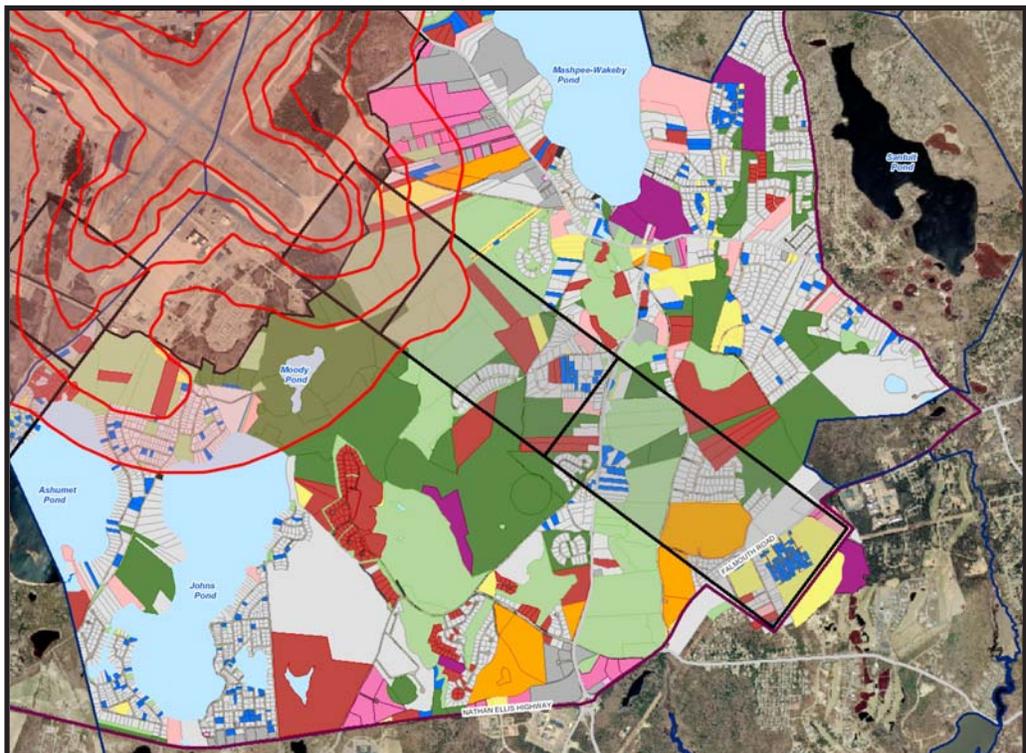


Massachusetts Military Reservation **Joint Land Use Study**

Bourne • Falmouth • Sandwich • Mashpee

October, 2005



Prepared by



Cape Cod Commission
Barnstable, MA

through a grant provided by the
U.S. Department of Defense, Office of Economic Adjustment

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Massachusetts Military Reservation

Joint Land Use Study

Bourne • Falmouth • Sandwich • Mashpee

BACKGROUND

■ JOINT LAND USE STUDY PROGRAM

The U.S. Department of Defense (DoD) initiated the Joint Land Use Study (JLUS) program in 1985. The JLUS program is a cooperative land-use planning effort between military installations and the surrounding communities. The objectives of the program are twofold: to ensure that future community growth and development are compatible with the training or operational missions of the installation; and, to seek ways to reduce the operational impacts of military installations on adjacent land.

DoD's Office of Economic Adjustment manages the JLUS program. The Massachusetts Military Reservation (MMR) was selected for a JLUS due to the rapid population growth and ongoing development pressures in Barnstable County, particularly in the four Upper Cape towns (Bourne, Falmouth, Mashpee and Sandwich) surrounding the MMR. Otis Air National Guard Base is the only Air National Guard installation currently engaged in the JLUS program.

MMR—Location and Land Use

As noted in the introduction to the Training Year (TY) 2003 State of the Reservation Report, "The Massachusetts Military Reservation (MMR) is a full service military base and is home to the Massachusetts Air National Guard's (MAANG) Otis Air National Guard (ANG) Base, the U.S. Coast Guard's (USCG) Air Station Cape Cod, the Veterans Administration Cemetery, the U.S. Air Force's Cape Cod Air Force Station, and the Massachusetts Army National Guard's (MAARNG) Camp Edwards. It includes parts of the towns of Bourne, Mashpee, and Sandwich, and abuts the town of Falmouth in Barnstable County, Massachusetts. The MMR covers nearly 21,000 acres – approximately 30 square miles" (Army National Guard, p. 1). (Figure 1. MMR Occupants on page 3.)

Two major land-use areas characterize the MMR: the Camp Edwards northern training area, and the cantonment area in the southern portion of the base. According to the Draft Master Plan/ Area-Wide Environmental Impact Report for the MMR, "The northern training zone is a largely wooded area comprised of about 14,575 acres with rolling topography and few roads. The MAARNG currently conducts small arms and maneuver training in parts of this area and has in the past conducted artillery training on ranges surrounding the Impact Area" (Massachusetts National Guard, p. III-12), while the cantonment area "is a flat, developed area with roads, utilities, airfield support buildings and housing on about 5,900 acres" (ibid., p. III-14). (Figure 2. MMR Major Land Uses on page 5.)

Otis Air National Guard Base

The ANG website describes the Otis ANG Base as home to the 102nd Fighter Wing and other Air National Guard units, including the 253rd Combat Communications Group. "The wing is equipped with the F-15 Eagle, America's premier air sovereignty fighter aircraft. Our aircraft and their crews are on continuous 24-hour, 365-day alert to guard the nation's skies. Specifically, our mission is to protect the Northeast United States from:

- Armed attack from another nation,
- Terrorist attack, and
- Activities such as smuggling, illicit drug activity, and illegal immigration.

The wing is also an integral part of an Expeditionary Aerospace Force and immediately deployable to support U.S. Air Force requirements anywhere in the world. As such, we must continually train to be prepared for any assigned mission. Otis ANG Base is the only active air defense base on the East Coast between the U.S./Canadian border and the Washington, D.C. area. The 102nd Fighter Wing plays a lead role in homeland defense. Aircraft perform around-the-clock combat air patrols over the East Coast. Today, the 102nd Fighter Wing's area of responsibility includes over 500,000 square miles, 90 million people, and the major industrial centers of Boston, New York, Philadelphia, Detroit, and all national command centers in Washington, D.C." (Otis Air National Guard website, www.maotis.ang.af.mil).

Coast Guard Air Station Cape Cod

Air Station Cape Cod was commissioned on August 29, 1970 when Air Station Salem, MA and Air Detachment Quonset Point, RI were consolidated into one command. The air station flies both helicopters and fixed-wing aircraft to perform a variety of Coast Guard missions. The primary mission, Search and Rescue, involves the protection of life and property in the offshore areas from the Canadian border to central New Jersey.

In recent years, the air station has averaged over 250 search and rescue cases, performed 189 searches, saved 71 lives, performed 89 medical evacuations, and assisted 150 people per year. This operations tempo made the air station one of the

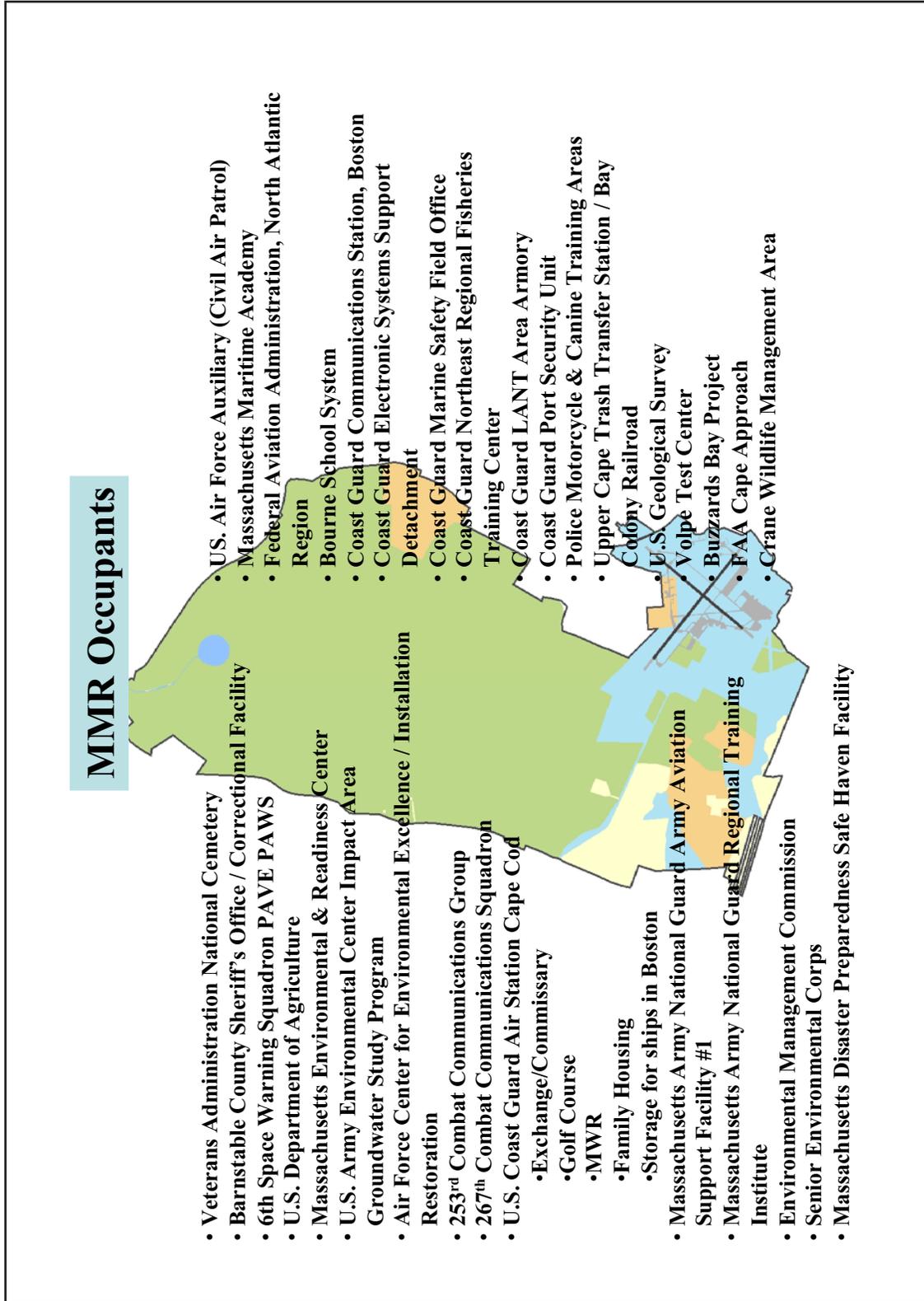


Figure 1. MMR Occupants
(Source: Environmental & Readiness Center)

Mass. Military Reservation Master Plan Study Management Zones

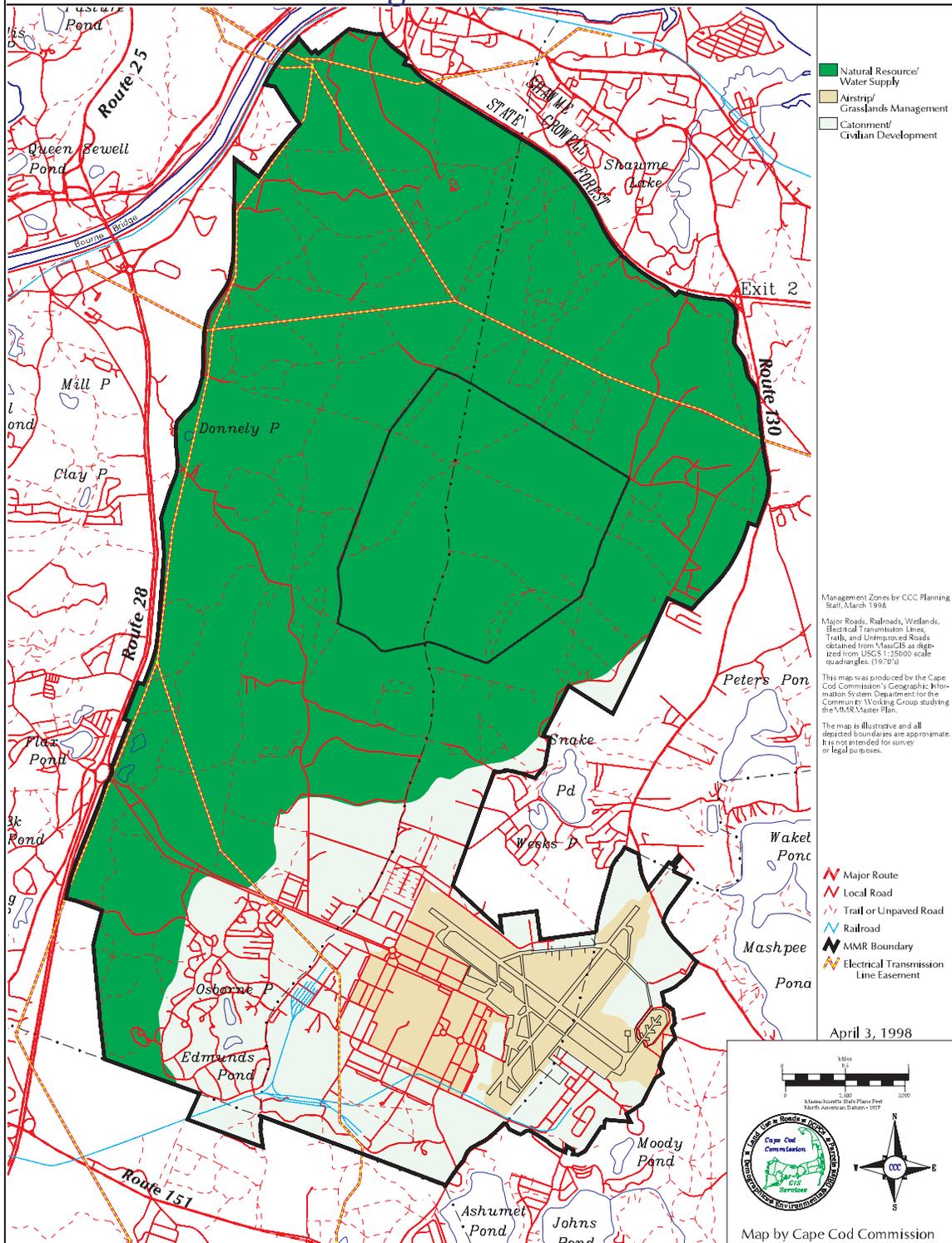


Figure 2. MMR Major Land Uses

(Source: MMR Master Plan Final Report, CCC, September 8, 1998)

busiest search and rescue units in the country. Air Station Cape Cod aircraft also play a primary role in conducting offshore patrols in the fertile New England fishing areas to ensure both domestic and foreign vessels are adhering to U.S. laws.

The air station has four HH-60J “Jayhawk” helicopters, which can fly 300 miles offshore at a maximum airspeed of 180 knots, hover 45 minutes on scene to perform rescue hoists, then return. In addition to Search and Rescue, other helicopter missions include law enforcement/ fisheries enforcement patrols, logistics missions, and heavy-lift aids to navigation support of the many offshore lighthouses of New England.

The air station also has four HU-25 “Guardian” fixed-wing aircraft, which round out the unit’s inventory. These versatile jets can fly 800 miles offshore at an airspeed of 380 knots, orbit for 30 minutes on scene to drop survival equipment to a boat in distress, then return. In addition to Search and Rescue, Cape Cod’s HU-25s are utilized for law enforcement/ fisheries enforcement patrols, logistics missions, drug interdiction, and Asian migrant interdiction operations. With top speeds in excess of 500 knots/0.855 mach and state-of-the-art radar and sensor packages on board, the Guardians are called upon to perform operations from Sandy Hook, NJ and north to the Canadian border.

Since September 11, 2001, the air station has also taken on the extra task of providing homeland security for the major ports and hundreds of miles of shoreline in New England. This increased role has been absorbed into the normal operations at the air station while the staffing at the air station has remained the same. With the same crews and number of aircraft as pre-9/11, the air station supports over 50 scheduled flights a week and is still able to support the numerous search and rescue cases created from the extremely dangerous offshore environment.

Camp Edwards Army National Guard

Camp Edwards, one of the major commands on the base, is responsible for providing a training venue for soldiers and airmen of the Army National Guard. The soldiers and airmen that train at Camp Edwards are predominantly members of the Massachusetts National Guard; however, Camp Edwards also provides training opportunities for military members from Rhode Island, Connecticut, New Hampshire, and Maine as well as some active duty units.

In addition to the traditional Guard training venue of one weekend a month and a two-week training period once a year, several units being mobilized for federal active duty have also conducted their pre-mobilization and post-mobilization training at Camp Edwards. Over 4,500 soldiers and airmen have trained at Camp Edwards for duty performed in countries such as Afghanistan, Bosnia, Iraq, and Kuwait, along with many homeland defense missions.

Typical training includes individual weapon firing, leader development training, maneuver training, land navigation, driver training, and other common military

training events. Also located on the base are the Massachusetts National Guard's Regional Training Institution that provides education and training in soldier and leadership skills, and an Army Aviation Battalion that provides helicopter support.

Upper Cape Water Supply Reserve

The Upper Cape Water Supply Reserve (the Reserve) is in the northern portion of MMR and includes most of Camp Edwards' northern training area. The purpose of the Reserve, created by Chapter 47 of the Acts of 2002, is to ensure the permanent protection of the drinking water supply and wildlife habitats, while allowing compatible military training. The law requires independent oversight, monitoring, and evaluation of activities in the Reserve. The law created the Environmental Management Commission (EMC) and, an Environmental Officer as part of the EMC staff, to oversee compliance with and enforcement of Environmental Performance Standards established through the state's environmental review process. The EMC consists of three members - the commissioner of the Massachusetts (MA) Department of Fish and Game; the commissioner of the MA Department of Conservation and Recreation; and the commissioner of the MA Department of Environmental Protection.

The EMC and its staff also coordinate with state environmental agencies in enforcement of environmental laws and regulations on the MMR and facilitate an open and public review of activities on the Reserve. The Environmental Officer monitors activities on and uses of the Reserve and the impact of those activities and uses on the water supply and wildlife habitats.

The legislation established two advisory councils to assist the EMC. The Community Advisory Council (CAC), consisting of 15 members, assists the EMC by providing advice on issues related to the protection of the Reserve. The Scientific Advisory Council (SAC), consisting of nine members, assists the commission by providing scientific and technical advice relating to the protection of the drinking water supply and wildlife habitat within the Reserve. The Environmental Officer reports to the EMC and acts as a liaison between the military, CAC, SAC, the general public, and the EMC.

Need for the Study

Population Growth in the Region

Fifteen towns covering approximately 412 square miles comprise Barnstable County (Cape Cod). From 1990 to 2000, the population of Barnstable County grew by 35,625 persons, a growth rate of 19.1%, while the population of Massachusetts as a whole grew by only 5.5%. This makes Barnstable County's growth rate the third highest in the state, behind only Nantucket and Dukes counties. The number of housing units on Cape Cod has more than doubled since 1970 (from 65,676 to an estimated 153,501). An analysis of development potential under existing zoning completed in 2000 for all 15 Cape towns by the Cape Cod Commission in partnership with the

Massachusetts Executive Office of Environmental Affairs revealed that, with no additional growth management or land-protection efforts, the Cape could add 37,000 houses and at least 50,000 people at build-out. In particular, the towns of Mashpee and Sandwich are two of the fastest-growing communities in the Commonwealth, with Mashpee experiencing a 64% increase in population and Sandwich a 30% increase in population between 1990 and 2000.

As the Cape has continued to develop, residential and commercial development has gradually encroached on base operations. As a result, there is an increasing level of conflict between base operations and residences, including noise from aircraft and other military activities, and an increasing risk that any aircraft accidents could result in casualties in neighborhoods around the base. Aircraft noise and accident potential are more specifically discussed below. In addition, Air National Guard, Army National Guard aviation, and Coast Guard personnel have expressed serious concerns about the potential hazard to navigation posed by the recent construction and proposed development of wireless communication towers in several locations surrounding the base, as well as the possibility of future wind-turbine development.

Aircraft Noise and Accident Potential

Periodically, the Air National Guard evaluates aircraft noise and accident potential related to all flying operations taking place at the Otis Air National Guard Base. The Air Installation Compatible Use Zone (AICUZ) report was last prepared in 1996 with a new study expected later in 2005. The AICUZ is “designed to aid local planners in establishing land-use guidelines which ensure public safety and health and preserve the operational capabilities of Otis Air National Guard Base” (Air Installation Compatible Use Zone report, Department of the Air Force, 102nd Fighter Wing, January 1996 cover memo). The goal of the program is to “promote compatible land-use development around military airfields by providing information on aircraft noise exposure and accident potential. AICUZ reports describe three basic types of constraints that affect, or result, from flight operations. The first involves areas that the FAA and DoD have identified for height limitations. These constraints are more specifically discussed in p. 2 of the report by Broadcast Signal Lab, LLC in Appendix 2. The second constraint involves noise zones resulting from aircraft operations. The third constraint involves accident potential zones based on statistical analysis of past DoD aircraft accidents” (Air Installation Compatible Use Zone Study, Department of the Air Force, Headquarters 102nd Fighter Wing, Massachusetts Air National Guard, p. 4-6).

Noise Contours

According to the AICUZ report, using the NOISEMAP computer program, which is similar to the FAA’s Integrated Noise Model, the DoD produces noise contours showing the noise exposure of current aircraft operations. The AICUZ report contains noise contours plotted at increments of 5 decibels (dB), ranging from 65 dB Day/Night Average Sound Level (Ldn) to 80 dB Ldn (ibid, p. 6). Noise contours for Otis Air National Guard Base are illustrated on Figure 2. MMR Joint Land Use Study Area on page 13.

The delineation of noise contours and Accident Potential Zones are based on data from the Air Installation Compatible Use Zone Resource Book for Otis Air National Guard Base, Massachusetts Air National Guard, Otis Air National Guard Base, Massachusetts, Air National Guard Environmental Planning Division, May 2002. Nearly all studies on residential aircraft noise compatibility recommend against residential uses in noise zones above 75 dB Ldn (ibid, p. A-6). Usually no restrictions are necessary below noise zone 65 dB Ldn. Between noise zones 65 and 75 dB Ldn, residential use is discouraged, and noise level reduction measures should be considered. For commercial/industrial uses, the AICUZ study recommends that noise reduction measures be incorporated for office or transient lodging above 75 dB Ldn. Cultural, entertainment and recreational uses except golf and riding stables should be prohibited above 75 dB Ldn. Residential uses, food services, cultural, entertainment, auto sales or general retail should be prohibited above 80 dB Ldn.

Safety – Accident Potential Zones

According to the 1996 AICUZ report, “DoD analysis has determined that the areas immediately beyond the ends of runways and along the approach and departure flight paths have the greatest potential for aircraft accidents. Based on this analysis, DoD developed three zones to identify aircraft accident potential. The Clear Zone (CZ), the area closest to the end of the runway, has the highest potential for an aircraft accident of the three zones” (ibid., p. 6). According to FAA regulations, Otis Air National Guard CZs encompass areas 3,000 feet wide by 3,000 feet long at the end of each runway. This potential decreases as the distance from the end of the runway increases through Accident Potential Zone (APZ) 1 and APZ2. The APZ1 and APZ2 are 3,000 feet wide by 5,000 feet long and 3,000 feet wide by 7,000 feet long, respectively. The overall risk in the Clear Zone is such that DoD generally acquires the land through purchase or easement to prevent development” (ibid, p. 6). Outside of CZs, land- use controls and density restrictions are generally recommended.

The AICUZ study recommends that no residential use, places of assembly, or hospitals/nursing homes be allowed within the CZ or APZ1. Within the APZ1, agriculture, limited manufacturing, publishing or printing uses are acceptable; however, wholesale and retail trade or eating establishments should not be allowed with the exception of building material, marine or automotive sales. Golf courses without clubhouses or parks are also acceptable uses within the APZ1.

Within the APZ2, single-family residential uses should be limited to a density of 1 or 2 dwelling units/acre. Most commercial uses are acceptable within this safety zone, with the exception of eating/drinking establishments, hospitals/nursing homes, churches, group camps, or outdoor sports facilities.

OVERALL GOAL OF THE JLUS

The overall goal of the MMR JLUS is to develop a land-use plan in partnership with MMR military officials for the areas adjacent to the MMR that minimizes conflicts of existing surrounding uses on military operations, avoids future land-use conflicts, and ensures that adequate infrastructure exists for future development within the study area, including future use of the cantonment area.

■ Objectives for the Study

- Address land-use conflicts raised by residential development, including M.G.L. Chapter 40B residential development, which can obtain exemptions from municipal land-use regulations, and commercial development adjacent to the base.
- Address approaches to control unauthorized access to the base, taking into account natural resources, base security, and public safety.
- Explore possible modifications to military operations to reduce conflicts with neighboring uses without compromising military readiness or training capabilities.
- Address the height and visibility of wireless communication and wind-energy towers and the conflicts with Air National Guard, Army National Guard, and Coast Guard flight operations.
- Analyze the adequacy of existing water, sewer, and transportation infrastructure.
- Based on the feasibility study, evaluate the potential impacts of the proposed Northeast Regional Center for Homeland Security Defense Training on the study area of the surrounding communities.
- Evaluate accessibility of the MMR during public emergencies, including potential emergency shelter and evacuation routes.
- Identify opportunities for changes in municipal, county, and state land-use regulations, open space protection strategies, and other approaches to address land-use conflicts surrounding the base.

MMR JLUS STUDY AREA

Input on the MMR JLUS study area was received from the Technical Advisory Committee at the start of the JLUS process and was approved in March 2004 by the Policy Committee. The study area consists of land areas between the base boundary and major roadways surrounding the base, as well as Accident Potential Zones and noise contours based on the May 2002 Resource Book. The MMR JLUS study area is illustrated in the following map. (*Figure 3. MMR Joint Land Use Study Area on page 13.*)

MMR JLUS PROCESS

The following is a timeline of events associated with the MMR JLUS:

- Spring 2003—John Leigh, U.S. Department of Defense, Office of Economic Adjustment, and Brian Nickerson of the MMR Environmental & Readiness Center present concept of JLUS for the MMR to town planners in the towns of Mashpee, Falmouth, Sandwich and Bourne.
- Summer 2003—At the request of the town planners, John Leigh and Brian Nickerson discuss participation by the Cape Cod Commission in the planning process for MMR JLUS.
- March–May 2003—Resolutions of support received from the Boards of Selectmen in the towns of Mashpee, Falmouth, Bourne and Sandwich.
- July–November 2003—Preparation of scope of work for MMR JLUS by Commission staff and JLUS grant application materials by the town of Sandwich, designated as lead community in the JLUS.
- December 2003—Scope of work approved by Department of Defense, and grant awarded.

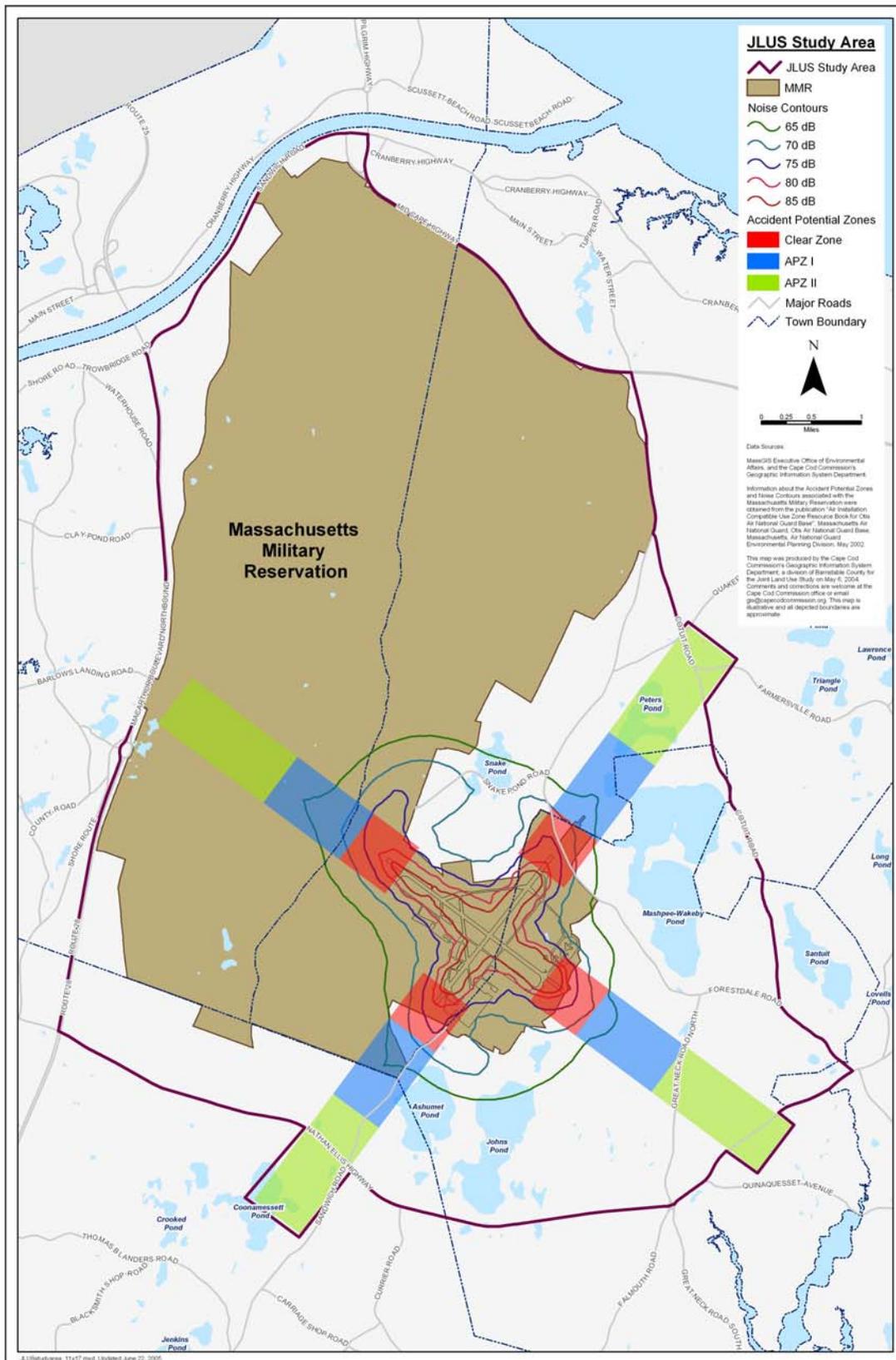


Figure 3. MMR Joint Land Use Study Area

- January 2004—First Technical Advisory Committee meeting held.
- February 2004—First Policy Committee meeting held.
- March 2004—Policy Committee approves study area and problem/ issues statement.
- May–June 2004—Briefings by Commission staff to Boards of Selectmen in Bourne, Sandwich, Mashpee, and Falmouth about the JLUS process, study area and problem/ issues statement
- June 2004—Feasibility study for NE Regional Center for Homeland Security reviewed by Commission staff for the Technical Advisory Committee.
- June 2004— Scope of work amended to hire a consultant to address conflicts between flight operations at MMR and wireless communications towers.
- July 2004 to March 2005—Review of wireless tower issues by consultant.
- January 2005—Contract extended to June 30, 2005 to allow completion of amended scope of work and to incorporate updated AICUZ study into JLUS.
- March 2005—Draft report regarding military flight operations and conflicts with wireless towers presented to Technical Advisory Committee.
- April-May 2005—Preparation of build-out analysis, and infrastructure capacity analysis.
- June 2005—Meetings with Technical Advisory Committee to discuss build-out analysis and draft recommendations.
- July 2005—Presentation of draft MMR JLUS final report to Policy Committee.
- July 2005—Presentation of final draft MMR JLUS to Cape Cod Commission’s Planning Committee.
- August 2005—Presentation of final draft MMR JLUS to Cape Cod Commission.
- August 2005—Technical Advisory Committee meeting held to discuss final revisions based on comments received.
- September 2005—Preparation of final MMR JLUS report.
- October-December 2005—Presentation of final MMR JLUS to Boards of Selectmen and Planning Boards in the towns of Mashpee, Bourne, Falmouth, and Sandwich.

■ TECHNICAL ADVISORY COMMITTEE MEETINGS

Technical Advisory Committee meetings were held on the following dates:

January 16, 2004; March 12, 2004; June 18, 2004; July 26, 2004; October 21, 2004; March 18, 2005; June 3, 2005; June 17, 2005; and August 25, 2005. Refer to Appendix 8 for minutes of these meetings.

■ POLICY COMMITTEE MEETINGS

Policy Committee meetings were held on the following dates:

February 6, 2004; March 31, 2004; and July 20, 2005. Refer to Appendix 8 for minutes of these meetings.

■ PROGRESS REPORTS

Quarterly reports were filed with the Office of Economic Adjustment for the following periods:

January 1 – March 31, 2004; April 1— June 30, 2004; July 1 – September 30, 2004; October 1 – December 31, 2004; January 1 – March 31, 2005; and April 1— June 30, 2005.

ANALYSIS OF EXISTING LAND USE AND ZONING

■ EXISTING LAND USE

The following review of existing land use was based on Property Type Classification Codes prepared by the Massachusetts Department of Revenue, Division of Local Services, Bureau of Local Assessment, revised November 2002 and, in the case of Falmouth, data from town assessors' files.

Town of Bourne

Land within the MMR JLUS study area in the town of Bourne consists of approximately 1,157 acres located east of MacArthur Boulevard, the south side of Sandwich Road along the Cape Cod Canal, and south of the Exit 1 interchange with Route 6. Almost half of this total (541 acres) consist of protected open space. Municipal facilities within the study area include the town of Bourne municipal solid waste facility and the Upper Cape Regional Technical High School. Existing residential development within the study area accounts for approximately 161 acres of land. Only 13 acres of existing commercial/industrial development is within the study area, although considerable commercial development exists just outside the study area along MacArthur Boulevard.

Developable land within the study area includes approximately 48 acres of residentially zoned land including a 14-acre parcel that is currently in recreational use, and 190 acres of commercial/industrial land. The majority of the land within the study area borders the northern training areas of the MMR used by the Army National Guard. None of the developable land lies within the APZs or noise contours for the Otis Air National Guard base, as these zones lie completely within the confines of the MMR for the town of Bourne. (*Figure 4. Existing Land Use—Town of Bourne on page 18.*)

Three wireless communication towers exist along MacArthur Boulevard, a flight path used by the Army National Guard helicopters in their training. These facilities range from 50 feet to over 200 feet in height.

Town of Falmouth

Land within the MMR JLUS study area in the town of Falmouth consists of approximately 2,534 acres of land. Almost 80% of the study area consists of either federal or state land holdings, or other protected open space. This land, along with

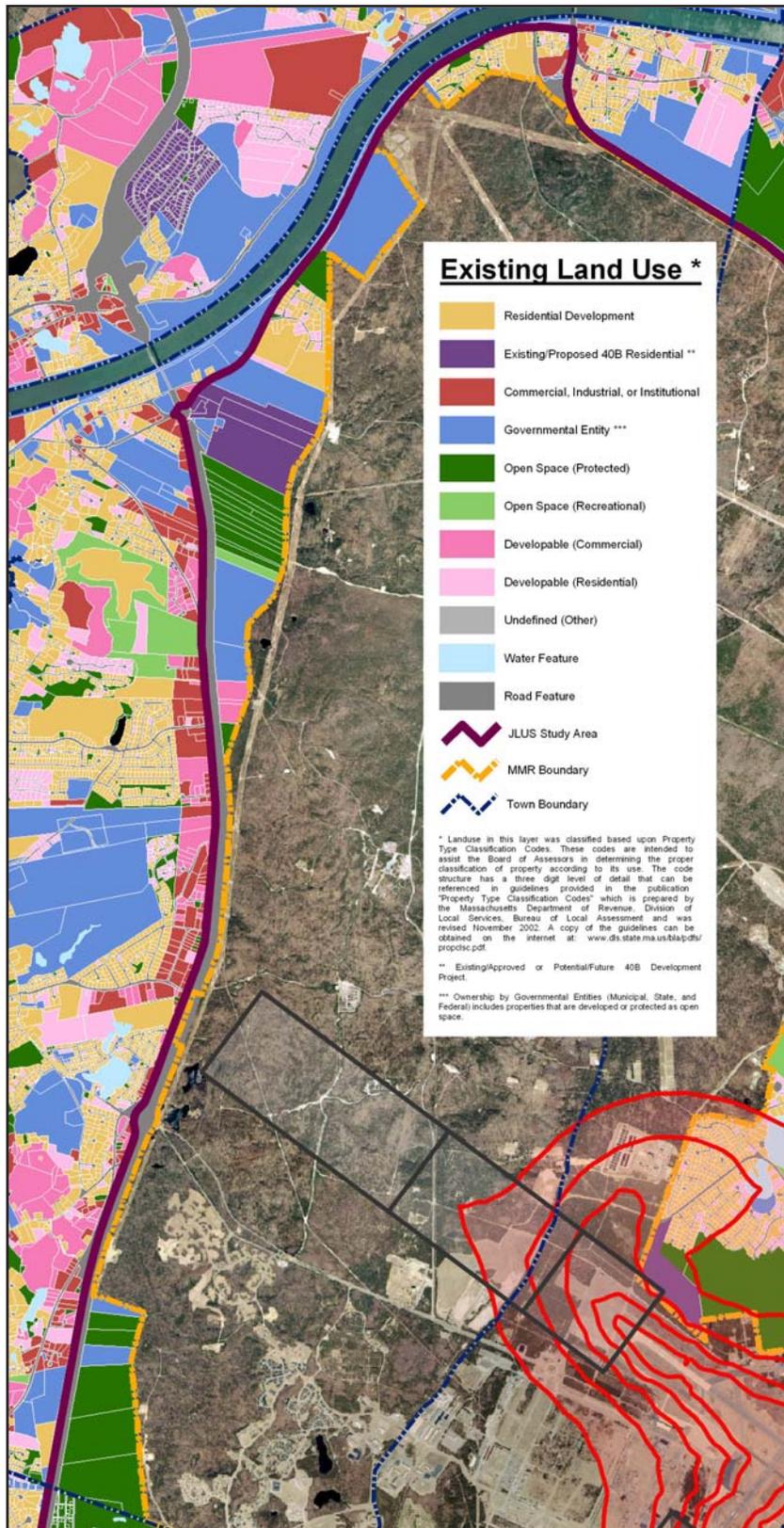


Figure 4. Existing Land Use Map—Town of Bourne

protected open space in the town of Bourne between the western boundary of the base and Route 28 (MacArthur Boulevard), forms a buffer between the base boundary and considerable residential and commercial development to the south.

Existing residential development accounts for almost 217 acres of land within the study area. The 84-acre Barnstable County fairgrounds are located partially within the study area. The fairgrounds are used primarily for a two-week period during the last part of July for the annual Barnstable County fair. Existing commercial uses account for approximately 28 acres of land within the study area. Recreational uses include the Cape Cod Country Club and the Paul Harney golf course. (Figure 5. *Existing Land Use—Town of Falmouth.*)

Developable land within the study area includes a small amount of commercial/ industrial land and approximately 88 acres of residential land.

There is no land within the CZ in the town of Falmouth. However, a total of 642 acres of land lies within the APZ1 and APZ2 for the Otis Air National Guard base. The majority of this land is protected open space. Existing residential development accounts for approximately 51 acres of land within the APZ1 and APZ2. There is also one parcel with an existing residence that could be subdivided into 5 additional lots within the APZ1. There are no proposed M.G.L. Chapter 40B developments within the study area for the town of Falmouth.

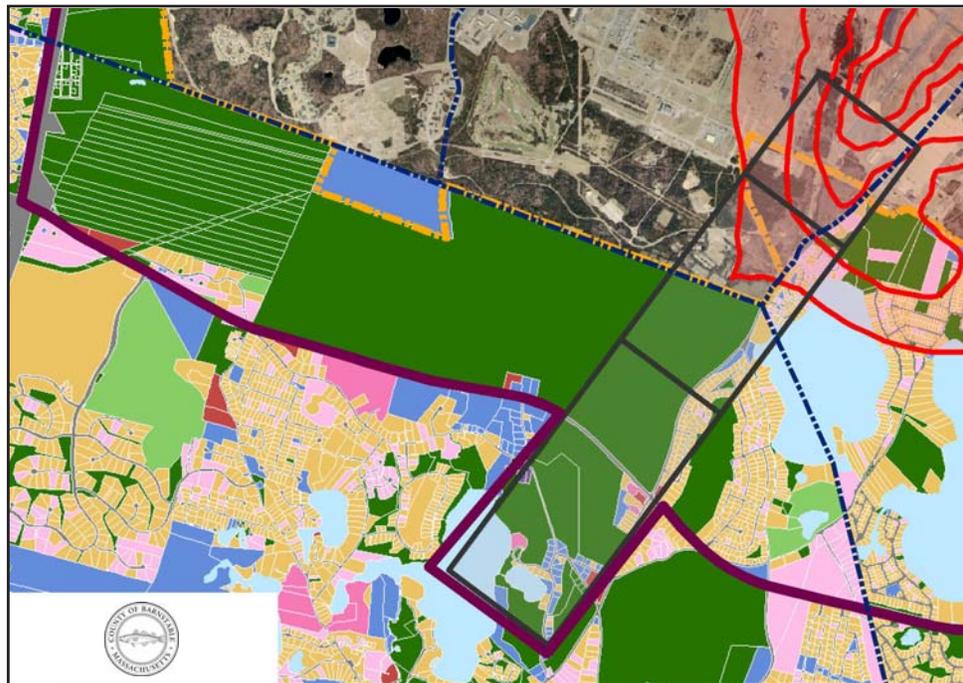


Figure 5. Existing Land Use Map—Town of Falmouth

An existing 180-foot wireless communications tower approved by the Cape Cod Commission as a Development of Regional Impact in 2003 is located within the MMR JLUS study area along Route 151. The tower is not located within an APZ but is within 1/2-mile of an Air National Guard flight path.

Town of Sandwich

The town of Sandwich has the second largest land area (3,252 acres) within the study area for the MMR JLUS. Over 255 acres of this land area consists of Peters Pond and Snake Pond. Almost one third of the study area consists of existing residential uses, with almost 25% protected open space. Open space recreational uses account for over 385 acres of land, with existing commercial/industrial development accounting for almost 100 acres of land. There are over 39 acres of developable commercial/industrial land and 357 acres of developable residential land within the study area.

The majority of the land within the CZ is within the control of the Otis Air National Guard Base and owned by the Commonwealth of Massachusetts. However, eight existing single-family homes and one retail establishment are within the CZ to MMR. (*Figure 6. Existing Land Use—Town of Sandwich on page 21.*)

Of the four towns in the MMR JLUS study area, Sandwich has the second largest land area (over 341 acres) within the APZ1. Of this total, approximately 61 acres are potentially developable for residential purposes, and 132 acres are already developed with single-family homes.

Of the 478 acres within the APZ2, over 40% is either water or protected open space. The town of Sandwich also acquired a 37-acre property within the APZ2. However, a considerable amount of existing residential development is located within the APZ2.

There are approximately 66 acres of residentially developable land within the 70-74 dB Ldn contour. The majority of this land is proposed for development of 79 single-family homes under M.G.L. Chapter 40B. Approximately 148 acres of existing residential development are also within this noise contour, with almost 82 acres subject to an Agricultural Preservation restriction. A 5-acre residential comprehensive permit is also located within the 75-79 dB Ldn noise contour.

Sandwich has a total of 600 acres within the 65-69 dB Ldn noise contour. Existing residential development accounts for almost half of this total, with some potential for additional residential development. Other land within this noise contour includes 134 acres subject to an Agricultural Preservation restriction.

A 150-foot wireless communications tower within the study area was granted a DRI approval in 2003 by the Cape Cod Commission. The tower, if constructed, would be located immediately adjacent to an Otis Air National Guard runway and just outside of the APZ1.

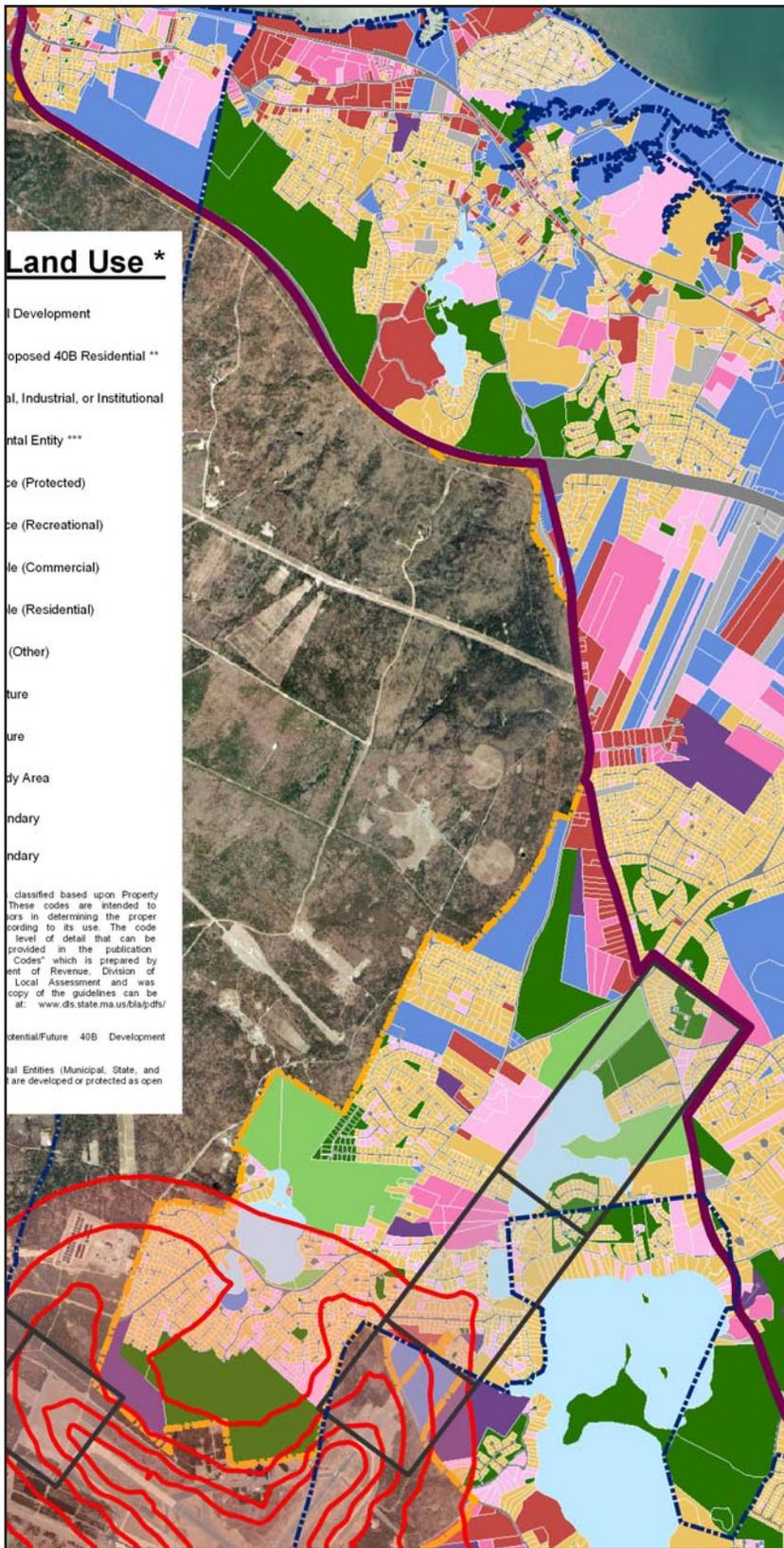


Figure 6. Existing Land Use—Town of Sandwich

Town of Mashpee

The town of Mashpee has the largest land area (6,521 acres) within the study area for the MMR JLUS. Almost 20% of the study area consists of Mashpee Wakeby Pond, and Ashumet and Johns Ponds.

Of the total land area within the study area, approximately 1,182 acres are within one of the safety zones to the Otis Air National Guard Base. Mashpee has approximately 224 acres within the CZ to the Otis Air National Guard Base. The majority of the land within the Mashpee CZ is owned by the Department of the Air Force under the control of the Air National Guard or is otherwise protected open space. Approximately 7 acres of existing residential development is within the CZ and approximately 30 acres are developable for residential use within the CZ. In addition, approximately 10 acres of vacant municipal property lies within the CZ. (*Figure 7. Existing Land Use—Town of Mashpee on page 23.*)

Of the 468 acres within the APZ1, almost half (218 acres) is protected open space. There are approximately 55 acres of residentially developable land within the APZ1. Over 118 acres within the APZ1 are already developed for residential use.

Of the 490 acres within the APZ2, 150 acres are protected open space. Over 27 acres of developable residential land are located in the APZ2, with a total of 136 acres of existing residential uses. There is one 90-bed nursing home within the APZ2 in Mashpee.

Less than 2 acres of developable residential land are located within the 75-79 dB Ldn noise contour. However, approximately 30 acres of developable residential land are within the 70-74 dB Ldn noise contour, with 15 acres of existing residential development. Almost 65 acres of land are available for residential development in the 65-69 dB Ldn noise contour, and almost 100 acres of existing residential development.

One parcel totaling 48 acres is proposed for 122 units of housing under M.G.L. Chapter 40B along with commercial and industrial development within the Mashpee study area. The property is located immediately adjacent to the Otis Air National Guard Base and within the 65-69 dB Ldn noise contour. A 92-acre parcel is also proposed for residential development under M.G.L. Chapter 40B for 200-400 units; a portion of this property is within the CZ to Otis Air National Guard Base, and at least half of the parcel is within the 65-69 dB Ldn noise contour. In addition, two Chapter 40B projects totaling 95 units are under construction, and an additional 54-unit project is proposed by the Mashpee Housing Authority.

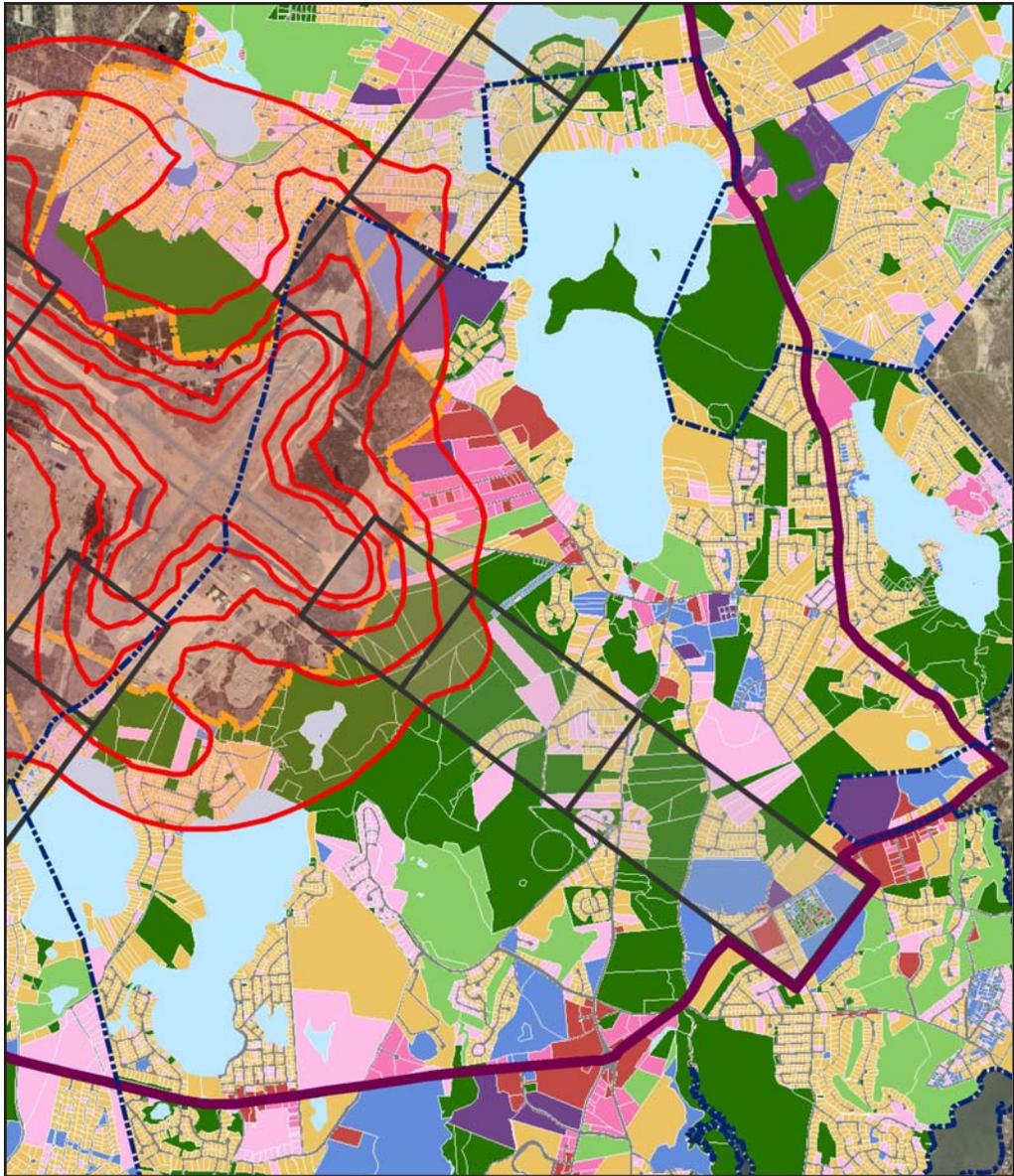


Figure 7. Existing Land Use Map—Town of Mashpee

There is one 150-foot wireless communications tower within the MMR JLUS study area that was granted a DRI approval by the Cape Cod Commission in 2002. This tower is located on Echo Road and is 150 feet in height. While outside any of the APZs to Otis Air National Guard base, it is located in very close proximity to these safety zones and is directly within an Air National Guard flight path. Another wireless tower lies outside the MMR JLUS study and also just outside the APZ2 in Mashpee. This tower is also in close proximity to an Air National Guard flight path. (Figure 8. Existing Land Use—Town of Barnstable on page 24.)

Town of Barnstable

A small portion of the MMR JLUS study area is within the town of Barnstable. This land consists of approximately 107 acres along a stretch of Route 28 from Noisy Hole Road at the Mashpee town line to Sandwich-Cotuit Road (Route 130). Existing land use consists of approximately 26 acres of protected town-owned land, 17 acres of existing residential development, and 6 acres of existing commercial use. The remaining land consists of approximately 57 acres of vacant residential land. None of the land is within the safety zones or noise contours.



Figure 8. Existing Land Use Map—Town of Barnstable

■ EXISTING ZONING

The following review of zoning bylaws was completed for land area within the MMR JLUS study area.

Town of Bourne (zoning bylaw dated October 2002):

Zoning districts within the MMR JLUS study area include B-2 and B-3 Business, R-40 Residential, and SDD Scenic Development. Water Resource District-A encompasses a section of the study area to the north and extends into the western part of the MMR. Allowed uses within the B-2 Business District include single and two-family dwellings, non-profit fraternal organizations, religious or educational uses, technology campus, contractors yards, wholesaling and bulk storage, and municipal uses. Mobile home parks, residential service facilities, golf courses, hospitals, and nursing homes are allowed by special permit. Other special permit uses include retail uses, banks, restaurants, commercial recreation, and adult uses. Motor vehicle service stations and flea markets are allowed by special permit from the Board of Selectmen.

Allowed uses within the B-3 Business District are more restrictive than the B-2 District and include fraternal organizations, religious uses, technology campus,

contractors yards, wholesaling and bulk storage, and municipal uses. Hospitals and nursing homes, commercial recreation, banks and restaurants, and retail uses are allowed by special permit.

Allowed uses within the R-40 District include single-family and two-family dwellings, non-profit fraternal organizations, religious or educational uses, and municipal uses. Residential social service facilities, hospitals, nursing homes and golf courses are allowed by special permit. The R-40, B-2 and B-3 Districts allow Open Space Community and Extensive Resort Development subject to a special permit. An Open Space Community requires a minimum of 10 acres of land. Density increases are allowed for affordable housing and allowed if the development provides undisturbed natural areas. Multi-family dwellings are allowed in communities containing 25 acres or more. Extensive Resort Development is allowed in communities containing 50 acres or more with guest units in place of residential units.

The purpose of the Scenic Development District is for intensive use of land while preserving or enhancing landscaping and tree cover, minimizing visibility of parking lots and signs, and avoiding creation of hazards or congestion. Any use permitted within the R-40 District is permitted in the Scenic Development District. In addition, the planning board may grant a special permit for an exception to allow hotels, motels, or professional offices and other accessory retail.

The town of Bourne does not have a wireless communications overlay district. In the R-40 District, no antennas or towers greater than 40 feet in height are allowed. In the B-2, B-3 and SDD Districts, antennas or towers (of any kind) greater than 40 feet in height are allowed by special permit from the planning board. Power generation (including wind) is not mentioned as a specific use in the zoning bylaw.

Chapter 5 of the town of Bourne's general bylaw includes an Airport Approach Protection Bylaw of the Otis Air Force Base. The bylaw references a Map of Approach Zones dated February 12, 1957. The intent of the bylaw is to avoid hazards to aviation through height restrictions for new structures or trees above elevations referenced on the February 1957 map. However, copies of the map are no longer available in the town. It should be noted that the current APZs on the Bourne side of the base fall entirely within the boundaries of the MMR.

Town of Falmouth (zoning bylaw dated April 1999):

Zoning districts within the MMR JLUS study area include the Public Use District, Agriculture A and AA Districts, and a small portion within the B-3 Business District. Uses allowed by right in the Public Use District include single-family and two-family dwellings, housing for the elderly, as well as churches, schools, libraries, museums, hospitals, educational institutions, and daycare centers. Other permitted uses include municipal purposes such as parks, playgrounds, and recreation. Uses allowed by special permit in the Public Use District include commercial accommodations, private clubs, campgrounds, and boat storage.

Allowed uses within the Agriculture Districts include single-family residences and community service uses such as churches, schools, libraries, parks, playgrounds, and daycare centers. Special permit uses include commercial accommodations, private clubs, research and philanthropic institutions, boat storage, golf courses, and contractors yards.

Allowed uses within the B-3 District include single-family and two-family residences, housing for the elderly, community service uses such as churches and schools, all municipal uses, passenger stations, retail sales under 4,000 square feet in size, restaurants and marinas. Special permit uses include commercial accommodations, private clubs, multi-family dwellings up to six units / acre, scientific research, shopping centers, and windmills.

Television and radio antennas not exceeding 50 feet in height are permitted as accessory uses in all zoning districts, and television and radio antennas exceeding 50 feet in height require a special permit from the Zoning Board of Appeals in all districts. Power generation as a principal use is not allowed in any zoning district. Windmills are allowed in the Public Use, Agricultural and Business Districts as an accessory use by special permit. Height limits are not specified for this use.

Land within the MMR APZs is subject to an Accident Prevention Zone overlay district. Within the overlay district, no new school, hospital, theater, public housing, multi-family dwelling, duplex, planned residential development, or place of assembly is allowed, with a height limit of 35 feet for any new uses. Conversions of existing structures for dwelling purposes are allowed only by special permit, and the Zoning Board of Appeals must determine that the proposed conversion will not increase public exposure to noise or accident potential. The bylaw references to APZs are based on an AICUZ study dated October 26, 1979.

Town of Sandwich (zoning bylaw dated May 2004):

Zoning districts within the study area include R-2 Low Density Residential and BL-2 Business Limited. Allowed uses within the R-2 District include single-family residential and agricultural uses, schools, religious and municipal uses, and sportsmen's clubs. Uses allowed by special permit include hospitals and nursing homes.

Allowed uses in the BL-2 district include agricultural, schools, religious, and municipal uses. Uses allowed by special permit include various commercial uses, such as banks, major commercial complexes, medical services, restaurants, retail uses, and hospitals, nursing homes, indoor recreational uses, single-family and multi-family residential uses, and motels.

The zoning bylaw does not include an Accident Prevention Zone Overlay District. Chapter 3 of the general bylaws contains an Airport Approach Protection Bylaw that regulates and restricts the height of structures or objects of natural growth in the vicinity of the Otis Air Force Base to prevent airport hazards. The height limitations are very generous and are based on a map prepared in 1957.

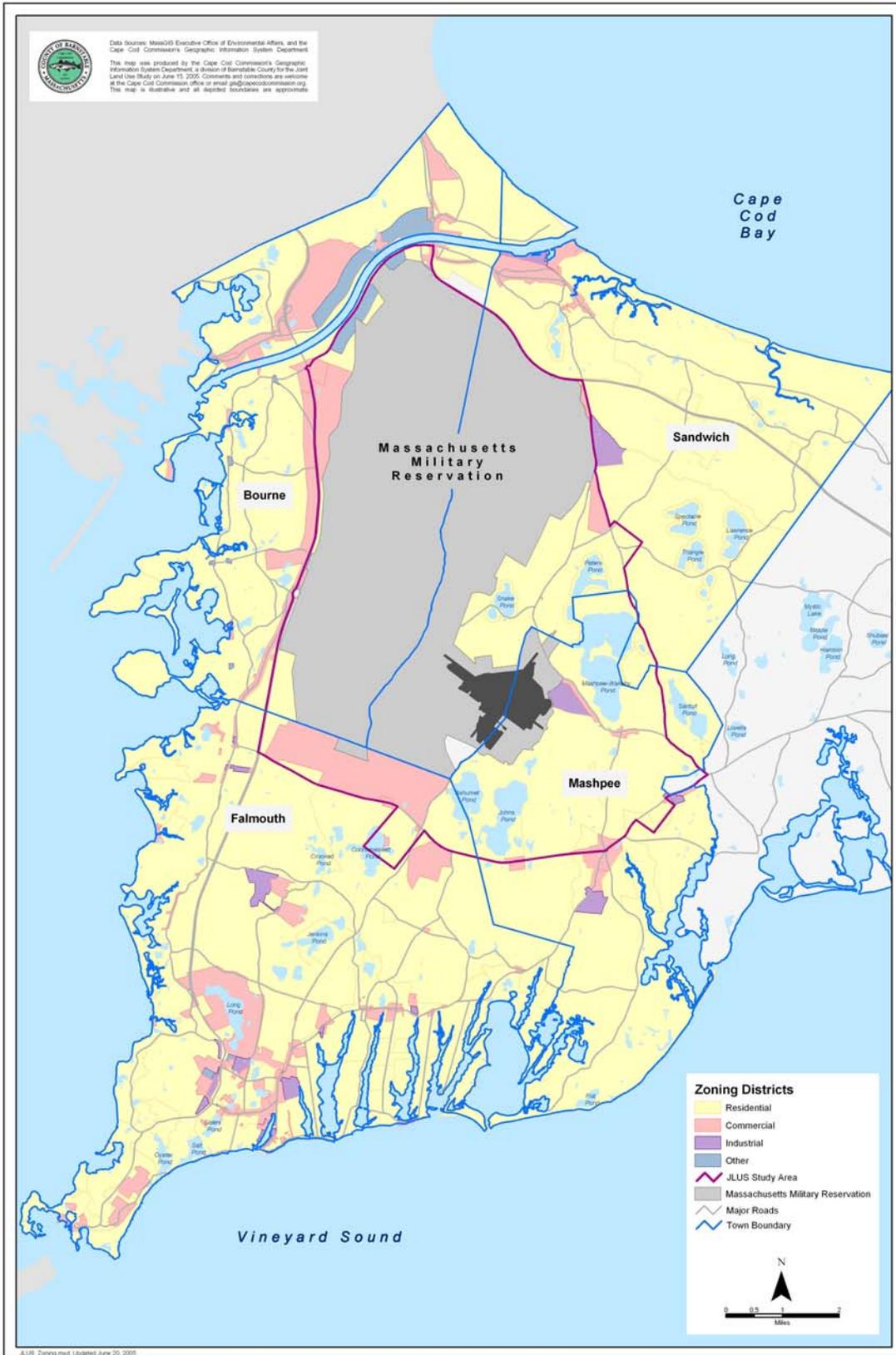


Figure 9. Existing Zoning

Wireless communications facilities are allowed only within the Wireless Telecommunications Overlay District, covered in Section 3820 of the zoning bylaw. This section of the bylaw refers to a plan entitled “Wireless Telecommunications Overlay District” prepared by the Cape Cod Commission dated March 27, 1998, revised January 6, 1999 and as amended at special town meeting March 22, 1999. All facilities are subject to a special permit. The bylaw sets a maximum height of 150 feet although the planning board can grant a waiver up to 180 feet if the applicant can demonstrate that 150-foot maximum height would prohibit the carriers’ ability to operate. The planning board can also waive setback requirements if the applicant controls adjacent property so that the fall zone would be clear of any structures. Only one lot in the study area is included in this district. A 150-foot wireless telecommunications facility was approved on this property by the Cape Cod Commission as a Development of Regional Impact in 2003 and is currently in the hearing process before the Sandwich Planning Board. Wind turbines or generators are also allowed as an accessory use in all zoning districts by special permit. Height limits are not specified for these uses.

The town of Sandwich has a cluster development bylaw. At least twice the lot area required in the district is required for cluster with no increased density allowed over conventional zoning. However, there are relaxed standards for lot coverage and setbacks. Cluster development is the preferred form of development for any proposed project in the town.

The town has an affordable housing/conditional density program that allows an increase in density provided at least half of the units are affordable. The planning board can also waive certain design standards and improvements required under the subdivision rules and regulations. The town has identified potential sites for affordable housing that are required to be certified under the state’s planned production program.

Town of Mashpee (zoning bylaw dated April 22, 2004):

The majority of the land surrounding the base is zoned R-5 residential at a density of one residence per two acres. Other zoning districts within the MMR JLUS study area consist of C-3 Commercial (a strip along Route 130), C-2 Commercial (near the intersection of Route 130 and Great Neck Road North), and I-1 Industrial between the C-3 area and the MMR.

In the R-5 district, single-family residential uses, places of worship, private or public schools, agricultural uses, governmental buildings, and related facilities are allowed by right. Two-family, duplexes and apartment buildings are allowed by special permit in all districts only under the Open Space Incentive Development (OSID) provisions of the bylaw which allow increased density of residential units in the form of transfer of development rights from portions of parcels within an OSID to

be preserved as open space, to those parcels within the OSID that will be developed. The majority of the land near the base could only be protected open space under OSID, with potential development limited to the few remaining parcels between Route 130 and Ashumet Road. Public parks or playgrounds, nursery schools, public recreational buildings, libraries or museums as well as community centers are allowed by staff-level plan review through the building inspector's office in the residential and commercial districts.

In the Commercial Districts, motels and hotels are allowed by special permit. Trade schools, private clubs, and indoor/outdoor recreational facilities are also allowed by either special permit or plan review in the commercial zones. Retail sales, restaurants, service businesses, live theater or concert halls, movie theaters, professional offices and health-related facilities are allowed by special permit in the commercial zones.

Allowed uses in the Industrial District include places of worship, private or public schools, agricultural uses, private clubs, and governmental buildings. Two-family or apartment buildings are allowed by special permit under the OSID bylaw. Recreational buildings and nursery schools are allowed by plan review. Golf driving ranges and golf courses are allowed by special permit. Business offices, medical clinics, laboratories, and commercial centers are also allowed by special permit in the industrial zone.

The Mashpee zoning bylaw includes an Otis ANG Accident Prevention Zone. The bylaw references to APZs are based on a map dated January 1987. Within this zone, new schools, hospitals, theaters, or places of public assembly are not allowed. Height limits within the zone are set at 35 feet.

The zoning bylaw includes a Wireless Facility Overlay District, defined as areas within the 210-foot wide NStar transmission line easement between the Falmouth and Barnstable town lines, as well as all other lands NOT located within the following: boundaries of the Mashpee National Wildlife Refuge, within 1,000 feet of mean high water of a great pond or tidal water body, within historic districts or within 1,000 feet of an historic district, structure or place, within the Otis Air National Guard APZ, R-3 or R-5 zoning districts or within 300 feet of a right-of-way of any scenic roadway. Within the Wireless Facility Overlay District, personal wireless facilities up to 100 feet in height are allowed by special permit, except that the Planning Board may grant a waiver to allow a height of up to 200 feet where circumstances warrant. Other than the NStar transmission line easement, the MMR's APZs are specifically excluded from the overlay district. This easement extends across the back of the southeast APZ2.

In all other areas, personal wireless communication facilities are allowed up to 10 feet above the average height of buildings within 300 feet of the proposed facility,

or 10 feet above the average tree canopy height if there are no buildings within 300 feet.

The Mashpee zoning bylaw does not specifically mention windmills or set a height limit for wind turbines. Public utilities are allowed in all zoning districts with a special permit; however, they are already entitled to obtain a zoning exemption under M.G.L. Chapter 40A, Sec. 3.

Major portions of the town are within a Groundwater Protection Overlay District. The provisions of this district are to protect public health from contamination of existing and potential water supplies and to preserve limited water supplies for present and future use. There are restrictions on the storage of liquid petroleum products, liquid hazardous materials, treatment works, and other uses within the overlay district.

Town of Barnstable (zoning ordinance dated October 17, 2002):

The portion of the study area within the town of Barnstable is zoned RF- Residential with a minimum one-acre lot size requirement. However, the land area is also within a Water Resource Protection Overlay District, where a two-acre minimum lot size is required. Over one-quarter of this same land is designated a Wellhead Protection Overlay District for the Cotuit Water District well.

BUILD-OUT ANALYSIS

Based on existing land use and zoning, the following analysis of future development potential within the study area was calculated using methodology developed for a build-out analysis completed for all 15 towns on Cape Cod in 2000 for the Massachusetts Executive Office of Environmental Affairs. The analysis was then refined based on input received from the town planners in the four Upper Cape towns. The following is a town-by-town summary of the results of the build-out analysis.

■ TOWN OF BOURNE

Under existing zoning, development potential within the study area consists of approximately 70 residential lots/units and over 3.7 million square feet of commercial space. Of the approximately 190 acres that are potentially developable for commercial use, approximately 158 acres are currently proposed for a 361-unit residential development under M.G.L. Chapter 40B with 85,000

**Table 1.
Town of Bourne**

Legend Category	Sum of Acres
Vacant Industrial/Commercial	190
Vacant Comm/Indust (Does not meet bylaw size)	1
Vacant Residential	34
Vacant Residential (Does not meet bylaw size)	2
Existing SF Residential (Subdividable Lot Size)	5
Existing Commercial Development	13
Existing Residential Development	161
Vacant Municipal Property	20
Municipal Facilities	175
Recreation (Developable)	14
Protected	343
Protected (Municipal)	198
Not Developable Size	0
Water	0

Total Acres 1,157

square feet of retail space. This site is located at the Bourne Rotary and borders the northern training areas of the MMR used by the Army National Guard. The site is also within the flight path used by Army National Guard helicopters. There are no APZs or noise contours within the study area for the town of Bourne. (Figure 10. Build-out Analysis for the Town of Bourne on page 33.)

■ TOWN OF FALMOUTH

Under current zoning, development potential within the study area for the town of Falmouth consists of over 100,000 square feet of commercial/industrial space and 69 residential lots/units. There is no developable land within the CZ in the town of Falmouth. However, there is one parcel with an existing residence that could be subdivided into 5 additional lots within the APZ1. All of the potential

**Table 2.
Town of Falmouth**

Legend Category	Sum of Acres
Vacant Industrial/Commercial	7
Vacant Comm/Indust (Does not meet bylaw size)	0
Vacant Residential	72
Vacant Residential (Does not meet bylaw size)	17
Existing SF Residential (Subdividable Lot Size)	16
Existing Commercial Development	28
Existing Residential Development	217
Vacant Municipal Property	1
Municipal Facilities	0
Recreation (Developable)	46
Protected	1,831
Protected (Municipal)	191
Not Developable Size	0
Water	242

Total Acres 2,668

commercial development is located within the APZ2, while only 2.5 acres of residentially developable land are within the APZ2. The town's existing Accident Prevention Zone bylaw prohibits those uses (including schools, places of assembly, multi-family housing, etc.) that could potentially conflict with the APZ2. The bylaw should be updated, however, to reflect current safety zones and noise contours. (Figure 11. Build-out Analysis for the Town of Falmouth on page 35.)

■ TOWN OF SANDWICH

Development potential within the study area for the town of Sandwich consists of over 511,000 square feet of commercial/industrial space and 431 residential lots/units. None of the developable commercial/industrial land is within the safety zones or noise contours to Otis.

A very small portion of a 65-acre developable residential parcel is within the CZ to Otis. Under existing zoning, this parcel could be developed for 33 lots/units. This property was proposed as a 72-unit residential development under Chapter 40B. The Sandwich Zoning Board of Appeals denied the project but the denial was overturned by the state Housing Appeals Committee. In the decision, the residential development is to be clustered outside of the CZ. It is still located, however, within the 70-74 Ldn noise contour.

**Table 3.
Town of Sandwich**

Legend Category	Sum of Acres
Vacant Industrial/Commercial	40
Vacant Comm/Indust (Does not meet bylaw size)	0
Vacant Residential	358
Vacant Residential (Does not meet bylaw size)	136
Existing SF Residential (Subdividable Lot Size)	82
Existing Commercial Development	98
Existing Residential Development	987
Vacant Municipal Property	48
Municipal Facilities	60
Recreation	384
Recreation (Does nto meet bylaw size)	1
Protected	498
Not Developable Size	10
Water	256

Total Acres 3,252

Other potential residential development within the APZ1 consists of portions of a larger parcel and several smaller parcels totaling approximately 105 acres. Development potential within the APZ1 is 39 lots/units. A total of 129 acres of residentially developable land are partially within the APZ2. Development potential within the APZ2 is 14 lots/units. In addition to this land, two large recreational uses partially within the APZ2 could be converted to residential use under existing zoning. Of the 77 potential lots/units, 44 lots/units are located within the APZ2.

Portions of vacant residential parcels are within the noise contours to Otis Air National Guard Base. Approximately 44 acres with 29 potential lots/units are partially within the 65-69 Ldn contour. However, only eight potential lots are developable within the 65-69 Ldn contour. Of the approximately 76 acres within the 70-74 Ldn contour (the 40B development discussed above), 87% of this parcel is within the 70-74 contour. (Figure 12. Build-out Analysis for the Town of Sandwich on page 39.)

■ TOWN OF MASHPEE

Under existing zoning, development potential within the study area consists of 578,892 square feet of commercial/industrial space and 916 residential lots/units. None of the developable commercial/industrial land is located within the CZ or APZ1 to Otis, and only 8,991 square feet of developable commercial/industrial space is within the APZ2. Approximately 87 acres of commercial/industrial land with a development potential of 265,800 square feet are located within the 65-74 Ldn noise contours. One of the largest industrially zoned parcels within the noise contours was proposed for a residential development under M.G.L. Chapter 40B. However, MassHousing, a quasi-public lending agency for affordable housing, recently denied the applicant a site-eligibility letter based on an inappropriate use of industrial land.

Of the developable residential land, several parcels totaling over 300 acres are located partially within either the APZ1 or APZ2 to Otis Air National Guard Base. However, the actual development potential within the APZ1 is limited to 31 lots/units and 18 units within the APZ2. Development on most of these parcels could be clustered to avoid the safety zones entirely. A total of 103 acres

**Table 4.
Town of Mashpee**

Legend Category	Sum of Acres
Vacant Industrial/Commercial	140
Vacant Comm/Indust (Does not meet bylaw size)	1
Vacant Residential	514
Vacant Residential (Special Permit)	72
Vacant Residential (Does not meet bylaw size)	150
Existing SF Residential (Subdividable Lot Size)	145
Existing Commercial Development	177
Existing Residential Development	1583
Vacant Municipal Property	180
Municipal Facilities	177
Recreation (Developable)	113
Protected	1147
Protected (Municipal)	872
Not Developable Size	4
Water	1243

Total Acres 6,521

with the potential for 55 lots/units are located partially within the CZ. Again, with the exception of one small parcel, development on these sites could be clustered to avoid the CZ. The town's existing Accident Prevention Zone bylaw prohibits those uses (including schools, places of assembly, multi-family housing, etc.) that could potentially conflict with the safety zones. The bylaw should be updated, however, to reflect current safety zones and noise contours.

Approximately 287 acres of vacant residential land with a development potential of 142 residential lots/units are located partially or completely within one of the noise contours to Otis. The actual development potential within the 65-69 Ldn contour is 29 lots/units, 13 lots/units within the 70-74 Ldn contour, and only 1 lot/unit within the 75-79 Ldn contour. In addition, a portion of a vacant municipal property lies within the CZ and 65-75 Ldn contours. Development of this municipal property should be restricted. (Figure 14. Buildout Analysis for the Town of Mashpee on page 43.)

■ TOWN OF BARNSTABLE

Of the approximately 107 acres of land within the study area for the town of Barnstable, approximately 57 acres of residentially zoned land remain developable. Of this total, four acres do not meet the current minimum lot size requirement. Development potential consists of 24 additional lots/units that could be built on the 57 acres of land. There is currently a proposal to develop a 128-unit residential development under M.G.L. Chapter 40B on this 57-acre parcel. The property lies just outside of the APZ2 and outside of any high noise contours. (Figure 13. Buildout Analysis for the Town of Barnstable on page 42.)

Table 5.
Town of Barnstable

Legend Category	Sum of Acres
Vacant Residential	53
Vacant Residential (Does not meet bylaw size)	4
Existing Commercial Development	6
Existing Residential Development	18
Protected (Municipal)	26

Total Acres 108

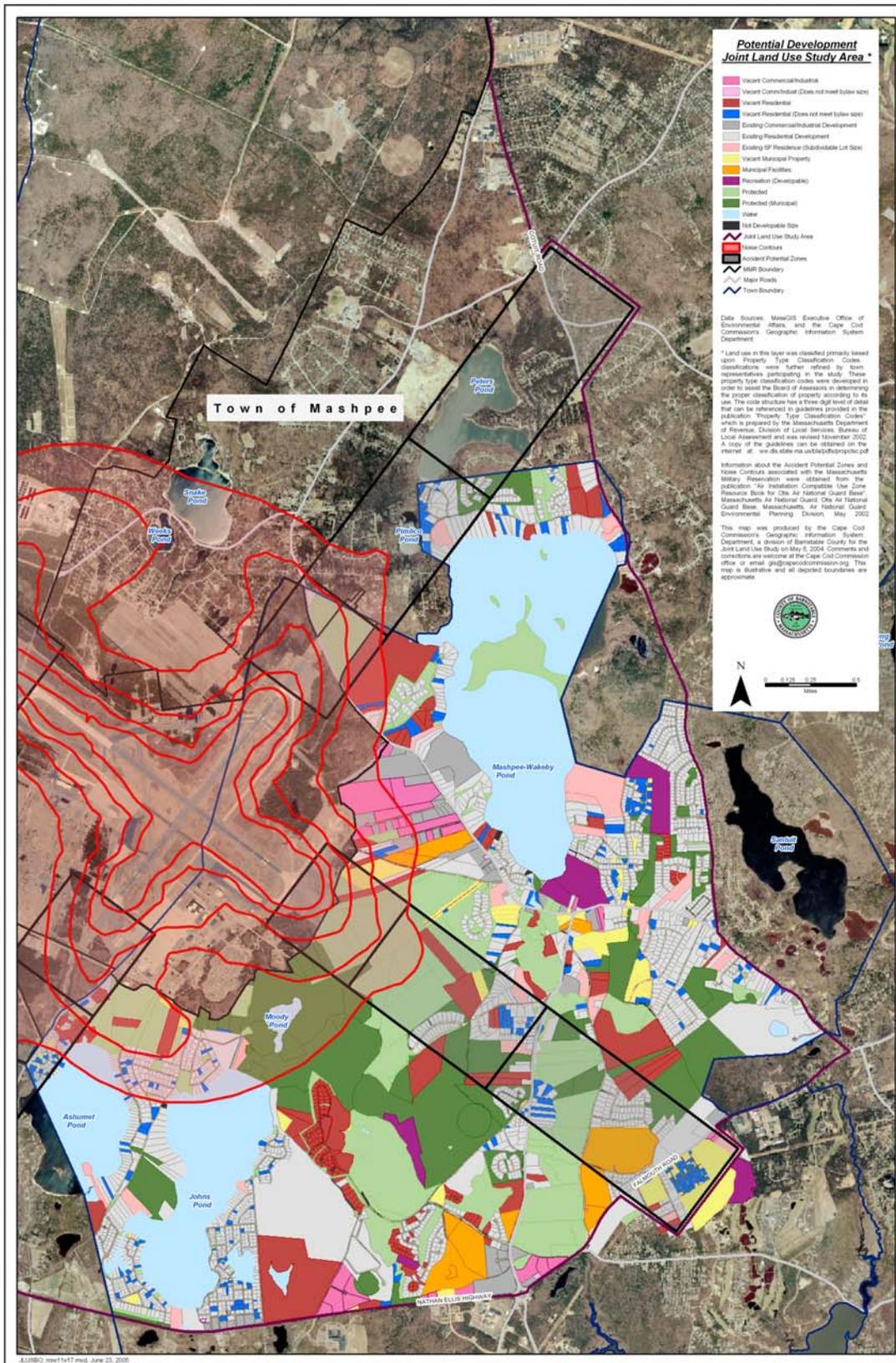


Figure 14. Build-out Analysis for the Town of Mashpee

POTENTIAL LAND USE CONFLICTS

■ EXISTING RESIDENTIAL DEVELOPMENT

All four towns have considerable residential development within the MMR JLUS study area. Within the town of Bourne, several large subdivisions and condominium developments surround the northern training areas used by the Army National Guard on the western and northern boundary of the MMR. While noise or accident potential are not issues of concern due to the lack of firing ranges on this side of the base, there remains the potential for trespass, illegal dumping, soil erosion from ATVs and foot traffic, and public safety issues from unexploded ordnance on the northern MMR training lands.

The towns of Mashpee, Sandwich and Falmouth all have existing residential development within noise contours and/or accident potential zones. For example, existing residential development in Falmouth is within the APZ2 and 65-69 dB noise contour. While residential density is within acceptable limits for the APZ2, noise attenuation measures and real estate disclosure should be considered for existing development in these areas.

According to assessor's data, 2.3 acres of existing residential development and one retail business (on 5.3 acres of land), with 4.4 acres of vacant residential land are within the CZ in the town of Sandwich. Over 132 acres of existing residential development is in the APZ1 and 114 acres in the APZ2. Purchase of properties and vacant land should be undertaken by the Air Force within the CZ and considered for the APZ1. Sandwich also has over 200 acres of existing residential development in the 65-69 dB noise contour, over 130 acres of residential development in the 70-74 dB contour, and a five-acre comprehensive permit in the 75-79 dB contour. In addition, noise attenuation measures and disclosure should be provided for homes in these areas.

A total of 6.72 acres with three existing homes and seven residential condominiums and over 10 acres of vacant municipal property are located in the CZ to Otis Air National Guard Base. Similar to Sandwich, Mashpee has over 130 acres of existing residential development within the APZ1 and 132 acres in the APZ2. Purchase of properties and vacant land should be undertaken by the Air Force within the CZ and considered for the APZ1. Almost 170 acres of existing residential development are located within the 65-69 dB contour, with only a small amount of land in the 70-80 dB contours. Again, noise attenuation measures and real estate disclosure are recommended for these areas.

In the town of Sandwich, existing recreational uses in the APZ2 could also be intensified or converted to residential use with the potential for 44 lots / units within the APZ2.

■ CHAPTER 40B RESIDENTIAL DEVELOPMENT

Perhaps one of the most startling results of the land-use mapping is the number of proposed residential developments under M.G.L. Chapter 40B or planned production affordable housing in close proximity to the MMR boundary, with potentially hundreds of new residential units within or immediately adjacent to the AICUZ air safety zones and noise contours. The towns of Bourne, Mashpee, and Sandwich each have one or more proposed Chapter 40B projects immediately abutting the MMR or within either safety zone or noise contours. The likelihood of additional density associated with these developments raises concern about the incompatibility of these sites with air safety. (*Figure 15. Proposed Chapter 40B Projects/Planned Production Sites and Air Safety Zones/Noise Contours on page 47.*)

Established in 1969, Chapter 774 of the Acts of 1969, the Massachusetts Comprehensive Permit Law (also called Chapter 40B) was established to increase the supply and improve the regional distribution of low- and moderate-income housing by allowing a limited suspension of existing local regulations that are inconsistent with the construction of such housing (www.mass.gov/dhcd/Toolkit/ch40Bgl.htm). Projects seeking a comprehensive permit must first receive preliminary approval under a state or federal subsidy program. The plans, application, and eligibility letter are then filed with the local zoning board of appeals (ZBA), which seeks the input of other local boards in the review of an application. Chapter 40B proposals typically seek relief primarily from density restrictions and setback provisions in local bylaws.

The state's Housing Appeals Committee may overturn a ZBA's denial of a comprehensive permit if less than 10% of a municipality's total housing units are subsidized low- and moderate-income housing units. None of the towns within the JLUS study area have met the 10% affordable housing goal set by the statute, although the town of Bourne is perhaps the closest to reaching the 10% goal with approximately 6.7% affordable housing. Therefore, it has been difficult for communities on the Cape to limit the density or the location of these developments. With respect to proposed projects within or adjacent to safety zones/high noise areas, if a community has already allowed residential development in those areas, then it is extremely difficult for a denial of a 40B application to be upheld by the Housing Appeals Committee.

Several sites are identified by the towns for potential development of affordable housing through the state's affordable housing plan certification process. Some of these sites fall within safety zones to Otis Air National Guard Base. As with Chapter 40B developments, the likelihood of additional density associated with these developments raises concern about the incompatibility of these sites with air safety.

■ POTENTIAL RESIDENTIAL DEVELOPMENT

In addition to proposed residential development under Chapter 40B, there is land that is potentially developable for residential use within safety zones or noise contours in the towns of Falmouth, Mashpee, and Sandwich. Development on most of these properties could be clustered to avoid the APZs or high noise areas. However, acquisition or purchase of development rights or easements should be considered for any properties in the CZ or APZ1 where clustering is not feasible.

■ WIRELESS COMMUNICATION FACILITIES

The MMR JLUS identifies, among other issues, the issue of compatibility between land use surrounding MMR and the activities at MMR. One objective of the MMR JLUS was to address the height and visibility of wireless communication and wind-energy towers and the conflicts with Air National Guard, Army National Guard, and Coast Guard flight operations.

The MMR JLUS scope of work was amended in June 2004 to hire a consultant to develop recommendations to address this potential land-use conflict. Broadcast Signal Lab, LLP, under the direction of the JLUS Technical Advisory Committee, was contracted for this portion of the JLUS. The consultant's final report can be found in its entirety in Appendix 2. A summary of the report's major findings is described below.

The report discusses the compatibility issues between taller structures and flight safety. In general, the flight operations from MMR fall into two broad categories: fixed-wing aircraft (airplanes) and rotary-wing aircraft (helicopters). The representatives of fixed-wing operations at MMR, particularly the Air National Guard, expressed satisfaction with the FAA notification and determination process for identifying potential hazards to air navigation. They are accustomed to working within the lanes and surfaces defined for their various types of aircraft and operations. These routes and areas steer clear of obstructions, and where obstructions must be avoided, they are well-documented on navigation maps and are properly lighted and marked. Consequently, the fixed-wing aircraft representatives do not seek any additional regulation to protect navigable airspace near MMR.

In contrast, helicopters are highly maneuverable machines that are called upon to perform specialized duty in the worst of weather conditions. Their maneuverability enables them to adapt to difficult conditions. Those involved in helicopter operations provided insight to their safety requirements. In particular, the U.S. Coast Guard operates Search and Rescue ("SAR") missions from U.S. Coast Guard Air Station Cape Cod. In contrast, the helicopter operations of the Army National Guard at this site are largely training oriented. (*Figure 16. Wireless Communication Facilities and Flight Paths on page 51.*)

SAR operations occur when required, which can be at a time when the cloud “ceiling” is very low. SAR helicopters will fly below the 500-foot level in such situations. With few exceptions, Army National Guard helicopter training missions are generally postponed in weather that force deviation from normal operational rules.

The JLUS committee concluded that all routine air operations from MMR are adequately protected by FAA hazard-review processes. Only the Coast Guard Search and Rescue operations, which are likely to require exceptional flying operations and occur in extreme conditions, require further consideration in local regulation of structure heights. There are specific routes leading to and from the base that are utilized by Coast Guard helicopters in inclement weather. They employ three routes that largely follow local primary roads as visual references.

For routine flight operations from MMR, the report recommends that the towns of Mashpee, Sandwich, Falmouth, and Bourne consider acting to protect navigable airspace by requiring FAA Determinations of No-Hazard or evidence of exemption from the determination process for all new structures *throughout their communities*. Local enforcement of that process will complete the circle of controlling unreasonably tall structures.

The report also recommends that each of the four towns establish a 3,000-foot wide Search and Rescue (“SAR”) Corridor District within which would be an absolute height limit of 100 feet above ground, even if FAA says a greater height is not hazardous. This will provide a degree of safety and path predictability to U.S. Coast Guard helicopter pilots when they must deviate from normal operational altitudes in emergencies during hostile weather. Structures in this district that exceed 60 feet in height would be required to be marked with a traditional red obstruction light, unless waived for good reason by the permit-granting authority.

Finally, the report recommends that height limits established through local bylaws for all uses, including wireless, amateur, or other radio services should be reviewed to ensure consistency with the new height regulations established for the SAR Corridor District. In particular, communities should align their local tower regulations with the SAR corridor plan. Improvement of local wireless regulation not only will support the rational deployment of wireless communication facilities, but also will protect the SAR corridors from unnecessarily tall wireless communication towers. One key way to accomplish this is to permit less invasive wireless communication towers (such as, for example, 80 feet or less in height) to be installed in a more distributed fashion within large districts that currently do not permit them. With reduced heights, these facilities will need to be spaced closer together than would the tall towers, requiring relaxation of restrictions on the locations of these shorter structures. However, the current restrictions on the taller towers can be retained.

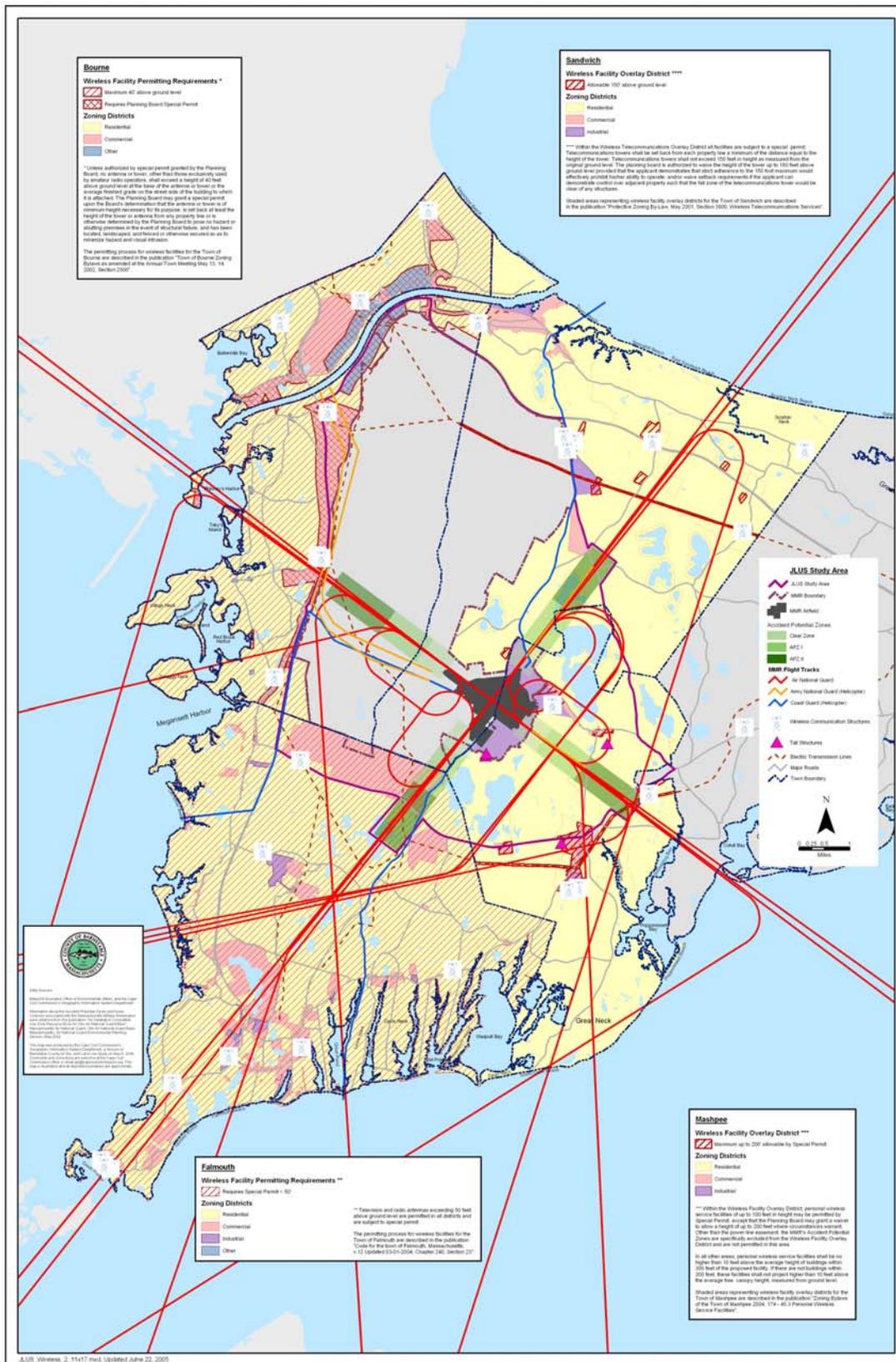


Figure 16. Wireless Communication Facilities and Flight Paths

INFRASTRUCTURE CAPACITY

■ UPPER CAPE WATER RESOURCES AND MMR

Existing Water Supply

All of the water supplies on Cape Cod originate from one of six groundwater lenses, collectively called the Cape Cod Aquifer (USGS, 1980). These lenses are hydrologically separated from the mainland by the Cape Cod Canal. Therefore, precipitation that falls directly on the Cape is the only source of freshwater to the aquifer.

In 1982, the U.S. Environmental Protection Agency (EPA) designated the Cape Cod aquifer as a “sole source aquifer.” The designation protects an area’s groundwater resource by requiring EPA review of any proposed projects within the designated area that are receiving federal financial assistance to ensure that those projects do not endanger the water source (www.epa.gov/safewater/ssanp.html).

The westernmost and largest lens of the aquifer, above which the MMR is located, is designated as the “Sagamore Lens” and serves as a drinking-water supply for the Upper Cape towns of Bourne, Falmouth, Mashpee, and Sandwich adjacent to the MMR, as well as to the towns of Barnstable and Yarmouth. The occupants of the MMR also obtain their drinking water from the Sagamore Lens.

The permeable soil characteristics of the Sagamore Lens provide for efficient recharge of the aquifer by precipitation, but the permeable soils also allow contaminants to move relatively quickly through groundwater. The September 1998 MMR Master Plan Final Report (Cape Cod Commission, p. 18) notes that “According to recent estimates, the MMR contains a Superfund site that has contaminated approximately 65 billion gallons of groundwater within the Sagamore Lens. Of existing water supplies, one public water supply well site has been lost, three are imminently threatened, and one will require long-term vigilance to maintain. Of potential water supplies, one proposed site is threatened and several other potential sites have been lost. The water supply needs of the surrounding communities are projected to increase by 40% by the year 2020, leading to a projected water supply deficit in the range of five to fifteen million gallons per day.” These figures are corroborated by the Upper Cape Regional Water Supply Study completed in 2003 by Earth Tech, Inc. The higher end of the deficit range reflects typical operation of supply wells for less than 24 hours per day and the potential that the towns’ largest supplies may need to be off line for maintenance. The deficit range generally reflects current district water supplies, with only limited supplies recently being added (e.g., Turner Road,

Mashpee) to district inventories. Future water supplies detailed in the Earth Tech report remain either undeveloped or have not been brought on line. The contamination of the aquifer by past military and non-military practices is under investigation, and substantial remediation efforts are under way. These efforts will need to continue beyond 2020.

These resources are shared by the MMR and surrounding communities, and they are strategically important for sustainability of the Sagamore Lens. Therefore, pursuit of shared infrastructure warrants consideration. Shared infrastructure has already been implemented in the form of the Upper Cape Water Supply Cooperative (UCRWSC) enacted through special legislation by the Massachusetts State Legislature. Through the cooperative, the Air Force Center for Environmental Excellence has provided approximately 3 million gallons of water per day to the towns of Bourne, Sandwich, Mashpee, and Falmouth as well as occupants of the MMR using three newly constructed wells at the base. This effort can serve as a pilot program for future cooperative ventures between the MMR and local communities.

Projected Public Water Supply Deficits

Despite this added supply of drinking water, the balance of projected water-supply deficits underscores the need to find additional sources of drinking water to replace sources lost to contamination. A fourth potential UCRWSC water-supply well, WS-4, remains undeveloped due to its remote location (2004 Annual State of the Reservation Report). In addition to areas within the MMR, undeveloped parcels of adequate size necessary to meet New Source Approval requirements for future public water supplies exist on the margins of the MMR, including a parcel between the MMR and the Bourne Rotary currently proposed for mixed retail and residential housing. Such potential water supplies should be considered to supplement existing UCRWSC water supplies.

Potential Future Development and Water Use at MMR

Northeast Regional Center for Homeland Security
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In March 2004, the Environmental and Readiness Center of the Massachusetts National Guard conducted a feasibility study to develop and construct a Northeast Regional Center for Homeland Security on the MMR based on a concept envisioned by Representative William Delahunt (D - MA). The timing of the feasibility study provided a unique opportunity for the MMR JLUS to examine the potential impact of this facility, if developed, on the infrastructure of the base and the surrounding communities.

The facility, as proposed, would simulate dense urban ports in which military, civilian, and rescue training operations could be conducted in an integrated fashion. Components of the center would include:

1. Joint Operations Urban Training Center,
2. Joint Combined Operations in Urban Areas Center,
3. indoor small-arms training facility,
4. fire-training facility,
5. hazardous materials training facility,
6. emergency driving course,
7. emergency operations center, and
8. intermodal transportation center.

The proposal envisions the need for nominal water supplies on the order of 47,130 gallons per day (GPD).

Other Projected Water Demand

The J-well, MMR's public water supply with a maximum capacity of 2 million GPD, was supplying 310,000 GPD of water to the MMR when the MMR Master Plan Final Report was prepared by the Cape Cod Commission in conjunction with the Community Working Group in 1998. Water withdrawals from the J-well have decreased to as low as 260,000 GPD in recent years due to reductions of personnel (2004 Annual State of the Reservation Report). The MMR Master Plan discusses an anticipated 20% increase in water demand at the MMR due to changes in water use not related to MMR expansion.

The MMR Master Plan further identifies a number of nonmilitary uses of the MMR that would increase seasonal high water demand by up to 63,000 GPD. Potential uses included a research facility/technology center, a courthouse, a cultural center, and a county correctional facility (now constructed). The county correctional facility obtains water from the UCRWSC. Seasonal high water demand estimated in the MMR Master Plan for projects such as ballfields and cemeteries could be irrigated using local irrigation wells, while the existing golf course has its own water supply well. Projected increases in water demand described above can be completely met by the J-well or a combination of water from the J-well and local irrigation wells. Low-level concentrations of volatile organic compounds observed in water samples collected from the J-well, while meeting regulatory limits, have underscored the need for a backup water supply. A backup supply is currently available from the Upper Cape Water Supply Cooperative.

The consequences of the Base Realignment and Closure process undertaken in 2005 raises a number of questions about the development potential of the cantonment area of the MMR. The magnitude of this potential development is beyond the scope of this analysis. However, based on projected public water-supply deficits, in the absence of a military presence at Otis, it can be presumed that under either commercial or residential zoning, full development of the base would outstrip available water supplies.

Protection of Drinking Water Quality

Substantial portions of the cantonment area of the MMR are within Department of Environmental Protection (DEP)-approved Zone II wellhead protection areas. Therefore, protection of drinking water quality is recommended for any proposed use of the cantonment area, including facilities proposed for the Northeast Regional Center for Homeland Security as follows:

- Zone II areas for the Upper Cape Water Supply Cooperative and other current Zone II areas should be used as an overlay for any proposed development plans for the cantonment area.
- Alternative sites outside of Zone II areas should be considered, particularly for uses that involve hazardous materials or wastes.
- Further environmental review of any proposed uses should include a detailed description of threats to drinking water from proposed uses, spill-prevention and mitigation strategies, and emergency response plans to protect water quality.

Existing Wastewater Infrastructure

According to the MMR Training Year 2003 State of the Reservation Report, “The 102nd Fighter Wing operates the installation’s wastewater treatment plant (WWTP) located in the cantonment area along the southern boundary of the MMR in the Town of Sandwich at the Falmouth town line. The current WWTP became operational in December 1995 and is comprised of two treatment trains each with a maximum capacity of 215,000 GPD, one of which serves as a maintenance backup. It replaced a facility that was constructed in 1936 and subsequently upgraded in 1941 with a 6-million gallon per day capacity” (Massachusetts National Guard, p. 55). Massachusetts DDEP issued the 102nd Fighter Wing a new discharge permit early in 2004 that authorizes an average 360,000-gallon per day discharge from the WWTP to enable the WWTP to accept a maximum 60,000-gallon per day sewage discharge from the new Barnstable County Jail and House of Corrections just north of Connery Avenue. “The MAARNG operates two facilities in the Reserve (Camp Edwards) with individual septic systems: Range Control and the Ammunition Supply Point (ASP)” (ibid., p. 56).

Communities surrounding the MMR rely on three types of wastewater treatment systems: individual on-site treatment systems, package (“neighborhood”) plants, and centralized wastewater collection. Septic systems or, in some cases, cesspools that remain in compliance with Massachusetts on-site wastewater treatment and disposal regulations (Title 5) are the primary wastewater infrastructure used by the surrounding communities. Package systems have greater flow volumes and higher treatment levels that are used to mitigate the impacts associated with larger commercial/residential projects or schools. There are 14 package plants that are permitted by the DEP in the Upper Cape communities. The town of Mashpee has seven operating treatment plants and collection systems, and two more facilities are proposed. There is also a

proposal to expand and make use of the existing package treatment plant at Sandwich’s Forestdale School to accommodate additional development in the area. There are only two centralized municipal and institutional wastewater collection, treatment, and disposal systems in the Upper Cape communities. Falmouth has a limited wastewater collection system (sewer) that conveys wastewater from Woods Hole and downtown Falmouth to a facility in the West Falmouth Harbor watershed for treatment and disposal. As noted above, the other centralized system handles wastewater generated at the MMR.

Wastewater Capacity

Wastewater flows averaging 180,000 GPD and permitted flows for the new jail of 60,000 GPD together exceed the 215,000 GPD maximum capacity of each treatment train. The Homeland Security Feasibility Study discusses the need for an additional treatment train to accommodate wastewater flows from the jail and the proposed Homeland Security facility while maintaining a reserve maintenance train.

Wastewater treatment needs are described in the following Table:

Wastewater Treatment Needs (GPD)	
Average Flow*	180,000
20% increase**	36,000
New Jail*	60,000
Homeland Defense Facility*	47,130
Total Projected Wastewater Flow	323,130
Single Treatment Train Max Capacity*	215,000
Reserve Maintenance Train Max Capacity*	215,000
Total Maximum Capacity*	430,000
Permitted Capacity (12-month moving average)*	360,000
*Homeland Security Feasibility Study **MMR Master Plan	

Mitigation of Wastewater Impacts

Wastewater generated by Upper Cape communities is primarily treated and disposed of using on-site disposal systems, with only limited areas benefiting from advanced wastewater treatment. The vast majority of the on-site wastewater disposal systems are a source of unmitigated nutrients that contribute to eutrophication of marine surface waters. Past wastewater disposal at the MMR

could also contribute to this problem as a plume of nutrient-contaminated groundwater within the Ashumet Valley migrates toward Green and Bourne ponds, estuaries along the south coast of Falmouth along Vineyard Sound that are already experiencing impacts from development in their watersheds.

Potential solutions to wastewater-related problems, such as the creation of inter-municipal wastewater cooperatives and aggregation and advanced treatment of wastewater, are being discussed at the regional level to find watershed-based solutions to impacts on surface waters from existing development. The close proximity of the MMR's wastewater treatment facility to neighboring residential communities within impaired watersheds and within the MMR JLUS study area warrants an assessment of the feasibility of adding capacity to the MMR treatment facility (see Table above) to mitigate nitrogen loading to groundwater within the MMR JLUS study area and the conveyance of treated wastewater to watersheds that do not discharge to sensitive marine waters (e.g. existing disposal beds along the Cape Cod Canal) have been discussed. Such collaborative efforts could be undertaken by the Upper Cape towns and the MMR on a cost-sharing basis.

Conclusions and Recommendations

Water-quality impairment has been a result of poor past land-use decisions both at the MMR and in neighboring communities and has resulted in regional water-quality problems and projected water-supply deficits on the Upper Cape that require regional solutions. Further development at the MMR and neighboring communities provides a unique opportunity to work collectively toward finding solutions to water-quality problems. A collaborative approach should consist of integrated planning and, where appropriate, shared infrastructure for solving water-quality problems should be an integral component of these solutions.

The location of study area neighborhoods adjacent to the MMR could aid the development of collaborative solutions to water-supply and wastewater problems faced by Upper Cape communities. Water supplies provided through the UCRWSC are a promising start to replacing contaminated water supplies lost to the Upper Cape. A projected water-supply deficit remains, however. Many neighborhoods within the study area currently obtain their drinking water from private wells. While the MMR Impact Area Groundwater Study's 2004 transition from investigation to cleanup as a rapid response action in Demolition Area 1 is encouraging (2004 Annual State of the Reservation Report), recent detections of contaminated groundwater in new areas underscore the need for each town's water district to plan an expansion of public water supplies to neighboring communities with private wells.

■ UPPER CAPE TRANSPORTATION NETWORK

Regional Roadways and Intersections

The regional roadway network surrounding MMR includes (starting at the Bourne Bridge and moving clockwise):

- Sandwich Road
- Route 6
- Route 130
- Great Neck Road
- Route 151
- Route 28

Development adjacent to these roads is characterized by a mix of residential and commercial uses. Due to intensive development, “off-season” traffic volumes now exceed the summer traffic volumes of about 20-25 years ago at many locations. On portions of these roads, particularly the roads approaching the Cape Cod Canal bridges, peak-period traffic volumes often exceed capacity, resulting in long backups and extreme delays. There are numerous constraints to adding road capacity, including financial, environmental, and community character issues.

According to the MMR Training Year (TY) 2003 State of the Reservation Report, “The Reserve (Camp Edwards) has an extensive transportation system including 120 miles of roads. However, a relatively small percentage of roads (approximately 21%) in the Reserve are paved. The majority of roads in the Reserve are unimproved single-vehicle trails that are utilized by wheeled vehicles for training and remediation purposes” (Massachusetts National Guard, p. 9).

Transportation Analysis—Introduction

Consistent with the December 2003 Scope of Work for the MMR JLUS, the transportation analysis is limited to a review of traffic operations and safety at the locations where the base access/egress intersects with the regional road system. The locations are Route 28 at the Otis Rotary, Route 151 at Sandwich Road, and Route 130 at Snake Pond Road.

Traffic Operations

The MMR Master Plan Final Report (1998), prepared by the Cape Cod Commission in conjunction with the Community Working Group, included analyses of the Route 151/Sandwich Road and the Route 130/Snake Pond Road intersections. Both were calculated as operating at Level of Service F (failure conditions) in both 1997 actual conditions and 2002 expected conditions based on stop-sign control.

Both intersections currently operate with full traffic-signal control. More recent analyses of these intersections, performed as part of the Talanian/South Cape Village traffic impact study (October 2003), indicate both intersections operated at

Level of Service C (acceptable conditions) or better during 2002 summer month/ peak-period conditions. It appears that full traffic-signal control has alleviated the past traffic congestion problems.

Traffic operations at the Otis Rotary were also analyzed as part of the Talanian/ South Cape Village traffic impact study (October 2003). As of 2002, the Connery Avenue approach to the rotary operated at Level of Service F conditions during peak periods during the summer.

It should be noted that typical peak-period conditions on Cape Cod generally occur between approximately 3 p.m. and 6 p.m. on weekdays and 10 a.m. and 2 p.m. on Saturdays.

Safety

The Otis Rotary is included in the top 1,000 high-crash locations in Massachusetts by the Massachusetts Highway Department. It ranks as number 228, with 73 crashes in the three-year period ending in 1999. The other locations do not appear on the high-crash list.

Future Conditions

There is considerable potential development within the defined study area that includes parts of Bourne, Falmouth, Sandwich, and Mashpee. This includes the potential for over 1,300 additional residential units (primarily in Mashpee and Sandwich) and over 4 million square feet of industrial/ commercial development (primarily in Bourne).

It is clear based on the analyzed level of service, potential area development, and background traffic growth rates of approximately 1% annually over the past decade, that traffic operations at these locations are likely to deteriorate.

In addition, based on the analysis contained in the feasibility study, it is expected that the Northeast Regional Training Center for Homeland Defense/Homeland Security will result in an increase of approximately 1,100 trips on a summer Friday. A key assumption in arriving at this estimate is that a high percentage of personnel attending military training events will arrive in convoys without access to private vehicles.

Alternatives for Consideration

The alternatives available to not worsen safety and traffic operations include:

- limit activities that would increase external automobile traffic during peak periods;

- offset increases in trip generation through the purchase of vacant developable land within the study area and the permanent protection of that land as open space;
- widen intersections and make related improvements.

Recommendations

- Update Level-of-Service analyses and crash data, identify operational deficiencies and develop measures to mitigate impacts of any uses that may add traffic through these intersections.
- If the homeland security facilities are constructed, implement the following measures:
 - minimize the increase in training events during the summer months;
 - restrict training personnel to using the Main Entrance (Connery Avenue) only;
 - create a bicycle/pedestrian loop and operate a seasonal shuttle service on the MMR campus;
 - to the extent possible, schedule base activities to avoid travel through the access/egress points during peak periods of adjacent street traffic.
- In the absence of the ability or support for intersection widening, limit new uses as follows:
 - Under applicable regulations, for any uses that will result in a net increase in traffic, offset the estimated trip generation of that use with the purchase of vacant developable land within the study area (preferably residential land). For example: An increase in daily traffic of 100 vehicle trips per day could be offset by the purchase of 10 residential house lots placed in a conservation restriction.
 - Limit new uses so there is no net increase in traffic: For each new use, eliminate an old use that generated the same amount of traffic.

BASE SECURITY AND ACCESS

■ GENERAL ACCESS TO THE MMR

Prior to September 11, 2001, the Massachusetts Military Reservation was an “open” post. This meant that anyone, for any reason, could travel onto or through the base. Security requirements after September 11, 2001 required that the Army National Guard limit access to the base to personnel with valid reasons to be on the base. Soldiers now perform security for the base at the MMR’s three external gates. All three gates are considered “primary” gates under Unified Facilities Criteria (UFC) 4-012-01, Security Engineering: Entry Control Facilities/ Access Control Points, developed by the DoD. This designation requires the gates to have video security

and blast-proof areas. There has been discussion about changing the designation so that only the Bourne gate (Connery Avenue) would remain a primary gate while the other two gates would be changed to secondary. The major impact of this change would be the requirement that all visitors and commercial vehicles use the Bourne gate.

Due to the nature of military operations at Otis, the perimeter of Otis Air National Guard Base is completely secured through fencing. However, substantial portions of the MMR are not fenced, particularly the northern training areas. In these areas, trespass, illegal dumping, soil erosion from ATVs and foot traffic, and public safety issues from unexploded ordnance remain a concern. Therefore, military officials should work with the Environmental Officer established through the Upper Cape Water Supply Reserve, local police departments, and the Massachusetts Environmental Police to reduce trespass onto the base.

■ BASE ACCESS DURING EMERGENCIES

The Massachusetts State Police, in conjunction with numerous agencies including the Massachusetts Emergency Management Agency, local emergency planners, and MMR military officials, have developed traffic management plans for Cape Cod in the event of a hurricane or other state of emergency. Particularly during the peak summer season, plans are focused on preventing extensive backups of traffic on and leading to the Sagamore and Bourne bridges, the only means of egress from the Cape by land.

To keep traffic flowing off Cape in the event of a hurricane, the plans focus on redirecting traffic around congested areas to points on the regional road system where entering or merging traffic will not affect the primary flow of traffic. In certain situations, traffic may be detoured through the MMR. In the event the bridges had to be closed due to sustained high winds, military officials have agreed to provide designated emergency parking areas and temporary shelter if needed until it is possible for people to leave the Cape safely.

■ CAMP EDWARDS SITE CONSOLIDATION PLAN

In early 2005, the Massachusetts Army National Guard (MAARNG) completed a detailed planning effort or Site Consolidation Plan (SCP) for Camp Edwards at the MMR. Planned improvements to existing facilities will ensure the continued quality of training that soldiers expect from Camp Edwards, within the standards of design excellence and environmental awareness that the public expects from the Army National Guard.

A key planning step in the creation of the SCP was the 1998 MMR Master Plan Final Report prepared in conjunction with the Community Working Group (CWG) by the Cape Cod Commission. A key recommendation of that plan was the consolidation of current military uses into distinct areas for more efficient present operations and

the preservation of other land for future generations. This is one of the important concepts of sustainability that has been incorporated into the creation of the SCP.

The SCP includes a long-term approach to coordinating land-based, military activities under Military Land Use Districts (MLUDs) for all of the Massachusetts National Guard's properties within the MMR. The SCP provides detailed descriptions of each of the MLUDs. Similar to municipal zoning, these MLUDs map out the locations of military activities and structures according to the best land-management practices. The MLUDs will become the basis for acting on each of the facilities and infrastructure projects proposed in the SCP.

Proposed improvements include replacing and repositioning the three security gates at the MMR. At the Sandwich gate, the SCP proposes to relocate Greenway Road further into the base to better buffer adjacent residential properties and improve base security. (*Figure 17. Overview of MAARNG Site Consolidation Plan on page 65.*)

UNIQUE LAND PROTECTION STRATEGIES

■ ARMY COMPATIBLE USE BUFFER PROGRAM

Legislation authorized in 2002 under 10 U.S.C. § 2684a authorizes a military installation to enter into an agreement with a state or local government or a private conservation organization to limit encroachment on lands neighboring the installation. The agreement would allow the installation to provide operation and maintenance funds to the partner group, who in turn would purchase title to "buffer" the installation from internal and external encroachments—a zone defined as an "Army Compatible Use Buffer (ACUB)." Priorities for funding are based on the following factors: training mission; encroachment risk; partner contribution; magnitude of the opportunity; and available parcels. Camp Edwards qualifies as a Tier 3 candidate out of five possible tiers.

■ THE UPPER CAPE WATER SUPPLY RESERVE

Chapter 47 of the Acts of 2002 created the Upper Cape Water Supply Reserve (the Reserve) in the northern portion of MMR. The legislation is designed to ensure the permanent protection of drinking water supply and wildlife habitats, while allowing compatible military training. The law provides for the independent oversight, monitoring, and evaluation of activities in the Reserve by the Environmental Management Commission (EMC). The EMC Environmental Officer monitors activities on and uses of the Reserve and the impact of those activities and uses on the water supply and wildlife habitats.

■ Mashpee National Wildlife Refuge

Congress designated the Mashpee National Wildlife Refuge (MNWR) in 1995. The MNWR is a unique land management partnership among multiple state, regional, and local organizations to protect land within a rapidly developing suburban landscape. The approach is a watershed-based design to protect down-gradient habitats in Waquoit Bay. The irregular pattern of the land within the boundaries of the MNWR was based on remaining undeveloped land within the watershed at the time the refuge was designated. Of the 5,800 acres within the MNWR, over 4,100 acres have been acquired so far. The Air National Guard owns several protected parcels within the refuge, while others still in need of protection are immediately adjacent to the Otis Air National Guard Base and within air-safety zones or high-noise areas. Cooperation and communication between military officials and refuge partners will ensure that any fencing associated with runway lighting maintains emergency access to MNWR lands. (Figure 18. Mashpee National Wildlife Refuge on page 67.)

RECOMMENDATIONS

The recommendations listed below are organized into two categories: general recommendations that apply to all four Upper Cape towns and the MMR, and town-by-town recommendations that may affect one or more communities and the MMR.

As proposed by the Area-Wide Environmental Impact Report for the MMR, the Massachusetts Military Reservation Military-Civilian Community Council (MCCC) was formed in 2004 to discuss policies and projects that affect the southern 5,000 acres or cantonment area of the MMR. The MMR MCCC includes regional and local government representatives, the Cape Cod Community College, and military representatives. The MMR MCCC can provide ongoing oversight to ensure implementation of the MMR JLUS recommendations that affect the cantonment area of the base.

For actions that affect the northern training areas of the MMR (Camp Edwards), the Environmental Officer and Environmental Management Commission established through the Upper Cape Water Supply Reserve should be consulted about implementation of recommendations for these areas.

Finally, through resolutions signed by the boards of selectmen at the outset of the MMR JLUS process, the towns of Bourne, Falmouth, Sandwich, and Mashpee have committed to a good faith effort to examine the MMR JLUS recommendations and consider implementation of those recommendations to the extent feasible, and subject to the approval of the appropriate local legislative and regulatory bodies. Annual meetings of the MMR JLUS Technical Advisory Committee should be held to assess progress on implementation of the recommendations contained in this report.



Figure 17. Overview of MAARNG Site Consolidation Plan (Courtesy of Brian Nickerson, Environmental and Readiness Center.)

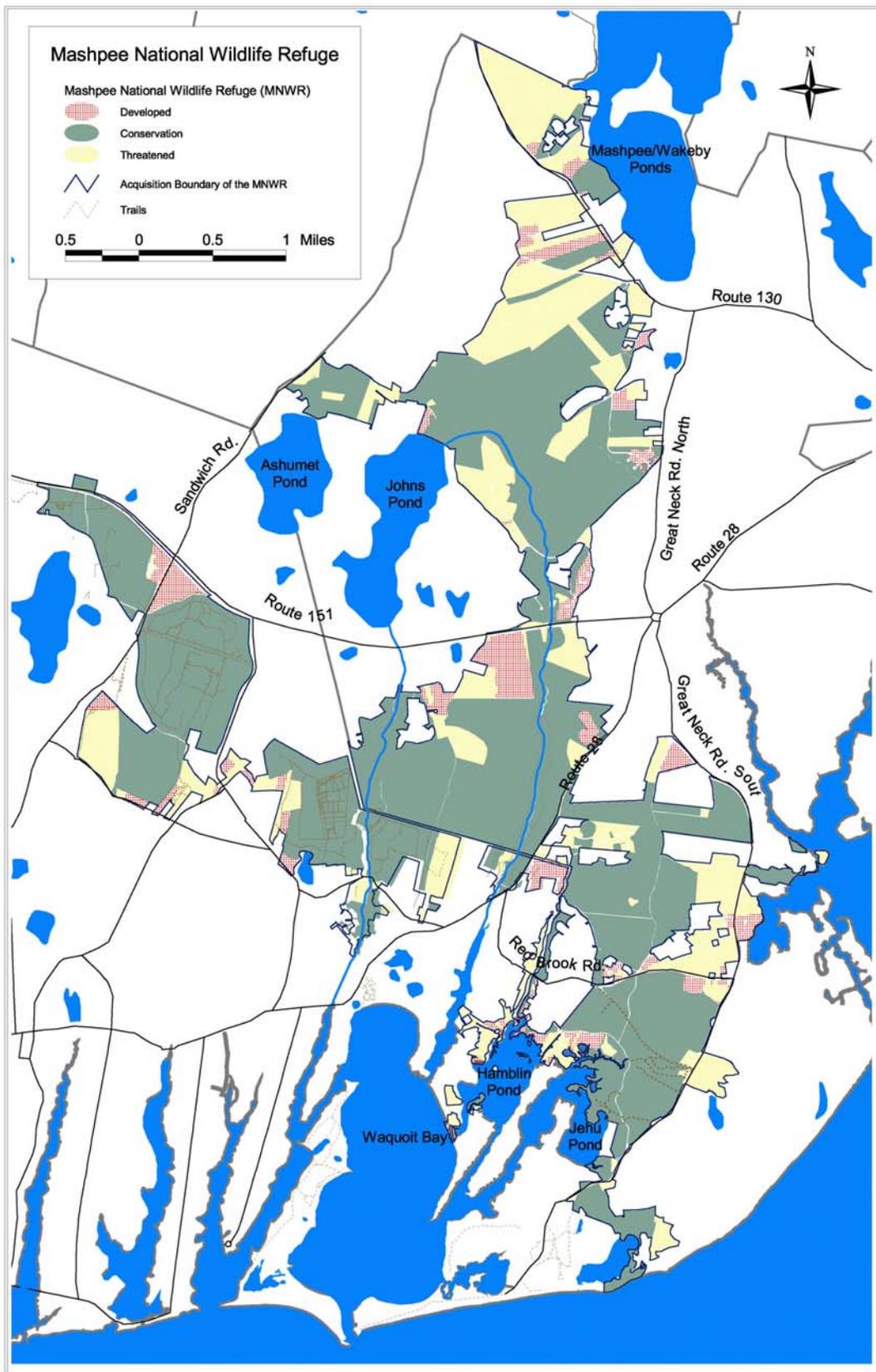


Figure 18. Mashpee National Wildlife Refuge (Courtesy of F. Thomas Fudala, Mashpee Town Planner.)

■ GENERAL RECOMMENDATIONS

Land Use Restrictions/Acquisition

- Local officials, Cape Cod Commission staff, and military officials should approach state housing agencies involved with M.G.L. Chapter 40B development regarding development restrictions in Otis Air National Guard safety zones and noise contours. Encourage state officials to consider application of restrictions to airfields statewide.
- The Air Force should consider establishing a compatible-use buffer program for lands adjacent to the Otis Air National Guard Base, similar to the Army's program established in 2002 under 10 U.S.C. §2684a. Under applicable programs, priorities for acquisition should be vacant lands within airfield safety zones and within areas of high airfield noise identified in the Otis Air Installation Compatible Use Zone study. Some land areas that correspond with these priorities include remaining developable land within the boundaries of the Mashpee National Wildlife Refuge that immediately abut base boundaries.
- State agencies, the four Upper Cape towns, and military officials should explore all available options for acquisition of properties that could have significant encroachment potential through fee-simple purchase, purchase of development rights, or restrictive use easements.
- As recommended by Air Force policy (Air Force Instruction 32-7063 Air Installation Compatible Use Zone Program), the Air Force should acquire or seek restrictive use easements for vacant land or properties within the CZ in the towns of Mashpee and Sandwich, and consider acquisition for land or properties within the APZ1 or noise contours greater than 70-75 dB Ldn.

Water Supply and Wastewater Infrastructure

- Explore available options to develop additional water supply capacity to supplement the Upper Cape Regional Water Supply Cooperative, including acquisition of undeveloped properties with water supply potential.
- Taking into account future growth needs of the Air National Guard at Otis, the 102nd Fighter Wing and interested Upper Cape municipalities should explore the feasibility of expanding capacity at the MMR's wastewater treatment facility to improve water quality within the MMR JLUS study area, including establishment of a quasi-public state entity.
- To protect existing water quality for MMR users and the Upper Cape towns, environmental review of the Camp Edwards Site Consolidation Plan (which includes the Northeast Regional Center for Homeland Security) should address the following: update the Zone II areas for the Upper Cape Water

Supply Cooperative and consider alternatives to development in Zone II areas; contain a detailed description of threats to drinking water from proposed uses; describe emergency response, spill-prevention, and mitigation strategies to protect water quality; and incorporate low-impact development strategies.

- Future uses of the MMR should be connected to the MMR's wastewater treatment facility.

Transportation Infrastructure

- Base activities should be scheduled to avoid travel through the access / egress points during peak periods of adjacent street traffic.
- Any new uses within the MMR or the JLUS study area that will result in a net increase in traffic should be offset by either purchase of vacant developable land within the study area (preferably residential land), or elimination of an existing use generating the same amount of traffic.

Personal Wireless Communications Facilities

- The towns of Mashpee, Sandwich, Falmouth, and Bourne should consider acting to protect navigable air space by requiring FAA Determinations of No-Hazard or evidence of exemption from the determination process for all new structures greater than 20 feet in height throughout their communities. To assist in this determination, an information worksheet should be developed for distribution by the building inspector's offices. Sample worksheets developed for Falmouth Airpark and Otis Air National Guard Base are included in Appendix 7.
- To provide a higher degree of safety and path predictability to U.S. Coast Guard and Army National Guard helicopter pilots to deviate from normal operational altitudes in emergencies during hostile weather, the towns of Mashpee, Sandwich, Falmouth, and Bourne should establish a 3,000-foot wide Search and Rescue ("SAR") Corridor District for the following roadways:
 - Route 130 north of Runway 05
 - Sandwich Road, John Parker Road, and Shorewood Drive south of Runway 23
 - Route 28 south of the Otis Rotary

Within these corridors, there should be an absolute height limit for all structures, including wireless communications facilities and wind turbines of 100 feet above ground, even if FAA says a greater height is not hazardous. Structures in this

district that exceed 60 feet in height should be required to be marked with a traditional red obstruction light, unless waived for good reason by the permit granting authority.

- Height limits established through local bylaws for all uses, including wireless, amateur, or other radio services, should be reviewed to ensure consistency with the new height regulations established for the SAR Corridor District.

Communication

- The four towns should provide an opportunity for military officials to comment on proposed zoning changes within the Accident Potential Zones or noise contours for Otis Air National Guard Base.
- The four towns and the Cape Cod Commission should provide a mechanism for military officials to comment on proposed development projects within the JLUS study area, even when the military is not a direct abutter to the project.
- Mashpee town officials should encourage ongoing communication between military officials and Mashpee National Wildlife Refuge partners to ensure that any fencing associated with runway lighting maintains emergency access to MNWR lands.
- Each community and the military should develop and maintain a JLUS link on its public web site that provides residents, developers, and businesses with information about military operations and an opportunity to comment about JLUS implementation efforts and any additional local measures to promote land-use compatibility around the MMR.

Base Access

- The four Upper Cape towns should encourage implementation of the Army National Guard Base Consolidation Plan, which will reduce the impact of military training on surrounding land use, particularly the proposal to relocate the Sandwich gate farther into the base to better buffer adjacent residential properties and improve base security. Preparation of a similar plan for Otis Air National Guard Base should be considered by the Air National Guard.
- Military officials should continue to work with the Environmental Officer established through the Upper Cape Water Supply Reserve, local police departments, and the Massachusetts Environmental Police to address trespassing and illegal dumping activities to the MMR.

Air Safety and Noise

- Noise contours should be incorporated into the zoning bylaws for all four towns or an overlay district should be considered to restrict development in noise-sensitive areas (please refer to Appendix 5 for suggested bylaw language).
- Local officials for the four Upper Cape towns should adopt and enact local policies to promote disclosure of safety and noise hazards, including the recording of disclosure documents prior to land transactions and development or sale of property (refer to Appendix 3, Hampton Roads Realtors Association® Purchase Agreement Addendum and Florida Department of Transportation Noise Disclosure Statement).
- The four Upper Cape communities should develop sound-attenuation standards for new construction and retrofitting of existing buildings for those uses above the 65 dB Ldn noise contours based on U.S. Department of Housing and Urban Development (HUD) standards. For additional information, please refer to: <http://www.hud.gov/offices/cpd/energyenviron/environment/compliance/qa/noise.cfm>
- The four Upper Cape communities should pursue uniform building code modifications to mitigate noise for new structures built in high-noise areas (see Appendix 6 for general noise-reduction construction standards).
- Land-use and build-out data provided in this MMR JLUS should be revised to reflect new Accident Potential Zones/noise contours when available.

■ TOWN-BY-TOWN RECOMMENDATIONS

Towns of Mashpee and Falmouth

- Existing Accident Prevention Zone bylaws in the towns of Mashpee and Falmouth should incorporate Accident Potential Zones from the new AICUZ study when available.

Towns of Mashpee and Sandwich

- The towns of Mashpee and Sandwich should explore the feasibility of crafting a local bylaw mandating cluster for developable residential land within the safety zones or noise contours to avoid these areas.
- The towns of Mashpee and Sandwich should reconsider planned-production affordable housing sites within the APZ1 and APZ2 or noise contours, unless density is restricted to one or two units/acre or development is clustered to avoid these areas.

Town of Bourne

- The town of Bourne's general bylaw should be amended to eliminate the Airport Approach Protection bylaw for Otis Air Force Base as the APZs for Bourne fall entirely within the boundaries of the MMR.

Town of Mashpee

- The town of Mashpee should restrict use of vacant municipal property within the CZ to avoid residential uses, schools, hospitals/nursing homes, places of assembly, or commercial uses.
- The town of Mashpee's Accident Prevention Zone bylaw should be amended to exclude the NStar easement from the wireless overlay district, where wireless communications facilities up to 200 feet in height are allowed.

Town of Sandwich

- The town of Sandwich should eliminate the Airport Approach Protection bylaw in the town's general bylaws and include an Accident Prevention Zone district into the town's zoning bylaws. At a minimum, this bylaw should be based on the town of Falmouth's or Mashpee's APZ bylaw, which restricts schools, hospitals, multi-family or public housing, or places of assembly with a height limit of 35 feet.
- The town of Sandwich should consider a zoning amendment to discourage conversion of recreational properties to residential use within the APZ2 or to prevent intensification of recreational uses, and should explore the feasibility of acquiring fee ownership or development rights on these properties to avoid incompatible uses.
- To reduce conflicts with residential uses on Snake Pond Road, access at the Sandwich gate to the MMR should be restricted to regular employees of the base only and access to visitors and commercial traffic should be prohibited. Working with the MMR Environmental Management Commission to ensure protection of the MMR Upper Cape Water Supply Reserve, military officials and the town of Sandwich should also explore the feasibility and costs to the town, state, and the military associated with relocating the Sandwich gate to a less residential location along existing paved roadways, including the potential for upgrading the intersection and signal at the Sandwich Industrial Park (Jan Sebastian Drive) and Route 130 from a three-way to a four-way intersection.
- The town of Sandwich should review the Wireless Telecommunications Overlay District Plan document to eliminate any lots that are located within the proposed SAR Corridor Overlay District.

REFERENCES

- Training Year (TY) 2003 State of the Reservation Report. Massachusetts Army National Guard.
- Final Area-Wide Environmental Impact Report for the Massachusetts National Guard. May 15, 2001.
- Air Installation Compatible Use Zone Study. Department of the Air Force, Headquarters 102nd Fighter Wing. Massachusetts Air National Guard. January, 1996.
- Massachusetts Military Reservation Master Plan Final Report. September 8, 1998. Cape Cod Commission in conjunction with the Community Working Group.

APPENDIX 1

- **Executive Summary, Air Installation Compatible Use Zone Resource Book for Otis Air National Guard Base, May 2002**

APPENDIX 2

- **Discussion of Airport Compatibility Issues between Local Land use and MMR Flight Operations.
Broadcast Signal Lab, LLP**

APPENDIX 3

- **Hampton Roads Realtors Association® Purchase Agreement Addendum; Florida Department of Transportation Noise Disclosure Statement**

APPENDIX 4

■ City of Tucson, Arizona Sample Land Use Code

APPENDIX 5

- **City of Virginia Beach, Virginia, Air Installation
Compatible Use Zone Sample Zoning Amendments**

APPENDIX 6

■ Basic Sound Level Reduction Construction Methods and Materials List

APPENDIX 7

■ Sample Worksheets for FAA No-Hazard Determination

APPENDIX 8

■ MMR JLUS Technical Advisory Committee/Policy Committee Meeting Minutes



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