Airport Master Plan Update

Technical Advisory Committee Briefing #2

October 21, 2022

BOCA RATON AIRPORT

Briefing Agenda

Comments:

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- Airport Master Plan Update Status
- Review of Future Demand
- Airfield Capacity and Facility Requirements
- Alternatives and Concepts
- Other Master Planning Elements
- Next Steps

Airport Master Plan Update Status

Project Background

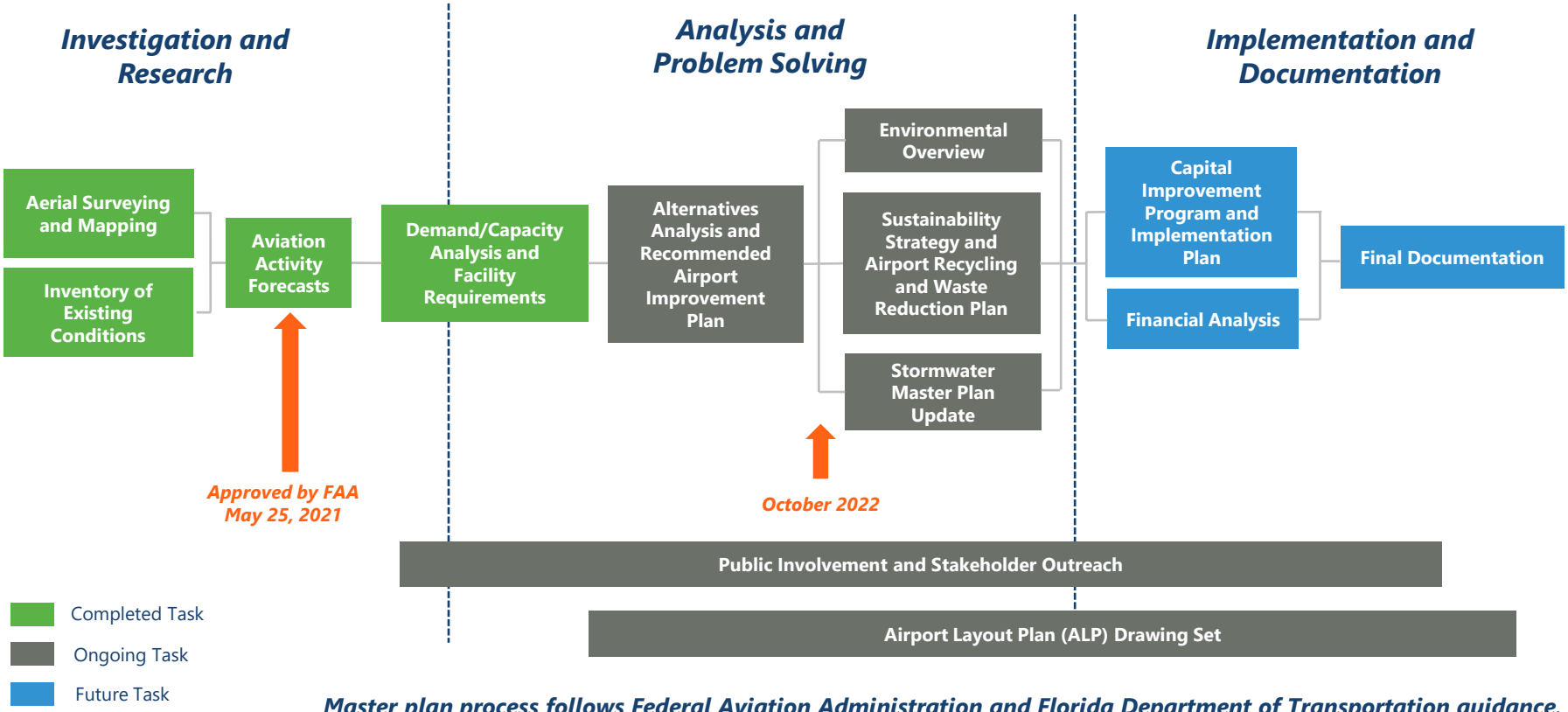
What is an Airport Master Plan?

- Local level planning effort tailored to BCT
- Intended to guide future airport development over a 20-year timeframe that:
  - Satisfies future aviation demand
  - Identifies facility requirements for all Airport users
  - Considers environmental and socioeconomic impacts
  - Enables the Airport to achieve its mission
  - Complies with all applicable FAA requirements

"An airport master plan is a comprehensive study of an airport and usually describes the short-, medium-, and long-term development plans to meet future aviation demand."

- FAA Advisory Circular 150/5070 – 6B – Airport Master Plans

Project Process



Master plan process follows Federal Aviation Administration and Florida Department of Transportation guidance.

Technical Advisory Committee

- Provide feedback and technical guidance on each element of the Master Plan Update:
  - Bring various master local perspectives to the master planning process
  - Provide input and guidance on technical analyses
  - Provide ideas for consideration in the Master Plan
- Help build the Airport's future by sharing what you learn from your participation in the Technical Advisory Committee

Primary Master Plan Goals

To evaluate the fleet of business jet aircraft that operate at the Airport

To define, evaluate, and recommend safety, capacity, and operational enhancements for BCT

To update the 10-year Capital Improvement Program (CIP) for the Airport

To establish a plan that optimizes the use of BCT's limited land assets

Review of Future Demand

Future Demand Summary *(Approved by FAA May 25, 2021)*

CATEGORY	ACTUALS		PROJECTED		
	FY 2020 (Base Year)	FY 2021	FY 2025	FY 2030	FY 2040
Total Aircraft Operations	**71,756**	**78,136**	**80,800**	**90,000**	**111,200**
Itinerant	45,683	52,537	50,600	55,800	67,200
Local	26,073	25,599	30,200	34,200	44,000
Total Based Aircraft	**241**	**208**	**253**	**267**	**298**
Single Engine	130	107	132	133	137
Multi Engine	27	25	28	29	31
Jet	81	68	90	101	125
Helicopter	3	4	3	4	5

Net Increase – 55%
- *Airfield Infrastructure*
- *Itinerant Aircraft Parking Apron*
- *Fuel Farm Requirements*
- *General Aviation/FBO Terminal*
- *Vehicular Parking*

Net Increase – 24%
- *Hangar Requirements*
- *Maintenance Requirements*
- *Based Aircraft Parking Apron*

NOTE: FBO – Fixed Base Operator; FY – Fiscal Year (October 1 – September 30)
SOURCE: Ricondo & Associates, Inc., March 2021.

Airfield Capacity and Facility Requirements

Airport Capacity and Facility Requirements

Items evaluated/incorporated in the MPU and discussed throughout the remainder of the TAC Briefing

- **Airfield**
  - FAA design standards for runways and taxiways
  - Lighting and signage
- **General Aviation / Aeronautical Use**
  - Hangar space
  - Apron parking
- **Support Facilities**
  - Navigational aids
  - Fuel facilities and vehicular parking
- **Landside / Other**
  - Potential adjacent land opportunities
  - Underground stormwater containment
  - Advanced Air Mobility (AAM) alternatives

Airfield Capacity

	BASE (FY 2020)	FY 2025	FY 2030	FY 2040
Annual Operations	71,756	80,800	90,000	111,200
Annual Service Volume	136,000	136,000	136,000	136,000
Annual Service Volume Ratio	**53%**	**59%**	**65%**	**82%**

- Airfield capacity is adequate to accommodate forecast demand throughout the planning period
- FAA recommends planning for new runways at 60% of capacity
  - New runway not possible at BCT
  - Capacity enhancement could consist of taxiway improvements (aircraft holding bay capacity), or operational changes (limiting or restricting touch-and-go operations)

Airfield capacity must be balanced with other airport components including hangars, apron areas, and landside facilities. BCT has limited developable space which could impact ASV ratio.

SOURCES: US Department of Transportation, Federal Aviation Administration, Advisory Circular 150/5060-5, *Airport Capacity and Delay*, December 1995; Ricondo & Associates, Inc., *Aviation Activity Forecasts*, January 2021.

Additional General Aviation Facility Requirements

General Aviation Facility Description[1/2/]	FY 2025	FY 2030	FY 2040
Hangars			
T-Hangars	30,000	32,000	40,000
Conventional Hangars	59,000	92,000	163,000
Maintenance Hangars	10,000	16,000	28,000
Subtotal Hangars	**99,000**	**140,000**	**231,000**
Apron			
Hangar Access	99,000	140,000	231,000
Based and Itinerant Apron	11,000	79,000	294,000
Subtotal Apron	**110,000**	**219,000**	**525,000**
Other Support Areas[3/]	**39,000**	**87,000**	**243,000**
Grand Total	**248,000**	**434,000**	**999,000**
Grand Total in Acres	**5.69**	**9.96**	**22.93**

SOURCE: Ricondo & Associates, Inc., March 2021.

NOTES:

FBO – Fixed Base Operator
FY – Fiscal Year (October 1 – September 30)

1/ Values are presented in square feet unless otherwise noted.
2/ Additional general aviation facilities are needed to accommodate future demand identified in the preliminary aviation activity forecasts. These values are in excess of the current general aviation facilities at BCT.
3/ Other support areas include GA/FBO Terminal facilities, vehicular parking, and landscaping/drainage areas.

Requirements do not include planned improvements within the Atlantic Aviation leasehold (2.8 acres)

Alternatives and Concepts

Alternatives and Concepts

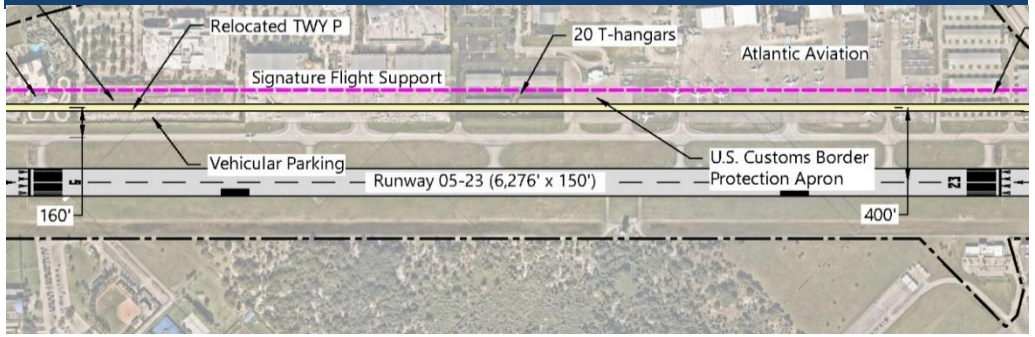
Airfield Alternatives and Concepts

Runway to Taxiway Centerline Separation

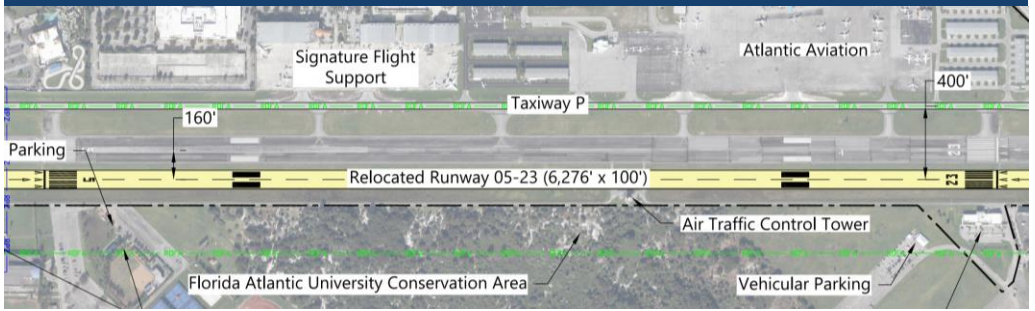
- Existing separation – 240’
- FAA standard separation – 400’
- Modification of Standards (MOS) approved May 5, 2004
- Operational restriction (SOP - January 7, 2016)
- At the FAA’s request, a new MOS was developed and will be considered during the next runway or taxiway rehabilitation or improvement project.

Relocating the runway or taxiway is not practical due to operational, financial, and environmental impacts

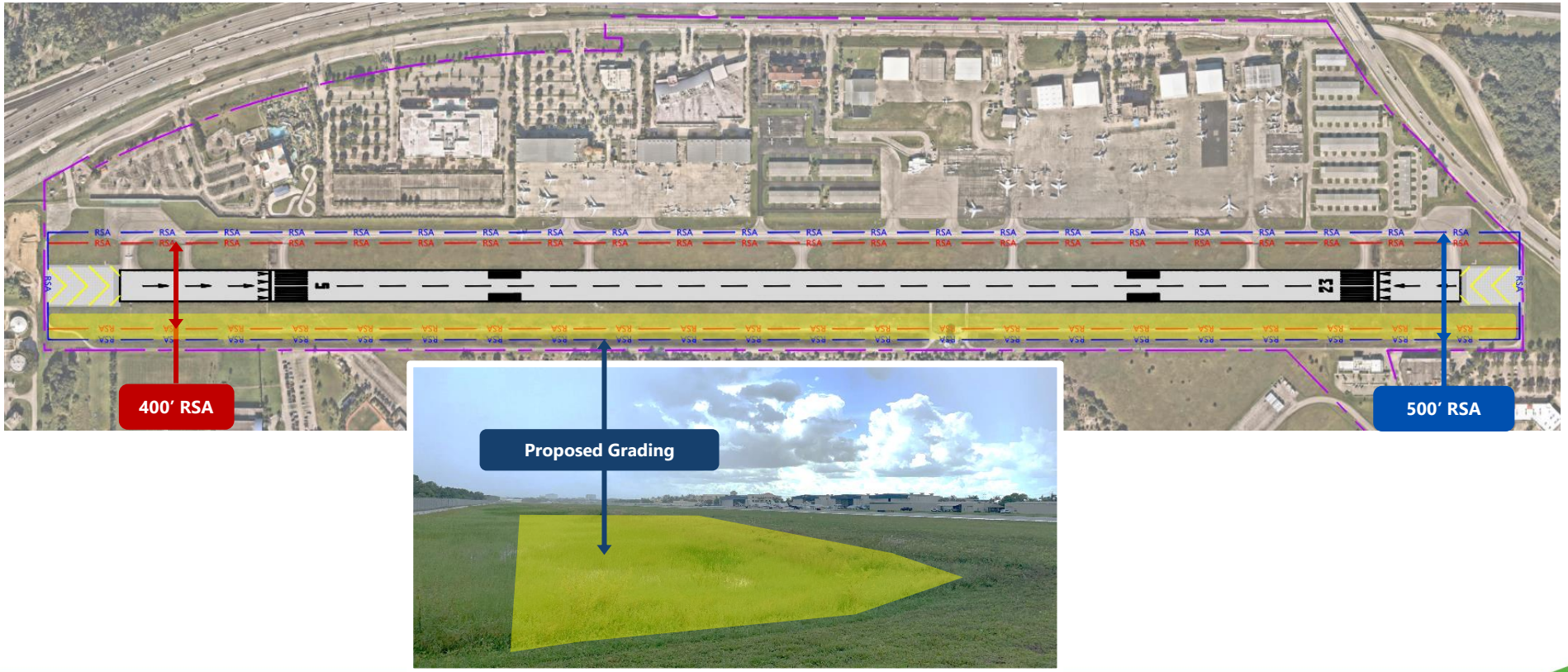
Relocate Parallel Taxiway Alternative



Relocate Runway Alternative

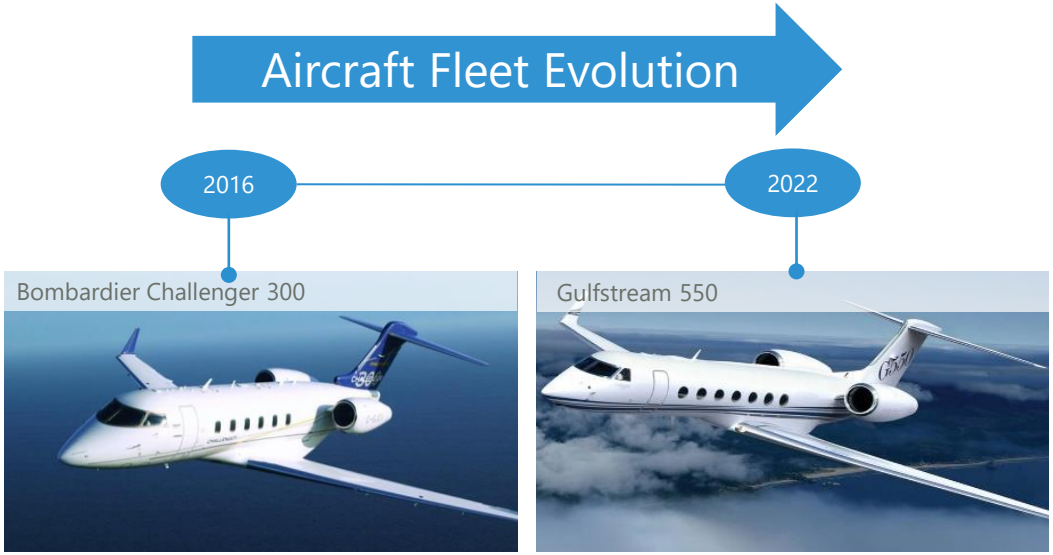


Runway Safety Area Improvements



Engineered Material Arresting System (EMAS)

EMAS installed in 2016 (Runway 23 approach end) and 2017 (Runway 5 approach end)

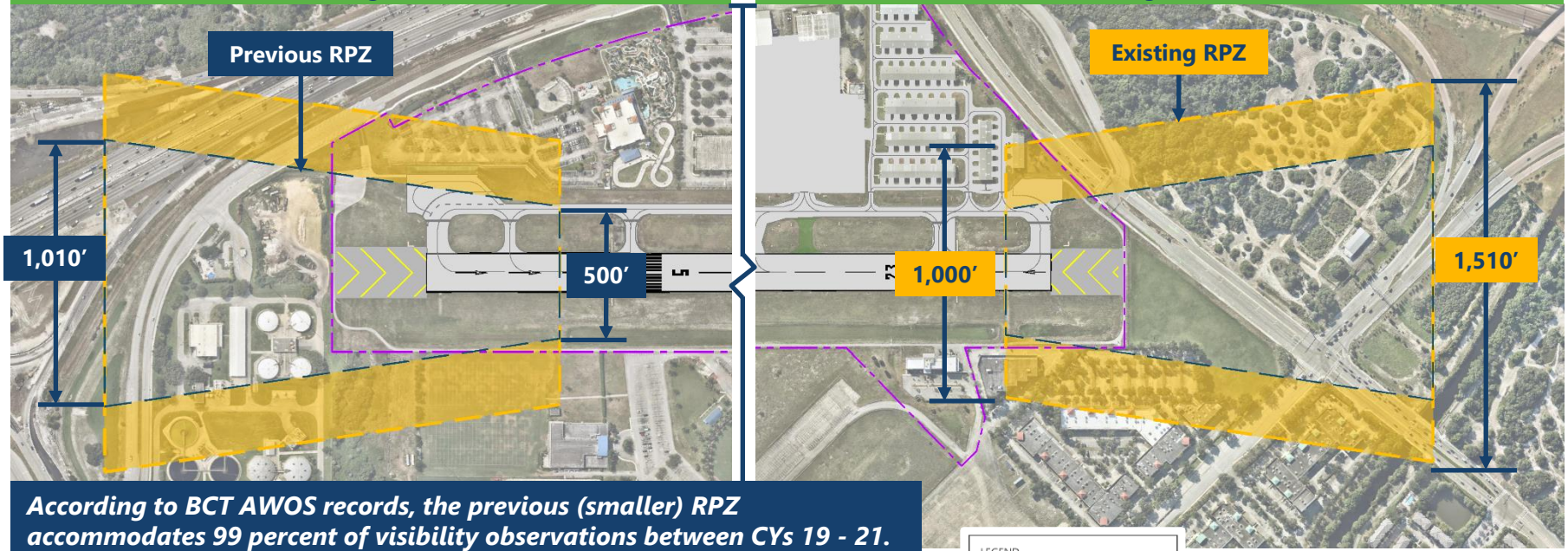


Recommendation: Coordinate with the EMAS manufacturer to study whether the performance of the existing EMAS is sufficient to accommodate the current fleet of aircraft.

Approach Runway Protection Zone

Runway 5 End

Runway 23 End

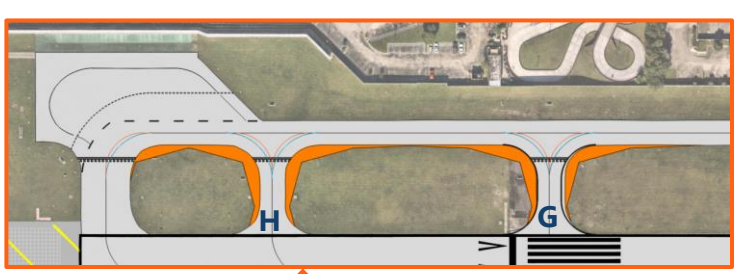


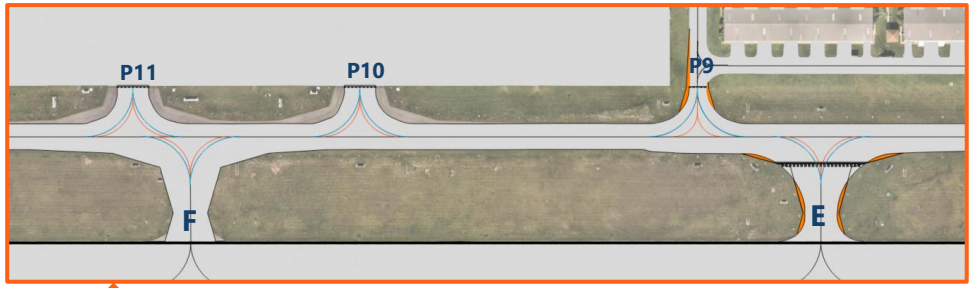
According to BCT AWOS records, the previous (smaller) RPZ accommodates 99 percent of visibility observations between CYs 19 - 21.

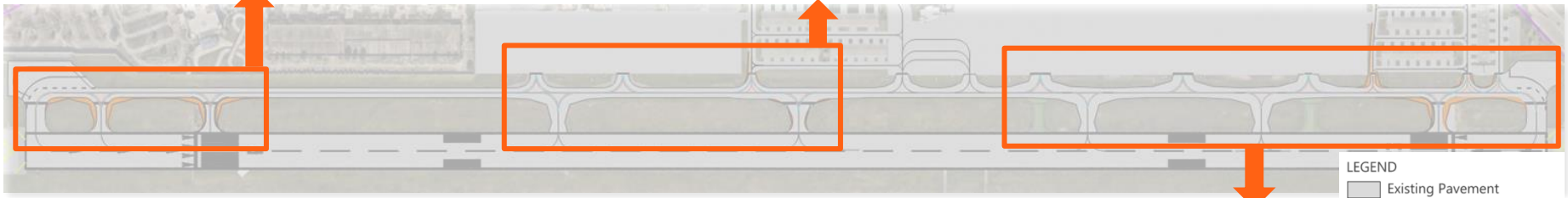
Recommendation: Request FAA increase visibility minimums (back to 1-mile) to correlate to smaller RPZ to reduce incompatible land uses.

Existing RPZ = 49.0 acres
Previous RPZ = 29.5 acres

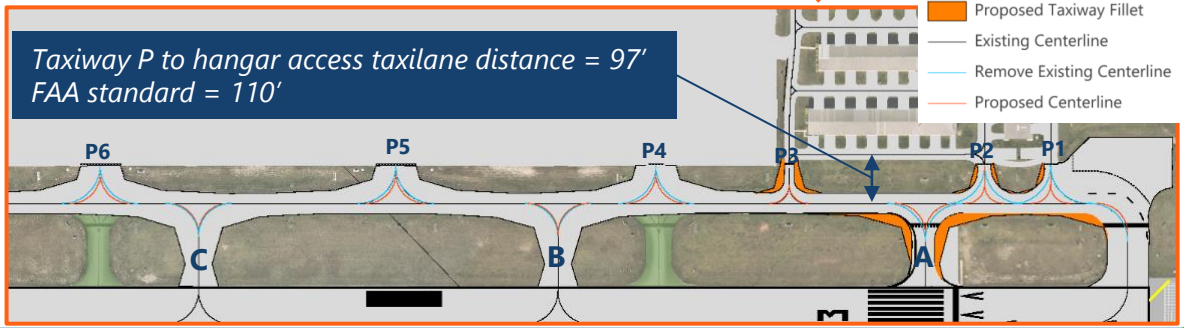
Taxiway Geometry Enhancements







Recommendation: Geometry enhancements at Taxiways H, G, E, A, and P3 to provide standard taxiway edge safety margin in accordance with FAA design standards for the current fleet of aircraft.



Previously Considered Taxiway Geometry Enhancements

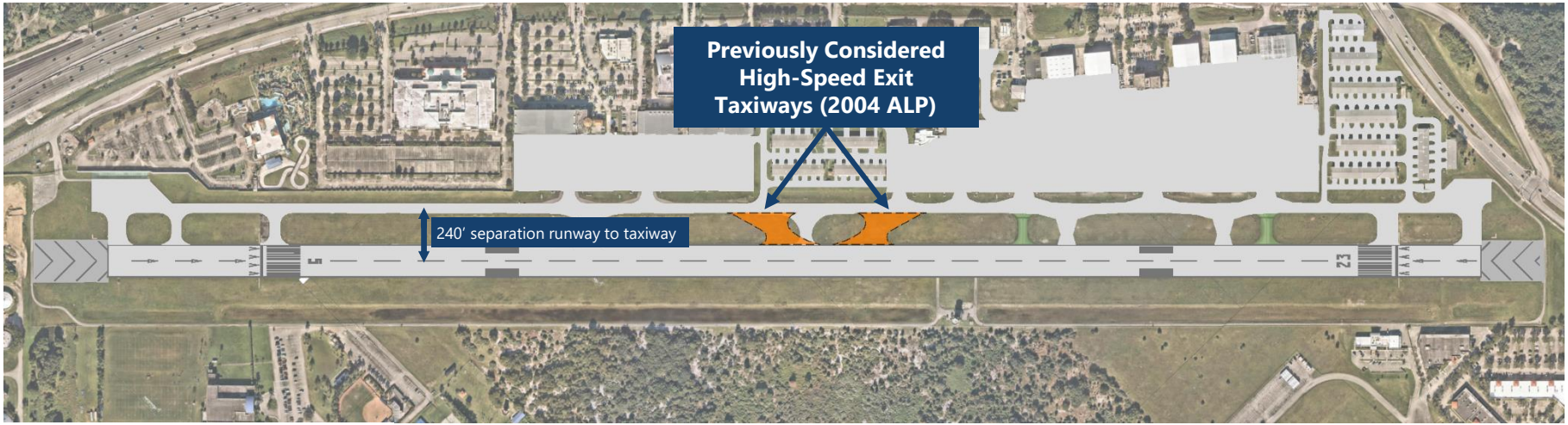


Table 4-5. Runway to Taxiway Separation for Reverse Turns from a High-Speed Exit Based on TDG

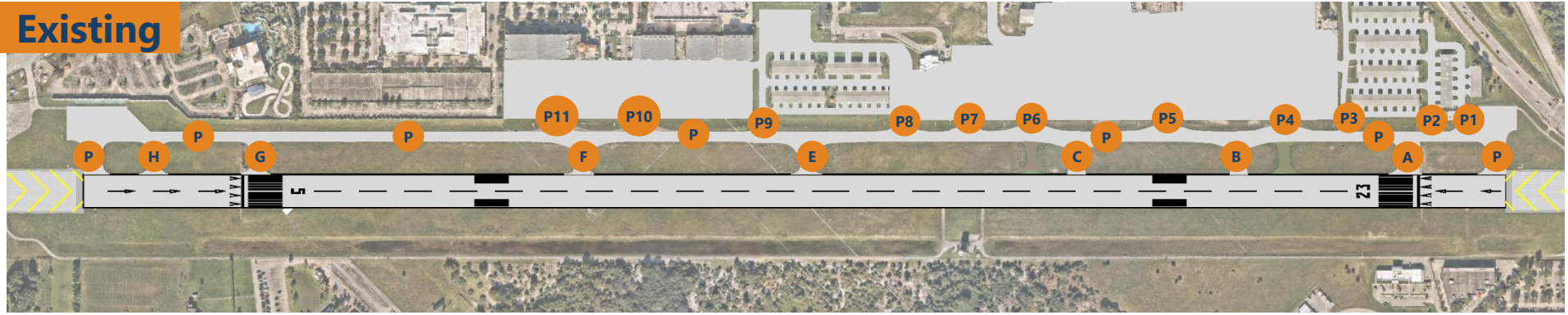
Runway Centerline to Taxiway/ Taxilane Centerline	TDG			
	3	4	5	6
Recommended separation	350 ft (107 m)	450 ft (137 m)	450 ft (137 m)	600 ft (183 m)
Radius for 150-degree turn after 30-degree exit	79 ft (24.1 m)	121 ft (37 m)	121 ft (37 m)	152 ft (46 m)
Minimum separation [1]	348 ft (106 m)	427 ft (130 m)	427 ft (130 m)	485 ft (148 m)

Note 1: Minimum separation distance based on the standard 30-degree high speed exit and maximum 50-degree steering angle for the reverse turn.

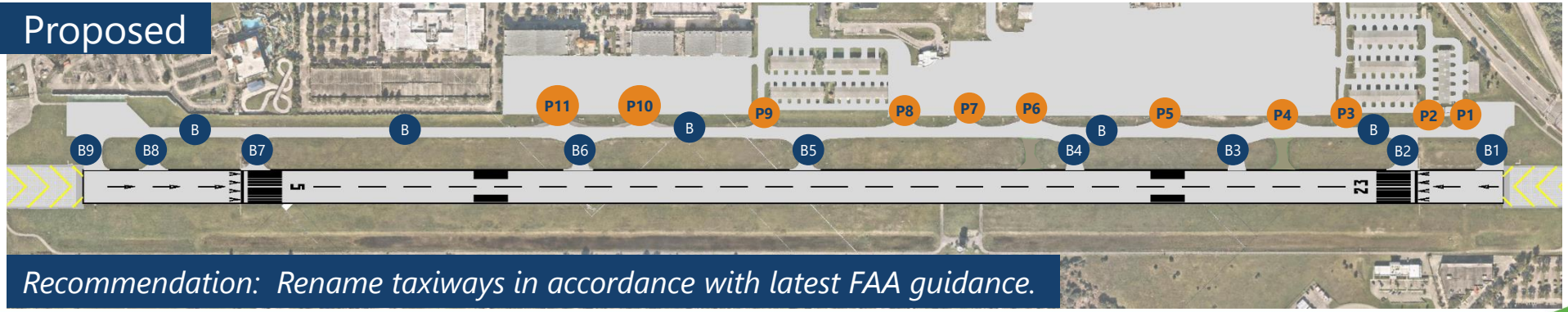
Low probability of approach category C and D aircraft using the high-speed exits due to their distance from the threshold.

Taxiway Nomenclature Changes

Existing



Proposed

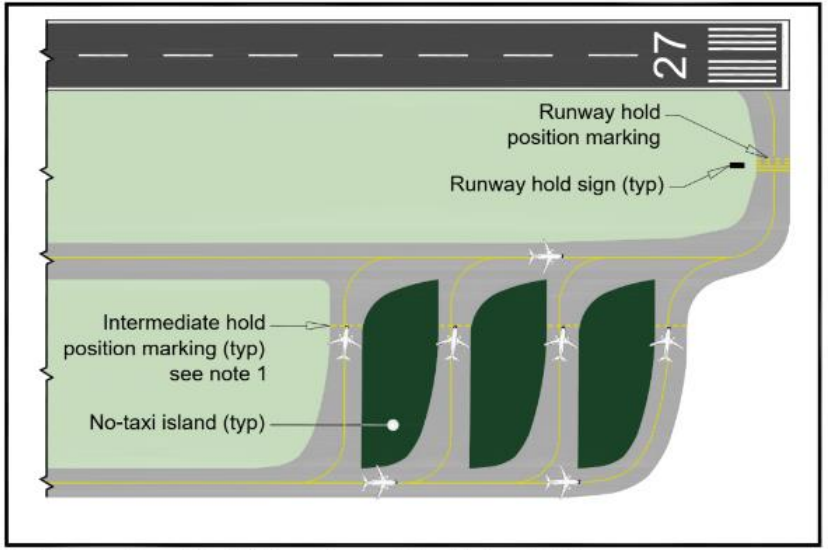


Recommendation: Rename taxiways in accordance with latest FAA guidance.

Aircraft Holding Bays

- Existing holding bays are within the taxiway object free area and are considered a wide expanse of pavement
- Proposed aircraft holding bays provide an aircraft staging area when the parallel taxiway is cleared to accommodate ADG-III (wingspan > 79') aircraft using the runway

FAA Recommended Aircraft Holding Bay Configuration

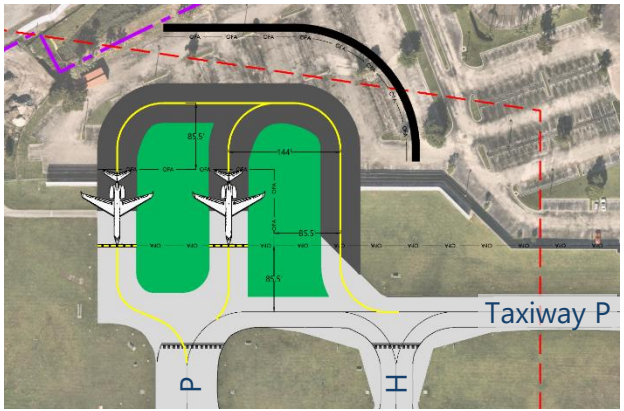


Note 1: Locate intermediate hold lines at the outer limit of the inner TOFA.

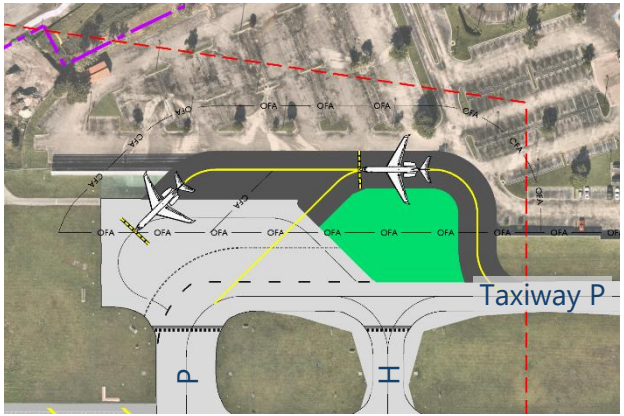
Runway 5 Aircraft Holding Bay Options

Option 1

Aircraft holding bay will accommodate ADG-III aircraft (Gulfstream G-550).

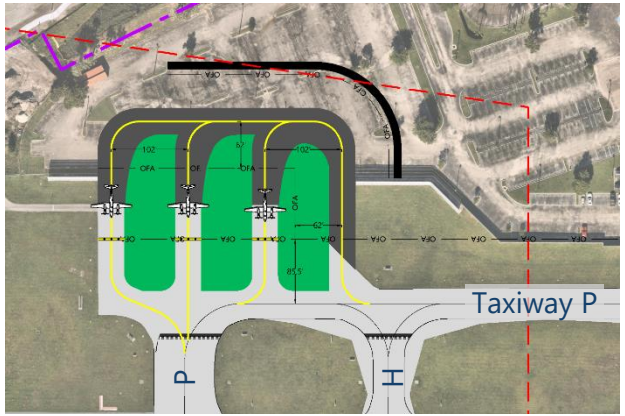


Option 2



Option 3

Aircraft holding bay will accommodate ADG-II aircraft (Gulfstream G-450).



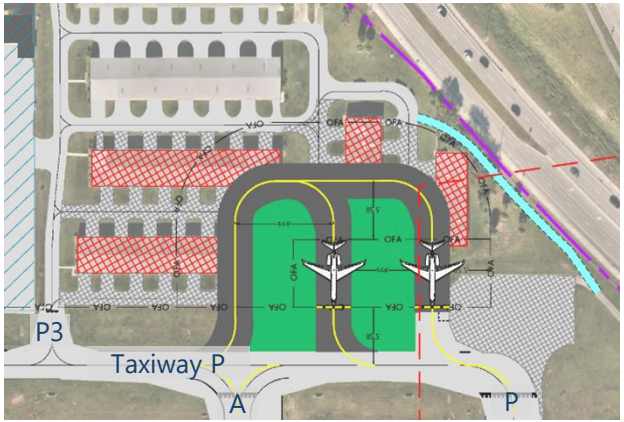
LEGEND
- Proposed Pavement
- Grass Island
- Centerline
- Object Free Area
- Blast Fence
- Runway Protection Zone
- Property Boundary

Recommendation: Construct aircraft holding bay outside of Taxiway P taxiway object free area and in accordance with current FAA design standards.

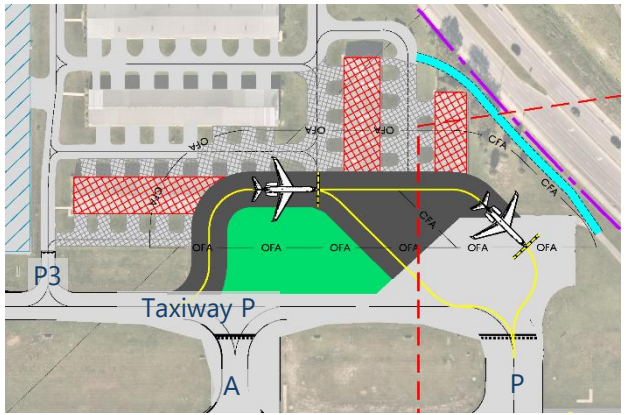
Runway 23 Aircraft Holding Bay Options

Option 1

Aircraft holding bay will accommodate ADG-III aircraft (Gulfstream G-550).

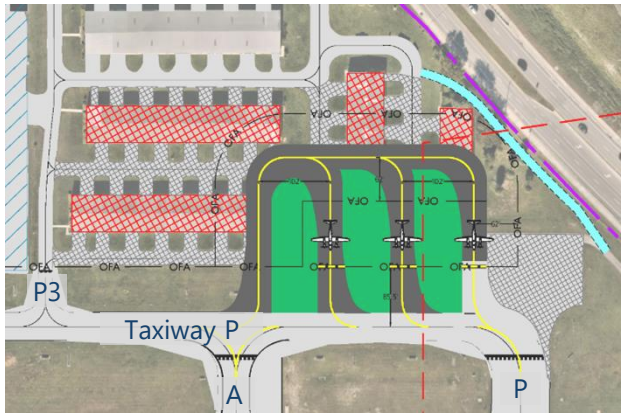


Option 2



Option 3

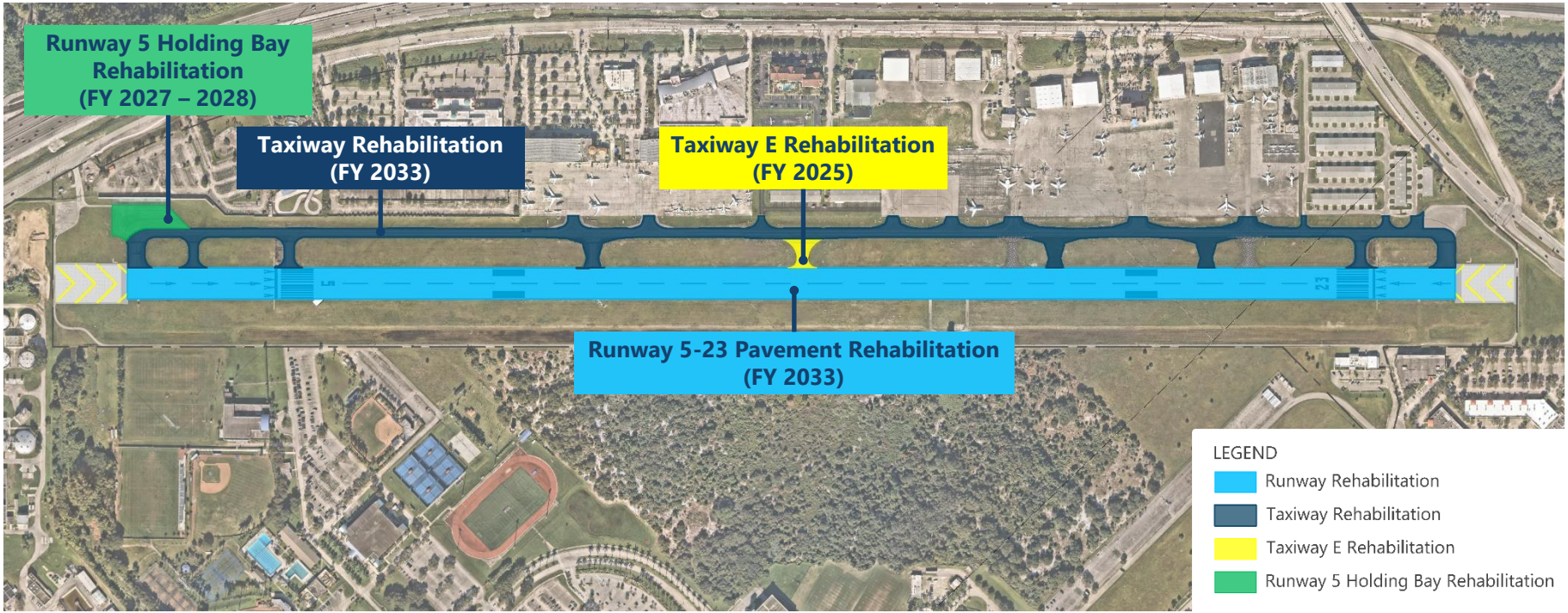
Aircraft holding bay will accommodate ADG-II aircraft (Gulfstream G-450).



LEGEND
- Proposed Pavement
- Grass Island
- Pavement Demolition
- Hangar Demolition
- Centerline
- Object Free Area
- Vehicle Service Road
- Runway Protection Zone
- Property Boundary

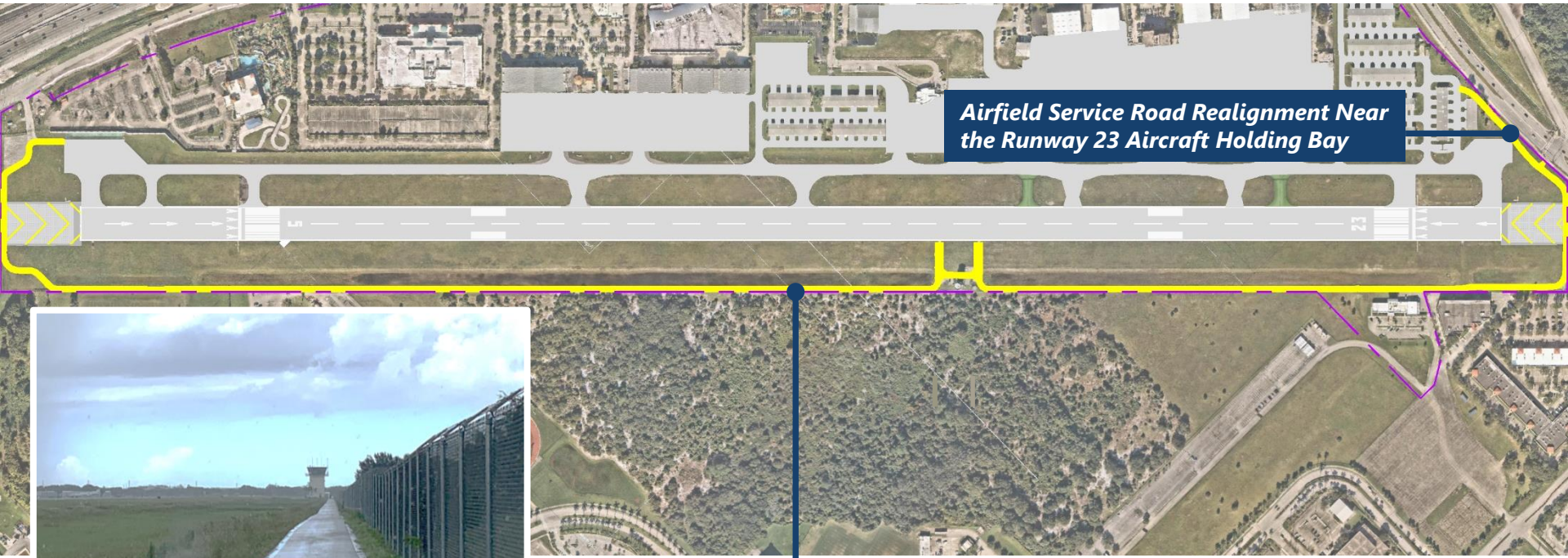
Recommendation: Construct aircraft holding bay outside of Taxiway P taxiway object free area and in accordance with current FAA design standards.

Pavement Rehabilitation
(2019 FDOT *Statewide Airfield Pavement Management Program*)



SOURCE: Florida Department of Transportation, Aviation and Spaceport Office, *Statewide Airfield Pavement Management Program District 4*, November 2019.

Airfield Service Road

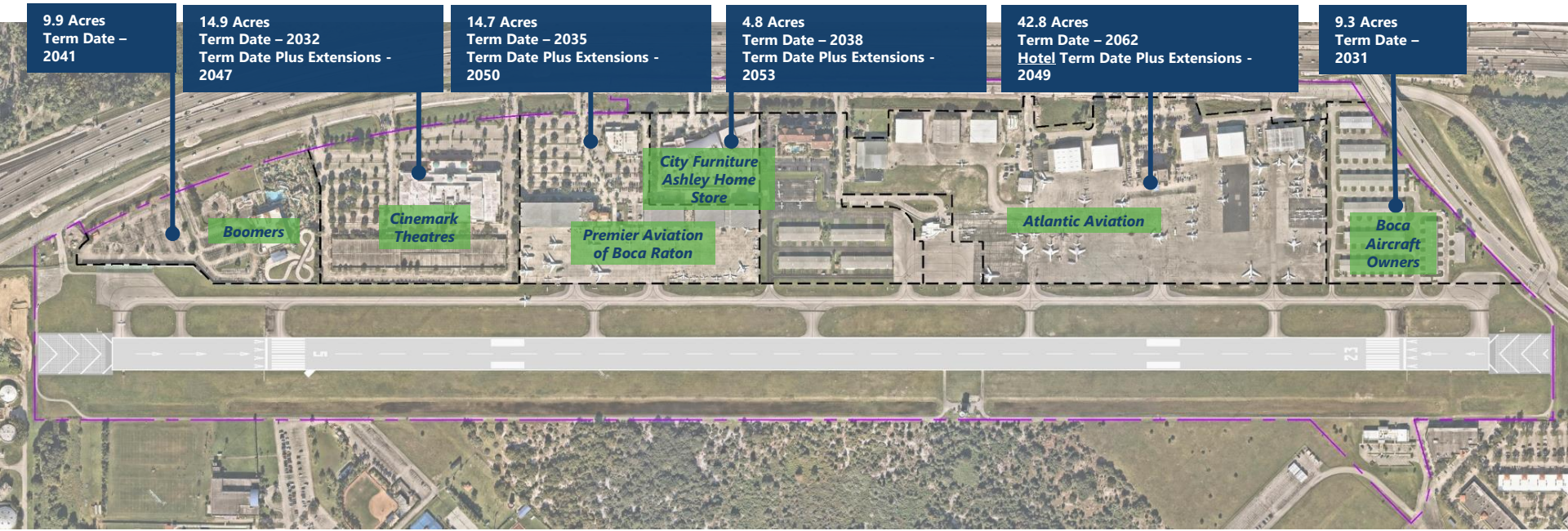


Recommendation: Widen airfield service road by 3′ – 4′ for emergency vehicles (project will consider stormwater implications)

Alternatives and Concepts

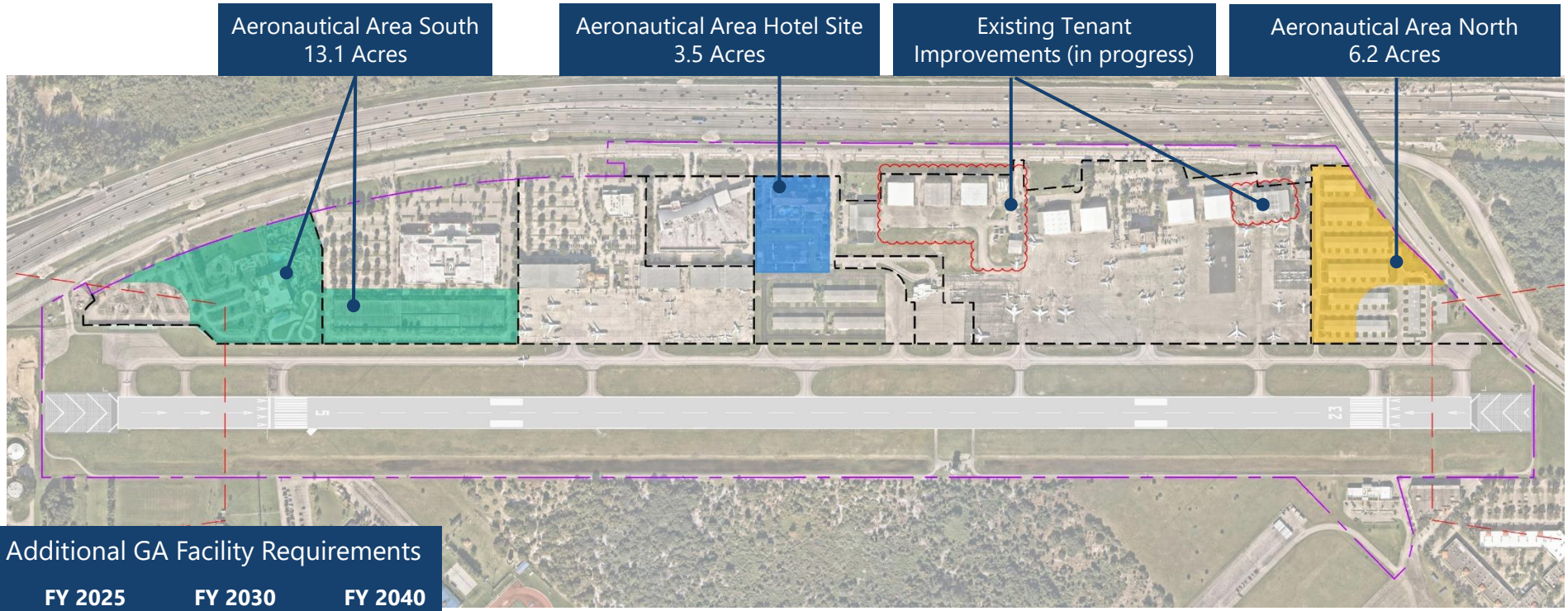
General Aviation / Aeronautical Use Concepts

Existing Property and Leaseholds



SOURCES: Boca Raton Airport Authority, January 2020 (leasehold details); Ricondo and Associates, *Airport Layout Plan*, June 2018; Martinez Geospatial, Inc., November 2019 (aerial photo).

GA/Aeronautical Use – Potential Redevelopment Sites

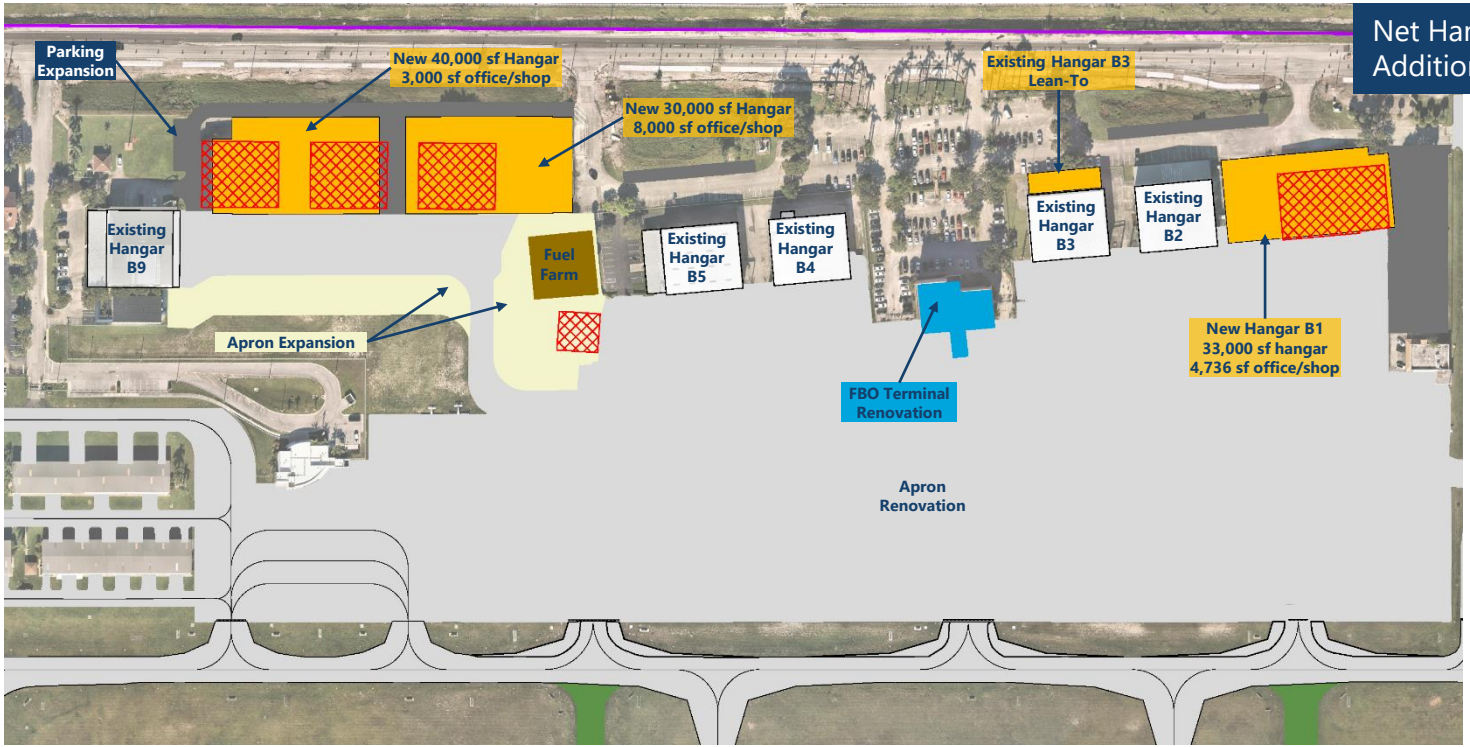


Additional GA Facility Requirements

FY 2025	FY 2030	FY 2040
6 Acres	10 Acres	23 Acres

SOURCES: Boca Raton Airport, Airport Layout Plan, June 2018; Atlantic FBO Facilities and Site Renovation - Boca Raton, Florida, Conceptual Design, May 2022; Ricondo, August 2022.

Atlantic Aviation Proposed Improvements

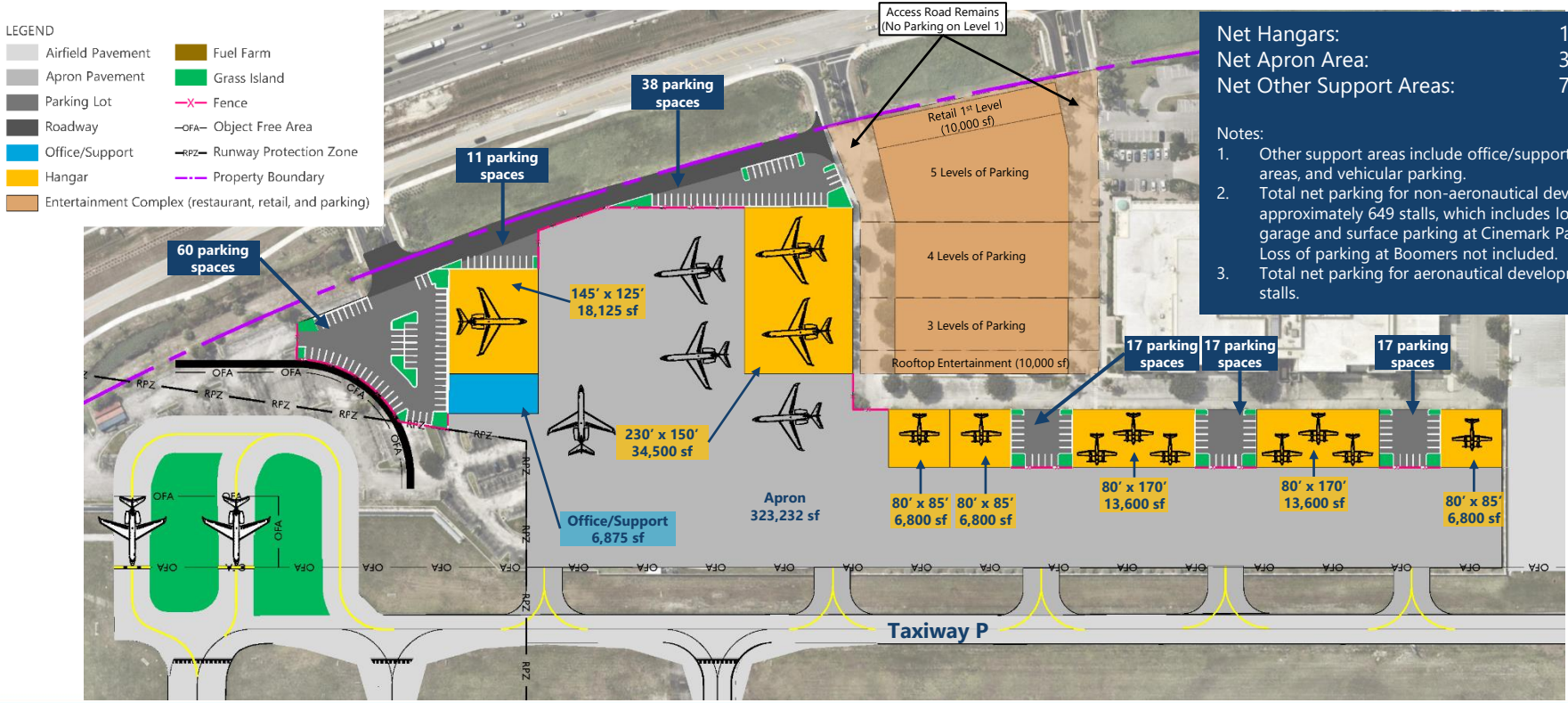


Net Hangar Development: 54,000 sf
Additional Apron Area: 70,000 sf

LEGEND
- Apron Expansion
- Apron Pavement
- Parking Lot
- FBO Terminal
- Fuel Farm
- Existing Hangar
- New Hangar
- Hangar Demolition
- Property Boundary

SOURCE: Atlantic FBO Facilities and Site Renovation - Boca Raton, Florida, Conceptual Design, May 2022.

GA/Aeronautical Use
South Area Alternative 1A

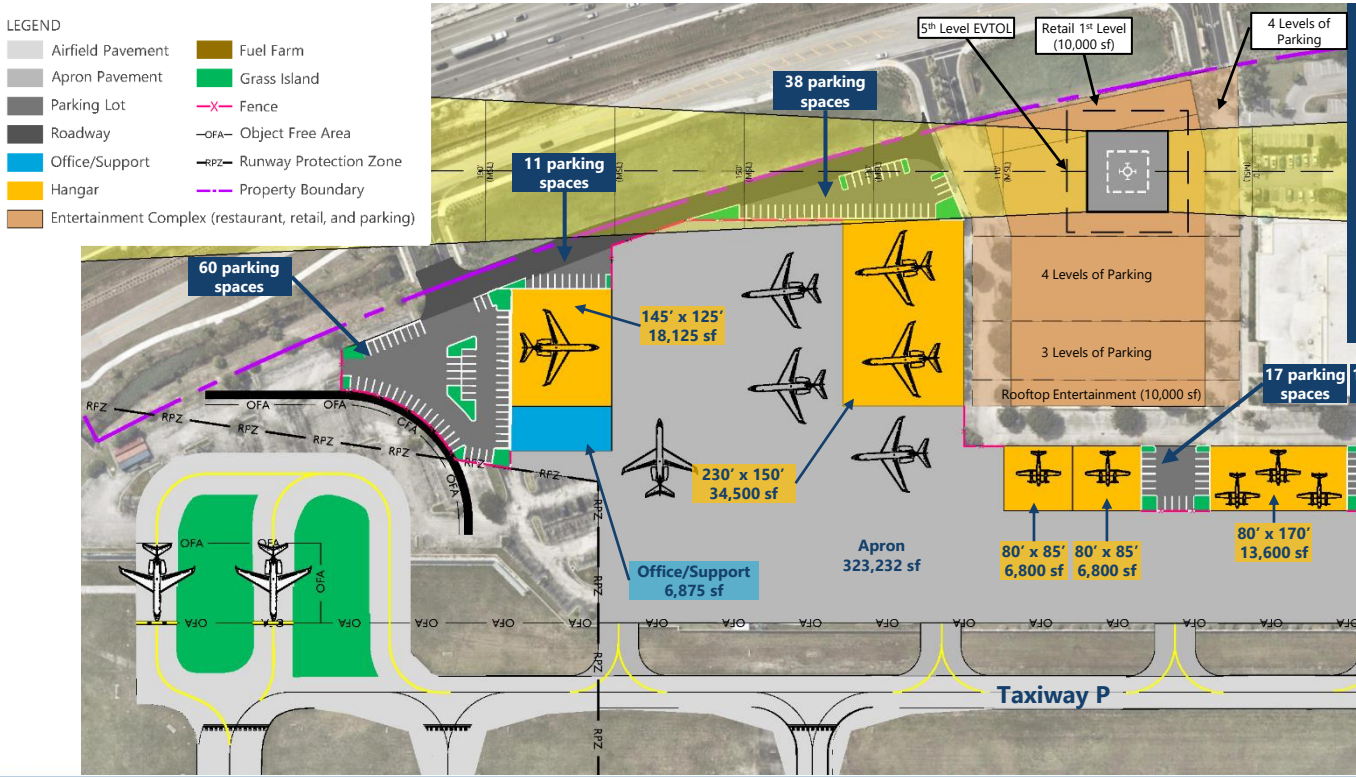


Net Hangars:	100,225 sf
Net Apron Area:	323,232 sf
Net Other Support Areas:	74,500 sf

Notes:

1. Other support areas include office/support areas, drainage areas, and vehicular parking.
2. Total net parking for non-aeronautical development is approximately 649 stalls, which includes loss of parking garage and surface parking at Cinemark Palace (774 stalls). Loss of parking at Boomers not included.
3. Total net parking for aeronautical development is 160 stalls.

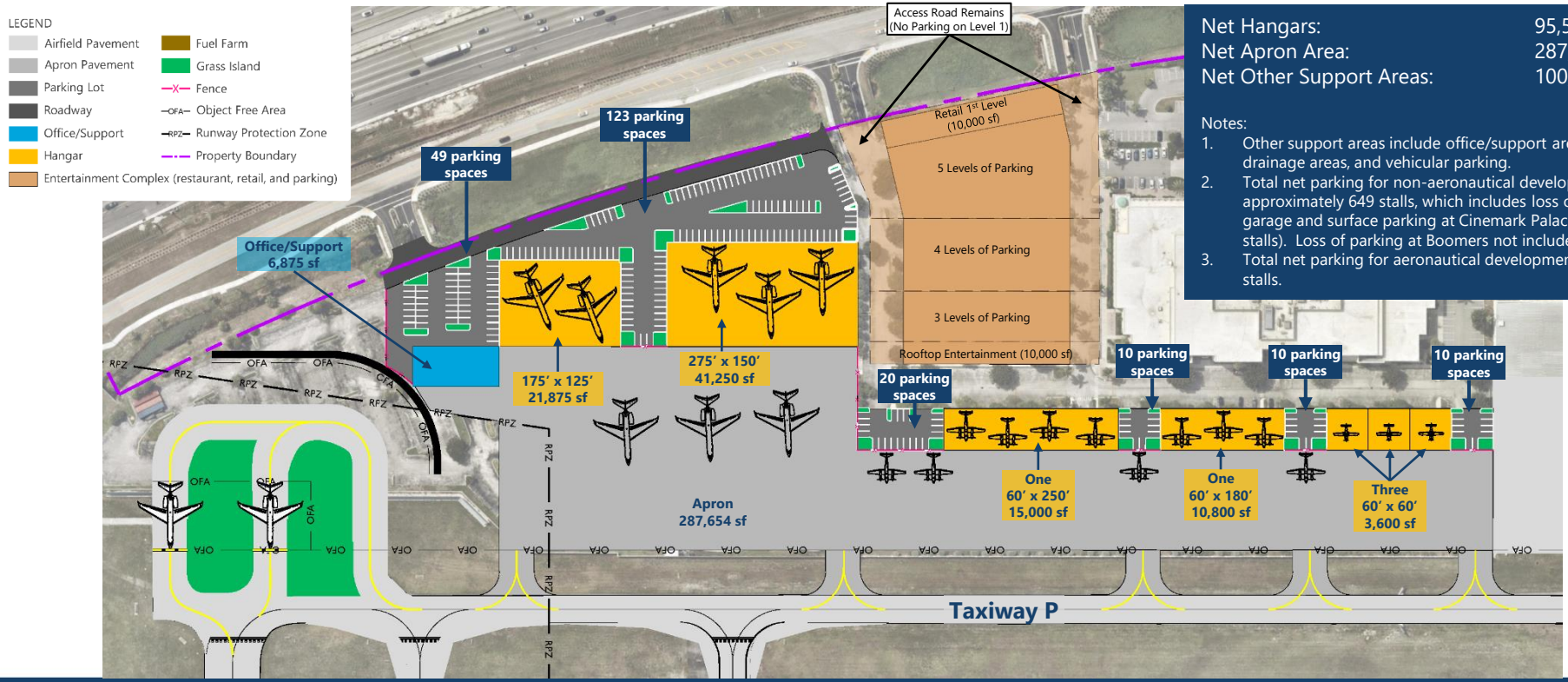
GA/Aeronautical Use
South Area Alternative 1B



Net Hangars:	100,225 sf
Net Apron Area:	323,232 sf
Net Other Support Areas:	74,500 sf

Notes:
1. Other support areas include office/support areas, drainage areas, and vehicular parking.
2. Total net parking for non-aeronautical development is approximately 474 stalls, which includes loss of parking garage and surface parking at Cinemark Palace (774 stalls). Loss of parking at Boomers not included.
3. Total net parking for aeronautical development is 160 stalls.

GA/Aeronautical Use
South Area Alternative 2A



Net Hangars:	95,525 sf
Net Apron Area:	287,654 sf
Net Other Support Areas:	100,150 sf

Notes:
1. Other support areas include office/support areas, drainage areas, and vehicular parking.
2. Total net parking for non-aeronautical development is approximately 649 stalls, which includes loss of parking garage and surface parking at Cinemark Palace (774 stalls). Loss of parking at Boomers not included.
3. Total net parking for aeronautical development is 222 stalls.

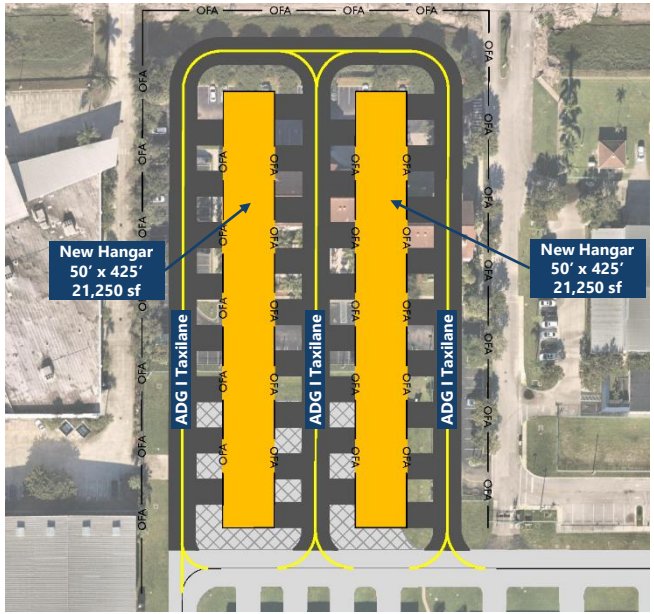
GA/Aeronautical Use
Hotel Site Alternatives

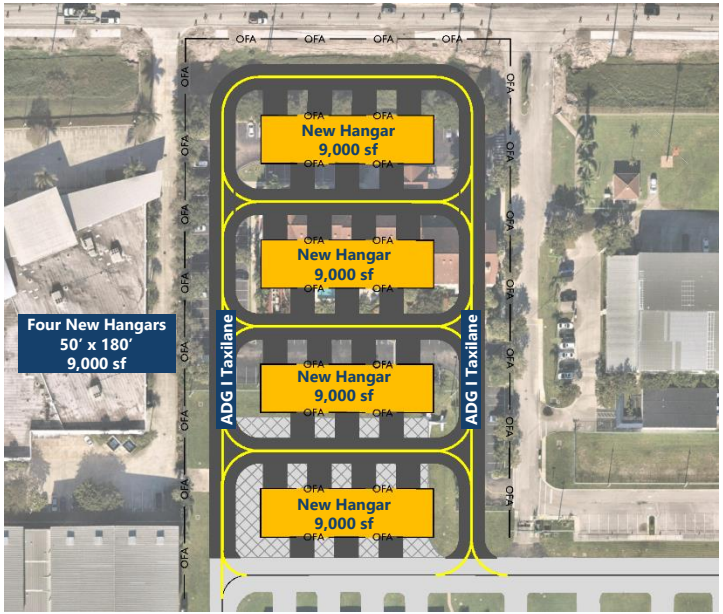
Hotel Site Alternative 1

New T-hangars:	42,500 sf (34 units)
Apron Pavement Loss:	32,900 sf

Hotel Site Alternative 2

New T-hangars:	36,000 sf (28 units)
Apron Pavement Loss:	32,900 sf

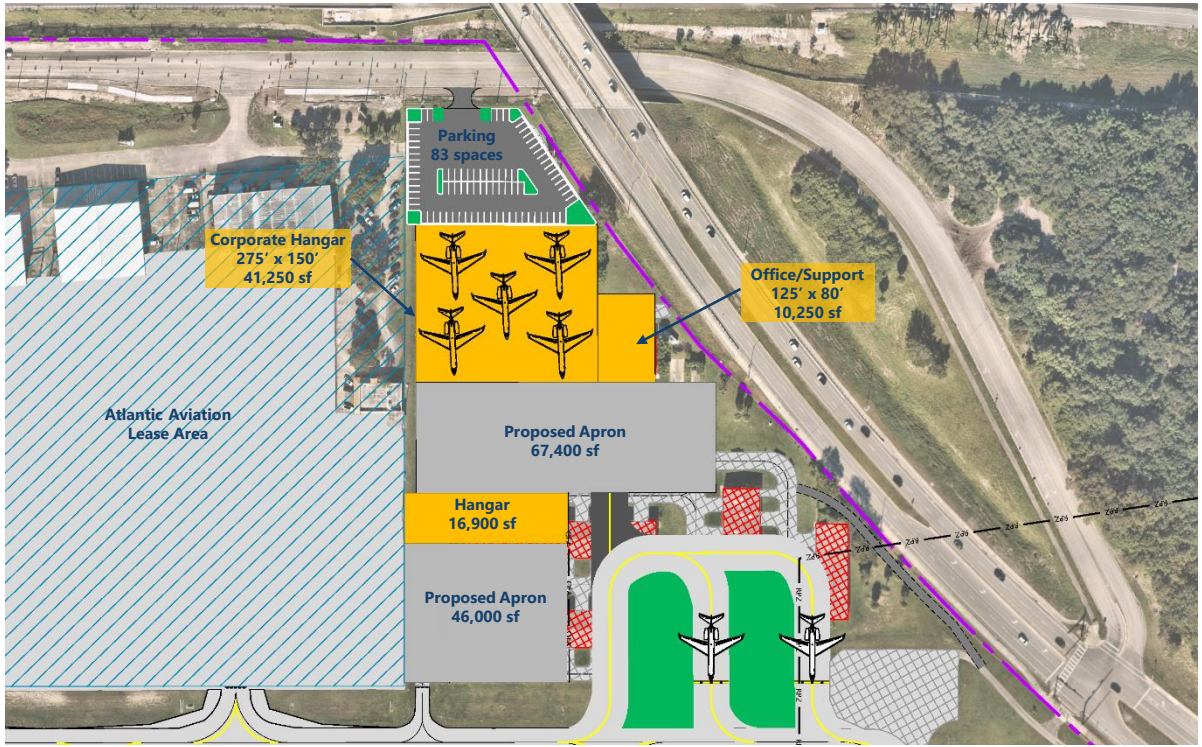




LEGEND
- Apron Demolition
- Taxilane Pavement
- New Hangar
- Centerline
- OFA Taxilane Object Free Area (OFA)

SOURCES: Boca Raton Airport; Airport Layout Plan (ALP), June 2018 (basemap); Nearmap, Florida, November 2021 (aerial image for visual reference only - may not be to scale); Ricondo, July 2022 (proposed alternatives).

GA/Aeronautical Use
North Area Alternative 1



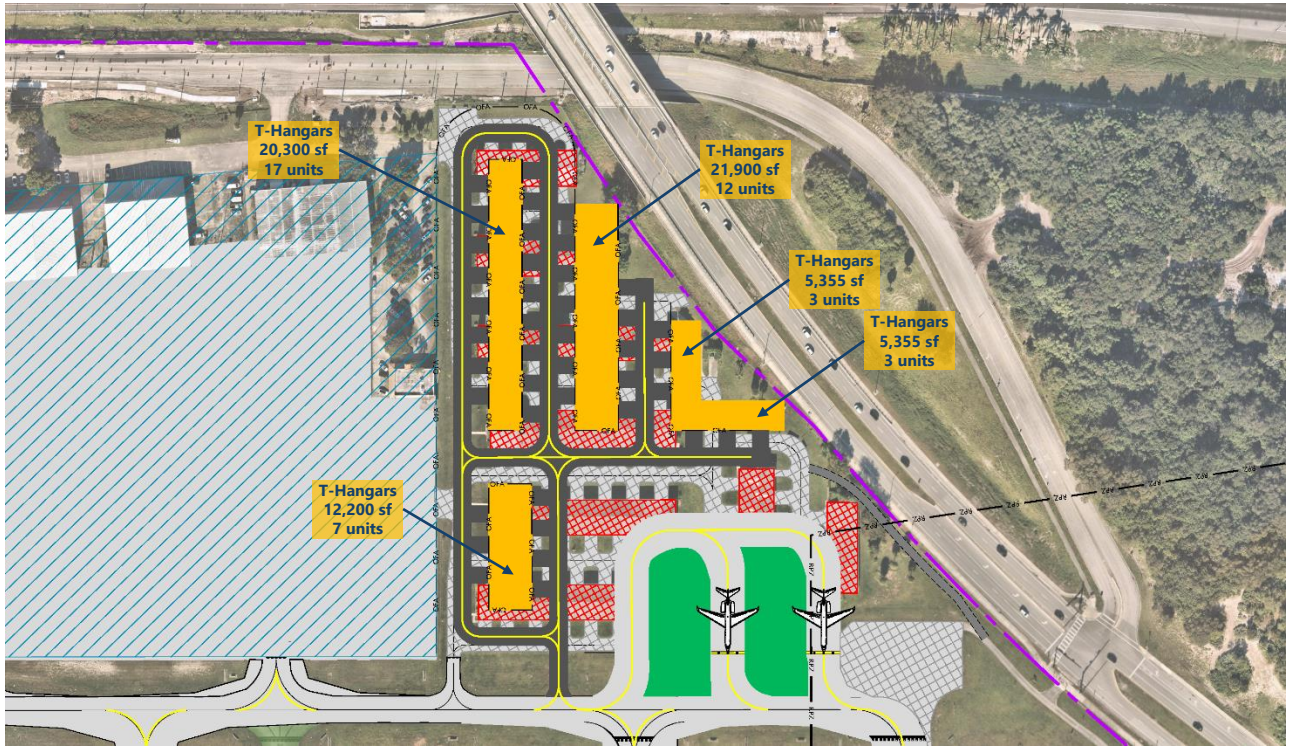
Net Hangars:	(32,480) sf
Net Apron Area:	113,400 sf
Net Other Support Areas[1]:	35,461 sf

Notes:
1. Other support areas include office/support areas, drainage areas, and vehicular parking.

LEGEND
- Airfield Pavement
- Apron Pavement
- Parking Lot
- Pavement Demolition
- Hangar Demolition
- Hangar
- Grass Island
- OFA Object Free Area
- RPZ Runway Protection Zone
- Centerline
- Property Boundary

SOURCES: Boca Raton Airport; Airport Layout Plan (ALP), June 2018 (basemap); Nearmap, Florida, November 2021 (aerial image for visual reference only - may not be to scale); Ricondo, July 2022 (proposed alternatives).

GA/Aeronautical Use
North Area Alternative 2



Net Hangars:	(35,770) sf
Net Other Support Areas:	N/A

Notes:
1. Alternative 2 does not include vehicular parking.

LEGEND
- Airfield Pavement
- Apron Pavement
- Parking Lot
- Pavement Demolition
- Hangar Demolition
- Hangar
- Grass Island
- OFA Object Free Area
- RPZ Runway Protection Zone
- Centerline
- Property Boundary

SOURCES: Boca Raton Airport; Airport Layout Plan (ALP), June 2018 (basemap); Nearmap, Florida, November 2021 (aerial image for visual reference only - may not be to scale); Ricondo, July 2022 (proposed alternatives).

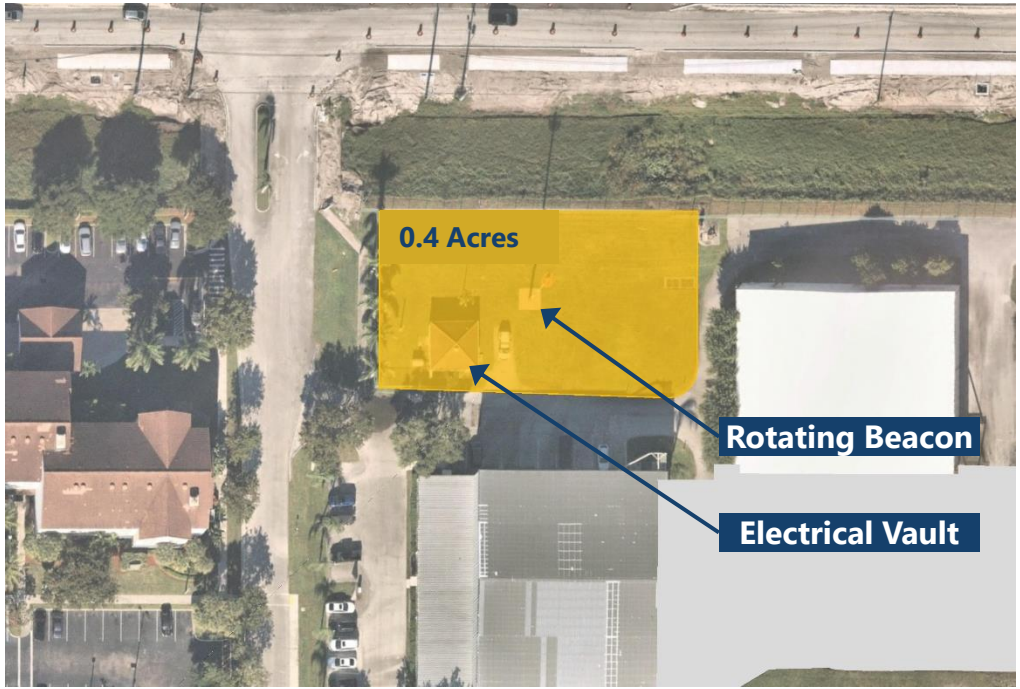
Alternatives and Concepts

Support Facility Concepts

Support Facilities

- **Air Traffic Control Tower**
  - Constructed in 2000
  - *Replacement with new remote or virtual tower*
- **Automated Weather Observing System (AWOS)**
  - Installed in 2013
  - *Replacement with Automated Surface Observing System (ASOS)*

Relocation of Electrical Vault and Rotating Beacon



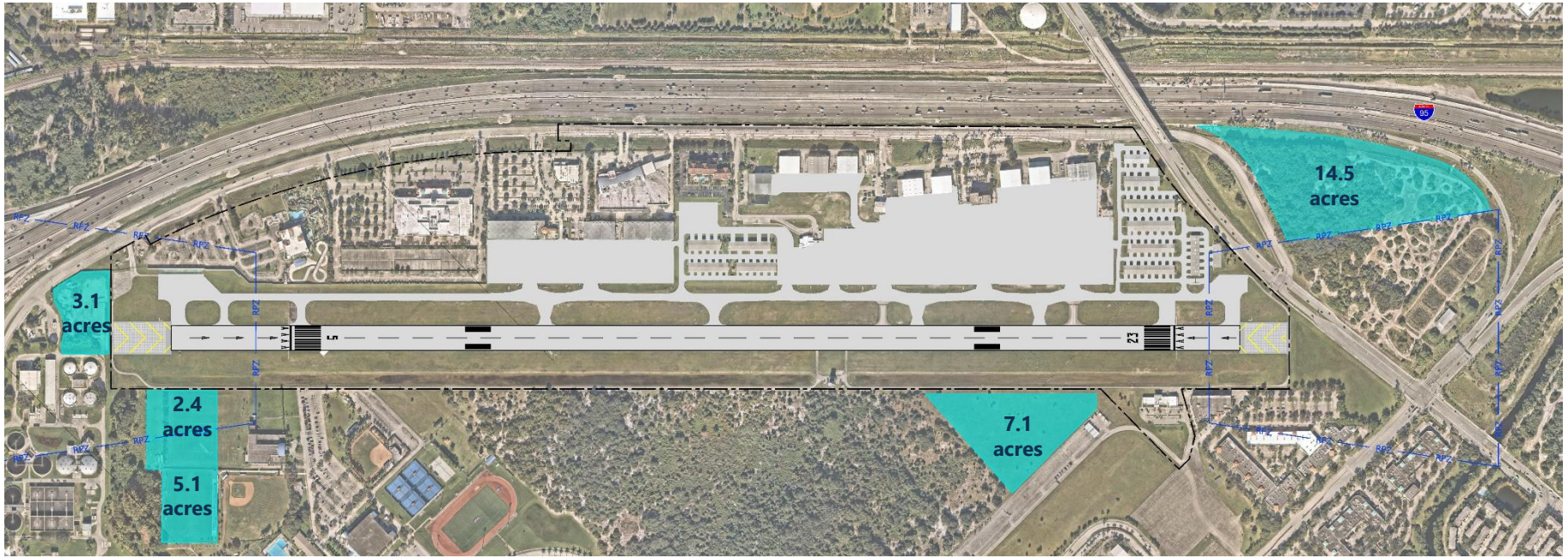
- Beacon to be relocated on top of ATCT[1]
- Electrical equipment to be relocated to the first floor of ATCT
- Approximately 0.4 acres could be used for developable space
  - Vehicular parking
  - Other

NOTE:
1. Installing a rotating beacon on top of an ATCT requires authorization from FAA regional office per FAA AC 150/5340-30, *Design and Installation Details for Airport Visual Aids*.

Alternatives and Concepts

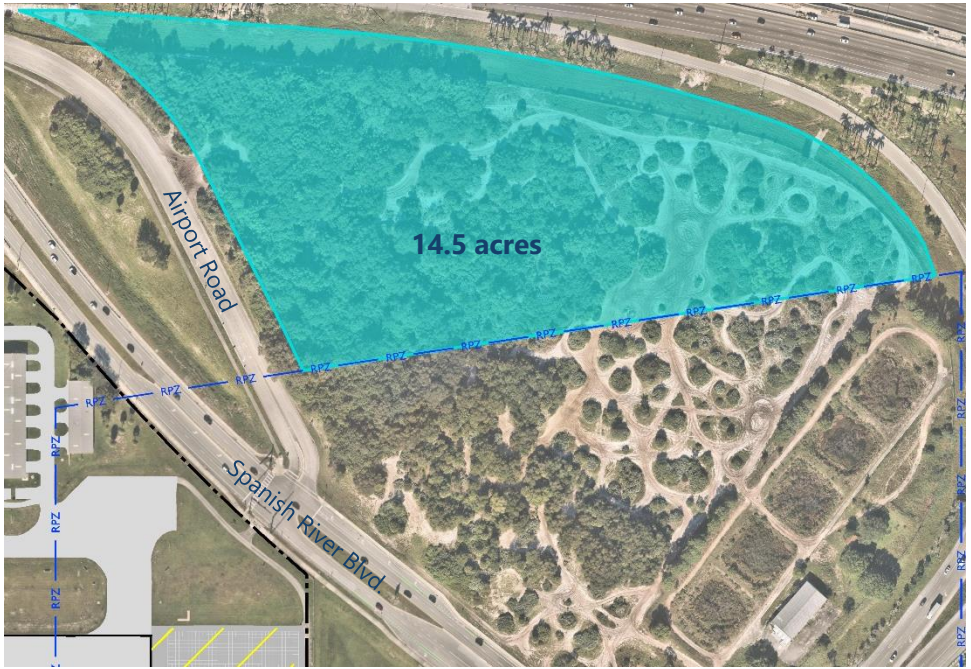
Landside Concepts

Potential Adjacent Land Opportunities



Potential Uses: *Aeronautical Development* | *Non-Aeronautical Development* | *Drainage / Stormwater* | *Advanced Air Mobility*

Potential Adjacent Land Opportunities



- Approximately 14.5 acres located outside of RPZ and road right of ways
- Parcels owned by the Trustees of the Internal Improvement Trust Fund (TIITF)
- Potential uses
  - Airport support facilities
  - Non-aeronautical development
  - Drainage / stormwater
  - Advanced air mobility
  - Aircraft parts storage

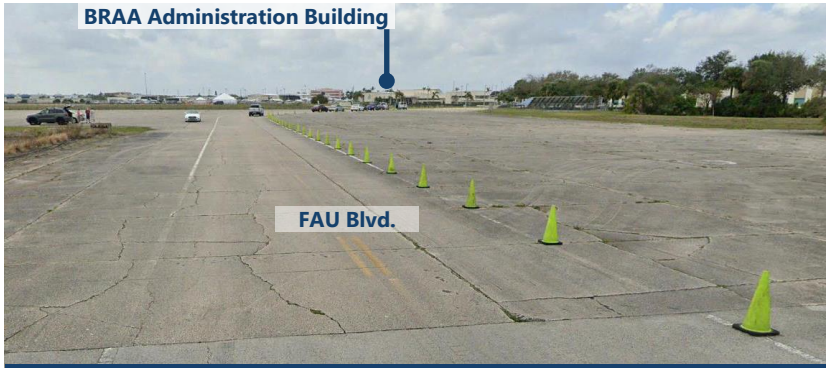
Underground Stormwater Containment

Recommendation: Evaluate capital costs, ongoing maintenance expenses, and return on investment on a case-by-case basis.

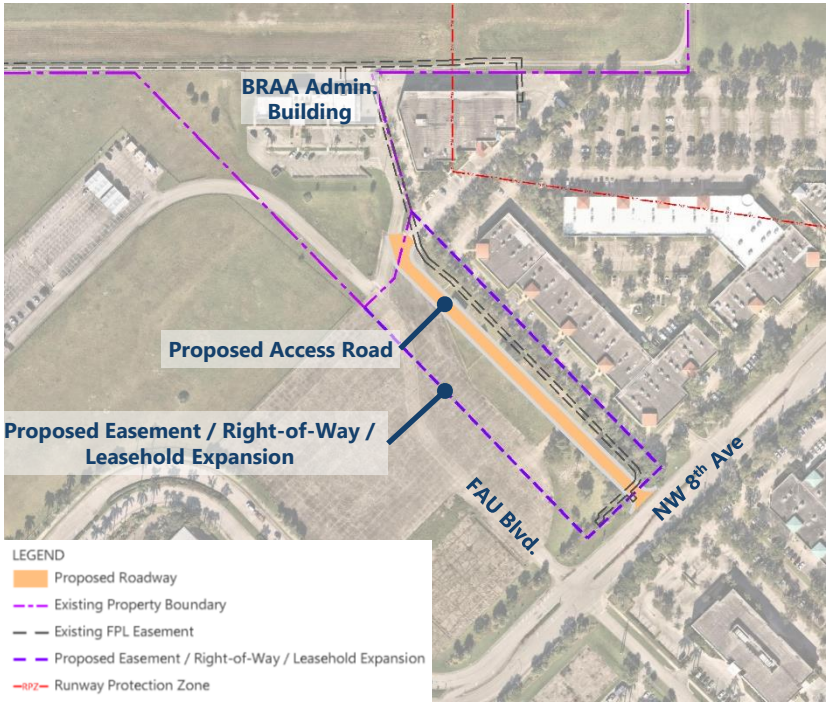
SOURCES: American Infrastructure Development, Inc., *Underground Containment Feasibility Study*, August 2020; ADS Pipe, https://www.adspipe.com/water-management-solutions (accessed October 12, 2022); Contech, https://www.conteches.com/knowledge-center/pdh-articles/introduction-to-designing-corrugated-metal-pipe-cmp-stormwater-detention-systems (accessed October 12, 2022).

BRAA Administration Building Access Road

The BRAA does not own the access road, have a dedicated right of way, or an easement preserving access to the Administration Building.



Recommendation: Obtain a dedicated right-of-way, easement, or expand leasehold to preserve access to existing and future Airport assets (BRAA Administration Building, Air Traffic Control Tower, etc.).



Source: Nearmap, Florida, November 2021 (aerial image for visual reference only – may not be to scale).

Alternatives and Concepts

Advanced Air Mobility Alternatives

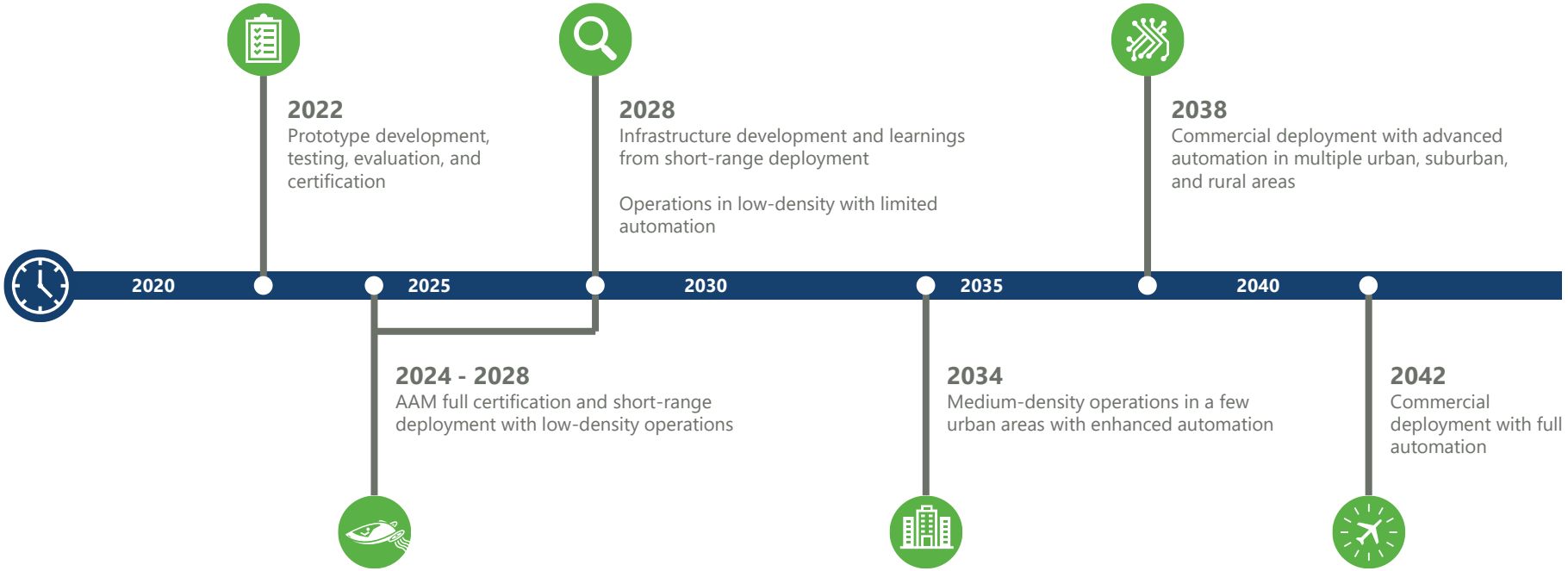
Advanced Air Mobility (AAM)

- AAM is a transportation system that will operate highly automated aircraft to transport passengers and cargo
- Other uses include public services and private/recreational operations
- Electric vertical takeoff and landing (eVTOL) aircraft
- Early stages of AAM will rely on existing transportation infrastructure
- Significant uncertainty surrounding AAM operations
  - Access and integration into airspace
  - Public acceptance
  - Affordability and economies of scale
  - Noise and environmental considerations

***Lilium Jet** (representative AAM aircraft)*

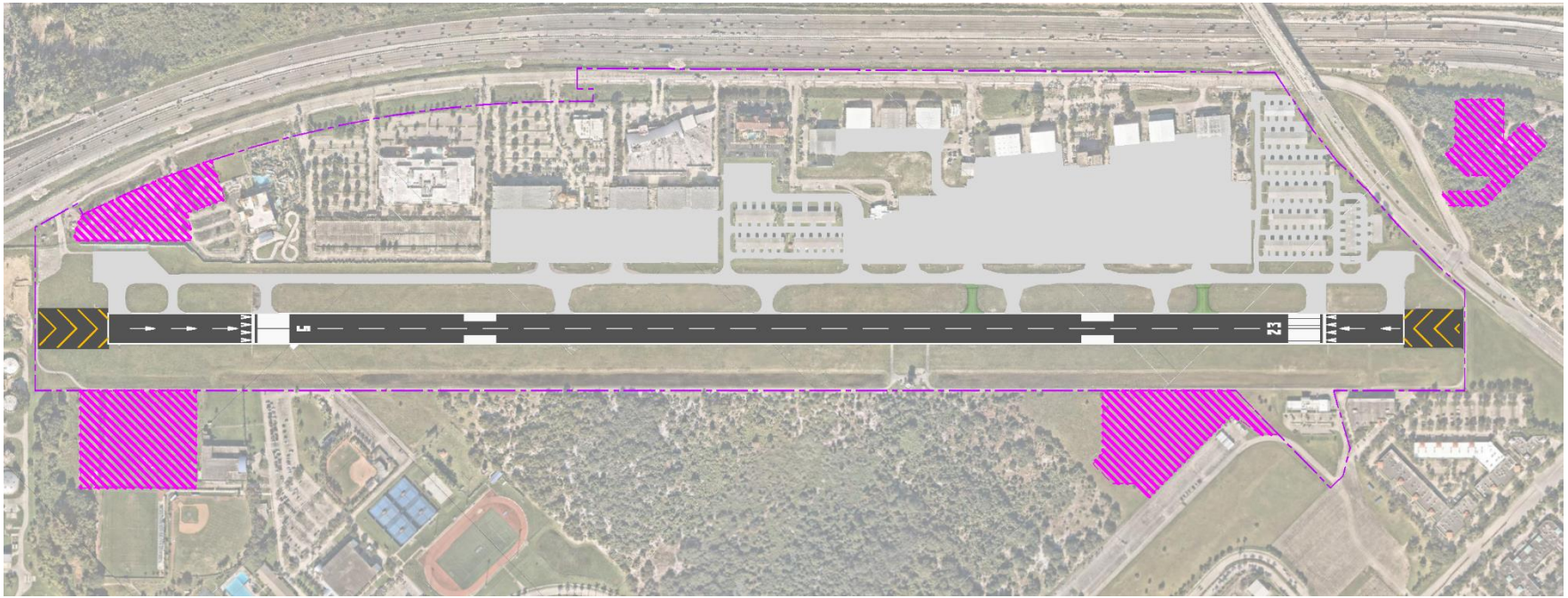
SOURCES: Federal Aviation Administration, https://www.faa.gov/uas/advanced_operations/urban_air_mobility (accessed March 17, 2022); Vertical Flight Society, https://vtol.org/news/press-release-vfs-electric-vtol-directory-hits-600-concepts (accessed March 17, 2022); Lilium, https://lilium.com/news (accessed April 5, 2022).

Advanced Air Mobility Preliminary Timeline



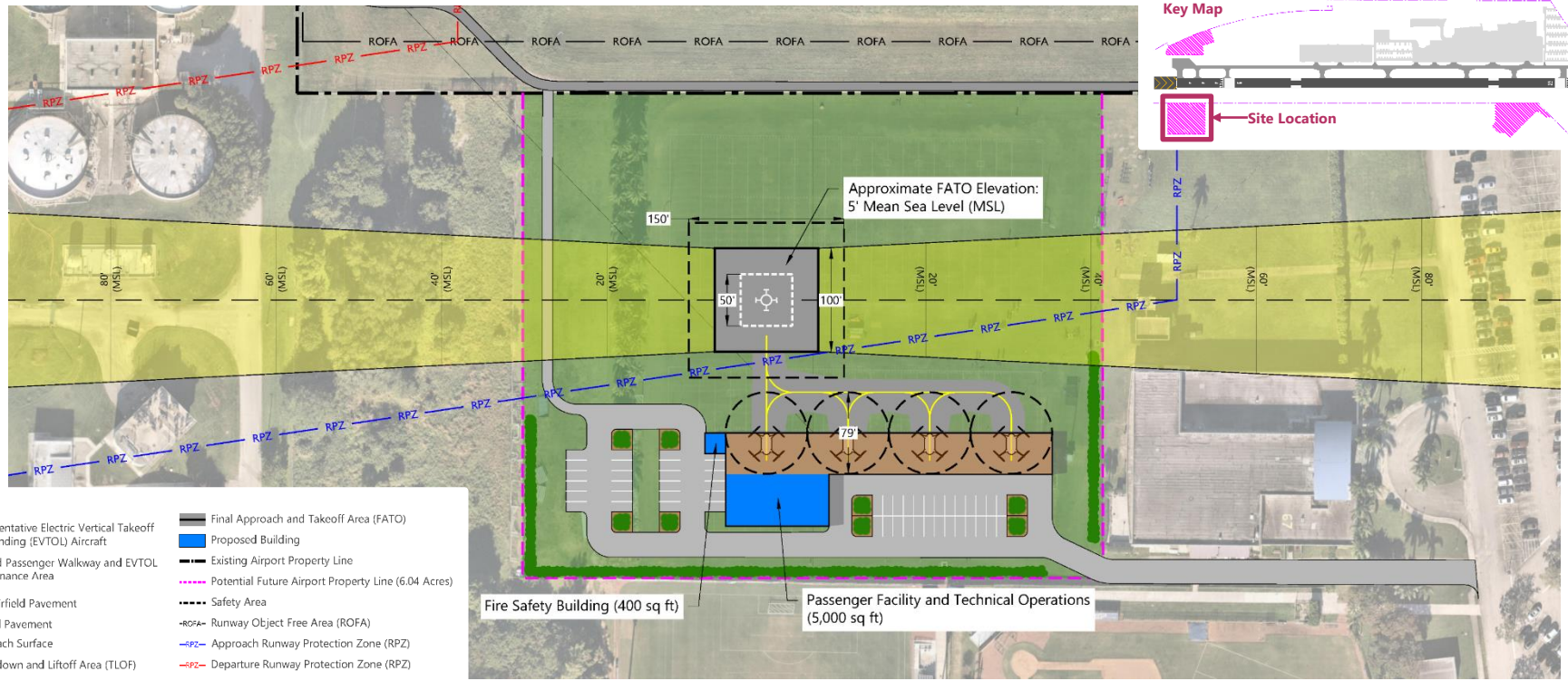
SOURCE: Deloitte, *Advanced Air Mobility - Can the United States Afford to Lose the Race?*, January 26, 2021, https://www2.deloitte.com/us/en/insights/industry/aerospace-defense/advanced-air-mobility.html (accessed June 20, 2022).

Advanced Air Mobility Site Location Options



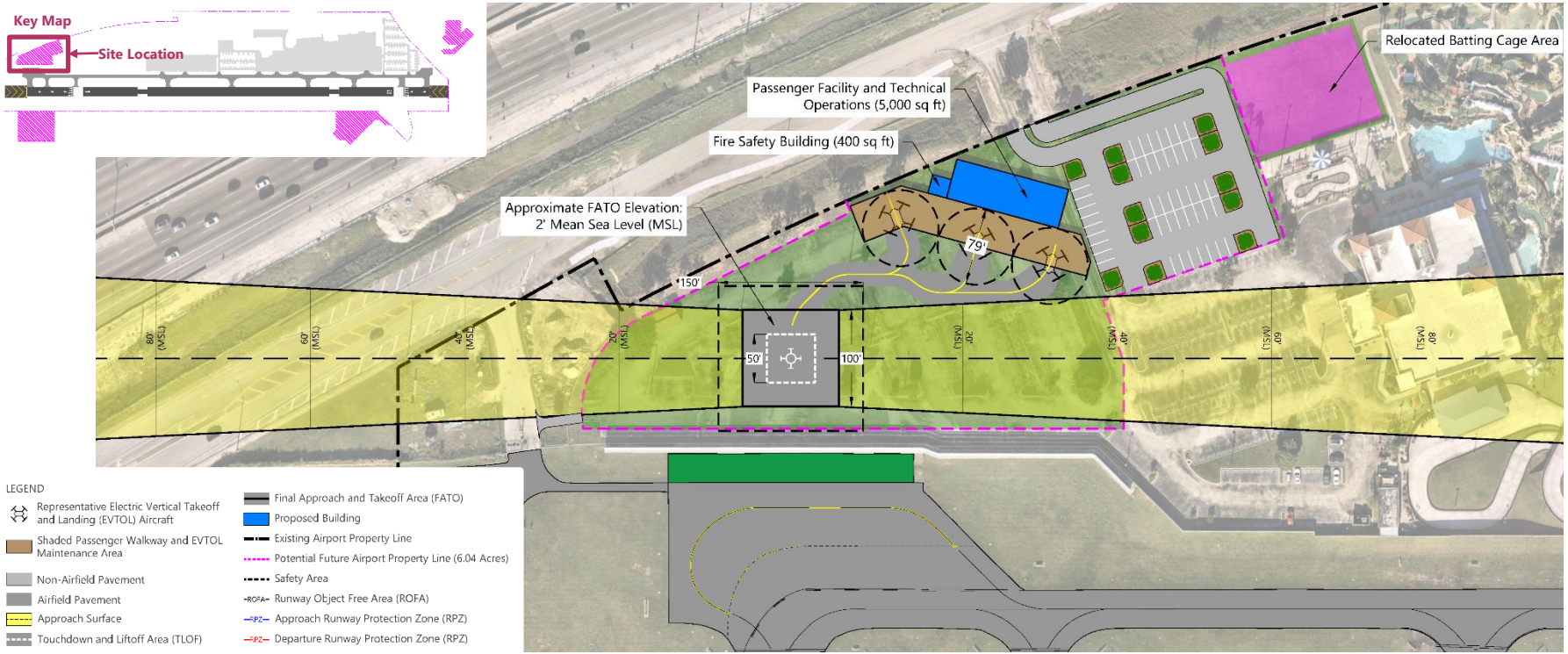
SOURCES: Draft Engineering Brief No. 105, Vertiport Design issued February 28, 2022; Ricondo & Associates Inc., July 2021; Nearmap, Florida, November 2021 (aerial image for visual reference only - may not be to scale).

Advanced Air Mobility – Alternative #1
East of Runway 5 Approach End



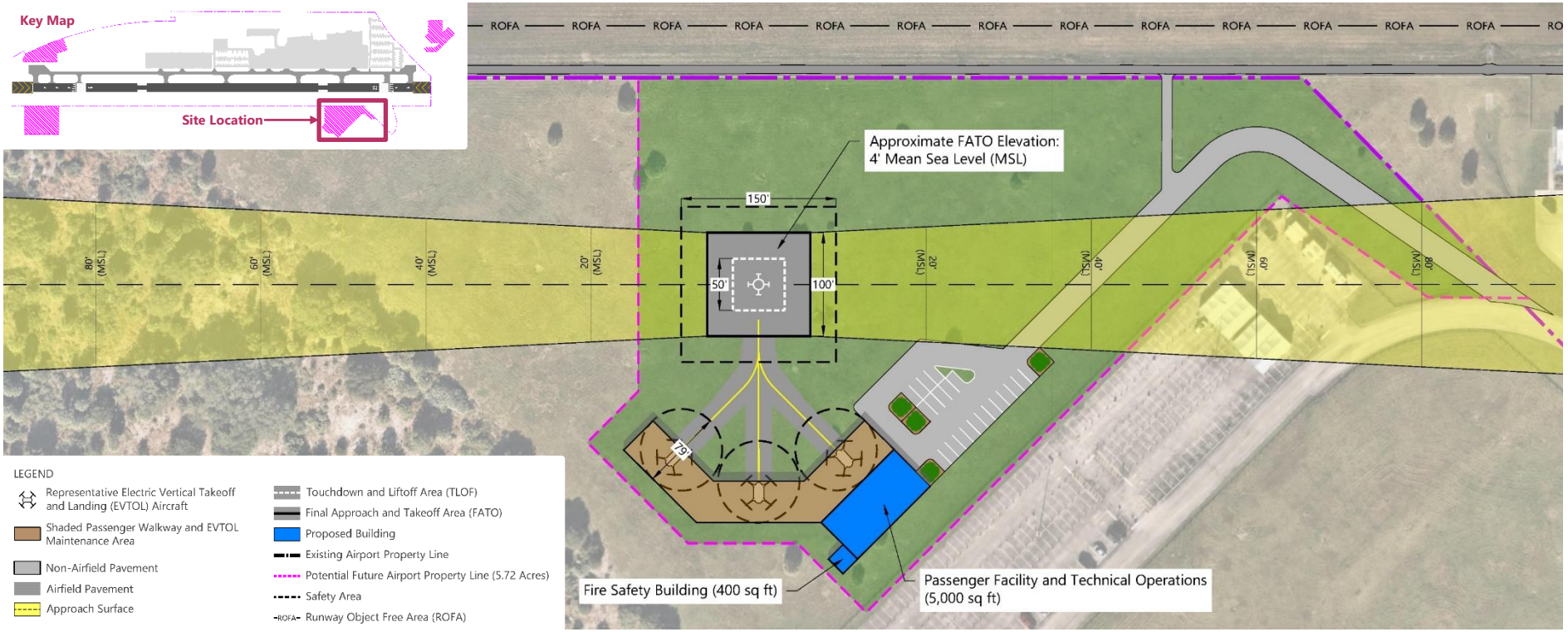
SOURCES: Draft Engineering Brief No. 105, Vertiport Design issued February 28, 2022; Ricondo & Associates Inc., July 2021; Nearmap, Florida, November 2021 (aerial image for visual reference only - may not be to scale).

Advanced Air Mobility – Alternative #2
West of Runway 5 Approach End



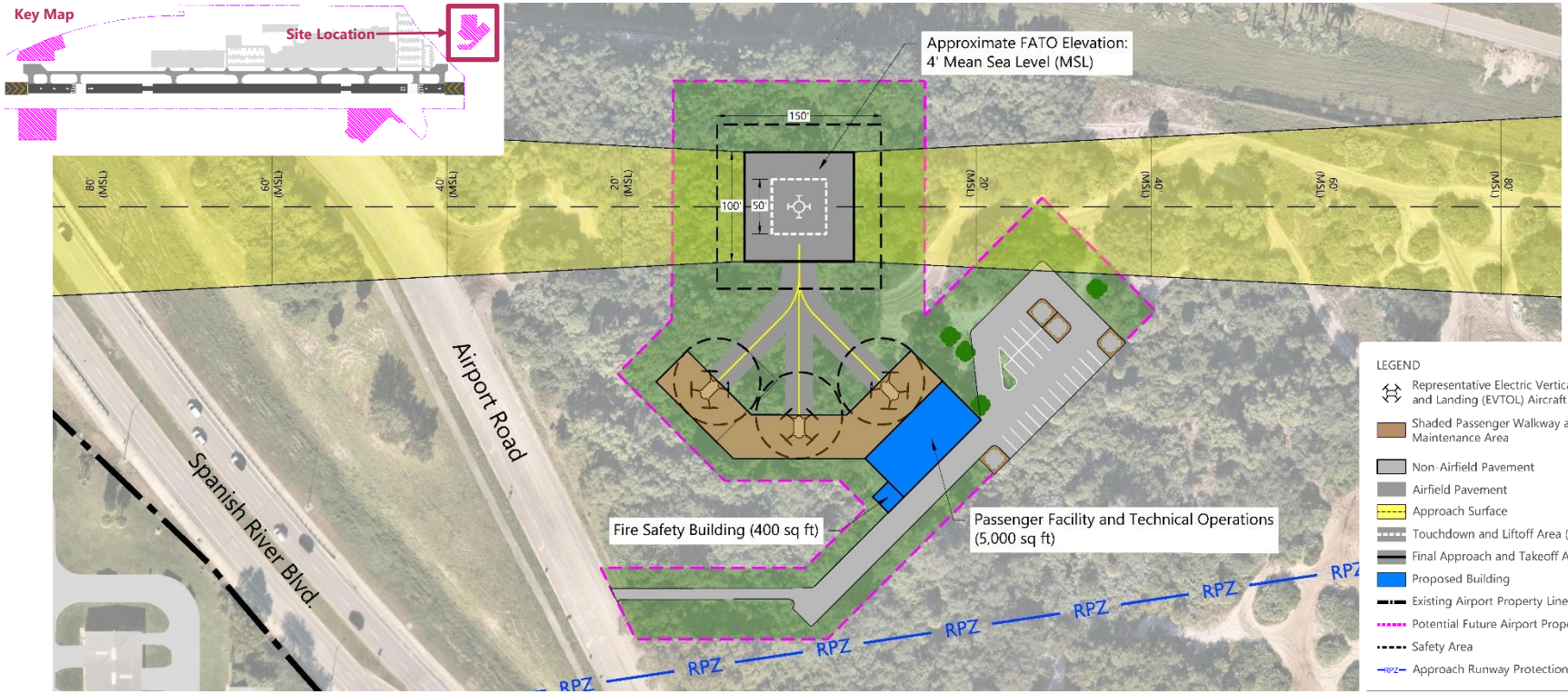
SOURCES: Draft Engineering Brief No. 105, Vertiport Design issued February 28, 2022; Ricondo & Associates Inc., July 2021; Nearmap, Florida, November 2021 (aerial image for visual reference only - may not be to scale).

Advanced Air Mobility – Alternative #3
East of Runway 5 Approach End



SOURCES: Draft Engineering Brief No. 105, Vertiport Design issued February 28, 2022; Ricondo & Associates Inc., July 2021; Nearmap, Florida, November 2021 (aerial image for visual reference only - may not be to scale).

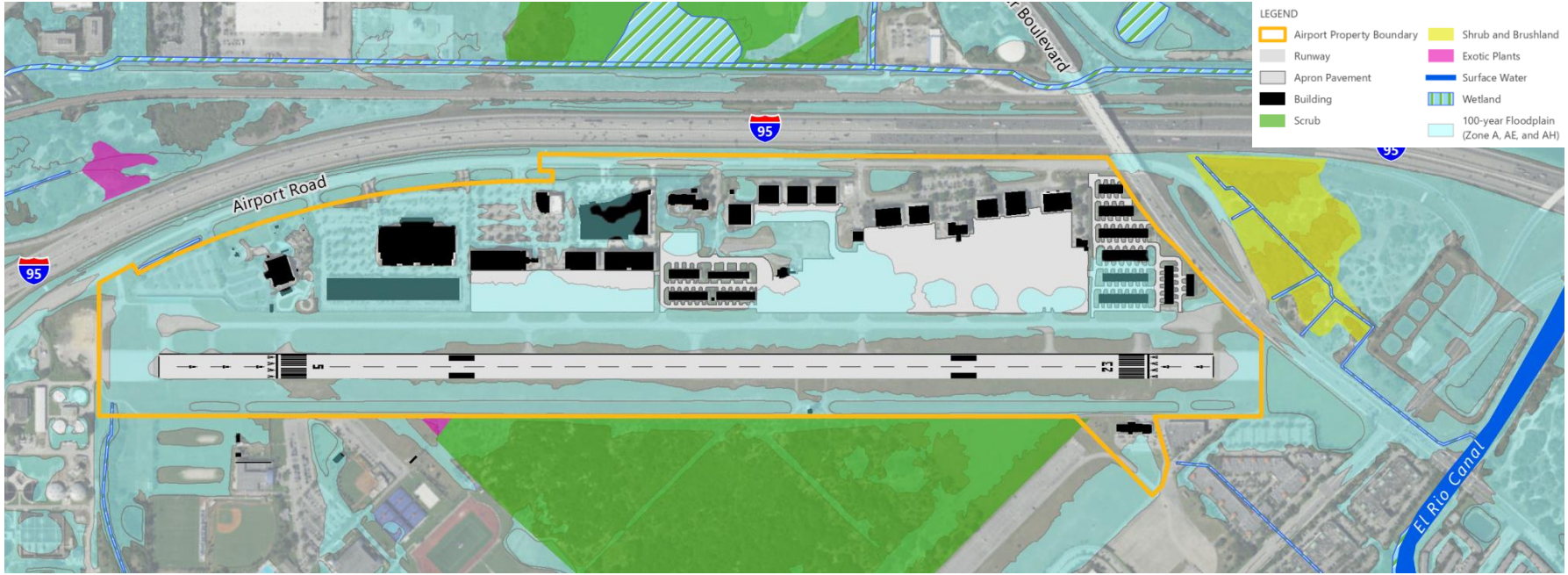
Advanced Air Mobility – Alternative #4
Potential Adjacent Land Opportunity (North of Airport Road)



SOURCES: Draft Engineering Brief No. 105, Vertiport Design issued February 28, 2022; Ricondo & Associates Inc., July 2021; Nearmap, Florida, November 2021 (aerial image for visual reference only - may not be to scale).

Other Master Planning Elements

Environmental Overview



SOURCES: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community, January 2019 (basemap); US Fish and Wildlife Service, National Wetland Inventory and Ricondo & Associates, based on aerial imagery, October 2020 (wetlands); Federal Emergency Management Agency, FIRM Panels 12011C, 12099C, 2019 (floodplains); US Census, TIGER/Line Shapefile, 2019 (water); Ricondo & Associates, Inc., Airport Layout Plan, 2012 (Airport property and airfield)

Identify National Environmental Policy Act (NEPA) categories of concern for projects and level of study for projects

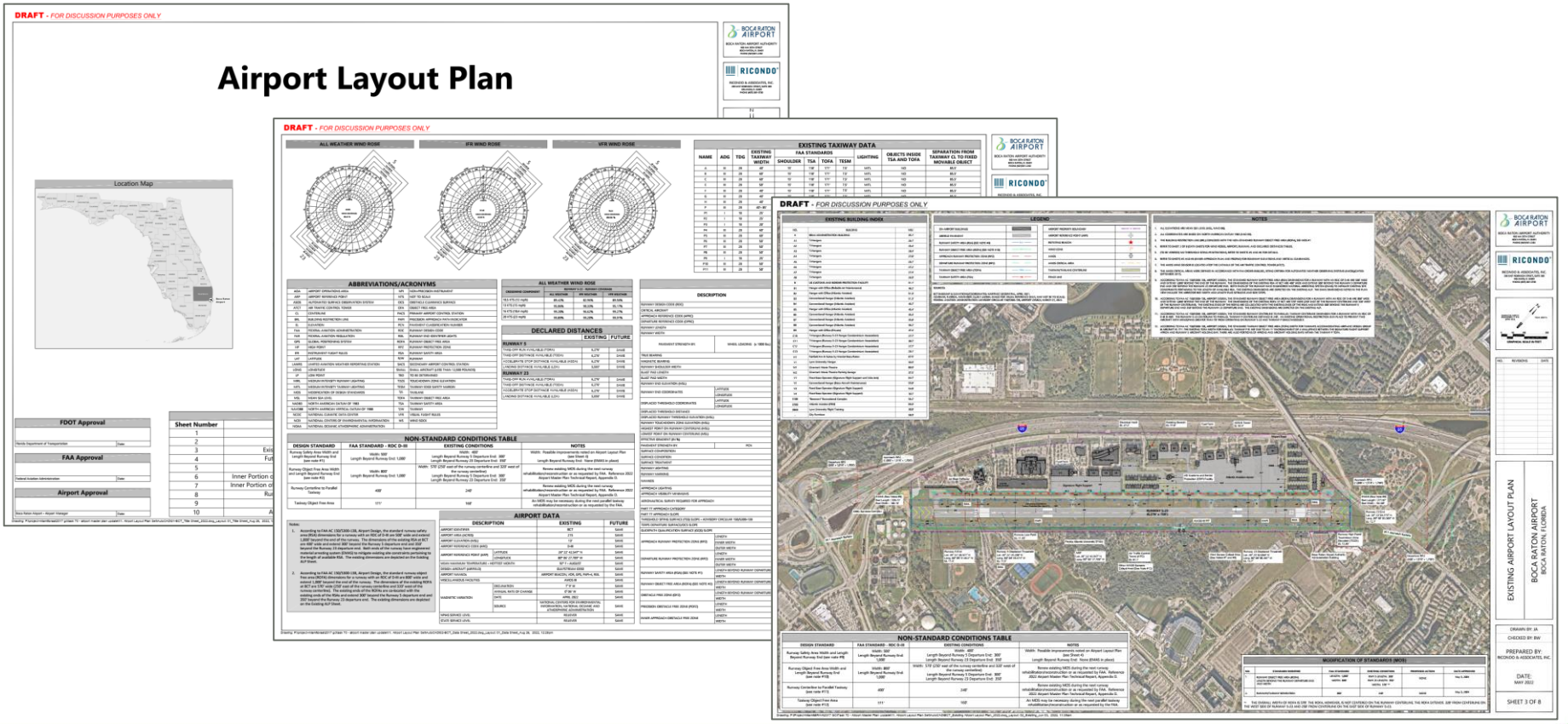
Sustainability Strategy and Airport Recycling, Reuse, and Reduction (ARRWR) Plan

- Identify programmatic level initiatives to integrate sustainability to the proposed master plan development projects
- ARRWR Plan (FAA requirement) to improve waste management performance
- Groundwork for future Sustainability Management Plan

Typical Airport Focus Areas

- Waste
- Water
- Energy
- Emissions
- Sustainable Design
- Financial Resiliency
- Community

Airport Layout Plan Drawing Set



Next Steps

Next Steps

Comments:

bctmpu@ricondo.com

- Develop Remaining Sections of the Master Plan Update
  - Environmental and Sustainability
  - ALP Development
  - Capital Improvement Program and Financial Analysis
- BRAA Board Workshop
- Finalize and Submit Master Plan Update to FAA and FDOT

On behalf of the Boca Raton Airport Authority Staff and project team, thank you for attending the TAC briefings and for providing input into the planning process.

THANK YOU

BOCA RATON AIRPORT