CHAPTER FOUR: DEVELOPMENT ALTERNATIVES

INTRODUCTION

The objective of this chapter is to identify feasible development options that meet the projected levels of aviation demand as well as maintain a safe aviation environment in and around Chandler Municipal Airport over the 20-year planning period. In this chapter, a series of airport development scenarios are identified and considered. The ultimate goal is to develop the underlying rationale that supports the final Master Plan recommendations. Through this process, an evaluation of the highest and best uses of Airport property is made while considering local goals, physical constraints, and appropriate federal airport design standards, where appropriate.

The number of potential alternatives that can be considered are endless. Therefore, some judgment must be applied to identify alternatives that have the potential to be implemented. In order to achieve this objective, the following five sections help determine a recommended approach to future development at Chandler Municipal Airport:

- Summary of Airport Requirements
- Ability of Existing Facilities to Accommodate Improvements
- Identification of Development Alternatives
- Evaluation of Alternatives
- Conclusions

SUMMARY OF AIRPORT REQUIREMENTS

Chandler Municipal Airport will continue in its role as a Federal Aviation Administration (FAA)-designated general aviation reliever airport, supporting the region's general and business aviation activities including flight training, and providing service to light and corporate class aircraft. The preceding capacity analysis and facility requirements chapter projected that overall airfield capacity at Chandler Municipal Airport will be sufficient to accommodate demand throughout the 20-year planning period. However, the Airport is projected to be increasingly utilized by larger corporate class aircraft. Based on a continuation of the Airport's existing role and using industry and FAA planning standards, the facility requirements analysis identified the following needs for Chandler Municipal Airport within the 20-year planning period:

- Runway extension and widening
- Extension of parallel Taxiway B
- Installation of Approach Lighting System
- Construction of additional hangar facilities
- Construction of additional apron
- Reconfiguration and construction of additional auto parking
- Reconfiguration and construction of north side airport access roadways

- Construction of south side airport access roadways

ABILITY OF EXISTING FACILITIES TO ACCOMMODATE IMPROVEMENTS

This section evaluates the ability of Chandler Municipal Airport to accommodate the necessary facility improvements identified to meet current and projected demand.

Airfield

Runways

As identified in the preceding chapter, the forecasted demand for future aviation activity is projected to reach the capacity of the existing runway and taxiway system toward the end of the forecast period. Additionally, the analysis completed in previous chapters indicates that Chandler Municipal Airport will be increasingly utilized by larger corporate class aircraft. The analysis indicated that the current runway size is sufficient for the smaller aircraft that use the Airport, but falls short of the requirements necessary for larger aircraft to use the Airport on a year-round basis. As identified in Table 3.4, a runway length of 7,000 feet would provide service to 100 percent of corporate general aviation aircraft at 60 percent useful load. The Airport is constrained by Germann Road to the northeast and Queen Creek Road to the southwest. The alternatives section below discusses the runway extension options available at Chandler Municipal Airport, assuming that the roads and surrounding development are fixed constraints and that this runway length cannot be accommodated. Additionally, because of the location of taxiways, hangars and apron in relation to Runway 4L-22R, it was determined that extension of this runway was not practical. Due to the increased usage of the Airport by corporate class aircraft, it is recommended that the Airport be upgraded to meet ARC C-II design standards. If Runway 4L-22R were upgraded to meet these standards, the taxiway, apron, and the majority of hangars would require relocation. Thus, the runway extension alternatives evaluate the extension of Runway 4R-22L.

Another option that was investigated to meet the identified runway length requirements was the use of declared distances. Runways are normally fully usable in both directions. Furthermore, they normally have clear approaches to each runway end. The use of declared distances can be effective on runways where providing a conventional configuration is impractical for cost or other reasons. Declared distances allow portions of the runway to be counted for certain aircraft operational requirements, typically take-off but not included for others, typically landing. The use of declared distances is effective because the majority of aircraft, particularly larger corporate class aircraft, require more runway length for take-off operations than landing operations. It was determined that using declared distances could provide a longer runway for take-off, however, the FAA strongly discourages the use of declared distances when other options are available. Typically, declared distances are used to address operational limitations in cases where other options are not available. In the case of Chandler Municipal Airport, it was determined that relocation of the roadways limiting expansion is

physically possible, but because of current City policy it is not feasible or desirable. Therefore, the use of declared distances was not utilized in determining runway length alternatives.

Taxiways

Taxiways are primarily constructed to facilitate aircraft movements to and from the runway system. The availability of entrance and exit taxiways can affect the overall airfield efficiency. The current system of full and partial parallel taxiways provides adequate access to each of the Airport's parallel runways. However, as activity at the Airport continues to grow, operation of the Airport in the most efficient manner possible will become critical in avoiding costly delays to users of the Airport. Construction of additional taxiways will assist in operating the airfield as efficiently as possible. The taxiway alternatives allow for two-way taxiing of aircraft on the airfield and in the terminal apron area. An additional taxiway alternative involves an end-around taxiway that would enhance the safety and capacity of the airport by allowing unrestricted taxi around runway 4L-22R.

At the majority of airports with a parallel runway configuration, departing aircraft typically use the inboard runways while arriving aircraft use the outboard runways. This can result in delays or risks of runway incursion when outboard runway traffic has to cross active inboard runways to make its way to the terminal area. To improve efficiency and provide a safe means of movement around a runway, an end-around taxiway may be constructed to allow transition around the departure end of a runway. At Chandler Municipal, the primary benefit of the proposed end-around taxiway would be the allowance of aircraft arriving on runway 4R to taxi around the northeast end of departure runway 4L. End-around taxiways must remain outside of the standard runway safety area, which extends 1,000 feet from the departure end of the runway. Due to these design considerations, Chandler Municipal's end-around taxiway can be visualized as an extension of Taxiway P to the northwest, intersected by an extension of Taxiway A to the northeast.

In order to avoid potential issues where pilots departing from runway 4L might mistake an aircraft taxiing on the end-around taxiway for one actually crossing near the departure end of the runway, a visual screen type device would be required. Through a partial or complete masking effect, the visual screen will enable pilots to better discern when an aircraft is crossing the active runway versus operating on the end-around taxiway. This will eliminate any false perceptions of runway incursions, which could lead to unnecessary aborted takeoffs.

NAVAIDs

The current instrument approach procedures at Chandler Municipal Airport provide opportunities for instrument training operations and access during inclement weather conditions with cloud ceilings as low as 400 feet above ground level and visibility as low

as one mile. In order for Chandler Municipal to implement a precision approach with lower weather minimums, an approach lighting system is required. This system would allow for the installation of a precision instrument approach which would likely be global positioning system (GPS)-based. This system would provide additional training opportunities for pilots practicing to fly using instruments, and would also provide access to the Airport in more inclement weather conditions than are possible today. A precision approach could also potentially help to eliminate approach and traffic pattern conflicts with Memorial Airfield and Stellar Airpark.

A significant amount of flexibility exists in the design of new GPS-based precision approach procedures, which can be created to avoid areas of conflict in the air and on the ground. Because of the relative lack of inclement weather in the Phoenix area, access to the Airport would not be significantly improved by installation of a precision approach, however, improved airspace utilization and additional instrument training opportunities could provide a significant benefit to the Airport.

Landside

Similar to airfield facilities development, landside development opportunities also look to existing structures to accommodate improvements.

Hangars

The Airport currently has conventional hangars, t-hangars and shade hangars on the north side of the airfield to protect aircraft from sun and weather exposure. As identified in Chapter One, the Airport currently has 238 hangar units. The required development of hangars would be in addition to the existing facilities currently provided. The use of the existing hangar units is accounted for in the calculation of required hangar units. The current number of hangar units does not meet current or projected demand for hangar storage. Limited developable land exists for additional hangar development on the north side of the airfield. The southeast side of the airfield has sufficient area available to accommodate the projected need for additional hangar units, but will require additional infrastructure to support this development, including apron, taxi lanes, and access roadways.

Apron

Chandler Municipal Airport has a limited amount of apron pavement located along the northwest side of the airfield. The Airport's existing aircraft apron has adequate pavement to accommodate some additional hangar development, but is insufficient to meet the current and projected need for transient apron, tie-downs and hangar facilities. Additional apron space is needed to support increases in transient and locally based aircraft operations, as well as the construction of additional tie-downs and additional hangar facilities. The amount of developable land on the north side of the airfield is insufficient to construct the amount of apron identified to meet projected demand.

Sufficient developable land exists on the southeast side of the airfield to construct the necessary apron area to meet projected demand, but needs to be coordinated with other development in that vicinity.

Auto Parking

Overall, the Airport has sufficient auto parking to meet the projected demand. However, some individual areas on the Airport have insufficient parking according to future demand projections. Additionally, some areas on the Airport currently used for auto parking are planned to be converted to other uses, thus additional auto parking will be considered along with other facility development alternatives.

Alternatives for developing the airfield and landside facilities mentioned above are addressed in the next section, *Identification of Development Alternatives*. These alternatives make use of existing facilities where they provide benefit, cost savings or minimize the impacts to other areas. In some instances, however, the ability to use existing facilities does not present itself or constitute the most logical approach to development. In these circumstances, a given facility may require the replacement or removal of an existing facility to make way for new opportunities.

IDENTIFICATION OF DEVELOPMENT ALTERNATIVES

Each of the airport requirements listed above present several development alternatives. Because Chandler Municipal Airport, like so many general aviation airports, has experienced times of strong growth as well as times of decreased activity levels, this study aims to provide the flexibility to respond to aviation demand beyond the current expectations. Development alternatives were formulated for each facility requirement discussed above grouped according to airside and landside segments. Because the scope, demand and location of the required facilities differ from one another, they can be developed and evaluated independently. Some required facilities may have more alternatives than others due to the amount of developable land, realistic placement, and ability to meet FAA standards. Before specific airside and landside alternatives are reviewed, a discussion on the “No Action” Alternative and the possible transfer of aviation services are presented.

No Action Alternative

The no action or do nothing alternative maintains the Airport in its present condition and provides no improvement of any type to the existing facilities. With this alternative, Chandler Municipal Airport’s two parallel runways, which are currently 4,401 and 4,870 feet long, and other airside and landside facilities would be retained as they are today. The Beech King Air turbo-prop aircraft would remain the design aircraft with the runways designed to meet ARC B-II criteria. This length is sufficient to accommodate 100 percent of all small aircraft. Under almost all conditions this length is adequate for use by single-engine and twin-engine piston aircraft. While other facilities, such as

aircraft storage, are able to accommodate today's users, a no action alternative would not accommodate future users or expanded aircraft sizes or capabilities. The overlaying result of this alternative would be its inability to satisfy aircraft performance demands on a year-round basis in future years.

Considering that the region has experienced strong growth in all socioeconomic categories over the past several years and the aviation forecast presented earlier in this document predicts continued growth at Chandler Municipal Airport, enhancements are essential to keep pace with demand. Without the facilities identified in the previous section, regular users of the Airport will be constrained from taking advantage of the Airport's air transportation capabilities and the Airport may be unable to attract potential new users.

The consequences of the no action alternative extend beyond Chandler Municipal Airport and the Chandler/Gilbert area. Other airports within Maricopa County rely on Chandler Municipal Airport to help accommodate the demand for general aviation services in the region, one of the reasons the Airport is designated by the FAA as a reliever airport. Without facilities designed to meet the needs of aviation in the region, airports such as Williams Gateway, Falcon Field, and large commercial service airports like Phoenix Sky Harbor International Airport would be at or exceeding capacity due to the increased level of general aviation activity that would utilize those airports. General aviation facilities like Chandler Municipal Airport not only provide convenience to general aviation users in their immediate environs, they also assist in avoiding major congestion at other general aviation and commercial service airports.

The no action alternative will also adversely affect the economic climate in the Chandler community. Businesses and industries seeking locations with adequate and convenient aviation facilities are attracted to airports that maintain and expand their services and facilities to keep up with the ever-changing and growing demands of general aviation. Chandler Municipal Airport has much to offer businesses in terms of airside and landside facilities. Without adequate maintenance and additional and on-going improvements, existing users and potential businesses for Chandler Municipal Airport and the City of Chandler could be lost. Because of the impact the no action alternative may have on the viability of the Airport as well as the opportunities that lay ahead, the no action alternative is not considered prudent.

Transfer of Aviation Services

The relocation of services to another airport is always a potential alternative. It would be difficult to duplicate the services and convenience that Chandler Municipal Airport provides, whether at an existing facility or a new site. There are only two public-use general aviation airports within 20 miles that could potentially service the needs of Chandler Municipal Airport users: Falcon Field and Williams Gateway Airport. Falcon Field in Mesa has nearly 1,000 based aircraft and a lengthy waiting list for other aircraft owners searching for places to base their aircraft. Its longest runway is 5,100 feet long

and would require an extension and/or new runway to meet future demand identified for Chandler Municipal if aircraft and services were transferred from Chandler Municipal Airport. Due to the number of based aircraft and operations at Chandler Municipal Airport, and the lack of existing facilities at Falcon Field to meet the existing or long-range demand for based aircraft and operations projected for Chandler Municipal, shifting services would not be possible without major development costs to Falcon Field.

Williams Gateway Airport is being developed to serve the needs of large commercial jet aircraft as a reliever to Phoenix Sky Harbor and is not intended to serve as a primary general aviation facility. Williams Gateway is working closely with the City of Phoenix to attract additional airlines to serve the growing East Valley's commercial service needs.

As part of the Maricopa Association of Government's previous Regional Aviation System Plan (RASP), development of new airport sites has been recommended to accommodate the projected increases in demand for general aviation activity throughout the Phoenix metropolitan region. While new sites have been recommended, no additional analysis has been undertaken in the region as there are no identified sponsors for new airports due to the economic and environmental costs of new site development. The economic and environmental costs of developing a new airport site are far greater than the cost of developing an existing site. An option exists to encourage the relocation of some services or activity to another facility, should it become necessary. For example, training activity can be encouraged to go elsewhere. It is also possible to encourage the basing of aircraft at other regional airports. There are limited means available to encourage relocation due to regulations imposed by the FAA regarding providing the Airport being open to provide service to any and all users. Providing access to the nation's air transportation system provides many economic benefits to the City of Chandler and the surrounding region. Failure to provide the necessary airport facilities and services diminishes the many social and economic benefits the Airport provides. Therefore, the master planning process attempts to provide the Airport with the needed facilities which have been identified in the previous chapter, at the levels forecasted throughout the 20-year planning period.

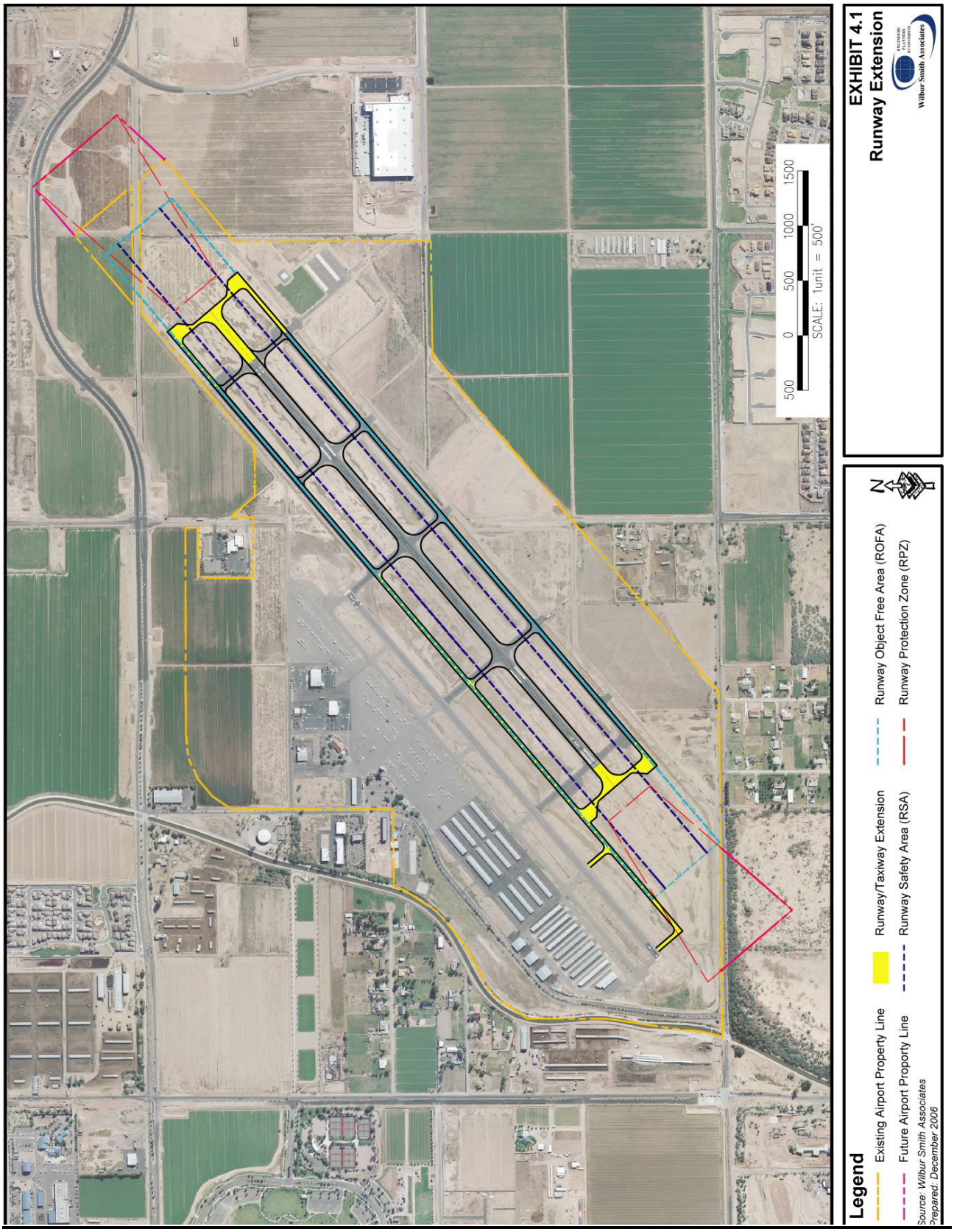
Airside Alternative

Runway Alternative – Runway 4R-22L extension to 5,700 feet

Under this scenario, Runway 4R-22L would be extended to 5,700 feet. This would be accomplished by extending the runway 590 feet to the northeast, and 240 feet to the southwest and is depicted in **Exhibit 4.1**. This alternative provides enhanced accommodation of small to medium-sized corporate class aircraft by providing the maximum runway length possible within the confines of existing Airport property. Public roads located beyond each end of the runway limit the amount of runway extension possible and this alternative assumes that the roads are fixed constraints. In this alternative, the runway is designed to accommodate ARC C-II aircraft. In order to accommodate this class of aircraft, the Runway Safety Area (RSA) and Runway Object Free Area (ROFA) requirements and required Runway Protection Zones (RPZ) become

larger than what currently exists. ARC C-II standards require the RSA to be expanded to 500 feet wide and 1,000 feet beyond the end of each runway end. The ROFA is required to be 800 feet wide and extends 1,000 feet beyond each runway end. The RPZ for ARC C-II runways with instrument approach visibility of not less than one mile is 500 feet (inner width) by 1,700 feet (length) by 1,010 (outer width). This alternative maintains the RSA and the ROFA on existing Airport property, and requires the purchase or acquisition of easements of approximately 22.3 acres to achieve control of the expanded RPZ.

The intent of this alternative is to accommodate corporate class aircraft to the greatest extent possible without realignment of roadways at either runway end, while also maintaining the future RSA and ROFA on existing Airport property. A shorter runway extension alternative would accommodate fewer aircraft and the cost differential associated with this alternative versus other, shorter extensions, is marginal. While this length would better accommodate small to medium-sized corporate class aircraft, it would preclude most of these aircraft from operating at their full capacity in terms of carrying maximum loads of fuel, cargo or passengers during warmer weather. A pavement strength of 75,000 pounds for dual wheel aircraft would be appropriate for this length.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Existing Airport Property Line
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Runway Object Free Area (ROFA)
Runway Protection Zone (RPZ)
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Source: Wilbur Smith Associates
Prepared: December 2006
EXHIBIT 4.1
Runway Extension
Wilbur Smith Associates

Taxiways

Runway 4R-22L has a full parallel taxiway on the southeast side of the runway (Taxiway C), and a partial parallel taxiway on the northwest side of the runway (Taxiway B). The first taxiway alternative calls for an extension of Taxiway B to the southwest to the approach end of Runway 4L. This would be accomplished by extending Taxiway B to the southwest approximately 4,359 feet and to the northeast 600 feet to the proposed future end of Runway 4R-22L. If Runway 4R-22L is extended, Taxiway C would also be extended to the new runway ends. The proposed taxiway extensions are depicted on **Exhibit 4.2**. This alternative would provide full-length parallel taxiways on each side of both runways, providing two-way taxi circulation for both runways. Taxiway B could be used for operations on both runways and could reduce the need for aircraft to make mid-field runway crossings while transitioning to and from Runway 4R-22L and the north apron area.

Another alternative calls for an extension of Taxiway B and C to the proposed ends of Runway 4R-22L. The extension of Taxiway B and C would provide dual parallel taxiways on Runway 4R-22L and a partial parallel taxiway on Runway 4L-22R which would supplement the full parallel taxiway on the north side of Runway 4L-22R. This would allow two-way taxi circulation to Runway 4R-22L and partial two-way access to the northeast portion of Runway 4L-22R. This alternative is depicted in **Exhibit 4.3**.

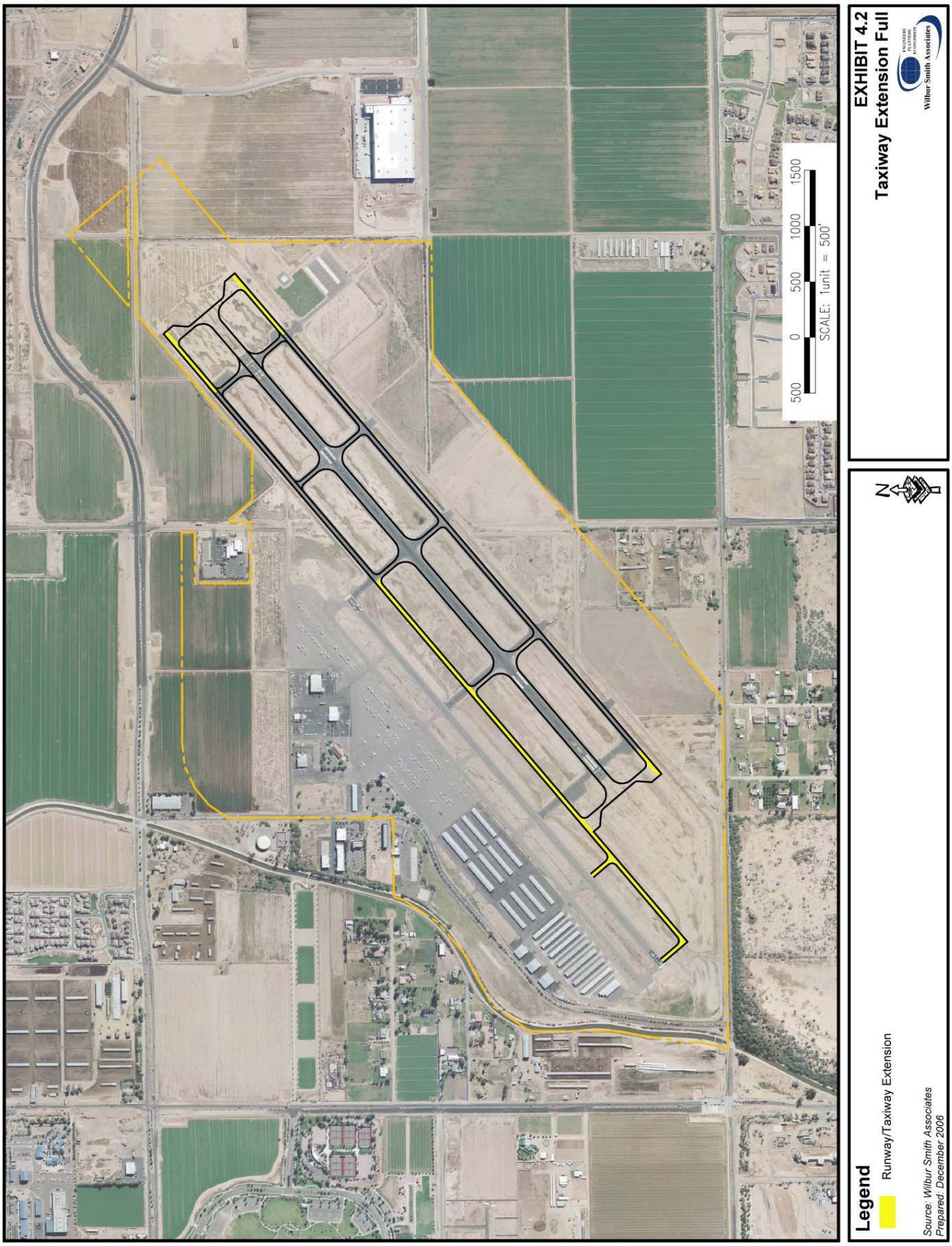


EXHIBIT 4.2
Taxiway Extension Full

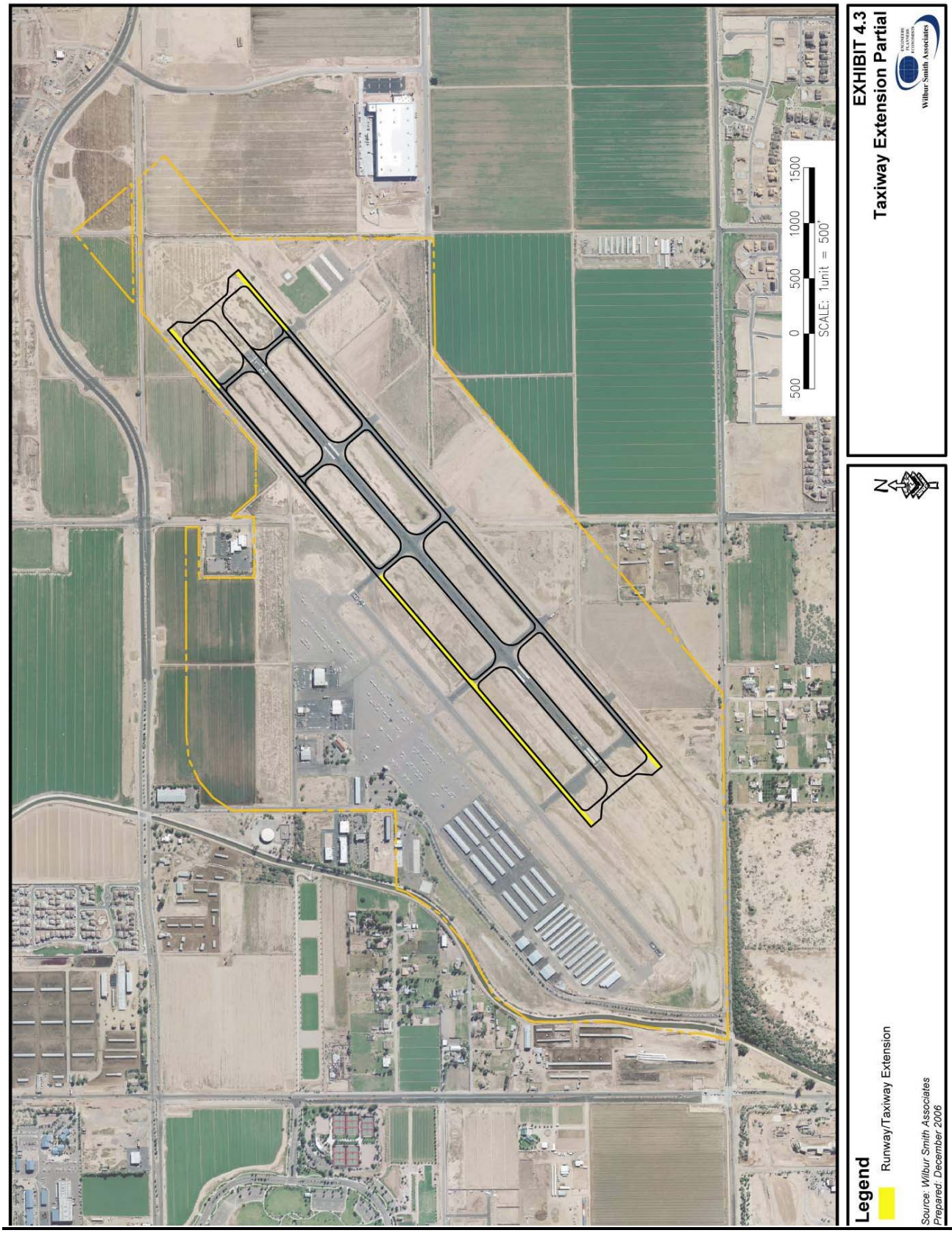


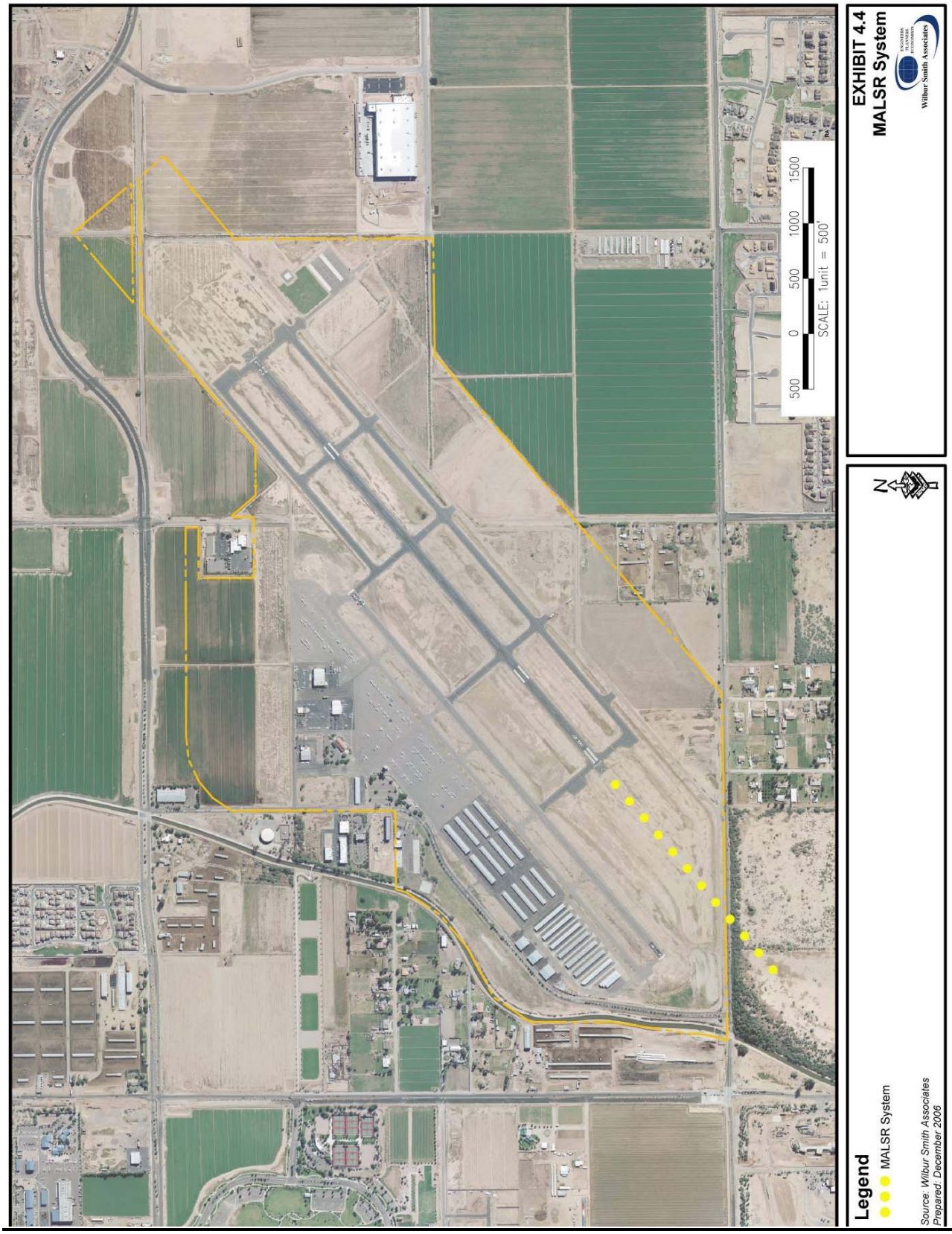
EXHIBIT 4.3
Taxiway Extension Partial

NAVAIDs

An approach light system is required on Runway 4R in order implement a precision approach procedure (ILS or GPS) and achieve lower instrument approach minima. Discussed below are options for an approach light system which include a Medium Intensity Approach Lighting System Runway Alignment Indicator Lights (MALSR) as well as an option that implements a precision approach with no approach lighting system.

A MALSR allows for precision approach minima as low as 200 feet and ½ mile visibility. The MALS portion of the system extends 1,400 feet from the runway threshold on the extended runway centerline, while the Runway Alignment Indicator Lights (RAILS) portion of the system extends an additional 1,000 feet. Based on the location of the current runway threshold, installation of a MALSR on Runway 4R would require approximately 1,000 feet of the system to extend beyond the current Airport property boundaries and across Queen Creek Road. The location of this approach light system is depicted in **Exhibit 4.4**.

A second option is to install a precision approach system with the existing 1-mile visibility minima in place. While this alternative would not reduce approach visibility minima, it would not require the installation of an approach lighting system, thus avoiding any possible encroachment on nearby properties. This system would provide adequate precision approach instrumentation necessary for pilot training.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MALSR System
Source: Wilbur Smith Associates
Prepared: December 2006
EXHIBIT 4.4
MALSR System
Wilbur Smith Associates

Apron Expansion

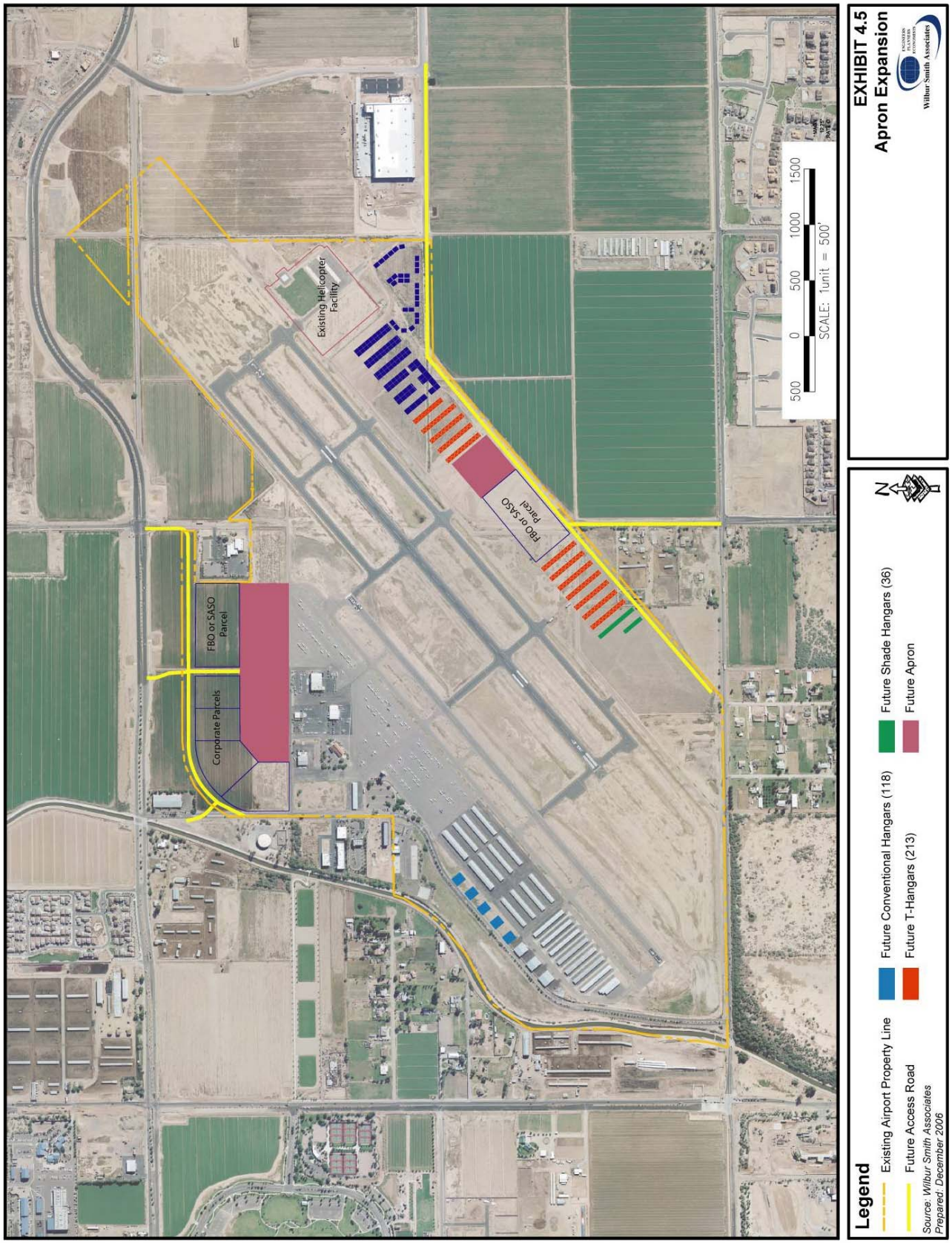
Developable land for apron expansion at Chandler Municipal Airport exists north of the FBO and terminal area and along the entire southeast side of the airfield.

The first alternative depicted in **Exhibit 4.5** calls for apron development on the north side of the airfield surrounded by the existing and possible future FBO as well as corporate hangars. Along the southeast side of the airfield, this alternative also shows apron area located between a future FBO and hangar facilities which would maintain access to off-airport parcels adjacent to the Airport, allowing a possible "through-the-fence" operation. A "through-the-fence" operation allows for aviation development located off airport property while providing access to the taxiway and runway system as well as other airport facilities. Business and industrial parks are common "through-the-fence" facilities because they provide additional land development opportunities while maintaining access to the airport. Aeronautical related companies and businesses having expedited travel and shipping needs find these types of facilities convenient and more economical than facilities located directly on airport property. Airports also benefit from this type of arrangement by extending the reach of the airport and improving revenue streams.

The FAA discourages the development and operation of "through-the-fence" activities. Chandler Municipal has worked to address the FAA's concerns related to these activities including being able to preclude access, charging for access to the facilities, and limiting the activities in the areas to non-aviation.

The second alternative to apron development depicted in **Exhibit 4.6** illustrates the same development in the north side of the Airport as in the first alternative. On the southeast side of the Airport, however, the apron area providing access for a "through-the-fence" operation discussed above in the first alternative would be substituted for additional t-hangar development.

Since the north and southeast area represented in these alternatives are separate and exclusive from one another they can be evaluated and implemented independently. Proposed development on the north side of the Airport can be accompanied by either development alternative in the southeast side. The evaluation of alternatives discussed in the next section reviews these areas independently.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Existing Airport Property Line
Future Access Road
Future Conventional Hangars (118)
Future T-Hangars (213)
Future Shade Hangars (36)
Future Apron
Source: Wilbur Smith Associates
Prepared: December 2006
EXHIBIT 4.5
Apron Expansion
Wilbur Smith Associates

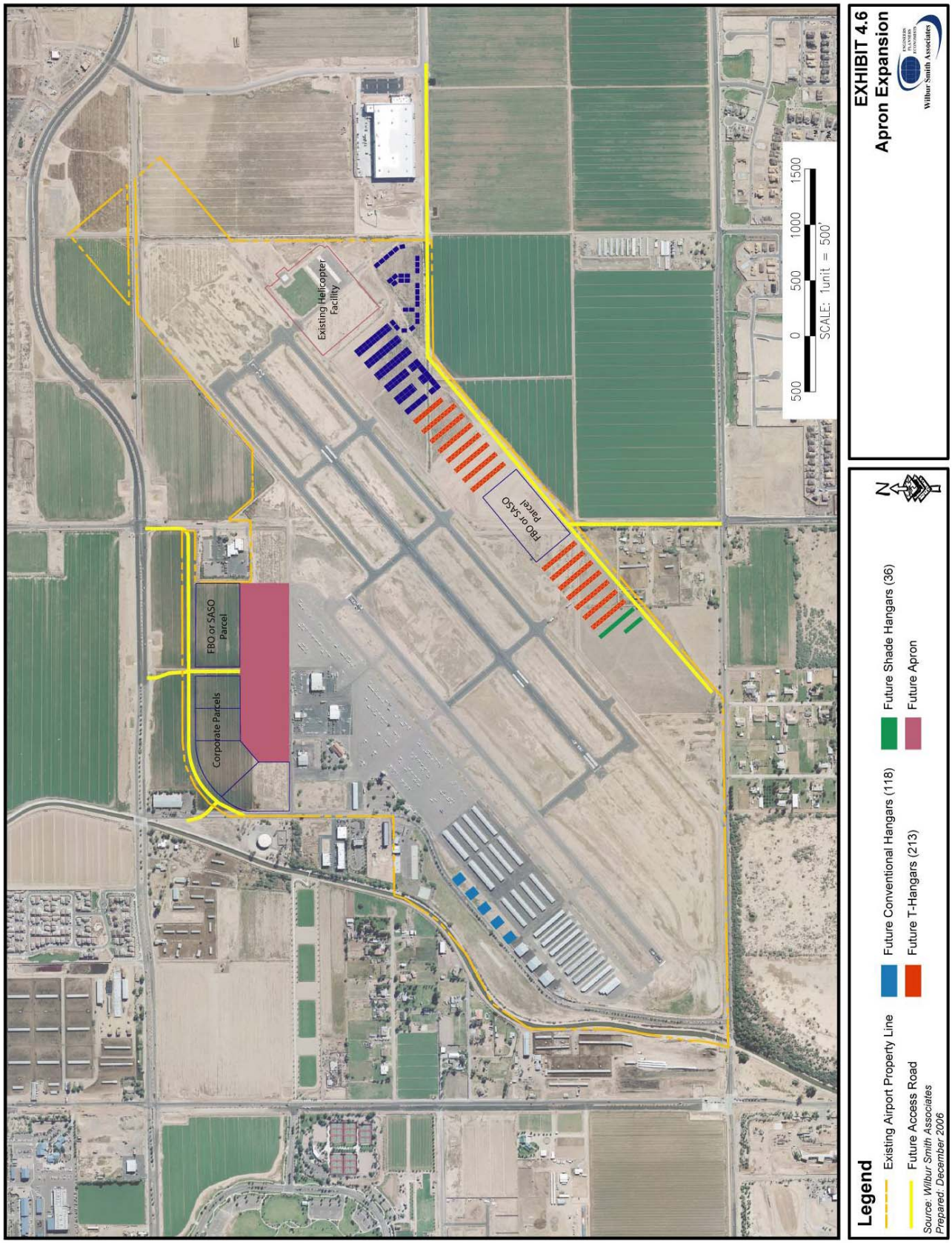


EXHIBIT 4.6
Apron Expansion

Wilbur Smith Associates

Construct Additional Hangars

Construction of future hangars at Chandler Municipal Airport will be comprised of primarily individual conventional and t-hangar structures. Additional shade hangar structures could also be developed, however demand for this type of facility is projected to be minimal. The number and types of hangars developed at the Airport will primarily be determined by market demand for hangar facilities at the Airport. Hangar developers, who lease Airport land from the City, will develop facilities that are the most marketable at the Chandler Municipal Airport. As the Airport gains additional corporate class aircraft tenants, the demand for larger conventional hangars will be greater. Alternatively, if the Airport remains in the present configuration, demand for smaller t-hangars will be greater. Hangar development layouts to accommodate both of these needs are illustrated in Exhibits 4.5 and 4.6 discussed in the previous section.

EVALUATION OF ALTERNATIVES

Because each facility requirement discussed above can be developed independently, without impacting other future facility requirements, they can also be evaluated independently. Each development alternative identified in the preceding section has been reviewed based on the following criteria:

- Safety and efficiency of aviation operations
- Ability to accommodate expected general aviation demand
- Acceptability to users, ADOT, FAA, and the community at large
- Land availability and ownership
- Environmental factors
- Airspace/obstruction requirements
- Consistency with area wide plans
- Political, jurisdictional and implementation factors
- Economic feasibility
- Accessibility

Each alternative impacts the criteria listed above differently and to varying degrees. The evaluation summarized below demonstrates the critical impacts and issues of each alternative as they relate to the above criteria.

Runways

As stated earlier, the selection of an appropriate runway length (and hence the Airport's classification) depends on the family of aircraft forecast to use the runway on a regular basis. Since the existing runway is adequate for 100 percent of all small aircraft, the need for a runway extension is based upon whether future demand by larger aircraft is likely. It is important to note, however, that corporate class aircraft are already using the Airport today, but with limited capacity in terms of fuel, cargo and passengers, especially during the summer months. An estimate of future demand by the corporate

segment of general aviation was completed based on existing usage of the Airport by larger aircraft as well as an analysis of economic activities and national aviation trends.

The City of Chandler has experienced strong economic growth in the past and is projected to see that growth continue in the future. Nationally, activity from the business segment of general aviation has recently also experienced strong growth, which is projected to continue in the future. Given the nature and extent of development expected in the Chandler area, and the projected growth in corporate general aviation activity nationally, it is reasonable to assume that a significant increase in demand by the corporate segment of general aviation will accompany the anticipated arrival of corporate headquarters, increased employment and population to the City of Chandler and surrounding areas. Based on these factors, and the activity that is occurring at other similar airports in the Phoenix region, it very likely that demand for services at Chandler Municipal Airport by larger general aviation aircraft will remain strong.

With this expected growth comes the need for additional runway length. As discussed in the preceding chapter, 7,000 feet of runway length is necessary to fully accommodate aircraft expected to use Chandler Municipal Airport. The runway alternative presented above proposes an 830-foot extension to Runway 4R-22L resulting in a length 5,700 feet. Although this length is dramatically shorter than the 7,000 feet identified in the facility requirements, it is the maximum allowable length within the confines of the Airport property.

As part of the evaluation process, it should be noted that an existing City ordinance No. 2978, § 3, 5-27-99 states that,

> *To guarantee to the citizens of the City of Chandler the continued quiet enjoyment in and to the homes, schools, churches and work places, the Chandler Municipal Airport shall not be permitted to accommodate, in any fashion, aircraft which requires for landing a runway longer than six thousand eight hundred (6,800) feet. Extension of the runway shall require voter approved bonds, which specify that the bond monies are for the purpose of extending the runway.*

While a 5,700-foot long runway is significantly shorter than the 6,800-foot long runway previously examined and included in the City ordinance, the City of Chandler has committed to conducting a bond election should a runway extension project be approved by the City Council. In order to achieve an adequate runway length to accommodate corporate class activity and have a measurable impact on the ability of the Airport to serve these types of aircraft, a runway extension is necessary.

The action alternative (extending Runway 4R-22L to 5,700 feet) accommodates a wide range of aircraft while enhancing the level of operational safety at the Airport. It is believed that this alternative will garner greater acceptance from Airport users, ADOT and the FAA because the runway will be able to accommodate the greatest number of

Airport users possible with an enhanced level of safety. The extension and associated RSA and ROFA dimensions fall within the Airport property, limiting the impact of the proposed extension to the immediate Airport environs.

The FAA does not necessarily require the fee simple acquisition of the RPZ area, but highly recommends that the airport have positive control over development within the RPZ. It is preferred that the Airport own the property through fee simple acquisition, however, avigational easements (providing positive control with the RPZ) can be pursued if fee simple purchase is not possible. It should be noted that avigation easements can often cost as much as 80 percent of the land value and may not fully prohibit incompatible land uses from the RPZ. Because the City has defined that the runway length extension perimeters remain within the Airport boundary, there will be no impacts to surrounding roadways or property acquisitions as a result of actual runway pavement additions. The only properties that may be required are those that fall within the RPZ, in which case fee simple or avigation easements may be necessary.

Aircraft sound emissions are often the most noticeable environmental effect an airport will produce on the surrounding community. If the sound is sufficiently loud or frequent in occurrence it may interfere with various activities or otherwise be considered objectionable. To determine the noise related impacts the runway extension could have on the environment surrounding Chandler Municipal Airport, noise exposure patterns were analyzed for projected operational levels over the long range period. Noise contours developed by the Integrated Noise Model (INM) Version 6.2 and accepted by the FAA and the Environmental Protection Agency (EPA) were developed for the runway extension alternative and compared with current noise contours. Discussions with the Airport and Air Traffic Control Tower (ATCT) staff were conducted in developing aircraft fleet mix using the flight tracking information, runway utilization and hours of aircraft operation. Also, the forecasts of future aviation activity developed earlier in this report were used as an input in the noise model.

Noise contours for Chandler Municipal Airport were developed based on operational activity in the existing year (2005) and the forecast year (2025) with the assumption that Runway 4R-22L is extended to 5,700 feet.

The INM works by defining a network of grid points at ground level around the site. It then selects the shortest distance from each grid point to each flight track and computes the noise exposure generated by each aircraft operation by aircraft type and engine thrust level, and by time of day/night along each flight track. Corrections are applied for atmospheric acoustical attenuation, acoustical shielding of the aircraft engines by the aircraft itself, and aircraft speed variations. The noise exposure levels for each aircraft are then summed at each grid location to provide a day-night level (DNL), which is the 24-hour average sound level expressed in decibels, including an additional 10-decibel penalty for night-time operations (those occurring between the hours of 10 p.m. and 7 a.m.). The cumulative noise exposure levels at all grid points are then used to plot noise exposure contours for selected values (e.g., 65, 70, and 75 DNL).

The decibel scale from zero to 120 includes most of the range of typical daily sound levels, and is shown in **Table 4.1**.

DNL noise levels are indicated by a series of modeled contour lines superimposed on a diagram of the Airport and surrounding area. These levels are calculated for designated points on the ground based on the noise impacts of all aircraft operations. Some operations are far enough away from a location that their effect is minimal, while other operations may dominate noise exposure levels at that location. For example, a location just east of the airport may be affected by an aircraft departure to the east but unaffected by an arrival from the west.

Table 4.1
COMMON SOUND LEVELS

Decibels	Common Aircraft Sound Level	Common Daily Sound Level
110	B-747 takeoff at 2 miles	Rock Band
100	DC-10 takeoff at 2 miles	Gas Lawn Mower at 3 feet
90	B-727 takeoff at 2 miles	Garbage Disposal at 3 feet
80	Learjet 25 takeoff at 2 miles	Shouting at 3 feet
70		Normal Speech at 3 feet
60		Large business office
50	Piper Twin Comanche takeoff at 2 miles	Dishwasher in next room

SOURCE: Federal Aviation Administration
PREPARED: October 2006

The following is a summary of the 2005 and 2025 operational data used in the noise modeling analysis.

Aircraft Operations – The annual operations for 2005 were 235,111, approximately 644 operations per day, and the annual operations for the forecast year are estimated to be 400,600, approximately 1,098 operations per day.

Runway Utilization – The runway utilization at Chandler Municipal Airport is influenced primarily by prevailing wind conditions and secondarily by aircraft departure or arrival into the terminal airspace. Airport management and air traffic controllers provided estimates of runway utilization, as shown in **Table 4.2**. These utilizations rates are not expected to change throughout the forecast period. Chandler Municipal Airport also operates a single helipad located to the east of the runways. The location of this facility is also considered in this analysis.

Table 4.2
RUNWAY UTILIZATIONS

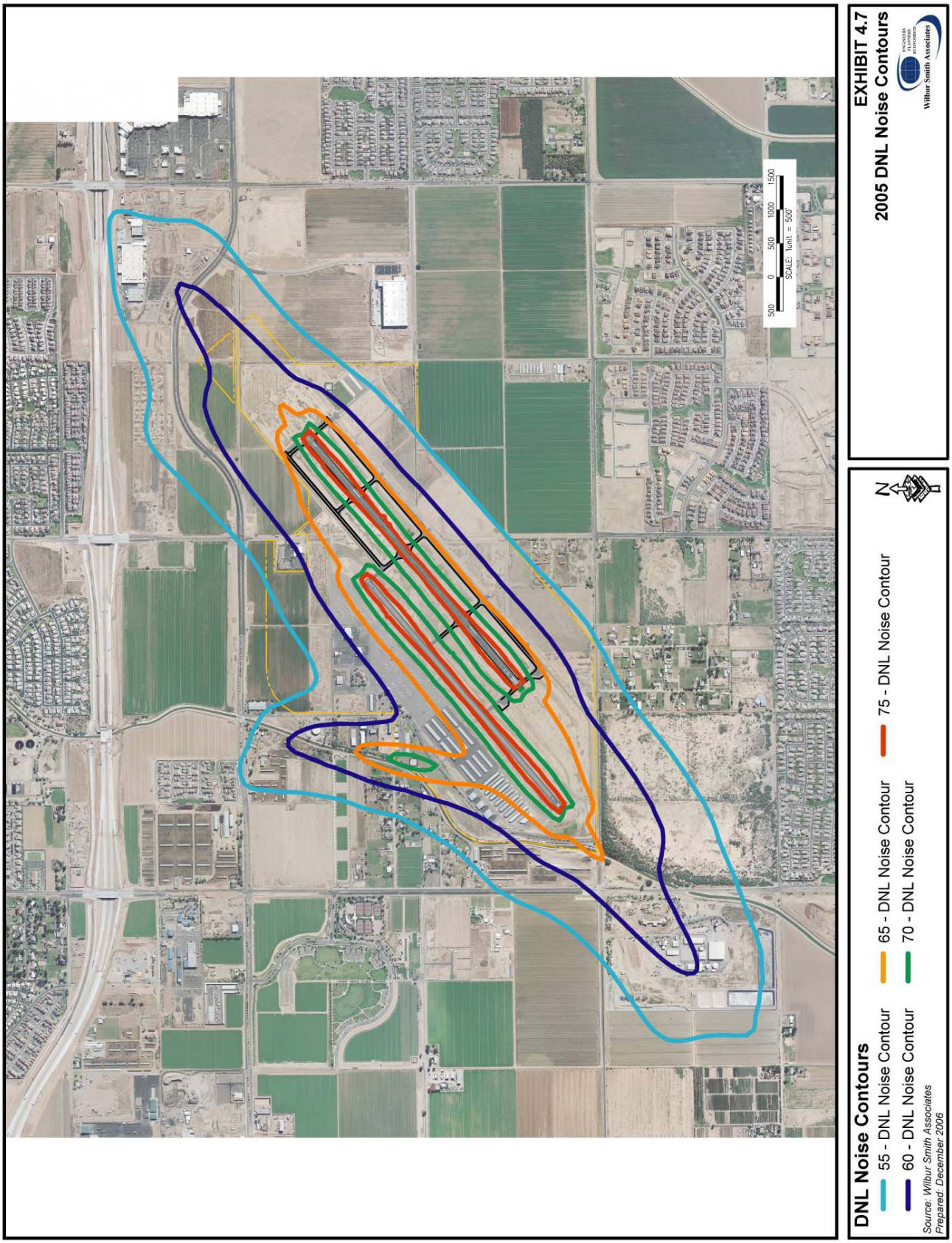
Runway End	Day	Night
Runway 4L	24.6%	0.4%
Runway 4R	24.6%	0.4%
Runway 22L	24.6%	0.4%
Runway 22R	24.6%	0.4%

SOURCE: Chandler Municipal Airport officials
PREPARED: October 2006

Approach and Departure Profiles – Approach and departure profiles illustrate an aircraft's altitude along its flight path. INM's vast database includes information regarding standard approach and departure profiles for the aircraft in this analysis.

Flight Tracks – Flight tracks project an aircraft's flight path as if shown on the surface. Due to meteorological conditions, aircraft type, stage length, air traffic control instructions, and pilot judgment, flight tracks are unique to each operation. Generalized flight tracks were developed for Chandler Municipal Airport based on operations and fleet mix data, as well as discussions with airport management and air traffic controllers. These flight tracks took into account local traffic patterns, instrument approach procedures, and noise abatement procedures used by both fixed-wing and helicopter aircraft.

Noise Exposure Impacts – FAA Order 5050.4B requires that the 65, 70, and 75 DNL noise contours be developed for existing and future airport conditions. According to FAA criteria noise levels greater than 65 DNL are generally considered unacceptable for noise-sensitive land uses, such as residences, hospitals, and schools. However the City of Chandler has opted to use the 55 DNL noise contour as the limiting point were noise sensitive land uses are considered to be unacceptable. The existing and forecast year 55, 60, 65, 70, and 75 DNL noise contours modeled for this analysis are displayed on **Exhibit 4.7 and 4.8**, respectively, on the following pages.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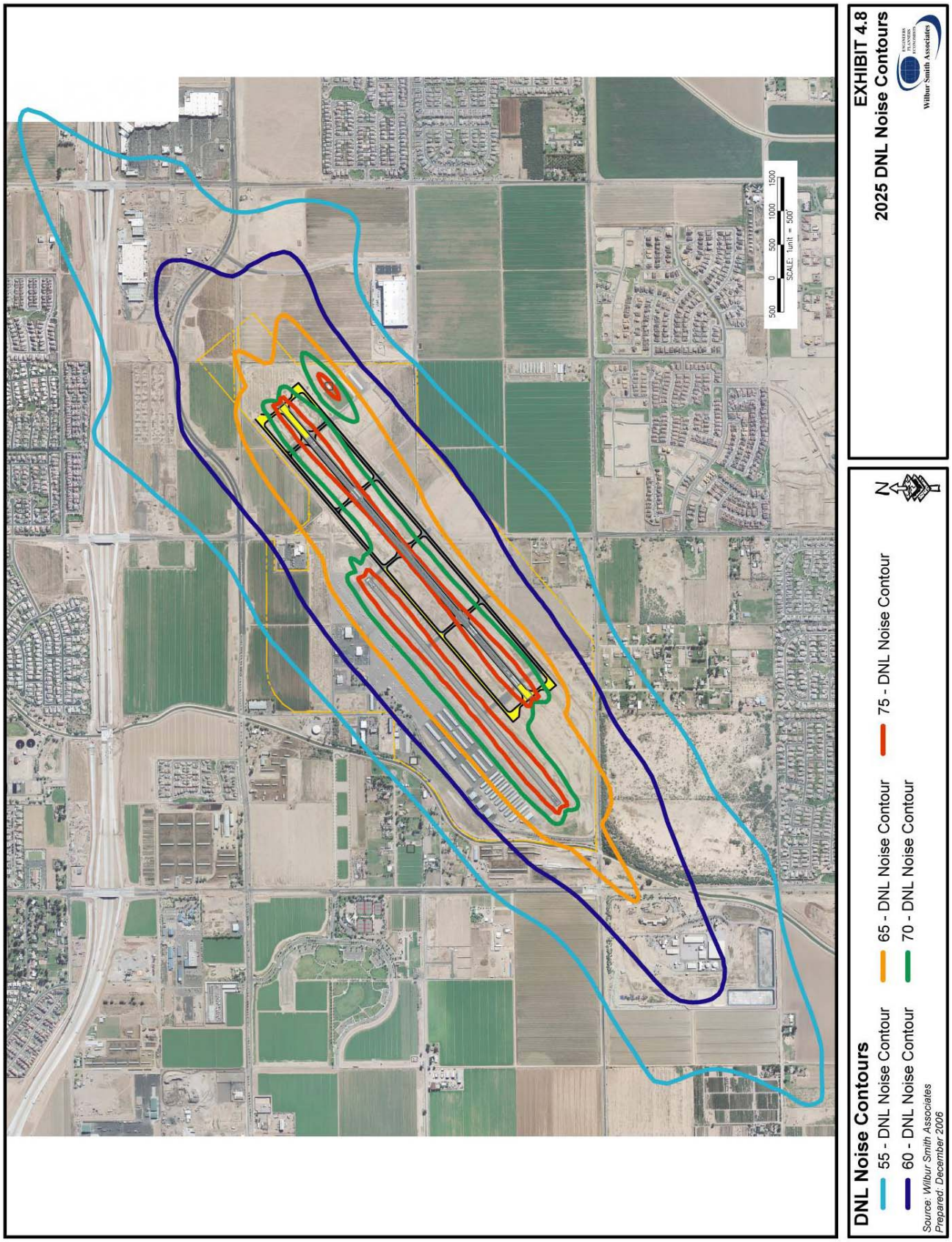
DNL Noise Contours
55 - DNL Noise Contour
60 - DNL Noise Contour
65 - DNL Noise Contour
70 - DNL Noise Contour
75 - DNL Noise Contour
N
Source: Wilbur Smith Associates
Prepared: December 2006
EXHIBIT 4.7
2005 DNL Noise Contours
Wilbur Smith Associates


500 0 500 1000 1500
SCALE: 1unit = 500
DNL Noise Contours
55 - DNL Noise Contour
60 - DNL Noise Contour
65 - DNL Noise Contour
70 - DNL Noise Contour
75 - DNL Noise Contour
N
Source: Wilbur Smith Associates
Prepared: December 2006
EXHIBIT 4.8
2025 DNL Noise Contours
Wilbur Smith Associates

Throughout the forecast period, the 75 DNL area encompasses approximately 57 acres; the 70 DNL area covers approximately 165 acres; and, the 65 DNL covers approximately 349 acres. Relocating the helipad from the western edge of the airport helps to keep more of the noise contours within the airport property line, but a small amount of noise does fall outside the boundary. Based on this analysis the proposed extension of Runway 4R-22L will not result in significant noise impacts to the surrounding community.

Considering the review of evaluation criteria highlighted above, it is recommended that the Airport proceed with extending Runway 4R-22L to 5,700 feet. While this ultimate runway length is short of the FAA-identified runway length requirement in the facility requirements section, this alternative provides the greatest runway length within the Airport property boundary and the physical limitations of development around the Airport. This alternative maintains safe aircraft operational areas, accommodates the greatest number of corporate class aircraft expected to use the Airport and has minimal impact to the surrounding community.

Taxiways

There were two alternatives presented earlier that address taxiway circulation around the Airport. The first alternative called for an extension of Taxiway B to the southwest to the approach end of Runway 4L, extension of Taxiway B to the northeast to the ultimate end of Runway 22L and the extension of Taxiway C to the new extended ends of Runway 4R-22L. The second alternative called for an extension of Taxiway B only to the proposed ends of Runway 4R-22L and an extension to Taxiway C to the new extended ends of Runway 4R-22L.

The only evaluation criteria where these two alternatives differ is in the efficiency of aircraft movement and cost associated with each alternative. Both alternatives recognize the value and importance of extending Taxiway B to the ends of runways 4R and 22L. With hangar development proposed on the southeast side of the Airport, a growing number of aircraft will utilize Taxiway C within the forecast period. The southeast side of the Airport will accommodate over 300 various hangar types, an FBO and potential “through-the-fence” operation such as an aviation industrial park. With this type of potential development, aircraft on the southeast side of the Airport will benefit from direct access to the ends of Runway 4R-22L through the extension of Taxiway C. The cost associated with extending Taxiway C is worth the benefit a significant number of aircraft will receive from the efficient, safe and standardized taxiway configuration this alternative provides. Additionally, the full extension of taxiway B will provide two-way taxiway circulation to both runways. Therefore, the first alternative of extending both Taxiway B and C to the ends of each runway is recommended.

NAVAIDs

In the previous section two alternatives for implementation of a precision approach were discussed. One included the installation of a MALSR which would allow for a precision approach with minima as low as ½ mile and 200 feet. The other alternative discussed was the installation of a precision approach without an approach lighting system.

The advantages of installing a MALSR include the ability to provide an instrument approach with lower minima while providing an additional level of safety by making the Airport and runway threshold easier for pilots to identify during night time operations in all weather conditions. Disadvantages include the need to acquire additional property to accommodate the last 1,000 feet of the approach light system and potential issues with light emissions disturbing the surrounding community.

The alternative of not installing an approach light system would maintain the Airport's approach minima at 1 mile and 400 feet. The advantages of this option include elimination of the need to acquire additional property for the approach light system and reduced light emissions on the surrounding community. Disadvantages include higher approach minima and potentially a lower margin of safety due to the runway environment being more difficult to identify during night operations.

Because of the relative lack of instrument meteorological conditions (IMC) in the Phoenix area, the primary benefits of a precision approach at Chandler Municipal Airport would be the enhancement of instrument training opportunities at Chandler Municipal Airport and the ability to help to eliminate approach and traffic pattern conflicts with Memorial Airfield and Stellar Airpark. Currently, the majority of precision approach training occurs at Williams Gateway Airport or at Casa Grande Airport. Providing a precision approach would offer additional instrument training opportunities at Chandler Municipal Airport. Because the precision approach would primarily be used for training purposes, the cost of installing an approach lighting system is greater than the benefit of slightly lower approach minima the system would provide.

Based on the most recent draft of new Part 77 guidance, the precision approach with the expected aircraft types at Chandler Municipal Airport would call for a 34:1 approach slope, not a 50:1 as previously required. Using existing survey and obstruction data as a guide, the 34:1 approach slope would not be obstructed. Additional development planned to take place off the end of Runway 4R should undergo an obstruction evaluation prior to design or construction to avoid the approach surface.

Apron Expansion

There is one apron expansion alternative for the north side of the Airport and two for the southeast side of the Airport. The northern expansion alternative can be implemented with either southeastern alternative which can be compared to each other in order to provide an overall apron expansion recommendation.

On the north side of the Airport, the proposed apron expansion alternative avoids the relocation of existing facilities. The resulting apron configuration encircles the FBO, terminal building and other facilities located on the north side of the airfield. The apron would be developed to accommodate additional corporate hangars and a second FBO in the area. This alternative provides an area of apron space with room for additional tie-downs and improves the layout and efficiency of the northern Airport area. Based on the factors stated above, it is recommended that the Airport develop the expanded apron area in the north side of the Airport to accommodate growth of based aircraft and expanded Airport services.

The southeast side of the Airport has two development alternatives that can be evaluated. The only difference between these two alternatives is that the first provides enough undeveloped area to allow construction of a taxilane to access off-airport properties in the event the Airport wishes to pursue and allow "through-the-fence" opportunities. The second alternative proposes to develop t-hangars along the entire south side of the airport boundary, which could limit access to private land adjacent to the Airport. Considering that the Airport has ample opportunities for hangar development throughout the southeast side of the property and the possible benefits that the "through-the-fence" may bring, it is recommended that the first alternative for apron expansion on the southeast side of the Airport be pursued. Additionally, a large apron stretching along the southeast side of the Airport between Taxiway C and the proposed hangars (see next section – Additional Hangars) is recommended to provide adequate access to all landside facilities proposed on the southeast side of the Airport.

Additional Hangars

Although there are a considerable number of additional hangar facilities recommended as part of this Master Plan, there are no alternatives related to proposed hangar development at Chandler Municipal Airport. Instead, hangar developers who lease land from the Airport will develop hangars based on market conditions and the needs of Airport users. This Master Plan illustrates recommended hangar development to make the most use out of existing facilities and take advantage of available Airport land while considering the increase of based aircraft types identified in the forecast chapter of this report. Similar hangar facility types are developed in clusters in order to maximize land development opportunities and co-locate categories of airport users with one another.

As shown on the apron expansion alternative Exhibits 4.5 and 4.6, t-hangars and shade hangars are proposed along the southeast side of the Airport along with smaller conventional hangars. Since there is such a strong demand for these types of facilities, this section of the Airport, with its large amount of available land with convenient access to the airfield, is ideal for a large-scale small hangar complex. Consistent with the existing Airport layout, larger conventional hangars and corporate facilities are proposed for the north side of the Airport.

SUMMARY

The recommended landside development alternatives are presented in **Exhibit 4.9** and recommended airside development alternatives are presented in **Exhibit 4.10.** The process utilized in assessing the airside and landside development alternatives involved a detailed analysis of short and long term requirements as well as future growth potential. Current and future airport and aircraft design standards were considered at every stage of development. Safety both in the air and on the ground was given a high priority in the development and analysis of alternatives. Important considerations of local political influences and surrounding community interests were also applied to the development and analysis of alternatives.

After review and input from the Planning Advisory Committee, City officials, public and other Airport stakeholders, an Airport development plan concept will be developed. The resultant plan will represent airside and landside facilities that fulfill safety design standards while addressing future demands to the greatest extent possible. The development plan for Chandler Municipal Airport must represent a means by which the Airport can evolve in a balanced manner with the rest of the community and accommodate the forecasted demand. In addition, the plan must provide for flexibility to meet activity growth beyond the long range planning horizon.

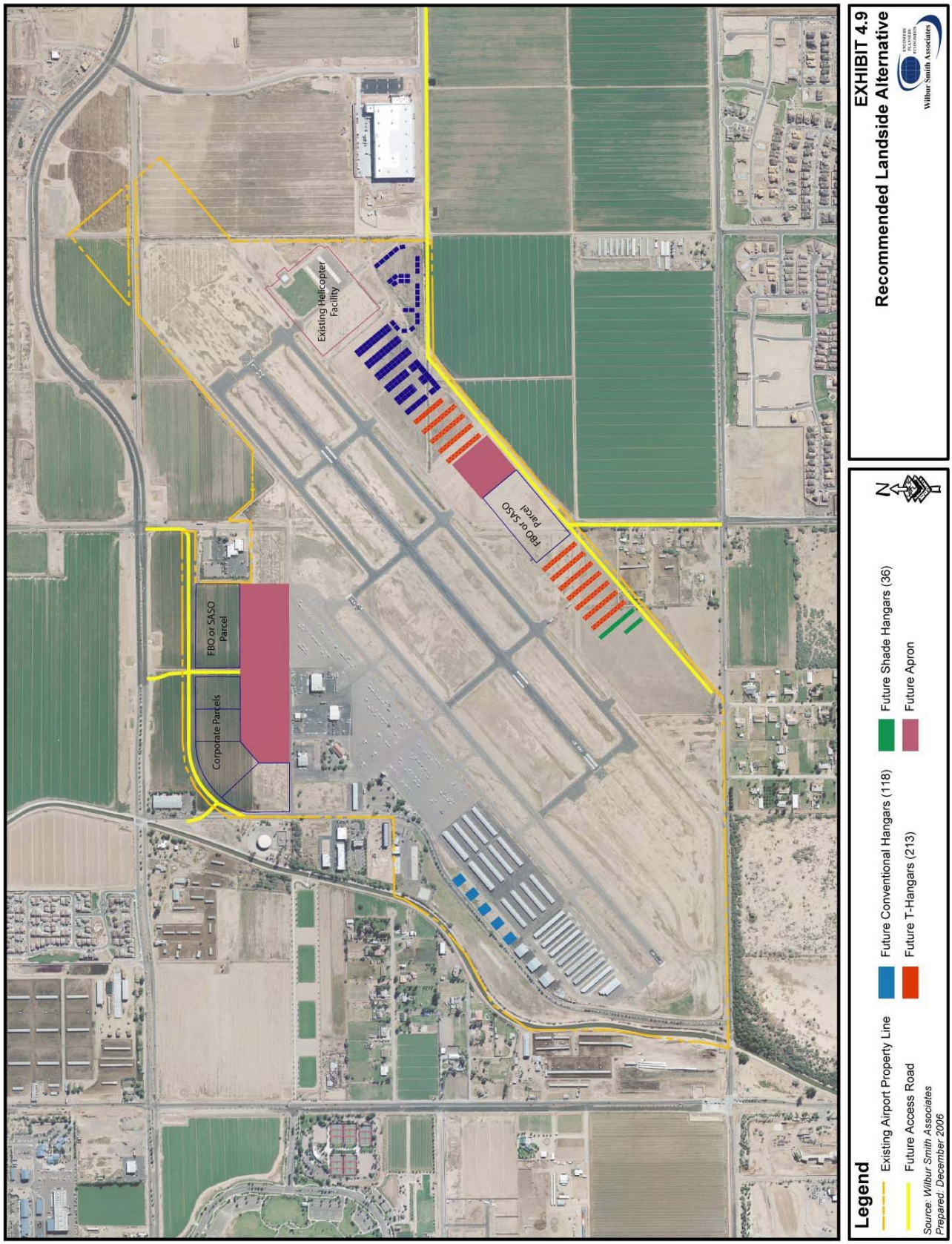
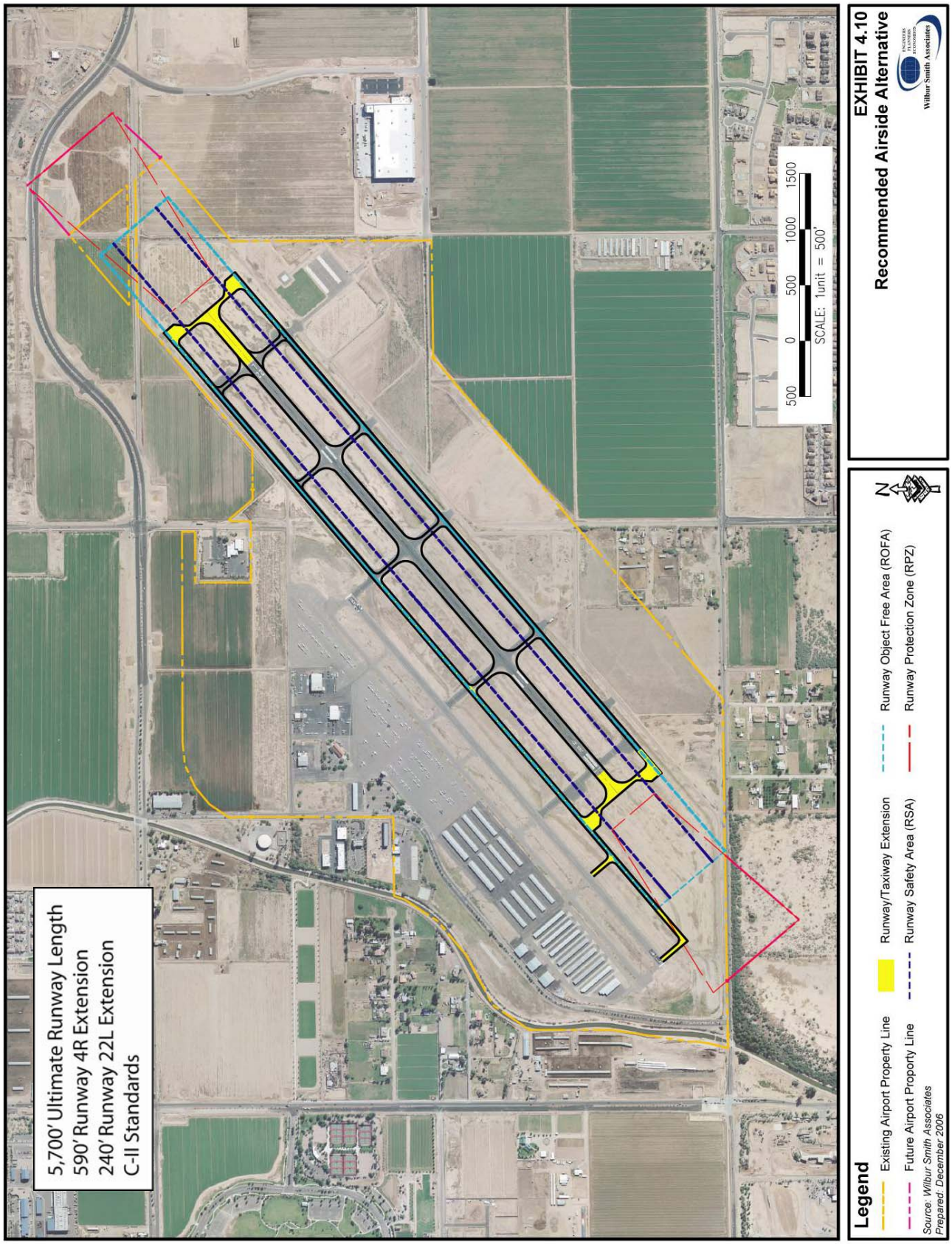


EXHIBIT 4.9
Recommended Landside Alternative

Wilbur Smith Associates


5,700' Ultimate Runway Length
590' Runway 4R Extension
240' Runway 22L Extension
C-II Standards
500 0 500 1000 1500
SCALE: 1unit = 500'
EXHIBIT 4.10
Recommended Airside Alternative
Wilbur Smith Associates
Legend
Existing Airport Property Line
Future Airport Proporty Line
Runway/Taxiway Extension
Runway Safety Area (RSA)
Runway Object Free Area (ROFA)
Runway Protection Zone (RPZ)
N
Source: Wilbur Smith Associates
Prepared: December 2006