# WILLOW RUN AIRPORT
# 2017 MASTER PLAN UPDATE



DETROIT METRO ▪ WILLOW RUN
WAYNE COUNTY AIRPORT AUTHORITY

Mead & Hunt

JUNE 2017

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Chapter 1

# Inventory of Existing Conditions

One of the initial tasks in the preparation of an airport master plan is the collection of information on the condition of existing facilities and services. This inventory of data is necessary to not only evaluate the physical attributes of airside and landside infrastructure, but also to complete subsequent study tasks, such as demand/capacity analyses and the determination of facility requirements. Information collected focuses on the use, size, quantity, type, area, operational intent, and other characteristics of the airside and landside components of an airport. Typical categories of information that are collected include history, physical infrastructure, regional setting, surrounding land uses, environmental features, historical aviation activity, business affairs, and socioeconomic demographics of the surrounding community. This Inventory chapter reviews all existing airfield and landside facilities that are part of Willow Run Airport (Airport).

Several sources of information were referenced to provide a thorough background and inventory of the Airport. These include, but were not limited to, the previous Airport Master Plan, the Integrated Airport Land Use Strategic Plan, Pavement Condition Report, and the Airport website. In addition, historical Airport data, aircraft operations, based aircraft, cargo, and parking data were obtained from the Federal Aviation Administration (FAA) databases and Airport records.

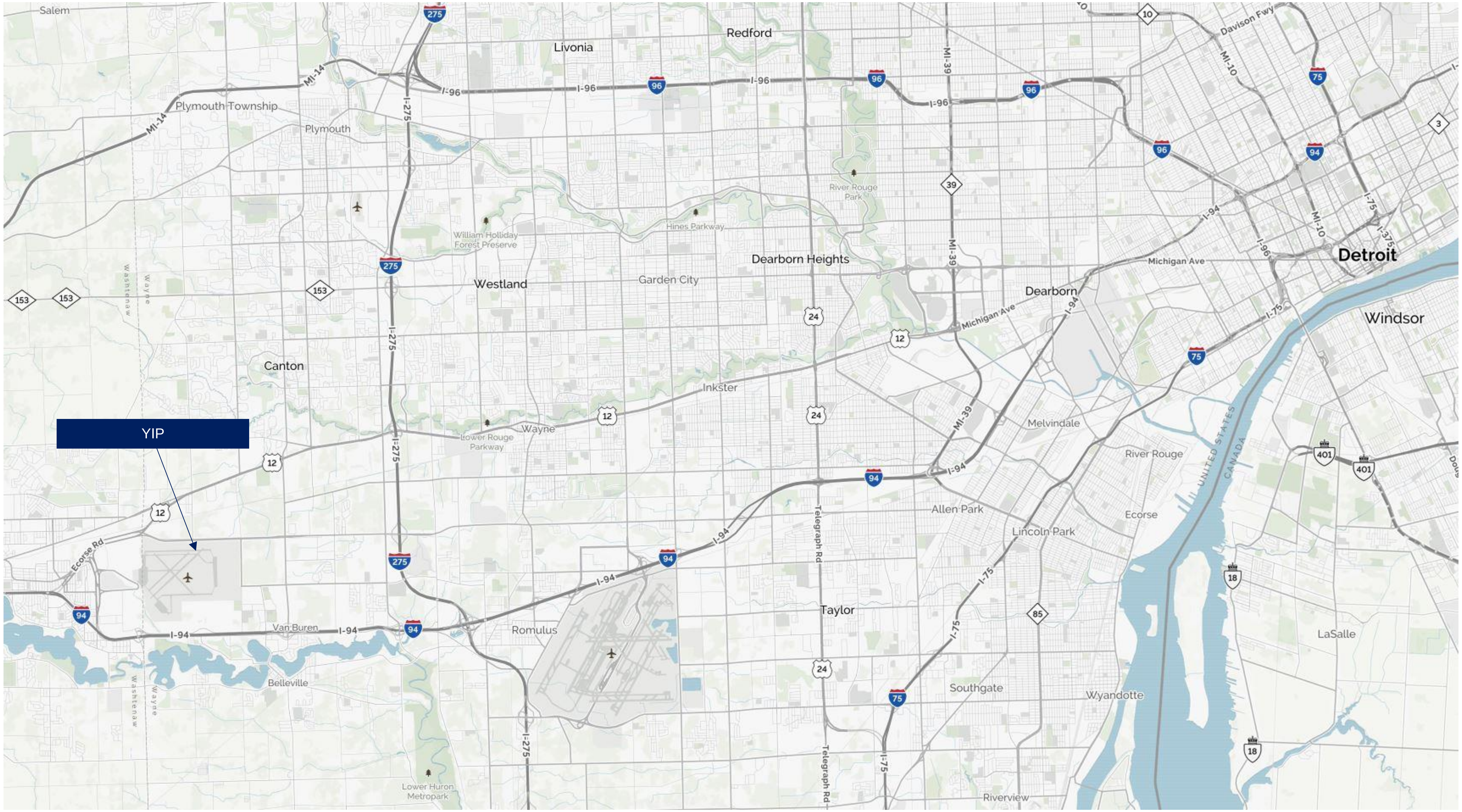
This chapter is organized by the following sections:



## 1.1 Background

Willow Run Airport is operated and managed by the Wayne County Airport Authority (WCAA or Authority) who also operates and manages the Detroit Metropolitan Wayne County Airport (DTW). The Airport straddles Wayne County and Washtenaw County and is located 30 miles west of downtown Detroit and seven miles west of DTW. **Figure 1-1 – Airport Regional Map** depicts the location of the Airport within the Metro Detroit Area.

Airport Regional Map




Source: MapQuest Imagery

Figure 1-1

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Originating in 1941 during World War II, the Airport was the primary commercial and passenger airport serving the Detroit area. With the jet age came a need for the airlines to have more space and larger facilities to accommodate the newer aircraft. As a result, airline services dwindled from the Airport and shifted towards DTW. Today, all scheduled passenger airline service occurs at DTW with the Airport serving an integral role as one of the areas primary general aviation (GA) and cargo airports.

Today, the Airport serves as a national reliever and cargo facility airport for Southeast Michigan. It has three runways and a limited taxiway system (i.e.; not all runways have parallel taxiways). Occupying 2,600 acres, the Airport serves cargo, corporate and GA clients. The Airport offers FAA Tower and U.S. Customs operations to provide ease of access for its users. The Airport has handled on average approximately 200,000,000 lbs. of cargo annually over the last five years. Airport-based carriers transport a wide range of cargo, including high-value automotive and electronic components, emergency medical supplies, mail, and packages.

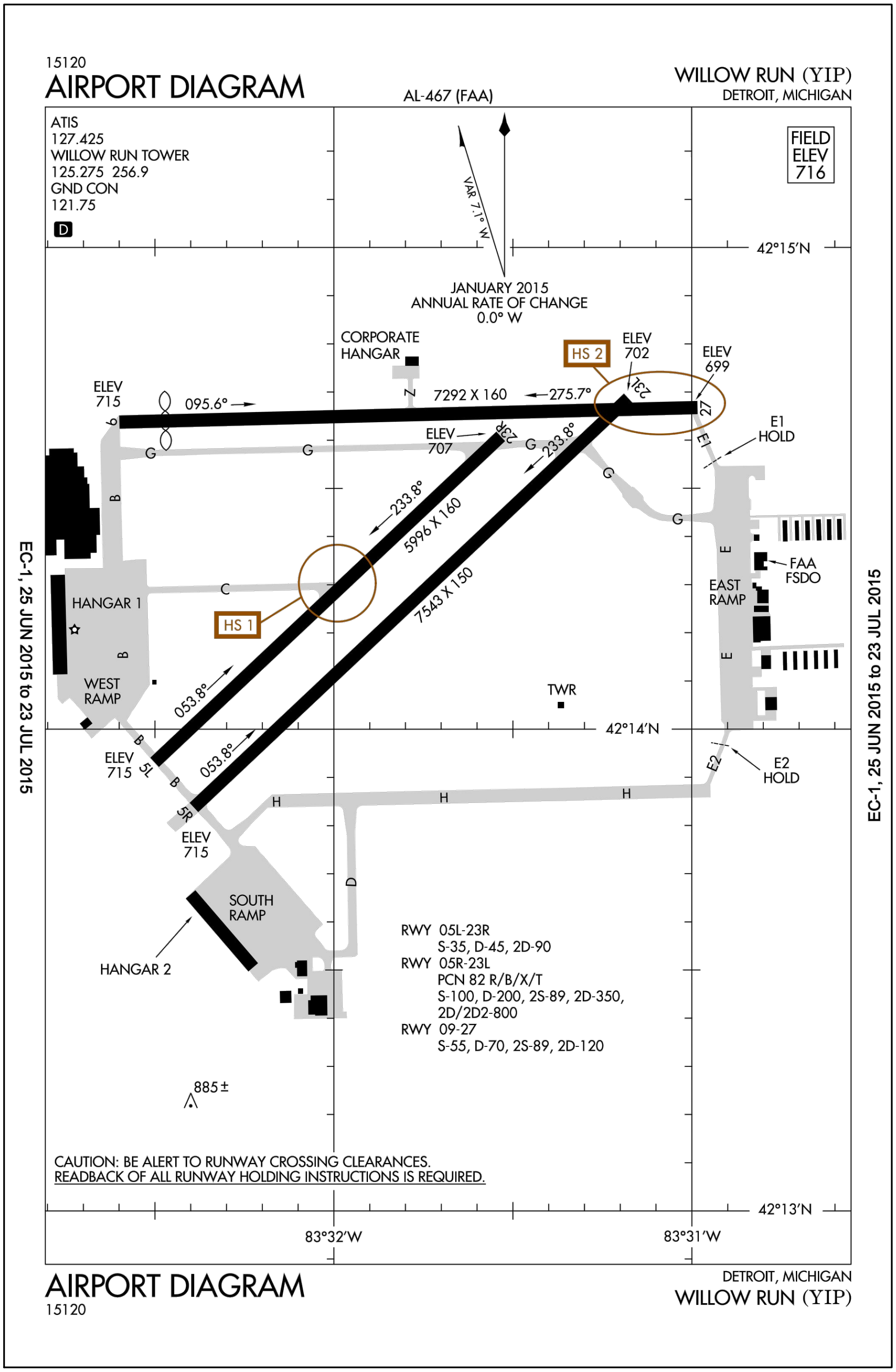
## 1.2 Existing Airfield Conditions

The airfield existing conditions include the runway, taxiway, airfield lighting, visual aid, and navigational aid components of the Airport. This section also includes pavement assessment data, meteorological conditions, as well as an overview of the regional airspace.

### 1.2.1 Runways

The existing airfield configuration, illustrated in **Figure 1-2 – Airport Diagram**, consists of three runways: one crosswind runway, Runway 9-27, and two parallel runways, Runway 5L-23R and Runway 5R-23L. The pavement surfaces consist of two asphalt runways (5L-23R and 9-27) and one newly reconstructed concrete runway (5R-23L). **Table 1-1 – Runway Specifications** contains additional key dimensions and capabilities for each of the three runways.

## Airport Diagram




Source: Federal Aviation Administration

Figure 1-2

**Table 1-1 – Runway Specifications**

| | **5L** | **23R** | **5R** | **23L** | **9** | **27** |
|---|---|---|---|---|---|---|
| **Length/Width** | 5,996'/160' | | 7,543'/150' | | 7,292'/160' | |
| **Displaced Threshold** | N/A | | N/A | | 576' | N/A |
| **Pavement Strength** | S-35<br>D-45<br>2D-90 | | S-100<br>D-200<br>2S-89<br>2D-350<br>2D/2D2-800 | | S-55<br>D-70<br>2S-89<br>2D-120 | |
| **Pavement** | Asphalt | | Concrete | | Asphalt | |
| **Runway Lighting** | MIRL | MIRL | HIRL, CL, MALSR, TDZ | HIRL, CL, MALSR, | MIRL | MIRL |
| **Navigational Aids** | N/A | | LOC/GS | LOC/GS | N/A | |
| **Visual Aids** | PAPI | PAPI | N/A | PAPI | PAPI | N/A |

Source: Federal Aviation Administration

## 1.2.2 Taxiways

The taxiway system, as illustrated in **Figure 1-2 – Airport Diagram,** provides aircraft access between the runways and aprons across the Airport. The current taxiway system does not provide full length parallel taxiways to the primary Runways 5L and 5R, with Taxiway G running the full length of Runway 9-27 in an atypical manner (not parallel and void of runway exit points). The Airport also has two hot-spot locations. The FAA defines hot spots as locations on an airport movement area with a history of potential risk of collision or runway incursion, and where heightened attention by pilots and drivers is necessary. The Airport has a hot spot on Runway 5L-23R at the intersection of taxiway Charlie and another hot spot at the approach ends of Runway 27 and Runway 23L. **Table 1-2 – Taxiway Specifications** contains width information on each of the taxiways at the Airport.

**Table 1-2 – Taxiway Specifications**

| Taxiway/Taxilane | Width |
|---|---|
| Bravo | 80' |
| Charlie | 80' |
| Delta | 75' |
| Echo | 50' |
| Echo 1 | 50' |
| Echo 2 | 50' |
| Golf | 75' |
| Hotel | 160' |
| Zulu | 50' |

Source: Federal Aviation Administration

### 1.2.3 Pavement Condition

Pavement condition is categorized using a metric called Pavement Condition Index (PCI), which identifies pavement surface conditions using various factors. The factors used vary from the pavement's structural integrity to surface traction, capacity, and roughness. The PCI scale ranges from a value of 0 (pavement failure conditions) to a value of 100 (pavement with excellent condition). With over twelve million square feet of pavement and three runways at the Airport serving cargo, corporate, and GA clients; pavement is critical to the airfield and its infrastructure. Many of the Airport's facilities were originally built before America's entry into World War II, and the pavements have not undergone major reconstruction. Thus, pavement at the Airport is generally in poor condition, except for areas that were recently reconstructed and brought up to current FAA standards. The most deteriorated areas of the Airport are the aprons and Runway 9-27.

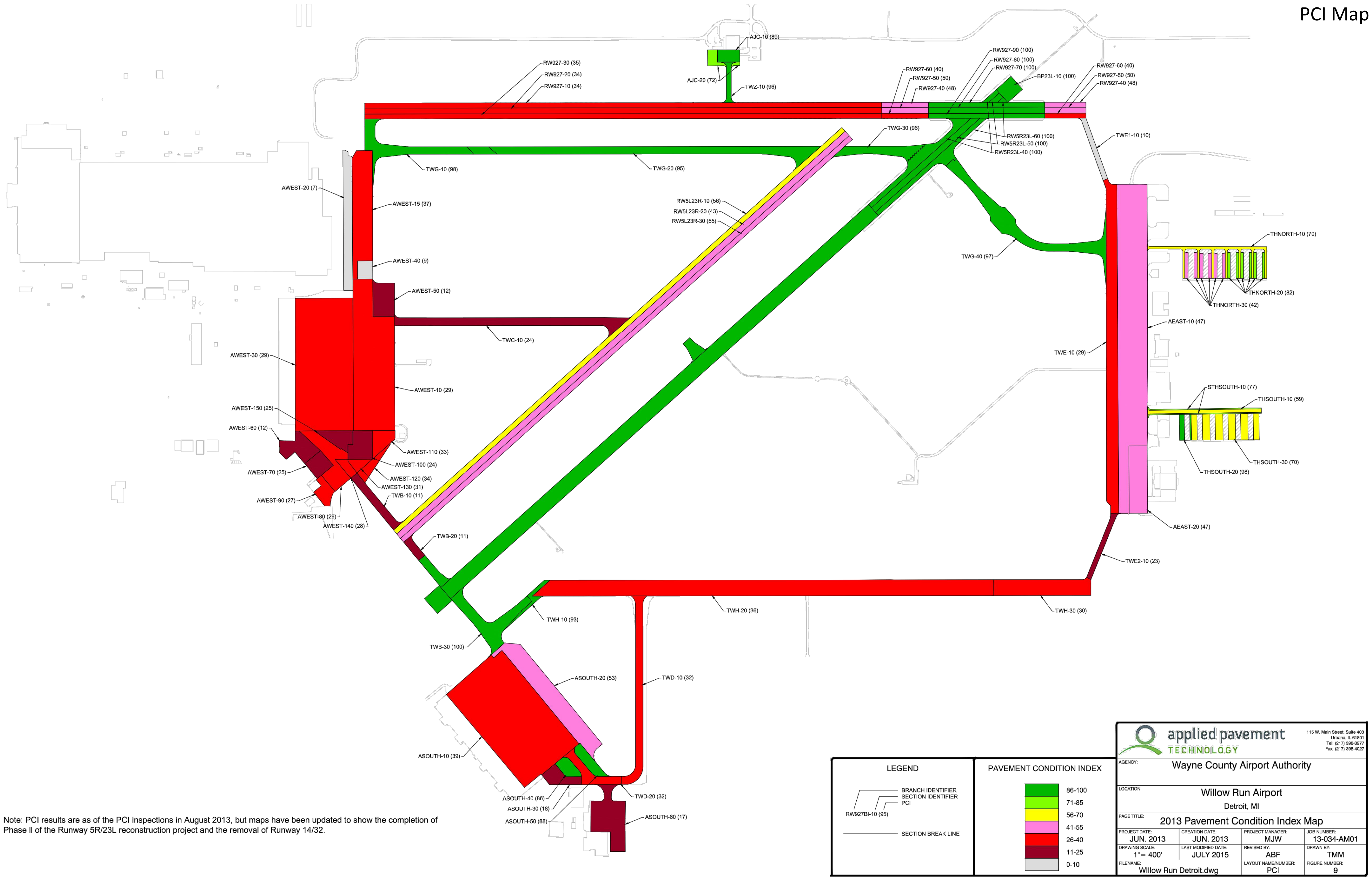
A PCI map, created by Applied Pavement Technology (APTech), is included as **Figure 1-3 – PCI Map.** The results reflect an assessment conducted in June of 2013. The map is color coded based on the pavement evaluation and reflects pavement conditions at the time of the assessment. **Table 1-3 – PCI Rating Scale,** which was used in the study shows standard PCI numbers and the type of maintenance that is recommended to be, or typically is, done. According to APTech, pavements with PCIs above 70 are candidates for routine maintenance and restorative activities. Pavement with PCIs between 40 and 70 are more likely to be candidates for major rehabilitation activities (such as structural overlays), and pavements with PCIs below 40 are most likely candidates for reconstruction. Although there have been several pavement removals and pavement reconstruction efforts following the assessment (Runway 14-32 removal and Runway 5R-23L pavement reconstruction), it is clear from the map that the Airport generally exhibits poor pavement conditions.

**Table 1-3 – PCI Rating Scale**

| PCI | Rating | Recommended/Typical Repair Type |
|---|---|---|
| 100-86 | Good | Preventative Maintenance |
| 85-71 | Satisfactory | |
| 70-56 | Fair | Major Rehabilitation |
| 55-41 | Poor | |
| 40-26 | Very Poor | Reconstruction |
| 25-11 | Serious | |
| 10-0 | Failed | |

Source: Applied Pavement Technology (APTech)

# PCI Map




Note: PCI results are as of the PCI inspections in August 2013, but maps have been updated to show the completion of Phase II of the Runway 5R/23L reconstruction project and the removal of Runway 14/32.

Source: Applied Pavement Technology

Figure 1-3

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### 1.2.4 Meteorological Conditions

The air traffic control procedures and runway operating configurations rely heavily on wind and weather conditions. Wind and weather also play a vital role in airfield capacity and landing and departing limitations for pilots. Southeast Michigan is home to vast array of different meteorological events, from snow during winter months to heavy rain and thunderstorms in the summer months. Based on an analysis of wind data generated through the FAA's Wind Analysis Tools, the Airport has at least 95 percent coverage at the Airport for all three runways combined in an all-weather type scenario. **Table 1-4 – Runway Wind Coverage** shows the wind coverage percentage for each of the four crosswind components evaluated by the FAA. The table also provides separate coverage percentages for only the crosswind Runway 9-27, for only the parallel Runways 5R-23L/5L-23R and coverage with all runways.

**Table 1-4 – Runway Wind Coverage**

| Wind Coverage – All Weather | | | |
|---|---|---|---|
| | **RWY 9-27** | **RWY 5R-23L & 5L-23R** | **Combined** |
| **10.5 Knots** | 89.53% | 89.80% | 96.02% |
| **13 Knots** | 94.77% | 94.31% | 98.42% |
| **16 Knots** | 98.58% | 98.20% | 99.62% |
| **20 Knots** | 99.76% | 99.59% | 99.95% |

Source: Federal Aviation Administration AGIS Database

### 1.2.5 Regional Aeronautical Environment

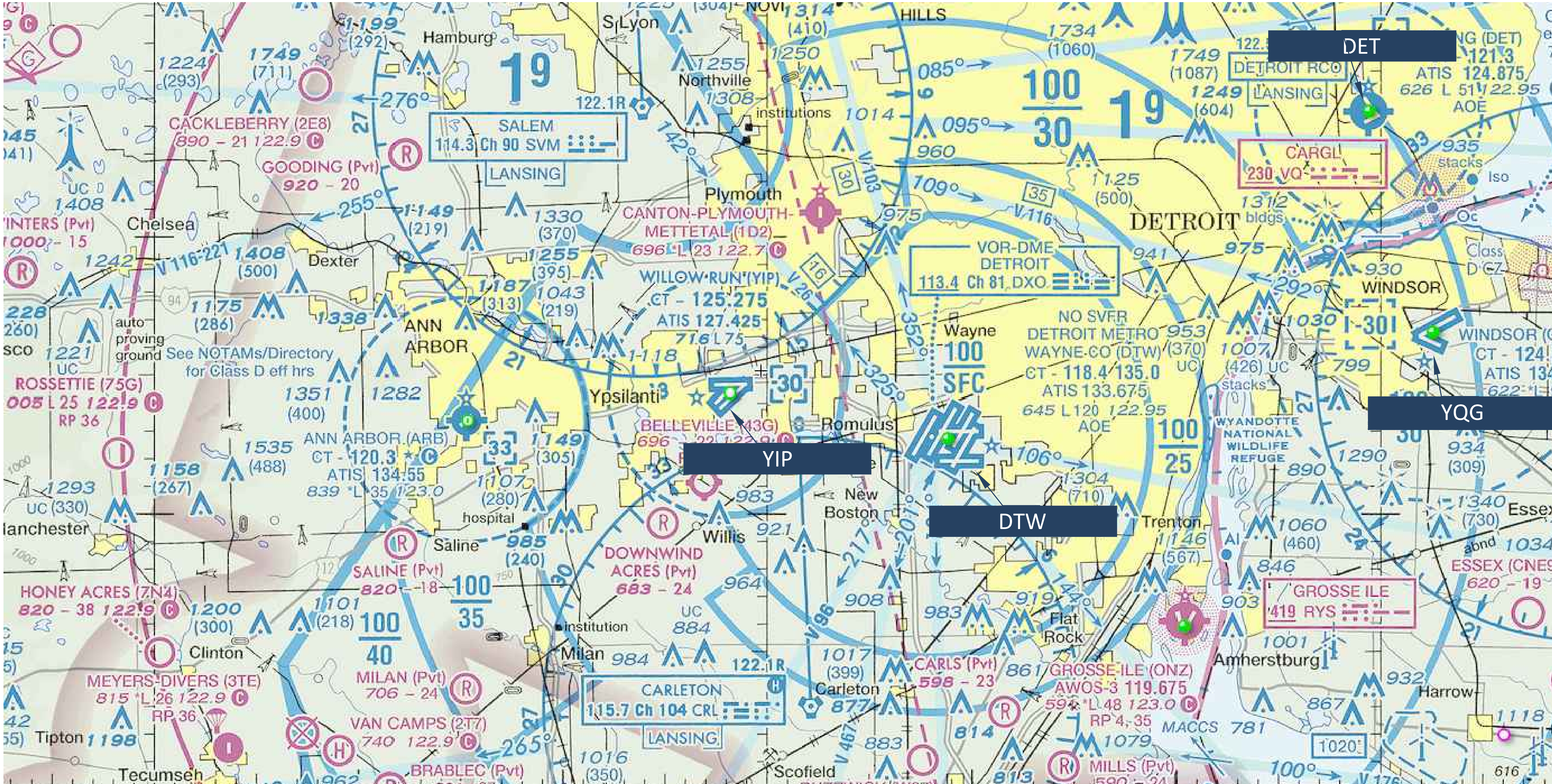
Many airports share the Detroit regional airspace, as shown in **Figure 1-4 – Detroit Region Sectional**. DTW, Toledo Express (TOL), Detroit City Airport (DET), Oakland County International (PTK), Flint (FNT), and Windsor Airport (YQG) are additional major airports within the Southeast Michigan region. These airports handle multiple types of operations from commercial air service to GA.

The Airport is protected by Class D airspace and is near DTW's Class B airspace. The Airport's Class D airspace extends from the surface up to but not including 3,000 feet Mean Sea Level (MSL), the DTW Class B airspace extends from the top of Class D up to and including 10,000 MSL. Since the Airport is near DTW Class B airspace, all traffic into the Airport must be closely monitored and coordinated to ensure proper separation is maintained. Both airspaces are controlled by an operational Airport Traffic Control Tower (ATCT).

Approach procedures at the Airport provide pilots with necessary information to safely and efficiently land at the Airport. Approach procedures are beneficial in times of low visibility due to weather and in high traffic areas to minimize confusion and maximize separation of aircraft landing not only at the same airport, but also at surrounding airports. The FAA has developed eight instrument approach procedures to meet the needs of Airport and surrounding airspace, which are summarized below.

- VOR A – All Runways
- ILS or LOC RWY 5R
- ILS or LOC RWY 23L
- RNAV (GPS) – RWY 5L
- RNAV (GPS) – RWY 5R
- RNAV (GPS) – RWY 9
- RNAV (GPS) – RWY 23L
- RNAV (GPS) – RWY 23R

Detroit Region Sectional




Source: SkyVector Detroit Sectional Map

Figure 1-4

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## 1.3 Existing Land Use – Airport Property

Land uses surrounding the Airport are a key component to be reviewed to identify areas where expansion opportunities are present or issues may arise. Land uses surrounding the Airport include a mix of industrial, commercial, residential, and agricultural. Industrial and commercial areas are primarily west of the Airport. Agricultural fields exist on all sides of the Airport but are primarily located south of the Airport and to the north. Due to its location between the two growing metropolitan areas of Ann Arbor to the west and Detroit to the east, residential areas exist on all sides of the Airport in both small and large blocks. **Figure 1-5 – Land Use** shows the Airport and the surrounding land uses.

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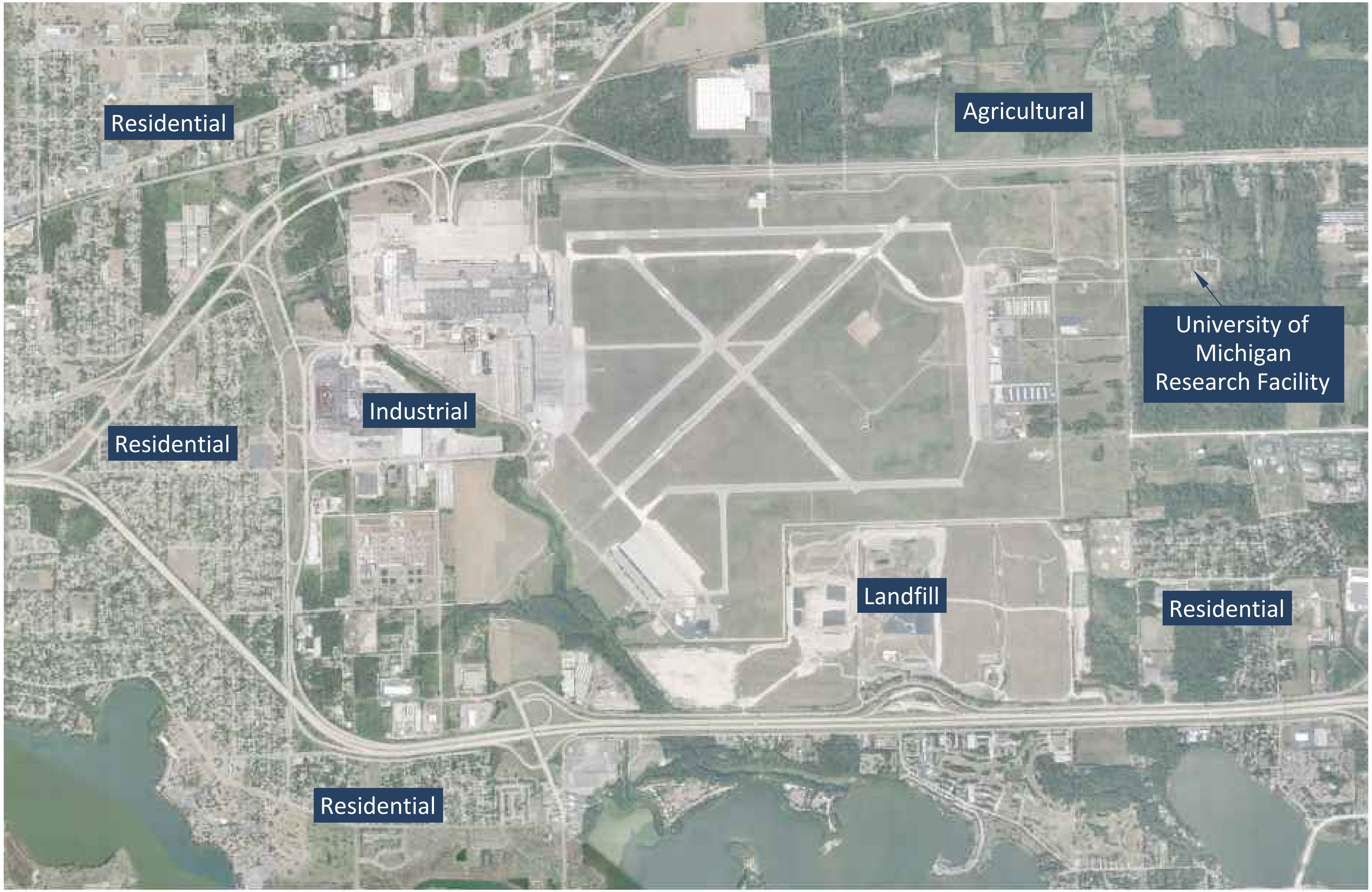
Land Use




Source: Google Earth Imagery

Figure 1-5

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## 1.4 General Aviation Facilities

Due to its expansive runways and open space, the Airport has served as one of Southeast Michigan's primary airports for GA users for the past several decades. In 2014, there were 190 based aircraft at the Airport that range from single-engine to jet aircraft. Additionally, the Airport also has three based helicopters. As a result, the Airport offers a full complement of services to support GA operations, including Fixed Based Operators (FBO), flight schools, hangars, buildings, and aprons.

There are currently two FBOs, AvFlight and Active Aero Service, Inc., operating at three locations at the Airport. Active Aero Service, Inc. and AvFlight East are located on the East Ramp; AvFlight West is located on the West Ramp. Each of these FBO locations provides full service to its customers, including aircraft fueling, food service, and rental cars.

Eagle Flight Center is a pilot training and flight school located at the Airport. The Flight school is affiliated with nearby Eastern Michigan University, which provides flight training for students aspiring to become pilots and for other aviation industry professionals. Eagle Flight is located on the West Ramp south of Hangar 1 and north of the WCAA Maintenance Facility.

A variety of hangars at the Airport are used by based and itinerant aircraft for recreational, cargo, and business flying purposes. WCAA owns and operates the largest hangar at the Airport, Hangar 1, having approximately 156,000 square feet of space for both offices and aircraft. Hangar 1 is located on the West Ramp. In addition to Hangar 1, the Black Eagle and Bird Cage T-Hangars offer more than 130 T-Hangar Bays for rent to GA aircraft on the east side of the Airport.

**Table 1-5 – Airport Tenants (West/South Ramps)** provides a list of all the tenants who currently utilize each Facility. **Figure 1-6 – West/South Ramps** depicts the locations of the facilities/tenants on the West Ramp. **Table 1-6 – Airport Tenants (East/North Ramp)** provides a tenant list for both the East Ramp and North Ramp. **Figure 1-7 – East Ramp** and **Figure 1-8 – North Ramp** depicts location information for each.

### Table 1-5 – Airport Tenants (West/South Ramps)

| West and South Ramp Tenants | | |
|---|---|---|
| **Tenant** | **Location** | **Category** |
| Ameristar Jet Center | Hangar 1 | Cargo |
| AvFlight Willow Run West | Hangar 1 | FBO |
| Baltia Airlines | Hangar 1 | Cargo |
| Eagle Flight Center | West Ramp | Flight Training |
| Flagship Private Air | Hangar 1 | General Aviation |
| Kalitta Air | South Ramp | Cargo |
| Kalitta Charter | South Ramp | Cargo |
| M2 Aircraft Management | Hangar 1 | Cargo |
| Mead & Hunt | Hangar 1 | Airport Planner |
| RS&H | Hangar 1 | Airport Planner |
| Specialize Global Logistics Services | Hangar 1 | Cargo |
| U.S Customs and Border Protection | Hangar 1 | Government |
| Visible Ink | Hangar 1 | Publications |
| Willow Run Airport Administration | Hangar 1 | Airport Support |
| Yankee Air Museum | Hangar 1 | Museum |

Source: Willow Run Airport Directory

### Table 1-6 – Airport Tenants (East/North Ramps)

| North and East Ramp Tenants | | |
|---|---|---|
| **Tenant** | **Location** | **Category** |
| Active Aero Service Inc. | East Ramp | FBO |
| Active Aero/USA Jet | East Ramp | FBO |
| AvFlight East | East Ramp | FBO |
| Bird Cage T-Hangars | East Ramp | General Aviation |
| Black Eagle T-Hangars | East Ramp | General Aviation |
| Buzzard Air Service | East Ramp | Flight Training |
| FAA Airways Facility Field Office | East Ramp | Government |
| FAA Flight Standards District Office | East Ramp | Government |
| Hantz Air Hangar | North Ramp | Corporate |
| Yankee Air Museum | East Ramp | Museum |

Source: Willow Run Airport Directory

West/South Ramps


Source: Google Earth Imagery

Figure 1-6

East Ramp


Source: Google Earth Imagery

Figure 1-7

North Ramp


Source: Google Earth Imagery

Figure 1-8

## 1.5 Support Facilities

Support facilities include the various operations at an airport that support the airfield and its tenants. **Figure 1-9 – Airport Support Facilities** shows the location for each of the identified support facilities:

- Aircraft Rescue and Fire Fighting (ARFF)
- Airport Snow Removal and Maintenance Equipment
- Fuel
- Utilities

### 1.5.1 Airport Rescue and Fire Fighting (ARFF)

The ARFF facility is located immediately east of the West Ramp, as shown in **Figure 1-9 – Airport Support Facilities**. The ARFF facility and operations support FAR Part 139 Index Group A. The FAR Part 139 index determination is based on the largest group aircraft that serves the Airport with an average of five or more daily departures. The Airport currently maintains the requirements and equipment for Index Group A, as classified in FAR Part 139. The ARFF facility is an approximately 3,000-square-foot building that consists of equipment bays and office spaces. The Airport owns two fire/crash units; a 2007 Oshkosh Striker, and a 1998 E-1 HPR. In addition to the fire/crash units, the ARFF also has a 2004 Chevrolet 1500 pick-up truck.

### 1.5.2 Airport Snow Removal and Maintenance

The Airport's snow removal and maintenance equipment facilities are located on the northeast side of the Airport's property, south of Hangar 1 and west of Taxiway Bravo as shown in **Figure 1-9 – Airport Support Facilities**.

### 1.5.3 Fuel Services

Fuel at the Airport is stored in above ground storage tanks. The WCAA fuel farm contains tanks for Jet A and 100 low lead (LL) fuel types. It is located immediately south of the South Ramp. All aircraft requiring Jet-A fueling (with the exception of Kalitta) are handled by FBOs through tank trucks. Aircraft requiring 100LL are fueled by one of two options, either through an FBO by tank trucks, or by utilizing self-service pumps located on the East Ramp. A summary for the fuel facilities is provided in **Table 1-7 – Fuel Storage**. Fuel tank locations are shown in **Figure 1-9 – Airport Support Facilities.** A summary of annual fuel flowage from 2010 to 2015 is provided in **Table 1-8 – Fuel Flowage.**

**Table 1-7 – Fuel Storage**

| Fuel Storage | | | |
|---|---|---|---|
| **Tenant/Responsible Party** | **Fuel Type** | **Capacity (Gallons) *** | **Storage Type** |
| WCAA Fuel Storage | 100LL | 30,000 Tank | Above Ground Tank |
| WCAA Fuel Storage | Jet A | (6) 50,000 Tank | Above Ground Tank |

Source: Wayne County Airport Authority
*Capacity values are approximate.

**Table 1-8 – Fuel Flowage**

| | Fuel Flowage (Gallons) | |
|---|---|---|
| **Fiscal Year** | **Jet A** | **100 LL** |
| **2010** | 8,464,052 | 171,181 |
| **2011** | 7,724,735 | 146,705 |
| **2012** | 6,939,892 | 135,023 |
| **2013** | 5,586,601 | 127,768 |
| **2014** | 6,166,391 | 140,841 |
| **2015** | 6,245,914 | 125,268 |

Source: Wayne County Airport Authority

Airport Support Facilities


Source: Google Earth Imagery

Figure 1-9

### 1.5.4 Utilities

#### 1.5.4.a Water and Sewer
Water and sewer for the Airport are provided by Wayne County and the Ypsilanti Community Utilities Authority (YCUA) respectively. There are two underground municipal water line systems that exist around Airport property. These two systems serve the Airport together, with each being able to serve all facilities independently. There are two main sanitary sewer subsystems, each serving separate areas of the Airport.

#### 1.5.4.b Gas and Electric
Primary power is provided by DTE Energy to each facility, with dedicated feeds for airfield facilities and equipment.

#### 1.5.4.c Storm Water Drainage
The WCAA has an existing agreement with the Michigan Department of Environmental Quality (MDEQ) for its storm water drainage. The permit allows the Airport to dispose of wastewater in accordance with state and federal regulations. Based on a recent study for WCAA's Airport Land Use Strategic Plan, Airport generated storm water is directed to off-airport surface drainage in three general discharge locations. Most storm water is collected on the Airport and directed southwest to outfall structures, adjacent to Runway 5R, which feed into Willow Creek. A small portion of the airfield drains northeast into the Horner drain ditch, just northeast of Runway 23, and a similar portion of Airport property drains southeast in the Begole drain ditch. The rest of the eastern portion of the Airport property drains northwest in the Hanshaw drain ditch.

## 1.6 Airport Access/ Parking

### 1.6.1 Airport Access
There are two primary entrance and exit roadways to the Airport, Beck Road on the east side of the Airport and Wiard Road on the west side. These primary entrance roadways are accessible from Interstate 94 on the south side and US 12/Ecorse Road on the north side. In addition to the primary access roadways, there is a public service road that traverses the southern boundary of the Airport and allows easy access between the west and east sides without having to go around the north side. **Figure 1-10 – Ground Access** outlines the roadway access system for the Airport and roads in the surrounding vicinity.

### 1.6.2 Parking
There are several parking lots at Airport associated with the various facilities. Hangar 1 has adjacent parking available for its tenants and visitors. In addition to the parking available by Hangar 1, there are also several small lots adjacent to the GA facilities, including two FBO's (Active Aero and AvFlight East/West) and the FAA facility.

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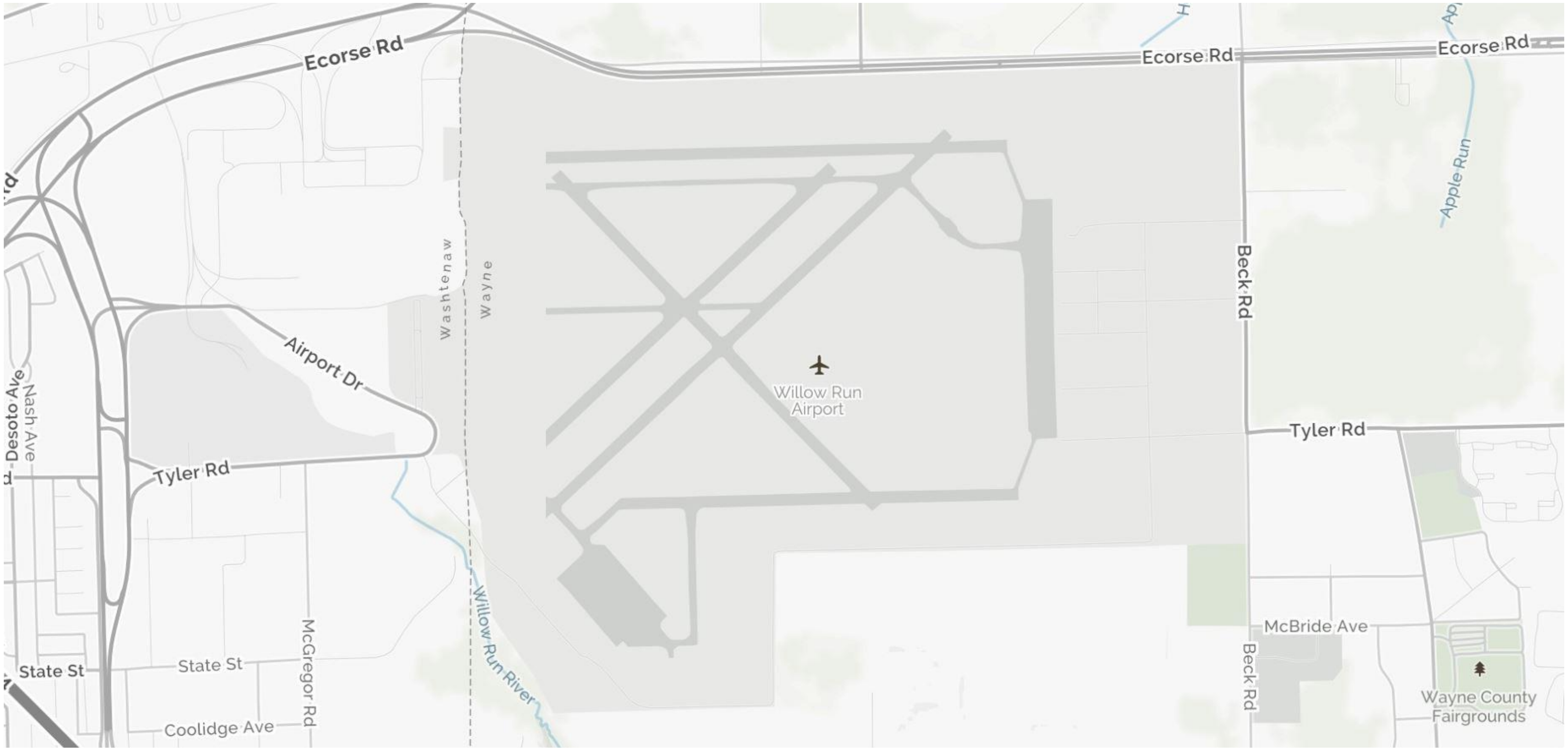


Source: MapQuest Imagery

Figure 1-10

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**Chapter 2**

# Aviation Activity Forecasts

Projecting future aviation activity at an airport is one of the most important and vital steps in the master planning process. The forecast of aviation demand at Willow Run Airport (Airport) will serve as the basis for determining future facility requirements throughout the planning period (2014-2040) and will help inform strategic decisions throughout the planning process.

This chapter is organized by the following sections:

## 2.1 Background

This chapter presents the assumptions, methodologies, and historical data used to create the forecast and discusses socioeconomic and other factors that could influence future aviation demand at the Airport. The specific components of aviation activity to be forecasted include:

- **Air Carrier Operations –** Operations conducted by an aircraft originally designed to have more than 60 passenger seats or a cargo payload of more than 18,000 pounds and that carries passengers, cargo, or mail on either a scheduled or charter basis for hire.
- **Air Taxi/Commuter Operations –** Operations conducted by an aircraft originally designed to have no more than 60 passenger seats or a cargo payload of 18,000 pounds or less and that carries passengers, cargo, or mail on either a scheduled or charter basis for hire.
- **General Aviation (GA) Operations –** Civil aviation operations other than air carrier or air taxi operations.
- **Military Aviation Operations** – All operations conducted by military aircraft.
- **Based Aircraft** - The total number of active GA aircraft that use the Airport as their "home base."
- **Recommended Critical Aircraft** – The most demanding aircraft type with more than 500 annual operations at the Airport, excluding touch-and-go operations.

## 2.2 Historical Activity

Historical operations reported by the FAA were used as the baseline data for this forecast. **Table 2-1** shows the historical activity for air carrier, air taxi, itinerant GA, itinerant military, total itinerant, local GA, local military, total local, and total operations from 1990-2014. Within this timeframe, operations at the Airport have varied from 177,774 in 1998 to 64,372 in 2009. Volatility in the local economy, specifically in the automobile industry, was a significant influence on the level of operations at the Airport during that time frame since the auto industry and the economy were in free-fall during 2007-2008 due to the U.S. economic recession. The resulting bankruptcy, and subsequent government bailout of the auto companies had a dramatic effect on the regional economy, which led to the decline in operations at the Airport during this period. By 2010, the auto industry and the Michigan economy had started to stabilize and began a slow recovery; as a result, activity has increased from 64,372 in 2009 to 68,060 in 2014.

## 2.3 Forecasting Methods

Three methods were considered for this forecast: trend analysis, market share analysis, and regressions analysis. Each method was used to estimate the total operations anticipated over the planning horizon and then compared to the other methods to understand the possible range of activity. The approach and results of each method are summarized as follows.

### 2.3.1 Trend Analysis

Trend analysis forecasting utilizes historic trends to project future activity by using a regression equation with time as the independent variable. For this analysis, compound average annual growth rates (CAGR) were used as the trend to project future activity. CAGR for three different historical time frames were analyzed: 1990-2014 (-2.5 percent), 2000-2014 (-5.0 percent), and 2010-2014 (0.27 percent).

**Table 2-1 – Willow Run Airport Historical Operations (1990-2014)**

| Year | Air Carrier | Air Taxi | Itinerant GA | Itinerant Military | Total Itinerant | Local GA | Local Military | Total Local | Total Operations |
|---|---|---|---|---|---|---|---|---|---|
| 1990 | 9,939 | 17,933 | 34,261 | 490 | 62,623 | 64,396 | 394 | 64,790 | 127,413 |
| 1991 | 13,677 | 19,316 | 37,574 | 430 | 70,997 | 80,604 | 869 | 81,473 | 152,470 |
| 1992 | 6,478 | 22,652 | 37,980 | 367 | 67,477 | 69,449 | 1,003 | 70,452 | 137,929 |
| 1993 | 6,960 | 30,871 | 41,991 | 340 | 80,162 | 83,757 | 1,520 | 85,277 | 165,439 |
| 1994 | 10,275 | 42,361 | 33,509 | 362 | 86,507 | 72,575 | 86 | 72,661 | 159,168 |
| 1995 | 10,069 | 40,819 | 36,778 | 479 | 88,145 | 82,922 | 1,474 | 84,396 | 172,541 |
| 1996 | 8,417 | 35,916 | 33,335 | 127 | 77,795 | 64,509 | 610 | 65,119 | 142,914 |
| 1997 | 6,837 | 32,510 | 48,430 | 934 | 88,711 | 67,863 | 712 | 68,575 | 157,286 |
| 1998 | 9,359 | 32,196 | 57,630 | 85 | 99,270 | 78,490 | 14 | 78,504 | 177,774 |
| 1999 | 13,472 | 32,837 | 57,698 | 353 | 104,360 | 63,889 | 633 | 64,522 | 168,882 |
| 2000 | 13,406 | 28,050 | 53,010 | 180 | 94,646 | 52,747 | 16 | 52,763 | 147,409 |
| 2001 | 6,934 | 18,355 | 43,867 | 251 | 69,407 | 43,198 | 8 | 43,206 | 112,613 |
| 2002 | 4,584 | 16,419 | 47,393 | 50 | 68,446 | 49,453 | 22 | 49,475 | 117,921 |
| 2003 | 4,366 | 17,105 | 46,458 | 67 | 67,996 | 45,187 | 31 | 45,218 | 113,214 |
| 2004 | 5,838 | 18,595 | 48,286 | 50 | 72,769 | 42,224 | 24 | 42,248 | 115,017 |
| 2005 | 4,904 | 20,219 | 44,139 | 25 | 69,287 | 37,804 | 17 | 37,821 | 107,108 |
| 2006 | 3,537 | 16,016 | 37,742 | 62 | 57,357 | 31,745 | 37 | 31,782 | 89,139 |
| 2007 | 4,682 | 15,875 | 32,143 | 64 | 52,764 | 26,831 | 26 | 26,857 | 79,621 |
| 2008 | 2,997 | 12,325 | 33,223 | 93 | 48,638 | 34,513 | 119 | 34,632 | 83,270 |
| 2009 | 1,274 | 8,724 | 25,610 | 142 | 35,750 | 28,240 | 382 | 28,622 | 64,372 |
| 2010 | 3,099 | 9,850 | 26,384 | 92 | 39,425 | 27,613 | 107 | 27,720 | 67,145 |
| 2011 | 4,402 | 10,331 | 24,730 | 308 | 39,771 | 26,751 | 753 | 27,504 | 67,275 |
| 2012 | 3,535 | 9,931 | 27,394 | 152 | 41,012 | 33,650 | 30 | 33,680 | 74,692 |
| 2013 | 2,703 | 9,463 | 25,238 | 122 | 37,526 | 30,567 | 92 | 30,659 | 68,185 |
| 2014 | 3,217 | 8,438 | 25,437 | 162 | 37,254 | 30,748 | 58 | 30,806 | 68,060 |
| CAGR 1990-2014 | -4.4% | -3.0% | -1.2% | -4.3% | -2.1% | -2.9% | -7.4% | -2.9% | -2.5% |
| CAGR 2000-2014 | -9.1% | -7.7% | -4.8% | -0.7% | -6.0% | -3.5% | 9.0% | -3.5% | -5.0% |
| CAGR 2010-2014 | 0.8% | -3.0% | -0.7% | 12.0% | -1.1% | 2.2% | -11.5% | 2.1% | 0.3% |

Source: Willow Run FAA Terminal Area Forecast (2015)

Trend analysis of each of these timeframes results in a different estimate of future activity. In the end, the 2010-2014 timeframe represents the most reliable trend because it reflects the most current period of activity, and it does not include the most significant economic recession in recent history or the most devastating event in U.S. aviation history – the attacks of September 11, 2001. Both events caused tremendous disruption to the economy and the aviation industry. As a result, the aviation activity during those periods of instability should be viewed as outliers and would significantly alter any analysis that incorporated them.

Trend analysis results in a formula that represents a sloped line, which is the "trend line" of the data points being considered. The trend line is extended into the future at the same slope with future data points falling along the line. The consultant calculated the trend line based on analysis of the actual data for 2010-2014 and projected that trend line out to 2040. The CAGR between 2010-2014 actual data will not match the CAGR of the trend line for other periods of time because the CAGR is, by definition, compounded, which results in a curved line over time, not straight like the trend line. In addition, because historical operations do not match the historical trend line data, the CAGR calculation using actual data (i.e., 2014) is different than the trend line CAGR when using projected future data. **Figure 2-1** depicts the historical operations and the resulting trend line.

**Figure 2-1 – Total Operations Trend Line**

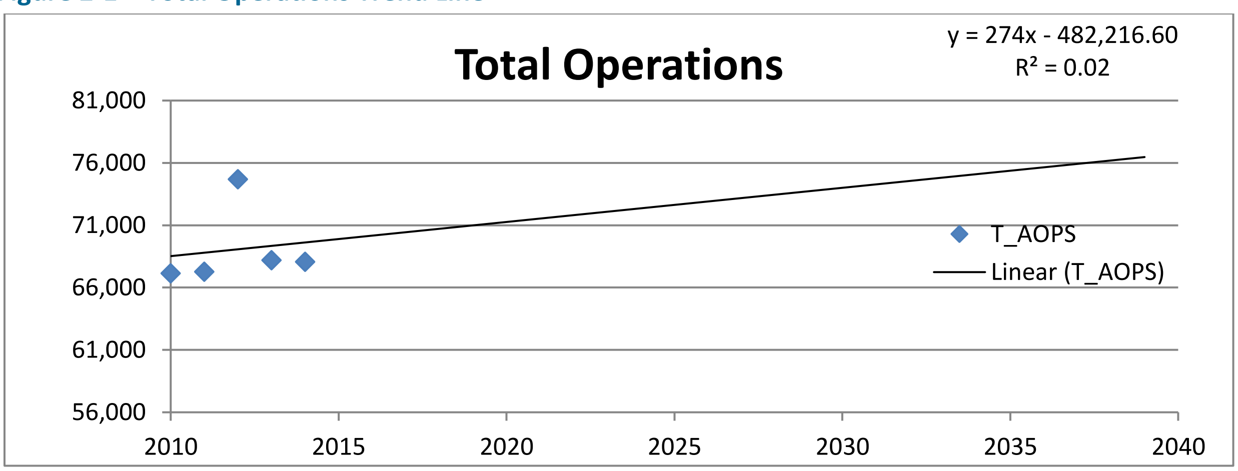


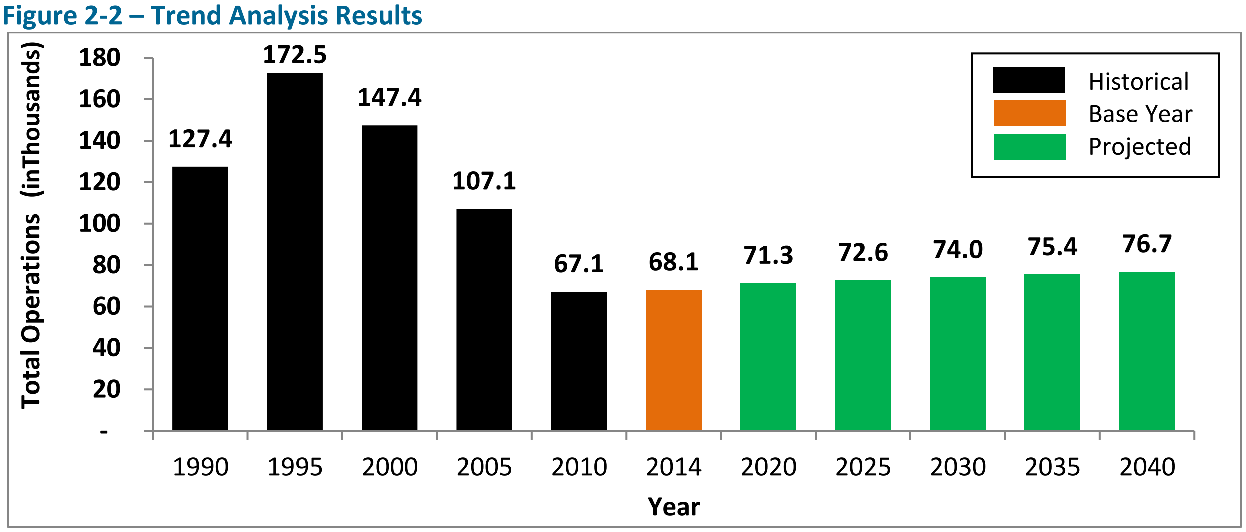

**Table 2-2** and **Figure 2-2** show the results of the trend analysis forecasting method. This method results in total operations of 76,743 in 2040, which equates to a CAGR of 0.46 percent through the 25-year planning period.

**Table 2-2 – Trend Analysis Results (Total Operations)**

| Year | Total Operations |
|---|---|
| 2014 | 68,060 |
| 2020 | 71,263 |
| 2025 | 72,633 |
| 2030 | 74,003 |
| 2035 | 75,373 |
| 2040 | 76,743 |
| ***Compound Annual Growth Rate – Trend Line Analysis (Total Operations)*** | |
| CAGR 2010-2014 | 0.34% |
| CAGR 2014-2020 | 0.77% |
| CAGR 2020-2030 | 0.38% |
| CAGR 2030-2040 | 0.36% |
| CAGR 2014-2040 | 0.46% |

Source: WCAA data and J|D analysis

**Figure 2-2 – Trend Analysis Results**




Source: WCAA data and Jacobsen|Daniels analysis

## 2.3.2 Market Share Analysis

The market share analysis method assumes that the relative share of the overall market, as well as the rate of growth or decline in the market share over time, will continue. This forecasting method is available if a reliable larger aggregate "market" forecast is available. This approach is a "top-down" method of forecasting. In this case, the operations for each aviation activity category at the Airport are considered as a function of the historical operations of each aviation activity category for all airports in the U.S. That resulting market share is then applied against the forecast of future U.S. operations for each aviation activity category to determine the likely operations in the future.

As seen in **Table 2-3** the market share of U.S. operations was determined for three different historical time frames: 1990-2014, 2000-2014, and 2010-2014. Again, each of these market shares results in a different estimate of future activity. Like the trend analysis, it was determined that the 2010-2014 timeframe represents the most reliable historic data because it reflects the most current period of activity and it does not include the most significant economic recession in recent history or the most devastating event in U.S. aviation history – the attacks of September 11, 2001. Both events resulted in tremendous disruption to the economy and the aviation industry. As a result, the aviation activity during those periods of instability should be viewed as outliers and would significantly alter any analysis that incorporated them. The 2010–2014 timeframe includes annual operations levels that reflect the painfully slow economic recovery that is just now beginning to sustain momentum. It is possible that the economic recovery in Michigan could result in more activity at the Airport and, as a result, a slightly higher market share compared to U.S. airports throughout the planning period. In addition, a major runway reconstruction project in 2013 may have impacted operations at the Airport because the loss of the primary runway may have affected operating decisions of the tenants. Nonetheless, the 2010-2014 average market share was considered to be the most appropriate market share from which to project future activity at the Airport.

**Table 2-3 – Willow Run Airport Market Share of U.S. Operations**

| Year | Air Carrier Operations | Air Taxi Operations | Itinerant GA Operations | Local GA Operations | Itinerant Military Operations | Local Military Operations |
|---|---|---|---|---|---|---|
| 2009 | 0.0097% | 0.0710% | 0.0721% | 0.0741% | 0.0039% | 0.0282% |
| 2010 | 0.0239% | 0.0811% | 0.0767% | 0.0750% | 0.0026% | 0.0078% |
| 2011 | 0.0334% | 0.0866% | 0.0732% | 0.0740% | 0.0084% | 0.0543% |
| 2012 | 0.0268% | 0.0850% | 0.0814% | 0.0936% | 0.0044% | 0.0022% |
| 2013 | 0.0206% | 0.0824% | 0.0762% | 0.0856% | 0.0036% | 0.0069% |
| 2014 | 0.0241% | 0.0759% | 0.0771% | 0.0861% | 0.0048% | 0.0044% |
| 2000-2014 | 0.0341% | 0.1083% | 0.0944% | 0.0913% | 0.0034% | 0.0079% |
| 2005-2014 | 0.0256% | 0.0936% | 0.0838% | 0.0810% | 0.0035% | 0.0116% |
| 2010-2014 | 0.0258% | 0.0883% | 0.0839% | 0.0848% | 0.0063% | 0.0174% |

Source: Willow Run FAA Terminal Area Forecast (2015), National FAA Terminal Area Forecast and Jacobsen|Daniels analysis

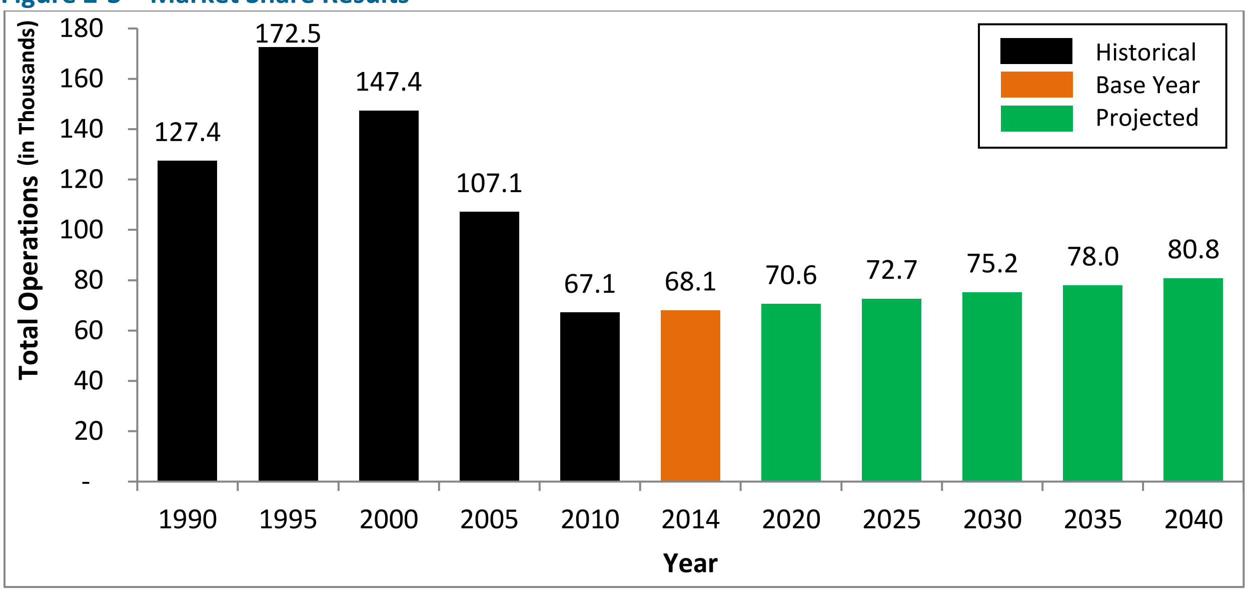
For each category, the average market share between 2010-2014 timeframe was multiplied by the FAA's Terminal Area Forecast (TAF) for all airports to project activity at the Airport. **Table 2-4** and **Figure 2-3** show the results of the market share analysis forecasting method. The resulting CAGR of 0.66 percent throughout the planning period results in total operations of 80,816 through the 25-year planning period.

**Table 2-4 – Market Share Results (Total Operations)**

| Year | Air Carrier Operations | Air Taxi Operations | Itinerant GA Operations | Local GA Operations | Itinerant Military Operations | Local Military Operations | Total Operations |
|---|---|---|---|---|---|---|---|
| 2014 | 3,217 | 8,438 | 25,437 | 30,748 | 162 | 58 | 68,060 |
| 2020 | 4,331 | 8,622 | 28,258 | 31,039 | 213 | 228 | 72,691 |
| 2025 | 5,032 | 7,608 | 28,849 | 31,645 | 213 | 228 | 73,575 |
| 2030 | 5,492 | 7,907 | 29,486 | 32,299 | 213 | 228 | 75,624 |
| 2035 | 5,989 | 8,235 | 30,174 | 33,007 | 213 | 228 | 77,845 |
| 2040 | 6,635 | 8,730 | 31,077 | 33,933 | 213 | 228 | 80,816 |
| CAGR 2014-2020 | 6.13% | 0.43% | 2.13% | 0.19% | 5.61% | 31.44% | 1.33% |
| CAGR 2020-2030 | 2.40% | -0.86% | 0.43% | 0.40% | 0.00% | 0.00% | 0.40% |
| CAGR 2030-2040 | 1.91% | 1.00% | 0.53% | 0.49% | 0.00% | 0.00% | 0.67% |
| CAGR 2014-2040 | 2.82% | 0.13% | 0.77% | 0.38% | 1.06% | 5.40% | 0.66% |

Source: Willow Run FAA Terminal Area Forecast (2015), National FAA Terminal Area Forecast and Jacobsen|Daniels analysis

**Figure 2-3 – Market Share Results**




Source: Willow Run FAA Terminal Area Forecast (2015), National FAA Terminal Area Forecast and Jacobsen|Daniels analysis

### 2.3.3 Regression Analysis

Regression analysis forecasts dependent variables based on their relationship to independent or explanatory variables. The relationship between the dependent and independent variables is established using historic data for both variables and then translating that relationship using a separate forecast of the independent variable. The strength of the relationship between the variables is measured by the $R^2$ statistic (called the coefficient of determination). Only variables with a strong $R^2$ value (i.e., a consistent relationship between each other) are used to project future activity. Complete correlation of the variables would yield an $R^2$ coefficient of 1.

For this analysis, the relationship between operations and socioeconomic variables of population, manufacturing, employment, and per capita income for the Detroit-Warren-Ann Arbor Michigan Combined Statistical Area (CSA) were utilized. The relationship of operations to each of these socioeconomic variables as well as a combination of the variables was evaluated during this analysis, a process referred to as multi-variable regression analysis. The strongest relationship to the historical activity was correlated to a combination of all three socioeconomic variables, not just one of them.

The historic relationship between operations and socioeconomic data were analyzed for the three periods also evaluated for the trend and market share analyses: 1990-2014, 2000-2014, and 2010-2014. In each period, a relationship between operations and at least one socioeconomic variable was established. However, of the three time periods, the regression analysis results using the data from 2010-2014 had the strongest correlation with an overall $R^2$ value of 0.81 and satisfied other statistical criteria typically used in favorable regression analysis (e.g., favorable Significance F and P-Value percentages). **Table 2-5** depicts the $R^2$ values for all aviation activity categories and the variables analyzed.

**Table 2-5 – Regression Analysis Results**

| Variable | Time Period | Air Carrier | Air Taxi | Itinerant GA | Local GA | Itinerant Military | Local Military |
|---|---|---|---|---|---|---|---|
| **Population** | 1990-2014 | 0.0019 | 0.0277 | 0.3905 | 0.0340 | 0.1300 | 0.1806 |
| | 2000-2014 | 0.2822 | 0.7126 | 0.8882 | 0.5832 | 0.1611 | 0.5533 |
| | 2010-2014 | **0.8489** | 0.6755 | 0.0198 | 0.1577 | 0.6700 | 0.7308 |
| **Per Capita Income** | 1990-2014 | 0.5223 | 0.5255 | 0.6991 | 0.4587 | 0.0651 | 0.5258 |
| | 2000-2014 | 0.4737 | 0.8053 | 0.8739 | 0.6552 | 0.0431 | 0.4311 |
| | 2010-2014 | 0.0113 | 0.3564 | 0.0586 | 0.4683 | 0.0143 | 0.0631 |
| **Manufacturing Employment** | 1990-2014 | 0.0008 | 0.0041 | 0.3082 | 0.0701 | 0.1084 | 0.2991 |
| | 2000-2014 | 0.4849 | 0.6923 | 0.6995 | 0.5938 | 0.0347 | 0.6185 |
| | 2010-2014 | 0.0872 | 0.5162 | 0.0093 | 0.3390 | 0.0000 | 0.0963 |
| **Multivariate** (Pop, Per Cap and Emp) | 1990-2014 | 0.8141 | 0.5503 | 0.8171 | 0.7320 | 0.3441 | 0.5405 |
| | 2000-2014 | 0.8592 | 0.8982 | 0.9361 | 0.7497 | 0.4533 | 0.6506 |
| | 2010-2014 | 0.8221 | **0.8164** | **0.9065** | **0.8466** | **0.9035** | **0.9449** |

Source: Jacobsen|Daniels

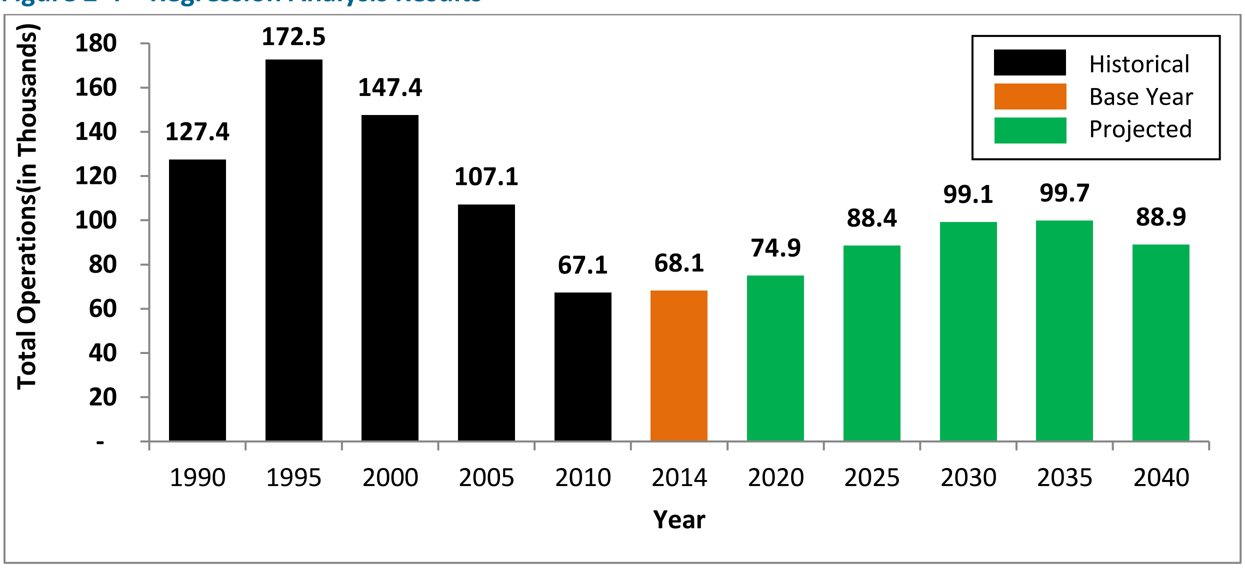
**Table 2-6** and **Figure 2-4** show the results of the regression analysis forecasting method based on independent future projections of population, employment and per capita income for the CSA over the forecasting horizon. The resulting CAGR of 1.07 percent results in total operations of 88,873 through the 25-year planning period.

### Table 2-6 – Regression Analysis Results (Total Operations)

| Year | Total Operations |
|---|---|
| 2014 | 68,060 |
| 2020 | 74,851 |
| 2025 | 88,397 |
| 2030 | 99,062 |
| 2035 | 99,743 |
| 2040 | 88,873 |
| ***Compound Annual Growth Rate – Regression Analysis Results (Total Operations)*** | |
| CAGR 2010-2014 | 0.27% |
| CAGR 2014-2020 | 4.24% |
| CAGR 2020-2030 | 2.84% |
| CAGR 2030-2040 | -1.08% |
| CAGR 2014-2040 | 1.07% |

Source: WCAA data and Jacobsen|Daniels analysis

### Figure 2-4 – Regression Analysis Results




Source: WCAA data and Jacobsen|Daniels analysis

### 2.3.4 Selected Forecasting Method

**Table 2-7** and **Figure 2-5** summarize the results of the three forecasting methods. All three methods resulted in similar activity levels at the end of the forecast period. The market share method was selected to establish the Master Plan Update forecast of projected operations for the following reasons:

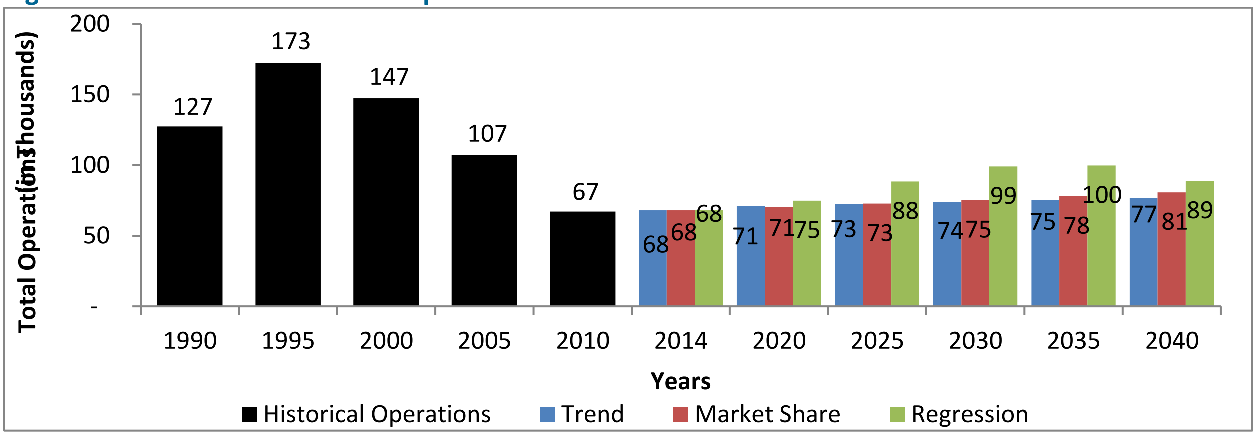
- The historical trend in market share over the past several years is fairly consistent/reliable, especially considering the impacts of the economy and auto industry on Airport operations.
- It is reflective of the Airport's role in the region and the nation, which is anticipated by WCAA to continue.
- It is founded on a reliable larger forecast (FAA TAF).
- It seems to reflect an appropriate level of sophistication for the data compared to the simplistic trend analysis and the complex regression analysis.
- It represents an intermediate middle forecast between the higher (Regression) and the lower (Trend Line) methods.

**Table 2-7 – Forecast Method Comparison**

| Year | Trend | Market Share | Regression |
|---|---|---|---|
| 2014 | 68,060 | 68,060 | 68,060 |
| 2020 | 71,263 | 70,608 | 74,851 |
| 2025 | 72,633 | 72,687 | 88,397 |
| 2030 | 74,003 | 75,228 | 99,062 |
| 2035 | 75,373 | 77,978 | 99,743 |
| 2040 | 76,743 | 80,816 | 88,873 |
| CAGR 2014-2020 | 0.27% | 1.33% | 4.24% |
| CAGR 2020-2030 | 0.77% | 0.40% | 2.84% |
| CAGR 2030-2040 | 0.38% | 0.67% | -1.08% |
| CAGR 2014-2040 | 0.36% | 0.66% | 1.53% |

Source: Willow Run FAA Terminal Area Forecast (**2015**), National FAA Terminal Area Forecast and Jacobsen|Daniels analysis

**Figure 2-5 – Forecast Method Comparison**




Source: Willow Run FAA Terminal Area Forecast (2015), National FAA Terminal Area Forecast and Jacobsen|Daniels analysis

## 2.4 Update for 2015 Activity

After the forecasting effort was completed, actual activity levels for 2015 became available along with the revised 2016 FAA TAF results for the Airport. The 2015 actual activity reflected a significant drop in annual operations and the selected Master Plan forecast was not within the required tolerance compared to the 2016 FAA TAF. Therefore, the market share analysis was updated to include the 2015 actual data. For this analysis, the same market share methodology was used, but with updated Airport operations data through 2015 as well as the 2016 FAA TAF projections of total future U.S. operations through 2040. **Table 2-8** depicts the revised market share for the Airport relative to the total U.S. activity for each aviation activity category. Also included are the average market shares for each category for three historic timeframes, including the recommended base 2010-2015. Again, 2010-2015 was selected because it represents the most reliable historic data that reflects the most current period of activity and it does not include the most significant economic recession in recent history or the most devastating event in U.S. aviation history – the attacks of September 11, 2001. Both events resulted in tremendous disruption to the economy and the aviation industry. As a result, the aviation activity during those periods of instability should be viewed as outliers and would significantly alter any analysis that incorporated them. The revised analysis is summarized in **Table 2-9**, **Table 2-10**, and **Figure 2-6** below. The result is a CAGR of 0.82 percent between 2014 and 2040 for total projected operations.

### Table 2-8 – Willow Run Airport Market Share of U.S. Operations by Category

| Year | Air Carrier Operations | Air Taxi Operations | Itinerant GA Operations | Local GA Operations | Itinerant Military Operations | Local Military Operations |
|---|---|---|---|---|---|---|
| 2009 | 0.0097% | 0.0710% | 0.0721% | 0.0741% | 0.0039% | 0.0282% |
| 2010 | 0.0239% | 0.0811% | 0.0767% | 0.0750% | 0.0026% | 0.0078% |
| 2011 | 0.0334% | 0.0866% | 0.0732% | 0.0740% | 0.0084% | 0.0543% |
| 2012 | 0.0268% | 0.0850% | 0.0814% | 0.0936% | 0.0044% | 0.0022% |
| 2013 | 0.0206% | 0.0824% | 0.0762% | 0.0856% | 0.0036% | 0.0069% |
| 2014 | 0.0241% | 0.0759% | 0.0771% | 0.0861% | 0.0048% | 0.0044% |
| 2015 | 0.0210% | 0.0865% | 0.0659% | 0.0734% | 0.0054% | 0.0054% |
| 2000-2015 | 0.0332% | 0.1073% | 0.0929% | 0.0903% | 0.0035% | 0.0078% |
| 2005-2015 | 0.0232% | 0.0867% | 0.0769% | 0.0741% | 0.0032% | 0.0107% |
| 2010-2015 | 0.0249% | 0.0830% | 0.0753% | 0.0813% | 0.0049% | 0.0138% |

Source: Willow Run FAA Terminal Area Forecast (**2016**), National FAA Terminal Area Forecast and Jacobsen|Daniels analysis

According to the 2016 FAA TAF, total U.S operations are expected to be 114,947,958 in 2040.

### Table 2-9 – Projected Total U.S. Operations by Category

| Year | Air Carrier Operations | Air Taxi Operations | Itinerant GA Operations | Local GA Operations | Itinerant Military Operations | Local Military Operations | Total Operations |
|---|---|---|---|---|---|---|---|
| 2015 (actual) | 14,071,772 | 10,541,447 | 32,548,919 | 35,699,248 | 3,490,160 | 1,266,381 | 97,617,927 |
| 2020 | 17,163,468 | 9,307,757 | 33,090,527 | 36,390,129 | 3,491,200 | 1,266,966 | 100,710,047 |
| 2025 | 20,048,634 | 8,259,298 | 33,693,043 | 37,087,113 | 3,491,977 | 1,266,966 | 103,847,031 |
| 2030 | 21,786,820 | 8,558,319 | 34,342,123 | 37,837,517 | 3,492,834 | 1,266,966 | 107,284,579 |
| 2035 | 23,649,870 | 8,881,565 | 35,043,655 | 38,647,912 | 3,493,760 | 1,266,966 | 110,983,728 |
| 2040 | 25,620,887 | 9,233,909 | 35,804,987 | 39,526,451 | 3,494,758 | 1,266,966 | 114,947,958 |
| CAGR ‘15-‘20 | 4.05% | -2.46% | 0.33% | 0.38% | 0.01% | 0.01% | 0.63% |
| CAGR ‘20-‘30 | 2.41% | -0.84% | 0.37% | 0.39% | 0.00% | 0.00% | 0.63% |
| CAGR ‘30-‘40 | 1.63% | 0.76% | 0.42% | 0.44% | 0.01% | 0.00% | 0.69% |
| CAGR ‘14-‘40 | 2.43% | -0.53% | 0.38% | 0.41% | 0.01% | 0.00% | 0.66% |

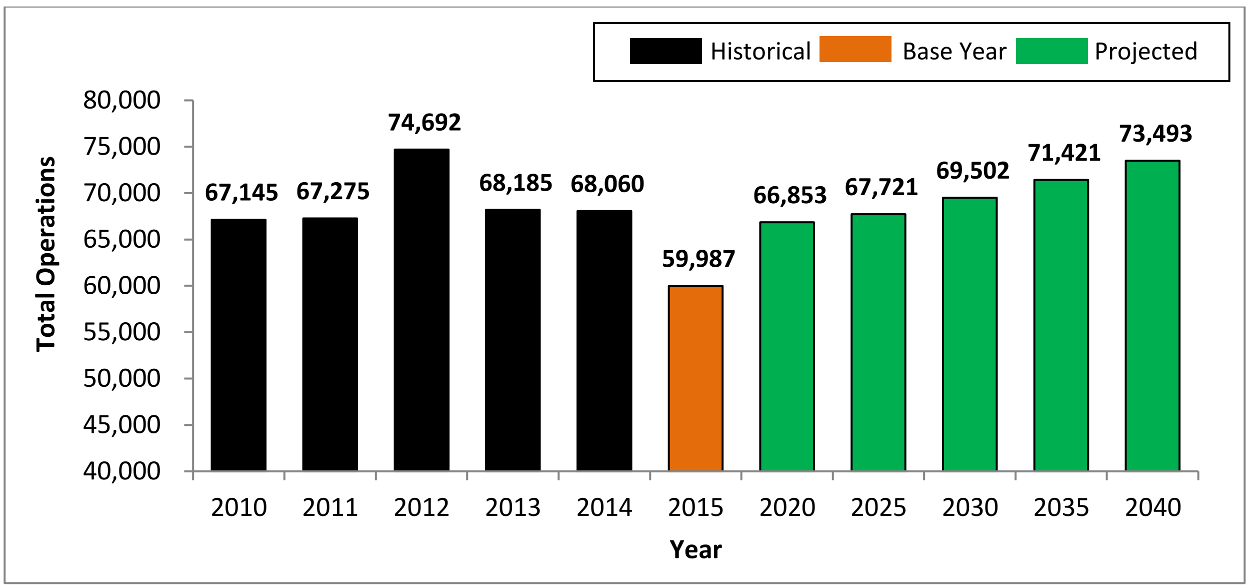
Source: FAA Terminal Area Forecast (2016), National FAA Terminal Area Forecast and Jacobsen|Daniels analysis

**Table 2-10 – Revised Market Share Total Operations by Category**

| Year | Air Carrier Operations | Air Taxi Operations | Itinerant GA Operations | Local GA Operations | Itinerant Military Operations | Local Military Operations | Total Operations |
|---|---|---|---|---|---|---|---|
| 2015 (actual) | 2,956 | 9,117 | 21,452 | 26,206 | 187 | 69 | 59,987 |
| 2020 | 4,276 | 7,728 | 24,916 | 29,588 | 170 | 175 | 66,853 |
| 2025 | 4,995 | 6,858 | 25,369 | 30,155 | 170 | 175 | 67,721 |
| 2030 | 5,428 | 7,106 | 25,858 | 30,765 | 170 | 175 | 69,502 |
| 2035 | 5,892 | 7,374 | 26,386 | 31,424 | 170 | 175 | 71,421 |
| 2040 | 6,383 | 7,667 | 26,960 | 32,138 | 170 | 175 | 73,493 |
| CAGR '15-'20 | 7.66% | -3.25% | 3.04% | 2.46% | -1.94% | 20.47% | 2.19% |
| CAGR '20-'30 | 2.41% | -0.84% | 0.37% | 0.39% | 0.00% | 0.00% | 0.39% |
| CAGR '30-'40 | 1.63% | 0.76% | 0.42% | 0.44% | 0.01% | 0.00% | 0.56% |
| CAGR '14-'40 | 3.13% | -0.69% | 0.92% | 0.82% | -0.39% | 3.79% | 0.82% |

Source: Willow Run FAA Terminal Area Forecast (2016), National FAA Terminal Area Forecast and Jacobsen|Daniels analysis

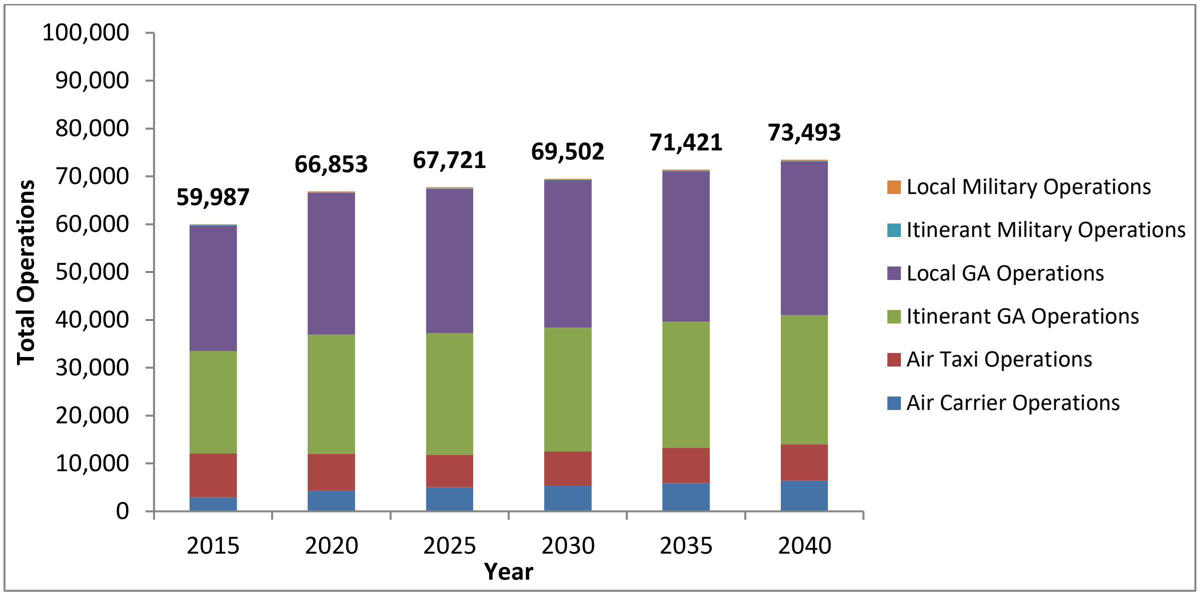
**Figure 2-6 – Revised Market Share Results**




Source: Willow Run FAA Terminal Area Forecast (**2016**), National FAA Terminal Area Forecast and Jacobsen|Daniels analysis

**Figure 2-7** shows forecast operations by category of operation and forecast year for the Airport.

**Figure 2-7 – Willow Run Airport Recommended Forecast by Category**




Source: Willow Run FAA Terminal Area Forecast (2016), National FAA Terminal Area Forecast and Jacobsen|Daniels analysis

## 2.5 Comparison with TAF

The TAF is produced each year by the FAA Aviation Policy and Plans Office (APO) Division for airports in the National Plan of Integrated Airport Systems (NPIAS). The TAF contains both historical and forecast data and is prepared to assist the FAA in meeting its planning, budgeting, and staffing requirements. Typically, for airports with fewer than 100,000 annual enplanements, the FAA bases forecasts on historical trends. Commercial operations forecasts may be prorated in comparison to national forecast trends by category. Generally, the TAF projects military activity at its most recent level unless there is specific knowledge of a change in operations.[1] TAF is prepared for each airport assuming an unconstrained demand for aviation services (i.e., an airport's forecast is developed independent of the ability of the airport and the air traffic control system to supply the capacity required to meet the demand)[2] and is based in part on the national FAA Aviation Forecast.

The TAF summary report for each airport includes the following basic elements:

- **Itinerant Aircraft Operations** – Air carrier, air taxi plus commuter, GA, military, and total
- **Local Aircraft Operations** – GA, military, and total

[1] Forecast Process for 2015 TAF https://www.faa.gov/data_research/aviation/taf/media/ForecastProcessfor2015TAF.pdf
[2] Forecasting Aviation Activity by Airport, prepared for: Federal Aviation Administration Office of Aviation Policy and Plans Statistics and Forecast Branch (APO-110) Washington, DC (2001)

- **Total Operations** – Itinerant plus local
- **Enplanements** – Air carrier and commuter

**Table 2-11** shows the 2016 TAF for the Airport while **Table 2-12** shows the Willow Run Airport Master Plan Forecast. **Figure 2-8** illustrates a comparison of both forecasts. The TAF projects total operations growing from 59,987 to 69,980 with a CAGR of 0.62 percent. The Recommended Forecast projects operations growing from 59,987 to 73,493 with a CAGR of 0.82 percent. This reflects a difference between the TAF and the recommended forecast of 9.3 percent in 2025 (the first 10 years) and 5.2 percent in 2040, which is within tolerance of the TAF according to FAA guidelines.

The two forecasts are relatively close in total operations, with notable differences. The Master Plan forecast projects that air carrier operations will grow faster than the TAF predicts, offsetting the marginal growth in air taxi operations. Itinerant GA operations are also expected to increase faster than the TAF anticipates.

### Table 2-11 – 2016 TAF for Willow Run Airport

| Year | Air Carrier Operations | Air Taxi Operations | Itinerant GA Operations | Local GA Operations | Itinerant Military Operations | Local Military Operations | Total Operations |
|---|---|---|---|---|---|---|---|
| 2015 | 2,956 | 9,117 | 21,452 | 26,206 | 187 | 69 | 59,987 |
| 2020 | 3,041 | 9,953 | 20,465 | 25,887 | 187 | 69 | 59,602 |
| 2025 | 3,142 | 10,857 | 20,787 | 26,942 | 187 | 69 | 61,984 |
| 2030 | 3,247 | 11,846 | 21,115 | 28,040 | 187 | 69 | 64,504 |
| 2035 | 3,352 | 12,926 | 21,449 | 29,185 | 187 | 69 | 67,168 |
| 2040 | 3,459 | 14,106 | 21,788 | 30,371 | 187 | 69 | 69,980 |
| CAGR 2015-2020 | 0.57% | 1.77% | -0.94% | -0.24% | 0.00% | 0.00% | -0.13% |
| CAGR 2020-2030 | 0.66% | 1.76% | 0.31% | 0.80% | 0.00% | 0.00% | 0.79% |
| CAGR 2030-2040 | 0.63% | 1.76% | 0.31% | 0.80% | 0.00% | 0.00% | 0.82% |
| CAGR 2015-2040 | 0.63% | 1.76% | 0.06% | 0.59% | 0.00% | 0.00% | 0.62% |

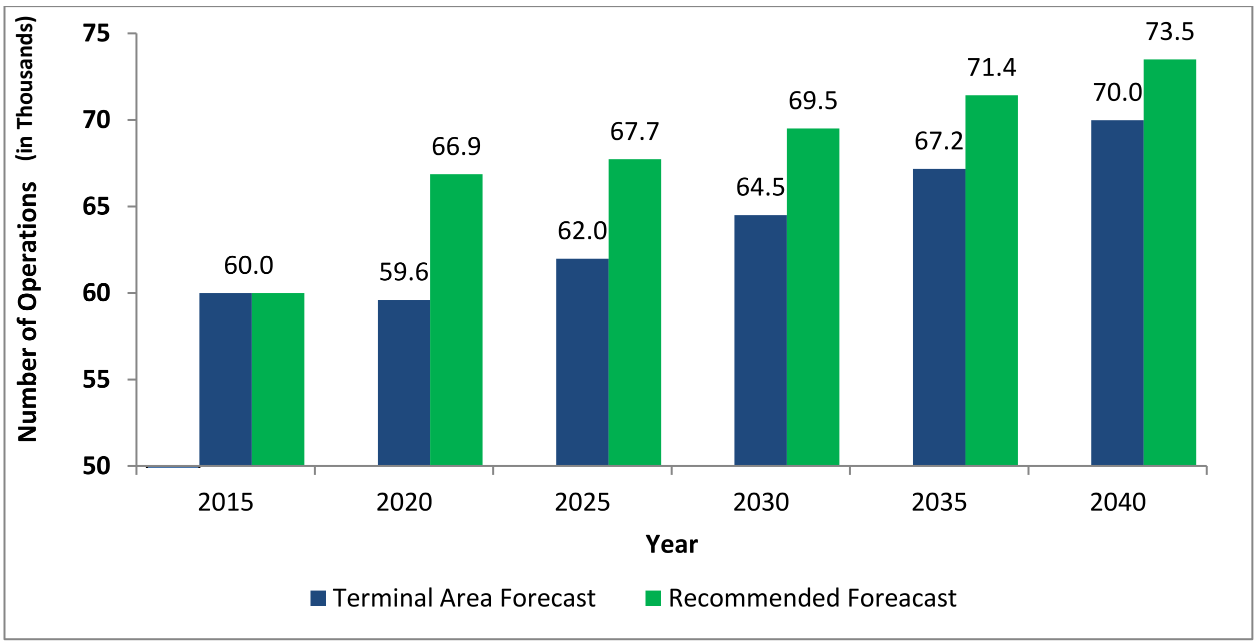
Source: Willow Run FAA Terminal Area Forecast (2016)

**Table 2-12 – Willow Run Airport Master Plan Forecast**

| Year | Air Carrier Operations | Air Taxi Operations | Itinerant GA Operations | Local GA Operations | Itinerant Military Operations | Local Military Operations | Total Operations |
|---|---|---|---|---|---|---|---|
| 2014 | 3,217 | 8,438 | 25,437 | 30,748 | 58 | 162 | 68,060 |
| 2015 | 2,956 | 9,117 | 21,452 | 26,206 | 187 | 69 | 59,987 |
| 2020 | 4,276 | 7,728 | 24,916 | 29,588 | 170 | 175 | 66,853 |
| 2025 | 4,995 | 6,858 | 25,369 | 30,155 | 170 | 175 | 67,721 |
| 2030 | 5,428 | 7,106 | 25,858 | 30,765 | 170 | 175 | 69,502 |
| 2035 | 5,892 | 7,374 | 26,386 | 31,424 | 170 | 175 | 71,421 |
| 2040 | 6,383 | 7,667 | 26,960 | 32,138 | 170 | 175 | 73,493 |
| CAGR 2015-2020 | 7.66% | -3.25% | 3.04% | 2.46% | -1.94% | 20.47% | 2.19% |
| CAGR 2020-2030 | 2.41% | -0.84% | 0.37% | 0.39% | 0.00% | 0.00% | 0.39% |
| CAGR 2030-2040 | 1.63% | 0.76% | 0.42% | 0.44% | 0.01% | 0.00% | 0.56% |
| CAGR 2015-2040 | 3.13% | -0.69% | 0.92% | 0.82% | -0.39% | 3.79% | 0.82% |

Source: Willow Run FAA Terminal Area Forecast (2016), National FAA Terminal Area Forecast and Jacobsen|Daniels analysis

**Figure 2-8 - Forecast Comparison**




Source: Willow Run FAA Terminal Area Forecast (2016) and Jacobsen|Daniels Analysis

## 2.6 Based Aircraft

The based aircraft numbers are influenced by the economy, aircraft sales, local and state tax codes, and decisions made regarding regional GA airports by aircraft owners. As indicated in the FAA Aerospace

Forecast for 2015-2040, the total U.S. based aircraft fleet is expected to grow 0.4 percent annually while based jet aircraft are expected to increase by 2.8 percent a year.

**Table 2-13** shows the historical based aircraft by type from 1990-2014. The CAGR for total based aircraft during that period was -0.78 percent with based aircraft jumping to a high of 379 in 2005, then declining to 190 in 2014. It should be noted that a lack of detailed, accurate, and consistent records of based aircraft may affect the validity of this data.

**Table 2-13 – Historical and U.S. Market Share for Based Aircraft by Type (1990-2014)**

| Year | Total | Share of U.S. Market |
|---|---|---|
| 1990 | 231 | 0.142% |
| 1995 | 227 | 0.144% |
| 2000 | 227 | 0.126% |
| 2005 | 379 | 0.192% |
| 2010 | 262 | 0.158% |
| 2014 | 190 | 0.113% |
| CAGR 1990-2014 | 0.149% | |
| CAGR 2000-2010 | 0.152% | |
| CAGR 2010-2014 | 0.127% | |

Source: Willow Run FAA Terminal Area Forecast (2015)

The Airport market share of U.S. based aircraft was determined for 2014 (market share equals 0.113 percent). Using the 2010-2014 timeframe market share methodology and FAA data for historical and projected U.S. based aircraft, total based aircraft at the Airport are expected to increase to 237 in 2040. **Table 2-14** shows the projection of based aircraft by classification from 2015-2040. The total based aircraft CAGR during that period is projected to be 0.88 percent.

**Table 2-14 – Based Aircraft Market Share Analysis Results (2014-2040)**

| Year | Single | Jet | Multi | Helicopter | Other | Total |
|---|---|---|---|---|---|---|
| 2014 (Actual) | 86 | 66 | 35 | 3 | 0 | 190 |
| 2020 | 90 | 69 | 37 | 3 | 0 | 200 |
| 2025 | 94 | 72 | 38 | 3 | 0 | 208 |
| 2030 | 98 | 75 | 40 | 3 | 0 | 217 |
| 2035 | 102 | 79 | 42 | 4 | 0 | 226 |
| 2040 | 107 | 82 | 44 | 4 | 0 | 237 |
| CAGR 2015-2020 | 0.84% | 0.84% | 0.84% | 0.84% | 0.00% | 0.84% |
| CAGR 2020-2030 | 0.84% | 0.84% | 0.84% | 0.84% | 0.00% | 0.84% |
| CAGR 2030-2040 | 0.86% | 0.86% | 0.86% | 0.86% | 0.00% | 0.86% |
| CAGR 2014-2040 | 0.88% | 0.88% | 0.88% | 0.88% | 0.00% | 0.88% |

Source: Willow Run FAA Terminal Area Forecast (**2015**), National FAA Terminal Area Forecast and Jacobsen|Daniels analysis

## 2.7 Recommended Critical Aircraft

The FAA defines the Design Aircraft in FAA Advisory Circular 150/5300-13A, *Airport Design,* as "An aircraft with characteristics that determine the application of airport design standards for a specific runway, taxiway, taxilane, apron, or other facility (such as Engineered Materials Arresting System [EMAS]). This aircraft can be a specific aircraft model or a composite of several aircraft using, expected, or intended to use the airport or part of the airport. (Also called 'critical aircraft' or 'critical design aircraft.')" This is generally the most demanding aircraft in terms of weight, wingspan, and performance characteristics, which are currently, or are planned to use the airport.

To be eligible for designation as the design aircraft for FAA-funded projects, an aircraft or grouping of aircraft generally needs to make "regular use" of an airport or part of the airport. The FAA defines regular use as 500 annual operations, excluding touch-and-go operations. Therefore, the determination of the recommended design aircraft will identify the most demanding aircraft or grouping of aircraft currently conducting or expected to conduct at least 500 annual operations.

However, as noted in FAA Advisory Circular 150/5300-13A, *Airport Design*, "the first consideration of the airport planner should be the safe operation of aircraft likely to use the airport. Any operation of an aircraft that exceeds design criteria of the airport may result in either an unsafe operation or a lesser safety margin unless air traffic control (ATC) Standard Operating Procedures (SOPs) are in place for those operations. However, it is not the usual practice to base the airport design on an aircraft that uses the airport infrequently, and it is appropriate and necessary to develop ATC SOPs to accommodate faster and/or larger aircraft that use the airport occasionally." The design aircraft for specific projects should be determined on a case by case basis in consultation with the FAA if the project includes FAA funding.

To determine the recommended critical aircraft, existing fleet mix information for the Airport from 2010-2014 Traffic Flow Management System Counts (TFMSC) was analyzed. The TFMSC report is compiled by the FAA and is designed to provide information on traffic counts by airport or by city pair for various data groupings, such as aircraft type or by hour of the day. It includes data for flights that fly under Instrument Flight Rules (IFR) and are captured by the FAA's en-route computers. Most visual flight rules flights and some non-en-route IFR traffic are excluded.

**Table 2-15** depicts the existing fleet mix from 2010 to 2015 for aircraft classified as heavy and large jets by the FAA TFMSC data system, which are the physically most demanding aircraft that should be considered in determining the critical aircraft type sorted in order of descending prevalence of 2015 operations.

### Table 2-15 – Existing Fleet Mix

| TFMSC Weight Class | Aircraft | Operations 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|
| Heavy Eqpt | B17 - Boeing B-17 Flying Fortress | 30 | 8 | 16 | 16 | 13 | 18 |
| Heavy Eqpt | B744 - Boeing 747-400 | | 4 | 11 | | | 2 |
| Heavy Eqpt | C17 - Boeing Globemaster 3 | | 3 | 4 | | 4 | 2 |
| Heavy Eqpt | E6 - Boeing E-6 Mercury | | 3 | | | | 2 |
| Heavy Eqpt | B742 - Boeing 747-200 | | | | | 3 | 1 |
| Heavy Eqpt | K35R - Boeing KC-135 Stratotanker | 2 | | 13 | | | 2 |
| Heavy Eqpt | DC87 - Boeing (Douglas) DC 8-70 | 107 | 126 | 11 | | | |
| Heavy Eqpt | All others (B24, A330, DC10, B767) | 3 | 4 | 0 | 0 | 1 | 0 |
| | **Subtotal Heavy Eqpt** | **142** | **148** | **55** | **16** | **21** | **27** |
| Large Jet Eqpt | DC91 - Boeing (Douglas) DC 9-10 | 1,343 | 1,248 | 1,397 | 1,151 | 1,220 | 1,281 |
| Large Jet Eqpt | DC93 - Boeing (Douglas) DC 9-30 | 844 | 986 | 1,068 | 737 | 836 | 646 |
| Large Jet Eqpt | B722 - Boeing 727-200 | 349 | 720 | 537 | 315 | 438 | 495 |
| Large Jet Eqpt | MD83 - Boeing (Douglas) MD 83 | 91 | 108 | 128 | 161 | 264 | 212 |
| Large Jet Eqpt | B734 - Boeing 737-400 | | 18 | 40 | 19 | 40 | 134 |
| Large Jet Eqpt | MD82 - Boeing (Douglas) MD 82 | | | | | 6 | 40 |
| Large Jet Eqpt | B73Q - Boeing 737 Stage 3 | | | | | 20 | 37 |
| Large Jet Eqpt | B738 - Boeing 737-800 | 14 | 14 | 27 | 22 | 28 | 36 |
| Large Jet Eqpt | B733 - Boeing 737-300 | 8 | 110 | 14 | 95 | 61 | 30 |
| Large Jet Eqpt | MD80 - Boeing (Douglas) MD 80 Series | 11 | | | | | 18 |
| Large Jet Eqpt | B732 - Boeing 737-200/VC96 | 25 | 31 | 44 | 9 | 4 | 16 |
| Large Jet Eqpt | A320 - Airbus A320 All Series | 6 | | 2 | 14 | 12 | 14 |
| Large Jet Eqpt | B737 - Boeing 737-700 | | 8 | 5 | 3 | 6 | 13 |
| Large Jet Eqpt | All Others (DC 8, B727-100, B737, etc.) | 181 | 215 | 95 | 13 | 12 | 8 |
| | **Subtotal Large Jet Eqpt** | **2,872** | **3,458** | **3,357** | **2,539** | **2,947** | **2,980** |

Sources: FAA Traffic Flow Management System Counts (TFMSC), Aviation System Performance Metrics (ASPM), CY 2010-2015

The Boeing DC-9-10 and DC-9-30 aircraft represent the most commonly used large aircraft at the Airport. Both aircraft conducted over 500 operations at the Airport in calendar year 2015. As the DC-9-30 is slightly larger and heavier than the DC-9-10, it is the largest aircraft conducting over 500 annual operations and is therefore the current critical design aircraft. The DC-9 aircraft are used primarily for cargo operations and are utilized by several of the cargo operators on the airfield.

The recommended future critical aircraft was determined by considering the recommended forecast as well as tenant interviews and industry research. Carrier interviews indicated they currently do not have any plans to significantly change their fleets and are currently working to equip their current aircraft for NextGen avionics standards by 2020, indicating that they intend to continue to operate roughly their same fleet for the foreseeable future.

Table 2-15 shows that while the DC-9-10 and DC-9-30 are clearly the most commonly used cargo aircraft at the Airport today, the number of annual cargo operations by these types has remained relatively constant since 2010, but the number of annual cargo operations for B727s, MD-80s, and B737s has been increasing in recent years. Additionally, USA Jet recently purchased a B727 aircraft; therefore, the number of operations conducted by B727 aircraft is anticipated to increase in the future. Based on this information, the Boeing 727, which is slightly larger than the DC-9-30, is also expected to conduct over 500 annual operations in the future and will therefore be the design critical aircraft in the future.

To further examine the critical aircraft for the Airport, the types and variants of the most prevalent aircraft types operating at the Airport were also examined. The operational data obtained from the FAA TFMSC data does not include detail regarding which variant of the aircraft is being utilized (i.e., DC-9-15, DC-9-32, DC-9-33, etc.). To estimate the number of operations by model variant, the FAA aircraft registry was examined for the Airport tenants operating these large jet aircraft, namely USA Jet Airlines, Inc. and Kalitta Charters II, LLC. **Table 2-16** presents the large jet aircraft types registered to these companies.

## Table 2-16 – Tenant Aircraft Registry

| Owner | N Number | Serial Number | Manufacturer Name | Model |
|---|---|---|---|---|
| USA JET AIRLINES INC | 191US | 45718 | DOUGLAS | DC-9-15 |
| USA JET AIRLINES INC | 192US | 47156 | DOUGLAS | DC-9-15F |
| USA JET AIRLINES INC | 194US | 47016 | DOUGLAS | DC-9-15F |
| USA JET AIRLINES INC | 195US | 47017 | DOUGLAS | DC-9-15F |
| USA JET AIRLINES INC | 196US | 47155 | MCDONNELL DOUGLAS | DC-9-15F |
| USA JET AIRLINES INC | 198US | 47045 | MCDONNELL DOUGLAS | DC-9-15F |
| USA JET AIRLINES INC | 199US | 47153 | DOUGLAS | DC-9-15F |
| USA JET AIRLINES INC | 9354 | 47018 | MCDONNELL DOUGLAS | DC-9-15F |
| KALITTA CHARTERS II LLC | 915CK | 47086 | MCDONNELL DOUGLAS | DC-9-15F |
| KALITTA CHARTERS II LLC | 917CK | 47152 | DOUGLAS | DC-9-15F |
| | | | **TOTAL DC9-15** | **10** |
| USA JET AIRLINES INC | 231US | 48114 | MCDONNELL DOUGLAS | DC-9-31 |
| | | | **TOTAL DC-9-31:** | **1** |
| USA JET AIRLINES INC | 205US | 47690 | MCDONNELL DOUGLAS | DC-9-32F |
| USA JET AIRLINES INC | 208US | 47220 | MCDONNELL DOUGLAS | DC-9-32F |
| USA JET AIRLINES INC | 215US | 47480 | MCDONNELL DOUGLAS | DC-9-32 |
| | | | **TOTAL DC-9-32:** | **3** |
| USA JET AIRLINES INC | 327US | 47414 | MCDONNELL DOUGLAS | DC-9-33F |
| KALITTA CHARTERS II LLC | 916CK | 47291 | DOUGLAS | DC-9-33F |
| | | | **TOTAL DC-9-33:** | **2** |
| USA JET AIRLINES INC | 934US | 48124 | MCDONNELL DOUGLAS | DC-9-34 |
| | | | **TOTAL DC-9-34:** | **1** |
| USA JET AIRLINES INC | 727US | 22470 | BOEING | 727-223 |
| KALITTA CHARTERS II LLC | 720CK | 21298 | BOEING | 727-200 |
| KALITTA CHARTERS II LLC | 722CK | 20948 | BOEING | 727-2H3 |
| KALITTA CHARTERS II LLC | 723CK | 20545 | BOEING | 727-2H3 |
| KALITTA CHARTERS II LLC | 724CK | 20383 | BOEING | 727-225 |
| KALITTA CHARTERS II LLC | 725CK | 22252 | BOEING | 727-224 |
| KALITTA CHARTERS II LLC | 726CK | 21951 | BOEING | 727-2M7 |
| KALITTA CHARTERS II LLC | 729CK | 22982 | BOEING | 727-264 |
| KALITTA CHARTERS II LLC | 752DH | 22466 | BOEING | 727-223 |
| KALITTA CHARTERS II LLC | 866AA | 21371 | BOEING | 727-223 |
| | | | **TOTAL 727-200:** | **10** |
| USA JET AIRLINES INC | 831US | 49791 | MCDONNELL DOUGLAS | MD 83 |
| USA JET AIRLINES INC | 948AS | 53021 | MCDONNELL DOUGLAS | MD-83 |
| | | | **TOTAL MD-83:** | **2** |
| KALITTA CHARTERS II LLC | 730CK | 26437 | BOEING | 737-4C9 |
| KALITTA CHARTERS II LLC | 732CK | 24271 | BOEING | 737-405 |
| | | | **TOTAL 737-400:** | **2** |

Note: Registry is aircraft registered to the owner, not all aircraft may currently be airworthy or operational
Source: FAA Aircraft Registry

Assuming that the percentage of aircraft models and variants registered to the tenants is representative of the percentage of operations by aircraft model and variant, **Table 2-17** includes an approximation of operations by model variant.

**Table 2-17 – DC-9 Operations by Model & Variant**

| Model | Variant | Number Registered | % of Total | 2015 Operations |
|---|---|---|---|---|
| DC-9-10 | DC-9-15 | 10 | 100% | 1,281 |
| | | | | |
| DC-9-30 | DC-9-31 | 1 | 14% | 92 |
| DC-9-30 | DC-9-32 | 3 | 43% | 277 |
| DC-9-30 | DC-9-33 | 2 | 29% | 185 |
| DC-9-30 | DC-9-34 | 1 | 14% | 92 |
| | **Subtotal DC-9-30** | **7** | **100%** | **646** |

Source: FAA TFMSC Operations; FAA Aircraft Registry

It is interesting to note that, while the DC-9-30 is the identified current critical aircraft type, FAA AC 150/5300-13A, *Airport Design* states that the critical design aircraft can be a single aircraft type or a family grouping of aircraft types based upon a combination of aircraft approach category (AAC) and airplane design group (ADG) classifications. In reviewing the TFMSC data by AAC and ADG, it was found that greater than 500 operations were conducted in 2015 by AAC “D” aircraft (**Table 2-18**); most of these operations, however, were conducted by aircraft types that are smaller than the DC-9-30 but have faster approach speeds. While the DC-9-30 is a larger aircraft with more physically demanding characteristics, it is also important to recognize the operational characteristics of these smaller aircraft types with faster approach speeds when determining the critical design standards of the airfield. While the DC-9-30 is the current critical aircraft type, it is recommended that the airfield be designed to D-III standards to account for both the faster approach speeds of smaller business jet aircraft types (D) and the wingspan of the more physically demanding DC-9-30 (III).

**Table 2-18 – 2015 Operations by Aircraft Approach Category "D" Aircraft**

| Aircraft | AAC | ADG | Departures | Arrivals | Total Operations |
|---|---|---|---|---|---|
| B742 - Boeing 747-200 | D | V | 1 | 1 | 2 |
| B744 - Boeing 747-400 | D | V | 1 | 1 | 2 |
| C17 - Boeing Globemaster 3 | D | IV | 1 | 1 | 2 |
| E6 - Boeing E-6 Mercury | D | IV | 1 | 1 | 2 |
| K35R - Boeing KC-135 Stratotanker | D | IV | 1 | 1 | 2 |
| F18 - Boeing FA-18 Hornet | D | I | 6 | 8 | 14 |
| GLF2 - Gulfstream II/G200 | D | II | 1 | 1 | 2 |
| GLF4 - Gulfstream IV/G400 | D | II | 60 | 62 | 122 |
| GLF5 - Gulfstream V/G500 | D | II | 41 | 41 | 82 |
| GLF6 - Gulfstream | D | III | 2 | 2 | 4 |
| LJ35 - Bombardier Learjet 35/36 | D | I | 667 | 676 | 1,343 |
| LJ60 - Bombardier Learjet 60 | D | I | 38 | 38 | 76 |
| T38 - Northrop T-38 Talon | D | I | 2 | 2 | 4 |
| LJ40 - Learjet 40; Gates Learjet | D | I | 15 | 15 | 30 |
| LJ45 - Bombardier Learjet 45 | D | I | 61 | 64 | 125 |
| | | **TOTAL** | **898** | **914** | **1,812** |

Source: 2015 Traffic Flow Management System Count Database

## 2.8 Critical Aircraft Sensitivity Analysis

The DC-9 and B727 aircraft types are both quite old. While the operators of these aircraft at the Airport have indicated they intend to equip these aircraft for NextGen avionics requirements and continue flying them for the foreseeable future, at some point these aircraft will need to be retired. Therefore, it is prudent to examine other aircraft types that may need to be considered as replacement aircraft in the planning of the Airport.

Aircraft age and useful life will be significant factors when determining replacement aircraft. During interviews with tenants they noted that they have considered or are likely to consider the CRJ200, Boeing 727, 737-400, 737-800, and MD80 as viable replacements for their aircraft fleet.

They also indicated a strong preference for narrow-body aircraft with low door sill heights. Many airports to and from which the on-demand cargo carriers operate have extremely limited ground support equipment for cargo handling and in some cases, there is either no forklift, or no more than small Class IV or V forklift. Thus, low door sill height is an important consideration in their fleet mix choices. Aircraft availability, loads, and operating cost are significant factors that the carriers use to determine fleet makeup. USA Jet, which accounts for approximately 52.6 percent of the jet operations at the Airport, has recently purchased a Boeing 727.

**Table 2-19** presents the current cargo aircraft conducting the majority of the large jet operations at the Airport, along with a list of some of the likely potential replacement aircraft.

### Table 2-19 – Potential Replacement Aircraft

| Aircraft | Wingspan | Length | Aircraft Approach Category | Airplane Design Group | Taxiway Design Group | Maximum Takeoff Weight | Sill Height |
|---|---|---|---|---|---|---|---|
| **Primary Cargo Aircraft in YIP Fleet** | | | | | | | |
| DC-9-15 | 89 ft, 4.8 in | 104 ft, 4.8 in | C | III | 2 | 90,700 lbs | 7 ft, 0 in |
| DC-9-30 | 93 ft, 3.6 in | 125 ft, 7.2 in | C | III | 2 | 108,000 lbs | 7 ft, 0 in |
| 737-400 | 94 ft, 9 in | 115 ft, 7 in | C | III | 3 | 142,500 lbs | 8 ft, 7 in |
| MD-83 | 107 ft, 10.2 in | 147 ft, 10 in | D | III | 4 | 160,000 lbs | 7 ft, 3 in |
| 727-200 | 108 ft | 153 ft, 2 in | C | III | 4 | 184,800 lbs | 8 ft, 0 in |
| **Potential YIP Fleet Replacement Aircraft** | | | | | | | |
| CRJ-200 | 69 ft, 8 in | 87 ft, 10 in | C | II | 3 | 51,000 lbs | 5 ft, 8 in |
| 717-200HGW | 93 ft, 5 in | 124 ft | C | III | 3 | 121,000 lbs | 7 ft, 3 in |
| 737-500 | 94 ft, 9 in | 97 ft, 9 in | C | III | 3 | 124,500 lbs | 8 ft, 7 in |
| 737-300 | 94 ft, 9 in | 105 ft, 7 in | C | III | 3 | 130,000 lbs | 8 ft, 7 in |
| 737-600 | 112 ft, 7 in | 97 ft, 9 in | C | III | 3 | 143,500 lbs | 9 ft, 0 in |
| 737-700W | 117 ft, 5 in | 110 ft, 3 in | C | III | 3 | 154,500 lbs | 9 ft, 0 in |
| 737-800W | 117 ft, 5 in | 129 ft, 7 in | D | III | 3 | 174,200 lbs | 9 ft, 0 in |
| 737-900W | 117 ft, 5 in | 138 ft, 2 in | D | III | 3 | 174,200 lbs | 9 ft, 0 in |
| A319 | 117 ft 6 in | 111 ft | C | III | 3 | 166,449 lbs | 11 ft, 4 in |
| A320 | 117 ft 6 in | 123 ft, 4 in | C | III | 3 | 171,961 lbs | 11 ft, 4 in |
| LM-100J (C-130) | 132 ft, 7 in | 112 ft, 9 in | C | IV | 2 | 164,000 lbs | 0 ft |
| 757-200 | 124 ft, 10 in | 154 ft, 1 in | C | IV | 4 | 240,000 lbs | 12 ft, 5 in |
| 767-200 | 156 ft, 1 in | 159 ft, 2 in | C | IV | 5 | 310,000 lbs | 13 ft, 5 in |
| 767-300 | 156 ft, 1 in | 180 ft, 3 in | C | IV | 5 | 412,000 lbs | 13 ft, 6 in |

Notes: Maximum Takeoff Weight may vary based on engines & maximum allowable payload
Door sill heights may vary based on weight of fuel/cargo onboard aircraft
Sources: Aircraft manufacturer airport planning manuals; FAA Advisory Circular 150/5300-13A, Airport Design

Eventual replacement of the primary cargo aircraft in the fleet will depend upon a number of factors, such as aircraft age, useful life, maintenance and operating costs, acquisition costs, crew training costs, and operational considerations such as sill height.

One of the largest narrow body aircraft cargo conversion programs currently occurring in the US is for the B737-400 aircraft. B757 and B767 cargo conversions are also being completed and a program to convert

CRJ200 aircraft has recently been initiated. However, many of the cargo conversions are for dedicated cargo carriers, often operating between bases of operation where they have adequate ground support equipment. The on-demand nature of Airport cargo operators means that they are regularly flying into airports where there is limited ground support equipment, hence the increased importance on sill height to their operational capability.

At this point, it is pure speculation as to when their current aircraft may be retired and what the replacement aircraft will be. However, note that many of these aircraft are a similar narrow body class of aircraft. With the exception of larger and taller B757 and B767 aircraft, and the wider LM-100J, these narrow body aircraft have a similar Runway Design Code of C-III or D-III. The narrow body aircraft with maximum takeoff weights between the DC-9-15's 90,700 pounds and the B727's 184,800 pounds, all have similar characteristics, with wingspans between 93 feet and 118 feet.

Therefore, the likely eventual replacement aircraft for the older DC-9-15s, DC-9-30s, and B727 aircraft is likely to be an aircraft with similar dimensional characteristics, weights, and design standards, such as the B717 or B737, which has a lower sill height than the Airbus narrow body aircraft, such as the A319 and A320. Therefore, the critical design aircraft conducting at least 500 operations is anticipated to remain a C-III or D-III aircraft.

There is also the potential for increased operations by larger air cargo aircraft at the Airport, such as the B757 and B767. Large air cargo aircraft already conduct operations at the Airport; however, the number of annual operations is substantially less than 500. When considering future long-term business plans, air cargo tenants at the Airport expressed an interest in expanding their fleet of aircraft to include wide-body aircraft so that air freight support could be provided contractually to major air freight integrators such as UPS, FedEx, and DHL. While the existing tenants are interested in acquiring these aircraft, they emphasized that no plans have been made to purchase wide-body aircraft. Should these aircraft be purchased, it is not anticipated that the number of operations by wide body aircraft would exceed the 500 operations threshold to be designated as the design critical aircraft; however, as the Airport does receive operations by wide body aircraft, up to and including the B747, the Airport should consider the dimensional and safe maneuvering needs of these aircraft within this master plan and for projects in the future.

## 2.9 Factors Affecting Aviation Demand

Many factors can affect the demand for aviation activity at an airport. Reliever airports are often influenced by the activity and policies of the adjacent hub airport. This is in addition to national and regional trends in population, per capita income, and employment; local and regional tourism; airport prominence (location and catchment area); air service options; and the cost and convenience of the facilities and services offered at the airport. The following sections provide information on factors affecting the forecast for the Airport.

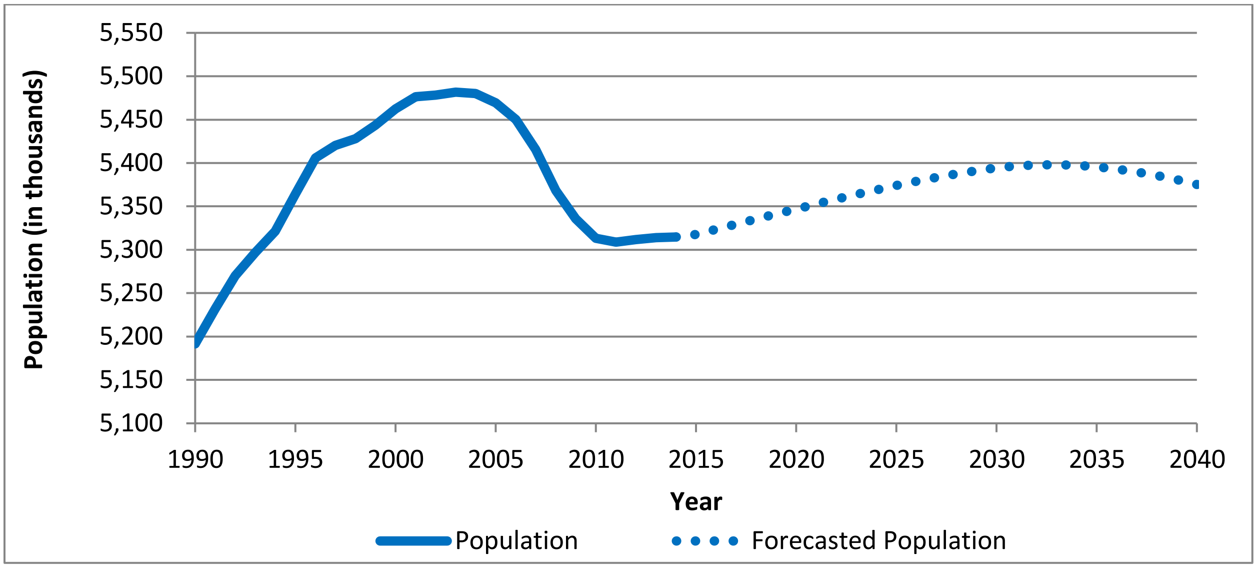
### 2.9.1 The U. S. and Regional Economy

According to Woods and Poole Economics Inc., (Woods & Poole) the long-term outlook for the U.S. economy is for steady, yet modest growth through the year 2050. Although periodic business cycles, such as the 2008-2009 recession, will interrupt and change the growth trajectory, the nation's employment and income are expected to rise modestly every year from 2015 to 2050. Gross Domestic Product (GDP) is forecast to grow at an average annual rate of 1.9 percent over the next three decades. Although employment growth has been uneven in recent years, with particularly sharp job losses in manufacturing, the economy appears to have stabilized and is expected to produce steady job gains through 2050. In the long-run, the civilian unemployment rate is expected to stabilize around 5.2 percent through 2050. Inflation, as measured by the annual percent change in the Personal Consumption Expenditure Price Index, is forecast to increase from 1.2 percent in 2013 to 3.9 percent by 2050. Oil prices are expected to stabilize at an average price below $90 per barrel through 2050, but still lead to inflationary pressures late in the forecast period. Total U.S. employment is projected to increase from 182.3 million jobs in 2013 to 278.8 million in 2050. And total residential population is projected to reach 428.0 million in 2050, up from a 2013 Census estimate of 316.1 million people; the U.S. is expected to remain the world's third most populous nation through 2050. Personal income per capita (in 2009 dollars) is projected to increase from $41,707 in 2011 to $64,657 in 2050.

### 2.9.2 Combined Statistical Area (CSA) Population

The historical and forecasted population for the Detroit-Warren-Ann Arbor Michigan CSA from Woods & Poole is shown in **Figure 2-9.** The historical population data in the 2015 Woods & Poole database includes 2010 Census results.

**Figure 2-9 – Population for the Detroit-Warren-Ann Arbor Michigan CSA 1990-2040 (in thousands)**



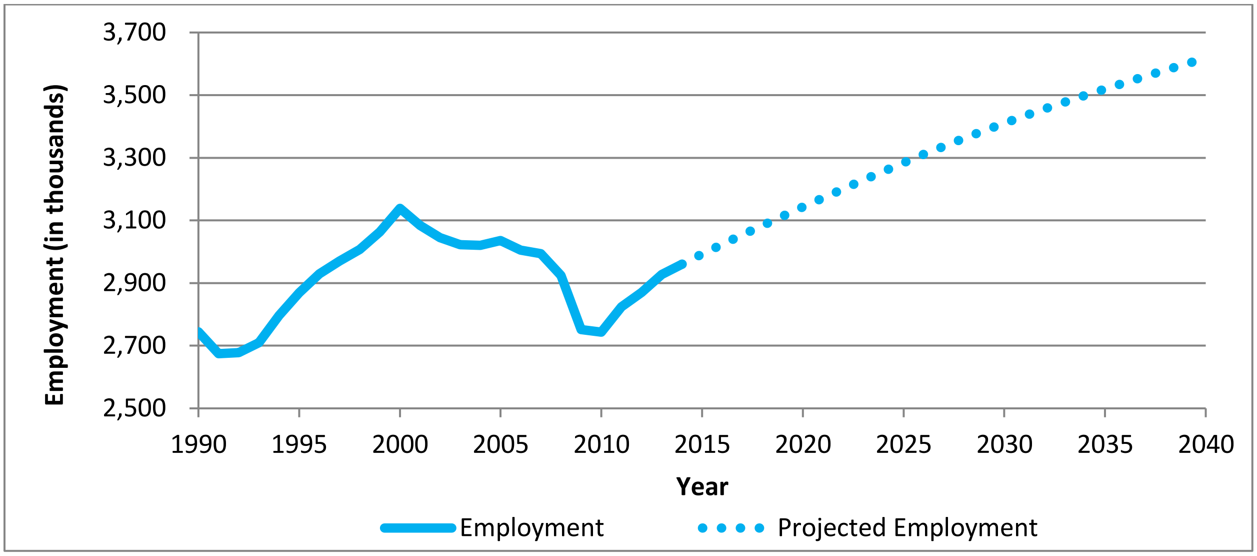

Source: Woods and Poole Economics 2015 Michigan State Profile

### 2.9.3 CSA Employment

The employment data in the Woods & Poole database are a complete measure of the number of full- and part-time jobs by place of work. Historical data, 1990-2014, are from the U.S. Department of Commerce, Bureau of Economic Analysis. The employment data include wage and salary workers, proprietors, private household employees, and miscellaneous workers.

The historical and forecasted employment for the Detroit-Warren-Ann Arbor Michigan CSA is shown in **Figure 2-10.**

**Figure 2-10 – Employment for the Detroit-Warren-Ann Arbor Michigan CSA 1990-2040 (in thousands)**



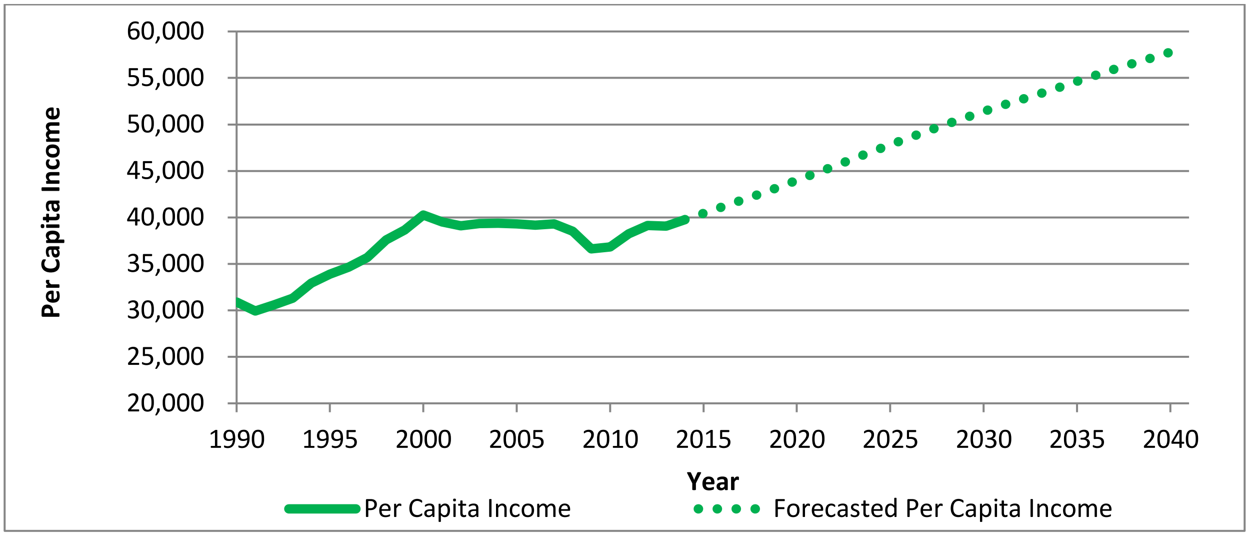

Source: Woods and Poole Economics 2015 Michigan State Profile

### 2.9.4 CSA Per Capita Income

The historical data (1990-2014) for per capita income are from the U.S. Department of Commerce, Bureau of Economic Analysis. Per capita income is the income received by persons from all sources, that is, from participation in production, from both government and business transfer payments, and from government interest, which is treated like a transfer payment. Persons consist of individuals, nonprofit institutions serving individuals, private uninsured welfare funds, and private trust funds.

The historical and forecasted per capita income for the Detroit-Warren-Ann Arbor Michigan CSA is shown in **Figure 2-11**.

Figure 2-11 – Per Capita Income for the Detroit-Warren-Ann Arbor Michigan CSA 1990-2040




Source: Woods and Poole Economics 2015 Michigan State Profile

### 2.9.5 Manufacturing and the Auto Industry

According to Woods and Poole, the economic outlook for the Northeast Region (which includes Michigan and the Detroit-Warren-Ann Arbor Michigan CSA) depends in part on the prospects for stability in manufacturing output and employment. Although manufacturing experienced very sharp employment declines in the 2008-2009 U.S. recession, the industry is expected to remain significant in the Northeast region through 2050. Manufacturing earnings account for a high percentage of total earnings—in 2013, manufacturing earnings accounted for more than 30 percent of total earnings in large portions of the Northeast, with most county levels above the national average of 9.7 percent. Manufacturers usually “export” their goods out of the locality in which they are produced, bringing additional jobs in support industries and income into the region. In much of the Northeast, manufacturing jobs form the basis of regional economies. In 2013, 39.1 percent of U.S. manufacturing jobs were in the Northeast and that proportion is expected to remain above 35 percent through 2050.

The historical and forecasted manufacturing employment for the Detroit-Warren-Ann Arbor Michigan CSA is shown in **Table 2-20** and **Figure 2-12**. The most recent period (2010-2015) has seen an increase in manufacturing across all regions of the U.S., where the strongest gains come from within the CSA with a growth rate of 3.62 percent. This indicates that the manufacturing employment has emerged out of the recession period and could portend additional growth in the future.

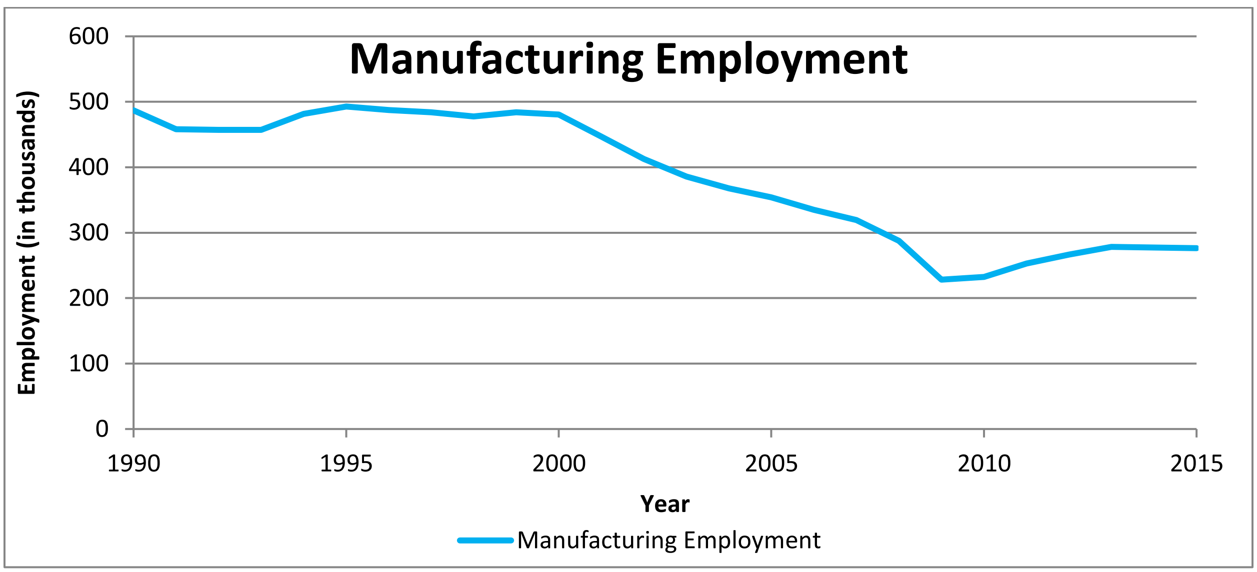
Some experts, particularly within the Detroit-Warren-Ann Arbor Michigan CSA, believe automotive manufacturing will rebound steadily over the forecast period in line with recent manufacturing gains. For example, according to the Steel Manufacturers Association Center for Automotive Research, U.S. automobile production will have consistent growth of 2.43 percent during the forecast period. **Figure 2-13** shows this forecast extrapolated out to 2040. Being that the Detroit area represents the heart of the U.S. automobile industry, this may result in air carrier and air taxi cargo operations at the Airport above and beyond the projections reflected in the Master Plan forecast.

**Table 2-20 – Manufacturing Employment (in thousands)**

| Year | US | Great Lakes | Michigan | CSA |
|---|---|---|---|---|
| 1990 | 18,372 | 4,054 | 881 | 487 |
| 1995 | 17,853 | 4,152 | 918 | 493 |
| 2000 | 17,751 | 4,117 | 911 | 481 |
| 2005 | 14,733 | 3,338 | 697 | 354 |
| 2010 | 12,105 | 2,628 | 499 | 232 |
| 2015 | 12,758 | 2,851 | 580 | 277 |
| CAGR 1990-2000 | -4.09% | -4.24% | -5.53% | -7.14% |
| CAGR 2000-2010 | -3.76% | -4.39% | -5.84% | -7.02% |
| CAGR 2010-2015 | 1.06% | 1.64% | 3.03% | 3.62% |
| CAGR 1990-2015 | -1.45% | -1.40% | -1.66% | -2.22% |

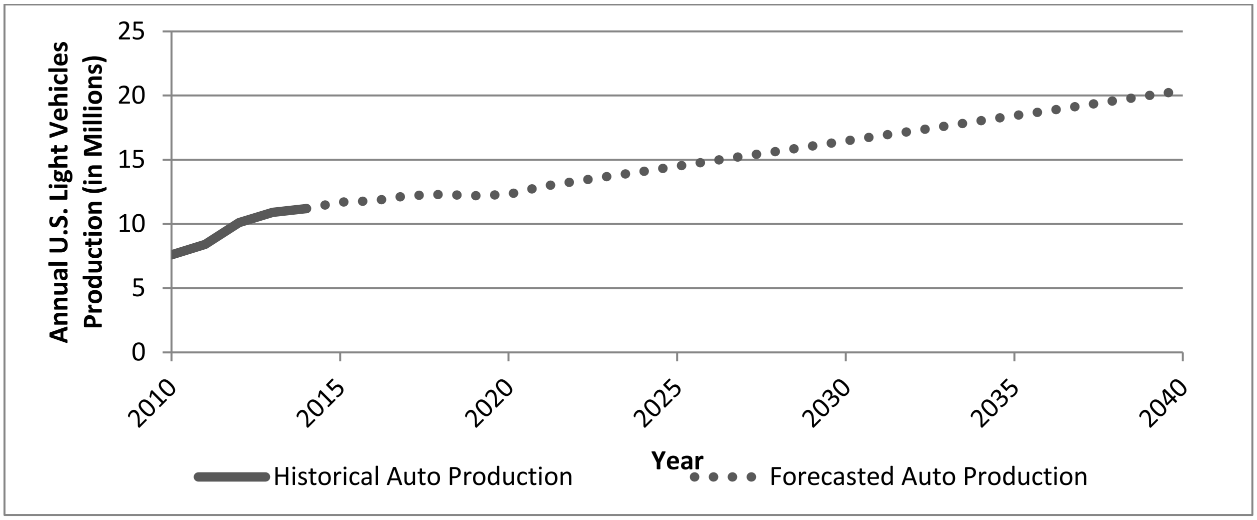
Source: Woods and Poole Economics 2015 Michigan State Profile

**Figure 2-12 – Manufacturing Employment for the Detroit-Warren-Ann Arbor Michigan CSA 1990-2015**




Source: Woods and Poole Economics 2015 Michigan State Profile

**Figure 2-13 – Automobile Production Forecast (2007-2040) (in Millions)**




Source: Steel Manufacturers Association, Center for Automotive Research

## 2.9.6 Other Factors That Could Affect the Operations Forecast Results

Historically, air carrier and air taxi operations at the Airport have been driven by charter services offered by USA Jet, Johnson Controls, and Kalitta Charters. Today, Kalitta Charters is the only remaining tenant offering air taxi services. Competition among operators and other alternatives (e.g., commercial air service out of Detroit Metropolitan Wayne County Airport [DTW]) as well as relatively low growth rates in population and employment in the area have negatively affected charter operations at the Airport. Both USA Jet and Johnson Controls have dissolved their air carrier/air taxi operations. Kalitta Charters continues to operate out of the Airport and is anticipating increased operations if the area realizes the anticipated growth in population, per capita income, and automotive manufacturing. A number of relatively new as well as long time tenants, including Kalitta Charters, USA Jet, Ameristar, and IFL Group, operate just-in-time cargo services for the auto and manufacturing industry nationwide. With the production of automobiles expected to grow at a steady rate during the forecast period, there is an opportunity for Airport tenants to see an increase in business that would likely drive additional service and operations.

GA activity at the Airport is heavily influenced by Eagle Flight Center, based aircraft and the Airport's proximity to a relatively large proportion of the area's population. Eagle Flight Center is affiliated with Eastern Michigan University and serves as the official flight training school for the university's Aviation Flight Technology Degree. Enrollment levels at a flight school are tied to enrollment levels in the Universities Aviation Flight Technology program, which has experienced a 5 percent annual enrollment increase over the past few years.

## 2.10 Air Cargo Forecast Addendum

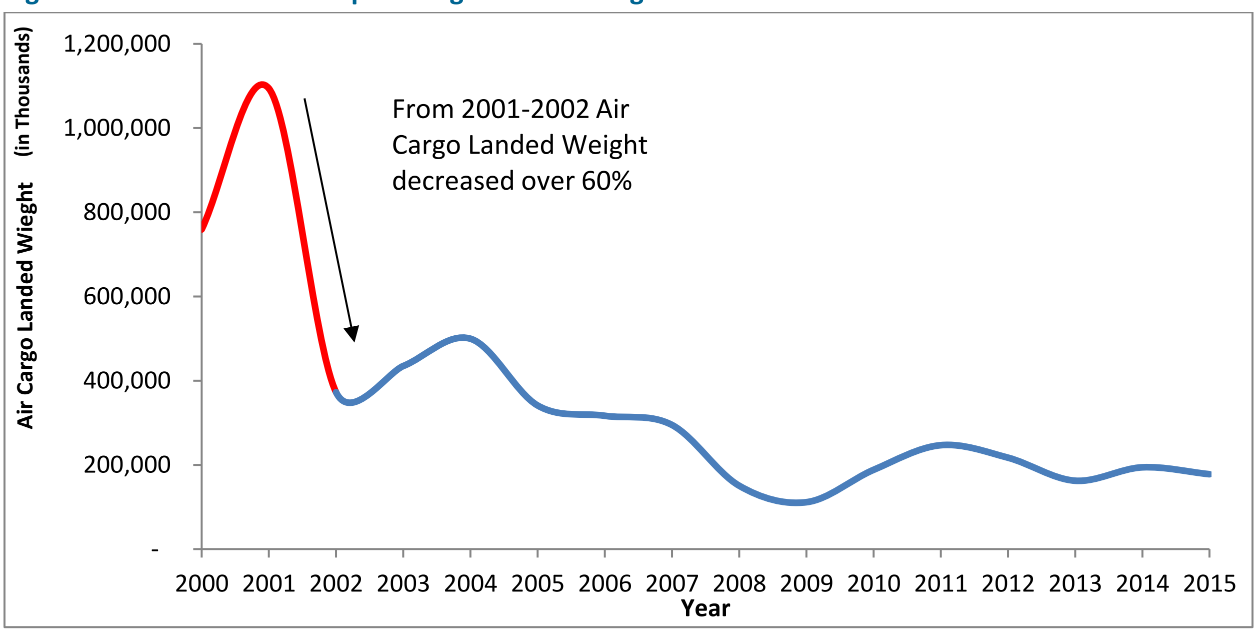
This addendum to the Aviation Activity Forecast addresses historic and projected cargo activity at the Airport.

### 2.10.1 Historical Cargo Activity

In the 1990s, the Airport served as a regional cargo hub for Zantop Air Transport (and subsequently what is now known as Kalitta Air) using a range of aircraft including B747s. The hub at the Airport served major cities throughout America on weeknights and was contracted to serve the automotive industry as an on-needed basis. An example would be the potential shut down of an automotive production line due to a delay in the shipment of assembly parts. When these instances occurred, cargo carriers at the Airport would be called upon to ship automobile parts to that production line. This need grew because just-in-time delivery methods significantly reduced the need for on-site storage of parts.

Early in the new millennium, two significant events dramatically impacted cargo landed weight at the Airport—the events of September 11, 2001 occurred, and Kalitta Air shifted 747 operations away from the Airport. By 2002 cargo landed weight had decreased more than 60 percent from the previous year. **Figure 2-14** shows the Airport's annual air cargo landed weight from 2000 to 2015.

**Figure 2-14 – Willow Run Airport Cargo Landed Weight**

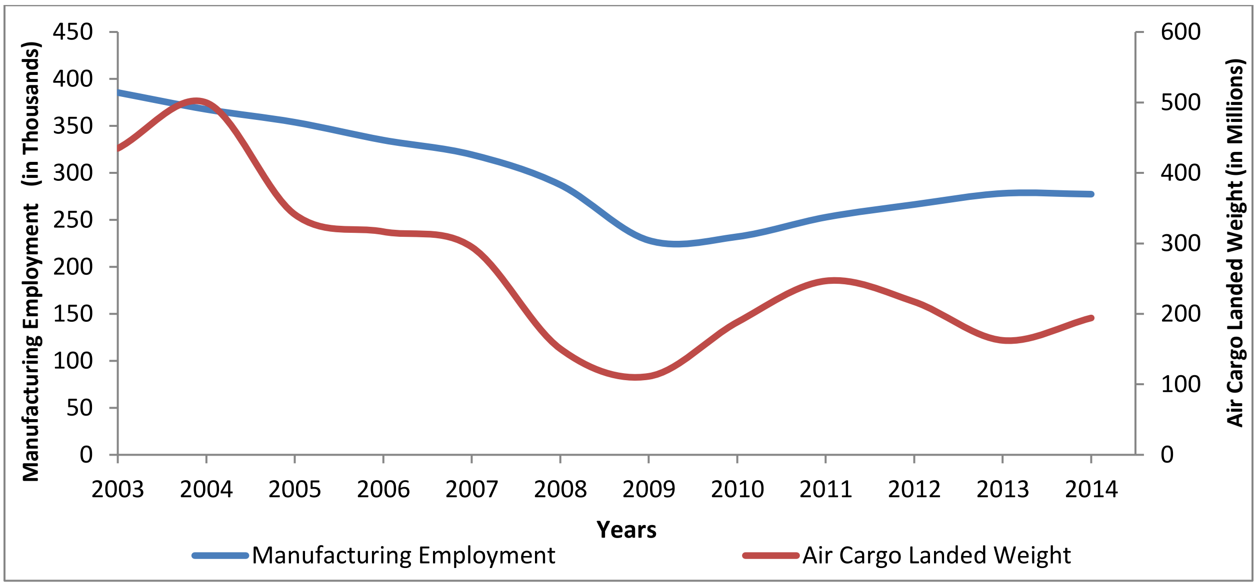



Source: WCAA Records

To better understand the trend in air cargo at the Airport, it is appropriate to consider the trends in regional manufacturing employment, U.S. automobile production, and U.S. automotive sales. Regional employment is highly dependent on the automotive industry. According to the Detroit Regional Chamber, an impressive 63 of the top 100 automotive suppliers in North America are headquartered in Michigan, and the state is ranked No. 1 for North American car, truck, and motor vehicle production. In fact, Michigan is responsible for the production of approximately 21 percent of all automobiles in the U.S.

**Figure 2-15** shows the manufacturing employment from the Detroit-Warren-Ann Arbor-Michigan CSA from 2003-2014. As indicated, there has been a steady decrease in employment between 2003 and 2009 similar to the decrease in cargo landed weight at the Airport. Around 2010, the trend reversed and a slow increase has occurred in both employment and cargo landed weight, similar to air cargo landed weight at the Airport.

**Figure 2-15 – CSA Manufacturing Employment Compared to Air Cargo Landed Weight**

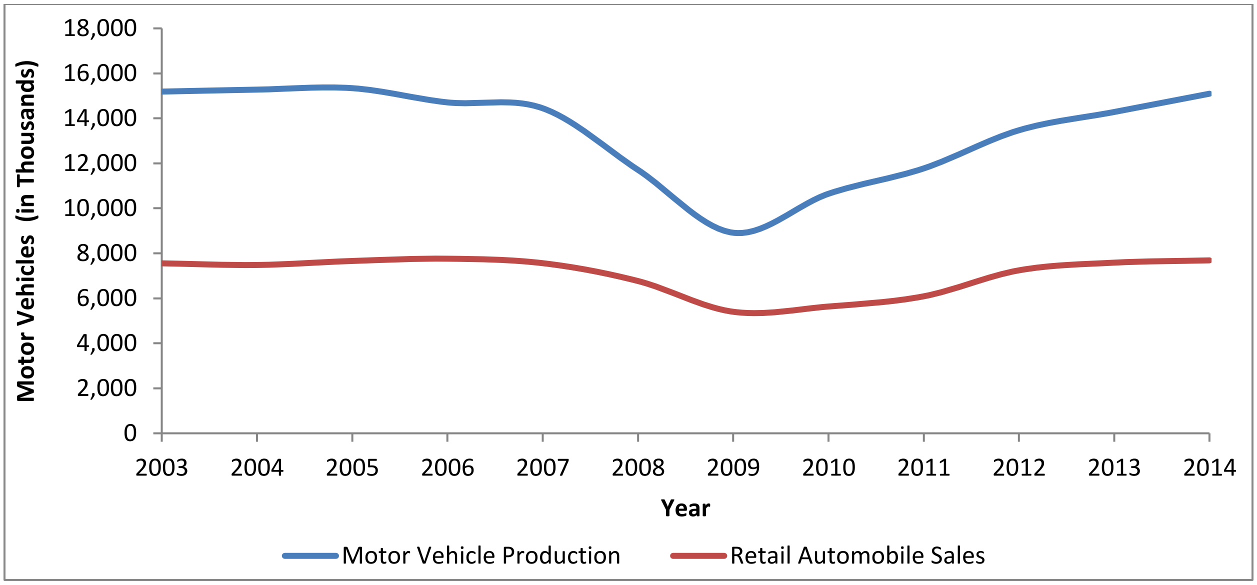



Source: Woods and Poole Economics 2015 Michigan State Profile

Because a significant amount of the Airport's cargo activity is related to the automotive industry, the Great Recession of 2008-2009 resulted in a dramatic downturn in cargo activity. As two of the three largest U.S. automotive companies entered into federal bankruptcy, U.S. automobile production plummeted. As a result, demand for just-in-time shipment of automobile parts declined significantly. However, by 2010, the auto industry and the Michigan economy stabilized and began what has been by most economic measures a painfully slow recovery. Not coincidentally, cargo landed weight at the Airport has been increasing since 2010 as well, albeit slowly. This is consistent with the slow but steady rebound in manufacturing employment as well as the overall economic recovery underway in the region.

**Figure 2-16** shows the U.S. automobile production and sales trends from 2003-2014. This clearly depicts the precipitous decrease from 2005 through 2009 and a recovery beginning in 2010.

**Figure 2-16 – U.S. Automobile Production and Sales**




Source: Bureau of Transportation Statistics – Annual U.S. Motor Vehicle Production and Factory (Wholesale) Sales

The Airport serves as a base for many of the region's just-in-time cargo operators, including USA Jet, Kalitta Charters, IFL Group, and Ameristar. The Airport is conducive to their business model as it is conveniently located near the automobile manufacturers and many of their suppliers, does not have the congestion and other activity constraints of nearby Detroit Metro Airport, and has historically provided marginally adequate and relatively inexpensive facilities.

### 2.10.2 Cargo Operators and Aircraft

There are more than 80 carriers that have reported cargo landed weight at the Airport since 2008, with more than 35 reporting cargo activity in 2014 alone. As shown in **Table 2-21,** the four largest cargo operators mentioned previously accounted for 83 percent of the cargo landed weight at the Airport in 2014. No other individual cargo carrier handles more than 2.5 percent of the annual cargo landed weight in 2014.

**Table 2-21 – Cargo Landed Weight by Carrier**

| Carriers | Percentage of Cargo Landed Weight (2014) |
|---|---|
| USA Jet | 43% |
| Kalitta Charters | 25% |
| Ameristar | 8% |
| IFL Group | 7% |
| Others | 17% |

Source: Jacobsen|Daniels and WCAA Records

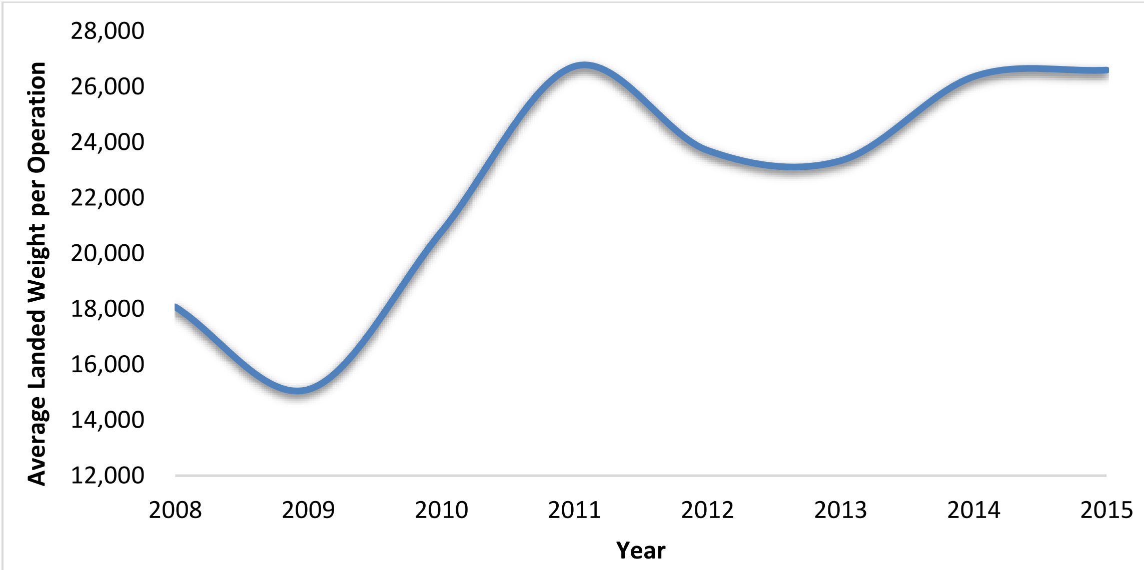
Interestingly, the average landed weight per cargo operation has increased 47 percent since 2008. This indicates an increase in the size of aircraft being used for cargo operations. **Table 2-22** lists the cargo operations, landed weight and landed weight per operation from 2008 through 2015. Average landed weight per cargo operation is shown in **Figure 2-17**.

**Table 2-22 – Cargo Operations, Cargo Landed Weight and Landed Weight per Operation**

| Year | Cargo Operations | Cargo Landed Weight | Landed Weight/ Operation |
|---|---|---|---|
| 2008 | 8,326 | 150,504,984 | 18,077 |
| 2009 | 7,372 | 111,332,940 | 15,102 |
| 2010 | 9,058 | 188,203,708 | 20,778 |
| 2011 | 9,230 | 246,739,675 | 26,732 |
| 2012 | 9,158 | 217,158,227 | 23,712 |
| 2013 | 6,958 | 162,380,193 | 23,337 |
| 2014 | 7,366 | 194,188,703 | 26,363 |
| 2015 | 6,686 | 177,846,371 | 26,600 |

Source: Jacobsen|Daniels and WCAA Records

**Figure 2-17 – Average Cargo Landed Weight per Operation**




Source: Jacobsen|Daniels and WCAA Records

It is apparent that the number of smaller cargo aircraft operations is declining while the use of larger cargo aircraft is increasing. This is confirmed by comparing the percentage of cargo landed weight by aircraft type in 2010 and 2014 as shown in **Table 2-23**.

**Table 2-23 – Percentage of Cargo Landed by Aircraft**

| Aircraft Series | Percent of Cargo Landed Weight (2010) | Percent of Cargo Landed Weight (2014) |
|---|---|---|
| DC-9 | 49% | 46% |
| B727 | 13% | 16% |
| MD-80 | 1% | 13% |
| B737 | 1% | 4% |
| Other | 36% | 21% |

Source: Jacobsen|Daniels and WCAA Records

## 2.10.3 Forecast of Cargo Activity

Absent a more accurate forecasting method, regression analysis was used to estimate the total air cargo landed weight anticipated over the planning horizon. Through this analysis it was determined that many socioeconomic variables like unemployment, population, and per capita income do not correlate well with historical cargo landed weight at the Airport (see **Table 2-24**). This may be explained by the unique nature and general function of on-demand cargo logistics. Much of the demand for these services is based on unpredictable events within the automotive industry such as the timely delivery of certain assembly parts, vehicle demand in certain regions of the country, production schedules or even the weather. This variability makes it difficult to accurately predict the demand for just in time cargo deliveries based on correlation with socioeconomic metrics.

**Table 2-24 – Cargo Landed Weight Regression Analysis Results**

| Variables | Time Period | R2 Values |
|---|---|---|
| Motor Vehicle Production | 2000-2015 | 0.0000 |
| | 2005-2015 | 0.0279 |
| | 2010-2015 | 0.1256 |
| Retail Sales | 2000-2015 | 0.4187 |
| | 2005-2015 | 0.3225 |
| | 2010-2015 | 0.1577 |
| Manufacturing Employment | 2000-2015 | 0.7295 |
| | 2005-2015 | 0.8039 |
| | 2010-2015 | 0.0904 |
| Multivariate (Pop, Per Cap and Emp) | 2000-2015 | 0.7468 |
| | 2005-2015 | 0.8013 |
| | 2010-2015 | 0.4005 |

Source: Jacobsen|Daniels

Nonetheless, a relationship between air cargo landed weight and manufacturing employment for the Detroit-Warren-Ann Arbor Michigan CSA established a reasonable correlation of about 80 percent from 2005-2014. Therefore, a representative model was created from this relationship and used to project cargo landed weight through 2040 based on independent projections for manufacturing employment from Woods and Poole. However, technology advancements over the past decade have resulted in productivity gains that have effectively reduced the number of manufacturing jobs necessary to produce automobiles and other manufactured products. Consequently, the historical correlation between local manufacturing jobs and cargo landed weight at the Airport may not fully account for these productivity gains and, as a result, project artificially lower estimates of cargo landed weight.

In addition, the automotive industry's embrace of lean manufacturing would seem to suggest an increasing dependence on just-in-time deliveries that could benefit the on-demand cargo operators like those at the Airport. Because of the difficulty in predicting demand for just-in-time cargo deliveries, especially given the potential concern regarding the weak correlation between manufacturing employment and cargo landed weight at the Airport, a reasonable proxy of projected cargo landed weight was also considered. The Detroit Region Air Cargo Analysis (April 2016) completed as part of the Detroit Metropolitan Wayne County Airport Master Plan Update indicates cargo tonnage handled at the Airport is expected to increase at a CAGR of 1.2 percent, about the same rate as the national population growth, through the planning horizon. Therefore, it is reasonable to assume that cargo landed weight would increase at a similar CAGR to accommodate the projected growth in cargo tonnage.

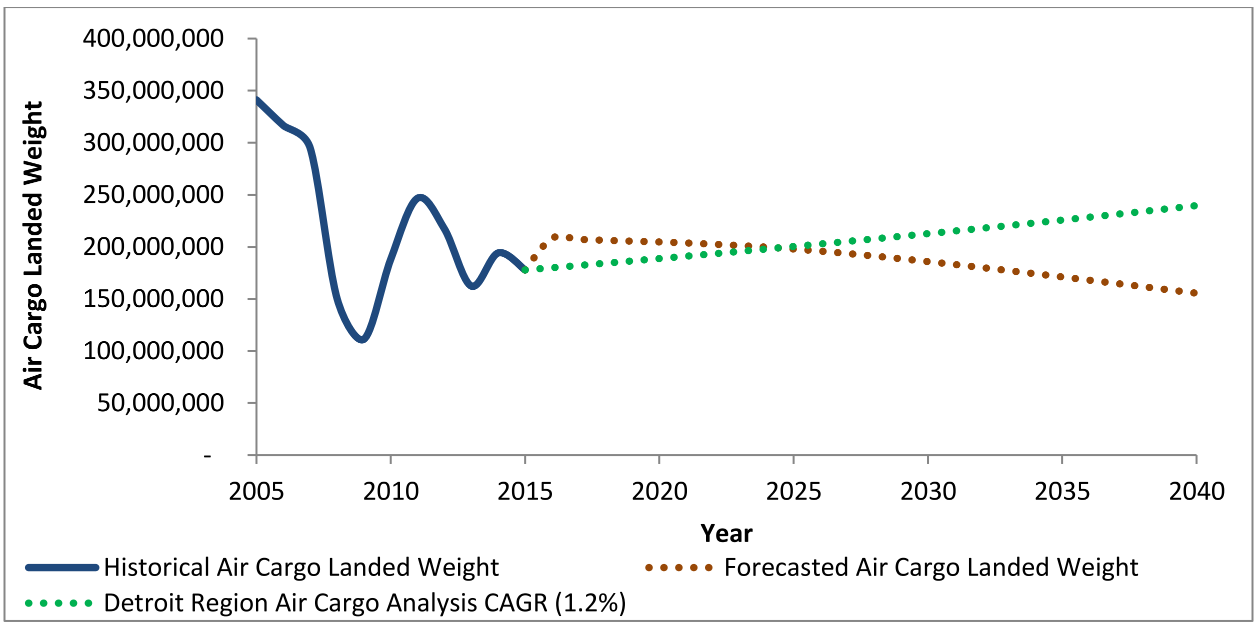
The results of both projections of cargo landed weight are summarized in **Table 2-25** and reflected in **Figure 2-18**.

**Table 2-25 – Historic and Projected Air Cargo Landed Weight**

| Year | Air Cargo Landed Weight (Regression Analysis) | Detroit Region Cargo Analysis |
|---|---|---|
| 2014 | 194,188,703 | 194,188,703 |
| 2015 | 177,846,371 | 177,846,371 |
| 2020 | 204,728,847 | 188,776,344 |
| 2025 | 197,954,505 | 200,378,044 |
| 2030 | 185,876,966 | 212,692,754 |
| 2035 | 171,127,170 | 225,764,295 |
| 2040 | 155,500,885 | 239,639,178 |
| CAGR 2015-2020 | 1.20% | 1.20% |
| CAGR 2020-2030 | -0.95% | 1.20% |
| CAGR 2030-2040 | -1.77% | 1.20% |
| CAGR 2015-2040 | -0.88% | 1.20% |

Source: WCAA Data and Woods and Poole Economics 2015 Michigan State Profile

**Figure 2-18 – Historical and Projected Air Cargo Landed Weight**




Source: WCAA Data and Woods and Poole Economics 2015 Michigan State Profile

### 2.10.4 Critical Aircraft

While the type of aircraft used for cargo operations at the Airport is highly dependent on carrier decisions, we understand from the Airport's largest cargo carriers (USA Jet, Kalitta Charters, and IFL Group) that they are evaluating upgrading their aircraft fleets as the DC-9s become obsolete. Carrier interviews concluded a strong preference for replacing DC-9s with other used narrow body aircraft with low door sill heights to accommodate loading and unloading of cargo from the apron. This trend can be seen in **Table 2-26,** which illustrates the annual cargo operations by aircraft type since 2010.

**Table 2-26 – Cargo Operations by Aircraft Type**

| Aircraft | 2010 | 2011 | 2012 | 2013 | 2014 |
|---|---|---|---|---|---|
| DC-9 | 2,090 | 2,210 | 2,428 | 1,794 | 2,024 |
| B727 | 316 | 606 | 494 | 322 | 400 |
| MD-80 | 28 | 48 | 72 | 136 | 272 |
| B737 | 18 | 138 | 90 | 138 | 126 |
| **TOTALS** | **2,452** | **3,002** | **3,084** | **2,390** | **2,822** |

Source: Jacobsen|Daniels and WCAA Records

While the DC-9 is clearly the most commonly used cargo aircraft at the Airport, the number of annual cargo operations is about the same as it was in 2010. Although a smaller percentage of total cargo operations, the number of operations of B727, MD-80, and B737 aircraft have all increased since 2010. Aircraft availability, load, and operating cost are significant factors that determine a carrier's choice of aircraft. USA Jet has recently purchased a Boeing 727 and is expecting to either augment or replace its current DC-9-10 series aircraft with the B727. Based on this information, by 2025 it is expected that the most commonly used large jet for cargo operations at the Airport will be the Boeing 727.

### 2.10.5 Factors That Could Affect Cargo Landed Weight

An improving economy in the region bodes well for the Airport's current cargo tenants. With the increase in manufacturing activity in North America, it is possible that the demand for just-in-time deliveries and other cargo operations will increase as well. Because of the Airport's geographic location, and the established business relationships of the existing cargo operators, additional cargo activity will likely be tied to the automotive industry. However, it could also include other high value manufacturing activities, such as electronics or pharmaceuticals, that warrant the speed of aircraft delivery as part of the logistics chain.

Anecdotal evidence suggests that infrastructure improvements such as additional runway length and instrumentation may also affect demand at the Airport. According to several of the Airport's cargo operators, airport infrastructure and their ability to serve certain markets with their fleet are key considerations as they make investment and growth decisions. In addition, several established cargo operators do not operate at the Airport today despite its unique geographic location. For example, DHL has a distribution warehouse located relatively close to the Airport, yet they drive their cargo approximately 70 miles from that warehouse to Toledo Express Airport. DHL has indicated they handle approximately 200,000 pounds of cargo each week out of Toledo Express Airport.

Many factors can affect the demand for cargo activity at an airport. Reliever airports are often influenced by the activity and policies of the adjacent hub airport, in addition to national and regional trends in manufacturing, work force, employment, airport prominence (location and catchment area), air cargo service options, and the cost and convenience of the facilities and services offered at the airport.

**Chapter 3**

# Facility Requirements

An analysis of how well existing facilities can meet current and projected demand is needed to plan for future infrastructure improvements at the Willow Run Airport (Airport). This analysis will help determine the long-term flexibility and growth potential of existing infrastructure to meet changing demand for the next 20 years. Facilities unable to accommodate existing and future anticipated demand will be evaluated to determine infrastructure improvement options that can be developed to enhance their capacity. This chapter provides a summary of the analysis that was conducted of existing facilities at the Airport and their capacity to meet existing and future demand. Facilities in need of improvement will be identified in each section and listed at the conclusion of this chapter.

This chapter is organized by the following sections:

## 3.1 Demand/Capacity Analysis

Demand/capacity analyses measure the capacity of an airfield configuration given a volume of air traffic within a specified time before delays are incurred. Many factors can impact the capacity of an airfield including the configuration of the runways, number and location of exit taxiways, local weather conditions, and traffic flow patterns, such as those dictated by the wind. Federal Aviation Administration (FAA) Advisory Circular (AC) 150/5060-5, *Airport Capacity and Delay*, offers mathematical formulas to determine the capacity of an airfield based on the fleet mix of aircraft that operate at an airport, the number of runways, and the orientation of runways. In general, airfields with a single runway have a capacity of 230,000 to 240,000 aircraft operations based on fleet mix, while airfields with two intersecting runways have a capacity of 230,000 to 265,000 annual operations. Airfields with two parallel runways capable of simultaneous operations that intersect a single runway, like the airfield configuration found at the Airport, have a capacity of 355,000 to 340,000 operations based on aircraft fleet mix.

Since total aircraft operations at the Airport are projected to increase from 68,060 in 2014 to 73,493 in 2040, it appears no capacity related improvements are needed to the existing airfield configuration. This is important to note given that the elimination of unnecessary airfield pavement surfaces will be considered as a part of the alternatives analysis. Should a decision be made to reduce or eliminate a runway in favor of a preferred development action, it does not appear this will impact the throughput capacity of the Airport.

## 3.2 Wind Coverage/Runway Designation

FAA AC 150/5300-13A, *Airport Design*, recommends the primary runway at an airport be oriented so that 95 percent of the time, aircraft taking off or landing on the runway are operating in the direction of local prevailing winds. If the primary runway is unable to be aligned in the direction of local prevailing winds 95 percent of the time, a crosswind runway is recommended for those aircraft types impacted by crosswinds on the primary runway. Since aircraft typically land and takeoff into the wind, crosswind runways are beneficial for small aircraft that are more impacted by winds that are perpendicular to an aircraft's path of travel.

Data obtained from the National Climatic Data Center (NCDC) was used to evaluate the wind coverage provided by the three runways at the Airport. This evaluation assessed how well the orientation of the runways provided wind coverage when four wind velocities were present, based on the maximum allowable velocities for various aircraft categories ranging from small single propeller engine aircraft (10.5 knots), twin propeller engine aircraft (13 knots), and jet aircraft (16 knots and 20 knots). During all weather conditions (**Table 3-1**) with an allowable crosswind of up to 10.5 knots, the orientation of Runway 5L/23R, 5R/23L, and 9/27 provide 96.02 percent coverage. Individually, the orientation of parallel runways 5L/23R and Runway 5R/23L provides coverage 89.80 percent of the time, thus indicating that Runway 9/27 is needed to achieve 95 percent wind coverage when 10.5-knot winds are present. In addition, the orientation of parallel runways 5L/23R and 5R/23 do not achieve 95 percent wind coverage (94.31 percent) with an allowable crosswind of up to 13 knots. This indicates Runway 9/27 is needed for up to B-II aircraft, which includes most single- and twin-engine propeller driven aircraft and some small jets, when crosswinds are present that limit the use of the parallel runways 5L/23R and 5R/23L.

**Table 3-1 – Wind Coverage in All Weather Conditions**

<table>
<tr><th>Allowable Crosswind (in knots)</th><th>Runway 5L</th><th>Runway 23R</th><th>Runway 5R</th><th>Runway 23L</th><th>Runway 9</th><th>Runway 27</th></tr>
<tr><td rowspan="4">10.5</td><td>54.72%</td><td>71.42%</td><td>54.72%</td><td>71.41%</td><td>54.55%</td><td>72.56%</td></tr>
<tr><td colspan="2">89.80%</td><td colspan="2">89.80%</td><td colspan="2">89.53%</td></tr>
<tr><td colspan="2"></td><td colspan="4">96.02%</td></tr>
<tr><td colspan="6">96.02%</td></tr>
<tr><td rowspan="4">13</td><td>56.87%</td><td>74.80%</td><td>56.87%</td><td>74.80%</td><td>56.27%</td><td>76.84%</td></tr>
<tr><td colspan="2">94.31%</td><td colspan="2">94.31%</td><td colspan="2">94.77%</td></tr>
<tr><td colspan="2"></td><td colspan="4">98.42%</td></tr>
<tr><td colspan="6">98.42%</td></tr>
<tr><td rowspan="4">16</td><td>58.93%</td><td>77.83%</td><td>58.93%</td><td>77.83%</td><td>57.85%</td><td>79.99%</td></tr>
<tr><td colspan="2">98.21%</td><td colspan="2">98.20%</td><td colspan="2">98.58%</td></tr>
<tr><td colspan="2"></td><td colspan="4">99.62%</td></tr>
<tr><td colspan="6">99.62%</td></tr>
<tr><td rowspan="4">20</td><td>59.58%</td><td>78.96%</td><td>59.58%</td><td>78.96%</td><td>58.26%</td><td>80.99%</td></tr>
<tr><td colspan="2">99.59%</td><td colspan="2">99.59%</td><td colspan="2">99.76%</td></tr>
<tr><td colspan="2"></td><td colspan="4">99.95%</td></tr>
<tr><td colspan="6">99.95%</td></tr>
</table>

Note: Single runway end coverages calculated with a 3-knot tailwind
Source: National Climatic Data Center, FAA Airports Geographic Information System wind analysis tool
Station: Willow Run Airport, Ypsilanti, Michigan
Period of Record: 2005-2014 based on 116,711 observations

**Table 3-2** presents the wind coverage at the Airport when visual flight rules (VFR) conditions are present, which is when the cloud ceiling is greater than or equal to 1,000 feet about ground level (AGL) and the visibility is greater than or equal to 3 statute miles. Individually, the orientation of Runways 5L/23R and Runway 5R/23L provide 89.54 percent coverage for allowable crosswinds up to 10.5 knots and 94.20 percent coverage for allowable crosswinds up to 13 knots during VFR conditions. This demonstrates that Runway 9/27 is needed to achieve 95 percent wind coverage at the Airport for allowable crosswinds up to 13 knots.

**Table 3-2 – Wind Coverage in Visual Flight Rules Conditions**

<table>
<tr><th>Crosswind (in knots)</th><th>Runway 5L</th><th>Runway 23R</th><th>Runway 5R</th><th>Runway 23L</th><th>Runway 9</th><th>Runway 27</th></tr>
<tr><td rowspan="4">10.5</td><td>52.64%</td><td>72.50%</td><td>52.64%</td><td>72.50%</td><td>51.80%</td><td>74.00%</td></tr>
<tr><td colspan="2">89.54%</td><td colspan="2">89.54%</td><td colspan="2">89.57%</td></tr>
<tr><td colspan="2"></td><td colspan="4">96.14%</td></tr>
<tr><td colspan="6">96.14%</td></tr>
<tr><td rowspan="4">13</td><td>54.79%</td><td>76.09%</td><td>54.79%</td><td>76.09%</td><td>53.37%</td><td>78.50%</td></tr>
<tr><td colspan="2">94.20%</td><td colspan="2">94.20%</td><td colspan="2">94.90%</td></tr>
<tr><td colspan="2"></td><td colspan="4">98.54%</td></tr>
<tr><td colspan="6">98.54%</td></tr>
<tr><td rowspan="4">16</td><td>56.91%</td><td>79.32%</td><td>56.91%</td><td>79.31%</td><td>54.83%</td><td>81.72%</td></tr>
<tr><td colspan="2">98.28%</td><td colspan="2">98.28%</td><td colspan="2">98.69%</td></tr>
<tr><td colspan="2"></td><td colspan="4">99.69%</td></tr>
<tr><td colspan="6">99.69%</td></tr>
<tr><td rowspan="4">20</td><td>57.50%</td><td>80.46%</td><td>57.50%</td><td>80.46%</td><td>55.16%</td><td>82.70%</td></tr>
<tr><td colspan="2">99.63%</td><td colspan="2">99.63%</td><td colspan="2">99.79%</td></tr>
<tr><td colspan="2"></td><td colspan="4">99.96%</td></tr>
<tr><td colspan="6">99.96%</td></tr>
</table>

Note: Single runway end coverages calculated with a 3-knot tailwind
Source: National Climatic Data Center, FAA Airport Geographic Information System wind analysis tool
Station: Willow Run Airport, Ypsilanti, Michigan
Period of Record: 2005-2014 based on 96,564 observations
Visual Flight Rules = Ceiling greater than or equal to 1,000 feet and visibility greater than or equal to 3 statute miles

When instrument flight rules (IFR) are present, the cloud ceiling height is less than 1,000 feet AGL and/or the visibility is less than 3 statute miles. During these conditions, the orientation of parallel runways 5L/23R and 5R/23L provide wind coverage 90.96 percent of the time when allowable crosswinds up to 10.5 knots are present. Likewise, 94.83 percent wind coverage is achieved by these parallel runways when up to 13-knot crosswinds are present in IFR conditions. Again, Runway 9/27 is needed to achieve 95 percent wind coverage at the Airport when IFR conditions are present. **Table 3-3** presents the wind coverage at the Airport during IFR conditions.

**Table 3-3 – Wind Coverage in Instrument Flight Rules Conditions**

| Crosswind (in knots) | Runway 5L | Runway 23R | Runway 5R | Runway 23L | Runway 9 | Runway 27 |
|---|---|---|---|---|---|---|
| **10.5** | 64.29% | 65.70% | 64.29% | 65.70% | 66.98% | 65.28% |
| | 90.96% | | 90.96% | | 89.00% | |
| | | | 95.40% | | | |
| | 95.40% | | | | | |
| **13** | 66.46% | 68.15% | 66.46% | 68.15% | 69.51% | 68.65% |
| | 94.83% | | 94.83% | | 94.01% | |
| | | | 97.85% | | | |
| | 97.85% | | | | | |
| **16** | 68.26% | 70.30% | 68.25% | 70.30% | 71.75% | 71.55% |
| | 97.88% | | 97.88% | | 98.07% | |
| | | | 99.30% | | | |
| | 99.30% | | | | | |
| **20** | 69.19% | 71.36% | 69.19% | 71.36% | 72.54% | 72.64% |
| | 99.39% | | 99.39% | | 99.63% | |
| | | | 99.90% | | | |
| | 99.90% | | | | | |

Note: Single runway end coverages calculated with a 3-knot tailwind
Source: National Climatic Data Center, FAA Airport Geographic Information System wind analysis tool
Station: Willow Run Airport, Ypsilanti, Michigan
Period of Record: 2005-2014 based on 20,674 observations
IFR = Ceiling less than 1,000 feet and/or visibility less than 3 statute miles

The true heading of each runway was calculated to perform the wind analysis, which in turn was used to calculate each runway's magnetic azimuth. The magnetic azimuth of a runway is used to determine its designation, which is the whole number nearest to one-tenth the magnetic azimuth of a runway's centerline. Since the magnetic azimuth of a runway can change based on the slow drifting position of the magnetic north pole, a periodic review should be conducted to determine if the runway's designation needs to be changed. According to information obtained from the National Oceanic and Atmospheric Administration (NOAA), the magnetic declination of the Airport's location as of October 2015 was 7.1 degrees west of true north. Adding this declination to the true bearing of the runway (**Table 3-4**), no designation changes are needed to Runway 5L/23R and Runway 5R/23L; however, Runway 9/27 should be changed to Runway 10/28 to reflect the orientation of its magnetic azimuth. For the purposes of this master plan, the designation of the runway will continue to be referred to as 9/27, as that is what is currently listed in all FAA publications and other data sources; however, a change of the designation to 10/28 is needed in the future.

**Table 3-4 – Magnetic Declination Calculation / Runway Designation Check**

| Item | Runway 5L | Runway 23R | Runway 5R | Runway 23L | Runway 9 | Runway 27 |
|---|---|---|---|---|---|---|
| True Bearing | 46.72195 | 226.7328 | 46.70477 | 226.7184 | 88.54694 | 268.565 |
| Declination | 7.100 W | 7.100 W | 7.100 W | 7.1167 W | 7.100 W | 7.1167 W |
| Magnetic Azimuth | 53.82195 | 233.8328 | 53.80477 | 233.835067 | 95.64694 | 275.681667 |
| Runway Designation | 5L | 23R | 5R | 23L | 10 | 28 |

Note: Magnetic declination calculated for October 9, 2015, using World Magnetic Model (WMM) by Mead & Hunt, Inc. (2015)
Source: National Oceanic and Atmospheric Administration

## 3.3 Identification of Design Standards

The design of airfield surfaces is based on standards set forth in FAA AC 150/5300-13A, *Airport Design*, that are derived from the physical and operational characteristics of the type of aircraft intended to use a surface. The design of runways is based on the Runway Design Code (RDC), a coding system that determines the dimensions of a runway's design surfaces as it relates to the approach speed, wingspan, and vertical stabilizer (tail) height of an aircraft. The first component of the RDC, the Aircraft Approach Category (AAC), relates to the approach speed of an aircraft and is categorized by a letter. The second component of the RDC, the Airplane Design Group (ADG) categorizes aircraft by wingspan and tail height and is categorized by a Roman numeral. **Table 3-5** presents the classification of AAC categories and the ADG groups along with examples of aircraft types that typically comprise each classification.

**Table 3-5 – Runway Design Code Coding System**

| Aircraft Approach Categories | |
|---|---|
| **Category** | **Approach Speed** |
| Category A | Less than 91 knots |
| Category B | 91 knots or more, but less than 121 knots |
| Category C | 121 knots or more, but less than 141 knots |
| Category D | 141 knots or more, but less than 166 knots |
| Category E | 166 knots or more |

| Airplane Design Groups | | |
|---|---|---|
| **Group** | **Tail Height** | **Wingspan** |
| I | Less than 20 feet | Less than 49 feet |
| II | From 20 feet to less than 30 feet | From 49 feet to less than 79 feet |
| III | From 30 feet to less than 45 feet | From 79 feet to less than 118 feet |
| IV | From 45 feet to less than 60 feet | From 118 feet to less than 171 feet |
| V | From 60 feet to less than 66 feet | From 171 feet to less than 214 feet |
| VI | From 66 feet to less than 80 feet | From 214 feet to less than 262 feet |

Source: FAA AC 150/5300-13A, *Airport Design*

A third and final component of the RDC relates to the visibility minimums of a runway's approach, which factors into the width of a runway and the dimensions of its approach surfaces. **Table 3-6** lists the visibility minimums defined by FAA AC 150/5300-13A, *Airport Design*, which are used in conjunction with the AAC and ADG to determine the dimensions of the design surfaces of a runway. Visibility minimums are expressed by Runway Visual Range (RVR) values unless the runway has a visual approach in which "VIS" is used as the designation.

**Table 3-6 – Runway Design Code Visibility Minimum Classifications**

| Runway Visual Range | Instrument Flight Visibility Category (statute mile) |
|---|---|
| 5000 | Not lower than 1 mile |
| 4000 | Lower than 1 mile but not lower than 3/4 mile |
| 2400 | Lower than 3/4 mile but not lower than 1/2 mile |
| 1600 | Lower than 1/2 mile but not lower than 1/4 mile |
| 1200 | Lower than 1/4 mile |
| VIS | Visual approach only |

Source: FAA AC 150/5300-13A, *Airport Design*

**Table 3-7** lists the existing AAC, ADG, and visibility minimum components of the RDC classification for each runway at the Airport. The existing RDC classification of Runway 5R/23L, the primary runway, is D-IV-4000, while the RDC classification of Runway 5L/23R and Runway 9/27 is D-IV-5000.

**Table 3-7 – Runway Design Code Classifications of Airport's Runways**

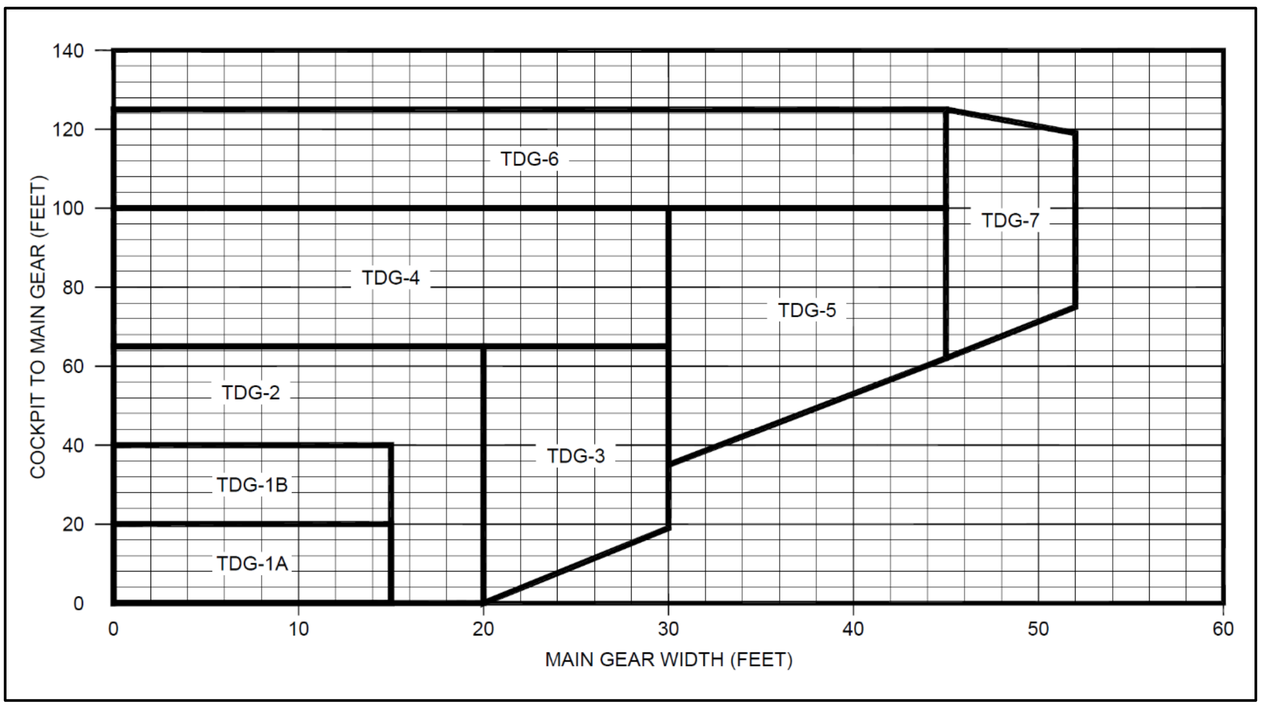
| Runway | Aircraft Approach Category | Airplane Design Group | Visibility Minimum | Runway Visual Range |
|---|---|---|---|---|
| 5L/23R | D | IV | Not lower than one mile | 5000 |
| 5R/23L | D | IV | Not lower than ¾ mile | 4000 |
| 9/27 | D | IV | Not lower than one mile | 5000 |

Source: 2007 Airport Layout Plan, FAA Terminal Procedures

The 2007 update of the Airport Layout Plan (ALP) indicated that the design standards of the airfield were based upon category D-IV standards. This was driven by the Douglas DC-8, a category D-IV aircraft, which was the most demanding type operating at the Airport at the time. A review of the existing fleet mix of aircraft currently conducting operations at the Airport found the Douglas DC-9, a category C-III aircraft, is the most demanding type of large aircraft conducting over 500 annual operations. Interviews with based Airport users found that in addition to the DC-9, other large aircraft types are expected to increase in operation over the planning period. USA Jet, a based tenant, recently purchased a Boeing 727-200 (category C-III aircraft) to complement its fleet of Douglas DC-9s and McDonnell Douglas MD-83 (category D-III) aircraft. Other tenants at the Airport indicated the Boeing 737-800 (category D-III aircraft) and Boeing 757-200SF (category C-IV aircraft) were potential types that could replace or complement Douglas DC-9 operations during the planning period. Air cargo tenants at the airport have also indicated that their future business plans include pursuing contract flying of B767 cargo aircraft. Since it is anticipated that large aircraft will continue to operate at the Airport in the future and the airport will continue to have occasional operations by wide-body aircraft such as the B767 and similar types, it is prudent that the airfield should continue to be maintained at its current classification of category D-IV standards. A separate discussion about the recommended design standards for Runway 9/27, which is primarily used in crosswind conditions, is presented in Section 3.4.2.b as a part of the runway length analysis.

In addition to the RDC, the Taxiway Design Group (TDG) is a similar classification system used to determine the design of a taxiway that includes its width as well as its intersection fillet design and separation from runways, taxilanes, and other taxiways. The TDG is based on the width of the main landing gear and its distance to the cockpit of the most demanding type of aircraft intended to regularly conduct operations on its surface. Note that the TDG designation for a series of taxiways at an airport will often vary based on the aircraft type intended to regularly conduct operations on its surface as well as the purpose of the taxiway. Typically, the parallel taxiway of a runway is designed for the largest types of aircraft intended to regularly use the runway, while connector taxiways will be designed for specific aircraft types using aprons or hangar facilities. **Figure 3-1** illustrates the main gear width and cockpit to main gear distance dimensions for the seven TDG classifications that are identified by FAA AC 150/5300-13A, *Airport Design*.

**Figure 3-1 – Taxiway Design Group Classifications**




Source: FAA AC 150/5300-13A, *Airport Design*

**Table 3-8** presents the TDG classifications and required taxiway widths for existing and projected critical aircraft types that are anticipated to conduct operations at the Airport for the next 20 years. The taxiways at the airport at all currently designed to TDG 5 standards at 75 feet in width. TDG 5 aircraft are not anticipated to conduct 500 annual operations at the airport, however the runway can accommodate wide-body aircraft (TDG 5) and does so occasionally. Therefore, the taxiway system needs to be capable of accommodating TDG 5 operations on an occasional basis to safely taxi these aircraft around the airfield. As shown in the table, TDG 5 aircraft are expected to conduct operations at the Airport in the future; thus, it is prudent that the taxiway system should continue to be maintained to support TDG 5 aircraft.

**Table 3-8 – Taxiway Design Group Classifications of Current & Projected Critical Aircraft Types**

| Aircraft | Taxiway Design Group | Required Taxiway Width |
|---|---|---|
| Douglas DC-9-10 | 2 | 25 feet |
| McDonnell Douglas MD-83 | 4 | 50 feet |
| Boeing 727-200 | 4 | 50 feet |
| Boeing 737-800 | 4 | 50 feet |
| Boeing 757-200SF | 4 | 50 feet |
| Boeing 767-300 | 5 | 75 feet |

Source: FAA AC 150/5300-13A, *Airport Design*; Aircraft manufacturers planning manuals

## 3.4 Runways

The following section presents the analysis that was conducted of the three runways at the Airport and their ability to meet existing and future demand. This evaluation also included a review of the configuration of the three runways as well as each individual runway's length, width, grade, strength, and pavement condition. Other runway design standards such as safety areas, object free areas, and airspace protection surfaces were also evaluated to determine if improvements are needed to meet the design standards of the critical aircraft types. The recommended course of action and any improvements found to be needed to meet existing and/or future demand are discussed at the conclusion of each subsection.

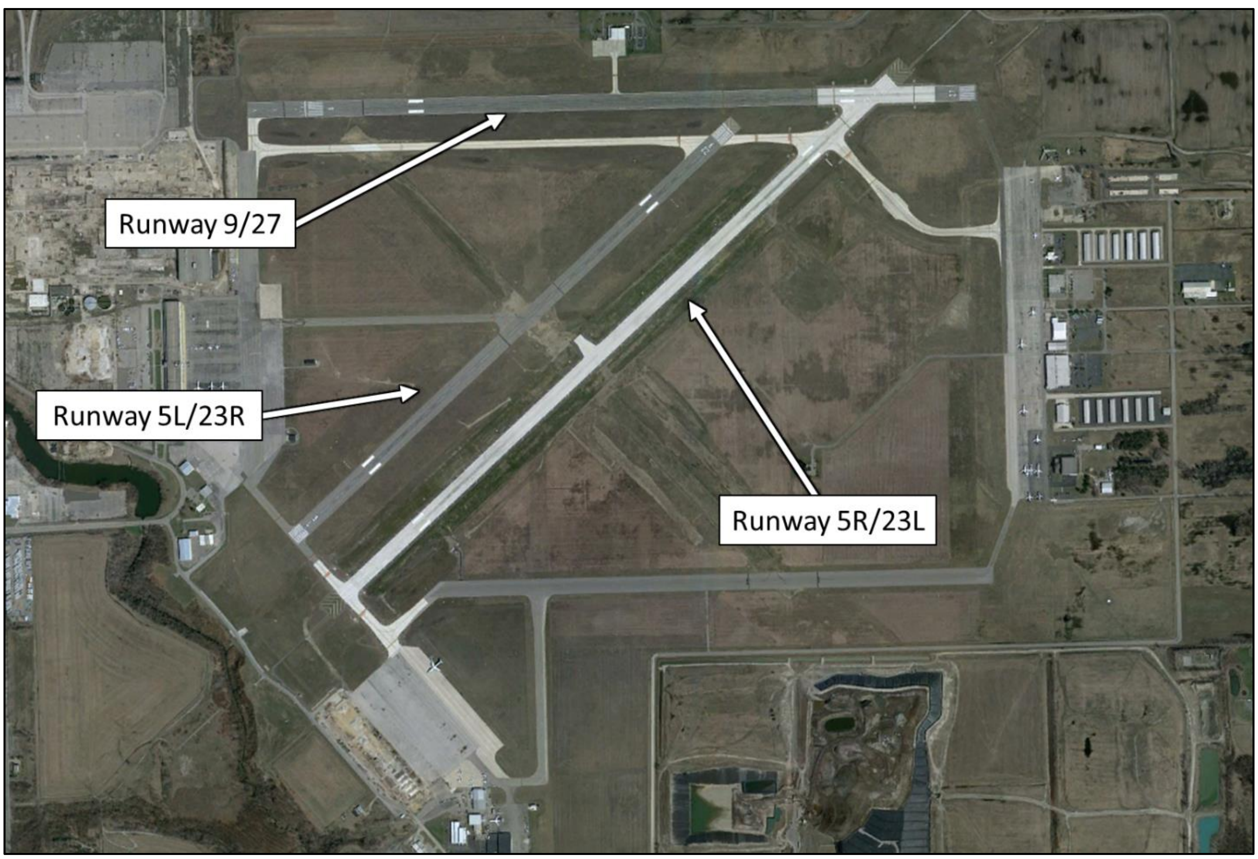
### 3.4.1 Runway Configuration

The configuration of the three runways at the Airport is V-shaped with two runways (Runway 5R/23L and Runway 5L/23R) parallel to one another in a northeast/southwest direction (**Figure 3-2**). Runway 5R/23L is the primary runway at the Airport with Runway 5L/23R used in a supplementary role when the direction of the wind favors use of these runways. The airfield also has an east/west oriented Runway 9/27 that intersects Runway 5R/23L at the approach end of Runway 23L. Since these two runways intersect near the thresholds of Runway 23L and Runway 27, there is a potential for a taxiing aircraft to maneuver onto the wrong runway for departure; thus, the FAA has designated this intersection as a "hot spot", or an area with a history of potential risk of collision or runway incursion, requiring heightened attention by pilot and ground vehicle operators. Hot spots should be eliminated, where practicable, to improve airfield safety and eliminate the potential for a wrong runway departure as in the case of the intersection of Runway 5R/23L and Runway 9/27. Thus, it is recommended that the intersection of Runway 5R/23L and Runway 9/27 be reconfigured to eliminate the runway ends from intersecting one another near their thresholds.

Concerning Runway 5R/23L and Runway 5L/23R which parallel one another, the lateral distance (753 feet) is such that simultaneous operations under VFR can be conducted. Local air traffic control tower personnel have noted the benefit in maintaining two parallel runways is that it provides an option to separate aircraft with slower approach and departure speeds from those with faster approach and departure speeds when these aircraft types are operating simultaneously at the Airport; however, the demand/capacity analysis determined that parallel runways are not anticipated to be needed during the planning period for capacity purposes.

Since Runway 5L/23R is not needed for wind coverage or capacity purposes, it would be ineligible for funding participation in the federal Airport Improvement Program (AIP) for any improvements; thus, any improvements to the runway would need to be funded locally. Since there does not appear to be a need to maintain the runway according to AIP funding eligibility guidelines, Runway 5R/23L could be closed if cost savings are desired to operate and maintain the Airport. However, there is no requirement that the runway be closed so it could continue to remain open until its condition deteriorates to a point where a closure or improvement project is needed.

**Figure 3-2 – Runway Configuration**




Aerial: Google Earth (2016)

## 3.4.2 Runway Length Analysis

The length of a runway should accommodate the landing and takeoff distance requirements of the most demanding types of aircraft (existing or projected) intended to regularly conduct operations on its surface. FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design*, provides guidelines to determine the recommended length of a runway based on a critical design aircraft that is anticipated to operate on the surface over a period of several years. As such, it is important to first identify the runway length requirements of aircraft that are anticipated to conduct regular operations at the Airport during the planning period. In addition, it is also important to consider federal funding eligibility guidelines when reviewing runway length needs. For a runway project to be eligible for federal funding participation, at least 500 annual operations are needed by an individual aircraft type or a family grouping of aircraft types. Runway length needs are reviewed in this section by three different levels of demand: the demand of the largest aircraft types with the greatest runway length needs, the demand of aircraft most affected by crosswind conditions at the Airport, and the runway length demand for Runway 5L/23R.

### 3.4.2.a Large Aircraft Runway Length Needs

Heavy and large aircraft have the greatest runway length needs. To evaluate the runway length needs of these aircraft types, it is first important to understand the types and number of operations conducted by these aircraft at the Airport. **Table 3-9** presents the types and number of IFR operations conducted by heavy (greater 255,000 pounds) and large (between 41,000 pounds and 255,000 pounds) aircraft in 2015. It is noted that the FAA's Traffic Flow Management System Count (TFMSC) database classifies the B-17 and the B-24 as "heavy," although the maximum operating weight of these aircraft are less than 255,000 pounds. While it may appear to skew the number of operations, a decision was made to include these in the following evaluation since the B-17 is based at the Airport.

**Table 3-9 – Heavy and Large Aircraft Operations (2014)**

| Weight Class | Aircraft Type | 2014 IFR Operations | | |
|---|---|---|---|---|
| | | Departures | Arrivals | Total Operations |
| Heavy Eqpt | B17 - Boeing B-17 Flying Fortress | 11 | 7 | 18 |
| Heavy Eqpt | B742 - Boeing 747-200 | 1 | 0 | 1 |
| Heavy Eqpt | B744 - Boeing 747-400 | 1 | 1 | 2 |
| Heavy Eqpt | C17 - Boeing Globemaster 3 | 1 | 1 | 2 |
| Heavy Eqpt | E6 - Boeing E-6 Mercury | 1 | 1 | 2 |
| Heavy Eqpt | K35 - Boeing KC-135 Stratotanker | 1 | 1 | 2 |
| | **Total for Heavy Equipment** | **16** | **11** | **27** |
| Large Jet Eqpt | A320 - Airbus A320 All Series | 7 | 7 | 14 |
| Large Jet Eqpt | B722 - Boeing 727-200 | 248 | 247 | 495 |
| Large Jet Eqpt | B732 - Boeing 737-200/VC96 | 8 | 8 | 16 |
| Large Jet Eqpt | B733 - Boeing 737-300 | 15 | 15 | 30 |
| Large Jet Eqpt | B734 - Boeing 737-400 | 66 | 68 | 134 |
| Large Jet Eqpt | B737 - Boeing 737-700 | 6 | 7 | 13 |
| Large Jet Eqpt | B738 - Boeing 737-800 | 18 | 18 | 36 |
| Large Jet Eqpt | B739 - Boeing 737-900 | 2 | 2 | 4 |
| Large Jet Eqpt | B73Q - Boeing 737 Stage 3 | 18 | 19 | 37 |
| Large Jet Eqpt | DC9 - Douglas DC 9-10/30/50 | 1 | 3 | 4 |
| Large Jet Eqpt | DC91 - Boeing (Douglas) DC 9-10 | 638 | 645 | 1,283 |
| Large Jet Eqpt | DC93 - Boeing (Douglas) DC 9-30 | 324 | 322 | 646 |
| Large Jet Eqpt | MD80 - Boeing (Douglas) MD 80 Series | 9 | 9 | 18 |
| Large Jet Eqpt | MD82 - Boeing (Douglas) MD 82 | 20 | 20 | 40 |
| Large Jet Eqpt | MD83 - Boeing (Douglas) MD 83 | 107 | 105 | 212 |
| | **Total for Large Equipment** | **1,487** | **1,495** | **2,982** |

Note: IFR Operations
Source: FAA TFMSC database

Next, it is important to understand the haul or stage length being flown by these aircraft types. Interviews with large aircraft operators at the Airport indicate that flights are regularly conducted to destinations as far away as southern Texas and Mexico, such as:

- Del Rio, Texas (1,141 nautical miles)
- Laredo, Texas (1,175 nautical miles)
- Brownsville, Texas (1,195 nautical miles)
- El Paso, Texas (1,254 nautical miles)
- Saltillo, Mexico (1,306 nautical miles)
- Queretaro, Mexico (1,549 nautical miles)
- Aguascalientes, Mexico (1,551 nautical miles).

**Table 3-10** presents the most prevalent airports (stage lengths greater 1,000 nautical miles) served by users to and from the Airport.

**Table 3-10 – Operations by Origin/Destination Airport – Greater than 1,000 NM haul length (2014)**

| Rank | Airport | State/ Country | Longest Runway at Airport (ft.) | Nautical Miles/Flight | Arrivals from | Departures to | Total Ops to/from |
|---|---|---|---|---|---|---|---|
| 1 | LRD - Laredo | TX | 8,743 | 1,175 | 140 | 84 | 224 |
| 2 | ELP - El Paso | TX | 12,020 | 1,254 | 27 | 67 | 94 |
| 3 | BRO - Brownsville | TX | 7,399 | 1,195 | 43 | 32 | 75 |
| 4 | MMIO - Saltillo | Mexico | 9,506 | 1,306 | 4 | 29 | 33 |
| 5 | DRT - Del Rio | TX | 6,300 | 1,141 | 15 | 9 | 24 |
| 6 | MMQT - Queretaro | Mexico | 11,482 | 1,549 | 2 | 11 | 13 |
| 7 | MMAS - Aguascalientes | Mexico | 9,843 | 1,551 | 4 | 7 | 11 |
| 8 | MMCU - Chihuahua | Mexico | 8,531 | 1,356 | 6 | 4 | 10 |
| 9 | SDM - San Diego | CA | 7,972 | 1,682 | 6 | 3 | 9 |
| 10 | SAT - San Antonio | TX | 8,505 | 1,049 | 5 | 4 | 9 |
| 11 | MMLO - Leon/Guanajuato | Mexico | 11,480 | 1,577 | 1 | 7 | 8 |
| 12 | MFE - Mc Allen | TX | 7,120 | 1,204 | 1 | 7 | 8 |
| 13 | SKF - San Antonio | TX | 11,550 | 1,059 | 2 | 5 | 7 |
| 14 | MMHO - Hermosillo | Mexico | 7,546 | 1,544 | 2 | 4 | 6 |
| 15 | MMMY - Monterrey | Mexico | 9,843 | 1,281 | 3 | 3 | 6 |
| 16 | CNO - Chino | CA | 7,000 | 1,671 | 4 | 1 | 5 |
| 17 | MMTO - Mexico City | Mexico | 13,780 | 1,412 | 3 | 2 | 5 |
| 18 | PVU - Provo | UT | 8,599 | 1,271 | 2 | 3 | 5 |
| | | | | All Others | 40 | 31 | 71 |
| | | Total (Greater than 1,000 NM haul length) | | | 310 | 313 | 623 |

Source: FAA TFMSC database

Next, haul length restrictions placed upon large aircraft as a result of the current runway length of 7,543 feet to conduct flights to destinations greater than 1,000 nautical miles were also examined. The weight of an aircraft factors into the distance required for takeoff; thus, in order to carry the maximum allowable payload, a reduction in fuel is needed to reduce the weight of the aircraft so it can takeoff from a 7,543-foot runway. This, in turn, affects the haul length that can be obtained with a full payload. **Table 3-11** presents the haul length available for existing and future large aircraft types when departing with maximum allowable payload from the existing 7,543 feet of runway length that is available at the Airport. **Figure 3-3** graphically depicts the maximum range of each aircraft under these conditions along with the locations of the top 18 origin/destination airports to which non-stop flights were conducted according to the TFMSC database.

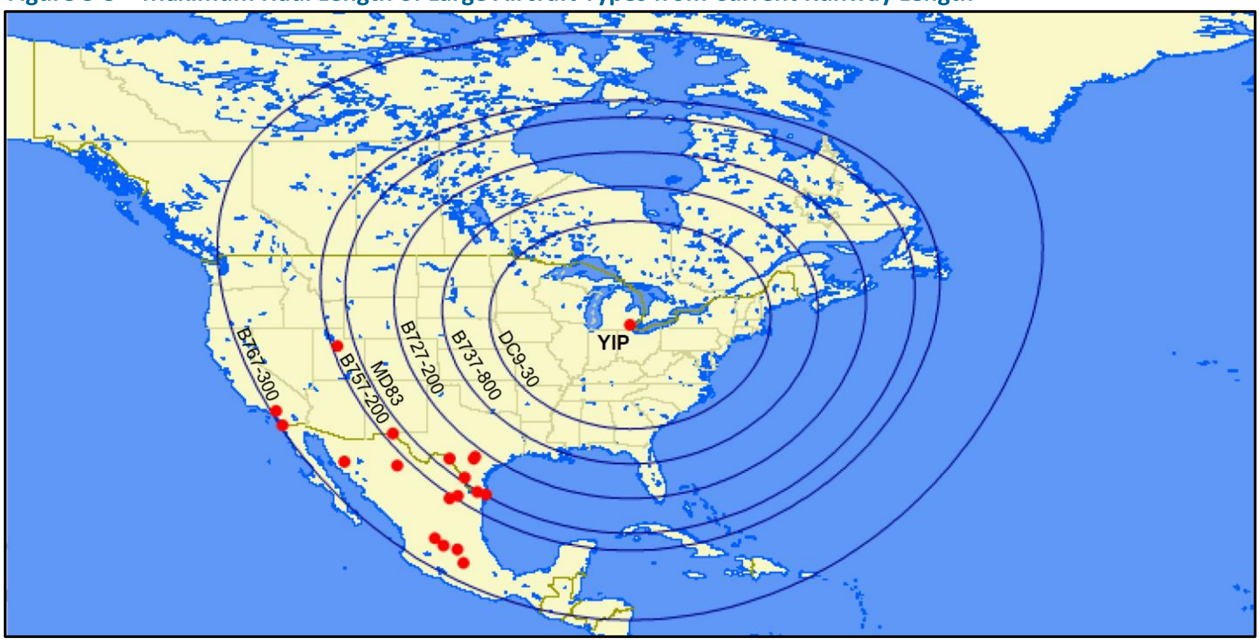
**Table 3-11 – Maximum Haul Length of Large Aircraft Types from Current Runway Length**

| Aircraft Type | Engines | Max Allowable Takeoff Weight (LB) | Percent of Max Takeoff Weight Allowed | Haul Length Available with Full Payload (NM) |
|---|---|---|---|---|
| **Current Runway Length = 7,543 feet** | | | | |
| DC9-30 | JT8D-7 | 103,000 | 95% | 600 |
| MD83 | JT8D-219 | 150,000 | 94% | 1,200 |
| B737-800 | CFM56-7B24 | 157,000 | 90% | 800 |
| B727-200 | JT8D-17 | 180,000 | 91% | 1,000 |
| B757-200 | PW2037 | 234,000 | 92% | 1,300 |
| B767-300 | CF6-80C2B7F | 367,000 | 89% | 1,700 |

Note: Runway length required on hot day, airfield elevation 716 feet mean sea level

Source: Manufacturer airport planning manuals

**Figure 3-3 – Maximum Haul Length of Large Aircraft Types from Current Runway Length**




Note: Red dots identify destinations over 1,000 nm that were flown non-stop from the Airport in 2014 as listed in Table 3-10
Source: Great Circle Mapper (gcmap.com)

Except for the Boeing 767-300, existing and future large aircraft types that are anticipated to be operating at the Airport during the planning period have limited ability to conduct non-stop flights to destinations in Mexico, Texas, and the West Coast. Interestingly, large aircraft currently conducting operations at the Airport, such as the DC-9-30, Boeing 727-200, and MD-83, are unable to fly to several regular key destinations with a full payload. Thus, there appears to be a need for additional runway length.

The frequency with which flights requiring additional runway are conducted ultimately determines the eligibility of FAA funding for a project to provide additional runway length. According to FAA Airport Improvement Program (AIP) funding eligibility guidelines, a project must demonstrate that at least 500 annual operations are in need of the proposed improvement, in this case additional runway length. **Table 3-12** presents the number of IFR operations that were conducted at the Airport by large aircraft type that exceeded the haul length available with a full payload from the existing length of the runway according to the FAA's TFMSC database.

**Table 3-12 – 2015 Operations to/from Destinations over Haul Length Limit**

| Aircraft Type | 2015 Total Operations | Haul Length Available with Full Payload from Existing Runway Length (nautical miles) | 2015 Operations to/from Destinations over Haul Length Limit |
|---|---|---|---|
| DC-9-10 | 1,288 | 750 | * |
| DC-9-30 | 648 | 600 | 156 |
| 727-200 | 495 | 1,000 | 183 |
| MD-80 | 272 | 1,200 | 70 |
| 737-400 | 171 | 750 | 30 |
| 737-800 | 36 | 800 | 5 |
| 737-300 | 30 | 1,250 | 2 |
| 737-200 | 16 | 600 | 2 |
| A320 | 14 | 1,800 | 0 |
| 737-700 | 13 | 1,400 | 0 |
| 737-900 | 4 | 600 | 0 |
| 737-200 | 0 | 1,300 | 0 |
| 767-300 | 0 | 1,700 | 0 |
| **TOTAL** | **2,987** | **-** | **448** |

*Note: DC-9-10 is limited by range of aircraft and not existing runway length.

Sources: Operations – FAA TFMSC IFR operations

Efficient haul length computed from aircraft manufacturers planning manuals

Prepared by: Mead & Hunt, Inc. (2016)

According to TFMSC data, 448 operations were conducted by large aircraft that exceeded the haul length limit available with a full payload operating from the existing length of runway at the Airport.

To compensate for the lack of needed runway length, large aircraft departing the Airport to destinations greater than the aircraft's payload/range capability will either conduct flights at a reduced payload, a reduced fuel load, and/or will make a fuel stop prior to arriving to their intended destination. Information provided by USA Jet Airlines, a based tenant, indicates that for their fleet of aircraft and the carriers that are contracted to perform work for USA Jet Airlines, this need to stop for fuel to reach the intended destination occurred 88 times in 2015. **Table 3-13** presents the number of occurrences when USA Jet Airlines and its contracted carriers had to make a stop for fuel prior to arriving to their intended destination for flights departing the Airport between 2011 and November 2016.

**Table 3-13 – USA Jet Airlines Fuel Stop Occurrences**

| Year | USA Jet Airlines Fleet | | Other Contracted Carriers | | TOTAL OPERATIONS | |
|---|---|---|---|---|---|---|
| | Total Ops | Fuel Stops | Total Ops | Fuel Stops | Total Ops | Fuel Stops |
| 2011 | 112 | 27 | 147 | 31 | 259 | 58 |
| 2012 | 200 | 76 | 266 | 76 | 466 | 152 |
| 2013 | 185 | 77 | 148 | 36 | 333 | 113 |
| 2014 | 294 | 29 | 295 | 24 | 589 | 53 |
| 2015 | 227 | 43 | 254 | 45 | 481 | 88 |
| 2016* | 109* | 16* | 127* | 34* | 236* | 50* |
| **TOTAL** | **1,127** | **268** | **1,237** | **246** | **2,364** | **514** |

*Total operations through November 8, 2016

Source: USA Jet Airlines

As shown above, 88 fuel stops by USA Jet and its contracted carriers were conducted in 2015. These operations are in addition to the 448 operations conducted that exceeded the haul length limit available with a full payload operating from the existing length of runway at the Airport, and do not include other carriers such as Kalitta or others that may also have to conduct fuel stops due the lack of available length at the Airport. Therefore, at least 536 operations were conducted at the Airport that were potentially runway length limited for the payload/range required for the operation, or were required to conduct an intermediate fuel stop. Since the frequency of these operations occurs more than 500 times annually, a project to provide additional runway length at the Airport would currently meet FAA AIP funding eligibility guidelines. Therefore, as operations needing additional runway length totaled more than 500 in 2015, and are projected to increase over the planning period, the Airport should continue to plan to provide additional runway length.

Aircraft manufacturer planning manuals were used to determine the length of runway needed for existing and future aircraft types to depart from the Airport with a full payload to reach the top destinations greater than 1,000 nautical miles (**Table 3-14**). Given that large aircraft are conducting flights to destinations on the West Coast and Mexico, the takeoff distance calculations assumed aircraft types would be operating at maximum takeoff weight for a 1,750-nautical mile flight. Runway length calculations also assumed aircraft were operating on a warm day (approximately 83-degree Fahrenheit day) at the elevation of the airfield (716 feet above mean sea level [MSL]) adjusted for the runway centerline gradient (13 feet of runway centerline elevation change).

**Table 3-14 – Runway Length Requirements – Existing and Future Fleet of Large Aircraft Types**

| Aircraft Type | Engines | Takeoff Weight (LB) | Runway Length Required (FT) |
|---|---|---|---|
| **Stage Length 1,750 NM** | | | |
| DC-9-30 | JT8D-7 | 108,000 | 9,600 |
| 737-800 | CFM56-7B24 | 170,000 | 9,500 |
| 727-200 | JT8D-17 | 196,000 | 9,700 |
| MD-83 | JT8D-219 | 160,000 | 9,200 |
| 757-200 | PW2037 | 240,000 | 8,200 |
| 767-300 | CF6-80C2B7F | 370,000 | 7,500 |

Note: Runway length required on hot day, airfield elevation 716 feet mean sea level

Source: Manufacturer airport planning manuals

Based on information presented in the preceding table, the Boeing 737-800, DC-9-30, and 727-200 have the most demanding runway length needs at 9,500 feet, 9,600 feet, and 9,700 feet, respectively. In taking an average of these runway length needs, 9,600 feet of runway is recommended to meet the needs of current users of large aircraft. Planning should be initiated so that 9,600 feet of runway can be provided at the Airport.

### 3.4.2.b Runway 9/27

Runways intended to accommodate aircraft affected by crosswind conditions are designed for the most demanding types that are affected by local crosswinds. The wind analysis conducted for the Airport found that aircraft with 10.5-knot and 13-knot crosswind limitations are most affected when crosswind conditions are present on the parallel arrangement of Runway 5L/23R and Runway 5R/23L. Since the parallel arrangement of these runways does not provide 95-percent coverage as recommended by the FAA, Runway 9/27 is recommended to be maintained to accommodate aircraft during crosswind conditions.

**Critical Aircraft Determination –** First, a determination must be made of the critical design aircraft for Runway 9/27 for its runway length needs. Aircraft most affected by 10.5-knot crosswinds are generally single- and twin-engine propeller driven types while aircraft affected by 13-knot crosswinds are business jet types. Since jets have the most demanding takeoff distance needs and ultimately determine the length of a runway, a review was conducted to identify the most prevalent jet aircraft types affected by 13-knot crosswinds that conduct operations at the Airport. The FAA's TFMSC database provides a count of the number of IFR operations at an airport by aircraft type. Jet aircraft types affected by 13-knot crosswinds are classified in the TFMSC database as "Large Commuter Equipment" and "Medium Commuter Equipment", respectively. **Table 3-15** presents a representation of the most prevalent aircraft types within the "Large Commuter Equipment" and "Medium Commuter Equipment" TFMSC classifications who conducted operations at the Airport in 2015. The table includes the percentage of fleet mix operations for IFR and VFR for each aircraft type as well as the number of annual IFR operations, estimated VFR operations, and Airport Reference Code (ARC) classifications.

**Table 3-15 – 2015 Operations by Prevalent Jet Aircraft Affected by 13-knot Crosswinds**

| Aircraft | Fleet Mix % | | 2015 Operations | | | ARC |
|---|---|---|---|---|---|---|
| | IFR | VFR | IFR | VFR | Total | |
| **Large Commuter Equipment** | | | | | | |
| E145 – Embraer ERJ-145 | 0.57% | 0.00% | 128 | 0 | 128 | C-II |
| **Large Commuter Equipment Subtotal** | - | - | **128** | **0** | **128** | - |
| **Medium Commuter Equipment** | | | | | | |
| FA20 – Dassault Falcon/Mystère 20 | 14.81% | 0.25% | 3,305 | 94 | 3,399 | B-II |
| LJ35 – Bombardier Learjet 35/36 | 8.93% | 0.13% | 1,993 | 47 | 2,040 | D-I |
| H25B – Bae HS 125/700-800/Hawker 800 | 7.01% | 0.13% | 1,565 | 47 | 1,612 | C-II |
| BE40 – Raytheon/Beech Beechjet 400/T-1 | 3.91% | 0.13% | 873 | 47 | 920 | B-I |
| CL30 – Bombardier (Canadair) Challenger 300 | 2.69% | 0.00% | 600 | 0 | 600 | C-II |
| LJ25 – Bombardier Learjet 25 | 2.48% | 0.00% | 554 | 0 | 554 | C-I |
| C560 – Cessna Citation V/Ultra/Encore | 2.44% | 0.00% | 543 | 0 | 543 | B-II |
| C56X – Cessna Excel/XLS | 1.90% | 0.00% | 425 | 0 | 425 | B-II |
| C680 – Cessna Citation Sovereign | 1.63% | 0.00% | 364 | 0 | 364 | B-II |
| F2TH – Dassault Falcon 2000 | 1.52% | 0.00% | 339 | 0 | 339 | B-II |
| **Medium Commuter Equipment Subtotal** | - | - | **10,561** | **235** | **10,796** | - |
| **Large & Medium Commuter Equipment TOTAL** | - | - | **10,689** | **235** | **10,924** | - |

Notes:
Fleet Mix percentages representative of all operations conducted at the Airport in 2015
Not all aircraft types included; only those that represent the most prevalent aircraft types within each weight class
Sources: FAA TFMSC database, FAA OPSNET database, Mead & Hunt

According to TFMSC data, 10,924 operations were conducted by prevalent jet aircraft types affected by 13-knot crosswinds at the Airport. **Table 3-16** further breaks down this review of operations by ARC classification. B-II jet aircraft conducted the most number of IFR operations at the Airport (5,070), followed by C-II jet aircraft (2,340 operations) and D-I jet aircraft (2,040 operations). It is interesting to note that the number of operations conducted by each of these ARC classifications of prevalent jet aircraft types affected by 13-knot crosswinds exceeds the threshold needed (500 operations) to justify a critical aircraft type concerning the design of an airfield infrastructure project for the participation of federal funding.

**Table 3-16 – 2015 Operations by ARC Classification of Prevalent Jet Aircraft Affected by 13-knot Crosswinds**

| ARC | Fleet Mix % | | 2015 Operations | | |
|---|---|---|---|---|---|
| | IFR | VFR | IFR | VFR | Total |
| B-I | 3.91% | 0.13% | 873 | 47 | 920 |
| B-II | 22.30% | 0.25% | 4,976 | 94 | 5,070 |
| C-I | 2.48% | 0.00% | 554 | 0 | 554 |
| C-II | 10.27% | 0.13% | 2,293 | 47 | 2,340 |
| D-I | 8.93% | 0.13% | 1,993 | 47 | 2,040 |
| **TOTAL** | - | - | **10,689** | **235** | **10,924** |

Notes:
Includes operations by prevalent jet aircraft types categorized as “Large Commuter Equipment” and “Medium Commuter Equipment” in FAA TFMSC database
Fleet Mix percentages representative of all operations conducted at the Airport in 2015
Not all aircraft types included; only those that represent the most prevalent aircraft types within each weight class
Sources: FAA TFMSC database, FAA OPSNET database, Mead & Hunt

Runway percentage utilization information obtained from the Airport's Federal Aviation Regulation (FAR) Part 150 Airport Noise Compatibility Planning study was correlated with the total number of annual operations at the Airport to determine the number of operations conducted by these aircraft types on Runway 9/27. Jet aircraft affected by 13-knot crosswinds were categorized in the FAR Part 150 study as "Air Taxi" and "Business Jet" presented in **Table 3-17**. According to data from the FAR Part 150 study, "Air Taxi" and "Business Jet" classifications of aircraft conducted 20 percent of total arrival operations by these categories of aircraft types on Runway 27. Likewise, averaging and summing the percent of departure operations conducted by "Air Taxi" and "Business Jet" aircraft indicated that a total of 12.25 percent of total annual departure operations by this class of aircraft occurred on Runway 9/27.

**Table 3-17 – Percent Runway Utilization, Existing Runway Configuration**

| Aircraft Class | Rwy 5L | Rwy 5R | Rwy 9 | Rwy 23L | Rwy 23R | Rwy 27 |
|---|---|---|---|---|---|---|
| **ARRIVALS** | | | | | | |
| Air Carrier | 4.0% | 29.0% | 0.0% | 54.0% | 7.0% | 7.0% |
| Air Taxi | 13.0% | 19.0% | 0.0% | 36.0% | 13.0% | 20.0% |
| Business Jet | 13.0% | 19.0% | 0.0% | 36.0% | 13.0% | 20.0% |
| Single Engine Prop | 17.1% | 15.9% | 2.5% | 27.0% | 15.5% | 23.0% |
| Twin Engine Prop | 13.0% | 19.0% | 0.0% | 36.0% | 13.0% | 20.0% |
| Military | 3.0% | 35.0% | 0.0% | 60.0% | 2.0% | 0.0% |
| **DEPARTURES** | | | | | | |
| Air Carrier | 7.1% | 26.4% | 4.0% | 46.0% | 6.0% | 10.5% |
| Air Taxi | 14.3% | 32.7% | 2.0% | 34.0% | 11.0% | 6.0% |
| Business Jet | 9.2% | 11.3% | 3.0% | 52.0% | 11.0% | 13.5% |
| Single Engine Prop | 17.1% | 15.9% | 2.5% | 27.0% | 15.5% | 23.0% |
| Twin Engine Prop | 13.4% | 18.6% | 0.0% | 36.0% | 13.0% | 19.0% |
| Military | 9.0% | 29.0% | 0.0% | 54.0% | 8.0% | 0.0% |

Source: Willow Run Airport FAR Part 150 Study, June 2011

The total number of annual operations conducted on Runway 9/27 by prevalent jet aircraft types affected by 13-knot crosswinds can be determined by taking the total number of annual operations by these aircraft types at the Airport and multiplying it by the percentage of runway usage. Assuming the total number of operations is comprised of an equal number of arrivals and departures, prevalent jet aircraft affected by 13-knot crosswinds conducted:

- 1,092 annual arrival operations on Runway 9/27
  (10,924 total operations ÷ 2 = 5,462 total arrivals x 20 percent)
- 669 annual departure operations on Runway 9/27
  (10,924 total operations ÷ 2 = 5,462 total departures x 12.25 percent)
- 1,761 total annual operations (takeoffs and landings) on Runway 9/27

**Table 3-18** further presents the number of annual operations conducted on Runway 9/27 by prevalent jet aircraft types affected by 13-knot crosswinds sorted by ARC classification. The table also presents the number of annual operations conducted by prevalent jet aircraft types affected by 13-knot crosswinds sorted by AAC and ADG design standard categories as outlined in FAA AC 150/5300-13A, *Airport Design*.

**Table 3-18 – Annual Operations on Runway 9/27 by Prevalent Jet Aircraft Affected by 13-knot Crosswinds**

| ARC | 2015 Arrivals | % of Ops Rwy 9/27 | Rwy 9/27 Arrivals | 2015 Departures | % of Ops Rwy 9/27 | Rwy 9/27 Departures | Total Ops Rwy 9/27 |
|---|---|---|---|---|---|---|---|
| B-I | 460 | 20% | 92 | 460 | 12.25% | 56 | 148 |
| B-II | 2,535 | 20% | 507 | 2,535 | 12.25% | 311 | 818 |
| C-I | 277 | 20% | 55 | 277 | 12.25% | 34 | 89 |
| C-II | 1,170 | 20% | 234 | 1,170 | 12.25% | 143 | 377 |
| D-I | 1,020 | 20% | 204 | 1,020 | 12.25% | 125 | 329 |
| **ARC Total** | **5,462** | **-** | **1,092** | **5,462** | **-** | **669** | **1,761** |

| AAC | 2015 Arrivals | % of Ops Rwy 9/27 | Rwy 9/27 Arrivals | 2015 Departures | % of Ops Rwy 9/27 | Rwy 9/27 Departures | Total Ops Rwy 9/27 |
|---|---|---|---|---|---|---|---|
| B | 2,995 | 20% | 599 | 2,995 | 12.25% | 367 | 966 |
| C/D* | 2,467 | 20% | 493 | 2,467 | 12.25% | 302 | 796 |
| **AAC Total** | **5,462** | **-** | **1,092** | **5,462** | **-** | **669** | **1,762** |

| ADG | 2015 Arrivals | % of Ops Rwy 9/27 | Rwy 9/27 Arrivals | 2015 Departures | % of Ops Rwy 9/27 | Rwy 9/27 Departures | Total Ops Rwy 9/27 |
|---|---|---|---|---|---|---|---|
| I | 1,757 | 20% | 351 | 1,757 | 12.25% | 215 | 567 |
| II | 3,705 | 20% | 741 | 3,705 | 12.25% | 454 | 1,195 |
| **ADG Total** | **5,462** | **-** | **1,092** | **5,462** | **-** | **669** | **1,761** |

Notes:
* = Design standards for C & D aircraft when combined with ADG 'I' & 'II" classifications are the same except for blast pad length
Includes operations by prevalent jet aircraft types categorized as "Large Commuter Equipment" and "Medium Commuter Equipment" in FAA TFMSC database
Fleet Mix percentages representative of all operations conducted at the Airport in 2015
Not all aircraft types included; only those that represent the most prevalent aircraft types within each weight class
Sources: FAA TFMSC database, FAA OPSNET database, Mead & Hunt

For federal funding eligibility purposes, the critical aircraft type that determines the design of an airfield infrastructure project can be an individual type of aircraft or a family grouping of aircraft types. When taking this into consideration, the individual ARC classification of B-II jet aircraft types is the most prevalent at the Airport affected by 13-knot crosswinds that conducted over 500 annual operations. However, almost 800 operations were conducted at the Airport by larger jet aircraft types that are affected by 13-knot crosswinds with more demanding dimensional standards associated with the design of a runway; thus, it is prudent to also evaluate the number of operations conducted on Runway 9/27 by groupings of AAC and ADG associated with design standards identified in FAA AC 150/5300-13A, *Airport Design* to determine the critical design aircraft for Runway 9/27.

When evaluating the grouping of AAC aircraft types, the combination of 'C' and 'D' prevalent jet aircraft types affected by 13-knot crosswinds were the most demanding that conducted over 500 annual operations for this approach speed categorization. It is interesting to note that the family grouping of 'C' and 'D' aircraft types share the same dimensional standards except blast pad length when combined with ADG classifications 'I' and 'II'. Likewise, the family grouping of ADG 'II' jet aircraft were found to be the most prevalent at the Airport affected by

13-knot crosswinds that conducted over 500 annual operations. Thus, the critical design aircraft for Runway 9/27 should be a family grouping of C/D approach speed aircraft and a family grouping of ADG 'II' aircraft.

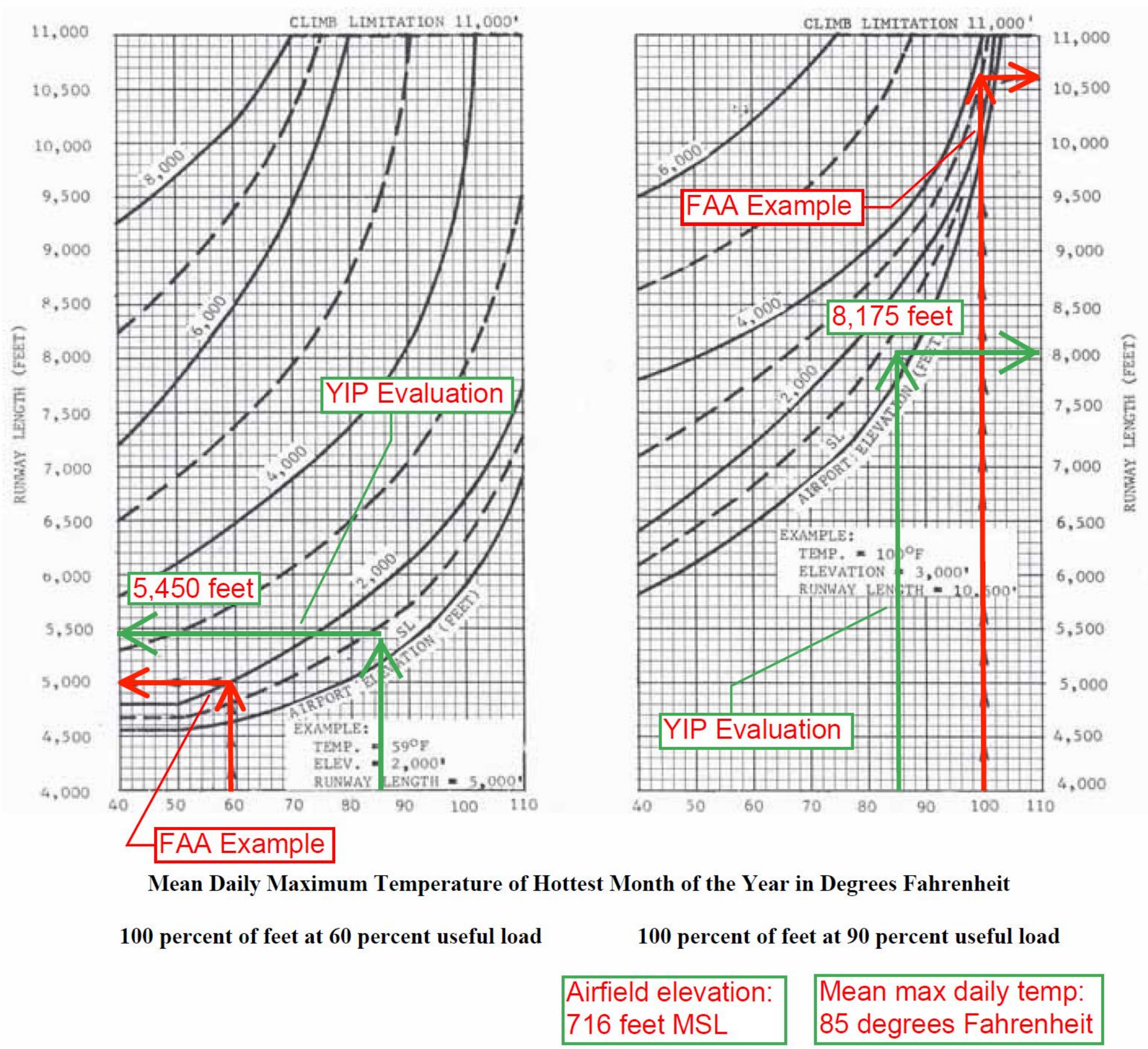
With the exception of the Learjet 35 and its associated family of similar Learjet aircraft types, most AAC 'D' aircraft are generally representative of larger types such as the Gulfstream V, Boeing 737-800, and most widebody aircraft that are not affected by 13-knot crosswind conditions. Thus, it does not appear prudent for use the AAC 'D' classification to represent the approach speed design standards for Runway 9/27. Since the dimensions of runway components for AAC 'C' and 'D' aircraft are identical when combined with ADG 'II' (except for blast pad length), it is recommended that the AAC 'C' classification be used to represent the approach speed design standard component for the family grouping of prevalent C/D jet aircraft types affected by 13-knot crosswinds that use Runway 9/27. Combined with the greater than 500 annual operations conducted by ADG 'II' aircraft, it is recommended that Runway 9/27 be classified as an ARC C-II runway.

**Runway Length Needs –** To determine the needed length of Runway 9/27 to accommodate the takeoff distance requirements of prevalent jet aircraft types affected by 13-knot crosswinds in most need of its use, FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design* was first referenced. Runway length needs for this classification of aircraft types based on similar performance characteristics and operating weights are defined in the advisory circular as turbojet powered aircraft that have an MTOW more than 12,500 pounds and up to and including 60,000 pounds. To calculate the recommended runway length for this fleet mix of aircraft types, FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design* provides runway length performance curves based on the percentage of aircraft types within this fleet mix. Airplanes that make up 75 percent of this classification according to the advisory circular include the Dassault Falcon 20, Learjet 35, and Beechjet 400A. Other prevalent jet aircraft types affected by 13-knot crosswinds that conduct operations on Runway 9/27, in particular the Hawker 800, make up the remaining percent of the fleet of aircraft types within this classification. Thus, it can be assumed that the classification of aircraft types representing 100 percent of the fleet represents those that conduct operations on Runway 9/27.

Discussions with business jet operators at the Airport indicated that long-range flights requiring cargo and/or fuel loads near or at MTOW are conducted daily. Ameristar Jet Charter, an on-demand cargo operator based at the Airport, indicated its fleet of Dassault Falcon 20 and Bombardier Learjet 35 aircraft conduct daily non-stop flights from the Airport to destinations as far away as Arkansas and the East Coast requiring near capacity fuel and/or cargo loads. Thus, it is logical to plan for the MTOW takeoff distance requirements of these aircraft when evaluating the length of Runway 9/27.

**Figure 3-4** presents the runway length performance curve from FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design*, for aircraft with an MTOW greater than 12,500 pounds and up to and including 60,000 pounds. Performance curves from the Advisory Circular for aircraft departing at both 60 percent useful load and 90 percent useful load have been included.

**Figure 3-4 – Runway Length Performance Curve for Jet Aircraft Affected by 13-knot Crosswinds**

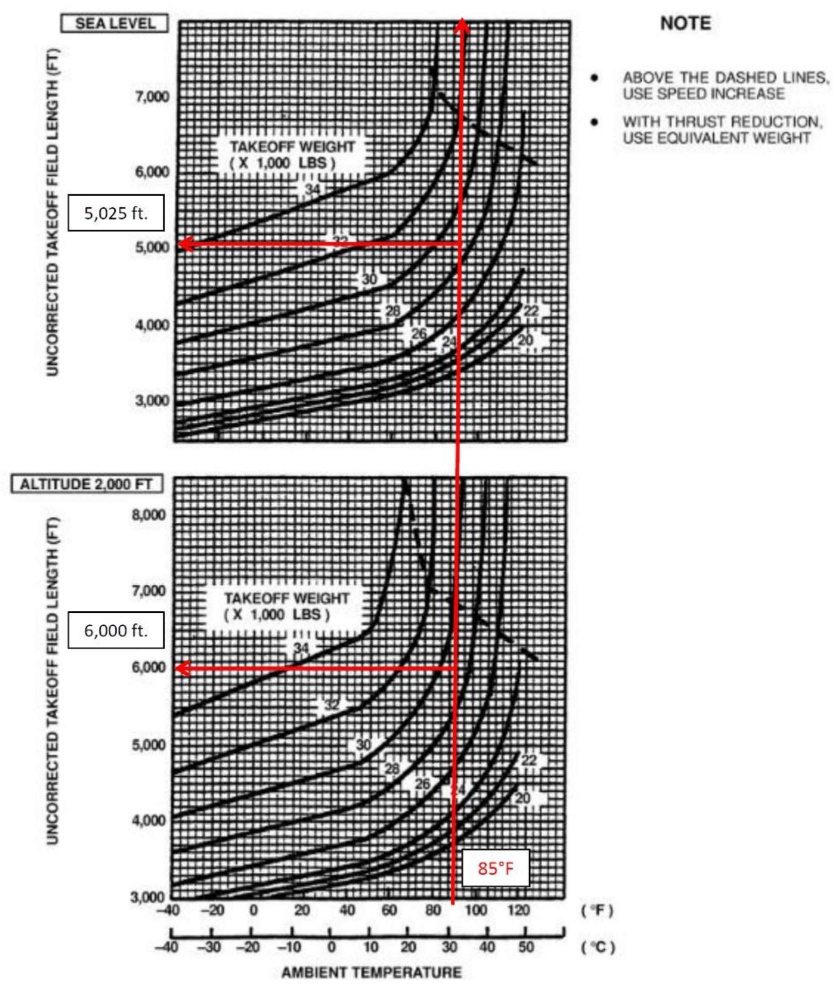



Note: Airport elevation 716 feet MSL, mean max daily temperature 85 degrees Fahrenheit
Source: FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design*

According to FAA AC 150/5325-4B, *Runway Length Requirements for Airport* Design, if the airfield elevation is 716 feet MSL, on an 85-degree Fahrenheit day jet aircraft with an MTOW more than 12,500 pounds and up to and including 60,000 pounds require 8,175 feet of runway to takeoff. Under these same conditions at 60 percent useful load these jet aircraft would require 5,450 feet of runway to takeoff. Since it has been indicated that daily operations are conducted at the Airport requiring these aircraft types to operate at or near MTOW, this methodology indicates that 8,175 feet of runway should be available for takeoff.

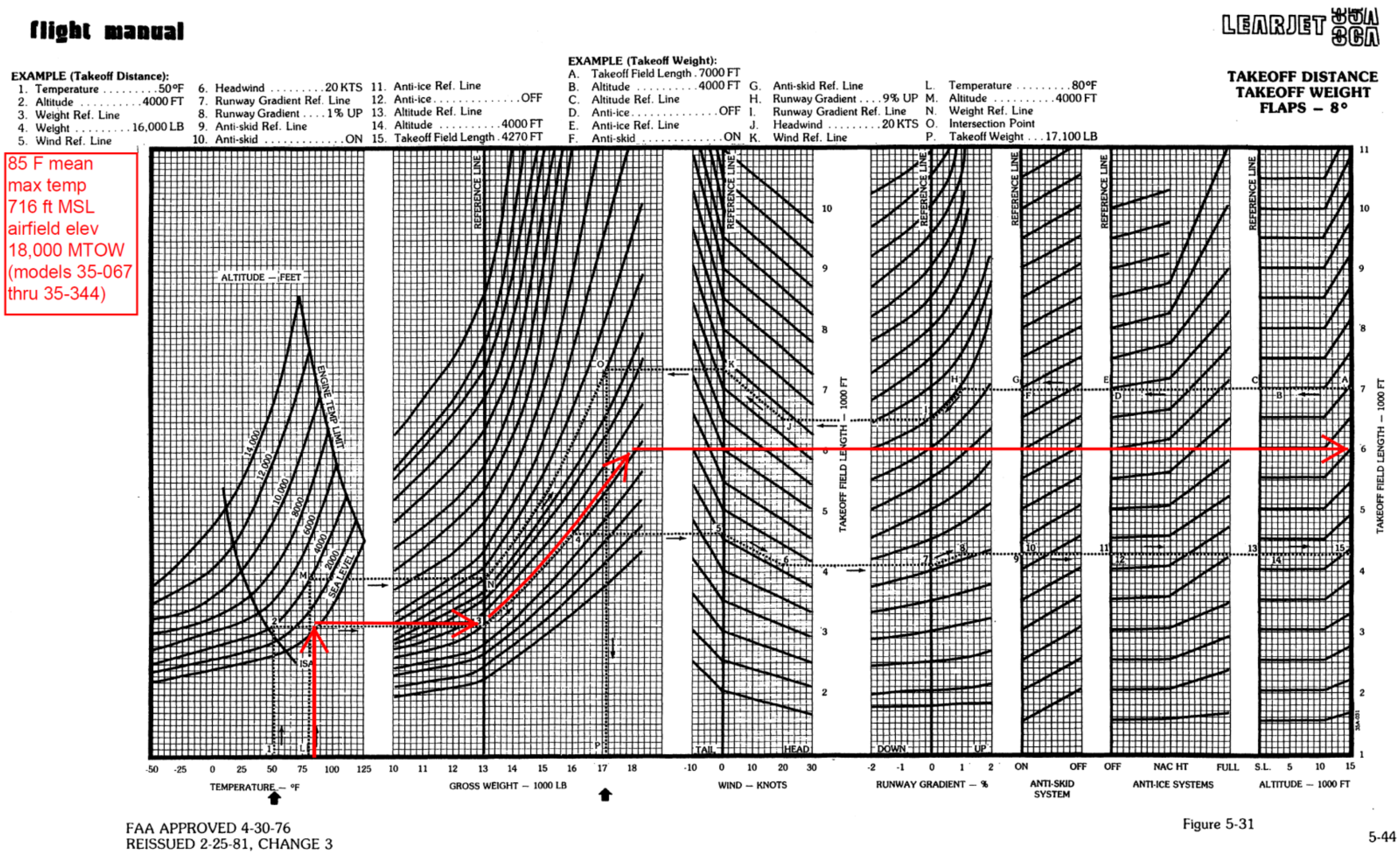
In further reviewing the runway length needs of prevalent jet aircraft types affected by 13-knot crosswinds, takeoff distance information was obtained for three representative aircraft types that conducted the most number of operations at the Airport. These aircraft are the Dassault Falcon 20 (3,399 annual operations), the Learjet 35 (2,040 annual operations), and the BAe Hawker 800 (1,612 annual operations). It is interesting to note that each of these aircraft types are representative of three different categories of ARC classifications: B-II, D-I, and C-II, respectively. **Figure 3-5**, **Figure 3-6**, and **Figure 3-7** present the runway length calculations for these aircraft types. Taking an average of the runway length needed to depart at MTOW from sea level and 2,000 feet MSL, the Dassault Falcon 20 requires approximately 5,500 feet for takeoff while the Learjet 35 requires 6,000 feet of runway length under the same conditions. The BAe Hawker 800 requires 6,049 feet of runway length to depart at MTOW from the Airport on an 85-degree Fahrenheit day.

### Figure 3-5 – Dassault Falcon 20 Runway Takeoff Length Needs




Note: Performance charts from flight manual for HU-25 Guardian, United States Coast Guard derivative of Falcon 20.
Source: United States Coast Guard

**Figure 3-6 – Learjet 35 Runway Takeoff Length Needs**




Source: Gates Learjet 35A/36A Airplane Flight Manual

### Figure 3-7 – Hawker 800 Runway Takeoff Length Needs

Hawker 800XP
Pro Line 21

TABULATED DATA

**Table 9** *continued*

**SPEEDS & TAKE-OFF FIELD LENGTHS**

**FLAPS 15°**

***Field Pressure Altitude (1000 ft) Flaps 15°***

***No Wind - Hard, Level, Dry Runway***

*NOTE: With engine antice ON, add 10° C to the actual air temperature before entering the table.*

| TAKE-OFF WEIGHT | | OUTSIDE AIR TEMPERATURE °C | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | |
| 28,000 lb 12,701 kg | V1 - KIAS | 122 | 122 | 123 | 124 | 125 | 126 | | | | $V_{FTO}$ = 170 kts |
| | VR - KIAS | 130 | 131 | 131 | 131 | 131 | 131 | | | | $V_{ERC}$ = 187 kts |
| | V2 - KIAS | 140 | 140 | 140 | 139 | 138 | 138 | | | | $V_{REF}$ = 137 kts |
| | TOFL - ft | 5207 | 5339 | 5645 | 6049 | 6518 | 7035 | | | | |
| 27,000 lb 12,247 kg | V1 - KIAS | 118 | 119 | 119 | 120 | 122 | 123 | | | | $V_{FTO}$ = 169 kts |
| | VR - KIAS | 128 | 128 | 128 | 128 | 128 | 129 | | | | $V_{ERC}$ = 183 kts |
| | V2 - KIAS | 138 | 138 | 137 | 137 | 136 | 135 | | | | $V_{REF}$ = 136 kts |
| | TOFL - ft | 4853 | 4980 | 5262 | 5619 | 6045 | 6523 | | | | |
| 26,000 lb 11,793 kg | V1 - KIAS | 115 | 115 | 116 | 117 | 118 | 119 | 120 | | | $V_{FTO}$ = 166 kts |
| | VR - KIAS | 125 | 125 | 125 | 125 | 125 | 126 | 126 | | | $V_{ERC}$ = 180 kts |
| | V2 - KIAS | 136 | 135 | 135 | 134 | 134 | 133 | 132 | | | $V_{REF}$ = 134 kts |
| | TOFL - ft | 4527 | 4640 | 4896 | 5226 | 5600 | 6039 | 6548 | | | |
| 25,000 lb 11,340 kg | V1 - KIAS | 113 | 113 | 112 | 113 | 114 | 116 | 117 | 118 | | $V_{FTO}$ = 164 kts |
| | VR - KIAS | 122 | 122 | 122 | 122 | 122 | 122 | 122 | 123 | | $V_{ERC}$ = 176 kts |
| | V2 - KIAS | 133 | 133 | 132 | 132 | 131 | 130 | 130 | 129 | | $V_{REF}$ = 131 kts |
| | TOFL - ft | 4321 | 4421 | 4535 | 4834 | 5171 | 5552 | 6016 | 6545 | | |
| 24,000 lb 10,886 kg | V1 - KIAS | 113 | 113 | 112 | 110 | 111 | 112 | 113 | 115 | | $V_{FTO}$ = 161 kts |
| | VR - KIAS | 118 | 118 | 119 | 119 | 119 | 119 | 119 | 120 | | $V_{ERC}$ = 172 kts |
| | V2 - KIAS | 131 | 131 | 130 | 129 | 129 | 128 | 127 | 126 | | $V_{REF}$ = 129 kts |
| | TOFL - ft | 4255 | 4352 | 4429 | 4468 | 4771 | 5116 | 5531 | 6015 | | |

85 F mean max daily temp = 29.4 C, Airfield elevation 716 ft MSL, MTOW = 28,000 lbs

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Source: Hawker 800XP flight manual

Takeoff length requirements calculated for prevalent jet aircraft types affected by 13-knot crosswinds indicate the existing length of Runway 9/27 (7,292 feet) meets the MTOW takeoff distance requirements of most aircraft types which is between 5,000 and 6,000 feet. However, continuing to maintain 7,292 feet of runway is limited by two constraints located at either end of the runway. To the east, Runway 9/27 crosses Runway 5R/23L at the thresholds of Runway 27 and Runway 23L. This crossing of runways is designated by the FAA as a “hot spot” with removal of this intersection a preferred mitigation action to eliminate the possibility of an unintentional runway incursion or wrong runway departure. This solution may require a reduction in the length of Runway 9/27 at this end of the runway.

Likewise, options to “shift” or provide additional runway length at the approach end of Runway 9 may be limited as well due to the adjacent American Center for Mobility (ACM) which is a site being developed for the testing of autonomous vehicles. While development plans for the ACM were not finalized at the time of the completion of this master plan update, it is anticipated that a series of roadways and other associated testing infrastructure will be located on site based on initial conceptual drawings. Due to this planned development, options may be limited to provide additional runway length at this end of the runway.

Taking these constraints and the runway length needs of prevalent jet aircraft types affected by 13-knot crosswinds in consideration, it is recommended that at least 5,000 feet of runway length be provided on Runway 9/27. Generally, runway lengths of 5,000 feet are typically considered to be adequate to meet the takeoff and landing distance requirements for small- and medium-sized business jet aircraft. This length is also generally recognized in the aircraft insurance industry as the minimum required length for a jet aircraft policyholder to conduct operations on a runway. The review of runway length requirements found that between 5,000 and 6,000 feet of runway is needed for prevalent jet aircraft types affected by 13-knot crosswinds to conduct MTOW takeoff operations on Runway 9/27; however, 5,000 feet appears to be the length that can be provided given the constraints at either end of the runway. Since 5,000 feet of runway length closely matches the takeoff distance needs of the three most prevalent jet aircraft types affected by 13-knot crosswinds that conduct operations on Runway 9/27, it is recommended that at least 5,000 feet of length be maintained.

### 3.4.2.c Runway 5L/23R

Runway 5L/23R is primarily used by smaller single- and twin-engine propeller driven aircraft as a result of a need to separate operations by these aircraft types that have slower approach speeds from the operations of jet aircraft with higher approach speeds that use Runway 5R/23L or when Runway 5R/23L is closed for any reason. Runway 5L/23R was originally constructed at a length of 6,655 feet to support the runway length requirements of the B-24 Liberator being constructed at the Airport in the 1940s. However, in 2007, an effort was undertaken to eliminate complex airfield geometry at the Airport. Since parallel Runway 5R/23L offered greater length, there was no longer a need to maintain the full 6,655-foot length of Runway 5L/23R. Thus, Runway 5L/23R’s intersection with Runway 9/27 was eliminated to remove the complex geometry of this intersection, resulting in a reduced runway length of 5,996 feet. Since Airport users with the most demanding runway length needs could no longer operate on Runway 5L/23R, a preliminary planning effort was undertaken in 2014 to further evaluate the runway’s length. Based on the types of aircraft that were conducting operations on the runway (smaller single- and twin-engine propeller driven aircraft), plans were initiated for a future reduction of the runway's length to 3,500 feet to reduce unnecessary airfield pavement at the Airport.

An additional runway length analysis was conducted to evaluate if 3,500 feet of runway length would satisfy the runway length requirements of Runway 5L/23R's primary users. The primary users of Runway 5L/23R are single- and twin-engine propeller driven aircraft with a maximum gross takeoff weight (MTOW) under 12,500 pounds. These aircraft conduct flight training operations, and mostly are Cessna 172SP, Cessna 172RG, and Piper Seminole aircraft. The aircraft are operated by the Eagle Flight Centre, which is Eastern Michigan University's (EMU's) flight program center based at the Airport. FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design,* lists guidelines to determine the recommended length of a runway. For runways intending to serve aircraft with an MTOW of 12,500 pounds or less, AC 150/5225-4B directs the use of a performance curve based on the percentage of the fleet of aircraft operating at an airport as presented in **Figure 3-8** on the next page. For airports primarily intending to serve communities on the fringe of a metropolitan area, the runway length performance curve associated with 100 percent of the fleet of aircraft is directed for use. Given that the mean daily maximum temperature of the warmest month of the year (July) between 2000 and 2015 was 85 degrees, and the elevation of the airfield is 716 feet above MSL, 3,500 feet of runway length is recommended for Runway 5L/23R.

The Eagle Flight Centre was interviewed as a part of the master planning process and indicated that a reduced length of Runway 5L/23R would not impact the flight training operations it conducts on the runway. AC 150/5325-4B, *Runway Length Requirements for Airport Design*, indicates that the recommended length of Runway 5L/23R should be 3,200 feet in length for 95 percent of the fleet and 3,800 feet in length for 100 percent of the fleet. It appears that reducing the runway to a length of 3,500 feet will provide for the runway length requirements of the small single- and twin-engine propeller driven aircraft using the runway. Reducing the length of Runway 5L/23R to 3,500 feet also reduces unnecessary airfield pavements while also eliminating complex airfield geometry currently present at the runway's intersection with Taxiway G. Additionally, reducing the length of Runway 5L/23R to 3,500 feet from the approach end of Runway 23R would align the new end of the runway with a taxiway intersection node that was constructed on Runway 5R/23L for a future connector taxiway between the parallel runways. Maintaining parallel Runway 5L/23R for capacity purposes does not meet federal funding eligibility requirements, and it does not appear a reduced runway length will impact the flight training operations of the Eagle Flight Centre, who are the primary users of the runway. Therefore, it is recommended that alternatives be considered for Runway 5L/23R that may include maintaining the runway at its current length, maintaining the runway at 3,500 feet in length, and closing the runway.

**Figure 3-8 – Runway Length Performance Curve for Small Aircraft**

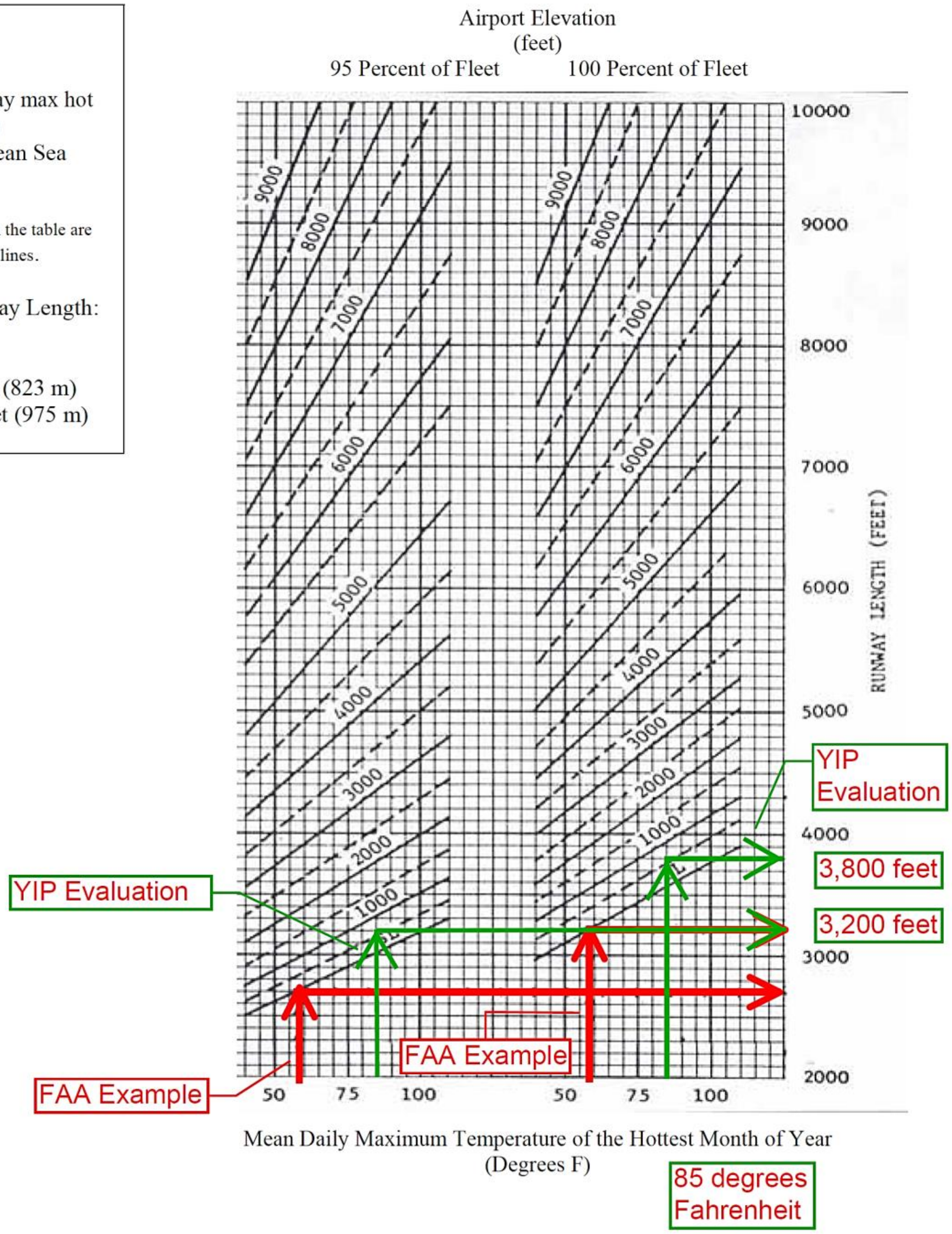
**Example:**

Temperature (mean day max hot month): 59° F (15° C)
Airport Elevation: Mean Sea Level

Note: Dashed lines shown in the table are mid values of adjacent solid lines.

Recommended Runway Length:

For 95% = 2,700 feet (823 m)
For 100% = 3,200 feet (975 m)




Note: Red arrows on performance curve refer to FAA examples noted
Source: FAA AC 5325-4B, *Runway Length Requirements for Airport Design*

### 3.4.3 Runway Width

The width of a runway is based on design standards identified in FAA AC 150/5300-13A, *Airport Design*, according to the runway's ADG designation. **Table 3-19** presents the ADG designation, existing width, and the design standard width for each runway at the Airport. Since all runways have an ADG designation of D-IV and a width of at least 150 feet, no runway width improvements are needed. However, as alternatives are considered for other needed airfield infrastructure improvements, changes may be needed to the existing configuration of runways that could affect their ADG designation. If an alternative proposes a change to the ADG designation of a runway, an evaluation will be conducted of the improvements needed to meet the new design standards including width. Further discussion about any changes to the ADG designation of runways at the Airport will be included as a part of the alternatives analysis presented later in the master plan report.

**Table 3-19 – Runway Widths and Design Standards**

| Runway | ADG Designation | Existing Width | Design Standard Width |
|---|---|---|---|
| Runway 5L/23R | D-IV | 160 feet | 150 feet |
| Runway 5R/23L | D-IV | 150 feet | 150 feet |
| Runway 9/27 | D-IV | 160 feet | 150 feet |

Source: FAA AC 150/5300-13A, *Airport Design*

### 3.4.4 Runway Grade

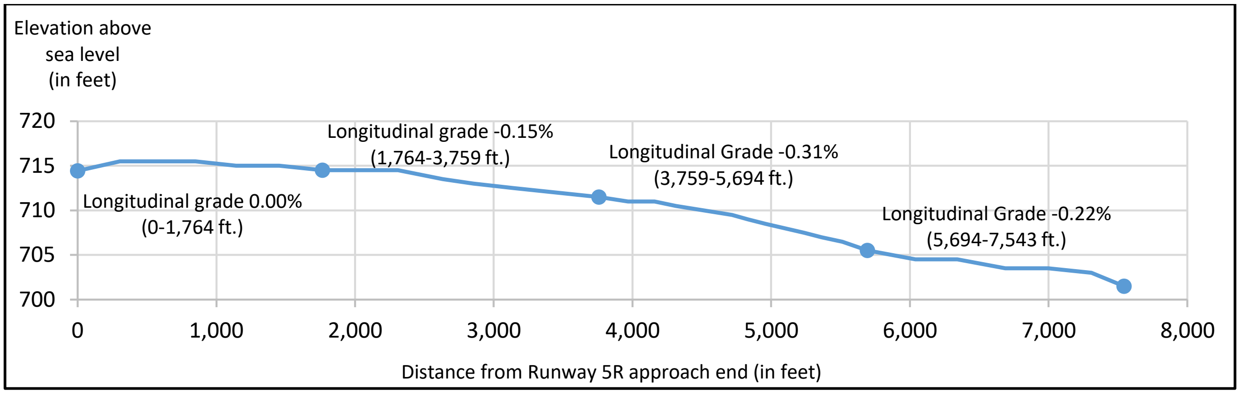
Runway gradient standards established in FAA AC 150/5300-13A, *Airport Design*, are designed to provide smooth flat surfaces for the takeoff and landing of aircraft and to provide pilots and air traffic controllers the ability to see that any one point of the runway surface is clear of aircraft, vehicles, wildlife, or other hazardous objects. The longitudinal and transverse grades of a runway are based on the AAC of the ADG classification of the runway. For runways designed for aircraft in approach categories A and B, the maximum longitudinal grade and maximum allowable grade changes is plus/minus 2.0 percent. However, for runways designed for aircraft in approach categories C, D, and E, the maximum longitudinal grade and maximum allowable grade change is plus/minus 1.50 percent. In addition, during the first and last quarter of runways designed for C, D, and E aircraft, longitudinal grades must be mathematically constant and may not exceed plus/minus 0.80 percent.

Each runway at the Airport is designed for aircraft in approach category D, thus the review of the grade on each runway focused on meeting approach category D standards. However, as airfield alternatives are considered, a reevaluation of the grade of the Airport's runways may be needed if the approach category designation of a runway changes to A or B. Alternatives that suggest a change in the approach category designation of the runway to A or B will include a grade change evaluation of the new classification as a part of the alternatives analysis.

#### 3.4.4.a Runway 5R/23L

**Figure 3-9** presents the grade of Runway 5R/23L based on elevation points that were obtained through an aerial mapping effort conducted as part of the preparation of this master plan while **Table 3-20** presents the longitudinal slope by quarter of runway. Elevation points located most closely near the quarter and midpoints of the runway were used to calculate the changes in quarterly longitudinal grade. According to approach category D design standards, the longitudinal grade of the runway in its entirety and within the first and last quarter of the runway meets design standards; however, there is a grade change between the first and last quarter of the runway that exceeds maximum allowable grade change standards.

**Figure 3-9 – Runway 5R/23L Longitudinal Grade**




Source: Mead & Hunt, Inc. (2016)

**Table 3-20 – Runway 5R/23L Longitudinal Grade by Quarter**

| Distance from Rwy 5R Approach End | Elevation | Change in Elevation | Longitudinal Grade |
|---|---|---|---|
| 0 ft. | 714.44 ft. MSL | n/a | n/a |
| 1,764 ft. | 714.50 ft. MSL | 0.06 ft. | 0.00% |
| 3,759 ft. | 711.50 ft. MSL | -3.00 ft. | -0.15% |
| 5,694 ft. | 705.50 ft. MSL | -6.00 ft. | -0.31% |
| 7,543 ft. | 701.51 ft. MSL | -3.99 ft. | -0.22% |
| | **TOTAL:** | 12.93 ft. | -0.17% |

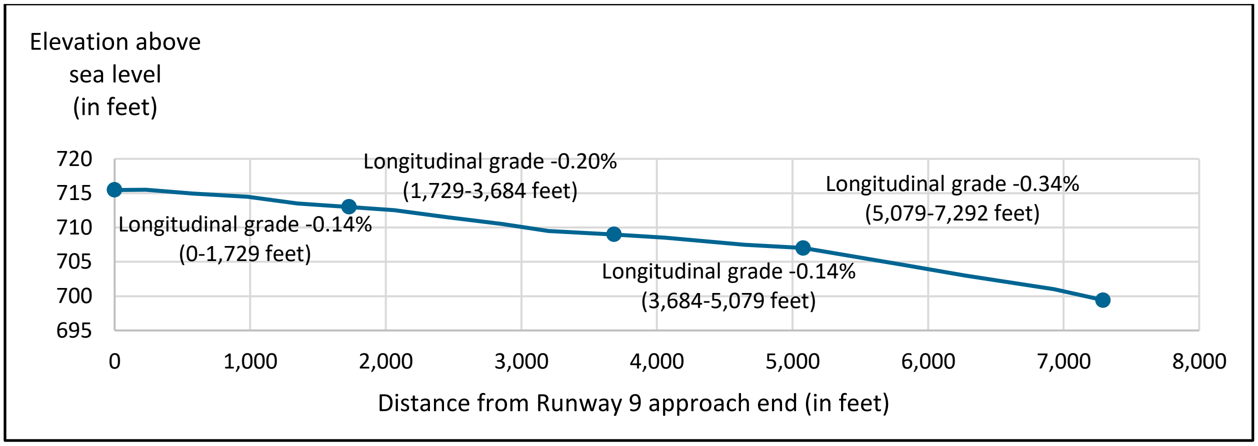
Source: Mead & Hunt, Inc. (2016)

When FAA AC 150/5300-13A, *Airport Design*, was released a project to reconstruct Runway 5R/23L was underway with the design and bid of construction plans completed. At this time, the surface gradient of the runway had been designed according to the standards from the previous version of the *Airport Design* AC (150/5300-13). To meet new surface gradient standards, a redesign of the runway profile would have been needed. Given the schedule of the ongoing project and the work that had already been completed it was not financially conducive to redesign the runway. Thus, a modification of standards was filed to allow for the grade changed within the first quarter of the runway ends (**Appendix A**). Since the runway was recently reconstructed, it would not be a prudent use of financial resources to correct the runway grade at this time. It is recommended that the modification of standards be maintained until the next rehabilitation or reconstruction of the runway is needed when correcting the grade to meet FAA design standards should be revisited.

### 3.4.4.b Runway 9/27

**Figure 3-10** presents the longitudinal grade of Runway 9/27 based on elevation points that were obtained through the aerial mapping effort while **Table 3-21** presents the longitudinal slope by runway quarter. Again, elevation points located most closely near the quarter and midpoints of the runway were used to calculate the quarterly longitudinal grade changes. The longitudinal grade of Runway 9/27 in its entirety changes 0.22 percent between runway ends, which is within approach category D standards as defined by FAA AC 150/5300-13A, *Airport Design*; likewise, the maximum allowable grade change between the ends of the runway is also within approach category D standards. While the longitudinal grade during the first and last quarter of the runway is also within approach category D standards, there are longitudinal grade changes in the first and last quarter of the runway that are not allowed in current FAA design guidance.

**Figure 3-10 – Runway 9/27 Longitudinal Grade**




Source: Mead & Hunt, Inc. (2016)

**Table 3-21 – Runway 9/27 Longitudinal Grade by Quarter**

| Distance from Rwy 9 Approach End | Elevation | Change in Elevation | Longitudinal Grade |
|---|---|---|---|
| 0 ft. | 715.47 ft. MSL | n/a | n/a |
| 1,729 ft. | 713.00 ft. MSL | -2.47 ft. | -0.14% |
| 3,684 ft. | 709.00 ft. MSL | -4.00 ft. | -0.20% |
| 5,079 ft. | 707.00 ft. MSL | -2.00 ft. | -0.14% |
| 7,292 ft. | 699.42 ft. MSL | -7.58 ft. | -0.34% |
| | **TOTAL:** | 16.05 ft. | -0.22% |

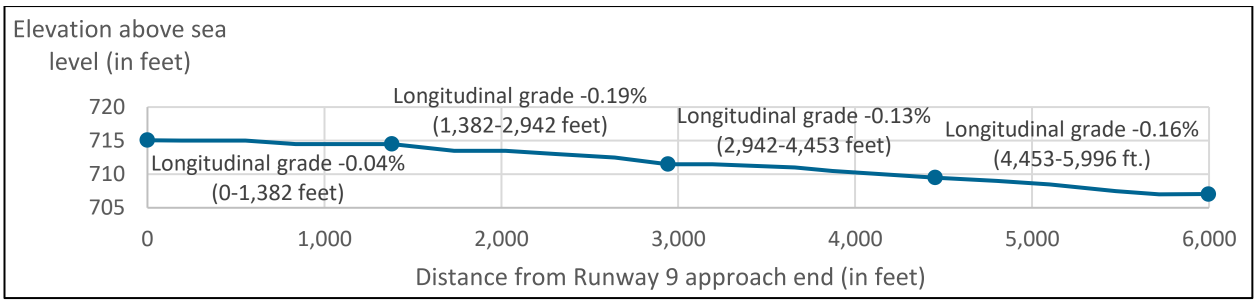
Source: Mead & Hunt, Inc. (2016)

Since there is a change in the longitudinal grade within the first and last quarter of the runway, improvements to the grade would be needed to meet approach category D design standards. However, as suggested previously during the reviews of the length and width of the runways, changes to the configuration of Runway 9/27 may be needed to address other infrastructure needs. If Runway 9/27 is to be maintained to approach category D standards, removing the grade change within the first and last quarter of the runway to meet design standards is recommended the next time a rehabilitation or reconstruction is planned for the runway. If the approach category classification of the runway changes, however, a review of the longitudinal grade of the runway in its new configuration will be needed according to the design standards of its new classification.

### 3.4.4.c Runway 5L/23R

The longitudinal grade of Runway 5L/23R is presented in **Figure 3-11** while **Table 3-22** presents the longitudinal slope of the runway by quarter. Determination of the longitudinal grade by quarter of runway was based on elevation points through the aerial mapping effort that were most closely located near the quarter and midpoints of the runway. The longitudinal grade of Runway 5L/23R is 0.13 percent between runway ends and meets the design standards for an approach category D classified runway. Between ends of the runway, the maximum allowable grade change also meets design standards for an approach category D runway as defined in FAA AC 150/5300-13A, *Airport Design*. Similar to the other runways at the Airport, there are longitudinal grade changes within the first and last quarter of the runway that do not conform to current FAA design standards.

**Figure 3-11 – Runway 5L/23R Longitudinal Grade**




Source: Mead & Hunt, Inc. (2016)

**Table 3-22 – Runway 5L/23R Longitudinal Grade by Quarter**

| Distance from Rwy 5L Approach End | Elevation | Change in Elevation | Longitudinal Grade |
|---|---|---|---|
| 0 ft. | 715.06 ft. MSL | n/a | n/a |
| 1,382 ft. | 714.50 ft. MSL | -0.56 ft. | -0.14% |
| 2,942 ft. | 711.50 ft. MSL | -3.00 ft. | -0.20% |
| 4,453 ft. | 709.50 ft. MSL | -2.00 ft. | -0.14% |
| 5,996 ft. | 707.03 ft. MSL | -2.47 ft. | -0.34% |
| | **TOTAL:** | 8.03 ft. | -0.13% |

Source: Mead & Hunt, Inc. (2016)

If Runway 5L/23R is to be maintained as an approach category D runway, improvements would be needed to eliminate the longitudinal grade within the first and last quarter of the runway. However, review of the length of Runway 5L/23R found that 3,500 feet of length is adequate to meet the needs of the aircraft types that most frequently conduct operations on its surface. If plans are initiated to maintain a 3,500-foot runway length, it is unlikely that Runway 5L/23R would be maintained to approach category D standards. Instead, it is more feasible that the runway would be maintained to approach category A or B standards; thus, the maximum allowable grade within the first and last quarter of the runway may meet design standards for this classification of runway. Further discussion about the longitudinal grade of the runway as it relates to development options to address facility needs is presented in the alternatives analysis of this master plan document.

### 3.4.5 Runway Strength

**Table 3-23** presents the strength of the three runways at the Airport based on the main landing gear configuration of an aircraft. The pavement strength of Runway 5R/23L is rated up to 800,000 pounds for aircraft with a main landing gear configuration of two dual wheels in double tandem (for example, Boeing 747), while Runway 9/27 is rated up to 120,000 pounds for aircraft with a dual tandem configuration (for example, Boeing 757). Runway 5L/23R is also rated up to 90,000 pounds for aircraft with a dual tandem configuration; however, for aircraft with dual wheel main landing gear configurations that most frequently conduct operations on the runway like the Beechcraft King Air series of aircraft, the runway is rated up to 45,000 pounds. Given the most demanding types of aircraft that typically conduct operations on each runway, it appears the strength of each runway is sufficient to meet demand throughout the planning period.

**Table 3-23 – Runway Strength**

| Main Landing Gear Configuration | Runway 5R/23L | Runway 9/27 | Runway 5L/23R |
|---|---|---|---|
| Single wheel | 100,000 lbs. | 55,000 lbs. | 35,000 lbs. |
| Dual wheel | 200,000 lbs. | 70,000 lbs. | 45,000 lbs. |
| Two single wheels in tandem | 89,000 lbs. | 89,000 lbs. | n/a |
| Dual tandem | 350,000 lbs. | 120,000 lbs. | 90,000 lbs. |
| Two dual wheels in double tandem | 800,000 lbs. | n/a | n/a |

Source: Federal Aviation Administration records (2015)

### 3.4.6 Runway Pavement Condition

The condition of a runway pavement surface is based on the Pavement Condition Index (PCI), a rating system that assigns a numerical value to the condition of runway based on observed pavement distresses. The PCI scale ranges from 0, which is assigned to pavements in a completely failed condition, to 100, which is assigned to pavements with no distress. It is recommended that pavements be maintained with a PCI value above 70. Pavements with PCI values between 70 and 40 are more likely to need a major rehabilitation, while pavements with PCI values less than 40 are in need of a reconstruction.

**Figure 3-12** presents the PCI survey of the airfield pavement surfaces that was originally conducted by Applied Pavement Technology in June 2013 and later updated in July 2015.

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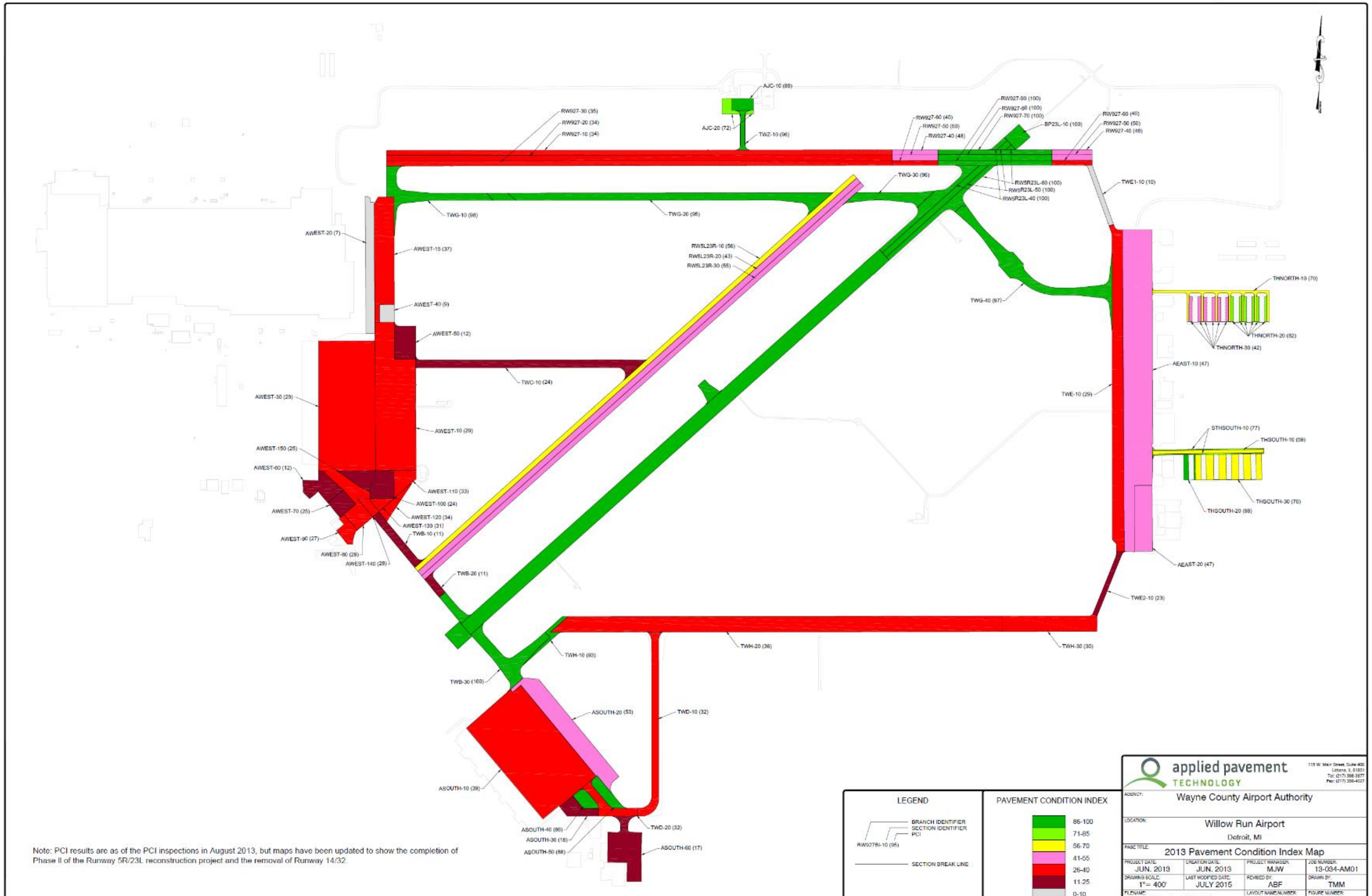
**Figure 3-12 – Pavement Condition Index Map**




Source: Applied Pavement Technology (2015)

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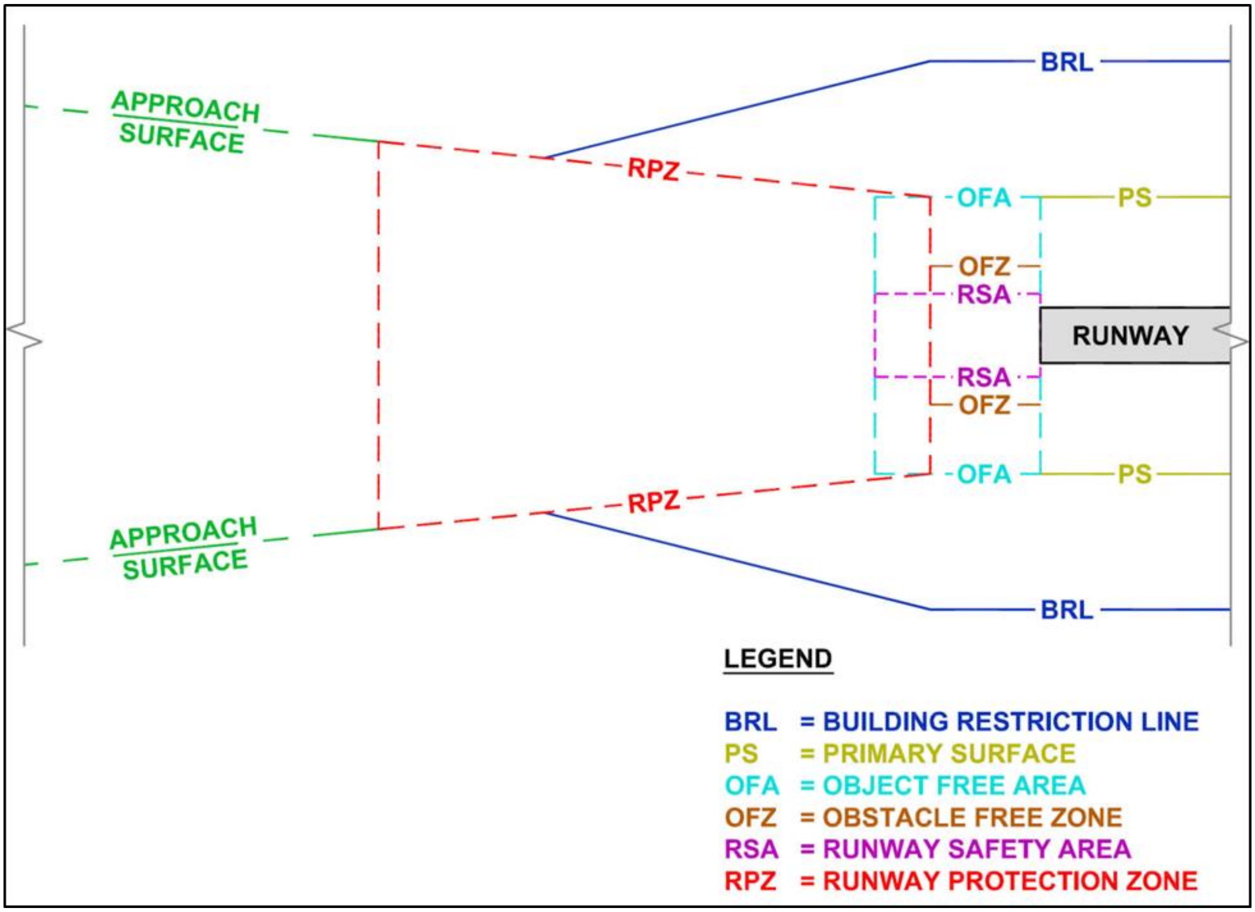
The pavement condition of Runway 5R/23L is in optimal condition, since it was reconstructed in 2014. The pavement condition of Runway 9/27, however, is in “poor” to “very poor” condition with some sections of pavement found to have a PCI of less than 40. Runway 5L/23R’s pavement condition was found to be slightly better by comparison; however, the PCIs of its pavement sections are less than 60 and considered to be in “fair” to “poor” condition. While continual preventative maintenance is anticipated to be needed on Runway 5R/23L throughout the planning period, a major rehabilitation or reconstruction is needed for Runway 9/27 and Runway 5L/23R.

When reviewing the pavement condition index map, it is interesting to also note the PCI ratings of the taxiways, taxilanes, and aprons at the Airport. Except for Taxiway G and the taxilanes from the east apron to the T-hangar areas on the east side of the Airport, all other pavement surfaces have PCIs of less than 40 with some sections of pavement with a PCI of less than 10, which is considered to be “failed.” To improve these pavement surfaces, a major rehabilitation or reconstruction will be needed. The condition and improvements needed to the taxiway system and the aprons at the Airport are further discussed in the next two sections. Given the expanse of pavement in need of major rehabilitation/reconstruction, and the limited funding available for such projects, the alternatives analysis will present development options to improve the condition of all pavement surfaces at the Airport. The analysis will also identify those surfaces, if any, not needed to support aviation demand projected for the planning period.

### 3.4.7 Runway Design Surfaces

There are also other design elements of the Airport’s runways in addition to the length, width, and strength of the pavement surface. These other runway design elements are intended to protect aircraft from obstructions and provide a margin of safety in the event of an unintentional deviation from the runway. These surfaces, presented in **Figure 3-13**, include safety areas, object free areas, and protection zones. A review of each of these design surfaces is presented in this section as they are associated with each runway at the Airport.

**Figure 3-13 – Runway Design Surfaces – Plan View**




Source: Mead & Hunt, Inc. (2016)

### 3.4.7.a Runway Safety Area

The runway safety area (RSA) is a two-dimensional surface centered on the runway that provides an area to support an aircraft in the event of an unintended excursion from the runway surface. According to FAA AC 150/5300-13A, *Airport Design*, RSAs must be:

- Cleared, graded, free of hazardous surface variations, and properly drained.
- Capable of supporting an aircraft without causing structural damage, as well as airfield maintenance and emergency response vehicles.
- Free of objects except those that are necessary, such as navigational signs and lighting, which must be mounted on low-impact resistant supports.

**Table 3-24** presents the safety area dimensions for a number of RDC designations. All runways at the Airport have an RSA that measures 1,000 feet beyond each runway end and 500 feet in width, meeting D-IV design standards. As noted previously, should changes be made to the RDC designation of a runway, changes may also be needed to the dimensions of its RSA. Since a focus has been placed on optimizing the efficiency of the airfield, any changes in the RDC designation of the runways at the Airport would likely result in a new designation that has less demanding design standards. It is anticipated that minimal improvements would be needed to the RSA to meet the design standards of the runway's new RDC classification. Proposed changes to the RDC classification of the runways at the Airport and the improvements, if any, that would be needed to the RSA and other design surfaces is discussed in the alternatives analysis.

**Table 3-24 – Runway Safety Area Design Standard Dimensions**

| RDC Classification | Length Beyond Runway End | Width |
|---|---|---|
| A/B-I | 240 ft. visibility ≥ ¾ mile<br>600 ft. visibility < ¾ mile | 120 ft. visibility ≥ ¾ mile<br>300 ft. visibility < ¾ mile |
| A/B-II | 300 ft. visibility ≥ ¾ mile<br>600 ft. visibility < ¾ mile | 150 ft. visibility ≥ ¾ mile<br>300 ft. visibility < ¾ mile |
| A/B-III | 600 ft. visibility ≥ ¾ mile<br>800 ft. visibility < ¾ mile | 300 ft. visibility ≥ ¾ mile<br>400 ft. visibility < ¾ mile |
| A/B-IV<br>C/D/E - I/II/III/IV | 1,000 ft. | 500 ft. |
| Runway 5R/23L (D-IV) | 1,000 ft. | 500 ft. |
| Runway 5L/23R (D-IV) | 1,000 ft. | 500 ft. |
| Runway 9/27 (D-IV) | 1,000 ft. | 500 ft. |

Source: FAA Advisory Circular 150/5300-13A, *Airport* Design (2015)

The RSA beyond the approach end of Runway 23R intersects Runway 9/27, which is an unusual airfield design configuration. While the intersection of an RSA and runway is permitted, it is recommended that options be considered as part of the alternatives analysis to decouple the RSA with Runway 9/27. Removal of this intersection would eliminate the potential for aircraft taxiing on Runway 9/27 or Taxiway G to pass through the RSA and/or penetrate airspace surfaces associated with Runway 5L/23R when aircraft are arriving and departing on Runway 5L/23R.

### 3.4.7.b Runway Object Free Area

The Runway Object Free Area (ROFA) is an additional airfield design surface centered on a runway that is intended to protect aircraft operating on the runway and within the RSA from colliding with objects. Aircraft are prohibited from parking within the ROFA, except for ground maneuvering purposes. In addition, all above-ground objects protruding from the edge of the RSA elevation are prohibited, except those fixed by function for navigational purposes. For runways designed for D-IV aircraft types, the ROFA extends 1,000 feet beyond the end of a runway and is 800 feet in width. The dimensions of the ROFA for Runway 9/27 and Runway 5L/23R meets these standards; however, the northwest corner of the ROFA for Runway 5R/23L is penetrated by an airfield service road, an airport operations area (AOA) perimeter fence, and Ecorse Road.

Options to correct this non-standard situation are limited:

- The runway would need to be shortened or shifted; or
- Declared distances would need to be implemented; or
- Relocation or closure of the roads would be necessary; or
- The perimeter fence would need to be relocated; or
- Any combination of these options.

It was not found to be viable from a fiscal, construction, airport design, and/or operational perspective to implement these options to address the non-standard ROFA for a couple of reasons. First, a small segment of Ecorse Road, the AOA fence, and the perimeter fence penetrate the ROFA. The service road is seldom utilized and is only done so by employees with badges for restricted access who are familiar with the Airport and its operations. Finally, Ecorse Road is not a heavily traveled road and its speed limit is such that vehicles are traveling at a high rate of speed and are occupying the ROFA for a brief period. Given the availability of limited funding to address other infrastructure needs at the Airport, it is recommended that this non-standard situation be addressed as a part of any future project that proposes changes to the configuration of Runway 5R/23L and/or the routing of the airfield service road, perimeter fence, or Ecorse Road.

It is noted that a review of the ROFA dimensions of the other runways at the Airport (Runway 5L/23R and Runway 9/27) will also be needed should the configuration of these runways change through a change in the runways' length or RDC classification. Airfield development alternatives presented in the alternatives analysis that propose changes to the configuration and/or RDC designation of the runways at the Airport will include a review of the proposed changed ROFA dimensions. Since all runways at the Airport are classified as D-IV, any reduction in the RDC classification of the runway will likely result in the need for few improvements to the ROFA since the dimensions are likely to be less demanding.

### 3.4.7.c Obstacle Free Zone

The Obstacle Free Zone (OFZ) is a three-dimensional volume of airspace centered on the runway from which taxiing aircraft, parked aircraft, vehicles, and other objects, except those fixed by function, are prohibited when aircraft are departing or arriving on a runway. The OFZ is comprised of four elements that are described in the following summaries.

**Runway Obstacle Free Zone** – The Runway Obstacle Free Zone (ROFZ) extends 200 feet beyond the end of a runway at a width determined by the type of aircraft conducting operations on the runway surface. Since the Airport receives operations by aircraft with a maximum certificated takeoff weight of more than 12,500 pounds, the width of the ROFZ on all three runways at the Airport is 400 feet, meeting FAA design standards. Should a runway be reconfigured to exclusively accept operations by aircraft less than 12,500 pounds, the width of the ROFZ would change depending on the approach speed of the aircraft and approach visibility minimum of the runway. In the details of the alternatives analysis, alternatives that propose changes to configuration of runways so that any runway becomes exclusive for use by aircraft less than 12,500 pounds will also discuss changes to the ROFZ, if found to be necessary.

**Inner-approach Obstacle Free Zone** – The inner-approach OFZ is a volume of airspace centered on a runway and only applies to runways with an approach lighting system (ALS). The inner approach OFZ begins 200 feet beyond the runway threshold and extends 200 feet beyond the last light unit in the ALS. The width is the same as the ROFZ and rises at a slope of 50:1 outward and upward from the beginning of the surface located 200 feet beyond the end of the runway. Only the approaches to Runway 5R and Runway 23L are equipped with an ALS, so this surface only applies to each end of this runway. At the approach end of Runway 5R, Tyler Road crosses under the slope of the inner-approach OFZ; however, the 50:1 slope of the inner-approach OFZ clears the roadway by 18 feet, thus preventing passing traffic from penetrating this airspace. Likewise, the slope of the inner-approach OFZ at the approach end of Runway 23L clears an Airport service road and Ecorse Road by 22 feet and 29 feet, respectively, preventing passing traffic from penetrating this airspace. Thus, no improvements to the inner-approach OFZs at the Airport are necessary.

**Inner-transitional Obstacle Free Zone** – The inner-transitional OFZ is a volume of airspace located adjacent to the ROFZ and inner-approach OFZ that only applies to runways with lower than ¾-mile approach visibility minimums. The precision instrument approaches to either end of Runway 5R/23L have a visibility minimum of ¾ mile while the non-precision instrument approaches to Runway 5L, Runway 23R, and Runway 9 have approach visibility minimums of 1 mile. Since the visibility minimums are not lower than ¾ mile, an inner-transitional OFZ is not located at end of the runways at the Airport. Should an instrument approach procedure be established with a visibility minimum lower than ¾ mile, implementation of an inner-transitional OFZ will be needed. FAA AC 150/5300-13A, *Airport Design*, provides guidance on how to determine the dimensions of an inner-transitional OFZ, derived from a mathematical formula based on the critical design aircraft of a runway and the category of the instrument approach.

**Precision Obstacle Free Zone –** The precision obstacle free zone (POFZ) is a volume of airspace centered at the threshold of a runway. The POFZ is 800 feet wide and extends 200 feet beyond the runway threshold. The POFZ is a surface that is in effect only when all the following operational conditions are present:

- The instrument approach to a runway has vertical guidance.
- The cloud ceiling is below 250 feet, visibility is less than ¾ statute mile, or the RVR is below 4,000 feet.
- An aircraft is on final approach within 2 miles of the runway threshold.

When POFZs are in effect, a wing of an aircraft from a taxiway may penetrate the POFZ as well as vehicles up to 10 feet high; however, penetration of the airspace from the fuselage or tail of an aircraft is not permitted. While other airfield pavement surfaces are not restricted from being located within a POFZ, it is beneficial to have the POFZ clear of other pavements to eliminate confusion of its boundary for taxiing aircraft and surface vehicles. At the Airport, a POFZ is located at both the approach end of Runway 5R and Runway 23L. While no airfield pavement surfaces are located within the POFZ at the approach end of Runway 5R, Runway 9/27 is located within the POFZ at the approach end of Runway 23L. It is recommended that, as a part of future airfield improvements, consideration be given to evaluate options to eliminate airfield pavement within the POFZ at the approach end of Runway 23L.

### 3.4.7.d Runway Protection Zone

The runway protection zone (RPZ) is a surface trapezoidal in shape and centered on the centerline of a runway to protect people and property on the ground. It is recommended that RPZs be controlled by an airport and be clear of any incompatible land uses such as buildings, wildlife attractants, objects of height, and any land use that results in concentration of persons. RPZs are located 200 feet beyond the end of a paved runway surface and have an inner and outer width based on the RDC classification of a runway and its approach. **Table 3-25** presents the RPZ dimensions of the runways at the Airport. Each RPZ meets D-IV design standards for the approach visibility minimum of each runway.

**Table 3-25 – Runway Protection Zone Dimensions**

| Dimension | Runway 5R | Runway 23L | Runway 5L | Runway 23R | Runway 9 | Runway 27 |
|---|---|---|---|---|---|---|
| Visibility Min. | ¾ mile | ¾ mile | 1 mile | 1 mile | 1 mile | Visual |
| Length | 1,700 ft. | 1,700 ft. | 1,700 ft. | 1,700 ft. | 1,700 ft. | 1,700 ft. |
| Inner Width | 1,000 ft. | 1,000 ft. | 500 ft. | 500 ft. | 500 ft. | 500 ft. |
| Outer Width | 1,510 ft. | 1,510 ft. | 1,010 ft. | 1,010 ft. | 1,010 ft. | 1,010 ft. |
| Area | 48.978 acres | 48.978 acres | 29.465 acres | 29.465 acres | 29.465 acres | 29.465 acres |

Source: FAA Advisory Circular 150/5300-13A, *Airport Design*

Should there be a change in the RDC designation and/or approach visibility minimum of a runway, a review will be needed of its RPZ dimensions. Currently, the Airport is engaged in an effort to lower the approach visibility minimums of Runway 23L from ¾ mile to ½ mile. When this occurs, the size of the RPZ would increase with the length and outer width changing from 1,700 feet and 1,510 feet, respectively, to 2,500 feet and 1,750 feet, respectively. No change would occur to the inner width of the RPZ. Likewise, should the RDC designation of a runway decrease, the size of the RPZ may also decrease. Should changes occur to the RDC designation and/or approach visibility minimum of a runway, consultation with FAA AC 150/5300-13A, *Airport Design*, will be needed to determine if changes are needed to the dimensions of RPZs. In addition, if a runway is extended or shifted at the Airport so that the RPZ extends beyond the boundary of the existing property line, it is recommended that land acquisition occur and/or easements be established so that land uses and objects of height can be controlled within this area.

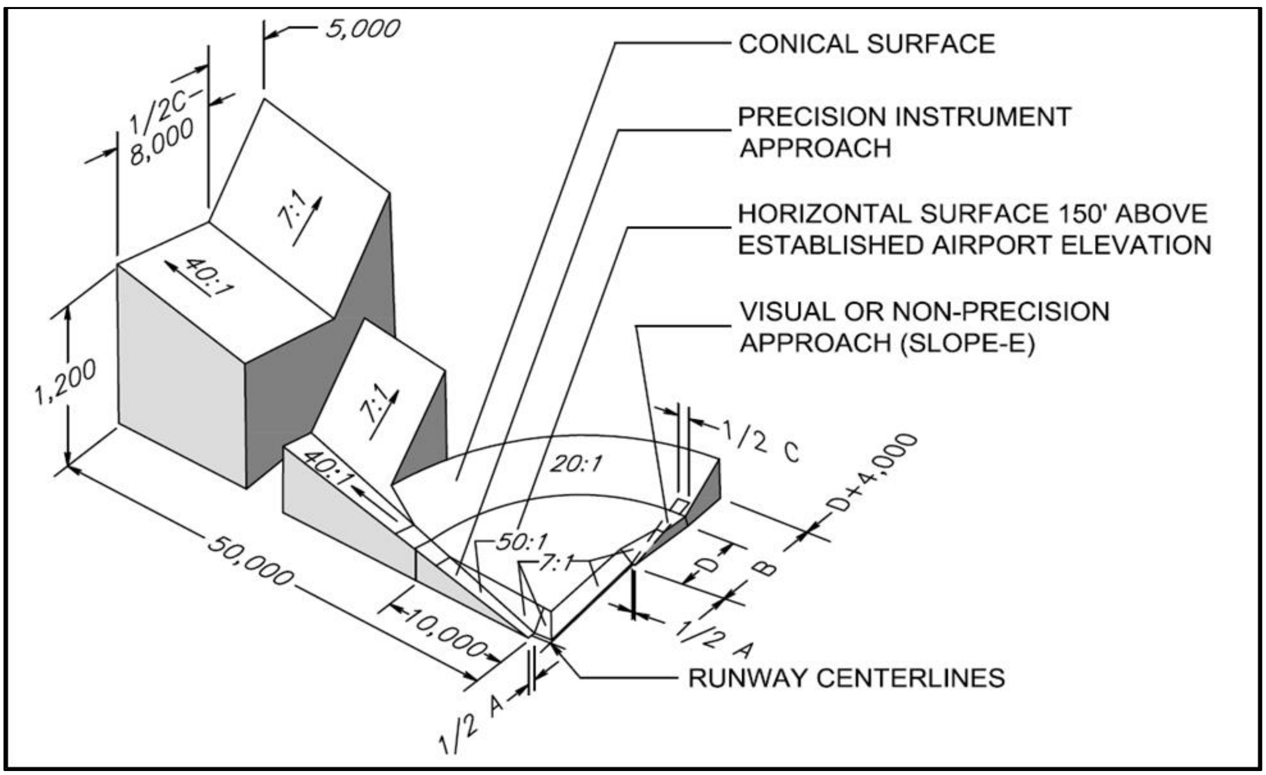
There are some roadways within the RPZs at the Airport. At the approach ends of Runway 5L and Runway 5R, Tyler Road passes through the RPZs. An airport perimeter road and Ecorse Road passes through the RPZs at the approach end of Runway 23L and Runway 23R. Approximately 1,531 linear feet of Ecorse Road and 1,248 linear feet of Tyler Road lie within the RPZs. Traffic counts taken of each road found that each has limited vehicle traffic with approximately 3,000 vehicles passing each day, or an average of 125 vehicles an hour. To eliminate these roads passing through the RPZ, Runway 5R/23L, the primary runway at the Airport, would need to be shortened, relocated, or closed. Reducing the length or closing the runway will negatively impact payload and/or range capacity of the most demanding types of aircraft using the Airport, while relocating the runway would require significant cost. Alternatively, closing the roads would negatively impact the surrounding communities as a result of not being able to use Ecorse Road or Tyler Road to travel east-west around the Airport. Relocation of each road would require significant cost and engineering challenges due to land constraints and the design speed of Ecorse Road.

Due to these challenges and impacts to both the users of the Airport and the surrounding community, a decision was made in 2013 to file a modification of standards for the roadways within the RPZs at either end of Runway 5R/23L. Should any change be planned to the configuration of Runway 5R/23L, it is recommended that alternatives be investigated to see if any option is available to remove the roadways from the RPZ; if none are available, then retention of the modification of standards may be necessary. A copy of the modification of standards for roadways within the RPZ are presented in **Appendix A**.

### 3.4.7.e Federal Aviation Regulation Part 77 Surfaces

FAR Part 77, *Safe, Efficient Use, and Preservation of the Navigable Airspace*, was developed to protect airspace surrounding airports to provide safe flight for aircraft when taking off and landing. FAR Part 77 defines five surfaces that surround each runway at an airport designed to preserve airspace and protect traversing aircraft from obstructions. The dimensions of each surface are based on the category of a runway as defined by FAR Part 77 and the approach (existing or planned) for each runway end. **Figure 3-14** graphically depicts some of the runway design surfaces which are discussed in the following subsections.

**Figure 3-14 – Runway Design Surfaces**




Source: Mead & Hunt, Inc. (2016)

**Primary Surface** – The primary surface is centered longitudinally on a runway and extends 200 feet beyond the end of a paved runway or at the end of a turf runway. The elevation of the primary surface is the same elevation as the runway centerline and has a width based upon the designation of the runway and type of the approach. According to FAR Part 77, runways with a visual approach or approaches with visibility minimums greater than ¾ mile are to have a primary surface of 500 feet. Since Runway 5L, 23R, and 9 have visibility minimums greater than ¾ mile and Runway 27 has a visual approach, the width of the primary surface for these runways is 500 feet. Runways with a precision instrument approach are to have a primary surface width of 1,000 feet, which is the width of the surface on Runway 5R/23L.

**Approach Surface** – The approach surface is centered longitudinally on a runway and extends outward and upward from each end of the primary surface. The dimensions of the approach surface at each end of a runway is based upon the type of approach for that runway end. The inner width of the approach surface is the same width as the primary surface and expands uniformly to a width of:

- 1,250 feet for utility runways with only visual approaches;
- 1,500 feet for runways other than utility with only visual approaches;
- 2,000 feet for utility runways with non-precision instrument approaches;
- 3,500 feet for non-precision instrument runways other than utility having visibility minimums greater than ¾ statute mile;
- 4,000 feet for non-precision instrument runways other than utility having a non-precision instrument approach with visibility minimums as low as ¾ statute mile; and
- 16,000 feet for precision instrument runways.

In addition, the approach surface extends horizontally to:

- 5,000 feet at a slope of 20:1 for all utility and visual runways;
- 10,000 feet at a slope of 34:1 for all non-precision instrument runways other than utility; and
- 10,000 feet at a slope of 50:1 with an additional 40,000 feet at a slope of 40:1 for all precision instrument runways.

**Table 3-26** lists the dimensions of the approach surfaces for each runway at the Airport.

**Table 3-26 – Approach Surface Dimensions**

| Dimension | Runway 5R | Runway 23L | Runway 5L | Runway 23R | Runway 9 | Runway 27 |
|---|---|---|---|---|---|---|
| Inner Width | 1,000 ft. | 1,000 ft. | 500 ft. | 500 ft. | 500 ft. | 500 ft. |
| Outer Width | 16,000 ft. | 16,000 ft. | 3,500 ft. | 3,500 ft. | 3,500 ft. | 1,500 ft. |
| Distance | 10,000 ft. @ 50:1, then additional 40,000 ft. @ 40:1 | | 10,000 ft. | 10,000 ft. | 10,000 ft. | 5,000 ft. |
| Slope | | | 34:1 | 34:1 | 34:1 | 20:1 |

Source: FAA Advisory Circular 150/5300-13A, *Airport Design*

An obstruction survey was completed as part of the master planning effort to update the ALP drawing sheet set. A review of obstructions within the runway approach surfaces at the Airport found that only a few light poles within the approach to Runway 9 and a few navigational aids fixed by function located throughout the airfield penetrate the approach surfaces at the Airport. This survey included verification that no tree obstructions penetrate the approach surface to Runway 5R/23L or to any other primary surface at the Airport. It is recommended that objects that could potentially penetrate approach surfaces at the Airport be monitored so that mitigation of these objects can occur before becoming obstructions. Note that an obstruction survey will be needed should any airfield reconfiguration occur that changes the length of the runways at the Airport resulting in a relocation of the approach surfaces. Additional information on existing and future potential obstructions to the approach surfaces at the Airport is presented on the approach surface sheets within the ALP drawing sheet set.

**Transitional Surface** – The transitional surface extends outward and upward at right angles to the runway at a slope of 7:1 from the sides of the primary and approach surfaces. Those portions of the transitional surface adjacent to precision approach surfaces that project through and beyond the limits of the conical surface extend to 5,000 feet measured horizontally from the edge of the approach surface and at right angles to the runway centerline. At the Airport, there are a few obstructions within the transitional surface of all three runways. As a part of the effort to update the ALP, the locations of these objects will be identified as well as determine the mitigation options that are available for their removal, if any. Obstruction lighting is recommended for any object that is unable to be removed.

**Horizontal Surface** – The horizontal surface is a plane 150 feet above the elevation of an airport whose perimeter is constructed by swinging arcs of specified radii from the center of each end of the primary surface for each runway at an airport and connecting the adjacent arcs by lines of tangent. The radius of each arch is:

- 5,000 feet for all runways designated as utility or visual, and
- 10,000 feet for all other runways.

The approach end of Runway 27 is the only runway at the Airport designated as visual, thus the radii of the arc found at this runway end is 5,000 feet; all other runway end arc radii are 10,000 feet.

**Conical Surface** – The conical surface extends outward and upward from the periphery of the horizontal surface at a slope of 20:1 for a horizontal distance of 4,000 feet.

Objects penetrating FAR Part 77 surfaces are hazards to air navigation unless determined otherwise by an aeronautical study conducted by the FAA. Aeronautical studies only determine if an object is a hazard to air navigation and do not give the FAA specific authorization to limit the height of objects that may be identified as hazards to air navigation. As such, it is the responsibility of an airport to work with state or local governmental jurisdictions to control objects that may penetrate FAR Part 77 surfaces. Objects that are identified as hazards to air navigation should be removed (or pruned in the case of vegetation) or illuminated with an obstruction light if the objects cannot be removed or are fixed by function. Additionally, it is recommended that an evaluation of hazards to air navigation occur prior to the implementation of any proposed project that changes FAR Part 77 surfaces at the Airport as a result of a runway reconfiguration or visibility minimum for an instrument approach procedure.

## 3.5 Taxiways

The taxiway system is interesting in that there were very few taxiways built when the Airport was constructed in the 1940s. As the Airport has evolved, the need for more taxiways so aircraft can transition on the airfield without having to use runways has increased; thus, taxiways have been created either through new construction or by use of a closed runway as demand has been realized. Currently, because there is no midfield access to Runway 5R/23L, landing aircraft are required to taxi to the end of the runway or back to the threshold to exit the runway. This increases the time needed for aircraft to clear the runway, which reduces the practical capacity of the runway, and limits the number of aircraft that can take off and land at the Airport. In addition, the lack of taxiways also increases the time needed for aircraft to taxi from the aprons to the other side of the airfield and/or to the departure ends of runways. This increases fuel burn for maneuvering aircraft, which increases aircraft operation costs and emissions.

To meet these needs, it is recommended that a parallel taxiway be constructed for Runway 5R/23L. Construction of a parallel taxiway would allow arriving aircraft to exit the runway near its midpoint or within the first or last third, depending on the type of aircraft. This would reduce the occupancy time of aircraft on the runway, which would increase practical capacity allowing for more aircraft departures and arrivals. Allowing aircraft to quickly exit the runway also increases runway safety in the event an aircraft cannot maneuver quickly enough for another arriving or departing aircraft. In particular for aircraft departing Runway 23L, construction of a parallel taxiway would also eliminate the need for aircraft to back-taxi to the threshold of the runway, which requires a 180-degree turn at the intersection of Runway 9/27. Construction of a parallel taxiway would eliminate the potential for a pilot to be disoriented when performing this 180-degree turn and accidentally departing from the wrong runway (Runway 27).

In addition to the hot spot at the intersection of Runway 5R/23L and Runway 9/27, another FAA designated hot spot is located at the intersection of Taxiway C and Runway 5L/23R. This hot spot is a remnant of a complex intersection from the original construction of the Airport where three runways and a taxiway intersected each other and created an eight-node intersection. Over time, the geometry of this intersection changed when two runways and an extension of Taxiway C to the west of Runway 5L/23R was removed. Prior to the removal of these surfaces, the complex geometry of this intersection resulted in it being designated as a hot spot. Despite the removal of Runway 14/32, the intersection remains a hot spot as result of the sharp angle at which Taxiway C intersects Runway 5L/23R. FAA design standards recommend that taxiways intersect runways at right angles whenever possible. To eliminate this hot spot, it is recommended that options be investigated to improve the geometry of the intersection of Taxiway C Runway 5L/23R in consideration of other airfield improvements that may change the configuration of the runways at the Airport.

## 3.6 Aprons

Aprons are designed to accommodate aircraft during the loading and unloading of passengers and/or cargo as well as to support fueling, maintenance, and aircraft storage. The size and layout of an apron is dependent upon factors that include purpose of the apron, number of aircraft parking positions, and size of aircraft using the apron as well as the movement patterns of aircraft and ground service vehicles, and locations of support facilities such as hangars and terminal buildings. Aprons should be designed to accommodate demand during peak periods of operation. Considering these factors, an analysis was conducted to determine the amount of apron space that will be needed to accommodate based and itinerant aircraft parking throughout the planning period.

Guidance established in FAA AC 150/5300-13A, *Airport Design*, was used to evaluate the demand for itinerant aircraft apron space at the Airport based on the total amount of apron space needed on a busy day of operation. Information obtained from the FAA's Operations Network (OPSNET) database determined that May was the peak month for itinerant aircraft operation in 2015 (3,216 itinerant operations). The number of itinerant operations occurring in the peak month was then divided by the total number of itinerant operations for 2015 (33,712) to determine the percentage of itinerant operations in the peak month (9.54 percent). It is assumed the percentage of itinerant operations in the peak month will remain constant throughout the planning period. This percentage was then multiplied by the projections of itinerant aircraft operations to determine peak month operations.

The projected number of itinerant aircraft operations by month was then divided by the number of days in May (31) to determine the average number of daily operations in the peak month. Since operations is a count of all takeoffs and landings, this number was then divided by two to determine the average number of daily landings in the peak month. Assuming that the demand for apron space during the peak month is equal to 50 percent of the average number of daily landings, this number was again divided by two. Applying fleet mix data obtained from the FAA's TFMSC database for IFR operations conducted at the Airport in 2015, the percentage of operations by fleet mix types was multiplied by the peak month average day landings to determine itinerant aircraft parking by type of aircraft.

**Table 3-27** presents the methodology used to determine the peak month average day itinerant aircraft apron demand.

**Table 3-27 – Peak Month Average Day Itinerant Aircraft Apron Demand**

| Criteria | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 |
|---|---|---|---|---|---|---|
| Annual GA itinerant operations | 33,712 | 37,090 | 37,391 | 38,562 | 39,822 | 41,180 |
| x Percentage of total operations in peak month | 9.54% | 9.54% | 9.54% | 9.54% | 9.54% | 9.54% |
| = Peak month operations | 3,216 | 3,538 | 3,567 | 3,679 | 3,799 | 3,929 |
| Peak month average day operations | 104 | 114 | 115 | 119 | 123 | 127 |
| Peak month average day landings | 52 | 57 | 58 | 60 | 62 | 64 |
| Peak month average day itinerant aircraft apron demand (in aircraft) | 26 | 29 | 29 | 30 | 31 | 32 |

| Class of Aircraft | % of Fleet | Apron SY per class | Demand | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 |
| Heavy *(Ex: 747-200, C-17)* | 0.05% | 11,950 | 11,950 | 11,950 | 11,950 | 11,950 | 11,950 | 11,950 |
| Large Jet *(Ex: DC-9-10, 727-200, MD-83)* | 14.65% | 4,920 | 18,740 | 20,903 | 20,903 | 21,623 | 22,344 | 23,065 |
| Large Commuter *(Ex: Convair 640, ERJ-145)* | 4.39% | 1,500 | 1,712 | 1,909 | 1,909 | 1,976 | 2,041 | 2,107 |
| Medium Commuter *(Ex: Falcon 20, Hawker 800)* | 48.95% | 800 | 10,182 | 11,356 | 11,356 | 11,748 | 12,140 | 12,531 |
| Small Equipment *(Ex: Cessna 172, King Air 200)* | 31.88% | 300 | 2,487 | 2,774 | 2,774 | 2,869 | 2,965 | 3,060 |
| Helicopter *(Ex: MD-902, Eurocopter EC-135)* | 0.09% | 730 | 730 | 730 | 730 | 730 | 730 | 730 |
| Total itinerant apron demand (square yards) | | | 45,801 | 49,622 | 49,622 | 50,896 | 52,170 | 53,443 |
| West apron itinerant parking capacity (sq. yd.) | | | 95,907 | 95,907 | 95,907 | 95,907 | 95,907 | 95,907 |
| Surplus / deficiency for total demand | | | 50,106 | 46,285 | 46,285 | 45,011 | 43,737 | 37,464 |
| South apron itinerant parking capacity (sq. yd.) | | | 144,727 | 144,727 | 144,727 | 144,727 | 144,727 | 144,727 |
| Surplus / deficiency for total demand | | | 98,926 | 95,105 | 95,105 | 93,831 | 92,557 | 91,284 |
| East apron itinerant parking capacity (sq. yd.) | | | 40,731 | 40,731 | 40,731 | 40,731 | 40,731 | 40,731 |
| Surplus / deficiency for total demand | | | -5,070 | -8,891 | -8,891 | -10,165 | -11,439 | -12,712 |

Note: Apron square yard demand per type includes 10 feet wingtip clearances and apron maneuvering dimensions.
Forecasts: Jacobsen | Daniels (2016)
Sources: FAA Traffic Flow Management System Counts (2015), Mead & Hunt, Inc. (2016)

Demand for itinerant aircraft parking is projected to increase from 26 aircraft in 2015 to 32 aircraft in 2040, with the apron area needed to accommodate this demand increasing from 45,801 square yards in 2015 to 53,443 square yards in 2040. It is also recommended that apron space be available daily for parking of at least one "Heavy" and "Helicopter" aircraft type. Currently, the capacity for itinerant aircraft apron parking on the west apron as well as the south apron exceeds projected demand.

In addition to mathematical projections of apron demand for itinerant aircraft parking, an effort was undertaken to qualitatively analyze the apron demands of four significant apron users at the Airport: AvFlight, Active Aero, EMU (Eagle Flight Centre), and Kalitta Charters. AvFlight oversees the parking of itinerant and based aircraft on both the west apron and the northern half of the east apron. The northern half of the east apron is used primarily by AvFlight to park itinerant aircraft; should a decision be made to park all itinerant aircraft on this apron an expansion would be needed to meet the calculated peak month average day demand for the planning period.

The west apron is used by AvFlight for a combination of based and itinerant aircraft parking needs. AvFlight leases hangar space to based aircraft that are parked in Hangar 1 and often needs to temporarily park based aircraft on the west apron as aircraft are repositioned in and out of the hangar bays. In addition, AvFlight officials indicated that Ameristar, a charter operator based in Texas that provides on-demand air cargo services, leases a small section of Hangar 1 and uses the Airport as a northern base for its charter operations. As a result, up to four narrow-body aircraft ranging from DC-9s, MD-80s, and 737s as well as five Dassault Falcon 20 business jet aircraft can be parked on the west apron. In addition, when there are seasonal slow periods of cargo activity additional itinerant cargo aircraft are parked on the west apron for extended periods of time. As a result, it is recommended that the capacity of the west apron be maintained to meet the itinerant and based aircraft apron parking demands of AvFlight.

Active Aero utilizes the southern portion of the east apron to park its fleet of based aircraft that includes six DC-9s, one MD-83, one 727-200, and three Falcon 20 aircraft. In addition, a number of non-airworthy narrow-body and business jet airframes that are used for parts and aircraft maintenance are also parked on the southern portion of the east apron. Active Aero's demand for apron space varies greatly based on the elastic demand for the on-demand air cargo services it provides. Since its entire fleet of aircraft could be parked at the Airport, it is recommended that the capacity of the southern portion of the east apron be maintained to meet the demands of Active Aero's on-demand air cargo operations.

EMU's Eagle Flight Centre at the southern end of the west apron leases a small section of apron to meet the parking needs of its fleet of Cessna 172 and Piper Seminole aircraft for flight training operations. Since EMU is responsible for the maintenance of this apron area, a detailed analysis of needed apron capacity was not conducted. It will be the discretion of EMU on the amount of apron area needed to meet the demand of its operations. Given that its fleet is comprised of small single-engine aircraft, it is not anticipated that additional apron area will be needed to meet the demand that is anticipated during the planning period.

Finally, Kalitta Charters utilizes the south apron for aircraft parking, which includes 727-200s and DC-9s as well as Learjet, Falcon 20, and Challenger business jet aircraft. The south apron was formerly used to support air cargo operations that were conducted out of the adjacent former Hangar 2; however, when Hangar 2 was demolished, air cargo operations shifted to the west apron, except for air cargo activity associated with Kalitta Charters. With reduced activity occurring on the south apron, it may not be necessary to improve the entire apron. Options should be considered to improve the south apron so that it adequately accommodates the demand of Kalitta Charters.

## 3.7 Navigational Aids and Weather Equipment

Navigational aids (NAVAIDs) are visual and electronic equipment used to guide aircraft during landing and takeoff that are located either on or off an airport as well as from orbiting satellites. Factors such as the type and volume of aviation activity, local meteorological conditions, and establishment of instrument approach procedures dictate the types of NAVAIDs that should be installed at an airport. FAA AC 150/5300-13A, *Airport Design*; FAA Order 7031.2C, *Airway Planning Standard Number One – Terminal Air Navigation Facilities and Air Traffic Control Services*; and FAR Part 139, the Aeronautical Information Manual (AIM) offer guidance on the type of visual and electronic NAVAIDs that should be installed at an airport. This section summarizes the review that was conducted of visual and electronic NAVAID equipment at the Airport and presents improvements needed to meet expected demand.

This section also reviews weather reporting equipment and provides climate information such as wind direction, wind speed, visibility, ceiling height, and the presence of rain/snow/etc. that factors into the use of visual and instrument-based navigation procedures. This review is presented at the end of the section and focuses on the need for upgrades or relocation of equipment to improve the accuracy of weather condition reporting at the Airport.

### 3.7.1 Visual Navigational Aids

Visual NAVAIDs require visual recognition by a pilot and include approach lighting, windsocks, and signage. Often, visual NAVAIDs compliment electronic NAVAIDs and may be required in certain circumstances to fulfill the installment of an electronic NAVAID. The following discusses each visual NAVAID at the Airport and any improvements that may be necessary to improve or continue to provide accurate navigational information to pilots.

#### 3.7.1.a Rotating Beacon

A rotating beacon is a high intensity light that rotates 360 degrees and assists in identifying the location of an airport from the air. At the Airport, the rotating beacon is located on top of the old control tower structure on Hangar 1. The angle of the light should be positioned so that on- and off-airport structures and surrounding terrain do not block the light when viewed from the air. Due to the height of the rotating beacon above Hangar 1, which is greater than six stories, there are no known obstructions to the light beam.

#### 3.7.1.b Wind Indicator

Fabric wind indicators, also known as wind cones, are devices that visually indicate the direction and velocity of the wind. If an airport has a Part 139 operating certificate, wind indicators are also required to be illuminated if an airport is open for operations at night. The primary lighted wind indicator at the Airport is located near the midpoint of Runway 5R/23L. Additional wind indicators are located:

- West of the fire station near the approach end of Runway 5L
- At the Runway 5R glide slope antenna
- Adjacent to Taxiway G near approach end of Runway 9
- South of the approach end of Runway 27 near the threshold of Runway 23L
- South of Taxiway G west of the approach end of Runway 23R

No improvements are need to the wind indicators at the Airport other than routine inspections and replacement of worn or faded fabric.

### 3.7.1.c Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights

Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR) are light bars positioned in a series off the end of a runway used in visual confirmation of the runway centerline during landing. MALSR light bars are each equipped with five lights that are preceded by a series of sequenced flashing lights. MALSR are most beneficial when visibility is limited at night, during inclement weather, and/or when lights from the surrounding environment have the potential to make visual identification of the runway threshold challenging. MALSR are also required for runways with an approach visibility minimum below ¾ mile. At the Airport, a MALSR is located at either end of Runway 5R/23L, meeting requirements for the instrument approaches established for the runway. If there is a desire to lower the visibility minimums of Runway 9/27 or Runway 5L/23R to below ¾ mile, the installation of a MALSR will be needed at the approach end of each corresponding runway.

### 3.7.1.d Precision Approach Path Indicators

Precision Approach Path Indicators (PAPI) are a series of red and white lights arranged in a single row consisting of either two- or four-light units that provide the correct glide slope path for an aircraft to land on a runway. Each light is aimed a different angle so that combinations of red and/or white lights identify if a pilot is on the glide slope, below the glide slope, or above the glide slope when landing. Four-light PAPI are located at the approach ends of Runway 5L, Runway 23R, Runway 23L, and Runway 9. Each PAPI is installed to the siting standards identified in FAA Order JO 6850.2B, *Visual Guidance Lighting Systems*; as such, improvements to the PAPI units are not necessary. Should any reconfiguration of the airfield be planned it is important to note the location of these PAPI units as their relocation may be necessary.

### 3.7.1.e Runway Edge Lighting

There are three types of runway edge lighting systems, each with a different number of illumination intensity settings. Runway 5R/23L is equipped with high intensity runway lighting (HIRL) that offers five illumination intensity settings. HIRL systems are required on runways that have a Category I, Category II, or Category III instrument approach. Given that Runway 5R and Runway 23L have Category I instrument approaches, improvements are not needed to the runway edge lighting system on Runway 5R/23L.

Runway 5L/23R and Runway 9/27 are equipped with medium intensity runway lighting (MIRL) that offers three light intensity settings. FAA AC 150/5340-30H, *Design and Installation Details for Airport Visual Aids*, directs that runways with visual or non-precision instrument approaches should have MIRL lighting systems installed. Given that Runway 5L, Runway 23R, and Runway 9 have non-precision instrument approaches, no improvements are needed to the runway edge lighting systems on these runways as well.

### 3.7.1.f Runway Centerline Lights

Runway centerline lighting systems are designed to facilitate landings, rollouts, and takeoffs by illuminating the center of the runway during low visibility and nighttime conditions. Centerline lights are required for runways with Category II and Category III precision instrument approaches. Runways with Category I precision instrument approaches below 2,400 feet RVR and runways with takeoff operations below 1,600 feet RVR are required until specifically approved by the FAA in an airline operator's specification for a runway. Although not required, centerline lights are required for runways with a Category I precision instrument approach greater than 170 feet wide or when used by aircraft with approach speeds over 140 knots.

Although all runways at the Airport are capable of supporting operations by aircraft with approach speeds over 140 knots (aircraft approach category D and greater), Runway 5R/23L is the only runway at the Airport equipped with centerline lighting. It is the desire of the Airport to gain a Category II or Category III precision instrument approach that offers lower minimums than the existing Category I approaches found on Runway 5R/23L. As noted, runway centerline lighting is required for Category II and Category III precision instrument approaches; thus, it is recommended the centerline lighting be maintained on Runway 5R/23L so that a Category II or Category III precision instrument approach can be established in the future and to support low visibility departure operations.

It is not recommended that centerline lights be pursued for Runway 5R/23L and Runway 9/27, since this planning effort is focused on reconfiguring each runway for aircraft with approach speeds less than 140 knots.

### 3.7.1.g Runway Touchdown Zone Lights

Runway touchdown zone (TDZ) lights are in-pavement lights arranged in rows within the touchdown zone of a runway used as a visual landing aid in low visibility and nighttime conditions. Runways with Category II and Category III precision instrument approaches are required to have TDZ lights, as well as runways with Category I precision instrument approaches with landing operations below 2,400 feet RVR. The TDZ of Runway 5R is the only runway at the Airport with TDZ lights. As previously mentioned, it is recommended that the TDZ lights on Runway 5R be maintained so that a Category II or Category III precision instrument approach can be established in the future. Should a Category II or Category III precision instrument approach be established for Runway 23L, the installation of the TDZ lights will be needed within the touchdown zone of Runway 23L. TDZ lights are not recommended on either Runway 5L/23R or Runway 9/27.

### 3.7.1.h Airfield Pavement Markings

Airfield pavement markings are applied to runways, taxiways, and apron surfaces and provide visual navigational cues for aircraft and ground vehicles navigating an airfield. Some examples of pavement markings include an aiming point and touchdown zone indicators, runway designation, runway side stripes, holding position markings, and air traffic control movement boundary markings. Markings applied to a runway are based on the type of visual or instrument approach procedure. Runways that support precision instrument approaches are required to include a landing designator marking, centerline, threshold markings, aiming point marking, TDZ markings, and side stripes. Since Runway 5R/23L is equipped with precision instrument approaches, these markings are applied to the runway. Likewise, Runway 5L/23R and Runway 9/27 have non-precision instrument approaches and are marked with the following non-precision markings: landing designator, centerline, threshold, and aiming point. Since Runway 9/27 has pavement width at the approach end of Runway 27 not available for use as a runway edge, there are markings on this runway as well. All runways at the Airport have markings in accordance with guidance in FAA AC 150/5340-1L, *Standards for Airport Markings*; thus, only routine maintenance to the markings is anticipated to be needed throughout the planning period to maintain the reflectivity and visibility standards.

### 3.7.1.i Airfield Signage


Airfield signage complements pavement markings by providing location and directional information through hold position signs, runway distance remaining signs, taxiway locations, taxiway directional signs, and destination location signs. FAA AC 150/5340-18F, *Standards for Airport Sign Systems*, provides guidance for the installation and maintenance of sign systems at an airport. It is recommended that the sign system at the Airport be maintained in accordance with this advisory circular with only routine inspections and maintenance anticipated during the planning period to ensure signs continue to meet reflectivity and visibility standards.

### 3.7.1.j Taxiway Edge Lighting

Taxiway edge lighting delineates the edge of a taxiway surface when visibility conditions are limited such as during the night and in inclement weather. Similar to runway edge lighting systems, taxiway edge lighting systems are equipped with different light intensity setting capabilities. At the Airport, all taxiways are equipped with medium intensity taxiway lights (MITL) that have three illumination settings, which are anticipated to meet the taxiway edge illumination demands of the planning period. Should any improvements to the taxiway edge lighting system be needed during the planning period, it is recommended that energy efficient light-emitting diode (LED) fixtures be considered to reduce energy usage and to decrease airfield operating expenses.

## 3.7.2 Electronic Navigational Aids

Electronic NAVAIDs transmit signals to be received by aircraft with proper avionics equipment so landings can be conducted when visibility is limited, such as during inclement weather, low cloud ceilings, and in nighttime conditions. Electronic NAVAIDs can be equipment that is installed on or off an airport as well as a satellite orbiting Earth. The following paragraphs review the electronic NAVAIDs found at the Airport.

### 3.7.2.a Instrument Landing System

An ILS is comprised of two components: a localizer and a glide slope antenna. The localizer is an antenna placed at the departure end of a runway that transmits a signal to align aircraft horizontally with the centerline of a runway when on approach to land. The glide slope antenna is positioned near the aiming point marking at the approach end of a runway and provides vertical guidance to an aircraft to align them with the correct landing descent path. ILS permit properly equipped aircraft with certified pilots to conduct precision instrument approaches during periods of reduced or very limited visibility.

The type of precision instrument approach offered by an ILS is categorized based on the minimum cloud ceiling height and visibility needed for a pilot to fly the approach, with Category III approaches offering the lowest decision heights and visibility requirements than Category I or Category II approaches. Currently, the Airport is equipped with a Category I ILS at either end of Runway 5R/23L that allows properly equipped aircraft to land when the cloud ceiling height is 300 feet or greater and the visibility is ¾ of a mile or greater.

Typically, Category I precision instrument approaches offer a visibility minimum of ½ mile and a ceiling height minimum of 200 feet. However, due to tree obstructions within the approaches to the runway, the visibility and ceiling height minimums were set at ¾ mile and 300 feet, respectively, when the existing precision instrument approaches were established for Runway 5R/23L. Discussions held with Airport tenants as a part of the inventory effort found that lower minimums are desired to reduce the need for aircraft to divert to Detroit Metropolitan Wayne County Airport when the visibility is less than ¾ mile and/or the ceiling height is less than 300 feet. To improve the visibility and ceiling height minimums for the precision instrument approaches to Runway 5R/23L, a tree mitigation effort was completed by the Airport that removed all tree obstructions within the approach surfaces to the runway. Since the tree obstructions have been removed, it is recommended that coordination occur with the Flight Procedure Standards Branch of the FAA to have the visibility and ceiling height minimums for the ILS approach procedures to Runway 5R and Runway 23L reduced to ½ mile and 200 feet.

Note that as a part of the preparation of this master plan, an effort was ongoing with the Flight Procedure Standards Branch of the FAA to reduce the visibility and ceiling height minimums of the ILS approach procedures to Runway 5R and Runway 23L. While the tree obstructions had been mitigated by the Airport, FAA databases used to establish the instrument approach procedures to Runway 5R and Runway 23L had not been updated with this information. As such, the visibility and ceiling height minimum for Runway 5R and Runway 23L remained at ¾ mile and 300 feet, respectively. The effort ongoing with the Flight Procedure Standards Branch of the FAA focused on verifying and updating the accuracy of the obstruction information in the FAA databases to have the approach minimums reduced. It is anticipated that once the accuracy of the information is verified the approach visibility and ceiling height minimums will be reduced to ½ mile and 200 feet.

There is also a demand from based users to have instrument approach procedures with visibility and ceiling height minimums lower than ½ mile and 200 feet, which are offered by Category II and Category III precision instrument approaches. This demand is driven by the need of on-demand cargo carriers to be able to conduct operations at the Airport in all weather conditions since the timeliness of their cargo delivery is critical to the production and business operations of their customers. It is recommended that planning be initiated to preserve for a Category II or Category III approach to Runway 5R/23L. **Table 3-28** presents the infrastructure and operational improvements needed for a Category II or Category III approach to Runway 5R/23L. Existing infrastructure elements such as the glide slope, localizer, and obstacle clearance surfaces would need to be improved to meet Category II and Category III standards, while installation of new infrastructure elements such as an ALSF-1 or ALSF-2 approach lighting system and remote monitoring equipment would also be needed.

**Table 3-28 – Category II and Category III Infrastructure and Operational Requirements**

| Required Element | Installed | Needed |
|---|---|---|
| Equipment | | |
| • Glide slope and localizer equipment for Category II/III authorization | | X[1] |
| • RVR equipment (touchdown, roll-out, and midfield for runways over 8,000 feet) | | X[2] |
| • Inner marker (typically required) | | X[3] |
| • Uninterrupted secondary power source and switchgear | X | |
| • Remote monitoring | | X |
| Lighting System Requirements | | |
| • ALSF-1 or ALSF-2 approach lights | | X |
| • In-pavement TDZ lights | X[4] | |
| • In-pavement runway centerline lights | X | |
| • High intensity runway lights | X | |
| Operational Requirements | | |
| • Surface Movement Guidance Control System Plan (SMGCS) plan | | X |
| • Airport traffic control tower open while aircraft conducting Category II/III ops | X | |
| • 3-degree glide path and threshold crossing height between 50 and 60 feet | X | |
| • Runway centerline consistent with localizer final course | X | |
| Airspace / Terminal Instrument Procedures | | |
| • No aircraft / ground vehicle penetration of OFZ, obstacle clearance surfaces, or POFZ | | X[5] |

Notes:

1 = Upgrade of existing glide slope and localizer needed

2 = RVR equipment needed at midfield and approach end Runway 23L assuming length of runway is extended greater than 8,000 feet

3 = May be needed for both Runway 5R and Runway 23L unless a radar altimeter minimum is not authorized

4 = Runway 5 only

5 = Establishment of obstacle clearance surfaces for Category II and Category III operations needed

Source: FAA Order 8400.13D, Procedures for the Evaluation and Approval of Facilities for Special Authorization Category I Operations and All Category II and III Operations

In addition to the infrastructure and operational requirements needed for a Category II or Category III precision instrument approach, a Surface Movement Guidance and Control System (SMGCS) plan would also be needed. **Table 3-29** presents the requirements for an SMGCS plan for operations below 1,200 feet RVR, but not less than 600 feet RVR. Installation of runway guard lights as well as development of a ground vehicle training and control program and a low visibility taxi route chart would be needed. Initial and periodic operational inspections of low visibility operations would also be needed as well as continual review and revision of the SMGCS plan.

**Table 3-29 – Surface Movement Guidance and Control System Plan Requirements**

| Required Element | Installed | Needed |
|---|---|---|
| Taxiway lights | X | |
| Runway guard lights | | X |
| 12-inch taxiway markings with black borders | X | |
| Taxiway guidance signs at all intersections | X | |
| Consideration of local issues | * | * |
| Ground vehicle training and control | | X |
| Low visibility taxi route chart | | X |
| Initial and periodic operational inspections | | X |
| Review and revision of SMGCS plan as needed | | X |

Notes: *Local issues would be considered as a part of plan development
Source: FAA AC 120-57A, Surface Movement Guidance and Control System

### 3.7.2.b Global Positioning System

The global positioning system (GPS) is a satellite-based navigation system that transmits location signals to properly equipped aircraft so that location, altitude, direction of travel, and speed can be determined. GPS offers the ability for aircraft to conduct non-precision approaches to runways that are not equipped with ground-based navigational equipment. **Table 3-30** summarizes the five satellite-based instrument approach procedures at the Airport.

**Table 3-30 – Global Positioning System Based Instrument Procedures**

| Runway | GPS Procedure | Visibility Minimum | Ceiling Height Minimum | Vertical Guidance |
|---|---|---|---|---|
| Runway 5L | Area Navigation (RNAV) (GPS) | 1 mile | 400 feet | No |
| Runway 5R | RNAV (GPS) | ¾ mile | 300 feet | Yes |
| Runway 9 | RNAV (GPS) | 1 mile | 300 feet | Yes |
| Runway 23L | RNAV (GPS) | ¾ mile | 300 feet | Yes |
| Runway 23R | RNAV (GPS) | 1 mile | 400 feet | No |

Source: Mead & Hunt, Inc. (2016)

Localizer performance with vertical guidance (LPV) is available on three runways: Runway 5R, Runway 23L, and Runway 9. These approaches offer properly equipped aircraft and trained pilots the ability to conduct a GPS-based approach with vertical guidance when the visibility is not lower than ¾ mile on Runway 5R and Runway 23L and not lower than 1 mile on Runway 9. All three approaches have a ceiling height minimum of 300 feet. With the implementation of NextGen, the FAA's satellite-based navigation initiative, GPS-based approaches offering LPV vertical guidance with near-precision instrument approach and visibility and ceiling height minimums are being introduced into the National Airspace System (NAS). GPS approaches with LPV vertical guidance offer the horizontal and vertical guidance accuracy of an ILS without the need to install ground-based navigational equipment; thus, GPS approaches offering vertical guidance can be established at virtually any runway within the NAS. It is recommended that the preservation and protection of airspace within all approaches at the Airport continue so that additional GPS approaches with vertical guidance can be obtained that offer lower visibility and ceiling height minimums.

#### 3.7.2.c Very High Frequency Omni-Directional Radio Range Antenna

Very High Frequency Omni-Directional Radio Range Antennas (VORs) are ground-based NAVAIDs that emit radio signals so that course and position can be determined in relation to the distance from the VOR. While a VOR is not located on Airport property, a VOR is installed approximately 7.5 miles east of the Airport at the Detroit Metropolitan Wayne County Airport and is used in navigating a non-precision instrument approach to the Airport. VORs do not offer the accuracy of GPS and the FAA is currently evaluating the necessity, benefits, and costs of these NAVAIDs throughout the NAS.

#### 3.7.2.d Automated Surface Observing System

The Automated Surface Observing System (ASOS) is a weather-observing unit located to the east of the midpoint of Runway 5R/23L that measures and transmits local weather conditions such as temperature, dew point, altimeter, wind speed, wind direction, visibility, cloud ceiling height, and type of precipitation. Weather equipment installed at an airport must be capable of reporting those climatic conditions that are appropriate for operational needs and atmospheric characteristics of the local environment. A site must also be chosen that accurately captures the weather conditions at the Airport.

The existing ASOS unit appears to meet the weather reporting accuracy needs of the Airport; however, installation of RVR units at the approach ends of midpoint of a runway are needed to achieve a Category II or Category III precision instrument approach. RVR is an instrumentally-derived value reported in feet that represents the horizontal distance a pilot will see down the runway from the approach end. Currently, an RVR unit is installed near the approach end of Runway 5R. To achieve a Category II or Category III precision instrument approach on Runway 5R/23L, RVR units would need to be installed near the midpoint of the runway and at the approach end of Runway 23L. It is recommended the Airport pursue installation of RVR units at these locations as a part of its planning efforts to gain a Category II or Category III precision instrument approach.

## 3.8 General Aviation Facilities

Generally, the size and type of facilities needed to support general aviation (GA) is directly proportional to the size and type of GA aircraft that operate at an airport. Other factors are also considered when reviewing and planning future GA development at an airport such as climate, availability of developable land, and anticipated demand. The review of GA facilities at the Airport focused on three components that are discussed in this section: GA terminals, fixed base operator (FBO) services, and hangar space.

### 3.8.1 General Aviation Terminals

There are three GA terminals at the Airport. Two are operated by AvFlight and one is operated by Active Aero Services. AvFlight West is located in Hangar 1, while AvFlight East is a standalone GA terminal building on the east side of the Airport. Active Aero's terminal is also located on the east side of the airfield within its facility shared by USA Jet. While each terminal is configured for the demands of itinerant aircraft users, AvFlight West primarily focuses on the needs of based aircraft users as well as charter, freight, and cargo handling while AvFlight East focuses primarily on GA passenger activity. Active Aero's terminal also focuses on GA passenger activity and accommodating cargo operations associated with USA Jet. Each terminal serves as a transfer point for pilots and passengers, and provides administrative offices for staff, space for pilots to plan flights and access weather information, and passenger lounge areas. Each GA terminal facility is capable of meeting the needs of the Airport's users throughout the planning period; thus, improvements are not anticipated to be needed.

### 3.8.2 Fixed Base Operator Services

FBO services support the operation of aircraft and include fueling, aircraft maintenance and repair, lavatory service, aircraft de-icing, ground power unit (GPU) service, and other ground handling services as well as passenger and pilot needs such as ground transportation, catering, and concierge services. Each GA terminal facility offers several services which are presented in **Table 3-31**.

**Table 3-31 – Fixed Base Operator Services**

| AvFlight West | AvFlight East | Active Aero |
|---|---|---|
| • Jet A & 100 low lead fuel | • Jet A & 100 low lead fuel | • Jet A & 100 low lead fuel |
| • Aircraft de-icing | • Aircraft de-icing | • Aircraft de-icing |
| • Ground handling | • Ground handling | • Ground handling |
| • GPUs | • GPUs | • GPUs |
| • Lavatory service | • Lavatory service | • Lavatory service |
| • Covered aircraft parking | • Concierge services | • Passenger stairs |
| • Cargo handling | • Crew courtesy vehicle | • Helicopter services |
| • Concierge services | • Car rental | • Covered aircraft parking |
| • Crew courtesy vehicle | • Catering | • Cargo handling |
| • Car rental | • Taxi/limousine service | • Concierge services |
| • Catering | • International refuse | • Crew courtesy vehicle |
| • Taxi/limousine service | • Private charter screening | • Car rental |
| | | • Catering |
| | | • Taxi/limousine service |

Sources: www.activeaeroservices.com, www.avflight.com (2016)

Many FBO services are provided by the three FBO facilities at the Airport including 100 low lead (LL) and Jet-A aviation fuels, aircraft de-icing, lavatory service, ground handling, crew courtesy vehicles, and car rentals. In addition, airframe, power plant, and avionics repair and maintenance services are offered by three licensed providers: International Turbine Industries, Top Flight Avionics, and The Aviation Depot. It appears FBO services currently being provided at the Airport will meet the needs of based and itinerant users throughout the planning period; however, planning should be initiated to preserve space for additional FBO services should demand be realized for additional FBO service capacity. This planning may include identifying space in existing hangar structures and/or the preservation of land for construction of new facilities.

### 3.8.3 Hangars

Typically in evaluating hangar capacity, it is assumed that all based aircraft will desire hangar storage. **Table 3-32** presents the growth in based aircraft that is projected for the planning period, which is expected to increase from 190 aircraft in 2014 to 237 aircraft in 2040. By type of aircraft, 21 additional single-engine aircraft, 9 additional multi-engine aircraft, 16 additional jet aircraft, and 1 additional based helicopter are projected to be based at the Airport during the planning period.

**Table 3-32 – Global Positioning System Based Instrument Procedures**

| Year | Single | Multi-Engine | Jet | Helicopter | TOTAL |
|---|---|---|---|---|---|
| 2014 | 86 | 35 | 66 | 3 | 190 |
| 2020 | 90 | 37 | 69 | 3 | 200 |
| 2025 | 94 | 38 | 72 | 3 | 208 |
| 2030 | 98 | 40 | 75 | 3 | 217 |
| 2035 | 102 | 42 | 79 | 4 | 226 |
| 2040 | 107 | 44 | 82 | 4 | 237 |

Source: Mead & Hunt, Inc. (2016)

Taking this into consideration, it is important to note that a few based aircraft types are not parked in hangars such as the narrow-body and business jet aircraft types operated by Active Aero/USA Jet and Kalitta Charters. Airport officials indicated that based aircraft in need of hangar space are located in Hangar 1 or within T-style hangars adjacent to the east apron. Hangar 1 has eight hangar bays, of which four are used for based aircraft parking and two are used for parking and maintenance of aircraft from the Yankee Air Museum. These hangar bays are large and have flexibility for additional aircraft parking pending the sizes of the types of aircraft in need of the space and the positioning of parked aircraft in the hangar bays. Small single- and twin-engine aircraft are typically not parked in Hangar 1 and instead park inside the T-style hangar structures located adjacent to the east apron.

Airport officials indicated that T-style hangars located adjacent to the east apron are near capacity and only have a few vacancies remaining; thus, it is assumed that parking for based aircraft in T-style hangars are at capacity. Since T-style hangars are designed for small single- and twin-engine aircraft, it is recommended that planning be initiated for an expansion of T-style hangars when demand of additional hangar parking for these aircraft types is realized.

Concerning capacity, it appears that six of the eight bays in Hangar 1 are currently utilized for aircraft and other storage purposes. Given the size of the bays and the flexibility to park multiple aircraft in each bay, Airport officials indicated that the parking capacity offered by the six bays should continue to be provided through the planning period with other areas identified on the airfield for hangar expansion. Built in 1942, Hangar 1 was originally constructed to support production of the B-24 Liberator bomber during World War II. Over time, some of the building and its systems have been modified and replaced to meet Hangar 1's evolving role at the Airport while other components have remained unchanged since its original construction. As a result, the condition of the building and its utilities have extended beyond their useful life and have deteriorated to a point that improvements are needed. It is recommended that planning be initiated to review options that are available to rehabilitate Hangar 1 so that at least six hangar bays of capacity can be provided for the planning period. Should it be not financially feasible to rehabilitate Hangar 1, it is also recommended that other areas of the airfield be identified for hangar development.

## 3.9 Air Cargo Facilities

The handling of on-demand air cargo is different than the handling of air cargo by courier services such as UPS and FedEx in that dedicated processing facilities located on-airport to sort and process cargo are not needed. Typically, freight arriving from an on-demand air cargo flight is specific to one customer and does not require to be sorted or processed; thus, the freight is removed from the aircraft and loaded directly to a truck for delivery. Likewise, freight arriving to the Airport for an on-demand air cargo flight has already been processed and sorted at its origin and is ready to be loaded directly to and aircraft. Given the method of how on-demand air cargo is handled between aircraft and truck, there is not a need for air cargo processing facilities at the Airport. However, it is important that adequate apron area be made available for aircraft, vehicles, and ground support equipment for the transfer of cargo between aircraft and truck. The analysis of apron area for itinerant aircraft parking considered the space needed to accommodate aircraft, vehicles, and ground support equipment associated with on-demand air cargo operations that are anticipated for the planning period. Thus, it appears the capacity of existing facilities is adequate to support on-demand air cargo operations.

Through interviews with Airport tenants, it was noted that the availability of a loading dock adjacent to the west apron would increase the efficiency of the transfer of freight between aircraft and truck. A loading dock on the south apron adjacent to the campus of facilities for Kalitta Air and Kalitta Charters was used frequently for the transfer of cargo between aircraft and truck when these activities occurred at Hangar 2. When Hangar 2 was removed, air cargo activities shifted to the west apron resulting in it being less convenient to use the loading dock on the south apron. Consideration should be given to construct a loading dock facility adjacent to the west apron to increase the efficiency of cargo transfer between aircraft and truck.

## 3.10 Aircraft Rescue and Firefighting Facility

The existing 3,000-square-foot aircraft rescue and firefighting (ARFF) facility is located adjacent to the west apron and is limited in size to meet the vehicle and firefighting equipment storage needs of the Airport. Most importantly, the size of the vehicle bays is not capable of housing newer generation ARFF vehicles that will need to be purchased to replace existing aging ARFF vehicles during the planning period. Likewise, support spaces in the facility for firefighting equipment and raw material storage are limited in size to meet the firefighting storage demands of the Airport. Additionally, the size of personnel areas for firefighters, such as locker rooms, break areas, and bunk areas, are limited in size and would benefit from an expansion to better accommodate the demands of firefighters. Finally, improvement utility infrastructure is needed at the ARFF facility as existing building utilities are outdated and in need of replacement. As such, it is recommended that planning be initiated to improve ARFF facilities at the Airport.

Whether the existing facility is expanded or a new ARFF facility constructed, several items need to be taken into consideration outlined in FAA AC 150/5210-15A, *Aircraft Rescue and Firefighting Station Building Design*. The following sections summarize the design elements that should be considered in improving the ARFF facility.

### 3.10.1 Aircraft Rescue and Firefighting Index

Currently, the ARFF Index at the Airport is Index A, which is the minimum designated index under FAR Part 139. Since there is no regularly scheduled commercial airline passenger service, this Index meets the requirements of the Airport's FAR Part 139 certificate. However, if requested in advance, the Airport has the capability to provide Index E services, which are the most demanding in terms of firefighting equipment and extinguishing agent. This is accomplished by temporarily repositioning firefighting vehicles from the Detroit Metropolitan Wayne County Airport. Given that the Airport has no commercial airline passenger service and has the capability to provide Index E services, no changes are anticipated to its ARFF index classification or on-demand firefighting arrangement.

### 3.10.2 Firefighting Vehicles

A significant deficiency with the existing ARFF facility is that the vehicle bays are not sized large enough for next generation ARFF vehicles that the Airport will need to purchase during the planning period. It is recommended that the vehicle bays be designed so that they are capable of housing at least two next generation vehicles. Although Index A can be met with a single vehicle, it is recommended that the Airport continue to maintain two vehicles in the event one of the vehicles needs to be taken out of service for routine maintenance or an unexpected repair.

### 3.10.3 Personnel Areas

Personnel areas at the existing ARFF facility are located towards the back of the building behind the vehicle bays and are limited in size considering the function of each room. In addition, some rooms for personnel were converted from storage areas and are not designed for the function served. Also, there are no locker room facilities for female firefighters in the existing ARFF facility. It is recommended that improvements to the ARFF facility include dedicated rooms for personnel functions, such as locker areas, dispatching, break room, training, and sleeping.

### 3.10.4 Building Location and Orientation

The location and orientation of an ARFF facility should be such that responding emergency vehicles have immediate access to the airfield with unimpeded access routes that have a minimum of turns. Access routes from the building should be such that crossing of taxiways, aprons, and other areas of potential congestion, such as vehicle parking areas, aircraft fuel storage areas, and service roads, are kept to a minimum. This is critical because of the need for a timely and safe response route so that ARFF response requirements as identified in FAR Part 139 can be maintained. In addition, it is desired that the building be oriented so that it has maximum surveillance of the airfield to assist responding personnel in locating the scene of an emergency.

### 3.10.5 Equipment and Raw Material Storage

In addition to having vehicle bays and personnel areas, improved storage areas are needed for equipment and raw material storage. FAA AC 150/5210-15A, *Aircraft Rescue and Firefighting Station Building Design*, provides guidance for storage areas that should be planned in an ARFF facility to accommodate firefighting turnout gear, first aid medical equipment, rescue tools, and self-contained breathing apparatuses (SCBA). Likewise, areas should be included in the design that account for the storage of raw material firefighting extinguishing agents such as foam. The design of this room should be large enough to store and move several foam shipment pallets as well as accepting raw material deliveries in an efficient manner.

## 3.11 Snow Removal and Maintenance Facilities

The snow removal and maintenance facility complex at the Airport is located on the southwest side of the airfield near the west apron adjacent to EMU's Eagle Flight Centre. It is comprised of a raw material storage structure and a snow removal equipment (SRE) building that houses vehicles and other maintenance equipment. As a part of the review of the Airport's facilities, the master planning project team toured the complex and spoke with maintenance personnel about capability of the facility to meet existing needs and needs expected over the course of the planning period. The SRE building structure was recently constructed in 2013 and provides sufficient storage space for the existing seasonal fleet of vehicles, equipment, and raw materials with capacity available to meet demands anticipated during the planning period such as the acquisition of an additional multi-task tandem plow/broom vehicle. There is, however, a need for additional storage for out of season equipment such as the storage of mowing equipment in the winter and the storage of plowing equipment in the summer. Some of this equipment is relocated seasonally; however, a storage facility to consolidate operations to the maintenance facility complex is recommended.

While the SRE facility has work areas for maintenance personnel, it does not have amenities such as locker rooms, bunk areas, or a break area that are especially needed during snow removal operations. Currently, these amenities are provided for maintenance personnel in Hangar 1, but it requires employees to transition between Hangar 1 and the maintenance facility complex multiple times each day. This results in inefficiencies when maintenance personnel complete tasks at the Airport that can be time critical such as snow removal operations. To increase efficiencies, it is recommended that personnel areas offered in Hangar 1 be relocated to the maintenance facility complex so that a centralized location can be made available for personnel, equipment, and raw materials.

## 3.12 Airfield Electrical Vault

The airfield electrical vault, located adjacent to the west apron, includes components such as transformers, lighting panels, relays, and constant current regulators (CCR) that are necessary to power airfield electrical components such as lights and NAVAIDs. A project was initiated in 2004 that resulted in the construction of the existing airfield electrical vault so that airfield electrical components previously kept in Hangar 1 could be upgraded and replaced in the new structure. Construction of the airfield electrical vault included excess capacity so it could remain flexible throughout its lifespan so that adequate space could be made available when components were upgraded or replaced. The additional capacity was also included in the event it was desired to relocate the airfield electrical generator in the structure that is currently located in a separate dedicated structure in the parking lot to Hangar 1.

The airfield electrical vault and its available capacity is anticipated to meet airfield electrical demands for the planning period; the electrical components within, however, may need to be replaced towards the end of the 20-year planning period. Airfield electrical components typically have a lifespan of 20-30 years and the components currently installed in the structure are approximately 12 years old. It is recommended that the airfield electrical components be continually inspected and maintained during the planning period to extend the lifespan of this equipment.

In addition to the airfield electrical vault, a review was also conducted of the airfield electrical generator, which was installed in 1996 in a dedicated structure that is located within the parking lot of Hangar 1. As noted, airfield electrical components have a lifespan of 20-30 years; while there have been no identified issues with the airfield electrical generator, it is anticipated that this equipment will need to be replaced during the planning period. Until a need has been identified to replace the equipment, it is recommended that continual inspection and maintenance occur to extend its lifespan. Also, the airfield electrical generator is located in proximity of a proposed utility infrastructure improvement project to install new water and sanitary sewer lines for the American Center for Mobility autonomous vehicle testing facility located at the site of the former bomber plant. Should it be found that the airfield electrical generator needs to be relocated, either through an infrastructure improvement project or replacement of the unit itself, it is recommended that consideration be given to relocate the generator to the airfield electrical vault so that efficiencies can be realized by having all airfield electrical components in a centralized location.

## 3.13 Airport Traffic Control Tower

The Airport Traffic Control Tower (ATCT) is located north of Taxiway H between Runway 5R/23L and the east apron. It is in operation 24 hours a day and is responsible for the separation of aircraft both taxiing on the ground and within the Class D airspace that surrounds the Airport. The ATCT has two air traffic controller disciplines: Tower Control and Ground Control. Tower Control is responsible for the safe separation of aircraft maneuvering through the Class D airspace around the Airport while Ground Control is responsible for the movement of aircraft and vehicles on the airfield. Aircraft on approach to, or departing from, the Class D airspace will communicate with Detroit Terminal Radar Approach Control Facility (TRACON). It is not anticipated that any changes to the air traffic control arrangement at the Airport will be needed during the planning period.

A review of the ATCT found that additional space is needed for the storage of computer equipment, records storage, training, and additional office space for ATCT personnel and FAA Technical Operations staff that share office space in the facility. In addition, utilities in the ATCT such has heating, ventilation, and air conditioning (HVAC) and electrical components such as lights are aging and inefficient. While upgrades are needed to the ATCT facility, it is an FAA-owned facility and ultimately the responsibility of the FAA to implement and finance any improvements.

Also as part of the review of the ATCT, an evaluation was conducted of the line-of-sight from the control cab and the ability of a controller to detect and identify objects at surface points on the airfield. To conduct this evaluation, the FAA's Air Traffic Control Visibility Analysis Tool was used to determine an observer's probability to detect, recognize, and identify an object (criteria object is front view of a minivan vehicle) from the ATCT control cab at the end of each runway at the Airport on a partly cloudy day with 10-mile visibility. **Table 3-33** presents the results of this analysis that found that the site of the ATCT at its present location passes all thresholds for object discrimination detection, recognition, and identification.

**Table 3-33 – Airport Traffic Control Tower Object Discrimination Analysis**

| Rwy | Detection | | | Recognition | | | Identification | | | LOS Angle of Incidence | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Thrsh. | Value | Pass? | Thrsh. | Value | Pass? | Thrsh. | Value | Pass? | Thrsh. | Value |
| 5R | 95.5% | 99.6% | Yes | 11.5% | 57.4% | Yes | 0.91% | 9.12% | Yes | ≥0.80 | 0.84 |
| 23L | 95.5% | 99.8% | Yes | 11.5% | 75.9% | Yes | 0.91% | 18.87% | Yes | ≥0.80 | 1.21 |
| 9 | 95.5% | 98.4% | Yes | 11.5% | 25.6% | Yes | 0.91% | 2.49% | Yes | ≥0.80 | 0.61 |
| 27 | 95.5% | 99.8% | Yes | 11.5% | 72.6% | Yes | 0.91% | 16.46% | Yes | ≥0.80 | 1.21 |
| 5L | 95.5% | 99.5% | Yes | 11.5% | 49.8% | Yes | 0.91% | 6.85% | Yes | ≥0.80 | 0.77 |
| 23R | 95.5% | 99.9% | Yes | 11.5% | 84.5% | Yes | 0.91% | 28.83% | Yes | ≥0.80 | 1.30 |

Note: Calculated assuming sunlight clouds, visibility 10 miles, observer eye height 785 feet MSL, ground elevation at ATCT 707 feet MSL
Source: FAA Air Traffic Control Visibility Analysis Tool (http://www.hf.faa.gov/Visibility/index.aspx) (2016)

However, the ATCT tower does not meet visibility requirements for line-of-sight (LOS) angle of incidence depth perception. The angle of an observer's view of the airfield surfaces from the ATCT control cab should exceed 0.8 degrees and it does not meet this threshold when viewing the approach end of Runway 9 and Runway 5L (0.61 and 0.77, respectively) from the existing ATCT control cab. To correct this, an increase in the height of the ATCT control cab would be needed. Since there is not a significant difference between the threshold and the actual angle of incidence, and a clear view is provided from the ATCT control cab to these points on the airfield, there does not appear to be an immediate need to increase the height of the ATCT control cab. When a decision is made to construct a new ATCT facility, an increase in the height of the ATCT control cab from the elevation of the existing facility will be needed if the new ATCT facility is constructed in close vicinity of the present location. An object discrimination analysis will be needed to determine the height of a new ATCT facility if a difference location is selected on the airfield for its construction.

## 3.14 Fuel Storage

The fuel storage facility at the Airport is located west of the Kalitta Air/Kalitta Charters complex to the south of the Tyler Road Extension. It is comprised of six 50,000-gallon Jet-A fuel tanks and one 30,000-gallon 100LL fuel tank. Combined, the Airport has the capability to store 300,000 gallons of Jet-A and 30,000 gallons of 100LL aviation fuel. To evaluate fuel storage requirements, it is first important to review the historical sale of fuel to establish a baseline of demand. **Table 3-34** summarizes the annual fuel sales from 2010 through 2015. As illustrated in the table, an average of 6,854,598 gallons of Jet-A fuel and 141,131 gallons of 100LL fuel have been sold between 2010 and 2015.

**Table 3-34 – Global Positioning System Based Instrument Procedures**

| Fiscal Year | Jet-A Sales (in gallons) | 100LL Sales (in gallons) | TOTAL SALES (in gallons) |
|---|---|---|---|
| 2010 | 8,464,052 | 171,181 | 8,635,233 |
| 2011 | 7,724,735 | 146,705 | 7,871,440 |
| 2012 | 6,939,892 | 135,023 | 7,074,915 |
| 2013 | 5,586,601 | 127,768 | 5,714,369 |
| 2014 | 6,166,391 | 140,841 | 6,307,232 |
| 2015 | 6,245,914 | 125,268 | 6,371,182 |
| ***2010-2015 Average*** | ***6,854,598*** | ***141,131*** | ***6,995,729*** |

Note: Fiscal year October through September
Source: Wayne County Airport Authority records (2016)

To calculate the fuel storage turnover rate, or the rate at which the fuel tanks at the Airport need to be refilled to meet demand, the annual sale of fuel is divided by the number of days in a year to find the average daily fuel sales. The total fuel storage capacity at the Airport is then divided by the average daily fuel sales to determine the average fuel storage turnover rate. **Table 3-35** presents the fuel storage turnover rate for Jet-A fuel while **Table 3-36** presents the fuel storage turnover rate for 100LL fuel. The fuel storage tanks at the Airport can store, on average, a 16-day supply of Jet-A fuel and a 77-day supply of 100LL fuel. Since greater than two weeks of Jet-A and eleven weeks of 100LL fuel can be stored at the Airport, there does not appear to be a need for an increase in fuel storage capacity.

**Table 3-35 – Jet-A Fuel Storage Turnover Rate**

| Fiscal Year | Jet-A Sales (in gallons) | Average Daily Fuel Sales (in gallons) | Total Jet-A Fuel Storage Capacity (in gallons) | Average Fuel Storage Turnover Rate |
|---|---|---|---|---|
| 2010 | 8,464,052 | 23,189.2 | 300,000 | 12.9 days |
| 2011 | 7,724,735 | 21,163.7 | 300,000 | 14.2 days |
| 2012 | 6,939,892 | 18,961.5 | 300,000 | 15.8 days |
| 2013 | 5,586,601 | 15,305.8 | 300,000 | 19.6 days |
| 2014 | 6,166,391 | 16,894.2 | 300,000 | 17.8 days |
| 2015 | 6,245,914 | 17,112.1 | 300,000 | 17.5 days |
| ***2010-2015 Average*** | ***6,854,598*** | ***18,779.7*** | ***300,000*** | ***16.0 days*** |

Note: Fiscal year October through September
Source: Wayne County Airport Authority records (2016)

**Table 3-36 – 100 Low Lead Fuel Storage Turnover Rate**

| Fiscal Year | 100LL Sales (in gallons) | Average Daily Fuel Sales (in gallons) | Total 100LL Fuel Storage Capacity (in gallons) | Average Fuel Storage Turnover Rate |
|---|---|---|---|---|
| 2010 | 171,181 | 469.0 | 30,000 | 64.0 days |
| 2011 | 146,705 | 401.9 | 30,000 | 74.6 days |
| 2012 | 135,023 | 368.9 | 30,000 | 81.3 days |
| 2013 | 127,768 | 350.0 | 30,000 | 85.7 days |
| 2014 | 140,841 | 385.9 | 30,000 | 77.7 days |
| 2015 | 125,268 | 343.2 | 30,000 | 87.4 days |
| ***2010-2015 Average*** | ***141,131*** | ***386.7*** | ***30,000*** | ***77.6 days*** |

Note: Fiscal year October through September
Source: Wayne County Airport Authority records (2016)

## 3.15 Utility Infrastructure

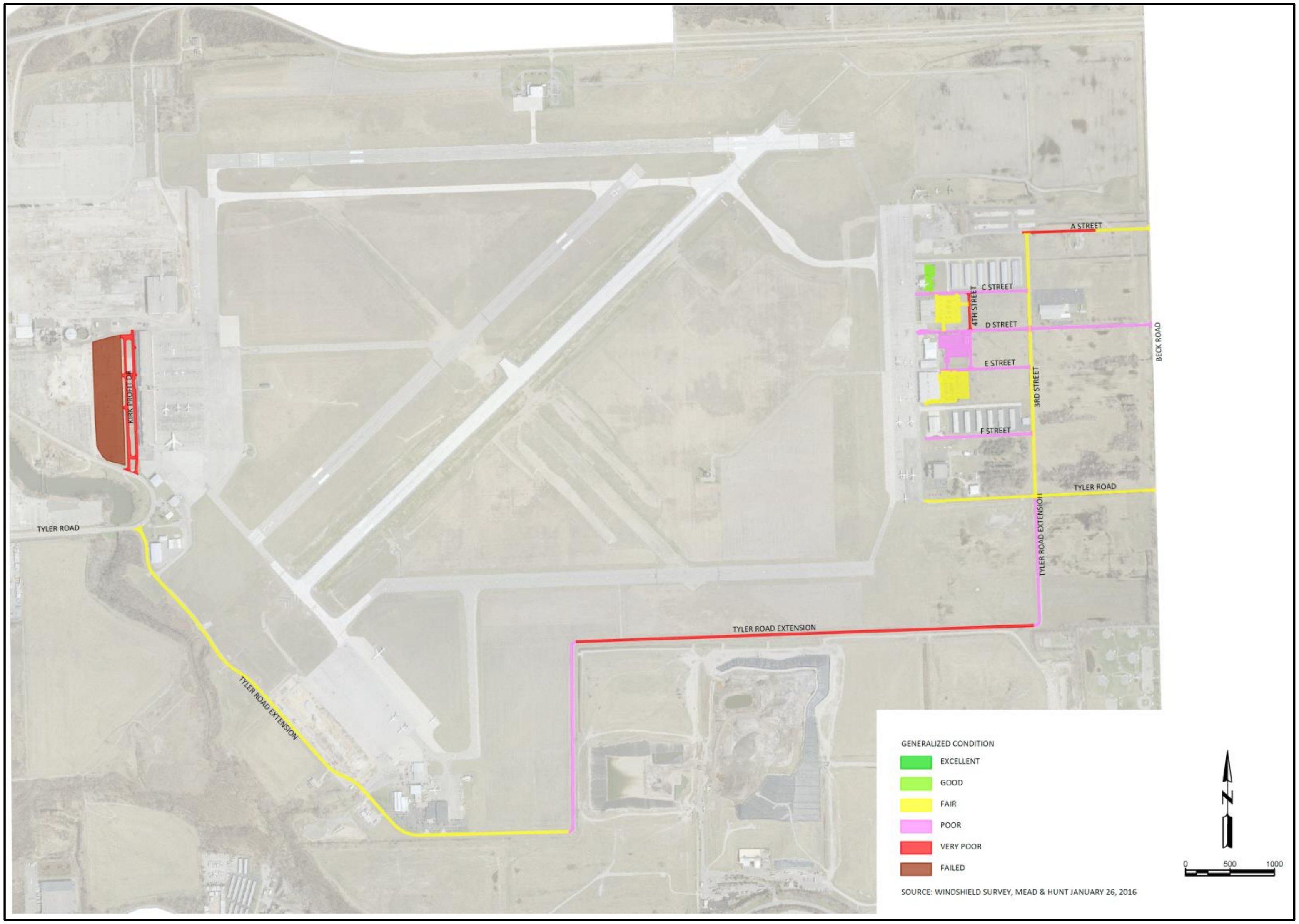
Much of the utility infrastructure at the Airport such as water mains, sewer lines, and underground electrical utility lines has not been replaced since it was originally installed, some of which dates to the 1940s. Due to the age of the infrastructure, utility issues such as electrical outages and water/sewer line breaks are commonly experienced that result in Airport users needing to frequently rely on temporary utility resources such as generator power and portable toilets. Many of the tenants have expressed improvements to utility infrastructure being a top priority for their infrastructure needs at the Airport. As such, improvements to utility infrastructure are recommended. As part of the master planning process, existing utility infrastructure plans were reviewed to update the overall utility infrastructure plan for the Airport. Options to improve utility infrastructure as a result of this review will be presented and discussed as a part of the alternatives analysis.

## 3.16 Airport Access

The Airport is uniquely located at the juncture of two major roadways: Interstate 94 and U.S. Route 12. Due to the manufacturing activity that occurred at the site of the former bomber plant, efficient and convenient access was constructed between these major roadways and the Airport. Thus, no Airport access improvements are necessary from the east or west. The South Apron area, however, requires vehicles to enter the Airport from its eastern or western most access points and travel via Tyler Road to this area. Given the proximity of the Interstate 94 Service Road to the south, it is recommended planning be initiated for the construction of an access road between this roadway and Tyler Road Extension to provide more efficient access with Interstate 94.

Improvements are also needed to the surface condition of many existing roadways that have deteriorated. **Figure 3-15** presents the conditions of existing roadways that range from “poor” to “failed” based on a visual inspection conducted as part of the master plan inventory effort. It is recommended that the surface conditions of these roadways be improved as funding becomes available.

**Figure 3-15 – Landside Surface Road Conditions**




Note: Based on visual inspection conducted January 26, 2016 by Mead & Hunt, Inc.

A concern was also expressed about the need of fuel trucks to traverse on the Tyler Road Extension roadway used by public traffic when traveling between the east apron and the fuel farm located adjacent to the south apron. Safety concerns and the tracking of de-icing salt during winter onto the airfield environment, which leads to accelerated corrosion of aircraft components, are the primary reasons to eliminate the need for fuel trucks and other Airport service vehicles to access the Tyler Road Extension when traveling between the east apron and the south apron/fuel storage facility. It is recommended that a dedicated landside access roadway be considered between the south apron and the east apron to eliminate the need for fuel trucks and other dedicated Airport service vehicles to travel on the Tyler Road Extension roadway.

## 3.17 Summary

In summary, many infrastructure improvements are needed at the Airport. Some of these are to improve the design of the Airport through the elimination of FAA designated hot spots and complex runway/taxiway intersection geometry, while others are to improve its design through construction of a parallel taxiway to Runway 5R/23L. Other improvements are intended to increase efficiency and lower operating cost through the removal of unnecessary pavement and reduction of secondary runway lengths. Nearly all improvements are associated with upgrade of aging infrastructure at the Airport that has exceeded its useful life. Careful consideration will be needed in how to best use limited financial resources given the number of improvements needed. Further information on the cost and the timing to implement these improvements given limited financial resources will be discussed as a part of the master plan's financial analysis.

The following summarizes the infrastructure improvements and other considerations identified as a part of the review of facility requirements at the Airport:

- **Wind Coverage –** Runway 9/27 is needed for single- and twin-engine propeller driven aircraft and some small jets when crosswinds limit the use of the parallel runways 5L/23R and 5R/23L.

- **Runway Designation –** The designation of Runway 9/27 should be changed to Runway 10/28 to reflect the orientation of its magnetic azimuth.

- **Runway Design Standards –** The airfield should continue to be maintained to meet category D-IV standards. However, it is not necessary that all surfaces be designed to D-IV standards; only those intended to support regular operations by these aircraft types.

- **Taxiway Design Standards –** The taxiway system that supports the primary runway, Runway 5R/23L, should be designed to support TDG 5 standards.

- **Runway Configuration –** There is an operational desire to maintain two parallel runways to separate operations between slower, single-engine aircraft and higher speed jet aircraft. However, Runway 5L/23R could be closed if operational and maintenance cost savings are desired, since the runway would be ineligible for federal AIP funding participation if any infrastructure improvements are planned. In addition, it is recommended that the intersection on Runway 5R/23L and Runway 9/27 be reconfigured to eliminate the runway ends from intersecting one another near their thresholds, and to address an FAA designated hot spot.

- **Runway Length Analysis –** Planning should be initiated to extend at least one runway to 9,600 feet, and a crosswind runway should be maintained at a length of at least 5,000 feet to meet the runway length needs of each runway's the most critical users. Likewise, Runway 5L/23R should be maintained at a length of at least 3,500 feet.

- **Runway Width –** No runway width improvements are needed; however, as alternatives are considered for other needed airfield infrastructure improvements, changes may be needed to the design standards of some runways, which may result in a change of runway width.

- **Runway Grade –** Grade changes in the first and last quarter of Runway 5R/23L exceed maximum allowable grade change standards; however, given the completion of a recent pavement reconstruction project, it is recommended that a modification of standard for this grade change be maintained until the next rehabilitation or reconstruction of the runway, at which time it should be evaluated again.

  Likewise, the grade changes within the first and last quarter of Runway 9/27 and Runway 5L/23R does not meet approach category D design standards. However, as other infrastructure improvement projects are considered that may change the design of these runways, it is recommended a review of the longitudinal grade be conducted to determine if any improvements are needed to meet appropriate design standards.

- **Runway Pavement Condition** – The condition of pavement on Runway 5R/23L is considered to be in optimal condition; however, improvements are needed to the condition of Runway 9/27 and Runway 5L/23R.

- **Runway Object Free Area –** The ROFA at the approach end of Runway 23L is penetrated by an airfield service road, an AOA perimeter fence, and Ecorse Road. It is recommended that an existing modification of standards for this condition be maintained until a dedicated funding source or an FAA directive is received to make improvements.

- **Inner-transitional Obstacle Free Zone –** Should an instrument approach procedure be established with a visibility minimum lower than ¾ mile for any runway at the Airport, implementation of an inner-transitional OFZ will be needed.

- **Precision Obstacle Free Zone –** It is recommended that, as a part of future airfield improvements, consideration be given to evaluate options to eliminate airfield pavement within the POFZ at the approach end of Runway 23L.

- **Runway Protection Zone –** As a part of any future project that changes the configuration of Runway 5R/23L and/or the routing of Ecorse Road, it is recommended that alternatives be investigated to remove roads within the RPZ at the approach end of Runway 23L.

- **Federal Aviation Regulation Part 77 Surfaces –** Some objects were identified as penetrating the transitional surface; however, these objects may not be hazards to air navigation. It is recommended that the Airport continue to work with the FAA to verify these objects are not hazards to air navigation and mitigate those that can be removed. Likewise, it is recommended objects that could potentially penetrate approach surfaces at the Airport be monitored so that mitigation can occur before these objects become obstructions.

- **Taxiway System** – It is recommended that a parallel taxiway be constructed for Runway 5R/23L. Also, it is recommended that options be investigated to improve the geometry of the intersection of Taxiway C with Runway 5L/23R to address the FAA-designated hot spot at this location.

- **Aprons** – The capacity of the northern half of the east apron and much of the west apron appear to be needed for itinerant aircraft parking. The capacity of the southern half of the east apron should also be maintained to meet the demands of Active Aero/USA Jet. It is not anticipated additional capacity will be needed for the apron maintained by EMU's Eagle Flight Centre. The south apron appears to have more capacity than is needed to meet aircraft parking needs.

- **Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights** – If there is a desire to lower the visibility minimums of Runway 9/27 or Runway 5L/23R to below ¾ mile, the installation of a MALSR will be needed at the approach end of each corresponding runway.

- **Taxiway Edge Lighting** – Should any improvements to the taxiway edge lighting system be needed during the planning period it is recommended that energy efficient LED fixtures be considered to reduce energy usage and expenses associated with the operation of the airfield.

- **Instrument Landing System –** It is recommended that continued coordination occur with the Flight Procedure Standards Branch of the FAA to have the visibility and ceiling height minimums for the ILS approach procedures to Runway 5R and Runway 23L reduced to ½ mile and 200 feet.

  Also, planning should be initiated to protect the ability to have Category II and III precision instrument approach procedures with visibility and ceiling height minimums lower than ½ mile and 200 feet.

- **Global Positioning System –** The preservation and protection of airspace for all approaches at the Airport is recommended so that additional GPS approaches with vertical guidance can be obtained.

- **Fixed Base Operator Services** – Although FBO services currently being provided at the Airport will meet the needs of based and itinerant users throughout the planning period, it is recommended planning be initiated to preserve space for additional FBO services.

- **Hangars** – Planning should be initiated for additional T-style hangars and covered aircraft parking capacity equaling at least six bays in Hangar 1. Given the deteriorating condition of Hangar 1, it is recommended that options be explored to rehabilitate the hangar as well as to identify other areas on the airfield for hangar development, should replacement of this facility be needed.

- **Air Cargo Facilities** – The availability of a loading dock located adjacent to the west apron would increase efficiency of the transfer of freight between aircraft and truck.

- **Aircraft Rescue and Firefighting Facility** – Improved ARFF facilities are needed at the Airport that include increased vehicle bay space, additional storage areas, and larger personnel areas for firefighters.

- **Snow Removal and Maintenance Facilities** – It is recommended that additional storage space for off-season equipment and for personnel areas offered in Hangar 1 be relocated to the maintenance facility complex so that a centralized location can be made available for personnel, equipment, and raw materials.

- **Airfield Electrical Vault** – The components within the airfield electrical vault are anticipated to need to be replaced towards the end of the 20-year planning period. In addition, replacement of the airfield electrical generator is anticipated during this same time period, which could be relocated from the parking lot of Hangar 1 to the airfield electrical vault.

- **Airport Traffic Control Tower** – Additional space and utility grades are recommended to the ATCT facility; however, it is the responsibility of the FAA to implement and finance these improvements.

- **Utility Infrastructure** – It is recommended the utility infrastructure at the Airport be maintained and improved as necessary.

- **Airport Access** – It is recommended the pavement condition of roadways both on and surrounding the Airport be improved. Also, construction of an interior access road between the east apron and south apron is recommended for fuel trucks and other Airport service vehicles.

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Chapter 4

# Alternatives Analysis


Alternatives to offer development options that can meet existing and long-term demand were prepared to address facility requirements. The preparation of each alternative took into consideration the short-, medium-, and long-term needs of the Willow Run Airport (Airport) as well as economic, operational, and environmental needs. In this chapter, each prepared alternative is described with advantages and disadvantages and compared with other development options. Selection of the preferred alternatives is based on quantitative and qualitative considerations compared to the other development options, taking into account tangible and intangible factors. Some preferred alternatives are based on a single, logical course of action that did not require a comprehensive analysis. All alternatives presented in this chapter are conceptual and subject to further refinement upon time of implementation through financial, environmental, and engineering means.

The presentation, analysis, and selection of the preferred alternatives are organized by the following sections:

## 4.1 Evaluation Criteria Methodology

A set of criteria was used in the methodology that reviewed the advantages and disadvantages of each alternative in selecting the preferred development options. Each criterion focused on qualitative and quantitative factors that were considered when comparing the merits and deficiencies of each alternative. The following summarizes the factors used as a part of this alternative evaluation methodology:

- **Operational Factors –** Operational factors such as existing and projected aircraft operations as well as based aircraft, type of aviation activities, and landside vehicle access were considered to evaluate alternatives for their ability to accommodate projected demand. This evaluation criterion helped identify the advantages and disadvantages of each alternative in addressing such operational factors as aircraft delay, airfield circulation, and convenience to Airport users.

- **Economic Factors –** Economic factors such as construction costs and return on investment were considered in comparing the financial feasibility of the proposed alternatives. Understanding that significant investment is needed to improve the Airport, this evaluation criterion focused on the selection of the most cost effective option that meets the financial goals of the Airport as well as the demands of its users.

- **Environmental Factors –** This evaluation criterion focused on the impacts each alternative would have on the environment as well as impacts to other surrounding socio-economical environmental conditions. Comparison of the number and types of environmental categories impacted factored into selection of the recommended alternative.

- **Implementation Feasibility –** Tangible and intangible factors that affect the ability to implement the proposed alternatives were also considered in the selection of the preferred development options. This qualitative analysis focused on such criterion as logic, common sense, and probability of unknown contingencies that helped support or negate the feasibility of implementing each alternative.

The following sections present the alternatives prepared to address the needs identified through the facility requirement analysis. The presentation of each alternative is organized to consider the previously described evaluation criteria and includes a summary table to compare advantages and disadvantages. Through the review of advantages and disadvantages, selection of the preferred alternative is identified at the conclusion of each section with justification why the development option is the best to meet the demands of the Airport's users.

## 4.2 Future Long-Term Runway Length Needs

As a part of the review of facility requirements, it was determined that additional runway length is needed for some aircraft types on long haul flights that regularly conduct operations at the Airport, in particular those used for on-demand air cargo operations such as the DC-9-30, MD-83, and Boeing 727-200. The length of additional runway needed was determined by the haul or stage lengths being flown from the Airport that required aircraft to make concessions to fuel, cargo loads, or both. Through this analysis, it was recommended that planning be initiated for a runway length of 9,600 feet to meet the runway length needs of existing and future aircraft types to fly stage lengths of approximately 1,750 nautical miles for destinations that are frequently visited in Mexico and on the West Coast.

The review of facility requirements identified the need for many infrastructure improvements at the Airport. However, understanding that limited financial resources are available to carry out the improvements, a decision was made to focus the 20-year planning effort on replacing existing aging infrastructure and eliminating unnecessary excess infrastructure items. Thus, an extension of runway length is not planned for the 20-year planning period. It is, however, prudent to continue to plan for a runway extension should an immediate need for additional runway length be realized during the planning period.

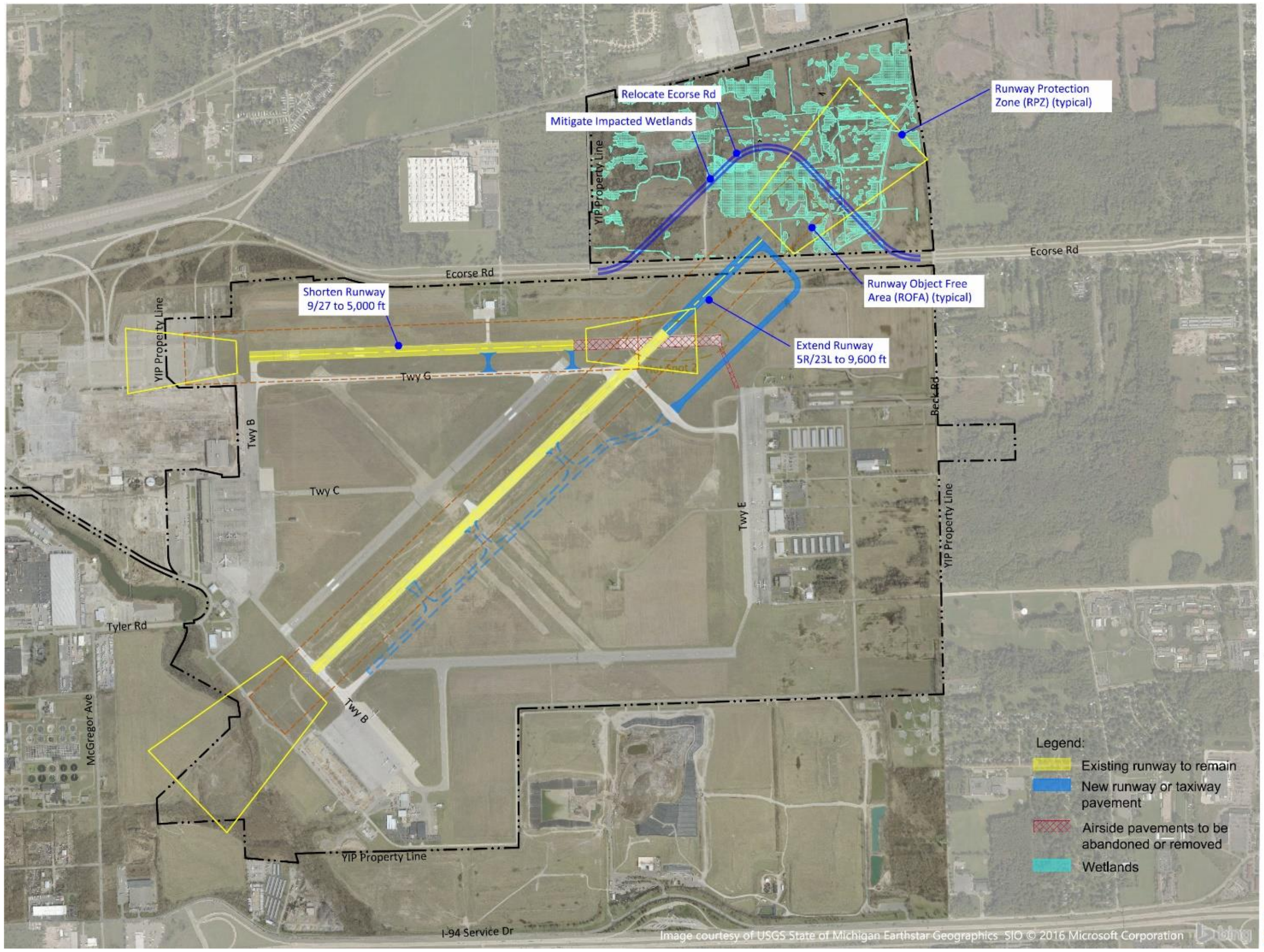
As a part of the development of alternatives, three options were prepared to illustrate how 9,600 feet of runway length could be provided at the Airport. These alternatives are intended to conceptualize the infrastructure improvements that would be necessary to provide additional runway length at the Airport and not to indicate improvements recommended to occur during the planning period. Each alternative presented in the following section includes advantages and disadvantages to consider when comparing the development options.

### 4.2.1 Future Long-Term Runway Extension Alternative 1 – Approach End Runway 23L

The first future long-term runway extension alternative proposes a 2,057-foot extension at the approach end of Runway 23L to provide 9,600 feet of runway length (**Figure 4-1**). In addition to the runway extension, a partial parallel taxiway would be constructed at the approach end of Runway 23L that would connect the new runway threshold with Taxiway G. Construction of this partial parallel taxiway could be incorporated as part of a future parallel taxiway to Runway 5R/23L. As a result of the proposed runway extension, this alternative also proposes a relocation of Ecorse Road around the extended runway threshold.

With the implementation of a runway extension at the approach end of Runway 23L, this alternative proposes that Runway 9/27 be shortened to a length of 5,000 feet to resolve the hot spot at the intersection of these two runways. New connector taxiways between Taxiway G and the relocated threshold of Runway 27, and between Taxiway G and Runway 9/27 at the access point to the Hantz Air hangar are also proposed by this alternative.

## Figure 4-1 – Future Long-Term Runway Extension Alternative 1: Approach End Runway 23L




### Runway Extension Alternative 1

**PROS**
- Provides recommended long-term runway length
- Opens up development area east of Runway 9/27
- Provides partial parallel taxiway to Runway 5R/23L
- Resolves hot spots
- Reduces impact to the east of Beck Rd
- No impact to the southwest

**CONS**
- Requires relocation of Ecorse Road
- Ecorse Road within RPZ
- Aircraft potentially 100' lower on approach from the northeast

| Runway | Existing | Future | Change |
|---|---|---|---|
| 5R/23L | 7,543' | 9,600' | +2,057' |
| 5L/23R | 5,996' | 5,996' | - |
| 9/27 | 7,292' | 5,000' | -2,292' |

Prepared by: Mead & Hunt
Date: October 4, 2016

NORTH

0 750' 1,500'
Graphic scale in feet

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Source: Mead & Hunt, Inc. (2016)

An extension of Runway 5R/23L at the approach end of Runway 23L has many potential advantages. First, it provides the recommended long-term runway length needed to support existing and future users of the Airport considering the ranges of flights being conducted at the Airport that require concessions to fuel and/or cargo loads. Extension to the north also does not require land acquisition, since all development would occur on existing Airport property except for the relocation of the Ecorse Road right-of-way. Shortening Runway 9/27 would resolve the hot spot issue, through which development area then opens up to the north of the East Apron since runway design surfaces are moved away from this area. Moving the Runway 27 threshold further to the west through the proposed shortening of Runway 9/27 also increases the height of aircraft on approach for landing to the east of the Airport. This would lessen the impact of aircraft noise on the community in this area. Construction of a partial parallel taxiway as proposed by this alternative is also a benefit to consider as it reduces occupancy time on Runway 5R/23L for aircraft departing Runway 23L and can be incorporated as part of a full future parallel taxiway to this runway. Finally, extension of the runway at the approach end of Runway 23L would not impact areas off-Airport to the southwest of the Airport, which include businesses, industrial uses, and residential areas.

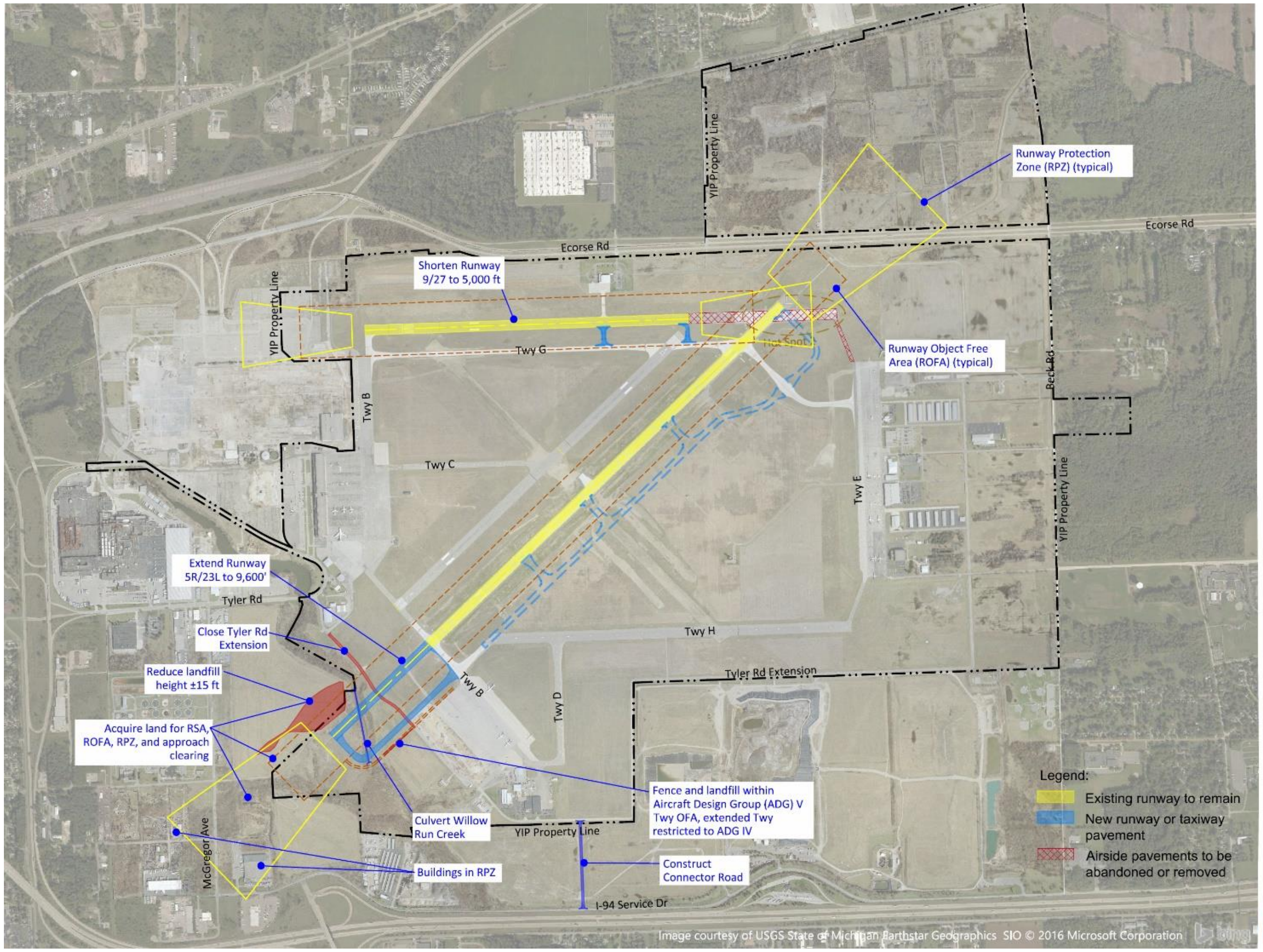
The significant disadvantage with this alternative is that the flight path of aircraft arriving to Runway 23L would be lower over areas to the northeast of the Airport. Since the communities under this flight path are considered to be more noise sensitive areas, since they are primarily comprised of residential areas, there is the potential that implementation of this runway extension option could result in public controversy. If residents of these communities would strongly object to extension of Runway 5R/23L at the approach end of Runway 23L, that could lead to significant cost and time needed for implementation. Relocation of Ecorse Road is an additional disadvantage with this alternative since it would be routed through the Runway Protection Zone (RPZ), which is an undesired land use. Completion of an RPZ analysis and approval by the FAA would be necessary to relocate the road as proposed or else Ecorse Road may need to be closed. Finally, relocation of the 23L end to the northeast increases the airspace conflict between the 23L final approach and approaches into Detroit Metropolitan Wayne County Airport (DTW).

To implement Long-Term Runway Extension Alternative 1, the estimated rough order of magnitude (ROM) cost is $40,000,000.

### 4.2.2 Future Long-Term Runway Extension Alternative 2 – Approach End Runway 5R

Future Long-Term Runway Extension Alternative 2, presented in **Figure 4-2**, proposes an extension of Runway 5R/23L at the approach end of Runway 5R to provide 9,600 feet of runway length. Similar to the long-term runway extension proposed at the approach end of Runway 23L, a partial parallel taxiway is proposed that would connect the new threshold of Runway 5R with Taxiway B. Construction of this partial parallel taxiway could also be incorporated as part of a future parallel taxiway to Runway 5R/23L. As a result of the proposed extension, a portion of Tyler Road Extension would need to be closed with this alternative; however, a new connector road is proposed between Tyler Road Extension and the Interstate 94 Service Drive to provide access to the south portion of the airfield.

**Figure 4-2 – Future Long-Term Runway Extension Alternative 2: Approach End Runway 5R**




**Runway Extension Alternative 2**

**PROS**
- Provides recommended long-term runway length
- Opens up development area east of Runway 9/27
- Provides partial parallel taxiway to Runway 5R/23L
- Resolves hot spots
- Reduces impacts to the east of Beck Rd
- Keeps Ecorse Rd in place
- Avoids impacts to northeast

**CONS**
- Impacts Tyler Rd Extension
- Impacts Willow Run Creek
- Impacts landfill
- Land acquisition required for RSA, ROFA, RPZ, approach clearing, and landfill height reduction
- Aircraft potenially 100' lower on approach from the southwest

| Runway | Existing | Future | Change |
|---|---|---|---|
| 5R/23L | 7,543' | 9,600' | +2,057' |
| 5L/23R | 5,996' | 5,996' | - |
| 9/27 | 7,292' | 5,000' | -2,292' |

Prepared by: Mead & Hunt
Date: October 4, 2016

NORTH

0 750' 1,500'
Graphic scale in feet

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WAYNE COUNTY AIRPORT AUTHORITY

Source: Mead & Hunt, Inc. (2016)

To implement this alternative, land acquisition would be needed for the runway safety area (RSA), runway object free area (OFA), RPZ, and approach clearing associated with the proposed long-term runway extension at the approach end of Runway 23L. Construction of a culvert for Willow Run creek to pass under the runway extension would also be needed. Approximately 15 feet of elevation associated with the topography of a former landfill to the southwest of the Airport would also be needed to mitigate grading and height impacts associated with design surfaces for the extended runway. Mitigation of topography and a perimeter fence would also be needed for the design surfaces associated with the partial parallel taxiway, in particular the taxiway (OFA).

Although the proposed runway extension occurs at the opposite end of Runway 5R/23L from its intersection with Runway 9/27, this alternative as proposed would correct the hot spot at the intersection of the two runways. Runway 9/27 would be shortened to a length of 5,000 feet with remaining pavement, and Taxiway E1, removed. Construction of new connector taxiways between Taxiway G and the relocated threshold of Runway 27 as well as between Taxiway G and Runway 9/27 at the access point to the Hantz Air hangar are also proposed with this alternative.

The primary advantage to consider with Long-Term Runway Extension Alternative 2 is that it provides 9,600 feet of runway length to meet the runway length needs of the Airport's most demanding users while avoiding impacts to the communities to the northeast of the Airport. It also allows Ecorse Road to remain open at its existing alignment. Resolution of the hot spot at the intersection of Runway 5R/23L and Runway 9/27 eliminates airfield geometry to prevent an unintended runway incursion. Also, impacts cause by the overflights of aircraft to the east of Beck Road are reduced as the height of arrival and departure paths over these areas associated with Runway 9/27 would increase due to the relocation of the Runway 27 threshold to the west. The relocation of the Runway 27 threshold to the west also opens up additional developable area to the north of the East Apron as a result in the shift of runway design surfaces as well as the height clearance gained from the change in arrival and departure paths. Finally, construction of a partial parallel taxiway would help reduce runway occupancy times for aircraft departing to the north on Runway 5R.

There are three significant disadvantages to consider with extending Runway 5R/23L at the approach end of Runway 5R to provide 9,600 feet of runway length. The first is that the additional 2,057 feet would impact Willow Run Creek. To mitigate this impact, the construction of a culvert to reroute Willow Run Creek under the proposed long-term runway extension would be necessary. The second is that design surfaces associated with the proposed long-term runway extension and its Federal Aviation Regulation (FAR) Part 77 airspace protection surfaces would impact the topography of the landfill to the southwest of the Airport. To mitigate this impact, the height of the landfill would need to be lowered, requiring coordination with federal, state, and local officials. The third significant disadvantage to consider is that land acquisition would be necessary to not only construct the runway extension but also mitigate two buildings located within the shifted RPZ at the approach end of Runway 5R.

Closure of a portion of Tyler Road Extension for the runway extension is an additional disadvantage to consider given that landside access between the east and south portions of the Airport would be removed. Another potential drawback is that aircraft on approach to land Runway 5R would be approximately 100 feet lower over areas to the southwest of the Airport. These lower flight paths have the potential to increase aircraft noise concerns from affected communities to the southwest of the Airport. In total, it is estimated to have a ROM cost of $56,000,000 to implement Long-Term Runway Extension Alternative 2.

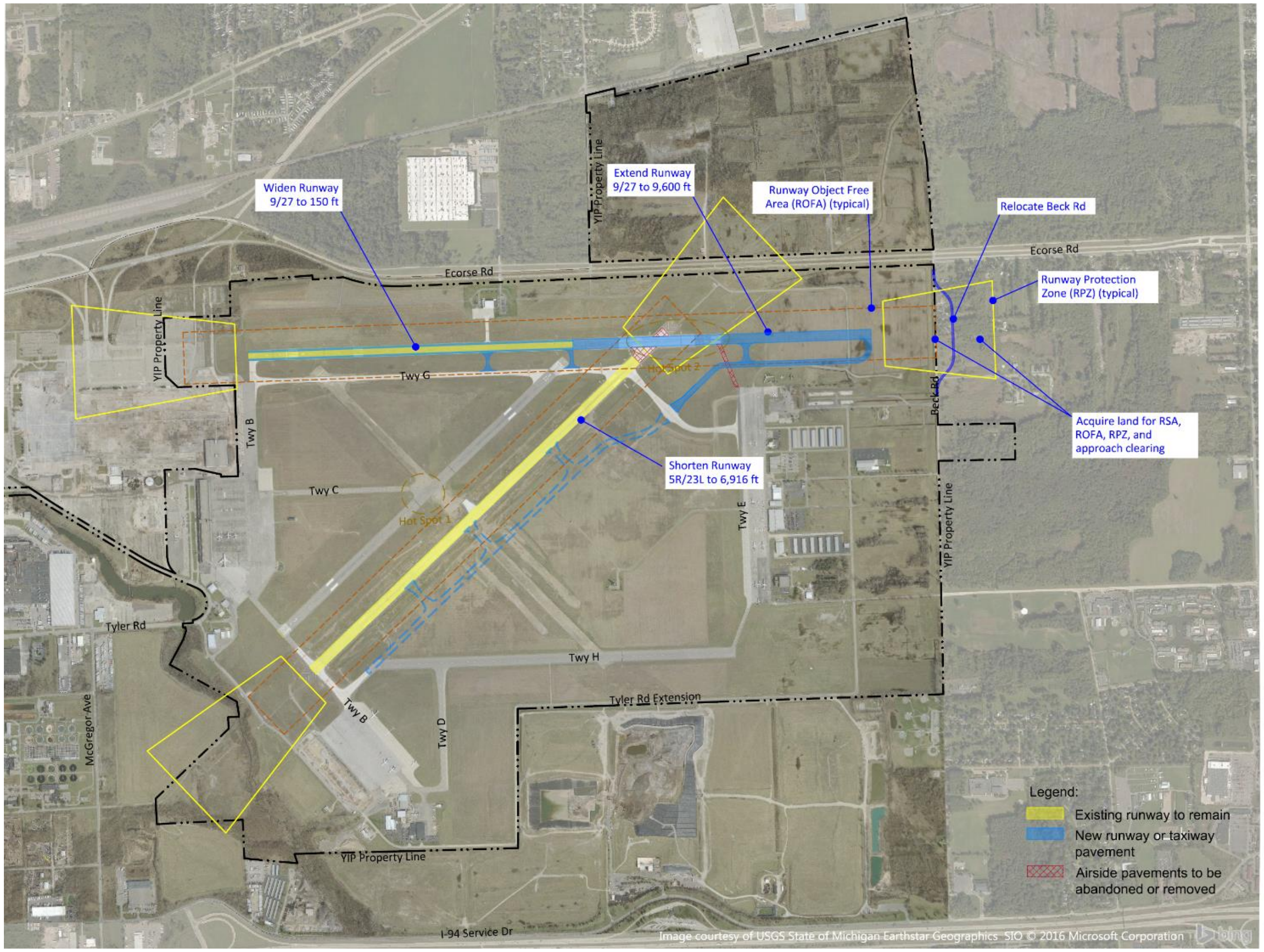
### 4.2.3 Future Long-Term Runway Extension Alternative 3 – Approach End Runway 27

The third future long-term runway extension alternative as illustrated in **Figure 4-3** proposes to extend Runway 9/27 by 2,308 feet at the approach end of Runway 27 to provide 9,600 feet of runway length at the Airport. As part of the effort to provide the increased length and correct the hot spot at the intersection of Runway 9/27 and Runway 5R/23L, Future Long-Term Runway Extension Alternative 3 proposes that Runway 5R/23L would be reduced to a length of 6,916 feet to decouple it from Runway 9/27. Pavement associated with the closed portion of Runway 5R/23L as well as Taxiway E1 would be removed. Construction of a partial parallel taxiway is proposed to provide access to the approach end of Runway 27, and three connector taxiways are proposed to provide access from Runway 9/27 to the taxiway system. This alternative also has the proposed relocation of Beck Road to accommodate height clearance requirements for the approach slope to the new Runway 27 threshold. To implement this alternative, it is estimated to have a ROM cost of $27,000,000.

Similar to the other two runway length alternatives, Future Long-term Runway Extension Alternative 3 has the advantage of providing the recommended long-term runway length needed for the Airport's most demanding users. It also provides a solution to resolve the hot spot at the intersection of Runway 9/27 and Runway 5R/23L as well as avoid impacts to communities under the flight path of Runway 5R/23L to both the northeast and southwest of the Airport. In addition, this development option would avoid impacts to Ecorse Road. Implementation of this alternative also provides a full parallel taxi route for aircraft utilizing Runway 9/27 with the partial parallel taxiway that would be constructed for the approach end of Runway 27.

The most significant disadvantage with Future Long-Term Runway Extension Alternative 3 is that it has impacts to existing Airport operations. First, the length of primary Runway 5R/23L would be reduced. This reduction in runway length would impact the ability of the most demanding aircraft types to conduct operations on the runway without needing to make additional concessions in cargo and/or fuel loads. The proximity of DTW and its associated airspace is another disadvantage to consider with extending Runway 9/27 to the east because the ability to arrive on Runway 27 and depart on Runway 9 would be impacted by traffic at the other airport. This development option also requires land acquisition for the relocation of Beck Road, design surfaces associated with the runway extension, and for the control of land uses within the relocated RPZ.

## Figure 4-3 – Future Long-Term Runway Extension Alternative 3: Approach End Runway 27




**Runway Extension Alternative 3**

**PROS**
- Provides recommedned long-term runway length
- Provides parallel taxiway to Runway 9/27
- Resolves hot spots
- No impacts to Ecorse Rd
- No impacts to southwest

**CONS**
- Shortens primary Runway 5R/23L
- Runway 27 arrivals and Runway 9 departures limited by DTW airspace
- Requires relocation of Beck Rd
- Land acquisition required for RSA, ROFA, RPZ, approach clearing, and Beck Rd relocation
- Beck Rd within RPZ

| Runway | Existing | Future | Change |
|---|---|---|---|
| 5R/23L | 7,543' | 6,916' | -627' |
| 5L/23R | 5,996' | 5,996' | - |
| 9/27 | 7,292' | 9,600' | +2,308' |

Prepared by: Mead & Hunt
Date: October 4, 2016

NORTH

0 750' 1,500'
Graphic scale in feet

Source: Mead & Hunt, Inc. (2016)

### 4.2.4 Summary

In summary, it was decided that, due to the scope of the infrastructure needs at the Airport and limited availability of funding, the focus of improvements for the 20-year planning period would not include a runway extension. However, these three alternatives conceptualize options for how additional runway length could be provided at the Airport should a need be realized during the planning period. It is not the intent of this effort to provide a recommended development option; however, it is noted that a consensus was reached with project team members for the option that extends Runway 5R/23L at the approach end of Runway 5R to the south. This option was agreed upon because it would provide additional runway length while limiting impacts to residential areas to the northeast of the Airport and would not increase the airspace conflict between the Airport approaches and DTW approaches to the northeast. At the time a decision is made to plan for a runway extension, it is recommended that these three alternatives be revisited with consideration given to the advantages and disadvantages of each as a part of the planning and decision-making process for a recommended course of action.

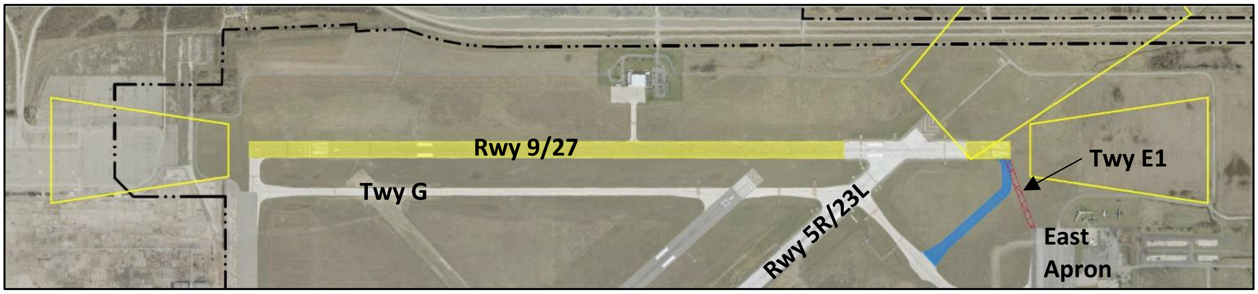
## 4.3 Runway 9/27

The review of facility requirements determined that Runway 9/27 is needed to support single-engine, twin-engine, and small jet aircraft when 10.5-knot and greater crosswinds are present. The review of runway length requirements determined that at least 5,000 feet of runway length is recommended to be maintained on Runway 9/27. The following alternatives present options to maintain at least 5,000 feet of runway length, while considering other factors such as FAA design standards, surrounding constraints, removal of unnecessary airfield pavements, and mitigation of complex runway/taxiway intersection geometry.

### 4.3.1 Alternative 1 – Maintain Existing Runway 9/27 Configuration, 7,292 feet by 160 feet

Alternative 1 proposes that Runway 9/27 be maintained in its existing configuration of 7,292 feet long by 160 feet wide (**Figure 4-4**). To improve the condition of existing pavement, Alternative 1 proposes the runway be reconstructed to the west and east of the intersection of Runway 5R/23L. In addition, to eliminate direct access from the East Apron to Runway 9/27 in accordance with FAA design standards, Alternative 1 also proposes the removal of Taxiway E1 and construction of a new connector taxiway from Taxiway G to the approach end of Runway 27. The estimated cost to implement Alternative 1 is **$32,400,000**, which includes reconstruction of existing pavement, construction of new pavement, and removal of Taxiway E1.

**Figure 4-4 – Alternative 1: Maintain Existing Runway 9/27 Configuration, 7,292 feet by 160 feet**




Legend:
Pavement reconstruction areas
New airside pavements
Airside pavements to be abandoned or removed
Airport property line
Source: Mead & Hunt, Inc. (2016)

Alternative 1 offers the advantage of retaining Runway 9/27 at its existing 7,292-foot length so that the MTOW takeoff distance requirements of single-engine, twin-engine, and jet aircraft in crosswind conditions can be met in warm temperature conditions. Retaining the existing width of Runway 9/27 at 160 feet proposed by Alternative 1 also has the advantage of providing an additional runway at the Airport designed for D-IV aircraft operations. However, Alternative 1 also presents the disadvantage of not correcting the complex geometry of the intersection of Runway 5R/23L and Runway 9/27, which would continue the potential for a wrong runway departure for pilots who are not familiar with the configuration of the airfield.

**Table 4-1** summarizes the advantages and disadvantages that should be considered with Alternative 1.

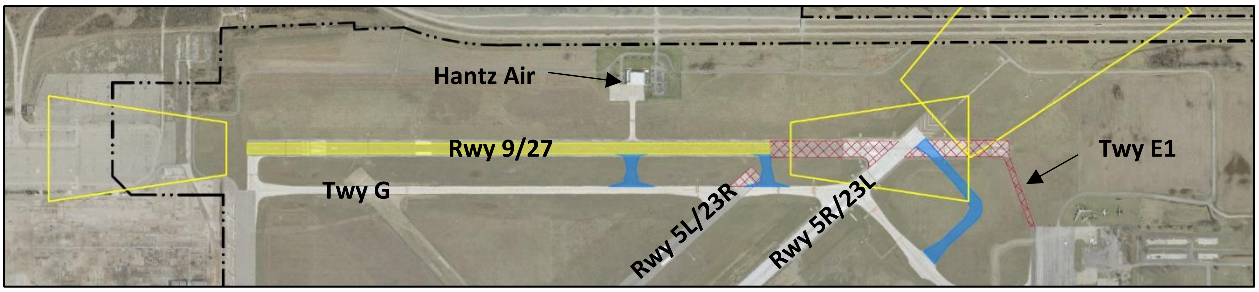
**Table 4-1 – Alternative 1 Summary of Considerations**

| Advantages | Disadvantages |
|---|---|
| • Retains existing length/width of runway<br>• Runway can continue to support D-IV aircraft operations | • Does not correct complex geometry at intersection of Runway 5R/23L & Runway 9/27 |
| **Estimated Cost: $32,400,000** | |

## 4.3.2 Alternative 2 – Reconfigure Runway 9/27 to 5,000 feet by 100 feet at Approach End Runway 9

To correct the complex geometry of the intersection of Runway 5R/23L and Runway 9/27 and be cognizant of impacts to the American Center for Mobility (ACM) to the west, Alternative 2 (**Figure 4-5**) proposes to reconstruct Runway 9/27 at 5,000 feet long and 100 feet wide at the approach end of Runway 9. Reconstructing the runway at this length and width would meet C-II design standards and still be able to provide the minimum length of runway that is recommended for single-engine, twin-engine, and small- to mid-sized business jet aircraft. In implementing Alternative 2, 5,000 feet of runway at a 100-foot width from the approach end of Runway 9 would be reconstructed, while the remaining existing runway pavement at the approach end of Runway 27 would be removed to eliminate complex geometry at the intersection of Runway 5R/23L. Existing runway pavement 30 feet wide parallel to either side of the 5,000 feet of reconstructed runway would be converted into runway shoulders, and connector Taxiway E1 would be removed. To provide access to the new runway threshold, a portion of the approach end of Runway 23R would be removed for the construction of a new connector taxiway. In addition, two other connector taxiways would be constructed to provide access between the Hantz Air hangar and Taxiway G and to provide access between Taxiway G and the threshold of Runway 23L. Implementation of Alternative 2 is estimated to cost **$16,100,000**.

**Figure 4-5 – Alternative 2: Reconfigure Runway 9/27 to 5,000 feet by 100 feet at Approach End Runway 9**




Legend:
Pavement reconstruction areas
New airside pavements
Airside pavements to be abandoned or removed
Airport property line
Source: Mead & Hunt, Inc. (2016)

The most significant advantage of Alternative 2 is that complex runway intersection geometry is eliminated with the decoupling of the thresholds of Runway 23L and Runway 27. This decoupling of the runway thresholds eliminates the potential of an aircraft to depart from the wrong runway when taxiing to the threshold of Runway 23L. Reduction in the length of Runway 9/27 also reduces the amount of pavement that needs to be maintained on Runway 9/27, thus lowering its operational and maintenance costs.

Reconfiguration of Runway 9/27 to a 5,000-foot runway designed to C-II standards has the disadvantage o needing to shorten or close Runway 5L/23R as a result of the location of the new Runway 27 threshold to the existing threshold of Runway 23R. This reduction (or closure) would also be necessary as a result of the movement of arriving and departing aircraft on Runway 9/27 with those taxiing on the ground. Also, a reduction in the length of Runway 9/27 would limit the jet aircraft types that could depart at or near MTOW on a warm day. An additional disadvantage is the overlap of the RPZ at the approach end of the relocated Runway 27 threshold with Runway 5R/23L, Taxiway G, and the proposed new connector taxiway to the threshold of Runway 23L. RPZs are to be kept clear of non-compatible uses in an effort to protect people and property on the ground, but the relocation of the Runway 27 threshold would place aircraft taxiing on these two surfaces within the RPZ to the runway. A summary of the advantages and disadvantages to consider with Alternative 2 is presented in **Table 4-2**.

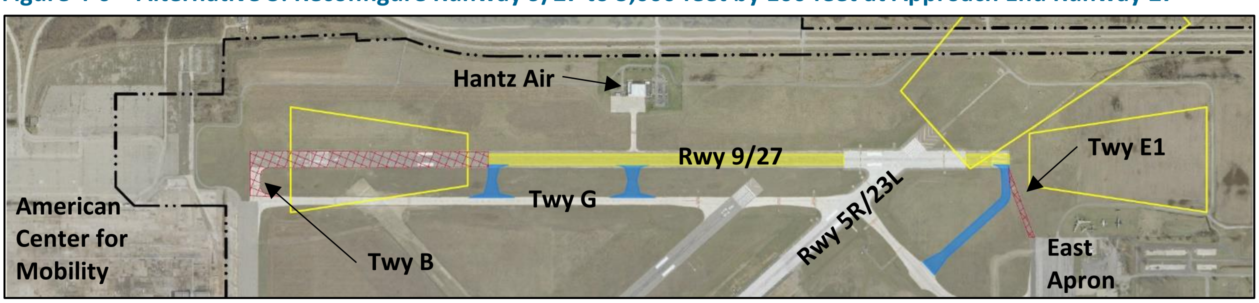
**Table 4-2 – Alternative 2 Summary of Considerations**

| Advantages | Disadvantages |
|---|---|
| • Removes complex runway intersection geometry with Runway 5R/23L<br>• Eliminates potential of an aircraft to depart from wrong runway<br>• Reduces amount of pavement needing to be maintained on Runway 9/27 | • Limits operations at MTOW on warm day by business jet aircraft types<br>• Requires Runway 5L/23R to be shortened or closed<br>• RPZ at approach end Runway 27 overlies Runway 5R/23L, Taxiway G, and proposed new connector taxiway |
| **Estimated Cost: $16,100,000** | |

### 4.3.3 Alternative 3 – Reconfigure Runway 9/27 to 5,000 feet by 100 feet at Approach End Runway 27

Alternative 3 is similar to Alternative 2 in that it proposes Runway 9/27 be reconstructed to meet C-II design standards at a length of 5,000 feet and a width of 100 feet; however, the reconfiguration of the runway would occur at the approach end of Runway 27 (**Figure 4-6**). With Alternative 3, 2,292 feet of runway pavement would be removed at the approach end of Runway 9. Pavement would also be removed on Taxiway B between Runway 9/27 and Taxiway G. Taxiway E1 would also be removed between Runway 9/27 and the East Apron. Existing runway pavement 30 feet wide located either side of the reconstructed 100-foot runway width would remain and be converted into paved runway shoulders. To implement Alternative 3, there would be new infrastructure consisting of the construction of new connector taxiways between the runway and Taxiway G at the new threshold of Runway 9 and at the existing threshold of Runway 27. Construction of an additional connector taxiway between Taxiway G and Runway 9/27 to provide access to the Hantz Air hangar is also proposed by Alternative 3.

**Figure 4-6 – Alternative 3: Reconfigure Runway 9/27 to 5,000 feet by 100 feet at Approach End Runway 27**




Legend:
Pavement reconstruction areas
New airside pavements
Airside pavements to be abandoned or removed
Airport property line
Source: Mead & Hunt, Inc. (2016)

Alternative 3 has the advantage of providing a crosswind runway for single-engine, twin-engine, and small jet aircraft while removing the RPZ at the approach end of Runway 9 from the former bomber plant site property now owned by the American Center for Mobility. These two advantages achieve the desired airport planning objectives of providing a crosswind runway for those aircraft types in need of its use, reducing the amount of airfield pavement that needs to be maintained, and controlling land uses within the RPZ. However, Alternative 3 also has a significant disadvantage to consider that could impact the safety of airfield operations. Implementation of Alternative 3 at the approach end of Runway 27 does not correct the complex geometry at the intersection of Runway 5R/23L and Runway 9/27 that could potentially lead to a wrong runway departure when an aircraft is required to maneuver into position on Runway 9/27 for a departure on Runway 23L. In addition, MTOW operations on the runway during warm weather conditions by business jet aircraft types on Runway 9/27 would be limited with a 5,000-foot length.

This alternative was not considered a feasible development option since it does not offer a solution to correct the intersection geometry of Runway 5R/23L and Runway 9/27; thus, a cost estimate was not prepared. Instead, the reason Alternative 3 was developed for comparison and evaluation with the other feasible development options. A summary of the advantages and disadvantage to consider with Alternative 3 is presented in **Table 4-3**.

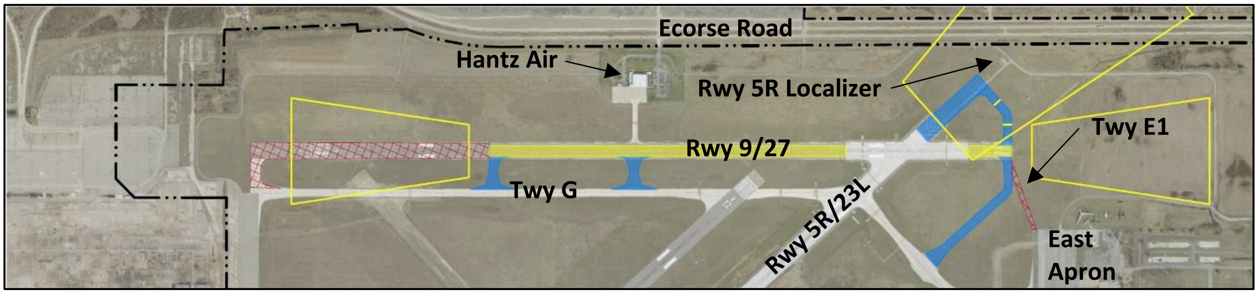
**Table 4-3 – Alternative 3 Summary of Considerations**

| Advantages | Disadvantage |
|---|---|
| • Provides crosswind runway for single-engine, twin-engine, and small jet aircraft<br>• Removes RPZ at approach end of Runway 9 from American Center for Mobility property | • Does not remove complex airfield geometry at intersection of Runway 5R/23L and Runway 9/27<br>• MTOW operations in warm weather conditions by business jet aircraft limited |

### 4.3.4 Alternative 4 – Reconfigure Runway 9/27 to 5,000 feet by 100 feet & Extend Runway 5R/23L 780 feet

Alternative 4, presented in **Figure 4-7**, offers a solution to address the complex geometry at the intersection of Runway 5R/23L and Runway 9/27 while offering an option to reconstruct Runway 9/27 at a length of 5,000 feet and width of 100 feet at the approach end of Runway 27. To improve the complex geometry, Alternative 4 proposes a 780-foot extension at the approach end of Runway 23L that would include construction of a connector taxiway between the approach ends of Runway 23L and Runway 27 and between the approach end of Runway 27 and Taxiway G. Runway 9/27 would be reconstructed similar to the configuration proposed in Alternative 3 at a length of 5,000 feet and width of 100 feet from the approach end of Runway 27, and the remainder of the runway at the approach end of Runway 9 would be removed. Removal of Taxiway E1 between the threshold of Runway 27 and the East Apron is also proposed by Alternative 3. Finally, this alternative also proposes construction of new connector taxiways between the new location of the threshold of Runway 9/27 at the approach end of Runway 9 and between the access point to the Hantz Air hangar on Runway 9/27 and Taxiway G.

**Figure 4-7 – Alternative 4: Reconfigure Runway 9/27 to 5,000 feet by 100 feet & Extend Runway 5R/23L 780 feet**




Legend:

- Pavement reconstruction areas
- New airside pavements
- Airside pavements to be abandoned or removed
- Airport property line

Source: Mead & Hunt, Inc. (2016)

An advantage with Alternative 4 is that with the 780-foot extension of Runway 5R/23L at the approach end of Runway 23L and the construction of a new connector taxiway to the approach end of Runway 23L, the need for aircraft to taxi onto Runway 9/27 and maneuver into position for a takeoff on Runway 23L is eliminated. Thus, the concern of a wrong runway departure as a result of the complex geometry at the intersection of the two runways is resolved; however, with the implementation of Alternative 4 a new potential for a wrong runway departure is introduced as a result of the connector taxiway proposed between Taxiway G and the approach ends of Runway 27 and Runway 23L. In this configuration, aircraft taxiing from Taxiway G to the approach end of Runway 23L could potentially be confused by the need to cross the threshold of Runway 9/27 and unintentionally depart from Runway 27. Another consideration with Alternative 4 is that the proposed 780-foot extension of Runway 23L would only be available for departures as a result of the height clearance required for the approach RPZ over Ecorse Road. An additional consideration with Alternative 4 is that blast protection may be needed for the localizer antenna for Runway 5R.

Similar to Alternative 3, Alternative 4 was not considered a feasible development options since mitigation is not proposed for the intersection geometry of Runway 5R/23L and Runway 9/27; likewise, a cost estimate was not prepared. **Table 4-4** summarizes the advantages and disadvantages to consider with Alternative 4 for comparison with the other feasible development options.

**Table 4-4 – Alternative 4 Summary of Considerations**

| Advantage | Disadvantages |
|---|---|
| • Eliminates need for aircraft departing Runway 23L to taxi and maneuver into position on Runway 27. | • Introduces potential for wrong runway departure on Runway 27<br>• 780-foot extension on Runway 23L only available for departures<br>• Blast protection may be needed for Runway 5R localizer |

### 4.3.5 Recommended Alternative – Runway 9/27

It is recommended that Alternative 2, which proposes to reconstruct Runway 9/27 at a length of 5,000 feet and a width of 100 feet at the approach end of Runway 9, be the preferred development option to meet the objective of providing a crosswind runway for single-engine, twin-engine, and small jet aircraft. With implementation of Alternative 2, complex geometry at the intersection of Runway 5R/23L is removed by decoupling the runway ends to eliminate the potential of a wrong runway departure. This decoupling of the runways also eliminates the need for aircraft to taxi and maneuver into position on Runway 9/27 for takeoff on Runway 23L as is needed with the existing airfield configuration. Alternative 2 also does not impact the development of the autonomous vehicle testing ACM site to west of Runway 9/27. Also, a length of 5,000 feet generally meets the takeoff and landing distance requirements of small-engine and twin-engine aircraft while meeting runway insurance requirements for business jet aircraft types,

Although there are disadvantages with Alternative 2, it appears to be the best option to provide a crosswind runway for aircraft types in need of its use in comparison with the other development options. The most significant disadvantage is that it reduces the length of Runway 9/27 and the ability of jet aircraft types to conduct MTOW operations in warm weather conditions; however, these situations are limited due to the seasonal temperature changes at the Airport. Alternative 2 also offers the advantage of lowered pavement maintenance costs with a reduction in airfield pavement. While removal of newer pavement at the intersection of Runway 9/27 and Runway 5R/23L will be needed, it will create a safer operating environment for aircraft with the elimination of this runway/runway intersection. Finally, while the land uses within the RPZs at either end of the runway are undesirable, mitigation efforts can be used to control activities and land uses, such as easements for the portion over the ACM property, and air traffic control procedures for the portion of the airfield within the RPZ at the approach end of Runway 27. Taking these disadvantages into consideration with the advantages, Alternative 2, which proposes the reconstruction of a 5,000-foot-long by 100-foot-wide runway at the approach end of Runway 9 is the recommended development option to improve Runway 9/27.

## 4.4 Runway 5L/23R

Runway 5L/23R was not found to not be needed for wind coverage or capacity purposes through the review of facility requirements, thus it would ineligible for funding participation from the federal Airport Improvement Program (AIP). To reduce infrastructure improvement costs, Runway 5R/23L could be closed once its condition deteriorates to a point where the condition of its surface is unsafe for aircraft operations. However, there would be a benefit in retaining Runway 5L/23R for traffic separation purposes. Thus, it was found through the review of facility requirements that the following three alternatives should be considered for Runway 5L/23R:

- Maintaining the runway at its current length of 5,996 feet
- Reconfiguring the runway to 3,500 feet in length
- Closure of the runway

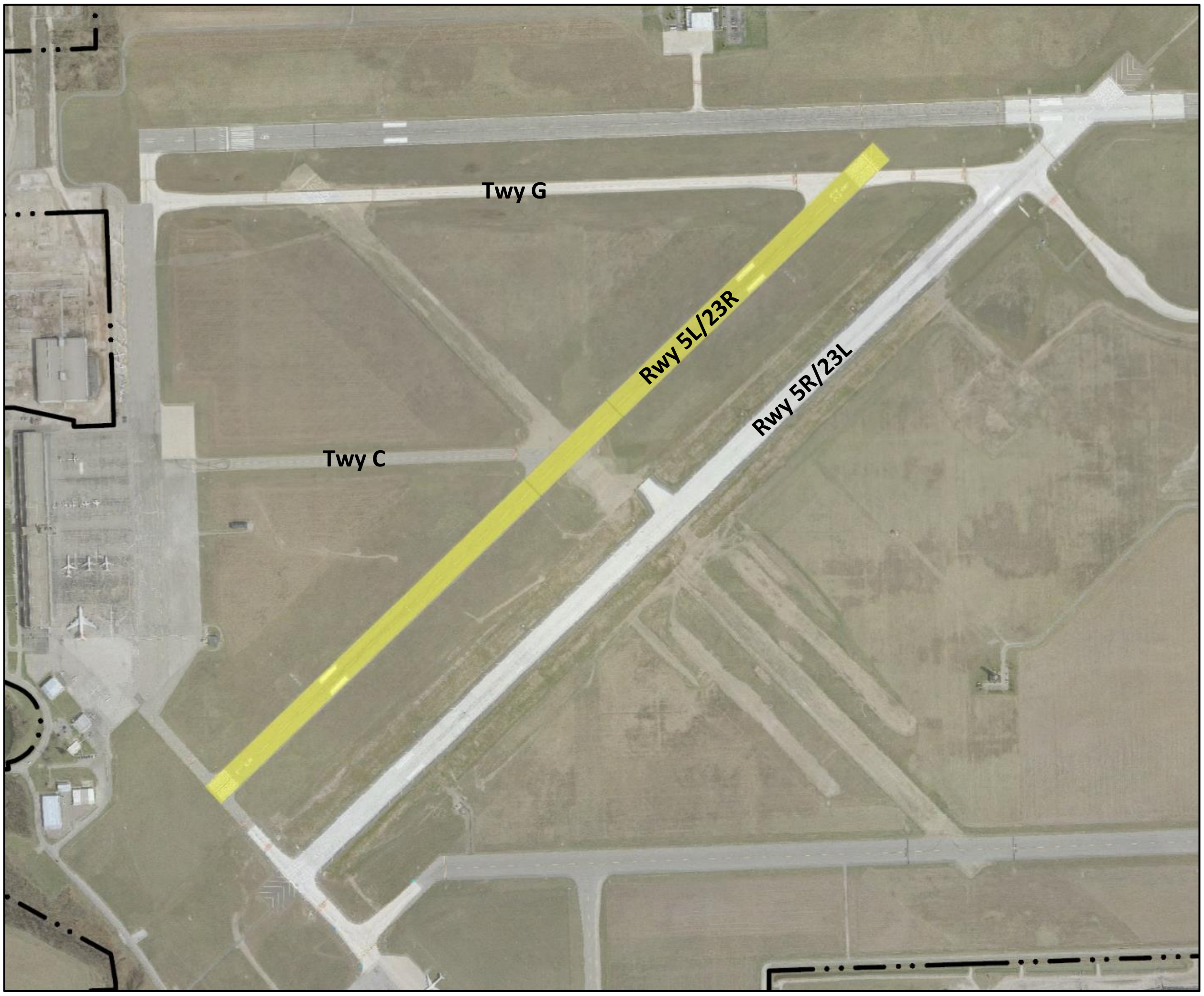
The following section will review the advantages and disadvantages of each alternative in determining the recommended development option for Runway 5L/23R.

### 4.4.1 Alternative 5 – Reconstruct Runway 5L/23R at 5,996 feet by 150 feet

Alternative 5 proposes that Runway 5L/23R be reconstructed at its existing length of 5,996 feet and reconfigured to a width of 150 feet to meet D-III design standards of the airfield's critical aircraft designation. No other airfield infrastructure changes are proposed with this alternative. The cost to implement a 5,996-foot-by-150-foot reconstruction of Runway 5L/23R is estimated at **$26,500,000**. The advantage to consider with Alternative 5 is that Runway 5L/23R would remain to support operations on Runway 5R/23L should needs arise to separate traffic (i.e. smaller single engine-aircraft from larger air cargo aircraft) or if Runway 5R/23L is closed. However, it is unlikely that a project to reconstruct Runway 5L/23R would be eligible for federal funding participation requiring its implementation to be fully funded by the Airport sponsor. Reconstruction of Runway 5L/23R at its existing 5,996-foot length also does not offer a solution to improve complex intersection geometry with Taxiway C and Taxiway G.

**Figure 4-8** illustrates the portion of pavement that would be reconstructed on Runway 5L/23R as proposed by Alternative 5, and considerations are summarized in **Table 4-5**.

**Figure 4-8 – Alternative 5: Reconfigure Runway 5L/23R at 5,996 feet by 150 feet**




Legend:

Pavement reconstruction areas

Airport property line

Source: Mead & Hunt, Inc. (2016)

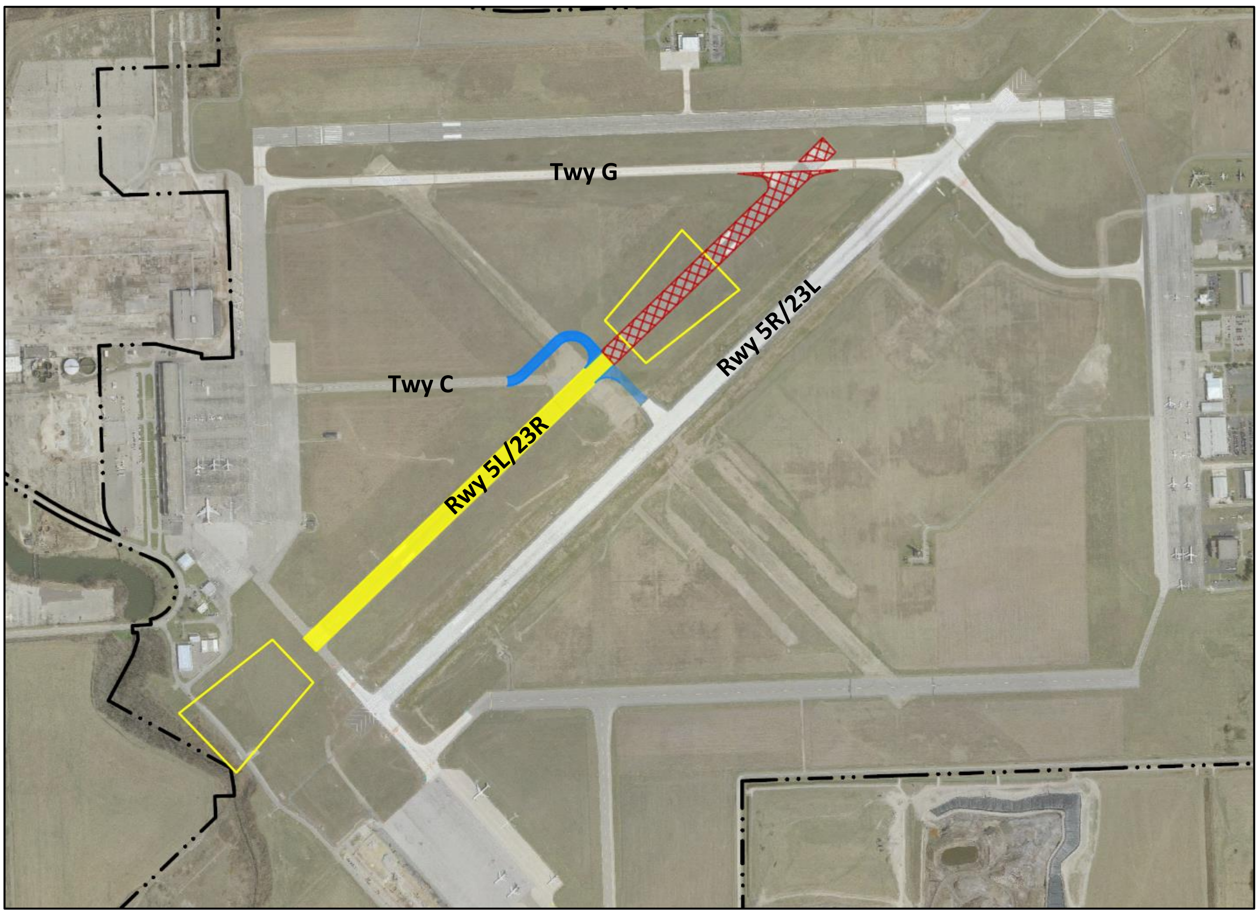
**Table 4-5 – Alternative 5 Summary of Considerations**

| Advantage | Disadvantage |
|---|---|
| • Continues to provide secondary runway for Runway 5R/23L | • Project unlikely eligible for federal funding<br>• Does not correct complex intersection geometry with Taxiway C and Taxiway G |
| **Estimated Cost: $26,500,000** | |

### 4.4.2 Alternative 6 – Reconstruct Runway 5L/23R at 3,500 feet by 75 feet

Alternative 6 proposes to reconstruct Runway 5L/23R in a configuration that would be more suitable for smaller aircraft that most frequently use the runway. Meeting B-II design standards, Alternative 6 would reconstruct Runway 5L/23R at a length of 3,500 feet and a width of 75 feet from the approach end of Runway 5L (**Figure 4-9**). Remaining runway pavement would be removed, and Taxiway C would be rerouted so that it intersects the location of the new proposed runway threshold at the approach end of Runway 23R at a 90-degree angle. This alternative also proposes construction of continued routing of Taxiway C between this new runway threshold and an existing taxiway intersection node with Runway 5R/23L. It is estimated to cost **$5,500,000** to implement Alternative 6.

**Figure 4-9 – Alternative 6: Reconstruct Runway 5L/23R at 3,500 feet by 75 feet**




Legend:
- Pavement reconstruction areas
- New airside pavements
- Airside pavements to be abandoned or removed
- Airport property line

Source: Mead & Hunt, Inc. (2016)

Alternative 6 offers the advantage of providing a supplemental runway to support smaller aircraft operations from Runway 5R/23L, for example, when single-engine aircraft operations coincide with larger air cargo jet operations. Implementation of Alternative 6 also offers the advantage of eliminating complex taxiway intersection geometry with the removal of the runway's intersection with Taxiway G and the rerouting of Taxiway C so that it intersects the runway at a 90-degree angle. While there are operational advantages with Alternative 6, the significant disadvantage is that the project would likely not be eligible for federal funding participation, since Runway 5L/23R is not needed for capacity purposes as defined by guidelines set forth in the AIP handbook.

**Table 4-6** summarizes the advantages and disadvantage with Alternative 6.

**Table 4-6 – Alternative 6 Summary of Considerations**

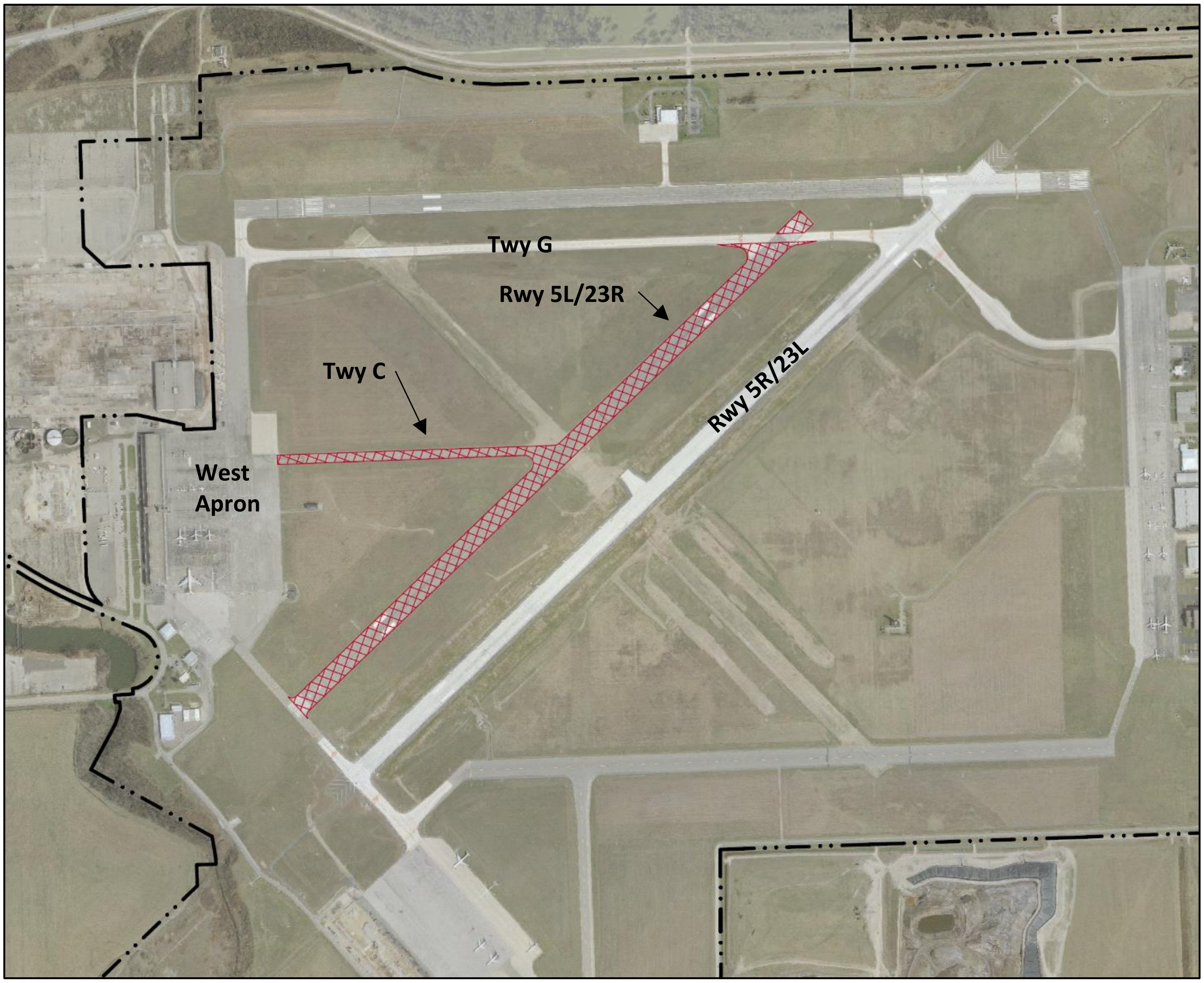
| Advantages | Disadvantage |
|---|---|
| • Provides supplemental runway to separate smaller aircraft from Runway 5R/23L<br>• Eliminates complex taxiway intersection geometry with Taxiway C & Taxiway G | • Project is likely not eligible for federal funding |
| **Estimated Cost: $5,500,000** | |

### 4.4.3 Alternative 7 – Close and Remove Runway 5L/23R

Considering that improvements to the condition of the pavement on Runway 5L/23R would likely not be eligible for federal funding participation, Alternative 7 proposes to close and remove Runway 5L/23R when the condition of the pavement surface is deemed unsafe for aircraft operations. With the removal of Runway 5L/23R, Taxiway C between the runway and the West Apron would also be removed. The cost to implement Alternative 7 is estimated at **$1,700,000**. An advantage with Alternative 7 is that while improvements to the condition of the pavement would likely not be eligible for federal funding participation, the cost to remove Runway 5L/23R may be eligible since it would eliminate unneeded pavements from the airfield reducing FOD and improving airfield operational safety. In addition, closure of these pavement surfaces reduces operational and maintenance costs for the Airport while also eliminating taxiway intersection geometry with Taxiway C and Taxiway G. A disadvantage to consider with Alternative 7 is that with the removal of Runway 5L/23R, a supplemental runway would not be available to separate traffic from Runway 5R/23L. This would increase the introduction of slower traffic into the traffic pattern of Runway 5R/23L, which also supports operations by faster larger air cargo aircraft.

**Figure 4-10** illustrates the pavement that would be removed by Alternative 7, and a summary of the advantages and disadvantages is presented in **Table 4-7**.

**Figure 4-10 – Alternative 7: Close and Remove Runway 5L/23R**




Legend:
Airside pavements to be abandoned or removed
Airport property line
Source: Mead & Hunt, Inc. (2016)

**Table 4-7 – Alternative 7 Summary of Considerations**

| Advantages | Disadvantages |
|---|---|
| • May be eligible for federal funding<br>• Reduces operational and maintenance costs<br>• Eliminates complex taxiway intersection geometry with Taxiway C & Taxiway G | • Removes supplemental runway to support operations on Runway 5R/23L<br>• Increases slower traffic in traffic pattern for Runway 5R/23L |
| **Estimated Cost: $1,700,000** | |

### 4.4.4 Runway 5L/23R Recommended Alternative

Considering the needs identified through the review of facility requirements, it could be argued that Alternative 5 or Alternative 6 are the best options to address operational considerations at the Airport. However, due to AIP funding eligibility guidelines, it would be unlikely that federal funding would be available to improve Runway 5L/23R; thus, any improvements would be the responsibility of the Airport. Since a focus of this master planning effort is to reduce operational and maintenance costs by removing unnecessary infrastructure elements, it is recommended that Alternative 7 be implemented, which proposes to close and remove Runway 5L/23R. With the closure and removal of Runway 5L/23R and Taxiway C, airfield operational and maintenance costs can be reduced. Likewise, costs to implement this alternative may also be reduced, since it may be eligible for federal funding participation. Removal of Runway 5L/23R also eliminates the complex taxiway intersection geometry of Runway 5L/23R at Taxiway C and Taxiway G.

While there are disadvantages to consider with implementation of Alternative 7, each is not a significant consideration that will impact the safety and efficiency of Airport operations. While removal of Runway 5L/23R integrates slower single-engine aircraft into the traffic pattern with operations conducted by faster, larger air cargo aircraft, it is not anticipated this frequency will result in an impact to capacity that increases aircraft arrival and departure delays. This impact to operations by faster, larger jet air cargo aircraft is further reduced with the construction of a parallel taxiway as discussed in the next section that will expedite slower aircraft exiting the runway, which is currently not available. Likewise, AIP project eligibility guidelines and FAA planning directives do not indicate that Runway 5L/23R is a necessary infrastructure element at the Airport needed to support safe and efficient aircraft operations. While it is beneficial to have a parallel runway capable of supplementing operations on the primary runway, the review of facility requirements has found this infrastructure element is not required. Thus, to reduce operating and maintenance costs, it is recommended that Alternative 7 be implemented when the pavement condition of Runway 5L/23R deteriorates to a condition when it is deemed unsafe for aircraft operations.

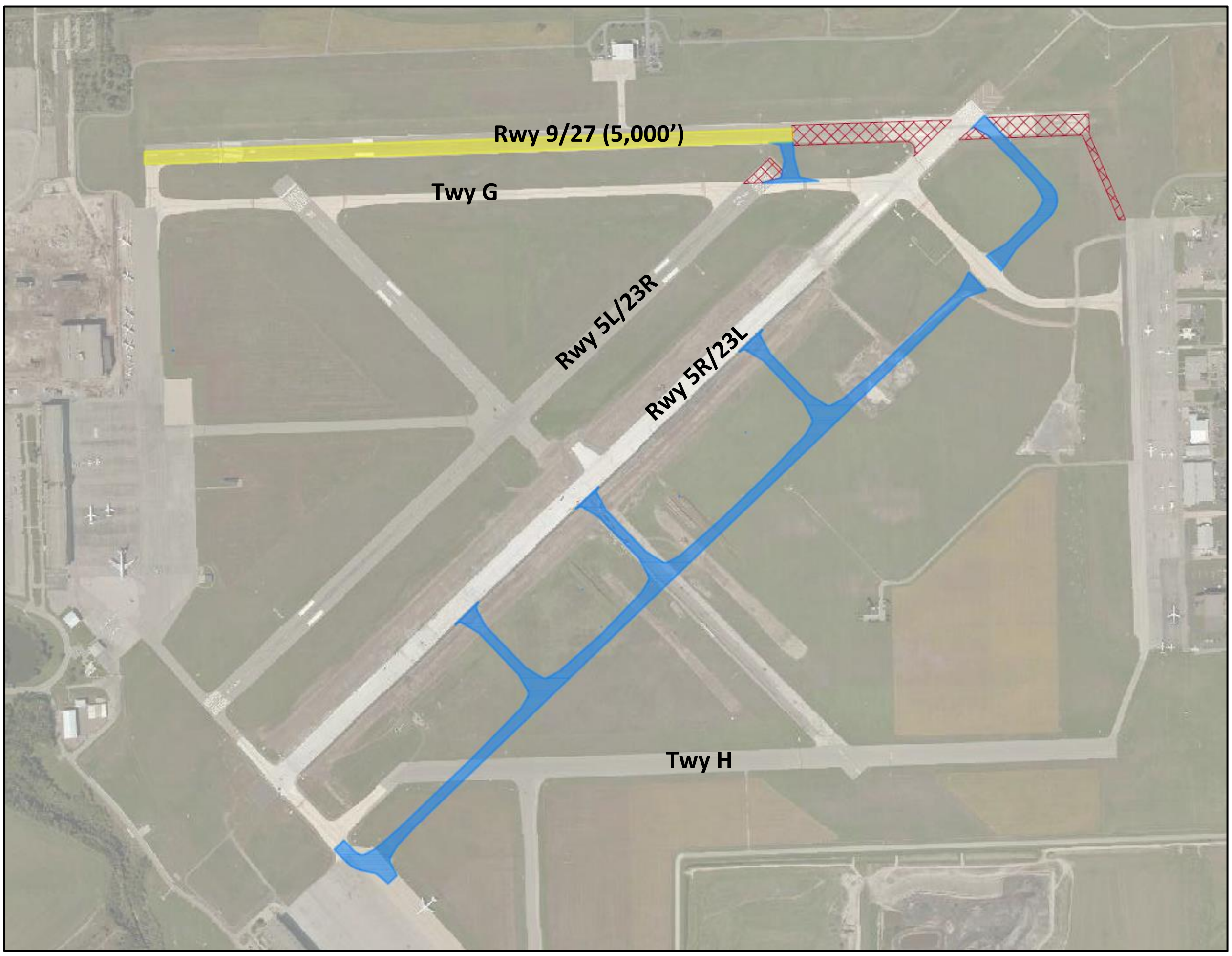
## 4.5 Parallel Taxiway

The configuration of the airfield is somewhat deficient in that it does not have a parallel taxiway to support operations on its primary runway. Parallel taxiways (along with supporting connector taxiways) are beneficial to increase the safety and efficiency of airfield operations allowing aircraft to quickly exit a runway after landing and reduce the occupancy time needed to maneuver into position for takeoff. Parallel taxiways also provide for the ground movement of aircraft on an airfield without needing to taxi directly on the runway. The review of facility requirements found that the construction of a parallel taxiway for Runway 5R/23L would be beneficial to decrease runway occupancy time and provide more direct taxi routes for aircraft on an airfield. Thus, three alternatives were prepared to evaluate options that are available to provide a parallel taxiway to Runway 5R/23L. The following section presents these three alternatives, lists the considerations for each, and recommends the preferred parallel taxiway development option.

### 4.5.1 Alternative 8 – Construction of East Side Parallel Taxiway to Runway 5R/23L

Alternative 8 proposes the construction of a parallel taxiway to the east of Runway 5R/23L as illustrated in **Figure 4-11**. Approximately 85,000 square yards of new pavement construction would occur between an existing intersection node on Taxiway G to the east of Runway 5R/23L and Taxiway H as well as between the Taxiway G intersection node and the approach end of Runway 23L. Alternative 8 also proposes construction of three connector taxiways between the parallel taxiway and Runway 5R/23L. The estimated cost to implement Alternative 8 is **$29,000,000**. The cost to implement Alternative 8 does not include pavement removal associated with Alternative 2, which is the recommended development option for Runway 9/27 that proposes a 5,000-foot-by-100-foot reconfiguration of the runway at the approach end of Runway 9.

**Figure 4-11 – Alternative 8: Construction of East Side Parallel Taxiway to Runway 5R/23L**




Legend:

Pavement reconstruction areas

New airside pavements

Airside pavements to be abandoned or removed

Source: Mead & Hunt, Inc. (2016)

Alternative 8 offers the advantage of providing a parallel taxiway to Runway 5R/23L while resolving the complex geometry at the intersection of Runway 9/27 and Runway 5R/23L to eliminate the potential for a wrong runway departure. The construction of three connector taxiways between the parallel taxiway and Runway 5R/23L provides access points for aircraft to quickly exit the runway environment after landing, improving safety and increasing the throughput capacity of the runway. Construction of the parallel taxiway to the east of Runway 5R/23L also allows for the removal of Taxiway H, which opens up significant area for development to the southeast with access to the airfield for aeronautical related development. Implementation of Alternative 8 also offers the advantages of allowing Runway 5L/23R to be maintained as a runway if desired as well as the reconfiguration of Runway 9/27 to a C-II runway that is 5,000 feet long. While Alternative 8 offers many advantages, a disadvantage to consider is that tenants and other Airport users to the west of Runway 5R/23L would be required to cross the runway to access the parallel taxiway. A recap of the advantages and disadvantages with Alternative 8 is presented in **Table 4-8**.

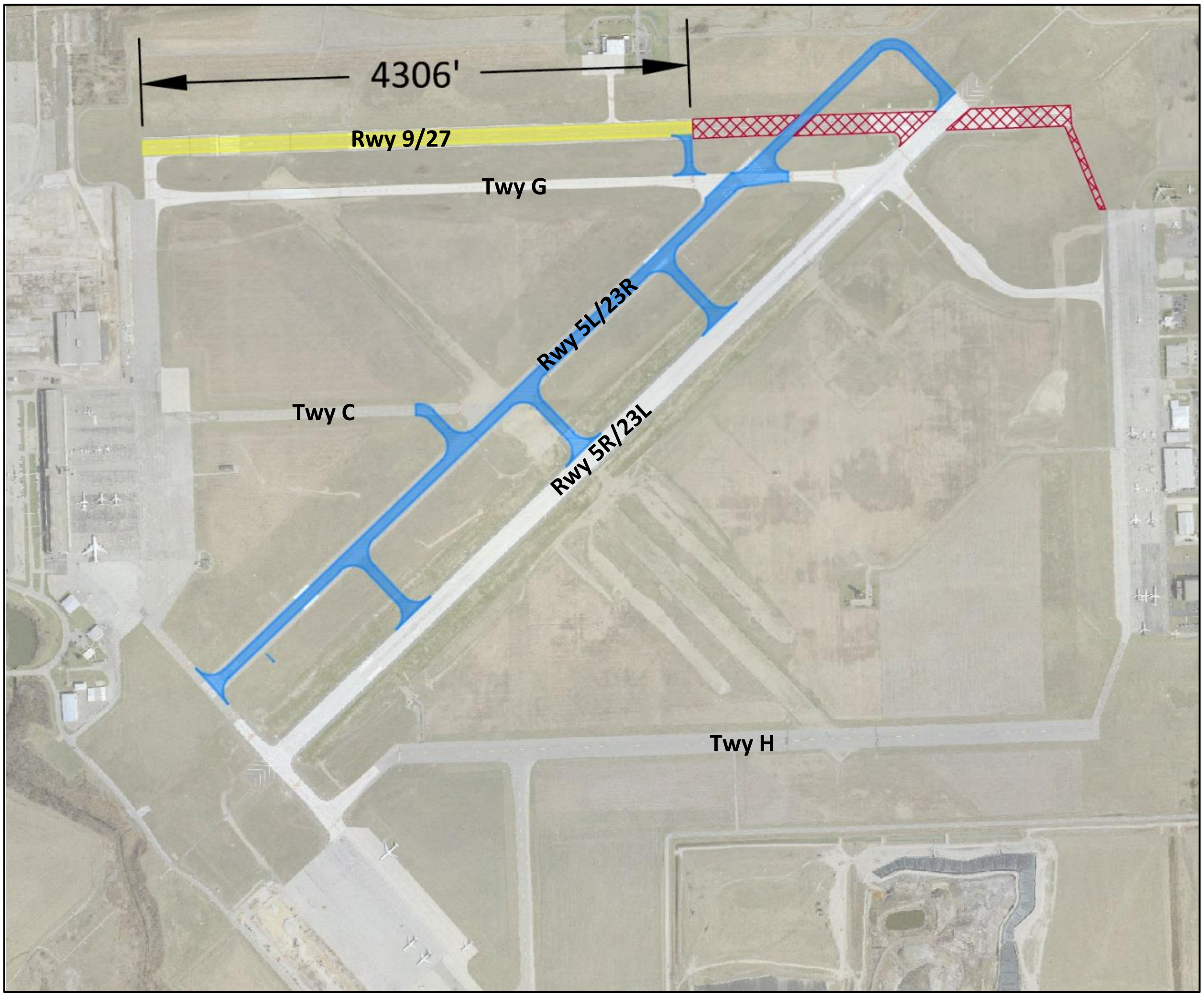
**Table 4-8 – Alternative 8 Summary of Considerations**

| Advantages | Disadvantages |
|---|---|
| • Eliminates complex runway intersection geometry with Rwy 9/27 & Rwy 5R/23L<br>• Provides additional access points on Runway 5R/23L to increase safety & capacity<br>• Allows for removal of Taxiway H, opening up significant development area<br>• Allows Runway 5L/23R to be maintained<br>• Allows Runway 9/27 to be maintained at a length of 5,000 feet | • West side tenants & Airport users required to cross Runway 5R/23L to access parallel taxiway |
| **Estimated Cost: $29,000,000** | |

## 4.5.2 Alternative 9 – Convert Runway 5L/23R to Parallel Taxiway

Alternative 9 (**Figure 4-12**) proposes to close and reconstruct the pavement of Runway 5L/23R into a parallel taxiway for Runway 5R/23L. Alternative 9 also proposes construction of three new connector taxiways with Runway 5R/23L as well as the construction of new pavement for the parallel taxiway between Taxiway G and the approach end of Runway 23L. A reconfiguration with the intersection of Taxiway C is also proposed so that it intersects at a 90-degree angle meeting FAA airfield design standards. Implementation of Alternative 9 assumes that the length of Runway 9/27 would be reconfigured, which would have to occur at a length of 4,306 feet to meet standards for runway and taxiway design surfaces. The estimated cost to implement Alternative 9 is **<u>$27,100,000</u>**, which does not include the costs to reconfigure Runway 9/27.

**Figure 4-12 – Alternative 9: Convert Runway 5L/23R to Parallel Taxiway**




Legend:
- Pavement reconstruction areas
- New airside pavements
- Airside pavements to be abandoned or removed

Source: Mead & Hunt, Inc. (2016)

Implementation of Alternative 9 has the advantage of allowing for the reconfiguration of Runway 9/27 so that complex geometry at the intersection of Runway 5R/23L and Runway 9/27 can be eliminated to prevent a wrong runway departure. Similar to Alternative 8, Alternative 9 also offers the advantage of providing multiple access points for aircraft to exit the runway environment between the parallel taxiway and Runway 5R/23L to increase safety and capacity of the airfield. Alternative 9 offers an additional advantage shared by Alternative 8 in that Taxiway H can be removed to open up a significant area for development with access to the airfield for aeronautical purposes.

A disadvantage with Alternative 9 is that tenants and Airport users to the east of Runway 5R/23L would be required to cross Runway 5R/23L to access the parallel taxiway, which has the potential to increase aircraft taxi runway crossings. Another disadvantage is that, in order to meet FAA airfield design standards, Runway 9/27 would have to be reconfigured at a length of 4,306 feet to provide adequate separation between runway and taxiway design surfaces, which is less than the recommendation of at least 5,000 feet of runway length as determined by the review of facility requirements. Finally, implementation of Alternative 9 does not allow Runway 5L/23R to be maintained as a permanent runway, although it does offer the option of being converted temporarily into a runway for emergency use should the need arise as a result of an unexpected closure of Runway 5R/23L.

The advantages and disadvantages to consider with Alternative 9 are summarized in **Table 4-9**.

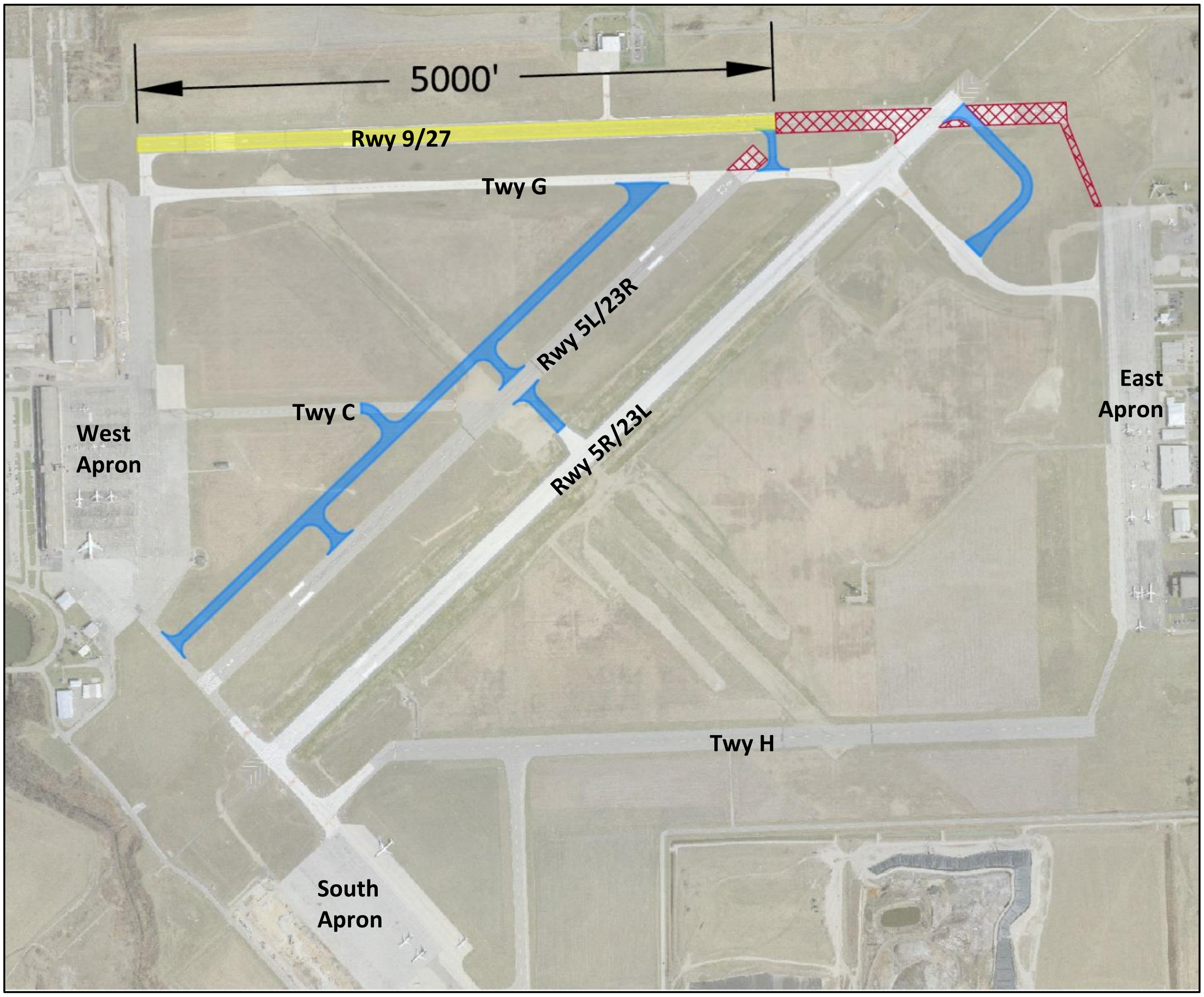
**Table 4-9 – Alternative 9 Summary of Considerations**

| Advantages | Disadvantages |
|---|---|
| • Eliminates complex runway intersection geometry with Rwy 9/27 & Rwy 5R/23L<br>• Provides additional access points on Runway 5R/23L to increase safety & capacity<br>• Allows for removal of Taxiway H, opening up significant development area | • East side tenants & Airport users must cross Runway 5R/23L to access parallel taxiway<br>• Runway 9/27 can only be configured to 4,306 feet in length<br>• Does not allow Rwy 5L/23R to be maintained as a permanent runway |
| **Estimated Cost: $27,100,000** | |

### 4.5.3 Alternative 10 – Construct West Side Parallel Taxiway

Alternative 10 proposes to provide a parallel taxiway for Runway 5R/23L by constructing a new taxiway parallel to the west of Runway 5L/23R (**Figure 4-13**). Use of this new taxiway to support operations on Runway 5R/23L would be achieved by a new connector taxiway that would be constructed between the proposed new parallel taxiway and Runway 5R/23L that would cross Runway 5L/23R. This would offer a midfield access point for aircraft to exit Runway 5R/23L and for Runway 5L/23R, which could continue to be used for aircraft operations. Alternative 10 also proposes the construction of two connector taxiways between the proposed parallel taxiway and Runway 5L/23R and a reconfiguration of Taxiway C so that it intersects the new parallel taxiway at a 90-degree angle. Construction of an additional connector taxiway is also proposed between an existing intersection node on Taxiway G and the approach end of Runway 23L. It is noted that Alternative 10 could also be implemented in phases based on the availability of funding. Not including the improvements necessary to reconfigure Runway 9/27 at a length of 5,000 feet, implementation of Alternative 10 is estimated to cost **$19,700,000**.

**Figure 4-13 – Alternative 10: Construct West Side Parallel Taxiway**




Legend:

Pavement reconstruction areas

New airside pavements

Airside pavements to be abandoned or removed

Source: Mead & Hunt, Inc. (2016)

Alternative 10 has a few advantages that achieve the desired objective of providing a parallel taxiway to Runway 5R/23L. It does allow for the removal of complex geometry at the intersection of Runway 5R/23L and Runway 9/27 to prevent a wrong runway departure. It also allows Runway 5L/23R to remain open and provides 5,000 feet of runway length for aircraft in need of Runway 9/27 during crosswind conditions. Taxiway H could also be removed with the implementation of Alternative 10, opening up significant area with airfield access for development benefiting aeronautical-related businesses.

However, there are significant disadvantages to consider with Alternative 10. First, sufficient access points are not provided for aircraft to exit Runway 5R/23L in an efficient manner, which may not significantly increase the safety or capacity of the runway due to lack of a significant decrease in runway occupancy times. Second, there would be an increased need for aircraft to cross Runway 5L/23R and Runway 5R/23L from all areas of airfield such as when transitioning between the following:

- The parallel taxiway and Runway 5R/23L
- East Apron and parallel taxiway
- West Apron and Runway 5R/23L via parallel taxiway
- South Apron and approach end of Runway 23L

Advantages and disadvantages to consider with Alternative 10 are summarized in **Table 4-10**.

**Table 4-10 – Alternative 10 Summary of Considerations**

| Advantages | Disadvantages |
|---|---|
| • Eliminates complex intersection geometry with Runway 9/27 & Runway 5R/23L<br>• Allows Runway 5L/23R to remain open<br>• Allows 5,000 feet of length on Runway 9/27<br>• Allows for removal of Taxiway H, opening up significant development area | • Sufficient access points not provided for aircraft to exit Runway 5R/23L<br>• Increased need for aircraft from all areas of the airfield to cross Runway 5L/23R and Runway 5R/23L |
| **Estimated Cost: $19,700,000** | |

### 4.5.4 Parallel Taxiway Recommended Alternative

In review of the advantages and disadvantages of the three alternatives, it is recommended that Alternative 8, which proposes the construction of a parallel taxiway to the east of Runway 5R/23L, be considered as the preferred development option to provide a parallel taxiway to Runway 5R/23L. Alternative 8 shares a number of advantages offered by both Alternative 9 and Alternative 10. Similar to Alternative 9, implementation of Alternative 8 offers an option to provide a parallel taxiway to Runway 5R/23L, while eliminating the "hot spot" at the intersection of Runway 9/27 and Runway 5R/23L. Alternative 8 also provides additional access points for aircraft to efficiently exit Runway 5R/23L similar to Alternative 9. Similarities with Alternative 10 also factors into the recommendation of implementing Alternative 8, since Runway 5L/23R can continue to be maintained as an operational runway while 5,000 feet of runway length can be provided on Runway 9/27. Alternative 8 also shares the advantage offered by Alternative 9 and Alternative 10 of allowing for the removal of Taxiway H so that additional aeronautical-related developable area can be made available at the Airport. While tenants and Airport users on the west side of the airfield would be required to cross Runway 5R/23L to access the parallel taxiway, this occurrence is expected to lessen in frequency with West Apron tenants expressing interest in establishing facilities on the east side of the airfield. Thus, Alternative 10 is recommended as the preferred development option to provide a full parallel taxiway to Runway 5R/23L.

## 4.6 Taxiway System

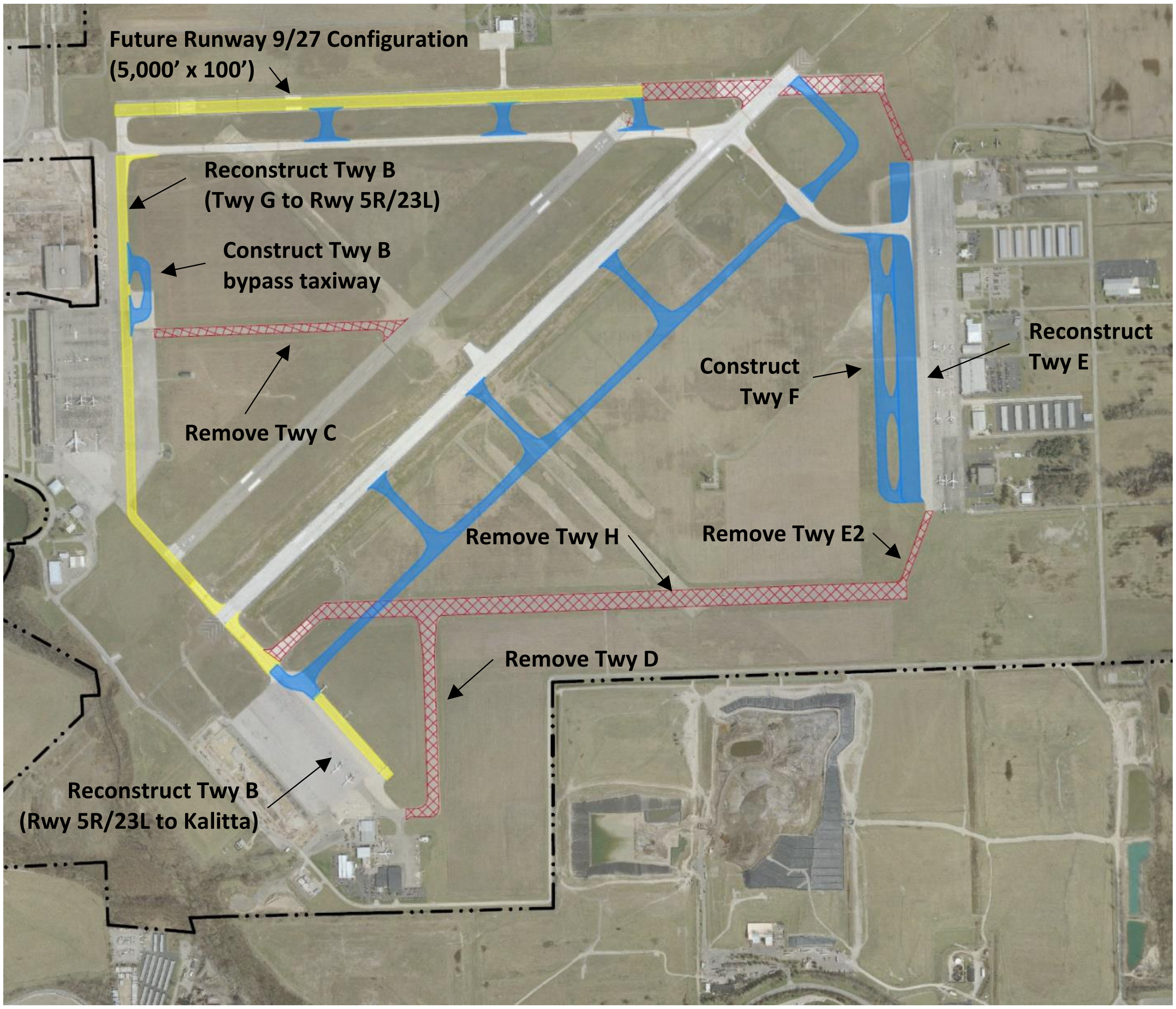
Except for Taxiway G, the condition of most of the taxiway system pavement has deteriorated to a point where reconstruction is needed. Given that this is often a costlier pavement condition improvement option, a review was conducted of the taxiways that should be improved. The review showed that some could be closed and removed as a result of the future construction of a parallel taxiway to Runway 5R/23L. **Table 4-11** lists the taxiways that are recommended for reconstruction as well as for closure and removal along with the estimated cost to implement each project. **Figure 4-14** also graphically depicts these same recommended taxiway system improvements (Alternative 11).

**Table 4-11 – Recommended Taxiway System Improvements**

| Project | Estimated Cost |
|---|---|
| Reconstruct Taxiway B (between Taxiway G and Runway 5R/23L) | $10,600,000 |
| Reconstruct Taxiway B (between Runway 5R/23L and Kalitta) | $2,300,000 |
| Construct Taxiway B bypass taxiway | $2,385,000 |
| Reconstruct Taxiway E | $7,200,000 |
| Construct Taxiway F west side parallel to Taxiway E | $9,036,500 |
| Remove Taxiway D | $500,000 |
| Remove Taxiway C | $400,000 |
| Remove Taxiway H & Taxiway E2 | $1,800,000 |
| **Subtotal** | **$34,221,500** |
| | |
| Construct East Side Parallel Taxiway | $29,000,000 |
| **TOTAL** | **$63,221,500** |

Source: Mead & Hunt, Inc. (2017)

**Figure 4-14 – Alternative 11: Taxiway System Improvements**




Legend:
- Pavement reconstruction areas
- New airside pavements
- Airside pavements to be removed
- Airport property line

Source: Mead & Hunt, Inc. (2016)

In combination with construction of a parallel taxiway, Alternative 11 is estimated to cost **$63,221,500** to implement the recommended proposed taxiway system improvements. Taxiway pavements to the south of Runway 5R/23L (Taxiway D, Taxiway E2, and Taxiway H) are recommended for removal with the construction of a parallel taxiway, since these taxi routes will no longer be needed to transition aircraft a between the east, south, and west portions of the airfield. Remaining taxiway system pavements in need of improvement (Taxiway B between Taxiway G and

Runway 5R/23L, Taxiway G between Runway 5R/23L and the Kalitta apron, and Taxiway E along the edge of the East Apron) are recommended for reconstruction. It is recommended that Taxiway C be removed at the time Runway 5L/23R is permanently closed. Construction of Taxiway F is also proposed should an expansion occur to the west of the East Apron. Finally, should the West Apron be closed, a bypass taxiway on Taxiway B is proposed so that aircraft can pass one another on Taxiway B should travel in opposite directions occur at the same time on the taxiway.

## 4.7 Hangar 1 / Administration Offices

Hangar 1 provides covered parking for a number of based aircraft used by businesses, private individuals, and the Yankee Air Museum as well as office space for Airport administration, aeronautical related businesses, and the United States Customs and Border Patrol (CBP). Aircraft parking in Hangar 1 currently occupies six of eight hangar bays, which is projected to be the anticipated demand during the planning period. As a result of the age of the building, Hangar 1 needs significant improvements. A 2016 facility assessment conducted In September 2016 found that an estimated $56 million of improvements are necessary to rehabilitate the building for an additional 30 years of use. In comparison with the approximate $835,000 of revenue that is generated each year from its use, it may not be financially feasible to rehabilitate Hangar 1. Thus, options were explored to identify other areas on the airfield where the aircraft storage capacity and office space offered by Hangar 1 could be replaced.

### 4.7.1 Alternative 12 – Rehabilitate Hangar 1

One alternative to improve the condition of aircraft storage facilities, Airport administration/office space, and CBP office space offered by Hangar 1 is to implement a full or partial rehabilitation of Hangar 1 (Alternative 12). Implementing a rehabilitation of the structure and utilities of Hangar 1 to gain an additional 30 years of useful life is estimated to cost **$56,000,000**. The most significant advantage to consider with a proposed rehabilitation of Hangar 1 is that tenants and activities associated with Hangar 1, such as itinerant on-demand air cargo operations, would remain on the West Apron. This would eliminate the need to find other places on the airfield to relocate tenants and associated activities and eliminate the need to make any landside access changes to the Airport. However, the most significant disadvantage to consider with implementation of Alternative 12 is the cost necessary to improve Hangar 1 so it can accommodate the demands of its users for the planning period. A summary of the advantages and disadvantage with Alternative 12 is presented in **Table 4-12**.

**Table 4-12 – Alternative 12 Summary of Considerations**

| Advantages | Disadvantages |
|---|---|
| • Keeps tenants and associated activities at current location<br>• No changes necessary to landside access | • Cost to rehabilitate building |
| **Estimated Cost: $56,000,000** | |

### 4.7.2 Alternative 13 – Construct New Airport Administration/CBP Offices

Alternative 13 proposes construction of a new building for Airport administration, CBP, and other offices in Hangar 1. Two sites are well suited for the construction of such a hangar structure, located adjacent to the South Apron (Site 1) and at a site to the south of the East Apron (Site 2, **Figure 4-15**). In an effort to centralize office space for maintenance, operations, and administrative staff, Alternative 13 also includes the construction of a new maintenance facility.

**Figure 4-15 – Sites for Alternative 13: Construct New Airport Administration/CBP Offices**


Source: Mead & Hunt, Inc. (2017)

Each site has advantages to consider. Site 1 offers the advantage of utilizing a part of the South Apron for the movement of equipment and vehicles to and from the maintenance facility, reducing the amount of landside pavements that would need to be constructed. Site 1 also has the advantage of not competing with the apron frontage needs of other proposed airfield infrastructure developments. Shifting the CBP and maintenance facilities to the east of Runway 5R/23L is also an advantage to consider given that most activity at the Airport will occur on this side of the airfield because of the proposed master plan developments. This also would reduce the number of runway crossings by aircraft and vehicles associated with these two facilities. Finally, construction of a new maintenance facility at Site 1 could be phased for a later date if it was desired for operational or financial purposes. Like Site 1, Site 2 offers the advantage of relocating CBP and maintenance facility activities to the east of Runway 5R/23L. This places these two infrastructure elements closer to activity occurring on the East Apron while reducing the need for aircraft and vehicle crossings on Runway 5R/23L. Site 2 also offers an advantage similar to Site 1 in that the maintenance facility portion could be phased and implemented at a later date, if desired. Finally, Site 2 does not interfere with other East Apron development plans proposed by the master plan, in particular the expansion of apron space and developable area for hangars to the north.

Both Site 1 and Site 2 have disadvantages to consider as well. The proposed layouts at Site 1 and Site 2 incorporate the construction of a new maintenance facility, which adds cost to this development option. Construction of a new administration/CBP/maintenance facility at Site 1 on the South Apron isolates these facilities from the East Apron, which is a focal point for activity that occurs at the Airport. A disadvantage to consider with the implementation of a new administration/CBP/maintenance facility at Site 2 is that additional landside access infrastructure would need to be constructed than if such a facility were built at Site 1.

Based on order of magnitude, it is estimated to cost **$9,250,000** to implement a new administration /CBP/maintenance facility at Site 1 adjacent to the South Apron and **$9,700,000** to implement such a facility at Site 2 adjacent to the East Apron. A summary of considerations of both sites associated with Alternative 13 is presented in **Table 4-13**.

**Table 4-13 – Alternative 13 Summary of Considerations**

| **Site 1 (South Apron)** | | **Site 2 (East Apron)** | |
|---|---|---|---|
| **Advantages** | **Disadvantages** | **Advantages** | **Disadvantages** |
| • Utilizes South Apron for facility access<br>• Does not impact other apron plans<br>• Shifts facilities east of Runway 5R/23L<br>• Maintenance facility can be phased | • Requires new maintenance facility<br>• Site isolated from East Apron activity | • Shifts facilities to east of Runway 5R/23L<br>• Maintenance facility can be phased | • Requires new maintenance facility<br>• Requires additional pavements for access |
| **Estimated Cost: $9,250,000** | | **Estimated Cost: $9,700,000** | |

### 4.7.3 Alternative 14 – Transfer Hangar 1 to Private Entity & Install Modular Admin Office

Rehabilitation of Hangar 1 will incur significant cost to the Airport; thus, an alternative was developed that reduces construction and operational costs to the Airport while continuing to provide the Hangar 1 facility for tenants interested in its use. As proposed by Alternative 14, Hangar 1 would be transferred to a private entity for ownership and operation while modular administration offices for Airport staff would be installed adjacent to the South Apron, at the site formerly occupied by the Yankee Air Museum on the East Apron, or at the campus of buildings for snow removal and airfield maintenance vehicles. The significant advantage of Alternative 14 is that it transfers the operating and maintenance cost of Hangar 1 to a private entity through an arrangement such as a lease agreement, since some interest has been expressed by tenants for the continued operation of this structure. Alternative 14 also allows tenants and associated activities to remain in Hangar 1 on the West Apron and continues to preserve space on the East Apron and the South Apron for future aeronautical related development.

The cost to improve Hangar 1, however, is a significant disadvantage to consider, since it may be challenging to convince a private entity to take over the operation and maintenance of Hangar 1 which needs $56 million in improvements. Due to the cost to improve Hangar 1 and the unlikely willingness of a private entity to make this level of investment, Alternative 14 is not considered to be a feasible alternative. Also, installation of modular offices is not anticipated to provide sufficient office space needed to meet the demands of administration, operations, and maintenance staff. As a result, a cost estimate was not prepared for Alternative 14 whose advantages and disadvantages to consider are presented in **Table 4-14**.

**Table 4-14 – Alternative 14 Summary of Considerations**

| Advantages | Disadvantages |
|---|---|
| • Transfers operating and maintenance cost of Hangar 1 to private entity<br>• Keeps tenants and associated activities at current location<br>• Preserves space on East Apron and South Apron for aeronautical development | • May be challenging to find private entity willing to take on operation/maintenance |

### 4.7.4 Alternative 15 – Demolish Hangar 1 & Install Modular Admin Office

Should transfer of the ownership and operation of Hangar 1 to a private entity not be an attractive option, Alternative 15 offers another option that proposes to demolish Hangar 1 and install a modular office for Airport and CBP staff. Similar to Alternative 14, installation of a modular administrative office is proposed either adjacent to the South Apron, at the site formerly occupied by the Yankee Air Museum on the East Apron, or at the existing campus of buildings for snow removal and airfield maintenance vehicles. With Alternative 15, tenants that formerly occupied Hangar 1 would be responsible for finding replacement facilities that suit their needs, either through new construction or by arrangements with other Airport tenants. It is assumed with implementation of Alternative 15 that land would be made available on the airfield for tenants to construct replacement facilities.

With Alternative 15, the removal of Hangar 1 eliminates the cost and liability to all parties for the continued operation and maintenance of the structure; however, demolition of Hangar 1 displaces tenants and requires them to find other locations on the airfield for their activities. A summary of these considerations and the estimated cost to implement Alternative 15 are presented in **Table 4-15**.

Alternative 15 is not considered to be a feasible alternative, since installation of a modular office is not anticipated to provide sufficient office space needed to meet the demands of administration, operations, maintenance, and CBP personnel; thus, a cost estimate was not prepared for the entire implementation of this alternative. A cost estimate was prepared, however, for the demolition the Hangar 1, which is anticipated at **$5,000,000**.

**Table 4-15 – Alternative 15 Summary of Considerations**

| Advantage | Disadvantage |
|---|---|
| • Eliminates cost to operate and maintain Hangar 1 | • Displaces tenants from Hangar 1 |
| **Estimated Cost: $5,000,000*** | |

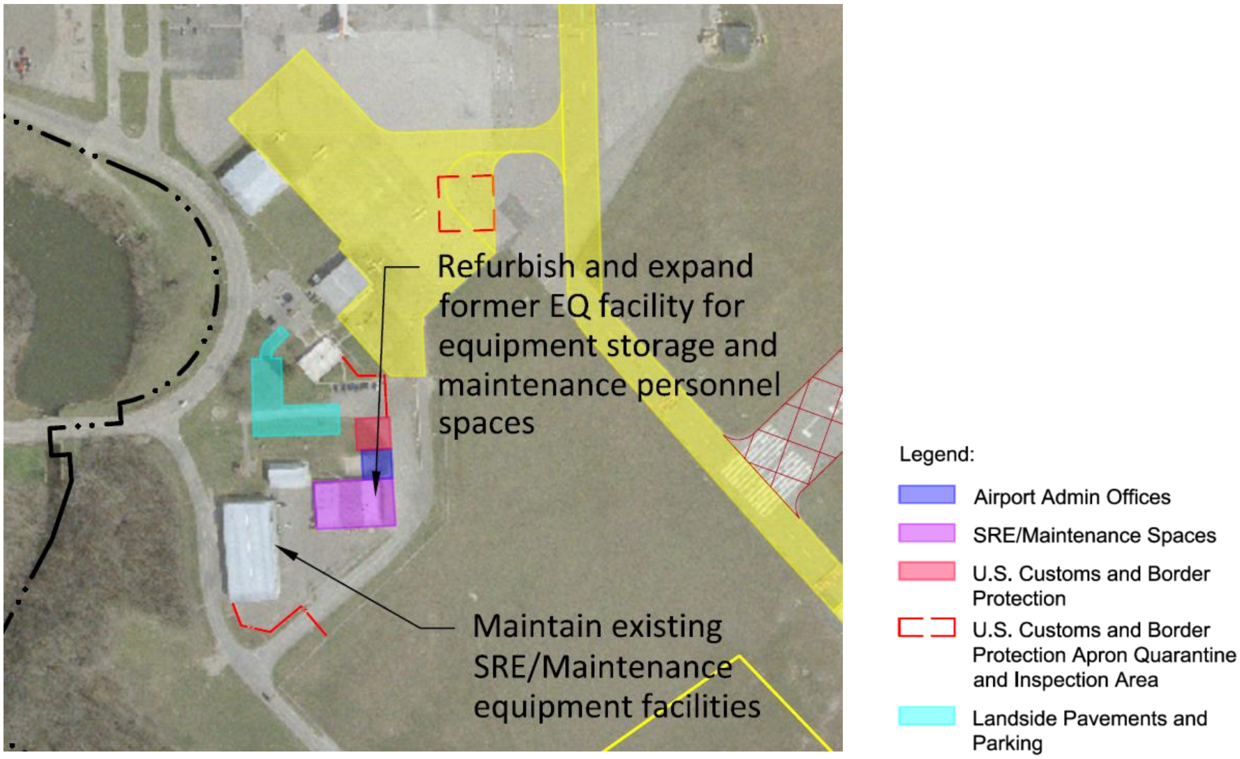
* Note = Demolition cost for Hangar 1 only. No cost estimate was prepared for the installation of a modular office

### 4.7.5 Alternative 16 – Expand Former EQ Building

Adjacent to the existing Airport maintenance facilities near the West Apron is the former EQ building that is currently partially used for supply and vehicle storage. The rehabilitation and expansion of this building, as discussed in a later section, is the logical development option to expand storage area for maintenance equipment and centralize office space for maintenance employees. To centralize office space for maintenance, operations, administrative, and CBP staff, Alternative 16 proposes an additional expansion of this building be planned to accommodate the need office areas that would be lost with the demolition of Hangar 1 (**Figure 4-16**).

Alternative 16 is estimated to cost **$5,100,000** to implement. An advantage of Alternative 16 is that it centralizes office space for three departments within the Airport administration so efficiencies can be gained from inter-department tasks. It also utilizes and maintains existing facilities that have been recently built for maintenance equipment storage. It also offers an option to provide sufficient office space and work areas needed for the CBP that Hangar 1 does not currently provide. Use of the West Apron to implement Alternative 16 is a disadvantage to consider with Alternative 16, since there would be a need to maintain pavement on the West Apron even after Hangar 1 is demolished. The location of Alternative 16 to the west of Runway 5R/23L is an additional disadvantage, since these facilities would be isolated from the South Apron and East Apron. Likewise, aircraft and vehicle crossings of Runway 5R/23L would be necessary for the transition between activities occurring at the site of Alternative 16 and those at the South Apron and East Apron. **Table 4-16** summarizes the advantages and disadvantages with Alternative 16.

**Figure 4-16 – Alternative 16: Demolish Hangar 1 & Expand Former EQ Building**




Source: Mead & Hunt, Inc. (2017)

**Table 4-16 – Alternative 16 Summary of Considerations**

| Advantages | Disadvantages |
|---|---|
| • Centralizes maintenance, operations, administrative personnel and equipment<br>• Utilizes and maintains existing maintenance facilities | • Requires portion of West Apron to be maintained<br>• Facilities located to the west of Runway 5R/23L |
| **Estimated Cost: $5,100,000** | |

## 4.7.6 Hangar 1 / Administrative Offices Recommended Alternative

As part of the master planning process, input was received from tenants on the deteriorating condition of Hangar 1 and the immediate need for improvements; likewise, inquiries were also received on the availability of land elsewhere on the Airport for Hangar 1 tenants to construct their own replacement facilities. Given the cost that is necessary to rehabilitate Hangar 1 in comparison to the revenue that is generated from its use, it is unlikely that any investment made into improving the facility will be financially feasible. Thus, Alternative 16, which proposes to expand the former EQ building to provide space for Airport administrative and maintenance staff, in combination with a demolition of Hangar 1, appears to be the best solution considering financial factors to address the deteriorating condition of Hangar 1 and provide a centralized area for WCAA personnel and equipment. Given that

Alternative 16 is estimated to cost $5,100,000 and demolition of Hangar 1 is estimated to cost $5,000,000, a total of $10,100,000 would be necessary to implement these two development options.

Since it is estimated to cost $56 million to fully rehabilitate Hangar 1, implementation of Alternative 16 offers the holistic advantage of reducing the level of investment needed to improve the Airport given that there are other significant infrastructure needs. It also reduces the risk and liability to operate and maintain the deteriorating hangar, which is a significant consideration regardless if the Airport or a private entity decides to continue to operate and maintain Hangar 1. An additional advantage to consider with Alternative 16 is that Airport operations, maintenance, and administrative staff will have a centralized location for office space allowing for efficiencies in inter-department tasks.

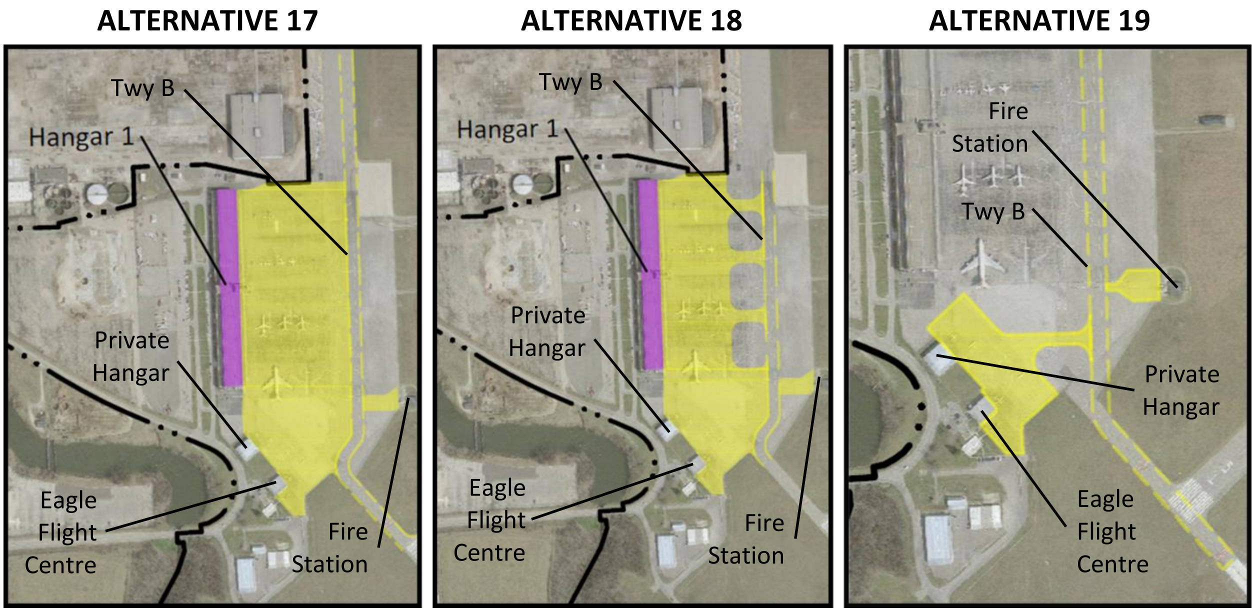
The need to relocate existing Hangar 1 tenants is the most significant disadvantage to consider with Alternative 16. Although some tenants had expressed interest in constructing new facilities, others may find this an undesirable option for their operational and office space needs. It will be important that an implementation plan is developed for Alternative 16 that gives each tenant sufficient time to plan for the relocation of their facilities. Consideration should especially be given to the Yankee Air Museum. This tenant expressed concerns about losing covered parking for its historic fleet of aircraft near the site of its future museum on the West Apron.

Consideration for office space should also be given in the expansion of the former EQ building for the CBP, which currently has office space in Hangar 1. Comments expressed through the alternative evaluation process indicate there may be a need to accommodate office space for this agency as a part of the proposed expansion of the former EQ building. It is recommended that, prior to the implementation of this alternative, coordination occurs with the CBP to determine their plans for office space at the Airport because of the demolition of Hangar 1, and to determine the size of office space CBP may need if integrated into the expansion of the former EQ building. As with any relocation, communication between the Airport and tenants will be key to the successful implementation of this recommended development option.

## 4.8 West Apron

The review of facility requirements found that the West Apron is used for a variety of itinerant and based aircraft parking associated with Hangar 1, Eastern Michigan University's (EMU) Eagle Flight Centre, and a private hangar. Most of the activity on the West Apron occurs at Hangar 1 which, at its peak, requires use of most of the apron; thus, improvements to the apron are dependent upon the decision to continue to operate and maintain Hangar 1. Three alternatives are presented in **Figure 4-17** to show options available to improve the apron based on the operation of Hangar 1 taking into consideration cost implementation factors. The advantages and disadvantages of each alternative and the identification of the preferred development option are presented in this section.

**Figure 4-17 – West Apron Alternatives**




Legend:
Proposed building rehabilitation/construction site
Pavement reconstruction areas
Airport property line
Source: Mead & Hunt, Inc. (2016)

## 4.8.1 Alternative 17 – Reconstruct West Apron (including Eagle Flight)

Alternative 17 proposes to reconstruct the entire West Apron to the west of Taxiway B including a portion in front of the fire station to the east of Taxiway B. This alternative includes the rehabilitation of the portion of the apron adjacent to the Eagle Flight Centre, for which EMU is responsible EMU. The rehabilitation has been included as an order of magnitude comparison with the other development options. The estimated cost to implement Alternative 17 is **$28,100,000**. The advantage to consider with Alternative 17 is that it retains West Apron activities at their current location if Hangar 1 is kept in operation throughout the planning period; however, the cost to rehabilitate the entire apron west of Taxiway B and to improve Hangar 1 so that Alternative 17 is a viable option are disadvantages to consider. The advantage and disadvantages are summarized in **Table 4-17**.

**Table 4-17 – Alternative 17 Summary of Considerations**

| Advantages | Disadvantages |
|---|---|
| • Retains West Apron activities at existing location | • Assumes Hangar 1 is kept in operation<br>• Cost to rehabilitate entire West Apron<br>• Cost to improve Hangar 1 for viability of this development option |
| **Estimated Cost: $28,100,000** | |

### 4.8.2 Alternative 18 – Reconstruct West Apron at 75 Percent Size and Reduced Strength

To reduce the cost to improve the West Apron so that it can continue to support activities at Hangar 1, Alternative 18 proposes to reconstruct the apron at 75 percent of its existing size and at a reduced pavement strength. To accomplish this, three "islands" would be created by the construction of three connector taxiways between the proposed reduced size of the West Apron and Taxiway B. Similar to Alternative 17, Alternative 18 also includes reconstruction of the southern portion of the West Apron adjacent to the Eagle Flight Centre and a private hangar as well as a portion of the apron to the east of Taxiway B in front of the fire station. Alternative 18 is estimated to cost **$17,300,000** to implement.

The advantage of Alternative 18 is that it provides a more cost-effective option to improve the West Apron so that activities can continue to be supported at Hangar 1. However, at an estimated cost of $22,400,000, the cost to implement Alternative 18 can also be considered a disadvantage when considering the costs of other needed infrastructure improvements at the Airport. A final consideration with Alternative 18 is that it would require the continued operation of Hangar 1 to make this a viable option to support the apron demands of the Airport's users. A summary of the advantage and disadvantages to consider Alternative 18 is presented in **Table 4-18**.

**Table 4-18 – Alternative 18 Summary of Considerations**

| Advantage | Disadvantages |
|---|---|
| • Retains West Apron at a reduced implementation cost | • Cost of implementation remains significant<br>• Requires continued operation of Hangar 1 |
| **Estimated Cost: $17,300,000** | |

### 4.8.3 Alternative 19 – Reconstruct West Apron adjacent to Eagle Flight Centre

Alternative 19, which proposes to reconstruct the southern portion of the West Apron adjacent to the Eagle Flight Centre and a private hangar, was developed assuming that Hangar 1 would be removed and there would no longer be a need for improving most of the existing apron pavement. In addition, Alternative 19 also proposes to reconstruct a portion of the West Apron to the east of Taxiway B in front of the fire station. Implementation of Alternative 19 also assumes the taxiway routing would be straightened at the southern end of the West Apron. Reconstructing the West Apron adjacent to the Eagle Flight Centre as proposed by Alternative 19 is estimated to cost **$5,100,000**.

The cost to implement Alternative 19 is an advantage in comparison with the other development options since there would no longer be a need to improve or continually maintain the remainder of the West Apron. Likewise, the fact that Alternative 19 improves only the southern portion of the West Apron is an additional factor to consider since it assumes the remainder of the West Apron and Hangar 1 would be closed. Closing these facilities would require relocation of activities that currently occur at this location to elsewhere on the Airport. **Table 4-19** summarizes the advantages and disadvantages to consider with Alternative 19.

**Table 4-19 – Alternative 19 Summary of Considerations**

| Advantages | Disadvantages |
|---|---|
| • Cost of implementation | • Closes most of West Apron |
| • Eliminates need to fully maintain West Apron | • Requires relocation of Hangar 1 activities |
| **Estimated Cost: $5,100,000** | |

### 4.8.4 West Apron Recommended Alternative

Since plans are for Hangar 1 to be closed and removed, it is recommended Alternative 19 be implemented to improve the West Apron. This would reconstruct the apron area adjacent to the Eagle Flight Centre, a private hangar, and in front of the fire station to the east of Taxiway B. Except for the Yankee Air Museum, these would be the remaining users in demand of West Apron space, eliminating the need to reconstruct the entire apron as proposed by Alternative 17 and Alternative 18. Thus, Alternative 19 is the recommended option to improve the West Apron.

With implementation of Alternative 19, consideration will need to be given to the Yankee Air Museum, which is in the process of relocating its museum to the west side of the airfield on the site of the former bomber plant adjacent to Hangar 1. Yankee Air Museum officials expressed interest in airside access via the West Apron for the new museum to allow for itinerant aircraft visitors and to park and taxi their fleet of airworthy historic aircraft. It is recommended that, as part of the implementation of Alternative 19, consideration also be given to the West Apron demands of the new Yankee Air Museum, which could be achieved either through a lease agreement or transfer of ownership.

## 4.9 South Apron

The review of facility requirements determined there is a need to improve the condition of the South Apron since it is used to support the operations of Kalitta Charters. This section reviews the four alternatives developed (**Figure 4-18)** with the advantages and disadvantages of each and the preferred alternative recommended at the conclusion.

### 4.9.1 Alternative 20 – Reconstruct South Apron

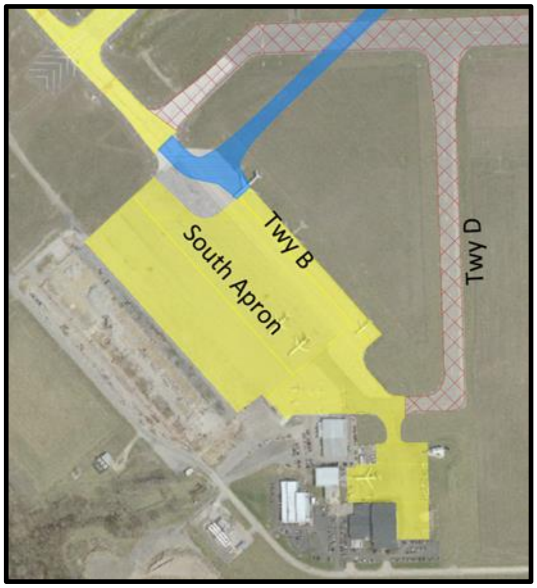
To provide a baseline for the comparison of costs, Alternative 20 proposes to reconstruct the entire South Apron and the apron adjacent to the Kalitta facility at an estimated cost of **$35,800,000**. The advantage of this alternative is that the entire existing south apron would be maintained. The disadvantage to this alternative is the cost to rehabilitate the entire apron. These considerations are shown in **Table 4-20** for comparison with the other development options.

**Table 4-20 – Alternative 20 Summary of Considerations**

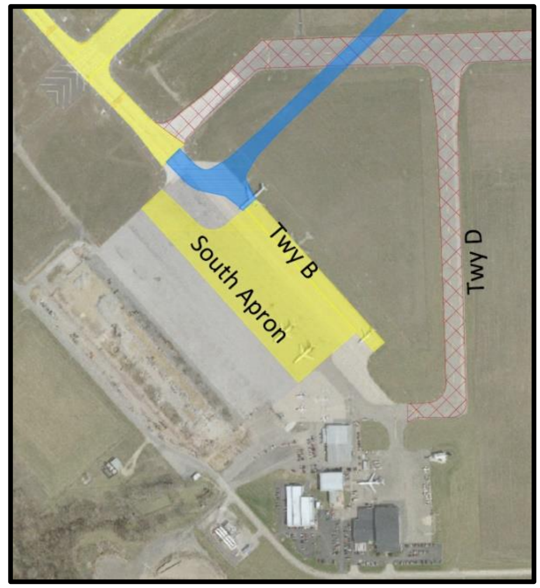
| Advantage | Disadvantage |
|---|---|
| • Retains existing South Apron | • Cost of implementation |
| **Estimated Cost: $35,800,000** | |

**Figure 4-18 – South Apron Alternatives**

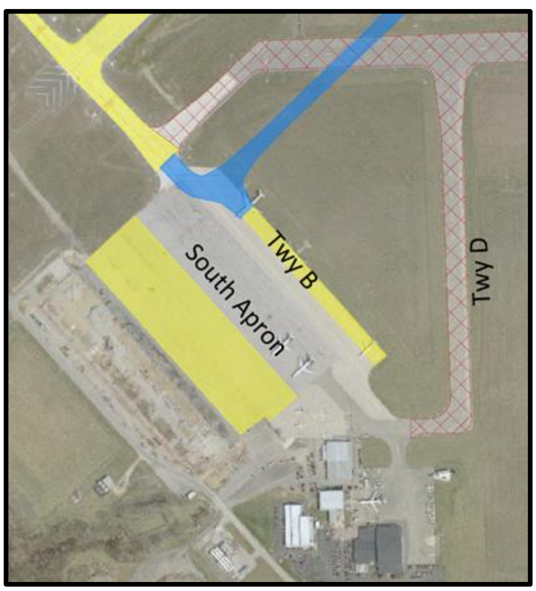
**ALTERNATIVE 20**




**ALTERNATIVE 21**




**ALTERNATIVE 22**




**ALTERNATIVE 23**


Legend:

Pavement reconstruction areas

Airside pavements to be removed

Source: Mead & Hunt, Inc. (2016)

### 4.9.2 Alternative 21 – Reconstruct South Apron (400 feet from Taxiway B Centerline)

Alternative 21 proposes to reconstruct the South Apron at a reduced size of 400 feet from the centerline of Taxiway B to focus apron improvements so that parking can be accommodated for a row of narrow-body aircraft. The estimated cost to implement Alternative 21 is **$12,800,000**. In considering the advantages of Alternative 21, it provides an option to reconstruct the South Apron at a reduced size in a cost-saving effort without accumulating the expense to improve the entire apron. Should additional apron area be needed, Alternative 21 also offers the advantage of being flexible for additional expansion through improvement of remaining existing pavement. While a less costly option than reconstructing the entire apron, the $12.8 million dollar estimated cost is an additional factor given the costs to improve other needed infrastructure at the Airport. These considerations are summarized in **Table 4-21**.

**Table 4-21 – Alternative 21 Summary of Considerations**

| Advantages | Disadvantage |
|---|---|
| • Provides needed South Apron area without reconstructing the entire existing apron<br>• Allows for additional apron expansion if needed | • Cost of implementation |
| **Estimated Cost: $12,800,000** | |

### 4.9.3 Alternative 22 – Reconstruct South Apron (350 feet Along Front of Former Hangar 2 Area)

Alternative 22 was developed as a complementary option that could be implemented together with Alternative 21. Alternative 22 proposes to reconstruct the South Apron 350 feet along the front of the footprint of the former Hangar 2. This proposed apron improvement area would allow for an additional row of narrow-body aircraft to be parked on the South Apron at a cost of **$12,800,000**. An advantage of Alternative 22 is that is offers an option to provide additional apron area should it be needed to complement Alternative 21. This implementation as a second phase to Alternative 21 is an advantage; however, the dependency of Alternative 21's implementation to implement Alternative 22 is a disadvantage to consider as well. **Table 4-22** summarizes the advantages and disadvantage to consider with Alternative 22.

**Table 4-22 – Alternative 22 Summary of Considerations**

| Advantages | Disadvantage |
|---|---|
| • Can be implemented as part of a second phase to Alternative 21<br>• Allows for additional apron expansion if needed | • Alternative 21's implementation needed to implement Alternative 22 |
| **Estimated Cost: $12,800,000** | |

### 4.9.4 Alternative 23 – Reconstruct South Apron (Kalitta Only)

Alternative 23, which proposes to rehabilitate only the southern portion of the South Apron adjacent to the Kalitta facility, was prepared as a development option if it were decided to transfer the maintenance of the South Apron to a private entity such as Kalitta. At an estimated cost of **$10,200,000**, Alternative 23 offers the advantage of being implemented as part of phased approach to improving the South Apron with Alternative 21 and Alternative 22. If Alternative 23 is implemented as a standalone option, it would not provide sufficient area to meet the parking demands of the South Apron. Likewise, if implemented as a standalone option, the parking demand for the South Apron would need to be transferred to another apron area at the Airport. A summary of the considerations with Alternative 23 is presented in **Table 4-23**.

**Table 4-23 – Alternative 23 Summary of Considerations**

| Advantage | Disadvantages |
| --- | --- |
| • Can be implemented as part of a phased approach to improve the entire South Apron | • Does not meet South Apron aircraft parking demand if implemented as a standalone project<br>• Requires South Apron activity to be transferred to another apron if implemented as a standalone option |
| **Estimated Cost: $10,200,000** | |

### 4.9.5 South Apron Recommended Alternative

There is a need to park large aircraft associated with Kalitta Charters and other itinerant users on the South Apron; however, use of the entire apron area is not needed at all times. Realizing the need to improve cost efficiencies, it is recommended that Alternative 21 be implemented, which proposes to reconstruct a reduced portion of the apron to the west of Taxiway B. This alternative reduces the cost to improve the apron as much as possible while still providing area for the parking of narrow-body aircraft types that are the most demanding types in need of use of the apron.

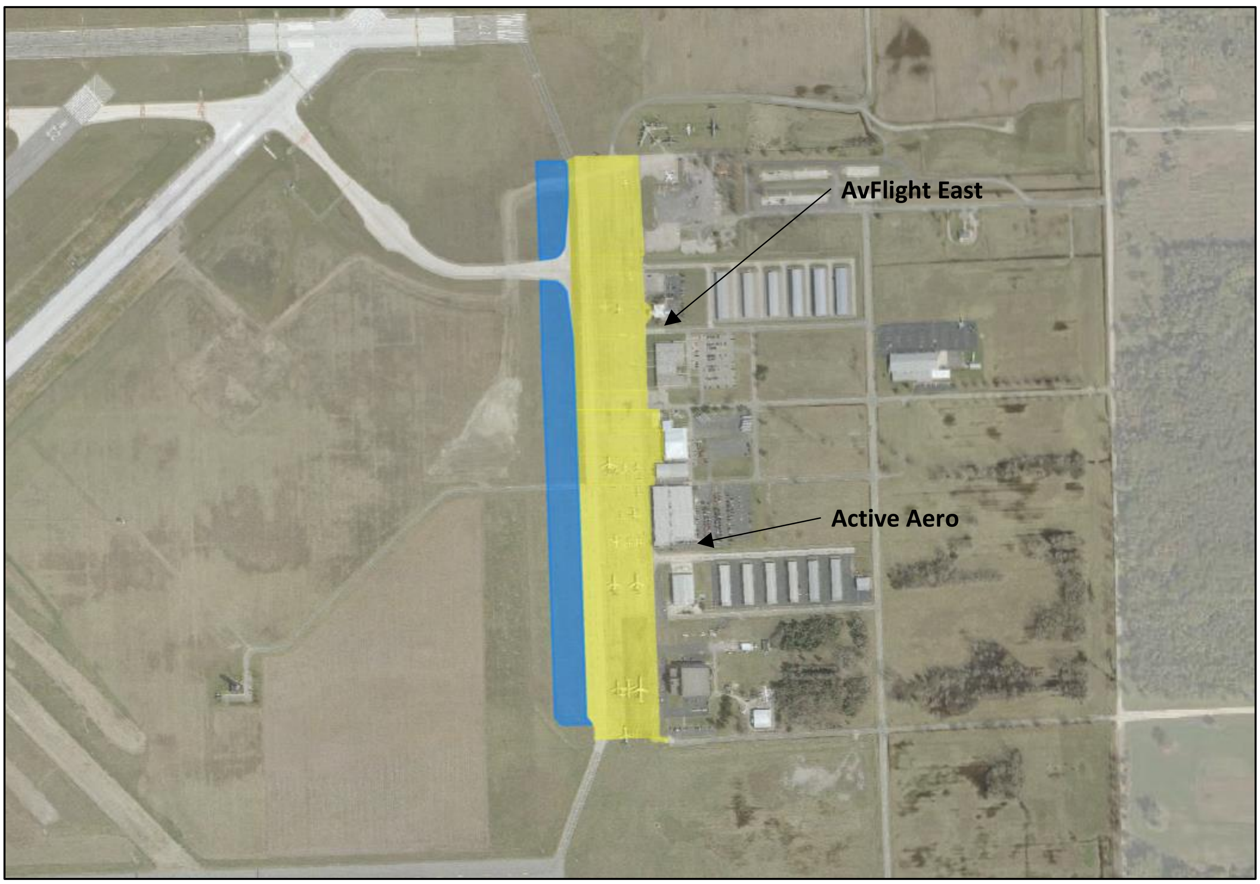
It is important to consider that remaining existing South Apron pavement would be retained, allowing for future improvements such as those proposed by Alternative 22 and Alternative 23 should additional reconstructed apron area be needed to meet demand. With the implementation of Alternative 21, the advantage is that activity presently occurring on the South Apron can remain at its existing location while allowing the Airport to retain control of the surface should it be needed for another existing or future Airport user. Considering the cost needed for other infrastructure improvements at the Airport, reconstruction of a portion of the South Apron to the west of Taxiway B is the preferred development option for this infrastructure element.

## 4.10 East Apron

The review of facility requirements found that the existing capacity of the East Apron should be maintained and expanded to accommodate future additional demand, if needed. The northern half of the East Apron is primarily utilized by the AvFlight East facility for a combination of based and itinerant aircraft parking needs while the southern half of the East Apron is used primarily by Active Aero for their fleet of narrow-body and business jet aircraft. Should reductions or eliminations be made to other apron areas on the airfield, it is recommended that additional apron capacity be made on the East Apron.

**Figure 4-19** presents Alternative 24, which is the single, logical development option to improve the East Apron. Reconstruction of the entire existing apron is recommended by Alternative 24 with a cost of **$19,900,000** estimated for the southern portion adjacent to the Active Aero facility and a cost of **$13,600,000** estimated for the northern portion adjacent to AvFlight. In addition, the northern portion of the apron used primarily by activity occurring at the AvFlight East facility would be reconstructed at a reduced strength more suitable for business jet aircraft types. In addition to these improvements, Alternative 24 also recommends an expansion of the East Apron to the west because of the additional apron area that will be needed with the closure of the West Apron. The estimated cost to expand the East Apron is **$15,400,000**. In total, it is estimated to cost **$48,900,000** to implement the improvements proposed by Alternative 24.

**Figure 4-19 – Alternative 24: Recommended East Apron Improvements**




Legend:
Pavement reconstruction areas
New airside pavements
Source: Mead & Hunt, Inc. (2017)

## 4.11 Aircraft Rescue and Firefighting Facility

The review of facility requirements found that many improvements are needed to the aircraft rescue and firefighting (ARFF) facility including larger vehicle bays for newer generation vehicles and larger support spaces for crew, equipment, and raw materials. In evaluating how to improve the ARFF facility, three alternatives were developed that proposed to either improve the existing facility or construct a new ARFF facility. Preparation of the three alternatives was completed without a detailed analysis of options available to either improve the existing building or construct a new building, which is the type of analysis typically completed as part of a concept/budget report. Rather, alternatives presented in this section are conceptual in nature with cost estimates prepared based on order-of-magnitudes of other similar ARFF facility improvement projects recently completed in the industry. It is recommended that a concept/budget report be conducted prior to implementation of the recommended alternative to better identify the dimensions, sizing, and other design characteristics associated with the preferred development option.

**Figure 4-20** presents the locations of the three alternatives, which are discussed in greater detail in this section with the comparison of advantages and disadvantages that should be considered.

### 4.11.1 Alternative 25 – Refurbish/Expand Existing Facility

One option to improve ARFF facilities at the Airport is to refurbish and expand the existing ARFF facility located on the West Apron at an estimated cost of **$2,500,000**. Alternative 25 proposes improvements to the building, which include, but are not limited to:

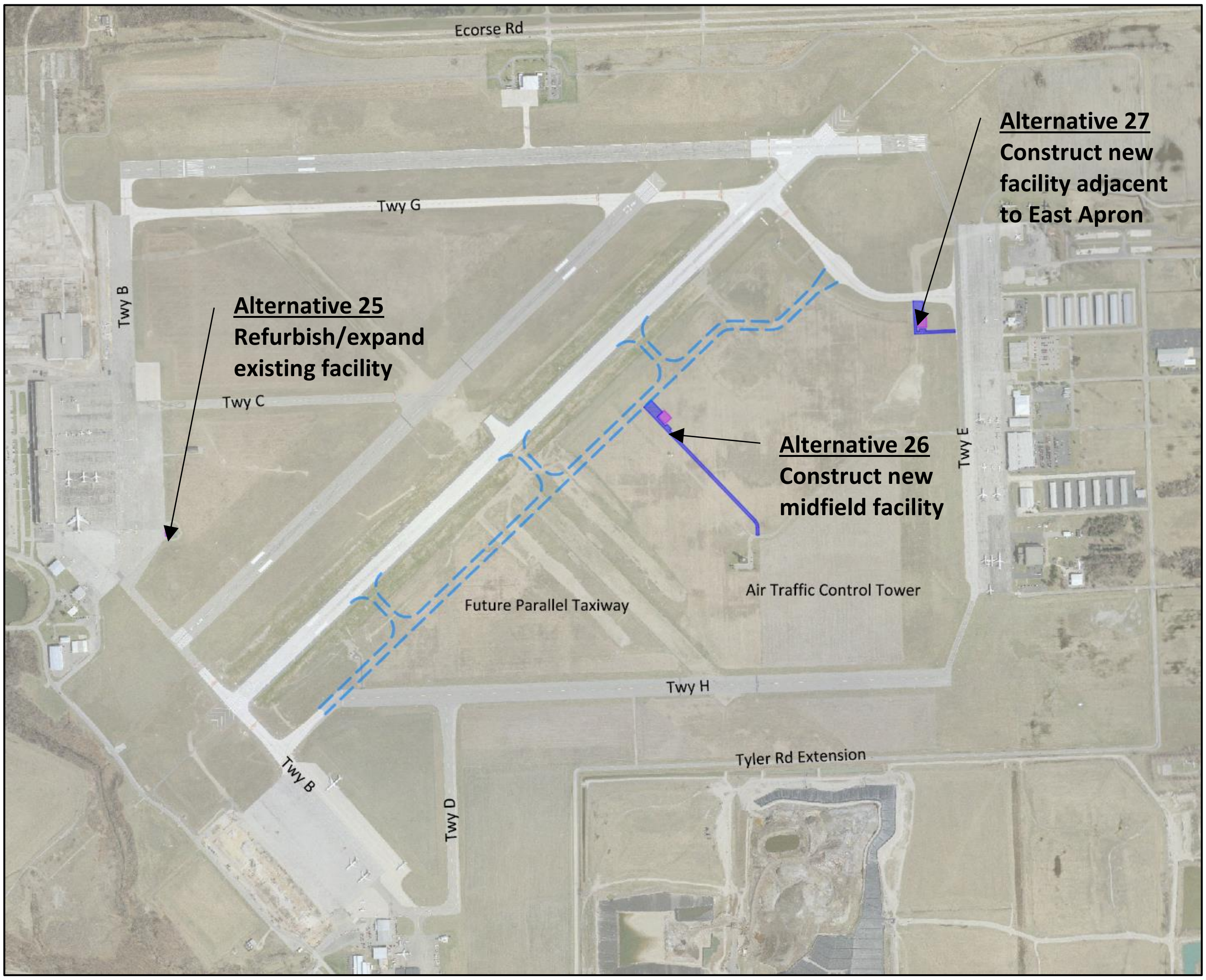
- Enlarge the vehicle bays to accommodate at least two next generation ARFF vehicles
- Create dedicated rooms for personnel functions such as a locker area, dispatching, break room, training, and sleeping
- Expand storage areas for equipment and raw materials
- Improve building utilities

The advantage with Alternative 25 is that it keeps ARFF operations at their existing location. However, renovation and expansion costs should be considered to provide larger vehicle bays for next generation ARFF vehicles, since this would be a significant structural improvement to the building. Likewise, another consideration with Alternative 25 is that landside access to the facility requires vehicles cross the West Apron, which is also utilized by aircraft and increases the chance of an aircraft/vehicle incident. A summary of considerations with Alternative 25 is presented in **Table 4-24**.

### Table 4-24 – Alternative 25 Summary of Considerations

| Advantage | Disadvantages |
|---|---|
| • Retains ARFF operations at existing location | • Cost to renovate / expand facility<br>• Requires significant structure improvement to building to expand vehicle bays<br>• Landside access requires vehicles to cross West Apron |
| **Estimated Cost: $2,500,000** | |

### Figure 4-20 – Aircraft Rescue and Firefighting Facility Alternatives




Legend:

Proposed building rehabilitation/construction site

Pavement reconstruction areas

New airside pavements

Source: Mead & Hunt, Inc. (2016)

### 4.11.2 Alternative 26 – Construct New Midfield Facility

Alternative 26 proposes the construction of a new midfield ARFF facility near the Airport Traffic Control Tower (ATCT) and the midpoint of Runway 5R/23L, if a future parallel taxiway is constructed adjacent to Runway 5R/23L. The construction of this new facility would be sized appropriately to address all the capacity needs identified with the existing facility through the review of facility requirements. While a concept budget report is needed to appropriately identify the facility design and floorplan, enlarged vehicle bays and dedicated personnel and storage areas would be included as well as implementation of energy efficient utilities. In addition to construction of the new building, Alternative 26 also proposes the construction of a landside access road that would connect to an existing service road that provides access to the ATCT. The total estimated order-of-magnitude cost to implement Alternative 26 is **$4,300,000**.

In considering the advantages and disadvantages of Alternative 26, construction of a new building allows a facility to be adequately designed without limitations that could be experienced with the renovation/expansion of an existing structure. The centralized midfield location is also an advantage in that the response time to all points on the airfield would be more equal than available at the existing ARFF facility location. There are also disadvantages to construction of a new building, with the most significant consideration being the cost. Additionally, Alternative 26 cannot be implemented without the construction of a parallel taxiway to Runway 5R/23L. Finally, landside access to a midpoint facility as proposed by Alternative 26 would require vehicles to cross the East Apron, creating an opportunity for a vehicle/aircraft conflict. A summary of the advantages and disadvantages with Alternative 26 is presented in **Table 4-25**.

**Table 4-25 – Alternative 26 Summary of Considerations**

| Advantages | Disadvantages |
|---|---|
| • Construction of a new facility adequately designed for needed demands<br>• Reduced response times<br>• Centralized midfield location | • Cost to construct new facility<br>• Requires construction of parallel taxiway<br>• Landside access requires vehicles to cross East Apron |
| **Estimated Cost: $4,300,000** | |

### 4.11.3 Alternative 27 – Construct New Facility Adjacent to East Apron

Construction of a new ARFF facility adjacent to the East Apron is proposed by Alternative 27. Like Alternative 26, the construction of this new facility would be sized appropriately to address capacity needs identified through the review of facility requirements such as enlarged vehicle bays and dedicated personnel and storage areas. The design of a new building would also incorporate energy efficient utilities. In addition to construction of the new building, Alternative 26 proposes the construction of a landside access road that would connect to an existing service road that provides access to the ATCT. The total estimated order-of-magnitude cost to implement Alternative 26 is **$4,000,000**.

Like Alternative 26, Alternative 27 offers the advantage of being able to construct a new building to adequately meet demand without design limitations than can be experienced sometimes with the rehabilitation / expansion of an existing structure. The site of the proposed ARFF facility adjacent to the East Apron is an additional advantage given that construction of a parallel taxiway would not be needed to implement this development option. The significant disadvantage with Alternative 27, which is similar to Alternative 26, is the cost to construct a new building. Also similar to Alternative 26 is the additional disadvantage that landside access to the site requires vehicles to cross the East Apron, creating the potential for a vehicle/aircraft conflict. Finally, the site of the proposed facility is not centrally located on the airfield and increases the response time for emergencies should they occur on the south and west of the airfield. **Table 4-26** summarizes the advantages and disadvantages to consider with Alternative 27.

**Table 4-26 – Alternative 27 Summary of Considerations**

| Advantages | Disadvantages |
|---|---|
| • Construction of a new facility adequately designed for needed demands<br>• Does not require construction of future parallel taxiway to Runway 5R/23L | • Cost to construct new facility<br>• Landside access requires vehicles to cross East Apron<br>• Increased emergency response times to west and south of airfield |
| **Estimated Cost: $4,000,000** | |

## 4.11.4 Recommended ARFF Facility Alternative

In reviewing alternatives to improve ARFF facilities at the Airport, it is also important to consider the response time needed for emergency vehicles to reach all areas of the airfield, in particular the requirements set forth by FAR Part 139 for the certification of airports. FAR Part 139 certificated airports are required to have emergency vehicles reach the midpoint of the farthest certificated runway within three minutes from the sound of alarm. A response time analysis was conducted for each ARFF facility alternative to the midpoints of Runway 5R/23L and Runway 9/27 assuming the acceleration, flat line, and turning speeds of ARFF vehicles. The results of this response time analysis are presented in **Table 4-27**. The analysis found that Alternative 26 (midfield location) has the lowest response time to the primary runway (Runway 5R/23L).

**Table 4-27 – Aircraft Rescue and Firefighting Facility Alternatives Response Times**

| ARFF Alternative | Response Times | |
|---|---|---|
| | Runway 5R/23L | Runway 9/27 |
| Alternative 25 – Refurbish/Expand Existing Facility | 2 min 38 sec | 2 min 54 sec |
| Alternative 26 – Construct New Midfield Facility | 1 min 39 sec | 2 min 45 sec |
| Alternative 27 – Construct New Facility Adjacent to East Apron | 2 min 22 sec | 2 min 42 sec |

Source: Mead & Hunt, Inc. (2016)

Taking into consideration the response time to the midpoint of each runway, as well as a geographic qualitative analysis of the response routes needed to travel to other locations on the airfield, Alternative 26, which proposes the construction of a new midfield ARFF facility, appears to be the best option to provide an adequately sized ARFF facility that can minimize response times for emergencies at the Airport. While the cost to construct a new facility is a consideration, it avoids potential design challenges that could be associated with the renovation / expansion of the existing ARFF facility. Likewise, challenges associated with landside access to the site, requiring vehicles to transit the East Apron, can be mitigated through existing mechanisms in place for vehicle crossings associated with landside access to the ATCT. However, implementation of Alternative 26 cannot occur until construction of a future parallel taxiway to Runway 5R/23L is completed, which is a recommended infrastructure improvement identified through this master planning effort. Thus, Alternative 26, which proposes construction of a new midfield ARFF facility, is recommended to improve ARFF facilities at the Airport.

## 4.12 Snow Removal Equipment and Maintenance Facility

The review of facility requirements identified that improvements are needed to snow removal equipment (SRE) and maintenance vehicle facilities at the Airport, most significantly to personnel work areas that are limited such as locker rooms, bunk areas, and break areas needed during snow removal operations. Likewise, there is a need for additional covered storage for out of season equipment as well as a centralized location for all personnel and equipment associated with snow removal and maintenance activities, currently separated between the existing campus and Hangar 1.

In evaluating how to improve SRE and maintenance facilities at the Airport, it was identified that the former EQ building adjacent to the existing SRE/maintenance facility could be renovated and expanded to provide additional vehicle parking and personnel areas. Providing a centralized SRE/maintenance facilities campus would improve task efficiencies since the time needed to traverse between the existing maintenance personnel areas in Hangar 1 and the existing SRE/maintenance facility campus would be eliminated.

This single, logical alternative, which is included as a part of the recommended alternative for improved office areas for Airport administrative and operations staff as well as the CBP, provides the best option to utilize existing infrastructure in providing a centralized campus concept to increase efficiencies associated with snow removal and other airfield maintenance activities.

## 4.13 Utility Infrastructure

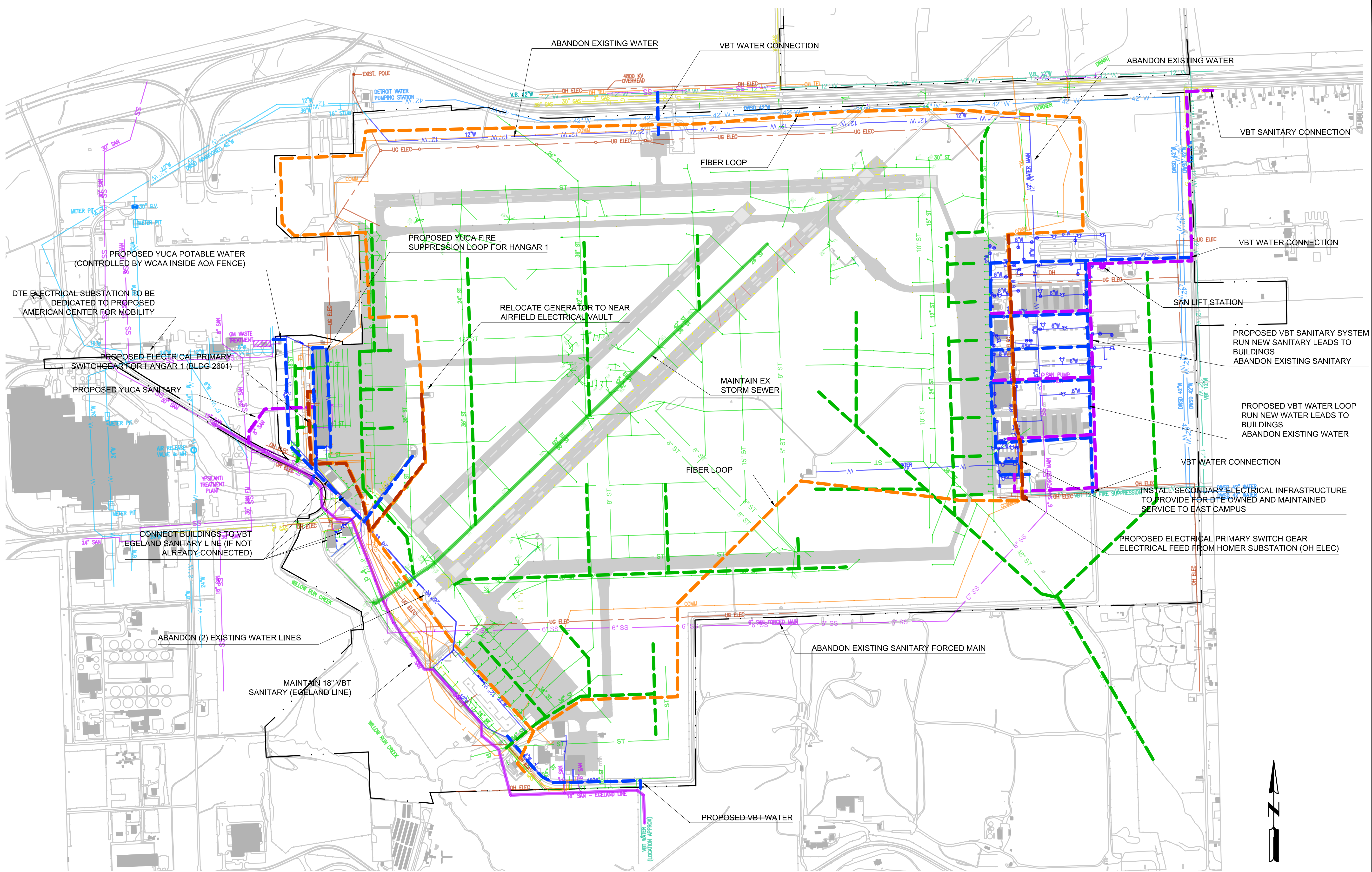
The review of facility requirements found that most of the utility infrastructure at the Airport including water mains, sewer lines, and underground electrical utility lines need replacement since most components have not been replaced since their original installation, some dating back to the 1940s. In addition, installation of fiber optic utility lines for internet access is also needed at the Airport to improve connectivity. Since replacement of existing utility components is needed, alternatives with advantages and disadvantages to consider was not prepared; thus, Alternative 28 is the single, logical alternative developed to improve utility infrastructure at the Airport and is illustrated in **Figure 4-21**.

While not all utility infrastructure components need replacement (for example storm sewer lines adjacent to Runway 5R/23L), it was assumed that the remainder of the utility infrastructure components would need a complete replacement. **Table 4-28** presents the cost estimates prepared for the utility infrastructure improvements at the Airport. Storm sewer improvements were divided into two phases with the first phase focusing on immediate needs necessary to keep the system functional during the planning period, while the second phase would replace the remaining system components. To keep the system functional during the planning period, it is estimated to cost **$25,040,000**, while replacement of all needed utility infrastructure components is estimated to cost **$56,040,000**.

**Table 4-28 – Estimated Costs Utility Infrastructure Improvements**

| Item | Total Cost |
|---|---|
| Storm Sewer (Phase I) | $5,000,000 |
| Water Main | $6,760,000 |
| Sanitary Sewer | $4,030,000 |
| Electrical Utilities | $3,740,000 |
| Fiber Optic Utilities | $5,510,000 |
| **Subtotal (Phase I)** | **$25,040,000** |
| Storm Sewer (Phase II) | $31,000,000 |
| **GRAND TOTAL** | **$56,040,000** |

Source: Mead & Hunt, Inc. (2017)




CONCEPTUAL EXISTING UTILITY LINES TO REMAIN

- Sanitary Sewer Lines
- Storm Sewer Lines

CONCEPTUAL PROPOSED UTILITY LINES

- Water Lines
- Sanitary Sewer Lines
- Storm Sewer Lines
- Fiber Lines
- Electric Lines

NOTE:
CONCEPTUAL PROPOSED UTILITY LINES ARE FOR MAIN TRUNK LINES, BRANCH LINES AND LEADS ARE NOT SHOWN

Mead & Hunt

Mead and Hunt, Inc.
2605 Port Lansing Road
Lansing, MI 48906
phone: 517-321-8334
meadhunt.com



# FIGURE 4-21 RECOMMENDED UTILITY PLAN

WILLOW RUN AIRPORT

REVISION

NOT FOR CONSTRUCTION

| | |
|---|---|
| AIP NO.: | NA |
| M&H NO.: | 29618-00-141529.01 |
| DATE: | JUNE 24, 2016 |
| DESIGNED BY: | MDB |
| DRAWN BY: | |
| CHECKED BY: | |

DO NOT SCALE DRAWINGS

SHEET CONTENTS
CONCEPTUAL UTILITY IMPROVEMENTS

SHEET NO. 1 of 1

C-101

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## 4.14 Recommended Development Plan

In summary, over $196 million of infrastructure improvements are being recommended to address facility needs to meet the demands of the Airport's users through the 20-year planning period. Given this cost, prioritization of projects through the preparation of the Capital Improvement Plan (CIP) will be key to make sure the most critical needs are addressed first, understanding that there are limitations in the amount of funding that will be available from federal, state, and local sources. Again, note that selections of the recommended alternatives were based on the most logical option available to address a facility need in comparison with operational, economic, environmental, and implementation factors. A summary of these alternatives is presented below as well as in **Figure 4-22** at the conclusion of this section. Other recommendations not summarized below from the review of facility requirements are also presented in the figure, such as the identification of areas for aeronautical development and improvement of taxistreets to the T-style hangar areas adjacent to the East Apron. Also note that the costs for the various alternatives are order of magnitude estimates for comparison purposes and further refinement of costs will be conducted as part of the development of the CIP.

**Runway 9/27** – It is recommended that Runway 9/27 be reconstructed at a length of 5,000 feet and at a width of 100 feet from the approach end of Runway 9 to correct the complex runway intersection geometry with Runway 5R/23L and avoid impacts to the ACM while still providing a crosswind runway for single-engine, twin-engine, and small- to mid-sized business jet aircraft.

**Runway 5L/23R –** Due to AIP funding eligibility guidelines, and the need to reduce operational and project implementation costs, it is recommended that Runway 5L/23R be removed when the useful life of the pavement has been exceeded.

**Parallel Taxiway –** To increase the safety and efficiency of the airfield, it is recommended that a parallel taxiway be constructed to the east of Runway 5R/23L.

**Taxiway System –** As a result of the recommendation for a parallel taxiway to Runway 5R/23L, a number of existing taxiways could be closed with improvements focused on the remaining taxiways. These recommended taxiway system improvements are:

- Reconstruct Taxiway B between Taxiway G and Runway 5R/23L
- Reconstruct Taxiway B between Runway 5R/23L and Kalitta
- Construct Taxiway B bypass taxiway
- Reconstruct Taxiway E
- Construct Taxiway F west side parallel to Taxiway E
- Remove Taxiway C
- Remove Taxiway D
- Remove Taxiway H
- Remove Taxiway E2

**Hangar 1 / Administration Offices –** Due to the cost to improve Hangar 1, it is recommended that this structure be removed and an expansion of the former EQ building be completed to replace office space for Airport administration, operations, maintenance, and CBP staff. This expansion of the former EQ building would be completed in concert with a separate renovation and expansion project to also improve the building for maintenance vehicle equipment storage and personnel work areas. Coordination with the existing tenants of Hangar 1 will be necessary to implement this alternative so that options are available for their relocation to other sites on the airfield.

**West Apron –** With the closure and removal of Hangar 1, it is recommended the West Apron be reconstructed adjacent to the Eagle Flight Centre, a private hangar, and in front of the fire station at the southern portion of the existing surface.

**South Apron –** Understanding the cost necessary to improve the entire apron when full capacity is not needed all the time, is it recommended that a reduced portion be reconstructed to the west of Taxiway B. A phased approach to improve the remainder of the apron can be implemented as demand dictates and financial resources are available.

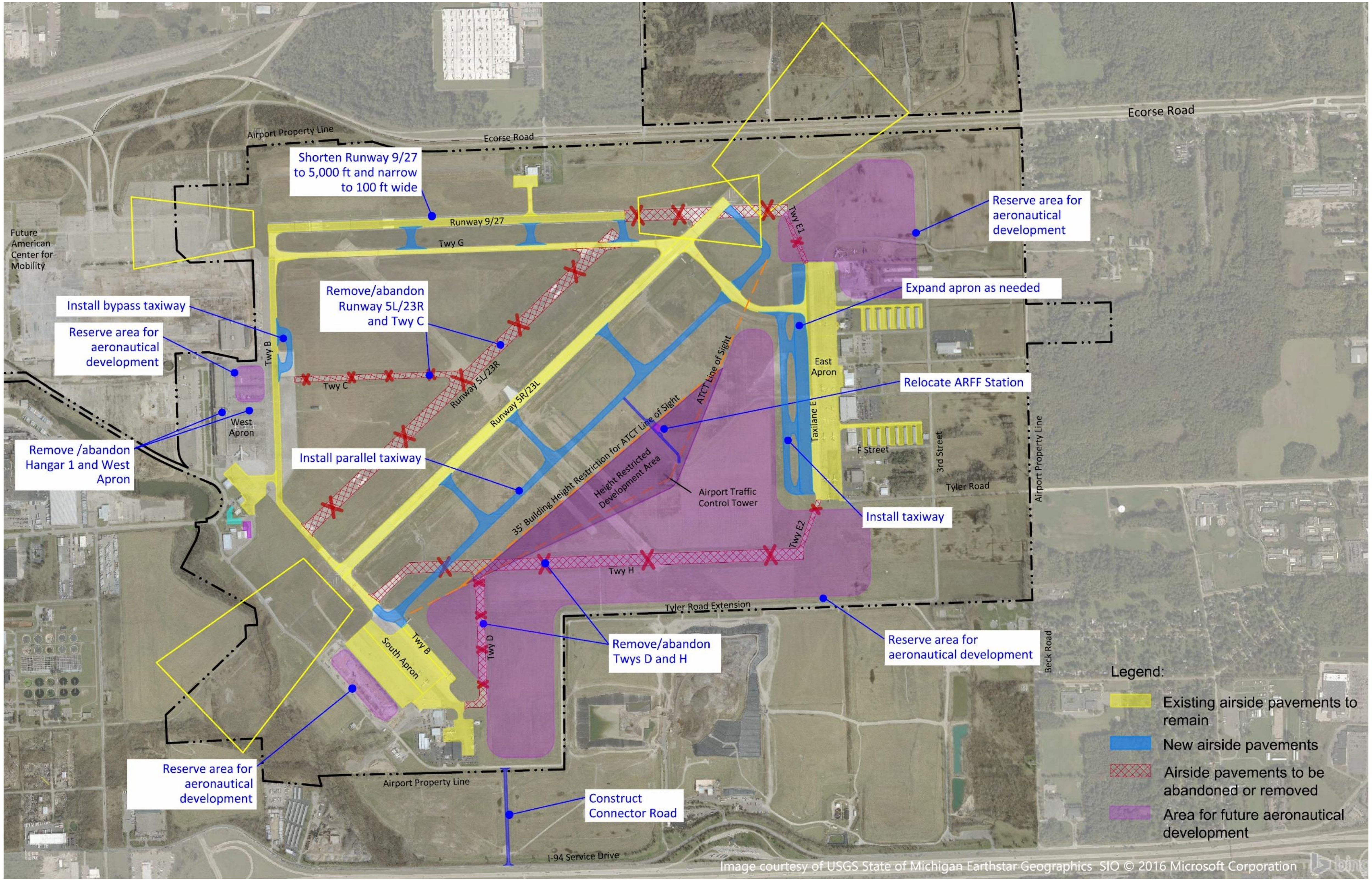
**East Apron –** It is recommended that the entire East Apron be reconstructed as well as expansion of the apron surface to the west to accommodate capacity removed from the closure of the West Apron and Hangar 1. Pavement reconstructed to the north adjacent to the AvFlight East facility is recommended at a reduced strength more appropriate for the single-engine, twin-engine, and business jet size aircraft types that most frequently park on its surface.

**Aircraft Rescue and Firefighting Facility –** Construction of a new midfield structure near the ATCT and midpoint of Runway 5R/23L is recommended to improve the facility for ARFF at the Airport. It is important to note that construction of a parallel taxiway is needed for the implementation of this alternative.

**Snow Removal Equipment and Maintenance Facility –** Refurbishment and expansion of the former EQ building adjacent to the existing SRE building is recommended to improve facilities and provide a centralized campus for equipment and personnel.

**Utility Infrastructure –** Complete replacement of most utility infrastructure at the Airport is needed including storm sewer lines, water mains, sanitary sewer line, and electrical utilities as well as installation of fiber optic lines.

Figure 4-22 – Recommended Development Plan




Source: Mead & Hunt, Inc. (2017)

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**Chapter 5**

# Environmental Overview

Prior to the implementation of any infrastructure project receiving federal funds, a review of environmental categories must be conducted in accordance with the National Environmental Policy Act of 1969 (NEPA). As a part of the master planning process, a review was conducted of these categories to identify potential environmental concerns that should be considered for the recommended development actions. This review was not intended to identify or delineate any specific environmental concern nor can it be used in the place of a Categorical Exclusion (CatEx), Environmental Assessment (EA), or an Environmental Impact Statement (EIS) to fulfill NEPA requirements.

Information presented in this chapter is based on data collected from a number of available resources as well as previous environmental studies and discussions from Wayne County Airport Authority (WCAA) staff. Review of each category was conducted in conformance with Federal Aviation Administration (FAA) Order 1050.1F, *Environmental Impacts: Policies and Procedures*, FAA Order 5050.4B, *National Environmental Policy Act (NEPA) Implementing Instructions for Airport Actions*, FAA Advisory Circulars (ACs), and applicable federal, state, and local regulations. Further investigation of all 23 environmental categories, for example, cultural resource studies or wetland delineations, will be needed to verify the information presented in this chapter during preparation of a NEPA document prior to design and construction of each recommended alternative.

The presentation of information from the environmental overview has been organized into the following sections:

5.1 Air Quality
5.2 Biological Resources

5.3 Climate
5.4 Coastal Resources
5.5 Department of Transportation Act, Section 4(f)
5.6 Farmlands
5.7 Hazardous Materials, Solid Waste, and Pollution Prevention
5.8 Historical, Architectural, Archeological, and Cultural Resources
5.9 Land Use
5.10 Natural Resources and Energy Supply
5.11 Noise and Noise-Compatible Land Use
5.12 Socioeconomics, Environmental Justice, and Children's Environmental Health and Safety Risks
5.13 Visual Effects
5.14 Water Resources
5.15 Conclusion

## 5.1 Air Quality

An air quality analysis is the measure of the condition of the air in terms of pollutant concentrations. Air quality is regulated out of concern for human health (especially the health of children, the elderly, and those with certain health conditions). Poor air quality can also affect crops and vegetation as well as buildings and other facilities. Air quality is regulated by the United States Environmental Protection Agency (EPA) under the Clean Air Act (CAA), which includes standards for six pollutants. The USEPA regulates these pollutants to permissible levels via standards called National Ambient Air Quality Standards (NAAQS).

Areas that have concentrations of the criteria pollutants below the NAAQS are designated as "attainment areas." Areas with concentrations of these pollutants above the NAAQS are designated as "nonattainment areas." Nonattainment areas must implement plans to lower pollutant levels below the standards. In addition, aviation-related federal actions planned for nonattainment areas must conform to such plans (also known as "General Conformity").

Willow Run Airport (Airport) is located in both Washtenaw and Wayne counties. Washtenaw County was previously designated a nonattainment area for 1-hour Ozone (1979), 8-hour Ozone (1997), PM-2.5 (1997), and PM-2.5 (2006), but is currently in attainment for all criteria air pollutants. Wayne County has been designated a nonattainment area due to Sulfur Dioxide since 2010. It had previously been designated nonattainment due to 1-hour Ozone (1979), 8-hour Ozone (1997), Carbon Monoxide (1971), PM-2.5 (1997), and PM-2.5 (2006).

Due to Wayne County's status as a nonattainment area, proposed projects at the Airport (especially those which may increase landside or airside capacity or result in a change in operations) will need to be evaluated to determine if they:

- Are listed as exempt under the Clean Air Act;
- Are presumed to conform to the Clean Air Act; or
- Would result in emissions which are below de minimis levels

Conformance with Michigan's State Implementation Plan and other state or local air quality standards will also need to be evaluated on a project by project basis.

## 5.2 Biological Resources

Biological resources include plants (vegetation), animals (wildlife), and the habitats where they occur. Habitats are the resources and conditions that support the continuous existence of plants or animals in any particular area. Together, biological resources form ecosystems that are dynamic and respond over time to changes in the environment, whether natural or human-induced. Biological resources provide aesthetic, recreational, and socioeconomic values to society as well as being valuable in their own right. Accordingly, federal and state laws and statutes exist to protect certain species and habitats of special importance.

The Endangered Species Act (ESA) is the primary statute concerning biological resources such as fish, wildlife, and plants, and their habitats. The ESA requires federal agencies to conserve threatened and endangered species and avoid adverse impacts to their designated critical habitats.

Early agency coordination with the EPA for this master plan project directed the use of the United States Fish and Wildlife Service's (USFWS) Information for Planning and Conservation (IPaC) tool to create a trust resources list; the agency also directed the use of the Fish and Wildlife Service's website to obtain detailed information about the species listed in the IPaC report and their habitats in order to determine if there is suitable habitat for listed species within the Airport area (see **Appendix B**).

According to an IPaC Trust Resources Report generated with data provided by the USFWS, there are five Federally-listed endangered species and four Federally-listed threatened species in the vicinity of the Airport. Due to the disturbed and developed nature of the Airport property, it is possible that the property does not provide quality habitat for Federally-listed species.

Review of detailed information about these species and their habitats was not completed under this master plan project; further research and consultation with the USFWS regarding Federally-listed species will likely be required during NEPA-level assessments conducted for individual projects.

Early agency coordination with the Michigan Department of Natural Resources (DNR) for this master plan project resulted in a response that the DNR is no longer conducting Environmental Reviews and directed the request for information to the Michigan State University (MSU) Extension Michigan Natural Features Inventory (See **Appendix B**). The EPA also recommended use of the Michigan State University Extension Michigan Natural Features Inventory Rare Species Explorer website to identify state-listed species in the project area.

According to the inventory, there are 58 State-listed endangered species, 94 State-listed threatened species, and 145 species of special concern in Washtenaw and Wayne counties. The database also lists 13 Federally-listed endangered species and five Federally-listed threatened species in Washtenaw and Wayne counties. Due to the developed nature of the Airport property (mowed turf grass, pavement, and active airport operations), it is unlikely the area provides quality habitat for State-listed threatened or endangered species. Further consultation with the appropriate state agency may be required for NEPA-level assessments conducted for each individual development project proposed by the master plan.

Biotic resources are also protected under the Migratory Bird Treaty Act (MBTA), the Fish and Wildlife Coordination Act, and the Magnuson-Stevens Act, among others.

The MBTA protects migratory birds, including their eggs, active nests, and bird parts. According to an IPaC Trust Resources Report generated for the area, there are 21 migratory bird species of conservation concern that could potentially be affected by activities in the vicinity of the Airport. However, no tree or brush type vegetation clearing is included in the projects proposed under this master plan; therefore, the taking of birds protected by the MBTA is not anticipated.

The recommended projects proposed under this master plan do not involve modification of a natural stream, body of water, or other water resources; therefore, the projects are unlikely to impact resources protected under the Fish and Wildlife Coordination Act. The projects proposed under this master plan are not anticipated to directly or indirectly affect fish species, habitat, or public access. Also, the Airport does not appear to include water resources that may be considered fish habitat. Therefore, impacts to resources protected under the Magnuson-Stevens Act are not anticipated from the proposed development projects.

## 5.3 Climate

Greenhouse gases are those that trap heat in the earth's atmosphere. Both naturally occurring and man-made, or anthropogenic, greenhouse gases include water vapor ($H_2O$), carbon dioxide ($CO_2$), methane ($CH_4$), nitrous oxide ($N_2O$), and ozone ($O_3$).

Research has shown a direct link exists between fuel combustion and greenhouse gas emissions. Therefore, sources that require fuel or power at an airport are the primary sources that would generate greenhouse gases. Aircraft are probably the most often cited air pollutant source, but they produce the same types of emissions as cars. Aircraft jet engines, like many other vehicle engines, produce $CO_2$, water vapor, nitrogen oxides, carbon monoxide, oxides of sulfur, unburned or partially combusted hydrocarbons (also known as volatile organic compounds [VOCs]), particulates, and other trace compounds.

Airport development has the potential to both affect climate change and to be affected by it. Changes in resource categories such as air quality, natural resources, and energy supply can potentially contribute to climate change by increasing the amount of greenhouse gases emitted. Conversely, some airport projects may be impacted by the potential effects of climate change, such as rising sea levels.

Based on FAA data, operations activity at the Airport as compared to total aviation activity throughout the United States represents less than 1 percent of U.S. aviation activity. Therefore, assuming that greenhouse gases occur in proportion to the level of activity, greenhouse gas emissions associated with existing and future aviation activity at the Airport would be expected to represent less than 0.03 percent of U.S.-based greenhouse gases. Therefore, emissions of greenhouse gases as a result of the proposed projects are not expected to be significant.

## 5.4 Coastal Resources

Coastal resources are those within coastal waters and shorelands such as islands, salt marshes, estuaries, beaches, and dunes as well as their wildlife and habitats. Coastal resources include those along the oceans as well as the Great Lakes. These resources are protected under the Coastal Barrier Resources Act and the Coastal Zone Management Act as well as several other statutes.

As noted, the Airport is located in both Washtenaw and Wayne counties. Washtenaw County is an inland county and is not included in the State's Coastal Zone management Plan (CZMP) nor in the Coastal Barrier Resource System (CBRS) as defined by the USFWS.

Wayne County has a short border with Lake Erie, and some areas of Wayne County are included in the State's CZMP and the CBRS. However, the Airport is located inland approximately 20 miles from the shore of Lake Erie; therefore, proposed projects at the Airport are not anticipated to occur in or impact a coastal zone in Wayne County.

## 5.5 Department of Transportation Act, Section 4(f)

Department of Transportation (DOT) Act, Section 4(f) properties are publicly-owned parks, recreational areas, wildlife and waterfowl refuges, and historic sites that are protected by the DOT Act of 1996 (now codified at 49 U.S.C. § 303). There are several parks and community resources in proximity to the Airport, including resources operated by the Cities of Bellville and Ypsilanti, Van Buren Township, and Washtenaw and Wayne Counties.

Three parks and two recreation areas are within a one-mile radius of the Airport. These parks are Van Buren Park, Van Buren Township Park, and Victory Park. Recreation areas associated with the Wayne County Fairgrounds and

Harbour Club Golf Course are located within one mile of the Airport. Van Buren Park is located approximately 0.5 miles south of the Airport. Van Buren Township Park (also known as Beck Fields) is located approximately 0.15 miles southeast of the airport. Victory Park is located approximately 0.6 miles northeast of the Airport. Wayne County Fairgrounds is located approximately 0.8 miles southeast of the Airport. Harbour Club Golf Course is located about one mile south of the Airport.

There are also two schools (with playgrounds) located within a one-mile radius of the Airport. These schools are McBride Middle School and Rawsonville Elementary School. McBride Middle School is located approximately 0.4 miles southeast of the Airport while Rawsonville Elementary School is located about 0.9 miles southwest of the Airport.

Based on the Information for Planning and Conservation (IPaC) Trust Resources Report, it appears there are no wildlife refuges or wildlife management areas or scenic byways in proximity of the Airport.

Projects proposed for construction on Airport property are not anticipated to cause "taking" of these parks, recreation areas, or schools in the area since the proposed development will occur on existing Airport property. Other effects, such as noise and air quality, may need to be evaluated to determine whether they impact these resources.

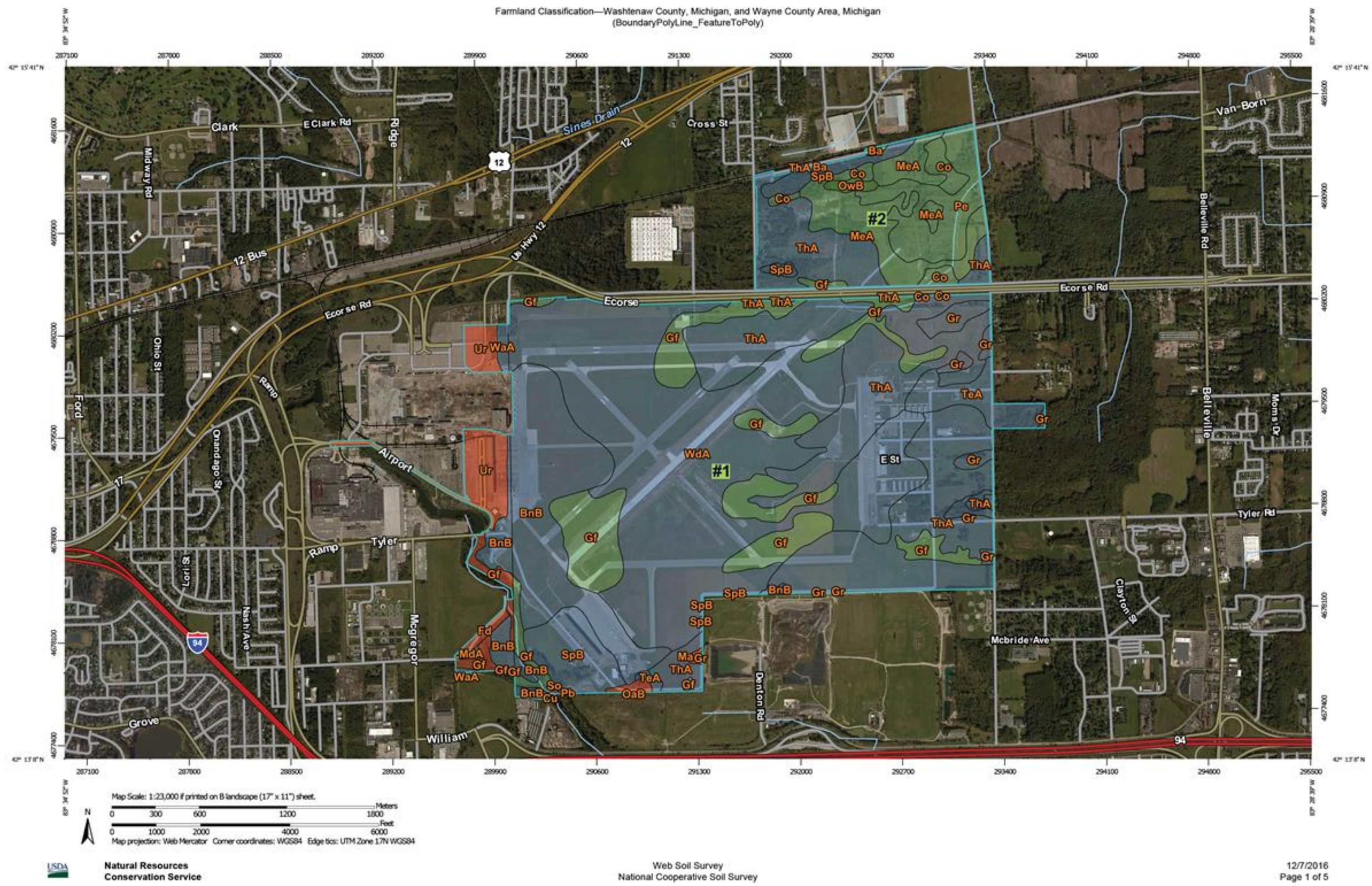
## 5.6 Farmlands

The Farmland Protection Policy Act of 1981 (FPPA) was enacted to minimize the extent to which federal actions and programs contribute to the unnecessary and irreversible conversion of farmland to non-agricultural uses. Farmland can be classified as "prime farmland," "unique farmland," or "farmland that is of statewide or local importance," pursuant to the FPPA. Prime farmland has the best combination of physical and chemical characteristics for producing food, forage, fiber, and oilseed crops. Unique farmland is defined as land other than prime farmland that is used for the production of specific high-value food and fiber crops such as citrus, tree nuts, olives, cranberries, fruits, and vegetables. Any federal action that may result in conversion of farmland to a non-agricultural use requires coordination with the United States Department of Agriculture (USDA) Natural Resource Conservation Services (NRCS).

According to the NRCS Web Soil Survey Data Explorer, Airport property contains prime farmland, prime farmland if drained, and farmland of local importance. **Figure 5-1** presents the farmland classification map that was generated from the NRCS Web Soil Survey Data Explorer.

Early coordination was conducted with the USDA to identify resources under the agency's purview that may be impacted by future projects at the Airport. In response to a request for information about any resources on or near Airport property, the USDA indicated that the Airport is located in an urbanized area associated with Ann Arbor, Michigan and is therefore exempt from the FPPA (see **Appendix C**).

**Figure 5-1 – NRCS Web Soil Survey Data Explorer Soil Classification Map***




*Map legend appears on the following page.

Source: Natural Resources Conservation Service Web Soil Survey Data Explorer (2016)

# MAP LEGEND

**Area of Interest (AOI)**

Area of Interest (AOI)

**Soils**

**Soil Rating Polygons**

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

**Soil Rating Lines**

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

**Soil Rating Points**

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

**Water Features**

## 5.7 Hazardous Materials, Solid Waste, and Pollution Prevention

Federal, state, and local laws regulate the handling and disposal of hazardous materials, chemicals, substances, and wastes. Applicable federal statutes include the Resource Conservation and Recovery Act (RCRA) and the Comprehensive Environmental Response, Compensation, and Liability Act, as amended by the Superfund Amendments and Reauthorization Act of 1986 and the Community Environmental Response Facilitation Act of 1992.

The United States Environmental Protection Agency (US EPA) NEPAssist database (NEPAssist) database lists the following sites within a one-mile radius of the Airport:

- 0 Superfund sites
- 4 Brownfield sites
- 3 Toxic Release Inventory sites
- 11 National Pollutant Discharge Elimination System facilities
- 6 air emission facilities

During the early agency coordination conducted under this master plan project, the EPA indicated that the single brownfield site located on Airport property is the site of Hangar 2 (see **Appendix C**).

NEPAssist also lists 107 hazardous waste facilities registered under the RCRA within a one-mile radius of the Airport with some of these facilities located on Airport property. Designation as an RCRA facility indicates that these organizations generate hazardous waste and must manage this waste accordingly as well as report this activity to the EPA. Early agency coordination with the EPA resulted in a list of RCRA sites on Airport property (see **Appendix C**).

The Michigan Department of Environmental Quality and Michigan Department of Licensing and Regulatory Affairs Storage Tank Information Databases provide information about underground storage tanks (USTs) and leaking underground storage tanks (LUSTs). Due to the activity in the area, there are several USTs in the vicinity of the Airport. When a release occurs from a UST, it is considered an Open LUST. According to the database, there are 43 Open LUSTs in zip codes 48111 and 48198 with three located on or near Airport property.

Proximity to industrial facilities that are subject to environmental regulation (including hazardous waste generators), when taken alone, is not an indicator of potential hazardous waste impacts or other environmental concerns. Such facilities are heavily regulated and maintained in order to prevent potential issues, and systems are in place to limit and mitigate the impacts of a rare release. Further assessment of potential hazardous material impacts, for example, Phase I or Phase II Environmental Site Assessments, may be required under the preparation of NEPA-level documentation for individual development projects proposed under this master plan.

### 5.7.1 Solid Waste

The FAA Modernization and Reform Act of 2012 updated the definition of airport planning to include waste and recycling that required airports completing a master plan to consider issues related to waste and recycling. To meet this requirement, an Airport Recycling, Reuse, and Waste Reduction Plan was developed for the Airport and is included in **Appendix D** of this master plan report. In general, the WCAA has a recycling program in place for the Authority's offices at the Airport with the potential to expand this program to include other materials and/or materials generated by Airport tenants. Please see the plan for more detailed information.

## 5.8 Historical, Architectural, Archeological, and Cultural Resources

Historical, architectural, archeological, and cultural resources include a variety of sites, properties, and facilities related to activities as well as societal and cultural institutions. Such resources express past and present elements of human culture and are important to the community.

Section 106 of the National Historic Preservation Act is the principal statute concerning historical, architectural, archeological, and cultural resources. Section 106 requires that prior to undertaking any action (a project, activity, or program), a federal agency consider that action's potential impacts to these resources, specifically those resources included in, or eligible for inclusion in, the National Register of Historic Places (NRHP).

According to NEPAssist database, there are no historic properties on the NRHP within the proposed project area, on Airport property or within 0.5 miles of the Airport property boundary. According to NEPAssist, the closest listed historic property is the Starkweather Religious Center (Starkweather Hall), which is located about 1.75 miles from the Airport.

Information provided by the Michigan State Historic Preservation Office (SHPO) and enclosed in **Appendix C** describes three elements of historic significance at the Airport: the Bomber Plant, the Willow Run Historic District, and Hangar 2.

### 5.8.1 Bomber Plant and Willow Run Historic District

In 2012, the SHPO determined that the Airport appeared to meet the criteria for listing in the NRHP. In 2013, staff from the SHPO visited the site and reviewed a Cultural Resources Management Plan (CRMP) for the Airport. In early 2014, SHPO expressed the opinion that the Airport contributed to a larger historic place including the adjacent Willow Run Bomber Plant, referred to as the Willow Run Historic District. The Airport's eligibility for listing on the NRHP was dependent on the presence of the bomber plant. In spring 2014, the bomber plant was in the process of being demolished and this action affected the historic character of the property to the extent that the plant and the district no longer met the criteria for listing on the NRHP.

### 5.8.2 Hangar 2

In 2013, SHPO determined that the Hangar 2 contributed to the historic nature of the Willow Run Historic District. With the demolition of the bomber plant, SHPO determined that since the district was no longer eligible for listing, the demolition of Hangar 2 would not result in impacts to historic properties. The SHPO considers the CRMP developed in 2013 as the record of the Airport and documentation of the circumstances resulting in the loss of eligibility of listing.

### 5.8.3 Tribal Resources

Coordination conducted with the Little Traverse Bay Bands of Odawa Indians indicated that there were "no known cultural resources associated with [the] tribe" on or near the Airport (see **Appendix C**).

### 5.8.4 Archeological

According to a CatEx completed in 2012 for reconstruction of Runway 5R/23L and provided by Jacobsen Daniel for review under this master plan, the Michigan Department of Transportation's (MDOT) Environmental Clearance Organizer database showed that the southwest portion of the Airport was identified as an area with the potential to yield artifacts based on past archeological surveys. The CatEx also states that "the entire airfield has been previously disturbed so the likelihood of finding artifacts is minimal." The CatEx also noted that if areas within the areas of potential concern were selected for a batch plant, "a Phase I investigation would be conducted prior to construction to assess the potential for the presence of artifacts." The results of such an investigation were not provided for review under this master plan.

### 5.8.5 Summary

In summary, it does not appear that historical, architectural, archeological, or cultural resources will be impacted by future development proposed by this master plan. As part of NEPA-level assessments for individual projects, further consultation with the SHPO and Tribal Historic Preservation Office will be required to identify potential impacts to these resources, if any, that could result from each proposed project.

## 5.9 Land Use

Land use around the Airport is regulated by the WCAA *Joint Airport Zoning Ordinance of Wayne and Washtenaw Counties*, which has been in effect since October 1, 2016. This ordinance establishes airport zoning that restricts the height of structures and objects, and regulates the use of property around the Detroit Metropolitan Wayne County (DTW) and Willow Run airports. A review of this land use ordinance, which is presented in **Appendix E** was conducted as part of this environmental overview to summarize its jurisdictional authority.

WCAA established the Joint Airport Zoning Ordinance of Wayne and Washtenaw Counties to regulate land uses within a 20-mile radius of the DTW and a 15-mile radius of the Airport. The ordinance also controls the height of objects within these two radii based upon Federal Aviation Regulation (FAR) Part 77 surface dimensions. The plan set that illustrates the boundaries and zones of the Joint Airport Zoning Ordinance is included in **Appendix E**.

All uses existing at the time the ordinance was adopted are "grandfathered," meaning the ordinance does not impact existing structures, even if the height of the use or the use itself does not comply with ordinance regulations. New construction or expansion of existing structures occurring within the jurisdiction of the ordinance must conform to established height limitations and land use restrictions. The ordinance provides the WCAA legal authority to enforce height restrictions on manmade and natural objects and to prevent land uses that would:

- Create electrical interference with radio communications between the airports and aircraft or create interference with navigational aids (NAVAIDs) employed by aircraft
- Make it difficult for flyers to distinguish between any Airport lights and others or cause glare to the eyes of flyers using the airport
- Create air pollution in such amounts as to impair the visibility of flyers in the use of the airports
- Locate or permit the operations of a waste disposal site within 10,000 feet of any runway, unless the construction, location, and operation is approved by the FAA
- Otherwise endanger the landing, take off, or maneuvering of aircraft
- Attract birds
- Raise the descent minimums of any instrument approach procedure or otherwise limit operations at the airports

The Chief Executive Officer of the WCAA is designated as the zoning administrator charged with administering and enforcing the ordinance with a zoning board of appeals established by appointment from the joint airport zoning board. Property owners or entities looking to develop new uses or to change existing uses must file a permit application if the proposed development exceeds the limitations set forth by the ordinance (height and/or use). Those who violate the ordinance are guilty of a misdemeanor and, upon conviction, are punishable by fines not exceeding $500 or imprisonment for a term to not exceed 90 days, or both. Sheriffs of Wayne and Washtenaw counties and their respective deputies are empowered to issue and serve appearance tickets for violations of this ordinance.

Prior to the establishment of the Joint Airport Zoning Ordinance of Wayne and Washtenaw Counties no direct method was available for the WCAA to control land uses surrounding the airports other than through means established indirectly through local township and city zoning ordinances. With the establishment of this ordinance, the WCAA is given legal authority to control incompatible land uses that could impact operations at the Airport.

## 5.10 Natural Resources and Energy Supply

Airport activities, including construction, operation, and maintenance have the potential to modify a facility's consumption of natural resources (such as water or construction materials) and use of energy supplies (electricity, natural gas, or fuel for aircraft and ground vehicles). Natural resource and energy supply impacts are those that could increase the amount of energy required to operate aircraft, Airport-related service vehicles, terminal lighting, and other uses such as heating and air-conditioning. Except for electricity necessary to operate airfield lighting, NAVAIDs, and other energy dependent components, energy requirements for an airport are largely dependent upon aviation activity levels.

The FAA defines two types of energy use that should be considered when determining the potential natural resource and energy supply impacts of a proposed project:

- Natural resource and energy supply uses related to major changes in stationary facilities such as airfield lighting, or building heating and cooling needs that may exceed local supply or capacities
- Natural resource and energy supply uses related to major changes in the movement of aircraft and ground vehicles to the extent that demand exceeds available energy supply

Aviation activity levels at the Airport are projected to increase, which may result in an increase in the energy required for aircraft operations at the facility; however, the proposed removal of Runway 5L/23R and a number of taxiways are anticipated to decrease energy demand. Installation of light-emitting diode (LED) airfield lighting that requires less energy than incandescent lighting may also decrease airfield energy consumption.

Given the availability of natural resources and energy to the Airport as a result of its location near a major metropolitan area and that existing demand for natural resources and energy are within existing capacity, adverse impacts on energy supplies or natural resources as a result of the proposed projects are not anticipated.

## 5.11 Noise and Noise-Compatible Land Use

Noise is considered unwanted sound that, at an airport, is generally associated with the operation of aircraft. Some land uses are more sensitive to noise than others; for example, residential, educational, health, religious, recreational, cultural, and historic areas or sites. As a part of the environmental overview a noise contour analysis was conducted of the recommended airfield configuration based upon 2015 calendar year annual operations from the following data sources:

- Air Traffic Activity System (ATADS) tower counts
- FAA Traffic Flow Management System Counts (TFMSC)
- Terminal Area Forecast reports

Using this information, determinations were made of operational conditions to complete the noise model contour analysis. The conditions that were assumed for the modeling include:

- **Total Aircraft Activity Levels –** The ATADS data showed that for the 2015 base period, there were a total of 59,987 annual operations, or an average of 164 operations per day.

- **Aircraft Fleet Mix Categories –** An aircraft fleet mix representative of the types of aircraft that conduct operations at the Airport according to instrument flight rules flight plan data available from the TFMSC database.
- **Time of Day –** Particular attention is paid to operations occurring after 10 p.m. and before 7 a.m. The overall percentage of nighttime operations at the Airport as determined from the FAR Part 150 study that was conducted is 14.0 percent.
- **Runway Use –** The FAR Part 150 study that was conducted for the Airport determined that aircraft are in southwest flow approximately 49 percent of the time, departing and arriving on Runways 5L & 5R and in northeast flow approximately 38 percent of the time, departing and arriving on Runways 23L & 23R. The remaining 13 percent of the time, aircraft operate to the east and west on Runway 9/27.
- **Departure and Arrival Procedures –** Aircraft departure climb profiles were identified based upon the actual climb gradient for the types of aircraft and distances flown at the Airport.
- **Flight Paths –** FAA radar data was used to identify the location and use of flight paths for arriving and departing aircraft at the Airport. The flight paths were aggregated into a set of generalized flight paths for aircraft to allow the modeling to accommodate changes from existing flight procedures.

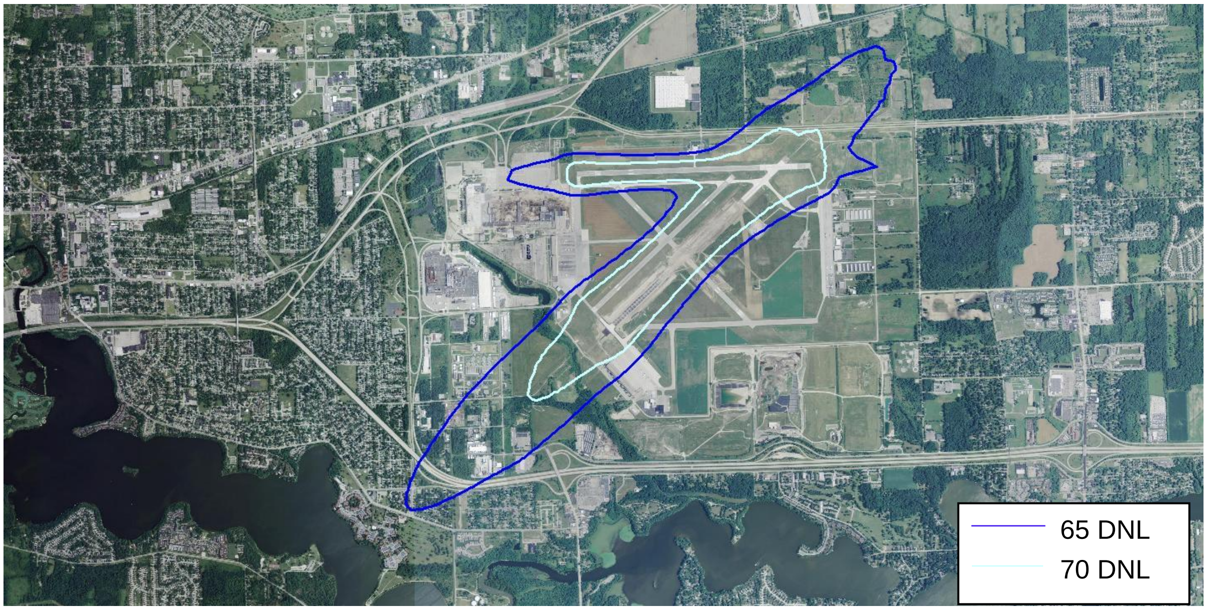
Additional detail on the previously mentioned conditions as well as a copy of the complete noise contour report that was completed for the Airport by BridgeNet International is presented in **Appendix F**.

The primary noise criterion to describe the existing noise environment is the annual average day night noise level (DNL). DNL is the average sound level in decibels (dB), from an average 24-hour operational day at an airport. The DNL contours prepared for an airport include a 10 dB noise penalty for each aircraft operation that occurs between 10 p.m. and 7 a.m. local time to account for the heightened sensitivity of noise during nighttime hours. By determining the locations of the DNL contours, a map is then developed to illustrate the impact of aircraft noise on surrounding land uses. The compiled data was then used as input to the FAA's Aviation Environmental Design Tool (AEDT) v2b computer model for the calculation of noise in the airport environs. Levels of 65 DNL and above are considered to be significant for noise-sensitive land uses such as residences, churches, and schools.

The noise contours do not represent the noise levels present on any specific day; rather they represent the daily energy-average of all 365 days of operation during the year. The noise contour pattern extends from the Airport from the runway end, reflective of the flight tracks used by all aircraft. The relative distance of the contours from the Airport along each route is a function of the frequency of use of each runway for total arrivals and departures, as well as its use at night, and the type of aircraft assigned to it.

Based upon the operational conditions presented previously, and the AEDT noise model, noise contours were developed. The existing annual base period 2015 DNL noise exposure contours for the Airport are presented in **Figure 5-2**. This figure presents the 65 and 70 DNL noise exposure contours. There are 2,027 acres in the 65 DNL noise contour.

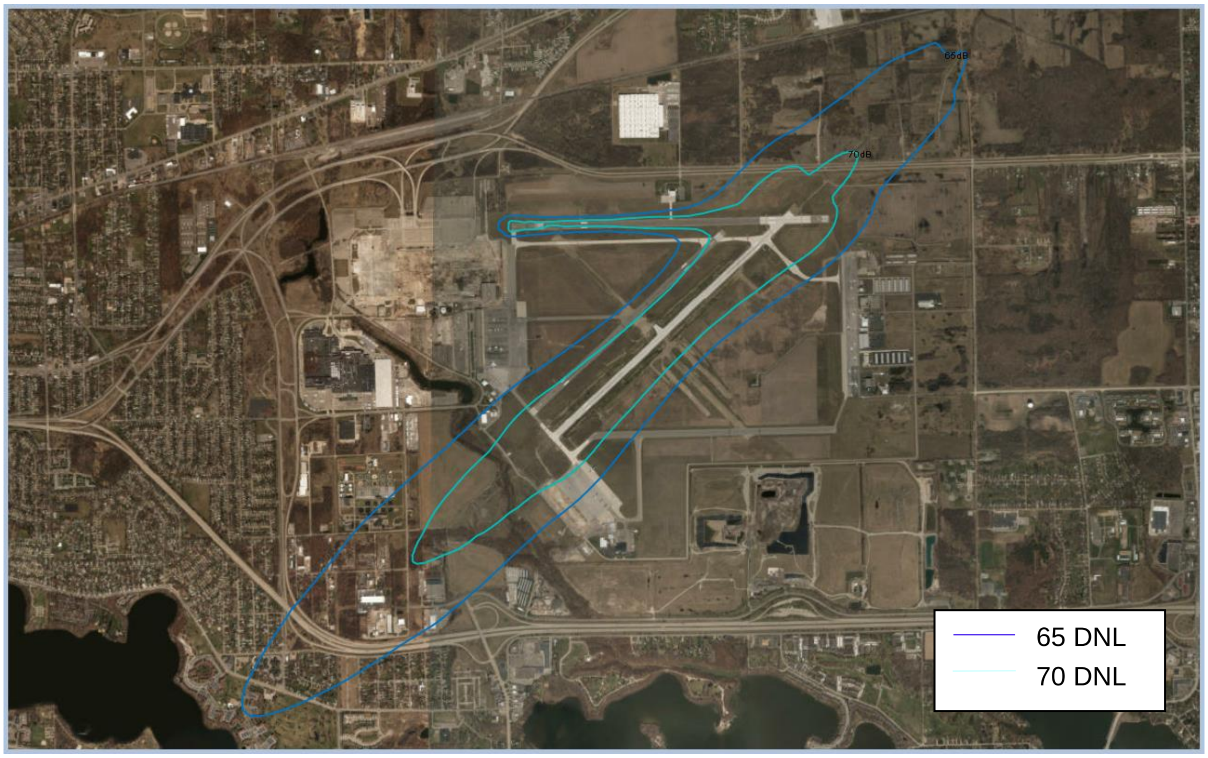
**Figure 5-2 – Existing DNL Noise Contours, Baseline 2015**




Source: BridgeNet International (March 2017)

Assuming that Runway 5R/23L is retained at its existing length, Runway 9/27 is reduced in length at the approach end of Runway 27 to a length of 5,000 feet, and Runway 5L/23R is closed, noise contour modeling was performed for the recommended configuration of the airfield. For this analysis, the time of day, fleet mix, operations, and AEDT flight tracks remain the same as the existing airfield configuration, however, the runway use changes with the closure of Runway 5L/23R. Based upon these conditions, noise contours were developed for the recommended configuration of the airfield that is presented in **Figure 5-3**. This figure presents the 65 and 70 DNL noise exposure contours. There are 1,244 acres in the 65 DNL noise contour.

**Figure 5-3 – Recommended Airfield Configuration DNL Noise Contours**




Source: BridgeNet International (March 2017)

In summary, the overall shape of the existing and recommended airfield configuration contours are very similar since aircraft will be using the same general flight patterns, with the majority of traffic utilizing Runway 5R/23L and a lesser amount of Runway 9/27. Although increased traffic is expected to use Runway 5R/23L, the noise contour to the southwest of the Airport is slightly narrower as a result of the closure of Runway 5L/23R. Given the close similarities of the noise contours between the two models, significant changes to noise compatible land use are not anticipated as a result of the recommended airfield configuration. While the frequency of aircraft utilizing the flight path to Runway 5R/23L is anticipated to increase with the closure of Runway 5L/23R and the reduction in the length of Runway 9/27, the intensity of the noise is not anticipated to change significantly based on the results of the noise modeling software.

Within both the existing and future 65 DNL noise contours are transportation (Airport), woodlands, active agriculture, grassland, and commercial and office activity land uses; the noise levels are expected to be compatible with these land uses. There is also a residential area located south of I-94 that falls within the 65 DNL contour; however, this is the same as under current conditions. Therefore, no new impacts are expected from the proposed improvements. Further evaluation of noise impacts may be required under project NEPA analysis.

## 5.12 Socioeconomics, Environmental Justice, and Children's Environmental Health and Safety Risks

Major airport development projects can impact the socioeconomic conditions of the surrounding community. Such projects have the potential to impact neighboring populations, including children, and may do so disproportionately to the overall area population.

Environmental justice requires the fair treatment of people of all races, cultures, and income levels, and no group of people should shoulder a disproportionate share of impacts of a given project. Environmental justice is defined as the right to a safe, healthy, productive, and sustainable environment for all, where environment includes the ecological, physical, social, political, aesthetic, and economic environment. Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, is intended to identify, address, and avoid disproportionately high and adverse human or environmental impacts on specific populations.

FAA Order 1050.1F requires evaluation of potential environmental health and safety risks that could disproportionately affect children. These could include products or substances a child is likely to come in contact with or ingest, such as air, food, drinking water, recreational waters, soil, or products they might use or to which they might be exposed.

Demographic information provided by the U.S. Census for a 0.5-mile area around the Airport was reviewed under this analysis. The proposed projects including in the near to mid-term planning period would occur on existing Airport property; therefore, there would be no minority or low-income populations within the proposed project areas. While such populations may exist near the Airport, the proposed projects are not anticipated to cause impacts to residents, businesses, or other environmental justice communities in the area.

## 5.13 Visual Effects

Airport lighting such as runway lights, taxiway lights, NAVAIDs, parking lot lights, and terminal/hangar building lights can produce light emissions that could potentially contrast with the visual character of an area. When a project is proposed that would introduce new or relocated airport lighting facilities, a visual effects analysis may be needed to determine the impact to residential or other sensitive areas and to detect glare that could affect pilots and air traffic controllers. A visual effects analysis can be conducted as a part of the NEPA process prior to project construction; however, an initial review of potential visual effects was completed as a part of this environmental overview.

Overall, the proposed developments are not anticipated to result in visual effects that could impact local residences and other light sensitive areas. While construction of a proposed parallel taxiway to Runway 5R/23L will install new airfield lighting, closure of Runway 5L/23R and reduction in length of Runway 9/27 will remove airfield lighting associated with these facilities. Removal of other structures such as Hangar 1 would also reduce existing lighting. Construction of new structures, such as hangars, that could introduce new lighting may incorporate shielding elements, where appropriate, to reduce visual effects for areas surrounding the immediate vicinity of the Airport. Each project may require review for visual effects during the environmental review process to determine if shielding measures are needed.

## 5.14 Water Resources

Water resources, such as surface waters and groundwater, are important to the ecosystem and the human environment. Impacts to water quality typically include:

- Increases in impervious surfaces and runoff (as compared to infiltration to recharge groundwater),
- Ground disturbance activities that can result in temporary increases in sediment load to surface waters, and
- Other changes that impact an area's capacity to store water after a rain event.

Because wetlands, floodplains, surface waters, groundwater, and other water resources are all connected within the overall water system, this section includes a review of each.

### 5.14.1 Surface Water

Surface waters include lakes, ponds, rivers, streams, creeks, and wetlands. Surface waters collect water from precipitation that does not infiltrate the soil and instead flows across the land. Surface waters can be hydrologically connected to groundwater.

There are two surface water resources on Airport property: Homer Drain and Willow Run (a stream/creek). Homer Drain is located in the far northeast section of the Airport and Willow Run passes through the far southwest portion of the Airport. Other water resources near the Airport include McKinstry Drain (approximately 0.4 miles to the east), Belleville Lake (approximately 1.5 miles to the southeast), and Ford Lake (approximately 2.0 miles to the southwest).

According to EPA Impaired Waterbody History Reports and Waterbody Quality Assessment Reports, segments of the water resources near the Airport have been designated as impaired water bodies primarily due to Polychlorinated Biphenyls (PCBs). Early agency coordination conducted with the EPA confirmed this, which is presented in **Appendix C**. Future developments proposed by this master plan are unlikely to be a source of additional PCBs; impacts to these water resources are not anticipated due to the proposed development.

### 5.14.2 Wetlands

Wetlands are areas that support specific vegetation due to inundation or saturation by ground water. Sometimes these are called swamps, marshes, or bogs. Wetlands provide benefits to the natural and human environments that include habitat, water filtration, water storage, and recreation. There are several statutes, regulations, orders, and other requirements related to wetlands. The Clean Water Act (CWA) regulates the discharge of pollutants into waters of the United States (including wetlands) and establishes a program to regulate discharge of fill material into such waters. The CWA also requires projects not to violate water quality standards.

A water of the United States is considered a jurisdictional surface water or wetland under the CWA; however, not all surface waters are under the jurisdiction of the CWA. This determination is made on a case-by-case basis by the U.S. Army Corps of Engineers (USACE). Non-jurisdictional wetlands are protected under Executive Order 11990, Protection of Wetlands.

A review of the USFWS's National Wetlands Inventory (NWI) maps found that there are very few mapped wetlands on Airport property (**Figure 5-4**). The majority of Airport property has been graded and developed or maintained in a mowed condition.

Neither a wetland delineation nor a field check of the NWI maps were completed under this master plan project. Further assessment of potential wetland resources on Airport property may be required under development of NEPA-level documentation for the individual development projects proposed under this master plan.

## Figure 5-4 – National Wetlands Inventory Map


December 7, 2016

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

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

National Wetlands Inventory (NWI)
This page was produced by the NWI mapper

### 5.14.3 Floodplains

A floodplain is a flat, low area adjacent to a stream, river, or creek that may flood during high water flow conditions. A 100-year floodplain includes the area that has a one-percent chance of flooding in any given year. Projects within a 100-year floodplain are discouraged.

According to Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) for Airport property, there are floodplains in Washtenaw County located near or on Airport property (see **Figure 5-5** on the following page). Floodplain information is not shown on the FEMA FIRM for areas outside Washtenaw County (i.e. areas in Wayne County). Additional floodplain information from Wayne County may be needed to evaluate potential impacts to floodplains from proposed projects at the Airport on a case-by-case basis.

### 5.14.4 Groundwater

Groundwater, or subsurface water, can be an important source of water for households, businesses, industries, and agriculture. Developments being proposed under the master plan are not anticipated to impact groundwater resources; however, further investigation may be needed to determine any potential impacts to groundwater, aquifers, or other similar water resources in proximity of the Airport.

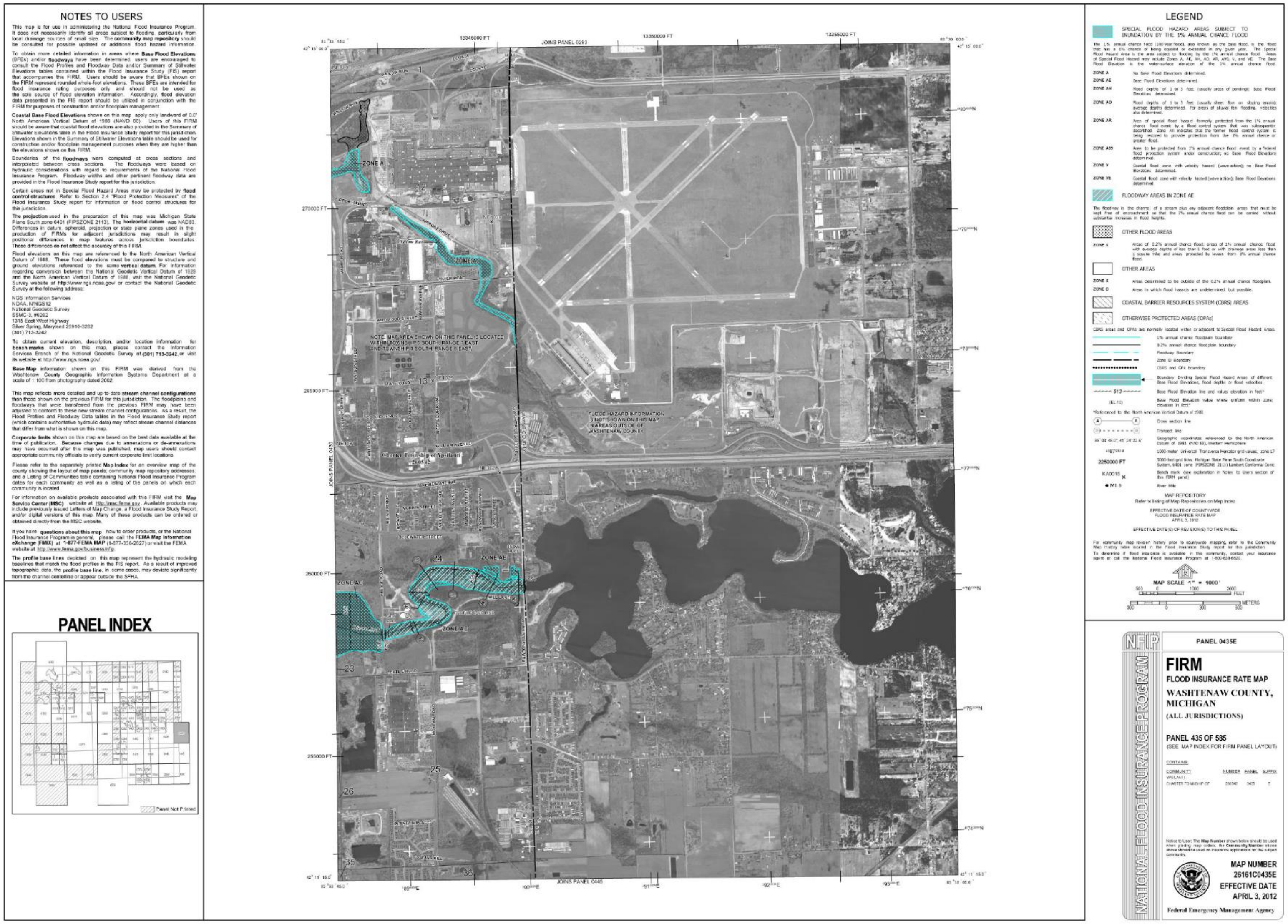
### 5.14.5 Wild and Scenic Rivers

The Nationwide Rivers Inventory (NRI) is a list maintained by the U.S. Department of the Interior National Park Service (NPS). The NPS identifies river segments that possess remarkable natural or cultural values and are of more than local or regional importance. All federal agencies are required to seek to avoid or mitigate impacts to NRI segments. According to the NPS, segments of the Huron River, which is located approximately 0.5 miles to the south of the Airport, are listed on the NRI. The proposed developments are unlikely to impact the natural, cultural, or aesthetic value of the Huron River.

The National Wild and Scenic Rivers System preserves rivers with outstanding natural, cultural, and recreational values. The system is administered by the Bureau of Land Management, NPS, USFWS, and the U.S. Forest Service. According the National Wild and Scenic Rivers System website, there are no rivers in the National Wild and Scenic Rivers System in the Ypsilanti area.

Rivers designated as American Heritage Rivers list are also protected. The NEPAssist database indicates that the closest river designated as an American Heritage River is the Detroit River, which is approximately 18 miles from the Airport. Impacts to the Detroit River are not anticipated from developments proposed by this master plan.

**Figure 5-5 – Federal Emergency Management Agency Flood Insurance Rate Map**




Source: Federal Emergency Management Agency (2016)

## 5.15 Conclusion

This environmental overview is intended to inform the master planning process. It is not intended to meet the requirements of the NEPA, FAA Order 1050.1F, or FAA Order 5050.4B. Development of a NEPA document such as a CatEx, EA, or an EIS is required for each proposed development to further evaluate potential environmental impacts and identify mitigation or other measures that may be necessary to reduce such impacts. The summary below presents a summary of the findings of this environmental overview.

- **Air Quality** – Washtenaw County is in attainment for criteria air pollutants; Wayne County is a nonattainment area for Sulfur Dioxide.
- **Biological Resources** – There may be federally-listed or state-listed endangered and threatened species in the vicinity of the Airport; however, due to the disturbed and developed nature of the Airport, it is possible that the property does not provide quality habitat for these resources.
- **Climate** – Given the level of operations activity at the Airport in proportion to the total level of aviation activity in the U.S., increases in greenhouse gas emissions as a result of the proposed projects are not expected to be significant.
- **Coastal Resources** – The proposed projects at the Airport would not occur in a coastal zones.
- **Department of Transportation Act, Section 4(f)** – Projects proposed for construction are not anticipated to impact parks, recreation areas, or schools in the area.
- **Farmlands** – Although Airport property contains prime farmland, prime farmland if drained, and farmland of local importance, it is located in an urbanized area associated with Ann Arbor, Michigan and is exempt from the FPPA.
- **Hazardous Materials, Solid Waste, and Pollution Prevention** – There are a number of regulated facilities and storage tanks in proximity of and at the Airport. These are monitored and maintained to prevent releases. Implementation of the projects proposed under the master plan are not anticipated to impact hazardous materials, nor are impacts to solid waste and impacts from pollution anticipated.
- **Historical, Architectural, Archeological, and Cultural Resources** – There are no historic properties within 0.5 miles of the Airport according to the NRHP database. The Willow Run Historic District is no longer eligible for listing on the NRHP; the Bomber Plant and Hangar 2 have been demolished.
- **Land Use** – Enactment of the Joint Airport Zoning Ordinance of Wayne and Washtenaw Counties provides a method for the control of new incompatible land uses surrounding the Airport, as well as control of objects of height from impacting Airport operations.
- **Natural Resources and Energy Supply** – The airfield's energy demand is anticipated to decrease as a result of the proposed improvements. Adverse impacts on energy supplies or natural resources as a result of the proposed projects are not anticipated.
- **Noise and Noise-Compatible Land Use** – The recommended airfield configuration is not anticipated to significantly increase noise impacts or impacts to noise-compatible land use around the Airport. The area within the 65 DNL decreases from 2,027 acres of impact with the existing airfield configuration to 1,279 acres of impact with implementation of the recommended airfield configuration.

- **Socioeconomics, Environmental Justice, and Children's Environmental Health and Safety Risks** – Socioeconomic and environmental justice impacts are not anticipated as a result of the proposed master plan developments. Significant impacts to children's environmental health are not anticipated.
- **Visual Effects** – Visual effects resulting from the proposed developments are not anticipated to impact local residences and other light sensitive areas.
- **Water Resources** – Segments of the water resources near the Airport have been designated as impaired water bodies primarily due to PCBs; however, future developments proposed by this master plan are unlikely to be a source of additional PCBs. Impacts to wetlands, floodplains, groundwater resources, or protected rivers are not anticipated due to proposed development at the Airport.

**Chapter 6**

# Capital Improvement Plan

The timeline to implement the recommended alternatives is guided by a Capital Improvement Plan (CIP), which helps to identify the level of financial, staffing, and scheduling resources needed for each improvement while organizing the timing of necessary preliminary projects such as design and environmental reviews. CIPs also help to identify the capital needs of an airport and assist the funding allocation decisions of federal, state, and local officials.

The CIP for the Willow Run Airport (Airport) is a fluid document that is updated annually by the Wayne County Airport Authority (WCAA) based on the priority of short-term needs and changes in demand for long-term needs. Each annual preparation of the Airport's CIP is reviewed and approved by the Federal Aviation Administration (FAA) Detroit Airports District Office (Detroit ADO). Due to the fluidity of this document and the nature of changing needs annually, a CIP was not prepared specific to the projects identified in this master plan; rather, the CIP effort for the master plan focused on identifying funding sources available to implement the proposed projects. The following describes in more detail what is incorporated into a CIP as well as available funding sources:

6.1 Introduction
6.2 Funding Resources
6.3 Summary

## 6.1 Introduction

CIPs summarize the development plans of an airport, typically for 5-year (short), 10-year (mid-term), and 20-year (long-term) periods that is intended to project the level of financial resources for each project and help to balance scheduling conflicts, establish timelines for environmental reviews, and address potential property needs such as leases, easements, and land acquisitions. Infrastructure improvements identified through master plan and airport layout plan (ALP) efforts will be included in a CIP, such as runway and taxiway extensions, airfield pavement rehabilitations, and equipment purchases such as Aircraft Rescue and Fire Fighting (ARFF) and snow removal equipment (SRE) vehicles. Projects eligible to receive federal funding from the Airport Improvement Program (AIP) must be identified on an airport's CIP as this information is used to update the FAA database used in awarding federal funds. CIPs may also include projects ineligible for federal funding to assist decision makers in financial planning and project implementation decisions. Intended to be updated regularly based on changing conditions and priorities, CIPs are intended to help balance scheduling conflicts, identify timelines for environmental review requirements, and address property needs such as leases, easements, and land acquisitions.

## 6.2 Funding Resources

Federal, state, and local funding sources are available to accommodate the capital demands of the projects listed in the Airport's CIP. The following section reviews each financial resource that is available and identifies the types of projects from the CIP plan that are eligible to receive funding from each.

### 6.2.1 Airport Improvement Program

Administered by the FAA, AIP was created through the Airport and Airway Improvement Act of 1982. This act was designed to set aside federal funding for the distribution of eligible non-revenue producing projects at an airport such as planning, airfield construction, navigational equipment, and environmental mitigation. AIP funds are distributed to different categories of public-use airports owned by public entities that are included in the National Plan of Integrated Airport Systems (NPIAS), with some exceptions made for public use airports under private ownership identified by the NPIAS. Since the Airport is included in the NPIAS, it is eligible to receive funds through the AIP program.

There are two primary methods in which AIP funding is awarded: entitlement and discretionary. Entitlement funds are a predetermined, apportioned amount given to different classifications of airports based on a distribution calculation defined in the AIP legislation. Discretionary funding is the remainder of the AIP funds that are awarded on a national prioritization system. Since the Airport is a general aviation facility that has more than one million pounds of landed all-cargo weight annually it receives non-primary entitlement and cargo entitlement funding. Combined, this equates to approximately $600,000 in entitlement funding that the Airport receives each year.

For federally eligible projects, AIP funding typically accounts for 90 percent of the project costs with the airport and/or state agency equally sharing the remaining 10 percent. The Michigan Department of Transportation Office of Aeronautics (MDOT Aero) typically pays for half of the remaining 10 percent with an airport responsible for 5 percent of the total project cost.

Utilization of this funding source can be applied to most of the projects identified on the CIP plan, most notably those that require a significant amount of capital such as the construction of a parallel taxiway to Runway 5R/23L, a reconfiguration of Runway 9/27, and improvements to taxiway and apron surfaces.

### 6.2.2 State of Michigan

MDOT Aero through the State of Michigan also provides funding for Airport development through the collection of aviation fuel taxes and user fees. Typically, this funding is used to assist airports in meeting the 10 percent local match required for projects receiving federal funding by contributing 5 percent of the total project cost with the remaining 5 percent financed by the Airport. Two additional MDOT Aero programs are also available to help finance projects identified on the CIP. The first is the Crack Sealing and Paint Marking Program, which provides up to 50 percent of a project's eligible cost for the crack sealing and paint marking of runways. Funds available from this program could be utilized for the annual pavement maintenance and preservation projects that are identified on the CIP through 2021. The second available program, the Airport Loan Program, offers publicly-owned airports the opportunity to borrow up to $100,000 for capital improvements. Funds available from this loan program could be applied to most projects listed on the CIP to help meet any funding gaps not covered by other federal, state, and local resources.

### 6.2.3 Airport Financing Sources

The Airport has multiple funding sources that are available from its day-to-day operations to meet the local share of the projects included in the CIP. These sources of revenue include rents from tenants, leases, and landing fees collected from aircraft operations. Funds raised from these sources are not subject to federal or state requirements that would limit their applicability and these funds can be utilized to fund all improvement projects at the Airport. In addition, the Airport receives funding collected from the operation of the WCAA airport system as a whole, which includes funds from revenue generated at the Detroit Wayne County Metropolitan Airport. Funds from Airport sources are most beneficial for projects that are not eligible to receive federal or state funding, or in instances where federal or state funding accounts for a limited portion of an intended project. Projects on the Airport's CIP most likely to benefit from Airport financing sources include utility infrastructure replacement, upgrades to the fire station and maintenance facilities, and the demolition of Hangar 1.

Given the level of investment to implement the projects proposed by the master plan, decisions may need to be made in the future on the priority of implementation for the proposed projects should greater limitations in the availability of Airport financing sources be experienced. Since CIPs are intended to be fluid documents, it is recommended that the availability of funding from Airport sources be considered at the time of the next update of the CIP.

## 6.3 Summary

In summary, significant financial investment from federal, state, and Airport sources is needed to implement the CIP; however, creation of the plan allows an implementation schedule to be established that manages the timing of the future capital needs for the proposed infrastructure improvements. The CIP also helps to identify the level of financial, staffing, and scheduling resources needed for each improvement project and demonstrates the short-, mid-, and long-term financial needs of the Airport to federal, state, and Airport decision makers. Several funding resources made available through federal and MDOT Aero programs in combination with local Airport funding mechanisms are available to assist in raising the necessary capital for each improvement project. However, the limited availability of funding from these resources may require this CIP to be reviewed and adjusted in the future as necessary to maintain a viable and financially feasible plan to improve the Airport. Periodic update of the CIP in the future as demands and priorities change will continue to allow the Airport to meet the demands of its unique set of on-demand air cargo, flight training, and other general aviation users that serve Southeast Michigan.

**Appendix A**

# Modification of Standards

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# FAA GREAT LAKES REGION
# REQUEST FOR MODIFICATION OF STANDARDS

*Attach additional documentation, sketches, or plans if necessary*

## BACKGROUND

| 1. AIRPORT NAME AND LOC ID: | 2. LOCATION (CITY, STATE): | |
|---|---|---|
| **Willow Run Airport (YIP)** | **Ypsilanti, MI** | |
| **3. EFFECTED RUNWAY/TAXIWAY/TAXILANE:** Runway 5R-23L | **4. APPROACH (EACH RUNWAY):** _X_ PIR<br>___ NPI<br>___ VISUAL | **5. AIRPORT REF. CODE (ARC):** D-IV |

**6. DESIGN AIRCRAFT (EACH RUNWAY/TAXIWAY):**

DC-8

## MODIFICATION TO STANDARDS

**7. TITLE OF STANDARD(S) BEING MODIFIED (CITE REFERENCE DOCUMENT(S)):**

- Advisory Circular 150/5300-13A
- Page : 79
- Paragraph : 313.b Aircraft approach categories C, D, E., Note (2)

**8. DESCRIPTION OF STANDARD/REQUIREMENT:**

"The maximum allowable grade change is ±1.50 percent; however, no grade changes are allowed in the first and last quarter of the runway length."

**9. DESCRIPTION OF PROPOSED MODIFICATION:**

Willow Run Airport (YIP) plays an integral role to the region, serving as a FAR Part 139 reliever airport for Detroit Metropolitan Wayne County Airport (DTW), accommodating on-demand cargo for the surrounding region, and serving as a primary general aviation (GA) airport for corporate and leisure aviation activity in the area. The airport is home to a number of cargo and corporate facilities (e.g. Johnson Controls), on-demand charter operations (e.g. USA Jets and Kallita) and recreational GA aircraft. Approximately 224 aircraft are based at YIP, including 69 jet aircraft.

Runway 5R-23L at Willow Run Airport (YIP) is the Airport's primary runway at 7,542-ft in length, 150-ft width, and Category I ILS approaches to both runway ends. Between 2012-2014, the runway is scheduled to be fully reconstructed. The planed duration of the reconstruction occurs over three construction seasons. Each construction season is planned to cover a single phase of the three phase reconstruction.

Phase 1, which was designed in late 2011 and bid/awarded in early 2012, includes reconstruction of the north 3,000-ft of the runway and will occur during the 2013 construction season; Phase 2 and 3 will cover the reminder of the runway and are in the process of being designed.

Although only Phase 1 of the reconstruction has been designed and bid, the entire runway profile was completed during Phase 1, in late 2011, prior to the draft version of AC150/5300-13A being published. The overall runway profile was driven by the need to raise the runway centerline and increase transverse slopes. This will improve drainage and address existing issues with standing water on and around the runway. At the time of designing the runway profile, it met all of the requirements outlined in AC 150/5300-13, the version of the AC in effect at the time.

The designed profile of the runway has one grade change in the first quarter of the runway on the 5R (southern) end and four grade changes in the first quarter of the runway on the 23L (northern) end. The grade changes that occur within the first quarter of the runway ends are the result of tying into existing taxiways and runways such as Runway 9-27 and Taxiway G on the north and Taxiway B on the south, meeting transverse grading requirements and maintaining the threshold elevations. The proposed grade changes are similar to those which currently exist today. All grade changes not impacted by Runway 9-27 include vertical curves in accordance with AC 150/5300-13 requirements. The attached Figures 1 and 2 depict the grade change locations and grades.

To the north, three of the four grade changes are assumed to be allowable based on AC 150/5300-13A guidance Paragraph 313.b Note (6) because Runway 9-27 was deemed the "dominant" runway for the runway-runway intersection. Thus, the Runway 9-27 crown carries through Runway 5R-23L, creating grade changes on the Runway 5R-23L profile. The remaining grade change is located 1,329-ft from the Runway 23L threshold and represents difference of only .16% (-.19 to -.35). While this area is approximately 330-ft past the aiming point, it was acceptable due to its vertical curve and minimum grade change.

The sole grade change to the south is located approximately 585-ft from the Runway 5R threshold. The midpoint of the vertical curve is located approximately 500-ft before to the aiming point. This is an area which would not see much high speed traffic as aircraft landing Runway 5R should touchdown past the grade change. Aircraft departing Runway 5R and landing Runway 23L should be at relatively low speed when traversing the grade change. In most cases, aircraft departing Runway 23L would be airborne prior to reaching the grade change.

**10. EXPLAIN WHY STANDARD(S) CANNOT BE MET:**

At the time of design, the standards outlined in *AC 150/5300-13 Chapter 5 Surface Gradient and Line of Sight, Section 502, paragraph (2) Aircraft Approach Categories C and D, Note (a)* were current, and the Draft AC 150/5300-13A had not been published for review. As such, the design was completed in accordance with the information/standards available at the time. The runway was designed under the standards to ensure appropriate drainage, maintain existing runway and taxiway intersections, and meet the RSA and runway grading standards. However, in order to meet all of these requirements, grade changes which were allowed at the time were required to occur within the first quarter of the runway ends.

The most significant impact of meeting the new standards is the impact on the schedule and cost of the project. Redesigning the runway profile will require the northern 3,000-ft of the runway, which has been bid and awarded, to be redesigned. This will result in the rebidding of the project and delay of construction to 2014 at the earliest. Redesigning the southern portion of the runway will have also have significant impacts on the overall schedule due to redesigning the entire runway profile and associated transverse grades.

From a cost perspective, addressing all of these issues and complying with current surface gradient standards would require significant portions of the airfield to be rebuilt, including portions of Taxiway G (recently reconstructed) and Taxiway B.

Finally, the resulting runway profiles would be less effective from a drainage perspective than those that are proposed.

**11. DISCUSS ALL VIABLE ALTERNATIVES:**

The alternatives considered are described below.

- Meet Runway Profile Requirements on the Northern end – *To accommodate the desired runway centerline elevations (drainage purposes), maintain the intersection of Runway 9-27 (the dominate runway in the intersection), and meet all current grade change requirements; significant reconstruction of Taxiway G, which is not in need of replacement, would be required. Reconstructing these areas is estimated to add approximately $1,850,000 in additional costs and the need to redesign the northern 3,000-ft that has already been bid/awarded. Significant impacts to the construction schedule are also a major detractor of this alternative. Other negative impacts include potential changes to runway threshold elevations, triggering rebuilding of the Runway 5R-23L approaches.*
- Meet Runway Profile Requirements on the Southern end – *To accommodate the desired runway centerline elevations (drainage purposes) and meet all current grade change requirements; significant*

*reconstruction of areas that are not in need of replacement would be required. This would include large portions of Taxiway B. Reconstructing this area is estimated to add approximately $300,000 in additional costs. Significant impacts to the construction schedule are also a major detractor of this alternative. Other negative impacts include potential changes to runway threshold elevations, triggering rebuilding of the Runway 5R-23L approaches.*

- No Action (Obtain MOS) – *Preferred alternative.*

12. ASSURANCE THAT;

- THE MOS WILL PROVIDE AN ACCEPTABLE LEVEL OF SAFETY,
- THE MODIFICATION TO MATERIALS, CONSTRUCTION OR EQUIPMENT STANDARDS WILL PROVIDE A PRODUCT THAT WILL MEET FAA STANDARDS FOR ACCEPTANCE AND THAT THE FINISHED PRODUCT WILL PERFORM FOR ITS INTENDED DESIGN LIFE,
- MODIFICATION IS NECESSARY TO CONFORM TO LOCAL LAWS AND REGLUATIONS (IF APPLICABLE):

The MOS being request will allow grade changes within the first quarter of the runway ends on Runway 5R-23L. The Proposed MOS will provide an acceptable level of safety for the following reasons. The current design which was completed prior to AC 150/5300-13A, aligns with the standards available at that time, which are assumed to represent an acceptable level of safety.

- *Southern End*
  - The grade change contains a vertical curve which was acceptable under the previous version of guidance - AC 150/5300-13.
  - The midpoint of the vertical curve is located approximately 585-ft down the runway. This is an area which would not see much high speed traffic as,
    - Aircraft landing Runway 5R should touchdown past the grade change.
    - Aircraft departing Runway 5R and landing Runway 23L should be at relatively low speed when traversing the grade change.
    - Aircraft departing Runway 23L should be airborne prior to reaching the grade change.

- *Northern End*
  - Three of the four grade changes are the result of the runway to runway intersection with Runway 9-27 and occur within the first 500-ft of the runway. Runway 9-27 is considered the dominant runway in this intersection as Runway 5R-27L crosses Runway 9-27 at a more crucial (high velocity) point.
  - The fourth grade change, located approximately 1,329-ft down the runway only results in .16% change (-.19% to -.35%). This change is well below the maximum grade change allowable under the previous version of guidance - AC 150/5300-13. The grade change also contains a vertical curve which was also acceptable.
    - Aircraft landing Runway 5R should be down and decelerating prior to reaching the grade change.
    - Aircraft departing Runway 5R should be airborne prior to reaching the grade change.
    - Aircraft departing Runway 23L should be accelerating and in the initial phase of their takeoff roll.

| 13. SIGNATURE OF ORIGINATOR: | 14. PRINTED NAME OF ORIGINATOR: | 15. DATE: |
|---|---|---|
| 16. ORIGINATOR'S TITLE/ORGANIZATION: | 17. TELEPHONE: | 18. E-MAIL: |
| 19. DATE OF LATEST FAA SIGNED ALP: | | |

*** * * * * * * * * * * * * * * BELOW IS TO BE COMPLETED BY THE FAA * * * * * * * * * * * * * * ***

| | |
|---|---|
| 20. ADO RECOMMENDATION: | |
| 21. SMS / SAS-2 FORM REQUIRED? | |
| 22. ADO SIGNATURE: | 23. DATE: |
| 24A. REGIONS APPROVAL (IF APPLICABLE): | |
| 24B. REGIONS SIGNATURE | 24C. DATE: |
| 24D. HEADQUARTERS APPROVAL (IF APPLICABLE): | |
| 24E. HEADQUARTERS SIGNATURE | 24F. DATE: |

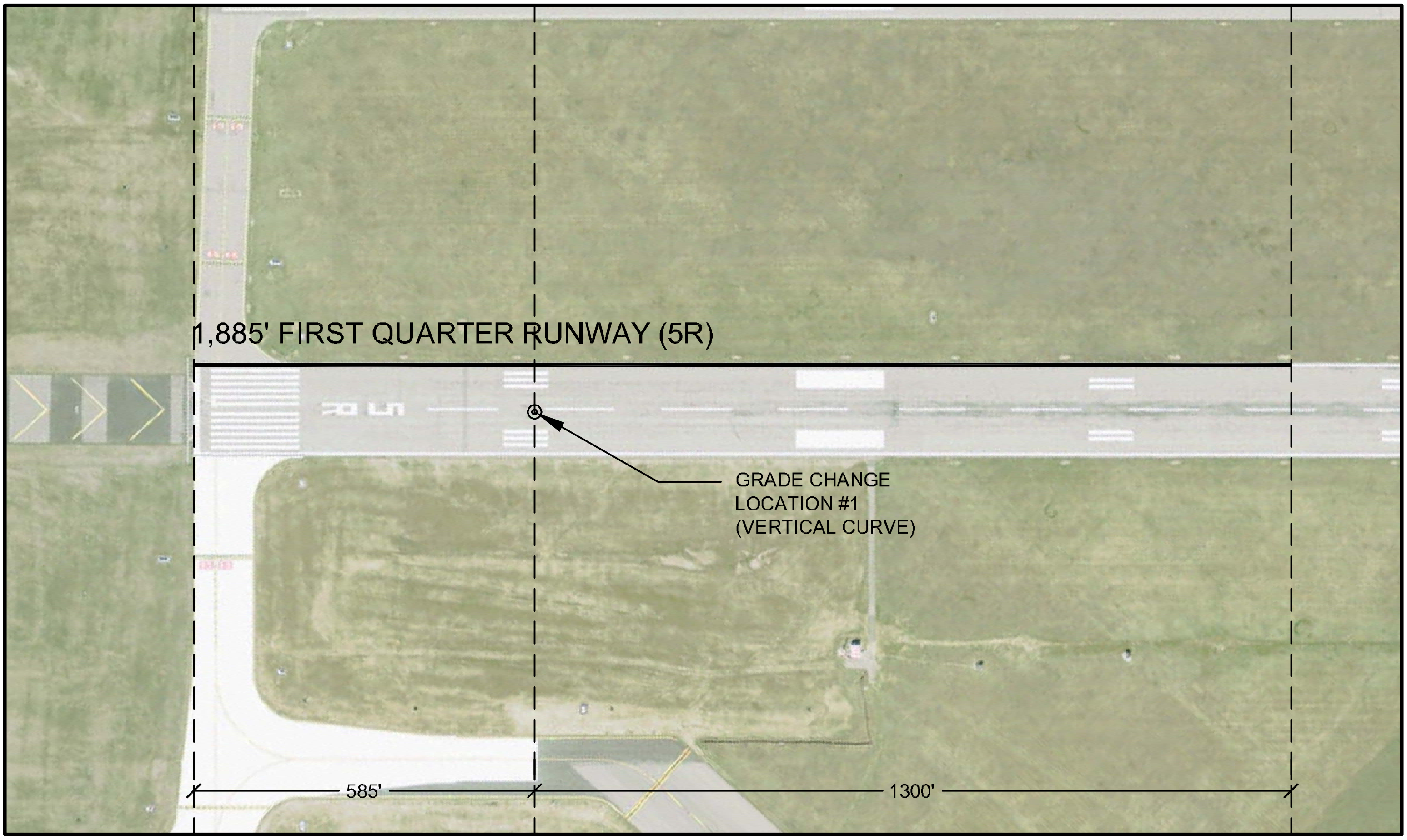
**25. ADO'S FINAL ACTION:**

☐ UNCONDITIONAL APPROVAL ☐ CONDITIONAL APPROVAL ☐ DISAPPROVAL

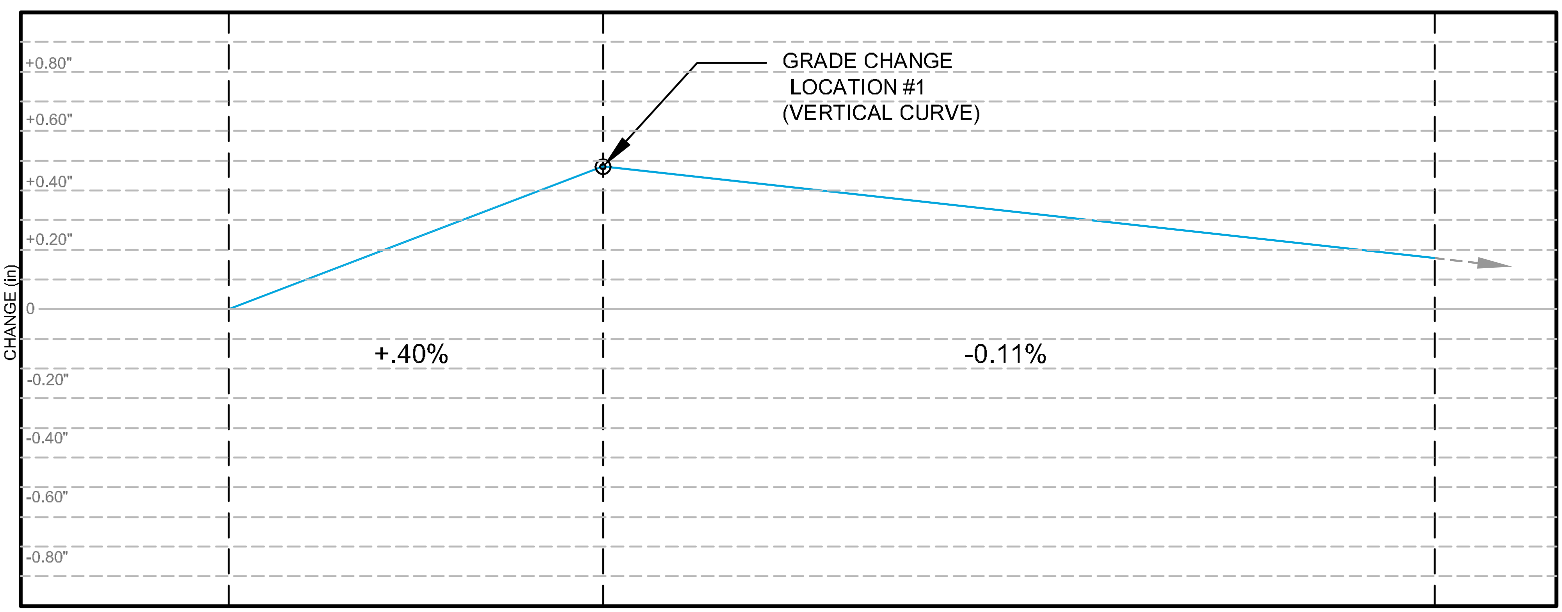
| DATE: | SIGNATURE: | TITLE: |
|---|---|---|
| CONDITIONS OF APPROVAL: | | |

Forward a copy and all supporting documents to AGL-620

PLAN VIEW




PROFILE VIEW

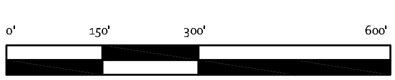



NOTES:

FIGURE #2:

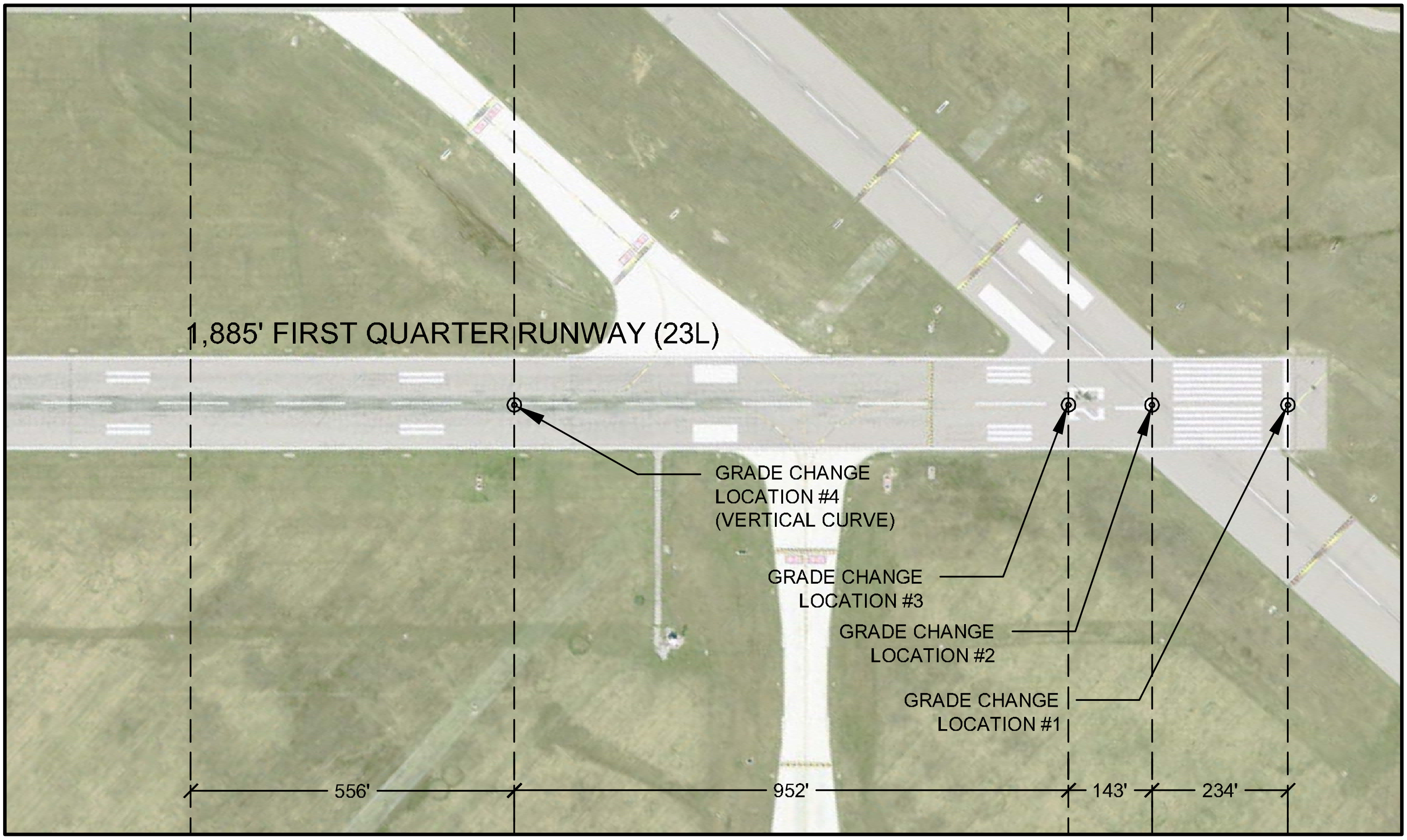
# Runway Gradient MOS
# RUNWAY 5R-23L (South)

Wayne County Willow Run Airport January 2013

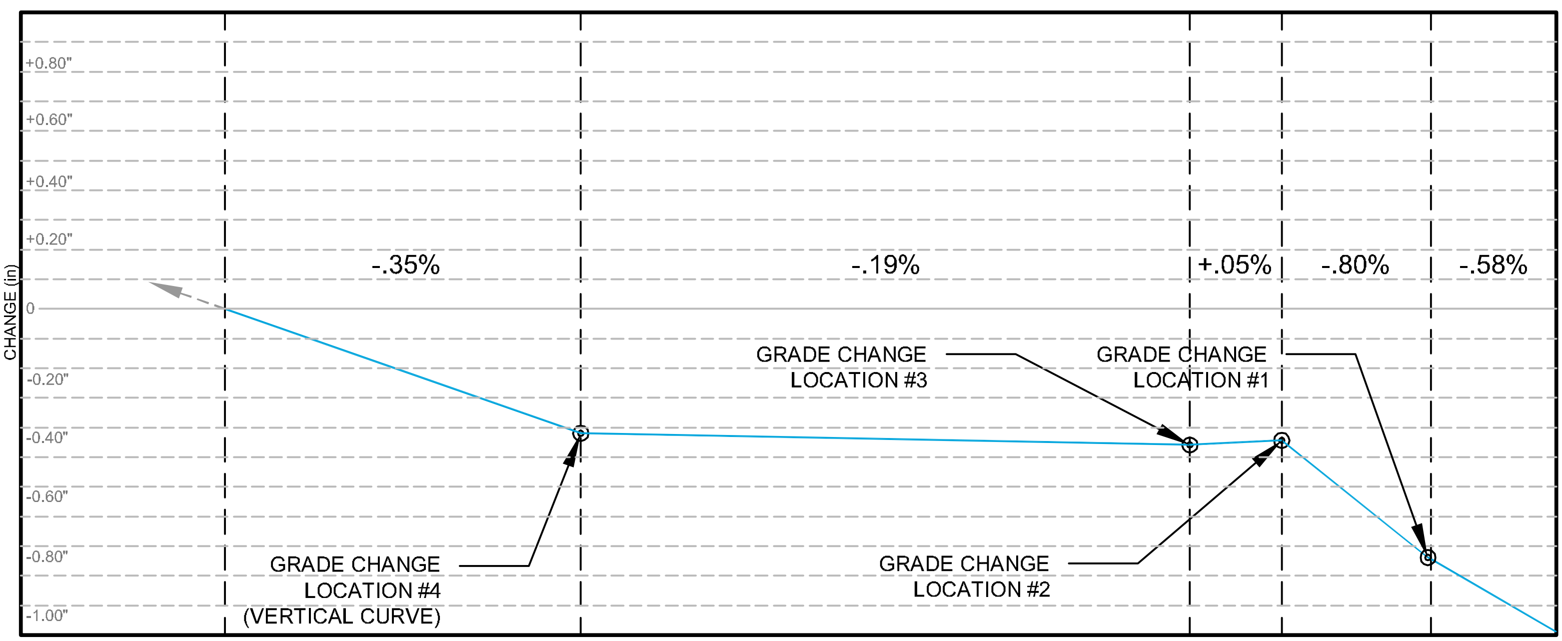



jacobsendaniels associates, llc
planning and implementation consultants

*PLAN VIEW*




*PROFILE VIEW*




NOTES:

Location of grade changes #1, #2, and #3 are assumed to be acceptable based on AC 150/5300A (¶ 313.b) due to Runway 9-27 deemed the "dominant" runway for the runway-runway intersection.

FIGURE #1:

# Runway Gradient MOS
# RUNWAY 5R-23L (North)

Wayne County Willow Run Airport January 2013

NORTH

0' 150' 300' 600'

jacobsendaniels associates, llc
*planning and implementation consultants*

# FAA GREAT LAKES REGION
# REQUEST FOR MODIFICATION OF STANDARDS

*Attach additional documentation, sketches, or plans if necessary*

## BACKGROUND

| 1. AIRPORT NAME AND LOC ID: | 2. LOCATION (CITY, STATE): | |
|---|---|---|
| **Willow Run Airport (YIP)** | **Ypsilanti, MI** | |
| **3. EFFECTED RUNWAY/TAXIWAY/TAXILANE:** | **4. APPROACH (EACH RUNWAY):** | **5. AIRPORT REF. CODE (ARC):** |
| Runway 5R-23L | _X_ PIR<br>___ NPI<br>___ VISUAL | D-IV |

**6. DESIGN AIRCRAFT (EACH RUNWAY/TAXIWAY):**

DC-8

## MODIFICATION TO STANDARDS

**7. TITLE OF STANDARD(S) BEING MODIFIED (CITE REFERENCE DOCUMENT(S)):**

| | | |
|---|---|---|
| ✈ Advisory Circular 150/5300-13A | | |
| ✈ Page : | 82 | 68 |
| ✈ Paragraph : | Figure 3-23 Transverse grade limitations | Section 309, Runway Object Free Area (ROFA), Table 3-3, Transverse grades |

**8. DESCRIPTION OF STANDARD/REQUIREMENT:**

“The ROFA clearing standard requires clearing the ROFA of above-ground objects protruding above the nearest point of the RSA. For new runways, terrain should not protrude above the nearest point of the RSA within a distance from the edge of the RSA equal to one-half the most demanding wingspan of the RDC of the runway.”

“Table 3-3 Transverse grades” states that a positive grade of 10:1 is permissible to a distance of one-half the most demanding wingspan of the RDC of the runway.

**9. DESCRIPTION OF PROPOSED MODIFICATION:**

Willow Run Airport (YIP) plays an integral role to the region, serving as a FAR Part 139 reliever airport for Detroit Metropolitan Wayne County Airport (DTW), accommodating on-demand cargo for the surrounding region, and serving as a primary general aviation (GA) airport for corporate and leisure aviation activity in the area. The airport is home to a number of cargo and corporate facilities (e.g. Johnson Controls), on-demand charter operations (e.g. USA Jets and Kallita) and recreational GA aircraft. Approximately 224 aircraft are based at YIP, including 69 jet aircraft.

Runway 5R-23L at Willow Run Airport (YIP) is also the Airport’s primary runway at 7,542-ft in length, 150-ft width, and Category I ILS approaches to both runway ends. Between 2012 and 2014, the runway is scheduled to be fully reconstructed. The planed duration of the reconstruction occurs over three construction seasons. Each construction season is planned to cover a single phase of the three phase reconstruction.

Phase 1 which has been designed, bid, and awarded includes reconstruction of the north 3,000-ft of the runway and will occur during the 2013 construction season; Phase 2 and 3 will cover the reminder of the runway and are in the process of being designed.

Portions of the Phase 1 design contain upward sloping transitions within the OFA at a ratio of 6:1. During the time Phase 1 was being designed (Late 2011) it met all of the requirements outlined in AC 150/5300-13. The contract was bid and awarded in early 2012, prior to release of AC 150/5300-13A. It should also be noted that significant portions of the Phase 1 areas require unique grading due to the intersection of Runway 9-27 and Taxiway G. These areas, which have exceptions for grade requirements, greatly reduce the areas that do not meet the current maximum slope requirement of 10:1. The attached exhibits highlight the areas that contain the 6:1 grade. As depicted, the area is limited to a narrow section (approximately 5-25-ft) at each edge of the OFA where the newly graded areas blend with the existing terrain outside the OFA.

The modification being sought would allow the existing design, which aligns with the version of AC 105/5300-13 in affect at the time, to be maintained for Phase 1 of the runway reconstruction. Phase 2, which is currently being designed, will meet current AC 150/5300-13A requirements for regarding transverse grade limitations.

**10. EXPLAIN WHY STANDARD(S) CANNOT BE MET:**

Phase 1 of the Runway 5R-23L reconstruction, the north 3,000-ft, has been designed, bid and awarded based on requirements contained within the previous AC 150/5300-13, which includes using a 6:1 grade to transition from the proposed elevation at the edge of the RSA to existing ground in the OFA. Altering the grade to meet the new AC's requirements, although feasible, is not preferred due to the additional costs and potential impacts to the schedule.

**11. DISCUSS ALL VIABLE ALTERNATIVES:**

The alternatives considered include the following:

- Meet RSA/OFA Grading Criteria – *Altering Phase 1 of the Runway 5R-23L Reconstruction to meet the current AC's grading criteria is not preferred because it will require additional cost and change order negotiation, which could impact the schedule. The estimated cost associated with completing this alternative from a construction standpoint is estimated at $25,000.*
- No Action (Obtain MOS) – *Preferred alternative.*

**12. ASSURANCE THAT;**

- ✈ THE MOS WILL PROVIDE AN ACCEPTABLE LEVEL OF SAFETY,
- ✈ THE MODIFICATION TO MATERIALS, CONSTRUCTION OR EQUIPMENT STANDARDS WILL PROVIDE A PRODUCT THAT WILL MEET FAA STANDARDS FOR ACCEPTANCE AND THAT THE FINISHED PRODUCT WILL PERFORM FOR ITS INTENDED DESIGN LIFE,
- ✈ MODIFICATION IS NECESSARY TO CONFORM TO LOCAL LAWS AND REGLUATIONS (IF APPLICABLE):

The current design aligns with the previous version of AC 150/5300-13, which was in effect at the time of design. Furthermore, the areas that contain a 6:1 slope are very narrow and at the very outside edge of the OFA.

| 13. SIGNATURE OF ORIGINATOR: | 14. PRINTED NAME OF ORIGINATOR: | 15. DATE: |
|---|---|---|
| 16. ORIGINATOR'S TITLE/ORGANIZATION: | 17. TELEPHONE: | 18. E-MAIL: |
| 19. DATE OF LATEST FAA SIGNED ALP: | | |

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| 20. ADO RECOMMENDATION: | |
|---|---|
| 21. SMS / SAS-2 FORM REQUIRED? | |
| 22. ADO SIGNATURE: | 23. DATE: |
| 24A. REGIONS APPROVAL (IF APPLICABLE): | |
| 24B. REGIONS SIGNATURE | 24C. DATE: |
| 24D. HEADQUARTERS APPROVAL (IF APPLICABLE): | |
| 24E. HEADQUARTERS SIGNATURE | 24F. DATE: |

**25. ADO'S FINAL ACTION:**

| ☐ UNCONDITIONAL APPROVAL | ☐ CONDITIONAL APPROVAL | ☐ DISAPPROVAL |
|---|---|---|

| DATE: | SIGNATURE: | TITLE: |
|---|---|---|

**CONDITIONS OF APPROVAL:**

Forward a copy and all supporting documents to AGL-620

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# FAA GREAT LAKES REGION
# REQUEST FOR MODIFICATION OF STANDARDS

*Attach additional documentation, sketches, or plans if necessary*

## BACKGROUND

| 1. AIRPORT NAME AND LOC ID: | 2. LOCATION (CITY, STATE): | |
|---|---|---|
| **Willow Run Airport (YIP)** | **Ypsilanti, MI** | |
| **3. EFFECTED RUNWAY/TAXIWAY/TAXILANE:** Runway 5R-23L | **4. APPROACH (EACH RUNWAY):** _X_ PIR<br>___ NPI<br>___ VISUAL | **5. AIRPORT REF. CODE (ARC):** D-IV |

**6. DESIGN AIRCRAFT (EACH RUNWAY/TAXIWAY):**

DC-8

## MODIFICATION TO STANDARDS

**7. TITLE OF STANDARD(S) BEING MODIFIED (CITE REFERENCE DOCUMENT(S)):**

- Advisory Circular 150/5300-13A
- Page : 72
- Paragraph : 310.d

**8. DESCRIPTION OF STANDARD/REQUIREMENT:**

Paragraph 310.d of AC 150/5300-13A states the permissible land uses which do not require further evaluation. Of the five permissible land uses stated in paragraph 310.d, item number three states that "Airport service roads, as long as they are not public roads and are directly controlled by the airport operator'.

Paragraph 310.e of AC 150/5300-13A states "The FAA Office of Airports must evaluate and approve any proposed land use located within the limits of land controlled by the airport owner of an existing or future RPZ that is not specifically allowed in Paragraph 310.d."

**9. DESCRIPTION OF PROPOSED MODIFICATION:**

Willow Run Airport (YIP) plays an integral role to the region, serving as a FAR Part 139 reliever airport for Detroit Metropolitan Wayne County Airport (DTW), accommodating on-demand cargo for the surrounding region, and serving as a primary general aviation (GA) airport for corporate and leisure aviation activity in the area. The airport is home to a number of cargo and corporate facilities (e.g. Johnson Controls), on-demand charter operations (e.g. USA Jets and Kallita) and recreational GA aircraft. Approximately 224 aircraft are based at YIP, including 69 jet aircraft.

Runway 5R-23L is one of four runways at YIP and one of two runways in the primary operating configuration. Due to its length (7,542-ft) and operational capability (Category I ILS capable), Runway 5R-23L is the most heavily utilized arrival and departure runway at YIP. Runway 5R-23L is the longest runway at YIP and essential to serving the needs of tenants operating larger aircraft. In addition to being the longest runway, Runway 5R-23L is the only Category I ILS capable runway. Runway 9-27 provides similar length (7,292-ft), but is restricted in operational capability to arrivals on Runway 9 and departures on Runway 27 and does not have Category I ILS capability; all due to nearby obstructions and airspace conflicts related to DTW operations.

Runway 5R-23L is utilized by approximately 67% of all departures and 75% of all arrivals. The following table details the existing runway utilization.

Existing Runway Utilization

| Runway | % of Total Arrivals | % of Total Departures |
|---|---|---|
| 5R | 27% | 26% |
| 23L | 48% | 41% |
| Other | 25% | 33% |

The approach/departure RPZs on both ends of Runway 5R-23L OFA are currently penetrated by public roads, Ecorse Road on the north and Tyler Road on the south. The critical point on the north end is 754-ft north of the Runway 23L threshold and 583-ft west of the extended runway centerline. On the south, the critical point is 1,023-ft south of the Runway 5R threshold and along the extended runway centerline. A Modification to Standards (MOS) is required for the RPZ to allow these penetrations while operations on Runway 5R and 23L are conducted. Figure 1 depicts the locations where the RPZ's are impacted by the roads.

Approximately 1,531 linear feet of the Ecorse Road and 1,248 linear feet of Tyler Road lies within the RPZs. Ecorse Road and Tyler Road are designated as a County Class A road with limited traffic and a Regional Class B with limited traffic, respectively. The most recent traffic counts along Ecorse Road were conducted just to the east of the extended runway centerline in 2010. These counts indicate that average annual daily traffic (AADT) in this area is approximately 3,000 vehicles a day, or an average of around 125 vehicles per hour. Tyler Road in the vicinity of the RPZ is primarily used as a non AOA airport service road, providing access to and from airport facilities. The posted speed limit on Ecorse Road is 55 mph and 25 mph along Tyler Road.

**10. EXPLAIN WHY STANDARD(S) CANNOT BE MET:**

Runway 5R-23L is the airports longest and primary runway and is bound to the north by Ecorse Road and to the south by Tyler Road. Eliminating the roads from the RPZs would require the runway to be shortened, relocated, or closed. Reducing the length or closing the runway will negatively impact payload and/or range capacity, and compromise YIP's primary airport tenant's operations. Relocating the runway would require extensive cost. Alternatively, the roads could be closed or relocated. Closing either road would negatively impact the surrounding communities as a result of not being able to use Ecorse Road or Tyler Road. Significantly increased travel times for airport employees/tenants would also result in significant additional O&M expenses. Relocating either road would require extensive cost. The alternatives described below, although feasible, are not viable from a fiscal, constructability and/or operational perspective.

**11. DISCUSS ALL VIABLE ALTERNATIVES:**

The alternatives considered include:

- Shorten Runway 5R-23L (Reduced 4,530-ft. (2,050-ft to clear Tyler Road and 2,480-ft to clear Ecorse Rd.) – *Alternative not preferred as it reduces the runway length for all operations to 3,012-ft. resulting in under half of the current runway length being available. This would have significant impacts that limit take-off and landing operations as well as the airports design aircraft. If both ends or either end was shortened to clear the RPZs of one of the roads, the airports ability to service larger aircraft would be compromised. Approximately 35 % of the aircraft types operating at YIP typically require runway lengths greater than 7,000-ft., including A319, A320, B727, B737, B707, B747, DC8, DC9, and MD80. The runway length required for these aircraft to depart during the summer months at maximum takeoff weight can range between 8,000 – 10,000-ft. Any reduction in available runway length will negatively impact payload and/or range capacity, and compromise our primary airport tenants such as National Airlines, USA Jets, and Kallita.*

  *This alternative would include abandoning or removing runway pavement, rebuilding the approaches to Runway 5R and 23L and relocating the approach lighting system (ALS), glide slope (GS), localizer and potentially other NAVAID equipment. Estimated cost - $1,000,000 (in addition to the potential loss of future revenue).*

- Relocate Ecorse Road to the North - *Alternative not preferred due to cost. The alternative would include the relocation of approximately 11,000-ft of Ecorse Road to the north so that it is outside of the RPZ . Estimated cost - $16,500,000*

- Relocate Tyler Road to the South - *Alternative not preferred due to cost. The alternative would include the relocation of approximately 11,000-ft of Tyler Road to the south so that it is outside of the RPZ. Due to the nature of the terrain, extensive fill would be required to allow the road to shift south. In addition, impacts to the creek to the south would require extensive environmental review. Estimated cost - $18,500,000*

- Tunnel Roads Under RPZ– *Alternative not preferred due to construction cost. Development costs include relocation of all utilities, and lowering significant portions of Ecorse Road and Tyler road, construction of tunnel structures. Estimated cost - $50,000,000.*

- Close Runway – *Alternative not preferred due to the resulting reduction in airfield capacity. Runway 5R-23L is the airports longest runway and only runway with Category I ILS approach capability. If permanently closed, it is likely that some users of the airport would move their operations to another airport with greater runway length and/or more reliable availability during IMC conditions.*

- Close Tyler Road and Ecorse Road – *Alternative not preferred due to negative impacts to the surrounding communities as a result of not being able to use Ecorse Road or Tyler Road. Significantly increased travel times for airport employees/tenants would also result in significant additional O&M expenses.*

- Control activity on Tyler Road and Ecorse Road – *Alternative not considered viable due to difficulty in effectively controlling both public roads.*

- No Action (Obtain MOS) – *Preferred alternative due to the least negative impact from a financial, constructability and operational perspective. All of the other alternatives have significant operational, constructability and/or financial impediments and are therefore not viable.*

**12. ASSURANCE THAT;**

- ✈ THE MOS WILL PROVIDE AN ACCEPTABLE LEVEL OF SAFETY,
- ✈ THE MODIFICATION TO MATERIALS, CONSTRUCTION OR EQUIPMENT STANDARDS WILL PROVIDE A PRODUCT THAT WILL MEET FAA STANDARDS FOR ACCEPTANCE AND THAT THE FINISHED PRODUCT WILL PERFORM FOR ITS INTENDED DESIGN LIFE,
- ✈ MODIFICATION IS NECESSARY TO CONFORM TO LOCAL LAWS AND REGLUATIONS (IF APPLICABLE):

Considering YIP's role as a FAR Part 139 reliever airport for DTW and its importance as a cargo and corporate GA facility; any reduction in runway length at YIP would have an adverse impact on the tenants ability to conduct business and their operations, potentially resulting in a loss of revenue to the Airport and economic development opportunities for the surrounding communities.

The MOS being requested will allow the RPZs on both ends of Runway 5R-23L to contain a public roadway. The proposed MOS will provide an acceptable level of safety for the following reasons:

- Small segments of Ecorse Rd or Tyler Rd penetrates the RPZs.
- Ecorse Road, although a Class A road, is not heavily traveled, and vehicles are operating at a high rate of speed and have no reason to be stopped on the road in the area within (i.e.; no signalized intersections, driveways, etc.), adjacent or near the Runways north end.
- Tyler Road is rarely traveled except by airport tenants.

| 13. SIGNATURE OF ORIGINATOR: | 14. PRINTED NAME OF ORIGINATOR: | 15. DATE: |
|---|---|---|
| 16. ORIGINATOR'S TITLE/ORGANIZATION: | 17. TELEPHONE: | 18. E-MAIL: |
| 19. DATE OF LATEST FAA SIGNED ALP: | | |

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|---|---|---|
| 20. ADO RECOMMENDATION: | | |
| 21. SMS / SAS-2 FORM REQUIRED? | | |
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| 24A. REGIONS APPROVAL (IF APPLICABLE): | | |
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| 24D. HEADQUARTERS APPROVAL (IF APPLICABLE): | | |
| 24E. HEADQUARTERS SIGNATURE | 24F. DATE: | |
| 25. ADO'S FINAL ACTION: | | |
| ☐ UNCONDITIONAL APPROVAL | ☐ CONDITIONAL APPROVAL | ☐ DISAPPROVAL |
| DATE: | SIGNATURE: | TITLE: |
| CONDITIONS OF APPROVAL: | | |

Forward a copy and all supporting documents to AGL-620

**Appendix B**

# Environmental Review Documents

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**IPaC** **U.S. Fish & Wildlife Service**

# Endangered species

Listed species[1] are managed by the Endangered Species Program of the U.S. Fish and Wildlife Service. The species below are potentially affected by activities in this location.

1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information.

**This resource list is for informational purposes only and should not be used for planning or analyzing project level impacts.**

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by creating a project and making a request from the Regulatory Review section.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency.

**A letter from the local office and a species list which fulfills this requirement can only be obtained by requesting an official species list either from the Regulatory Documents section in IPaC or from the local field office directly.**



## Birds

| | |
|---|---|
| Red Knot<br>Calidris Canutus Rufa | Threatened |

## Clams

| | |
|---|---|
| Northern Riffleshell<br>Epioblasma Torulosa Rangiana | Endangered |
| Snuffbox Mussel<br>Epioblasma Triquetra | Endangered |

## Flowering Plants

| | |
|---|---|
| Eastern Prairie Fringed Orchid<br>Platanthera Leucophaea | Threatened |

## Insects

| | |
|---|---|
| Mitchell's Satyr Butterfly<br>Neonympha Mitchellii Mitchellii | Endangered |
| Poweshiek Skipperling CH<br>Oarisma Poweshiek | Endangered |

## Mammals

| | |
|---|---|
| Indiana Bat<br>Myotis Sodalis | Endangered |
| Northern Long-eared Bat<br>Myotis Septentrionalis | Threatened |

## Reptiles

| | |
|---|---|
| Eastern Massasauga (=rattlesnake)<br>Sistrurus Catenatus | Threatened |

# Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

THERE ARE NO CRITICAL HABITATS AT THIS LOCATION.

**IPaC** **U.S. Fish & Wildlife Service**

# Migratory birds

Birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any activity that results in the take (to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct) of migratory birds or eagles is prohibited unless authorized by the U.S. Fish and Wildlife Service[3]. There are no provisions for allowing the take of migratory birds that are unintentionally killed or injured.

Any person or organization who plans or conducts activities that may result in the take of migratory birds is responsible for complying with the appropriate regulations and implementing appropriate conservation measures.

The species of migratory birds below are potentially affected by activities in this location.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)



| | |
|---|---|
| American Bittern<br>Botaurus Lentiginosus | Breeding |
| Bald Eagle<br>Haliaeetus Leucocephalus | Year-round |
| Black Tern<br>Chlidonias Niger | Breeding |
| Black-billed Cuckoo<br>Coccyzus Erythropthalmus | Breeding |
| Blue-winged Warbler<br>Vermivora Pinus | Breeding |
| Bobolink | Breeding |

Dolichonyx Oryzivorus

| | |
|---|---|
| Brown Thrasher<br>Toxostoma Rufum | Breeding |
| Common Tern<br>Sterna Hirundo | Breeding |
| Dickcissel<br>Spiza Americana | Breeding |
| Golden-winged Warbler<br>Vermivora Chrysoptera | Breeding |
| Henslow's Sparrow<br>Ammodramus Henslowii | Breeding |
| Least Bittern<br>Ixobrychus Exilis | Breeding |
| Marsh Wren<br>Cistothorus Palustris | Breeding |
| Peregrine Falcon<br>Falco Peregrinus | Breeding |
| Pied-billed Grebe<br>Podilymbus Podiceps | Breeding |
| Red-headed Woodpecker<br>Melanerpes Erythrocephalus | Breeding |
| Rusty Blackbird<br>Euphagus Carolinus | Wintering |

| | |
|---|---|
| Short-eared Owl<br>Asio Flammeus | Wintering |
| Upland Sandpiper<br>Bartramia Longicauda | Breeding |
| Willow Flycatcher<br>Empidonax Traillii | Breeding |
| Wood Thrush<br>Hylocichla Mustelina | Breeding |

**IPaC** **U.S. Fish & Wildlife Service**

# Facilities

## Wildlife refuges

THERE ARE NO REFUGES AT THIS LOCATION.

## Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

**IPaC** **U.S. Fish & Wildlife Service**

# Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

This location overlaps the following wetlands:

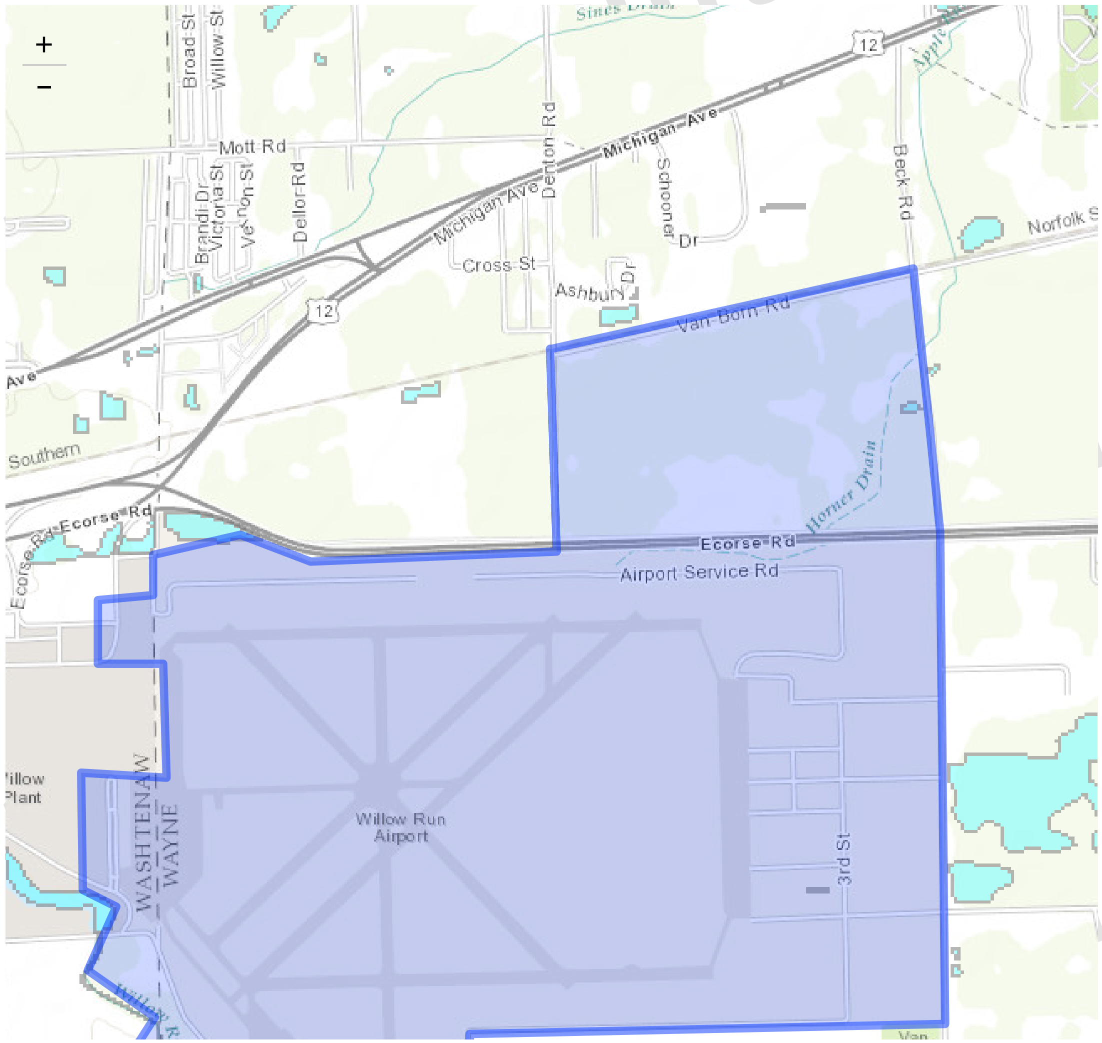
FRESHWATER EMERGENT WETLAND
- PEMC

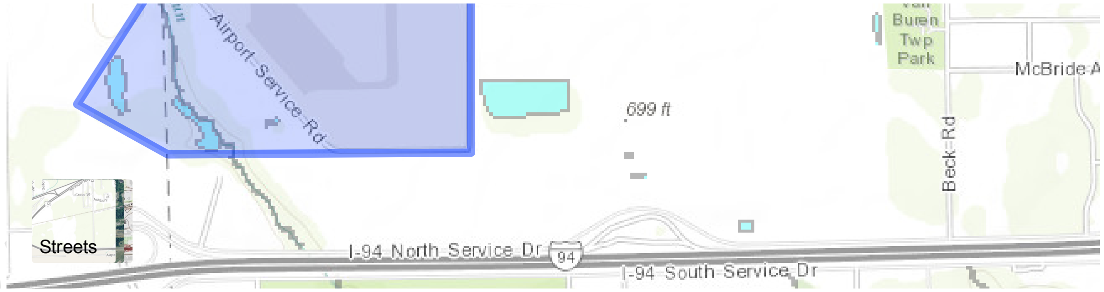
FRESHWATER FORESTED/SHRUB WETLAND
- PSSC
- PFO1Cx

FRESHWATER POND
- PUBHh
- PUBHx
- PUBG

OTHER
- Pf

RIVERINE
- R2UBH




Airport Service Rd
Van Buren Twp Park
McBride A
699 ft
Beck Rd
Streets
I-94 North Service Dr
94
I-94 South Service Dr

**Attachment 10**



May 6, 2016

Mr. Bryan Wagoner, PE, CHMM
Wayne County Airport Authority
1 L.C. Smith Terminal
Detroit, MI 48242-5004

Dear Mr. Wagoner:

The Michigan Department of Natural Resources (DNR) is, unfortunately, no longer able to conduct Environmental Reviews (ER) and ceased acceptance of review requests September 16, 2011. Funding for the program was not included in the state budget and issuance of clearance letters will no longer be done. Project review requests can be sent to Michigan Natural Features Inventory (MNFI), a program of Michigan State University Extension.

MNFI will review projects for potential impacts to endangered species, but there is a cost to the requestor for MNFI's services. For information on environmental reviews or to request environmental reviews go to MNFI website at http://mnfi.anr.msu.edu/. Requests will no longer be accepted through the DNR Endangered Species Assessment web site.

Endangered species and wetland laws remain in place. Under Part 365 of Public Act 451 people are not allowed to take or harm any endangered or threatened of fish, plants or wildlife. The DNR will still be responsible for issuing permits and enforcement relative to the take of endangered and threatened species.

If you have any questions, please e-mail me at SargentL@michigan.gov. Thank you.

Sincerely,

Lori G. Sargent

Lori G. Sargent
Nongame Wildlife Biologist

cc: John Paul Minear, Wayne County Airport Authority

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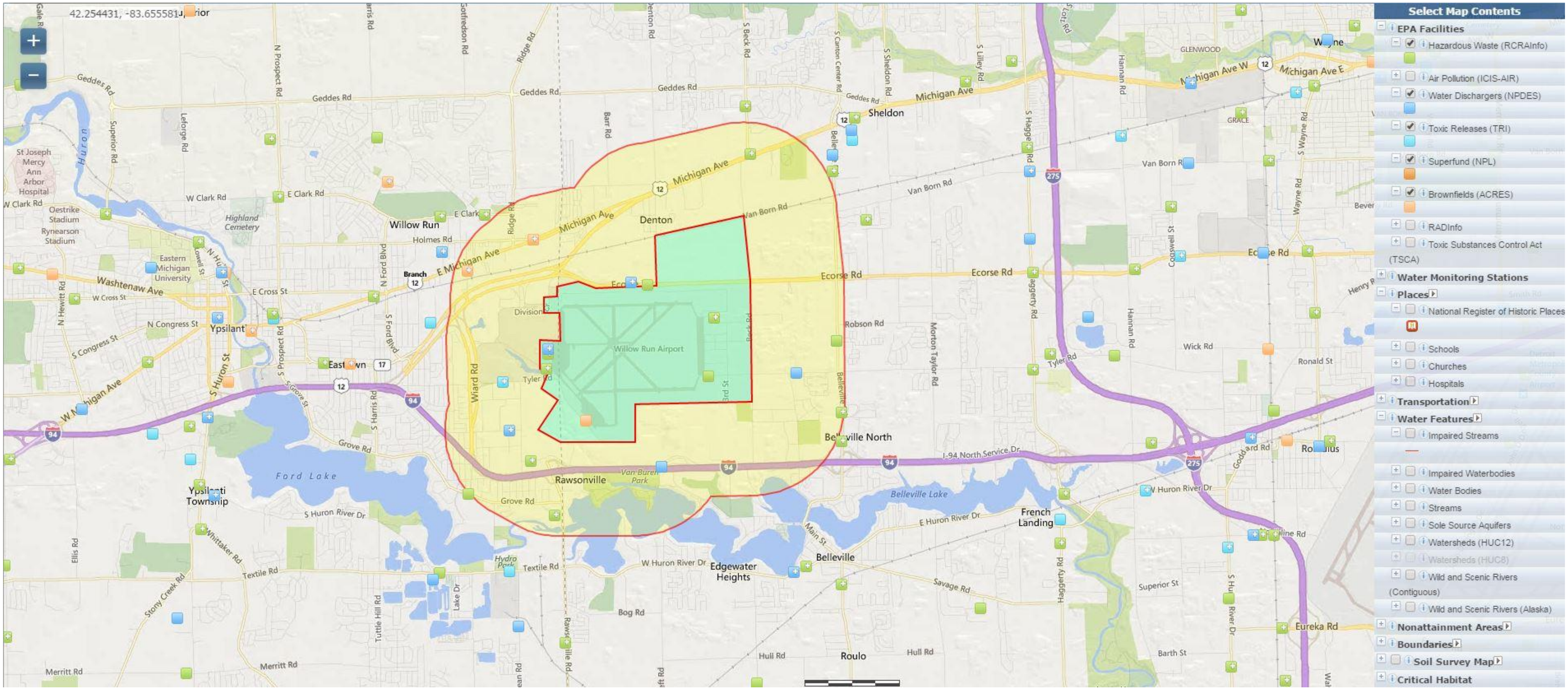
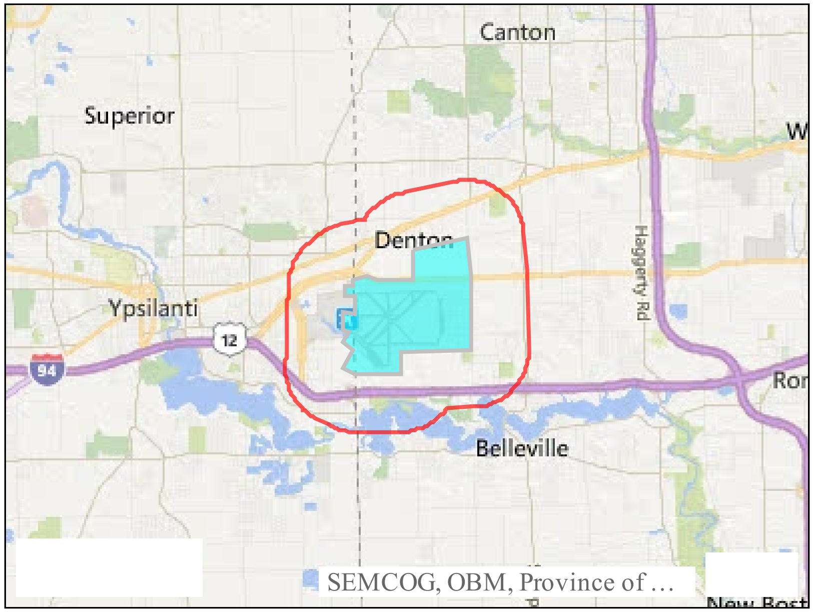
# Attachment 24



# NEPAssist

Home | Help




**Entities highlighted in yellow are confirmed to be located on the Airport. Entities underlined in green are directly adjacent to Airport property.**

**Report question:** ***Within 1 mile of a Brownfields site?*** **yes**

Modify question by entering a new buffer distance and unit for the selected study area:

1 | miles ▼ | Submit

Features within Study Area

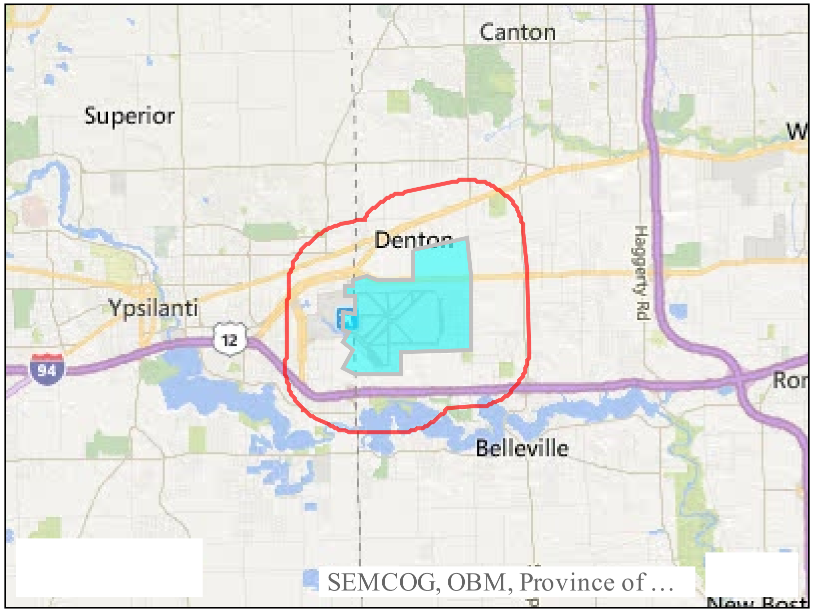
Features found: 4

| Name | Distance | Units |
|---|---|---|
| WILLOW RUN AIRPORT, HANGAR #2 | 0 | mile |
| 3105 E MICHIGAN AVE | .56 | mile |
| 2801 HOLMES ROAD | .77 | mile |
| SEC OF EAST MICHIGAN AVE. AND WIARD ROAD | .86 | mile |

# NEPAssist

Home | Help

United States Environmental Protection Agency




**Report question:** ***Within 1 mile of a Toxic Release Inventory (TRI) site?*** **yes**

Modify question by entering a new buffer distance and unit for the selected study area:

1 miles Submit

Features within Study Area

Features found: 5

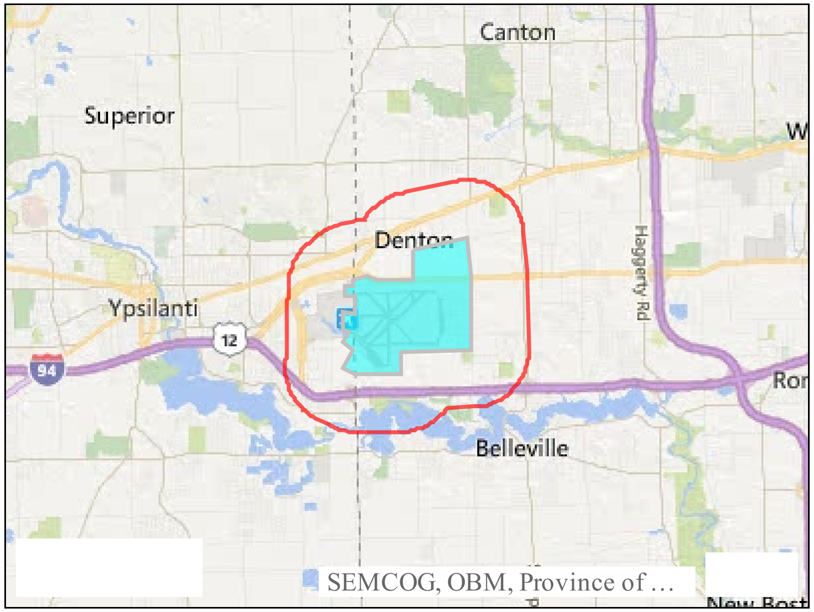
| Name | Distance | Units |
|---|---|---|
| GM POWERTRAIN WILLOW RUN | .05 | mile |
| WAYNE DISPOSAL INC | .39 | mile |
| MASCOTECH FORMING TECHNOLOGIES YPSILANTI | .42 | mile |
| GENERAL MOTORS CORP MIDSIZE CAR DIV WILLOW RUN ASSEMBLY | .49 | mile |
| GREAT LAKE INC | .92 | mile |

**Entities highlighted in yellow are confirmed to be located on the Airport. Entities underlined in green are directly adjacent to Airport property.**

# NEPAssist

Home | Help

EPA United States Environmental Protection Agency




**Report question:** ***Within 1 mile of a water discharger (NPDES)?*** **yes**

Modify question by entering a new buffer distance and unit for the selected study area:

1 | miles | Submit

Features within Study Area

Features found: 11

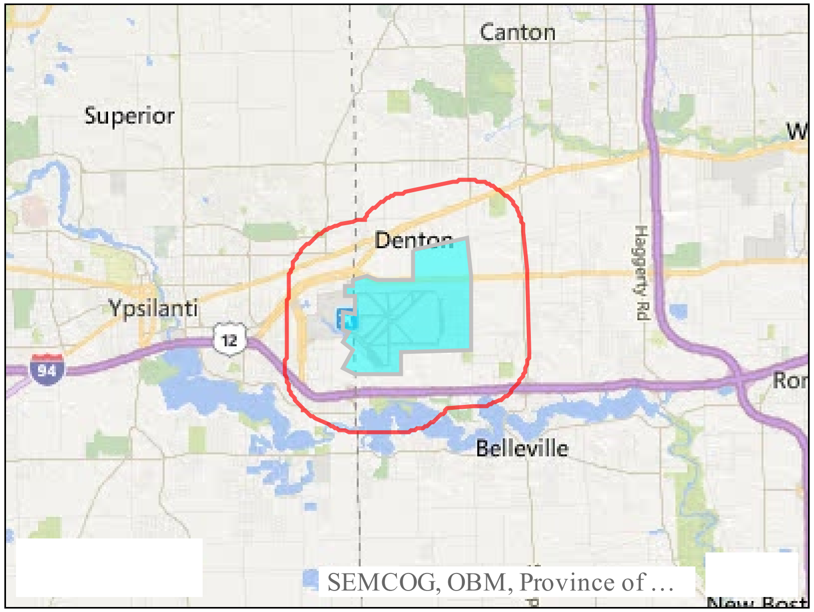
| Name | Distance | Units |
|---|---|---|
| WILLOW RUN AIRPORT | 0 | mile |
| FORD/GM WILLOW RUN CR-CLEANUP | 0 | mile |
| WILLOW RUN AIRPORT | 0 | mile |
| FORD/GM WILLOW RUN CR-LF | 0 | mile |
| GM-SERVICE PARTS OPRTNS-BELVIL | .04 | mile |
| GM-CCA 58 | .04 | mile |
| YCUA REGIONAL WASTEWATER TREATMENT PLANT | .31 | mile |
| YCUA WILLOW RUN AIRPORT | .31 | mile |
| WAYNE DISPOSAL INC | .39 | mile |
| VAN BUREN TWP-SWMA | .48 | mile |
| RACER-POWERTRAIN-WILLOW RUN | .59 | mile |

**Entities highlighted in yellow are confirmed to be located on the Airport. Entities underlined in green are directly adjacent to Airport property.**

# NEPAssist

Home | Help

United States Environmental Protection Agency




**Report question:** ***Within 1 mile of an air emission facility?*** **yes**

Modify question by entering a new buffer distance and unit for the selected study area:

1 | miles | Submit

Features within Study Area

Features found: 6

| Name | Distance | Units |
|---|---|---|
| CADILLAC ASPHALT LLC, RAWSONVILLE | .23 | mile |
| YCUA REGIONAL WASTEWATER TREATMENT PLANT | .31 | mile |
| WAYNE DISPOSAL INC | .39 | mile |
| GENERAL MOTORS CORP MIDSIZE CAR DIV WILLOW RUN ASSEMBLY | .49 | mile |
| WILLOW STATION | .55 | mile |
| RACER TRUST - WILLOW RUN PLANT INDUSTRIAL LAND | .59 | mile |

**Entities highlighted in yellow are confirmed to be located on the Airport. Entities underlined in green are directly adjacent to Airport property.**

# NEPAssist

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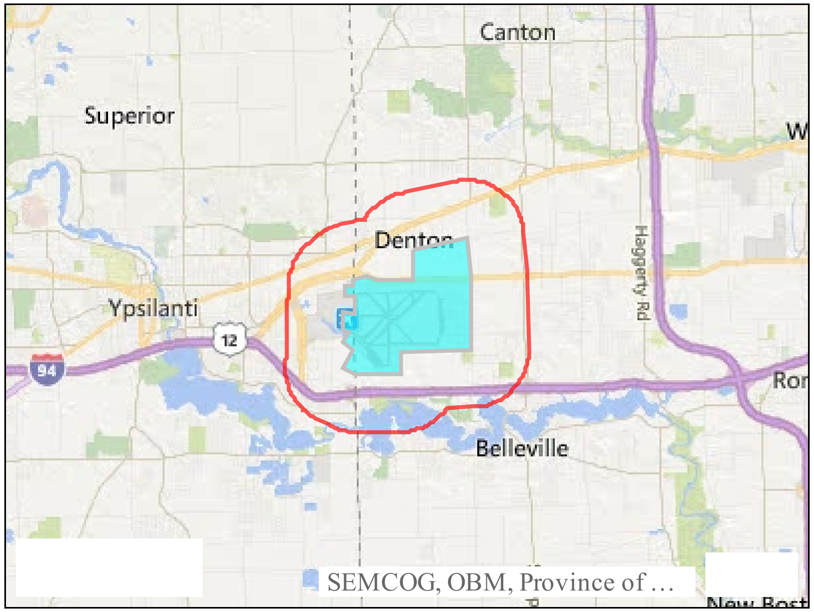
United States Environmental Protection Agency




**Entities highlighted in yellow are confirmed to be located on the Airport. Entities underlined in green are directly adjacent to Airport property.**

**Report question:** ***Within 1 mile of a hazardous waste (RCRA) facility?*** **yes**

Modify question by entering a new buffer distance and unit for the selected study area:

1 | miles | Submit

Features within Study Area

Features found: 107

| Name | Distance | Units |
|---|---|---|
| ACTIVE AERO CHARTER | 0 | mile |
| UNIVERSITY OF MI BECK RD FACILITY | 0 | mile |
| ROUSH INDUSTRIES INC | 0 | mile |
| YANKEE AIR FORCE/YANKEE AIR MUSEUM | 0 | mile |
| RECOVERY SPECIALISTS INC | 0 | mile |
| AMERICAN INTERNATIONAL AIRWAYS INC | 0 | mile |
| EQIS TRANSFER & PROCESSING | 0 | mile |
| FEDERAL AVIATION ADMINISTRATION | 0 | mile |
| YPSILANTI COMMUNITY UTILITY AUTHORITY | 0 | mile |
| COUNTY OF WAYNE AIRPORT AUTHORITY | 0 | mile |
| ACE AIRCRAFT FINISHERS INC | 0 | mile |
| WOLVERINE DISPOSAL, INC. | 0 | mile |
| EAGLE AVIATION CENTER | 0 | mile |
| AVFLIGHT WILLOW RUN CORPORATION | 0 | mile |
| KALITTA AIR LLC | 0 | mile |
| KALITTA CHARTERS LLC | 0 | mile |
| ZANTOP INTERNATIONAL AIRLINES INC | 0 | mile |
| EXPRESS NET AIRLINES | 0 | mile |
| CHRYSLER PENTASTAR AVIATION INC | 0 | mile |
| ZANTOP INTERNATIONAL AIRLINES INC | 0 | mile |
| MICHIGAN INSTITUTE OF AERONAUTICS INC | 0 | mile |
| ROSENBALM AVIATION INC | 0 | mile |
| YANKEE AIR FORCE INC | 0 | mile |
| ZANTOP INTERNATIONAL AIRLINES INC | 0 | mile |
| AMERISTAR JET CHARTER | 0 | mile |
| AMERICAN INTERNATIONAL AIRWAYS INC | 0 | mile |
| JOHNSON CONTROLS | .01 | mile |
| GENERAL MOTORS LLC | .04 | mile |
| GENERAL MOTORS LLC | .04 | mile |
| OLYMPIC LASER PROCESSING | .20 | mile |
| CONTRACTORS STEEL CO | .21 | mile |
| CADILLAC ASPHALT LLC, RAWSONVILLE | .23 | mile |
| CONSTELLIUM AUTOMOTIVE USA LLC | .25 | mile |
| KITTY HAWK TURBINES | .26 | mile |

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| | | |
|---|---|---|
| CRYSLER PENTASTAR AVIATION INC | .29 | mile |
| MOTORS LIQUIDATION COMPANY | .29 | mile |
| MOTORS LIQUIDATION COMPANY | .29 | mile |
| MOTORS LIQUIDATION COMPANY | .29 | mile |
| GENERAL MOTORS CORPORATION | .30 | mile |
| GENERAL MOTORS CORPORATION | .30 | mile |
| B & H TRUCKING INC | .31 | mile |
| MY-WAY TRUCKING INC | .31 | mile |
| YCUA REGIONAL WASTEWATER TREATMENT PLANT | .31 | mile |
| WOLVERINE FREIGHTLINER WESTSIDE INC | .33 | mile |
| KALITTA CHARTERS LLC | .33 | mile |
| MI DEPT/TRANSPORTATION | .34 | mile |
| MI DEPT/TRANSPORTATION | .34 | mile |
| UPS GROUND FREIGHT | .34 | mile |
| MI DEPT/TRANSPORTATION | .34 | mile |
| CORBY ENERGY SERVICES INC | .35 | mile |
| MICHIGAN DISPOSAL WASTE TREATMENT PLANT | .36 | mile |
| CROWN INDUSTRIAL SERVICES INC | .36 | mile |
| ADVANCE CUSTOM PAINT LTD | .38 | mile |
| ITC HOLDINGS | .38 | mile |
| WAYNE DISPOSAL INC | .39 | mile |
| DTE ENERGY/MICHCON | .41 | mile |
| MASCOTECH FORMING TECHNOLOGIES YPSILANTI | .42 | mile |
| A & K AUTO SALES & PARTS LLC | .42 | mile |
| 5TH AVENUE CLEANERS | .44 | mile |
| KMART 3155 | .45 | mile |
| VAN BUREN TWP-SWMA | .48 | mile |
| GENERAL MOTORS CORP MIDSIZE CAR DIV WILLOW RUN ASSEMBLY | .49 | mile |
| INTERNATIONAL TRANSMISSION COMPANY LLC | .49 | mile |
| WORK SKILLS CORP | .49 | mile |
| MOTORS LIQUIDATION COMPANY | .49 | mile |
| GENERAL MOTORS CORP MIDSIZE CAR DIV WILLOW RUN ASSEMBLY | .49 | mile |
| MOBIL OIL CORP | .50 | mile |
| A-1 AUTO SALVAGE & SCRAP LLC | .50 | mile |
| EXPRESS TOOL & DIE CO INC | .52 | mile |
| EQ INDUSTRIAL SERVICES | .53 | mile |
| DTE ENERGY/MICHCON | .55 | mile |
| SLOAN PETROLEUM | .56 | mile |
| POINTE SCIENTIFIC INC | .57 | mile |
| DTE MICHCON | .57 | mile |
| CONRAIL WILLOW RUN CAR SHOP | .58 | mile |
| MOELLER MFG COMPANY INC | .58 | mile |
| REVITALIZING AUTO COMMUNITIES ENVIRONMENTAL RESPONSE TRUST | .59 | mile |
| REVITALIZING AUTO COMMUNITIES ENVIRONMENTAL RESPONSE | | |

| | | |
|---|---|---|
| TRUST | .59 | mile |
| SEDRICK MCCULLOUGH | .60 | mile |
| SPEEDWAY LLC | .63 | mile |
| PRECISION PARTNERS CORP | .64 | mile |
| EXXONMOBIL OIL CORP | .64 | mile |
| RATLIFF TRUCKING CORP | .66 | mile |
| PENSKE TRUCK LEASING CO LP | .66 | mile |
| LIDELL SPECIALTY PRODUCTS INC | .66 | mile |
| HD SUPPLY WATER WORKS LTD WW2630 | .66 | mile |
| TARGET STORE T2415 | .66 | mile |
| WOODWARD DETROIT CVS LLC | .66 | mile |
| MERCHANTS AUTOMATIC PRODUCTS CO | .66 | mile |
| PETSMART/3 E CO | .70 | mile |
| HURON VALLEY COLLISION | .71 | mile |
| COACHS CATASTROPHE CLEANING | .74 | mile |
| YPSI COMM UTIL AUTH SNOW RD PUMP STATION | .78 | mile |
| FORD MOTOR COMPANY | .79 | mile |
| ARCTIC EDGE OF CANTON | .85 | mile |
| ROBERT HMEMERING | .89 | mile |
| GREAT LAKE INC | .92 | mile |
| BOYLE PAT CHEVROLET INC | .93 | mile |
| BELLEVILLE PROPERTY CO LLC | .93 | mile |
| MEIJER INC | .93 | mile |
| ATCHINSON FORD SALES INC | .94 | mile |
| AUTOZONE STORES INC | .94 | mile |
| CAPPO MANAGEMENT XV11 INC | .95 | mile |
| WALGREEN CO | .97 | mile |
| METRO AUTO SERVICE CENTER INC | .97 | mile |
| WAL-MART STORES EAST LP | 1.00 | mile |
| DOWNS CORP | 1.00 | mile |

**Entities highlighted in yellow are confirmed to be located on the Airport. Entities underlined in green are directly adjacent to Airport property.**

**Attachment 2**

STATE OF MICHIGAN
MICHIGAN STATE HOUSING DEVELOPMENT AUTHORITY
STATE HISTORIC PRESERVATION OFFICE

RICK SNYDER
GOVERNOR

SCOTT WOOSLEY
EXECUTIVE DIRECTOR

April 24, 2014

ERNEST P GUBRY
FEDERAL AVIATION ADMINISTRATION
DETROIT AIRPORTS DISTRICT OFFICE
11677 SOUTH WAYNE ROAD SUITE 107
ROMULUS MI 48174

RE: ER-930515 Runway 14-32 Decommission & Removal; Demolition of Hangar 2 – Willow Run Airport, Section 13, T3S, R7E, Ypsilanti Township, Washtenaw County (FAA)

Dear Mr. Gubry:

Under the authority of Section 106 of the National Historic Preservation Act of 1966, as amended, we have reviewed information in your April 3 and April 17 letters pertaining to the two above-cited undertakings at Willow Run Airport.

We initially reviewed the Runway 14-32 Removal and responded on November 26, 2012 with an opinion that the undertaking would have an *adverse effect* on the Willow Run Airport, which appears to meet the criteria for listing in the National Register of Historic Places (NRHP), as it would result in the loss of Runway 14-32, a contributing feature in the Willow Run Airport.

In response to our opinion, consultation continued through correspondence and electronic communication, and several staff from the SHPO conducted a site visit to the Willow Run Airport in August 2013. We also received a Cultural Resources Management Plan (CRMP) for the airport on September 23, 2013. In our comments on the CRMP on dated January 22, 2014, we expressed our opinion that the airport and its resources contribute to a larger NRHP eligible complex that includes the adjacent Willow Run Bomber Plant. We referred to this area as the Willow Run Historic District. We also noted that without the plant, the rest of the airport would not retain its historic context and would probably not be eligible for listing in the NRHP. The FAA agreed with this assessment and with the adverse effect finding and a Memorandum of Agreement (MOA) was developed to mitigate the effects of the runway removal, which was signed by the SHPO on December 19, 2013 and forwarded to the FAA for signature and execution.

In your letter dated April 17, 2014, you provided documentation that the adjacent Willow Run Bomber Plant, an integral contributing resource to the historic significance of the site, is in the process of being demolished by the owner of the property, and in fact less than 50% of it remains. Based on this information, the FAA has asserted that the demolition has affected the historic integrity to the extent that neither the Bomber Plant, nor the overall Willow Run Historic District meets the criteria for listing in the NRHP.

The FAA has made a new finding that *no historic properties are affected* by the removal of Runway 14-32. Based on the information provided, the SHPO concurs with the opinion that the Willow Run Historic District no longer appears to meet the criteria for listing in the NRHP, and we concur with the *no historic properties* finding. Based on the new finding, the proposed MOA, which has not yet been executed, will be disregarded.

Likewise, in June 2013 the FAA initiated consultation with the SHPO on the demolition of Hangar 2 at the Willow Run Airport. In our letter dated August 14, 2013, the SHPO considered the loss of Hangar 2 to result in an *adverse effect* on the Willow Run Historic District. In view of the recent demolition of the Bomber Plant, and the change in NRHP eligibility status for the site, the SHPO concurs with the FAA's new finding of *no historic properties affected* for this undertaking.

Regarding the CRMP for the Willow Run Airport, we want to thank you for the time and consideration put forth in the creation of this document. In light of the loss of eligibility of the site, the CRMP is not necessary for making decisions and planning activities for the site, but it remains an important part of the historical record of the Willow Run Airport, and documentation of the circumstances leading to its loss of eligibility as a historic site.

The State Historic Preservation Office is not the office of record for these undertakings. You are therefore asked to maintain a copy of this letter with your environmental review record for these undertakings. If the scope of work changes in any way, or if artifacts or bones are discovered, please notify this office immediately.

If you have any questions, please contact Martha MacFarlane Faes, Deputy State Historic Preservation Officer at (517) 335-2720. Please reference our project number in all communication with this office regarding these undertakings. Thank you for your cooperation.

Sincerely,

Brian D. Conway
State Historic Preservation Officer

BDC:MMF:bgg

Copy: Sean Brosnan, Willow Run Airport
Theresa L. Samosiuk, Wayne County Airport Authority
Advisory Council on Historic Preservation
Valerie Hoag, MEDC

STATE OF MICHIGAN
MICHIGAN STATE HOUSING DEVELOPMENT AUTHORITY
STATE HISTORIC PRESERVATION OFFICE

RICK SNYDER
GOVERNOR

KEVIN ELSENHEIMER
EXECUTIVE DIRECTOR

July 6, 2016

JOHN PAUL MINEAR
WAYNE COUNTY AIRPORT AUTHORITY
1 L C SMITH TERMINAL MEZZANINE
DETROIT MI 48241

RE: ER-930515 Willow Run Airport – Master Plan Update, Ypsilanti, Washtenaw County (FAA)

Dear Mr. Minear:

The State Historic Preservation Officer (SHPO) received your early coordination notification for Willow Run Airport – Master Plan Update. Section 106 of the National Historic Preservation Act of 1966, as amended, requires federal agencies to take into account the effect of their undertakings on historic properties. It is the responsibility of the federal agency, not the SHPO, to fulfill the requirements of Section 106. Under the Section 106 regulations, the SHPO responds with a determination that they either concur or disagree with an adequately-documented determination of eligibility and an adequately-documented determination of effect made by the agency.

As this is early coordination and not enough information on the proposed undertaking is available at this time, it is premature for the SHPO to provide meaningful comment. However, as plans are developed, a section 106 application must be submitted to the SHPO for review, comment and meaningful consultation.

We remind you that federal agency officials or their delegated authorities are required to involve the public in a manner that reflects the nature and complexity of the undertaking and its effects on historic properties per 36 CFR § 800.2(d). The National Historic Preservation Act also requires that federal agencies consult with any Indian tribe and/or Tribal Historic Preservation Officer (THPO) that attach religious and cultural significance to historic properties that may be affected by the agency's undertakings per 36 CFR § 800.2(c)(2)(ii).

The State Historic Preservation Office is not the office of record for this undertaking. You are therefore asked to maintain a copy of this letter with your environmental review record for this undertaking. If the scope of work changes in any way, or if artifacts or bones are discovered, please notify this office immediately.

If you have any questions, please contact Brian Grennell, Cultural Resource Management Specialist, at 517-335-2721 or by email at grennellb@michigan.gov. **Please reference our project number in all communication with this office regarding this undertaking.** Thank you for this opportunity to review and comment, and for your cooperation.

Sincerely,

Brian G. Grennell

Brian G. Grennell
Cultural Resource Management Specialist

for Brian D. Conway
State Historic Preservation Officer

BGG

Enclosure(s)

ER-930515

DETROIT METRO • WILLOW RUN
WAYNE COUNTY AIRPORT AUTHORITY

1 L.C. Smith Terminal • Mezzanine
Detroit, MI 48242-5004
ph 734 942-3550
fax 734 247-7138
www.metroairport.com

RECEIVED
MAY 05 2016

April 28, 2016

Mr. Brian Conway
State Historic Preservation Officer
State Historic Preservation Office
Michigan Historical Center
P.O. Box 30740
702 W. Kalamazoo St.
Lansing, MI 48909-8240

Subject: Agency Early Coordination Letter
Willow Run Airport – Master Plan Update
Ypsilanti, Michigan

Dear Mr. Brian Conway:

The Wayne County Airport Authority (WCAA) is writing to inform you of its project to update the master plan for the Willow Run Airport (Airport) located in Van Buren Township near Ypsilanti, Michigan. As part of this project, an environmental overview will be conducted to evaluate potential environmental impacts of possible developments that will be addressed in the master plan.

The master plan process is in its early stages and decisions have not yet been made on the alternatives to address facility needs; however, we would like to collect any general information you may have about environmental resources on, or in proximity to, the Airport. The preliminary information we have collected about facility needs indicates that:

- Changes will be needed to the configuration of runways and taxiways to meet Federal Aviation Administration (FAA) airfield design standards
- Improvements will be needed to buildings, roads, and utility infrastructure
- Areas are needed on-airport for future aeronautical and non-aeronautical development

It should be noted that the environmental overview is not intended to satisfy environmental clearance requirements as outlined in FAA Order 5050.4B, the National Environmental Policy Act of 1969 (NEPA), or determine or delineate any detailed environmental concerns. Nor does it imply that the development addressed in the master plan will occur. Instead, the intent is to identify environmental constraints that can be used in developing any future NEPA document if growth at the Airport necessitates the proposed development addressed in the master plan. If any of the alternatives from the master plan are implemented, coordination would occur prior to design and construction to prepare a NEPA compliant document would be completed to further evaluate the level of environmental impact and determine if mitigation measures or selection of another alternative is necessary to reduce adverse effects.

Your comments are being requested as it relates to:

- Specific areas of concern
- Specific benefits to your organization
- Available technical information for the Willow Run Airport and surrounding area
- Mitigation or permitting requirements that may be necessary for future projects

Every attempt will be made to avoid, minimize, or mitigate social, environmental, or economic impacts for the developments outlined in the master plan. All proposed development would also comply with any local, state, or federal permitting requirements at the time of construction, should these projects be pursued.

If you would like additional information on the Willow Run Airport master plan update please contact:

Mr. John Paul Minear, AIA, NCARB, C.M.
Deputy Director, Planning
Planning and Strategy Management
Wayne County Airport Authority
L.C. Smith Building – Mezzanine
Detroit, MI 48241
Phone: (734) 247-7370
E-mail: john.minear@wcaa.us

We would appreciate your assistance in forwarding copies of this notification to the appropriate staff within your organization and requests your comments be returned to Mr. John Paul Minear within 45 days after receipt of this letter.

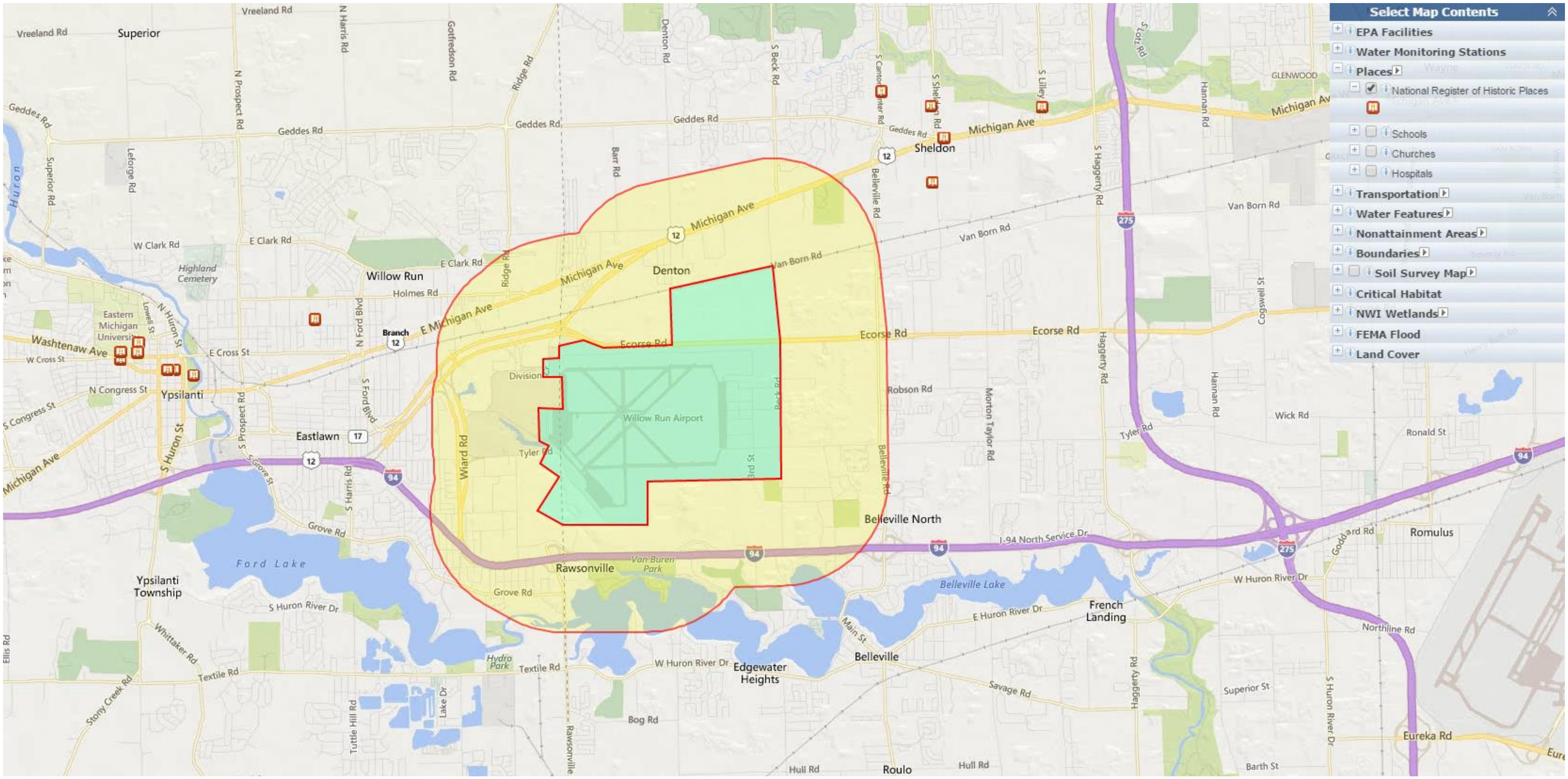
Sincerely,

Wayne County Airport Authority

Bryan C. Wagoner

Bryan Wagoner, PE, CHMM
Director of Environment & Sustainability

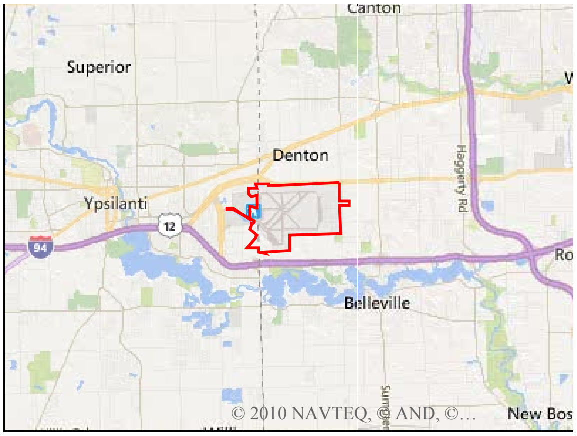
Enclosures



Select Map Contents
EPA Facilities
Water Monitoring Stations
Places
National Register of Historic Places
Schools
Churches
Hospitals
Transportation
Water Features
Nonattainment Areas
Boundaries
Soil Survey Map
Critical Habitat
NWI Wetlands
FEMA Flood
Land Cover
Willow Run Airport
Denton
Willow Run
Ypsilanti
Eastlawn
Rawsonville
Belleville North
Belleville
Sheldon
Superior
Romulus
French Landing
Edgewater Heights
Ypsilanti Township
Roulo
Ford Lake
Belleville Lake
Michigan Ave
Ecorse Rd
Van Born Rd
Geddes Rd

# NEPAssist

Home | Help




**Report question:** ***Within 0.5 miles of a historic property on the National Register of Historic Places?*** **no**

Modify question by entering a new buffer distance and unit for the selected study area:

miles | Submit Query

Nearest Features to Study Area

Features found: 1

| Name | Distance | Units |
|---|---|---|
| Starkweather Religious Center | 1.75 | miles |

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Appendix C

# Early Coordination Letter Responses

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**From:** John Paul Minear <John.Minear@wcaa.us>
**Sent:** Monday, May 02, 2016 9:17 AM
**To:** Wes Andrews
**Cc:** Wayne G. Sieloff; Mark Breukink; Kelly Morris; Bryan Wagoner; Stephanie Ward; Zachary Puchacz; Chris Mullin; Helen Dixon (helen.dixon@dixonandcompanyinc.com)
**Subject:** RE: Willow Run Airport - Tribal Comments

**Categories:** Filed by Newforma

Mr. Andrews,

Thank you for your timely response and we appreciate the information below. We will make note of the change in status of Leonard Mitchell and revise our contact list. Thanks again!

JPM

John Paul Minear, AIA, NCARB, CM
Deputy Director, Planning
Planning and Strategy Management
Wayne County Airport Authority
L.C. Smith Building - Mezzanine
Detroit, MI 48241
Direct: (734) 247-7370
Fax: (734) 247-7138

-----Original Message-----
From: Wes Andrews [mailto:wandrews@LTBBODAWA-NSN.GOV]
Sent: Sunday, May 1, 2016 3:53 AM
To: John Paul Minear <John.Minear@wcaa.us>
Subject: Willow Run Airport - Tribal Comments

Dear Mr. Minear,

Your letter of April 26 was forwarded to me for response.

I have reviewed the documentation you sent regarding this project as well as researched our files and other sources.

It is my determination that there are no known cultural resources associated with our tribe that will be impacted by this undertaking.

Also please note that Mr. Leonard Mitchell is no longer the official contact person for these type of matters for the tribe.

Sincerely,

Wesley Andrews

THPO & NAGPRA Representative
The Little Traverse Bay Bands of Odawa Indians
7500 Odawa Circle
Harbor Springs, MI 49740

(231) 670-0713
(231) 753-2807 (fax)

--

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES
LANSING

RICK SNYDER
GOVERNOR

DR. WILLIAM E. MORITZ
DIRECTOR

May 6, 2016

Mr. Bryan Wagoner, PE, CHMM
Wayne County Airport Authority
1 L.C. Smith Terminal
Detroit, MI 48242-5004

Dear Mr. Wagoner:

The Michigan Department of Natural Resources (DNR) is, unfortunately, no longer able to conduct Environmental Reviews (ER) and ceased acceptance of review requests September 16, 2011. Funding for the program was not included in the state budget and issuance of clearance letters will no longer be done. Project review requests can be sent to Michigan Natural Features Inventory (MNFI), a program of Michigan State University Extension.

MNFI will review projects for potential impacts to endangered species, but there is a cost to the requestor for MNFI's services. For information on environmental reviews or to request environmental reviews go to MNFI website at http://mnfi.anr.msu.edu/. Requests will no longer be accepted through the DNR Endangered Species Assessment web site.

Endangered species and wetland laws remain in place. Under Part 365 of Public Act 451 people are not allowed to take or harm any endangered or threatened of fish, plants or wildlife. The DNR will still be responsible for issuing permits and enforcement relative to the take of endangered and threatened species.

If you have any questions, please e-mail me at SargentL@michigan.gov. Thank you.

Sincerely,

Lori G. Sargent
Nongame Wildlife Biologist

cc: John Paul Minear, Wayne County Airport Authority

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USDA

United States Department of Agriculture

Natural
Resources
Conservation
Service

Michigan State Office

3001 Coolidge Road
Suite 250
East Lansing, MI
48823-6321

Telephone:
(517) 324-5270
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(855) 701-4363

www.mi.nrcs.usda.gov





May 4, 2016

John Paul Minear, AIA, NCARB, C.M.
Deputy Director, Planning
Planning and Strategy Management
Wayne County Airport Authority
L.C. Smith Building - Mezzanine
Detroit, Michigan 48241

Dear Mr. Minear:

The Natural Resources Conservation Service (NRCS) under Part 523 of the Farmland Protection Policy Act has reviewed the Area of Future Potential Development for the Willow Run Master Plan Update. This review was conducted with respect to the effect(s) that the proposal may have on prime and/or unique farmland. Subpart B of Part 523 of the Farmland Protection Policy Act states that 'Lands identified as "urbanized area" (UA) on the Census Bureau maps' are not covered by the act. Since the Area of the Future Potential Development for the Willow Run Master Plan Update extent is UA on the 2010 Census Bureau Reference Map for Ann Arbor, MI, we have concluded that this proposal will have no negative impact on prime and/or unique farmland.

Should the scope of the project change to where expansion will occur, please resubmit the proposal for our review.

Sincerely,

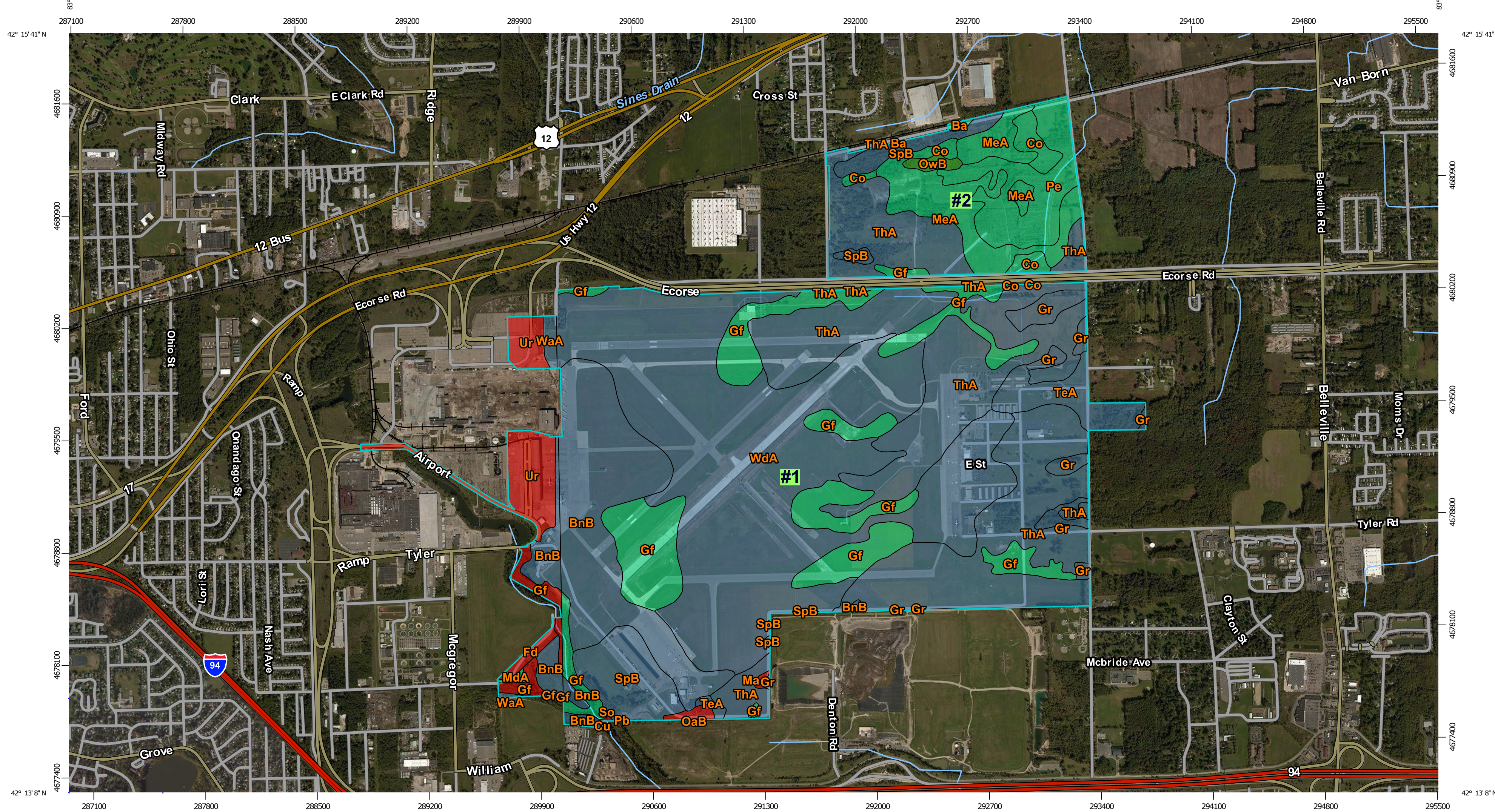
Garry Lee

GARRY LEE
State Conservationist

cc:
Tamarra Roseburgh, District Conservationist, NRCS, Monroe, MI
Albert Jones, Area Conservationist, NRCS, Flint, MI

# Attachment 12

Farmland Classification—Washtenaw County, Michigan, and Wayne County Area, Michigan
(BoundaryPolyLine_FeatureToPoly)




Map Scale: 1:23,000 if printed on B landscape (17" x 11") sheet.

N

Meters: 0, 300, 600, 1200, 1800

Feet: 0, 1000, 2000, 4000, 6000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

# MAP LEGEND

**Area of Interest (AOI)**

Area of Interest (AOI)

**Soils**

**Soil Rating Polygons**

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

**Soil Rating Lines**

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

**Soil Rating Points**

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

**Water Features**

## MAP INFORMATION

Streams and Canals

**Transportation**

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

**Background**

Aerial Photography

The soil surveys that comprise your AOI were mapped at scales ranging from 1:15,800 to 1:20,000.

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Washtenaw County, Michigan
Survey Area Data: Version 15, Sep 26, 2016

Soil Survey Area: Wayne County Area, Michigan
Survey Area Data: Version 13, Sep 21, 2016

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

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

Date(s) aerial images were photographed: Sep 17, 2014—Sep 27, 2014

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

# Farmland Classification

| Farmland Classification— Summary by Map Unit — #1, Washtenaw County, Michigan (MI161) | | | | |
|---|---|---|---|---|
| **Map unit symbol** | **Map unit name** | **Rating** | **Acres in AOI** | **Percent of AOI** |
| BnB | Boyer loamy sand, 1 to 6 percent slopes | Farmland of local importance | 30.5 | 1.3% |
| Fd | Fill land | Not prime farmland | 6.5 | 0.3% |
| Gf | Gilford sandy loam, till plain, 0 to 2 percent slopes | Not prime farmland | 19.1 | 0.8% |
| MdA | Matherton sandy loam, 0 to 4 percent slopes | Prime farmland if drained | 1.4 | 0.1% |
| Ur | Urban land | Not prime farmland | 66.5 | 2.8% |
| WaA | Wasepi sandy loam, 0 to 4 percent slopes | Farmland of local importance | 6.9 | 0.3% |
| **Subtotals for #1** | | | **130.9** | **5.5%** |
| **Totals for Area of Interest** | | | **2,365.1** | **100.0%** |

| Farmland Classification— Summary by Map Unit — #1, Wayne County Area, Michigan (MI602) | | | | |
|---|---|---|---|---|
| **Map unit symbol** | **Map unit name** | **Rating** | **Acres in AOI** | **Percent of AOI** |
| BnB | Boyer loamy sand, 0 to 6 percent slopes | Farmland of local importance | 225.7 | 9.5% |
| Co | Corunna fine sandy loam | Prime farmland if drained | 0.2 | 0.0% |
| Cu | Cut and fill land | Not prime farmland | 0.1 | 0.0% |
| Gf | Gilford sandy loam | Prime farmland if drained | 252.6 | 10.7% |
| Gr | Granby loamy fine sand | Farmland of local importance | 40.5 | 1.7% |
| Ma | Made land | Not prime farmland | 1.5 | 0.1% |
| OaB | Oakville fine sand, 0 to 6 percent slopes | Not prime farmland | 4.7 | 0.2% |
| Pb | Pits, borrow | Not prime farmland | 0.0 | 0.0% |
| So | Sloan silt loam, wet | Not prime farmland | 0.4 | 0.0% |
| SpB | Spinks loamy sand, 0 to 6 percent slopes | Farmland of local importance | 66.0 | 2.8% |
| TeA | Tedrow loamy fine sand, 0 to 2 percent slopes | Farmland of local importance | 49.4 | 2.1% |
| ThA | Thetford loamy sand, 0 to 2 percent slopes | Farmland of local importance | 512.2 | 21.7% |
| WdA | Wasepi sandy loam, 0 to 4 percent slopes | Farmland of local importance | 722.3 | 30.5% |
| **Subtotals for #1** | | | **1,875.6** | **79.3%** |
| **Totals for Area of Interest** | | | **2,365.1** | **100.0%** |

| Farmland Classification— Summary by Map Unit — #2, Wayne County Area, Michigan (MI602) | | | | |
|---|---|---|---|---|
| **Map unit symbol** | **Map unit name** | **Rating** | **Acres in AOI** | **Percent of AOI** |
| Ba | Belleville loamy fine sand | Prime farmland if drained | 1.9 | 0.1% |
| Co | Corunna fine sandy loam | Prime farmland if drained | 28.7 | 1.2% |
| Gf | Gilford sandy loam | Prime farmland if drained | 3.8 | 0.2% |
| MeA | Metamora sandy loam, 0 to 3 percent slopes | Prime farmland if drained | 103.2 | 4.4% |
| OwB | Owosso-Morley complex, 2 to 6 percent slopes | All areas are prime farmland | 6.5 | 0.3% |
| Pe | Pewamo loam | Prime farmland if drained | 83.7 | 3.5% |
| SpB | Spinks loamy sand, 0 to 6 percent slopes | Farmland of local importance | 27.0 | 1.1% |
| ThA | Thetford loamy sand, 0 to 2 percent slopes | Farmland of local importance | 103.8 | 4.4% |
| **Subtotals for #2** | | | **358.7** | **15.2%** |
| **Totals for Area of Interest** | | | **2,365.1** | **100.0%** |

## Description

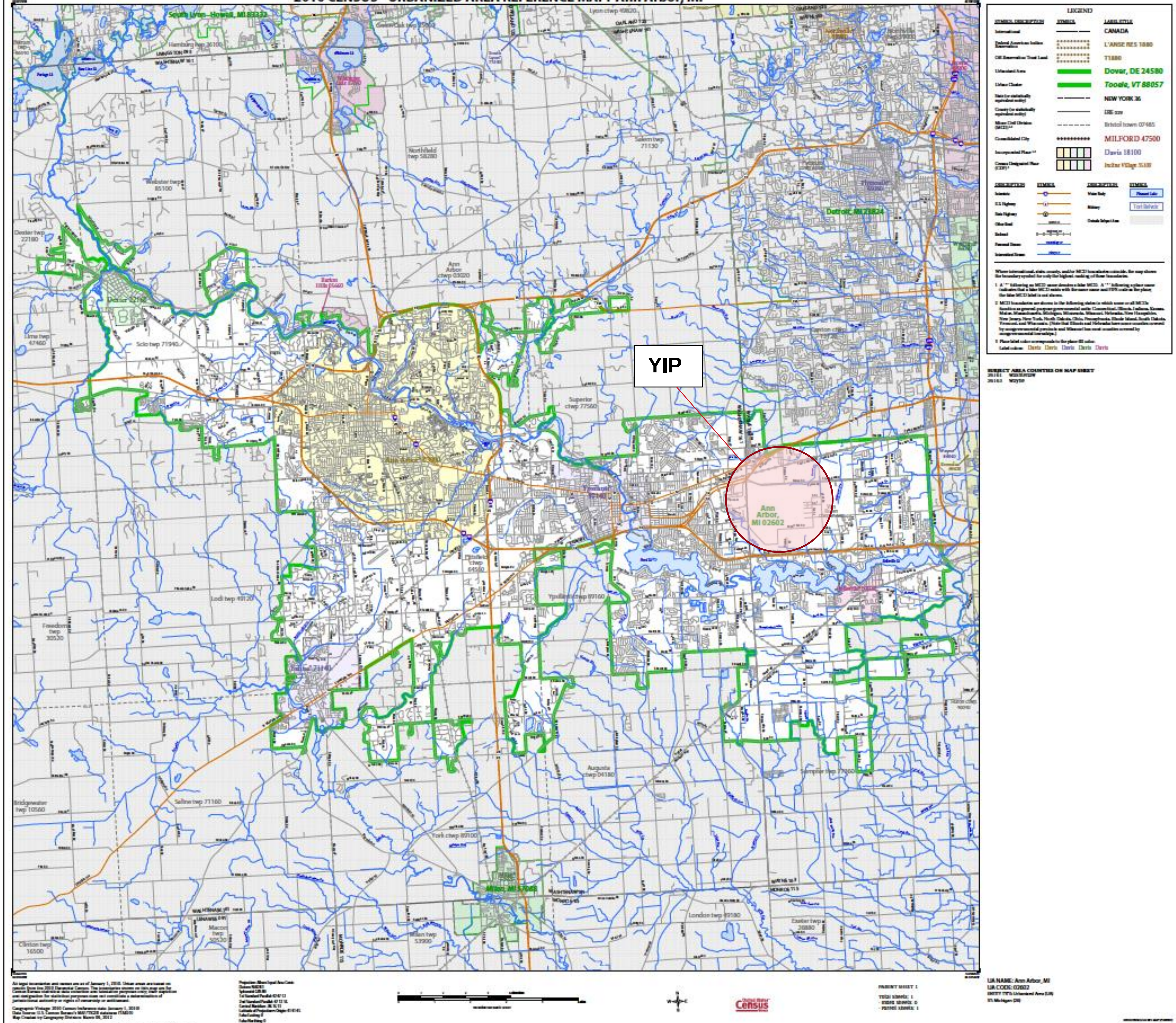
Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.

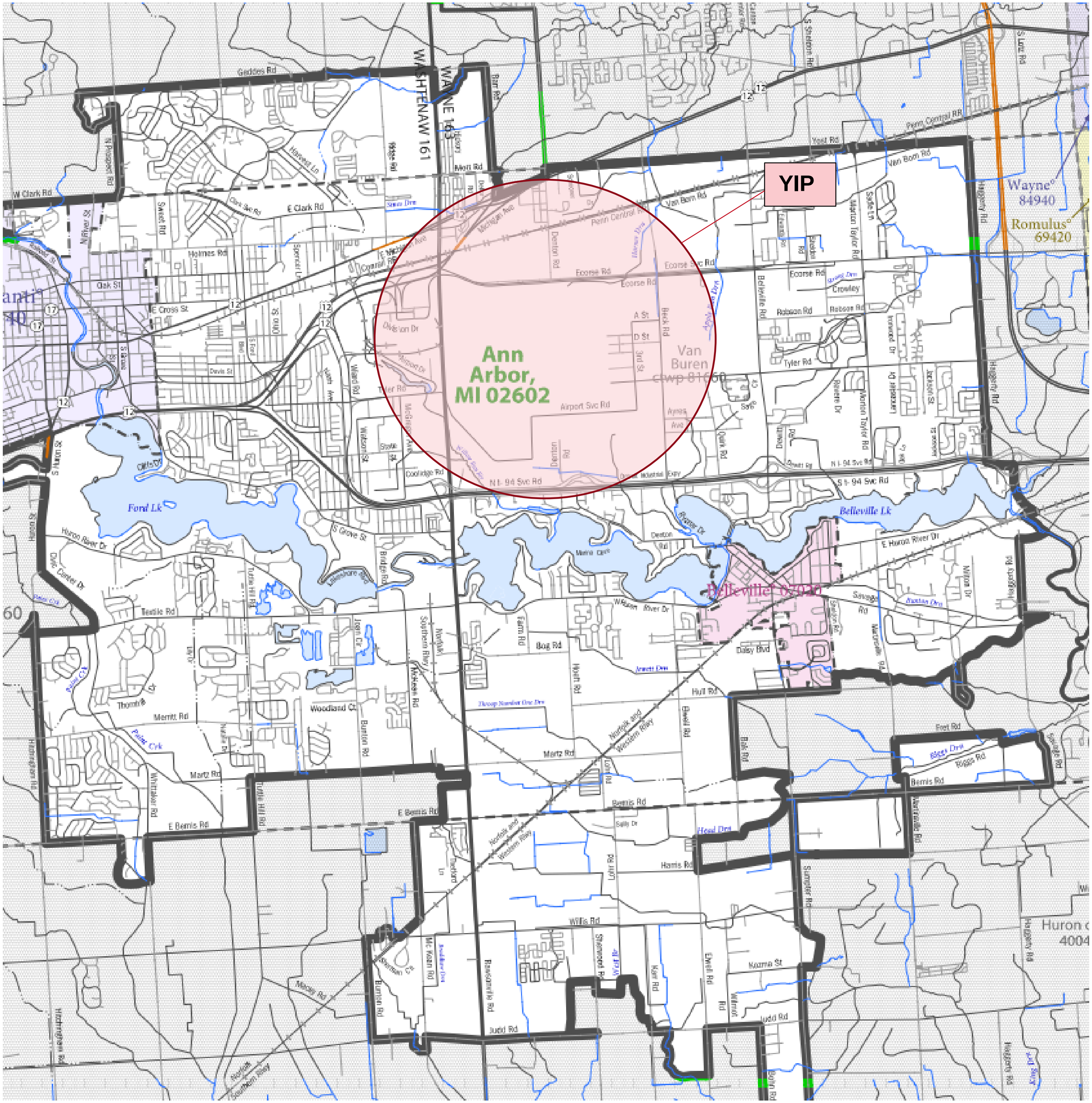
## Rating Options

*Aggregation Method:* No Aggregation Necessary

*Tie-break Rule:* Lower

2010 CENSUS - URBANIZED AREA REFERENCE MAP: Ann Arbor, MI




YIP
Ann Arbor, MI 02602
Van Buren ctwp 81660
Belleville 07040
Wayne 84940
Romulus 69420
WASHTENAW 161
WAYNE 163
Ford Lk
Belleville Lk
Ecorse Rd
Van Born Rd
Geddes Rd
E Clark Rd
Willis Rd
Judd Rd
Bemis Rd
Martz Rd
Huron River Dr
Haggerty Rd
Norfolk and Western Rlwy

## Zachary Puchacz

| | |
|---|---|
| **From:** | Zachary Puchacz |
| **Sent:** | Tuesday, May 24, 2016 4:32 PM |
| **To:** | Zachary Puchacz |
| **Subject:** | FW: Agency Early Coordination Letter Response |

---

**From:** John Paul Minear [mailto:John.Minear@wcaa.us]
**Sent:** Tuesday, May 24, 2016 2:31 PM
**To:** Mark Breukink <mark.breukink@meadhunt.com>
**Cc:** Kelly Morris <Kelly.Morris@wcaa.us>; Chris Mullin <Chris.Mullin@wcaa.us>; Wayne G. Sieloff <Wayne.Sieloff@wcaa.us>
**Subject:** FW: Agency Early Coordination Letter Response

FYI

*John Paul Minear*, AIA, NCARB, CM
Deputy Director, Planning
Planning and Strategy Management
Wayne County Airport Authority
L.C. Smith Building - Mezzanine
Detroit, MI 48241
Direct: (734) 247-7370
Fax: (734) 247-7138

---

**From:** Best, Matthew [mailto:mbest@vanburen-mi.org]
**Sent:** Tuesday, May 24, 2016 2:07 PM
**To:** John Paul Minear <John.Minear@wcaa.us>
**Cc:** Bryan Wagoner <Bryan.Wagoner@wcaa.us>; Akers, Ron <rakers@vanburen-mi.org>; Taylor, James <jtaylor@vanburen-mi.org>
**Subject:** Agency Early Coordination Letter Response

Mr. Minear,

After a review of the request for environmental information that may be pertinent to the Willow Run Master Plan Update, Van Buren Township does not have any environmental concerns regarding the plan update at this time. Van Buren Township does have an interest in the future development plans as well as utility, road and building improvements on and nearby the Willow Run airport property. As this plan continues on, I ask that you please keep Van Buren Township informed of its progress.

With the Center for American Mobility at the Willow Run Facility, the Township is keenly aware of the possibility of new development and infrastructure needs the area has. The Township is ready to assist you in this effort. Let us know how we can be of assistance.

Please feel free to contact Director Ron Akers or myself regarding the Master Plan Update if you have any questions.

Thank you,

Matthew R. Best, M.S.

Deputy Director
Planning & Economic Development
Charter Township of Van Buren
mbest@vanburen-mi.org
Ph: 734-699-8913
Fax: 734-699-8958

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

JUN 01 2016

REPLY TO THE ATTENTION OF: E-19J

Brittany Smith, Community Planner
Federal Aviation Administration
Detroit Airports District Office, DET-ADO-600
11677 South Wayne Road, Suite 107
Romulus, Michigan 48174

**RE: Early Coordination – Preparation of an Airport Layout Plan Update for the Willow Run Airport, Ypsilanti, Washtenaw County, Michigan**

Dear Ms. Smith:

The U.S. Environmental Protection Agency has received correspondence dated April 26, 2016, from the Wayne County Airport Authority (WCAA). We understand that WCAA is preparing a master plan update (Update) for the Willow Run Airport (Airport). The purpose of WCAA's correspondence was to request EPA's assistance in identifying and providing information on sensitive environmental resources within the Airport property and surrounding community; information provided will be utilized in the preparation of a revised master plan and subsequent future environmental reviews undertaken by the Airport. Based on the limited information provided, EPA offers the following comments for consideration when preparing a revised master plan and any future environmental processing[1] required for Airport actions.

**Current Use/Future Projections**

EPA recommends that based aircraft, current operations by airplane category, and forecasted based aircraft, operations, and Airport capacity be included in the Update. Safety issues (e.g., aborted take-offs or landings) should be substantiated by stating numbers of occurrences/year to rationalize needed revisions. This information will assist FAA with identification of necessary revisions to the Update.

**Resource Conservation and Recovery Act (RCRA) and Brownfield Sites**

According to EPA's web-based application which provides screening of environmental assessment indicators,[2] a number of RCRA sites and one brownfield site, Hangar #2, are located on or near Airport property. RCRA sites include the following:

ACE Aircraft Finishers,
Active Aero Charter,
Avflight Willow Run Corporation,
Michigan Institute of Aeronautics, Inc.,

[1] In accordance with the National Environmental Policy Act (NEPA)
[2] Nepassist.EPA.gov

Yankee Air Force, Yankee Air Museum,
Eqis Transfer & Processing,
Recovery Specialists, Inc.,
Wolverine Disposal, Inc.,
American International Airways, Inc.,
Ameristar Jet Charter,
Chrysler Pentastar Aviation, Inc.,
Eagle Aviation Center,
Express Net Airlines,
General Motors Corp., Midsize Car Division, Willow Run Assembly, and
International Transmission Company, LLC.

**Compatible Land Use**
If the Update is to include land acquisition outside the existing Airport boundary, the Airport should consider possible conflicts between future proposed actions and Federal, state, regional, local, or tribal use plans,[3] policies, or controls for the area. EPA recommends that any potential acqusitions be clearly identified in the Update.

**Transportation**
If the Update will result in expansion of the current Airport footprint, impacts to local roads by future development (e.g., McGregor Avenue, Ecorse, Road, and Beck Road) should be considered. EPA recommends that any potential road relocations or road closures be clearly identified in the Update.

**Water Quality**
According to NEPAssist, two waterbodies are listed on the Clean Water Act Section 303(d) list of impaired waterbodies. Information concerning impairments for the Sines Drain referenced dissolved oxygen, Escherichia coli, Polychlorinated Biphenyls (PCBs), sedimentation and siltation as impairments. The Willow Run Drain impairment is listed as PCBs.

**Floodplains**
Executive Order 11988 requires Federal agencies to take action to reduce the risk of flood loss, restore the natural and beneficial values of floodplains, and minimize the impacts of floods on human safety, health, and welfare. EPA recommends the Update note if any portions of the Airport property are located within Federal Emergency Management Agency (FEMA) designated floodplains.

**Federally-listed Species, Critical Habitat, Migratory Birds, National Wildlife Refuges, and State-listed Species**
During 2015, U.S. Fish and Wildlife Service (USFWS) introduced a project planning tool known as IPAC – Information for Planning and Conservation[4] – which is designed to streamline the USFWS environmental review process. When designating a project location in IPAC, USFWS recommends considering not only the physical location of project activities where direct impacts

[3] Land use management plans include all types of formally-adopted documents for land use planning, zoning, and related regulatory requirements, including formally proposed plans. Local plans should be included even though they are subject to future change. Proposed land use plans should also be included if they have been formally proposed in written form and are being actively pursued.
[4] https://ecos.fws.gov/ipac/

are likely to occur, but also consider the surrounding area on the landscape where potential indirect effects to species may occur (e.g., consider direct and indirect effects such as noise or dust).[5]

Once a trust resource list is obtained from IPAC, access the USFWS Region 3 website at http://www.fws.gov/midwest/endangered/section7/s7process/index.html for detailed information pertaining to listed species including habitat descriptions. These descriptions should be used to help determine if there is suitable habitat for the species on your trust resource list within the proposed project area. If is determined there is suitable habitat or documented listed species occur in the proposed project area, USFWS staff at the Ecological Services Field Office in East Lansing, Michigan can provide specific recommendations for the proposed project (depending on scope, scale, timing, etc.). These recommendations are meant to assist in project planning. For listed species, conservation measures recommended by the USFWS Field Office are based on anticipated impacts to species' conservation and can reduce potential impacts on listed species and the environment, as well as streamline any future consultations that may be needed.

FAA should use this tool to request a trust resource report covering Federally-listed threatened or endangered species; Federally-proposed or candidate species; critical habitat for listed species; migratory birds protected by the Migratory Bird Treaty Act; and National Wildlife Refuges. In the revised master plan, FAA should indicate if any listed species are present on Airport property and if future Airport proposals (or land acquisition) could detrimentally affect any listed species or their critical habitat. Any coordination with USFWS regarding trust resources should be included as an appendix to the master plan.

Additionally, EPA recommends that FAA and/or the Airport coordinate further with the Michigan Natural Features Inventory[6] (MNFI) to determine if any state-listed species are present on or adjacent to Airport property. Any coordination with MNFI regarding state-listed species should be included as an appendix to the draft NEPA documentation.

**Vegetation and Wildlife Habitat**

The information provided is unclear whether the proposed Update will require or propose updates to the Airport Airspace Drawing (Part 77 surfaces), the inner portion of the Approach Surface Drawing (formerly known as the runway protection zone), land use within the Airport boundary and/or in the vicinity of the Airport, or if changes or updates to the Airport's Runway Safety Area determinations (if existing) require land use changes. EPA recommends that land use drawing and property map drawings (as well as any future NEPA documents) include information on current vegetation and vegetation management on Airport property and whether vegetation may need to be cleared or "topped" for future construction and/or to meet FAA requirements.

**Wildlife Hazards & Attractants/Wildlife Strikes**

EPA recommends the Airport document all wildlife hazards and attractants, such as open water or vegetation on/near Airport property, and disclose any safety issues associated with wildlife at

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[5] For projects with a federal nexus that are required to consult with USFWS under Section 7 of the Endangered Species Act, definitions of Action and Action Area can be found at 50 CFR 402.02.

[6] http://www.mcgi.state.mi.us/esa/ EPA note – MDNR is not conducting site reviews at this time. The Michigan Natural Features Inventory (MNFI) will review projects for potential impacts to endangered species, but there is a cost to the requestor for these services.

the Airport. If any changes to the Update necessitate additional coordination regarding the potential for changes to wildlife hazards and/or attractants, EPA recommends these changes be noted in the Update.

**Historic, Architectural, Archeological, and Cultural Resources**
EPA recommends FAA undertake consultation with the Michigan State Historic Preservation Office (SHPO) under Section 106 of the National Historic Preservation Act to determine if Airport property contains historical or archaeological properties, including properties listed on the National Register of Historic Properties or properties that are eligible for listing. This information will assist FAA with early identification of potential impacts that may occur to historic properties within future-defined areas of potential effect (APE). EPA recommends that any historic properties on Airport property be clearly identified in the Update.

**Noise**
Sensitive receivers adjacent to or near the Airport, such as schools, churches, hospitals, and residences, may be impacted if future improvements to the Airport would allow for the use of noisier/larger aircraft and/or more frequent operations. EPA recommends that sensitive noise receivers be clearly identified in the Update.

Thank you for the early solicitation of EPA's comments regarding the proposal. We are available to discuss our comments with you in further detail if requested. If you have any questions about this letter, please contact Kathy Kowal of my staff at 312-353-5206 or via email at kowal.kathleen@epa.gov.

Sincerely,

Kenneth A. Westlake, Chief
NEPA Implementation Section
Office of Enforcement and Compliance Assurance

cc: John Paul Minear, WCAA
Bryan Wagoner, WCAA

STATE OF MICHIGAN
MICHIGAN STATE HOUSING DEVELOPMENT AUTHORITY
STATE HISTORIC PRESERVATION OFFICE

RICK SNYDER
GOVERNOR

KEVIN ELSENHEIMER
EXECUTIVE DIRECTOR

July 6, 2016

JOHN PAUL MINEAR
WAYNE COUNTY AIRPORT AUTHORITY
1 L C SMITH TERMINAL MEZZANINE
DETROIT MI 48241

RE: ER-930515 Willow Run Airport – Master Plan Update, Ypsilanti, Washtenaw County (FAA)

Dear Mr. Minear:

The State Historic Preservation Officer (SHPO) received your early coordination notification for Willow Run Airport – Master Plan Update. Section 106 of the National Historic Preservation Act of 1966, as amended, requires federal agencies to take into account the effect of their undertakings on historic properties. It is the responsibility of the federal agency, not the SHPO, to fulfill the requirements of Section 106. Under the Section 106 regulations, the SHPO responds with a determination that they either concur or disagree with an adequately-documented determination of eligibility and an adequately-documented determination of effect made by the agency.

As this is early coordination and not enough information on the proposed undertaking is available at this time, it is premature for the SHPO to provide meaningful comment. However, as plans are developed, a section 106 application must be submitted to the SHPO for review, comment and meaningful consultation.

We remind you that federal agency officials or their delegated authorities are required to involve the public in a manner that reflects the nature and complexity of the undertaking and its effects on historic properties per 36 CFR § 800.2(d). The National Historic Preservation Act also requires that federal agencies consult with any Indian tribe and/or Tribal Historic Preservation Officer (THPO) that attach religious and cultural significance to historic properties that may be affected by the agency's undertakings per 36 CFR § 800.2(c)(2)(ii).

The State Historic Preservation Office is not the office of record for this undertaking. You are therefore asked to maintain a copy of this letter with your environmental review record for this undertaking. If the scope of work changes in any way, or if artifacts or bones are discovered, please notify this office immediately.

If you have any questions, please contact Brian Grennell, Cultural Resource Management Specialist, at 517-335-2721 or by email at grennellb@michigan.gov. **Please reference our project number in all communication with this office regarding this undertaking.** Thank you for this opportunity to review and comment, and for your cooperation.

Sincerely,

Brian G. Grennell
Cultural Resource Management Specialist

for Brian D. Conway
State Historic Preservation Officer

BGG

Enclosure(s)

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ER-930515

DETROIT METRO • WILLOW RUN
WAYNE COUNTY AIRPORT AUTHORITY

1 L.C. Smith Terminal • Mezzanine
Detroit, MI 48242-5004
ph 734 942-3550
fax 734 247-7138
www.metroairport.com

RECEIVED
MAY 05 2016

April 28, 2016

Mr. Brian Conway
State Historic Preservation Officer
State Historic Preservation Office
Michigan Historical Center
P.O. Box 30740
702 W. Kalamazoo St.
Lansing, MI 48909-8240

Subject: Agency Early Coordination Letter
Willow Run Airport – Master Plan Update
Ypsilanti, Michigan

Dear Mr. Brian Conway:

The Wayne County Airport Authority (WCAA) is writing to inform you of its project to update the master plan for the Willow Run Airport (Airport) located in Van Buren Township near Ypsilanti, Michigan. As part of this project, an environmental overview will be conducted to evaluate potential environmental impacts of possible developments that will be addressed in the master plan.

The master plan process is in its early stages and decisions have not yet been made on the alternatives to address facility needs; however, we would like to collect any general information you may have about environmental resources on, or in proximity to, the Airport. The preliminary information we have collected about facility needs indicates that:

- Changes will be needed to the configuration of runways and taxiways to meet Federal Aviation Administration (FAA) airfield design standards
- Improvements will be needed to buildings, roads, and utility infrastructure
- Areas are needed on-airport for future aeronautical and non-aeronautical development

It should be noted that the environmental overview is not intended to satisfy environmental clearance requirements as outlined in FAA Order 5050.4B, the National Environmental Policy Act of 1969 (NEPA), or determine or delineate any detailed environmental concerns. Nor does it imply that the development addressed in the master plan will occur. Instead, the intent is to identify environmental constraints that can be used in developing any future NEPA document if growth at the Airport necessitates the proposed development addressed in the master plan. If any of the alternatives from the master plan are implemented, coordination would occur prior to design and construction to prepare a NEPA compliant document would be completed to further evaluate the level of environmental impact and determine if mitigation measures or selection of another alternative is necessary to reduce adverse effects.

Your comments are being requested as it relates to:

- Specific areas of concern
- Specific benefits to your organization
- Available technical information for the Willow Run Airport and surrounding area
- Mitigation or permitting requirements that may be necessary for future projects

Every attempt will be made to avoid, minimize, or mitigate social, environmental, or economic impacts for the developments outlined in the master plan. All proposed development would also comply with any local, state, or federal permitting requirements at the time of construction, should these projects be pursued.

If you would like additional information on the Willow Run Airport master plan update please contact:

Mr. John Paul Minear, AIA, NCARB, C.M.
Deputy Director, Planning
Planning and Strategy Management
Wayne County Airport Authority
L.C. Smith Building – Mezzanine
Detroit, MI 48241
Phone: (734) 247-7370
E-mail: john.minear@wcaa.us

We would appreciate your assistance in forwarding copies of this notification to the appropriate staff within your organization and requests your comments be returned to Mr. John Paul Minear within 45 days after receipt of this letter.

Sincerely,

Wayne County Airport Authority

Bryan C. Wagoner

Bryan Wagoner, PE, CHMM
Director of Environment & Sustainability

Enclosures

**Appendix D**

# Recycling, Reuse, and Waste Reduction Plan

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## Executive Summary

As mandated by Section 132(b) of the Federal Aviation Administration (FAA) Modernization and Reform Act of 2012 (FMRA), this Recycling, Reuse, and Waste Reduction Plan was prepared as a part of the update of the Willow Run Airport (Airport) Master Plan. The purpose of this plan is to document and assess the Airport's existing waste and recycling program and provide recommendations for improvement. In addition, this plan focuses on the management of solid waste and other materials generated at the Airport that can be recycled or disposed of in a landfill. This plan does not address the management of other types of waste, specifically hazardous waste, universal waste, industrial waste, or waste from international flights as the handling and disposal of these materials are regulated by Federal, state, and local laws.

To develop this plan, a review was conducted of recycling practices at the Airport that included a tour of facilities and interviews with employees to gain an understanding of the refuse materials that are recycled and those that are transferred to solid waste facilities. Lease agreements, facility management contracts, Airport rules and regulations, and purchasing agreements were also reviewed as a part of the information collection effort.

A number of factors considered during the review that led to the development of the Recycling, Reuse, and Waste Reduction Plan recommendations include:

- Feasibility of recycling
- Commitment and support by management towards recycling
- Technical and economic factors
- Federal, state, and local recycling and waste management policies

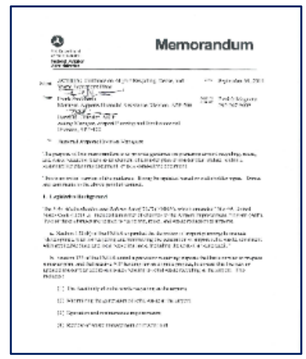
Several recommendations were developed for the waste and recycling program at the Airport. Provision of additional waste and recycling hauling services, collection, and education is recommended to expand the depth of the program. Changes to language in lease agreements, contracts, purchasing practices, and rules and regulations to encourage recycling is also advised. Expansion of the recycling program to all Wayne County Airport Authority (WCAA) facilities and continued employee encouragement for recycling practices also can strengthen the waste and recycling management program at the Airport. With continual evaluation and improvement of the program through coordination and input from WCAA employees and tenants, success can be achieved in minimizing the solid waste stream from the Airport.

# 1. Introduction

## A. Regulatory Background and Project Purpose

Section 132(b) of the FMRA expanded the definition of airport planning to include "developing a plan for recycling and minimizing the generation of airport solid waste." FMRA Section 133 added a requirement that airports that have or plan to prepare or update a master plan, and that receive Airport Improvement Program (AIP) funding for an eligible project, ensure that new or updated master plans address issues related to solid waste recycling. These issues include 1) the feasibility of solid waste recycling, 2) minimizing the generation of solid waste, 3) operation and maintenance requirements, 4) review of waste management contracts, and 5) the potential for cost savings or revenue generation.

In September 2014, the FAA released a memorandum titled "Guidance on Airport Recycling, Reuse, and Waste Reduction Plans." This memo details the FAA's expectations and suggestions for an airport's recycling plan. This guidance is applicable to Federally-obligated airports that are preparing or updating a master plan or other planning efforts or undertaking a standalone recycling project.


Memorandum

*FAA Recycling, Reuse, and Waste Reduction Guidance Memo*

In compliance with FMRA and in accordance with the FAA's guidance memo, this Airport Recycling, Reuse, and Waste Reduction Plan was developed for the Airport as part of the Airport Master Plan. The purpose of this plan is to document and assess the Airport's existing waste and recycling program based on the factors and variables listed above and provide recommendations for improvement. The content of this plan was governed by the extent and accuracy of available information.

## B. Airport Description

The Airport is a general aviation reliever airport and cargo facility located in Southeast Michigan, located about 30 miles west of downtown Detroit, Michigan. The Airport is owned by Wayne County and operated and managed by the WCAA who also manages and operates Detroit Metropolitan Wayne County Airport (DTW).

The FAA classifies the Airport as a non-primary national reliever facility in the National Plan of Integrated Airport Systems (NPIAS). This means the Airport is designated by the FAA to relieve congestion at a commercial service airport (DTW) and provide improved general aviation access to the community. The Airport serves cargo, corporate, and general aviation activities; it handles an average 200 million pounds of cargo each year. Additional information regarding Airport operations and activities is contained in the Airport Master Plan or is available through the Airport's website at www.willowrunairport.com.

## C. Waste Definition and Plan Focus

Municipal Solid Waste (MSW) consists of everyday items that are used and then discarded. There are five primary types of MSW generated at airports:

General MSW consists of common inorganic waste, such as product packaging, disposable utensils, plates and cups, bottles, and newspaper. Less common items, such as furniture and clothing, are also considered general MSW.

Food waste is either food that is not consumed or the waste generated and discarded during food preparation activities.

Green waste consists of trees, grass clippings, leaves, weeds, small branches, and similar debris generated by landscape maintenance activities. Green waste and food waste together may be referred to as "compostables."

Deplaned waste is a specific type of MSW that is removed from passenger aircraft. These materials include bottles and cans, newspaper and mixed paper, plastic cups, service ware, food waste, food soiled paper, and paper towels.

Construction and Demolition Waste (C&D) is any non-hazardous solid waste from land clearing, excavation, and/or the construction, demolition, renovation or repair of structures, roads, and utilities. C&D waste commonly includes concrete, wood, metals, drywall, carpet, plastic, pipes, land clearing debris, cardboard, and salvaged building components.

This plan focuses on the management of municipal solid waste and other materials that can be recycled or disposed of in a landfill. This plan does not address the management of other types of waste, specifically hazardous waste, universal waste, industrial waste, or waste from international flights as the handling and disposal of these materials are regulated by Federal, state, and local laws. Construction and demolition debris that is subject to special requirements and requires special handling is not included in this plan.

The Airport contracts with US Ecology to collect and recycle spent aircraft deicing fluid runoff (containing propylene glycol). The US Environmental Protection Agency (EPA), classifies this material as a regulated industrial process wastewater under the National Pollutant Discharge Elimination System (NPDES). The Airport's practice of collecting and recycling this waste presents environmental and economic benefits; however, as the scope of this plan is limited to MSW as defined above, further discussion about the Airport's deicing program is not included in this document. More information about aircraft deicing fluid recycling is available from the WCAA Department of Environment & Sustainability.

## D. Key Airport Buildings and Plan Scope

The Airport's infrastructure is made up of several buildings and other facilities, including: Hangar 1, Aircraft Rescue and Fire Fighting Building (ARFF), Snow Removal Equipment (SRE) and Airport Maintenance Complex, Fuel Farm, other hangars, and Airport parking areas. More information about these facilities is included in the Airport's Master Plan Report, Chapter A: Inventory of Existing Conditions.

### Hangar 1

Hangar 1 is the largest hangar at the Airport; it is owned and operated by WCAA. WCAA has offices, conference rooms, and breakroom space in Hangar 1 for employees working at the Airport. In addition to WCAA areas, portions of Hangar 1 are rented to various tenants as listed in **Table 1**.

**Table 1: Hangar 1 Tenants**

| Tenant | Category |
|---|---|
| Ameristar Jet Center | Cargo |
| AvFlight Willow Run West | Fixed Base Operator |
| Baltia Airlines | Airline |
| Flagship Private Air | Charter Operator |
| M2 Aircraft Management | Cargo |
| Mead & Hunt | Airport Consultant |
| RS&H | Airport Consultant |
| Specialize Global Logistics Services | Cargo |
| U.S Customs and Border Protection (CBP) | Government |
| Visible Ink | Publications |
| Yankee Air Museum | Museum |
| Source: WCAA (2017) | |

### Aircraft Rescue and Fire Fighting Building

The ARFF facility at the Airport is equipped and staffed to support operations at the Airport and provides vehicle storage as well as office spaces and living quarters.

### Snow Removal Equipment and Airport Maintenance Complex

The Airport has an SRE and Maintenance Complex which consists of three buildings: the primary storage and shop building, a salt storage building, and an older building used for the storage of equipment and materials.

### Fuel Farm Area

The Airport's fuel farm area consists of above ground storage tanks and a modular office facility.

### Other Hangars

In addition to Hangar 1, there are a variety of hangars at the Airport for based and itinerant aircraft.

### Airport Parking Areas

There are several parking lots at the Airport associated with the various facilities. Hangar 1 has an adjacent parking lot for employees, tenants, and visitors. Parking is also available next to the Fixed Base Operators (FBOs) and the FAA facility.

### Plan Scope

The facilities described above include buildings and areas over which WCAA has direct control of waste management and others over which the WCAA has influence but not direct control. Per FAA guidance, areas over which the Airport Sponsor (in this case, WCAA) has direct control or influence should be included in the Recycling, Reuse, and Waste Reduction Plan; areas outside Airport Sponsor control or influence may be excluded.

The WCAA has direct control over operations and activities related to waste management in Hangar 1 and associated parking areas, in the ARFF building, at the SRE/Airport Maintenance Complex, and at the Fuel Farm. In addition, the WCAA can influence the management of waste and recyclables in tenant spaces, including those in Hangar 1, other hangars and areas leased by WCAA, and United States Customs and Border Patrol (CBP) spaces.

The WCAA does not have control or influence over waste management in areas controlled by the FAA, including offices, breakrooms, and the airport traffic control tower (ATCT). The FAA contracts independently for housekeeping and waste collection services; therefore, they are excluded from this plan.

In summary, this plan covers the buildings, facilities, areas, and activities list in **Table 2**.

**Table 2: Buildings, Facilities, and Areas Included in Recycling, Reuse, and Waste Reduction Plan**

| Under WCAA Control | Under WCAA Influence |
|---|---|
| - Hangar 1<br>  ○ WCAA Areas<br>- ARFF Building<br>- SRE/Maintenance Complex<br>- Fuel Farm Office<br>- Parking at Hangar 1 | - Hangar 1<br>  ○ Leased space, including CBP areas<br>- Other Hangars and Areas leased to tenants by WCAA<br>- Parking Areas associated with tenant spaces |

## 2. Existing Program

The WCAA has a recycling program in place for employees working at the Airport. The following sections describe various elements of this program.

### A. Drivers

The Airport's recycling program is driven in large part by the WCAA's recycling efforts and commitment to environmentally responsible practices. The availability to "piggy-back" on the program at DTW is key to the program's continuation.

### B. Operation and Maintenance Requirements

WCAA employees located in Hangar 1 place recyclable materials in recycling bins located at their desks (trash and paper) and in the common breakroom area (plastic bottles). WCAA employees are responsible for transferring the contents of their office paper recycling bins to a communal container for recycling. Once the paper and plastic recycling containers are full, WCAA employees transport recyclables from the Airport to a central collection point at DTW.

Under the State of Michigan's Beverage Container Act, beverage containers including aluminum cans and plastic bottles for soft drinks, carbonated water, and alcoholic beverages have a $0.10 deposit at the time of purchase that can be refunded when the containers are returned to a grocery store or other location. Due to this program, WCAA employees at the Airport collect their empty aluminum cans and plastic bottles and return them for the refund.

Refundable beverage containers are not included in the Airport's recycling program; however, due to the refund program, it is likely that a high percentage are recycled and do not contribute to the Airport's landfill waste stream.

WCAA employees in Hangar 1 also have a garbage can at their desks. The Airport's custodial contractor, Sparkle Janitorial, empties the contents of the office garbage cans, as well as those in the breakroom, restrooms, and CBP areas, into large containers and disposes of the waste in dumpsters located outside Hangar 1.

Airport maintenance employees place scrap metal in a designated fenced area for recycling. Once this material is accumulated in a significant quantity, WCAA employees transport the scrap metal to GLE Scrap Metal in Warren, Michigan for recycling. WCAA employees working in the SRE/Airport Maintenance Complex buildings place waste materials in a dumpster in this area. They either bring recyclables to Hangar 1 and place them in the common containers or throw them away in the dumpster.

WCAA employees working at the ARFF facility collect aluminum cans and plastic bottles in a communal location until they are returned for a refund. ARFF employees do not currently recycle paper or non-refundable plastic bottles (water bottles).

The custodial contractor does not service any areas or buildings other than those noted in Hangar 1. The other tenants in Hangar 1 and other hangars are responsible for contracting with their own custodial service or transporting waste materials to their own dumpsters.

### C. Existing Infrastructure and Practices

There are four (4) eight cubic yard waste dumpsters located within a fenced area adjacent to Hangar 1. These dumpsters are used for waste from the WCAA offices in Hangar 1. A fifth dumpster is located at the SRE/Airport Maintenance Complex for use by WCAA employees in that area. All five dumpsters are serviced on a weekly basis by Waste Management under a contract that includes these containers at the Airport and several containers at DTW.

## D. Current Recycling, Reuse, and Waste Reduction Efforts

### Recycling

Office paper and non-refundable plastic bottles generated at the Airport are currently recycled through WCAA's program at DTW. Scrap metal is recycled directly from the Airport. Printer ink cartridges from office equipment are also recycled.

### Reuse

WCAA employees reuse office supplies, furniture, and refillable beverage tumblers. Airport maintenance employees reuse parts, equipment, and other materials as often as possible to reduce waste.

According to the WCAA's Procurement and Contracting Ordinance (effective September 2014), surplus property shall be disposed of by the following methods which constitute reuse: public auction; sale by bid, proposal or quote; transfer (donation) to other public entities, non-profits, or charitable organizations; or trade-in on new property or by recycling. The Airport has received surplus property from other WCAA offices and areas and follows this Ordinance for the disposal of unwanted items generated at the Airport.

### Waste Reduction

WCAA employees at the Airport (including those in Hangar 1, the SRE/Airport Maintenance Complex and the ARFF facility, use water coolers and WCAA-provided tumblers to reduce waste generated by bottled water.

## E. Program Tracking and Performance

Under the current program, the volume or weight of waste generated at the Airport is not tracked. Similarly, the volume of paper and plastic recyclables generated at the Airport is not tracked separately from materials generated at DTW. These materials are comingled at the collection point at the Smith Building at DTW; information about the total generated volume is tracked by the WCAA Department of Environment Department. The Maintenance Department Manager at the Airport does submit a work order in the WCAA's electronic system each time a load of paper and plastic recyclables are transported to DTW. In addition, the Maintenance Department Manager maintains the scale tickets provided by GLE Scrap Metal.

Based on the size of the dumpsters and their collection frequency, it is estimated that the Airport generates approximately 416 cubic yards of waste each year. Using US EPA conversion factors, this equates to about 28.7 tons of waste each year.

Based on the capacity of the recycling carts and the frequency with which they are transported to DTW, it is estimated that the Airport generates approximately 0.2 cubic yards of paper recyclables and 0.2 cubic yards of plastic recyclables each year. Using US EPA conversion factors, these figures equal about 873 pounds of paper and 53 pounds of plastic each year. Based on the scale tickets provided by GLE Scrap Metal, it is estimated that the Airport recycles 7,040 pounds of metal each year. As a rough estimate, the Airport's recycling rate is approximated at between 8 and 12 percent, based on the above numbers.

# 3. Waste Audit

Airport staff provided information about the Airport's buildings and facilities, areas that generate waste, the types of waste generated in each area, the collection schedule for waste materials, and the materials that can be recycled under the current program. Airport staff have informally observed waste and recycling related behaviors and, for the purpose of this report, described generally how waste flows through the Airport. Airport staff also described waste and recycling collection and hauling practices.

A waste audit or material sort, which involves the collection and analysis of a sample of the waste produced was not completed for this project. Instead, Airport information and records and waste and recycling industry trends were evaluated to identify the source, composition, and quantity of waste generated at the Airport. This evaluation included areas under direct control or influence of the Airport. This information was then used to identify opportunities to improve and monitor program effectiveness.

## A. Sources and Composition

The majority of activities at the Airport generate waste. **Table 3** shows the areas at the Airport under WCAA control and the types of waste likely generated there based on the activities taking place.

**Table 3: WCAA Waste by Area and Material**

| Area \| Material | Office Paper | Newspapers | Magazines | Plastic | Aluminum | Cardboard | Glass | Food Waste | Paper Products | Liquids | Toiletries | Packaging | Styrofoam | Metals | Green / Yard Waste | Deplaned Waste | Construction and Demolition Waste | Other Waste |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hangar 1 | | | | | | | | | | | | | | | | | | |
| Airport Administration Office | x | x | x | x | x | X | | x | x | | | x | | | | | | x |
| Restrooms | | | | x | | X | | x | x | x | x | x | | | | | | x |
| | | | | | | | | | | | | | | | | | | |
| Airport Maintenance Facility | x | x | x | x | x | x | | x | x | x | | x | x | x | | | x | x |
| ARFF Facility | x | x | x | x | x | x | x | x | x | | | x | | | | | | x |
| Other Airport employee work areas | x | x | x | x | x | x | | x | x | | | x | | | | | | x |

Source: Mead & Hunt, Inc. (2017)

## B. Quantity

Based on the calculations in *Section 2E: Program Tracking and Performance*, the Airport generates approximately 416 cubic yards of waste and 35.4 cubic yards of recyclables each year. See Section 2E above for more information.

## C. Purchases

WCAA purchases disposable items for use at the Airport, including printer paper, paper towel, garbage bags, printer cartridges, and batteries. Information about the type and number of these items purchased each year may provide additional information about opportunities to substitute disposable items for durable alternatives or for items containing recycled content.

# 4. Review of Contracts

## A. Waste Management and Custodial Contracts

The Airport's waste is collected by Waste Management under an agreement that covers both of WCAA's airports. Waste Management was selected following a Request for Bids process.

The Airport contracts with Sparkle Janitorial for custodial services in the WCAA offices as well as the Customs and Border Patrol areas.

The Airport is charged for its portion of the monthly invoice from Waste Management; the Airport funds waste collection and custodial services through its Operation and Maintenance budget.

### B. Purchasing Policy

The Airport adheres to the WCAA's Procurement and Contracting Ordinance. Review of this document did not find reference to sustainable purchase practices or preferences, such as purchase of durable goods vs. disposable alternatives or preference for goods containing post-consumer (recycled) content; however, the purchasing policy does outline the process for disposal of surplus items; see *Section 2D: Reuse* for more information.

### C. Minimum Standards

The Minimum Standards for Commercial Aeronautical Services at Willow Run Airport developed by WCAA prescribes regulations that must be followed by any person or entity that provides or seeks to provide commercial aeronautical services at the Airport. The intent of the Minimum Standards is to ensure each person or entity is reasonably fit, willing, and able to perform the services it seeks to provide at the Airport while also promoting good service and fair competition, among other intents. A review of the Minimum Standards did not identify any specific waste disposal or material recycling requirements that are to be met for any person or entity that provides commercial aeronautical services at the Airport.

### D. Tenant Leases

WCAA staff at the Airport provided sample tenant leases for review of waste disposal and recycling clauses under this project. While specific recycling measures were not identified from the review of sample leases, clauses were included for the removal and disposal of waste. A sample lease similar to those for Hangar 1 tenants required that the removal of garbage and refuse shall be made only by way of areas provided by the WCAA in which the WCAA could assess a fee to the tenant for the disposal of garbage and refuse.

Because FBOs handle hazardous materials, compliance with environmental laws for the storage, use, and disposal of this form of waste is included in FBO lease agreements. In a sample FBO lease agreement that was reviewed for this project, a tenant must comply with all environmental laws for the proper use, storage, treatment, and disposal of hazardous waste. This includes the requirement to contract with a licensed hazardous waste transporter and/or treatment and disposal facility, if necessary, to assure proper transport and disposal of hazardous materials. The requirement of adequate facilities on the premises for the management and, as necessary, pretreatment of hazardous materials and the proper disposal was also included in the lease.

## 5. Recycling Feasibility

### A. Commitment and Support

Management commitment to and support of a waste management program is a key indicator of success. WCAA has shown commitment to a recycling program at both of its airports. WCAA developed a Workplace Recycling Policy (effective December 2015). For the most part, this procedure focuses on recycling at DTW but could be expanded to include instructions for recycling in WCAA spaces at the Airport.

## B. Technical and Economic Factors

### Local Markets and Infrastructure

The market for recycled materials can vary based on a number of factors and interactions. Waste haulers, for example, will typically accept materials that can be recycled cost-effectively in the area while manufacturers who purchased recycled materials want them to be predictable and ready for use. Therefore, recycling facilities are particular about the materials that are accepted with preference given to materials that are of high value, clean, and easy to separate.

**Table 4** presents the materials that are accepted under the area's residential recycling programs; as noted above, inclusion in such programs typically indicates that the market and/or infrastructure for these materials is strong. WCAA currently recycles those materials highlighted in blue.

**Table 4: Materials Accepted in Surrounding Area Recycling Programs**

| *City of Ypsilanti* | *Van Buren Township* | *Ypsilanti Township* |
|---|---|---|
| • Paper – newspaper, magazines, junk mail<br>• Boxes – cardboard boxes, boxboard<br>• Plastics - #1,2,4,5,6, and 7<br>• Metals – tin cans, aluminum beverage cans, aluminum foil and trays<br>• Glass – bottles and jars, clear and colored glass<br>• Milk Cartons and Juice Boxes<br>• Rechargeable Batteries<br>• Styrofoam | • Paper – newspaper, office paper<br>• Boxes – cardboard<br>• Plastics – #1 or 2<br>• Metals – tin cans, aluminum cans<br>• Glass – bottle and jars | • Paper – newspaper, office paper, junk mail<br>• Boxes – corrugated, boxboard<br>• Plastics – #1, 2, 4, 5 & 7<br>• Metals – aluminum, tin can<br>• Glass – bottles and jars, clear and colored glass<br>• Milk Cartons and Juice Boxes |

Note: Materials recycled by WCAA highlighted in blue
Source: City of Ypsilanti, Van Buren Township, Ypsilanti Township (2017)

There are several commercial recycling centers near the Airport as well. ReCommunity Recycling, located 9.5 miles to the southeast in New Boston, is a materials recovery facility (MRF) where recyclables, such as plastics, glass, cans, and paper are sorted by material, compressed into large bales, and then sent to manufacturing facilities to be made into new products. Royal Oak Recycling is located 9.6 miles to the east and accepts commercial paper, cardboard, plastic, and metals. GLR Advanced Recycling is located 10 miles north of the Airport in Northville and accepts metal, paper, electronics, and plastic. Taylor Recycling is located 12 miles to the east in Taylor and processes cardboard, paper, glass, wood, and metals. In addition to these commercial recycling centers there are numerous commercial metal recyclers in the vicinity of the Airport. Given the number of recycling centers near the Airport, the on-going recycling needs of the Airport appear to be accommodated.

There are five landfill facilities near the Airport. Immediately adjacent to the Airport to the south is the Wayne Disposal landfill managed by US Ecology. This landfill is a commercial hazardous waste landfill permitted to accept PCB contaminated wastes. Republic Services operates the Sauk Trail Hills landfill 4 miles to the northeast near Canton. Two landfills owned and operated by Waste Management are located 5 miles to the east near Wayne (Woodland Meadows landfill) and 15 miles to the southeast near Taylor (Detroit West Area landfill). Finally, the Riverview Land Preserve landfill, located 17 miles to the southeast near Woodhaven, is owned and operated by the City of Riverview. All landfills have capacities that are anticipated to exceed 10 years meeting the capacity needed by the Airport and the surrounding community for the foreseeable future.

### Logistical Considerations and Constraints

In order to maintain a recycling program, certain elements must remain in place. This includes encouraging WCAA employees to continue recycling practices and continuing to provide bins and dumpsters for employees to recycle. WCAA can also realize recycling efforts in purchasing practices; however, to establish recycling standards through this mechanism may be more challenging given the many factors that influence procurement decisions. Improved communication and coordination will be key to removing or minimizing challenges through this mechanism such as time, labor, or supply needs.

Additional resources such as labor, waste and recycling hauling services, space, and education for WCAA employees provide opportunities to expand the recycling program. Allocation of resources to expand the recycling program may require collaboration and coordination, as well as innovative thinking and problem solving, to resolve challenges associated with cost and logistics for the collection and transfer of recycling materials.

### Recycling and Landfill Facility Requirements

The recycling facilities and landfills that accept waste from the Airport have specific acceptance criteria and requirements. Adherence to these specifications offers significant protections: the safety of employees handling these materials; the integrity and operation of the equipment and infrastructure used to transfer, sort, and convert these materials; and the value of the recyclable stream.

Recycling facilities have specific material standards so it is important that non-recyclable items are not included in the Airport's recycling stream.

Other items generated at the Airport may require special handling and be prohibited or restricted from disposal in a MSW landfill. For example, beverage containers (included under the State's refund program), tires, yard clippings, appliances, asbestos, drums, lead acid batteries, radioactive waste, medical waste, hazardous waste, septage, sewage and used oil. It is paramount that restricted and regulated wastes are not included in the Airport's MSW stream.

## C. Federal, State, or Local Policies

In order to evaluate the Airport's existing recycling plan in the context of local, state, and national requirements, federal government, State of Michigan, and local waste and recycling regulations and policies/factors were reviewed.

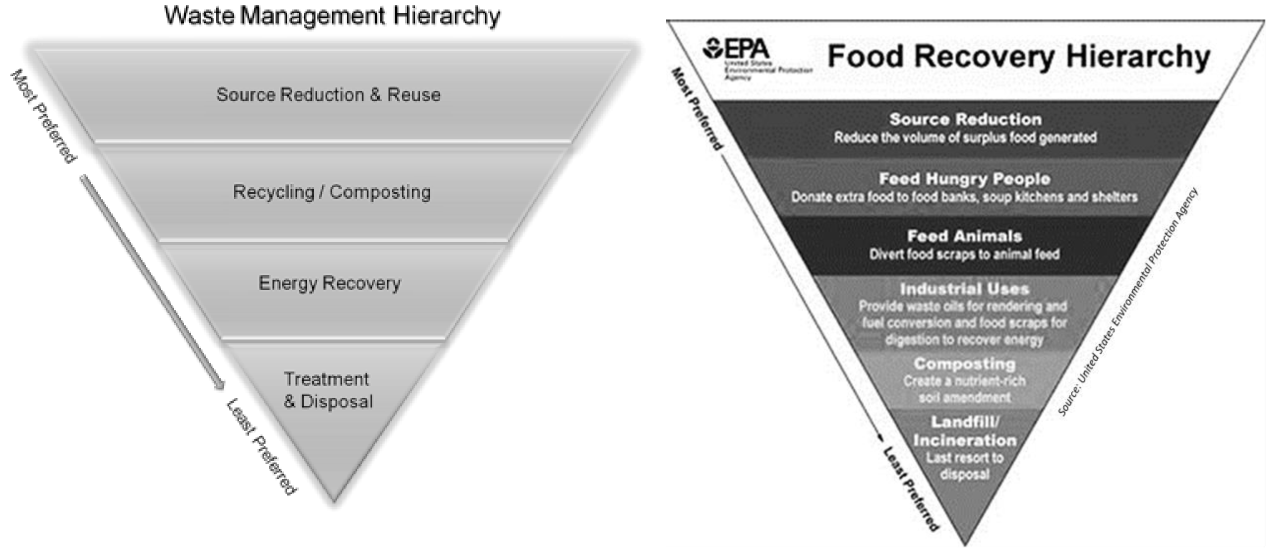
### Federal

At the Federal level, the EPA is responsible for developing a solid waste management program under the Resource Conservation and Recovery Act (RCRA) and related policies and guidance. RCRA provides the framework for management of hazardous and non-hazardous waste. All generators of hazardous waste, including airports, are required to comply with RCRA and all other Federal waste laws and regulations.

As described in Section 1A, the FAA's definition of airport planning was updated in 2010 through FMRA to include planning for recycling and waste minimization. WCAA is required to address solid waste as part of conducting an airport master planning project. The FAA provides guidance on airport waste and recycling in the September 2014 memo on the topic as well as in a synthesis document prepared in 2013 (both available on the Administration's website).

The EPA has developed a hierarchy of waste management strategies. This hierarchy (**Figure 1**, left) ranks these strategies from most- to least-environmentally preferred and places emphasis on reducing, reusing, and recycling. In addition to the general waste management hierarchy, the EPA has also developed a preference ranking of management strategies for food waste **(Figure 1**, right).

**Figure 1: Waste Management and Food Recovery Hierarchies**




*Source: United States Environmental Protection Agency*

### State

In Michigan, the Michigan Department of Environmental Quality (MDEQ) oversees solid waste management and recycling. Currently MDEQ efforts are focused on providing convenient access to residential recycling. A goal has been set to double the residential recycling rate (from 15 percent to 30 percent).

The Michigan Beverage Container Act (“bottle bill”), enacted in 1976 to reduce litter, places a $0.10 deposit on metal, glass, paper, and plastic containers under one gallon that contain beer, soft drinks, carbonated and mineral water, wine coolers, or canned cocktails. Retail customers and restaurants pay $0.10 per container at the point of sale and receive this back as a refund when the containers are returned. The majority of unredeemed deposits (75 percent) are used for state environmental programs while the remainder goes to retailers participating in the program. As of 2014, 94.2 percent of eligible containers were redeemed.

### Local

The Wayne County Department of Public Services Environmental Services Group Land Resource Management Division (LRMD) manages the County solid waste program. LRMD oversees landfills, transfer stations, and processing facilities in Wayne County and enforces County and State waste regulations at these facilities. The LRMD’s solid waste goals and objectives include increasing the awareness of the need for recycling in order to reduce reliance on landfills.

In Washtenaw County, the Washtenaw County Consortium for Solid Waste Management (WCCSWM) is a consortium of representatives who voluntarily meet to discuss and study solid waste, recycling, and utilization of recycled products. Comprised of representatives of Washtenaw County-based governments, businesses, and public institutions, the consortium also meets to develop policy and programs for ratification and implementation by member representatives.

All counties in the state are required to prepare a solid waste management plan (SWMP). Wayne County's SWMP was last updated in 2000, and Washtenaw County's SWMP was developed in 1999; however, Washtenaw County is currently undergoing an amendment to their plan. In Wayne County, the LRMD is responsible for developing, enforcing, tracking, and supporting this plan. The LRMD provides education and information material to the public, school groups, and businesses and industry in Wayne County, as well as information and support to local businesses intending to start recycling programs. In Washtenaw County, the Solid Waste Planning Committee oversees the SWMP and meets once a month to analyze and review data about current solid waste activities and support infrastructure and set priorities and goals related to waste diversion and reduction.

#### Community Culture

Many recycling opportunities are available in both Washtenaw County and Wayne County for both workers and users of the Airport. Cities such as Detroit, Romulus, Ypsilanti, and Ann Arbor as well as Van Buren and Ypsilanti townships have curbside recycling programs and recycling drop-off locations. In addition, numerous private recycling enterprises are available throughout Southeast Michigan. Based on the area's recycling programs, area residents have many opportunities to recycle and are familiar with general recycling practices, which are influential factors for the success of recycling at the Airport.

#### Other Incentives

The WCAA is committed to environmentally responsible operations and manages associated programs under the Department of Environment & Sustainability. In addition to the Master Plan project for the Airport, WCAA is also in the process of developing an Airport Master Plan for Detroit Metropolitan Wayne County Airport, including an Airport Recycling, Reuse, and Waste Reduction Plan for that facility. The work at DTW may result in additional recommendations or policies applicable to the Airport.

### D. Logistical Constraints

Recycling is limited by logistics associated with finding a convenient area to place waste and recycling containers while limiting access to prevent unauthorized use. In addition, recycling materials requires transporting them to DTW's Smith Building; larger recyclables such as cardboard boxes are difficult to store and transport with existing space and available vehicles.

## 6. Potential for Cost Savings or Revenue Generation

Because waste is collected under a contract with Waste Management, it may be difficult to reduce the required size and collection frequency of the five dumpsters by diverting materials to recycling and reducing waste generation that could result in cost savings. Likewise, the recyclable materials generated are collected under an agreement with Royal Oak that includes materials generated at WCAA areas at DTW; it may be difficult at this point to receive a rebate for the existing recyclable materials or an additional stream with rebate potential (cardboard). Based on the current arrangement of services, there is a low potential for cost savings or revenue generation from recycling, reuse, or waste reduction efforts at the Airport; however, this is something WCAA is recommended to consider during the next contracting period for these and related services (i.e. how can WCAA and the contractor benefit financially from successes in recycling, reuse, and waste reduction?).

# 7. Recommendations

## A. Tracking and Reporting

It is recommended that waste and recycling generation at the Airport be tracked and reported to WCAA employees, tenants, and applicable departments within WCAA on a regular basis. Because Waste Management does not provide scale tickets for the waste collected from the Airport's dumpsters, this information may be limited to approximations based on the container sizes and collection schedules. Similarly, to track the volume of recyclables generated, the capacity of the recycling carts and the frequency at which they are taken to DTW plus the scale tickets from GLE Scrap Metal would have to be converted to an estimated volume or weight.

## B. Objectives and Targets

It is recommended that WCAA set specific, measurable, achievable, realistic, and time-bound (SMART) goals for the Airport's waste and recycling program. Having an established set of objectives and targets provides a basis and foundation for subsequent activities and actions. Progress toward such goals does require tracking, but can also provide information on progress and improvements, which can be a valuable education and outreach tool.

The waste source, quantity and composition information in Sections 2 and 3 provides baseline data for establishing objectives and targets; this information can be used to calculate target levels for the Airport. A physical material sort would further inform goal-setting efforts.

The following is a list of potential objectives and targets WCAA might adopt or use as inspiration for other goals.

- Recycle 15 percent of waste stream by 2022
  (Current rate is approximately 10 percent)
- Hold meetings to evaluate and improve recycling programs
- Encourage tenant recycling

In the absence of established specific objectives and targets, the following sections present general, universal recommendations for increasing recycling and reducing waste generation at the Airport.

## C. Purchasing

It is recommended that the Airport adopt an informal practice of purchasing supplies and items which are durable (reusable), recyclable under the existing program, or contain post-consumer (recycled) content. In addition, it is recommended that WCAA evaluate inclusion of such purchasing preferences during the next update to the official purchasing policy.

## D. Reduce and Reuse

It is recommended that WCAA continue to avoid the creation of waste at the source wherever possible and reuse items to the extent practical.

## E. Recycling and Composting

Recycling is the second preferred waste management strategy, according to the EPA, after waste reduction. Recycling allows waste items to be processed into raw materials to make new products. The FAA guidance expects an Airport's Recycling, Reuse, and Waste Reduction Plan to document, at a minimum, the facility's existing program to recycle paper, plastic bottles, aluminum cans, and plastic cups. The Airport recycles most of these materials; plastic cups are typically used aboard flights and are not currently generated at the Airport.

It is unlikely that significant amounts of glass, food waste, or compostable paper products are generated at the Airport; therefore, these materials are not included in the Airport's existing recycling program (and their exclusion is recommended to continue). Cardboard may be generated in significant volume at the Airport; however, as noted above logistical constraints associated with transporting this material have prevented its inclusion in the program up to this point.

### Paper

WCAA is currently recycling paper collected from administration offices at the Airport. Paper, including printer paper, newspapers and magazines, are collected and managed separately from plastic, aluminum, and trash; this protects the value of the paper stream by minimizing contamination of the paper by the liquids found in beverage containers and the greases in food waste. It is recommended that the Airport expand the program to additional areas (including the ARFF Facility and SRE/Airport Maintenance Complex) and encourage increased recycling of paper by employees and tenants as doing so reduces the environmental impacts associated with landfilling this material and manufacturing virgin paper.

### Plastic Bottles

WCAA is currently recycling non-refundable plastic bottles such as water bottles and juice bottles collected in administration offices at the Airport. Plastic bottles are collected and managed separately from paper products, aluminum cans, and refundable plastic bottles. Plastic bottles that have a deposit are collected by WCAA employees at the Airport and returned for the refund.

It is recommended that WCAA expand plastic recycling and return to additional areas (ARFF building and SRE/Airport Maintenance Complex) and encourage increased recycling of plastic bottles by employees and tenants as doing so reduces the environmental impacts associated with landfilling this material and manufacturing virgin plastic.

### Aluminum Cans

Aluminum cans that have a deposit are collected by WCAA employees at the Airport and returned for the refund. Non-refundable aluminum cans are comingled with the non-refundable plastic bottles or thrown away.

It is recommended that WCAA provide recycling for non-refundable aluminum cans in offices and other employee work areas. This could mean comingling non-refundable aluminum cans with non-refundable plastic bottles to create a "beverage containers" stream, if this is acceptable to Royal Oak recycling. Once this program is in place, it is recommended that WCAA encourage increased recycling of non-refundable aluminum cans by employees and tenants as doing so reduces the environmental impacts associated with landfilling this material and manufacturing virgin aluminum containers.

### Cardboard

WCAA is not currently recycling cardboard generated at the Airport. It is recommended that employees at the Airport work with the WCAA Department of Environment & Sustainability to evaluate options for recycling cardboard at the Airport. Since this material is difficult to transport to DTW, it is being landfilled; however, cardboard is a desirable recyclable material and alternative solutions likely exist under the Waste Management contract or Royal Oak agreement.

An ideal cardboard recycling program would collect and manage this material separately from other streams. This arrangement protects its value and makes it more desirable by recyclers because it requires less processing after collection. An important element of this program is breaking down cardboard boxes to maximize the capacity of a collection container. If a cardboard program is established at the Airport, it is recommended that WCAA provide feedback to employees on the progress and performance of this program and solicit their feedback regarding improvements that could be made to increase or support participation.

### Other Recyclables

As other recyclable materials are identified in the waste stream and occur in a consistent and significant quantity, the Airport should work with its employees and the waste hauling contractor to design and implement strategies to separate, collect, and process these materials.

### Tenant Recycling

Several tenants expressed interest in recycling at the facility via Airport provided containers. In addition, one tenant recently contacted Airport administration to inquire about space for a recycling dumpster; it appears this tenant is interested in contracting for recycling services and was looking for Airport permission to place a container in the area adjacent to Hangar 1, which currently houses four waste dumpsters. It is recommended that WCAA coordinate with tenants that have expressed interest in recycling and provide for or support such efforts based on available resources. If WCAA cannot provide recycling containers, staff from the Department of Environment & Sustainability may be able to provide resources and guidance to those tenants who pursue contracting for containers or collection service on their own.

In the future, WCAA may consider updating the Minimum Standards or individual tenant leases to reflect a preference for recycling over other waste management options. At this time, it is not recommended that WCAA require tenants to recycle; however, voluntary participation may grow to a level when such a requirement is palatable.

## F. Containers and Bins

The existing recycling containers in the WCAA offices are generally blue in color and include small deskside recycling cans and large recycling carts (provided by Royal Oak for paper and plastic bottles). In the ARFF building and SRE/Maintenance Complex buildings, there are no formal recycling bins. Simple signage could designate an ordinary trash can as a recycling bin if/when recycling practices are expanded to these outlying buildings.

## G. Education and Outreach

Under the existing program, education of and outreach to WCAA employees is primarily accomplished through the placement of containers for waste and recycling.

To supplement this information, it is recommended that WCAA improve the in-office messaging for employees and provide brief, clear instructions for recycling. Providing clear instructional signage at the recycling stations/recycling bins can improve participation and reduce contamination.

It is also recommended that the Airport provide simple on-going training for employees, tenants, and contractors that explains the recycling program, including its purpose and requirements. Such a training program will promote participation and compliance, resulting in increased recycling and reduced contamination. In addition, training can designate a contact and a mechanism to receive feedback and ideas for improvement.

Training on the recycling program could include emails, meetings, and posters. The content of such training should include reminders and information about the materials that are accepted for recycling at the Airport, the location of the containers to be used for the program, and the positive effect the program is having in reducing the Airport's environmental impact.

Information from WCAA's Department of Environment & Sustainability as well as Waste Management and Royal Oak Recycling should be incorporated into the training materials. In addition, different stakeholders and organizations involved in collection, housekeeping, recycling, and other waste activities could be asked to provide content, send email reminders, or to present during meetings.

Once a training and education program is implemented, it is recommended that WCAA actively maintain such a program to facilitate its continued success. The content of trainings and printed resources/materials should be updated as the program changes and grows.

## H. Contracts

As noted under *Tenant Recycling* above, it may be beneficial for WCAA to update the Minimum Standards, which all tenants are required to adhere to, or to update individual tenant leases to include language in support of recycling.

## I. New Development Projects

As the Airport changes and grows, it is strongly recommended that recycling, reuse, and waste reduction be considered in the construction and operation of new or renovated buildings and spaces.

The Airport's Master Plan is evaluating alternative spaces for WCAA offices in the event these are moved out of Hangar 1. Planning for and installation of a dishwasher in a new or renovated space might increase the use of reusable dishes and silverware in the office breakroom. Likewise, space for office waste and recycling bins as well as the common carts for paper and plastic should be allocated in the new area if at all possible.

## J. Continuous Improvement

It is recommended that the maintenance and improvement of the recycling program at the Airport follow a simple Plan-Do-Check-Act (PDCA) cycle methodology.

### Plan

The recommended strategies in this document make up most of the "plan" portion of the process. Defining success (for example, something like "15 percent recycling by 2022"), establishing materials and areas of focus, collecting baseline information (visual inspections, surveys, etc.), and identifying strategies are all a portion of the planning aspect. In the future, additional areas of focus, baseline measurements, and goals could be desirable.

### Do

Implementation of strategies included in this plan represents the "do" portion of the process. This involves implementing the recommendations in this plan and making progress toward achieving the goals. In "doing," the Airport will continue developing a culture of awareness for waste management and will begin to enhance the practices and processes for improving and optimizing its activities associated with reduction, reuse, recycling, composting, and other waste management elements at the facility.

### Check

After implementing strategies, the "check" portion of the process involves the reporting aspect of the implementation process. As strategies are implemented, this step involves regularly tracking and checking the progress toward meeting the goals.

The Airport has finite resources (financial, staffing, capital, etc.); therefore, the management and tracking of the plan must not be unnecessarily arduous. If tracking and checking become too difficult or time consuming, the entire plan may suffer. Checking may include the development and use of tools (like spreadsheets) for measuring success and identifying areas for improvement, including a simple mechanism for feedback and process for reviewing suggestions.

In addition to regular review of the program's progress, the following scenarios may also trigger re-evaluation of the program and/or the constraints described in this report:

- New state recycling laws, requirements, or goals
- Expanded accepted materials under recycling agreement with Royal Oak
- New local infrastructure, for example, establishment of a composting facility
- New WCAA programs or goals
- New or changes in tenants or tenant programs or goals

### Act

The "act" portion of the process encompasses taking what has been learned in the previous stages and acting in response. It can be helpful to ask "what did we learn" and "how can we do better next time?" By re-evaluating the strategies, activities, goals, and metrics, adjustments can be identified and put into action.

It is recommended that meetings with representation from WCAA, Airport Operations, and tenants participating in the program be held on a regular basis to drive the continuous improvement cycle (review the recycling program and plan and implement improvements/adjustments). It is recommended that participation in these meetings be on a voluntary basis initially.

## K. Recommendation Summary

The recommendations outlined in this report do not require major capital improvements (as listed in the Airport's Capital Improvement Program [CIP]) and were designed to be compatible with the Airport's existing plans and programs, including the in-progress master plan, and the existing recycling program.

**Table 5** summarizes recommendations for the Airport's waste and recycling program as described in this report.

**Table 5: Recommendations Summary**

| Waste and Recycling Program Recommendations |
|---|
| • Establish additional resources such as labor, waste and recycling hauling services, space, and education for WCAA employees to provide opportunities for expansion of recycling program.<br>• Update contracts during the next contracting period for facility management services for cost savings or revenue generation from recycling, reuse, or waste reduction efforts.<br>• Track and report WCAA-related waste and recycling generation (specific to the Airport).<br>• Establish SMART goals for the waste and recycling program.<br>• Adopt an informal practice of purchasing supplies and items that are durable (reusable), recyclable under the existing program, or contain post-consumer (recycled) content. Evaluation of such purchasing preferences (and implementation of a more detailed program) are recommended during the next update to the purchasing policy.<br>• Continue to avoid waste creation at the source when possible and reuse items to the extent practical.<br>• Continue to exclude glass, food waste, or compostable paper products from the existing recycling program since it is not feasible to recycle these materials given the amount that is generated.<br>• Expand the paper and plastic bottle recycling programs to all WCAA facilities including the ARFF Facility and SRE/Airport Maintenance Complex.<br>• Encourage increased recycling of paper by employees. This could include reaching out to employees to increase awareness.<br>• Provide containers and encourage recycling for non-refundable aluminum cans.<br>• Evaluate options for recycling cardboard and provide opportunities to employees to solicit feedback regarding progress and performance of program.<br>• Work with employees and the waste hauling contractors to design and implement strategies to separate, collect, and process other recyclable materials in the waste stream that occur in a consistent and significant quantity.<br>• Coordinate with tenants that have expressed interest in recycling to provide or support such efforts based on available resources.<br>• Consider updating the Minimum Standards or individual tenant leases to reflect a preference for recycling over other waste management options. It is not recommended at this time to require tenants to recycle; however, voluntary participation may grow to a level when such a requirement is palatable.<br>• Install signage to designate trash cans from recycling bins.<br>• Improve in-office messaging for employees & provide clear instructions for recycling at the Airport.<br>• Provide simple on-going training for employees, tenants, and contractors about recycling program.<br>• Consider recycling, reuse, and waste reduction in the construction and operations of new or renovated buildings and spaces. Space for office waste and recycling bins as well as common carts for paper and plastic should be allocated in new areas if possible.<br>• Follow a simple PDCA cycle methodology for the maintenance & improvement of the recycling program.<br>• Hold meetings with representation from WCAA and tenants participating in recycling to drive the continuous improvement of the program and to plan for and implement improvements and adjustments as needed. Participation in these meeting is recommended to be voluntary. |

## 8. Conclusion

The Airport has a simple recycling program in place for WCAA employees and maintenance activities located at the Airport. This program is primarily focused on office paper, plastic bottles, and scrap metal and relies in large part on the program established for the WCAA offices at DTW's Smith Terminal. This program is recycling approximately ten percent of the waste generated at the Airport. It is recommended that WCAA consider expanding the existing program to include cardboard and to support tenants who have expressed interest in recycling.

This report described the existing program and outlined recommended improvements that will allow the Airport to increase landfill diversion and recycling volumes. In addition, this plan documents and supports the Airport's compliance with the FMRA and FAA guidance on the topic of recycling, reuse, and waste reduction.

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**Appendix E**

# Zoning Documents

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*Joint Airport Zoning Ordinance of Wayne and Washtenaw Counties*

**June 2016**

WAYNE COUNTY AIRPORT AUTHORITY
ZONING ORDINANCE
GENERAL

An Ordinance establishing airport zoning regulations restricting the height of structures and objects of natural growth and otherwise regulating the use of property in the vicinity of the Detroit Metropolitan Wayne County Airport and the Willow Run Airport; providing for the allowance of variances from such regulations; designating the Zoning Administrator charged with the administration and enforcement of such regulations; establishing an airport zoning board of appeals; providing for enforcement; and imposing penalties for violation of this Ordinance.

Pursuant to the authority conferred by the provisions of the Airport Zoning Act, being Act No. 23 of the Public Acts of the State of Michigan for the year 1950 (Extra Session), MCL 259.431 et seq., and for the purpose of promoting the health, safety, and general welfare of the inhabitants of the Counties Wayne and Washtenaw by preventing the establishment of the airport hazards and thereby protecting the general public, users of the Detroit Metropolitan Wayne County Airport and the Willow Run Airport, and occupants of land in the vicinity of the Detroit Metropolitan Wayne County Airport and the Willow Run Airport, and preventing the destruction and impairment of the utility of said airports and the public investment therein.

ARTICLE 1
DEFINITIONS

### 1.1 Words and Phrases

For the purposes of this Ordinance, the words, terms and phrases set forth in Sections 1.2 through 1.13 inclusive, shall have the meanings prescribed in those sections.

### 1.2 Airport/Airports

The term "Airport" means the Detroit Metropolitan Wayne County Airport or the Willow Run Airport, which may be collectively referred to herein as the "Airports" or singularly as an "Airport", and includes all appurtenances used or acquired for all of the Airports' buildings or facilities, and all other appurtenant rights of way or other existing or future interests.

### 1.3 Airport Hazard

"Airport Hazard" means any structure or tree within the Airport Hazard Areas of the Airports which exceeds the height limitations established by this Ordinance, or any use of land or appurtenances within any Airport Hazard Area which interferes with the safe use of the Airports by aircraft. Additionally, any proposed construction activity within the Airport Hazard Area that has received a "Determination of Presumed Hazard" from the Federal Aviation Administration ("FAA") or a structure of height that would increase the minimum safe altitude or visibility requirements declared for a safe instrument approach or departure as prescribed by the FAA is defined as an Airport Hazard.

### 1.4 Airport Hazard Area

The term "Airport Hazard Area" means any area of land or water, or both, lying within a 20 mile radius from the established center of the Detroit Metropolitan Wayne County Airport and 15 miles from the established center of the Willow Run Airport. These areas surrounding each of the respective Airports are areas which an Airport Hazard might exist if not prevented by this Ordinance.

### 1.5 Airport Zoning Act

The term "Airport Zoning Act" refers to Act No. 23 of the Public Acts of the State of Michigan for the year 1950 (Extra Session), MCL 259.431 et seq.

### 1.6 Board

The term "Board" means the "Joint Airport Zoning Board for Wayne and Washtenaw Counties that has the power to adopt, administer, amend and enforce airport zoning regulations applicable to the Airport Hazard Area. The Joint Airport Zoning Board for

Wayne and Washtenaw Counties does not have the power to hear appeals or grant variances.

### 1.7 Land-Use Guidance Zone

The term "Land Use Guidance Zone" means an area or zone in which certain types of land uses are recommended due to noise, vibrations, fumes, dust, fuel particles and other effects that may be caused by the operation of aircraft landing at, or taking off from, or operating at the Airports.

### 1.8 Above Mean Sea Level

The term "Above Mean Sea Level" denotes elevations above sea level based upon and determined by reference to United States Coast and Geodetic Survey datum.

### 1.9 Non-Conforming Use

The term "non-conforming use" means any structure, tree or use of land which does not conform to a regulation prescribed in this Ordinance or any amendment as of the effective date of such regulation.

### 1.10 Person

The term "person" means any individual, firm, partnership, corporation, company, association, joint stock association, municipal corporation or other public body, including any trustee, emergency manager, receiver, assignee or other similar representative.

### 1.11 Structure

The term "structure" means any object constructed or installed by man, including but not limited to any buildings, towers, smokestacks, overhead transmission lines, wind turbine generators and radio and television aerials and antennae, but not including highways.

### 1.12 Tree

The term "tree" means any object of natural growth.

### 1.13 Zoning Administrator

"Zoning Administrator" means the Chief Executive Officer of the Wayne County Airport Authority, or his/her designee, who is designated and charged with the administration and enforcement of this Ordinance.

## 1.14 Zoning Board of Appeals

"Zoning Board of Appeals means the appeals board established by Section 28 of the Airport Zoning Act.

# ARTICLE 2
# PURPOSE AND LIMITATIONS

## 2.1 Title

This Ordinance includes all Airport Zoning Plans attached hereto as Exhibits 1 through 8 dated June 2016 and shall be known as the "Joint Airport Zoning Ordinance of Wayne and Washtenaw Counties."

## 2.2 Objective

The principle objective of this Ordinance is to prevent the creation or establishment of air hazards to the Airports, thereby providing additional safety and protection to the users of the Airports and to the people who live and work in the vicinity of the Airports.

## 2.3 Hazard Area

The Ordinance establishes regulations on land within: (a) a 20 mile radius of the Detroit Metropolitan Wayne County Airport (see attached Sheet 3); and (b) a 15 mile radius of the Willow Run Airport (see attached Sheet 3). This Ordinance establishes a huge air bowl with a maximum height limitation of 500 feet above the established elevation of each of the Airports at the outer edge and has a height limitation as low as 25 feet above the ground at some locations in the approaches to the runways immediately adjacent to the Airports. The height limitations of this Joint Zoning Ordinance shall become less restrictive as the distance from each of the Airports is increased.

## 2.4 Hazards

Structures and trees which project above the height limitations under this Ordinance are considered hazards to flying and endanger lives and property. The prescribed height limits are not arbitrarily set, but are based on past experience and studies made by the Michigan Aeronautics Commission and by the Federal Aviation Administration. Height limits are based upon the established elevation of each of the Airports or upon the elevation of the end of the nearest runway at each of the Airports.

## 2.5 Existing Non-Conforming Objects

The Ordinance does not affect existing structures, the height of which exceeded the limits imposed by this Ordinance at the time it became effective. New construction, and construction increasing the height of existing structures, within any Airport Hazard Area, must conform to the height limitations required by this Ordinance. The Ordinance also restricts such uses of land within the vicinity of the Airports that will unreasonably interfere with radio communications systems, navigational aids, or other devices used by the Airports and aircraft, or would reduce visibility or would create confusing lights, or would be subject to undesirable effects that may be caused by the operation of aircraft.

### 2.6 Administration

The Chief Executive Officer, or his/her designee, shall administer and enforce the provisions of the Ordinance, in close cooperation with the Joint Airport Zoning Board for Wayne and Washtenaw Counties.

### 2.7 Heights Requiring Permits

To effectively administer the Ordinance, the Zoning Administrator hereby establishes application heights which are below the allowable height limits of the Ordinance. This is done to make it easier for the local zoning boards and the general public to decide whether an application for permit must be filed with the Zoning Administrator. This was also done to give added insurance to those who are constructing the higher, more costly structures. The establishment of application heights reduces the number of those who must make application (see attached Sheet 2.)

### 2.8 Land-Use Types Requiring Permits

To promote the general purpose and objectives of this Ordinance and its effective administration, all persons making use of land within the areas shown on attached Sheet 2 of the zoning plans are advised to consult Section 3.07 of this Ordinance as to undesirable land uses within any designated Airport Land Use Guidance Zone. The Michigan Zoning Enabling Act, Act 110 of 2006, also clarifies the establishment of uses of land inconsistent with the Airport Zoning Act.

### 2.9 Provisions for Variance

The Ordinance contains provisions for the variance of the regulations in event of practical difficulty or unnecessary hardship if the relief granted would not be contrary to the public interest and safety. It is the intent of the Joint Airport Zoning Board for Wayne and Washtenaw Counties and Zoning Administrator, with the cooperation of the public, to have the Ordinance administered in a reasonable and just manner in keeping with the responsibilities involved.

### 2.10 Where to Obtain Copies of this Ordinance

Information regarding height limits and copies of the Ordinance are available at the offices of the Wayne County Airport Authority, or the Michigan Department of Transportation, 2700 East Airport Service Drive, Lansing, Michigan 48906. A copy of the Ordinance is on file with the Wayne County Airport Authority and available at www.metroairport.com.

ARTICLE 3
ZONES

## 3.1 Airport Hazard Area

The Airport Hazard Area consists of all the lands within Wayne County and Washtenaw County which are located beneath the approach, transitional, 150 foot horizontal, conical and 500 foot horizontal surfaces, said lands being located within a circle having a radius extending horizontally 20 miles from the established center of the usable landing areas of the Detroit Metropolitan Wayne County Airport and within a circle having a radius extending horizontally 15 miles from the Willow Run Airport, each known as the Airport reference point. The boundaries of the Hazard Areas is shown on the Airport zoning plans numbered 1 through 8 , which maps are attached and made a part of this Ordinance.

## 3.2 Airport Zoning Plans

The height limitations shown on the attached airport zoning plans are imposed on the lands in the Airport Hazard Area, the same being based upon the elevations Above Mean Sea Level at the ends of the respective Airports' runways and the established elevation of each of the Airports, which elevations are shown on sheets 3 of the zoning plans.

## 3.3 Legal Height Limitations

No person may erect or maintain any structure to a height in excess of the limitations prescribed by the terms of this Ordinance and the attached maps and plans, or to plant or allow any tree to grow to a height in excess of the limitations prescribed by the terms of this Ordinance and the attached maps and plans; or to establish any use of lands contrary to the provisions of this Ordinance.

## 3.4 Unlawful Land Use

Notwithstanding any other provisions of this Ordinance, no person may use any lands within the Airport Hazard Area which:

- (a) Would create electrical interference with radio communications between the Airports and aircraft or create interference with navigational aids employed by aircraft;
- (b) Would make it difficult for flyers to distinguish between any Airport lights and others or result in glare to the eyes of flyers using the airport;

(c) Would create air pollution in such amounts as to impair the visibility of flyers in the use of the Airports;

(d) Would locate or permit the operation of a dump, waste disposal site, sanitary landfill, hazardous waste facility, solid waste transfer station or recycling facility within 10,000 feet of any runway at the Airports, unless the construction, location and operation of the site is approved or authorized by the Federal Aviation Administration as not being in violation of its orders, rules or regulations applicable to the Airports, or unless a waiver is issued by the Federal Aviation Administration.

(e) Would otherwise endanger the landing, taking off, or maneuvering of aircraft;

(f) Would attract birds; or

(g) Would raise the descent minimums of any instrument approach procedure to the Airports, or otherwise limit operations at either of the Airports, as determined by an airspace study conducted by the Federal Aviation Administration.

### 3.5 Non-Conforming Existing Uses

The provisions of Section 3.3 of this Ordinance shall not apply to structures, trees or other non-conforming uses existing in the Airport Hazard Areas on the effective date of this Ordinance, unless the Zoning Administrator determines it to be abandoned, or 80% torn down, destroyed, deteriorated, or decayed. The definition of abandoned shall be the same as that definition used by each respective local land use zoning agency.

### 3.6 Alterations to Non-Conforming Land Use

The provisions of Section 3.3 of this Ordinance shall apply to changes or alterations which increase the height of existing structures, trees or other non-conforming uses after the effective date of this Ordinance, with the same force and effect as though the same were new uses.

### 3.7 Land-Use Guidance Zone

(a) Purpose. The purpose of a Land Use Guidance Zone as defined in this Ordinance, is to designate areas in which certain types of land uses are recommended due to undesirable effects that may be caused by the operation of aircraft. See the land-use guidance, as shown on Sheets 6 and 7 of the airport zoning plans, for recommended land uses.

(b) Acceptable Land-Use. The uses of land within the areas shown on the zoning plans are acceptable land-uses as outlined in land-use guidance chart, as shown on Sheet 8 of the airport zoning plans.

ARTICLE 4
ORDINANCE ADMINISTRATION

## 4.1 Approach Standards

The approach, transitional, conical and inner horizontal surfaces which establish the height limitations under this Ordinance are denoted on sheets 3, 4 and 5 of the zoning plans, and are established in conformance with approach standards or regulations of the Michigan Aeronautics Commission or the Federal Aviation Administration. In acting upon applications for permits the Zoning Administrator will arrive at proper height limitations by interpolating between contours shown on the zoning plans.

## 4.2 Zoning Administrator as Administrative Agency

The Chief Executive Officer of the Wayne County Airport Authority is designated as the Zoning Administrator charged with the duty of administering and enforcing this Joint Zoning Ordinance. The Zoning Administrator may appoint a designee to perform the duties of the Zoning Administrator. The Zoning Administrator shall act as the "administrative agency" referred to in the Airport Zoning Act. The duties of the Zoning Administrator shall include those of issuing permits as provided below, but the Zoning Administrator shall not have or exercise any of the powers or duties delegated to the Board of Appeals. The Zoning Administrator is granted sole authority to approve land uses on Airport property in accordance with State and Federal guidelines. The Zoning Administrator may adopt such rules of procedure as may be necessary in connection with the administration and enforcement of this Ordinance.

## 4.3 Board of Appeals

There is hereby created a Board of Appeals consisting of five members, each to be appointed for a term of 3 years and until his or her successor is appointed and qualified, one of whom shall be designated as Chair and one of whom shall be designated as Vice-Chair, which appointments shall be made by the Joint Airport Zoning Board for Wayne and Washtenaw Counties and provided that upon such appointments being initially made, one member of the Board shall be appointed for a term of 1 year, two for terms of 2 years each, and two for terms of 3 years each. Board members shall be removable by the appointing body for cause shown, upon written charges and after notice and opportunity to be publicly heard. The Board of Appeals has the powers set forth in Section 28 of the Airport Zoning Act and shall exercise such powers as are conferred upon it in the Airport Zoning Act and in this Ordinance.

(a) Official Name: The Board of Appeals shall be officially known as the Joint Airport Zoning Board of Appeals

(b) Compensation: The Board of Appeals shall receive such compensation and expense reimbursement for attendance at meetings and hearings, and may employ such necessary personnel, as may be provided for by resolution of the Wayne County Airport Authority Board.

(c) Rules and Procedures: The Board of Appeals shall adopt rules concerning its organization and procedure, including appeal forms, and other authorized matters, consistent with the provisions of the Airport Zoning Act and this Ordinance. Such rules shall include, but not be limited to, providing a reasonable period of time from which appeal may be taken to it from an action of the Zoning Administrator. Meetings of the Board shall be held at the call of the Chair and at such other times as the Board may determine, and notice of all meetings shall be given to all members. An annual meeting shall be held during the month following the anniversary date of this Ordinance. The Chair, or in his or her absence the Vice-Chair, may administer oaths or affirmations and issue subpoenas to compel the attendance of witnesses. All hearings of the Board of Appeals shall be public, and it shall keep minutes of its proceedings, showing the vote of each member upon each question, or if absent or failing to vote, then so indicating, and the Board shall keep records of its examinations and other official acts, all of which shall be immediately filed in the offices of the Board and shall be a public record.

(d) Powers: The Board of Appeals, by the concurring vote of a majority of its members, shall have the power to issue certificates of variance under the provisions of this Ordinance, or to otherwise decide appeals from any order, requirement, rule, regulation, decision or determination made by the Zoning Administrator under the powers conferred upon it by this Ordinance.

(e) Who May Appeal: Any person, including the governing body of any political subdivision, aggrieved by any decision of the Zoning Administrator made in the administration of this Ordinance, may appeal to the Board of Appeals.

(f) Appeal Procedure: All appeals from actions of the Zoning Administrator shall be taken within the time and in the manner provided by the rules of the Board of Appeals, by filing with the Zoning Administrator and with the Board a notice of appeal specifying the grounds of appeal. The Zoning Administrator shall promptly transmit to the Board all the papers constituting the record upon which the action appealed was taken. An appeal shall stay all proceedings in furtherance of the action appealed from, unless the Zoning Administrator certifies to the Board, after the notice of appeal has been filed with it, that by reason of the facts stated in the certificate a stay would, in the Zoning Administrator's opinion, cause imminent peril to life or irreparable damage to property. In that case, proceedings shall not be stayed otherwise than by order of the Board and on due cause shown. The Board shall fix a time for the hearing of the appeal, give public notice and due notice to the parties in interest, and decide the appeal within a reasonable time. At the hearing any party may appear in person or by agent or by attorney. The Board may, in conformity with the provisions of this Ordinance, reverse, affirm or modify, wholly or partly, the order, requirement, decision or determination as ought to be made, and to that end shall have all the powers of the Zoning Administrator.

(g) Certificates of Variance: An application for certificate of variance is to be submitted on the form provided for by the rules of the Board of Appeals. If the application is granted, the applicant will receive a certificate of variance in the form prescribed by such rules. The certificate shall provide that it is not effective for a period of thirty (30) days following the date of its issuance. Immediately upon issuance, copies of the certificate shall be filed with the Zoning Administrator, the Michigan Aeronautics Commission and each political subdivision affected by the certificate. In acting upon applications for variance, variances shall be allowed where a literal application or enforcement of the regulations would result in practical difficulty or unnecessary hardship and the relief granted would not be contrary to the public interest and approach protection, but would do substantial justice and be in accordance with the spirit of the regulations of this Ordinance; provided, however, that any variance may be allowed subject to any reasonable condition or conditions subsequent that the Board of Appeals may deem necessary to effectuate the purpose of this Ordinance. Nothing in this section shall be construed to permit a use which would conflict with any general zoning ordinance or regulation of any political subdivision applicable to the same area.

## ARTICLE 5
## PERMITS

### 5.1 Permit Maps

There is attached hereto as Sheets 1 through 8 of the Airport zoning maps, a "permit map 2" showing applicable height limitations within the Airport Hazard Area above which permits are required under this Ordinance. The permit maps are affixed to this Ordinance for the information of and consultation by all persons proposing to make uses of land within the Airport hazard areas, whether the same be new uses or changes in existing uses, and it shall not be a defense in any action that a person charged with violation of this Ordinance, whether in a criminal or civil action, failed to consult this Ordinance or the permit maps prior to the action giving rise to the violation.

### 5.2 Application for Permits

Applications for permits shall be made to the Zoning Administrator in three (3) copies upon forms furnished by the Zoning Administrator, and the Zoning Administrator shall, within 15 days from the application, determine whether the height limitations as designated by the Airport zoning maps and this Ordinance, would or would not be violated if the application were granted and shall grant or deny the application accordingly (i.e. the Zoning Administrator not being vested with authority to permit a variance). The Zoning Administrator shall advise applicant of its action within three (3) days after the action has been taken. In the event of a denial, the applicant may apply to the Board of Appeals for a certificate of variance. The Zoning Administrator is authorized and directed to approve all applications for permits for uses not exceeding 25 feet in height above the existing ground level as the same may exist on the effective date of this Ordinance, notwithstanding anything to the contrary herein contained, it being intended that the minimum height limitation to be imposed by this Ordinance shall be 25 feet above ground level existing on the date of this Ordinance. The issuance of a permit shall not be construed to permit a use that violates section 3.5 of this Ordinance or any general zoning Ordinance or regulations of any political subdivision applicable to the same area.

### 5.3 Permit Procedures

Persons desiring to create new uses, or to change existing uses, must file an application for a permit if the proposal involves objects that exceed the limitations set forth and depicted on Sheet 2 titled "Permit Required Map" or in any case where an object may be in violation of section 3.4 or 3.7 of this Ordinance.

Persons desiring to create new uses, or to change existing uses, shall proceed with one of the following after consulting the applicable permit map:

(a) Procedure One: If it appears, after consulting the permit map, that the proposed new use, or changed existing use, would clearly and unequivocally not violate the terms of this Ordinance, then the new use may be created, or existing use changed, without applying for a permit hereunder or taking any further action under this Ordinance.

(b) Procedure Two: If it appears, after consulting the permit map, that the proposed new use, or changed existing use may violate the terms of this Ordinance, then the new use shall not be created, or existing use changed, until a proper permit has first been obtained from the Zoning Administrator in accordance with the provisions of this Ordinance. In as much as the height limitations imposed in the airport hazard area steadily incline from the airport center, and at various rates according to location of approaches, the permit maps are only approximations for any given segment of the airport hazard area and therefore a height limitation may be somewhat greater than accorded by the maps, depending upon the particular plat of land involved. The purpose of this second procedure is, therefore, to enable the Zoning Administrator to make exact mathematical determinations and enable users of the land within the hazard area to avoid violations of this Ordinance.

(c) Procedure Three: If it appears, after consulting the permit map, that the proposed new use, or change in existing use, will violate the provisions of this Ordinance, then no such new or changed use shall be undertaken unless the person proposing to undertake it shall first apply to the Board of Appeals and obtain a certificate of variance in accordance with the procedures contained in this Ordinance.

### 5.4 Exception for Emergency Repairs

No permit is required for the emergency repair or emergency replacement of nonconforming public utility structures, other than buildings, when the height of such structures will not be increased by such repairs or replacement. It is intended that in the application of this provision any combination of circumstances calling for immediate action or remedy in the repair or replacement of such non-conforming public utility structures shall be deemed an emergency.

## ARTICLE 6
## JUDICIAL ACTION

### 6.1 Appeals to Circuit Court

Any person, including the Michigan Aeronautics Commission on behalf of and in the name of the State, aggrieved by any decision of the Board of Appeals, may appeal to the Circuit Court of the County of Wayne or the Circuit Court for the County of Washtenaw, as applicable, and as provided in Section 30 of the Airport Zoning Act.

### 6.2 Penalties

Any person who violates this Ordinance or any regulations, orders or rulings made pursuant to this Ordinance, shall be guilty of a misdemeanor and, upon conviction thereof, shall be punished by a fine of not more than $500.00 or imprisoned for a term not to exceed 90 days, or both. Each day a violation continues to exist after notice shall constitute a separate offense. Such notice may be given by the Zoning Administrator by certified mail, return receipt requested, addressed to the person maintaining the violation at the last known address.

### 6.3 Appearance Ticket Authorization

Unless prohibited by state law, the following persons are empowered to issue and serve appearance tickets for violations of this Ordinance, pursuant to Act No. 175 of the Public Acts of 1927, as amended by Act No. 506 of the Public Acts of 1980, Act No. 366 of the Public Acts of 1984 and Act No. 49 of the Public Acts of 1988, being sections 764.9c and 764.9f of the Michigan Compiled Laws:

Sheriffs of Wayne or Washtenaw Counties or their respective deputies

### 6.4 Civil Action Available

The Chief Executive Officer of the Wayne County Airport Authority, on behalf of and in the name of the Joint Airport Zoning Board for Wayne and Washtenaw Counties, may, in addition to any criminal action taken, institute in the Circuit Court of Wayne County or the Circuit Court of Washtenaw County, whichever venue is appropriate, an action to prevent, restrain, correct or abate any violation of this Ordinance or the Airport Zoning Act, or of airport zoning regulations adopted under this Ordinance or under the Airport Zoning Act, or of any order or ruling made in connection with their administration or enforcement, and the court shall adjudge to the plaintiff such relief, by way of injunction (which may be mandatory) or otherwise, as may be proper under all the facts and circumstances of the case, in order to effectuate fully the purposes of this Ordinance or the Airport Zoning Act and the regulations adopted and orders and rulings made pursuant thereto.

## ARTICLE 7
## FEDERAL LAWS
## FEDERAL AVIATION REGULATIONS

### 7.1 Federal Laws (Part 77, 14 C.F.R. §77.1*et seq.*)

The Ordinance is not intended to conflict with existing federal approach protection laws. The Federal Aviation Administration requires that it be given notice of any construction or alteration:

(a) That would be more than 200 feet above ground level at its site.
(b) That would be above an imaginary surface extending outward and upward at 100:1 slope within 20,000 feet of the nearest point of a runway more than 3200 feet in length.
(c) That would be above an imaginary surface extending outward and upward at 50:1 slope within 10,000 feet of the nearest point of a runway less than 3200 feet in length.

## ARTICLE 8
## SEVERABILITY OF PROVISIONS

### 8.1 Severability of Provisions

If any of the provisions of this Ordinance or its application to any person or circumstance is held invalid, such invalidity shall not affect other provisions or applications of this Ordinance which can be given effect without the invalid provisions or applications of the Ordinance, and to that end the invalid provisions of this Ordinance are declared to be severable.

## ARTICLE 9
## AMENDMENTS

## 9.1 Amendments

This Ordinance, and the regulations prescribed herein, may be amended by the Joint Airport Board for the counties of Wayne and Washtenaw after a public hearing is held in relation to the proposed amendment, pursuant to Section 19 of the Airport Zoning Act.

ARTICLE 10
REPEAL OF PRIOR ZONING ORDINANCE

## 10.1 Repeal

The Joint Airport Zoning Board for Wayne and Washtenaw Counties hereby repeals all prior existing Airport zoning ordinances at the Detroit Metropolitan Wayne County Airport and the for Willow Run Airport

ARTICLE 11
EFFECTIVE DATE

## 11.1 Effective Date

This Ordinance shall take effect on October 1, 2016.

This Ordinance was approved by the Joint Airport Zoning Commission for Wayne and Washtenaw Counties on July 21, 2016.

#110780

STATE OF MICHIGAN

DEPARTMENT OF TRANSPORTATION

OFFICE OF AERONAUTICS

# WAYNE & WASHTENAW COUNTIES
# JOINT AIRPORT ZONING BOARD

# AIRPORT ZONING ORDINANCE

## INCLUDES WILLOW RUN AND DETROIT METRO - WAYNE COUNTY AIRPORT

June 2016

JOINT AIRPORT ZONING BOARD

APPROVED ____________ DATE

APPROVED ____________ DATE

APPROVED ____________ DATE

APPROVED ____________ DATE

APPROVED ____________ DATE

APPROVED ____________ DATE

APPROVED ____________ DATE

APPROVED ____________ DATE

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APPROVED ____________ DATE

APPROVED ____________ DATE

MICHIGAN AERONAUTICS COMMISSION EST. 1929

MDOT

MICHIGAN DEPARTMENT OF TRANSPORTATION
OFFICE OF AERONAUTICS

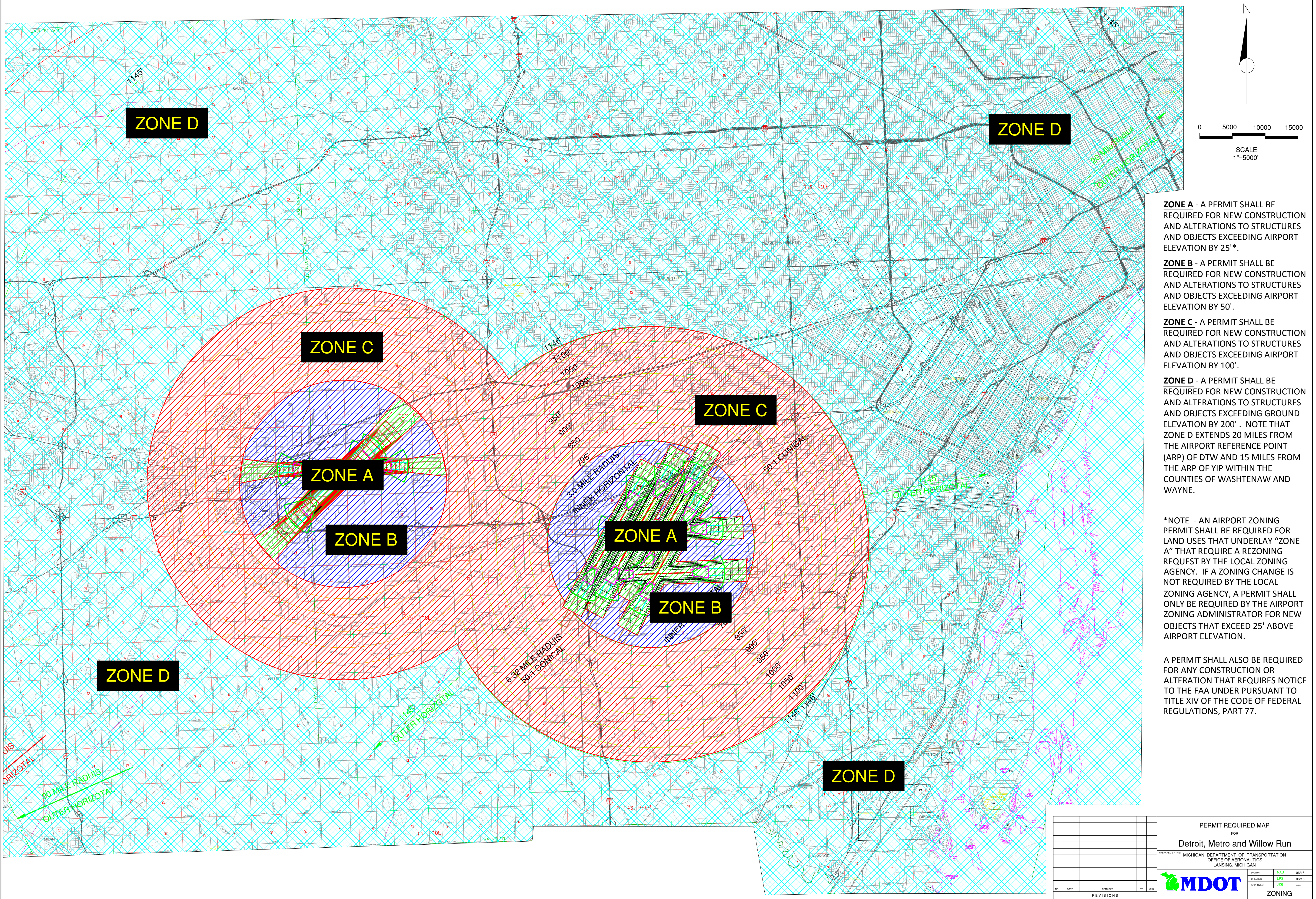
APPROVED ____________ MIKE TROUT - DIRECTOR ____________ DATE

**The following plan set is adopted along with the written ordinance under the authority of Section 17 of the Michigan Airport Zoning Act, Act 23 of 1950 as amended. This plan set is to be used to supplement the written ordinance.**

| AIRPORT / LICENSE CLASS | SITE NO. | FAA IDENTIFIER |
|---|---|---|
| DETROIT METRO WAYNE CO / AIR CARRIER | 82-17 | DTW |
| WILLOW RUN / AIR CARRIER | 82-18 | YIP |

| REVISION NUMBER | AIRPORT ZONING ORDINANCE REVISIONS | REVISION DATE |
|---|---|---|

| SHEET NUMBER | INDEX TO SHEETS | LATEST REVISION DATE |
|---|---|---|
| 8 | Compatible Land Use Guidelines (All Airports) | 6/16 |
| 7 | Land Use Zoning at Willow Run | 6/16 |
| 6 | Land Use Zoning at Detroit Metro | 6/16 |
| 5 | YIP Approach Height Zoning | 6/16 |
| 4 | DTW Approach Height Zoning | 6/16 |
| 3 | Height Zoning Restriction for Detroit Metro and Willow Run | 6/16 |
| 2 | Permit Required Map | 6/16 |
| 1 | Title Sheet | 6/16 |




**ZONE A** - A PERMIT SHALL BE REQUIRED FOR NEW CONSTRUCTION AND ALTERATIONS TO STRUCTURES AND OBJECTS EXCEEDING AIRPORT ELEVATION BY 25'*.

**ZONE B** - A PERMIT SHALL BE REQUIRED FOR NEW CONSTRUCTION AND ALTERATIONS TO STRUCTURES AND OBJECTS EXCEEDING AIRPORT ELEVATION BY 50'.

**ZONE C** - A PERMIT SHALL BE REQUIRED FOR NEW CONSTRUCTION AND ALTERATIONS TO STRUCTURES AND OBJECTS EXCEEDING AIRPORT ELEVATION BY 100'.

**ZONE D** - A PERMIT SHALL BE REQUIRED FOR NEW CONSTRUCTION AND ALTERATIONS TO STRUCTURES AND OBJECTS EXCEEDING GROUND ELEVATION BY 200'. NOTE THAT ZONE D EXTENDS 20 MILES FROM THE AIRPORT REFERENCE POINT (ARP) OF DTW AND 15 MILES FROM THE ARP OF YIP WITHIN THE COUNTIES OF WASHTENAW AND WAYNE.

*NOTE - AN AIRPORT ZONING PERMIT SHALL BE REQUIRED FOR LAND USES THAT UNDERLAY "ZONE A" THAT REQUIRE A REZONING REQUEST BY THE LOCAL ZONING AGENCY. IF A ZONING CHANGE IS NOT REQUIRED BY THE LOCAL ZONING AGENCY, A PERMIT SHALL ONLY BE REQUIRED BY THE AIRPORT ZONING ADMINISTRATOR FOR NEW OBJECTS THAT EXCEED 25' ABOVE AIRPORT ELEVATION.

A PERMIT SHALL ALSO BE REQUIRED FOR ANY CONSTRUCTION OR ALTERATION THAT REQUIRES NOTICE TO THE FAA UNDER PURSUANT TO TITLE XIV OF THE CODE OF FEDERAL REGULATIONS, PART 77.

| NO. | DATE | REMARKS | BY | CHK |
|---|---|---|---|---|
| | | | | |

REVISIONS

PERMIT REQUIRED MAP

FOR

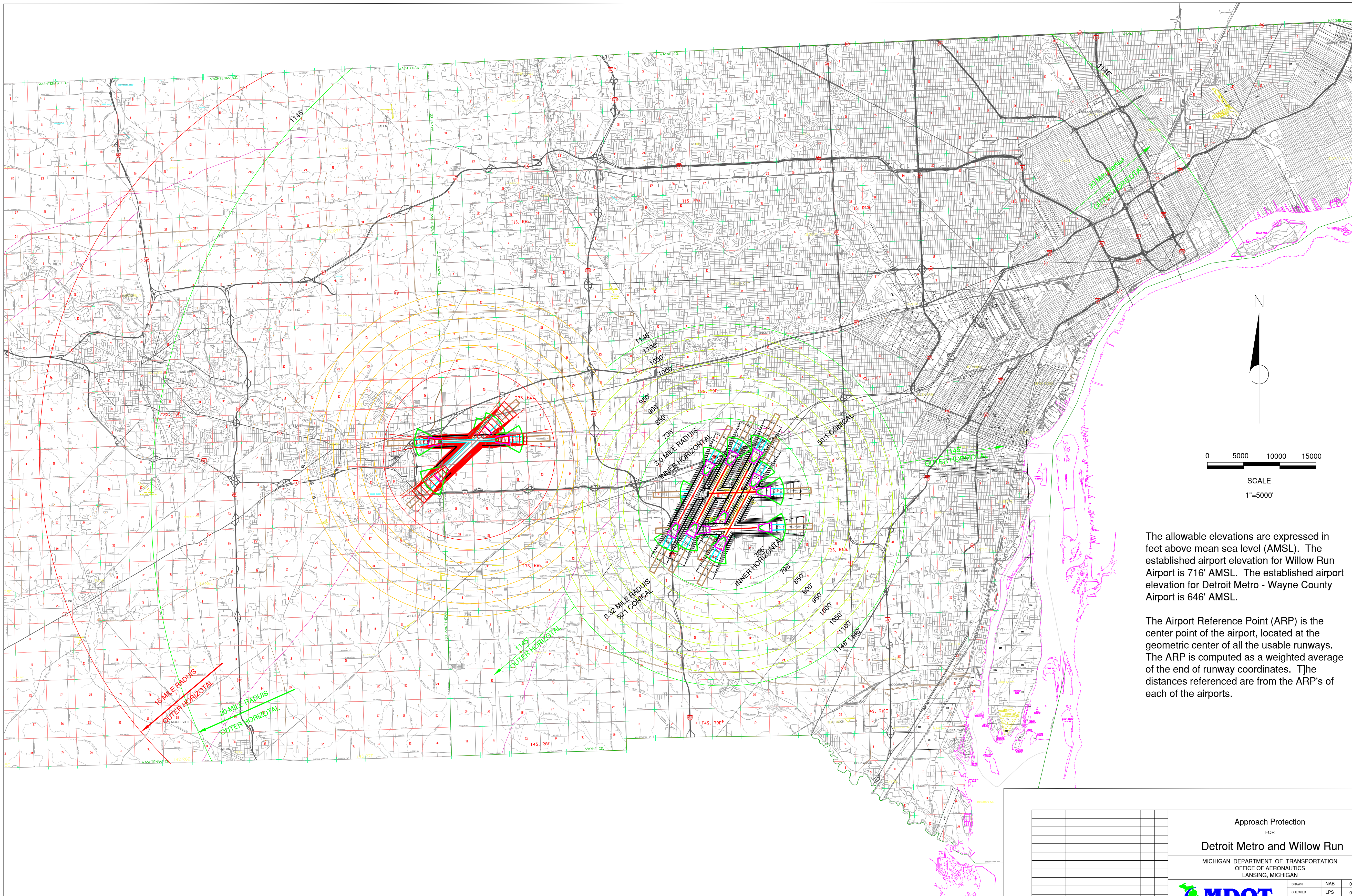
Detroit, Metro and Willow Run

PREPARED BY THE: MICHIGAN DEPARTMENT OF TRANSPORTATION
OFFICE OF AERONAUTICS
LANSING, MICHIGAN

MDOT

| | | |
|---|---|---|
| DRAWN | NAB | 06/16 |
| CHECKED | LPS | 06/16 |
| APPROVED | JZB | --/-- |

ZONING




The allowable elevations are expressed in feet above mean sea level (AMSL). The established airport elevation for Willow Run Airport is 716' AMSL. The established airport elevation for Detroit Metro - Wayne County Airport is 646' AMSL.

The Airport Reference Point (ARP) is the center point of the airport, located at the geometric center of all the usable runways. The ARP is computed as a weighted average of the end of runway coordinates. T]he distances referenced are from the ARP's of each of the airports.

| NO. | DATE | REMARKS | BY | CHK |
|---|---|---|---|---|
| 1 | 03/16 | ARP Changed Runways Removed and Extended | NAB | LS |

REVISIONS

Approach Protection

FOR

Detroit Metro and Willow Run

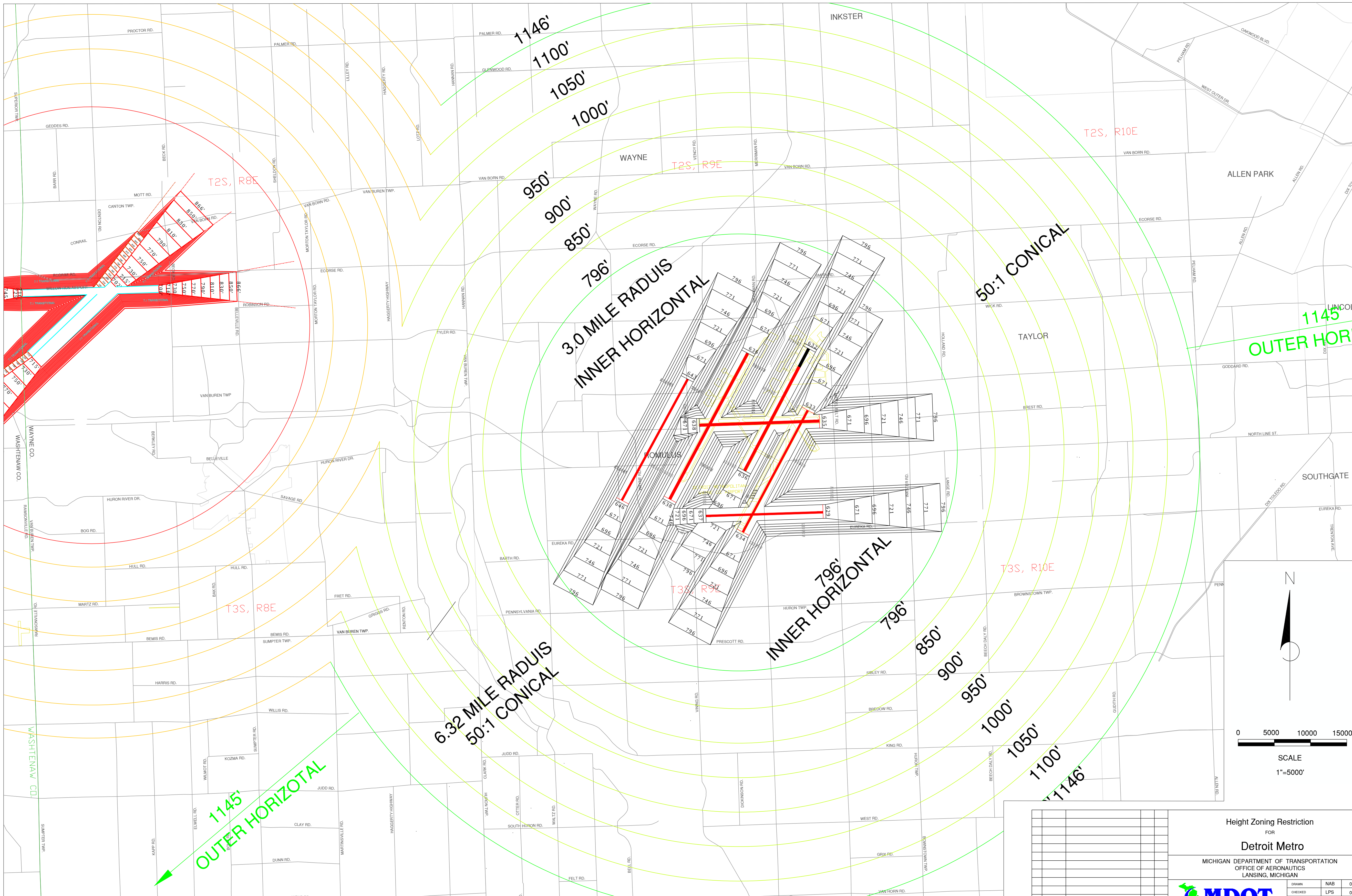
MICHIGAN DEPARTMENT OF TRANSPORTATION
OFFICE OF AERONAUTICS
LANSING, MICHIGAN

MDOT

| | | |
|---|---|---|
| DRAWN | NAB | 03/16 |
| CHECKED | LPS | 06/16 |
| PLOTTED | | |

ZONING

SHEET 3 OF 8




Height Zoning Restriction

FOR

Detroit Metro

MICHIGAN DEPARTMENT OF TRANSPORTATION
OFFICE OF AERONAUTICS
LANSING, MICHIGAN

MDOT

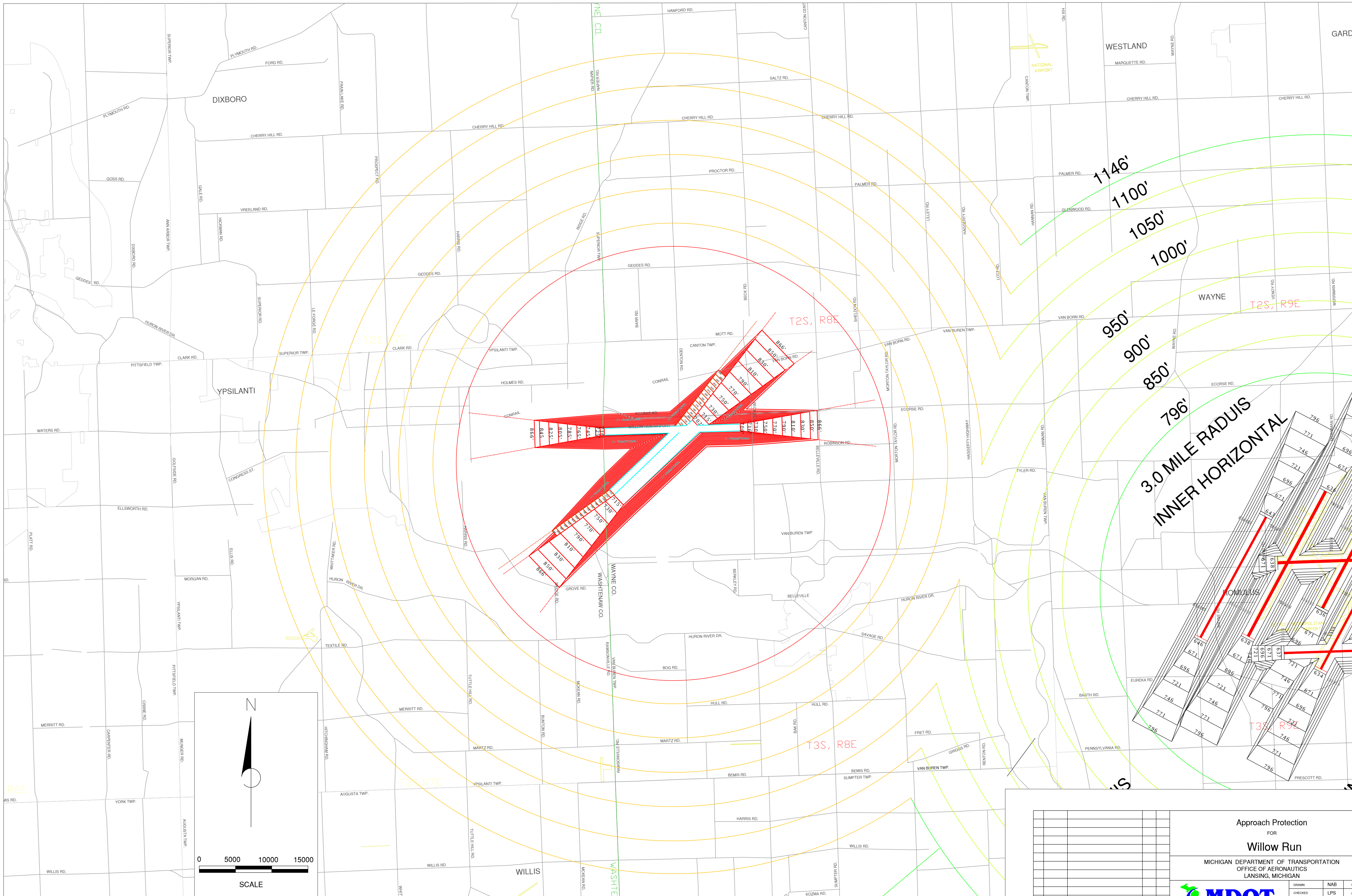
| | | |
|---|---|---|
| DRAWN | NAB | 03/16 |
| CHECKED | LPS | 06/16 |
| PLOTTED | | |

| NO. | DATE | REMARKS | BY | CHK |
|---|---|---|---|---|

REVISIONS

ZONING

SHEET 4 OF 8




| NO. | DATE | REMARKS | BY | CHK |
|---|---|---|---|---|
| 1 | | | | |

REVISIONS

Approach Protection

FOR

Willow Run

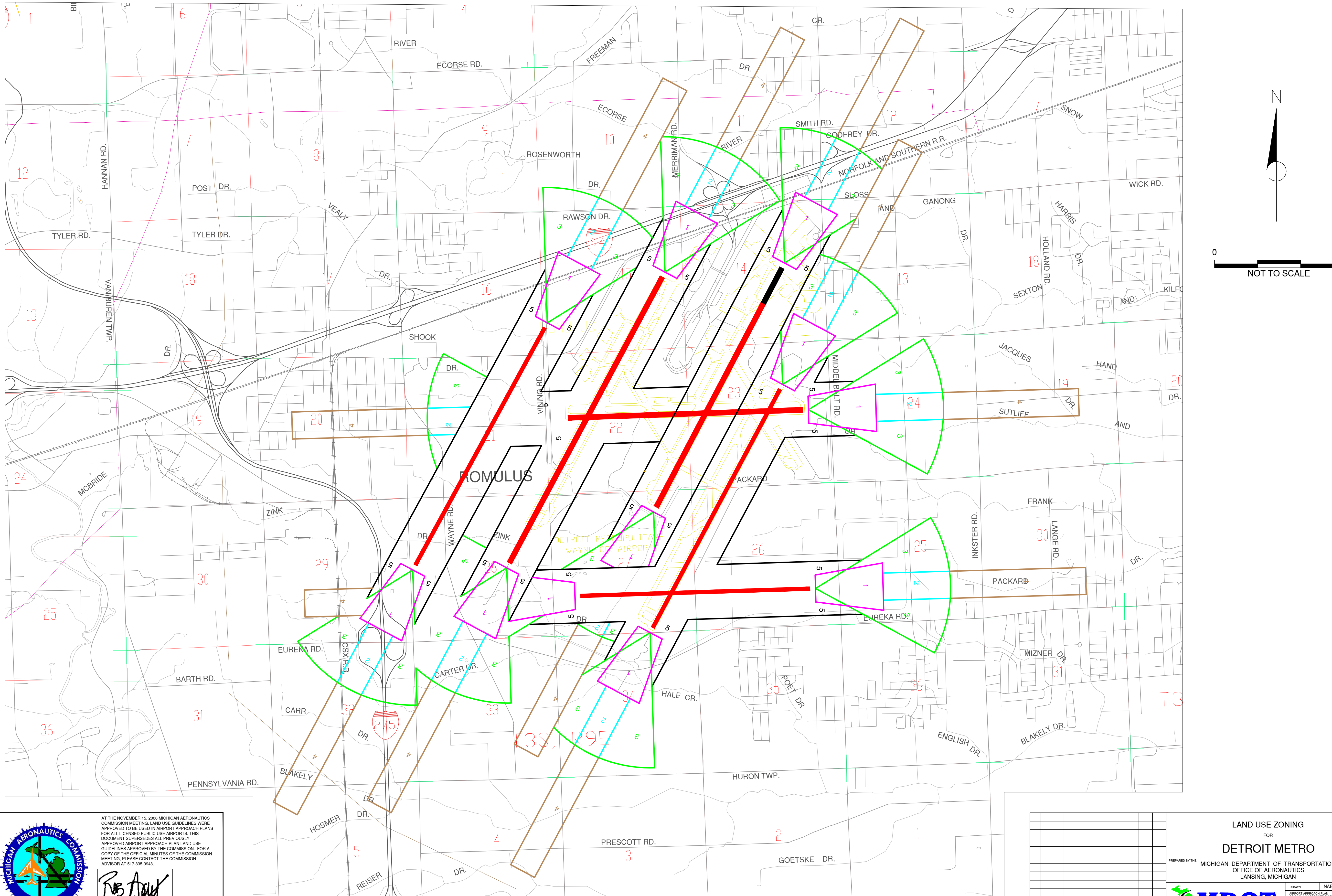
MICHIGAN DEPARTMENT OF TRANSPORTATION
OFFICE OF AERONAUTICS
LANSING, MICHIGAN

MDOT

| | | |
|---|---|---|
| DRAWN | NAB | 03/16 |
| CHECKED | LPS | 06/16 |
| PLOTTED | | |

ZONING

SHEET 5 OF 8




AT THE NOVEMBER 15, 2006 MICHIGAN AERONAUTICS COMMISSION MEETING, LAND USE GUIDELINES WERE APPROVED TO BE USED IN AIRPORT APPROACH PLANS FOR ALL LICENSED PUBLIC USE AIRPORTS. THIS DOCUMENT SUPERSEDES ALL PREVIOUSLY APPROVED AIRPORT APPROACH PLAN LAND USE GUIDELINES APPROVED BY THE COMMISSION. FOR A COPY OF THE OFFICIAL MINUTES OF THE COMMISSION MEETING, PLEASE CONTACT THE COMMISSION ADVISOR AT 517-335-9943.

Rob Abent

ROB ABENT
ON BEHALF OF THE MICHIGAN
AERONAUTICS COMMISSION

11/15/2006
DATE

| NO. | DATE | REMARKS | BY | CHK |
|---|---|---|---|---|

REVISIONS

LAND USE ZONING

FOR

# DETROIT METRO

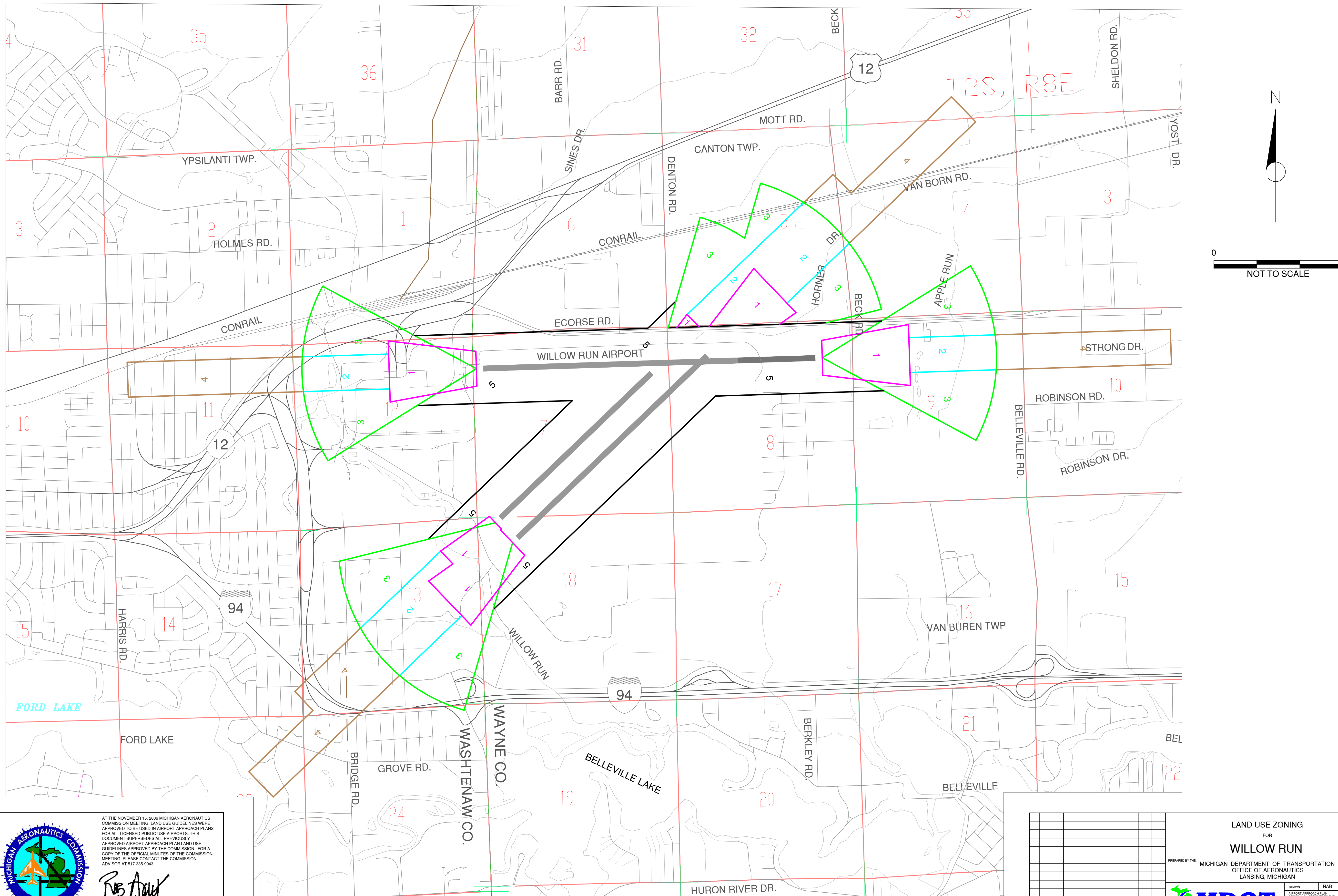
PREPARED BY THE: MICHIGAN DEPARTMENT OF TRANSPORTATION
OFFICE OF AERONAUTICS
LANSING, MICHIGAN

MDOT

| | | |
|---|---|---|
| DRAWN | NAB | 03/16 |
| AIRPORT APPROACH PLAN ORIGINALLY APPROVED BY THE MICHIGAN AERONAUTICS COMMISSION ON THIS DATE: | | XX/XX/XX |

ZONING

SHEET 6 OF 8

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Rob Abent

ROB ABENT
ON BEHALF OF THE MICHIGAN AERONAUTICS COMMISSION

11/15/2006
DATE

| NO. | DATE | REMARKS | BY | CHK |
|---|---|---|---|---|

REVISIONS

LAND USE ZONING
FOR
WILLOW RUN

PREPARED BY THE: MICHIGAN DEPARTMENT OF TRANSPORTATION
OFFICE OF AERONAUTICS
LANSING, MICHIGAN

| DRAWN | NAB | 03/16 |
|---|---|---|
| AIRPORT APPROACH PLAN ORIGINALLY APPROVED BY THE MICHIGAN AERONAUTICS COMMISSION ON THIS DATE: | | XX/XX/XX |

ZONING

SHEET 7 OF 8

### ACCIDENT SAFETY ZONES, LAND USE GUIDELINES AND PLANNING STRATEGIES FOR NEW DEVELOPMENT

| Accident Safety Zone | Land Use Characteristics | Land Use Guidelines | Land Use Planning Strategies<br>*All aviation uses are acceptable |
|---|---|---|---|
| Zone 1 (See Special Note) | Population Density | Avoid land uses which concentrate people indoors or outdoors. | 1. 0-5 people/acre.<br>2. Airport sponsor should purchase property if possible.<br>3. Zone land uses, which by their nature, will be relatively unoccupied by people (i.e. mini-storage, small parking lots). |
| | Residential vs. Non-Residential Land Use | Prohibit all residential land uses. All non-residential land uses permitted outright subject to the Population Density and Special Function Land Use guidelines. | 1. Create a height hazard overlay ordinance around the airport.<br>2. Airport sponsor should purchase property if possible.<br>3. Airport sponsor should obtain avigation and obstruction easements.<br>4. During the site development process, shift all structures away from the runway centerlines if possible.<br>5. Landscaping requirements shall establish only low growing vegetation.<br>6. Prohibit high overhead outdoor lighting.<br>7. Require downward shading of lighting to reduce glare.<br>8. Evaluate all possible permitted conditional uses to assure compatible land use. |
| | Special Function Land Use | Prohibit all Special Function Land Uses. | 1. Prohibit overhead utilities and all noise sensitive land uses.<br>2. Zone land for uses other than for schools, play fields, hospitals, nursing homes, daycare facilities and churches.<br>3. Limit storage of large quantities of hazardous or flammable material.<br>4. Ensure permitted uses will not create large areas of standing water, or generate smoke/steam, etc. |

**Special Note:** Since the dimensions of Zone 1 are similar to the dimensions of the Runway Protection Zone (RPZ), those airports receiving federal grant dollars from the FAA's Airport Improvement Program, should strongly consider purchasing the RPZ or otherwise acquire rights to the property for the RPZ.

### COMPATIBLE LAND USE MATRIX

| Accident Safety Zone | Land Use Characteristics | Land Use Guidelines | Land Use Planning Strategies<br>*All aviation uses are acceptable |
|---|---|---|---|
| Zone 2 | Population Density | Avoid land uses which concentrate people indoors or outdoors. | 1. 0-5 people/acre.<br>2. Zone land uses, which by their nature, will be relatively unoccupied by people (i.e. mini-storage, small parking lots). |
| | Residential vs. Non-Residential Land Use | Prohibit all residential land uses. All non-residential land uses permitted outright subject to the Population Density and Special Function Land Use guidelines. | 1. Create a height hazard overlay ordinance around the airport.<br>2. Obtain avigation and obstruction easements.<br>3. During site development process, shift all structures away from the runway centerlines if possible.<br>4. Prohibit mobile home parks.<br>5. Landscaping requirements shall establish only low growing vegetation.<br>6. Prohibit high overhead outdoor lighting.<br>7. Require downward shading of lighting to reduce glare.<br>8. Evaluate all possible permitted conditional uses to assure compatible land use. |
| | Special Function Land Use | Prohibit all Special Function Land Uses. | 1. Prohibit overhead utilities and all noise sensitive land uses.<br>2. Zone land for uses other than for schools, play fields, hospitals, nursing homes, daycare facilities and churches.<br>3. Limit storage of large quantities of hazardous or flammable material.<br>4. Ensure permitted uses will not create large areas of standing water, or generate smoke/steam, etc. |

### COMPATIBLE LAND USE MATRIX

| Accident Safety Zone | Land Use Characteristics | Land Use Guidelines | Land Use Planning Strategies<br>*All aviation uses are acceptable |
|---|---|---|---|
| Zone 3 | Population Density | Avoid land uses which concentrate people indoors or outdoors. | 1. < 25 people/acre.<br>2. Zone land uses, which by their nature, will be relatively unoccupied by people (i.e. mini-storage, small parking lots). |
| | Residential vs. Non-Residential Land Use | Limit residential development to Low Density housing standards. All non-residential land uses permitted outright subject to the Special Function Land Use guidelines. | 1. Create a height hazard overlay ordinance around the airport.<br>2. Obtain avigation and obstruction easements.<br>3. During site development process, shift all structures away from the runway centerlines if possible.<br>4. Prohibit mobile home parks.<br>5. Landscaping requirements shall establish only low growing vegetation.<br>6. Prohibit high overhead outdoor lighting.<br>7. Require downward shading of lighting to reduce glare.<br>8. Evaluate all possible permitted conditional uses to assure compatible land use. |
| | Special Function Land Use | Prohibit all Special Function Land Uses. | 1. Prohibit overhead utilities and all noise sensitive land uses.<br>2. Zone land for uses other than for schools, play fields, hospitals, nursing homes, daycare facilities and churches.<br>3. Limit storage of large quantities of hazardous or flammable material.<br>4. Ensure permitted uses will not create large areas of standing water, or generate smoke/steam, etc. |

### COMPATIBLE LAND USE MATRIX

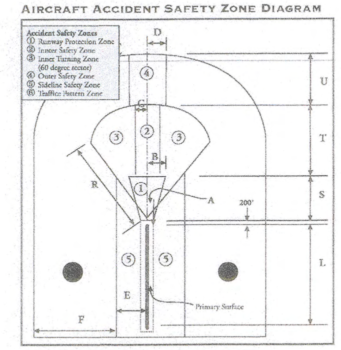
| Accident Safety Zone | Land Use Characteristics | Land Use Guidelines | Land Use Planning Strategies<br>*All aviation uses are acceptable |
|---|---|---|---|
| Zone 4 | Population Density | Limit population concentrations. | 1. < 40 people/acre in buildings, < 75 persons/acre outside buildings. |
| | Residential vs. Non-Residential Land Use | Limit residential development to Low Density housing standards. All non-residential land uses permitted outright subject to the Special Function Land Use guidelines. | 1. Create a height hazard overlay ordinance around the airport.<br>2. Obtain avigation easements.<br>3. Clustered development to maintain density as long as open space remains unbuilt. Place clustered development away from ex tended runway centerline.<br>4. Prohibit mobile home parks.<br>5. Require downward shading of lighting to reduce glare.<br>6. Evaluate all possible permitted conditional uses to assure compatible land-use. |
| | Special Function Land Use | Prohibit all Special Function Land Uses. | 1. Evaluate noise sensitive land uses in light of aircraft noise contour lines (if available) when establishing new zoning.<br>2. Prohibit high overhead utilities and all noise sensitive land uses.<br>3. Zone land for uses other than for schools, play fields, hospitals, nursing homes, daycare facilities and churches.<br>4. Limit storage of large quantities of hazardous or flammable material.<br>5. Ensure permitted uses will not create large areas of standing water, or generate smoke/steam, etc. |

### COMPATIBLE LAND USE MATRIX

| Accident Safety Zone | Land Use Characteristics | Land Use Guidelines | Land Use Planning Strategies<br>*All aviation uses are acceptable |
|---|---|---|---|
| Zone 5 | Population Density | Avoid land uses which concentrate people indoors or outdoors. | 1. 0-5 people/acre.<br>2. Zone land uses, which by their nature, will be relatively unoccupied by people (i.e. mini-storage, small parking lots). |
| | Residential vs. Non-Residential Land Use | Prohibit all residential land uses. All non-residential land uses permitted outright subject to the Population Density and Special Function Land Use guidelines. | 1. Airport sponsor should purchase property if possible.<br>2. Create a height hazard overlay ordinance around the airport.<br>3. Obtain avigation and obstruction easements.<br>4. During site development process, shift all structures away from the runway centerlines if possible.<br>5. Landscaping requirements shall establish only low growing vegetation.<br>6. Prohibit high overhead outdoor lighting.<br>7. Require downward shading of lighting to reduce glare.<br>8. Evaluate all possible permitted conditional uses to assure compatible land use. |
| | Special Function Land Use | Prohibit all Special Function Land Uses. | 1. Prohibit overhead utilities and all noise sensitive land uses.<br>2. Zone land for uses other than for schools, play fields, hospitals, nursing homes, daycare facilities and churches.<br>3. Limit storage of large quantities of hazardous or flammable material.<br>4. Ensure permitted uses will not create large areas of standing water, or generate smoke/steam, etc. |

## APPENDIX A

### AIRCRAFT ACCIDENT SAFETY ZONE DIAGRAM




### SAFETY ZONE DIMENSION (IN FEET)

| Dimension | Runway Length Category (L) | | |
|---|---|---|---|
| | Runway less than 4,000 | Runway 4,000 to 5,999 | Runway 6,000 or more |
| A | 125 | 250 | 500 |
| B | 225 | 505 | 875 |
| C | 225 | 500 | 500 |
| D | 225 | 500 | 500 |
| E | 500 | 1,000 | 1,000 |
| F | 4,000 | 5,000 | 5,000 |
| R (60° Sector) | 2,500 | 4,500 | 5,000 |
| S | 1,000 | 1,700 | 2,500 |
| T | 1,500 | 2,500 | 2,500 |
| U | 2,500 | 3,000 | 5,000 |

Note:
Data Source: NTSB accident investigations 1984-1991. Illustration Source: Hodges and Shutt, Institute of Transportation Studies, University of California Berkley 1993.

38

AT THE SEPTEMBER 16, 2009 MICHIGAN AERONAUTICS COMMISSION MEETING, THESE LAND USE GUIDELINES WERE AMENDED AND APPROVED TO BE USED IN AIRPORT APPROACH PLANS FOR ALL LICENSED PUBLIC USE AIRPORTS. THIS DOCUMENT AMENDS ALL PREVIOUSLY APPROVED AIRPORT APPROACH PLAN LAND USE GUIDELINES APPROVED BY THE COMMISSION. FOR A COPY OF THE OFFICIAL MINUTES OF THE COMMISSION MEETING, PLEASE CONTACT THE COMMISSION ADVISOR AT 517-335-9568.

ANY AIRPORT SPONSOR OR DULY AUTHORIZED REPRESENTATIVE OF A ZONED LOCAL GOVERNMENTAL UNIT MAY REQUEST THAT THE MICHIGAN AERONAUTICS COMMISSION AMEND AN AIRPORT APPROACH PLAN. ALL SUCH REQUESTS MUST CLEARLY STATE THE CHANGE FROM THE CURRENT PLAN, THE REASON FOR THE REQUESTED CHANGE AND ANY STANDARDS USED TO JUSTIFY THE MODIFICATION. PLEASE CONTACT THE AIRPORT'S DIVISION ZONING SPECIALIST TO REQUEST ANY SUCH AMENDMENTS.

MICHIGAN DEPARTMENT OF TRANSPORTATION
AIRPORTS DIVISION

| NO. | DATE | REMARKS | BY | CHK |
|---|---|---|---|---|
| E | 11/23/09 | CHANGED SPECIAL NOTE, ADDED MODIFICATION NOTE | LPS | RH |
| D | 10/30/06 | ZONE 3 MODIFICATIONS, TITLE CHANGE | LPS | RH |
| C | 8/26/03 | SAFETY ZONE DIAGRAM | NAB | |
| B | 4/16/02 | Delete Zone 6 | NAB | |
| A | 3/01/02 | New guidelines / strategies | NAB | |

REVISIONS

LAND USE GUIDELINES
FOR
STATE OF MICHIGAN
AIRPORT APPROACH PLANS

MICHIGAN DEPARTMENT OF TRANSPORTATION
AIRPORTS DIVISION
LANSING, MICHIGAN

APPROVED

11/23/09

AIRPORTS DIVISION ADMINISTRATOR — DATE

| | | |
|---|---|---|
| DRAWN | NAB | 8/03 |
| CHECKED | | |
| PLOTTED | | |

DETROIT METRO WILLOW RUN ZONING SHEET 8 OF 8

FILE NUMBER 00—00

**Appendix F**

# Noise Analysis

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# Noise Contour Report

*May 15, 2017*
*Willow Run Airport*

**Prepared for:**
Mead & Hunt
2605 Port Lansing Road
Lansing, MI 48906

**Prepared by:**
Cindy Gibbs

**Airports Division**
20201 SW Birch Street, Suite 250
Newport Beach, CA 92660
T: 949-250-1222 | F: 949-250-1225

# Table of Contents

**Introudction**



Tables



Figures

# Willow Run Airport Noise Contour Report

**INTRODUCTION.** This report summarizes the noise analysis related to the Airport Layout Plan (ALP) update Alternative 4 at Willow Run Airport (YIP). The analysis included generating annual average DNL noise contours for the existing year conditions and ALP Update Alternative 4 using the FAA's Aviation Environmental Design Tool (AEDT) v2b. Alternative 4 includes the following airfield changes: No change to Runway 5R/23L; shorten Runway 9/27 to 5,000', close/abandon Runway 5L/23R.

## Existing Baseline Noise Modeling Inputs

### Existing Aircraft Operations

The existing noise environment for Willow Run Airport was analyzed based upon 2015 calendar year annual operational conditions. The development of the baseline conditions utilizes data from a variety of sources. The sources of data for this report are listed below:

- Air Traffic Activity System (ATADS) tower counts (OPSNET),
- FAA Traffic Flow Management System Counts (TFMSC), and
- Terminal Area Forecast Reports (TAF).

The AEDT noise model requires a variety of operational data to model the noise environment around an airport. These data include the following information, which are discussed in detail in the following paragraphs:

- Total Aircraft Activity Levels
- Aircraft Fleet Mix Categories
- Detailed Fleet Mix
- Time of Day
- Runway Use
- Departure and Arrival Procedures
- Flight Paths
- Flight Path Utilization

### Total Aircraft Activity Levels

The total aircraft operational levels were derived directly from the FAA's Air Traffic Activity System (ATADS) tower counts. The ATADS data showed that for the 2015 base period, there were a total of 59,987 annual operations, or an average of 164 operations per day (an operation is one takeoff or one landing). The ATADS information also contained a breakdown by noise category are shown in **Table 1**.

**Table 1 – Aircraft Counts for Baseline Period, Aircraft Category (2015)**

| Category | Annual Operations | Average Daily Operations |
|---|---|---|
| **ITINERANT** | | |
| *Air Carrier/Cargo Wide Body* | 17 | 0.04 |
| *Air Carrier/Cargo Narrow Body* | 4,937 | 13.53 |
| *Corporate/Commuter Jet* | 17,981 | 49.26 |
| *Propeller/Helicopter* | 10,776 | 29.52 |
| | | |
| **LOCAL** | | |
| *Civil* | 26,275 | 71.9 |
| **TOTAL** | **59,987** | **164.25** |

*Source:* BridgeNet International, February 2017

## Aircraft Fleet Mix Categories

The category breakdown used by airports are useful for air traffic purposes, but do not provide sufficient detail necessary for the noise analysis. As a result, the breakdowns by aircraft fleet mix categories of aircraft operations are presented within this section. The categories are defined relative to type of aircraft (i.e., jet or propeller) as well as size and noise characteristic. The breakdown by these categories was determined from the different sources of operational data that were described above with the primary source being the ATADS. **Table 2** presents a more in-depth operational breakdown of the different types of aircraft.

It is not possible to definitively categorize all of the operations into unique groups. For example, some general aviation propeller operations are actually unscheduled commuter propeller flights. Similarly, some air taxi operations are small single-engine piston aircraft that may be categorized as general aviation piston, or vice versa. But these generally define the categories of operations that occur at the Airport and will be used within this report.

**Table 2 – Detailed Aircraft Fleet Mix Assumptions for Existing Conditions (2015)**

| Aircraft Type | 2015 Representative Operations | | |
|---|---|---|---|
| | IFR Ops | VFR & Local Ops | Total |
| B744 - Boeing 747-400 | 6 | 0 | 6 |
| C17 - Boeing Globemaster 3 | 6 | 0 | 6 |
| Subtotal Heavy | 11 | 0 | 11 |
| DC91 - Boeing (Douglas) DC 9-10 | 1,505 | 47 | 1,552 |
| DC93 - Boeing (Douglas) DC 9-30 | 896 | 47 | 943 |
| B722 - Boeing 727-200 | 507 | 47 | 554 |
| MD83 - Boeing (Douglas) MD 83 | 240 | 0 | 240 |
| B734 - Boeing 737-400 | 121 | 0 | 121 |
| Subtotal Large Jet | 3,268 | 141 | 3,409 |
| E120 - Embraer Brasilia EMB 120 | 296 | 0 | 296 |
| CVLT - Convair CV-540/580/600/640, VC-131H | 205 | 0 | 205 |
| SW3 - Fairchild Swearingen SA-226T/TB Merlin 3 | 177 | 0 | 177 |
| SH36 - Shorts 360 | 175 | 0 | 175 |
| E145 - Embraer ERJ-145 | 128 | 0 | 128 |
| Subtotal Large Commuter | 980 | 0 | 980 |
| FA20 - Dassault Falcon/Mystère 20 | 3,305 | 94 | 3,399 |
| LJ35 - Bombardier Learjet 35/36 | 1,993 | 47 | 2,040 |
| H25B - BAe HS 125/700-800/Hawker 800 | 1,565 | 47 | 1,612 |
| BE40 - Raytheon/Beech Beechjet 400/T-1 | 873 | 47 | 920 |
| CL30 - Bombardier (Canadair) Challenger 300 | 600 | 0 | 600 |
| LJ25 - Bombardier Learjet 25 | 554 | 0 | 554 |
| C560 - Cessna Citation V/Ultra/Encore | 543 | 0 | 543 |
| C56X - Cessna Excel/XLS | 425 | 0 | 425 |
| C680 - Cessna Citation Sovereign | 364 | 0 | 364 |
| SW4 - Swearingen Merlin 4/4A Metro2 | 362 | 0 | 362 |
| F2TH - Dassault Falcon 2000 | 339 | 0 | 339 |
| Subtotal Medium Commuter | 10,922 | 235 | 11,157 |
| C172 - Cessna Skyhawk 172/Cutlass | 2,291 | 32,022 | 34,313 |
| BE20 - Beech 200 Super King | 1,157 | 1,884 | 3,041 |
| AC50 - Aero Commander 500 | 919 | 1,884 | 2,803 |
| C25B - Cessna Citation CJ3 | 680 | 0 | 680 |
| PC12 - Pilatus PC-12 | 600 | 0 | 600 |
| SR22 - Cirrus SR 22 | 459 | 0 | 459 |
| B350 - Beech Super King Air 350 | 357 | 0 | 357 |
| C208 - Cessna 208 Caravan | 345 | 0 | 345 |
| BE58 - Beech 58 | 305 | 1,507 | 1,812 |
| Subtotal Small Equip | 7,113 | 37,296 | 44,409 |
| EXP - McDonnell MD-902 Explorer | 9 | 0 | 9 |
| EC35 - Eurocopter EC-135 | 11 | 0 | 11 |
| Subtotal Helicopter | 20 | 0 | 20 |
| Total | 22,314 | 37,673 | 59,987 |

***Some numbers may not add up due to rounding.***
***Source:*** BridgeNet International, February 2017

## Time of Day

In the DNL metric, any operations that occur after 10 p.m. and before 7 a.m. are considered more intrusive and their noise levels are penalized by adding 10 dBA. The nighttime operations assumptions were determined from the FAR Part 150 Study. The overall percentage of nighttime operations at Willow Run Airport was determined to be 14.0 percent. The time of day assumptions used in the model were specific to each aircraft operation.

## Runway Use

An additional important consideration in developing the noise exposure contours is the percentage of time each runway is utilized. The speed and direction of the wind dictate the runway direction that is utilized by an aircraft. From a safety and stability standpoint, it is desirable, and usually necessary, to arrive and depart an aircraft into the wind. When the wind direction changes, the operations are shifted to the runway end that favors the new wind direction.

Aircraft are in southwest flow approximately 49% of the time, departing and arriving on Runways 05L/R and in northeast flow approximately 38% of the time, departing and arriving on Runways 23L/R. For the remaining 13% of the time, aircraft operate to the east and west on Runway 9/27. **Table 3** shows the runway use percentage as based on the runway use in the FAR Part 150 Study.

**Table 3 – Percentage Runway Utilization, Existing Runway Configuration**

| Aircraft Class | Runway 5L | Runway 5R | Runway 9 | Runway 23L | Runway 23R | Runway 27 |
|---|---|---|---|---|---|---|
| **ARRIVALS** | | | | | | |
| Air Carrier | 4.0% | 29.0% | 0.0% | 54.0% | 7.0% | 7.0% |
| Air Taxi | 13.0% | 19.0% | 0.0% | 36.0% | 13.0% | 20.0% |
| Business Jet | 13.0% | 19.0% | 0.0% | 36.0% | 13.0% | 20.0% |
| Single Engine Prop | 17.1% | 15.9% | 2.5% | 27.0% | 15.5% | 23.0% |
| Twin Engine Prop | 13.0% | 19.0% | 0.0% | 36.0% | 13.0% | 20.0% |
| Military | 3.0% | 35.0% | 0.0% | 60.0% | 2.0% | 0.0% |
| **DEPARTURES** | | | | | | |
| Air Carrier | 7.1% | 26.4% | 4.0% | 46.0% | 6.0% | 10.5% |
| Air Taxi | 14.3% | 32.7% | 2.0% | 34.0% | 11.0% | 6.0% |
| Business Jet | 9.2% | 11.3% | 3.0% | 52.0% | 11.0% | 13.5% |
| Single Engine Prop | 17.1% | 15.9% | 2.5% | 27.0% | 15.5% | 23.0% |
| Twin Engine Prop | 13.4% | 18.6% | 0.0% | 36.0% | 13.0% | 19.0% |
| Military | 9.0% | 29.0% | 0.0% | 54.0% | 8.0% | 0.0% |

Source: Willow Run FAR Part 150 Study

## Departure Climb Profile

The aircraft departure stage length is the distance the aircraft flies from the Airport to its first destination. The stage length of a flight can be used as a rough surrogate for the aircraft departure weight. Generally, heavier aircraft climb at a slower rate, and thus the noise levels under the flight path are likely to be louder. The rate of climb of an aircraft is called the departure climb profile. The stage length assumption is used to determine the rate of climb of each of the different aircraft operating at the airport. The various stage length assumptions are associated with commercial jet operations and not for other categories of aircraft. The different stage lengths used in the AEDT model are listed below.

| | |
|---|---|
| Stage Length 1: | 0 to 500 nautical miles flight distance |
| Stage Length 2: | 500 to 999 nautical miles flight distance |
| Stage Length 3: | 1000 to 1499 nautical miles flight distance |
| Stage Length 4: | 1500 to 2499 nautical miles flight distance |
| Stage Length 5: | 2500 to 3499 nautical miles flight distance |
| Stage Length 6: | 3500 to 4499 nautical miles flight distance |
| Stage Length 7: | +4500 nautical miles flight distance |

The AEDT noise model contains different departure climb profiles for each of the aircraft contained in the model. These climb profiles define the rate of climb, speed, and engine thrust based upon the weight of the aircraft. Typically the flight distance stage length is used to assign the departure climb profile using flight distance data. However, flight distance does not always correlate to the departure climb profile.

Thus for this report, the aircraft departure climb profiles were identified based upon the actual climb gradient for aircraft operating at Willow Run. The radar data can be used to show the rate of climb for different aircraft.

## Flight Paths and Flight Path Utilization

The FAA and the Airport have established paths for aircraft arriving and departing from Willow Run. These paths are not precisely defined ground tracks, but represent a path along the ground over which aircraft generally fly. The identification of the location and use of the flight tracks is based upon the FAA's radar data. The flight paths used in the noise model are derived from all of the actual flight paths flown throughout the base period study year.

In the development of the existing noise contours it is important to aggregate the flight tracks into a set of generalized flight paths of aircraft operating at the Airport to allow the modeling of different alternative scenarios that may involve the shifting or redesign of the flight procedures.

In the AEDT noise model, a flight path consists of a backbone or center flight path, and the dispersion or spread of all flights that use that backbone. A computer program was used to develop the AEDT flight paths from the actual radar flight track data. The program first assigns each aircraft operation to an air traffic control procedure. The software then calculates the average path of all the aircraft that flew those procedures. The program also determines the dispersion of the flight tracks on that path.

## Existing Baseline Noise Conditions

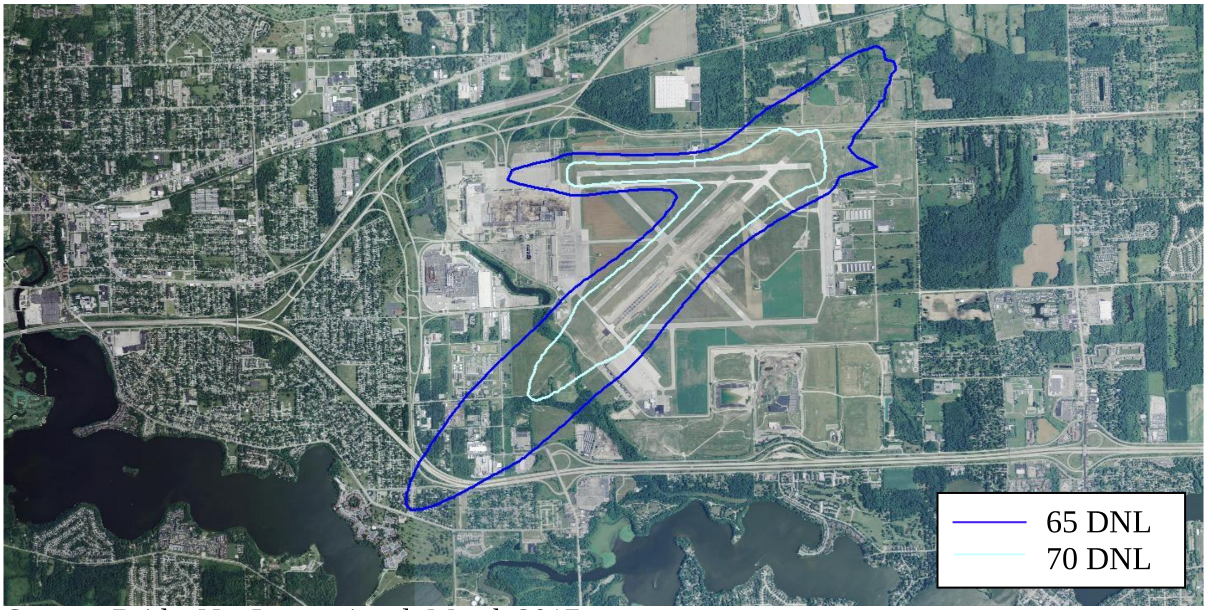
The primary noise criterion to describe the existing noise environment is the annual average day night noise level, DNL. The compiled data as described in the preceding sections is used as input to the FAA's Aviation Environmental Design Tool (AEDT) v2b computer model for the calculation of noise in the airport environs. Levels of 65 DNL and above are considered to be significant for noise-sensitive land uses such as residences, churches, and schools.

The noise contours do not represent the noise levels present on any specific day; rather they represent the daily energy-average of all 365 days of operation during the year. The noise contour pattern extends from the Airport from the runway end, reflective of the flight tracks used by all aircraft. The relative distance of the contours from the Airport along each route is a function of the frequency of use of each runway for total arrivals and departures, as well as its use at night, and the type of aircraft assigned to it.

### DNL Noise Contours

Based upon the operational conditions presented previously, and the AEDT noise model, noise contours were developed. The data showed that for the 2015 base period, there were a total of 59,987 annual operations. The existing annual base period 2015 DNL noise exposure contours for Willow Run Airport are presented in **Figure 1**. This figure presents the and 65 and 70 DNL noise exposure contours. There are 2,027 acres in the 65 DNL noise contour.

**Figure 1 – Existing DNL Noise Contours, Baseline 2015**




***Source:*** BridgeNet International, March 2017

## With Project Noise Modeling Inputs

This report analyzed Alternative 4 from the Master Plan:

- No change to Runway 5R/23L; shorten Runway 9/27 to 5,000', close/abandon Runway 5L/23R.

The time of day, fleet mix, operations and AEDT flight tracks remain the same for Alternative 4 and the Baseline; however, the runway use changes with the closure of Runway 5L/23R. **Table 4** shows the runway use for Alternative 4. The direction aircraft operate also remains the same, with the majority of the operations departing to the southwest and arriving from the northeast.

**Table 4 – Runway Use, Master Plan Alternative 4**

| Aircraft Class | Runway 5L | Runway 5R | Runway 9 | Runway 23L | Runway 23R | Runway 27 |
|---|---|---|---|---|---|---|
| **ARRIVALS** | | | | | | |
| Air Carrier | | 32.0% | 0.0% | 68.0% | | 0.0% |
| Air Taxi | | 32.0% | 0.0% | 64.0% | | 4.0% |
| Business Jet | | 32.0% | 0.0% | 64.0% | | 4.0% |
| Single Engine Prop | | 32.0% | 2.5% | 42.5% | | 23.0% |
| Twin Engine Prop | | 32.0% | 0.0% | 48.0% | | 20.0% |
| Military | | 32.0% | 0.0% | 68.0% | | 0.0% |
| **DEPARTURES** | | | | | | |
| Air Carrier | | 37.5% | 0.0% | 62.5% | | 0.0% |
| Air Taxi | | 48.6% | 0.4% | 49.8% | | 1.2% |
| Business Jet | | 22.9% | 0.6% | 73.8% | | 2.7% |
| Single Engine Prop | | 32.0% | 2.5% | 42.5% | | 23.0% |
| Twin Engine Prop | | 32.0% | 0.0% | 49.0% | | 19.0% |
| Military | | 37.5% | 0.0% | 62.5% | | 0.0% |

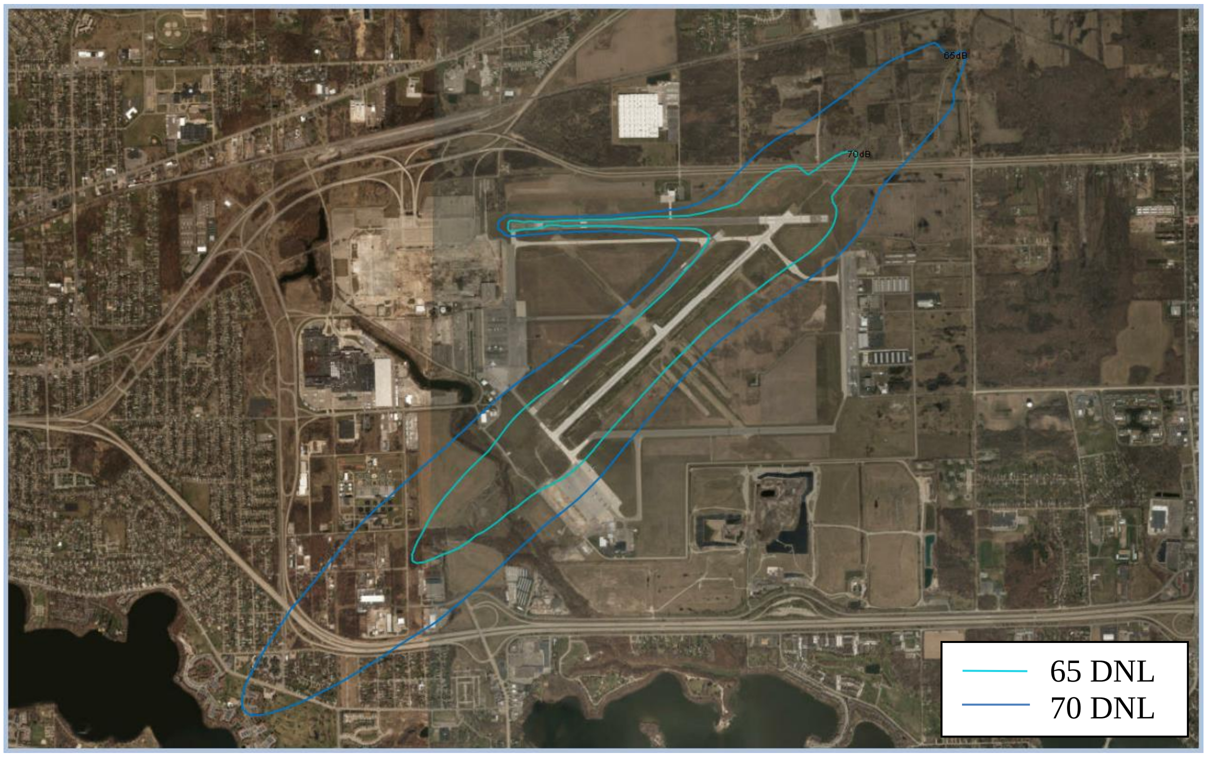
***Source:*** Mead & Hunt, March 2017

## Master Plan Alternative 4 Noise Conditions

### DNL Noise Contours

Based upon the operational conditions presented previously, and the AEDT noise model, noise contours were developed for Alternative 4 and presented in **Figure 2**. This figure presents the 65, 70 and 75 DNL noise exposure contours. There are 1,244 acres in the 65 DNL noise contour.

**Figure 2: Master Plan Alternative 4 Noise Contours**




***Source:*** BridgeNet International

## Summary

This analysis generated two DNL noise contours for the following scenarios:

- Existing, baseline operations for 2015, and
- Master Plan Alternative 4 operations.

**Table 5** shows the size, in acres, of each of the scenarios. Alternative 4 is 748 acres smaller than the Baseline 2015 noise contour. The shape of the contours are very similar since aircraft will be using the same general flight patterns, with the majority of the air traffic departing Runway 23L, the north-south runway, and a smaller amount utilizing the east-west runway. The Master Plan Alternative 4 DNL noise contour is slightly narrower than the Baseline which reflects the closure of the parallel runway.

**Table 5 – DNL Noise Contours, in Acres**

| Scenario | 65 DNL Contour, in Acres |
|---|---|
| *2015 Baseline* | 2,027 |
| *Master Plan Alternative 4* | 1,244 |

***Source:*** BridgeNet International, March 2017

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**Appendix G**

# Cost Estimates

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**ENGINEERING COST ESTIMATE**
**WILLOW RUN AIRPORT MASTER PLAN**

PROJECT: Taxiway A with Shoulders Option
LOCATION: Willow Run Airport
CITY: Ypsilanti, Michigan
DATE: 1/24/2017
PREPARED BY: CTD
REVIEWED BY: SCT

___FINAL DESIGN
___ PROJECT PROGRAMMING
___ FEASIBILITY STUDY
_x_ AIRPORT MASTER PLANNING
BASED ON FY **2016** DOLLARS

WORK DESCRIPTION: Install Parallel Taxiway A with Lighting and Drainage systems.

| ITEM DESCRIPTION | UNIT | QTY | UNIT PRICE | ITEM COST |
|---|---|---|---|---|
| Mobilization and General Conditions | LS | 1 | $ 1,900,000.00 | $ 1,900,000 |
| Safety and Security | LS | 1 | $ 950,000.00 | $ 950,000 |
| Project Survey & Stakeout | LS | 1 | $ 161,000.00 | $ 161,000 |
| Erosion Control | LS | 1 | $ 380,000.00 | $ 380,000 |
| Waste Management Plan | LS | 1 | $ 32,000.00 | $ 32,000 |
| Remove Existing RCP (Allowance) | LF | 7000 | $ 12.00 | $ 84,000 |
| Remove Existing Inlet/Manhole (Allowance) | EA | 18 | $ 340.00 | $ 6,120 |
| Remove Existing Electrical (Allowance) | LS | 1 | $ 16,500.00 | $ 16,500 |
| Remove Pavement Over 6" | SY | 10000 | $ 8.00 | $ 80,000 |
| Unclassified Excavation | CY | 98912 | $ 10.00 | $ 989,118 |
| Subgrade Undercut | CY | 5800 | $ 12.00 | $ 69,600 |
| 6" Subbase Course | CY | 24000 | $ 28.00 | $ 672,000 |
| 16.5" Subbase Course Shoulders | CY | 53400 | $ 20.00 | $ 1,068,000 |
| Crushed Aggregate Base Course 6" | CY | 24600 | $ 30.00 | $ 738,000 |
| Undercut Fill Material Choke Stone | CY | 5800 | $ 34.00 | $ 197,200 |
| 4" Bituminous Surface Course (RAP Allowed) | TON | 14600 | $ 89.00 | $ 1,299,400 |
| 6" Bitminous Base Course (RAP Allowed) | TON | 31000 | $ 72.00 | $ 2,232,000 |
| Portland Cement Concrete Pavement, 14.5-Inch | SY | 83500 | $ 49.00 | $ 4,091,500 |
| Bituminous Tack Coat | GAL | 21100 | $ 1.10 | $ 23,210 |
| Airport Pavement Marking, Solid, Yellow, With Reflective Beads | SF | 18000 | $ 1.70 | $ 30,600 |
| Airport Pavement Marking, Solid, Black | SF | 29000 | $ 1.70 | $ 49,300 |
| 18 Inch - 48 Inch Reinforced Concrete Pipe (Allowance) | LF | 9500 | $ 185.00 | $ 1,757,500 |
| 6 Inch Perforated PE Underdrain Complete | LF | 152700 | $ 13.00 | $ 1,985,100 |
| Underdrain Cleanout | EA | 40 | $ 730.00 | $ 29,200 |
| Catch Basin | EA | 24 | $ 8,500.00 | $ 204,000 |
| 2-# 6 AWG 5KV, L-824C Cable, Bare Counterpoise Wire, in Conduit | LF | 22000 | $ 15.00 | $ 330,000 |
| Location And Protection Of Existing Cables And Equipment | LS | 1 | $ 7,200.00 | $ 7,200 |
| Electrical Handhole | EA | 20 | $ 5,500.00 | $ 110,000 |
| L-861T New Elevated MITL And Base | EA | 118 | $ 1,360.00 | $ 160,480 |
| Install New Airfield Guidance Sign, On New Base | EA | 20 | $ 8,300.00 | $ 166,000 |
| Electrical Controls Upgrades | LS | 1 | $ 30,000.00 | $ 30,000 |
| | | | CONSTRUCTION TOTAL = | $ 19,849,028 |
| | | | CONSTRUCTION CONTINGENCIES (15%) = | $ 2,977,354 |
| | | | CONSTRUCTION TOTAL = | $ 22,826,382 |
| | | | ENGINEERING DESIGN(8%) = | $ 1,826,111 |
| | | | CONSTRUCTION ADMIN (10%) = | $ 2,282,638 |
| | | | PROJECT TOTAL = | $ 26,935,131 |
| | | | **BUDGET ESTIMATE =** | **$ 27,000,000** |

Note: These costs were developed without the benefit of field surveys or soils investigation.
A final cost estimate will be dependent upon development of these items and further design.

**ENGINEERING COST ESTIMATE**
**WILLOW RUN AIRPORT MASTER PLAN**

PROJECT: Runway 9/27 Reconstruct and Taxiway A North of G
LOCATION: Willow Run Airport
CITY: Ypsilanti, Michigan
DATE: 1/24/2017
PREPARED BY: CTD
REVIEWED BY: SCT

___FINAL DESIGN
___ PROJECT PROGRAMMING
___ FEASIBILITY STUDY
_x_ AIRPORT MASTER PLANNING
BASED ON FY **2016** DOLLARS

WORK DESCRIPTION: Shorten Runway 9/27 to 5,000' and narrow to 100' wide, with Lighting and Drainage systems.

| ITEM DESCRIPTION | UNIT | QTY | UNIT PRICE | ITEM COST |
|---|---|---|---|---|
| Mobilization and General Conditions | LS | 1 | $ 1,280,000.00 | $ 1,280,000 |
| Safety and Security | LS | 1 | $ 640,000.00 | $ 640,000 |
| Project Survey & Stakeout | LS | 1 | $ 110,000.00 | $ 110,000 |
| Erosion Control | LS | 1 | $ 256,000.00 | $ 256,000 |
| Waste Management Plan | LS | 1 | $ 22,000.00 | $ 22,000 |
| Remove Existing RCP (Allowance) | LF | 7000 | $ 12.00 | $ 84,000 |
| Remove Existing Inlet/Manhole (Allowance) | EA | 10 | $ 340.00 | $ 3,400 |
| Remove Existing Electrical (Allowance) | LS | 1 | $ 16,500.00 | $ 16,500 |
| Pulverize Pavement Over 6" | SY | 79000 | $ 0.75 | $ 58,990 |
| Unclassified Excavation | CY | 62300 | $ 10.00 | $ 623,000 |
| Subgrade Undercut | CY | 3700 | $ 12.00 | $ 44,400 |
| 6" Crushed Aggregate Base Course | CY | 15000 | $ 30.00 | $ 450,000 |
| Undercut Fill Material Choke Stone | CY | 3700 | $ 34.00 | $ 125,800 |
| 6" Recycled Concrete Aggregate Base Course | CY | 15100 | $ 28.00 | $ 422,800 |
| Bitminous Base Course (RAP Allowed) | TON | 30500 | $ 72.00 | $ 2,196,000 |
| Portland Cement Concrete Pavement, 14.5-Inch | SY | 82300 | $ 49.00 | $ 4,032,700 |
| Bituminous Tack Coat | GAL | 13100 | $ 1.10 | $ 14,410 |
| Airport Pavement Marking, Solid, White, With Reflective Beads | SF | 60000 | $ 1.70 | $ 102,000 |
| Airport Pavement Marking, Solid, Yellow, With Reflective Beads | SF | 41000 | $ 1.70 | $ 69,700 |
| Airport Pavement Marking, Solid, Red, With Reflective Beads | SF | 800 | $ 1.70 | $ 1,360 |
| Airport Pavement Marking, Solid, Black | SF | 26000 | $ 1.70 | $ 44,200 |
| Reinforced Concrete Pipe (Allowance) | LF | 8500 | $ 185.00 | $ 1,572,500 |
| 6 Inch Perforated PE Underdrain Complete | LF | 22900 | $ 13.00 | $ 297,700 |
| Underdrain Cleanout | EA | 37 | $ 730.00 | $ 27,010 |
| Catch Basin | EA | 25 | $ 8,500.00 | $ 212,500 |
| 2-# 6 AWG 5KV, L-824C Cable, Bare Counterpoise Wire, in Conduit | LF | 26000 | $ 15.00 | $ 390,000 |
| Location And Protection Of Existing Cables And Equipment | LS | 1 | $ 7,200.00 | $ 7,200 |
| Electrical Handhole | EA | 20 | $ 5,500.00 | $ 110,000 |
| L-861T New Elevated MITL And Base | EA | 78 | $ 1,360.00 | $ 106,080 |
| Install New Airfield Guidance Sign, On New Base | EA | 15 | $ 8,300.00 | $ 124,500 |
| Electrical Control Upgrades | LS | 1 | $ 30,000.00 | $ 30,000 |
| | | | | |
| | | | CONSTRUCTION TOTAL = | $ 13,474,750 |
| | | | CONSTRUCTION CONTINGENCIES (15%) = | $ 2,021,212 |
| | | | CONSTRUCTION TOTAL = | $ 15,495,962 |
| | | | ENGINEERING DESIGN(8%) = | $ 1,239,677 |
| | | | CONSTRUCTION ADMIN (10%) = | $ 1,549,596 |
| | | | PROJECT TOTAL = | $ 18,285,235 |
| | | | **BUDGET ESTIMATE =** | **$ 18,300,000** |

Note: These costs were developed without the benefit of field surveys or soils investigation.
A final cost estimate will be dependent upon development of these items and further design.

Mead & Hunt

**ENGINEERING COST ESTIMATE**
**WILLOW RUN AIRPORT MASTER PLAN**

DETROIT METRO • WILLOW RUN
WAYNE COUNTY AIRPORT AUTHORITY

PROJECT: Taxiway E Reconstruct
LOCATION: Willow Run Airport
CITY: Ypsilanti, Michigan
DATE: 1/24/2017
PREPARED BY: CTD
REVIEWED BY: SCT

___FINAL DESIGN
___ PROJECT PROGRAMMING
___ FEASIBILITY STUDY
_x_ AIRPORT MASTER PLANNING
BASED ON FY **2016** DOLLARS

WORK DESCRIPTION: Reconstruct Taxiway E with Lighting and Drainage systems.

| ITEM DESCRIPTION | UNIT | QTY | UNIT PRICE | ITEM COST |
|---|---|---|---|---|
| Mobilization and General Conditions | LS | 1 | $ 455,000.00 | $ 455,000 |
| Safety and Security | LS | 1 | $ 228,000.00 | $ 228,000 |
| Project Survey & Stakeout | LS | 1 | $ 40,000.00 | $ 40,000 |
| Erosion Control | LS | 1 | $ 92,000.00 | $ 92,000 |
| Waste Management Plan | LS | 1 | $ 8,000.00 | $ 8,000 |
| Remove Existing RCP (Allowance) | LF | 4000 | $ 12.00 | $ 48,000 |
| Remove Existing Inlet/Manhole (Allowance) | EA | 10 | $ 340.00 | $ 3,400 |
| Remove Existing Electrical (Allowance) | LS | 1 | $ 16,500.00 | $ 16,500 |
| Pulverize Pavement Over 6" | SY | 27900 | $ 0.75 | $ 20,925 |
| Unclassified Excavation | CY | 20100 | $ 10.00 | $ 201,000 |
| Subgrade Undercut | CY | 1200 | $ 12.00 | $ 14,400 |
| 6" Crushed Aggregate Base Course | CY | 4850 | $ 30.00 | $ 145,500 |
| Undercut Fill Material Choke Stone | CY | 1200 | $ 34.00 | $ 40,800 |
| 6 " Recycled Concrete Aggregate Base Course | CY | 4900 | $ 28.00 | $ 137,200 |
| 6 " Bitminous Base Course (RAP Allowed) | TON | 10000 | $ 72.00 | $ 720,000 |
| Portland Cement Concrete Pavement, 14.5-Inch | SY | 28000 | $ 49.00 | $ 1,372,000 |
| Bituminous Tack Coat | GAL | 4300 | $ 1.10 | $ 4,730 |
| Airport Pavement Marking, Solid, Yellow, With Reflective Beads | SF | 11000 | $ 1.70 | $ 18,700 |
| Airport Pavement Marking, Solid, Black | SF | 13500 | $ 1.70 | $ 22,950 |
| Reinforced Concrete Pipe (Allowance) | LF | 4000 | $ 185.00 | $ 740,000 |
| 6 Inch Perforated PE Underdrain Complete | LF | 10100 | $ 13.00 | $ 131,300 |
| Underdrain Cleanout | EA | 11 | $ 730.00 | $ 8,030 |
| Catch Basin | EA | 9 | $ 8,500.00 | $ 76,500 |
| 2-# 6 AWG 5KV, L-824C Cable, Bare Counterpoise Wire, in Conduit | LF | 15000 | $ 15.00 | $ 225,000 |
| Location And Protection Of Existing Cables And Equipment | LS | 1 | $ 7,200.00 | $ 7,200 |
| Electrical Handhole | EA | 4 | $ 5,500.00 | $ 22,000 |
| L-861T New Elevated MITL And Base | EA | 18 | $ 1,360.00 | $ 24,480 |
| Install New Airfield Guidance Sign, On New Base | EA | 4 | $ 8,300.00 | $ 33,200 |
| Electrical Controls Upgrades | LS | 1 | $ 30,000.00 | $ 30,000 |
| | | | | |
| | | | CONSTRUCTION TOTAL = | $ 4,886,815 |
| | | | CONSTRUCTION CONTINGENCIES (15%) = | $ 733,022 |
| | | | CONSTRUCTION TOTAL = | $ 5,619,837 |
| | | | ENGINEERING DESIGN(8%) = | $ 449,587 |
| | | | CONSTRUCTION ADMIN (10%) = | $ 561,984 |
| | | | PROJECT TOTAL = | $ 6,631,408 |
| | | | **BUDGET ESTIMATE =** | **$ 6,700,000** |

Note: These costs were developed without the benefit of field surveys or soils investigation.
A final cost estimate will be dependent upon development of these items and further design.

**ENGINEERING COST ESTIMATE**
**WILLOW RUN AIRPORT MASTER PLAN**

PROJECT: East Apron Reconstruct North portion
LOCATION: Willow Run Airport
CITY: Ypsilanti, Michigan
DATE: 1/24/2017
PREPARED BY: CTD
REVIEWED BY: SCT

___FINAL DESIGN
___ PROJECT PROGRAMMING
___ FEASIBILITY STUDY
_x_ AIRPORT MASTER PLANNING
BASED ON FY **2016** DOLLARS

WORK DESCRIPTION: Reconstruct Northern portion of the East Apron with new drainage systems.

| ITEM DESCRIPTION | UNIT | QTY | UNIT PRICE | ITEM COST |
|---|---|---|---|---|
| Mobilization and General Conditions | LS | 1 | $ 700,000.00 | $ 700,000 |
| Safety and Security | LS | 1 | $ 350,000.00 | $ 350,000 |
| Project Survey & Stakeout | LS | 1 | $ 60,000.00 | $ 60,000 |
| Erosion Control | LS | 1 | $ 140,000.00 | $ 140,000 |
| Waste Management Plan | LS | 1 | $ 12,000.00 | $ 12,000 |
| Remove Existing RCP (Allowance) | LF | 3500 | $ 12.00 | $ 42,000 |
| Remove Existing Inlet/Manhole (Allowance) | EA | 12 | $ 340.00 | $ 4,080 |
| Pulverize Pavement Over 6" | SY | 55800 | $ 0.75 | $ 41,850 |
| Unclassified Excavation | CY | 38500 | $ 10.00 | $ 385,000 |
| Subgrade Undercut | CY | 2300 | $ 12.00 | $ 27,600 |
| 6" Crushed Aggregate Base Course | CY | 9300 | $ 30.00 | $ 279,000 |
| Undercut Fill Material Choke Stone | CY | 2300 | $ 34.00 | $ 78,200 |
| 6" Recycled Concrete Aggregate Base Course | CY | 9300 | $ 28.00 | $ 260,400 |
| 6" Bitminous Base Course (RAP Allowed) | TON | 19500 | $ 72.00 | $ 1,404,000 |
| Portland Cement Concrete Pavement, 14.5-Inch | SY | 56000 | $ 49.00 | $ 2,744,000 |
| Bituminous Tack Coat | GAL | 8400 | $ 1.10 | $ 9,240 |
| Airport Pavement Marking, Solid, White, With Reflective Beads | SF | 7500 | $ 1.70 | $ 12,750 |
| Airport Pavement Marking, Solid, Yellow, With Reflective Beads | SF | 3000 | $ 1.70 | $ 5,100 |
| Airport Pavement Marking, Solid, Black | SF | 6,500 | $ 1.70 | $ 11,050 |
| Reinforced Concrete Pipe (Allowance) | LF | 3500 | $ 185.00 | $ 647,500 |
| Catch Basin | EA | 12 | $ 8,500.00 | $ 102,000 |
| | | | CONSTRUCTION TOTAL = | $ 7,315,770 |
| | | | CONSTRUCTION CONTINGENCIES (15%) = | $ 1,097,366 |
| | | | CONSTRUCTION TOTAL = | $ 8,413,136 |
| | | | ENGINEERING DESIGN(8%) = | $ 673,051 |
| | | | CONSTRUCTION ADMIN (10%) = | $ 841,314 |
| | | | PROJECT TOTAL = | $ 9,927,500 |
| | | | **BUDGET ESTIMATE =** | **$ 10,000,000** |

Note: These costs were developed without the benefit of field surveys or soils investigation.
A final cost estimate will be dependent upon development of these items and further design.

**ENGINEERING COST ESTIMATE**
**WILLOW RUN AIRPORT MASTER PLAN**

Mead & Hunt

DETROIT METRO • WILLOW RUN
WAYNE COUNTY AIRPORT AUTHORITY

PROJECT: East Apron Reconstruct South portion
LOCATION: Willow Run Airport
CITY: Ypsilanti, Michigan
DATE: 1/24/2017
PREPARED BY: CTD
REVIEWED BY: SCT

___FINAL DESIGN
___ PROJECT PROGRAMMING
___ FEASIBILITY STUDY
_x_ AIRPORT MASTER PLANNING
BASED ON FY **2016** DOLLARS

WORK DESCRIPTION: Reconstruct Southern portion of the East Apron with new drainage systems.

| ITEM DESCRIPTION | UNIT | QTY | UNIT PRICE | ITEM COST |
|---|---|---|---|---|
| Mobilization and General Conditions | LS | 1 | $ 930,000.00 | $ 930,000 |
| Safety and Security | LS | 1 | $ 460,000.00 | $ 460,000 |
| Project Survey & Stakeout | LS | 1 | $ 80,000.00 | $ 80,000 |
| Erosion Control | LS | 1 | $ 190,000.00 | $ 190,000 |
| Waste Management Plan | LS | 1 | $ 16,000.00 | $ 16,000 |
| Remove Existing RCP (Allowance) | LF | 4600 | $ 12.00 | $ 55,200 |
| Remove Existing Inlet/Manhole (Allowance) | EA | 18 | $ 340.00 | $ 6,120 |
| Pulverize Pavement Over 6" | SY | 74100 | $ 0.75 | $ 55,575 |
| Unclassified Excavation | CY | 51100 | $ 10.00 | $ 511,000 |
| Subgrade Undercut | CY | 3000 | $ 12.00 | $ 36,000 |
| 6" Crushed Aggregate Base Course | CY | 12400 | $ 30.00 | $ 372,000 |
| Undercut Fill Material Choke Stone | CY | 3000 | $ 34.00 | $ 102,000 |
| 6" Recycled Concrete Aggregate Base Course | CY | 12400 | $ 28.00 | $ 347,200 |
| 6" Bitminous Base Course (RAP Allowed) | TON | 26000 | $ 72.00 | $ 1,872,000 |
| Portland Cement Concrete Pavement, 14.5-Inch | SY | 75000 | $ 49.00 | $ 3,675,000 |
| Bituminous Tack Coat | GAL | 11200 | $ 1.10 | $ 12,320 |
| Airport Pavement Marking, Solid, White, With Reflective Beads | SF | 12000 | $ 1.70 | $ 20,400 |
| Airport Pavement Marking, Solid, Yellow, With Reflective Beads | SF | 3000 | $ 1.70 | $ 5,100 |
| Airport Pavement Marking, Solid, Black | SF | 9600 | $ 1.70 | $ 16,320 |
| Reinforced Concrete Pipe (Allowance) | LF | 4600 | $ 185.00 | $ 851,000 |
| Catch Basin Diameter | EA | 18 | $ 8,500.00 | $ 153,000 |
| | | | | |
| | | | CONSTRUCTION TOTAL = | $ 9,766,235 |
| | | | CONSTRUCTION CONTINGENCIES (15%) = | $ 1,464,935 |
| | | | CONSTRUCTION TOTAL = | $ 11,231,170 |
| | | | ENGINEERING DESIGN(8%) = | $ 898,494 |
| | | | CONSTRUCTION ADMIN (10%) = | $ 1,123,117 |
| | | | PROJECT TOTAL = | $ 13,252,781 |
| | | | **BUDGET ESTIMATE =** | **$ 13,300,000** |

Note: These costs were developed without the benefit of field surveys or soils investigation.
A final cost estimate will be dependent upon development of these items and further design.

**ENGINEERING COST ESTIMATE**
**WILLOW RUN AIRPORT MASTER PLAN**

Mead & Hunt

DETROIT METRO • WILLOW RUN
WAYNE COUNTY AIRPORT AUTHORITY

PROJECT: East Apron Expansion
LOCATION: Willow Run Airport
CITY: Ypsilanti, Michigan
DATE: 1/24/2017
PREPARED BY: CTD
REVIEWED BY: SCT

___FINAL DESIGN
___ PROJECT PROGRAMMING
___ FEASIBILITY STUDY
_x_ AIRPORT MASTER PLANNING
BASED ON FY **2016** DOLLARS

WORK DESCRIPTION: Expand the East Apron with drainage systems.

| ITEM DESCRIPTION | UNIT | QTY | UNIT PRICE | ITEM COST |
|---|---|---|---|---|
| Mobilization and General Conditions | LS | 1 | $ 550,000.00 | $ 550,000 |
| Safety and Security | LS | 1 | $ 275,000.00 | $ 275,000 |
| Project Survey & Stakeout | LS | 1 | $ 47,000.00 | $ 47,000 |
| Erosion Control | LS | 1 | $ 110,000.00 | $ 110,000 |
| Waste Management Plan | LS | 1 | $ 9,400.00 | $ 9,400 |
| Remove Existing Inlet/Manhole (Allowance) | EACH | 12 | $ 340.00 | $ 4,080 |
| Pulverize Pavement Over 6" | SYD | 1100 | $ 1.00 | $ 1,100 |
| Unclassified Excavation | CY | 30500 | $ 10.00 | $ 305,000 |
| Subgrade Undercut | CY | 1800 | $ 12.00 | $ 21,600 |
| 6" Crushed Aggregate Base Course | CY | 7400 | $ 30.00 | $ 222,000 |
| Undercut Fill Material Choke Stone | CY | 1800 | $ 34.00 | $ 61,200 |
| 6" Recycled Concrete Aggregate Base Course | CY | 7400 | $ 28.00 | $ 207,200 |
| 6" Bitminous Base Course (Rap Allowed) | TON | 15300 | $ 72.00 | $ 1,101,600 |
| Portland Cement Concrete Pavement, 14.5-Inch | SY | 43200 | $ 49.00 | $ 2,116,800 |
| Bituminous Tack Coat | GAL | 6600 | $ 1.10 | $ 7,260 |
| Airport Pavement Marking, Solid, White, With Reflective Beads | SF | 6500 | $ 1.70 | $ 11,050 |
| Airport Pavement Marking, Solid, Yellow, With Reflective Beads | SF | 4500 | $ 1.70 | $ 7,650 |
| Airport Pavement Marking, Solid, Black | SF | 5000 | $ 1.70 | $ 8,500 |
| Reinforced Concrete Pipe (Allowance) | LF | 3200 | $ 185.00 | $ 592,000 |
| Catch Basin | EACH | 12 | $ 8,500.00 | $ 102,000 |
| | | | | |
| | | | CONSTRUCTION TOTAL = | $ 5,760,440 |
| | | | CONSTRUCTION CONTINGENCIES (15%) = | $ 864,066 |
| | | | CONSTRUCTION TOTAL = | $ 6,624,506 |
| | | | ENGINEERING DESIGN(8%) = | $ 529,960 |
| | | | CONSTRUCTION ADMIN (10%) = | $ 662,451 |
| | | | PROJECT TOTAL = | $ 7,816,917 |
| | | | **BUDGET ESTIMATE =** | **$ 7,900,000** |

Note: These costs were developed without the benefit of field surveys or soils investigation.
A final cost estimate will be dependent upon development of these items and further design.

Mead & Hunt

**ENGINEERING COST ESTIMATE**
**WILLOW RUN AIRPORT MASTER PLAN**

DETROIT METRO • WILLOW RUN
WAYNE COUNTY AIRPORT AUTHORITY

PROJECT: West Apron Reconstruct Portion
LOCATION: Willow Run Airport
CITY: Ypsilanti, Michigan
DATE: 1/24/2017
PREPARED BY: CTD
REVIEWED BY: SCT

___FINAL DESIGN
___ PROJECT PROGRAMMING
___ FEASIBILITY STUDY
_x_ AIRPORT MASTER PLANNING
BASED ON FY **2016** DOLLARS

WORK DESCRIPTION: Reconstruct a Portion of the West Arpon with drainage systems.

| ITEM DESCRIPTION | UNIT | QTY | UNIT PRICE | ITEM COST |
|---|---|---|---|---|
| Mobilization and General Conditions | LS | 1 | $ 300,000.00 | $ 300,000 |
| Safety and Security | LS | 1 | $ 150,000.00 | $ 150,000 |
| Project Survey & Stakeout | LS | 1 | $ 30,000.00 | $ 30,000 |
| Erosion Control | LS | 1 | $ 60,000.00 | $ 60,000 |
| Waste Management Plan | LS | 1 | $ 6,000.00 | $ 6,000 |
| Remove Existing RCP (Allowance) | LF | 2800 | $ 12.00 | $ 33,600 |
| Remove Existing Inlet/Manhole (Allowance) | EA | 15 | $ 340.00 | $ 5,100 |
| Pulverize Pavement Over 6" | SY | 21300 | $ 1.00 | $ 21,300 |
| Unclassified Excavation | CY | 14700 | $ 10.00 | $ 147,000 |
| Subgrade Undercut | CY | 900 | $ 12.00 | $ 10,800 |
| 6" Crushed Aggregate Base Course | CY | 3600 | $ 30.00 | $ 108,000 |
| Undercut Fill Material Choke Stone | CY | 900 | $ 34.00 | $ 30,600 |
| 6" Recycled Concrete Aggregate Base Course | CY | 3600 | $ 28.00 | $ 100,800 |
| 6" Bitminous Base Course (RAP Allowed) | TON | 7500 | $ 72.00 | $ 540,000 |
| Portland Cement Concrete Pavement, 14.5-Inch | SY | 21300 | $ 49.00 | $ 1,043,700 |
| Bituminous Tack Coat | GAL | 3200 | $ 1.10 | $ 3,520 |
| Airport Pavement Marking, Solid, Yellow, With Reflective Beads | SF | 500 | $ 1.70 | $ 850 |
| Reinforced Concrete Pipe (Allowance) | LF | 2800 | $ 185.00 | $ 518,000 |
| Catch Basin Diameter | EA | 15 | $ 8,500.00 | $ 127,500 |
| | | | | |
| | | | CONSTRUCTION TOTAL = | $ 3,236,770 |
| | | | CONSTRUCTION CONTINGENCIES (15%) = | $ 485,516 |
| | | | CONSTRUCTION TOTAL = | $ 3,722,286 |
| | | | ENGINEERING DESIGN(8%) = | $ 297,783 |
| | | | CONSTRUCTION ADMIN (10%) = | $ 372,229 |
| | | | PROJECT TOTAL = | $ 4,392,297 |
| | | | **BUDGET ESTIMATE =** | **$ 4,400,000** |

Note: These costs were developed without the benefit of field surveys or soils investigation.
A final cost estimate will be dependent upon development of these items and further design.

Mead & Hunt

**ENGINEERING COST ESTIMATE**
**WILLOW RUN AIRPORT MASTER PLAN**

DETROIT METRO • WILLOW RUN
WAYNE COUNTY AIRPORT AUTHORITY

PROJECT: South Apron Reconstruct Portion
LOCATION: Willow Run Airport
CITY: Ypsilanti, Michigan
DATE: 1/24/2017
PREPARED BY: CTD
REVIEWED BY: SCT

___FINAL DESIGN
___ PROJECT PROGRAMMING
___ FEASIBILITY STUDY
_x_ AIRPORT MASTER PLANNING
BASED ON FY **2016** DOLLARS

WORK DESCRIPTION: Reconstruct a Portion of the South Apron with drainage systems.

| ITEM DESCRIPTION | UNIT | QTY | UNIT PRICE | ITEM COST |
|---|---|---|---|---|
| Mobilization and General Conditions | LS | 1 | $ 650,000.00 | $ 650,000 |
| Safety and Security | LS | 1 | $ 325,000.00 | $ 325,000 |
| Project Survey & Stakeout | LS | 1 | $ 55,000.00 | $ 55,000 |
| Erosion Control | LS | 1 | $ 130,000.00 | $ 130,000 |
| Waste Management Plan | LS | 1 | $ 11,000.00 | $ 11,000 |
| Remove Existing Rcp (Allowance) | LF | 3600 | $ 12.00 | $ 43,200 |
| Remove Existing Inlet/Manhole (Allowance) | EACH | 20 | $ 340.00 | $ 6,800 |
| Pulverize Pavement Over 6" | SYD | 51000 | $ 1.00 | $ 51,000 |
| Unclassified Excavation | CY | 35000 | $ 10.00 | $ 350,000 |
| Subgrade Undercut | CY | 2100 | $ 12.00 | $ 25,200 |
| 6" Crushed Aggregate Base Course | CY | 8400 | $ 30.00 | $ 252,000 |
| Undercut Fill Material Choke Stone | CY | 2100 | $ 34.00 | $ 71,400 |
| 6" Recycled Concrete Aggregate Base Course | CY | 8400 | $ 28.00 | $ 235,200 |
| 6" Bitminous Base Course (Rap Allowed) | TON | 18000 | $ 72.00 | $ 1,296,000 |
| Portland Cement Concrete Pavement, 14.5-Inch | SY | 50400 | $ 49.00 | $ 2,469,600 |
| Bituminous Tack Coat | GAL | 7600 | $ 1.10 | $ 8,360 |
| Airport Pavement Marking, Solid, Yellow, With Reflective Beads | SF | 500 | $ 1.70 | $ 850 |
| Reinforced Concrete Pipe (Allowance) | LF | 3600 | $ 185.00 | $ 666,000 |
| Catch Basin Diameter | EACH | 20 | $ 8,500.00 | $ 170,000 |
| | | | | |
| | | | CONSTRUCTION TOTAL = | $ 6,816,610 |
| | | | CONSTRUCTION CONTINGENCIES (15%) = | $ 1,022,492 |
| | | | CONSTRUCTION TOTAL = | $ 7,839,102 |
| | | | ENGINEERING DESIGN(8%) = | $ 627,128 |
| | | | CONSTRUCTION ADMIN (10%) = | $ 783,910 |
| | | | PROJECT TOTAL = | $ 9,250,140 |
| | | | **BUDGET ESTIMATE =** | **$ 9,300,000** |

Note: These costs were developed without the benefit of field surveys or soils investigation.
A final cost estimate will be dependent upon development of these items and further design.

DETROIT METRO ▪ WILLOW RUN
WAYNE COUNTY AIRPORT AUTHORITY

Prepared by: **Mead & Hunt, Inc. 2605 Port Lansing Rd. Lansing, Michigan 48906**
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