EDWARD F. KNAPP STATE AIRPORT (MPV)

Airport Master Plan
DRAFT

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VERMONT
AGENCY OF TRANSPORTATION

Prepared By:

CHA

CHAPTERS

FIGURES

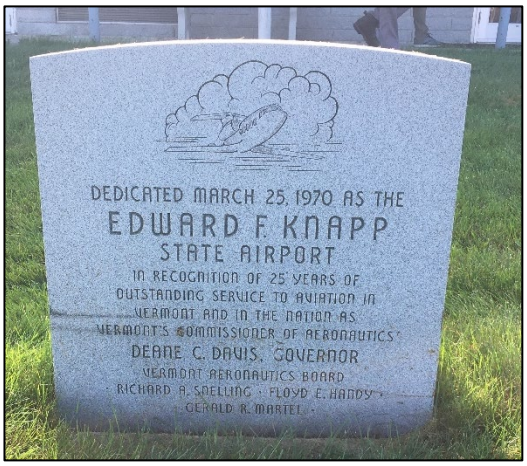
TABLES

1 INTRODUCTION & INVENTORY

Understanding the background of an airport and the region it serves is essential to making informed decisions pertaining to airport-related improvements. Therefore, to develop a well-rounded understanding of the Edward F. Knapp State Airport ('MPV' or 'the Airport'), an inventory of key airport elements was conducted and discussed in the subsequent sections.

1.1 INVENTORY OF EXITISTING CONDITIONS

The Edward F. Knapp State Airport, originally named the Barre-Montpelier Airport, was initially constructed in 1929 with a turf airstrip allowing aircraft to land and depart from virtually any direction. In 1935 the Airport was acquired by the municipalities of Barre and Montpelier, which later constructed two paved runway, each 2,200 feet long and 100 feet wide, through Works Progress Administration funding. In the following decades, several airfield improvements were made including runway extensions and widening as well as installation of airfield lighting and nearby obstruction lights. In the late 1960s, the State of Vermont assumed ownership of the Airport and, in 1970, rededicated the facility as the Edward F. Knapp State Airport in honor of the State's first aeronautics director. [1]



Since the early days of the Airport, several air carriers have operated out of MPV including both passenger and air freight services. However, passenger airline service was discontinued at Airport in 1989. Vermont Flying Service continues to remain as the Airport's longest running Fixed Base Operator, having begun in 1946. [1]

1.2 AIRPORT ROLE

MPV is a public-use airport owned by the State of Vermont and maintained by the Vermont Agency of Transportation (VTrans). According to the Federal Aviation Administration's (FAA) *2021 – 2025 National Plan of Integrated Airport Systems (NPIAS)* report, MPV is designated as a General Aviation (GA) airport and is currently classified with a role of "regional". As defined within the NPIAS, a regional airport, "*supports regional economies with interstate and some long-distance flying and has high levels of activity, including some jets and multiengine propeller aircraft*."

[1] Turner, Richard. (2011). *From Barre-Montpelier to E.F. Knapp: The Story of a Small Airport in Berlin, Vermont*. Concord, N.H.: Town and Country Reprographics

Additionally, MPV is classified as a Category 3 airport within the Vermont Airport System Plan (VASP). According to the VASP, Category 3 airports, *"can accommodate jet activity during a broader range of weather conditions and offer greater variety of facilities and services than Category 2 Airports that can service a more diverse base of regular operators and aircraft."* For Category 3 airports, the VASP lists the following minimum service level standards:

- A primary runway of at least 5,000 feet in length
- Self-serve fuel (both 100LL and Jet-A)
- Full-time airport manager and operations staff
- A full-service Fixed Base Operator (FBO)
- Runway and taxiway edged lighting
- A GPS instrument approach procedure providing vertical guidance
- A terminal building
- Own/operate snow removal equipment
- Aircraft and avionics maintenance services
- A rotating beacon
- On Site Concessions or Restaurant
- Precision Instrument Approach (ILS /CAT I)
- Rental car availability

Subsequent sections of this Master Plan will review each recommendation in relation to existing services and facilities available at MPV.

1.3 AIRPORT LOCATION & STATE TRANSPORTATION NETWORK

MPV is located within the Town of Berlin, approximately four miles south of the City of Montpelier and three miles west of the City of Barre. The Town of Berlin, the City of Montpelier, and the City of Barre are located within Washington County and situated approximately 40 miles southeast of Burlington, VT.

The Airport is accessible on the ground via Interstate 89 and Vermont State Route 62. The Airport also falls within the service area of Green Mountain Transit (GMT), which provides public transit service throughout portions of central Vermont. GMT Route 81 follows a portion of Airport Road, north of MPV, with the "East View Lane" stop located approximately 0.5 miles north of the Airport terminal Building.

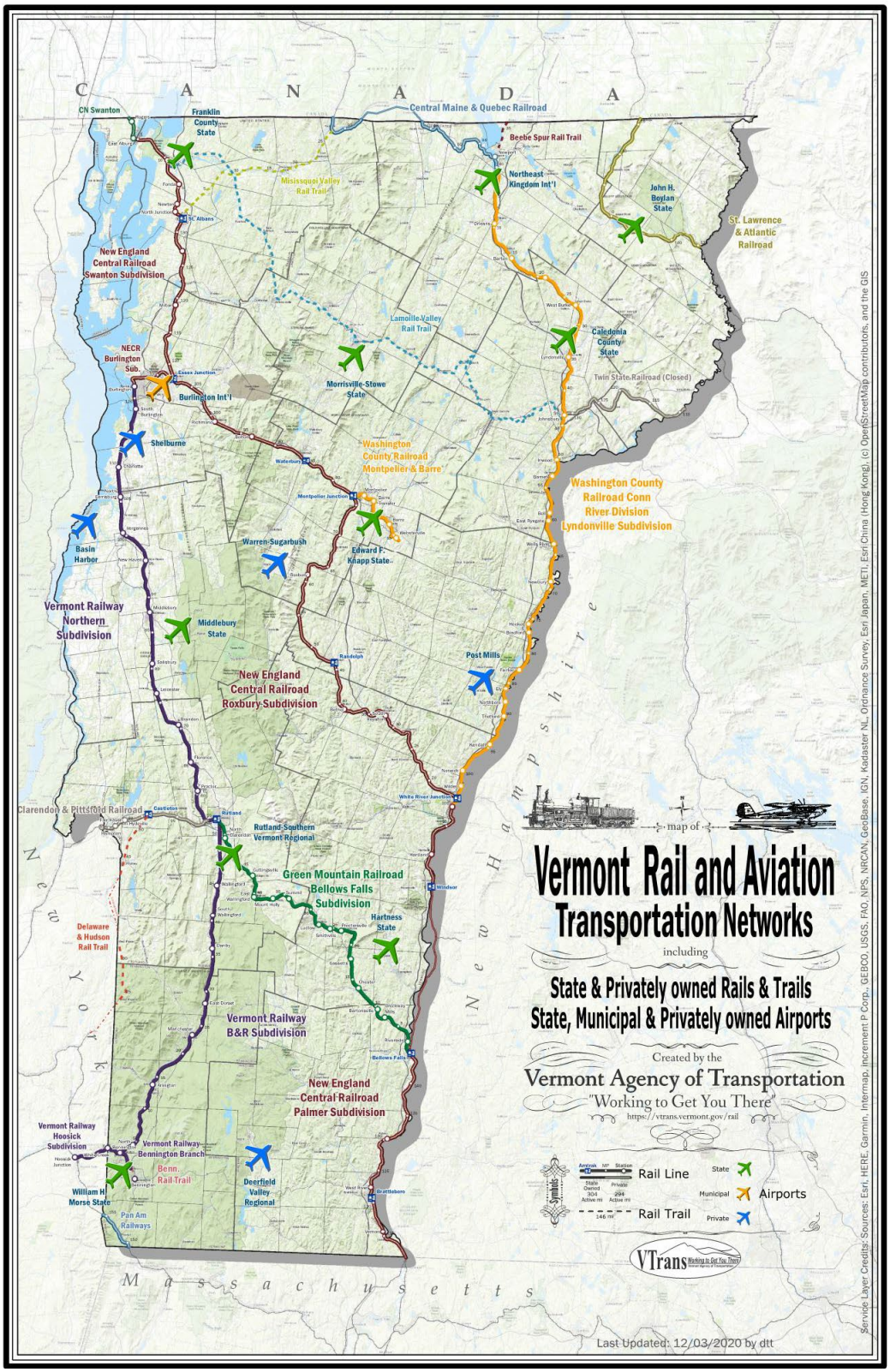
Figure 1-1 depicts the location of MPV respective to the State of Vermont and the Washington County region.

Figure 1-1 – MPV Location

Source: CHA, 2021.

In addition to owning and maintaining a network of airports within the State of Vermont, VTrans also ensures safe and efficient transportation of people and goods through the State's railway infrastructure **Figure 1-2** depicts the agency's network of airports along with the State's railway system.

Figure 1-2 – Vermont Rail & Aviation Transportation Networks

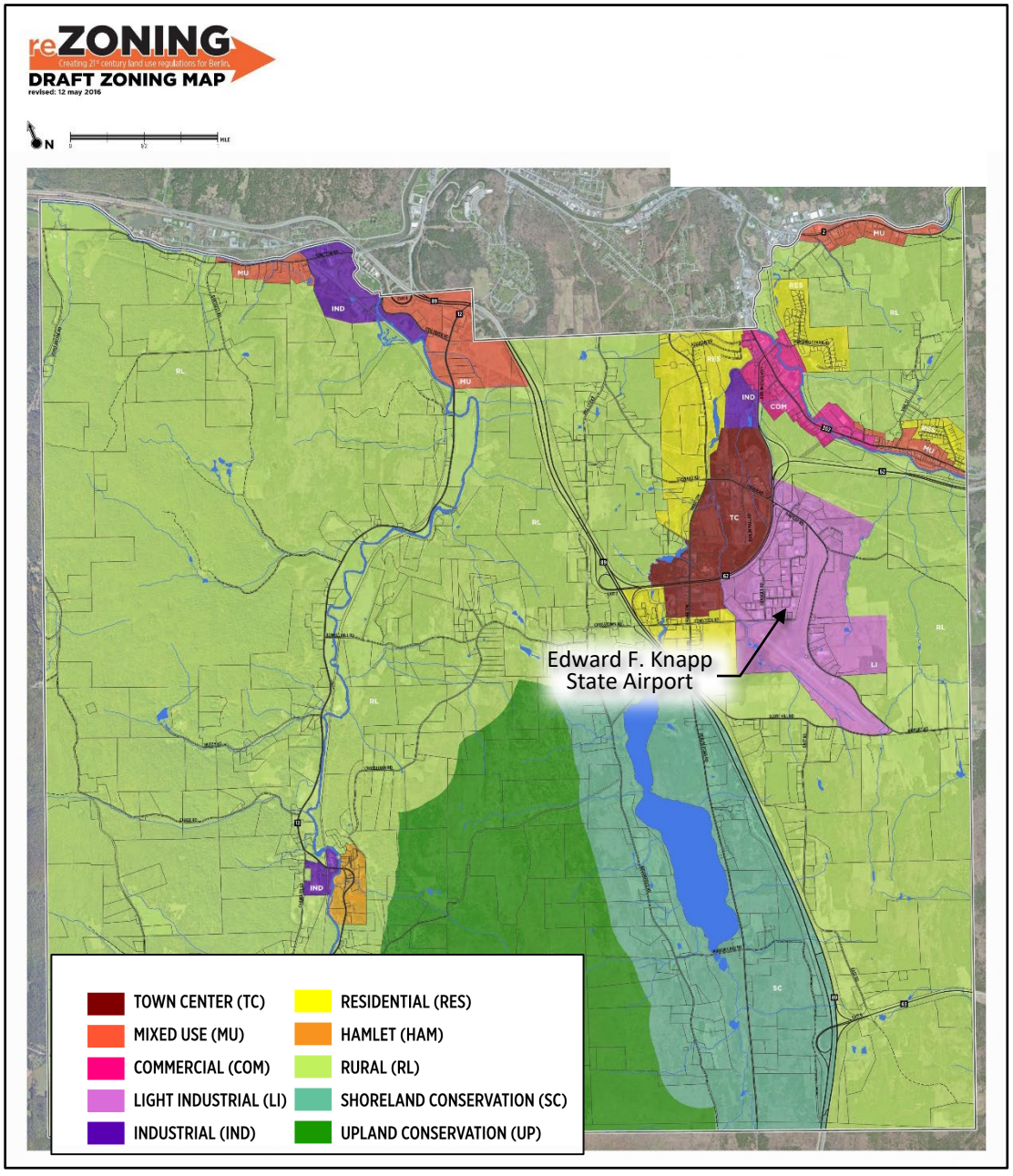


Source: Vermont Agency of Transportation.

1.3.1 Local Zoning & Airport Overlay Districts

Within the Berlin town limits, MPV and portions of the adjacent property parcels are zoned as "light industrial" as show on **Figure 1-3**. According to the Town of Berlin's Zoning Regulations, a light industrial district, "*encourages a wide range of industrial and commercial enterprises at low densities while maintaining the rural character of the surrounding area and protecting adjacent residential neighborhoods from adverse impacts associated with incompatible uses*." The area which surrounds the Airport is zoned town center, rural, and residential respectively.

Figure 1-3 – Berlin Zoning

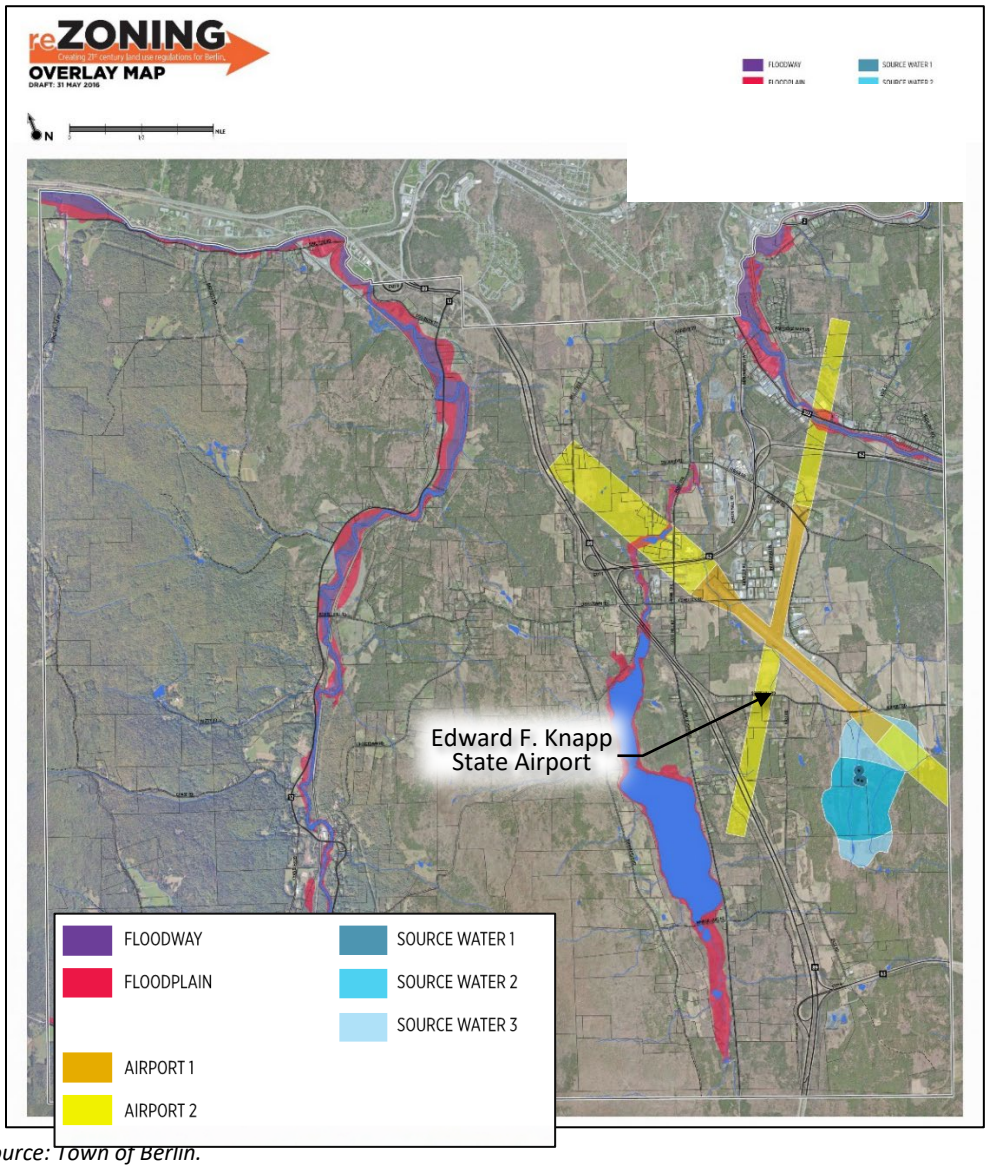


Source: Town of Berlin.

Additionally, the *Berlin Land Use and Development Regulations* identifies Airport Overlay (AIR) Districts (**Figure 1-4)** over each runway and runway approach corridor at MPV. As stated within the regulations, the AIR districts are intended to ensure, "*a compatible relationship between the airport and other development in the vicinity*." Specifically, the AIR districts establish:

- ***Height Limitations:*** Prohibits landowners from installing structures or allowing vegetation to grow in excess of a height that would interfere with airport operations.
- ***Land Use Regulation:*** Prohibits land uses that would generate electrical or magnetic interference; smoke, steam, dust, or air emissions; light or glare impairment; wildlife attractants; or any land uses that would endanger the landing and departure of aircraft.

Figure 1-4 – Airport Overlay (AIR) District



Source: Town of Berlin.

1.3.2 Area Plan Study Goals

MPV serves both Barre and Montpelier residents within its reach, providing economic, recreational, and transportation-related benefits to the surrounding communities. In this role, the Central Vermont Regional Planning Commission (CVRPC) lists nine planning goals, which can relate to area transportation planning:

- ***Goal 1:*** Enable the transportation system to operate at its highest efficiency by managing travel demand and encouraging shifts to under-utilized and more efficient travel modes.
- ***Goal 2:*** To integrate modes of travel in order to allow for their most effective use and ultimately reduce dependence on single occupant vehicles.
- ***Goal 3:*** To make necessary improvements to achieve a transportation system appropriately structured and designed to move goods and people safely, effectively, and economically.
- ***Goal 4:*** To promote a regional transportation system that preserves and enhances residential and economic development potential in growth areas. 2

The Town of Berlin also established goals for MPV in its 2018 Master Plan. The plan itself seeks to establish the groundwork for MPV to maintain its current state, evolve physical space/ services, and transform surrounding infrastructure to better benefit area citizens.[3] In addition, the plan also mentions the potential for higher density development of the surrounding land that could facilitate future area growth.

1.4 AIRPORT FACILITIES

A primary role of master planning is developing a detailed listing of recommended facilities and improvements for implementation over the 20-year planning period. As such, the first step in this process is to compile an inventory of existing facilities and to review their current condition.

Airport facilities are often described as either airside or landside, depending upon the type of operation they support. Airside facilities are those related to the landing, takeoff, and taxiing of aircraft in the airport environment. Examples of airside facilities include: the runway and taxiway system; airfield lighting, marking and visual aids; and aircraft parking and apron areas. Landside facilities are those related to the transition from air to ground movement or vice versa. Examples of landside facilities include: the airport terminal building, aircraft refueling area, aircraft storage, and vehicle parking. **Figure 1-5** depicts the existing airfield infrastructure.

[2] Source: CVRPC (https://centralvtplanning.org/wp-content/uploads/2012/03/CVRPC%20Regional%20Transportation%20Plan.pdf)

[3] Source: Town of Berlin (http://www.berlinvt.org/wp-content/uploads/2014/09/Berlin-Plan-2018-08-14.pdf)

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EDWARD F. KNAPP STATE AIRPORT MASTER PLAN UPDATE

GRAPHIC SCALE (FEET)

0 250 500 1000

LEGEND

Airport Property Boundary

On-Airport Building

RUNWAY 5-23 (3,001' X 75')

RUNWAY 17-35 (5,000' X 100')

H G F A E E D C B A

Figure 1-5
Existing Airfield Infrastructure

1.4.1 Airside Facilities

1.4.1.1 Runways

MPV operates under a dual-runway system. Runway 17-35, oriented northwest-southeast, serves as the primary runway and is 5,000 feet long by 100 feet wide. The runway is constructed of asphalt and is listed in good condition. The runway's load-bearing capacity is estimated at 31,000 pounds for single-wheel aircraft and 70,000 pounds for double-wheel aircraft. The runway maintains precision markings for the Runway 17 ILS approach and non-precision markings on the Runway 35 approach, with all markings being in good condition. The Runway 35 approach end has a 502-foot displaced threshold, with a portion of the runway end recently rehabilitated to ensure a published runway length of 5,000 feet. There are no published Declared Distances for the runway.

Runway 5-23, oriented northeast-southwest, serves as a crosswind, visual-only runway 3,001 feet long by 75 feet wide. It is primarily used by single-engine aircraft with a restriction of less than 10 passenger seats. Additionally, Runway 5-23 is plowed in the winter (although it is the last area to be plowed so it may remain snow covered for several days after a storm). **Table 1-1** presents the characteristics of the runway.

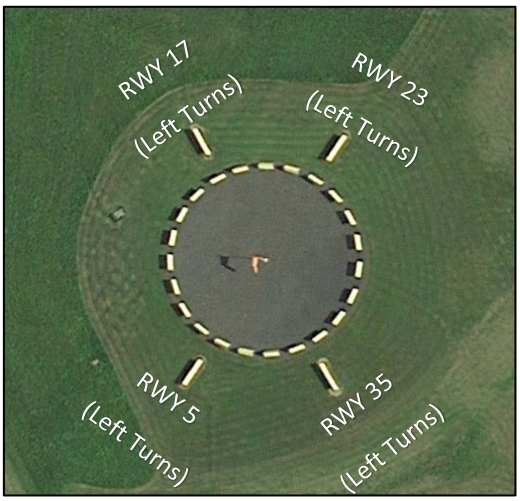
Table 1-1 – MPV Runways

Runway Feature	Runway 17-35	Runway 5-23
Length	5,000'	3,001'
Width	100'	75'
Displaced Threshold	502'	N/A
Pavement Type	Asphalt – Good Condition	Asphalt – Good Condition
Pavement Strength	31,000 lbs. Single-Wheel 70,000 lbs. Double-Wheel	30,000 lbs. Single-Wheel 46,000 lbs. Double-Wheel
Gradient	1.48%	1.01%
Edge Lighting	MIRL	MIRL
Approach Instrumentation	RWY 17 - Precision RWY 35 – Non-Precision	Visual
Approach Lighting	RWY 17 – MALSR	-
Approach Aids	RWY 17 – PAPI-4	-
Runway Markings	RWY 17 – Precision RWY 35 – Non-Precision	Basic

1.4.1.2 Visual Aids & Lighting

An airport's rotating beacon light universally indicates the location and presence of an airport. MPV's beacon is equipped with an optical system that projects two beams of light (one green and one white), 180 degrees apart. Additionally, operation of the beacon during daylight hours

may indicate the airport is under Instrument Meteorological Conditions (IMC). MPV's rotating beacon is located west of Airport Road, adjacent to the airport terminal building.



A segmented circle is a 100-foot diameter circular area sited at an airport that aids pilots in locating the wind cone (i.e., windsock) and direction of the traffic pattern. MPV's segmented circle is located east of Runway 17-35 and southwest of the Runway 5 end. All runway ends have a standard left-hand traffic pattern. A wind cone is located in the center of the segmented circle, which provides pilots general wind direction and speed.

Runway 17 is equipped with a 4-box Precision Approach Path Indicator (PAPI) located on the left side of the runway along with a Medium Approach Light System with Runway Alignment Indicator Lights (MALSR) to accompany the Runway 17 Instrument Landing System (ILS). The MALSR consists of a combination of threshold lamps, steady burning light bars and flashers. The system is used to provide visual information to pilots on runway alignment, height perception, roll guidance, and horizontal references during Category I precision instrument approaches.

Both Runway 17-35 and Runway 5-23 are equipped with Medium Intensity Runway Lights (MIRLs).

1.4.1.3 Runway Markings & Instrument Approach Procedures

Runway markings denote runway direction, type of approach associated with the runway (e.g., visual, non-precision, precision), runway width, and provide aiming guidance to pilots. Currently, Runway 17 has precision markings in good condition and Runway 35 has non-precision markings in good condition. Runway 5-23 has basic markings in good condition.

Precision Markings in red brackets; Non-Precision Markings in orange brackets.

RNAV (GPS) Approaches

An RNAV (Area Navigation) approach is a non-precision, GPS-based Instrument Approach Procedures (IAP) that utilizes satellite technology to provide aircraft navigation to the runway

environment. This type of approach is widely used, as RNAV (GPS) approaches do not require ground-based navigational equipment.

The Runway 17 RNAV (GPS) provides both lateral and vertical guidance whereas the Runway 35 RNAV (GPS) only provides lateral guidance.

Instrument Landing System

Runway 17 is also equipped with a Category I Instrument Landing System (ILS). ILS approaches utilize ground-based navigational equipment (e.g., a localizer and glideslope antennas) to provide both lateral and vertical guidance to the runway. An ILS is considered a precision IAP and generally provides lower landing visibility minimums than most non-precision and/or GPS-based approaches.

Additionally, the ILS approach can also be performed using only lateral navigation guidance provided by the localizer. Pilots must refer to the respective IAP chart when performing a localizer-only approach to ensure minimum landing visibility is maintained.

Table 1-2 lists the minimums for each IAP at MPV.

Table 1-2 – MPV Approach Procedures

Approach Procedure	Category A		Category B		Category C		Category D	
	Minimum Ceiling (AGL)	Minimum Visibility (MI)	Minimum Ceiling (AGL)	Minimum Visibility (MI)	Minimum Ceiling (AGL)	Minimum Visibility (MI)	Minimum Ceiling (AGL)	Minimum Visibility (MI)
RWY 17 – RNAV (GPS) / LPV	1509	¾	1509	¾	1509	¾	1509	¾
LNAV/VNAV	1624	1 ¼	1624	1 ¼	1624	1 ¼	1624	1 ¼
LNAV MDA	1680	¾	1680	¾	1680	1 ¼	1680	1 ¼
Circling	1900	1 ¼	1980	1 ½	2700	3	2920	3
RWY 17 – ILS / S-ILS	1486	¾	1486	¾	1486	¾	1486	¾
S-LOC	2980	1 ¼	2980	1 ½	2980	3	2980	3
Circling	2980	1 ¼	2980	1 ½	2980	3	2980	3
RWY 35 – RNAV (GPS) / LNAV MDA	1940	1	1940	1 ¼	1940	2 ½	1940	2 ½
Circling	1980	1 ¼	1980	1 ¼	2700	3	2920	3

Source: FAA Terminal Procedures Publication
AGL – Above Ground Level (Feet)
MI – Statute Mile

Alternate Minimums & Departure Procedures

An alternate airport is often required during instrument flight planning. Before an airport can be listed as an alternate, it must meet minimum runway and IAP criteria. While the FAA specifies standard alternate airport minimum criteria, some airports have non-standard minimums or IAPs that are not authorized for use when selecting an alternate airport. Each of the IAPs at MPV are currently not authorized for use as an alternate.

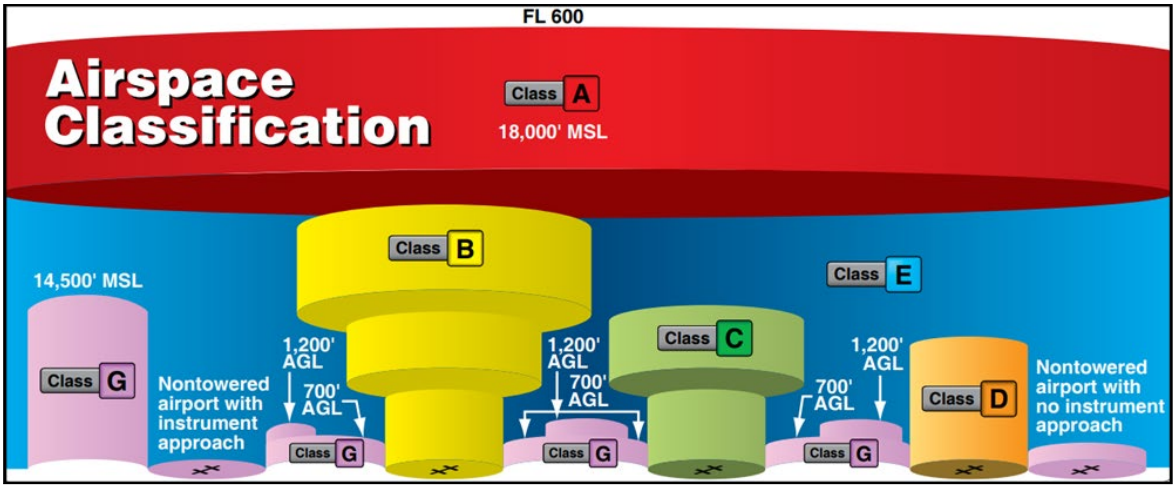
Furthermore, when a runway contains objects that penetrate the 40:1 Departure Surface, a Departure Procedure may be evaluated. A Departure Procedure may reduce the runway takeoff distance available, require non-standard aircraft climb rates, or require non-standard departure minimums. All runway ends have Departure Procedures in place to ensure obstacle avoidance. Pilots must refer to the respective IAP chart to ensure their aircraft can perform the Departure Procedure.

1.4.1.4 Airspace

There are two types of aircraft flight operations in the National Airspace System (NAS): Visual Flight Rules (VFR) and Instrument Flight Rules (IFR). VFR operations rely on pilots maintaining visual separation from aircraft and objects and require minimum weather conditions for operation. Conversely, IFR operations rely on radar detection, instrument navigation, and separation by Air Traffic Control (ATC). IFR flights permit operations below VFR weather minimums (i.e., during IMC). As discussed above, Runway 17-35 has published IAPs.

The NAS classifies airspace uses a lettering-system (e.g., Class A, B, C, D, E, and G) and includes controlled and uncontrolled areas of airspace. Class A airspace is a controlled airspace and is generally reserved for business and commercial aircraft as it begins at 18,000 feet above Mean Seal Level (MSL). Class A airspace requires operation under IFR flight plan and communication with ATC. The Class B, C, and D airspaces are also considered controlled airspace and are generally centered around larger airports. Communication with ATC must be established prior to entering the Class B, C, or D airspaces. The Class E and G airspaces encompass the majority of the NAS's airspace below 18,000 feet MSL. Class E airspace can be either controlled or uncontrolled, depending on the type of operation (i.e., VFR or IFR). Class G airspace is always uncontrolled. **Figure 1-4** depicts the National Airspace System.

Figure 1-6 – National Airspace System

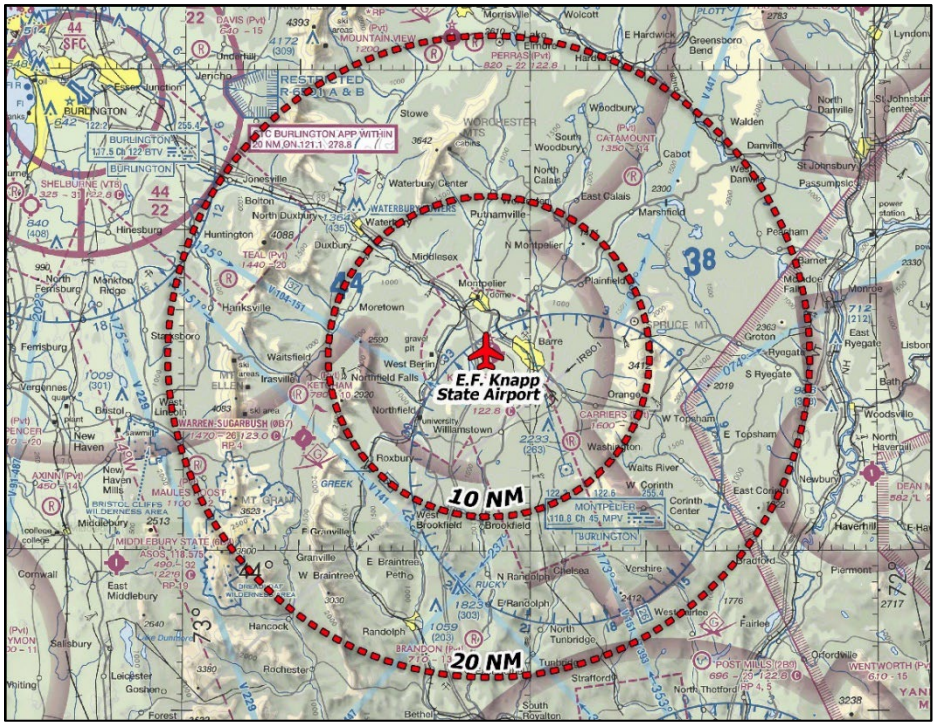


Source: Chapter 15, *FAA Airplane Flying Handbook*

Most non-towered GA airports are located within Class G airspace extending from the ground to either 700 feet or 1,200 feet above ground level where it then becomes Class E airspace. In some locations, however, Class E begins at the surface and extends vertically to 18,000 feet mean sea level.

As denoted by the dashed magenta line around the Airport on **Figure 1-5,** MPV is located within Class E airspace extending from the ground to 18,000 feet mean sea level. Although communication with Air Traffic Control (ATC) is not required within Class E airspace, the airspace is considered controlled. Aircraft must adhere to weather minimums specific to each class of airspace.

Figure 1-7 – MPV Airspace



Source: FAA Sectional Aeronautical Chart, CHA, 2021.

1.4.1.5 Taxiways

An airport's system of taxiways provides aircraft with connectivity between the runways, aircraft parking aprons, storage hangars, and other facilities. **Figure 1-5** depicts the following taxiway system at MPV:

- **Taxiway 'A'** is a full-length parallel taxiway serving both ends of Runway 17-35. The taxiway is 35 feet in width, meeting standards for Taxiway Design Group (TDG) 2. The northern and southern portions of the taxiway were constructed in 2009 and consist of both standard and non-standard runway to taxiway separation. The northernmost portion of Taxiway 'A' is located approximately 450 feet from the Runway 17-35 centerline to ensure clearance from the ILS glideslope/critical area. Additionally, a portion of Taxiway 'A' (from Taxiway D to C) is located approximately 220 feet from the Runway 17-35 due to the rising terrain within the Upper Apron.
- **Taxiway 'B'** is a connector taxiway providing direct access between Taxiway 'A' and the Tie Down Apron. The Taxiway is designed for TDG 2 standards.
- **Taxiway 'C'** is a connector taxiway providing access between Taxiway 'A' and Runway 17-35, and the Upper Apron. The taxiway is 40 feet in width, exceeding FAA standards for TDG 2.
- **Taxiway 'D'** is a connector taxiway providing access between Taxiway 'A' and Runway 17-35, and the FBO Apron. The taxiway is 50 feet in width, exceeding FAA standards for TDG 2.
- **Taxiway 'E'** is a connector taxiway providing access between Taxiway 'A' and Runway 17-35, and subsequently the Terminal Apron. The taxiway is 35 feet in width, meeting the standards for TDG 2. Taxiway E was constructed in 2009 during the Taxiway 'A' extension project described previously.
- **Taxiway 'F' & 'H'**, combined, serve as a partial parallel taxiway for Runway 5-23, with a connection on the Runway 5 end. The taxiway is 35 feet in width, meeting FAA standards for TDG 2. The southern portion (Taxiway 'F') is located approximately 150 feet from the Runway 5-23 centerline. The northern portion (Taxiway 'H') is located approximately 240 feet from the Runway 5-23 centerline due to previous FAA standards prior to the narrowing of Runway 5-23 to 75 feet in width.
- **Taxiway 'G'** is a connector taxiway providing access between Taxiways 'F' and Taxiway 'H', and Runway 5-23. The taxiway is approximately 35 feet in width, meeting FAA standards for TDG 2.

1.4.1.6 Aprons

Airport aprons, also referred to as ramps, provide space for short-term and long-term aircraft parking, as well as the loading/unloading of passengers and goods. There are a total of five apron areas located throughout MPV:

- **Terminal Apron:** Located immediately south of the Runway 5 end and adjacent to Taxiway 'E', the terminal apron was rehabilitated and expanded during the 2009 construction project. The apron consists of approximately 66,000 square feet of pavement. The Airport Terminal Building and the self-serve fuel station are located along the eastern edge of the apron. The apron is accessible via Taxiways 'A' and 'E'.
- **FBO Apron:** The FBO Apron is connected directly to and south of the Terminal Apron and consists of approximately 66,000 square feet of pavement. Four hangars are located toward the southern portion of the apron, with the northern portion providing space for seven aircraft tie-down locations capable of accommodating small single- and twin-engine piston aircraft. The FBO Apron is accessible via Taxiways 'A' and 'D'.
- **Upper Apron:** The Upper Apron is located southeast of the FBO Apron and consists of two subsections: a northern and southern section bisected by Taxiway 'C'. The northern subsection is approximately 43,000 square feet of pavement providing aircraft tie-down parking. However, the pavement within the northern portion of the apron (approximately 32,800 square feet) has deteriorating and is unusable for aircraft operation. This area is demarcated by traffic cones. The southern subsection contains two hangars with approximately 17,000 square feet of pavement for aircraft staging. The Upper Apron is accessible via Taxiways 'A' and 'C'.
- **Tie-down Apron:** The Tie-Down Apron is located is the southernmost apron area at MPV and consists of approximately 32,000 square feet of pavement and 12 aircraft tie-down positions accommodating small single- and twin-engine piston aircraft. The Tie-down Apron is accessible via Taxiway 'A'.
- **Jet Apron**: The Jet Apron is located directly west of the Runway 5 end and consists of approximately 69,000 square feet of pavement. The apron is used to park jet, or turbine, aircraft when spacing within Terminal and/or FBO apron is limited. There are currently no tie-down spaces within the Jet Apron. Additionally, the Jet Apron is also used for temporary staging of airfield maintenance equipment. The Jet Apron is accessible via Taxiways 'F' and 'E'.

Figure 1-6 depicts each apron area, and **Table 1-3** provides a breakdown of each area's space.

Figure 1-8 – Apron Areas

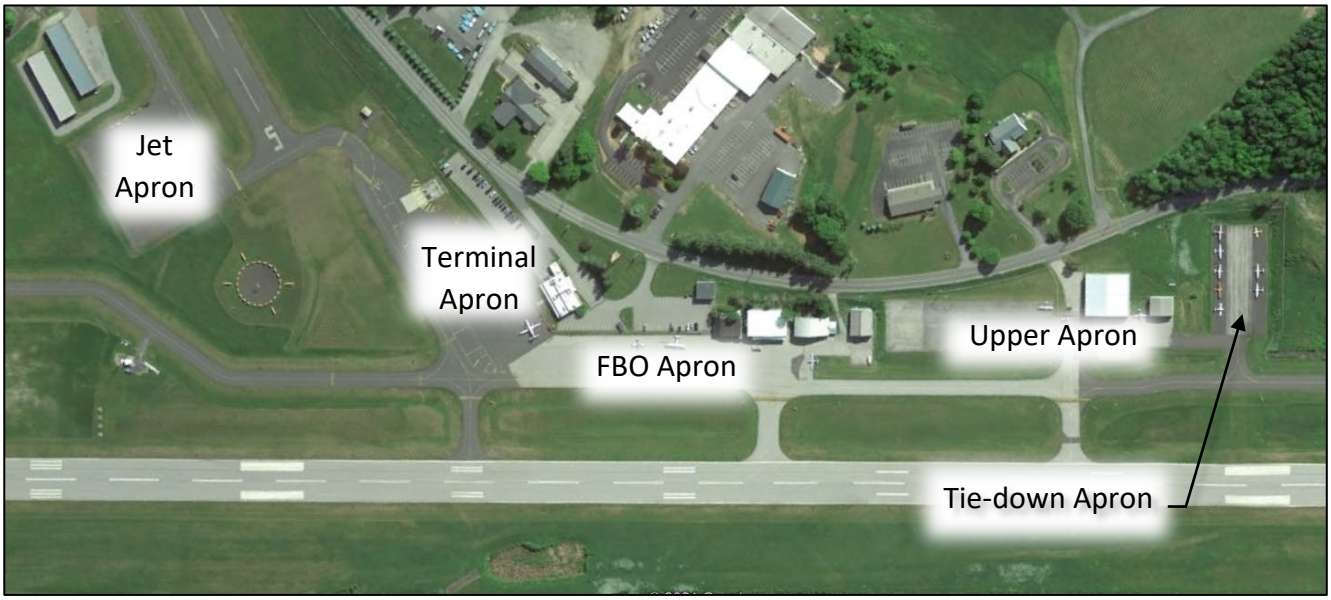


Table 1-3 – Apron Areas

Apron Area	Area (SF)
Terminal Apron	66,000
FBO Apron (7 Tie-Downs)	66,000
Upper Apron (Currently closed due to disrepair)	60,000
Tie Down Ramp (12 Tie Downs)	32,000
Jet Apron	69,000

Source: CHA, 2021

1.4.1.7 Automated Surface Observing System

An Automated Surface Observing System (ASOS) provides pilots with current meteorological conditions, such as wind speed, direction, and cloud ceiling. An ASOS at MPV is located adjacent to the Runway 17 glide slope antennae, west of the segmented circle. The ASOS is maintained by the National Weather Service (NWS) and the Department of Defense (DOD). ASOS weather data is uploaded directly in the NWS database and available for public review. Additionally, updated meteorological information can be accessed via the ASOS radio frequency (132.675) and via phone (802-229-2037).

1.4.2 Landside Facilities

As previously discussed, landside facilities are those related to the transition from air to ground movement or vice versa. Examples of landside facilities include: the airport terminal building, aircraft refueling area, aircraft storage, and vehicle parking.

1.4.2.1 Airport Buildings

There are a total of 14 buildings at MPV consisting of aircraft hangars, storage facilities, and office space. The majority of the buildings are privately owned and operated, including the FBO building owned by Vermont Flying Service. **Table 1-4** lists the on-airport buildings along with their approximate area.

Table 1-4 – MPV Buildings

No.	Building Type	Description	Area (SF)
1	Terminal Building	Currently leased to private firm	6,600 SF
2	Cold Storage Garage	3-bay garage; storage for off-season equipment	1,600 SF
3	Fixed Based Operator Hangar	FBO Office and Hangar; base for aircraft maintenance services	3,200 SF
4	Cold Storage Hangar	Currently leased to FBO	5,600 SF
5	Private Hangar	Currently owned by private firm (same firm as terminal building)	4,500 SF
6	Civil Air Patrol Hangar	Currently owned by Civil Air Patrol	3,000 SF
7	FBO Hangar	Cold storage hangar owned by FBO	9,800 SF
8	Private Hangar	Privately owned hangar	2,300 SF
9	T-Hangar	4-unit T-Hangar	6,900 SF
10	T-Hangar	4-unit T-Hangar	7,700 SF
11	Private Hangar	Privately owned hangar	2,900 SF
12	Private Hangar	Privately owned hangar	5,100 SF
13	T-Hangar	3-unit T-Hangar	5,000 SF
14	VTrans Building (Offices and Hangar)	Hangar space leased to private user; used for SRE storage	13,500 SF

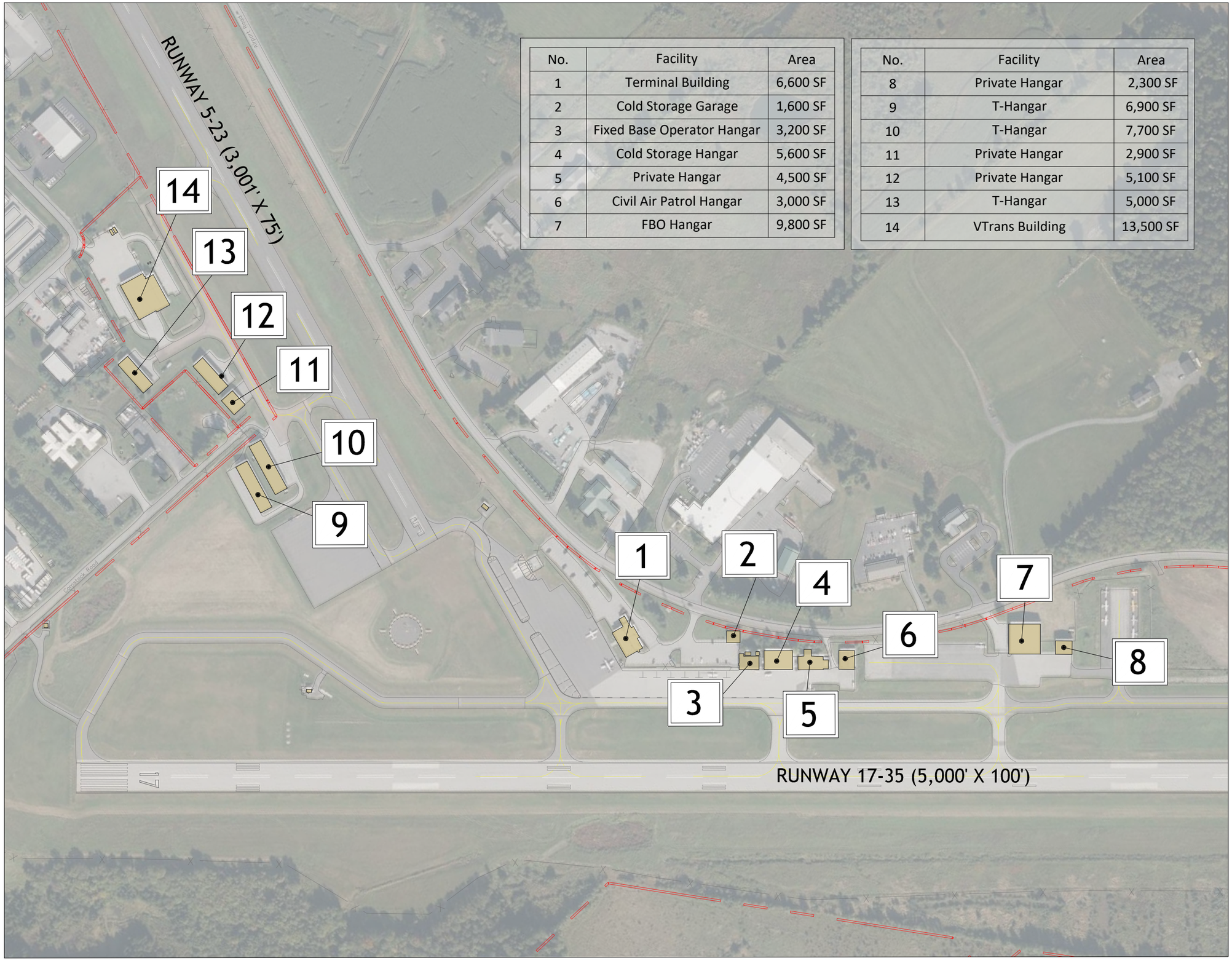
Source: VTrans, CHA, 2020.

1.4.2.2 Aircraft Refueling

Both 100-LL and Jet A fuel is available at MPV through two underground 10,000-gallon fuel tanks storage tanks operated by Vermont Flying Service. The refueling pumps are located in the northern portion of the Terminal Apron

1.4.2.3 Airport Security

Many GA airports have limited security procedures and rely heavily on the flying community to report suspicious or hazardous activity. The Facility Requirements portion of this master plan will further discuss general recommendations regarding existing security practices and procedures in accordance with the Transportation Security Administration's (TSA) Airport Characteristics Measurement Tool. The Airport currently has full perimeter fencing.



No.	Facility	Area
1	Terminal Building	6,600 SF
2	Cold Storage Garage	1,600 SF
3	Fixed Base Operator Hangar	3,200 SF
4	Cold Storage Hangar	5,600 SF
5	Private Hangar	4,500 SF
6	Civil Air Patrol Hangar	3,000 SF
7	FBO Hangar	9,800 SF

No.	Facility	Area
8	Private Hangar	2,300 SF
9	T-Hangar	6,900 SF
10	T-Hangar	7,700 SF
11	Private Hangar	2,900 SF
12	Private Hangar	5,100 SF
13	T-Hangar	5,000 SF
14	VTrans Building	13,500 SF

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EDWARD F. KNAPP STATE AIRPORT MASTER PLAN UPDATE

GRAPHIC SCALE (FEET)

0 150 300 600

LEGEND

Airport Property Boundary

On-Airport Building

Figure 1-9
MPV Buildings

1.5 EXISITING AIRPORT ACTIVITY

An aircraft operation is defined as either a landing or a takeoff. Thus, each flight includes at least two operations; one takeoff and one landing. According to the 2021 FAA Terminal Area Forecast (TAF), there were approximately 10,300 annual operations at MPV in 2020, which amounts to an average of 14 landings per day. Of that total, operations consisted of approximately 20% itinerant and 80% local according to the 2021 TAF. Local operations are flights originate at MPV and generally stay within the airport vicinity, conducted mostly by based aircraft, and primarily include single- and multi-engine piston aircraft. Itinerant operations are flights arriving from outside of or departing the local area and are conducted by a mix of based and transient aircraft.

The number of based aircraft at an airport is used to determine the need for aircraft hangar space, apron area, and other related facilities. Based aircraft include those owned by individuals, businesses, or organizations that are stored at the Airport on a regular basis. According to FAA Airport Master Records, MPV has a total of 43 based aircraft. Of that total, there are 39 are single-engine piston aircraft, two multi-engine aircraft, one jet, and one helicopter. As MPV is a GA airport, the majority aviation activity is generated by light, private, recreational, and training aircraft utilizing single- and multi-engine piston aircraft. It is important to note that Wiggins Aviation operates three daily flights to/from MPV with a Beech 99 or Embraer 110.

Table 1-5 provides a depiction of the types of aircraft based at MPV along with aircraft that frequently utilize the Airport.

Table 1-5 – Aircraft Utilizing MPV

Single Engine	Multi Engine	Jet
 Piper Archer	 Beechcraft 99	 Cessna Excel

2 FORECASTS OF AVIAITON ACTIVITY

Projecting the future demand of aviation activity at an airport is a vital step in the airport master planning process. The forecasts of aviation activity presented within this chapter serve as the basis for effective decision-making, airport development guidance, and facility recommendations in subsequent chapters of the E.F. Knapp State Airport (MPV) Master Plan Update. The projections help guide airport development over the 20-year planning horizon by identifying current and future facility needs and providing a general timeline of when those developments may be needed. Prior to use in the master planning effort, the recommended forecasts are submitted to the Federal Aviation Administration (FAA) for review and approval. Once approved, the forecasts are then used to perform the Facility Requirements and to prepare a Development Plan for this Master Plan Update.

Forecasts are prepared for short-term (1-5 years), intermediate-term (6-10 years), and long-term (11-20 years) intervals. Short-term forecasts are used to identify deficiencies that need immediate attention. Medium-term forecasts are used in planning foreseeable capital improvement needs. Long-term forecasts provide more generalized information and are used for space and land use planning to accommodate potential future demand.

General aviation (GA) airports are typically influenced by national and regional trends in population, household income, airport prominence, airport-based aircraft, and the region in which the airport is located. The population growth (or decline) can influence the growth of aviation demand. Household income can also be an indicator of GA aircraft purchase trends or overall increase in flying. Airports that have enhanced facilities and services to offer users will generally attract greater aviation activity. An airport's based aircraft count is also another factor that directly contributes to aviation activity. The addition of hangars, instrument approaches, and facilities that can accommodate a wider range of piston, twin-engine, and turbine aircraft, can increase airport activity and demand.

2.1 FORECAST CATEGORIES

Aviation demand forecasts are prepared for a variety of aviation categories. These categories are determined based on the type and level of activity expected at an airport over the planning horizon and can vary in relevance depending on the size and category of an airport and the basic objectives of a specific master plan. The forecasts prepared for MPV include the following categories:

- **Based Aircraft:** Based aircraft are defined as aircraft that use a specific airport as a home base. These are the aircraft that typically rent tie-down or hangar space for extended periods of time and, depending on state and local regulations, are registered as based at that specific airport and pay local user taxes to that jurisdiction. At many GA airports with

less itinerant (i.e., visiting) aircraft activity, based aircraft can be an indicator of growth (or decline).

- **Operations:** An operation can be defined as either a take-off or landing of an aircraft. Operations are typically segregated into three sectors based on the aircraft/operator's purpose and operating certifications. These sectors include:
  - **General aviation** encompasses all other operations not including air carrier, air taxi and commuter, and military. These operations are conducted under Federal Aviation Regulation (FAR) Part 91 (General Operating and Flight Rules).
  - **Air taxi** operations are considered itinerant GA operations (i.e., operations that did not originate at the airport). These operations refer to carriers that operate aircraft with 60 or fewer seats or cargo On-Demand Operations. Air taxi carriers are governed under FAR Part 135 (Operating Requirements: Commuter and on Demand Operations and Rules Governing Persons on Board Such Aircraft).
  - **Military** includes operations conducted by the nation's military forces.
  - **Touch & Go Operations** are training exercises in which an aircraft lands on the runway and immediately departs. These types of operations do not generally require flight plans and are not included in operational counts when justifying airport infrastructure. At GA airports with high levels of training activity, however, this type of activity should be considered from an infrastructure and airspace planning perspective.

Based aircraft and operations are classified into a fleet mix, which is a breakdown of aircraft by specific type. Aircraft fleet mix typically refers to the aircraft power plant, such as: single-engine piston, multi-engine piston, turboprop, jet, and rotorcraft/helicopter. In some analyses, it can also refer to an aircraft's Airport Reference Code (ARC) (e.g. B-II).

Additional operations forecasts conducted as part of this forecasting effort include local/itinerant operations, peak operating-hour, and annual instrument approaches. A forecast of the critical aircraft is also presented.

2.2 AIRPORT ACTIVITY INFLUENCES

2.2.1 COVID-19 / 2020 Pandemic

In January of 2020, COVID-19 (commonly referred to as Coronavirus) began impacting the aerospace industry and air travel as a whole. According to FAA and industry sources, the impacts of COVID on the Aerospace system have been split, in terms of types of users. Although impacted by the virus outbreak, GA users were not as impacted as commercial operators. While travel restrictions were placed on the commercial industry and routes, route restrictions were not placed on civil aviation.

Business and travel restrictions have had an impact on itinerant GA travel; however, recreational flying during the pandemic has been largely stable. In addition, during 2020, GA pilots began assisting with COVID-19 relief efforts by aiding in delivery of personal protective equipment to medical facilities.

General Aviation Aircraft Shipment Reports, published by the General Aviation Manufactures Association (GAMA)[4&5], indicates aircraft shipments in the United States declined from 1,771 aircraft in 2019 to 1,552 aircraft in 2020; however, the number of single-engine piston aircraft remained relatively stable with approximately a 3.0 percent increase in shipments, showing the trend of stability amongst smaller aircraft users.

Due to the impacts of COVID-19 on the aviation industry, it was important to analyze and become familiar with historical activity trends at MPV prior to 2020 to determine the level of impact to the Airport's activity and to further determine recovery efforts. MPV does not have scheduled commercial service activity; therefore, the Airport was not as heavily impacted as commercial service airports.

2.2.2 Hangar Development & Act 250 Permitting

VTrans property management reports that three to four requests per year are received for private-hangar development and hangar leasing/rental. Historically, new hangar development at the Airport has been slow due to state/environmental permitting and other necessary approvals. Currently, all hangars at MPV are occupied.

To aid in the permitting process, VTrans has established three layouts of potential hangar sites at MPV as part of the State's Act 250 permitting process. These hangars are based upon preestablished sizing (e.g., 60'x60, 60'x80', and 120'x120') accommodating a variety of GA aircraft. There is currently interest by a developer to construct a hangar within a portion of the upper apron.

Although the number of aircraft that may be based at MPV as a result of Act 250 permitting will vary depending on single or multiple hangar occupancy (based on size), planning should consider these permitting efforts and the potential impact of additional based aircraft.

2.3 APPLIED FORECAST DATA

Aviation activity forecasting is not considered an exact science and, as such, it can be difficult to project future airport demand based on historic facility information alone. There are many uncontrollable variables that can affect the true outcome of activity levels throughout the

[4] General Aviation Manufactures Association. "General Aviation Aircraft Shipment Report." 16 May 2020. https://gama.aero/wp-content/uploads/2019ShipmentReport03162020.pdf

[5] General Aviation Manufactures Association. "General Aviation Aircraft Shipment Report." 24 February 2021. https://gama.aero/wp-content/uploads/2020ShipmentReport-02242021.pdf

forecast period. Therefore, several data resources were reviewed to ensure regional, national, and industry trends that can affect future activity at MPV were incorporated into the forecast methodologies. Guidance provided by the FAA in Advisory Circular (AC) 150-5070-6B, *Airport Master Plans*, was also used to identify suggested forecasting methodologies. The following provides a brief overview of each data resource used to develop the MPV forecasts:

- **The FAA Terminal Area Forecast (TAF)** is a detailed economic model, prepared by the FAA, which provides historical and projected growth of passenger enplanements, operations, and GA aircraft activity. The national level TAF is a cumulative total of all U.S. airport activity. These projections account for national economic conditions and trends within the aviation industry as a whole. From the national forecasts, airport specific projections are derived that reflect regional market and socioeconomic conditions and anticipated demand. In this relatively top-down approach, specific airport development and marketing actions do not influence FAA projections. The most recent TAF was published in May 2021.[6]

  Each airport's TAF is considered the benchmark by which Master Planning forecasts are measured. According to the FAA, forecasts that differ from the TAF by 10 percent within a five-year planning period or 15 percent within a 10-year planning period must document the variance prior to FAA approval.

- **Vermont Airport System Plan (VASP**) is a 20-year statewide planning document developed for the Vermont Agency of Transportation's 16 public-use airports. In addition to inventorying the attributes of each airport, the VASP developed forecasts of aviation activity including based aircraft and operations. Forecasts developed for the plan were referenced and serve as the basis for most MPV forecasting scenarios.

- **Vermont Department of Health & United States Census Bureau** are two sources used to acquire historic and current socioeconomic data by county in Vermont. Socioeconomic data includes factors based on population and household income within the catchment area. Historic and projected trends of these factors can be relevant in predicting changes in airport activity within the forecast period, such as based aircraft ownership and overall itinerant users. For Washington County, ten-year historic household income data was gathered from the US Census Bureau and ten-year historic population data was gathered from the Vermont Department of Health.

- **FAA Aerospace Forecast, Fiscal Years (FY) 2020-2040** is an annually issued document providing an overview of aviation industry trends and expected growth for each aviation

[6] The 'FAA 2020 TAF' was published in May 2021 and consists of historical data (1990 to 2019) and forecasted aviation activity levels (2020 to 2045). The forecasts provided in the 2020 TAF account for COVID-19.

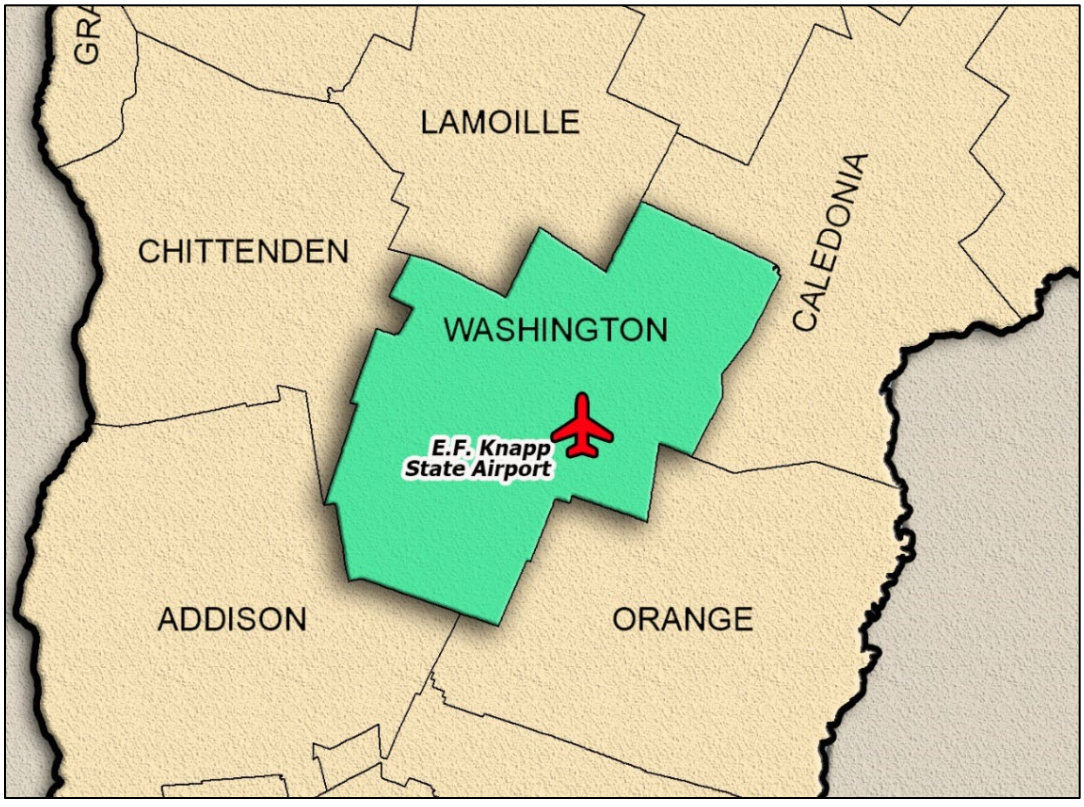
market segment (e.g., GA activity, air taxi operations, commercial, etc.). The FAA Aerospace Forecast also provides projected fleet mix operations by aircraft by type (e.g., single- and multi-engine piston, turboprop, turbine, etc.). National growth rates are provided over a 20-year forecast horizon. Subsequent forecasts utilized the FAA Aerospace Forecasts to develop potential activity scenarios along with potential fleet mix projections.

- **FAA Airport Master Record, Form 5010-1** is a form published by the FAA listing a facility's aeronautical data, including based aircraft and airport operations. Oftentimes, the based aircraft and airport operations data reported within the Airport Master Record are used to update an airport's TAF. For MPV, the Airport's Master Record and TAF list the same baseline data.

2.4 AIRPORT CATCHEMENT AREA

the State, the primary catchment area for MPV users is Washington County, Vermont.

Figure 2-1– MPV Catchment Area (Washington County, VT)



Source: CHA, 2021.

2.5 BASELINE ACTIVITY DATA & MPV TAF

Prior to initiating each forecast, a baseline year must first be identified for both airport operations and aircraft based at the airport. Generally, the baseline year is the most recently recorded calendar or fiscal year of data and is the year from which subsequent forecasts are derived and

carried forward throughout the 20-year planning horizon. At non-towered airports, such as MPV, it is often challenging to identify baseline activity, particularly airport operations. Therefore, for the purposes of activity forecasting, baseline data as listed within the 2020 TAF was used. It is important to note that the 2020 TAF year data corresponds with the based aircraft and airport operations listed within Airport's Master Record (i.e., 5010).

As shown on **Table 2-1**, the 2020 TAF lists airport operations and based aircraft at MPV remaining static throughout the forecast period.

Table 2-1 – E.F. Knapp State Airport Terminal Area Forecast (2021)

Year	Itinerant Operations				Local Operations				
	Air Taxi & Commuter Ops.	GA Ops.	Military Ops.	Total	Civil Ops.	Military Ops.	Total	Total Ops.	Based Aircraft
Historic:									
2010	625	8,000	1,000	9,625	14,500	0	14,500	24,125	54
2011	625	8,000	1,000	9,625	14,500	0	14,500	24,125	54
2012	625	8,000	1,000	9,625	14,500	0	14,500	24,125	53
2013	625	8,000	1,000	9,625	14,500	0	14,500	24,125	53
2014	625	8,000	1,000	9,625	14,500	0	14,500	24,125	53
2015	625	8,000	1,000	9,625	14,500	0	14,500	24,125	54
2016	625	8,000	1,000	9,625	14,500	0	14,500	24,125	53
2017	625	8,000	1,000	9,625	14,500	0	14,500	24,125	51
2018	500	1,500	500	2,500	8,000	0	8,000	10,500	51
2019	300	1,500	500	2,300	8,000	0	8,000	10,300	43
2020	300	1,500	500	2,300	8,000	0	8,000	10,300	43
2010-2020 AAGR	**-3.6%**	**-8.0%**	**-3.4%**	**-6.9%**	**-2.9%**	**0.0%**	**-2.9%**	**-4.2%**	**-1.1%**
Projected:									
2021	300	1,500	500	2,300	8,000	0	8,000	10,300	43
2026	300	1,500	500	2,300	8,000	0	8,000	10,300	43
2031	300	1,500	500	2,300	8,000	0	8,000	10,300	43
2036	300	1,500	500	2,300	8,000	0	8,000	10,300	43
2041	300	1,500	500	2,300	8,000	0	8,000	10,300	43
2021-2041 AAGR	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**

Note: AAGR- Average Annual Growth Rate.
Source: FAA 2020 TAF, CHA, 2021.

2.5.1 Baseline Activity Summary

Table 2-2 and **Table 2-3** provide a summary of the 2020 airport operations and based aircraft, as reported in the 2020 TAF, which are used as the baseline data for subsequent forecasting activity. Note that baseline airport operations do not include military activity.

Table 2-2 – MPV Baseline Year 2020 Airport Operations

Operation Type	Total Operations
Itinerant	1,800
Local	8,000
Total	**9,800**

Source: FAA 2020 TAF, CHA, 2021.

Table 2-3 – MPV Baseline Year 2020 Based Aircraft

Aircraft Category	Aircraft Count
Single-Engine Piston	39
Multi-Engine Piston	2
Turboprop	1
Jet	1
Total	**43**

Source: FAA 2020 TAF, Airport Master Record (5010-1), CHA, 2021.

2.6 AVIATION ACTIVITY FORECASTS

The forecast of aviation activity presented in this section consists of a projection of airport operations and based aircraft through the 2041 planning horizon. As discussed previously, the 2020 operations as well as the existing based aircraft information reported in the 2020 TAF for MPV were used as the baseline for this forecasting effort. Note that each forecast was developed assuming unconstrained conditions.

This section consists of an explanation and execution of the following data and forecast methodologies for based aircraft and aircraft operations:

- TAF Based Forecasts
- Vermont Airport System Plan Forecasts
- Socioeconomic Forecasts
- Operations per Based Aircraft Forecasts

After the various forecast methodologies were evaluated and a preferred forecast selected, projected operations were further categorized by type of operation (i.e., local vs. itinerant), followed by the determination of aircraft fleet mix and peak activity levels.

2.6.1 TAF Based Forecasts

As discussed, each airport's TAF is considered the benchmark by which Master Planning forecasts are measured. Master Plan forecast that differ by 10 percent within a five-year planning period and/or 15 percent within a 10-year planning period generally require additional documentation and justification. As a means to gauge if forecasting methodologies exceed these benchmarks, the following scenarios were developed as comparative measures. It is important to note that

the following TAF scenarios do not incorporate local factors influencing potential airport activity and are, therefore, not carried forward as recommended forecast.

MPV TAF Scenarios

Projected Growth Scenario

The Projected Growth scenario projects the baseline data using the FAA TAF parameters (i.e., growth within 10 percent of the five-year TAF period and within 15 percent of the 10-year TAF period). Years in between the five- and 10-year benchmarks are interpolated via a fixed-number average.

Additionally, to calculate the remaining years within the forecast period (i.e., 2032 – 2041), the 2020 through 2031 Average Annual Growth Rate (AAGR) of 1.2 percent was applied. This methodology resulted in a positive increase in both based aircraft and total operations and is only used as a comparison tool to quickly gauge other forecasts.

Historic Trend Scenario

The TAF Historic Trend scenario assumes that previous airport data will predict future activity. This scenario calculates the AAGR of the previous 10-years of TAF data for both operations (-14.5 percent AAGR for itinerant operations and -5.8 percent AAGR for local operations) and based aircraft (-2.3 percent) and applies it to the respective baseline counts. Due to a historic decline in both based aircraft and total operations, the forecasted numbers result in an unlikely decline based on current demand and development plans according to VTrans.

Table 2-4 – MPV TAF Based Forecast Scenarios

Year	TAF		Projected Growth		Historic Trend	
	Based Aircraft	Total Operations	Based Aircraft	Total Operations	Based Aircraft	Total Operations
2021	43	9,800	44	9,963	42	9,077
2026	43	9,800	47	10,780	38	6,302
2031	43	9,800	49	11,270	33	4,480
2036	43	9,800	53	11,987	30	3,236
2041	43	9,800	56	12,748	27	2,362
% AAGR	**0.0%**	**0.0%**	**1.2%**	**1.2%**	**-2.3%**	**-6.5%**
% Growth	**0.0%**	**0.0%**	**27.9%**	**28.0%**	**-36.6%**	**-74.0%**

Note: AAGR- Average Annual Growth Rate.
Source: FAA 2020 TAF, CHA, 2021.

Statewide TAF Scenarios

Projected Growth Forecast

In addition to forecasting activity for individual airports, the TAF issues a statewide forecast. In this scenario, the statewide projected average annual growth rate from 2021 through 2041 for itinerant and local operations, as well as based aircraft, were applied to the baseline conditions. Statewide, the TAF forecasts a 0.9 percent AAGR for itinerant operations, a 0.02 percent AAGR

for local operations, and a 0.7 percent AAGR in based aircraft. It is important to note that the statewide forecasted total itinerant operations include air carrier, air taxi, general aviation, and military. The application of these rates to MPV is depicted in **Table 2-5**.

Table 2-5 – Statewide TAF Based Projected Growth Forecast (All Users)

Year	Based Aircraft	Itinerant Operations	Local Operations	Total Operations
2021	43	1,816	8,002	9,818
2026	45	1,901	8,009	9,910
2031	46	1,989	8,017	10,006
2036	48	2,081	8,025	10,106
2041	49	2,177	8,032	10,209
% AAGR	**0.7%**	**0.9%**	**0.02%**	**0.2%**
% Growth	**13.8%**	**19.9%**	**0.4%**	**4.0%**

Note: AAGR- Average Annual Growth Rate.
Source: FAA 2020 TAF, CHA, 2021.

Given that MPV serves almost exclusively GA aircraft, an additional analysis was used with only itinerant GA and local civil projected average annual growth rates applied (0.1 percent and 0.02 percent, respectively), as shown in **Table 2-6**.

Table 2-6 – Statewide TAF Based Projected Growth Forecast (General Aviation)

Year	Itinerant Operations	Local Operations	Total Operations
2021	1,802	8,002	9,804
2026	1,811	8,009	9,820
2031	1,819	8,017	9,836
2036	1,828	8,025	9,853
2041	1,837	8,033	9,870
% AAGR	**0.1%**	**0.02%**	**0.03%**
% Growth	**1.9%**	**0.4%**	**0.7%**

Note: AAGR- Average Annual Growth Rate.
Source: FAA 2020 TAF, CHA, 2021.

Historic Trend

In the Historic Trend analysis, the historic AAGRs (from 2010 through 2020), as detailed in the statewide TAF for itinerant operations (-2.9 percent), local operations (-3.6 percent), and based aircraft (0.1 percent), were applied to the respective baseline activity levels and projected at a static rate throughout the forecast horizon. See **Table 2-7**.

Table 2-7 – Statewide TAF Based Historic Trend Forecast (All Users)

Year	Based Aircraft	Itinerant Operations	Local Operations	Total Operations
2021	43	1,748	7,713	9,461
2026	43	1,508	6,427	7,935
2031	43	1,301	5,355	6,656
2036	43	1,122	4,462	5,584
2041	44	968	3,718	4,686
% AAGR	**0.1%**	**-2.9%**	**-3.6%**	**-3.5%**
% Growth	**1.3%**	**-44.6%**	**-51.8%**	**-50.5%**

Note: AAGR- Average Annual Growth Rate.
Source: FAA 2020 TAF, CHA, 2021.

Similar to the previous statewide scenarios, because MPV predominately serves GA aircraft, the statewide historic AAGRs for only itinerant GA and local civil users were analyzed, as shown in **Table 2-8**.

Table 2-8 – Statewide TAF Based Historic Trend Forecast (General Aviation)

Year	Itinerant Operations	Local Operations	Total Operations
2021	1,771	7,721	9,492
2026	1,634	6,465	8,099
2031	1,507	5,413	6,920
2036	1,390	4,533	5,923
2041	1,283	3,796	5,079
% AAGR	**-1.6%**	**-3.5%**	**-3.1%**
% Growth	**-27.6%**	**-50.8%**	**-46.5%**

Note: AAGR- Average Annual Growth Rate.
Source: FAA 2020 TAF, CHA, 2021.

2.6.2 Vermont Airport System Plan Forecasts

The VASP is a 20-year planning document prepared by VTrans that details anticipated growth, challenges, and development recommendations over a 20-year planning horizon for each airport under the Agency's control, including MPV.

A major component of the VASP involved planning-level forecasts for each State facility. To accomplish this, the VASP developed low-growth, average-growth, and high-growth percentages throughout the State. While the VASP forecasted based aircraft and airport operations for MPV using an average-growth percentage, the baseline data used to project this activity was based on the 2017 TAF (prior to the 2020 pandemic). This 2017 baseline data exceeds current TAF and Airport Master Record activity levels. Therefore, the growth rate used for MPV, and identified within the VASP, was the only factor within the following forecast scenarios that was applied to the current baseline data.

Operations

The VASP draft outlines a low-growth, average-growth, and high-growth scenario and applies projected average annual growth rates at 5-year, 10-year, and 20-year intervals. Note, **Table 2-9** outlines the average annual growth rates and total operations projected for MPV.

Table 2-9 – Vermont Airport System Plan Growth for MPV (Operations)

Scenario	5-Year	10-Year	20-Year
FAA TAF (2018)	24,125	24,125	24,125
Average Growth (.42%)	24,636	25,158	26,234
High Growth (.84%)	25,155	26,230	28,518
Low Growth (.21%)	24,379	24,636	25,159

Source: Vermont Airport System Plan (2020 DRAFT), CHA, 2021.

These growth rates were subsequently applied to the existing baseline operations data at the Airport and carried throughout the forecast horizon. **Table 2-10** depicts the total operations forecasts for the three scenarios.

Table 2-10 – Vermont Airport System Scenarios (Operations)

Year	Average Growth	High Growth	Low Growth
2021	9,841	9,882	9,821
2026	10,050	10,304	9,924
2031	10,262	10,745	10,029
2036	10,480	11,203	10,135
2041	10,702	11,682	10,241
% AAGR	**0.4%**	**0.8%**	**0.2%**
% Growth	**8.7%**	**18.2%**	**4.3%**

Note: AAGR- Average Annual Growth Rate.
Source: Vermont Airport System Plan (2020 DRAFT), CHA, 2021.

Based on the above figures, it was determined that the High Growth yielded the most feasible growth rates of the three forecasting scenarios.

Based Aircraft

The VASP draft also provides a low-growth, average-growth, and high-growth scenario for based aircraft, with the AAGRs being depicted in **Table 2-11**.

Table 2-11 – Vermont Airport System Plan Growth for MPV (Based Aircraft)

Scenario	5-Year	10-Year	20-Year
FAA TAF (2018)	54	54	54
Average Growth (-1.61%)	49	45	38
High Growth (1.20%)	56	60	67
Low Growth (-2.39%)	47	42	33

Source: Vermont Airport System Plan (2020 DRAFT), CHA, 2021.

Each AAGR was applied to the baseline count of based aircraft at MPV and assumed throughout the 20-year forecast horizon, as shown in **Table 2-12**.

Table 2-12 –Vermont Airport System Plan Scenarios (Based Aircraft)

Year	Average Growth	High Growth	Low Growth
2021	42	44	42
2026	39	46	37
2031	36	49	33
2036	33	52	29
2041	31	55	26
% AAGR	**-1.6%**	**1.2%**	**-2.4%**
% Growth	**-27.7%**	**26.9%**	**-38.4%**

Note: AAGR- Average Annual Growth Rate.
Source: Vermont Airport System Plan (2020 DRAFT), CHA, 2021.

2.6.3 Econometric Forecasts

The economic outlook of an airport's catchment area can factor into the type and level of activity the facility may experience. Generally speaking, population and household income indicate potential levels of discretionary spending and the propensity of aviation users to utilize a local GA airport. As such, these two socioeconomic factors (e.g., population and household income) within the MPV catchment area were examined to develop the following two econometric forecast scenarios.

Population Econometric Forecast

The population econometric forecasts adjust the MPV TAF projections to account for population growth within the Airport's catchment area (e.g., Washington County). It is important to note that according to the Vermont Department of Health's population statistics, the population of the State of Vermont increased 2.8 percent over the past ten years. The population of Washington County, however, declined by 1.9 percent during the same time period with an AAGR of -0.2 percent. As such, the population economic forecast indicates a decline in both aircraft operations and based aircraft when applying Washington County's population growth rate to the baseline operations and based aircraft counts.

Household Income Econometric Forecast

Similar to the Population Econometric Forecast, a Household Income Econometric Forecast uses projected change in household income over the forecast period as a metric for growth. Unlike population for Washington County, which is projected to decrease, household income has increased 1.9 percent annually over the past ten years (adjusted for inflation) and is expected to continue trending upward at this rate according to 2020 U.S. Census data. In the case of airports such as MPV, income is often a more accurate metric than population as most of the Airport's operators are individual aircraft owners. As such, the 1.9 percent AAGR was applied to the baseline operation and based aircraft counts, resulting in growth exceeding the FAA forecast parameters.

Table 2-13 provides a summary of the econometric forecasts.

Table 2-13 – TAF Based Econometric Forecasts

Year	Population Econometric		Household Income Econometric	
	Based Aircraft	Operations	Based Aircraft	Operations
2021	43	9,782	44	9,985
2026	43	9,689	48	10,966
2031	42	9,597	53	12,044
2036	42	9,505	58	13,229
2041	41	9,415	64	14,528
% AAGR	**-0.2%**	**-0.2%**	**1.9%**	**1.9%**
% Growth	**-3.7%**	**-3.8%**	**45.5%**	**45.5%**

Note: AAGR- Average Annual Growth Rate.

Source: CHA, 2021.

2.6.4 Operations per Based Aircraft Forecasts

Operations per based aircraft (OPBA) forecasts involve a relatively straightforward forecasting methodology which assumes a total number of annual operations conducted by each aircraft based at the Airport. This methodology is often used at non-towered airports, such as MPV, where historical annual operations are not as easily obtainable.

Parameters for using OPBA forecasting originate from FAA Order 5090.3C, *Field Formulation of the National Plan of Integrated Airport Systems*, which gives the following general guidelines for OPBA values:

- 250 OPBA for a typical GA airport with less itinerant traffic
- 350 OPBA for a busier GA airport with more itinerant traffic
- 450 OPBA for busy reliever airports

To develop an OPBA forecast at MPV, a preferred based aircraft forecast was first selected. Four of the nine based aircraft forecasts projected a decline in based aircraft. However, local demand and future planned developments contradict a downward trend. The projected based aircraft from the VASP High Growth forecast was selected to represent the preferred based aircraft forecast as it showed modest growth.

As shown in the recommended based aircraft forecast, MPV is projected to have 55 based aircraft by 2041. Based on current levels of itinerant traffic at MPV, 250 operations per based aircraft were used and applied (based on FAA planning guidance within FAA Order 5090.3C) to the 2041 based aircraft count, thus resulting in a projection of 13,810 operations. The operations from 2021 through 2040 are a result of a statistical interpolation using an AAGR.

Table 2-14 – OPBA Forecast

Year	Based Aircraft*	Operations
2021	44	9,991
2026	46	10,946
2031	49	11,901
2036	52	12,855
2041	55	13,810
% AAGR	**1.2%**	**1.6%**
% Growth	**26.9%**	**38.2%**

Note: AAGR- Average Annual Growth Rate.
Source: CHA, 2021.
*Based aircraft forecast derived using VASP Growth Scenario (Section 2.6.2).

2.7 SUMMARY OF FORECAST

The previously discussed operations and based aircrafts forecasts were derived using a variety of forecasting methodologies and incorporated various external data resources to further refine the projected activity data at MPV. **Table 2-15** and **Table 2-16** summarize each forecast.

Table 2-15 – Operations Forecast Summary

Year	TAF	MPV TAF Scenarios		Statewide TAF Scenarios				VASP Scenarios			Econometrics		OPBA
		Projected Growth	Historic Trend	Projected Growth (All Users)	Projected Growth (GA)	Historic Trend (All Users)	Historic Trend (GA)	Average Growth	High Growth	Low Growth	Population	Household Income	
2020	9,800	9,800	9,800	9,800	9,800	9,800	9,800	9,800	9,800	9,800	9,800	9,800	9,800
2021	9,800	9,963	9,077	9,818	9,804	9,461	9,492	9,841	9,882	9,821	9,782	9,985	9,991
2026	9,800	10,780	6,302	9,910	9,820	7,935	8,099	10,050	10,304	9,924	9,689	10,966	10,946
2031	9,800	11,270	4,480	10,006	9,836	6,656	6,920	10,262	10,745	10,029	9,597	12,044	11,901
2036	9,800	11,987	3,236	10,106	9,853	5,584	5,923	10,480	11,203	10,135	9,505	13,229	12,855
2041	9,800	12,748	2,362	10,209	9,870	4,686	5,079	10,702	11,682	10,241	9,415	14,528	13,810
% AAGR	**0.0%**	**1.2%**	**-6.5%**	**0.2%**	**0.03%**	**-3.5%**	**-3.1%**	**0.4%**	**0.8%**	**0.2%**	**-0.2%**	**1.9%**	**1.6%**
% Growth	**0.0%**	**28.0%**	**-74.0%**	**4.0%**	**0.7%**	**-50.5%**	**-46.5%**	**8.7%**	**18.2%**	**4.3%**	**-3.8%**	**45.5%**	**38.2%**

Source: FAA 2020 TAF, Vermont Agency of Transportation, Vermont Department of Health, US Census Bureau, CHA, 2021.

Table 2-16 – Based Aircraft Forecast Summary

Year	TAF	MPV TAF Scenarios		Statewide TAF Scenarios		Vermont Airport System Plan			Econometrics	
		Projected Growth	Historic Trend	Projected Growth	Historic Trend	Average Growth	High Growth	Low Growth	Population	Household Income
2020	43	43	43	43	43	43	43	43	43	43
2021	43	44	42	43	43	42	44	42	43	44
2026	43	47	38	45	43	39	46	37	43	48
2031	43	49	33	46	43	36	49	33	42	53
2036	43	53	30	48	43	33	52	29	42	58
2041	43	56	27	49	44	31	55	26	41	64
% AAGR	**0.0%**	**1.2%**	**-2.3%**	**0.7%**	**0.07%**	**-1.6%**	**1.2%**	**-2.4%**	**-0.2%**	**1.9%**
% Growth	**0.0%**	**27.9%**	**-36.6%**	**13.8%**	**1.3%**	**-27.7%**	**26.9%**	**-38.4%**	**-3.7%**	**45.5%**

Source: FAA 2020 TAF, Vermont Agency of Transportation, Vermont Department of Health, US Census Bureau, CHA, 2021.

2.8 PREFERRED FORECASTS

Following an assessment of each of the based aircraft and operations scenarios, forecasts that were not plausible based on too high or too low of growth were eliminated.

Additionally, Act 250 permitting to enable hangar development within pre-examined sites is anticipated to result in additional based aircraft and airport operations. There is currently a hangar developer interested in constructing at the Airport, and additional hangars are anticipated as the permitting process is finalized. It is important to note that such development would be privately funded.

2.8.1 Preferred Based Aircraft Forecast *(VASP High Growth)*

The forecast from the MPV TAF Projected Growth reflected static growth and thus was removed from consideration. Given the historic trend conditions and market uncertainty caused by the COVID-19 pandemic, several of the based aircraft forecast scenarios reflected negative growth throughout the forecast period, thus were also removed from consideration. The Vermont Airport System Plan High Growth scenario projected an AAGR of 1.2 percent and 26.9 percent growth over the planning period, thus the forecast showed modest growth that is in-line with VTrans knowledge of local demand and planned developments at MPV.

Table 2-17 summarizes the MPV preferred based aircraft forecast.

Table 2-17 – MPV Preferred Based Aircraft Forecast *(VASP High Growth)*

Year	Based Aircraft
2021	44
2026	46
2031	49
2036	52
2041	55
AAGR	**1.2%**
% Growth	**26.9%**

Source: Vermont Agency of Transportation, CHA, 2021.

2.8.2 Preferred Operations Forecast *(VASP High Growth)*

Much like the based aircraft forecast, the TAF yields static growth and was removed from consideration. While certain scenarios yielded negative growth, the three VASP scenarios projected positive growth rates, as did the Household Income Econometric and Statewide TAF Projected Growth scenarios. Household Income is considered a reliable metric of overall operations, though not as reliable as based aircraft. The reason the Statewide TAF Projected Growth scenarios were eliminated was that, although indicating growth, the market for the various airports varies greatly, thus the statewide TAF was not as reliable of source for portraying activity levels specific to MPV. Given this, and that the VASP forecasts were uniquely calculated

to MPV, these were considered the most reliable. As a result, the VASP High Growth scenario was selected as the preferred operations forecast scenario. This yielded an annual growth rate of 0.8 percent and 18.2 percent growth in the forecast period.

Table 2-18 – MPV Preferred Operations Forecast *(VASP High Growth)*

Year	Operations
2021	9,882
2026	10,304
2031	10,745
2036	11,203
2041	11,682
AAGR	**0.8%**
% Growth	**18.2%**

Source: Vermont Agency of Transportation, CHA, 2021.

Preferred Operations Forecast vs. FAA TAF

details the recommended operations forecast for MPV in comparison to the FAA 2020 TAF forecast. The recommended forecast predicts operations to be approximately 5.1 percent higher than the TAF in five years and approximately 9.6 percent above the TAF in 10 years, both of which are within the acceptable ranges provided in AC 150/5070-6B*, Airport Master Plans*.

Table 2-19 – MPV Preferred Operations Forecast vs. FAA TAF

Year	Operations		
	MPV TAF	Preferred Forecast	Preferred Forecast vs. FAA TAF
2020	9,800	9,800	0.0%
2021	9,800	9,882	0.8%
2026	9,800	10,304	5.1%
2031	9,800	10,745	9.6%
2036	9,800	11,203	14.3%
2041	9,800	11,682	19.2%
% AAGR	**0.0%**	**0.8%**	-
% Growth	**0.0%**	**18.2%**	-

Source: FAA 2020 TAF, Vermont Agency of Transportation, CHA, 2021.

2.9 LOCAL/ITINERANT OPERATIONS

The percentage of local and itinerant operations at GA airports can vary greatly by airport location, size, and type of activity. Rural airports that mostly experience activity by based aircraft generally have a greater percentage of local operations, while airports nearby larger metropolitan areas or tourist destinations may have a greater percentage of itinerant operations.

According to the MPV TAF, the local/itinerant operations split at the Airport was historically 63/37 percent, respectively. However, the MPV TAF also reports that the spread of local/itinerant operations increased to 80/20 percent in 2018, which is atypical and considered an anomaly.

To determine a probable local/itinerant operations spread, the TAF for the State of Vermont was examined and indicated that historic statewide operations were approximately 50 percent local and 50 percent itinerant operations with a gradual increase of itinerant operations throughout the forecast period. Additionally, examination of similarly sized GA airports within proximity of MPV (e.g., RUT, LEB) indicate a narrower spread of local/itinerant operations.

As such, it is assumed that the current split of local/itinerant operations at MPV is closer to its historically report spread (e.g., 63 percent local and 37 percent itinerant) with a gradual increase of itinerant operations throughout the forecast period. **Table 2-20** lists the projected local/itinerant forecast for MPV.

Table 2-20 – Local/Itinerant Operations

Year	Local Operations	Local Percent	Itinerant Operations	Itinerant Percent	Total Operations
2021	6,196	62.7%	3,686	37.3%	9,882
2026	6,391	62.0%	3,913	38.0%	10,304
2031	6,592	61.4%	4,153	38.6%	10,745
2036	6,797	60.7%	4,406	39.3%	11,203
2041	7,009	60.0%	4,673	40.0%	11,682

Source: CHA, 2021.

2.10 AIRCRAFT FLEET MIX FORECAST

The FAA Aerospace Forecast is an annually issued document providing an overview of aviation industry trends and growth rates over a 20-year forecast horizon, including the breakdown of aircraft fleet mix by type. **Table 2-21** lists the AAGRs of aircraft projected within the *FAA Aerospace Forecast, FY 2020 - 2040*.

Table 2-21 – FAA Fleet Mix Projection

Year	Single-Engine	Multi-Engine	Turboprop	Jet	Rotorcraft	Other
2021	60.0%	6.0%	4.7%	7.5%	5.0%	16.8%
2026	57.3%	5.9%	4.9%	8.6%	5.4%	17.9%
2031	54.4%	5.8%	5.2%	9.7%	5.9%	19.0%
2036	51.7%	5.6%	5.6%	10.7%	6.4%	20.0%
2041	49.6%	5.5%	6.0%	11.4%	6.8%	20.7%

Source: FAA Aerospace Forecast, *FY 2020 – 2040*

Note: Represents national projections

According to the Aerospace Forecast, the number of single-engine piston aircraft will decrease by 2040, with an increase of larger aircraft including turboprop and jet aircraft. It is important to

note that the majority of aircraft activity at MPV are single-engine piston aircraft, which are expected to continue to represent the majority of the operating aircraft fleet mix. As the FAA Aerospace Forecast presents national projections, the fleet mix growth rates would not reflect MPV's local characteristics and demand. Therefore, a percentage breakdown using national based aircraft numbers as a baseline was utilized and adjusted for local considerations and demand. **Table 2-22** and **Table 2-23** lists the projected fleet mix for of airport operations and based aircraft at MPV.

Table 2-22 – Operations Fleet Mix

Year	Single-Engine	Multi-Engine	Turboprop	Jet	Rotorcraft	Total
2021	7,171	712	558	865	576	9,882
2026	7,241	740	606	1,052	665	10,304
2031	7,276	767	679	1,256	767	10,745
2036	7,295	792	767	1,467	882	11,203
2041	7,364	818	864	1,651	985	11,682

Source: CHA, 2021.

Table 2-23 – Based Aircraft Fleet Mix

Year	Single-Engine	Multi-Engine	Turboprop	Jet	Rotorcraft	Total
2020	39	2	0	1	1	43
2021	40	2	0	1	1	44
2026	41	2	1	1	1	46
2031	43	2	1	2	1	49
2036	45	2	2	2	1	52
2041	47	2	2	3	1	55

Source: CHA, 2021.

2.11 PEAK ACTIVITY

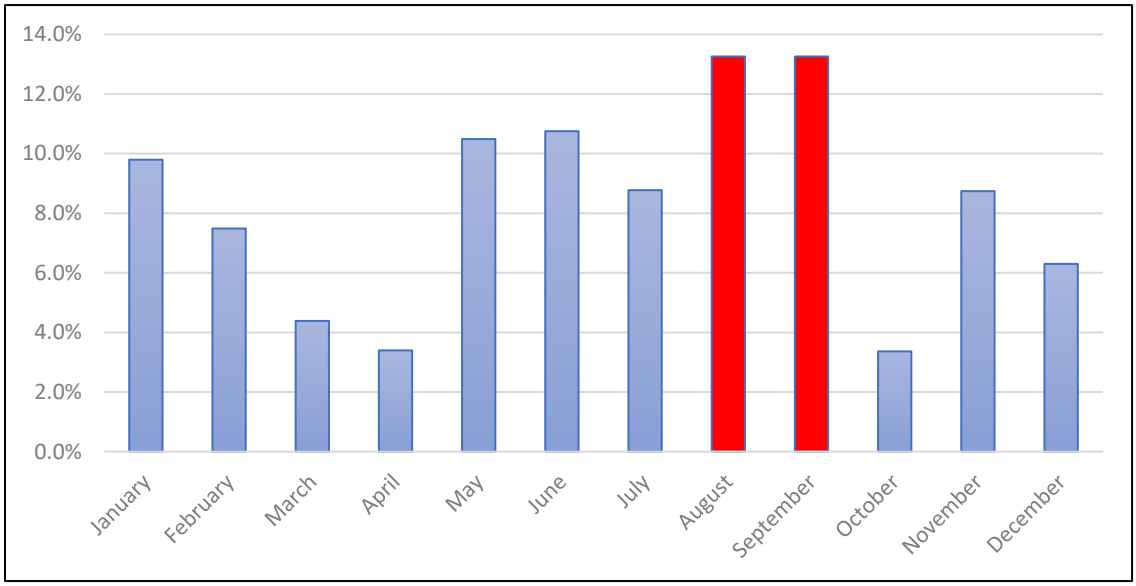
To ensure adequate apron and aircraft staging space is available at an airport, an understanding of the facility's most demanding (i.e., peak) period of activity is necessary. Peak Month and Peak Day forecasts guide future facility requirements needed to accommodate above average levels of utilization. The Peak Month is the calendar month of the year during which the highest level of aircraft operations typically occurs. Likewise, the Peak Day is the highest level of operations occurring within the Peak Month. At non-towered airports, tracking periods of peak activity can be challenging unless local observations are maintained.

VTrans utilizes a system that provides approximate aircraft operations data by recording the number of aircraft radio announcements on each airport's common traffic advisory frequency (CTAF). Although the number of operations reported through this system is not exact, the data provides valuable operational trend and peak activity levels.

As shown on **Figure 2-2**, MPV experienced its Peak Month activity in the months of August and September of 2020, with each month encompassing approximately 13.3 percent of the total annual data recordings for the year.

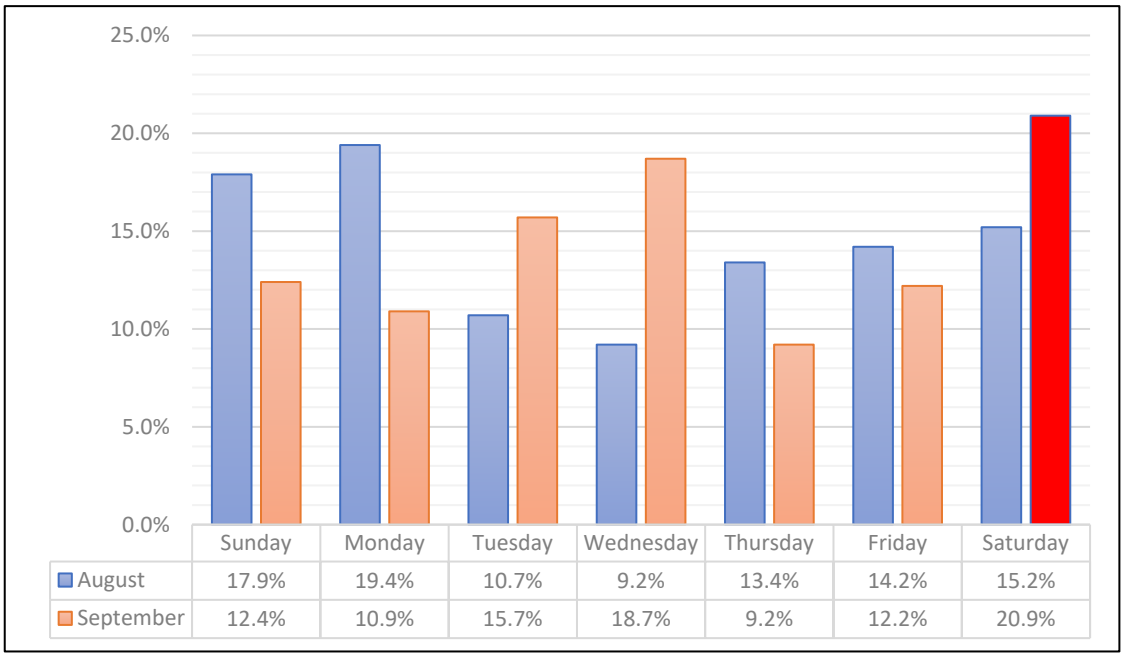
Furthermore, **Figure 2-3** shows that, similar to many GA airports, MPV experience its Peak Day during the weekend, with Saturdays in September representing 20.9 percent of peak day operations.

Figure 2-2 – MPV Peak Months (2020)



Source: VTrans (G.A.R.D.) data for MPV, CHA, 2021

Figure 2-3 – MPV Peak Day (2020)



	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
August	17.9%	19.4%	10.7%	9.2%	13.4%	14.2%	15.2%
September	12.4%	10.9%	15.7%	18.7%	9.2%	12.2%	20.9%

Source: VTrans (G.A.R.D.) data for MPV, CHA, 2021

Using these percentages (13.3 and 20.9 percent, respectively), **Table 2-24** lists the projected number of Peak Month and Peak Day aircraft operations at MPV based on the preferred operations forecast. A Peak Day-Hour is also listed and represents the estimated heaviest volume of aircraft operations the airport may experience in the span of an hour, such as during an airport event or fly-in gathering.

Table 2-24 – MPV Peak Month, Day, Hour

Year	Peak Month	Peak Day	Peak Hour
2020	1,303	68	10
2021	1,314	69	10
2026	1,370	72	11
2031	1,429	75	11
2036	1,490	78	12
2041	1,554	81	12

Source: CHA 2021.

2.12 CRITICAL AIRCRAFT

The critical aircraft (commonly referred to as the "design aircraft") determination is a key consideration in FAA decision making on project justification. The "critical aircraft" or "critical aircraft family" represent the most demanding aircraft or grouping of aircraft with similar characteristics (relative to AAC, ADG, TDG)[7], that are currently using or are anticipated to use an airport on a regular[8] basis. While the Study is not limited to planning for design aircraft, they must still be considered when planning airfield and landside facilities, as they may require specific facility design accommodations within their designated areas of operation.

When daily traffic counts are not available, the critical aircraft is typically determined through aircraft flight plan data obtained from either third-party sources or reviewing the FAA's Traffic Flow Management System Counts (TFMSC) and Operational Network (OPSNET) databases. The TFMSC provides operation counts based on filed flight plans while OPSNET are airport and/or tower operation counts. Unfortunately, due to the nature of non-towered GA airports, MPV does not have OPSNET data, and TFMSC data is typically incomplete.

The Airport's previous Master Plan Report (1998) identified the Cessna Citation III (ARC B-II) as the critical aircraft for airfield and pavement design. Upon review of the FAA's TFMSC data, operations at MPV over the past ten years have not averaged above the necessary 500 annual AAC "B" and ADG "II" operations to designate ARC B-II as the critical aircraft family. However, as stated, TFMSC data does not represent all aircraft activity at GA airports. Nevertheless, MPV has

[7] AAC (Aircraft Approach Category), ADG (Airplane Design Group), TDG (Taxiway Design Group).

[8] According to FAA AC 150/5000-17, *Critical Aircraft and Regular Use Determination*, the terminology of "regular use" is defined as 500 annual operations, including itinerant and local operations but excluding touch-and-go operations. An operation is either a takeoff or landing.

averaged approximately 440 ARC B-II TFMSC operations in the two years leading to the baseline year of 2020, and thus it can be assumed that the airport is currently experiencing regular activity of B-II aircraft. Additionally, available data depicts an upward trend of ADG Group II operations while AAC "B" and "C" operations have been holding steady. As a result, it is unlikely that MPV will be increasing to ARC C-II standards, and it is projected that the airport is to remain at ARC B-II for the forecasted planning period. Additionally, each runway will have a respective critical aircraft listed on the Airport Layout Plan Drawing Set. **Table 2-25** depicts the breakdown of operations of two years prior to the baseline year. Note, 2020 was not included due to inaccurate data as a result of COVID-19 impacts.

Table 2-25 – Annual Operations by AAC and ADG

Category	I	II	III	Total
2018				
A	380	46	0	426
B	512	416	4	932
C	16	14	2	32
D	0	4	2	6
Total	**908**	**480**	**8**	**1,396**
Category	**I**	**II**	**III**	**Total**
2019				
A	326	46	0	372
B	540	302	2	844
C	14	46	2	62
D	4	2	0	6
Total	**884**	**396**	**4**	**1,284**

Source: TFMSC, 2021.

3 FACILITY REQUIREMENTS

This chapter analyzes the ability of the Edward F Knapp State Airport (MPV) and its existing facilities to accommodate the current and anticipated levels of activity as described in **Chapter 2, *Forecast of Aviation Activity***. The identified facilities include the following general categories:

- Airside Facility Requirements
- Landside Facility Requirements

The demand/capacity and facility requirement analysis provide a basis for assessing the capability of existing Airport facilities to accommodate current and future levels of activity. The evaluation of this relationship frequently results in the identification of deficiencies that can be alleviated through planning and development activities. Analyses of various airside and landside functional areas were performed with the guidance of several publications, including:

- Federal Aviation Administration (FAA) Advisory Circular (AC) 150/5300-13A, *Airport Design*
- AC 150/5060-5, *Airport Capacity and Delay*
- AC 150/5325-4B, *Runway Length Requirements for Airport Design*

The facility requirement calculations were developed for the planning period of 2021 through 2041 and were based on various forecast components and should be regarded as generalized planning tools. Should the forecast prove to be an underestimate of traffic growth, the schedule for proposed developments may be advanced. Likewise, if traffic growth does not materialize, deferral of additional facilities may be practical.

3.1 FORECAST SUMMARY

Table 3-1 provides a summary of the preferred forecasts presented in **Chapter 2**, which have been used to estimate when activity levels will trigger the need for various improvements. In addition, this table provides forecast peak operations (with a peak month of July), by month, day, and hour. Note that some airfield facilities are recommended for safety improvements, and not dependent on a specific airport activity level.

Table 3-1 – Forecast Summary

	Planning Period (year)				
Activity	**2021**	**2026**	**2031**	**2036**	**2041**
Annual Operations	9,882	10,304	10,745	11,203	11,682
Peak Operations					
Peak Month	1,314	1,370	1,429	1,490	1,554
Peak Day	39	72	75	78	81
Peak Hour	10	11	11	12	12
Based Aircraft	44	46	49	52	55

Source: CHA 2021.

3.2 AIRSIDE FACILITY REQUIREMENTS

It is important for airports to assess their existing infrastructure to determine the need for future improvements and associated airfield requirements. The airside facility requirements analysis includes an examination and evaluation of:

- Critical Aircraft
- FAA Design Standards
- Runway Design Standards
- Taxiway Design Standards
- Airfield Capacity
- Runway Length Analysis
- Wind Coverage
- Airfield Pavement
- Lighting and Visual Aids
- Navigation Aids
- Instrument Approach Procedures

The following provides a description of each item and an evaluation of existing and future requirements according to current FAA and industry standards.

3.2.1 Critical Aircraft

The critical, or design, aircraft is defined as the most demanding aircraft operating or projected to operate on the airport's runways, taxiways, or aprons. According to the FAA, the design aircraft can be either a specific aircraft model or a composite of several aircraft and must account for a minimum of 500 annual itinerant operations (i.e., an average of five landings per week). Additionally, as identified in previous chapters, the critical aircraft at MPV (existing and forecast)

include twin engine business aircraft, such as a Cessna Citation Excel. As defined within the **Chapter 2**, the design aircraft is classified using three parameters:

- ***Aircraft Approach Category (AAC):*** Consists of a letter (e.g., A through E) corresponding to the design aircraft's approach speed in landing configuration.
- ***Airplane Design Group (ADG):*** Consists of a Roman numeral (e.g., I through VI) corresponding to the design aircraft's wingspan or tail height, whichever is most restrictive.
- ***Taxiway Design Group (TDG):*** Consists of a number (e.g., 1 through 7) corresponding to the Main Gear Width (MGW) and the Cockpit to Main Gear (CMG) distance.

The identified ACC and ADG are combined to form the Runway Design Code (RDC), which specifies the appropriate design standards for the runway. In addition to the ACC and ADG, the

RDC consists of a third component related to runway visibility minimums, expressed as Runway Visual Range (RVR).

After determining the RDC for each runway, the airport itself is classified with an Airport Reference Code (ARC). The ARC is used for airport planning and design purposes and is signified by the highest RDC at the airport. The ARC uses the same classification system as the RDC, minus the runway visibility component. Since Runway 17-35 is classified with an RDC of B-II-4000, the ARC for MPV will be B-II. It is recommended that ARC B-II is maintained throughout the planning period.

Table 3-2 summaries the classifications applicable to MPV throughout the planning period.

Table 3-2 – Runway Design Code Analysis Summary

Runway	AAC	ADG	RVR
17-35	B	II	4000 (i.e., Lower than 1 mile but not lower than 3/4 mile)
5-23	B	I	VIS (i.e., Visual Approach)
Airport	**AAC**	**ADG**	**RVR**
Airport	B	II	N/A

Source: FAA AC 150/5300-13A, *Airport Design*

3.2.2 FAA Design Standards

AC 150/5300-13A identifies safety areas and zones surrounding runways and taxiways that must be protected from objects, hazards, or obstacles that may impact safety. The key standards that protect the runway and Taxiway 'A' Areas consist of the following:

- ***Runway Safety Area (RSA) and Taxiway Safety Area (TSA*)**: The RSA is a defined surface surrounding a runway prepared for reducing the risk of damage to aircraft in the event of an undershoot, overshoot, or excursion from the runway. This area must also support

snow removal, aircraft rescue, and firefighting vehicles/equipment. The RSA should be free of objects, except for those that must be located in the area because of their function. The TSA is a defined surface alongside a taxiway prepared or suitable for reducing the risk of damage to an aircraft deviating from the taxiway. RSA and TSA are graded, drained, and maintained, and typically consisted of a stabilized mowed grass area. Safety area enhancement projects are considered high priority by the FAA.

- ***Runway Object Free Area (ROFA) and Taxiway Object Free Area (TOFA):*** The ROFA and TOFA are areas centered on a runway, taxiway, or taxilane centerline provided to enhance the safety of aircraft operations by remaining clear of objects (e.g., roads, buildings, parked aircraft, etc.), except for those that need to be within the area due to their function. There are no surface requirements for an OFA.
- ***Runway Protection Zone (RPZ):*** The RPZ is a trapezoidal area generally offset 200 feet from each runway end that is used to enhance the protection of people and property on the ground. The FAA encourages airport property ownership and compatible land uses within each RPZ and clearing of all above ground objects where practical. Homes, other buildings, and wildlife attractants are considered incompatible land uses within an RPZ. Trees and roads are not specifically prohibited (if not an airspace penetration) but are discouraged within the RPZ.
- ***Runway Object Free Zone (ROFZ):*** The ROFZ is centered about the runway with an elevation the same as the nearest point on the runway centerline. Objects that are not fixed-by-function are not permissible within the ROFZ.

The spatial dimensions of the RSA/TSA, ROFA/TOFA, RPZ, etc., are defined by the RDC. **Table 3-3** presents the current FAA design standards applicable to MPV.

Table 3-3 – Runway and Taxiway Design Standards

Airfield Area	Runway 17-35 (RDC B-II-4000)	Runway 5-23 (RDC B-I-VIS)
Runway Width	75'100'	60'
RSA		
- Width	150'	120'
- Length Beyond Runway End	300'/300'	240'/240'
- Length Prior to Threshold	300'/300'	240'/240'
ROFA		
- Width	500'	250'
- Length Beyond Runway End Length Prior	300'/300'	240'/240'
to Threshold	300'/300'	240'/240'
ROFZ		
- Width	400'	250'
- Length Beyond Runway End	200'	200'
Approach RPZ		
- Length	1,700'/1,000'	1,000'
- Inner Width	1,000'/500'	250'
- Outer Width	1,510'/700'	450'
Departure RPZ		
- Length	1,000'	1,000'
- Inner Width	500'	250'
- Outer Width	700'	450'
Runway Centerline to		
- Parallel Taxiway Centerline	240'	150'
- Edge of Aircraft Parking	250'	125'
Taxiway Width	35'	25'
Taxiway Centerline to		
- Fixed or Movable Object	65.5'	44.5'
Taxilane Centerline to		
- Fixed or Movable Object	57.5'	39.5'
TSA	79'	49'
TOFA	131'	89'
Taxilane OFA	115'	79'

Source: FAA AC 150/5300-13A, *Airport Design*

3.2.3 Runway Design Standards

Using the FAA design standards listed in **Table 3-3**, this chapter reviews the existing runway conditions at MPV and discusses any related deficiencies. **Figure 3-1** depicts Runway 17-35 and Runway 5-23 safety and object free areas.

3.2.3.1 Runway Width

The current width of Runway 17-35 is 100 feet, which exceeds the minimum requirement of 75 feet for RDC B-II-4000, as listed on **Table 3-3**. If the current ¾ visibility minimum on the ILS was reduced to ½ mile, the runway width requirement would increase to 100'. The current width of

Runway 5-23 is 75 feet which exceeds the minimum requirement of 60 feet for RDC B-I-VIS. As such, the current runway widths are adequate and may be maintained throughout the planning period. If a full runway reconstruction was needed in the future, the width could potentially be reduced to 60'.

3.2.3.2 Runway Safety Area

According to AC 150/5300-13A, standard RDC B-II-4000 runway dimensions include a length beyond and prior to the runway end of 300 feet, a length prior to the runway end of 300 feet, and a width of 150 feet. Approximately 300 feet beyond the Runway 17 end, the terrain decreases substantially within the northwest corner of the RSA at a grade of approximately 25 percent. This exceeds the FAA safety parameters of no more than a negative grade of five percent.

The Runway 5-23 RSA is 120 feet in width and extends 240 feet beyond both approach and departure ends. The terrain meets FAA safety standards. Both RSAs were reviewed using the survey and mapping activities of this study, as well as via a field inspection conducted in August 2021.

However, both runways have lighting fixture foundations that have heaved more than the allowable 3 inches above the ground; general maintenance is recommended.

3.2.3.3 Runway Object Free Area (ROFA)

The Runway 17-35 OFA is 500 feet in width and extends 300 feet beyond each runway end. The airport security fence is within the ROFA located in the northwest corner at the Runway 17 end. Additionally, the terrain decreases within this area and thus the fence does not penetrate the ROFA.

A portion of the terrain along the southwest edge of the ROFA at the Runway 35 end rises at a seven percent grade. However, this is well within the tolerances of the FAA standard of no more than a positive 25 percent grade. The ROFA for Runway 35 end extends beyond the airport property with a small portion of the southwest corner encroaching on Scott Hill Road. The Runway 5-23 OFA is 250 feet in width and extends 240 feet beyond each runway end.

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GRAPHIC SCALE (FEET)

0 350 700 1400

LEGEND

- Airport Property Boundary
- ### Ground Contour (Feet MSL)
- ROFA Runway Object Free Area
- RSA Runway Safety Area
- TOFA Taxiway Object Free Area
- TSA Taxiway Safety Area
- OFZ Obstacle Free Zone
- Navaid Critical Area

Figure 3-1
MPV Safety Areas

3.2.3.4 Runway Protection Zone (RPZ)

The Runway Protection Zones (RPZ) begins 200-feet from each runway end/threshold. Airport ownership and control of the RPZs, either through easement or acquisition, is desirable to ensure compatible land uses, airspace, and ground protection within the area. As the RPZs are primarily designated to protect people and property on the ground, the FAA considers the clearing of all objects within RPZs a safety benefit. However, homes, schools, churches, and other places of public assembly, as well as public roads, are strictly prohibited from the RPZ where the property is owned or controlled by the Airport. When such incompatible activities are located in on private property within the RPZ, the Airport should consider acquisition or other control of the property if feasible. The RPZ land use policy is stated in the FAA Memorandum, Interim Guidance on Land Uses Within a Runway Protection Zone. Currently, all RPZs extend beyond airport property. **Figure 3-2** and **Figure 3-3** depict the Runway 17-35 and Runway 5-23 RPZs.

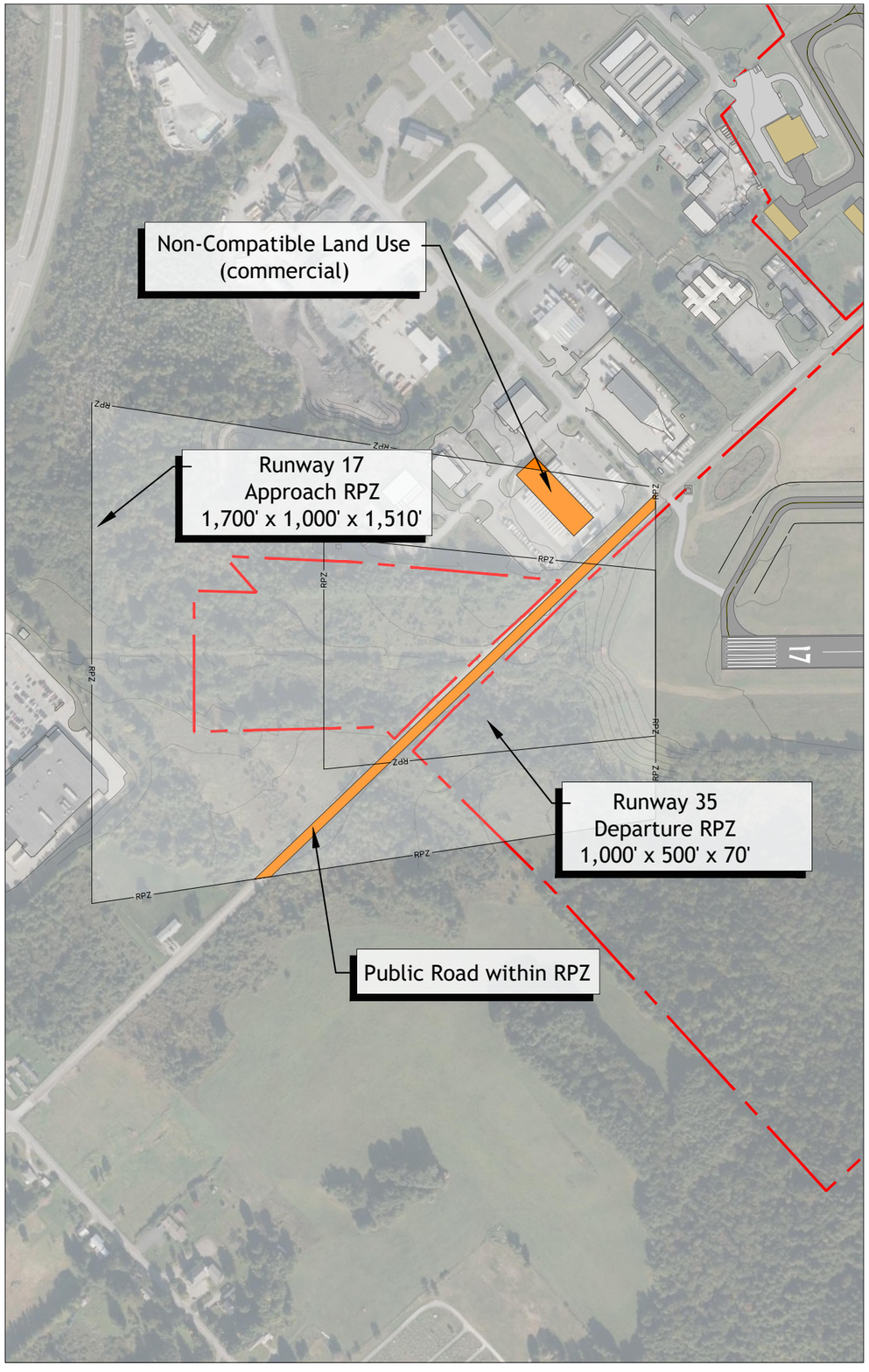
The Approach RPZ for Runway 17 and Departure RPZ for Runway 35 both begin 200 feet beyond the runway end. However, the Runway 17 Approach RPZ is larger due to the landing visibility minimum provided by the Instrument Landing System (ILS). The Runway 17 Approach RPZ has an inner width of 1,000 feet, an outer width of 1,510 feet, and extends 1,700 feet whereas the Runway 35 Departure RPZ has an inner width of 500 feet, an outer width of 700 feet, and extends 1,000 feet. It is important to note that the Departure RPZ is located entirely within the Approach RPZ boundary. The Runway 17 Approach RPZ contain portions of commercial property located on the eastern and northern edge. A portion of Comstock Road is located within the RPZs.

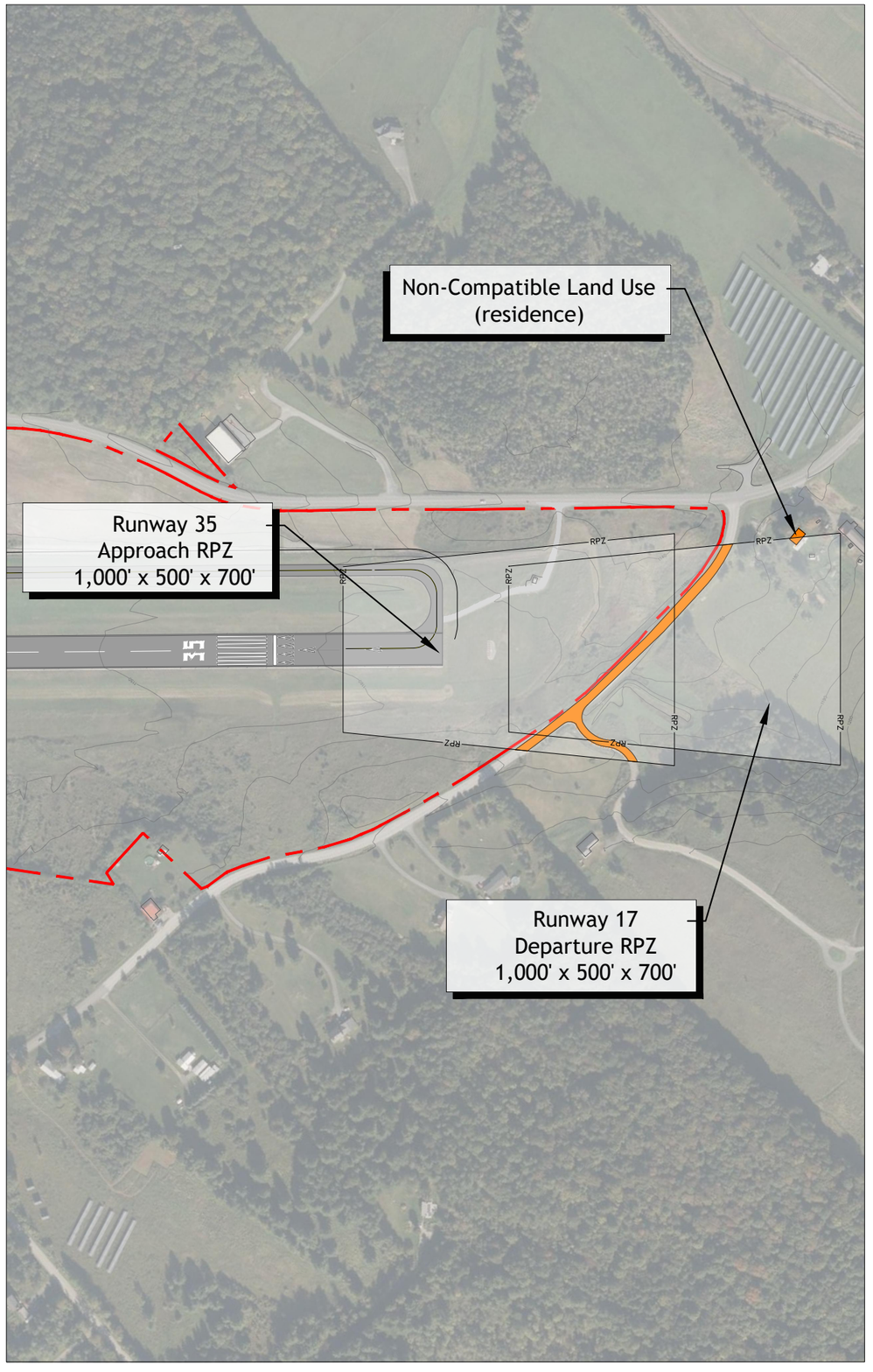
As Runway 35 has a 502-foot displaced threshold, the Approach and Departure RPZ begin at different locations. The Runway 35 Approach RPZ begins 200 feet from the runway's displaced threshold whereas the Runway 17 Departure RPZ begins 200 feet beyond the end of the runway. These RPZs share the dimensions (e.g., 500-foot inner width, 700-foot outer width, and 1,000-foot length). Portions of each RPZ extend beyond the airport property boundary. A residential building is located partly within the Departure RPZ and it is recommended that no further development is pursued within the RPZ through easements and/or property purchase. A public road (Scott Hill Road) runs east to west within both RPZs.

The RPZs for Runways 5 and 23 have an inner width of 250 feet, an outer width of 450 feet, and extend 1,000 feet. The Runway 5 RPZ is entirely within the airport property. The Runway 23 RPZ contain several commercial buildings as well as a portion of church. Approximately 75% of the church building and its parking lot are beyond the RPZ.

For all portions of the RPZs located off-airport property, property acquisition or easements should be considered, and would be eligible for FAA funding. For preexisting noncompatible conditions, it is common for that development to remain indefinitely. However, if a runway upgrade (e.g., extension, widening, strengthening) was under consideration, property acquisition

would likely be required as a prerequisite to remove the noncompatible land use. Without any upgrades, voluntary acquisition should be considered when properties become available. Easements may also be considered to prevent additional noncompatible development in the RPZs.





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EDWARD F. KNAPP STATE AIRPORT MASTER PLAN UPDATE

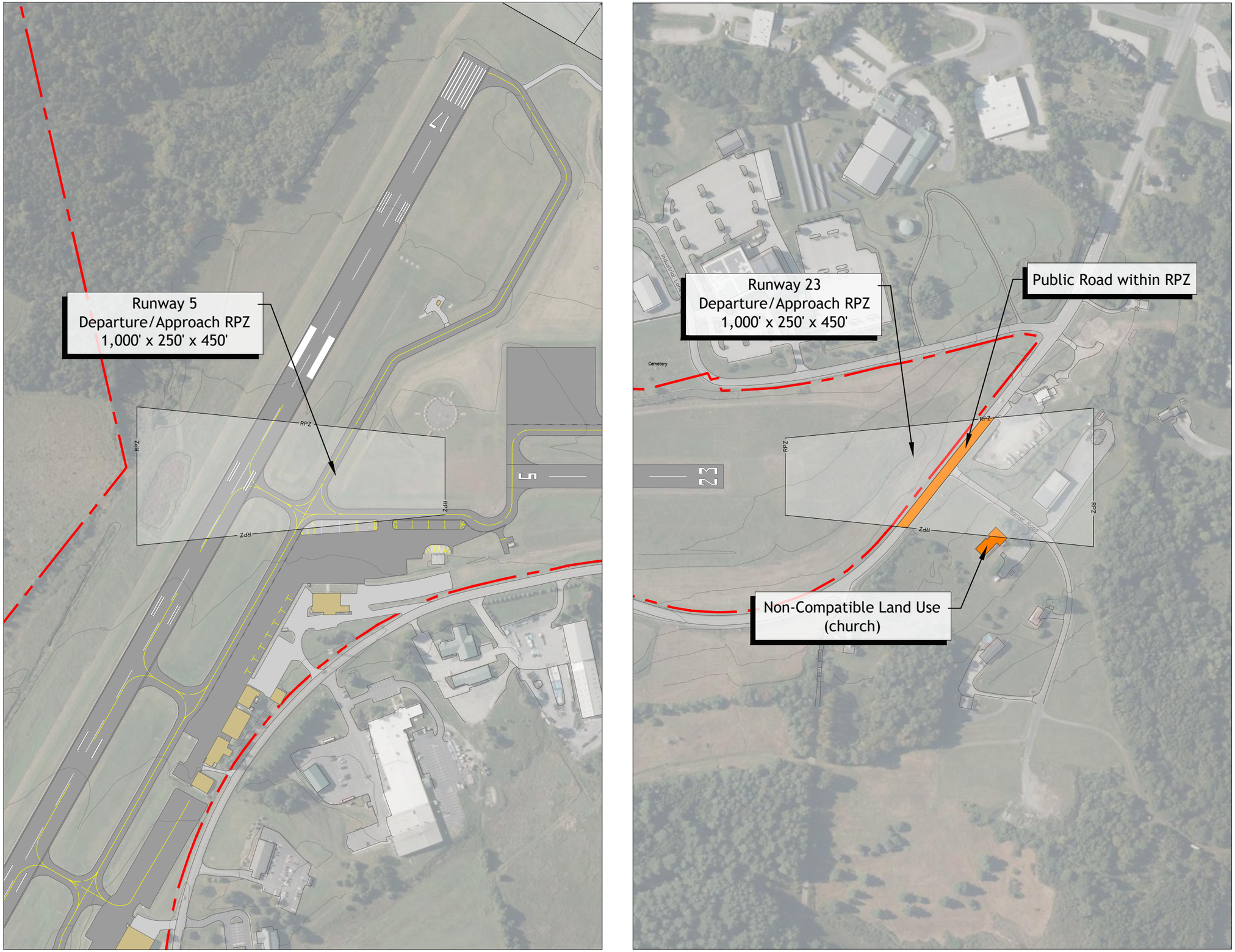
GRAPHIC SCALE (FEET)

0 300 600 1200

LEGEND

- Airport Property Boundary
- ### Ground Contour (Feet MSL)
- RPZ Runway Protection Zone

Figure 3-2
Runway 17-35
Runway Protection Zones



VERMONT
AGENCY OF TRANSPORTATION

EDWARD F. KNAPP STATE AIRPORT MASTER PLAN UPDATE

GRAPHIC SCALE (FEET)

0 150 300 600

LEGEND

- Airport Property Boundary
- ###~ Ground Contour (Feet MSL)
- RPZ Runway Protection Zone

Figure 3-3
Runway 5-23
Runway Protection Zones

3.2.4 Taxiway Design Standards

Using the FAA design standards presented in **Table 3-3**, the following sections review the existing Taxiway conditions at MPV and discuss deficiencies related to each taxiway standard.

3.2.4.1 Taxiway Width and Safety Area Standards

There are currently eight named taxiways at MPV as shown in **Table 3-4**. All but two taxiways are 35 feet in width. These widths comply with or exceed the requirements for TDG-2. Taxiway 'C' is 40 feet and Taxiway 'D' is 50 feet wide due to the length of the taxiway stubs in which fillet geometry standards supersedes width standards.

Table 3-4 - Taxiways

Taxiway	TDG	ADG	Width	Taxiway Safety Area	Taxiway Object Free Area
A	2	II	35 FT	79 FT	131 FT
B	2	II	35 FT	79 FT	131 FT
C	2	II	40 FT	79 FT	131 FT
D	2	II	50 FT	79 FT	131 FT
E	2	II	35 FT	79 FT	131 FT
F	2	I	35 FT	49 FT	89 FT
G	2	I	35 FT	49 FT	89 FT
H	2	I	35 FT	49 FT	89 FT

Source: CHA, 2021

Currently, Runway 23 is the only runway end without a full-length parallel taxiway. Runway 17 and Runway 35 end are served by Taxiway 'A'; and Runway 5 end is served by Taxiway 'E' and Taxiway 'F'. It is recommended that Taxiway 'H' be fully extended to the end of Runway 23 to provide a full parallel taxiway for improved airfield safety. Full parallel taxiways are recommended by the FAA but are not a design standard requirement.

As discussed in the previous chapter, the two runways have different Runway Design Codes and thus differing critical aircraft. As such, the taxiways servicing their respective runways have different design standards.

Based on the critical aircraft of ADG II for Runway 17-35, taxiways serving the runway require a TSA width of 79 feet and a TOFA width of 131 feet. Runway 5-23 taxiways require a TSA width of 49 feet and a TOFA width of 89 feet due to a critical aircraft of ADG I. A review of site conditions determined that the TSA surface satisfies the FAA standard to support both aircraft and vehicles within the area. All objects within the TOFA are fixed-by-function.

3.2.4.2 Taxiway Geometry

Taxiways are recommended to adhere to FAA design standards for the geometry of the fillets based on the critical aircraft and the angle of the taxiway intersection. These standards have been

updated since the last major airfield pavement project in 2010 and thus all current taxiways have outdated geometry. It is recommended that fillet geometry be updated during pavement reconstruction projects. For rehabilitation projects, the existing geometry may be adequate, but should be reviewed and confirmed with the FAA as part of any associated future design projects.

3.2.4.3 Direct Apron-to-Runway Access

Direct apron-to-runway access refers to the nonstandard airfield geometry allowing an aircraft to taxi from a point within the apron to the runway, and vice versa, without making any turns. Such a layout can cause unsafe operating scenarios in which a pilot mistakes the runway for a taxiway or a taxiway for a runway. Presently, the following areas have direct apron-to-runway access:

- Upper Apron to Runway 17-35 via Taxiway 'C'
- FBO Apron to Runway 17-35 via Taxiway 'D'
- Jet Apron to Runway 5 end via Taxiway 'E'

These nonstandard taxiway connectors can be mitigated by use of painted green islands or taxiway redesign.

3.2.5 Airfield Capacity

Airfield capacity is defined as the maximum rate that aircraft can arrive at, or depart from, an airfield with an acceptable level of delay. It is a measure of the number of operations that can be accommodated at an airport during a given time period, which is determined based on the available airfield system (e.g., runways, taxiways, NAVAIDs, etc.) and airport activity characteristics.

The current guidance provided by the FAA to evaluate airfield capacity is described in AC 150/5060-5, *Airport Capacity and Delay*. The following provides a brief definition of the two key capacity parameters:

- ***Annual Service Volume (ASV):*** A reasonable estimate of the airport's annual maximum capacity, accounting for annual weather characteristics, runway use, aircraft fleet mix, and other conditions.
- ***Hourly Airfield Capacity:*** The maximum number of aircraft operations that can take place on the runway system in one hour. As airport activity occurs in certain peaks throughout the day, accommodating the peak hour activity is most critical.

AC 150/5060-5 provides the estimated ASV and hourly airfield capacity for VFR and IFR operations based on various runway configurations and the type of aircraft operating, or projected to operate, at the airport. **Table 3-5** presents the ASV and hourly airfield capacity for the dual, non-intersecting runway configuration and type of aircraft operating at MPV. The table also list the forecast activity level.

Table 3-5 – ASV and Hourly Capacity

ASV*	Hourly Operations (VFR)*	Hourly Operations (IFR)*	2041 Annual Operations	2041 Peak Hour Operations
270,000	150	59	11,682	12

Source: AC 150/5060-5, *Airport Capacity and Delay*; CHA

*ASV based on runway configuration #14 with a mix index of 0-20

Based on the runway configuration and operating aircraft at MPV, the ASV is 270,000 operations and the hourly airfield capacity is 150 operations for VFR and 59 operations for IFR. A total of 11,682 annual operations and 12 peak hour operations are projected at MPV by the end of the planning period. Therefore, the Airport has surplus airfield capacity to accommodate existing and projected growth in operations. Airfield improvements are not needed to increase operational capacity.

3.2.6 Runway Length

Runway length requirements are based on a variety of conditions including: airport elevation, mean daily maximum air temperature, runway gradient, and the gross takeoff and landing weights of the design aircraft expected to regularly use the runway (i.e., at least 500 annual itinerant operations).

AC 150/5325-4B, *Runway Length Requirements for Airport Design*, outlines the process for determining recommended runway length at an airport. In summary, this process involves: identifying the design aircraft, or family of aircraft, and its maximum certified takeoff weight (MTOW); calculating the recommended runway length for the design aircraft based on the appropriate "runway length curves"; and, if appropriate, adjusting the recommended runway length for aircraft and runway characteristics (e.g., runway gradient, wet runway conditions).

As discussed in **Chapter 2**, the design aircraft for primary Runway 17-35 has been identified as a variant of an ARC B-II aircraft currently. The most demanding aircraft to use MPV on a regular basis is the Cessna Excel/XLS with a MTOW of 20,200 pounds and is listed as a large aircraft with fewer than 10 passenger seats. Additionally, the crosswind Runway 5-23 is designed under B-I (small) standards and the Beechcraft Baron has been identified as its respective critical aircraft. Runway length requirements for these particular aircrafts are listed in **Table 3-6** below:

Table 3-6 - Critical Aircraft Runway Length Requirements

Aircraft Type	Runway Length Requirements*
Cessna Excel/XLS (Runway 17-35)	4,700'
Beechcraft Baron (Runway 5-23)	3,400'

*= 1,000' Above MSL @ 80°F Mean Maximum Temp of Hottest Month, MTOW, Dry Pavement

Source: FAA AC 150/5325-4B

The primary Runway 17-35 provides 5,000 feet of length for takeoff, and 4,500 feet of length for landing on the Runway 35 end due to the displaced threshold. The crosswind Runway 5-23 provides 3,000 feet of length for takeoff and landing. It is important to note that **Table 3-6** represents the maximum runway length required at Maximum Takeoff Weight (MTOW). Thus, it is reasonable to assume that the current runway lengths of 5,000 feet and 3,000 feet will remain adequate length for all regular users. Additionally, as there is no forecast change in the critical aircraft, it is expected that MPV sufficiently meets the runway length requirements throughout the planning period. Although, some jet operations may be hindered by the runway length, such operations are not anticipated to exceed 500 annually, or justify a runway extension.

3.2.7 Wind Coverage

Local wind conditions at an airport can have a significant role in runway use as aircraft operate most efficiently when landing and departing into the wind. Runways not oriented to take full advantage of the prevailing wind patterns are used infrequently. Pilots must ensure that the crosswind component, or wind component perpendicular to the direction of travel, is not beyond the limits of the aircraft. Crosswind components differ depending on the size of aircraft and the associated ARC for the runway. According to FAA criteria, an airport should provide at least 95 percent wind coverage for aircraft categories anticipated to use the airport regularly.

The 95 percent wind coverage is computed on the basis of a crosswind not exceeding 10.5 knots for ARC A-I and B-I; 13 knots for ARC A-II and B-II; 16 knots for ARC A-III, B-III, and C-I through D-III. Given the ARC for MPV is forecasted to remain ARC B-II, **Table 3-7** provides the coverage for the all-weather, VFR, and IFR weather wind conditions for a 10.5, 13 and 16-knot crosswind for the Airport's runway.

Table 3-7 – Runway Wind Coverage

Runway	All Weather	VFR	IFR
	(knots – percent coverage)		
Combined	10.5 – 99.3% 13 – 99.9% 16 – 100%	10.5 – 99.4% 13 – 99.9% 16 – 100%	10.5 – 99.2% 13 – 99.8% 16 – 100%
Runway 17-35	10.5 – 98.7% 13 – 99.5% 16 – 99.9%	10.5 – 98.6% 13 – 99.4% 16 – 99.9%	10.5 – 98.9% 13 – 99.6% 16 – 99.9%
Runway 5-23	10.5 – 92.0% 13 – 95.4% 16 – 98.7%	10.5 – 92.1% 13 – 95.6% 16 – 99.0%	10.5 – 92.1% 13 – 95.0% 16 – 98.2%

Source: NOAA National Climatic Data Center
EF Knapp State Airport 2011 – 2020

Table 3-7 shows that combined runway wind coverage at MPV for each weather condition (i.e., all-weather, VFR, and IFR) exceeds the 95 percent minimum wind coverage for each crosswind component. Therefore, adequate wind coverage is provided at MPV by the current runway configuration.

3.2.8 Airfield Pavement Condition

An important feature of airfield pavement is its ability to withstand repeated use by aircraft of significant weight. After repeated use, the condition of the pavement may deteriorate. VTrans conducted a statewide Airport Pavement Management System Update Report in 2012 which discussed the functional remaining life of all airfield pavement across all state airports in Vermont. The 2012 report resulted in a Pavement Condition Index (PCI) of 83 (satisfactory), scored out of 100, for MPV as a whole. An updated analysis was conducted in 2022, resulting in a PCI of 66 (fair).

Based on the findings, it is recommended that MPV perform pavement rehabilitation on the following areas within the forecast period:

- Runway 17-35
- Taxiway 'C'
- Taxiway 'D'
- Upper Ramp
- Civil Air Patrol Hangar Apron
- Fueling Apron
- Taxilane servicing the FBO Apron

This study's Airport Capital Improvement Plan (ACIP) will provide an estimate and target period for all pavement rehabilitation.

3.2.9 Runway Lighting and Navigational Aids

Runway lighting, marking, and instrumentation allows for the safe operation of aircraft during nighttime hours and low visibility conditions.

As previously discussed in **Chapter 1**, both Runway 17-35 and Runway 5-23 are equipped with Medium Intensity Runway Lights (MIRLs). Runway 17 is also equipped with a four-box Precision Approach Path Indicator (PAPI-4) as well as a Medium-Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR) to accompany the Instrument Landing System (ILS). Runway 35 is equipped with Runway End Identifier Lights (REILs).

As Runway 35 is equipped with an RNAV (GPS) instrument approach procedure, it is recommended that a four box PAPI is installed on this runway end. The installation of a PAPI-4 on the Runway 35 end may enhance the runway's current GPS procedure by offering both lateral and vertical guidance. Additional study would be required to determine obstruction feasibility and compliance prior to a revised Instrument Approach Procedure (IAP).

3.2.10 Instrument Approach Procedures

Instrument Approach Procedures (IAPs) are published by the FAA for specific runway ends. MPV has a total of three published IAPs for Runway 17-35, two of which are for approaches to Runway 17, including a full precision instrument approach. The two additional procedures include non-precision GPS approaches to Runways 17 and 35. The FAA has no requirements for IAPs at general aviation airport; however, approaches to both ends of the primary runway is a general goal and is provided at MPV. Due to terrain obstructions to the south and the length of Runway 5-23 (i.e., a minimum length of less than3,200 feet and a full parallel taxiway is recommended for an IAP), the master plan does not recommend pursuing additional IAPs for MPV.

As mentioned, the installation of a PAPI on the Runway 35 end may allow for enhanced GPS guidance capable of providing both horizontal and vertical guidance.

3.2.11 Airspace Obstruction Removal

An airspace obstruction study was completed in 2020 for each runway end at MPV. The obstruction study identified the airspace surfaces applicable to each runway along with obstructions (both vegetative and fixed object) within and underlying each airspace surface. As part of the study, an Obstacle Action Plan was developed to identify a priority of obstruction removal needs along with proposed object mitigation. An Environmental Assessment to begin the removal of obstructions within the airspace surfaces is also being conducted as part of this study.

3.3 LANDSIDE FACILITY REQUIREMENTS

The landside facility requirements examine existing airport facilities and structures that accommodate the movement and storage of aircraft, and provide facilities to support pilots, passengers, and airport employees. The landside facility requirements analysis includes an examination and evaluation of:

- Aircraft Storage Space
- Passenger Terminal Building Space
- Fuel Storage Requirements
- Airfield Apron Space
- Vehicle Parking Requirements
- Airfield Maintenance Equipment Storage
- Airport Security and Fencing

The following sections provides a description of each item and a brief evaluation of existing and future requirements according to current FAA and industry standards.

3.3.1 Aircraft Storage Space

Due to various weather conditions, hangars are highly desirable in the State of Vermont as snowstorms, frost, and intense cold can cause icing on parked aircraft, which can be extremely disrupting to aircraft operations. Additionally, during warmer months, heat and sun exposure can

damage avionics and fade paint, and thunderstorms and hail can cause considerable damage. For GA airports, while virtually all aircraft owners would prefer hangar storage over tie-downs, hangar requirements are generally a function of the number and type of based aircraft, hangar rental/construction costs, and area climate.

As discussed within Chapter 2, MPV is forecasted to experience a modest growth in based aircraft with the increase concentrated on single-engine aircraft and jets, as shown on **Table 3-8.**

Table 3-8 – MPV Current and Forecasted Based Aircraft

Aircraft Type	2021	2026	2031	2036	2041
Single-Engine	40	41	43	45	47
Multi-Engine	2	2	2	2	2
Jet	1	1	2	2	3
Helicopter	1	1	1	1	1
Other	0	1	1	2	2
Total	**44**	**46**	**49**	**52**	**53**

Source: CHA, 2021.

It is estimated that 33 of the current based aircraft utilize hangar storage (T-hangar or box/community hangars) while 10 single-engine based aircraft lease tie-down space within the Upper Apron. For planning purposes, it is assumed that the 10 single-engine based aircraft currently leasing tie-down spaces will continue to do so, and all additional based aircraft introduced throughout the forecast period will utilize hangar storage.

To forecast anticipated hangar space, **Table 3-9** lists potential storage space requirements for each type of based aircraft (i.e., single-engine, multi-engine, etc.). It is important to note that any additional hangar development at MPV is anticipated to be privately-funded box hangars.

Table 3-9 – Estimated Aircraft Storage Area Requirements

Aircraft Type	Estimated Hangar Space Requirement (SF)	2021	2026	2031	2036	2041
Single-Engine	1,600	48,000	49,600	52,800	56,000	59,200
Multi-Engine	2,000	4,000	4,000	4,000	4,000	4,000
Jet	4,400	4,400	4,400	8,800	8,800	13,200
Helicopter	1,600	1,600	1,600	1,600	1,600	1,600
Other	1,600	-	1,600	1,600	3,200	3,200
Total		**58,000**	**61,200**	**68,800**	**73,600**	**81,200**

Source: CHA, 2021.

As discussed within Chapter 1, there are several box/community and T-Hangars located at MPV totaling approximately 60,000 square feet of aircraft storage space. However, it estimated that approximately 3,000 square feet is reserved for maintenance activities provided by the FBO within Hangar #4. Based upon conversations with the FBO and VTrans, all hangars are at capacity. As such, as the projected number of based aircraft at MPV increases it is anticipated that additional hangar space will be warranted. Per **Table 3-9**, the long-term potential hangar demand

is approximately 81,000 square feet. With an existing capacity of approximately 58,000 square feet, this study will plan for at least 24,000 square feet of additional hangar space.

It is important to note that while this study identifies areas for future hangar development, construction of future hangars will likely be privately-funded and it is the financial responsibility of the potential tenant to develop and maintain the hangar. The State of Vermont is currently undergoing a master permitting effort to allow a more streamlined approach for potential tenants. These pre-permitted hangar locations will be discussed further within Chapter 4.

3.3.2 Aircraft Parking & Tie-Down Requirements

Aircraft aprons provide parking and tie-down positions for based and itinerant aircraft parking as well as staging areas for aircraft stored in conventional hangars. As discussed within Chapter 1, there are a total of seven tie-down positions located on the eastern edge of the FBO Apron and 12 tie-downs positions on the northern and southern edges of the Tie-Down Apron. Based upon airport site visits, it is estimated that the 10 based aircraft currently leasing tie-down spaces will continue to do so. Additionally, as presented within the Chapter 2, it is forecasted that MPV will experience 12 peak hour operations by the end of the forecast period. While not each peak hour operation will require a tie-down position, it recommended that at least 10 based tie-down positions and the existing seven itinerant tie-down positions are maintained.

Based upon these assumptions applied to approximate apron sizing requirements, **Table 3-9** lists the recommended apron space needs throughout the forecast period.

Table 3-10 – Estimated Apron Parking Space Requirements

Aircraft Type	Estimated Apron Requirement (SF)	2021	2026	2031	2036	2041
Single-Engine	2,700	27,000	29,700	35,100	40,500	45,900
Multi-Engine	3,500	7,000	7,000	7,000	7,000	7,000
Jet	7,500	7,500	7,500	15,000	15,000	22,500
Helicopter	5,000	5,000	5,000	5,000	5,000	5,000
Other	2,000	-	2,000	2,000	4,000	4,000
Fueling Area	4,800	4,800	4,800	4,800	4,800	4,800
Total		**46,500**	**51,200**	**64,100**	**71,500**	**84,400**

Source: CHA, 2021.

As listed within **Table 1-3** within Chapter 1, there is approximately 293,000 square feet of apron space located throughout the airfield. However, the pavement within the Upper Apron has deteriorated beyond its useful life and is mostly unavailable for aircraft parking. Therefore, only approximately 233,000 square feet of apron is currently available for based and itinerant aircraft parking. Additionally, both, the Upper Apron and the Tie-Down Apron have been identified as a potential locations for future hangar development. Should these areas be used for future hangars, only approximately 201,000 square feet of apron would be available for based and

itinerant aircraft parking. Therefore, MPV is anticipated to have sufficient apron space for both transient and tie-down parking throughout the forecast period.

3.3.3 Fuel Storage Requirements

The airport recently added self-service fueling capabilities to provide Jet-A and 100LL/AVGas from its fuel facility located on the northeastern edge of the Terminal Apron. Additionally, the FBO provides full service fueling via a fuel truck. The current fuel tank capacities are adequate.

3.3.4 Terminal Building Requirements

The MPV terminal building was constructed in 1959 and formally used for airline ticketing and passenger processing. A small portion of the terminal building is leased to a private accounting firm, but the building is mostly vacant and provides minimal accommodations for airport visitors. As the majority of transient aircraft users are directed to the FBO during operating hours, the terminal building is underutilized. However, public restrooms are currently only available within the terminal building. Although renovations to the Terminal Building would not be considered a high capital development priority, it is recommended that the terminal building lobby area remains open and maintained for pilot and customer use.

As part of this study, areas for potential future terminal building reconstruction are identified.

3.3.5 Vehicle Parking Requirements

Vehicle parking facilities are intended to provide space for design hour passengers/pilots, visitors, employees, etc. Consideration should also be made for off-peak passenger/pilots leaving a vehicle in the lot for more than the normal period. The Town of Berlin provides vehicle parking requirements under their zoning ordinance; however, airports do not fall under any of the predetermined categories. As such, vehicle parking requirements were calculated using the Airport Cooperative Research Program (ACRP) Report 113, *Guidebook to General Aviation Facility Planning*.

For planning purposes, the metric used for vehicle parking requirements was one parking space per 1,000 square feet of hangar space. In order to account for the expected growth of the airport, the forecasted hangar space requirements discussed in Section 3.3.1 of this chapter was used, **Table 3-11** identifies the future vehicle parking space requirement.

Table 3-11 – Estimated Vehicle Parking Requirements

Existing Parking Spaces (Approx.)	Estimated Vehicle Parking Requirements				
	2021	2026	2031	2036	2041
104	60	63	73	78	84
Surplus/(Deficit)	**44**	**41**	**31**	**26**	**20**

Source: CHA, 2021

Thus, it is concluded that MPV provides sufficient parking to accommodate airport visitors.

3.3.6 Airport Security and Fencing

Perimeter fencing surrounds the entire airport boundary of the airport with a total of six key coded security gates. It is not expected that MPV will require additional security fencing throughout the planning period beyond regular maintenance. However, it is recommended that all sections of the perimeter fencing and security gates are maintained to deter wildlife and enhance airport security.

3.4 FACILITY REQUIREMENTS SUMMARY

Table 3-12 provides a summary of the recommendations discussed within this chapter. These recommendations are carried forward to the Development Alternatives where, if applicable, solutions are presented.

Table 3-12 – Facility Recommendations

Facility	Recommendation
Runways	• Address non-standard conditions within the RSA, ROFA, and RPZ • Rehabilitate Runway 17-35 • Install Runway 35 PAPI-4 • Remove runway obstructions
Taxiways	• Address non-standard conditions within the TSA and TOFA • Realign a portion of Taxiway 'A' to meet runway-taxiway separation standards • Develop partial or full parallel Taxiway 'H' connecting to Runway 23 end to improve safety • Address non-standard FAA taxiway configuration that currently provide direct runway-to-apron connections • Rehabilitate each taxiway as needed
Hangar and Apron Parking	• Construct additional hangar space • Provide additional apron tie-down for transient aircraft • Rehabilitate existing public aprons/tie-down aprons

Source: CHA, 2021

4 DEVELOPMENT ALTERNATIVES

The primary focus of this element of the Master Plan Update for the Edward F. Knapp State Airport (MPV) is the identification and evaluation of development alternatives considered as key components of the overall Airport's improvement strategy. This chapter provides development strategies to accommodate future aviation demand identified in ***Chapter 2, Forecasts of Aviation Demand***, as well as the deficiencies and constraints identified in ***Chapter 3, Facility Requirements***. The overall goal of this analysis, as stated in Federal Aviation Administration (FAA) Advisory Circular (AC) 150/5070-6B, *Airport Master Plans*, is to:

- Identify alternative concepts to address previously identified facility requirements.
- Evaluate these alternatives, individually and collectively, so there is a clear understanding of strengths, weaknesses, and implications of each.
- Select a reasonable alternative or set of alternatives.

Development alternatives, or concepts, may focus on demand/capacity relationships, operational safety, and/or improving the Airport's revenue stream. Additionally, it may be necessary to include development concepts for future years beyond the term of the planning period, in order to protect areas reserved for future runway or taxiway development, facility expansion, etc.

The development concepts presented in this chapter are organized based on specific areas at the Airport. From this effort, and using the previously determined facility requirements, the most reasonable and feasible alternative was identified for each area. The alternatives identified represent a level of detail consistent with FAA guidance for a master planning effort. The alternatives have been designed to address the airport facility deficits identified in ***Chapter 3*** and are presented as follows:

- Runway Standards
- Taxiway Extension Alternative
- Taxiway Realignment Alternative (including updated pavement geometry)
- Hangar & Apron Layout Alternatives

The goal of this chapter is to identify a range of alternatives for airfield and landside development that are consistent with the FAA guidelines and standards and goals of MPV. The alternatives are based on a review of the Airport's needs as well as current environmental, physical, and financial constraints. Note that prior to the development of any airport project, an environmental analysis and permitting may be required. The following sections summarize previous findings related to facility requirements and the objectives of the alternative development process.

4.1 INFLUENCING DEVELOPMENT FACTORS

There are several factors that influence the evaluation of the alternatives and determine the final recommended development plan. These factors include:

- ***FAA Design Standards and Guidance:*** Airfield recommendations and designs consistent with the guidance provided by FAA AC 150/5300-13A, *Airport Design*. At MPV, key considerations include safety area grading, required clearances from aprons and hangars, and pavement geometry.
- ***Environmental Impacts:*** Evaluation of the potential impacts on the environment, as Airport improvements may impact wetlands, water quality, and flooding.
- ***Consistency with Master Plan Objectives:***
  - Aviation Demand – Accommodating projected operations and design aircraft
  - Apron Capacity – Satisfying the projected needs and constraints of the apron area
  - Hangar Layout – Identifying areas for future hangar development
- ***Construction and Maintenance Costs****:* The overall project feasibility, associated costs, constructability.

Table 4-1 summarizes the facility requirements identified in the previous chapter.

Table 4-1 – Summary of Facility Requirements

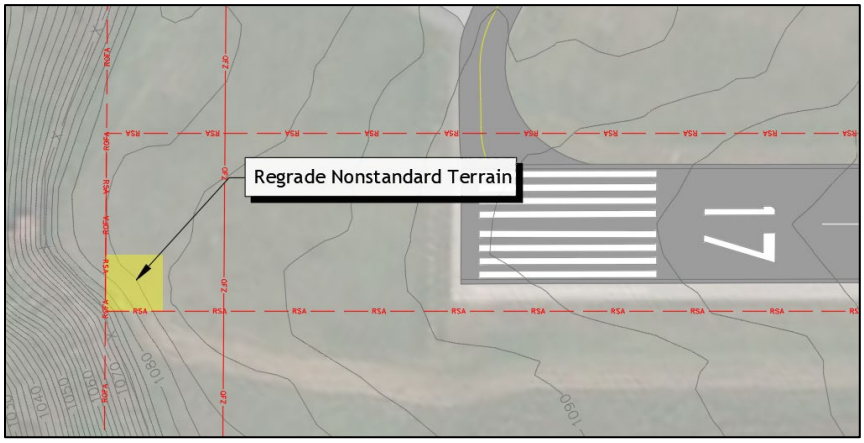
Facility	Recommendation
Runways	• Address non-standard conditions within the RSA, ROFA, and RPZ • Rehabilitate Runway 17-35 • Install Runway 35 PAPI-4 • Remove runway obstructions
Taxiways	• Address non-standard conditions within the TSA and TOFA • Realign a portion of Taxiway 'A' to meet runway-taxiway separation standards • Develop partial or full parallel Taxiway 'H' connecting to Runway 23 end to improve safety • Address non-standard FAA taxiway configuration that currently provide direct runway-to-apron connections • Rehabilitate each Taxiway as needed
Hangar and Apron Parking	• Construct additional hangar space • Provide additional apron tie-down for transient aircraft • Rehabilitate existing public aprons/tie-down aprons

4.2 DEVELOPMENT ALTERNATIVES

4.2.1 Runway Standards

Runway Safety Area (RSA)

A nonstandard grading condition was identified within the northwest corner of the Runway 17 RSA. The terrain within this area decreases at approximately a 25 percent grade, exceeding the FAA allowable five percent grade. It is recommended that the terrain is regraded and reinforced with a retaining wall or embankment.



Runway Protection Zones (RPZ)

The Runway 17 Approach RPZ contains portions of commercial property located on the eastern and northern edges. A portion of Comstock Road is also located within the RPZ. The Runway 35 RPZ contains portions of a residential building as well as a public road (Scott Hill Road) that runs east to west. It is recommended that no further development is pursued within the RPZs and these areas are protected through purchase of easements and/or property acquisition.

For all portions of the RPZs located off-airport property, property acquisition or easements should be considered, and would be eligible for FAA funding. For preexisting noncompatible conditions, it is common for that development to remain indefinitely. However, if a runway upgrade (e.g., extension, widening, strengthening) was under consideration, property acquisition would likely be required as a prerequisite to remove the noncompatible land use. Without any upgrades, voluntary acquisition should be considered when properties become available. Easements may also be considered to prevent additional noncompatible development in the RPZs.

Airspace Obstructions

An airspace obstruction study was completed in 2020 for each runway end at MPV. The obstruction study identified the airspace surfaces applicable to each runway along with obstructions (both vegetative and fixed object) within and underlying each airspace surface. As part of the study, an Obstacle Action Plan was developed to identify a priority of obstruction

removal needs along with proposed object mitigation. An Environmental Assessment to begin the removal of obstructions within the airspace surfaces is also being conducted as part of this study.

4.2.2 Taxiway 'H' Extension

Runway 23 is currently the only runway end at MPV that is not served by a full-length parallel taxiway. Aircraft departing Runway 23 must "back taxi" on the runway prior to departure. Currently, Taxiways 'F' and 'H' serve Runway 5-23, but terminate at the runway's halfway point.

Therefore, **Figure 4-1** depicts a full-length extension (35-foot width) of Taxiway 'H' to the Runway 23 end. This concept enhances safety by eliminating the need for aircraft back taxi operations to Runway 23. Additionally, the extension of Taxiway 'H' also provides additional ingress/egress and increases aircraft maneuvering for the hangars on the northern portion of the airfield.

Following the ADG I standards of Taxiway 'H', the extension potentially results in the airport perimeter fencing encroaching into the Taxiway Object Free Area (TOFA). A survey should be conducted to verify the potential encroachment prior to development. If relocation of the airport perimeter fence is necessary, it will remain within the limits of the airport property. Additionally, as the terrain within this area remains relatively even, minimal safety area grading would be anticipated.

4.2.3 Taxiway 'A' Realignment

Taxiway to Runway Separation

Taxiway 'A' contains approximately 900 linear feet of nonstandard runway to taxiway separation (i.e., less than 240 feet) between Taxiways 'B' and 'D'. This portion of Taxiway 'A' was constructed in the late 1990s and is located approximately 225 feet from the Runway 17-35 centerline due to rising terrain east of the taxiway and adjacent to the Upper Ramp. **Figure 4-2** depicts a realignment of the nonstandard portion of Taxiway 'A' to accommodate the FAA design standard of 240 feet between the taxiway and runway centerlines per Runway Design Code II.

Taxiway Object Free Area (TOFA)

The standard Taxiway 'A' TOFA extends 65.5 feet of each side of the centerline, or 131 feet total width, per Airplane Design Group (ADG) II criteria. This design standard is based upon the following formula using an ADG II aircraft with a 79-foot wingspan: 79' x 1.4 + 20' = 131 feet.

Upon shifting of the taxiway to a 240' runway offset, the corresponding TOFA and Taxiway Safety Area (TSA) would also shift eastward. Resultantly, the rising ground to the east would become an 'object' within the TOFA.

This concept would involve approximately 9,000 square feet of additional taxiway pavement and approximately 5,500 of pavement removal for the taxiway shift. Additionally, to accommodate the shifted TOFA, approximately 2,000 cubic yards of the adjacent terrain would need to be

removed and graded to provide a clear TOFA. The construction of a retaining wall could be used to maintain the adjacent Upper Ramp area.

As the critical aircraft anticipated to utilize Taxiway 'A' on a regular basis has a wingspan of no greater than 55 feet, compared to the 79-foot wingspan for ADG II as a whole. As such, it may be possible to reduce the TOFA width to 48.5 feet on each side of the centerline, or 97 feet total width, by using the FAA formula: 55' x 1.4 + 20' = 97 feet. If the TOFA width is reduced, grading of the adjacent terrain may potentially be minimized to under approximately 400 cubic yards. The Approach will be studied during the design phase to explore all options to achieve a standard TOFA.

4.2.4 Painted Taxiway Island

In addition to a partial shift of Taxiway 'A', **Figure 4-2** shows the installation of a painted taxiway island at the east end of Taxiway 'D'. As Taxiway 'D' currently allows direct apron access to Runway 17-35, the painted island requires aircraft taxiing from the FBO apron area and the Civil Air Patrol Hangar (Hangar 6) to make a turn prior to entering the runway. This FAA standard is intended to prevent pilots from inadvertently entering the runway. The concept includes a TDG I taxilane is located on the north and south sides of the painted island, allowing for multiple points of entry/exit into and out of the FBO apron area.

4.2.5 Hangar Development

As discussed within ***Chapter 3***, MPV is forecasted to experience a growth in based aircraft and, as such, an increase in hangar demand. The following concepts depict potential areas for hangar development and expansion. Note that all development will be market-driven based on demand and funded by the aircraft owner or developer.

When determining potential hangar layouts, the Vermont Agency of Transportation (VTrans) developed standards sizes to use in an effort to pre-permit hangars (for stormwater, water/wastewater, and Act 250) and streamline the development process. These standards including a 20-foot hangar separation and dimensions for small, medium, and large corporate hangars:

- Small Hangar: 60' x 60'
- Medium Hangar: 60' x 80'
- Large Hangar: 120' x 120'

Each proposed hangar development site has or would be required to be vetted through the State's permitting process. While the actual development within each site may be different than depicted, development involving less impervious area should satisfy the previous permitting requirements. Additionally, all hangar development within the airport property would require FAA review via the 7460-1, *Notice of Construction or Alteration*, submittal process.

4.2.5.1 North Hangar Development

Three hangar development areas were identified within the northern portion of the airfield. The first location is a 3.6-acre greenfield site directly east of the Runway 17 end and northwest of the Runway 5 end. **Figure 4-3** depicts two large hangars (120' x 120') and a 27,300 SF apron within this area, accessed via a new connector to Taxiway 'A'. Additionally, vehicular parking can be accessed via Comstock Road. The layout would result in 74,000 SF of new impervious surface.

The second location is the 1.1-acre vacant redevelopment site located directly west of Buildings 11 and 12. **Figure 4-4** depicts a small (60' x 60') and medium (60' x' 80') hangar and a 10,000 SF apron within this area. A TDG 2 taxilane located at the midpoint of Taxiway 'H' would provide airfield access. However, significant grading would be required to ensure proper drainage and safe aircraft taxiing operations as the terrain of the brownfield site is approximately four feet lower than the taxilane. Vehicular access would be via a driveway, connecting onto Comstock Road, located west of the proposed hangars.

Figure 4-5 depicts an alternative layout to **Figure 4-4**. In this concept, an additional small hangar and expanded apron is shown in place of vehicular surface parking adjacent to Comstock Road.

4.2.5.2 South Hangar Development

Two hangar development areas were identified within the southern portion of the airfield. **Figure 4-6** depicts three medium hangars located within the Upper Ramp. The terrain within the Upper Ramp area rises from Taxiway 'A' and is approximately eight feet above the taxiway elevation. As such, hangar development within the Upper Ramp would be located within the Runway 17-35 Federal Aviation Regulation (FAR) Part 77 Primary Surface (as are all existing hangars on the Main and FBO Apron). Although the FAR Part 77 surfaces are not airfield design criteria, FAA coordination and airspace review, including completion of an FAA 7460 form, would be required prior to proceeding with hangar development. Additionally, this layout only accommodates ADG I aircraft due to the confined space and safety area setback requirements. Lastly, the existing pavement within Upper Ramp has significantly deteriorated and, therefore, would require rehabilitation to support aircraft hangars or parking.

Figure 4-7 depicts a large hangar within the Tie-down Ramp. Due to the footprint of the existing impervious pavement and the size of the hangar, portions of the hangar would be within Runway 17-35 FAR Part 77 Primary Surface, with the remaining portion penetrating the Transitional Surface. Additionally, the hangar would require relocation of the existing 10 aircraft currently utilizing the tie-downs in order to accommodate a larger ADG II aircraft. However, as mentioned in ***Chapter 3***, there is sufficient apron space throughout the airfield to accommodate the displaced tie down positions. If only ADG I aircraft would be using the hangar, then only six tie-down would be removed.

Depending upon the ultimate hangar development pursued at MPV, there are two locations that can accommodate replacement tie-downs:

- ***Jet Apron*** has adequate area to accommodate 10-15 tie-down locations, plus transient large and jet aircraft.
- ***Upper Apron*** was designed to accommodate 15 light aircraft tie-downs. With rehabilitation this apron could provide tie-downs, hangars, or a combination of both.

4.3 RECOMMENDED PLAN

The Recommended Plan depicts the alternatives (**Figure 4-8**) recommended to be pursued as development projects in the future and lays the foundation for the Airport Layout Drawing. The following briefly summarizes each potential development area along with the preferred concept where applicable.

Taxiway Extension

It is recommended that Taxiway 'H' is extended to the Runway 23 end to eliminate the need to back taxi on the runway and improve overall airfield safety. Based on the modest level of activity utilizing this runway, the taxiway extension is a long-term or lower priority recommendation. As mentioned, an FAA MOS would be required due to the location of the airport security fencing within the future TOFA, or a small location of the fence could be relocated.

Taxiway 'A' Realignment

It is recommended that the nonstandard portion of Taxiway 'A' is realigned to provide 240 feet of runway to taxiway separation. Although an MOS is not anticipated, FAA coordination should occur prior to development to discuss the feasibility of an MOS vs. taxiway realignment.

Hangar Development

It is recommended that the hangar sites as depicted in **Figure 4-3, Figure 4-5, Figure 4-6** and **Figure 4-7** are considered for development. Each development site is located entirely within the airport property and provides immediate airfield access without significant impervious pavement. With the exception of hangar development within Tie Down apron, each development site does not impact either based aircraft or existing aircraft operations.

VERMONT
AGENCY OF TRANSPORTATION

EDWARD F. KNAPP STATE AIRPORT MASTER PLAN UPDATE

Extend Taxiway 'H' at Standard 150' Offset from Runway 5-23

Relocate Existing Fence

Update Taxiway Geometry

Industrial Lane

Cemetery

Airport Road

240'

150'

GRAPHIC SCALE (FEET)

0 100 200 400

LEGEND

- Airport Property Boundary
- ###~ Ground Contour (Feet MSL)
- Future Apron/Taxiway
- Pavement Removal
- TOFA / TSA — Future Taxiway/Taxilane Object Free Area/Safety Area

Figure 4-1
Taxiway 'H' Extension

VERMONT
AGENCY OF TRANSPORTATION

EDWARD F. KNAPP STATE AIRPORT MASTER PLAN UPDATE

Construct Painted Island to Mitigate Direct Apron-to-Runway Access

Construct Painted Islands to Mitigate Direct Apron-to-Runway Access

8 Foot Elevation Increase

Realign Taxiway 'A' to Standard 240' Offset

Reconstruct Fillets to FAA Standards Taxiway Design Group 2

Localizer Critical Area

240'

GRAPHIC SCALE (FEET)

0 50 100 200

LEGEND

- Airport Property Boundary
- ###~ Ground Contour (Feet MSL)
- Future Apron/Taxiway
- Pavement Removal
- TOFA / TSA — Future Taxiway/Taxilane Object Free Area/Safety Area
- NAVAID Critical Area

Figure 4-2
Taxiway 'A' Realignment

VERMONT
AGENCY OF TRANSPORTATION

EDWARD F. KNAPP STATE AIRPORT MASTER PLAN UPDATE

Optional 25' Taxilane

Large Hangars (120' x 120')
Taxiway Design Group 2

120' x 120'

Potential Tie-Down Replacement

Glide Slope Critical Area

AWOS Critical Area

Comstock Road

GRAPHIC SCALE (FEET)

0 50 100 200

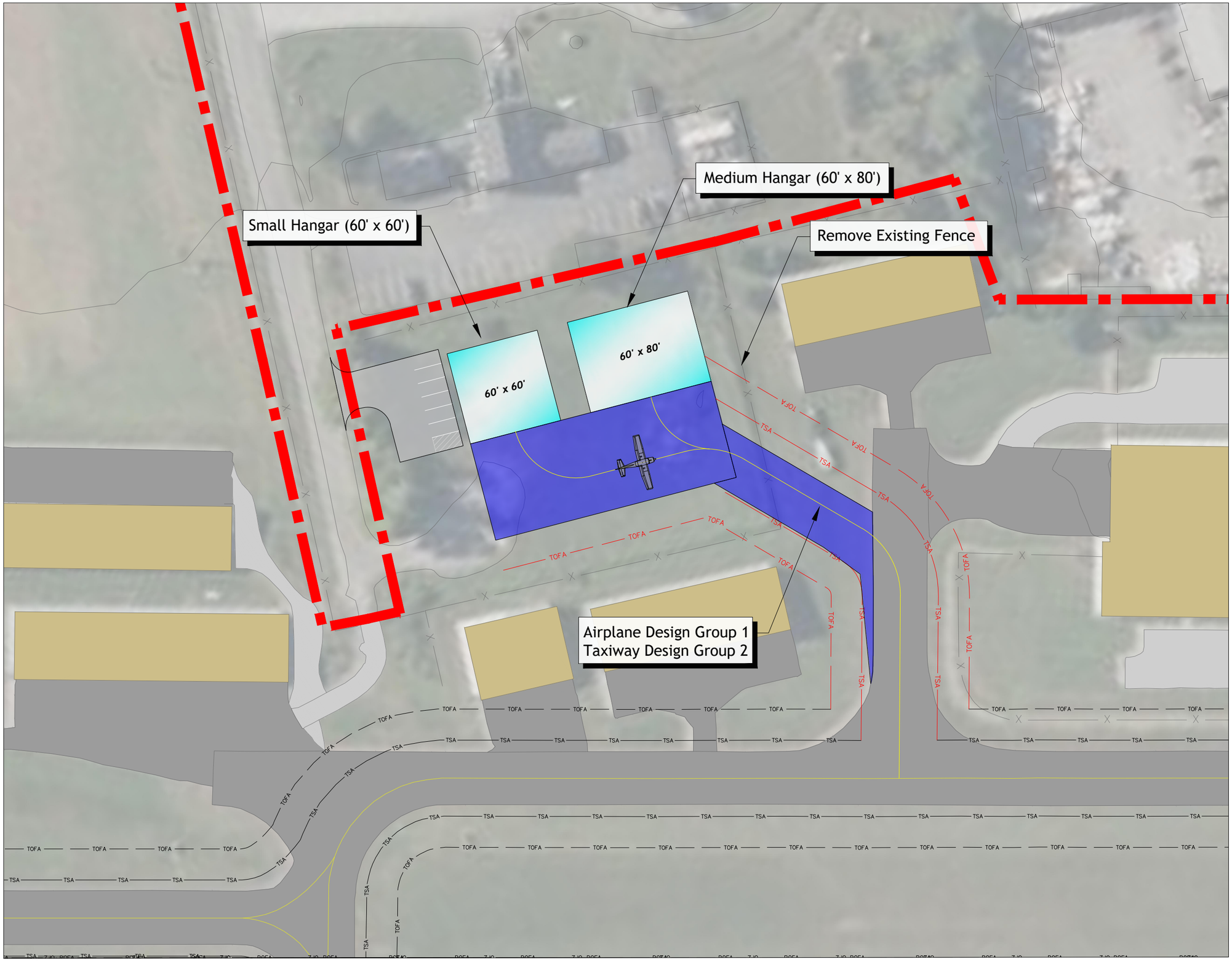
LEGEND

- Airport Property Boundary
- ###~ Ground Contour (Feet MSL)
- Future Hangar Development
- Future Apron/Taxiway
- TOFA / TSA Future Taxiway/Taxilane Object Free Area/Safety Area
- NAVAID Critical Area

Figure 4-3
North Site #1 Alternative

VERMONT
AGENCY OF TRANSPORTATION

EDWARD F. KNAPP STATE AIRPORT MASTER PLAN UPDATE



GRAPHIC SCALE (FEET)

0 30 60 120

LEGEND

- Airport Property Boundary
- ###~ Ground Contour (Feet MSL)
- Future Hangar Development
- Future Apron/Taxiway
- TOFA / TSA — Future Taxiway/Taxilane Object Free Area/Safety Area

Figure 4-4
North Site #2 (Concept 1)

VERMONT
AGENCY OF TRANSPORTATION

EDWARD F. KNAPP STATE AIRPORT MASTER PLAN UPDATE

Medium Hangar (60' x 80')

Remove Existing Fence

Small Hangars (60' x 60')

60' x 60'

60' x 60'

60' x 80'

Airplane Design Group 1
Taxiway Design Group 2

TOFA

TSA

GRAPHIC SCALE (FEET)

0 30 60 120

LEGEND

- Airport Property Boundary
- ###~ Ground Contour (Feet MSL)
- Future Hangar Development
- Future Apron/Taxiway
- TOFA / TSA — Future Taxiway/Taxilane Object Free Area/Safety Area

Figure 4-5
North Site #2 (Concept 2)

VERMONT
AGENCY OF TRANSPORTATION

EDWARD F. KNAPP STATE AIRPORT MASTER PLAN UPDATE

Medium Hangars (60' x 80')

Construct Painted Islands to Mitigate Direct Apron-to-Runway Access

60' x 80'

60' x 80'

60' x 80'

Realigned Taxiway 'A' to standard 240' offset

Update Taxiway Fillet Geometry

240'

1140

1130

GRAPHIC SCALE (FEET)

0 30 60 120

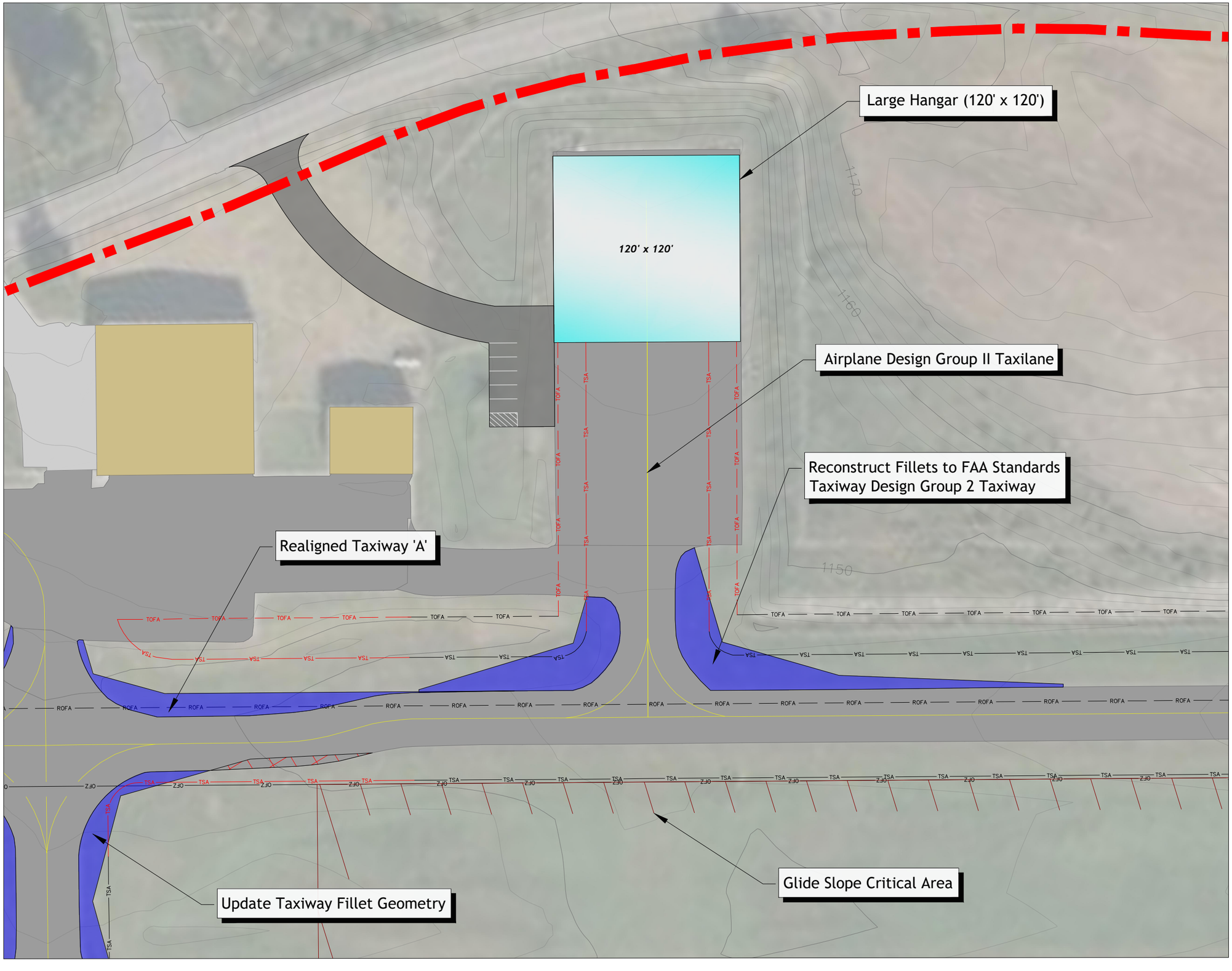
LEGEND

- Airport Property Boundary
- ### Ground Contour (Feet MSL)
- Future Hangar Development
- Future Apron/Taxiway
- Pavement Removal
- TOFA / TSA Future Taxiway/Taxilane Object Free Area/Safety Area

Figure 4-6
Upper Ramp Alternative

VERMONT
AGENCY OF TRANSPORTATION

EDWARD F. KNAPP STATE AIRPORT MASTER PLAN UPDATE



GRAPHIC SCALE (FEET)

0 30 60 120

LEGEND

- Airport Property Boundary
- ###~ Ground Contour (Feet MSL)
- Future Hangar Development
- Future Apron/Taxiway
- TOFA / TSA — Future Taxiway/Taxilane Object Free Area/Safety Area
- NAVAID Critical Area

Figure 4-7
Tie-Down Ramp Alternative

VERMONT
AGENCY OF TRANSPORTATION

EDWARD F. KNAPP STATE AIRPORT MASTER PLAN UPDATE

Tie-Down Ramp Development

Taxiway 'H' Extension

Upper Ramp Development

Construct Painted Island

Realign Taxiway 'A' to Standard 240' Offset

North Site 2 Development

North Site 1 Development

Update Taxiway Fillet Geometry

GRAPHIC SCALE (FEET)

0 250 500 1000

LEGEND

- Airport Property Boundary
- ###~ Ground Contour (Feet MSL)
- Future Hangar Development
- Future Apron/Taxiway
- Pavement Removal
- TOFA / TSA — Future Taxiway/Taxilane Object Free Area/Safety Area

Figure 4-8
Recommended Plan

5 ENVIRONMENTAL OVERVIEW

5.1 INTRODUCTION

Identifying the potential environmental impacts that could result from the implementation of an airport development program has become an integral part of the planning process. This environmental overview discussion was prepared to identify the potential environmental resources associated with the proposed development at the E.F. Knapp State Airport (MPV). The overview will discuss potential impacts to the various resource categories identified in Federal Aviation Administration (FAA) Order 5050.4B: *National Environmental Policy Act (NEPA) Implementing Instructions for Airport Actions* and FAA Order 1050.1F: *Environmental Impacts: Policies and Procedures* as well as providing guidance/recommendations on the different types of NEPA processing requirements.

In 1969, U.S. Congress passed the National Environmental Policy Act with the purpose of protecting the natural and human environment and overall quality of life. NEPA requires all federal agencies to assess and disclose, to the public, significant environmental impacts relating to federally funded or federally approved actions. Due to the FAA's participation in airport planning and development projects, airport sponsors are obligated to incorporate the NEPA process into their development programs. The FAA provides guidance for such evaluation and integration through FAA Order 5050.4B and FAA Order 1050.1F. As described in these orders, proposed airport development projects subject to NEPA guidelines are evaluated based on their potential to result in significant environmental impact. There are three levels of NEPA processing:

- **Categorical Exclusion (CatEx)** – for actions that have been found (under normal circumstances) to have no potential for significant environmental impact. Actions that are eligible for a CatEx are listed in Chapter 5 of FAA Order 1050.1F. CatEx documents can take anywhere from a few weeks to three months to prepare, depending on the level of agency coordination and what kind of documentation is required by the FAA to support the CatEx. For example, a runway reconstruction is an action that would qualify for a CatEx; however, a noise analysis could be required to demonstrate that there are no adverse impacts caused by flight pattern changes during construction. The FAA review time may take 30 to 60 days for a CatEx; however, it does not require a public notice of availability for the proposed action.
- **Environmental Assessment (EA)** – for actions that, based on past, similar projects, could have significant environmental impacts. The list of actions normally requiring an EA can be found in Chapter 6 of FAA Order 1050.1F. Upon review of the EA findings, the FAA issues project approval in the form of a Finding of No Significant Impact (FONSI) or decides to prepare an Environmental Impact Statement (EIS). An EA typically takes 12 months to obtain an FAA decision. Although public review and involvement (in the form of a meeting

and/or workshop) are typical of the EA process, a public hearing is not required if not requested by the public or recommended by the FAA.

- **Environmental Impact Statement (EIS)** – for actions that have been found to normally have significant environmental impacts. An EIS is the most detailed level of environmental review requiring public scoping at the beginning of the process and multiple public meetings/hearings throughout the process. Executive Order (EO) 13807[9] requires federal agencies to process environmental reviews and authorization decisions for "major infrastructure projects" requiring an EIS. The EO sets a government-wide goal of reducing the average time to complete required environmental reviews and authorization decisions for major infrastructure projects to not more than two years from publication of a notice of intent to prepare an environmental impact statement (EIS) to issuance of a record of decision (ROD).

This section provides a preliminary review of the environmental conditions at the Airport and identifies potential environmental documentation necessary to implement the major development items identified in the development alternative section. This documentation does not replace the completion of an environmental analysis to conform to NEPA guidelines, but rather identifies the likely required studies. The resource categories that were reviewed are consistent with the Desk Reference accompanying FAA Order 1050.1F.

5.2 AIR QUALITY

The Clean Air Act Amendments (CAAA) of 1990 requires the EPA to set National Ambient Air Quality Standards (NAAQS) for six "criteria" pollutants considered harmful to public health and the environment. The NAAQS identify two types of air quality standards: primary and secondary. Primary standards provide public health protection, including protecting the health of "sensitive" populations, such as asthmatics, children, and the elderly. Secondary standards were established to provide public welfare protection, including protection against impaired visibility and damage to animals, soils, crops, vegetation, and buildings. The six "criteria air pollutants" that have been established by the U.S. Environmental Protection Agency (EPA) to protect public health and welfare include:

- Ozone (O_3)
- Carbon monoxide (CO)
- Particulates (PM10 and PM2.5)
- Sulfur dioxide (SO_2)

[9] Executive Order (EO) 13807[9]: *Establishing Discipline and Accountability in the Environmental Review and Permitting Process for Infrastructure,* August 15, 2017

- Nitrogen dioxide (NO_2)
- Lead (Pb)

The Vermont Agency of Natural Resources (ANR) has established rules to regulate air pollution, per Vermont Code, Title 10 Conservation and Development, which in-turn, the Vermont ANR Department of Environmental Conservation, Air Quality and Climate Division administers. As of 2021, Washington County, in which the Airport is located was in attainment with all six EPA criteria air pollutants.

No air quality modeling was conducted as part of this Study. If proposed developments require air quality modeling, it would be conducted during preparation of additional environmental documentation prior to construction. Since Washington County is in attainment for all criteria pollutants, future projects will not have to undertake construction emissions modeling.

5.3 BIOTIC RESOURCES

Information regarding biotic communities in Washington County was obtained through a screening of the U.S. Fish & Wildlife Service's (USFWS) Information Planning and Conservation (IPaC) System and the Vermont ANR Natural Resources Atlas.

According to the Natural Resources Atlas, habitat blocks of moderate to low priority encircle the Airport. A habitat block is defined as a contiguous area of natural cover with little or no permanent internal fragmentation from human development. Each habitat block is given a value between one (1) and ten (10) based on its biological and conservation values and potential for habitat fragmentation in relation to the following factors:

- Building density
- Average parcel size
- Population change
- Percent conserved
- Road (miles of road/square mile of habitat block)

The habitat blocks north and west of Runway 17-35 are partially located on Airport property. **Figure 5-1** depicts the location of surrounding habitat blocks and their value.

A large portion of the Airport consists of impervious surfaces such as asphalt, concrete, and buildings. Significant acreage within the Air Operations Area (AOA) is comprised of managed turf adjacent to runways, taxiways, and apron areas. These areas provide minimal ecological diversity and show extensive habitat fragmentation.

While no specific critical habitat designations are applicable for the Airport property, such habitats can support a range of wildlife, including reptiles, amphibians, mammals, songbirds, and

wading birds. For both security purposes and to prevent large mammals, such as deer and coyote, from traversing the runways, the Airport maintains fencing around the airfield.

For implementation of the airfield recommendations, a more detailed environmental analysis would be conducted to assess potential impacts to biotic communities.

Figure 5-1: Vermont ANR Natural Resources Atlas Habitat Blocks

5.3.1 Threatened and Endangered Species

The Endangered Species Act of 1973 (ESA) provides for listing, conservation, and recovery of endangered and threatened species of plants and wildlife. Section 7(a)(2) of the ESA states that federal agencies shall ensure the actions it authorizes, funds, or carries out are not likely to jeopardize the continued existence of a listed species or result in destruction or adverse modification of designated critical habitat. Section 9 of the ESA prohibits the take of listed species. Take is defined in the ESA as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect." The definition of harm also includes adverse habitat modifications. Federal actions that could result in a take must be coordinated under Section 7.

Federally Listed Species

The IPaC report prepared as part of this overview identified two species as potentially occurring at the Airport. The northern long-eared bat (*Myotis septentrionalis*) is listed as threatened and the monarch butterfly (*Danaus plexippus)* is listed as a candidate species. The IPaC report indicated that no critical habitat for either species is found at the Airport (see Appendix B for the full report).

The northern long-eared bat hibernates in caves and mines with summer roosting and foraging habitat occurring in upland forests and woods. Any project with the potential to clear trees would have to coordinate with the USFWS to satisfy Section 7 requirements. The Final 4(d) rule, issued on January 14, 2016, prohibits an incidental take that may occur from tree removal activities within 150 feet of known occupied maternity roost tree(s) during the "pup season" (generally June 1 to July 31). The 4(d) rule also prohibits an incidental take that may occur from tree removal activities within ¼ mile of a hibernation site, year-round.

The monarch butterfly is a candidate species, not yet listed or proposed for listing as threatened or endangered. There are generally no Section 7 requirements for candidate species.

The IPaC report also identified the following 8 migratory birds as having distributional ranges that overlap the Airport:

- Bald Eagle (*Haliaeetus leucocephalus)*
- Black-billed Cuckoo (*Coccyzus erythropthalmus*)
- Bobolink (*Dolichonyx oryzivorus*)
- Canada Warbler (*Cardellina canadensis*)
- Evening Grosbeak (*Coccothraustes vespertinus*)
- Lesser Yellowlegs (*Tringa flavipes*)
- Olive-sided Flycatcher (*Contopus cooperi*)

- Wood Thrush (*Hylocichla mustelina*)

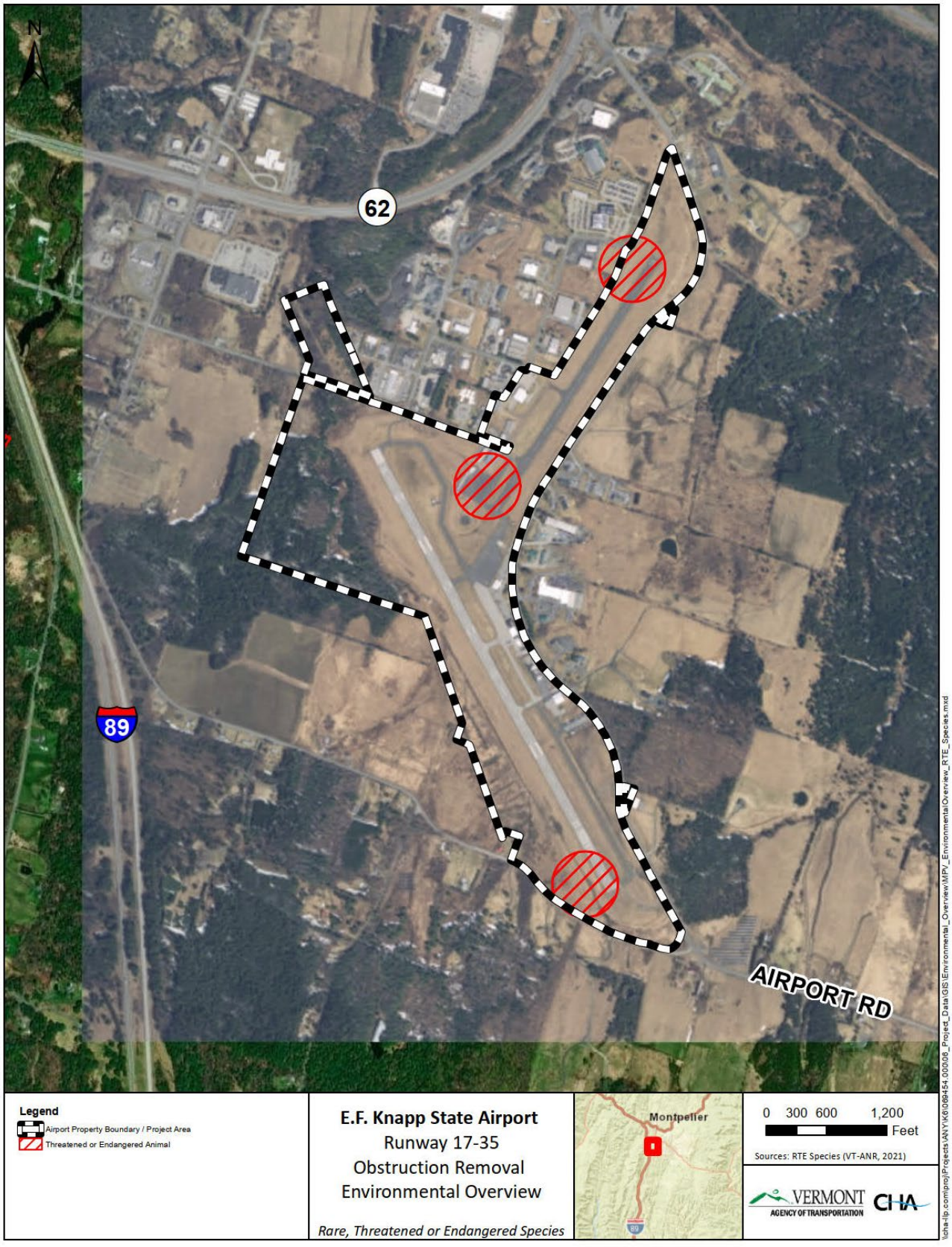
Closer to implementation of specific airfield recommendations, more detailed environmental analysis would be conducted, including consultation with the USFWS, confirmation of existing species within the project area, an evaluation of potential impacts to those species and habitat areas, and, if appropriate, mitigation measures to address any potential adverse impacts.

State-Listed Species

There are 36 state-endangered and 16 state-threatened animals in Vermont. The Vermont Natural Resources Atlas indicated three areas within Airport property with the potential to contain a state-endangered vertebrate species. **Figure 5-2** identifies the areas with the potential to contain a state-endangered species.

The Vermont ANR Fish & Wildlife Department indicated that upland sandpiper (*Bartramia longicauda*), a state-endangered grassland bird, has been observed at the Airport in grass areas on the edge of both runways and open ground. According to the Vermont Grassland Bird Management and Recovery Plan (2014), the upland sandpiper prefers open grassland for breeding but has also been reported breeding in blueberry barens. Taller grasses are used for nesting. Areas of short grasses are used for broad rearing and feeding. A more detailed environmental analysis would be conducted prior to implementation of airfield recommendations, including formal consultation with the Vermont ANR, potential field surveys to determine the presence/absence of any listed species, and an evaluation of potential impacts to those species and habitat areas. If appropriate, mitigation measures to address adverse impacts would be pursued.

Figure 5-2: Vermont ANR Natural Resources Atlas Habitat Blocks



5.4 CLIMATE

Based on FAA data, operations activity at MPV represents less than 1 percent of U.S. aviation activity; therefore, if greenhouse gases (GHGs) occur in proportion to the level of activity, GHG emissions associated with future aviation activity would be expected to represent less than 0.001 percent of U.S. based GHG.

5.5 COASTAL RESOURCES

The 1982 Coastal Barriers Resources Act (CBRA) governs Federal activities involving or affecting coastal resources, including the Great Lakes. Vermont has not developed a Coastal Zone Management Program given that the state does not lie within a coastal zone. Actions carried out in the Master Plan would not impact coastal resources.

5.6 DEPARTMENT OF TRANSPORTATION ACT, SECTION 303

Pursuant to Section 303 of the U.S. Department of Transportation [formerly Section 4(f)], projects requiring the use of any publicly-owned land, including public parks, recreation areas, wildlife or waterfowl refuge areas, and historic sites (including traditional cultural properties) of national, state, or local significance shall not be approved by the Secretary of Transportation unless there is no feasible and prudent alternative to the use of such land, and such program includes all possible planning to minimize harm.

Based on a review of the surrounding area, there are no public parks, recreational areas, or wildlife/waterfowl refuge areas near MPV. A review of the National Register of Historic Places (NRHP) indicated the presence of two historically significant resources: the Chauncey B. Leonard House and the Currier Park Historic District. Review of the Vermont State Register of Historic Places shows the Perrin Farmstead within the vicinity of the Airport. These resources are discussed in further depth in a subsequent section.

Future projects at the Airport should be individually evaluated based on the Area of Potential Effect (APE) for impacts to historic resources as part of the required environmental documentation under NEPA. Coordination with local and state historic preservation agencies will be required.

5.7 PRIME AND UNIQUE FARMLAND

The Farmland Protection Policy Act (FPPA) limits the conversion of significant agricultural lands to non-agricultural uses as a result of federal actions [7 U.S. Code (USC) § 4201, et seq.]. The determination of whether farmlands are subject to FPPA requirements is based on soil type; the land does not have to be actively used for agriculture. Farmland subject to FPPA requirements can be pastureland, forested, or other land types, but not open water or developed urban or transportation areas. The FPPA regulates four types of farmland soils:

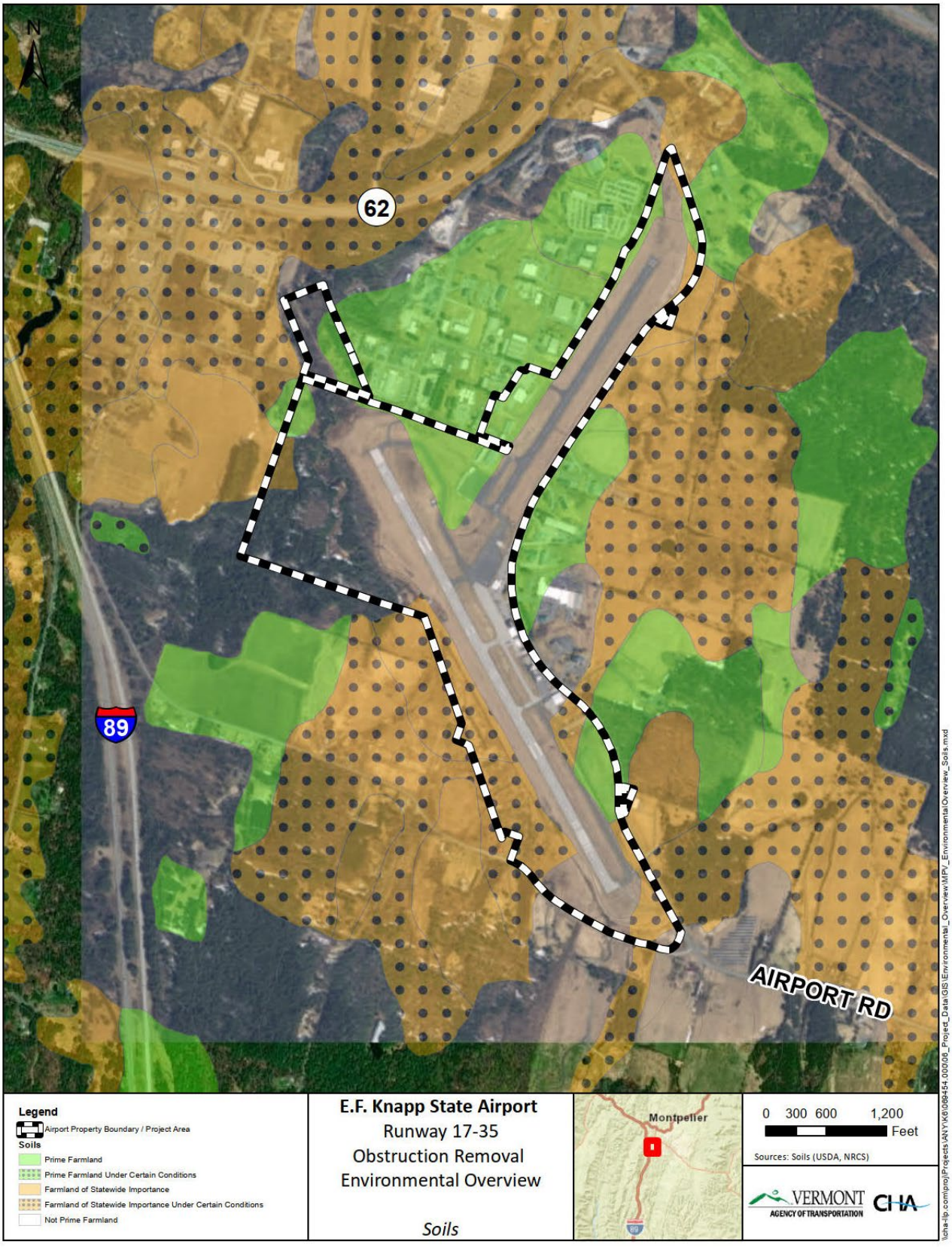
- Prime Farmland

- Unique Farmland
- Farmland of Statewide Importance
- Farmland of Local Importance

The evaluation is based upon soils identified by the Natural Resources Conservation Services (NRCS). Prime farmland is defined by the NRCS as "land that has the best combination of physical and chemical characteristics" for agriculture. This includes land with these characteristics used for livestock or timber production but not land that is already urbanized or used for water storage. Unique farmland is defined as "land other than prime farmland that is used for production of specific high-value food and fiber crops," with such crops defined by the Secretary of Agriculture. Farmland of statewide or local importance is farmland other than prime or unique farmland that "is used for the production of food, feed, fiber, forage or oilseed crops."

Based on NRCS soil data review, approximately 12.7 percent of Airport property is considered prime farmland, 3.2 percent is considered farmland of statewide importance, and an additional 14.2 percent is considered farmland of statewide importance if drained and/or drained and protected from flooding**. Figure 5-3** shows the location of prime and unique farmland at MPV.

Figure 5-3: NRCS Soils Map, Farmland Classification



5.8 HAZARDOUS MATERIALS

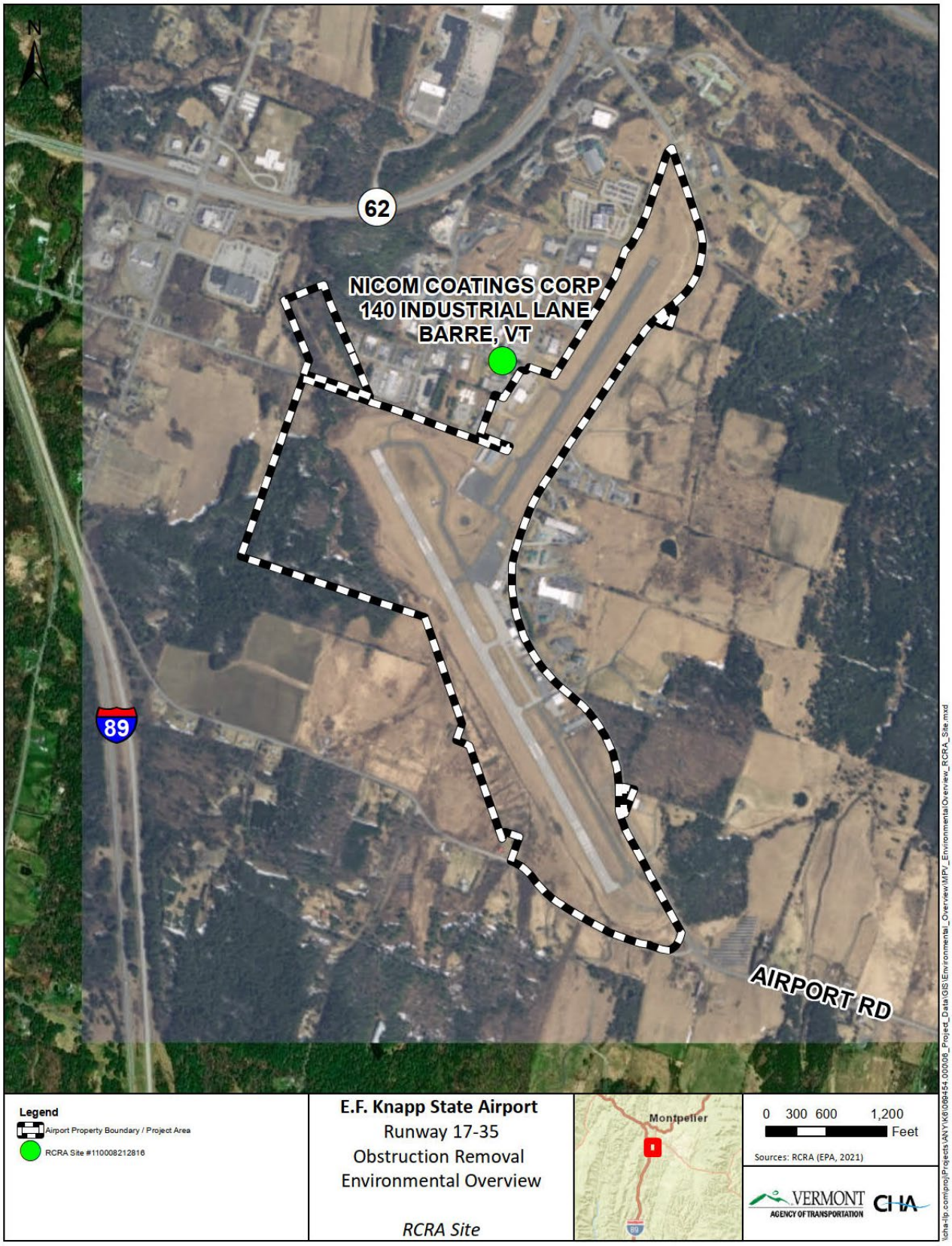
Based on available GIS data from the EPA, there are no sites on Airport property with an active National Pollutant Discharge Elimination System (NPDES) permit pursuant to the CWA.

There are no sites on the EPA National Priorities List (NPL) on or adjacent to MPV. The NPL is a list of national priorities amongst the known releases of hazardous substances throughout the United States established by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

The Resource Conservation and Recovery Act (RCRA) details the proper management of hazardous and non-hazardous solid waste. According to the EPA RCRA Info search engine, there are no actively reporting facilities on Airport property. Nicom Coating Corporation, located approximately 300 feet north of the Airport (140 Industrial Lane), produces ignitable waste and reports to the EPA under RCRA. **Figure 5-4** displays the location of Nicom Coating Corporations.

Modifications to the existing airport facilities should be evaluated for the potential to generate additional hazardous materials; however, it is not expected that any recommended project would produce wastes that could not be properly mitigated and addressed.

Figure 5-4: RCRA Reporting Facility



5.9 HISTORIC, ARCHITECTURAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

Under the National Historic Preservation Act of 1966 and the Archaeological and Historic Preservation Act of 1974, federal undertakings, such as the actions included in the Master Plan Update, are subject to Section 106 review to ensure that properties or data having historic, scientific, prehistoric, archaeological, or paleontological significance are surveyed, recovered, or preserved.

Photo: Perrin Farmstead, State Register Nomination Form

The Chauncey B. Leonard House is located approximately 0.5 miles northwest of the Airport and is included in the National Register of Historic Places (NRHP). Additionally, the NRHP web-based map displays a polygon representing the Currier Park Historic District overlapping Airport property. This historic district includes 48 buildings and 1 site, south of MPV. Further coordination is necessary to determine the exact location of each property included in the Currier Park Historic District. While not listed on the NRHP, the Perrin Farmstead is listed on the Vermont State Register of Historic Places and is located to the west of the airport.

In August of 2021, a VTrans Historic Preservation Officer investigated the significance of a separate potential NRHP site, a Greek Revival home located at 641 Comstock Road directly north of MPV. The Vermont Advisory Council on Historic Preservation voted not to include the property on the NRHP.

An Archaeological Resource Assessment (ARA) performed in 2021 found nine archaeologically sensitive areas (ASAs) sensitive for pre-contact Native American archaeology and a historic farmstead sensitive for both pre- and post-contact archaeology. The subsequent Archaeological Phase I survey, performed by a VTrans Archaeology Officer, found no archaeologically sensitive areas associated with the farmstead. The historic farmstead does not appear on the NRHP but is listed on the Vermont State Register of Historic Places.

The Vermont Division for Historic Preservation provides an Online Resources Center (ORC) that includes the Vermont Architectural Resource Inventory (VARI), the Vermont Archaeological Inventory (VAI), and listings on the Vermont State Register of Historic Places. Individual projects will need to be assessed for the potential to impact resources listed in the ORC. A more detailed environmental review, including consultation with the Vermont Division for Historic Preservation

and state recognized Native American tribes, would be conducted to confirm existing resources and assess any potential effects prior to implementation of specific airfield recommendations.

Figure 5-5: Historic Resources

5.10 LAND USE

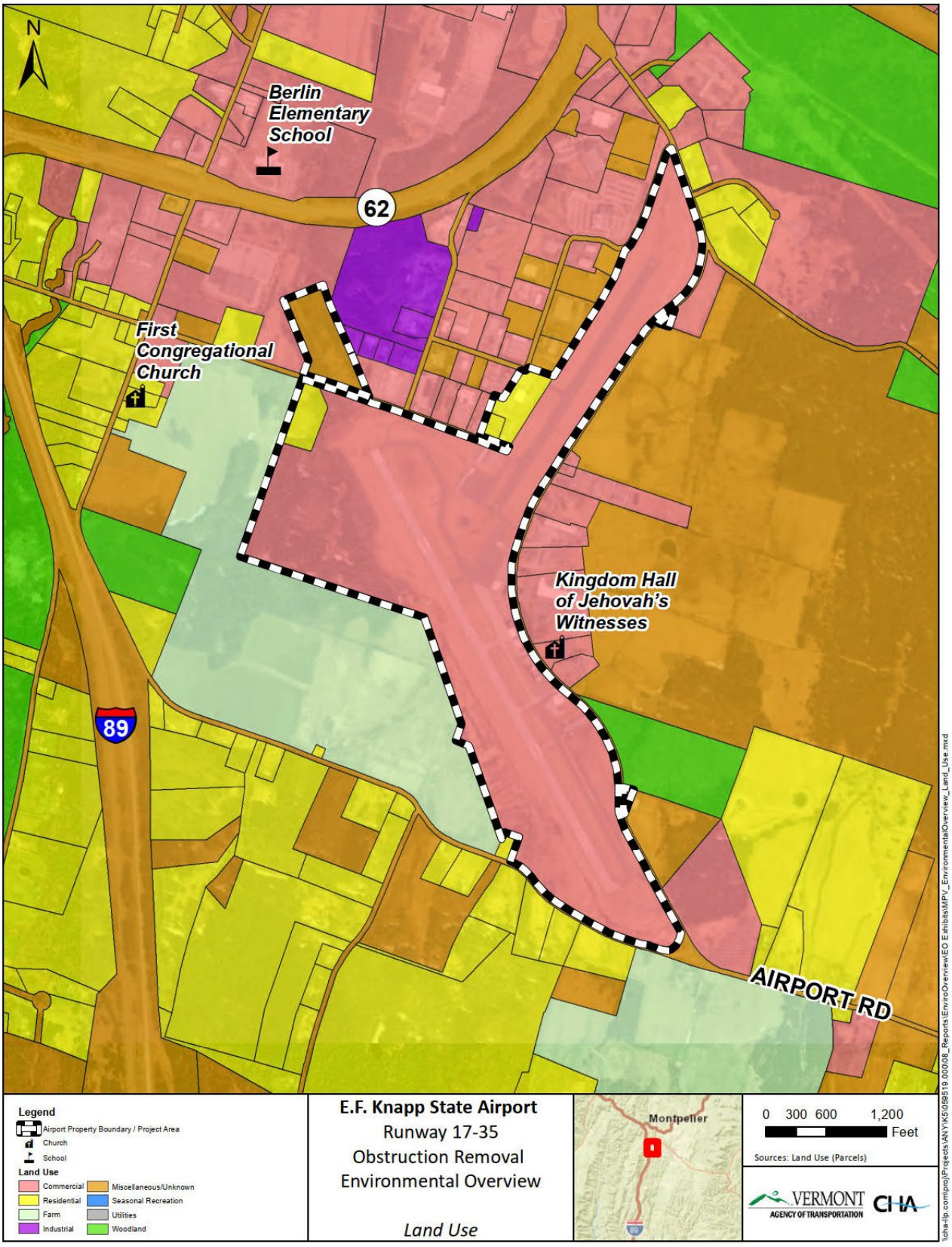
The compatibility of existing and planned land uses with an airport action is usually associated with noise impacts; however, other potential impacts of FAA actions may also affect land use compatibility (e.g., disruption of communities, relocation, induced socioeconomic impacts, land uses protected under Section 4(f), etc.). The impacts on land use, if any, should be analyzed and described under the appropriate impact category with any necessary cross-references to the Land Use section of the NEPA document to avoid duplication.

The land surrounding MPV contains a diverse mix of uses, including the following: farm, residential, woodland, industrial, and commercial.

Berlin Elementary School (372 Paine Turnpike North) is located north of Runway 17. First Congregational Church (1808 Scott Hill Rd.), Christ the Redeemer Lutheran (46 Warner Rd.) and Kingdom Hall of Jehovah's Witnesses (2070 Airport Rd.) are all within 0.5 miles of MPV.

Figure 5-6 shows land use surrounding the Airport and the location of each identified building.

Figure 5-6: Land Use



5.11 NATURAL RESOURCE & ENERGY SUPPLY

The effects of airport development on energy supply typically relate to the amount of energy required by stationary facilities (such as terminal building heating and cooling and airfield lighting) and movement of air and ground materials. The effects of airport development on natural resources typically relate to basic materials, such as gravel, fill dirt, etc., that are required for construction. Although aviation activity at MPV is anticipated to modestly increase over the coming years, the increase in energy consumption by aircraft and vehicles due to the proposed airport development projects would be minimal. The local power company should have no difficulty in meeting the energy demands of the proposed airport development. The anticipated increase in fuel consumption is not anticipated to be significant and the additional demand could be met by existing fuel supplies.

5.12 NOISE & COMPATIBLE LAND USE

Aircraft noise is often the most noticeable environmental effect that an airport imposes on its surrounding community. If the sound is sufficiently loud or frequent in occurrence, it may interfere with various activities or be considered a nuisance. Since 1972, the FAA has been developing and enforcing aircraft noise standards, which are based on cumulative day-night average noise levels (DNL). In simple terms, DNL is the average noise level over a 24-hour period, with noise occurring at night (defined as 10:00 p.m. through 7:00 a.m.), being artificially increased by 10 decibels (dB). The weighting reflects the added intrusiveness of nighttime noise events attributable to the fact that community background noise levels decrease at night. The use of DNL to assess aircraft noise exposure has proven to be an effective and appropriate device to determine the relative compatibility of noise-sensitive land uses adjacent to airports.

Normally, a noise analysis assesses the effects of airport development having the potential to cause aircraft noise outside the airport's boundaries. For most actions, if the DNL 65 dB contour lies entirely within the airport boundaries, a noise analysis is not required; however, a proposed project and its effects should be considered when determining what analysis is appropriate. Based on FAA Order 1050.1F, Desk Reference, Chapter 11, Section 11.1.2, "*No noise analysis is needed for projects involving Design Group I and II airplanes (wingspan less than 79 feet) in Approach Categories A through D (landing speed less than 166 knots) operating at airports whose forecast operations in the period covered by the NEPA document do not exceed 90,000 annual propeller operations (247 average daily operations) or 700 annual jet operations (2 average daily operations). These numbers of propeller and jet operations result in DNL 60 dB contours of less than 1.1 square miles that extend no more than 12,500 feet from start of takeoff roll. The DNL 65 dB contour areas would be 0.5 square miles or less and extend no more than 10,000 feet from start of takeoff roll*". Although MPV will not have more than 90,000 annual propeller operations in the planning period, the Airport is forecasted to have over 700 annual jet operation. Depending on the airport action, a noise analysis may be required.

5.13 ENVIRONMENTAL JUSTICE

Environmental Justice laws, regulations, and policies are found in Title VI of the Civil Rights Act of 1964, the National Environmental Policy Act of 1969, Title 23 of the USC, Section 109(h), the Uniform Relocation, and Real Properties Acquisitions Policy Act of 1970, and most recently, Executive Order 12898: Federal Actions to Address Environmental Justice in Minority and Low-Income Populations. Executive Order 12898 directs each federal agency to develop a strategy addressing environmental justice concerns in its programs, policies, and regulations. The purpose of this Order is to avoid disproportionately high and adverse human health or environmental impacts on minority and low-income populations. On July 16, 1997, the DOT issued its Final Order on Environmental Justice as Order 5610.2. To identify minority and low-income populations in the vicinity of MPV, demographic data from the U.S. Census Bureau, 2019 American Community Survey 5-year Estimates was reviewed and compiled.

MPV is located in Washington County. Washington County most accurately represents the geographic, social, and economic environment around MPV and is therefore considered the Community of Comparison (COC). The Affected Communities include Census Tract 9545 and 9554. Census tract information is specific to the georeferenced demographics of the area in which MPV is located. Affected Communities that are more than 50% minority or low-income are automatically designated as EJ populations. All other Affected Communities are designated as an EJ population if the low income or minority populations are 125% of the COC. Based on this data, Census tract 9554 contains an EJ population of low-income and should be taken into consideration when moving forward on actions that could potentially impact this population.

Table 5-1: Minority & Low-Income Population Groups

	Washington County (COC)	Census Tract 9545
Total Survey Population Determined	58,350	2,793
Minority Persons	3,393	101
Percent Minority	5.815%	3.616%
125% COC		4.520%
Potential Minority EJ Impact?		No
Total Survey Population Determined	56,075	2,530
Low Income	5916	216
Percent Low Income	10.550%	8.538%
125% COC		10.672%
Potential Low Income EJ Impact?		Yes

Source: U.S. Census, 2019 ACS Survey (5-year estimates)

5.14 VISUAL EFFECTS

Some visual resources are protected under federal, state, or local regulations. According to FAA Order 1050.1F, these resources generally include, but are not limited to, federal, state, or local scenic roadways/byways; Wild and Scenic Rivers; National Scenic Areas; protected trails; and biological resources; and features protected under other federal, state, or local regulations. In addition to NEPA, laws protecting resources that may be affected by visual effects include Section 106 of the National Historic Preservation Act (NHPA), Section 4(f) of the DOT Act, the Wild and Scenic Rivers Act, and the Coastal Zone Management Act. In addition, there may be state and local regulations, policies, and zoning ordinances that apply to visual effects.

Visual resources and visual character impacts are normally related to a decrease in the aesthetic quality of an area resulting from development, construction, or demolition. Analysis of visual impacts considers whether the alternatives would affect, obstruct, alter, or remove visual resources including buildings, historic sites, or other landscape features, such as topography or vegetation, that are visually important or have unique characteristics. According to FAA Order 1050.1F Desk Reference, the significant determination is dependent on the criteria listed below. All future airport actions going through the NEPA process would be evaluated for visual impacts based on the following:

- Would the action have the potential to affect the visual character of the area, including the uniqueness and aesthetic value?
- Would the action have the potential to contrast with the visual resources in the area?
- Would the action have the potential to block or obstruct the views of visual resources?

5.15 WATER RESOURCES

Water quality standards applicable to the Airport are established under the federal Clean Water Act (CWA) and the Vermont ANR per Vermont Code, Title 10 Conservation and Development, which in-turn, the Vermont Department of Environmental Conservation administers. Together, these regulations include requirements for controlling discharges into surface water and groundwater, develop waste treatment management plans and practices, and establish federal permitting requirements for discharges (CWA Section 402) and dredged and fill materials (CWA Section 404). Existing surface water resources and groundwater quality at the Airport are described below.

5.15.1 Surface Water

Washington County lies in the Winooski watershed. Surface water features on and in the immediate vicinity of the Airport are depicted in **Figure 5-7**. Small, unnamed tributaries run parallel to Runway 17/35 on the western boundary of MPV and traverse the area southeast of Runway 5/23 past the airport property line. Pond Brook, a tributary to Stevens Branch and,

subsequently, the Winooski River, connects to Berlin Pond west of MPV. Berlin Pond is the sole water source for Montpelier, portions of Berlin, and the Central Vermont Medical Center. A sparse distribution of existing wetlands is described in subsequent sections.

The Vermont Water Quality Standards establish surface water classifications based on use, management objectives, and criteria met. There are four possible classifications for Vermont surface water: A(1) excellent, A(2) public water source, B(1) very good, or B(2) good. All waters at or below 2,500 feet are designated Class B(2) for all uses, unless specifically designated. A water way that fails to meet its classification is listed as impaired, and a restoration plan must be developed and implemented. Pond Brook was not classified on the Vermont Natural Resources Atlas. With a topography below 2,500 feet, it is assumed that Pond Brook is a Class (2) stream.

Any future projects that would potentially add additional impervious surface would increase the potential for runoff from the Airport into nearby surface waters. Prior to implementation of these improvements, more detailed documentation would be required to specifically quantify the additional impervious surface area and assess resulting impacts to surface water resources. Drainage improvements would be required to minimize stormwater runoff and associated potential for adverse impacts to surface waters. These improvements should be included in the project design and fully evaluated in the project-specific environmental documentation to be conducted closer to the time of construction. If such elements are incorporated, it is not anticipated that the proposed projects would result in adverse impacts to surface water quality.

5.15.2 Groundwater

General maintenance and minor projects typically do not affect water quality. Based on review of the US EPA Sole Source Aquifer Interactive Map, there are no sole source aquifers in the vicinity of MPV. The Vermont ANR Natural Resources Atlas identified a surface water source protection area (SPA) surrounding Berlin Pond. The boundary of this SPA is west of MPV. Additionally, the Berlin Municipal Water System groundwater SPA covers the Runway Protection Zone (RPZ) of Runway 35, the Berlin Water Company groundwater SPA overlaps most of Runway 5/23, and the Shaws Berlin Corners groundwater SPA includes the RPZ of Runway 17. Groundwater resources are shows in **Figure 5-7**. Moreover, at the level of effort for this overview, no specific information on groundwater quality in the immediate vicinity of the Airport was available. Any proposed projects would be evaluated closer to implementation, when more details are available, in a project-specific environmental document to determine potential impacts.

5.15.3 Stormwater

Stormwater at MPV is currently managed through a system of swales, catch basins, drains, and channels, that ultimately lead to on-site bioretention areas. Any modifications to the drainage system or modifications to physical facilities at the Airport which would result in a change to either the quantity or potential quality of stormwater discharge from the Airport should be

evaluated. In general, new airfield or major terminal projects would trigger the need to address water quality and associated permitting. General maintenance and minor projects typically do not affect water quality.

5.15.4 Wild and Scenic Rivers

Through the National Wild and Scenic Rivers Act of 1968 (16 U.S.C 1271), rivers can be federally designated as wild and scenic if they contain remarkable scenic, recreational, or fish and wildlife related values. Such rivers are granted protection under the Act and must be evaluated as part of the NEPA process. Based upon a review of the National Wild and Scenic Rivers System and the Nationwide Rivers Inventory, there are no designated Wild and Scenic Rivers or potential candidates for inclusion in the National Wild and Scenic River System near MPV.

5.15.5 Wetlands

Wetlands at the Airport are regulated and protected under both federal and state regulatory programs. U.S. Department of Transportation Order 5660.1A, *Preservation of the Nation's Wetlands*, implements Executive Order 11990, *Protection of Wetlands*. The U.S. Army Corps of Engineers (USACE) administers Section 404 of the Clean Water Act (CWA) (33 CFR 320-332)[10] which regulates discharges of fill into wetlands and waters of the United States. Wetlands as defined in 33 CFR Part 328 are "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas." The Vermont ANR Department of Environmental Conservation serves as the state's Section 401 certification agency coinciding with any federal Section 404 permits issued by the USACE. Work occurring within designated wetlands will require securing appropriate permits from the USACE and the State which may include an ANR Act 250 permit depending on the airport action.

In order to identify wetlands occurring near MPV, data available online through the National Wetlands Inventory (NWI) mapper and the Vermont Natural Resources Atlas were reviewed (see **Figure 5-7**. Wetland boundaries were not formally delineated as part of this overview.

Based on available NWI data, two palustrine (non-tidal) freshwater emergent (PEM) wetlands are located on the airfield, east of Runway 17/35. The NWI map also shows freshwater forested/shrub wetlands (PSS) near the RPZ on both sides of Runway 17/35 and off the end of Runway 23.

[10] CFR: Code of Federal Regulations

Similar to the NWI map, the Vermont Natural Resources Atlas depicts Class 2 wetlands on the airfield, east of Runway 17/35, and in the RPZ of Runway 17/35 and Runway end 23. Additionally, a large wetland is shown east of MPV.

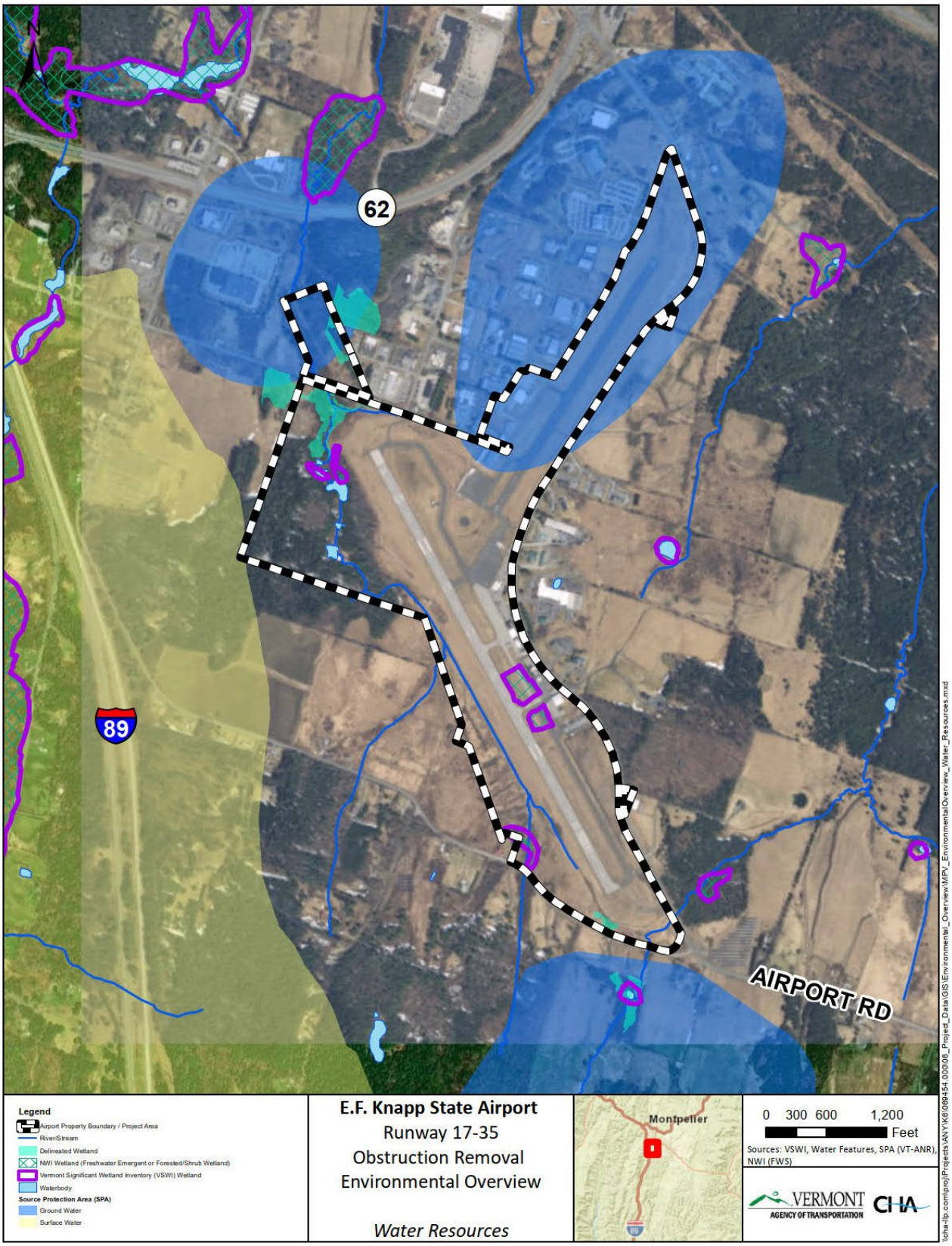
A delineation completed in July of 2021 in preparation for tree clearing identified six wetlands and a vernal pool (see **Figure 5-7**). It is anticipated that prior to initiating specific projects, a current wetland delineation would be required to determine federal and state regulated wetland boundaries within the project area.

5.15.6 Floodplains

Executive Order 11988, *Floodplain Management*, defines floodplains as "the lowland and relatively flat areas adjoining inland and coastal waters including flood prone areas of offshore islands", including the area that would be inundated by a 100-year flood. A 100-year floodplain is an area that has a 1 percent chance of being flooded in any given year. A 500-year floodplain is an area that has a 0.2 percent chance of being flooded in any given year.

According to the FEMA Flood Insurance Rate Map (FIRM), dated March 19, 2013 (Panel Numbers 50023C0433E and 50023C0429E), MPV is not within the floodplain. Based on this, the projects recommended in the Master Plan are not anticipated to impact floodplains; however, prior to implementation, project-specific environmental documentation would be prepared to document any existing floodplains in the area and evaluate potential for impacts. If it is determined that a proposed action would occur within the 100-year floodplain, compliance with applicable state and federal flood and stormwater management standards must be demonstrated.

Figure 5-7: Water Resources



5.16 SUMMARY

Projects recommended in the Master Plan are anticipated to have some impacts on the environment, with concerns generally focused on water quality, biotic communities, threatened and endangered species, and wetlands. As noted under each of the resource-specific sections, before implementation of the proposed development projects, further environmental documentation would be required to identify existing conditions at that time, determine impacts on each resource, and if appropriate, identity mitigation measures to address potential adverse impacts. Once project details are available, if appropriate under NEPA, Categorical Exclusion(s) or Environmental Assessment(s) will be prepared in accordance with FAA guidance. Based on past studies and the types of projects recommended in the Master Plan, it is anticipated that impacts can be successfully mitigated, allowing implementation of the recommended plan.

6 IMPLEMENTATION PLAN

Chapter 4, *Development Alternatives* presented development alternatives and the recommended airport development plan (see **Figure 4-8** *Recommended Plan*) for the E.F. Knapp State Airport (MPV). The plan contains recommendations for both airside and landside development, which are further discussed in terms of two implementation phases during the 20-year planning period presented within the Airport Capital Improvement Plan (ACIP). This chapter also presents the Airport Layout Plan (ALP) associated with the recommended future development at MPV. The ALP illustrates the proposed future airport layout and serves as the official development plan for the Airport. The ALP approval is an additional requirement for airport projects, in addition to the more focused environmental reviews, engineering design, and permitting activities.

6.1 AIRPORT CAPITAL IMPROVEMENT PLAN

The Airport Capital Improvement Plan (ACIP) lists the recommended projects and associated cost estimates for the 20-year planning period. Grant-eligible projects at MPV may receive 90 percent federal funding, with the Vermont Agency of Transportation (VTrans) responsible for the remaining share. Grant-eligible capital projects include planning and environmental studies, runway and taxiway development and rehabilitation, airport lighting, security enhancements, aircraft parking aprons, obstruction removal, land acquisition, and navigational aids. Projects that are ineligible for funding include those that generate revenue and do not directly benefit the general public, such as hangars, fuel farms, and office buildings. A private entity or developer, such as a fixed base operator (FBO) or other corporation, may fund and construct grant-ineligible projects.

In addition to the proposed airport developments, the airport must also continually rehabilitate existing airfield facilities (e.g., pavement rehabilitation or reconstruction typically occurs every 20 years). As such, the ACIP includes these additional items. Although these items are not considered new capital developments, the associated costs can comprise the majority of an airport's annual capital investment.

Note that the ACIP does not constitute a commitment on behalf of the VTrans nor FAA to fund any of the projects. In addition, the ACIP does not imply that the projects would receive environmental approvals. Thus, the ACIP serves as a planning document that must remain flexible. The ACIP should undergo regular updates as project priorities and demands indicate. It should also be noted that the costs are planning level estimates and will need to be refined prior to obtaining a grant.

Table 6-1 provides the 20-year ACIP for MPV, organized into the following three phases:

- Short-Term (0 to 5 years)
- Long-Term (5 to 20 years)

Table 6-1 – MPV Airport Capital Improvement Plan (ACIP)

Project	Estimated	Federal (90%)	VTrans (10%)
Short-Term (0 - 5 Years)			
Environmental Assessment (Short-Term Projects)	$ 250,000	$ 225,000	$ 25,000
Avigation Easement Acquisition	$ 200,000	$ 180,000	$ 20,000
Obstruction Removal	$ 370,000	$ 315,000	$ 55,000
Runway 17-35 Rehabilitation (PE & Permits)	$ 300,000	$ 270,000	$ 30,000
Runway 17-35 Rehabilitation (Final Design & Construction)	$ 3,000,000	$ 2,700,000	$ 300,000
Hangar Development Areas	$ 450,000	$ 405,000	$ 45,000
Apron Rehabilitation (assumed FBO - Dark Green & Tiedown - Salmon)	$ 350,000	$ 315,000	$ 35,000
Total	**$ 4,920,000**	**$ 4,410,000**	**$ 510,000**
Long-Term (5 - 20 Years)			
1 - Taxiway 'H' Extension	$ 4,790,000	$ 4,311,000	$ 479,000
2 - Corporate Hangar Development (North Site #1)		Privately Funded	
3 - Small Hangar Development (North Site #2)		Privately Funded	
4 - Upper Ramp Hangar Development		Privately Funded	
5 - Tie-Down Ramp Hangar Development		Privately Funded	
6 - Install Runway 35 PAPI (4-Box)	$ 380,000	$ 342,000	$ 38,000
7 - Runway Obstruction Removal (Runway 5 end - Easements & EA)	$ 360,000	$ 324,000	$ 36,000
8 - Taxiway A - Magenta - 216,000SF (Mill & Overlay)	$ 2,070,000	$ 1,863,000	$ 207,000
a - Taxiway Geometry Update - New Pavement - 7,000SF	$ 590,000	$ 531,000	$ 59,000
9 - Taxiway 'A' Realignment	$ 1,970,000	$ 1,773,000	$ 197,000
10 - Runway 5-23 - Cyan - 235,000SF (Mill & Overlay)	$ 2,950,000	$ 2,655,000	$ 295,000
11 - Taxiway G & H - Purple - 52,000SF (Mill & Overlay)	$ 650,000	$ 585,000	$ 65,000
12 - Taxiway E & Terminal Apron - Yellow - 120,000 SF (Mill & Overlay)	$ 1,170,000	$ 1,053,000	$ 117,000
a - Taxiway Geometry Update - New Pavement - 9,000SF	$ 730,000	$ 657,000	$ 73,000
13 - Taxiway F & Jet Apron - Green - 96,000SF	$ 1,050,000	$ 945,000	$ 105,000
14 - Taxiway C Apron - Blue - 19,000 SF (Full Depth)	$ 420,000	$ 378,000	$ 42,000
15 - Upper Apron (if hangar development is not pursued) - Gold - 52,000SF	$ 930,000	$ 837,000	$ 93,000
16 - Replace AWOS	$ 380,000	$ 342,000	$ 38,000
Total	**$ 18,440,000**	**$ 16,596,000**	**$ 1,844,000**
Grand Total	**$ 23,360,000**	**$21,006,000**	**$ 2,354,000**

Note that all long-term estimates include 20% Design/C&I cost
Runway 17 ILS, MALSR, and PAPI are FAA owned/maintained
*Based on 2012 PMS Report

Source: CHA, 2022.

6.2 AIRPORT LAYOUT PLAN

The ALP drawing set illustrates all development projects identified for MPV throughout the 20-year planning horizon. Upon approval by the FAA and VTrans, the ALP becomes the official document to be referenced for future development at the Airport. The FAA requires that the ALP be followed consistently regarding all new airport facilities. As such, keeping the drawings accurate and up to date is a high priority. FAA policy requires that the ALP be updated at least every five years. Although the ALP is the only drawing that is signed by the FAA, it is part of a larger drawing set that includes the sheets listed in **Table 6-2**. These ALP drawings can be found in **Appendix __**.

Table 6-2 – ALP Drawing Index

Sheet No	Sheet Title
1	Title Sheet
2	Airport Data Sheet
3	Existing Airport Layout Plan
4	Future Airport Layout Plan
5	Airport Airspace Plan
6	Runway 17 Inner Portion of Approach
7	Runway 35 Inner Portion of Approach
8	Runway 5 Inner Portion of Approach
9	Runway 23 Inner Portion of Approach
10 - 12	Runway Obstruction Data Tables
13	Terminal Area Plan
14	Land Use Plan
15	Airport Property Map

6.2.1 Existing and Future ALP Sheets

The second sheet presents critical data of the Airport in general, its runways, its taxiways, and other conditions, as they exist today (Existing) and as they are projected to change with the recommended developments (Future). The third sheet of the drawing set illustrates the airport layout as it exists today. The drawing identifies key FAA airfield design standards (e.g., Runway Safety Areas, Object Free Areas, and Runway Protection Zones) and illustrates existing landside facilities. Key information, such as runway end elevations and runway-taxiway offsets, is also illustrated on Sheet 3. The proposed ALP (Sheet 4) includes all features of the Existing Airport Facilities sheet and illustrates each recommended facility for MPV. Several offices within the FAA review this drawing for consistency with airport design standards, flight procedures, surrounding airspace, and environmental requirements. Sheet 13 (Terminal Area Plan) displays the terminal area in greater detail.

Approval of this plan represents the acceptance of the general location of future facilities. However, prior to the development phase of each project, VTrans is required to submit the final locations, heights, and exterior finish of each proposed structure for approval. ALP approval does not represent environmental clearance under the National Environmental Policy Act (NEPA), or compliance with permit requirements. Such approvals must be obtained prior to development and are not part of the ALP process.

It is also noted that ALP approval does not represent a commitment on behalf of the FAA, VTrans, or others to fund or pursue the projects depicted. Rather, this Master Plan and associated ALP represent the first products of the planning and development process and are intended to depict a broad and long-range view of the potential improvements to the Airport. The ALP drawings were prepared in accordance with FAA design standards for Airport Reference Code (ARC) B-II

for Runway 17-35 and its associated taxiways, and B-I (small) for Runway 5-23 and its associated taxiways. Aircraft within ARC B-II include the Cessna Excel, while ARC B-I (small) includes the Beechcraft Baron. The following publications were used during the drawing preparation:

- FAA Advisory Circular 150/5300-13B, *Airport Design*
- FAA Advisory Circular 150/5070-6B, *Airport Master Plans*
- Federal Aviation Regulations, Part 77, *Safe, Efficient Use, and Preservation of the Navigable Airspace*

6.2.2 Airport Airspace

Sheets 5 through 10 of the ALP Drawing Set illustrate the airspace requirements associated with Title 14 of the Code of Federal Regulations (CFR); Federal Aviation Regulations (FAR) Part 77. FAR Part 77.23 identifies a series of geometric planes (i.e., imaginary surfaces) that extend outward and upward from an airport's runways to define obstruction clearing requirements. These surfaces identify the maximum acceptable height of objects by defining three dimensional surfaces surrounding all sides of the airfield. When an object penetrates an imaginary surface, it is considered an airspace obstruction and may present a hazard to air navigation.

Sheet 5, Airport Airspace Plan, illustrates the overall dimensions of the Part 77 surfaces, and highlights penetrations to the outer surfaces. Sheets 6 through 9, the Inner Approach Surface Drawings, provide greater detail regarding the close-in airspace obstructions at either runway end, particularly to the inner portions of each FAR Part 77 approach surface. For each obstruction, the height, penetration, ownership, and proposed action/disposition are indicated in the associated tables on Sheet 10 through 12.

6.2.3 Land Use Plan & Property Map

Sheets 14 and 15 depict the existing and proposed land uses within proximity to the airport along with associated landowners; as well as avigation easements providing access rights for obstruction (i.e. tree) clearing activity and restrictions to land uses.

APPENDIX A – RECYCLING PLAN

RECYCLING PLAN

Sustainability and green initiatives are being encouraged in a variety of areas as communities expand. The Federal Aviation Administration (FAA) encourages airport sustainability planning efforts to identify sustainability objectives that reduce environmental impacts, realize economic benefits, and improve community relations. While the FAA is beginning to develop comprehensive airport sustainability plans at several of the nation's commercial service airports, the FAA Modernization and Reform Act of 2012 requires all airport master plans to include a section that addresses potential recycling initiatives. Topics to be discussed may include the feasibility of solid waste recycling at the airport, minimizing the generation of solid waste, operations and maintenance requirements of the program, a review of current waste management contracts, and the potential for cost savings or revenue generation from recycling efforts.

The following information will identify common types and sources of waste generated by General Aviation (GA) airports, current waste disposal procedures, and a recommended plan for implementing recycling initiatives at Edward F. Knapp State Airport (MPV or the Airport).

TYPES AND SOURCES OF WASTE AT MPV

According to the 2013 FAA document *Recycling, Reuse, and Waste Reduction at Airports*, one of the key elements of developing a recycling plan is to identify the types and sources of waste at an airport. This varies depending upon the type of facility (e.g., GA or commercial service). A GA airport does not typically generate as much waste as that of a commercial service airport. Additionally, most waste generated by GA airport operations can be disposed of with normal trash collection.

The following, as defined in *Recycling, Reuse, and Waste Reduction at Airports*, presents the types of waste typically generated by activity at MPV.

- **Municipal Solid Waste (MSW)** consists of everyday items that are used and then discarded, such as product packaging, bottles, containers, paper products, food scraps, etc. Every airport produces a certain amount of MSW. MSW at GA airports can usually be disposed of with normal trash collection.
- **Green Waste** is a type of MSW that includes yard waste, such as grass clippings, leaves, small branches, and similar debris generated by landscaping activities. On-airport mowing and tree clearing activities produce green waste. Green waste can also include food that

is not consumed or generated during food preparation activities but discarded. Green waste can be composted but is typically discarded as MSW.

- **Construction and Demolition Waste (C&D)** is also generally categorized as MSW; it includes non-hazardous solid waste from land clearing, excavation, and/or the construction, demolition, renovation, or repair of structures, roads, and utilities. Although some special requirements may be placed on construction and demolition waste, such as tar, roofing materials, asbestos containing building materials, etc, C&D waste can be a major component of airport waste, especially during an airport improvement project. Airport improvement projects should identify proper disposal procedures for C&D waste.
- **Hazardous Waste** includes waste that is ignitable, corrosive, toxic, or reactive. Hazardous waste must be handled in accordance with federal regulations outlining proper treatment and disposal. According to the FAA, examples of hazardous waste often found at an airport include, but are not limited to, solvents, caustic part washes, heavy metal paint waste and paint chips, waste fuels (e.g., sump fuels or tank sludge), unusable water conditioning chemicals, nickel-cadmium, and waste pesticides. Airport and aircraft maintenance operations can generate hazardous waste.
- **Universal Waste** is a type of hazardous waste that has less stringent regulations. According to the U.S. Environmental Protection Agency (EPA), if handled in a responsible method prior to legal recycling, these wastes are less heavily regulated. Examples of universal waste include, but are not limited to, batteries, aerosol cans, certain pesticides, mercury-containing devices (e.g., thermostats and thermometers), mercury-containing lighting (e.g., florescent bulbs), and electronic devices. Various items located throughout an airport and within an aircraft may generate universal waste.

VERMONT WASTE & RECYCLING REGULATIONS

The State of Vermont offers specialty C&D waste drop-off centers where certain items can be repurposed or recycled. As of January 1, 2015, Vermont's Architectural Waste Recycling Law (Act 175) requires that commercial projects producing 40 cubic yards (approximately one large roll-off container) or more of "architectural waste" within 20 miles of a facility that recycles architectural waste shall do the following:

- Arrange for the transfer of architectural waste from the project site to a certified solid waste facility, which shall be required to recycle the architectural waste or arrange for its reuse unless the facility demonstrates to the Secretary a lack of marketability for recycling or reuse and a plan for reentering the market when it is established;
- Arrange for a method of disposition of the architectural waste that the Secretary of Natural Resources deems appropriate as an end use, including transfer of the architectural waste to an out-of-state facility that recycles architectural waste.

Architectural waste is a subset of C&D waste defined as discarded dry wall, metal, asphalt shingles, clean wood, plywood, and oriented strand board derived from the construction or demolition of buildings or structures (10 V.S.A 6605m).

Act 250, Vermont's land use and development law, requires permit applicants to submit a Construction Waste Management Plan for projects involving more than 5,000 square feet of construction and/or demolition. Construction Waste Management Plans are project-specific plans that list all waste materials, quantities, and how the waste will be handled. The Vermont Agency of Natural Resources (ANR) strongly encourages the inclusion of waste management specifications in contract documents so that contractors and subcontractors are obligated to manage jobsite waste accordingly.

CURRENT WASTE DISPOSAL PROCEDURES

Municipal Solid Waste

Trash and recycling receptacles for MSW are available in the terminal and tenant facilities. Casella Waste Systems, Inc. (Casella) is contracted to provide one trash and one recycling dumpster for general waste at the Airport; these dumpsters are stationed at the Snow Removal Equipment (SRE) Building. Myers Container Services (Myers) is contracted by Vermont Flying Service to provide one trash and one recycling dumpster exclusively for their use. Vermont Agency of Transportation (VTrans) and tenant personnel transport their waste to the dumpsters. Casella and Myer are responsible for proper recycling or disposal of collected materials.

Green Waste

Green waste is generated through mowing, landscaping, and tree clearing activity. Vegetation removed to protect runway approach surface clearance is either chipped on site or hauled offsite to be chipped, mulched, and/or composted.

Construction and Demolition Waste

Disposal for C&D waste at MPV is dependent upon the type of associated activity. C&D waste is typically generated from airport sponsored activity and, thus, can be properly disposed of. Materials that can be repurposed or recycled should be separated from landfill waste at the project site and then transported to a C&D recycling center. The marketability of C&D waste depends on quantity, condition, and location of accepting facilities. Most recently, the Airport was able to recycle fencing instead of sending it to a landfill.

As previously described, commercial construction and demolition projects located within 20 miles of an architectural waste recycling facility that produce 40 cubic yards or more of architectural waste must abide by Act 175 requirements. Based on the ANR's Architectural Waste Recycling Facility Map, MPV is not within 20 miles of an architectural waste recycling facility. The Airport should periodically review this map to confirm that new facilities have not

become available. However, the airport is not currently required to recycle all architectural waste.

Additionally, if an Act 250 permit is required for the completion of a construction or demolition project, the project must include the development of a Construction Waste Management Plan. A template plan can be found on the ANR Construction & Demolition Waste Recycling Website.

Hazardous and Universal Waste

Hazardous and universal waste is generated at MPV through airport and aircraft maintenance operations. Both VTrans and Vermont Flying Service have established procedures for the disposal of hazardous and universal waste that ensures collection and disposal separately from MSW.

RECYCLING PLAN DEVELOPMENT

Unlike many other GA airports, MPV does offer recycling. Review of the common types of waste discarded at MPV suggests that it would be beneficial to implement a recycling plan aimed at increasing the amount of materials diverted from a landfill. This can be done by formalizing a process for identifying, sorting, and collecting recyclable materials.

The following provides a recommended outline for the development of a recycling plan at MPV. Information provided in the FAA's *Recycling, Reuse, and Waste Reduction at Airports* and the EPA's *Developing and Implementing an Airport Recycling Program* was used to develop the outline.

- **Step 1 – Identify a Waste Collector:** Casella and Myers are contracted to provide both a trash and recycling dumpster at MPV with bi-weekly pick-up. Casella recycling services include single stream MSW recycling, non-hazardous C&D waste recycling, and organic waste recycling. These services are available for both residential and business customers. Organic waste must be collected separately and discussed with Casella before implementation. Casella operates recycling facilities in both Rutland and Williston, Vermont while their nearest landfill is much further away from the Airport in Bethlehem, New Hampshire. Myers offers residential and commercial single stream recycling along with C&D recycling. They operate a recycling center out of Waterbury, Vermont. The C&D recycling facilities listed above can also be utilized for certain materials, but the materials will need to be transported.

  Bi-weekly recycling pick-up is only intended for recyclable materials associated with MSW. Special wastes, such as C&D, hazardous, and universal waste, must follow federal regulations for proper disposal and be coordinated with the waste collector.

- **Step 2 – Identify a Collection System:** Casella and Myers utilize single-stream recycling, which requires no sorting of recyclable materials upon initial collection because the materials are sorted at their facility. This form of recycling allows all recyclables to be

placed into a single recyclable dumpster. To improve the effectiveness of the current dumpsters, confirm that recycling and trash signage on the dumpsters is clear and concise to indicate proper disposal to users.

- **Step 3 – Identify Appropriate Location of Recycling Receptacles:** Since Casella and Myers offer single stream recycling, only a single type of recycling receptacle is necessary. It is recommended that recycling receptacles be placed adjacent to trash receptacles and in common areas to ensure all airport tenants and visitors are aware that recycling is available at the Airport. Trash and recycling receptacles should be easy to distinguish from one another at just a glance.
- **Step 4 – Educate Airport Tenants and Visitors:** It is recommended that both tenants and visitors are informed and reminded of the recycling procedures at MPV. This can be accomplished through face-to-face meetings, newsletters, emails, and airport signage. Information should identify the location of recycling receptacles, types of recyclable material allowed to be placed in the receptacles, and the importance of recycling within the community.
- **Step 5 – Monitor and Refine the Plan:** It is important to monitor and, if necessary, refine the recycling plan. A periodic check of the trash receptacles prior to trash collection should be conducted to determine the level of sorting of MSW versus recyclable materials. If adjustment is necessary, consideration should be given to the placement of receptacles, collection times, or if additional receptacles may be necessary.
  A potential cost benefit of implementing a recycling plan may be decreased waste within the trash dumpsters and, thus, fewer required trash collections.

Recycling Plan Summary

As discussed, airports generate multiple types of waste. Fortunately, a large percentage of this waste is considered recyclable in one form or another. For construction and demolition waste and hazardous and universal waste, it is recommended that MPV continue to reuse or recycle material when practical or available. For MSW, it is recommended the aforementioned steps are implemented to establish a recycling program at the Airport. A recycling program has the potential to lessen the overall environmental impact of the Airport, enhance the Airport's relationship with the community, and provide the Airport potential cost savings by reducing trash collection.

APPENDIX B – IPAC RESOURCE LIST

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Project information

NAME

E.F. Knapp Enviro Overview

LOCATION

Washington County, Vermont

DESCRIPTION

None

Local office

New England Ecological Services Field Office

(603) 223-2541
(603) 223-0104

70 Commercial Street, Suite 300
Concord, NH 03301-5094

http://www.fws.gov/newengland

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Log in to IPaC.
2. Go to your My Projects list.
3. Click PROJECT HOME for this project.
4. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information. IPaC only shows species that are regulated by USFWS (see FAQ).
2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS
Northern Long-eared Bat Myotis septentrionalis Wherever found No critical habitat has been designated for this species. http://ecos.fws.gov/ecp/species/9045	Threatened

Insects

NAME	STATUS
Monarch Butterfly Danaus plexippus Wherever found No critical habitat has been designated for this species. http://ecos.fws.gov/ecp/species/9743	Candidate

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

THERE ARE NO CRITICAL HABITATS AT THIS LOCATION.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON (IF A BREEDING SEASON IS INDICATED FOR A BIRD ON YOUR LIST, THE BIRD MAY BREED IN YOUR PROJECT AREA SOMETIME WITHIN THE TIMEFRAME SPECIFIED, WHICH IS A VERY LIBERAL ESTIMATE OF THE DATES INSIDE WHICH THE BIRD BREEDS ACROSS ITS ENTIRE RANGE. "BREEDS ELSEWHERE" INDICATES THAT THE BIRD DOES NOT LIKELY BREED IN YOUR PROJECT AREA.)
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. http://ecos.fws.gov/ecp/species/1626	Breeds Dec 1 to Aug 31
Black-billed Cuckoo *Coccyzus erythropthalmus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. http://ecos.fws.gov/ecp/species/9399	Breeds May 15 to Oct 10
Bobolink *Dolichonyx oryzivorus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 20 to Jul 31
Canada Warbler *Cardellina canadensis* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 20 to Aug 10
Evening Grosbeak *Coccothraustes vespertinus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 15 to Aug 10

Lesser Yellowlegs Tringa flavipes This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. http://ecos.fws.gov/ecp/species/9679	Breeds elsewhere
Olive-sided Flycatcher Contopus cooperi This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. http://ecos.fws.gov/ecp/species/3914	Breeds May 20 to Aug 31
Wood Thrush Hylocichla mustelina This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Aug 31

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.

2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (▪)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

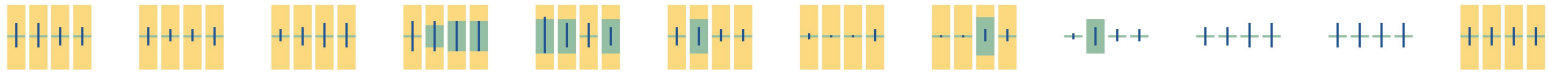
Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

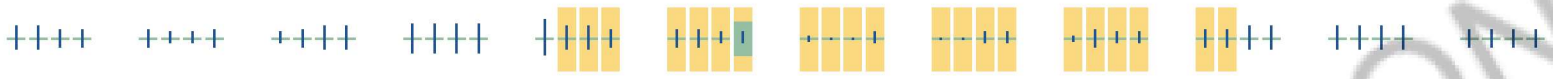
No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.

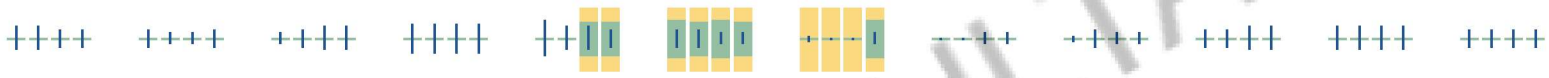
Bald Eagle
Non-BCC Vulnerable
(This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)



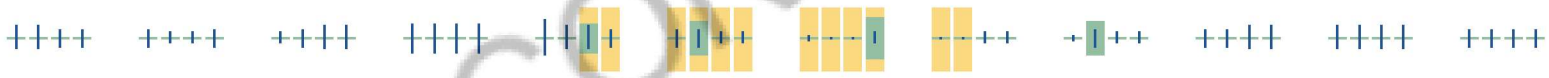
Black-billed Cuckoo
BCC Rangewide (CON)
(This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



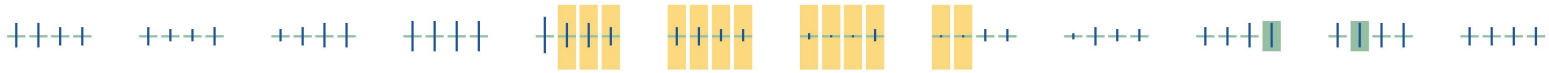
Bobolink
BCC Rangewide (CON)
(This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



Canada Warbler
BCC Rangewide (CON)
(This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

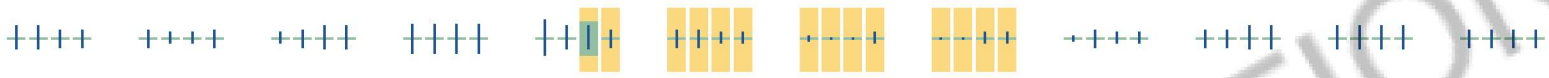


Evening Grosbeak
BCC Rangewide (CON)
(This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

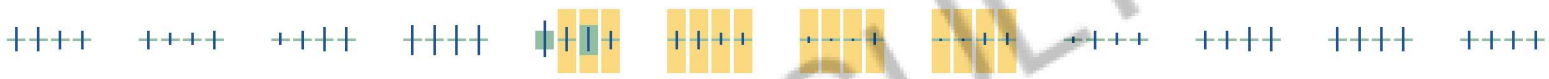


Lesser Yellowlegs
BCC Rangewide (CON)
(This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Olive-sided Flycatcher
BCC Rangewide (CON)
(This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



Wood Thrush
BCC Rangewide (CON)
(This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the AKN Phenology Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS AT THIS LOCATION.

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

WETLAND INFORMATION IS NOT AVAILABLE AT THIS TIME

This can happen when the National Wetlands Inventory (NWI) map service is unavailable, or for very large projects that intersect many wetland areas. Try again, or visit the NWI map to view wetlands at this location.

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.