.00%	57.00%	57.00%	57.00%
	14R	RUNWAY CLOSED								
	24L	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	24R	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	32L	RUNWAY CLOSED								
	32R	43.00%	43.00%	43.00%	47.00%	47.00%	47.00%	43.00%	43.00%	43.00%
	6L	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	6R	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Turboprop	14L	57.00%	57.00%	57.00%	51.00%	51.00%	51.00%	57.00%	57.00%	57.00%
	14R	RUNWAY CLOSED								
	24L	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	24R	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	32L	RUNWAY CLOSED								
	32R	43.00%	43.00%	43.00%	47.00%	47.00%	47.00%	43.00%	43.00%	43.00%
	6L	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	6R	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Jet	14L	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%
	14R	RUNWAY CLOSED								
	24L	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	24R	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	32L	RUNWAY CLOSED								
	32R	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%
	6L	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	6R	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Note: Totals may not add to 100% due to rounding.

Source: MAC, Mead & Hunt

Table 6: Baseline Condition & 2025 No-Action Track Utilization

	Arrivals											
Aircraft Group	**14L - Left Turn**	**14L - Straight In**	**14R - Straight in**	**14R - Right Turn**	**24L - Straight in**	**24R - Straight in**	**32L - Straight in**	**32L - Left Turn**	**32R - Straight In**	**32R - Right Turn**	**06L - Straight In**	**06R - Straight In**
Helicopter	17%	83%	39%	61%	0%	100%	23%	77%	42%	58%	100%	0%
Single Piston	29%	71%	74%	26%	100%	100%	26%	74%	36%	64%	100%	100%
Twin Piston	15%	85%	50%	50%	0%	100%	37%	63%	63%	37%	100%	0%
Turboprop	11%	89%	100%	0%	0%	100%	37%	63%	63%	37%	100%	0%
Jet	0%	100%	0%	0%	0%	0%	100%	0%	100%	0%	0%	0%

Note: Totals may not add to 100% due to rounding.

Source: MAC, Mead & Hunt

Table 7: Baseline Condition & 2025 No-Action Track Utilization

	Departures														
Aircraft Group	**14L - Right Turn**	**14L - Left Turn**	**14R - Right Turn**	**14R - Straight Out**	**24L - Left Turn**	**24R - Left Turn**	**24R - Right Turn**	**24R - Straight Out**	**32L - Left Turn**	**32L - Straight Out**	**32R - Left Turn**	**32R - Right Turn**	**32R - Straight Out**	**06L - Straight Out**	**06R - Straight Out**
Helicopter	60%	40%	90%	10%	100%	76%	18%	6%	51%	49%	22%	58%	20%	100%	100%
Single Piston	28%	72%	67%	33%	100%	14%	76%	8%	64%	36%	30%	44%	26%	100%	100%
Twin Piston	21%	79%	50%	50%	100%	0%	0%	0%	36%	64%	47%	24%	29%	100%	100%
Turboprop	21%	79%	50%	50%	100%	0%	0%	0%	36%	64%	47%	24%	29%	100%	100%
Jet	0%	100%	0%	0%	100%	0%	0%	0%	0%	0%	0%	50%	50%	100%	100%

Note: Totals may not add to 100% due to rounding.

Source: MAC, Mead & Hunt

Table 8: 2025 With Project Track Utilization

	Arrivals							
Aircraft Group	**14L - Left Turn**	**14L - Straight In**	**24L - Straight in**	**24R - Straight in**	**32R - Straight In**	**32R - Right Turn**	**06L - Straight In**	**06R - Straight In**
Helicopter	17%	83%	0%	100%	42%	58%	100%	0%
Single Piston	29%	71%	100%	100%	36%	64%	100%	100%
Twin Piston	15%	85%	0%	100%	63%	37%	100%	0%
Turboprop	11%	89%	0%	100%	63%	37%	100%	0%
Jet	0%	100%	0%	0%	100%	0%	0%	0%

Note: Totals may not add to 100% due to rounding.

Source: MAC, Mead & Hunt

Table 9: 2025 With Project Track Utilization

	Departures										
Aircraft Group	**14L - Right Turn**	**14L - Left Turn**	**24L - Left Turn**	**24R - Left Turn**	**24R - Right Turn**	**24R - Straight Out**	**32R - Left Turn**	**32R - Right Turn**	**32R - Straight Out**	**06L - Straight Out**	**06R - Straight Out**
Helicopter	60%	40%	100%	76%	18%	6%	22%	58%	20%	100%	100%
Single Piston	28%	72%	100%	14%	76%	8%	30%	44%	26%	100%	100%
Twin Piston	21%	79%	100%	0%	0%	0%	47%	24%	29%	100%	100%
Turboprop	21%	79%	100%	0%	0%	0%	47%	24%	29%	100%	100%
Jet	0%	100%	100%	0%	0%	0%	0%	50%	50%	100%	100%

Note: Totals may not add to 100% due to rounding.

Source: MAC, Mead & Hunt

Table 10: Day/Night Splits for All Scenarios

	Day	Night
Helicopter	91.10%	8.90%
Single Piston	97.40%	2.60%
Twin Piston	93.90%	6.10%
Turboprop	93.90%	6.10%
Jet	100.00%	0.00%

Note: Totals may not add to 100% due to rounding.

Runway 24L/6R has 100% daytime operations

Source: MAC, Mead & Hunt

U.S. Department
of Transportation
**Federal Aviation
Administration**

Office of Environment and Energy

800 Independence Ave., S.W.
Washington, D.C. 20591

6/26/2018

Joshua Fitzpatrick
Environmental Protection Specialist
Federal Aviation Administration
Minnesota Airports District Office
6020 28th Ave South, Room 102
Minneapolis, MN 55450

Dear Joshua,

The Office of Environment and Energy (AEE) has received the memo from Mead & Hunt on behalf of the Metropolitan Airports Commission (MAC) dated June 11th, referencing the Environmental Assessment for the Crystal Airport (KMIC) in Crystal, MN requesting approval for non-standard AEDT aircraft substitutions.

AEE has reviewed the proposed substitutions and approves all **except** for the Eurocopter 145, Cirrus SR22 Turbo.

- The twin engine Eurcopter 145 has a MTOW of approx. 7,900lbs and is therefore better mapped to the twin engine Bell 222 with a MTOW of 7,800lbs
- AEDT includes as standard input, the Cirrus SR22 with the turbocharged Lycoming TIO-540-J2B2 engine

Also, please note that for AEDT the designation of the ANP aircraft type alone is not sufficient for making a valid aircraft type selection in the model. Appropriate airframe, ANP and BADA designations, as well as engine designation in some instances, are required for noise modeling purposes.

The table included below provides reference to appropriate AEDT aircraft types for each of the requested substitutions.

Proposed			FAA AEE Approved Substitution				
Aircraft Group	Aircraft Type	Suggested	AEDT EQUIP_ID	AEDT Airframe	AEDT Engine	AEDT ANP	AEDT BADA
HEL	EuroCopter 145	Bell 206	**3805**	**Bell 222**	**TPE331-1**	**B222**	**P28A**
SEP	American Champion (Scout)	CNA172	1260	Aviat Husky A1B	IO-360-B	CNA172	TB21
SEP	Vans RV 6/7/8/9/12	GASEPV	1898	Mooney M20-K	TSIO-360C	GASEPV	TB21
SEP	Beech 24 Musketeer	GASEPV	1898	Mooney M20-K	TSIO-360C	GASEPV	TB21
SEP	Beech 35 Bonanza	CNA208	1276	Raytheon Beech Bonanza 36	TIO-540-J2B2	CNA208	TBM8
SEP	Beech 77 Skipper	GASEPF	1882	Cessna 150 Series	O-200	GASEPF	C172
SEP	Bellanca Viking	GASEPV	1898	Mooney M20-K	TSIO-360C	GASEPV	TB21
SEP	Cessna 140	GASEPF	1882	Cessna 150 Series	O-200	GASEPF	C172
SEP	Cessna 152	GASEPF	1882	Cessna 150 Series	O-200	GASEPF	C172
SEP	Cessna 177	CNA172	1261	Cessna 172 Skyhawk	IO-360-B	CNA172	C172
SEP	Cessna 180	CNA182	1262	Cessna 182	IO-360-B	CNA182	C182
SEP	Cessna 185	CNA182	1262	Cessna 182	IO-360-B	CNA182	C182
SEP	Cessna 182 Turbo	CNA20T	3171	Cessna 206	TIO-540-J2B2	CNA20T	PA27
SEP	Cessna 210 Turbo	CNA20T	3171	Cessna 206	TIO-540-J2B2	CNA20T	PA27
SEP	Cirrus SR22 Turbo	CNA20T	**1325**	**Cirrus SR22**	**TIO-540-J2B2**	**COMSEP**	**SR22**
SEP	Diamond DA40	GASEPV	1898	Mooney M20-K	TSIO-360C	GASEPV	TB21
SEP	Grumman AA5A	GASEPF	2102	Piper PA-28 Cherokee Series	IO-360-B	GASEPF	P28A
SEP	Piper J-3 Cub	GASEPF	1882	Cessna 150 Series	O-200	GASEPF	C172
TEP	Beech 65 Queen Air	BEC58P	1196	Raytheon Beech Baron 58	TIO-540-J2B2	BEC58P	BE58
TEP	Beech 75	BEC58P	1196	Raytheon Beech Baron 58	TIO-540-J2B2	BEC58P	BE58
TEP	Beech 95	BEC58P	1196	Raytheon Beech Baron 58	TIO-540-J2B2	BEC58P	BE58
TEP	Beech E-55	BEC58P	1196	Raytheon Beech Baron 58	TIO-540-J2B2	BEC58P	BE58
TEP	Diamond Twin Star DA42	PA30	2104	Piper PA-30 Twin Comanche	IO-320-D1AD	PA30	BE58
TEP	Piper PA44	PA30	2104	Piper PA-30 Twin Comanche	IO-320-D1AD	PA30	BE58
STP	Socata TBM-9	CNA208	1533	EADS Socata TBM-700	PT6A-64	CNA208	TBM8

Please understand that this approval is limited to this particular Environmental Assessment for Crystal Airport and for use with AEDT 2d only. Further non-standard AEDT inputs for additional projects at this or any other site will require separate approval.

Sincerely,

Rebecca Cointin
Manager
AEE-100/Noise Division

cc: Airports Contacts (Jim Byers, Frank Smigelski APP-400)

Mead & Hunt, Inc.
M & H Architecture, Inc.
7900 West 78th Street, Suite 370
Minneapolis, Minnesota 55439
952-941-5619
meadhunt.com

June 11, 2018

Joshua Fitzpatrick, Environmental Protection Specialist
FAA Dakota-Minnesota Airports District Office, MSP-ADO-600
6020 28th Avenue South, Room 102
Minneapolis, MN 55450

CC to:
Sean Doyle, Environmental Protection Specialist AEE-100
FAA Office of Environment and Energy
800 Independence Avenue SW
Washington, DC 20591

Subject: Crystal Airport
Environmental Assessment Request for AEDT Non-Standard Aircraft Substitutions

Dear Josh,

We are writing to request a recommendation from the Federal Aviation Administration (FAA) for substitution aircraft noise profiles to represent aircraft types for which the Aviation Environmental Design Tool (AEDT) does not identify a standard substitution aircraft noise profile.

Environmental Assessment – Background
Mead & Hunt is conducting an Environmental Assessment (EA) for airfield improvements at Crystal Airport in Crystal, Minnesota, on behalf of the Metropolitan Airports Commission (MAC). The proposed project would convert portions of primary Runway 14L/32R blast pads to usable runway for a total published length of 3,750 feet with declared distances; decommission Runway 14R/32L; and reduce the length of existing turf Runway 06R/24L from 2,123 feet to 1,669 feet. The design aircraft for all runways at Crystal Airport are small aircraft with fewer than 10 passenger seats and weighing less than 12,500 pounds.

Noise Modeling – Proposed Grouping
Based on the MAC's flight track system data, we have identified the aircraft types in the table on the next page that operate at the Airport but are not available in the AEDT. We respectfully request that FAA AEE provide recommended substitutions for these aircraft types for the purposes of generating the noise contours for the EA at Crystal Airport.

Helicopters NOT In AEDT	**Suggested Aircraft Noise Profile ID**
EuroCopter 145	Bell 206
Single Engine Piston NOT In AEDT	
American Champion	CNA172
Vans RV 6/7/8/9/12	GASEPV
Beech 24 Musketeer	GASEPV
Beech 35 Bonanza	CNA208
Beech 77 Skipper	GASEPF
Bellanca Viking	GASEPV
Cessna 140	GASEPF
Cessna 152	GASEPF
Cessna 177	CNA172
Cessna 180	CNA182
Cessna 185	CNA182
Cessna 182 Turbo	CNA20T
Cessna 210 Turbo	CNA20T
Cirrus SR22 Turbo	CNA20T
Diamond DA40	GASEPV
Grumman AA5A	GASEPF
Piper J-3 Cub	GASEPF
Twin Engine Piston NOT in AEDT	
Beech 65 Queen Air	BEC58P
Beech 75	BEC58P
Beech 95	BEC58P
Beech E-55	BEC58P
Diamond Twin Star DA42	PA30
Piper PA44	PA30
Single Engine Turboprop NOT in AEDT	
Socata TBM-9	CNA208

Thank you for your assistance. Please let me know if you require any additional information.

Sincerely,

Mead & Hunt, Inc.

Evan Barrett, AICP
Aviation Planner