# 4.0 Alternatives Analysis

In this chapter, the physical arrangement of future airport facilities is determined through an analysis of alternative airport layouts. The purpose of the analysis is to identify how projected facility requirements can be developed and accommodated on airport. The result of this process is a "preferred" conceptual alternative, which will serve as the basis to prepare the Airport Layout Plan.

Prescott Municipal Airport's (PRC) proximity to Prescott, Prescott Valley and Chino, makes the airport very convenient to private aircraft owners and local travelers. Maximizing the airport to accommodate the growth of general aviation, and commercial service, will help increase the economic benefit of the airport for not only the local area, but for the surrounding communities. It will also enhance safety of the airport by implementing projects which meet current FAA Design Standards presented in the previous chapter. At the same time, PRC is located near existing and planned residential areas, and it is acknowledged that additional development could impact these areas. Thus, the alternatives analysis must balance environmental effects, financial feasibility, and operational impacts to the airport, its users, and the surrounding communities.

The Alternatives Analysis was completed for both airfield and landside facilities. The airfield analysis, in Section 4.2, focuses on runway requirements, taxiways and navigational aids. Section 4.3 discusses the landside alternatives, which include aircraft apron, conventional hangars, T-hangars, Airport Rescue and Firefighting Facility (ARFF), Air Traffic Control Tower (ATCT), and other support facilities. Airport access and automobile parking are discussed in Section 4.4.

Thus, this chapter includes the following components:

- Airfield Alternatives
- Landside Alternatives
- Recommended Development Concept

### 4.1 Airfield Alternatives

The Facility Requirements (Chapter 3, Section 3.2) identified a number of potential facility improvements within the airfield area of PRC that could enhance airport safety and utility. These potential improvements are:

- Extend the primary runway (Runway 3R-21L) with relative taxiways;
- Extend the utility runway (Runway 3L-21R) with the relative taxiways;
- Runway separation and safety area improvements;
- Taxiway exists and connectors improvements;
- Taxiway lighting; and
- NAVAID.

The feasibility of these options is analyzed in this section.

# **4.1.1** Airport Development Constraints

Before developing an alternative concept, it is necessary to determine where such development could reasonably occur on the airport. The existing airport site is constrained by physical features and existing development. The constraints should be noted at the outset of the analysis, and those which effectively limit future development should be noted.

## Constraints to airfield development:

- Antelope Gold Club, residential community, and State Route 89 to the West of PRC property;
- Existing development on both sides of Runway12-30 and a cemetery ground;
- Existing development south of Runway 3R-21L;
- Existing and planned development north of Runway 3L-21R;
- Bottleneck Wash to the north, affluent to Granite Creek to the East;
- Down sloping terrain toward Granite Creek with at 1.3% slope grade;
- Lack of adequate roadway access to the east of the airfield; and
- Land privately owned to the east of abandoned railroad tracks.

# 4.1.2 Airfield Alternative Development Assumptions

In developing the alternatives for this analysis, several assumptions were made. These assumptions are based on information gathered during the development of previous chapters, including the Aviation Demand Forecast and the analysis presented in Chapter 3:

- The alternative will meet appropriate FAA design criteria. These standards are presented in Chapter 3. As noted in that chapter, the primary runway is designed as Category C-III, and it is appropriate to maintain it as such, thus the proposed runway extension and taxiway will be designed to meet C-III standards.
- The alternative will meet appropriate FAA Runway Safety Area (RSA) standards. As noted in Chapter 3, multiple deviations from standards were identified.
- The alternative should provide clear Federal Aviation Regulation (FAR) Part 77 Surfaces. The FAR Par 77 surfaces are imaginary surfaces designated to protect the airport's airspace. The two surfaces of concern in this analysis are the Primary and Transitional surfaces. The Primary surface is a rectangular surface around the runway having a 1,000 foot width for Runway 3R-21L and 500 foot width for Runway 3L-21R, and extending 200 feet beyond each runway end. The primary surface is at the same elevation as the runway.

The Transitional surface extends upwards and outwards, at a 7:1 slope, from the edge of the primary surface of the runway. Objects penetration these surfaces are considered obstructions and should be removed, if possible. These surfaces were used in this analysis

to insure that there are no penetrations to Part 77 surfaces that include airport buildings, adjacent roads and aircraft parking areas.

### 4.1.3 Airfield Alternatives

Airfield infrastructure (e.g., runways, taxiways, safety areas) is generally the first consideration in developing airport alternatives because of their primary role in supporting and directing aircraft movements. Airfield development also tends to dominate airport land use; therefore, selection of an airfield concept will usually affect the amount and location of other types of land uses.

Runways and taxiways must be designed to safely and efficiently assist the flow of aircraft to and from the landside facilities. The primary considerations in airfield development are the runway orientation, operational capacity and runway length. Various airfield development alternatives were identified to satisfy the facility requirements presented in Chapter 3. The airfield alternatives focus on providing RSA improvements, additional runway length, taxiway efficiencies, and improving operations and safety. The airfield alternatives (A, B, and C) under consideration are illustrated on **Figures 4.1** through **4.3**.

- **A. Airfield Alternative A**: As illustrated in **Figure 4.1**, this alternative addresses all the items listed at the beginning of this section according to design standards, constraints, and feasibility.
  - Runway Length: As stated in Chapter 3, a primary Runway 3R-21L extension would provide commercial users the required infrastructure to expand and begin regional jet service. A runway length up to 10,570 feet would be ideal. However, any extension that would increase the runway length above the 9,300 feet could allow jet operation with some operational restrictions (see *Runway Length Analysis White Paper*). Additional runway length was also examined for parallel Runway 3L-21R. The parallel runway is currently 4,846 feet in length. Based on the examination in the previous chapter, it would appear that approximately 6,200 feet of runway length would be needed to adequately accommodate the fleet mix anticipated to utilize this runway. In addition, this runway should be widened to 75 feet in width in order to accommodate the existing and forecast aircraft fleet mix.
  - Runway Safety Areas (RSA): Alternative A addresses all non-standard RSA issues for the approach end of Runway 3R, Runway 3L, and 12. The non-standard RSA issues for Runway 3R and 12 are accomplished by implementing a runway shift by 940 feet and 150 feet respectively. Runway 3L's RSA has a non-standard positive slope (i.e., hump), which would be cut and graded to RSA standard.
  - **Taxiways**: Additional capacity and efficiency is always improved with the addition of strategically placed taxiways. The two parallel runways are already equipped with parallel taxiways, which is one of the most efficient

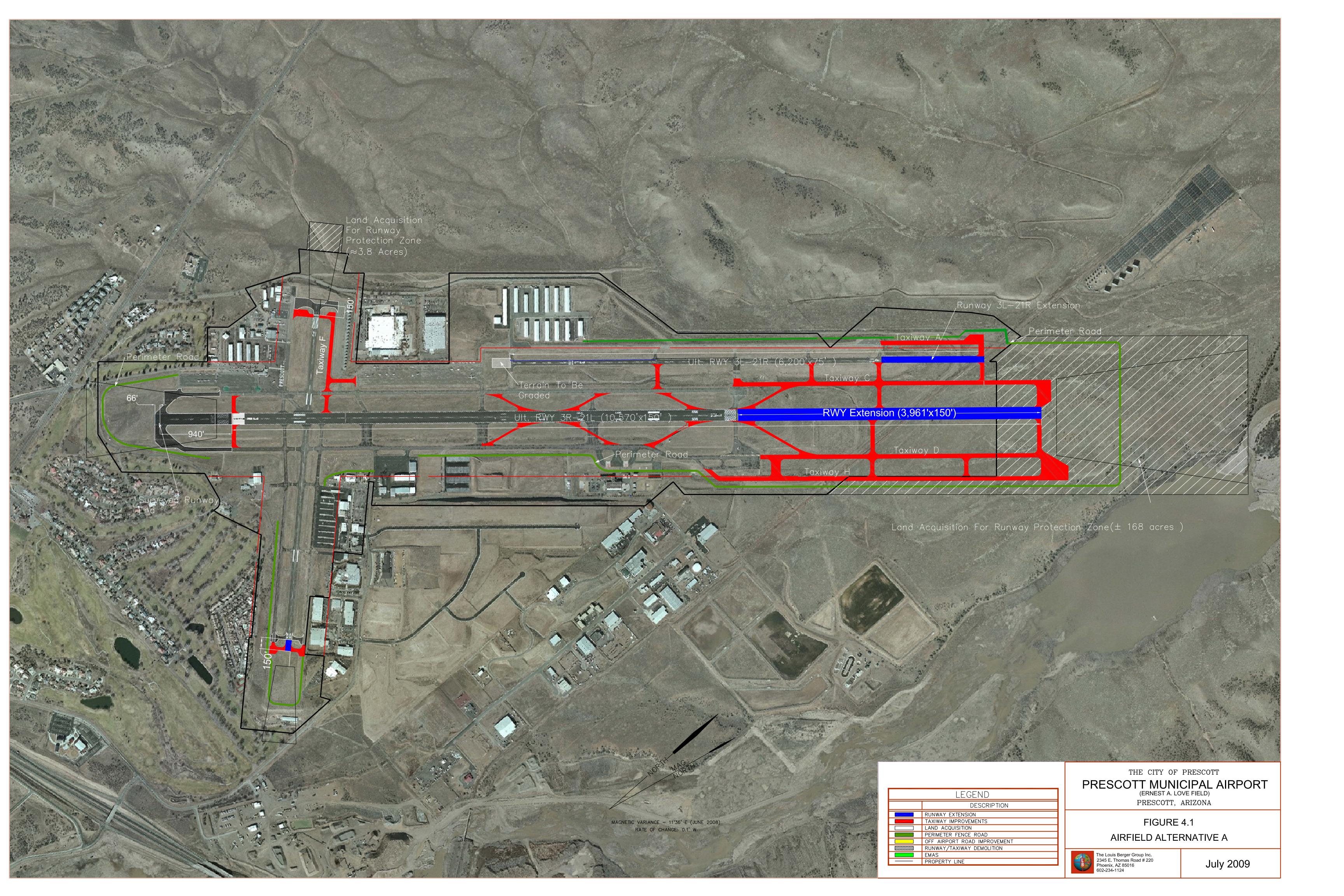
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means of increasing capacity. Alternative A continues to provide the parallel taxiways with the proposed runway extensions. Another means of increasing capacity is to construct additional taxiway exits in key locations. Based upon criteria established in Advisory Circular 150/5300-13, Airport Design, up to eight new high-speed taxiway exits on the primary runway would provide additional airfield capacity. In addition, the extension of the partial parallel taxiway leading to and from the approach end of Runway 12 would also enhance the airport's overall operational capacity.

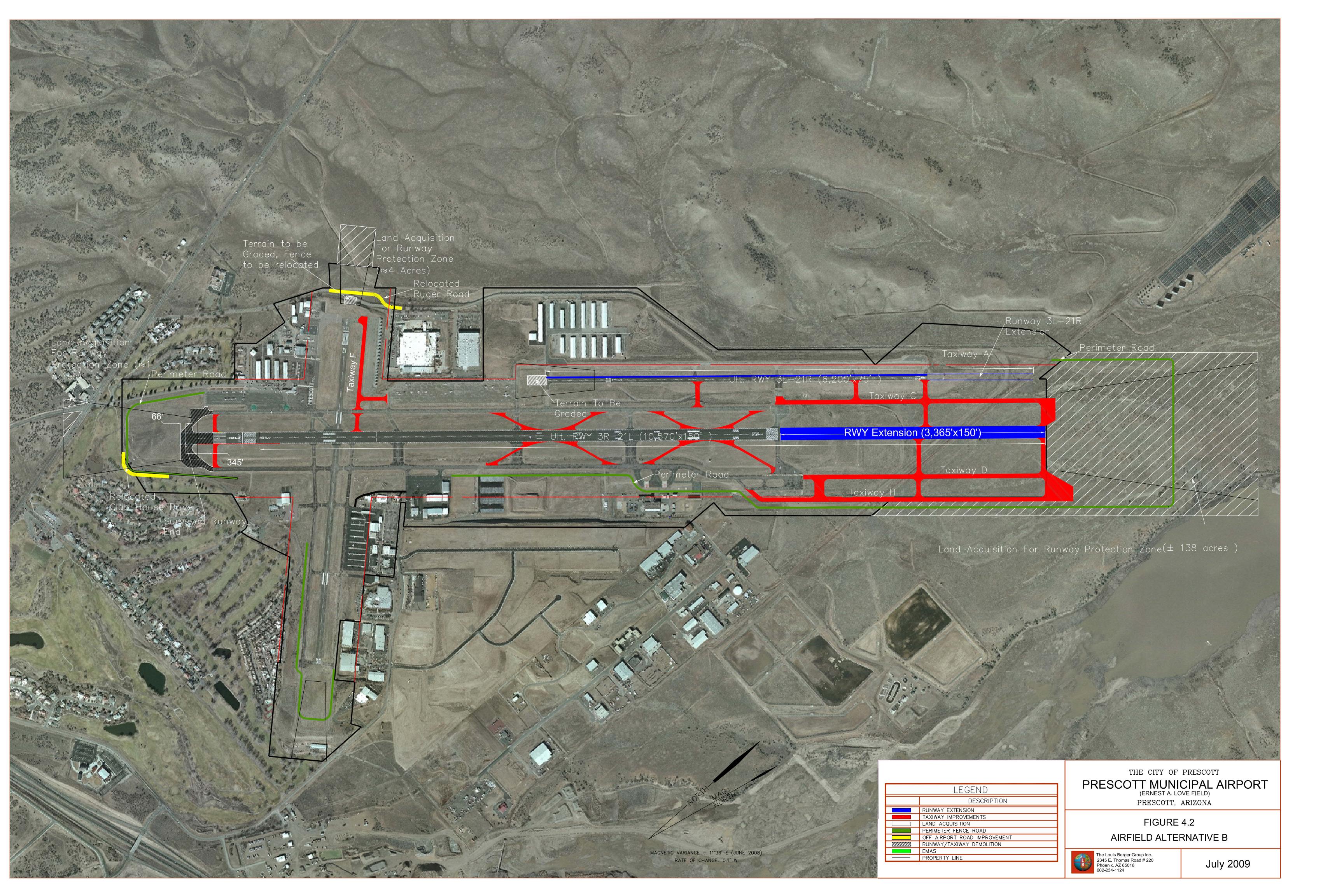
• Runway Protections Zones & Land Acquisition: In Alternative A, the following estimated land acquisitions would be required by the City in order to provide adequate control over the area encompassed by the Runway Protection Zones (RPZ):

Runway 12 RPZ	3.8 acres
Runway 30 RPZ	1.4 acres
Runway 21L and 21R RPZs	168 acres
<b>Estimated Total</b>	173.2 acres



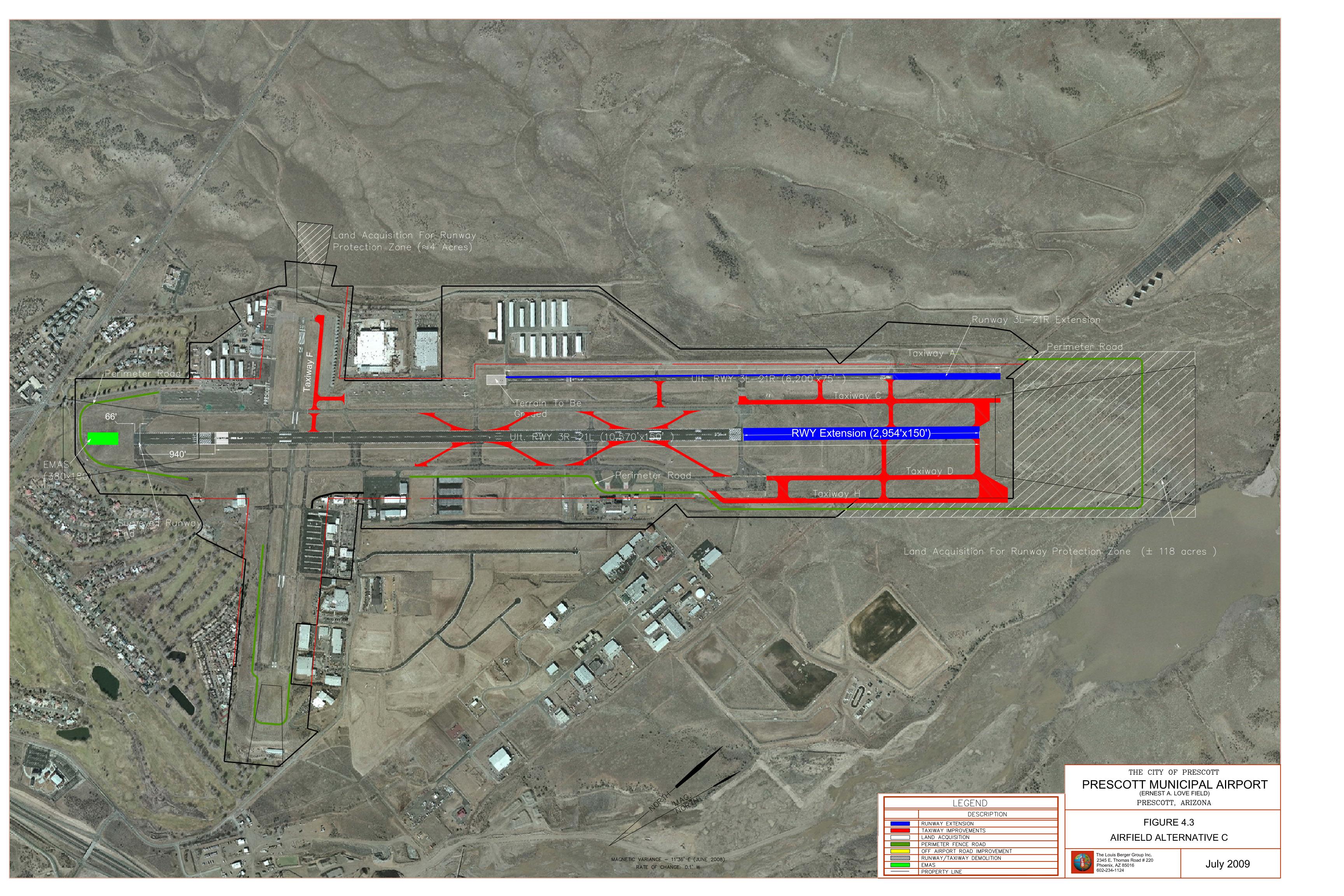
- **B.** Airfield Alternative B: As illustrated in Figure 4.2, this alternative also addresses all the items listed at the beginning of this section according to design standards, constraints, and feasibility.
  - **Runway Length**: Runway extensions for Runway 3R-21L and Runway 3L-21R would also be provided in Alternative B, with runway lengths up to 10,570 feet and 6,200 feet respectively.
  - Runway Safety Areas (RSA): Alternative B addresses all non-standard RSA issues for the approach end of Runway 3R and Runway 12 in slightly different ways than Alternative A. The non-standard RSA issues for Runway 3R would continue to be accomplished by implementing a runway shift by 345 feet (not 940 feet as suggested in Alt. A). Runway 12's RSA would become standard by filling and grading the approach end of Runway 12 and relocating the airport service road and Ruger Road. Like Alternative A, Runway 3L's RSA would be cut and graded to RSA standard.
  - **Taxiways**: The proposed taxiway layout would remain as described and illustrated in Alternative A
  - Runway Protections Zones & Land Acquisition: In Alternative B, the following estimated land acquisitions would be required by the City in order to provide adequate control over the area encompassed by the Runway Protection Zones (RPZ):

Estimated Total	143.0 acres
Runway 21L and 21R RPZs	138 acres
Runway 3R RPZ	1.0 acres
Runway 12 RPZ	4.0 acres



- **C. Airfield Alternative C**: As illustrated in **Figure 4.3**, this alternative also addresses all the items listed at the beginning of this section according to design standards, constraints, and feasibility.
  - **Runway Length**: Runway extensions for Runway 3R-21L and Runway 3L-21R would also be provided in Alternative C, with runway lengths up to 10,570 feet and 6,200 feet respectively.
  - Runway Safety Areas (RSA): Alternative C addresses all non-standard RSA issues for the approach end of Runway 3R and 12 by installing Engineered Material Arresting Systems (EMAS) at each end. EMAS is an acceptable means of bringing safety areas into compliance, given that the benefits out way the costs of improving the safety areas by other methods (i.e., Alternatives A and B). Runway 3L's RSA would be cut and graded to RSA standard.
  - **Taxiways**: The proposed taxiway layout would remain as described and illustrated in Alternative A and B.
  - Runway Protections Zones & Land Acquisition: In Alternative C, the following estimated land acquisitions would be required by the City in order to provide adequate control over the area encompassed by the Runway Protection Zones (RPZ):

Runway 12 RPZ	4.0 acres
Runway 21L and 21R RPZs	118.0 acres
<b>Estimated Total</b>	122.0 acres



# 4.2 Landside Alternatives

The Facility Requirements (Chapter 3, Section 3.3) identified a number of potential facility improvements within the landside area of PRC that could enhance the level of service provided to general aviation users, passengers, and others. These potential improvements focused on seven areas:

- Commercial Terminal Building;
- Apron Areas;
- Hangars and Fixed Based Operator (FBO) Facility;
- Airport Rescue and Fire Fighting (ARFF) facility relocation;
- Air Traffic Control Tower (ATCT) relocation;
- Conventional and T-Hangars; and
- Land acquisition.

Each of these area where developed in three (3) different alternatives. The alternatives where based on space requirement identified in Chapter 3, FAA 150/5300-13, *Airport Design Standards*, and operational efficiency. Airport access issues are addressed in Section 4.4.

#### 4.2.1 Landside Alternative 1

Commercial Terminal Building: As shown in Figure 4.4, Landside Alternative 1 redevelops the existing terminal area. This includes constructing a new commercial service terminal building that incorporates the functions of the existing terminal building and provides for expansion capabilities. The existing site would be reconfigured to accommodate the ultimate terminal building, additional auto parking, ground access and rental car parking.

**Airport Administration & Maintenance Facility**: Adjacent to the new terminal facility would be a new airport administration/maintenance facility (located specifically at the current airport administration location).

**Fixed Based Operator (FBO)**: An FBO type development is shown in the area south of the runway intersections, along Club House Drive. This development area includes a 12,000 SF conventional hangar, 25,000 SY of apron area, and adjacent auto parking. A realignment of Club House drive would be required.

**Air Traffic Control Tower (ATCT)**: The ATCT is currently located on the east side of the field and accessible from Wilkinson Drive. The tower was built in 1987 and is operated by FAA Air Traffic Controllers. Due to the height of the current tower and the well documented obstructed views of various critical areas of the airfield, an alternative location is to be considered. Alternative 1 centrally locates the ATCT on the east side off Melville Drive.

**Airport Rescue and Fire Fighting Facility:** The ARFF facility is currently located south of the Runway 3R/21L and 12/30 intersection and it is accessible from Club House Drive. In effort to meet the FAA FAR Part 139 Index-A emergency response requirements on the airfield, a new

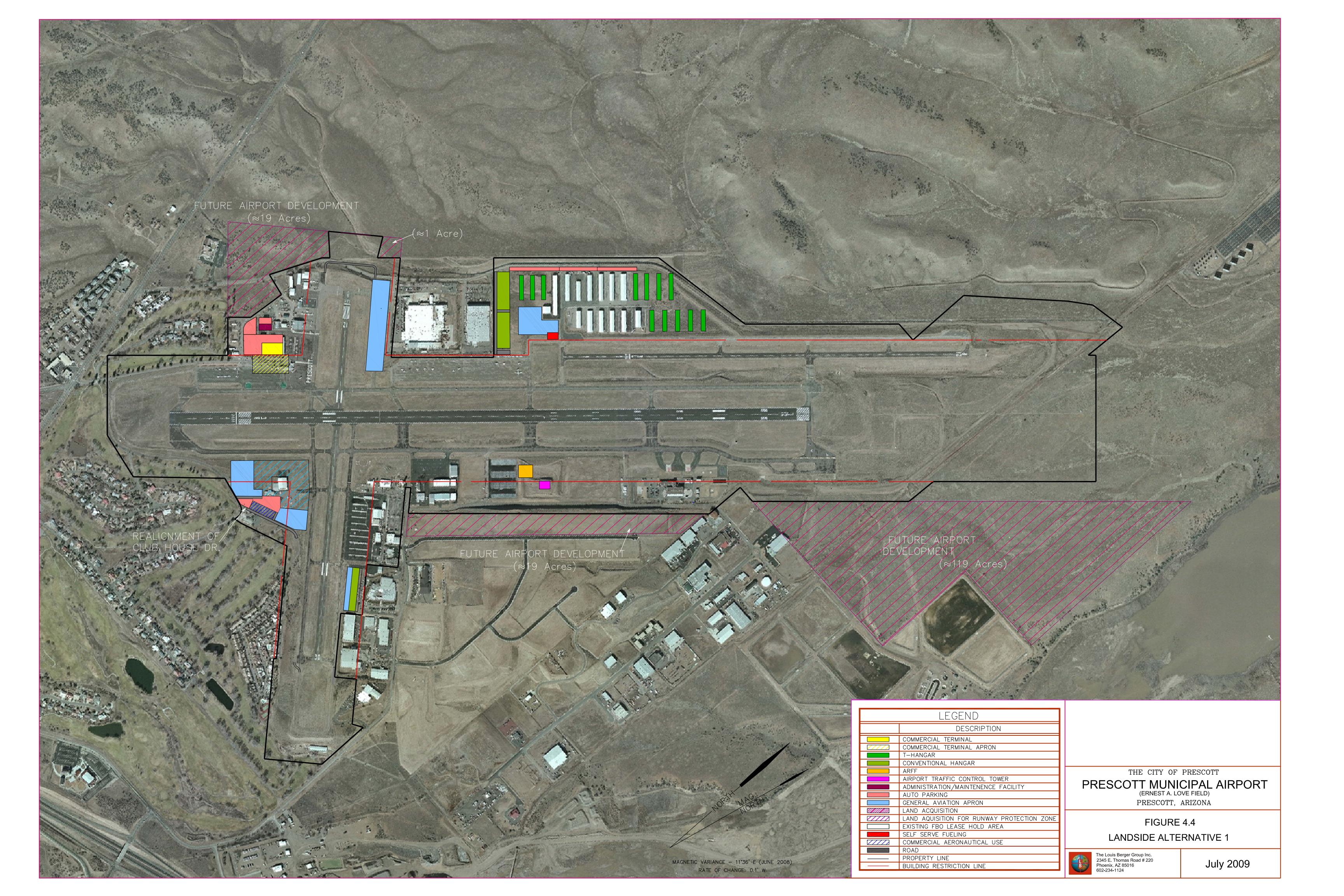
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more central location is desired. This alternative places the ARFF facility at midfield on the east side off Melville Drive and adjacent to the proposed ATCT location.

Conventional & T-Hangars: The PRC requirements for conventional and T-hangar space were estimated from industry planning standards and through discussions with airport tenants and management. The analysis identified a current deficit of 12 T-hangar bays, which is anticipated to increase to 114 by 2027. Likewise, conventional hangar space is incorporated into each development scenario to satisfy the current deficit of 45,000sf and 101,500sf through 2027. To satisfy the facility requirements, several development locations and configurations were identified and illustrated on Figures 4.4, 4.5, and 4.6. As multiple layouts could be recommended, they are referred to as options instead of alternatives.

**Land Acquisition:** Approximately 160-acres of land are proposed to be acquired to allow for future airport expansion and development.



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## 4.2.2 Landside Alternative 2

Commercial Terminal Building: As shown in Figure 4.5, Landside Alternative 2 centrally locates the commercial terminal building with respect to the airfield on the east side of Runway 3R-21L. An available lot next to the USFS was identified as a potential site. While the site can accommodate the terminal and all other support facilities, the major constraint identified is access.

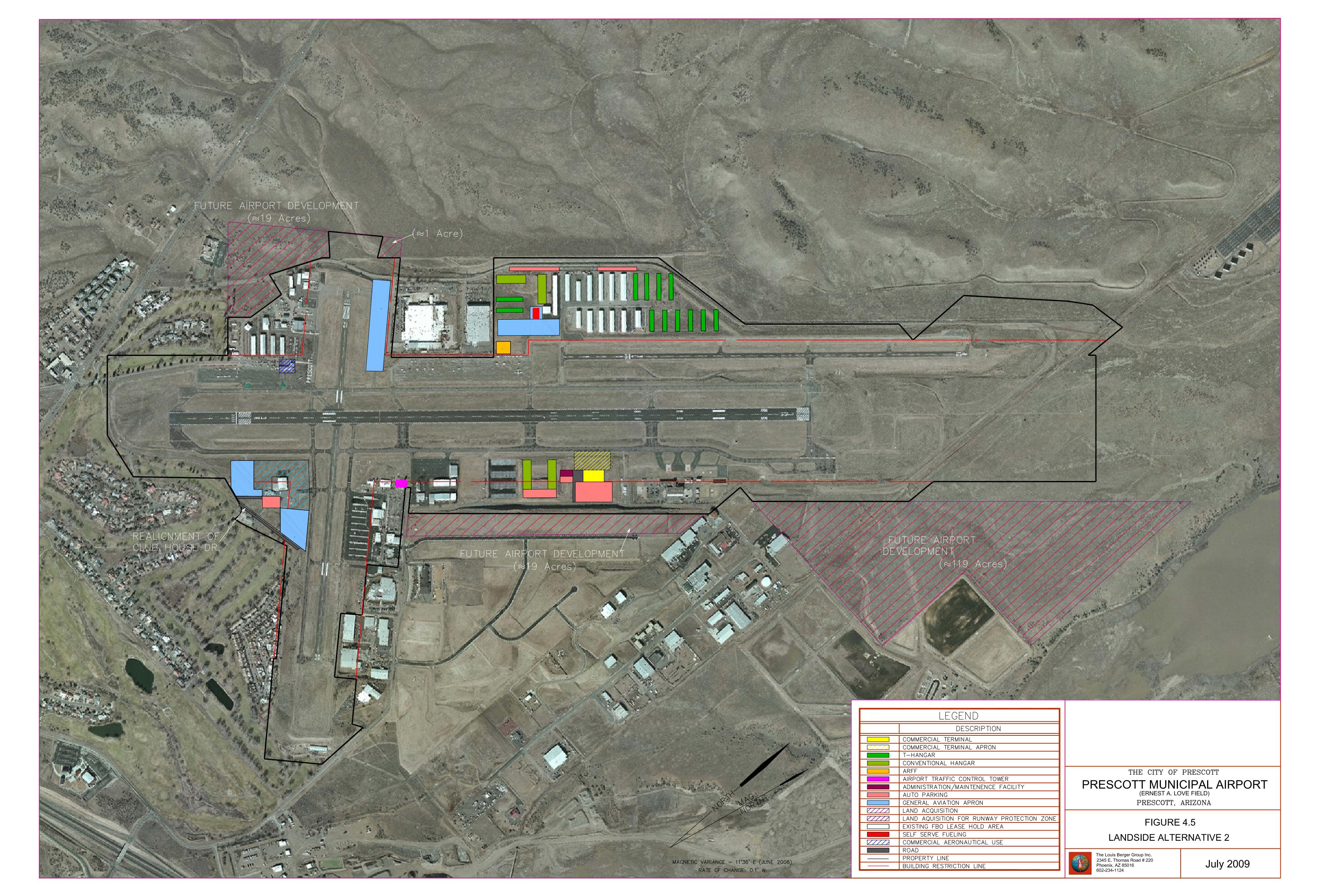
**Airport Administration & Maintenance Facility**: Like Alternative 1, this alternative places the administration & maintenance facility adjacent and just south of the new commercial terminal facility.

**Fixed Based Operator (FBO)**: Similar to Alternative 1, the FBO development is shown in the area south of the runway intersections, along Club House Drive. However, the proposed aprons and auto parking are configured differently.

**Air Traffic Control Tower (ATCT)**: In this scenario, the ATCT would remain at its current location and reconstructed at a higher elevation in effort to facilitate a more complete line-of-sight of the entire airfield.

**Airport Rescue and Fire Fighting Facility:** Alternative 2 also centrally locates the ARFF facility; however, its location would be on the west side and in proximity to the approach end of Runway 3L near the general aviation apron.

**Land Acquisition:** Approximately 160-acres of land are proposed to be acquired to allow for future airport expansion and development.



### 4.2.3 Landside Alternative 3

Commercial Terminal Building: As shown in Figure 4.6, Landside Alternative 3 redevelops the existing terminal area (not unlike Alternative 1). This also includes constructing a new commercial service terminal building that incorporates the functions of the existing terminal building and provides for expansion capabilities. For this alternative, the commercial terminal building is shown approximately in the same location as presented in the previously prepared terminal design plans. The major constraint identified related to the limited space available for aircraft movement.

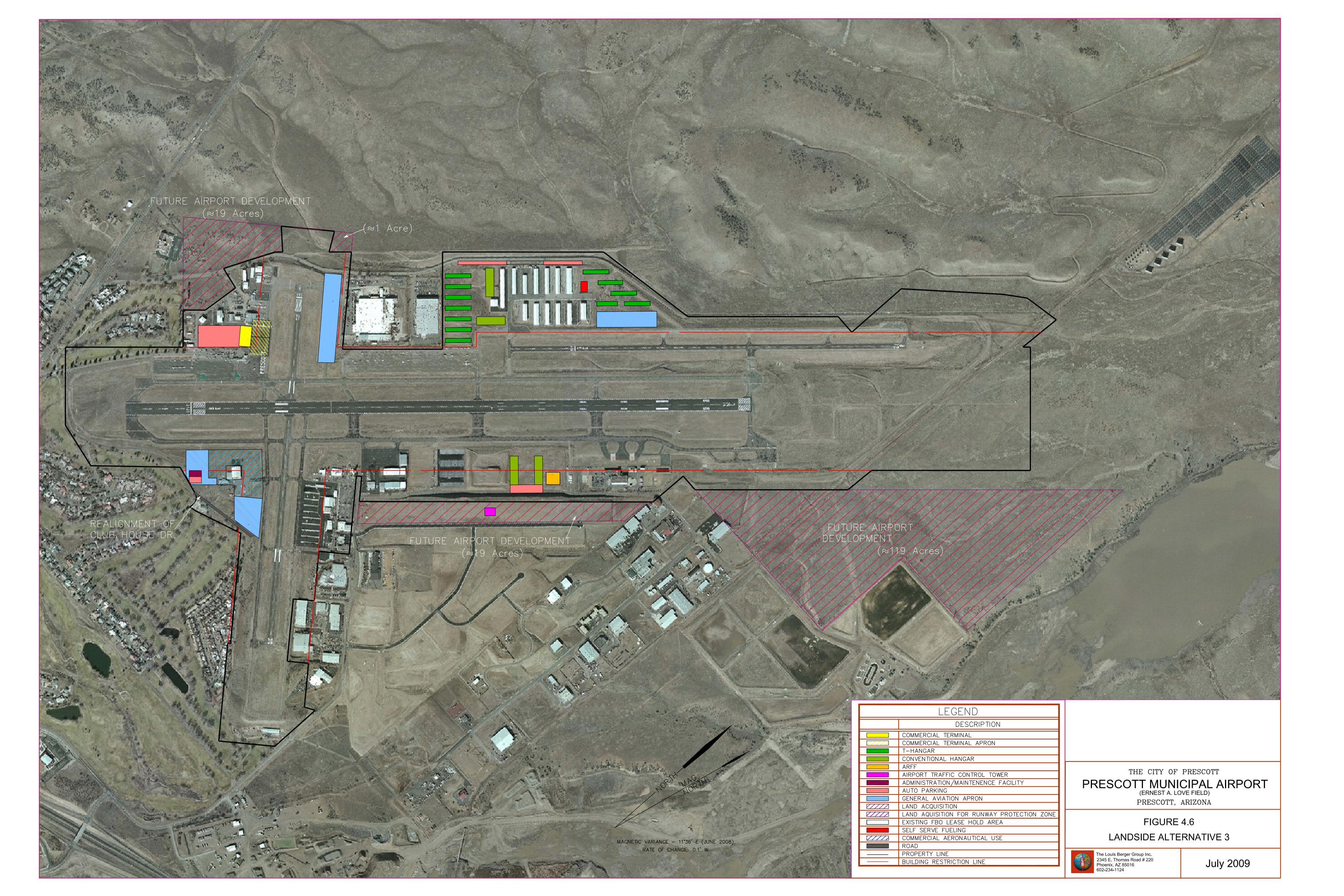
**Airport Administration & Maintenance Facility**: Unlike Alternatives 1 and 2, Alternative 3 separates the new commercial terminal building and the airport administration facilities. As such, under this scenario the facility would be located adjacent to the redeveloped FBO area off Club House Drive.

**Fixed Based Operator (FBO)**: Once again, the FBO type development is shown in the area south of the runway intersections, along Club House Drive. This development area includes a 12,000 SF conventional hangar, 25,000 SY of apron area, and adjacent auto parking.

**Air Traffic Control Tower (ATCT)**: Similar to Alternative 1, this alternative centrally locates the ATCT east of Runway 3R-21L, but further back and east of Mellville Drive on land not currently owned by the Airport.

**Airport Rescue and Fire Fighting Facility:** This alternative places the ARFF facility at midfield on the east side off Melville Drive, but further north than the proposed location presented in Alternative 1.

**Land Acquisition:** Approximately 160-acres of land are proposed to be acquired to allow for future airport expansion and development.

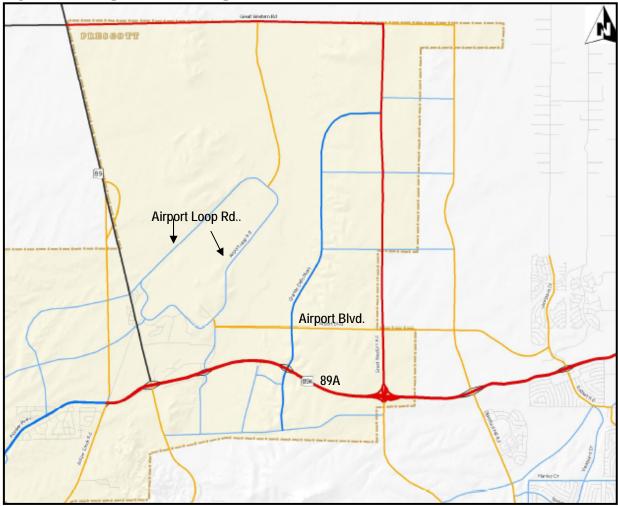


# 4.3 Airport Access

The recommended 2030 airport roadway network was presented in the April 2009 Draft Final Airport Area Transportation Plan. Based on the results of the plan and the travel demand model and the more detailed subarea studies, the projected layout is presented in **Figure 4.7** on a broader scale and **Figure 4.7a**, which identifies specific lanes changes. Overall, the land uses surrounding the airport are anticipated to generate significant travel demands as they develop over the next 20 years. In order to adequately meet these demands, existing roadways in the area will need to be improved and new roadways will need to be constructed. The following major roadway improvements are recommended, as per documented in the Draft Final City of Prescott-Airport Area Transportation Plan, to meet the anticipated future growth in the study area:

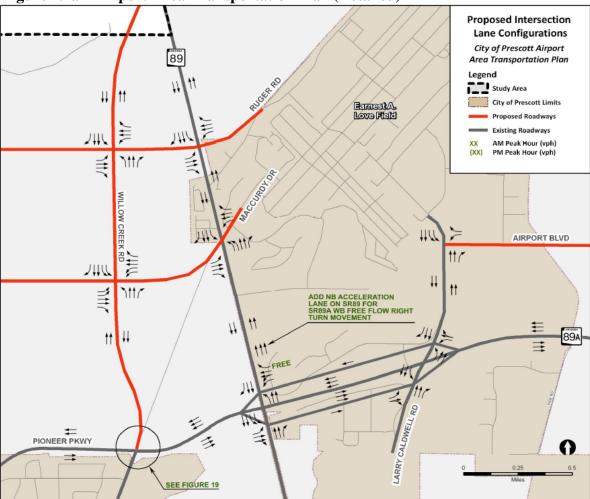
- Widen SR 89A to 6 lanes
- Realign Willow Creek Road north of SR 89A as a four-lane minor arterial
- Widen SR 89 to four lanes between SR 89A and Willow Creek Road
- Widen SR 89 to six lanes north of Willow Creek Road
- Widen Larry Caldwell Drive to four lanes north of SR 89A as adjacent development occurs
- Construct a new high speed limited access facility north-south near the Great Western section line and east-west near the Road 5
- South alignment with free flow connections to SR 89A
- Construct a new east-west minor arterial one mile north of SR 89A between Larry Caldwell Drive and Viewpoint Drive
- Construct a new north-south roadway providing access from Road 5 South to the airport
- Extend Glassford Hill Road north of SR 89A
- Extend Granite Dells Parkway north of SR 89A
- Extend Ruger Road realignment as a four-lane collector roadway west of SR 89 to serve the West Airport GPA area
- Extend MacCurdy Road as a 4-lane collector roadway west of SR 89 to serve the West Airport GPA area





Source: April 2009 Draft Final Airport Area Transportation Plan





Source: Yavapai County 2008, Arizona State Land Department 2008, Field Data Services of Arizona, Inc. 2008, United Civil Group 2008, City of Prescott 2008, as compiled by AECOM, 2009. Source: April 2009 Draft Final Airport Area Transportation Plan

## 4.4 Alternatives Evaluation

The final issue to consider prior to alternative development is the creation of evaluation factors for the analysis. For this study, these factors were developed to ensure that the selected alternative was consistent with the role of Prescott Municipal Airport as follows:

- Airport Utility and Efficiency: The preferred alternative should provide the maximum
  possible utility and efficiency. By doing so, the Airport will achieve a key aspect of the
  airport' role, which is to develop and maintain facilities that meet the needs of its users
  and surrounding community. The appropriate runway length is a key factor in achieving
  this goal. Additionally, the overall configuration of the airport should be designed for
  maximum operational efficiency.
- **Airport and Community Safety**: This criterion is derived from the need to focus on safety for both airport users and local citizens. To accomplish this, the preferred alternative should meet all current FAA design standards, as defined by *AC 150/5300-13*, *Airport Design*; which incorporate the results of years of research conducted by the FAA on aircraft operating characteristics and accidents.
- Environmental Impacts: The best alternative will maintain or improve the Airport's effort to be a good neighbor. Thus, the preferred alternative will have minimal negative (and potentially positive) impacts to the community and the environment surrounding the airport. Factors such as potential noise impacts, land use compatibility, and other environmental issues will be broadly considered as part of this criterion. A more detailed environmental assessment will be completed in the next chapter.
- Estimated Cost: the relative cost of the alternatives will be a consideration in the evaluation.

#### 4.4.1 Evaluation

To address the airfield need of PRC, several alternatives were presented, and thus an evaluation analysis is prudent in effort to formulate the best and most efficient preferred alternative concept. The following alternatives will be evaluated as listed below and analyzed in Table 4.1:

- No- Build- Status Quo: The No-Build Status Quo Alternative is a baseline case that is used to compare the existing facilities to the other alternatives. Since no development takes place, there are no changes to the existing facilities and any design standards which currently do not fully conform.
- Airfield Alternatives A, B, and C
- Landside Alternatives 1, 2, and 3

**Table 4.1 - Airport Alternatives Evaluation Analysis** 

1 able 4.1 - Airport Alternatives Evaluation Analysis					
Alternatives	Airport Utility &	Airport &	Environmental Impacts <sup>1</sup>	Cost Estimates (000)	
	Efficiency	Community Safety	Impacts <sup>1</sup>	(000)	
No-Build	No improvement or impacts to utility and/or efficiency	No improvements to the RSAs, missed opportunity on economic benefits	None	\$200 (annual pavement maintenance & upkeep)	
Airfield Alt. A	Yes	Yes RSA's Improved to standard and 173- acres of land required for acquisition for RPZ protection as a result of runway extensions	Increased Noise Footprint, Land Use Impacts, and Temporary Construction Impacts	\$175,740	
Airfield Alt. B	Yes	Yes RSA's Improved to standard and 143- acres of land required for acquisition for RPZ protection as a result of runway extensions	Increased Noise Footprint, Land Use Impacts, and Temporary Construction Impacts	\$173,510	
Airfield Alt. C	Yes	Yes RSA's Improved to standard and 122- acres of land required for acquisition for RPZ protection as a result of runway extensions	Increased Noise Footprint, Land Use Impacts, and Temporary Construction Impacts	\$176,000	
Alternatives	Airport Utility &	Airport &	Environmental	Cost Estimates	
	Efficiency	Community Safety	Impacts <sup>1</sup>	(000)	
Landside Alt. 1	Yes	Not Applicable	Potential increase in light emissions.	\$74,065	
Landside Alt. 2	Yes	Not Applicable	Potential increase in light emissions.	\$74,065	
Landside Alt. 3	Yes	Not Applicable	Potential increase in light emissions.	\$74,065	
1		•	•		

An environmental overview is provided in Chapter 5. Prior to any development, a biological survey should be conducted to evaluate the types of native vegetation to be disturbed by the proposed development and to determine whether any impacts to the referenced species in Chapter 5 would be anticipated.

# 4.5 Recommended Development Concept & Summary

This chapter has attempted to outline alternative solutions to the key development issues at PRC. Those key issues involved a runway extension, the location of the commercial terminal facilities, the redevelopment of the general aviation area, and the adequacy of ground access to the landside facilities.

Overall, a combination of Airfield Alternative A and B, along with Landside Alternative 1 appears to be the consensus towards the preferred alternative, with several modifications. **Table 4.2** provides a summary of the preferred alternatives recommendation projects along with an estimated cost, which are also illustrated in **Figure 4.8**:

Table 4.2 Preferred Airport Alternative

Primary Airport Projects	<b>Estimated Cost</b>
1. Provide a 3,365 foot extension to Runway 3R-21L	\$13,400,000
2. Provide a 1,354 foot extension to Runway 3L-21R with 15 feet of additional width	\$7,320,000
3. Make standard all non-standard RSA for Runway 12-30 and Runway 3L-21R (RSA for Runway 3R-21L is corrected via the runway extension and shift provided in item #1 cost)	\$1,370,000
4. Taxiway extensions with 15' shoulders (Taxiways A, C, D, F, and H)	\$26,770,000
5. Highspeed taxiways off Runway 3R-21L	\$4,050,000
6. Construct a new combined use commercial terminal building within the existing terminal area footprint	\$13,300,000
7. Relocate and construct a new ATCT	\$12,300,000
8. Relocate and centralize the ARFF facility	\$3,950,000
9. Construct a new Airport Administration/Maintenance facility	\$5,570,000
10. Redevelop the existing general aviation areas (aprons and hangars)	\$14,380,000
11. Install self-service fueling station	\$20,000
12. Acquire land for runway extension and RPZ protection (145 acres)	\$10,875,000
13. Acquire land for future east side airport development (138 acres)	\$10,350,000
14. Design/construct airport perimeter road (58,470 s.y.)	\$3,320,000
15. Install/relocate perimeter fence	\$300,000
16. Environmental Assessment	\$250,000
17. Provide ground access improvements	To Be Determined
Estimated Total	\$127,525,000

Based upon these development recommendations, all of the "unconstrained" forecast could be accommodated. In an effort to move forward, preliminary recommended airside and landside concepts have been proposed to the Project Advisory Committee (PAC) and the public. Pending review of the preferred alternative and input from the PAC, as well as the public, the Capital Improvement Plan (Chapter 6) will present a refinement of this basic development concept into a final plan with recommendations and timing for the overall development program.

