4. Demand Capacity Analysis and Facility Requirements

In this section, the aviation activity forecasts for HWO are compared with the existing capacity of each Airport functional system. Capacity gaps are identified and used to determine future facility requirements for the Airport. The facility requirements reflect those improvements necessary to meet growing demand and potentially changing demand characteristics, as well as those necessary to maintain and/or upgrade critical infrastructure, systems, and facilities.

4.1 General Overview

The analyses documented in this section are organized by functional system, with each system assessed separately. The facility requirements for each system will provide the foundation for the subsequent definition of alternative concepts to meet the forecast demand over the 20-year planning horizon. Three functional systems were identified:

- **Airfield Facilities** include airfield elements that support the arrival, departure, and ground circulation. The assessment of required facilities addresses the airfield configuration (runway location and runway lengths), and the supporting taxiway system. The ability of the existing airfield to accommodate forecast operational demand (magnitude and characteristics), in terms of runway capacity and design standards, was evaluated during the 2014 Airfield Safety Enhancement and Geometry (ASEG) Study. The ASEG Study evaluation and recommendations were used for this Master Plan.
- **General Aviation Facilities include:**
  - FBO terminal facilities
  - Aircraft Parking (apron and hangar)
  - Vehicle Parking
- **Support Facilities include:**
  - Air Traffic Control Tower (ATCT)
  - Pembroke Pines Fire Station
  - Airport Administration and maintenance
  - Fuel Storage

- Airport police and security
- Utilities

The methodologies used to determine facility capacity and requirements are in accordance with industry standards, FAA guidance, and planning factors adjusted, as appropriate, to reflect actual Airport-use characteristics. In calculating demand/capacity, the information presented in Sections 2 and 3 of this MPU was used, along with any additional information that more accurately reflects existing or future conditions. Planning experience at, and knowledge of, other airports was also used as appropriate in the evaluation of facility capacities. This approach ensures that capacity assessments are sensitive to the specific requirements at HWO but are also reflective of industry standards and practices.

4.1.1 MPU SENSITIVITY ANALYSIS FORECAST

As previously discussed, the Aviation Activity forecasts prepared in 2016 (and subsequently approved by the FAA in April 2017) for the Airfield Safety Enhancement and Geometry (ASEG) Study were intended to serve as the basis for analysis for this Master Plan Update. However, in the interim, BCAD staff advised that the Airport had already exceeded the operational demand levels projected for 2035. For this reason, the FAA has since accepted the use of an MPU Sensitivity Analysis Forecast that applies the ASEG Study Forecast compounded annual growth rate of 0.66 percent to the 2017 historical number of operations and based aircraft.

For planning purposes, future facility requirements in this MPU are based on Planning Activity Levels (PALs) and Sensitivity Levels (SLs) in lieu of forecast years. PAL 1 and PAL 2 are based upon the ASEG Study forecast from the 2016 ASEG Study. SL 1 and SL 2 are based upon the MPU Sensitivity Analysis Forecast. While the PALs and SLs coincide with demand levels from certain years, they may be achieved irrespective of the associated year. The following are the corresponding demand level years associated with each PAL and SL:

- PAL 1 – coincides with 2025 demand levels from the ASEG Study forecast
- PAL 2 – coincides with 2035 demand levels from the ASEG Study forecast
- SL 1 – coincides with the 2025 demand levels from the MPU Sensitivity Analysis forecast
- SL 2 – coincides with the 2035 demand levels from the MPU Sensitivity Analysis forecast

Table 4.1-1 provides a summary of the operational demand levels associated with PAL 1, PAL 2, SL 1 and SL 2, namely a summary of total aircraft operations and delineation of based aircraft. Aircraft operations are delineated as either Local or Itinerant. The volume of total aircraft operations is used to evaluate the capacity of the airfield. The based aircraft and peak itinerant aircraft parking demands are used to evaluate functional systems such as aircraft parking apron and storage hangar requirements.

Table 4.1-1: Operations and Based Aircraft Demand Projections

FACTOR	PAL 1	PAL 2	SL 1	SL 2
Total Aircraft Operations	182,189	195,487	238,608	254,833
Local	116,789	126,313	156,765	167,425
Itinerant	65,400	70,174	81,843	87,408
Total Based Aircraft	423	454	433	463
Single-Engine Piston	356	382	364	390
Multi-Engine Piston	44	47	45	48
Jet	1	1	1	1
Helicopter	22	24	23	24

SOURCES: (PALs) Kimley-Horn and Associates, Inc., *Airfield Safety Enhancement and Geometry Study*, April 2017; (SLs) American Infrastructure Development, Inc. April 2017.
PREPARED BY: American Infrastructure Development, Inc., June 2017.

4.2 Airfield Requirements

This section describes HWO's airfield and airspace requirements for the 20-year planning period, through 2035. The airfield requirements are based on the findings of the ASEG Study and further refined to meet current operational needs. This section describes the methods and demand levels for determining future facility requirements in accordance with FAA Advisory Circular (AC) 150/5060-5 (Change 2), *Airport Capacity and Delay*, as well as the airfield design standards prescribed in AC 150/5300-13A (Change 1), *Airport Design*. The airfield requirements established under the ASEG Study are summarized in the following subsections.

4.2.1 AIRFIELD CAPACITY

Airfield capacity is an estimate of the number of aircraft that can be processed through the airfield system within a specific period without inducing unacceptable levels of delay. Many factors can influence airfield capacity, including runway configuration, taxiway configuration, ATC procedures, weather conditions, and aircraft fleet mix. The goal of an airfield capacity analysis is to determine if the airfield infrastructure is sufficient to accommodate existing and forecast demand.

An airport's Annual Service Volume (ASV) is an important indicator of an airport's annual airfield capacity. The ASV is essentially the number of annual operations that can occur before the maximum operational delay is reached. The Airfield Weighted Hourly Capacity (CW) factor of 147.0 was derived during the ASEG Study and used for planning purposes for this Master Plan:

$$C_W = \frac{(C_{n1} \times W_{N1} \times P_{n1}) + (C_{n2} \times W_{n2} \times P_{n2})}{(W_{n1} \times P_{n1}) + (W_{n2} \times P_{n2})}$$

C_W = Airfield weighted hourly capacity
$_n$ = Number of runway-use configurations
C = Hourly capacity of each runway-use configuration
W = FAA ASV weighting factor from AC 150/5060-5, Table 3-1
P = Percent of time the Airport operates under each configuration

$$C_W = \frac{(178.2 \times 1 \times 0.82) + (134.2 \times 15 \times 0.10) + (67.3 \times 4 \times 0.02) + (0 \times 0 \times 0.06)}{(1 \times 0.82) + (15 \times 0.10) + (4 \times 0.02) + (0 \times 0.06)}$$

The formula utilized in the methodology and assumptions presented in the ASEG Study for estimating the Airport's ASV is described below:

$$ASV = C_W \times D \times H$$

C_W = weighted hourly capacity of 147.0D = the ratio of annual operations to average daily operations during the peak month
H = the ratio of average daily operations to average peak-hour operations during the peak month

Table 4.2-2 summarizes the calculated ASV for the Airport, which ranges from 254,000 to 257,000 with a median of 255,500 operations per year. The ASV for SL 1 is an outlier and can be attributed to fluctuations in operational peaking demand characteristic, in addition to mathematical rounding.

Table 4.2-2: Annual Service Volume Weighted Hourly Capacity

FACTOR	PAL 1	PAL 2	SL 1	SL 2
Annual Operations	182,189	195,487	238,608	254,833
Avg. Daily Operations in Peak Month (March)	655	703	847	912
Avg. Peak Hour in Peak Month	105	113	136	146
(D) Daily Demand Ratio	278.2	278.1	281.7	279.4
(H) Hourly Demand Ratio	6.2	6.2	6.2	6.2
(ASV) Annual Service Volume	255,000	254,000	257,000	255,000

NOTES:

PAL = Planning Activity Level

SL = Sensitivity Level

SOURCES: (PALs) Kimley-Horn and Associates, Inc., *Airfield Safety Enhancement and Geometry Study*, April 2017; (SLs) American Infrastructure Development, Inc. April 2017.

PREPARED BY: American Infrastructure Development, Inc., April 2017.

According to the ATC's traffic counts, 226,376 aircraft operations were conducted at HWO during calendar year 2017. Based on the Airport's current demand profiles, this represents approximately 88 percent of the airfield's ASV. Should demand continue to grow at the rate forecasted under the Sensitivity Analysis, aircraft operations would exceed the ASV at SL 2 (Sensitivity 2035). FAA guidelines suggest that planning for additional capacity should be initiated when an airfield reaches 60 percent of ASV. Additional capacity could be achieved through demand management practices, operational changes, and/or the construction of new airfield infrastructure (e.g., taxiways, NAVAIDs, or runways).

4.2.2 RUNWAY ANALYSIS

This section presents an overview of the analysis of the runway system at HWO conduct as part of the ASEG Study. The analysis of the runway system considered pavement dimensions, separation, lighting and safety areas in compliance with regulations. To evaluate the runways, certain airport characteristics must be defined, including the Airplane Design Group (ADG), Runway Design Code (RDC), and critical design aircraft. The following subsections evaluate the physical and operational characteristics of the runway system at HWO.

4.2.2.1 Airplane Design Group – Existing and Future Fleet Mix

The current and projected aircraft fleet mix composition at HWO consists of both ADG I and ADG II aircraft. Common ADG I aircraft types that operate at HWO includes the Cessna Citation I (500), Cessna Citation CJ1 (525), Piper Seneca, Beechcraft King Air 100, Piper Navajo, Beechcraft Baron and Piper Cheyenne. Common ADG II aircraft types that operate at HWO include the Beechcraft King Air B200, Pilatus PC12, and Cessna CJ2,

Currently, HWO has a 12,500-pound weight restriction on aircraft operating at the facility. It is assumed that this weight restriction will remain in effect through the SL2 planning level, limiting the jet activity. Therefore, the existing and projected future aircraft fleet mix is expected to remain similar.

4.2.2.2 Design Aircraft

The design aircraft is used to determine the FAA design standards which should be applied to the design of runways, taxiways, aprons, and other facilities. To justify funding for future development projects, the design aircraft must represent the most demanding aircraft anticipated to utilize the airport on a regular basis. Currently, the FAA considers the most demanding aircraft is that which conducts a minimum of 500 annual operations.

The 2009 Airport Master Plan identified the Beech King Air F90 as the design aircraft for HWO. The King Air F90 is a B-I small aircraft with a wingspan of forty-five feet and maximum takeoff weight (MTOW) of 10,950 pounds. The ASEG Study indicated that as of April 2016, airport records indicated there is one King Air B200 and one Cessna Citation I Business Jet based at HWO. The Cessna Citation I is a B-I aircraft with a wingspan of fort seven feet and a MTOW of 11,850 pounds. The King Air B200 is a B-II "small" aircraft with a wingspan of fifty-four feet and a MTOW of 12,500 pounds which is the weight limit at HWO.

Considering the King Air B200 is the largest of these two aircraft, the design aircraft, identified in the ASEG Study, is the Beech King Air B200 for all four runways at HWO. Additionally, this will result in the change of the Airport Reference Code (ARC) from a B-I to a B-II.

4.2.2.3 Runway Design Code

The RDC is used to identify the applicable design standards for runway development in accordance with AC 150/5300-13A. The three components that define the RDC include the Aircraft Approach Category (AAC), ADG, and the highest approach visibility minimums that either end of the runway is planned to provide. The existing RDCs at HWO are as follows: 1L, 19R, 1R, 19L, and 10L - B-I-Visual; 28R - B-I-5,000; 10R – B-II-5,000; and 28L – B-II-Visual. The ASEG Study indicates that the future RDC for Runways 10R-28L and 10L-28R is B-II-5,000 and the RDC for Runways 1L-19R and 1R-19L is B-II-Visual.

4.2.2.4 Wind Coverage Analysis

The layout or orientation of the physical runway surfaces at an airport is primarily a function of wind coverage requirements for the existing and projected aircraft fleet mix. Ideally, a runway is oriented with the prevailing wind, as landing and departing the aircraft into the wind enhances performance. FAA planning standards indicate that an airport should be capable of operating under allowable wind conditions at least 95 percent of the time. **Table 4.2-3** presents the allowable crosswind components based on aircraft RDC, as detailed in AC 150/5300-13A, *Airport Design*.

Table 4.2-3: Allowable Crosswind Components Per Runway Design Code

RUNWAY DESIGN CODE	ALLOWABLE CROSSWIND COMPONENT
A-I and B-I*	10.5 knots
A-II and B-II	13.0 knots
A-III and B-III C-I though C-III D-I through D-III	16.0 knots
A-IV and B-IV C-IV through C-VI D-IV through D-VI	20.0 knots
E-I through E-VI	20.0 knots

NOTE: *Includes A-I and B-I small aircraft.

SOURCE: Federal Aviation Administration, Advisory Circular 150/5300-13A (Change 1), *Airport Design*, February 26, 2014.
PREPARED BY: American Infrastructure Development, Inc., April 2017.

To evaluate runway orientation, 10 years of historical weather data were collected from the National Oceanic and Atmospheric Administration records of the Airport's on-site Automated Weather Observation System unit. The data were then analyzed for all-weather, VFR, and IFR conditions using the FAA's Wind Analysis Design Tool. **Appendix D** of this Master Plan Update details the collected weather data.

Table 4.2-4 presents the wind coverage percentages for HWO's runways based on the allowable crosswind components. While the wind coverage percentages for a crosswind component of 10.5 knots are applicable to HWO for assessing wind coverage, the table also analyzes a crosswind component of 13.0 knots. This is warranted due

to the high level of flight training activity that occurs at the Airport as well as the limited use of the critical design aircraft

In accordance with the wind coverages associated with a 10.5 knot crosswind component, none of the four individual runway orientations provide the desired 95 percent wind coverage. However, the combined wind coverage provided by the four runway configurations exceeds 99 percent for all weather classes. **Exhibit 4.2-1** through **Exhibit 4.2-3** graphically depict the windrose for each of the three weather classifications.

Table 4.2-4: North Perry Airport Wind Coverage

		CROSSWIND COMPONENT	
WEATHER CLASS	RUNWAY	10.5 KNOTS (ADG I)	13.0 KNOTS (ADG II)
All Weather	01/19	84.85%	91.9%
	10/28	93.75%	97.22%
	All Weather Combined	98.84%	99.8%
VFR	01/19	84.94%	92.02%
	10/28	94.01%	97.41%
	VFR Combined	98.93%	99.84%
IFR	01/19	84.06%	90.25%
	10/28	88.85%	93.87%
	IFR Combined	97.45%	99.2%

NOTES:

VFR = Visual Flight Rules

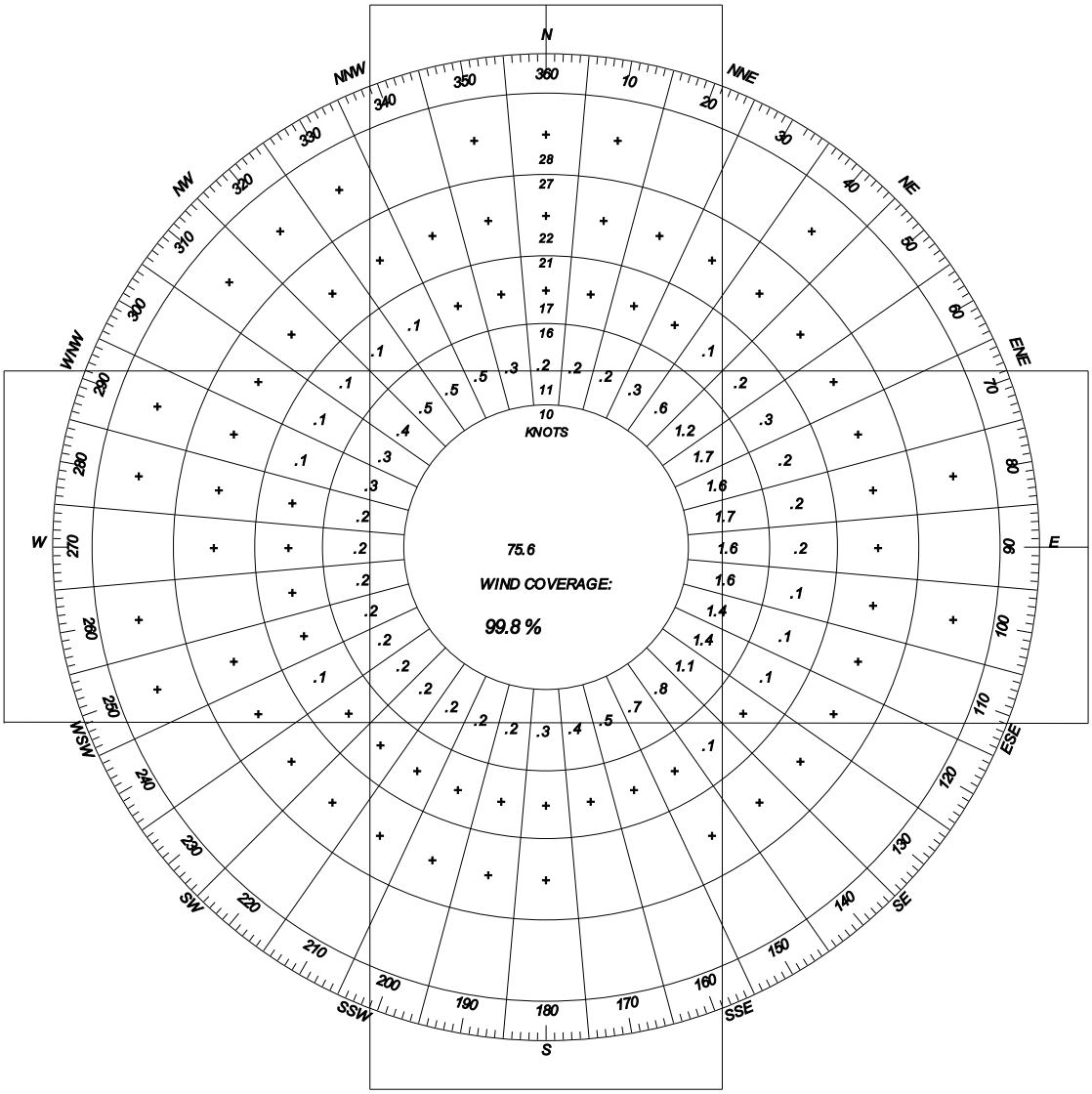
IFR = Instrument Flight Rules

ADG = Airplane Design Group

SOURCES: Federal Aviation Administration, Wind Analysis Design Tool, https://airports-gis.faa.gov/agis/publicToolbox/airportDesignTools.jsp (accessed June 23, 2017); National Oceanic and Atmospheric Administration, National Climatic Data Center, Station USAF#722037 (2007-2016), (accessed June 23, 2017).

PREPARED BY: American Infrastructure Development, Inc., June 2017.

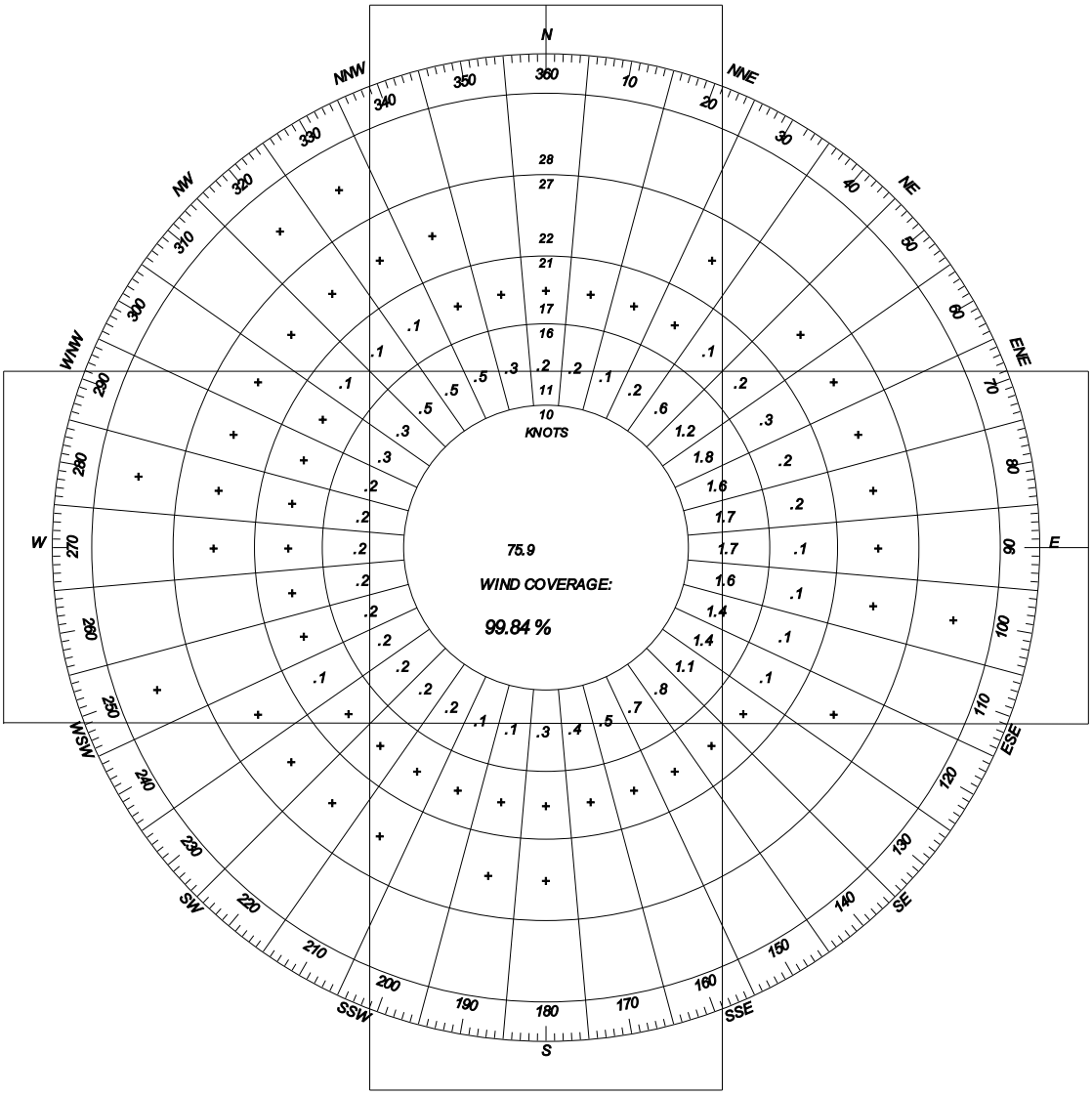
Exhibit 4.2-1: All Weather – Windrose



SOURCES: Federal Aviation Administration, Wind Analysis Design Tool, https://airports-gis.faa.gov/agis/publicToolbox/airportDesignTools.jsp (accessed June 23, 2017); National Oceanic and Atmospheric Administration, National Climatic Data Center, Station USAF#722037 (2007-2016), (accessed June 23, 2107).

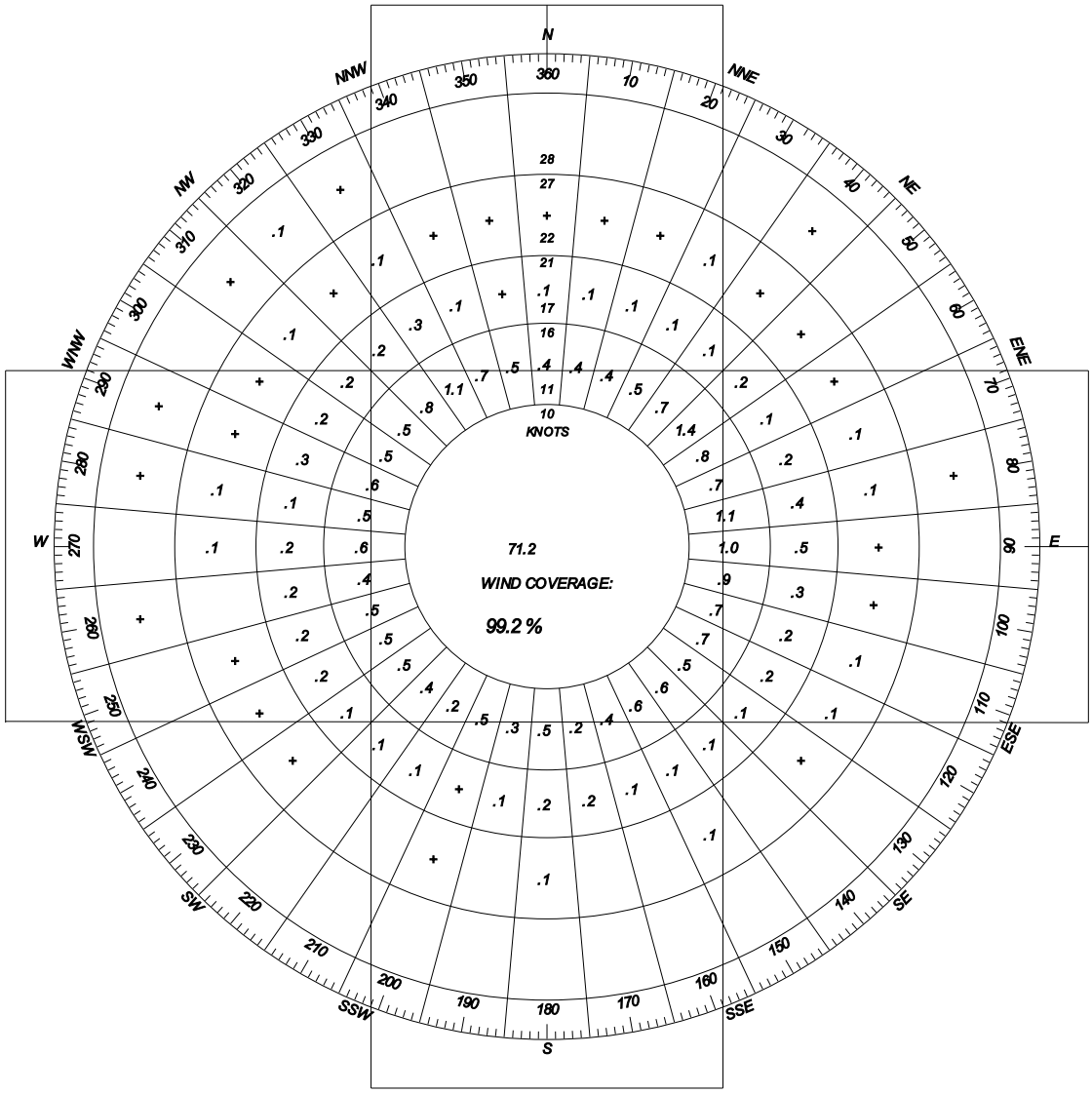
PREPARED BY: American Infrastructure Development, Inc., June 2017.

Exhibit 4.2-2: Visual Flight Rules – Windrose



SOURCES: Federal Aviation Administration, Wind Analysis Design Tool, https://airports-gis.faa.gov/agis/publicToolbox/airportDesignTools.jsp (accessed June 23, 2017); National Oceanic and Atmospheric Administration, National Climatic Data Center, Station USAF#722037 (2007-2016), (accessed June 23, 2017).
PREPARED BY: American Infrastructure Development, Inc., June 2017.

Exhibit 4.2-3: Instrument Flight Rules – Windrose



SOURCES: Federal Aviation Administration, Wind Analysis Design Tool, https://airports-gis.faa.gov/agis/publicToolbox/airportDesignTools.jsp (accessed June 23, 2017); National Oceanic and Atmospheric Administration, National Climatic Data Center, Station USAF#722037 (2007-2016), (accessed June 23, 2017).
PREPARED BY: American Infrastructure Development, Inc., June 2017.

4.2.2.5 Runway Length

The runway length, width, and separation requirements presented in the ASEG Study will be used for planning purposes through the 20-year forecast period. **Appendix E** of this Master Plan Update provides the ASEG Study's runway analysis. BCAD staff have indicated that Broward County intends on maintaining the existing limitation on the maximum takeoff weight of aircraft operating at HWO to 12,500 pounds through the 20-year planning period.

FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design*, defines the parameters for calculating runway length requirements for an airport based on the aircraft performance characteristics. Considering the Airport elevation of 8-feet above mean sea level and the mean maximum temperature for the hottest month of 91 degrees, a runway length of 4,150 feet to accommodate the critical design aircraft is recommended. For aircraft with less than 10 passenger seats, the minimum runway length is 3,100 feet for 95 percent of the fleet and 3,600 feet for 100 percent of the fleet.

4.2.2.6 Runway Width

All four runways at HWO exceed the runway width standard of 75 feet as described in AC 150/5300-13A based upon the RDC of B-II. Currently all four runways at HWO are 100 feet wide. The ASEG Study recommends maintaining the extra width as it provides an additional margin of safety which is particularly important at HWO due to the high level of pilot training. Additionally, the AC indicates the extra 25 feet of width provides additional crosswind tolerance.

4.2.2.7 Pavement Condition

The FDOT Pavement Evaluation Report for HWO dated June 2015 indicated that all four runways were in "good" condition. With scheduled maintenance, no major pavement rehabilitations are anticipated through the 20-year planning horizon.

4.2.2.8 Runway Safety Area and Object Free Area

The 2009 Master Plan and ALP identified the HWO Airport Reference Code (ARC) as a B-I "small". As noted in subsection 4.2.2.3 the design aircraft for North Perry is now an ADG II aircraft, resulting is an ARC B-II (specifically B-II small). Due to the change to B-II "small", the Runway Safety Area (RSA) will increase from 120 feet to 150 feet in width and from 240 feet to 300 feet beyond the runway end. Likewise, the Runway Object Free Area (ROFA) will increase from 240 feet to 300 feet beyond the runway end and the width will increase from 250 feet to 500 feet.

4.2.2.9 Runway Separation

Runway separation standards between runways and various airfield components have been impacted by the change in the RDC from B-I "small" to B-II "small". **Table 4.2-5** compares the runway separation requirements of B-I "small" to B-II 'small'.

Separation standards between the following parallel runway-to-taxiway are not met for a B-II "small" aircraft. The ASEG Study recommends addressing these separation deficiencies during future pavement projects

- Taxiway B to Runway 1L-19R – 225 feet (15 feet deficiency)
- Taxiway D to Runway 1R-19L – 225 feet (15 feet deficiency)
- Taxiway N to Runway 10L-28R – 225 feet (15 feet deficiency)
- Taxiway L to Runway 10R-28L – 225 feet (15 feet deficiency)
- Taxiway A to Runway 1L-19R – Construct to a 240-foot separation

Table 4.2-5: Runway Separation Standards Compared

RUNWAY CENTERLINE TO:	B-I SMALL (FEET)	B-II SMALL (FEET)	B-II SMALL STANDARDS MET
Parallel Runway Centerline (for simultaneous approaches)	VFR – 700 IFR – 4,300	VFR – 700 IFR – 4,300	VFR – Yes IFR – No
Holding Position	125	125	Yes
Parallel Taxiway/Taxilane Centerline	150	240	No – Taxiways B, D, N, & L
Aircraft Parking Area	125	250	Yes

SOURCES: Federal Aviation Administration, Advisory Circular 150/5300-13A, Airport Design., February 2014; American Infrastructure Development, Inc., May 2018.
PREPARED BY: American Infrastructure Development, Inc., June 2018.

4.2.3 TAXIWAY ANALYSIS

The taxiway requirements presented in the ASEG Study will be used for planning purposes through the SL 2 forecast period. Appendix E of this Master Plan Update provides the ASEG Study's taxiway analysis.

4.2.3.1 Taxiway Dimensions and Separation Standards

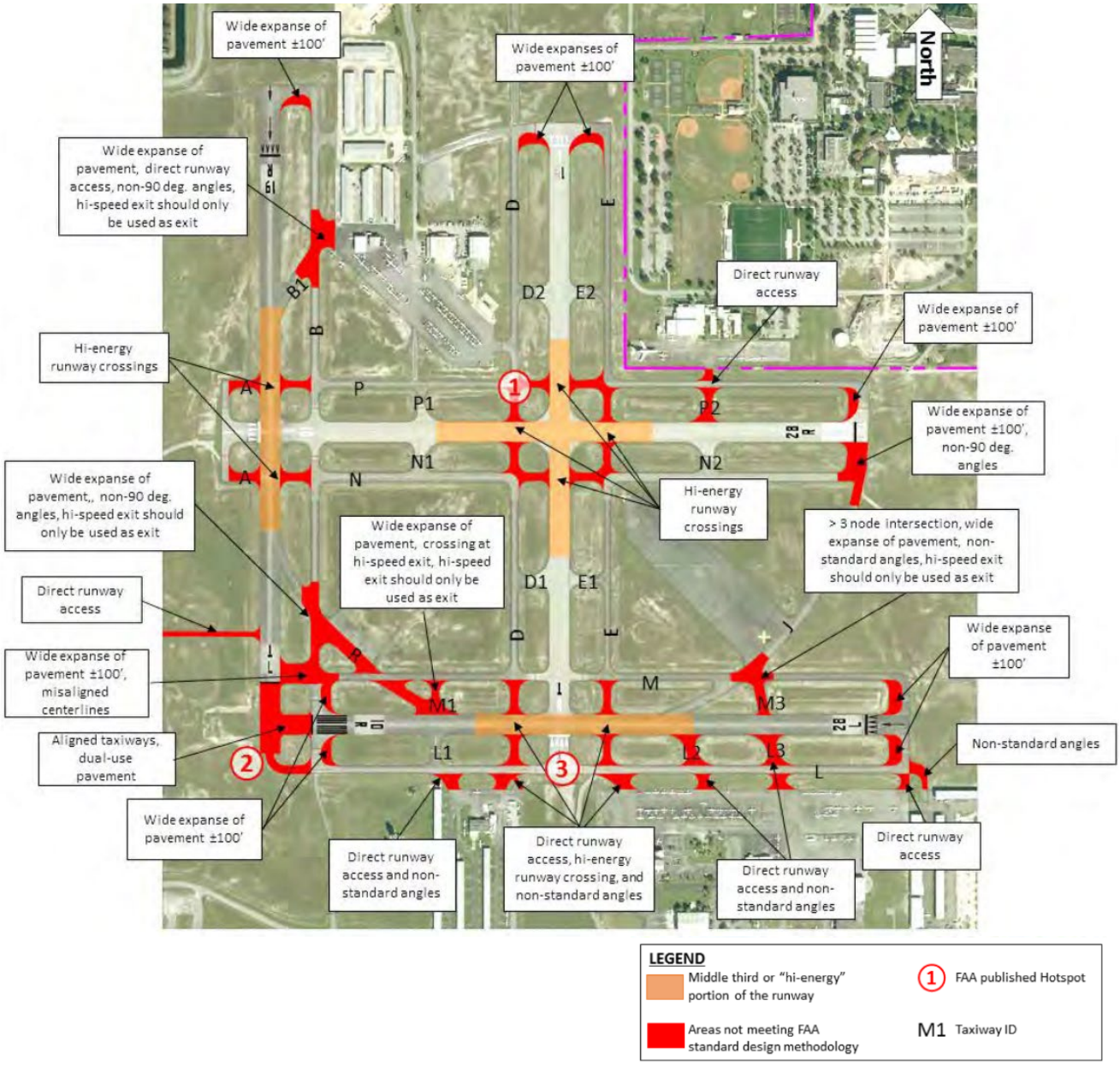
FAA AC 150/5300-13A updates provide revised guidance for taxiway geometry related to interfacing with runways to mitigate runway incursions. The ASEG Study identified three existing Hot Spots on the airfield at HWO. These hot spots are those locations where runway incursions have incurred or have a high likelihood of occurring. The Hot Spots and other taxiway geometry concerns identified in the ASEG Study are depicted in **Exhibit 4.2-4**.

HWO meets the B-II taxiway design standards for TSA, TOFA, pavement width, and centerline turn radius. Taxiways B, D, L, N, R, and J exceed the 35-foot design standard width. Except for Taxiway R and existing J, it is recommended that HWO maintain the additional taxiway width to enhance safety for pilots until such time that a major rehabilitation warrants the evaluation of the benefit versus the cost of maintaining the excess pavement. The ASEG Study recommends the removal of pavement associated with Taxiway R and the existing Taxiway J configuration. The ASEG Study also recommended that Taxiway A and the replacement/relocated Taxiway J should be designed to the 35-foot standard width.

The ASEG Study identified the separation between the South Apron connector and the adjacent Taxiway L near the end of Runway 28L is 97 feet. This does not meet the minimum separation requirement of 105 feet for a lateral taxiway-to-taxiway separation standard of 105 feet. Therefore, the ASEG Study recommends the apron connector be shifted to the west to eliminate the direct access from the South Apron to Runway 10R-28L. This relocation would also rectify the separation concern between the two taxiways. Additionally, the shift of Taxiways B and D and the associated TOFA will result in the required relocation of one grass tie-down adjacent to Taxiway B as well as limited use of pavement surrounding the fuel farm adjacent to Taxiway D.

The 2015 FDOT Pavement Evaluation report indicated that all parallel taxiways are in "good" condition.

Exhibit 4.2-4: Taxiway Geometry Concerns



SOURCE: Kimley-Horn and Associates, Inc., *Airfield Safety Enhancement and Geometry Study*, April 2017.
PREPARED BY: American Infrastructure Development, Inc., June 2017.

4.2.4 LIGHTING, MARKING, AND NAVAIDS

Runways 1L-19R and 10R-28L are both equipped with medium intensity runway lights (MIRLs), runway end identifier lights (REILs), and precision approach path indicators (PAPIs) on each runway end. Runways 1R-19L and 10L-28R are both only equipped with PAPIs on each runway end.

Runway ends 28R and 10R have non-precision markings, while all other runway ends have basic visual approach markings. According to the ASEG Study, runway markings are in good condition and are considered adequate. Ongoing maintenance is required throughout the planning horizon to restore the condition of these marking over time.

Most of the taxiways at HWO are lighted with MITLs. These lighted taxiways provide circulation to all currently developed areas of the Airport. Taxiways A, N, N1, N2, and J are not lighted, and only the southern portion of Taxiway E is lighted. If the instrument approach to Runway 28R is upgraded to support nighttime operations, then the lighting of Taxiway N is also recommended.

Based upon discussions with BCAD staff related to the ASEG Study's recommendation to shorten the Runway 1L end to mitigate the intersection with the 10R end, additional airfield lighting is required to maintain efficient use of the airfield. Although Runway 1L-19R is lighted, the reduction in available runway length will impact the use of this runway; therefore, it is recommended that runway edge lighting be installed on Runway 1R-19L and that taxiway edge lighting be installed on the full length of parallel Taxiway E and connector D1. The lighting of Runway 1R-19L and Taxiway E would offer more runway length for night operations in the north–south flow.

4.2.5 HELIPAD

In the future, BCAD may wish to consider a dedicated helipad as a means for further segregating helicopter operations from aircraft operations if it is deemed necessary for safety or traffic management purposes. Should BCAD choose to proceed with the development of a helipad, further coordination with FAA and FDOT would be initiated for purposes of further planning and programming the facility in advance of design, construction, and commissioning.

4.2.6 SUMMARY OF AIRFIELD REQUIREMENTS

Due to change in the critical design aircraft from B-I to B-II, several airfield improvements to airfield geometry are required to meet the FAA design standards to increase operational safety and minimize the potential for runway incursions. The following summarizes the ASEG Study's recommended airfield improvements.

- Shift Taxiways B, D, L, and N 15 feet from runway centerline.
- Install runway edge lighting on 10L-28R
- Install taxiway lights on Taxiways A, N, N1, and N2
- Construct a full-length Taxiway A with a lateral separation of 240 feet to the west of and parallel to Runway 1L-19R
- Miscellaneous taxiway geometry improvements to enhance pilot situational awareness and minimize the potential for runway incursions, including eliminating direct runway access.
- Shift South Apron taxiway connector to the west

4.3 General Aviation / Fixed-Base Operator Facilities

This section discusses whether the existing FBO facilities and other GA facilities can accommodate the demand levels forecast through SL 2. This information will contribute to the evaluation of future airport facility development alternatives.

4.3.1 AIRCRAFT PARKING

The existing apron areas at HWO comprise 1,445,900 square feet of paved surface, of which 1,009,900 square feet are used for aircraft parking and tie-down, circulation, aircraft movement, and FBO frontage. The remaining 436,000 square feet of pavement accounts for hangar egress. Transient GA aircraft are typically parked at the FBO apron areas. The aircraft and helicopter parking area requirements prescribed in FAA AC 150/5300-13A and 150/5390-2C, *Heliport Design* are as follows:

- 3,600 square feet per single-engine aircraft,
- 4,000 square feet per multiengine aircraft,
- 4,500 square feet per jet aircraft, and
- 3,600 square feet per helicopter (Bell 206)

A visual inspection of the Airport's apron space conducted on May 19, 2017 confirmed that existing aircraft parking demand on both the north and south sides of the airfield exceed the current aircraft storage capacity. **Exhibits 4.3-1** through **4.3-3** are aerial photographs of the various apron areas located on the north and south side of the airfield. As is demonstrated in the exhibits, operators and tenants are parking aircraft in grass areas adjacent to the north apron and aircraft are being triple parked on the south apron.

Exhibit 4.3-2 shows aircraft triple parked on the western portion of the south apron. This situation not only provides an inconvenience to an aircraft owner if their aircraft is parked between two other aircraft, but it also increases the potential for unintended property damage as the FBO is required to reposition aircraft that may be obstructing other aircraft parking positions.

Bobby's Landing has plans to expand the north apron soon. It should be noted that the Runway Visibility Zone (RVZ) limits the ability to park aircraft in certain areas adjacent to the north apron. The RVZ will be analyzed as part of the Alternatives chapter of this Master Plan.

Based on the existing availability of apron space, the current GA apron area is insufficient for the requirements of the planning period. Additional hangar egress is also included in the apron requirements. It should be noted that HWO tenants have expressed the need for a wash rack. The proposed location for the wash rack will be evaluated in the Alternatives Chapter as part of proposed apron development. Apron requirements for based and itinerant aircraft parking through the SL 2 forecast period are as follows:

- PAL 1: 1,643,100 square feet
- PAL 2: 1,765,900 square feet

- SL 1: 1,706,000 square feet
- SL 2: 1,850,100 square feet

Exhibit 4.3-1: Existing North Apron Area

SOURCES: Google Earth, June 2018.
PREPARED BY: American Infrastructure Development, Inc., June 2017.

Exhibit 4.3-2: Existing South Apron Area (Western Portion)

SOURCES: Google Earth, June 2018.
PREPARED BY: American Infrastructure Development, Inc., June 2017.

Exhibit 4.3-3: Existing South Apron Area (Eastern Portion)

SOURCES: Google Earth, June 2018.
PREPARED BY: American Infrastructure Development, Inc., June 2017.

4.3.2 AIRCRAFT HANGARS

The quantity and type of GA hangars at an airport are influenced by factors such as aircraft fleet mix, local climate conditions, security, and aircraft owner preferences. In general, piston aircraft are typically stored on the apron, in T-hangar units, or conventional hangars. Helicopters, turboprop, and jet aircraft are typically stored in conventional hangars.

Nationally, the percentage of based aircraft stored in hangars can vary from 20 percent to over 80 percent; compared to the national average, airports in Florida typically have a higher percentage of owners that store aircraft in hangars. As of 2017, 47 percent of the based aircraft at HWO are stored in hangars and there is currently a waiting list for T-hangars. Therefore, to account for the increased desire for based aircraft owners to hangar their aircraft, this analysis uses a 60 percent threshold for based aircraft stored within t-hangars/shade hangars. Approximately 77 percent of the aircraft in hangars are stored in T-hangars, while 23 percent are stored in multiuse/conventional or corporate hangars. Currently, the Airport has 26 shade port positions, 154 T-hangar positions, and 5 conventional hangar positions, totaling 185 positions dedicated to aircraft storage. It should be noted that for planning purposes, hangar square footage dedicated to aircraft maintenance and repair has been deducted from this analysis. GA hangar requirements for aircraft parking through the SL 2 forecast period are presented in **Table 4.3-1** and assume of 1,600 square feet needed per aircraft

Table 4.3-1: Aircraft Hangar Requirements 1/

DEMAND LEVEL	BASED AIRCRAFT	T-HANGAR/SHADE PORT DEMAND (77%)	CONVENTIONAL HANGAR DEMAND (23%)	TOTAL AIRCRAFT STORGAE REQUIREMENTS (SPACES)	ESTIMATED CAPACITY (SPACES) 2/	DEFICIENCY
PAL 1	423	195	58	254	185	68
PAL 2	454	210	63	272	185	87
SL 1	433	200	60	260	185	74
SL 2	463	214	64	278	185	92

NOTES:

1/ Hangar demand levels assume that 60 percent of based aircraft at HWO will be stored in T-hangar/Shade Port or Conventional Hangar. Rounding may cause slight differences in calculations.

2/ The capacity of conventional hangars that accommodate multiple aircraft simultaneously is inversely proportional to the size of the aircraft fleet that is being stored. The larger the aircraft being stored, the lower the capacity of the hangar. For the purposes of this analysis, an average of 1,600 square feet per aircraft was assumed for estimating the aircraft storage capacity of the existing conventional hangars.

SOURCES: American Infrastructure Development, Inc., June 2018.
PREPARED BY: American Infrastructure Development, Inc., June 2018.

Utilizing the Total Aircraft Storage Requirements from Table 4.3-1, the minimum GA hangar space requirements for aircraft storage hangars and aircraft maintenance hangars through the SL 2 forecast period is determined based on an assumption of 1,600 square feet of storage space per aircraft plus an allowance for maintenance hangar space. The allowance for maintenance hangar space is 70,000 square feet for PAL 1 and SL 1 and 84,000 square feet for PAL 2 and SL 2. The resulting square feet, based on the four forecasting periods, in listed below. The breakout of T-hangar/shade port and conventional hangars will be analyzed in the Alternatives chapter of this Master Plan.

- PAL 1: 476,200 square feet
- PAL 2: 519,500 square feet
- SL 1: 485,800 square feet
- SL 2: 528,200 square feet

Bobby's Landing has identified future expansion plans, which include T-hangar or shade port developments through the 20-year planning period for this Master Plan Update. Bobby's Landing is planning to develop the 10-acres of land north of their existing lease hold to include 15,200 square feet of T-hangars, 76,700 square feet of corporate hangars, and 13,700 square feet of aircraft canopies. Wayman also has provided expansion plans which include an additional 20,000 square feet of ramp space and a dual taxiway for improved airfield access. The design and construction of aircraft storage facilities should be planned within the first 5-years of the planning period to increase capacity and to meet the current and forecasted demand. Future hangar and apron development proposed by Bobby's Landing and Wayman will be analyzed during the alternatives process for this master plan. Any future hangar development should consider the following siting criteria:

- Hangars must be configured so that they do not encroach or obstruct any of the following:
  - runway obstacle free zones,
  - runway protection zones,
  - runway, taxiway, and taxilane object free areas,
  - the runway visibility zone,
  - airspace protection surfaces,
  - air traffic control line-of-sight, and
  - NAVAID critical areas.
- Where possible, hangars should be located where vehicle access and parking exist to minimize paving, drainage, and utilities. Where that is not possible, new development plans must include adequate drainage for the additional pavement.

4.3.3 FIXED-BASE OPERATOR / TERMINAL FACILITIES

The existing four FBOs occupy approximately 14,600 square feet of terminal building space, which includes passenger lobbies, flight planning areas, pilot rooms, FBO administration offices, restrooms, and classrooms. **Table 4.3-2** summarizes the gross area of existing FBO terminal space.

Table 4.3-2: Fixed-Base Operator Terminal Space (Square Feet)

FIXED-BASE OPERATOR	TERMINAL SIZE
North Perry Central	3,400
Hollywood Aviation	2,100
Bobby's Landing*	5,300
Pelican Flight Training	3,800
Total	**14,600**

NOTE:

* Bobby's Landing is proposing a new 10,000 square foot terminal building expansion which is not included in the table above but will be analyzed as part of the Alternatives chapter.

SOURCE: Broward County Aviation Department, April 2017.
PREPARED BY: American Infrastructure Development, Inc., October 2017.

For planning purposes, peaking characteristics for the forecasted demand levels can be utilized to estimate the usage of terminal/FBO spaces at HWO. Peak characteristics and peak operations were calculated to determine the requirements for facility and capacity levels for terminal. The same methodology utilized in the ASEG Study to determine peak operation projects was used for this Master Plan. To project the future peak month operations, an 11.1 percent ratio of peak month operations was applied to the total projected PAL and SL operations. The ASEG Study determined that the peak month for operations between 2006 and 2015 was March; therefore, the peak month average day was determined by dividing the peak month operations by 31. Projected peak month peak day was determined by applying the 4.7 percentage of operations that occurred on the peak day of the peak month as

provided in the ASEG Study. The 4.7 percent was calculated by dividing the peak month peak day operations by the peak month operations. **Table 4.3-3** presents the peak month and peak day operations for the PALs and SLs.

Table 4.3-3: Peak Month and Peak Day Forecast

DEMAND LEVEL	ANNUAL OPERATIONS	OPERATIONS IN PEAK MONTH	PEAK MONTH OPERATIONS	# OF DAY IN MONTH	PEAK MONTH AVG. PEAK DAY	PEAK MONTH PEAK DAY OPERATIONS	% PEAK MONTH PEAK DAY TO PEAK MONTH OPERATIONS
PAL 1	182,189	11.1%	20,303	31	655	954	4.7%
PAL 2	195,487	11.1%	21,784	31	655	954	4.7%
SL 1	236,608	11.1%	26,263	31	883	1,286	4.7%
SL 2	254,833	11.1%	28,286	31	912	1,329	4.7%

NOTES:

PAL – Planning Activity Level

SL – Sensitivity Level

SOURCES: Kimley-Horn and Associates, Inc., ASEG Study, April 2017; American Infrastructure Development, Inc., June 2018.
PREPARED BY: American Infrastructure Development, Inc., June 2018.

The peak characteristics provided in Table 4.3-3 were applied to the annual operations forecasts for the PALs and SLs. **Table 4.3-4** summarizes the resulting peak operations forecast which includes the projected peak month operations, average daily, average peak hour, and the peak month peak hour. Peak hourly data were based upon the data obtained during the forecasting for the ASEG Study.

Table 4.3-4: Peak Operations Forecast

	PAL 1	PAL 2	SL 1	SL2
Annual Operations	182,189	195,487	236,608	254,833
Peak Month Operations	20,303	21,784	21,977	24,484
PMAD Operations	655	703	709	790
PMAD Peak Hour Operations	105	113	113	126
Peak Month-Peak Hour Operations	142	153	154	171

NOTES:

PAL = Planning Activity Level

SL = Sensitivity Level

PMAD = Peak Month Average Day

SOURCES: Kimley-Horn and Associates, Inc., *ASEG Study*, April 2017; American Infrastructure Development, Inc., June 2018.
PREPARED BY: American Infrastructure Development, Inc., June 2018.

To determine the future FBO space requirements the following variables are considered: the peak hourly operation, estimated number of peak hour pilot/passengers, space requirements per peak-hour pilot/passenger, and other factors reflecting HWO operations.

An estimated 3 pilot/passengers are assumed per peak hour operation. Nationwide, FBO / terminal building space requirements per passenger/pilot generally vary between 50 to 75 square feet. A review of similar facilities associated with airports of comparable size in Florida indicate an average of 62.5 square feet per passenger/pilot. Local aircraft owners typically do not use GA terminal facilities as often as pilot/passengers associated with itinerant operations. For this reason, an 80 percent multiplier was applied. **Table 4.3-5** presents the findings of the FBO / terminal space analysis based on the aforementioned variables, as well as the deficiency for each sensitivity level.

The peak hour pilot/passenger was derived by multiplying the peak month peak hour in Table 4.3-4 by a factor of 3 to estimate the pilot/passenger accommodation. The passenger terminal utilization was determined by applying the assumption that 83 percent of pilots and passengers utilize the facilities and services contained within the terminal building. The results were then multiplied by a ratio of 62.5 square feet per pilot/passenger utilizing the terminal to estimate terminal building space requirements.

Considering 62.5 square feet per peak-hour pilot/passenger, the future FBO space requirements will exceed the existing available space by PAL 1. Ultimately, by planning level SL2, the terminal demand will be 26,600 square feet resulting in a deficiency of 12,000 square feet. Therefore, the current facilities comprising approximately 14,600 square feet are insufficient for the SL horizon.

Table 4.3-5: Fixed-Base Operator Terminal Space Requirements

DEMAND LEVEL	PEAK MONTH PEAK HOUR OPERATIONS	ESTIMATED PEAK HOUR PILOT/PASSENGERS	PASSENGER TERMINAL UTILIZATION 1/	TERMINAL SPACE DEMAND (SQUARE FEET)	CURRENT TERMINAL SPACE (SQUARE FEET)	TERMINAL DEFICIENCY
PAL 1	142	426	354	22,100	14,600	7,500
PAL 2	153	459	381	23,800	14,600	9,200
SL 1	154	462	383	24,000	14,600	9,400
SL 2	171	513	426	26,600	14,600	12,000

NOTES:

PAL – Planning Activity Level

SL – Sensitivity Level

1/ The passenger terminal utilization assumes that 80 percent of peak hour pilots and passengers utilize the facilities and services contained within the terminal building.

SOURCES: Kimley-Horn and Associates, Inc., *ASEG Study*, April 2017; American Infrastructure Development, Inc., June 2018.
PREPARED BY: American Infrastructure Development, Inc., June 2018.

4.3.4 VEHICLE PARKING REQUIREMENTS

Vehicle parking and circulation, which is adjacent to each FBO and tenant building, totals 371,500 square feet. Airport staff indicated that the FBO parking areas currently operate above capacity and are determined to be insufficient. For planning purposes, a ratio of aircraft storage to vehicle parking was utilized to estimate the square footage of parking required to meet the planning level demands. The ratio of existing hangar/apron aircraft parking square footage to existing vehicle parking square footage was determined to be 21.3 percent. The 21.3 percent was applied to the projected planning level requirements aircraft storage for both hangars and apron t-downs. It is estimated that 117,700 square feet of additional pavement is required to accommodate demand at SL 2. **Table 4.3-6** provides the vehicular parking requirements, including circulation, for the planning levels.

Table 4.3-6: Vehicle Parking Demand (sq. ft.)

ACTIVITY LEVEL	PARKING DEMAND (SQUARE FEET)1/	PARKING DEFICIENCY (SQUARE FEET)1/
PAL 1	436,900	65,400
PAL 2	469,400	97,900
SL 1	452,400	80,900
SL 2	489,200	117,700

NOTES:

PAL – Planning Activity Level

SL – Sensitivity Level

1/ Vehicular parking requirements include circulation space.

SOURCE: American Infrastructure Development, Inc., June 2018.
PREPARED BY: American Infrastructure Development, Inc., June 2018.

Pembroke Pines Zoning Code requires 3.5 parking spaces per 1,000 square feet of office space, 10 parking spaces per 1,000 square feet of restaurant space, and 5 parking spaces per 1,000 square feet for places of assembly. The Pembroke Pines Zoning Code indicates 1 parking space per airport hangar and 1 parking space for every 5 apron tie-downs, **Table 4.3-7** outlines the parking requirements for future development based upon City of Pembroke Pines Zoning Code. The ratio methodology presented above in Table 4.3-6 exceed Pembroke Pines Zoning Code requirements.

Table 4.3-7: City of Pembroke Pines Parking Requirements Based Upon Proposed Tenant Development

	OFFICE (SQ.FT.)	T-HNAGAR/ CANOPY UNITS	CORPORATE HANGAR (SQ. FT)	APRON TIE-DOWNS	TERMINAL/ RESTAURANT	REQUIRED # OF PARKING SPACES[2]	PROPOSED # OF PARCKING SPACES[3]
Bobby's Landing	22,750	5	76,700	39	15,000	219	287
Wayman	9,700	0	0	6	0	35	42
Additional Development	2,100	4	0	12	5,000	39	36
Total Spaces						**293**	**365**
Total Square Feet[1/]						**102,664**	**127,750**

NOTES:

1/ Assumes a 350 square feet parking space for vehicle parking and circulation

2/ Based on city zoning code.

3/ Parking spaces are based on a 21.3% ratio.

SOURCE: American Infrastructure Development, Inc., June 2018.
PREPARED BY: American Infrastructure Development, Inc., June 2018.

4.4 Support Facilities

Support facilities provide essential, core services needed for the safe and efficient operation of airports. Support services vary based on the type of airport and the amount of passenger and aircraft activity. These services at HWO were assessed to determine if they are adequately meeting the needs of the Airport, or if improvements are needed to meet an acceptable level of support. The support facilities were also evaluated to determine if the services will adequately accommodate the forecast Airport growth and recommended development. This section describes the facility requirements for HWO's primary support facilities, including the ATCT, fire support, aircraft fuel storage, Airport administration/maintenance facilities, Airport security, and other tenant support facilities determined to be critical to the Airport's operations.

4.4.1 AIR TRAFFIC CONTROL TOWER

Air traffic activity at HWO is controlled by an FAA contract tower located south of the Runway 10R end, between parallel runway ends 1L and 1R. According to the ASEG Study, the existing tower provides a good overall view of the approach areas and the entire airfield, except for Taxiway Bravo near the Runway 19R end. The controller's view of Taxiway Bravo is obstructed by hangars located between Runways 19R and 19L. BCAD staff has indicated that the tower cab is in poor condition and is near the end of its useful life. Given the visibility issue and the age of the building, it is proposed that a new tower be constructed within the 10-year planning horizon. Prior to constructing a new tower, an ATCT siting study should be conducted to research viable locations. These locations should consider constructing a taller tower cab to mitigate existing visibility issues. Currently, the ATCT total leasehold is 37,980 square feet. Parking occupies 6,846 square feet of the leasehold while the tower facility occupies about 3,741 square feet of the leasehold. The remaining 27,393 square feet of land within the leasehold is vacant and potentially

could be suitable for the expansion of the ATCT facility. Based upon the available square footage, the current site meets the FAA Order 6480.7D, *Airport Traffic Control Tower and Terminal Radar Approach Control Facility Design Guidelines*, recommended parameters for a low-activity ATCT which are provided below.

- Site Area – 4,800 square feet
- Parking – 2,700 to 10,800 square feet (10 to 40 spaces)
- Future Site Expansion – Up to 10,000 square feet
- Total Site – 10,200 to 25,000 square feet

4.4.2 CITY OF PEMBROKE PINES FIRE STATION

Currently, HWO does not offer five or more daily scheduled or unscheduled air carrier, commuter, or charter aircraft departures; therefore, it is not required to maintain on-site ARFF services. Fire support services are provided to the Airport by Fire Station No. 33, which is located on Airport property and operated by the City of Pembroke Pines. It is recommended that BCAD maintain airfield access to the fire station and continue coordinating with the City of Pembroke Pines for fire services. Additionally, BCAD staff have indicated that a new fire truck will be added to the fleet in late June 2018. Modifications to the fire station service road may be required to accommodate the larger fire truck's limited maneuvering capabilities. This will be further analyzed in Section 5 of this Master Plan Update.

4.4.3 BCAD AIRPORT ADMINISTRATION AND MAINTENANCE FACILITIES

BCAD staff have indicated that the 2,800-square-foot administrative building is insufficient for staff needs due to lack of storage and office space. A 1,400-square-foot expansion of the existing building is recommended to add four additional offices at 350 square feet each to accommodate staff needs in the intermediate planning period.

BCAD staff have also indicated that the existing 1,600-square-foot maintenance building has inadequate space for staff and equipment. A new 3,100-square-foot maintenance building is recommended in a new location, which would allow for convenient access to the airfield and Airport Perimeter Road. The new facility should include covered storage for maintenance equipment, three 800-square-foot bays for trucks, and two 350-square-foot offices for maintenance staff.

4.4.4 AIRCRAFT FUEL STORAGE

The four FBOs that operate at the Airport maintain fuel storage and manage fuel sales. The Airport currently has a fuel storage capacity of 47,000 gallons of Avgas and 10,000 gallons of Jet A. Fuel trucks provide additional capacity of 6,200 gallons of Avgas and 3,000 gallons of Jet A. North Perry Central anticipated the addition of a 6,000-gallon Jet A tank by the end of 2018. Other tenants, including Helicopters, Inc. and Wayman Flight Training, have fuel storage either in tanks or fuel trucks; however, they do not sell fuel, and they only utilize their fuel storage for their own operations. Both Helicopters, Inc. and Wayman Flight Training indicated through interviews that their current fuel storage capacity is adequate for current operations.

An analysis of Airport data from 2010 through 2015 determined an average 3.03 gallons of fuel dispensed per operation. By applying this ratio to forecast activity, the future fuel requirements were quantified. It is estimated that

aviation gasoline (Avgas) represents 60 percent of total fuel sales, with jet fuel representing 40 percent of total fuel sales. **Table 4.4-1** presents the fuel storage requirements for the PALs and SLs.

The existing fuel storage capacity provided for both Avgas and Jet A at the Airport is sufficient for meeting demand with a 1-week reserve supply.

Table 4.4-1: Fuel Storage Requirements

		ANNUAL DEMAND (GALLONS)			WEEKLY DEMAND (GALLONS)			STORAGE TANK[2/] REQUIREMENTS	
DEMAND LEVEL	TOTAL OPERATIONS	AVGAS	JET A	TOTAL[1/]	AVGAS	JET A	TOTAL	AVGAS TANK	JET A TANK
PAL 1	182,189	330,970	220,647	551,617	6,365	4,243	10,608	1	1
PAL 2	195,488	355,130	236,753	591,883	6,829	4,553	11,382	1	1
SL 1	238,608	433,463	288,975	722,438	8,336	5,557	13,893	1	1
SL 2	254,833	462,938	308,625	771,563	8,903	5,935	14,838	1	1

NOTES:

PAL – Planning Activity Level SL – Sensitivity Level

1/ Annual Demand based on average of 3.03 gallons of fuel per operation.

2/ Storage requirements assume the continued use of 10,000-gallon fuel tanks.

SOURCE: American Infrastructure Development, Inc., April 2017.
PREPARED BY: American Infrastructure Development, Inc., August 2017.

4.4.5 AIRPORT POLICE AND SECURITY

Currently, the Airport does not have a dedicated police or security office located on Airport property. HWO complies with FAA security standards by maintaining a 6-foot-high fence around Airport property, with controlled access points for authorized personnel and tenants. The Airport is patrolled by BCAD operations staff during the day and a private security company during the night hours. Interviews with BCAD management staff indicated that the arrangement with the private security company is adequate for the level of security required at HWO. Forecast operations are not anticipated to impact the way the Airport operates and, therefore, will not require changes to existing security measures. Additional fencing and controlled access points will be required as hangar and apron development progresses through the 20-year planning horizon. Fencing and controlled gate access improvements will be further investigated in the alternatives chapter of this master plan.

4.4.6 UTILITIES

Any future development at the Airport should consider the need for utilities, such as water, sanitary sewer, drainage, power, and industrial waste. Small GA airports access utilities in a similar manner to a small commercial industrial park. Therefore, long-term service planning for water, sanitary sewer, septic, and power is accomplished by the local utility company. BCAD will coordinate with local utility providers to ensure appropriate utility needs are met.

BCAD staff has indicated that the electrical vault has reached the end of its useful life and require replacement. Considering the vacant land adjacent to the existing location of the electrical vault, it is recommended that the new vault be relocated slightly south of the existing location between the ATCT and t-hangar building. The design of the new electrical vault should consider the capacities ability to accommodate the installation of runway edge lighting on 10L-28R and the lights on Taxiways A, N, N1, and N2.

The main utility distribution site that serves HWO should be studied to determine if current capacity would be sufficient for the future enhancements to meet the facility requirements,

4.5 Airport Facility Requirements Summary

This section summarizes the overall facility requirements necessary to satisfy the demand levels project for the various PALs and SLs. It also identifies existing facilities that nearing the end of their useful life and therefore are expected to be replaced during the 20-year planning horizon.

4.5.1 AIRFIELD IMPROVEMENTS

- Shift Taxiways B, D, L, and N 15 feet from runway centerline.
- Install runway edge lighting on 10L-28R
- Install taxiway lights on Taxiways A, N, N1, and N2
- Construct a full length Parallel Taxiway A with a minimum separation of 240 feet to the west of Runway 1L-19R
- Miscellaneous taxiway geometry improvements to enhance pilot situational awareness and minimize the potential for runway incursions. These include eliminating direct runway access,
- Shift South Apron taxiway connector to the west

4.5.2 GENERAL AVIATION AND SUPPORT FACILITIES

Table 4.5-1 summarizes the gross facility requirements that would be required to satisfy the GA demand levels associated with PAL 1, PAL 2, SL 1 and SL 2. In addition to quantifying the gross areas required for aircraft storage, terminal and buildings, and vehicular parking, it also includes a 35 percent contingency for landscaping and drainage areas. As shown, there is currently approximately 70 acres of airport property dedicated to GA facilities at HWO. At both the PAL 2 and SL 2 demand levels, the gross requirements are projected to increase to approximately 87.3 and 90.9 acres, respectively.

Table 4.5-1: General Aviation Facility Requirements Summary 1/

FACILITY	EXISTING	PAL 1 2/	PAL 2 3/	SL 1 4/	SL 2 5/
Aircraft Storage/Maintenance: 6/					
Hangars	355,200	476,200	519,500	485,800	528,200
Apron	1,445,900	1,643,100	1,765,900	1,706,000	1,850,100
Subtotal (Aircraft Storage/Maintenance)	**1,801,100**	**2,119,300**	**2,285,400**	**2,191,800**	**2,378,300**
Terminal & Other Buildings 7/	52,100	78,700	82,700	80,600	85,500
Vehicle Parking	371,500	436,900	469,400	452,400	489,200
Landscape/Drainage 8/	785,400	897,700	963,800	929,100	1,004,300
Total (acres)	**3,010,100 (69.1)**	**3,532,600 (81.1)**	**3,801,300 (87.3)**	**3,653,900 (83.9)**	**3,957,300 (90.9)**

NOTES:

1/ Unless noted otherwise, all values are expressed in square feet.

2/ PAL 1: Coincides with 2025 demand levels from ASEG Study forecast

3/ PAL 2: Coincides with 2035 demand levels from ASEG Study forecast

4/ SL 1: Coincides with the 2025 demand levels from the MPU Sensitivity Analysis forecast

5/ SL 2: Coincides with the 2035 demand levels from the MPU Sensitivity Analysis forecast

6/ The distribution of aircraft storage requirements at HWO is projected to increase from 47 percent to 60 percent. Although this distribution is subject to change as market conditions and customer preferences evolve, the gross aircraft storage requirements would remain relatively constant

7/ Other Buildings may include administration, classrooms, and enclosed storage areas.

8/ A contingency of 35 percent is provided in consideration for landscape area and drainage.

SOURCE: American Infrastructure Development, Inc., June 2018.
PREPARED BY: American Infrastructure Development, Inc., June 2018.

Table 4.5-2 summarizes the facility deficiencies associated with the PAL 1, PAL 2, SL 1 and SL 2 demand levels, should no additional GA facilities be constructed at HWO. These values also are reflective the additional GA facilities that would be required to be constructed at the Airport to adequately serve the operational demand levels associated with each PAL and SL. As shown, a total of 21.7 additional acres of would need to be identified for future GA development to satisfy the SL 2 demand levels. This is reflective of a 31.5 percent increase in area dedicated to GA.

Table 4.5-2: General Aviation Facility Deficiency Summary [1/]

FACILITY	PAL 1 [2/]	PAL 2 [3/]	SL 1 [4/]	SL 2 [5/]
Aircraft Storage/Maintenance: [6/]				
Hangars	121,000	164,300	130,600	173,000
Apron	197,200	320,000	260,100	404,200
Subtotal (Aircraft Storage/Maintenance)	**318,200**	**484,300**	**390,700**	**577,200**
Terminal & Other Buildings [7/]	26,600	30,600	28,500	33,400
Vehicle Parking	65,400	97,900	80,900	117,700
Landscape/Drainage [8/]	112,300	178,400	143,700	218,900
Total (acres)	**522,500 (12.0)**	**791,200 (18.2)**	**643,800 (14.8)**	**947,200 (21.7)**
Net Increase in Requirements	**17.4%**	**26.3%**	**21.4%**	**31.5%**

NOTES:

1/ Unless noted otherwise, all values are expressed in square feet.

2/ PAL 1: Coincides with 2025 demand levels from ASEG Study forecast

3/ PAL 2: Coincides with 2035 demand levels from ASEG Study forecast

4/ SL 1: Coincides with the 2025 demand levels from the MPU Sensitivity Analysis forecast

5/ SL 2: Coincides with the 2035 demand levels from the MPU Sensitivity Analysis forecast

6/ The distribution of aircraft storage requirements at HWO is projected to increase from 47 percent to 60 percent. Although this distribution is subject to change as market conditions and customer preferences evolve, the gross aircraft storage requirements would remain relatively constant

7/ Other Buildings may include administration, classrooms, and enclosed storage areas.

8/ A contingency of 35 percent is provided in consideration for landscape area and drainage.

SOURCE: American Infrastructure Development, Inc., June 2018.
PREPARED BY: American Infrastructure Development, Inc., June 2018.

Table 4.5-3 provides a summary comparison of the Airport's existing airport support facilities and the requirements associated with PAL 2 and SL 2. As noted, the airport has adequate fuel storage facilities and therefore additional fuel storage tanks are not anticipated. Regardless of the demand level, BCAD staff have indicated a need to accommodate the following aviation support facilities:

- expansion or relocation of administrative and maintenance facilities,
- replacement of the air traffic control tower,
- modification to the fire station drive to accommodate a larger fire truck, and
- replacement/relocation of the airfield's electrical vault.

Table 4.5-3: Aviation Support Facility Requirements [1/]

FACILITY	EXISTING	ASEG STUDY FORECAST		MPU SENSITIVTY ANALYSIS FORECAST	
		PAL 2 [2/]	DEFICIENCY	SL 2 [3/]	DEFICIENCY
Fuel Farm	55,200 (Avgas) 23,000 (Jet A)	6,829/wk (AvGas) 4,553/wk (Jet A)	None	8,903/wk (Avgas) 5,935/wk (Jet A)	None
Fire Station	11,900	11,900	None	11,900	None
Air Traffic Control (ATC) Tower Site:	37,980	25,000	None [4/]	25,000	None [4/]
Airfield Electrical Vault	1	1	None [5/]	1	None [5/]
BCAD Facilities					
Airport Administration	1,600	3,100	1,500	3,100	1,500
Airport Maintenance	2,800	4,200	1,400	4,200	1,400
Subtotal (BCAD Facilities)	**4,400**	**7,300**	**2,900**	**7,300**	**2,900**

NOTES:

1/ Unless noted otherwise, all values are expressed in square feet.

2/ PAL 2: Coincides with 2035 demand levels from ASEG Study forecast

3/ SL 2: Coincides with the 2035 demand levels from the MPU Sensitivity Analysis forecast

4/ Due to the age and condition of the existing ATC tower, a replacement ATC tower is anticipated during the 20-year planning horizon

5/ Due to the age and condition of the existing airfield electrical vault, a replacement vault is anticipated during the 20-year planning horizon.

SOURCE: American Infrastructure Development, Inc., June 2018.
PREPARED BY: American Infrastructure Development, Inc., June 2018.

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