6. Alternatives

This Alternatives chapter documents a variety of proposed development scenarios to accomplish the recommended facility improvements identified in Chapter 5, Capacity Analysis and Facility Requirements. It evaluates the scenarios against several evaluation factors to determine if the recommended improvements enhance the safety and efficiency of the Greater Binghamton Airport (BGM or the Airport) and meet future demand while minimizing environmental and community impacts. The evaluation factors used to compare development options were selected based on specific considerations associated with the Airport.

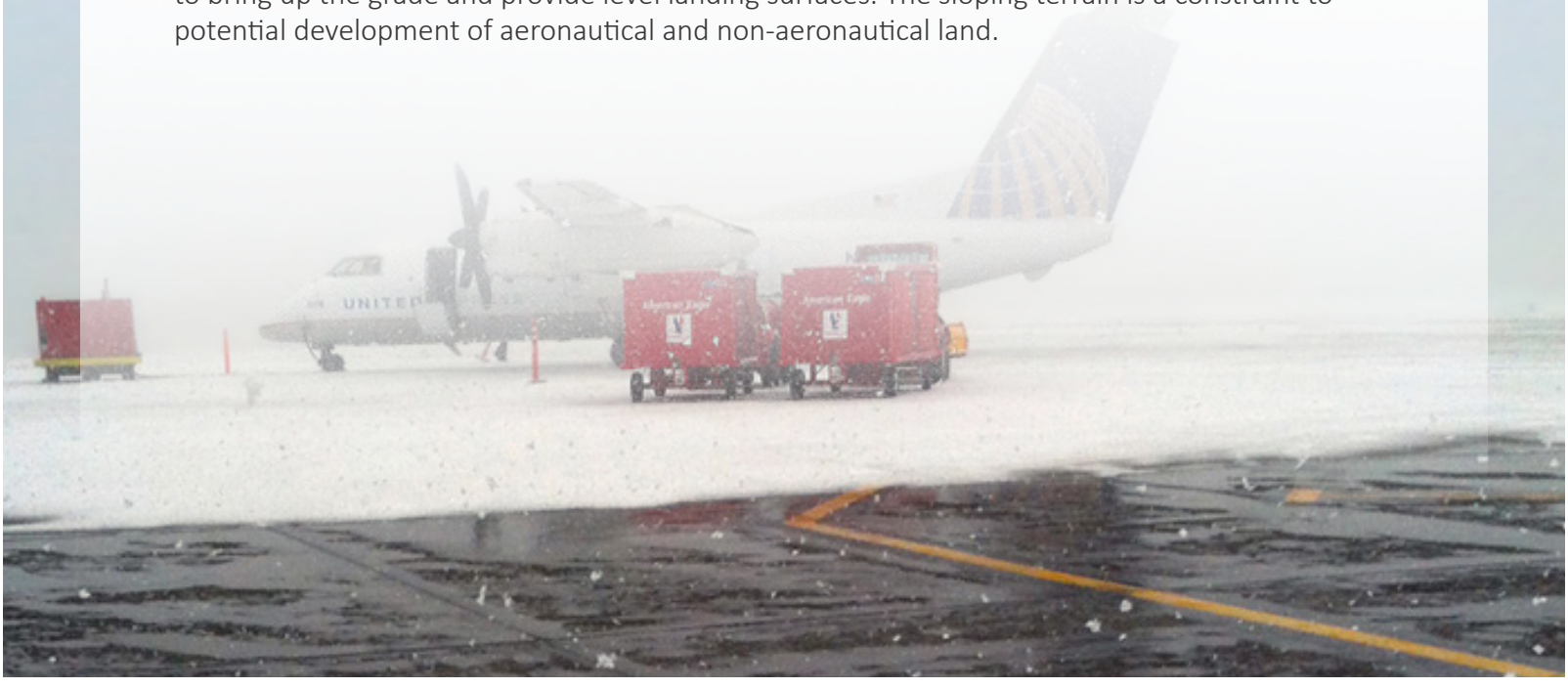
Airside alternatives will be considered first followed by an evaluation of general aviation and landside facilities and completing with an evaluation of terminal alternatives. Each of these areas will include a no-build alternative, as well as other potential alternatives for consideration. The preferred alternatives are selected based on assessed criteria, as well as their compatibility with one another and the overall airport environment. These individual alternatives combine to create an overall Preferred Airport Development Alternative. This chapter also reviews land uses for non-aeronautical areas to maximize revenue generation as part of the landside alternatives.

The identification and evaluation of the Airport development alternatives are outlined as follows:

- Development Constraints
- Airside Alternatives
- General Aviation and Landside Alternatives
- Terminal Area Alternatives
- Preferred Airport Development Alternative

6.1. DEVELOPMENT CONSTRAINTS

Terrain - BGM was built on top of Mt. Ettrick, and as such, there are steep drop offs surrounding the Airport. These drop offs are most pronounced at the runway ends where fill has been used to bring up the grade and provide level landing surfaces. The sloping terrain is a constraint to potential development of aeronautical and non-aeronautical land.



6.2. AIRSIDE ALTERNATIVES

Airside alternatives present potential solutions to geometry or airport design deficiencies as identified in Chapter 5. The alternatives presented are evaluated against each other according to the criteria identified below, and a recommended airside alternative for the Airport is presented.

6.2.1. Evaluation Criteria

A set of evaluation criteria has been developed to provide an equal and consistent assessment of each alternative. These criteria pose questions regarding how each of the alternatives address identified issues, such as: aviation user needs (facility requirements) and operational efficiency, environmental impacts, Federal Aviation Administration (FAA) standards, costs, and long-term flexibility/expansion. These evaluation criteria are as follows:

- **Facility Requirements:** Does the alternative meet the existing and future needs of the Airport and is the alternative feasible for implementation? What affect does this alternative have from an operational standpoint?
- **Environmental Impact:** Qualitative assessment of the potential environmental consequences associated with implementation of the alternative. Important social, economic, and environmental effects of the alternative will be identified and described. Potential mitigation measures, as appropriate, will be identified. Chapter 4, *Environmental Overview*, provides a detailed review of environmental considerations for the Airport.
- **FAA Standards:** Does the alternative meet the design standards of FAA Advisory Circular (AC) 150/5300-13A, *Airport Design*, and Code of Federal Regulations (CFR) Part 77 *Safe, Efficient Use, and Preservation of the Navigable Airspace* (Part 77) to the maximum extent feasible?
- **Development Costs:** Does the alternative have reasonable development costs in comparison to other alternatives that achieve the same goal? Order of magnitude cost estimating will be used to evaluate and score each alternative.
- **Development Flexibility:** To what extent does this alternative leave flexibility for change and future surrounding development?

These evaluation factors have been given a scoring value, as follows:

Facility Requirements:	None	(0)	Some	(1)	Most	(2)	All	(3)
Environmental Impact:	High	(0)	Moderate	(1)	Minor	(2)	None	(3)
FAA Standards:	None	(0)	Some	(1)	Most	(2)	All	(3)
Development Costs	High	(0)	Medium	(1)	Low	(2)	None	(3)
Development Flexibility:	Poor	(0)	Fair	(1)	Good	(2)	Excellent	(3)

Alternatives were compared using both a qualitative and quantitative comparison and given a value based on the alternative's ability to meet the requirements of the evaluation factor. Selection of a recommended alternative is based on the alternative meeting demand needs, enhancing operations and safety, while minimizing environmental and community effects, and providing future flexibility.

6.2.2. Summary of Airside Facility Requirements

In Chapter 5, *Facility Requirements*, airside improvements were identified that should be addressed within the 20-year planning period. These improvements include:

- Consideration toward increasing the size of the runway safety area (RSA), and runway object free area (ROFA) for Runway 10-28 from an aircraft approach category (AAC) – airplane design group (ADG) B-II to accommodate AAC-ADG C-II aircraft
- Acquiring control of all land uses within existing runway protection zones (RPZs) through fee simple acquisition or avigation easements
- The request of a Modification of Standard (MOS) for penetrations to the runway visibility zone (RVZ) in the terminal area
- Pursuing the installation of runway end identifier lights (REILs) for Runway 10
- Relocating Taxiway A to provide a taxiway separation of 400 feet from Runway 16-34 from the current 300 feet, or request an MOS from the FAA for the deficit in runway/taxiway separation
    - Associated with this non-standard separation, runway hold-short signs along Taxiway A are improperly placed at offset angles
- Pursuing a full-length parallel taxiway for Runway 10-28. (Note: at the time of the drafting of this document, the Airport recently completed construction of a full-length parallel taxiway for Runway 10-28, and as such, this recommendation will not be further discussed)

6.2.3. Alternatives Considered and Dismissed

As discussed in Chapter 5, there are engineered materials arrestor systems (EMAS) on both ends of Runway 16-34 in order to mitigate for a lack of full dimensional RSAs. The EMAS bed for the Runway 34 departure end is reaching the end if its useful life. A planning level cost analysis was conducted to determine the cost of removing the EMAS and providing a full dimensional RSA. The Runway 16 departure end EMAS was constructed in 2011 and is nearing the end of it's useful life per FAA standards for equipment.

It is estimated that approximately 2.5 million cubic yards of material would need to be brought in to level the Runway 34 departure end. At an estimated $25 per cubic yard, the cost for fill alone to create a standard RSA would be approximately $63 million. This estimate does not include engineering costs, nor costs associated with modifications to the existing approach light system, the relocation (or potential tunneling) of Knapp Road, or environmental impacts and mitigation. Due to the extremely high cost, this alternative has been considered and dismissed.

6.2.4. Airside Alternative 1 - No Build

The No Build Alternative recommends no changes to the existing runway and taxiway layout at BGM. Alternatives that recommend acquiring land will be compared against the No Build option. The existing airport layout is shown in Figure 6-1.

The No Build Alternative was assessed against the five evaluation factors; the results are below:

- **Facility Requirements:** The No Build Alternative does not meet BGM's current or future

facility requirements related to runways, taxiways, instrumentation, or approach lighting. This evaluation factor was given a value of **None (0)** as it does not meet any of the recommended facility requirements.

- **Environmental Impact:** This alternative does not propose any additional construction, and as such, there are no environmental consequences. This evaluation factor was given the highest value of **None (3)** since the alternative has no additional environmental and/or natural resource impacts.
- **FAA Standards:** The No Build Alternative does not address FAA standards as identified in FAA AC 150/5300-13A, or Part 77, including adequate safety areas and geometry criteria. The evaluation factor was assigned a value of **None (0)** as it does not meet, or attempt to meet, FAA standards.
- **Development Costs:** There are no design or construction costs associated with the No Build Alternative and it is therefore scored as **None (3)** for development costs.
- **Development Flexibility:** With no proposed changes to the Airport, this alternative provides flexibility for future development. This evaluation component was awarded a value of **Excellent (3)** for future development flexibility.

6.2.5. Airside Alternative 2 – Increased RSA and ROFA for Runway 10-28

The following airside alternatives include options for increasing the size of the RSA and ROFA for Runway 10-28. As discussed in Chapter 3, *Aviation Forecasts*, Runway 10-28 currently has an AAC-ADG of B-II as represented by the Beechcraft Super King Air 350. Visibility minimums of existing approaches are a factor in the determination of the size of the RSA and ROFA, and with current visibility minimums of ¾ mile, the RSA is 300 feet beyond each departure end and 150 feet wide, while the existing ROFA is also 300 feet beyond each departure end and is 500 feet wide.

If Runway 10-28 were to increase to an AAC-ADG of C-II, as forecast in Chapter 3, the RSA would increase in size to 1,000 feet beyond each runway end, and 500 feet wide, while the ROFA would increase to 1,000 feet beyond each runway end and 800 feet wide. Also, south of Runway 10-28, a portion of the airport perimeter fence, and two small navigational aid (NAVAID) buildings for the offset Runway 16 localizer antenna, and the Runway 34 glideslope antenna would also be within the expanded ROFA. The increased ROFA and RSA can be seen in **Figure 6-2**.

Options for accommodating the increased RSA and ROFA will be presented in the following alternatives and include a No Build Alternative, constructing a full-dimensional RSA and ROFA by infilling steep drop offs at the ends of Runway 10-28, the installation of EMAS on one or both ends of the runway, and providing for an acceptable level of safety through declared distances. Lastly, the expanded RSA and ROFA would extend off Airport property and these parcels should be acquired by the Airport in order to have full control over the use of this land.

The goal of these alternatives is to maximize RSA available to the extent practical and financially feasible even if the RSA does not meet full standards. According to FAA AC 150/5300-13A, the "FAA recognizes that incremental improvements inside full RSA dimensions can enhance the margin of safety for aircraft." FAA Order 5200.8, *Runway Safety Area Program*, states in Appendix 2 that "when it is not practicable to obtain an RSA that meets current standards through the measures identified […], the feasibility of increasing the size of the RSA by including

Figure 6-1: Existing Airport Layout

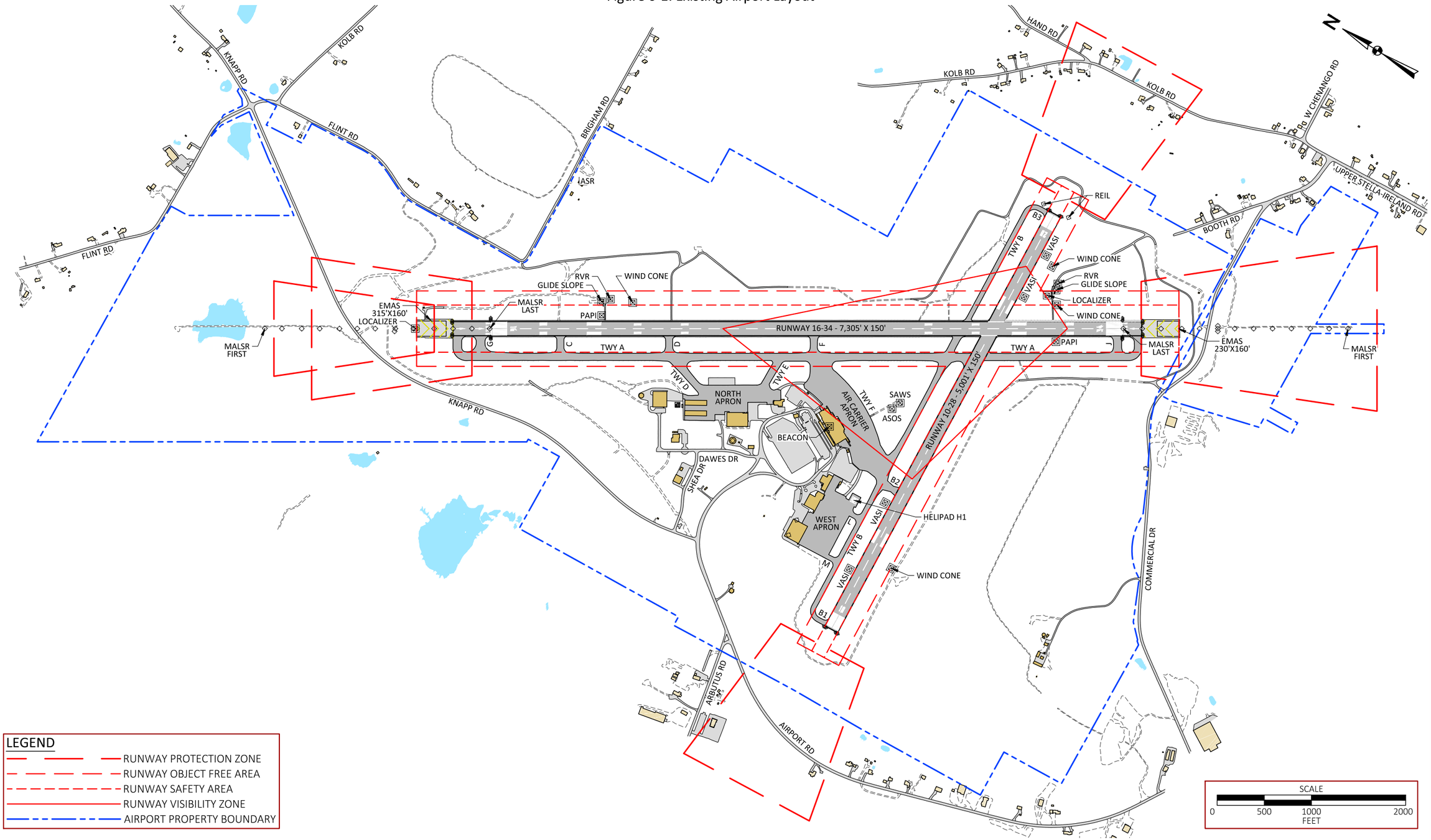


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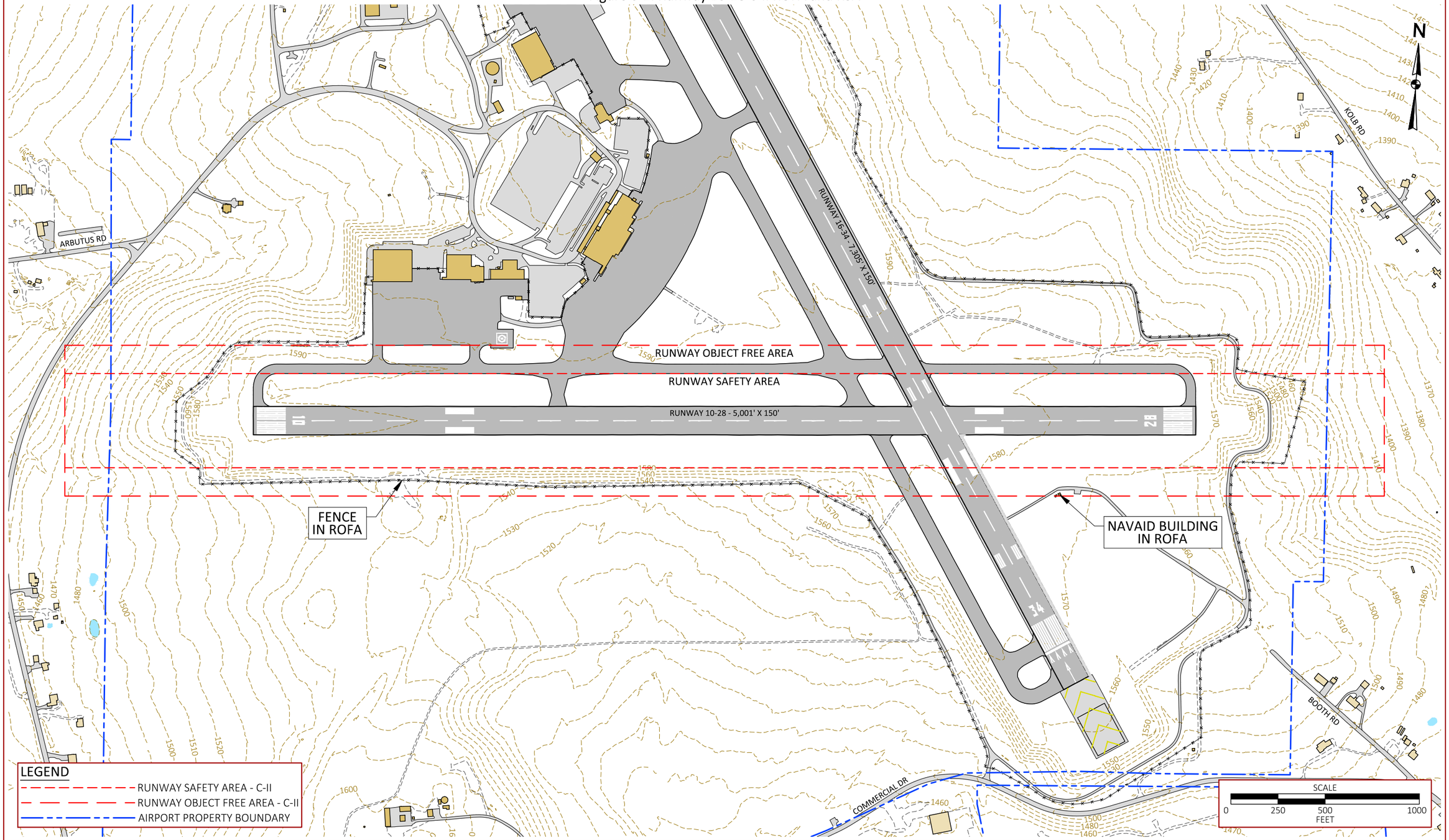
Figure 6-2: Runway 10-28 C-II ROFA and RSA



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additional land parcels should be considered, even if their inclusion will result in an RSA with an irregular shape."

Airside Alternative 2A – Full Dimensional Expanded RSA and ROFA

Airside Alternative 2A is shown in Figure 6-3. Airside Alternative 2A includes increasing the size of the Runway 10-28 RSA and ROFA to accommodate C-II aircraft. The full dimensional RSA would be accomplished by filling in land on both ends of Runway 10-28. It is estimated this would require approximately 2.75 million cubic yards of fill material which would need to be graded and stabilized. As there is insufficient infill material at the Airport, all of the material would need to be brought in from other sources.

At a planning level estimate of $25.00 per cubic yard of infill material, the cost of constructing a full dimensional RSA on the Runway 10 approach end of the runway would cost approximately $25 million, and the cost to do so on the Runway 28 approach end would cost approximately $44 million. Due to the extremely high cost of this alternative, it has been considered and dismissed.

Airside Alternative 2B – EMAS

Another alternative to meet FAA standards for a C-II RSA is through the use of EMAS. EMAS utilizes low density concrete blocks which crush under the weight of an aircraft, thereby stopping the aircraft in a short distance, usually with minimal or no damage to the aircraft. It has been installed at 68 U.S. airports with plans to install an additional three EMAS systems at two additional U.S. airports.[1] EMAS has safely stopped 15 overrunning aircraft.

FAA Order 5200.9 (the Order), *Financial Feasibility and Equivalency of Runway Safety Area Improvements and Engineered Material Arresting Systems* provides guidance for comparing various RSA alternatives with ones that utilize EMAS. It also assists in determining the maximum financially feasible costs, whether they include EMAS or not.

The Order points out that a standard EMAS installation can provide a level of safety equivalent to a full dimensional RSA for overruns. An EMAS installation must be capable of stopping the overrunning (or in some cases, undershooting) design aircraft travelling at 70 knots. In some cases, such as the case with Runway 10-28 at BGM, space limitations or other circumstances might not permit a standard EMAS installation. In such cases, a non-standard EMAS that can stop the design aircraft at 40 knots or more should be considered. For planning purposes, Runway Safe, the only EMAS manufacturer in the US was contacted and asked for guidance on the appropriate size of EMAS systems that might be able to be accommodated on both ends of Runway 10-28. A company spokesperson indicated the approximate size for the systems would be 150 feet by 300 feet. Further, these would not be standard systems, capable of stopping the design aircraft at 70 knots and would be classified as non-standard systems. The approximate cost of each EMAS system is estimated to be roughly $4,000,000.

Airside Alternative 2B is considered against the evaluation factors below and can be seen in Figure 6-4.

[1] FAA.gov, https://www.faa.gov/news/fact_sheets/news_story.cfm?newsId=13754. Accessed 13 March 2020

- **Facility Requirements:** Airside Alternative 2B meets BGM's future facility requirements related to the use of Runway 10-28 by C-II aircraft. The FAA recognizes EMAS as a viable alternative to a full dimensional RSA and ROFA. EMAS would be relatively easy to implement once production resumes. This evaluation factor was given a value of **Most (2)** as it does somewhat restrict the utility of Runway 10-28 due to setback requirements.
- **Environmental Impact:** This alternative does not propose any improvements that are anticipated to have environmental impacts, and as such, there are no environmental consequences, and as such this evaluation factor was given the highest value of **None (3)**.
- **FAA Standards:** The alternative meets FAA standards as identified in FAA AC 150/5300-13A, including adequate safety areas. The evaluation factor was assigned a value of **All (3)** for its ability to meet FAA standards.
- **Development Costs:** Costs associated with Airside alternative 2B are high, particularly in comparison to other viable alternatives. The alternative scores as **High (0)** for development costs.
- **Development Flexibility:** The addition of EMAS would have little effect on the overall development of the Airport and was given a value of **Excellent (3)** for future surrounding development.

Airside Alternative 2C – Declared Distances

A third alternative to meet FAA RSA and ROFA standards is to effectively shorten the runway through the use of declared distances. Per FAA AC 150/5200-13A, declared distances utilize specific portions of runway pavement as a substitute for a full dimensional RSA and/or ROFA. Declared distances typically limit a runway's use and are typically associated with one or more displaced thresholds.

The FAA defines four declared distances:

- **Takeoff Run Available (TORA)** – the runway length declared available and suitable for satisfying takeoff run requirements. The TORA is measured from the start of takeoff to a point 200 feet from the beginning of the departure runway protection zone.
- **Takeoff Distance Available (TODA)** – this distance comprises the TORA plus the length of any remaining runway or clearway beyond the far end of the TORA.
- **Accelerate-Stop Distance Available (ASDA)** – the runway plus stopway length declared available and suitable for the acceleration and deceleration of an aircraft that must abort its takeoff. A stopway is an area beyond the takeoff runway able to support the airplane during an aborted takeoff, without causing structural damage to the airplane.
- **Landing Distance Available (LDA)** – the runway length that is declared available and suitable for satisfying aircraft landing distance requirements.

The proposed declared distances for Airside Alternative 2C can be seen in **Figure 6-5**. The alternative is evaluated against the factors described in **Section 6.2.1** with the following results:

- **Facility Requirements:** Airside Alternative 2C does meet BGM's future facility requirements by providing adequate safety areas, however the shortened runway lengths from implementing declared distances do not meet the runway length requirements for AAC-ADG C-II aircraft. This evaluation factor was given a value of **Some**:

Figure 6-3: Airside Alternative 2A

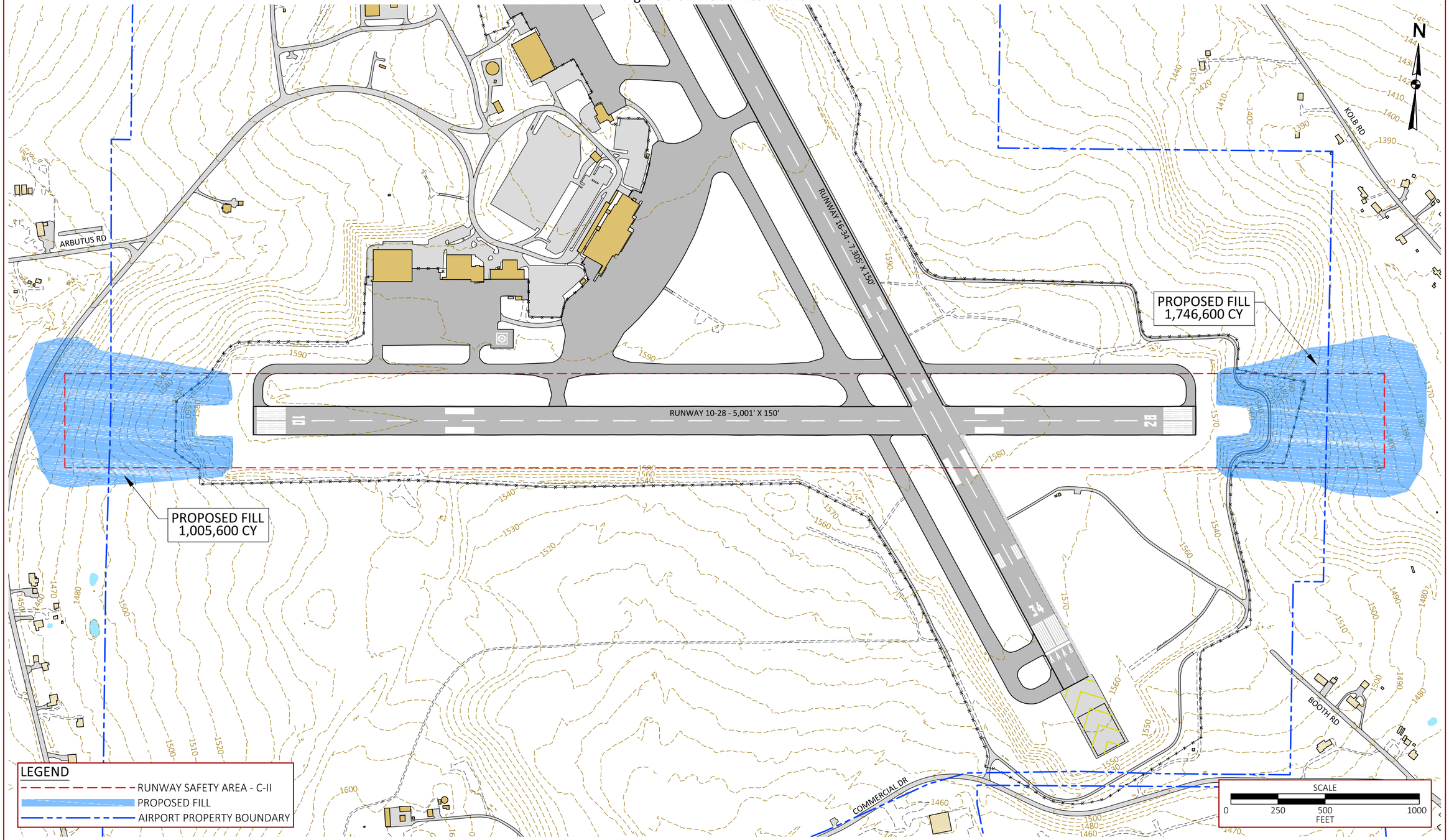

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Figure 6-4: Airside Alternative 2B

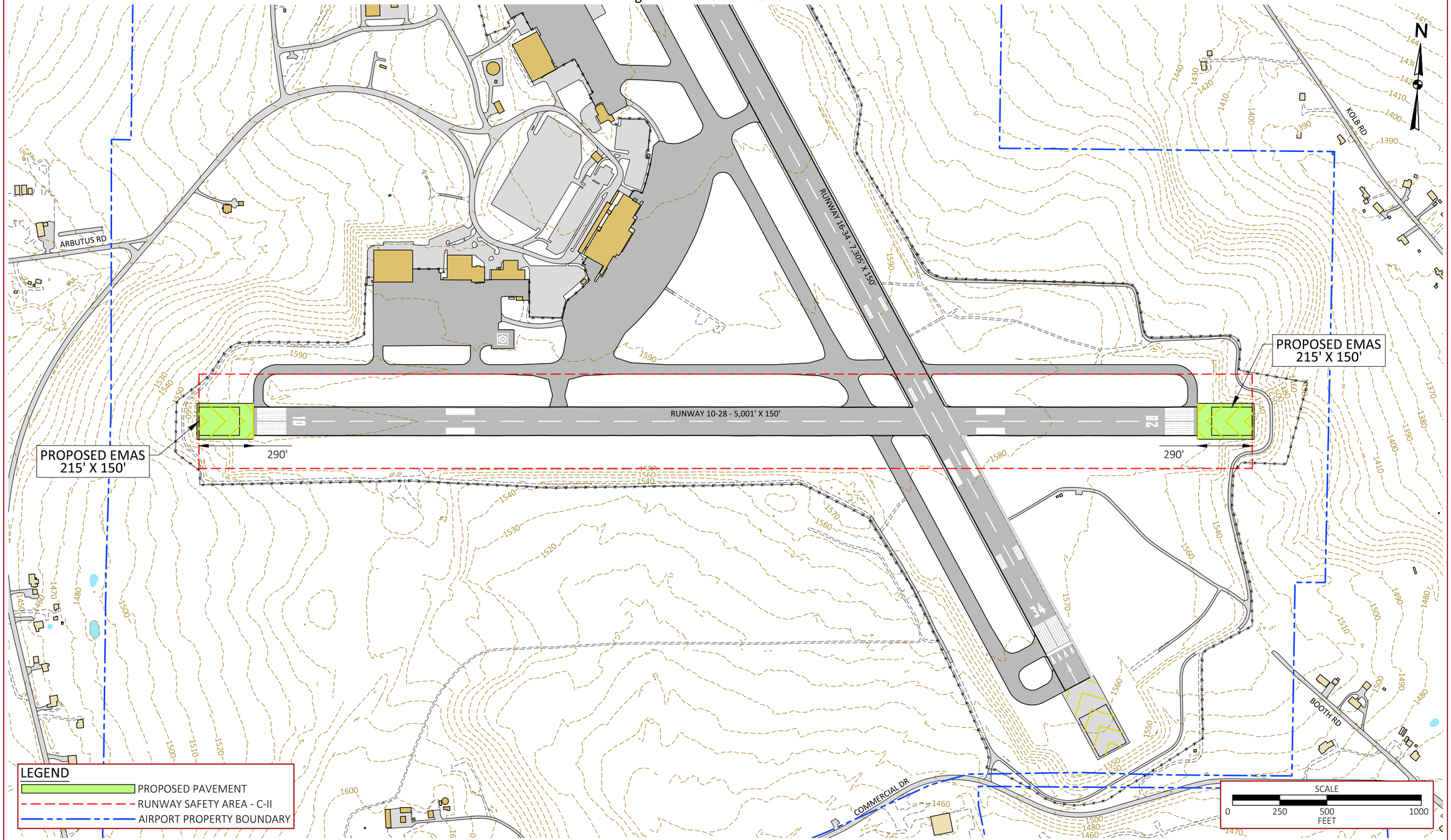

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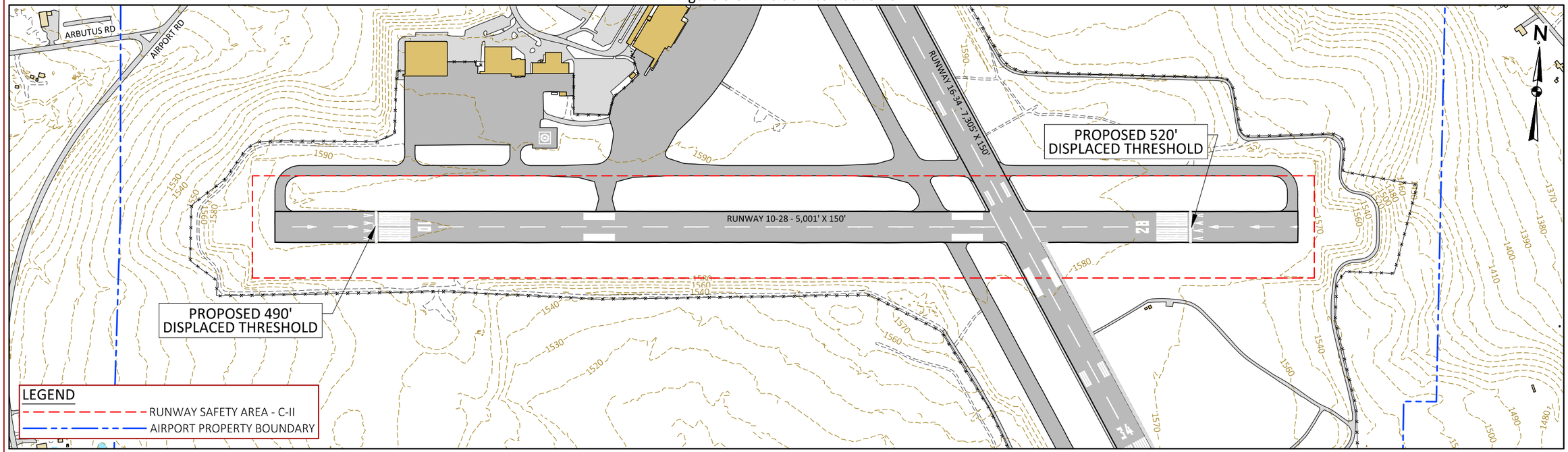
Figure 6-5: Airside Alternative 2C



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(1) as it does somewhat restrict the utility of Runway 10-28.

- **Environmental Impact:** This alternative does not propose any additional construction, and as such, there are no environmental consequences, and as such this evaluation factor was given the highest value of **None (3)**.
- **FAA Standards:** The alternative meets FAA standards as identified in FAA AC 150/5300-13A, including adequate safety areas. The evaluation factor was assigned a value of **All (3)** as it does meet FAA standards.
- **Development Costs:** Costs associated with Airside Alternative 2C are minimal, and the alternative is scored as **None (3)** for development costs.
- **Development Flexibility:** With no proposed physical changes to the Airport, this alternative provides flexibility for future development, however the reduced runway lengths implemented through declared distances limit the utility of the runway. This evaluation component was awarded a value of **Good (2)**.

6.2.6. Preferred RSA and ROFA Alternative for Runway 10-28

As can be seen in **Table 6-1**, Alternative 2C – Declared Distances ranks highest and is selected as the preferred airside alternative to meet FAA standards as related to an increased RSA and ROFA for Runway 10-28.

Table 6-1: Runway 10-28 RSA and ROFA Alternatives

	Facility Requirements	Environmental Impact	FAA Standards	Development Costs	Development Flexibility	Total
No Build	None (0)	None (3)	None (0)	None (3)	Excellent (3)	9
Alt. 2A	N/A	N/A	N/A	N/A	N/A	0
Alt. 2B	Most (2)	None (3)	All (3)	High (0)	Excellent (3)	11
Alt. 2C	Some (1)	None (3)	All (3)	None (3)	Good (2)	12

Source: McFarland Johnson analysis.

6.2.7. Airside Alternative 3 – RPZs

As discussed in Chapter 5, *Facility Requirements*, the Airport should control all land uses within the RPZs. Currently, the RPZs at the ends of Runway 10-28 and Runway 34 extend off Airport property. A total of 19 parcels comprising 151 acres of land fall underneath the three RPZs. At a planning level estimate of $20,000 per acre, the total estimated cost to acquire these parcels is approximately $3.0 million. The RPZs with proposed airport property acquisitions can be seen in **Figure 6-6** and **Figure 6-7**. While the acquisition of the land within the RPZs in fee simple is recommended, avigation easements with sufficient land use controls to protect people and property within the RPZ would be sufficient. Airside Alternative 3 is discussed against the evaluation factors below:

- **Facility Requirements:** Airside Alternative 3 meets BGM's future facility requirements related to the control of RPZs and is feasible to implement. This evaluation factor was given a value of **All (3)**.
- **Environmental Impact:** This alternative does not propose any additional construction, and as such, there are no environmental consequences. This evaluation factor was given a value of **None (3)** for impacts to the environment.

- **FAA Standards:** The alternative meets FAA standards as identified in FAA AC 150/5300-13A, including airport control over RPZs. The evaluation factor was assigned a value of **All (3)** for meeting FAA standards.
- **Development Costs:** While the property acquisitions would be costly, they are considered an Airport Improvement Program (AIP) eligible expense. The alternative is given a score of **Medium (1)** for development costs.
- **Development Flexibility:** With no proposed physical changes to the Airport, this alternative provides flexibility for future development. This evaluation component was awarded a value of **Excellent (3)** for future flexibility.

6.2.8. Preferred RPZ Alternative

As can be seen below in **Table 6-2**, Airside Alternative 3 which recommends acquiring land within the three RPZs that fall off Airport property scores highest against the No Build Alternative and is selected as the preferred RPZ alternative.

Table 6-2: RPZ Alternatives Evaluation Summary

	Facility Requirements	Environmental Impact	FAA Standards	Development Costs	Development Flexibility	Total
No Build	None (0)	None (3)	None (0)	None (3)	Excellent (3)	9
Alt. 3	All (3)	None (3)	All (3)	Medium (1)	Excellent (3)	13

Source: McFarland Johnson analysis.

6.2.9. Airside Alternative 4 – Miscellaneous Airside Items

Airside Alternative 4 includes various miscellaneous items referenced in Chapter 5, *Facility Requirements,* which include:

- The installation of runway end identifier lights (REILs) for Runway 10
- The relocation of the localizer control building at the approach end of Runway 16 outside of the RSA for Runway 16-34

Airside Alternative 4 can be seen in **Figure 6-8**. These improvements will be assessed against the evaluation factors below.

- **Facility Requirements:** Airside Alternative 4 meets BGM's future facility requirements related to safety and is feasible to implement. This evaluation factor was given a value of **All (3)**.
- **Environmental Impact:** The changes proposed would have little, if any, environmental consequences. This evaluation factor was given a value of **None (3)**.
- **FAA Standards:** The alternative meets FAA standards as identified in FAA AC 150/5300-13A, including ensuring objects remain outside of RSAs. The evaluation factor was assigned a value of **All (3)** for meeting FAA standards.
- **Development Costs:** The REILs and remarking of the taxiway would have minimal costs, but the relocation of the localizer control building would be challenging and somewhat costly given the terrain. The alternative is given a score of **Medium (1)** for development costs.

Figure 6-6: Airside Alternative 3A

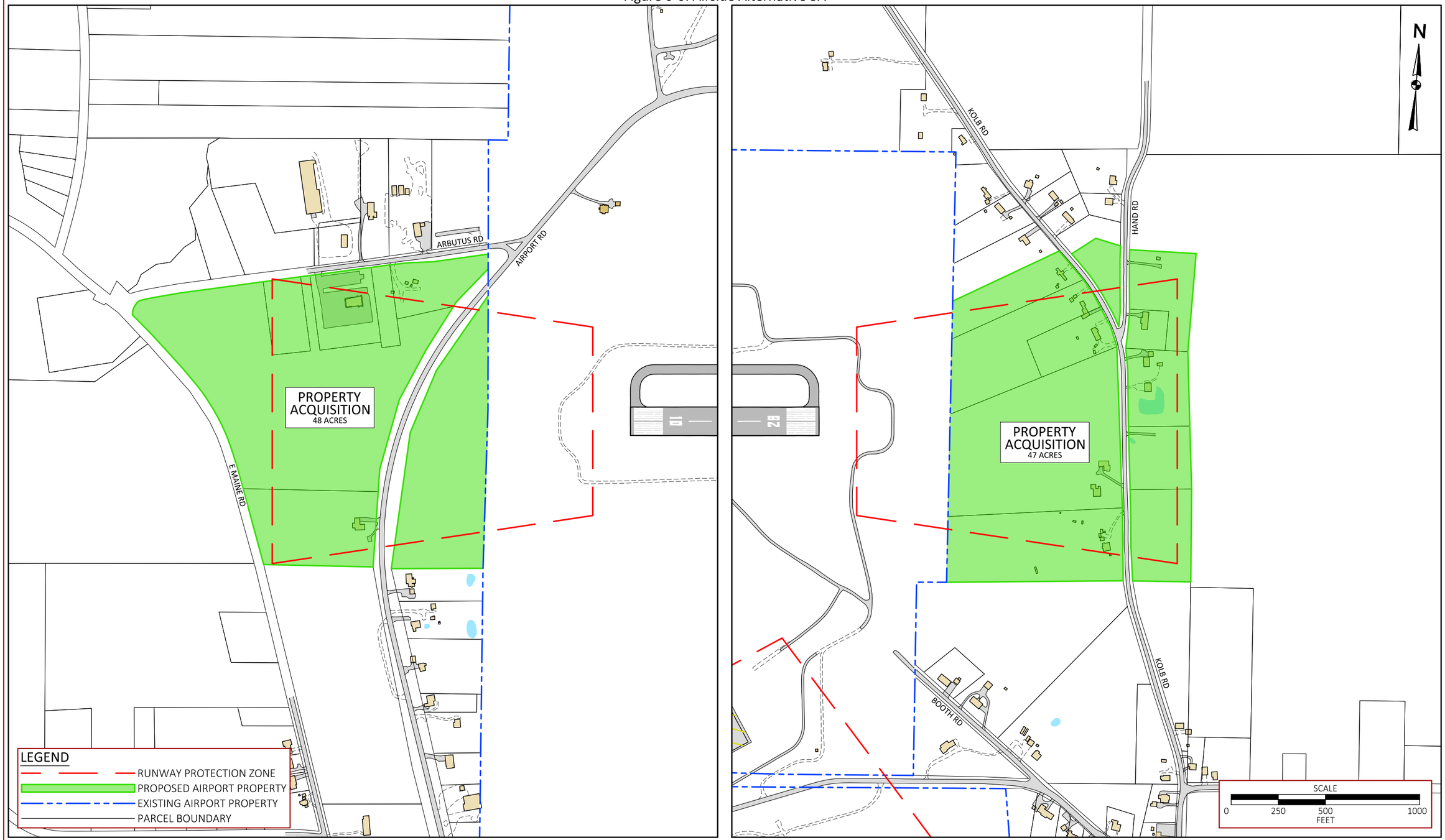

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Figure 6-7: Airside Alternative 3B

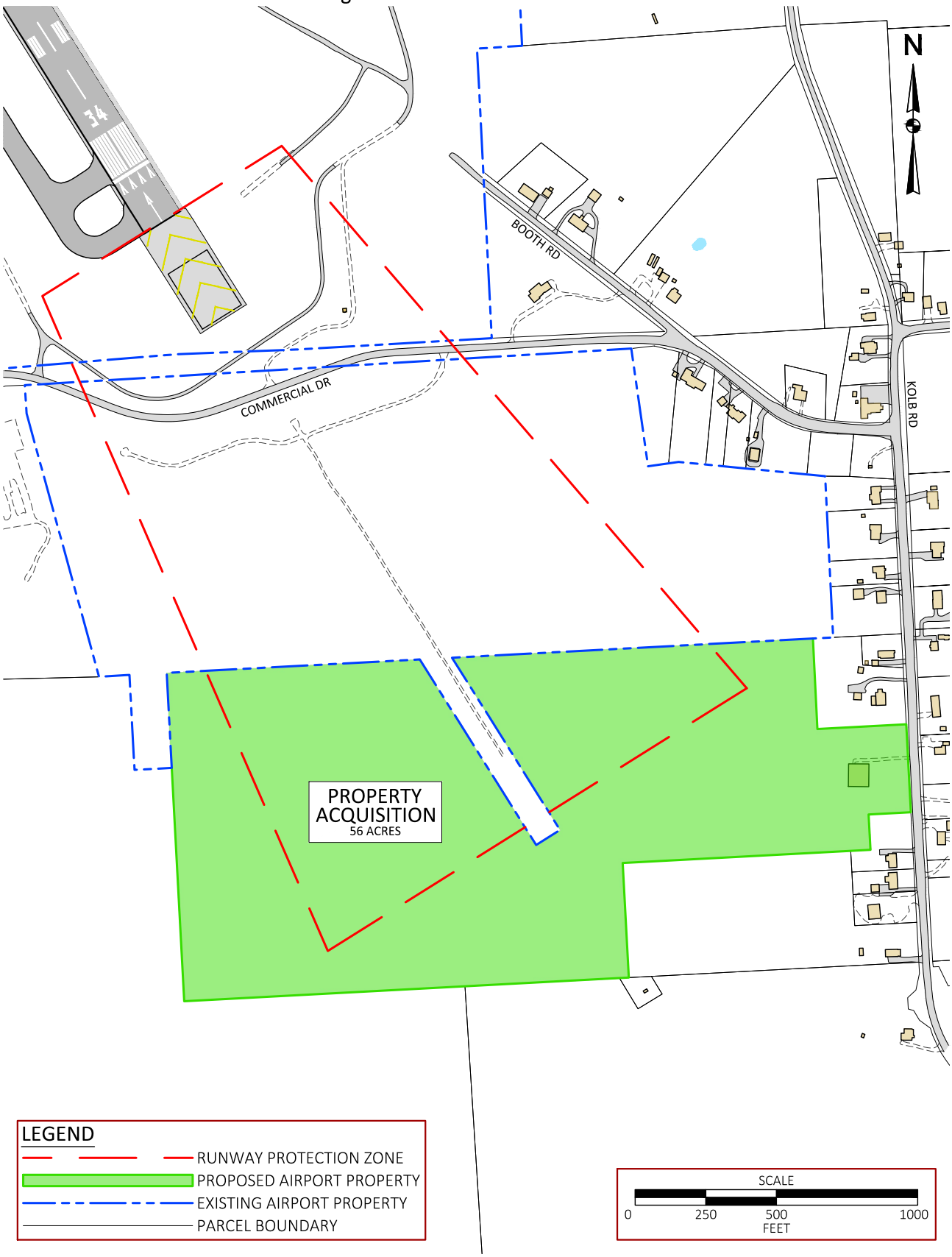

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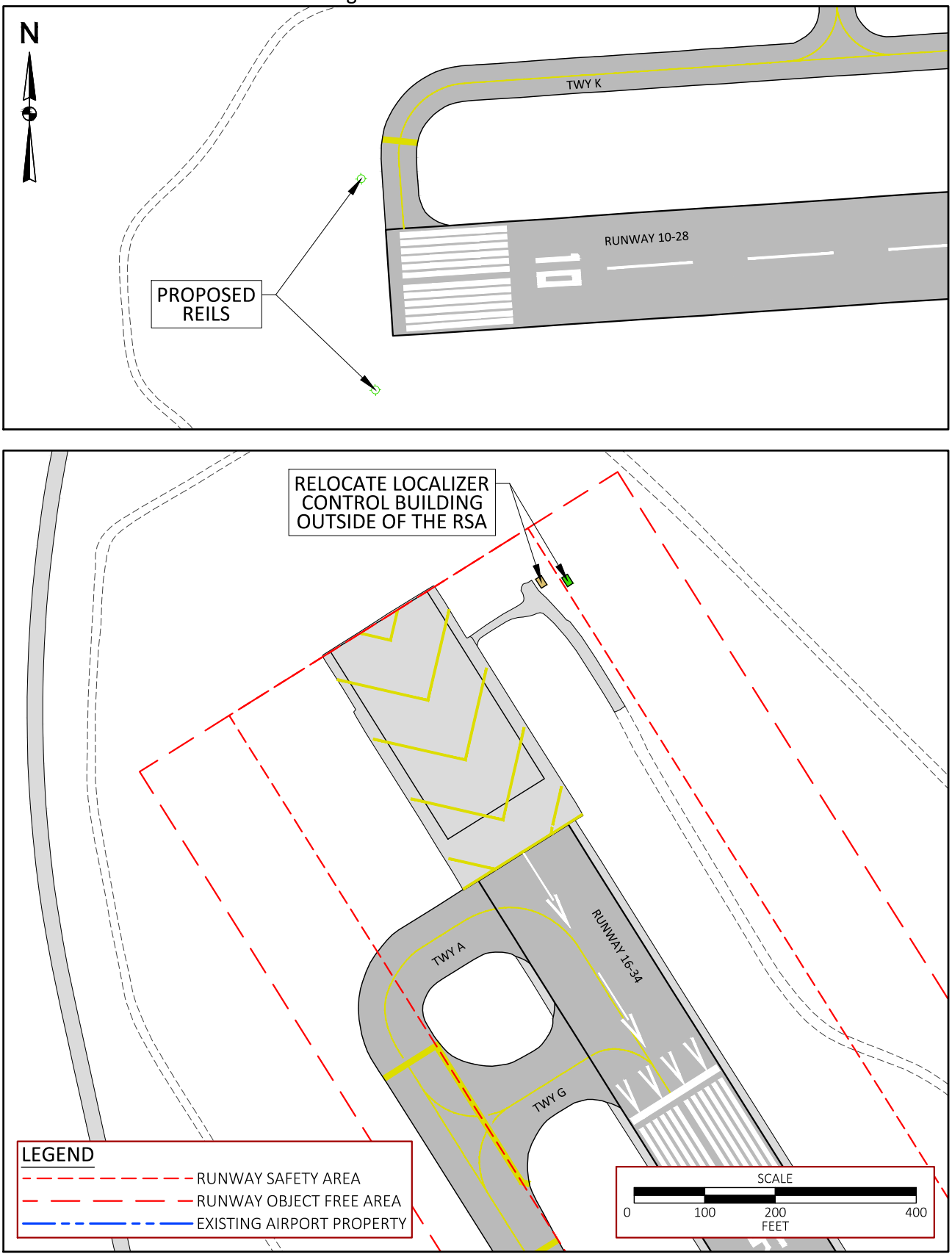
Figure 6-8: Airside Alternative 4



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- **Development Flexibility:** With minimal physical changes to the Airport, this alternative provides flexibility for future development. This evaluation component was awarded a value of **Excellent (3)** for future flexibility.

Table 6-3 shows the results of the comparison to the No Build Alternative.

Table 6-3: Miscellaneous Airside Improvements Evaluation

	Facility Requirements	Environmental Impact	FAA Standards	Development Costs	Development Flexibility	Total
No Build	None (0)	None (3)	None (0)	None (3)	Excellent (3)	9
Alt. 4	All (3)	None (3)	All (3)	Medium (1)	Excellent (3)	13

Source: McFarland Johnson analysis.

As can be seen in **Table 6-3**, Airside Alternative 4 scores higher than the No Build Alternative and it is recommended these improvements be implemented.

6.2.10. Airside Alternative 5

Airside Alternative 5 is the final airside alternative and relates to providing a runway centerline-to-taxiway centerline separation of 400 feet from the existing 300 feet between Taxiway A and Runway 16-34 in order to meet FAA standards for AAC-ADG D-II and C-III aircraft. Also, runway hold-short signs along Taxiway A are not aligned with hold-short markings per FAA standards. There are three potential alternatives to meet FAA standards with respect to this separation. They include the No Build Alternative, physically relocating the taxiway, and requesting an MOS from the FAA.

Alternatives are assessed against the evaluation factors below.

Airside Alternative 5A – Relocate Taxiway

It is anticipated that the cost of relocating Taxiway A would be approximately $31 million. A significant portion of this cost is attributable to infill areas as the terrain drops off steeply as the taxiway approaches the Runway 16 and Runway 34 ends. Further, the alternative will also require the relocation of a portion of Knapp Road on the Runway 16 approach end. Airside Alternative 5A can be seen in **Figure 6-9**, and is assessed against the evaluation factors below.

- **Facility Requirements:** Airside Alternative 5A would meet the Airport's future facility requirements in relation to the design aircraft using Runway 16-34 and Taxiway A. It would allow for standard sign placement along Taxiway A and the stub taxiways from Runway 16-34 to Taxiway A. This evaluation factor was given a value of **All (3)** for meeting facility requirements.
- **Environmental Impact:** With significant construction and infill required, there would be some environmental impacts, although it is anticipated there would be no wetland impacts. This alternative is given a score of **Minor (2)** for impacts to the environment.
- **FAA Standards:** The alternative meets FAA standards as identified in FAA AC 150/5300-13A, including separation standards as they relate to runways and parallel taxiways. The evaluation factor was assigned a value of **All (3)** as it does meet FAA standards.

- **Development Costs:** Costs associated with Airside Alternative 5A are significant, and the alternative is scored as **High (0)** for development costs.
- **Development Flexibility:** The relocation of the taxiway crowds existing airport infrastructure, including the necessity to potentially eliminate the deicing pad adjacent to the T-hangars. Also, it is anticipated there will be some loss of some aircraft parking at the terminal building. This alternative scores **Poor (0)** For future development flexibility.

Airside Alternative 5B – Modification of Standards (MOS)

Another alternative that would not involve relocating the taxiway would be to request an MOS from the FAA for the non-standard condition of the runway/taxiway separation. It is recommended at least one hold-short sign on each of the stub taxiways be relocated to the FAA standard position in alignment with the runway hold-short markings. Further, due to the non-standard hold lines, this alternative would also consider the installation of runway guard lights at each of the hold lines along Taxiway A. This alternative is assessed below.

- **Facility Requirements:** Airside Alternative 5B is a viable alternative and generally reflects the existing condition, however it would not provide FAA standard separation between Taxiway A and Runway 16-34 and would require signs on the stub taxiways to be relocated from existing positions to those along the hold line at each of the stub taxiways, just off the pavement for Taxiway A. The alternative would also include the recommendation to include runway guard lights at each of the hold lines. This evaluation factor was given a value of **Some (1)** for meeting existing and future needs and minimizing impacts on operations.
- **Environmental Impact:** With limited construction associated with the relocation of the signs and installation of the runway guard lights, there would be no environmental impacts. This alternative is given a score of **None (3)** for impacts to the environment.
- **FAA Standards:** The alternative does not meet FAA standards as identified in FAA AC 150/5300-13A, including separation standards as they relate to runways and parallel taxiways. However, the alternative does propose the relocation of the taxiway hold signs to the standard position. The evaluation factor was assigned a value of **Some (1)** as it does not meet all FAA standards.
- **Development Costs:** The costs associated with Airside Alternative 5B include the installation of new runway guard lights and the relocation of existing hold signs. As a result, the alternative is scored as **Low (2)** for development costs.
- **Development Flexibility:** With no construction, there remains potential for future development. This alternative scores **Excellent (3)** for maintaining future development potential.

The alternatives relative to the runway/taxiway separation between Runway 16-34 and Taxiway are compared below in **Table 6-4**.

Figure 6-9: Airside Alternative 5A - Relocate Taxiway

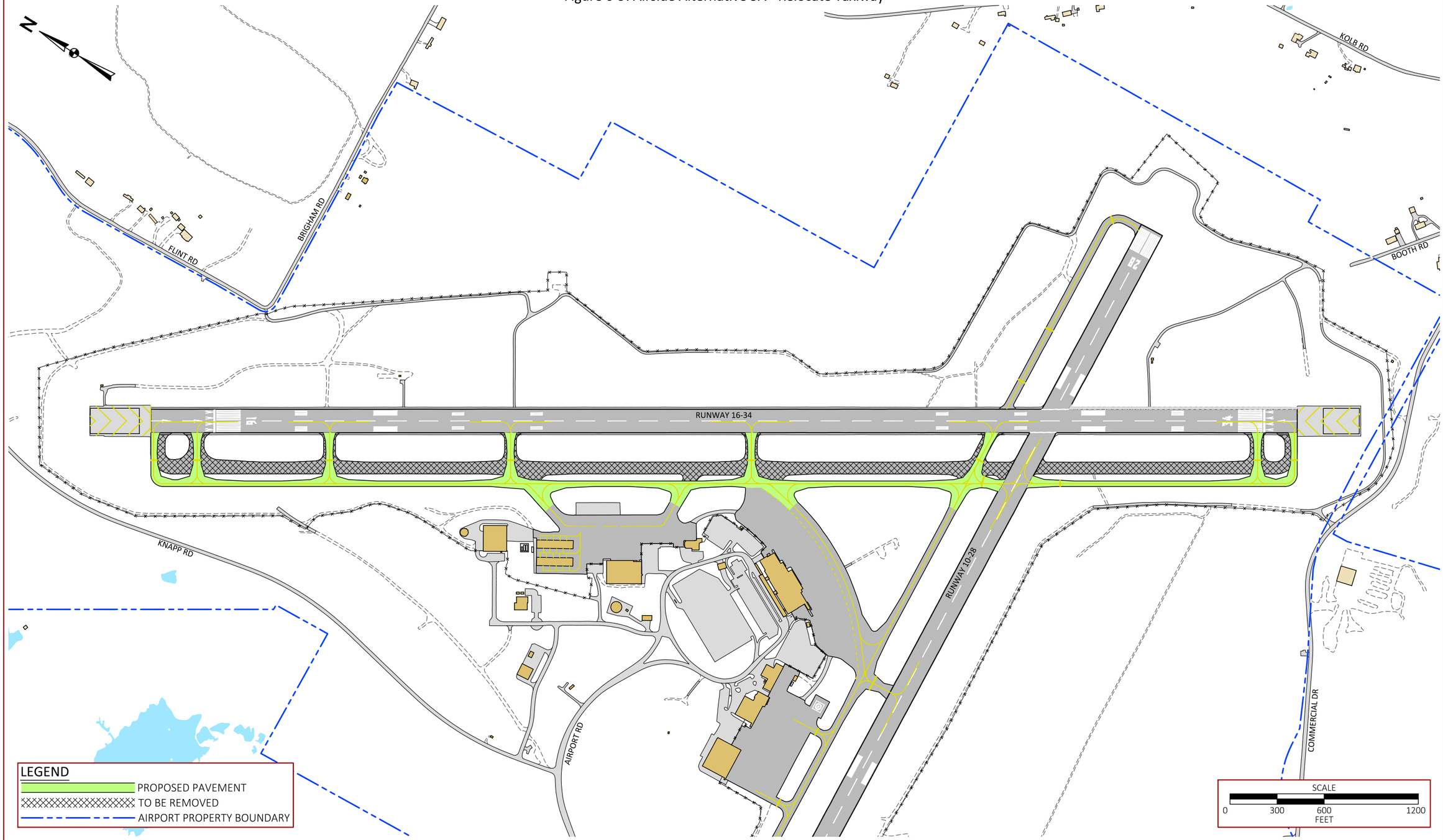

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Table 6-4: Airside Alternative 5 Evaluation Summary

	Facility Requirements	Environmental Impact	FAA Standards	Development Costs	Development Flexibility	Total
No Build	None (0)	None (3)	None (0)	None (3)	Excellent (3)	9
Alt. 5A	All (3)	Minor (2)	All (3)	High (0)	Poor (0)	8
Alt. 5B	Some (1)	None (3)	Some (1)	Low (2)	Excellent (3)	10

Source: McFarland Johnson analysis.

Alternative 5B scores highest and requesting an MOS from FAA is the recommended alternative.

6.2.11. Preferred Airside Alternative

The evaluation and selection of a Preferred Airside Alternative must satisfy the long-term aeronautical needs of the Airport, including such factors as satisfying future aeronautical needs, minimizing environmental impacts, meeting FAA standards, cost, and flexibility. The summary of the evaluation can be seen in Table 6-5.

Table 6-5: Airside Alternatives Evaluation Summary

	Facility Requirements	Environmental Impact	FAA Standards	Development Costs	Development Flexibility	Total
No Build	None (0)	None (3)	None (0)	None (3)	Excellent (3)	9
Alt. 2C	Some (1)	None (3)	All (3)	None (3)	Good (2)	12
Alt. 3	All (3)	None (3)	All (3)	Medium (1)	Excellent (3)	13
Alt. 4	All (3)	None (3)	All (3)	Medium (1)	Excellent (3)	13
Alt. 5B	Some (1)	None (3)	Some (1)	Low (2)	Excellent (3)	10

Source: McFarland Johnson analysis.

In consideration of the analysis above, it is recommended the Airport:

- Implement declared distances for Runway 10-28 at such time the critical aircraft for the runway has an AAC-ADC of C-II (Airside Alternative 2C – Declared Distances)
- Acquire RPZs off Airport property, either in fee simple, or through avigation easements (Airside Alternative 3 – RPZs)
- Install REILs at the end of Runway 10 (Airside Alternative 4 – Miscellaneous Airside Items)
- Relocate the localizer control building at the approach end of Runway 16 so it is outside the RSA (Airside Alternative 4 – Miscellaneous Airside Items)
- Request an MOS from the FAA for the separation distance between Runway 16-34 and Taxiway A, as well as relocate the existing stub taxiway hold signs and install runway guard lights (Airside Alternative 5B – Modification of Standards (MOS))

6.3. GENERAL AVIATION AND LANDSIDE ALTERNATIVES

Outside of the runways and taxiways at BGM, several items were noted in Chapter 5 that should be addressed within the planning period, including:

- Planning to replace the airfield lighting vault and should consider locations for future siting to ensure the facility does not impede future development Installing a primary

wind cone
- Ensuring that all supplemental wind cones are located outside of an expanded future ROFA
- Updating the Airport traffic control tower (ATCT) within the planning period to meet current equipment needs and meet height standards
- Plan for the construction of additional conventional hangar units to accommodate new based tenants, as well as transient aircraft
- Assessing available land for compatible non-aeronautical use

6.3.1. Evaluation Criteria

A set of evaluation criteria was developed to provide an equal and consistent assessment of each alternative. These criteria pose questions regarding how each alternative addresses land use compatibility, environmental and cultural effects, potential for expansion, operational efficiency, and revenue generating capability. Each alternative was evaluated against the No Build Alternative.

- **Land Use Compatibility:** Is the alternative compatible with on- and off-airport patterns of land use? The criterion will evaluate such things as access to the airside movement areas, access to the local road network, and the degree to which the alternative is compatible with activities occurring in surrounding areas.
- **Environmental Effects:** Important social, economic, and environmental effects of the alternative will be identified and described. Potential mitigation measures, as appropriate, will be identified. Federal and State regulatory requirements (e.g., permits, Pennsylvania Department of Environmental Protection, National Environmental Policy Act) will be described.
- **Potential for Expansion:** Is the alternative flexible and dynamic in the sense that it has the ability to accommodate both planned and unanticipated future changes in demand? This criterion recognizes the fact that location decisions made today will influence future airport development for many years to come. Planning shall consider future development needs beyond the facility requirements of the current period.
- **Operational Efficiency:** Will this alternative contribute to the development of a smoothly functioning airport with efficient movement of aircraft? This criterion will consider whether the alternative makes the best and most efficient use of airport facilities and infrastructure.
- **Revenue Generation Capability:** Does the alternative take a strategic business and capital-based approach that allows or creates opportunities for airport management to increase revenue generation and/or diversify revenue sources thereby improving the overall competitiveness and cost effectiveness of the Airport?

These evaluation factors have been given a scoring value, as follows:

Land Use Compatibility:	Poor	(0)	Fair	(1)	Good	(2)	Excellent	(3)
Environmental Impact:	High	(0)	Moderate	(1)	Minor	(2)	None	(3)
Expansion Potential:	Poor	(0)	Fair	(1)	Good	(2)	Excellent	(3)
Operational Efficiency:	None	(0)	Low	(1)	Moderate	(2)	High	(3)
Revenue Generation:	Poor	(0)	Fair	(1)	Good	(2)	Excellent	(3)

6.3.2. General Aviation and Landside Alternative 1 – No Build

The No Build Alternative can be seen in **Figure 6-1**, and proposes no changes to the landside and GA areas of the Airport. The No Build Alternative is evaluated as follows:

- **Land Use Compatibility:** As the Airport property and surrounding land use are currently compatible, and the No-Build alternative proposes no changes, the alternative scores **Excellent (3)** with respect to land use compatibility.
- **Environmental Effects:** This alternative proposes no changes and no environmental impacts. It is given a score of **None (3)** for impacts to the environment.
- **Potential for Expansion:** With nothing being built, the potential for expansion at the Airport remains high and this alternative scores **Excellent (3)** for future expansion potential.
- **Operational Efficiency:** This alternative does nothing to enhance operational efficiency and scores **None (0)** for operational efficiency.
- **Revenue Generation Capability:** With no changes to the Airport, there are no opportunities for increased revenue generation and this alternative scores **Poor (0)** for revenue generation.

6.3.3. General Aviation and Landside Alternative 2

General Aviation and Landside Alternative 2 can be seen in **Figure 6-10**, and includes multiple recommendations from Chapter 5, *Facility Requirements*, including:

- The Airport should plan to replace the airfield lighting vault and should consider locations for future siting to ensure the facility does not impede future development
- With the lighting vault relocated, the Airport should expand the West Apron to the east
- The Airport should install a primary wind cone in the vicinity of former Taxiway G.
- The supplemental wind cones should be relocated outside of the Runway 16-34 ROFA
- The Airport should plan for the addition of a new corporate hangar on the North Apron
- The Airport should plan for the addition of a new corporate hangar on the West Apron
- The ATCT should be updated within the planning period to meet current equipment needs and meet height standards
- The Airport should preserve space on the West Apron for a US Customs and Border Protection (USCBP) Federal Inspection Station (FIS)

As discussed in Chapter 5, *Facility Requirements*, the existing airfield lighting vault was constructed well over 40 years ago and has served its useful life at BGM. Discussions with airport staff indicate frequent failures in equipment and a need to replace the facility to modern equipment. Relocating the lighting vault provides an opportunity to expand the West Apron toward the east.

As a Code of Federal Regulations (CFR) Part 139 airport that serves commercial air traffic, a primary wind cone is required, and it is recommended one be installed within the planning period. A site within the vicinity of former Taxiway G was identified as meeting the siting criteria for a primary wind cone. Also, the supplemental wind cones should be sited outside of RSAs and ROFAs.

It is recommended the Airport plan for additional corporate hangars to meet future demand. Locations could include the West and North Aprons. Lastly, the ATCT was constructed in 1950 and is outdated. Consideration should be made to improving the ATCT, however, maintaining its current location on the Airport.

These improvements will be considered against the evaluation criteria below.

- **Land Use Compatibility:** The recommendations in this alternative are compatible with on- and off-airport patterns of land use, and as such scores **Excellent (3)** with respect to land use compatibility.
- **Environmental Effects:** These recommendations in the GA and Landside Alternative 2 would have minimal environmental impacts as the proposed improvements are on previously developed land. It is given a score of **Minor (2)** for impacts to the environment.
- **Potential for Expansion:** These recommendations have some impact on future expansion potential, and this alternative scores **Good (2)** for future expansion potential.
- **Operational Efficiency:** A new, relocated lighting vault, a primary wind cone, and a new ATCT would enhance operational efficiency. This alternative scores **High (3)** for enhancing operational efficiency.
- **Revenue Generation Capability:** This alternative provides multiple opportunities to increase revenue generation at the Airport, including the leasing of hangar space or land for hangar development, and potentially lease space inside of the terminal building from a relocated ATCT. This set of recommendations scores **Excellent (3)** for revenue generation.

The comparison between GA and landside Alternatives 2 and the No Build Alternative can be seen below in **Table 6-6**.

Table 6-6: GA and Landside Alternative 2 Comparison

	Land Use	Environmental Effects	Expansion Potential	Operational Efficiency	Revenue Generation	Total
No Build	Excellent (3)	None (3)	Excellent (3)	None (0)	None (0)	9
GA Alt. 2	Excellent (3)	Minor (2)	Good (2)	High (3)	Excellent (3)	13

Source: McFarland Johnson analysis.

As can be seen in **Table 6-6**, GA and Landside Alternative 2 scores higher and it is recommended those projects be carried forward.

6.3.4. General Aviation and Landside Alternative 3 – Corporate Hangars

Chapter 5 identified the potential need for additional hangar space at BGM, particularly for larger, corporate jet aircraft. The Airport should plan for the construction of additional conventional hangar units to accommodate new based tenants, as well as transient aircraft, at BGM.

GA and Landside Alternative 3 proposes up to three box hangars on the southwest quadrant of the Airport, with access to the approach end of Runway 10. This alternative can be seen in **Figure 6-11**, and is evaluated below using the criteria from **Section 6.3.1**.

Figure 6-10: General Aviation and Landside Alternative 2

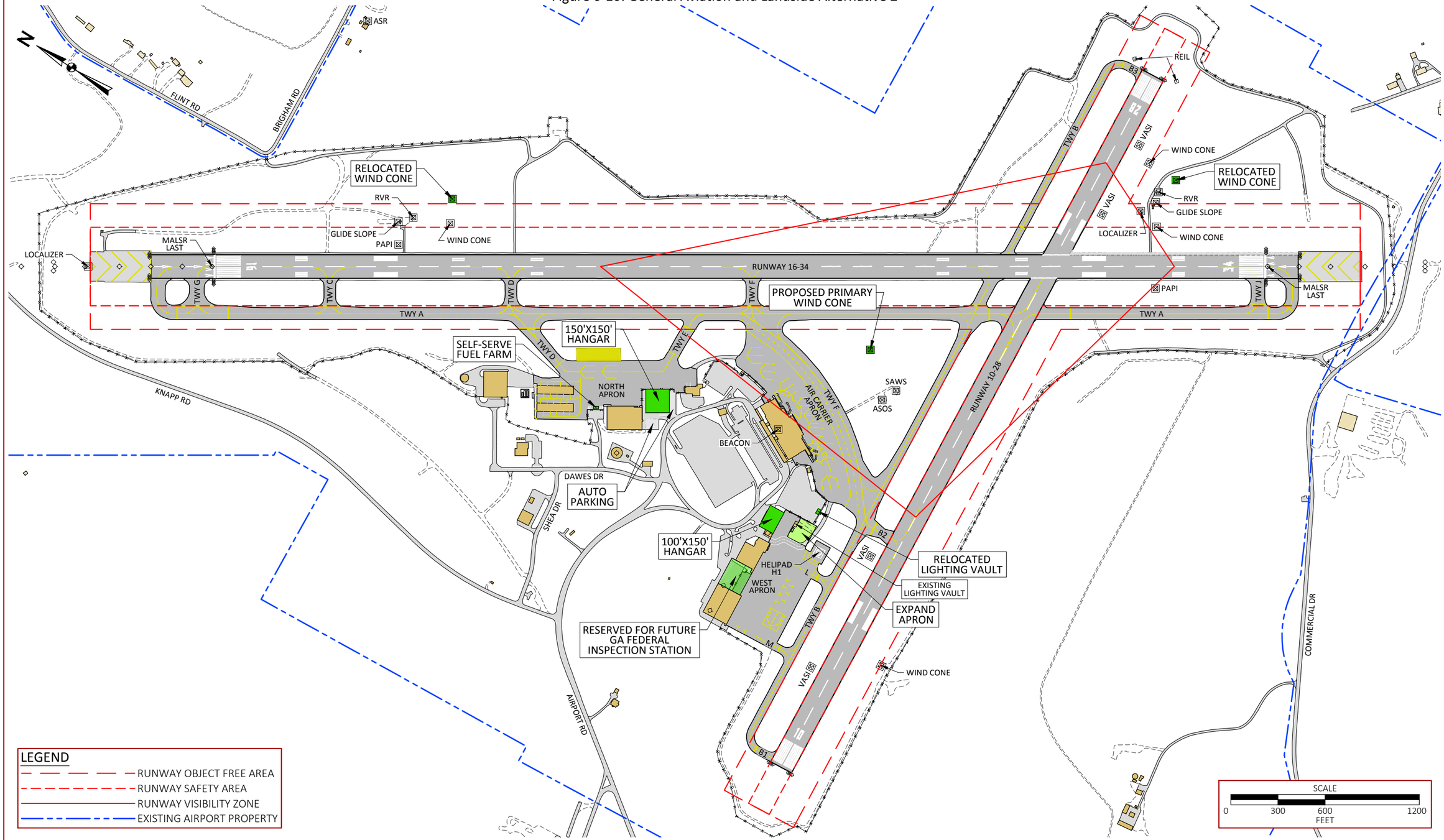

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Figure 6-11: General Aviation and Landside Alternative 3 - Corporate Hangars

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- **Land Use Compatibility:** This alternative works very well with the surrounding land use and makes excellent use of the land the hangars are situated on. It is perhaps the only viable use of the land, and it scores **Excellent (3)** with respect to land use compatibility.
- **Environmental Effects:** There would be some minor environmental impacts with the addition of new facilities, but those effects could be mitigated with proper grading and drainage. This alternative is given a score of **Minor (2)** for impacts to the environment.
- **Potential for Expansion:** This alternative makes the best use of the available land, while leaving other areas of the Airport available for future expansion. It scores **Excellent (3)** for future expansion potential.
- **Operational Efficiency:** The location of the hangars is not the most optimal for airport operational efficiency as some arriving and departing aircraft, particularly those utilizing Runway 16-34 will have long taxi times and will inevitably have to cross Runway 10-28. This alternative scores **Low (1)** for enhancing operational efficiency.
- **Revenue Generation Capability:** This alternative maximizes revenue generation for this parcel of land as one of the only potential uses of this space. This alternative scores **High (3)** for revenue generation capability.

Table 6-7 below compares GA and Landside Alternative 3 against the No Build Alternative.

Table 6-7: GA and Landside Alternative 3 Evaluation

	Land Use	Environmental Effects	Expansion Potential	Operational Efficiency	Revenue Generation	Total
No Build	Excellent (3)	None (3)	Excellent (3)	None (0)	None (0)	9
GA Alt. 3	Excellent (3)	Minor (2)	Excellent (3)	Low (1)	High (3)	12

Source: McFarland Johnson analysis.

As can be seen, GA and Landside Alternative 3 scores higher. It is recommended the Airport move forward with hangar construction or find a developer willing to build on the site.

6.3.5. Preferred General Aviation and Landside Alternative

Table 6-8 details the preferred GA and Landside Alternatives. It is recommended the Airport move forward with these improvements.

Table 6-8: GA and Landside Alternatives Evaluation Summary

	Land Use	Environmental Effects	Expansion Potential	Operational Efficiency	Revenue Generation	Total
GA Alt. 2	(N/A)	None (3)	Excellent (3)	High (3)	Fair (1)	10
GA Alt. 3	Excellent (3)	Minor (2)	Excellent (3)	Low (1)	High (3)	12

Source: McFarland Johnson analysis.

6.3.6. Non-Aeronautical Land Use Alternative

A goal of the Airport, and the FAA is financial self-sufficiency. As part of this Master Plan Update, areas for non-aeronautical development have been explored and included in this analysis in an effort to generate revenue. Five sites totaling approximately 270 acres have been identified that would be suitable for concurrent non-aeronautical development.

One of the sites is an approximately 154-acre site along Commercial Drive. A second site to the west of the existing terminal building and parking lots of approximately 29 acres could be suitable for concurrent non-aeronautical development. A third site is located northeast of the approach end of Runway 16 and is approximately 47 acres which could also be utilized for concurrent non-aeronautical development. A fourth site of approximately 4.5 acres is located along Commercial Drive.

A fifth site of approximately 37 acres has been identified off of the approach end of Runway 16. Given its distance from the Airport, it is unlikely it could ever be developed for aeronautical use. Also, with very little road frontage, it is not an ideal site for commercial development. It is recommended this parcel be released and disposed of. An adjacent land user has proposed to acquire the site for agricultural uses All five sites for non-aeronautical development can be seen in Figure 6-12.

6.4. PREFERRED AIRPORT DEVELOPMENT ALTERNATIVE

The preferred airport development alternative combines the recommended airside, general aviation and landside alternatives and is shown in Figure 6-13. This figure also shows the construction of buildings due to requests from interested potential tenants.

Figure 6-12: Land Use Alternative 1

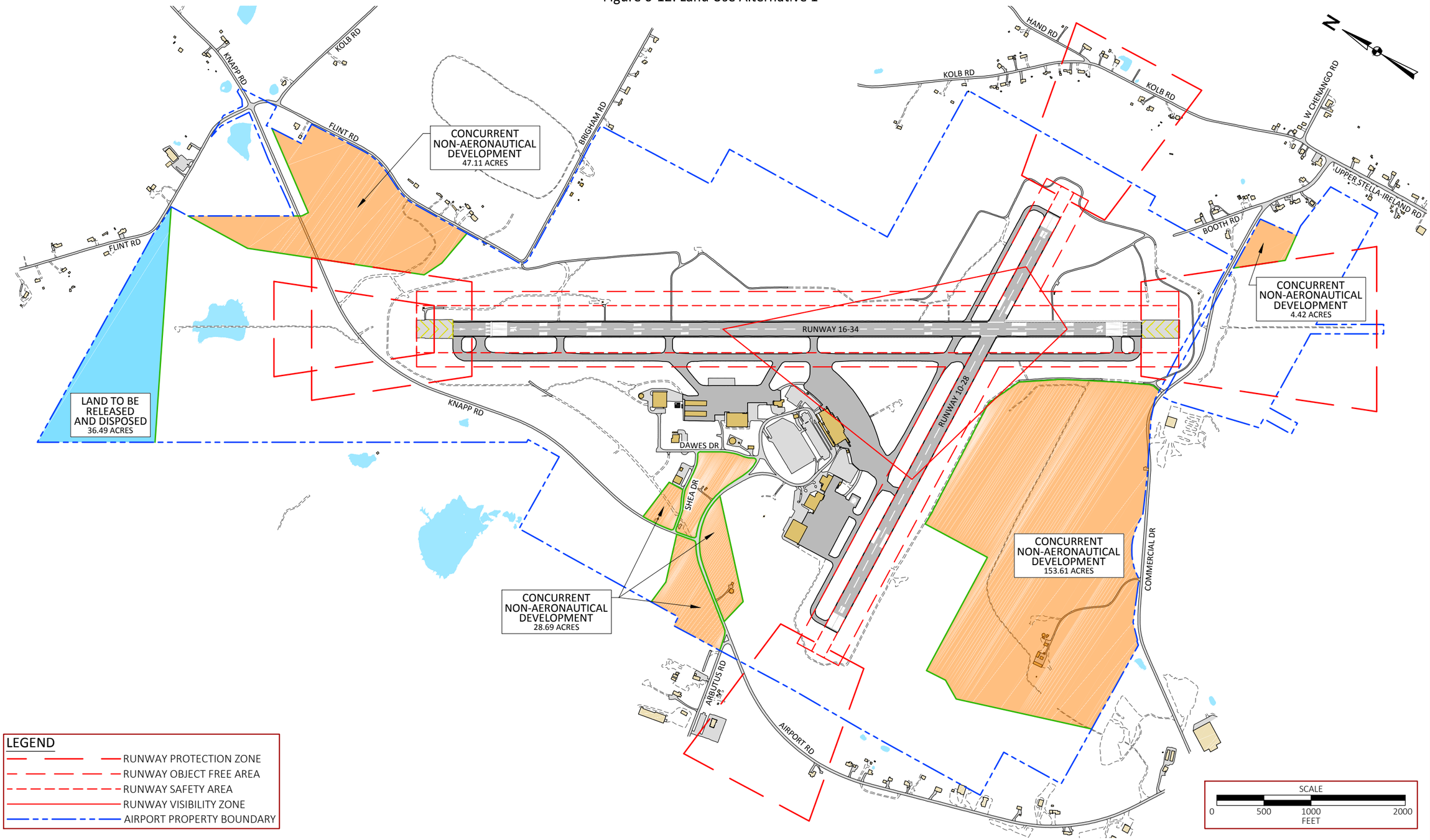

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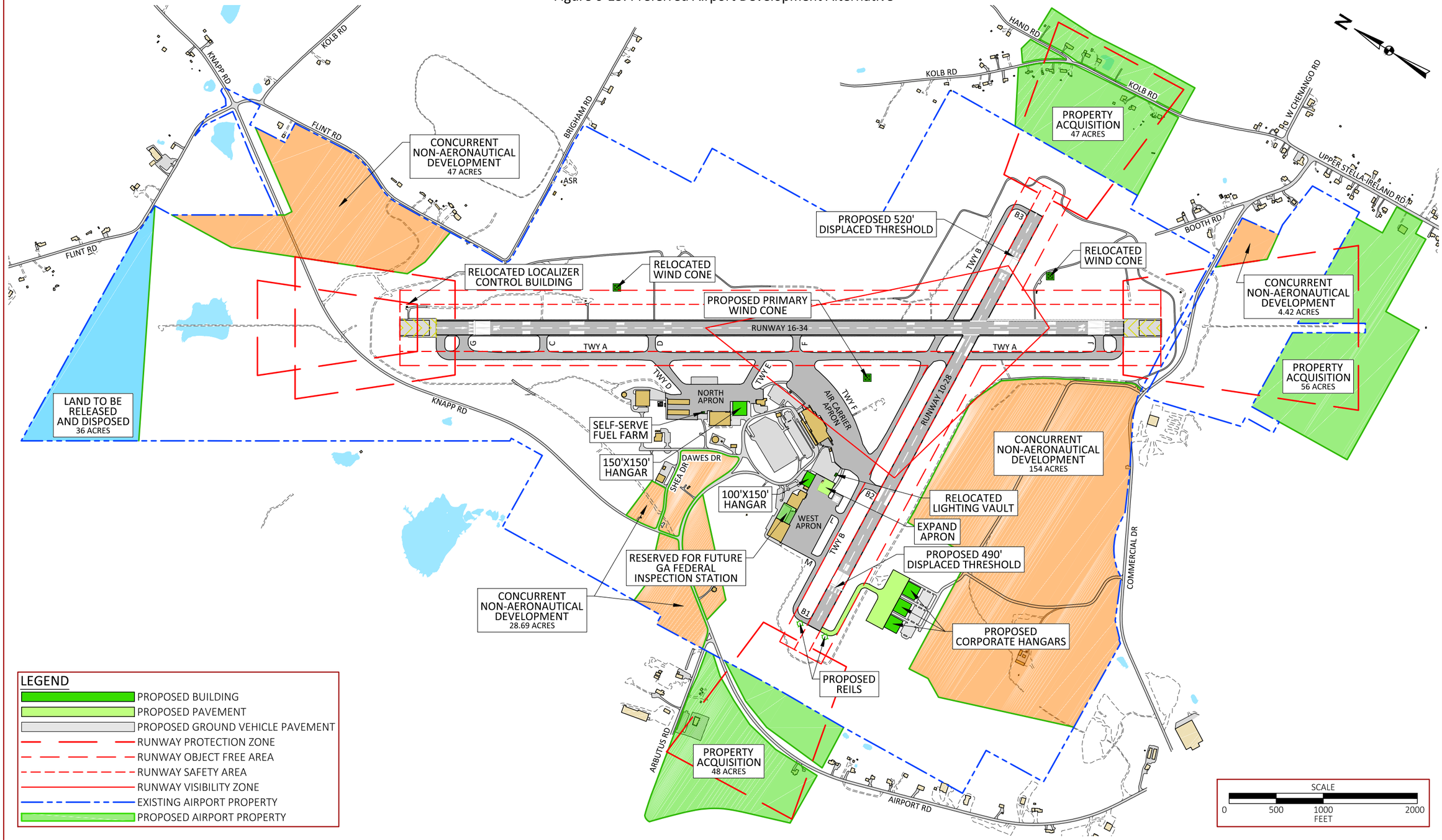
Figure 6-13: Preferred Airport Development Alternative



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