



## Chapter 6

# Alternatives Analysis

### 6.0 OVERVIEW

The primary objective of this chapter is to identify a preferred development alternative that the Airport Commission of Forsyth County (ACFC) can pursue for the Smith-Reynolds Airport (INT) to meet long-term aviation demand, satisfy FAA standards, and/or to improve efficiency or safety. The alternatives presented herein propose additional or replacement facilities as necessary to satisfy demand or to resolve the safety deficiencies that were both pointed out earlier in the forecast and facility requirements chapters. As a result, three functional areas were considered in identifying the development alternatives shown herein: 1) airside - runways, taxiways, and navigational aids, 2) landside - hangars, parking, access, etc., and 3) general airport requirements - ground access, support, and non-aviation land uses etc.

Because the number of possible of alternatives is virtually limitless, intuitive judgment was incorporated along with input received from the ACFC and airport management in order to produce development recommendations that provide the greatest potential for implementation.

### 6.1 DEVELOPMENT CONSIDERATIONS

In order to meet current and future aviation demand and to achieve the development goals of the ACFC, the airside and landside requirements that were previously identified were utilized as a baseline for future development. Prior to identifying a preferred development alternative, several criteria were evaluated. In general, similar criteria were used to measure the effectiveness and the feasibility of the various growth options available, and are grouped into four general categories:

- Operational – The selected development alternative should be capable of meeting the airport’s facility needs as identified for the planning period. Preferred options should resolve any existing or future deficiencies as indicated by FAA design, safety, and security criteria.
- Environmental – Airport growth and expansion may impact both the airport and surrounding environs; therefore, the selected plan should seek to mitigate impacts both within and adjacent to the airport property. Alternatives should also seek to obtain a reasonable balance between expansion needs and off-site acquisition and relocation needs while being sensitive to potential environmental impacts.
- Cost – Some alternatives may result in excessive costs due to expansive construction, acquisition and/or other development requirements. In order for a preferred alternative to



best serve the airport and the community, it must satisfy development needs at a reasonable cost.

- Feasibility – The alternative concepts must be acceptable to the FAA, NCDOT Division of Aviation, Master Plan Steering Committee (MPSC), ACFC, and also by the community being served. In addition, the proposed developments should be economically feasible.

These evaluation criteria address economic, operational, environmental and other issues which are crucial to strategic long-term planning decisions. The following sections use these evaluation criteria to determine those alternatives which best meet the airport's long-term planning goals and development needs.

## **6.2 ORDER OF MAGNITUDE COST ESTIMATES**

Because costs are always a factor when considering the proposed layout and subsequent selection of a preferred development alternative, order of magnitude estimates have been provided for each alternative presented. These costs were provided such that comparisons could be made between similar alternatives in order to facilitate the decision-making process. Linear costs were applied equally to all proposed developments despite the fact that real world per unit costs typically drop as the project size increases. The reasons for these drops include mobilization savings, increases in profit margins, and bid competitiveness relative to the project fee. For the purpose of these analyses and discussions it is most important that the construction values are applied equally for each type of development for all alternatives. In doing so, a fair comparison can be derived. For these reasons and because limited information was available during the time of these analyses, the costs provided are to be used for purposes of comparison only. More refined estimates of costs for the selected alternative will be provided later in the capital improvement chapter.

## **6.3 NO DEVELOPMENT ALTERNATIVE**

Despite the identification of existing deficiencies and expected demand shown in earlier chapters of this report, one option that the airport may wish to consider is a no-development approach. This option does not resolve previously identified deficiencies and will not accommodate forecasted demand; however, this is always the lowest cost alternative due to the fact that the airport will not expend funds to construct improvements. Rather, airport expenditures will be limited to the rehabilitation, replacement, and/or maintenance of existing facilities only. This approach could limit the airport's growth potential and ultimately the forecasts of aviation activity presented earlier may be much less than forecasted due to inadequate or a lack of available facilities and/or capabilities.

## **6.4 INSTRUMENT APPROACH ALTERNATIVE**

Prior to the development of landside alternatives, it was important to first establish the airport's planned improvements to the airport's instrument approach procedures. These improvements



could ultimately affect the size of the runway's Protection Zones (RPZs), safety and object free areas, and FAR Part 77 imaginary surfaces. The sizes of these protective zones and surfaces define the development boundaries that will be utilized later to establish the proposed location of future landside facilities.

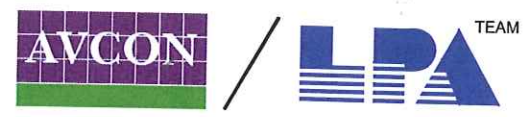
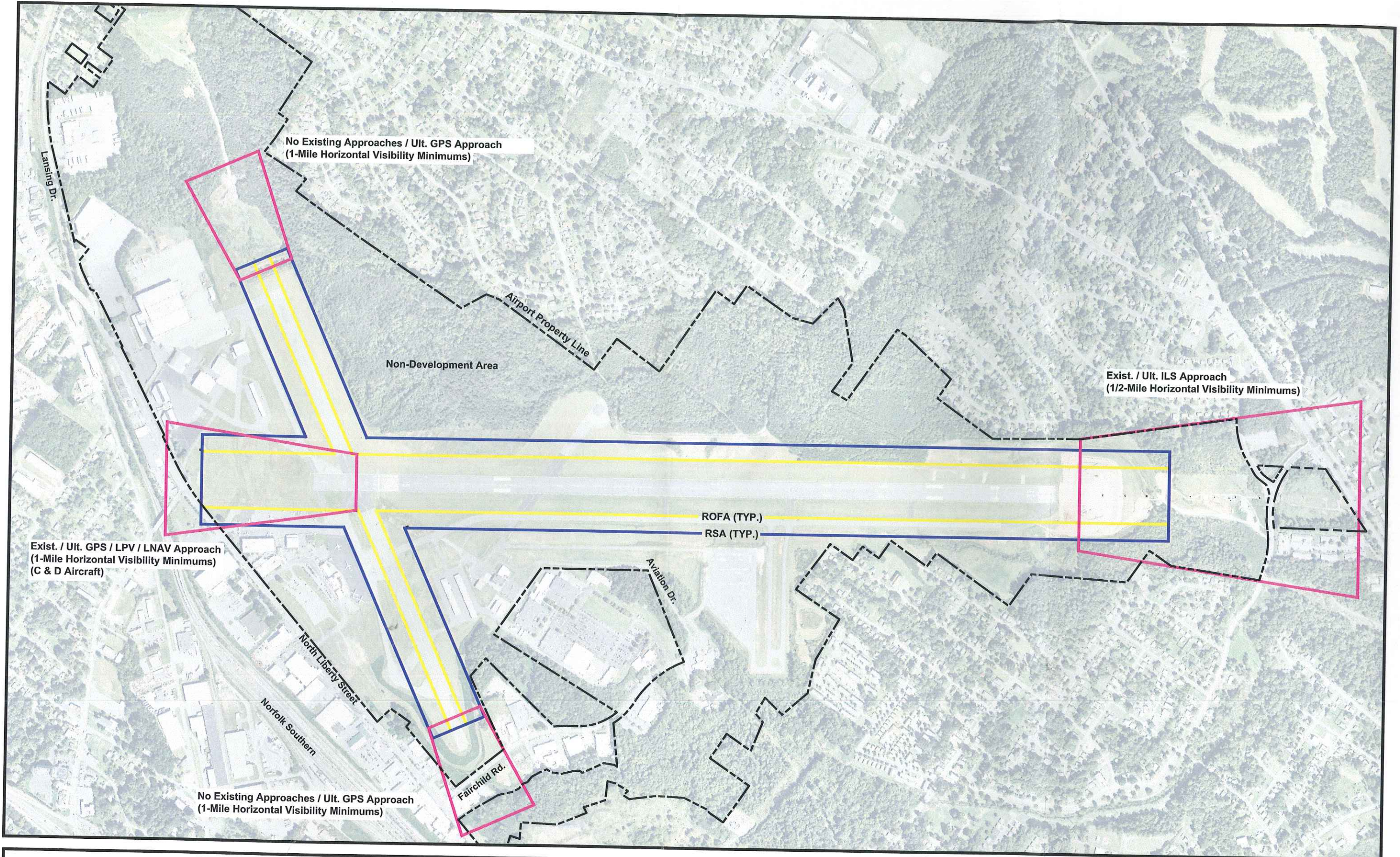
At INT, there are currently published approach procedures that pilots can utilize to navigate to Runways 15 and 33 during poor visibility conditions. The VOR/DME approach to Runway 15 is an approach procedure that allows pilots to use ground based VOR equipment to navigate to the vicinity of the airport. The visibility minimums for the VOR/DME approach are as low as 1 mile. Runways 15 and 33 also have multiple GPS approach procedures including a LPV, LNAV/VNAV, and GPS circling approaches. However, the Instrument Landing System (ILS) approach procedure for Runway 33 provides both vertical and horizontal navigation and allows pilots to navigate while horizontal visibility minimums are as low as 1/2 mile. INT's existing navigational capabilities to Runways 15 and 33 are currently sufficient for the types of activities that are conducted on the main runway; however, there are currently no published approach procedures which are available to Runways 4 or 22.

The installation of additional navigational aids and approach lighting to Runway 4-22 would allow the runway to be usable during low visibility conditions which could ultimately attract additional traffic. However, due to the proximity of the airport's terminal facilities, there is no feasible method to achieve minimums less than 1 mile for this runway. The reason for this is that doing so would increase the FAR Part 77 primary surface width from 500 feet to 1,000 feet which would then create a myriad of nonstandard conditions. Furthermore, reducing minimums lower than 1 mile would also increase the size of the RPZs which would also create incompatible land uses and additional nonstandard conditions. For these reasons, the recommended improvements to Runway 4-22's navigational aids and approaches are limited to the installation of a Runway End Indicator Lights (REILs) and Precision Approach Path Indicator (PAPI) lighting. The installation of such should allow the airport to implement GPS LPV approach procedures to the ends of Runway 4 and 22 which may allow the approach to achieve horizontal visibility minimums as low as 1 mile. It should be noted that any future recommendations within this study to illuminate, remove, or relocate existing obstructions may aid to improve (lower) the airport's decision height and/or horizontal minima. Hence, any planned navigational aid improvements should be performed in conjunction with any necessary tree removal or obstruction lighting and/or safety area improvements in order to achieve the lowest obtainable approach minimums. It should be noted that for the purposes of this planning study, it was assumed that both ends of Runway 4-22 would ultimately have approaches with minimums equal to or greater than 1 mile. **Exhibit 6-1** graphically depicts the existing and ultimate approaches and associated RPZs at INT and **Table 6-1** illustrates the RPZ dimensions as they relate to the approach speed and visibility minimums.



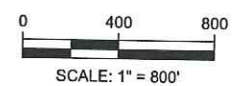
Table 6-1 Runway Protection Zone Dimensions					
Approach Visibility Minimums	Facilities Expected To Serve	Dimensions			
		Length (L) feet	Inner Width (W1) feet	Outer Width (W2) feet	RPZ Acres
Visual and not lower than 1- mile	Small Aircraft Exclusively	1,000	250	450	8.035
	Aircraft Approach Categories A & B	1,000	500	700	13.770
	Aircraft Approach Categories C & D	1,700	500	1,010	29.465
Not lower than $\frac{3}{4}$ mile	All Aircraft	1,700	1,000	1,510	48.978
Lower than $\frac{3}{4}$ mile	All Aircraft	2,500	1,000	1,750	78.914

Source: FAA AC 150/5300-13.



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Instrument Approach Alternative



6-1

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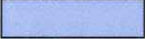



## 6.5 AIRSIDE AND LANDSIDE ALTERNATIVES ANALYSIS


As pointed out earlier in the facility requirements chapter, no additional runway length was deemed necessary to accommodate future activity at INT. For this reason, discussions of extending the airport's existing runways are limited within this chapter; however, the airport's intent to preserve such a capability is addressed within the high and preferred alternatives herein. Because all navigational aid and improvements to the airport's approach procedures had been discussed earlier, the only remaining planning elements to evaluate were the landside and airside facilities that would be necessary to accommodate future growth and demand through the remainder of the planning period. Because the development of such can directly affect one another, the remaining elements were evaluated and are therefore presented collectively in the following sections along with order of magnitude cost estimates. In order to facilitate the planning process, three development alternatives were discussed including: 1) a low development alternative, 2) a high development alternative, and 3) a preferred development alternative.


### Low Development Alternative

The low development alternative reflects a constrained development scenario that provides basic improvements and allocations for new facilities as necessary to accommodate business and based aircraft growth throughout the 20-year planning period. The order of magnitude cost estimates for the low development alternative are shown in **Table 6-2**; whereas, a graphical depiction of the alternative is illustrated in **Exhibit 6-2**.

 Commercial Hangar Development – On the northernmost portion of airport property, this alternative illustrates the proposed construction of three large hangars which are slated to be utilized for future Maintenance Repair and Overhaul (MRO) facilities. Each building contains approximately 50,000 square feet of space which collectively have a capacity of 150,000 square feet.

 Auto Parking – In support of the three MRO facilities, an 85,000 square foot parking lot has been shown north and adjacent to the hangar facilities. Based on 500 square feet per space, the proposed lot should provide up to 170 spaces, or approximately 56 spaces per hangar.

 Land Development – This alternative depicts two land development areas which are located on the west and northeastern portions of airport property. The western property includes approximately 13.8 acres of land that currently contains an apron area for general aviation aircraft parking. The future uses of this area include the construction of t-hangars, box hangars and additional apron as necessary to accommodate parking and aircraft storage for corporate and recreational aircraft types. The northeastern property is currently undeveloped and includes approximately 23.3 acres of property that can be utilized for corporate development, air cargo, and/or small to medium MRO facilities.

 Access Improvements – A new access road has been shown which extends from

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Lansing Drive in the vicinity of Conrad Street to the east side of the airfield. The two-lane road will extend a distance of approximately .9 miles and will provide access to future eastside development areas.

**Land and Easement Acquisition** – Because the low development alternative depicts a minimum development solution, only one 8.1 acre swath of land acquisition which is located near the end of Runway 33 has been depicted which would increase the airport's developable property. Conversely, there are multiple parcels of easement acquisition shown within the RPZs or as needed for obstruction removal which has been shown with a yellow net pattern. This land is to be acquired via easement or acquisition in order to ensure land use compatibility within the RPZs. In total, approximately 8.1 acres of land is shown to be acquired and approximately 46.4 acres of additional easement is shown to be acquired. It is important to note that these acquisitions can be avoided altogether if the county can demonstrate that appropriate zoning controls are in place that will prevent incompatible development in these areas.

**Terrain Obstruction** – The green area located east of Runway 15-33 illustrates where the terrain currently penetrates the runway object free area and imaginary surface planes as described in FAR Part 77. In total, approximately 24.2 acres of property needs to be re-graded to resolve this deficiency. The soil removed from this area could potentially be utilized to relocate Taxiway A and/or to prepare the 23.3 acre northeastern development site for MROs, air cargo, or corporate aircraft.

**New Airfield Pavement Construction** - All proposed new airfield pavement has been graphically illustrated in purple. In the northernmost portion of property, a new taxiway connector has been shown which provides access to the proposed north MRO facility. Also, within the MRO facility, the construction of a 242,000 square foot apron area is illustrated as needed for hangar frontage. Finally, a partial taxiway connector has been shown which leads from the end of Runway 22 to the proposed eastside development area. The proposed taxiway will allow aircraft to utilize to cross access existing facilities or utilize Runway 22 or Taxiway F to access alternate portions of the airfield.

**Pavement Rehabilitation** – As pointed out earlier in the facility requirements chapter, the existing separation from Runway 15-33 to Taxiway A centerline is less than required per FAA AC 150/5300-13, Airport Design. However, the proposed scenario assumes that a modification of design standards waiver will be approved by the FAA which will allow the taxiway to remain in-place and continue to function as is. The entire length of Taxiway A, (approximately 379,000 square feet), is in need of rehabilitation and has therefore been depicted in orange.

**Pavement Reconstruction** – There are two pavement areas located on the airfield that are currently beyond repair and therefore need to be reconstructed. As depicted in pink, approximately 2,000 linear feet of pavement located near the end of Runway 22 is in poor condition and cannot be repaired. Similarly, the pavement located adjacent to the terminal

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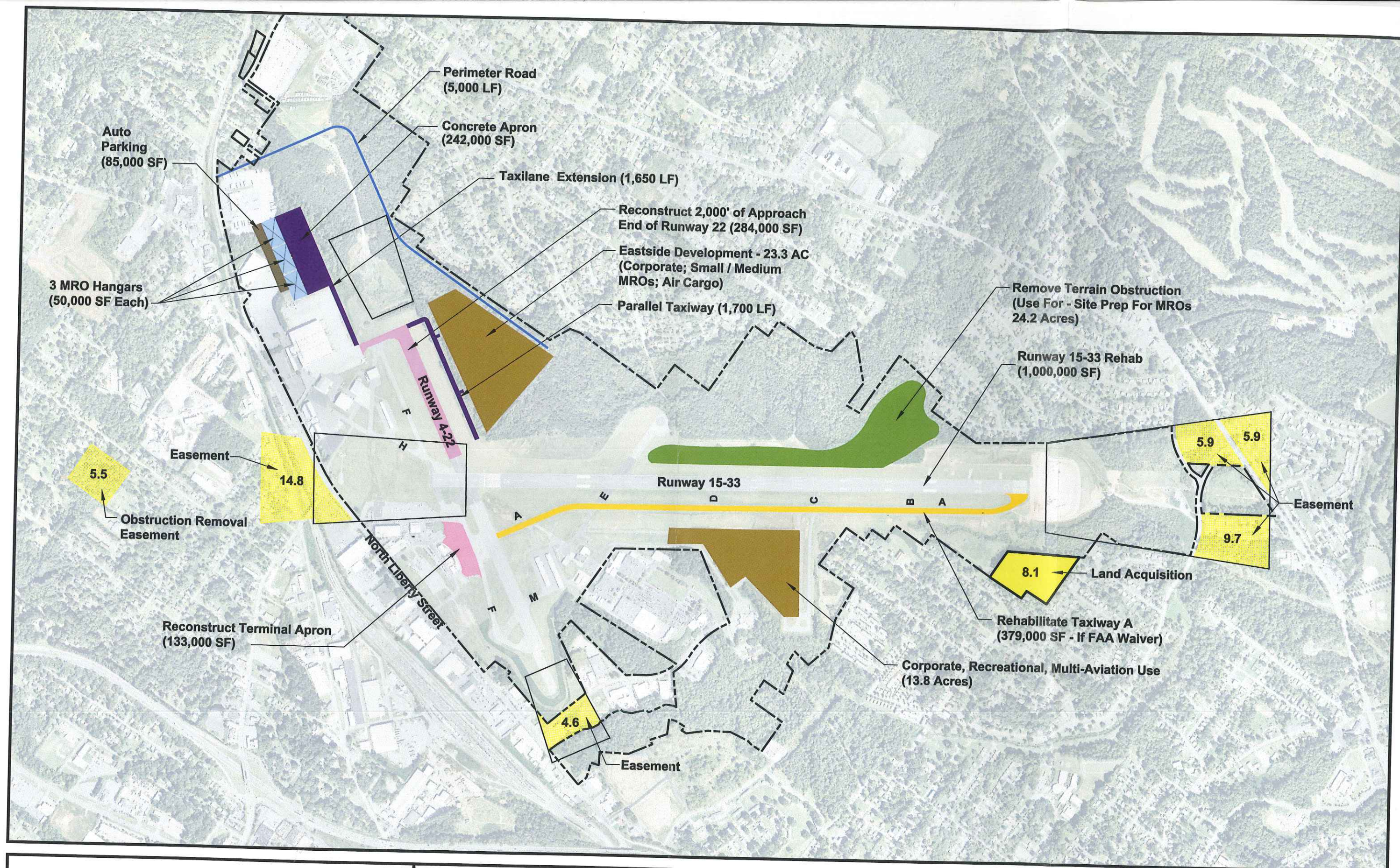


facility is also in poor condition and therefore needs to be reconstructed. In total, both projects include approximately 417,000 square feet (or 9.6 acres) of newly reconstructed asphalt pavement.

**Table 6-2**  
**Order of Magnitude Costs – Low Development Alternative**

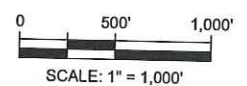
Quantity	Unit	Item Description	Unit Cost	Total Cost
133,000	SF	Reconstruct Terminal Apron	\$8	\$1,064,000
150,000	SF	Construct 3 Hangars (MROs – 50,000 SF EA)	\$85	\$12,750,000
82,500	SF	Taxilane Extension (1,650 LF)	\$21	\$1,732,500
85,000	SF	Construct Auto Parking	\$7	\$595,000
242,000	SF	Construct Concrete Apron North	\$14	\$3,388,000
108,000	SF	Construct Perimeter Access Road (5,000 LF)	\$7	\$756,000
284,000	SF	Reconstruct 2,000 LF Approach End - Runway 22	\$8	\$2,272,000
1,015,000	SF	Develop East Corporate, MROs, Air Cargo	\$14	\$14,210,000
84,000	SF	Construct East Parallel Taxiway	\$21	\$1,764,000
1,054,000	SF	Remove Terrain Obstruction / Site Prep	\$2	\$2,108,000
1,000,000	SF	Runway 15-33 Rehab	\$8	\$8,000,000
379,000	SF	Rehab Taxiway A (FAA waiver)	\$8	\$3,032,000
603,000	SF	Develop Corp, Rec, Multi-Aviation Use Facility	\$14	\$8,442,000
1	LS	Obstruction Removal Land Easement Acquisition	\$20,000	\$20,000
		<b>Total – Low Development Alternative</b>		<b>\$60,133,500</b>





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Low Development  
Alternative



6-2

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## High Development Alternative

The high development alternative reflects an unconstrained development scenario that provides improvements and allocations for new facilities as necessary to accommodate business and based aircraft well beyond the 20-year planning period. The order of magnitude cost estimates for the high development alternative are shown in **Table 6-3**; whereas, a graphic depiction of the alternative is illustrated in **Exhibit 6-3**.

**Commercial Hangar Development** - On the northernmost portion of airport property, this development alternative illustrates the proposed construction of two 50,000 square foot hangars which are slated to be utilized for future MRO facilities. In addition, this alternative depicts another very large hangar (203,000 square foot) that mimics the airport's existing maintenance hangar which is occupied by Piedmont. Collectively, the three hangars will provide approximately 303,000 square feet of space for additional aviation maintenance, cargo, or other aviation related activities. In addition to hangar construction, this alternative illustrates the construction of a 16,000 square foot executive terminal which is shown to the southwest of the existing terminal facility.

**Auto Parking** - In support of the commercial hangar developments, two parking lots are shown on the high development alternative. The northernmost provides parking for the large hangar and contains 76,000 square feet of space. Based on 500 square foot per vehicle space, the northernmost lot should provide up to 152 parking spaces. The lot to the south supports the two 50,000 square foot hangars and contains 63,000 square feet of space which should provide up to 126 spaces in total or 63 spaces for each hangar.

**Land Development** - Two land development areas are shown located on both the west and northeastern portions of airport property. The western property includes approximately 13.8 acres of land that currently contains an apron area for general aviation aircraft parking. The future uses of this area include the construction of t-hangars, box hangars and additional apron as necessary to accommodate parking and aircraft storage for corporate and recreational aircraft types. The northeastern property is currently undeveloped and includes approximately 23.3 acres of property that can be utilized for corporate development, air cargo, and/or small to medium MRO facilities.

**Access Improvements** - In support of the proposed developments shown to the east of Runway 15-33, a new access road has been depicted on this alternative which extends from Lansing Drive in the vicinity of Conrad Street to the east of Runway 33. The road which will have two lanes that will extend a distance of approximately 1.75 miles and will provide access to those facilities that are to be located to the east of Runway 15-33 and/or south of Runway 22.

**Land and Easement Acquisition** - Similar to the low development alternative, land acquisition related to those areas which are necessary to increase the airport's developable property has been shown in solid yellow; whereas, easement acquisitions are shown with a yellow net pattern. Land areas located within the RPZs or for construction removal are to

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be acquired via easement or acquisition in order to ensure land use compatibility within the runway protection zones. Unlike the previous alternative, the high development alternative includes many additional parcels of land which will allow the airport to expand its developable property envelope. The high development alternative includes 29.7 acres of proposed property acquisitions and 46.4 acres of easement acquisition of those properties located within RPZs or as needed for obstruction removal.

**Terrain Obstruction** – A green area located east of Runway 15-33 illustrates where the terrain currently penetrates the runway object free area and imaginary surface planes as described in FAR Part 77. In total, approximately 24.2 acres of property needs to be re-graded to resolve this deficiency. The soil removed from this area could potentially be utilized to relocate Taxiway A and/or to prepare the 23.3 acre northeastern development site for MROs, air cargo, or corporate aircraft.

**New Airfield Pavement Construction** – In the northernmost portion of property, a new taxiway has been shown which provides access to the proposed north MRO facilities and associated apron areas. Collectively, the new taxiway and apron areas encompass approximately 623,000 square feet of additional pavement (14.3 acres). This exhibit also illustrates a 1,062 foot runway extension and associated parallel taxiway that will allow Runway 4-22 to reach an overall length of 5,000 feet. Also included is a parallel taxiway with connectors which is located east of Runway 15-33 and includes 430,000 square feet of new pavement. This taxiway and associated connectors will ultimately provide airfield access to future development areas to be located on the eastern side of the airfield. In addition, this exhibit illustrates the relocation and reconstruction of Taxiway A which is located west of Runway 15-33. The reconstruction resolves the nonstandard separation issue and would therefore avoid having to operate under a modification of design standards. Included in this alternative is a 118,000 square foot expansion of the existing terminal apron and realignment of Taxiway F which would remove the existing bulge and allow it to meet separation standards for ADG-II aircraft. In total, the high development alternative includes the addition of 1,453,300 square foot (33.36 acres) of additional runway, taxiway and apron area.

**Pavement Rehabilitation** – As indicated in orange, there are two pavement areas within this alternative that are proposed to be rehabilitated. Approximately 273,000 square feet of runway pavement located between the end of Runway 4 and the intersection of Runways 4/22 and 15/33 is shown to be rehabilitated along with approximately 81,000 square feet of Taxiway F.

**Pavement Reconstruction** – There are two pavement areas located on the airfield that are currently beyond repair. As depicted in pink, approximately 2,000 linear feet of pavement located near the end of Runway 22 is in poor condition and is therefore in need of reconstruction. Similarly, the pavement located adjacent to the terminal facility is also in poor condition and therefore needs to be reconstructed. In total, both projects include approximately 417,000 square feet (or 9.6 acres) of asphalt reconstruction.

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**Terminal Landside Improvements** - The proposed landside improvements shown on this alternative include a reconfiguration of the existing airport terminal parking and access. The proposed reconfiguration creates two exit lanes and one entrance lane within both the north and south terminal access roads. Furthermore, the proposed improvements include the creation of short and long-term parking facilities along with a defined curbside drop-off /access lane. These improvements are graphically depicted in **Exhibit 6-4**.

**Pavement Removal** – In addition to the aforementioned improvements, the high development alternative includes the removal of approximately 52,000 square feet of existing pavement which is located near the end of Runway 4. This pavement is in poor condition and is not required for safety area and is therefore not needed.

**Consolidated Fuel Farm** – 100LL and Jet-A fuel storage is currently located in multiple locations at INT. In the future, airport management would like to consolidate all of its fuel storage into one centralized location. For this reason, a location to accomplish this was identified within the corporate, recreational, multi-aviation use area depicted on the western side of the airfield, centered on Runway 15-33.

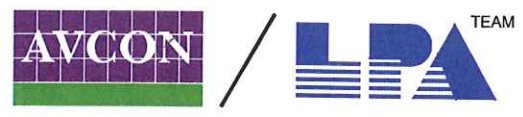
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**Table 6-3**  
**Order of Magnitude Costs – High Development Alternative**

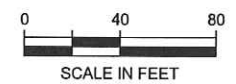
Quantity	Unit	Item Description	Unit Cost	Total Cost
133,000	SF	Reconstruct Terminal Apron	\$8	\$1,064,000
118,000	SF	Construct Rotorcraft Apron	\$14	\$1,652,000
273,000	SF	Rehab Runway 4 from 4 to RW 15	\$8	\$2,184,000
63,000	SF	Realign / Reconstruct Taxiway F	\$8	\$504,000
52,000	SF	Demolish Runway 22 Overrun Pavement	\$4	\$208,000
350,000	SF	Landside Improvements	\$7	\$2,450,000
100,000	SF	Construct 2 Hangars (MROs – 50,000 SF EA)	\$85	\$8,500,000
82,500	SF	Taxilane Extension (1,650 LF)	\$21	\$1,732,500
63,000	SF	Construct Auto Parking	\$7	\$441,000
76,000	SF	Construct Auto Parking	\$7	\$532,000
203,000	SF	Construct Large Hangar	\$85	\$17,255,000
16,000	SF	Executive Terminal	\$85	\$1,360,000
1	LS	Consolidated Fuel Farm	\$700,000	\$700,000
1,000,000	SF	Runway 15-33 Rehab	\$8	\$8,000,000
546,000	SF	Construct Concrete Apron North	\$14	\$7,644,000
215,000	SF	Construct Perimeter Access Road (9,300 LF)	\$7	\$1,505,000
284,000	SF	Reconstruct 2000 LF Approach end - Runway 22	\$8	\$2,272,000
160,000	SF	Extend Runway 22 by 1,062' to 5,000' (including taxiway extension)	\$21	\$3,360,000
81,000	SF	Rehab / Overlay Taxiway F	\$8	\$648,000
1,015,000	SF	Develop East Corporate, MROs, Air Cargo	\$14	\$14,210,000
344,000	SF	Construct East Parallel Taxiway	\$21	\$7,224,000
1,054,000	SF	Remove Terrain Obstruction / Site Prep	\$2	\$2,108,000
327,000	SF	Relocate / Reconstruct Taxiway A (no FAA waiver)	\$8	\$2,616,000
603,000	SF	Develop Corp, Rec, Multi-Aviation Use Facility	\$14	\$8,442,000
7.6	AC	Land Acquisition	\$4,000	\$30,400
5.8	AC	Land Acquisition	\$4,000	\$23,200
8.2	AC	Land Acquisition	\$4,000	\$32,800
8.1	AC	Land Acquisition	\$4,000	\$32,400
1	LS	Obstruction Removal Land Acquisition	\$20,000	\$20,000
		<b>Total – High Development Alternative</b>		<b>\$96,750,300</b>





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Terminal Landside  
Development Alternative




6-4


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## 6.6 PREFERRED DEVELOPMENT ALTERNATIVE


The preferred development alternative is basically a hybrid of the previously illustrated high and low development alternatives but also includes some elements that were not previously discussed. This scenario provides improvements and allocations for new facilities as necessary to accommodate business and based aircraft beyond the 20-year planning period. The order of magnitude cost estimates for the high development alternative are shown in **Table 6-4**; whereas, a graphic depiction of the alternative is illustrated in **Exhibit 6-5**.

 Commercial Hangar Development - On the northernmost portion of airport property, the preferred development alternative illustrates the proposed construction of three large hangars shown in light blue which are slated to be utilized for future MRO facilities. Each building contains approximately 50,000 square feet of space which have a collective capacity of 150,000 square feet. In addition to the northernmost hangar development, a 16,000 square foot Executive Terminal is shown north of the proposed rotorcraft apron and south of the landside improvements area. The intent of this building is to provide a facility for transient pilots and passengers to access restrooms, weather, and/or to relax while they are waiting for fuel or for their passengers to arrive.

 Auto Parking - In support of the three planned MRO facilities, an 85,000 square foot parking lot has been shown north and adjacent to the hangar facilities. Based on 500 square foot per space, the proposed lot should provide up to 170 spaces, or approximately 56 spaces per hangar.

 Land Development - Two land development areas are shown to be located on both the west and northeastern portions of airport property. The western property includes approximately 13.8 acres of land that currently contains an apron area for general aviation aircraft parking. The future uses of this area include the construction of t-hangars, box hangars and additional apron as necessary to accommodate parking and aircraft storage for corporate and recreational aircraft types. The northeastern property is currently undeveloped and includes approximately 23.3 acres of property that can be utilized for corporate development, air cargo, and/or small to medium MRO facilities.

 Access Improvements - In support of the proposed eastern developments, a new access road has been shown which extends from Lansing Drive in the vicinity of Conrad Street. The proposed two-lane road will extend a distance of approximately 1.75 miles and will provide access to those facilities that are to be located to the east of Runway 15-33 and/or south of Runway 22.

 Land and Easement Acquisition - Land acquisition related to areas which lie within the RPZs has been shown in yellow or with a net pattern. An easement or acquisition is necessary in these areas to ensure land use compatibility within the airport's RPZs. In addition to easements, the preferred development alternative includes the acquisition of additional parcels of land which will allow the airport to expand its developable property





envelope. In total, 46.4 acres of easement and 29.7 acres of property acquisition are shown on the preferred development alternative.

**Terrain Obstruction** – A green area located east of Runway 15-33 illustrates a location where the terrain currently penetrates the runway object free area and imaginary surface planes as described in FAR Part 77. In total, approximately 24.2 acres of property needs to be re-graded to resolve this deficiency. The soil removed from this area could potentially be utilized to prepare the 23.3 acre northeastern development site for MROs, air cargo, or corporate aircraft.

**New Airfield Pavement Construction** – In the northernmost portion of property, a new taxiway has been shown which provides access to the proposed north MRO facilities and associated apron areas. Collectively, the new taxiway and apron areas encompass approximately 324,500 square feet of additional pavement (7.45 acres). This exhibit also illustrates the proposed reserving of land for a 1,062 foot extension of Runway 4-22 that will ultimately allow the runway to reach a length of 5,000 feet. In addition, a parallel taxiway with connectors has been shown to the east of Runway 15-33 which includes 347,500 square feet of new pavement. This taxiway and associated connectors will ultimately provide airfield access to future development areas to be located on the eastern side of the airfield. Included in this alternative is a 118,000 square foot expansion of the existing terminal apron and realignment of Taxiway F (63,000 square foot) which removes the bulge in the taxiway and allows it to meet separation standards for ADG-II aircraft. In total, this exhibit includes the addition of 853,000 square foot (19.58 acres) of additional runway, taxiway and apron area.

**Pavement Rehabilitation** – As indicated in orange, there are three pavement areas within the proposed development alternative that are shown to be rehabilitated. These areas include Taxiway F (81,000 square feet) and a large section of Runway 4 pavement (273,000 square feet) which located between the intersection of Runway 15 and Runway 4. The third and final area includes an overlay of Taxiway A which consists of approximately 379,000 square feet of pavement. In total, the preferred development alternative includes the rehabilitation of approximately 740,000 square feet (16.9 Acres) of pavement.

**Pavement Reconstruction** – There are two pavement areas located on the airfield that are currently beyond repair and therefore need to be reconstructed. As depicted in pink, approximately 1,800 linear feet of pavement located near the end of Runway 22 is in poor condition and is therefore beyond repair. Similarly, the pavement located adjacent to the terminal facility is also in poor condition and therefore also needs to be reconstructed. In total, both projects include approximately 417,000 square feet (or 9.6 acres) of asphalt reconstruction.

**Terminal Landside Improvements** – The proposed landside improvements shown on this alternative include a reconfiguration of the existing airport terminal parking and access. The proposed reconfiguration creates two exit lanes and one entrance lane within both the north and south terminal access roads. Furthermore, the proposed improvements include the

# SMITH REYNOLDS AIRPORT

## MASTER PLAN UPDATE



creation of short and long-term parking facilities along with a defined curbside drop-off /access lane. These improvements were graphically depicted earlier in **Exhibit 6-4**.

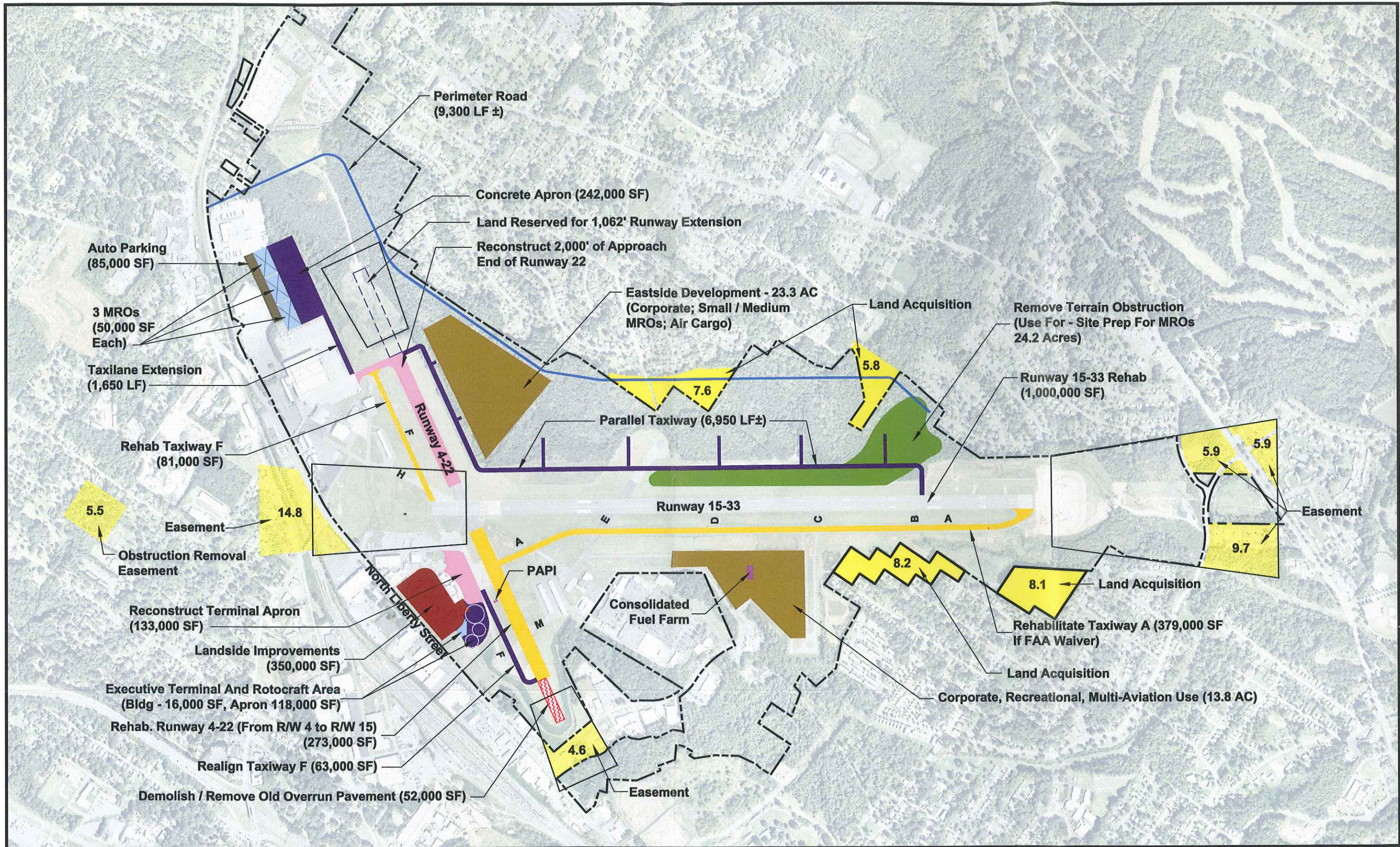
**[Red Box]** Pavement Removal – In addition to the aforementioned improvements, the high development alternative includes the removal of approximately 52,000 square feet of existing pavement which is located near the end of Runway 4. This pavement is in poor condition and is not required for safety area and is therefore not needed.

**[Purple Box]** Consolidated Fuel Farm – 100LL and Jet-A fuel storage is currently located in multiple locations at INT. In the future, airport management would like to consolidate all of its fuel storage into one centralized location. For this reason, a location to accomplish this was identified within the corporate, recreational, multi-aviation use area depicted on the western side of the airfield, centered on Runway 15-33.



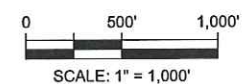
**Table 6-4**  
**Order of Magnitude Costs – Preferred Development Alternative**

Quantity	Unit	Item Description	Unit Cost	Total Cost
133,000	SF	Reconstruct Terminal Apron	\$8	\$1,064,000
63,000	SF	Realign / Reconstruct Taxiway F	\$6	\$378,000
273,000	SF	Rehab Runway 4 from 4 to RW 15	\$8	\$2,184,000
52,000	SF	Demolish Runway 22 Overrun Pavement	\$4	\$208,000
118,000	SF	Construct Rotorcraft Apron	\$14	\$1,652,000
350,000	SF	Landside Improvements	\$7	\$2,450,000
150,000	SF	Construct 3 Hangars (MROs – 50,000 SF EA)	\$85	\$12,750,000
82,500	SF	Taxilane Extension (1,650 LF)	\$21	\$1,732,500
16,000	SF	Executive Terminal	\$85	\$1,360,000
85,000	SF	Construct Auto Parking	\$7	\$595,000
242,000	SF	Construct Concrete Apron North	\$14	\$3,388,000
215,000	SF	Construct Perimeter Access Road (9,300 LF)	\$7	\$1,505,000
284,000	SF	Reconstruct 2,000 LF Approach end – Runway 22	\$8	\$2,272,000
81,000	SF	Rehab / Overlay Taxiway F (north)	\$8	\$648,000
347,500	SF	Construct East Parallel Taxiway	\$21	\$7,297,500
1	LS	Consolidated Fuel Farm	\$700,000	\$700,000
1,000,000	SF	Runway 15-33 Rehab	\$8	\$8,000,000
1,015,000	SF	Develop East Corporate, MROs, Air Cargo	\$14	\$14,210,000
1,054,000	SF	Remove Terrain Obstruction / Site Prep	\$2	\$2,108,000
379,000	SF	Rehab Taxiway A (FAA waiver)	\$8	\$3,032,000
603,000	SF	Develop Corp, Rec, Multi-Aviation Use Facility	\$14	\$8,442,000
46,000	SF	Construct T-Hangars in Corp, Rec, Multi-Use Area	\$20	\$920,000
7.6	AC	Land Acquisition	\$4,000	\$30,400
5.8	AC	Land Acquisition	\$4,000	\$23,200
8.2	AC	Land Acquisition	\$4,000	\$32,800
8.1	AC	Land Acquisition	\$4,000	\$32,400
1	LS	Obstruction Removal Land Acquisition	\$20,000	\$20,000
		<b>Total – Preferred Development Alternative</b>		<b>\$77,034,800</b>



SMITH REYNOLDS AIRPORT  
MASTER PLAN UPDATE

Preferred Airport  
Development Alternative



6-5

DRAWING NO.



## **6.7 POTENTIAL ENVIRONMENTAL IMPACTS**

An environmental overview was conducted earlier as a component of Chapter 2 to identify those environmental considerations that could potentially affect future airport development. Resource categories of concern included water quality and wetlands, light emissions and visual effects, hazardous materials, social impacts such as environmental justice, and noise. Guidelines provided in FAA Order 1050.1E, Environmental Impacts and Procedures, were reviewed to determine the level of environmental documentation needed to satisfy the requirements of National Environmental Policy Act of 1969 (NEPA). The anticipated permitting requirements were also considered.

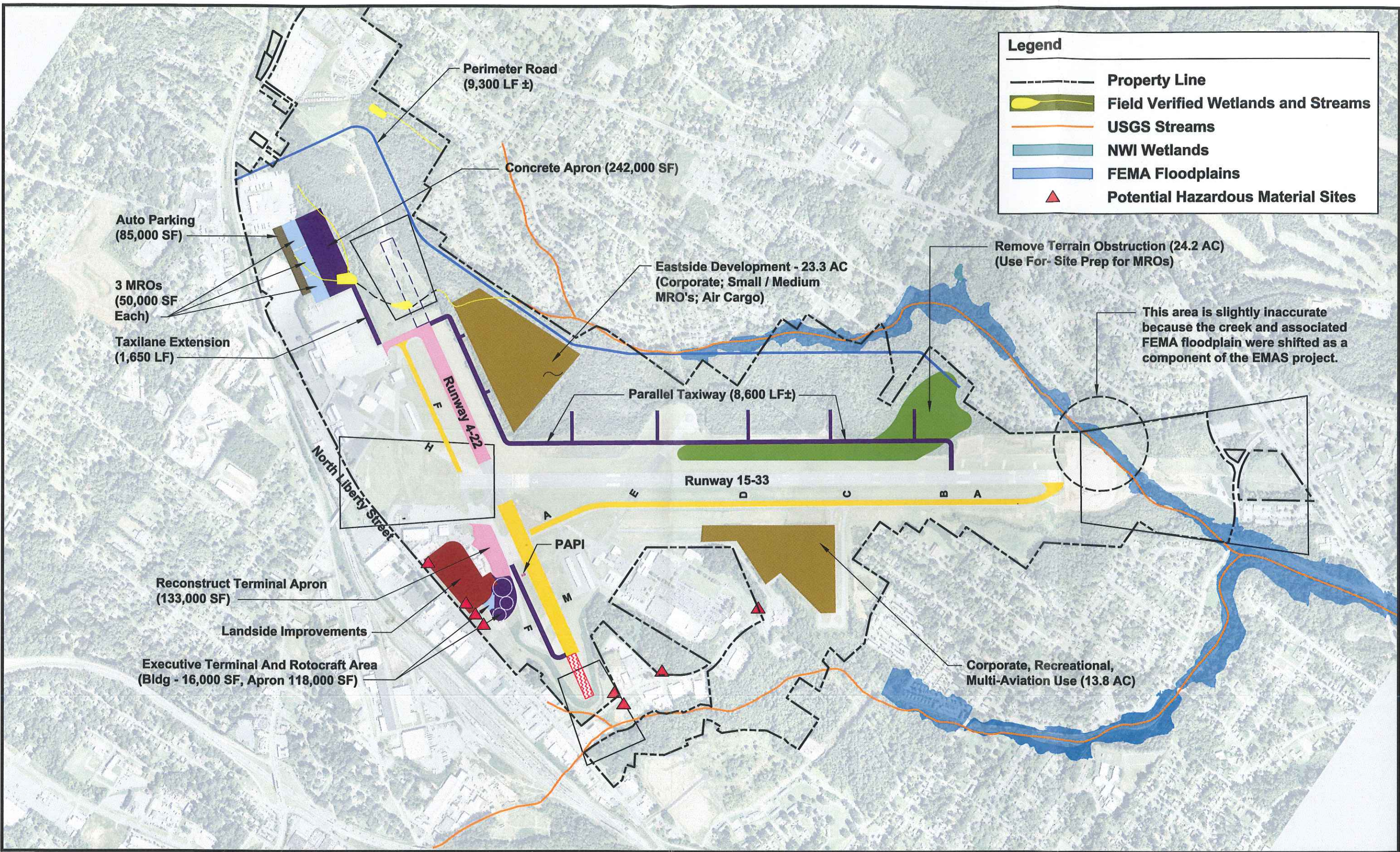
### **Preferred Airport Development**

The preferred airport development alternative was evaluated relative to the environmental resources identified earlier in Chapter 2. Several of the projects depicted involve the reconstruction, overlay, or rehabilitation of existing airport facilities and thus any environmental impacts associated therewith would be minimal. It is important to note that although all projects shown on the preferred alternative were evaluated, only those that demonstrated the potential of causing environmental impacts are discussed in the following sections. Once identified, the steps required to address any environmental concerns have also been discussed. Those environmental considerations that were identified for each improvement project are discussed in the following sections.

### **Water Quality and Wetlands**

One environmental consideration pertaining to new construction would be the potential water quality impacts associated with the creation of impervious surfaces at INT, which could result in additional stormwater management requirements. As indicated in **Exhibit 6-6**, the proposed new construction projects include:

- Auto Parking (85,000 square feet),
- MRO's (50,000 square feet),
- North Apron (242,000 square feet),
- Perimeter Road (9,300 linear feet),
- East Parallel Taxiway,
- Executive Terminal (16,000 square feet),
- Rotorcraft Area (118,000 square feet),
- Eastside Development Area, and
- Corporate, Recreational, Multi-aviation Use Development Area.

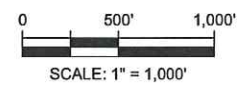


Legend	
	Property Line
	Field Verified Wetlands and Streams
	USGS Streams
	NWI Wetlands
	FEMA Floodplains
	Potential Hazardous Material Sites



SMITH REYNOLDS AIRPORT  
MASTER PLAN UPDATE

Environmental Impacts





Other proposed development could result in impacts to jurisdictional waters of the United States that are associated with Brushy Fork Creek, including construction of the following projects:

- Taxilane Construction (1,650 linear feet)
- North Apron (242,000 square feet)
- Perimeter Road (9,300 linear feet)

These impacts would occur to the north of the airport, where a jurisdictional determination has been previously verified by the USACE and NCDENR. The tributary to Brushy Fork Creek to the southwest is graphically depicted on **Exhibit 6-6** but has not been field verified.

### **Hazardous Materials**

Based on the results of a regulatory records search,<sup>1</sup> the proposed improvements that would be located in close proximity to potential hazardous material sites or hazardous materials generators include:

- Corporate, Recreational, Multi-aviation Use Area
- Terminal Apron Reconstruction, Landside Improvements
- Executive Terminal and Rotorcraft Area

Additional investigations may be needed prior to construction activities in order to identify potential contamination.

### **Light Emissions and Visual Effects**

The proposed improvement projects that would involve clearing of currently wooded areas on Airport property adjacent to residential development include:

- Eastside Development Area
- East Parallel Taxiway
- Removal of Terrain Obstructions (24.2 acres)

Construction of the proposed parallel taxiway would provide access for additional future development to the east of the airport. Maintaining a wooded buffer between airport development and the adjacent residential areas would minimize the impact of light emissions off site.

### **Social Impacts and Environmental Justice**



Due to the residential development adjacent to INT, proposed future land acquisition could result in social impacts, including the potential relocation of multiple residences and one church located south of the airport. In addition, minority and low-income environmental justice

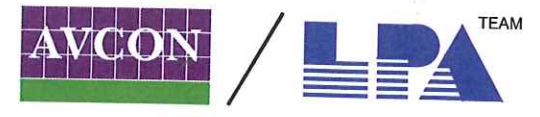
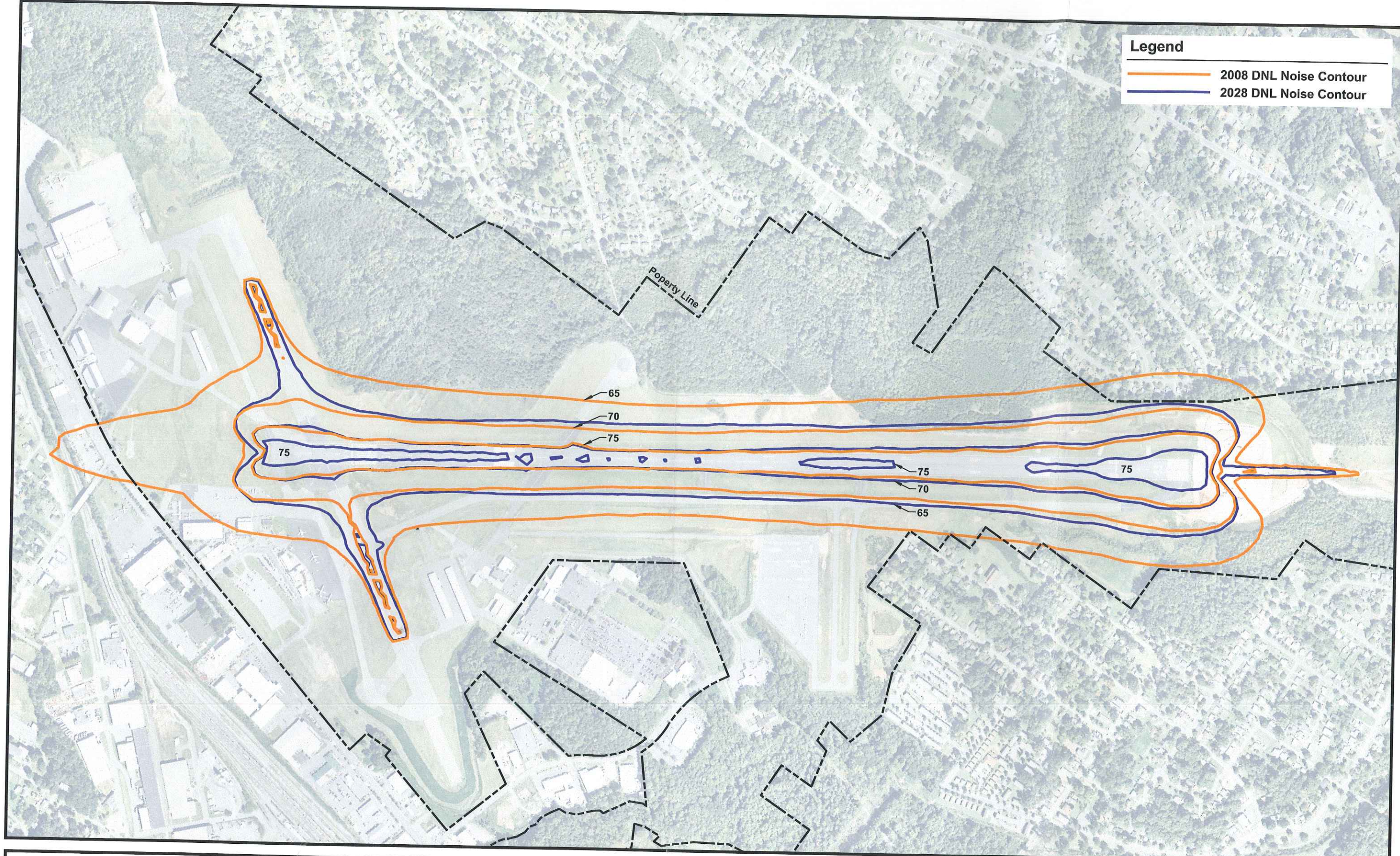
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<sup>1</sup> Environmental FirstSearch Technology Corporation, Job Number: PL725001-03, September 3, 2009.

Y:\Planning\INT\ith Reynolds\WPU\Drawings\exhibits\Exhibit 6-7-noise contours.dwg May 11 2012

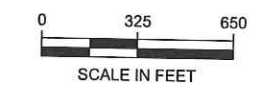
**Legend**

-  2008 DNL Noise Contour
-  2028 DNL Noise Contour



SMITH REYNOLDS AIRPORT  
MASTER PLAN UPDATE

2008 and 2028 DNL Noise Contours



6-7

DRAWING NO.





populations were identified adjacent to the airport<sup>2</sup> (refer to **Table 2-12** in Chapter 2). Proposed future land acquisition should be evaluated to determine if there are disproportionate impacts to these populations.

## **Noise Impacts**

As part of this Master Plan Update for INT, an evaluation of existing and future noise exposure was conducted using the FAA's Integrated Noise Model (INM) computer program (Version 7.0b). The following sections document the assumptions, inputs, and findings of the INM analyses for the following two scenarios: 1) 2008 Existing, and 2) 2028 Future. These analyses should be viewed as a generalized evaluation of airport noise exposure for comparative purposes only. Moreover, the associated noise contours were not developed to the precision required for Federal Aviation Regulations (FAR) Part 150 Noise Studies.

The activity assumptions below were developed based on conversations with personnel from the INT Air Traffic Control Tower (ATCT) and review of ATCT records and FAA databases. They are intended to represent the most prevalent operating characteristics.

- Touch-and-Go Activity Flow – 60% Runway 4, 40% Runway 22
- Other Fixed-Wing Activity Flow – 30% Runway 15, 70% Runway 33
- Helicopter Activity – Begins and ends on Runway 4-22 near terminal apron
- Day/Night Activity Split – 95% Day, 5% Night

The FAA-approved operations forecast presented earlier in Chapter 3 was used to develop the INM inputs for years 2008 and 2028. As shown in **Table 6-5**, the 2008 inputs by aircraft type were determined by reviewing FAA flight plan records from the Enhanced Traffic Management System Counts (ETMSC) database. In the INM software, 11 aircraft were selected to represent INT's existing and future activity mix. According to FAA flight plan records, the majority of INT's corporate jet activity is comprised of medium-sized jets which are best represented by the CNA55B (Citation V) aircraft. Although the airport still receives occasional operations by loud/old Stage 2 corporate jets like the Lear 25, the frequency of Stage 2 corporate jet operations is expected to decline year-to-year as the planes are retired from service (all new jets are subject to Stage 4 aircraft noise standards). Larger corporate jet activity is also common at INT by Citations, Gulfstreams, and Falcons, and a steady increase is expected during the forecast years because these longer-range jets are now the preferred option of many corporations due to longer-range, more passengers, reduced costs, etc. Daily operations by commercial jets are also expected to continue at a steady level through 2028, with older models (e.g., Boeing 737-200) gradually phased-out as airlines modernize their fleets. While some Very Light Jet (VLJ) activity is currently conducted at INT, this limited effort focused on aircraft that were most representative of INT's noise exposure.

**Exhibit 6-7** illustrates the Day-Night Average Noise Level (DNL) 65 decibel (dB) noise contours for the existing and future scenarios, which represents the average annualized noise

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<sup>2</sup> United States Census Bureau, *2000 Census: Summary File 3*.

# *SMITH REYNOLDS AIRPORT*

## *MASTER PLAN UPDATE*



exposure of INT activity. The federal government considers noise levels below DNL 65 dB to be compatible with residential and other noise-sensitive developments (e.g., schools and places of worship). General findings of the INM analyses include:

- 2008 Existing Noise Contour – Due to current operations by loud/old Stage 2 commercial and corporate jets (e.g., Boeing 737-200 and Lear 25), the 2008 Existing DNL 65 dB noise contour extends over residential parcels near the Runway 33 end.
- 2028 Future Noise Contour – As louder and old Stage 2 commercial and corporate jets are phased out of service, the size of the 2028 Future DNL 65 dB noise contour is expected to decrease in size in comparison to the 2008 contours and subsequently produce no incompatible noise impacts to residential parcels. This is a common expectation at airports around the country even as activity levels are projected to increase.

Although some nearby residential parcels may currently be exposed to incompatible airport noise levels (i.e., greater than DNL 65 dB), the situation should continually improve as loud/old Stage 2 jets are phased out of service. Overall, the recommendations of the preferred airport development alternative would not result in changes to the airport's noise exposure or aircraft fleet mix characteristics.

**SMITH REYNOLDS AIRPORT  
MASTER PLAN UPDATE**



**Table 6-5  
Integrated Noise Model Inputs 2008 and 2028**

2008 EXISTING INM INPUTS													
INM CODE	B260L	CNA172	GASEPF	BEC58P	CNA441	LEAR25	CNA55B	CNA750	GV	737700	737D17		
TYPE	HEL1	SEP	SEP-T&G	MEP	TP	JET (STAGE 2)	JET (MED)	JET (LARGE)	JET (>60K)	COMM-NEW	COMM-OLD		
AIRCRAFT	BELL 206	CESSNA 172	SINGLE ENGINE	BEECH BARON	CONQUEST II	LEAR 25	CITATION V	CITATION X	GULFSTREAM V	737-700	737-200		
TOTAL OPS	518	16,325	14,452	11,383	2,499	200	4,263	1,132	466	466	133		
TOTAL DAILY OPS	1.4192	44.726	39.5945	31.1863	6.8466	0.5475	11.6796	3.1024	1.2775	1.2775	0.365		
DAY ARR & DEP	0.6741	21.2449	37.6148	14.8135	3.2521	0.2601	5.5478	1.4736	0.6068	0.6068	0.1734		
NIGHT ARR & DEP	0.0355	1.1182	1.9797	0.7797	0.1712	0.0137	0.292	0.0776	0.0319	0.0319	0.0091		
2028 FUTURE INM INPUTS													
INM CODE	B260L	CNA172	GASEPF	BEC58P	CNA441	LEAR25	CNA55B	CNA750	GV	737700	737D17		
TYPE	HEL1	SEP	SEP-T&G	MEP	TP	JET (STAGE 2)	JET (MED)	JET (LARGE)	JET (>60K)	COMM-NEW	COMM-OLD		
AIRCRAFT	BELL 206	CESSNA 172	SINGLE ENGINE	BEECH BARON	CONQUEST II	LEAR 25	CITATION V	CITATION X	GULFSTREAM V	737-700	737-200		
TOTAL OPS	553	18,661	13,240	11,799	3,007	0	5,130	1,443	721	721	0		
TOTAL DAILY OPS	1.5151	51.126	36.274	32.326	8.2384	0	14.0537	3.9526	1.9763	1.9763	0		
DAY ARR & DEP	0.7197	24.2849	34.4603	15.3549	3.9132	0	6.6755	1.8775	0.9387	0.9387	0		
NIGHT ARR & DEP	0.0379	1.2782	1.8137	0.8082	0.206	0	0.3513	0.0988	0.0494	0.0494	0		



## **6.8 ENVIRONMENTAL DOCUMENTATION & PERMITTING**

In compliance with NEPA, and as outlined in FAA Order 1050.1E, *Environmental Impacts: Policies and Procedures*, and FAA Order 5050.4B, *NEPA Implementing Instructions for Airport Actions*, airport improvement projects that require environmental review and approval before implementation typically fall within one of three categories:

- ➔ Those actions that are normally categorically excluded, such as minor expansion of facilities where minimal or no additional land is required;
- ➔ Those actions requiring an Environmental Assessment (EA), such as a runway/taxiway extension project; or,
- ➔ Those actions normally requiring an Environmental Impact Statement (EIS), such as a new commercial service airport or a new runway to handle air carrier aircraft.

Under “extraordinary circumstances”, an action that would typically be categorically excluded could require an EA or EIS. Such extraordinary circumstances occur when the proposed action may have a significant affect on a resource, such as residential areas, wetlands, floodplains, water quality, or hazardous materials.

Considered independently of one another, the majority of the improvement projects proposed as part of the preferred airport development alternative could be approved under the “Categorical Exclusions for Facility Siting, Construction and Maintenance” listed in FAA Order 1050.1E.<sup>3</sup> Due to the anticipated stream and wetland impacts associated with the north apron development projects and the potential social and environmental justice impacts associated with future land acquisition, it is likely that these airport improvements would involve extraordinary circumstances that would require the preparation of an EA. Based on guidance in FAA Order 1050.1E, land acquisition of three acres or less could be categorically excluded. As depicted on **Exhibit 6-6**, the parcels identified for future acquisition exceed this three-acre threshold. Finally, additional coordination with the FAA would be necessary to determine the appropriate level of NEPA documentation associated with construction of the proposed parallel taxiway. However, an EA may be requested to address potential impacts to the tributary to Brushy Fork Creek and the secondary impacts associated with providing access to the east side of airport property for future development.

### **Regulatory/Permitting Considerations**

The following environmental permits and/or certifications may be required from local, state, and federal regulatory agencies for construction of future airport improvement projects.

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<sup>3</sup> U.S. Department of Transportation, FAA Order 1050.1E, *Environmental Impacts: Policies and Procedures*, March 20, 2006, Chapter 3, Paragraph 310, p. 3-10.



### **Clean Water Act Section 404 Permit**

The USACE is authorized under Section 404 of the Clean Water Act (CWA) to issue permits for the placement of dredged or fill material into jurisdictional waters of the United States, including wetlands.

### **Clean Water Act Section 401 Certification**

Projects requiring state or federal permits that would result in a discharge to wetlands and jurisdictional waters of the United States must also obtain a Section 401 Water Quality Certification from the NCDENR. Under Section 401 of the CWA, NCDENR must review the proposed action and analyze its potential impact to water quality, and ensure that any discharge into jurisdictional areas would be in accordance with State water quality standards.

### **Clean Water Act Section 402 Compliance**

Section 402 of the CWA authorizes the USEPA to regulate stormwater discharges. This regulatory authority in North Carolina was given to the NCDENR through the Stormwater Management and Sediment Reduction Act of 1991. Stormwater discharges are regulated through the issuance of National Pollutant Discharge Elimination System (NPDES) permits. Section 402 compliance would be completed prior to construction of the proposed improvements. In addition to the NPDES permit, more stringent requirements from the City of Winston-Salem may be applicable.

### **Agency Coordination**

The potential need to survey for federally protected species or cultural resources in the areas to be impacted by new construction should be coordinated with the USFWS and North Carolina SHPO, respectively, prior to land disturbance activities. In addition, as has already been completed to the north of Runway 4-22, areas to be impacted by new construction should be surveyed for jurisdictional waters of the United States and verified by the USACE and NCDENR.