# Chapter 5.0 – Alternatives Analysis

The Master Plan process thus far has accumulated the baseline of existing airport data, presented the outlook for the future in terms of operational activity, and defined the facilities that would be needed if there were no constraints. In Chapter 5, "Alternatives Analysis", the master plan takes the facility requirements discussion and assesses project development concepts that can be realistically provided. It is the difference between "requirements" and "reality". The objective is to create a realistic and achievable plan of improvements that can be depicted on the Airport Layout Plan (ALP) and ultimately implemented if the demand warrants. The process identifies and evaluates alternatives that can meet the needs of the airport user and is consistent with the strategic vision of RIAC. The "alternative analysis" process involves:

- Identifying reasonable options that can achieve the facility requirement
- Evaluating the pro and con for each option to understand the most reasonable option
- Selecting the preferred alternative.

When assessing the implications of each alternative the most prominent factors are:

- Operational and safety improvements
- Engineering feasibility
- Environmental, and land use impacts
- Financial implications

Chapter 5 presents the figures depicting the alternative airport layouts. At the conclusion of the chapter is a figure that depicts the recommended alternatives which ultimately are shown on the ALP.

In order to better understand the general location of the alternatives, this narrative will often refer to specific quadrants of the airfield. These quadrants are identified in Figure 5.1. In addition the alternatives are labeled as follows:

- Runway Alternatives – R1.
- Runway Approach and Lighting Alternatives – L1, L2, L3
- Taxiway Alternatives – T1, T2, T3.
- Apron Area Alternatives – A1, A2, A3, A4.
- Old Terminal Building Alternatives – O1, O2, O3, O4.
- Corporate Hangar and T-Hangar Alternatives – H1, H2, H3, H4.
- Snow Removal Equipment (SRE) Building Alternatives – S1, S2, S3.
- Fuel Farm Relocation Alternatives – F1, F2, F3, F4.
- Automobile Parking Areas and Access Development Alternatives – P1, P2, P3.

Figure 5.1
SFZ Airfield Quadrants


It is important that the alternatives meet the needs to improve the airport role in the system while balancing the competing needs of the airport's functional elements. Since the Master Plan covers a 20 year period, the recommended alternative should be functional through the various stages of the plan. For example, general aviation development in the North and West quadrants of SFZ would not be practical because airside access to support facilities neither exists in these quadrants nor is it practical to develop the access. Thus, it is reasonable to assume for this master plan effort that most airport development throughout the planning period will occur in the East quadrant where aircraft operations are currently supported. Initial assessments by the planning team suggest that there is enough developable airport property in the east quadrant of the area to support adequate aircraft apron and hangar alternatives that meets the facility requirements throughout the 20-year planning period.

## 5.1 Airport Runway System Alternatives

The *Baseline Conditions* section of this Master Plan identified the primary Runway 5-23, as 5,000 feet long. The runway length analysis completed in the *Facility Requirements* concluded that the existing length of the primary runway (5,000 feet) is capable of accommodating 100% of the small aircraft fleet as well as critical design aircraft, which is the Dassault Falcon 50. This aircraft requires 4,890 feet of takeoff distance in standard weather conditions.

The facility requirements stated that Runway 15-33, the crosswind runway, length is recommended to be 80% of the length of R/W 5-23 or a length of 4,000 feet. That is 790 feet short of its current length (3,120 feet). R/W 5-23 has more than 95% wind coverage, and the current length of R/W 15-33 can accommodate 95% of the small aircraft that typically use the airport. Therefore an extension of the Runway 15-33 is not a critical airport need at this time.

As a result of our analysis, a runway extension will not be recommended for either runway as part of this Master Plan. Therefore the recommended alternative is R1: Do-Nothing (status quo).

## 5.2 Runway Approach and Lighting Alternatives

This is the single most important improvement for creating a more efficient, effective and safe airport. In addition it is a benefit to the overall performance of the Rhode Island airport system. These alternatives consider a Lateral Precision with Vertical Guidance (LPV) Approach and Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR) for Runway 05. Currently SFZ is a reliever airport that is limited to serve the pilots in this area of Rhode Island and Massachusetts under IFR conditions. The LPV/MALSR is a qualitative improvement to the airport. There are several alternatives to improve this condition and they are evaluated below.

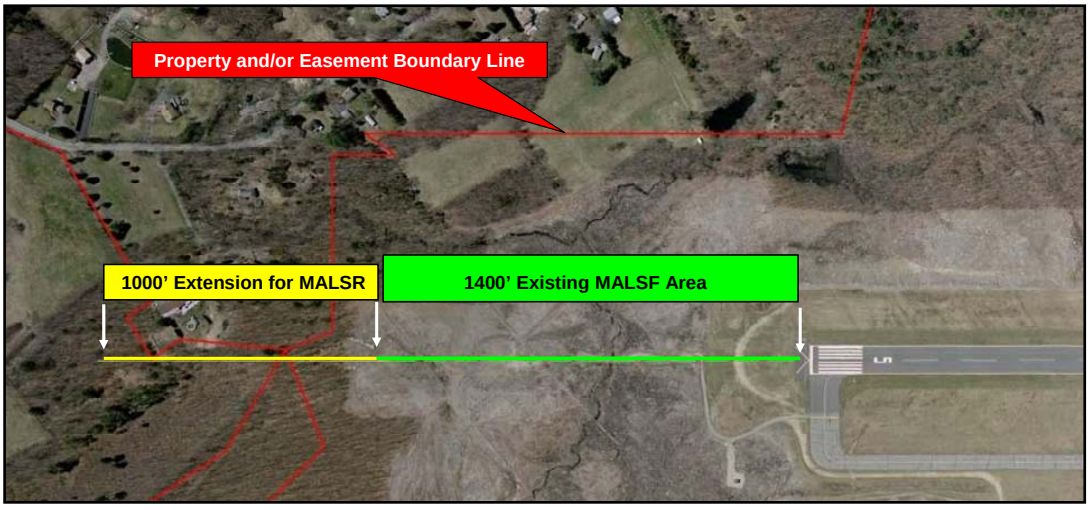
The preliminary review discussed in Chapter 2 entitled, *LPV – Precision Approach Feasibility*, revealed that if the required clearance surfaces can be achieved SFZ is a viable candidate for an LPV approach to Runway 5. In addition to meeting the clearance requirements for precision approach runways the Airport must provide "All Weather" runway markings.

However, to achieve the FAA standard for the lowest visibility minimums it will be necessary to complement the LPV with a Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR). As a result the existing Medium Intensity Approach Lighting System with Sequenced Flashing (MALSF) would have to be replaced.

The proposed MALSR system extends 2,400 feet from the end of Runway 5 end verses 1,400 feet for the existing MALSF. The MALSR has a series of lights spaced at 200-foot increments. The lights start at the runway end elevation and extend upward at a maximum slope of 2% (50:1). The area affected for a MALSR approach lighting system is illustrated on Figure 5.2. It is clear from that depiction the requirements to install a MALSR would require a dramatic change in the land requirements needed for the infrastructure and to protect the light clearance surface.

In addition to upgrading the MALSF, the existing Runway Safety Area (RSA) would have to be increased to meet the new requirements imposed by a precision approach runway. Here again it is anticipated to impose significant costs to grade the existing terrain to achieve the RSA standard from the existing 300 feet long to 600 feet long.

Figure 5.2
MALSF vs. MALSR Land Area Impacts



Runway Approach options L1, L2 and L3 are analyzed below.

### Option L1: No-Build (Status Quo)

**Pro**

The objective to lower the minimums would not be achieved
The existing MALSF would not have to be replaced
The RSA would not have to be increased.
Land use and environmental impacts remain unchanged
No engineering feasibility study or aeronautical study is required

**Con**

The existing non-precision approach would remain.
An additional level of safety cannot be provided
The ability to serve the user is under achieved
The effectiveness of the airport to serve as a reliever airport is reduced.
The performance of the RI airport system is not improved

### Option L2: Upgrade Runway 5 to an LPV Approach and Maintain MALSF

**Pro**

A new LPV Approach will be implemented
The minimums could improve from 400'down to 200'[1]
The existing MALSF will remain for Runway 5
The existing RSA will meet the requirements of the LPV approach
The effectiveness of the airport to serve as a reliever airport is improved
The ability to serve the user is improved
The RI airport system performance is improved
There will be no land use change

**Con**

An obstruction analysis is required to determine obstructions [2]
It may require some obstruction removal
It will require an Environmental Assessment
Engineering may be needed to clear approach surfaces

### Option L3: Upgrade Runway 5 to an LPV Approach with a MALSR

**Pro**

A new LPV Approach will be implemented
It will improve ceiling minimums from 400' down to 200' and visibility from ¾ mile down to ½ mile[3]
The existing MALSF will be upgraded to a MALSR
The effectiveness of the airport to as a reliever airport would be enhanced beyond Option L2
The RI airport system performance is enhanced beyond the performance in Option L2

[1] New approach minimums will be developed by FAA based on the obstruction clearing
[2] Coordination with FAA, Flight Procedures in Atlanta, could allow SFZ to be placed on the FAA 2010 candidate survey list for LPV. This would make the survey component eligible to be funded with FAA resources.
[3] Is dependent on obstruction clearing requirements being accomplished by RIAC.

Con

It requires some obstruction removal
It may be necessary to clear the MALSR light plane surface
It may require land acquisition and/or avigation easements
It will require the existing RSA to be upgraded to meet the LPV and MALSR requirements
It will require an EA to study obstruction removal light emissions and RSA improvements
It will require electrical utility upgrades
It will require site planning and extensive engineering[4]

Facts:

- The Precision Approach Feasibility Study conducted in this AMP discussed why an LPV approach in lieu of an ILS is warranted. The benefit of the new technology (See Chapter 2, Section 2.3 of the Feasibility Study) can improve the approach minimums for Runway 05 at less cost.
- Alternative L2 provides the LPV with no land acquisition requirements. It is estimated to cost approximately $450,000 to implement as determined in Section 2.3 of the LPV Approach Feasibility Study. It does not lower the existing ¾ mile visibility minimums.
- Alternative L3, with a MALSR, provides the LPV with increased visibility from the current ¾ mile down to ½ mile. The cost to implement would be in excess of $2 million dollars.
- The increased cost above the L2 alternative is primarily the cost to acquire land and/or easements as well as extending the existing RSA to meet runway design criteria for lower visibility minimums
- It would require a more extensive EA process.
- The cost/benefit for L3 is questionable based on current activity levels.

Conclusion:

- Based on the information developed above it is more reasonable to adopt Option L2: Maintain Existing MALSF with a New LPV Approach Option L3.
- Conduct an FAA LPV Aeronautical Survey[5] to update[6] the data for the Runway 05. For new or revised Instrument Approach Procedures FAA requires accurate airport data.
- Conduct an Airspace Analysis and submit it to FAA with a request to develop an LPV procedure for Runway 05.
- Incorporate Alternative L2 as part of an EA for the Short (0 – 5) Range development subsequent to this AMP project.
- Do not dismiss Alternative L3 for the Medium - Long Range time frame
- Incorporate a more detailed analysis of Alternative L3 as part of a subsequent AMP/ALP project (say in 5 – 6 years). Develop a new recommendation or reaffirm this finding based on that future analysis.

[4] If the airport meets activity levels established by FAA the MALSR improvement will be accomplished by FAA
[5] See Footnote 1 above.
[6] The previous survey was conducted in 1996.

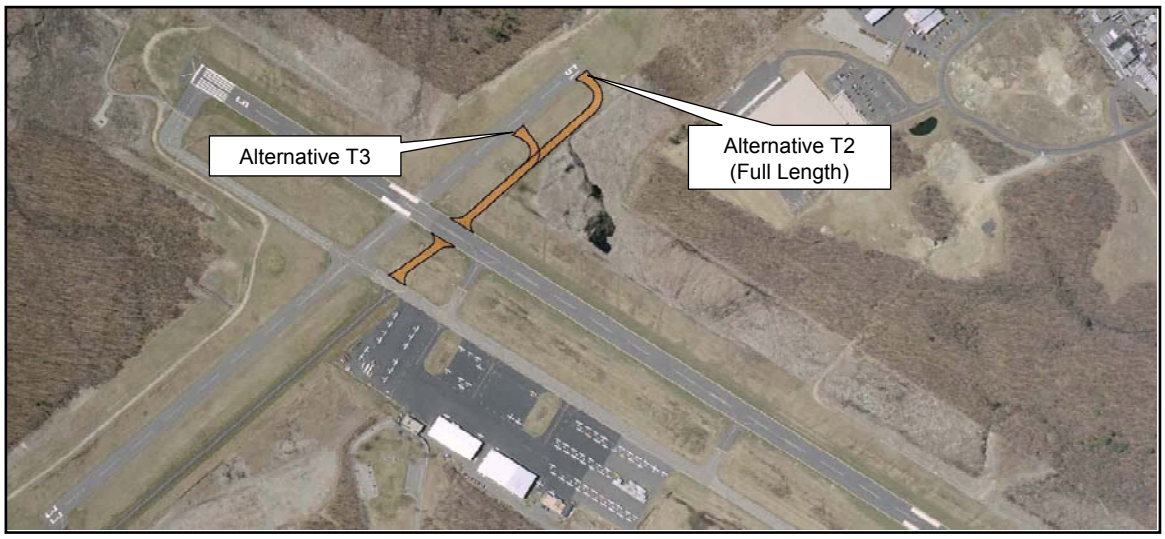
## 5.3 Airport Taxiway System Alternatives

Airports should provide a safe and efficient taxiway system to expedite aircraft movement to and from the runways and aprons. A full taxiway system improves the operational efficiency and increases airport safety. It is especially important at airports without an air traffic control tower. Parallel taxiways enhance safety by reducing the taxiing time on the runway. This in turn reduces the potential for runway incursions which is a stated FAA goal for the national airport system.

Runway 5-23 is already served by a full parallel taxiway (Taxiway B). Runway 15-33 however is served only by a partial taxiway (Taxiway A). Taxiway A extends from Taxiway B to the end Runway 33. Currently aircraft departing from Runway 15 must back taxi on Runway 15-33 from Taxiway B to the end of Runway 15. The result is an increased runway occupancy time. That also introduces the potential for runway incursions on Runway 15-33.

Taxiway options T1, T2 and T3 are analyzed below. Option T2 and T3 are shown in Figure 5.3.

Figure 5.3
Taxiway Alternatives




### Option T1: No-Build (Status Quo)

| Pro |
|---|
| There are no changes to the existing facilities |
| There are no engineering requirements |
| There are no investment costs incurred to implement improvements |
| There are no change to the existing environmental conditions |
| **Con** |
| Back taxiing will continue on Runway 15-33 |
| There will be no reduction in aircraft runway occupancy time |
| The objective to provide safety and operational enhancements will not be achieved |
| The airport will not achieve the RIASP system performance goals |

### Option T2: Construct Parallel Taxiway to Runway 15-33

**Pro**

It extends the existing T/W A to the end of R/W 33 and results in taxiway access for both runways
It eliminates the need for landing and departing aircraft to back taxi on Runway 15-33
It provides the maximum safety enhancement and operational flexibility
Stub T/W C would be removed off setting the amount of impervious area created by new T/W A

**Con**

It would require (a) filling wetlands and (b) wetland mitigation
It increases the amount of airport impervious surface
It will require relocating the VASI on Runway 15
It will be the most costly of the three options

### Option T3: Extend Taxiway A Up To Delineated Wetlands

**Pro**

It eliminates the environmental impact on the wetlands
It reduces the area of impervious surface created as compared to T2
It still provides a modest improvement to the operational efficiency and safety of R/W 15-33
It creates new storm water drainage
It will modify the Airport Storm Water Pollution Prevention Plan (SWPPP)
It is a good compromise from an operational, engineering, environmental and cost perspective

**Con**

It doesn't achieve the maximum operational and safety benefits

### Conclusion

Option T3 Extending Taxiway A up to the delineated wetlands provides most of the operational benefits without creating the environmental issues associated with filling wetlands.

## 5.4 Apron Area Alternatives

The Facility Requirements revealed that the current aircraft apron area is capable of accommodating the forecasted aircraft demand until 2017. Technically, at that point, a deficiency of 274 square yards would exist. However, that is misleading, because Figure 5.4 shows a significant portion of the existing aircraft apron lies within the Runway Visibility Zone (RVZ). The RVZ must remain clear of objects in order to provide a clear line of sight for aircraft traversing the runways. It is essential that aircraft tie-downs currently within the RVZ be relocated outside the RVZ to meet the FAA airports design standards. It can be accommodated by constructing new aircraft apron(s).

The analysis considered how the location of existing aprons would meet the future parking and operational needs. The apron space requirements outlined in Chapter 4, *Facility Requirements* was used to develop alternative apron expansions to meet the anticipated aircraft parking deficiencies through 2027. The apron alternatives will also include the area needed to relocate aircraft parking within the RVZ. The total apron development area should be at least 18,814 square yards (the deficiency through 2027) plus 9,900 square yards (area needed to offset the relocation of 36 aircraft parking spaces within the RVZ). The total is 28,714 SY of new apron.

Figure 5.4
Apron within Runway Visibility Zone

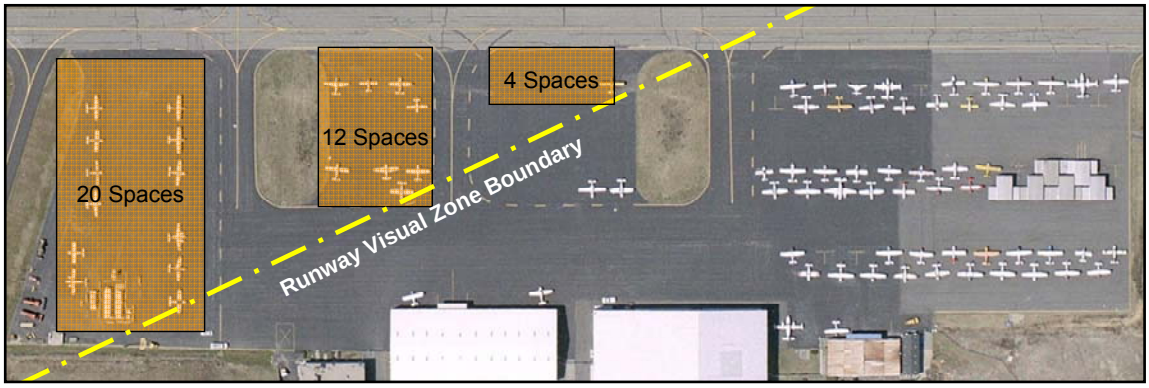
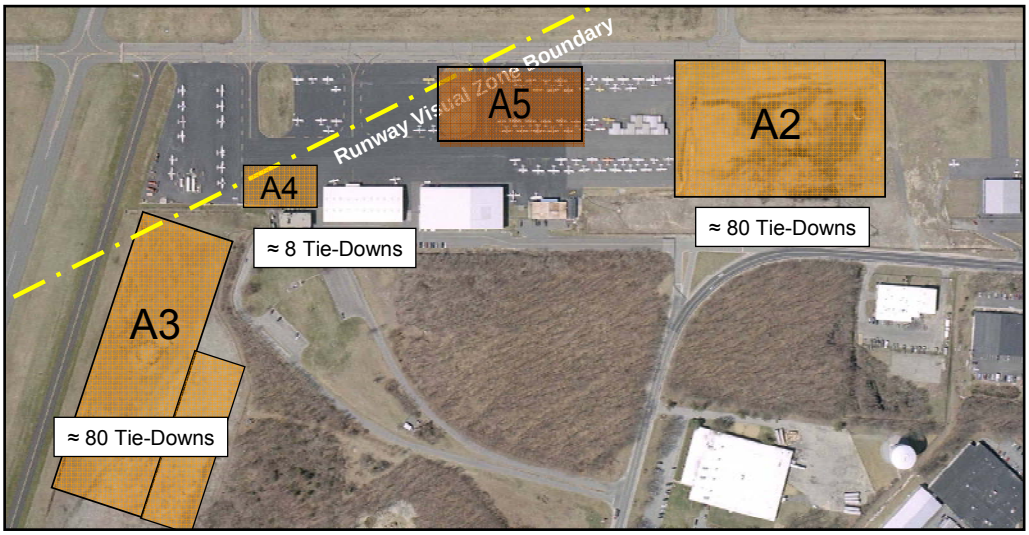



Figure 5.4a
Apron Alternatives Areas




Apron options A1, A2, A3, A4 and A5 are analyzed below.

## Option A1: No Build Status Quo

**Pro**

There are no changes to the existing facilities
There are no engineering requirements
There are no investment costs incurred to implement improvements
There are no change to the existing environmental conditions

**Con**

It does not correct the non-standard RVZ situation
It will not accommodate the apron space requirements projected for 2017
It will not meet the planning objective to improve aircraft parking.

### Option A2: Expand Aircraft Apron Adjacent to Runway 5-23

**Pro**

It will provide easy access to the new terminal, existing hangar areas and other aviation facilities
It will remove all the aircraft located in the RVZ
It will accommodate the projected apron space requirements through the 20-year planning period
It will provide easy access to the airfield taxiway system

**Con**

There could be wetland impacts and may require wetland mitigation
It increases impervious surface
Operationally it could conflict with potential hangar development planned in the same area

### Option A3: Expand Aircraft Apron Adjacent to Runway 15-33

**Pro**

It will accommodate the projected apron requirements throughout the 20-year planning period

**Con**

From an engineering perspective significant amount of excavation and grading is required
Operationally, it is located relatively far from the primary runway as compared to A2
Operationally, there is a need to taxi around the existing fuel farm to access Taxiway B
Operationally, it could impact or be shared with potential hangar development in the same area
The constraints associated with this alternative are slightly more restrictive than alternative A2
It will increase the impervious surface
There could be wetland impacts and may require wetland mitigation

### Option A4: Reconfigure Existing Apron in Front of the Old Terminal Building

**Pro**

Provides partial relief to the obstructed RVZ
The 2,400 SY of apron area in front of the former Terminal Building could accommodate 8 aircraft.
It could be used to relocate aircraft from the RVZ until additional apron area is constructed
It could provide some relief for needed tie-downs with minimal effort and investment

**Con**

There will be a temporary conflict with future development of the old Terminal Building and area.

### Option A5: Reconfigure Existing New England Aviation Apron

**Pro**

Provides relief to the obstructed RVZ with minimal need for construction
Provides for an area of about 40,000 square feet of space
Potential to also reconfigure grass drainage area immediately to the south
Does not increase impervious surface

**Con**

Contingent on availability of the space from New England Aviation leasehold

### Conclusion

Option A2: Expand Aircraft Apron Adjacent to Runway 5-23 has the least amount of constraints and provides for the most operational and safety benefits. The need for wetland mitigation will be addressed in the EA. Options A5 and A4 should be fully maximized in the short-term before expanding to A2.

## 5.5 Old Terminal Building Alternatives

The new terminal building is in excellent condition and no improvements are needed at this time. However, the Old Terminal building, (the southernmost building located in the East quadrant of the airport), is in poor condition and is currently used for rental property and aviation maintenance services. Very little building maintenance has been done and repair is needed. It has a residual value but requires additional investment to serve a new use.

Old Terminal Building options O1, O2, O3 and O4 are analyzed below.

### Option O1: No-Build (Status Quo)

**Pro**
- There are no changes to the existing facilities
- There are no engineering requirements
- There are no investment costs incurred to implement improvements
- There are no change to the existing environmental conditions

**Con**
- There are on-going maintenance costs and reoccurring utility costs
- No changes will occur to existing facilities
- Efforts to increase revenue production are minimized

### Option O2: Rehabilitate Old Terminal Building for Aeronautical Use

**Pro**
- It could continue as rental property available for offices charter service, and aircraft other services

**Con**
- It will require extensive building repairs and upgrades to utilities
- Other improvements would be required to accommodate future uses
- There will be numerous engineering issues and costs associated to meet new building codes
- Environmentally there would be temporary solid waste management issues during rehabilitation

### Option O3: Demolish Old Terminal Building

**Pro**

The utilities need to be capped and taken out of service resulting in a reoccurring cost saving
The residual land has valuable airside access for private investment (i.e. hangar development)

**Con**

It will require extensive costs associated with demolition and removal
It will require extensive site work to prepare the area for future use.
The existing access and parking area has limited use
Revenue from the existing rental property leases would be temporarily lost
Environmentally, there will be temporary solid waste management issues during demolition
There will be no operational benefit unless the area is replaced with a new aeronautical facility.

### Option O4: Convert Old Terminal to an Airport Restaurant

**Pro**

Creates a potential opportunity for integrated development of hangar/restaurant facility

**Con**

It will require private investment and extensive costs associated with rehabilitation/conversion
It will relinquish valuable airside access currently afforded to an aircraft service facility
Environmentally, there will be temporary solid waste management issues during demolition
It will reduce the overflow parking for the lower terminal area

### Conclusion

Options O2 and O4 will require extensive and costly repairs to the building. Option O3, demolishing the building does create the possibility for the future reuse of the area for additional apron area or hangar space. In lieu of demolishing the building or continuing to use it solely for rental space, the highest and best use would be to rehabilitate the building for a mixed use. First, it should retain an aeronautical use. Second, it should include rental space and/or an airport restaurant.

It is clear that the reuse of the old terminal area with or without the building has a future potential for generating revenue from different sources. The revenue should exceed the revenue generated by the building's current function. Whatever choice evolves it is contingent on a specific demand and willing private investment. From an aeronautical perspective it is desirable to retain the airfield side (lower level) for an aeronautical use. It has an interim use to relocate the based aircraft in the RVZ.

## 5.6 Conventional Hangar and T- Hangar Alternatives

The Facility Requirements analysis concluded that alternatives for citing T-Hangars and Conventional Hangars should be evaluated. T-hangars are a nested group of single-unit aircraft hangars, while conventional hangars are generally large multi-aircraft structures. The facility requirements for based and itinerant aircraft indicated that by 2012 there would be a deficiency for hangar space of 7,000 SF. By 2027 the deficiency rises to 49,500 SF. However, considering the current use of aircraft hangars coupled with the findings of the airport user surveys, it suggests an immediate need for approximately 5,300 SF of hangar space. This analysis will evaluate areas for potential hangar development.

Figure 5.6 shows the proposed areas for Corporate and T-hangar development.

Figure 5.6
Hangar Alternatives Areas


Hangar options H1, H2, H3 and H4 are analyzed below.

### Option H1: No-Build (Status Quo)

**Pro**

There are no changes to the existing facilities
There are no engineering requirements
There are no investment costs incurred to implement improvements
There are no change to the existing environmental conditions

**Con**

The existing demand for aircraft storage will not be met
An opportunity to increase airport revenue will be lost

### Option H2: Construct T-Hangars in the East Quadrant Adjacent to Runway 15-33

**Pro**

It will accommodate the projected need for based aircraft storage for 20-year planning period
It will have direct access to Taxiway A and Runway 15-33
It will have its own access roadway from Limerock Road
It will have a new automobile parking area located landside to serve this area
It provides for phased development of T-hangars that can be constructed as demand increases
Airport management supported the option because it provides operational flexibility
Provides an opportunity to increase airport revenue
It will require excavation to bring this area to grade
It could affect adjacent wetland and may require some wetland mitigation

It Increases the impervious surface and impacts storm water drainage
The adjacent property owner voiced opposition because it increases the potential for flooding

### Option H3: Construct T-hangars in the South Quadrant Adjacent to Runway 15-33

**Pro**
It provides some ability to accommodate the need for projected hangar space

**Con**
It requires a significant area of tree removal
It requires some fill
It requires a taxiway/taxilane and stub taxiway to access Runway 15-33
It has limited space for automobile parking
It is disconnected from existing aviation functions located in the East quadrant
It requires minor changes in traffic patterns
It increases the amount of impervious surface and may impact storm water drainage
Operationally it is not the most desirable option
It is a very costly investment and less likely to stimulate private development as compared to H2

### Option H4, 4a, 4b: Construct T-hangars or Conventional Hangar Adjacent to Runway 5-23 (North or South of Rosetti Hangar

**Pro**
It could provide a corporate tenant with direct access to the primary runway
It could provide a significant increase in airport revenue
It consolidates all hangar development in the same area
Expanding the roadway to Rosetti hangar will provide separate access to hangar area

**Con**
It would require minor fill and grading
Construction may temporarily affect adjacent wetlands
It increases the impervious surface and could impact storm water drainage

### Conclusion

It is clear that Option H3, development of t-hangars in the south quadrant of the airport has very limited benefit. Option H2 and Option H4 have their respective operational benefits. Option H2 provides based tenants with adequate storage and separate access to their t-hangar area. Option H4, meanwhile protects for private corporate/conventional hangar development and maintains it in the northeastern portion of the east quadrant.

To maintain flexibility over this planning period and provide private investment interests with different options it is best to show both Option H2 and H4 on the ALP to protect the land use of these two areas. In addition, the Old Terminal Site and the current hangar location of New England Aviation provide additional areas that can be redeveloped to accommodate conventional/corporate type hangar development.

## 5.7 Snow Removal Equipment (SRE) Building Alternatives

Airport operators utilize sophisticated and expensive equipment for snow and ice removal. Adequate storage and maintenance buildings are needed to protect this equipment. In addition to protecting the equipment, these buildings provide the proper environment for servicing the equipment. In the absence of an adequate storage building RIAC currently stores the snow removal equipment outdoors in an area adjacent to the approach end of Runway 33, and along the edge of the aircraft parking apron adjacent to Taxiway A.

A primary objective in citing an airport SRE building is to avoid areas that are more suitable for hangar or apron development which have the potential of generating airport revenue. The areas considered for SRE development in this analysis is shown in Figure 5.7.

Figure 5.7
SRE Building Alternatives


SRE options S1, S2, and S3 are analyzed below.

### Option S1: No-Build (Status Quo)

**Pro**
- There are no changes to the existing facilities
- There are no engineering requirements
- There are no investment costs incurred to implement improvements
- There are no change to the existing environmental conditions

**Con**
- The snow removal equipment will continue to be kept outside with no protection from the elements
- The useful life of the equipment will be shorter and become more expensive to maintain

### Option S2: Construct SRE Building Airside (Northeast of the approach end of R/W 33)

**Pro**
- It meets the need to provide enclosed storage and a maintenance area for the SRE
- It probably would not require a change in the snow removal operations
- It would continue to have direct and efficient access to the airfield from Limerock Road
- It can be oriented to allow prevailing winter winds to blow snow and debris from the entrance doors

Insignificant amounts of grading is required
No tree removal is required
The building will not interfere with any FAA obstruction surfaces

Con

There is an increase of the impervious surface
The extension of utilities is required from Limerock Road

### Option S3: Construct SRE Building Landside (Off Albion Road across from New Terminal)

Pro

It meets the need to provide enclosed storage and a maintenance area for the SRE

Con

It would require the SRE to cross a public road (Albion Road)
Is relatively far from the airfield runways and taxiways
It may require a change their current routine of conducting snow removal operations
It will require the transition of equipment from the upper level
It will require grading
It will require tree removal
It is a more costly option than S2

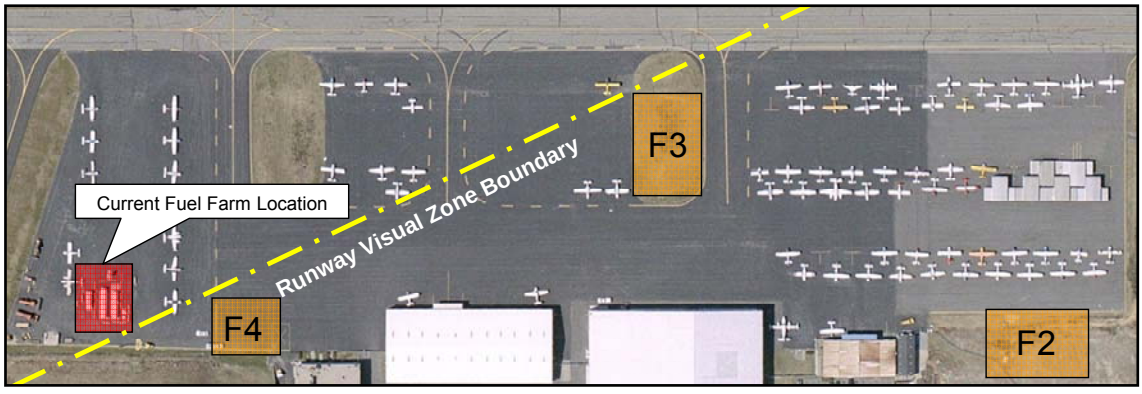
### Conclusion

Option S2 is the logical choice to be shown on the ALP for two reasons. First, it is more efficient to locate a SRE Building on the airport. Second the investment cost is lower.

## 5.8 Fuel Farm Relocation Alternatives

As noted in the Facility Requirements chapter, the current location of the fuel farm penetrates the Runway Visibility Zone. At airports such as SFZ with intersecting runways and no air traffic control tower FAA design standards require a clear line of sight for aircraft between the intersecting runways. It requires permanent objects, such as fuel facilities, to be designed or cited so they provide an unobstructed line of sight from any point five feet above an intersecting centerline within the RVZ. Figure 5.8 depicts alternatives for relocating the fuel farm.

Figure 5.8
Fuel Farm Relocation Alternatives



Fuel Farm options F1, F2, F3, F4 and F5 are analyzed below.

### Option F1: Do-Nothing (Status Quo)

**Pro**

There are no changes to the existing facilities
There are no engineering requirements
There are no investment costs incurred to implement improvements
There are no change to the existing environmental conditions

**Con**

The Fuel farm continues to be located in RVZ
An airport safety risk is not addressed

### Option F2: Relocate the Fuel Farm Just North of the New England Aviation Hangar

**Pro**

It will be clear of the RVZ
It has direct access from the airport entrance road and provides easy circulation for fuel trucks
It will provide a centralized location for fueling if the current apron is expand to the north
It will have little impact to aircraft operations

**Con**

It may require removing and/or reconfiguring some tie-downs in the vicinity of the fuel farm
It will require some grading, pavement construction, fencing and lighting
It may impact some existing tenants leases
It will require paving, electric power, lighting, storm drainage and fencing
It will require the construction of an access road from the current airport entrance to the fuel farm.
It will increase the area of impervious surface.

### Option F3: Relocate the Fuel Farm to the Grass Island Between the Aprons

**Pro**

It will be just outside the RVZ
It is a centralized location for all aircraft to self-fuel if the airport were to provide self fueling
It requires a minimal amount of grading

**Con**

It will require fuel trucks to operate in the vicinity of taxiing aircraft
It will require the grass island to be paved which could affect apron drainage
The height of security lighting poles may be limited due to proximity to R/W 5-23 and T/W B
It may require the reconfiguration of the existing based and transient tie-down layout.
It will impact aircraft operations during fuel deliveries
Increases impervious surface.

Option F4: Relocate the Fuel Farm South of the Old Terminal on the Existing Apron, Outside the RVZ.

Pro
The location is clear of the RVZ
It will require minimal engineering
There is no environmental impact

Con
It will be relatively far from any proposed apron expansion to the north
It will require fuel trucks to operate in the vicinity of taxiing aircraft
It may impact operations associated with the development of the Old Terminal building

Option F5: Construct Fuel Farm with SRE Building and T-Hangars Adjacent to R/W 15-33

Pro
Suggested by the LAG and Airport Staff
The location is clear of the RVZ
It provides for a centralized facility with Options S2 and H2
Potential to offset/share infrastructure development
Eliminates operational impacts of other alternatives
Fuel deliveries do not interact with aircraft
Aircraft fueling trucks stay on the airfield

Con
It will require paving, electric power, lighting, storm drainage and fencing
It will require the construction of an access road from the current airport entrance to the fuel farm.
It will increase the area of impervious surface.

Conclusion

Considering the relatively extensive requirements in regards to construction and utilities associated with Alternatives F2 and F4, as well as F2's potential impact to a tenant's existing leasehold, and F3's construction and operational limitations, Alternative F5 appears to have the least number of operational impacts and improves the safety of aircraft on the apron during fuel deliveries. Alternative F5 also satisfies the need to clear the RVZ, which is the objective for the Fuel Farm relocation alternatives. Therefore F5 should be reflected on the ALP. Figure 5.6 provides the general location of F5 to the east of H2.

## 5.9 Automobile Parking Areas and Access Alternatives

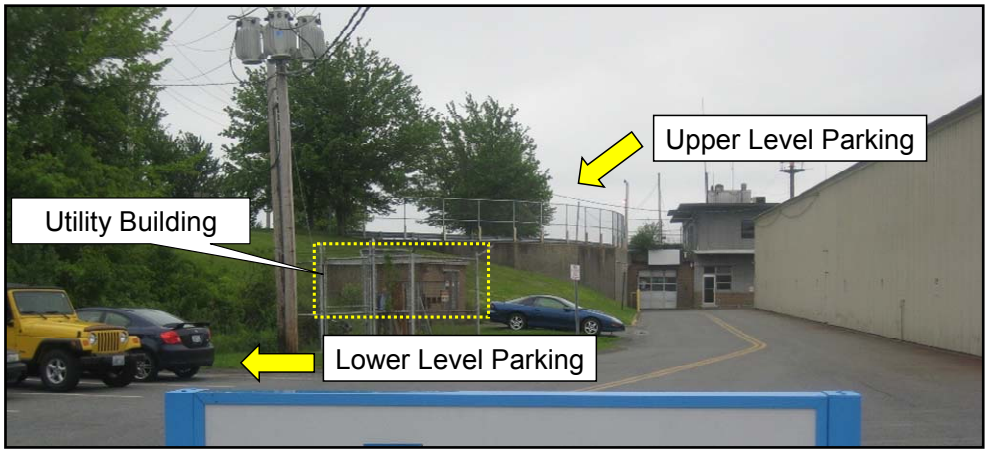
The Facility Requirements chapter stated that the capacity of automobile parking at SFZ is adequate. However, since terminal operations have moved to a new terminal building, reasonable pedestrian access to the former terminal parking area is unavailable. This is depicted in the aerial view in Figure 5.9 which shows potential alternatives and the ground level view in Figure 5.9a.

During project inventory and site visits it was observed that the pavement of the upper level parking area as well as the roadway that serves these parking areas is deteriorated. The parking access alternatives

discussed below assumes that should an access alternative be implemented pavement rehabilitation to the upper level should be included when deemed appropriate by the level of use.

Figure 5.9
Automobile Parking Access Alternatives (Aerial)


Figure 5.9a
Automobile Parking Access Alternatives (Ground Level)




Access and Parking options P1, P2 and P3, are analyzed below.

### Option P1: Do-Nothing (Status Quo)

**Pro**

There are no changes to the existing facilities
There are no engineering requirements
There are no investment costs incurred to implement improvements
There are no change to the existing environmental conditions

Con
Automobile parking will continue to be constrained at the lower level
Pedestrian access between the upper and lower level parking areas will be inadequate.

Option P2: Construct Access Road [with Sidewalk] Connecting Upper and Lower Auto Parking Areas

Pro
It provides additional parking at the upper level when the lower level is filled to capacity
It improves access and vehicle circulation between the lower and upper level terminal areas
Con
It will require excavation
It will require the removal of the existing Utility Building
Environmentally it will increases the impervious surface

Option P3: Construct Pedestrian Stairway Connecting Upper and Lower Auto Parking Areas

Pro
It will provides pedestrian access between the upper and lower terminal areas
It will require less engineering and will cost significantly less compared to Option P2.
Requires minimal excavation
There is increase of impervious surface.
Con
It provides pedestrian access but no direct automobile access between parking levels
When lower level parking is at capacity it is a more circuitous route to get to upper level parking
It creates safety and maintenance issues during snow conditions

Conclusion

Alternative P2 provides the greatest benefit in terms of operational efficiency and would require the most engineering, design and construction investment. Discussions with RIAC regarding the automobile parking issue pointed toward a previous study that RIAC undertook. The study revealed that the costs associated with providing pedestrian only access was comparable to what it would cost to construct an actual roadway connecting the upper and lower levels.

## 5.10 Additional Alternatives

The following subsections outline issues that were not discussed in previous sections. Some of these issues are secondary and only need to be monitored at this time. The result of the discussion in this section will allow for the prioritization, cost estimates, and implementation plan to be developed as part of the final Capital Improvement Plan (CIP) for Airport's Master Plan as a whole over the next 20 years.

### 5.10.1 Non-Aeronautical Development Opportunities on Airport Property

Many airports have significant property that can be developed for non-aeronautical uses, such as industrial parks, recreational uses, agricultural leases or retail businesses. In some cases, these uses are considered

temporary until a higher aeronautical use is warranted, otherwise non-aeronautical use within airport property remains as surplus to anticipated aviation needs. In either case, revenue from these areas provides supplemental revenue to the airport and improves the airport's financial standing. Figure 5.10 identifies two areas within North Central's property boundary that are suitable for non-aeronautical development.

In addition to the areas identified in Figure 10.0, it was also determined through talks with RIAC that there are parcels of land off of the extended centerline of Runway 15 in the Southeast quadrant of the airport within RIAC property and adjacent to Harris Road that could be used for development.

Figure 5.10
Potential Non-Aeronautical Development Areas on Airport Property


## Facts

- The areas consist of approximately 15.6 acres of developable land.
- It will require significant tree removal, excavation, grading and site development.
- It will increase impervious surface depending on the type of development.
- It will require automobile parking and roadway development to provide access from Jencks Hill Road and/or Albion Road.

## Conclusion

It is recommended that RIAC protect this area, as well as the others identified, and consider a future development plan for these areas. Moreover, RIAC should work closely with the adjacent towns and Statewide Planning Program when off-airport property is being considered for development. The strategic location of the airport and its proximity to I-295 make it a focal point for future development.

### 5.10.2 Airport Security and Airport Perimeter Fencing Alternatives

RIAC has implemented and maintains a General Aviation Security Plan for all their general aviation airports. As observed during project inventory and site visits the existing security measures at the airport which included fencing around the existing terminal and hangar areas, as well as the card readers for airside access provides adequate security to the airport at this time. However, while fencing is adequate in the East quadrant of the airport, there are areas in the South and West quadrants of the airfield that remain unfenced.

#### Conclusion

In order to enhance the security of the entire airfield while improving the airport's wildlife management, it is recommended that the airport construct fencing and extend the current fence line around the airport.

### 5.10.3 Airport Utilities

The wastewater utilities appear to be the only inadequacy in regards to a need for utilities. In 2007, RIAC undertook efforts to evaluate airport waste water disposal alternatives and the potential for public sewer connections at SFZ due to an inadequate septic system at the airport. The study identified a recommended alternative for the airport to connect to the Lincoln public sewer system in Powder Hill Road. However, the study also mentions that RIAC has the option to repair the current system without connecting to the public sewer.

#### Conclusion

Considering the proposed development for the 20-year planning period and the potential for converting a portion of the old terminal into a restaurant, it is assumed that the wastewater flow rate will increase at the airport as development occurs. It is recommended that RIAC move forward with the recommended wastewater disposal alternative outlined in the study. The recommendation is reflected in Phase I of the Capital Improvement Plan and the cost is identified in the Financial Plan. The cost associated with this improvement should be borne by the Rhode Island Department of Administration (DOA), as previously agreed to between Rhode Island Department of Transportation and the DOA when the airport was transferred to RIAC.

## 5.11 Airport Performance

As a part of RIAC's Airport System Plan Update (RI/ASPU), completed in 2004 a methodology was developed to assess each airport's performance, or how well an airport is able to meet the aviation needs of the state with respect to its specified role. In this study, SFZ was identified as a General Aviation/Reliever Airport. Figure 5.11 below outlines the facility and service objectives for General Aviation Business Airports.

Figure 5.11
Facility and Service Objectives, General Aviation Business Airports

**640-06(2) Facility and Service Objectives, General Aviation Business Airports**

| **Airside Facilities** | **General Aviation Business Airports** |
|---|---|
| Aircraft Design Group | B category aircraft |
| Primary Runway Length | Greater than 3,500 feet and less than 5,000 feet |
| Crosswind Runway Length | 80% of Primary Runway Length |
| Primary Runway Width | 75 feet |
| Crosswind Runway Width | Dictated by ARC |
| Taxiway | Full Parallel |
| Approach | Non-Precision |
| Lighting | MIRL and LITL |
| Visual Aids | Rotating Beacon; Lighted Wind Cone/Segmented Circle; REILS; VGSI (PAPIs on primary runway); MALSR Approach Lighting |
| Weather | ASOS or AWOS |
| **Landside Facilities** | |
| Hangars Based | 50% of based fleet |
| Hangars Transient | 25% of overnight aircraft |
| Apron | 50% of based; 75% of peak month avg. daily arrivals |
| Terminal/Administration | 1,000 square feet General Aviation<br>1,000 square feet Commercial (WST only) |
| Operations/Maintenance Hangar | 5,000 square feet |
| Auto Parking | Equal to the number of based aircraft |
| **Services** | |
| FBO | Enhanced or Basic Service |
| Maintenance | Full or Limited Service |
| Fuel | Jet A and 100LL |
| Terminal/Pilot | Phone, Restrooms, Flight Planning/Lounge |
| Ground Transportation Services | On-site courtesy car |
| Security | Fencing, Controlled Access, Security Lighting |
| Utilities | All |
| Food | Vending/Catering |

Source: Rhode Island Airport System Plan

Based upon these objectives, an analysis was completed that summarized the ability of each airport to fulfill their role within the system, including North Central. This analysis identified these facility and service objectives as goals that the airport should attempt to achieve as they plan future development to meet future airport needs.

Figure 5.11a identifies each of RIAC's airport facilities and their ability to meet their facility and service objectives in 2009 and through the planning period of 2029.

Figure 5.11a
Facility and Service Objectives Compliance (Current and Proposed Conditions)

**FACILITY AND SERVIVE OBJECTIVES COMPLIANCE**

Meets Objective

Does Not Meet Objective

| Airside Facilities | 2009 | 2029 |
|---|---|---|
| Aircraft Design Group | | |
| Primary Runway Length | | |
| Primary Runway Width | | |
| Crosswind Runway Length | | |
| Crosswind Runway Width | | |
| Taxiway | | |
| Instrument Approach | | |
| Primary Runway Lighting | | |
| Visual Aids | | |
| Weather | | |
| **Landside Facilities** | | |
| Hangars Based | | |
| Hangars Transient | | |
| Apron | | |
| Terminal/Administration | | |
| Operations/Maintenance Building | | |
| Auto Parking | | |
| **Services** | | |
| FBO | | |
| Maintenance | | |
| Fuel | | |
| Terminal/Pilot | | |
| Ground Trans. Services | | |
| Security | | |
| Utilities | | |
| Food | | |
| Other | | |
| % Meeting Standard | **64%** | **92%** |

Source: The Louis Berger Group Inc.

## 5.12 Airport Alternatives Matrix

The following matrix identifies each of the airport alternatives identified throughout this Working Paper, with the preferred alternative to be identified for each category. This is a condensed summary of the alternatives identified in each category above.

Table 5.12
Alternatives Analysis Summary Matrix

| Category | Alternatives | Preferred Alternative |
|---|---|---|
| Runways | R1: No-Build/Status Quo | Option R1 No-Build/Status Quo |
| Runway 5 Approach and Lighting System Upgrades | L1: No-Build/Status Quo<br>L2: Maintain Existing MALSF with an LPV approach<br>L3: Upgrade the Approach Lighting System from a MALSF to a MALSR with an LPV approach | Option L2 based on the information developed is the best option at this time. However, do not dismiss L3 for the Medium - Long Range time frame. Perform a more detailed analysis of L3 as part of an AMP Update in 5 – 6 years. |
| Taxiways | T1: No-Build (Status Quo)<br>T2: Construct Parallel Taxiway to Runway 15-33<br>T3: Extend Taxiway A Up To Delineated Wetlands | Option T3 provides most of the operational benefits without creating the environmental issues associated with filling wetlands. It also has minimal engineering and more reasonable investment costs. |
| Aprons | A1: No Build/Status Quo<br>A2: Expand Aircraft Apron Adjacent to Runway 5-23<br>A3: Expand Aircraft Apron Adjacent to Runway 15-33<br>A4: Reconfigure Existing Apron in Front of the Old Terminal Building<br>A5: Reconfigure a portion of the New England Aviation Leasehold | Option A4 and A5 provide for short-term options, while Option A2 has the least amount of constraints and provides for the most operational and safety benefits. The need for wetland mitigation will be addressed in the EA. |

| Category | Alternatives | Preferred Alternative |
|---|---|---|
| Old Terminal Building | O1: No-Build-Status Quo<br>O2: Rehabilitate Old Terminal Building for Aeronautical Use<br>O3: Demolish Old Terminal Building<br>O4: Convert Old Terminal to an Airport Restaurant | Option based on private development proposals provided to RIAC. Highest and Best Use is likely a hybrid maintaining aeronautical development. |
| Corporate Hangars/T-Hangars | H1: No-Build/Status Quo<br>H2: Construct New T-hangars in the East quadrant adjacent to R/W 15-33<br>H3: Construct New T-hangars in the South quadrant adjacent to R/W 15-33<br>H4, 4a, 4b: Construct T-hangars or Corporate Hangar Adjacent to R/W 5-23 (north or south of Rosetti Hangar) | Options H2 and H4 have their respective operational benefits. To maintain flexibility and provide private investment with different options it is best to show Option H2 and H4 on the ALP. Also, the Old Terminal Building and the New England Aviation hangar provide areas for redevelopment options. |
| Snow Removal Equipment Building | S1: No Build/Status Quo<br>S2: Construct an SRE Building Airside, in the East Quadrant adjacent to Wilbur Road<br>S3: Construct an SRE Building Landside, in the East Quadrant adjacent to the Airport Entrance Road | Option S2 is the logical choice. In addition the practical consideration that an SRE is more efficient if located on the airport, it is also function of what is the most cost effective. |

| Category | Alternatives | Preferred Alternative |
|---|---|---|
| Fuel Farm Relocation | F1: No-Build-Status Quo<br>F2: Relocate Fuel Farm North of the New England Aviation Facility<br>F3: Relocate Fuel Farm to the apron island located outside the RVZ<br>F4: Relocate Fuel Farm south of the Old Terminal building on the existing apron, outside the RVZ<br>F5: Consolidates service facilities with S2 and H2 options minimizing operational impacts | Option F5 appears to have the least number of operational impacts. Option F5 also satisfies the need to clear the RVZ, which is the objective for the Fuel Farm relocation alternatives. |
| Automobile Parking Area and Access Development | P1: No-Build/Status Quo<br>P2: Construct an Access Road with sidewalk from the Airport Entrance Road to Upper Level Parking Area<br>P3: Construct a Pedestrian Walkway from Upper Level Parking to Existing Terminal | Option P3 provides the greatest benefit in terms of operational efficiency and also increases the safety for pedestrian traffic. Construction could be phased dependent on available funds. |

## 5.13 Preferred Alternative and Conceptual Layout Plan

The preferred alternative and conceptual layout plan can be found on the following page.