AIRPORT LAYOUT PLAN UPDATE
Belfast Municipal Airport
Belfast, Maine
Final Technical Report
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This document represents the final report prepared under a Federal Aviation Administration Airport Improvement Program Grant (3-23-0007-06-2005) for the city of Belfast, Maine.

This technical report and associated airport layout plan update, were prepared by Stantec Consulting Services, Inc., formerly Dufresne-Henry, Inc.

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BELFAST MUNICIPAL AIRPORT
AIRPORT LAYOUT PLAN UPDATE

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BELFAST MUNICIPAL AIRPORT
AIRPORT LAYOUT PLAN UPDATE

INTRODUCTION

The purpose of this Airport Layout Plan Update (ALPU) is to identify potential development options specifically associated with closed Runway 10-28 at Belfast Municipal Airport. The existing Airport Layout Plan (ALP) is an integral component of the Airport Master Plan Update (AMPU) completed in 1999, which was based on data compiled in the mid 1990s, and is now nearly 10 years old. Since that time a number of critical growth and operational issues have surfaced that need to be assessed and factored into the preferred layout plan. Included in this assessment is a fresh look at terminal area development, growth within the adjoining (off-airport) industrial park, and an evaluation of airport land usage for aeronautical/nonaeronautical purposes.

This ALPU will help the community focus on the best course of action for continued development of the airport, by identifying the key critical issues the airport faces in the next ten years.

Belfast is in a multiyear airport development plan that included the reconstruction of Runway 15-33, expansion of hangar and aircraft parking facilities, construction of an airport access road, plus plans for the development of a new terminal building, expanded aircraft parking, and fueling facilities. Having met all required safety and capacity issues for the next 10 years, the airport is now in a position to start focusing on long-term landside development, particularly along the closed runway, with a realistic assessment of the existing terminal area configuration on the east end of the closed runway. An equally important component of this study is the identification of aviation development limits on the west end of the closed runway over the next 20 years. These limits are critical to future expansion of both the airport and adjacent industrial park.

SECTION A
INVENTORY OF EXISTING AIRPORT CONDITIONS

This section describes the role, activity, and physical facilities of the Belfast Municipal Airport (BST)[1] in Belfast, Maine. Airport development is a constant process, and changes to the physical facilities at the airport will likely occur during the preparation of the airport layout plan update. As a result, information may change during project development. Where possible, these changes will be incorporated in this report. Information that has not changed significantly since the last update, and is not necessary for this update, such as the history of the airport, has not been repeated in this document.

This inventory was conducted using the following sources of information:

- Current airport master plan update (AMPU) and airport layout plan (ALP) update.
- Site visit and local area knowledge.
- Interview with city officials.
- Coordination with the Maine Department of Transportation (MDOT) and Federal Aviation Administration (FAA)
- FAA and MDOT Websites.

INFRASTRUCTURE

This section explains the physical layout and features of the airport.

Location and Role

BST is located along Coastal Maine, approximately 100 miles east of Portland, Maine and 36 miles south of Bangor, Maine, in Waldo County. The airport is located off U.S. Route 1 and Congress Street, 1 mile south of the city center. Route 1 is a north-south connector between Canada (St. Stephen, New Brunswick) and points south. State Route 3 is located east of the airport (bisects U.S. Route 1) providing access to Augusta and I-95. See Figure A as well as the location and vicinity maps on the ALP Title Sheet in Appendix A.

- Owner: ....City of Belfast
- Use: .... Public
- NPIAS Role:[2] .... General aviation (current and 5-year plan)
- Airport Reference Point: ....44° 24' 34" N / 069° 00' 43"
- Field Elevation: .... 197.7 feet above mean seal level (MSL)
- Area Owned in Fee Simple: .... 221 acres
- Area Owned in Easement:.. 80 acres

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[1] BST is the FAA identifier for this airport.
[2] National Plan of Integrated Airports System. Readers can refer to the FAA Web site for information on NPIAS (http://www.faa.gov/airports_airtraffic/airports/planning_capacity/npias/).

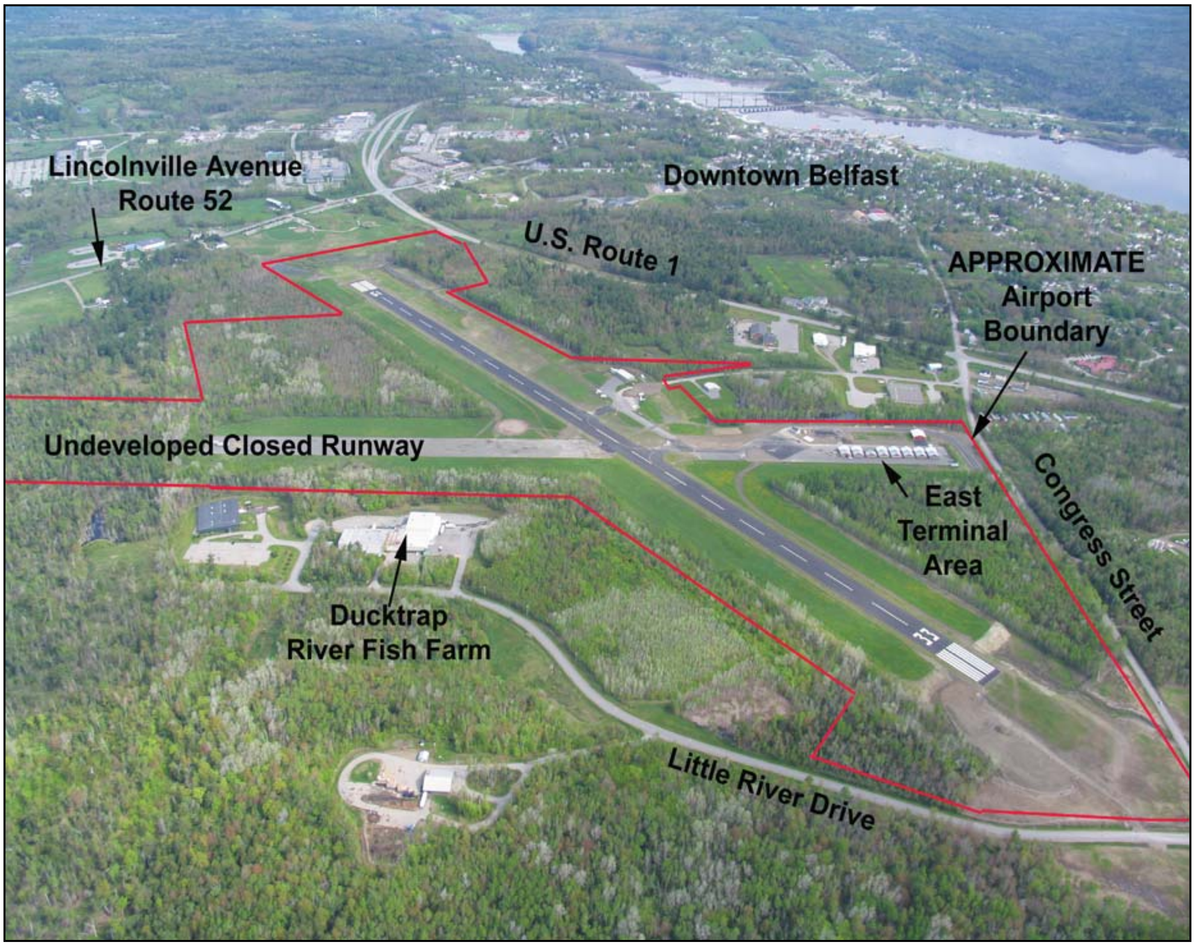


Figure A – Belfast Municipal Airport
Source: Dufresne-Henry, Inc., photograph (July 2005)

Figure B – Belfast Municipal Airport, Runway 15-33
Source: Dufresne-Henry, Inc., photograph (July 2005)

Runway

BST has a single paved runway designated 15-33 (true bearing 133.42 – 313.43 degrees) that is 4,000 feet long and 100 feet wide. The surface is bituminous with a weight bearing capacity of 30,000 pounds for single-wheel aircraft. The Runway 15 end elevation is 197.7 feet and the Runway 33 end elevation is 158.7 feet, resulting in a gradient of 0.98% sloping toward the Runway 15 end. Runway 15-33 is in excellent condition, having been fully reconstructed in 2004. Refer to the Existing ALP (Appendix A) and Figures A and B.

Taxiways

The airport has three taxiways; two stubs connecting a short parallel taxiway to the runway. The parallel taxiway is approximately 350 feet long and 35 feet wide. The two stub taxiways are approximately 50 feet wide and 130 feet long. The runway to taxiway centerline distance is 200 feet. Design standards for this airport require a minimum of 25 foot wide taxiways[3] and a runway-taxiway separation of 225 feet.[4]

Aprons and Tie Downs

The airport has one large aircraft parking apron that was originally the east end of now closed Runway 10-28 (see Figures B and C). The apron was expanded slightly in the summer of 2005 when the terminal building and fueling apron were moved to their current location, and again in 2006 to make room for an additional row of hangars.

Figure C – Terminal Area
Source: Maine Scenic Airways, Sandy Reynolds (Jan 2008)

3 Advisory Circular (AC) 150/5300-13, *Design Manual*, Table 4-1. This document can be obtained/viewed on the FAA Web site (http://www.faa.gov/airports_airtraffic/airports/resources/advisory_circulars/).

4 Design Manual, Table 2-1.

Hangars

The airport has a total of 19 hangars. The majority of hangars are located on the closed runway; a collection of 15 individual wood frame hangars of approximately 1,120 square feet (28 x 40 feet). Table 1 lists the current hangars, which are shown on the Existing ALP (Appendix A).

Airport Lighting, Visual Navigation Aids, Markings

The following are airport lights and systems:

- Airport Rotating Beacon..On airport
- Runway Lights .... Medium Intensity Runway Lights (MIRL)
- Runway End Identifier Lights (REIL)... Runway 15 & 33
- Vertical Guidance Slope Indicators (VGSI) .... None

Table 1
Buildings

Building Index	Ownership	Building Index	Ownership
1	Public	22	Private
2	Private	23	Private
3	Private	24	Private
4	Private	25	Private
5	Private	26	Private
6	Private	28	Private
7	Private	29	Private
8	Private	30	Private
9	Private	37	Private
10	Private	38	Private
11	Private	39	Private
12	Private	40	Private
13	Private	42	Private

GEOMETRIC STANDARDS

FAA geometric design standards ensure the safety, economy, efficiency, and longevity of an airport. Each of the required elements are addressed in the following paragraphs and shown on the Existing ALP (Appendix A).

Generally, runway standards are related to aircraft approach speed and airplane wingspan and designed or planned approach visibility minimums. Taxiway and taxilane standards are related to the airplane design group.

Design Aircraft – Existing

Airport geometric standards are based on the airport reference code, which is established by the airport's design aircraft. The design aircraft is defined as the largest and fastest aircraft (in terms of wingspan and approach speed) that conducts at least 500 annual operations (takeoffs or landings), whether locally based or itinerant.

Based aircraft at Belfast include traditional Cessna, Beechcraft, Grumman, and Piper airplanes. The Beech 90 is the largest itinerant aircraft operating at the airport.

The Raytheon Beech 90 is a twin-engine seven passenger turboprop aircraft that meets the FAA definition of the airport's design aircraft. The Beech 90 represents the largest aircraft in terms of wingspan and fastest on landing approach with 500 or more annual operations. The design aircraft's performance and specifications are listed below.

- Design Aircraft: .... Beech 90 King Air
- Wingspan: .... 45 feet, 10 inches (ARC Design Group I)
- Approach Speed: .... 98 knots (ARC Approach Speed: B)
- MGTOW: .... 9,000 pounds[5]
- Takeoff Field Length: .... 2,372 feet[6]
- Landing Distance: .... 2,501 feet[7]

Airport Reference Code (ARC) – Existing

The ARC is a coding system used to relate the airport design criteria to the operational and physical characteristics of the airplanes intended to operate at the airport. The code has two components relating to the airport design aircraft (discussed in the previous section). The first component, depicted by a letter, is the aircraft approach category and relates to the aircraft approach speed (operational characteristic). The second component, depicted by a Roman numeral, is the airplane design group and relates to the airplane wingspan (physical characteristic).

The existing ARC is B-I based on designation of the Beech 90 as the design aircraft. This classification does not mean larger and faster aircraft do not and cannot use the airport, but as the speed and wingspan increases, the likelihood of an aircraft in this speed and size range using BST is increasingly unlikely. The forecasts chapter will address the ARC as it relates to future facility needs.

5 Maximum Gross Takeoff Weight.
6 Takeoff and landing distance computed to clear a 50 foot obstacle, at MGTOW, zero wind, 0.9% runway gradient, at airport elevation (897'), and 80°F.
7 Computed for BST by applying the same conditions used for takeoff field length.

Instrument Approach Procedures (IAP) – Existing

As addressed earlier, designed or planned approach visibility minimums impact runway design. There are three straight-in instrument procedures to the airport, two to Runway 15 and one to Runway 33, and all three have authorized circling to the opposite runway end.

- Non-Directional Beacon (NDB) Runway 15 (see Figure D, page 9).
- Global Positioning System (GPS) Runway 15 (see Figure E, page 10).
- Global Positioning System (GPS) Runway 33 (see Figure F, page 11).

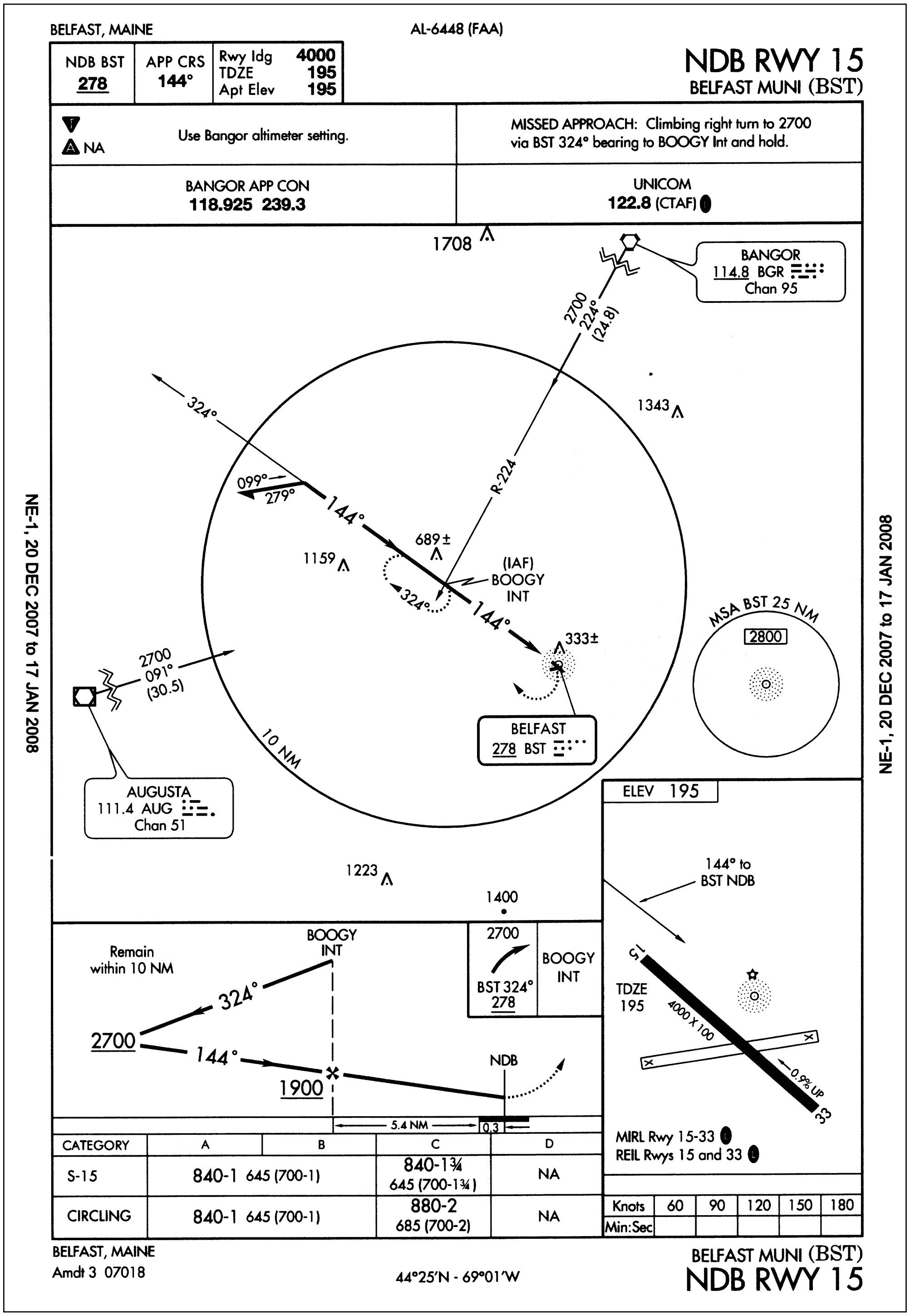


Figure D – NDB Runway 15 IAP

Source: U.S. Department of Transportation, U.S. Terminal Procedures (Northeast), Effective 20 December 2007

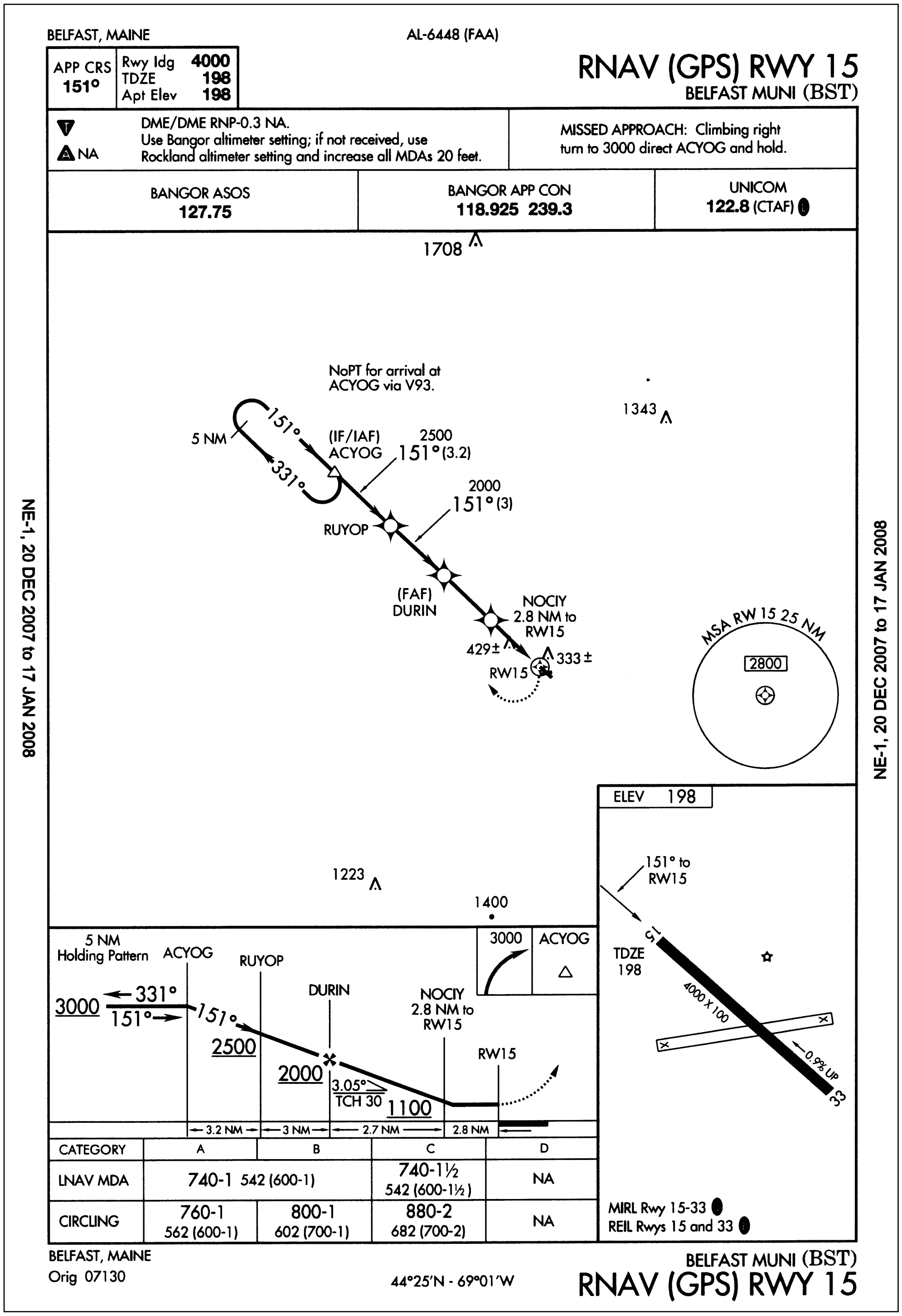
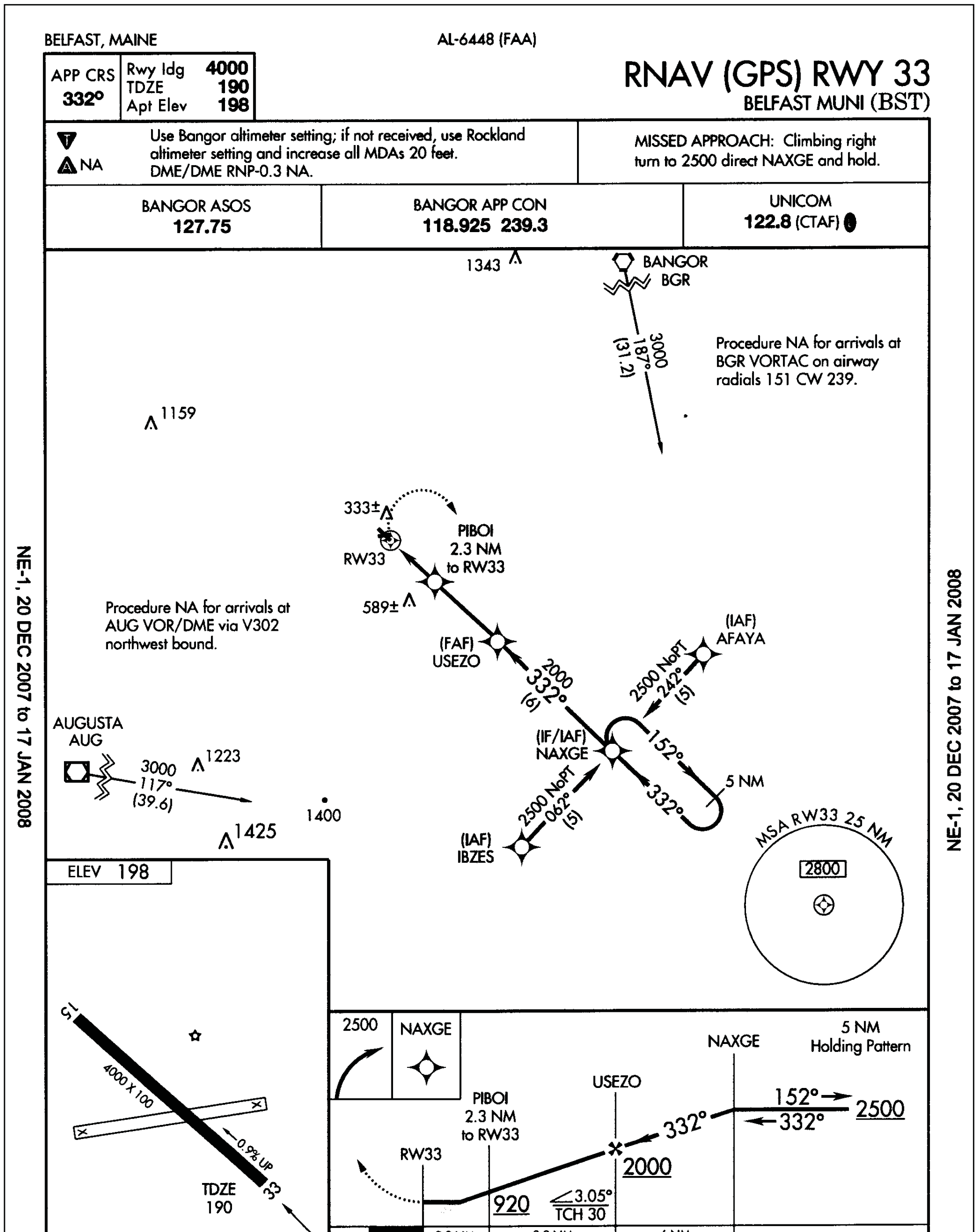


Figure E – GPS Runway 15 IAP
Source: U.S. Department of Transportation, U.S. Terminal Procedures (Northeast), Effective 20 December 2007



CATEGORY	A	B	C	D
LNAV MDA	700-1 510 (600-1)		700-1½ 510 (600-1½)	NA
CIRCLING	760-1 562 (600-1)	800-1 602 (700-1)	880-2 682 (700-2)	NA

BELFAST, MAINE
Orig 07130
44°25′N - 69°01′W
BELFAST MUNI (BST)
RNAV (GPS) RWY 33

Figure F – GPS Runway 33 IAP
Source: U.S. Department of Transportation, U.S. Terminal Procedures (Northeast), Effective 20 December 2007

Object Free Area (OFA) – Existing

The runway OFA clearing standards requires clearing the OFA of above ground objects protruding above the runway safety area edge elevation. The airplane design group standards for Belfast requires an OFA that is 400 feet in width (200 feet either side of the runway centerline), and extends 240 feet beyond each runway end.[8] An analysis of the airport indicates no OFA deficiencies.

Runway Width – Existing

The minimum required width is based on the ARC and runway visibility minimums. Runway 15-33 is 100 feet wide. The design standard for this airport is 60 feet wide.[9]

Runway Safety Area (RSA) – Existing

The required size of the RSA is based on the airplane design group and visibility minimums, which at BST requires an area that extends 240 feet beyond the end of each runway and an area that is 120 feet wide (60 feet either side of the runway centerline).[10] RSAs were upgraded and brought into full compliance during the 2004 runway reconstruction project (see Existing ALP, Appendix A).

Obstacle Free Zone (OFZ) – Existing

OFZ clearing standards precludes taxiing and parked airplanes and object penetrations, except for frangible navigation aids that need to be located in the OFZ because of their function. The OFZ at Belfast is based on runways serving large aircraft, or those weighing more than 12,500 pounds. This application requires an OFZ that is 400 feet wide and extends 200 feet beyond each runway end.[11] The airport is in compliance with OFZ standards.

Runway Protection Zones (RPZ) – Existing

The RPZ's function is to enhance the protection of people and property on the ground. This is achieved through airport ownership over RPZs. This control includes clearing RPZ areas (and maintaining them clear) of incompatible objects and activities. Control is preferably exercised through the acquisition of sufficient property interests in the RPZ.

The RPZ dimension for a particular runway end is a function of the aircraft approach category and approach visibility minimum associated with that runway end. Belfast has instrument approach procedures to both Runways 15 and 33 (see Instrument Approach Procedures, page 8).

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8 Design Manual, Paragraph 307 and Table 3-1.
9 Design Manual Table 3-1, based on facilities for aircraft approach category A and B with not lower than ¾ mile visibility minimums.
10 Design Manual, Paragraph 305 and Table 3-1.
11 Design Manual, Paragraph 306 a. and 306 a. (2).

The required RPZ on both runway ends is 1,000 feet long with a 500 foot inner width and 700 foot outer width, resulting in an area of 13.77 acres. The entire Runway 15 RPZ rests either on airport property or is protected by an avigation easement. Approximately 30 percent of the Runway 33 RPZ is unprotected. See Existing ALP (Appendix A).

Building Restriction Line (BRL)

The BRL is a line parallel to the runway at a distance where the Part 77[12] transitional surface is 20 feet above the runway elevation.[13] At 20-feet, the BRL is 140 feet from the edge of the Part 77 primary surface, where the transitional surface angles upward at a 7:1 slope. The Part 77 primary surface at Belfast is 500 feet wide, centered on the runway. This puts the BRL 390 feet from the runway centerline.

SUPPORT FACILITIES

Administration/FBO Building

The FBO building was moved to its present location in 2004. Refer to Building #1 on the Existing ALP and Figure C (page 5). It is a single-story, 28 x 40 foot wood structure that offices the airports only FBO.

Fueling Facilities

The airport offers aviation gasoline (100LL), provided through a double-walled above ground 5,000 gallon tank. The fueling area is located on the main ramp adjacent to the FBO. Refer to the Existing ALP and Figure C (Page 5).

Ground Access

Airport access changed in 2004 when the FBO building was moved to its current location. The access, recently named Wright Brothers Drive, connects to Congress Street.

Automobile Parking

Automobile parking changed in 2004 when the FBO building was relocated. Refer to Area A on the Existing ALP and Figure C (page 5). The paved lot measures 50 x 128 feet with room for approximately 10 automobiles.

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12 14 CFR Part 77 *Objects Affecting Navigable Airspace.* This document can be obtain on the Internet (http://www.access.gpo.gov/nara/cfr/waisidx_04/14cfr77_04.html).

13 Design Manual Paragraph 210. A 20-foot building is used as a baseline and does not restrict taller buildings provided they do not penetrate the protected airspace around the airport or exceed local zoning regulations. Buildings lower than 20 feet can be closer to the runway surface, provided they do not penetrate the transitional surface.

BASED AIRCRAFT AND OPERATIONS

Based Aircraft – Existing

There are approximately 23 total based aircraft, plus an additional 10 to 12 aircraft owners waiting to relocate once new hangars are built.[14] Table 2 is an inventory of the existing based aircraft fleet-mix.

Table 2
Existing Based Aircraft - Fleet Mix

Category	Number
Ultralight	0
Sport Aircraft	0
Single-Engine Reciprocating	22
Multiengine Reciprocating	0
Turboprop	0
Jet	0
Helicopter	1
Total	**23**

Aircraft Operations – Existing

FAA records indicate that Belfast reported 13,000 operations in 2004.[15] However, this count appears high. Generally, aircraft operations reported to the FAA at non-towered airports have a high probability of being distorted because there is no realistic means of obtaining accurate information.

An on-going study being completed for the Vermont Agency of Transportation using acoustical measuring equipment indicates non-towered general aviation airports average 0.71 operations per day per based aircraft.[16] With 23 based aircraft, BST would average 16.3 operations per day or approximately 6,000 per year if the same analysis is applied.

One method of assessing the accuracy of these numbers is to apply FAA guidelines that suggest a range of 250 to 450 operations per based aircraft, depending on the airport location and type of activity. Airports in northern latitudes tend to be on the low side (because of winter conditions). Those with considerable flight training activity and/or commercial operations tend to be on the high side. Considering the nature of operations at BST, the 6,000 count total just discussed would equal 261 operations per based aircraft, which is within the recommended range.

Table 3 (page 15) lists the current FAA data, sorted by fleet-mix. In addition, the adjusted numbers just discussed are shown with the new recommended total. Table 4 is the same data sorted by fleet-mix. This data assumes the local/itinerant mix is 65/35 percent respectively.

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14 These are prospective new, not existing airport tenants.

15 Master Record, FAA Form 5010-1. A copy of the airport's master record can be obtain over the Internet from GCR Associates (http://www.gcr1.com/5010web/airport.cfm?Site=BST).

16 The study was prepared by Dufresne-Henry, Inc.

Table 3
Aircraft Operational Data

Aircraft Category	FAA 5010 Data		Adjusted Data	
	Number	Percent of Total	Number	Percent of Total
Air Carrier	0	0.0%	0	0.0%
Commuter	0	0.0%	0	0.0%
Air Taxi	1,000	7.7%	462	7.7%
General Aviation (Local)	9,000	69.2%	4,152	69.2%
General Aviation (Itinerant)	3,000	23.1%	1,386	23.1%
Military	0	0.0%	0	0.0%
Total	**13,000**		**6,000**	

Table 4
Existing Operations by Fleet-Mix

Aircraft Category	Local		Itinerant		Total	
	Count	Mix	Count	Mix	Count	Mix
Ultralight	0	0.0%	0	0.0%	0	0.0%
Sport Aircraft	0	0.0%	0	0.0%	0	0.0%
Single-Engine Reciprocating	3,705	95.0%	1,638	78.0%	5,343	89.1%
Multiengine Reciprocating	0	0.0%	105	5.0%	105	1.8%
Turboprop	0	0.0%	315	15.0%	315	5.3%
Microjet	0	0.0%	0	0.0%	0	0.0%
Helicopter	195	5.0%	42	2.0%	237	4.0%
Total	**3,900**		**2,100**		**6,000**	

AIRSPACE

Imaginary Surfaces

Title 14 CFR, Part 77, Objects Affecting Navigable Airspace, in part, establishes standards for determining obstructions in navigable airspace. The size of each imaginary surface is based on the type of approach and aircraft category for each runway end. Table 5 (next page) lists the existing dimensions of the imaginary surfaces.

Table 5
FAR Part 77 Imaginary Surfaces

Runway	Type Approach	Visibility Minimums	Primary Surface Width	Approach Surface			
				Inner Width	Length	Outer Width	Slope
15	Non-Precision	1 mile	500'	500'	5,000	3,500	34:1
33	Non-Precision	1 mile		500'	5,000	3,500	34:1

Source: Part 77.25, *Civil Airport Imaginary Surfaces*

Air Traffic Service

Bangor Approach Control provides air traffic services to/from the airport, and with minor changes, the local airspace structure remains unchanged since the last update. Figure G shows the current airspace structure around Belfast.

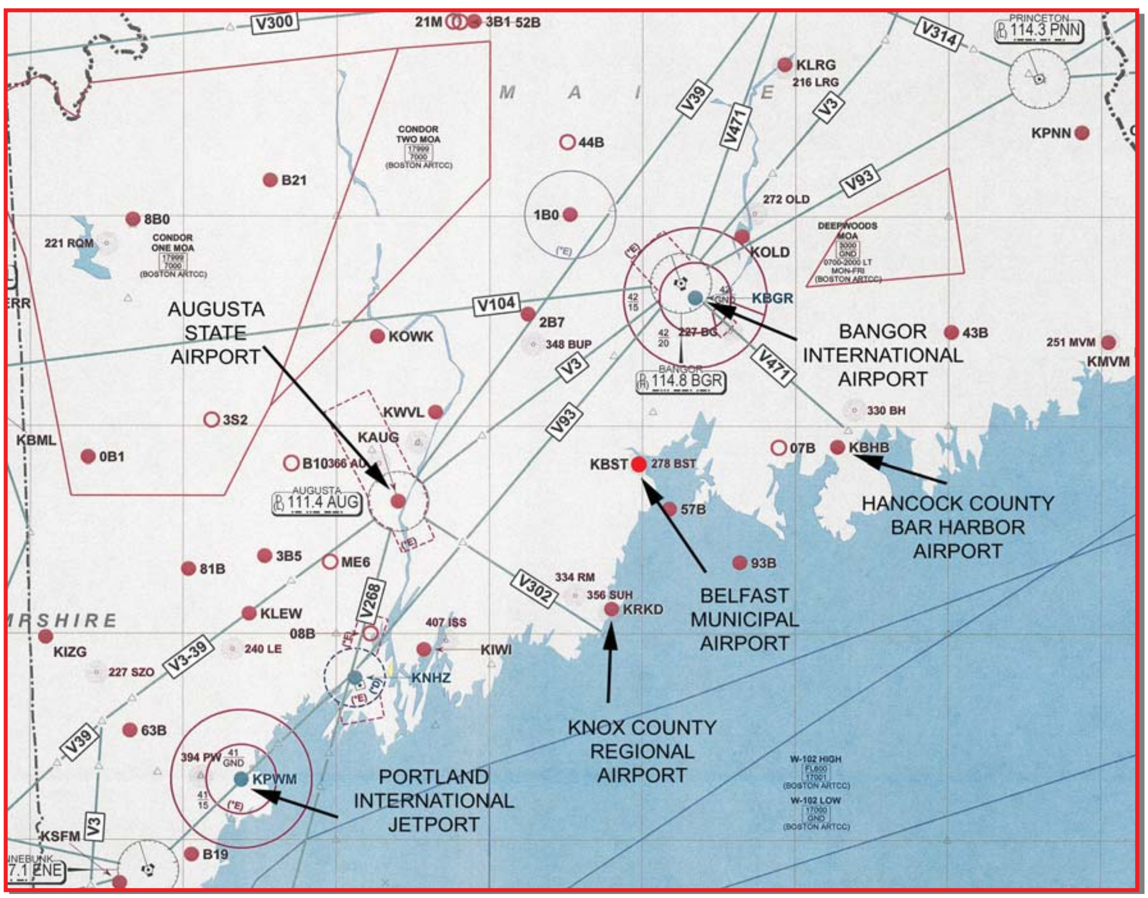

Figure G – Regional Airspace Structure
Source: AOPA Real-Time Flight Planner

SECTION B

FORECASTS OF AVIATION ACTIVITY

Forecasts of future levels of aviation activity are the basis for effective decisions in airport planning. These projections are used to determine the need for new or expanded facilities. In general, forecasts should be realistic, based upon the latest available data, be supported by information in the study, and provide an adequate justification for airport planning and development. It is important to stress that forecasts do not drive development; to the contrary, development is triggered by actual measured demand.

Forecasts are prepared for short-, medium- and long-term periods and specify the existing and future critical aircraft. Short-term forecasts, for up to five years, are used to justify near-term development and support operational planning and environmental improvement programs. Intermediate-term forecasts (a 6- to 10-year time frame) are typically used in planning capital improvements and long-term forecasts (beyond 10 years) are helpful in general planning.

FORECAST ELEMENTS

To establish the demands likely to be placed on airport facilities, forecasts should include all relevant aviation demand elements, including both the type and level of aviation activity expected at the airport over the planning period. The specific elements to be forecast will vary depending on the size and category of an airport and the objectives of the study. Forecasts for the following elements will be prepared for this study:

- Based Aircraft;
- Aircraft Fleet Mix;
- Operations; and
- Operations Fleet Mix

BASE YEAR

The base year for this study is 2006. The short term period is through 2011; the intermediate-term is 2012 through 2016; the long term period is 2017 through 2026.

FORECAST ANALYSIS

The primary source of aviation forecasts for this update is the Maine Aviation Systems Plan (MASP).[17] Maine Department of Transportation completed an update of the MASP in 2006[18], which is a guide to assist the Office of Passenger and Intermodal Transportation[19] in allocating airport funds. Of particular interest to this update are the forecast

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17 Based on the project scope of work.

18 Maine Aviation Systems Plan Update, Final Technical Report, Wilber-Smith Associates, Cincinnati, OH, March 2006.

19 Formerly the Office of Passenger Transportation

methodologies and anticipated growth rates for BST, projected based aircraft and operations, airport reference code, the airport's functional level, and how the airport fits into the overall state plan.

This ALPU will use MASP data as a baseline and then adjust for current national trends, as well as local demographics and conditions. Base year data in the MASP will be adjusted to reflect the most recent information available.

MASP Airport Classifications

The MASP classifies airports into four categories, or function levels, based on several factors, such as accessibility, population, facilities, etc. These function levels identify facilities and services that should ideally be available at airports within those four levels (I, II, III, and IV).

Level I airports accommodate commercial airline service and a full range of general aviation aircraft, while Level IV airports accommodate only single engine general aviation aircraft. Level II and III airports fall in between. BST is classified as a Level II facility, meaning it should be capable of accommodating all business and personal use single- and twin-engine general aviation aircraft, and some small corporate and business jet aircraft. Schedule commercial airline operations are not typically accommodated at Level II airports.

Level II airports should be capable of supporting:

- aircraft design group Category B aircraft (an ARC component)[20],
- runways between 3,500 and 5,000 feet in length and 75 feet wide; and
- airside, landside, and service levels. Only landside needs will be addressed throughout the remaining sections of this ALPU.

In developing its forecasts, the MASP identified historic relationships between Maine aviation and U.S. aviation activity, along with actual demand trends experienced at each airport, with the state, region, and at a national level. Demand projections were then developed for both commercial and general aviation.

MASP FORECASTS

To summarize the findings, the systems plan forecasts a 2 percent average annual growth rate for based aircraft statewide. By application of the 2 percent growth rate, BST would have 33 aircraft at the end of the 20 year planning cycle (2025). The fleet-mix is forecasted to change in its composition as ultralight, sport aircraft, and jet aircraft production outpace growth in other components of the general aviation industry. The number of single-engine reciprocating and multiengine reciprocating aircraft is expected to decrease as a

[20] See Airport Reference Code – Existing, Page 7.

percentage of the whole, while jet aircraft increase, as a percentage. The report does not breakout turboprop aircraft in its analysis.

SERVICE AREA DEMOGRAPHICS

The demographic characteristics of the service area in terms of population, income, and unemployment are reviewed to assist in the bottom-up analysis. These will be compared to trends at the national and state levels and then used to adjust the FAA's forecasts. For planning purposes demographics from Waldo County (Figure H) will be used as the service area for the airport. While some pilots and other users of the airport travel from outside Waldo County, the majority live and work within the region.

Population

The size and composition of the service area's population - and its potential for growth - are basic elements in creating demand for air transportation services. The population in the service area grew at an average annual rate of 1.16 percent (16.3 percent overall) during the period 1990 to 2004, from 33,018 to 38,392. During the same period the state population increased at the rate of 0.27 percent annually (3.8 percent overall), and the U.S. population grew by 1.3 percent annually (16.9 percent overall).[21]

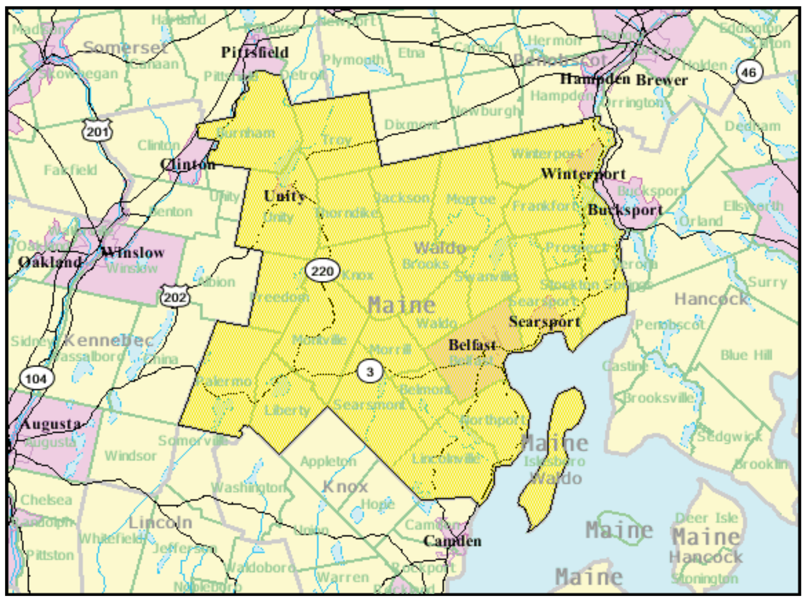


Figure H – Airport Service Area (Waldo County)
Source: U.S. Census Bureau

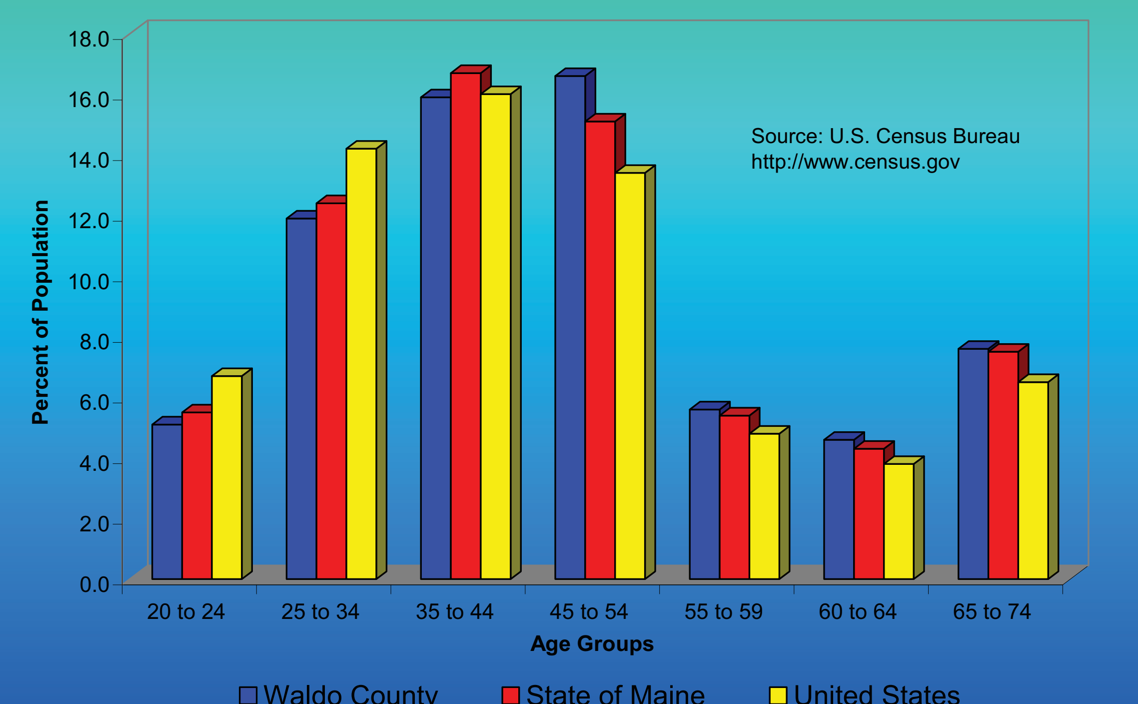
More important, Waldo County has a higher percentage of people in the age group 45 and older than the state and U.S., which normally equates to higher disposable personal income (Figure I next page). The discretionary purchasing power available to residents over any period of time is a good indicator of consumers' financial ability to travel, including their ability to own and operate personal aircraft. High levels of average personal disposable income in the area served by the airport provide a strong basis for higher than average levels of consumer spending on air travel and other aviation products.

[21] U.S. Census (http://www.census.gov).

Income

Income determines the ability of people to use the transportation network. In the case of general aviation, disposable income is the driving economic incentive that can be used to buy or rent aircraft and to pay for flight training, maintenance, insurance, and other related expenses. Median household income[22] in the service area was reviewed and compared with state and U.S. levels to determine the relationship. Our analysis shows that during the period 1989 to 2000, the median household income in Waldo County grew at a faster rate (46.8 percent) then at the state (33.7 percent); possibly a function of the age variation addressed in the previous section.

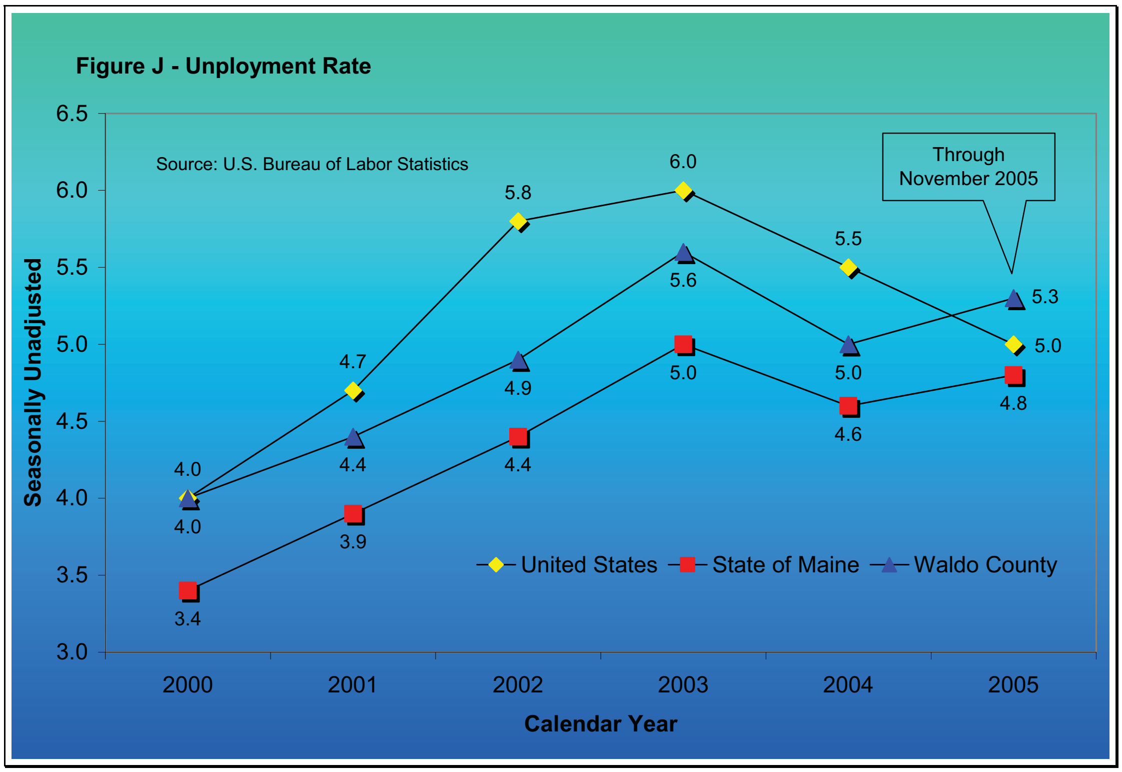
Figure I - Age Group Comparison



22 U.S. Census. Median household income is the amount which divides the income distribution into two equal groups, half having incomes above the median, half having incomes below the median. The medians for households, families, and unrelated individuals are based on all households, families, and unrelated individuals, respectively. The medians for people are based on people 15 years old and over with income.

Unemployment

The last component reviewed was unemployment in the region as compared to national and state levels. Unemployment in the service area was reviewed and compared to state and U.S. levels during the period 2000 through November 2005. Data indicate that during this period the county has had a slightly higher level of unemployment than the state, but lower than the nation with the exception of 2005.[23, 24] See Figure J.



Demographic Summary

The demographic analysis indicates a very strong service area in terms of potential general aviation growth in the state of Maine and the United States. Population growth since 1990 has outpaced state levels by 6.5 percentage points, and kept pace with national levels. Median household income is slightly higher than the average state income levels, but one percent less than the federal level. The unemployment rate, in this highly seasonal tourist region is slightly higher than the state rate, but historically lower than national unemployment rates.

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23 Bureau of Labor Statistics (http://www.bls.gov).
24 Maine Department of Labor (http://www.state.me.us/labor/unemployment).

AVIATION FORECASTS FOR BELFAST

National trends indicate general aviation will grow at about 2 to 3 percent per year, while MSASP forecasts indicated a 2 percent annual growth rate statewide, but local demographics suggest the service area could exceed federal and state forecasts by a wide-margin. The city of Belfast is a progressive and influential community with strong business ties, and a higher median age group, particularly those with more disposable personal income. The local government is proactive, one that aggressively promotes the airport and adjacent business park, and is keenly aware of the potential both bring to the community. The airport has undergone a complete runway construction project, relocated the FBO, is constructing new fueling facilities, and is ready to approve new hangar construction as soon as this update is complete.[25] This upbeat approach to aviation is refreshing and should help stimulate aviation growth in this region, adding a measurable difference to state and national growth rates.

As discussed earlier, the airport has a hangar waiting list of 10 to 12 aircraft owners waiting to relocate to BST. Assuming they follow through, the airport can expect total based aircraft to increase from 23 to 33 or more within the next one to two years. This equates to a 50 percent growth rate in aircraft and probably a slightly lower rate of growth in operations.

For planning purposes a 50 percent increase in based aircraft and 20 percent increase in operations will be used for the first two years, followed by a more modest 6 percent growth rate for based aircraft and 4 percent operations during the remaining short and intermediate terms. This rate of growth for based aircraft will slow to 5 percent in the long-term as the airport maximizes its available infrastructure, and operations will slow to 3 percent as fuel prices continue to impact general aviation. However, this region of Maine has unlimited potential. If government and business remain strong proponents of the airport, and the population continues to grow in the 45-60 year age group, the airport can achieve unprecedented growth during and beyond the 20-year planning period.

Based Aircraft – Forecast

Table 6 shows the projected growth rate for the short-, intermediate-, and long-terms. The largest growth will be in the “sport aircraft” category, which because of lower initial acquisition and operating costs, will outpace the more traditional single-engine reciprocating aircraft. Multiengine reciprocating aircraft will be replaced by turboprop and micro jets, such as the Eclipse 500.

[25] See *Based Aircraft*, page 14.

Table 6
Forecast Based Aircraft (Fleet-Mix)

Category	Existing (2006)		Short-Term (2007-2011)		Intermediate (2012-2016)		Long-Term (2017-2026)	
	Count	Mix	Count	Mix	Count	Mix	Count	Mix
Ultralight	0	0%	4	10%	5	10%	8	10%
Sport Aircraft	0	0%	10	25%	19	35%	29	35%
Single-Engine Reciprocating	22	96%	32	45%	16	29%	22	27%
Multiengine Reciprocating	0	0%	0	0%	0	0%	0	0%
Turboprop	0	0%	4	10%	5	10%	8	10%
Microjet	0	0%	1	2%	4	8%	8	10%
Helicopter	1	4%	3	8%	4	8%	7	8%
Total	**23**	**100%**	**42**	**100%**	**54**	**100%**	**82**	**100%**

Operations – Forecast

Aircraft operations will grow at the same annual rate as based aircraft provided long-term fuel prices increase at a rate consistent with inflation and the consumer price index. In addition, the current local/itinerant ratio of 65/35 percent will remain unchanged. Figure K and Table 7 (next page) show the projected number of operations for the three planning periods.

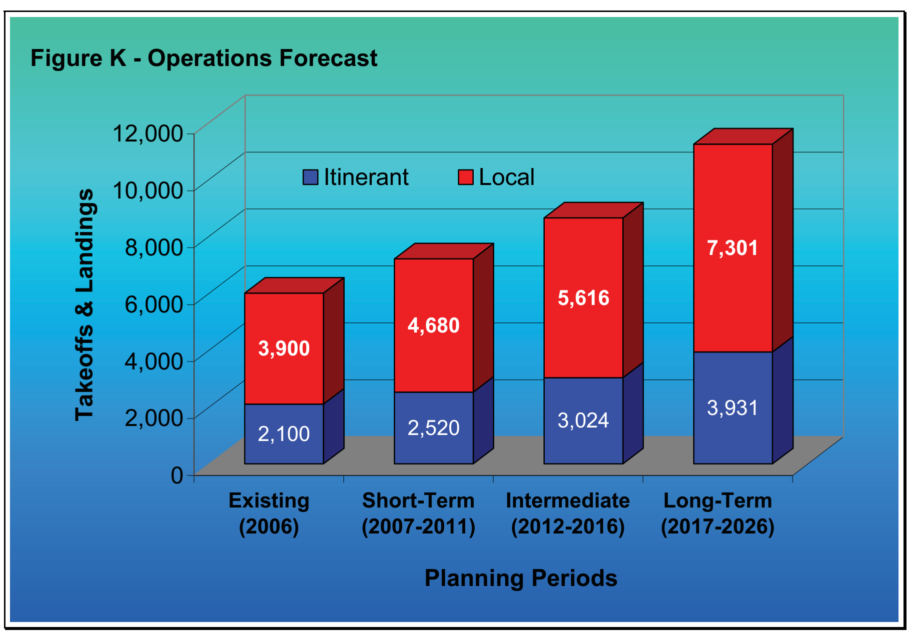

Table 7
Forecasted Operations (Fleet-Mix)

Category		Existing (2006)		Short-Term (2007-2011)		Intermediate (2012-2016)		Long-Term (2017-2026)	
		Count	Mix	Count	Mix	Count	Mix	Count	Mix
Itinerant	Ultralight	0	0.0%	126	5.0%	302	10.0%	590	15.0%
	Sport Aircraft	0	0.0%	252	10.0%	454	15.0%	786	20.0%
	Single-Engine Reciprocating	1,638	78.0%	1,310	52.0%	1,270	42.0%	1,337	34.0%
	Multiengine Reciprocating	105	5.0%	76	3.0%	60	2.0%	0	0.0%
	Turboprop	315	15.0%	504	20.0%	605	20.0%	786	20.0%
	Microjet	0	0.0%	126	5.0%	181	6.0%	236	6.0%
	Helicopter	42	2.0%	126	5.0%	151	5.0%	197	5.0%
	Total Itinerant	2,100		2,520		3,024		3,931	
Local	Ultralight	0	0.0%	468	10.0%	562	10.0%	730	10.0%
	Sport Aircraft	0	0.0%	936	20.0%	1,123	20.0%	1,460	20.0%
	Single-Engine Reciprocating	3,705	95.0%	2,574	55.0%	2,752	49.0%	3,431	47.0%
	Multiengine Reciprocating	0	0.0%	0	0.0%	0	0.0%	0	0.0%
	Turboprop	0	0.0%	234	5.0%	281	5.0%	365	5.0%
	Microjet	0	0.0%	94	2.0%	449	8.0%	730	10.0%
	Helicopter	195	5.0%	374	8.0%	449	8.0%	584	8.0%
	Total Local	3,900		4,680		5,616		7,301	
Total Operations	Ultralight	0	0.0%	594	8.3%	864	10.0%	1,320	11.8%
	Sport Aircraft	0	0.0%	1,188	16.5%	1,577	18.3%	2,246	20.0%
	Single-Engine Reciprocating	5,343	89.1%	3,884	54.0%	4,022	46.6%	4,768	42.5%
	Multiengine Reciprocating	105	1.8%	76	1.1%	60	0.7%	0	0.0%
	Turboprop	315	5.3%	738	10.3%	886	10.3%	1,151	10.3%
	Microjet	0	0.0%	220	3.1%	631	7.3%	966	8.6%
	Helicopter	237	4.0%	500	7.0%	600	7.0%	781	7.0%
Total		**6,000**		**7,200**		**8,640**		**11,232**	

Design Aircraft – Forecast

The existing critical aircraft is the Beech 90. With continued growth of the neighboring industrial park and Coastal Maine, the design aircraft will probably change to the Beech 350 or similar in the next 10 years. The 350 has a slightly longer wingspan and faster approach speed, putting it in the ARC B-II category

Airport Reference Code – Forecast

The existing ARC is B-I, but will increase as demand for short-haul on-demand air taxi service increases for both business and pleasure purposes. In addition, continued development of the Belfast Business Park will result in increased demand for corporate business class aircraft. The airport can expect the ARC to change to B-II within the next 5-10 years as the design aircraft increases in size and speed from the existing Beech 90 to the Beech 350, or similar.

Forecast Summary

Table 8 provides a forecast summary of based aircraft, operations, design aircraft, and the ARC.

Table 8
Forecast Summary

Component	Existing (2006)	Short Term (2007-2011)	Intermediate (2012-2016)	Long Term (2017-2026)
Based Aircraft	23	42	54	82
Local Operations	3,900	4,680	5,616	7,301
Itinerant Operations	2,100	2,520	3,024	3,931
Total Operations	6,000	7,200	8,640	11,232
Design Aircraft	Beech 90	Beech 90	Beech 350	Beech 350
Airport Reference Code	B-I	B-I	B-II	B-II

SECTION C

DEMAND CAPACITY ANALYSIS & FACILITY REQUIREMENTS

This section uses the results of the inventory and forecasts reported in previous sections as well as established planning criteria, to determine the airport's current landside capacity and requirements through the twenty-year planning period. Capacity refers to the maximum number of aircraft that an airfield configuration can accommodate during a specified interval of time, when there is continuous demand for service. The facility requirements evaluation is used to identify the adequacy of existing facilities and identify what new facilities may be needed during the current planning period. Options for providing these facilities will be evaluated in the next section to determine the most cost effective and efficient means for implantation.

LANDSIDE CAPACITY & REQUIREMENTS

This section addresses issues related to landside capacity and recommended changes. These changes include aircraft parking (apron and hangar space), aircraft fueling facilities, and automobile parking.

Aircraft Parking

Currently, there are approximately 23± based aircraft at BST, with all but four parked in hangars. It is assumed that this 82 percent hangar versus apron parking will remain relatively unchanged provided new hangar space is made available as demand is created. Table 9 shows the overall parking demand.

Table 9
Aircraft Parking Demand

Component	Existing (2006)	Short Term (2007-2011)	Intermediate (2012-2016)	Long Term (2017-2026)
Based Aircraft	23	42	54	82
Hangar Space	19	34	45	67
Apron Space (SF)	8,280	15,084	19,609	29,414
Itinerant Operations	2,100	2,520	3,024	3,931
Peak Hour Aircraft	1.1	1.3	1.5	2.0
Apron Space (SF)	5,880	7,056	8,467	11,007
Total Required Apron (SF)	**14,160**	**22,140**	**28,076**	**40,421**

Aircraft Parking Capacity

The aircraft parking capacity of BST is essentially unlimited. Figures L and M show potential development areas on the airport's east and west sides respectively. Figure L illustrates existing development as well as areas suitable for future development in the east terminal area. The areas shown in blue are relatively flat, essentially free of vegetation, and uplands, which minimizes permitting and development costs. The total size of the areas shown in blue is approximately 250,000 square feet (5.75 acres).

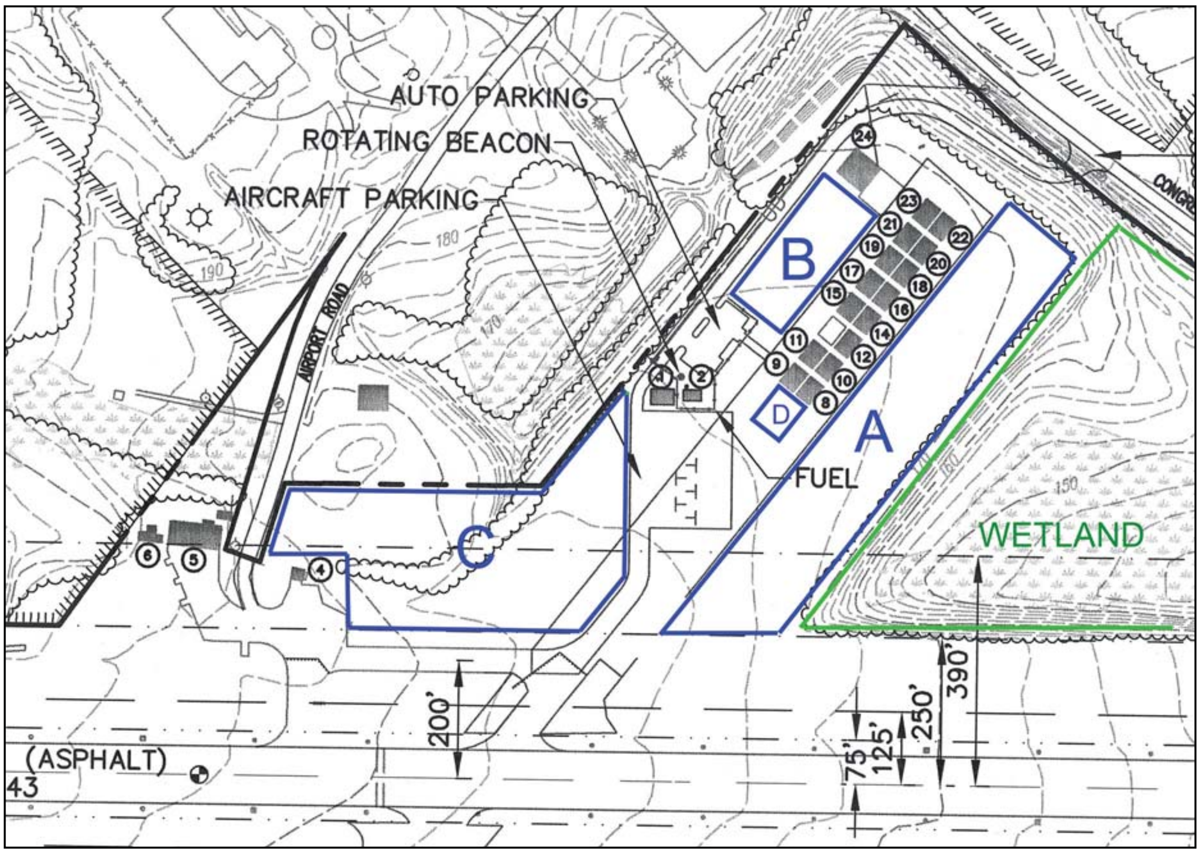

Figure L: East Quadrant Available Land
Source: Dufresne-Henry, Inc., graphic

Figure M shows land available in the airport's western quadrant, which is currently undeveloped. Area E is the most suitable land available because it is flat, relatively clear of trees, and uplands, which minimizes development costs.

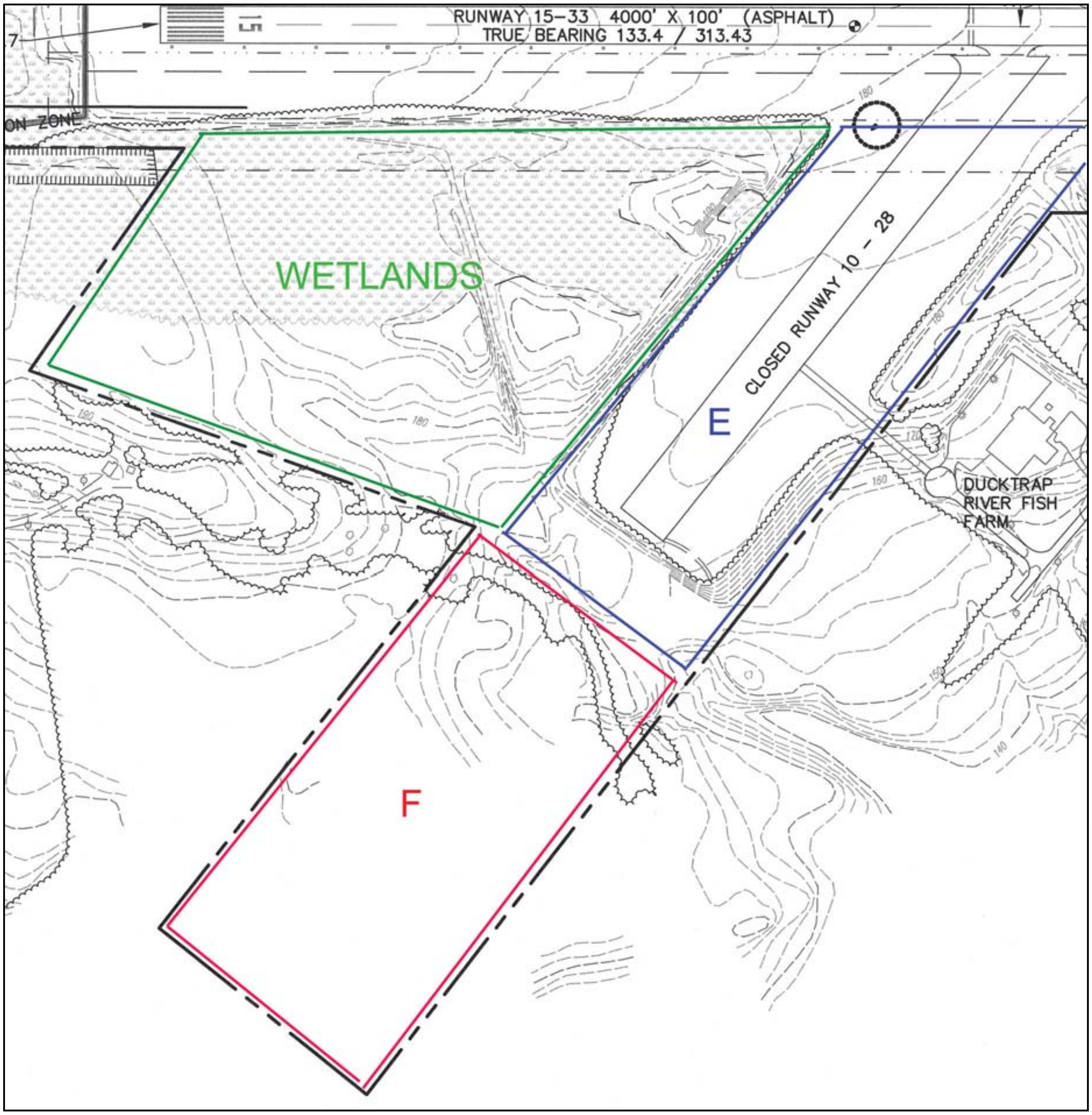

Figure M: West Quadrant Available Land
Source: Dufresne-Henry, Inc., graphic

Area E as shown on Figure M (previous page) is about 960,000 square feet (22 acres). The area labeled as “wetlands” (approximately 40.5 acres) should be avoided because of high permitting and mitigation costs. Area F (approximately 22 acres) should be the last area developed because of dense vegetation and its location from the runway. This area might be suitable for compatible non –aviation development; a future revenue source through a land lease.

Aircraft Parking Requirements

Forecasts indicate that based aircraft will increase from the current 23 to 82 in the long-term. This increase will result in the need for 59 additional aircraft parking spaces for based aircraft. Itinerant aircraft operations will increase from the current 2,100 to nearly 3,931 in 20 years. Using standard planning assumptions, peak summer operations will be 15 percent of the total, or 590 itinerant operations per month. Peak-month average day is 590 aircraft ÷ 30 days, which is 20 operations, or 10 visiting aircraft per day. Peak-hour is 20 percent of this, or an average of 2 aircraft per hour during the busiest day of the busiest month. This itinerant demand plus based aircraft results in the need for parking for 84 aircraft. The hangar versus apron parking ratio will be at an 82/18 percent split, or 67 hangared and 15 on aprons (15 based and 2 on tie downs). Refer to Table 9 (page 26).

Required Hangar Space

The airport currently has 19 hangar parking spaces. Assuming 82 percent of all future based aircraft will be hangared (82 in the long-term), the airport will need 48 more hangar spaces (67 total) in the next 20 years.

Required Apron Space

Required apron space is normally calculated based on 2,700 square feet per based aircraft and 3,400 square feet for itinerant aircraft, however, these dimensions will vary with the size of aircraft. While 2,700 square feet is ample space for most small recreational aircraft, a larger footprint should be calculated for itinerant aircraft. A Beech King Air 200 requires approximately 6,000 square feet for ample wing clearance. For planning purposes a conservative 2,700 feet per based aircraft and 6,000 square feet per itinerant aircraft will be used. This results in a long-term demand of 27,000 square feet for based aircraft (10 aircraft times 2,700 square feet) and 12,000 for itinerant (2 aircraft times 6,000 square feet), or 39,000 square feet, plus space for fueling, marshalling of aircraft, and passenger loading and unloading, which takes place in the vicinity of the FBO.

Demand Summary

In the next 20 years, BST will require a minimum of 37 more hangar parking spaces and approximately 39,000 square feet of apron space for aircraft parking and approximately 10,000 square feet for short-term aircraft servicing, or 49,000 square feet of paved apron.

The airport currently accounts for nearly 221 acres, plus an additional 80 acres in avigation easements. Of the 221 acres, the airport uses approximately 6 acres for landside activity and 55 acres for airside activity (runway, taxiway, and geometric setbacks). There is approximately 48 acres of wetland, or areas blocked because of wetland, for a total area either currently used, or restricted availability of 109 acres, leaving 112 acres available for future development. This 112 acres, or 4.8 million square feet, is ample for all required development through the long-term (20 years) and beyond.

Aviation Compatible Development

There is one large area on the airport that is not required for future development and can potentially aid the airport financially by providing revenue through its lease or sale. Future development includes runway, taxiway, and approach protection considerations, as well as ramp/apron space and hangar development.

This ALPU focused primarily on future landside apron and hangar requirements. Land required for aviation and aeronautical use for the next 20 planning years was analyzed in detail. Available land on the airport's east side (see Figure L, page 27) will accommodate forecasted growth in the next two decades. The available land (5.4± acres) will permit development of sufficient hangars and expansion of aircraft parking space to meet the airport's long-term needs.

Planning for at least the next 20-years is essential, but looking beyond is prudent. Setting aside land for future generations will assure the long-term existence of the airport and will prevent incompatible development. Available land on the airport's east side will meet forecasted needs through the intermediate-term, preserving land for future compatible aviation development beyond the next 10 to 20-years, as well as unforeseen demand is a wise investment.

The area previously identified on Area E on Figure M (page 28) is ideally suited for aeronautical use. While this area can be reserved for long-term needs, it is well situated for commercial aviation development, such as large corporate hangars. Area E is a 13± acre parcel that once served as a paved runway. The area is level, dry, and located immediately next to the Belfast Business Park, with easy access and close to utilities. With proper planning, watching aviation trends in terms of aircraft size and local demand, and matching this demand with the right size hangar lots, this area can easily hold in excess of 100 to 150 hangar spaces.

Non-Aviation Compatible Development

This ALPU examined all available land needs for the next 20-years and beyond, and as just discussed in the previous paragraphs, the airport has sufficient usable land for all land and airside needs for the foreseeable future. What land remains is either wet or well in excess of the airport's needs. While wetland areas can be developed, should be preserved in its existing state to avoid high mitigation and development costs, particularly when there is ample upland areas more suitable for development. What remains is a large parcel that once served as a runway protection/safety area for the now closed crosswind runway. The area identified as Area F on Figure M (Page 31), consists of approximately 25± acres of upland, semi-forested land in close proximity to the Belfast Business Park, an access road, and utilities. Our analysis indicates that this area in excess of the airport's present and future aeronautical needs through at least the next 20-year planning period, if not the next 40 years or more.

The city has expressed an interest in using this parcel for non-aviation use, such as an expansion of the existing business park. While this report indicates that there is ample land for aviation development exclusive of this parcel, the use of this parcel, or any other land deeded as “airport property” cannot be transferred without formal FAA approval. The FAA approval process, known as a “deed of release”, must be processed per federal guidelines. Because this land was originally purchased with federal monies, its future lease or sale must be at “fair market value” and realized funds used solely for airport development and operations. Further, site improvement and development costs, such as utilities, grading, and excavation, etc., cannot be paid for out of airport proceeds unless the area is developed for aeronautical purposes. The FAA, New England Region, Airports Division can provide further guidelines and may assist in the deed of release process if they concur with the findings of this report.

SECTION D
ALTERNATIVES ANALYSIS

The alternatives analysis component considers facility requires determined in the previous section, accepted airport standards, and the ultimate goals of the Airport and its users, to produce a long-term development alternative. Once the long-range development program has been established, short-range improvements can be readily implemented without jeopardizing the ultimate concept. The program will evaluate how to best improve existing airport facilities in terms of overall efficiency, while also accommodating the logical and efficient development of the future airport. The goal of this alternatives analysis is to optimize on-airport land use, maximize the capacity and economic viability of the existing facilities, and identify the facilities and practical stages of future development.

ASSUMPTIONS

It is important to address several key assumptions and project needs that were developed in earlier parts of this study before any alternatives can be analyzed. These assumptions are part of the foundation upon which the alternatives are built.

- The airport will remain a general aviation airport under NPIAS.
- The existing types of aircraft using the airport are not expected to change significantly throughout the planning period and the existing mix of operations is forecast to remain primarily single engine aircraft. However, increasing use of the airport by slightly larger business class turboprop and turbofan aircraft is inevitable as the region grows economically and the local business park expands.
- Available runway length meets the needs of a majority of the current fleet and will not be analyzed as part of this study.
- Hangars are at capacity and demand for them will outpace apron needs.
- Apron space for parking is at a deficit and must be addressed in the near term.

LANDSIDE - EAST

Landside facilities include aprons, hangars, and support facilities (storage buildings, automobile parking, etc.).

Hangars

This is the primary issue at the airport today. Having successfully completed all safety and capital reconstruction programs, the airport is prepared to embark on an aggressive hangar development program. Demand has been consistently high and has outpaced the need for apron space. The analysis indicates that the airport will need approximately 48 more hangar spaces in the next 20-years. Spaces can be in the form of individual conventional or T-hangars, or large conventional hangars with the capacity for two or more aircraft. The primary demand will be for individual hangars.

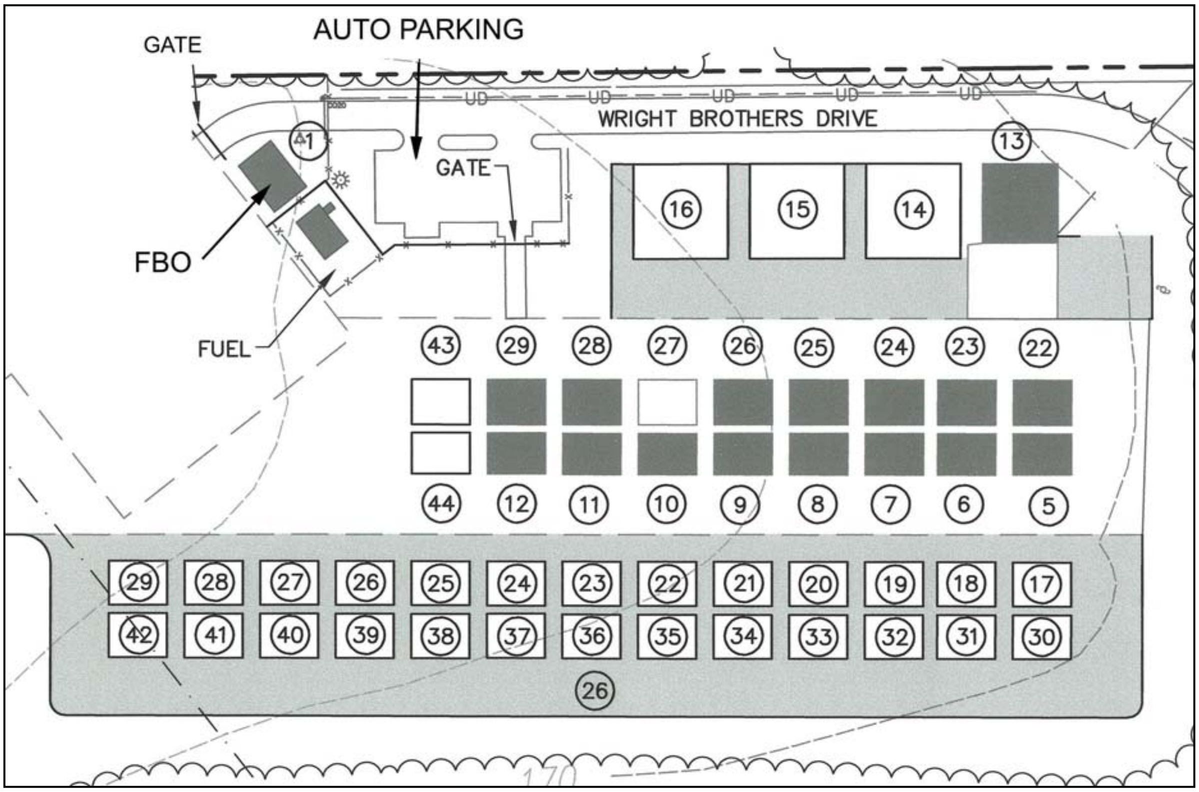

Figure N: Proposed East Hangar Development
Source: Dufresne-Henry, Inc., analysis

Several alternatives were analyzed and presented to the city and its airport committee. After reviewing several options it was decided that future development on the airport's west side should remain consistent with existing hangar design; that is, individual wood framed hangars, clustered in close proximity to each other, with electric service. Also, additional large capacity hangars are needed in the area of the existing large hangar on the airport's east side. Figure N shows the proposed hangar layout. The shaded hangars are existing units. This graphic shows an additional 29 personal hangars, approximately 30 x 40 feet. In addition, three additional 65 x 65 foot hangars can be developed in this area.

An important concept in the Figure N design is the avoidance of all wetland areas, while still meeting the airport's long-term needs. This design avoids expensive and time consuming mitigation and development costs.

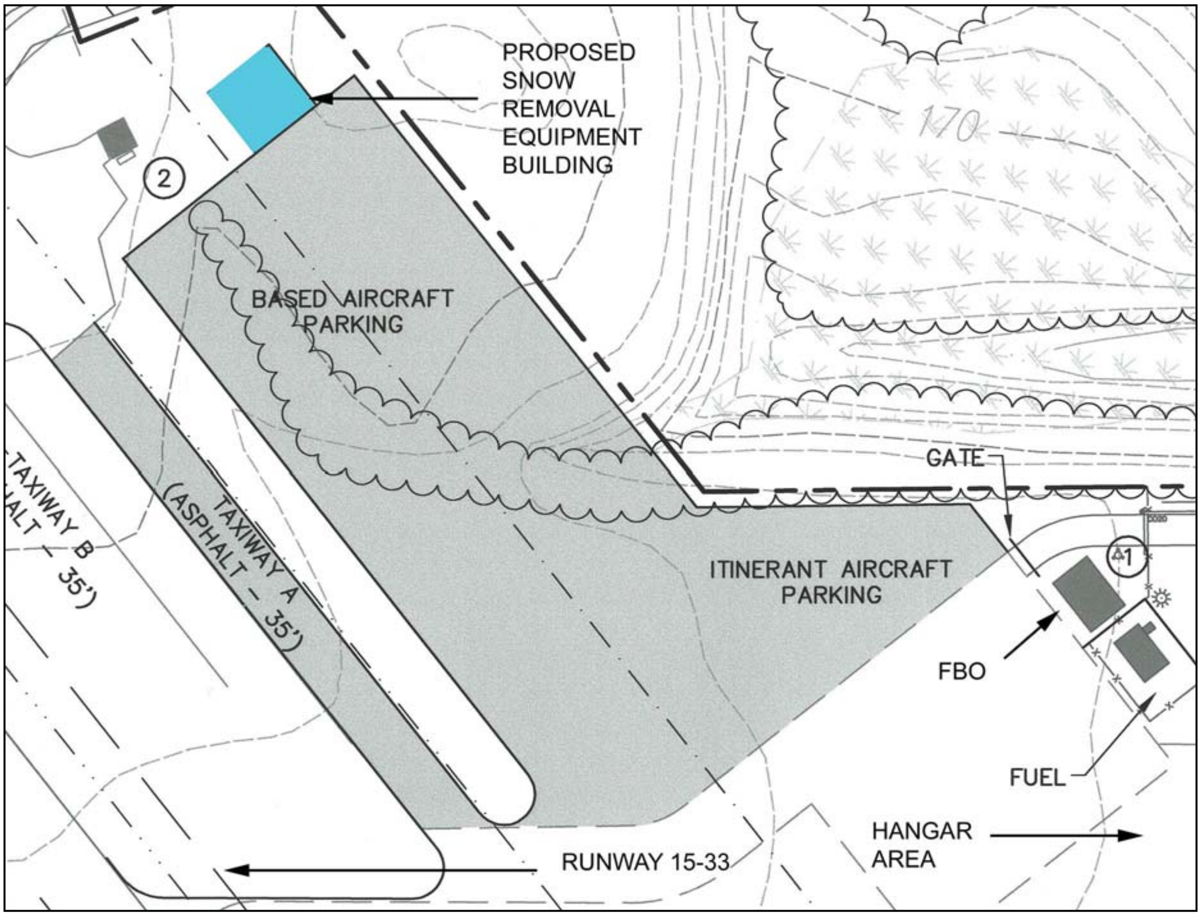

Figure O: Proposed East Apron Expansion
Source: Dufresne-Henry, Inc., graphic

Aprons

Outside aircraft parking and hold areas were also designed and approved by the city and airport committee. Long-term apron demand will require approximately 39,000 square feet of paved area (See Required Apron Space, page 29), plus additional space for short-term aircraft parking. The plan adopted (Figure O), shows an apron of approximately 100,000 square feet. While this area exceeds the forecasted needs, only the area actually required for existing and short-term demand should be constructed. The area can be developed starting at the existing apron and expanded northwest, or started from the airport fence line and expanded southwest. Because this area is relatively level and all upland, construction costs will be minimal.

Support Facilities

Construction of a snow removal equipment building will permit the city to store airport equipment at the airport. Currently equipment is being stored off airport in a city garage. On airport storage will free up valuable city space and keep the equipment in close proximity to the airport. A small 2,500 square foot building is proposed for construction on the airport's east side, directly off the proposed apron just discussed (See Figure O on the previous page).

LANDSIDE – WEST

Development of hangars and additional apron space is proposed on the airport's west side (see Aviation Compatible Development, page 30). The concept shown on Figure P is based on several meetings between the consultant, city, and airport committee. And while this area is not required for immediate use, presenting this concept now indicates the city's strong commitment to both retaining this area for future aviation development, while showing that the airport has ample room for development beyond the traditional 20-year planning period. This concept shows both private single aircraft hangars (same design as currently used on the east side), as well as various size conventional hangars, ample for both private and industrial use. This concept leaves access to the existing Belfast Business Park, as well as the area proposed for lease or sale for compatible non-aviation development.

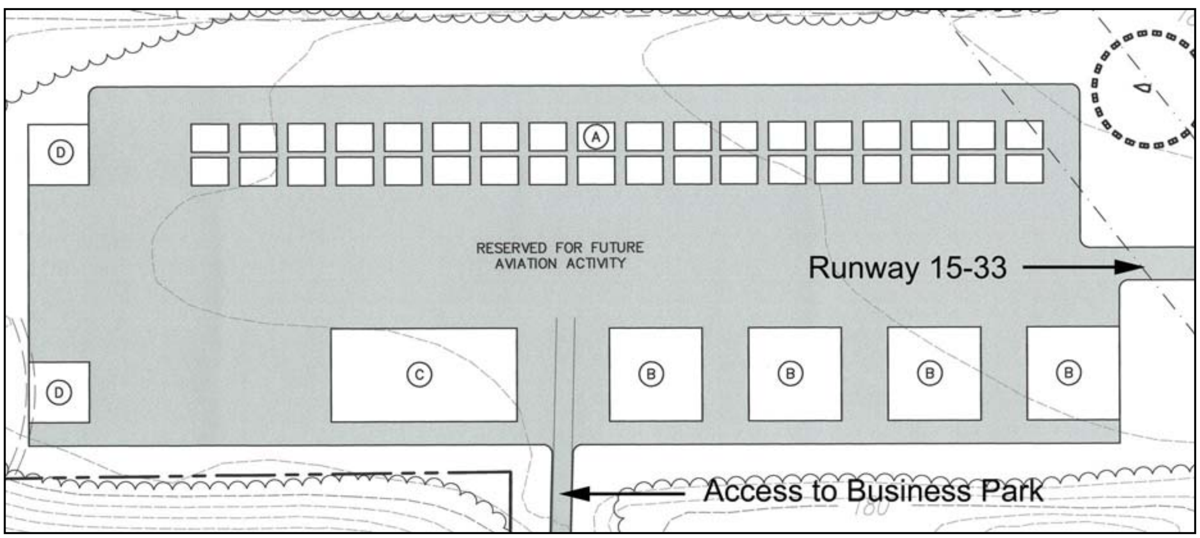

Figure P: Proposed West Terminal Area
Source: Dufresne-Henry, Inc., graphic

AIRSIDE

Airside alternatives include the runway, taxiway, and support facilities (lights, signs, etc.).

Runway

No change to the runway infrastructure is recommended in this study, other than the addition of Precision Approach Path Indicator (PAPI) lights on both runway ends.

Taxiways

Consistent with the last AMPU and ALPU, this plan recommends construction of a full-length parallel taxiway on the airport's east side. The taxiway should be designed to ARC B-II standards, which requires a 35 foot wide taxiway, setback 240 feet from the runway centerline. This design will not impact wetlands on the south end if the stub to the Runway 33 end does not extend to the runway end. Likewise, the north end of the taxiway will require acquisition of a small parcel of land (approximately 1.63 acres).

The two existing stub taxiways leading from the existing apron should be narrowed to 35 feet during the parallel taxiway construction project, or when required for normal pavement reconstruction.

PREFERRED ALTERNATIVE

Sheets 3 and 4 in Appendix A show the preferred alternatives as approved by the Belfast City Council on January 17, 2006.

SECTION E
FINANCIAL ANALYSIS

Schedules of proposed development resulting from recommendations in this AMPU and estimates of development costs are discussed in this section. Recommended development is distributed over three periods (short-, intermediate- and long-terms), based on need (i.e. demand) and the funding capacity of the FAA, state and city). Private funding will also play a major role in future development at the airport.

Although each period has a designated length of time, projects identified for one period may overlap with another as demand and funding warrant. It should not be assumed that projects listed anywhere in this report will be funded or that they will take place in the period suggested. The Capital Costs Table presented later in this section list planning-level cost estimates and identify anticipated financial responsibility for each improvement, as well as the estimated cost shares for each funding agency.

Funding from the FAA and/or MDOT is not necessarily guaranteed because it is discussed in this document. At least two situations must occur before federal and state funding will be approved. First, the airport sponsor must indicate a willingness and financial capability to fund its share of the project; and second, the FAA and MDOT must agree to capitalize the project.

AIP FUNDING

The Airport and Airway Trust Fund provides the revenue source used to fund AIP projects. Taxes and user fees are collected from the various segments of the aviation community and placed in the Trust Fund. These revenue sources include taxes on airline tickets and freight waybills, international air carrier departure fees, and fuel taxes on aviation fuels.

Funding for the AIP is distributed under specific guidelines outlined in the 1982 Airport and Airway Improvement Act, as amended. The FAA distributes entitlement funding for commercial-service and primary airports based on the number of enplaned passengers using the airport. General aviation airports also receive their funding from the FAA, but individual states determine the distribution of funds based on a ceiling provided by the FAA.

The AIP assists the development of a nationwide system of public-use airports by providing funding for airport planning and development projects at airports included in the NPIAS. It also provides funding for noise compatibility planning and noise compatibility programs established by the Aviation Safety and Noise Abatement Act of 1979.

Funding of projects that qualify under the AIP is typically divided into three sources: federal, state and local. The current Federal share of eligible costs for general aviation airports is 95%. The remaining 5% is divided between the state and airport.

Eligible projects include those improvements related to enhancing airport safety, capacity, security, and environmental concerns. In general, sponsors can use AIP funds on most airfield capital improvements or repairs except for terminals and non-aviation development. Any professional services that are necessary for eligible projects - such as planning, surveying, and design - are eligible as is runway, taxiway, and apron pavement maintenance. Aviation demand at the airport must justify the projects, which must also meet Federal environmental and procurement requirements.

Projects related to airport operations and revenue-generating improvements are typically not eligible for funding. Operational costs - such as salaries, maintenance services, equipment, and supplies - are also not eligible for AIP grants.

CONSTRUCTION COSTS AND INFLATION

Construction and planning cost estimates presented in this section are based on 2005 dollar values. To compute up-to-date cost estimates or revisions at any time in the future, refer to the Construction Cost Index (CCI). The CCI is revised every week to reflect changes in typical labor rates and material costs. By applying future CCI numbers as they are determined, cost estimates in this section can be updated to more accurately reflect ongoing inflationary factors.

PROJECT COSTS

Planned projects listed below for both the East and West Ramp areas. Estimated costs, updated to 2007 dollars, are shown in Table 10 (follows the synopsis on page 39).

EAST RAMP

Expand Aircraft Aprons

Exclusive of the apron around the proposed hangars, the alternatives shown earlier call for adding approximately 100,000 square feet of paved apron. Because the area proposed for construction is upland and fairly level, costs will be relatively low per square foot (approximately $3.50 sf).

Prepare Hangar Development Area

The cost of preparing an area for hangars is listed separate from the actual hangar costs, primarily because the city plans to develop the area using AIP and/or local funding, for eventual development of hangars with private funding. This project calls for the design and construction of two areas totaling approximately 90,000 square feet for future hangar construction, including preparation of underground electric service.

Design and Construct SRE Building

Plans call for the design and construction of a 50 x 50 foot snow removal equipment building. Cost will vary depending on the ultimate design and facilities (utilities, heat, etc.).

For planning purposes it will be assumed that this 2,500 square foot building will have full electric, but no water for heating system installed.

WEST RAMP

Prepare Hangar Development Area

The cost of preparing an area for hangars is listed separate from the actual hangar costs, primarily because the city plans to develop the area using AIP and/or local funding, for eventual development of hangars with private funding. This project involves the design and construction of an area totaling approximately 360,000 square feet for future hangar construction, including preparation of underground electric, water, and telephone service. Plus, design and construct a 450 x 35 lighted taxiway.

AIRSIDE

Design and Construct Taxiway

This project consists of the design and construction of a full-length parallel taxiway along the east side of Runway 15-33, setback 240 feet from the runway centerline, with 35 foot wide stub taxiways to the existing apron. This will involve the design and construction of a 4,000 x 35 foot lighted taxiway.

Install PAPI on Runway 15 and 33

This project consists of the design, construction, and alignment of two PAPI systems, one for each end of the runway. This project can be funded at 100% by the FAA if the city is willing to wait for available funds.

Table 10
Capital Costs Summary

Project	Total Cost	FAA Share (95%)	State Share (2.5%)	Local Share (2.5%)
Expand Aircraft Aprons	$472,500	$448,875	$11,813	$11,813
Prepare Hangar Development Area	$445,200	$422,940	$11,130	$11,130
Design and Construct SRE Building	$262,500	$249,375	$6,563	$6,563
Prepare West Ramp Area	$1,913,625	$1,817,944	$47,841	$47,841
Design and Construct Parallel Taxiway	$1,890,000	$1,795,500	$47,250	$47,250
Install PAPI	$315,000	$300,000	$0	$0
Totals	**$5,298,825**	**$5,034,634**	**$124,596**	**$124,596**

Note: Updated 1/2008 to reflect 2007 dollars.

APPENDIX A
AIRPORT LAYOUT PLAN

INTRODUCTION

The airport layout plan set for this project includes four separate sheets. An airspace analysis was not completed for this project, nor was a land-use plan, both of which can be found in the 1999 Airport Master Plan (see page 1). The ALP was prepared using guidance from AC 150/5070-6B, Airport Master Plans.[26]

- Cover Sheet .... Sheet 1
- Existing Airport Layout .... Sheet 2
- Proposed Airport Layout .... Sheet 3
- Terminal Plan .... Sheet 4

[26] A copy of this document is available on the FAA Web site (http://www.faa.gov/airports_airtraffic/airports/resources/advisory_circulars/).

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VICINITY MAP
NOT TO SCALE

BELFAST MUNICIPAL AIRPORT
BELFAST, MAINE

AIRPORT LAYOUT PLAN UPDATE

NOVEMBER 2007
AIP PROJECT NO. 3-23-0007-06-2005

INDEX OF SHEETS

SHEET NO.	TITLE
1.	TITLE SHEET
2.	EXISTING AIRPORT LAYOUT PLAN
3.	ULTIMATE AIRPORT LAYOUT PLAN
4.	TERMINAL AREA PLAN

LEGEND	EXISTING
AIRPORT REFERENCE POINT	
BUILDING RESTRICTION LINE	
BUILDINGS	
CONTOURS	
EASEMENT (AVIGATION)	
FENCE LINE	
OBJECT FREE AREA	
OBSTACLE FREE ZONE	
PAPI	
PAVEMENT	
PROPERTY LINE (AIRPORT)	
REIL	
ROTATING BEACON	
RUNWAY SAFETY AREA	
SEGMENTED CIRCLE/WIND CONE	
TREE LINE	
UTILITY POLE	
VASI	NOT OPERATIONAL
WETLANDS (DELINEATED)	
WIND CONE	NONE

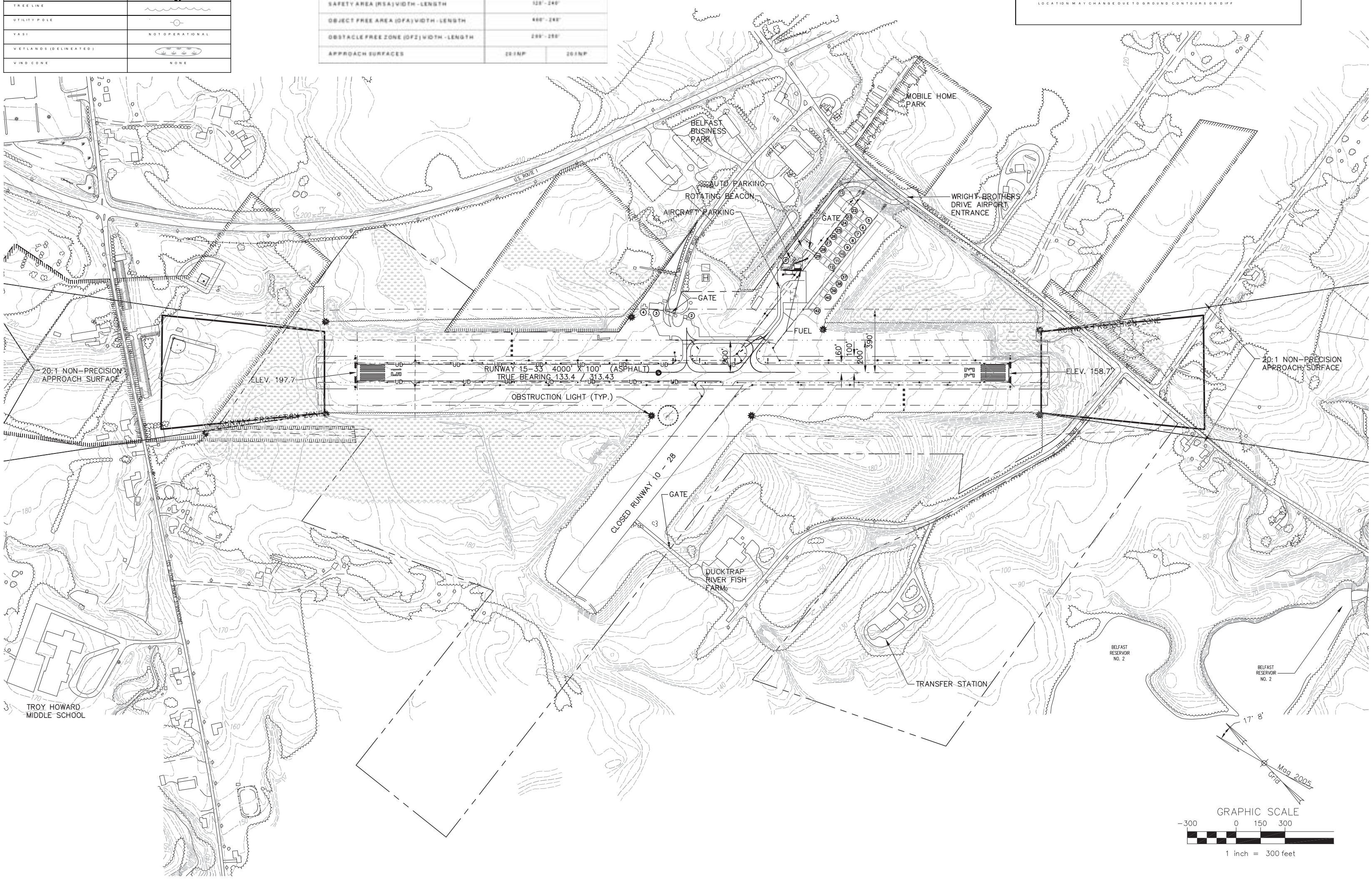
RUNWAY DATA	EXISTING	
	15	33
LENGTH - WIDTH	4000' X 100'	
STRENGTH (POUNDS)	30,000 LBS SW	
COMPOSITION	ASPHALT	
MARKINGS	NON-PRECISION	
LIGHTING	MIRL	
NAVAIDS	NDB	NONE
VISUAL AIDS	VASI	NONE
EFFECTIVE GRADIENT	0.97	-0.97
END ELEVATIONS	197.7'	158.7'
END COORDINATES	N44°24'47.39" W069°01'12.65"	N44°24'29.240" W069°00'22.58"
BUILDING RESTRICTION LINE (BRL)	390'	
SAFETY AREA (RSA) WIDTH - LENGTH	120' - 240'	
OBJECT FREE AREA (OFA) WIDTH - LENGTH	400' - 240'	
OBSTACLE FREE ZONE (OFZ) WIDTH - LENGTH	250' - 250'	
APPROACH SURFACES	20:1 NP	20:1 NP

AIRPORT DATA	EXISTING
AIRPORT CATEGORY	UTILITY-GENERAL AVIATION
AIRPORT ELEVATION	198'
AIRPORT REFERENCE POINT	N 44°24'34.00" W 069°00'43.00"
DESIGN AIRCRAFT	BEECH 90
AIRPORT REFERENCE CODE	B-I
MEAN MAX TEMPERATURE	81°F
TAXIWAY LIGHTING	NONE
TAXIWAY MARKINGS	BASIC
TERMINAL NAVAIDS	NON-DIRECTIONAL BEACON
VISUAL NAVAIDS	ROTATING BEACON; REIL
ACREAGE OWNED IN FEE SIMPLE	221±
ACREAGE OWNED IN EASEMENT	80±
FUEL AVAILABILITY	100LL
USE/OWNERSHIP	PUBLIC/PUBLIC

BUILDINGS	EXISTING
FIXED BASE OPERATOR	1
PRIVATE HANGAR	2
PRIVATE HANGAR	3
PRIVATE HANGAR	4
PRIVATE HANGARS	5-12
PRIVATE HANGARS	13
PRIVATE HANGARS	22-26
PRIVATE HANGARS	28-29
PRIVATE HANGARS	37-40
PRIVATE HANGARS	42

BUILDING RESTRICTION LINE

NOTE: BUILDING RESTRICTION LINE (BRL) WAS ESTABLISHED IN ACCORDANCE WITH FAA DESIGN AND FAR PART 77 CRITERIA. ITS LOCATION AT BELFAST MUNICIPAL AIRPORT UTILIZES A 20 FOOT VERTICAL OBJECT HEIGHT. THE BRL LOCATION MAY CHANGE DUE TO GROUND CONTOURS OR DIFF



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Issued	By	Appd.	YY.MM.DD

File Name: Sheet 02 Exisiting Airport Layout.dwg	CEJ			
	Dwn.	Chkd.	Dsgn.	YY.MM.DD

Permit-Seal

Client/Project

BELFAST MUNICIPAL AIRPORT

Belfast, Maine

Title

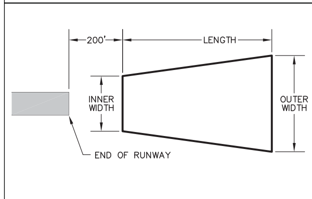
EXISTING AIRPORT LAYOUT

Project No.	Scale	
195210090	AS NOTED	
Drawing No.	Sheet	Revision
2	2 of 4	0

LEGEND	EXISTING	PROPOSED
AIRPORT REFERENCE POINT	(symbol)	(symbol)
BUILDING RESTRICTION LINE	(symbol)	(symbol)
BUILDINGS	(symbol)	(symbol)
CONTOURS	(symbol)	(symbol)
EASEMENT (AVIGATION)	(symbol)	(symbol)
FENCE LINE	(symbol)	(symbol)
OBJECT FREE AREA	(symbol)	(symbol)
OBSTACLE FREE ZONE	(symbol)	(symbol)
PAPI		(symbol)
PAVEMENT	(symbol)	(symbol)
PROPERTY LINE (AIRPORT)	(symbol)	(symbol)
REIL	(symbol)	SAME
ROTATING BEACON	(symbol)	(symbol)
RUNWAY SAFETY AREA	(symbol)	(symbol)
SEGMENTED CIRCLE/WIND CONE	(symbol)	SAME
TREE LINE	(symbol)	(symbol)
UTILITY POLE	(symbol)	(symbol)
VASI	NOT OPERATIONAL	NONE
WETLANDS (DELINEATED)	(symbol)	(symbol)
WIND CONE	NONE	(symbol)

RUNWAY DATA	EXISTING		PROPOSED	
	15	33	15	33
LENGTH - WIDTH	4000' X 100'		4000' X 100'	
STRENGTH (POUNDS)	30,000 LBS SW		30,000 LBS SW	
COMPOSITION	ASPHALT		ASPHALT	
MARKINGS	NON-PRECISION		NON-PRECISION	
LIGHTING	MIRL		MIRL	
NAVAIDS	NDB	NONE	NONE	
VISUAL AIDS	VASI	NONE	PAPI	PAPI
EFFECTIVE GRADIENT	0.97	-0.97	0.97	-0.97
END ELEVATIONS	197.7'	158.7'	197.7'	158.7'
END COORDINATES	N44°24'47.39" W069°01'02.60"	N44°24'20.240" W069°00'22.58"	N44°24'47.39" W069°01'02.60"	N44°24'20.240" W069°00'22.58"
BUILDING RESTRICTION LINE (BRL)	390'		390'	
SAFETY AREA (RSA) WIDTH - LENGTH	120' - 240'		150' - 300'	
OBJECT FREE AREA (OFA) WIDTH - LENGTH	400' - 240'		500' - 300'	
OBSTACLE FREE ZONE (OFZ) WIDTH - LENGTH	200' - 250'		200' - 400'	
APPROACH SURFACES	20:1 NP	20:1 NP	34:1 NP	34:1 NP

PROPOSED RUNWAY PROTECTION ZONE (RPZ) DIMENSIONS

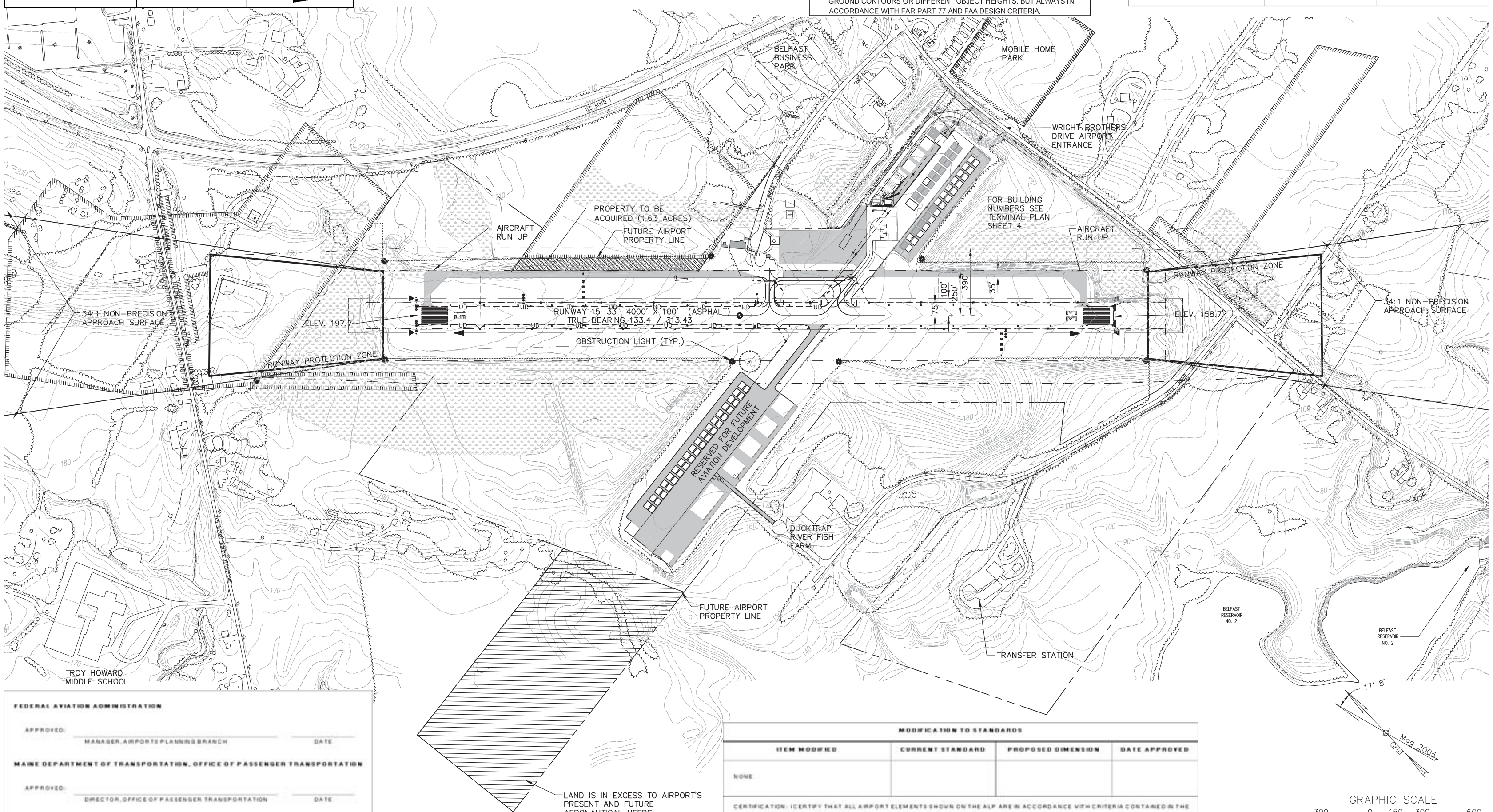


RUNWAY	INNER-WIDTH	OUTER-WIDTH	LENGTH	ACRES
15	500'	700'	1,000'	13.770
33	500'	700'	1,000'	13.770

BUILDING RESTRICTION LINE

NOTE: BUILDING RESTRICTION LINE (BRL) WAS ESTABLISHED IN ACCORDANCE WITH FAA DESIGN AND FAR PART 77 CRITERIA. ITS LOCATION AT BELFAST MUNICIPAL AIRPORT UTILIZES A 20 FOOT VERTICAL OBJECT HEIGHT. THE BRL LOCATION MAY CHANGE DUE TO GROUND CONTOURS OR DIFFERENT OBJECT HEIGHTS, BUT ALWAYS IN ACCORDANCE WITH FAR PART 77 AND FAA DESIGN CRITERIA.

AIRPORT DATA	EXISTING	PROPOSED
AIRPORT CATEGORY	UTILITY-GENERAL AVIATION	GENERAL AVIATION
AIRPORT ELEVATION	198'	198'
AIRPORT REFERENCE POINT	N44° 24 34.00" W069° 00' 43.00"	N44° 24 34.00" W069° 00' 43.00"
DESIGN AIRCRAFT	BEECH 90	BEECH 350
AIRPORT REFERENCE CODE	B-I	B-II
MEAN MAX TEMPERATURE	81° F	81° F
TAXIWAY LIGHTING	NONE	LITL
TAXIWAY MARKINGS	BASIC	BASIC
TAXIWAY OBJECT FREE AREA WIDTH	N/A	131'
TERMINAL NAVIAIDS	NON-DIRECTIONAL BEACON	NONE
VISUAL NAVAIDS	ROTATING BEACON; REIL	ROTATING BEACON; PAPI; REIL
ACREAGE OWNED IN FEE SIMPLE	221+	199.4+
ACREAGE OWNED IN EASEMENT	80+	81.6+
FUEL AVAILABILITY	100LL	100LL + JET A
USE/OWNERSHIP	PUBLIC/PUBLIC	PUBLIC/PUBLIC



GRAPHIC SCALE

−300 0 150 300 600

1 inch = 300 feet

FEDERAL AVIATION ADMINISTRATION

APPROVED: ______________________ ________
MANAGER, AIRPORTS PLANNING BRANCH — DATE

MAINE DEPARTMENT OF TRANSPORTATION, OFFICE OF PASSENGER TRANSPORTATION

APPROVED: ______________________ ________
DIRECTOR, OFFICE OF PASSENGER TRANSPORTATION — DATE

CITY OF BELFAST

APPROVED: ______________________ ________
CITY MANAGER, JOSEPH J. SLOCUM — DATE

MODIFICATION TO STANDARDS

ITEM MODIFIED	CURRENT STANDARD	PROPOSED DIMENSION	DATE APPROVED
NONE			

CERTIFICATION: I CERTIFY THAT ALL AIRPORT ELEMENTS SHOWN ON THE ALP ARE IN ACCORDANCE WITH CRITERIA CONTAINED IN THE CURRENT EDITION OF FAA AC 150/5300-13 EXCEPT AS NOTED IN THIS TABLE.

ERVIN C. DECK, SR. AVIATION PLANNER — DATE
STANTEC CONSULTING SERVICES, INC.

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File Name: Sheet 03 Proposed Airport Layout.dwg	CEJ			
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Client/Project

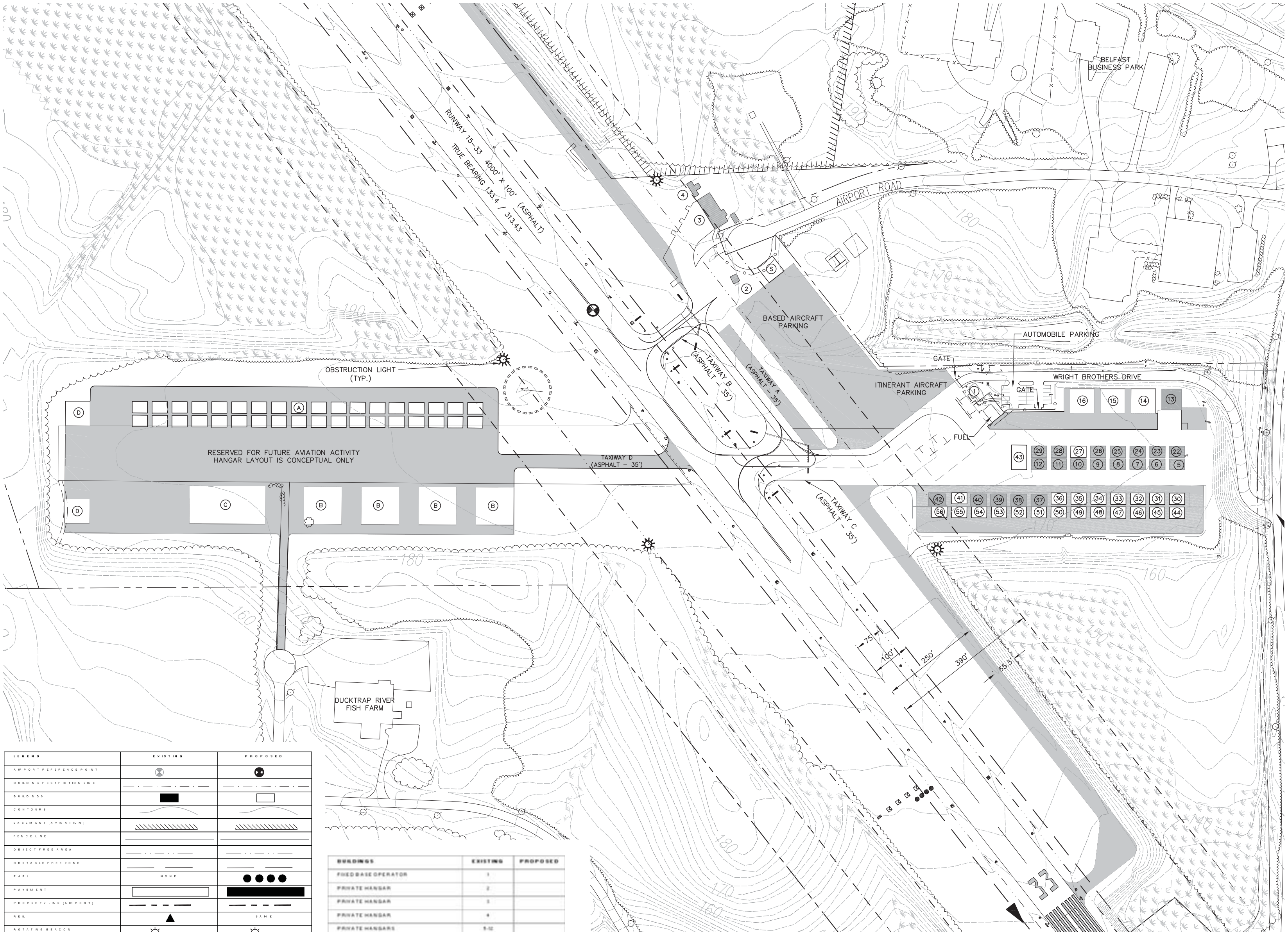
BELFAST MUNICIPAL AIRPORT

Belfast, Maine

Title

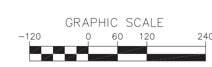
PROPOSED AIRPORT LAYOUT

Project No.	Scale	
195210090	AS NOTED	
Drawing No.	Sheet	Revision
3	3 of 4	0



LEGEND	EXISTING	PROPOSED
AIRPORT REFERENCE POINT		
BUILDING RESTRICTION LINE		
BUILDINGS		
CONTOURS		
EASEMENT (AVIGATION)		
FENCE LINE		
OBJECT FREE AREA		
OBSTACLE FREE ZONE		
PAPI	NONE	
PAVEMENT		
PROPERTY LINE (AIRPORT)		
REIL		SAME
ROTATING BEACON		
RUNWAY SAFETY AREA		
SEGMENTED CIRCLE/WIND CONE		SAME
TREE LINE		
UTILITY POLE		
VASI	NOT OPERATIONAL	NONE
WETLANDS (DELINEATED)		
WIND CONE	NONE	

BUILDINGS	EXISTING	PROPOSED
FIXED BASE OPERATOR	1	
PRIVATE HANGAR	2	
PRIVATE HANGAR	3	
PRIVATE HANGAR	4	
PRIVATE HANGARS	5-12	
PRIVATE HANGARS	13	14-16
PRIVATE HANGARS	22-26	27
PRIVATE HANGARS	28-29	
PRIVATE HANGARS	37-40	30-36
PRIVATE HANGARS	42	41
PRIVATE HANGARS		44-56
SNOW REMOVAL EQUIPMENT BUILDING		[illegible]



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File Name: Sheet 04 Terminal Plan Proposed Airport Layout.dwg | CEJ Dwn. | Chkd. | Dsgn. | YY.MM.DD

Permit-Seal

Client/Project
BELFAST MUNICIPAL AIRPORT
Belfast, Maine

Title
TERMINAL LAYOUT

Project No. 195210090
Scale AS NOTED
Drawing No. 4
Sheet 4 of 4
Revision 0