HIO MASTER PLAN UPDATE

Planning a Shared Future

Summary Report

PORT OF PORTLAND

DRAFT FINAL
AIRPORT MASTER PLAN
SUMMARY REPORT

For

PORTLAND-HILLSBORO AIRPORT
Hillsboro, Oregon

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Summary Report

Introduction

The Federal Aviation Administration (FAA) recommends that airports update their long-term planning documents every seven to 10 years, or as necessary, to address local changes at the airport. Hillsboro Airport (Airport or HIO) last updated the master plan document in 2005. In 2018, the Port of Portland (Port), with financial support from the FAA, completed a nearly two-year process to update the HIO Airport Master Plan.

An airport master plan evaluates an airport's capabilities and role, forecasts future aviation demand, and forms plans for the timely development of improved or new facilities that may be required to meet that demand. The goal for this update was to provide strategic guidance for HIO's long-term development and sustainability. This master plan document defines future development programs and provides justification for projects that will assist the Port in securing funding participation through federal and state airport improvement programs.

Airport master plans are prepared in accordance with FAA technical guidance. This is intended to be a proactive document that identifies and then plans for future facility needs well in advance of the actual need. This is done to ensure that the Port can coordinate project development, public engagement, stakeholder coordination, environmental documentation, design, financing, and construction in a timely manner.

Objectives that guided the 2018 HIO Airport Master Plan include:

- *Develop active and productive public involvement throughout the planning process.*
- *Formulate and maintain a long-term development program which will yield a safe, efficient, economical, and environmentally acceptable aviation facility.*
- *Preserve public and private investments made in the Airport's infrastructure.*
- *Reflect community goals and objectives of the surrounding communities for quality of life, economic development, and compatible land use.*
- *Research factors likely to affect air transportation demand in the region and develop new aviation demand forecasts to cover a 20-year planning horizon.*
- *Determine projected aviation facility needs of Airport users.*
- *Recommend improvements that enhance the Airport's long-term economic, environmental, and social sustainability.*
- *Establish a schedule of development priorities and a financial program for implementation.*
- *Recommend aviation and non-aviation related land uses on Airport property, coordinating with surrounding jurisdictions to ensure future compatibility with off-Airport development.*

An important outcome of the master plan process was the recommended development plan that identifies preferred areas for facility development. Implementing such planning will ensure development areas will be readily available when required to meet future needs and protect development areas from incompatible land use. The result is a detailed Airport land use concept that outlines specific uses for airport property, including land intended to enhance revenues from commercial/industrial development. The implementation plan included in the study prioritizes future development and provides either an existing project justification or establishes triggers for future justification.

Planning Process

The HIO master planning process included comprehensive stakeholder and public involvement. The centerpiece was the 18-member Planning Advisory Committee (PAC). The PAC comprised a diverse group of community members, airport businesses, and agency representatives. Two members of the PAC were ex-officio representing the Port of Portland (Steve Nagy, Sr. Manager General Aviation) and the community (Jerry Willey, PAC Chair). In addition to nine PAC meetings, the project team received community input through a broad range of outreach methods that coincided with key phases of the project. Community engagement focused on a multimedia approach including online and live open houses, videos, and more than 30 community events and quarterly tenant meetings. Based on an understanding of the local community, the Port emphasized Latinx community outreach, including Spanish translation for various outreach events.

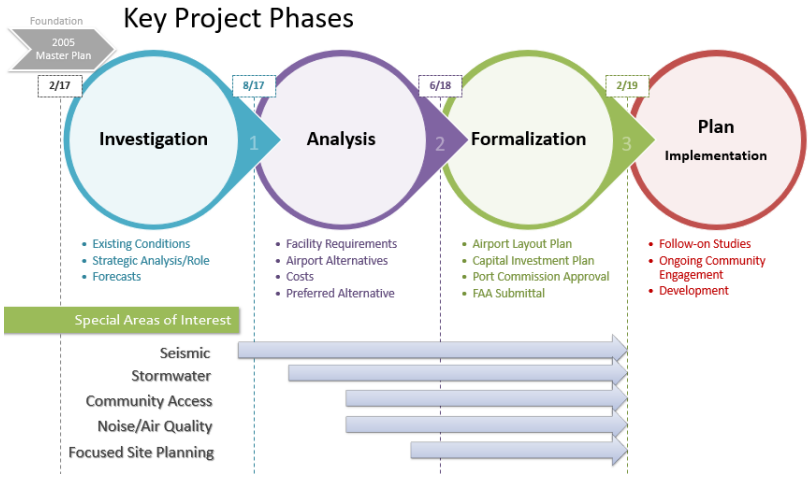

Figure ES1 – Key Project Phases

Through the nearly two-year process, a plan emerged which was guided by sustainability goals that address aviation demand, while considering potential environmental and socio-economic impacts. The plan began with an investigative phase where existing conditions, the role of the Airport, and a 20-year forecast were determined. The analysis phase followed with determining the facility requirements, creating three airport alternatives and then, with PAC and community input, crafting a preferred alternative with project phasing. Evaluation criteria were developed to guide the review and analysis of the different alternatives.

Evaluation Criteria

- *Community planning compatibility*
- *Environmental factors*
- *Financial factors*
- *Operational safety and efficiency*
- *Seismic resilience*
- *Social equity*

The planning effort investigated several areas of special interest including Seismic, Stormwater, Community Access, Noise/Air Quality, and Focused Site Planning which included a 50-year Land Supply Analysis, Cornell Road Subarea Market Study, and an investigation by Portland State University Masters in Real Estate Development students on private development potential in the Cornell Subarea. This additional effort built understanding, explored equity topics and informed the development of the preferred alternative.

Community Involvement Strategy

The Port of Portland and the project team developed a community involvement plan that identified an outreach strategy focused on soliciting input to influence the project at key milestones throughout the planning process. The plan created a diverse schedule of opportunities to engage the public on meaningful topics in advance of decisions. The community involvement process was designed to share information about Hillsboro Airport and collect input on master plan elements that the community could affect. Some elements were more technical or regulatory in nature and were shared primarily for informational purposes.

The project team provided a variety of options for community members to engage in the master plan process. Tools and strategies focused on engaging community members in places they normally spend time, culturally specific engagement with the Latinx community of Washington County, and online engagement. A full report summarizing public involvement activities and outcomes is provided in **Appendix H** of the Master Plan narrative report.

Planning Advisory Committee

The Port convened a Planning Advisory Committee of 18 members to meet publicly throughout the master plan process to advise the project team on key inputs for the master plan analysis and help the Port engage communities affected by, and interested in, Hillsboro Airport and the master plan update.

The former Hillsboro Airport Roundtable Exchange (HARE) provided input on the public involvement scope for the master plan update, including the creation of the committee. The Port worked with local governments and organizations to appoint members that represented a balance of different perspectives.

PAC members met nine times to review project information and provide advice to the project team on key inputs to the analysis as the plan was developed. The project team worked with PAC members throughout the process to ensure their concerns and aspirations were understood and considered as they developed key elements of the master plan. Project staff also used PAC meetings to explain how PAC and community input influenced master plan elements. The PAC also provided concept suggestions and valuable advice as the Port developed an ongoing community engagement strategy. A full report summarizing each of the PAC meetings activities and outcomes is provided in **Appendix J** of the Master Plan narrative report.

Study Phases

The following sections summarize key study phases and outcomes of the 2018 Hillsboro Airport Master Plan Update.

1.0 INVENTORY

Preface

Conducting a detailed inventory of the existing conditions at the HIO is a critical foundational step in the master plan process. The inventory establishes a history and current baseline for numerous airport elements, such as based aircraft, operations, and hangars. The history and baseline are subsequently used as inputs when developing the aviation demand forecasts. Additionally, various other factors are identified in the inventory that may influence the master plan development, including area transportation plans, comprehensive plans, and land use zoning.

Airport History

In 1928, Dr. Elmer Smith purchased 100 acres of the Hawthorn Estate and established a private airport consisting of two turf runways. The local American Legion post assisted in the construction of the original runways. Prior to establishing HIO, Hillsboro's first airstrip was located approximately four blocks north of Main Street. In 1933, several local businessmen acquired the deed for the Airport site, leasing it to the city of Hillsboro for a five-year period. The lease provided the city an option to purchase the Airport at the end of the lease period. Between 1933 and 1938, two runways, one 3,000 feet long (oriented northeast to southwest) and one 2,800 feet long (oriented northwest-southeast), were constructed as a Works Progress Administration project. The city purchased the Airport in 1938 for $7,500.

During World War II, the federal government invested more than $600,000 in improving HIO to serve as a satellite field for the Portland Air Base. Improvements included grading, drainage, and lighting equipment. The Airport site also expanded by 280 acres. The Army did not use the Airport significantly during the war and returned it to civilian use in 1945.

The Port assumed ownership of HIO on February 1, 1966. With federal assistance, the Port constructed two parallel taxiways, acquired additional land for approach protection, and installed fencing. The FAA commissioned the opening of an airport traffic control tower in 1966. In the mid-1970s, the Port constructed the present terminal building on NE Cornell Road and acquired an additional 700 acres of land. The Port extended the primary runway to 6,300 feet in 1976 and installed an Instrument Landing System (ILS). In 1977, a new threshold taxiway at the Runway 30 end produced the existing 6,600-foot usable length for the runway that is still in place today. In 2015, HIO added the third runway that is parallel to the primary runway. Runway 13L/31R is 3,600 feet long and primarily accommodates operations by pilots who are practicing takeoffs and landings. This critical infrastructure addressed an airfield capacity shortage and was a key outcome of the 2005 master plan. **Exhibit ES1** provides an overview of HIO's property and key airfield infrastructure.

Airport System Planning

Airport planning occurs on federal, state, and local levels. At the federal level, Hillsboro Airport is included in the *National Plan of Integrated Airport Systems* (NPIAS). This annual FAA report to the U.S. Congress identifies airports it considers significant in the national air transportation system. There are 3,332 existing airports included in the NPIAS, all of which are eligible for varying levels of FAA funding for capital improvements. The NPIAS identifies HIO as a National General Aviation Reliever airport. Reliever airports receive planning and development assistance from FAA to accommodate the full range of general aviation activity that might otherwise use busier commercial service airports. National Reliever

Exhibit ES1
EXISTING AIRFIELD FACILITIES

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Airports support the national and state system by providing communities with access to national and international markets in multiple states and throughout the United States. HIO is one of 88 National Reliever Airports in the US.

At the state level, HIO is included in the *Oregon Aviation Plan 2007* (OAP) as a Category II – Urban General Aviation Airport. These airports support all general aviation aircraft and accommodate corporate aviation activity, including business jets, helicopters, and other general aviation activity. The primary users are businesses that may service a large geographic region. These airports all experience high levels of general aviation activity. HIO meets all the state recommendations for this airport type except for available vehicle parking.

Airport Administration

The Airport is owned by the Port of Portland, a regional government agency with boundaries encompassing Washington, Clackamas, and Multnomah counties. A nine-member commission sets Port policy. Members of the Port Commission are appointed by the Governor, and confirmed by the state senate, who serve four-year terms. While the Port has many responsibilities other than aviation, the focus of this master plan is Hillsboro Airport. Direct day-to-day management of the Airport is the responsibility of a professional airport manager who has a staff of two operations and four maintenance employees.

Existing Conditions

Hillsboro Airport is approximately 963 acres in size. Of this, approximately 243 acres are disconnected from the main airport property by roads. There are three runways at the Airport. Primary Runway 13R-31L is 6,600 feet long and capable of accommodating most general aviation aircraft. Crosswind Runway 2-20 is 3,821 feet long and it is designed to accommodate smaller single and multi-engine piston-powered aircraft that are more susceptible to crosswinds which would make landing on the primary runway more difficult. Runway 13L-31R is 3,600 feet long and it is intended to accommodate local training activity. The Airport is considered an all-weather facility because it has published instrument approach procedures that allow for continued operations in poor weather/visibility conditions. The Airport has an FAA-owned and operated air traffic control tower.

Historical and Baseline Inventory Elements

The baseline year for the master plan is 2016. There are currently 354 based aircraft at the Airport, ranging in size from small piston-powered aircraft to many of the largest business jets in production. The mix of based aircraft includes 49 jets, 35 helicopters, 17 turboprops, 253 single/multi-engine piston aircraft. The Airport had nearly 200,000 operations (a take-off or a landing) in 2016, ranking second in the state only to PDX. The Airport has a full array of aircraft storage hangars. These include small T-hangars and box hangars, many of which are owned by the Port. There are also several large conventional hangars owned and utilized by airport businesses and private corporations.

Summary

The baseline information and activity data collected in this section will inform the analyses in subsequent phases of the master plan. Key highlights include:

- HIO was established over 90 years ago and is now approximately 963 acres in size
- Three runways provide all-weather capability with an Instrument Landing System, along with crosswind and parallel runways
- The FAA owns and staffs an Air Traffic Control Tower

- HIO is home to 354 aircraft, including large jets owned by major companies and housed in large corporate hangars

2.0 STRATEGIC ANALYSIS

Preface

The strategic analysis evaluates the feasibility of alternative roles for Hillsboro Airport within the context of the local, state, and national system of airports. This analysis provides a foundation for the Port to determine what Hillsboro Airport's role should be through 2036. The defined role will form the basis for the determination of aviation demand (Chapter Three) and facility requirements to meet the aviation demand through the end of the planning period (Chapter Four).

The role of an airport can change over time. For example, as aviation demand grows in a region, an airport could transition from a non-commercial service facility (i.e., general aviation) to a commercial service facility (i.e., passenger airlines).

Current Role

On the federal level, the NPIAS identifies a current and future role for each of the 3,332 existing public use airports in the report. Airports are classified as either primary (i.e., commercial service) or non-primary (limited or no commercial service). Primary airports board or enplane more than 10,000 passengers each year. There are 382 primary airports and 2,950 non-primary airports in the United States. Non-primary airports are further classified as general aviation (2,564), general aviation reliever (259), and general aviation non-primary commercial service (127), which means they have between 2,500-9,999 annual passenger enplanements. HIO is currently classified as a general aviation reliever airport.

General aviation reliever airports serve a vital function in the national aviation system. They are located in more populated areas and are planned and designed to attract general aviation activity that might otherwise use more congested commercial service airports. The Port's two reliever airports in the region, Hillsboro and Troutdale, combine to meet this need, with Hillsboro being more capable of accommodating larger general aviation aircraft (i.e., business jets). HIO meets its current role as one of only 88 National General Aviation Reliever Airports.

Future Role Possibilities

An in-depth analysis determined if another, more comprehensive, role for the Airport is necessary and feasible. Each of the potential roles for the Airport builds upon its current role as a general aviation reliever facility by introducing commercial and/or air cargo service. The following four potential roles for the Airport were considered:

- General Aviation/Reliever
- General Aviation/Reliever/Commuter Service with less than 10 passenger-seat aircraft.
- General Aviation/Reliever/Commercial Service
- General Aviation/Reliever/Air Cargo

Commercial Service Potential

As demand for passenger airline service grows in a community or region, the need for a secondary commercial service airport may eventually be planned. An analysis of those U.S. cities with viable secondary commercial service airports reveals that most of those cities have a much larger population than Portland and are not readily comparable to the Portland area. Three are cities that have a similar population base to Portland: Las Vegas, Orlando, and Tampa. In contrast to Portland/Hillsboro, each of these cities has a major tourist attraction and at least twice the number of total visitors annually compared to Portland.

Paine Field in Everett, within the greater Seattle area, will initiate commercial service in March 2019 with service from Alaska Airlines and United Airlines. Seattle had 40.3 million flying passengers in 2015 compared to Portland's 16.7 million. **Table ES1** below shows the relevant data for these cities.

TABLE ES1
Comparable Cities with Secondary Commercial Airports

City	2016 MSA Population	2016 Visitor Base	2015 Passengers
Las Vegas	2,138,330	43 million	44.8 million
Orlando	2,403,021	66 million	39.9 million
Tampa	2,990,492	22 million	19.9 million
Seattle*	3,765,621	38 million	40.3 million
Portland	2,411,688	9 million	16.7 million

*Beginning in 2018

Using Seattle as a comparison, it is reasonable to conclude that Portland would need to at least double the number of passengers at PDX before commercial service at a secondary airport, such as HIO, would become viable. PDX is not forecast to double in passengers within the 20-year planning horizon of this master plan and is planning facility improvements to meet future demand.

Additional analysis examined the current capability of HIO to accommodate commercial passenger service. There are several limiting factors, including runway length, runway strength, terminal facilities, parking facilities, and roadway access. In addition, Hillsboro Airport would have to meet the federal requirements for an airport operating certificate under Federal Aviation Regulation Part 139 (Part 139), which mandates that HIO would need to have passenger screening, security, firefighting, and numerous other facilities not necessary in its current role. Nonetheless, HIO is arguably the most capable of the six other NPIAS airports in the region with corporate shuttle service using regional jet aircraft. Evolving into a commercial service role would be somewhat easier for HIO than for other local airports.

One type of passenger service that is possible at HIO is commuter service by a carrier utilizing aircraft with fewer than 10 passenger seats. Aircraft of this size can and do currently operate at the Airport, although not in a commercial capacity. This type of service does not require the Airport to have a Part 139 certificate. Thus, passenger screening and a variety of other regulatory requirements do not apply. Most of these small commercial carriers benefit from federal subsidy programs for which HIO is not eligible. While technically feasible, there has been no interest from these small-aircraft commercial carriers to begin service at Hillsboro.

Air Cargo Potential

Hillsboro Airport currently accommodates limited air cargo service. Current regulations limit the air cargo capacity for non-Part 139 airports such as HIO to 7,500 pounds per aircraft. To permit larger air cargo capacity, the Airport would have to hold a Part 139 certificate and undergo significant infrastructure improvements.

Air cargo facilities are typically located at major airports that have the infrastructure to support their operations. This includes the infrastructure to accommodate the intermodal truck delivery aspect of air cargo. PDX currently serves this role for the entire region. Limited air cargo feeder service utilizing small aircraft at HIO began in 2018, however, the air cargo business model still relies primarily on truck delivery. Discussions with the air cargo carriers indicated that large scale feeder service from HIO to PDX would not be cost-effective as compared to traditional trucking of cargo without further significant deterioration of the surface transportation network and associated delays with the regional roadway system.

During the 20-year scope of this master plan, a secondary commercial service airport in the Portland region is not anticipated to be needed based on demand. Therefore, traditional commercial passenger service at Hillsboro Airport is not currently considered feasible. However, at the request of the PAC, the preferred alternative includes development areas which could accommodate future commercial air service, should the demand materialize in the long term. Air cargo service, beyond the limited service currently conducted, is also not considered feasible at this time. The most viable future role for the Hillsboro Airport is to continue its current role as a general aviation reliever airport. Since airport master plans are typically updated every seven to 10 years, the future role of Hillsboro Airport should be addressed again at that time.

Summary

The role analysis in this section will inform subsequent phases of the master plan. Key highlights include:

- The most viable role for the Hillsboro Airport is to continue its current role as a general aviation reliever airport
- A future master plan will reexamine the role of Hillsboro Airport to determine if additional roles are warranted at that time.

3.0 FORECAST

Preface

Forecasts of future aviation demand are an essential element of master planning and provide an important opportunity for the PAC and broader community to develop an understanding of the Airport and what factors affect the level and type of activity that occurs there. Forecasts are developed as part of planning studies and are approved by the FAA. Once the FAA approves the forecasts, they become the basis for establishing future facilities and informs the timeframes for their implementation. The forecasts for HIO are summarized in the following sections.

Aviation Trends and Forecast Inputs

The FAA publishes an annual aerospace forecast that tracks historical activity and provides a 25-year forecast of future aviation demand. Most aviation demand indicators were negatively affected by the national recession of 2007-2009. Following the relatively slow economic recovery, the FAA forecasts that aviation demand (both commercial service and general aviation) is once again on a growth trend. Overall, nationwide general aviation operations are forecast to grow 0.3 percent annually through 2037 and the active general aviation fleet (actual aircraft in operation) is forecast to grow 0.9 percent annually.

In addition to the FAA's national forecasts, forecasting models consider other data points such as recent local socioeconomic forecast data from the Portland area's regional government (Metro) for population, employment, and income. Models also consider historical trends in airport operations and based aircraft, supported by FAA aircraft registration information.

The FAA has oversight responsibility to review and approve aviation forecasts developed in conjunction with airport planning studies. For a general aviation reliever airport such as Hillsboro Airport, this includes forecasting of based aircraft and operations for a period of 20 years. The base year of the forecasts is 2016, and the specific forecast years are 2021 (short term), 2026 (intermediate term), and 2036 (long term).

The forecasts of aviation demand are unconstrained, meaning that the forecast does not consider constraints such as available facilities or funding, but assumes the projected growth could be accommodated. Once a set of forecast data is approved by the FAA, the next step is to identify the facilities necessary to meet the forecast demand such as more hangars to accommodate growth in based aircraft and improvements to meet operational growth. There are also airport improvements recommended in the master plan that are not demand-based, such as potential airfield geometry adjustments necessary to meet recent changes to FAA design standards.

Process

The FAA provides a process for development of aviation demand forecasts. The forecasts should be:

- realistic;
- based on the latest available and reliable data;
- reflective of current conditions at the airport (as a baseline);
- supported by information in the study; and
- able to provide adequate justification for airport planning and development.

The forecast process for an airport master plan consists of a series of basic steps that vary in complexity depending upon the issues to be addressed and the level of effort required. The seven-step process is as follows:

1) **Identify Aviation Activity Measures**: The level and type of aviation activities likely to impact facility needs. For general aviation, this typically includes based aircraft and operations.
2) **Review Previous Airport Forecasts**: May include the FAA *Terminal Area Forecast*, state or regional system plans, and previous master plans.
3) **Gather Data**: Determine what data are required to prepare the forecasts, identify data sources, and collect historical and forecast data.

4) **Select Forecast Methods**: Choose among various accepted methodologies such as regression analysis, trend analysis, market share or ratio analysis.
5) **Apply Forecast Methods and Evaluate Results**: Prepare the actual forecasts and evaluate for reasonableness.
6) **Summarize and Document Results**: Provide supporting text and tables as necessary.
7) **Compare Forecast Results with FAA's Terminal Area Forecast (TAF)**: Apply comparison method with the TAF to determine conformance. Forecasts that differ by less than 10 percent in the 5-year forecast period, and 15 percent in the 10-year forecast period, are considered in conformance.

Aviation activity can be affected by many influences on the local, regional, and national levels, making it difficult to predict year-to-year fluctuations of activity over 20 years. Therefore, it is important to remember that forecasts serve only as guidelines, and planning must remain flexible enough to respond to a range of unforeseen developments. These guidelines remain valuable as planning tools and help the airport owner and community understand general trends and basic expectations.

Approach and Methodology

The approach to forecasting is to employ multiple methods to develop projections for each aviation demand indicator (based aircraft and operations). The results define a planning envelope that identifies the upper and lower limits of potential growth. One of these projections may be the selected forecast, or an average may be used if there are no obvious outliers. A final determination requires both an analytical process and the judgment of the experienced forecaster.

FAA guidance specifies that the forecasting methods employed should be relatively simple unless there is a specific need to employ more complex statistical methods. Typical simple methods include trend line analysis, regression analysis, and market share analysis. With excellent historical data and active public engagement, these typical methods proved sufficient in the development of the forecasts for Hillsboro Airport.

Findings

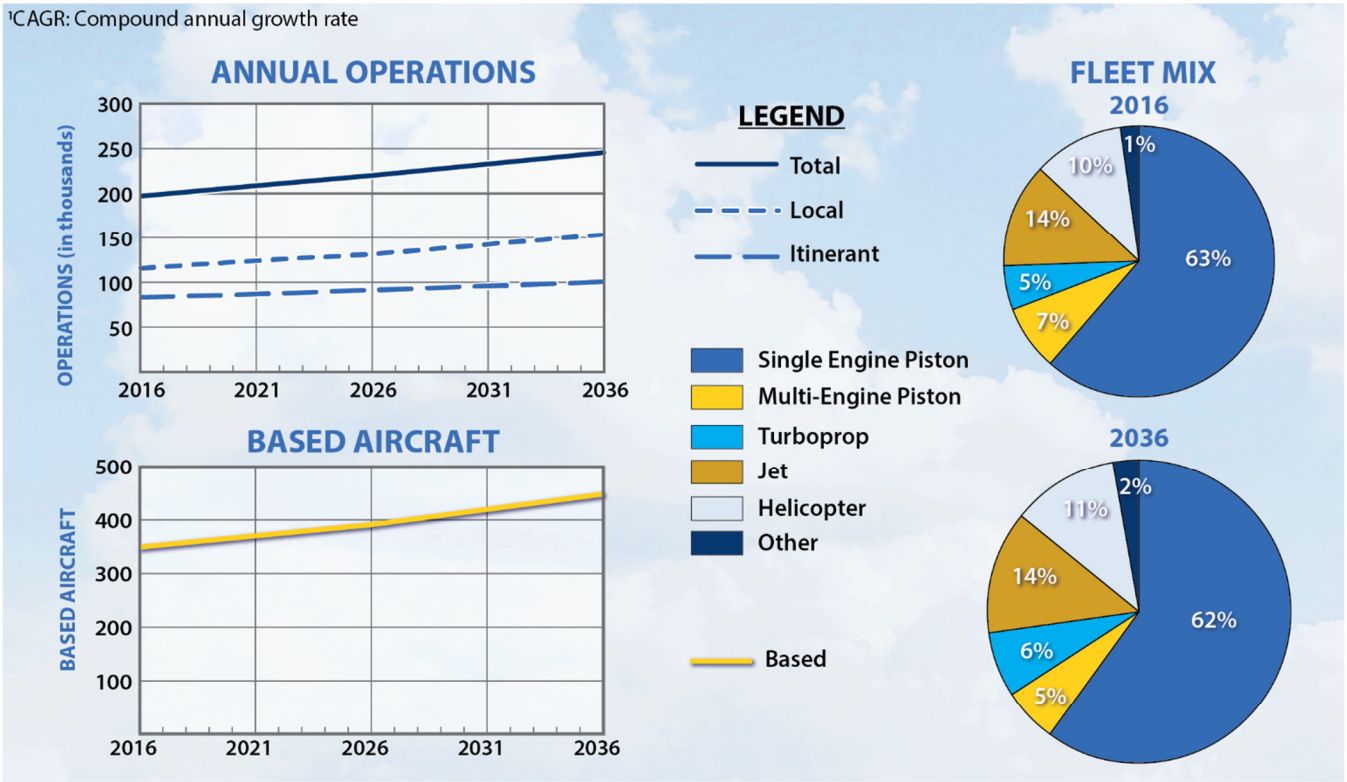
As of 2016, there were 354 aircraft based at the Hillsboro Airport with 223 single engine piston-powered aircraft, making up the majority of aircraft. There were 49 jet-powered aircraft, 35 helicopters, 17 turboprops and 25 multi-engine piston-powered aircraft. By 2036, the preferred forecast anticipates a total of 445 based aircraft, representing an average of six different methods employed. The overall compound annual growth rate in based aircraft at HIO is projected to be 1.15 percent.

The on-Airport control tower tracks operations during their operating hours of 6:00 a.m. to 10:00 p.m. In 2016, there were 197,763 operations. Multiple forecasts of each operational type (local general aviation, itinerant general aviation, air taxi, and military) defined a range of alternative demand levels. A single forecast for each operational type was selected, then combined to provide a total operations forecast. The preferred forecast concludes that by 2036, total annual operations at HIO are forecast to grow to 247,700 for an annual growth rate of 1.13 percent. **Exhibit ES2** summarizes the forecasts of aviation demand for the Airport.

By 2036, HIO expects 445 based aircraft and 247,700 total annual operations, representing an annual growth rate of just over 1.1 percent.

	BASE YEAR	FORECAST			CAGR[1]
	2016	2021	2026	2036	2016-36
ANNUAL OPERATIONS					
Itinerant Operations					
Air Taxi	4,364	4,400	4,600	5,000	0.68%
General Aviation	77,778	81,500	85,600	94,800	0.99%
Military	268	300	300	300	0.57%
Total Itinerant Operations	***82,410***	***86,200***	***90,500***	***100,100***	***0.98%***
Local Operations					
General Aviation	115,332	121,800	130,000	147,500	1.24%
Military	21	100	100	100	8.12%
Total Local Operations	***115,353***	***121,900***	***130,100***	***147,600***	***1.24%***
TOTAL OPERATIONS	**197,763**	**208,100**	**220,600**	**247,700**	**1.13%**
BASED AIRCRAFT					
Single Engine Piston	223	234	245	275	
Multi-Engine Piston	25	25	25	24	
Turboprop	17	20	22	28	
Jet	49	52	55	62	
Helicopter	35	38	41	47	
Other	5	6	7	9	
TOTAL BASED AIRCRAFT	**354**	**375**	**395**	**445**	**1.15%**
PEAKING OPERATIONS					
Annual	197,763	208,100	220,600	247,700	
Peak Month - August (11.17%)	22,085	23,245	24,641	27,668	
Busy Day	903	952	1,009	1,133	
Design Day	712	750	795	893	
Design Hour (11.02%)	79	83	88	98	

[1]CAGR: Compound annual growth rate



The forecasts of based aircraft and operations developed for the master plan were then compared to the most recent FAA TAF for the Airport. Total operations are within the FAA range for consistency. When utilizing the based aircraft count of 354, validated by FAA in August 2017, and applying the FAA TAF based aircraft growth rate (1.62%), the master plan forecast for based aircraft is also within the FAA range for consistency.

Critical Aircraft Determination

The critical aircraft is defined as the most demanding aircraft type, or grouping of aircraft with similar characteristics, that make regular use of the airport. Regular use is defined as 500 annual operations, excluding touch-and-go operations. The critical aircraft is important because it defines the dimensions of various safety-oriented airport design standards such as the runway safety area (RSA), runway object free area (ROFA), obstacle free zone (OFZ), and the runway protection zones (RPZ). These are described in more detail in the next section.

The most demanding aircraft type that makes regular use of HIO is represented by the Gulfstream 650 business jet.

Hillsboro Airport is home to 49 business jets, of which 11 are among the largest in production today. The combination of operations by these large business jets exceeds the threshold for determination of the critical aircraft. In FAA parlance, the critical aircraft is described as D-III-2, which is best represented by the Gulfstream 650 business jet. The letter 'D' represents the aircraft approach category, which describes the approach speed of the aircraft in landing configuration. The Roman numeral 'III' represents the airplane design group, which describes the wingspan of the aircraft. The number '2' represents the wheel-gear width, which relates primarily to taxiway design standards.

Each runway is assigned a critical aircraft which is described in terms of the runway design code (RDC). The RDC has the same first two components as the critical aircraft, but the third component is replaced with a number that represents the lowest visibility minimums that an aircraft can complete a landing. The overall airport critical aircraft determines the RDC of the primary runway.

Summary

Exhibit ES2 provides a summary of each forecast prepared for the master plan. The aviation demand forecasts will inform the analyses in subsequent phases of the master plan. Key highlights for expected demand through 2036 include:

- A net increase of 91 based aircraft is expected for a total of 445 by the end of the forecast period
- Annual operations are expected to increase from just under 200,000 today to 247,700 in 2036
- Aviation activity is expected to grow annually by approximately 1.1 percent
- The critical aircraft at HIO is represented by the Gulfstream 650 business jet

4.0 FACILITY REQUIREMENTS

Preface

To properly plan for the future of the Hillsboro Airport, it is necessary to identify specific types and quantities of facilities required or desired to adequately serve the Airport over the next 20 years. Facilities

are broadly classified as airside (i.e., runways, taxiways, navigational aids, marking and lighting) and landside (i.e., hangars, aircraft parking apron, and automobile parking).

There are four primary sources to identify the facility requirements:

- Aviation Demand Forecasts: The forecasts of aviation demand serve as data inputs to various models, which have been constructed following FAA guidance, to generate facility needs.
- Design Standards Review: FAA design standards are reviewed and evaluated to determine those that apply to the airport based on types and scales of planned activity. Design standards primarily relate to the numerous imaginary safety related surfaces and separation distances.
- Facility Maintenance: Airports are required to maintain their pavement surfaces for the useful life of those pavements. The pavements require routine maintenance and occasionally must be rehabilitated or reconstructed. This category also includes maintenance of airport structures and landside facilities.
- Support Facilities: This category includes all airport related facilities that do not naturally fall into the airside and landside categories and includes elements such as fuel facilities, access and circulation, and general on-airport land use.

Airfield Capacity

Annual Service Volume (ASV) is an estimate of the maximum level of aircraft operations that can be accommodated in a year without incurring significant delay factors. As operations near or surpass the ASV, delay factors increase exponentially. For HIO, the calculated current ASV is approximately 384,000 annual operations. ASV is expected to remain largely unchanged through 2036. Only when annual operations reach 60-75 percent of the ASV should planning for capacity improvements begin. In 2036, operations are forecast to reach 50 percent of the ASV.

Analysis in accordance with FAA Advisory Circular 150/5060-5, *Airport Capacity and Delay,* concludes that the airfield is fully capable of accommodating projected growth in aviation demand. Therefore, no projects specifically aimed at enhancing airfield capacity are needed during the 20-year planning horizon for the Master Plan.

HIO is fully capable of accommodating projected growth in aviation demand throughout the 20-year planning period.

Airfield Requirements

The airfield requirements include detailed analysis of the following:

- Runway Configuration
- Runway Design Standards
- Runways
- Taxiways
- Instrument Approaches

Runway Configuration

There are three runways at Hillsboro Airport. Primary Runway 13R-31L is 6,600 feet long, Crosswind Runway 2-20 is 3,421 feet long, and Parallel Runway 13L-31R is 3,600 feet long. The three-runway configuration is in the proper orientation and provides adequate wind coverage for all aircraft utilizing the Airport. All three runways should be maintained in their current configuration throughout the planning period.

Runway Design Standards

The FAA has established several design standards to protect aircraft operational areas and keep them free from obstructions that could affect their safe operation. These include the runway safety area (RSA), runway object free area (ROFA), runway obstacle free zone (OFZ), and runway protection zone (RPZ).

The RSA north of the Runway 13R threshold is out of compliance with current FAA design standards as a result of a drainage ditch that traverses the area. Alternatives to bring the RSA up to current design standards are the subject of a separate Environmental Assessment (EA) underway at the time this summary is being prepared. All other RSAs at HIO meet the FAA design standards.

The ROFAs beyond both ends of Primary Runway 13R-31L extend beyond the Airport perimeter fence which constitutes an object penetration. Options for mitigating the ROFA deficiency are examined in the Airport Alternatives chapter.

The OFZs surrounding all runways meet design standards and will be maintained.

RPZs are two-dimensional trapezoidal areas beyond the runway ends established to enhance the protection of people and property on the ground. Many airports have incompatible land uses within their RPZs, including Hillsboro Airport. It is the responsibility of the airport sponsor (Port of Portland) to pursue policies that will ultimately provide for compatible land uses within the RPZs. If the size or location of an RPZ changes, thus introducing new incompatible land uses into the RPZ, a detailed alternatives analysis defining how the sponsor intends to address the incompatible uses must be approved by FAA headquarters. Existing RPZ land use incompatibilities are generally acceptable, with the understanding that as opportunities arise to clear the RPZ, the airport sponsor should pursue and/or support those. As no changes are planned to the existing runway configurations or design aircraft, there are no anticipated changes to the RPZ and therefore no need to resolve current incompatibilities at this time.

Runways

Primary Runway 13R-31L is generally capable of accommodating nearly all aircraft in the general aviation fleet in dry conditions, including most of the largest business jets in production. Under certain conditions (hot days, wet runways, heavy loading), specific aircraft models may need a longer runway in order to takeoff with a high percentage of their design load. The analysis, utilizing flight planning manuals of specific large business jets which are based at the Airport, determined that a runway length of 7,500 feet would fully meet the needs under most operating conditions. Although potentially justified, lengthening the runway would also require resolving serious land use incompatibilities and significant infrastructure investments that could make a runway extension infeasible. The potential to extend the primary runway is examined in the Airport Alternatives. Ultimately, extension of the primary runway was determined to be unnecessary and unjustified for the 20-year planning horizon. The Primary Runway effectively meets the needs of the existing and future general aviation fleet at the Airport and should be maintained at its current length. Both the crosswind and the parallel runway are adequate and should be maintained at their current length and width. The full runway length analysis, including a table of runway length requirements for specific aircraft models, is included in Chapter 4 of the narrative report.

Taxiways

Several areas on the airfield do not meet the current FAA recommendations for taxiway and hold apron design. FAA places a high priority on resolving identified “hot spots”, which are airfield areas where the geometry of the taxiways may increase the chance for a runway incursion. There are two airfield hot

spots at Taxiways A6 and A8. The hot spot at Taxiway A8 is additionally included in the FAA's Runway Incursion Mitigation (RIM) program.

Instrument Approach Procedures (IAP)

Visibility minimums and cloud ceiling heights define the capability of an IAP to a runway. The following describes the current IAPs to each runway and future considerations:

- Runway 31R has a Category 1 (CAT 1) IAP with ½-mile visibility minimums. This is an excellent IAP, typically the best for a general aviation airport, and it should be maintained.
- Runway 31L has an IAP with 1-mile visibility minimums. As this is the most heavily utilized end of this runway, visibility minimums as little as ½-mile were considered. It was determined that visibility minimums less than 1-mile would enlarge the RPZ, adding new incompatible land uses to the RPZ, which would require FAA approval or significant relocations of portions of Cornell Road and Brookwood Parkway. Because of this, visibility minimums are planned to remain at 1-mile for Runway 31L.
- Runway 2-20 does not have IAPs to either end. No IAPs are planned for Runway 2-20.
- Runway 13L-31R is the training runway. No IAPs are needed for this runway.

Landside Requirements

Landside facilities are those necessary for handling aircraft and passengers while on the ground. These facilities provide the essential interface between the air and ground transportation modes. The capacities of the various components of each area were examined in relation to projected demand to identify future landside facility needs. This analysis focused on the need to support general aviation activity, which includes recreational flying, business aviation, charter, military, and some portions of air cargo and air ambulance activity. The calculated landside needs by component over the next 20-years are:

- Aircraft Hangars: Approximately 100,000 additional square feet.
- Aircraft Parking Apron: Approximately 13,000 additional square yards.
- Auto Parking and Access: Approximately 431 new vehicle spaces (285 in the terminal area).
- General Aviation Services: Fixed-Base Operators (FBOs) are the primary provider of general aviation services. This is planned to continue.
- Terminal Building: Consider construction of a new terminal building in a new location because of the age and location of the current facility.
- Airport Land Use Plan: Reserve sufficient flight line property for aviation uses. Other land not needed for aviation purposes may be used for non-aviation revenue support development with FAA approval.

Summary

Exhibit ES3 summarizes both the airside and landside facility requirements. Key findings include:

- HIO will need strategic safety and efficiency improvements
- The program will identify aviation land to provide additional space for small GA hangars
- Plans will need to address the near-term need for additional terminal parking.
- A variety of alternatives for both the airside and landside requirements were considered in Airport Alternatives (Chapter 5).

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	AVAILABLE	POTENTIAL IMPROVEMENT/CHANGE
RUNWAYS	**RUNWAY 13R-31L**	
	RDC: D-III-2400	Maintain
	Runway length/width: 6,600' x 150'	Consider extension to 7,500'
	Pavement strength: Planned PCN of 26-33	Maintain
	RSA: 500' wide x 1,000' beyond runway ends	Non-standard RSA grade on Rwy 13R end
	ROFA: 800' wide x 1,000' beyond runway ends	Non-standard: ROFA extends over roads
	OFZ: 400' wide x 200' beyond runway ends	Meets standard - maintain
	RPZ ownership: partial ownership	Acquire if feasible
	RPZ Incompatibilities: Roads	Remove RPZ incompatibilities if feasible
	Precision (13R)/ Nonprecision (31L) markings	Meets standard - maintain
	High intensity runway lighting (HIRL)	Meets standard - maintain
	Distance-To-Go signs: None	Add Distance-To-Go signs
	RUNWAY 2-20	
	RDC: B-II-VIS	RDC: B-II-5000
	Runway length/width: 3,821' x 75'	Maintain
	Pavement strength: PCN = 20	Maintain
	Standard RSA, OFA, OFZ	Meets standard - maintain
	RPZ ownership: full ownership	Maintain
	RPZ Incompatibilities: None	Maintain
	Basic marking	Non-precision marking
	Medium intensity runway lighting (MIRL)	Meets standard - maintain
	RUNWAY 13L-31R	
	RDC: B-I(s)-VIS	Maintain
	Runway length/width: 3,600' x 60'	Maintain
	Pavement strength: PCN = 10	Maintain
	Standard RSA, OFA, OFZ	Meets standard - maintain
	RPZ ownership: partial ownership	Acquire if feasible
	RPZ Incompatibilities: Road	Remove RPZ incompatibilities if feasible
	Basic marking	Meets standard - maintain
	Medium intensity runway lighting (MIRL)	Meets standard - maintain
TAXIWAYS	TDG-2	TDG-3
	Centerline markings	Meets standard - maintain
	Width standard is 50 feet	50' width for primary taxiways
	Medium intensity taxiway lighting (MITL)	Meets standard - maintain
	Taxiway layout/geometry deficiencies	Redesign taxiway layout/geometry deficiencies
INSTRUMENT NAVIGATION AND WEATHER AIDS	ASOS	Maintain
	Beacon	Maintain
	5 Windsocks	Maintain
	RUNWAY 13R-31L	
	½-mile precision ILS (13R)	Maintain
	1-mile non-precision GPS (31L)	Maintain
	RUNWAY 2-20	
	Visual	Maintain
	RUNWAY 13R-31L	
	Visual	Maintain
VISUAL AIDS	**RUNWAY 13R-31L**	
	PAPI-4L	Maintain
	REILs (31L)	Maintain
	RUNWAY 2-20	
	PAPI-4L	Maintain
	RUNWAY 13R-31L	
	PAPI-4L	Maintain

ASOS - Automated Surface Observation System
MIRL/HIRL - Medium/High Intensity Runway Lighting
MITL - Medium Intensity Taxiway Lighting
OFZ - Obstacle Free Zone
PAPI - Precision Approach Path Indicator
PCN - Pavement Classification Number
RDC - Runway Design Code
REIL - Runway End Identification Lights
ROFA - Runway Object Free Area
RPZ - Runway Protection Zone
RSA - Runway Safety Area
TDG - Taxiway Design Group

HANGAR POSITIONS

	Available	Short Term	Intermediate Term	Long Term
Based Aircraft	**354**	**375**	**395**	**445**
Hangar Positions				
T-Hangars	182	158	165	182
Executive/Box Hangars	25	49	51	58
Conventional Hangar Positions	170	113	120	138
Hangar Area (s.f.)				
T-Hangars	219,500	221,000	230,000	255,000
Conventional Hangar	373,600	282,000	300,000	345,000
Executive/Box Hangars	60,900	107,000	113,000	127,000
Total Hangar Area	**654,000**	**610,000**	**643,000**	**727,000**
Maintenance Area	52,200	66,000	69,000	78,000

AIRCRAFT PARKING

Aircraft Parking Positions				
Local Positions	179	66	69	77
Transient Piston Positions	24	47	50	55
Transient Business Jet Positions	7	12	12	14
Aircraft Parking Apron (s.y.)				
Local Apron Area	46,500	33,100	34,600	38,400
Transient Apron Area	44,800	56,800	59,600	65,900
Total Apron	**91,300**	**89,900**	**94,200**	**104,300**

Auto Parking				
Terminal Area	283	362	436	540
Terminal Employee	38	40	42	45
Terminal Rental Car	139	140	146	159
Local Based Aircraft Owners	177	188	198	223
Airport Businesses	396	418	443	496
Total Parking Spaces	**1,033**	**1,148**	**1,265**	**1,463**
Terminal Building				
GA Area (s.f.)	-	1,245	1,305	1,425
Charter Area (s.f.)	-	12,036	16,624	21,428
Total Building Area (s.f.)	**-**	**13,281**	**17,929**	**22,853**
Fuel Storage (static)				
Jet A Capacity	223,500 gal.	Maintain	Maintain	Maintain
AvGas Capacity	110,000 gal.	Maintain	Maintain	Add 10,000 gal. tank
Perimeter Fencing				
Linear Feet	32,100	Maintain and Replace As Needed	Maintain and Replace As Needed	Maintain and Replace As Needed

RED - Total need exceeds existing availability

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5.0 AIRPORT ALTERNATIVES

Preface and Process

Airport Alternatives identify and describe possible specific capabilities that are required or desired to meet the facility requirements defined in previous chapters. Development alternatives are categorized as relating to the airside or the landside. Airside alternatives relate to runways, taxiways and navigational aids. Landside alternatives relate to on-airport land use, hangars, aprons, terminal building, and support services.

A five-step process led to the identification of a preferred alternative. The process is shown in **Exhibit ES4**. The first step examines airfield development alternatives. The second step examines initial land use alternatives. The third step examines more detailed landside development options. The fourth step examines development alternatives for the Cornell and Evergreen Subareas. The final step presents the rationale supporting the preferred alternative. At each step, a series of evaluation criteria and analysis guided the selection of a preferred alternative. Our goal was to have an efficient, flexible, and incremental plan.

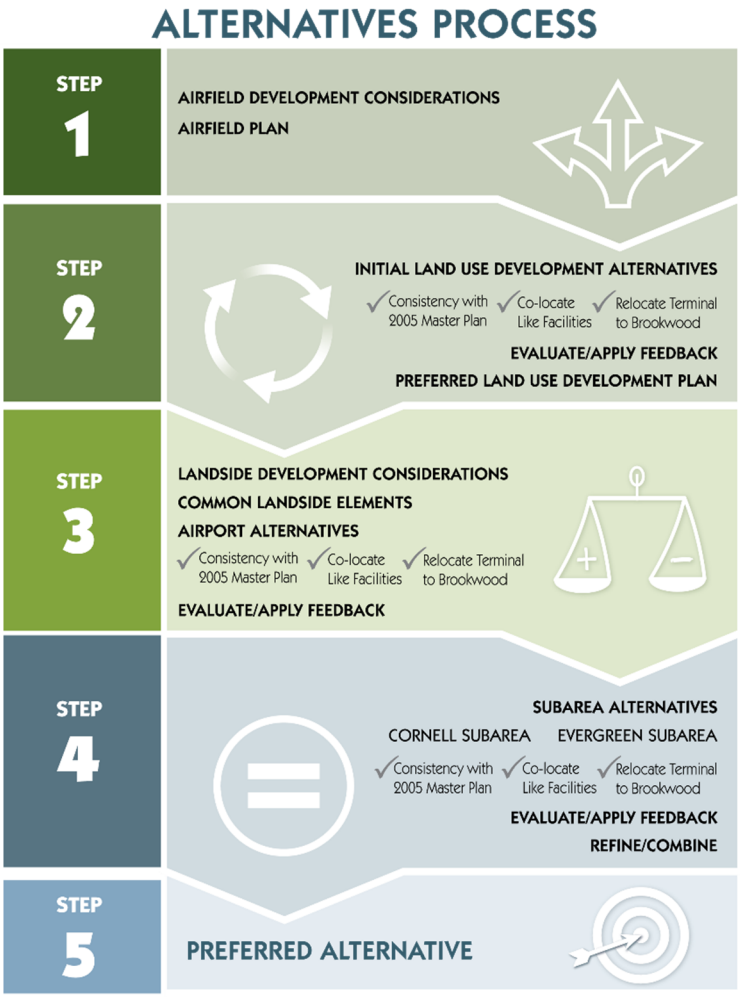

Exhibit ES4: ALTERNATIVE DEVELOPMENT AND REVIEW PROCESS

Planning Elements

The alternatives process is employed for airport elements with multiple potential solutions. If only one solution is viable, the reasoning and justification for that solution is explained and reflected in the preferred alternative. For those with multiple viable solutions, development alternatives focus on the following primary elements:

Airfield Elements:

- Identify runway length alternatives
- Address deficiencies to runway design standards
- - Runway Safety Area (RSA)
- - Runway Object Free Area (ROFA)
- - Runway Protection Zone (RPZ)
- Mitigate Runway Incursion Mitigation (RIM) location

- Mitigate hot spots
- Mitigate taxiway geometry issues
- Identify strategic property acquisition

Landside Elements:

- Overall Airport land use plan
- Future location of a replacement terminal building
- Future location of flight schools
- Future hangar mix and locations
- Identify locations for consolidated maintenance equipment facility
- Identify potential locations for a replacement control tower
- Provide for a continuous perimeter service road
- Present options for the highest and best use of Airport land

Step 1 - Airfield Development Alternatives

Adequate available runway length is a key feature of any airport master plan. Runway 13R-31L is 6,600 feet long, a length that meets the current needs of most aircraft operators. Operators of some large business jets would benefit from a runway length of up to 7,500 feet, which would accommodate long-haul international flights where intermediate stops are otherwise necessary. There is limited demand for the longer runway and justification for FAA funding is not expected until beyond the 20-year planning horizon of this master plan. As a result, the current available length of 6,600 feet is carried over to the preferred alternative.

Exhibit ES5 depicts areas discussed in the next several paragraphs. The Runway Object Free Area (ROFA) is an object-clearance surface where no object penetrations are allowed. Portions of NE Cornell Road and NE 25th Avenue, including fencing and the airport perimeter road, cross the boundaries of the ROFA for Runway 13R-31L. To resolve this penetration, several alternatives were considered to shorten the runway either physically or through declared distances. Because the runway length analysis showed that a longer, not a shorter, runway is needed, alternatives to shorten the runway were not considered feasible. The recommended alternative is to shift both penetrating roads, the perimeter road, and associated fencing slightly, routing around the ROFA.

The RSA that extends 1,000 feet north of the Runway 13R threshold is out of compliance with current FAA design standards due to a drainage swale that crosses the RSA approximately 300 feet north of the Runway 13R threshold. A series of alternatives are currently being considered in a separate EA evaluation.

Runway Protection Zones (RPZs) are trapezoidal areas on the approach of each runway end. These areas should be clear to protect people and property on the ground. RPZ standards have changed over time and now prohibit public roads, structures and various other incompatible facilities. There are existing roads in the RPZs on approach to Runway 13R, 13L, and 31L. Because the roads pre-date the recent changes, no immediate action is necessary. If the size or location of the RPZs change in the future, an alternatives analysis would be required with FAA approval. No changes are planned to current RPZs.

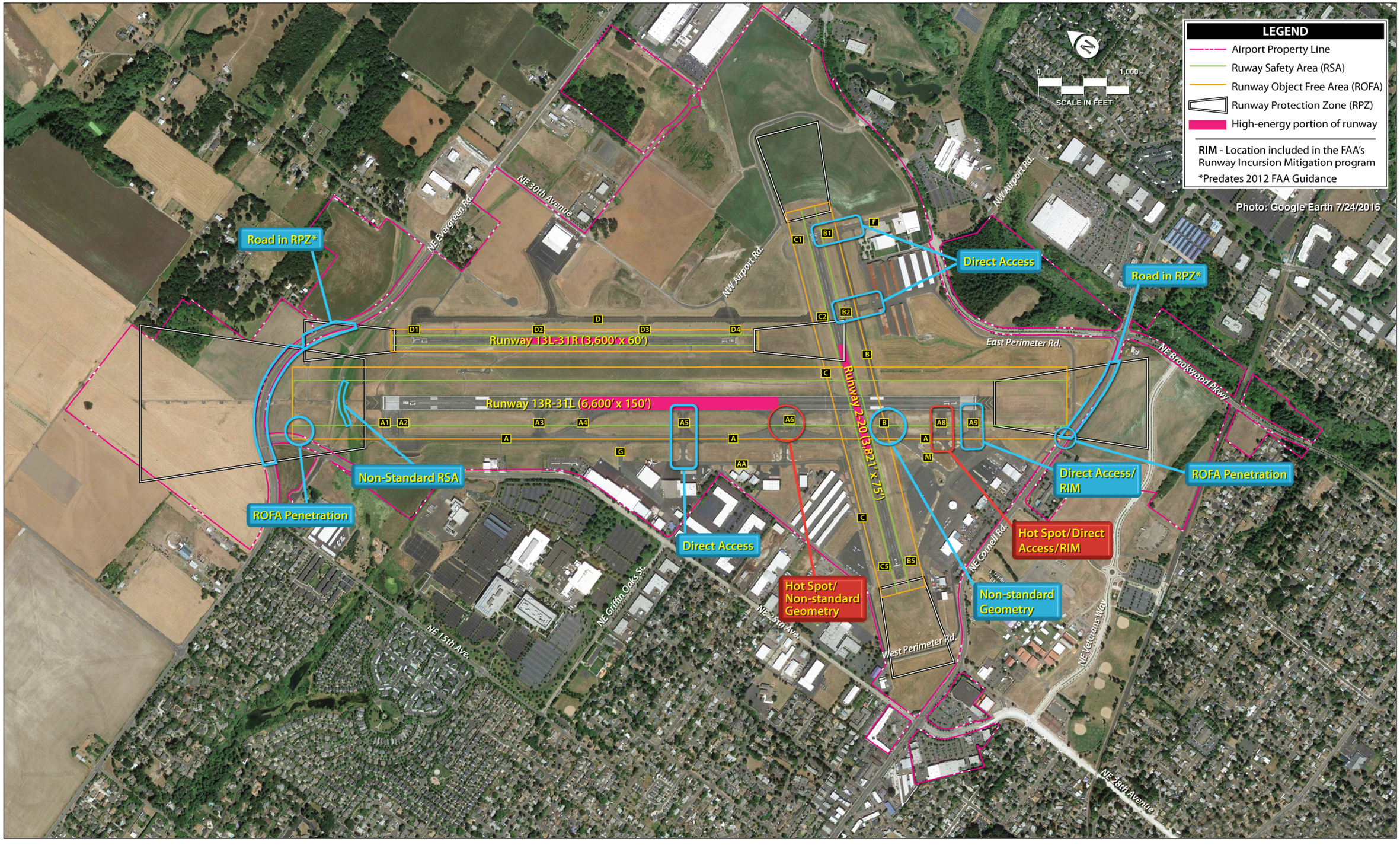

Exhibit ES5
AIRFIELD AREAS OF FOCUS

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Future improvements, including the widening of roads (Cornell Road and 25th Avenue) that have segments within RPZs, could also trigger the need to address the non-standard condition. Transportation plans should consider this potential impact to HIO as improvements are planned for roadway segments within the RPZs.

Two taxiway locations at HIO are presently identified in the FAA RIM program, which identifies and provides funding to address hot spots. Connecting taxiways A6 and A8 each have characteristics that FAA has determined can lead to pilot confusion. Taxiway A6 is a wide expanse of pavement that also allows direct access from an aircraft apron to the runway, both being design elements that should be avoided. The short-term mitigation measure includes incorporating redesigned markings to enhance pilot awareness. The preferred alternative provides a long-term solution by creating a separate taxiway next to A6. Taxiway A8 and the existing hold apron at the Runway 31L threshold has also been identified by the FAA as a hot spot. Pilot confusion can lead to taxiing toward the runway from the hold apron at A8 without a clearance. The short-term solution provides reconfigured lighting and markings to separate the hold apron from the terminal apron. The preferred alternative provides a long-term redesign for A8 and the hold apron that will be incorporated into the terminal redevelopment program.

The previous Airport Layout Plan included a taxiway (Taxiway E) that is situated between the parallel runways. The planned taxiway is retained in this plan to improve ground movement efficiency and provide direct access to the airfield's north side. The cross-airfield taxiway between Runways 13R/31L and 13L/31R, located near the north end of the airfield, will enhance the circulation of aircraft as they taxi between the east and west sides of the Airport.

Prior planning established the site for a helicopter training pad on the airfield's north side. This master plan confirmed that this facility is best situated as originally planned. This site consolidates most training activities on the north side of the airfield.

Step 2 – Initial Land Use Development Alternatives

Planning airport land use is a critical element in the overall airport development plan. There are several guiding principles that all federally obligated airports (including Hillsboro Airport) must consider:

Initial Land Use Development Considerations

1. First and foremost, airports must plan to use airport property to meet current and future aviation demand.
2. Airports must strive toward economic self-sufficiency.
3. Airport land that is not necessary for aviation purposes may be used for compatible non-aviation revenue generation to aid in the economic self-sufficiency of the airport (requires FAA approval).
4. Generally, all land immediately adjacent to the runway and taxiway system must be reserved for aviation purposes.

Based on the 50-Year Forecast/Land Use Analysis, **Appendix G** of the Master Plan narrative report, HIO has enough undeveloped land to accommodate future aviation needs with additional land available to lease for compatible non-aviation uses. Three land use alternatives evaluated methods of identifying

and distributing the land designation. A set of evaluation criteria guided by the Planning Advisory Committee assists planners to analyze each alternative objectively. The evaluation criteria are:

- **Community Planning Compatibility**: Conforming with community plans, flexibility to adapt to changing circumstances, preserving opportunities, proposing socially feasible development, and meeting multiple stakeholders' needs.
- **Environmental Factors**: Increasing compatibility of neighboring uses with typical airport operations. Includes natural resources, air quality, storm water, noise, airport-induced traffic, etc.
- **Financial Factors**: Considers Airport's financial sustainability, balancing costs with expected benefits, opportunities for new/increased revenues, and business success on and around the Airport.
- **Operational Safety and Efficiency**: Increasing overall operational safety and efficiency of the Airport as it grows to meet future traffic levels. Includes meeting all applicable FAA regulations.
- **Seismic Resilience**: Capability of facilities to recover following a major earthquake. "Resilience" means investments made prior to a major earthquake, enabling a quicker recovery.
- **Social Equity**: Equitable distribution of community and economic benefits, while seeking proportional distribution of any airport impacts.

Land Use Alternative 1 – Consistent with 2005 Master Plan: The first alternative is similar to the plan considered during the previous master plan process. Planning includes relocating flight schools to the Airport's north side, gaining closer access to the parallel training runway. The terminal building would remain in the south quadrant (along Cornell Road), with new non-aviation development opportunities in the north quadrant. Hangar construction is incremental based on demand.

Land Use Alternative 2 – Co-locate Similar Facilities: This alternative expands upon recommendations from the 2005 master plan by grouping complementary aviation uses, such as small general aviation and flight training near the parallel training runway. Corporate aviation eventually replaces smaller T-hangars in the east quadrant.

Land Use Alternative 3 – Relocate Terminal to Brookwood: The third alternative considers the feasibility of relocating the terminal and air shuttle services to the east quadrant near NE Brookwood Parkway, while flight schools locate in the north quadrant closer to the parallel runway and corporate aviation development locates in the south quadrant near Cornell Road.

From evaluation and analysis of three generalized land use alternatives, the preferred option is to remain consistent with the direction of the 2005 master plan. Four land use themes emerged that informed subsequent alternatives:

Land Use Themes

1. The terminal building should remain in the south quadrant as this location is already established as the main Airport entrance point. Synergies with the Washington County Fair Complex and MAX Light Rail should be maximized.
2. Flight schools should relocate to the airfield's north side, closer to the training runway and planned helipad.
3. The west side will accommodate infill hangar opportunities.
4. Additional corporate development will be planned in the east quadrant, eventually replacing the existing T-hangars as their economic life expires.

Step 3 - Landside Development Considerations and Airport Alternatives

Building on the conclusions in Step 2, a number of landside development considerations guide the analysis of specific land uses within each quadrant. Landside alternatives all share common features which are summarized below:

- **West Side Infill Development:** The west quadrant accommodates infill hangar development on some currently undeveloped land. All other existing facilities remain.
- **Storm Water Management:** All conceptual planning considers management and treatment of storm water and water quality. Each landside development alternative reserves space for these purposes.
- **Washington County Fair Complex and Events Center:** With the development of the Events Center, alternatives provide opportunities for enhanced synergies with future airport development.
- **Cornell Market Study Conclusions:** Alternatives reflect conclusions of a joint study examining the feasibility of non-aviation uses along NE Cornell Road. The study concludes that limited commercial/retail development could complement aviation uses and enhance revenues.
- **Historic Resources:** Preserving specific historic airport resources is a goal. Alternatives maintain or feature adaptive reuse of some of the original hangars, the "Mushroom" fuel island and the airport beacon.
- **Terminal Building:** A replacement terminal building will remain in the Cornell parcel. Alternatives examine the location within the Cornell parcel and its orientation to the airside facilities.
- **Flight School Campus:** Flight schools will eventually locate in the Airport's north quadrant, closer to the parallel runway and planned helipad.
- **Noise Considerations:** Alternatives consider the noise patterns that result from the location of various landside development elements, as well as other environmental considerations.
- **Aviation Learning Campus:** Landside planning considers the feasibility of supporting an aviation learning campus.
- **Viewshed Preservation:** Enhancement of the sightlines that the public has of the built environment, especially in the Cornell Subarea, needs special attention. This includes Cornell parcel sightlines and the proposed development of an aircraft viewing area.
- **Control Tower Alternatives:** The FAA owns and staffs the control tower which is now more than 50 years old. Plans provide two conceptual locations for a replacement tower which FAA could consider for future development.

Airport Alternatives

Step 3 concludes with the analysis of three Airport Alternatives. Each provides a high-level arrangement of existing and future airport facilities that meet the facility requirements, as well as the common elements identified thus far in the Alternatives process. The major elements that differentiate each alternative are described below:

Airport Alternative 1: Examines the location of flight schools in the northwest corner of the Airport in proximity to the intersection of 30th Avenue and Evergreen Road. The terminal building is reconstructed just north of its existing location to allow for additional vehicle parking.

Airport Alternative 2: Examines the location of flight schools in the east quadrant, replacing the existing T-hangars. The terminal building is shown farther north, along with an FBO terminal.

Airport Alternative 3: Features flight schools located in the north quadrant, near the intersection of Runways 13R-31L and 2-20. A reoriented terminal building frees up enough land to allow complementary non-aeronautical development parcels along Cornell Road.

Presentations to the PAC and at other public involvement opportunities led to the selection of Airport Alternative 3, shown in **Exhibit ES6**. A full analysis of each Airport Alternative, including the application of the selection criteria, is provided in Chapter Five of the master plan narrative report.

Step 4 - Subarea Alternatives

The next step in the alternatives analysis features refined alternatives within two subareas. Subarea Alternatives provide a greater level of detail and understanding that will guide the development and redevelopment in areas along NE Cornell Road and NE Evergreen Road.

The Cornell Subarea is the current airport entrance and home to the existing terminal building. It is also home to two flight schools and other aviation services. The Evergreen Subarea is largely undeveloped; however, a new parallel training runway and an FBO hangar were developed since the last master plan.

The Evergreen Subarea also includes the Airport's east quadrant, which is currently home to corporate aviation hangars and several T-hangars. There is an undeveloped parcel north of the corporate hangars fronting NE Brookwood Parkway. Both subareas present opportunities for HIO to lease land not needed for aviation purposes in order to support aviation uses and/or generate additional revenues.

Cornell Subarea Alternatives

The Cornell Subarea fronting NE Cornell Road is currently constrained, especially for vehicle parking. The terminal building houses activity by a corporate air shuttle as well as several non-aviation uses. The terminal building is aging and is planned to be replaced at some point in the future. All flight schools in the area are planned to locate in the north side of the Airport. Three alternatives were considered for the Cornell Subarea.

Evergreen Subarea Alternatives

Each Evergreen Subarea Alternative maintains that all land approximately 1,000 feet from the runways is reserved for aviation uses. This is enough aviation property to accommodate the next 50 years of aviation development anticipated at the Airport. This leaves approximately 100 acres of Airport property that is available for non-aviation land leases. Three alternatives were considered for the Evergreen Subarea.

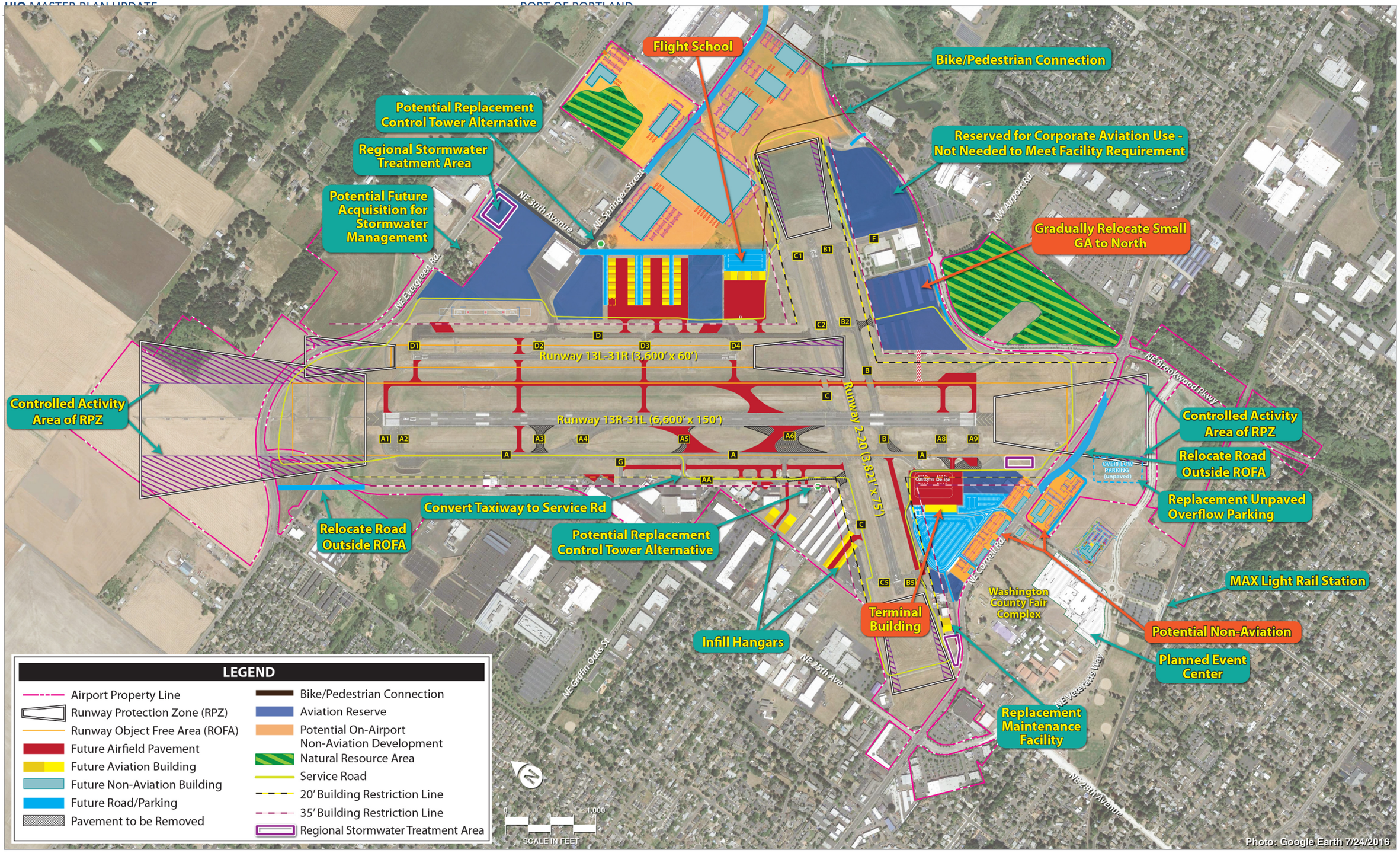

Exhibit ES6
AIRPORT ALTERNATIVE 3

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Step 5 - Preferred Alternative

Following additional analysis from the consultant team and input from the public and PAC, a single preferred alternative emerged, which is presented on **Exhibit ES7**. The major elements of the plan, by Airport quadrant, are summarized as follows:

- **Airside Development:** Mitigation of hot spots, RIM locations, and correction of the non-standard ROFA. New taxiways and hold aprons to improve circulation, especially from the north quadrant to Runway 13R-31L.
- **West Quadrant:** Infill hangar development on undeveloped land. Potential location of replacement control tower and community viewing area.
- **South Quadrant:** Over time, the flight school will relocate to the north quadrant of the Airport, in closer proximity to the parallel training runway. Ultimately, a replacement terminal building will be constructed and reoriented parallel to the primary runway. A replacement terminal building will be located to maximize use of the parcel and allow appropriate complimentary non-aviation commercial development along NE Cornell Road. A new apron to accommodate aircraft used by corporate shuttles.
- **East Quadrant:** This area reserves space for future corporate aviation development as the economic life of existing T-hangars structures expire.
- **North Quadrant:** The north side of the airfield accommodates flight schools and new general aviation hangars. Approximately 100 acres are identified as potential non-aviation development.

Cornell Subarea Preferred Alternative

The preferred alternative plans for the flight schools to relocate to the north quadrant of the Airport and the terminal facilities to redevelop over time. A new terminal loop road with surface parking nearby will connect to a gateway intersection at Cornell Road and 34th Avenue. An aviation reserve area to accommodate future demand beyond the current planning horizon is included. Local aircraft storage needs will also be accommodated in other airport areas.

Reorienting the Cornell Subarea toward terminal-related uses and relocating the flight schools to the Evergreen Subarea provides for additional land for vehicle parking and new opportunities for non-aviation development. Land facing NE Cornell Road may be redeveloped for complementary non-aviation revenue support, including commercial and retail. Non-aviation development will contribute revenue for the Airport and provide opportunities to connect the Airport to the community through increased on-Airport commercial and retail activity. Planned redevelopment of the Cornell Subarea also provides a unique opportunity to increase the synergies between the Washington County Fair Complex, the MAX light rail station and the Airport. The visual sightline from NE 34th Avenue to the Airport enhances this connection.

The Cornell Subarea features an aviation learning campus concept. The aviation museum may also remain in this area. Other historic resources are likely to be preserved. The “Mushroom” fuel island could remain and possibly be converted to an electric vehicle charging station. The existing airport beacon may also be relocated and preserved in some capacity.

Exhibit ES8 presents the Cornell Subarea preferred alternative.

Evergreen Subarea Preferred Alternative

The preferred alternative plans for flight schools to be located on the north side of the Airport. By consolidating flight school activity in this area, student pilots would have more direct access to the parallel training runway, reducing the need to cross active runways. This also helps segregate small and large aircraft operations, enhancing safety and efficiency.

An area identified for future hangars to house small general aviation aircraft is immediately north of the planned flight school and south of the existing FBO facility. The assumption is these hangars will accommodate any tenants of the east T-hangars when they are removed, as well as projected growth in based aircraft. This facility layout provides the shortest access road, reducing development costs.

Approximately 100 acres in the Evergreen Subarea provide potential non-aviation development opportunities that would generate airport operating revenue for HIO. Following careful analysis, the preferred road configuration connects the end of Springer Street over time to the existing signalized intersection at NE Brookwood Parkway.

Exhibit ES9 presents the Evergreen Subarea preferred alternative.

Summary

The alternatives analysis first examined airside needs related to the runway and taxiway system. Runways are planned to remain the same length and width through the 20-year planning period of the master plan. The redesign of specific taxiways will reduce potential pilot confusion that could result in runway incursions. New taxiways will increase aircraft movement efficiency and improve access to the airfield's north side.

Key Findings:

- *HIO runways are planned to remain the same length and width for the 20-year planning period of the master plan.*
- *Land is also reserved for future aviation uses that plans conclude will accommodate HIO aviation needs for at least 50 years.*

On the landside, the Cornell Subarea features a replacement terminal building oriented to face the primary runway, along with a terminal loop road with interior vehicle parking. Flight schools and other general aviation activity will eventually locate in the north quadrant, closer to the parallel training runway and planned helipad. This has the added benefit of moving noise patterns farther to the north over land that is more compatible with normal Airport operations. By relocating these aviation activities, the property fronting NE Cornell Road may generate new revenue from non-aviation commercial and/or retail development. Synergies with the Washington County Fair Complex and Events Center should increase and complement the Cornell parcel development.

The Evergreen Subarea will accommodate flight schools and storage hangars for small general aviation aircraft. There will be new opportunities for storage hangars on the north side when T-hangars have exhausted their useful and economic life. All land adjacent to the runway system, to a depth of approximately 1,000 feet, are reserved for future aviation uses. It is estimated this land will accommodate future aviation uses for at least 50 years.

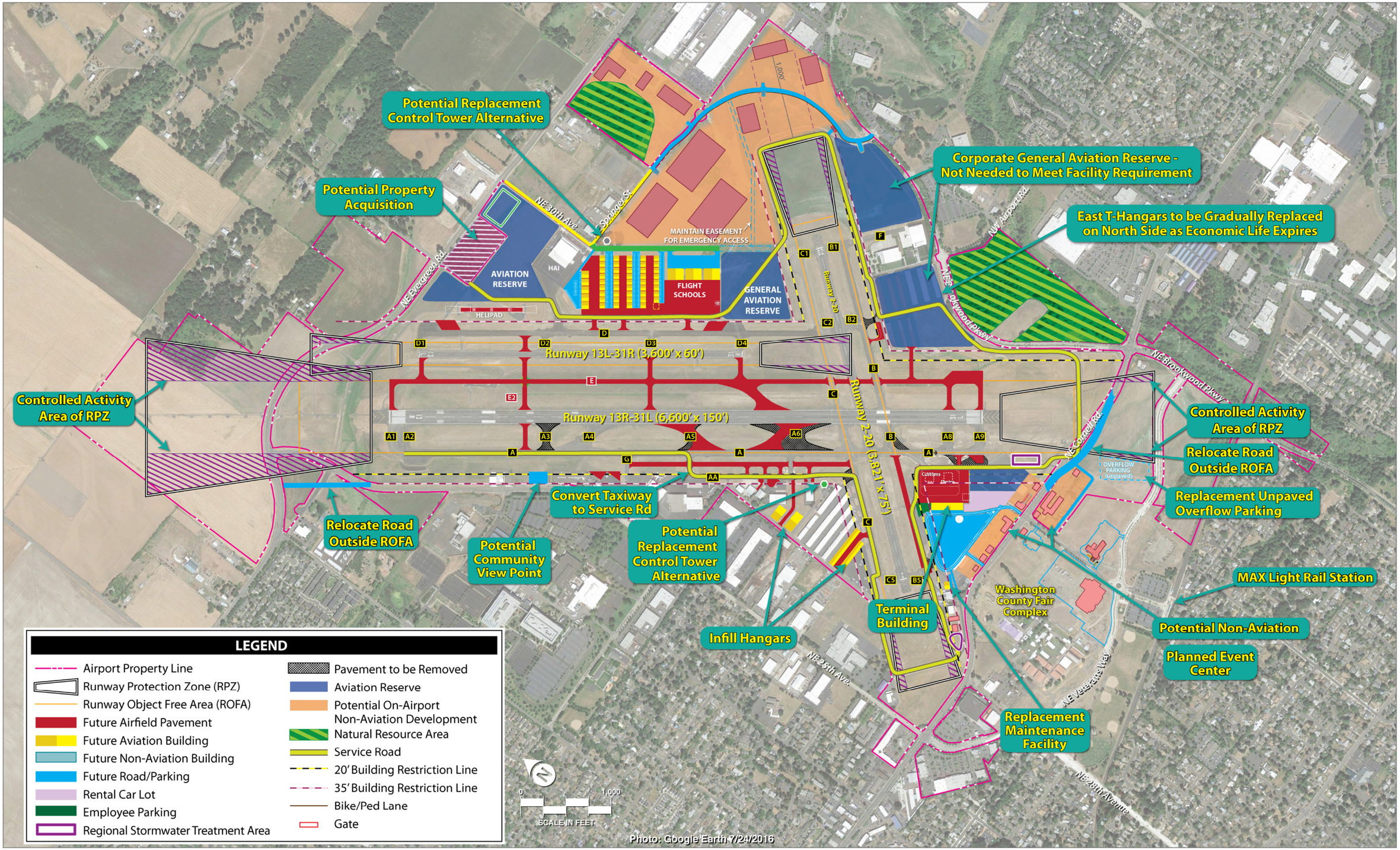


Exhibit ES7
PREFERRED AIRPORT ALTERNATIVE

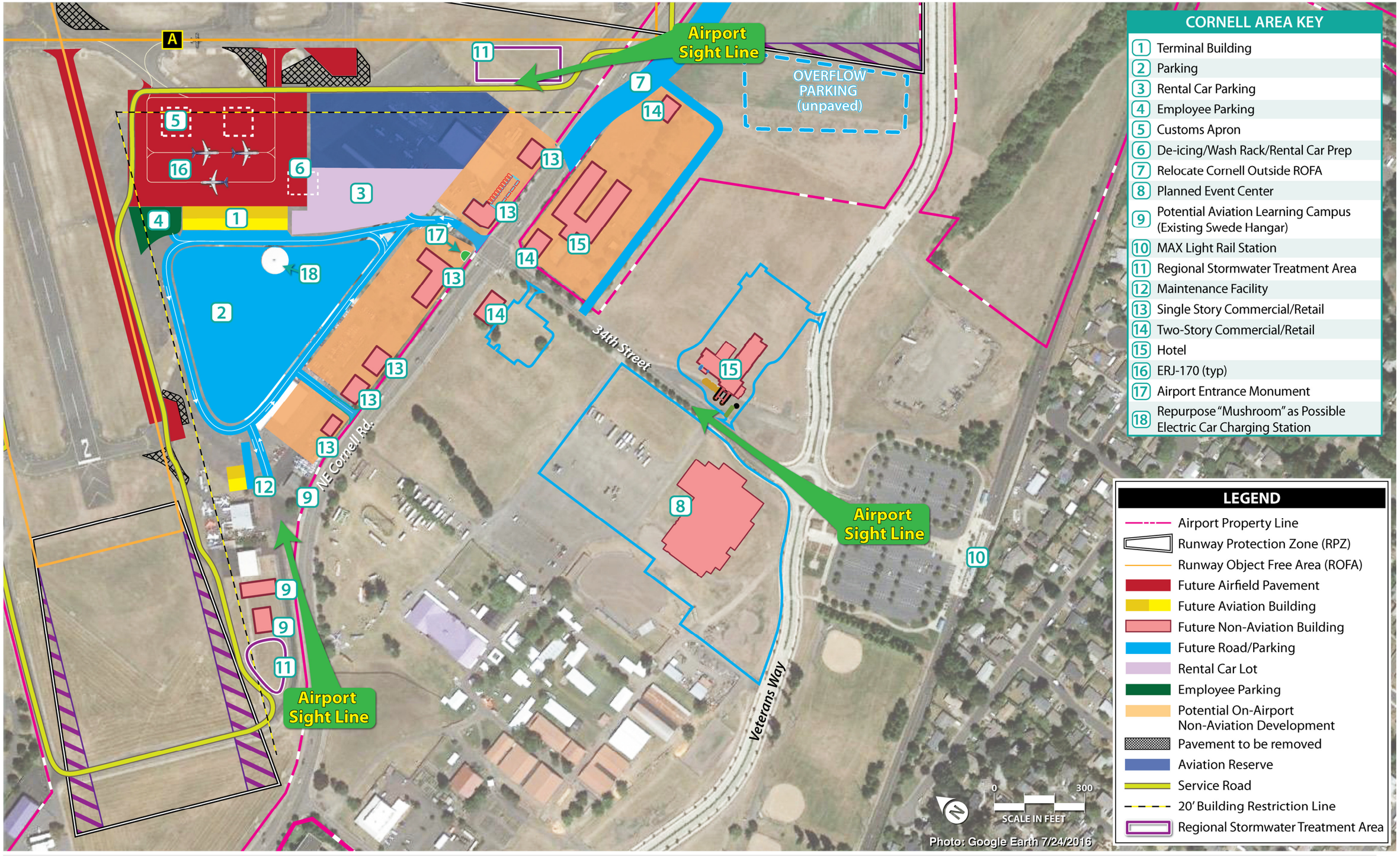
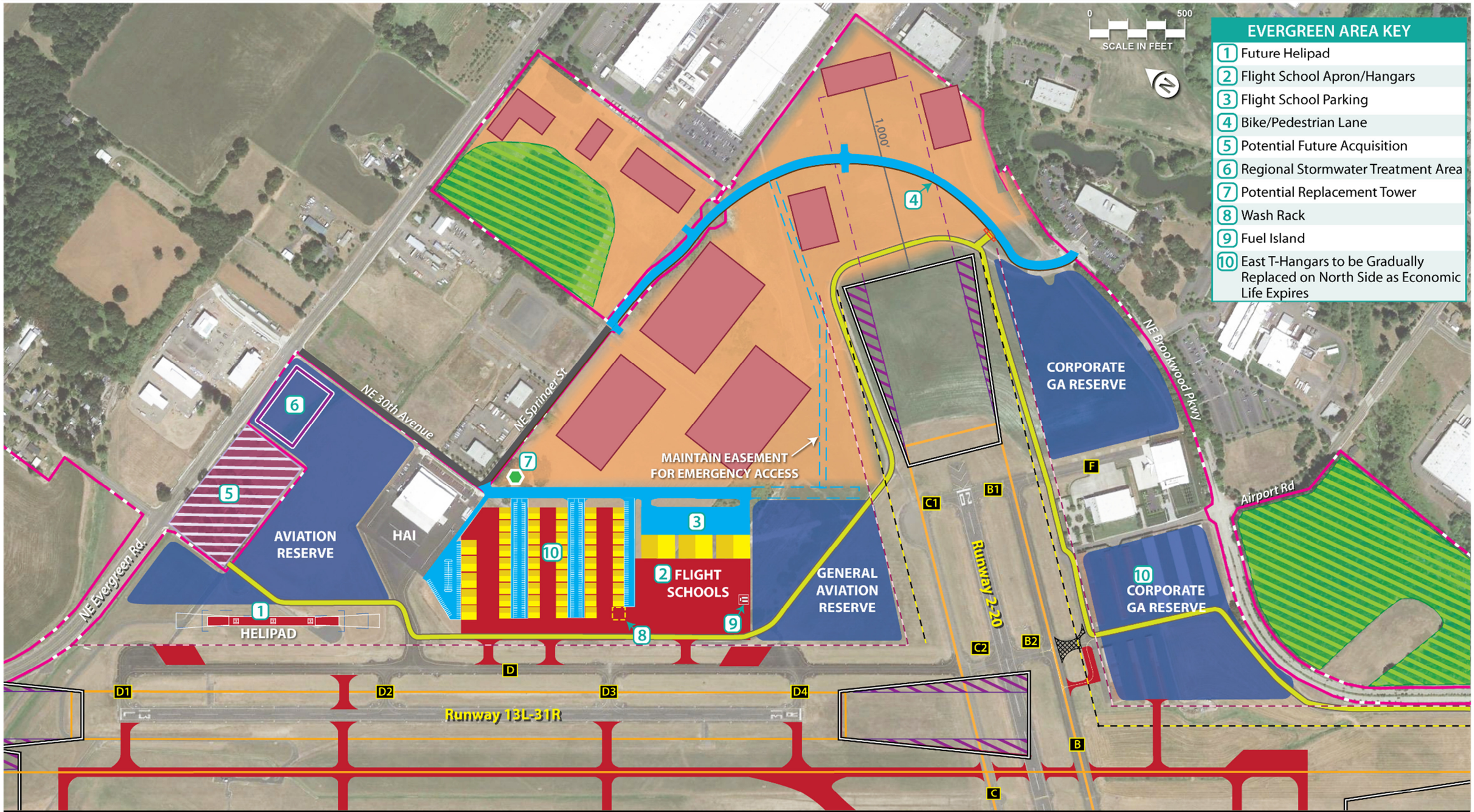


Exhibit ES8
PREFERRED CORNELL SUBAREA ALTERNATIVE



LEGEND

- Airport Property Line
- Runway Protection Zone (RPZ)
- Runway Object Free Area (ROFA)
- 20' Building Restriction Line (BRL)
- 35' Building Restriction Line
- RPZ Controlled Activity Area
- Future Airfield Pavement
- Future Aviation Building
- Future Non-Aviation Building
- Gate
- Future Road/Parking
- Service Road
- Pavement to be removed
- Bike/Pedestrian Lane
- Aviation Reserve
- Potential On-Airport Non-Aviation Development
- Natural Resource Area

Exhibit ES9
PREFERRED EVERGREEN SUBAREA ALTERNATIVE

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The remaining undeveloped land in the Evergreen Subarea features the development of compatible non-aviation uses such as light industrial or warehousing. Revenue from land leases in this area will support the HIO's financial position.

The alternatives analysis, including the public involvement program that provided excellent input through many different methods, yielded a preferred alternative that establishes the key master plan findings. In order to identify an implementation strategy, the remaining tasks in the master plan examine the preferred alternative at the project level in order to identify connected projects, establish priorities, and evaluate feasibility.

6.0 FINANCIAL FEASIBILITY ANALYSIS

Preface and Process

The Capital Improvement Program (CIP) establishes the development needs for Hillsboro Airport over the 20-year planning horizon. The CIP builds on the analysis in previous chapters and identifies projects that will support forecast activity, operational efficiency, and compliance with FAA design standards. Basic economic, financial, and management rationale guides development of the CIP to assess feasibility and phasing.

The overall process of developing the CIP involves several steps:

- Develop a generalized list of projects necessary to complete the program and to understand the rough order-of-magnitude development costs
- Assess, prioritize, and connect enabling projects
- Assess the feasibility of the ranked list of projects by examining all likely funding sources and determining when capital funding may be available

Prioritization of the Capital Improvement Program

The FAA utilizes a priority ranking system to help objectively evaluate potential airport projects. Projects are weighted toward safety, security, reconstruction, standards, and capacity, in that order (FAA Order 5100.38D, *Airport Improvement Handbook*). Typically, the FAA will provide funding for the highest priority projects before considering lower priority projects, even if a lower priority project is considered a more urgent need by the local sponsor. Nonetheless, all projects in the master plan, regardless of FAA priority, should be included in the master plan CIP along with any planned funding requests.

The Port also utilizes its own method to establish priorities for projects identified in the HIO Master Plan, including consideration of input from the public and the PAC. Projects at the top of the pyramid (**Figure ES2**) are those that FAA has already identified for funding within the next few years. However, even lower priority projects may also occur in early years if the market is ready for development and Port funds are available. The priorities for the HIO Master Plan are listed below:

Priority 1 - Existing FAA Grant Funded Projects: Several substantial projects are already advancing in the planning/design/construction process. It is the Port's highest priority to keep these projects moving forward to completion.

Priority 2 – Airfield Safety Projects: Safety is a top priority for both the FAA and the Port of Portland. As a result, projects related to airfield safety have a higher probability of receiving FAA grant funding.

Priority 3 – Maintain Existing Assets: When accepting any FAA grant, the airport sponsor is obligated to continually maintain that asset. Therefore, projects related to asset management are a high priority for both the FAA and the Port.

Figure ES2 – Project Priority Pyramid

Priority 4 – Improve Efficiency and Capacity: These projects generally are airfield-related and are necessary to address growing demand. The timing of these types of projects is often the most susceptible to outside factors such as FAA funding limitations. These projects should remain on the airport CIP until all factors come together for a successful project implementation.

Priority 5 – Development Driven Aviation: Accommodating changes in aviation demand is critical to the orderly growth of the Airport. When demand exists for new/replacement facilities, such as hangars, the Port should promote that land use on Airport property. Under certain circumstances, the Port may wish to make an initial investment (such as site prep or utility extension) so that aviation development is more attractive to a private developer. Land leases can then be established/modified to reflect a reasonable return on investment.

Priority 6 – Development Driven Non-Aviation: Facilitating non-aviation development on the Airport should only be considered when it has been established that there is excess land not needed for future aviation uses. In this case, airports are encouraged to monetize non-aviation land to generate revenue, typically through ground leases, for the airport. The airport sponsor may wish to improve non-aviation land through site preparation and/or utility extension to attract a developer. It should be noted that FAA funds would not be available for this purpose.

Projects Currently Underway

Several HIO projects, including those with FAA funding, are currently underway or planned for the near future. These projects are listed in **Table ES2** along with the estimated cost. These projects are considered separate from the master plan CIP. Each of these projects is eligible for federal funding.

TABLE ES2
Current Projects
Hillsboro Airport

Project Name	Estimated Cost
Runway 13R-31L Reconstruction	$22,468,000
Runway Safety Area Improvements (Runway 13R)	$19,404,000
Taxiway A Rehabilitation	$13,360,000
Taxiway F Rehabilitation	$1,100,000
East Perimeter Road Reconstruction	$1,700,000
Total	**$58,032,000**

Source: Port of Portland

Master Plan Capital Improvement Program

The master plan CIP includes future projects for which the Airport may request FAA funding, which is annually updated and reviewed with FAA. Projects in the CIP are evaluated based on priority and funding availability. Periodically, new projects will arise that can then be added to the annual CIP presented to the FAA. The CIP presented on **Exhibit ES10** lists those projects that have emerged from the Airport master plan process and identifies eligibility of each project for FAA funding. The first year of the CIP is federal fiscal year 2020. **Exhibit ES11** color-codes all projects into short-, intermediate-, and long-term timeframes.

Short-Term Projects (Years 1-5)

Because of the extensive work already planned in the short-term planning period, plans call for only three new FAA eligible master plan projects in the first five-year period. These include a comprehensive EA of near-term projects, the northern cross-airfield taxiway, and make improvements necessary for T-hangar development in the west quadrant near the control tower. Other projects are related to preparing non-aviation land for revenue-generating industrial development. This includes widening NE 30th Avenue and NE Springer Street and improving the intersection of NE 30th Avenue and NE Evergreen Parkway. This would imply site preparation and environmental mitigation that may be required prior to entering into leases with commercial/industrial businesses.

Intermediate-Term Projects (Years 6-10)

The primary focus of the intermediate-term projects is the redevelopment of the Cornell Subarea. Plans call for the construction of a new terminal building situated closer to the main runway along with a new aircraft parking apron and associated vehicle parking lots. The first step for commercial redevelopment along the frontage to NW Cornell Road takes place in the intermediate term.

Two significant airfield projects are planned in the intermediate term. The first will provide a full, unobstructed runway object free area for Runway 13R-31L by slightly rerouting Cornell Road and NE 25th Avenue. The second will reconstruct Taxiway A6 to provide a more traditional geometry and eliminate the FAA-identified hot spot.

Long-Term Projects (Years 11-20)

The long-term projects focus on the buildout of the Cornell Subarea, airfield capacity and efficiency improvements, and the eventual location of the flight schools in the Airport's north side. Extending NE Springer Road to NE Brookwood Parkway and additional site preparation will also facilitate the expansion of the north side industrial property. A dedicated helicopter flight training pad will coincide with the relocation of the flight schools. While these projects establish a trajectory for long-term growth at HIO, a future master plan will also guide long-term development. The plan will update these projects to reflect any changing aviation and market trends, FAA design requirements, and community input.

Cornell Subarea Plan

Exhibit ES12 provides greater detail of the planned improvements within the Cornell Subarea, separated by planning horizon categories. In the short term, the only noticeable change is the redevelopment of the existing hotel site south of Cornell Road. The existing hotel will revert to the Airport and the lessee is obligated to return the land to its original state. Plans call for the redevelopment of a new hotel on the same site.

Cornell Subarea redevelopment will begin in the intermediate planning horizon. A new terminal building will replace the existing building. An access loop road and an interior surface parking lot are also planned. These facilities are planned to be constructed while the existing aviation hangars remain in their current location. The existing terminal building may also remain for a time as well. Ultimately, however, the existing terminal building will be removed to allow for the remainder of Cornell Subarea redevelopment planned for the long-term horizon.

In the long-term planning horizon, plans call for the parking lot and loop road expansion and removal of the existing aviation hangars along NE Cornell Road. Remaining NE Cornell Road frontage will be redeveloped to accommodate non-aviation commercial development. The southwest corner of the Cornell Subarea will be planned as an aviation education campus.

Evergreen Subarea Plan

Exhibit ES13 provides greater detail of the projects planned for the Evergreen Subarea during the next 20 years. The short-term projects identified are geared toward facilitating initial development of the non-aviation land for industrial uses. Widening of NE 30th Avenue and NE Springer Street will accommodate more intensive industrial traffic. The intersection at Evergreen Road and NE 30th Avenue will be improved with dedicated turn lanes and a traffic signal. Land north and south of Springer Street will be improved with utilities, drainage, and other site preparations so the property is ready for non-aviation development. These traffic and utility improvements mutually benefit both aviation and non-aviation development.

The long-term planning horizon also envisions that once the existing east side T-hangars no longer have economic viability, that land would be reserved to accommodate future corporate aircraft activity, subject to market demand. Displaced tenants of the existing T-hangars would have the option of relocating to hangar facilities on the north side of the airfield.

Funding the CIP

There are four sources of funding that are most commonly used to finance HIO development, as shown in **Figure ES3** and described below.

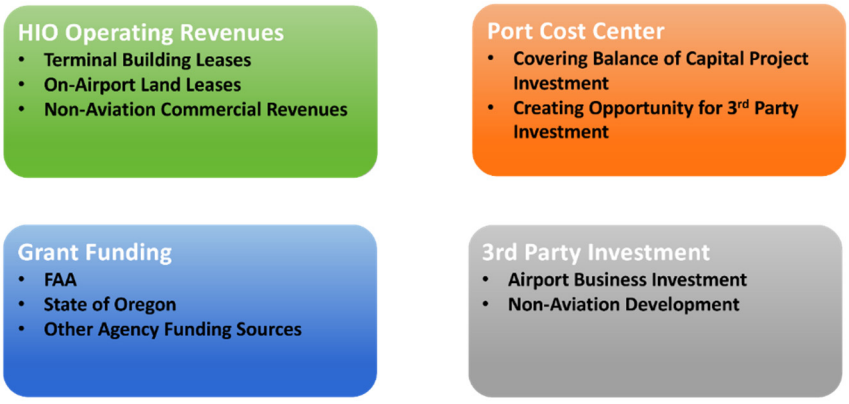


Figure ES3 – CIP Funding Sources

The first source is revenues generated from operations of the Airport. This includes building leases, ground leases (aviation and non-aviation), landing fees, and fuel flowage fees. Ideally, funds generated from these sources would cover the matching share of FAA and state grants.

MP Project Number	Project Name	Estimated Cost w/ Contingencies (2018 Dollars)	Eligible for FAA Funding?
SHORT TERM PROJECTS (Years 1-5)			
1	Comprehensive Environmental Assessment (EA)	$2,800,000	Yes
2	Widen NE 30th Avenue	$2,508,000	No
3	Widen/Extend NE Springer Street	$2,780,000	No
4	Intersection Improvements at 30th & Evergreen	$1,026,000	No
5	Industrial Development - Enabling Infrastructure (South of Springer Street)	$693,000	No
6	Industrial Development - Enabling Infrastructure (North of Springer Street)	$669,000	No
7	Infill Hangar - South	$183,000	Yes
8	Redevelop Hotel	$0	No
9	Construct Crossfield Twy A3/E2 and Remove Existing Twy A3	$3,663,000	Yes
SHORT TERM TOTAL		***$14,322,000***	
INTERMEDIATE TERM PROJECTS (Years 6-10)			
1	Comprehensive Environmental Assessment (EA)	$2,800,000	Yes
2	Terminal Building Construction with Phase I Loop Road from 34th Avenue	$10,039,000	Partial
3	Construct Terminal Apron	$5,086,000	Yes
4	Construct Regional South Stormwater Treatment Area	$2,960,000	Yes
5	Construct Rental Car Parking (Phase I)	$1,646,000	No
6	Construct Phase I Parking for New Terminal Building	$3,625,000	No
7	Re-purpose "Mushroom" Building as Possible EV Charging Station and Decommission Tanks	$230,000	No
8	Construct Employee Parking	$547,000	No
9	Relocate Existing Beacon	$123,000	Yes
10	Remove Existing Terminal Building	$630,000	No
11	Twy A5 & A6 Improvements	$4,312,000	Yes
12	Relocate NE 25th Including Right-of-Way Swaps and Acquisition	$3,203,000	Yes
13	Relocate Cornell Road Including Right-of-Way Swaps	$2,859,000	Yes
14	Construct Single Story Commercial Retail (Middle Parcel)	$486,000	No
15	Airport Entrance Monument	$485,000	No
16	Infill Hangars - North	$459,000	Yes
INTERMEDIATE TERM TOTAL		*$39,490,000*	
LONG TERM PROJECTS (Years 11-20)			
1	Extend Springer Street to Brookwood Pkwy	$4,997,000	No
2	Intersection Improvements at Springer St & Brookwood Pkwy	$497,000	No
3	Industrial Development - Enabling Infrastructure (East Toward Brookwood)	$444,000	No
4	Construct South Portion of Twy E	$4,886,000	Yes
5	Twy B2 Relocation	$881,000	Yes
6	De-icing/Wash Rack/Rental Car Prep	$473,000	No
7	Construct North Side Taxilane and Enabling Infrastructure (Phase I)	$2,175,000	Yes
8	Construct Regional Northeast Water Quality Facility	$6,705,000	Yes
9	Runup Pad Construction on Twy D	$1,225,000	Yes
10	NE 30th Extension to Flight School	$2,109,000	Yes
11	Vehicle Service Road (VSR) Construction	$1,965,000	Yes
12	Flight School Apron Fuel Island	$738,000	Yes
13	Helipad Construction	$535,000	Yes
14	Construct VSR from Springer to T-hangars and Add Gate	$474,000	Yes
15	Construct North Side Taxilane and Enabling Infrastructure (Phase II)	$2,383,000	Yes
16	Remove T-Hangars	$1,444,000	No
17	Extend Twy B and Remove Pavement	$3,263,000	Yes
18	Remove Hillsboro Aero Academy Hangars and Ramp	$1,169,000	No
19	Construct Rental Car Parking (Phase II)	$1,384,000	No
20	Apron Connectors and Pavement Removal	$840,000	Yes
21	Remove 3301 Hangar	$473,000	No
22	Remove Sheepspen Hangar (3301-A)	$218,000	No
23	Phase II Loop Road and Parking Expansion	$3,691,000	No
24	Construct Regional South Stormwater Treatment Area	$1,264,000	No
25	Relocate Twy AA and Convert Old Twy AA to Service Road	$5,128,000	Yes
26	Construct Middle Portion of Twy E	$7,488,000	Yes
27	Construct North Portion of Twy E	$6,486,000	Yes
28	Construct Twy Connectors	$4,367,000	Yes
29	Land Acquisition - Acquire Two Parcels on Evergreen Road	$2,472,000	Yes
30	Construct Maintenance Facility	$2,468,000	Yes
31	Construct Single Story Commercial Retail (East Parcel)	$162,000	No
32	34th Avenue and Cornell Improvements, Roundabout Leading to Terminal	$4,528,000	No
33	Connect Phase II Loop Road to Cornell Rd	$2,533,000	No
34	Construct Single Story Commercial Retail (West Parcel)	$324,000	No
35	Extend Twy B to Flight Museum	$604,000	Yes
36	Community View Point Construction off of NE 25th Ave	$359,000	No
37	VSR Continuation Along Twy A	$19,000	Yes
38	RPZ Land Acquisition	$511,000	Yes
LONG TERM TOTAL		*$81,682,000*	
CIP TOTAL		**$135,494,000**	

Exhibit ES10
CAPITAL IMPROVEMENT PROGRAM

SHORT TERM PROJECTS (1-5 YEARS)

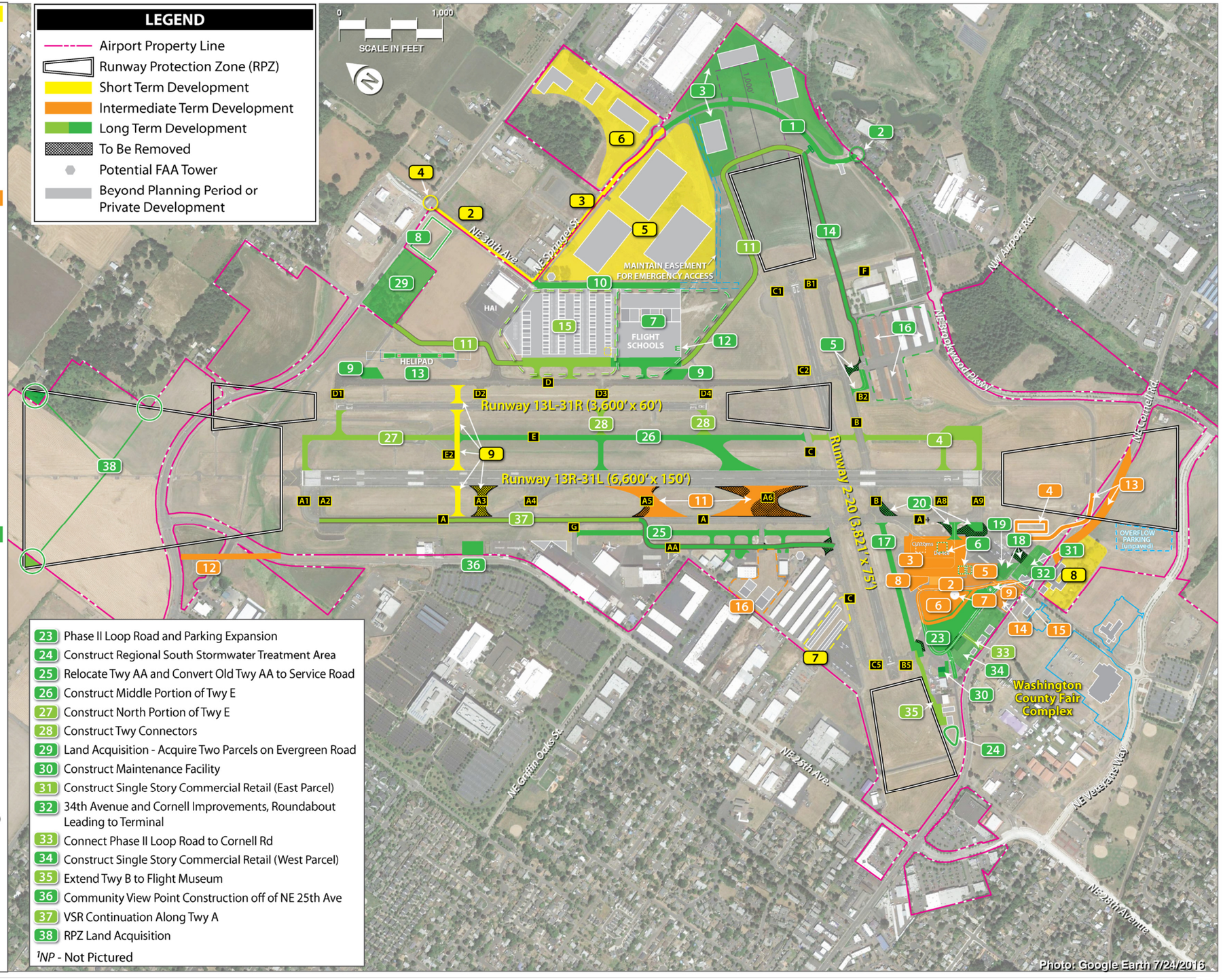
1. Comprehensive Environmental Assessment (EA) -*NP*[1]
2. Widen NE 30th Avenue
3. Widen/Extend NE Springer Street
4. Intersection Improvements at 30th & Evergreen
5. Industrial Development - Enabling Infrastructure (S of Springer St)
6. Industrial Development - Enabling Infrastructure (N of Springer St)
7. Infill Hangar - South
8. Redevelop Hotel
9. Construct Crossfield Twy A3/E2 and Remove Existing Twy A3

INTERMEDIATE TERM PROJECTS (6-10 YEARS)

1. Comprehensive Environmental Assessment (EA) -*NP*
2. Terminal Building Construction with Phase I Loop Road from 34th Avenue
3. Construct Terminal Apron
4. Construct Regional South Stormwater Treatment Area
5. Construct Rental Car Parking (Phase I)
6. Construct Phase I Parking for New Terminal Building
7. Re-purpose "Mushroom" Building as Possible EV Charging Station and Decommission Tanks
8. Construct Employee Parking
9. Relocate Existing Beacon
10. Remove Existing Terminal Building - *NP*
11. Twy A5 & A6 Improvements
12. Relocate NE 25th Including Right-of-Way Swaps and Acquisition
13. Relocate Cornell Road Including Right-of-Way Swaps
14. Construct Single Story Commercial Retail (Middle Parcel)
15. Airport Entrance Monument
16. Infill Hangars - North

LONG TERM PROJECTS (11-20 YEARS)

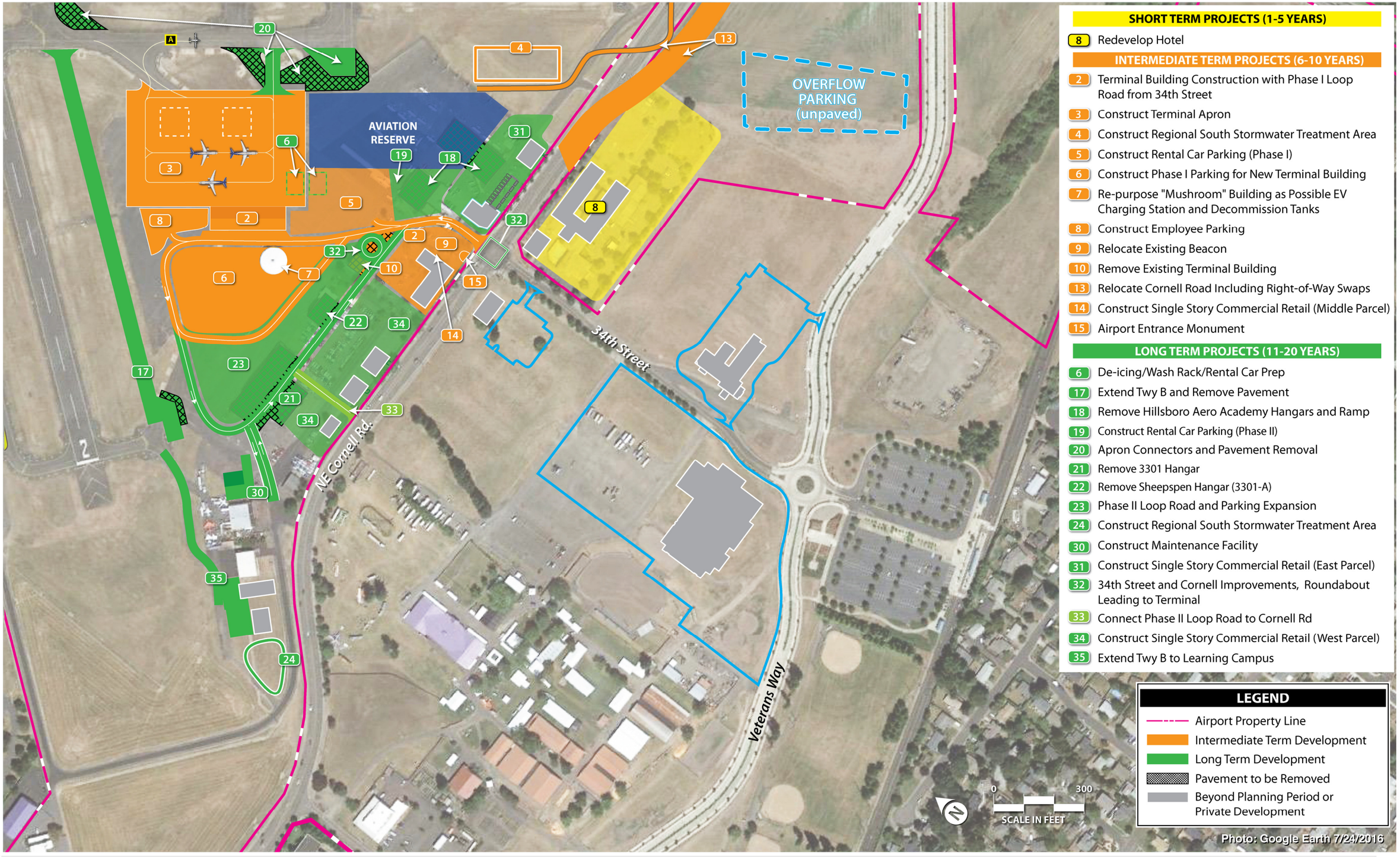
1. Extend Springer Street to Brookwood Pkwy
2. Intersection Improvements at Springer St & Brookwood Pkwy
3. Industrial Development - Enabling Infrastructure (East Toward Brookwood)
4. Construct South Portion of Twy E
5. Twy B2 Relocation
6. De-icing/Wash Rack/Rental Car Prep
7. Construct North Side Taxilane and Enabling Infrastructure (Phase I)
8. Construct Regional Northeast Water Quality Facility
9. Runup Pad Construction on Twy D
10. NE 30th Extension to Flight School
11. Vehicle Service Road (VSR) Construction
12. Flight School Apron Fuel Island
13. Helipad Construction
14. Construct VSR from Springer to T-hangars and Add Gate
15. Construct North Side Taxilane and Enabling Infrastructure (Phase II)
16. Remove T-Hangars
17. Extend Twy B and Remove Pavement
18. Remove Hillsboro Aero Academy Hangars and Ramp
19. Construct Rental Car Parking (Phase II)
20. Apron Connectors and Pavement Removal
21. Remove 3301 Hangar - *NP*
22. Remove Sheepspen Hangar (3301-A) - *NP*



23. Phase II Loop Road and Parking Expansion
24. Construct Regional South Stormwater Treatment Area
25. Relocate Twy AA and Convert Old Twy AA to Service Road
26. Construct Middle Portion of Twy E
27. Construct North Portion of Twy E
28. Construct Twy Connectors
29. Land Acquisition - Acquire Two Parcels on Evergreen Road
30. Construct Maintenance Facility
31. Construct Single Story Commercial Retail (East Parcel)
32. 34th Avenue and Cornell Improvements, Roundabout Leading to Terminal
33. Connect Phase II Loop Road to Cornell Rd
34. Construct Single Story Commercial Retail (West Parcel)
35. Extend Twy B to Flight Museum
36. Community View Point Construction off of NE 25th Ave
37. VSR Continuation Along Twy A
38. RPZ Land Acquisition

[1]*NP* - Not Pictured

Exhibit ES11
PREFERRED ALTERNATIVE DEVELOPMENT PHASING



SHORT TERM PROJECTS (1-5 YEARS)

- 8 Redevelop Hotel

INTERMEDIATE TERM PROJECTS (6-10 YEARS)

- 2 Terminal Building Construction with Phase I Loop Road from 34th Street
- 3 Construct Terminal Apron
- 4 Construct Regional South Stormwater Treatment Area
- 5 Construct Rental Car Parking (Phase I)
- 6 Construct Phase I Parking for New Terminal Building
- 7 Re-purpose "Mushroom" Building as Possible EV Charging Station and Decommission Tanks
- 8 Construct Employee Parking
- 9 Relocate Existing Beacon
- 10 Remove Existing Terminal Building
- 13 Relocate Cornell Road Including Right-of-Way Swaps
- 14 Construct Single Story Commercial Retail (Middle Parcel)
- 15 Airport Entrance Monument

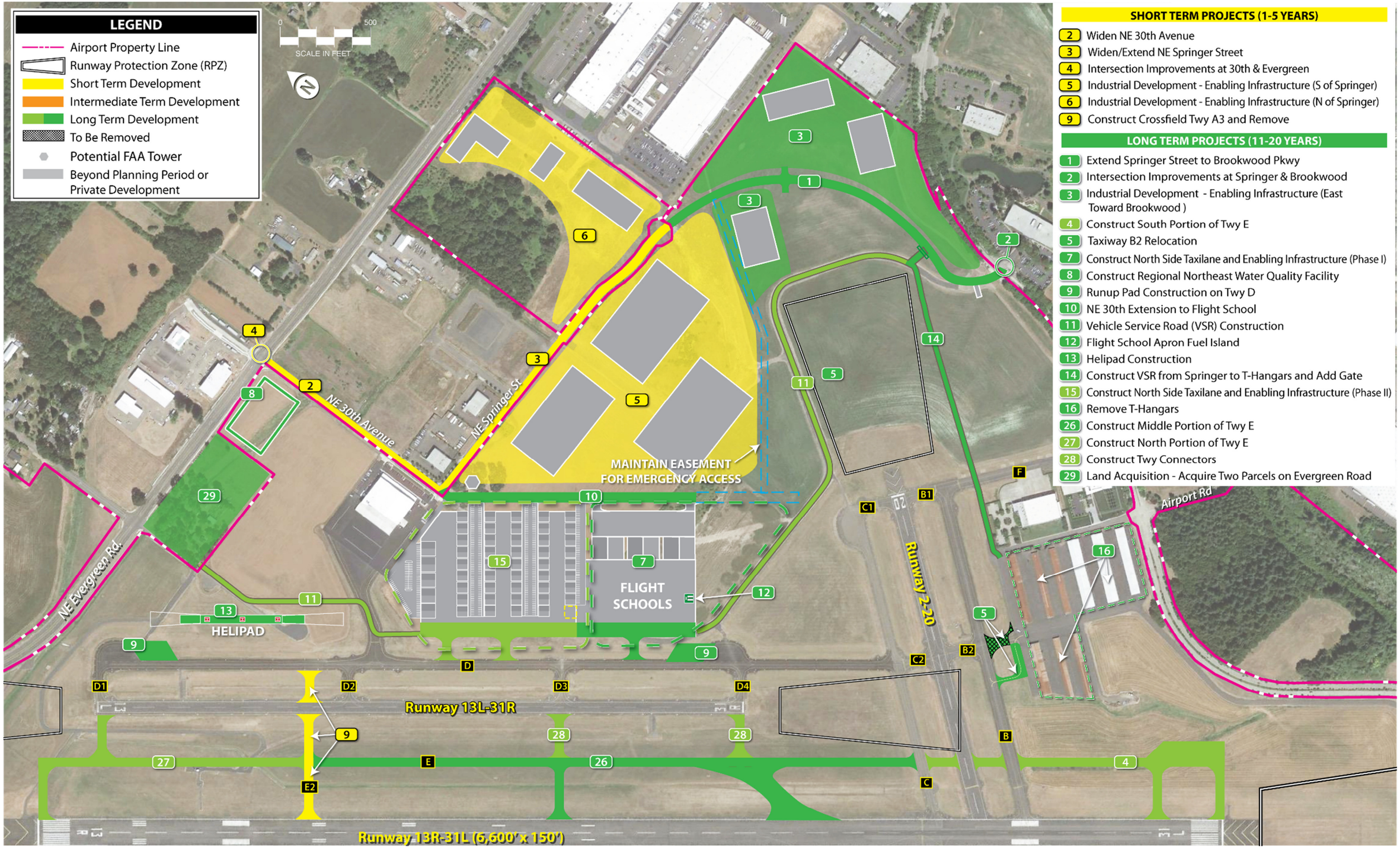
LONG TERM PROJECTS (11-20 YEARS)

- 6 De-icing/Wash Rack/Rental Car Prep
- 17 Extend Twy B and Remove Pavement
- 18 Remove Hillsboro Aero Academy Hangars and Ramp
- 19 Construct Rental Car Parking (Phase II)
- 20 Apron Connectors and Pavement Removal
- 21 Remove 3301 Hangar
- 22 Remove Sheepspen Hangar (3301-A)
- 23 Phase II Loop Road and Parking Expansion
- 24 Construct Regional South Stormwater Treatment Area
- 30 Construct Maintenance Facility
- 31 Construct Single Story Commercial Retail (East Parcel)
- 32 34th Street and Cornell Improvements, Roundabout Leading to Terminal
- 33 Connect Phase II Loop Road to Cornell Rd
- 34 Construct Single Story Commercial Retail (West Parcel)
- 35 Extend Twy B to Learning Campus

LEGEND

- Airport Property Line
- Intermediate Term Development
- Long Term Development
- Pavement to be Removed
- Beyond Planning Period or Private Development

Exhibit ES12
PREFERRED CORNELL SUBAREA ALTERNATIVE DEVELOPMENT PHASING



SHORT TERM PROJECTS (1-5 YEARS)

- 2 Widen NE 30th Avenue
- 3 Widen/Extend NE Springer Street
- 4 Intersection Improvements at 30th & Evergreen
- 5 Industrial Development - Enabling Infrastructure (S of Springer)
- 6 Industrial Development - Enabling Infrastructure (N of Springer)
- 9 Construct Crossfield Twy A3 and Remove

LONG TERM PROJECTS (11-20 YEARS)

- 1 Extend Springer Street to Brookwood Pkwy
- 2 Intersection Improvements at Springer & Brookwood
- 3 Industrial Development - Enabling Infrastructure (East Toward Brookwood)
- 4 Construct South Portion of Twy E
- 5 Taxiway B2 Relocation
- 7 Construct North Side Taxilane and Enabling Infrastructure (Phase I)
- 8 Construct Regional Northeast Water Quality Facility
- 9 Runup Pad Construction on Twy D
- 10 NE 30th Extension to Flight School
- 11 Vehicle Service Road (VSR) Construction
- 12 Flight School Apron Fuel Island
- 13 Helipad Construction
- 14 Construct VSR from Springer to T-Hangars and Add Gate
- 15 Construct North Side Taxilane and Enabling Infrastructure (Phase II)
- 16 Remove T-Hangars
- 26 Construct Middle Portion of Twy E
- 27 Construct North Portion of Twy E
- 28 Construct Twy Connectors
- 29 Land Acquisition - Acquire Two Parcels on Evergreen Road

Exhibit ES13
PREFERRED EVERGREEN SUBAREA ALTERNATIVE DEVELOPMENT PHASING

The second source is grant funding. The primary FAA grant program, the Airport Improvement Program (AIP), provides up to 90 percent funding for eligible projects. Many projects identified in the CIP are eligible for FAA funding. There are other grant funding sources from the state and other agencies, but these are typically small in scale compared to FAA grants.

The third source is directly from the Port Cost Center. This includes revenue contributed from PDX that is used to finance projects at HIO. In the past, Port Cost Center funds have been used to match FAA grants and to finance projects that led to additional private ground leases and, consequently, more revenue to support the Airport.

Finally, private third parties may choose to invest in facilities on Airport property to meet their business needs. The Airport would then receive income from a long-term ground lease. The private development may be either aviation-related or non-aviation as long as it is physically located on land designated for these purposes.

Summary

A total of 64 new projects estimated to cost $135.5 million in 2018 dollars have been identified through the master planning process. The major themes of the master plan are:

- Construction of several new taxiways to facilitate efficient aircraft movement around the airfield
- Design and reconstruction of several taxiways that are considered hot spots by the FAA
- Redevelopment of the Cornell Subarea to accommodate both aviation and non-aviation uses
- Introduction of commercial uses along Cornell Road
- Shifting small portions of Cornell Road and 25th Avenue to meet FAA design standards for the airfield
- Construction of a replacement terminal building parallel to the primary runway
- Relocation and consolidation of flight schools in the north quadrant of the Airport
- Utilization of more than 100 acres of property in the Evergreen Subarea for non-aviation development

7.0 AIRPORT LAYOUT PLAN

The Airport Layout Plan (ALP) is a set of drawings that depicts HIO's existing conditions along with the master plan's recommended improvements. Prepared according to FAA criteria, the ALP comprises a set of drawings, each with a specific purpose and prescribed contents. The ALP is a crucial document because to establish eligibility for federal funding, proposed facilities must first appear on an approved ALP. As such, FAA requires airports to keep the ALP current at all times. To satisfy this requirement, the ALP is presented along with the master plan as the key master plan deliverable that is approved by the FAA at the end of the project.

The full Airport Layout Plan set of drawings is included with the 2018 Airport Master Plan Update in **Appendix B** of the master plan narrative report.

8.0 AREAS OF SPECIAL INTEREST

Several companion studies were prepared concurrently with the master plan. These studies helped to inform and integrate areas of special community interest that warranted additional analysis beyond what master plan methodology normally provides. Each is briefly described below. Full reports are included in the cited appendices in the master plan narrative report.

Noise and Air Quality Analysis

The FAA mandates a specific software model for analyzing and graphically describing existing and future noise and air quality effects from airport operations. Accordingly, planners used inputs from current aviation activity as well as approved forecasted activity to analyze noise and air quality using the Aviation Environmental Design Tool (AEDT). The outputs from the AEDT model guided several master plan analyses and was also presented to the public at an Information Session held on October 12, 2017.

The modeling results were incorporated into the Airport Alternatives (Chapter 5) evaluation process and discussed in the Environmental Overview. The noise contour outputs were useful in understanding the potential differences among land use alternatives that located key aviation uses in various areas of the Airport. The master plan also provides updated estimates for emissions of certain criteria pollutants. Lead emissions have been a topic of concern at HIO and the master plan provides current information on the FAA's program to reduce lead emissions through alternative fuels.

Appendix C of the master plan narrative report contains the full Noise and Air Quality Analysis. **Appendix E** of the master plan contains the Environmental Overview.

50-Year Forecast/Land Supply Analysis

As an added element of the master plan update for HIO, planners examined the total supply of land that may be required for aviation uses over a 50-year period. The master plan provides forecasts of aviation demand and facility needs over a 20-year period. The master plan's development program identifies land for aviation development along with land held in reserve that is adjacent to the runways and taxiways. This reserved land significantly exceeds forecast requirements for the 20-year master plan timeframe. The 50-year analysis examines potential growth scenarios for an additional 30 years. If enough suitable land has been reserved for future aviation development, then non-aviation areas with longer lease terms may be considered as an important part of HIO's financial sustainability strategy. The study also demonstrates to FAA that land along NE Cornell Road that is currently designated for aviation uses can be converted to non-aviation uses that enhance revenues and make the Airport more self-sustaining over time.

Even though the master plan concluded that HIO's role will not include scheduled airline service, a scenario looked at that possibility and the resulting land use needs. The analysis concluded that the land allocated for aviation use in the master plan will meet the needs of the Airport for the next 50 years in its present role as a general aviation reliever airport. At the end of that period, an additional 18 acres of land would remain available to accommodate aviation growth. While the analysis shows that the Cornell Subarea could support some level of commercial passenger service, the area becomes constrained when enplanements increase beyond 250,000 annual passengers due to high level parking assumptions. The

analysis should give the Port confidence that the 2018 HIO Airport Master Plan Update reserves sufficient land area to accommodate growth in current aviation uses for a 50-year timeframe (2066).

Appendix G of the master plan narrative report contains the full 50-Year Land Supply Analysis report.

Seismic Resilience Assessment

The Port commissioned a seismic resilience assessment to inventory and assess existing facilities at HIO, review existing emergency response plans, and understand the stated role and expectations from stakeholder agencies. The assessment was used as part of the master planning process to incorporate appropriate resilience goals for HIO into the master plan. As a part of the study, structural assessments of two key Port-owned buildings were completed. Two agency stakeholder meetings were also convened by the Port during the master plan study phase to better understand the status of regional resilience planning and any defined role that had been identified for HIO.

Appendix K of the master plan narrative report contains the full Seismic Resilience Assessment report.

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