CHAPTER FOUR
ALTERNATIVES ANALYSIS

The facility requirements presented in **Chapter Three** identify the type and magnitude of development anticipated over the 20-year planning horizon in order to accommodate the forecasted levels of activity at Burlington International Airport (BTV). This chapter presents a logical pattern of development to satisfy the subsequent facility requirements and to meet applicable FAA design standards. Each of the alternative airfield development strategies presented in this section aims to provide sufficient facilities to accommodate the forecasted aviation demand presented in **Chapter Two**, address land use compatibility issues and improve accessibility to the airport. However, because of the limited amount of developable space on the airfield, not every alternative is able to meet every demand. All alternatives focus on ways by which the airport will: comply with Part 77 airspace regulations; improve safety; improve future airport operation and residential compatibility; and, accomplish runway/taxiway and terminal/hangar/apron improvements. Multiple studies and analyses were conducted as part of this Master Plan effort and include a June 2009 Transportation and Parking study, Terminal Building Layout analysis, June 2009 Hotel Feasibility Study, and February 2010 Runway 19 extension analysis. The findings of these studies are incorporated into the Master Plan and the full studies are located in the Appendices.

The major areas of focus for the alternative developments are: Terminal Area Improvements; Hangar-Apron Improvements; and, Road Access to the Airport. The five alternative development strategies are summarized below and are outlined in greater detail in **Sections 4.1** through **4. 6**.; the recommended preferred alternative development plan is introduced in **Section 4.7**.

- **Alternative Development Strategy #1, Maintain Existing Facility**
  This alternative simply examines the existing runway-taxiway configuration at BTV, including its constraints and its ability to serve existing and forecasted demand at the airfield.

  Summary: The existing airfield does not have the ability to accommodate the demand forecasted in Chapters Two and Three of this report. Specific challenges include terminal constraints; road access constraints; automobile parking; and, airfield safety issues, including the existing geometry of Runway 1-19.

- **Alternative Development Strategy #2, Minor Runway Improvements**
  This alternative proposes a 500-foot Runway 19 extension and a 300-ft shift of Runway 1-19 and an expansion of the existing terminal building towards the southeast. New

construction that would occur in the South End Development (SED) area of the airfield includes a cargo apron and cargo building; two separate corporate hangar buildings and a corporate jet center; three t-hangar buildings; one maintenance hangar building; and a larger, re-located fuel farm facility. Alternative #2 also plans for a new 20,000-square foot maintenance equipment storage building to be constructed in the northwest of the airfield near the Runway 15 end.

Lastly, Alternative #2 includes an extensive network of road improvements that would provide direct airport access so that automobiles would no longer pass through the residential neighborhood in order to reach the airport.

Summary: The terminal expansion for Alternative #2 would provide 35,500-square feet of additional concourse space and eight commercial gates. In addition, the road access improvements proposed in this alternative would provide more direct access to the terminal area while moving airport traffic away from the adjacent residential neighborhood. The Runway 19 extension would improve safety by allowing Runway 19 to be more prominent to aircraft in the air; at the Runway 1 end, the 300-foot runway shift would provide clearance for the new SED road to be constructed.

- **Alternative Development Strategy #3, Extend Runway 1-19**
  This alternative recommends that Runway 1-19 become a full crosswind runway in order to accommodate commercial and cargo operations during periods when Runway 15-33 is unavailable. This would involve an extension of Runway 1-19 to over 6,000-feet in length. The existing terminal would be expanded by 22,000-square feet to the southwest. The terminal expansion concept would provide four additional commercial gates.

  New construction to occur in the South End Development (SED) area of the airfield would include a cargo apron and cargo building; two separate corporate hangar buildings and a corporate jet center; three t-hangar buildings; one maintenance hangar building; and a larger, re-located fuel farm facility. Alternative #3 also plans for a new 20,000-square foot maintenance equipment storage building to be constructed in the northwest of the airfield near the Runway 15 end.

  Alternative #3 also includes an extensive network of road access improvements that would provide direct airport access so that automobiles would no longer pass through the residential neighborhood in order to reach the airport.

  Summary: The extension of Runway 1-19 to a true crosswind runway would be convenient during times when Runway 15-33 is unavailable; however, the project would require extensive land acquisition and property demolition whose costs may outweigh the benefits of the extension. In addition, the runway extension would create

a significant amount of new penetrations to the FAR Part 77 surfaces. The terminal expansion concept would not optimize the space available for the terminal to grow and would not provide sufficient gate positions to satisfy the demand forecast.

- **Alternative Development Strategy #4, Closure of Runway 1-19 and New Terminal Location**

  This alternative proposes the closure of Runway 1-19 in order to construct a new, larger terminal building in its place. The larger terminal, which would measure approximately 270,000-square feet, would provide a total of up to 27 gates. New road access around the terminal building would facilitate access to the terminal.

  A new landside development area and a 20,000-square foot maintenance equipment storage building would be constructed adjacent to the new terminal building.

  New construction to occur in the South End Development (SED) area of the airfield includes a cargo apron and cargo building; two separate corporate hangar buildings and a corporate jet center; three t-hangar buildings; one maintenance hangar building; and a larger, re-located fuel farm facility.

  Summary: The larger terminal and the 27 total commercial gates would satisfy the facility demand requirements forecasted for the airport in 2030. In addition the road access around the terminal building would move the point of entry to the airport from Airport Drive to Route 2/Williston Road, which would remove airport traffic from the adjacent residential neighborhood. However, closing Runway 1-19 is an unpopular option for general aviation airport users at BTV and may cause capacity constraints at the airport.

- **Alternative Development Strategy #5, Closure of Runway 1-19 and Existing Terminal Extension**

  This alternative proposes the closure of Runway 1-19 and the extension of the existing terminal toward the northeast, in the place of Runway 1-19. The terminal extension measures approximately 56,000-square feet and would provide nine additional commercial gates.

  New construction to occur in the South End Development (SED) area of the airfield includes a cargo apron and cargo building; two separate corporate hangar buildings and a corporate jet center; three t-hangar buildings; one maintenance hangar building; and a larger, re-located fuel farm facility. Alternative #5 also plans for a new 20,000-square foot maintenance equipment storage building to be constructed.

  Summary: This new concourse would not meet the demand for terminal space but would come close to satisfying the requirement for commercial gates forecasted for

the airport in 2030. However, closing Runway 1-19 is an unpopular option for general aviation airport users at BTV and may cause capacity constraints at the airport.

4.1 Alternative #1: Maintain Existing Facility

The first alternative development strategy considered for BTV retains the existing length and orientation of Runways 15-33 and 1-19. This is the "no development" strategy because it will not result in significant changes to airfield geometry and allows for a continuation of the existing airfield development to the best extent possible.

While it does preserve the existing infrastructure, this alternative becomes impractical after the short term as it does not address safety issues on the airfield that require runway geometry to change. This strategy also does not seek to improve or mitigate land use impacts caused by airport noise on the surrounding neighborhood, and does not improve vehicular traffic access to the airport. This strategy does maintain the terminal building in the 2010 location. However, facility and gate demands will require significant investment into the building to accommodate future space requirements. The existing facilities at BTV will be unable to accommodate the number of enplanements and operations forecasted for the airport during the planning period. Specific challenges include:

- **Terminal Constraints**: The facility requirements presented in **Chapter Three** collectively supported the expansion of the existing terminal building in order to accommodate the anticipated 1,609,916 enplanements forecasted for 2030. Specifically, the facility requirements presented recommend increased ticket counter and baggage claim belt lengths, increased baggage claim, operations and maintenance, public circulation, and food and concession areas, as well as increased public restroom and passenger hold-room space (See **Section 3.8**). As of 2009, the airport has 15 physical commercial gates, although only 10 are classified as operational. The commercial aircraft gate requirements analysis conducted in **Section 3.8.2** forecasts a need for up to 25 gates by 2030.

- **Road Access Constraints**: As is described in **Section One** and in **Appendix G** the connection between the airport and the regional transportation system is limited due to congestion and a road system that does not efficiently link to the interstate. As of 2009-2010, vehicular traffic arriving and departing from the airport mixes with a significant amount of local traffic. Airport Drive is bounded on the south side by neighborhood homes and White Street, which serves as one of the primary airport access, runs through the neighborhood before it intersects with Route 2.

  US Route 2 is the main route to the airport and is congested between I-89 and Airport Drive, especially during peak commuter periods. In addition, all vehicles accessing the South End Development must utilize Route 2. This adds to the congestion and also creates difficult turning movements for trucks that are expected to access the SED.

While Alternative #1 attempts to utilize existing facilities as much as possible, some improvements to the Route 2 corridor and entrances into the SED will be required to accommodate the increased vehicle traffic. These improvements include the addition of turn lanes onto and off of Route 2 as well as the widening of entrances to allow truck traffic to access the SED. These minor improvements will not address congestion on Route 2 or access to the airport from this congested Route 2 corridor.

As enplanements increase and development continues on the airfield, vehicle congestion at the terminal area will remain. Level of Service on Route 2 can continue to be expected to deteriorate if no improvements are made.

- **Parking:** As of 2009, BTV has a three-level, 2,100 space parking garage for airport users, 1,790 of which are for airport terminal users. Forecasted parking demand for 2030 is 5,827 spaces (See **Section 3.8.1**). Plans exist to expand the parking garage by 1,400 spaces. Pending funding approval, construction for the project should begin in spring 2010. The airport will need to provide an estimated additional 2,327 spaces in order to accommodate forecasted parking demand. The existing parking deck will not be able to accommodate additional levels after the planned improvements. Some additional parking may be found by relocating employee parking and also shuttling employees and passengers from remote areas of the airfield.

  It should be noted that if the airport does not or is not able to provide parking to address the forecasted parking demands, then the private sector likely will. However, if the private sector provides for this parking then the airport would lose revenue to these competitors. Also, as private parking providers would need to be located off airport property it would create parking inefficiencies and potentially utilize valuable commercially zoned land that may be better utilized with a different use. These parking inefficiencies could place more vehicle trips on Route 2 and through the neighborhood as airport users search for parking spaces. This searching and then the shuttle services necessary from remote parking areas would likely compound the traffic congestion on Route 2 and increase negative impacts on the nearby residential neighborhood.

- **Airfield Safety:** Runway 15-33 and Runway 1-19 intersect near the Runway 19 threshold. In addition, Taxiway Echo located at the end of Runway 19 provides access to the Air National Guard Ramp. The proximity of the Runway 1-19 threshold to Runway 15-33 and the taxiway creates a large, poorly-defined expanse of pavement. Airfield geometry such as this can lead to confusion by pilots navigating on the ground and can lead to runway incursions. While the intent of this alternative is to maintain the existing airfield facilities, this is not practical given the need to address the safety issue present at the Runway 19 threshold. A solution to this safety issue would be to construct Runway 1-19 so that the geometry was more defined in order to increase pilot situational awareness. For the purpose of this alternative, the pavement that exists between Runway 19

threshold and Runway 15-33 is removed. As of 2010, an extension to Runway 19 is being sought to address this issue. The proposed design involves increasing the pavement length by 500-feet to the north and providing a displaced threshold. This extension addresses this safety issue and as it is under design in 2010 it is considered part of the existing facility.

In addition, to provide appropriate clearances new hold positions must be established on Taxiway Golf near the Runway 15 threshold. Per the coordination that was done in spring 2010 these hold positions are provided in order for the potential CAT II operations to be conducted at the airfield, if and when this is available.

4.1.1 Part 77 Surfaces

Primary Surface: The existing 1,000-foot wide primary surface for Runway 15-33 is penetrated by four objects: the glideslope antennas for both Runways 15 and 33; the glideslope building near the Runway 33 threshold; and an electric utility pole near the intersection of Runway 15-33 and Runway 1-19.

The existing 500-foot wide primary surface for Runway 1-19 is penetrated by the same pole as for the Runway 15-33 primary surface.

Approach Surface: The existing 50:1 precision approach surfaces for Runways 15 and 33 are both penetrated by vegetative and manmade structures. The Runway 15 approach is penetrated by numerous trees and by one off-airport building. The Runway 33 approach is penetrated by numerous trees, one pole next to the localizer equipment shelter, and one off-airport building associated with the asphalt plant northeast of the airport.

The existing 34:1 non-precision approach surface for Runway 1 is impacted by several off-airport trees. The existing 20:1 visual approach surface for Runway 19 is not impacted by any structure. However, with the proposed extension of Runway 1-19 the future runway should plan to have non-precision instrument approaches to both ends. The approach to Runway 19 will be impacted by nine acres of tree penetrations both on and off airport property. Approximate 0.5 acres of these trees will also impact the threshold siting surface.

Transitional Surface: The existing transitional surface for Runway 15 is obstructed by numerous trees as well as two electric utility poles, one on-airport building (the Army Guard building northeast of the Runway 15 threshold), and the Air Traffic Control Tower north of the terminal building.

The existing transitional surface for Runway 33 is obstructed by trees, one off-airport building associated with the asphalt plant, and two poles from the previous ASR tower site.

The existing transitional surface for Runway 1 is penetrated by the rotating beacon, numerous trees, the new ASR-11 tower, and two buildings: the Hangar/Maintenance Shop and the new ASR-11 building.

The existing transitional surface for Runway 19 is clear of penetrations.

4.1.2 Airport Design Analysis

Runway Criteria: In Alternative Development Strategy #1, both runways maintain their existing lengths and orientation. The existing Runway 15-33 length of 8,322-feet meets the minimum runway length requirement of 4,200-feet for a precision approach. Furthermore the runway width of 150-feet meets the minimum requirements from AC 150/5300-13 for Group IV aircraft that are forecasted to use the runway.

The existing, usable 3,387-feet length of Runway 1-19 is sufficient to accommodate small aircraft with less than 10 passenger seats during the hottest months of the year (See **Section 3.4.2**). The runway width of 75-feet meets the FAA design requirement for the smaller general aviation aircraft that operate at the airport.

As is stated in **Section 3.4.2**, Runway 15-33 has sufficient length to accommodate long-range Boeing 757-type operations and therefore no additional runway length is anticipated. This runway also has sufficient crosswind coverage to accommodate operations by the intended aircraft under all weather conditions- and also provides the needed crosswind coverage for the smaller general aviation aircraft during Instrument Meteorological Conditions (IMC). Runway 1-19 appears to be of sufficient length to accommodate the majority of the general aviation and small corporate aircraft fleet under all weather conditions, and therefore no additional runway length is anticipated.

Separation Criteria: The runway-centerline to taxiway-centerline separation between Runway 15-33 and Taxiway G, 600-feet, meets FAA Standards for Group C/D aircraft. The runway-centerline to taxiway-centerline separation between Runway 1-19 and Taxiway A, 300-feet, meets FAA Standards for Group B-II aircraft.

4.1.3 Demand/Capacity Review

This section analyzes the ability of Alternative Development Strategy #1 to accommodate the forecasted demand for aircraft storage and the increases in the annual service volumes of the airfield.

Storage Capacity: The facility requirements section of this Master Plan Update, **Chapter Three**, identifies potential aircraft storage and service facility demand. The facilities included in the recommendations include t-hangars, corporate hangars, executive hangars, maintenance hangars, apron tie-downs, automobile parking spaces, and 10-day fuel storage space.

The existing facility conditions at BTV will be unable to accommodate the demand forecasted in **Chapter Two** and **Chapter Three** of this report. See **Section 4.6** for information regarding specific facility demand over the planning horizon.

4.1.4 Other Considerations

Land Use: The residential neighborhood adjacent to the airport is generally not considered compatible with airports as normal airfield operations may disturb some residents. The airport is currently in the process of purchasing residential properties that are within the 65-decibel noise level contour of the airport's operations. However other measures such as a vegetative buffer zone between airport traffic and the residential neighborhood may become necessary in order to separate these two land uses.

The existing Runway Protection Zones (RPZ) have a Moderate impact on adjacent land uses. Land uses within the RPZ for Runway 15 include the South Burlington Wastewater Treatment Facility, undeveloped wetlands, and the right-of-way for Interstate-89; land uses within the RPZ for Runway 33 include undeveloped wetlands and airport property; land uses within the RPZ for Runway 1 include industrial uses and the right-of-way to Williston Road. The existing RPZ for Runway 19 is completely within the limits of airport property.

LEGEND

- = AIRPORT PROPERTY LINE
- = PRIMARY SURFACE
- = RUNWAY SAFETY AREA
- = RUNWAY PROTECTION ZONE
- = WETLANDS
- = EXISTING ON-AIRPORT BUILDINGS
- = CONSTRUCTION COMPLETED 2010

EXISTING RUNWAY 19 RPZ
ARC-A/B, VISUAL
500'x1000'x700'

EXISTING RUNWAY 19 END
LAT: 44° 28' 25.03"
LONG: 73° 09' 11.04"
ELEV: 329.4' MSL

ARMY GUARD APRON/BLDGS

VT AIR NATIONAL GUARD

EXISTING RUNWAY 33 END
LAT: 44°27'56.73"
LONG: 73°08'30.35"
ELEV:334.5' MSL

EXISTING RUNWAY 33 RPZ
ARC: C/D, ILS > 3/4 MI
1000'x1700'x1510'

EXISTING RUNWAY 15-33 (8,322' x 150')

EXISTING RUNWAY 1-19 (3,612' x 75')

CEMETERY

EXISTING RUNWAY 15 RPZ
ARC:C/D, ILS 1/2 MI
1000'x2500'x1750'
(FEE & EASEMENT
ACQUISITION)

EXISTING RUNWAY 15 END
LAT: 44° 28' 50.44"
LONG: 73° 09' 57.18"
ELEV: 305.8' MSL

EXISTING
ATCT PARKING

EXISTING PARKING GARAGE

EXISTING
TERMINAL BUILDING

EXISTING RUNWAY 1 END
LAT: 44° 27' 49.77"
LONG: 73° 09' 03.62"
ELEV: 334.5' MSL

EXISTING RUNWAY 1 DEPARTURE RPZ
ARC: A/B, NON-PRECISION < 1 MI
500'x1000'x700'

GRAPHIC SCALE
500 0 250 500 1000 2000
(IN FEET)
1 inch = 1000 ft.

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FIGURE 4.1

Development Alternative #1: Maintain Existing Facility

4.2 Alternative #2: Minor Runway Improvements

The second alternative development strategy considered for BTV assumes that Runway 1-19 will be shifted/extended. The Runway 19 end is extended by 500-feet and the Runway 1 end is shifted by 300-feet. The location of Runway 15-33 will remain the same.

The intersection and paved area at the crossing of Runway 15-33 and Runway 1-19 is ambiguous and can cause pilot confusion and unsafe conditions. Alternative #2 would extend Runway 19 by 500-feet in order to better distinguish the runways at their intersection for pilots operating on the ground and to help reduce the potential for runway incursions. Runway 1 is shifted 300-feet in order to provide sufficient clearance for a potential perimeter road to access the SED to be constructed.

A new 18,000-square yard general aviation apron was constructed in the SED area of the airfield, southeast of the commercial terminal building, in spring 2010. The SED development plan for Alternative #2 also includes: a 60,000-square foot cargo building; one 18,500-square foot and one 32,000-square foot corporate hangar buildings and one 60,000-square foot corporate jet center; one 28,000-square foot maintenance hangar building; five 3,700-square foot executive hangar buildings; three, 18,600-square foot t-hangar buildings; and a new, relocated fuel farm. In addition, Alternative #2 plans for a new, 20,000-square foot airport maintenance equipment storage building to be located near the Runway 15 end.

Taxiway Golf will be realigned and extended to become a full parallel taxiway to Runway 15-33 with a 500-foot runway centerline-to-taxiway centerline separation distance. This will establish an efficient corridor for a future Taxiway Golf extension to the planned South End Development. Taxiway Juliet was realigned to lead aircraft to the new cargo apron in spring 2010.

Alternative #2 plans for the commercial terminal building to be expanded to the south, creating eight additional commercial gates and approximately 35,500-square feet of additional concourse space. The concourse extension is attached to the existing concourse and angles away to increase the separation between the Taxilane Alpha Object Free Area (OFA) and the terminal building. The concourse expansion then straightens once the necessary taxilane separation is achieved. In theory, Taxilane Alpha should be classified as a Taxiway. However, applying the taxiway standards would cause the associated OFA to be impacted by aircraft that are parked at the existing gates. As such, the concourse expansion concept uses the Taxilane OFA, which will allow larger aircraft to utilize the proposed gates without violating the OFA.

The concourse expansion in **Figure 4.2** shows eight additional gate positions. One existing gate will be removed to make room for the extension-therefore although the figure shows nine new gates, the extension provides a total of eight additional gates. The existing Bull Pin area (located between southern concourse and terminal access road) will be redeveloped as both

terminal building space and terminal support space. Sufficient space is provided to allow a modified Group III Taxilane access to the inside arm of the concourse expansion.

Alternative #2 improves road access to the airport through the following measures:

- **Exit 14-N**: Interstate-89 is within one-half mile of airport property. The proposed Exit 14-N from I-89 will route traffic coming from the north directly onto a limited access roadway toward the airport terminal. This allows airport traffic coming from the north to avoid taking Exit 14 onto the already congested Route 2, Williston Road. Based on a September 2005 analysis conducted by the Chittenden County Metropolitan Planning Organization (MPO), 47% of airport users originate from the north, and the majority of these users take Exit 14 onto Route 2 to access the airport. This data suggests that the proposed Exit 14-N will be effective in reducing traffic congestion on Route 2.

- **SED access road**: The limited access road will become an SED access road at the intersection of Kennedy Drive and Route 2, which will provide better access to the SED area for airport users. It is recommended that the intersection of Kennedy Drive and Route 2 become a grade-separated intersection, further reducing congestion in this area.

- **Dual Road System:** A limited access roadway from the airport to I-89 that is separate from the local road network will prevent or discourage cut-through traffic.

- **Terminal Loop:** Circulation around the terminal was developed in order to provide two-level access to the terminal building if the airport chooses. Conceptually this provides a means to have second-floor ticketing and first-floor baggage claim. An interior loop provides circulation from the existing parking deck and potential hotel site without rerouting traffic onto other roads.

- **Connections to the Neighborhood:** The road access plan presented in the Alternative #2 adds cul-de-sacs and encloses roads that currently connect to Airport Drive in order to deter airport through-traffic in the adjacent residential neighborhood. The decision of which roads, if any, from the neighborhood would be connected to a new airport system would ultimately have to be coordinated with the City of South Burlington.

- **Access to Cemetery:** The road alternative in Alternative #2 prioritizes maintaining public access to Eldridge cemetery.

- **Green Space Buffer:** A minimum 70-foot green space buffer between the neighborhood and the limited-access road provides a noise buffer and a physical barrier between the two land uses.

Any road improvement off-airport will require significant coordination with the City of Burlington, VTRANS, and the MPO.

4.2.1 Ultimate Part 77 Surfaces

Primary Surface: The 1,000-foot Runway 15-33 primary surface will not be affected by the changes proposed by Alternative #2- therefore the existing penetrations to this surface will remain its only penetrations. This includes the glideslope antennas for both Runways 15 and 33; the glideslope building near the Runway 33 threshold; and the electric utility pole near the intersection of Runway 15-33 and Runway 1-19.

The location of the 500-foot primary surface for Runway 1-19 is affected by the runway shift/extension proposed by Alternative #2. However, this new primary surface does not have any new penetrations as a result of its new location. The existing penetration, the electric utility pole, remains the only penetration.

Approach Surface: The existing 50:1 approach surfaces for Runways 15 and 33 are not affected by the runway shift/extension of Runway 1-19. Therefore the existing penetrations to these surfaces will remain unchanged. The Runway 15 approach is penetrated by numerous trees and by one off-airport building. The Runway 33 approach is penetrated by numerous trees, one pole next to the localizer equipment shelter, and one off-airport building associated with the asphalt plant.

The approach surfaces for Runway 1-19 will change locations as a result of the 500-foot runway extension to the north. In addition, the approach for Runway 19 will increase from visual (20:1) to non-precision (34:1). This increase is not directly related to the runway shift; instead, providing a non-precision approach to Runway 19 is a natural progression for the airport to offer non-precision approaches on both ends of this runway. Runway 1 will remain a 34:1, non-precision approach. The 300-foot shift north slightly alters the penetrations to the approach surface by decreasing the number of penetrations. No new penetrations to the Runway 1 approach surface appear as a result of the runway shift.

The newly shifted, 34:1 approach surface for Runway 19 gains dozens of vegetative obstructions. (The existing 20:1 approach surface has no penetrations.) Approximately half of the obstructions are on airport property, and the other half are located off airport property. All of these trees must be removed for safety reasons.

Transitional Surface: The transitional surface to Runway 15-33 does not change as a result of the airfield improvements proposed by Alternative #2. Therefore the existing penetrations to this runway's transitional surface remain the only penetrations. The existing transitional surface for Runway 15 is obstructed by numerous trees as well as two electric utility poles, one on-airport building (the Army Guard building northeast of the Runway 15 threshold), and the Air Traffic Control Tower north of the terminal building. The existing transitional surface for Runway 33 is

obstructed by trees, one off-airport building associated with the asphalt plant, and two poles from the previous ASR tower site.

The shift/extension of Runway 1-19 causes the transitional surface to shift as well. No new penetrations to the Runway 1 transitional surface were identified- in fact, the new transitional surface is penetrated by less objects than the existing transitional surface. However, the new transitional surface for Runway 19 is penetrated by a large group of trees on both sides of the runway. These trees must be removed or trimmed in order to remove the obstructions to the transitional surface.

4.2.2 Airport Design Analysis

Runway Criteria: Alternative #2 proposes a 500-foot extension of Runway 19 and a 300-foot shift of Runway 1. Both runway ends will change location, and the net length will increase to 3,812-feet. The orientation of Runway 1-19 and of 15-33 will remain the same. Each runway remains at an appropriate length to serve the aircraft size anticipated to use each facility.

Separation Criteria: The runway centerline-to-taxiway centerline separation distance between the existing Taxiway Golf and Runway 15-33 is 600-feet. Instead of ending at Taxiway Alpha, the taxiway will be extended to Taxiway Charlie, and will be realigned with a 500-foot centerline separation along its entire length. This meets FAA Design Standards for runways used by Category C/D aircraft.

4.2.3 Demand/Capacity Review

This section analyzes the ability of Alternative Development Strategy #2 to accommodate the forecasted demand for aircraft storage and the increases in the annual service volumes of the airfield.

Storage Capacity: The facility requirements section of this Master Plan Update, **Chapter Three**, identifies potential aircraft storage demand. The SED area of the airfield is the most practical location for the new construction, and as such the proposed construction is located here.

The existing fuel farm will be demolished; a new, larger fuel farm will be located next to the new SED access road. The SED area construction will require the demolition of the existing fuel farm and the following buildings:

Building 17: Hexagon Hangars (2)
Building 16: Hangar
Building 19: Alert Hangars

The loss of the three buildings listed above constitutes a net loss of approximately 67,000-square feet of hangar space.

Additionally, the terminal expansion will occur on the existing general aviation apron south of the terminal building, causing this apron to be demolished. The expansion will also require the demolition of the Montair building and the Innotech Hangar, Buildings 5 and 6. This constitutes a loss of 29,000-square feet of general aviation hangar space (Building 6) and an estimated 60,000-square yard area of apron.

Five on-airport buildings will also be demolished in order to construct the southeastern general aviation apron in the SED development area. These buildings are commercial buildings and office buildings owned by the airport.

In total, the construction proposed in Alternative #2 represents a loss of over 96,000-square feet of hangar space and approximately 60,000-square yards of apron space.

Considering these losses and the planned facilities proposed by Alternative #2, the planned construction will satisfy the facility requirements forecasted for Cargo building square footage, Cargo apron space, T-hangar square footage, and Apron tie-downs in 2030 as was forecasted in Chapters Two and Three of this Master Plan Update. The alternative will not satisfy the requirements for maintenance hangar space, executive hangars, and corporate hangars in 2030.

4.2.4 Other Considerations

Land Use: Alternative Development Strategy #2 recommends a minimum of 70-feet of vegetative buffer between the airport and the adjacent residential neighborhood. This will reduce noise impacts from the airport on nearby residences, and will also act as a physical separation between the land uses.

The new road alignment proposed by Alternative #2 may infringe upon the General Aviation apron and hangars southeast of Eldridge cemetery.

The 500-foot extension of Runway 19 and the 300-foot shift of Runway 1 would cause the Runway Protection Zone (RPZ) for both runway ends to change location as well. Due to the declared distances established for Runway 1-19, the most critical RPZ beyond the end of Runway 1 is the Departure RPZ. The sizes of both RPZs will remain the same as existing (500' x 1,000' x 700').

The new departure RPZ for Runway 1 would consist of 6.17 acres of on-airport property (45%) and 7.61 acres of off-airport property (55%). Existing land uses within the new Runway 1 RPZ would be primarily industrial with small portions of undeveloped wetlands and 400-length feet of Williston Road. In addition, approximately 575-length feet of the new SED access road would be located within the RPZ area. These uses are generally considered compatible with FAA RPZ guidance.

The new Runway 19 RPZ would be completely on airport property and no obstructions are identified- therefore no land acquisition would be necessary.

The existing RPZs for Runways 15 and 33 are not affected by the Runway 1-19 extension/shift. The Runway 15 RPZ measures 1,000-feet in inner width, 1,750-feet in outer width, and is 2,500-feet long. The airport maintains positive control over 71% of the RPZ through both fee-simple ownership and aviation easements restricting both heights and development. Existing land uses within the Runway 15 RPZ include the South Burlington Waste Water Treatment Facility, industrial/warehouse development, the right-of-way to Interstate 89, and undeveloped wetland area associated with tributaries to the Winooski River.

The RPZ for Runway 33 is 1,000-feet by 1,700-feet by 1,510-feet and begins 200' beyond the Runway 33 threshold. The airport maintains positive control over almost 82% of the RPZ through fee-simple ownership. Approximately nine acres of the Runway 33 RPZ are beyond the limits of airport property. Existing land uses within and adjacent to the Runway 33 RPZ are primarily airport property, undeveloped steep grades and wetlands associated with Muddy Brook. These uses are generally considered compatible with FAA RPZ guidance.

The shift/extension of Runway 1-19 would remove some less-compatible land uses from the Runway 1 RPZ and would move the RPZ further onto airport property. Specifically, the new RPZ would contain less than half of the length feet of Williston Road than the old RPZ did; and the new RPZ location would eliminate an estimated 200,000-square feet of industrially-zoned land use from the RPZ. This would increase safety by decreasing the number of people who could potentially be within the RPZ in the event of an aircraft accident.

The Runway Safety Area (RSA) for Runway 1-19 would also change location along with the runway extension/shift. The new RSA would remain on airport property and would not require any land acquisition or significant grading.

Wetlands: A small portion of the new SED access road proposed by Alternative #2 may be constructed through undeveloped wetlands (south of the Runway 1 end). In addition, approximately 600-length feet of the proposed Limited Access Road may cross through wetland areas (west of the Runway 15 end). This would require further environmental analysis before construction could begin.

LEGEND

- = AIRPORT PROPERTY LINE
- = PRIMARY SURFACE
- = RUNWAY SAFETY AREA
- = RUNWAY PROTECTION ZONE
- = WETLANDS
- = NEW BUILDINGS TO MEET DEMAND
- = EXISTING BUILDINGS
- = TO BE DEMOLISHED
- = PROPOSED CONSTRUCTION
- = CONSTRUCTION COMPLETED 2010

FUTURE RW 19 RPZ
ARC-A/B, NON-PRECISION > 1 MI
500'x1000'x700'

ARMY GUARD APRON/BLDGS

VT AIR NATIONAL GUARD

CORPORATE
JET CENTER
(±60,000-SF)

MAINTENANCE
HANGAR
(±28,000-SF)

RUNWAY 1-19
500-FT EXTENSION

EXISTING RUNWAY 15-33 (8,322' x 150')

ULTIMATE RUNWAY 1-19 (3,812' x 75')

EXTENDED TAXIWAY G

GA APRON
COMPLETED 2010
(±18,000-SY)

CARGO APRON
CONSTRUCTION
(±38,000-SY)

REALIGNED TAXIWAY G

FUTURE
FUEL FARM

CORPORATE
HANGAR
(±32,000-SF)

FUTURE EXIT 14-N
AIRPORT PARKWAY

LIMITED
ACCESS ROAD

AIRPORT MAINTENANCE
BUILDING (±20,000-SF)

CEMETERY

CARGO BUILDING
(±60,000-SF)

CORP.
APRON
(±17,000-SY)

5 EXECUTIVE HANGARS
(EACH ±3,700-SF)

CORP.
HANGAR
(±18,500-SF)

T-HANGAR BUILDING
DEVELOPMENT
(EACH ±18,600-SF)

CONCOURSE
EXTENSION
(35,500-SF)

SED ACCESS
ROAD

RUNWAY 1-19
300-FT SHIFT

FUTURE RUNWAY 1 DEPARTURE RPZ
ARC:A/B, NON-PRECISION > 1 MI
500'x1000'x700'

GRADE-SEPARATED
INTERSECTION
RECOMMENDED

GRAPHIC SCALE
500 0 250 500 1000 2000
(IN FEET)
1 inch = 1000 ft.

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FIGURE 4.2

Development Alternative #2: Minor Runway Improvements

4.3 Alternative #3: Extend Runway 1-19

The third alternative development strategy for BTV assumes that Runway 1-19 becomes a true crosswind runway for BTV. In order to meet FAA Standards, the length of a crosswind runway must measure 80% of the length of the main runway, meaning that Runway 19 will be extended to the north by 3,046-feet, from 3,612-feet to 6,658-feet.

Runway 1-19 would increase in width from 75-feet to 100-feet, which meets FAA Standards to serve Group III aircraft. A Group IV, parallel by-pass taxiway would be constructed along the runway extension to service aircraft using this portion of the runway. The taxiway would be constructed to Group IV standards in order to accommodate potential occasional usage by those Group IV aircraft on the airfield.

The new Runway 19 end would extend past the airport property line by more than 1,150 feet and would obstruct Taxiway Foxtrot, used by the Vermont Air National Guard, as well as National Guard Park Road, and a cluster of off-airport hangars and other buildings along Commerce Avenue and Ethan Allen Drive. Approximately 300-feet of the extended runway length would pass through off-airport property wetland areas.

Alternative #3 assumes that the commercial terminal is expanded by 300-feet toward the southwest at an angle in order to avoid the Taxilane Alpha Object Free Area (OFA). This extension would provide approximately 22,000 additional square feet of terminal space, and four additional commercial gates. The Bull Pin area (inside of the concourse) would be redeveloped for an additional 47,920-square feet of terminal building space. As such, airside access to the rear side of the concourse would become a non-issue as no gates would be located there.

Alternative #3 would improve road access to the airport by the following measures:

- **SED access road**: The limited access road would become an SED access road at the intersection of Kennedy Drive and Route 2, which would provide better access to the SED area for airport users. It is recommended that the intersection of Kennedy Drive and Route 2 become a grade-separated intersection, further reducing congestion in this area (See **Figure 4.3**).

- **Dual Road System:** A limited access roadway from the airport to I-89 that is separate from the local road network would prevent or discourage cut-through traffic.

- **Terminal Loop:** Circulation around the terminal would be developed in order to provide two-level access to the terminal building. Conceptually this would provide a means to have second-floor ticketing and first-floor baggage claim. An interior loop would provide circulation from the existing parking deck and potential hotel site without rerouting traffic onto other roads.

- **Connections to the Neighborhood:** The road access plan presented in Alternative #3 adds cul-de-sacs and encloses roads that currently connect to Airport Drive in order to deter airport through-traffic in the adjacent residential neighborhood. The decision of which roads, if any, from the neighborhood would be connected to a new airport system would ultimately have to be coordinated with the City of South Burlington.

- **Access to Cemetery:** The road alternative in Alternative #3 would prioritize maintaining public access to Eldridge cemetery.

- **Green Space Buffer:** A minimum 70-foot green space buffer between the neighborhood and the limited-access road would provide a noise buffer and a physical barrier between the two land uses.

A new 18,000-square yard general aviation apron was constructed in the SED area of the airfield, southeast of the commercial terminal building, in spring 2010. The SED development plan for Alternative #3 also includes: a 60,000-square foot cargo building; one 18,500-square foot and one 32,000-square foot corporate hangar buildings and one 60,000-square foot corporate jet center; one 28,000-square foot maintenance hangar building; five 3,700-square foot executive hangar buildings; three, 18,600-square foot t-hangar buildings; and a new, relocated fuel farm. In addition, Alternative #3 plans for a new, 20,000-square foot airport maintenance equipment storage building to be located near the Runway 15 end.

Taxiway Golf would be realigned and extended to become a full parallel taxiway to Runway 15-33 with a 500-foot runway centerline-to-taxiway centerline separation distance. This would establish an efficient corridor for a future Taxiway Golf extension to the planned South End Development. Taxiway Juliet was realigned to lead aircraft to the new cargo apron in spring 2010.

4.3.1 Ultimate Part 77 Surfaces

Primary Surface: According to FAA AC 150/5300-13 *Airport Design*, a runway serving Group C/D aircraft may have a maximum grade change of 1.5%, excluding the first and last quarters of the runway length, which may have a maximum grade change of 0.8%. Ideally, there would be no change in runway grade for the runway extension- therefore the elevation of the new Runway 19 end is estimated to be the same as its existing runway end, 329.4-feet. This elevation was used in the FAR Part 77 obstruction analysis conducted for Alternative #3.

The primary surface for Runway 1-19 would remain 500-feet wide, and would extend 200-feet beyond the newly extended Runway 1-19 threshold. This primary surface is obstructed by dozens of vegetative obstructions and one electric utility pole. The existing obstruction to the Runway 1-19 primary surface, one pole near the intersection of Runways 15-33 and 1-19, would also remain a penetration.

The 1,000-foot primary surface for Runway 15-33 would not be affected by the changes proposed by Alternative #3. Therefore its existing obstructions would remain the only penetrations to this surface. These are: the glideslope antennas for both Runways 15 and 33; the glideslope building near the Runway 33 threshold; and an electric utility pole near the intersection of Runways 15-33 and 1-19.

Approach Surface: The existing 50:1 approach surfaces for Runways 15 and 33 would not be affected by the changes proposed by Alternative #3, and the existing penetrations to these surfaces would remain the only obstructions. The Runway 15 approach is penetrated by numerous trees and by one off-airport building. The Runway 33 approach is penetrated by numerous trees, one pole next to the localizer equipment shelter, and one off-airport building associated with the asphalt plant northeast of the airport.

The existing 34:1 non-precision approach surface for Runway 1 is also not affected by the extension to the Runway 19 end, and its existing penetrations, several off-airport trees, will remain the only obstructions to this surface.

The newly extended Runway 19 end of the runway would increase to a 34:1 non-precision approach as a result of the extension, which would allow it to become a true crosswind runway to Runway 15-33. The existing 20:1 visual approach surface for Runway 19 would not be impacted by any structure. The new 34:1 approach would not be obstructed by any structure, either. One reason for this is the fact that the approach surface is situated above an area of undeveloped wetlands; another reason is that the terrain to the north of Runway 19 decreases in slope, yet for the runway extension, the earth will be filled in to minimize the runway grade. Therefore the runway end elevation would be significantly higher than the elevations of the surrounding terrain.

Transitional Surface: The transitional surface for Runways 15 and 33 would not be affected by the extension of Runway 19. Therefore the existing obstructions to this transitional surface would remain the only penetrations. For the Runway 15 transitional surface, these are: numerous trees, one electric utility pole, one Army Guard on-airport building, and the Air Traffic Control tower. The penetrations to the Runway 33 transitional surface are: several trees, one off-airport building associated with the asphalt plant, and two poles from the previous ASR tower site.

The transitional surface for Runway 1 is not affected by the extension of Runway 19- it is obstructed by the rotating beacon, numerous trees, the new ASR-11 tower, and two on-airport buildings: the Hangar Maintenance Shop and the new ASR-11 tower building.

The transitional surface for Runway 19 would increase in size as the runway end is extended. Assuming a future Runway 19 end elevation of 329.4-feet, the future transitional surface analysis was conducted and detected dozens of vegetative penetrations to this surface. All of these trees would have to be removed in order to avoid impacts to the transitional surface. The

analysis also found one off-airport building to be a penetration to the future transitional surface, which would likely need to be removed.

4.3.2 Airport Design Analysis

Runway Criteria: The extension of Runway 1-19 to 6,658-feet to become a full crosswind runway would allow the airport to serve commercial and cargo operations during periods when Runway 15-33 is unavailable (for example, during pavement rehabilitation projects).

The Runway Safety Area (RSA) for Runway 1-19 would increase in size along with the runway extension- the new RSA would meet FAA Design Standards for aircraft approach categories C and D, for Group III aircraft, and would measure 500-feet wide and 1,000-feet past each runway end. The FAA requires that the RSA be cleared and graded- this would require the removal of seven off-airport industrial buildings near the Runway 1 end and at least eight off-airport buildings near the Runway 19 end.

Separation Criteria: The taxiway-centerline to runway-centerline separation between the extended Runway 19 and the new bypass taxiway would be 400-feet, which meets FAA Standards for Group IV aircraft.

Summary: The existing usable 3,387-feet of Runway 1-19 should be sufficient to accommodate small aircraft with less than 10 passenger seats during the hottest months of the year. As is stated in the Runway Length Analysis in **Section 3.4.2**, considering that Runway 1-19 provides over 95% crosswind coverage during Instrument Meteorological Conditions (IMC), there appears to be no significant justification for extending Runway 1-19. Extending Runway 1-19 to 6,658-feet would entail construction of over 3,000-feet of runway toward the north- this would require significant land acquisition, road relocations, and reconfiguration of several airfield facilities on the airfield.

While extending Runway 1-19 would be beneficial for accommodating commercial and cargo operations during periods when Runway 15-33 is out of service, the associated costs and potential land use impacts may be higher than the expected benefits of the project.

4.3.3 Demand/Capacity Review

This section analyzes the ability of Alternative Development Strategy #3 to accommodate the forecasted demand for aircraft storage and the increases in the annual service volumes of the airfield.

Storage Capacity: While the extension of Runway 1-19 would require 21 off-airport buildings to be demolished, it would not require any existing on-airport storage facilities to be demolished. However the construction in the SED area proposed by Alternative #3 would require the existing fuel farm as well as the following hangars to be removed:

Building 17: Hexagon Hangars (2)
Building 16: Hangar
Building 19: Alert Hangars

The terminal expansion would require the demolition of the General Aviation apron south of the existing terminal building as well as the following buildings:

Building 5: Montair building
Building 6: Innotech Hangar

The fuel farm would be relocated adjacent to the new SED Access Road. The loss of the five buildings listed above would constitute a net loss of over 96,000-square feet of hangar space and approximately 60,000-square yards of general aviation apron space.

Five on-airport buildings would also be demolished in order to construct the southeastern general aviation apron in the SED development area. These buildings are commercial buildings and office buildings owned by the airport.

Considering these losses and the planned facilities proposed by Alternative #3, the planned construction will satisfy the facility requirements forecasted for Cargo building square footage, Cargo apron space, T-hangar square footage, and Apron tie-downs in 2030 as was forecasted in Chapters Two and Three of this Master Plan Update. The alternative will not satisfy the requirements for maintenance hangar space, executive hangars, and corporate hangars in 2030.

4.3.4 Other Considerations

Land Use: The Runway 19 extension and the associated RPZ and imaginary surfaces would require significant land acquisition for construction as well as for obstruction removal. Approximately 50-acres of land would have to be acquired for this project.

In addition, the over 3,000-foot runway extension would require a substantial amount of filling in order to maintain the runway grade. This is because the terrain to the north of Runway 19 is mostly wetlands, which have a much lower elevation than the existing airfield.

The Runway Protection Zone (RPZ) associated with the Runway 19 extension would have a 500-foot inner width, a length of 1,700-feet, and an outer width of 1,010-feet, and would meet FAA Standards for Aircraft approach Categories C and D with not lower than one-mile visibility. Almost half of the acreage of this new RPZ is undeveloped wetlands; the remaining area includes at least seven off-airport buildings and an estimated 585-length foot section of Ethan Allen Drive. In order to control land use practices within this area, it is recommended that the entire 29.47-acre RPZ be acquired by the airport through either easements or fee-simple acquisition.

Wetlands: The Runway 19 extension would impact at least 3.25-acres of undeveloped wetlands. Additional environmental analysis must be conducted before construction plans could begin.

Terminal Area: The terminal extension included in Alternative #3 involves a concourse expansion angled to the southeast. This extension would provide 22,000-square feet of additional concourse space, approximately 48,000-square feet of terminal service area, and four additional commercial gates. This would not satisfy the demand forecasted for 2030. Additionally, the orientation of the terminal extension does not take advantage of the space available for expansion. For example, the angled extension does not allow for gates to be located on the rear side of the concourse.

LEGEND

- = AIRPORT PROPERTY LINE
- = PRIMARY SURFACE
- = RUNWAY SAFETY AREA
- = RUNWAY PROTECTION ZONE
- = WETLANDS
- = NEW BUILDINGS TO MEET DEMAND
- = EXISTING BUILDINGS
- = TO BE DEMOLISHED
- = PROPOSED CONSTRUCTION
- = CONSTRUCTION COMPLETED 2010

FUTURE RUNWAY 1-19 END
EST. ELEV. 329.4'

EXTENDED RUNWAY 1-19
(3,046-FT)

ARMY GUARD
APRON/BLDGS

GROUP IV
BYPASS
TAXIWAY

400'

400'

75'

VT AIR NATIONAL GUARD

TAXIWAY F

EXISTING RUNWAY 15-33 (8,322' x 150')

EXTENDED TAXIWAY G

REALIGNED TAXIWAY G

ULTIMATE RUNWAY 1-19 (6,658 x 100')

CORPORATE
JET CENTER
(±60,000-SF)

MAINTENANCE
HANGAR
(±28,000-SF)

CARGO APRON
CONSTRUCTION
(±38,000-SY)

CORPORATE
HANGAR
(±32,000-SF)

FUTURE
FUEL FARM

CARGO BUILDING
(±60,000-SF)

CORP.
APRON
(±17,000-SY)

5 EXECUTIVE HANGARS
(EACH ±3,700-SF)

CORP. HANGAR
(±18,500-SF)

T-HANGAR BUILDING
DEVELOPMENT
(EACH ±18,600-SF)

AIRPORT MAINTENANCE
BUILDING (±20,000-SF)

NEW SERVICE
AREA (±47,920-SF)

CONCOURSE
EXTENSION
(±22,000-SF)

SED ACCESS ROAD

GRADE-SEPARATED
INTERSECTION
RECOMMENDED

CEMETERY

GRAPHIC SCALE
500 0 250 500 1000 2000
(IN FEET)
1 inch = 1000 ft.

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FIGURE 4.3
Development Alternative #3: Extend Runway 1-19

4.4 Alternative #4: Closure of Runway 1-19 and New Terminal Location

The fourth alternative development strategy for BTV proposes to relocate the commercial terminal facility to the southeast of its existing location (closer to the South End Development area.) The new terminal facility would measure more than 270,000-square feet. New airside parking (27 total gates) and new landside development space (almost 520,000-square feet) bordering the new terminal building would also be constructed.

The new terminal location would require Runway 1-19 and its associated Taxiways Alpha, Bravo, and Charlie to be removed completely. Runway 15-33 would remain in use. The existing Taxiway Golf would be extended past Taxiway Alpha to Taxiway Charlie, to create a full parallel taxiway to serve Runway 15-33. Two Group III taxilanes would be constructed to lead aircraft from the parallel taxiway to the new airside parking area.

This alternative would provide for future expansion opportunities, ample space for new airside parking (up to 27 total gates), and improved terminal-area circulation for automobiles, while shifting the primary access-point from Airport Drive and the surrounding residential neighborhood to the Route 2 (Williston Road)/Kennedy Drive intersection. This would move activity centers away from residential neighborhoods, which could improve airport-neighborhood relations. Alternative #4 recommends a grade-separated crossing at the Route 2 intersection, which would enhance traffic flow and capacity in this area. However, Alternative #4 does not address the existing single road system used by local traffic to move through the airport to I-89, which creates traffic congestion.

A new 18,000-square yard general aviation apron was constructed in the SED area of the airfield, southeast of the commercial terminal building, in spring 2010. The SED development plan for Alternative #4 also includes: a 60,000-square foot cargo building; one 18,500-square foot and one 32,000-square foot corporate hangar buildings and one 60,000-square foot corporate jet center; one 28,000-square foot maintenance hangar building; five 3,700-square foot executive hangar buildings; three, 18,600-square foot t-hangar buildings; and a new, relocated fuel farm. Alternative #4 plans for a new, 20,000-square foot airport maintenance equipment storage building to be located adjacent to the new area designated for landside development.

4.4.1 Ultimate Part 77 Surfaces

As this alternative assumes that Runway 1-19 is removed, only Runway 15-33 Part 77 surfaces are analyzed.

Primary Surface: The primary surface for Runway 15-33 would not be penetrated by the new terminal building and airside parking locations. Therefore the existing four penetrations to the primary surface, the two glideslope antennas, one electric utility pole, and the glideslope building at the Runway 33 end would remain the only penetrations to this surface.

Approach Surface: The development related to Alternative #4 would not impact the existing 50:1 approach surfaces of Runways 15 and 33. Therefore the existing penetrations would remain the only penetrations to these surfaces. The existing penetrations to the Runway 15 approach surface are numerous trees and one off-airport building; the existing penetrations to the Runway 33 approach surface are several trees, one off-airport building associated with the asphalt plant, and one pole next to the localizer equipment shelter.

Transitional Surface: Assuming a 50-foot building elevation and using the ground elevation points from an October 2008 aerial survey, the new terminal building would not be a penetration to the Runway 15-33 transitional surface. Furthermore, using the same ground elevation points and the overall height of the ERJ-190, one of the largest aircraft anticipated to use the gates at the new terminal building, of 34.6-feet, the aircraft does not seem to penetrate the transitional surface.

The existing penetrations to the transitional surface to Runway 15 are numerous trees, two electric utility poles, one on-airport Army Guard building, and the Air Traffic Control Tower. The existing penetrations to the transitional surface to Runway 33 are trees, one off-airport building associated with the asphalt plant, and two poles from the previous ASR tower site.

4.4.2 Airport Design Analysis

Runway Criteria: The removal of Runway 1-19 is not a favored option among general aviation users of the airport. As is mentioned in **Section 3.4.2**, the mix of aircraft types utilizing BTV, as well as the significant number of operations by small aircraft, justify the existence and continued maintenance of both runways.

Runway 15-33 would reach 60% capacity between 2015 and 2020 if it became the only serviceable runway at BTV. In 2030, Runway 15-33 will reach 71% of the Annual Service Volume (ASV) - (See **Figure 3.2**). The FAA recommends that planning associated with runway capacity-enhancing projects begin when demand reaches 60-percent of the ASV so that the project can be in place before demand reaches 80-percent of the ASV. Therefore new capacity enhancing projects would become necessary at BTV before 2020.

Separation Criteria: The new, parallel taxiway to Runway 15-33 would have a runway-centerline to taxiway-centerline separation of 500-feet, which meets FAA Design Standards for Group C/D aircraft. The location of the airside parking facility in relation to the Runway 15-33 centerline would meet FAA Design Standards for Group IV aircraft, which require a separation of at least 500-feet between the runway center line and the aircraft parking area. The separation between these two objects in Alternative #4 is approximately 575-feet. The fuel farm adjacent to the new SED access road would not obstruct the object-free areas of the new Group III taxilanes.

4.4.3 Demand/Capacity Review

This section analyzes the ability of Alternative Development Strategy #4 to accommodate the forecasted demand for aircraft storage and the increases in the annual service volumes of the airfield.

The construction proposed by Alternative #4 requires a significant amount of demolition, including that of Runway 1-19 and its associated Taxiways Alpha, Bravo, and Charlie; the existing cargo apron adjacent to Taxiway Charlie; and the following on-airport buildings (See **Figure 4-4** for building numbers):

Building 20: ASR-Tower (2005)
Building 11: FedEx Hangar (Cargo)
Building 10: Maintenance Shop/Equipment Storage
Building 23: Sand/Snow Equipment Building
Building 12: Maintenance Hangar
Building 13: Landside Office Building
Building 14: Corporate Hangar (Heritage Aviation)
Building 15: P&W Hangar (Corporate)
Building 25: General Aviation T-Hangar Building
Building 9: General Aviation Corporate Hangar
(Building 21 is the Previous ASR-9 Tower Site and would be demolished regardless).

This demolition constitutes a gross loss of over 131,000-square feet of storage space, over 31,000-square feet of maintenance space and 47,000-square yards of cargo apron space.

The SED area construction would require the demolition of the existing fuel farm (Building 7) and the following buildings:

Building 17: Hexagon Hangars
Building 16: Hangar
Building 19: Alert Hangars

The fuel farm would be enlarged and relocated next to the new SED access road. However, the loss of the three buildings listed above constitutes a net loss of approximately 67,000-square feet of hangar space.

The demolition required for the proposed development in Alternative #4 represents a net loss of 198,743-square feet of storage space.

Additionally, five on-airport buildings would be demolished in order to construct the southeastern general aviation apron in the SED development area. These buildings are commercial buildings and office buildings owned by the airport, and are not included in the

calculations for net loss of storage space.

Considering these losses and the planned facilities proposed by Alternative #4, the planned construction will satisfy the facility requirements forecasted for Cargo building square footage, Cargo apron space, and T-hangar square footage in 2030 as was forecasted in Chapters Two and Three of this Master Plan Update. The alternative will not satisfy the requirements for executive hangars, corporate hangars, or maintenance hangars in 2030.

Alternative #4 represents the largest net loss of storage space of any of the six alternatives.

Expansion would be possible for air cargo or other activities in the existing terminal area once Runway 1-19 is abandoned and the new terminal facilities are developed. This area could be reserved for the next planning period to ensure that the airport will be able to accommodate future demand well into the next planning period.

4.4.4 Other Considerations

Terminal Area: Expansion potential for air cargo or other activities in the existing terminal area would be available once Runway 1-19 is abandoned and the new terminal facilities are developed. Access to the existing terminal area could be made available from the new terminal area to avoid the need to use Airport Drive.

Wetlands: The terminal access road leading from Williston Road may be located on wetland areas. Additionally, a small portion of the landside development area may impact these wetlands. Further environmental analysis will be necessary before construction plans could begin.

LEGEND

- = AIRPORT PROPERTY LINE
- = PRIMARY SURFACE
- = RUNWAY SAFETY AREA
- = RUNWAY PROTECTION ZONE
- = WETLANDS
- = NEW BUILDINGS TO MEET DEMAND
- = EXISTING BUILDINGS
- = TO BE DEMOLISHED
- = PROPOSED CONSTRUCTION
- = CONSTRUCTION COMPLETED 2010

ARMY GUARD APRON/BLDGS

VT AIR NATIONAL GUARD

CORPORATE JET CENTER (±60,000-SF)

MAINTENANCE HANGAR (±28,000-SF)

CARGO APRON CONSTRUCTION (±38,000-SY)

CORPORATE HANGAR (±32,000-SF)

CARGO BUILDING (±60,000-SF)

5 EXECUTIVE HANGARS (EACH ±3,700-SF)

T-HANGAR DEVELOPMENT (EACH ±18,500-SF)

EXISTING RUNWAY 15-33 (8,322' x 150')

REALIGNED TAXIWAY G

EXTENDED TAXIWAY G

NEW AIRSIDE PARKING

LANDSIDE DEV'T.

EXISTING PARKING GARAGE

EXISTING TERMINAL BUILDING

REMOVE RUNWAY 1-19

NEW TERMINAL BUILDING ±270,000-SF

GRADE-SEPARATED INTERSECTION RECOMMENDED

CORP. APRON (±17,000-SY)

CORP. HANGAR (±18,500-SF)

MAINTENANCE EQUIPMENT STORAGE BUILDING: ±20,000-SF

GRAPHIC SCALE

500 0 250 500 1000 2000

(IN FEET)

1 inch = 1000 ft.

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FIGURE 4.4

Development Alternative #4: Closure of Runway 1-19 and New Terminal Location

4.5 Alternative #5: Closure of RW 1-19 and Existing Terminal Expansion

The fifth alternative development strategy considered for BTV closes Runway 1-19 and its associated Taxiways Alpha, Bravo and Charlie, and extends the existing terminal toward the east, in place of the runway. The terminal extension would measure approximately 40,200-square feet and would provide nine additional gates. (The extension would provide a total of eleven new gates but would require the demolition of two existing gates, for a net total of nine additional commercial gates). Runway 15-33 would remain in use.

A new 18,000-square yard general aviation apron was constructed in the SED area of the airfield, southeast of the commercial terminal building, in spring 2010. The SED development plan for Alternative #5 also includes: a 60,000-square foot cargo building; one 18,500-square foot and one 32,000-square foot corporate hangar buildings and one 60,000-square foot corporate jet center; one 28,000-square foot maintenance hangar building; five 3,700-square foot executive hangar buildings; three, 18,600-square foot t-hangar buildings; and a new, relocated fuel farm. Alternative #5 plans for a new, 20,000-square foot airport maintenance equipment storage building to be located adjacent to the new SED access road.

4.5.1 Ultimate Part 77 Surfaces

Only the FAR Part 77 surfaces for Runway 15-33 will be discussed in this section, as Alternative #5 involves the removal of Runway 1-19.

Primary Surface: The existing 1,000-foot primary surface for Runway 15-33 would not be affected by the changes proposed by Alternative #5. Therefore the existing penetrations to this surface will remain its only obstructions. This entails four objects: the glideslope antennas for both Runways 15 and 33; the glideslope building near the Runway 33 threshold; and an electric utility pole near the intersection of Runway 15-33 and Runway 1-19.

Approach Surface: The existing 50:1 approach surfaces for both Runways 15 and 33 would be unaffected by the changes proposed by Alternative #5. Therefore the existing penetrations to these surfaces will remain their only obstructions. The existing Runway 15 approach is penetrated by numerous trees and by one off-airport building. The existing Runway 33 approach is penetrated by numerous trees, one pole next to the localizer equipment shelter, and one off-airport building associated with the asphalt plant northeast of the airfield.

Transitional Surface: The existing terminal building is not an obstruction to the transitional surface to Runway 15-33. Assuming a 50-foot high concourse extension to the existing terminal building, the extension would not obstruct the transitional surface. A 50-foot maximum height is recommended for this concourse extension in order to avoid penetrating the transitional surface.

The heights of two aircraft commonly anticipated to use the proposed gates were used to analyze if aircraft parked at the gates represent a potential obstruction to the existing Runway

15-33 transitional surface. The Airbus 320 (38.6-feet) and the ERJ-190 (34.6-feet) do not appear to penetrate the transitional surface of Runway 15-33. Aircraft parked at the northernmost gate of the concourse extension would have a slight possibility of becoming an obstruction to this surface. Aircraft parked at the gate would meet the transitional surface at an elevation of 370-feet. Depending on the specific ground elevation under that gate after construction, and the height of the particular aircraft parked at that gate, the aircraft may become an obstruction. It is recommended that only smaller aircraft park in this position.

4.5.2 Airport Design Analysis

Runway Criteria: Closing Runway 1-19 is an unpopular development option for users of the general aviation facilities at BTV. As is stated in **Section 3.4.2**, the mix of aircraft types and the significant number of operations by the smaller aircraft at BTV justifies the existence and continued maintenance of both runways.

Runway 15-33 would reach 60% capacity between 2015 and 2020 if it were the only serviceable runway at BTV. In 2030, Runway 15-33 is anticipated to reach 71% of the ASV (See **Figure 3.2**, Single Runway System Capacity). The FAA recommends that planning associated with runway capacity-enhancing projects begin when demand reaches 60-percent of the Annual Service Volume (ASV) of the airport so that the project can be in place before demand reaches 80-percent of the ASV. Because the removal of Runway 1-19 would cause such capacity constraints to the airport that new, capacity-enhancing projects would become necessary in several years, the removal of Runway 1-19 is not a favored option.

4.5.3 Demand/Capacity Review

This section analyzes the ability of Alternative Development Strategy #5 to accommodate the forecasted demand for aircraft storage and the increases in the annual service volumes of the airfield.

Storage Capacity:

The SED area construction would require the demolition of the following buildings:

Building 17: Hexagon Hangars (2)
Building 16: Hangar
Building 19: Alert Hangars

This constitutes a net loss of approximately 67,000-square feet of hangar space.

The SED construction would also require the demolition of five on-airport buildings which currently serve as leased commercial and office space.

Considering these losses, the planned construction for Alternative #5 would satisfy the facility

requirements forecasted for Cargo building square footage, Cargo apron space, T-hangar square footage, and Apron tie-downs in 2030 as was forecasted in Chapters Two and Three of this Master Plan Update. The planned construction would not satisfy requirements for executive hangars, corporate hangars, and maintenance space in 2030.

However, the removal of Runway 1-19 would provide expansion potential for airfield development, which would give the airport flexibility to locate and construct storage and maintenance facilities in order to meet demand beyond 2030.

4.5.4 Other Considerations

Terminal Area: The expansion of the existing terminal would provide nine additional gates and approximately 40,200-square feet of concourse space. This addition comes close to meeting the commercial gate requirements forecasted for 2030, up to 25 gates.

Land Use: The elimination of Runway 1-19 and its associated Taxiways (Alpha, Bravo, and Charlie) would make available a wide section of on-airport property for new development. Options for new development in these areas include additional terminal building and commercial gate expansion or a cell phone lot for short-term parkers; additional commercial apron space; and airport office or aircraft maintenance facilities.

LEGEND

- = AIRPORT PROPERTY LINE
- = PRIMARY SURFACE
- = RUNWAY SAFETY AREA
- = RUNWAY PROTECTION ZONE
- = WETLANDS
- = NEW BUILDINGS TO MEET DEMAND
- = EXISTING BUILDINGS
- = TO BE DEMOLISHED
- = PROPOSED CONSTRUCTION
- = CONSTRUCTION COMPLETED 2010

ARMY GUARD APRON/BLDGS

VT AIR NATIONAL GUARD

CORPORATE JET CENTER (±60,000-SF)

MAINTENANCE HANGAR (±28,000-SF

CARGO APRON CONSTRUCTION (±38,000-SY)

CORPORATE HANGAR (±32,000-SF)

CARGO BUILDING (±60,000-SF)

5 EXECUTIVE HANGARS (EACH ±3,700-SF)

T-HANGAR DEVELOPMENT (EACH ±18,500-SF)

EXISTING RUNWAY 15-33 (8,322' x 150')

REALIGNED TAXIWAY G

EXTENDED TAXIWAY G

EXISTING PARKING GARAGE

EXISTING TERMINAL BUILDING

CONCOURSE EXTENSION (±40,200-SF)

REMOVE RUNWAY 1-19

CEMETERY

CORPORATE HANGAR (±18,500-SF)

CORPORATE APRON (±17,000-SF)

AIRPORT MAINTENANCE EQUIPMENT STORAGE FACILITY (±20,000-SF)

FUTURE FUEL FARM

GRAPHIC SCALE

500 0 250 500 1000 2000

(IN FEET)

1 inch = 1000 ft.

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VISION 2030 MASTER PLAN UPDATE

FIGURE 4.5

Development Alternative #5: Close Runway 1-19 and Extend Existing Terminal

4.6 Alternatives Comparison

Each of the five alternative airfield development strategies prepared for BTV were designed to evaluate current Part 77 impacts, improving the ability of the airport to serve its current and future critical aircraft, address potential land use impacts, and provide necessary facilities to meet anticipated demand over the planning horizon. In addition, the alternatives provide a choice of layouts to illustrate options for accommodating anticipated building and apron facility needs. **Section 4.6** compares the alternatives in order to develop the preferred alternative.

4.6.1 Runway-Taxiway Comparison

The facility requirements indicate that the existing Runway 15-33 length, 8,322-feet, is sufficient to accommodate the types of aircraft anticipated to use the runway over the planning horizon: Group C-IV aircraft. The existing length of Runway 1-19, 3,612-feet, is sufficient to accommodate group B-II aircraft, which is the size of aircraft anticipated to use the runway over the planning horizon. Alternatives #1, 2, and 3 preserve both runways in order to best serve the types of aircraft anticipated to use the airport over the planning horizon.

The RPZ impact of Alternative #3 is listed as Significant because the new RPZ to the extended Runway 19 would require the demolition of at least fourteen off-airport buildings. The future RPZ would also include an estimated 585-length foot section of Ethan Allen Drive.

The Part 77 impacts of Alternatives #1, #2, and #3 are listed as Significant because of the large number of surface penetrations that occur with those particular layouts, including on-airport buildings. Alternatives #4 and #5 eliminate Runway 1-19 and therefore eliminate many Part 77 penetrations that otherwise would have become safety issues.

Figure 4.6: Alternative Strategy Comparison

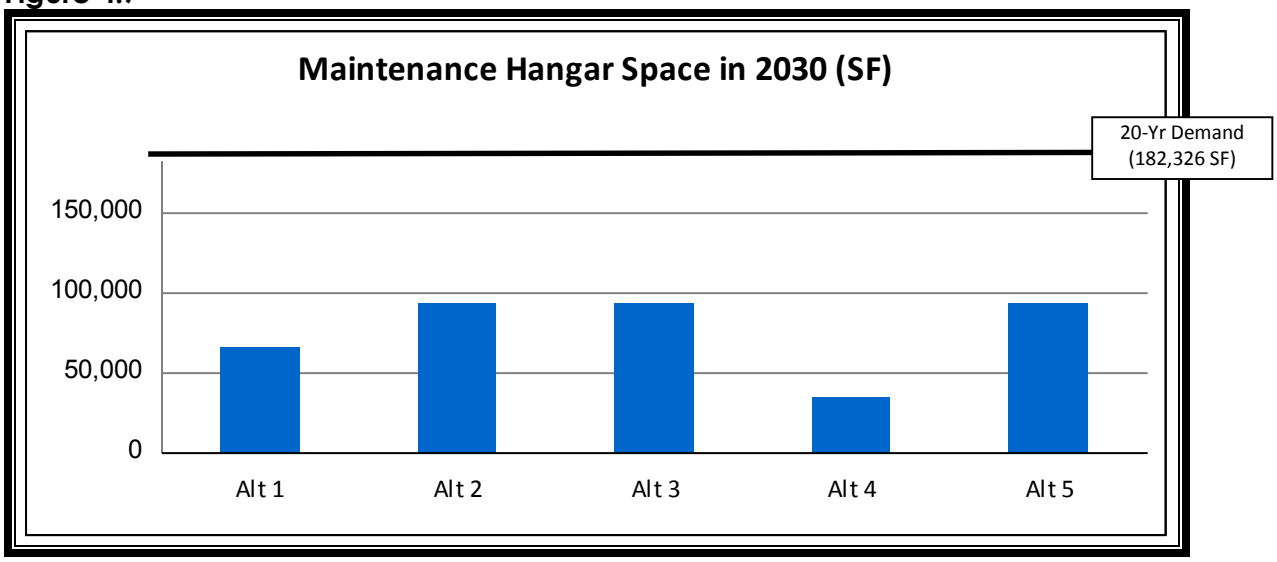
	Ability to Serve B-II and C-IV Aircraft	RPZ Impact on Adjacent Land Uses	Part 77 Impacts
Alt. #1 No Development	Good	Moderate	Significant
Alt. #2: Minor Runway Improvements	Good	Moderate	Significant
Alt. #3: Runway 1-19 as Crosswind	Good	Significant	Significant
Alt. #4: Close Runway 1-19, New Terminal Building	Poor	Moderate	Moderate
Alt. #5: Close Runway 1-19, Extend Existing Terminal	Poor	Moderate	Moderate

4.6.2 Maintenance Space

The 20-year forecast for BTV shows a demand for almost 183,000-square feet of maintenance hangar space. The lack of available construction space makes it possible for the airport to gain only 28,000-square feet of maintenance hangar space. As of November 2009, there are approximately 66,000-square feet of maintenance hangar space at the airport (Buildings 12

and 18). Alternative #1 is the "No Development" option and therefore only the existing maintenance buildings are included in this alternative. With the additional 28,000-square feet of construction, the airport will have a total of 94,000-square feet of maintenance hangar space in Alternatives #2, #3, and #5. Alternative #4 requires the demolition of Building 12 and therefore has less net maintenance building square footage.

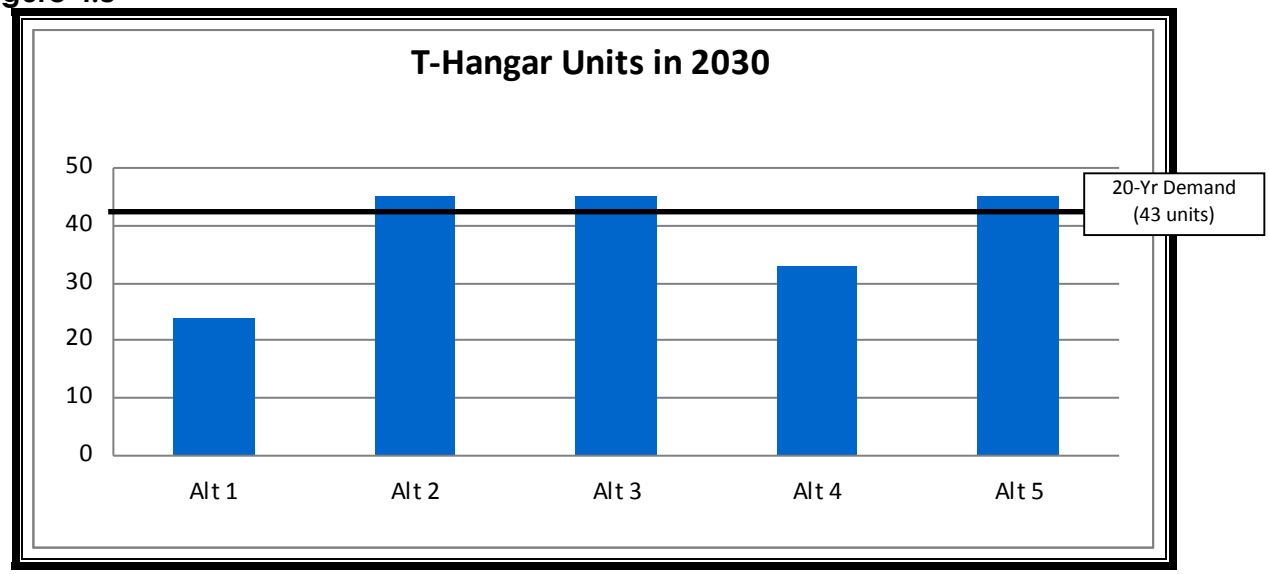
Figure 4.7



4.6.3 T-Hangar Units

Buildings 17 (Hexagon Hangars) and 25 contain t-hangar units and are each assumed to have 12 t-hangar units. The forecasted demand for t-hangar units is 43 units in 2030, which constitutes approximately 51,600-square feet, assuming 1,200-square feet per unit. Alternatives #2, #3, #4 and #5 provide three t-hangar buildings each which total 55,800-square feet of space. The number of units provided will depends on the size of each unit (door width and depth). For the purposes of this analysis, 33 units with 45-foot doors are assumed. However, Alternatives #2 through #5 include the demolition of Building 17, and Alternative #4 also requires the demolition of Building 25. Therefore only Alternatives #2, #3, and #5 will provide sufficient t-hangar units to meet the demand in 2030.

Figure 4.8

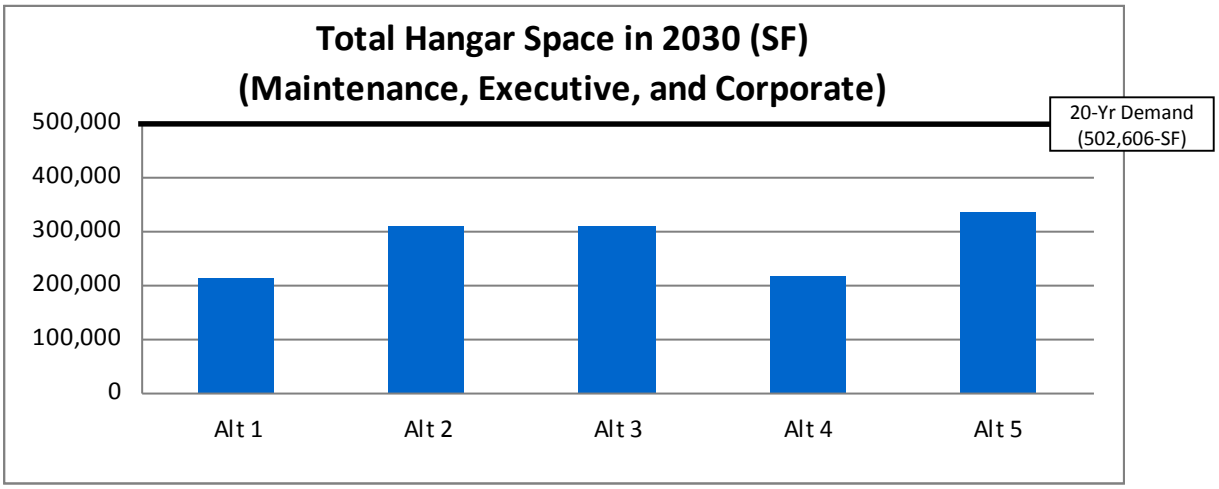


4.6.4 Total Hangar Space

As of November 2009, the airport has a total hangar storage space capacity of 216,600-square feet. This includes maintenance (66,000-square feet), executive (3,600-square feet), and corporate (147,000-square feet) hangars. Alternative #1 provides for no new construction. Alternatives #2, #3, #4, and #5 each plan for an additional 157,000-square feet of hangar capacity, providing 28,000-square feet of maintenance hangar space, 18,500-square feet of executive hangar space, and 110,500-square feet of corporate hangar space. Alternatives #2 and #3 require the demolition of Buildings 6, 16, and 19 and therefore each provides net 309,444-square feet of hangar space. Alternative #4 requires the demolition of Buildings 12, 14, 15, 16 and 19 and provides a net 219,330 square-feet of hangar space. Alternative #5 requires the demolition of Buildings 16 and 19 and provides net 338,600-square feet of hangar space.

The facilities forecast for 2030 calls for approximately 182,000-square feet of maintenance hangar space, 21,600-square feet of executive hangar space, and 300,000-square feet of corporate hangar space- a total of over 500,000-square feet of hangar space. The alternatives were unable to provide the forecasted amount of hangar space because of the limited area available for development on the airfield.

Figure 4.9



4.6.5 Apron Space

Cargo Apron Space: The existing cargo apron at BTV (along Taxiway Charlie) measures approximately 45,000-square yards. In 2010 an 18,000-square yard cargo apron was constructed in the South End Development (SED) area, meaning that the total size of cargo apron at the airport is 63,000-square yards. The SED development plan included in Alternatives #2 through #5 includes a 38,000-square yard cargo apron to serve the forecasted 2030 demand. The facilities forecast conducted in Chapter Three requires a 25,000-square yard cargo apron to serve the anticipated demand in 2030. Therefore even with the demolition of the existing Cargo apron along Taxiway Charlie required by Alternatives #4 and #5, each of the alternatives will satisfy the 2030 requirement.

General Aviation Apron Space: The 20-year facilities forecast recommends apron space for 25 apron tie-downs. As of 2009 there are 22 tie-downs at the airport. The SED area development proposed in Alternatives #2 through #5 provides five apron tie-downs. This will fulfill these facility demands over the planning horizon.

The SED area development proposes a corporate apron of approximately 17,000-square yards in size, and a general aviation apron of nearly 37,500-square yards.

Commercial Apron Space**:** The existing commercial apron at BTV measures approximately 40,000-square yards. The "Vision 2030" ALP does not recommend additional commercial apron space, although Alternative #4 provides a large area of new commercial apron space to be built (approximately 133,000-square yards). The remaining alternatives do not provide additional commercial apron space.

Figure 4.10: Apron Space in 2030

	Net Cargo Apron Space (SY)	Net Commercial Apron Space (SY)	Net GA Apron Space (SY)
Alternative 1	65,000	40,000	72,000
Alternative 2	103,000	40,000	85,500
Alternative 3	103,000	40,000	85,500
Alternative 4	56,000	40,000	126,500
Alternative 5	56,000	40,000	126,500
Recommended by MPU in 2030	**25,000**	**n/a**	**n/a**
Existing Apron Space (SY)	65,000	40,000	72,000

4.6.6 Fuel Storage

The fuel storage requirements for 2030 assume that all cargo aircraft will require 80-percent fuel; commercial operations over 1,500 nautical miles will require 80-percent fuel; and that 10% of all commercial aircraft will take on fuel while at BTV. The requirements plan for enough capacity for a 10-day reserve. Based on these demand assumptions and the forecasted operations by aircraft type used to determine total commercial, cargo and business/general aviation options, an estimated average daily demand was determined. Average daily demand for Jet-A is anticipated to reach approximately 40,959 gallons in 2030; and average daily demand for AvGas is anticipated to grow to 321 gallons per day by 2030. As of 2009, the airport has the capacity to store 60,000 gallons of Jet-A fuel (in three, 20,000-gallon tanks) and 12,000 gallons of AvGas (in one tank). However each of the five alternatives plans for an almost 12-times larger fuel farm facility to be constructed on the airfield, which will be more than adequate to meet the fuel demands through the planning horizon.

4.6.7 Terminal Area and Commercial Gates

The facilities requirement section of this Master Plan Report, **Chapter Three**, anticipates that 395,854 additional square feet of terminal space will become necessary by 2030. Additionally, FAA AC 150/5360-13, *Airport Terminal Facilities*, recommends 0.08 to 0.12-square feet of terminal space per annual enplanement. Applying the forecasted enplanements for 2030, 1,609.916, to this formula produces an estimated terminal building space of between 128,793 and 193,190-square feet. This equals an additional 53,524-square feet of terminal space.

While none of the development alternatives meets the requirement from **Chapter Three**, Alternatives #2, #3, and #4 either satisfy or almost satisfy the terminal space requirement from AC 150/5360-13. Neither Alternative #1 nor #5 meets this requirement.

In addition, the facilities recommendation in **Chapter Two** forecasted the demand for up to 25 gates in 2030. The airport currently has 15 commercial gates, although as of 2009 only 10 are

considered active. Alternatives #2 through #5 provide 20 or more gates in 2030, with Alternative #4 providing 27. Alternative #1 does not meet the gate requirements for 2030.

Figure 4.11

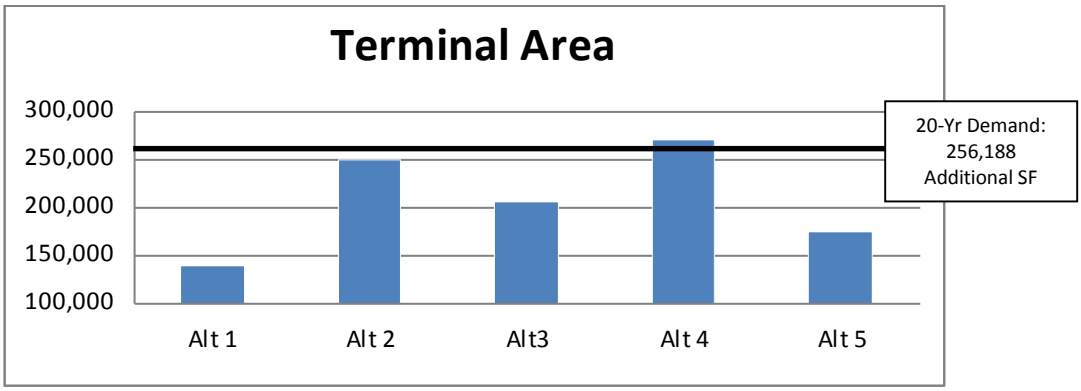
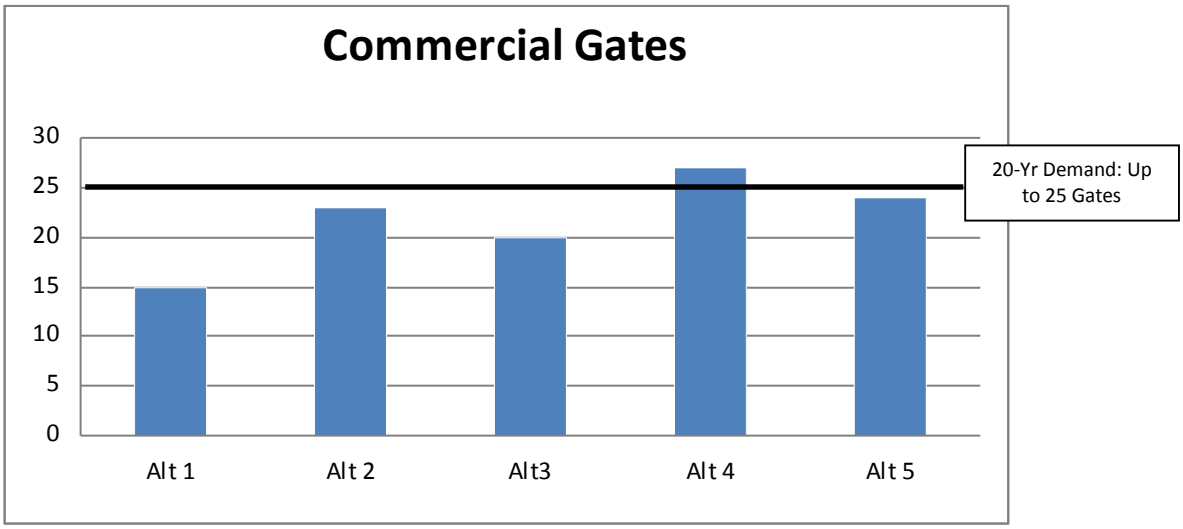


Figure 4.12



4.6.8 Summary of Alternative Development Costs

Each alternative developed offers various options as solutions to airport demands. **Figure 4.13** displays the estimated cost of the development items proposed by each alternative, and takes into account the building demolitions necessary for construction. The costs listed in this report include projects that are anticipated to be covered by federal and state funds as well as local (Third-party) funds. The airport should not assume that it will be responsible for 100% of the costs listed in **Figure 4.13**. The costs listed represent the comparable projects discussed within this chapter and do not take into account any studies or analysis and additional, unrelated projects that could be included in a comprehensive development plan.

Figure 4.13: Alternatives Cost Comparison					
Alternative/Facility	**Alt. #1**	**Alt. #2**	**Alt. #3**	**Alt. #4**	**Alt. #5**
Demolish Buildings	$0	$394,203	$783,531	$888,243	$296,847
Demolish Fuel Farm	$0	$13,350	$13,350	$13,350	$13,350
Demolish Aprons/Pavement	$0	$750,000	$750,000	$1,337,642	$587,642
Demolish Taxiways/Runways	$0	$0	$0	$919,789	$919,789
Land Acquisition for Construction Projects	$0	$0	$12,130,058	$0	$0
Runway 1-19 Extension/Shift	$0	$2,100,000	$6,594,467	$0	$0
RW 1-19 Parallel Taxiway Extension	$0	$0	$7,396,458	$0	$0
Taxiway G Realignment	$0	$5,000,000	$5,000,000	$5,000,000	$5,000,000
Taxiway G Extension	$0	$4,200,000	$4,200,000	$4,200,000	$4,200,000
Hold Apron/De-Icing Facility	$0	$3,800,000	$3,800,000	$3,800,000	$3,800,000
SED Construction:	$0				
Corporate Apron	$0	$2,771,000	$2,771,000	$2,771,000	$2,771,000
Cargo Apron	$0	$6,194,000	$6,194,000	$6,194,000	$6,194,000
GA "Nub" Apron	$0	$6,112,500	$6,112,500	$6,112,500	$6,112,500
New T-Hangars	$0	$2,145,200	$2,145,200	$2,145,200	$2,145,200
New Maintenance Hangars	$0	$3,652,444	$3,652,444	$3,652,444	$3,652,444
New Executive Hangars	$0	$2,246,722	$2,246,722	$2,246,722	$2,246,722
New Corporate Hangars	$0	$14,414,111	$14,414,111	$14,414,111	$14,414,111
New Parking Spaces	$0	$453,000	$453,000	$453,000	$453,000
Aircraft Tie-Downs	$0	$980	$980	$980	$980
New Cargo Building	$0	$7,826,667	$7,826,667	$7,826,667	$7,826,667
SED Access Road	$0	$3,718,000	$3,718,000	$3,718,000	$3,718,000
Tunnel from Access Road to Cargo Apron	$0	$600,600	$600,600	$600,600	$600,600
Total SED Construction Estimate:	**$0**	**$50,135,224**	**$50,135,224**	**$50,135,224**	**$50,135,224**
20,000-SF Maintenance Equipment Storage Facility	$0	$2,968,872	$2,968,872	$2,968,872	$2,968,872
Terminal/Concourse Expansion with Gates	$0	$94,686,573	$68,538,823	$225,991,826	$18,030,597
New Landside Development Area	$0	$0	$0	$13,244,799	$0
New Taxilanes	$0	$0	$0	$1,314,768	$0
Future Fuel Farm	$0	$3,500,000	$3,500,000	$3,500,000	$3,500,000
New Terminal Loop Road	$0	$0	$0	$4,408,047	$0
Road Access Improvements	$0	$50,000,000	$20,000,000	$0	$0
TOTAL	**$0**	**$217,548,222**	**$185,810,783**	**$317,722,560**	**$89,452,321**

4.7 Preferred Alternative: RW 1-19 Shift and SED Area Improvements

The Preferred Alternative for BTV combines elements from the previous five alternatives to create a balanced airport layout that would meet FAA standards, improve safety, and satisfy facility requirements. The preferred alternative recommends a Runway 1-19 extension/shift, as

well as improving landside road access to the airport, and expanding the existing terminal building toward the south.

The Preferred Alternative proposes a 450-foot displacement of the Runway 19 threshold to the northeast, and a 300-foot shift of Runway 1. This would accomplish two things: on the Runway 19 end, the 450-foot threshold displacement would make the runway more prominent to pilots, therefore increasing safety on the airfield; on the Runway 1 end, the 300-foot shift would provide clearance for the new SED access road to be constructed without impeding the safety surfaces on the airfield. The approach to Runway 19 would increase from a 20:1 visual approach to a 34:1 non-precision approach along with the threshold displacement.

The Preferred Alternative recommends a 450-foot displacement of the Runway 19 threshold instead of the 500-foot displacement included in Development Alternative #2 for several reasons, including the fact that the 450-foot shift would allow aircraft sitting at the threshold of Runway 19 to be outside of the Object-Free Area (OFA) for Runway 15-33 without the Runway 15-33 OFA impeding on the ANG Taxiway Foxtrot. This should allow for better coordination for the simultaneous use of both runways. See **Appendix I** for the full analysis.

In addition, the Preferred Alternative includes a concourse expansion of 35,500-square feet toward the southeast. The expansion would provide an additional eight commercial gates to the airport and would optimize the space available for growth by extending at an angle to avoid the Taxilane Alpha OFA, before straightening out again. A Design Group III taxilane would be constructed to provide access into the aircraft parking area. The taxilane would wrap around the concourse so that aircraft could park on either side of the expanded concourse. The inner corner of the expansion could be used for Federal Inspection Services (FIS) or other airport services.

The Preferred Alternative includes a re-alignment and extension of Taxiway Golf in order to create a full, parallel taxiway to serve Runway 15-33.

The SED area would be developed, including a 60,000-square foot cargo building; one 18,500-square foot and one 32,000-square foot corporate hangar buildings and one 60,000-square foot corporate jet center; one 28,000-square foot maintenance hangar building; five 3,700-square foot executive hangar buildings; three, 18,600-square foot t-hangar buildings; and a new, relocated fuel farm. A new 18,000-square yard general aviation apron was constructed in the SED area of the airfield, southeast of the commercial terminal building, in spring 2010. A 20,000-square foot airport maintenance equipment storage building would be constructed to the northwest of the airfield, near the Runway 15 end.

This Alternative would improve road access to the airport through the following measures (See **Figure 4.15**):

- **Exit 14-N**: Interstate-89 is within one-half mile of airport property. The proposed Exit 14-N from I-89 would route traffic coming from the north directly onto a limited access roadway toward the airport terminal. This would allow airport traffic coming from the north to avoid taking Exit 14 onto the already congested Route 2, Williston Road. Based on a September 2005 analysis conducted by the Chittenden County Metropolitan Planning Organization (MPO), 47% of airport users originate from the north, and the majority of these users take Exit 14 onto Route 2 to access the airport. This data suggests that the proposed Exit 14-N would be effective in reducing traffic congestion on Route 2.

- **SED access road**: The limited access road would become an SED access road at the intersection of Kennedy Drive and Route 2, which would provide better access to the SED area for airport users. It is recommended that the intersection of Kennedy Drive and Route 2 become a grade-separated intersection, further reducing congestion in this area.

- **Dual Road System:** A limited access roadway from the airport to I-89 that is separate from the local road network would prevent or discourage cut-through traffic.

- **Terminal Loop:** Circulation around the terminal would be developed in order to provide two-level access to the terminal building. Conceptually this would provide a means to have second-floor ticketing and first-floor baggage claim. An interior loop would provide circulation from the existing parking deck and potential hotel site without rerouting traffic onto other roads.

- **Connections to the Neighborhood:** The road access plan presented in the Preferred Alternative would add cul-de-sacs and enclose roads that currently connect to Airport Drive in order to deter airport through-traffic in the adjacent residential neighborhood. The decision of which roads, if any, from the neighborhood would be connected to a new airport system would ultimately have to be coordinated with the City of South Burlington.

- **Access to Cemetery:** The road alternative in the Preferred Alternative would prioritize maintaining public access to Eldridge cemetery.

- **Green Space Buffer:** A minimum 70-foot green space buffer between the neighborhood and the limited-access road would provide a noise buffer and a physical barrier between the two land uses.

Any road improvement off-airport would require significant coordination with the City of Burlington, VTRANS, and the MPO.

4.7.1 Ultimate Part 77 Surfaces

Primary Surface: The existing, 1,000-foot Runway 15-33 primary surface is unaffected by the changes proposed by the Preferred Alternative. However the existing, 500-foot Runway 1-19 primary surface would shift location as the runway threshold locations shift. This would not result in more penetrations to the Runway 1-19 primary surface, however- the existing penetrations would remain the only obstructions to this surface. The primary surface for Runway 15-33 is penetrated by four objects: the glideslope antennas for both Runways 15 and 33; the glideslope building near the Runway 33 threshold; and an electric utility pole near the intersection of Runway 15-33 and Runway 1-19.

The primary surface for Runway 1-19 is penetrated by the same utility pole as for the Runway 15-33 primary surface.

Approach Surface: The existing 50:1 approach surfaces for Runways 15 and 33 are unaffected by the airfield improvements proposed by the Preferred Alternative. The existing penetrations would remain the only obstructions to these surfaces. The Runway 15 approach is penetrated by numerous trees and by one off-airport building. The Runway 33 approach is penetrated by numerous trees, one pole next to the localizer equipment shelter, and one off-airport building associated with the asphalt plant northeast of the airfield.

The existing 34:1 non-precision approach surface for Runway 1 is impacted by several off-airport trees. The existing 20:1 visual approach surface for Runway 19 is not impacted by any structure. After the runway shift, the number of penetrations to the Runway 1 approach surface will decrease. The approach to Runway 19 will increase from a 20:1 visual to a 34:1 non-precision approach in conjunction with the threshold displacement. As a result of the threshold displacement as well as the lower-sloped and longer approach surface, the number of penetrations to the Runway 19 approach surface will increase from zero to dozens of vegetative obstructions.

Transitional Surface: The transitional surface for the newly extended Runway 19 is penetrated by several trees on both sides of the surface. This is an increase from the zero penetrations to the existing RW 19 transitional surface.

The transitional surface for Runway 1 shifts along with the runway, although no new penetrations to the surface are identified as a result of the shift.

There are no new penetrations to the transitional surfaces of Runways 15 and 33 as a result of the Runway 1-19 shift. Therefore the existing penetrations remain the only obstructions. The existing obstructions to the transitional surface to Runway 15 are numerous trees, two electric utility poles, one on-airport building (the Army Guard building northeast of the Runway 15 threshold), and the Air Traffic Control Tower. The existing obstructions to the transitional surface

to Runway 33 are several trees, one off-airport building associated with the asphalt plant, and two poles from the previous ASR-11 tower site.

4.7.2 Airport Design Analysis

Runway Criteria: The Runway 1-19 extension-shift will result in a net increase in runway length of 150-feet, increasing the runway length from 3,612-feet to 3,762-feet. The orientation and design standards of the runway will not change. The ultimate length of Runway 1-19, 3,762-feet, is sufficient to accommodate small aircraft with less than 10 passenger seats during the hottest months of the year (See **Section 3.4.2**). The runway width of 75-feet meets the FAA design requirement for the smaller general aviation aircraft that operate at the airport. Runway 1-19 appears to be of sufficient length to accommodate the majority of the general aviation and small corporate aircraft fleet under all weather conditions.

The length, orientation, and design standards of Runway 15-33 will not change. The existing length of Runway 15-33, 8,322-feet, meets the minimum runway length requirement of 4,200-feet for a precision approach. The runway width of 150-feet meets the minimum requirements from AC 150/5300-13, *Airport Design*, for Group IV aircraft that are forecasted to use the runway.

As is stated in **Section 3.4.2**, Runway 15-33 has sufficient length to accommodate long-range Boeing 757-type operations and therefore no additional runway length is anticipated. This runway also has sufficient crosswind coverage to accommodate operations by the intended aircraft under all-weather conditions, and also provides the needed crosswind coverage for the smaller general aviation aircraft during Instrument Meteorological Conditions (IMC).

Separation Criteria: The 500-foot runway-centerline to taxiway-centerline separation between Runway 15-33 and the newly realigned and extended Taxiway Golf meets FAA Design Standards for runways used by Category C/D aircraft. The 300-foot runway-centerline to taxiway-centerline separation between Runway 1-19 and Taxiway Alpha meets FAA standards for Group B-II aircraft.

4.7.3 Demand/Capacity Review

This section analyzes the ability of the Preferred Alternative Development Strategy to accommodate the forecasted demand for aircraft storage and the increases in the annual service volumes of the airfield.

Storage Capacity:

The SED area construction will require the demolition of the existing fuel farm as well as the following buildings:

Building 17: Hexagon Hangars (2)

Building 16: Hangar
Building 19: Alert Hangars

This constitutes a loss of approximately 67,000-square feet of hangar space. The fuel farm (Building 7) will be enlarged and relocated adjacent to the new SED access road.

The terminal expansion will require the demolition of the Innotech Hangar and the Montair Building, (Buildings 5 and 6) as well as the General Aviation apron south of the terminal building. This constitutes a loss of 29,000-square feet of hangar space and almost 60,000-square yards of apron space.

In total, this demolition represents a net loss of 96,440-square feet of hangar space and almost 60,000-square yards of apron space. The SED construction will also require the demolition of five on-airport buildings which currently serve as leased commercial and office space.

Even considering these losses, the planned construction will satisfy the facility requirements forecasted for Cargo building square footage, Cargo apron space, T-hangar square footage, and Apron tie-downs in 2030 as was forecasted in Chapters Two and Three of this Master Plan Update. The planned construction will not satisfy the facility requirements forecasted for Executive hangar space, corporate hangar space and Maintenance hangar space in 2030. The main reason for this is the limited amount of space available for construction on the airfield.

4.7.4 Other Considerations

Land Use: The proposed greenspace border separating the airport and the adjacent residential community will require significant land acquisition. All of the land parcels in this area are eligible noise impacted properties for the FAR Part 150 Noise Land Re-Use Plan that was launched in October 2008 (See **Section 1.6**).

Wetlands: The proposed SED access road may impact an area of undeveloped wetlands. Also, a small portion of the proposed Exit 14-N Airport Parkway road design may impact wetland areas. Environmental analysis will be necessary before construction can begin on these projects.

Terminal Area: The comprehensive terminal area development plan adds an additional 100,000-square feet of terminal space to the building. Included in this number are the 35,500-square foot concourse expansion, the new FIS area, and the addition of a partial third-floor for administrative offices.

Figure 4.14: Preferred Alternative Cost	Cost
Demolish Buildings	$394,203
Demolish Fuel Farm	$13,350
Demolish Aprons/Pavement	$750,000
Runway 1-19 Extension/Shift	$2,100,000
Taxiway G Realignment	$5,000,000
Taxiway G Extension	$4,200,000
Hold Apron/De-Icing Facility	$3,800,000
SED Construction	$50,135,224
20,000-SF Maintenance Equipment Storage Facility	$2,968,872
Terminal/Concourse Expansion with Gates	$94,686,573
Future Fuel Farm	$3,500,000
Road Access Improvements (including 14-N)	$50,000,000
TOTAL	**$217,548,222**

LEGEND

- = AIRPORT PROPERTY LINE
- = PRIMARY SURFACE
- = RUNWAY SAFETY AREA
- = RUNWAY PROTECTION ZONE
- = WETLANDS
- = NEW BUILDINGS TO MEET DEMAND
- = EXISTING BUILDINGS
- = TO BE DEMOLISHED
- = PROPOSED CONSTRUCTION
- = CONSTRUCTION COMPLETED 2010

FUTURE RW 19 RPZ
ARC-A/B, NON-PRECISION > 1
500'X1,000X700'

ARMY GUARD APRON/BLDGS

VT AIR NATIONAL GUARD

RUNWAY 1-19
450-FT EXTENSION

ULTIMATE RUNWAY 1-19 (3,762' X 75')

EXISTING RUNWAY 15-33 (8,322' x 150')

EXTENDED TAXIWAY G

REALIGNED TAXIWAY G

GA APRON
COMPLETED 2010
(±18,000-SY)

FUTURE
FUEL FARM

CORPORATE
JET CENTER
(±60,000-SF)

MAINTENANCE
HANGAR
(±28,000-SF)

CARGO APRON
CONSTRUCTION
(±38,000-SY)

CORPORATE
HANGAR
(±32,000-SF)

CARGO BUILDING
(±60,000-SF)

5 EXECUTIVE HANGARS
(EACH ±3,700-SF)

T-HANGAR BUILDING
DEVELOPMENT
(EACH ±18,600-SF)

CORP.
HANGAR
(±18,500-SF)

CORP.
APRON
(±17,000-SY)

FUTURE EXIT 14-N
AIRPORT PARKWAY

LIMITED
ACCESS ROAD

AIRPORT MAINTENANCE
BUILDING (±20,000-SF)

EXISTING PARKING GARAGE

EXISTING TERMINAL BUILDING

CONCOURSE EXPANSION
± 35,500-SF

RUNWAY 1-19
300-FT SHIFT

GRADE-SEPARATED
INTERSECTION
RECOMMENDED

CEMETERY

GRAPHIC SCALE
500 0 250 500 1000 2000
(IN FEET)
1 inch = 1000 ft.

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BURLINGTON INTERNATIONAL AIRPORT
VISION 2030 MASTER PLAN UPDATE

FIGURE 4.15
Preferred Development Alternative