

Chapter Five

AIRPORT DEVELOPMENT ALTERNATIVES

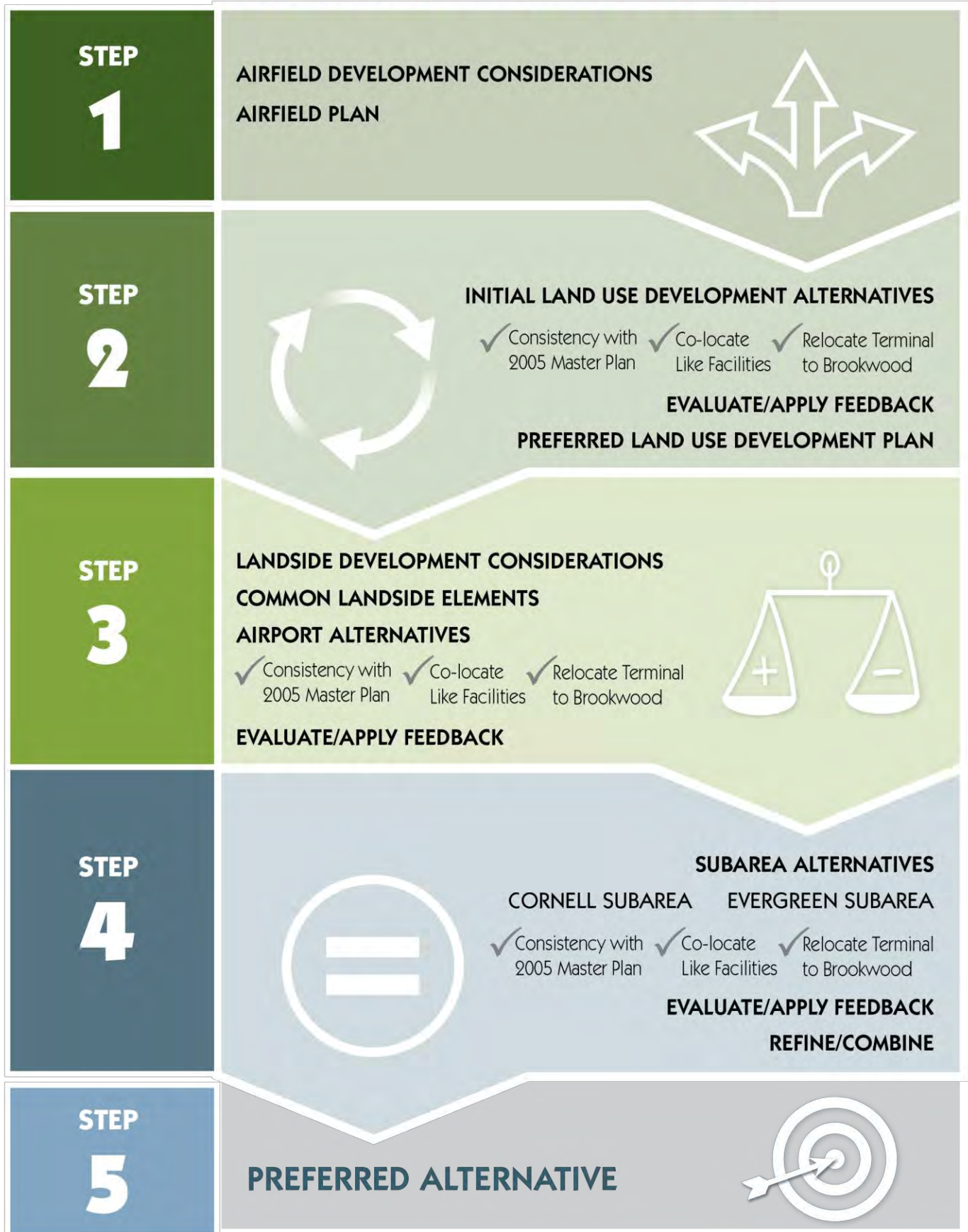
Airport Master Plan
Hillsboro Airport

The previous chapter identified airfield and landside facilities to satisfy the projected airport needs for the next 20 years. Next, alternatives will be identified and discussed. Reasonable alternatives will meet the needs of airport users and be consistent with the mission and vision of the Port of Portland. In this chapter, three types of alternatives will be addressed:

- 1) **Airside Alternatives:**
 - These alternatives include runway and taxiway elements focused on FAA design standards.
- 2) **Initial Land Use Alternatives:**
 - These alternatives focus on the overall picture of long-term land use at the airport.
- 3) **Landside:**
 - These alternatives include a detailed presentation of landside facility needs focused on two defined subareas – The Cornell Road terminal area and the undeveloped north/northeast portions of the airport.

There are a wide variety of potential airside and landside development options. Reasonable alternative development options are identified and discussed in this chapter. Factors such as cost and environmental constraints will be addressed in a future chapter. The goal of this chapter is to identify a viable set of alternatives. An alternative will be recommended based upon various criteria and presented in the next chapter. **Exhibit 5A** shows the process of how alternatives are developed and reviewed.

ALTERNATIVES PROCESS



Any development proposed for a master plan evolves from analysis of projected needs for a specific time period (i.e., the 20-year forecasts). These needs were determined by using industry-accepted statistical methodologies. However, unforeseen future events could impact the timing of these identified needs. One purpose of the master planning process is to develop a viable concept for meeting the projected demands for the next 20 years. However, no plan of action should be developed which is inconsistent with the future goals and objectives of the Airport. This chapter presents alternatives to meet the Airport's development needs, improve the Airport system, while responding to environmental, fiscal and other objectives.

The development alternatives for the Airport can be categorized into two functional areas: the **airside** (runways, navigational aids, taxiways, etc.) and **landside** (hangars, apron, terminal area, support facilities and vehicle access). Within each of these areas, specific capabilities and facilities are required or desired. Each functional area interrelates and affects the development potential of the others. All areas are then examined individually and combined to ensure that the final plan is functional, efficient and cost-effective.

Not all airside or landside elements require detailed alternatives discussion. Detailed discussion is intended to present solutions to specific issues. For those airside or landside elements where only one solution is reasonable or where no alternative is necessary, an explanation narrative is provided.

5.1 NON-DEVELOPMENT ALTERNATIVES

Prior to presenting development alternatives for the existing Hillsboro Airport, the following non-development options are considered:

- **No-Build:** This alternative considers discontinuing all new capital investments at the Airport except for routine maintenance and safety-related projects.
- **Relocate Airport:** This alternative considers constructing a new airport and closing the existing facility.
- **Transfer Services:** This alternative considers transferring all services to another existing airport and closing the existing facility.

While non-development alternatives are introduced in this master plan, the FAA, the airport sponsor (Port of Portland) and the consulting team are all contractually obligated to complete this master plan for the existing airport. If the airport sponsor desires to pursue one of the non-development alternatives, then additional and separate planning studies need to be undertaken after completion of this master plan.

5.1.1 NO-BUILD ALTERNATIVE

The no-build alternative considers making no new capital investments in the Airport. Limited maintenance and upkeep would continue so that the Airport remains safe for aviation activity. No new hangars or apron area would be planned by the Airport sponsor; however, this would not and could not include

the prohibition of hangar construction by a private entity. The obvious result of the no-build alternative is that the Airport would be unable to meet the forecast demand for aviation services in the area.

The primary reason a community might choose a no-build alternative is to be unfettered by the grant assurances (see Appendix B) associated with the acceptance of airport development grants. Grant assurances are part of the grant package contract that the airport sponsor commits to when accepting a development grant from the FAA. Grant assurances make airport sponsors responsible for maintaining the facilities developed or equipment acquired under an FAA grant. The term “useful life” means not-to-exceed twenty (20) years from the date of acceptance of a grant offer of federal (FAA) project funds. There is no limit on the duration of the terms, conditions and assurances regarding real property acquired with federal (FAA) funds.

As previously outlined in Exhibit 1B, the Airport has received nearly \$43 million in development grants since 2004. These grants represent a direct economic stimulus of lasting positive economic impact. The no-build alternative means that the Airport would forgo future grants for airport development, resulting in a negative economic impact which would become more noticeable through the years.

The Port of Portland has a vested interest in maintaining and improving Airport facilities for both recreational and business aviation users. This is even more important because of the significant number of technology businesses in the region. Without a commitment to ongoing improvement of the Airport, Airport users cannot take full advantage of the Airport's air transportation capabilities.

The unavoidable consequence of the no-build alternative is that the capability of the Airport would eventually diminish and its ability to serve general aviation would deteriorate. This would lead to fewer people using the Airport and would ultimately negatively impact the local economy. Safety concerns would arise, especially if necessary routine maintenance were postponed or eliminated and liability for damage to aircraft or accidents could increase. The long-term consequences of the no-build alternative could reduce the quality of the existing Airport facilities, producing undesirable results. This scenario results in an overall unpleasant experience for regular users and visitors.

Even under a no-build scenario, the airport paved areas will still require regular maintenance and replacement to ensure safety. As a federally funded airport, the Port is obligated to maintain the federal investment in the airport through grant assurances.

Table 5A presents estimates of the cost to maintain the existing pavements at the airport during the next 20 years. The estimates are based on an analysis of the current and projected pavement condition, as previously shown in Exhibit 1F. Required pavement maintenance includes seal coating, crack sealing, overlays and reconstruction. Costs do not include maintenance of tenant leaseholds.

Table 5A
20-Year Pavement Maintenance Cost Summary
Hillsboro Airport

Period	Total Cost
Short-Term: 1-5 Years	\$18,000,000
Intermediate-Term: 6-10 Years	\$15,000,000
Long-Term: 11-20 Years	\$23,000,000
Total	\$56,000,000

Source: Coffman Associates analysis of pavement condition (reference Exhibit 1F). Includes 2018-2021 program to rehabilitate Runway 13R-31L and meet Runway Safety Area Criteria.

5.1.2 RELOCATE AIRPORT ALTERNATIVE

This option considers constructing a new airport to replace the existing Hillsboro Airport. The new airport requires completion prior to closure of the existing airport. Additional studies beyond the scope of this master plan are required. These would include a feasibility study, a site selection study, a master plan for the replacement site, and appropriate environmental documentation of the new site (typically an environmental assessment [EA] or environmental impact statement [EIS]).

A more detailed analysis would include identifying an acceptable site for a new airport. A large portion of the development costs are eligible for FAA grant funding; however, replacement airports are expensive and generally rank low on the FAA national priority ranking system. Typically, non-revenue producing facilities to be located within the airport property line are eligible for funding. Elements outside the property line, such as utility extension and surface roads, are not eligible for funding.

Oregon's land use regulations heavily restrict development of new urban services (such as public use airports) outside of established urban growth boundaries. There are currently no suitable alternative sites within the Portland metropolitan urban growth boundary, and action to expand the boundary would require either approval of the Metro regional government or new legislation.

The trigger for pursuing a replacement airport is often encroachment upon the existing airport to the point where it can no longer fulfill its role. Currently, the Hillsboro Airport is relatively unconstrained and able to serve as a reliever airport to the vast majority of general aviation aircraft in operation. The community has grown around the Airport; however, the Airport sponsor, in coordination with the city of Hillsboro and Washington County, has been proactive in protection of the Airport through area zoning and other land use measures.

5.1.2.1 Disposal of Existing Land

All existing Airport land was purchased with financial assistance from the federal government. Airport land that is acquired with federal funds is continually obligated for airport purposes. If the federally-acquired land is no longer necessary for airport purposes, it may be released from obligation and used for other non-aviation purposes, but the federal government (FAA) must agree and all future revenue generated on the land must go to the airport fund. In some cases, airport land may be sold, with the

revenue returning to the airport or the federal government. If an airport no longer exists and the land is sold, the proceeds must be returned to the federal government.

5.1.3 TRANSFER OF SERVICE ALTERNATIVE

This alternative considers the feasibility of transferring aviation services and activity to other existing airports in the region. This would involve closing the existing Airport, therefore leaving more than 350 aircraft owners and multiple businesses to find other base locations. There is no other airport in the region that could absorb the aircraft and activity levels that exist today at Hillsboro Airport. Therefore, it is likely that aircraft owners would be dispersed to a multitude of other airports, including Portland International Airport.

The negative impact of transferring services and closing the Airport would be substantial. Losing the aviation transportation facility and the associated economic benefits could have severe consequences to the local economy. This option could not be legally pursued without active FAA participation and it would likely require repayment of federal funds expended on past capital improvement projects at the Airport. The negative impact on existing private investments at the Airport would also have to be reimbursed.

Closing the Airport would mean losing a substantial investment in a sizable transportation facility. In a situation where public funds are limited, the closure of a functional airport facility represents an unjustifiable loss of significant public investment. Many public and private investments were made to the Airport. Abandoning these investments and transferring aviation services to another airport would result in an investment with little or no return.

5.1.4 NON-DEVELOPMENT ALTERNATIVES SUMMARY

The purpose of this master plan is to examine aviation needs at the Hillsboro Airport over the course of the next 20 years. Therefore, this master plan examines the needs of the existing Airport and presents a program of needed capital improvement projects to cover the scope of the plan. Nonetheless, various non-development alternatives may be considered by the Airport sponsor.

Information pertaining to the three most common non-development alternatives include:

- 1) No-build
- 2) Replacement
- 3) Transfer of services

This section is not intended as a recommendation to pursue one of these alternatives, but for informational purposes only. If the Airport sponsor were to pursue one of these alternatives, additional study beyond the scope of this master plan would be required.

5.2 REVIEW OF PREVIOUS PLANNING DOCUMENTS

The Port considers airport planning to be a continuous process. On an annual basis the Port updates the Capital Improvement Program to address development needs for the next five years. Most capital improvement projects, especially those needing federal grant funding assistance, must be depicted on the Airport Layout Plan (ALP). The most current ALP for the Airport is dated May 2015. The last master plan for the Airport was completed in June 2005.

Exhibit 5B presents the current ALP for the Airport. Portions of the ALP were updated to address specific changes at the Airport, including the construction of Parallel Runway 13L-31R (completed in 2015), as well as the rehabilitation and reconfiguration of Runway 2-20 (completed in 2010). The ALP reflects many of the future facility needs based on the forecasts of aviation activity identified during the previous master plan study, including relocating most small general aviation activity to the north side of the airfield, which is closer proximity to the parallel runway.

This master plan process includes an update to the ALP. Some elements from the current ALP may be incorporated into the new ALP. The current ALP remains a valuable reference, especially while analyzing various alternative development scenarios.

5.3 PLANNING CONSIDERATIONS

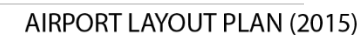
As determined in previous chapters, various Airport elements require consideration in this *Alternatives* chapter. The issues are the result of findings of the Aviation Demand Forecasts, Demand/Capacity Analysis, and Aviation Facility Requirements and are listed as follows:

The primary airfield elements considered include:

- 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

The primary landside elements considered include:

- Overall Airport land use plan
- Future location of a replacement terminal building
- Future location of flight schools
- Future hangar type mix and location



Other important elements to be considered in the alternatives discussion include:

- Identify suitable locations for additional hangars by type
- 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

5.4 AIRFIELD DEVELOPMENT CONSIDERATIONS

The alternatives analysis begins by addressing the airfield requirements established in the *Facility Requirements* chapter. Airfield design has a direct impact on potential landside alternatives because of the various minimum set-back distances and object clearing standards associated with airfield elements. This section presents the airfield alternatives analysis.

5.4.1 RUNWAY LENGTH

Runways 2-20 and 13L-31R are both planned to remain at their current length as they adequately accommodate the critical design aircraft for these runways. There no specific alternatives are considered for these runways.

Analysis from the *Facility Requirements* chapter concludes that an optimal runway length for Primary Runway 13R-31L is 7,500 feet. This length would fully accommodate the critical aircraft (Gulfstream 650) and numerous other business jets. The current length of 6,600 feet is usable by the critical aircraft under most conditions; however, there are times when these operators are weight-restricted and must take on less fuel, fewer passengers, or make an intermediate fuel stop. Therefore, a runway extension of 900 feet is considered.

Consideration of a runway extension must take into account all safety standards and surfaces. In fact, current FAA guidance indicates that an airport sponsor cannot build into a non-standard condition. This means that proper planning for a runway extension must consider meeting all design standards, including the runway safety area (RSA), runway object free area (ROFA), runway object free zone (OFZ), and the runway protection zones (RPZs).

A runway can be extended on either runway end or a combination of both. At Hillsboro, there are existing constraints on both ends of Runway 13R-31L. Cornell Road on the south end and Evergreen Road on the north end are both approximately 1,200 feet from the runway ends and both roads traverse the existing RPZs. Any extension to either runway end will necessarily shift the location of the RPZ, thus introducing new incompatible land uses into the RPZs (i.e., different parts of the roads). To avoid the need to relocate both roads, a potential extension of the runway is examined for only one end.

An extension to the north impacts Evergreen Road and farm land currently included within the planned Jackson East industrial development area. An extension to the south would impact Veterans Drive,

Brookwood Parkway, the TriMet rail line, and at least one home south of the rail line. Because an extension to the north includes land far more compatible for aviation purposes, only an extension to the north is considered.

5.4.1.1 Options for Evergreen Road

The analysis examined two potential options to address impacts to Evergreen Road:

- 1) Tunnel Evergreen Road under the runway, or
- 2) Re-route Evergreen Road around the runway extension, including the RPZ.

Exhibit 5C presents a graphic of a 900-foot extension of Runway 13R-31L to the north. As depicted, the pavement extension extends over Evergreen Road.

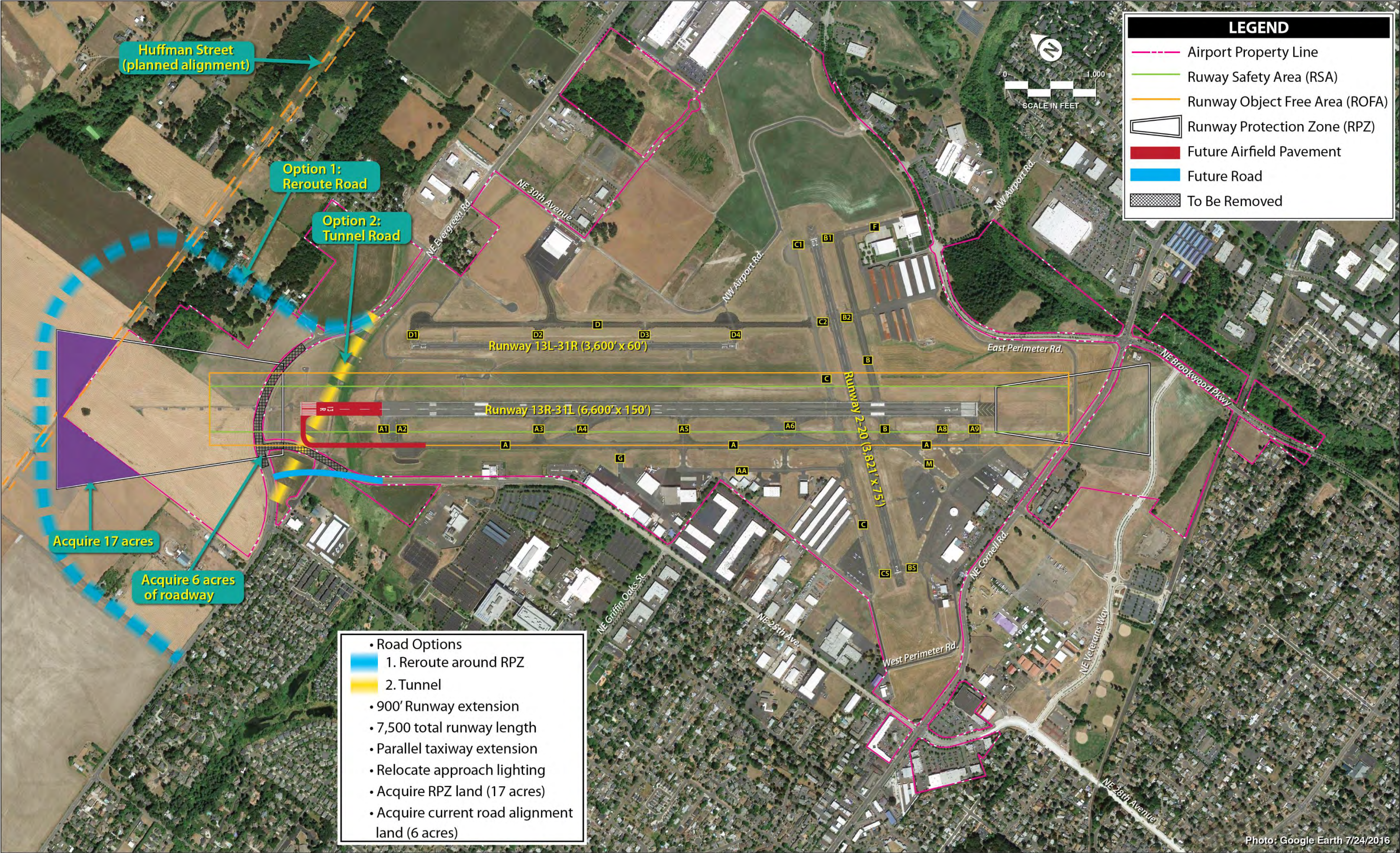
Tunneling roads under runways is relatively common for high utility airports, such as Hillsboro, but cost is a significant factor. Re-routing roads is also relatively common. In fact, Evergreen Road was previously re-routed around the RSA. New standards apply for relocating roads which require that RPZs also meet standard (i.e.: no new roads). Therefore, re-routing Evergreen Road to accommodate the runway extension requires adding 8,000 feet around the entire RPZ and an estimated cost of \$3-4 million. **Table 5B** summarizes the approximate cost associated with removing Evergreen Road from the RPZ.

TABLE 5B Preliminary Cost for Removing Evergreen Road from RPZ Hillsboro Airport	
Mitigation Option	Cost Estimate
Tunnel Evergreen Road under runway.	\$8-10 million
Re-route Evergreen Road by adding 8,000-foot extension around RPZ.	\$3-4 million

Another consideration is impacts to planned roadway improvements in the Jackson East project area. According to information provided by the City of Hillsboro, Huffman Road is a planned five-lane road extending from Brookwood Parkway, west to Jackson School Road. A portion of the RPZ associated with the runway extension would cross over the Huffman Road alignment. A re-route of that scale represents a significant change to the local street network and needs to be considered in context of the larger Transportation System Plan. Any plan to extend the runway must consider other future road alignments and not just Evergreen Road.

There are two airports on the extended runway centerline from Hillsboro Airport. Sunset Airstrip Airport (1OR3) is approximately 3.75 miles to the northwest of the runway centerline, and North Plains Gliderport (1OR4) is approximately 4.75 miles northwest. Any extension to the runway at Hillsboro will lower the protected airspace and may impact these facilities.

While an extension would be intended only to accommodate current users of the Airport, commercial service may be needed beyond the planning period. As discussed at length in Chapter Two – *Role of the Airport*, Hillsboro Airport is planned to remain a reliever general aviation facility over the next 20+ years. Nonetheless, at some point in the future, the Portland region may need a secondary commercial service airport and Hillsboro Airport is the most likely candidate. Future master plans will establish a new runway length that considers the commercial aircraft that may serve the airport. For now, the Port of Portland may desire to preserve the possibility of extending the runway, not only for current general aviation users but also for possible commercial service.



For these reasons, the Port of Portland might consider including an extension of the runway to 7,500 feet as a long-term project. This would place the extension on the airport layout plan (ALP) and allow for protection of the airspace. It would also provide documentation of the planned runway extension so that collaboration with area transportation agencies can begin which would preserve the potential for a longer runway.

5.4.2 RUNWAY 13R-31L OBJECT FREE AREA (ROFA)

The ROFA is an imaginary surface centered about the runway centerline. The ROFA clearing standard requires clearing the ROFA of above-ground objects protruding above the nearest point of the RSA (AC 150/5300-13A, *Airport Design*, para. 309). The ROFA does not have the same grading standards as the RSA; instead, the intent of the ROFA is to protect the wings of an aircraft were it to veer from the runway and come to a stop at the edge of the RSA.

For Runway 13R-31L, the ROFA design standard is 800 feet wide, extending 1,000 feet beyond the runway end and extending 600 feet prior to the landing threshold. The ROFA on both ends of Runway 13R-31L extends slightly beyond Airport property into public road rights-of-way; therefore, the ROFA is non-standard.

On the Runway 13R end, approximately 0.13 acres in the northwest corner of the ROFA extend beyond Airport property and onto 25th Avenue. The west edge of the ROFA crosses Airport property approximately 857 feet from the runway end. The closest point of the non-standard ROFA is 358 feet from the extended runway centerline and 108 feet from the RSA.

On the Runway 31L end, approximately 0.10 acres in the southwest corner of the ROFA extend beyond Airport property and onto Cornell Road. The west edge of the ROFA crosses Airport property approximately 931 feet from the end of the runway. The closest point of the non-standard ROFA is 308 feet from the extended runway centerline and 58 feet from the RSA.

Exhibit 5C shows the existing non-standard ROFA on both ends of the runway. In addition to the ROFA clearing standard, for new runways, terrain should not protrude above the nearest point of the RSA *within a distance from the edge of the RSA equal to one-half the most demanding wingspan* of the RDC of the runway. Applying this aspect of the standard as a way to examine objects in the ROFA seems appropriate; therefore, the Gulfstream 650 is shown straddling the edge of the RSA (rather than the outer wheel on the RSA edge).

The following alternatives analysis examines possible solutions, both long-term and short-term, for the ROFA.

5.4.2.1 Alternative 1: Shift, Realign, Relocate Runway (Port of Portland Considers Not Feasible)

Shifting the runway means maintaining the current runway orientation and adding length to one end, while reducing the length by the same amount on the other end. The closest point of the ROFA on the

Runway 13R end is approximately 90 feet from the perimeter fence and Evergreen Road. The end of the ROFA is penetrated on the Runway 31L end by approximately 69 feet. Shifting the runway to the north-west by at least 70 feet would provide a clear ROFA on the Runway 31L end; however, the ROFA would still be penetrated near the Runway 13R end because that ROFA penetration (25th Avenue) is on the outer (west) edge of the ROFA. If 25th Avenue were to be relocated so that it is no longer a penetration to the ROFA, then it may be feasible to shift the runway between 70 and 90 feet to the northwest. **Table 5C** shows the elements of the project, as well as an order-of-magnitude cost estimate. In total, shifting the runway 70 feet to the northwest is estimated to cost approximately \$6.0 million.

TABLE 5C
Runway Shift Project Estimate
Hillsboro Airport

Project Element	Order-of-Magnitude Cost Estimate
Relocation of 25 th Avenue	\$1,500,000
Construction of 70 feet of runway on the Runway 13R end	\$1,300,000
Removal of 70 feet of runway on the Runway 31L end	\$80,000
Remark the runway	\$60,000
Potential relocation of the localizer antenna 70 feet to the northwest	\$1,000,000
Relocation of all runway edge lights	\$600,000
Potential relocation of the MALSR leading to Runway 31R	\$1,500,000
Redesign of all instrument approaches to both ends of the runway	FAA Cost
TOTAL	\$6,040,000

Source: Coffman Associates

When considering any project that will change the runway, it will be necessary to consider any new incompatible land uses introduced to the RPZs. By shifting the runway, the location of both runway ends will change and the RPZs will shift, creating new incompatible land uses to be mitigated. Thus, a detailed analysis of the incompatible land uses in the relocated RPZ would need to be reviewed and approved by FAA headquarters. That review would first examine the feasibility of providing fully compliant RPZs by rerouting Evergreen Road and Cornell Road around the RPZs or tunneling. The cost for either of these options would add between \$3-10 million to the project cost.

There is not a viable option for shifting the runway to the southwest as there are numerous roads and homes in the area. Realigning the runway means rotating the runway so that the ROFA is no longer penetrated. Realigning the runway would impact other existing infrastructure, such as the taxiways and the recently constructed parallel runway. Realigning the runway would also require a complete reconstruction of the parallel runway in order to maintain adequate separation. Reconstructing both runways is estimated to cost between \$20-30 million.

Relocating the runway means reconstructing it at another location. This would require property acquisition, construction of new runways, taxiways, aprons and hangars, as well as accommodation for all existing leaseholders. The old airport site would have to be restored back to economically viable land which may include removal of pavement and environmental restoration. The cost is likely in the hundreds of

millions of dollars. In addition, because the current Airport site is perfectly viable, from a cost benefit standpoint, there is not justification to relocate the Airport. Therefore, relocating the Airport to a new site is not considered feasible.

To consider the shift, realignment or relocation options, a full cost-benefit analysis would need to be undertaken. Based on consultant experience, it is likely that the cost would far exceed the benefit.

5.4.2.2 **Alternative 2: Shorten Runway**
(Port of Portland Considers Not Feasible)

To provide a fully compliant ROFA, the runway would have to be shortened by 143 feet on the Runway 13R end and 69 feet on the Runway 31L end. This would reduce the total runway length from 6,600 feet to 6,388 feet. Shortening the runway by a total of 212 feet would be the minimum to strictly comply with design guidelines. Other factors, such as the location of lighting, electrical boxes or perimeter roads, may require additional shortening.

Analysis presented in the draft HIO master plan indicated that an optimal runway length for the Airport would be 7,500 feet. Since the runway is currently only 6,600 feet in length, operators of the critical aircraft (Gulfstream 650) already have to take weight penalties under certain conditions. **Table 5D** presents the runway length needs of the Gulfstream 650, the current corporate shuttle aircraft (ERJ-145), and several comparable aircraft. Each of these aircraft operate regularly at the Airport.

TABLE 5D
Operating Aircraft Weight Restrictions
Hillsboro Airport

Example Aircraft	ARC	Take-off Length Required at MTOW		% Useful Load for Takeoff on 6,600' Runway		% Useful Load for Takeoff on 6,388' Runway	
		Dry	Wet	Dry	Wet	Dry	Wet
Gulfstream 650 ¹	D-III	6,509	7,439	100%	83%	97%	81%
Global Express	C-III	6,913	7,036	95%	93%	92%	91%
Gulfstream 550	D-II	6,720	6,958	98%	96%	95%	92%
ERJ-145 ²	C-II	7,495	8,619	88%	77%	85%	85%

¹ Critical Aircraft

² Current Corporate Shuttle Aircraft

ARC: Airport Reference Code; MTOW: Maximum Takeoff Weight

Source: Aircraft operating manuals verified with UltraNav flight planning software.

Shortening the runway would exacerbate the weight penalties and reduce the safety margin for the critical aircraft. Further, shortening the runway could potentially negatively impact the economic benefit and feasibility of the Airport for those that operate the critical or similar aircraft.

5.4.2.3 **Alternative 3: Implement Declared Distances
(Port of Portland Considers Not Feasible)**

Declared distances represent the maximum length available that is suitable for meeting takeoff, rejected takeoff, and landing distance performance requirements for turbine-powered aircraft. These are defined by the FAA as:

Takeoff run available (TORA) – The distance to accelerate from brake release to lift-off, plus safety factors.

Takeoff distance available (TODA) – The distance from brake release past lift-off, to start of takeoff climb, plus safety factors.

Accelerate-stop distance available (ASDA) – The distance to accelerate from brake release to takeoff decision speed (V_1), and then decelerate to a stop, plus safety factors.

Landing distance available (LDA) – The distance from the threshold to complete the approach, touch-down, and decelerate to a stop, plus safety factors.

At Hillsboro Airport, the TORA and TODA are equal to the actual runway length. The ASDA and the LDA are the primary considerations in determining the runway length available for use by aircraft, as these calculations must consider providing the RSA (and ROFA) to standard in operational calculations. The ASDA and LDA can be figured as the usable portions of the runway length less the distance required to maintain adequate RSA and ROFA beyond the ends of the runway or prior to the landing threshold. By regulation, a full 1,000 feet of RSA and ROFA must be available at the far end of a departure operation in the ASDA calculation. For LDA calculations, 600 feet of RSA and ROFA is required prior to the landing threshold, and 1,000 feet of RSA and ROFA is required beyond the far end of the landing operation.

Table 5E shows what the declared distances would be to meet ROFA standards. Because only 600 feet of ROFA is required prior to landing (which is available on both ends), the landing thresholds would not have to be relocated. At the departure ends of the runway, the edge lights would have to be changed to reflect where the end of the runway is declared to be. Implementation of declared distances will shorten the length for which pilots can calculate their allowable takeoff and landing weights and speeds.

TABLE 5E
Declared Distances for Consideration
Hillsboro Airport

Parameters	Rwy 13R	Rwy 31L
Accelerate-stop Distance	6,531	6,457
Landing Distance	6,531	6,457
Takeoff-run	6,600	6,600
Takeoff Distance	6,600	6,600

Source: AC 150/5300-13A, *Airport Design*, para. 322

When declared distances are implemented, there are separate approach and departure runway protection zones (RPZs). Recent FAA guidance on RPZs indicates that any change to the size or location of the RPZ that introduces new incompatible land uses require special analysis that must be reviewed and approved by FAA headquarters (FAA Memorandum, *Interim Guidance on Land Uses Within a Runway Protection Zone*, September 27, 2012).

FAA AC 150/5300-13A, *Airport Design*, Paragraph 322, says, “Declared distances may be used to obtain additional RSA and/or ROFA prior to the runway’s threshold (the start of the LDA) and/or beyond the stop end of the LDA and ASDA. However, declared distances may only be used for these purposes where it is impracticable to meet the airport design standards or mitigate the environmental impacts by other means, and the use of declared distances is practical.” While it is technically feasible to implement declared distances, FAA generally does not support new application of this method if there are viable solutions.

The timeframe to implement the declared distances alternative would be approximately one year. The official airport facility directory (AFD) would also need to be updated to reflect the declared distances. This option may be considered as an interim step; however, the Port of Portland is currently working with Washington County and the city of Hillsboro to ultimately shift the roadway penetrations out of the ROFA, which is discussed in Alternative 4.

5.4.2.4 Alternative 4: Remove ROFA Penetrations (Port of Portland Considers Feasible in the Long-Term)

Alternative 4 seeks to realign roadways in order to remove any object penetrations and provide a standard ROFA. On both runway ends, this would involve re-routing roads around the ROFA. Cornell Road and the portion of 25th Avenue which impacts the ROFA are owned and maintained by Washington County. Both roads are included in the city of Hillsboro’s *Transportation System Plan*.

The long-term permanent solution to this issue is to realign both roads so that they are no longer ROFA penetrations. The Port of Portland has initiated discussions with both the city of Hillsboro and Washington County to ensure that these roadway realignments are included in land use, transportation, and capital project planning.

5.4.2.5 Procedure and Timeframe to Implement ROFA Solution

During this master planning process, a preferred alternative will be identified. Each of the alternatives will take some time to implement. The shortest estimated timeframe is Alternative 3 - Declared Distances, which could be implemented within a year if the project were expedited, while the time required to implement Alternative 4 – Relocate Roads may be closer to 10 years. Since neither of the viable alternatives can occur immediately, an interim modification of standards (MOS) process should be followed.

Modification of Standards (MOS) Process

FAA has established a process to request a formal/temporary Modification of Standards. The MOS process will document the non-standard ROFA issue and the sponsor's preferred resolution for the FAA. By approving a MOS, the FAA concurs that the non-standard condition provides an acceptable level of safety and economy and can remain in place until the agreed upon timeframe for implementing a project to remedy the non-standard issue. When granted, MOS are not permanent and are to be reviewed periodically. The FAA suggests MOS review at least every five years or when there is a project under consideration that may impact the MOS, or when ongoing planning efforts may address the MOS.

The FAA has a process in place which permits airport sponsors to request a MOS if no reasonable alternative exists for meeting design standard immediately. When requesting a MOS, the airport sponsor must document the following:

1. Explain why the standard cannot be met;
2. Discuss viable alternatives; and
3. State why modification would provide an acceptable level of safety, economy, durability, and workmanship. (Durability and workmanship don't apply as this issue is a planning standard.)

There are four primary reasons why the Airport cannot meet the ROFA standard currently:

1. The Airport does not own public rights-of-way that present ROFA penetrations, and cannot unilaterally plan, authorize, or fund road relocations to resolve the conflict, necessitating collaborative planning with local jurisdictions (which is already under way).
2. The Airport desires to maintain the existing 6,600 feet of runway length because this length already falls below the recommended runway length of 7,500 feet.
3. Shortening the runway may compromise the safe and efficient operations of the critical aircraft that require the maximum runway length currently available. There are 13 C/D-III business jets based at the Airport, as well as numerous operations by C-II aircraft (e.g., ERJ 145) that require the current full length of Runway 13R-31L.
4. The Airport is currently under grant for a full depth reconstruction of Runway 13R-31L. Any alteration of the current runway footprint (through shortening, shifting, or declared distances) would incur substantial costs and delays, including updates to the design report, technical plans, construction safety and phasing plans, and safety management systems plan.

While the ROFA for Runway 13R-31L is non-standard, the current condition does provide an acceptable level of safety, thus a temporary MOS can be considered. This determination is based on an analysis of the depth of ROFA penetration by the wing of the critical aircraft if it were to come to rest straddling the edge of the RSA. If the wing of the aircraft does not extend to the perimeter fence or road, then an acceptable level of safety is provided.

The existing ROFA is dimensioned to account for any aircraft in airplane design group (ADG) III, which includes all wingspans between 79 and 118 feet in width. At Hillsboro, the critical aircraft (Gulfstream 650) has a 99'7" wingspan. This is the largest aircraft in ADG III that operates at the Airport regularly. Therefore, an analysis examined whether the wing of this aircraft would extend into the non-standard

part of the ROFA (perimeter fence and road) if the aircraft were situated in the RSA at the nearest point to the non-standard ROFA.

If a Gulfstream 650 were to come to a stop with its wheels straddling the RSA, the wing would extend approximately 49.8 feet into the ROFA. Therefore, the ROFA penetrations cannot be any closer to the edge of the RSA than 49.8 feet. The closest edge of the non-standard ROFA is 58 feet from the RSA on the Runway 31L end and 108 feet on the Runway 13R end. **Exhibit 5D** graphically shows that no part of the critical aircraft would extend into the non-standard portion of the ROFA if the aircraft were to come to rest straddling the closest edge of the RSA. Therefore, an acceptable level of safety is provided currently.

5.4.2.6 ROFA Conclusion

The Port of Portland desires to preserve the maximum possible runway length at Hillsboro Airport. Many of the tenants who operate large business jets within the critical aircraft category have indicated that more runway length, not less, is desired. The Port has begun discussions with area transportation agencies to facilitate plans to shift portions of 25th Avenue and Cornell Road outside the ROFA, thus meeting standard and preserving runway length. Because of the complex nature of shifting these roads, it is estimated that a lead time of at least 10 years is needed before implementation. An extensive collaborative planning effort will be required that involves the Port, the city of Hillsboro, Washington County and possibly other area agencies.

In the interim, the Port has requested and received approval to prepare a Modification of Standards (MOS) for the current ROFA condition. When the ALP that results from this master plan is submitted to the FAA for review, the MOS will need to be submitted and reviewed concurrently. The MOS will reflect the master plan recommendation for resolving the non-standard ROFA. Once accepted by FAA, the MOS could be valid for up to five years prior to review and possible extension until the standard ROFA has been established.

5.4.3 RUNWAY SAFETY AREA (RSA)

All RSAs at the Airport currently meet design standards except for the RSA beyond the Runway 13R threshold. This RSA extends a distance of approximately 385 feet before it reaches a narrow ditch. The RSA area, other than the ditch, meets RSA grading standards. In addition, at times, the ditch and areas around the ditch will overflow with water, which is a possible wildlife attractant. One result of the current design is that the ditch will overflow, as intended, and open water will disperse outside the ditch channel. This has had the adverse effect of creating wetlands and it was identified as a potential wildlife attractant in the Airport's Wildlife Hazard Management Plan as updated in 2015. Therefore, mitigation of the non-standard RSA should include mitigation of the open water issue.

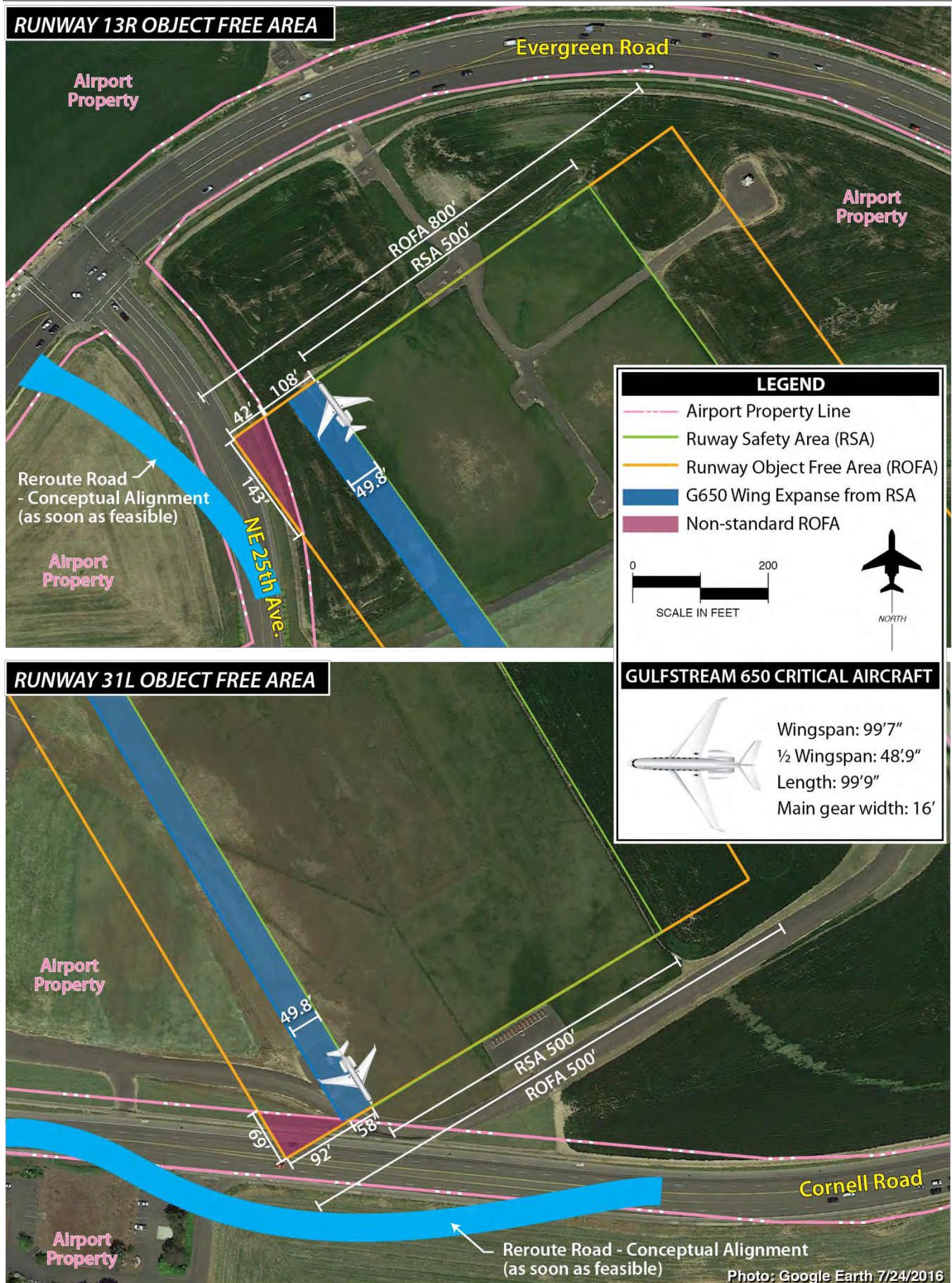


Exhibit 5D

Following the process outlined in FAA Order 5200.8, *Runway Safety Area Program*, alternatives to mitigating the RSA issue are presented. The first alternative to be considered is always to fix non-standard RSA by constructing the traditional graded area around the runway to standard. Where it is not practicable to obtain the entire safety area in this manner, as much as possible should be obtained. Then, an alternatives analysis should follow that considers:

- Relocation, shifting, or realignment of the runway.
- Reduction of runway length where the existing runway length exceeds that which is required for the existing or projected design aircraft.
- A combination of runway relocation, shifting, grading, realignment, or reduction.
- Declared Distances.
- Engineered Materials Arresting Systems (EMAS).

5.4.3.1 Alternative 1 – Standard RSA

The non-standard RSA was identified prior to this master plan and the Port is concurrently working on solutions with the FAA to bring the RSA up to standard. An Environmental Assessment has been programmed (beginning in 2018) that will include an alternatives analysis of how to appropriately provide a standard RSA.

The means to providing a standard RSA may include:

- Filling the RSA to a conforming grade.
- Diverting swale flow into a pipe or culvert under the graded RSA.
- Redirect the swale flow outside the RSA.

Associated considerations include:

- Filling the wetlands to eliminate wildlife hazards.
- Planning wet areas to reduce/eliminate open water.

5.4.3.2 Alternative 2 – Relocation, Shift, Realignment of the Runway

Relocating the runway means moving it to another location, either on the current Airport property footprint or to a new location all together. As noted in the ROFA discussion above, relocating, shifting, or realigning the runway would significantly impact numerous other facilities under the ownership of multiple jurisdictions as well as the entire cost of the newly constructed parallel runway. This alternative is not considered feasible by the Port of Portland.

5.4.3.3 Alternative 3 – Declared Distances

Table 5F shows the declared distances that would provide for a standard RSA. As noted, the closest point of the non-standard RSA is 385 feet from the Runway 13R end. The TORA and TODA would both remain at 6,000 feet. The ASDA for departures from Runway 13R would have the full 6,000 feet available as the

full RSA is available on the far end. The LDA for Runway 13R would be shortened by 215 feet (6,385 feet available) as 600 feet of RSA is required prior to landing. On the Runway 31L end, both the ASDA and LDA would be shortened by 615 feet leaving an available length of 5,985 feet.

TABLE 5F
Declared Distances for Consideration
Hillsboro Airport

Parameters	Rwy 13R	Rwy 31L
Accelerate-stop Distance (ASDA)	6,000	5,985
Landing Distance (LDA)	6,385	5,985
Takeoff-run (TORA)	6,600	6,600
Takeoff Distance (TODA)	6,600	6,600

Source: AC 150/5300-13A, Airport Design, para. 322

As noted in Section 5.4.2.2, at 6,600 feet, the runway length meets the needs of most operators most of the time. However, the critical aircraft (Gulfstream 650) and other large business jets may at times require up to 7,500 feet. Shortening the runway would have an adverse effect on current operators at the Airport and is not considered feasible based on current or future requirements.

5.4.3.4 Alternative 4 – EMAS

EMAS – Engineered Materials Arresting Systems – is an engineered compressible concrete material that is located beyond the runway end for the purpose of safely stopping an aircraft overrun. A standard EMAS installation requires 600 feet of space beyond the runway end. A portion of the 600 feet is for an aircraft lead-in, and the remaining portion is for the EMAS bed itself.

EMAS functions similar to the sandy, high-speed exits provided on highways in mountainous terrain in order to safely stop a runaway tractor trailer. The FAA considers the installation of EMAS as an acceptable substitute to providing the full RSA in certain circumstances. EMAS is designed to stop an aircraft overrun by exerting predictable deceleration forces on the landing gear as the EMAS material crushes. It is designed to minimize the potential for structural damage to the aircraft, since such damage could result in injuries to passengers and/or affect the predictability of deceleration forces.

Guidance for evaluating an EMAS alternative and for determining the maximum financially feasible cost for RSA improvements is provided in FAA Order 5200.9, *Financial Feasibility and Equivalency of Runway Safety Area Improvements and Engineered Material Arresting Systems*.

A standard EMAS installation is capable of safely stopping a design aircraft that leaves the runway end traveling at 70 knots or less. The RSA where the EMAS is located should also provide for potential short landings to runway ends with vertical guidance. Vertical guidance is available to both runway ends with the precision approach path indicator (PAPI) lights and additionally to Runway 31R through the ILS. Therefore, a standard EMAS bed would be a portion of the 600-foot RSA needed prior to landing.

The standard EMAS bed would be approximately 340 feet long with a 260-foot lead-in. The lead-in area is an essential factor in calculating the stopping ability of the EMAS bed. The maximum allowable cost to install an EMAS bed is estimated at \$10 million. Currently, EMAS installations for a single runway end are costing approximately \$8 million. To install a standard EMAS bed, the ditch would have to be routed around the EMAS bed. Because this alternative would still require extensive work to re-route the ditch, it is clearly preferred to address the ditch in a way that eliminates the wildlife hazard and produces a standard RSA.

5.4.3.5 RSA Conclusion

The alternatives considered in this analysis follow the procedure outlined in FAA Order 5200.8, *Runway Safety Area Program*, and include relocation, shifting and/or realignment, declared distances, and EMAS. None of these is considered preferable to correcting the existing runway to meet the RSA standard with its current runway ends. Because it is practicable to obtain the full traditional graded area surrounding the runway, the RSA beyond/behind Runway 13R should be brought up to standard. The Port of Portland has begun the environmental documentation process for this project. The alternatives section of the environmental documentation will detail potential engineering solutions that brings the RSA up to standard.

5.4.4 RUNWAY PROTECTION ZONES (RPZ)

The RPZs beyond the runway ends are intended to be clear of incompatible land uses to enhance the protection of people and property on the ground. Where practical, airport owners should own the property under approach and departure areas to at least the extent of the RPZs. FAA Memo titled, *Interim Guidance on Land Uses Within a Runway Protection Zone (Interim Guidance)*, published in September 2012, provides guidance on RPZ land use compatibility. The Interim Guidance was discussed in detail in the Facility Requirements chapter.

The Interim Guidance distinguishes between existing and new (as of 2012) incompatible land uses in RPZs. For existing incompatible land uses, airport sponsors are to follow the original guidance, which is to pursue opportunities to provide compatible land uses within the RPZ. For example, when working with local transportation agencies, if it is feasible to relocate roads out of RPZs, those opportunities should be pursued. Likewise, if an airport is able to remove an RPZ from an incompatible land use, they should pursue those possibilities. There is no current FAA regulation that requires RPZ land use incompatibilities that existed prior to the 2012 publication of the Interim Guidance to be immediately removed. While existing incompatibilities are not “grandfathered,” it is new incompatibilities that are the focus of the Interim Guidance.

The Interim Guidance provides a procedure for analyzing RPZ alternatives and requires review and approval of any solution by FAA Headquarters in Washington, D.C. Typically, new incompatibilities may be introduced as the result of:

1. An airfield project (e.g., runway extension or shift);
2. A change in the critical design aircraft that increases the RPZ dimensions;
3. A new or revised instrument approach procedure that increases the RPZ dimensions; or
4. A local development proposal in the RPZ (either new or reconfigured).

5.4.4.1 Runway 13R-31L RPZs

The RPZs beyond both ends of Runway 13R-31L have incompatible land uses within them, which are Cornell Road and Evergreen Road. These incompatible land uses are considered an existing condition, as their presence within the RPZ predates the Interim Guidance. No immediate plan or action is needed to remove the roads from the RPZs.

Specific care has been taken during development of this master plan to maintain the RPZs at their current size and location. For example, the instrument approach procedures to both runway ends are planned to maintain their current visibility minimums, thus the RPZs won't change in size. Should a future plan call for the extension of the runway to the north, that plan would need to identify a method to meeting the RPZ standard by re-routing or tunneling Evergreen Road.

Airports don't always have control of the incompatible land uses in their RPZs, as is the case with Hillsboro, where the roads through the RPZs are maintained by Washington County. There are plans in development for improvements to the Cornell/Brookwood and Cornell/25th Avenue intersections. If the road improvements increase the area of incompatible land use within the RPZ, then the Interim Guidance should be followed. The FAA should be consulted and an RPZ analysis may be required.

5.4.4.2 Crosswind Runway 2-20 RPZs

The RPZs for the crosswind runway remain entirely on Airport property. The Airport perimeter road does cross the RPZ; however, this is an existing condition and limited access perimeter service roads are permissible in the RPZs. No action is needed for the Runway 2-20 RPZs.

5.4.4.3 Parallel Runway 13L-31R RPZs

The RPZ serving Runway 13L extends beyond Airport property and over Evergreen Road. Once again, this is an existing condition as planning for this runway occurred prior to the publication of the Interim guidance. No action is necessary currently; however, the Airport should pursue opportunities to remove the RPZ from Evergreen Road when feasible.

5.4.4.4 RPZ Conclusion

At Hillsboro Airport, the RPZs serving Runways 13R, 31L, and 13L extend beyond Airport property and over public roads, which are considered incompatible land uses within the RPZs. The roads through the RPZs are considered an existing condition, which do not require immediate mitigation. Instead, Port of Portland will work with Washington County to pursue future opportunities to establish RPZs with compatible land uses, as feasible.

Any airfield development alternative that would introduce new incompatible land uses within an RPZ would require FAA Headquarters approval. Since the roads through the RPZs are not owned by the Airport, staff should be aware of any planned changes to the roadway system that could impact RPZ land use compatibility.

5.4.5 STRATEGIC PROPERTY ACQUISITION

Certain adjacent properties may be considered for acquisition by the Airport. Typically, land acquisition helps protect an airport from encroachment, meet standards, or facilitate expansion. When land is acquired for immediate airport use, the cost is eligible for FAA grant funding. The FAA does not support a “land banking” acquisition that may or may not be used for airport purposes in the future.

There is some adjacent land that is recommended for acquisition. All RPZ land should be under the direct ownership of the Airport, where feasible. The far corners of the RPZ serving Runway 13R are not currently owned by the Airport. These corners encompass approximately 0.9 acres and are recommended for acquisition.

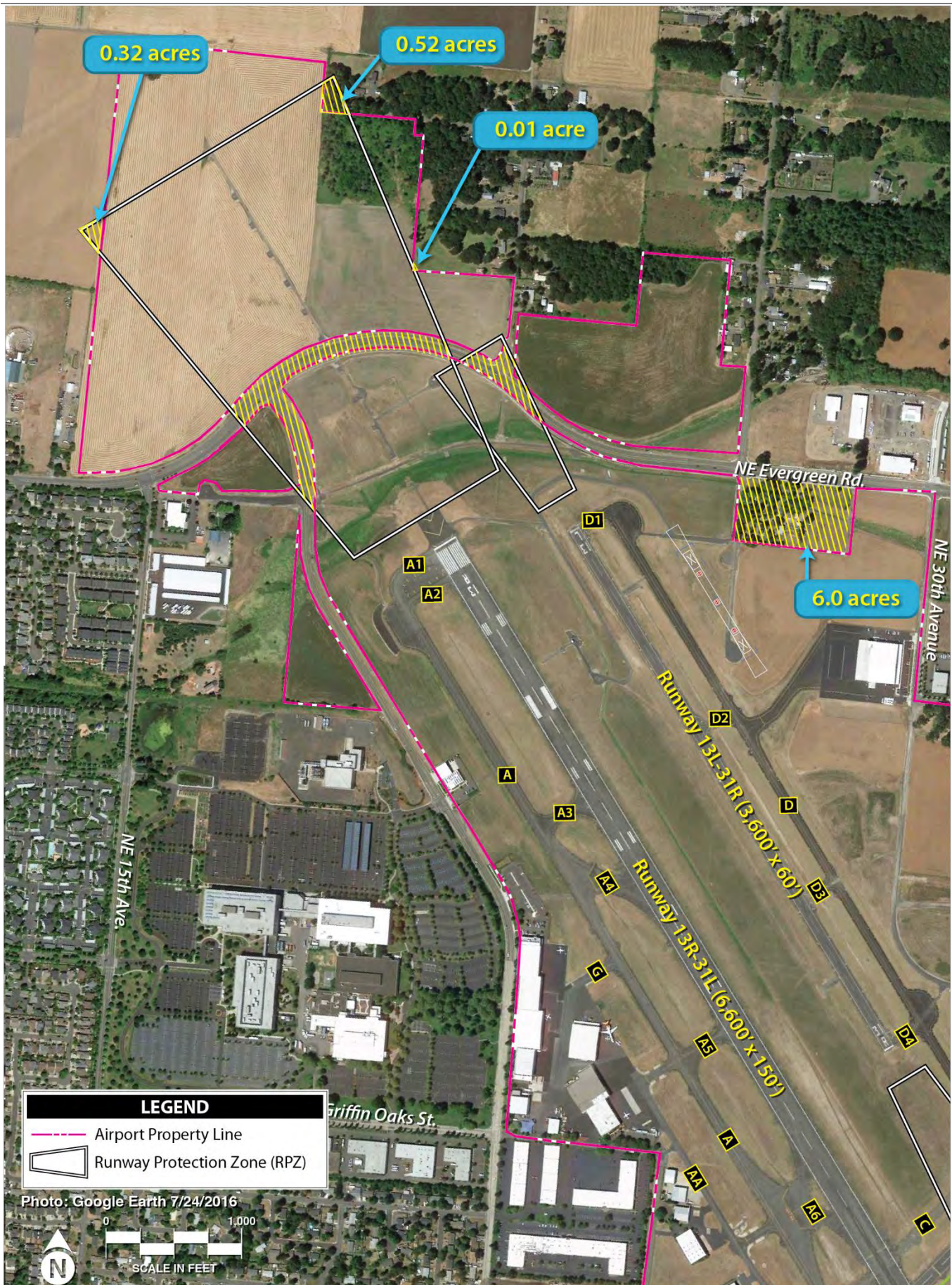
There is a parcel encompassing approximately 6.0 acres located south of Evergreen Road and east of NW 268th Ave. This parcel occupies land that may be needed for airside development. This parcel is near the planned helicopter helipad operations area and is within the future 65 DNL noise contour (see Appendix C). Acquisition of this parcel is on the current ALP and may become a higher priority when the helipad is built. The Airport should continue to plan for acquisition of this parcel. **Exhibit 5E** shows the considered property acquisition for the Airport.

5.4.6 RUNWAY INCURSION MITIGATION (RIM) PROGRAM

RIM is an FAA initiative that began in 2015, which identifies airport risk factors that might contribute to a runway incursion and develops strategies to help airport sponsors mitigate those risks. Runway incursions occur when an aircraft, vehicle, or person enters the protected area of an airport designated for aircraft landings and take offs. Risk factors that contribute to runway incursions may include unclear taxiway markings, airport signage, and more complex issues, such as the runway or taxiway layout. Through RIM, the FAA will focus on reducing runway incursions by addressing risks at specific locations at the airport that have a history of runway incursions.

Taxiways A8 and A9 are included in the FAA’s Runway Incursion Mitigation (RIM) program. The primary issue at Taxiways A8 and A9 is that, on occasion, pilots have crossed the hold line when instructed by the tower to hold short of the hold line. The FAA Runway Safety Action Team (RSAT) recommended adding a “Hot Spot” designation to the airport diagram at Taxiway A8 in 2015. Since then, there have been no incursions at this location attributable to the taxiway geometry and RSAT has indicated that the “Hot Spot” designation is working.

The hold apron serving Runway 31L has a non-standard configuration in that it connects directly to the terminal apron and Taxiway A. Three potential redesigns of the hold apron are presented on **Exhibit 5F**, each of which would decouple the hold apron from the terminal apron. The design intent of each of the alternatives is to provide pilots a more familiar taxiway/runway/hold apron interface in which they would clearly understand that they are entering or leaving a hold apron and approaching a runway hold line.





Alternative 1: This option would reconfigure the hold apron to provide individual hold bays. This is the newest design concept from the FAA contained in FAA AC 150/5300-31A, *Airport Design*. This design would be suitable to accommodate current operations from the flight school located in the terminal area. If the flight schools were to ultimately relocate to the north side of the airfield, in closer proximity to the parallel runway, then this design is likely not necessary as utilization of the parallel runway for training increases. Pilots prefer to position their aircraft into the prevailing wind direction when performing pre-flight checks and run-ups. This design does not support that preferred aircraft orientation.

Alternative 2: This alternative would remove (or mark as non-movement) the connection between the terminal apron and the hold apron. Pilots would receive a clearance to enter Taxiway A and then proceed to the hold apron. This is a more familiar movement for pilots.

Alternative 3: This alternative would construct the hold apron in a configuration that is more familiar to pilots. As shown, pilots would receive a clearance to enter Taxiway A and then proceed to the hold apron. A hold apron of this classic design will allow pilots to perform their preflight checks while facing the predominant wind direction, which is pilot-preferred.

5.4.7 TAXIWAY HOTSPOTS

FAA has implemented a “Hot Spot” program to alert pilots to be especially vigilant in areas of airport that have had runway incursions in the past. There are two FAA designated hot spots at Hillsboro Airport. Master plans should consider alternatives that could reduce confusion that could lead to runway incursions. Common alternatives to consider are:

- 1) Maintain the “Hot Spot” designation because alerting pilots to the concern has solved the problem.
- 2) Improve signage and/or lighting. Installation of Runway Guard Lights to the side of the taxiway hold line is a common solution.
- 3) Redesign the pavement geometry so pilots encounter a more intuitive pavement layout.

Hot Spot 1 – Taxiway A6: Taxiway A6 violates several geometry standards which are as follows:

- The convergence of two acute-angled taxiways creates a wide expanse of pavement;
- The hold bar is longer than desired (to be avoided);
- The convergence of two acute-angled taxiways should be avoided; and
- Taxiway A6 is two taxiways, which can be confusing.

Through consultation with the tower and Airport administration, it was determined that simply maintaining a “Hot Spot” designation and/or improving the lighting and signage would not solve all the issues with the Taxiway A6 intersection. Therefore, a geometric solution is provided.

When looking at a geometric solution, there were some key considerations. The first is that Taxiway A6 is highly utilized. The second is that the acute-angled exit design is beneficial to getting aircraft off the runway, thus increasing overall airfield capacity. Therefore, the preferred design is a single acute-angled taxiway exit. The primary direction of the acute-angled exit (to accommodate landing to Runway 31L) was developed based on information from tower personnel regarding runway exit usage.

Hot Spot 2 – Taxiway A8: As noted previously, there have been several runway incursions at Taxiway A8. In 2015, the FAA RSAT designated this as a “Hot Spot.” If the designation did not have the desired effect of reducing incursions, then the next step was to install Runway Guard Lights. After a year of monitoring, the RSAT was satisfied that the “Hot Spot” designation had been successful, and that Runway Guard Lights would not be necessary. Therefore, the “Hot Spot” designation is planned to remain in place as a means to alert pilots.

Taxiway A8 is also considered in the FAA RIM program. Previous analysis of this RIM location indicated that a redesign of the hold apron at the south end of Taxiway A would enhance pilot situational awareness in this area. Once the hold apron is reconstructed to prevent movement directly from the terminal apron to the hold bay, RSAT should continue to monitor incursions in this area. If the hold bay redesign significantly reduces incursions, then the “Hot Spot” designation may not be necessary in the future.

5.4.8 OTHER TAXIWAY GEOMETRY ALTERNATIVES

Runway Crossing Taxiways: Now that the parallel runway has been constructed, there is a need to improve the efficiency of aircraft ground movements. Currently aircraft can only access the north side of the airfield via Taxiway C to Taxiway D. For aircraft landing on Runway 31L, this can add significantly to taxi times and fuel burn.

The planning standard to consider for runway crossing taxiways is to avoid the middle portion of the runways, an area referred to by the FAA as the “high-energy” area. A crossing taxiway is planned to extend from Taxiway A across the parallel runways and terminating at Taxiway D. This crossing taxiway is located outside the glide slope critical area. Because of the location of this planned new taxiway, existing Taxiways A3 and D2 are redundant and are planned to be removed.

Parallel Taxiway Between Runways: Now that there is a parallel runway system, improved efficiency of ground movements between the runways is desirable. The previous master plan considered a taxiway situated between the two runways for this purpose. The taxiway would extend the full length of the primary runway, thus providing threshold access to the parallel runways. This concept is carried through to this master plan.

The segment that offers the most efficiency is from Taxiway B to the Runway 13L threshold. This taxiway will facilitate movements by the large aircraft based on the east side of the airfield to the most commonly used departure runway. This will also reduce or eliminate the need for these operators to cross the active runway to access the departure threshold.

The middle portion of the taxiway extending from Taxiway B to the north runway crossing taxiway (short of the glide slope critical area) is the second priority. This portion of the taxiway will facilitate movements between the runways. The third phase is the final extension to the Runway 13R threshold. This phase is challenging because of the current location of the glide slope antenna. This portion may not be feasible because the glide slope antenna is a required element of the instrument landing system (ILS) approach to Runway 13R. FAA’s NextGen plan aims to achieve the same visibility minimums (½-mile) as an ILS with GPS; however, these have not yet been implemented. This third phase of the middle taxiway should only be constructed if the ½-mile visibility minimums to Runway 13R can be preserved.

Taxiway A5 Redesign: Taxiway A5 currently provides direct access from an apron area to Runway 13R-31L, which is discouraged. This taxiway is planned to be redesigned to be an acute-angled runway exit, which would complement the redesign of Taxiway A6. As planned, the replacement Taxiway A5 would no longer have direct access from the apron area and it would have higher utilization to the airfield as an acute-angled exit.

Taxiway AA Relocation: Taxiway AA is currently 275 feet from Taxiway A. The minimum separation distance between parallel taxiways is 152 feet. Shifting and extending Taxiway AA north to Taxiway G will provide for additional aircraft parking apron, which is much needed in this area.

East T-Hangar Taxilane Redesign: The taxilane leading to the existing east side T-hangars has direct access to Runway 2-20. Two alternatives were considered:

- Shift the location of Taxiways C2 and B2 (the Runway 2-20 crossing taxiways that align with the T-hangar taxilane) to the east approximately 200 feet; and
- Reroute the taxilane extending from Taxiway B into the T-hangar area.

Shifting Taxiways C2 and B2 was not considered desirable because of the utility of aircraft taxiing from Taxiway B to Taxiway D. Therefore, it is recommended that the taxilane be shifted to eliminate the direct access concern.

Taxiway F Direct Access: Taxiway F currently provides direct access from the corporate hangars to Runway 20. There are currently two hangars housing large corporate jets that use Taxiway F. The aircraft never use Runway 2-20 and always depart on Runway 13R-31L. Because the current users of this taxiway are extremely unlikely to inadvertently take off from Runway 2-20, it is not considered necessary to alter Taxiway F.

The area on the north side of Taxiway F is currently undeveloped. Depending on the planned development for this area (corporate, terminal, or small general aviation), a separate dedicated taxilane may be considered. As currently envisioned, any new development in this area would access the airfield via an extension of Taxiway B and not via Taxiway F.

Taxiway B Completion: Taxiway B is planned to extend from Taxiway A to the Runway 2 threshold to improve ground movement efficiency. This is carried over from the previous master plan.

5.4.9 HELICOPTER TRAINING PAD

The current ALP includes a helicopter training pad which is proposed for a location at the north end, approximately 240 feet to the east of Taxiway D. It is 700 feet long and has three landing pads. This is an appropriate location for a helicopter training pad as it is in proximity to Delta Pattern, farthest away from higher density neighborhoods, and closer to planned industrial uses along Evergreen Road.

The planned location of the helipad has been evaluated for airspace suitability by the FAA and found to be acceptable. Barring any unforeseen landside development considerations, the planned helipad location is preserved and landside planning will occur assuming that the helipad will be developed at this location.

5.4.10 AIRSIDE COST ESTIMATE

It is difficult to know precisely what the cost of individual projects will be when actually constructed. However, preparing order-of-magnitude cost estimates is an effective way to compare relative costs. Many federal agencies utilize a system of five classes of estimates, as presented in **Table 5G**. The Master Plan scope limits cost estimates to Class 5.

TABLE 5G
Cost Estimate Classification

Estimate Class	Name	Purpose	Project Definition Level
Class 5	Order of Magnitude	Screening or Feasibility	0% to 2%
Class 4	Intermediate	Concept Study or Feasibility	1% to 15%
Class 3	Preliminary	Budget, Authorization, or Control	10% to 40%
Class 2	Substantive	Control or Bid/Tender	30% to 70%
Class 1	Definitive	Check Estimate or Bid/Tender	50% to 100%

Source: U.S. Department of Energy

The cost estimates include environmental documentation, design, engineering, construction administration, and contingencies that may arise on the project. Cost estimates were developed based on recent airport construction costs in the region. Capital costs presented here should be viewed only as estimates subject to further refinement during design. Nevertheless, these estimates are considered sufficient for planning purposes.

Table 5H shows the order-of-magnitude cost estimates to construct the airside elements. The total airside program is estimated at approximately \$39.8 million in 2018 dollars.

Table 5H
Order of Magnitude Cost Summary
Hillsboro Airport - Airside Facilities

Project	Cost
Parallel Taxiway to Rwy 13-31 (to A3 area)	\$6,281,000
Parallel Taxiway Connectors (to A3 Area)	\$4,803,000
Taxiway A5 and A6 Highspeeds	\$4,002,000
Taxiway AA and Connectors	\$3,969,000
Taxiway from B to Rwy 31L Threshold	\$3,650,000
Taxiway (A3 Area) to North Thresholds	\$3,421,000
Taxilane East Corporate Area	\$2,366,000
Taxiway B Extension to Rwy 2	\$2,089,000
Cornell Road Realignment	\$2,000,000
25th Avenue Realignment	\$1,400,000
Hold Apron Expansion Parallel Rwy	\$1,208,000
Helipad	\$1,108,000
Hold Apron East of Rwy 31L	\$1,079,000
Replacement Taxiway A3 at Twy A	\$804,000
Taxilane to East T-Hangars from New Parallel Twy	\$517,000
West Infill Taxilane	\$434,000
Taxilane East T-Hangar Relocate	\$405,000
Hold Apron Reconfiguration West of Rwy 31L (RIM Project)	\$287,000
Total	\$39,823,000

RIM: Runway Incursion Mitigation

Source: Coffman Associates

5.4.11 AIRSIDE CONCLUSION

Exhibit 5G presents the overall airside plan. Most of the improvements considered on the airside plan would not be impacted by any landside alternatives to be considered in the next sections of this chapter. Certain taxiways and the Runway 31L hold apron may be modified based on planned landside development. Any further airside considerations will be discussed in detail in the recommended concept.

5.5 INITIAL LAND USE DEVELOPMENT ALTERNATIVES

The overall goal of landside planning is to identify and plan for the highest and best use of airport property. There are several guiding principles that all federally obligated airports (including Hillsboro Airport) must consider.

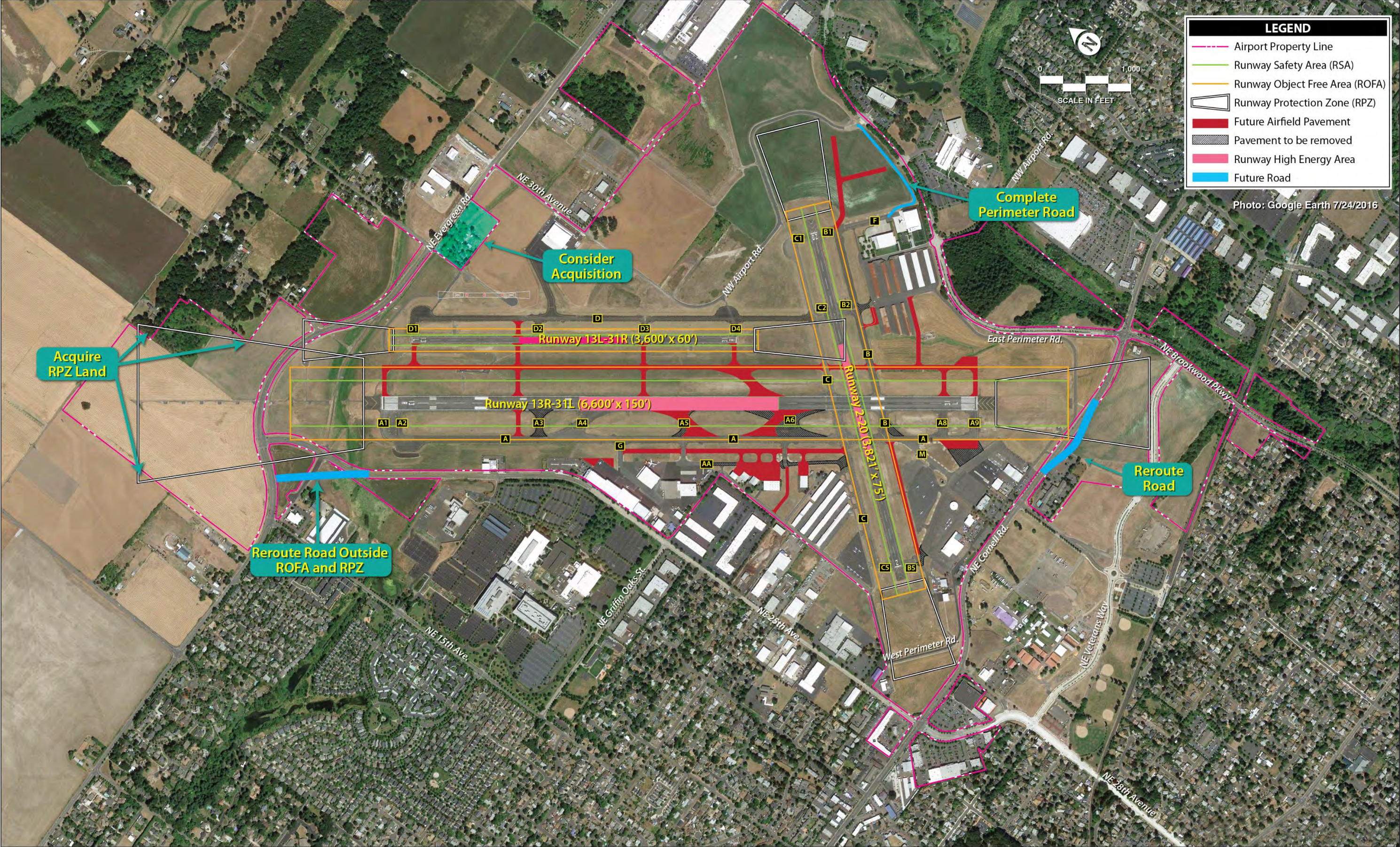
- 1) Airports must plan to use airport property for aviation purposes, first and foremost.
- 2) Airports must strive toward economic self-sufficiency.
- 3) Airport land that is not necessary for aviation purposes may be used for compatible non-aviation revenue generation to aid in the economic self-sufficiency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

Prior to developing specific landside alternatives, it is helpful to have a general understanding of land use options on the Airport property. As stated, the starting place is to assume that all Airport property is reserved for aviation uses. At Hillsboro Airport, that starting point can be reasonably refined to serve as the basis for more detailed analysis. **Exhibit 5H** presents a generalized land use plan for the airport. Four land use categories are identified:

Aviation Use: This category identifies the Airport land that should be reserved for aviation use. It includes all land immediately adjacent to the runways. These lands have ready access to the runway/taxiway system. In most cases, these lands should be reserved for aviation use, even if portions may not be needed for aviation development beyond what the facility requirements of this master plan recommend. For those portions of the aviation use that are not likely to be needed within the 20-year forecast of the master plan, short-term compatible non-aviation uses may be permissible, with FAA approval. Any short-term non-aviation use must be able to be converted to an aviation use relatively quickly. Short-term uses, such as agriculture or vehicle parking, may be appropriate. Construction of non-aviation facilities, such as buildings, is not appropriate for the aviation use land.

Investment Preservation: This category of land use identifies existing facilities that should be preserved as new landside development alternatives are considered. These existing facilities represent significant private investment already made at the Airport or something to be preserved. For example, many hangars represent a significant existing investment by private businesses. In the terminal area, there are some potentially historical buildings that should be preserved in some capacity.

Non-Aviation Revenue Support: This category is Airport land that will never be available for aviation use because it is inaccessible to the runway/taxiway system. At Hillsboro Airport, this land is all outside the perimeter fence and across the streets.





Aviation/Non-Aviation Revenue Support: This is Airport land that is likely in excess of what will be needed for aviation purposes. The Airport could pursue long-term leases for compatible non-aviation development (with FAA approval) in these areas.

5.5.1 LANDSIDE CONSIDERATIONS

For purposes of analysis, four quadrants are discussed individually. **Exhibit 5H** delineates the development areas and designates them as North, East, South and West. The exhibit provides additional orientation information, including the proximity of the Jackson East project area and the North Hillsboro Industrial Renewal Area. Two subareas are also defined: the Evergreen Subarea and the Cornell Subarea. Detailed landside alternatives of the subareas will be presented later in this chapter. The following describes high-level considerations for each of the four development areas of the Airport:

North Side Development Considerations: This area has historically been identified for future general aviation development and the Port of Portland has made the significant investment of a parallel runway to support this future development. To this end, Hillsboro Aviation (FBO) has made a significant investment in a facility to support aviation needs in this area. The Port of Portland has also planned a dedicated heliport facility in this area to support the extensive helicopter training activity at the Airport. Consideration is given to relocating the main Airport terminal building to the north sector of the Airport. The current location, in the Cornell parcel, has limitations including a lack of vehicle parking and a limited aviation development opportunity. In addition, it is felt that the aviation activity in the Cornell parcel is over capacity and there may be an opportunity to address this by relocating the terminal to a different location on the Airport. The north sector currently encompasses more than 240 acres which can accommodate forecast aviation demand well into the future, therefore there is an opportunity to encourage non-aviation leases that would help the financial self-sufficiency of the Airport.

East Side Development Considerations: The east side of the airfield has existing hangars – both corporate and T-hangars. There are other undeveloped areas that are readily accessible to the runway/ taxiway system. The current plan for the east side is to accommodate corporate aviation exclusively by relocating the T-hangars to the north side and to target undeveloped areas for corporate aviation growth. Other considerations are to relocate the terminal building or flight schools to the area, to potentially maintain the T-hangars where they are and to plan for additional T-hangars adjacent to the existing T-hangars.

South Side Development Considerations: The south side is the terminal area adjacent to Cornell Road. This area is currently providing a variety of aviation services, including the terminal building, corporate shuttle activity, flight schools, and other aviation businesses. Considerations for this area include mainlining or potentially relocating one or all these facilities to other areas of the Airport because there are current capacity constraints in this location. Vehicle parking is already deficient. The sheer quantity of aviation uses leads to aircraft apron congestion, especially for the flight schools. The triangular shape of the Cornell area also limits the usable space, primarily due to various height restrictions adjacent to the runways.

West Side Development Considerations: The west side of the Airport is built-out developed with established FBO facilities, private hangars, and numerous T-hangars. Maintaining the current facilities and infilling undeveloped parcels is an option. Other options for consideration include relocating the T-hangars to the north side and redeveloping that area for larger conventional hangars to facilitate expansion of FBO services.

5.5.2 EVALUATION CRITERIA

In addition to the general land use guidelines, a set of evaluation criteria was developed by the project team in consultation with the project's Planning Advisory Committee (PAC). The purpose of the evaluation criteria is to provide a framework for analysis of the Airport development alternatives and to guide the master plan process and, more specifically, to guide the landside planning element. A description of the evaluation criteria follows.

Community planning compatibility: Conformance with community plans, flexibility to adapt with changing circumstances, preserving opportunities, proposing socially feasible development, meeting needs of multiple stakeholders.

Environmental factors: Increasing the compatibility with neighboring uses with typical airport operations. Includes natural resources, air quality, stormwater, noise, airport-induced traffic, etc.

Financial factors: Considers the financial sustainability of the Airport, balancing costs with expected benefits, opportunities for new/increased revenues, and business success on and around the Airport.

Operational safety and efficiency: Increasing the overall operational safety and efficiency of the Airport as it grows to meet future traffic levels. Includes meeting all applicable FAA regulations.

Seismic resilience: Enhancement of facilities to be better capable of recovery following a major earthquake. "Resilience" means investments made prior to a major earthquake allow for a quicker recovery.

Social equity: Aimed at the equitable distribution of community and economic benefits, while seeking a proportional distribution of any airport impacts.

5.5.3 GENERALIZED LAND USE ALTERNATIVES

Building on this understanding of the Airport land uses, and the evaluation criteria having been established, more specific land use alternatives are identified below (see also Step 3 in Figure 5A). While still general in nature, the land use alternatives are intended to present three different alternatives for the location of various functional elements of the Airport. The primary functional elements considered are:

- Flight schools and training activity
- Terminal building and corporate shuttle operations
- FBO services

- Private corporate aviation storage and activity
- General aviation storage and activity

The land use alternatives presented here will be refined later in this chapter to present detailed layouts of planned future facilities (see also Step 4 in Figure 5A).

5.5.3.1 General Land Use Alternative 1 – Consistency with 2005 Master Plan

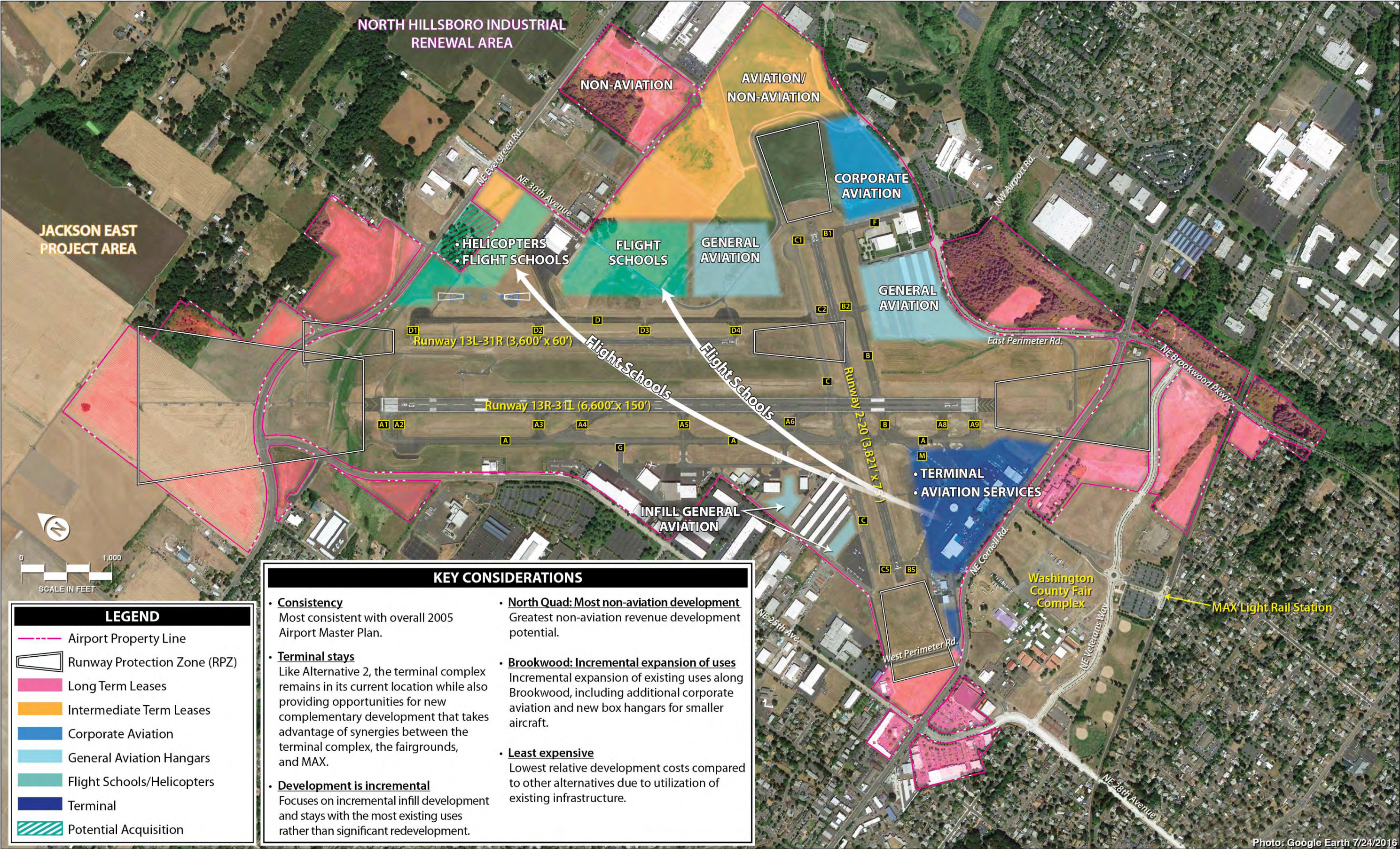
Exhibit 5J presents the first of three general land use alternatives. Alternative 1 closely reflects the land uses and development patterns established in the 2005 Airport Master Plan. With that plan's recommended parallel runway now implemented, land for new facilities aimed at serving small general aviation-oriented businesses is available on the north side of the airfield. As existing leases in the Cornell terminal area expire, the flight schools would be able to lease land near the parallel runway that offers better proximity to the airfield facilities sized for their operations.

Within the south side area, Port of Portland owned/controlled improvements would be redeveloped with a focus on a public terminal facility. Other related facilities, such as rental car parking and storage, customs, and other incidental concessions, would also be included either inside or adjacent to the terminal. The existing historical context would be ideally preserved and incorporated into the redevelopment. This specifically includes the fueling island (the Mushroom) and the Swede Ralston Hangar, current home for the Airway Science for Kids program. In addition to terminal functions within the Cornell terminal area, other opportunities for aviation-based educational facilities may be available, as would other aviation-related commercial development and possibly a public airfield observation facility. New facilities would be sited to more efficiently use the entire parcel and increase the visual appeal from Cornell Road.

The existing aircraft storage facilities in the east side development area along Brookwood Parkway, on the east side of the airfield, would remain during the 20-year planning period. The undeveloped parcel at the south end of the general aviation hangars would be planned for additional T-hangar and box hangar facilities. This is a slight change from the previous master plan in which all the existing small general aviation hangars in this location were planned for relocation to the north side of the airfield. Undeveloped land to the northeast of the established corporate hangars along Brookwood Parkway would be reserved for additional corporate aviation development.

Within the north side area, aviation facilities that are focused on accommodating general aviation activity by smaller single and twin piston/turboprop aircraft would be encouraged. The primary activities planned for the area are flight training businesses, general aviation aircraft storage hangars, and an FBO catering to these users. These uses are ideally positioned near the parallel runway.

Alternative One seeks to group small general aviation functional elements together. Helicopter flight school activity is positioned toward the north end of the parallel runway closer to the planned helicopter training pad (approximately 15 acres). Additional fixed-wing flight school activity is positioned in proximity to the center of the parallel runway (approximately 25 acres). General aviation aircraft storage is positioned nearer to the south end of the parallel runway (approximately 22 acres).



In all three alternatives, the property immediately adjacent to SolarWorld, with frontage on Evergreen Road (approximately 26 acres), is identified for future compatible long-term non-aviation development. This parcel is relatively disconnected from the rest of the Airport property and is unlikely to be needed for aviation purposes. In addition, NE Springer Street is planned to be extended to the east, terminating with a cul-de-sac just short of the SolarWorld property. When constructed, this road would effectively close this property to any future aviation development opportunity.

The land to the east of the planned flight schools and general aviation facilities, including the land wrapping around the Runway 20 RPZ (approximately 67 acres), is planned for either aviation or non-aviation development. The aviation forecasts previously presented indicate that land already identified for future aviation uses will, at a minimum, meet the aviation demand over the next 20 years and perhaps as long as the next 50 years. Therefore, the 67 acres surrounding the Runway 20 RPZ can be used for compatible non-aviation revenue producing purposes (with FAA approval). In addition, a six -acre parcel at the corner of Evergreen Road and NE 30th Avenue is shown for non-aviation uses.

The west side development area near the FAA Control Tower on the west side of the airfield is nearly at full build-out. Several undeveloped smaller parcels remain for infill opportunities. Development could include private hangar development or Airport support facilities, such as a consolidated maintenance facility or fuel farm.

Exhibit 5K presents a summary of the evaluation criteria as applied to Alternative 1.

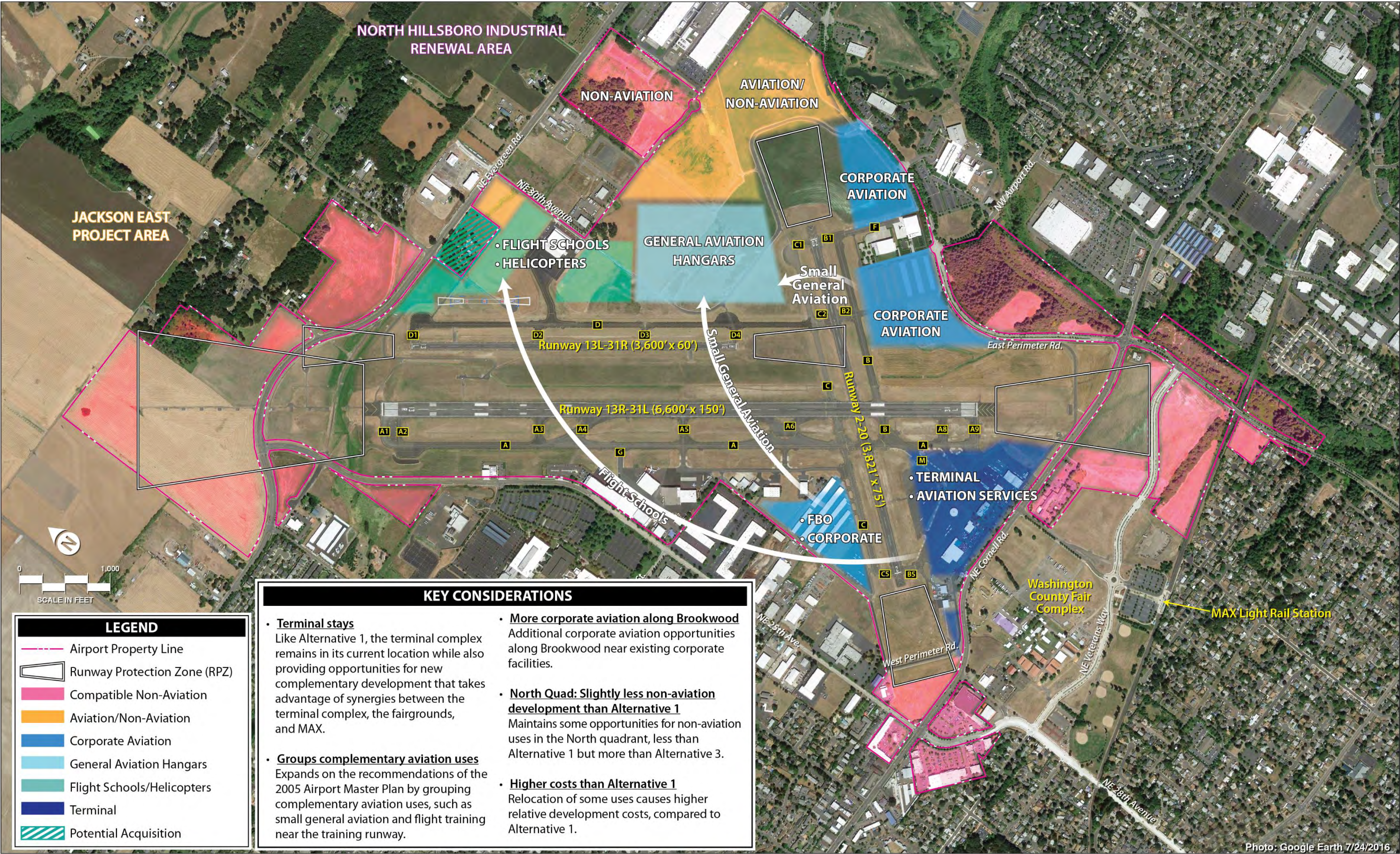
5.5.3.2 General Land Use Alternative 2 – Co-locate Like Facilities

Alternative 2, as depicted on **Exhibit 5L**, provides a variation on the 2005 Airport Master Plan land use strategy by focusing on the relocation of the existing T-hangars and connected box hangars along Brookwood Parkway. These facilities for smaller general aviation aircraft would be relocated or reconstructed on the north side of the airfield. In their place would be planned growth of private corporate aviation facilities. Undeveloped land to the northeast of the existing corporate hangars along Brookwood Parkway would be reserved for large corporate hangars.

Within the south side development area, the focus would be on accommodating corporate shuttle and business jet aircraft with the potential for multiple terminal facilities and shared parking. This concept provides a high degree of flexibility for accommodating any increase in corporate shuttle activity. The public terminal would be constructed by the Port of Portland and leased for aviation and aviation-related operations. Any additional executive terminal facilities would be constructed by private operators. The existing historical context would be ideally preserved and incorporated into the redevelopment. This specifically includes the fueling island (the Mushroom) and the Swede Ralston Hangar, current home for Airway Science for Kids. Other opportunities for aviation-based educational facilities may be available, as would other compatible aviation-related commercial development and public observation. New facilities would be sited to more efficiently use the entire parcel and increase the visual appeal from Cornell Road.

EVALUATION CRITERIA	CONSIDERATIONS FOR ALTERNATIVE 1
Community Planning Compatibility: Conformance with community plans, flexibility to adapt with changing circumstances, reserving opportunities, proposing socially feasible development, meeting needs of multiple stakeholders.	<p>Because the 2005 Airport Master Plan has been in place for over 10 years, area plans recognize the Airport’s pattern for development. The commissioning of a parallel runway that meets design criteria for small aircraft suggests that facilities for small aircraft will be constructed in close proximity to that runway and that eventually flight training operations would be better located there.</p> <p>The disadvantage to relocating the flight schools, which bears consideration, is the impact it could have on the student population. Many students rely on other transportation modes, especially transit and bicycles. Some may also walk to and from apartments in the area. In its present location, the flight school is much more convenient than what is shown in Alternative 1.</p> <p>Area zoning also recognizes the possible compatibility between Airport facilities and the Washington County Fairplex. Supported by multiple modes, the entire subarea along Cornell Avenue will be studied in greater depth and incorporated into this master plan. Land owned by the Port of Portland that is not needed for aviation purposes would be developed as compatible industrial or commercial uses that generate revenue that supports the Airport as required by FAA grant assurances.</p>
Environmental Factors: Increasing the compatibility with neighboring uses with typical airport operations. Includes natural resources, air quality, stormwater, noise, airport-induced traffic, etc.	<p>Alternative 1 calls for new development in multiple areas on the Airport. The construction of new impervious areas will create needs and opportunities for project elements directed solely at improving water quality and drainage throughout Airport property. The Port of Portland is also taking action to address areas where wildlife hazards are potentially attracted to habitat and/or standing water. Projects conducted by private developers would be required to mitigate their impacts within their own leaseholds, thereby eliminating unwanted impacts to neighboring leaseholds and property.</p> <p>Regarding noise and air quality, Alternative 1 has the potential to greatly reduce taxi times and additional flight time that is directly attributed the distance between aircraft parking and the facilities used for the majority of flight training activities. This distance currently results in additional emissions as aircraft queue to take off on the main runway or to cross the main runway. Airfield improvements that are common to all of the alternatives would also increase the efficiency of the ground operations for all users and thus further reduce fuel consumption and emissions. The preferred locations that small general aviation aircraft will perform safety checks (run-ups) near runway ends would also change over time as more small aircraft locate to the north side of the airfield. This change would generally be further from noise sensitive uses.</p> <p>Compared to other alternatives, Alternative 1 features more infill development and could use less undeveloped land during the forecast period.</p>

EVALUATION CRITERIA	CONSIDERATIONS FOR ALTERNATIVE 1
Financial Factors: Considers the financial sustainability of the Airport, balancing costs with expected benefits, opportunities for new/increased revenues and business success on and around the Airport. It also recognizes the value of investments already made in Airport facilities.	<p>Development costs and operating costs must strike a balance with revenues in order to be financially feasible and sustainable. Alternative 1 reflects significant investments by numerous parties in new facilities, however it does not suggest that tenants will be required to relocate prior to lease terms expiring thereby creating a hardship or need for compensation. Redevelopment of the Cornell terminal area facilities will accomplish a number of simultaneous objectives and create new opportunities for revenue. When properly phased, sustainable business success for the Port and its tenants is achievable.</p> <p>Compatible non-aeronautical development is a significant part of the feasibility of the Port-led projects that support Alternative 1. Because of the more compact nature of infill, more land for development will generate revenues that support critical infrastructure projects that increase the value of all investment at the Airport.</p>
Operational Safety and Efficiency: Increasing the overall operational safety and efficiency of the Airport as it grows to meet future traffic levels. Includes meeting all applicable FAA regulations.	<p>The proposed uses of land shown in Alternative 1 enhance safety and efficiency of the Airport and airspace overall. By locating storage facilities near the preferred airfield facilities for each aircraft type, the need for runway crossing is greatly reduced, as is the inefficient routing of taxiing aircraft that must cross runways or inefficiently use airspace once airborne to access the preferred facilities.</p> <p>Because Alternative 1 proposes infill of small general aviation storage hangars on the west side near the FAA Tower, other alternatives are more efficient. This is a tradeoff for the advantages that infill has over increasing undeveloped land consumption on the east side of the airfield.</p>
Seismic Resilience: Enhancement of facilities to be better capable of recovery following a major earthquake. “Resilience” means investments made prior to a major earthquake allow for a quicker recovery.	<p>New construction offers the ability to determine the appropriate level of seismic resilience incorporated. Port-owned buildings are considered vulnerable and are not likely to survive a moderate to severe earthquake. Investment to increase resilience in existing facilities is not considered to be feasible and so replacement of the terminal building and a maintenance facility is considered prudent. Other buildings are owned by private interests, many of which are newer and up to life safety code for seismic.</p> <p>As with each of the alternatives in this analysis, the master planning process will be refined during development of the capital improvement program and the ability to increase funding for projects to make them more resilient will be explored.</p>
Social Equity: Aimed at the equitable distribution of community and economic benefits while seeking a proportional distribution of any Airport impacts.	<p>Because businesses that conduct flight training would be relocating closer to Evergreen Road, Alternative 1 potentially distributes impacts to a wider economic demographic population. The ground movement portion of flight training activities would be focused further from neighborhoods south of Cornell Road. Other aspects of Alternative 1 are unchanged from current planning.</p>



The west side FBOs have limited or no room for expansion. This alternative considers relocating the existing T-hangars and connected box hangars to the north side of the airfield, in closer proximity to the parallel runway. Approximately 14 acres would then be available for redevelopment as larger FBO hangars. Alternative 2 also examines the potential to relocate the FAA Control Tower to the north side of the airfield, which would open additional development potential on the west side.

All small general aviation facilities would be located on the north side of the airfield in proximity to the parallel runway. Alternative 2 depicts a slightly different arrangement of flight training facilities and aircraft storage hangars for smaller aircraft than Alternative 1, but the overall land use objectives and advantages are similar. Approximately 15 acres would be available immediately adjacent to the planned helicopter training pad. An additional 13 acres would be planned to the south of the existing north side FBO hangar to accommodate fixed-wing flight schools. Approximately 45 acres would be planned to be reserved for T-hangars and connected box hangars to accommodate the relocation and forecast growth in general aviation aircraft.

The remaining land to the east of the planned flight schools and general aviation land, including the land wrapping around the Runway 20 RPZ (approximately 56 acres) would be planned for either aviation or non-aviation development. This is 11 acres less than Alternative 1 because of the plan to accommodate all existing and future general aviation activity to the north side. The aviation forecasts previously presented indicate that land already identified for future aviation uses will, at a minimum, meet the aviation demand over the next 20 years and perhaps as long as the next 50 years. In all likelihood, none of the 56 acres identified will be needed to meet aviation demand. In addition, a five-acre parcel at the corner of Evergreen Road and NE 30th Avenue would be planned for non-aviation uses if it is not needed for helicopter flight schools.

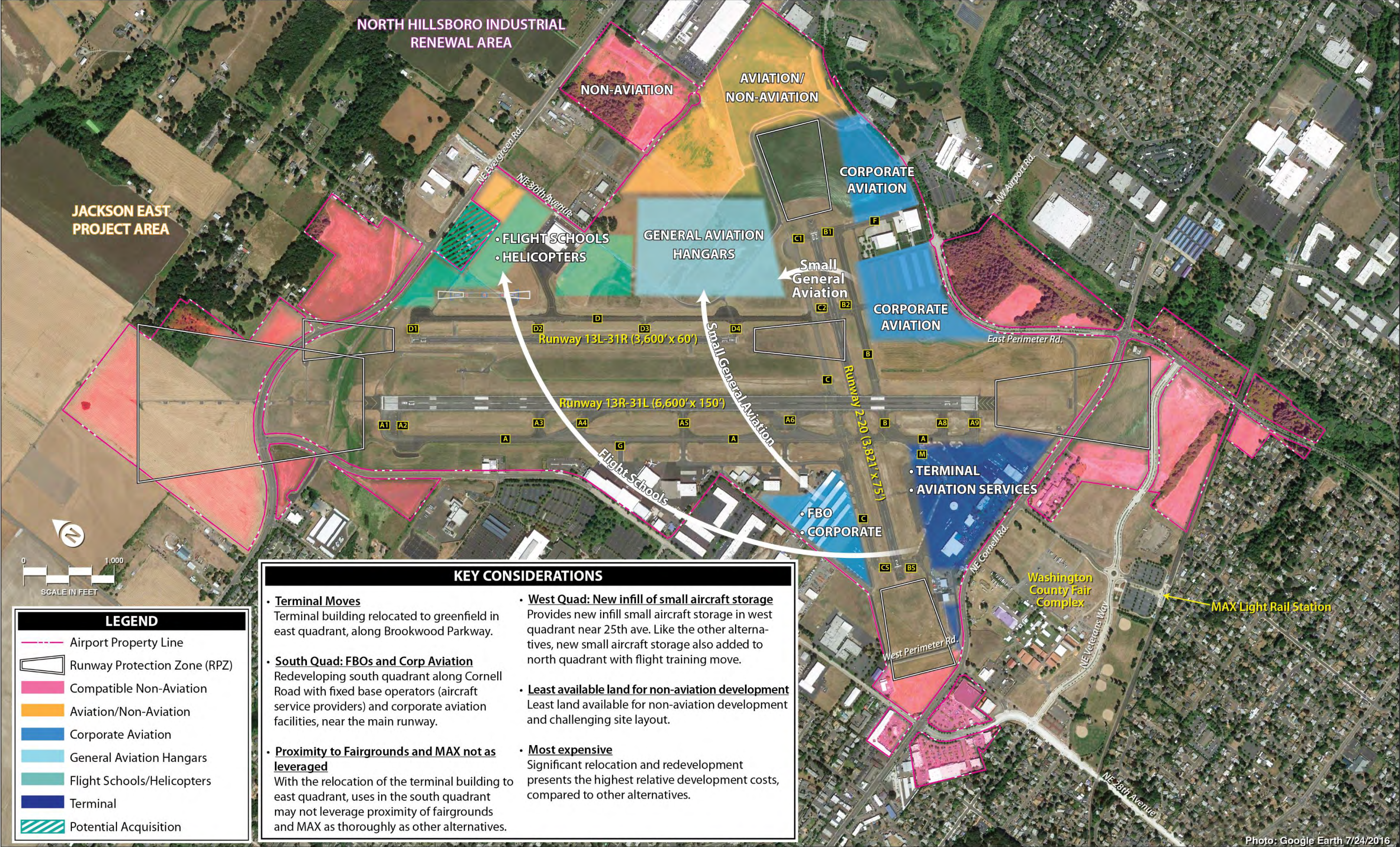
Exhibit 5M presents a summary of the evaluation criteria as applied to Alternative 2.

5.5.3.3 General Overview Alternative 3 – Relocate Terminal to Brookwood

Alternative 3, as depicted on **Exhibit 5N**, examines the potential to relocate the terminal facilities to the undeveloped area along Brookwood Parkway. To the south of the existing corporate hangars along Brookwood Parkway, the area currently occupied by T-hangars, would be planned to be redeveloped to support growth in corporate aviation.

EVALUATION CRITERIA	CONSIDERATIONS FOR ALTERNATIVE 2
Community Planning Compatibility: Conformance with community plans, flexibility to adapt with changing circumstances, reserving opportunities, proposing socially feasible development, meeting needs of multiple stakeholders.	<p>The key difference between this concept and Alternative 1 is the strategy to segregate facilities by function. However, this represents a small variation to existing plans, especially as they relate to other community plans around the Airport. The key advantage to segregating by function is for efficiency of operations on the ground, and to some extent in the air as well. Pilots will tend to prefer to use the runways and taxiways that are most convenient to where their storage facilities are located and this arrangement maximizes this benefit.</p> <p>Because the 2005 Airport Master Plan has been in place for over 10 years, area plans recognize the Airport’s pattern for development. The commissioning of a parallel runway that meets design criteria for small aircraft suggests that facilities for small aircraft will be constructed in close proximity to that runway and that eventually flight training operations would be better located there.</p> <p>The disadvantage to relocating the flight schools which bears consideration is the impact it could have on the student population. Many students rely on other transportation modes, especially transit and bicycles. Some may also walk to and from apartments in the area. In its present location on Cornell Road, the flight schools are more convenient than what is shown in Alternative 2.</p> <p>Area zoning also recognizes the possible compatibility between Airport facilities and the Washington County Fairplex. Supported by multiple modes, the entire area along Cornell Road will be studied in greater depth and incorporated into this master plan. Land owned by the Port of Portland that is not needed for aviation purposes would be planned for development as compatible industrial or commercial uses that generate revenue that supports the Airport as required by FAA grant assurances.</p>
	<p>Alternative 2 calls for new development in multiple areas on the Airport. The creation of new impervious areas will create needs and opportunities for project elements directed solely at improving water quality and drainage throughout the Airport’s property. The Port of Portland is also taking action to address areas where wildlife hazards are potentially attracted to habitat and/or standing water. Finally, projects conducted by private developers would be required to mitigate their impacts within their own leaseholds, thereby eliminating unwanted impacts to neighboring leaseholds and property.</p> <p>Regarding noise and air quality, Alternative 2 has the potential to greatly reduce taxi times and additional flight time that is directly attributed the distance between aircraft parking and the runways used for the majority of flight training operations. This distance currently results in additional emissions as aircraft queue to take off on the main runway or to cross the main runway. Airfield improvements that are common to all of the alternatives would also increase the efficiency of the ground operations for all users and thus further reduce fuel consumption and emissions. The preferred locations that small general aviation aircraft will perform safety checks (run-ups) near runway ends would also change over time as more small aircraft locate to the north side of the airfield. This change would generally be further from noise sensitive uses.</p> <p>Compared to other alternatives, Alternative 2 features more new land development in the north area to meet facility requirements.</p>

EVALUATION CRITERIA	CONSIDERATIONS FOR ALTERNATIVE 2
Financial Factors: Considers the financial sustainability of the Airport, balancing costs with expected benefits, opportunities for new/increased revenues and business success on and around the Airport. It also recognizes the value of investments already made in Airport facilities.	<p>Alternative 2 may increase the opportunities for commercial/retail development in the Cornell terminal area through redevelopment and passenger-related concessions. Development costs and operating costs must strike a balance with revenues in order to be financially feasible and sustainable. Alternative 2 reflects significant investments by numerous parties in new facilities, however it does not suggest that tenants will be required to relocate prior to lease terms expiring thereby creating a hardship or need for compensation. Redevelopment of the Cornell terminal area facilities will accomplish a number of simultaneous objectives and create new opportunities for revenue. When properly phased, sustainable business success for the Port and its tenants is achievable.</p> <p>Compatible non-aeronautical development is a significant part of the feasibility of the Port-led projects that support Alternative 2. Because the alternative seeks to accommodate small aircraft facilities in the north area of the Airport, more aviation reserves would be needed and less land for non-aeronautical development land would be available that could generate lower revenues during the planning period as compared to other alternatives.</p>
	<p>The proposed uses of land shown in Alternative 2 enhance safety and efficiency of the Airport and airspace overall. By locating aircraft storage facilities near the preferred airfield facilities for each aircraft type, the need for runway crossing is greatly reduced, as is the inefficient routing of taxiing aircraft that must cross runways or inefficiently use airspace once airborne to access the preferred facilities.</p> <p>Because Alternative 2 discourages infill of general aviation storage hangars on the west side near the FAA Tower or on the east side near Brookwood Parkway, following implementation this will be the most efficient arrangement of facilities as compared to other alternatives. Without the need for additional airfield projects, there would be a significant reduction in taxiing and holding aircraft along Taxiway A. In order to maximize efficiency and safety, a fuel farm or satellite facility is required on the east side of the airfield.</p>
Seismic Resilience: Enhancement of facilities to be better capable of recovery following a major earthquake. “Resilience” means investments made prior to a major earthquake allow for a quicker recovery.	<p>New construction offers the ability to determine the appropriate level of seismic resilience incorporated. Port-owned buildings are considered vulnerable and may not survive a moderate to severe earthquake. Investment to increase resilience in existing facilities is not considered to be feasible and so replacement of the terminal building and a maintenance facility is considered prudent. Other buildings are owned by private interests, many of which are newer and up to life safety code for seismic.</p> <p>As with each of the alternatives , the master planning process will be refined during development of the capital improvement program and the ability to increase funding for projects to make them more resilient will be explored.</p>
	<p>Because businesses that conduct flight training would be relocating to the north side closer to Evergreen Road, Alternative 2 potentially distributes impacts to a wider economic demographic population. The ground movement portion of flight training activates would be focused further from neighborhoods south of Cornell Road.</p> <p>A portion of the student pilot population would see an increase in commute distances and reduced convenience for public transportation options.</p> <p>There would be no notable change in the transportation patterns, aside from the change in vehicle trips to/from the flight schools and an increase in bicycle/pedestrian traffic between the MAX station and the flight school location. Other aspects of Alternative 2 are unchanged from current planning.</p>
Social Equity: Aimed at the equitable distribution of community and economic benefits while seeking a proportional distribution of any Airport impacts.	



By relocating the terminal building, and assuming that all flight schools relocate to the north side of the airfield, the Cornell area becomes open for FBO and/or corporate aviation development. This location may be inviting for one of the existing FBOs to expand or relocate. Since auto parking would not be required at the scale that current uses require, the hangars could be set along the current setback from Cornell Road to allow for the maximum apron depth for multiple large aircraft parking positions. The existing historical context would be ideally preserved and incorporated into the redevelopment. This specifically includes the fueling island (the Mushroom) and the Swede Ralston Hangar, current home for Airway Science for Kids. Other opportunities for aviation-based educational facilities would be available, as would other compatible aviation-related commercial development and public observation. New facilities would be sited to more efficiently use the entire parcel and increase the visual appeal from Cornell Road.

Like each of the other two alternatives, the north side area would reserve land along Taxiway D for flight training and small aircraft storage. Land set farther back would be available for compatible non-aviation revenue support. Like Alternatives 1 and 2, approximately 15 acres adjacent to the planned helicopter training pad is reserved for flight training. Approximately 24 acres of land for general aviation hangar storage is then considered adjacent to the center of the runway. Alternative 3 then considers the feasibility of locating fixed-wing flight schools on approximately 14 acres at the intersection of Taxiways C and D.

Potential non-aviation development includes the previously discussed six-acre parcel at the intersection of Evergreen Road and NE 30th Avenue and the 26-acre parcel adjacent to SolarWorld. In addition, between 55 and 76 acres of land extending around the Runway 20 RPZ could be available for non-aviation development. A range of available non-aviation land is considered initially to allow for flexibility if additional land may be needed to support flight school development or terminal development along Brookwood Parkway.

Exhibit 5P presents a summary of the evaluation criteria as applied to Alternative 3.

5.5.4 GENERALIZED LAND USE CONCLUSION

The three Airport Alternatives explore several different development themes. These are a “big picture” view intended to inform more detailed analysis to follow. The PAC, the public through an online open house, city and county staff, and the Port of Portland all provided input. Following review of these general land use alternatives, several conclusions will be carried into the next step of the analysis:

1. The terminal building should be planned to remain in the Cornell area.
2. Flight schools will relocate away from the Cornell parcel
3. The west side will accommodate infill opportunities only.
4. Corporate development will be accommodated on the eastside, north of the existing corporate hangars.

EVALUATION CRITERIA	CONSIDERATIONS FOR ALTERNATIVE 3
Community Planning Compatibility: Conformance with community plans, flexibility to adapt with changing circumstances, reserving opportunities, proposing socially feasible development, meeting needs of multiple stakeholders.	<p>The changed land use patterns depicted in Alternative 3 represent a change in existing planning, both on the ALP and in community plans. Terminal facilities located on Cornell Road have been the front door for the Airport since its opening nearly 90 years ago. However, there could be advantages to putting the terminal in private hands and allowing for its development closer to the businesses that operate corporate flight departments and move their employees by air.</p> <p>Because the 2005 Airport Master Plan has been in place for over 10 years, area plans recognize the Airport’s pattern for development. Changing the location of the terminal may have impacts to traffic patterns along Brookwood Parkway. The depicted location in Alternative 3 allows for the existing signalized intersection at the City of Hillsboro’s Brookwood Library entrance to be the terminal’s entrance location. If this location is preferred, additional traffic studies would be performed to quantify the changes to Brookwood Parkway traffic patterns and peak volumes. There would be a corresponding decrease to Airport-generated vehicle trips along Cornell Road.</p> <p>The disadvantage to relocating the flight schools, which bears consideration, is the impact it could have on the student population. Many students rely on other transportation modes, especially transit and bicycles. Some may also walk to and from apartments south of the Cornell terminal area. In its present location on Cornell Road, the flight school is more convenient than what is shown in Alternative 3, but shorter than is shown in other alternatives.</p> <p>Area zoning also recognizes the possible compatibility between Airport facilities and the Washington County Fairplex. Supported by multiple modes, the entire subarea along Cornell Road will be studied in greater depth and incorporated into this master plan. Land owned by the Port of Portland that is not needed for aviation purposes would be planned for developmenet as compatible industrial or commercial uses that generate revenue that supports the Airport as required by FAA grant assurances.</p>
	<p>Alternative 3 calls for new development in multiple areas on the Airport. The creation of new impervious areas will create needs and opportunities for project elements directed solely at improving water quality and drainage throughout the Airport’s property. The Port of Portland is also taking action to address areas where wildlife hazards are potentially attracted to habitat and/or standing water. Projects conducted by private developers would be required to mitigate their impacts within their own leaseholds, thereby eliminating unwanted impacts to neighboring leaseholds and property.</p> <p>Regarding noise and air quality, Alternative 3 has the potential to reduce taxi times and additional flight time that is directly attributed the distance between aircraft parking and the runway used for the majority of flight training operations. This distance currently results in additional emissions as aircraft queue to take off on the main runway or to cross the main runway. Airfield improvements that are common to all of the alternatives would also increase the efficiency of the ground operations for all users and thus further reduce fuel consumption and emissions. The preferred locations that small general aviation aircraft will perform safety checks (run-ups) near runway ends would also change over time as more small aircraft locate to the north airfield area. This change would generally be farther from noise sensitive uses.</p> <p>Compared to other alternatives, Alternative 3 features more new development in the north side of the Airport, near Evergreen Road, to meet facility requirements.</p>
	<p>Alternative 3 reflects significant investments by numerous parties in new FBO facilities. Redevelopment of the Cornell terminal area facilities could accomplish a number of simultaneous objectives and create new opportunities for revenue, however this potential would likely be reached slower than with other alternatives that include passenger facilities. However, because the amount of parking needed for FBO activities is much lower, this alternative could have the benefit of increasing the amount of apron in front of the flightline as a reserve for additional aviation development beyond the planning period. When properly phased, sustainable business success for the Port and its tenants is achievable.</p>

EVALUATION CRITERIA	CONSIDERATIONS FOR ALTERNATIVE 3
<p><i>CONTINUED...</i></p> <p>Financial Factors: Considers the financial sustainability of the Airport, balancing costs with expected benefits, opportunities for new/increased revenues and business success on and around the Airport. It also recognizes the value of investments already made in Airport facilities.</p>	<p>Alternative 3 also would require funding for one or more capital projects to extend a taxiway and construct an apron that accommodates the corporate shuttle operation. While eligible for discretionary FAA funding, it is possible that these projects would not compete well with other airports that vie for the same funds.</p> <p>Alternative 3 may decrease the opportunities for commercial/retail development in the Cornell terminal area because of the reduced emphasis on passenger-related activity and concessions. Development costs and operating costs must strike a balance with revenues in order to be financially feasible and sustainable. Because the Brookwood terminal location would re-focus passenger activity out of the Cornell terminal area, potential revenues may be reduced.</p> <p>Compatible non-aeronautical development is a significant part of the feasibility of the Port-led projects that support Alternative 3. Because the alternative seeks to accommodate small aircraft facilities only in the north airfield area near Evergreen Road, more aviation reserves would be needed and less land for non-aeronautical development land would be available that could generate lower revenues during the planning period as compared to other alternatives. However, some land could be reserved for non-aviation development and still retain the flexibility to be connected to the airfield if needed.</p>
<p>Operational Safety and Efficiency: Increasing the overall operational safety and efficiency of the Airport as it grows to meet future traffic levels. Includes meeting all applicable FAA regulations.</p>	<p>The proposed uses of land shown in Alternative 3 enhance safety and efficiency of the Airport and airspace overall. By locating aircraft storage facilities near the preferred airfield facilities for each aircraft type, the need for runway crossing is greatly reduced, as is the inefficient routing of taxiing aircraft that must cross runways or inefficiently use airspace once airborne to access the preferred facilities.</p> <p>Because Alternative 2 discourages infill of general aviation storage hangars near the FAA Tower or near Brookwood Parkway, following implementation this will be the most efficient arrangement of facilities as compared to other alternatives. Without the need for additional airfield projects there would be a significant reduction in taxiing and holding aircraft along Taxiway A. In order to maximize efficiency and safety, a fuel farm or satellite facility is required on the east side of the airfield.</p>
<p>Seismic Resilience: Enhancement of facilities to be better capable of recovery following a major earthquake. “Resilience” means investments made prior to a major earthquake allow for a quicker recovery.</p>	<p>New construction offers the ability to determine the appropriate level of seismic resilience incorporated. Port-owned buildings are considered vulnerable and may not survive a moderate to severe earthquake. Investment to increase resilience in existing facilities is not considered to be feasible and so replacement of the terminal building and a maintenance facility is considered prudent. Other buildings are owned by private interests, many of which are newer and up to life safety code for seismic.</p> <p>As with each of the alternatives in this analysis, the master planning process will be refined during development of the capital improvement program and the ability to increase funding for projects to make them more resilient will be explored.</p>
<p>Social Equity: Aimed at the equitable distribution of community and economic benefits while seeking a proportional distribution of any Airport impacts.</p>	<p>Because businesses that conduct flight training would be relocating to the north side, closer to Evergreen Road, Alternative 3 potentially distributes impacts to a wider economic demographic population. The ground movement portion of flight training activities would be focused further from neighborhoods south of Cornell Road.</p> <p>A portion of the student population would see an increase in commute distances and reduced convenience for public transportation options, although with a location closer to Brookwood, this represents less of an impact as compared to other Alternative 1.</p> <p>There would be no notable change in the transportation patterns, aside from the change in vehicle trips to/from the flight schools and an increase in bicycle/pedestrian traffic between the MAX station and the flight schoos. The distance from the depicted flight school location to transit connections is the shortest compared to other alternatives. Other aspects of Alternative 3 are unchanged from current planning.</p>

General Land Use Alternative 1 – Consistency with 2005 Master Plan (**Exhibit 5J**) is the best representation of the preferred generalized land use plan. In general, it is preferred that the terminal building or a replacement terminal building remain in the Cornell parcel. Primary feedback on this subject showed that people felt that the Cornell parcel was the entrance to the airport and that a terminal building should be located there. Locating other aviation services in the Cornell parcel will be considered in the more detailed subarea alternatives presented later in this chapter.

Flight schools should be located in either the north or east sides of the airport. The more detailed alternatives to follow will test three different potential locations on the opposite side of the main runway. The undeveloped area north of the east side corporate hangars should be reserved for additional corporate aviation. The east side T-hangars should remain a general aviation use; however, the more detailed alternatives to follow will test the possibility of a flight school or additional corporate aviation in this location.

The north side of the airport, near the parallel training runway, should be reserved for general aviation use. The specific location of flight schools and general aviation hangars will be examined in the more detailed facility alternatives to follow later in this chapter. **Table 5J** presents a summary table of the land area in the north side development area included in the three alternatives. The land area identified for each functional element will likely adjust based on a final recommended concept. At that time, a comprehensive on-Airport land use plan will be finalized.

TABLE 5J**Northside Land Use by Area (Acres)****Hillsboro Airport**

General Land Use Function	Alternative 1	Alternative 2	Alternative 3
Helicopter Flight School Area	15	15	15
Fixed-Wing Flight School Area	25	13	14
General Aviation Small Aircraft Storage Area	22	45	24-40
Non-Aviation/Aviation Area	67	56	55-76
Non-Aviation/Aviation (Evergreen and 30th Ave) Area	5	5	5
Non-Aviation (Adjacent SolarWorld) Area	26	26	26
Total Acres	160	160	155-160

All figures in acres.

5.6 LANDSIDE ALTERNATIVES

Landside alternatives include all airport elements that are not specifically addressed in the airside alternatives. This includes the terminal building, aircraft apron, aircraft hangars, vehicle parking, street access and other land uses.

5.6.1 PROCESS AND GOALS

The process of narrowing the range of possible landside development alternatives is iterative. All considerations at this stage are informed by prior work with the project team, the Planning Advisory Committee, airport tenants and businesses, the public, the broader Port team, the city and county, and the FAA.

The first step is to identify general land use assumptions, which was completed in the previous section of this chapter. The next step is to add detail to the general land use assumptions, employing certain industry best practices and applying previously-identified evaluation criteria to illustrate alternatives for potential development of the airport.

The overall goal of this process is to craft a sustainable approach to the long-term development of the airport. The Port of Portland has long understood that long-range airport planning is critical to successful development of their airports, including Hillsboro. This is evidenced by the fact that the airport master plans are updated on a regular schedule, approximately every seven to ten years, and that they frequently coordinate with FAA to refine their capital project priorities. The following best practice guidelines are considered when refining the alternatives into a single preferred alternative:

Safe and Efficient : Safety is the primary concern when planning improvements to any airport and it must not be compromised. For the airside, preserving or increasing the efficiency of aircraft movements is a key emphasis. By promoting an efficient design, aircraft operators will save time and money, and negative impacts from noise and emissions are reduced. On the landside, vehicle movements and access to facilities is important.

Flexible: All alternatives considered must be capable of addressing some uncertainty. To this end, a conservative approach has been applied so that alternatives reserve more land for aviation purposes than identified in the facility requirements. This includes land adjacent to the runway and taxiways, to a parcel depth of approximately 1,000 feet.

Incremental: Fiscal constraints require careful and creative approaches to phasing the 20-year development plan. While the actual phasing plan is presented in subsequent chapters, all alternatives presented here can be phased over time.

Affordable: A general understanding of development costs and sources of funds is necessary to creating alternatives that can be realistically implemented. As a general aviation reliever airport, assured federal funds are limited to \$150,000 annually. Other sources of funds, including FAA discretionary, state, or local funds, will be necessary to implement major projects.

5.6.1.1 Subarea Process

At the outset of the master plan process, it was known that two areas of the airport should receive focused attention during the alternatives analysis. The first is the south development area, which includes the triangle area bounded by Cornell Road and the two runways as well as airport property

south of Cornell. This area will be called the Cornell Subarea. The second is the Evergreen parcel which encompasses the north and east quadrants of the airport, both which have large undeveloped land areas.

The subsequent discussion in this chapter focuses on alternative development concepts for these two subareas. Prior to the subarea analysis, certain elements common to all alternatives are presented.

5.6.2 COMMON ELEMENTS

Several elements of the plan are common to each alternative. These are discussed below.

5.6.2.1 West Side Infill Development

The west side of the airport is home to numerous aviation facilities, including several FBOs, private conventional hangars, and T-hangars. Currently, there are two undeveloped areas on the west side. All three alternatives consider the same infill development of these areas. As shown on the alternatives, two box hangars are planned with an access taxilane. The larger of the two box hangars is approximately 22,000 square feet and the smaller one is 17,000 square feet. The west side T-hangar structures shown are approximately 25,000 square feet in size. Combined, the west side infill opportunities encompass a total of 92,900 square feet as shown on the alternatives. This represents 94 percent of the total new hangar square footage forecasted needs over the next 20 years as outlined in the *Facility Requirements* chapter.

5.6.2.2 Stormwater Management

Conceptual planning must consider management and treatment of stormwater. Requirements for stormwater management are established by Clean Water Services, a regional water quality district that has oversight of stormwater design and construction standards in Washington County. There are two main considerations for future development at Hillsboro Airport: water quality and stormwater detention.

Landowners are responsible for managing the quality of the stormwater that runs off their property. This is often accomplished through the placement of facilities to detain and/or convey runoff from the property. The methods chosen to meet these standards will best meet the development proposed.

For the purposes of conceptual planning, this study recognizes two implementable methods: regional and local. Regional treatment involves conveying runoff from various impervious surfaces into larger facilities where treatment can be accomplished at a larger scale. Local treatment methods treat runoff within an individual parcel. In general, Hillsboro Airport will employ regional treatment methods for common use areas of the airport. Individual leased areas are planned to be treated locally for stormwater runoff. Individual lessees will be responsible for attainment of applicable standards and permitting as a condition of receiving a lease.

For each alternative, areas have been set aside at a large scale to allow for regional treatment of runoff from common-use aviation facilities within each major drainage basin. The scale of these surface facilities also assumes that existing aviation facilities not currently accounted for in runoff treatment volumes will also be treated at three times the actual areas, or a 3:1 ratio. Some impervious areas within the airport property (Runway 2-20, Taxiways A, B, C, AA, M, and the connectors) are currently treated to Clean Water Services standards. Assuming the untreated areas are accounted for properly in the future, the volume of runoff from new development shown in the alternatives will be accounted for at a 1:1 ratio.

Stormwater detention is also an important consideration. Runoff from storm events must be managed to limit impact of downstream. FAA design standards limit time following a storm event to 48 hours that a surface-level facility may have residual water. Proper design of facilities for future development will also be the subject of follow-on permitting work as individual projects are implemented.

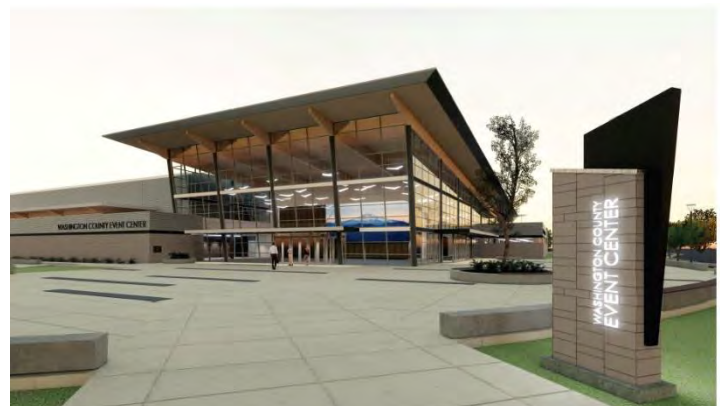
For this conceptual planning stage, it is also important to recognize that other treatment methods may have a smaller footprint in exchange for potentially higher development costs. Subsurface treatment methods can meet criteria without utilizing larger surface facilities, which could limit development and attract wildlife. These considerations will be the subject of follow-on work as individual projects are implemented. Whatever methods are chosen, this will be the result of intergovernmental coordination to identify the best solutions.

An appropriate follow-on study to this airport master plan is Stormwater Master Plan. Such a study typically provides detailed analysis of the following:

- Permitting requirements;
- Mitigation techniques for surface flooding and wildlife attractants;
- Identification of aging infrastructure;
- Development of an asset management program;
- Development of a list of projects for stormwater modifications and improvements.

5.6.2.3 Washington County Fair Complex and Events Center

Washington County plans to construct a new events center, located at the northwest corner of Veterans Drive and 34th Avenue. The Hillsboro Airport Master Plan project team has engaged representatives from Washington County to integrate planning for both the airport and the Washington County Fair Complex, including the events center. This coordination is intended to enhance the physical and conceptual relationship between the airport, on the north side of Cornell Road, and the Fair Complex, on the south side of Cornell Road.



Conceptual rendering of the planned Washington County Events Center

The plan for the events center includes exposition space, a conference center, commercial kitchen, concessions and office space. The facility space will be 91,200 square feet. Adjacent to the interior lobby, a large entry plaza will accommodate an outdoor exhibit area and provide an opening to the Fair Complex. The facility will offer a variety of room configurations to accommodate various events such as consumer shows, trade shows, conferences, corporate meetings and seminars, banquets and receptions, fundraisers, festivals and other community uses. The events center will be the anchor facility for the well-attended annual County Fair, providing indoor exhibit space, restrooms and concessions.

As currently conceived, the proposed events center has an aviation design theme, reflecting its proximity and relationship to Hillsboro Airport. Style elements related to aviation include the sweeping, angular roof line intended to simulate wings and aviation-themed interior lighting.

There are a number of public events held annually at the Washington County Fair Complex, most notably the annual Washington County Fair. Overflow parking is needed for these events and airport-owned, undeveloped land to the east (between Veterans Drive and Cornell Road) could be used for this purpose. Each of the alternatives shows the approximate location of potential overflow parking on airport property.

5.6.2.4 Cornell Market Study

The Port, in partnership with Washington County, has initiated a market study to identify viable commercial development along Cornell Road adjacent to both the airport and the events center. While this study is still in development, early findings have been taken into consideration when developing the alternatives for the Cornell subarea. The early findings include:

- There is demand for retail space in the area as existing retail space is near 100 percent occupancy;
- Commercial/retail needs to be supported by the community-at-large and not just the airport or the Washington County Events Center;
- There is demand for up to two hotels of different uses, such as a branded hotel and an extended-stay hotel. Hotels do not need road-facing lots to be successful; and
- There is potential need for one sit-down restaurant south of Cornell Road.

Based on these early findings, the alternatives reflect the potential for commercial/retail/hotel development in the Cornell subarea. This includes airport property north and south of Cornell Road and portions of Washington County property.

5.6.2.5 Enhance Airport/Fair Complex/Community Synergies

Numerous stakeholders have expressed the importance of creating a “gateway” connector between the community, the Fair Complex, and the airport. The 34th Avenue connection between the Fair Complex and the airport is considered an important strategic asset that should create a visual and physical gateway. The northern sightline along 34th Avenue (from the events center to the airport) should emphasize

views of the airport and views from the airport. Sightlines of the airport from other directions are also emphasized. The intent is to use care when blocking sightlines with buildings or other facilities. In addition, a more prominent airport entrance sign or symbol is encouraged. Examples may include a display aircraft or historical element (i.e., static display aircraft, airport beacon, etc.) along with custom signage.

Each alternative maintains the intersection of Cornell Road and 34th Avenue as the primary entrance/exit from the airport. This is an airport important asset planned to be preserved and enhanced.

5.6.2.6 Historic Resources

Two historic resources are specifically considered in the airport alternatives. The first is the fuel island, commonly referred to as the “mushroom,” located on the terminal area aircraft apron. The mushroom is an iconic structure constructed in the 1950s and is currently used to refuel aircraft and refuelers. The mushroom itself does not house aboveground fuel storage tanks (ASTs), but underground storage tanks (USTs) are located below the pavement.

The second historic feature is the Swede Ralston Hangar, which is in the southwest corner of the terminal area. This hangar was constructed by Norman Ralston, known as “Swede,” who was an early aviation pioneer in Oregon and helped establish Hillsboro Airport. The Swede Ralston Hangar was the first commercial hangar built at the airport. Today, the Swede Ralston Hangar houses Airway Science for Kids, a non-profit organization promoting interest and growth toward higher learning and careers in aerospace, science, technology, engineering and mathematics (STEM) for regional area youth.



Fuel Island – “Mushroom”: 1960s



Original Swede-Ralston Hangar: 1930s

5.6.2.7 Terminal Building

Alternatives will each examine replacing the existing terminal building with a new, more modern facility, located in the Cornell parcel. Each of the alternatives considered identify a 25,000-square-foot footprint reserved for the new terminal building. This footprint is the space forecast needed long-term for a single-story facility. No determination has been made as to whether the replacement terminal building is one or two stories.

Terminal buildings are usually a prominent and significant feature of an airport. At Hillsboro Airport, this is especially true because of the terminal's prominence along Cornell Road and the opportunity to strengthen the synergies between the airport and the broader community. Because of this, when the replacement terminal building is designed, the Port would like to incorporate elements that increase the synergy between the community and the airport. Optional amenities such as conference rooms available for community use or a second story viewing platform could be added as plans area developed.

5.6.2.8 Flight School Campus

Currently, there are two highly-active flight schools that have a base of operations in the Cornell parcel. As discussed previously, flight school operations are planned to be relocated to the Evergreen subarea (either the north quadrant or the east quadrant). The primary purpose of the planned relocation is to locate flight school activity in proximity to the infrastructure that supports them, namely the recently constructed parallel training runway and the planned helicopter training pad. Additionally, combining the location of similar types of aviation services reduces the potential for conflicts or congestion. For example, by consolidating flight schools to the north side of the airport, the amount of potential interaction of student pilot aircraft with larger business jets is reduced, thus improving the efficiency and safety of the airfield. The alternatives examine three different potential locations for the flight school campus.

5.6.2.9 Noise Considerations

Hillsboro Airport has a robust noise monitoring and fly friendly program. Managing and mitigating noise is a central focus of airport planning and operations. For the alternatives analysis, noise contours were developed for each of the alternatives and are presented in **Appendix B**. The primary difference in the noise contours is the planned location of the flight schools. The three future locations considered are: 1) the north side near the planned helicopter training site, 2) the east side in the location of the existing T-hangar facilities off Brookwood Parkway, or 3) a northcentral location near the intersection of the two runways.

The flight schools generate the most helicopter activity, which has a noticeable impact on the extent of the noise contours. The 65 day-night average sound level (DNL) is the federal threshold of significance. While in Oregon, the 55 DNL is also considered for advisory purposes. The 65 DNL noise contour for each alternative remains largely on airport property and generally falls on compatible land uses (both existing uses and zoned future uses) where it extends beyond airport property.

5.6.2.10 Aviation Learning Campus

The airport has a long history of engaging the public and promoting aviation and science. As previously mentioned, the aviation museum and the first hangar built at the airport (Swede Ralston Hangar) are in the southwest corner of the Cornell parcel. This general area of the airport is considered for expanded

aviation educational opportunities in locations where there is not a need for specific airport-related facilities.

As currently envisioned, the Swede Ralston Hangar would remain in its current location, however it could be relocated to the west, adjacent the aviation museum. The area to the north of the aviation museum is considered for an airport maintenance building that would replace the current facility. The area to the south of the aviation museum would be reserved for facilities to support the aviation learning campus.

5.6.2.11 Community Viewpoint Options

The activity at airports attracts the interest of a wide variety of observers. To encourage people to enjoy and support airport activity, the Port of Portland is interested in reserving a location on airport property where people can view airplanes taking off and landing.

A location near the fire station along 25th Avenue could be used for this purpose. This location is feasible because the narrow parcel shape limits potential aviation development and proximity to the taxiway provides for good sightlines. This location allows for viewing from a parked vehicle. A small structure, such as a park shelter, could be also be provided. Any planned formal viewing area should be limited in its purpose to aircraft viewing and should not encourage long stays, such as picnics or parties.

5.6.2.12 Control Tower Alternatives

The FAA owns and staffs the airport traffic control tower located in the west quadrant of the airport. This tower was constructed in the early 1960s and is considered by FAA to be beyond its useful life of 25-30 years. In addition, because of the relatively low height of the tower, there are portions of the airfield, specifically portions of Taxiway C, that are not fully visible from the tower. It is an FAA decision to replace any federally-owned control tower. The airport's responsibility is only to provide the appropriate land area to accommodate a replacement tower. FAA's Facilities and Equipment Division provides the funding.

Each of the airport alternatives recognizes that the FAA may decide to replace the existing tower in the future by identifying two viable sites. The first is at the existing location and the second is on the north side of the airfield. If the FAA were to pursue a replacement control tower, they would undertake a site selection study and then negotiate with the airport for an acceptable site. The preferred site may be one of the two shown or a currently unidentified third site.

5.6.3 ALTERNATIVE OVERVIEWS

Three Airport Alternatives for the airport have been developed and are presented in this section. These three alternatives include the subarea alternatives to follow. For illustrative purposes, Cornell subarea 1 and Evergreen subarea 1 are combined to show Airport Alternative 1. The same is true of Alternatives 2 and 3. Each of the three alternatives addresses the following key considerations:

- Meet 20-year aviation facility needs.
- Meet FAA aviation safety standards (design standards).
- Reserve land for 20-year aviation need and additional flight-line land (land in proximity to the taxiway system) well beyond the 20-year timeframe.
- Identify land that would be appropriate for non-aviation revenue support development.
- Integrate with other local plans and comply with area zoning.
- Make use of west side infill development opportunities to meet a portion of forecast hangar needs.
- Preserve existing facilities with recent capital investments (includes private hangars and the planned helicopter training pad).
- Meet current and future stormwater and natural resource needs.

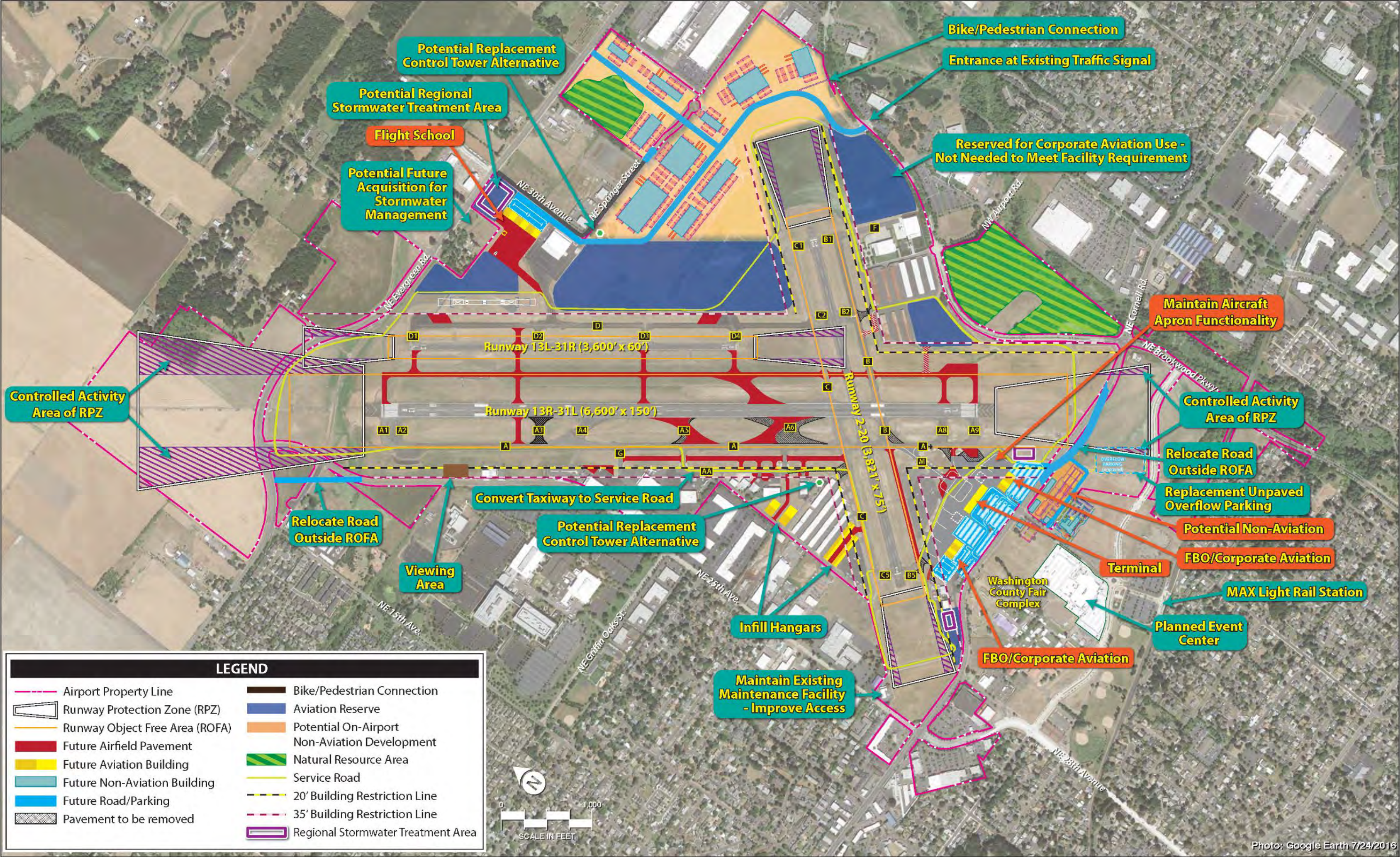
Each of the three alternatives meets the 20-year facility requirements for the airport. In the next chapter, a preferred alternative (recommended concept) will be identified. That recommended concept may be one of the three overall airport alternatives or it may combine the best elements from each of the alternatives. If the recommended concept is a combination of elements from each of the alternatives, then a new analysis of meeting the facility requirements is needed. The result may be addition or subtraction of hangars shown on the recommended concept.

5.6.3.1 Airport Alternative 1

The first alternative is shown on **Exhibit 5Q**. The plan includes relocation of the flight schools to the northwest side of the airfield, near the planned helicopter training site. A replacement terminal building is planned to be constructed to the immediate north of the existing facility with additional vehicle parking. Other aviation services are planned to remain in the Cornell parcel. As shown, this may include several larger hangars that would support businesses that cater to larger aircraft operators or support corporate shuttle services.

This alternative is intended to maintain the existing operational nature of the Cornell parcel to the greatest degree. The aircraft apron can still be utilized similar as it is now except the flight school activity will be relocated. The existing taxiways providing access to the runways from the Cornell parcel would be maintained.

In the Cornell parcel, space for non-aviation development is available south of Cornell Road. There is no opportunity north of Cornell because vehicle parking is needed to support both terminal building operations and larger hangar activity.



5.6.3.2 Airport Alternative 2

The second overall airport alternative is presented on **Exhibit 5R**. In this alternative, consideration is given to relocating the flight schools to the east quadrant of the airport where a T-hangar complex is currently located. This option is being explored based on discussion with one of the flight schools, which expressed interest in the area. Locating a flight school complex would trigger the need to relocate/replace most of the T-hangars in this location to the north side of the airport, as shown on the exhibit.

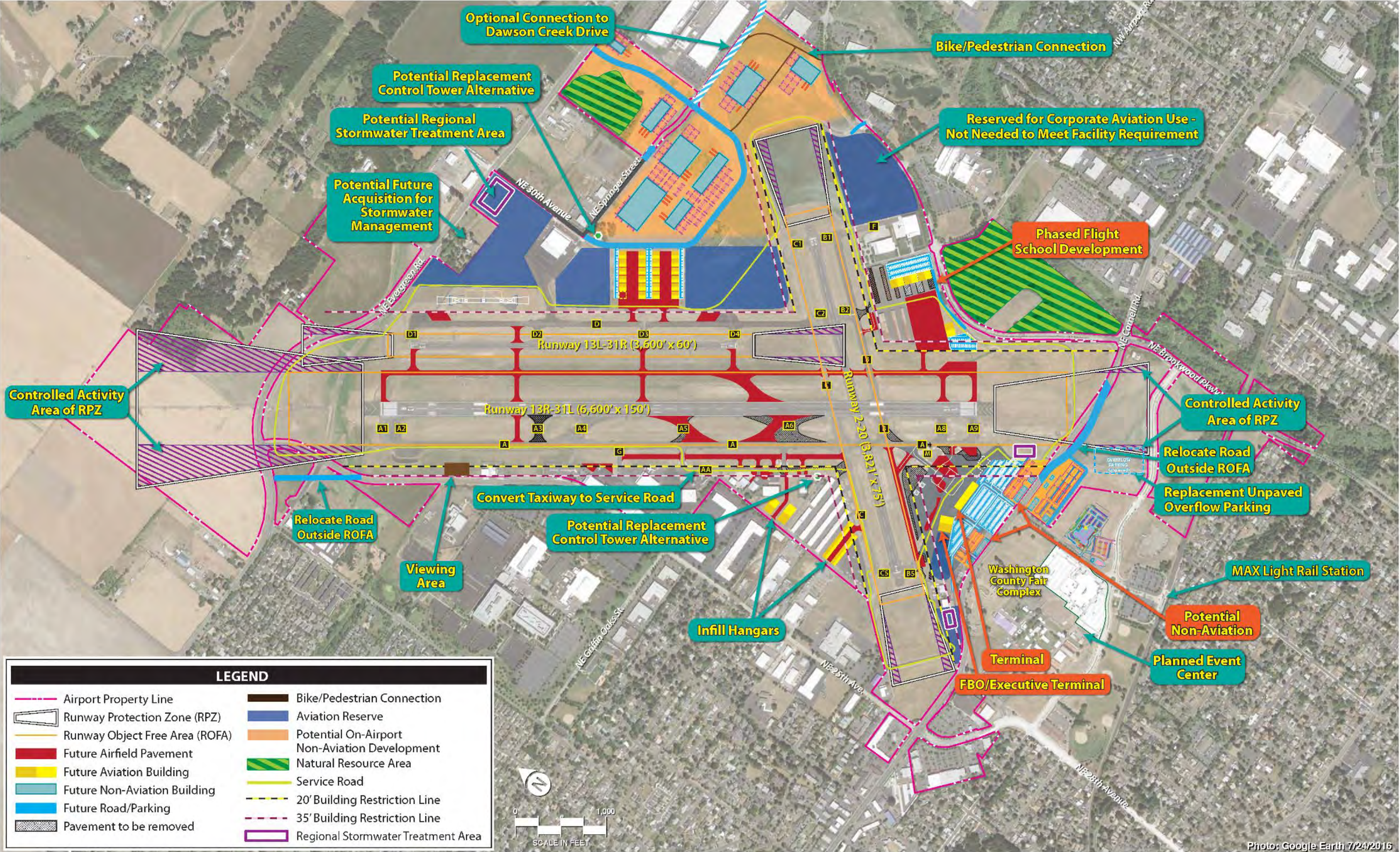
In the Cornell parcel, a new terminal building is planned to be constructed farther to the north and adjacent to the “mushroom,” which would be incorporated into the new facility. This location for the terminal building is also an effort to utilize the airside land more in the north portion of the Cornell parcel. The redevelopment of the Cornell parcel also includes space for a single large FBO type hangar/executive terminal. Like Alternative 1, this hangar would serve operators of larger corporate jets or the corporate shuttles that use the terminal building.

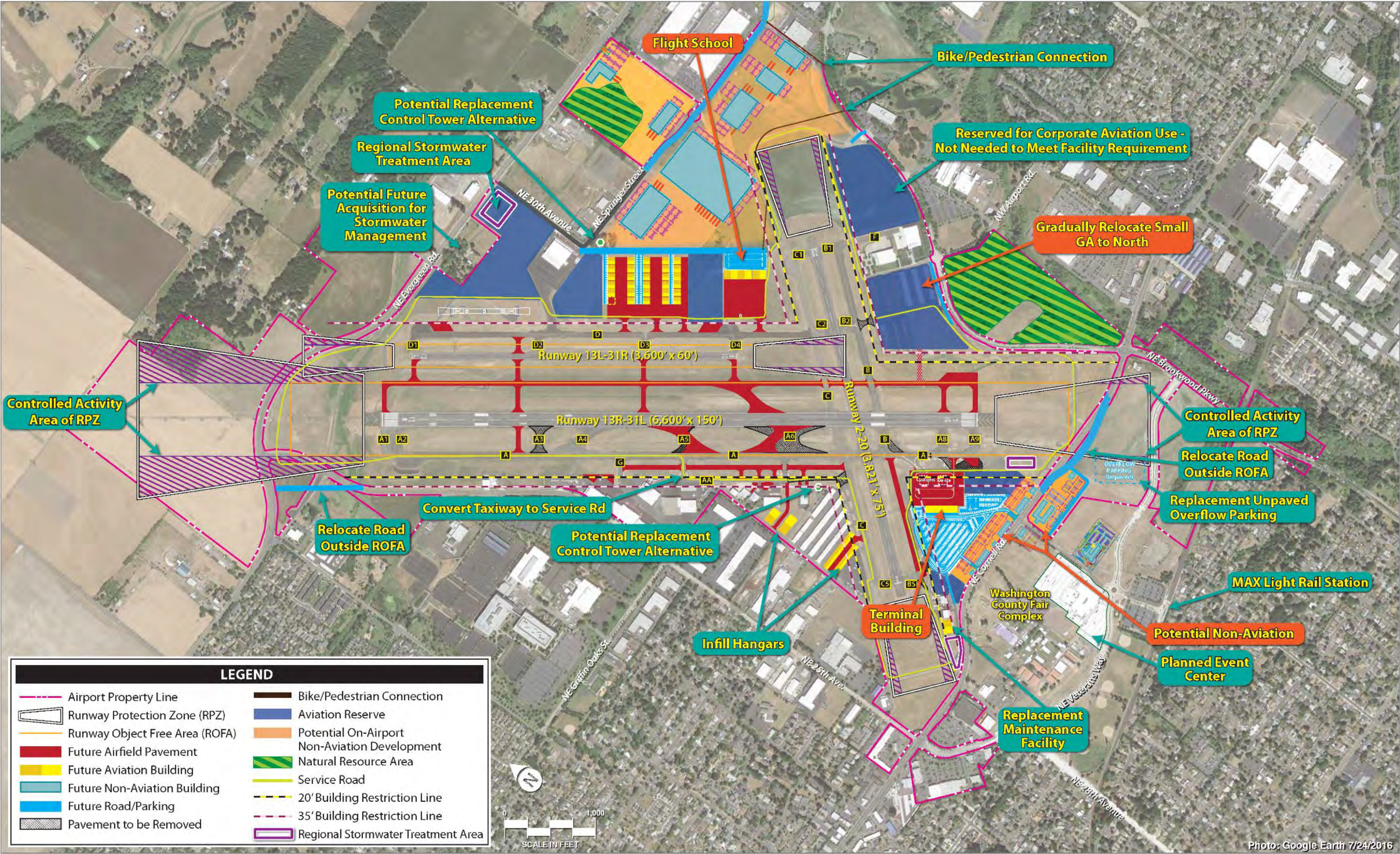
This alternative is the first of two to consider non-aviation retail/commercial on the north side of Cornell.

5.6.3.3 Airport Alternative 3

The third overall airport alternative is presented in **Exhibit 5S**. The flight schools are planned to be relocated to the north-central part of the airport. The primary aviation facility considered in the Cornell parcel is a replacement terminal building. The terminal building is located at the northernmost point of the Cornell parcel to maximize the triangle space and to reduce relatively unproductive land (i.e., the large aircraft tie-down apron). The terminal building has been reoriented to face the primary runway, which is a more traditional layout. New or replacement hangars for aviation use are not considered in the Cornell parcel.

The plan is for T-hangars in the east quadrant to remain in place at least short-term, however, this land is identified for redevelopment to corporate aviation parcels when needed. When redevelopment occurs, the aircraft stored in the T-hangars are planned for relocation to replacement storage hangars located on the north side of the airport, adjacent to the parallel training runway. As depicted, the northside replacement hangars are smaller individual box hangars, which is more in demand than T-hangars, however T-hangars could be constructed as well. The relocation of T-hangars’ occupants would be triggered once the T-hangar land is needed for further corporate aviation development. The T-hangar area is the secondary corporate aviation development location after the land north and east of the existing corporate hangars along Brookwood has been developed. Redevelopment of the east T-hangar will be driven by the Port’s asset management decisions.





5.7 SUBAREA ALTERNATIVES

The alternatives development process includes a more detailed examination of both the Cornell subarea and the Evergreen subarea. The Cornell subarea includes the on-airport triangle-shaped parcel north of Cornell Road, the airport property south of Cornell, and portions of the Washington County Fair Complex. The Evergreen subarea encompasses airport property in the north and east quadrants of the airport. There are large undeveloped tracts of land in both subareas. Three detailed alternatives for the both subareas are presented below.

5.7.1 CORNELL SUBAREA INTRODUCTION

5.7.1.1 Cornell Subarea Alternative 1

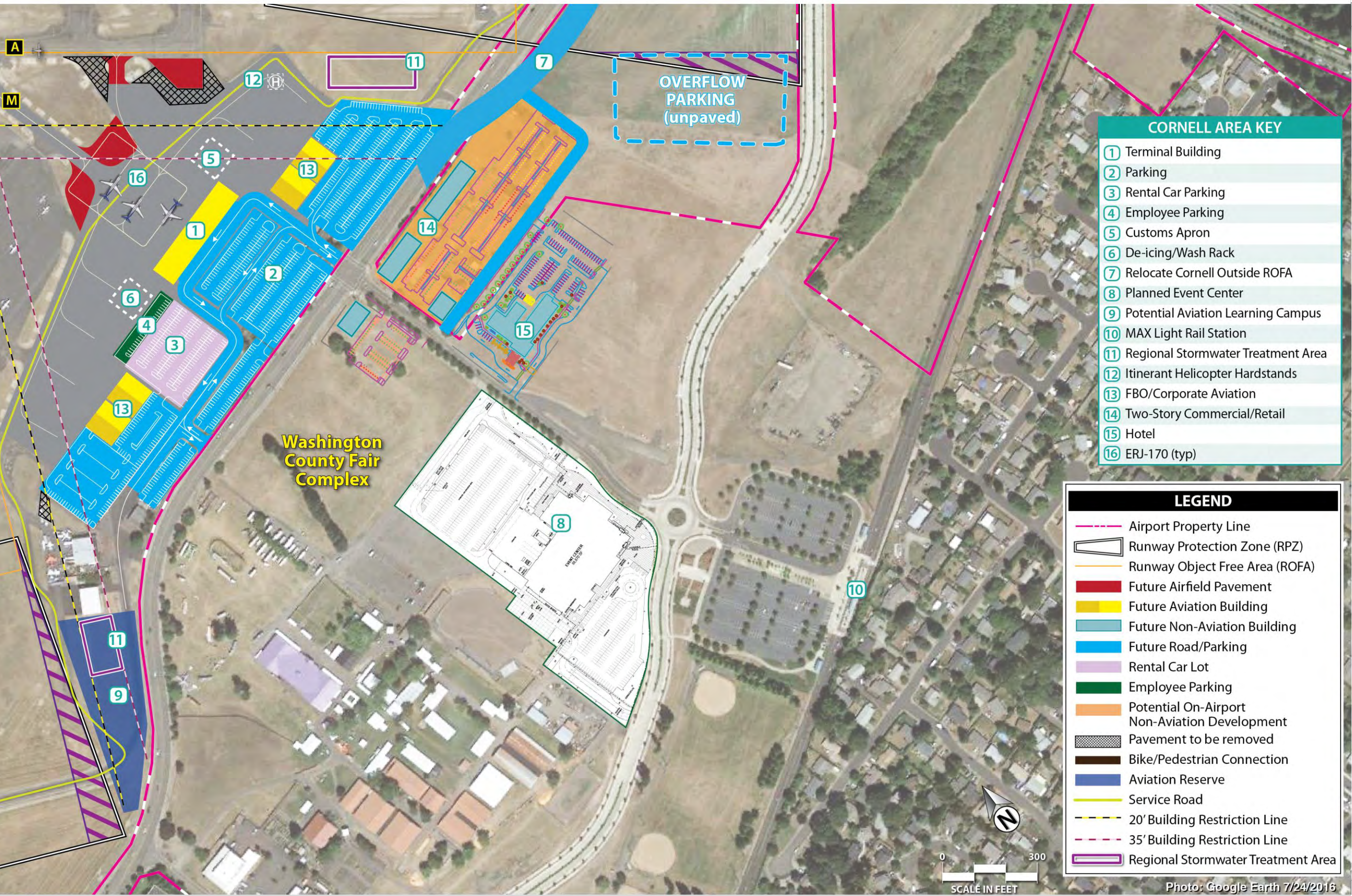
The first Cornell Subarea alternative is presented on **Exhibit 5T**. This alternative is intended to reflect a status-quo option, essentially building upon the development pattern that currently exists. A replacement terminal building is planned to be constructed to the immediate north of the existing facility with additional vehicle parking. As noted previously, the terminal building footprint shown is approximately 25,000 square feet, which would accommodate the long-term need for a single-story building. Future additional study will determine the specific design of the replacement terminal building.

This alternative considers several conventional hangars to continue to be located in the Cornell parcel. As shown, they are replacement hangars, however, there are conventional hangars in this approximate location that could remain. The existing conventional hangars are leased by flight schools, which are planned to be relocated to the north side of the airfield. These conventional hangars could have a new purpose to support terminal building activity or other business jet activity, for example, the expansion of an existing FBO at the airport.

The plan for the existing hangar (Sheep's Pen) to the immediate west of the terminal building is replaced it with a dedicated rental car lot. This may be done sooner to alleviate the existing vehicle parking deficit.

The aircraft apron can be utilized similar to its current usage. A small portion of unpaved area would need to be paved to accommodate the corporate shuttles. As shown, three corporate shuttle aircraft (assumed to be Embraer 170s) can utilize the apron in a stacked manner, similar to what exists today. The large aircraft tie-down apron would remain. This is a drawback of this alternative as it results in maintaining underutilized pavement.

Non-aviation commercial/retail development is limited in this alternative and is located south of Cornell Road. The airport parcel south of Cornell Road, currently occupied by a two-story hotel, is planned for commercial redevelopment. Buildings are planned to be situated up to the right-of-way of Cornell and 34th Avenue, with vehicle parking to be located behind the buildings. A stand-alone restaurant is planned on Washington County land on the southwest corner of the intersection. A multi-story branded hotel (i.e., Hilton, Marriott, Holliday Inn, etc.) is planned just to the south to serve the new events center and the region.



5.7.1.2 Cornell Subarea Alternative 2

The second alternative for the Cornell subarea is presented on **Exhibit 5U**. As with each of the Cornell subarea alternatives, the flight schools are relocated to another area of the airport. The planned replacement terminal building is located farther to the north, adjacent to the “mushroom.” By moving the terminal building to the north, a portion of the underutilized tie-down apron can be converted to transient apron with a higher utilization rate.

A single conventional hangar/FBO facility is considered in the parcel potentially as an executive terminal or an FBO satellite facility to cater to business jet operators.

This potential layout for the Cornell parcel presents the possibility of non-aviation commercial/retail development along the north side of Cornell, on airport property. By limiting the aviation uses in the Cornell parcel to the terminal building and a single support facility, less parking will be needed. There are several key components to the non-aviation development. A non-aviation parcel depth of at least 200 feet is planned and the buildings are planned close to the roadways with parking in back.

Non-aviation development is also planned south of Cornell Road. On the airport property parcel, the existing hotel is planned to be removed and replaced with commercial/retail development. Farther to the south, on Washington County land, a multi-story hotel and a stand-alone restaurant are planned.

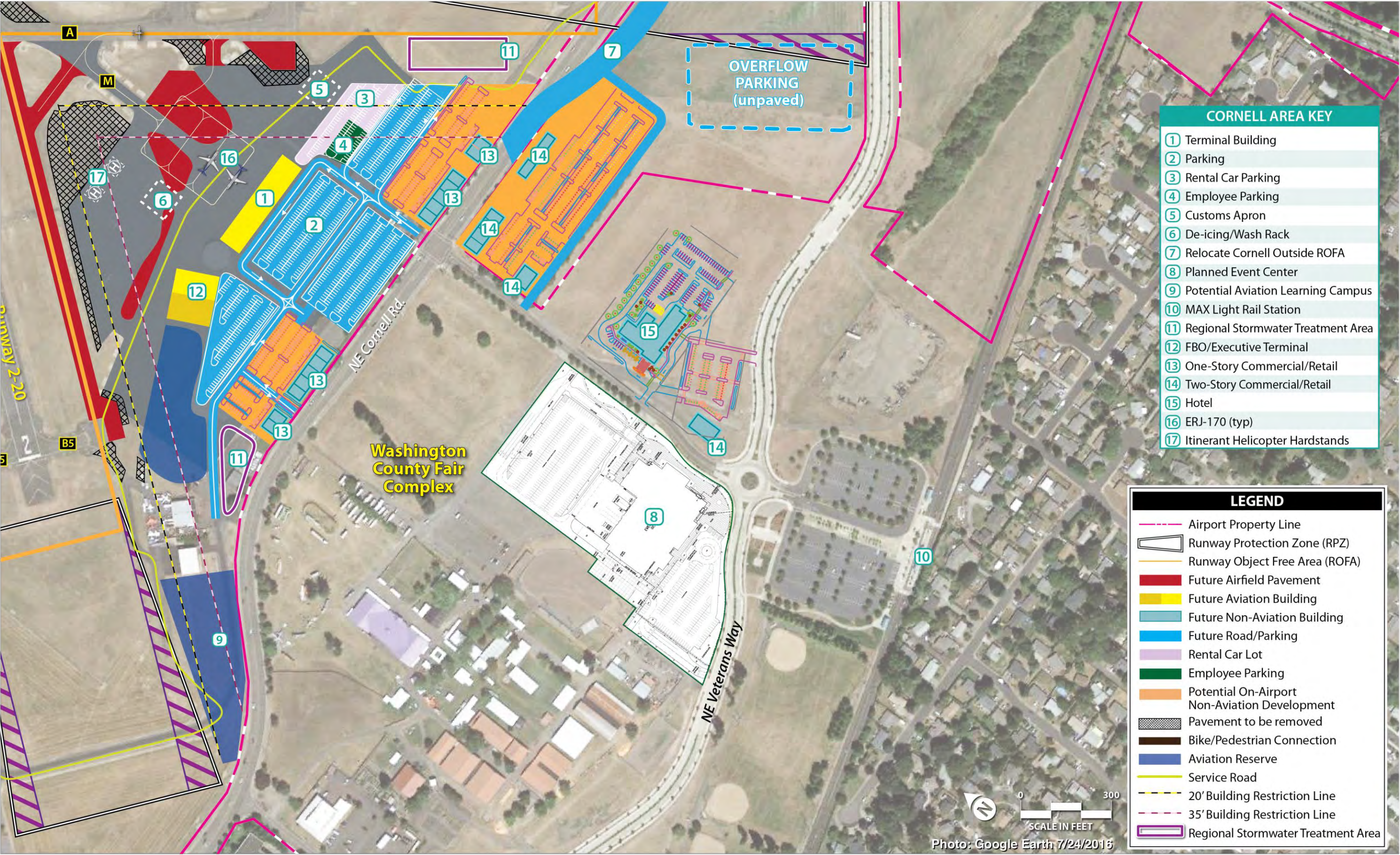
5.7.1.3 Cornell Subarea Alternative 3

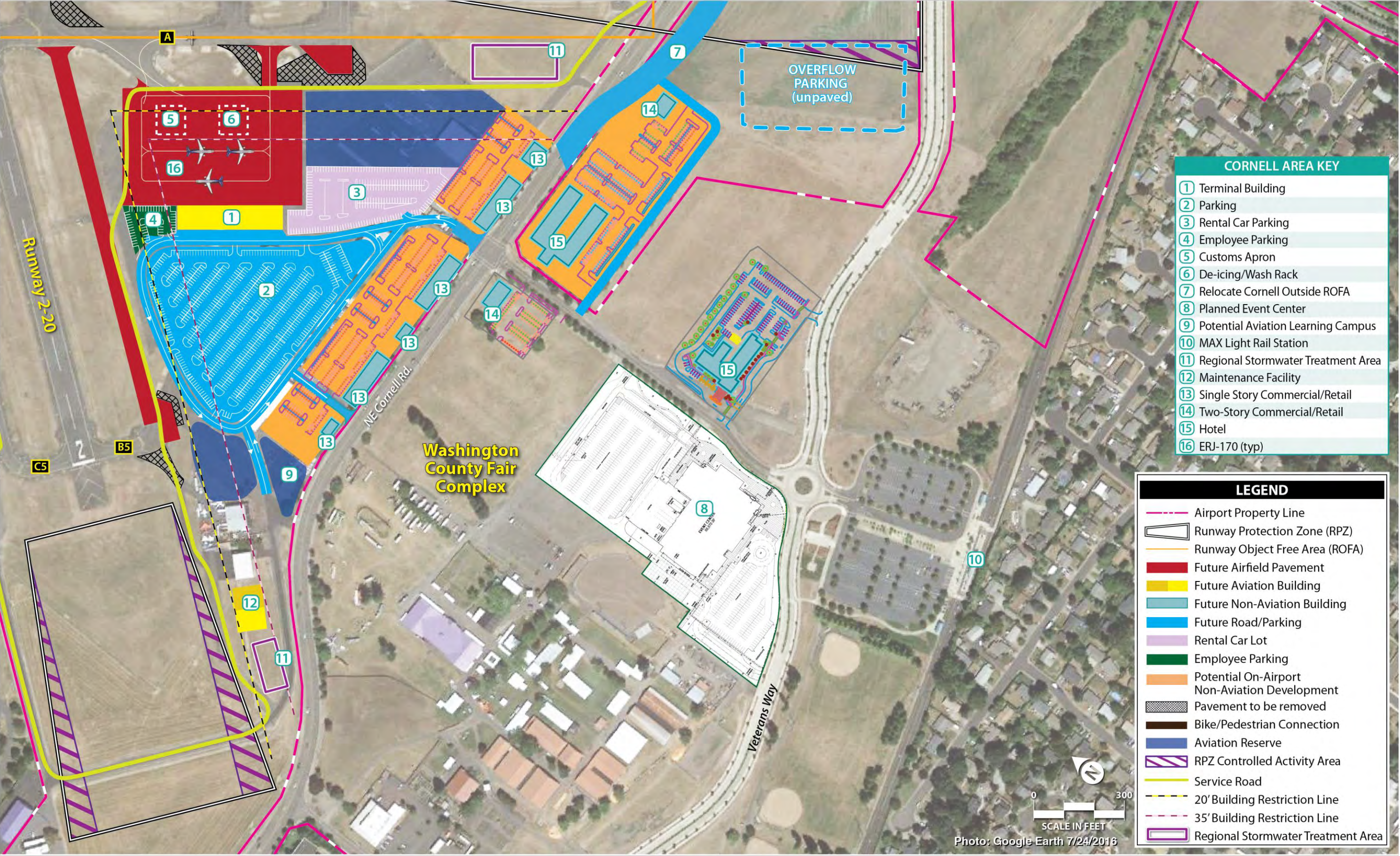
The third Cornell subarea alternative is presented on **Exhibit 5V**. This is a completely new concept that considers how the airport terminal area could be planned if the site were to be redeveloped from scratch. Current best practices encourage locating terminal facilities facing the primary runway. Therefore, in this alternative, the replacement terminal is shifted to the north and oriented to be parallel to Runway 13R-31L. This layout is very efficient from an aviation perspective as the terminal apron is near the parallel taxiway.

Relocating the terminal building to the northernmost point of the Cornell parcel maximizes development potential of the parcel. Serving the replacement terminal building is a traditional terminal loop road. Terminal loop roads reduce congestion and encourage the orderly flow of traffic. As depicted, public parking is located within the loop road. Parking for rental cars is to the side of the terminal building. Additional aviation land reserved for future expansion is located adjacent to the rental car lot.

Because the terminal building is moved to the north of the Cornell parcel, more of the area along Cornell Road is available for non-aviation development. The commercial/retail development depicted along Cornell includes a number of buildings fronting Cornell with parking located in back. The buildings are spaced in a manner to preserve the sightlines to the airport terminal and airfield. The commercial/retail buildings on the north side of the intersection of Cornell and 24th Avenue are “L” shaped to create a more significant airport entrance.

On Port property south side of Cornell, an extended stay type hotel and a retail establishment are planned. On the Washington County land, a stand-alone restaurant is planned, along with a multi-story hotel farther to the south, adjacent to the events center.





5.7.2 EVERGREEN SUBAREA INTRODUCTION

The Evergreen subarea encompasses airport property in the north and east quadrants of the airport. The north quadrant is beginning to see aviation development with the recent construction of an FBO hangar. The parallel training runway (developed as a result of the prior master plan) is operational, and a location for a helicopter training pad has been identified, air spaced by FAA, and included on the current ALP.

The areas in immediate proximity to the runway and taxiway systems have been reserved for future aviation uses including the north side to a depth of 1,000 feet from the parallel runway. This depth would allow space for all essential aviation infrastructure, including access roads, vehicle parking, hangars, apron, and taxilanes. The Facility Requirements chapter indicated that not all the aviation reserve will be needed within the 20-year scope of this Master Plan; however, it is prudent to reserve this depth for future aviation needs. Because of the unique nature of aviation land (having access to a runway), maintaining an aviation reserve is considered a prudent best practice in airport planning.

The east quadrant of the airport includes two existing uses: 1) corporate aviation flight departments, and 2) T-hangars for smaller general aviation aircraft. The area to the north of the existing corporate hangars has long been planned to accommodate corporate aviation expansion. This is carried over to all three development alternatives.

The previous Master Plan and ALP addressed the possibility of relocating all east-side T-hangars to the north side of the airfield and reserving the east area for additional corporate development. Relocating small general aviation aircraft storage and activity to the north quadrant is logical because of the availability of the runway that small general aviation aircraft operators are most likely to use.

For a number of reasons, the east T-hangars have not been relocated to date.

- 1 - They are in acceptable condition and are revenue-producing facilities.
- 2 - There is not a demand for redeveloping the space for corporate aviation hangars.
- 3 - The cost to either move the T-hangar or reconstruct new facilities does not make financial sense.

The alternatives will evaluate several options for the east T-hangar area, but it should be understood that any redevelopment must be financially sound.

5.7.2.1 Evergreen Subarea Alternative 1

The first Evergreen subarea alternative is depicted in **Exhibit 5W**. The primary feature of this alternative is for flight schools planned to be relocated to a consolidated “campus” north of the existing north-side FBO hangar. This location provides several benefits. First, the flight schools have a significant level of helicopter training activity and this location is near the planned helicopter training pad. Second, the parallel training runway is also in close proximity, which will reduce taxi times for fixed wing aircraft. Third, 30th Avenue provides ready access to the area and new access roads would not have to be constructed to serve the flight schools. A drawback of this location is that it is farthest from the general location where student pilots reside, which is south and east of the airport.

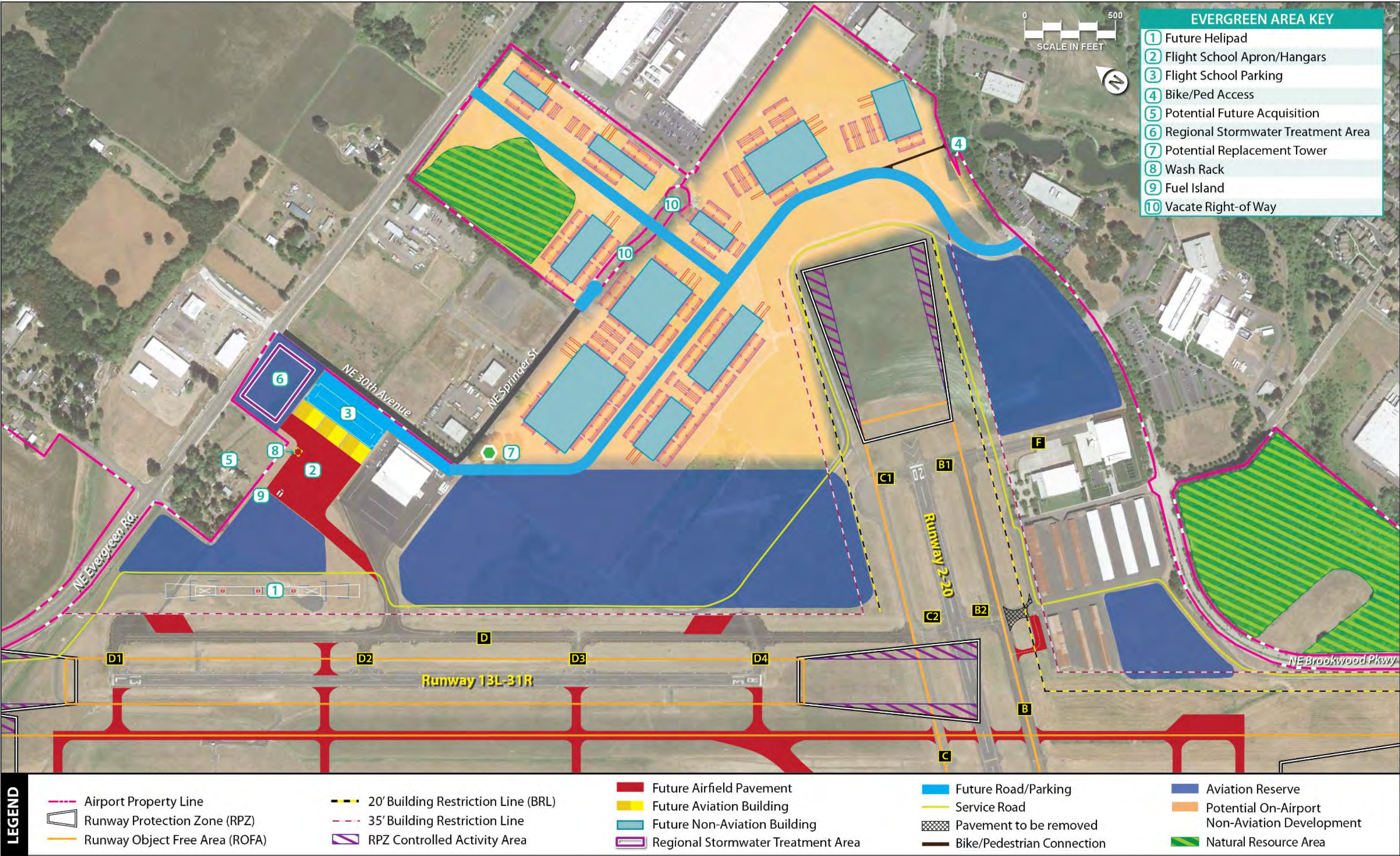


Exhibit 5V does not depict any other aviation development because it is paired with Cornell Subarea Alternative 1, which includes several general aviation hangars, in addition to the replacement terminal building. This means the combination of a north side flight school “campus,” west side infill hangars, Cornell parcel hangars and existing east side hangars, will meet the long-term facility requirement.

The land not specifically reserved for future aviation uses is planned to be made available for compatible non-aviation revenue support purposes. Compatibility of non-aviation uses is an important consideration: such as homes, schools and churches should not be in close proximity to airports. Therefore, the planned non-aviation uses are limited to industrial and manufacturing use. The industrial/manufacturing buildings shown on **Exhibit 5W** are conceptual in nature.

Exhibit 5W shows a roadway plan that extends from Brookwood Parkway to 30th Avenue, with a spur that extends to a new access point at Evergreen. The intersection at Brookwood is designed to take advantage of the existing signal.

As with each of the Evergreen subarea alternatives, a bicycle/pedestrian (bike/ped) path is planned to provide access from Brookwood, through airport property, and ultimately connect to Evergreen at 30th Avenue. In this alternative, the bike/ped path is planned to extend from a public access point at Brookwood and extend to the planned interior airport roads.

5.7.2.2 Evergreen Subarea Alternative 2

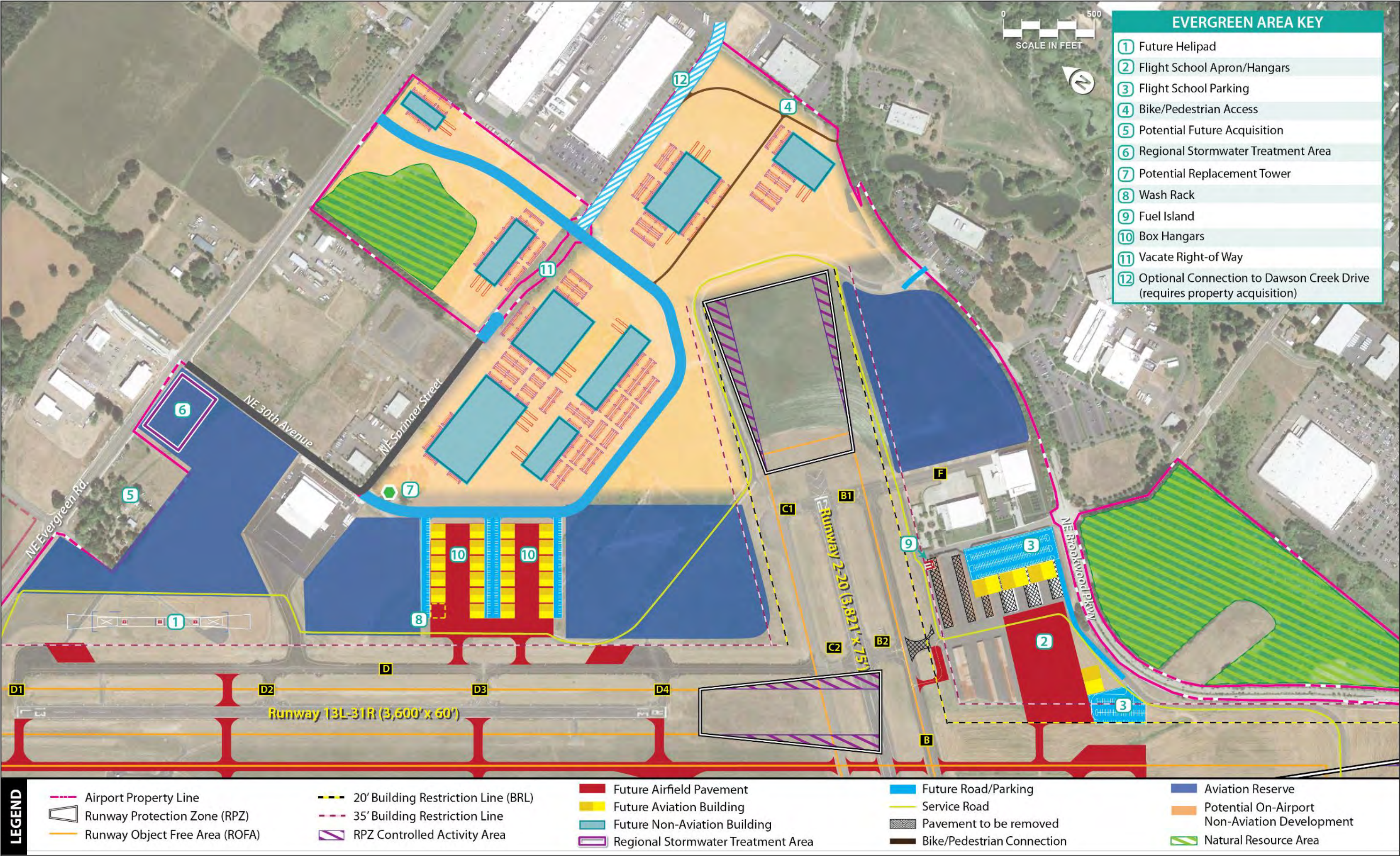
The second Evergreen subarea alternative is presented on **Exhibit 5Y**. The primary feature of this alternative is consideration of a flight school campus located in the east quadrant where the T-hangars are currently located. To accommodate flight school needs, including hangar space, vehicle parking, aircraft apron and vehicle access, six of the nine T-hangar structures would require relocation. The exhibit shows a series of box hangars on the north side which would replace the T-hangar facilities in the east quadrant.

Initially, several potential layouts were examined for an east quadrant flight school campus. Through a process of elimination, the option presented is considered the most feasible. A key factor for choosing this option is the Penny Way intersection availability with Brookwood as the vehicle access point rather than proposing a new intersection at Brookwood.

This alternative includes significant noise impacts. By locating a flight school in the east quadrant, the 65 DNL would extend across Brookwood, which does not occur currently or in either Alternative 1 or 3. Fortunately, the 65 DNL would not go into incompatible land uses; however, the 55 DNL would extend to the east and overlay residential housing who have not previously had this level of noise exposure.

Additional challenges to locating the flight schools in the east quadrant include:

- 1) Helicopters would have a longer taxi to get to the planned helicopter training pad.
- 2) Fixed wing aircraft would have to cross Runway 2-20 to access the parallel runway.
- 3) The location is on the Runway 13R approach, which means landing aircraft would be low on approach over the flight schools, where helicopters may be taking off.



As with each of the three alternatives, the undeveloped area north and east of the existing corporate hangars is planned for future corporate hangar development. On the north side of the airfield, the plan reserves the land fronting the parallel runway for future aviation development.

As with each of the three alternatives, surface road access is an important consideration, primarily because of the cost of construction. Access roads needed to support aviation development are eligible for FAA funding, however, roads whose primary purpose is to support non-aviation development are not.

In Evergreen Subarea Alternative 2, a road is extended from the end of 30th Avenue. The south side of the road would serve planned aviation uses, while the north side would serve non-aviation uses. That section of roadway serving planned aviation uses would be eligible for FAA funding, when it is needed for aviation purposes (i.e., only when the box hangars shown are constructed). The road extending from 30th Avenue turns toward the northeast and extends to a new Evergreen Road access point. This alternative does not consider extending the road to Brookwood, but it does consider possibly extending Dawson Creek Drive. The non-aviation buildings shown are conceptual and may change in size and location in the future.

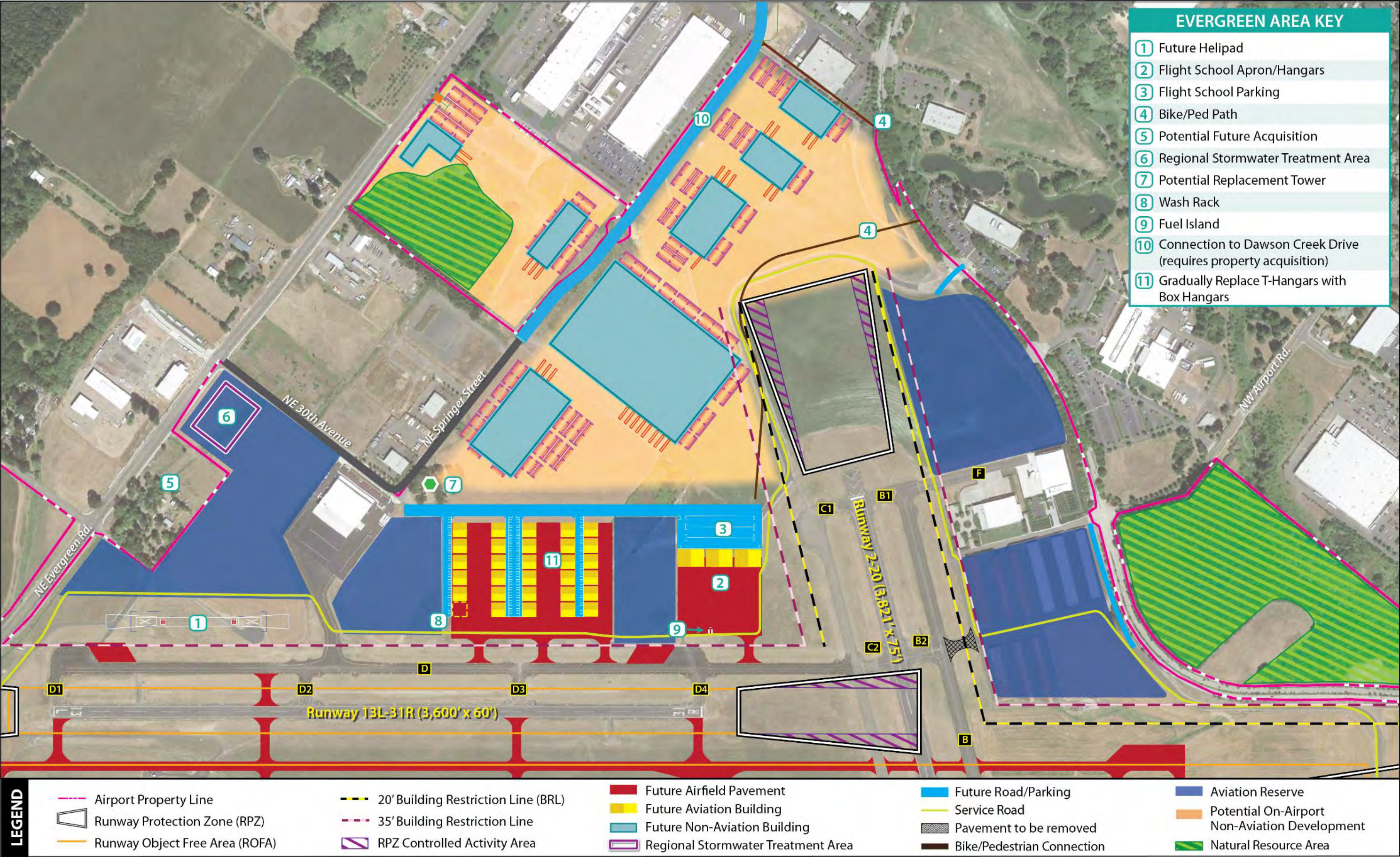
5.7.2.3 Evergreen Subarea Alternative 3

The third Evergreen Subarea alternative is presented on **Exhibit 5Z**. This concept considers locating a flight school campus centrally in the airport, near intersection of the runways. This location provides excellent aircraft access to both the parallel runway and the crosswind runway and provides good proximity to the planned helicopter training pad. Although not as close as Alternative 1, as helicopters would have a short taxi to the training pad and that taxi would be on Taxiway D exclusively. This would limit helicopter interaction with fixed wing aircraft.

A series of box hangars (or T-hangars) is located slightly to the north of the planned flight school complex. These box hangars are intended to replace the existing T-hangars in the east quadrant. The east quadrant T-hangars would only require replacement if there is a corporate development opportunity in that location, which would only be encouraged once the area to the northeast of the existing corporate hangars is fully developed. During the 20-year scope of this Master Plan, the box hangars depicted are not likely to be needed. However, it is important to recognize that the aviation reserve land in the north quadrant is intended to accommodate future general aviation needs.

The Evergreen subarea has added new roads – one to serve aviation needs and one to serve non-aviation needs. The aviation road extends from 30th Avenue to the flight school complex. The non-aviation road extends from the end of Springer Street to Dawson Creek Drive. The extension to Dawson Creek Drive requires acquisition of private property, which can complicate implementation.

The conceptual layout for industrial/manufacturing buildings reflects larger facilities than considered in Alternatives 1 and 2. It should be understood that, once a preferred roadway network is chosen, a variety of building sizes can be considered. Ultimately, any new industrial/manufacturing facilities will be constructed to meet the needs of the developer.



5.7.3 SUBAREA CONCLUSION

Three different development alternatives were presented for the Cornell subarea and the Evergreen subarea.

Major considerations include:

- relocation of all flight school activity to the Evergreen Subarea,
- construction of a replacement terminal building in the Cornell subarea, and
- non-aviation land uses planned for both subareas.

Additionally, each alternative meets the major facility requirements, such as vehicle parking, aircraft apron and hangar area.

5.8 ALTERNATIVES SUMMARY

5.8.1 AIRFIELD ELEMENTS

The alternatives analysis for the Hillsboro Airport Master Plan was a multi-phased process. Phase one examined airside needs. For those elements, such as the runway safety area and the runway object-free area, an FAA-prescribed alternatives process was employed. For other elements where only one alternative made logical sense, that alternative was presented as a preferred solution.

5.8.2 COMMON ELEMENTS

In the second phase, the initial landside alternatives analysis identified appropriate land uses. This analysis included examining the airport while considering selection criteria including: community compatibility, environmental factors, and operational and safety factors. This analysis resulted in three general land use planning alternatives. Three general land use planning alternatives were then evaluated in the more detailed subarea alternatives analysis.

5.8.3 SUBAREA CONCEPTS

The third phase considered three different detailed alternatives for the Cornell subarea. All three include a replacement terminal building. Additionally, Alternative 1 considers maintaining a large general aviation facility presence with hangars on both sides of the replacement terminal building. Alternative 2 considers a single executive terminal/FBO satellite facility to supplement the replacement terminal building. Alternative 3 considers only the terminal building and no other general aviation activity. Both Alternatives 2 and 3 accommodate the aviation facility requirements sufficiently to allow consideration of non-aviation revenue support facilities in the Cornell subarea.

The last phase considered three different detailed alternatives for the Evergreen subarea. Alternative 1 considered a flight school campus to be located in the north corner of the airfield in close proximity to

the planned helicopter training pad and parallel training runway. Alternative 2 considered the flight school campus to be located in the east quadrant, replacing existing T-hangars. Alternative 3 considered the flight school campus to be located central to the airfield on the north side. Noise contours for all three alternatives were prepared and presented in **Appendix C**.

The available land for non-aviation development in the Evergreen subarea is the same for all three alternatives. The primary differences among the three conceptual layouts is the roadway network. The roadway network is an important consideration because only those access roads necessary to support immediate aviation development are eligible for FAA funding.

5.8.4 NEXT STEPS

The next step in the master plan process is to weigh the alternatives and to arrive at a single preferred development alternative. The preferred development alternative may be one of the three airport alternatives or it may be a combination of the best concepts from each alternative. The next chapter in this Master Plan will present that single preferred alternative and describe the major considerations that led to its selection.

5.9 PREFERRED ALTERNATIVE

5.9.1 KEY THEMES

Numerous avenues for public outreach and involvement were employed to gain feedback and consensus on the long-range plan direction for Hillsboro Airport. The outreach included written and verbal comments/suggestions from the Planning Advisory Committee, several public open houses, two on-line open houses and participation at several community events. From the comments and suggestions received, several primary themes emerged and are summarized below:

- Keep the terminal building in the Cornell subarea;
- Move flight schools north, closer to the training runway;
- Add commercial/industrial uses;
- Create shuttle connection to MAX light-rail station and other amenities;
- Preserve historic features (e.g., Mushroom, Swede Ralston Hangar);
- Consider vehicle traffic and possible street system changes;
- Preserve opportunities for education and jobs on airport property;
- Examine the airport role following a seismic event;
- Consider renewable energy options;
- Adjust amount of commercial uses and orientation of development along Cornell road to create viewing areas and connections to Washington County Fair Complex;
- Ensure vehicle parking is adequate;
- Optimize Evergreen subarea roadway design for simple and cost-effective connections;
- Ground decisions based upon relevant market data; and
- Adjust flight school location to reduce infrastructure costs.

The project team carefully reviewed all comments and suggestions. While not all themes have corresponding project elements depicted, the most relevant themes and preferences and those that achieved consensus are included in the preferred alternative.

5.9.2 PREFERRED ALTERNATIVE

Exhibit 5AA presents the overall airport preferred alternative which consolidate all considerations into a single graphic. **Exhibit 5BB** presents a detailed view of the Cornell subarea and **Exhibit 5CC** presents a detailed view of the Evergreen subarea.

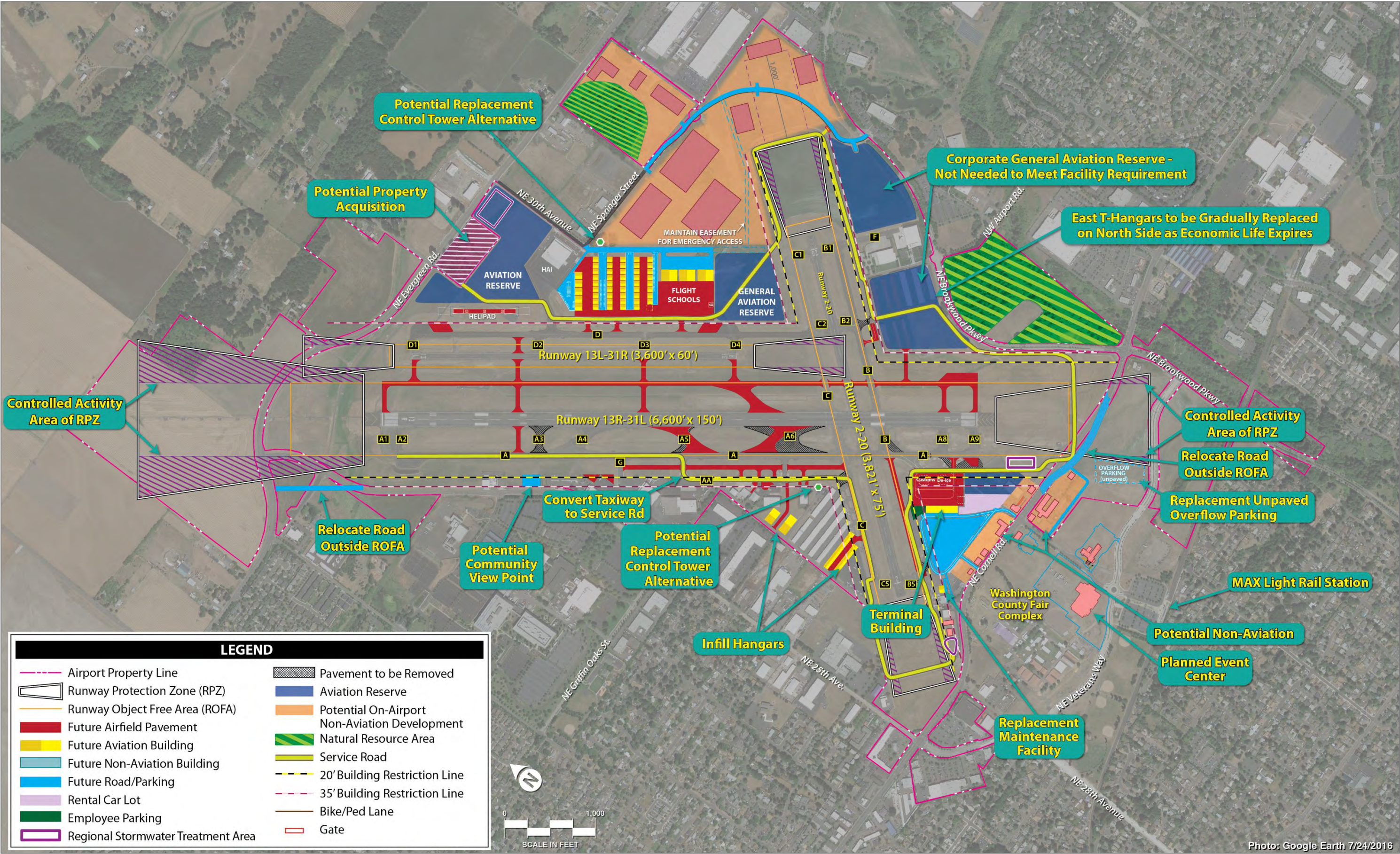
5.9.2.1 Overall Airport Preferred Alternative

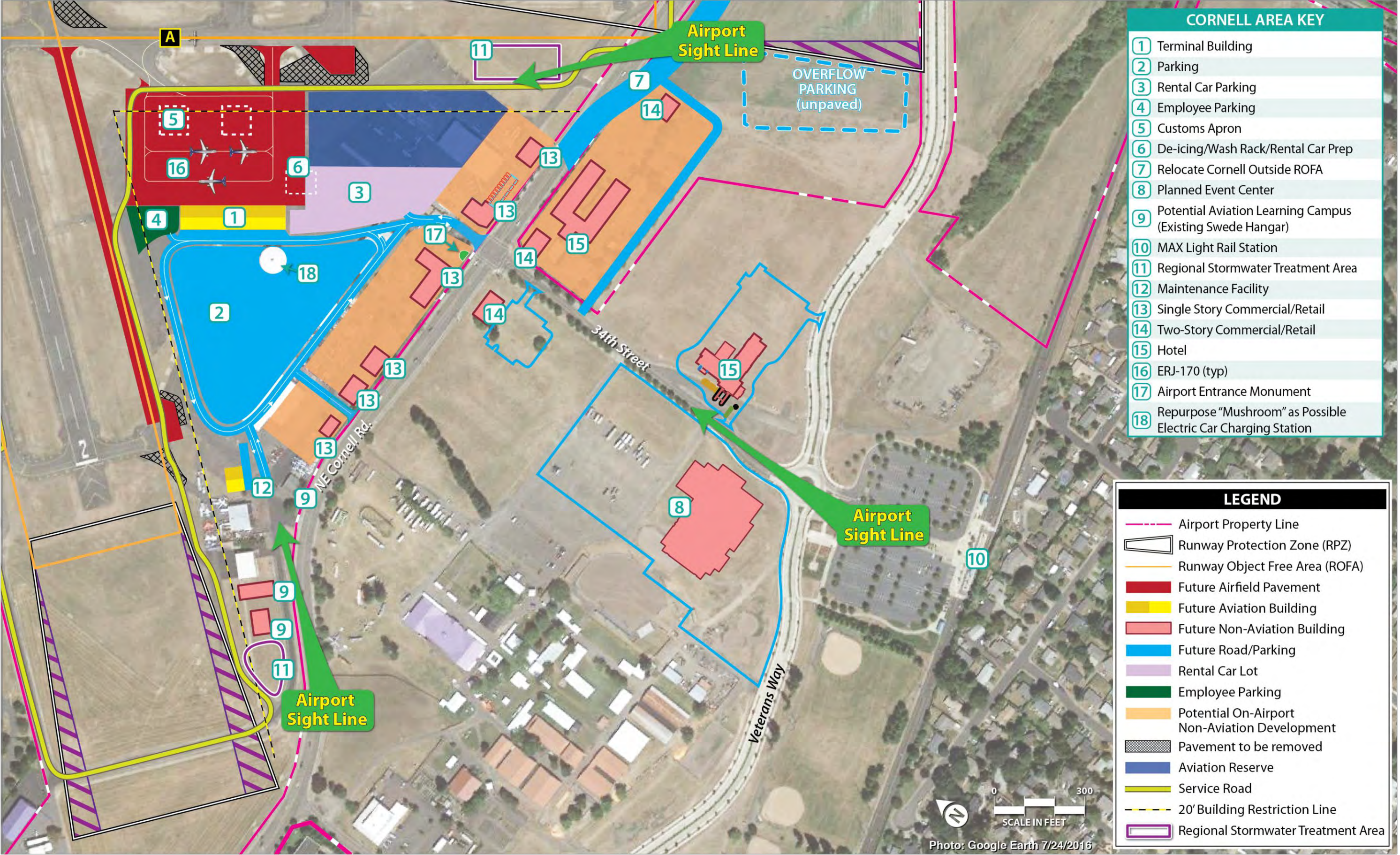
The overall plan is predicated on the primary considerations for each of the airport's four quadrants.

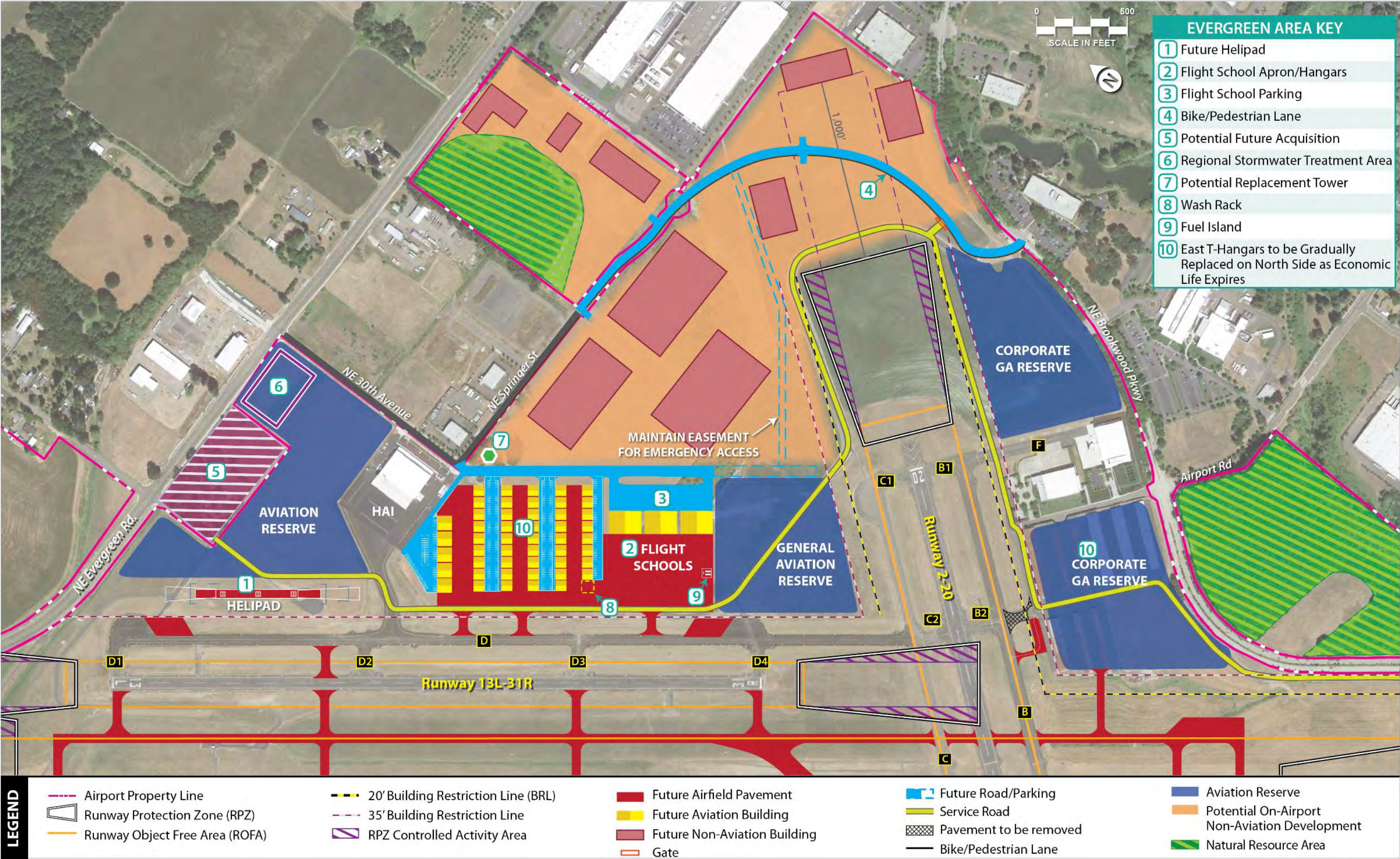
- **West Quadrant:** In the west quadrant, planning considers infill hangar development for currently undeveloped land.
- **South Quadrant:** In the south quadrant, the flight school is planned to be relocated north of the airfield, in closer proximity to the parallel training runway. Ultimately, a replacement terminal building will be constructed and reoriented to align with the primary runway. The replacement terminal building is planned to shift closer to the runway intersection, maximizing use of the parcel and allowing for appropriate non-aviation commercial development along Cornell Road.
- **East Quadrant:** In the east quadrant, the northeast section is planned for continued private corporate aviation development. The south portion of the east quadrant is currently home of several T-hangar structures. As economic life of these structures expires, aircraft owners are expected to have opportunities to move to privately developed hangars in the north quadrant. Ultimately, the south portion of the east quadrant would accommodate additional corporate aviation development.
- **North Quadrant:** The north side of the airport field is planned to accommodate all flight schools and opportunities for privately developed hangars and associated facilities.

The airside elements are similar to **Exhibit 5G**, previously presented and described in Section 5.4. The primary airside features of the preferred alternative are:

- Shift segments of Cornell Road and 25th Avenue to fully comply with the FAA standard for Runway Object Free Areas, while preserving existing runway length.
- Separate the existing Runway 31L hold apron from the aircraft apron to mitigate this FAA designated RIM (Runway Incursion Mitigation Program) location. This approach disconnects the aircraft apron so that pilots must first enter Taxiway A to access the hold apron. This more traditional layout should reduce the number of inadvertent aircraft movements to the runway from the hold apron.







- Reorient Taxiways A5 and A6 to eliminate the wide expanse of pavement and direct access from the west apron area to the runway via Taxiway A5. This area is currently a FAA-designated Hot Spot, and this redesign will enhance pilot situational awareness.
- Expand the hold aprons serving parallel Runway 13L-31R to accommodate additional anticipated aircraft using this runway when the flight school is relocated to the north quadrant.
- Shift Taxiway AA closer to Taxiway A, which will improve aircraft circulation in this heavily utilized FBO area.
- Construct a number of new taxiways that allow more efficient surface routings for taxiing aircraft, including a new center parallel taxiway between the two parallel runways. The section from Taxiway B to the runway 31L threshold is the highest priority portion which will provide direct access for east quadrant aircraft to the Runway 31L threshold without having to cross an active runway.
- Reconfigure the terminal apron to serve the new terminal location, properly sized to accommodate the aircraft and activity level anticipated in this area.
- Connect two segments of perimeter service road east of Taxiway F to allow for the continuous movement of vehicles that would otherwise need to cross a runway to move between quadrants.

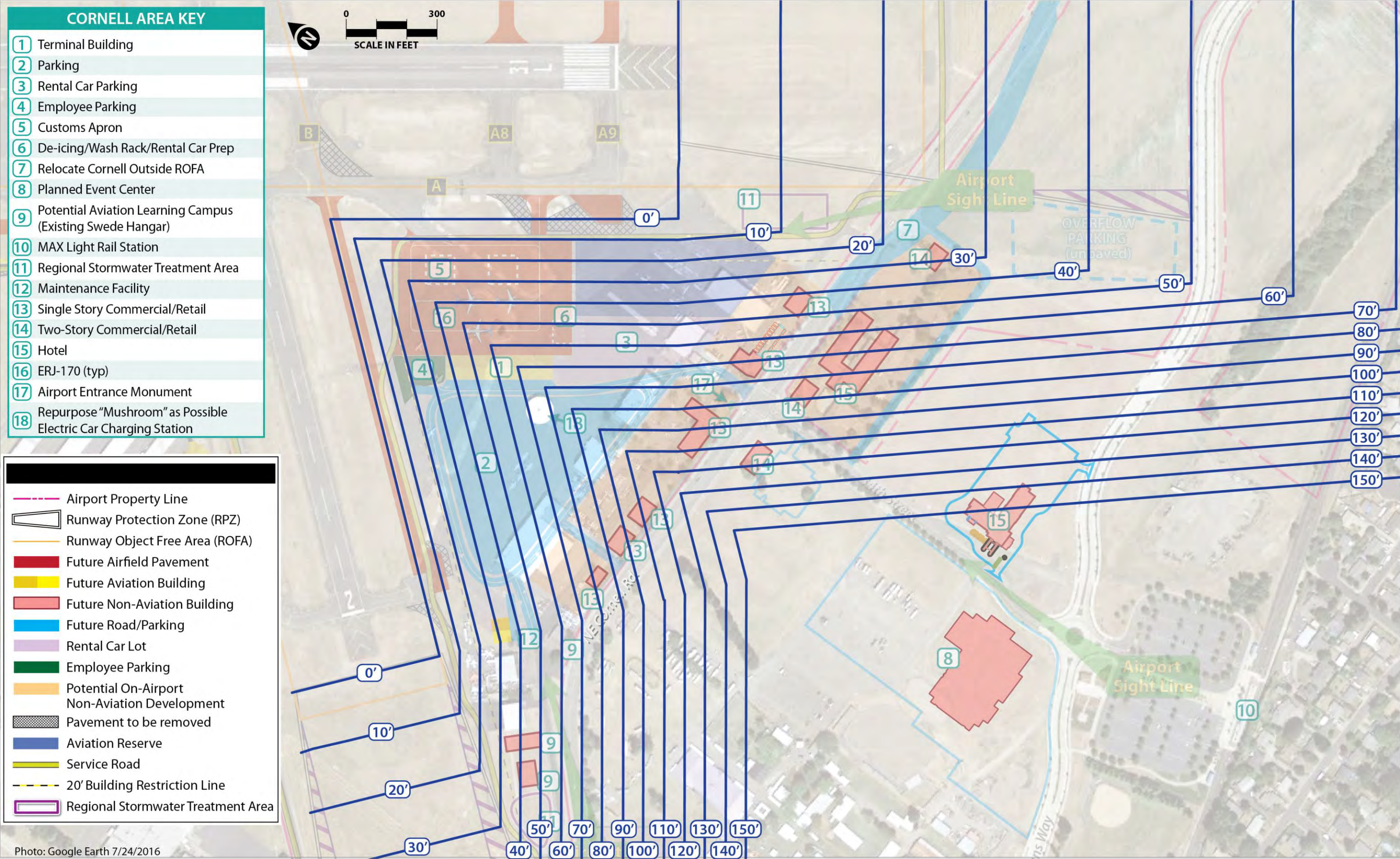
5.9.2.2 Cornell Subarea Preferred Alternative

The preferred alternative for the Cornell subarea is most reflective of **Exhibit 5V**, which is Alternative 3. The major theme of the Cornell subarea is the planned construction of a replacement terminal building that is reoriented to be parallel to primary Runway 13R-31L. The terminal building is planned to serve transient general aviation users as well as corporate shuttle flight operations.

The location of the planned replacement terminal building is slightly north of its current location. This location enables the airport to maximize limited space available in the Cornell parcel. Currently, the area closest to intersecting runways is an underutilized aircraft parking apron. By shifting the terminal building to this area, more land is available for development.

At this stage of the planning process, the terminal building's design is yet to come. However, comments and suggestions from the public and Planning Advisory Committee supports a contemporary style that compliments the Washington County Events Center design. The footprint shown on exhibits reserved approximately 25,000 square feet, meeting long-term need for a single-story building. If a two-story building is considered, then additional space for parking or other uses may be available.

When locating facilities, every effort should be given to avoid penetration of the FAR Part 77 imaginary surfaces. The transitional surface, a sloped surface that rises at a 7:1 ratio from the edge of the primary surface of the runways, is closest of the FAR Part 77 surfaces to the planned development in the Cornell subarea. **Exhibit 5DD** shows the transitional surface contours overlaid on the Cornell subarea preferred alternative. As can be seen on the exhibit, the western portion of the terminal loop road is situated where the clearance to the transitional surface is between 20 and 30 feet. This height should be enough to accommodate road and parking lot light poles.



Other aviation activities that currently occur in the Cornell subarea would be co-located on the north side of the airfield, closer in proximity to the parallel training runway. A larger portion of small general aviation operations will likely take place on the training runway. By locating the flight schools on the north side, the number of runway crossings can be reduced. This is a significant safety enhancement and consistent with the purpose for constructing the parallel runway.

The new terminal building location provides an opportunity for a more traditional and efficient loop road. The terminal loop road would widen at the terminal building, allowing for passenger drop off and pickup. Vehicle parking area is provided within the loop road along with dedicated parking for employees and rental car businesses adjacent to the terminal building.

The intersection at Cornell Road and 34th Street will remain the primary airport entrance. The intersection would be enhanced to provide a gateway feel and provide for an attractive and functional design. A primary enhancement is to create greater depth for vehicle queueing when departing from the airport. In its present configuration, the existing airport entrance allows space for only a few cars at the intersection. Recognizing the future need to handle increased traffic within the Cornell subarea, the approach to Cornell was lengthened. Ultimately, if traffic volumes warrant, a roundabout can also be added. The airport entrance may also feature a pedestrian plaza, which is intended to invite community use and awareness of the airport.

With the migration of small general aviation businesses to the north quadrant and redevelopment of the terminal area, there is an opportunity to utilize part of the property along Cornell Road to generate revenue from non-aviation uses. As depicted on **Exhibit 5BB**, compatible non-aviation development such as commercial and retail is planned on airport property along Cornell Road. It must be noted that converting portions of this property from aviation to non-aviation land uses will require concurrence from FAA. Among the considerations, FAA will closely examine whether there is enough land reserved for aviation future purposes for the foreseeable future – as much as 50 years. Accordingly, the preferred alternative has identified abundant land to be held in reserve for aviation use.

The Cornell parcel is home to several historical resources on the airport. These include the Swede Ralston hangar, the “Mushroom” fuel island, and the airport beacon. The Swede Ralston hangar is the first hangar built at the airport and is currently utilized as an education facility. Plans call for this building to remain in its current location and serve as the anchor of a planned aviation education campus. The Mushroom could remain in its current location and be repurposed, possibly as an electric car charging station. The airport beacon, currently located at the entrance of the airport at Cornell Road and 34th Street, would require relocation, but the structure is planned to be preserved. A specific location has not been identified.

5.9.2.3 Evergreen Subarea Preferred Alternative

Exhibit 5CC shows the detail of the Evergreen subarea. This layout is most similar to **Exhibit 5Z**, Alternative 3. Some minor adjustments have been made to the alternative to arrive at the preferred alternative.

Alternative 3 depicted the flight school complex near the intersection of the two runways. A benefit noted for this site was that in a more central airport location, aircraft and helicopter noise contours

affected less residentially zoned land. However, the added costs of extending a new roadway and utilities to the far south end of the site makes the initial development much less viable. Following additional review, the flight school campus was adjusted slightly to the north. The noise contours were again modeled with the adjusted location, and the contours show nearly no change as compared to the original location. The selected location reduces development costs and also allows the flight school complex to expand more easily.

Exhibit 5CC depicts several connected box hangars next to the proposed flight school location. These hangars are intended to help accommodate projected hangar demand growth and serve as replacement hangars for any east side T-hangars that might be deemed economically non-viable in the future. Ultimately, the plan will accommodate corporate general aviation development in place of the T-hangars, at which time they would be removed.

There is a six-acre parcel of privately-owned land north of the airport along Evergreen Road identified for future airport acquisition. The acquisition purpose is to ensure land use compatibility in proximity of the airport. There is no urgency to acquire this land for safety or development purposes. By indicating the desire to acquire the land, however, the Port can be better positioned to act if the land becomes available. There is some potential for the land to serve a stormwater management function.

All land immediately adjacent to the runways is planned to be reserved for current or future aviation uses. The dark blue areas on the exhibit represent land reserved for future aviation uses beyond the 20-year term of the master plan. While this master plan does not forecast beyond its 20-year horizon, planners estimate that there is abundant land shown for future aviation development for at least 50 years. The Port of Portland will seek opportunities to generate revenue from land within the airport boundary but outside of the reserved areas.

Approximately 100 acres of land north of the airport is identified for potential non-aviation revenue support uses. Several large industrial/warehousing buildings are depicted; however, actual development will reflect market needs at the time of development. A road connecting an existing intersection at Brookwood Parkway to the end of Springer Street provides access and utilities through the site. Access provided by tenants within development parcels would extend from this roadway.

Additional corporate aviation uses along Brookwood Parkway in the east quadrant similar to the current Nike and Ochoco hangars will be further encouraged in this area. As noted above, the existing T-hangars would eventually be removed as additional corporate aviation development opportunities are realized.

5.9.3 COST SUMMARY

Table 5K consolidates the alternative cost estimates with the cost estimate for the preferred alternative. The three alternatives were within 10 percent of each other in overall cost. Therefore, comparing relative costs was not a significant factor in identifying the preferred alternative. Some adjustments were made to in the preferred alternative, particularly related to Evergreen subarea roadways, resulting in an overall lower cost than Alternative 3.

Table 5K
Alternatives Cost Estimate Summary
Hillsboro Airport

Element	Alt 1	Alt 2	Alt 3	Preferred Alternative
Airside Facilities: New taxiways and other improvements to meet standards.	\$41,000,000	\$41,000,000	\$41,000,000	\$39,800,000
Terminal and Apron	\$14,000,000	\$15,000,000	\$18,000,000	\$18,000,000
Aviation Landside Facilities: Hangar aprons and taxilanes, terminal loop road, parking, access to flight school, stormwater management	\$15,000,000	\$18,000,000	\$21,000,000	\$18,000,000
Non-Aviation for Cornell Subarea: roadways, intersections, public utilities, site grading, environmental mitigation	\$1,100,000	\$1,300,000	\$1,700,000	\$3,000,000
Non-Aviation for Evergreen Subarea: Roadways, intersections, public utilities, site grading, environmental mitigation	\$8,500,000	\$8,200,000	\$5,000,000	\$6,000,000
Total	\$79,600,000	\$83,500,000	\$86,700,000	\$84,800,000

Source: Coffman Associates and WHPacific Analysis

There are other costs for an airport to consider. On-going, routine maintenance and rehabilitation of runway, taxiways, and aprons is very important and a requirement of the FAA as part of the grant assurances. An estimated \$48 million is needed to maintain existing pavements during the next 20 years. Additionally, costs to maintain facilities and assets that are not eligible for FAA grant assistance will affect the overall finances, which are addressed in Chapter Six, Financial Feasibility and Capital Improvement Program.

5.9.4 VEHICLE PARKING SUMMARY

Vehicle parking is a critical consideration for this master plan. The allocation of existing and future parking in the Cornell subarea is outlined in **Table 5L**. Vehicle parking is constrained and there is an immediate need for more parking. Currently, there are approximately 625 parking spaces and in the next 20 years it is projected the need will increase to 965 parking spaces. For planning purposes, an additional 15 percent, or 1,120 parking spaces, is considered the high-range potential need.

The most impactful action planned to alleviate the parking issues in the Cornell parcel is the relocation of flight schools north of the airport. When this occurs, the need decreases by 240 parking spaces. Therefore, plans for the redeveloped Cornell parcel do not include flight school parking. Only terminal, employee, and rental car needs are needed.

The 20-year long range estimate for vehicle parking spaces in the terminal area is 745, with a 15 percent high-range need for 880 spaces. The preferred alternative provides approximately 859, which is near the

high range number. As final design occurs for the terminal redevelopment, there is a buffer of more than 100 spaces which provides appropriate flexibility.

Table 5L
Vehicle Parking Summary
Hillsboro Airport

Parking Use	Existing	Long Term	15% High Range	Preferred Alternative
Terminal	283	541	630	629
Employee	38	45	60	60
Rental Car	139	159	190	170
Flight Schools	165	220*	240*	224*
Total Parking Spaces	625	965	1,120	1,083
Total in Cornell Subarea	625	745	880	859

*Source: Coffman Associates analysis. * Parking spaces accommodated elsewhere on airport.*

Opportunities for new commercial/retail development are depicted within the Cornell subarea along Cornell Road. The amount of land set aside for these uses includes enough to meet applicable vehicle parking requirements per development code within their respective parcels. As such, **Table 5K** does not include this parking requirement.

5.9.5 HANGAR SUMMARY

Table 5M presents a summary of the hangar needs and the planned hangar development in the preferred alternative. Forecast growth in based aircraft indicates a need for 98,800 square feet of additional hangar space during the next 20 years. The preferred alternative would remove approximately 77,900 square feet of existing hangar space in the Cornell subarea. The east T-hangars are planned for replacement as their economic life expires over the planning period. Combined, approximately 340,100 square feet of hangar space is needed.

The preferred alternative depicts future hangar development. In the west quadrant, the existing undeveloped parcels can accommodate approximately 92,900 square feet of hangar space. The planned flight school complex on the north side includes 67,500 square feet of hangar space. The planned connected box hangars on the north side is approximately 214,000 square feet. In total, 374,400 square feet of new hangar space is depicted in the preferred alternative, which slightly exceeds the total need.

Table 5M
Hangar Summary for Preferred Alternative
Hillsboro Airport

Hangar Need	Hangar Area (s.f.)	Hangars Planned	Hangar Area (s.f.)
20-Year Facility Requirement	98,800	West Infill Hangars	92,900
Cornell Hangars to be Removed	77,900	North Flight School Hangars	67,500
East T-Hangars to be Removed	163,400	North Box Hangars	214,000
Total Need	340,100	Total Planned	374,400

Source: Coffman Associates analysis

While specific types of hangars are shown in the preferred alternative, what is actually constructed may be different depending on developer needs. Therefore, it is more important to understand the type of hangar facility intended for each airport quadrant. In terms of aviation uses, the south quadrant will ultimately only feature a terminal building. The east quadrant will eventually be redeveloped with corporate aviation uses. The west quadrant will develop with infill hangars in the small remaining amount of available land. The north quadrant will feature the flight school complex and eventually new small GA hangar facilities.

5.9.6 NOISE SUMMARY

Consistent with master planning methodology, planners considered potential noise impacts from each of the alternatives throughout the process. A detailed and in-depth discussion of the noise evaluation is contained in **Appendix C**. Utilizing the standard FAA computer simulation methodology and software, the Airport Environmental Design Tool, Version 2d (AEDT), noise contours were developed for each alternative and the preferred alternative.

AEDT is designed to predict annual average aircraft noise conditions at geographic locations. The noise model has the ability to generate noise exposure contours that can be overlain on a map of the airport and vicinity to graphically represent aircraft noise conditions.

Specialists prepared noise contours using the yearly day-night level sound level (DNL), which is FAA's primary noise metric. DNL accounts for the increased sensitivity during nighttime hours (10 p.m. to 7 a.m.). A 10-decibel weighting is applied to noise events occurring at night. DNL is a summation metric enabling objective analysis that can describe noise exposure comprehensively over a large area. The primary benefit of using the DNL metric is that it accounts for the average community response to noise as determined by the actual number and types of noise events and the time of day they occur. Generally, noise levels below 65 DNL are not considered significant and all land uses are acceptable. Noise levels above 65 DNL are significant and noise sensitive land uses should be avoided (i.e., homes, churches, hospitals, etc.).

As outlined in the State of Oregon's *Airport Land Use Compatibility Handbook*, 2003, the State Department of Environmental Quality (DEQ) standards for noise control, abatement and mitigation are included in Oregon Administrative Rules Chapter 340, Division 35. The standards outline recommended mitigation methods (soundproofing, land acquisition, etc.) for noise-sensitive land uses exposed to 55 DNL and above; however, there is no regulatory requirement for airports to mitigate below the 65 DNL level. Therefore, the 55 DNL is depicted for informational purposes only.

Exhibit 5EE shows the baseline noise contours in 2016. The exhibit shows that there are no sensitive land uses within the 65 DNL. Almost the entire 65 DNL is on airport property except for a small portion that crosses south of Cornell Road. A noticeable feature is the two large areas where noise is at the highest level. These two locations are the origin point for helicopter operations. The AEDT model incorporates noise from helicopter operations with greater precision than prior models.

2016 - EXISTING NOISE CONDITION

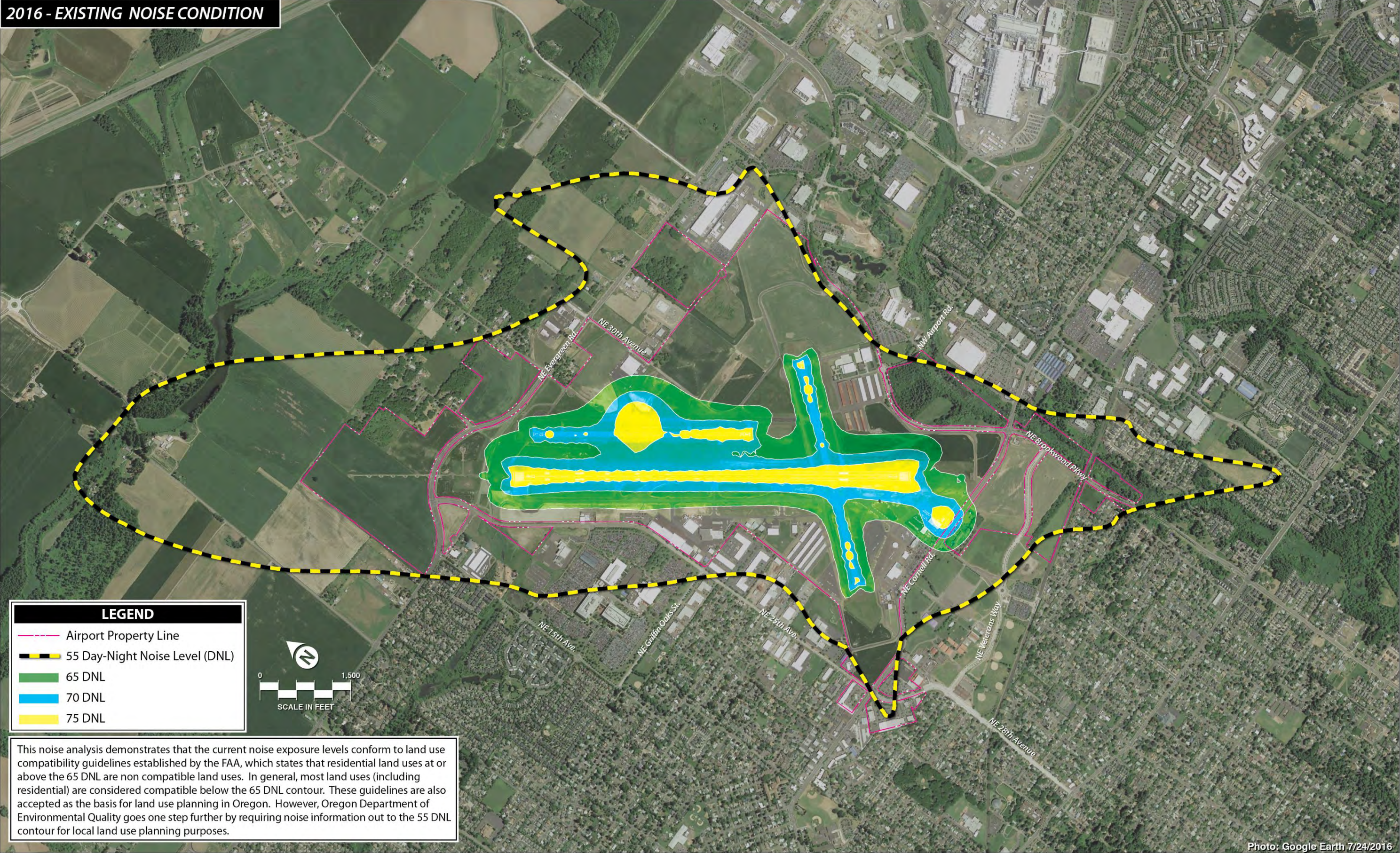


Exhibit 5FF shows the future noise contours for 2036. With flight schools planned to be relocated north, the 65 DNL in the Cornell parcel becomes smaller and entirely within airport property. On the north side, the highest intensity noise is concentrated around flight schools and planned helipad. The 65 DNL extends slightly north and across Evergreen Road. Approximately half of the six-acre parcel on the south-west corner of Evergreen Road and 30th Street falls within the 65 DNL.

Exhibit 5GG shows just the 55 DNL, for both baseline and future conditions. As noted, the 55 DNL is shown for information purposes according to Oregon statute. As depicted, the shape of the future 55 DNL is slightly larger than the baseline, which is primarily a function of the future airport fleet mix. The contours shift slightly north which corresponds to relocation of flight school activity to the north.

FAA funding for eligible noise mitigation projects is not requested or approved through an airport master plan. Funding for noise mitigation projects is typically the result of a recommendation of a Part 150 study or a *National Environmental Policy Act* (NEPA) Environmental Assessment for a specific airport project. There is no current need to conduct a Part 150 study, but future master plans should review this conclusion to verify that land use compatibility is still maintained.

5.9.7 NEXT STEPS

The next step in the master planning process is to identify and prioritize all projects necessary to accomplish the preferred alternative. Detailed cost estimates will further identify environmental, engineering and design, and contingency costs to implement each project. The analysis will also evaluate financial feasibility by the Port of Portland.

