Chapter 5
Alternatives Analysis

Alternatives presented in this chapter offer feasible development options to address infrastructure needs that were identified through the review of existing facilities and their ability to meet projections of future aviation demand. Each alternative presented in this chapter takes into consideration the long-term needs of the Asheville Regional Airport (Airport) while also addressing development actions necessary to meet immediate and short-term demands. The goal of this analysis was to focus on the advantages and disadvantages of each development option considering economic, operational, and environmental factors in an effort to identify a preferred alternative for each facility need.

Each alternative was quantitatively or qualitatively ranked based on its evaluation with the other proposed development options to satisfy each facility need. Tangible and intangible implementation factors as well as the ability of each alternative to meet the long-term goals and objectives of the Airport were also considered as a part of this evaluation. The alternative that most effectively addressed the needed infrastructure improvement considering these factors was selected as the preferred alternative. It should be noted that some preferred alternatives were based on a single, logical development option, and as a result, a comprehensive analysis that involved comparing several development options was not conducted. Since alternatives presented in this chapter are conceptual in nature they are subject to further refinement through financial, environmental, and engineering means.

The analysis of development options and selection of the preferred alternative for each facility requirement is presented in this chapter by the following sections:

5.1 Methodology and Evaluation Criteria
5.2 Runway 16/34
5.3 Taxiway System
5.4 Airport Traffic Control Tower (ATCT)
5.5 Automated Surface Observation System (ASOS)
5.6 Terminal Area
5.7 Terminal Curb Front
5.8 General Aviation Development
5.9 Vehicle Parking

5.10 Landside Access
5.11 Land Use
5.12 Summary of Recommended Alternatives

5.1 Methodology and Evaluation Criteria

In order to analyze the alternatives for each facility need, a set of evaluation criteria was established to review the advantages and disadvantages of the proposed development options. Merits and deficiencies were then compared and ranked with other alternatives based on quantitative or qualitative factors. This methodology centered on the following factors that were used to evaluate alternatives presented in this chapter:

- **Operational Factors –** Alternatives were evaluated for their ability to accommodate projected demand throughout the planning period that included aircraft operations, enplanements, vehicle traffic, based aircraft, air cargo activity, fuel sales, and the demand for hangar/apron space. This evaluation criterion focused on the advantages and disadvantages to address such operational factors as aircraft delay, airfield circulation, and convenience to Airport users.

- **Economic Factors –** Qualitative economic factors such as construction and life cycle costs were considered in comparing the cost effectiveness of the available development options. It should be noted that this economic evaluation did not focus only on the cost to design and construct each alternative but also operational and maintenance expenses associated with day-to-day operation.

- **Environmental Factors –** Though a more in-depth overview of the environmental factors that could impact development around the Airport are presented in Chapter 6, this element focused on those environmental conditions that would be directly impacted by the proposed development such as noise, air quality, water quality, scenic oversight, land use impacts, and socioeconomic impacts. A comparison of the number and types of environmental categories impacted by the available development options was factored in the selection of the recommended alternative.

- **Implementation Feasibility –** Often there are several factors both tangible and intangible that affect the ability to implement an infrastructure improvement project at an airport. Consideration of this factor focused on a qualitative analysis of an alternative to help support or negate the feasibility of implementing the proposed action. Such factors that were considered in this analysis included logic, common sense, and the probability of unknown contingencies.

Each section of this chapter addresses a need that was identified through the analysis of facility requirements and is organized so that the evaluation of all development options follows a structure that is based on the previously described evaluation criteria. A summary table presented at the end for each alternative discussion reviews advantages and disadvantages for comparison with the other proposed

development options. The preferred alternative along with justification supporting why it is the recommended course of action for the Airport to follow over the ensuing 20-year planning period is presented at the end of each section.

5.2 Runway 16/34

As noted in Chapter 4, Runway 16/34 is in need of several improvements to meet Federal Aviation Administration (FAA) design standards outlined in Advisory Circular (AC) 150/5300-13, *Airport Design*. Since it is projected Airplane Design Group (ADG) III and IV aircraft are anticipated to increase in operation at the Airport over the 20-year planning period, several improvements are needed to Runway 16/34 that include:

- Improving the longitudinal grade of the runway to meet allowable variance standards.
- Increasing the separation between Runway 16/34 and parallel Taxiway A by 75 feet to meet the 400-foot distance separation requirement between centerlines.
- Removing or relocating non-compliant objects within the Runway Safety Area (RSA) and Runway Object Free Area (ROFA) such as perimeter fencing, trees, drainage ditching, perimeter service road, Runway 34 localizer antenna array, Runway 16 localizer antenna array, and the Runway 16 localizer equipment building.
- Constructing paved shoulders to meet airfield design standards for ADG III and IV aircraft.

In addition, a major rehabilitation or reconstruction of Runway 16/34 is needed to improve the condition and Pavement Condition Index (PCI) value of the surface since it does not meet preferred industry standards and is anticipated to deteriorate to an unsatisfactory condition within five years. Other improvements needed include:

- Increasing the runway length if non-stop service is desired to markets west of the Rocky Mountains.
- Installing in-pavement edge lighting at runway/taxiway intersection locations that are longitudinally located 200 feet from adjacent edge lights.

Based upon these needs identified through the review of facility requirements, five alternatives were developed that offer feasible solutions to improve Runway 16/34 and correct the items that do not meet current FAA design standards as listed above. The following describes each proposed development action as well as evaluates advantages and disadvantages based on operational, economic, environmental, and implementation factors.

5.2.a Alternative 1 – Relocate Runway 75 Feet To The West

Alternative 1, illustrated in **Figure 5-1**, proposes to shift or relocate Runway 16/34 a distance of 75 feet to the west in order to obtain a 400foot separation between the centerlines of the runway and parallel Taxiway A to meet FAA runway design requirements for ADG III and IV aircraft. As a part of this project,

the connector taxiways between the runway and Taxiway A would also be extended 75 feet while an acquisition of 4.47 acres would be needed to control land uses within the relocated Runway Protection Zones (RPZs) at each end of the runway.

- **Operational Factors –** Shifting the runway 75 feet to the west would meet separation standards between the runway and parallel taxiway centerline for ADG III and IV aircraft and provide a sufficient safety margin between aircraft operating simultaneously on Taxiway A and Runway 16/34. Since the footprint of the relocated runway would overlap the footprint of the existing runway, closure of the entire airfield would be necessary and would affect all operations at the Airport for approximately six months.

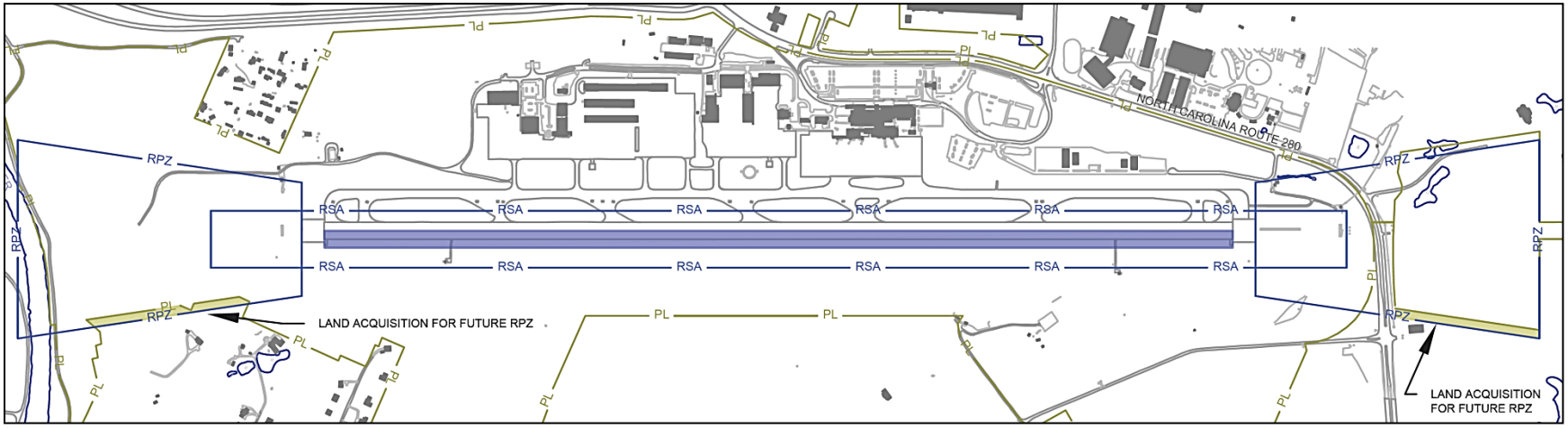
- **Economic Factors –** The cost of Alternative 1 from a construction standpoint is the less expensive option to increase separation between the runway and parallel Taxiway A; however, the indirect economic impacts during construction would be considerably significant. Most business activity at the Airport would most likely be halted during the anticipated six months of construction since the airfield would be closed. This would also significantly impact the entire Western North Carolina region which relies on the Airport for the transportation of people, goods, and services to and from the region.

- **Environmental Factors –** No significant impacts to the surrounding environment would occur with implementation of this alternative. A total of approximately 4.47 acres of currently undeveloped land would need to be acquired to control land uses within the relocated RPZs at each end of the runway. Though the runway would shift 75 feet to the west, noise contours established for the existing runway would remain relatively unchanged and within the existing footprint of the Airport.

- **Implementation Factors –** Implementation of this alternative would require that the Airport remain closed throughout the entire course of the project which is not feasible given the importance of the Airport in serving the Western North Carolina region. Closure of the Airport would restrict the movement of people, goods, and services which would impose unnecessary economic and quality of life hardships on businesses, institutions, and residents.

Table 5-1 summarizes the advantages and disadvantages of Alternative 1.

Figure 5-1: Alternative 1 – Relocate Runway 75 Feet to West



Source: Mead & Hunt, Inc. (2012)

Table 5-1: Alternative 1 Summary

Advantages	Disadvantages
• Minimal cost to design and construct alternative • Corrects the separation distance between the runway and parallel taxiway centerlines • No significant environmental impacts • Minimal land acquisition required within RPZs • Runway noise contours remain relatively unchanged	• Requires the Airport to be closed for an approximate 6 month period. • Significant economic impacts to Airport businesses and surrounding community during construction • Not feasible to close Airport for an approximate 6 month period for construction.

5.2.b Alternative 2 – Relocate Taxiway A 75 Feet To The East

Alternative 2 proposes to relocate parallel Taxiway A and its associated connector taxiways between the runway 75 feet to the east in order to provide sufficient separation between Runway 16/34 and Taxiway A. Grading and fill of land located east of the taxiway near each approach end of the runway would be required to accommodate the taxiway pavement and associated safety area. The relocation of several objects would also be needed with this alternative, including an airfield service road near the Landmark Aviation facility, the segmented circle and lighted wind cone near the South Apron, airfield perimeter fencing adjacent to the employee parking lot, Rental Car Drive adjacent to the rental car service facility, and Automated Surface Observing System (ASOS) weather equipment south of the employee parking lot.

- **Operational Factors –** Relocating Taxiway A 75 feet to the east would provide sufficient separation between the runway and parallel taxiway so that FAA design standards would be met for ADG III and IV aircraft. This would also provide adequate wingtip clearance should the largest type of aircraft from each ADG passes each other simultaneously while operating on Taxiway A and Runway 16/34. Implementation of Alternative 2 would not require complete closure of the airfield; however, partial closures of the taxiway during construction would require aircraft to back-taxi on the runway, reducing airfield capacity and possibly increasing flight delays and cancellations. Additionally, a temporary air carrier apron at a remote location could be necessary to support commercial airline operations during taxiway construction since the capacity of the terminal apron will be reduced.

  Since aircraft would be occupying the runway for an increased amount of time during partial closures of the existing parallel taxiway, the risk of a runway incursion is raised during the implementation of this alternative. Combined with the non-standard longitudinal grade of Runway 16/34 that prevents a clear line-of-sight from the opposite ends of the runway, additional measures such as the Airport Traffic Control Tower (ATCT) remaining operational 24 hours a day during construction may be needed to mitigate this risk. Likewise, the risk of a taxiway incursion is also increased with this alternative since the pushback of many commercial aircraft types from terminal gates would occur directly into the controlled movement area of Taxiway A.

  Other operational factors to consider is that Alternative 2 does not offer a solution to correct the non-standard longitudinal grade of Runway 16/34 or the relocation of objects not fixed by function within the runway safety area. It also does not offer an option to construct paved shoulders on Runway 16/34 as required by FAA AC 150/5300-13, *Airport Design* nor does it offer a solution to correct the deteriorating condition of the pavement on Runway 16/34. Also, this alternative requires the relocation of the segmented circle and ASOS weather unit in which potential airfield sites for these devices are limited as a result of the surrounding topography and other proposed airfield development.

- **Economic Factors –** Considerable cost for the implementation of this alternative would be for the fill material needed to grade the topography of the land along the east side of the taxiway near the approach ends of the runway. In addition, another economic factor to consider is that

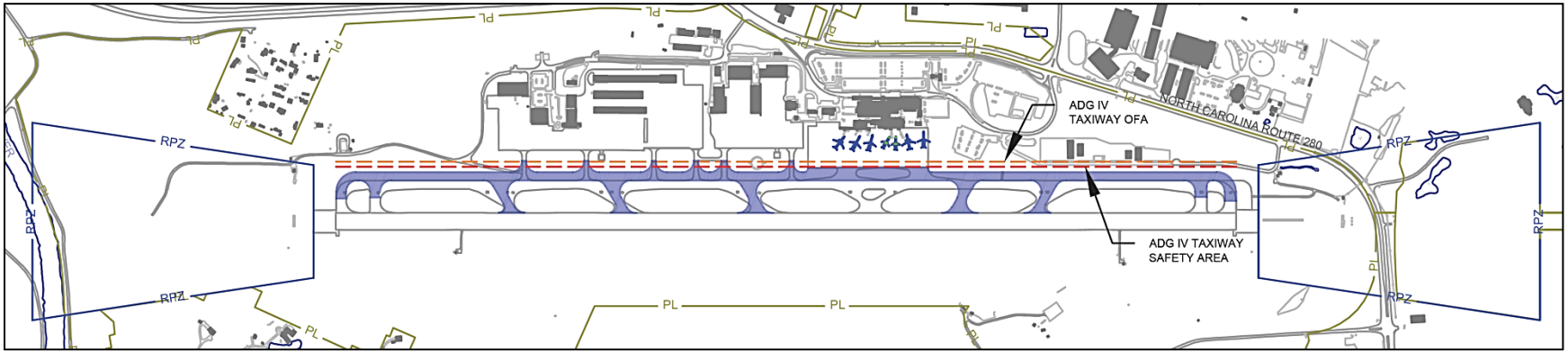
relocation of the taxiway would reduce available development area on the east side of the airfield which would impact revenue producing opportunities for the Airport.

- **Environmental Factors –** No land acquisition would be needed to implement Alternative 2 and no long-term significant environmental impacts are anticipated, though short-term environmental impacts may include reduce air quality as a result of construction equipment. Best industry practices and approval from federal, state, and local authorities would be needed to help prevent and mitigate the impacts of erosion and storm water drainage.

- **Implementation Factors –** Relocating the taxiway 75 feet to the east would place the taxiway safety area within a 10 foot lateral distance from Rental Car Drive; however, this 10 foot lateral distance is separated by approximately 30 feet of elevation change as a result of the difference between the grade of the taxiway and the grade of the roadway. As a result, a retaining wall would be necessary that would force the relocation of Rental Car Drive. Limited options are available to realign the roadway without changing the layout of the rental car service facility. Considering the time, labor, expenses, and level of mobilization needed to transport offsite fill material, construct a retaining wall, and revise the recently constructed rental car service facility, the cost-effective goal of this alternative may not be feasible.

Alternative 2 is illustrated in **Figure 5-2** while a summary of advantages and disadvantages is presented in **Table 5-2**.

Figure 5-2: Alternative 2 – Relocate Taxiway A 75 Feet To The East



Source: Mead & Hunt, Inc. (2012)

Table 5-2: Alternative 2 Summary

Advantages	Disadvantages
• Corrects runway to taxiway separation deficiency • Does not require runway closure • No land acquisition needed • No significant environmental impacts	• Back-taxiing on runway required during construction, leading to reduced capacity and increased chance of a runway incursion • Commercial apron taxilane is eliminated requiring many pushbacks of commercial aircraft from terminal gates to occur directly into the controlled movement area of Taxiway A. • Significant grading and fill material required for Taxiway A relocation • Edge of relocated taxiway safety area approximately 10 feet laterally from Rental Car Drive and 30 feet vertically between grades of the safety area and roadway. A required retaining wall would force the relocation of Rental Car Drive, impacting the layout of the rental car service facility • Does not correct the longitudinal grade of the runway, the need for paved runway shoulders, relocation of non-compliant objects within the runway safety area and object free area, or correct the deterioration of existing runway pavement

5.2.c Alternative 3 – Relocate Runway 250 Feet To The West

Alternative 3 proposes a 250-foot shift of Runway 16/34 to the west from its present location to meet FAA design runway/parallel taxiway separation requirements. The 250-foot relocation of the runway as proposed in this alternative is based on the maximum distance the runway can be shifted and still provide clear approaches considering the surrounding topography of the land. In addition to the relocation of the runway, this alternative also proposes a 250-foot extension of the connector taxiways between the runway and parallel Taxiway A. Approximately 15 acres of land acquisition would also be needed to control land uses within the relocated RPZs in addition to approximately 27.3 acres of additional land that may need acquisition or easements for possible obstruction clearing within the transitional surface.

- **Operational Factors –** While Alternative 3 offers a solution to correct the non-standard separation between Runway 16/34 and parallel Taxiway A, it would require a substantial closure of the Airport during periods when construction would occur within the safety area of the existing runway since the safety areas of both the relocated runway and existing runway overlap. Closure of the airfield would significantly impact most aeronautical and non-aeronautical activities at the Airport in addition to the air transportation demands of the Western North Carolina region. It should also be noted that while this alternative offers the opportunity for the relocation of parallel Taxiway A to the west, opening up additional areas for development on the east side of the airfield, it would diminish opportunities for aeronautical-related development within the northwest and southwest general aviation development areas.

- **Economic Factors –** From a qualitative perspective, the cost to implement this alternative is not significantly greater than compared to Alternative 1; however, consideration should be given to the cost associated with the land acquisition necessary to control land uses within the relocated RPZs. Additional cost is also anticipated based on the additional land acquisition or easements that may be necessary for obstruction clearing within land west of the relocated runway. The direct and indirect economic impact of this alternative is quite significant since the Airport, tenants, and other businesses that rely on aeronautical activity would be greatly affected during the periods the Airport is closed for construction. Likewise, the economic well-being of the surrounding region would also be impacted since the transport of people, goods, and services necessary for business activity would be constrained during periods the Airport is closed.

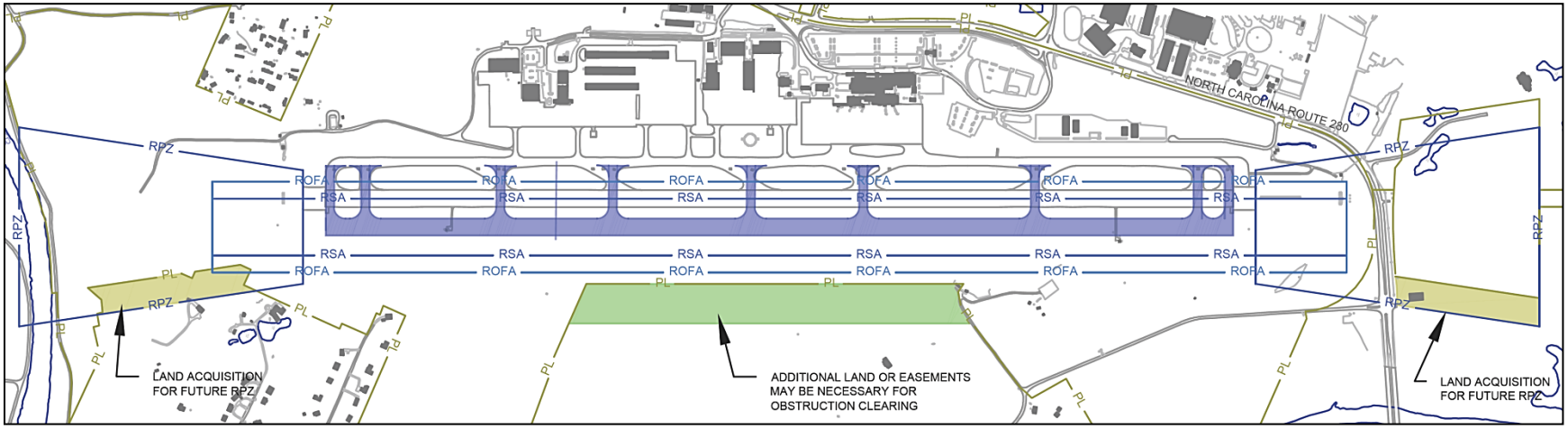
- **Environmental Factors –** Though implementation of this alternative would occur mostly within the existing footprint of Airport property, over 42 acres of land acquisition and easements may be needed to control land uses and obstructions within airfield design surfaces such as RPZs and the runway transitional surface. In addition, as a result of the surrounding topography, significant grading and filling is anticipated in order to meet design standards for the longitudinal grade of the relocated runway and associated safety area. Industry best practices that meet federal, state, and local requirements would also be necessary during construction to prevent erosion and reduce or prevent impacts to air and water quality.

- **Implementation Factors –** Substantial closure of the Airport needed to implement this alternative is a major factor to consider when evaluating its feasibility. Similar to the evaluation

of implementation factors for Alternative 1, closure of the Airport would impact the transport of people, goods, and services throughout the Western North Carolina region and impose unnecessary economic and quality of life hardships. In addition, the phasing of construction that would be required to minimize the time needed to close the existing runway as a result of overlapping runway safety areas would complicate the construction process and may increase the probability of a safety area violation such as an incursion or non-standard condition.

Figure 5-3 illustrates the proposed 250 foot relocation of Runway 16/34 to the west while **Table 5-3** summarizes its advantages and disadvantages.

Figure 5-3: Alternative 3 – Relocate Runway 250 Feet To The West



Source: Mead & Hunt, Inc. (2012)

Table 5-3: Alternative 3 Summary

Advantages	Disadvantages
• Corrects runway/parallel taxiway separation deficiency • Allow for relocation of Taxiway A to the west, which opens up some additional development areas on the east side of the airfield	• Substantial closure of the Airport required during periods the runway is being construction within the existing runway safety area • Diminished areas for aeronautical development on the west side of the airfield • Potential airspace impacts within the relocated transitional surface on the west side of the airfield as a result of surrounding topography • Significant economic and quality of life impacts to the surrounding community as a result of runway closure

5.2.d Alternative 4 – West Side Parallel Taxiway/Relocate Runway 75 Feet To The West

Alternative 4 proposes the construction of a west side parallel taxiway to be used as a temporary runway while Runway 16/34 is relocated 75 feet to the west. Upon completion of the relocated runway, the temporary runway would revert into a west side parallel taxiway that would be used to support planned aeronautical development on the west side of the airfield. Approximately 38.9 acres of land within temporary and permanent relocated airfield design surfaces would need to be controlled through acquisition or easements to prevent incompatible land uses and obstructions. In addition, connector taxiways on the east side of the runway would also need to be extended 75 feet while new connector taxiways between the runway and the west side parallel taxiway would need to be connected.

- **Operational Factors –** Alternative 4 offers a solution to correct the separation between Runway 16/34 and parallel Taxiway A while permitting Airport operations to continue uninterrupted during construction. Additionally, it also offers a solution to correct the non-standard longitudinal grade with the existing runway as well as provides an opportunity to construct paved shoulders and relocate non-compliant objects outside of the runway safety area. Conversion of the temporary runway into a parallel taxiway after construction is complete would help support the development of general aviation facilities on the west side of the airfield since infrastructure would already be in place to provide access to these areas from the runway. Though Alternative 4 offers many advantages, one challenge would be establishing a precision instrument approach to the temporary runway while the existing runway is closed. There is the potential for significant project delays as a result of the time needed to relocate or install new glide slope and localizer equipment and develop and publish new flight procedures for the temporary runway. Prior coordination with the FAA to expedite this process will be essential to minimize the time necessary to implement this process.

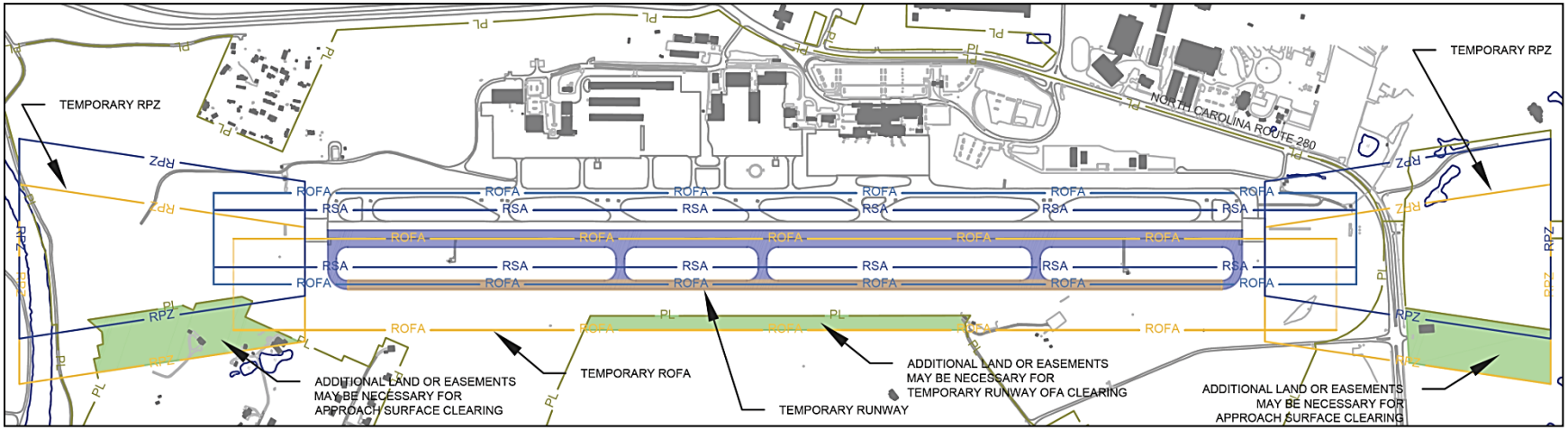
- **Economic Factors –** Qualitatively speaking, Alternative 4 offers a relatively economical solution to correct the non-standard separation between Runway 16/34 and the parallel taxiway. As a result of an ongoing fill project, there would be minimal cost associated with filling and grading the land within the area of the temporary runway/future parallel taxiway and its associated safety area. Likewise, Alternative 4 offers minimal adverse economic impacts to the surrounding region since aircraft operations would continue with little interruption during construction. This would allow businesses and other drivers of economic activity that rely on aviation for the transport of people, goods, and services to be minimally affected during construction.

- **Environmental Factors –** While most of the proposed site for the relocated runway is within the existing footprint of Airport property, approximately 38.9 acres of land acquisition would be needed to control land uses and objects of height within the temporary and permanently relocated airfield design surfaces such as RPZ, ROFAs, and transitional surface. No significant environmental impacts are anticipated with implementation of this alternative if all construction activities are performed in accordance with industry best practices and all applicable federal, state, and local environmental regulations.

- **Implementation Factors –** Alternative 4 offers many advantageous implementation factors to consider when evaluation options to correct the non-standard separation between Runway 16/34 and parallel Taxiway A. Most notably, implementation of this alternative does not require a partial or complete closure of the Airport which would allow aeronautical activities to continue with little interruption during construction. This advantage is a considerable factor to be cognizant of when comparing the runway alternatives since Alternatives 1, 2, and 3 require a partial or complete closure of the Airport. Since the Airport would remain operational, it could continue supporting the air transportation demands of the surrounding region. The long-term air transportation demands of the region will also benefit from an improved runway that would be well-suited to meet the projected level and type of aeronautical activity projected for the 20-year planning period. It should also be noted that implementation of this alternative will not significantly impact future infrastructure improvement opportunities at the Airport since adequate land would still be available to the east and west of the runway for aeronautical and non-aeronautical development opportunities.

Figure 5-4 illustrates the west side parallel taxiway/temporary runway concept as proposed by Alternative 4 while **Table 5-4** summarizes its advantages and disadvantages.

Figure 5-4: Alternative 4 – West Side Parallel Taxiway/Relocate Runway 75 Feet To The West



Source: Mead & Hunt, Inc. (2012)

Table 5-4: Alternative 4 Summary

Advantages

- Corrects runway/parallel taxiway separation deficiency
- Allows simultaneous operations by ADG III and IV aircraft on the runway and parallel taxiway
- Offers solution to also correct Runway 16/34's longitudinal grade, install runway shoulders, and relocate non-standard objects within safety area
- Airport does not require partial or complete closure during construction
- Temporary runway can be converted into a parallel taxiway which can help support aeronautical development on the west side of airfield
- Does not restrict other areas of the Airport for future aeronautical infrastructure development
- The economy of the surrounding region is not significantly impacted during construction since a partial or complete closure of the Airport is not necessary
- No significant environmental impacts are anticipated

Disadvantages

- Significant fill and grading cost required for construction of temporary runway/future west side parallel taxiway
- Land acquisition/easements needed for temporary and permanent relocated airfield design surfaces
- Project delays may be experienced with the establishment of precision instrument approaches to the temporary runway.

5.2.e Runway/Parallel Taxiway Separation Preferred Alternative

A qualitative review of Alternatives 1, 2, 3, and 4 found that Alternative 4 offers the most preferred solution to correct the identified deficiencies with Runway 16/34 considering operational, economic, environmental, and implementation factors. Alternative 4 proposes to relocate the runway 75 feet to the west in order to provide sufficient separation between parallel Taxiway A that meets airfield design standards outlined in FAA AC 150/5300-13, *Airport Design*. To avoid interrupting aircraft operations, Alternative 4 also proposes to also construct a temporary runway that would serve as a parallel taxiway to support future aeronautical development on the west side of the airfield once construction of the relocated runway is complete.

Since the Airport has a single runway, significant consideration was given in the selection of a preferred alternative to a development option that would not impact aircraft operations during construction. Alternative 4 offers the only solution that allows aircraft operations to continue uninterrupted during construction of the relocated runway since it proposes to utilize a temporary runway. While Alternative 2 does not require a closure of the runway, it does require aircraft to back-taxi on the runway during construction of the relocated taxiway that would reduce the throughput capacity of the runway, potentially leading to an increase in delays for arriving and departing flights. Alternative 3 requires temporary Airport closures during phases of construction occurring with the existing runway safety area while Alternative 1 requires a complete closure of the Airport for the entire duration of construction.

Implementing Alternative 4 allows the Airport to improve the deteriorating pavement of the existing runway, install paved shoulders, and relocate non-compliant objects within the runway safety area. While Alternative 2 offers a solution that is simple in concept to increase the separation between the runway and parallel taxiway, it requires a future runway rehabilitation project and safety area improvement project to correct these deficiencies.

Alternative 4 offers the only option that does not significantly impact Airport businesses, quality of life, or the economy of the surrounding region since use of the temporary runway allows aircraft operations to continue uninterrupted during construction. Considering these factors, the advantage of Alternative 4 over Alternative 2 is that Alternative 2 would restrict the type of aircraft that could operate at the Airport during construction since limited room would be available on the runway for aircraft to complete a 180 degree turn in transition to back-taxi. This would restrict aircraft types with long wheel base distances from operating at the Airport during construction which may impact flight schedules and efficient movement of people, goods, and services to and from the region. In comparison to the complete closure of the Airport required to implement Alternative 1 and the partial closures of the Airport required to implement Alternative 3, both of which would significantly impact Airport businesses, economic activity, and quality of life throughout the region, Alternative 4 offers the most feasible solution when considering these factors.

Other factors that were considered in the determination of a preferred alternative is that no significant environmental impacts are anticipated with Alternative 4 other than the fill and grading of land needed for construction and the land acquisitions/easements needed to control land uses and objects of heights within airfield design surfaces. Fill and grading of land needed to implement this alternative would occur

within the existing footprint of Airport property while land acquisition/easements needed would be for currently undeveloped land. Alternative 4 offers the fewest environmental impacts as compared to the significant fill and potential erosion and storm water damage associated with Alternative 2 and the fill and grading of previously undisturbed land associated with Alternative 3.

Alternative 4 also practices environmental sustainability with the reuse of the temporary runway as a parallel taxiway and serves as an investment for infrastructure development on the west side of the airfield. The location of the relocated runway and parallel taxiway in Alternative 4 allows the west side of the airfield to be developed for aeronautical uses that would otherwise be limited for these uses in comparison with Alternative 3. Alternative 4 also does not impact areas for future general aviation development on the east side of the airfield, the consolidated rental car service center, or the terminal area since Taxiway A can remain in its existing location unlike the concept proposed in Alternative 2.

Though project delays may be experienced as a result of the coordination needed to establish instrument approach procedures for the temporary runway, Alternative 4 offers the most feasible option to increase the separation between Runway 16/34 and parallel Taxiway A considering operational, economic, environmental, and implementation factors. The avoidance of a complete closure of the Airport during construction so that aeronautical activity can continue uninterrupted without a reduction in capacity strongly supports the justification of Alternative 4 as the preferred alternative. Therefore, it is recommended that Alternative 4 be considered to correct the deficiencies identified for Runway 16/34.

5.2.f Alternative 5 – Extend Runway 1,300 Feet To The North

Identified as a part of the facility needs analysis, the existing 8,001 foot length of Runway 16/34 was found sufficient to satisfy the runway length requirements of existing and future aircraft types serving markets east of the Rocky Mountains throughout the 20-year planning period. However, since the Airport has occasionally received inquiries regarding non-stop flights to destinations west of the Rocky Mountains, planning should be initiated for an extended runway if a future need is identified. Alternative 5 proposes a 1,300-foot extension to the north of Runway 16/34 based on the relocation of the runway as illustrated in Alternative 4. In addition to the runway extension, Alternative 5 also incorporates an extension of the existing and future west side parallel taxiway as well as the addition of a holding apron on Taxiway A at the approach end of Runway 16. The 1,300 foot extension proposed in this alternative is based on longest runway length that could be achieved without altering controlling objects to the north and south of the runway such as the French Broad River and North Carolina Route 280. A total of approximately 83.7 acres of land may be needed; acquisition of approximately 44.8 acres of land would be required in order to control land uses within the relocated RPZ at the approach end of Runway 16. An additional 38.9 acres of land may be needed to clear objects within the RPZs and ROFA for the temporary runway if it is decided to extend the runway at the same time as its relocation.

- **Operational Factors –** Increasing the length of Runway 16/34 by 1,300 feet maximizes the available takeoff and landing distance of the runway without impacting the French Broad River to the north and North Carolina Route 280 to the south. The increase in runway length would allow most existing and projected commercial service aircraft types to operate non-stop flights from the

Airport to west of the Rocky Mountains to such markets as Salt Lake City, Seattle, Portland, San Francisco, Los Angeles, and San Diego without making concessions to fuel and passenger loads.

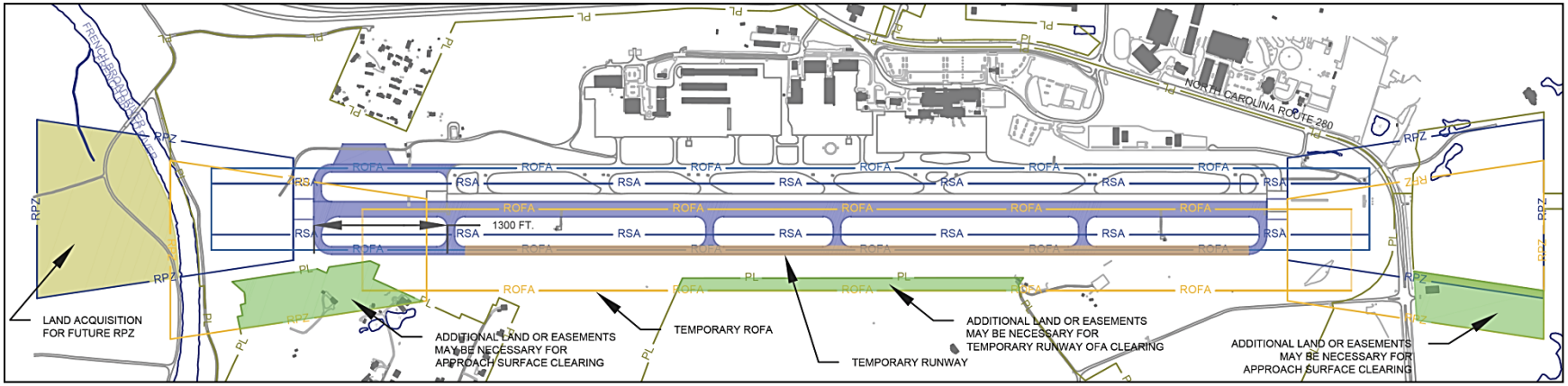
- **Economic Factors –** It is anticipated that significant cost associated with the implementation of this alternative would be for the fill and grading of land required for the extension of the runway and runway safety area. Additional project expenses are anticipated for the acquisition of land and easements that would be needed to control land uses within relocated airfield design surfaces such as the RPZ and ROFA. The economic benefit of the runway extension to the Western North Carolina region would be considerably measurable since the increase in destinations that could be achieved non-stop from the Airport would help further facilitate commerce and the efficient movement of people, goods, and services.

- **Environmental Factors –** Significant property acquisition and easements (up to 83.7 acres) would be required as a part of this alternative to control land uses and objects of height within the RPZ and ROFA of the relocated airfield design surfaces. However, this will be dependent on whether the runway extension coincides with the relocation of the runway proposed in Alternative 4. It should also be noted that the relocation of a few residents within the RPZ of the extended runway at the approach end of Runway 16 might be necessary since the boundary of this airfield surface designed to protect people and property on the ground extends over this area.

- **Implementation Factors –** The runway extension proposed in Alternative 5 could be incorporated with Alternatives 1, 2, and 3 as well if it is decided at the time of implementation that another alternative option is preferred to correct the non-standard separation between the runway and the parallel taxiway. Also, a temporary reduction in runway length would be necessary during construction of the extension in order to meet runway safety area requirements outlined in FAA AC 150/5370-2F, *Operational Safety on Airports During Construction*. This temporary reduction in available takeoff and landing distance may impact aircraft operations as concessions in fuel, passenger, and cargo loads may be needed to operate from the shorten runway that would temporarily limit the range of destinations that could be reached non-stop from the Airport during construction.

A 1,300 foot extension of Runway 16/34 to the north as proposed in Alternative 5 based on the configuration of the airfield recommended in Alternative 4 is presented in **Figure 5-5**. Advantages and disadvantages of Alternative 5 are summarized in **Table 5-5**.

Figure 5-5: Alternative 5 – Extend Runway 1,300 Feet To The North



Source: Mead & Hunt, Inc. (2012)

Table 5-5: Alternative 5 Summary

Advantages	Disadvantages
• Maximizes runway length between controlling factors to the north (French Broad River) and the south (North Carolina Route 280) • Provides runway length needed for existing and future commercial aircraft types to conduct non-stop flights to the west coast without needing to make concessions in fuel, passenger, or cargo loads • Proposed extension could be incorporated into any one of the runway/parallel taxiway separation alternatives • Provides the region with a valuable economic development tool that can help facilitate the efficient movement of people, goods, and services.	• Significant property acquisition/easements may be needed to control land uses and obstruction clearing • May require relocation of residents north of French Broad River located within future RPZ • Significant cost required for needed fill and grading to construct runway extension • Temporary reduction in runway length during construction to meet runway safety area standards

5.2.g Runway Extension Preferred Alternative

As a result of the French Broad River to the north and North Carolina Route 280 to the south, available options to increase the length of Runway 16/34 are limited. Alternative 5 offers the most logical solution considering these controlling factors and is recommended as the preferred alternative. It should be noted that although illustrated as a part of the airfield configuration presented in Alternative 4 to correct the separation between the runway and parallel taxiway, Alternative 5 could also be implemented in conjunction with Alternatives 1, 2, and 3. Though it was determined through the review of facility requirements that a runway extension is not anticipated to be needed for existing and projected commercial aircraft types operating at the Airport to serve markets east of the Rocky Mountains throughout the 20-year planning period, consideration should be given to Alternative 5 if non-stop flights to the West Coast is desired. Since the Airport has occasionally received inquiries in the past concerning non-stop flights to destinations west of the Rocky Mountains, Alternative 5 is presented for initial planning and conceptual purposes should it be determined that additional runway length is needed. It is recommended that this runway extension concept be considered if a need is presented in the future for additional runway length.

5.3 Taxiway System

The review of facility requirements found that improvements to the taxiway system are needed at the Airport in order to meet design standards outlined in FAA AC 150/5300-13, *Airport Design*. Most of these improvements are based upon the taxiway system accommodating ADG III and IV aircraft, which are projected to increase in operations throughout the planning period and become the critical design aircraft at the Airport. The following summarizes the taxiway system improvements that were identified as a part of the facility requirements analysis:

- Parallel Taxiway A should be retained at its existing width of 75 feet in anticipation of future operations by ADG IV aircraft. In addition, 25-foot paved shoulders, improvements to the topography of the safety area near its north and south junctures with Runway 16/34, and the relocation of a portion of the perimeter fencing near the existing ASOS unit to accommodate an increase in the width of the taxiway object free area will also be necessary to meet taxiway design standards for this category of aircraft.

- The surface gradient of taxiway pavement adjacent to a manhole cover within a fillet at the intersection of Taxiway R and Taxiway A may need to be corrected if it is found to be non-compliant with taxiway gradient design standards.

- An inverted low elevation portion of Taxiway P that does not meet transverse grade design standards needs to be corrected.

- The width of Taxiway H needs to be increased to 75 feet to meet design standards for ADG IV aircraft that are often parked on the south apron. Likewise, an increase in taxiway width to meet ADG III design standards is required for Taxiways D1, D2, F, and G.

One additional improvement recommended from the review of facility requirements is the renaming of the taxiway system to more closely align with the naming convention outlined in FAA AC 150/5340-18F, *Standards for Airport Sign System*, which does not require the reconfiguration of existing taxiway system infrastructure. The following section will focus on development options to correct the infrastructure-related improvements that were identified through the review of facility requirements. It should be noted that since there is a single, logical development option to correct each need, a single alternative has been prepared to address the needed taxiway system improvements.

5.3.a Alternative 6 – Taxiway System Improvements

Alternative 6 proposes several improvements to the taxiway system to address the deficiencies that were identified through the review of facility requirements. The most significant infrastructure improvements proposed by Alternative 6 is the retention of the existing 75-foot width of Taxiway A and the addition of 25-foot paved shoulders to the taxiway and its associated connector taxiways between Runway 16/34 and the terminal apron. As a part of the inclusion of paved shoulders, Alternative 6 also proposes to correct the inverted low portion of Taxiway P and a depression in the taxiway pavement surface near a manhole cover within the fillet at the intersection of Taxiway A and Taxiway R. Other taxiway system improvements proposed by Alternative 6 include increasing the width of the Taxiway A safety area to meet ADG IV standards which requires fill and grading along the eastern portion of the safety area near the approach ends of Runway 16/34. Increasing the safety area to meet ADG IV standards also requires increasing the width of the OFA with is also proposed in Alternative 6. As a result of these, a portion of the perimeter fence near the existing ASOS unit and a portion of an airfield access road near Taxiway D1 would have to be relocated to accommodate the increase in design standards. Finally, Alternative 6 proposes to widen Taxiway H to 75 feet in order to accommodate ADG IV aircraft and Taxiways D1, D2, F, and G to 50 feet in order to accommodate ADG III aircraft that frequently use these surfaces.

- **Operational Factors –** The improvements proposed by Alternative 6 will meet airfield design standards for the existing (ADG III) and future (ADG IV) critical design aircraft, which are designed to provide the safe separation of objects and other aircraft from the wingspans of these critical aircraft types. Since it is projected that ADG Category IV aircraft will increase operations at the Airport throughout the planning period, these improvements will provide a needed margin of safety so that these larger aircraft types can operate on Taxiway A. Likewise, increasing the widths of the north and south apron connector taxiways to meet the design standards of ADG III and ADG IV aircraft allows these surfaces to better accommodate the wider wheelbases of these aircraft types.

- **Economic Factors –** Qualitatively, a relative low cost is required to implement these alternatives; however, a significant portion of project cost would need to be devoted to the fill material and grading necessary to bring the Taxiway A safety area up to ADG IV design standards. Since there is a sharp drop in topography near the eastern boundary of the safety area at the approach

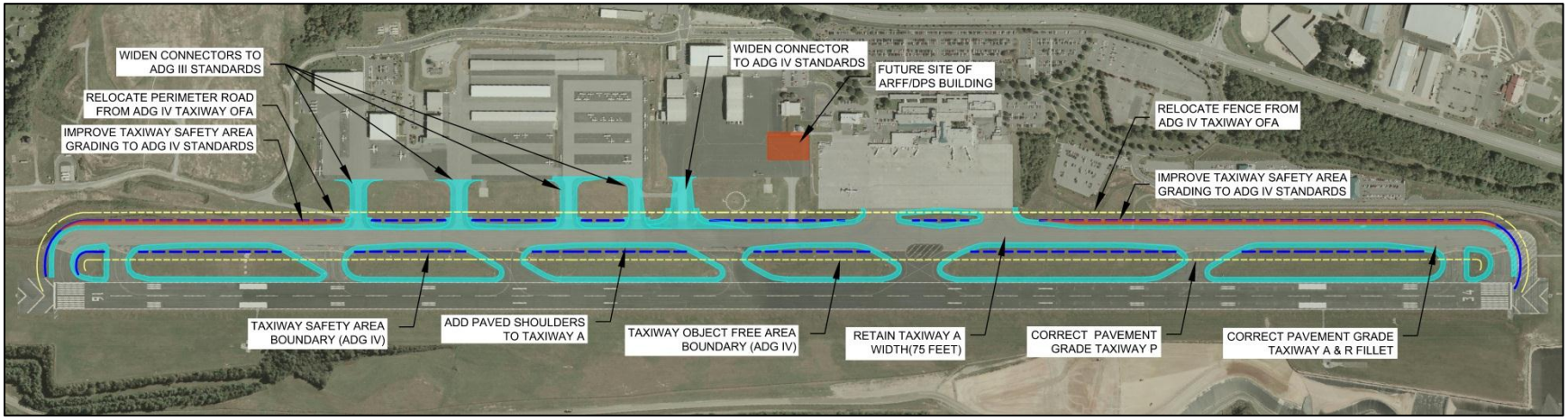
ends of Runway 16/34, significant fill would be necessary to raise the elevation of the ground within the expanded safety area.

- **Environmental Factors –** The deposit of fill material and grading necessary to correct the topography of the land within the expanded safety area of Taxiway A would require mitigation strategies and industry best practices to reduce or eliminate the effects of storm water runoff and erosion. Installation of paved shoulders along Taxiway A and its associated connector taxiways between Runway 16/34 and terminal apron would help reduce the effects of jet blast erosion on the safety area and reduce the potential of foreign object debris (FOD) on the taxiway surface.

- **Implementation Factors –** Temporary closures of Taxiway A and the connector taxiways between the runway and apron surfaces would be necessary during construction in order to increase the width of the connector taxiways and install paved shoulders. This may result in temporary airfield capacity reduction during portions of construction that require closures to Taxiway A as aircraft will need to back-taxi on Runway 16/34, resulting in increased runway occupancy times prior to takeoff or after landing. Improvements to the Taxiway A safety area may also impact the ability of ADG IV aircraft to utilize the taxiway during construction since the larger wingspans of these aircraft types may not adequately clear equipment and personnel working outside of the boundary of the existing safety area that meets ADG III standards.

Figure 5-6 illustrates the improvements that are proposed to the taxiway system as identified in Alternative 6 while **Table 5-6** summarizes the advantages and disadvantages of the taxiway system development plan.

Figure 5-6: Alternative 6 – Taxiway System Improvements



Source: Mead & Hunt, Inc. (2012)

Table 5-6: Alternative 6 Summary

Advantages

- Meets taxiway design standards outlined in FAA AC 150/5300-13, *Airport Design*
- Expanded Taxiway A OFA provides for safe separation of airfield objects from the wingspans of ADG IV aircraft
- Expanded width of connector taxiways better accommodate the wheelbases of ADG III and IV aircraft that use the north and south aprons, respectively
- Paved shoulders reduce the effects of jet blast erosion within taxiway safety area and helps eliminate FOD on taxiway
- Relative low cost to implement

Disadvantages

- Significant fill/grading required to improve Taxiway A OFA to meet design standards for ADG IV aircraft
- Temporary taxiway closures required during construction

5.3.b Taxiway System Improvements Preferred Alternative

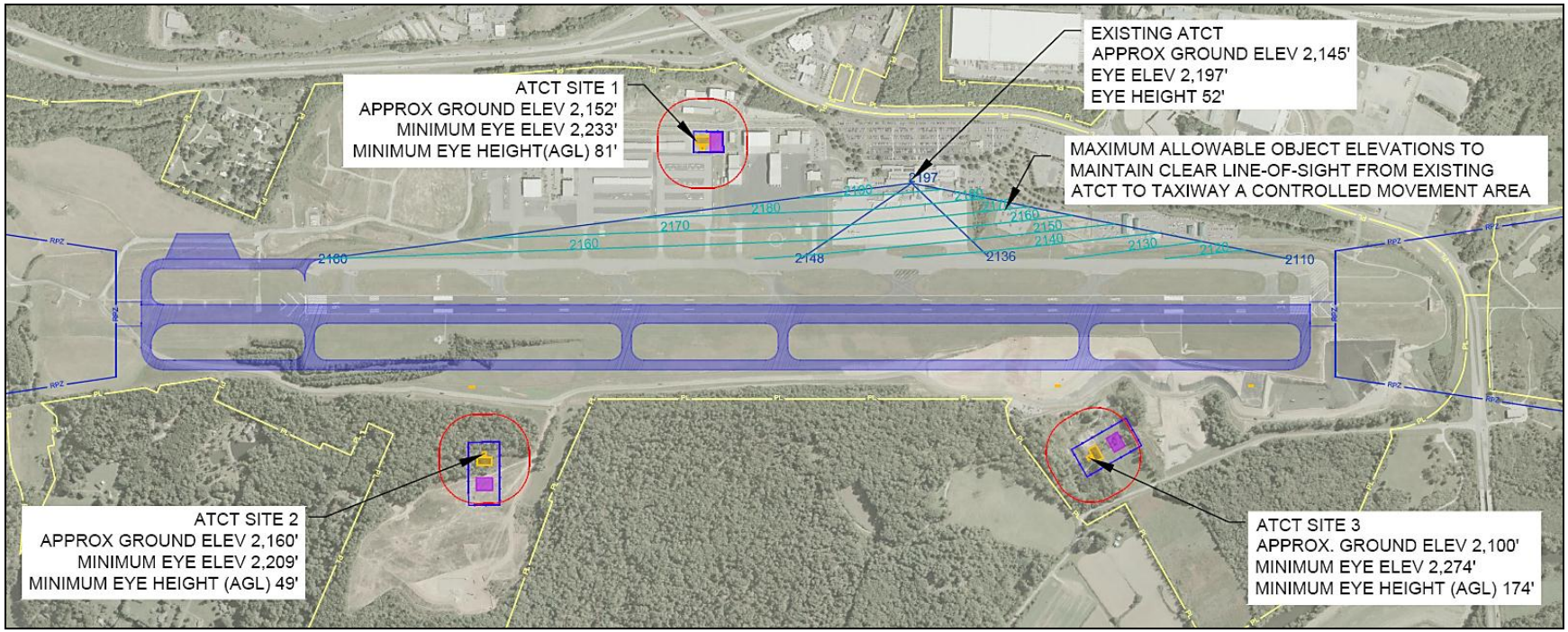
As a result of the logical options to provide correct the identified taxiway system deficiencies outlined in the review of facility requirements, there was not a need to prepare multiple alternatives for evaluation; therefore, the proposed taxiway system improvements presented in Alternative 6 should be considered as the recommended development actions. It should also be noted that additional taxiway system infrastructure will be needed to support any future development of aeronautical facilities on the west side of the airfield. As proposed in the Alternative 4 to correct the non-standard separation between Runway 16/34 and Taxiway A, a temporary runway designed for conversion into a west side parallel taxiway after construction of the relocated runway is complete offers one option to address this need. Should another development option be chosen to correct the non-standard separation between Runway 16/34 and Taxiway A, consideration should be given to construct a full or partial parallel taxiway on the west side of the airfield to support future aeronautical activities.

5.4 Airport Traffic Control Tower (ATCT)

A review of facility requirements identified that the existing airport traffic control tower (ATCT) is outdated and will be nearing the end of its useful life during the 20-year planning period; therefore, planning should be initiated to identify a preliminary site for construction of a new ATCT. Though the site for a new ATCT will ultimately be the decision of the FAA based upon extensive analysis of line-of-sight issues, object discrimination, and operational cohesiveness with Airport operations, FAR Part 77 surfaces, and the Airport Surveillance Radar (ASR), a preliminary site should be identified as a part of the master planning process to protect an area from other planned development. The varying topography surrounding the airfield and the location of other infrastructure elements limits ideal locations for construction of a new ATCT; however, three potential sites were identified as illustrated in **Figure 5-7** on the following page. The following section reviews these three sites and weighs advantages and disadvantages of each that will be used to justify the preferred site for construction of a new ATCT that will be identified on the Airport Layout Plan (ALP) drawing set.

It should be noted that the approximate ground elevation, minimum eye height elevation, and minimum eye height above ground level (AGL) are indicated for each ATCT site presented in **Figure 5-7** for initial site evaluation purposes. Further evaluation of the ATCT height necessary at each site to provide an obstructed view of the airfield will be necessary as part of a more comprehensive tower site evaluation study. The maximum allowable object elevations to maintain a clear line-of-sight from the location of the existing ATCT to the Taxiway A controlled movement area is also indicated in the figure and should be referenced for infrastructure development planning that occurs within this area. FAA Order 6480.4A, *Airport Traffic Control Siting Criteria*, requires that a visibility performance be conducted for potential ATCT sites using the FAA's Airport Traffic Control Tower Visibility Tool (ATCT VAT). Each location must provide a minimum probability of 95.5% of detecting or noticing the presence of an object on the airport surface in accordance with the ATCT VAT analysis tool. **Figure 5-7** presents the results of this analysis.

Figure 5-7: Airport Traffic Control Tower Alternatives



Object Discrimination Analysis Results – Probability Detection

Site	Min Threshold	Fut Rwy 16 End	Fut Rwy 34 End	Pass/Fail
1	95.5%	99.6%	99.6%	Pass
2	95.5%	99.9%	98.4%	Pass
3	95.5%	97.2%	100.0%	Pass

Sources: Mead & Hunt, Inc. (2012), FAA Airport Traffic Control Tower Visibility Analysis Tool (ATCT VAT)

5.4.a Alternative 7 – ATCT Site 1

Site 1 proposes the construction of a new ATCT on a currently undeveloped parcel of land located adjacent to the mid-ramp near the intersection of Wright Brothers Way and Aviation Way with access to the site provided from Wright Brothers Way. In addition to a control tower that is at least 81 feet above ground level (AGL) to provide the necessary minimum eye height from the tower cab, Alternative 7 also proposes the construction of an approach/departure control facility and an employee parking lot.

- **Operational Factors –** The site proposed in Alternative 7 offers a near midfield location that is often preferred by air traffic control in order to have a clear, unobstructed view of the runway, taxiways, and apron surfaces. This site also offers a location that provides a clear view of both the northwest and southwest general aviation (GA) development areas for when aeronautical facilities are planned on the west side of the airfield. In addition, the location and height meets minimum visibility performance criteria defined by FAA Order 6480.4A, *Airport Traffic Control Tower Siting Criteria*.

- **Economic Factors –** The use of a current undeveloped parcel of land reduces the need to impact existing revenue producing areas such as the mid-ramp and hangar structures on the south apron. Since the footprint of the facility proposed in Alternative 7 is located entirely within this available plot of land, removal of apron tie-down locations or hangar structures is not necessary which ultimately does not impact the revenue generating ability of the Airport.

- **Environmental Factors –** No significant environmental impacts are anticipated with the construction of an ATCT facility at Site 1 since significant grading of the land is not required and removal of trees or other obstructions are not needed.

- **Implementation Factors –** As a result of the topography of the south apron area, which is approximately 10 feet higher in elevation than the ground level at Site 1, a control tower with a height of 81 feet AGL is needed to provide a clear view of all airfield surfaces. Site 1 does not provide 300 feet of clearance from public areas around the facility for blast protection requiring the construction of a more blast resistant control tower structure at this site. In addition, further evaluation will be needed to determine if the construction of a control tower at this site would impact the operation of the Airport Surveillance Radar (ASR) since the feasibility of this site may be impacted if it is found an ATCT could interfer with ASR radar signatures.

The advantages and disadvantages of Site 1 are summarized in **Table 5-7**.

Table 5-7: Alternative 7 – ATCT Site 1 Summary

Advantages	Disadvantages
• No loss of existing aeronautical revenue generating areas • Midfield location • No significant environmental impacts • No tree removal necessary	• Does not meet 300 foot setback from public areas – requires blast protection • 81 feet tower height required as a result of topography of site • Proximity of site to ASR may interfere with radar signatures

5.4.b Alternative 7 – ATCT Site 2

Alternative 7 – Site 2 proposes the construction of a new ATCT within the northwest development area with landside access to the site made available via an extension of Pinner Road. A minimum ATCT tower height of 49 feet would be necessary to provide controllers with a clear view of each end of Runway 16/34 as a result of the surrounding topography at this site. The construction of an approach/departure control facility and an employee parking lot is also proposed at Site 2.

- **Operational Factors –** Site 2, located near the approach end of Runway 16, does not provide a midfield location for an ATCT tower which is desired as a part of the site selection process by the FAA. Site 2 does provide, however, a 300 foot setback from public areas which would not require the facility to be constructed from blast resistant materials. Additionally, location and height of the ATCT tower meets minimum visibility performance criteria defined by FAA Order 6480.4A.

- **Economic Factors –** Construction of an ATCT facility at Site 2 would greatly impact the aeronautical revenue generating potential of the northwest development area since limited space adjacent to the airfield would be available for the construction of hangars, taxiways, and other planned infrastructure improvements. In addition, significant cost for tree clearing, grading, and construction of an extended Pinner Road would be necessary with the development of an ATCT facility at this site.

- **Environmental Factors –** As a result of the surrounding topography and the lack of existing infrastructure at the site, significant tree clearing and grading would be necessary to construct an ATCT facility at this site. Care would also need to be taken to prevent erosion and water runoff from the site during construction from infiltrating the French Broad River which is located approximately 2,200 feet to the west.

- **Implementation Factors –** As noted in the review of economic factors, construction of an ATCT facility at Site 2 limits the opportunity to develop aeronautical facilities at this site. As a result, the northwest development area may not prove to be as attractive of a site for non-aeronautical commercial development such as warehouses, light industrial, self-storage, and machine shops that could benefit from the close proximity of aeronautical uses such as air freight forwarders, aircraft maintenance facilities, and Fixed Base Operators (FBOs).

Site 2 advantages and disadvantages are summarized in **Table 5-8**.

Table 5-8: Alternative 7 – ATCT Site 2 Summary

Advantages	Disadvantages
• Provides a location with a 300 foot setback from public areas	• Limits aeronautical development and revenue generating abilities of northwest development area • Grading and tree clearing necessary • Significant cost for grading, tree clearing, and extended access road • Not a midfield location

5.4.c Alternative 7 – ATCT Site 3

ATCT Site 3 designated in Alternative 7 proposes the construction of a control tower and approach control facility at a site on the southwest side of the airfield within an area designated for future commercial and non-commercial aeronautical development. In order to provide clear, unobstructed views of the airfield, a control tower with a minimum height of 174 feet would be necessary so that the tower cab can view each end of the runway. Landside access to the site and its accompanied approach/departure control facility and employee parking lot would be made available from Old Fanning Bridge Road.

- **Operational Factors –** Though Site 3 does not provide a desired midfield location for construction of a new air traffic control tower, it is located in close proximity to the proposed west side parallel taxiway offering controllers an advantageous view to coordinate runway crossings of vehicle and aircraft to and from this side of the airfield. The site, however, does not provide an advantageous view of the north side of the airfield, particularly to surfaces adjacent to the Landmark Aviation FBO where frequent aircraft movements occur. It should also be noted that Site 3 would provide for 300 feet of clearance around the site from public areas and would not require the tower and approach/departure control facilities to be constructed from blast resistant material. Also, the site's location and tower height meets minimum visibility performance criteria defined by FAA Order 6480.4A, *Airport Traffic Control Tower Siting Criteria*.

- **Economic Factors –** Section of Site 3 for the construction of a new ATCT facility would significantly impact the ability of the Airport to develop this site for revenue generating aeronautical uses such as facilities for air cargo operations and hangars for private or corporate use. Since most of the land within this development area that is contiguous with the airfield would be occupied by the ATCT facility, sufficient room may not be available for further aeronautical development that may significantly impact the ability of the Airport to attract and generate revenue from an expanded air cargo operation.

- **Environmental Factors –** Since a project is near completion to fill and grade this area with a used coal combustion product known as fly ash to support expansion of development areas at the Airport, environmental impacts as a result of the construction of the ATCT facility are anticipated to be minimal.

- **Implementation Factors –** Selection of Site 3 for the construction of a new airport traffic control tower would significantly impact the ability of the Airport to develop an air cargo facility since there is not another ideal location to support the infrastructure needed for this type of aeronautical operation. The primary intention of the fly ash grade and fill project at this site was to create an area for air cargo development since past inquiries have been received from air cargo operators about establishing an air cargo facility at the Airport. The use of this site for an air traffic control tower may significantly impact the ability to develop an air cargo facility since limited developable land contiguous with the airfield to support this type of aeronautical activity is available on existing Airport property.

The advantages and disadvantages of constructing a new air traffic control facility at Site 3 are summarized in **Table 5-9**.

Table 5-9: Alternative 7 – ATCT Site 3 Summary

Advantages	Disadvantages
• Located within close proximity to future west side parallel taxiway • Provides a location with a 300 foot setback from public areas	• Not a midfield location • Does not provide an advantageous view of north side of airfield • Limits aeronautical revenue generating potential of the west side development site • Significantly impacts the ability of the Airport to develop air cargo facilities • Tree clearing necessary

5.4.d Airport Traffic Control Tower Preferred Alternative

When considering the advantages and disadvantages of each proposed ATCT site in addition to operational, economic, environmental, and implementation factors, Site 1 should be considered as the preferred location for construction of a new ATCT facility. While a comprehensive site evaluation study is needed to further review the feasibility of this location for the construction of an ATCT facility, the following justifications support protecting this site for the future development of a new control tower:

- **Midfield Location –** The midfield location of Site 1 offers sightlines to the approach ends of Runway 16/34 that are approximately equal in distance, providing controllers with a centralized location to view all aircraft and vehicle movement on the airfield and the best visibility performance metrics in terms of minimum object detection to both ends of the airfield. The sightlines offered at Site 2 and Site 3 would be advantageous for only one end of the airfield, increasing the difficulty of controllers of visually identify airfield activity at the respective opposite end. A centralized, midfield location that Site 1 provides would offer the best available location for construction of a new ATCT so that controllers can clearly observe all airfield activity.

- **No Loss of Existing Aeronautical Revenue Generating Areas –** Site 1 offers a location on a currently undeveloped area of land near the mid-ramp and south apron that does not impede upon existing or future aeronautical revenue generating areas of the Airport. Construction of an ATCT facility at Site 2 would significantly reduce the area available at this site for other aeronautical related development while selection of Site 3 may altogether eliminate the potential of air cargo development at the Airport.

- **No Significant Environmental Impacts –** No significant environmental impacts are anticipated with constructing an ATCT facility at Site 1 since significant fill, grading, and tree clearing will not be necessary unlike Site 2 or Site 3, both of which would require this. The topography of Site 1 and lack of significant foliage within its immediate proximity offers the more favorable development site with the least environmental impacts compared to Site 2 and Site 3.

Disadvantages associated with Site 1 are minimal; though the location does not provide 300 feet of setback from public areas for protection from explosive devices, justification can be made to construct a new facility at this site with blast hardened materials given the disadvantages of constructing a tower at the other sites. Another disadvantage that should be considered with the selection of Site 1 as the preferred alternative for the construction of a new ATCT facility is the proximity of the ASR and the potential of the control tower to interfere with its radar operations. While construction of a control tower is not anticipated to create a shadow in the ASR radar coverage at the Airport, further evaluation of this potential will be needed as a part of the site evaluation study. Considering that these disadvantages are minimal in comparison with the significance of the disadvantages at Site 2 and Site 3, Site 1 should be considered as the preferred location for development of a new ATCT facility.

5.5 Automated Surface Observation System (ASOS)

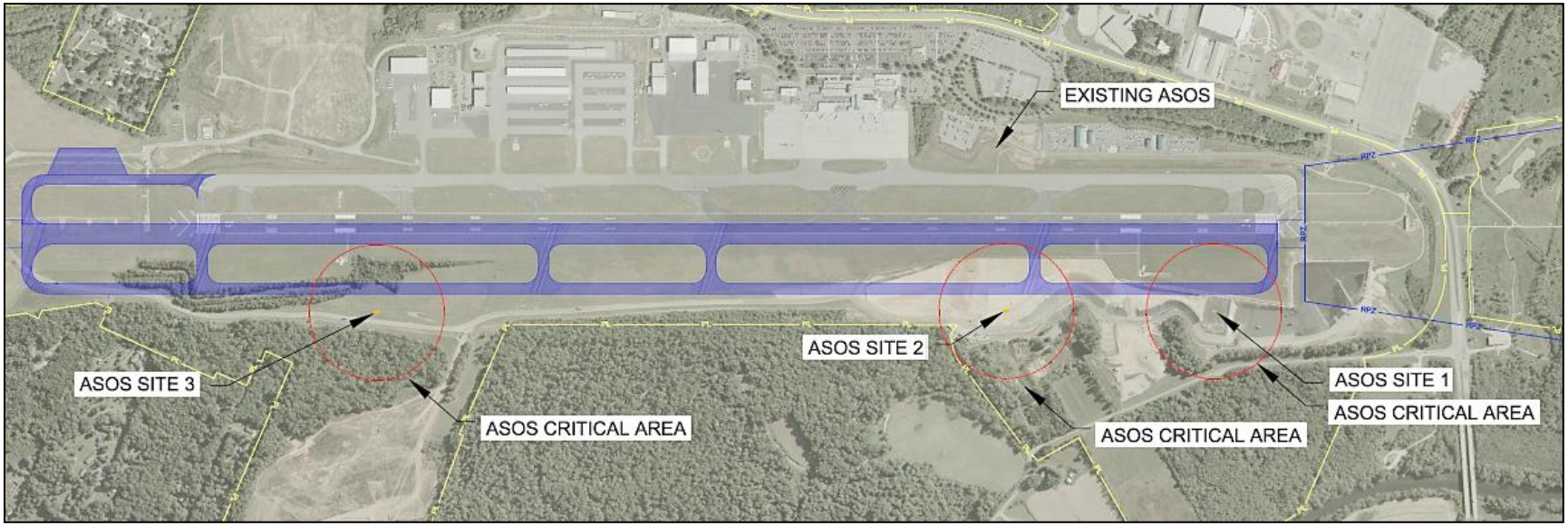
Relocation of the Automated Surface Observation System (ASOS) is recommended in Chapter 4. Its close proximity to Taxiway A, the employee parking lot, and the rental car service road may be affecting temperature readings at the Airport as a result of inadvertent reflected heat from the pavements being measured instead of the actual air temperature. As such, relocation of the ASOS is recommended to permit accurate airfield temperature measurements and move the equipment from being in such close proximity to numerous constructed facilities. Following guidance in FAA Order 6560.20B, *Siting Criteria for Automated Weather Observing Systems (AWOS)*, three locations illustrated in **Figure 5-8** were identified that could be considered as possible future sites for a relocated ASOS. Comparison of the advantages and disadvantages of each site is discussed in this section with selection and justification of the preferred site presented at its conclusion.

5.5.a Alternative 8 – ASOS Site 1

Site 1 proposes to relocate the ASOS to the southwest development area approximately 600 feet southwest of the Runway 34 glide slope antenna and would include a 500-foot critical area that would be required to be free of obstructions such as buildings and tress that could affect weather measurement readings.

- **Operational Factors –** Site 1 offers a location that most closely meets siting requirements identified in FAA Order 6560.20B stating an ASOS should be adjacent to the primary runway 1,000 feet to 3,000 feet down the runway from the threshold of the approach with the lowest minimums. The site also provides 500 feet of critical area around the ASOS that is free of most obstructions and objects such as buildings and trees that could affect weather condition measurement readings by sensors and other instrumentation. It should be noted that as a result of the higher ground elevation at Site 1 in comparison of the surrounding topography, significant tree clearing within the 500 foot critical area is not anticipated.

Figure 5-8: Automated Surface Observation System Alternatives



Source: Mead & Hunt, Inc. (2012)

- **Economic Factors –** While Site 1 is located within an area that has been filled with fly ash material and is suitable to support development, the adjacent sloping topography may interfere with the ability of instrumentation to record accurate airfield weather conditions. As such, additional fill and grading may be necessary to reduce the slope of the adjacent topography, which has the potential to add significant cost to the ASOS relocation project.

- **Environmental Factors –** No significant tree clearing is anticipated within the 500-foot critical area around Site 1 since its elevation is higher than the surrounding topography. Any trees within this 500-foot critical area that are taller than 15 feet less the elevation of the wind sensor must be removed to meet standards identified in FAA Order 6560.20B if they are found to interfere with local winds around the sensor.

- **Implementation Factors –** Relocation of the ASOS to Site 1 may impact infrastructure development planning within the southwest development area since the 500-foot critical area surrounding the site is required to be free of obstructions such as buildings within 15 feet in height of the 30 foot wind sensor. Further evaluation to identify the exact location of Site 1 will be necessary so that the maximum developable area possible can be obtained within the southwest development area without impacting the 500 foot critical area for the ASOS sensors and instrumentation.

A summary of the advantages and disadvantages of relocated the ASOS to Site 1 is presented in **Table 5-10**.

Table 5-10: Alternative 8 – ASOS Site 1 Summary

Advantages	Disadvantages
• Located near touchdown zone of runway approach with lowest minimums • ASOS critical area free of most objects that could affect sensor and instrumentation measurements • No significant tree clearing anticipated within ASOS critical area	• ASOS critical area may impact future infrastructure development within southwest development area • Fill and grading may be necessary if it is found surrounding topography could interfere with instrument readings

5.5.b Alternative 8 – ASOS Site 2

Site 2 proposes the relocation of the ASOS to a site approximately 1,060 feet northwest of the Runway 34 glide slope antenna within the southwest development area, which would include a 500 foot critical area that would need to be clear of obstructions that could affect the ability of sensors and instrumentation to accurately measure weather conditions.

- **Operational Factors –** Site 2 offers a location that is adjacent to the touchdown zone of Runway 34, which has lowest approach minimums and meets siting criteria identified in FAA Order 6560.20B. It is longitudinally located between 1,000 to 3,000 feet from the approach end of the runway and is clear of development such as buildings, hangars, and paved surfaces that could impact weather measurement readings by sensors and other ASOS instrumentation.

Tree clearing to the west of this site within the 500 foot critical area may be needed if it is determined these objects could shield the ASOS instrumentation from accurately recording weather conditions at the Airport.

- **Economic Factors –** Relocating the ASOS to Site 2 may result in additional costs for tree clearing within the 500 foot critical area if it is determined this is necessary for instrumentation to accurately record undisturbed wind conditions at the Airport. It should be noted that placement of an ASOS at Site 2 would greatly impact the Airport's ability to generate aeronautical-related revenue at the southwest development area since the critical area would need to be kept free of structures and other infrastructure elements that could affect the measurement of accurate weather conditions.

- **Environmental Factors –** Trees within the 500 foot ASOS critical area, in particular to the west and northwest of the site, that are found to be higher than 15 feet less the elevation of the wind sensor may require pruning or removal in order for accurate, undisturbed wind conditions to be measured at the Airport.

- **Implementation Factors –** An important factor to consider in evaluating the feasibility of relocating the ASOS to Site 2 is that the 500-foot critical area surrounding the site limits opportunities to develop the southwest development area for aeronautical uses. Since this critical area should be free of obstructions such as trees and buildings in order for instrumentation to accurately record local weather conditions, a significant portion of airside land within the southwest development area would need to be free of development. This may significantly impact the ability of the Airport to develop the site for aeronautical uses such as an air cargo operation since there are limited areas elsewhere on Airport property to support aeronautical-related development.

The advantages and disadvantages of relocating the ASOS to Site 2 are summarized in **Table 5-11**.

Table 5-11: Alternative 8 – ASOS Site 2 Summary

Advantages	Disadvantages
• Located adjacent to touchdown zone of runway approach with lowest minimums • ASOS critical area free of most obstructions such as trees and structures that could impact accurate weather condition readings	• Tree clearing within the critical area may be necessary, resulting in additional costs • The ASOS critical area would significantly impact the ability to develop the southwest development area for aeronautical uses and generate aeronautical related revenue

5.5.c Alternative 8 – ASOS Site 3

ASOS Site 3 is located approximately 500 feet southwest of the Runway 16 glide slope antenna within the northwest development area and includes a 500-foot critical area surrounding the site to protect sensors and instrumentation from obstructions that could lead to inaccurate measurements of true airfield weather conditions.

- **Operational Factors –** An operational advantage of Site 3 is that no existing infrastructure is located within the ASOS critical area that could interfere with the ability of wind sensors and other instrumentation to accurately measure local weather conditions; however, the site is not located adjacent to the touchdown zone of Runway 34, which has the lowest approach minimums. Further evaluation may be necessary to determine the feasibility of relocating the ASOS to Site 2 as there may be instances when local weather conditions at Site 2 could vary from those found within touchdown zone at the approach end of Runway 34.

- **Economic Factors –** Significant additional costs are anticipated to relocate the ASOS to Site 3 to meet standards identified in FAA Order 6560.20B. These include tree clearing necessary to free the critical area of obstructions and grading and filling to raise the elevation of the site to more closely match the elevation of the runway in order. Placement of the ASOS at Site 3 may also significantly impact the ability of the Airport to generate aeronautical-related revenue from the northwest development area in this scenario since the boundary of the critical area would prevent development from occurring within a significant portion of land adjacent to the airfield.

- **Environmental Factors –** Significant tree clearing may be necessary to relocate the ASOS to Site 3 since more than half of the critical area has tree obstructions that may affect sensors and instrumentation from accurately measuring local airfield weather conditions. Additionally, significant grading and filling may be necessary to more closely align the elevation of Site 3 with the elevation of the runway so that airfield weather conditions can be accurately recorded as recommended in FAA Order 6560.20B.

- **Implementation Factors –** Relocation of the ASOS to Site 3 would most significantly impact the Airport's ability to offer the northwest development area for aeronautical uses since the 500-foot critical area around the site would need to be kept free of obstructions and development such as hangars, taxiways, and aprons. Since there is limited land available on existing Airport property that can be utilized for the expansion of aeronautical-related facilities, relocation of the ASOS to Site 3 may impact the ability of the Airport to use this area for the accommodation of aviation infrastructure demands.

Advantages and disadvantages of relocating the ASOS to Site 3 are summarized in **Table 5-12**.

Table 5-12: Alternative 8 – ASOS Site 3 Summary

Advantages	Disadvantages
• No existing development located within the ASOS 500 foot critical area	• Not located adjacent to the touchdown zone of runway with the lowest approach minimums • Significant tree clearing necessary • Additional project costs anticipated for tree removal and grading/filling • Ability to develop northwest development area for aeronautical uses significantly impacted

5.5.d Automated Surface Observation System Preferred Alternative

Considering operational, economic, environmental, and implementation factors, it is recommended Site 1 be considered as the preferred location to relocate the ASOS. This option most closely meets the siting requirements identified in FAA Order 6560.20B without impacting the ability of the Airport to develop the west side of the airfield for future aeronautical uses. Relocation of the ASOS to a site approximately 600 feet southwest of the Runway 34 glide slope allows it to be adjacent to the touchdown zone of the primary runway with the lowest approach minimums (Runway 34) meeting siting criteria identified in FAA Order 6560.20B. The 500 foot critical area surrounding Site 1 is free of most obstructions and would require minimal tree clearing unlike Site 2 and Site 3. Site 1 also offers opportunities to develop the northwest and southwest development areas for future aeronautical uses since the critical area boundary does not lie over a large portion of developable land. Placement of an ASOS at Site 2 or Site 3 may restrict or prevent aeronautical development from occurring within these areas since the critical area boundary at these sites overlays a significant portion of developable land that is adjacent to the airfield. It should be noted that relocation of the ASOS to Site 1 will require a siting study to determine if the location meets requirements of FAA Order 6560.20B. Considering the advantages and disadvantages of all three ASOS alternative sites, planning should be initiated to preserve Site 1 for the future relocation of the Airport's weather measuring equipment.

5.6 Terminal Area

It is recommended that the size and configuration of the terminal area including the terminal building, boarding gates, aircraft parking positions, and apron, be able to accommodate the fleet mix of commercial aircraft types during periods of peak demand. A review of the existing terminal area found that additional aircraft parking positions, boarding gates, and expansion of the terminal building may be necessary to accommodate future demand throughout the planning period. It is anticipated that the Airport will need an additional one or two aircraft parking positions on the terminal apron, one to three boarding bridges with holding rooms, and additional area in the terminal building by 2030 in order to meet the projected increase in commercial airline passenger demand. Given the proximity of other infrastructure surrounding the terminal area and the limited room for expansion, four alternatives were prepared to conceptualize layouts on how these improvements could be implemented. The following section presents each of the terminal area alternatives, compares advantages and disadvantages, and recommends a preferred plan for the future expansion projects.

5.6.a Alternative 9 – Terminal Expansion Alternative 1a

Alternative 9 proposes to expand the terminal apron 85,773 square feet to the east adding an additional aircraft parking location for a Boeing 737 sized aircraft, and providing an expanded area for the parking and storage of airline ground service equipment (GSE). This would provide sufficient space for an additional remote aircraft parking position which could be located at the northwest corner of the terminal apron. Expansion and renovation of the terminal building is also proposed to create an additional area to accommodate the installation of three additional boarding bridges.

- **Operational Factors –** Alternative 9 provides for eight boarding bridges to meet demand projected throughout the planning period; however, only 10 aircraft parking positions would be available for remain overnight (RON) aircraft which is one short of the projected need. Additional RON aircraft would need to be parked at a remote location on the south end of the terminal apron until a parking position or boarding gate became available on the terminal apron. Requiring overflow RON aircraft to park on the south apron may result in inefficient commercial airline operations at the Airport due to the repositioning of aircraft between aprons.

  Alternative 9 also impacts the existing employee parking lot located south of the terminal apron since the amount of fill and grading required to increase the topography of the land for the apron expansion would result in a loss of parking spaces in the lot. In addition, the number parking spaces in the rental car ready/return lot would be eliminated as a result of the expanded terminal apron and terminal building.

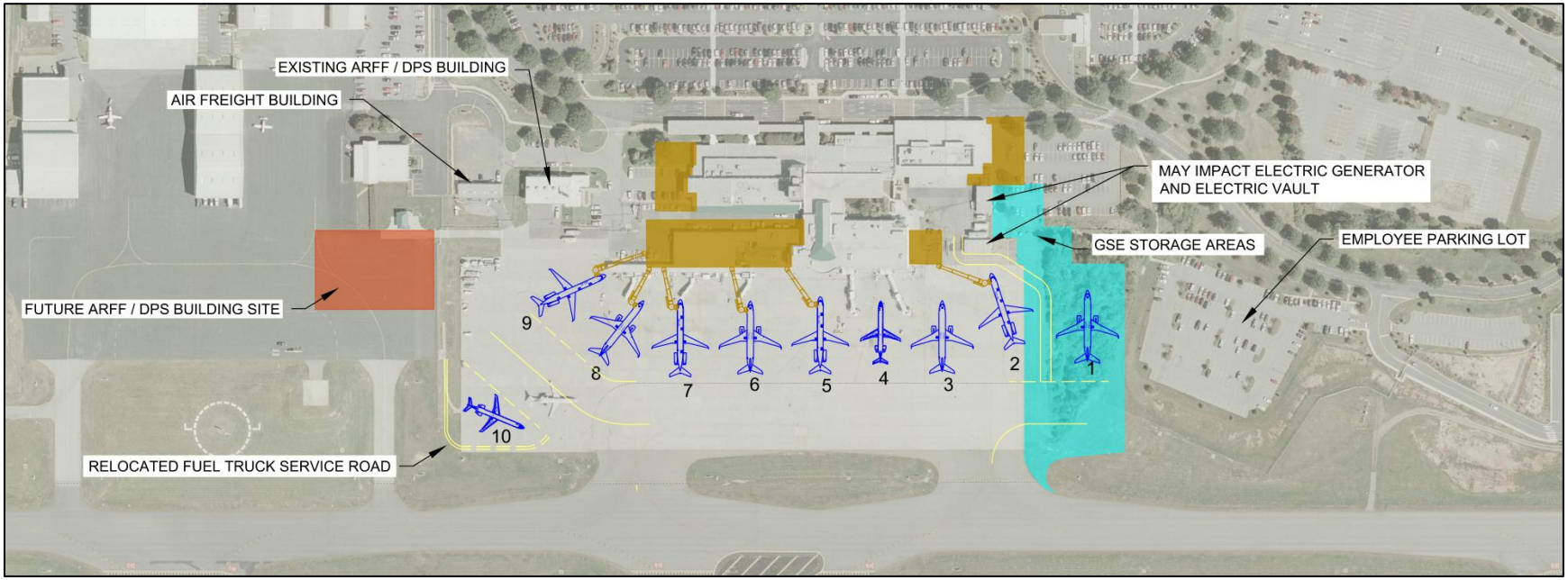
- **Economic Factors** – The most significant economic factor to consider with Alternative 9 is the cost to fill and grade the topography of the land within the proposed terminal apron expansion area. Significant project costs for fill and grading are anticipated to implement Alternative 9 as a result of the elevation change between the existing apron and the topography of the land within the apron expansion area since it varies approximately 35-40 feet in some areas.

- **Environmental Factors** – As a result of the fill and grading necessary for the terminal apron expansion, an environmental factor to consider with the implementation of Alternative 9 is the potential for erosion and storm water runoff impacts to areas south and east of the terminal area. Industry best practices should be considered if Alternative 9 is implemented to mitigate any potential erosion and storm water impacts as a result of terminal apron expansion.

- **Implementation Factors** – Though Alternative 9 provides enough boarding bridges and terminal building area to meet demand anticipated throughout the 20-year planning period, it does not provide adequate space on the terminal apron for RON aircraft parking. An additional expansion project would be necessary in addition to the implementation of Alternative 9 in order for the Airport to accommodate this projected demand.

Figure 5-9 illustrates Alternative 9 while a summary of its advantages and disadvantages is presented in **Table 5-13**.

Figure 5-9: Alternative 9 – Terminal Expansion Alternative 1a



Source: Mead & Hunt, Inc. (2012)

Table 5-13: Alternative 9 Summary

Advantages	Disadvantages
• Provides 8 terminal gates (need 8 to meet projection)	• Does not meet projected need for 11 remain overnight (RON) positions as only 10 are provided; any additional RON aircraft would have to be parked remotely on south apron • Substantial grade and fill required for terminal apron expansion to the south resulting in significant cost and environmental considerations • Apron expansion fill and grade impacts employee parking lot and rental car ready/return lot

5.6.b Alternative 10 – Terminal Expansion Alternative 1b

Alternative 10, presented in **Figure 5-10**, is similar to Alternative 9 as it proposes a renovation and expansion of the terminal building to accommodate the installation of three additional boarding bridges. An approximate 142,992 square foot expansion of the terminal apron to the east is proposed to accommodate two additional parking positions for Boeing 737 and 757 sized aircraft, respectively, and additional parking areas for GSE equipment. An additional remote aircraft parking position within the northwest corner of the terminal apron is also proposed with this alternative that would incorporate relocation of the fuel truck service road from the south end of the terminal apron.

- **Operational Factors –** Alternative 10 provides eight boarding gates and eleven RON aircraft parking positions meeting anticipated demand projected throughout the planning period. Accommodating the RON parking needs of all commercial airline aircraft on the terminal apron eliminates the need for overflow parking to occur on the south apron and increases the efficiency of aircraft repositioning at the boarding gates in between arrivals and departures.

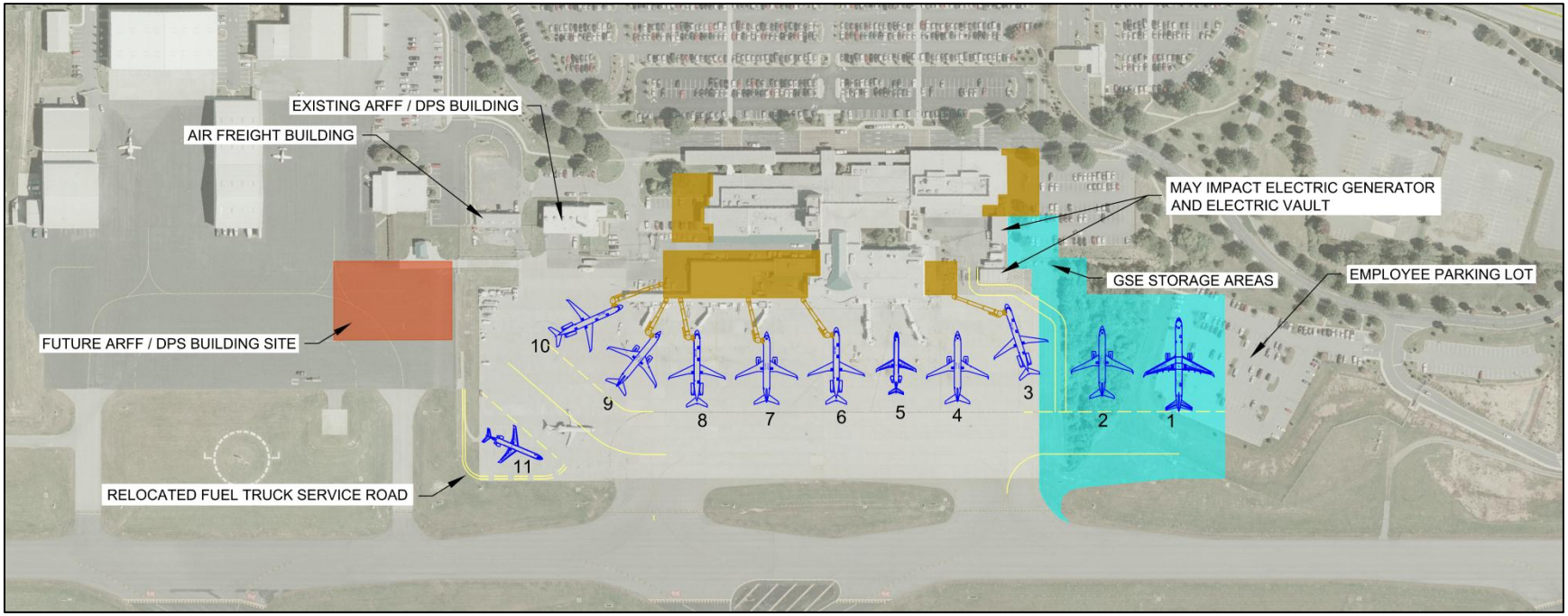
- **Economic Factors –** A significant economic factor to consider with Alternative 10 is the cost to fill and grade the topography of the land for the expansion of the terminal apron since the elevation change in this area varies from 35 to 40 feet in some places. Additional project costs might be necessary if it is found relocation of the airfield generator and electrical vault is necessary to accommodate the expansion of the terminal apron.

- **Environmental Factors –** A significant environmental concern with Alternative 10 is the amount of fill and grading necessary for the terminal apron expansion and its potential for erosion and storm water runoff impacts. If Alternative 10 is implemented, industry best practices should be followed during the fill and grading phase of the terminal apron expansion project to mitigate any potential erosion and storm water runoff impacts.

- **Implementation Factors –** The terminal apron expansion proposed in Alternative 10 would eliminate a significant number of vehicle parking spaces in the both the rental car ready/return and employee parking lots, requiring the Airport to create additional parking elsewhere for these uses.

Advantages and disadvantages discussed in the evaluation of operational, economic, environmental, and implementation factors are summarized in **Table 5-14**.

Figure 5-10: Alternative 10 – Terminal Expansion Alternative 1b



Source: Mead & Hunt, Inc. (2012)

Table 5-14: Alternative 10 Summary

Advantages	Disadvantages
• Provides 8 terminal gates to meet projected demand throughout planning period • Provides 11 RON aircraft parking positions on terminal apron to meet projected demand anticipated throughout the next 20 years	• Substantial fill and grading required to expand terminal apron resulting in significant project cost and environmental considerations • Impacts existing employee parking lot and rental car ready/return lot which may require development of additional parking lots for these uses

5.6.c Alternative 11 – Terminal Expansion Alternative 2a

Figure 5-11 illustrates Alternative 11 which proposes to create an additional 93,515 square feet of terminal apron area through a 38,909 square foot expansion to the south of Gate 1 and a 54,606 square foot expansion to the east of Gate 7. This requires the removal of the existing ARFF facility, air freight building, airport administration parking lot, and a small portion of rental car ready/return lot parking spaces. This apron expansion, in addition to establishing a remote aircraft parking position in the northwest corner of the terminal apron, would create 11 RON aircraft parking positions and an additional storage area for GSE equipment. Other improvements proposed by Alternative 11 include the relocation of the fuel truck service road from the south apron, construction of a blast wall between the terminal apron expansion and Terminal Drive, and a renovation and expansion to the terminal building for the installation of four additional aircraft boarding bridges.

- **Operational Factors –** The terminal area expansion proposed by Alternative 11 provides nine aircraft boarding bridges and 11 RON aircraft parking positions meeting the demand projected for the 20-year planning period. It should be noted that only a single taxi route exists for aircraft to maneuver into and out of parking positions 7 through 10, which might cause a conflict if aircraft are simultaneously exiting or entering this area.

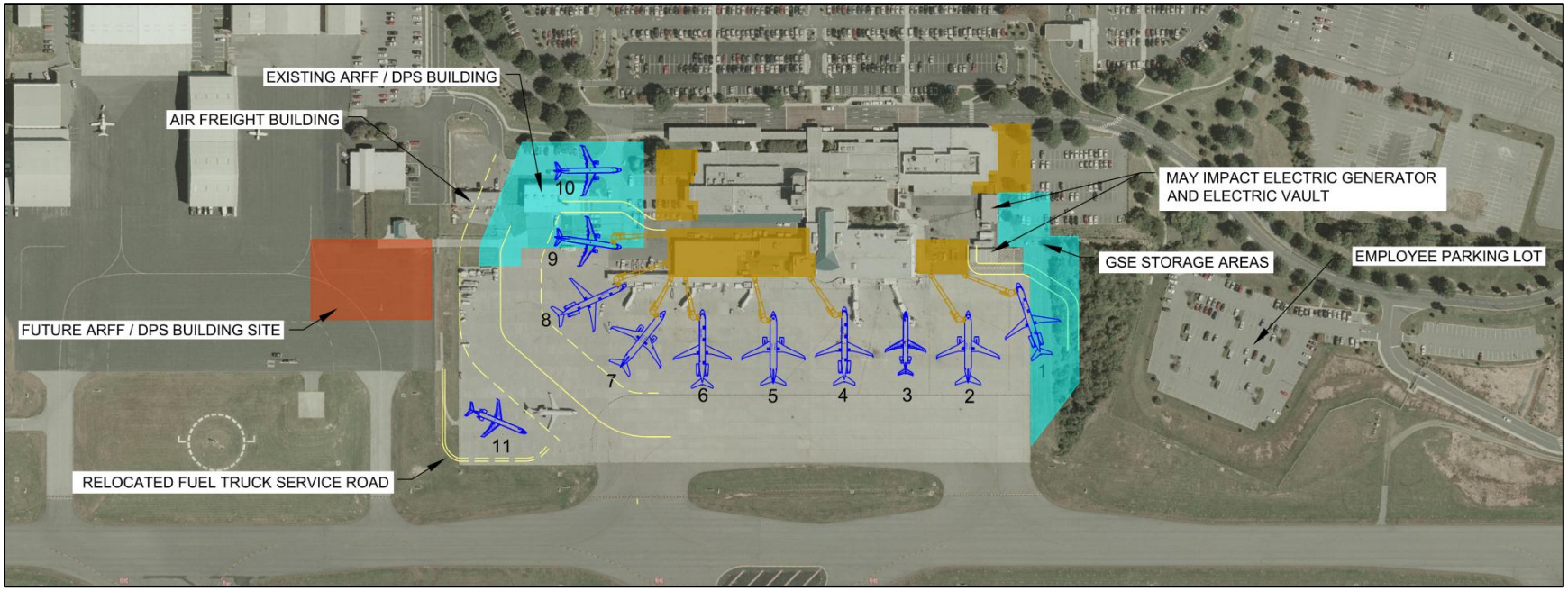
- **Economic Factors –** An economic factor to consider with Alternative 11 is the cost to remove the existing air freight building, ARFF/DPS facility, and Airport administration parking lot to the east and the fill and grading necessary to the south for the terminal apron expansion. Additional project costs may be accrued if it is found relocation of the generator and airfield electrical vault is necessary for the southward expansion of the terminal apron.

- **Environmental Factors –** To protect vehicular traffic on Terminal Drive and pedestrians from the effects of jet blast, construction of a blast wall may be necessary along the eastern edge of the eastern terminal apron expansion if Alternative 11 is implemented. Additional environmental protection measures may also be necessary to prevent erosion and storm water runoff impacts as a result of the southern terminal apron expansion since significant fill and grading will be necessary to raise the topography of this site to match the elevation of the terminal apron.

- **Implementation Factors –** This alternative requires the removal and replacement of the air freight building, the ARFF/DPS facility, and the Airport administration parking lot prior to or during construction of the terminal apron area improvements. In addition, the rental car ready/return lot will lose a small portion of vehicle parking spaces in order to accommodate the proposed terminal apron expansion.

The advantages and disadvantages of the terminal area improvements proposed by Alternative 11 are summarized in **Table 5-15**.

Figure 5-11: Alternative 11 – Terminal Expansion Alternative 2a



Source: Mead & Hunt, Inc. (2012)

Table 5-15: Alternative 11 Summary

Advantages	Disadvantages
• Provides 9 terminal gates to exceed projected demand throughout planning period • Provides 11 RON aircraft parking positions on terminal apron to meet projected demand • Does not impact employee parking lot	• Requires removal of existing air freight building, ARFF/DPS facility, and Airport administration parking lot • May require construction of a blast wall between eastward apron expansion and Terminal Drive • Fill and grading required for southward terminal apron expansion • A single taxi route is available for aircraft at terminal apron parking positions 7 through 10 • Impacts rental car ready/return lot which may require development of additional parking to meet demand

5.6.d Alternative 12 – Terminal Expansion Alternative 2b

Terminal area improvements proposed by Alternative 12, which are presented in **Figure 5-12**, include an 118,879 square foot expansion of the terminal apron that would provide 11 RON aircraft parking positions through a 27,227 square foot expansion east of boarding gate 7 and a 91,652 square foot expansion south of boarding gate 1. This apron expansion would require the removal of the air freight building, ARFF/DPS facility, Airport administrative parking lot, and a portion of the rental car ready/return lot. Relocation of the fuel truck service road connecting to the south apron is also proposed with this alternative to create an additional aircraft parking location at the northwest corner of the terminal apron. Finally, a renovation and expansion of the terminal building is proposed to accommodate the installation of four additional aircraft boarding bridges.

- **Operational Factors –** Alternative 12 provides nine aircraft boarding bridges and 11 RON aircraft parking positions to meet anticipated demand throughout the planning period. The additional boarding bridges and expansion of the terminal apron will allow the Airport to accommodate occasional charter flights or RON aircraft from irregular operations situations. It should be noted that only a single taxi route is available for aircraft to access boarding gates 8, 9, and 10 which may impact terminal apron operations if aircraft are simultaneously positioning into and out of these gates.

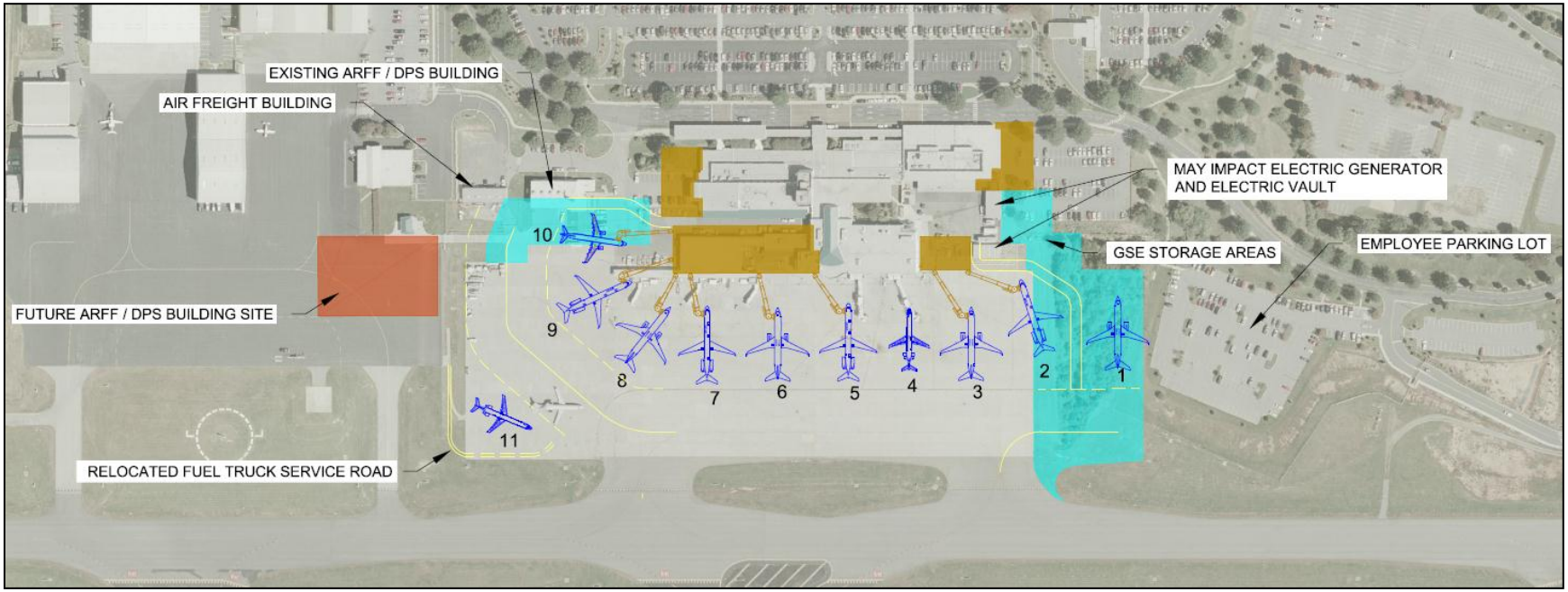
- **Economic Factors –** Fill and grading for the southward expansion of the terminal apron and removal of existing infrastructure such as the ARFF/DPS facility and air freight building for the eastward expansion of the terminal building will contribute significant cost to the overall project. Other items such as the airfield generator and electric vault may also contribute additional costs to the project if they need to be relocated.

- **Environmental Factors –** Due to the varying topography in this area, significant fill and grading necessary for the southward apron expansion could result in erosion and storm water drainage impacts if not properly mitigated. Industry best practices in compliance with local, state, and federal environmental laws will be necessary during the implementation of this phase of the project.

- **Implementation Factors –** An advantage of Alternative 12 over the other alternatives is that it provides the necessary amount of terminal apron space, boarding gates, and terminal building area to meet demand for the next 20 years without significantly impacting existing infrastructure or other future planned infrastructure improvements. Future plans by the Airport to relocate air freight operations and the ARFF/DPS facility would open up an area adjacent to the terminal building for development that could be utilized for a terminal area expansion, limiting the impact to other infrastructure elements such as the employee and rental car ready/return parking lots.

Table 5-16 summarizes the advantages and disadvantages of Alternative 12.

Figure 5-12: Alternative 12 – Terminal Expansion Alternative 2b



Source: Mead & Hunt, Inc. (2012)

Table 5-16: Alternative 12 Summary

Advantages	Disadvantages
• Provides 9 terminal gates to exceed projected demand • Provides 11 RON aircraft parking positions on terminal apron to meet projected demand • Offers a method to expand terminal building, terminal apron, and boarding gates without significantly impacting existing infrastructure or future planned development	• Requires removal of air freight building, ARFF/DPS facility, and Airport administration parking lot • Significant cost and environmental factors associated with the fill and grading for the southward terminal apron expansion • A single taxi route is available for aircraft at terminal apron parking positions 8 through 10 • May require relocation of airfield generator and electrical vault

5.6.e Preferred Terminal Expansion Alternative

Considering operational, economic, environmental, and implementation factors, it is recommended Alternative 12 (Terminal Expansion Alternative 2b) be considered as the preferred development option to improve terminal area infrastructure to meet the demand that is projected for the next 20 years. It should be noted that Terminal Expansion Alternative 2b is very similar to Terminal Expansion Alternative 2a in the following ways:

- Provide 11 RON aircraft parking positions on the terminal apron and four additional aircraft boarding bridges (for a total of nine) to meet the demand that is projected for the planning period.
- Provide additional area on the terminal apron for the storage of ground service equipment.
- Provide additional area in the terminal building through renovation and expansion.
- Require removal of the ARFF/DPS facility, air freight building, airport administration parking lot, and a small portion of the rental car ready/return lot prior to expansion of the terminal apron. In addition, both alternatives may require relocation of the electrical vault and airfield generator.

While each alternative shares several similarities, Alternative 2b should be considered as the recommended terminal expansion development option over Alternative 2a for several reasons. First, Alternative 2b offers a more linear layout that provides the greatest amount of terminal apron space without significantly impacting existing landside infrastructure. The 118,879 square foot terminal apron expansion proposed by Alternative 2b is greater than the 93,515 square foot expansion proposed by Alternative 2a and reduces impacts to the employee parking lot to the south and land adjacent to the terminal building to the north. It is important to note that Alternative 2b offers greater separation between Terminal Drive and the proposed expansion of the terminal apron to the north, which eliminates the need for a blast wall as would be necessary if Alternative 2a is implemented. Second, Alternative 2b does not impact land north of the terminal building as much as 2a would. Therefore, more land could be utilized for future terminal area improvements such as a relocated airport administration parking lot or a further northward expansion of the terminal building if demand unexpectedly exceeds projected capacity. Finally, Alternative 2b reduces the number of parking positions on the terminal apron to the north that would be impacted by a single taxi route as a result of its linear layout and the additional apron area that would be available for aircraft maneuvering.

One remaining factor to be considered when comparing Alternative 2a to 2b is the amount of fill and grading that will be necessary for a southward expansion of the terminal apron. While conceptually the layout of the terminal apron expansion varies between the two alternatives, a substantial difference in the amount of fill material that would be necessary for a southward expansion is not anticipated. This is the result of the topography within this proposed development area which sharply drops away from the north of the terminal apron and varies 30 to 40 feet from elevation of the terminal apron. While Alternative 2b would require a substantial amount of fill material to expand the terminal apron, it is not anticipated to be at a level that would be significantly greater than what would be necessary to implement the southward terminal apron expansion proposed in Alternative 2a. Considering the advantages and disadvantages of each terminal area alternative, it is recommended Alternative 2b be considered as the preferred development option to expand the terminal area so that adequate apron space, boarding gates, and terminal building area is available to meet the demand that is projected for the planning period.

5.7 Terminal Curb Front

During peak hours, the curb front of the terminal building is often congested with pedestrians, circulating traffic, and commercial vehicles involved in the transfer of passengers to and from arriving and departing commercial airline flights. Congestion occurs because the existing terminal curb front configuration does not provide a dedicated vehicle lane to separate waiting commercial vehicles from the flow of traffic on Terminal Drive. Providing a dedicated commercial vehicle curb and separating traffic lanes away from the front of the terminal building would help eliminate congestion related to waiting vehicles that become blocked in by pedestrians, circulating traffic, and other parked waiting vehicles on Terminal Drive. To address this need, a single logical alternative was prepared to plan for the construction of a dedicated commercial vehicle curb and traffic lanes away from the front of the terminal building. The following section reviews this alternative and discusses why is should be considered as the preferred development option to address this need.

5.7.a Alternative 13 – Commercial Vehicle Curb and Traffic Lanes

Alternative 13 (**Figure 5-13**) proposes the construction of a dedicated commercial vehicle curb and two traffic lanes east of Terminal Drive in front of the terminal building. One of the two traffic lanes would be dedicated to commercial vehicle staging, loading, and off-loading while the other would be intended for entering and exiting traffic. Construction of a retaining wall between the commercial vehicle lanes and the short-term parking lot may be necessary to reduce impact on the short-term lot as a result of the change in topography between the two areas.

- **Operational Factors –** As previously mentioned, separating waiting commercial vehicles from circulating traffic on Terminal Drive would help ease congestion in front of the terminal building by eliminating the need for taxis, limousines, and vans to occupy curb space in front of the terminal. Relocating these vehicles away from the front of the terminal would improve circulating traffic flow on Terminal Drive through the reduction of vehicles waiting curb side to pick up and drop off passengers and will provide a safe, visible, and dedicated area for passengers to board and off-load taxis, limousines, and vans.

- **Economic Factors –** Alternative 13 provides an expanded area to support commercial vehicle operations; this creates an opportunity for the Airport to generate additional non-aeronautical revenue through contracts that could be negotiated with an increased number of commercial transportation providers. An additional economic factor to consider with the implementation of Alternative 13 is that short-term parking spaces adjacent to the terminal may be lost, reducing the potential parking revenue that could be generated from this lot.

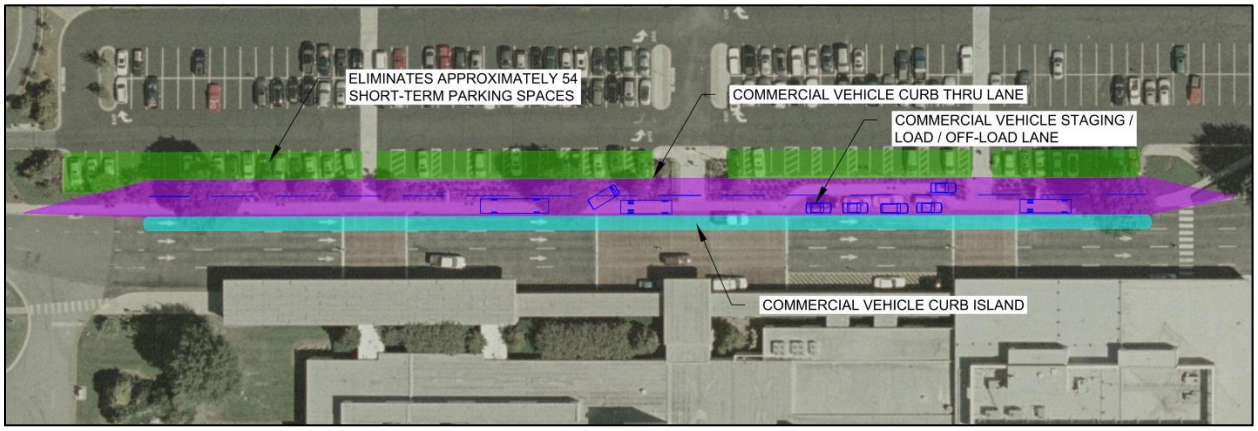
- **Environmental Factors –** An environmental factor to consider with Alternative 12 is that fill and grading will be necessary for the construction of the commercial vehicle curb and traffic lanes as a result of the topography change between the elevation of Terminal Drive and the short-term parking lot. Industry best practices will be necessary to prevent and mitigate any potential storm

water and erosion environmental impacts as a result of the fill and grading that will be necessary for the project.

- **Implementation Factors –** An implementation factor to consider is the loss of approximately 54 short-term parking spaces adjacent to the terminal building to implement Alternative 13; however, incorporating a retaining wall into the design of the commercial vehicle curb and traffic lanes may help reduce the number of parking spaces that are lost in the short-term lot. It is encouraged that a plan be established to expand parking in the short-term lot if parking spaces need to be eliminated to implement Alternative 13.

A summary of advantages and disadvantages is presented in **Table 5-17**.

Figure 5-13: Alternative 13 – Commercial Vehicle Curb and Traffic Lanes



Source: Mead & Hunt, Inc. (2012)

Table 5-17: Alternative 13 Summary

Advantages	Disadvantages
• Separates waiting commercial vehicles from circulating traffic • Improves traffic flow on Terminal Drive in front of terminal building • Reduces congestion in front of terminal building during peak hours caused by waiting vehicles	• May eliminate up to 54 short-term parking spaces • Fill and grading necessary for commercial vehicle lane construction

5.7.b Terminal Commercial Curb Front Preferred Alternative

Since limited area is available for development in front of the terminal, a single logical alternative was prepared to address terminal curb side congestion during peak hours as a result of pedestrians, circulating traffic, and waiting commercial vehicles. Alternative 13 offers the most feasible solution to improve traffic flow in front of the terminal by separating waiting commercial vehicles from the circulating traffic flow and other vehicles involved in the pick-up and drop off of passengers. It is recommended that planning be initiated to implement Alternative 13 to replace any lost parking capacity in the short-term lot as a result of the commercial vehicle curb and traffic lane construction.

5.8 General Aviation Development

Activity forecasts prepared for the Airport project that general aviation (GA) operations will increase 32 percent by 2030; therefore, it is recommended that the Airport expand GA facilities to accommodate the increase in apron space and hangars needed. A review of existing GA infrastructure at the Airport in comparison with the activity projections indicate that an additional 37,912 square feet of apron space, 52,500 square feet of box-style hangars, and 15 T-style hangars will be needed to accommodate GA operations.

Two areas on Airport property that are well-suited for GA development are north of the Landmark Aviation facility and west of the approach end of Runway 16 within the northwest development area. Alternatives were prepared for each location to conceptualize how GA development could occur in an effort to establish a recommended plan for GA infrastructure expansion at the Airport. The following section presents each alternative, reviews factors that should be considered if the alternative is implemented, and identifies a recommended layout plan that should be considered when development is ready to occur at each location. It should be noted that the recommended alternatives presented at the end of this section are conceptual in nature and are not intended to be a concrete plan of how development will actually occur within these areas.

5.8.a Alternative 14 – General Aviation Expansion Alternative 1

Alternative 14, illustrated in **Figure 5-14**, proposes a GA facility expansion that incorporates one 18,000 square foot box-style hangar, three 100- by 100-foot box-style hangars, five 80- by 80-foot box-style hangars, twelve 60- by 60-foot box box-style hangars, and two T-style hangar structures with ten aircraft parking positions each. A 135,775 square foot expansion of the north apron to support itinerant aircraft operations at Landmark Aviation is also proposed as well as an additional 145,136 square feet of apron space for maneuvering and parked aircraft in front of the hangar structures. Other airside infrastructure elements proposed in Alternative 14 include a north/south taxilane to join the hangar aprons with the north apron, connector taxiways to join the expanded GA area to Taxiway A, and a widening of Taxiways D1 and D2. Landside infrastructure improvements include a rerouting of Wright Brothers Way and construction of service roads and parking lots to access the expanded hangar areas.

- **Operational Factors –** The expansion of apron space, box-style hangars, and T-style hangars proposed by Alternative 14 would exceed the demand that is anticipated throughout the planning period; this is intended to illustrate how the site could be developed to its fullest extent. The layout of the taxilanes and supporting landside infrastructure would allow for the incremental phasing of development over time based upon demand so the site could remain flexible to meet future needs.

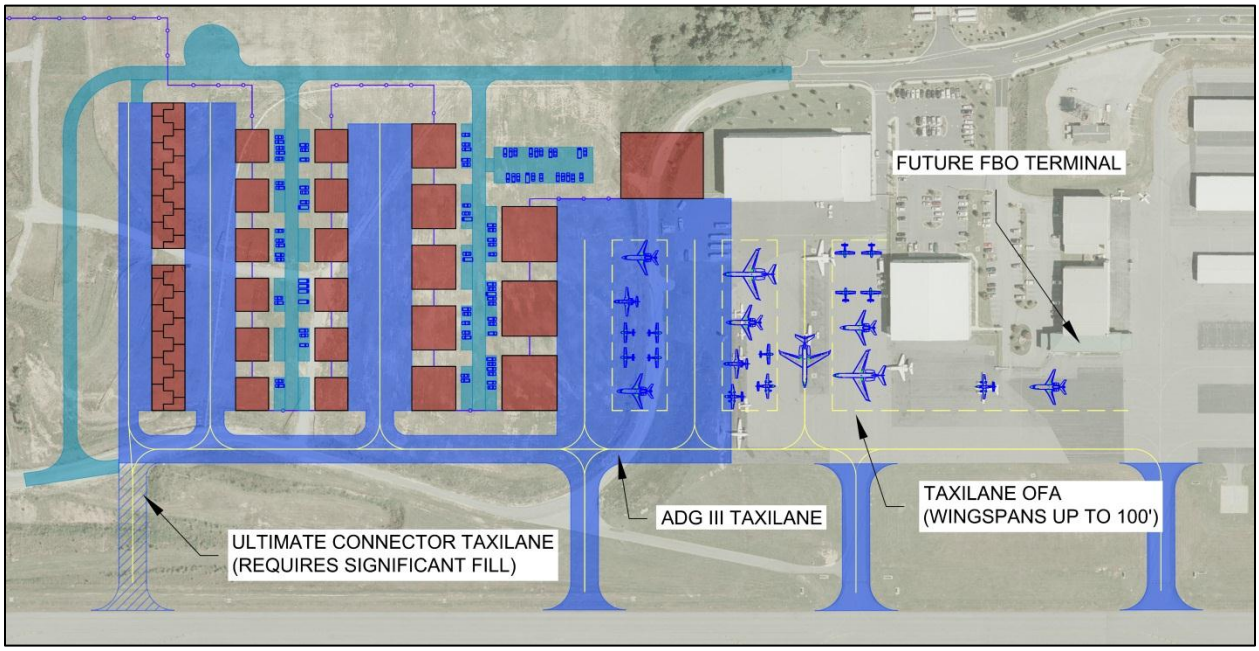
- **Economic Factors –** Expanding the general aviation area would not only increase opportunities for the Airport to generate additional aeronautical related revenue through hangar rents and building leases, but also would help contribute to the overall economy of Airport-based businesses through the ability to support an increase in aeronautical activity.

- **Environmental Factors –** Significant fill would be necessary for development to occur within this area since the topography of the land varies 40 to 50 feet in some places from the elevation of the airfield and existing general aviation infrastructure. Construction of a supplementary connector taxiway to the north would also require significant fill due to this varying topography.

- **Implementation Factors –** The orientation of some box-style and T-style hangars proposed in Alternative 14 face would north, which is undesirable during winter months since the front of these buildings would have limited exposure to sunlight from the south. Permitting the front of the building to face towards the south during winter months would allow sunlight to assist in the melting of snow and ice, which would prevent contaminates from freezing on hangar doors and apron surfaces. Though the Airport is not exposed to sub-freezing temperatures for long durations of time during the winter months, this may be a factor for those wishing to lease or build hangars within the development area.

Alternative 14 advantages and disadvantages are summarized in **Table 5-18**.

Figure 5-14: Alternative 14 – General Aviation Expansion Alternative 1



Source: Mead & Hunt, Inc. (2012)

Table 5-18: Alternative 14 Summary

Advantages	Disadvantages
• Meets aircraft storage needs • Provides for a variety of hangar sizes • Site can be developed incrementally over time as needed • Increase aeronautical revenue generating capability of the Airport	• Some hangars have north facing doors • Significant fill needed for development and supplemental connector taxiway

5.8.b Alternative 15 – General Aviation Expansion Alternative 2a

A set of three alternatives were prepared that focus on providing additional itinerant aircraft parking through an apron expansion between the existing north apron and Taxiway A. Alternative 2a, presented in **Figure 5-15**, is the first alternative that presents this concept by proposing a 71,761 square foot itinerant aircraft apron between Taxiway D1 and Taxiway D2. In addition to this apron, Taxiway D1 and D2 would be widened and the north apron would be expanded 49,883 feet to the north. Other taxiway/taxilane improvements would include the construction of a north/south taxilane and up to two additional connector taxiways between Taxiway A and the expanded general aviation area. These improvements would support the construction of three additional 100- by 100-foot box-style hangars, five 80- by 80-foot box-style hangars, twelve 60- by 60-foot box-style hangars, and four T-style hangars capable of parking ten aircraft each. Landside improvements proposed by Alternative 2a include an extension of Wright Brothers Way and the construction of service roads and parking lots to access the hangar facilities.

- **Operational Factors –** The additional 186,819 square feet of hangar facilities provides sufficient capacity to meet the demand that is projected for the planning period. The configuration also maximizes the number of aircraft hangars which could be built in the area and provides flexibility to develop the site incrementally over time with a variety of hangar styles and sizes as needed. Construction of the apron between Taxiway D1 and D2 would also provide additional itinerant aircraft parking near the future FBO Terminal.

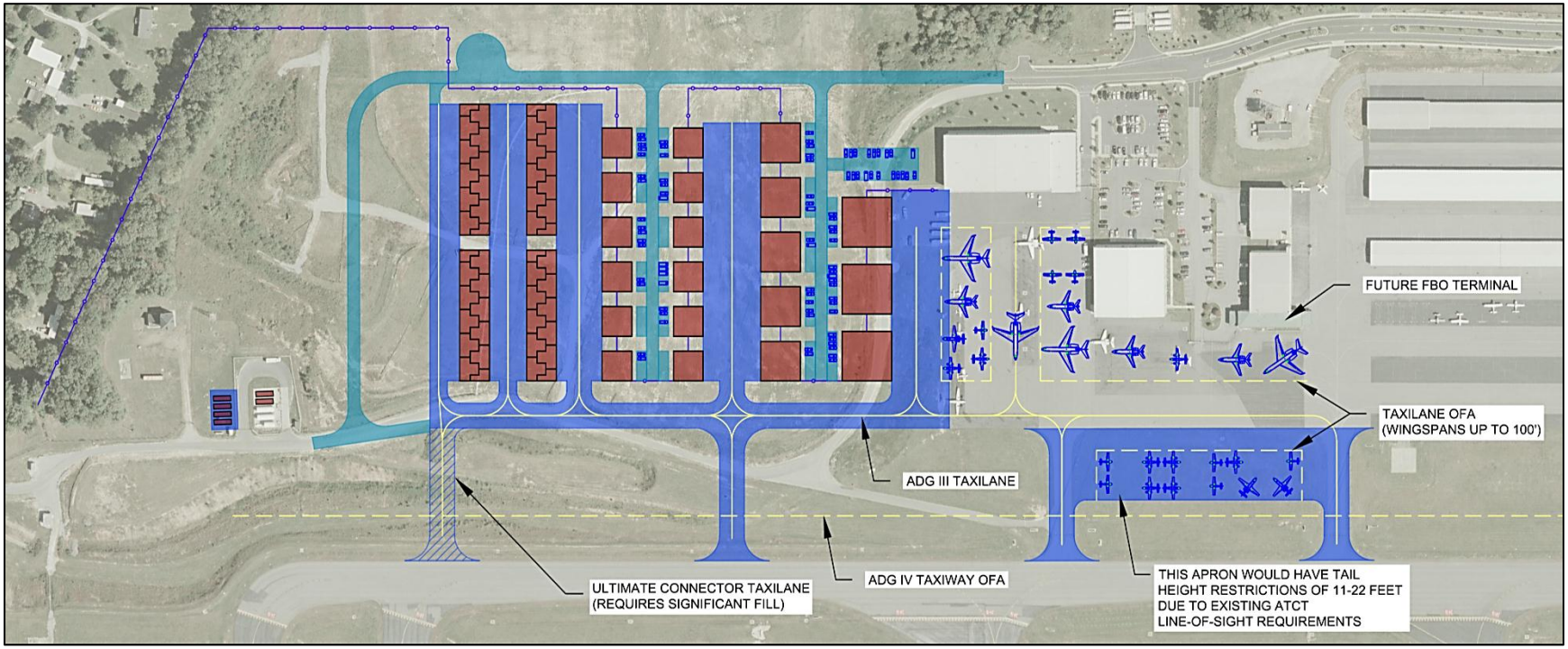
- **Economic Factors –** Expanding the general aviation area would offer an opportunity for the Airport to increase its aeronautical related revenue through additional hangar rents and leases as well as revenue that could be earned by an increase in aviation activity such as fuel purchases and landing fees. However, consideration should be given to the significant cost that would be necessary to fill and grade the land to the north for development as the topography within this area varies 40 to 50 feet in some locations.

- **Environmental Factors –** As noted, significant fill and grading would be necessary for implementing Alternative 2a. Erosion and storm water runoff controls would also be needed to reduce or eliminate and environmental impacts as a result of the fill and grading.

- **Implementation Factors – One** implementation factor to consider with Alternative 2a is that some hangars would have north facing doors, which is typically not desired during winter months in northern climates due to snow and ice melt concerns. An additional implementation factor is that tail height restrictions may be necessary for aircraft parked on the expanded apron between Taxiway D1 and D2 due to line-of-sight requirements with the existing ATCT. Aircraft parked on this expanded apron may be restricted to tail heights between 11 to 22 feet in order for air traffic controllers to have an unobstructed view of airfield surfaces within this area. It should be noted that the construction of a new ATCT would offer improved line-of-sight for controllers, which might eliminate the need for tail height restrictions on the expanded apron.

Table 5-19 summarizes the advantages and disadvantages of GA expansion Alternative 2a.

Figure 5-15: Alternative 15 – General Aviation Expansion Alternative 2a



Source: Mead & Hunt, Inc. (2012)

Table 5-19: Alternative 15 Summary

Advantages	Disadvantages
• Meets aircraft storage needs • Provides additional itinerant aircraft parking in close proximity to future FBO terminal • Provides variety of box-style hangar sizes • Can be implemented incrementally over time • Maximizes development area for aircraft storage hangars • Offers opportunity for Airport to increase aeronautical related revenue through hangar rents and leases	• Some hangars have north facing doors • Apron expansion towards Taxiway A would have tail height restrictions due to ATCT line-of-sight requirements • Significant fill required for development towards north and supplemental connector taxiway • Cost necessary to fill and grade land for development

5.8.c Alternative 16 – General Aviation Expansion Alternative 2b

General Aviation Expansion Alternative 2b, **Figure 5-16**, is the second alternative that incorporates an apron expansion between Taxiway A and the north apron to provide additional itinerant aircraft parking. The approximate 72,000 square foot expansion of the apron proposed in this alternative is also located between Taxiway D1 and Taxiway D2. This alternative also proposes to expand the north apron by approximately 49,900 square feet as well as construct a series of taxilanes to support development of three 100- by 100-foot box-style hangars, five 80- by 80-foot box-style hangars, fourteen 60- by 60- foot box-style hangars, and one T-style hangar capable of parking 10 aircraft. Landside improvements include an extension of Wright Brothers Way and construction of access roads and parking lots to support the hangar development. Nearly all development proposed by Alternative 2b would occur within the existing perimeter fence line of the Airport.

- **Operational Factors –** General Aviation Expansion Alternative 2b offers sufficient box-style hangar space to meet the demand that is projected for the planning period; however, the configuration is only capable of supporting one (1) T-style hangar structure which would not be capable of meeting the demand for 15 T-style hangar units by 2030. Alternative 2b also offers the ability to incrementally develop the site with a variety of box-style hangar sizes over time. Expansion of the north apron towards Taxiway A also provides additional itinerant aircraft parking in close proximity to the future FBO terminal building.

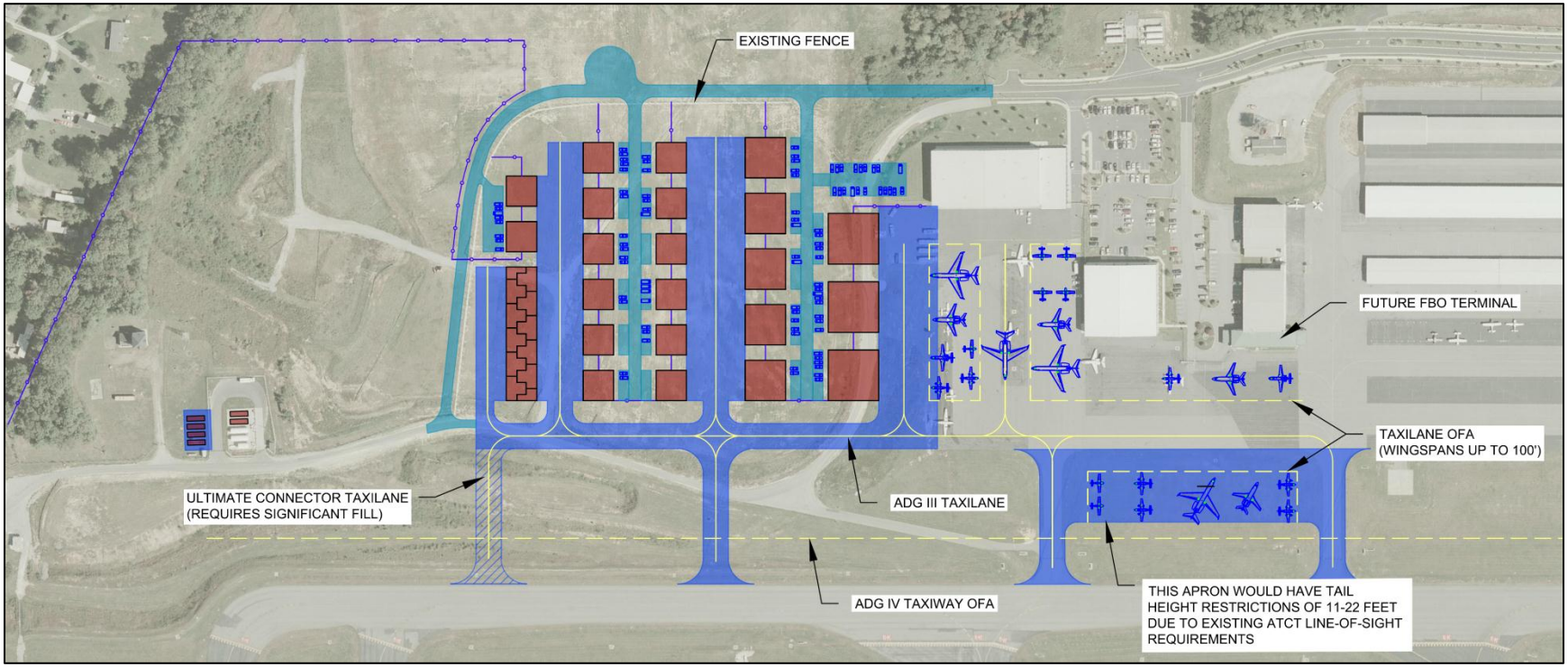
- **Economic Factors –** Expanding general aviation facilities offers an opportunity for the Airport to collect additional aeronautical-related revenue through hangar rents, leases, and fees earned through increased fuel purchases and aircraft landings. Since the expansion of facilities would occur within the existing perimeter fence line of the Airport, costs for fill and grade would not be as significant since this area has already been initially prepared for infrastructure development.

- **Environmental Factors –** Though fill and grade will be needed for development, it is not anticipated to be as significant as what would be necessary to implement General Aviation Expansion Alternatives 1 and 2a since the elevation of the topography within this area does not vary as greatly as it does to the north. Erosion and storm water runoff controls would be necessary; however, to reduce or eliminate any potential environmental impacts during any filling or grading activities.

- **Implementation Factors –** Some hangars will have northward facing doors, which is typically undesired during the winter months since sunlight from the south would not assist in the melting of snow and ice from hangar doors. In addition, the apron expansion towards Taxiway A may limit the types of aircraft that can be parked on the surface due to ATCT line-of-sight requirements. Since air traffic controllers in the ATCT need to have a clear view of Taxiway A and its adjoining connector taxiways, tail height restrictions between 11 to 22 feet would be necessary depending on an aircraft's parking position.

Advantages and disadvantages of GA expansion Alternative 2b are summarized in **Table 5-20**.

Figure 5-16: Alternative 16 – General Aviation Expansion Alternative 2b



Source: Mead & Hunt, Inc. (2012)

Table 5-20: Alternative 16 Summary

Advantages	Disadvantages
• Provides sufficient box-style hangar space to meet demand • Provides additional itinerant aircraft parking in close proximity to future FBO terminal • Provides variety of box-style hangar sizes • Can be implemented incrementally over time • Offers opportunity for Airport to increase aeronautical related revenue through hangar rents and leases • Significant fill and grade not needed since development occurs within existing fence line of Airport	• Some hangars have north facing doors • Apron expansion towards Taxiway A would have tail height restrictions due to ATCT line-of-sight requirements • Does not provide enough T-style hangar units to meet anticipated demand

5.8.d Alternative 17 – General Aviation Expansion Alternative 2c

General Aviation Expansion Alternative 2c (Alternative 17), illustrated in **Figure 5-17**, is the third and final alternative that incorporates an expansion of the north apron towards Taxiway A and, like Alternative 2b, proposes that nearly all development would occur within the existing perimeter fence line of the Airport. The approximate 72,400 square foot expansion of the north apron towards Taxiway A between Taxiways D1 and D2 as proposed by Alternative 2c would be complemented by an approximate 49,900 square foot expansion of the apron to the north. Taxilanes and connector taxiways proposed by Alternative 2c would provide access to three 100- by 100-foot box-style hangars, five 80- by 80-foot box-style hangars, twelve 60- by 60-foot box-style hangars, and two 9-unit T-style hangars. Landside improvements proposed by Alternative 2c include an extension of Wright Brothers Way and construction of service roads and parking lots to access the hangar structures.

- **Operational Factors –** Alternative 2c offers a layout that would meet the demand for box-style and T-style hangars while providing for a variety of box-style hangar sizes that could be implemented incrementally over time to meet demand. It also offers the operational advantage of additional itinerant aircraft parking in close proximity of the future FBO terminal building.

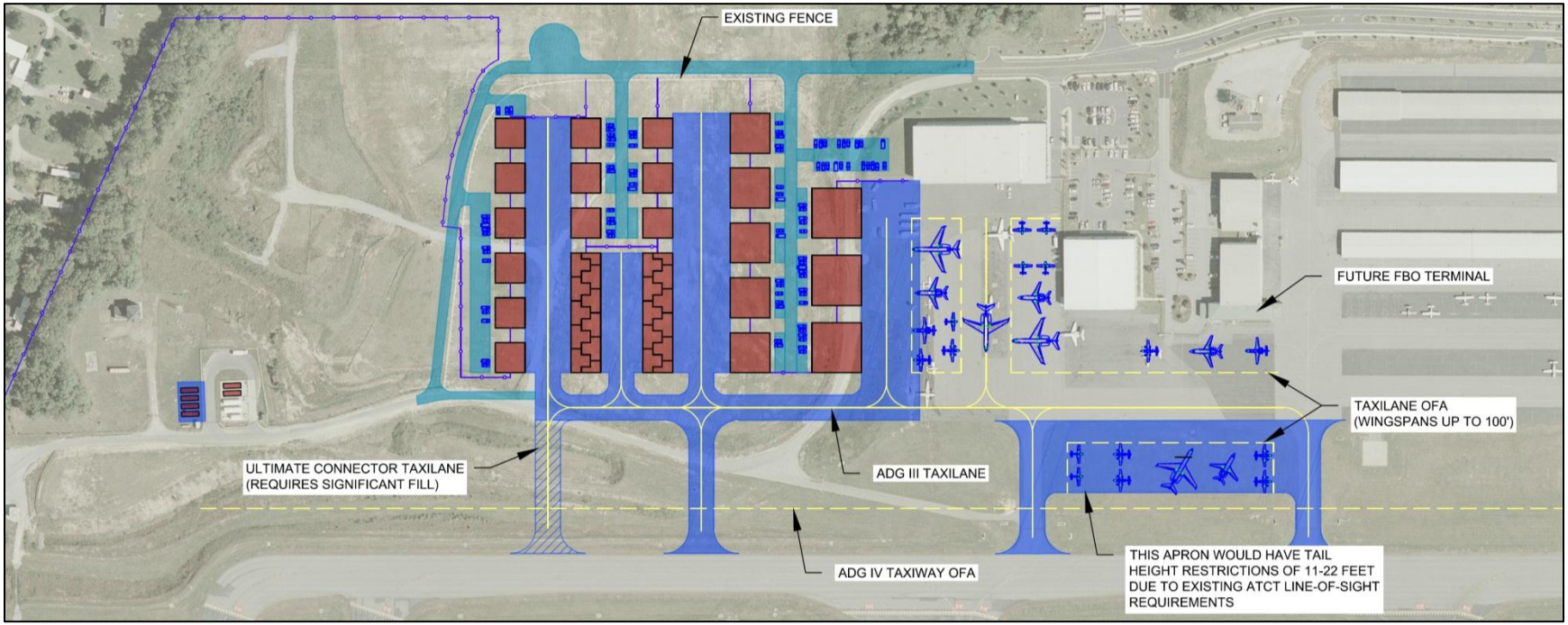
- **Economic Factors –** Expanding general aviation infrastructure offers an opportunity for the Airport to earn additional aeronautical-related revenue through hangar rents, building leases, increased fuel flowage fees and landing fees as a result of the increased number of based aircraft. The layout also offers the most cost-effective solution for expanding general aviation facilities within the existing fence line of the Airport since it offers a way to meet the anticipated demand for box- and T-style hangars without the need for significant fill and grading.

- **Environmental Factors –** Since all facility development is proposed to occur within the existing fence line of the Airport, significant fill and grading will not be necessary due to efforts that have been underway to prepare this land for development. However, erosion and storm water runoff controls may be necessary for any additional fill or grading that may occur within this area for development.

- **Implementation Factors –** Alternative 2c best maximizes the space available within the existing perimeter fence line of the Airport to expand general aviation facilities on the east side of the airfield to meet projected demand. While this is a significant advantage, some hangars will have northward facing doors which are typically not desired at airports which receive snow, ice, and sub-freezing temperatures during the winter months. In addition, tail height restrictions may be necessary for aircraft parked on the itinerant apron expansion between Taxiways D1 and D2 due to line-of-sight requirements from the ATCT.

A summary of advantages and disadvantages with GA Expansion Alternative 2c are presented in **Table 5-21**.

Figure 5-17: Alternative 17 – General Aviation Expansion Alternative 2c



Source: Mead & Hunt, Inc. (2012)

Table 5-21: Alternative 17 Summary

Advantages	Disadvantages
• Provides sufficient hangar space to meet demand • Provides additional itinerant aircraft parking in close proximity to future FBO terminal • Provides variety of box-style hangar sizes • Can be implemented incrementally over time • Cost effective option to meet anticipated hangar demand within existing perimeter fence line of Airport • Offers opportunity for Airport to increase aeronautical related revenue through hangar rents and leases • Significant fill and grade is not necessary	• Some hangars have north facing doors • Apron expansion towards Taxiway A would have tail height restrictions due to ATCT line-of-sight requirements

5.8.e Alternative 18 – General Aviation Expansion Alternative 3

General Aviation Expansion Alternative 3, presented in **Figure 5-18**, was prepared to illustrate how an expansion of the general aviation area could be developed without the need for northward facing hangars. The configuration of taxilanes, hangar aprons, and connector taxiways supports development of three 100- by 100-foot box-style hangars, four 80- by 80-foot box-style hangars, ten 60- by 60- foot box-style hangars, and three T-style hangar structures each capable of housing 10 aircraft. Expansion of the north apron is also proposed by this alternative through an approximate 49,900 square foot expansion towards Taxiway A, which would be located between Taxiways D1 and D2, and an approximate 69,770 square foot expansion to the north of Landmark Aviation. Landside improvements proposed by this alternative include the development of access roads, parking lots, and an extension of Wright Brothers Way to support the hangar development.

- **Operational Factors –** The anticipated demand for box- and T-style hangars throughout the planning period would be met with this alternative without the need for northward facing hangars. This orientation of hangar structures would allow sunlight from the south during the winter months to assist in melting of snow and ice away from all hangar doors. General Aviation Expansion Alternative 3 would also provide additional itinerant aircraft parking in close proximity to the future FBO terminal.

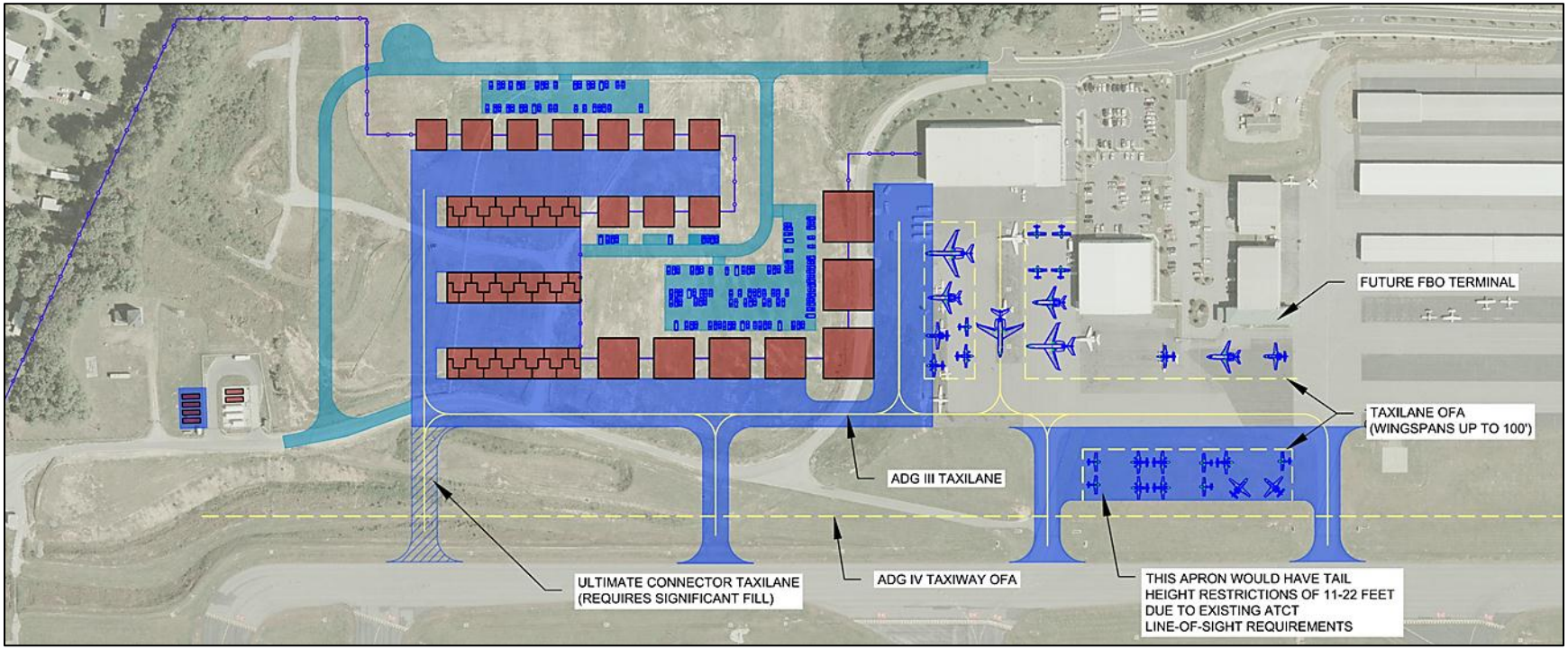
- **Economic Factors –** Expanding general aviation infrastructure would offer an opportunity for the Airport to earn additional aeronautical-related revenue through hangar rents and leases as well as through fees collected from fuel purchases and landings as a result of increased aviation activity. However, consideration should be given to the significant cost that would be necessary to prepare the site for development as a result of the fill material that would be needed to level the topography of the land which varies 40 to 50 feet from the elevation of the airfield in some areas.

- **Environmental Factors –** Significant fill would be needed to prepare the site for the development since the topography of the land varies 40 to 50 feet in some areas from the elevation of the airfield. Erosion and storm water runoff controls would need to be implemented during the process of filling and grading the land for development, which would mitigate and prevent any impacts to the surrounding environment.

- **Implementation Factors –** While the proposed layout eliminates the need for northward facing hangar doors, it would only provide a single taxi route for aircraft to access the T-style and 60- by 60-foot box-style hangars. Also, expansion of the north apron towards Taxiway A may result in tail height restrictions that vary between 11 and 22 feet for aircraft parked on the surface due to line-of-sight requirements from the ATCT.

A summary of GA expansion Alternative 3 advantages and disadvantages is presented in **Table 5-22**.

Figure 5-18: Alternative 18 – General Aviation Expansion Alternative 3



Mead & Hunt, Inc. (2012)

Table 5-22: Alternative 18 Summary

Advantages	Disadvantages
• Provides sufficient hangar space to meet demand • No northward facing hangar doors • Provides additional itinerant aircraft parking in close proximity to future FBO terminal • Offers opportunity for Airport to increase aeronautical related revenue through hangar rents and leases	• Significant fill and grade needed, resulting in increased project costs • A single taxi route is available for aircraft to access the T-style and 60 by 60 foot box-style hangars • Apron expansion towards Taxiway A would have tail height restrictions due to ATCT line-of-sight requirements

5.8.f General Aviation Expansion Recommended Alternative

It is recommended that Alternative 17 – General Aviation Expansion Alternative 2c be considered as the preferred development plan to expand general aviation infrastructure on the east side of the airfield. Alternative 2c is similar to the other general aviation expansion alternatives in that it would provide a variety of box-style hangar sizes that could be incrementally implemented over time to meet the demand projected for the planning period. In addition, it also would provide a sufficient number of T-style hangar units to meet the demand that is projected for the planning period. Unlike the other alternatives, Alternative 2c offers the most cost-effective way to expand general aviation infrastructure since all facility development would occur within the existing airfield perimeter fence line of the Airport. Land within the existing airfield perimeter fence line to the north of the existing general aviation area has been initially prepared for development through a fly ash fill material project. Topography of the land to the north of the airfield perimeter fence line in this area varies 40 to 50 feet in places from the elevation of the airfield, requiring significant fill if development were to occur within this area.

Alternative 2c requires that some hangars have northward facing doors, which are typically undesired at airports that experience snow, ice, and sub-freezing temperatures for prolong periods during the winter season. , The angle of sunlight from the south during the winter cannot assist in the melting of snow and ice buildup on the front of northward facing hangar doors. This is often a factor that is considered by pilots and aircraft owners when deciding to lease, rent, or construct a hangar in locations that are subjected to snow, ice, and below-freezing temperatures. Although the Airport experiences snowfall and ice, it is not typically subjected to below freezing temperatures for prolong periods; therefore, the buildup of these contaminates on pavement surfaces often melt away after only a few days due to air temperatures. As such, it is not anticipated that construction of northward facing hangars will be a significant detrimental factor in the development of the site for expanded general aviation facilities.

Alternative 2c also provides additional itinerant aircraft parking within close proximity of the future FBO building where pilots, passengers, and flight crews originate and depart for flights. It should be noted that construction of this apron expansion towards Taxiway A between Taxiways D1 and D2 may require the ATCT to accept some minor line-of-sight shadowing on Taxiway A or a tail height restriction letter agreement between the Airport, FBO, and ATCT. Pending the location of the aircraft parked on the apron expansion, tail heights may be restricted between 11 to 20 feet. Though this may limit the use of the apron to park larger general aviation aircraft such as Gulfsteams, Global Expresses, and some Dassault Falcon and Bombardier manufactured business aircraft, it is still anticipated to have significant usefulness even with tail height restrictions. Given that the ATCT may be eventually relocated resulting in the possible removal or increase of tail height restrictions for aircraft parked on the apron expansion, it is recommended General Aviation Expansion Alternative 2c (Alternative 17) be considered as the development plan to expand general aviation infrastructure at the Airport to meet demand projected for the planning period.

5.8.g Alternative 19 – Northwest Development Area Expansion Alternative

Significant land within the existing property line of the Airport is available for a combination of aeronautical and non-aeronautical development to the west of Runway 16/34. One site near the approach end of Runway 16, designated the Northwest Development Area, is well suited to support these uses and serve

as a supplemental area for general aviation infrastructure development. This area should be considered as a long-term planning option for expanding general aviation infrastructure at the Airport after the build-out of facilities on the east side of the airfield or when sufficient. In an effort to preserve this land for the additional expansion of general aviation facilities, Alternative 19 was prepared to illustrate how the site could be developed for a variety of aeronautical and non-aeronautical uses.

Alternative 19 proposes the construction of connector taxiways, aprons, and taxilanes that would be capable of support aircraft types up to Airplane Design Group III, which includes most business jets such as Gulfstreams, Dassault Falcons and the Bombardier Global Express. A west side parallel taxiway would provide airside access to the Northwest Development Area which is anticipated to be constructed as part of a runway relocation and airfield improvement project. The configuration of taxilanes and apron space proposed by Alternative 19 would be capable of supporting a variety of box-style hangar sizes capable of supporting aeronautical-related activities such as general aviation aircraft manufacturing and maintenance, corporate aircraft storage, and charter aircraft operations. Approximately 74 acres of land in Alternative 19 is reserved for non-aeronautical development and can include a variety of uses such as light industrial manufacturing facilities, warehouses, public storage facilities, and distribution centers. Landside access to the aeronautical and non-aeronautical facilities would be provided through an extension of Pinner Road and the construction of additional access roads and vehicle parking lots. It should be noted that all development within the Northwest Development Area would be planned for outside of the French Broad River flood plain boundary to the west.

- **Operational Factors –** Alternative 19 offers a long-term expansion plan for general aviation infrastructure that would be capable of meeting demand well beyond the planning period. It also offers an opportunity to utilize this property for non-aeronautical uses such as commercial and non-commercial development that might benefit from being in close proximity to the Airport.

- **Economic Factors –** The expansion of aeronautical and non-aeronautical facilities within this area would offer an opportunity for the Airport to collect additional revenue through rents, leases, and other contractual development agreements. Consideration should be given to the cost necessary to fill and grade the site for development as a result of the varying topography within this area.

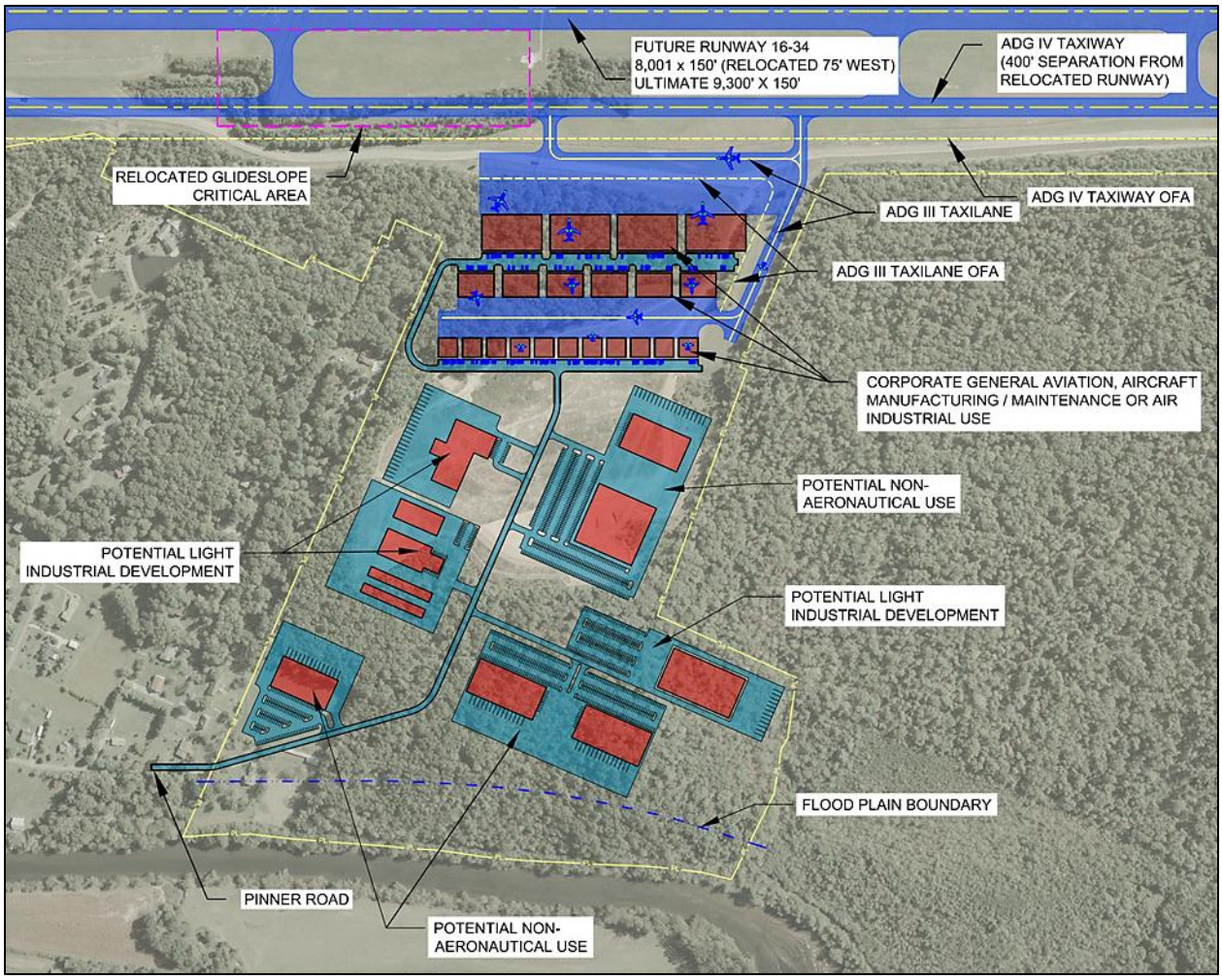
- **Environmental Factors –** The topography of the land within this area varies significantly from the elevation of the airfield and would require considerable fill and grading to prepare it for development. Erosion prevention measures, storm water runoff controls, and other measures to preserve water quality will be necessary due to the proximity to the French Broad River. Consideration should also be given to the potential environmental and quality of life impacts of increased commercial truck traffic on Pinner Road that would be traveling through existing residential areas.

- **Implementation Factors –** This site is rather isolated from the infrastructure on the east side of the airfield; significant taxiway and roadway infrastructure improvements would be necessary to prepare the site for development. Construction of a west side parallel taxiway would be

necessary to provide airside access to the site for aeronautical activities while an extension of Pinner Road and construction of access roads and parking lots would be needed to provide landside access to the site. Additional improvements to the condition and strength of pavement on the existing segment of Pinner Road may be necessary if significant truck traffic is anticipated as a result of commercial and non-commercial development within the Northwest Development Area.

Figure 5-19 illustrates Alternative 19 while advantages and disadvantages are discussed in **Table 5-23**.

Figure 5-19: Alternative 19 – Northwest Development Area Expansion Alternative



Source: Mead & Hunt, Inc. (2012)

Table 5-23: Alternative 19 Summary

Advantages	Disadvantages
• Supplemental site for long-term general aviation infrastructure expansion • Site for non-aeronautical development • Opportunity for additional aeronautical and non-aeronautical related revenue	• Significant fill and grading needed • Cost for fill and grading • Airside and landside improvements needed for access

5.9 Vehicle Parking

Currently, there is an immediate need for additional parking capacity at the Airport to meet existing and projected demand. As illustrated in the parking supply/demand summary presented in **Table 5-24**, the demand for public parking is anticipated to grow from 1,482 spaces in 2010 to 2,065 spaces in 2030, resulting in a need for 600 additional public parking spaces. Additional parking capacity is also needed in the rental car ready/return lot to meet demand; a deficit of 29 spaces existed in 2010 and is projected to grow to a deficit of 83 parking spaces by 2030. Walker Parking Consultants was tasked with the development and evaluation of alternatives to increase parking capacity at the Airport so that a recommended plan can be implemented to meet the demand for parking throughout the planning period. The follow sections reviews methods that are available to expand parking capacity, presents a series of alternatives, analyzes the advantages and disadvantages of each, and recommends a course of action that should be taken to expand parking infrastructure at the Airport once funding becomes available.

Table 5-24: Parking Supply/Demand Summary

Year	Projected Annual Enpl.	Public Parking			Employee Parking			Rental Ready/ Return			Total		
		Projected Parking Demand	Parking Supply	Parking Surplus/ (Deficit)	Projected Parking Demand	Parking Supply	Parking Surplus/ (Deficit)	Projected Parking Demand	Parking Supply	Parking Surplus/ (Deficit)	Parking Supply	Parking Demand	Surplus/ (Deficit)
2010	378,087	1,482	1,465	(17)	238	381	143	136	107	(29)	1,953	1,856	97
2015	410,793	1,610	1,465	(145)	263	381	118	148	107	(41)	1,953	2,021	(68)
2020	446,328	1,750	1,465	(285)	286	381	95	161	107	(54)	1,953	2,197	(244)
2025	484,937	1,901	1,465	(436)	310	381	71	175	107	(68)	1,953	2,386	(433)
2030	526,886	2,065	1,465	(600)	337	381	44	190	107	(83)	1,953	2,592	(639)

Source: Walker Parking Consultants (2012)

Notes: 1 – Parking supply figures exclude the 4 visitor spaces at the Maintenance Facility and the 578 RAC storage spaces.

5.9.a Short-Term, Premium, and Rental Car Ready/Return Parking

The duration of short term parking at an airport is generally considered to range from three to four hours or less. Patrons who use short-term parking are generally spending a short period of time at an airport to pick up, drop off, or meet and greet passengers prior to or after flights. At most airports, this user group comprises of two-thirds to three-quarters of all parking transactions; however, because the duration of the stays are short and turnover in the short term lot is high, only about three to five percent of the total public parking supply is needed to accommodate short term demand. Since this is the largest group of parking customers by far, and due to the fact that stays are short, the most convenient spaces at an airport are usually reserved for short term parking with appropriate measures taken to assure that adequate short term parking is available.

At the Airport, 193 of the total 1,465 public spaces are designated short-term, or 13 percent of the available capacity. The parking occupancy counts examined as part of the parking supply/demand analysis revealed that on average 70 spaces in the short-term lot were occupied overnight with a maximum around 120 spaces each month. Thus, a large number of parking patrons are using the short-term lot as a de facto premium parking area and are willing to pay the premium overnight charge for the chance to park as close as possible to the terminal. Another contributing factor may be that the long-term lot becomes congested and the user is willing to pay the premium rather than park in the overflow long-

term parking lots that have a longer and uphill walk to the terminal. In any event, there is a readily identified group of parking patrons who use the Airport that are willing to pay a premium price for a premium service.

In addition, the current rental car ready/return lot, located adjacent to the terminal at its south end, has inadequate capacity to meet existing demand and is very difficult to expand due to surrounding topography. As more ready/return capacity is needed, a decision must be made whether the ready/return operation will be in one location, or if the operation will be split by retaining the existing lot and creating more spaces elsewhere. If the operation moves completely to another location, then the ready/return lot would be available for another use.

The above two circumstances – premium parkers who need a "home" and a vacant lot immediately next to the terminal – create an opportunity. We recommend that the Airport consider relocating the rental car ready/return operation to another location and create a new premium parking product using the existing rental car ready/return lot. Such an initiative may take on the following characteristics:

- The lot is converted to a premium frequent parking lot with entry and exit via a credential such as a proximity card or an Automatic Vehicle Identification (AVI) tag.
- Patrons sign up for the frequent parker program to receive their credential and pay an annual or monthly fee.
- When a patron parks in the lot, his or her credit card on file is automatically charged and they receive a receipt via email the next day or they are billed monthly based on usage.
- The fee for parking overnight in the short-term lot is raised substantially, so that the lot is reserved and available for the true short-term parker. The hourly fee does not need to be changed. The idea is not to charge the true short-term parker more, but to encourage the premium parker to park elsewhere so that spaces are available for true short-term parkers.
- The fee for parking in the premium frequent parker lot is set higher than the long-term overnight rate, but lower than the new short-term overnight rate, reflecting the higher level of service provided.

5.9.b Options To Expand Long-Term Parking Infrastructure

Construction of a parking garage or the use of a remote parking lot accessed by shuttle buses (also known as a "shuttle lot") are two feasible options to expand long-term parking infrastructure at the Airport. Each type of facility has relative advantages and disadvantages. Parking garages offer the advantage of placing a large concentration of spaces in a convenient location for users. Most of the parking spaces in a garage are covered and protected from the elements and can be phased to meet growing demand. While they are expensive to build, they usually create more net revenue for an airport because they are relatively inexpensive to operate and the parking fees can be high compared to further, less convenient locations.

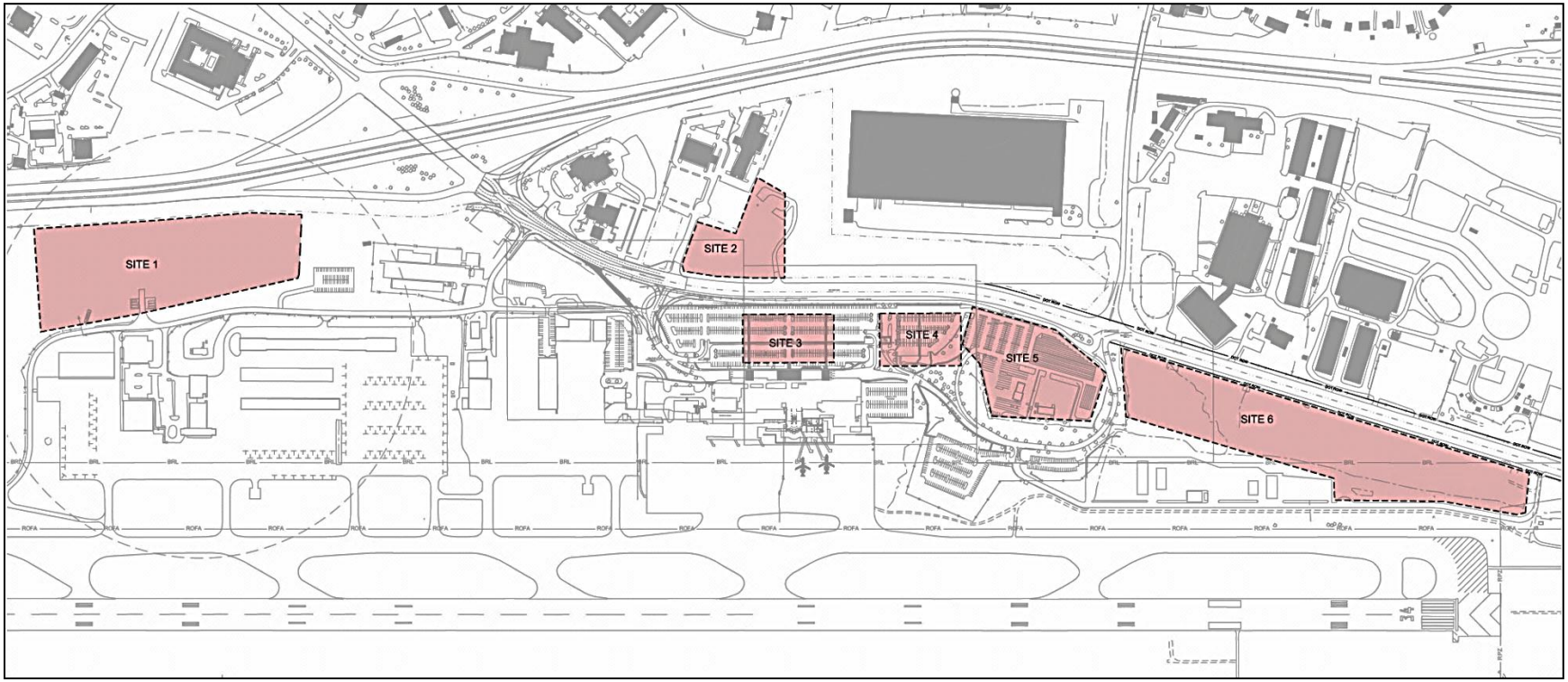
Remote parking lots with shuttle service to the terminal are usually inexpensive to develop but are expensive to operate due to the shuttle bus service. To provide an acceptable level of service to the user, buses must run frequently and must begin service well before the first flight in the morning and

continue to operate well after the last flight arrives at night. Since the level of service to the user is low compared to other options, parking fees are often lower compared to garages and lots nearer to the terminal building. Low fees combined with high operating costs limit the net revenue that can be generated by these facilities.

It is recommended that the Airport consider both parking garage and shuttle lot options to meet its parking needs, so that all the relative advantages and disadvantages can be considered when moving forward with a recommended parking infrastructure improvement plan. **Figure 5-20** identifies six sites on Airport property that are available to expand parking infrastructure either through the construction of a parking garage or a remote shuttle lot. The following alternatives highlight various ways each site can be developed for the expansion of parking infrastructure at the Airport.

It should be noted that the shuttle lot alternatives include a designation of a shuttle bus route that would enter, exit, and circulate through the lot. Also, each of the sites identified for shuttle lot development are currently vacant so there would be no displacement of existing surface lot spaces during construction. A temporary reduction in capacity would be necessary during construction of a parking garage since these alternatives occur on sites where there is currently surface parking. It is anticipated that during construction of a parking garage, up to 280 spaces would be temporarily displaced. Replacement of these displaced spaces would need to be incorporated into the final design of the garage. In addition, should a future curb lane be constructed in front of the terminal building, an additional 54 spaces would also need to be recuperated into the design of the parking garages proposed at each site.

Figure 5-20: Parking Alternative Sites



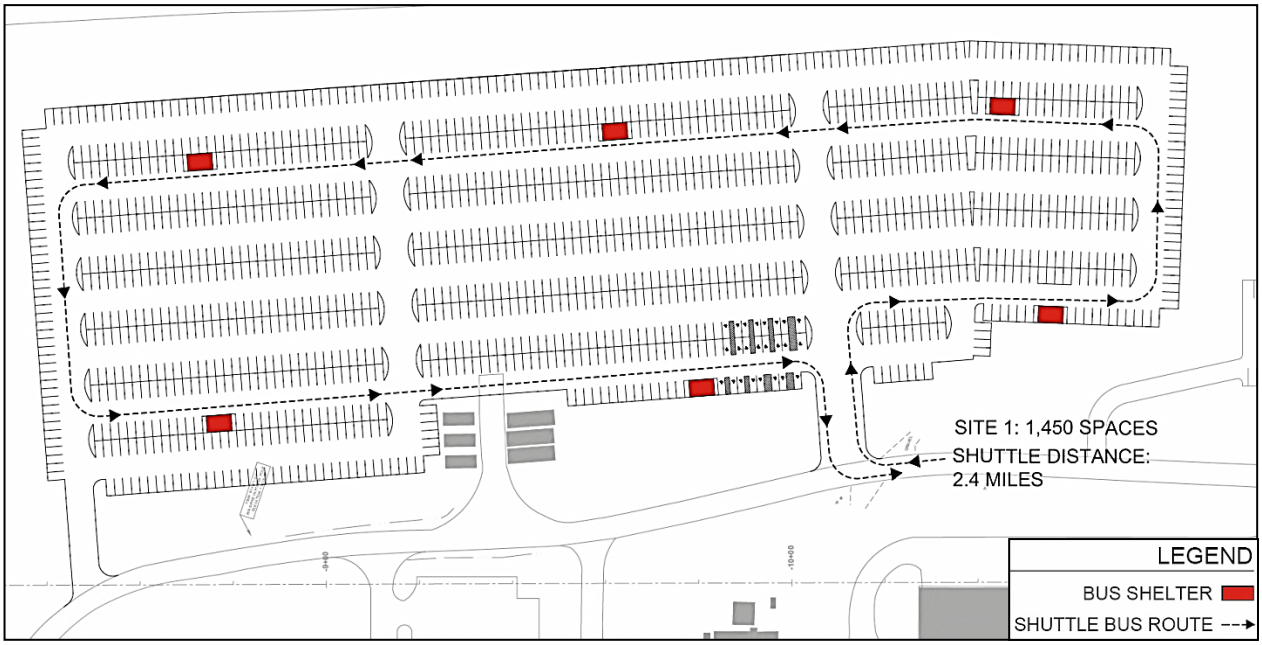
Source: Walker Parking Consultants (2012)

5.9.c Alternative 20 – Shuttle Lot at Site 1

A shuttle lot developed at Site 1 identified in **Figure 5-21** is located on Wright Brothers Way east of the Landmark Aviation facility and would accommodate approximately 1,450 spaces, well more than the number projected throughout the 2030 planning horizon. Thus, only a portion of the lot as illustrated would be required to meet the anticipated demand. Routing of the shuttle bus to access this lot is anticipated to be quite circuitous and its location would not be obvious to vehicles entering the Airport. Access to this lot would need to be enhanced by the new Airport entrance planned as a result of the Interstate 26/North Carolina Route 280 interchange redesign project. The shuttle route to, from, and through this lot would total 2.4 miles. Three shuttle buses would be needed to operate at all times to maintain a maximum shuttle bus wait time of about five minutes.

The relative advantages and disadvantages of this alternative are summarized in **Table 5-25**.

Figure 5-21: Alternative 20 – Shuttle Lot at Site 1



Source: Walker Parking Consultants (2012)

Table 5-25: Alternative 20 Summary

Advantages	Disadvantages
• More than enough area to meet demand • Can easily be phased • All spaces are a net add to the supply • No existing spaces are displaced • Shuttle route entirely on Airport property	• Route to reach lot is not intuitive with traffic flow to terminal building • Access to lot is difficult

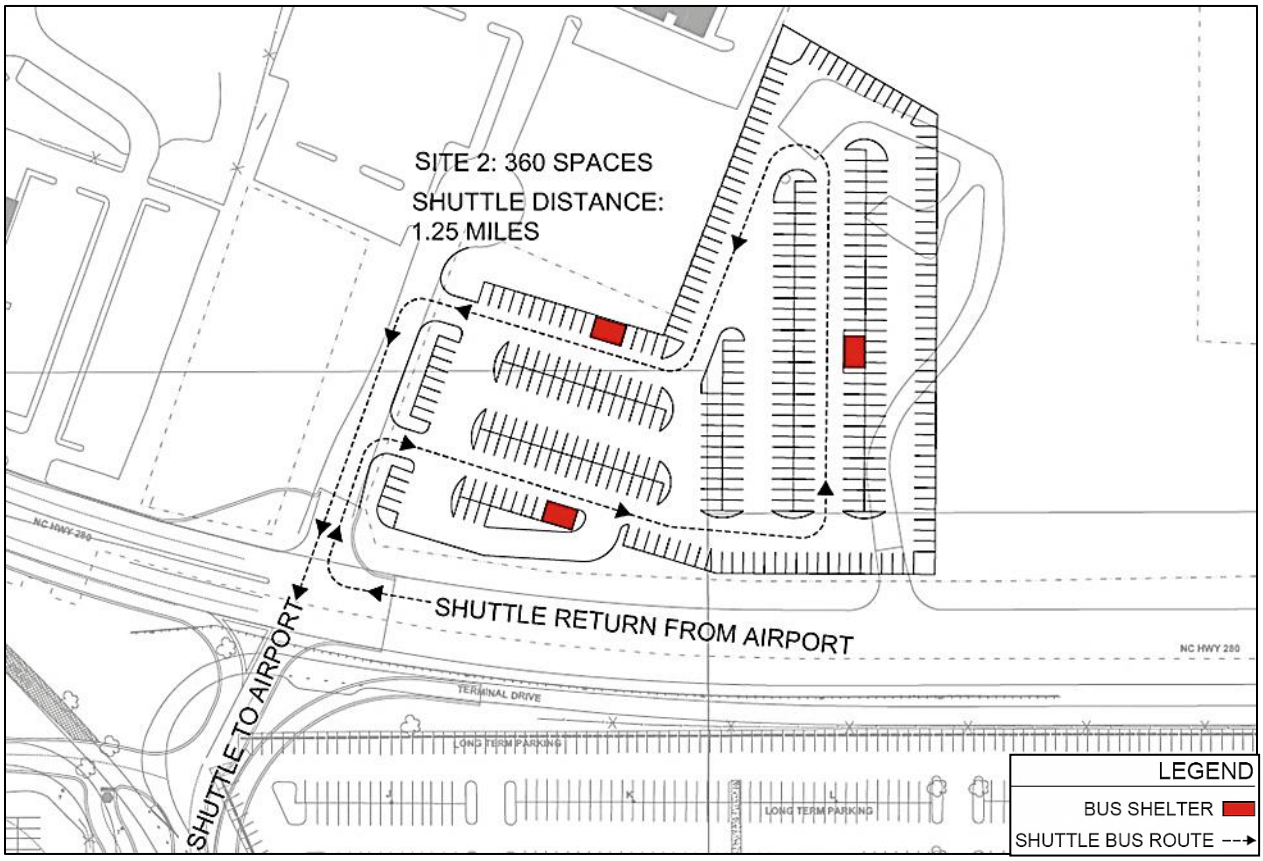
5.9.d Alternative 21 – Shuttle Lot at Site 2

Alternative 21 (**Figure 5-22**) proposes a shuttle lot at Site 2 located east of North Carolina 280 on Airport property at the southeast corner of Airport Park Road and North Carolina 280. Approximately 360 spaces

could be developed on this site, though it would not be enough to satisfy the Airport's needs through the planning period. It would be sufficient to meet the demand for parking until 2020 or 2025 according to parking demand forecasts. Access to and from the lot would occur via a traffic signal at Airport Park Road and North Carolina 280. The shuttle route to, from, and through this lot would be approximately 1.25 miles long and two buses would be necessary to operate at all times in order to maintain a maximum shuttle bus wait time of approximately four minutes.

The advantages and disadvantages of Alternative 21 are summarized in **Table 5-26**.

Figure 5-22: Alternative 21 – Shuttle Lot at Site 2



Source: Walker Parking Consultants (2012)

Table 5-26: Alternative 21 Summary

Advantages	Disadvantages
• All spaces are an addition to existing capacity; no existing spaces are displaced • Provides capacity to meet demand through 2020 • Lot is well visible from North Carolina 280	• Lot cannot be expanded to meet the Airport's long term needs • Shuttle bus route must access North Carolina 280 • Wayfinding to the lot may be difficult as it is located across North Carolina Route 280 away from the terminal • Site may be more appropriate for commercial development

5.9.e Alternative 22 – Parking Garage at Site 3

Construction of a parking garage at Site 3 located directly in front of the terminal building would need a capacity of 1,017 spaces to meet the demand projected through 2030. It would replace existing surface lot spaces that would be displaced by the construction of both the garage itself and a commercial vehicle curb lane. A summary of the needed parking capacity for a garage at Site 3 is presented in **Table 5-27** and assumes the existing rental car ready/return lot is converted into a premium frequent parker lot. It also assumes that a maximum of 280 existing parking spaces would be displaced with construction of a parking garage.

Table 5-27: Site 3 Parking Garage Capacity Projections

Year	Public Deficit	Premium Pkg Capacity in former R/R Lot	Rental Car Ready/Return Demand	Displaced by Commercial Vehicle Curb	Subtotal	Existing Spaces Displaced	Garage Spaces Needed
2010	17	-107	136	54	100	280	380
2015	145	-107	148	54	240	280	520
2020	285	-107	161	54	393	280	673
2025	436	-107	175	54	558	280	838
2030	600	-107	190	54	737	280	1,017

Source: Walker Parking Consultants (2012)

Alternative 22 (illustrated in **Figure 5-23**) proposes a parking garage at Site 3 with four levels that would include short-term and rental car ready/return parking on the ground level. This would give a maximum level of service to these two user groups with long-term parking spaces designated for the upper levels. Vertical vehicular circulation would be achieved through an express ramp system and parking spaces on all levels would be on level floors. It should be noted that the garage could be designed and phased for additional vertical expansion. A small number of short-term parking spaces and approximately half of the rental car ready/return spaces would be uncovered with both lots located adjacent to the garage. The existing access to the short- and long-term parking lots from Terminal Drive would also be used to provide access to the garage.

The advantages and disadvantages of Alternative 22 are summarized on the following page in **Table 5-28**.

Figure 5-23: Alternative 22 – Parking Garage at Site 3

Source: Walker Parking Consultants (2012)

Table 5-28: Alternative 22 Summary

Advantages	Disadvantages
• Locates the maximum number of parking spaces in the most convenient location • All rental car ready/return spaces are in the same location	• Approximately half of the rental car ready/return spaces are uncovered • Garage blocks the view between North Carolina 280 and terminal building • Long-term vertical expansions of garage could impact line of sight from existing ATCT

5.9.f Alternative 23 – Parking Garage at Site 4

Alternative 23 proposes the construction of a parking garage at Site 4, which would be located on the site of the existing exit plaza and portion of the long-term lot to the south. This garage would feature four levels and due to the topography of the site, only the top level would be above the grade of the terminal roadway at the northwest corner of the garage nearest the terminal. Rental car ready/return spaces would be located on the "grade" level nearest the terminal (Level 3 of the garage), with long-term parking on the other levels. Access to the two lowest levels would occur through a roadway leading to the overflow parking and the relocated exit plaza. Floor-to-floor circulation of traffic would be made available through an express ramp system located along the south edge. This garage alternative would require fewer spaces than the proposed Site 3 garage because fewer existing surface lot spaces would be displaced during construction. **Table 5-29** illustrates the needed capacity for a garage at Site 4 and assumes the existing rental car ready/return lot is converted to a premium frequent parker lot.

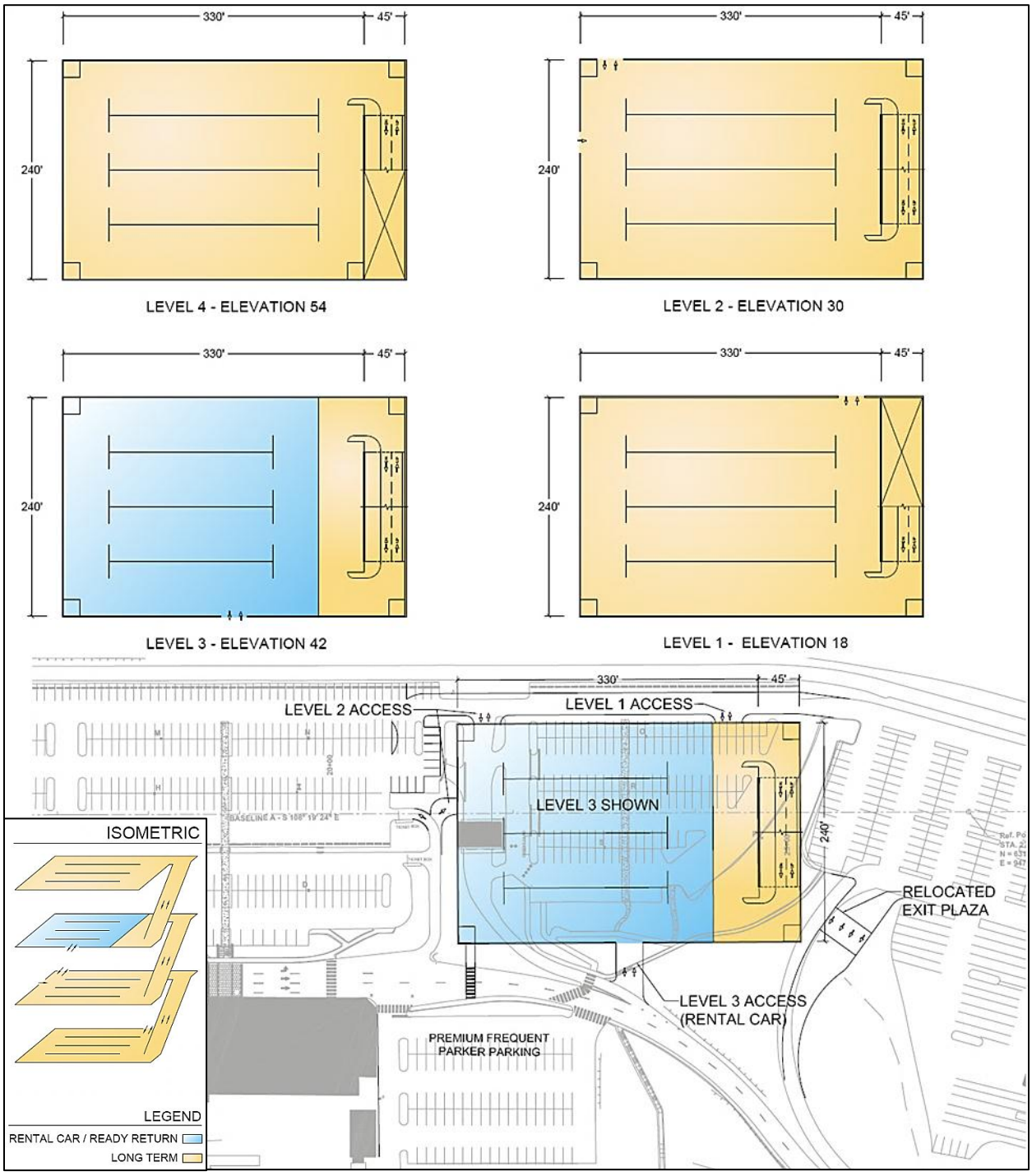
Table 5-29: Site 4 Parking Garage Capacity Projections

Year	Public Deficit	Premium Pkg Capacity in former R/R Lot	Rental Car Ready/Return Demand	Displaced by Commercial Vehicle Curb	Subtotal	Existing Spaces Displaced	Garage Spaces Needed
2010	17	-107	136	54	100	174	274
2015	145	-107	148	54	240	174	414
2020	285	-107	161	54	393	174	567
2025	436	-107	175	54	558	174	732
2030	600	-107	190	54	737	174	911

Source: Walker Parking Consultants (2012)

Figure 5-24 on the following page graphically illustrates the parking garage proposed for Site 4 while **Table 5-30** (located on Page 5-69) summarizes its advantages and disadvantages.

Figure 5-24: Alternative 23 – Parking Garage at Site 4



Source: Walker Parking Consultants (2012)

Table 5-30: Alternative 23 Summary	
Advantages	**Disadvantages**
• All rental car ready/return spaces are covered • Garage has a low profile; due to topography, only one level is above the terminal roadway • Fewer existing surface lot parking spaces are displaced	• Not as convenient to the terminal • Lower levels may need to be sprinkled and ventilated, increasing cost • Exit plaza may need to be relocated

5.9.g Alternative 24 – Parking Garage at Site 5

Alternative 24 proposes a parking garage at Site 5 which would be located within the existing overflow long-term parking lot. It would contain four levels to meet the projected demand for parking. Due to the topography of the site, the entire garage would be at or below the ground floor elevation of the terminal, thus eliminating concerns about visibility between North Carolina 280 and the terminal building. With this alternative, rental car ready/return parking would be relocated to the site of the current exit plaza and a portion of the existing overflow long-term parking lot to the south. Floor-to-floor vehicular circulation in the garage would be provided via an express ramp system along the south edge of the structure. Pedestrian access to and from the terminal would be provided via an elevated pedestrian walkway from the top level of the garage, which would cross over Terminal Drive and parallel an existing sidewalk. The walk from the center of the garage to the nearest corner of the terminal would be approximately 850 feet, or the distance of about two city blocks. It should be noted that the Airport may want to study the possibility of locating rental car ready/return spaces in the garage, if this option is desired.

Construction of a parking garage at Site 5 would require fewer parking spaces than a parking garage located at Site 3 or Site 4 since fewer existing surface lot spaces would be displaced. **Table 5-31** shown below illustrates the capacity that would be needed for a garage at Site 5, assuming the existing rental car ready/return lot would be converted to a premium frequent parker lot.

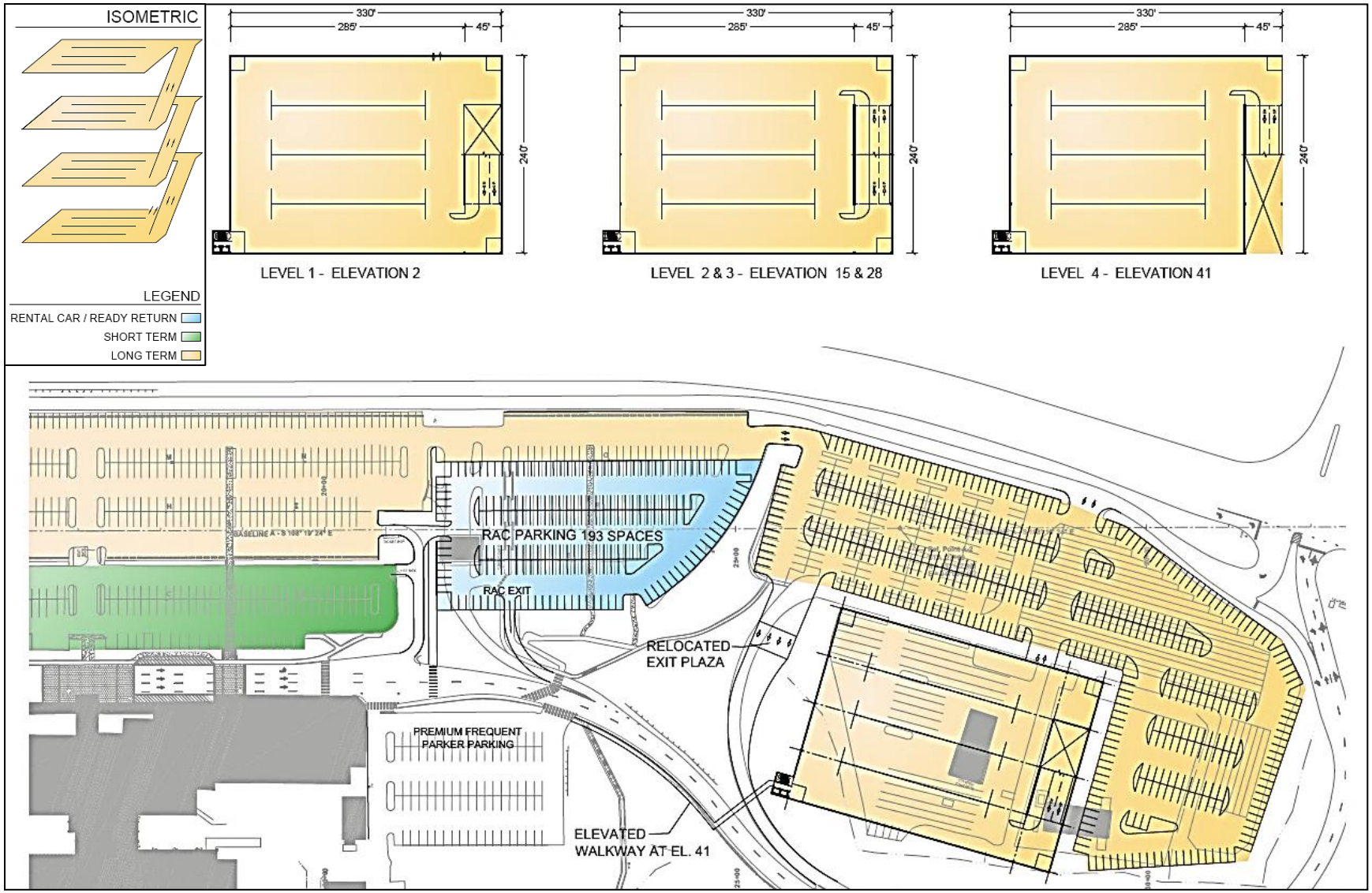
Table 5-31: Site 5 Parking Garage Capacity Projections

Year	Public Deficit	Premium Pkg Capacity in former R/R Lot	Rental Car Ready/Return Demand	Displaced by Commercial Vehicle Curb	Subtotal	Existing Spaces Displaced	Garage Spaces Needed
2010	17	-107	136	54	100	120	220
2015	145	-107	148	54	240	120	360
2020	285	-107	161	54	393	120	513
2025	436	-107	175	54	558	120	678
2030	600	-107	190	54	737	120	857

Source: Walker Parking Consultants (2012)

An illustration of Alternative 24 is presented in **Figure 5-25** while advantages and disadvantages of the construction of a garage at Site 5 are presented on Page 5-71 in **Table 5-32**.

Figure 5-25: Alternative 24 – Parking Garage at Site 5



Source: Walker Parking Consultants (2012)

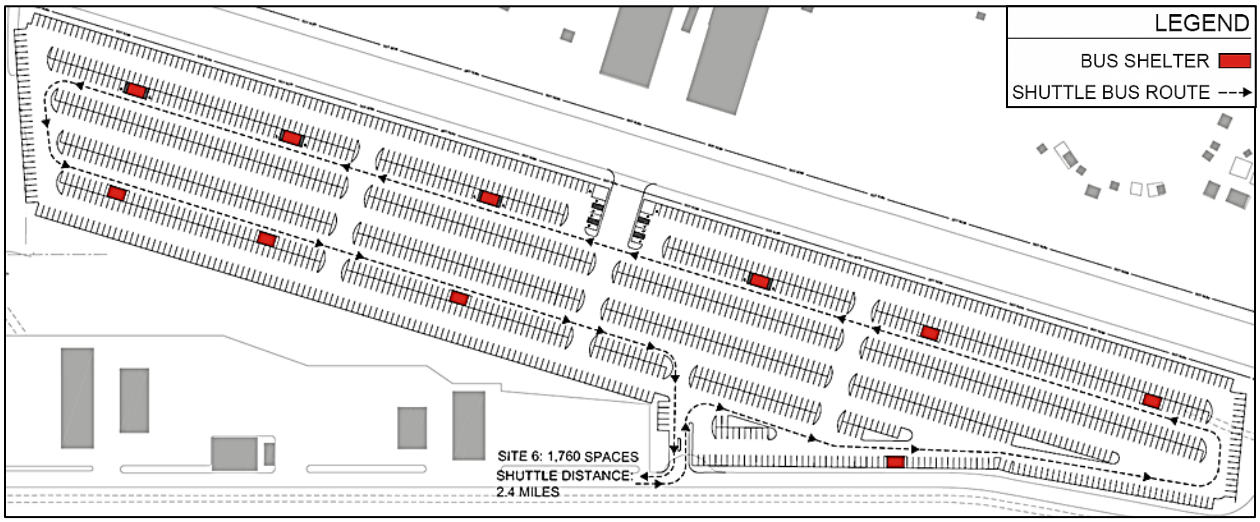
Table 5-32: Alternative 24 Summary	
Advantages	**Disadvantages**
• Parking garage has a low profile; due to the topography of the site, there would be little or no visual impacts on the view between North Carolina 280 and the terminal building • Fewer existing long-term surface lot spaces are displaced than a garage at Site 3 and Site 5 • All rental car ready/return spaces are in the same location and are in close proximity to baggage claim	• Not as convenient to the terminal, especially to the ticketing entrance • The walk from the center of the garage to nearest terminal entrance is over two blocks long • Construction of an elevated walkway increases cost to the project • Exit plaza relocation is necessary to allow sufficient space for rental car ready/return parking

5.9.h Alternative 25 – Shuttle Lot at Site 6

Alternative 25, as illustrated in **Figure 5-26**, proposes the construction of a shuttle lot on Airport property between North Carolina 280 and the rental car service facility south of the main Airport entrance; public access to the lot would be made available through North Carolina Route 280. Alternative 25 proposes 1,760 parking spaces at Site 6, which is almost three times the number of spaces needed to meet the demand projected for the Airport through the 2030 planning period. Therefore, a shuttle lot could be developed for public parking while still reserving a large portion of the site for other uses, including commercial development and/or the eventual expansion of the rental car service facility. The shuttle bus route to, from, and through the lot would total 2.4 miles and would enter and exit the lot through access from Rental Car Drive. Three buses would need to be in continual operation throughout the shuttle bus circuit in order to maintain a maximum wait time between buses of approximately 5 minutes. Construction of fewer parking spaces within Site 6 may reduce the wait time necessary between buses and/or require two buses to be in continual operation throughout the circuit.

The advantages and disadvantages of Alternative 25 are presented in **Table 5-33**.

Figure 5-26: Alternative 25 – Shuttle Lot at Site 6



Source: Walker Parking Consultants (2012)

Table 5-33: Alternative 25 Summary	
Advantages	**Disadvantages**
• More than enough area to meet demand • Only development of a portion of the site is needed to meet parking demand • Public access to the site made possible from North Carolina 280 • All spaces are a net addition to supply; no existing spaces are displaced • Shuttle bus route entirely on Airport	• Alternative uses land that could be better suited to support future commercial and non-commercial development

5.9.i Parking Expansion Alternative Financial Feasibility Analysis

In an effort to determine the most financially feasible alternative to expand parking at the Airport, an order-of-magnitude cost estimate was prepared to determine the affordability of constructing and operating a parking garage versus a remote shuttle lot. This evaluation reviewed order-of-magnitude cost estimates prepared by Walker Parking Consultants as well as existing parking revenues, expenses, and debt information obtained from the Airport. For cost estimate purposes, it was assumed that the construction of each alternative would not be phased and would be completed as a single project. It was also assumed that the Airport would finance construction of an alternative through taxable revenue bonds and 25-year bonds issued at 5.5 percent. Financing costs such as capitalized interest, a debt service reserve fund, financing fees, and costs of issuance were not factored into the cost estimates.

The following conclusions were made from the financial feasibility analysis determining the affordability of constructing and operating a parking garage versus as remote shuttle lot:

Remote Shuttle Lot – These conclusions assume construction of a 940-space shuttle parking lot.

- Per stall construction cost is estimated to be $2,500 to $3,000 plus 25 percent for project soft costs (planning, design, construction administration, etc.) or $3,125 to $3,750 per space. Assuming $3,500 per stall, the total project cost is estimated at $3,290,000.
- The annual debt service payment for the project is estimated at $242,500.
- The annual cost for a shuttle bus operation assuming 3 shuttle vans are in continual operation for 18 hours a day, 365 days a year, with an hourly cost of $60 is $1,200,000 a year.
- Assuming all 940 parking spaces are constructed at one time and shuttle buses are operating year-round, the total annual operating cost is estimated to be $1,442,500.
- If a remote shuttle lot were constructed immediately, the estimated revenue per passenger would need to increase by 54.3 percent to cover additional debt and operating costs, considering all other factors remain equal.

Parking Garage – These conclusions assume construction of a 1,017-space parking garage.

- The cost to construct a 1,017 space garage at $13,569 per stall is $13,800,000.
- Total project soft costs (planning, design, construction administration, etc.) are estimated at 25 percent of the total construction costs, and are estimated at $3,450,000.

- The total estimated cost for a 1,017 parking garage including construction and soft project costs is $17,250,000.
- The estimated annual debt service cost is $1,271,161.
- The annual operating cost for a parking garage at $650 per space per year is $661,050. This is assuming the Airport incurs annual operating costs for parking operations and incremental costs for structure operations such as elevator maintenance, joint repairs, preventative maintenance, electrical costs, etc.
- If the facility were constructed immediately, the revenue per passenger would need to increase 48 percent to cover additional debt, assuming all other factors remain equal.

In conclusion, it would cost $1.422 million per year to construct, finance, and operate a 940-space remote shuttle lot and $1.271 million per year to construct and finance a 1,017 space garage. However, these figures do not include the incremental costs of operating structured facility over a surface parking lot. A remote shuttle lot with associated shuttle operation will require $151,000 more per year (12%) than a parking garage; however, this variance will decrease over time based on the fact that incremental costs of operating a garage are not factored into this analysis. Therefore, on an order-of-magnitude basis, the costs per year for a remote shuttle lot are roughly equal to the costs per year for a structured parking facility. Since a parking garage provides a higher level of service, it can also demand higher parking fees. Likewise, since a remote shuttle lot provides a lower level of service, it typically generates lower parking fees. Given that costs are roughly equal between the two options, the revenue potential is greater for a parking garage over a remove shuttle lot.

5.9.j Recommended Parking Alternative

It is recommended that the Airport construct a parking garage to meet the demand for parking that is projected for the next 20 years. While the upfront cost to construct a parking garage would be greater than a remote shuttle lot ($17.25 million compared to $3.3 million), its annual operating expense is much less ($661,050 a year as compared to $1.4 million) which results in long-term cost savings for the Airport. In addition, a parking garage also offers a perceived higher level of customer service as compared to a remote shuttle lot. A parking garage that is located in close proximity to the air carrier terminal offers a more desirable parking option for Airport patrons since customers can quickly transfer between their vehicles and the terminal building. If a remote shuttle lot were constructed, customers may be required to wait several minutes for a shuttle in addition to the time it would take for the shuttle to transverse between the lot and terminal building.

Another advantage that supports the recommendation of constructing a parking garage to enhance customers' experience is through the opportunity to consolidate public and rental car ready/return parking into a single location that is close to the terminal building and is protected from weather elements. The current arrangement of parking at the Airport may require long-term parking customers to walk a considerable distance to their vehicles while being exposed to weather elements. Likewise, if a remote shuttle lot were constructed, customers may also be required to walk a considerable distance between their vehicles and the shuttle bus shelters which would also expose them to weather elements. Likewise, existing rental car customers are subjected to the same experience as they are required to exit the terminal and walk around to the side of the building to access the rental car ready/return lot which may be

not be easily located for those patrons who are unfamiliar with the Airport. Consolidating long-term and rental car ready/return parking into a parking garage not only offers protection for customers and vehicles from weather elements, it also serves as an easily identifiable landmark for those unfamiliar with the location of the Airport's parking facilities.

It is also recommended that the Airport undertake a financial feasibility analysis to more thoroughly evaluate the demands for parking so that a plan can be establish to address the financial and preliminary design concepts of a parking garage. The feasibility analysis should review the parking needs of passengers, meeters/greeters, employees, and the rental car agencies relative to historical/forecast originating passenger trends in order to plan for this facility in a timely and prudent manner. This analysis should also more closely examine:

- A phased approach to incrementally provide parking facilities.
- The proposed rate structure for the garage.
- The scope/magnitude of its incremental operating costs.
- A desired parking revenue control system.
- The feasibility of incorporating rental car ready/return spaces into the garage and its financial impacts.
- A clearer definition of the financing costs expected for the issuance of bonds.
- Alternative delivery methods.
- Public/private partnerships for financing/operations.
- Impacts to current surface lot operation during construction and potential need to construct and operate a temporary remote shuttle lot during construction.

While a financial feasibility analysis will more closely evaluate possible locations for a parking garage, it is the desire of the Airport that planning be initiated to preserve a site across from the terminal building as illustrated in Alternative 22 and a site occupied by existing overflow long-term parking lots as identified in Alternative 24. The site illustrated in Alternative 22 offers a location that is closest to the terminal building while the site illustrated in Alternative 24 offers a visually appealing location for a garage due to the surrounding topography which has already been protected by the Airport for the expansion of parking facilities. Preservation of each site is recommended until further evaluation can be conducted as part of the parking garage financial feasibility analysis to identify a location that is most financially viable to the Airport, convenient for customers, and most adequately meets demand throughout the planning period while providing a high level of customer service. It should be noted that the site occupied by existing overflow long-term parking lots as illustrated by Alternative 24 has been identified as Proposed Parking Deck Alternative 1 on the Airport Layout Plan (ALP) drawing set while the site across from the terminal building (Alternative 22) is identified on the ALP as Proposed Parking Deck Alternative 2.

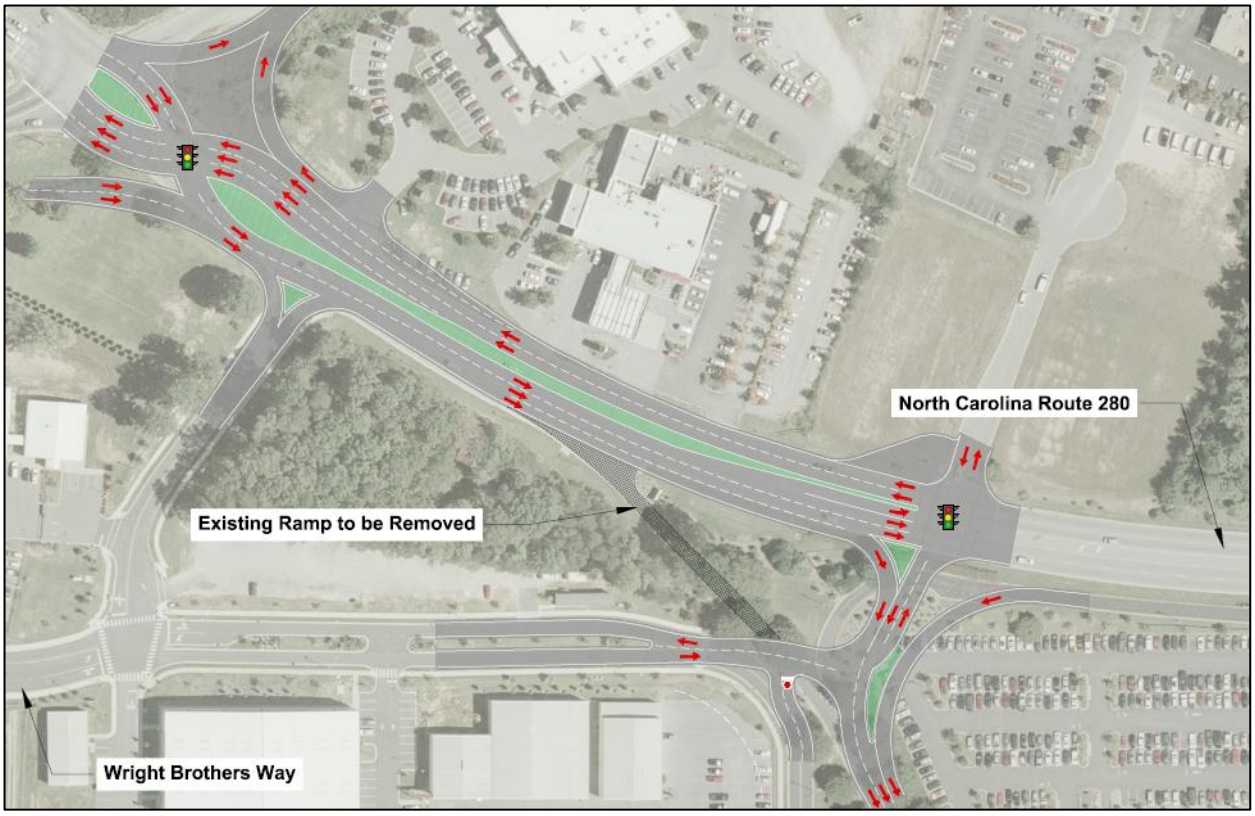
5.10 Landside Access

The North Carolina Department of Transportation (NCDOT) is in the process of redesigning the Interstate 26/North Carolina 280 interchange into a diverging diamond configuration where traffic on North Carolina 280 would cross over to the opposite side of the road for travel on the bridge over Interstate 26. As a result of the approaches that are necessary on North Carolina 280 for this type of interchange, and its proximity to the interchange with Aviation Way, access to the general aviation area will be impacted since left hand turns will not be permitted. In an effort to continue to provide access to the general aviation area for traffic in both directions on North Carolina 280, as well as improve the circulation of traffic into the terminal area, a single, logical landside access alternative was prepared based on the preliminary design of the diverging diamond interchange redesign. This alternative is presented in the following section and includes a discussion of factors, advantages, and disadvantages that should be considered for its implementation.

5.10.a Alternative 26 – Landside Access Alternative

Alternative 26 proposes a new airport entrance for both the general aviation and terminal areas to address landside access impacts as a result of the Interstate 26/North Carolina 280 interchange redesign. As illustrated in **Figure 5-27**, the intersection of North Carolina 280 and Aviation Way would be redesigned to allow right turns only for southbound North Carolina 280 traffic and traffic exiting the Airport on Aviation Way. To allow traffic on northbound North Carolina 280 to access the general aviation area, a new Airport entrance with a traffic light is proposed so that traffic entering from North Carolina 280 in both directions can access the general aviation and terminal areas. A realignment of Wright Brothers Way would be necessary so that traffic entering the Airport from the new entrance could access the general aviation area. Removal of an existing ramp for southbound North Carolina 280 traffic to enter the terminal area is also planned with this alternative. It should be noted that as a result of the proposed new Airport entrance, a rerouting of the Terminal Drive loop road around the long-term parking lot would be necessary, resulting in a slight loss of parking spaces.

Figure 5-27: Alternative 26 – Landside Access Alternative



Source: Mead & Hunt, Inc. (2012)

- **Operational Factors –** The proposed new Airport entrance would maintain a continuous traffic flow to the terminal area while permitting northbound traffic on North Carolina 280 to access the general aviation area. While a loss of parking spaces is anticipated as a result of the proposed rerouting of the Terminal Drive loop road, the reduction would be nominal and can be recuperated as a part of a future parking expansion project.

- **Economic Factors –** It is anticipated that the proposed landside access improvements proposed by this alternative would be funded by the NCDOT as a part of the Interstate 26/North Carolina 280 interchange redesign project. It is not anticipated that the Airport would need to contribute significant funding towards the implementation of this alternative.

- **Environmental Factors –** There are no significant environmental impacts anticipated with the implementation of this alternative since most development would occur on land that has been previously developed.

- **Implementation Factors –** The proposed alternative accommodates the roadway improvements that are planned for North Carolina 280 as a part of the interchange redesign project with Interstate 26. The proposed new Airport entrance would allow for a continuous flow of traffic on the Airport campus while allowing for controlled left turns onto North Carolina 280. It should be noted, though, that inbound traffic to the general aviation area would be combined with traffic

destined for the terminal area; as a result, signage may be necessary to redirect inbound and outbound traffic to their desired destinations.

Advantages and disadvantage of Alternative 26 are summarized in **Table 5-34**.

Table 5-34: Alternative 26 Summary

Advantages	Disadvantages
• Accommodates North Carolina 280 / Interstate 26 interchange improvements • Maintains continuous traffic flow to terminal building curb front and parking • Permits left turns to / from general aviation area and North Carolina 280	• Impacts a small number of long-term parking spaces • Mixes terminal area traffic with general aviation area traffic

In addition to a new entrance, it is recommended that a dedicated right turn lane be installed on Terminal Drive for traffic to turn onto southbound North Carolina 280. Currently, left hand turns are permitted from both lanes on Terminal Drive at the intersection that often results in traffic backups and restricts right hand turns. Installation of a dedicated right turn lane is recommended so that traffic backups can be alleviated by allowing traffic to turn right without need to wait for left turn traffic to clear from the right lane.

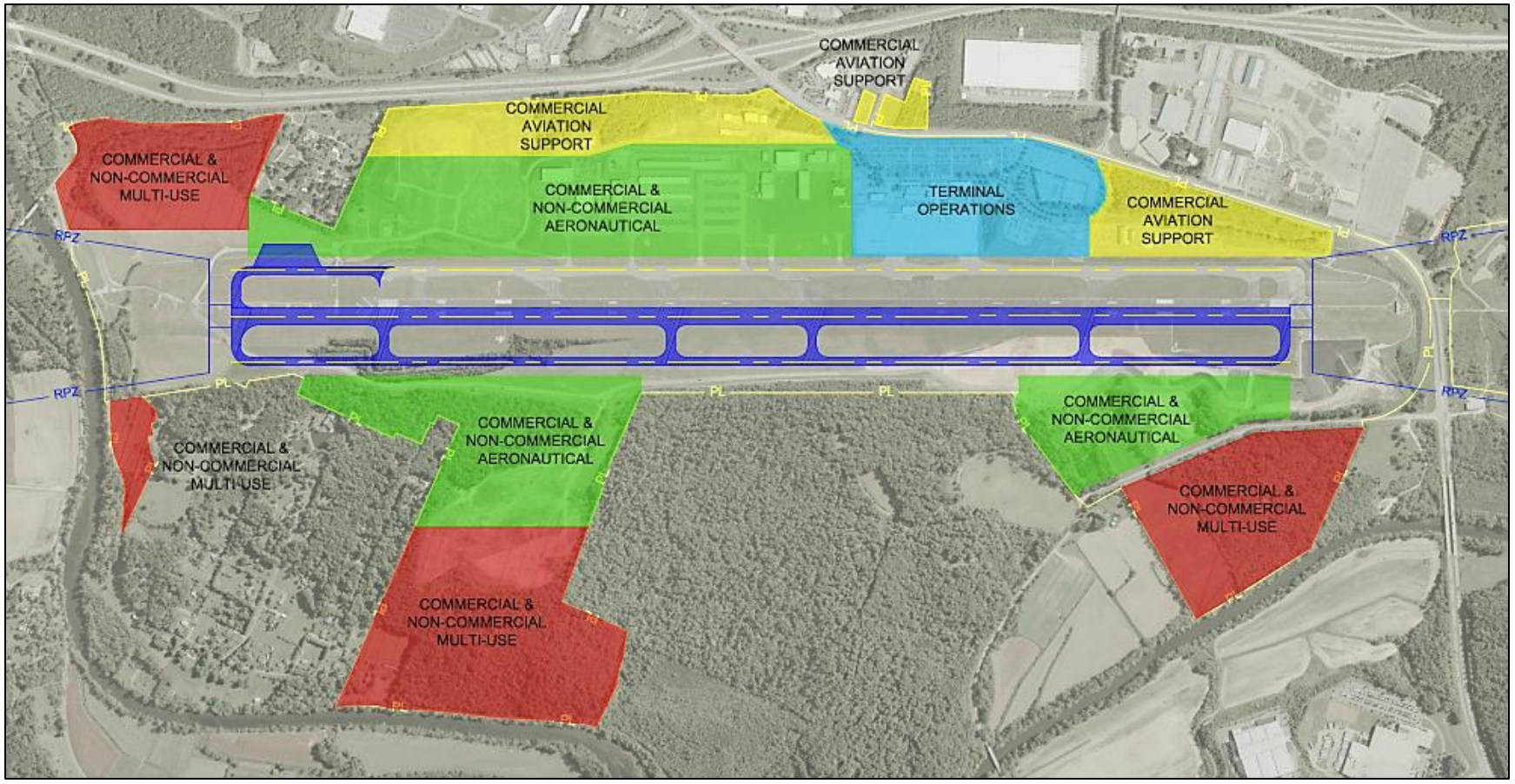
5.11 Land Use

Portions of Airport property not well suited for aeronautical development should be considered for non-aeronautical uses in an effort to create additional revenue generating opportunities for the Airport. It is recommended a land use plan be established to identify those areas that are best suited for non-aeronautical development while protecting sites that are anticipated to be needed for the future expansion of Airport facilities. In an effort to designate sites for aeronautical and non-aeronautical uses, a land use plan identifying zones for specific activities was developed. The following alternative identifies each of these zones and discusses the types of activities that are intended for each site. It is recommended this land use plan is referenced for future planning and development purposes as aeronautical and non-aeronautical development opportunities are presented to the Airport.

5.11.a Alternative 27 – Land Use Plan

As illustrated in **Figure 5-28**, the land use plan designates areas of Airport property for both aeronautical and non-aeronautical uses. Land adjacent to the airfield is reserved for aeronautical uses that include, but are not limited to, hangars, aprons, charter operations, air cargo, aircraft maintenance/repair, and FBOs. Land adjacent to North Carolina 280 has been designated for commercial non-aeronautical development since it is highly visible to traffic and is well suited to support development such as restaurants, hotels, strip mall shopping complexes, and offices. Land adjacent to the terminal area is designated for future terminal building renovation/expansion and parking lot expansion projects. Finally, land that is not suited to support aeronautical development is designated for commercial and non-commercial uses which includes, but is not limited to, light industrial, warehouses, distribution centers, private storage facilities, and offices.

Figure 5-28: Alternative 27 – Land Use Plan



Source: Mead & Hunt, Inc. (2012)

5.11.b Alternative 28 – Air Cargo Development

Projections indicate that air cargo activity could substantially increase from approximately 128,000 pounds a year to 30.5 million pounds a year by 2030 if a dedicated air cargo forwarded establishes an operation at the Airport. Given that the existing air cargo facility at the Airport would be unable to process this level of activity, it is recommended the Airport plan for an expansion of its air cargo facilities. Since the Airport has received interest in the past from freight forwarders about the availability of space to establish an air cargo operation, planning has been initiated to prepare an area for the expansion of air cargo facilities. An engineered fly ash fill project on the west side of the airfield adjacent to the approach end of Runway 34 has been undertaken by the Airport to prepare an area for future aeronautical development. It is recommended that this be considered for the development of future air cargo facilities if the Airport receives such an inquiry in the future from an air cargo operator.

While the layout of an air cargo facility will depend on the specific needs of an air cargo operator, **Figure 5-29** illustrates a configuration that should be considered in developing facilities at this site. As proposed in the drawing, approximately 376,300 square feet of apron and taxiway pavement is available to accommodate two to three Boeing 757 aircraft as well as four to six single- and small twin-engine feeder aircraft. This approximate 376,300 square feet of apron and taxiway area also includes a smaller apron which could be available for other aeronautical uses such as an aircraft maintenance facility, FBO service provider, or corporate hangars. Anticipated improvements to Old Fanning Bridge Road that include a traffic circle could be utilized to provide access roads and parking lots for facilities on the site that include an approximate 13,100 square feet package sorting facility.

Listed below are the operational, economic, environmental, and implementation factors that should be considered when developing an air cargo facility on this site. A summary of advantages and disadvantages is presented in **Table 5-35**.

- **Operational Factors –** An operational advantage of this site is that sufficient space is available to meet the facility requirements of an air cargo forwarder that would be well capable of processing upwards of 30.5 million pounds of air freight a year. While the future construction of a west side parallel taxiway would help alleviate the need for aircraft to cross Runway 16/34 to access the facility, runway crossings would still be necessary for aircraft to transition between the east and west of the airfield.

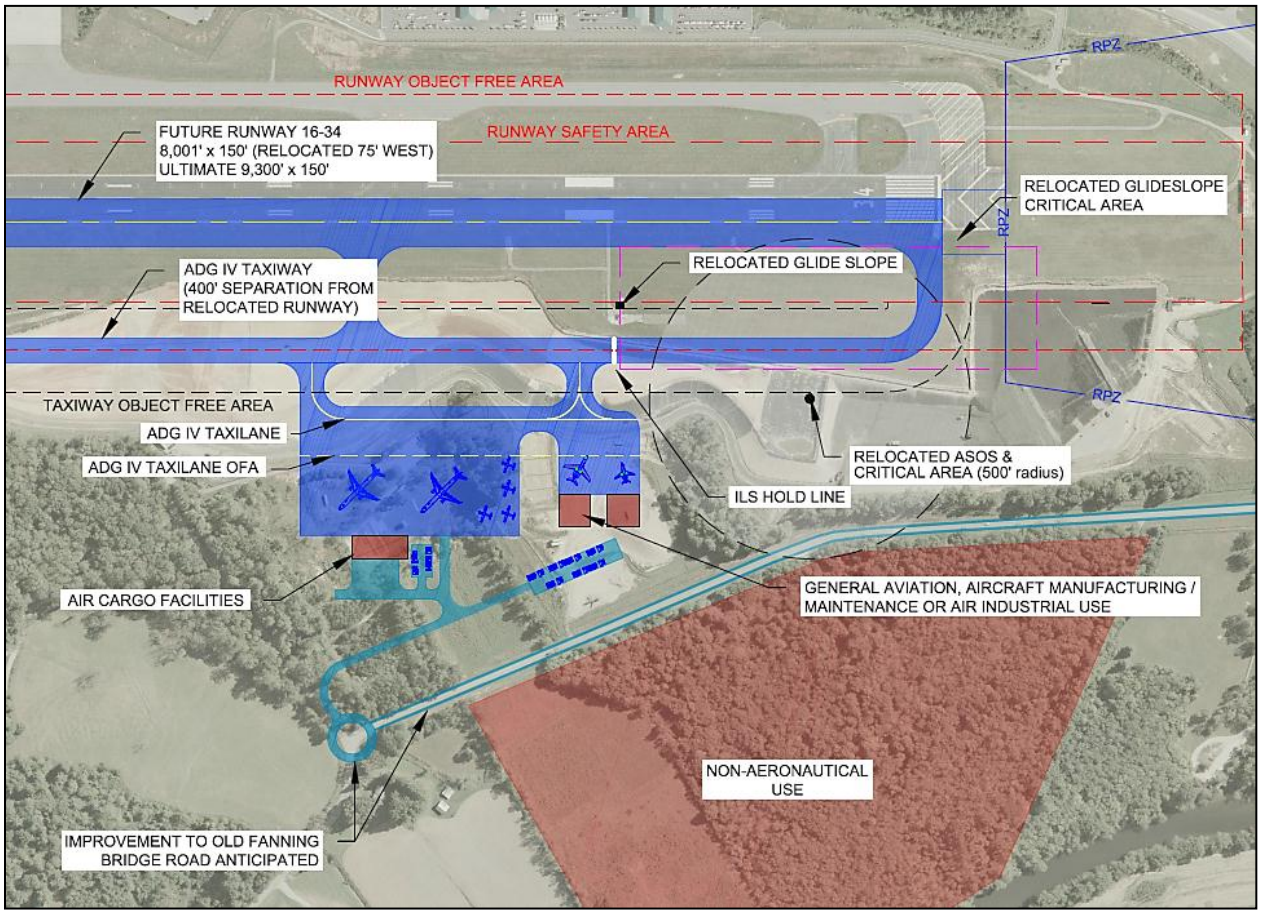
- **Economic Factors –** Economic benefits would be realized with the establishment of an air cargo operation at the Airport. For the Airport, it would offer an opportunity to earn additional aeronautical related revenue through rents, leases, landing fees, and fuel purchases that would be associated with air cargo activities. The surrounding region also serves to economically benefit from an air cargo operation at the Airport through the creation of several jobs and a more effective and efficient way to process the movement of air freight.

- **Environmental Factors –** As a result of the ongoing engineered fly ash fill project, minimal fill and grading would be necessary to prepare the site for future development. Given the proximity of the French Broad River, care should be taken, however, to control storm water runoff from the

site since the surrounding topography slopes away from the land that has been prepared for development.

- **Implementation Factors –** An advantage with the size of the air cargo facilities planned for the site is that additional developable area would be available for other aeronautical related uses. Planning should be initiated so that any future development does not occur within the relocated ASOS critical area.

Figure 5-29: Alternative 28 – Air Cargo Development



Source: Mead & Hunt, Inc. (2012)

Table 5-35: Alternative 28 Summary

Advantages	Disadvantages
• Meets air cargo space needs • Provides additional area for aeronautical related development • Opportunity to increase aeronautical related revenue • Provides region with jobs and air freight forwarding facility • Minimal fill and grading needed for development	• West side airfield access

5.12 Summary of Recommended Alternatives

In conclusion, the Airport is well-positioned to be able to expand and improve infrastructure so that the demands of users are adequately met throughout the planning period. The following summary lists the recommended alternatives that should be considered to address needs that were identified through the review of facility requirements. It should be noted that these alternatives have been selected because either they are the most logical option to address a facility need or, in comparison with operational, economic, environmental, and implementation factors, offer the best solution to improve existing infrastructure or expand facilities at the Airport.

A summary drawing of the recommended alternatives is presented in **Figure 5-30**.

- **Runway 16/34 –** It is recommended Runway 16/34 be relocated 75 feet to the west to provide separation between the runway and parallel Taxiway A that meets design standards identified in FAA AC 150/5300-13A, *Airport Design*. In addition, planning should be initiated to protect for a 1,300 foot extension of Runway 16/34 to the north should there be a need for additional runway length.

- **Taxiway System –** The following improvements are recommended for the taxiway system:

    - Paved shoulders are recommended for Taxiway A to meet ADG III and IV airfield design standards.
    - The Taxiway A safety area and object free area should be improved to meet ADG IV airfield design standards.
    - Connector taxiways between Taxiway A and the general aviation aprons should be widened to meet ADG III and IV airfield design standards
    - Various improvements are recommended to the connector taxiways to correct pavement grade variations between Runway 16/34 and Taxiway A.
    - Construction of a temporary runway for the relocation of Runway 16/34 is recommended. The temporary runway should be converted into a west side parallel taxiway after the new runway is completed to support aeronautical-related development opportunities on the west side of the airfield.

- **Air Traffic Control Tower –** It is recommended planning be initiated to protect for the future construction of a new ATCT at a site located adjacent to Wright Brothers Way on the south apron.

- **Automated Surface Observing System** – The ASOS should be relocated to a site adjacent to the southwest development area that most closely meets siting requirements identified in FAA Order 6560.20B while preserving land for future aeronautical related development. A siting study is recommended to further evaluate this location to determine the exact site upon which to relocate the ASOS unit.

- **Terminal Area –** An expansion of the terminal apron as well as renovation and expansion of the terminal building is recommended to accommodate additional aircraft boarding gates and parking positions that are needed to meet demand projected for the planning period.

- **Terminal Curb Front –** Construction of a dedicated commercial vehicle curb lane in front of the terminal building for waiting taxis, vans, buses, and other commercial vehicles is recommended to improve traffic flow and reduce vehicle/pedestrian congestion.

- **General Aviation Development –** To accommodate the demand for additional hangars and apron space for the planning period, an expansion of the general aviation area on the east side of the airfield is recommended to include an additional 122,300 square feet of apron space and box- and T-style hangars. In addition, land within the northwest development area on the west side of the airfield should be protected for the long-term expansion of general aviation facilities as well as for commercial and non-commercial non-aeronautical uses.

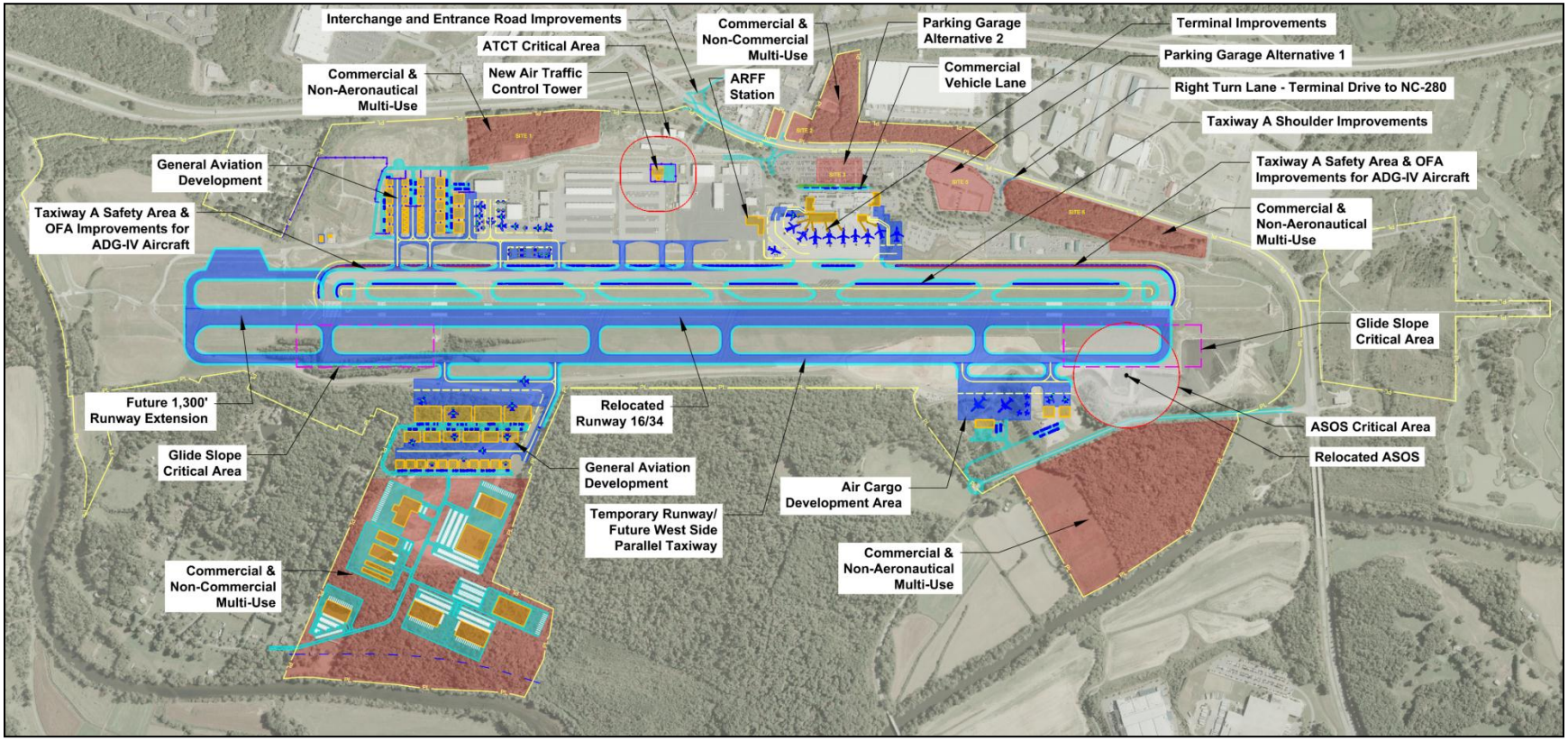
- **Vehicle Parking –** The Airport should consider constructing a parking garage to address capacity issues with long-term and rental car ready/return parking projected for the planning period. A parking garage financial feasibility analysis is recommended to further evaluate whether the parking garage should be constructed at a site adjacent to the terminal building or at site within the long-term overflow parking lot.

- **Landside Access –** Due to the Interstate 26/North Carolina 280 interchange redesign project, landside access improvements to Wright Brothers Way, Aviation Way, and Terminal Drive are recommended to preserve access into the general aviation area. In addition, a dedicated right turn lane is recommended on Terminal Drive so traffic can turn more efficiently onto North Carolina 280.

- **Land Use –**Future aeronautical and non-aeronautical development should be planned for specific sites that are designated for these uses according to the Airport's land use plan. This will protect land for future aeronautical-related infrastructure expansions while allowing the Airport to develop remaining portions of its property for non-aeronautical related uses.

- **Air Cargo Facilities –**Planning should be initiated to expand air cargo facilities in the event an air freight forwarder decides to establish an air cargo operation at the Airport. Any future expansion of air cargo facilities should be planned for an area west of the approach end of Runway 34 that has already been prepared for development through an engineered fly ash material project.

Figure 5-30: Summary of Recommended Alternatives



Source: Mead & Hunt, Inc. (2012)

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